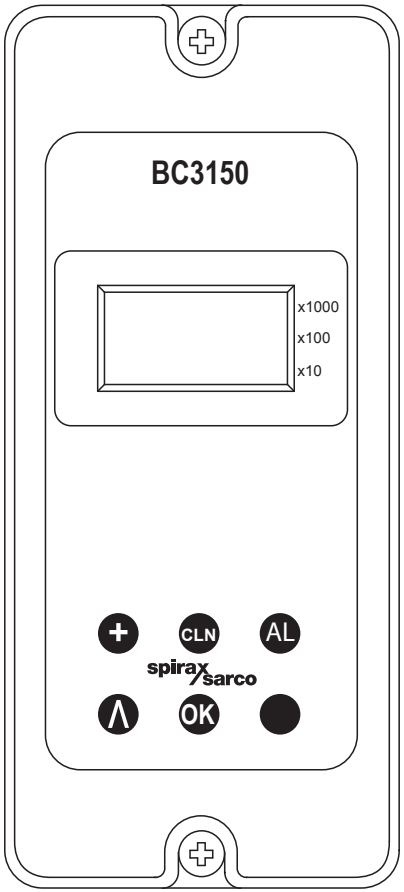
BC3150
Blowdown Controller
Installation and Maintenance Instructions



1. Safety information
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Commissioning password

Current legislation states that in order to prevent tampering and potentially hazardous programming errors, access to the pass codes required to enter commissioning mode should only be available to qualified and trained personnel.

Enter commissioning

To enter the commissioning mode, press and hold the OK button for 5 seconds.

The display will show the pass code '888'. Enter the pass code '745'. This is fixed and cannot be changed.

If the wrong passcode is entered, the display will return to showing the current process variable - run mode.

Special features

CALIBRATION from the Run Menu
Enables the operator (e.g. water treatment engineer / specialist) to calibrate the controller from the run menu. A pass code is not required.

- Using the ∧ button, select 'CAL'.
- Pressing OK button will access the calibration menu in commission mode. See Section 6.3.10 CAL- calibration.
- On completion or exiting calibration, the display will return to the process variable run menu and normal control will be resumed.

This page MUST be removed after commissioning and kept in a safe, access controlled location.

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1. Safety information

Safe operation of this product can only be guaranteed if it is properly installed, commissioned, used and maintained by qualified personnel (see Section 1.11) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

Your attention is drawn to IEE Regulations (BS 7671, EN 12953, EN 12952 and EN 50156). Elsewhere, other regulations will normally apply.

All wiring materials and methods shall comply with relevant EN and IEC standards where applicable.

Warning

This product is designed and constructed to withstand the forces encountered during normal use. Use of the product other than as a boiler controller, or failure to install the product in accordance with these Instructions, product modifications or repair could:

- **Cause injury or fatality to personnel.**
- **Cause damage to the product / property.**
- **Invalidate the CE marking.**

These instructions must be stored in a safe place near the installation of the product at all times.

Warning

This product complies with Electromagnetic Compatibility Directive 2014/30/EU and all its requirements.

This product is suitable for Class A Environments (e.g. industrial). A fully detailed EMC assessment has been made and has the reference number UK Supply BH BC3150 2008.

The product may be exposed to interference above the limits of Heavy Industrial 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.**

This product complies with Low Voltage Directive 2014/35/EU by meeting the standards of:

- **EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use.**

Static precautions (ESD)

Static precautions must be observed at all times to avoid damage to the product.

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Symbols



Equipment protected throughout by double insulation or reinforced insulation.



Functional earth (ground) terminal, to enable the product to function correctly.
Not used to provide electrical safety.



Clean earth / ground.



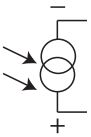
Safety earth.



Caution, risk of electric shock.



Caution, risk of danger, refer to accompanying documentation.



Optically isolated current source or sink.



Caution, Electrostatic Discharge (ESD) sensitive circuit. Do not touch or handle without proper electrostatic discharge precautions.



ac, alternating current.

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1.1 Intended use

i) Check that the product is suitable for use with the intended fluid.

ii) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous overpressure or overtemperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.

iii) Determine the correct installation situation and direction of fluid flow.

iv) Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.

v) Remove protection covers from all connections and protective film from all name-plates, where appropriate, before installation on steam or other high temperature applications.

1.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

1.3 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

1.4 Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider: flammable materials, substances hazardous to health, extremes of temperature.

1.5 Hazardous environment around the product

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

1.6 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk?
Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

1.7 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labeling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.8 Temperature

Allow time for temperature to normalise after isolation to avoid danger of burns.

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1.9 Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

1.10 Protective clothing

Consider whether you and / or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high / low temperature, radiation, noise, falling objects, and dangers to eyes and face.

1.11 Permits to work

All work must be carried out or be supervised by a suitably competent person.
Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.
Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety. Post 'warning notices' if necessary.

1.12 Handling

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

1.13 Residual hazards

In normal use the external surface of the product may be very hot.
Many products are not self-draining. Take due care when dismantling or removing the product from an installation.

1.14 Freezing

Provision must be made to protect products that are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

1.15 Disposal

On disposal of the unit or component, appropriate precautions should be taken in accordance with Local / National regulations.
Unless otherwise stated in the Installation and Maintenance Instructions this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

1.16 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

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2. User instructions and delivery information

Certain computer programs contained in this product were developed by Spirax-Sarco Limited ("the Work(s)").

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Spirax-Sarco Limited grants the legal user of this product (or device) the right to use the Work(s) solely within the scope of the legitimate operation of the product (or device). No other right is granted under this licence. In particular and without prejudice to the generality of the foregoing, the Work(s) may not be used, sold, licensed, transferred, copied or reproduced in whole or in part or in any manner or form other than as expressly granted here without the prior written consent of Spirax-Sarco Limited.

2.1 General description

The BC3150 is a blowdown controller for steam boilers. It controls TDS (total dissolved solids – salts in solution) by opening and closing a blowdown valve.

The product works by controlling the conductivity of liquids, in conjunction with a Spirax Sarco conductivity sensor, a boiler blowdown valve or condensate dump valve.

2.2 Front panel

The front panel has a 3 digit LCD graphic display and a five-button keypad:

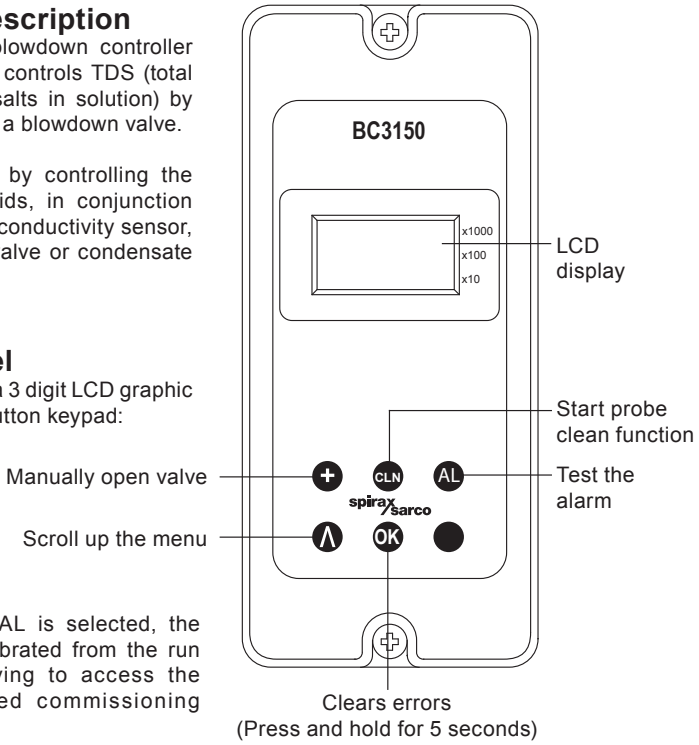


Fig. 1 Keypad and front panel definitions

OK Button

If pressed when CAL is selected, the product can be calibrated from the run menu, without having to access the password protected commissioning menu.

2.3 Using the buttons

- Press the ∧ button to scroll through the menus.
- The OK button is used to enter the commissioning mode (press and hold for five seconds).
- The AL button can be used to test the alarm relay and the external circuits.

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2.4 Manual test buttons (in priority order)

Note: When these buttons are released, the product will return to 'PV' or 'end' depending if pressed in run or commissioning mode.

AL Alarm button

This button can be used to test the alarm relay and the external circuits. The product will display, 'AL' + 'tSt' (meaning test) + 'PV' (TDS of conductivity) Note: The Alarm only occurs whilst the key is pressed.

Valve button

This button can open the valve. If a purge time is set, the valve will remain open for the preset purge time and will update the TDS reading. The product will display 'PV' + 'Pur' (meaning purge) + 'bLd' (meaning blowdown). The purge interval will be reset. If continuous mode is selected (purge time = 0) the valve will open for a minute. The product will display 'PV' + 'bld'. Note: In commission mode, the valve only opens whilst the key is pressed.

CLN Manual clean button

This button can electrically clean the probe for 20 seconds. The product will display PV + CLn (meaning clean). On completion of the cleaning time, the controller will revert to normal control after another 20 seconds. This is to allow any bubbles to disperse. Note: In commission mode, the cleaning only occurs whilst the key is pressed.

Additional information on probe cleaning

If it is found that the calibration has drifted to more than twice its original setting, then the probe may need cleaning.

15 minutes after the probe has been cleaned, it should then be possible to recalibrate the controller near to its original level. If not, the probe may not be sufficiently clean, so repeat the cleaning procedure. In most cases the controller can then be recalibrated. In exceptional circumstances, where abnormal scaling has been allowed to occur in the boiler, it may still not be possible to recalibrate the controller. In this case, it is permissible to repeat the cleaning period in 5-minute steps up to a maximum of 30 minutes, checking the calibration after each step. Wait for 15 minutes after each cycle to allow the system to stabilize.

Important note: The use of the probe cleaning function must not be regarded as a substitute for adequate water treatment. If scale is forming on the probe tip it is a certain warning that scale will also be forming on the boiler tubes. Boiler water treatment must be investigated.

Over-use of the probe cleaning function may shorten the life of the probe.

2.5 View parameter mode

Press the button in run mode to view and step through the parameters selected. Each parameter will remain on view for a further 2 minutes unless the button is pressed again.

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2.6 LCD display

After initially applying power to the product, it will automatically enter run mode. The current conductivity or TDS will then be displayed or 000 if a purge time has been set or the product has not been calibrated.

In normal operation (run mode) the display shows the actual Total Dissolved Solids (TDS) value in µS/cm or ppm, depending on the option chosen.

All ranges and operating parameters are selected using the software menu.



Actual TDS value

Once fully commissioned, the TDS value will alternate with information about alarms and the valve status.

Example of alarm status:



If a blowdown occurs, 'bLd' will be displayed, followed by the type of blowdown.

Example of valve status:



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2.7 Information line details (in priority order):

Alarm:



Indicates the alarm relay has been de-energised/released.



The operator is testing the alarm relay.



The PV value has exceeded the alarm level.

Probe cleaning / conditioning



The operator has started a cleaning cycle.

TDS blowdown valve (Total Dissolved Solids):



Indicates the blowdown relay is energised.



The TDS is has increased above the Set Point (SP), and the blowdown valve is being pulsed open for 10 seconds on, and 20 seconds off, until the TDS drops below the hysteresis of the SP.



