

**PLC Control Unit for a CSM-E Electrical
Compact Clean Steam Generator**
Installation, Start-up and Operation Manual



1. Safety information
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1. Safety information

1.1 General 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 1.2) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction (see IM-P486-17 supplied with the unit), as well as the proper use of tools and safety equipment must also be complied with.

1.2 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, Start-up and Operation Manual. 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.


1.3 Limits of responsibility

This Installation, Start-up and Operation manual is intended to be as complete and up to date as possible. It describes installation, start-up and operating procedures for the PLC control unit for Spirax Sarco indirect clean steam generators. Spirax Sarco reserves the right to update this manual and other product information regarding installation, start-up and operation, at any time and without having to notify owners of the product.


Spirax Sarco is not responsible for any inaccuracies in the specifications, procedures and / or content of other product documents provided by other manufacturers of components used on Spirax Sarco steam generators.

Spirax Sarco uses only top-quality components in the construction and control of its steam generators. Spirax Sarco accepts responsibility for complete systems only when it supplies all the components of the system. Otherwise Spirax Sarco accepts responsibility only for those parts that it has supplied, since it has no direct control over other manufacturers or their quality standards.

Note: the symbol  indicates 'warnings'.

 Spirax Sarco is not responsible for any injuries or damage caused by incorrect installation, commissioning or maintenance of the unit (see Section 1.1).

Only trained, authorised personnel must carry out installation, start-up and operating procedures. The personnel who carry out these procedures must read carefully and completely, and understand, all relevant product manuals before beginning any of the activities described in the procedures. Personnel must pay great attention to any Notes, Precautions and Warnings contained in the procedures described in this manual.

 When Spirax Sarco provides only the steam generator without any control accessories, then this manual applies only to the generator. In this case, responsibility for the additional components, their respective manuals, and for the entire system, rests with the provider of the accessories for the generation system.


1.4 Notices


This Installation, Start-up and Operation manual is intended as a procedural guide for the control unit for Spirax Sarco clean steam generators. Since each unit is manufactured according to the customer's specifications, the instructions contained in the manual may sometimes appear rather general. Where procedures differ greatly from those described in the manual, specific notes are provided.

Should this manual not answer all possible questions, or should the procedures described in it not be clearly understood, please contact Spirax Sarco for further clarification.

1.5 Warnings

Listed below are specific warnings pertaining to the unit. In addition, in the manual, 'warnings' are repeated when the procedures concerned refer to potentially hazardous areas. All warnings must be carefully read and understood. All precautions contained in the warnings must be carefully followed to reduce the risk of injury. They must be carefully studied before beginning any installation, start-up or maintenance operation.

 Every product or system that uses steam, diathermic oil or superheated water under pressure, or electricity, presents a potential hazard of serious injury to persons if the relevant installation, start-up and operating procedures are not followed attentively.


 The simultaneous presence of water and electrical energy can create potentially hazardous conditions.

 Potentially hazardous areas:

1. All electrical connections and cables.
2. All steam lines, valves and pressure regulators.
3. All steam, diathermic oil and superheated water lines, joints, valves and pressure regulators.

1.6 Connection of power lines

Only experienced, trained and qualified personnel must carry out electrical installation. Control units for Spirax Sarco clean steam generators are designed for indoor installation only, unless otherwise specified by the customer.

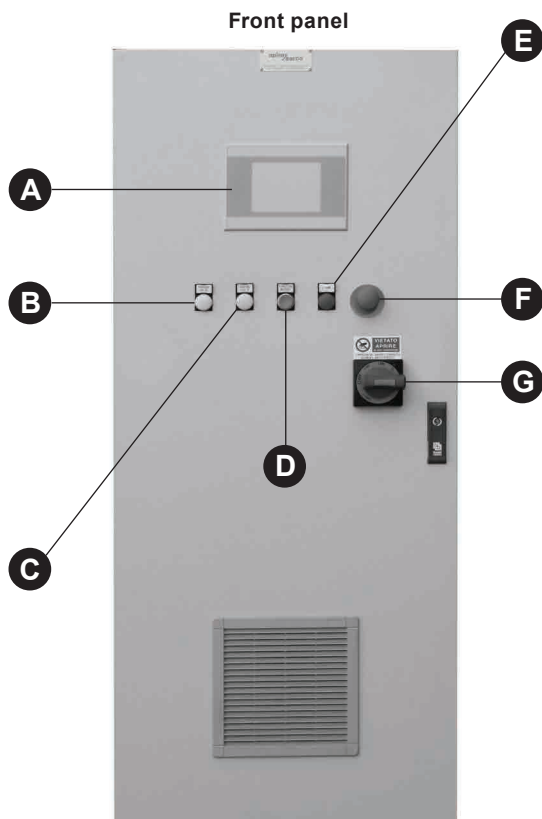
 Always ensure that the power supply is switched off before beginning any installation or maintenance operation.


— 2. General product information —

2.1 Control unit

The PLC smart control and safety unit is intelligent equipment designed to start-up, control and operate, either in local mode or by means of a remote system (**DCS** - Distribution Control System or **BMS** - Business Management System).

Location and identification of components



-
- A PLC**
PLC control unit (touch screen).
 - B L1: LED indicator**
When lit (white light) it indicates that the unit is powered (24 Vdc).
 - C L3: LED indicator**
When lit (white light) it indicates that the unit is powered (230 Vac).
 - D PRB: Push-button**
Manual reset push-button (after shutdown).
 - E L2: LED indicator**
When lit (red light) it indicates that the system is stopped due to intervention of one or more alarms.
 - F PE: Push-button**
Emergency stop push-button.
 - G IG: Main power switch**
This is a four-pole switch with a door locking handle that switches off the mains current and allows the door to be opened only when it is in the 'OFF' position.
 **Warning: the user must install an external circuit for interrupting the electricity supply. This circuit must be able to cut off the electrical power supply in the event of incorrect operation or to allow maintenance to be carried out on the unit. Failure to cut off the electricity supply could lead to hazardous conditions for personnel.**

2.2 Control features

The PLC control unit is designed for the regulation of pressure, water level, and bleeding, and the management of the blowdown function and alarm limits for Spirax Sarco indirect steam and electrical generators. The unit can be supplied with a video interface for the generator, or parts of it, with a graphic display of error messages, test functions, etc. Set-point values can be displayed and changed during operation, using the function keys.

As well as automation of individual generators, the system also enables computer structures to be created, such as networks of PCs, PLCs and microprocessor systems, thus allowing a high degree of integration between the automation systems for the various parts of the system. The supervisor system can be seen in terms of a display of machine, configuration and production control data. The unit has a main switch and is mounted in an IP54 metal container, measuring 1400 x 600 x 500 mm.

3. Installation

3.1 External connections

Trained and qualified electricians must carry out all electrical connections. Ensure that the on/off switch is in the **off** position before connecting to the mains. The installer must connect the power cables to the terminals on the mains switch mounted on the panel, and to the earth wire leading to the ground.

