APPLICATION GUIDE AG374

Externally powered Timers or Clocks
For models with an 'E' or 'G' suffix

Contents

Externally powered Timers or Clocks

1. Introduction

This Application Guide is intended to aid the selection of a Timer or Clock from the extensive range of models manufactured by BEKA associates. The guide also contains configuration examples.

The guide does not contain detailed system design or step-by-step configuration information which is contained in the instruction manual for each model. Detailed installation and certification information for use in hazardous areas is also contained in the instruction manual for each model which can be viewed on the BEKA website at www.beka.co.uk.

2. Description

The BEKA range of Timers or Clocks includes field and panel mounting models for general purpose applications and Ex certified models for use in gas and dust hazardous areas.

All models can be configured on-site as a Timer or as a Clock. This Application Guide is divided into three sections:

3. Selecting a model
4. Use as a Timer
5. Use as a Clock

All models can be supplied with an optional factory fitted display backlight and with dual control outputs. A wide range of marking and mounting accessories are also available.

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

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

One and two input models have similar functions. All Inputs can be configured to function with most types of active and passive sources including contacts, voltages, magnetic pick-offs and 2-wire proximity detectors.

Instruments are configured and calibrated via four push buttons using a common configuration menu. Although easy to configure on-site without the need for test equipment, instruments can be supplied configured and ready for installation with a printed slide-in scale card showing customer specified information for no additional charge.

Model	**BA374E**	**BA374G**
Some shown with optional backlight		
Enclosure material, size and IP rating	Field GRP 141 x 212mm IP66	Field GRP 122 x 120mm IP66
Number of M20 cable entries	3	2
Separate terminal compartment	Yes	No
Display	Primary: 8 digits 18mm high Secondary: 6 digits 12mm high	
Number of inputs	2	
Certification International IECEx **Gas** **Dust**	Ex ia IIC T5 Ga -40°C ≤ Ta ≤ +70°C N/A	Ex ia IIC T5 Ga -40°C ≤ Ta ≤ +70°C Ex ia IIIC T80°C Da -40°C ≤ Ta ≤ +60°C
Certification Europe ATEX **Gas** **Dust**	Group II Category 1G Ex ia IIC T5 Ga -40°C ≤ Ta ≤ +70°C N/A	Group II Category 1G Ex ia IIC T5 Ga -40°C ≤ Ta ≤ +70°C Group II Category 1D Ex ia IIIC T80°C Da -40°C ≤ Ta ≤ +60°C
Certification USA ETL	Class I Div 1 Gp A, B, C, D T5 Class II Div 1 Gp E, F, G. Class III Div 1 Class I Zone 0 AEx ia IIC T5 Ga -40°C ≤ Ta ≤ 70°C	
Certification Canada cETL	Class I Div 1 Gp A, B, C, D T5 Class II Div 1 Gp E, F, G. Class III Div 1 Ex ia IIC T5 Ga -40°C ≤ Ta ≤ 70°C	
Options - *must be specified when indicator is ordered*		
Backlight Control ouputs Status output	Included Included Included	Yes Yes Included
Accessories		
Pipe mounting kit Panel mounting kit Unsealed Sealed	BA393 N/A N/A	BA393G BA394G BA494G

BA374NG	BA574G
	
Field GRP 122 x 120mm IP66	Field GRP 122 x 120mm IP66
2	
No	No
Primary: 8 digits 18mm high Secondary: 6 digits 12mm high	
2	2
Ex nA ic IIC T5 Gc -40°C ≤ Ta ≤ +60°C Ex ic tc IIIC T80°C Dc -40°C ≤ Ta ≤ +60°C *Ex ic codes only refer to push button contacts*	Not Certified General purpose applications only
Group II Category 3G Ex nA ic IIC T5 Gc -40°C ≤ Ta ≤ +60°C Group II Category 3D Ex ic tc IIIC T80°C Dc -40°C ≤ Ta ≤ +60°C *Ex ic codes only refer to push button contacts*	
Class I Zone 2 AEx nA ic IIC T5 Gc Zone 22 AEx ic tc IIIC T80°C Dc -40°C ≤ Ta ≤ 60°C *Ex ic codes only refer to push button contacts*	
Ex nA ic IIC T5 Gc Ex n IIC T5 Gc Ex ic tc IIIC T80°C Dc Class III Div 2 Class II Div 2 Gp F, G -40°C ≤ Ta ≤ 60°C *Ex ic codes only refer to push button contacts*	
Yes Yes Included	Yes Yes Included
BA393G BA394G N/A	BA393G BA394G BA494G

Table 1 Field mounting Timers or Clocks

Model	BA377E	BA378E	BA377E-SS
Some shown with optional backlight			
Enclosure material & size	Panel Noryl 96 x 48 mm	Panel Noryl 144 x 72 mm	Rugged panel 316 S/steel 105 x 60 mm
Protection	Front IP66, rear IP20		
Display	Primary: 8 digits 9mm high Secondary: 6 digits 6mm high	Primary: 8 digits 18mm high Secondary: 6 digits 12mm high	Primary: 8 digits 9mm high Secondary: 6 digits 6mm high
Number of inputs	1	2	1
Certification International IECEx **Gas** **Dust**	Ex ia IIC T5 Ga -40°C ≤ Ta ≤ +70°C N/A		Ex ia IIC T5 Ga -40°C ≤ Ta ≤ +60°C * Ex ia IIIC T80°C Da -40°C ≤ Ta ≤ +60°C *
Certification Europe ATEX **Gas** **Dust**	Group II Category 1G Ex ia IIC T5 Ga -40°C ≤ Ta ≤ +70°C N/A		Group II Category 1G Ex ia IIC T5 Ga -40°C ≤ Ta ≤ +60°C * Group II Category 1D Ex ia IIIC T80°C Da -40°C ≤ Ta ≤ +60°C *
Certification USA ETL	Class I Div 1 Gp A, B, C, D T5 Class II Div 1 Gp E, F, G. Class III Div 1 Class I Zone 0 AEx ia IIC T5 Ga -40°C ≤ Ta ≤ 70°C		Zone 20 AEx ia IIIC T80°C Da -40°C ≤ Ta ≤ 60°C *
Certification Canada cETL	Class I Div 1 Gp A, B, C, D T5 Class II Div 1 Gp E, F, G. Class III Div 1 Ex ia IIC T5 Ga -40°C ≤ Ta ≤ 70°C		Ex ia IIIC T80°C Da -40°C ≤ Ta ≤ 60°C *
Options - *must be specified when indicator is ordered*			
Backlight Control ouputs Status output	Yes Yes No	Yes Yes Included	Yes Yes No
Accessories			
Rear sealing kit	BA495	N/A	BA495

** May be installed in an Ex e, Ex p, Ex n or Ex t panel enclosure without invalidating enclosure certification.*

BA377NE	BA577E	BA578E	BA577E-SS
			
Rugged panel 316 S/steel 105 x 60 mm	Panel Noryl 96 x 48 mm	Panel Noryl 144 x 72 mm	Rugged panel 316 S/steel 105 x 60 mm
Front IP66, rear IP20	Front IP66, rear IP20		
Primary: 8 digits 9mm high Secondary: 6 digits 6mm high	Primary: 8 digits 9mm high Secondary: 6 digits 6mm high	Primary: 8 digits 18mm high Secondary: 6 digits 12mm high	Primary: 8 digits 9mm high Secondary: 6 digits 6mm high
1	1	2	1
Ex nA ic IIC T5 Gc -40°C ≤ Ta ≤ +60°C Ex ic tc IIIC T80°C Dc IP66 -40°C ≤ Ta ≤ +60°C *Ex ic codes only refer to push button contacts*	Not Certified General purpose applications only		
Group II Category 3G Ex nA ic IIC T5 Gc -40°C ≤ Ta ≤ +60°C Group II Category 3D Ex ic tc IIIC T80°C Dc -40°C ≤ Ta ≤ +60°C *Ex ic codes only refer to push button contacts*			
Class I Zone 2 AEx nA ic IIC T5 Gc Zone 22 AEx ic tc IIIC T80°C Dc -40°C ≤ Ta ≤ 60°C *Ex ic codes only refer to push button contacts*			
Ex nA ic IIC T5 Gc Ex n IIC T5 Gc -40°C ≤ Ta ≤ 60°C *Ex ic codes only refer to push button contacts*			
Yes Yes No	Yes Yes No	Yes Yes Included	Yes Yes No
BA495	BA495	N/A	BA495

Table 2 Panel mounting Timers or Clocks

3. Selecting a model

When selecting a model the following requirements should be considered:

Mounting	Field or Panel
Location	Safe area Gas Hazardous area Zone 0, 1 or 2 Type of protection Certification authority Dust hazardous area Zone 20, 21 or 22 Type of protection Certification authority
Number of inputs	1 input 2 inputs
Options	Display backlight Dual control outputs

To simplify selection Table 1 summarises the specifications of all the field mounting instruments and Table 2 contains similar information for the panel mounting models.

Datasheets including specifications, instruction manuals and third party safety and ingress certificates for each model are available from the BEKA website www.beka.co.uk.

3.1 Mounting

The BEKA range of Timers or Clocks includes models for field and panel mounting.

