

**CSM-K Control Unit**  
**for the control of indirect steam generator systems**  
**Installation and Maintenance Instructions**

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TEMPLATE

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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 paragraph 'permits to work' page 6) 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.

## Safety note - Handling precautions

### PTFE

Within its working temperature range PTFE is a completely inert material, but when heated to its sintering temperature it gives rise to gaseous decomposition products or fumes, which can produce unpleasant effects if inhaled. The inhalation of these fumes is easily prevented by applying local exhaust ventilation to atmosphere as near to their source as possible.

Smoking should be prohibited in workshops where PTFE is handled because tobacco contaminated with PTFE will during burning give rise to polymer fumes. It is therefore important to avoid contamination of clothing, especially the pockets, with PTFE and to maintain a reasonable standard of personal cleanliness by washing hands and removing any PTFE particles lodged under the fingernails.

### VITON

If Viton has been subjected to a temperature approaching 315°C (599°F) or higher it may have decomposed and formed hydrofluoric acid. Avoid skin contact and inhalation of any fumes as the acid will cause deep skin burns and damage the respiratory system.

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended use / application. This product complies with the European Pressure Equipment Directive 97/23/EC, and carries the CE mark when so required.

- i) The products have been specifically designed for use on steam, air or condensate, which are in Group 2 of the above mentioned Pressure Equipment Directive. The products' use on other fluids may be possible but, if this is contemplated, Spirax Sarco should be contacted to confirm the suitability of the product for the application being considered.
- 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.

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## European Pressure Equipment Directive classification

Spirax Sarco Clean steam generators are classified under Table 5 of the European Pressure Equipment Directive. The CSM-K generator is a Category 3 or Category 4 product depending on size and pressure

**Other component parts within the package comply with the relevant European Directives where necessary, please refer to product specific component literature for further details.**

### 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.

### Lighting

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

### 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.

### 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.

### 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.

### 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 labelling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

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## Temperature

Allow time for temperature to normalise after isolation to avoid the danger of burns and consider whether protective clothing (including safety glasses) is required.

**PTFE seals** - If seals made from PTFE have been subjected to a temperature approaching 260°C (500°F) or higher, they will give off toxic fumes, which if inhaled are likely to cause temporary discomfort. It is essential for a no smoking rule to be enforced in all areas where PTFE is stored, handled or processed as persons inhaling the fumes from burning tobacco contaminated with PTFE particles can develop 'polymer fume fever'.

**VITON seals** - If the Viton seal has been subjected to a temperature approaching 315°C (599°F) or higher it may have decomposed and formed hydrofluoric acid. Avoid skin contact and inhalation of any fumes as the acid will cause deep skin burns and damage the respiratory system.

## Tools and consumables

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

## 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.

## 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.

## 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.

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## Residual hazards

In normal use the external surface of the product may be very hot. If used at the maximum permitted operating conditions the surface temperature of some products may reach temperatures of 192°C (377°F).

Many products are not self-draining. Take due care when dismantling or removing the product from an installation (refer to 'Maintenance instructions'). Ensure that all electrical supplies are isolated prior to commencing maintenance.

## Freezing

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

## Disposal

This product may contain PTFE and Viton, special care must be taken to avoid potential health hazards associated with decomposition/burning of these materials. With the exception of the seal materials 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. However, all components should be checked individually to ensure they can be disposed of safely.

### PTFE:

- Can only be disposed of by approved methods, not incineration.
- Keep PTFE waste in a separate container, do not mix it with other rubbish, and consign it to a landfill site.

### Viton:

- Waste parts can be landfilled, when in compliance with National and Local regulations.
- Parts can be incinerated, but a scrubber must be used to remove Hydrogen Fluoride, which is evolved from the product and with compliance to National and Local regulations.
- Parts are insoluble in aquatic media.

## 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. General information

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This manual covers the procedures for the Installation, Operation and Maintenance of the CSM-K control unit for the control of indirect steam generator systems. This manual is intended to be as complete and up to date as possible. Spirax Sarco reserves the right to update it at any time and without obligation to notify product owners of such changes.


### Responsibilities

Spirax Sarco is not responsible for inaccuracies in specifications, procedures and / or the content of other product literature, supplied by the manufacturers of components used in the construction of Spirax Sarco steam generators (i.e.: valves, pressure control, gauges, etc.). Spirax Sarco strives to use only the highest quality components in the building of our steam generators and will only be responsible for our own branded components. Spirax Sarco will not be responsible for other manufacturers products as we have no direct control over their quality. However, we will take full responsibility for any complete system which has been supplied by us.