For the power supply, please see the wiring diagram inside the control panel.

⚠ Warning: Before making a hole in the panel to connect the power cables, very carefully open the door and check that there are no obstacles inside the panel. Ensure that there is no contact with residues from the drilling or with metal pieces on the base or on the transformer or switch.

3.2 Terms of use and power applied

Units are normally wired for a three-phase input voltage of 400 Vac + Neutral 50 Hz. The type of generator supplied will define the required power rating.

GENERATOR WITHOUT PRE-HEAT TANK			
Unit	CSM-EE	CSM-EG	CSM-EI
Electrical resistance heating power	50 kW	100 kW	110 kW
Clean steam flowrate at 3 bar g	50 kg/h	100 kg/h	135 kg/h

GENERATOR WITH PRE-HEAT TANK			
Unit	CSM-EF	CSM-EH	CSM-EL
Electrical resistance heating power	35 kW (GV)* 15 kW (tank)	100 kW (GV)* 15 kW (tank)	110 kW (GV)* 15 kW (tank)
Clean steam flowrate at 3 bar g	50 kg/h	110 kg/h	150 kg/h

* **Note:** GV denotes Generator Vessel.

3.3 Mains power supply

Display: 5.7" Touch-screen with high resolution colour graphics

Input voltage: 400 Vac 3 pH + Neutral - 50 Hz (**always refer to wiring diagram**)

Input contacts: 3 A – 230 V for inductive loads

Output contacts: 6 A – 230 V for resistive loads

Operational ambient temperature: Minimum 0°C to a Maximum 50°C (inside the control cabinet)*

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


* **Note:** If the environmental conditions raise the temperature inside the cabinet to over 50°C, conditioning devices are available on request. Please contact your nearest Spirax Sarco branch or agency for further details.

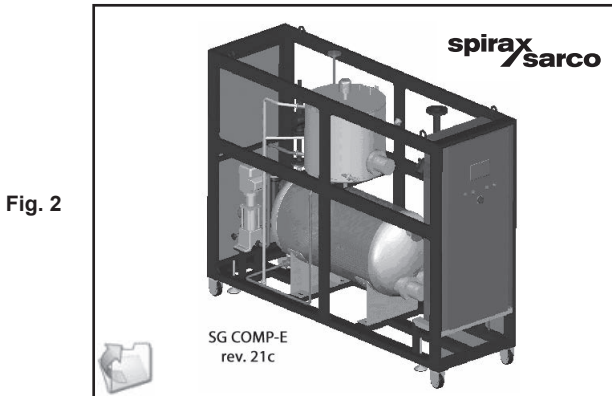
4. Commissioning


4.1 Initial screen

The control unit is fitted with a touch-screen display. To interact with the control screen, simply press with bare fingertips on the screen surface. When the unit is switched on, the screen displays the following image:



Press the  key to view the screen that displays the version of the installed program (Figure 2):




Press the  key again to view the screen shown in Figure 3, where a start-up menu offers three alternatives:

1. **Spirax Sarco address:** contact details for local Spirax Sarco Operating Company.
2. **Status:** machine manual/ automatic cycling and information about generator operation.
3. **Protected parameters:** machine configuration parameters, necessary to be able to use the generator.

Fig. 3



Press the  key to return to the screen shown in Figure 2.

4.2 Machine configuration and set-up


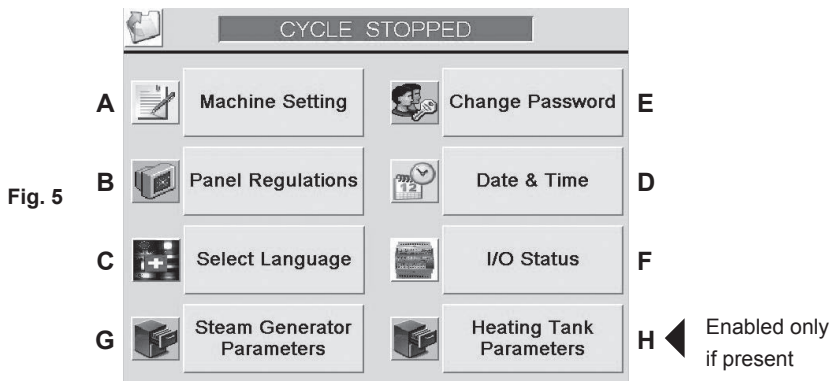
Press the  **PROTECTED PARAMETERS** key (Figure 3) to view the password insertion table screen (Figure 4).


Fig. 4




Insert the digit 3 and confirm by pressing the **ENTER** key.

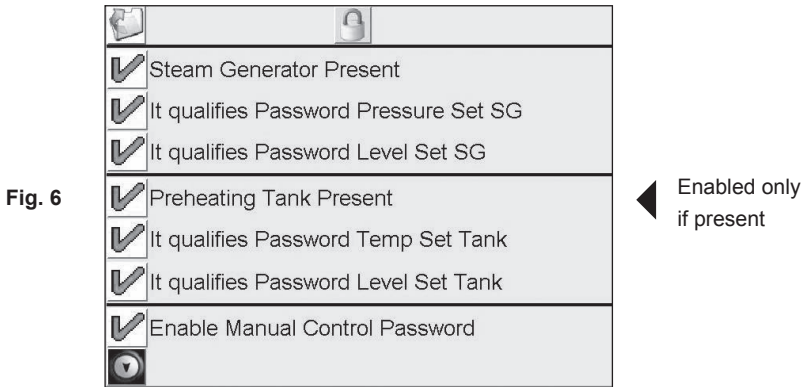
The following screen (Figure 5) will be displayed:





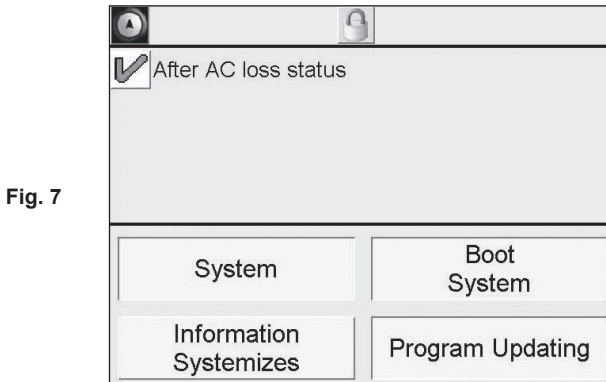
Press the  key to return to the screen shown in Figure 3.



4.2.1 Press the  Machine Setting key (Figure 5-A).


The following screen (Figure 6) will be displayed:



Press the  key to view the next screen (Figure 7) or the  key to return to the screen shown in Figure 5.



Press the  key and the padlock will open  allowing access to the settings functionality.

Press the box to the screen's left to enable  or disable different options.

Once selected, press the padlock key and it will close .