3.1.1 Field mounting models

Field mounting Timers or Clocks with a 'G' model number suffix have a robust glass reinforced polyester (GRP) enclosure with an 8mm thick toughened glass window. The enclosure has IP66 ingress protection which will not be degraded by 7J impacts to the GRP case or 4J impacts to the window at temperatures between -40°C and +70°C. The enclosure's ingress and impact protection has been independently assessed by a third party UKAS accredited test house. The resulting test certificate is shown on the BEKA website.

The enclosure material is carbon loaded to prevent the accumulation of static charges. GRP is very strong and will not corrode or degrade when used for installations in marine and waste water environments. For installations in hazardous areas, GRP overcomes the restrictions limiting the use of aluminium in potentially explosive atmospheres.

Field mounting instruments with a 'G' model number suffix have two M20 x 1.5 threaded cable entries. To maintain the integrity of the enclosure both cable entries should be fitted with impact resistant M20 x 1.5 IP66 glands, conduit entries or blanking plugs.

The instrument's units of measurement and tag information can be marked onto a slide-in scale card clearly visible above and below the display. Although easy to configure on-site, Timers or Clocks can be supplied configured and calibrated with this scale card printed with customer specified units of measurement for no additional charge.

A 316 stainless steel legend plate which can be supplied laser engraved with customer specified information is available as an option.

Field mounting Timers or Clocks are surface mounting, but can be pipe or panel mounted using one of the BEKA accessory kits.

BA393G	316 stainless steel pipe mounting kit, attaches an instrument to any vertical or horizontal pipe with outside diameter between 40 and 73mm.

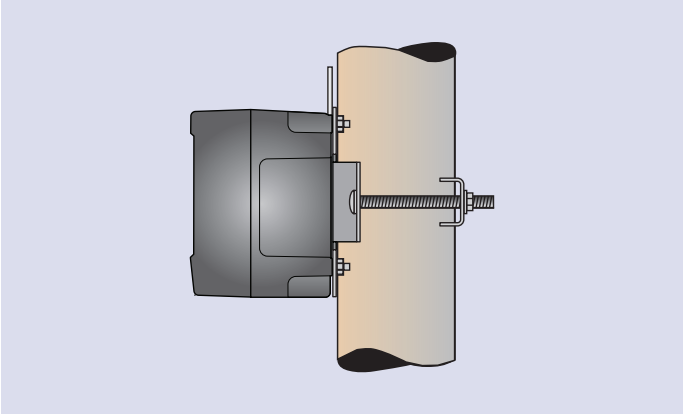

Fig 1 BA393G Pipe mounting kit

BA394G	316 stainless steel panel mounting kit secures a field mounting instrument into a panel aperture, but does not seal panel aperture.

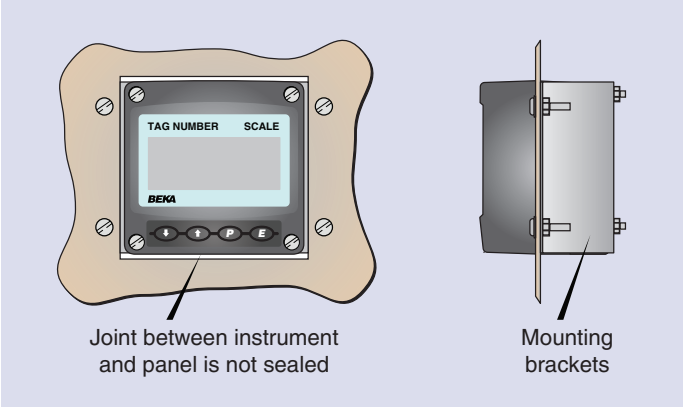

Fig 2 BA394G Panel mounting kit

BA494G GRP panel mounting kit secures a 'G' suffix field mounting instrument into a panel aperture and provides an IP66 seal between the front and rear of the panel.

The BA494G has ATEX and IECEx intrinsic safety certification confirming that when securing a BEKA intrinsically safe instrument housed in a 'G' enclosure it will not invalidate the intrinsic safety of the instrument.

The BA494G is not certified for securing a Ex nA or Ex tc certified field mounting instruments.

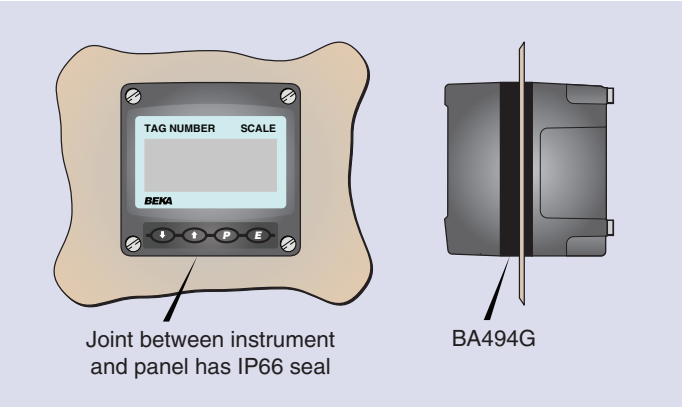

Fig 3 BA494G Sealed panel mounting kit

3.1.2 BA374E

In addition to the 'G' suffix intrinsically safe field mounting models, the BA374E intrinsically safe Timer or Clock is also available. This has a rugged GRP impact resistant IP66 enclosure including a separate field terminal enclosure with three tapped M20 x 1.5 cable entries. This model is supplied with a display backlight and dual control outputs.

Options include a printed internal display escutcheon showing customer specified units and tag information. An external stainless steel legend plate which can be supplied laser engraved with customer specified information is also available.

The BA374E Timer or Clock is surface mounting, but can be pipe mounted using a BA393 stainless steel pipe mounting kit.

3.1.3 Panel mounting models

Panel mounting Timers or Clocks are available in 96 x 48mm and 144 x 72mm glass loaded Noryl (modified PPE) DIN enclosures with a toughened scratch resistant glass display window. The enclosure size depends upon the display size and the number of inputs. Both enclosures have IP66 front of panel ingress protection, and when correctly installed provide an IP66 seal between the instrument and the instrument panel.

The ingress protection of the enclosures have been independently assessed at temperatures between -40°C and +70°C by a third party UKAS accredited test house. The resulting test certificate is shown on the BEKA website.

The instrument's units of measurement can be marked onto a slide-in scale card clearly visible at the right hand side of the display. The scale card can be fitted without opening the instrument enclosure or removing the Timer or Clock from the instrument panel. Although easy to configure on-site, Timers or Clocks can be supplied configured with the scale card printed with customer specified units of measurement for no additional charge.

For panel mounting applications in marine environments, or where the front of the instrument is likely to be impacted, single input rugged models are available in a rugged 316 stainless steel enclosure. These models, which are identified by an '-SS' model number suffix, have identical features as the other models including the slide-in scale card.

The stainless steel enclosure has IP66 front of panel ingress protection, and when correctly installed provides an IP66 seal between the instrument and the instrument panel. The ingress protection of the enclosure has been independently assessed at temperatures between -40°C and +70°C by a third party UKAS accredited test house. The resulting test certificate is shown on the BEKA website.

The intrinsically safe BA377E-SS Timer or Clock has been certified for installation in Ex e and Ex p enclosures without invalidating the certification of the panel enclosure in which it is mounted.

For applications in Zone 2 or 22 without the need for Zener barriers or galvanic isolators, the BA377NE Timer or Clock has Ex nA non-sparking and Ex tc dust ignition protection by enclosure.

Please see BEKA Application Guide AG310 for more information on how to install this Timer or Clock.

The rear of panel ingress protection of all 96 x 48mm and 105 x 60 rugged stainless steel Timers or Clocks can be increased from IP20 to IP66 with a BA495 rear cover sealing kit. Manufactured from 316 stainless steel the cover incorporates two M20 unthreaded entries for cable glands, allowing Timers or Clocks to be installed in open panels.

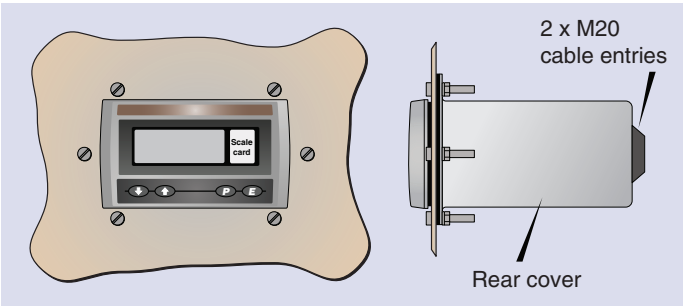

Fig 4 BA495 rear sealing kit

3.2 Location

Having decided how the Timer or Clock is to be mounted, the location of the installation will help to determine the required model.

3.2.1 General purpose application

If the Timer or Clock is to be installed in an area which does not have a flammable gas or combustible dust hazard, the following general purpose two input Timer or Clock should be selected.

Field mounting

BA574G 2 input

See Table 1

Panel mounting

BA577E	1 input	96 x 48mm
BA578E	2 input	144 x 72mm
BA577E-SS	1 input	Rugged 105 x 60mm

The panel mounting models are available in two alternative DIN enclosure sizes plus a rugged impact resistant instrument in a 316 stainless steel enclosure. See Table 2.

