

# **INSTALLATION AND MAINTENANCE MANUAL**

## **DIPHUSAIR-ASC**

### **HEAT EXCHANGE HUMIDIFICATION SYSTEM USING SUPERHEATED WATER**

MASC-EN-21-2

In compliance with the Rules and Standards of the European Union on Machine Safety, it is essential to read this protocol carefully before installing any equipment.



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## 1 Introduction

Dear Customer,

The DIPHUSAIR ASC humidifier is our answer to current technical requirements. These are met through their operating safety, functional convenience and financial efficiency.

To ensure the correct operation of your FISAIR humidifier, please read this Manual carefully and retain it for future consultation.

If there is any part of this document that you do not understand, or if you have any questions about your dehumidifier. please contact us:

**FISAIR, S.L.U.**

Tel.: (+34) 91 692 15 14 – Madrid – SPAIN

Fax: (+34) 91 691 64 56 – Madrid – SPAIN

Email address [www.info@fisair.com](mailto:www.info@fisair.com)

Or contact your local distributor.

### 1.1 Operation instructions

The correct use of the humidifier includes following our instructions for installation, set-up, operation and maintenance, as well as following the steps indicated in the instructions in the correct sequence as described.

This humidifier may only be used by persons who are fully qualified and authorized to do so.

Any person who transports and/or used the unit or who works with it must read and understand the relevant section of this manual, in particular the section entitled "Safety Instructions".

You are advised to keep a copy of the user manual in the place where the humidifier is going to operate (or nearby).

Ignoring these instructions may invalidate all applicable guarantees and warranties.

**FISAIR disclaims any liability if not all the installation and operating instructions it has provided are complied with; if the products have been modified or altered without the written consent of FISAIR; or if the products have been subjected to improper use, mishandling, alteration, improper maintenance or show signs of negligent use or being involved in an accident. These situations could include an incorrect power connection, impacts with other objects, removal or disarming of security fittings/measures, etc.**

## 2 Safety Instructions

Please read these safety notes carefully and examine the equipment to become familiar with it before installing, commissioning or servicing. The following symbols or messages may appear in this document or on the equipment. They warn of potential hazards or provide information that may help you clarify or simplify a procedure.



### See instructions

This manual should be read before the equipment is installed by properly qualified personnel. Incorrect installation can cause personal and equipment damage. You must consult the manual before maintenance or start-up.



### Attention

This is a safety alert symbol. It warns of the potential of bodily injury.

Observe all safety information with this symbol to avoid any situation that could lead to injuries and/or damage to the unit.



### Attention, Live Current

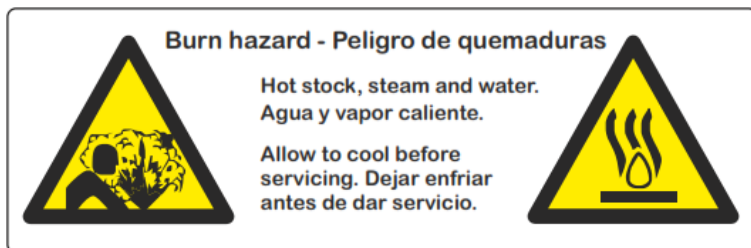
The presence of this symbol on a hazard or warning label indicates that there is a risk of electrocution, which can lead to personal injury or life-threatening conditions if the instructions are not followed.



### Turn off before opening

Turn off the power before opening the equipment to make new connections or perform maintenance in any part of it. Electric shock or fire may result if not turned off. Follow the equipment shutdown and control instructions to ensure the safety of the equipment and personnel.

## Hot surface and danger of burns

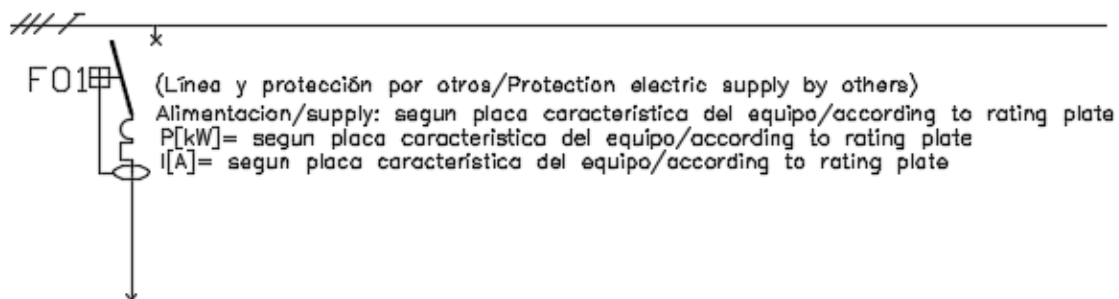


This steam humidifier has extremely hot surfaces. Water in the tank, pipes and distribution assemblies can reach 100°C. Contact with the equipment surfaces and boiler water inlets and outlets is very dangerous and can cause severe burns. Let the equipment cool down before maintenance or inspection of any part of the system.

## Fused Isolator installation and the power supply line.



The installer is required to mount a specific fused isolator on the machine's power supply.



### Caution: hot water and excessive pressure

- Drainage water can reach temperatures higher than 90°C and therefore damage the drainage ducts and the drain. Ensure the pipes and the drain can withstand this temperature.
- Excessive water supply pressure (greater than 2.5 bar) can cause the humidifier to overflow. Be sure to regulate the water inlet through the needle valve.

### General points

- If you notice that something is not working properly, switch off the unit immediately and take steps to ensure that it does not switch on again. All faults must be corrected immediately.
- Use duly qualified personnel to carry out repair work. This will ensure that the unit operates safely.
- Use only original FISAIR replacement parts.
- Refer to local regulations that restrict or regulate the use of this humidifier.

### How the unit works

- Do not jeopardise the safety of the unit.
- Periodically check the device's protection and alert devices.
- The unit's safety fittings must not be removed or disabled.

### Installing, Disassembling, Maintaining and Repairing the unit

- Switch off the unit's power supply when conducting maintenance work or making repairs to the unit.
- Never add components to the unit without prior written approval from FISAIR.



The I1 isolator switch must be placed in the "0" position and locked out with a padlock to access the fan plenum and/or perform any maintenance action within the unit.



Similarly, the pressurized water feed valves must be locked out in pressurized water equipment by means of a suitable mechanical valve lockout, for maintenance.



### **About the electrical components**

- Any work that affects the electrical components must be carried out by qualified electricians.
- Switch off the power supply and ensure that it does not re-connect while any electrical component is being handled.
- Switch off the unit immediately if any fault is detected in the electrical power supply.
- Use only original, correctly calibrated fuses.
- Carry out periodic checks of the electrical unit.
- All defects, such as loose connections or burnt cables, must be repaired immediately.

### 3 Transport and storage

When in transit, the unit must be protected from impacts of any kind, and all possible measures must be taken to prevent malfunctions due to improper loading or unloading of the unit.

When lifting the equipment, always use a pallet truck or forklift.

Upon receipt of the unit, make sure that the type and serial number of the plate correspond to the order and delivery information. Check that the unit is complete and in perfect conditions. If there are components missing or damaged during transport, immediately inform your supplier in writing.

Keep the unit dry and protected from the elements while in storage. If it has to be stored for a long period before installation, choose a place where the equipment will not be damaged mechanically or be contaminated by dust or construction materials. If stored outdoors, protect it against the weather and atmospheric elements.



#### Attention

Avoid direct exposure to the sun and places that can exceed 50°C.

**Note:** Storage area temperature and humidity conditions:

- ❖ Temperature: [-20...+50°C]
- ❖ Relative humidity: [5...95% RH] no condensation.

## 4 Rating plate




The rating plate provide essential information about the technical features of the machine.




The EC Machinery Safety Regulation requires all machinery operated within the European Economic Community to have a rating plate indicating its main features, the machine serial number and the manufacturer's name inscribed in a durable manner.

VxV steam generator equipment's are classified as machines.

The DIPHUSAIR-ASC series has two types of plates:

- The larger main plate is located on the outside of the electrical panel. It states:
  - Equipment model
  - Serial number
  - Design capacity
  - Nominal operating pressure (gauge)
  - Nominal maximum operating pressure (gauge)
  - Maximum admissible pressure (gauge)
  - Exchanger test pressure (gauge)
  - FISAIR devices it can be joined with
  - Machine type: Machine or Partly completed machinery
  - Designed in accordance with directive
  - Place and date of manufacture
- The smaller plate is inside the electrical panel. It shows:
  - Equipment model
  - Serial number
  - Electrical power connection
  - Nominal power for the equipment
  - Nominal current for the equipment.
  - Electrical wiring number
  - Programmable Logic Relay (PLR) configuration program
  - FISAIR devices it can be joined with
  - Machine type: Machine or Partly completed machinery
  - Designed in accordance with directive
  - Place and date of manufacture

<b>fisair</b> air humidity control		RS AIR S.L. C/ Urano, 20 - P.I. AIMAYR 28330 San Martín de la Vega MADRID (SPAIN) www.fisair.com	After Sales Service Servicio Postventa Mail: sat@fisair.com Tel: +349169 21514
Modelo Model Typ	ASC-115		
Nº Serie Serial Number Seriennummer	2020----01		
Capacidad de diseño Steam Output Design Design Dampfmenge	100 kg/h		
Presión Nominal de Func. (Manométrica) Nominal Operating Pressure (Gauge) Nennbetriebsdruck (Überdruck)	2,7 bar (g)		
Presión Nominal de Func. Máx.(Manométrica) Nominal Max. Operating Pressure (Gauge) Nominelle Max. Betriebsdruck (Überdruck)	3,75 bar (g)		
Presión Admisible Máxima (Manométrica) Maximum Allowable Pressure (Gauge) Maximal Zulässigen Druck (Überdruck)	6,5 bar (g)		
Presión Prueba Intercambiador (Manométrica) Test Pressure Exchanger (Gauge) Prüfdruck Tauscher (Überdruck)	30 bar (g)		
Equipos de FISAIR a los que puede incorporarse FISAIR equipment you can join FISAIR-Ausrüstung, an der Sie teilnehmen können	-		
Tipo de máquina Machine type Maschinen typ	Máquina Machine Maschine		
Diseñada de acuerdo a directiva Designed according to directive Entwickelt nach richtlinien	2006/42/CE		
Fabricado en España (UE) Made in Spain (EU) Hergestellt in Spanien (EU)	--/2020		
 			

<b>fisair</b> air humidity control		RS AIR S.L. C/ Urano, 20 - P.I. AIMAYR 28330 San Martín de la Vega MADRID (SPAIN) www.fisair.com	After Sales Service Servicio Postventa Mail: sat@fisair.com Tel: +349169 21514
Modelo Model Typ	ASC-115		
Nº Serie Serial Number Seriennummer	2020---01		
Alimentación Eléctrica Electric Supply Stromversorgung	230V/I+N/50Hz		
Esquema Eléctrico Wiring Diagram Schaltplan	E-09461		
Programa Configuración Configuration Program Setup	PC-20170448		
Equipos de FISAIR a los que puede incorporarse FISAIR equipment you can join FISAIR-Ausrüstung, an der Sie teilnehmen können	-		
Tipo de máquina Machine type Maschinen typ	Máquina Machine Maschine		
Diseñada de acuerdo a directiva Designed according to directive Entwickelt nach richtlinien	2006/42/CE		
Fabricado en España (UE) Made in Spain (EU) Hergestellt in Spanien (EU)	--/2020		
 			

## 5 General description

### 5.1 Equipment codification:

HEAT EXCHANGER GENERATOR MODEL BOILER STEAM TO CLEAN STEAM		WATER TYPE C or D		MAXIMUM CAPACITY (kg/h)
ASC	-	D	-	75
		C		110

### 5.2 Introduction

The control of environmental humidity is increasingly important in today's society for the comfort of people, the quality of production and maintenance processes and the conservation of materials or products made.

If the natural or controlled environment humidity is lower than that desired, a system may be needed to increase it to the required level. The DIPHUSAIR-ASC humidifier selected for each specific application provides the desired degree of humidity easily, reliably and permanently and at moderate operating costs.

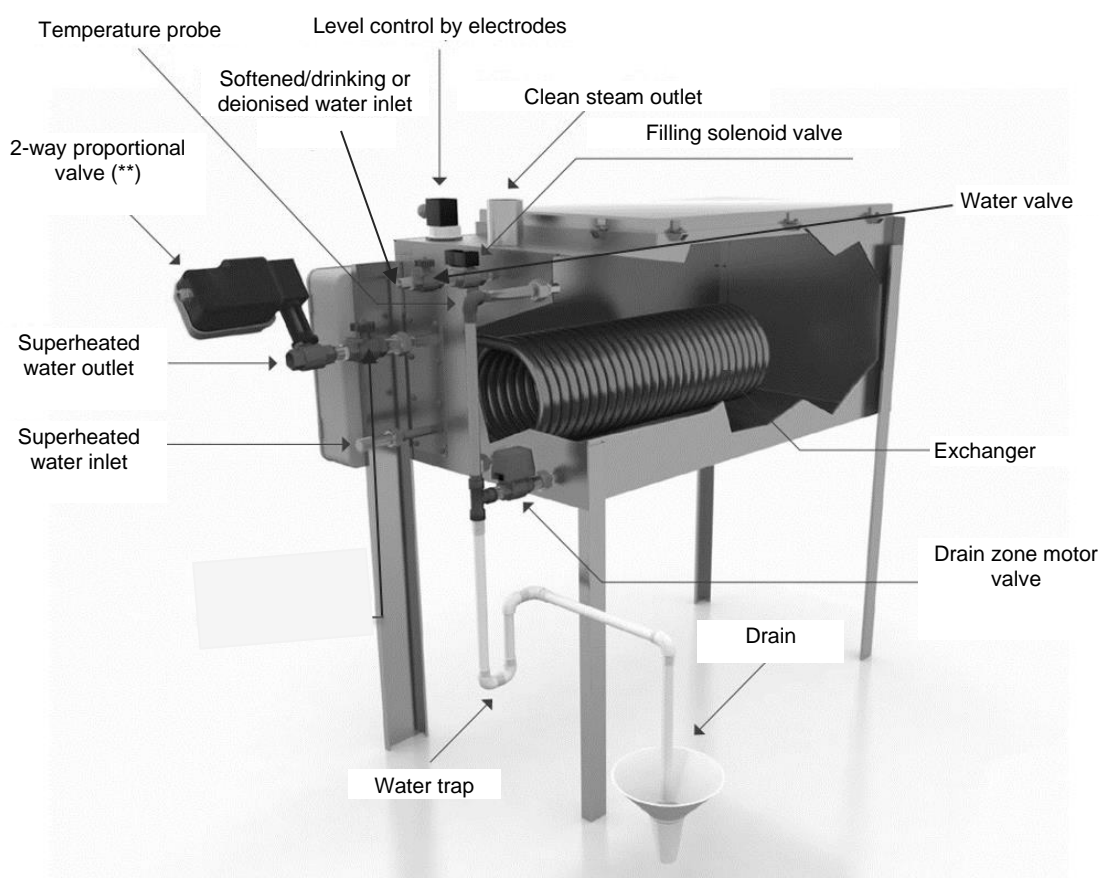
### 5.3 Operating principle

The DIPHUSAIR ASC series air humidifiers operate on the basis of a coil heat exchanger through which superheated boiler water circulates, providing the necessary heat to produce clean steam from drinking/softened or deionised water. The process of heat transmission is produced by conduction and convection in the nucleate boiling phase.

The special machining of the coil, from copper tube according to the EN1057:2007 standard, in a single piece without welding, makes this type of exchanger the most efficient; while also avoiding contamination and the contact of drinking water with superheated water. The external nickel-plating treatment of the coil further increases the already high corrosion resistance of the copper.

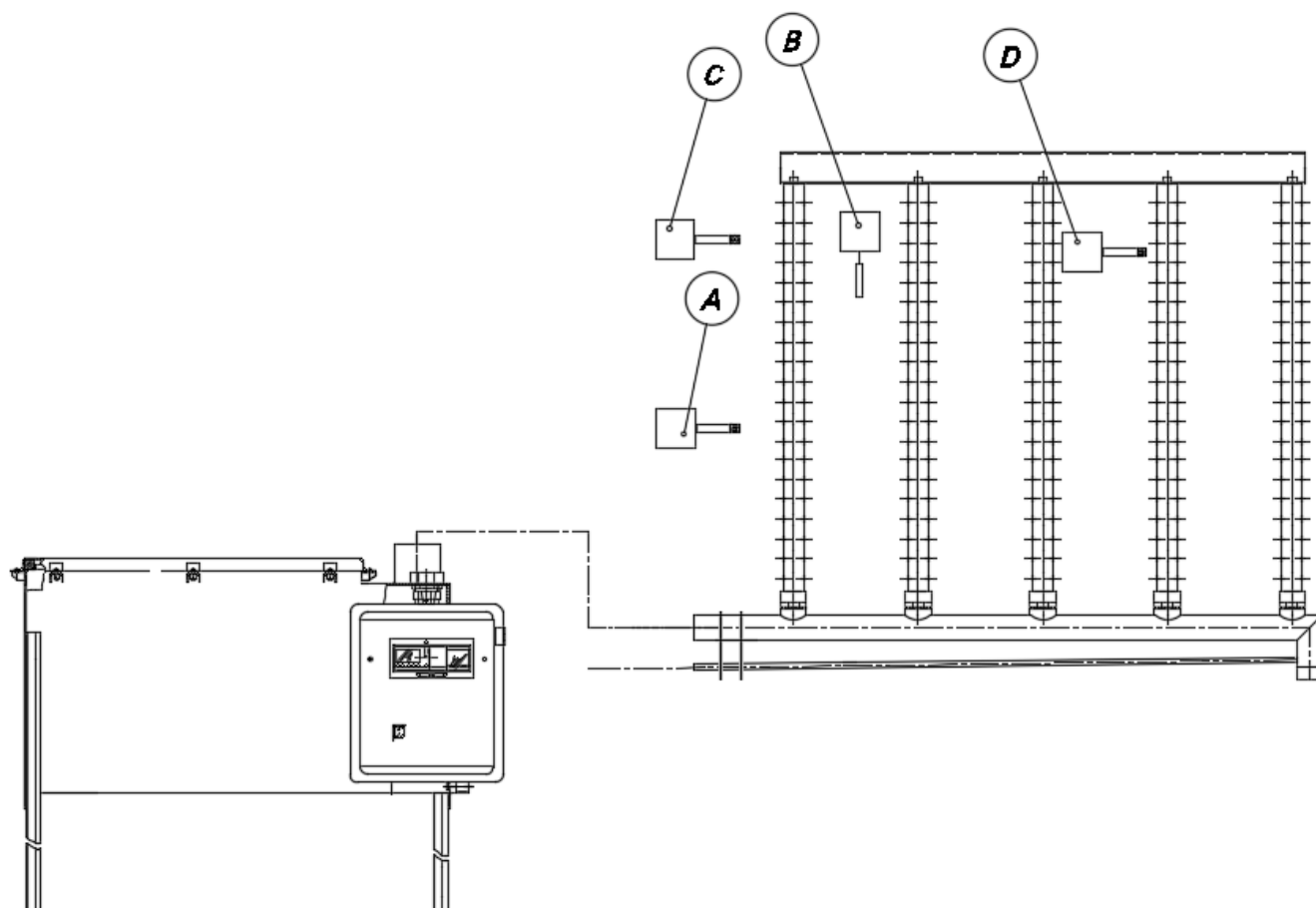
#### ASC for drinking/softened water

Fill and drain solenoid valves are installed for drinking/softened water for periodic purges. The filling valve is a float valve for deionised water and the drain valve is manual.



