

# PASTORMASTER

## CONTINUOUS HOT SANITARY WATER PASTEURIZATION AND PRODUCTION SYSTEM

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# PASTORMASTER

**CONTINUOUS HOT SANITARY WATER  
PASTEURIZATION AND PRODUCTION SYSTEM**



## **CONTENTS**

### **1. PRINCIPLE**

### **2. HOW IT WORKS**

#### **2.1. INITIAL NETWORK DISINFECTION**

#### **2.2. OPERATING PRINCIPLE**

#### **2.3. INSTALLATION PRINCIPLE**

#### **2.4. APPLICATIONS**

### **3. EQUIPMENT DESCRIPTION**

#### **3.1. HOUSING**

#### **3.2. HYDRAULIC CIRCUIT**

#### **3.3. ELECTRIC AND CONTROL CIRCUIT**

### **4. TECHNICAL FEATURES**

### **5. DIMENSIONS**

### **6. RECOMMENDATIONS**

### **7. TECHNICAL INSTALLATION INSTRUCTIONS**

#### **7.1. INSTALLATION INSTRUCTIONS**

#### **7.2. COMMISSIONING CONDITIONS**

#### **7.3. OPERATION AND MAINTENANCE**

### **8. COMMISSIONING REPORT**

### **9. MAINTENANCE AND TREATMENT PROCESSES**

### **10. THERMAL DISINFECTION PROTOCOL**

### **11. APPLICABLE STANDARDS**

### **12. GUARANTEE**

## 1. PRINCIPLE

Unlike any other known anti-legionella treatment process, the **Pastormaster** concept guarantees a permanent destruction of the *Legionella* present in hot water production systems and distribution circuits.

The **Pastormaster** system, installed in a balanced distribution network with recirculation, ensures continuous pasteurization and hot water production.

- **Pastormaster** is compact equipment ensuring the pasteurization and semi-instantaneous H.S.W. production.
- Bacteria present in the fluid are subject to a **continuous pasteurization** process ensuring their permanent destruction.
- The temperature in the network is maintained automatically at a constant value until the *Legionella* is systematically destroyed.
- The network is disinfected after a few days of operation.
- The network is kept health-safe in all of its components at any time during the day and night, with or without consuming hot water.
- There is no increase in power consumption compared to Standard Hot Sanitary Water Production Systems.

Thermal crash procedures to be carried out punctually and repeatedly in most installations have their own restrictions that must be constantly monitored as to scalding and corrosion risks. In this respect, the **Pastormaster** system, thanks to its original principle, is able to guarantee permanent efficiency.

**Pastormaster** avoids causing additional costs due to a consumption excess, as the calories required for reaching 70°C are recovered by the transfer unit and used for pre-heating.

Thanks to its original patented principle, **Pastormaster** guarantees a final efficiency not granted by other punctual and repetitive thermal crash treatments.

Applying an exclusively thermal treatment without using any chemical additives, **Pastormaster** preserves the initial physical/chemical characteristics of the sanitary water intended for human use, without deteriorating old installations.

This system is compliant with the provisions of ROYAL DECREE 865/2003, of the 4<sup>th</sup> July, Article 13 "INSTALLATION TREATMENT METHODS"

## 2. HOW IT WORKS

### During the Treatment Period

When Hot Sanitary Water is needed, the cold water (15°C) enters in the **Pastormaster** system previously mixed with hot water from the return circuit (52°C).

Next, the water mix (22°C) goes through the first heat exchanger, called transfer exchanger, where it is heated up (to 42°C) by the pasteurized water from the pasteurization deposit.

We must stress that the transfer exchanger does consume no thermal energy at all, as it heats up and cools down within the same temperature range.

The water heated up in the transfer exchanger is passed on to the pasteurization heat exchanger (secondary circuit), where the water temperature is increased to and regulated at 70°C by heat exchange with the fluid coming from the primary heater circuit existing in the installation.

The primary circuit water is re-circulated by means of a pump and a motorized three-way valve controlled by the **Pastormaster**'s own regulating system (recirculation pump and three-way valve of the primary heater circuit are outside the equipment and are not supplied by PHYSIS).