3.2.2 Explosive atmosphere applications

To select a Timer or Clock for a hazardous area installation, the Zone or Division in which it is to be installed and the hazard must be known, together with the required certification authority i.e. IECEx, ATEX or ETL.

The range includes intrinsically safe Ex ia models for installation in most gas and dust Zones. For installations in Zone 2 or 22 without the need for Zener barriers or galvanic isolators, models with non-sparking Ex nA certification for gas hazards and dust ignition protection by enclosure Ex tc are included.

Field mounting see Table 1

BA374E	2 input	1G	Ex ia	*Separate terminal compartment.*
BA374G	2 input	1GD	Ex ia	
BA374NG	2 input	3GD	Ex nA and Ex tc	

See Table 1

Panel mounting see Table 2

BA377E	1 input	96 x 48mm	1GD Ex ia
BA378E	2 input	144 x 72mm	1GD Ex ia
BA377E-SS	1 input	Rugged 105 x 60mm	1GD Ex ia
BA377NE	1 input	Rugged 105 x 60mm	3GD Ex nA and Ex tc

See Table 2

When selecting a Timer or Clock for installation in a hazardous area, the instrument's apparatus certificate should be consulted to ensure that the instrument has approval for use in the required Zone, gas group and ambient temperature.

3.3 Operating temperature

All the field and panel mounting Timers or Clocks, have an operating temperature of -40°C to +70°C. Between these temperatures the Timer or Clock will function normally, however at temperatures below -20°C the display digits will gradually change more slowly and contrast will be reduced. At some temperature below -20°C the display will stop functioning, but timing will continue normally and the instrument will not be damaged.

Models with an 'NE' and 'NG' suffix have a maximum certification temperature of +60°C but low temperature performance is the same as other models. The maximum dust certification temperature of 'G' suffix models is also +60°C.

The rugged BA377E-SS has a maximum certification temperature of +70°C when used purely as an intrinsically safe instrument. This is reduced to +60°C when mounted in an Ex e or Ex t enclosure and maintaining the integrity of the enclosure. The low temperature performance is the same as other models.

4. Use as a Timer

When configured as a Timer all BEKA externally powered Timers or Clocks have similar functions, although the number of inputs and the output options will differ. Fig 5 shows a simplified block diagram of a two input instrument.

A Timer can measure and display the elapsed time between external events. Timing can be started and stopped by a remote sensor, or from the front panel push buttons.

External events can also be controlled, such as opening a valve for a predetermined time via the optically isolated status output or the optional factory fitted isolated control outputs. 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 Timer to automatically repeat the timing period up to 99 times, or continuously, with a configurable delay between timed periods of up to 100 hours which is ideal for sampling and dosing applications.

Single input instruments are started and stopped by a high or low single input. Two input instruments provide more flexibility as starting is controlled by one input and stopping by the other.

The Timer 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 may be accomplished via the front panel push buttons or a remote contact.

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

A simplified block diagram of a two input instrument is shown in Fig 5. 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 instrument energises the associated sensor input terminals.

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

Internally powered Backlight

Dual isolated Control Outputs

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

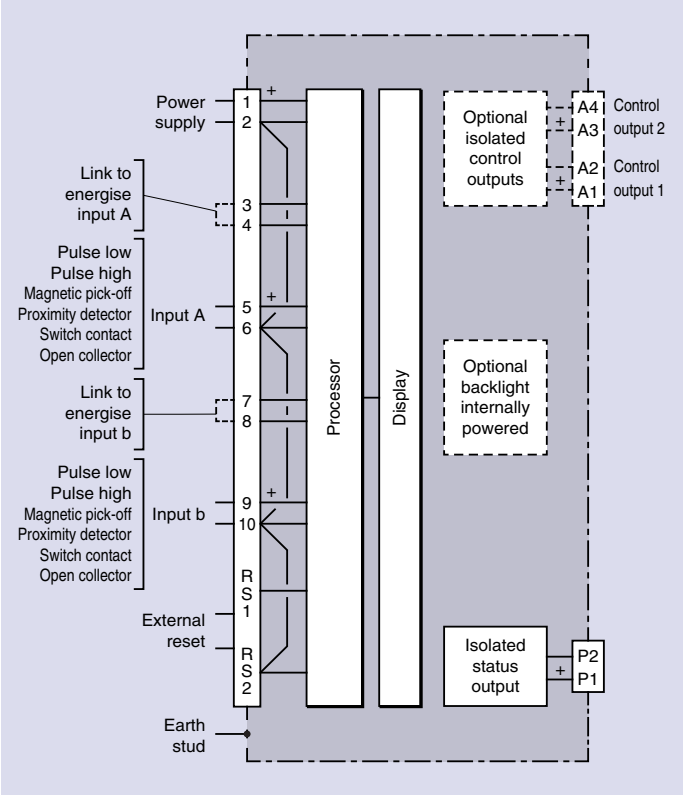

Fig 5 Simplified diagram of two input Timer

Single input Timers or Clocks do not have a status output, see Tables 1 and 2.

4.1 Timer function

The Timer function is represented by the state diagram shown in Fig 6. A state diagram describes the behavior of a system and is composed of a number of stable states linked by events, the transistions between states.

The circles in Fig 6 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 on input b or operation of the ▲ button.

The state diagram shown in Fig 6 applies both when the instrument is measuring the time between external events and when it is controlling external events.

The five Timer states are:

Reset

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

Running

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

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

Restart-delay

Entered automatically from *Running* or manually from Paused. At the end of the delay time automatically returns to *Running*.

Complete

Entered automatically from the *Running* state when the instrument has timed-up to the set time or timed-down from the set time to zero. Or, when the CYCLES function is enabled, there are no more timing cycles to perform.

The CYCLES function allows timing cycle to repeat up to 99 times, or it can be configured to repeat continuously.

4.2 Timer controls

Timers are controlled and configured via four front panel push buttons. In the timer mode i.e. when the instrument is measuring time between external events or is controlling external events, the push buttons have the following functions:

Push Button Functions

▼	When local control is enabled starts the Timer.
▲	When local control is enabled stops or pauses the Timer.
E + ▲	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 GLr GtoL is enabled in the LoC rSEt configuration function. To reset the grand total to zero from the timer mode press the E + ▲ buttons for ten seconds until CLr. no is displayed. Using the ▼ or ▲ button change the display to CLr. YES and press E.
▼ + ▲	When the two buttons are operated simultaneously for more than two seconds resets the Timer to zero or to the set time SEt t depending on whether the Timer is configured to *time-up* or *time-down*. This is a configurable function.
P + ▲	When enabled in the configuration menu, operating these two buttons simultaneously provides direct access from the timer mode to the set time SEt t and, if the repeat timing cycle is enabled, to the restart delay rSt dELA.
P + ▼	Shows in succession, firmware version number, instrument function ELAPSE or CLoC and output accessories: -A control outputs -P Status output **Note:** only field mounting and two input panel mounting instruments have a status output.
P + E	Accesses the configuration menu

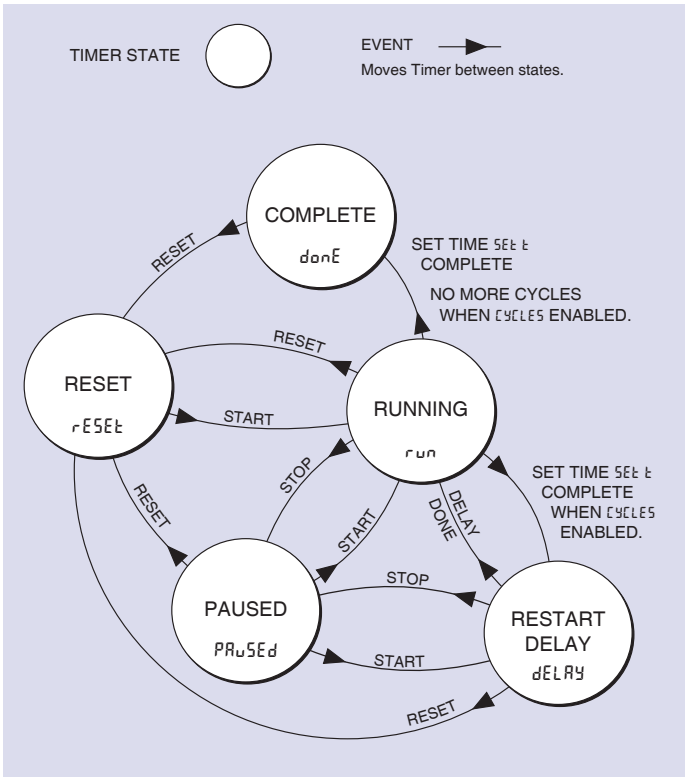

Fig 6 Timer state diagram

4.3 Timer Displays

Timers or Clocks have two digital displays and associated annunciators as shown in Fig 7.

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 SEt t. The display may be formatted as hh:mm:ss; hh:mm; mm:ss or ss.

Lower display The options available for the lower display depend on whether the Timer repeat cycle function CYCLES, which can repeat the timing period up to 99 times or continuously, is enabled.