Is displayed if a during a purge period (valve open). At the end of this time the product will either indicated 'Hi' or restart another purge interval.



The TDS has increased above the Set Point (SP), and the blowdown valve has been opened until the TDS drops below the hysteresis of the SP.



The operator is testing the blowdown valve.

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2.8 Alarm /error display messages

If an error occurs, an error menu 'ErX' will be displayed at the end of the parameter screens. Pressing and holding the OK button for 3 seconds can clear a message and re-energize the alarm relay(s). If the cause has not been corrected, the same error message will reappear. If the error or alarm is of a latching type, only the message will disappear. The alarm relay will remain de-energised until the correct passcode is entered in the commissioning menu. If more than one error or alarm has occurred, the next message will appear (in priority order) after the previous one has been cleared. See Section 9 - Fault finding.

2.9 Equipment delivery, handling and storage

Factory shipment

The product is tested, calibrated and inspected prior to shipment to ensure proper operation.

Receipt of shipment

Each carton should be inspected at the time of delivery for possible external damage. Any visible damage should be recorded immediately on the carrier's copy of the delivery slip.

Each carton should be unpacked carefully and its contents checked for damage. If it is found that some items have been damaged or are missing, notify Spirax Sarco immediately and provide full details. In addition, damage must be reported to the carrier with a request for their on-site inspection of the damaged item and its shipping carton.

Storage

If the product is to be stored for a period prior to installation, the environmental storage conditions should be at a temperature between 0 °C and 65 °C (32 °F and 149 °F), and between 10% and 90% relative humidity (non-condensing).

Ensure there is no condensation within the unit before installing and connecting the power.

Operators instructions

An alternative operator instruction manual, in place of this manual, for operating the equipment is required. This will avoid the commissioning menu passcode being disclosed to the operator.

The alarm reset passcode may optionally be disclosed if this is deemed necessary.

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3. System overview

3.1 Function

The product can be configured to control TDS / conductivity of water.
Once fully commissioned, the TDS value is displayed in µS/cm (or ppm if selected).
Note: Conductivity is expressed in parts per million (ppm) or micro Siemens per centimetre (µS/cm). Micro Siemens/centimetre is becoming the more common unit, and is therefore the default setting.
If the water conductivity exceeds the Set Point level, the TDS value shown on the display will alternate with 'bLd', and the valve relay will be energised until the conductivity drops below 5% of full scale (FS) below the set point.
If the system is carrying out a purge, The TDS value will alternate with 'Pur', and the valve relay will be energised until the conductivity drops 5% (FS) below the Set Point.
If the water conductivity exceeds the alarm level, the displayed TDS value will alternate with 'AL', and the valve relay will be energised until the conductivity drops 3% (FS) below the alarm level.

3.2 Inputs

The product can accept a signal from a Spirax Sarco conductivity probe (CP10 or CP30) and a Pt100 temperature sensor. A CP32 probe may also be used with the BC3150, but will not provide the scale monitoring and self-cleaning features.

A Pt100 temperature sensor may be connected to provide temperature compensation (2%/ °C). This is recommended if the boiler is working at varying pressures, or for other applications, such as condensate monitoring or coil boilers, where the temperature may vary. If a Pt100 is not fitted, the product uses a default temperature of 184 °C (10 bar g).

3.3 Outputs

3.3.1 Continuous output

Used when the probe is mounted in the boiler. The probe is able to constantly monitor the conductivity from the probe tip to the boiler shell.

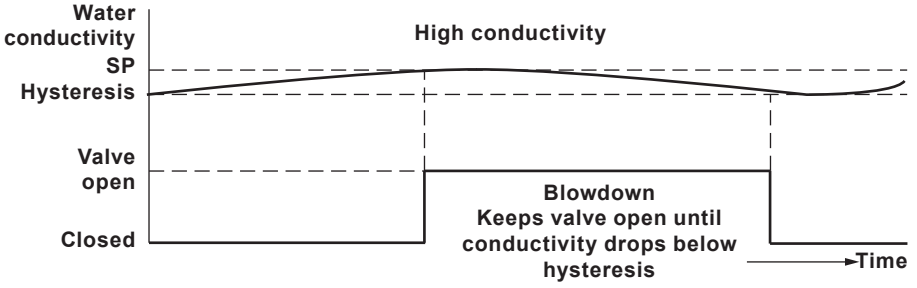


Fig. 2 Continuous output (purge time = 0s)

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3.3.2 Purge output

Used only when the probe is mounted in the blowdown line, Purge ensures the sensor measures the conductivity at boiler temperature. The purge duration time is the time the valve is open to enable a representative boiler sample to reach the probe. A purge occurs every 30 minutes either independent of burner firing, or dependent on cumulative boiler firing time.

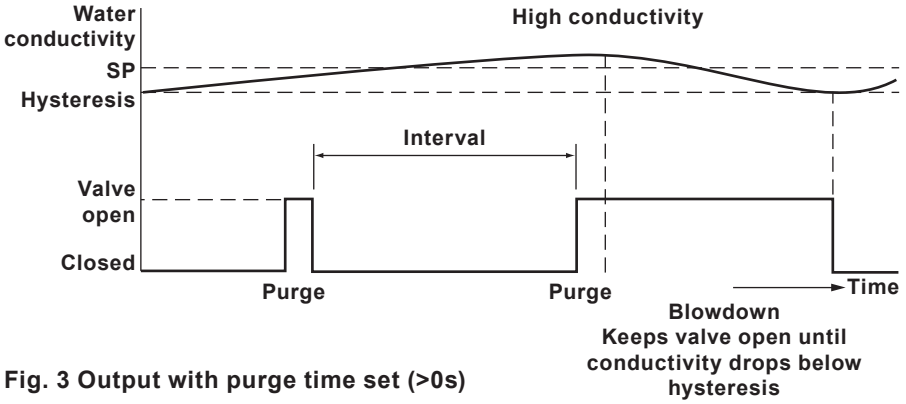


Fig. 3 Output with purge time set (>0s)

3.3.3 Pulsed output

For smaller boilers where the capacity of the blowdown valve is relatively high compared to the boiler size, the blowdown may be set to pulsed, rather than continuous output, opening for 10 seconds, and closing for 20 seconds. This slows the rate at which the boiler water is removed so that the level is not unduly affected, avoiding the risk of triggering a low water alarm.

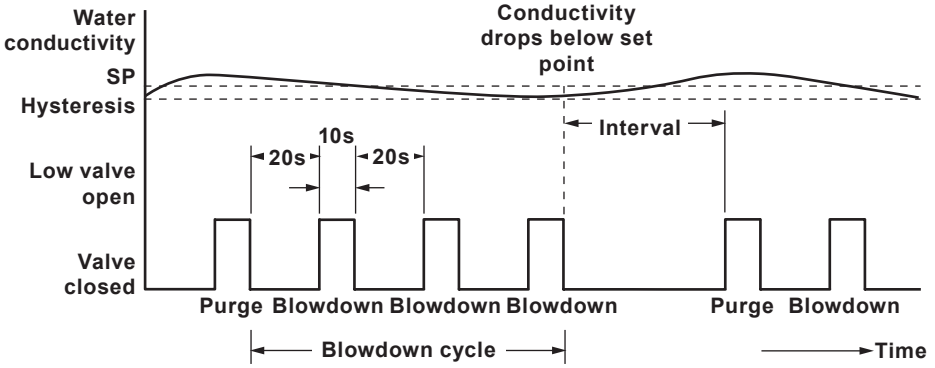


Fig. 4 Pulse output with purge time set (>0s)

3.3.4 4 - 20mA retransmit

An isolated 4 - 20 mA output is provided as standard, and may be used for remote display of the TDS level or as an output to a computerised management system.

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3.4 Other features

To prevent unwanted or inadvertent changes being made, most commissioning parameters are protected with a pass code.

The BC3150 can communicate via an infrared link between adjacent controllers – see Section 7, Communications.

3.5 Typical applications - Boiler control systems (BCS)

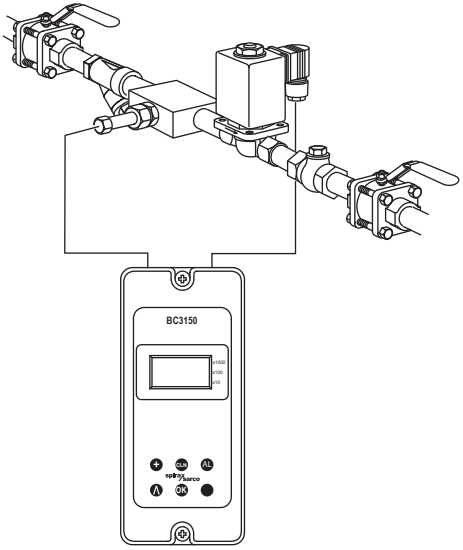


Fig. 5 BCS1 system

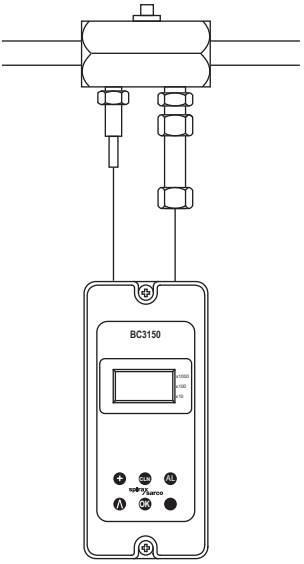


Fig. 6 BCS2 system

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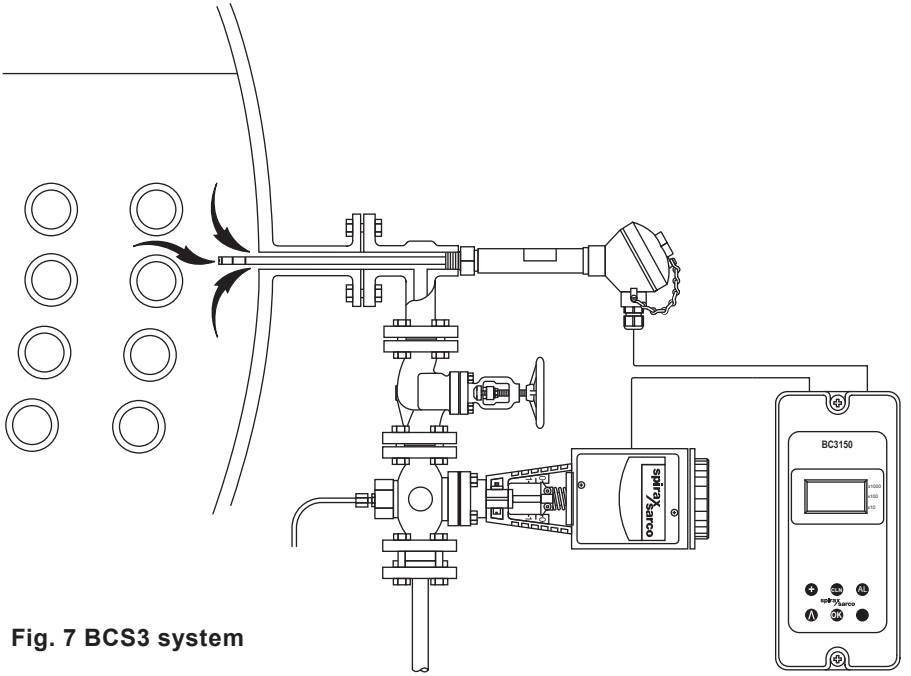