The water leaving the pasteurization heat exchanger enters the pasteurization unit at a temperature controlled at 70°C, which is maintained inside the unit during at least two minutes at maximum flow volume and very low speed, in order to ensure proper pasteurization.

The water, pasteurized at 70°C, goes to the motorized mixer three-way valve and at the same time to the second transfer exchanger circuit, where it is cooled down in the same measure as it was heated up in the first circuit, as said above. The water, pasteurized at 70°C and cooled down to approximately 50°C, goes through the three-way valve to pass on to the distribution network at a controlled temperature of 55 to 60°C.

The sanitary water mixer valve is placed inside the **Pastormaster** and electronically controlled over its own control centre.

From this moment on, the return circuit will keep the water permanently circulating at a temperature of 50/60°C, thus ensuring a total and definitive eradication of any *Legionella* bacteria, including those protected by their own bio-films, even if they are very old.

## When no Hot Sanitary Water is required

We just learned how the system works in the event of sanitary water consumption.

But what happens when no water is used, as may occur during the night?

In this case, the system works just the same, eradicating the *Legionella* bacteria from the water and the distribution circuit by means of a permanent circulation of a steady return water flow.

The fact is that when there is no consumption, no cold water enters the external network. But you may have observed that a temperature drop occurs in the return circuit, as while circulating through the transfer exchanger, the water going to distribution suffers a temperature drop.

The circulation pumps allow assuring a permanent flow volume in the return circuit, with approximately 20% of the installation's maximum instantaneous flow volume, and a sufficient load to guarantee the Hot Sanitary Water circulation through two heat exchangers, the pasteurization unit and the whole distribution network.

This way, the pasteurization and bacteriological sanitation of the water in the Hospital or Building network continue being granted, regardless of whether water is consumed or not.

## 2.1. INITIAL NETWORK DISINFECTION

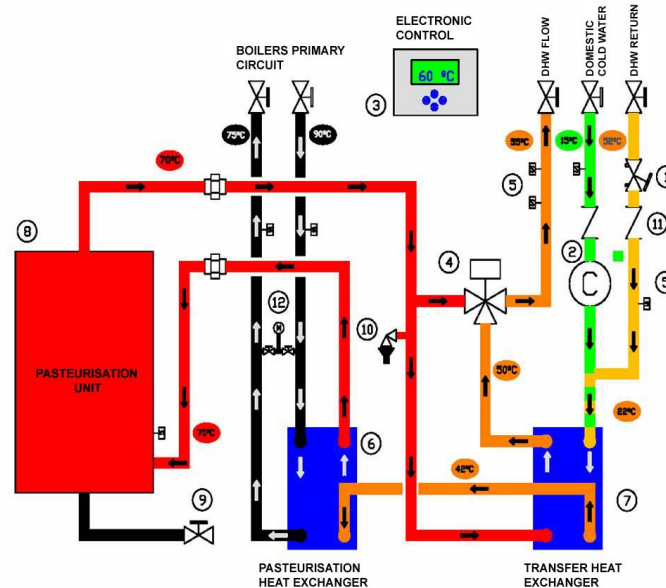
In the event of networks heavily infected by *Legionella*, a high-temperature treatment should be performed.

The **Pastormaster** equipment allows a punctual disinfection by distributing the hot water directly at the pasteurization temperature of 70°C.

After this punctual disinfection, the water is kept at 60°C during two weeks in order to destroy the bacteria colonies that might be present in the bio-film.

Then the water in the network will return to the desired operation temperature (55/60°C).

