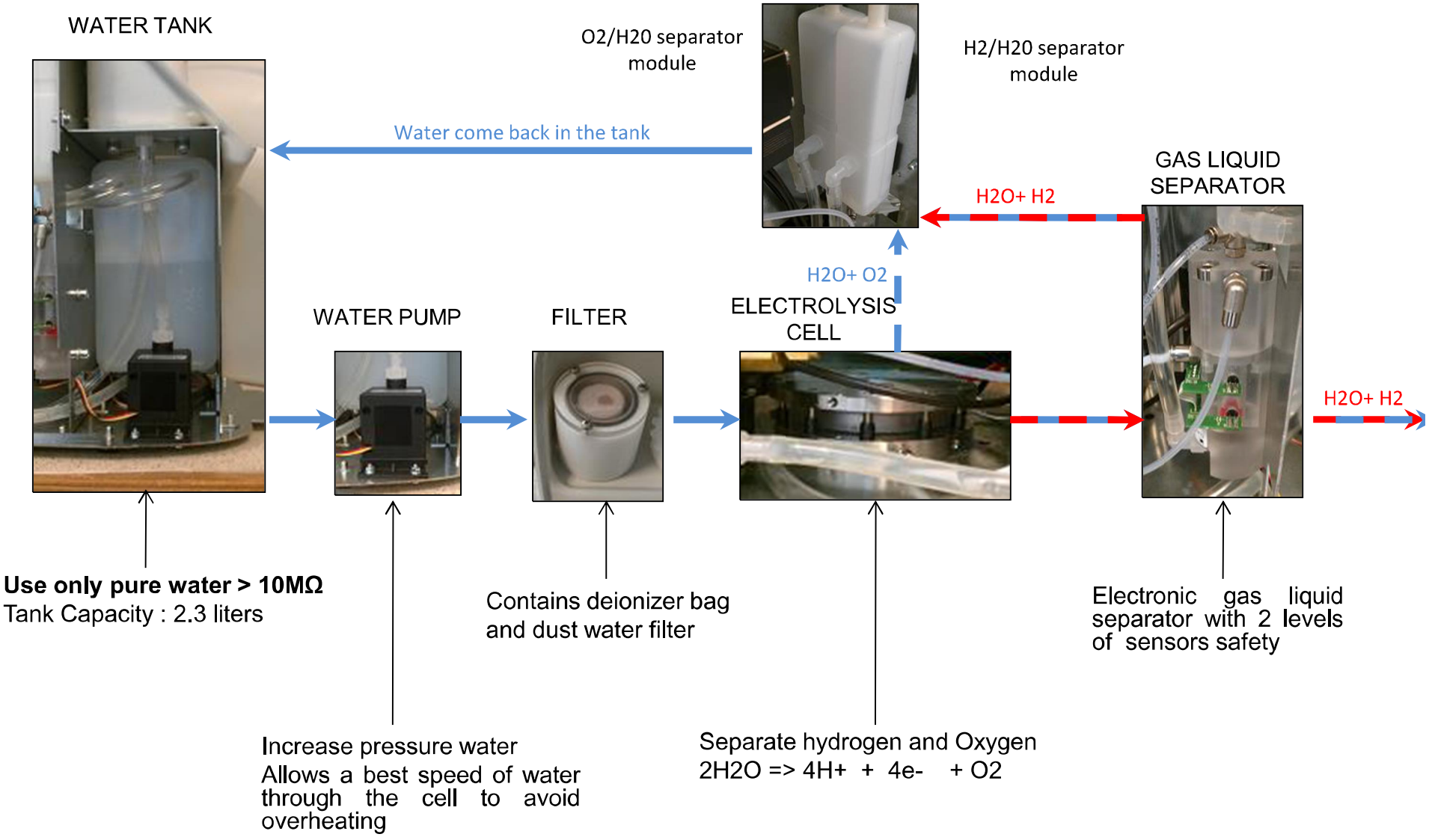
IngenieríaAnalítica
Chromatography & Spectrometry