Fig. 7 BCS3 system

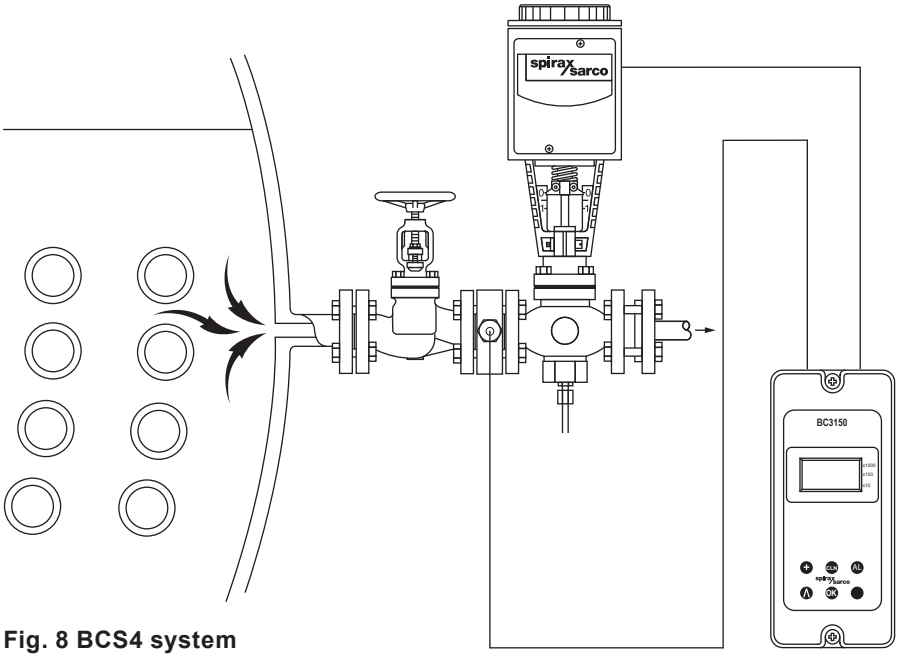


Fig. 8 BCS4 system

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3.6 Typical applications - condensate contamination detection system (CCD)

System description

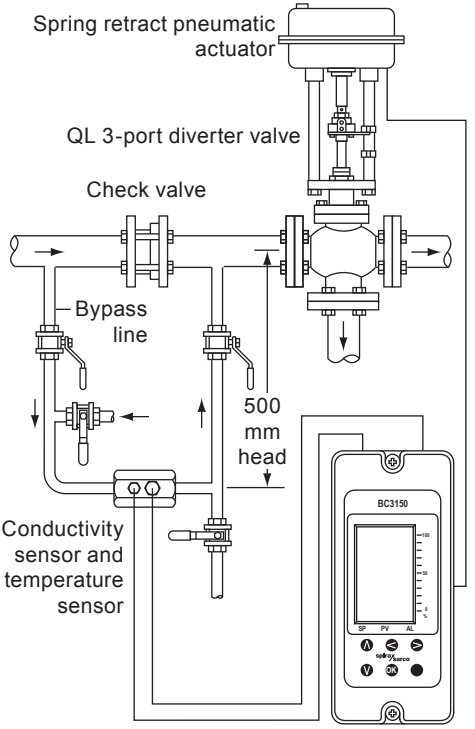
Note: Most countries have regulations that limit temperature and contamination levels for fluids being dumped to drain. It is also essential to follow guidelines issued by bodies such as the UK Health and Safety Executive.

The Spirax Sarco CCD system monitors and displays the conductivity of condensate return, and will redirect the flow to drain if the conductivity increases above a pre-set level to avoid contaminated water being returned to the boiler feedtank. It will not detect contaminants that do not change the conductivity, such as oils, fats, or sugars.

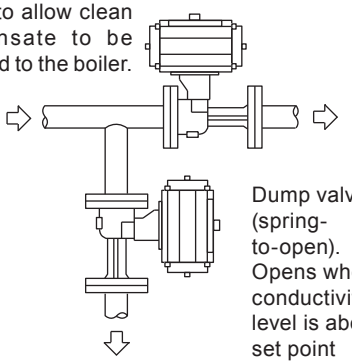
A conductivity sensor and a temperature sensor are mounted in a bypass line as shown in Figure 9. A check valve in the main line ensures a flow past the sensor under low flow conditions. The 500 mm head prevents flash steam flow in the bypass line. We recommend a 3-port diverter valve such as the Spirax Sarco QL. A spring retract pneumatic actuator is normally fitted to cause the valve to divert on failure of the air supply. Alternatively, two 2-port valves (M20, for example) may be used as shown in Figure 10, one as a spring-to-close isolating valve in the condensate return line, and one as a spring-to-open dump valve, in the drain line. On detection of high conductivity, the isolating valve closes and the dump valve opens, both under spring pressure.

Suitable 3-port solenoid valves may be selected from the Spirax Sarco range, and are described in separate literature.

Fig. 9 Typical application - CCD system



Isolating valve (spring-to-close) opens to allow clean condensate to be returned to the boiler.



Dump valve (spring-to-open). Opens when conductivity level is above set point allowing contaminated condensate to flow to drain.

Fig. 10
Alternative arrangement of a CCD system using separate valves

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4. Mechanical installation

Note: Read the 'Safety information' in Section 1 before installing the product.

The product must be installed in a suitable industrial control panel or fireproof enclosure to provide impact and environmental protection. A minimum of IP54 (EN 60529) or Type 3, 3S, 4, 4X, 6, 6P and 13 (UL50/NEMA250) is required. If installed in a harsh environment (conductive dust and / or wet conditions), extra protection is required.

During installation or maintenance, the rear of the product **must** be protected from environmental pollutants entering the product. Alternatively, the tasks can be performed in a dry clean environment.

Caution 1: The product must only be installed in the vertical orientation.

Caution 2: Do not cover or obstruct the infrared beam between products.

Ensure that the display can be easily read by the operator.

Warning: The boiler control panel or enclosure doors must be kept closed at all times unless installation or maintenance work is being carried out.

4.1 Environmental conditions

Install the product in an environment that minimises the effects of heat, vibration, shock and electrical interference (see Section 1 - Safety information).

Do not install the product outdoors without additional weather protection.

Do not attempt to open the product - it is sealed and has no replaceable parts or internal switches.

4.2 Installation on a DIN rail

The product is provided with a clip and a set of self-tapping screws to secure it to a 35 mm DIN rail. On the rear of the enclosure, two sets of holes are provided to give two height positions. The clip can be adjusted to give further positions. Locate the clip onto one set of holes and secure it using the two screws provided. Ensure the spring clip is fully engaged with the rail.

Warning: Only use the screws provided with the product.

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4.3 Installation on a chassis plate:

- Drill holes in chassis plate as shown in Figure 11.
- Fit unit to chassis plate and secure with 2 screws, nuts and washers, using the slots provided at the top and bottom of the case.

Warning: Do not drill the product case or use self-tapping screws.

4.4 Installation in a panel cutout:

(Minimum panel thickness 1 mm if the bezel is used).

- The product has integral threaded inserts (M4 x 0.7) at the top and bottom of the front panel.
- Two M4 x 25 mm screws are provided, together with fibre washers and a bezel.



Warning:
Do not use screws over 25 mm in length - danger of electric shock.

- Cut the panel to the dimensions given in Figure 11. Drill the screw holes in the panel in the positions indicated.
- Remove the backing from the gasket supplied and apply to front face of the product.
- The bezel can be used to enhance the appearance of the panel cutout. If required, fit this to the outside of the panel.
- Fit the unit from the rear of the panel, and secure using the screws, washers (and bezel) provided.
- Tighten the M4 screws to 1.0 - 1.2 Nm.

Warning:
Do not drill the product case or use self-tapping screws.

Fixing template cutout notes:

- Solid line indicates cutout required for panel mounting.
- Broken line indicates product outline.
- A minimum gap of 15 mm between units must be provided for product cooling.
- Mounting hole dimensions are the same for both panel and wall mounting.

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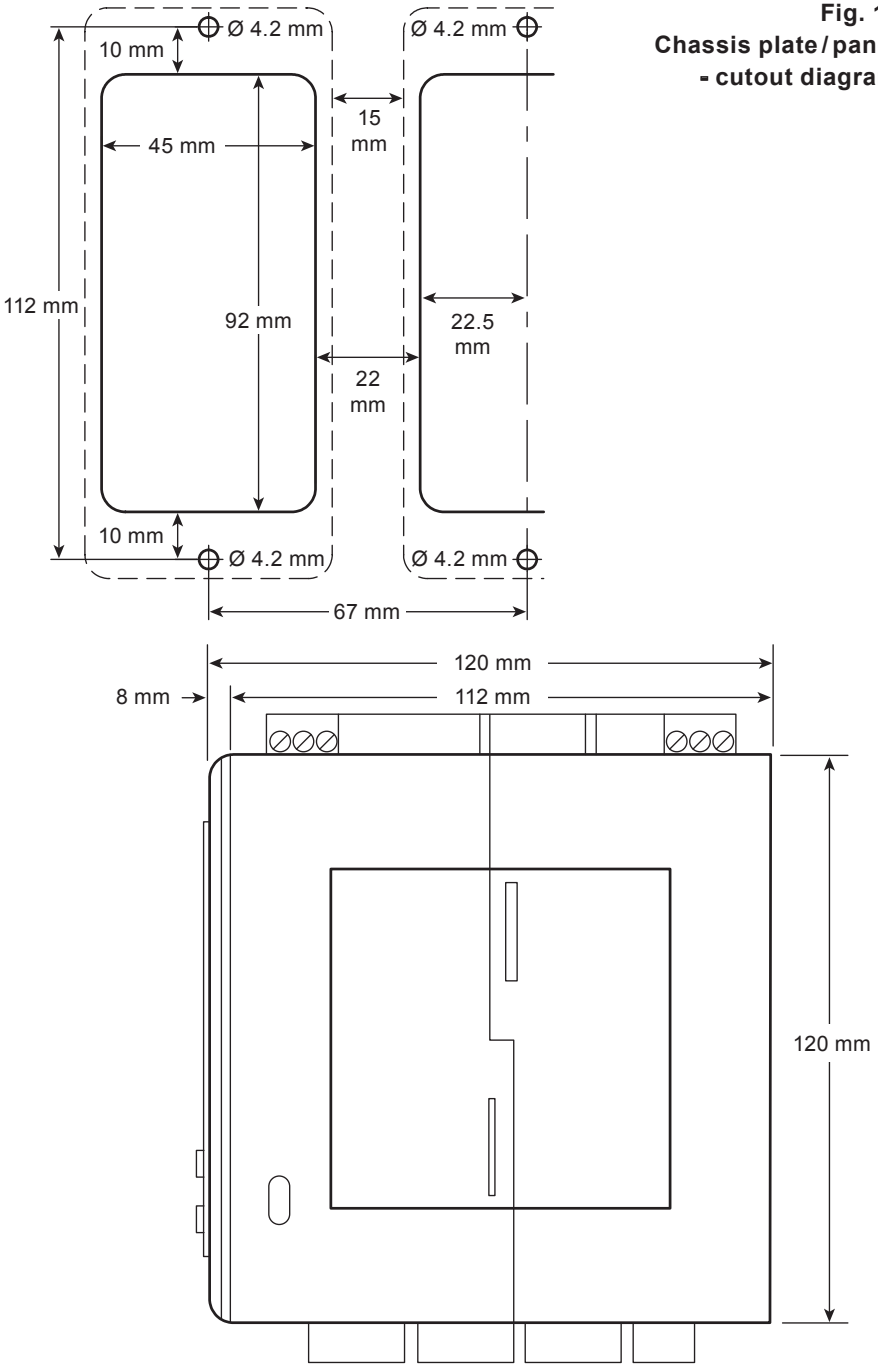


Fig. 11
Chassis plate / panel - cutout diagram

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5. Electrical installation

Note: Before installing observe the 'Safety Information' in Section 1.



