MANVIA SAMPLE DEGASSING SYSTEMS

INSTALLATION, OPERATION & MAINTENANCE MANUAL

manvia

SAMPLE DEGASSING SYSTEM DG-105

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Notes on Safety

In this manual, you will find various notes categorized under the following levels with the signal words “DANGER” and “CAUTION”.

 **DANGER**	**Indicates a hazardous situation which, if materialized, could result in a serious injury and even in death.**
 **CAUTION**	**Indicates a hazardous situation which, if materialized, could result in material damage or a moderate injury.**

 **DANGER**	Never use the input and output signals of the unit for operations that may threaten human life, cause damage to the system.
	Turn off the power supply when you set up the unit, connect new cables, or perform maintenance or inspections. Failure to do so, could cause electric shock or damage to the unit.
	Never touch any terminals while the power is on. Otherwise, electric shock may occur.

 **CAUTION**	Periodically check that the terminal screws on the power supply terminal block and mounting nuts are firmly tightened. Using the unit with loose screws may result in fire or malfunction.
	Connect the cables correctly to the terminals of the TS Series unit in accordance with the specified voltage and wattage. Failure to supply the correct voltage or wattage, or improper cable connection may cause fire, malfunction, or damage to the unit
	Do not attempt to repair, disassemble, or modify DG-105 sample degassing system, MANVIA is not responsible for any damages resulting from repairs, disassembly, or modification by unauthorized personnel.
	Do not use sharp-pointed tools to press touch switches. Doing so, may damage the screen.
	Do not uninstall or remove the protection against thermal contacts. It could cause moderate burns to the operator.
	Only personnel who possess the required knowledge and technical skills are authorized to set up the unit, connect the cables, and perform maintenance and inspections.

1 APPLICATIONS

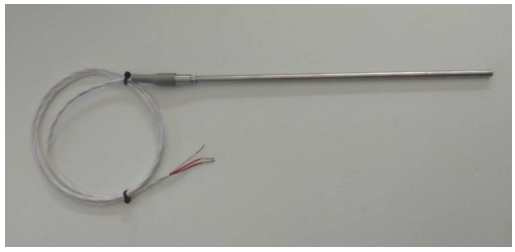
MANVIA DG-105 System offers a new design for conductivity measurement for water-steam cycle chemistry monitoring. This system ensures an effective CO_2 removal from sample and an appropriate temperature conditioning for an accurate degassed conductivity measurement. Therefore, maximizing power production and minimizing corrosion of equipment. Furthermore, optional sample self-cooling is available.

2 SPECIFICATIONS

Max Pressure/Temp Rating:	4 bar(g) / 50 ^{o}C
Sample Flow:	80 - 250 ml /min.
Sample Connection Inlet:	1/8" NPTF
Drain (sample and condensates common)	½" NPTM
Cooler Cooling Water Connect. (Only Self cooling Opt)	¼" NPTF
Cooling Water Consumption (Only Self cooling Opt)	4 l/min
Input Power:	110-120/220-240 VAC, 50/60 Hz.
Power Consumption:	1600 Watts
Plate mounting material :	Stainless steel AISI 304
Electric Enclosure Rating:	IP66 / NEMA 4X
Dimensions (HxWxD)	900 x 450 x 300 mm. (35.4 x 19.7 x 11.8")
Weight	27 kg (59.5 lbs.)
Burns protection grid / Flow protection not required / Compact wall mount design / CE Marking	

3 GENERAL DESCRIPTION

The objective of the degassing system is to raise the temperature of the sample to its boiling point in order to eliminate the greatest amount of CO_2 from it. To maximize the extraction efficiency of CO_2 and minimize the production of water vapor, precise temperature control has been designed by means of a control loop formed by a programmable logic controller, an RTD (PT100 type) and a heating cartridge that provides the necessary heat to raise and maintain the temperature at the required set point.



Temperature measure sensor

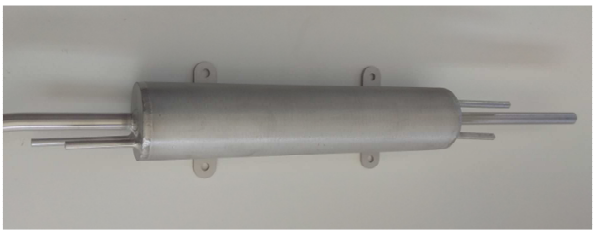
This set point is calculated by the programmable logic controller as a function of atmospheric pressure, so that no initial adjustment of the set point value is required. The measurement of the atmospheric pressure is carried out by an absolute pressure transmitter, integrated in the electrical box that also protects the programmable logic control.