Hydrogen generator

GENERAL INFORMATION OF H2 RUNNING



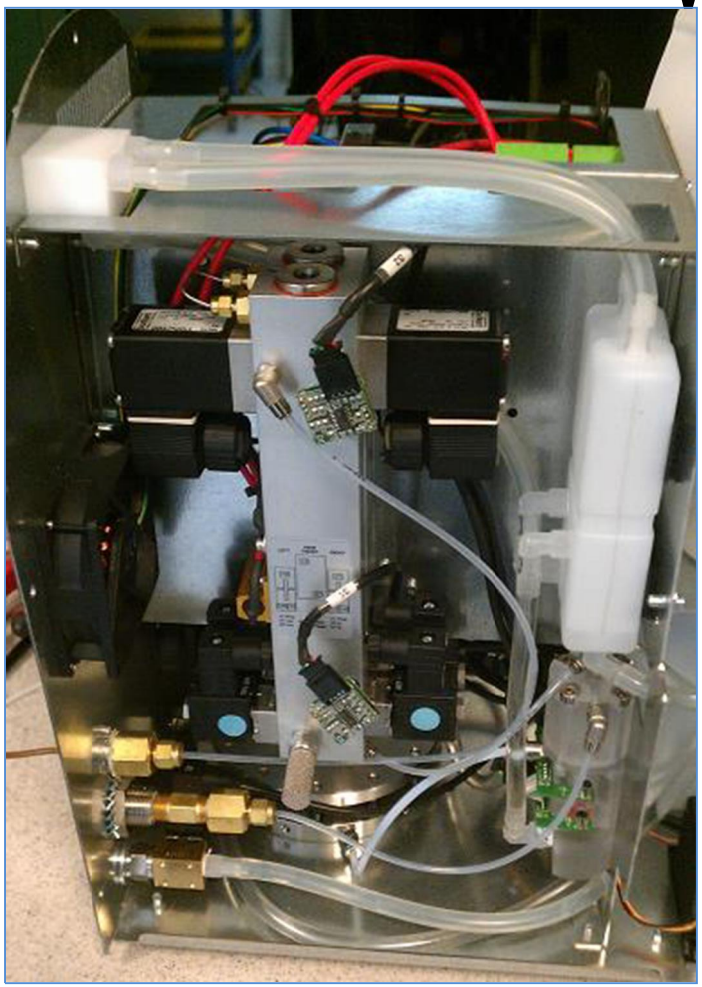
Hydrogen generator
ND series

- ND-H2 Purity > 99.9995%
- Pressure up to 10 bar
- Simple dessicant cartridge + Nafion tube

Hydrogen generator
PAR series

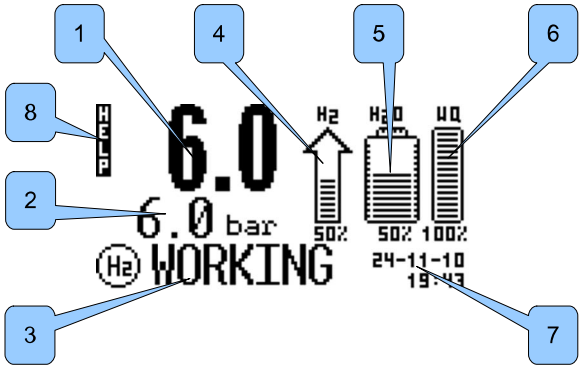
- Purity > 99.9999%
-Pressure up to 12 bar, on request 16 bar
-Single column dryer with programmable automatic regeneration via integrated clever calendar

Hydrogen generator
WM series

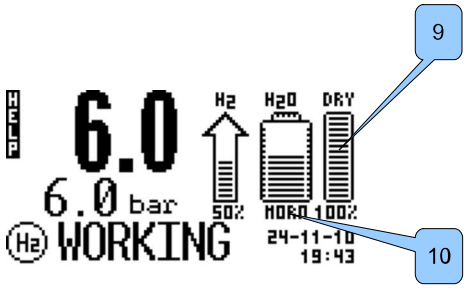


- Purity >99.99999%
- Automatic dryer regeneration
- Pressure up to 12 bar, on request 16 bar

