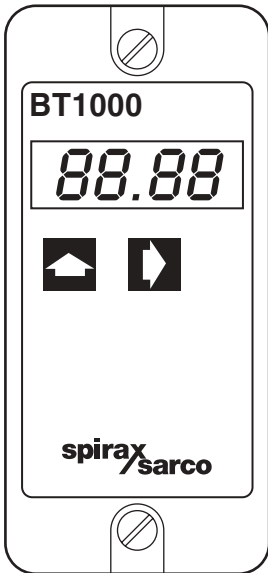


BT1000

Boiler Blowdown Timer

Installation and Maintenance Instructions



1. *General safety information*
2. *General product information*
3. *Installation*
4. *Setting up the timer*
5. *Wiring diagram*
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— 1. *General safety information* —

Your attention is drawn to Safety Information Sheet IM-GCM-10 as well as to any National or local regulations concerning boiler blowdown. In the UK, guidance is given in HSE Guidance Note PM60.

Safe operation of the product depends on it being properly installed, commissioned and maintained by a qualified person in compliance with the operating instructions.

It is essential to comply with general installation and safety instructions for pipeline and plant construction, as well as to make proper use of tools and safety equipment.

The product is designed and constructed to withstand the forces encountered during normal use. Use of the product for any other purpose, or failure to install the product in accordance with these Installation and Maintenance Instructions, could cause damage to the product, will invalidate the CE marking, and may cause injury or fatality to personnel.

Warning

Isolate the mains supply before unplugging the controller since hazardous voltages will be exposed on the controller base. This product complies with the requirements of Electromagnetic Compatibility Directive 89/336/EEC by meeting the standards of:

- Emissions EN 61326: 1997 A1 + A2 Class B equipment Table 4.
- Immunity EN 61326: 1997 A1 + A2 Industrial Locations.

The following conditions should be avoided as they may create interference above the limits specified in EN 61326 (Immunity) if:

- The product or its wiring is located near a radio transmitter.
- Excessive electrical noise occurs on the mains supply. Power line protectors (ac) should be installed if mains supply noise is likely. Protectors can combine filtering, suppression, surge and spike arrestors.
- Cellular telephones and mobile radios may cause interference if used within approximately 1 metre (39") of the product or its wiring. The actual separation distance necessary will vary according to the surroundings of the installation and the power of the transmitter.

If this product is not used in the manner specified by this IMI, then the protection provided may be impaired.

— 2. General product information —

The Spirax Sarco BT1000 blowdown timer is a dual voltage, purpose-designed cyclic timer for the control of blowdown intervals and their duration on steam boilers.

For multiple boiler installations, up to nine timers can be linked, preventing more than one boiler blowing down at a time. A time delay can be programmed to prevent different boilers blowing down in rapid succession. This feature avoids the possibility of overloading a blowdown vessel or pit which could lead to water being discharged to drain at too high a temperature. The timer can be wired to a switch box on the blowdown valve actuator to monitor valve operation and release an alarm relay if the blowdown valve fails to close fully within a certain period.

The timer cannot, however, be used to indicate that the valve has opened fully.

The BT1000 may also be used to open a small bore valve, e.g. a solenoid valve, on a timed basis to control TDS for those situations where a conductivity system is not wanted or is not possible.

The timer front panel has a four digit LED display and two push buttons to select functions and set parameters. In 'run' mode, the display will normally show a continuous display of the time to the next programmed blowdown in hours and minutes with a decimal point flashing at two second intervals.

An external key switch may be mounted on the boiler panel and wired to lock the blowdown valve off or to open it 'manually'. The BT1000 can also be used as a cumulative timer by wiring it to operate only when the boiler is actually firing, and so can be used where boilers only operate intermittently, as in the case of stand-by boilers.