Warning:
Isolate the mains supply before touching any of the wiring terminals as these may be wired to hazardous voltages.
Use only the connectors supplied with the product, or spares obtained from Spirax Sarco Ltd. Use of different connectors may compromise product safety and approvals.
Connecting the mains supply incorrectly can cause damage and may compromise safety.

5.1 General wiring notes:

Every effort has been made during the design of the product to ensure the safety of the user but the following precautions must be observed:

1. Maintenance personnel must be suitably qualified to work with equipment having hazardous live voltages.
2. Ensure correct installation. Safety may be compromised if the installation of the product is not carried out as specified in this manual.
3. The design of the product relies on the building installation for overcurrent protection and primary isolation.
4. Overcurrent protection devices rated at 3 amps must be included in all phase conductors of the installation wiring. If overcurrent protection is included in both supply wires then the operation of one must also cause the operation of the other. Refer to IEC 60364 (Electrical Installations of Buildings) or National or local standards for full details of requirements for overcurrent protection.
5. A 1 A quick-blow overcurrent protection device must be fitted to the burner input if used.
6. A 3 A quick-blow overcurrent protection device must be fitted to the relay circuit(s).
7. Relay contacts must be supplied on the same phase as the mains supply.
8. The product is designed as an installation category III product.
9. Install wiring in accordance with:
   - IEC 60364 - Low-voltage electrical installations.
   - EN 50156 Electrical Equipment for furnaces and ancillary equipment.
   - BS 6739 - Instrumentation in Process Control Systems: Installation design and practice or local equivalent.
   - National and Local Electrical Code (NEC) or Canadian code (CEC) for the US and Canadian markets. **Note:** use NEC Class 1 wire with a temperature rating greater than 75 °C. If the cable is to be exposed to a higher temperature, then a higher temperature rating needs to be selected.

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10. It is important that the cable screens are connected as shown in order to comply with the electromagnetic compatibility requirements.

11. All external circuits must meet and maintain the requirements of double / reinforced installation as stated in IEC 60364 or equivalent.

12. Additional protection must be provided to prevent accessible parts (e.g. signal circuits) from becoming Hazardous Live if a wire or screw is accidentally loosened or freed. Ensure all wires are secured to at least one other wire from the same circuit. The attachment must be as close to the terminal block as possible but must not apply undue stress on the connection. Example: Use a cable tie to secure the live and neutral wire together. If one wire becomes loose the other wire will prevent it from touching accessible parts.

13. A disconnecting device (switch or circuit breaker) must be included in the building installation. It must:

- Have a rating with sufficient breaking capacity.
- Be in close proximity to the equipment, within easy reach of the operator.
- Not be fitted in a position that makes it difficult to operate.
- Disconnect all phase conductors.
- Be marked as the disconnecting device for the product.
- Not interrupt a protective earth conductor.
- Not be incorporated into a mains supply cord.
- Comply with the requirements for a disconnecting device specified in IEC 60947-1 (Specification for low-voltage switchgear and control gear - General rules) and IEC 60947-3 (Switches, disconnectors, switch-disconnectors and fuse-combination units).

14. See Section 10 - 'Technical Information' for terminal and cable specification.

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5.2 Mains wiring notes:

1. Read Section 5.1 before attempting to wire the supply to the product.
2. The wiring connections are identified on the terminal plugs.
3. Fuses should be fitted in all live conductors.
4. Double or reinforced insulation must be maintained between:
   - Hazardous live conductors (mains and relays circuits) and
   - Safety extra low voltages (All other components / connectors / conductors).
5. The wiring diagrams show relays and switches in the **Power Off** position.
6. Where the probe is fitted in the blowdown line and a purge is required 10 – 60 minutes of boiler firing (cumulative), connect a live supply from the burner control to the burner input. This supply should be live whenever the burner is firing – see Wiring Diagram.

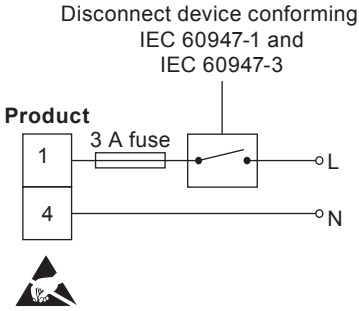


Fig. 12

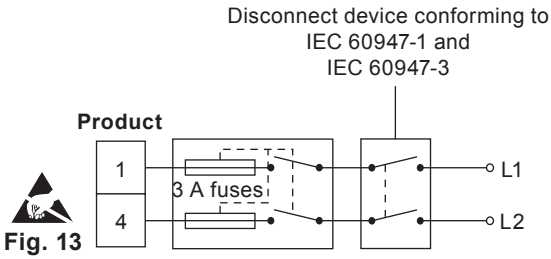


Fig. 13

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5.3 Blowdown valve wiring notes:

Note: The protective earth must be connected in accordance with National or Local regulations

Viewed from the underside, relays are shown in the power off position

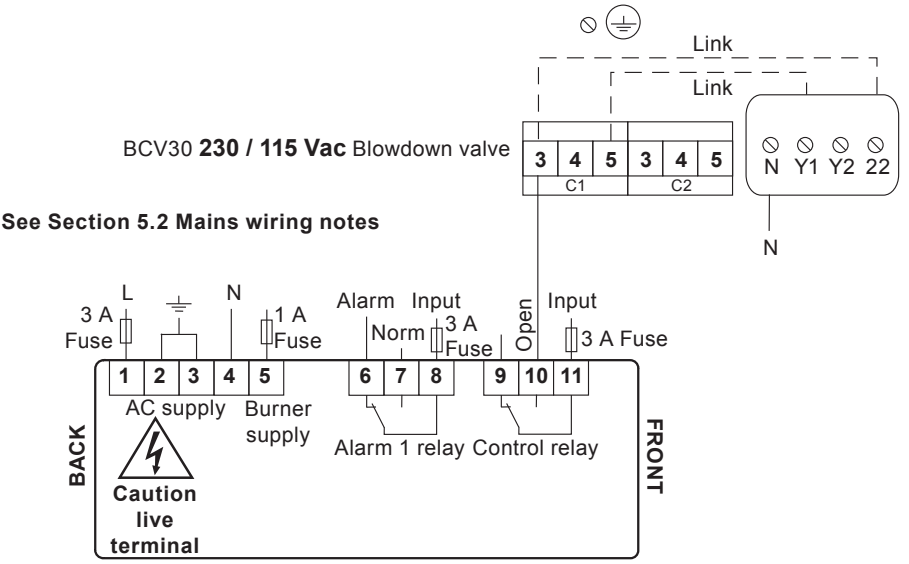


Fig. 14 BCV30 230 / 115 Vac blowdown valve

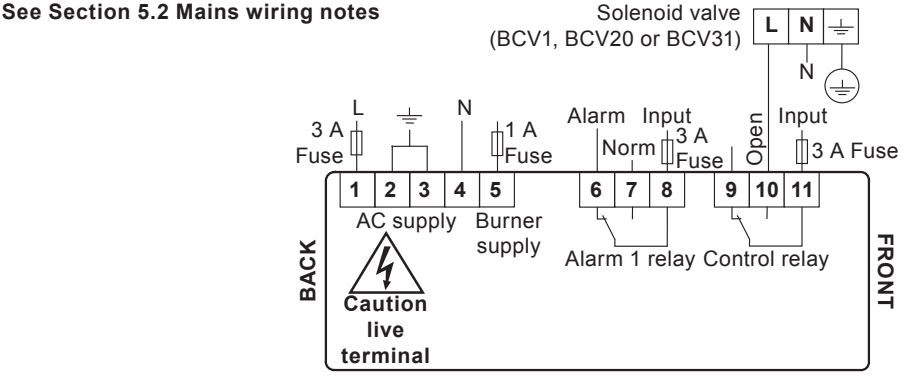


Fig. 15 BCV1, BCV20 or BCV31 solenoid valves

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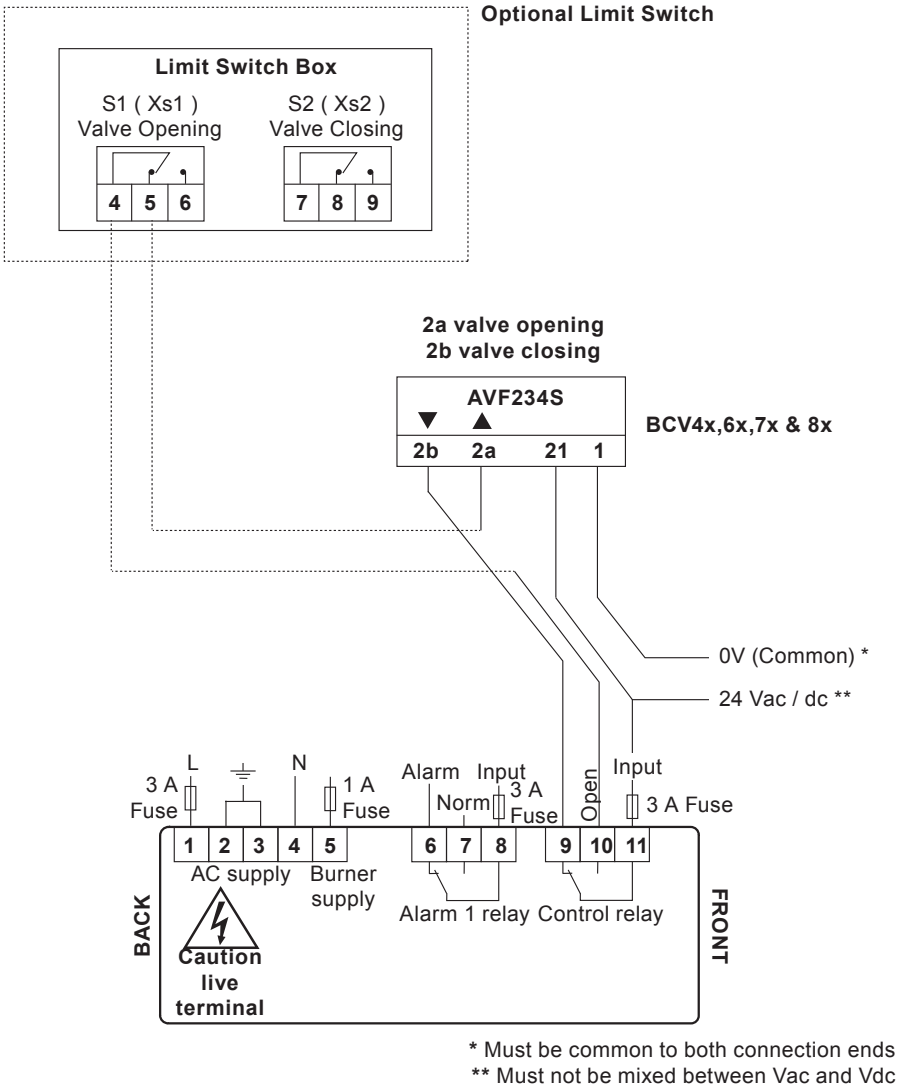