Touch Screen

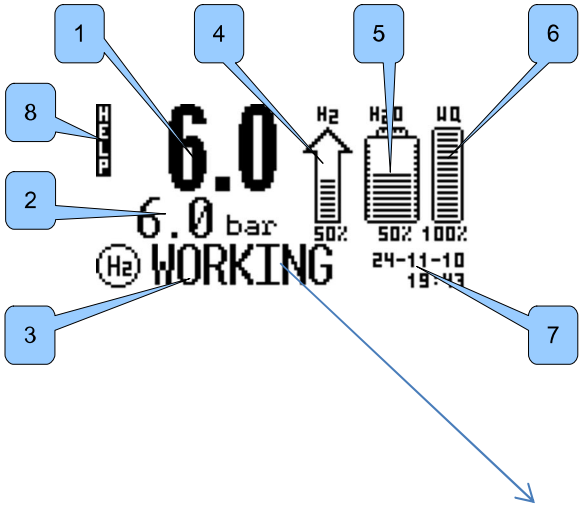


WM.H2 models



PAR.H2 models

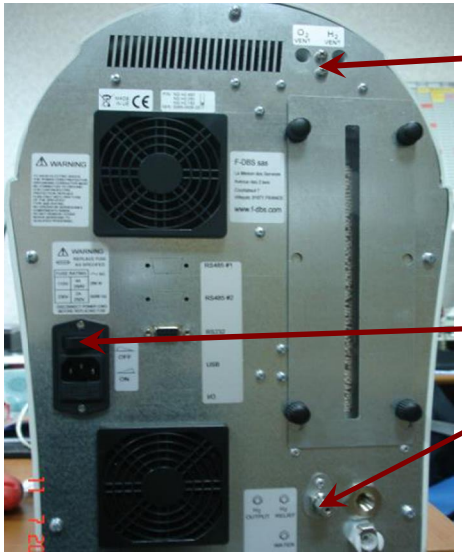
#	Description
1	Real outlet pressure
2	Pressure set by user (set-point)
3	System status and Pre-alarms display, see table 1 and 3
4	H2 Flow %
5	Water tank level
6 (WM.H2)	Water quality in percentages (100% GOOD – 0% BAD)
7	Date / Time
8	Touching this label an HELP windows will be shown
9 (PAR.H2)	Internal dryer residual life
10 (PAR.H2)	Quality of water : GOOD, NORMAL, BAD



Displayed on screen	Description
OFF	The system is STOPPED and does not produce H2
STARTING	The system is generating internal pressure before opening the OUTLET valve
CHECKING	When the system is pressurized, before to open the OUTLET valve, the unit make an automatic check of any internal leak.
FILLING	The system is filling the line connected ON the OUTLET with the maximum available flow
WORKING	The system is working and the line pressure has reached the VALUE set by the user
STANDBY	The system is internally pressurized and ready, but the OUTLET valve is close

START UP

1- Open the front door and fill water tank with pure water (Deionized, ASTM II, <0,1uS)



2- Remove the plugs from the back fittings of the generator

•3- Connect the hose to the hydrogen output fitting

4- Connect the voltage wire to the power socket and Turn on the power switch

Set the work set-point

Real pressure

Pressure set

1- Touch the screen on the center for at least 2 seconds

2- Select « Adjust Pressure »

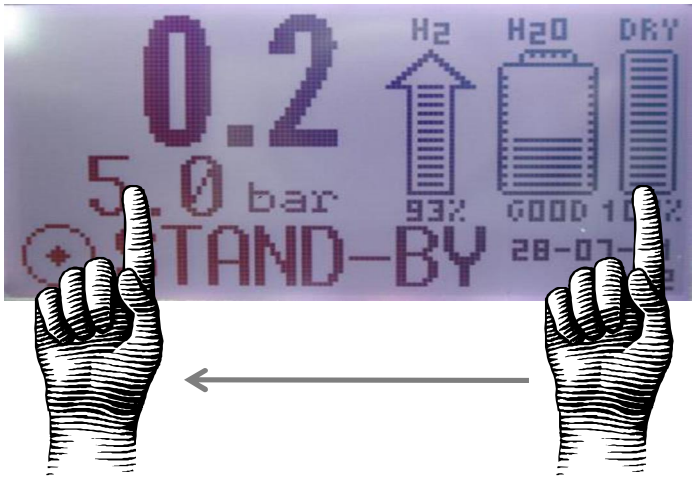
3- Increase or decrease the pressure with the arrows.

4- Touch the screen to valid it

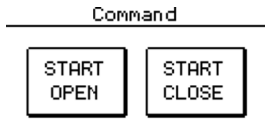
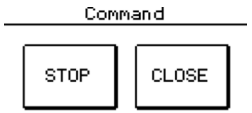
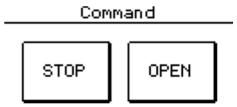
START UP

Touch the blue key or slide your finger right to left

or



Choose START CLOSED or OPEN

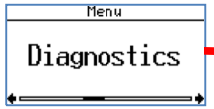
System status	Control screen	Description
OFF		When the machine is in the OFF state (production stopped) you can give the START command with subsequent opening of the outlet valve (START/OPEN) or not (START/CLOSE)
STARTING WORKING FILLING		During operation we can give the command to STOP or closure of the outlet valve
STANDBY		In the STANDBY state can give the command STOP or opening of the outlet valve