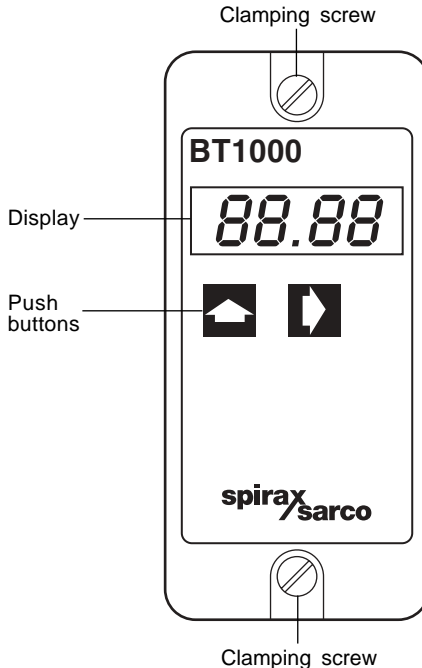


Fig. 1

3. Installation

WARNING

Isolate the mains supply before unplugging the controller since hazardous voltages will be exposed on the controller base.

To unplug the controller from its base, undo the two retaining screws and pull the controller straight forwards. Rocking the controller in the vertical plane will ease removal.

The controller must be installed in a suitable industrial control panel or fireproof enclosure to provide impact and environmental protection. Spirax Sarco can provide suitable enclosures. The controller may be mounted on a 'top hat' DIN rail using the clip provided or the clip can be removed and the controller base screwed directly to a chassis plate.

Caution: Allow 15 mm spacing between multiple units for air circulation.

The controller is for installation category II (Overvoltage category) and must be installed in accordance with IEC 60364 or equivalent.

The controller and all connected circuits must have a common isolation system which meets the relevant requirements of IEC 60947-1 and IEC 60947-3 or equivalent. This must be positioned close to the controller and clearly identified as the disconnect device.

A quick blow 3 amp external fuse must be fitted in all phases of the controller and relay supply. The relays are rated at 250 Vac 3 A and must be on the same phase as the controller supply. Cabling should be installed in accordance with BS 6793 - Instrumentation process control systems: Installation design and practice or local equivalent.

Note: The wiring diagrams (Section 5) show all relays in the power off position.

Maximum probe cable length	100 m (328 ft)
Maximum ambient temperature	55°C (131°F)
Minimum ambient temperature	0°C (32°F)
Protection rating	IP40

WARNING

If this product is not used in the manner specified by this IMI, then the protection provided may be impaired.

4. Setting up the timer

4.1 The timer is supplied set up as follows:

- 230 V mains supply.
- Timer configured for 'no valve switch box.'
- Alarm relay de-energises for all detected faults.
- Security switch OFF.

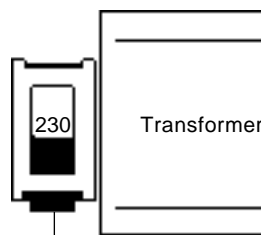


Fig. 2 Slide switch up for 115 V supply

The timer is suitable for operation at the following voltages (50-60 Hz):

230 V setting	198 V - 264 V
115 V setting	99 V - 121 V
Fuse type:	20 mm cartridge 100 mA anti-surge
Maximum power consumption	6 VA

4.2 To change the mains supply voltage:

- Unplug the timer from its base.
- Remove the rear cover panel.
- Slide out the printed circuit board.
- Slide the voltage selector switch to the required setting.
- Replace the printed circuit board.
- Replace the rear cover panel.
- Plug the timer into its base.

4.3 To change the switch settings:

- Unplug the timer from its base.
- Remove the rear cover panel.
- Slide out the printed circuit board. An 8-way switch on the printed circuit board determines the timer functions.
- Set the switches to the positions shown in Figure 3 for the chosen duties.
- Replace the printed circuit board.
- Replace the rear cover panel.

Note:- Only switches 6, 7, and 8 are used.

4.4 Valve switch box interface - Switch 6

The timer is supplied with switch 6 ON.

If a switch box is to be fitted to the blowdown valve actuator, set switch 6 to OFF to allow the timer to sense whether the valve has fully closed or not.

4.5 Fault alarm - Switch 7

The timer is supplied with switch 7 OFF, causing the alarm relay to be de-energised for all detected faults.

In the ON position, the alarm relay will only be de-energised if the valve fails to close fully. This avoids a spurious alarm signal being given if an air actuated valve is turned off. The valve may be manually opened and closed between blowdowns without causing an alarm.

4.6 Security feature - Switch 8

The timer is supplied with switch 8 OFF, and will allow any of the parameters to be set or changed. To prevent unwanted or inadvertent changes being made to the settings, set switch 8 to ON. The timer will then only allow changes to operating mode (run, OFF and OPEN), and clock reset.