**Note:** The symbol  will denote a warning/caution.

 **Spirax Sarco is not responsible for injury to personnel or product damage due to improper actions and procedures used for installation, operation and maintenance.**

These procedures should only be performed by trained and certified personnel. Before actioning these procedures the personnel should completely and carefully read and understand this manual and other applicable manuals for all supplied products. All personnel should also pay strict attention to all Notes, Cautions and Warnings described in this manual.

 **In the case where Spirax Sarco supplies a steam generator without any auxiliary control equipment, this manual is applicable only for the supplied generator part. The main contractor of the system will then assume the responsibility for other manufactures supplied components and for their relevant manuals, and for the complete generation of the system.**

### Scope of the manual

This manual has been conceived as an operating guide for the CSM-K control unit used on Spirax Sarco CSM series steam generators. Since every unit is built according to customer specifications, the manual instructions might sometimes appear too general and incomplete. Additional specific notes will be supplied when the procedures substantially differ from those included in the standard manual.

**Should this manual not respond to all questions or the procedures not be clearly comprehensive, the user is invited to contact Spirax Sarco for any clarification.**



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## Warnings

In the following pages several points with specific warnings are listed. Warnings are moreover repeated when the procedures refer to areas of potential hazard.

All warnings and relevant precautions have to be carefully studied and followed to reduce the risk of injury during operations regarding installation, start-up and maintenance.

**⚠ Every product or system using steam, diathermic oil or superheated water under pressure or electric power can represent a potential hazard to personal injury when procedures are not properly followed.**

**⚠ The simultaneous presence of water and electric power can generate hazardous conditions.**

**⚠ Areas with potential hazard:**

- 1. All connections and electric cables.**
- 2. All steam lines, valves, joints and pressure controllers.**
- 3. All steam lines, diathermic oil or superheated water, valves, joints and pressure controllers.**

## Connections of main power supplies

All procedures for the connection of main power supplies have to be performed by trained and qualified electrical personnel. The PLC unit for the control of Spirax Sarco steam generators are designed to be installed in covered locations, unless otherwise specified by the customer.

**⚠ Make sure to disconnect power before actioning any installation or maintenance procedure.**

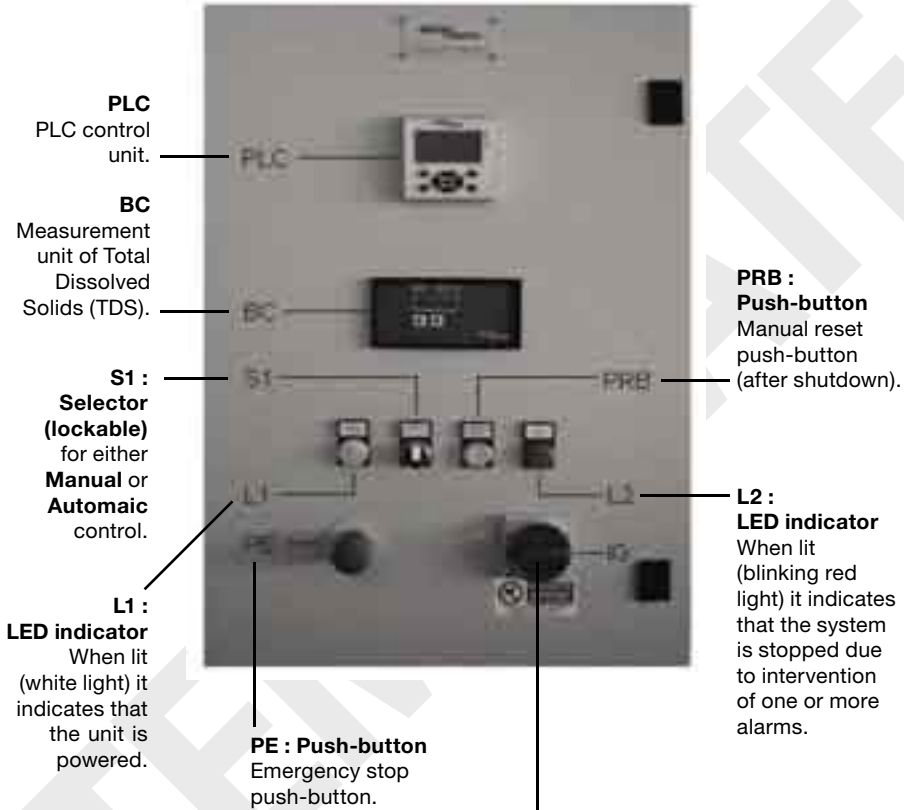
# 3. Control unit

## Description

CSM-K control and safety unit is a PLC type intelligent equipment designed to start-up, control and operate indirect steam generation systems, either in local mode or by ultimate means of a remote system (DCS/BMS).