(\*\*) Can also be used in 3 ways, according to general circuit

#### 5.4 Optional components for ASC steam generator:




---

A- DOUBLE ACTIVE PROBE (TEMPERATURE AND HUMIDITY H.R.), FOR DUCT/AHU OR ROOM

---

B- FLOW SWITCH

---

C- HUMIDISTAT (R.H.) WITH ROOM OR DUCT/AHU ACTIVE PROBE

---

D- MÁXIMUM HUMIDITY CUT-OFF HYGROSTAT

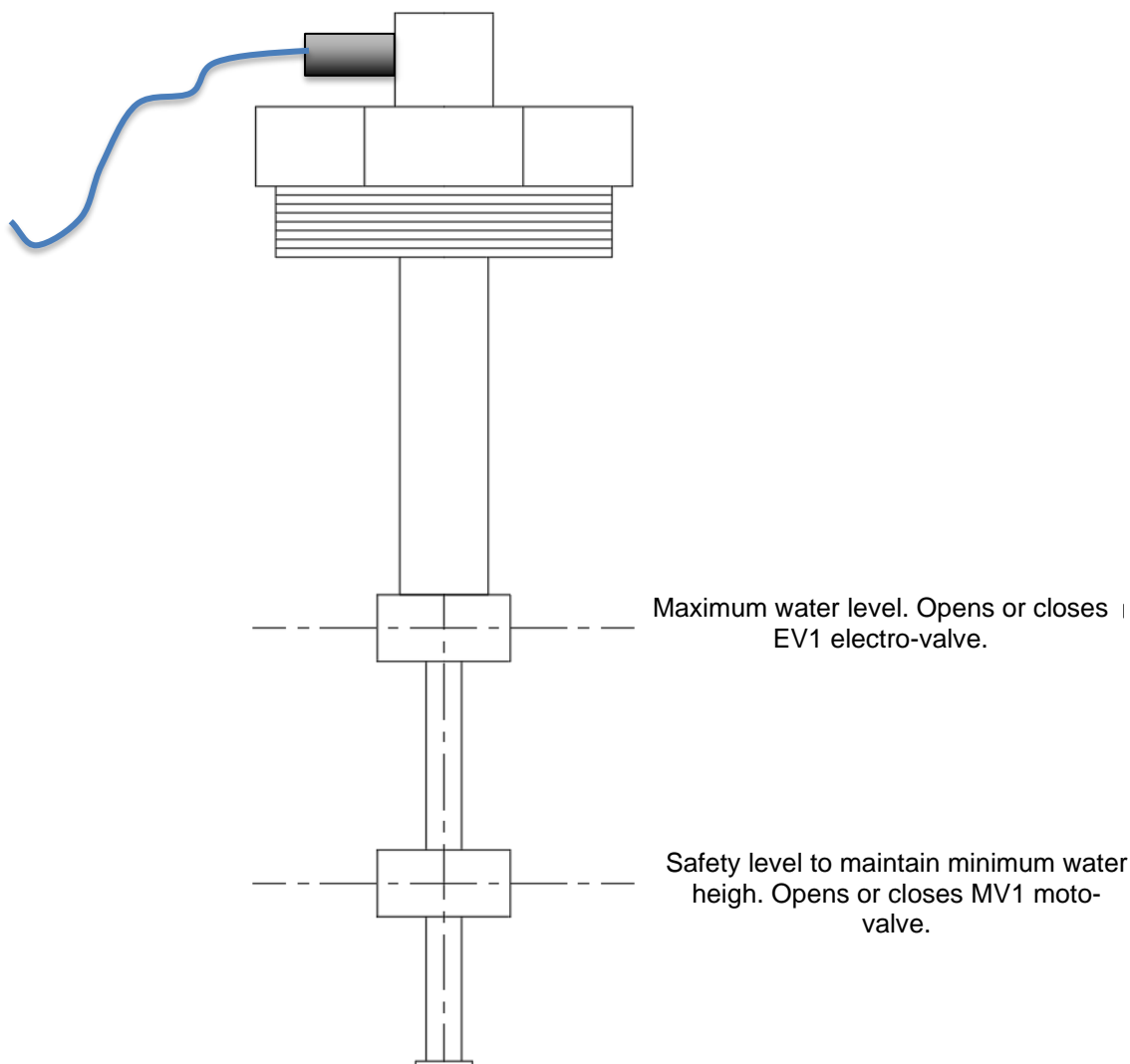
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E- SPECIAL FLEXIBLE STEAM TUBE + 2 CLAMPS

---

## 5.5 Level control Stainless steel float detector

The different water levels reached by the probe determine the electronic control of valve opening or closing according to the following figure:



**Note:** It is very important to keep the level detector clean of possible incrustations caused by inadequate water quality (see point "6.4 Main's water supply or treated water"). It is recommended to clean the detector every 3 months (see point "9. Maintenance").

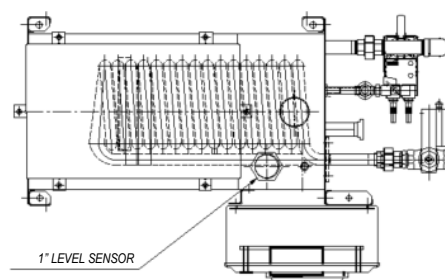
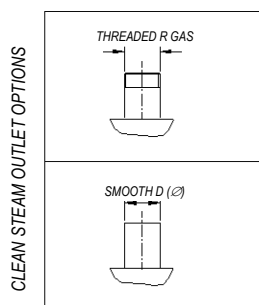
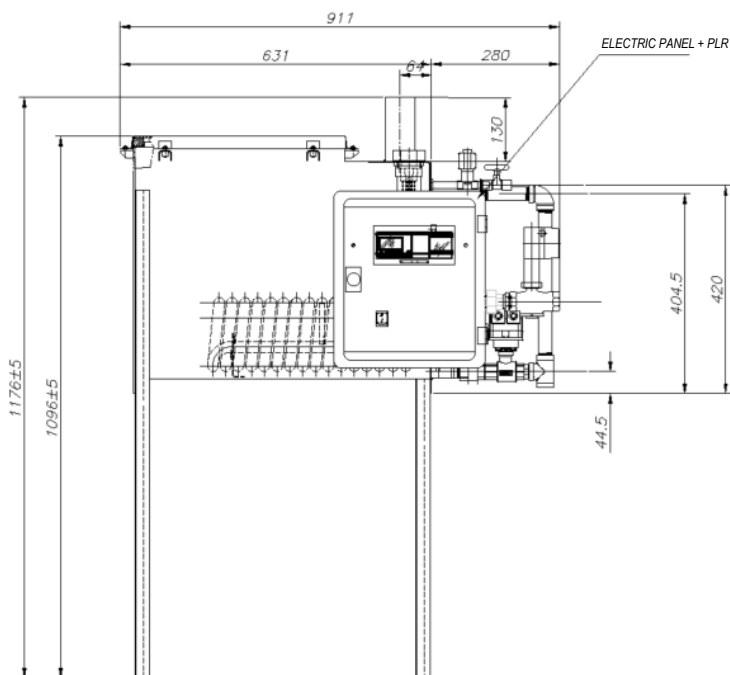
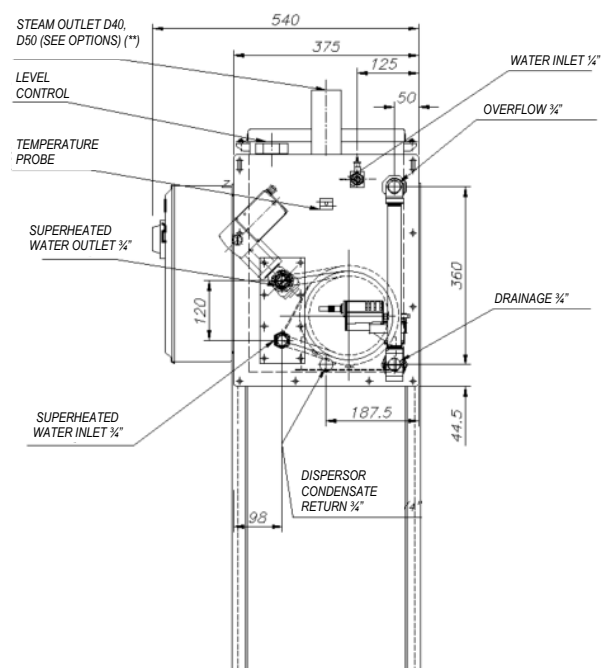
## 5.6 External ASC-75 dimensions

External dimensions: ASC-75 without isolation:

MODEL	CAPACITY (kg/h)	WEIGHT (kg) OPERATING / LOADING	STEAM OUTLET (**)	
			THREADED	SMOOTH
ASC-075	80 (*)	80/45	DN40 (1-1/2" GAS)	D40, D50

(\*) See yield table according to temperature and superheated water flow. Clean steam capacity limited by the MV1 superheated water valve capacity (ex: If the design capacity is 10 kg / h the MV1 superheated water valve is selected with a Kvs for this capacity).

(\*\*) Establish option.

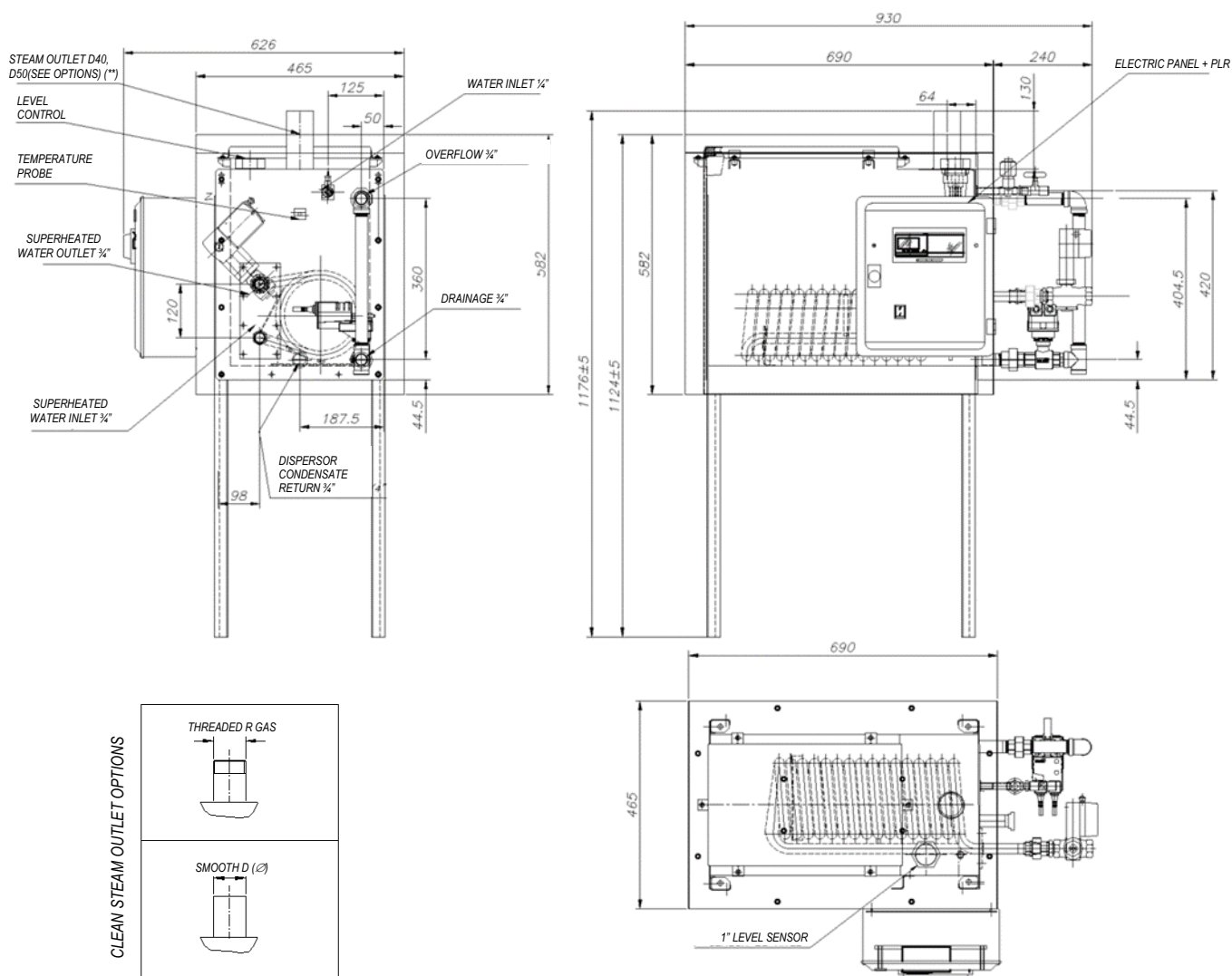


External dimensions: ASC-75 With isolation:

MODEL	CAPACITY (kg/h)	WEIGHT (kg) OPERATING / LOADING	STEAM OUTLET (**)	
			THREADED	SMOOTH
ASC-075	80 (*)	100/65	DN40 (1-1/2" GAS)	D40, D50

(\*) See yield table according to temperature and superheated water flow. Clean steam capacity limited by the MV1 superheated water valve capacity (ex: If the design capacity is 10 kg / h the MV1 superheated water valve is selected with a Kvs for this capacity).

(\*\*) Establish option.



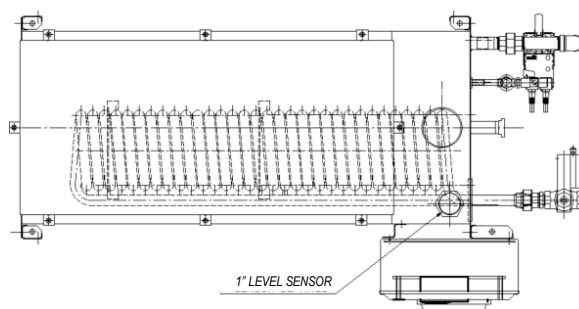
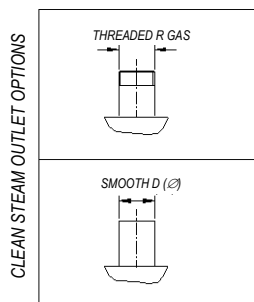
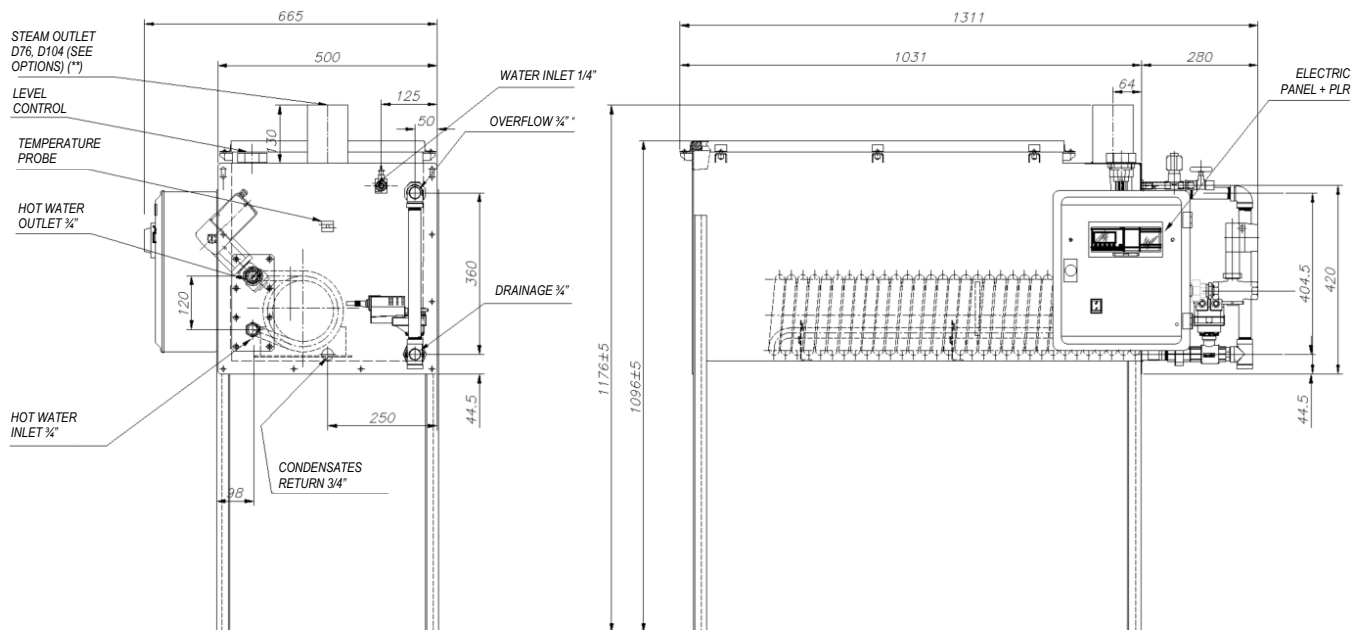
## 5.7 External ASC-115 dimensions

External dimensions: ASC-115 without isolation:

MODEL	CAPACITY (kg/h)	WEIGHTS (kg) OPERATING / LOADING	STEAM OUTLET (**)	
			THREADED	SMOOTH
ASC-115	125 (*)	160/65	2-1/2" GAS	D76, D104

(\*) See yield table according to temperature and superheated water flow. Clean steam capacity limited by the MV1 superheated water valve capacity (ex: If the design capacity is 10 kg / h the MV1 superheated water valve is selected with a Kvs for this capacity).

(\*\*) Establish option.