MENU

Change working pressure

User parameter

Alarm and prealarm history



Voltage, current, power values

Working time and H2 produced

Service Submenu

Leak test

Management of internal water tank

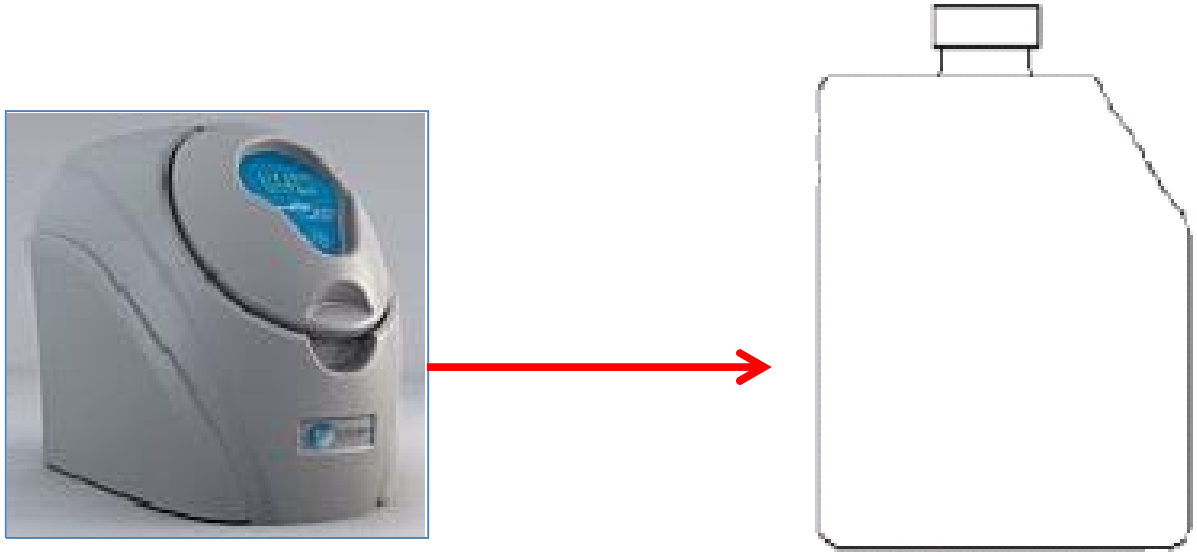
IngenieríaAnalítica
Chromatography & Spectrometry

MENU: Parameter

Name	Description	Min	Max	Typical	Unit of measure
Pressure Drop Delay	If the system cannot bring the H2 pipes up to pressure, after having waited for the time set in this parameter production is interrupted with a buzzer and visual alarm (“Out Pressure error”).	2	10	10	min
Pressure Rise	During the filling stage of pipes connected on the H2 outlet, if the pressure does not rise with a minimum slope defined by this parameter, production is interrupted with a buzzer and visual alarm (“Low Out Press”). When the value is set to 0.0, this check will be disabled.	0	100	0,3	psi/min
Autostart	"Enabled": when power is restored after a black-out the system restart and goes into the working mode. “Disabled”, when power is restored after a black-out, the system stays in OFF status.	No	Yes	Yes	
Pressure Unit	Defines the pressure unit: psi, bar	Psi	Bar	Bar	
Temperature Unit	Defines the temperature unit: °F,°C	°C	°F	°C	

MENU: Parameter

Name	Description	Min	Max	Typical	Unit of measure
Auto Refill Water	Enables the automatic external tank automatic filling function. If Enabled when the level of internal water tank go below 5% the auto fill start and terminate when the level arrive to 95%.	Disabled	Enabled		



Name	Description	Min	Max	Typical	Unit of measure
ZeroAir Module	Add a Air Zero generator to connect a combine generator	NO	YES	NO	

Air Zero

Hydrogen

Name	Description	Min	Max	Typical	Unit of measure
Hydrogen sensor	Add a external hydrogen sensor	NO	YES	NO	

When the customer use hydrogen as carrier gas, the only drawback is the danger of explosion in case of a leak in the column oven

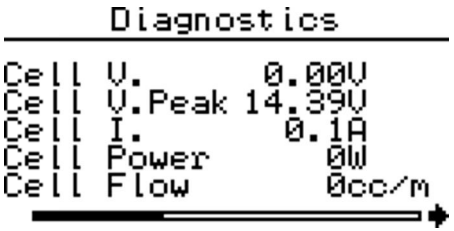
Detection Range	0.1% to 1% by volume (25% of LEL,Lower Explosion Limit)
Alarm threshold	Adjustable from 0.5% to 1% by volume
Ambiant Temperature of the body's sensor	0- 50°C max
Oven temperature of the GC for the H2 sensor metal pipeline	500°C max
Stability of reading	Better than 200 PPM (within one year)
Power Supply Voltage	From 8V to 30V (DC)
Communication port	RS-485
Protocol	MODBUS-RTU
Calibration:	Should be checked every year with a test gas (1.0%)

