VULCATHERM

VULCANIC S.A.S
48, rue Louis Ampère – ChanouxIndustrial Zone
F – 93330 NEUILLY SUR MARNE (France)
Tel.: (33) 01.49.44.49.20 – Fax : (33) 01.49.44.49.41
E-mail: catalogue-vulcanic@vulcanic.com
Web: www.vulcanic.com

CO2 VAPORISER WITH HEATING FLUID

Heating powers: 25, 40, 60 kW.

For:

25-THERMO VCO2- Heating power 25 kW
40-THERMO VCO2- Heating power 40 kW
60-THERMO VCO2- Heating power 60 kW
From type 10811

READ THIS MANUAL CAREFULLY AND FULLY BEFORE INSTALLING THE UNIT. THIS MANUAL IS AN INTEGRAL PART OF THE PRODUCT AND WILL ACCOMPANY IT THROUGH TO DISASSEMBLY.

EN

1 CE conformity declaration 5
2 General description of the machine 5
2.1 General characteristics 5
2.2 Principle of operation 5
2.3 Positioning of components 6
2.3.1 Heating fluid (thermofluid) 8
2.3.2 CO2 circuit 8
2.4 Cabinet 9
2.5 External dimensions 10
3 Information and documentation needed for operation, maintenance and repair 11
4 Description of work station likely to be occupied by operators 11
5 Normal use of the machine 11
6 Warnings and contra-indications in use 11
7 Assembly, installation and connection instructions 12
7.1 Hydraulic connection 12
7.2 Electrical connection 12
8 Machine commissioning and start up procedure 13
8.1 Commissioning and start up 13
9 Installation and assembly instructions to reduce noise and vibrations 14
10 Machine commissioning and operating procedure 14
10.1 Remote control 14
10.2 Local control 14
11 Information on residual risks 15
12 Instructions about protective measures 15
13 Tools that could be mounted on the machine 15
14 Stability conditions during operation, transport, assembly, or dismantling 15
14.1 Operating conditions 15
14.2 Transport conditions 15
14.3 Assemby and dismantling conditions 15
15 Transport, handling and storage 15
16 Procedure in case of accident or failure 16
16.1 In case of accident 16
16.2 In case of failure 16
16.3 Fault or anomaly diagnosis aid messages 16
16.3.1 Status message 16
16.3.2 Error messages 16
16.4 Troubleshooting 17
17 Settings and maintenance 17
17.1 Settings 17
17.1.1 Setting thresholds 17

17.1.2 Parameter settings 17
17.2 Maintenance 17
17.2.1 Preventive maintenance 17
17.2.2 Draining 17
17.3 Data backup battery replacement procedure 18
17.3.1 Removing the SGC v3 module from cabinet: 18
17.3.2 Removing the SGC.v3 rear panel: 18
17.3.3 Put the SGC.v3 back panel back in place: 18
17.3.4 Refitting and verification: 18
18 Controlling of the SGC 19
18.1 General description of the SGC.v3 19
18.2 Energising 19
18.3 Homepage of the SGC.v3 20
18.3.1 SGC.v3 input features: 21
18.4 Operating mode and menu access 22
18.4.1 UA1 Running modes and menus 22
18.4.2 UA2 Parameters menu 22
18.4.3 U2 Vulcatherm details 22
18.4.4 U3 Vulcatherm regulator 23
18.4.5 U5 T° and power for each element 23
18.5 Setting menu 24
18.5.1 R0 Language and time counter 24
18.5.2 R1 Modes and cooling source 24
18.5.3 R2 Vulcatherm regulator setup 24
18.5.4 R2B. Ramps 25
18.5.5 R2C. Delta T 25
18.5.6 R3 Remote set point 25
18.5.7 R4 External probe 25
18.5.8 R5 Analog copy 25
18.5.9 R7 Temperature alarm 26
18.5.10 R10 Fluid temperature limits (SGC.v3) 27
18.5.11 R11 Digital links 27
18.5.12 R11A Ethernet IP 27
18.5.13 R12 Date and time 27
18.6 Configuration menu 28
18.6.1 C1 Security threshold 28
18.6.2 C1A Flow rate calculation 28
18.6.3 C2 Safety managements 28
18.6.4 C2A Pump management 29
18.6.5 C4 Various information 29

18.6.6 C4A Electrical cabinet temperature 30
18.6.7 C5 Cooling law 31
18.6.8 C7 Propotionnal valve 31
18.6.9 C11 Bus status 31
18.6.10 C12 Digital link 31
18.6.11 C13 Copy configuration 31
18.6.12 C13A Input D configuration 31
18.6.13 C15 BACKUP AND RECOVERY FOR SGC V3 AND SGC V3TWIN 31
18.6.14 CHECKING THE SETTINGS 33
18.7 C17 MAINTENANCE MANAGEMENT 33
19 Economical operation, optimisation of regulation parameters 34
20 Spare parts 34
20.1 First emergency kit: 34
20.2 Second emergency kit: 34
20.3 Third emergency kit: 34
21 Airborne noise emissions 34
22 Warranty 34

1 CE CONFORMITY DECLARATION

See CE declaration supplied with the machine

2 GENERAL DESCRIPTION OF THE MACHINE

2.1 General characteristics

- Operating temperature : Range 90°C maximum for MEG and -29°C or -40 °C minimum at inlet for CO2, see rating plate.
- Supply voltage : see rating plate.
- Heating power : Standard 25, 40 and 60 kW(-5 +10%).
- Temperature regulator : SGC.V3.
- Temperature Sensors : On the MEG and on the CO2 outlet, see rating plate.
- Pumps : See hydraulic parts list.
- Noise level : Less than 75 dB(A).
- Vibration level : Frequency of weighted quadratic average acceleration less than 2.5 m/s2.