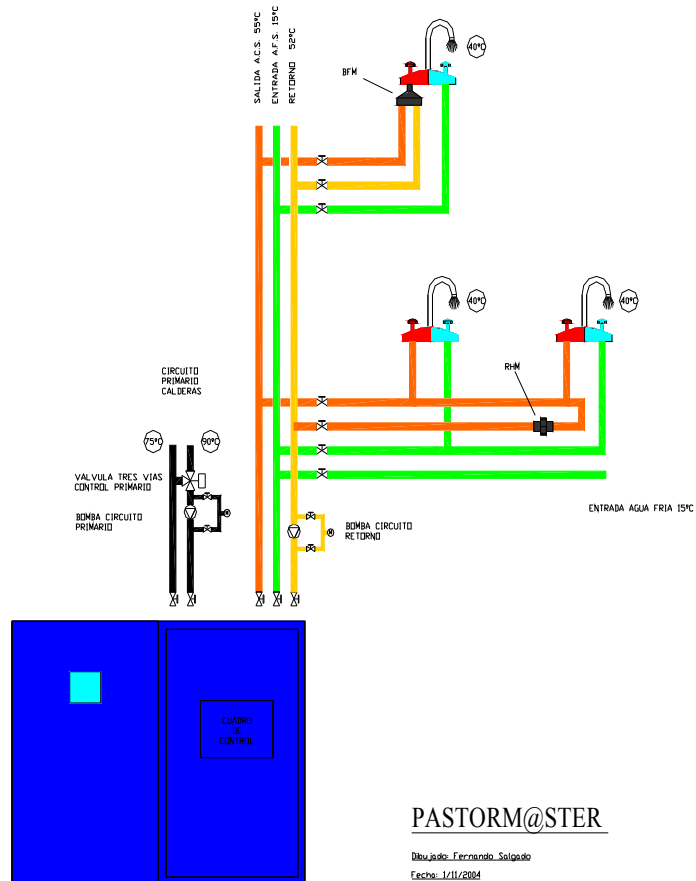
## 2.2. OPERATING PRINCIPLE



### LEGEND OF THE PRINCIPLE SCHEME:

- 1- Flow volume adjustment valve in the return
- 2- Used-up hot water counter
- 3- Integrated **Pastormaster** Control Panel
- 4- H.S.W. Outlet temperature control 3-way valve
- 5- Temperature sensors
- 6- Pasteurization heat exchanger
- 7- Transfer exchanger
- 8- Pasteurization Unit
- 9- Emptying drainpipe
- 10 Safety valve 7 bar Ø 1".
- 11 Retention valve
- 12 Manometer D = 60 0-6 bar

## 2.3. INSTALLATION PRINCIPLE



PASTORM@STER

Dibujado: Fernando Salgado  
Fecha: 1/11/2004

## 2.4. APPLICATIONS

Hot Sanitary Water Production at:

- Hospitals
- Clinics
- Rest Homes
- Hotels
- Spas
- Sports Installations, etc.





### 3.2. HYDRAULIC CIRCUIT

Consisting of:

- Pasteurization and Hot Sanitary Water Production Unit, built in 316 L stainless steel
- Pasteurization plate heat exchanger in 316 L stainless steel
- Transfer plate heat exchanger in 316 L stainless steel
- 316 L stainless steel pipes
- 3-way valve for controlling the outlet a distribution temperature
- Micro-metric return flow volume adjustment valve
- Used-up hot water counter



### 3.3. ELECTRIC AND CONTROL CIRCUIT

The equipment needs a 220v 440w electric power supply.

At the front door:

- General switch with IP55 protection outside the equipment for switching the equipment off from outside.
- Digital thermometer on the door, showing the temperature at the outlet to Hot Sanitary Water distribution and return circuit.
- Acoustic Alarm Trigger
- 4 Alarm Signaling Lamps:
  - Maximum Pasteurization Temperature
  - Minimum Pasteurization Temperature
  - Maximum Distribution Outlet Temperature
  - Minimum Distribution Outlet Temperature

Inside:

- Complete electric panel, including magnetic, thermal, and differential protection
- Electronic protection anode to protect the Pasteurization Unit against corrosion by water



- Electronic control panel including the following functions:

Pasteurization temperature (70°C) control sending a 0-10v digital signal to motorized valve outside the primary circuit heaters (not supplied)

Distribution outlet temperature (55–60°C) control sending a 0-10v digital signal to motorized valve (inside the **Pastormaster**)