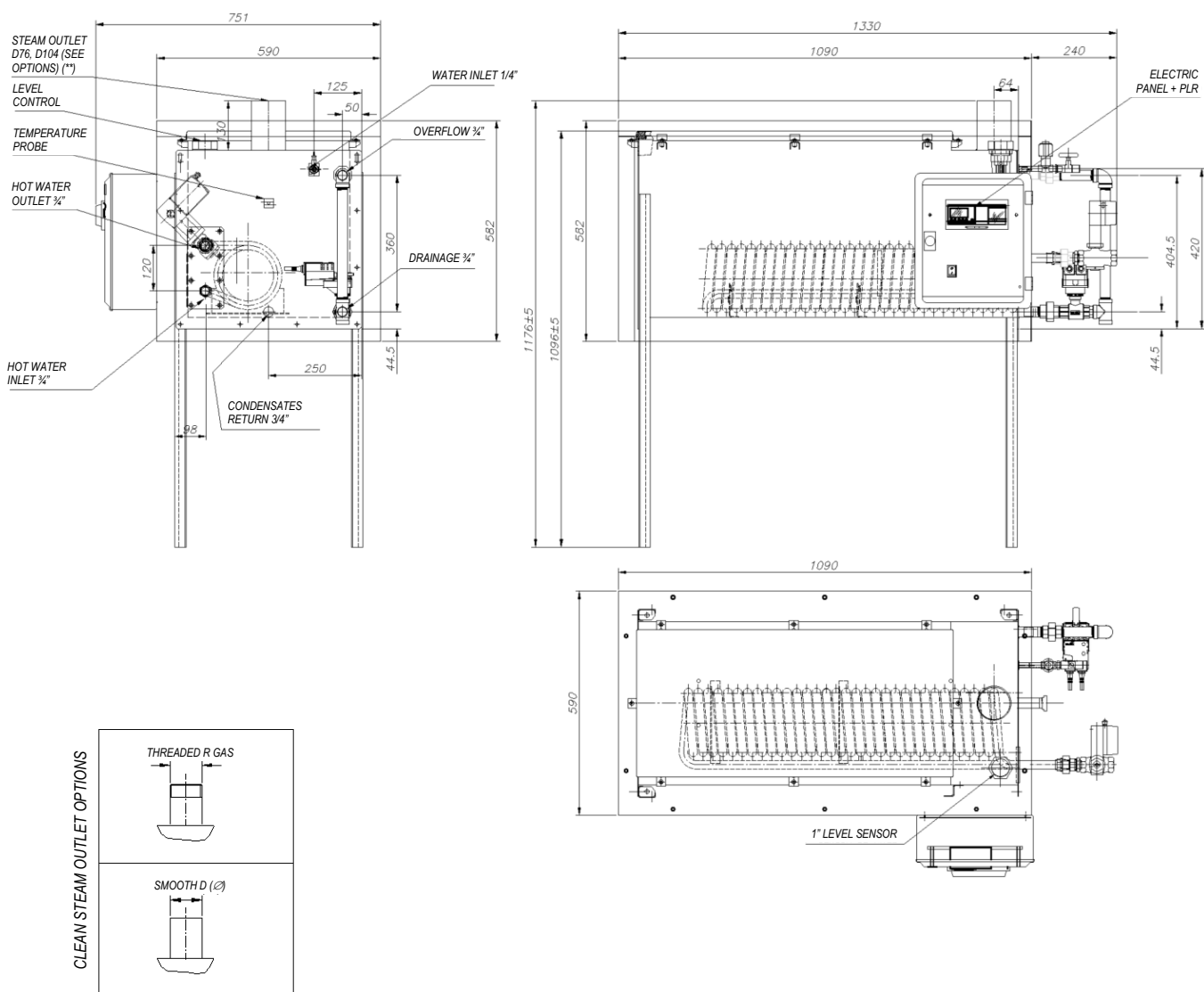


External dimensions: ASC-115 with isolation:

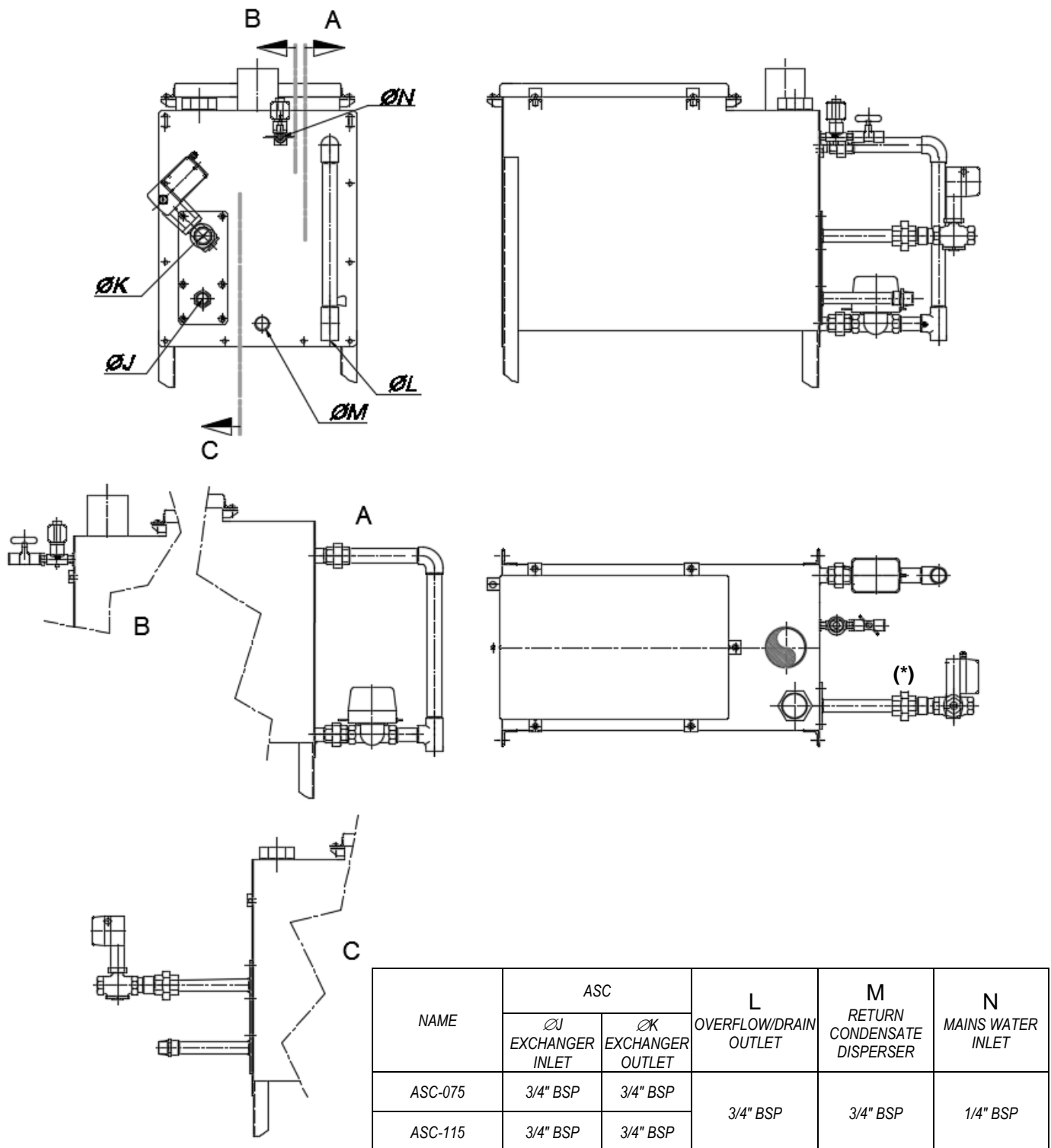
MODEL	CAPACITY (kg/h)	WEIGHTS (kg) OPERATING / LOADING	STEAM OUTLET (**)	
			THREADED	SMOOTH
ASC-115	125 (*)	188/93	2-1/2" GAS	D76, D104

(\*) See yield table according to temperature and superheated water flow. Clean steam capacity limited by the MV1 superheated water valve capacity (ex: If the design capacity is 10 kg / h the MV1 superheated water valve is selected with a Kvs for this capacity).

(\*\*) Establish option.



## 5.8 Valves and connections



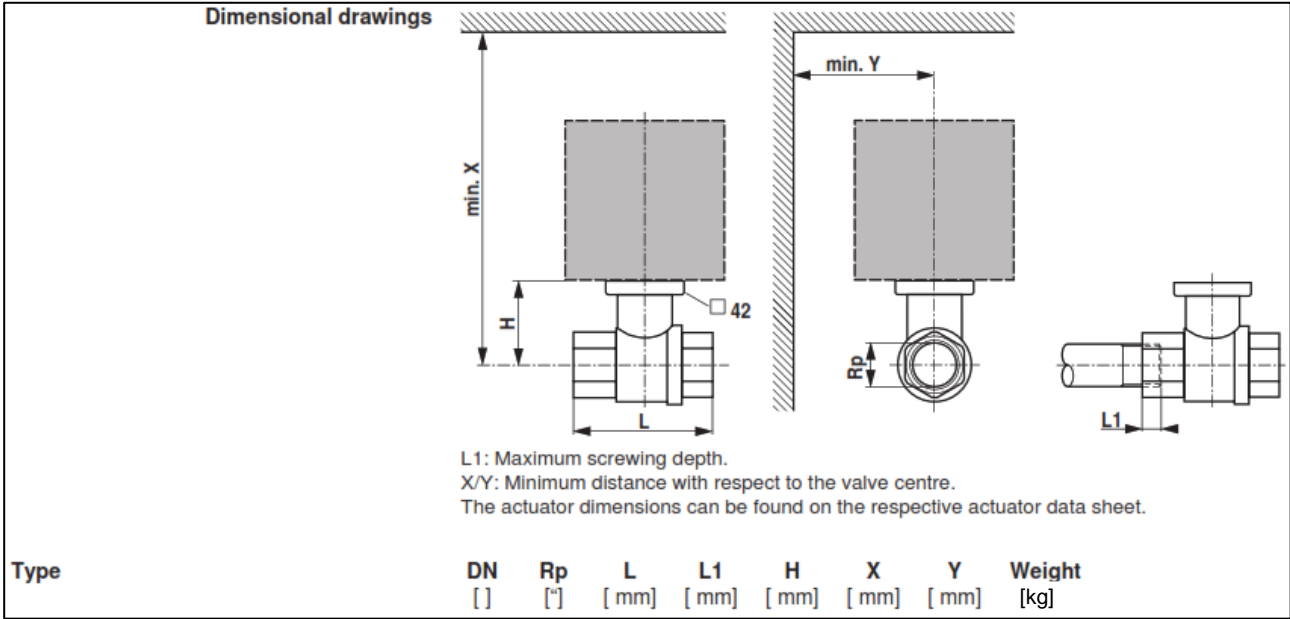
(\*) This 3-piece link may loosen during transport, check its tightness. Recommended tightening torque 17Nm.

5.9 Drain valve & actuator connections

DRAIN VALVE



kvs [ m³/h]	DN [ ]	Rp ["]	PN [ ]
32	20	¾	40



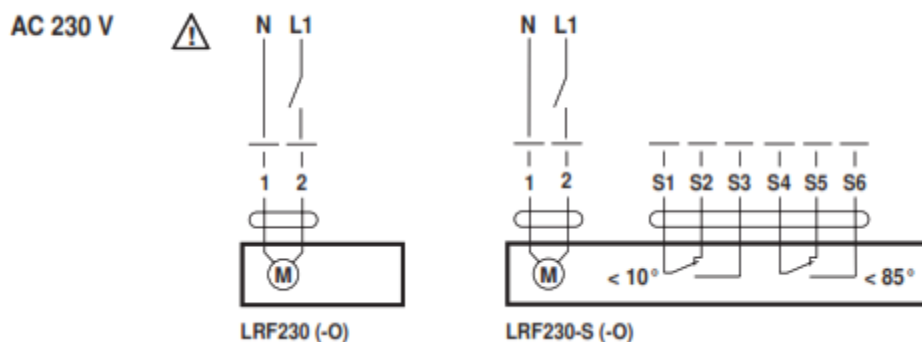
## DRAIN VALVE ACTUATOR

### Technical data

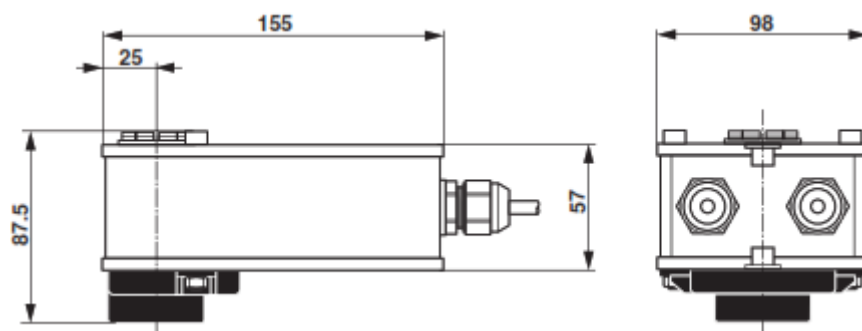
<b>Electrical data</b>	Nominal voltage	AC 230 V, 50/60 Hz
	Power supply range	AC 198 ... 264 V
	Power consumption	5 W at nominal torque
	Spring return	3 W
	Holding position	7 VA
<b>Functional data</b>	Auxiliary switch	2 x SPDT, 3 (0.5) A, AC 250 V II □ Switching points: 10° < fixed, 85° < fixed
	Connection	Motor Cable 1 m, 2 x 0.75 mm <sup>2</sup> Auxiliary switch Cable 1 m, 6 x 0.75 mm <sup>2</sup>
	Parallel connection	Yes (Note performance data for supply!)
	Torque (nominal torque) Motor	Min. 4 Nm at nominal voltage
	Spring return	Min. 4 Nm
<b>Safety</b>	Direction of rotation	LRF230-S Deenergised NC, ball valve closed (A – AB = 0%) LRF230-S-O Deenergised NO, ball valve open (A – AB = 100%)
	Manual override	With hand crank, can be fixed in any position
	Angle of rotation	95° <
	Running time	Motor 40 ... 75 s (0 ... 4 Nm) Spring return ~20 s at ~20 ... 50°C / max. 60 s at ~30°C
	Noise level	Motor Max. 50 dB (A) Spring return ~62 dB (A)
<b>Dimensions / Weight</b>	Service life	Min. 60'000 emergency settings
	Position indication	Mechanical
	Protection class	II Totally insulated □
	Degree of protection	IP54
	EMC	CE according to 89/336/EEC
<b>Dimensions / Weight</b>	Low voltage directive	CE according to 2006/95/EC
	Mode of operation	Type 1 (to EN 60730-1)
	Rated impulse voltage	4 kV (to EN 60730-1)
	Control pollution degree	3 (to EN 60730-1)
	Ambient temperature range	–30 ... +50°C
<b>Dimensions / Weight</b>	Media temperature	+5 ... +100°C (in ball valve)
	Non-operating temperature	–40 ... +80°C
	Ambient humidity range	95% r.H., non-condensating (to EN 60730-1)
	Maintenance	Maintenance-free
	Dimensions	See «Dimensions» on page 2
	Weight	Approx. 1.4 kg (without ball valve)



### Wiring diagram

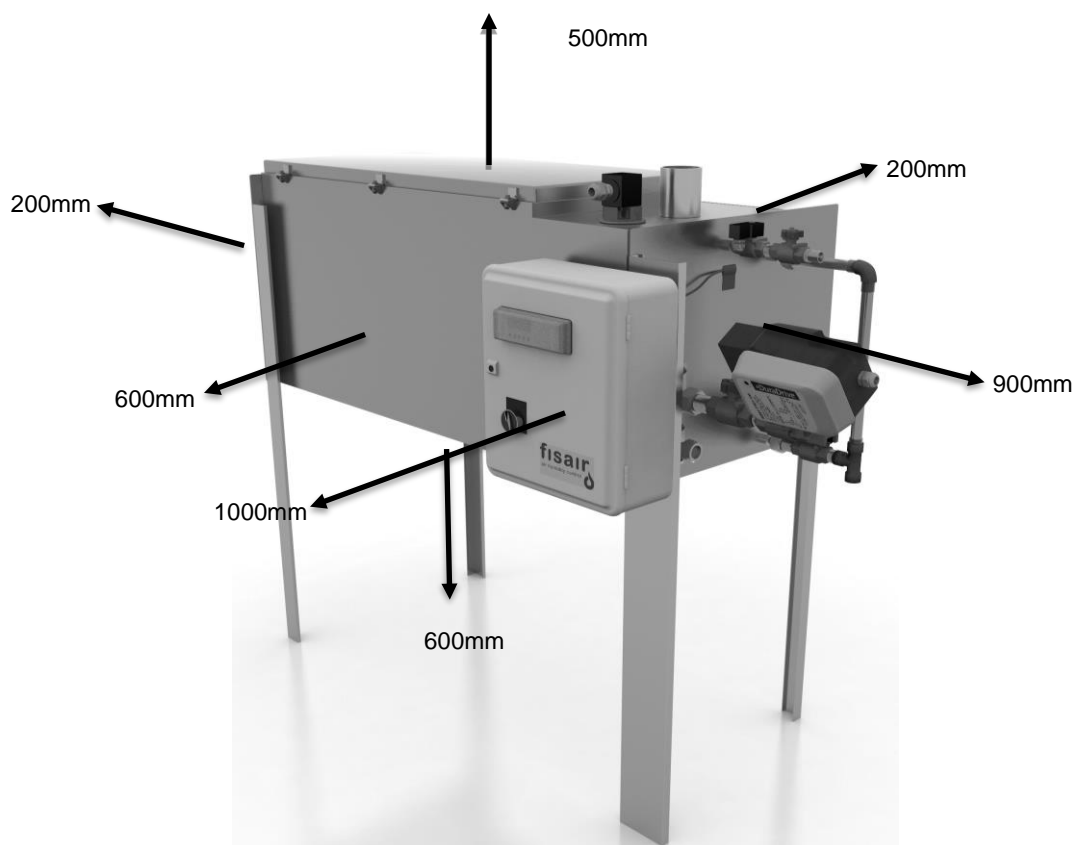


### Dimensions



## 6 Installation

### 6.1 Operating environment service and conditions areas



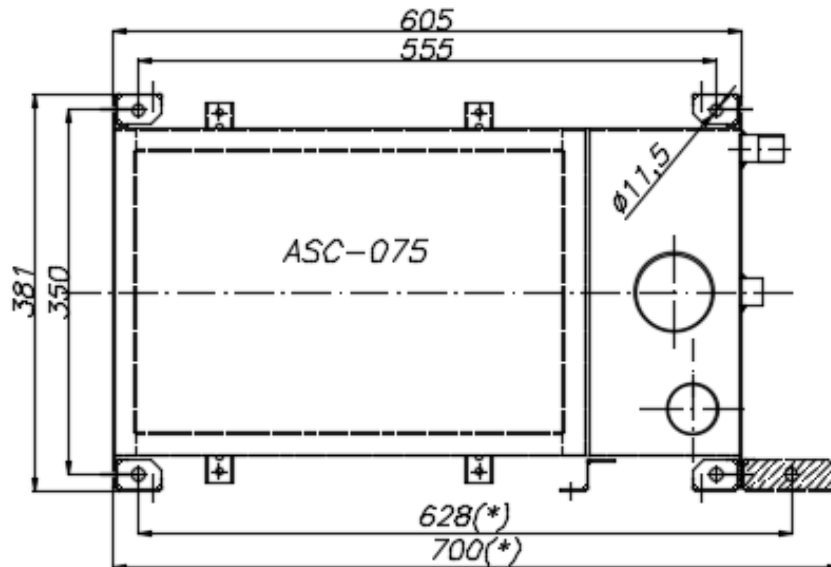
When choosing the installation location, provide the necessary room for periodic inspection and maintenance. In this regard, pay attention to the pipe routes. Avoid placing on critical equipment or processes, to prevent damage if there are leaks. Also avoid locations near electromagnetic sources. Consult the dimension information sheet for each model, and remember the following has to be done periodically:

- ❖ Clean/replace the water filters.
- ❖ Check and re-tighten screws in areas with sealing gaskets.
- ❖ Check for possible dirt inside the equipment when the exchanger is not operating.
- ❖ Verify the operation of the PLR and the connection of the different components.
- ❖ Verify the proper functioning of the different valves.
- ❖ Secure to the ground via the M10 drill holes found at the end of each leg.