CYCLES disabled
The lower display shows the set time SEt t or the lower display may be disabled if not required.

CYCLES 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.
During a restart delay, the remaining delay time before the next cycle starts is shown. Alternatively the lower display may be disabled if not required.

Reset annunciator RESET shown while the instrument is being reset to zero or to the set time SEt t.

Status output annunciator RTx shown while status output is activated.

Note: only field mounting and two input panel mounting instruments have a status output.

Control output annunciators '1' and '2' Activated when associated control output is *on*.

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

The Timer's display digit size depends upon the model as shown below.

	Display size 6 digits	8 digits
Field mounting		
All models	12mm	18mm
Panel mounting		
96 x 48mm	6mm	9mm
144 x 72mm	12mm	18mm
Rugged 105 x 60mm	6mm	9mm

If only the elapsed time display is required, the lower display may be disabled.

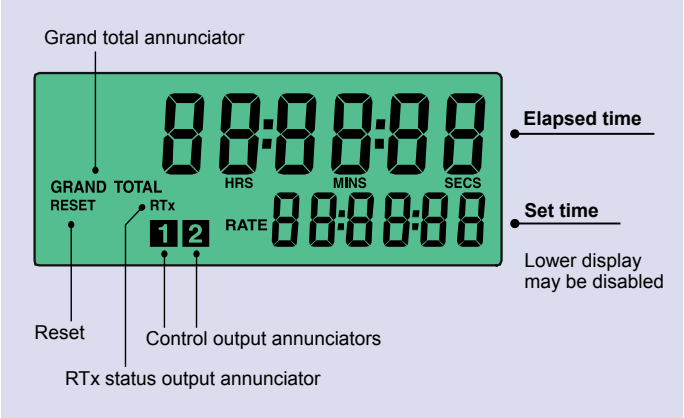

Fig 7 Timer display

The Timer may be reset by simultaneously operating the ▼ and ▲ push buttons, or remotely by connecting the instrument's external reset terminals RS1 and RS2 together. The instrument can be configured to reset in 1 second if using a manually operated contact, or rapidly within 2 milliseconds if being reset by another instrument.

The Timer maintains a protected Grand Total time which is not reset when the instrument is reset and is retained when the instrument is not powered.

4.4. Timer Configuration

All models are configured using a common intuitive menu which is accessed via the four instrument push buttons and can be protected by a user defined four digit alpha numeric access code. The configuration menu is shown diagrammatically in the full instrument instruction manual, together with a *get you started quickly* summary, supported by a detailed description of each configuration function. The Timer can be configured on-site without the need for external test equipment.

The configuration menu uses English language names to describe functions and variables such as CodE and dEbounCE. When the function name has more than eight characters a simple abbreviation is used such as di SP-2 (Display 2) and LoC rSEt (Local Reset). In this Application Guide these function and variable names are shown in a seven segment font, exactly as they appear on the Timer's display.

All Timer or Clock models can be supplied configured with a slide-in scale card printed with customer specified legends for no additional charge.

4.5 Configuration sequence

If configuration is not requested when the instrument is ordered, the Timer or Clock will be supplied with default Timer configuration which is defined in the full instruction manual for each model. A reset to factory defaults function rSEt dEF is included in the instrument configuration menu.

Although configuration is not difficult, BEKA Timers are versatile instruments that can perform many functions. For all but very simple applications, it is helpful to use the state diagram shown in Fig 6 to assist defining the required configuration. The state diagram shows the five timer states and the routes for moving between them. It applies when the Timer is measuring the period between external events and also when the Timer is controlling external events via the status and optional control outputs

4.6 Configuration as a simple stopwatch

To illustrate how the state diagram is used, consider a very simple application in which the Timer is required to operate as a stopwatch by measuring and displaying the period between the instrument ▼ and ▲ push buttons being operated. This requirement can be represented by the state diagram shown in Fig 8.

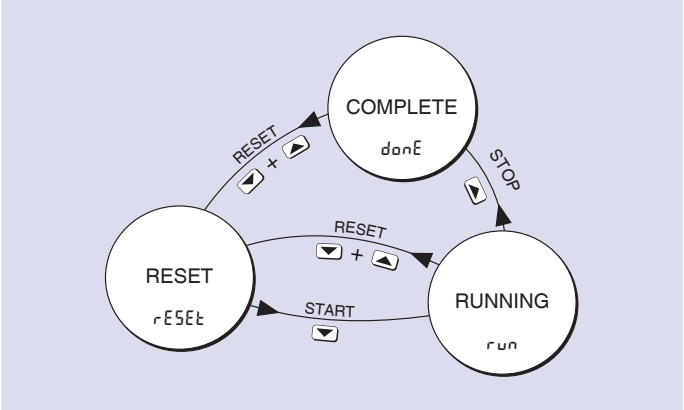

Fig 8 Timer state diagram when measuring time between external events.

This requires that:

StAr StoP function is set to:

	Start	Stop
LoCAL	▼ button	▲ button

With the Timer in the rESEt state, operating the ▼ button will move the Timer to the run state. Timing will continue until the ▲ button is operated which will move the Timer to the donE state. The time period between the ▼ and ▲ buttons being operated will be shown on the instrument's upper display. Before another time interval can be measured, the Timer has to be moved from the donE to the rESEt state by operating the ▼ and ▲ button simultaneously.

By changing the StAr StoP function configuration from LoCAL to another input, the Timer could measure and display the time interval between the input(s) being high or low and the Timer could be reset via the external reset input.

4.7 Configuration for controlling external events

When the Timer or Clock is fitted with optional control outputs it is able to control external events. To illustrate what the Timer can do, consider a very simple application in which the Timer is required to turn control output 1 *on* for 50 seconds when the instrument's ▼ push button is operated. This is represented by the Timer state diagram shown in Fig 9. In this illustration, start, stop and reset functions are shown controlled by the instrument's push buttons, but they can also be controlled by inputs from external sensors.

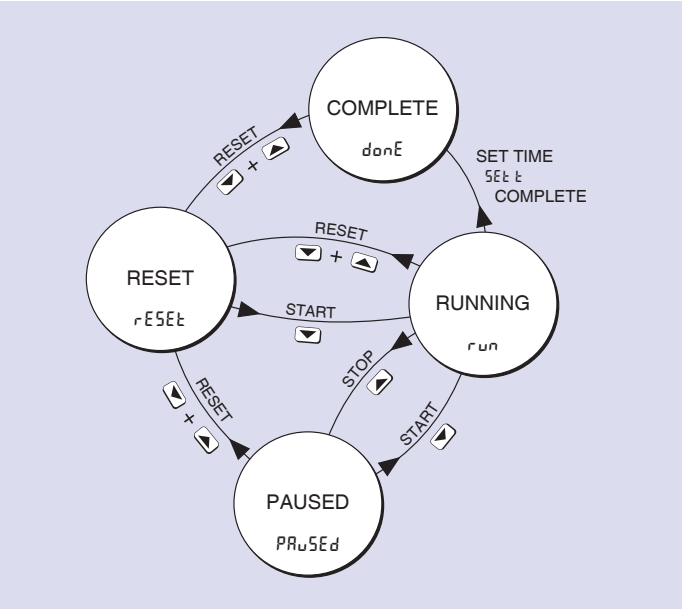

Fig 9 Timer state diagram when controlling external events

This requires that:

StAr StoP function is configured:

	Start	Stop
LoCAL	▼ button	▲ button

oP1 on function is configured:

EnbL	on
run	Control output 1 turns *on* when the Timer enters the run state.

oP1 oFF function is configured:

n run	Control output 1 turns *off* when the Timer enters any other than the run state.

Set time SEt t function is configured:

SEt t	50

With the Timer in the rESEt state, operating the ▼ button will move the Timer to the run state and control output 1 will turn *on*. When the set time of 50 seconds has expired, the Timer will automatically move to the donE state and control output 1 will turn *off*. Before control output 1 can be turned *on* for another 50 second period, the Timer must be moved from the donE to the rESEt state by operating the ▼ and ▲ button simultaneously, after which the Timer is ready to start again when the ▼ button is operated.

While in the run state the Timer may be moved to the PAuSEd state by operating the ▲ button, this will stop the timing period and turn control output 1 *off*. The Timer can be returned to the run state by operating the ▼ button which will turn control output 1 *on* again and complete the timing period. Alternatively, the Timer can be moved from the PAuSEd to the rESEt state by operating the ▼ and ▲ button simultaneously, from which a new timing cycle can be started.

4.8 Configuring repeated timing cycles

The Timer can be configured to automatically repeat a timing cycle a specified number of times up to 99, or to repeat the cycle continuously. A specified delay may be introduced between each timing cycle of up to 99 hours, 59 minutes and 59 seconds. Fig 10 shows the Timer state diagram when configured for repeating the timing cycle. In this illustration, start, stop and reset functions are shown controlled by the instrument's push buttons, but they can also be controlled by inputs from external sensors.