## Location and identification of components

Front panel



### IG : Main power switch

This power disconnect device is equipped with a door locking handle that breaks the three phases of the input voltage and allows to open the cabinet door only when it is in the 'OFF' position.

**⚠ Attention:** the user must provide an external stop circuit outside of the drive circuitry. The circuit must disable the system in case of improper operation or for unit maintenance. Failure to observe this precaution could result in a hazardous situation or in body injury for employed personnel.

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## Inside cabinet

(See attached wiring diagram)



Fig. 2

<b>IG</b>	Main power switch.
<b>PLC</b>	Control unit with analog and digital inputs and outputs.
<b>RE1 - RE3</b>	Resistors.
<b>R2-R8</b>	Relays.
<b>AL1</b>	24 Vdc power supply.
<b>I1</b>	Automatic switch for power supply of primary circuit.
<b>I2</b>	Automatic switch for power supply of secondary circuit.
<b>FT</b>	Fused terminal to protect solenoid valve for TDS control.
<b>FV</b>	Fused terminal to protect solenoid valve for steam control.
<b>FA</b>	Fused terminal to protect solenoid valve for water control.
<b>FS</b>	Fused terminal to protect solenoid valve for bottom blowdown system control.
<b>BC3100</b>	(optional) TDS control.
<b>K1</b>	(optional) remote switch for pump control.

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## 4. Control features

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The CSM-K control unit is a PLC based unit designed to provide control of:

- Pressure.
- Water level.
- Discharge blowdown where applicable.

**and operation of:**

- Blowdown function where applicable.
- All alarm limits of Spirax Sarco indirect steam generators.



The control unit is equipped with a video interface displaying screens with graphics of the generator and also selective parts, e.g. error and functional messages, etc.

Set point values can be displayed and modified during operation using functional keys.

Two LED's respectively indicate the **RUN** status of the program (Green light) and the presence of at least one alarm (Red light). The control unit enables the setting of all operating parameters by means of different display screens. The CSM-K control unit also provides a visual alarm signal.

In addition to the automation of a single generator, the system allows the achievement of computerized networks with PC's, PLC's and microprocessor based systems thus permitting a high level of integration among automation systems applied to the various units present in the plant. The supervision system can be considered in terms of visualization of data relevant to equipment, configuration and production control.

The control unit is equipped with a main power switch and is housed in a metal cabinet with protection degree IP54 and with dimensions of 700 x 500 x 250 mm.

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## 5. External connection

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All electrical connections have to be carried out by trained and qualified installation electricians. It is important to verify that the main power switch is in the 'OFF' position before connecting the line voltage.

The installer has to route the power cables, reach the terminals located on the main power switch mounted on the panel and run the ground wire to the earth ground terminal.

The units are normally wired for a 3-phase input voltage of 415 Vac 50 Hz. If necessary other input voltages can be provided on request.

**⚠ Attention:** Prior to drilling a hole in the panel for the connection of power cables, carefully open the panel door and verify there are no impediments inside the panel. Make sure to avoid contacts with drilling residuals or with any mechanical part left on the base or on the transformer or on the switch.

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## 6. Main power supply

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**Input voltage:** 415 V 3-phase – 50 Hz

**Minimum voltage:** 210 V

**Maximum voltage:** 240 V

**Output contacts:** 3 A – 230 V for inductive loads

**Output contacts:** 6 A – 230 V for resistive loads

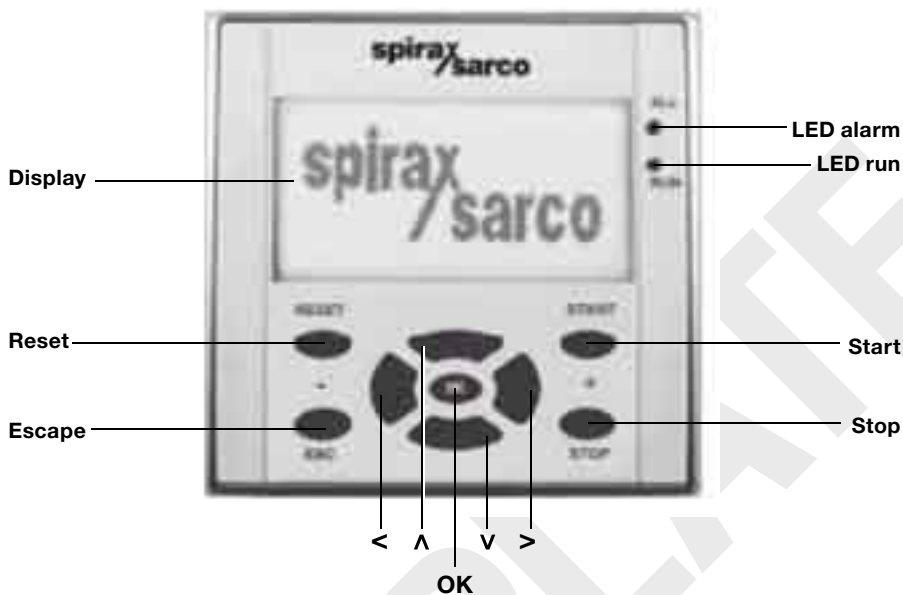
**Operational ambient temperature:** Minimum –20°C to a Maximum +55°C