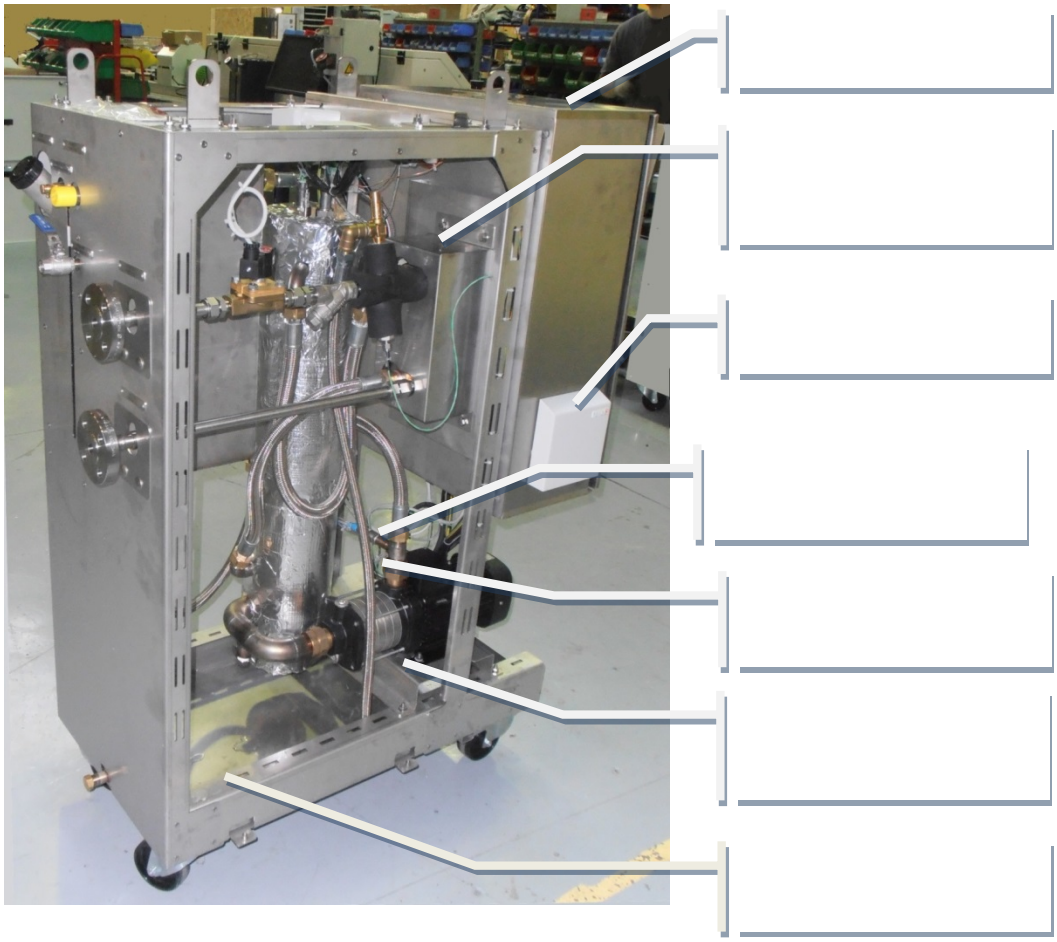
2.2 Principle of operation

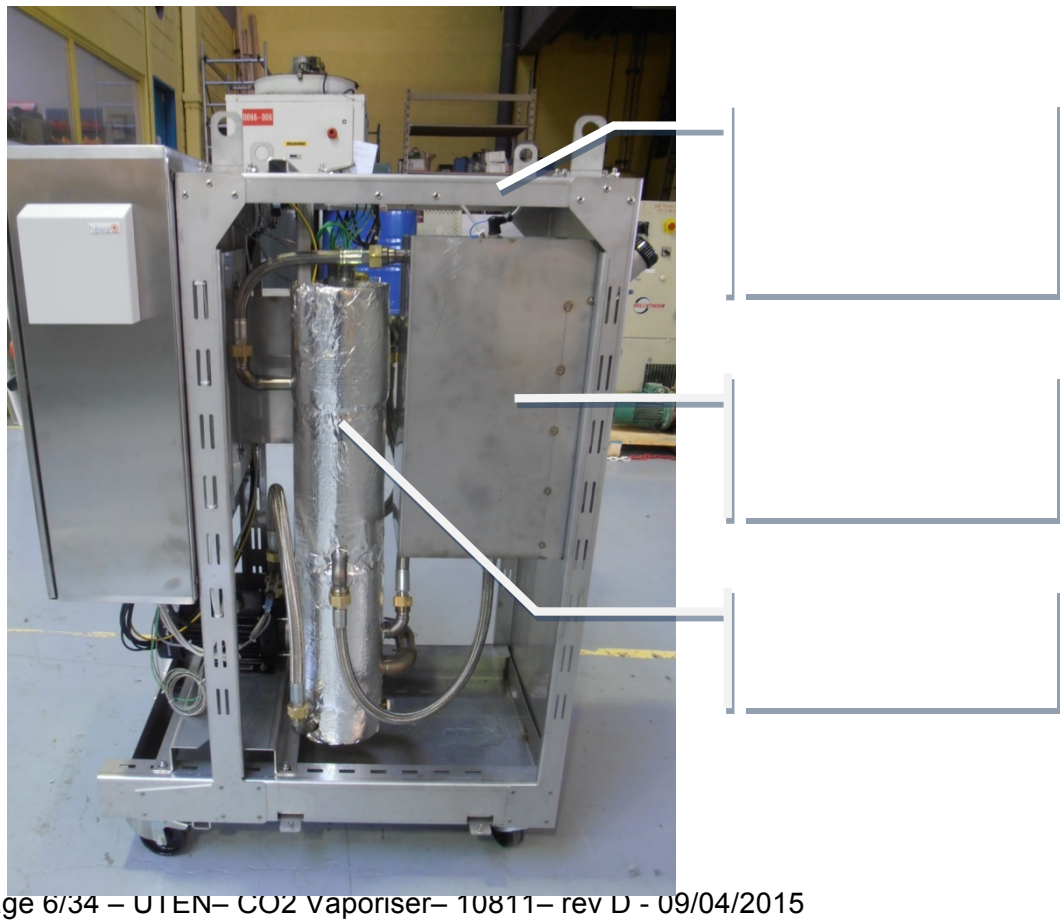
The machine comprises:

- An atmospheric tank allowing fluid supply and expansion
- A degassing bottle, generally integrated in the heater boiler. This bottle is placed just at the pump inlet, where the pressure is lowest in the circuit. It is generally built in such a way as to reduce the dimensionless speed of the MEG (Reynolds number Re), so as to facilitate the separation of the liquid and the gases. It also constitutes a reserve of liquid at the pump inlet.
- A pump
- A heater
- An exchanger
- An evaporator

Two flexible pipes connecting the degassing bottle and the tank. The bottom pipe allows filling, the top pipe allows degassing. The length and the position of these two pipes are carefully determined in order both to facilitate degassing and limit the warming of the tank by thermosyphon phenomena. The length and the position of these pipes should not be modified

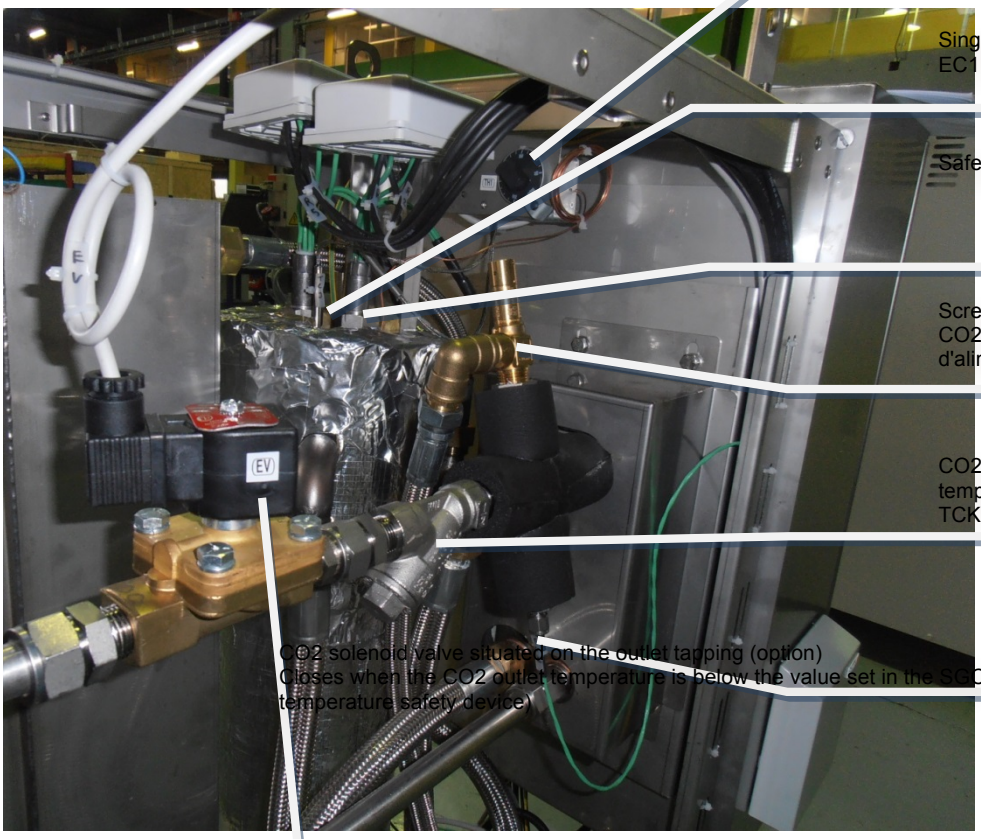
2.3 Positioning of components





CO2 outlet.
Tank top up.
TH1

Thermocouples J for internal temperature measurement and heating element TCK TC1…TC4



Single tube heaters EC1…EC4

Safety

Screen filter (option) on the CO2 supply inlet tapping. d'alimentation CO2.

CO2 exchanger outlet temperature measurement TCK

CO2 solenoid valve situated on the outlet tapping (option) Closes when the CO2 outlet temperature is below the value set in the SCC Eco (low CO2 temperature safety device)

.

V

2.3.1 Heating fluid (thermofluid)

- A 60% MEG (Mono-Ethylene-Glycol) and 40% water based anti-freeze (MEG mixture).
- Fluid group: 2 (97/23/EC PED fluids classification)
- Min/Max Temperature: - 40°C/ +90°C
- Pressure: 10 bar g

 IMPORTANT: Never mix antifreeze agents of different colours.

2.3.2 CO2 circuit

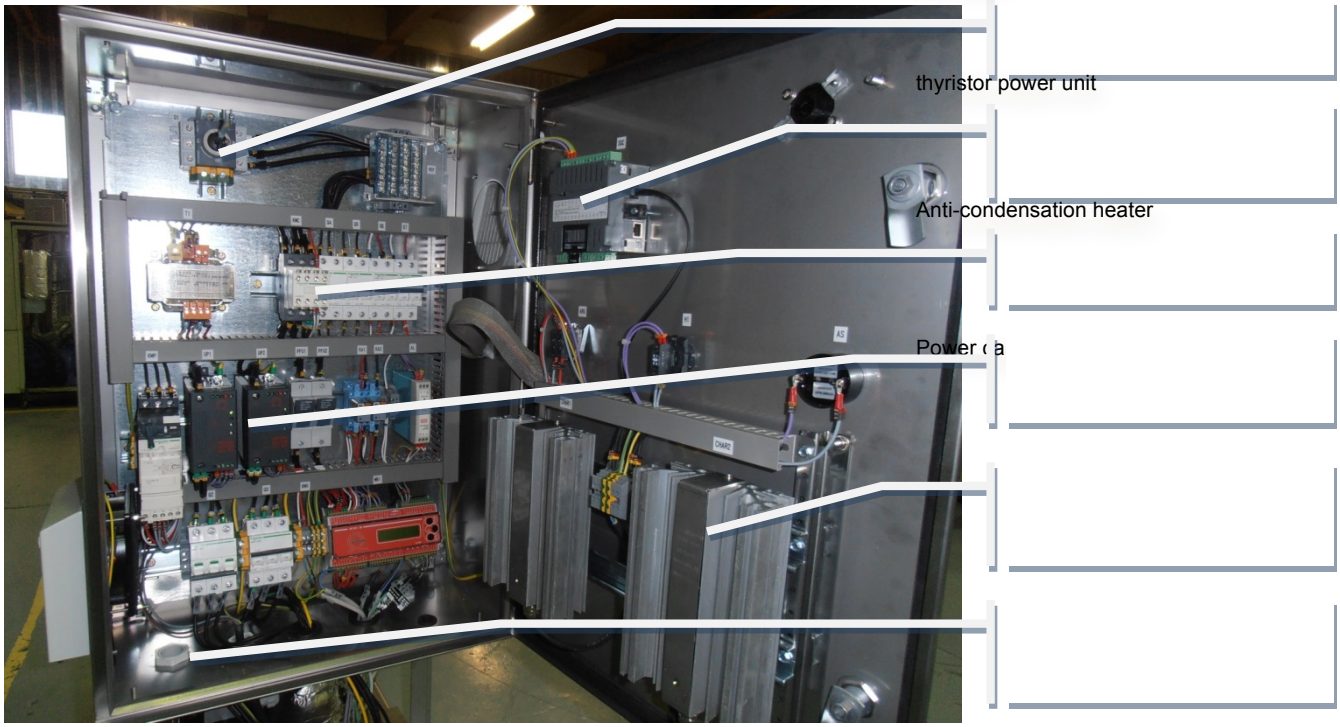
The CO2 circulates in the secondary circuit of a plate exchanger (ECH1). This may comprise a solenoid valve, a safety valve and a filter (See option page 9).
The CO2 is heated and vaporised by the heat transfer fluid circulating in the exchanger primary circuit.