**Boot
system**

By pressing this key, the PLC will reboot the whole system, as performed when turning on the control panel.

System


Strictly reserved for the installer.


**Information
systemizes**

Strictly reserved for the installer.

**Program
updating**

Strictly reserved for the installer.

Press the  key to return to the previous screen (Figure 6).

4.2.2 Press the  **Panel Regulations** key (Figure 5-B).

The following screen (Figure 8) will be displayed:

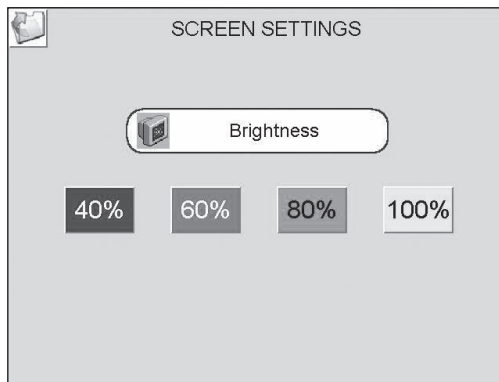




Fig. 8

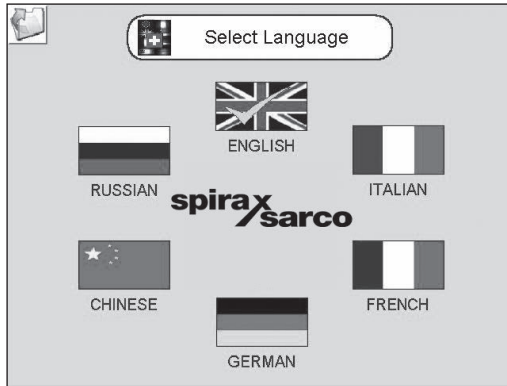
To change the brightness, press the key corresponding to the preferred percentage.

Press the  key to return to the screen shown in Figure 5.


4.2.3 Press the  **Select Language** key (Figure 5-C).


The following screen (Figure 9) will be displayed:

Fig. 9



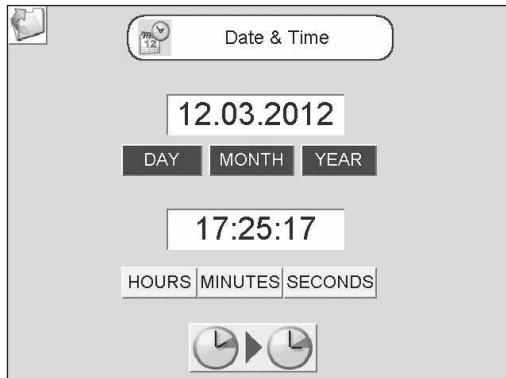
To select preferred language, press the corresponding key. The ✓ symbol will be displayed on the key to confirm the selection.

Press the  key to return to the screen shown in Figure 5.


4.2.4 Press the  **Date & Time** key (Figure 5-D).


The following screen (Figure 10) will be displayed:


Fig. 10



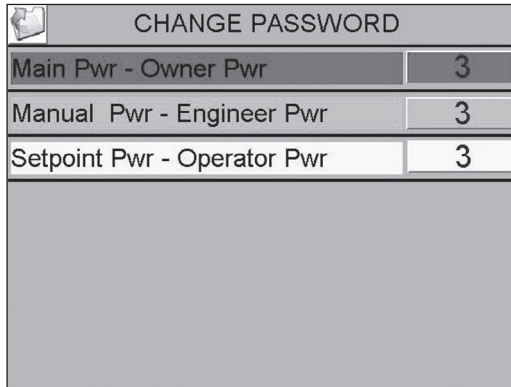
To change date or time settings, press the corresponding key (DAY/MONTH/YEAR or HOURS/MINUTES/SECONDS), enter the new value using numerical keypad displayed and confirm by pressing the **RET** key. The new value will now be displayed on the screen.

To change from standard time to daylight time saving or vice-versa, press the  key.

Press the  key to return to the screen shown in Figure 5.

4.2.5 Press the  **Change Password** key (Figure 5-E).

The following screen (Figure 11) will be displayed:





CHANGE PASSWORD	
Main Pwr - Owner Pwr	3
Manual Pwr - Engineer Pwr	3
Setpoint Pwr - Operator Pwr	3

Fig. 11

Change the password:

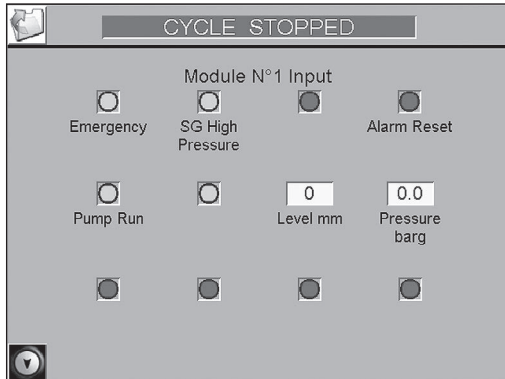
This section enables the user to change the password giving access to manual and automatic control parameters and settings. Press the screen area (number) corresponding to the password to be changed, enter the new password using the numerical keypad displayed and confirm by pressing the **RET** key. The new password will now be displayed on the screen.

Press the  key to return to the screen shown in Figure 5.

4.2.6 Press the  I/O Status key (Figure 5-F) to view all plant input and output screens.

The following screen (Figure 12) will be initially displayed (Module 1 input):

Fig. 12





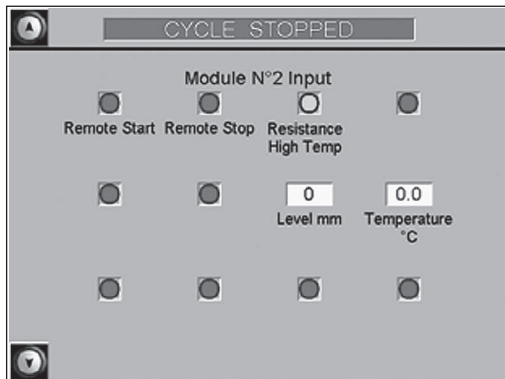

Press the  key to view the Module 2 input screen (Figure 13) or the  key to return to the screen shown in Figure 5.

Fig. 13



Press the  key to view the Module 3 input screen (Figure 14).

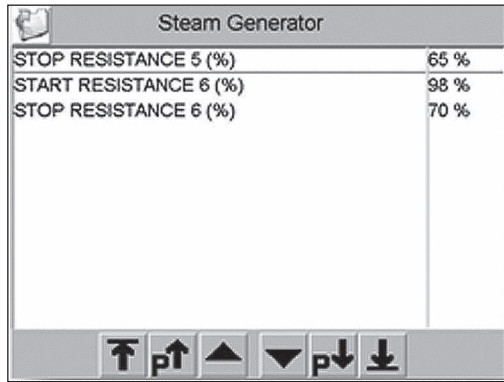


Fig. 14

Press the  key to view the Module 1 output screen (Figure 15).