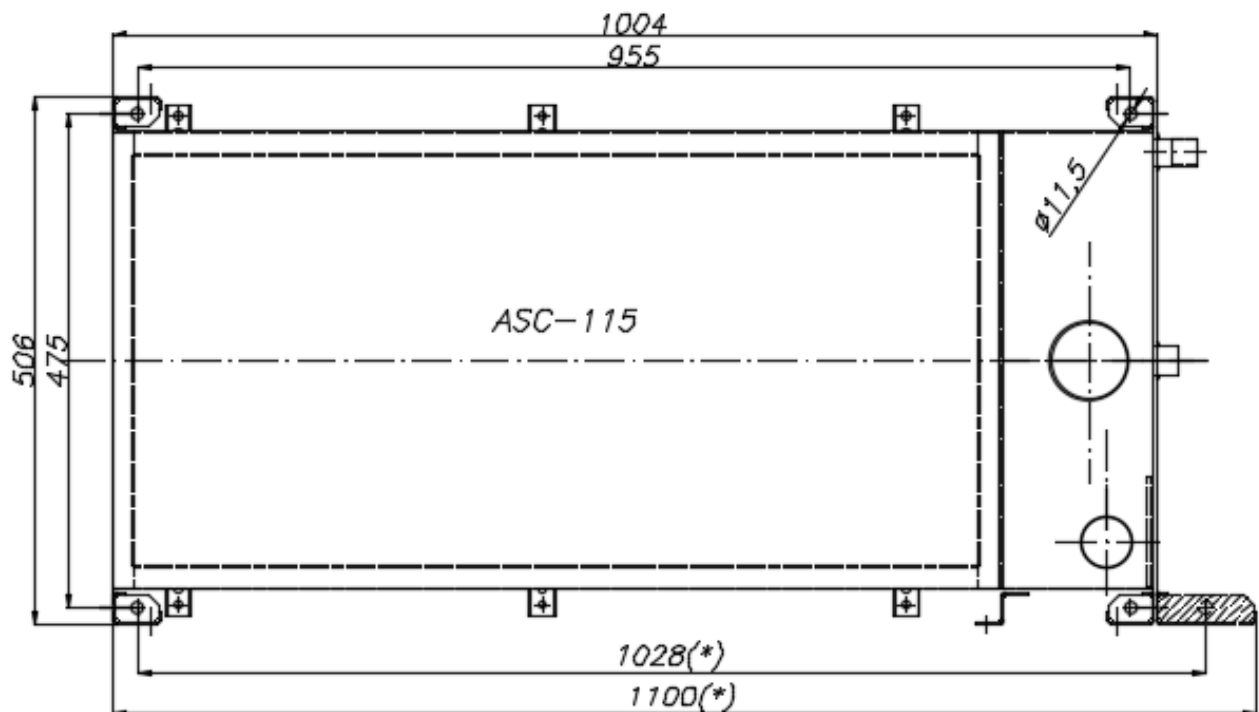
**Note:** Operating area temperature and humidity conditions:

- ❖ Temperature: [-20...+40°C]
- ❖ Relative humidity: [5...95% RH] no condensation.

## 6.2 Fixing of the ASC system to the floor



(\*) ASC without thermal insulation



**Note:** Fix to the floor with the M10 drills that can be found at the end of each leg.

### 6.3 Connection to the mains power supply



#### Attention

This equipment operates at elevated temperatures, so it must be connected to the electrical supply by qualified personnel following the applicable Electrical Regulations using temperature resistant wiring to at least 100°C.



#### Attention, Live Current

The equipment is intended for indoor installation with IP44 degree of protection for electrical equipment. The unit must be connected to the mains power supply of the installation using a power line protected against short-circuits and grounded to earth, with the cross-section and sensitivity required for each model's power rating.

The earth terminal must be made of solid metal-to-metal connections and a good radio frequency interference (RFI) conductor to earth (multi-conductor conductors).

The earth wire must have the same AWG size (mm<sup>2</sup>) as the power wiring or size according to the IEC 60364 standard requirements.

The power source is 230V/I+N/50Hz or 120V/I+N/60Hz

The equipment incorporates a terminal strip in its electrical panel to make the connection according to current regulations.

### 6.4 Mains or treated water supply

A table of required values for each type of water is attached. Damage caused by chlorine corrosion is not covered by the FISAIR guarantee policy.

**Note:** When the quality of the water exceeds a conductivity of 350 µS / cm, a water treatment is recommended to reduce its conductivity.

Chlorides			Total hardness	pH		Silica
Drinking water	Softened water	Deionised water	Drinking water	Drinking water	Softened or deionised water	< 15 ppm
< 15 ppm	< 10 ppm	< 5 ppm	< 200 ppm	6-8	7-8	

## 6.5 Insulation and thermal fluids supply

Models that use superheated water must be connected to the thermal fluid supply according to the regulations applicable in each case and according to good practice. The fluid transport pipes will carry de-aerators, traps, filters, cut-off valves and measuring instruments requesting the type of exchanger supplied.

Special care must be taken when levelling equipment, since a small imbalance could cause it to not work properly.

According to the additional technical instructions standard, ITE 02.15.2 Hot Surfaces:

*“Except for the surfaces of the heat-emitting components, any equipment surface that can be touched accidentally must have a temperature lower than 60°C or be protected, where necessary ...”, and appendix 03.1 of the same ITE, Minimum thermal insulation thickness: “Equipment components (e.g. devices, appliances, pipes and accessories) must have thermal insulation with the minimum thickness outlined below when they contain fluids at temperature: Lower than the environment, above 40°C and located in unheated rooms, including conduits, galleries, machine rooms and similar ...”* This type of equipment should be thermally insulated.

For equipment supplied without insulation, the customer must implement an insulating material in accordance with the requirements of the standard “UNE-EN ISO 13732-1: 2007. Methods for the evaluation of human response to contact with surfaces. Part 1: Hot surfaces. (ISO 13732-1: 2006)” which establishes the following reference:

Burn thresholds for contact periods of 1 min and longer			
	Burn thresholds for contact periods of:		
Material	1 min	10 min	8 hour or longer
Uncoated metal	51	48	43
Coated metal	51	48	43
Ceramic materials, glass and stone materials	56	48	43
Plastics	60	48	43
Wood	60	48	43

In this manual, the recommended tubing assembly diagram (6.8) is attached.

## 6.6 PLR microprocessor

The PLR that this type of equipment assembles is a programmable device for real time operational management and supervision of the different equipment components connected to it, working from the on-board display or a remote location.

Integration in the management and operational supervision with the PLR makes it possible to achieve a faster, simpler, more precise and reliable operation of the humidifier, as well as reducing the wiring needed for the electrical board.

The different components that can be assembled in the ASC equipment series means the series has a high range of combinations; therefore, the electrical diagram and PLR management protocol are attached according to the components assembled on the equipment.

The PLR management protocol and the electrical diagram can be found in the appendices of this manual.

**Note:** The automatic program has been designed, so that both its execution, and the actions and/or reactions that are produced in the machine and its surroundings, do not affect the degree of safety or functionality for which said machine has been designed, while also respecting the directive on electromagnetic compatibility.



### Attention

Deleting and/or modifying the said program contained in the PLR, run from the onboard display or from an online PC, will modify the terms and conditions of the guarantee, as well as affecting compliance with the explicit directives and standards that cover its manufacture. The installer, handler or user shall therefore bear full responsibility for any repercussions arising from the unit's modified functionality.



### Attention

The device programmed is not covered by the safety measures against personal injuries. For this purpose, a series of passive safety fittings are installed.

## 6.7 Installation and connection of control equipment

The location and assembly instructions of the control components are normally specified by their supplier.

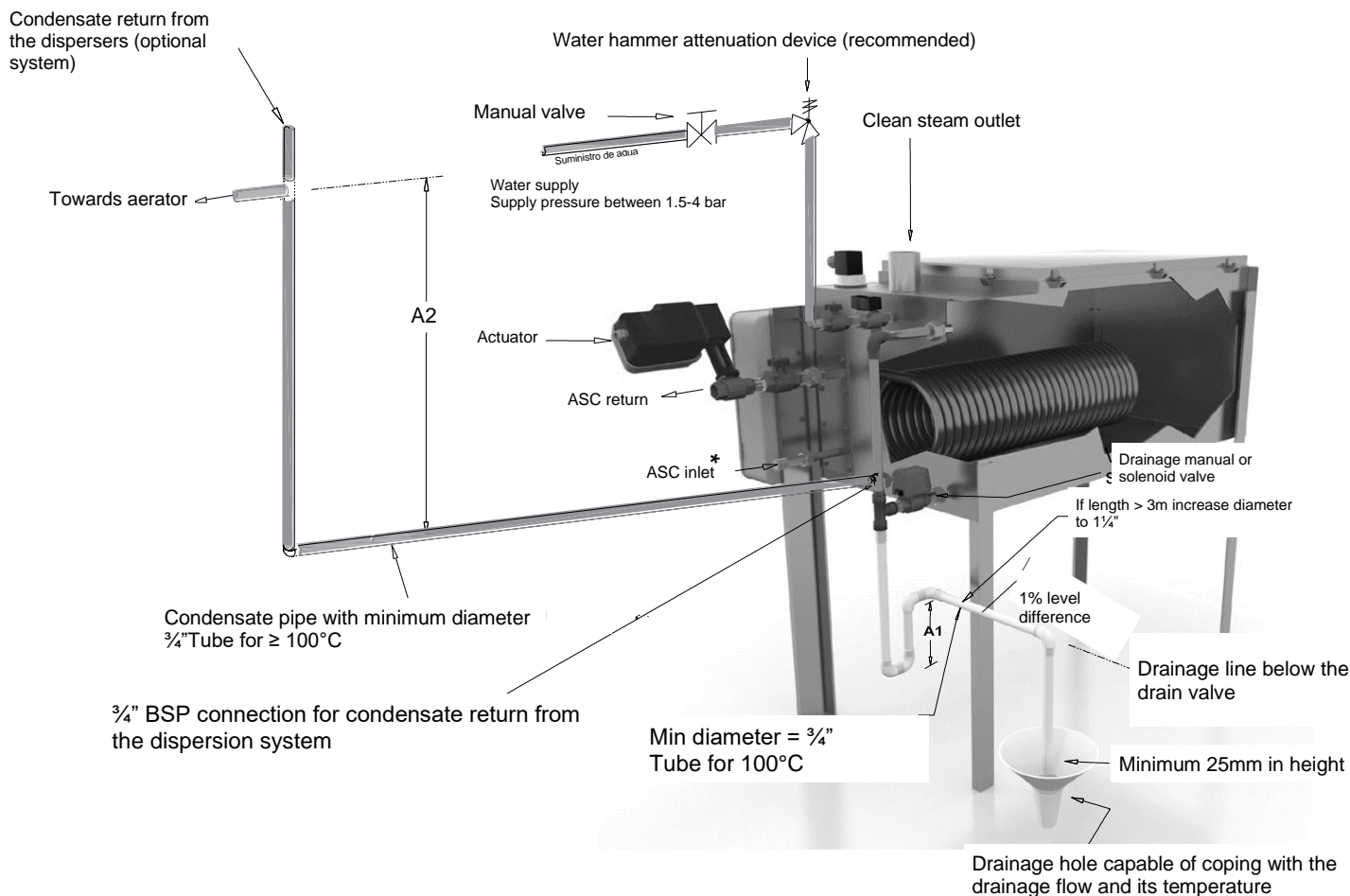
The operation of the proportional actuator of the valve that modulates the variable step of superheated water will be done by an external analogue signal [0...10] Vdc from the regulator/controller system that will command it or it can be operated manually, setting the desired valve opening value 0-100% in the PLR.

There are also two remote monitoring connections, without voltage, to check for the proper operation of or a fault in the equipment.

There is also a connection (H1) to connect an all/nothing digital signal from a possible hygostat or controller/regulator to stop or start the equipment.

**Note:** The electrical diagram is required to connect the power supply, the logic signal [0...10] Vdc and the remote monitoring connections.

## 6.8 Drinking or treated water and pressurized water connection



The drain valve must be manual for deionised water and the water supply pipe must be able to withstand 100°C.

	HEIGHTS A1 and A2	
Capacity (kg/h)	Water trap height (A1 in)	Aerator height (A2 in mm)
< 50	300	700
50-80	400	800
> 80	475	850

**ISOLATION VALVE (\*)** The installer must fit a consignable isolation valve, which is not part of the delivered components, in the superheated water supply. The superheated water supply valve must be consigned by means of a "loto device" that must be complied with by the installer.



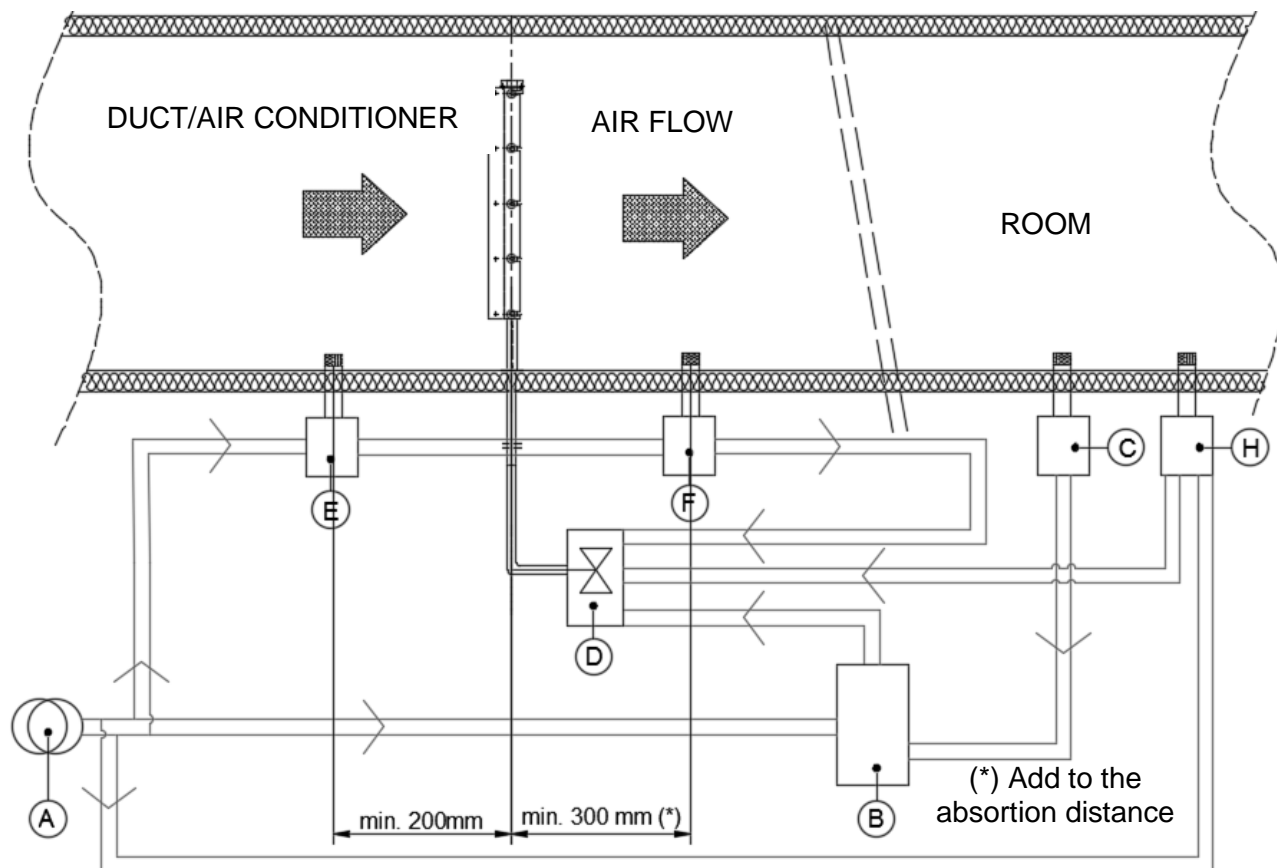
## Installation notes

1. The water supply is 25mm above the overflow line, thus eliminating a possible counter current.
2. If the water supply pipe is not metallic, a 50mm water trap is recommended to isolate the steam during maintenance.
3. Move the equipment away from the floor drain (it should never be placed on top), due to the possible formation of steam in the drain or overflow of hot water. This steam could affect the DIPHUSAIR ASC electrical components.
4. Damage caused by chlorine corrosion is not covered by the FISAIR guarantee policy.
5. It is also advisable to install Y-filters at the ASC inlet and water supply. These will be from the section of the pipe used.

## 6.9 Installation of control and location of sensors

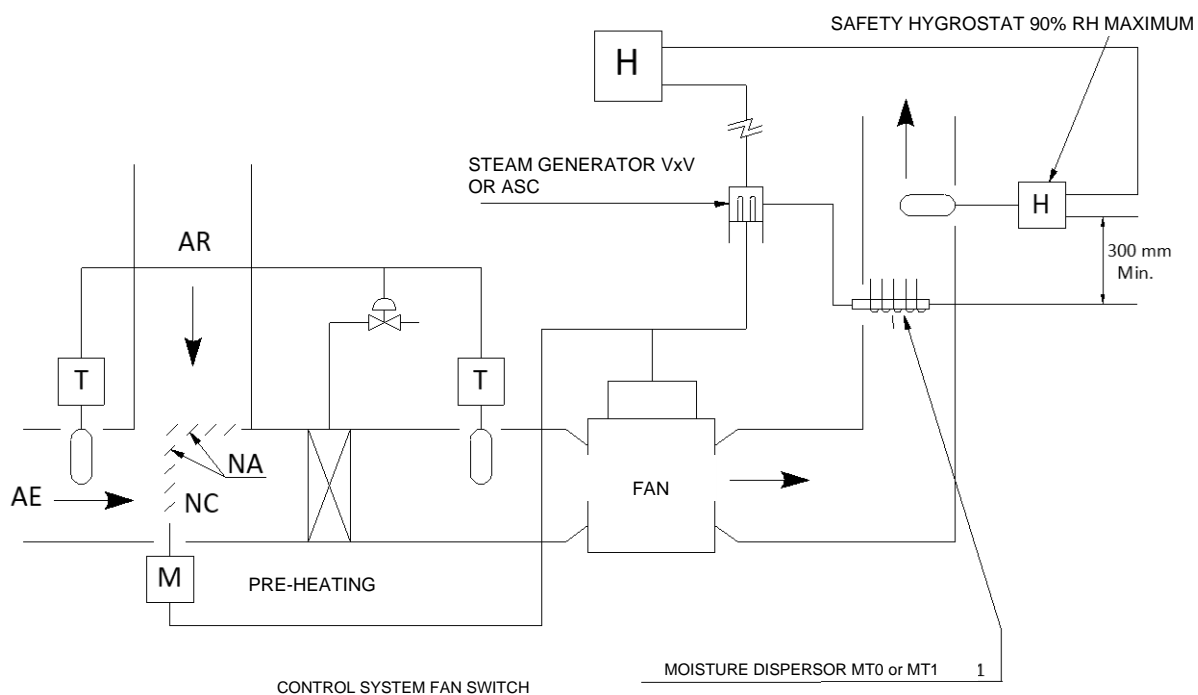
The location of the sensors has a significant impact on the operation of the humidifier. It is recommended not to exchange the conduit sensors with the room sensors, since each is calibrated for a certain air velocity.

The proposed assemblies appear below. Some components must be supplied by the installer.