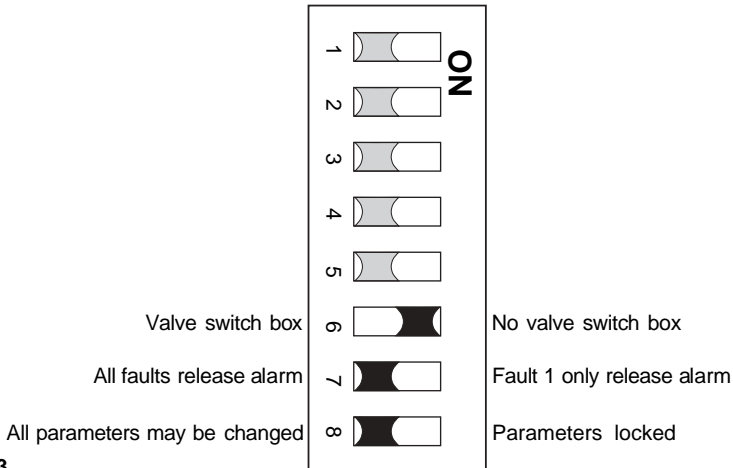


Fig. 3

5. Wiring diagrams

5.1 Main wiring diagram

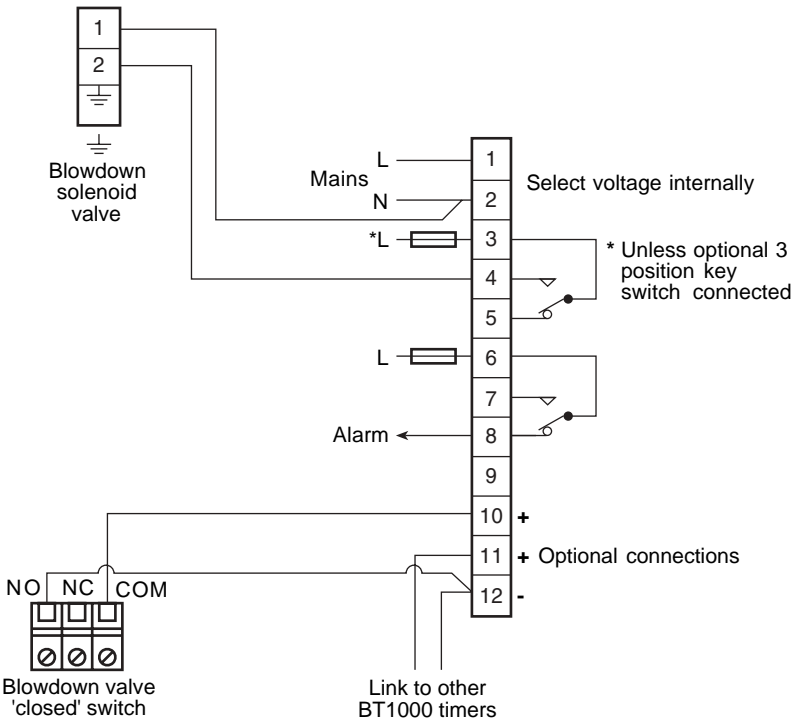


Fig. 4

5.2 Notes on the wiring diagram:

- Shown with valve closed and relays in power off position.
- For timers on multiple boiler installations, link terminal 11 on all timers and terminal 12 on all timers.
- Ideally the two terminals on each timer should be wired as for a ring main.
- Relays are rated at 250 Vac 3 A. For safety reasons each alarm relay should be protected by a quick-acting fuse rated at 3 A or below. If different mains supplies are used for the timer power supply and relays ensure that all supplies are from the same phase.

5.3 Wiring - manual override switch (optional)

It is possible to wire in a panel mounted switch for each boiler as shown below in order to provide a simple manual override. In order to prevent unauthorised operation a key-operated switch is recommended. The switch provides the following functions:-

Normal The timer operation continues normally.

Off Blowdown is prevented on this boiler.

Blowdown initiated by a BT1000 is also prevented on all other boilers if the link to other timers (terminals 11 and 12) has been wired. Wiring the switch in this way prevents the possibility of a fault being raised by the timer indicating that the valve has failed to open.