Secondary circuit characteristics.

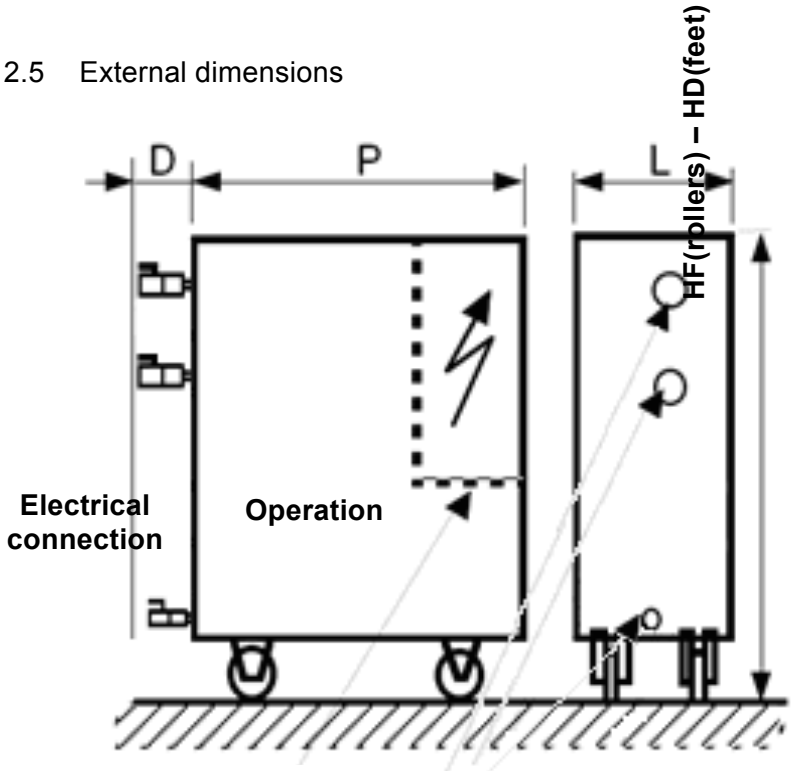
- Operating pressure : 40 bar g
- Min inlet temperature : - 29°C if the option that contains a solenoid valve, a safety valve and a filter is chosen, otherwise the min. temperature is -40°C
- Regulated temperature Max. at outlet : +15°C
- Fluid state on entry : Liquid
- Fluid state on exit : Gaseous

Option:
A liquid invasion prevention sleeve can be installed.
It comprises:
- A 10 µm filter at the CO2 circuit inlet
- A safety valve on the CO2 circuit
- A solenoid valve on the CO2 circuit that closes when the CO2 outlet temperature is less than the alarm threshold set in the main SGC regulator.

2.4 Cabinet


Inter isolator
SGC.v3 (Centralised Management System)
Contactor
thyristor power unit
Anti-condensation heater
Power c a

2.5 External dimensions



24/40-THERMO VCO2	60-THERMO VCO2
Approximate dimensions Height : 1310 mm Width : 600 mm Depth : 950 mm Approximate weight: 190 kg	Approximate dimensions Height : 1675 mm Width : 600 mm Depth : 1265 mm Approximate weight: 250 kg

3 INFORMATION AND DOCUMENTATION NEEDED FOR OPERATION, MAINTENANCE AND REPAIR

It's necessary to have the following documents for the use and maintenance of the vaporizer
- Instruction Manual.
- Electrical and hydraulic diagrams and parts list.
- Manuals for the main components.

4 DESCRIPTION OF WORK STATION LIKELY TO BE OCCUPIED BY OPERATORS

The work station likely to be occupied by the operators is:
- The SGCv3 installed on the door

5 NORMAL USE OF THE MACHINE

Supply of gaseous, temperature controlled CO2, the machine is intended for both internal and external use.

6 WARNINGS AND CONTRA-INDICATIONS IN USE

This machine must only be used to heat CO2, without exceeding the operating temperatures.
In addition it is essential that a mixture of 40% water and 60% mono-ethylene glycol is used in the primary heating circuit.

7 ASSEMBLY, INSTALLATION AND CONNECTION INSTRUCTIONS

For all documentation concerning the drawings and diagram, see the associated documentation

Check on the rating plate that the reference of the apparatus corresponds to that of this note and that the rated voltage, frequency and total power match your mains supply.

7.1 Hydraulic connection

Connect the CO2 circuit.
This connection must be done in accordance with good engineering practice and the applicable regulations, in particular for the cross section and characteristics of the pipes to be used. The connection pipes must be capable of continuously withstanding the maximum pressure and temperatures appearing on the hydraulic diagram and rating plate.
The characteristics are: 40 bar max. and -40°C to +90 °C for the temperature (minimum temperature of -29°C in the liquid invasion prevention option with CO2 solenoid, screen filter and safety valve).

7.2 Electrical connection

DANGER:
Connect the supply cable directly to the isolator-circuit breaker. This connection must be carried out according to good engineering practices and applicable regulations, particularly for the cable diameter to use. The power supply line must be able to withstand, in steady state, the maximum current shown on the electrical diagram and the identification plate. It shall be properly protected upstream, with distributed earthing.

IMPORTANT:

- If necessary, connect the connecting cables between the appliance and the automatic control device or remote control: See electric diagram.
- After having checked that there is an appropriate voltage on the power supply terminals, close the door of the electrical cabinet.

8 MACHINE COMMISSIONING AND START UP PROCEDURE

IMPORTANT WARNING:
- THE PUMP MUST NEVER BE OPERATED DRY
- FILL THE TANK

8.1 Commissioning and start up

After having checked that the drain plugs or taps are properly closed, manually fill the tank with thermal fluid up to the maximum level (overflow hole).
The flow rate and pressure are verified on the Machine Details page.

The following commands are executed on the SGC

- Switch on the equipment. The programme version number appears on the S.G.C. display panel. After a few seconds, the home page is displayed.
- If an error message appears, press the ESC RESET button. If the message does not disappear, or if other error messages appear, consult the corresponding chapter of the SGC Eco manual.
- On the air intake of the engine, observe the arrow indicating its correct direction of rotation. Failing this, remove a side panel allowing the viewing of the arrow appearing on the pump or its coupling.
- From the homepage, press F3, then 1, then ENTER, to go to “PUMP ONLY” mode. Then, press F3 to return to the homepage. In “pump only” mode the green indicator lamp no longer lights.
- By successive presses on the button, make short duration starts/stops: check the direction of rotation of the pump. If necessary, invert the order of 2 phases on the vaporiser power supply.
- Once the correct direction of rotation is checked, let the machine function in “Pump only” mode. Maintain the high level in the tank by successive additions of thermal fluid up to the overflow outlet, in order to avoid the triggering of the low level contact and the appearance of a fault.
- Monitor the pump outlet pressure: it must always be less than the maximum total manometric height (TMH) of the pump.
- Remove surplus heat transfer fluid using the level adjustment tap. Not complying with this step can lead to heat transfer fluid overflowing during heating.
- The vaporiser is ready to operate.
- If the pump generates an abnormal noise during heating or if the pressure and the flow are not stable, continue the degassing operation.

9 INSTALLATION AND ASSEMBLY INSTRUCTIONS TO REDUCE NOISE AND VIBRATIONS

Check the tightness of bolts and screws to limit the number of vibrating parts.