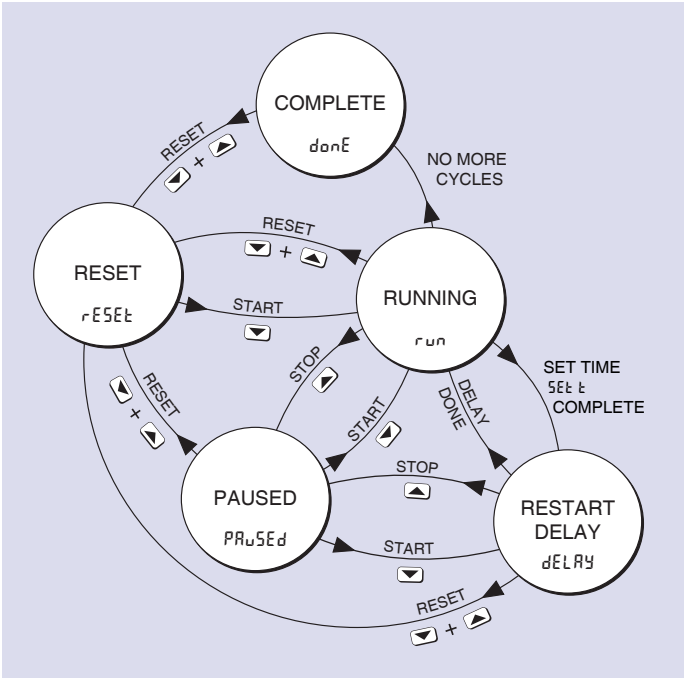

Fig 10 Timer state diagram including repeated timing cycle

To illustrate how the repeated timing cycle is configured, consider extending the simple application described in section 4.7. In this example the Timer is required to turn control output 1 *on* for 50 seconds when the instrument's ▼ push button is operated and to automatically repeat this timing cycle 20 times with a delay of 30 seconds between timing cycles.

This requires that:

StAr StoP function is configured:

	Start	Stop
LoCAL	▼ button	▲ button

oP 1 on function is configured:

EnbL	on
run	Control output 1 turns *on* when the Timer enters the run state.

oP 1 oFF function is configured:

n run	Control output 1 turns *off* when the Timer enters any other than the run state.

Set time SEt t function is configured:

SEt t	50

CYCLES function is configured:

EnbL	on
CYCL Cnt	20
rSt dELA	30

With the Timer in the rESEt state, operating the ▼ button will move the Timer to the run state and control output 1 will turn *on*. When the set time of 50 seconds has expired, the Timer will automatically move to the dELAY state and control output 1 will turn *off*. After the restart delay of 30 seconds has expired, the Timer will return to the run state and control output 1 will turn *on* for the second 50 second period. After the 20th run cycle the Timer automatically moves to the donE state and control output 1 turns *off*, as there is no delay state after the last run cycle. See Fig 10.

Before another group of 50 second timing periods can be started, the Timer must be moved from the donE to the rESEt state by operating the ▼ and ▲ button simultaneously, from which the Timer is ready to start again when the ▼ button is operated.

While in the run or dELAY states the Timer may be moved to the PAuSEd state by operating the ▲ button, this will stop the timing period, and if in the run state, turn control output 1 *off*. The timing cycle may be resumed from the point at which it was paused by operating the ▼ button. Alternatively, the timing cycle can be abandoned by moving the Timer from the PAuSEd to the rESEt state by operating the ▼ and ▲ button simultaneously, from which a totally new group of timing periods can be started by operating the ▼ button.

4.9 Starting and stopping the Timer

As mentioned in previous sections, Timers can be controlled by operating the instrument push buttons, or by inputs from external sensors or switches. How the Timer is started and stopped is defined by the StArStoP function in the configuration menu.

Voltage inputs are shown in the following table, but the low and high function varies with the type of input. The instruction manual for each model specifies the equivalent for proximity detector, switch contact and open collector inputs.

For single input instruments

	Start	Stop
Control 1	Input high	Input low
Control 2	Input low	Input high
LoCAL	▼ button	▲ button

For two input instruments

	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

Inputs may be independently configured to operate with a wide variety of sensors including:

Switch contacts
2-wire proximity detector
Open collector
Magnetic pick-off
Low and high voltage signals

4.10 Control outputs

All Timer or Clock models can be supplied with optional factory fitted dual control outputs which should be requested when the instrument is ordered. Each control output is a galvanically isolated solid state switch which can be independantly configured to turn *on* or *off* when the Timer enters a specified state. The status of the control outputs is shown by the '1' and '2' annunciators on the instrument's display. The annunciator is activated when the associated control output is *on*.

Each control output may be independently configured to turn *on* when the Timer enters a selected Timer state. e.g. if run is selected, control output turns *on* when the Timer enters the run state. The control output can be independently configured to turn *off* when the Timer enters any other state.

Configurable control output *on* states

Timer Display	Output 1 turns *on* when Timer enters selected state:
rESEt	Reset state
run	Run state
PAuSE	Paused state
dELAY	Restart delay state
donE	Done state
	Output 1 turns *on* when Timer enters any other than the selected state:
n rESEt	Reset state
n run	Run state
n PAuSE	Paused state
n dELAY	Restart delay state
n donE	Done state

Configurable control output *off* states

Timer Display	Output 1 turns *off* when Timer enters selected state:
rESEt	Reset state
run	Run state
PAuSE	Paused state
dELAY	Restart delay state
donE	Done state
	Output 1 turns *off* when Timer enters any other than that selected state:
n rESEt	Reset state
n run	Run state
n PAuSE	Paused state
n dELAY	Restart delay state
n donE	Done state

This allows each control output to be independently configured. When configuring a control output it is helpful to refer to the Timer state diagram.

To illustrate control output configuration, consider the common requirement when a control output is only required to be *on* in one Timer state. If control output 1 is required to be *on* when the Timer is in the run state it should turn on when the Timer enters the run state and turn *off* when the Timer enters any other state. This can be achieved with following configuration:

oP1on run	Turns *on* when Timer enters the run state.
oP1oFF n run	Turns *off* when Timer enters any other than the run state i.e. rESEt, PAuSEd, dELAY or donE states.

Alternatively if control output 1 is required to be *on* in all Timer states except the run state the required configuration is:

oP1on n run	Turns *on* when Timer enters any other than the run state i.e. rESEt, PAuSEd, dELAY or donE states.
oP1oFF run	Turns *off* when Timer enters the run state.

A control output can be configured to be *on* in more than one Timer state. Considering the Timer state diagram shown in Fig 9. If control output 1 is required to be *on* when the Timer is in the rESEt, run and PAuSEd states and *off* when it is in the done state. This can be achieved with the following configuration:

oP1on rESEt	Turns *on* when Timer enters the rESEt state.
oP1oFF donE	Turns *off* when Timer enters the donE state.

This example illustrates how the control output status remains unchanged while the Timer passes through unnamed states. When the Timer is rESEt control output 1 turns *on*. It remains *on* while the Timer is in the run or PAuSEd states and only turns *off* when the Timer enters the donE state.

4.10.1 Control output delay

Each control output may be delayed from turning *on* for a fixed time following the selected condition occurring, such as when the Timer enters the *Run* state. This delay can be adjusted in 1 second increments up to 32,400 seconds, which is 9 hours.

4.11 Status output

All field mounting BEKA Timers and the larger 144 x 72mm panel mounting two input models have an optically isolated open collector status output.

This is a passive output which must be externally powered, or connected to an instrument with an open collector or switch contact input. When connecting the status output from a Timer to another BEKA Timer or Clock the second instrument should be configured for an open collector input with the input energising link fitted.

The status output has the following electrical parameters:

Ron	=	60Ω + 3V
Roff	=	1MΩ
Imax	=	10mA

It can be connected to a PLC input or similar system to indicate the status of the Timer, or it may be used to switch low power loads such as an LED panel lamp or low power sounder.

Just like the control outputs the status output can be independently configured to turn *on* or *off* when the Timer enters any of it's five states. The 'RTx' annunciator on the Timer's display is activated when the status output is *on*.

The status output may be independently configured to turn *on* when the Timer enters one selected Timer state e.g. turns *on* when the Timer enters the run state if run is selected. The status output can be independently configured to turn *off* when the Timer enters any but the selected state e.g. *off* when entering the rESEt, PAuSEd, dELAY or donE status if n run is selected.

Configurable status output *on* states

Display	Status output turns *on* when Timer enters selected state
rESEt	Reset state
run	Run state
PAuSE	Pause state
dELAY	Restart delay state
donE	Done state
	Status output turns *on* when Timer enters any other than the selected state:
n rESEt	Reset state
n run	Run state
n PAuSE	Pause state
n dELAY	Restart delay state
n donE	Done state

Configurable status output *off* states

Display	Status output turns *off* when Timer enters selected state:
rESEt	Reset state
run	Run state
PAuSE	Pause state
dELAY	Restart delay state
donE	Done state
	Status output turns *off* when Timer enters any other than the selected state:
n rESEt	Reset state
n run	Run state
n PAuSE	Pause state
n dELAY	Restart delay state
n donE	Done state

Status output configuration is identical to control output configuration described in section 4.10 and includes a separate delay time.

4.12 Timer configuration examples

This section contains examples of Timer configurations requested by BEKA customers. Step-by-step instructions are not included nor are non-calibration configuration functions as it is assumed that the Timer has been reset to the factory defaults before configuration is started.