**Relative Humidity (RH):** from 5% to 95% non-condensing

**LCD display with energy saving dimmer function:** 4 lines each with 16 characters

## 7. Display and keyboard

Nine keys are located on the lower part of the panel just below the display.



### RESET key

During manual or automatic operation the key is pressed to acknowledge an alarm condition.

If the type of alarm does not provide a cycle stoppage (shutdown), the program resumes the normal operation.

If the alarms such as for maximum level, minimum level, maximum pressure etc, activate a cycle stoppage (shutdown), in order to resume the cycle it is necessary to press the external manual reset push-button.

### ESC key

In manual operation mode the **ESC** (escape) key is pressed to deactivate all active functions and return to Screen 3 for function selection.

In automatic operation mode the **ESC** key is pressed to return to Screen 3 (Selection menu) whilst the program is still running.

### START key

In automatic operation mode the **START** key is pressed to activate the selected functions and to resume the selected functions after a stop. **RUN** LED (green) is lit.

### STOP key

In automatic operation mode the **STOP** key is pressed to stop the active functions. **RUN** LED is switched off.

### OK key

In automatic operation mode the **OK** key is pressed to confirm the selected functions.

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### **< key**

In manual and automatic operation mode the < key is pressed to decrease the set point values.

### **> key**

In manual and automatic operation mode the > key is pressed to increase the set point values.

### **v key**

In manual and automatic operation mode the v key is pressed to select the functions to be activated and to select the relevant parameter to be programmed. In automatic operation mode this key is pressed to return from the set point programming screen to that displaying the values of the variables (pressure and level).

### **^ key**

In manual and automatic operation mode the ^ key is pressed to select the functions to be activated and to select the relevant parameter to be programmed. In automatic operation mode this key is pressed to return from the screen displaying the values of the variables (pressure and level) to the set point programming screen.

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## Initial screen

Powering the unit the display will show Screen 1:



**Screen 1**

By pressing the **V** key, Screen 2 or 3 will be displayed.



**Screen 2**

Horizontal steam generator (CSM-K)

or



**Screen 2**

Vertical steam generator (CSM-H)



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By pressing the **V** key again, screen 3 will be displayed where it will be possible to select one out of four operation modes (**Manual - Automatic - Historical alarms - Parameters**).

Press the **V** and **Λ** keys to move down and up for the selection of the desired operation mode.

Then press the **OK** key to confirm and store the choice and enter the selected mode.



Screen 3

## 8. Manual mode

Upon selection of the manual operation mode, by pressing the **V** key again, Screens 4, 5, 6 and 7 are accessed in sequence.

By pressing the **Λ** key the reverse selection is obtained.



**Screen 4**  
Feedwater control mode



**Screen 5**  
Pressure control mode



**Screen 6**  
Bottom blowdown control mode  
(if applicable)



**Screen 7**  
Conductivity control mode  
(if applicable)

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## General considerations in manual mode with manual mode selected

With the manual mode selected, it is possible, by pressing the **V** and **Λ** keys to access subsequent screens and select other functions. Previously selected functions however, are left active. If the previously selected function is to be deactivated, the **<** button should be pressed until 'OFF' is displayed or the set point reads '0'.

In order to deactivate all active functions and return to Screen 3 for function selection, it is necessary to press the **ESC** key.

During the operation in manual mode the alarm locks (safety switches) are active.

By pressing the emergency push-button all alarms will be displayed. Pressing the same push-button again, Screen 4 (feedwater manual control) will be displayed to allow the selection of the function to be activated by pressing the **V** and **Λ** keys.