Absolute pressure transmitter

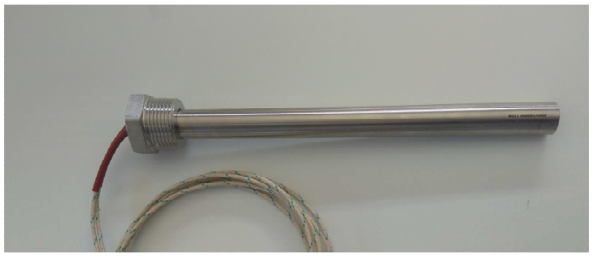
The CO_2 extracted from the sample leaves the atmosphere through a tube, which travels through the interior of a cooler, which guarantees that. In case of vapor occur at any time, it will condense and be eliminated by means of the general drainage of the system.

Drainage funnel

After the elimination of CO_2, the sample requires cooling to perform a measurement of cationic conductivity under optimal conditions. That is why the sample is directed to a cooler, for the operation of which there are two options, that the sample is cooled with cooling water from an external source or that it exchanges heat with itself, by passing the sample through the cooler prior to passing through the heater.

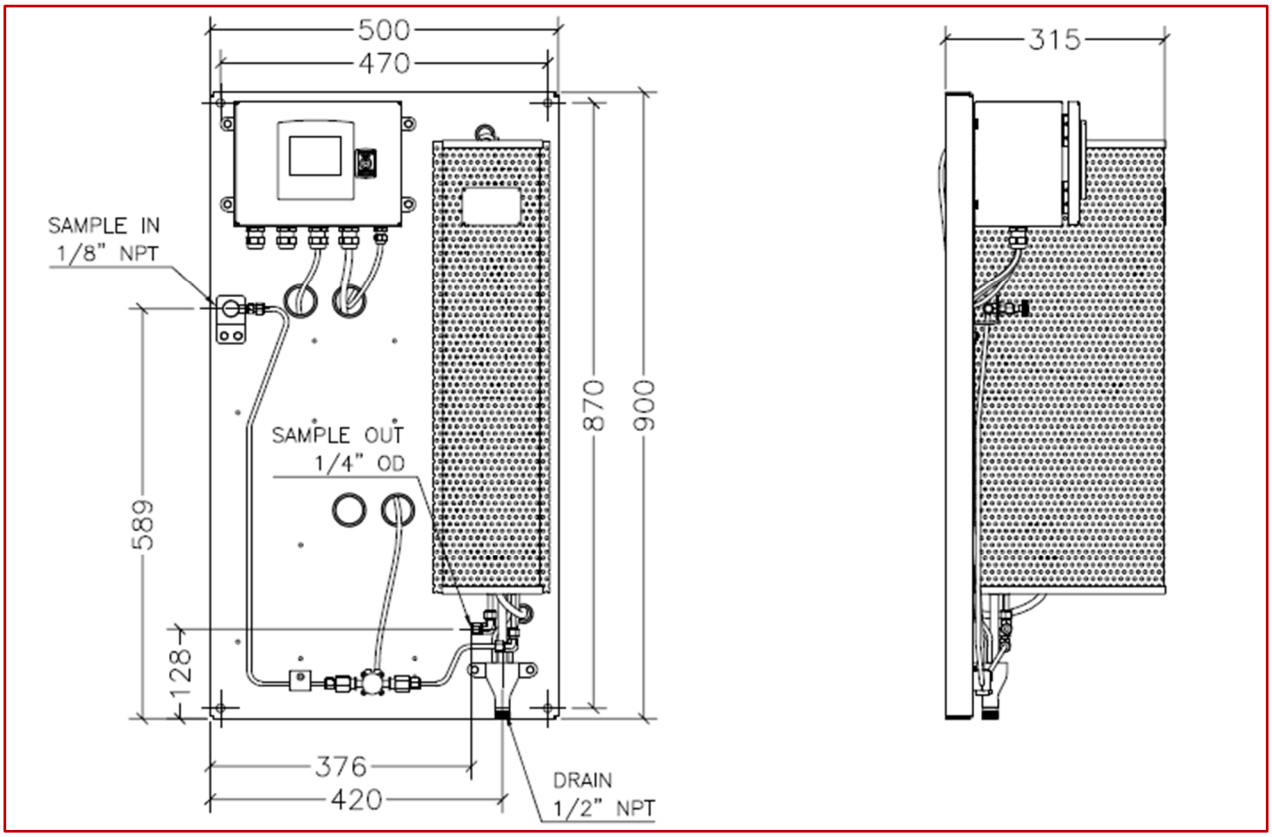


Heat exchanger



Heating cartridge

The option of self-cooling guarantees great stability to the system in the event of disturbances in the flow or temperature of the sample, as well as not requiring a consumption of cooling water and the installation required for cooling water supply.