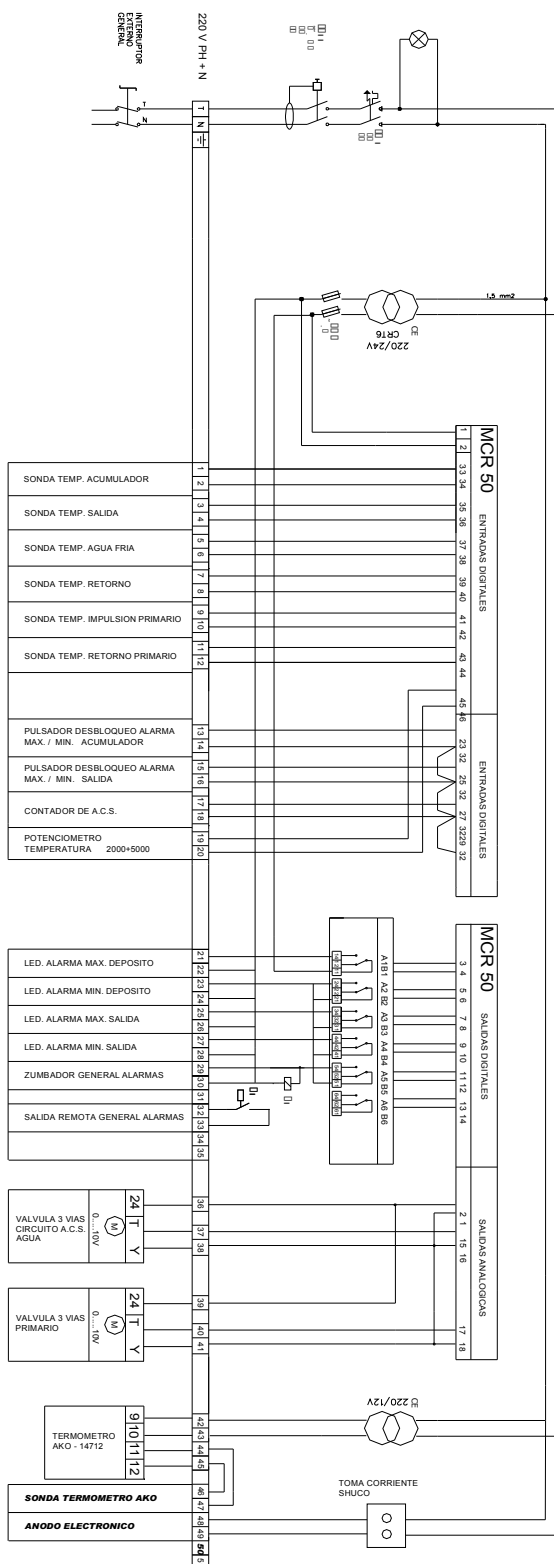
Temperature display of:

Established outlet temperature  
Inlet Cold sanitary water inlet  
Installation return water inlet  
Hot water outlet to distribution  
Pasteurization unit  
Primary circuit inlet  
Primary circuit outlet

Alarm History display



## ELECTRIC CIRCUIT

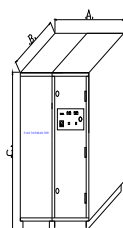


## 4. TECHNICAL FEATURES

<u>Model</u>	Power KW	P.U. Volume	Flow Volume	Pipe ND			Primary Temperature °C		Primary Flow Volume m³/h
			m³/h 40°C	C.W. Inlet H.S.W. Outlet	Return	Primary	Forw.	Return	
<b>BB05</b>	147	150	5	32	32	32	90	75	9
BB08	230	240	7.91	40	32	50	90	75	14
<b>BB11</b>	313	320	10.77	50	40	50	90	75	19
<b>BB14</b>	<b>390</b>	<b>400</b>	<b>13.42</b>	<b>65</b>	<b>50</b>	<b>65</b>	<b>90</b>	<b>75</b>	<b>23</b>

Note: Data may change

## 5. DIMENSIONS



<u>Model</u>	<b>A</b>	<b>B</b>	<b>C</b>
<b>BB05</b>	1305	850	1850
<b>BB08</b>	1700	900	1850
<b>BB11</b>	1910	1005	1850
<b>BB14</b>	<b>1910</b>	<b>1005</b>	<b>1850</b>

## 6. RECOMMENDATIONS

The efficiency of this concept is based essentially on the installation data and on the requirements to be fulfilled.