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## Manual control of the feedwater

**⚠** The supplied level transmitter has a working range defined by, and matched to, the specification of each generator. It is important that the working range of the transmitter matches that programmed in the control unit.

There are three types of level control:

### The three types are defined as:

Type [0], Type [1] and Type [2]

**Type [0]** - The level control is an on-off type of control provided by a level switch device. When the preset limits are exceeded this level switch controls the start-up or the stoppage of the feedwater pump or the opening and the closure of the isolation valve.

**Type [1]** - It is a continuous control acting on the feedwater pump by means of a level control modulating feedwater control valve and measuring unit. The pump, when provided, will run continuously in cycle.

**Type [2]** - It is a continuous control that through a level control and measuring unit operates on the frequency changer to change the flow of feedwater.

In order to manually control the feedwater proceed with the following steps:

Turn the 'cycle' selector to position '0' (Manual control) and select Screen 12 (Control display).



Screen 12



Screen 9

If the selector is turned to position '1' (Automatic control) an alarm status is obtained as displayed on Screen 9. In this situation switch the selector to position '0' to reach the condition displayed on Screen 12.

Once the manual mode is selected press the < (-) and (+) > keys to increase or decrease the valve opening and consequently adjust the level of the different types of generators. The display will indicate:

**Level type [0]** Valve graphic completely displayed (open).

**Level type [1]** The value in % of the control valve position and the value of the measured level.

**Level type [2]** The value in % corresponding to the required pump speed and the value of the measured level.

If the water flow is not required, only the profile of the valve position will be displayed. When the water flow is required through the control of the valve, the complete valve graphic will be displayed.

**During operation, the following alarm conditions can occur:**

- Measurement alarm (when a 4-20 mA transmitter is provided).
- Maximum level alarm.
- Maximum pressure alarm.
- Pump stoppage tripped alarm.

When an alarm condition occurs, as displayed on Screens 13 and 14, the isolation feedwater control valve of the water will close.

The operation will be stopped and the general alarm LED will light up. The alarm type indicated on the screen will be cleared by pressing the **RESET** button on the panel keyboard. The general alarm remains active and the LED will blink. It is necessary to remove the cause of the alarm before re-opening the valve. Then press the external manual reset push-button.

In order to resume the operation of level control press the < (-) and (+) > or <OFF ON> keys.



Screen 13



Screen 14

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## Manual control of the pressure

**⚠** The supplied pressure transmitter has a working range defined by, and matched to, the specifications of each generator. Normal ranges are 0 – 3, 0 – 4 or 0 – 10 bar. It is important that the working range of the transmitter matches that programmed in the control unit.

For manual control of the pressure valve proceed with the following steps:

Turn the 'cycle' selector to position '0' (Manual control) and select Screen 5 (Pressure control).



**Screen 5**

If the selector is turned to position '1' auto (Automatic control) an alarm status is obtained as displayed on Screen 8.

In this situation change the selector switch to position '0' to reach the condition displayed on Screen 8.



**Screen 8**

Press (+) > and < (-) keys to increase or decrease the pressure of the generated steam. The display will indicate the opening value of the valve in % and the steam pressure value in bar. When the required value of the position exceeds the limit of '0', the on-off solenoid control valve will be open. Meanwhile the Screen will show the complete graphic of the valve to indicate the working condition of the same.

The stoppage and the closure of the isolation steam control valve are instead indicated with the external profile only of the valve graphic. Screen 8 is supposed to be displayed during the normal operation in manual mode.

**During operation, the following alarm conditions can occur:**

- Transmitter alarm.
- Maximum level alarm.
- Minimum level alarm.
- Maximum pressure alarm.



**Screen 10**



**Screen 11**

When an alarm condition occurs, as displayed on Screens 10 and 11, the isolation steam control valve will close. The operation will be stopped and the general alarm LED will light up.

To acknowledge the alarm press the **RESET** key. Screen 4 will be displayed (manual control of feedwater) whilst the general alarm remains active. It is necessary to remove the cause of the alarm before re-opening the valve. Then press the external manual reset push-button.

Press the **V** and **A** keys to access Screen 5, then press the < (-) and (+) > keys to resume the operation of the valve.

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## Manual control of the bottom blowdown valve (with PLC control option)

For manual control of the bottom blowdown valve proceed with the following steps:

Turn the 'cycle' selector to position '0' (Manual control) and select Screen 6 (Bottom blowdown control).

If the selector is turned to position '1' (Automatic control) an alarm status is obtained as displayed on Screen 9.

In this situations switch the selector to position '0' to reach the condition displayed on Screen 12.