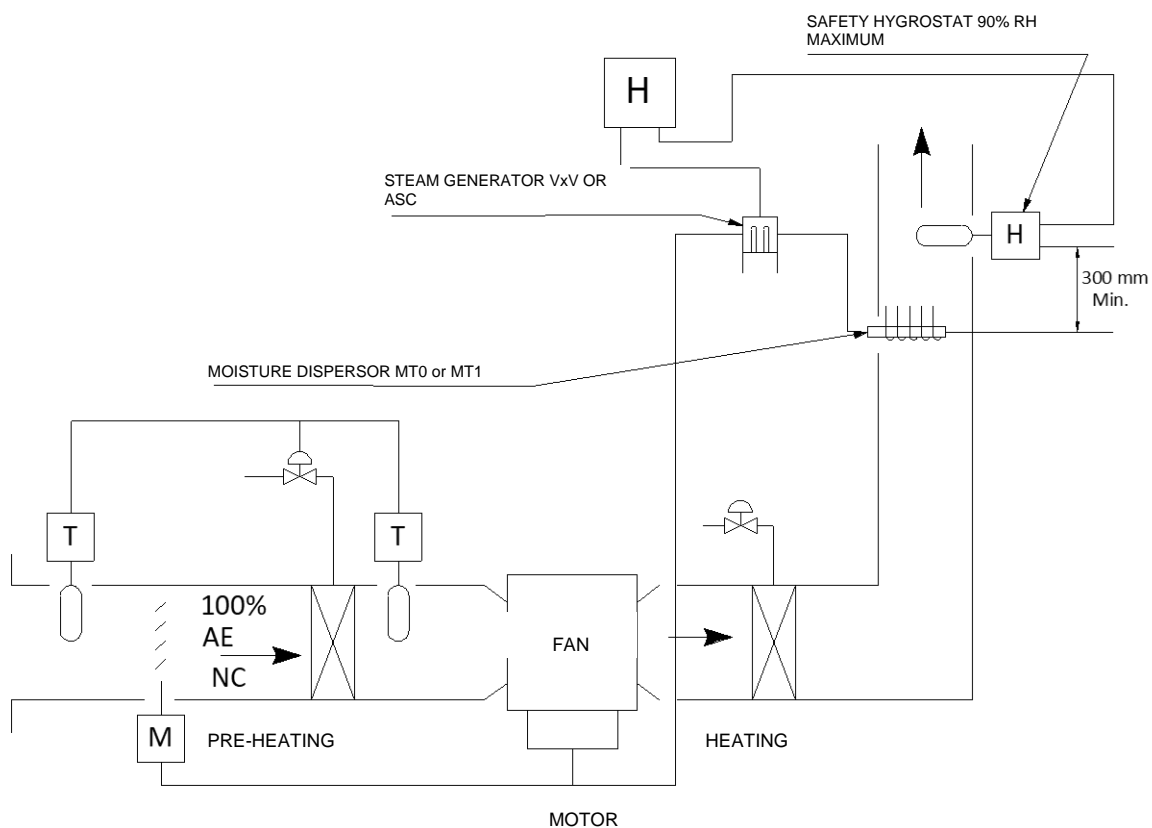


A	Transformer	F	Maximum humidity cut-off hygostat
B	Humidity Regulator	H	Humidistat (R.H.) with environmental/room or duct/AHU active probe
C	Double active probe (temperature and humidity R.H.), for duct/ AHU or room		
D	Steam generator control panel		
E	Flow switch		

### DUCT INSTALLATION WITH RETURN AND EXTERIOR AIR WITH PRE-HEATING



### DUCT INSTALLATION WITH 100% EXTERIOR AIR AND 2 HEATING STATIONS



## 7 Connection to the DIPHUSAIR MT1, MT0 or MT2 steam dispersion system

It is important that the dispersion system is placed where there is no possibility of condensation in the duct; neither upstream nor downstream. In general, the best position is after the heating coil or in the area where the temperature is higher, since, with high temperatures, the absorption distance is shorter.

It should not be placed near a filter, or where the flow can hit a metal surface head-on, or where it can affect the firefighting or smoke detection system.

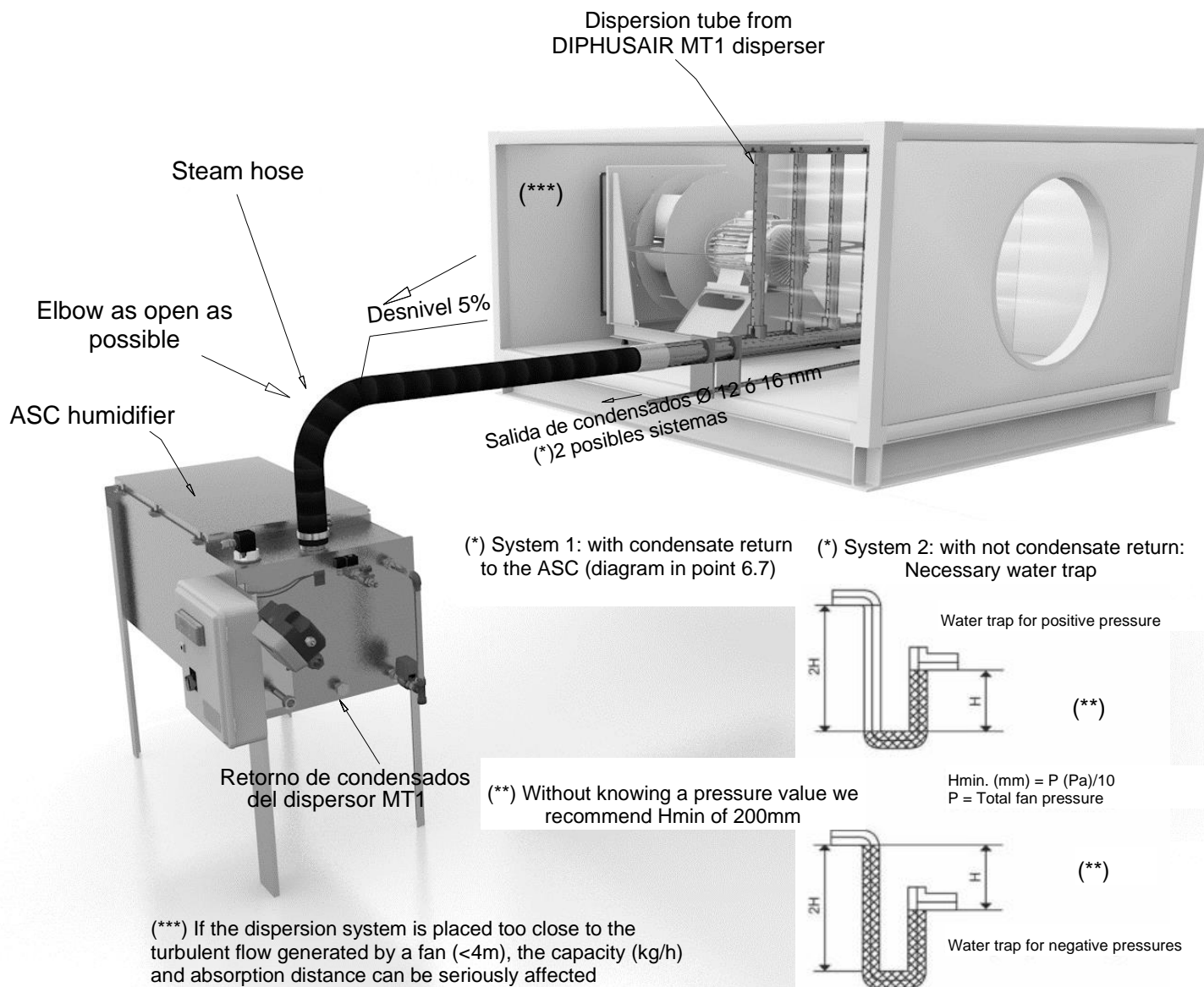
All recommendations for the application of DIPHUSAIR series are based on tests and field experience. However, these recommendations are based on duct air velocities, pressures and temperatures that are most encountered, and the recommendations may have to be modified when air flow velocities or pressures are high and/or air temperatures low. We also reserve the right to modify recommendations without notice if subsequent test or experience indicate that a change should be made. For the reason we urge you to check all applications with your FISAIR contact before installation.

**Note 1:** For the installation prior to filters, contact FISAIR since the absorption distances vary and the capacity may be affected.

**Note 2:** It is not recommended to install the disperser in areas where the air flow has a pressure greater than or equal to +500Pa (positive pressure), -500Pa (negative pressure). Contact Fisair for other pressures.

**Note 3:** If the dispersion system is placed too close to the turbulent flow generated by a fan (<4m), the absorption capacity (kg / h) and distance can be seriously affected.

## 7.1 Above the ASC humidifier



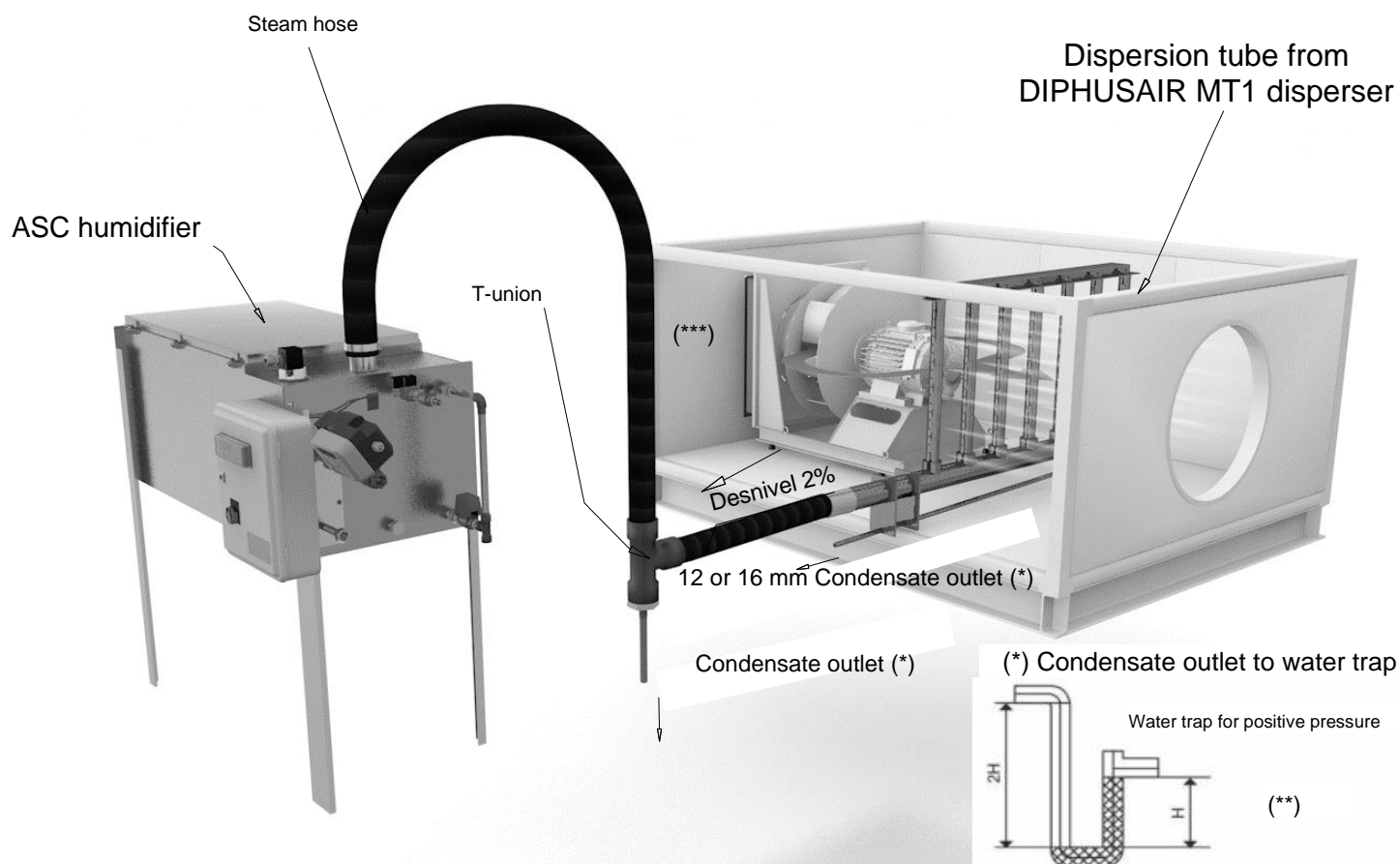
This installation example is also valid for MT0 & MT2(NP).

In system 2, the water outlet connection to the drain must have a water trap of sufficient height (2H) to overcome the pressure of the system and ensure the condensate is completely drained.

There must be a minimum height of 25mm between the end of the water trap and drain.

The water trap and drain must be able to withstand temperatures higher than 90°C.

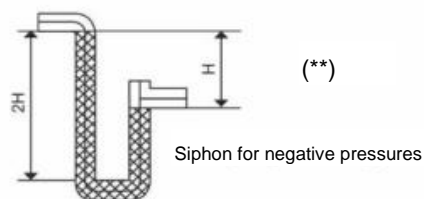
## 7.2 Below the ASC humidifier



(\*\*\*) If the dispersion system is placed too close to the turbulent flow generated by a fan (<4m), the capacity (kg / h) and absorption distance can be seriously affected

(\*\*) Without knowing a pressure value we recommend Hmin of 200mm

$H_{min. (mm)} = P (Pa) / 10$   
P = Total fan pressure



This installation example is also valid for MT0 & MT2.

There must be a minimum height of 25mm between the end of the water trap and drain.

The water trap and drain must be able to withstand temperatures higher than 90°C.

### 7.3 Tube to be used for the connection between the ASC humidifier and MT1, MT0 or MT2(NP) dispersion system.

A special flexible hose for the steam should be used. No more than 3m of flexible hose should be used between the ASC exchanger and the DIPHUSAIR MTx dispersion system.

Flexible steam hose			Rigid copper or stainless steel tube		
Size Ø [mm]	Maximum capacity [Kg/h]	Maximum recommended length [m]	Size Ø [mm]	Maximum capacity [Kg/h]	Maximum recommended length [m]
25	25	Recom 3, max 5	25	23	5
40	65	Recom 3, max 5	40	60	7
50	123	Recom 3, max 5	50	120	8
76	200	Recom 3, max 5	76	204	22
104	340	Recom 3, max 5	104	320	28

1. Use FISAIR flexible tubing for the best results. Other tubing may last less time or may cause foaming in the evaporation chamber, resulting in condensate discharge into the dispersion system. Do not use flexible tubing for outdoor applications.
2. The maximum recommended length is 3m, as longer lengths can cause the tube to twist or create lower points.

Description	SizeØ [mm]	Steam losses [kg/h/m]		Insulation thickness [mm]
		No insulation	Insulation	
Flexible tubing	25	0.20	-	-
	40	0.25	-	-
	50	0.32	-	-
	76	0.41	-	-
	104	0.53	-	-
Rigid tubing	25	0.18	0.028	50
	40	0.20	0.033	50
	50	0.27	0.040	65
	76	0.36	0.049	65
	104	0.49	0,061	75

Note: Data taken at room temperature of 25°C

## 8 Recommendations for commissioning

### 8.1 Launching

**IMPORTANT** Request start-up of your units by contacting:

[sat@fisair.com](mailto:sat@fisair.com) o [service@fisair.com](mailto:service@fisair.com)

<https://fisair.com/es/servicio/puestas-en-marcha/> (application in Spanish)

<https://fisair.com/service/start-ups/> (application in English)

Once the equipment has been connected to the air ducts, mains power supply and control components, where appropriate, the equipment commissioning process should be done as follows:



#### Attention

Before acting on the equipment electrical panel controls, check that its mechanical components can act freely, without being impeded by installation component assembly items.

Check the following points:

1. The humidifier is properly levelled before being filled and after filling (this point is critical).
2. Check the correct installation according to point 6 "Installation":
  - 2.1 Service and operating environment condition spaces are as according to point 6.1.
  - 2.2 Connection to the mains network according to specifications, according to Electrical diagram and in compliance with local regulations (point 6.2).
  - 2.3 Connection to the thermal fluid supply, treated or mains water and drainage according to point 6.
  - 2.4 Make sure that the isolating or shut-off valve for the superheated water supply is open
  - 2.5 Installation and connection of the control equipment according to point 6.6 and PLR management protocol (annex to this manual).

3. Press the equipment main switch on. Check that the green **ON** light is lit. Check the proper functioning of the PLR and follow its management protocol in the annex to this document.

After turning on the equipment, check that:

- ❖ The earth connection is properly made.
- ❖ The input signals are consistent with the expected values.
- ❖ After opening the water supply, the drain valve is closed.
- ❖ Check that the tank is full and reaches the minimum level (input C of the PLR active according to point 5.2, PLR connection status) and open the steam valve.
- ❖ The maximum level is reached (input E of the PLR active, according to PLR protocol point 5.2, PLR connection status) and close the solenoid filling valve after defoaming.

4. Perform the defoaming control according to point 8.2.

**Note:** It is advisable to check the electrical consumption of the main electrical components are in accordance with the nominal values.

After the equipment has reached its operating regime (at least 30 minutes), make the relevant temperature and humidity measurements.

## 8.2 Defoaming

The duration of defoaming determines the amount of water cleaned with each filling cycle. This means that since the maximum level is reached a waiting time is programmed until the filling solenoid valve EV1 is cut off.

Defoaming reduces the need for frequent cleaning of the humidifier. Each time the tank fills, it fills to the overflow level. A part of the fill water flows through the overflow towards the drainage, removing minerals left by the evaporation cycle and preventing surface residues.

Hot water flowing through the drain are operating costs. FISAIR recommends the user observes and controls the water supply  $\frac{1}{4}$ " needle valve to adjust the defoaming time and achieve a balance between reducing mineral build-up and conserving hot water.

## 8.3 Equipment shutdown

The equipment can be put out of service by closing the steam valve, either manually or automatically.

### **Manual:**

Press the equipment main switch.

### **Automatic:**

- The hygrostat or controller can turn the equipment off by the digital H1 all/nothing connection signal.
- The controller that emits the analogue signal [0...10] Vdc commanding the steam valve proportional actuator demands 0 kg/h of steam from a 0 Vdc signal.
- Any error arises that activates the fault alarm completely closes the steam valve.

## 8.4 Safety and control components

In addition to the usual electrical component protective devices, the humidifier electrical panel incorporates the following safety and control components:

**Note:** All the components act on the PLR if there is a failure. Go to the PLR management protocol.

- Pt100 sensor on the external housing: In conjunction with the PLR, it acts as a thermometer and thermostat.
- Float level detector (feed water > 100  $\mu\text{S}/\text{cm}$ , from the mains or softened); its 3 positions are as shown in point 5.5

## 9 Maintenance

**IMPORTANT** Request maintenance of your units by contacting:

[sat@fisair.com](mailto:sat@fisair.com) o [service@fisair.com](mailto:service@fisair.com)

<https://fisair.com/es/servicio/mantenimientos/> (application in Spanish)

<https://fisair.com/service/maintenance/> (application in English)



### Attention

Before performing maintenance, the equipment must have been turned off long enough for the equipment to cool down and the water in the tank to be completely drained. All supply valves must be closed.

### Preventive maintenance

The maintenance requirements vary according to the water quality, as the potable/softened water carries a variety of minerals according to the geographical area. Hard water (with a high mineral content) requires more frequent cleaning and more drainage/rinsing cycles. Softened water reduces mineral build-up inside the humidifier.