IngenieríaAnalítica
Chromatography & Spectrometry

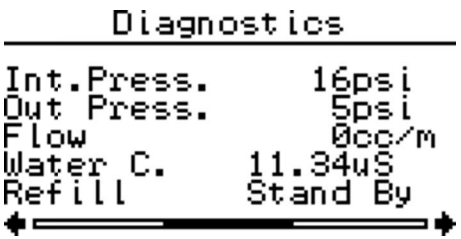
MENU: Parameter

Name	Description	Min	Max	Typical	Unit of measure
User flow limit	Allows to restrict the flow	50%	100%	100%	
Default Parameter	By selecting YES, all the parameters are set to their default values	No	Yes		
Start Mode	Defines the method used for line pressurization: Normal: The outlet valve is opened only after the internal circuit has been pressurized and after having automatically performed an “internal leak test” Fast: The valve is opened when the internal pressure is greater than the set-point set by the user and no "internal leak test" is carried out	Normal	Fast	Normal	
ID Address	Logical address in case of connection of the unit in a communication bus	1	1	31	
Baud Rate RS485	Speed of communication of the RS485 port	2400	38400	38400	

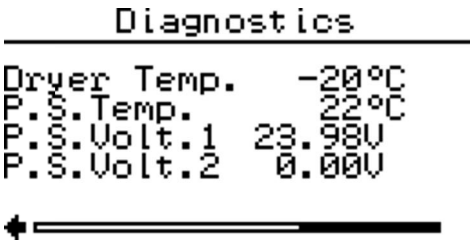
MENU: Diagnostic



- PEM cell voltage
- Peak PEM cell voltage
- PEM current
- PEM cell power supply
- H2 Cell flow produced (cc/min)



- Internal pressure
- External pressure
- Actual H2 Flow produced cc/min
- Water conductibility uS



- Column temperature
- Power Supply temperature
- power supply voltage no. 1
- power supply voltage no. 2 (only models with flow rates over 400 cc/min)

MENU=>Maintenance

Operation	Interval	Spare parts
Change water deioniser bag	4000 working hours or 1 year	SP.H2.DB01
Check the water filter	1000 working hours or 1 year	SP.H2.WFILT.M
Run an Automatic dryer regeneration program for PAR serie	As required or 12 months	
Change the dessicant cartridge for ND series	As required or 12 months	

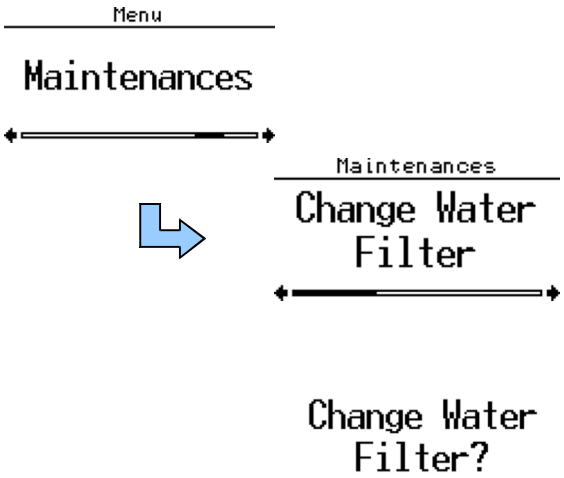
Change water deioniser bag and water filter

Unscrew the three screws

Pull the top cover and remove Oring and deionizer bag

Remove black O-ring

Remove water filter



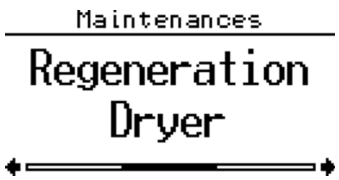
This command must be given when the DEIONIZER BAG is changed and the filter is cleared. It resets the counter that registers filter and deionizer bag's life as well as any correlated pre-alarms.

An additional confirmation is requested from the operator; to do so the operator touches the Touch Screen for 0.5 seconds.

Run an Automatic dryer regeneration PAR serie

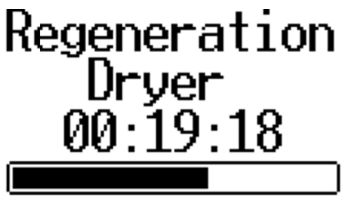
The procedure occurs for 3:30 hours

To access the dryer regeneration function, touch the Touch Screen for 0.5 seconds.