10 MACHINE COMMISSIONING AND OPERATING PROCEDURE

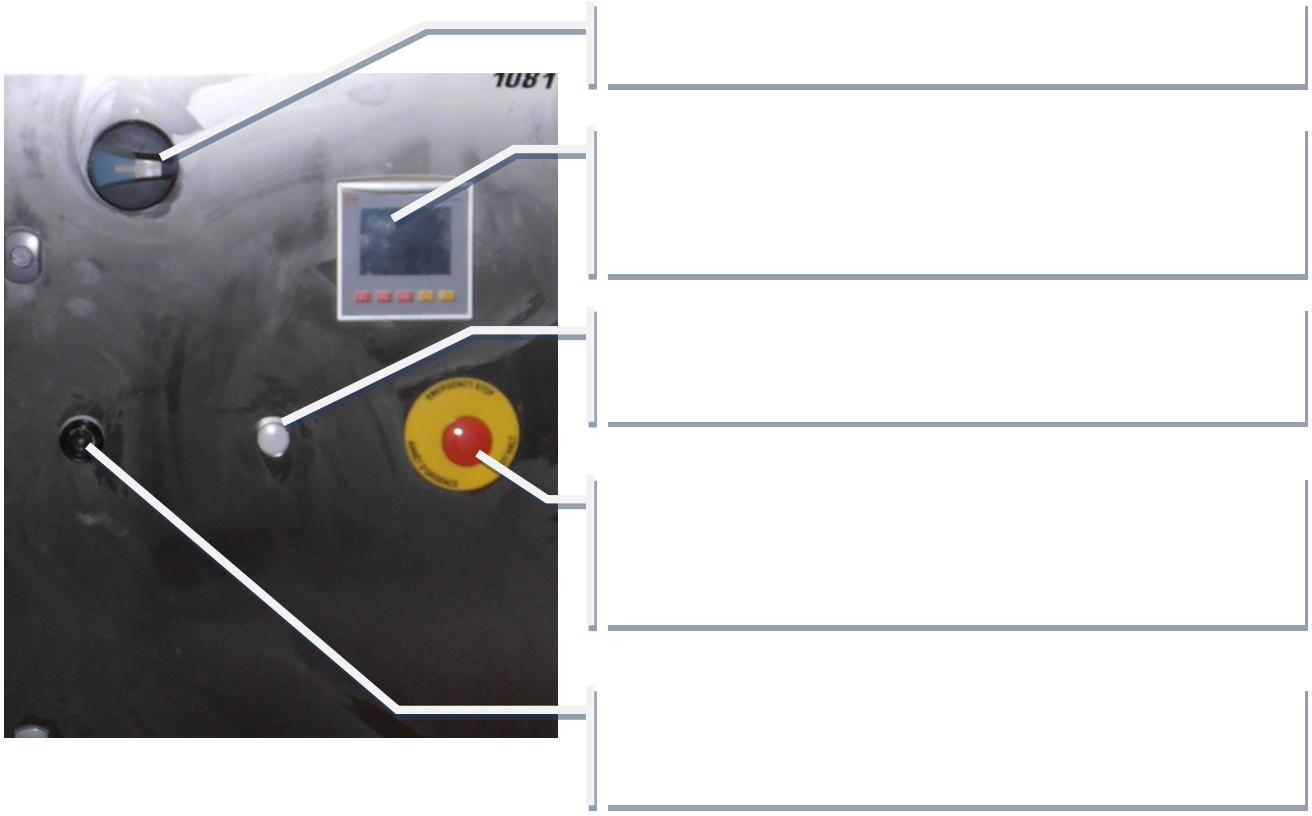
10.1 Remote control

Remote control uses two dry contacts (see electrical diagram).
Input inA: Allows Vulcatherm “local/remote” control selection.

- If input inA open (local mode), the equipment is operated by the SGC.v3
- If input inA is closed (remote mode) the machine is operated by the dry contact (input inB), the SGC.v3 no longer active.

Input inB: Allows the vaporiser to be switched off or started only when the vaporiser is in remote mode.

10.2 Local control



11 INFORMATION ON RESIDUAL RISKS

- Risk of cuts due to sharp corners and edges of the equipment.
- Risk of burns, allow the equipment to cool before any maintenance or lower the regulation setting to a maximum of 50°C.
- Residual risks related to defective assembly (see page 9, Chapter 7 Assembly Instructions)

12 INSTRUCTIONS ABOUT PROTECTIVE MEASURES

Compulsory wearing of personal protective equipment by the operator.
SGC Eco parameter setting is done with the cabinet door open and with voltage applied. Only a person with the necessary electrical authorisations can set the vaporiser parameters

13 TOOLS THAT COULD BE MOUNTED ON THE MACHINE

Not applicable. This system only uses a heating fluid to heat theCO2. No additional tool can be installed.

14 STABILITY CONDITIONS DURING OPERATION, TRANSPORT, ASSEMBLY, OR DISMANTLING

14.1 Operating conditions

The machine must be place on a flat, rigid surface that can support the weight of the equipment.

14.2 Transport conditions

The machine must be drained before any transport, handling and lifting must be done by the components provided for this. See the interface drawing.

14.3 Assemby and dismantling conditions

The machine must be cold, the temperature of the fluid in the primary must be less than 50°C.

15 TRANSPORT, HANDLING AND STORAGE

Handling and lifting must be done by the components provided for this. See the interface drawing.

16 PROCEDURE IN CASE OF ACCIDENT OR FAILURE

This chapter presents several messages likely to be displayed on the status indicator of the machine.

16.1 In case of accident

Stop the machine, using the emergency stop, if necessary and contact Vulcanic.

16.2 In case of failure

 Only for electrically authorised persons:
Observe the messages displayed by the SGC. However, if it is not possible to solve the malfunction problem quickly, contact the VULCANIC After Sales Service or your local reseller.

16.3 Fault or anomaly diagnosis aid messages

16.3.1 Status message

- **Low alarm**: Minimum authorised temperature is exceeded.
- **Safety devices INHIBITED**: Indicates that the safety devices are inactive.

   CAUTION: INHIBITING THE SAFETY DEVICES CAN CAUSE MAJOR DAMAGE TO PROPERTY AND PEOPLE (See CONFIGURATION Menu).
- **Maintenance necessary**: The machine requires maintenance.
- **URGENT: Replace the battery**: The battery needs replacing. Not replacing the battery will lead to the loss of the Vulcatherm parameters.

16.3.2 Error messages

- **Lack of flow rate**: The thermal fluid flow rate is less than the minimum contractual value.
- **Impos. init. : too much noise on Delta P**: the pressure sensor signal is unstable and it is impossible to calibrate this sensor. The problem can originate from the sensor itself, its electric connection or again from the SGC acquisition card.
- **DeltaP>> during initialisation**: The pressure deviation is too great compared to the threshold value during initialisation.
- **CPV signal outside limit**: Concerns the output pressure sensor. Break in one of the 2 power supply wires or measurement signal out of tolerance.
- **Output pressure too high**: The output pressure has exceeded the authorised maximum. (10 bar)
- **Pressure too low**: The pump pressure has reached the authorised minimum. (0.5 bar)
- **Main pump fault**: Primary pump thermal relay circuit breaker.
- **Thermostat triggering**: Heater overheating.
- **Emergency stop**: “Emergency stop” button pressed.
- **Internal T° sensor fault**: MEG circuit thermocouple fault.
- **External T° sensor fault**: Similar to the internal temperature sensor, see above, or breakage of one of the 3 CO2 circuit wires.**Fluid level low**: The tank level is too low. Check that there is no leak and add fluid.
- **TCK limitation fault. Element T**: Break in one of the 2 wires of one of the thermocouples inserted in the thermal insulation sheath of the heating element.
- **Voltage return**: Normally there is no voltage return on this system. If the “Voltage Return Fault” option is activated, this message is displayed after the switching on of the machine.

16.4 Troubleshooting

Troubleshooting and maintenance actions must be carried out by a trained and competent professional using this user manual and the hydraulic and electrical files. Generally, operating anomalies are displayed in plain language on the SGC home page. However, if unable to solve a malfunction problem quickly, contact the After Sales Service at VULCANIC or your local dealer.

17 SETTINGS AND MAINTENANCE

17.1 Settings

17.1.1 Setting thresholds

Default settings of the other limitation and safety devices:
- TH: Temperature limiter. Thermal fluid outlet safety device: See commercial specification
- RTH: Thermal Relay, set to the nominal value for the associated pump. See the pump rating plate

17.1.2 Parameter settings

See parameter setting booklet.

17.2 Maintenance

17.2.1 Preventive maintenance

After 10 hours of operation, then after 200 hours, 1000 hours, and every 2000 hours, proceed with the following operations:
- Check the operation of the level sensor.
- Check the cleanliness of the ventilation grids, inside the electric cabinets and hydraulic enclosures.
- Check the tightness of all the electric connections and the status of the relay contacts.
- Monitor the correct operation of the regulation.
- Monitor the status of joints and thermal insulation, so as to act preventively to avoid the risk of burns to the personnel.
- Test the operation of other safety devices and their setting value.

After 6000 hours of operation:
- Completely drain the installation in order to regenerate the quality of the heating fluid.
- Measure the change in the contractual values: flow rate, pressures, currents, reaction times, temperature deviations.

17.2.2 Draining

It is always possible to drain part of the heat transfer circuit.
Stop the equipment, after having checked that the heating fluid is at a temperature lower than 50°C. Otherwise, lower the regulation set point.
Carefully open the drain tap or plug of the degassing bottle, if necessary after having connected an evacuation pipe to the retention tray valve.