The following table is indicative:

ACTION	PERIODICITY
Cleaning the filters	Every 3 months
Inspect the proportional valve actuator.	Every 3 months
Inspect interior and valves in general (e.g. surfaces, operation, level switch and presence of foreign matter).	Every 2 months
Switchgear and wiring connections.	Every 2 months
Drinking/softened water: inspection and cleaning of drainage pipe; check foam drainage and clean possible mineral accumulations	Every 3 months
Deionised water: check the float valve closure	Every 3 months
General cleaning	Annual

## **Corrective maintenance**

The FISAIR superheated water exchanger humidifier is a very simple device whose components will fail very few times.

The valves and level switch are standard and may require repair as with any other mechanical or electrical failure, and are not described in this manual. The exchanger may need repairing or long-term replacement, as with any other conventional heat exchange element.

Similarly, minor components such as the seals and electrical panel components may need to be replaced in the long term. Each user can decide for himself whether to keep a store of replacement parts depending on the lead time to procure them from local distributors of this conventional material.

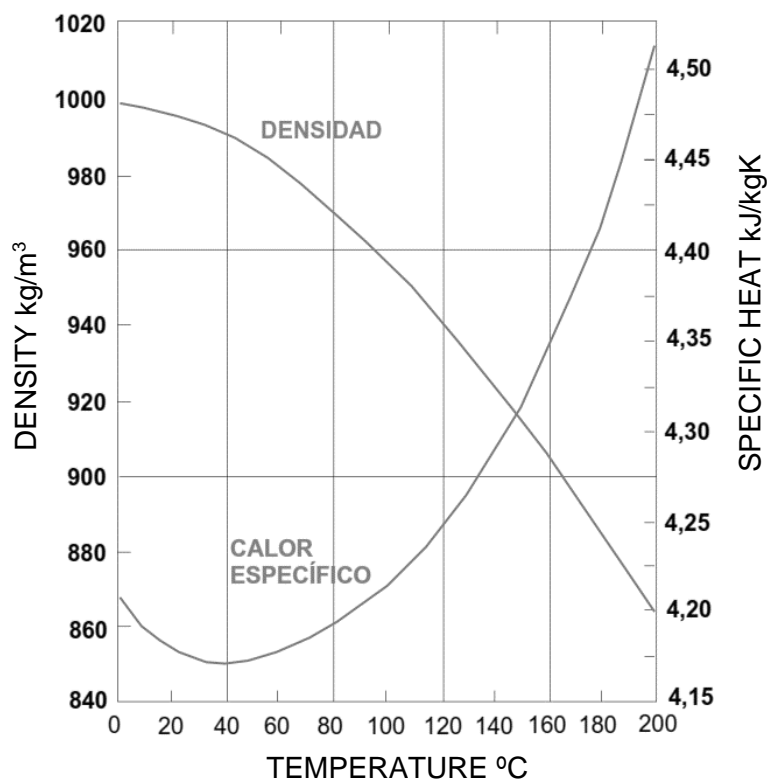
## **10 Troubleshooting**

When a fault occurs, it will be indicated in point 6 of the PLR management protocol (Cause and effect of possible operating failures). If a fault occurs, turn off the humidifier immediately via the main switch. Faults must be resolved exclusively by qualified personnel in accordance with the safety instructions.

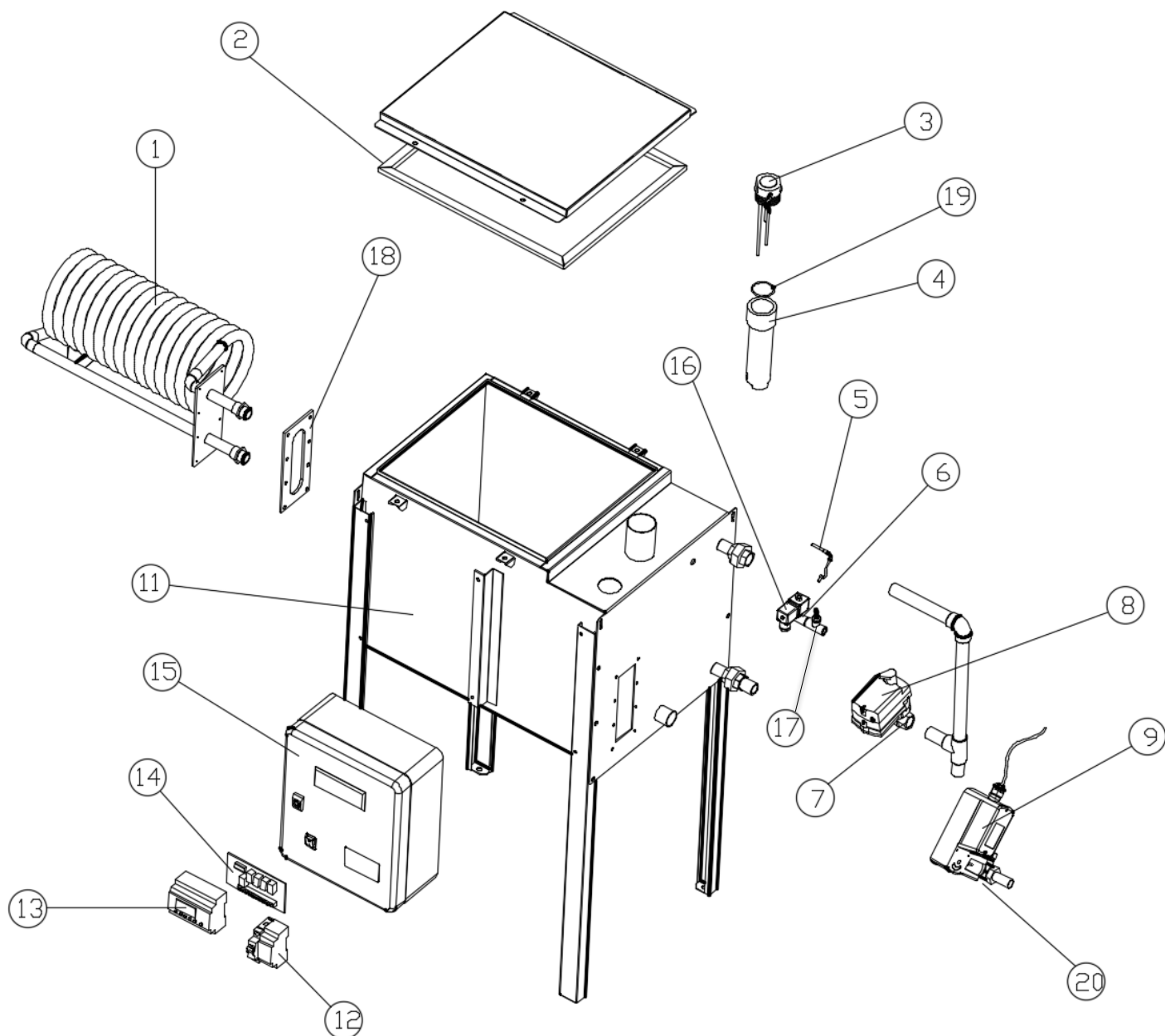
## 11 Water properties

PRESSURE kPa (abs.)	TEMPERATURE °C	SPECIFIC VOLUME		INTERNAL ENERGY		ENTHALPY		ENTROPY	
		Liquid m <sup>3</sup> /kg·10 <sup>-3</sup>	Steam m <sup>3</sup> /kg	Liquid kJ/kg	Steam kJ/kg	Liquid kJ/kg	Steam kJ/kg	Liquid kJ/kg·K	Steam kJ/kg·K
100	99.6	1.043	1.69	417.4	2506.1	417.5	2675.5	1.3	7.36
125	105.9	1.048	1.37	444.2	2513.5	444.3	2685.4	1.37	7.28
150	111.4	1.053	1.16	466.9	2519.7	467.1	2693.6	1.43	7.22
175	116.1	1.057	1	486.8	2524.9	486.9	2700.6	1.48	7.17
200	120.2	1.061	0.89	504.5	2529.5	504.7	2706.7	1.53	7.13
225	124	1.064	0.79	520.5	2533.6	520.7	2712.1	1.57	7.09
250	127.4	1.067	0.72	535.1	2537.2	535.4	2716.9	1.61	7.05
275	130.6	1.07	0.66	548.6	2540.5	548.9	2721.3	1.64	7.02
300	133.6	1.073	0.61	561.2	2543.6	561.5	2725.3	1.67	7
325	136.3	1.076	0.56	572.9	2546.4	573.3	2729	1.7	6.97
350	138.9	1.079	0.52	583.9	2548.9	584.3	2732.4	1.73	6.94
375	141.3	1.081	0.49	594.4	2551.3	594.8	2735.4	1.75	6.92
400	143.6	1.084	0.46	604.3	2553.6	604.7	2738.6	1.78	6.89
450	147.9	1.088	0.41	622.8	2557.6	623.3	2743.9	1.82	6.86
500	151.9	1.093	0.37	639.7	2561.2	640.2	2748.7	1.86	6.82
550	155.5	1.097	0.34	655.3	2564.5	665.9	2753	1.89	6.79
600	158.9	1.101	0.32	669.9	2567.4	670.6	2756.8	1.93	6.76
650	162	1.104	0.29	683.6	2570.1	684.3	2760.3	1.96	6.73
700	165	1.108	0.27	696.4	2572.5	697.2	2763.5	1.99	6.71
750	167.8	1.112	0.26	708.6	2574.7	709.5	2766.4	2.02	6.68
800	170.4	1.115	0.24	720.2	2576.8	721.1	2769.1	2.05	6.66

Density and Specific Heat v Temperature

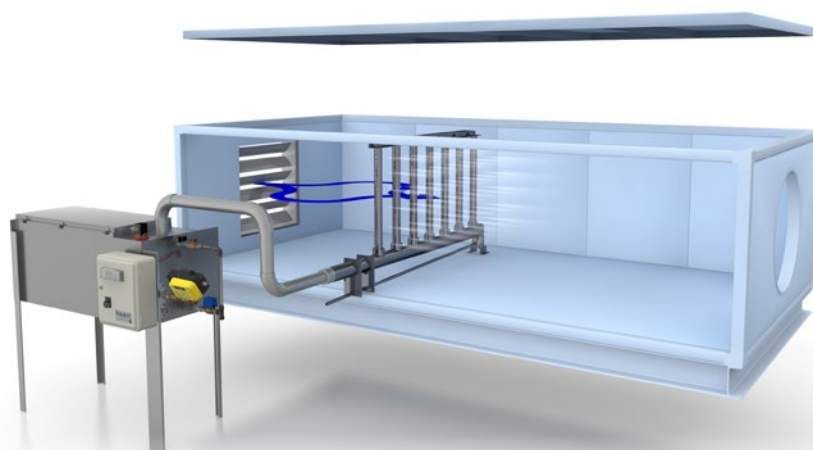


## 12 List of spare parts



Item	Code	Component
1	51310010	ASC-75 heat exchanger
	51310011	ASC-115 heat exchanger
2	62410081	Silicone gasket maintenance cap ASC-75
	62410083	Silicone gasket maintenance cap ASC-115
3	64220328	Float level sensor
4	44050060	Level sensor cover
5	64220021	Temperature probe PT100
6	63310003	Filling solenoid valve
7	63330060	Drain motor-valve body & actuator
8		
9	65620005	ASC control valve actuator
11	ASC serial number required	Tank
12	20650010	Power supply
13	64140005	PLR with screen
14	52000002	PCB SEF-011
15	52100025	Control panel
16	64510111	Solenoid valve coil
17	62010004	Filling needle valve
18	42090001	Silicon gasket exchanger
19	62410020	Level sensor O-ring
20	ASC serial number required	ASC control valve

## Annex



**Diphusair ASC  
connection with  
Diphusair MT1  
steam disperser  
in the AHU**

#### Diphusair ASC steam humidifier technical data

Modelo		ASC-75	ASC-115
Superheated water maximum pressure	kPa (G)	415,7	
Total electrical power	[W]	75	
Mains electrical connection		230V / I+N / 50Hz	
Steam pressure	kPa (G)	<4	
Maximum superheated water temperature	[°C]	145	
Maximum chassis temperature	[°C]	98	

#### Capacities and pressure drop of Diphusair ASC steam humidifiers

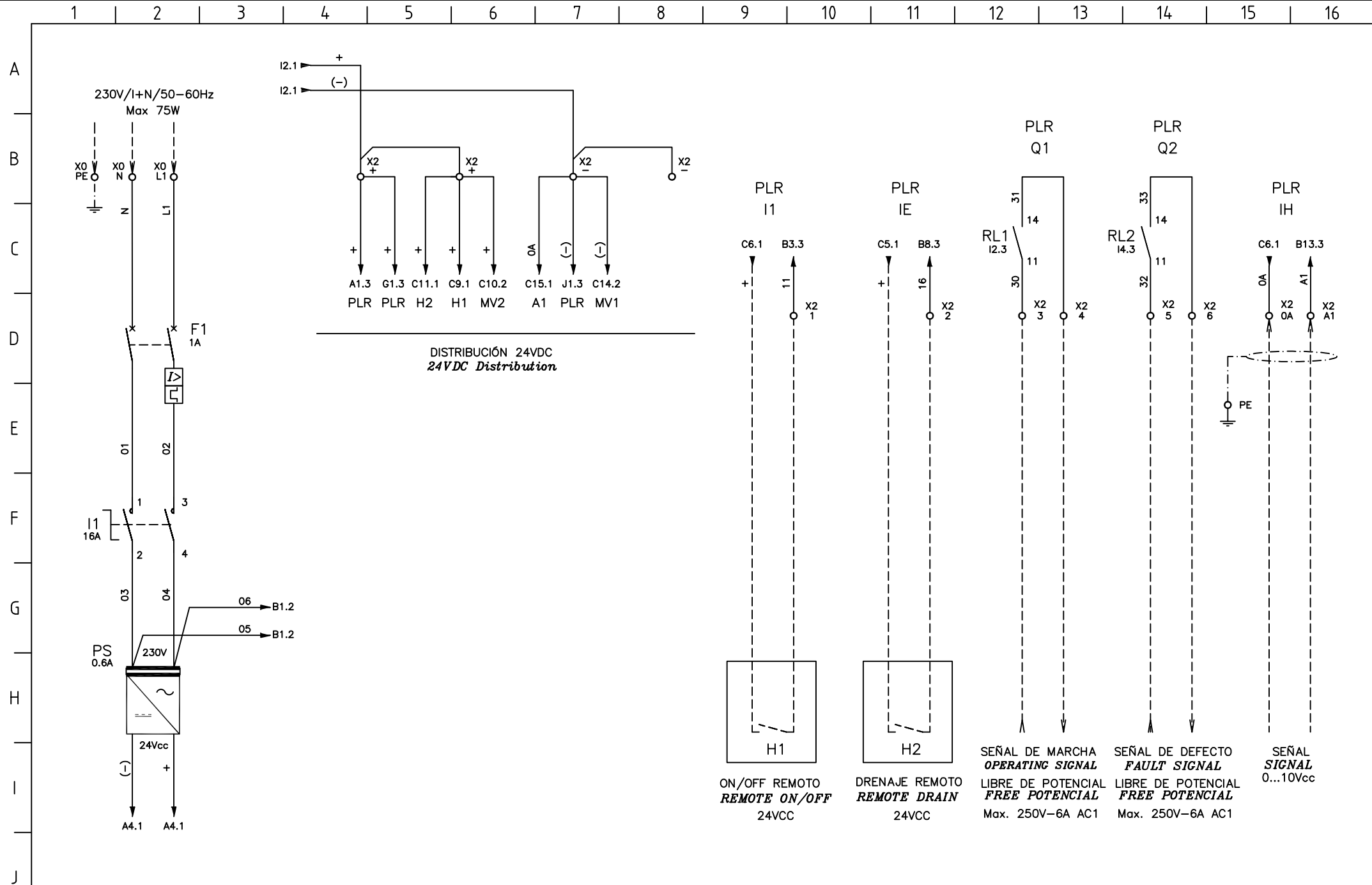
Model	Tasc: 125 °C				Tasc: 135 °C				Tasc: 145 °C			
	Q int [L/min]	Mext [kg/h]	ΔP [kPa]	ΔT int [°C]	Q int [L/min]	Mext [kg/h]	ΔP [kPa]	ΔT int [°C]	Q int [L/min]	Mext [kg/h]	ΔP [kPa]	ΔT int [°C]
ASC-75	26	20	13	7	27	28	13	10	27	44	13	15
	31	23	15		31	33	15		32	52	15	
	35	26	16		36	38	16		37	60	17	
	45	33	20		44	47	19		45	71	20	
	54	40	24		50	53	22		47	75	21	
ASC-115	42	31	25		40	42	23		42	66	24	
	47	35	30		45	48	28		48	76	30	
	54	40	38		50	53	33		54	86	38	
	66	49	57		59	63	46		64	102	53	
	75	56	77		64	68	55		69	110	64	

**Q int.:** Superheated water flow | **M ext.:** Clean steam production | **ΔP:** Superheated water pressure drop

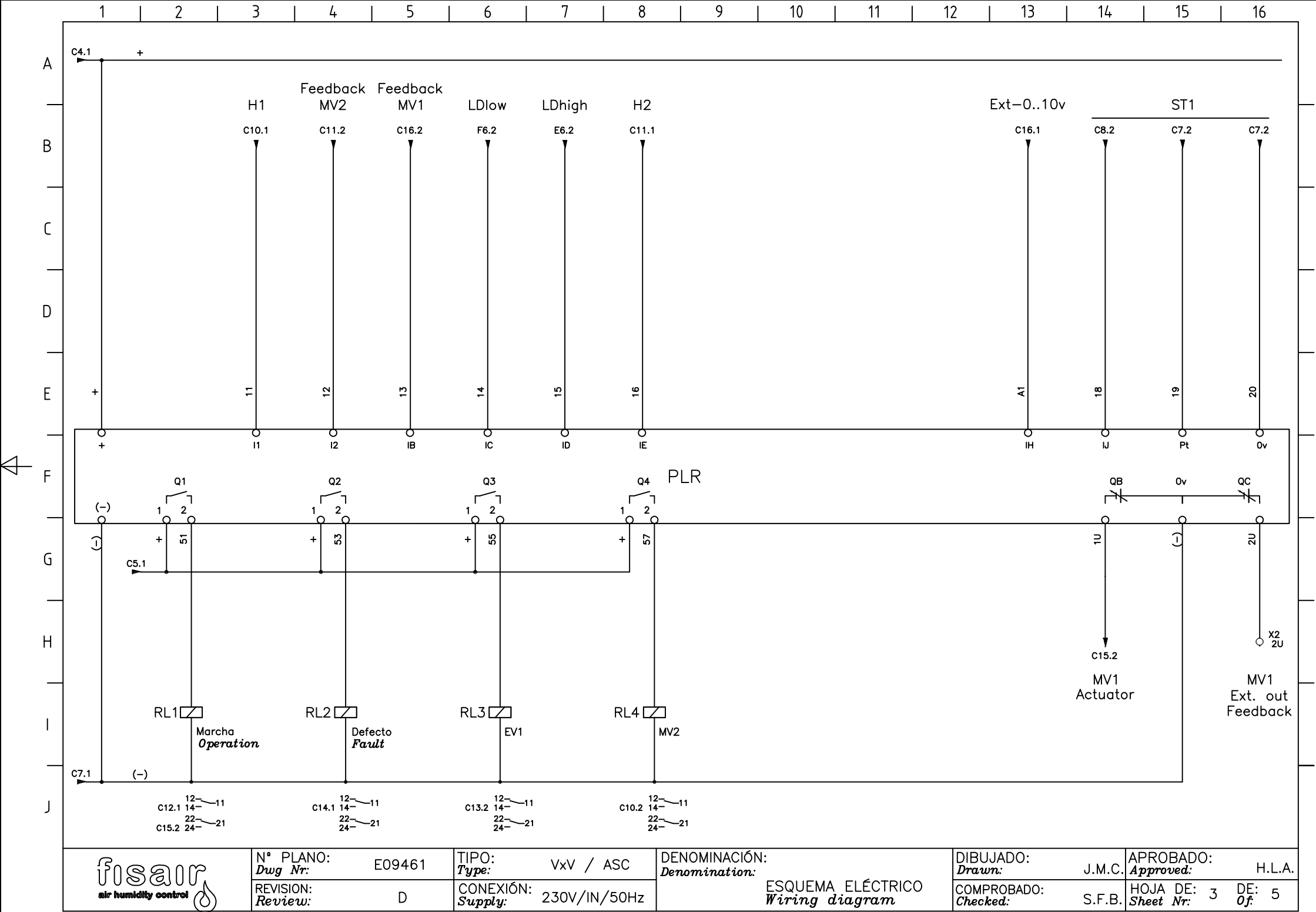
**ΔT int.:** Superheated water thermal gap | **Tasc:** Superheated water temperature