Screen 6



Screen 9

Press (ON) > and (OFF) < keys to open or close the bottom blowdown valve.

When the valve is closed (travel limit switch ON is active) the external profile only of the valve graphic will be displayed. When instead the valve is open (travel limit switch OFF is active) the screen will show the complete graphic of the valve.



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After a command to open or close the valve, the achievement of the travel limit is verified. If after a few seconds the intervention of the travel limit does not occur (the valve has not reached the open or closed position after the correspondent command) the general alarm is generated (Screen 17 and 18) and its associated LED will light up.

To acknowledge the alarm press the **RESET** key. Screen 4 will be displayed. It is necessary to remove the cause of the alarm before reopening the valve.

Press the **V** and **Λ** keys to return to Screen 16 (bottom blowdown), then press the (ON) **>** and (OFF) **<** keys to control the valve.



Screen 17



Screen 18

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## Manual control of the automatic blowdown valve

The control of TDS (Total Dissolved Solids) is by use of a BC3210 blowdown controller. The BC3210 is installed in the front panel and provides direct indication of the value of water conductivity. The same control can be performed by use of another optional controller (BC3100) installed inside the cabinet. In this case the value of the water conductivity is indicated on the PLC display. Two modes are provided: NORMAL mode during normal operation and ALARM mode when a condition of maximum TDS is verified (Screen 20).

Once the alarm condition has been removed, the mode returns to normal again.

When an alarm condition occurs, as displayed on Screen 20 the general alarm LED will light up.

To acknowledge the alarm press the **RESET** key. It is necessary to remove the cause of the alarm before re-opening the valve.

**Please note** that the product specific documentation for the BC3210 (IM-P403-53) will need to be referenced for any data regarding its installation and maintenance instruction.



Screen 20

## 9. Automatic mode

After a Start-up or Manual Mode press the **V** key and access Screen 3 where it will be possible to select one out of four operation modes (**Manual - Automatic - Historical alarms - Parameters**).



Screen 3

Press the **V** and **Λ** keys to move down or up and select the Automatic Mode (Screen 22). Then press the **OK** key to confirm and store the choice and enter the selected mode.



Screen 22


By pressing the **Λ** key the reverse selection is obtained. These four screens are used for local programming of set point values.



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## Pressure control

### Setting of the desired value (set-point)

 **The supplied pressure transmitter has a working range defined by, and matched to, the specification of each generator. Normal ranges are 0 – 3, 0 – 4 or 0 – 10 bar. It is important that the working range of the transmitter matches that programmed in the control unit.**

Set point values exceeding the maximum limit of the transmitter range are not accepted by the system.

The maximum acceptable values are stored in the area of configuration parameters. They can be modified only by authorized personnel via a password.

The maximum limit of the alarm (pressure switch) has to be lower than the discharge pressure of the safety valve supplied with the generator. This pressure value is indicated on the tag of the safety valve.

With **PRESSURE** highlighted press the **OK** key.

The digit of the set point value in decimal will blink.

Press the **V** or **Λ** keys to enter the desired value.

Then press the **<** key and move the cursor to the next digit which displays the unit value required.

Press the **V** or **Λ** keys to enter the desired value.

Then press the **<** key and move the cursor to the next digit which displays the unit value required in tenths (if provided).

Press the **V** or **Λ** keys to enter the desired value.

Finally press the **OK** key and afterwards the **V** key to progress to the next setting.

**Note:** The function will be disabled by setting the set point value to zero (0).

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## Level control

Press the **V** key to access Screen 24.

Set the desired value of level (set point).

Verify the type of level control selected:

- In the case of level control **Type [0]**, the set point is not applicable as it is an ON-OFF control.
- In the case of level controls **Type [1]** and **[2]** press the **<** or **>** keys until the required set point value is displayed on the screen and then press the **OK** key.

The digit of the set point value in units will blink.

Press the **V** or **Λ** keys to enter the desired value.

Then press the **<** key and move the cursor to the digit which displays the unit value required in tenths.

Press the **V** or **Λ** keys to enter the desired value.

Then press the **<** key and move the cursor to the digit which displays the unit value required in hundreds.

Press the **V** or **Λ** keys to enter the desired value.

Finally press the **OK** key and afterwards the **V** key to progress to the next setting.

## Bottom blowdown control

When the CSM-K control is equipped with the bottom blowdown option, it is possible to set the timing of its opening and closure.

The duration of opening is the time in seconds (3 to 60) during which the discharge is carried out. The duration of closure is the interval time in hours (0 to 99) between two subsequent discharges.