Example 1

A customer wished to use a BEKA BA378E two input panel mounting Timer or Clock to control a stirrer in a mixing vessel. The stirrer was required to operate for 45 minutes and was to be manually started by the operator who also needed to pause the stirrer rotation without affecting the total stirrer time. An emergency stop control was required to stop the stirrer rotation and cancel any remaining stirrer time. Large industrial control push buttons were required.

The Timer was required to show the elapsed time on the upper display in minutes and seconds and the timer set time on the lower display.

Fig 11 shows the BA378E instrument connections. Normally open push buttons which momentarily close when operated were used for the start control connected to input A and for the pause control connected to input b. The emergency stop and Timer reset also used a normally open push button which momentarily closed when operated.

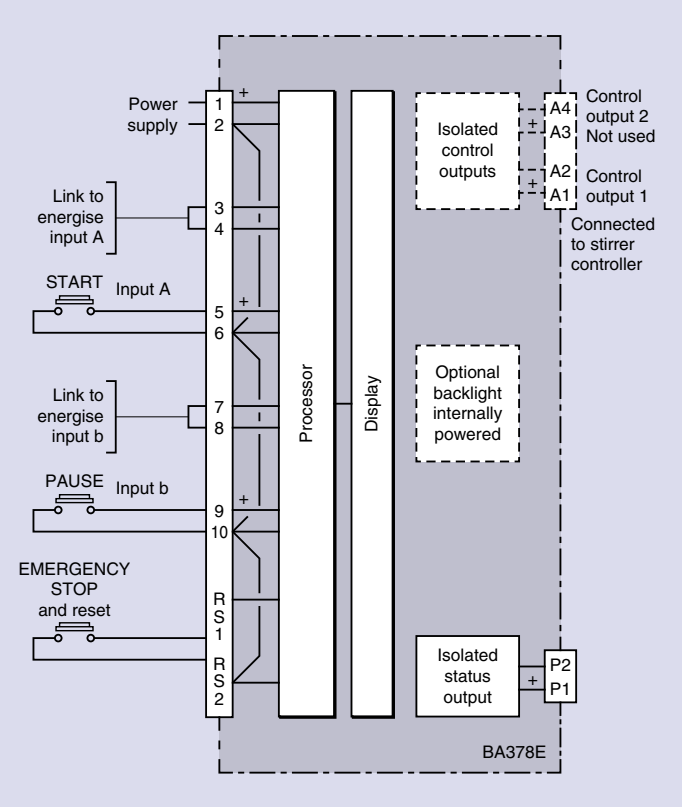

Fig 11 Timer wiring

Terminals 3 & 4 and 7 & 8 are linked to energise the inputs A and b which allows them to be used with switch contacts.

Operation

To start the timing cycle the operator presses the start button which will move the Timer from the rESEt to the run state and turn control output 1 *on*. Operating the pause button at any time during the timing cycle will move the Timer from the run to the PAuSEd state and turn control output 1 *off* with the elapsed time shown on the upper display. Pressing the start button will resume the timing cycle from the time at which it was paused.

At the end of each cycle the reset button must be operated to reset the Timer before the next timing cycle can be started. If required auto resetting at the end of each cycle can be included as shown in example 2.

If at any time during the timing cycle, or when the Timer is in the paused state, operating the reset push button will act as an emergency stop. Control output 1 will be turned *off* and the timing cycle will be cancelled.

Timer Configuration

FunCti on — ELAPSE

Configures BA378E Timer or Clock as a Timer

inPut-A — CONTACt

inPut-b — CONTACt

Configures both inputs to operate with switch contacts

di SP-2 — Std

Timer set time shown on lower display

StArStoP — ControL2

Configures Timer to start when input A is closed & to pause when input b is closed.

unit S — 30:00

Sets display format to minutes and seconds

SEt t — 45:00

Enters set time of 45 minutes

uP or dn — uP

Configures the Timer to *time-up* from zero

LoC rSEt — oFF

BA378E can not be reset from front panel buttons

E rSEt — FASt

Configures reset input to function is less than 1s

oP1 EnAbLE — on

oP1 on — run

oP1 oFF — n run

Configures control output 1 to be *on* when Timer is in run state.

Example 2 adding automatic resetting

This example illustrates how automatic resetting at the end of each timing cycle can be added to the system shown in example 1. The status output is connected to the reset terminals in parallel with the emergency stop button as shown in Fig 12.

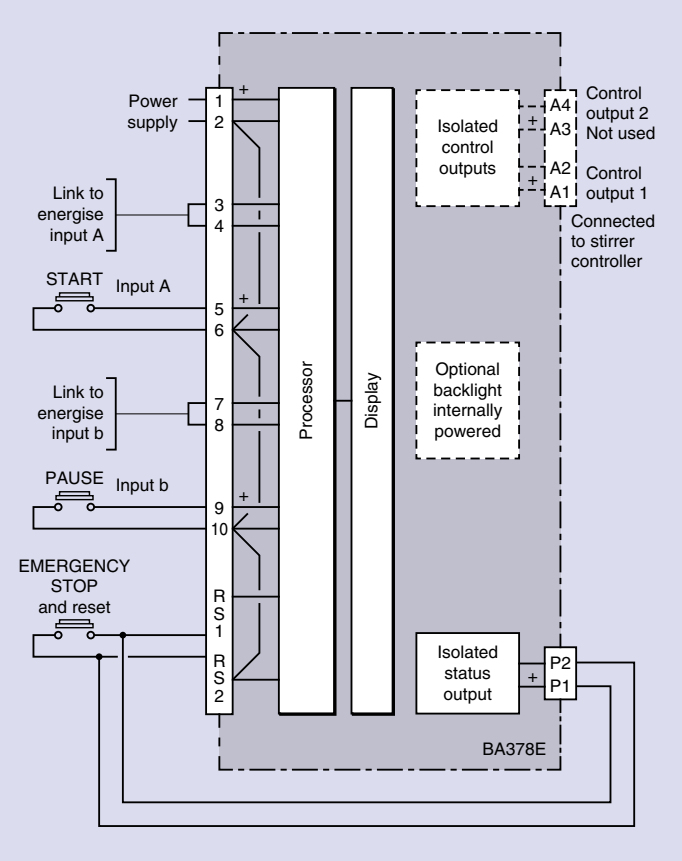

Fig 12 Timer wiring with automatic reset

Additional Timer Configuration

StAt oP EnAbLE	on
StAt on	donE
StAt oFF	n donE
StAt.dELA	1

Configures the status output, which is externally wired to the instruments reset terminals, to turn *on* one second after the Timer enters the done state. When the status output turns *on* the Timer moves from the donE state to the rESEt state. The status output therefore turns *off* and the Timer is ready to start another timing cycle when the start push button is operated.

Example 3 using the cycle function

This example is based on a simple dosing application in which a BA377E single input Timer was required to open a valve for a fixed time of 5 minutes every 6 hours. Once started the dosing cycle was required to repeat continuously. The process operator needed to pause or cancel the timing cycle at any time during the cycle using a large industrial switch and push button.

The Timer was required to show the elapsed dosing time on the upper display in hours and minutes and the delay time and Timer status on the lower display. Fig 13 shows the wiring for the BA377E

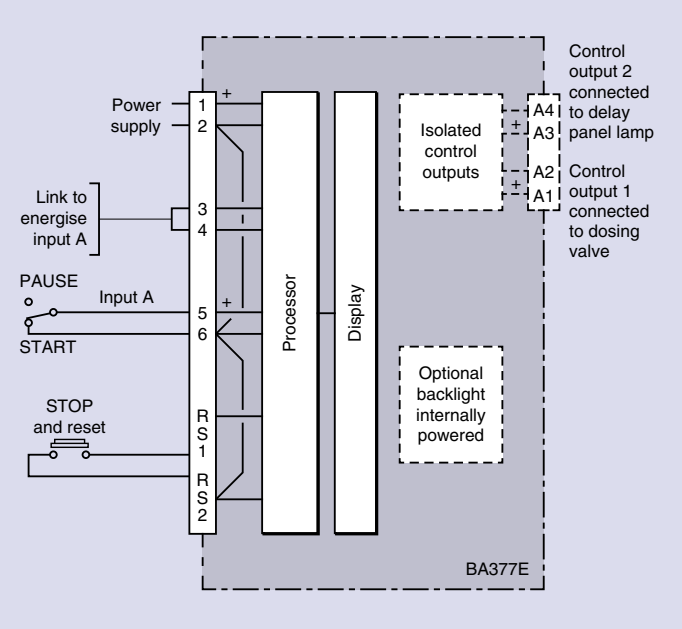

Fig 13 Single input Timer wiring

Operation

Providing the Timer has been reset, the timing cycle will begin when the operator moves the start / pause switch to the start position. The Timer will move from the rESEt to the run state and control output 1, which is connected to the dosing valve, will be turned on for 5 minutes.

After 5 minutes the Timer will automatically move from the run to the dELAY state and control output 2 will be turned on for 5 hours and 55 minutes. While in the delay state control output 2 is to be turned *on* to activate a panel lamp. When the delay time has expired, the Timer will move from the dELAY to the run state and the second dosing cycle will be performed.