External cooling water option dimensional drawing

4 INSTALLATION

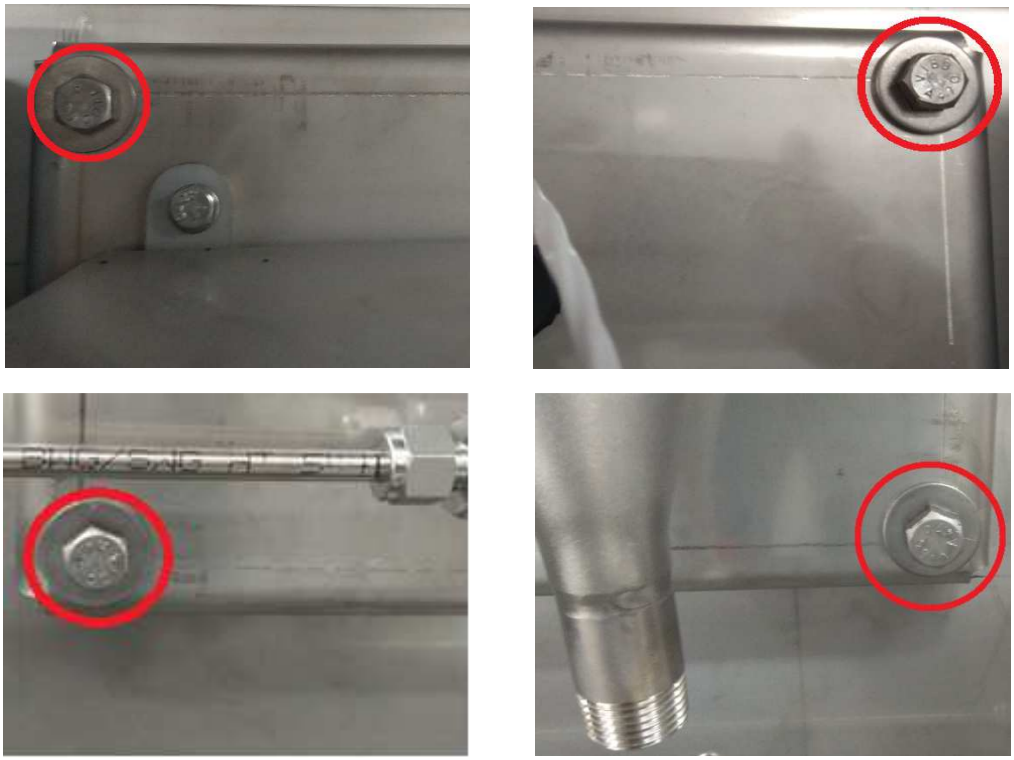
CAUTION: THE NECESSARY PROTECTIVE EQUIPMENT MUST BE USED IN ORDER TO AVOID KNOCKS, CUTS AND ENTRAPMENTS DURING INSTALLATION. FOLLOW THIS PROCEDURE FOR CORRECT INSTALLATION.

NEITHER MAINTENANCE OR INSTALLATION OPERATION MUST BE CARRIED OUT BY REMOVING PROTECTION GRID WITHOUT PREVIOUSLY CHECKING BOILER TEMPERATURE, IT CAN PRODUCE MODERATE BURNS BY DIRECT CONTACT WITH HOT SURFACES.

Warning indication in protection grid

4.1 Mechanical

This device must be located avoiding vibrations and direct exposition to sunlight. The system incorporates four holes in the four corners of degassing system panel, in order to fix it to a vertical wall. The degassing system must be mounted in vertical position, using four M-10 bolts in order to fix it to a smooth and bare wall.