Fig. 16
BCVxx Blowdown valves with 24 Vac / dc Supply 2 cable / 3pt

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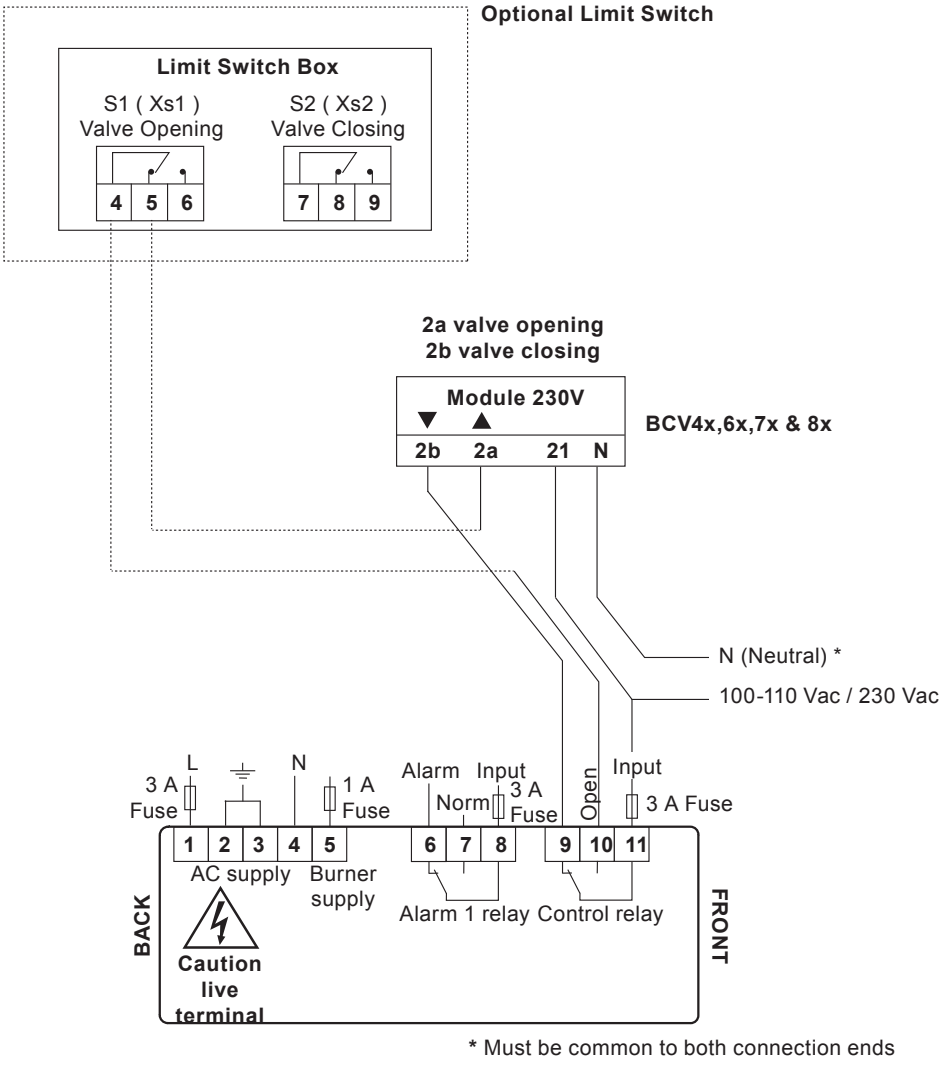


Fig. 17
BCVxx Blowdown valves with 100-110 Vac / 230 Vac supply 2 cable / 3pt

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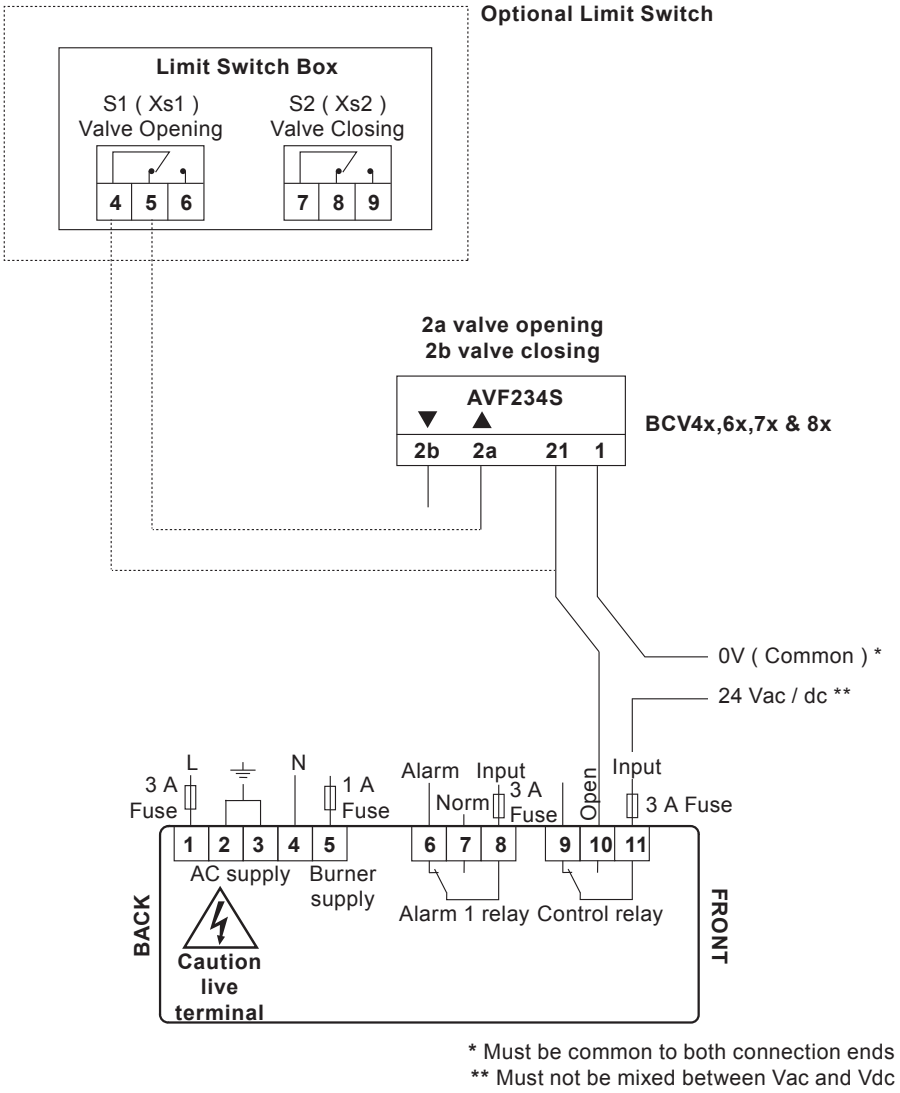


Fig. 18
BCVxx Blowdown valves with 24 Vac / dc Supply 1 cable / 2pt

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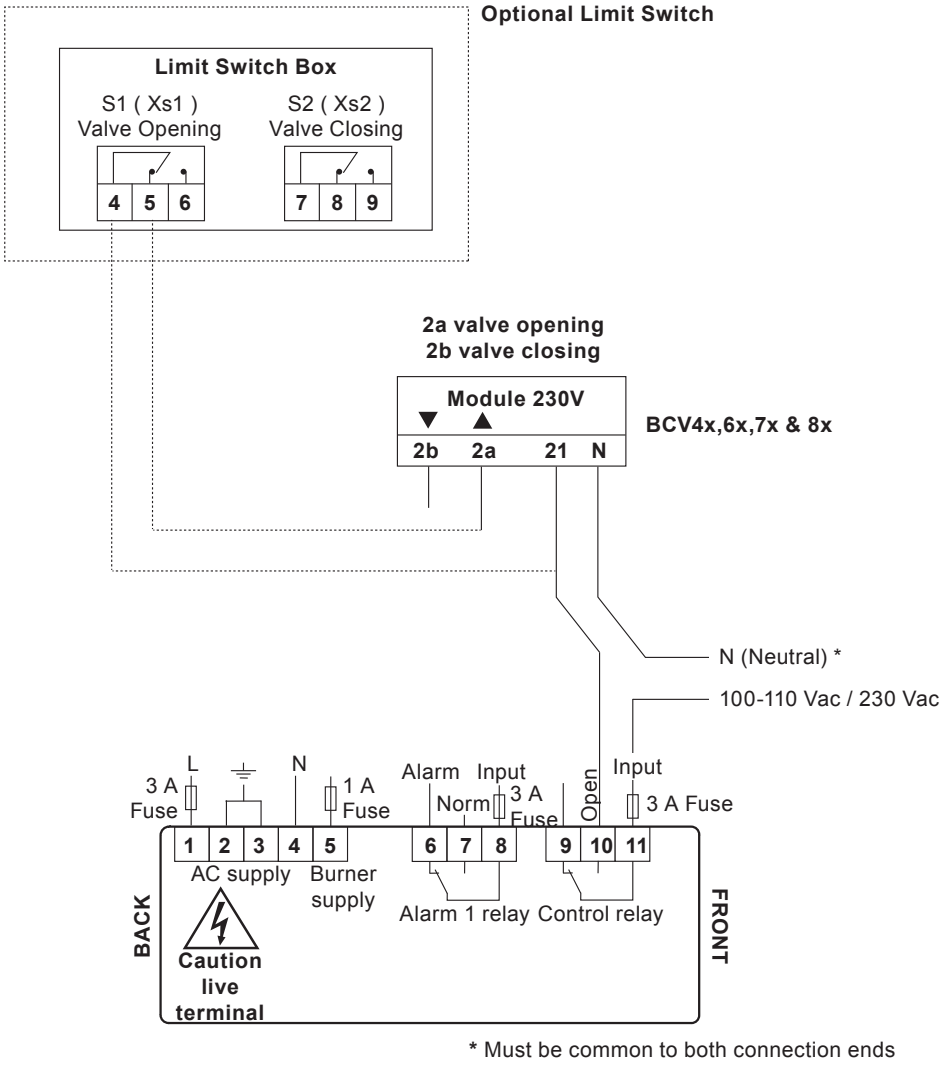


Fig. 19
BCVxx Blowdown valves with 100-110 Vac / 230 Vac Supply 1 cable / 2pt

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5.4 Signal wiring notes

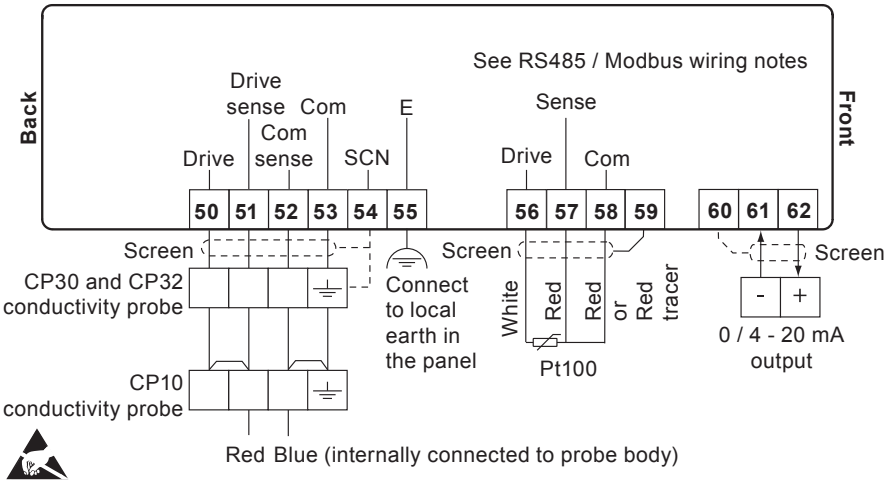
An earth current loop is created if a wire or screen is connected between two earth points that are at different potential (voltage). If the wiring diagram is followed correctly, the screen will only be connected to the earth at one end.