To immediately enable dryer regeneration, select this option by touching the Touch Screen for 0.5 seconds.
Hydrogen production will be suspended up to the end of the regeneration cycle.

The advancement bar and the time signal tell the operator when the operation will end.
Scrolling from top to bottom interrupts dryer regeneration.



An additional confirmation is requested.
To confirm, touch this option for 0.5 seconds. Instead, scrolling from top to bottom returns the screen to the display of the advancement of the process in course.
NOTE:
any "Dryer Saturated" pre-alarm is cancelled only upon the conclusion of the regeneration cycle.

MENU=>Maintenance=>Service

This procedure can be enabled in case of emergency and when there is no instrument to measure the pressure in output from the machine. Close the output with the special plug and run the procedure.

This procedure is enabled whenever the measurement of the internal pressure sensors needs calibration.
Connect the sample instrument to the exit of the generator and run the procedure

---

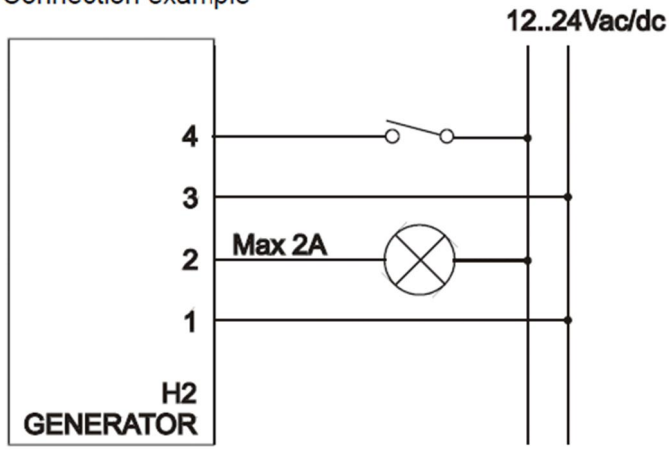
To update the display or main board firmware of the generator

---

Remote control

Pin	Description
1	Free contact (max 2A, 24Vac/dc) N.C.
2	Free contact (max 2A, 24Vac/dc) N.C.
3	Digital INPUT (+12..24Vdc) Impedance 5Kohm
4	Digital INPUT (0V)

Connection example



- A free potential contact (terminals 1 and 2) which is normally closed and opens when there is a stop of the production for any alarm.
– A digital input opto-isolated with which it can activate / stop the generation of hydrogen. When this input (terminals 3 and 4) is feeding the generator begins to produce, when you open the generator stops and goes into the OFF state.

ETHERNET

CONNECTION

Ask your costumer to connect his laptop on the USB port on the back of his H2 generator

ETHERNET CONNECTION

ASK YOUR COSTUMER TO :
-DOWNLOAD TEAMVIEWER PROGRAM
-EXECUTED THE PROGRAM
-BEGIN TEAMVIEWER WITHOUT INSTALLING THE APPLICATION
THIS WINDOWS APPEAR :

-HE NEEDS TO GIVE YOU HIS ID AND PASSWORD TO HAVE ACCESS TO HIS COMPUTER

WHEN YOU HAVE THE HAND ON YOUR COSTUMER COMPUTER:
-CREAT AN H2 FOLDER TO REGISTER THE PROGRAM AND DOWNLOAD THE PROGRAM
-EXECUTE THE PROGRAM AND COLLECT DATA

Upgrade

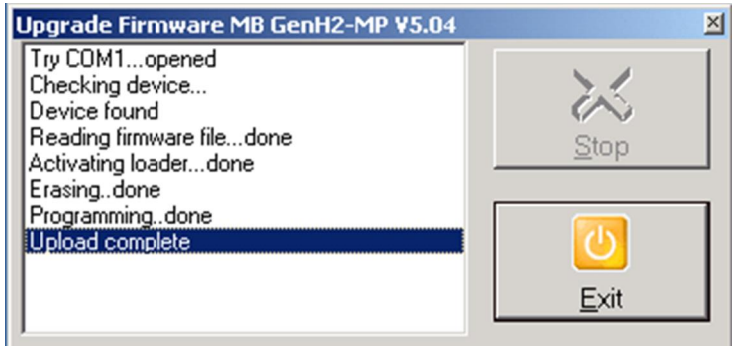
Firmware Upgrade

The correct sequence of upgrade the firmware of H2 generators is :

– Upgrade firmware MAIN board

– Upgrade firmware LCD board

– Update configurations settings



Example: MAIN board Firmware Upgrade

Connect the Generator to a PC by USB cable or serial RS-232 port.