Open

The blowdown valve on this boiler is held open, for example to drain a cold boiler. Blowdown initiated by a BT1000 is prevented on all other boilers if the link to other timers has been wired. The wiring prevents a fault or alarm being raised indicating that the valve has failed to close.

The switch shown is an industrial key switch with two Normally Open (NO) switch blocks and one Normally Closed (NC) switch block. The key is removable in any position. The switch assembly with 'Normal-Off-Open' legend plate is available as Spirax Sarco part number 4058190.

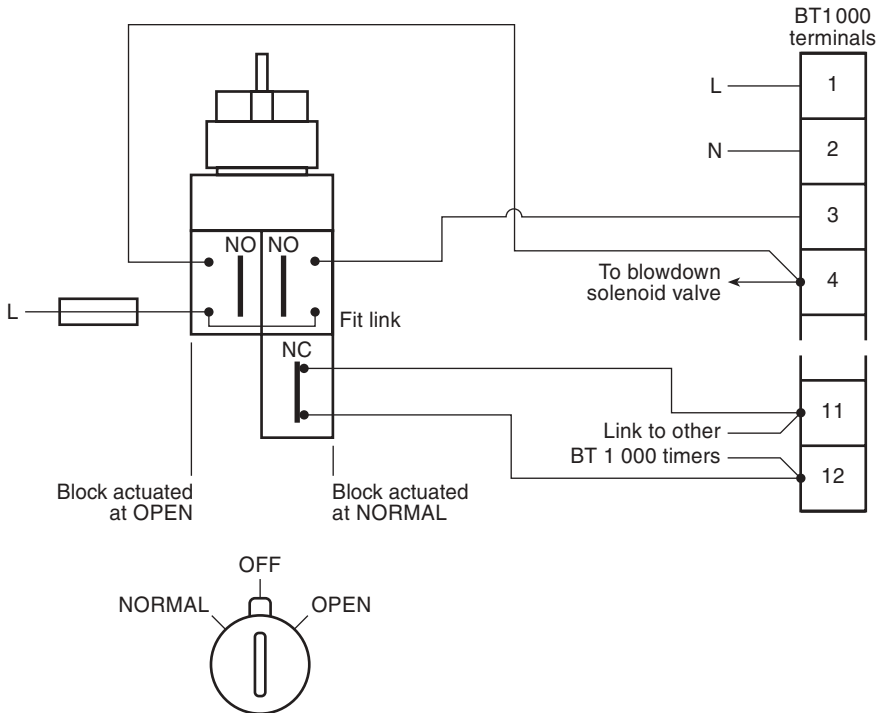


Fig. 5 Optional 3 position override key switch

6. Commissioning

6.1 Familiarisation

This section describes how the push buttons are used, and what the display readout means. The timer is commissioned in much the same way as a digital watch, using the two push buttons on the front panel, marked '▲' and '▶'. The '▲' button is used to step through the various options available, and also to change settings. The '▶' button is used to select settings that are to be changed.

The timer has a simple 'menu' system for setting the different functions. The items are organised as shown in Figure 6, and are displayed by pressing the '▲' button.

- Switch the timer on. The display will show a four digit figure and a flashing decimal point. This is the time to the next blowdown. Setting is described in the next section.
- Following Figure 6, press the '▲' button to step through the menu.

rES

In this option, the timer may be reset to the programmed blowdown interval, (time between blowdowns), regardless of the elapsed time. For example, if the timer has been set to give a blowdown every 12 hours, and the time to the next blowdown shown on the display is 7 hours 30 minutes, selecting 'rES' will give a blowdown in 12 hours time.

You will find that the display changes after 20 seconds. If this happens during familiarisation,

- Press the '▲' button until the required option appears.

When commissioning the timer, this change indicates that any new settings have been entered into permanent (non-volatile) memory.

Note

The display will show only **one** of the three modes below. Selection is described in the next section.

OFF In this mode, the timer will give no blowdown.

OPEN The timer will give a continuous blowdown, holding the valve open, for example to drain a boiler.

run This mode gives a timed blowdown, and is the usual mode selected.

blr This option is used for multiple boiler installations to prevent more than one boiler blowing down at the same time. It assigns priorities to the timers, the timer with the highest number having the highest priority.

PAUS Again, this option is only used for multiple boiler installations, where it ensures a minimum time between blowdowns from different boilers, for example to allow the contents of a blowdown vessel to cool.