### Setting of the interval time between two discharges:

Once the Automatic mode has been selected press the **V** key and access Screen 25. Then press the **<** or **>** keys to adjust the desired interval value until it is displayed on the screen.

The interval is selectable from 0 to 99 hours with increments of one hour.

**Note:** The function will be disabled by setting the interval value to zero (0).

### Setting of the discharge duration:

Once the Automatic mode has been selected press the **V** key and access Screen 26. Then press the **<** or **>** keys to adjust the desired duration period, to that displayed on the screen.

The duration is selectable from 3 to 60 seconds with increments of one second.

**Note:** The function will be disabled by setting the duration to zero (0).

Upon termination of the set point programming press the **OK** key to confirm and press the **V** key to access Screen 27.

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Verify that the cycle selector is turned to position '1' (Automatic mode).

In order to start-up the program of automatic control press the **START** key. The '**RUN**' LED on the right side of the display will light up.

The selected Screen 27 will display the main measurements related to the automatic operation such as set point and measurement of analog variables and opening value in % of the control valve.



Screen 27

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## General considerations in automatic operation

If the **STOP** key is pressed during automatic operation the cycle will be interrupted. All active outputs are cleared and the **RUN** LED is switched off. Set point values are however stored in memory. The **STOP** action Screen 22 will be displayed to allow the selection of different operation modes.



Screen 22

In order to re-start the interrupted cycle press in sequence the **V** key to select the automatic mode, the **OK** key and finally the **START** key.

The control outputs will return to active, Screen 27 will be displayed and the **RUN** LED will light up.

**Manual control, if required, can be carried out during automatic operation as follows:**

- Press the **STOP** key. All active outputs will be operated and Screen 22 will be displayed.
- Press the **Λ** key and select the manual operation mode.
- Turn the selector of the automatic cycle to position '0' (Manual mode)
- Press the **OK** key. The functions of manual control will be displayed on Screens 4, 5, 6 and 7. In order to re-start the automatic cycle and return to the relevant functional video screen, press the **ESC** key.

**Then proceed as follows:**

- Select the automatic mode using the **V** key.
  - Turn the selector of the automatic cycle to position '1'.
  - Press the **OK** key and then the **START** key.
- Note:** If the selector of the automatic cycle is left in position '0' during this operation, the associated alarm will be activated. Consequently, the selector has to be put into position '1'.
- Press in sequence the **RESET** key, the **OK** key and finally the **START** key.  
The automatic operation will then return to active and Screen 27 will be displayed.



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If the **ESC** key is pressed during the automatic cycle all operating functions will remain active and the **RUN** LED will remain lit. Screen 22 will be displayed. By pressing the **V** and **Λ** keys when this screen is displayed, it becomes possible to access, read and modify some configuration parameters, also permitted is 'read only' access of historical alarms.

However, it is not possible to select the manual operation mode because the automatic cycle is still active (**RUN** LED lit).

**In order to return to Screen 27:**

- Press the **ESC** key.
- Select the automatic operation mode using the **Λ** key.
- Then press in sequence the **OK** and **START** keys.

**Emergency shutdown procedure**

**In the case of an emergency situation, the following procedure should be followed:**

- Press the **EMERGENCY STOP** button.
- Isolate all services to the generator.
- Contact the maintenance personnel.

## 10. Alarms and blocks

As described in the manual operation mode all the block alarms are active during the automatic cycle. In detail they are:

**Block off the feedwater control when one of the following alarms occurs:**

- Stoppage of water pump.
- Minimum level of storage.
- Level transmitter.
- Maximum level.
- High pressure.

**Block off the pressure control when one of the following alarms occurs:**

- Pressure transmitter.
- Minimum level.
- Maximum level.
- High pressure.

**Block off the bottom blowdown control when one of the following alarms occurs (if applicable):**

- Bottom blowdown open.
- Bottom blowdown closed.

**Alarm only of the TDS control, without block of the cycle, for the alarm due to when the following occurs:**

- High TDS value.

The cycle will be interrupted by pressing the emergency push-button during the automatic operation, all active functions will be cleared and the relevant alarm will light up.



Screen 28

In order to resume the automatic operation reset the emergency push-button and press the **START** key.

The cycle will restart and the **RUN** LED will therefore light up.

# 11. Configuration

## 1. Parameters not protected by a password

### Actions of the pressure controller

To set the controller actions proceed as follows:

**Step 1** - Access Screen 3 (operation mode selection). Press the **V** and **Λ** keys to select the item '**PARAMETERS**'.

By then pressing the **OK** key Screen 29 will be displayed:



Screen 29

Enter the desired value of the proportional band (gain) constant (0 to 100%) using the **< -** and **+ >** keys.