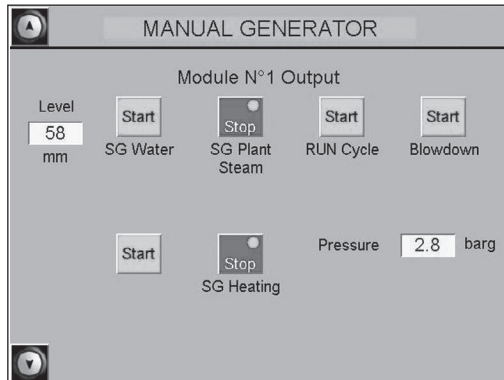


Fig. 15

Press the  key to view the Module 2 output screen (Figure 16).

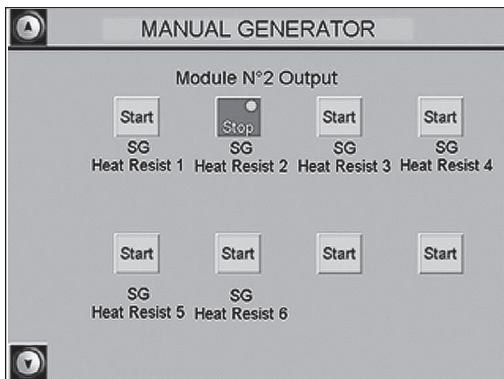



Fig. 16

Press the  key to view the Module 3 output screen (Figure 17). **Note: Enabled only if present.**

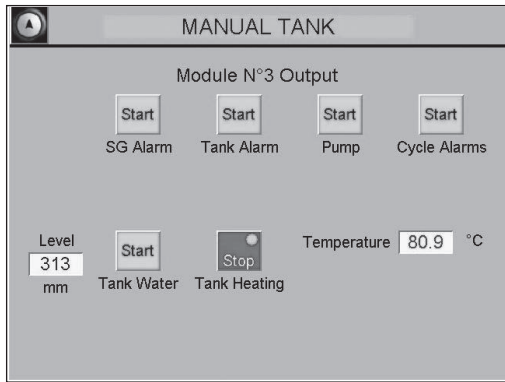





Fig. 17



Press the  key displayed on any of these screens to return to the previous screen.


For input screens:

Inputs that are switched 'ON' are displayed with a green light, inputs that are switched 'OFF' are displayed with a red light.

For output screens:

It is possible to override the status of individual output modules that are inactive (plant stopped). These are represented by a  key (green background) located adjacent to the output. To activate the output, press the key and the output will now be displayed with a  key (red background with green light).

To de-activate the output, press the  key and the output will now be displayed with a  key again.

4.2.7 Press the  **Heating Tank Parameters** key (Figure 5-H). **Note: Enabled only if present.**

The following screen (Figure 18) will be displayed:

Fig. 18

Heating Tank	
ANALOG INPUT LEVEL (digit)	715 dgt
ANALOG INPUT LEVEL (mm)	313 mm
LOW SCALE LEVEL (digit)	204 dgt
FULL SCALE LEVEL (digit)	1019 dgt
FULL SCALE LEVEL (mm)	500 mm
LOW LEVEL (mm)	220 mm
HIGH LEVEL (mm)	330 mm
DELTA START SET LEVEL (mm)	50 mm
MIN LEVEL ALARM DELAY AT START (min)	10 min
ANALOG INPUT FILTER LEVEL (sec)	1.5 sec
ANALOG INPUT TEMPERATURE (digit)	865 dgt







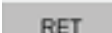
Press the  key to view the next screen (Figure 19) or the  key to return to the screen shown in Figure 5.

Fig. 19

Heating Tank	
ANALOG INPUT TEMPERATURE (°C)	81.1 °C
LOW SCALE TEMPERATURE (digit)	204 dgt
FULL SCALE TEMPERATURE (digit)	1019 dgt
FULL SCALE TEMPERATURE (°C)	100.0 °C
PROPORTIONAL BAND TEMPERATURE (%)	10 %
HIGH TEMPERATURE (°C)	95.0 °C
ANALOG INPUT FILTER TEMPERATURE (sec)	1.5 sec

Press the  key to return to the previous screen (Figure 18) or the  key to return to the screen shown in Figure 5.

To modify parameter default values, use the  and  keys to select the required parameter then press the screen area (number) corresponding to the parameter value.

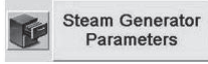
Enter the new value using the numerical keypad displayed and confirm by pressing the  key. The new value will now be displayed on the screen.

Further information about parameters and settings can be found in the following table (Fig. 20).

Parameter name	Description	Range/ units	Factory default	Comm. Value
Analog input level (Digit)	Digital representation of analogue signal	0-1023	Not changeable	
Analog input level (mm)	Representation in engineering unit of analogue signal	0-1000 mm	Not changeable	
Low scale level (Digit)	Minimum digital value of the analogue signal	0-1023	204	
Full scale level (Digit)	Maximum digital value of the analogue signal	0-1023	1019	
Full scale level (mm)	Full scale value of level transmitter	0-1000 mm	110 mm	
Low level (mm)	Minimum level alarm threshold	0-1000 mm	20 mm	
High level (mm)	Maximum level alarm threshold	0-1000 mm	100 mm	
Delta start set level (mm)	Differential level below level where water feed starts	0-100 mm	50 mm	
Min level alarm delay at start (min)	Alarm delay for minimum level alarm	0-120 min	10 min	
Analog input filter level (sec)	Analogue input level filter time	0-10 sec	1.5 sec	
Analog input temperature (Digit)	Digital representation of analogue signal	0-1023	Not changeable	
Analog input temperature (°C)	Representation in engineering unit of analogue signal	0-100°C	Not changeable	
Low scale temperature (Digit)	Minimum digital value of the analogue signal	0-1023	204	
Full scale temperature (Digit)	Maximum digital value of the analogue signal	0-1023	1019	
Full scale temperature (°C)	Full scale value of temperature transmitter	0-100°C	100°C	
Proportional band temperature (%)	Proportional band as percentage of input scan	0-100%	10%	
High temperature (°C)	Maximum temperature alarm threshold	0-100 °C	95°C	
Analogue input filter temperature (sec)	Analogue input temperature filter time	0-10 sec	1.5 sec	

Fig. 20

4.2.8 Press the



key (Figure 5-G) to view the screen shown in

Figure 21.

Press the and keys to view and navigate between the other screens (Figures 22, 23, 24, 25 and 26) or the key to return to the screen shown in Figure 5.