Int This sets the interval between boiler blowdowns for each boiler.

blDn The actual duration of each blowdown is set using this option.

- Press the '▲' button again to return to the start of the cycle. **Note:** You can step through the menu as often as you wish by pressing the '▲' button.

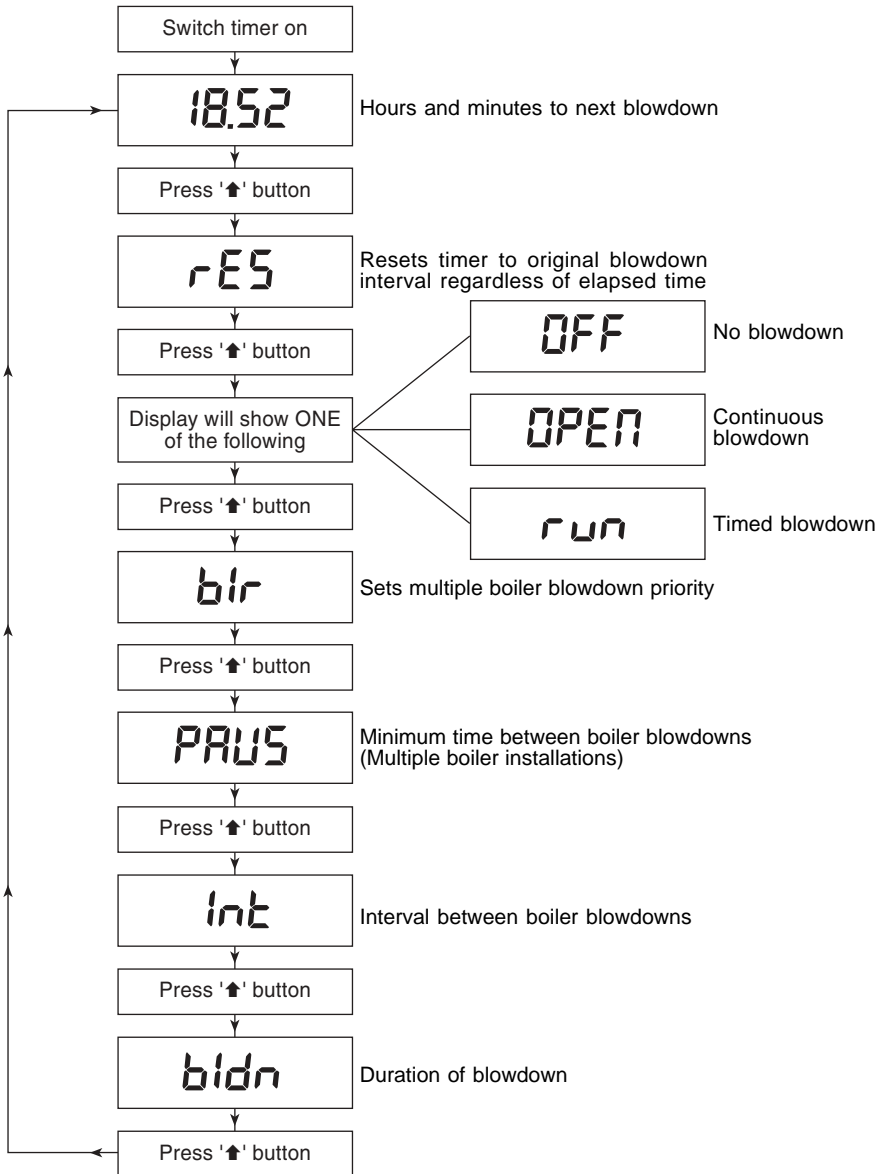


Fig. 6

Figure 7 illustrates the relationship between 'Int' and 'PAUS' for a multiple boiler installation. For clarity, a two boiler system is shown.

- Boiler timers 1 and 2 initially attempt to blowdown at the same time, but are prevented from doing so by the software.

Boiler timer 1, having the lowest priority, must then wait until the 'PAUS' time has expired until it is permitted to blow down, by which time the blowdown vessel will have cooled sufficiently.