Install the driver if needed.

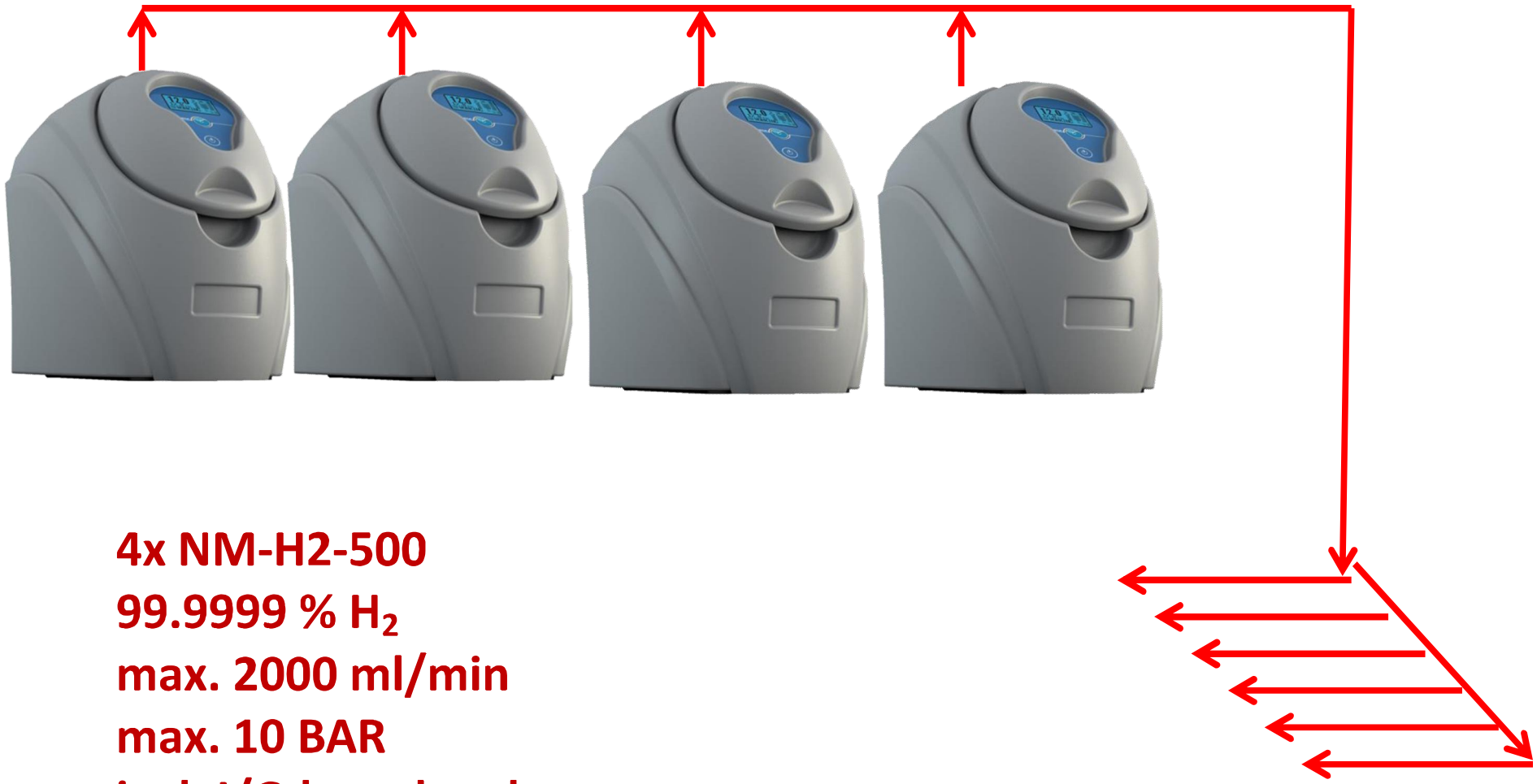
Run the program Firmware-MB-V504-HW4.exe, this program is valid for all models : ND, PAR, WM.

Before to proceed you have to confirm with “Continue” button.