 REMINDER: NEVER OPERATE THE PUMP WHEN DRY.

17.3 Data backup battery replacement procedure

17.3.1 Removing the SGC v3 module from cabi

Disconnect the electric power supply wire s the connectors (analogue, On/Off inputs/outp
Unscrew the brackets around the SGC.v3 inside the cabinet while holding the device in place to prevent it from falling.
Once the brackets have been removed, place the SGC.v3 on a flat and clear area.

17.3.2 Removing the SGC.v3 rear panel:

Before opening the SGC.v3 touch a grounded metal part to discharge your static electricity.

Remove the 4 screws on the rear of the SGC.v3.
Open the SGC.v3 rear panel carefully
Replace the battery:
Remove the battery while holding it as shown opposite and slide it gently under the clip.

IMPORTANT NOTE:
First obtain the replacement battery reference CR 2450N 3V LITHIUM BATTERY, to allow fast replacement (max. 5 minutes).

Slide the battery to the side under the clip, as shown opposite. The battery clip must be secure.
Note that the side of the battery facing you bears text (+).

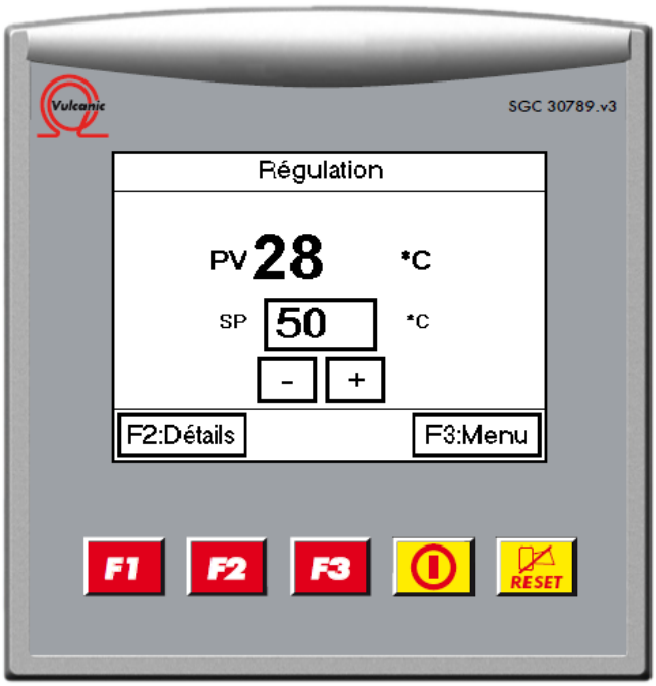
17.3.3 Put the SGC.v3 back panel back in place:
Close the SGC.v3 back panel and replace the 4 screws provided for this.

17.3.4 Refitting and verification:
You can now re-attach the SGC.v3 to the cabinet with the brackets. Put the terminal blocks back in their original position and restore power to the cabinet to run the machine.
Check that the "Urgent replace battery" message has gone from the homepage message bar.

18 CONTROLLING OF THE SGC

The following paragraphs present the other screens menu. These are the SGC.ECO screens which are presented. The corresponding SGCV3 screens are always similar to those from the SGC.ECO,

18.1 General description of the SGC.v3



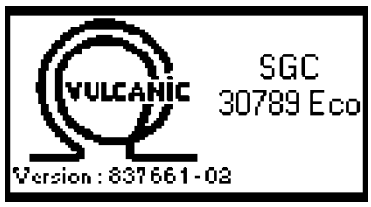
The interface comprises:

- An ON/OFF key : Thermal regulator On/Off.
- A Horn Reset/Off button : to turn off the horn and reset faults.
- Keys F1 .to. F3 : Browsing keys

On certain screens these 5 keys are completed by a touch keys which appear on the screen as needed. For example, in the screen above, the – and + keys used to reduce or increase the value of the setting (SP).

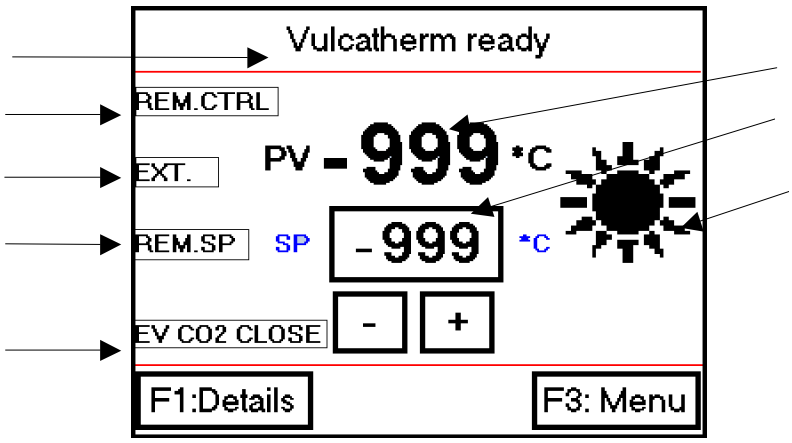
18.2 Energising

The first page after energising the machine displays the programme version number.



18.3 Homepage of the SGC.v3

The home page presents the summary of the main information. It also allows entering the set point.
If a fault is detected, the SGC automatically returns to this page.



Information and set point input zone:

1 - Machine status indicator.
2 - PV (Process Value): indicates the current measurement, in °C.
3 - SP (Set Point): indicates the current set point. Adjustable digital value.
4 - Remote operation indicator:
    a. Indicator unlit: local operation only.
    b. REM.CTRL (Remote Control): indicates that the thermal regulator is under remote control.
5 - Regulation mode indicator:
    A .Indicator unlit: regulation on internal sensor.
    b. EXT: indicates that regulation using the external sensor is active. Regulation must use the external sensor.
6 - Set point origin indicator:
    a. Indicator unlit: local set point modifiable through the keyboard.
    b. REM.SP (Remote Set Point): indicates that the remote set point is active. In this case, the set point cannot be entered on the keyboard.
7 - Heating/limitation indicator:

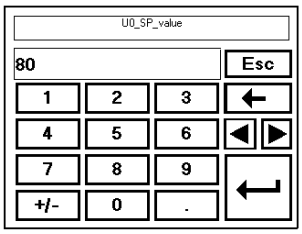
Heating

Heating power limitation.

The limitation indication appears in the following cases:
    a. The surface temperature of the heating elements has reached a maximum
    b. The flow rate is momentarily too low
    c. The heating fluid temperature has reached a maximum

8 – Valve position indicator.
    a. EV CO2 OPEN The CO2 valve is open
    b. EV CO2 CLOSED : The CO2 valve is closed

18.3.1 SGC.v3 input features:

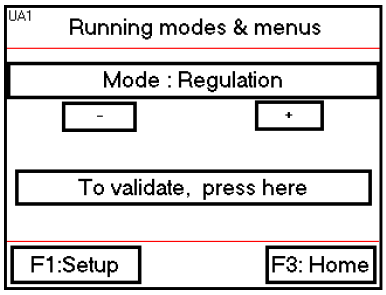


The SGC.v3 colour display is able to give relief effects (like a computer screen). These effects are used to indicate the possible actions. The meaning is as follows:

- Text without relief, on background with the same colour as the background display: simple wording (not modifiable)
- Text without relief, on background with a different colour from the background display: parameter displayed in read-only mod (not modifiable). For example: PV, pressure, flow rate, etc…
- Embossed text: button.
- Engraved numerical value: numerical input field. Touching this field causes the input keyboard to appear as here opposite.
- Engraved text associated with a set of + and – (plus and less) buttons. Pressing the + and – buttons allows scrolling the various possible choices.
- Special case: push/push button. Some selectors (selecting 2 choices only) alternate the appearance of a button and an input field. Each time the field is touched, the appearance change from "embossed" to "engraved" (that look like a button which is sometimes released, sometimes pushed in).

18.4 Operating mode and menu access

18.4.1 UA1 Running modes and menus



To open the operating modes selection page, press the F3 key on the homepage.

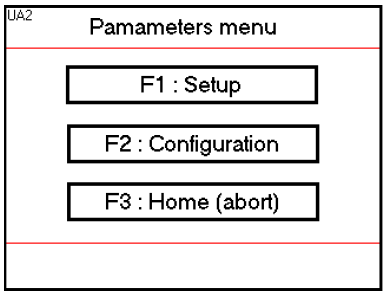
The operating modes are:

- Regulation: the pump (or pumps) is or are operating and Vulcatherm® regulates them to the set point temperature.
- Pump alone: the pump (or pumps) is or are operating alone without heating, for instance, to start a process or to check the flow rates and pressure.

The browsing keys are:

- Key F1 is used for changing over to the Settings screen.
- Key F3 return to home.