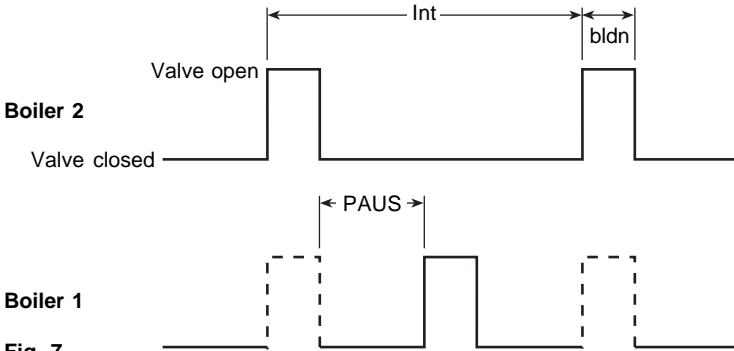


Fig. 7

6.2 Commissioning the timer

Once familiar with the way in which the timer operates, actual commissioning may be carried out as follows:-

Switch on the timer

Ignore the initial time display, which will be set during the commissioning procedure:

- Press '▲' until the display shows 'OFF', 'OPEN', or 'run'.
- Press the '▶' button. The display will flash.
- Use the '▲' button to select 'OFF', 'OPEN', or 'run', then press the '▶' button.
(For normal timed blowdown applications, select 'run').

If 'run' mode has been selected, after 20 seconds the display will revert to a four digit display with flashing decimal point, (the 'time to next blowdown' display). This shows that the selected function has been entered into memory.

If 'OFF' or 'OPEN' mode has been selected, the display will reset to show 'OFF' or 'OPEN' after 20 seconds:

- Press the '▲' until the display shows 'blr', then the '▶' button. A flashing number between 1 and 9 will appear.

For multiple boiler installations, each boiler timer needs to be given a different number in order to establish a blowdown priority, preventing more than one boiler blowing down at a time.

Set the first timer to '1', by pressing the '▲' button, then the '▶' button to stop the display flashing.

Further timers are numbered '2', '3', '4', etc. with the highest number having the greatest priority. Set timers on single boiler applications to '1'.

- Press the '▲' until the display shows 'PAUS'.
- Press the '▶' button. A number between 0.0 H and 9.9 H will appear, with the first digit flashing.

Multiple boilers

Use the '▲' button to select a suitable length of time to allow water blown down from other boilers to cool. This could depend on many factors, such as legal regulations, size of boiler, duration of blowdowns, and whether a vessel or pit is used:

- Press the '▶' button to change the second digit, then again to return to the 'PAUS' display.

Single boilers:

- Use the '▲' button to set the time to 0.0 H.
- Press the '▶' button to return to the 'PAUS' display.
- Press the '▲' button to display 'Int', then
- Press the '▶' button. A number between 00 H and 99 H will appear, and is the time between blowdowns. Again, this will vary according to type of boilers, boiler manufacturer's recommendations, water conditions, and regulations.
- Use '▲' and '▶' buttons to select an appropriate interval. Many boilers are set to blowdown once every 24 hours, but follow the boiler manufacturer's recommendations, or seek advice from a competent water treatment Company.
- Press '▶' button to return to 'Int' display.
- Press the '▲' button to display 'bldn', then the '▶' button. Two digits between 00 and 99 will appear, with the first digit flashing, and an 'S' or 'H' suffix. This is the duration, (in seconds or fractions of an hour), of the actual blowdown time. Many boilers are set to blowdown for about five seconds per day, but follow the boiler manufacturer's recommendations, as times can vary for specific applications and conditions

WARNING

An excessively long blowdown time can cause the boiler water level to become dangerously low.

The display may be configured as .00 to .99 H (fractions of an hour) or 00 to 99 seconds. The 'hours' setting would normally be selected only if the timer was to be used with a small bore valve for TDS control:

- Press the '▲' and '▶' buttons to select an appropriate duration and to change the units (seconds or hours) as required.
- Press the '▶' button to return to 'bldn' display.

Caution

The timer must not be switched off for 20 seconds following any changes to the settings, otherwise the memory will not be updated.

Once this time has elapsed, the timer will remember all its settings for an unlimited period, (non-volatile memory), even if it is switched off.

Whenever power is removed the BT1000 will also record the time to the next blowdown, and will re-start at this point when the power is restored. Example:- The display shows 2 hours 30 minutes to the next blowdown.