**Note:** the entered value will be stored until a successive modification.

**Step 2** - Press the **V** key to access the next screen, Screen 30.



**Screen 30**

Enter the desired value of the integral action constant (0 to 10) using the **<** - and + **>** keys.

**Note:** the entered value will be stored until a successive modification.

For values set near to '0' or to '10' this action will be fast or slow respectively.

**Step 3** - Press the **V** key to access the next screen, Screen 31.



**Screen 31**

In case of control with only the proportional band action, enter the desired value of the power reset constant (0 to 100%) using the **<** - and + **>** keys.

**Note:** the entered value will be stored until a successive modification.

This setting is only possible when the constant of the integral action is forced to '0'.

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## Actions of the level controller (ON-OFF control excluded)

To set the controller actions proceed as follows:

**Step 1** - Press the **V** key to access the next screen, Screen 32.



**Screen 32**

Enter the desired value of the proportional band (gain) constant (0 to 100%) using the **< -** and **+ >** keys.

**Note:** the entered value will be stored until a successive modification.

**Step 2** - Press the **V** key to access the next screen, Screen 37.



**Screen 37**

Enter the desired value of pre-alarm for low pressure using the **< -** and **+ >** keys. This value has to be lower than the control set point in any case.

**The cycle will not be blocked when this alarm occurs.**

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**Step 3** - Press the **v** key to access the next screen, Screen 33.

Enter the desired value of pre-alarm for level using the **<** - and **+** **>** keys. This is an absolute value ranging from '0' to '1000' (zero and full-scale values of the level transmitter).

**The cycle will not be blocked when this alarm occurs.**



Screen 33

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## 2. Parameters protected by a password

Once the setting of the parameters, not protected by a password, is terminated - press the **V** key to access the next screen, Screen 35.



Screen 35

**To enter the three digit password proceed as follows:**

- Press the **Λ** key (the value 3 is entered in the first digit 003).

Press the **OK** key to access the following Screens to set these parameters.



Screen 36

Use Screen 36 to enter the full-scale values of pressure and level according to the installed transmitters.

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**To enter the pressure value:**

- Press the **OK** key twice - The digit of the full-scale value in decimal will blink.
- Press the **V** or **Λ** keys to enter the desired value.
- Then press the **<** key and move the cursor to the digit which displays the unit value required - The value in units of the full-scale will blink.
- Press the **V** or **Λ** keys to enter the desired value.
- Press the **OK** key upon termination of the setting.

**To enter the level value:**

- Press the **OK** key twice - The preset value of the full-scale will blink (maximum value 999 mm).
- Press the **V** or **Λ** keys to enter the desired value in the blinking digit.
- Using the **<**- and **+>** keys move into the digit positions still to be set.
- Press the **V** or **Λ** keys to enter each desired value.
- Upon termination of this setting press in sequence the **OK** and **ESC** keys and finally the **V** key.
- The following screen, Screen 38 will be displayed.



**Screen 38**

Screen 38 is used to enter the values of zero and full-scale relevant to pressure control.

Press the **OK** key to set the zero scale. In order to modify it (normally 200) press the **V** or **Λ** keys to increase or decrease its value for each digit and use the **<**- and **+>** keys to move the cursor to the digit which displays the unit value required for change (tenths and hundreds).

Press the **OK** key when terminated.

To enter the value of full-scale use the **<**- and **+>** keys.

Then press then the **V** key.

The previous Screen 38 will be displayed.





Screen 39

This screen is used to enter the values of zero and full-scale relevant to level control. Follow the same procedure previously used for the pressure.

At the end of it press the **V** key.

Screen 40 will be displayed.



Screen 40

Screen 39 is used to enter the values of zero and full-scale relevant to the indication of water conductivity, if applicable.

Follow the same procedure previously used for pressure and level.

When the setting of all parameters is terminated press the **ESC** key.  
The initial Screen indicating the operation mode will be displayed.

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## 12. Repairs

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Should it be necessary to return the equipment for repairs please contact our nearest Branch Office or Agent or directly:

Spirax Sarco S.r.l.  
Ufficio Resi - Via per Cinisello,  
18 - 20054 Nova Milanese (MI)  
Tel. 0362-4917.1  
Fax 0362-4917307

### Loss of guarantee

Total or partial disregard of the above instructions involves loss of any right of guarantee.

Spirax-Sarco S.r.l.  
Via per Cinisello,  
18 - 20054 Nova Milanese (MI)  
Tel.: 0362 4917.1  
Fax: 0362 4917307

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