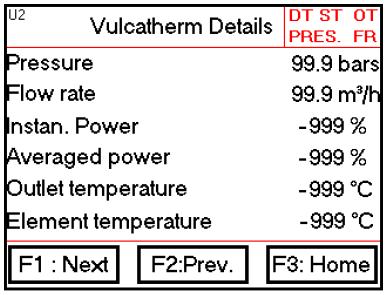
18.4.2 UA2 Parameters menu



It can be accessed from the homepage, by pressing on the F3 Operating modes & menus key, and then on the F1 settings key (see above).
This page gives access to three available menu levels:

- [F1]: Set-up menu: accessible to qualified personnel only.
- [F2]: Configuration menu: accessible to authorized personnel only (Caution: access by password).
- [F3]: Home (abort): return to the current menu (user menu).

18.4.3 U2 Vulcatherm details



In the top right zone, we find indicators of reasons for heater power limitation. These reasons can be:

- **ST** (Surface Temperature): The surface temperature of the heating elements has reached a maximum
- **OT** (Outlet Temperature): The temperature of the heating fluid has reached a maximum
- **DT** (DeltaT): the maximum delta T has been reached (only if the management of delta T is active).
- **FR** (Flow Rate). The flow rate is momentarily too low.
- **PRES** (Pressure). The pressure is momentarily too low

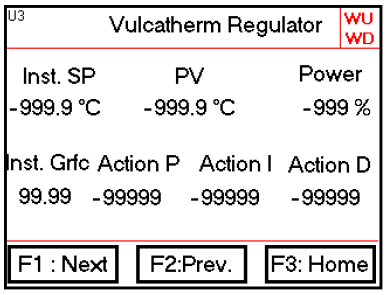
The central zone displays:

- **Pressure:** outlet pressure (in bar).
- **Flow**: output flow rate (in m3/h).
- **Instant. /av. power**. : Instantaneous and average powers (in %). The average power is calculated for 2 rolling minutes. The powers (instantaneous and average) are positive when the Vulcatherm is heating.

- **T°av. ele/Outlet**: indicates the Vulcatherm® heating element and outlet temperatures. The indicated heating element temperature is the average temperature of the heating element thermocouples installed in the heater. This indication is only available on thermal regulators with instrumented heating elements. The outlet temperature is the heat transfer fluid temperature at the outlet (in °C). If Vulcatherm® is regulating on an internal sensor, this value is equal to PV (process value).

18.4.4 U3 Vulcatherm regulator

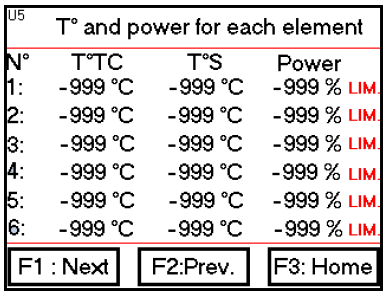
Allows viewing the operation of the regulator:



- **Inst. SP** (Set Point): The instant set point in °C, which can be different from the set point displayed on the Homepage, which indicates only the final set point.
- **PV** (Process Value): Temperature in °C measured on the internal or external probe, depending on the selection.
- **Power**: Power generated by the thermal regulator in % of the rated power.
- **GRFC** (instant Hot Cold Relative Gain): a way of adapting the cold outlet gain with respect to the heat outlet gain (and therefore modifying the respective value of the cold proportional band with respect to the hot proportional band). The higher the available cooling power, the lower the gain value.
  This value depends on the GRFC at 65°C entered on page C5 (see chapter 5.7), of the cooling law and on the instant temperature difference between the heating circuit and the cooling source
- **PID Action**: Displays Proportional, Integral and Derived actions. The sum of the three actions is 10 times the applied power in %.
- **WD/WU** indication (at the top right of the screen): In cascade mode, indicate whether the regulator is on "Winddown" or "Windup". That is, if the Vulcatherm® regulator is momentarily incapable of performing the Process regulator orders. (Because of a lack of available power).

18.4.5 U5 T° and power for each element

This screen only appears if “Step Control” is in use. Only for the 40 and 60 kW models
In the central zone, for each heating element, one finds:



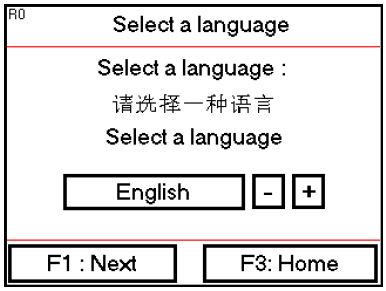
- **No.**: Number of heating element, numbered from (1 to 6).
- **T° TC**: temperature of heating element thermocouples.
- **T° S**: heating element surface temperature.
- **%**: Percentage power. The “LIM” indication indicates that the component concerned is in power limiting mode.

18.5 Setting menu

18.5.1 R0 Language and time counter

From top to bottom, it displays:

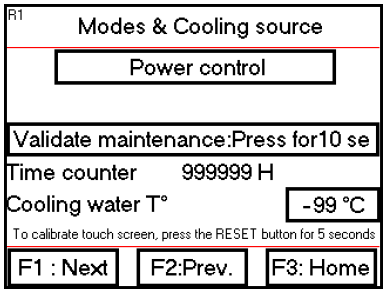
- The language selector. It allows selecting the display language of the operator and settings menus from:
  - Français (By default)
  - Anglais (English)
  - Allemand (German)
  - Espagnol (Spanish)



18.5.2 R1 Modes and cooling source

From top to bottom the display shows:

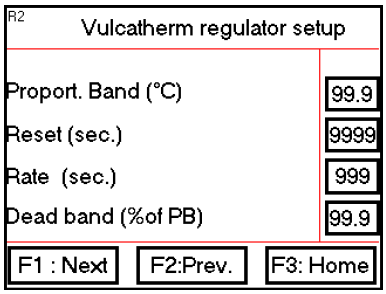
- Mode selection:
  - Temperature regulation: normal regulation operation.
  - Power proportioning: a way of establishing a constant heating power factor. Essentially, this mode is intended for regulation testing and development. Without surveillance, the outlet temperature of the Vulcatherm® can reach the temperature limits (maximum temperature if the sum of the power is positive, otherwise minimum temperature).



- Timer: Indicates the number of running hours of the main pump.
  If maintenance validation is necessary the indication: “Maintenance validation: press for 10s” appears. To validate the maintenance, hold the key down for 10 seconds.

18.5.3 R2 Vulcatherm regulator setup

In the central zone, we find:



- **Prop. Band:** Proportional band. Digital value adjustable between 0.1°C and 99.9°C.
- **Integral**: digital value adjustable between 1 and 9999 seconds. The integral time cannot go below 4 times the rate (derivative) time (See below). In some cases, decrementing the integral time can result in automatically decrementing the rate time.
- **Rate**: digital value adjustable between 0 and 999 seconds, with a maximum of a quarter of the integral time (See above). The display “0” means “rate time zero = no rate correction”. In some cases, decrementing the integral time can result in automatically decrementing the rate time.
- **Dead band**: digital value adjustable between 0 and 30% of the proportionate band.

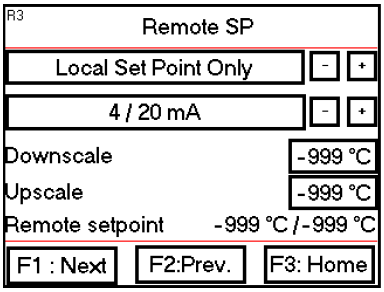
18.5.4 R2B. Ramps

See the corresponding chapter of the manual “UT30789”

18.5.5 R2C. Delta T

See the corresponding chapter of the manual “UT30789”

18.5.6 R3 Remote set point



In the central zone, we find:

- The set point selector allows a choice between:
  - **Local set point only:** The set point can only be input on the home page.
  - **Remote set point only:** the set point used comes from an external signal (digital or analogue). It cannot be modified on the home page.

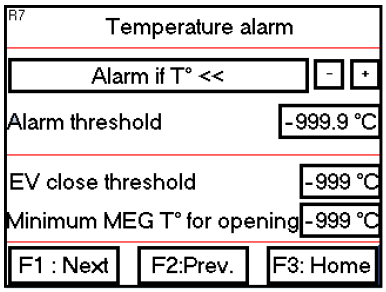
18.5.7 R4 External probe

See the corresponding chapter of the manual “UT30789”

18.5.8 R5 Analog copy

See the corresponding chapter of the manual “UT30789”

18.5.9 R7 Temperature alarm



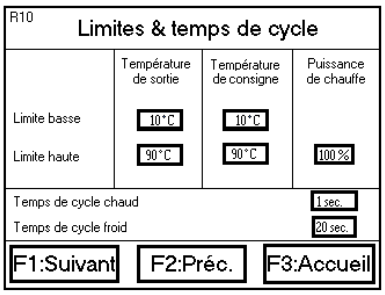
The SGC.V3 has a temperature alarm function. If the temperature from the regulating sensor goes out of the temperature range, an alarm is triggered. This alarm generates an intermittent audible signal, the cyclic display of a message on the home page screen and the activation of an electric contact.

In the central zone, the display shows:

- Choice of alarm:

  The alarm choice must be set to "**Alarm if T° <<**"
  - **No alarm**
  - **Band alarm**: The alarm trips if the absolute value gap between measurement and set point is greater than the alarm threshold.
  - **Alarm if T° >>**: The alarm trips if the measured temperature exceeds the alarm threshold.
  - **Alarm if T° <<**: The alarm trips if the measured temperature exceeds the alarm threshold.
- **Alarm threshold**: Digital value adjustable between the top and bottom of the scale. The alarm threshold is set at 0°C
- **EV Close threshold** : When the CO2 temperature is lower than the threshold, The valve is closed.
- **T° MEG mini pour ouverture** : When the temperature is Higher CO2 threshold , the valve is open .