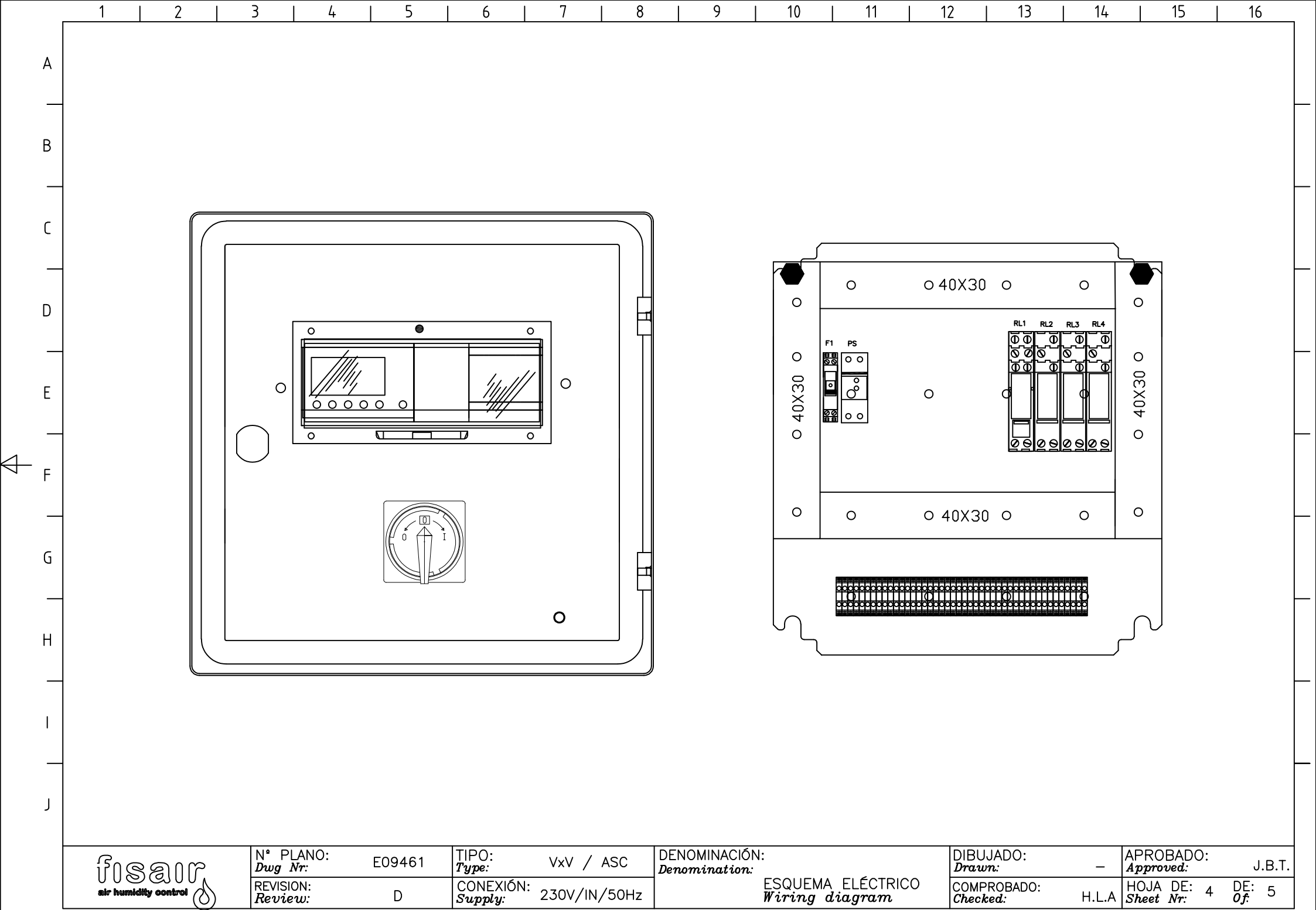
(\*) Request the corresponding capacities for other operating conditions.



The manufacturer reserves the right to change specifications without prior notification.

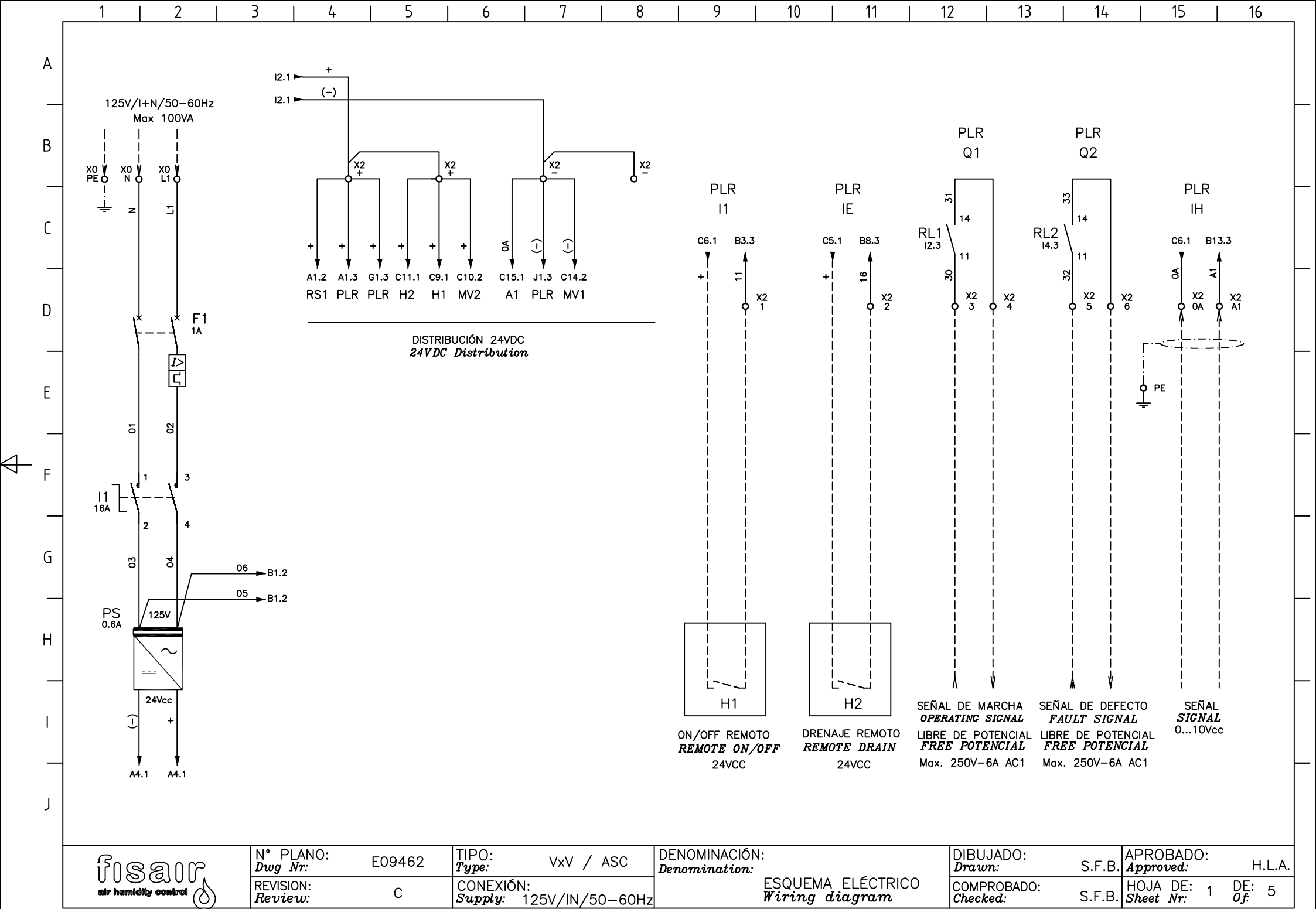




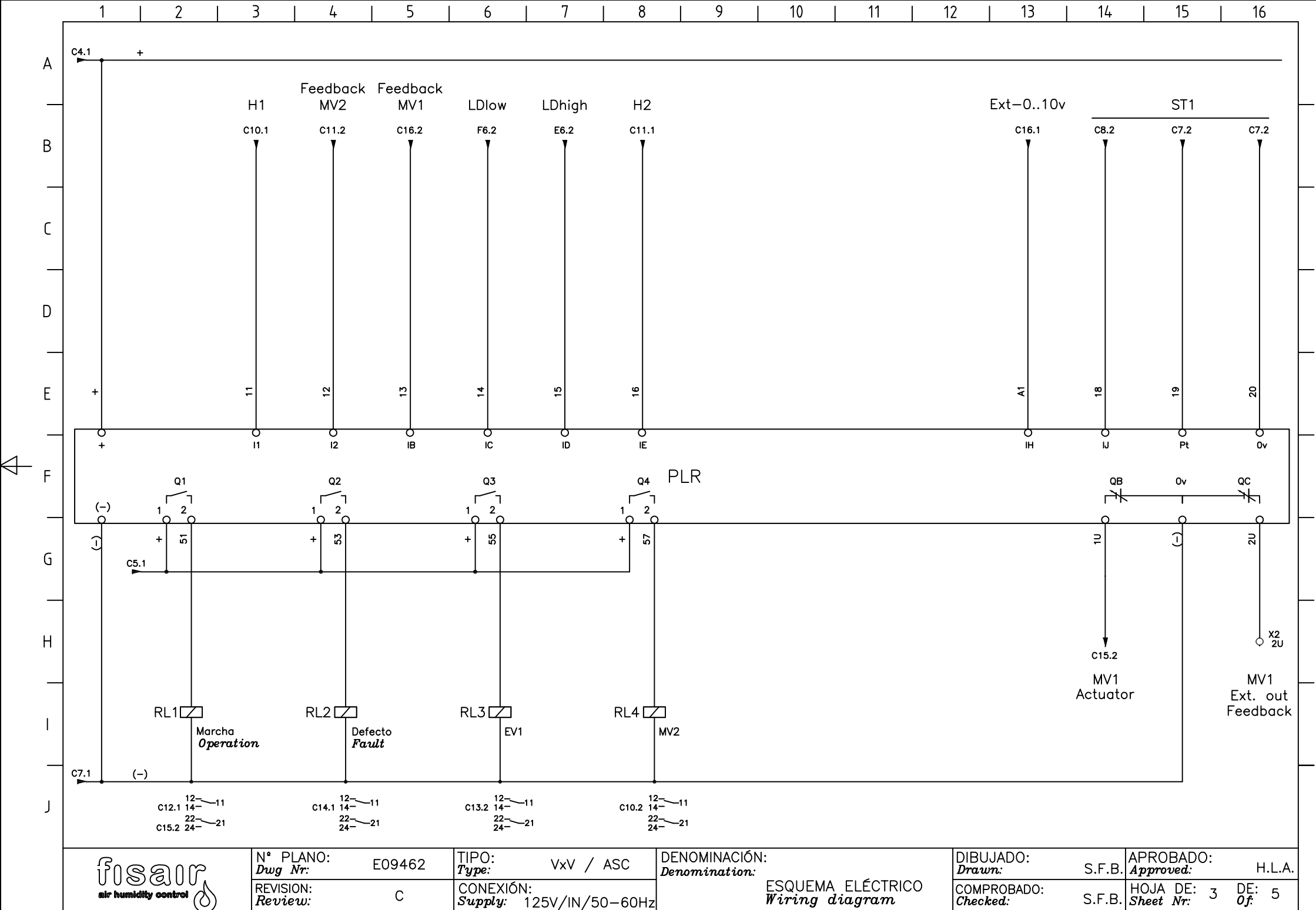


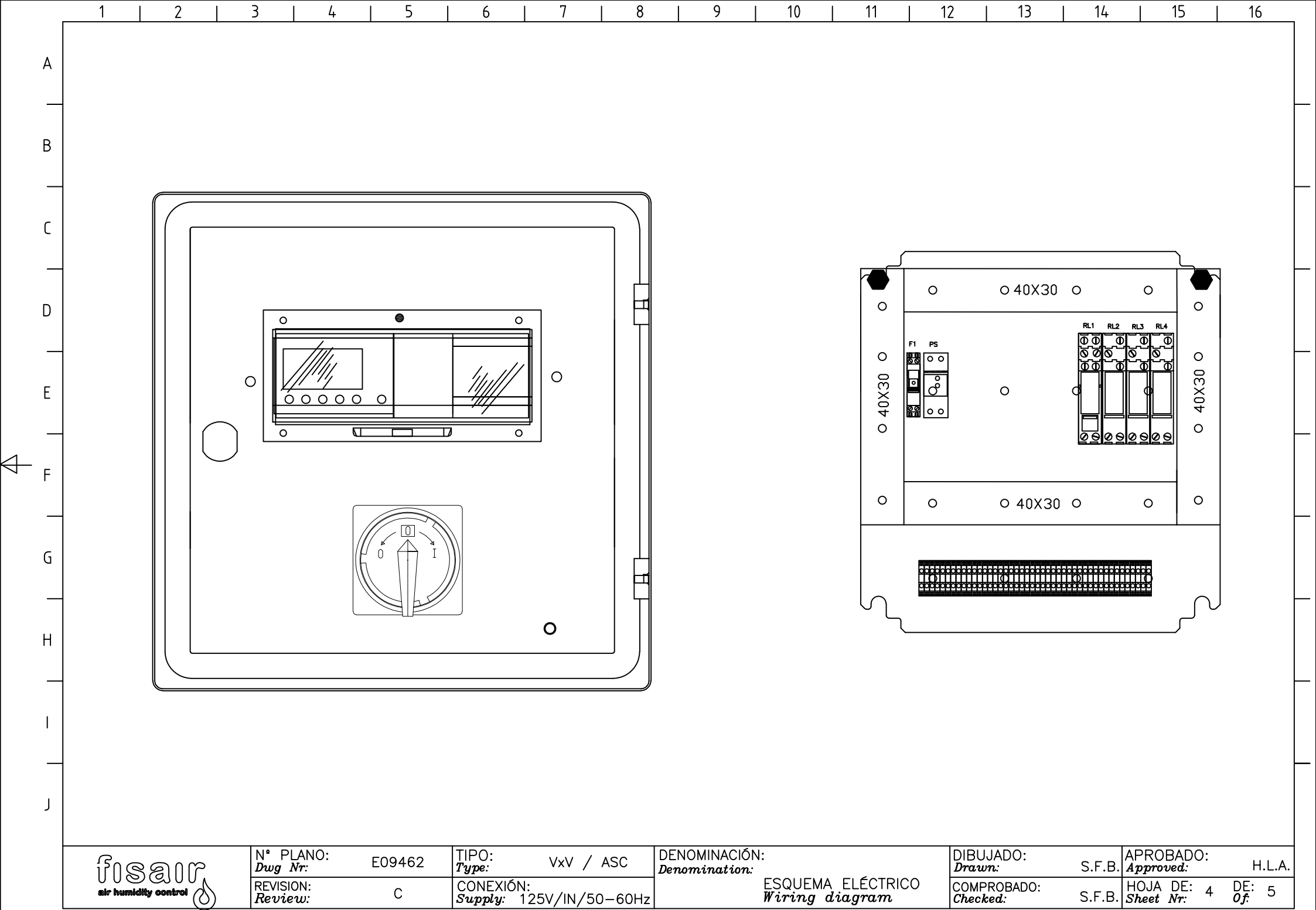




	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	Nombre <i>Name</i>	Descripción <i>Descripción</i>						Posición <i>Position</i>								
	F1	Protección magnetotérmica de Línea. <i>Magneto thermal circuit breaker</i>						D2.1								
B	I1	Interruptor Seccionador puesta en marcha de equipo on/off Main Switch.						F2.1								
	PS	Fuente de alimentación <i>Power supply</i>						H2.1								
C	LD	Detector de nivel <i>2/4 point level controller</i>						B2.2								
	S1	Cabezal sensor de nivel <i>Level sensor</i>						H2.2								
D	ST1	Sensor de temperatura de superficie. <i>Temperature sensor, reactivation air</i>						H7.2								
	EV1	Válvula solenoide <i>Solenoid electric valve</i>						H12.2								
E	MV1	Actuador eléctrico para válvula de vapor <i>Electric actuating modulator for steam valve</i>						H14.2								
	MV2	Motor para accionamiento de válvula de drenaje. <i>Electric motor for drain valve</i>						H9.2								
F	H1	Conexión remota para puesta en marcha <i>Remote conection for turn-on the machine</i>						H9.1								
	PLR	Relé programable <i>Programing logic relay</i>						E1.3								
G	H2	Conexión remota para drenaje depósito <i>Remote conection for water tank draining</i>						H10.1								
H																
I																
J		<b>Dispositivo opcional</b> <i>Optional device</i>														
		N° PLANO: <i>Dwg Nr:</i> E09461		TIPO: <i>Type:</i> VxV / ASC		DENOMINACIÓN: <i>Denomination:</i> ESQUEMA ELÉCTRICO <i>Wiring diagram</i>				DIBUJADO: <i>Drawn:</i> J.M.C.		APROBADO: <i>Approved:</i> H.L.A.				
		REVISION: <i>Review:</i> D		CONEXIÓN: <i>Supply:</i> 230V/IN/50Hz						COMPROBADO: <i>Checked:</i> S.F.B.		HOJA DE: 5 DE: 5 <i>Sheet Nr: Of</i>				