Cycling will continue until the start / pause switch is moved to the pause position, when both control outputs will turn *off* and timing will stop. The cycle will resume immediately the start / pause switch is moved to the start position.

Operating the STOP/reset button will abandon the existing cycle, reset the Timer and turn both control outputs *off*. When the STOP/reset switch is opened, the Timer will immediately respond to the START/PAUSE switch. If the START/PAUSE switch is in the PAUSE position, the Timer will remain in the reset state until the START/PAUSE switch is moved to the START position when the Timer will start a new cycle. If the START/PAUSE switch is in the START position when the STOP/reset switch is opened, the Timer will immediately start a new cycle.

Timer Configuration

FunCti on ELAPSE
Configures BA377E Timer or Clock as a Timer

inPut ContACt
Configures input to operate with a switch contact

di SP-2 on
Timer set time shown on lower display

StArStoP ControL2
Configures Timer to start when input A is closed & to pause when input A is open.

uni tS 12:00
Sets display format to hours and minutes

SEt t 00:05
Enters set time of 5 minutes

CYCLES EnbL on
Enable the cycle function

CYCL Cnt 00
00 instructs the cycle counter to repeat continuously

rSt dELA 05:55
Enters delay time of 5 hours 55 minutes

uP or dn uP
Configures the Timer to *time-up* from zero

LoC rSEt oFF
BA377E can not be reset from front panel buttons

E rSEt FASt
Configures reset input to function is less than 1s

oP1 EnAbLE on
oP1 on run
oP1 oFF n run
Configures control output 1 to *on* when Timer is in run state.

oP2 EnAbLE on
oP2 on dELAY
oP2 oFF n dELAY
Configures control output 2 to *on* when Timer is in dELAY state.

Example 4 multiple Timers

Multiple timing systems can be built by interconnecting two or more Timers. In this application the customer required an operator to easily adjust two separate times associated with a batch sampler, but the operator was not to have access to the instrument configuration menus. Although overall control was performed by a PLC, the sample mechanism and the operator were located within a gas hazardous area in which the PLC could not be located.

Two certified intrinsically safe two input BEKA Timers were located in the hazardous area connected to the PLC in the safe area via Zener barriers. Two input Timers are used because this application requires momentary switch contact inputs. The second Timer inputs are not used in this application. The Timer's RESE t function allows the operator to adjust both the run time SEt t (take a sample) and the restart delay rSt dELA (pause between sample) from the timer mode of Timer 1 without having access to other configuration functions.

Fig 14 shows the required sampler timing sequence and Fig 15 the connections for the two Timers.

Operation

When started by a momentary contact closure from the PLC at input A, Timer 1 was required to perform a batch of 10 samples. During the Timer run time, control output 2 was required to turn *on* to take the first sample, followed by the Timer delay period to allow the sampling mechanism to withdraw The process was then repeated 9 times to complete a batch of ten samples. When the batch had been completed and 10 samples had been taken, Timer 1 was required to move to the donE state which turned control output 1 *on* and after a short delay turned the status output *on* to reset Timer 1 as described in example 2.

The control output 1 of Timer 1 was connected to the input of Timer 2 who's run time provided the end of batch delay during which it's control output 1 was *on*. At the end of the run time, Timer 2 moved to the donE state which activated control output 2 to notify the PLC that the batch was complete and after a short delay turned the status output *on to* reset Timer 2.

Timer 1

Take first sample (run state)	Control output 2 *on*
Delay between samples (dELAY state)	
Repeat run & delay 9 more times to complete batch of 10 samples.	
Complete batch (donE state)	Control output 1 *on*
Reset Timer 1 (donE state)	Status output *on*

Timer 2

Start Timer 2 to provide end of batch delay	
Advise PLC (run state)	Control output 1 *on*
Advise PLC (donE state)	Control output 2 *on*
Reset Timer 2 (donE state)	Status output *on*

An emergency stop button was required to enable the operator to stop the sampling and cancel the batch at any time. To maintain electrical isolation between the two Timers a two pole emergency stop button was used.

The customer required that all times were shown in hours and minutes and initially all times were to be set to 10 minutes.

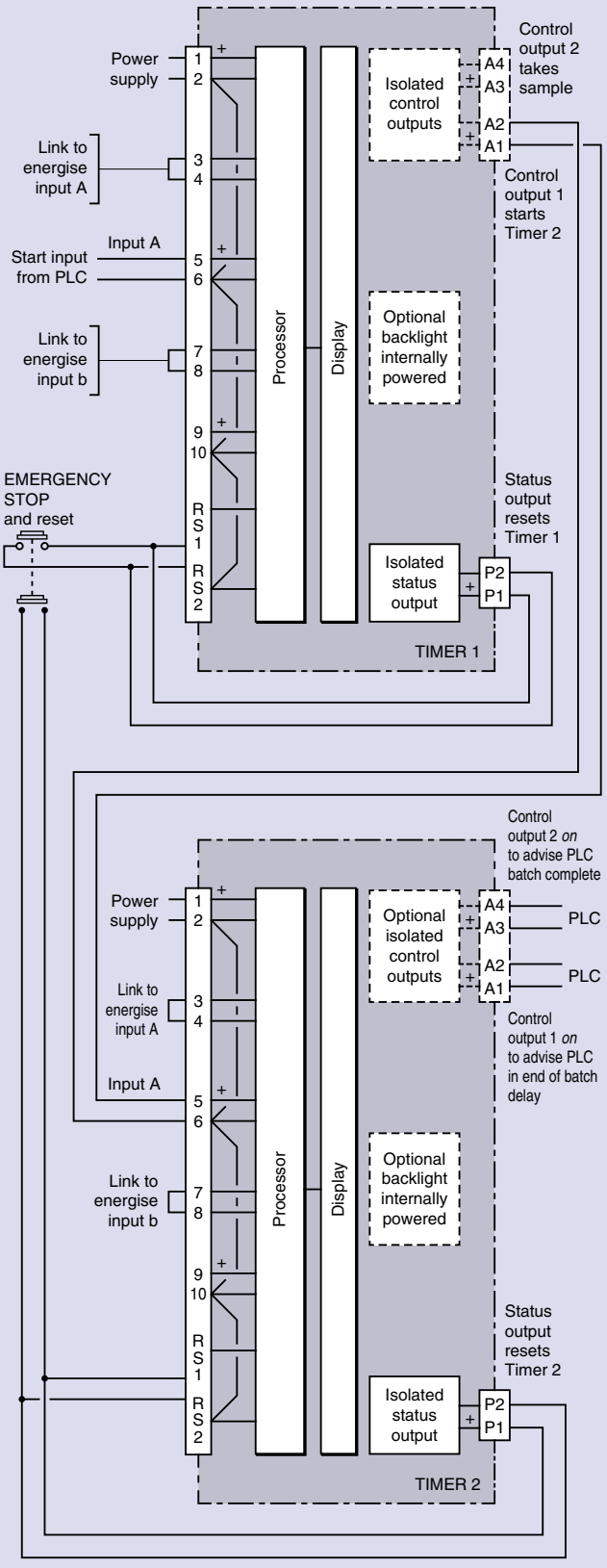

Fig 14 Required sampler timing sequence

Fig 15 Wiring for example 4

Timer 1 Configuration

FunCt on — ELAPSE
Configures Timer or Clock as a Timer

inPut-A — ContACt
Configures input A to operate with switch contacts

di SP-2 — Std
The CYCLES function is enabled so lower display will show cycles requested and cycles performed,together with *time-down* during delay periods.

StArStoP — ControL2
Configures Timer to start when input A is closed.

unitS — 30:00
Sets display format to minutes and seconds

SEt t — 00 10:00
Enters set time (time for one sample, initially 10 mins)

CYCLES EnbL — on
CYCL Cnt — 10
rSt dELA — 00 10:00
Enables timing cycle to be repeated 10 times (delay time initially 10 mins)

RCSEt t EnbL — on
Enables access to SEt t (time for one sample) and rSt dELA (delay time between samples) to be adjsted via the instrument front panel push buttons while the Timer is functioning.

uP or dn — uP
Configures the Timer to *time-up* from zero

LoC rSEt — oFF
Timer can not be reset from front panel buttons

E rSEt — FASt
Configures reset input to function is less than 1sec

StAt oP EnAbLE — on
StAt on — donE
StAt oFF — n donE
StAt.dELA — 0000 1
Configures status output to be on 1 second after the Timer enters the donE state. Status output is used to reset Timer 1.

oP 1 EnAbLE — on
oP 1 on — donE
oP 1 oFF — n donE
Configures control output 1 to be *on* when Timer is in the donE state which starts Timer 2.

oP2 EnAbLE — on
oP2 on — run
oP2 oFF — n run
Configures control output 2 to be *on* when Timer is in run state which controls sampler.

Timer 2 Configuration

FunCt on — ELAPSE
Configures Timer or Clock as a Timer

inPut-A — ContACt
Configures input A to operate with switch contacts

di SP-2 — Std
The CYCLES function is not enabled so lower display will shows SEt t the batch delay time.