18.5.10 R10 Fluid temperature limits (SGC.v3)



This SGC V3 screen brings the parameters Set point range, Power and PWM period and Fluid temperature limits.

- **SP set point (local or remote):**
  - **Lower SP limit**: Digital value adjustable between the bottom of the set point scale and the upper SP limit
  - **Upper SP limit**: Digital value adjustable between the lower SP limit and the top of the set point scale.

- **Power and PWM period**
  - **Maximum power**: It is possible that the heating efficiency is excessive. The heating power can be controlled by displaying a maximum power percentage of less than 100% (Example: a 20 kW VULCATHERM only dissipates 12 kW when its MAX POWER parameter is set to 60%).
  - **Hot cycle time**: Digital value which must be adjusted at max. 1 second. In the case of Vulcatherm having an individual heating control for each heating element, this parameter is inoperable and the cycle time is of 1.11 second.
  - **Cold cycle time**: Not used.

- **Fluid temperature limits**
  - **Fluid low temp. Limit**: Digital value adjustable between the bottom of the set point scale and 90°C, exclusively when the measurement probe is external. Allows limiting the minimum output temperature, independent of any other condition.
  - **Fluid high temp. Limit**: Digital value adjustable between 0°C and the high set point scale, exclusively when the measurement probe is external. Allows limiting the maximum output temperature, independent of any other condition.

  If the 2 values are overlapping, the bottom limit is aligned on the top limit.

18.5.11 R11 Digital links

See the corresponding chapter of the manual “UT30789”

18.5.12 R11A Ethernet IP

See the corresponding chapter of the manual “UT30789”

18.5.13 R12 Date and time

See the corresponding chapter of the manual “UT30789”

18.6 Configuration menu

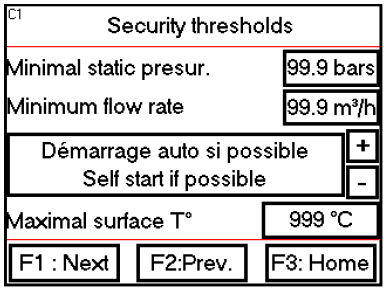
The screen pages shown in this chapter are reserved exclusively to users having all the skills needed for setting up a thermal regulator. The input of an incorrect parameter can cause extensive damage to properties and persons.

Caution: This menu is exclusively bilingual in French and English.
Access requires a password, using the following procedure:

- Go to the home page
- Press the F3 key to switch to the operating mode and menu screen.
- Press the F1 key to open the menu selection screen.
- Press the "Configuration menu" key F2
- Input the password "2009" to log on to the configuration menu.

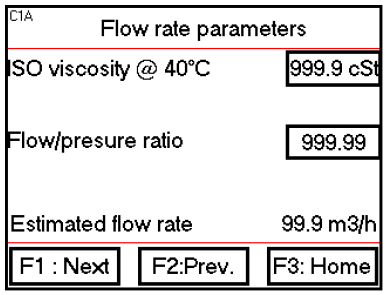
18.6.1 C1 Security threshold

In the central zone, we find:



- **Minimum static pressure**: Minimum static pressure of the heating fluid, measured on CPV.
- **Minimum flow**: Flow rate beneath which the "No flow rate" error message appears.
- **Start energising chose**
  - **No fault when power resumes**: Deactivate the "Power return" message on energising.
  - **Fault when power resumes**: Activate the "Power return" message on energising.
  - **Self start if possible** : Auto start of the Vulcatherm previous state when the power return
- **Maximum surface T°**: Maximum authorised surface temperature of the heating elements.

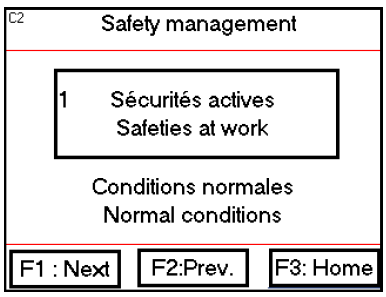
18.6.2 C1A Flow rate calculation



This screen only appears if the load loss method is used to estimate the flow rate.

- **ISO viscosity**: used for adjusting the kinematic viscosity of the fluid. This parameter is used by the flow rate estimation algorithm.
- **Coeff. Flow rate/Pressure**: flow rate/pressure coefficient. Used for calibrating the flow rate indication in m3/h.
- **Estimated flow rate**: Estimated flow rate in the heater

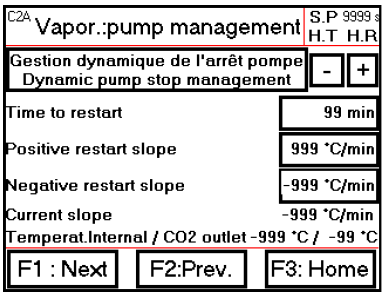
18.6.3 C2 Safety managements



Allows deactivation of most of the safety devices (By default, the safety devices are activated).

CAUTION: INHIBITING THE SAFETY DEVICES CAN CAUSE MAJOR DAMAGE TO PROPERTY AND PERSONS.

18.6.4 C2A Pump management



Only available in with a SGC.v3 , The pump management allows Better temperature control of the CO2.

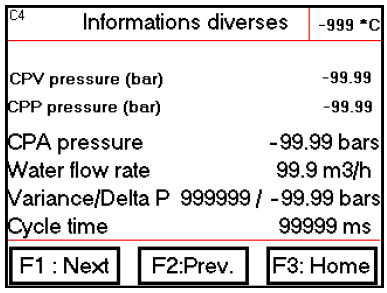
On the top right, We finds indications :

- **S.P** : Appears when the pump is stop
- **H.T** : Appears when the temperature of the exchange is too high
- **H.R** : Appears when the variation of the temperature of the CO2 (Current slope) is not in the limits configurated below (positive restart slope and negative restart slope)
- **Temporisation** : Time before the pump restart.

In the central area, we find :

- Management choice for the stop pump :
  - **No pump stop** : Stopping the pump when the temperature of the internal sensor exceeds 5°C the maximal temperature allowed
  - **Static pump stop management** : Stopping the pump when the CO2 temperature sensor reaches the set point
  - **Dynamic pump stop management** : Stopping the pump When The variation of CO2 temperature sensor (current slope) is null
- **Time to restart** : Time before the restart of the pump, Time before restarting the pump,when the values is 0, There is no time allowed to restart pump
- **Positive restart slope** : Positive variation slope threshold of the temperature of the CO2 wich result the restart the pump
- **Pente négative de redémarrage** : Negative variation slope threshold of the temperature of the CO2 wich result the restart the pump
- **Current slope** : instant variation slope température of the CO2
- **Température internal / CO2 outlet** : Instant temperature of internal probe and outler CO2 probe

18.6.5 C4 Various information



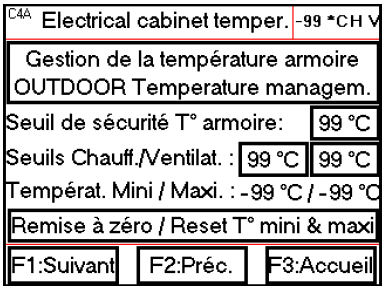
This screen shows, in read only, various information that is useful for checking the correct operation of the thermal regulator.

In the top right zone we find the temperature of the heat sink. This value is only valid if an electronic power board having a thyristor heating control is used.

In the central zone, from top to bottom and from left to right, we find:

- **Rotoflow**: Water flow rate.
- **CPV pressure**: Used for the calculation of the flow rate and for the display of the effective pressure present on the usage outlet pipe.
- **CPP pressure**: Used for calculating the flow rate.
- **CPA Pressure**: Used to control the inlet pressure.
- **Delta P**: indicates the net pressure difference (corrected with the measurement offset) between CPV and its reference probe (CPP, CPA or the atmosphere) depending on the Vulcatherm model. This value is valid only if the main pump is operated (else the value displayed is the last delta P before stopping of the pump).
- **Var**.: Variance. Indicates the variance (square of the standard deviation) of the Delta P signal above. The unit is kPa².
- **Cycle time**.: Cycle time.

18.6.6 C4A Electrical cabinet temperature



This screen indicates the temperature inside the electrical unit as well as the various settings for thermal management of the electrical unit.

In the top right zone, from left to right we find.

- The internal temperature of the electrical unit via the indicators:
- **H:** Means that unit heating is in operation.
- **V:** Means that the unit cooling fan is in operation.

In the central zone, from top to bottom and from left to right, it displays:

- Use of thermal management:
  - **No OUTDOOR Temper.management.:** The Vulcatherm is not outdoors
  - **OUTDOOR Temperaturemanagem.:** The Vulcatherm is outdoors and is fitted with a cooling fan and heaters to control the unit temperature
- **Cabinet T° safety limit:** maximum acceptable temperature in the electrical unit, above this temperature the Vulcatherm changes to fault status.
- **Heating threshold:** Only if outdoortemperaturemanagem. is selected, the unit heating switches on if the unit temperature is less than the threshold.
- **Ventilation threshold:** Only if outdoortemperaturemanagem. is selected, the unit fan switches on if the unit temperature is greater than the threshold.
- **Min./max. Temperature:** Minimum and maximum temperature of the electrical unit recorded by the SGC Eco, to reset these values to 0, press reset.