The earth terminal is a functional earth rather than a protective earth.

A protective earth provides protection from electric shock under a single fault condition. This product has double insulation and therefore does not require a protective earth. A functional earth is used in order for the product to operate. In this application, the earth is used as a sink or drain for any electrical interference. The earth terminal must be connected to a local earth in order to conform to the EMC directive.

5.5 Probe wiring

The maximum cable length for all probes is 100 m (9990 and 999.0 ranges), 10 m (9.990 range) or 30 m (99.90 range). All cables must be of the same gauge.



Note:
Do not connect terminals 53, 54, 59, 60 or 78 to any other earth.
Ensure that resistance from the probe body to the pipework / boiler shell is less than 1 ohm.
E = Functional earth. Connect these pins to earth local to the panel.

Fig. 20 Signal circuit (view from the top)

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5.6 Probe in blowdown (or condensate) line - CP10

For most applications the 1.25 m (4 ft) heat resisting probe cable will need to be extended using a junction box. If not, link terminals 50 to 51, and 52 to 53.

Note: Whilst pairs of conductors are linked at the junction box, the four wire connection is required to compensate for voltage drop.

5.7 Probe in boiler - CP30

The probe requires a 4 core screened cable connection.

Whilst pairs of conductors are linked at the probe, the four-wire connection compensates for voltage drop along the cable. The CP30 UL recognized probe is supplied with four 18 AWG, 12" long colour coded flying leads. These are to be cut to length and wired to a suitable terminal block housed in a suitable metal box. A length of flexible metal conduit is required between the probe and the terminal box to provide environmental and impact protection, and easy electrical connection. The cable socket is provided with a ½" NPT conduit adaptor for this purpose. See the CP30 IMI for further details.

5.8 Four wire Pt100

Will have two wires one colour, and two wires of another colour.

Link one of the pairs at the junction box, and connect to terminal 56.
Connect one of the remaining two wires to terminal 57, and the other to terminal 58.

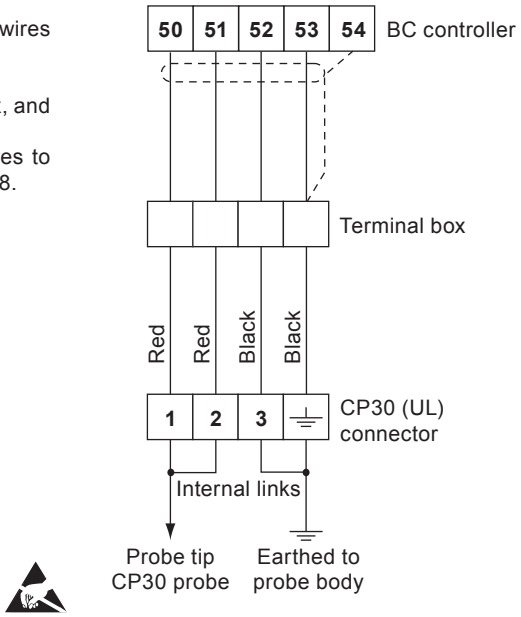


Fig. 21 Alternative wiring for the UL version

5.9 Temperature probe wiring

For the TP20, when the cable is to be longer than the 1.25 m (4 ft) supplied, a junction box and 3 core-screened cable will be needed. Colour codes for sensor wires vary, but a three-wire sensor will normally have 2 wires of one colour, and 1 wire of a different colour.

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6. Commissioning

6.1 General information

All commissioning for the product is carried out via the front panel.

WARNING:

On entering the commissioning mode the product will cease normal control. The control relay will shut the valve. For safety, the alarm relay will continue to operate as normal. To regain normal control, return to the run menu by selecting 'end'.

Note: If the purge time has been reset, a new purge interval will begin.

If during commissioning, the buttons are not pressed for over 5 minutes, the controller will revert to run mode and an error will be displayed. If the commissioning was incomplete the controller may not provide the correct control.

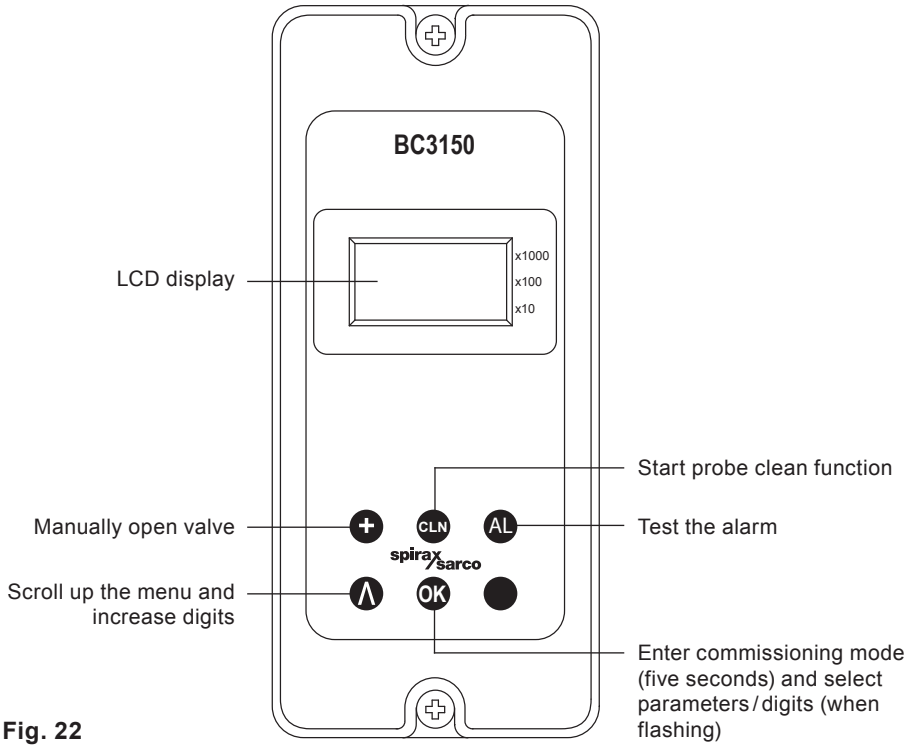


Fig. 22

The product has no battery. The programmed settings are held in non-volatile memory (Flash) and are written to after changing a parameter and pressing the OK button.

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6.2 Commissioning - Quick set-up

This section allows the user to carry out the minimum commissioning necessary to operate the system.

It accepts the defaults set in the factory, so will only work if the original default settings have not been altered. See default settings in Section 10, Technical information, to confirm.

Settings can then be tailored to suit the individual requirements of the customer / application if required.

WARNING:

It is essential that you comply with National / local regulations and Guidance notes, and the boiler manufacturer's recommendations. It is imperative that the settings you have accepted will allow the boiler to operate in a safe manner.

This procedure assumes a Pt100 is fitted to the controller.

Parameter	Action
Set Point	Set to the TDS to the level at which the blowdown valve is to open and press the OK button.
Alarm	Set to the TDS to the level at which the alarm is to operate and press the OK button (must be higher than SP).
Cal	Set to the actual measured value of the TDS and press the OK button.

Test the system to ensure that it is working correctly

6.3 Commissioning - Full

6.3.1 Main structure

On entering the correct pass code, the display will show the following menu structure:-



rAnge multiplier setting (x10, x100, x1000). Blank = x1.



Selects conductivity units:
ON = µS/cm (default)
OFF = ppm



Set **P**oint.
TDS level at which the valve will open.

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	**Al**arm relay released at this TDS level.
	**Al**arm **L**atch - Display the state of the alarm lockout. ON or OFF.
	**Pur**ge time - seconds. Sets duration of purge (probe in blowdown line installations).
	**Bur**ner input - Only visible if the purge time >0. ON = Purge occurs every half hour of boiler firing. OFF = Purge occurs every half-hour.
	Fi**LT**er - Increases the damping effect on the probe output. Visible only when purge time = 0.
	**CAl**ibration. Set to the actual TDS or conductivity value of the water.
	**Pul**sed output – on or off.
	**0** or **4** mA. Sets output to 0 - 20 mA or 4 - 20 mA.
	Internal **t**emperature **c**ompensation. Sets a default water temperature if a Pt100 is not fitted.
	**P**robe **F**actor. Displays a figure that indicates the probe condition.
	**End** – press the OK button to end commissioning menu and return to run mode.

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6.3.2 Main menu commissioning notes

rAn - Range multiplier setting

The range decimal point is used to select the most suitable range. Follow the boiler manufacturer's recommendations.

Use the ∧ button to move the indicator segment into view and to select the multiplier required for the range that you prefer too use (see Figure 23 for example):

- If the 0 to 9.99 range is required, then do not select a multiplier.
- If the 0 to 99.9 range is required, select x10
- If the 0 to 999 range is required, select x100
- If the 0 to 9990 range is required, select x1000

Press the OK button to accept the selection and move to the next menu option.

Multiplier	*Range	Example	
 x1000 x100 x10	0-9.99 ppm or µS/cm		4.530 µS/cm or ppm
 x1000 x100 x10	0-99.9 ppm or µS/cm		99.90 µS/cm or ppm
 x1000 x100 x10	0-999 ppm or µS/cm		350 µS/cm or ppm
 x1000 x100 x10	0-9990 ppm or µS/cm		5000 µS/cm or ppm

*Not accurate below 10% of range

Fig. 23

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6.3.3 µS/cm – Units

Micro Siemens/cm is the preferred option.

Press the OK button to select **On** for µS/cm. Press the ∧ button **to select OFF,** for ppm.

Press the OK button to confirm your selection and move to the next menu option.

6.3.4 SP - Set Point

The set point is the TDS value at which the blowdown or dump valve will open. The boiler manufacturer should be consulted wherever possible to specify the most suitable value. It has a fixed hysteresis of 5%. If the controller is only being used to provide an alarm, set the 'SP' reading to 99.9% FS.

To select a Set Point:

Press the OK button to show the current Set Point, then press the ∧ button to increase each digit.

Press the OK button to confirm your selection and move to the next menu option.

6.3.5 AL – Alarm

The TDS level at which the alarm is released. The alarm is used to warn of an unacceptably high TDS level. The level is set in accordance with the boiler manufacturers recommendations. The alarm setting must be above the Set Point level. The alarm has a fixed hysteresis of 3%. If the alarm is not used, set the 'AL' reading to 99.9% FS.

To select the alarm setting:

Press the OK button to show the current value, then ∧ button to increase each digit.

Press the OK button to confirm your selection and move to the next menu option.

6.3.6 ALL - Alarm latch

Select the state of the alarm lockout. ON or OFF.

To select an alarm latch:

Press the OK button to show the current value, then press the ∧ button to choose ON or OFF.

Press the OK button to confirm your selection and move to the next menu option.