StArStoP — ControL2
Configures Timer to start when input A is closed

unitS — 30:00
Sets display format to minutes and seconds

SEt t — 00 10:00
Enters set time (end of batch delay time, initially 10 mins).

CYCLES EnbL — oFF

RCSEt t EnbL — oFF

uP or dn — uP
Configures the Timer to *time-up* from zero

LoC rSEt — oFF
Timer can not be reset from front panel buttons

E rSEt — FASt
Configures reset input to function is less than 1sec

StAt oP EnAbLE — on
StAt on — donE
StAt oFF — n donE
StAt.dELA — 0000 1
Configures status output to be *on* 1 second after the Timer enters the donE state. Status output is used to reset Timer 2.

oP 1 EnAbLE — on
oP 1 on — run
oP 1 oFF — n run
Configures control output 1 to be *on* when Timer is in the run state which advises PLC that sampling system is in the end of batch delay time.

oP2 EnAbLE — on
oP2 on — donE
oP2 oFF — n donE
Configures control output 2 to be on when Timer is in done state advising PLC that batch is complete.

5. Use as a Clock

When configured as a Clock all BEKA externally powered Timers or Clocks are able to display time in a variety of twelve or twenty four hour formats. Fig 16 shows a simplified block diagram of a Timer or Clock when configured as a Clock.

All models except the small panel mounting BA377E, BA377E-SS, BA377NE, BA577E and the BA577E-SS have an optically isolated status open collector output which can be used to monitor the Clock or to perform simple control functions.

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

The Clock may be synchronised to a preconfigured time 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 the preconfigured time and will resume running from this time when the contacts are opened.

Instruments can be supplied with the following factory fitted accessories:

Backlight Internally powered

Dual isolated control outputs

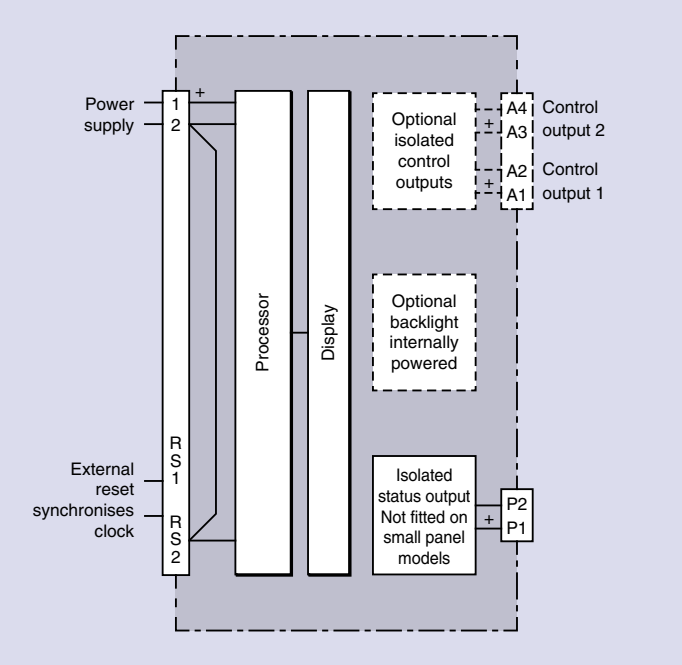

Fig 16 Simplified diagram of Clock

5.1 Initialisation and loss of power

When a Timer or Clock is configured as a Clock each time power is applied 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.

The Clock will have 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.

5.2 Controls when configured as a Clock

When a Timer or Clock is configured as a Clock it is configured and adjusted via the 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 in succession, firmware version number, instrument function ELAPSE or CLoC and output accessories:

-A control outputs

-P Status output (only fitted to field and large panel mounting instruments)

P + E Accesses the configuration menu

P + ▲ When ACSP is enabled, the Clock alarm times can be adjusted from the display mode i.e. when the Clock is displaying time, by operating these two buttons simultaneously.

5.3 Displays when configured as a Clock

When configured as a Clock the instrument has a single digital display plus annunciators as shown in Fig 17.

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 '1' and '2'	Show status of both optional control outputs.

The Clock's display digit size depends upon the model as shown below.

	Display size
Field mounting	
All models	18mm
Panel mounting	
96 x 48mm	9mm
144 x 72mm	18mm
Rugged 105 x 60mm	9mm

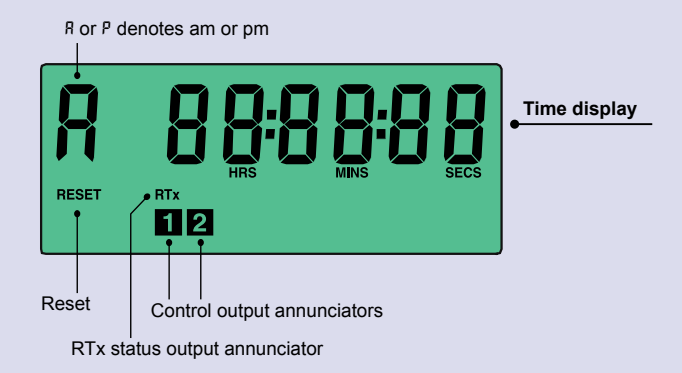

Fig 17 Clock display

The Clock may be synchronised with a pre-configured time by simultaneously operating the ▼ and ▲ push buttons, or remotely by connecting the instrument's external reset terminals together for more than one second.

5.4 Configuration as a Clock

When a Timer or Clock is configured as a Clock it is configured and adjusted 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 the instrument's full instruction manual.

All new Timers or Clocks can be supplied configured as requested at the time of ordering. If configuration is not requested, the Timer or Clock will be supplied with default Timer configuration but can easily be re-configured on-site.

If Clock configuration is requested without detailed information, the instrument will supplied with default Clock configuration as shown below. .

Function	Display	Default
Define configuration menu access code.	CodE	0000
Function	FunCti on	CLoC
Display	d, SPLAY	12:00
Set display time	SEt	A 12:00:00
Synchronise time	SYnC t	A 12:00:00
Enable status output [2]	EnbL	oFF
Enable control output 1 [1]	EnbL	oFF
Enable control output 2 [1]	EnbL	oFF
Enable access alarm times from timer mode.	ACSP	oFF
Define access code for adjusting alarm times from timer mode.	ACCd	0000
Reset to factory clock defaults.	rSEt dEF	

Notes: 1 Control outputs are a factory fitted option

2 Not included on small panel mounting models

5.5 Function

When configured as a Clock the instrument performs as a simple twelve or twenty four hour digital Clock with a variety of selectable display formats. It can be supplied with optional factory fitted dual solid state control outputs, each of which can be configured to turn *on* and *off* twice in each twelve or twenty four hour period.

The Clock display time is adjusted using the SEt function in the configuration menu, or it may be set to a pre-configured time entered via the synchronising SYnC t function. When the Clock reset contacts RS1 and RS2 are connected together, the displayed clock time is set to the configured synchronising time SYnC t. When the connection between RS1 and RS2 is opened, the Clock starts to run from the synchronising time.

5.6 Clock configuration example

This section contains an example of a Clock configuration requested by a BEKA customer. Step-by-step instructions are not included nor are non-calibration configuration functions as it is assumed that the instrument has been reset to the Clock factory defaults before configuration is started.

Example

A customer wished to use a BEKA Timer or Clock to control a dosing system and associated agitator. The dosing system was to operate for 5 minutes at midnight and for 5 minutes at midday. The agitator was required to operate for 10 minutes before dosing started, continue during dosing and for 30 minutes after dosing finished. A twenty four hour time display was required showing hours, minutes and seconds.

Operation

The BEKA Timer or Clock was fitted with optional dual control outputs and configured as a Clock. Control output 1 was used to control the agitator and control output 2 to control the dosing system.

Clock Configuration

FunCti on	CLoC

Configures Timer or Clock as a Clock

di SPLAY	24 0000

Selects 24 hour display of hours, minutes & seconds

oP 1 EnAbLE	on:2
oP 1:on 1	23:50:00
oP 1:oFF 1	00:35:00
oP 1:on 2	11:50:00
oP 1:oFF 2	12:35:00

Configures control output 1 which is connected to the agitator to switch *on* and *off* twice in each 24 hour period at the specified times.

oP2 EnAbLE	on:2
oP2:on 1	00:00:00
oP2:oFF 1	00:05:00
oP2:on 2	12:00:00
oP2:oFF 2	12:05:00

Configures control output 2 which is connected to the dosing system to switch *on* and *off* twice in each 24 hour period at the specified times.

SYnC t	08:00:00

Configures Clock display to reset to 0800:00 when the reset terminals are connected together.

6. Additional information

If additional information or help is required with a Timer or Clock application or configurations, please call one of our sales engineers who will be pleased to help.

BEKA operates an evaluation service which enables potential users to try an instrument on-site for up to three months.

Although Timers or Clocks can be configured on-site, instruments can be supplied configured to customer specified requirements with a printed slide-in scale card for no additional charge.

BEKA associates Ltd.
Old Charlton Road., Hitchin, Herts. SG5 2DA UK Tel: (01462) 438301 Fax: (01462) 453971 e-mail sales@beka.co.uk www.beka.co.uk