18.6.7 C5 Cooling law

See the corresponding chapter of the manual “UT30789”

18.6.8 C7 Propotionnal valve

See the corresponding chapter of the manual “UT30789”

18.6.9 C11 Bus status

See the corresponding chapter of the manual “UT30789”

18.6.10 C12 Digital link

See the corresponding chapter of the manual “UT30789”

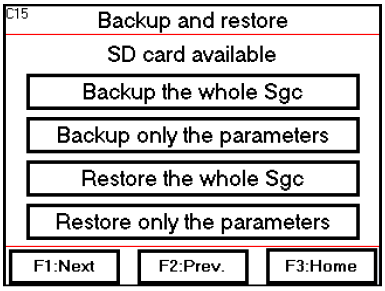
18.6.11 C13 Copy configuration

See the corresponding chapter of the manual “UT30789”

18.6.12 C13A Input D configuration

See the corresponding chapter of the manual “UT30789”

18.6.13 C15 BACKUP AND RECOVERY FOR SGC V3 AND SGC V3TWIN



This screen enables the user to create a backup or recovery of the SGC or SGC settings on an SD card. PLEASE NOTE: a micro SD card previously configured by the SD card software must be used to make a backup. An SD card with a SGC backup and settings is provided with the Vulcatherm

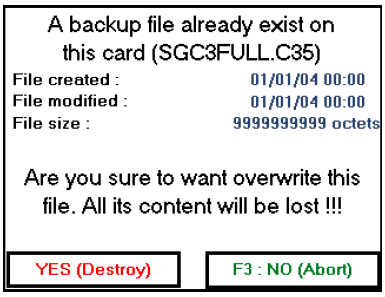
In the central zone, the display is:

- **SD card information:**
  - SD card available: A micro SD card is inserted into the SGC reader and is ready for use
  - No SD card: There is no SD card in the SGC reader or the card is not formatted by the SD card software
  - SD card locked for write:
- **Clone the CMS:** Enables all SGC and settings to be saved to the micro SD card. The screen in paragraph 12.8.2 appears
- **Clone settings**: Enables the SGC settings only to be saved. The screen in paragraph 12.8.3 appears
- **Restore full CMS:** Enables the whole SGC programme and settings to be recovered from the micro SD card. The screen in paragraph 12.8.4 appears
- **Restore settings:** Enables SGC settings to be recovered from the micro SD card. The screen in paragraph 12.8.5 appears

18.6.13.1 SAVING CMS

This screen enables the SGC programme and settings to be saved on the SD card inserted in the CMS.
It is still possible to cancel the backup by pressing F3
Otherwise, press "yes (delete)".

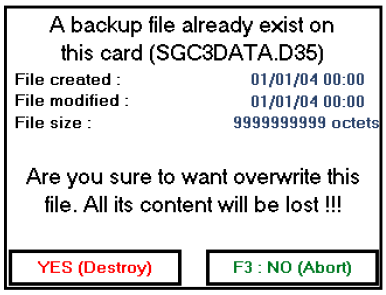
PLEASE NOTE: **Saving leads to the loss of the settings initially stored on the SD card (If the file already existed).**



18.6.13.2 SAVING SETTINGS

This screen saves the SGC settings on the SD card inserted in the CMS.
It is still possible to cancel the backup by pressing F3
Otherwise, press "yes (delete)".

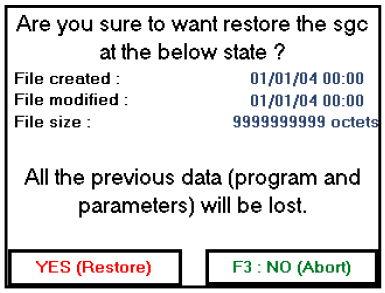
PLEASE NOTE: **Saving leads to the loss of the settings initially stored on the SD card (If the file already existed).**



18.6.13.3 SGC RECOVERY

This screen enables the SGC programme and settings to be restored from an SD card inserted in the CMS.
It is still possible to cancel the restore by pressing F3
Otherwise, press "yes (restore)".

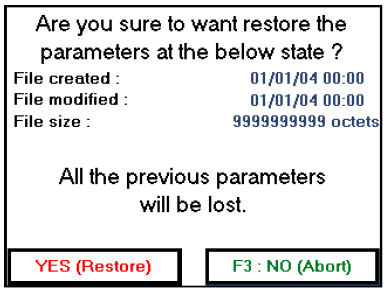
PLEASE NOTE: **Restoring a programme leads to the loss of the programme and settings originally stored on the CMS**
Once the restore operation has finished, please refer to paragraph 12.9



18.6.13.4 RECOVERING THE SETTINGS

This screen enables the SGC settings to be restored from an SD card inserted in the CMS.
It is still possible to cancel the restore by pressing F3
Otherwise, press "yes (restore)".

PLEASE NOTE: **Restoring the settings leads to the loss of the settings originally stored in the CMS**
Once the restore operation has finished, please refer to paragraph 12.9



18.6.14 CHECKING THE SETTINGS

PLEASE NOTE:

After restoring the programme and/or settings from a micro SD card, you are recommended to check that the settings saved in the "control menu", "configuration" and "Vulcanic" are the same as the settings specifications and the test sheet supplied with the Vulcatherm

Failure to follow this recommendation may lead to a malfunction of the Vulcatherm or even its destruction.

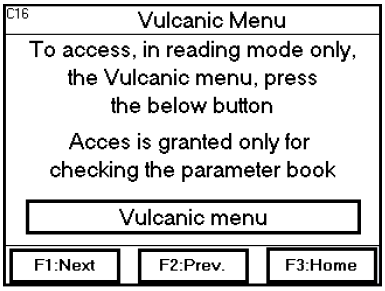
18.6.14.1 CONTROL AND CONFIGURATION MENU

If there is any difference between the settings saved and the settings specifications, please consult Vulcanic before restarting the Vulcatherm.

See paragraphs 11 and 12 of this manual for more information on checking the Vulcanic menu below

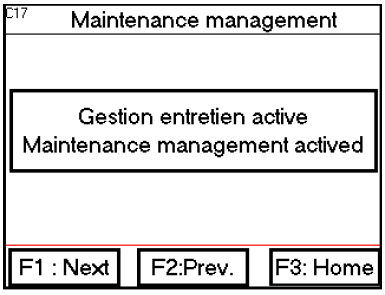
18.6.14.2 Vulcanic Menu

This screen grants read-only access to the Vulcanic menu.
The Vulcanic menu is not documented. In the event of any difference between the settings saved in the SGC V3 and the settings specifications, please consult Vulcanic Assistance



18.7 C17 MAINTENANCE MANAGEMENT

This screen enables activation or deactivation of the "Maintenance required" message display on the homepage



19 ECONOMICAL OPERATION, OPTIMISATION OF REGULATION PARAMETERS

Temperature regulation is executed by a manually-adjusted P.I.D regulator. The energy consumed in the network (electric current and cooling water) also depends essentially on this optimized adjustment.

The settings concerned are:

- The 3 PID parameters: proportional band, integral and rate time. Adjust the regulation parameters according to the position of the measurement probe, the thermal inertia and to the receiver oscillation period. The auto-regulation function.

- The dead band: processes calling regularly and alternately for heating and cooling nevertheless consume average energy with a constant sign. The adjustment of a dead band (temperature area within which the Vulcatherm produces neither heat nor cold) will sometimes allow the oscillations to be decreased. By cooling down the system, this dead band will save on pointless energy excesses. The dead band increases with the value of this parameter.

20 SPARE PARTS

See the electrical and hydraulic parts lists. Is the subject of another supply contract. Most of the standardised components are available in stock at VULCANIC or with its supplier.

20.1 First emergency kit:

Solenoid valve, mechanical pump seal, thermocouple and regulation or limitation sensor, safety thermostat, analogue pressure sensor, pressure switch, sieves for filters, fuses and bulbs.

20.2 Second emergency kit:

Heating elements, power unit.

20.3 Third emergency kit:

Motor-pumps, heating unit, SGC.

21 AIRBORNE NOISE EMISSIONS

Airborne noise: The machine's acoustic pressure level is less than 75 dB.

22 WARRANTY

Duration is 12 months as from the commissioning, and at the latest 18 months after provision. The terms and conditions of the guarantee are compliant with VULCANIC's general terms and conditions of sale or with the possible more favourable clauses included in the contract.
Particularly, the manufacturer cannot guarantee the performance of the process with which VULCATHERM® is connected, when it has not been commissioned for a design study service.
VULCATHERM® guarantees the NON-DEGRADATION of the thermal fluid by cracking or oxidation, in the conditions of operation defined by the initial contract, which govern the settings of the limiters and safety devices.
The repair of the defective parts or manufacturing defects will be carried out at the manufacturer's factory.