The timer is set to give a blowdown every 12 hours.

If the timer is switched off for any reason it will give a blowdown 2 hours 30 minutes after being switched on again.

The timer may be manually reset to the selected blowdown interval at any time by:

- Pressing the '▲' button to select 'RES', then pressing the '▶' button.

6.3 Using the timer

Spirax Sarco recommends that the security switch (switch 8) is set to ON, to prevent unwanted or inadvertent changes being made. Changes can still be made to the operating mode, ('run', 'OFF', 'OPEN'), and the timer may be reset. The other parameters can be viewed, but not changed.

The BT1000 timer is normally left in 'run' mode to give timed blowdowns. The display will show the time in hours and minutes to the next blowdown.

While blowing down the display will show '00.00' flashing.

In multiple boiler installations, a BT1000 may require a blowdown, but be prevented from doing so by the 'PAUS' parameter setting. If this situation occurs, the display will show a steady '00.00'.

If required, blowdown may be stopped by changing from 'run' to 'OFF'. To drain the boiler, change from 'run' to 'OPEN'.

WARNING

Before draining a boiler, ensure that the burner is off and the water is cool, or that there is no possibility of the blowdown vessel or pit becoming too hot and causing water to be discharged to drain at a higher than permitted temperature.

The 'RES' (reset) feature is useful to synchronise the blowdown to a particular time of day.

7. Maintenance

No special servicing or maintenance of the timer is necessary. In many countries, including the UK, legal regulations are in force concerning boiler blowdown. In particular, attention is drawn to the danger of working on a shutdown boiler whilst other boilers are operating. General guidance for the UK is given in Health and Safety Executive Guidance Note PM60.

Available spares

Spare fuses

Stock No. 4033380

Set of 3

8. Fault finding

Many faults that occur on commissioning are found to be due to incorrect wiring or setting up, so we recommend that a thorough check is first carried out should there seem to be a problem.

For multiple boiler applications, there should be approximately 14 Vdc between terminals 11 and 12 when none of the timers is blowing down, i.e. the link is open circuit.

Diagnostic facility

The BT1000 timer has a self-diagnostic facility which will display one of four fault codes in the event of a malfunction. A fault code will continue to be displayed until it is cleared by pressing the '▲' button.

'Flt 1' Valve failed to close fully (Switch 6 must be OFF).

'Flt 2' Valve failed to start to open (Switch 6 must be OFF).

'Flt 3' Parameters lost - Timer needs to be re-commissioned.

'Flt 4' Warning of hardware fault - In the unlikely event of this code being displayed, do not continue to use the timer as it may be possible for more than one boiler to blow down at a time.

Check the mains supply voltage and the ambient temperature inside the control panel are within the specified limits. If these limits are exceeded, it is possible that the transformer internal thermal fuse will blow, and that the transformer will need to be replaced.

Test mode

In addition to the diagnostic facility, the BT1000 has a test mode that can confirm the correct operation of the valve and actuator, the actuator wiring, and the wiring link to other timers (if fitted).

To start test mode:

- Turn off the power to the timer.
- Hold the '▲' button down and turn on the power again. The display will show '.0.0.0.0'. The valve will open, the alarm will operate, and the link to other timers will be at 0 V, as when a boiler is blowing down.
- Release the '▲' button. The display will show '- - - -'. The valve will close, the alarm will cease to operate, and the link to other timers (terminals 11 and 12) will be at approximately 14 Vdc, as when no blowdown is taking place.

Status check

This feature enables a check to be made of the status of the wiring link to any other timers, the valve position, and the settings of DIL switches 7 and 8, without dismantling the timer. The display will show '0' for 'open circuit' (OFF), or 'S' for 'short circuit' (ON):

- When in test mode, press the '▶' button.

Digit 1 Shows the status of the timer link, 'O' meaning 14 V (no blowdown) and 'S' for zero volts, i.e. shorted, as when blowdown is taking place.

Digit 2 Shows the valve status, 'O' indicating that the valve limit switch is open circuit, 'S' that the switch is closed.

Digit 3 Shows the fault alarm switch setting, (Switch 7), 'O' indicating the switch is off, and 'S' if the switch is on.

Digit 4 Shows the security switch setting, (Switch 8), 'O' for off, and 'S' for on.

To leave the test mode, turn the power off and then on again.