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6.3.7 Pur - Purge

It is used only when the probe is mounted in the blowdown line, and ensures the sensor measures the TDS at boiler temperature. The time varies for different installations and is adjustable from 0 - 99 seconds. The purge time is set to zero if the probe is installed in the boiler.

To select a Purge time:

Press the OK button to show the current value, then press the ∧ button to increase each digit.

Press the OK button to confirm your selection and move to the next menu option.

6.3.8 – Burner input

This feature is not visible if the Purge is set to zero (i.e. sensor in boiler).
The interval time between purges is fixed to ½ hour. This can be set to be independent of burner firing **(off)**, or dependant on cumulative boiler firing time **(on)**.

Press the OK button to select **On** for dependant. Press the ∧ button to select **OFF**, for independent.

Press the OK button to confirm your selection and move to the next menu option.

6.3.9 FLt – FiLTer

This feature is only shown if no purge time is selected, i.e. probe in boiler. Increases the damping effect on the probe output. If the probe is installed directly in the boiler, select **ON**. Filter **ON** - 64 seconds (default) or **OFF**, which gives an 8 second delay.

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6.3.10 CAL – Calibration

The boiler must be at working temperature when calibrating a system. This is particularly important if a temperature sensor is not fitted.

To ensure accuracy, the figures entered for both Set Point and Calibration must be greater than 10% of the chosen range. For the best accuracy, calibrate the controller with the TDS as close as possible to the Set Point. In some cases the boiler may need to be run for a period of time to allow the TDS to build up before calibration. Recalibrate the boiler at the Set Point once the boiler has settled down (after a few days in most cases). Check the calibration (as close to the Set Point as is practical) weekly to ensure optimum performance.
Allow the previous reading to stabilise before recalibrating the controller.

To calibrate the product:

Press the OK button to show the last calibration, then press the ∧ button to increase each digit.

Press the OK button to confirm your selection and move to the next menu option.

Note: The unit will take approximately 60 seconds to calibrate, during which time the full stops between the 'CAL' message will flash.

Calibration - Probe in blowdown line
The correct purge time needs to be selected first to ensure the sensor measures conductivity at boiler temperature. Once the water conductivity / TDS has been entered, the controller will open the valve and record the conductivity of the boiler water at the end of the selected purge time.

Calibration - Probe in a CCD system
We recommend that a competent water treatment company be consulted to establish the most suitable conductivity level for individual plant. Conditions vary widely, as do the chemical properties and conductivity of contaminants.

In many cases, the normal measured value of 'clean' condensate will be very low, perhaps only 1 or 2 µS/cm in some cases, whereas the set point may be much higher, perhaps 30 or 40 µS/cm.

To calibrate a CCD system, a liquid at approximately the maximum allowable conductivity is introduced into the system. Use a mixture of tap water and condensate, to simulate condensate at approximately the maximum allowable conductivity level (the set point).
5 litres (1.3 US gallons) will be plenty for most systems. Use the Spirax Sarco MS1 conductivity meter to check the conductivity. Close both stop valves (Figure 9, page 16) and open the drain valve and 'water for flushing and calibration' valve. Pour in the prepared water, and let it run through the system until bubble free. Close the drain valve. Allow the display to settle for two minutes. Calibrate the controller as described in the main text. It is advisable to check calibration after the system has been running for a few days, then periodically depending on the individual plant conditions. Consult your water treatment specialist if in any doubt.

Note: Ensure purge time is set to zero and a Pt100 is installed.

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6.3.11 PUL – Pulsed blowdown valve operation

This feature is suitable for use with solenoid or pneumatic valves only. It must not be used with motorised valves. If **'on'** is selected the valve will open for 10 seconds and close for 20 seconds until the conductivity drops below the Set Point (plus the corresponding hysteresis). If **'oFF'** is selected, the valve will remain open continuously until the conductivity drops below the Set Point (plus the corresponding hysteresis).

Press the OK button to show the current setting, and press ∧ to toggle between pulse **OFF** or **On**.

Press the OK button to confirm your selection and move to the next menu option.

6.3.12 4 - 20 mA output retransmission

The controller outputs the current loop standards in common use. It retransmits the actual conductivity or TDS with respect to the full-scale range, for example;
0 µS = 4 mA and 100 µS = 20 mA.

Press the OK button to show the current selection, and press the ∧ button to toggle between **4.20** and **0.20**.

Press the OK button to confirm your selection and move to the next menu option.
Note: If a purge time has been selected, the 4 - 20 mA (0 - 20 mA) is held at the value recorded at the end of the last purge cycle.

6.3.13 tc – Internal temperature compensation

If a Pt100 temperature sensor is not fitted, enter an estimated average water temperature. If a Pt100 is fitted and measures a temperature between 100 - 250 °C, the water temperature will be shown (not flashing). With a Pt100 fitted, this menu cannot be edited.

To enter a temperature if a Pt100 is fitted:

Press the OK button to show the value, then press the ∧ button to increase each digit.

Press the OK button to confirm your selection and move to the next menu option.

6.3.14 PF – Probe factor

Shows the calculated probe factor, which indicates the condition of the probe.
This function cannot be edited.

See Section 9, fault finding, for acceptable limits.

6.3.15 End

Press the OK button to enter run mode.

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7. Communications

7.1 Infrared (IR)

All products in the range can communicate via an infrared link between adjacent controllers. It enables the parameters of this product (OEM) to be passed to a product fitted with RS485 (USER).

USER products are fitted with a graphics display and OEM products either have LED's, or three digit displays.

This unit is always an IR slave – No set-up or adjustment is needed.

For further information on Infrared and RS485 communication, see User Installation and Maintenance Instructions.

IMPORTANT: Do not cover or obstruct the infrared beam between products.

See appendix for further details.

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8. Maintenance

Note: Read the 'Safety information' in Section 1 before carrying out any maintenance.

No special servicing, preventative maintenance or inspection of the product is required.

During installation or maintenance, the rear of the product must be protected from environmental pollutants entering the product. Alternatively, the tasks can be performed in a dry clean environment.

8.1 Cleaning instructions:

- Use a cloth dampened with water or isopropyl alcohol.
- Use of other cleaning materials could damage the product and invalidate the warranty.

8.2 TDS controls

Boiler blowdown controls and alarms do, however, require testing and inspection.
General guidance is given in Health and Safety Executive Guidance Notes BG01 and INDG436.

8.3 General weekly maintenance:

- Take a sample of the boiler water through a sample cooler, measure its conductivity (calculate the TDS).
- Check the conductivity controller calibration with the boiler at normal operating pressure.
- Check that the blowdown valve shuts when the power is removed.
- Operate any stop valves to ensure that they shut off, and move freely.

8.4 General six months maintenance:

- Isolate the system (or with the boiler empty), remove the conductivity probe.
- Clean the tip with fine abrasive paper/pad and wipe the insulation with a cloth.
- Examine the control / solenoid / stop valves and other fittings.
- Clean and refit or replace any parts necessary.

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9. Fault finding

WARNING:

Before fault finding read the Safety information in Section 1 and the General wiring notes in Section 5.1.

Please note that there are hazardous voltages present and only suitably qualified personnel should carry out fault finding.

The product must be isolated from the mains supply before touching any of the wiring terminals.

Safety may be compromised if the fault finding procedures are not carried out in line with this manual.

Relay fuses to be replaced by manufacturer or accredited service department.

During installation or maintenance, the rear of the product MUST be protected from environmental pollutants entering the product. Alternatively, the tasks can be performed in a dry clean environment.

9.1 Introduction

If for any reason a fault occurs on the product, the instructions in this section will allow the fault to be isolated and corrected. The most likely time for faults to occur is during installation and commissioning. The most common type of fault is wiring.

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9.2 System faults

Symptom	Action
1 **Display not illuminating**	**1.** Switch off the mains supply to the product. **2.** Check all wiring is correct. **3.** Check external fuse(s) are intact. Replace if necessary. **4.** Check the mains voltage is within specification. **5.** Switch on mains supply. If symptoms are still present return the product for examination. Consider the likelihood that the product has been damaged from mains borne surges / spikes. Consider installing an additional ac power line protector between the product and the mains supply. The protector needs to be positioned close to the product to gain full protection.
2 **Display flashes on and off (1 second approx.)**	**1.** Switch off the mains supply to the product. **2.** Disconnect all signal wires. **3.** Switch the mains supply on: If symptoms are still present, return the product for examination. **4.** Replace each signal wire in turn until the fault occurs. **5.** Investigate and rectify any faults in the wiring, external sensors / transducers and modules associated with that connection. **Explanation** The internal power supply is unable to power up. If the voltages cannot be generated, the power supply switches off for approx.fault is still present, the cycle is repeated until the fault is removed. This is a safety feature and does not damage the product.

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Symptom	Action
3 **Product powers up for a period of time (greater than 1 minute), then switches off**	**1.** Monitor the mains supply and ensure it is continuous and within the specification limits. **2.** Measure the ambient temperature and ensure it is less than specified. **3.** Investigate symptom 2. **Explanation** A re-settable thermal cut-out device will operate if one or more of the following occurs: **-** The power drawn exceeds the specification. **-** The input mains voltage is lower than specified. **-** The ambient temperature is higher than specified. **-** The internal power supply will switch off until the product temperature drops below 65 °C. This is a safety feature and does not damage the product.
4 **Alarm light switches on constantly after commissioning**	**1.** Select 'CLN' to the probe and attempt to re-commission the system again. **2.** Determine the probe condition (Section 9). **If:** Symptoms are still present, return and replace the product. **Explanation:** The system cannot be calibrated with the measured conductivity. Build-up of scale on the probe, usually caused by inadequate water treatment. **Note:** If this is the case, scale will also be present in the boiler, and a competent water treatment company should be consulted to avoid the possibility of serious boiler damage.

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9.3 Operational error messages

Any operational errors that occur will be displayed in the run mode, on the alarms and errors screen.

Error message	Cause	Action
1 **Power out**	There has been a loss of power to the product during operation.	**1.** Remove the power from the product. **2.** Check that all the wiring is correct. **3.** Check that the power supply is secure, i.e. does not suffer from 'brown outs'. **4.** Reapply power.
2 **Setup menu time out**	The operator has entered the commissioning mode and has not pressed a key for 5 minutes or more.	**3.** Re-enter the commissioning mode if required.
3 **Alarm 1**	A high TDS alarm has occurred.	**1.** Check the boiler operation. and the alarm level setting. The feedwater quality and treatment regime should be checked as soon as possible. Spirax Sarco offer boiler water treatment advice and service.
4 **Alarm is latched!**	Some errors latch the alarm relay for safety. Clearing the error from the error screen just removes the message.	**1.** Enter the commissioning (setup) mode. If the correct password is entered all the latched alarms will be cleared.

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9.4 Determining the probe condition

The probe condition can be checked without removing it from the boiler.
From the run menu select probe factor (PF) and compare it with the following table:

Probe factors	Typical
BCS1, BCS2, and BCS4	0.2 – 0.6
BCS3	0.3 – 0.7

A low cell constant indicates that the probe is able to conduct well, whereas a high cell constant indicates that the probe tip has become less conductive, perhaps due to a build-up of scale.

A very low cell constant, however, could indicate an internal short circuit. The further the probe tips from any part of the boiler, the higher the cell constant.