After confirm “DON'T TOUCH THE GENERATOR, DON'T SWITCH OFF, DON'T STOP THE PROGRAM” until you see “Upload complete” on the white window

PARALLEL MODE

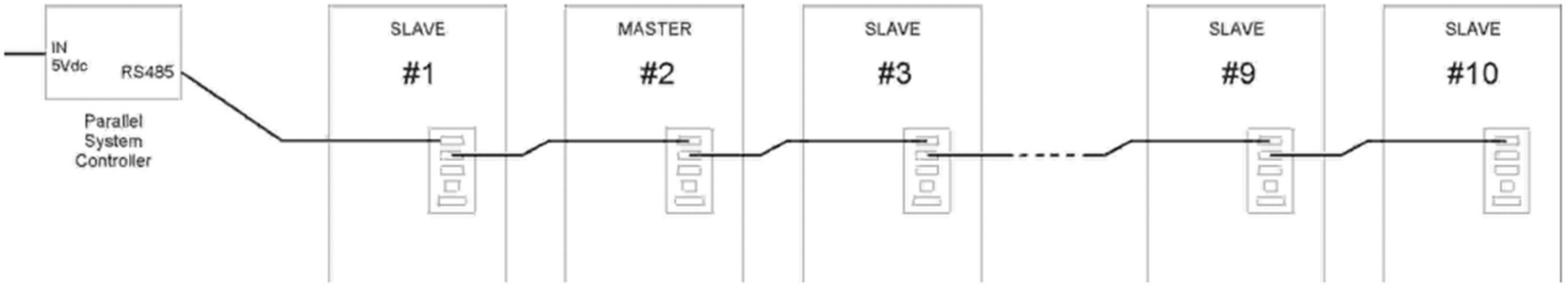
The “parallel mode“ is a system that allows you to add up the flow of multiple machines on a single line where each contributes in proportion to their ability. Maximum 10 units.



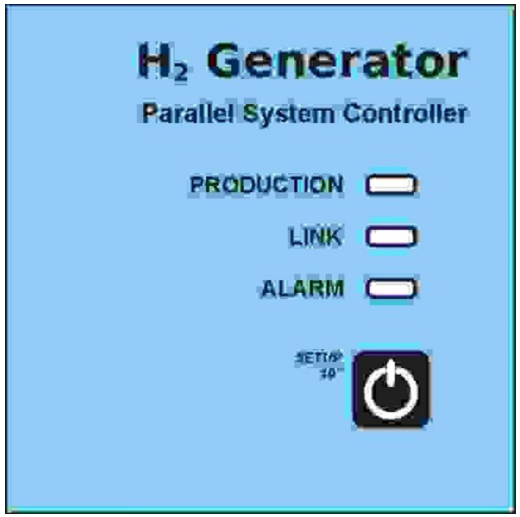
4x NM-H2-500
99.9999 % H_2
max. 2000 ml/min
max. 10 BAR
incl. I/O board and
RS-232 remote control

CONNECTION DIAGRAM

Connect the RS-485 controller with the BOX of 485 # 1 of the first generator and the RS 485 to RS # 2 of this 485 # 1 of the second and so on until the last generator.



BOX CONTROLLER (MASTER)



BOX controller acts as the master and controls all the generators connected to it.
This "BOX controller" has 3 LEDs and a button.
The meaning of the LEDs is specified in the follow table.

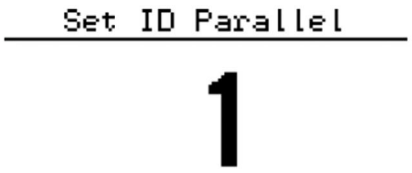
Green Led PRODUCTION	Yellow Led LINK	Red Led ALARM	Functionning
OFF	OFF	OFF	Controller is not powered
OFF	OFF	ON	no device connected
OFF	ON	OFF	In configuraztion mode
	ON	ON	No Master flow
	Regular FLASHING		Good communication
	Random FLASHING		Bad communication
		Fast FLASHING	Alarm or generator off line
		Slow FLASHING	Generator in pre alarm mode
ON			System in production
FLASHING			system ready for production

All LEDs blink when the controller BOX (Master Box) can not communicate with the generators connected to it (Slaves)

Pressing the start / stop button is activated or not the production.

SYSTEM IDs CONFIGURATION

In order for the system to work properly you must assign a unique number (ID) for each generator.



Holding down the button on the BOX controller for more than 10 seconds to start the search procedure of the generators connected to it (see par. 1.2)
Once activated the setup of all generators connected to the currently displayed "1“ on the display.
At this point
1. hold the center button on one of the generators for about half a second
2. the system will "beep" and all the other generators will see the number 2
3. Repeat the step 1 until the last generator
4. Press the button on the controller BOX

If everything works correctly, the yellow LED should flash controller of the BOX and evenly on the top LEFT of the display of each generator should see a "P".

The P in "reverse" indicates that the machine is being used by the system to read the line pressure and control it ("master flow controller")

The P is not in reverse indicates that the generator is simply a "slave"