First of all, it is important to verify:

- Primary Temperature 90°C
- Power
- H.S.W. Flow Volumes and Temperatures
- Flow volumes and loss of load in the return circuit

It is fundamental to eliminate dead or non-consumption points, to balance and ensure circulation in the whole network, and to follow the installation schemes and periodical maintenance schedules.

The equipment will be mounted by a specialized installer and maintenance will be done by qualified personnel periodically verifying proper operation of all devices.

We would recommend carrying out a preliminary thermal crash treatment at start-up, increasing the H.S.W. temperature to 70°C during at least 30 minutes and then bringing the distribution temperature back to 60°C during 2 weeks in order to make the distribution network health-safe.

Finally, the temperature will be restored to 55/60°C for normal use, ensuring that the return temperature at the farthest point is not below 50°C.

Equipment maintenance is simple, but indispensable for preserving perfect operation.



## 7. TECHNICAL INSTALLATION INSTRUCTIONS

### PASTORMASTER SERIES BB

#### NOTE :

The invention patent describing the general fluid pasteurization and permanent network disinfection principle upon which the **PASTORMASTER SERIES BB** sub-station is based, was registered with the NATIONAL INSTITUTE FOR INDUSTRIAL PROPERTY (INSTITUTO NACIONAL DE LA PROPIEDAD INDUSTRIAL, I.N.P.I.), Patent Number 0010442.

The efficiency of the fight against or prevention of the presence of *Legionella* and other bacteria reproducing in water and in Hot Sanitary Water feeding circuits needs a previous global verification of the perfect hydraulic operation of the whole distribution equipment, existing or planned.

### 7.1. INSTALLATION INSTRUCTIONS

**Pastormaster Series BB** is a factory-regulated and checked monoblock sub-station ready for installation.

This equipment must be installed according to specific conditions.

#### INSTALLATION CONDITIONS

##### Location

**Pastormaster Series BB** should be installed indoors, at a weather-protected place, in an area with the access restricted to the maintenance personnel.

**Pastormaster Series BB** has to be mounted indoors:

- ⇒ In a dry, ventilated room, with an indoor environment temperature not exceeding 40°C, provided with standard air inlets and ventilation outlets.
- ⇒ It will be mounted on a 100 mm minimum high, horizontally leveled platform.
- ⇒ A 1000 mm minimum free space must be left in front, on both sides and in the rear for maintenance of the internal hydraulic and electric elements.
- ⇒ In order to prevent lime incrustations, we would recommend to reduce the water hardness as far as possible (TH<15°F) by means of an appropriate treatment.



## Hydraulic Connections

- ⇒ Connect the cold water inlet and the hot water outlet-to-distribution pipes. Pipes equaling at least the nominal diameter should be used.
- ⇒ Connect the return pipes, the diameter of which should be at least the nominal diameter for such pipes. The return circulation pump should be installed in this circuit.
- ⇒ Connect the pipes of the primary forward and return heater circuit. The minimum diameter of such pipes should be at least equal to the nominal diameter. The re-circulation pump and the motorized three-way valve for the Pasteurization temperature control should be installed in this circuit.
- ⇒ The motorized three-way mixer valve in the heater circuit should be placed as close as possible to the connections, at a 1.5 meters maximum distance.
- ⇒ Control the homogeneity of materials, especially to avoid galvanic pairs.
- ⇒ Connect the drainpipes and sludge drainpipes to the sewer.

## Electric Power Supply Connections and Low Voltage Connections

- ⇒ Connect the devices according to valid standards.
- ⇒ Connect the electric power supply (220v Ph+N+T).
- ⇒ Connect the electric power supply to the primary heater pasteurization control valve (supplied power: 24 and 0-10v signal). This power is supplied by the **Pastormaster** electric panel.
- ⇒ An independent short-circuit protected line should be used for the power supply to primary circuit heater pumps and return circuit pumps.