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10. Technical information

10.1 For technical assistance

Contact your local Spirax Sarco representative. Details can be found on order/delivery documentation or on our web site: **www.spiraxsarco.com**

10.2 Returning faulty equipment

Please return all items to your local Spirax Sarco representative. Please ensure all items are suitably packed for transit (preferably in the original cartons).

Please provide the following information with any equipment being returned:

1. Your name, company name, address and telephone number, order number and invoice and return delivery address.
2. Description and serial number of equipment being returned.
3. Full description of the fault or repair required.
4. If the equipment is being returned under warranty, please indicate:
   - Date of purchase.
   - Original order number.

10.3 Power supply

Mains voltage range	110 V to 240 Vac at 50/60 Hz
Power consumption	7.5 W (maximum)

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10.4 Environmental

General		Indoor use only
Maximum altitude		2 000 m (6 562 ft) above sea level
Ambient temperature limits		0 - 55 °C (32 - 131 °F)
Maximum relative humidity		80% up to 31 °C (88 °F) decreasing linearly to 50% at 40 °C (104 °F)
Overvoltage category		III
Pollution degree		2 (as supplied)
		3 (when installed in an enclosure) **-** Minimum of IP54 or UL50 / NEMA Type 3, 3S, 4, 4X, 6, 6P or 13. See Section 4, Mechanical Installation.
Enclosure rating (front panel only)		NEMA type 4 hose down only (UL approval), and IP65 (verified by TRAC Global)
Torque rating for panel screws		1 - 1.2 Nm
LVD (safety)		Electrical Safety EN 61010-1 UL61010-1, 3rd Edition, 2012-05 CAN / CSA-C22.2 No. 61010-1, 3rd Edition, 2012-05
EMC:	Immunity / emissions	Suitable for heavy industrial locations
Enclosure	Material	Polycarbonate
Front panel	Material	Silicone rubber, 60 shore.
Solder		Tin / lead (60 / 40%)

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10.5 Cable / wire and Connector data

Mains and signal connector

Termination	Rising clamp plug-in terminal blocks with screwed connectors
Cable size	0.2 mm² (24 AWG) to 2.5 mm² (14 AWG)
Stripping length	5 - 6 mm

Note: Use only the connectors supplied by Spirax-Sarco Limited – Otherwise Safety and Approvals may be compromised.

TDS probe cable / wire

Type	High temperature
Shield type	Screened
Number of cores	4 (CP10 and CP20 - For most applications the 1.25 m (4 ft) heat resistant cable will need to be extended using a junction box)
Gauge	1 - 1.5 mm² (18 - 16 AWG)
Maximum length	100 m (9990 and 999.0 ranges) 30 m (99.90 range) 10 m (9.990 range)
Recommended type	Prysmian (Pirelli) FP200, Delta Crompton Firetuf OHLS

Pt100 probe cable / wire

Type	High temperature, twisted
Shield type	Screened
Number of cores	3
Gauge	1 - 1.5 mm² (18 - 16 AWG)
Maximum length	100 m (328 ft)
Recommended type	Various

4-20 mA output cable / wire

Type	Twisted pair
Shield type	Screened
Number of pairs	1
Gauge	0.23 - 1 mm² (24 - 18 AWG)
Maximum length	100 m
Recommended type	Various

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10.6 Input technical data

Water conductivity

Probe types:	CP10, CP30 and CP32
Ranges	Minimum ≥ 1 µS @ 25 °C
	0 - 9.99 ppm or µS / cm
	0 - 99.9 ppm or µS / cm
	0 - 999 ppm or µS / cm
	0 - 9990 ppm or µS / cm
Accuracy	±2.5% FSD (possibly > in high EM locations)
	±5% FSD for 0 - 9.999 range
µS / cm to ppm conversion	0.7
Neutralising factor	0.7
Resolution	0.1% FSD
Drive	ac - 4 wires

Temperature compensation (TC)

Sensor type	Pt100 – Class B or better
Range	0 - 250 °C (With Pt100 not fitted – user programmed temperature 100 - 250 °C, 1 °C steps)
Accuracy	±2.5% FSD – system accuracy ±5%
Resolution	1% FSD
Drive:	dc – 3 wires

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10.7 Output technical data

Probe cleaning (Press 'CLN' button in commissioning mode)	
Maximum voltage	32 Vdc
Drive	Pulsed (1 second on, 1 second off)
Time	20 seconds
4-20 mA	
Mimimum	0 mA
Maximum	20 mA
Open circuit voltage (maximum)	19 Vdc
Resolution	0.1% FSD
Maximum output load	500 ohm
Isolation	100 V
Output rate	10 / second
Relay(s)	
Contacts	2 x single pole changeover relays (SPCO)
Voltage ratings (maximum)	250 Vac
Resistive load	3 amp @ 250 Vac
Inductive load	1 amp @ 250 Vac
ac motor load	¼ HP (2.9 amp) @ 250 Vac
	$^{1}/_{10}$ HP (3 amp) @ 120 Vac
Pilot duty load	C300 (2.5 amp) - control circuit / coils
Electrical life (operations)	3 x 10^5 or greater depending on load
Mechanical life (operations)	30 x 10^6

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10.8 Programming parameters / default settings

The default settings in this table are used in the 'quick start' guide - See Section 6.3.

Range (rAn)		
Ranges	X 1 (no display)	0 to 9.99 µS/cm or ppm
	X 10 (bottom bar)	0 to 99.9 µS/cm or ppm
	X 100 (middle bar)	0 to 999 µS/cm or ppm
	X 1000 (top bar)	0 to 9990 µS/cm or ppm
Default	X 1000	
ON = µS/cm (uS) or OFF = PPM		
Ranges	OFF - ON	
Default	ON	
Set point (SP)		
Ranges	0 - 99.9% FSD	
Hysteresis	5% FSD	
Default SP	50% FS	
Alarm (AL)		
Ranges	0 - 99.9% FSD	
Hysteresis	3% FSD	
Default	99.9% FS	
Alarm latched (ALL)		
Ranges	OFF - ON	
Default	OFF	
Purge (Pur)		
Ranges	0 - 99 seconds (0 = feature not selected)	
Default	0	

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Burner (bur) - Only available if PURGE time is greater than 0 seconds.	
Ranges	ON or OFF
Default	ON
Filter (FLt) - Only available if PURGE time is = 0 seconds.	
Ranges	ON or OFF (TC = 64 or 8 seconds). Please note that the 8 second filter, also includes a 5% (FSD) Jump out function for CCD systems. TC = Time constant
Default	ON (OFF if PURGE - DURATION >0)
Pulsed (PuL) – Valve / solenoid drive	
Ranges	OFF - STANDARD (continuous) ON - Pulsed - 10 seconds open, 20 seconds closed
Default	OFF
Retransmit (rEt) 0 - 20 mA or 4 - 20 mA output	
Ranges	0 or 4 mA
Default	4 mA
Temperature compensation (tC)	
Ranges	100 - 250 °C
Default	184 °C (10 bar g)
Resolution (steps)	1 °C
Probe factor (PF)	
Ranges	0.01 to 1.00

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11. Appendix - Data registers

Data registers

Register	Parameters
0	2 (Identity) **Note:** When the device is an IR slave and there is a temporary error in the IR Master-Slave comms, an offset of +32768 is added to the identification value of that particular slave stored in the master's database.
1	Process variable (PV) - TDS @ 25 °C
2	Set Point (SP)
3	µS/cm or ppm (general data)
4	Alarm 1
5	Range index
6	Probe factor
7	Temperature compensation (°C or °F)
8	Purge time (seconds)
9	Clean duration (seconds)

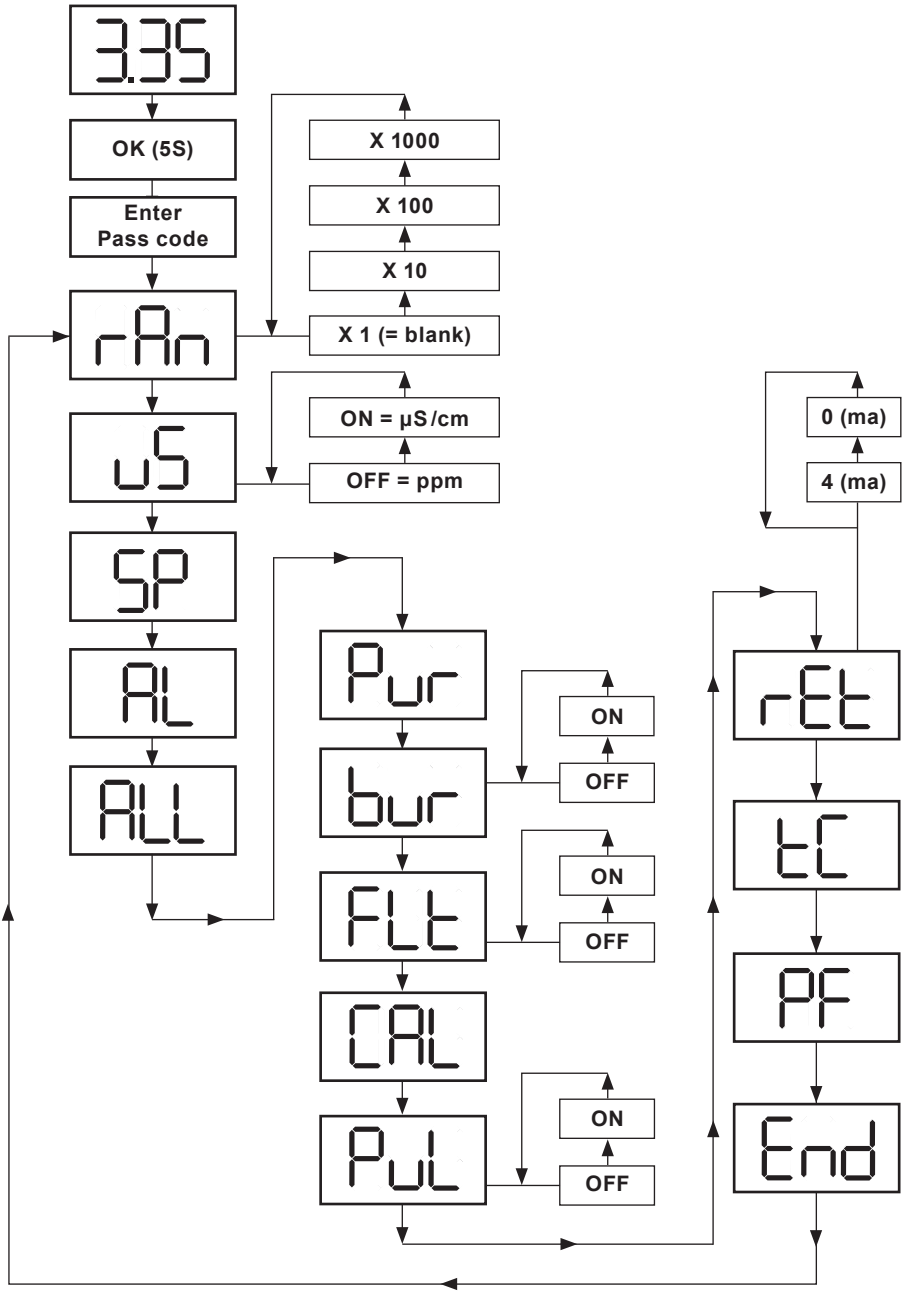
The format of the register data is 16 bit integer, with the most significant byte transmitted first.

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12. Menu map

Normal run mode display



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