Anchorage bolts

4.2 Process connections

Depending on the degassing system option chosen, process connections may vary in number and type, according to the next chart:

CONNECTION DESCRIPTION	DG105-0-C	DG105-0-D	DG105-1-C	DG105-1-D
SAMPLE INLET	1/8” NPTF	1/8” NPTF	1/8” NPTF	1/8” NPTF
SAMPLE OUTLET	1/4” OD	1/4” OD	1/4” OD	1/4” OD
DRAIN	1/2“ NPTM	1/2“ NPTM	1/2“ NPTM	1/2“ NPTM
COOLING WATER INLET	N/A	N/A	1/4“ NPTF	1/4“ NPTF
COOLING WATER OUTLET	N/A	N/A	1/4“ NPTF	1/4“ NPTF

Cooling water connections

Cooling water connections are not required when self-cooling option is installed. In case of external cooling water option, follow next steps:

- Keep the length of all tubing to a minimum. Only 80 mm of straight tube must be respected from connection fitting (¼" OD) to the previous curve upstream.
- Connect the cooling water IN. Should be piped to the bottom of the sample cooler in ¼" nominal bore tube and connected by means of ¼" NPTM fitting to ¼ NPTH connector located in the right lower side of the cooler.
- Pipe the cooling water OUT. Should be piped from the top of the sample cooler to an open drain or return cooling water circuit in ¼" nominal bore tube and connected by means of ¼" NPTM fitting to ¼ NPTH connector located in the right upper side of the cooler.

Sample inlet connections

- It is advisable the use of corrosion resistant pipework suitable for the fluid being sampled in order to connect degasser system to sampling stream.
- Keep the length of tubing to a minimum. Only 80 mm of straight tube must be respected from connection fitting (¼" OD) to the previous curve upstream.
- Connect sample IN in the left lower side connection of the degasser system by using 1/8" NPTM connector.

Drain connections

All possible effluents produced by the degassing system, are directed to a funnel in the lower part of the panel. Therefore, there is an only drain connection in the system. The drain pipe must be connected to the ½" NPTM threaded connection in the lower part of the funnel.

Drain pipe length must be as short as possible, and minimum size ½" in order to avoid backpressure. Furthermore, funnel must be higher than any other point in drain pipe path and drain point must be at atmospheric pressure.

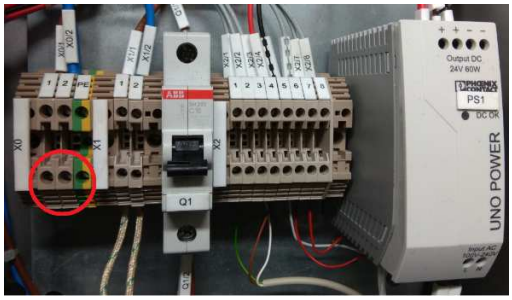
Drain connection

4.3 Electrical connections

CAUTION: IT WILL BE NECESSARY TO VERIFY THAT THERE IS NO VOLTAGE IN POWER SUPPLY CABLE BEFORE TO START ELECTRIC WIRING. FOLLOW THIS PROCEDURE FOR CORRECT INSTALLATION:

Power supply connection

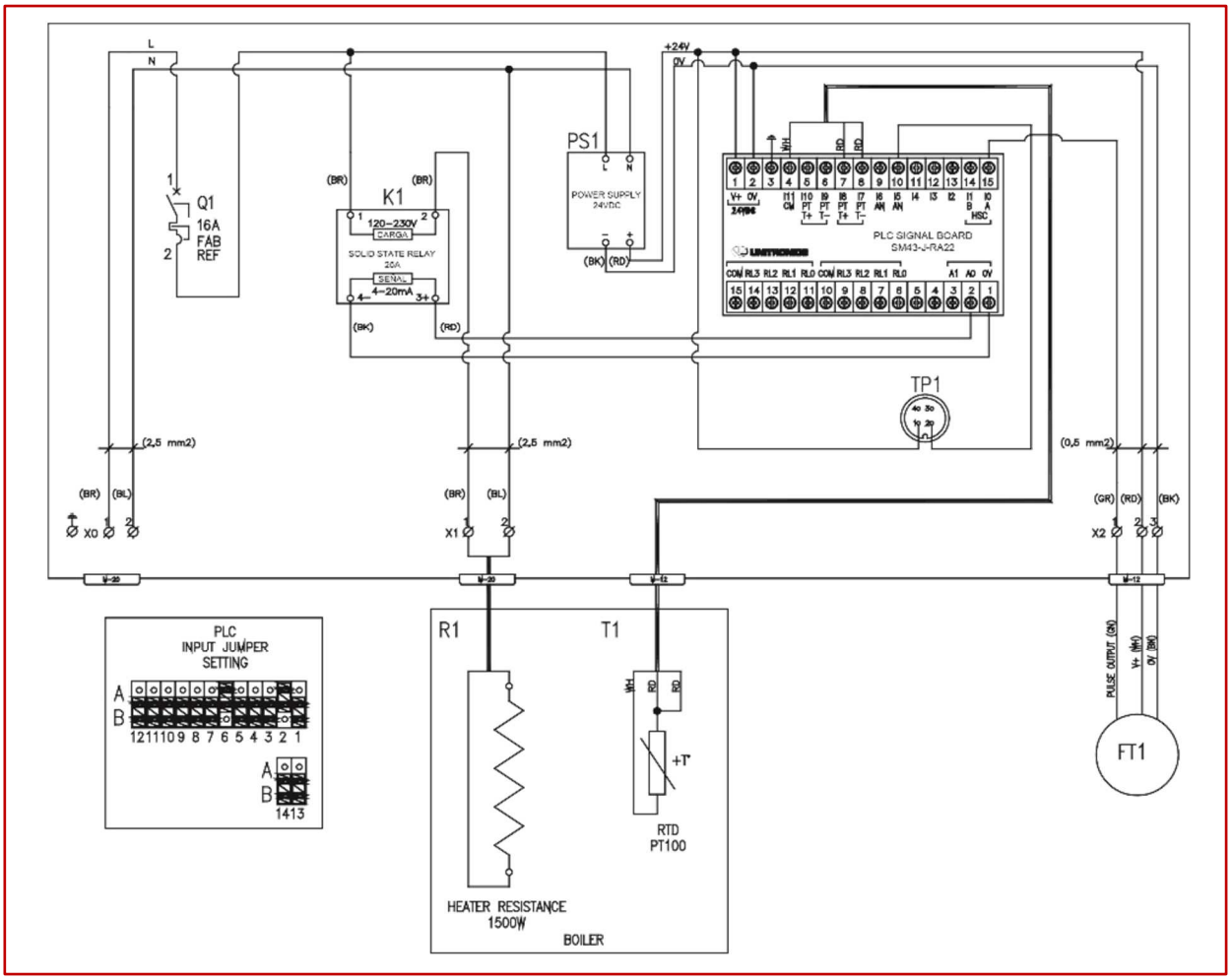
Degassing system, must be electrically supplied by connecting power supply cable to terminals X0. Required cable has to be three wires and size of wires must be 4 mm² (L+N+PE). Before connect cable, voltage supply must be checked and must be between 100-240 VAC 50/60 Hz.



Power supply terminals block

Follow next steps:

- Open the stainless steel electrical box located in the upper part of the panel.
- Verify that the automatic switch (Q1) is switched off. If not, switch them off.
- Introduce three wire power supply cable by using M-20 gland in left lower side of electrical box
- Connect the main cables in terminals “L”, “N”, and ground cable in “G” in X0 terminals block in the lower side of terminals.
- Finally, adjust gland to the cable and ensure that is correctly clamped.