Fig. 21

Steam Generator	
ANALOG INPUT LEVEL (digit)	636 dgt
ANALOG INPUT LEVEL (mm)	58 mm
LOW SCALE LEVEL (digit)	204 dgt
FULL SCALE LEVEL (digit)	1019 dgt
FULL SCALE LEVEL (mm)	110 mm
LOW LEVEL (mm)	20 mm
HIGH LEVEL (mm)	100 mm
DELTA START SET LEVEL (mm)	20 mm
MIN LEVEL ALARM DELAY AT START (min)	10 min
ANALOG INPUT FILTER LEVEL (sec)	1.5 sec
ANALOG INPUT PRESSURE (digit)	580 dgt

Fig. 22

Steam Generator	
ANALOG INPUT PRESSURE (barg)	2.8 barg
LOW SCALE PRESSURE (digit)	204 dgt
FULL SCALE PRESSURE (digit)	1019 dgt
FULL SCALE PRESSURE (barg)	6.0 barg
PROPORTIONAL BAND PRESSURE (%)	10 %
INTEGRAL ACTIVATION PRESSURE (1=Active)	1
INTEGRAL TIME PRESSURE (sec)	10 sec
LOW PREALARM PRESSURE (barg)	1.0 barg
CLEAN STEAM PRESENCE 0=(Not) 1=(Yes)	1
CLEAN STEAM PRESSURE DELTA SET (barg)	0.2 barg
CLOSED CLEANED STEAM LOW LEVEL (mm)	0 mm

Fig. 23

Steam Generator	
Del Steam-CI Steam CLOSED for MAX LEV (sec)	60 sec
ANALOG INPUT FILTER PRESSURE (sec)	1.5 sec
TDS PRESENCE 0=(Not) 1=(Yes)	1
ANALOG INPUT TDS (digit)	1019 dgt
ANALOG INPUT TDS (µS/cm)	1200
LOW SCALE TDS (digit)	204 dgt
FULL SCALE TDS (digit)	1019 dgt
LOW SCALE TDS (µS/cm)	400
FULL SCALE TDS (µS/cm)	1200
ANALOG INPUT FILTER TDS (sec)	1.5 sec
BLOWDOWN PRESENCE 0=(Not) 1=(Yes)	1

Fig. 24



Steam Generator	
Switching Delay Fill/Regul PRES (sec)	30 sec
Del Steam-CI Steam CLOSED for MAX LEV (sec)	0 sec
ANALOG INPUT FILTER PRESSURE (sec)	1.5 sec
TDS PRESENCE 0=(Not) 1=(Yes)	0
BLOWDOWN PRESENCE 0=(Not) 1=(Yes)	1
BLOWDOWN LIMITSW. ON 0=(Not) 1=(Yes)	0
BLOWDOWN OPEN (sec)	5 sec
BLOWDOWN CLOSED (hours)	24 Hour
SCREENSaver (1=Active)	0
MODBUS 0=(Not) 1=(Yes)	0


Fig. 25

Steam Generator	
Delta absolute Regul (from the Set)	0.50 Bar
START RESISTANCE 1 (%)	25 %
STOP RESISTANCE 1 (%)	15 %
START RESISTANCE 2 (%)	35 %
STOP RESISTANCE 2 (%)	20 %
START RESISTANCE 3 (%)	50 %
STOP RESISTANCE 3 (%)	30 %
START RESISTANCE 4 (%)	75 %
STOP RESISTANCE 4 (%)	52 %
START RESISTANCE 5 (%)	95 %

Fig. 26

Steam Generator	
STOP RESISTANCE 5 (%)	65 %
START RESISTANCE 6 (%)	98 %
STOP RESISTANCE 6 (%)	70 %

To modify parameter default values, use the  and  keys to select the required parameter then press the screen area (number) corresponding to the parameter value.

Enter the new value using the numerical keypad displayed and confirm by pressing the  key.

The new value will now be displayed on the screen.

Heating coil (element) control: Configuration parameters

The generator vessel has six heating elements (heater group) with each element programmed to switch 'ON' (START RESISTANCE) and 'OFF' (STOP RESISTANCE) as follows (refer also to Figures 25 and 26).

Step 1 - Setting pressure absolute delta value

Insert the 'Delta absolute Regul' setpoint value in bar g (two decimal places). This is used to control operating pressure in conjunction with heater group configured parameters (field rate settings).

E.g. If an operating pressure of 3 bar g is required and a 0.30 bar g 'Delta absolute Regul' setpoint value is inserted, the heating elements, in accordance with field rate settings, will produce an operating pressure of between 2.7 and 3 bar g.

Step 2 - Adding heating element field rate percentages:

Insert field rates for the heater group using values of between 0 and 100% for each 'ON' (START RESISTANCE) and 'OFF' (STOP RESISTANCE) element parameter.

Note: The above values are shown as examples only and will vary depending on the system characteristics and operating requirements.


Further information about parameters and settings can be found in the following table , on pages 22 and 23 (Figure 27).

Parameter name	Description
Analog input level (Digit)	Digital representation of analogue signal
Analog Input level (mm)	Representation in engineering unit of analogue signal
Low scale level (Digit)	Minimum digital value of the analogue signal
Full scale level (Digit)	Maximum digital value of the analogue signal
Full scale level (mm)	Full scale value of level transmitter
Low level (mm)	Minimum level alarm threshold
High level (mm)	Maximum level alarm threshold
Delta start set level (mm)	Differential level below level where water feed starts
Min level alarm delay at start (min)	Alarm delay for minimum level alarm
Analog input filter level (sec)	Analogue input level filter time
Analog input pressure (Digit)	Digital representation of analogue signal
Analog input pressure (bar g)	Representation in engineering unit of analogue signal
Low scale pressure (Digit)	Minimum digital value of the analogue signal
Full scale pressure (Digit)	Maximum digital value of the analogue signal
Full scale pressure (bar g)	Full scale value of pressure transducer
Proportional band pressure (%)	Proportional band as percentage of input scan
Integral activation pressure (1 = Active)	Activates integral control parameter
Integral time pressure (sec)	Integral action time
Low pre-alarm pressure (bar g)	Low pressure alarm
Clean steam presence 0 = (Not), 1 = (Yes)	Clean steam valve presence
Clean steam pressure delta set (bar g)	Differential from set to open clean steam valve
Closed cleaned steam low level (mm)	Clean steam valve closing for minimum level alarm
Del Steam-CI Steam CLOSED for MAX L(sec)	Delay clean steam valve closing for maximum level alarm
Analog input filter pressure (sec)	Analogue input pressure filter time
TDS presence 0 = (Not), 1 = (Yes)	Presence TDS controller
Analog input TDS (Digit)	Digital representation of analogue signal
Analog input TDS ($\mu\text{S/cm}$)	Representation in engineering unit of analogue signal
Low scale TDS (Digit)	Minimum digital value of the analogue signal
Full scale TDS (Digit)	Maximum digital value of the analogue signal
Low scale TDS ($\mu\text{S/cm}$)	Minimum range of TDS transducer
Full scale TDS ($\mu\text{S/cm}$)	Maximum range of TDS transducer
Analogue input filter TDS (sec)	Analogue input TDS filter time
Blowdown presence 0 = (Not), 1 = (Yes)	Blowdown presence
Blowdown limit switch On 0 = (Not), 1 = (Yes)	Blowdown limit switch presence
Switching delay fill / regul PRES (sec)	Time interval for full connection of heating coil (resistance group)
Blowdown closed (hours)	Time between blowdown operations
Blowdown open (sec)	Opening time of blowdown valve
Screensaver (1 = Active)	Screensaver presence
Modbus 0 = (Not), 1 = (Yes)	Modbus presence
Delta absolute regul (from the set)	Value in bar, tenths and hundredths when heating coil (resistance
Start resistance 1 (%)	Connect heating element 1
Stop resistance 1 (%)	Disconnect heating element 1
Start resistance 2 (%)	Connect heating element 2
Stop resistance 2 (%)	Disconnect heating element 2
Start resistance 3 (%)	Connect heating element 3
Stop resistance 3 (%)	Disconnect heating element 3
Start resistance 4 (%)	Connect heating element 4
Stop resistance 4 (%)	Disconnect heating element 4
Start resistance 5 (%)	Connect heating element 5
Stop resistance 5 (%)	Disconnect heating element 5
Start resistance 6 (%)	Connect heating element 6
Stop resistance 6 (%)	Disconnect heating element 6