## 7.2. COMMISSIONING CONDITIONS

### Start-Up

After having verified the different connections and characteristics of fluids:

- ⇒ Clean all connected circuits and drain them to the sewer.
- ⇒ Start the return circuit circulation pumps.
- ⇒ Adjust the return circuit flow volume using the pumps and regulation valves.
- ⇒ Adjust the primary regulation according to the initially established conditions.
- ⇒ Verify the pressures and temperatures of the different networks according to the initially established conditions.
- ⇒ Verify the water hardness ( $< 15^{\circ}\text{Hf}$ ).

### IMPORTANT NOTE

We must emphasize that under normal operating conditions, the constant fluid pasteurization temperature will be  $70^{\circ}\text{C}$  and the water temperature in the network to be pasteurized will be  $55/60^{\circ}\text{C}$ . It is important to verify the materials used in existing networks in order to prevent the thermal crash treatment, if performed, from deteriorating existing protection layers. This is especially applicable to networks using galvanized steel pipes, the polarity of which is inverted at temperatures over  $60^{\circ}\text{C}$ , thus increasing the corrosion phenomenon.

## 7.3. OPERATION AND MAINTENANCE

### Operation

Operating the **PASTORMASTER Series BB** is simple, as it is a completely automated system.

The electric sub-station equipment is standard-type. All control and monitoring devices are visible from the control position.

### Maintenance

The maintenance of **PASTORMASTER Series BB** is simple but absolutely necessary for preserving the technical characteristics of the equipment.

- ⇒ The cleaning cycle for (transfer and pasteurization) heat exchangers will depend on the water quality and consumption ( $\text{TH} < 15^{\circ}\text{F}$ ). Heat exchangers should be cleaned at least once a year.

- ⇒ Empty-purge the pasteurization unit once per week during 1-2 minutes.
- ⇒ The operation of safety devices (control panel, safety valve, lock valves, sensors, etc..) must be verified periodically.

## 9. MAINTENANCE AND TREATMENT PROCESSES

### HOT SANITARY WATER CIRCUITS

DAILY	WEEKLY	MONTHLY	ANNUALLY	ALWAYS
Temperature at return >50°C	Cleaning the bottom of Pasteurization Unit (1-2 minutes)	Preservation and cleaning of terminal points (random-rotating) All of them at the end of each year	General cleaning and disinfection	General cleaning and disinfection: .prior to first operation .after more than 1 month idle .after repairs or structure modifications .if a general revision becomes advisable .if requested by Health Authority .in the event of outbreak
Temperature check at checkpoints (fixed installation end points) >50°C	Opening terminal points (taps and showers) not used during 5 minutes	Drainpipe purge valves	<i>Legionella</i> detection at representative points	
		Temperature at terminal points (random-rotating) >50°C All at the end of the year	Preservation and cleaning of terminal points (all)	
			Temperature check at (all) terminal points >50°C	

*Legionella* Analysis: OUTLET + CLOSE TO THE PASTORMASTER  
OUTLET + FAR FROM THE PASTORMASTER  
OUTLET + CLOSE TO THE POINT OF RETURN  
TERMINAL POINTS

MAINTENANCE RECORDING BOOK: recording all planned actions as they are carried out

## **10. THERMAL DISINFECTION PROTOCOL**

### **THERMAL DISINFECTION**

1. Change checkpoint, power meter, of the HSW outlet temperature up to 70°C
2. Sequentially open all taps-showers of the installation during 5 minutes at a temperature exceeding 60°C
3. Finally, change checkpoint, power meter, of the HSW outlet temperature to typical operating parameters.

### **THERMAL DISINFECTION IN THE EVENT OF OUTBURST**

1. Change checkpoint, power meter, of the HSW outlet temperature up to 70°C
2. Sequentially open all taps-showers of the installation during 10 minutes at a temperature exceeding 60°C
3. Finally change checkpoint, power meter, of the HSW outlet temperature to maintain a temperature of 55-60°C during 3 months at terminal points.
4. After 3 months, change the HSW outlet temperature again to usual operating parameters.