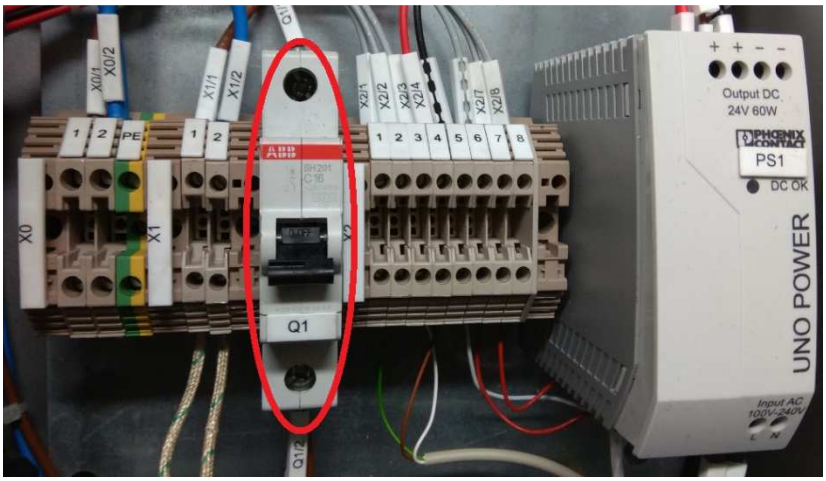


Degassing system electric wiring diagram

5 START UP

DANGER: TO AVOID THE RISK OF BURNS, IT IS ESSENTIAL BEFORE START-UP, VERIFY THAT PROTECTION GRID IS INSTALLED IN ANY CASE. FOLLOW THIS PROCEDURE FOR SAFE OPERATION:

- Open the cooling water inlet valve and outlet valve (if installed) for non self-cooling systems and ensure that a full flow can be seen at the cooling water outlet.
- Gradually open the sample inlet valve (not included in the system) and regulate the flow to achieve a value between 100 to 250 cm^3/min.
- Switch on the circuit breaker (Q1) inside the electrical box to start up the equipment and close the electrical box. In normal conditions, after circuit breaker is activated, heater will be energized when 5-6 minutes have passed. The turbine must count 1 liter volume to avoid heater problems.



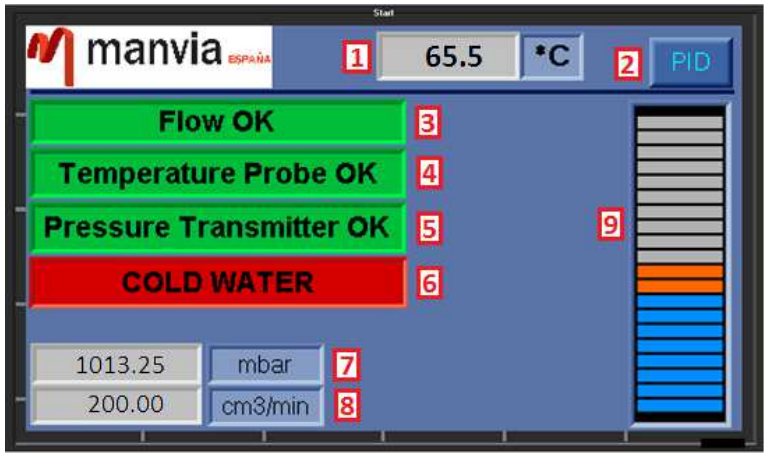
Circuit breaker

- In case of cold starting wait at least half an hour until temperature gets stabilized for getting accurate measurements.

Temperature controller parameters are workshop adjusted and it won´t be necessary to modify it, but if required, this operation is described in chapter 7 (Programming).

6 OPERATION

There is an only operation display in the programmable logic controller which looks like appears bellow:



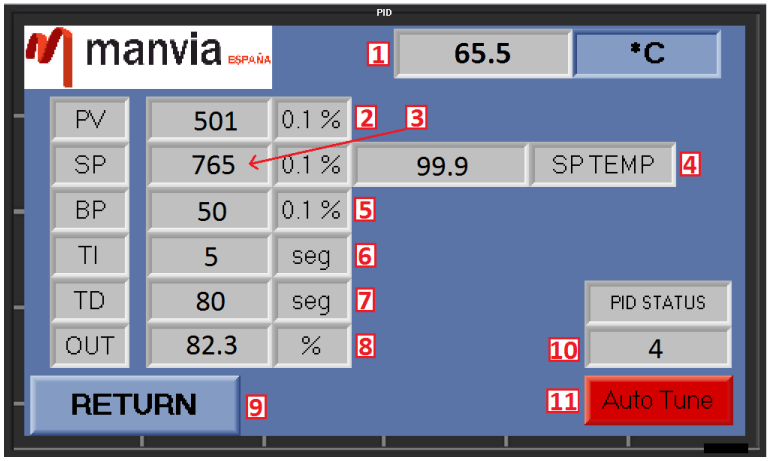
Operation display

The parameters shown in figure above are:

1. This textbox indicates temperature inside boiler in ºC, is the boiling point of water in this moment.
2. This command button switches to PID controller configuration display.
3. When sample flow is in a right value, this label shows a green color. In other case, it shows a red color indicating a flow alarm.
4. When temperature measurement element (PT100) is working properly, this label shows a green color. In other case, it shows a red color indicating a temperature measurement fail.
5. When absolute pressure measurement sensor is working properly, this label shows a green color. In other case, it shows a red color indicating a pressure measurement fail.
6. When sample temperature inside boiler is within the acceptable limits to consider that degasification is performed, this label shows a green color. In other case, it shows a red color indicating that the system is not ready for a correct reading of cation conductivity. Usually is in red color for some minutes during start up
7. This textbox indicates the actual value of atmospheric pressure in milibars.
8. This textbox indicates the actual value of flow in cubic centimeters per minute.
9. This temperature status bar indicates at first sight if temperature is near set point or not. Set point is reached when status bar is red up to the highest line of it.

7 PROGRAMMING

There is an only programming display in the programmable logic controller which looks like appears bellow:



Programming display

1. This textbox indicates temperature inside boiler in ºC, is the boiling point of water in this moment. Is not possible to modify it.
2. Indicates the process value or boiler temperature in programmable logic controller units. Is not possible to modify it.
3. Indicates the set point value or reference value in programmable logic controller units. Is not possible to modify it.
4. Indicates the set point value or reference value in ºC. Is not possible to modify it.

Configurable values

5. Proportional band in 0.1% units. This means that, for instance, a value of 1000 adjusted is a 100% of proportional band.
6. Integral time in seconds.
7. Derivative time in seconds.

All these three values are workshop adjusted but are modifiable by pressing inside textbox. Then a keypad is shown and is possible to introduce other value, pressing enter to accept change.

8. Is the analog output signal value in %. This signal value is directly proportional to power applied by heating cartridge.
9. This command button switches to operation display.
10. This textbox indicates the actual status of the system. The different possibilities are shown in the troubleshooting chapter.
11. This command button enables the programmable logic controller to automatically adjust PID values, if required.

8 MAINTENANCE

8.1 Preventive maintenance

In case of non self-cooling systems, remove scale from cooler by circulating an inhibited sulfamic acid cleaning solution through the cooling water side. No other preventive maintenance operation is needed.

8.2 Troubleshooting

The next codes may appear in PID status textbox in programming display.

VALUE	MESSAGE
0	FB status OK.
1 to 3	Auto-tune in progress.
4	PID running.
5, 6	Set point change in progress.
7	Integral-wind up.
8	Integral-wind down.
9	Pause mode, Integral and Derivative values are not currently being calculated.
10, 11	PV exceeds proportional band, no calculation performed.
12, 13	AT parameter mismatch. Note that this means that PID will run without Auto-tune. The user may either rewrite the PID values to the 32-MI long Auto-tune vector, or may re-run Auto-tune.
-1	Proportional band zero.
-2	Input range is invalid (PV input).
-3	Output range is invalid (CV output).
-4	Integral Overflow has reached maximum of 100,000. PID will not allow the Integral value to increase any further.
-5	Error in 32-MI long Auto Tune vector addresses, ex., vector exceeds the final address in the MI data type.
-6	Set Point less than Input low range or Set Point more than Input high range.
-7 to -10	Auto-tune error, failed to calculate PID parameters.
-11	Noise is more than 5% of Input Range. Note that noise is the range of PV oscillations, independent of the CV. In cases where auto tune is not completed due to error -11, increasing the input range may enable auto tune to run successfully.
-13	Auto-tune aborted. This may result if the Run Auto-tune element was not called for at least cycle during the auto-tune, or in the case of an unknown auto-tune error.

8.3 Spare parts

DEGASSER SYSTEM SPARE PARTS	
Part #	**Name**
H-1500-120	Heating cartridge 120 VAC
H-1500-230	Heating cartridge 230 VAC
RD-105	Solid State relay 110-230 VAC 50/60 Hz
STH-TXIH-2	Turbine
MV-PT105	Temperature sensor
MV-14082136	Pressure sensor
SC-1	Cooler

H-1500-120/230

RD-105

STH-TXIH-2

MV-14082136

MV-PT105

8.4 Standard warranty

MANVIA warrants products manufactured and supplied by it, to be free from defects in workmanship and, to the extent materials are selected by Seller, to be free from defects in materials, for a period of twelve months from shipment.

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