Fig. 27

	Range/units	Factory default	Comm. Value
	0-1023	Not changeable	
	0-1000 mm	Not changeable	
	0-1023	204	
	0-1023	1019	
	0-1000 mm	110 mm	
	0-1000 mm	20 mm	
	0-1000 mm	100 mm	
	0-20 mm	20 mm	
	0-120 min	10 min	
	0-10 sec	1.5 sec	
	0-1023	Not changeable	
	0-10 bar g	Not changeable	
	0-1023	204	
	0-1023	1019	
	0-10 bar g	6.0 bar g	
	0-100%	10%	
	1 = on 0 = off	1	
	10-1000 sec	10 sec	
	0-10 bar g	1.0 bar g	
	1 or 0	1	
	0-5 bar g	0.2 bar g	
	0-1000 mm	0 mm	
	0-180 sec	60 sec	
	0-10 sec	1.5 sec	
	1 or 0	0	
	0-1023	Not changeable	
	0-9999 µS/cm	Not changeable	
	0-1023	204	
	0-1023	1019	
	0-9999 µS/cm	400 µS/cm	
	0-9999 µS/cm	1200 µS/cm	
	0-10 sec	1.5 sec	
	1 or 0	1	
	1 or 0	1	
following a water re-fill	0-120 sec	30 sec	
	0-24 hours	24 hours	
	0-60 sec	5 sec	
	1 = on 0 = off	0	
	1 or 0	0	
group) is fully connected	0-10 bar	0.3 bar	
	0-100%	25%	
	0-100%	15%	
	0-100%	35%	
	0-100%	20%	
	0-100%	50%	
	0-100%	30%	
	0-100%	75%	
	0-100%	52%	
	0-100%	95%	
	0-100%	65%	
	0-100%	98%	
	0-100%	70%	

4.3 Machine operation and information

Press the  STATUS key (Figure 3) to view the screen shown in Figure 28.

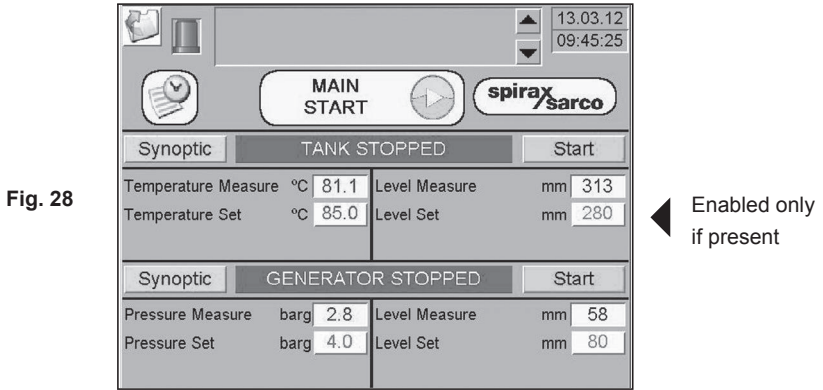



Fig. 28

Press the  key to return to the screen shown in Figure 3.

4.3.1 Manual operation - Generator

Press the generator **SYNOPTIC** key (Figure 28) to view the screen shown in Figure 29.

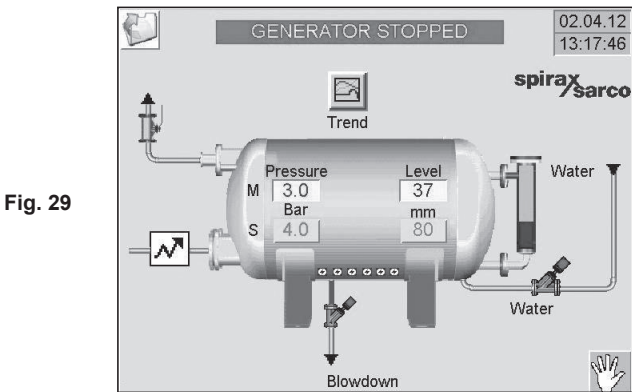


Fig. 29

Press the  key to view the password insertion table screen (Figure 4).

Insert the digit 3 and confirm by pressing the **ENTER** key. The generator synoptic screen (Figure 30) will be displayed allowing manual control functionality.

Note: This procedure can only be performed if the manual control password has been enabled (refer to Section 4.2.1 Figure 6).

Heating (Clean steam pressure)

To change the operating pressure set value, press the green **START** key adjacent to the heating coil(s) screen image. A new key will be displayed which, if pressed, will display a numerical keypad.

Enter the required pressure and confirm by pressing the **RET** key. The new value will now be displayed on the screen.

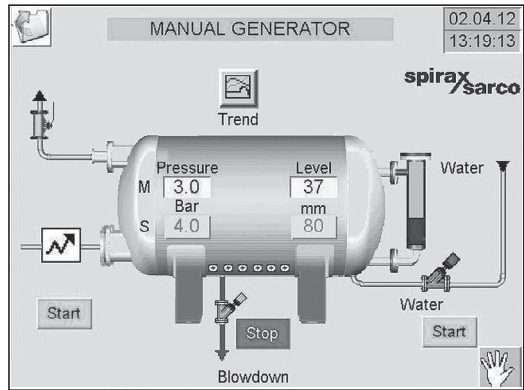


Fig. 30

Operating pressure will now be continuously controlled and maintained at this value in conjunction with heater control configured parameters (refer to programming steps in Section 4.2.8). To switch off (disconnect) the heating coil(s), press the key again (now displayed as a red **STOP** key). To reset the pressure, repeat the process.