## 11. APPLICABLE STANDARDS

ROYAL DECREE 865/2003 of the 4<sup>th</sup> July, establishing the hygiene/health criteria applicable to legionellosis prevention and control.

ROYAL DECREE 3099/1977 of the 8<sup>th</sup> September, by which the Safety Regulation for freezer plants and installations is approved.

ROYAL DECREE 1751/1998 of the 31<sup>st</sup> July, approving the Regulation for Thermal Installations in Buildings (RITE) and its complementary technical instructions and creating the Advisory Commission for Thermal Installations in Buildings, which establishes the conditions to be fulfilled by thermal installations in buildings (Heating, Air Conditioning, and Hot Sanitary Water), as modified by Royal Decree 1218/2002 of the 22<sup>nd</sup> November.

ROYAL DECREE 140/2003 of the 7<sup>th</sup> February, establishing the health criteria for the quality of water for human consumption.

UNE STANDARD 100030 IN/2005 Guide for the prevention and control of *Legionella* proliferation and dissemination in installations.

Technical Guide for the Prevention and Control of Legionellosis in installations subject to the provisions of Royal Decree 865/2003, issued by the Ministry of Health.

ORDER SCO/317/2003 of the 7<sup>th</sup> February, regulating the homologation procedure of training courses for the personnel doing hygiene/health maintenance jobs in installations subject to Royal Decree 909/2001 of the 27<sup>th</sup> July.

ORDER 2 of July 2004, regulating the training courses for the personnel performing hygiene/health maintenance tasks in installations subject to the provisions of Royal Decree 865/2003 of the 4<sup>th</sup> July, establishing the hygiene/health criteria for the prevention and control of legionellosis.

## 12. GUARANTEE

The guarantee period for **Pastormaster BB** will be 2 years from delivery date against any and all material flaws or manufacturing errors.

### GENERAL GUARANTEE CONDITIONS

- 1- PHYSIS DEVELOPMENT, S.L. guarantees the **Pastormaster** equipment.
- 2- Guarantee period 2 years.
- 3- The guarantee will enter in force starting on the invoicing date.
- 4- Commissioning will be executed free of charge by the PHYSIS Official Technical Customer Service.
- 5- Repairs or the replacement of equipment components or parts will not extend the guarantee period, not even for the replaced parts.
- 6- The elements under guarantee will be repaired or replaced free of charge, provided the faults are due to manufacturing errors.
- 7- The Official Technical Customer Service will be the only one competent for executing repairs under guarantee, the technical personnel being sent according to own organizational requirements. Should the equipment be manipulated by persons not belonging to PHYSIS, the guarantee would become nil and void.
- 8- Any parts replaced under guarantee will continue being the property of PHYSIS, the user being obliged to return them to PHYSIS carriage free within 7 days maximum. Otherwise the supplied replacement parts will be invoiced.
- 9- To include replaced parts or elements of the **Pastormaster** equipment in the guarantee, the installation must be compliant with the provisions of the Regulation concerning Thermal Installations in Buildings.

10- The guarantee will not be executable if failures are due to:

- Incorrect mounting, use, handling or maintenance.
- Electric power supply different from: 220v, 50 Hz, monophase with grounding.
- Incorrect water proprieties. The values should be:
  - Total hardness (TH) < 15 °F
  - pH between 7.0 and 8.5
  - Saltiness < 600 mg/l
  - Chlorides < 300 mg/l
- Hydraulic service pressures below 1 bar or higher than 7 bar.
- Natural equipment wear.

11- To ensure perfect operating of the **Pastormaster** equipment, a periodical annual maintenance is indispensable. This maintenance should be performed by experts of the PHYSIS Official Technical Customer Service.

The number of annual revisions will depend on the water quality and on the dirt accumulated inside the heat exchangers; the minimum number being 2 revisions per year.

12- The guarantee does not cover any damage and prejudice payments.