If the pressure reaches the programmed maximum (pressure switch set) value, the heating coil(s) will switch off (disconnect) automatically sending an alarm signal which will be displayed on the screen.

Note: The heating coil(s) cannot be switched on again (re-connected) until the operating pressure of the generator has fallen to within the programmed set value (below the pressure switch set value) and the manual reset button on the front of the control panel has been pushed.

Filling

If the water in the generator vessel falls below the minimum level to provide adequate coverage of the heating coil(s) and the feedwater pump is inactive, the coil(s) will switch off (disconnect) automatically sending an alarm which will be displayed on the screen. To fill the vessel, press the green **START** key adjacent to the feedwater control valve screen image which will open the valve and start the pump. When the correct water level has been reached, press the same key again (now displayed as a red **STOP** key) which will close the valve and stop the pump.

If the water in the vessel reaches the programmed maximum level, the valve will close and the pump will stop automatically sending an alarm signal which will be displayed on the screen. If the pump stops operating due to a blockage or other fault, the valve will close automatically sending an alarm signal which will also be displayed on the screen.

Notes:

The manual shut-off valve (located upstream of the pump and control valve) should be set at an opening of 15/20° to ensure a more linear and less turbulent flow of water into the generator. The heating coil(s) cannot be switched on again (re-connected) until the water reaches the minimum level and the pump is operating.

Blowdown (If automatic control valve is fitted)

To open the valve, press the green **START** key adjacent to the valve screen image. To close the valve, press the same key again (now displayed as a red **STOP** key).

An optional limit switch can be fitted to the valve which is wired into the electrical system to ensure that it closes in the event of a shut-down (fail-closed). If the valve remains open due to failure of the switch, an alarm signal will be displayed on the screen.

In addition, if the clean steam pressure reaches the programmed maximum (pressure switch set) value, the valve will close automatically sending an alarm signal which will be displayed on the screen.

Note: The valve cannot be re-opened until the operating pressure of the generator has fallen to within the programmed set value (below the pressure switch set value) and the manual reset button on the front of the control panel has been pushed.


Clean steam valve (if present)

Before opening the valve it is important to ensure that the operating pressure of the generator has reached the programmed set value.

To open the valve, press the green **START** key adjacent to the valve screen image. To close the valve, press the same key again (now displayed as a red **STOP** key).

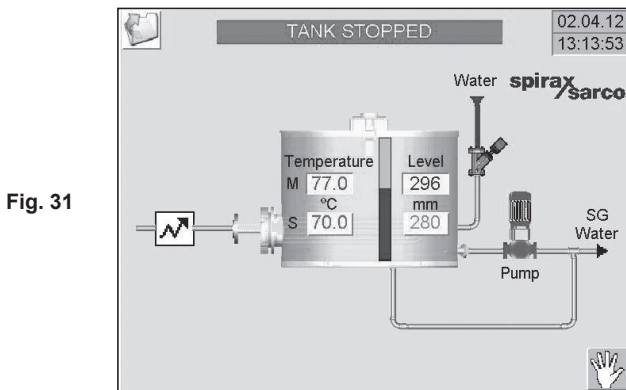
In addition, if the clean steam pressure reaches the programmed maximum (pressure switch set) value, the valve will close automatically sending an alarm signal which will be displayed on the screen.


Note: The valve cannot be re-opened until the operating pressure of the generator has fallen to within the programmed set value (below the pressure switch set value), and the manual reset button on the front of the control panel has been pushed.

Press the  key on either of the screens shown in Figures 29 or 30 to return to the screen shown in Figure 28.

4.3.2 Manual operation - Tank (if present)

Press the tank **SYNOPTIC** key (Figure 28) to view the screen shown in Figure 31.



Press the  key to view the password insertion table screen (Figure 4).

Insert the digit 3 and confirm by pressing the **ENTER** key. The tank synoptic screen (Figure 32) will be displayed allowing manual control functionality.

Note: This procedure can only be performed if the manual control password has been enabled (refer to Section 4.2.1 Figure 6).

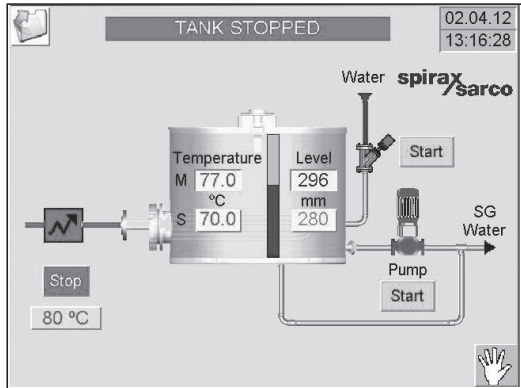


Fig. 32

Heating

To change the water temperature set value, press the green **START** key adjacent to the heating coil screen image. A new key will be displayed which, if pressed, will display a numerical keypad. Enter the required temperature and confirm by pressing the **RET** key. The new value will now be displayed on the screen.


Temperature will now be continuously controlled and maintained at this value by regulating the power supply to the heating coil. To switch off (disconnect) the heating coil, press the key again (now displayed as a red **STOP** key). To reset the temperature, repeat the process.

Filling

If the water in the tank falls below the minimum level to provide adequate coverage of the heating coil, the coil will switch off (disconnect) automatically sending an alarm which will be displayed on the screen. To fill the vessel, press the green **START** key adjacent to the feedwater control valve screen image which will open the valve allowing water supply to the tank. When the correct water level has been reached, press the same key again (now displayed as a red **STOP** key) which will close the valve and stop the water supply.

If the water in the tank reaches the programmed maximum level, the valve will close automatically sending an alarm signal which will be displayed on the screen.

Note: The heating coil cannot be switched on again (re-connected) until the water reaches the minimum level.

Press the  key on either of the screens shown in Figures 31 or 32 to return to the screen shown in Figure 28.

Additional information

Please note that during manual operation of both the generator and the tank:-

All control equipment and devices will be inactive except for those that are necessary for the safe operation of the unit.

Each time the display is changed, the manual control function is lost. To restore this functionality, it is necessary to enter the password again.

4.3.3 Automatic operation - Generator and tank (if present)

Before starting the automatic cycle, it is necessary to return to the screen shown in Figure 28 using the relevant navigation option(s) previously described and enter the analogical control data for generator (pressure and level) and tank (temperature and level).

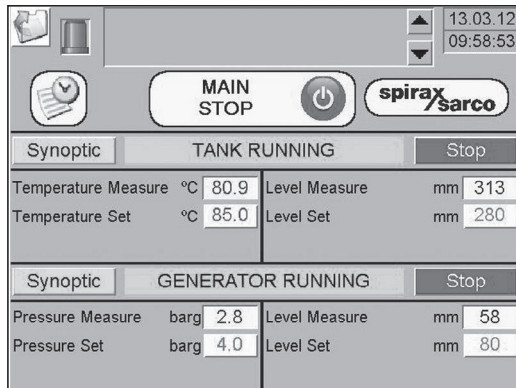
To enter a new generator **Pressure Set** value, press the screen area (box) corresponding to the value which will display the password insertion table (Figure 4). Insert the digit 3 and confirm by pressing the **ENTER** key thus allowing data to be entered.

Press the screen area (box) again, enter the new value using the numerical keypad displayed and confirm by pressing the **ENTER** key. The new value will now be displayed on the screen. Repeat the procedure to enter new set values for generator level and tank temperature and level (if enabled).

Note: These procedures can only be performed if the relevant passwords have been enabled (refer to Section 4.2.1 Figure 6).

When all set values have been entered, press the **MAIN START** key. The automatically controlled operating cycle for both generator and tank (if present) will begin and the following screen (Figure 33) will be displayed.

Fig. 33



← Enabled only if present

If a fault occurs during the automatic cycle (e.g. High Pressure, Low Level, etc.), an alarm will trigger sending a warning message which will be displayed on the screen.


Providing the alarm does not interrupt the cycle, the unit will continue to operate and the system will reset automatically when the fault has been rectified.

If the alarm does interrupt the cycle, the unit will shut-down and the screen shown in Figure 28 will be displayed.

After rectifying the fault, press the **MAIN START** key to continue with the automatic cycle and return to the screen shown in Figure 33.

Note: Following an alarm shut-down, the unit will not operate until the manual reset button on the front of the control panel has been pushed (an instruction to perform this procedure is also displayed on the screen).

Additional information

During the automatic cycle (Figure 33), it is possible to return to the screen shown in Figure 3 and make changes to any of the protected parameters described in Section 4.2 by pressing the  key, without interrupting the cycle.

During the automatic cycle (Figure 33), it is also possible to make changes to automatic control parameters and settings or to revert to manual control by pressing the **MAIN STOP** key and returning to the screen shown in Figure 28.

Note: Although all active outputs (measurements) are cleared from the display, set point values are stored in memory and remain displayed.

To make changes to automatic control parameters and settings, refer to the procedure described in Section 4.3.3. To revert to manual control, refer to the procedures described in Sections 4.3.1 and 4.3.2.

When all required changes have been made, use the relevant navigation option(s) previously described to return the screen shown in Figure 28 and press the **MAIN START** key to continue with the automatic cycle. All control outputs (measurements) will become active again as show in Figure 33.

4.3.4 Alarms and shut-downs

As previously described in Section 4.3.3, all alarms and shut-downs (cycle interruptions) are active during automatic operation.

In detail they are:

- Interruption of the feed water control cycle when one of the following alarms occurs:
 - tank water pump fault (not operating)
 - level transmitter fault
 - maximum water level
 - high steam pressure
 - pressure transmitter fault

- Interruption of the pressure control cycle when one of the following alarms occurs:
 - pressure transmitter fault
 - minimum water level
 - maximum water level
 - high steam pressure


- Interruption of the bottom blowdown control cycle when the following alarm occurs:
 - F.C. bottom blowdown closed

- Alarm only of the T.D.S. control (without interruption of the cycle) when the following occurs:
 - high T.D.S. value

If a problem or fault is observed during automatic operation, press the emergency stop button on the front of the control panel and the unit will shut-down (cycle interrupted), clearing all active functions and activating the relevant alarm signal(s) which will be displayed on the control panel screen.

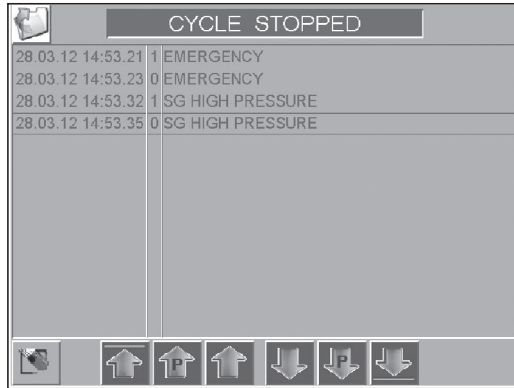
In order to resume automatic operation and restart the cycle following an interruption, ensure that the emergency stop button is in the stand-by position and then press the **MAIN START** key.

In addition to being displayed on the screen, all cycle alarms are stored in a special dedicated area.

To access them, press the  key that can be found on either of the screens shown in Figures 28 or 33.



The following screen (Figure 34) will be displayed:



Fig. 34






CYCLE STOPPED		
28.03.12 14:53.21	1	EMERGENCY
28.03.12 14:53.23	0	EMERGENCY
28.03.12 14:53.32	1	SG HIGH PRESSURE
28.03.12 14:53.35	0	SG HIGH PRESSURE


For each alarm, the start (1) and end (0) date and time is displayed.

By selecting the  key, the first stored alarm will be displayed. Selecting the  key displays the last alarm.


By selecting the  and  keys, it is possible to individually scroll through the alarm list.

By selecting the  and  keys, it is possible to navigate from one alarm menu screen to another.

By selecting the  key, all alarms are cleared from the display.

Press the  key to return to either of the previous screens (Figures 28 or 33).

4.3.5 Charts

Press the  **TREND** key that can be found on either of the screens shown in Figure 29 or Figure 30.

The following screen (Figure 35) will be displayed showing plant operating information in graphical format:

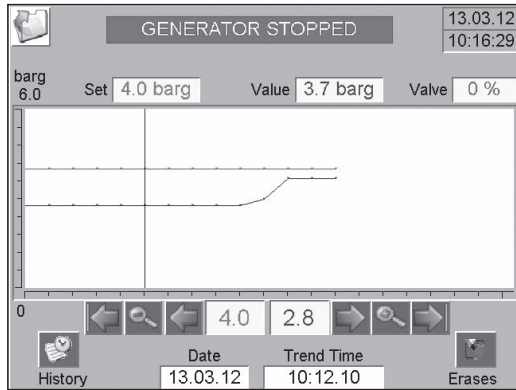







Fig. 35

Using the keys at the bottom of the screen allows the user to manoeuvre around the graphical display and enlarge specific areas for more detailed viewing if required. If an alarm interrupts the automatic cycle or the cycle ends, the chart recorded during the cycle is saved to a folder and removed from the display.

When the cycle has stopped, it is possible to display the list of saved charts by pressing the  **HISTORY** key.

Select the required chart using the   and   keys, then confirm by pressing the **RET** key. The selected chart is now displayed on the screen.

Charts can be deleted by pressing the  key to display the full list of saved charts, highlighting the chart for deletion and confirming by pressing the **RET** key.

5. Maintenance

Repairs

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., Returns Department, Via per Cinisello, 18,
20834 Nova Milanese (MB)

ITALY

Tel: +39 0362 49 171

Fax: +39 0362 49 17 307

Invalidation of warranty

The partial or total failure to follow the instructions given in this manual completely invalidates the warranty.