	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	Nombre <i>Name</i>	Descripción <i>Description</i>					Posición <i>Position</i>									
	F1	Protección magnetotérmica de Línea. <i>Magneto thermal circuit breaker</i>					B2.1									
B	F2	Protección magnetotérmica de Línea. <i>Magneto thermal circuit breaker</i>					D2.1									
	I1	Interruptor Seccionador puesta en marcha de equipo. on/off Main Switch.					F2.1									
C	PS	Fuente de alimentación <i>Power supply</i>					H2.1									
	RS1	Controlador de nivel de 2/4 puntos <i>2/4 point level controller</i>					B2.2									
D	S1	Cabezal sensor de nivel <i>Level sensor</i>					H2.2									
	ST1	Sensor de temperatura de superficie. <i>Temperature sensor, reactivation air</i>					H7.2									
E	EV1	Válvula solenoide <i>Solenoid electric valve</i>					H12.2									
	MV1	Actuador eléctrico para válvula de vapor <i>Electric actuating modulator for steam valve</i>					H14.2									
F	MV2	Motor para accionamiento de válvula de drenaje. <i>Electric motor for drain valve</i>					H9.2									
	H1	Conexión remota para puesta en marcha <i>Remote connection for turn-on the machine</i>					H9.1									
G	PLR	Relé programable <i>Programing logic relay</i>					E1.3									
	H2	Conexión remota para drenaje depósito <i>Remote connection for water tank draining</i>					H10.1									
H																
I																
J		<div><div><b>Dispositivo opcional</b></div><div><i>Optional device</i></div></div>														
		N° PLANO: <i>Dwg Nr:</i> E09462		TIPO: <i>Type:</i> VxV / ASC		DENOMINACIÓN: <i>Denomination:</i> ESQUEMA ELÉCTRICO <i>Wiring diagram</i>				DIBUJADO: <i>Drawn:</i> S.F.B.		APROBADO: <i>Approved:</i> H.L.A.				
		REVISION: <i>Review:</i> C		CONEXIÓN: <i>Supply:</i> 125V/IN/50-60Hz						COMPROBADO: <i>Checked:</i> S.F.B.		HOJA DE: 5 DE: 5 <i>Sheet Nr: 0f: 5</i>				

# **ZELIO 2 SR3 PLR MANAGEMENT PROTOCOL (DIPHUSAIR ASC, V21-1)**

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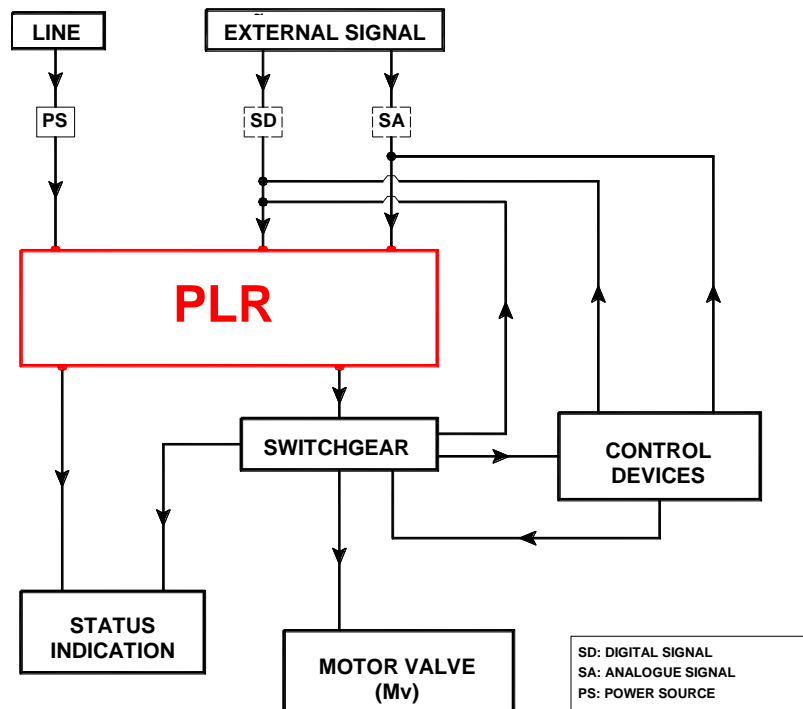
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## 1 Introduction.

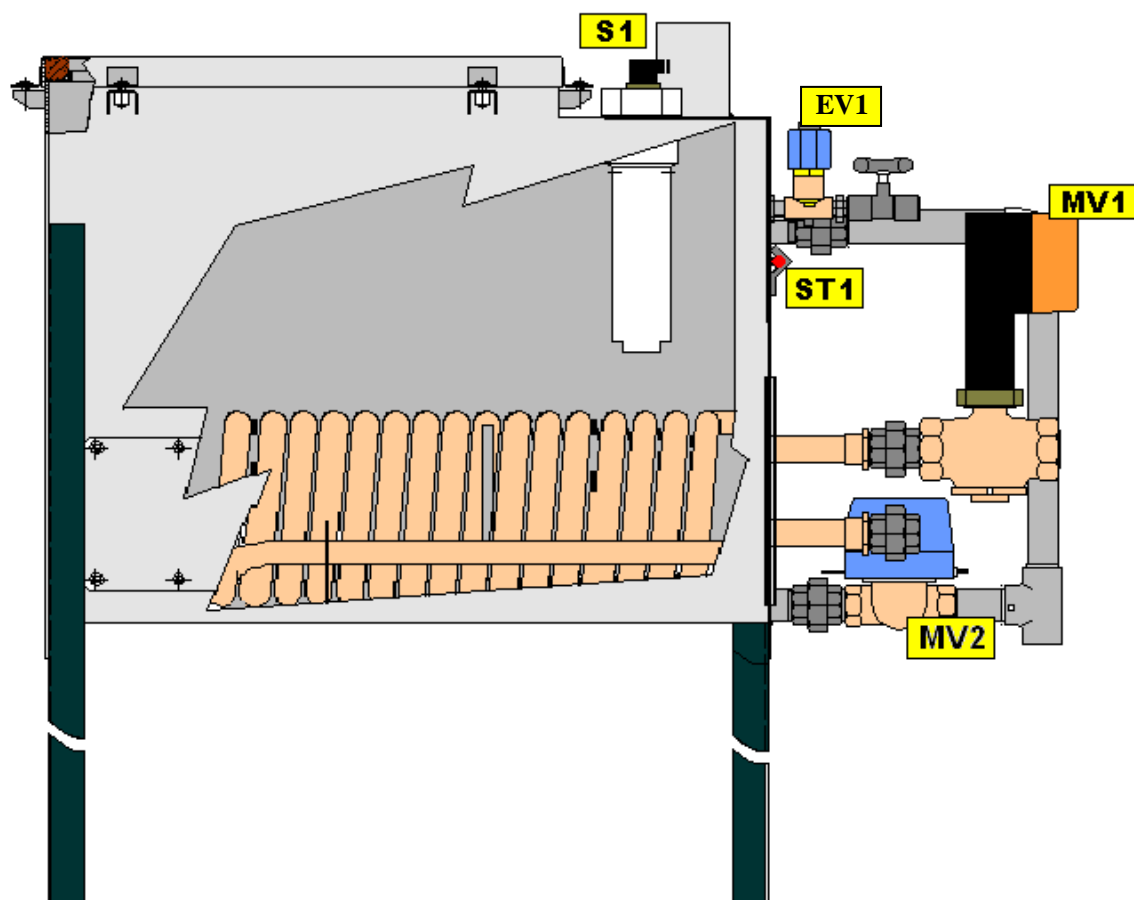
Integration in the management and operational supervision with the PLR ZELIO 2 SR3 makes it possible to achieve a faster, simpler, more precise and reliable operation of the humidifier, as well as reducing the wiring needed for the electrical board.

The ZELIO 2 SR3 PLR fitted to this type of equipment is a programmable device for the real time operation and supervision of the various equipment components connected to it.

*When using this protocol, the electrical diagrams must always be at hand.*



## 2 Components managed by the PLR

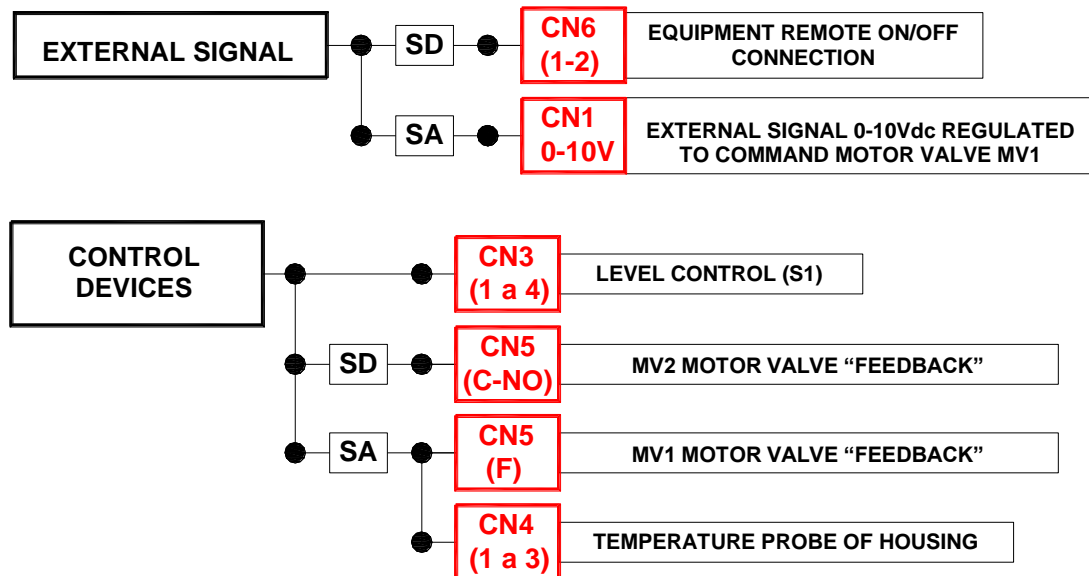


Component	Name	Description
<b>MV1</b>	Motor valve 1	Proportional electric actuator for the ASC boiler valve
<b>MV2</b>	Motor valve 2	Motor for operating the drain valve
<b>ST1</b>	Temperature sensor	Housing surface temperature sensor
<b>S1</b>	Level sensor	Float sensor for water level control
<b>EV1</b>	Solenoid valve	Solenoid valve for controlling drinking/softened water

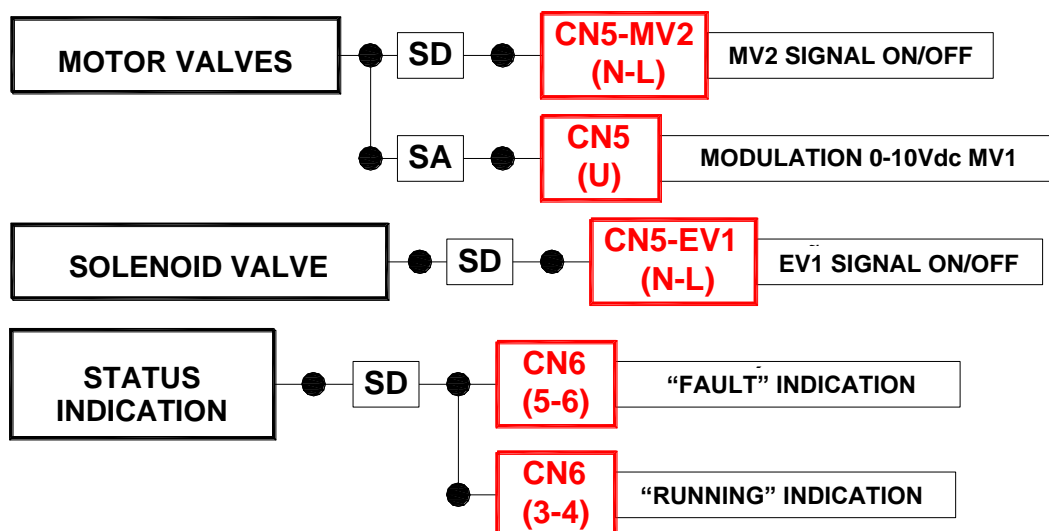
### 3 Switchgear, control devices and external signals connected to the PLR.

The electric controller has a 50 x 25 mm black and white screen and can connect 6 digital + 3 analogue inputs and 4 digital + 2 analogue outputs.

#### 3.1 PLR input connections



#### 3.2 PLR output connections



## **4 Functions provided by the ZELIO-2-SR3 PLR**

### **4.1 Controls**

- Motor-valve MV1 remote on-off operation control
- Proportional modulation to open motor-valve MV1 by a regulated external signal, 0-10Vdc for 0-100% opening, from a humidity controller/regulator.
- All-or-nothing activation of MV2 motor-valve
- All-or-nothing activation of EV1 solenoid valve
- Manual adjustment mode, opening MV1 motor-valve

### **4.2 Safety and alarms**

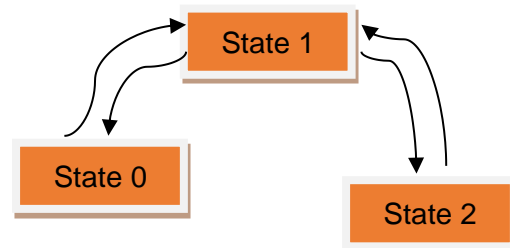
- Equipment alarm and shutdown due to excessively high temperature ( $\geq 98^{\circ}\text{C}$ ) of ASC housing, measured by the ST1 probe.
- Equipment alarm and shutdown due to low water level, measured by the float level controller S1.
- Equipment alarm and shutdown due to disparity between the value, 0-100% opening of MV1 (with the “external 0-10Vdc” or “manual” demand) and the 0-10Vdc value of MV1 actual positioning feedback valve. A deviation of  $\pm 5\%$  between the two values is allowed.
- Equipment alarm and shutdown due to disparity between the MV2 motor valve all/nothing open value and the MV2 actual positioning feedback.
- Blocked drain alarm, measured by the float level controller S1.
- “Running” and “fault/alarm” indication. Both connections must be free of voltage.

## 5 Deposit level regulation mode.

### 5.1 Deposit level regulation mode via float switch.

The following truth table shows a summary of the deposit water level control:  
It has the following bits:

- **H1:** Remote connection, start-up:
- **I1 :** Switch, start-up
- **HL:** S1 float switch, high level
- **LL:** S1 float switch, low level
- **EV1:** Water supply electrovalve
- **MV1:** Steam control motor valve



		Step no	Cycle status	H1	I1	HL	LL	EV1	MV1
Regulation cycle MV1	Increase in deposit water level	0	0	1	1	0	0	1	0*
		1	1	1	1	0	1	1	1
		3	2	1	1	1	1	0**	1
	Decrease in deposit water level	3	2	1	1	1	1	0***	1
		4	1	1	1	0	1	1	1
		5	0	1	1	0	0	1	0

(\*) Delay of 20 s. Parameter B247.

(\*\*) Delay of 20 s. Parameter B248.

(\*\*\*) Delay of 5 s.

**Note:** The parameters are modifiable. See section “8. Parameter configuration protocol”

- **State 0 (step 0)** Once switched on, the system detects there is no water and the equipment begins to fill by opening the supply electrovalve (EV1).
- **State 0 (step 1)** Once the low-level LL is reached (detected by the float level sensor S1), the motor valve 1 (MV1) is activated, which allows the boiler steam to reach the exchanger coil, producing clean steam.  
There is a delay of 20 s from when the low level is reached until the motor valve 1 (MV1) is activated to prevent misfire phenomena.  
When starting from empty (cold water), the MV1 motor valve opens 100% until reaching the set temperature of 85°C according to parameter B189 measured by the ST1 temperature probe. To modify this parameter, see section “8. Parameter configuration protocol” After reaching this temperature, the MV1 motor valve begins to regulate.
- **State 2 (step 2)** The equipment continues to fill until the maximum level HL is detected. After a delay of 20 s for defrothing, the water supply electrovalve closes. Motor valve 1 continues to inject boiler steam.
- **State 1 (step 4)** The equipment begins to drain due to the evaporation of the water produced by the transmission of heat in the exchanger. When the water level falls below the high level HL, the supply electrovalve (EV1) is reopened. There is a delay of 5 s from when the High level is reached until the supply electrovalve (EV1) is turned on to prevent misfire phenomena.
- The cycle is then repeated, with a new increase in the deposit water level starting (cycle status 1).

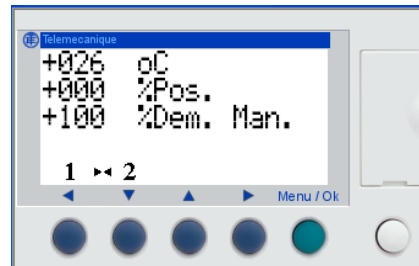
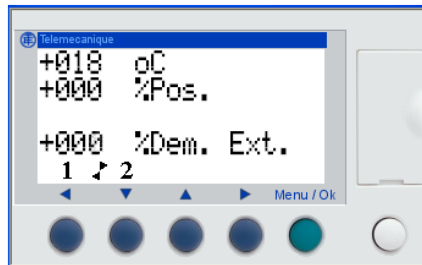
## 6 Management protocol

After meeting the installation prerequisites and checking the mains values coincide with those required by the machine, the following operations can be supervised, configured and adjusted to obtain the described actions. The operational sequences will be described using icons.

### 6.1 Supervision status

Follow the steps described in the equipment electrical installation instruction manual. Once connected to the electric supply, the magnetothermic switch (F1) is armed. Turn on the switch I1. It will light green, which means the equipment is “live”.

One of the following displays will appear on the PLR. The factory setting is “automatic” mode.



**SUPERVISION STATUS “AUTOMATIC” SUPERVISION STATUS “MANUAL”**

The following can be seen in both states:

- **ASC housing temperature (°C):** Temperature measured by the ST1 probe attached to the front of the ASC housing (e.g. 18°C and 26°C).
- **FEEDBACK actual opening position of valve (% Pos.):** MV1 motor valve actual opening percentage (e.g. 0%)

The following is seen in the “automatic” supervision status:

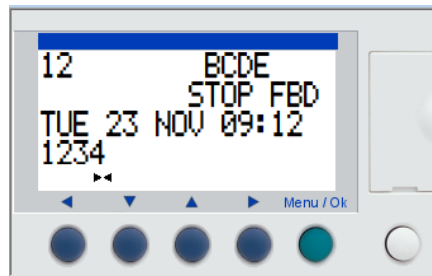
- **External signal opening demanded 0-10Vdc (% Dem. Ext.):** Opening percentage demanded by the external signal (0-10Vdc,-0-100% opening) from a humidity controller/regulator (e.g. 0%)

The following is seen in the “manual” supervision status:

- **Manual signal opening demanded (% Dem. Man.):** Opening percentage demanded by the manual signal to be adjusted in the PLR; factory setting 20% programmed opening (e.g. 100%).

## 6.2 Connection status.

- 1<sup>o</sup>) By continuously pressing the white key (located far right), the display appears with the abbreviation "Param" (parameters).
- 2<sup>o</sup>) Pressing the white key and green key (Menu/OK) brings up the connection display.



This shows:

1. **PLR DIGITAL INPUTS:** They are the alphanumeric values of the upper part indicated as 1-2-B-C-D-E.
  - ❖ 1: H1 ON/OFF Remote connection.
  - ❖ 2: "Feedback" of MV2 drain valve limit switch position reached (fully open).
  - ❖ B: "Feedback" of ASC MV1 valve open position, 0-10Vdc/0-100%.
  - ❖ C: PLR Input C active.
  - ❖ D: PLR Input D active
  - ❖ E: Direct emptying by external signal.
2. **PLR DIGITAL OUTPUTS:** They are the numerical values of the lower part indicated as 1-2-3-4.
  - ❖ 1: ASC MV1 valve opening signal .
  - ❖ 2: Alarm signal.
  - ❖ 3: EV1 fill solenoid valve opening signal.
  - ❖ 4: MV2 empty/drain motor valve opening signal.
3. Date and time.
4. "RUN" (run status of program installed on the PLR).

To return to the supervision screen, press the green key (Menu/OK) 3 times.

## 7 Launching.

### 7.1 Operation manual

In this mode, the equipment operates by opening the motor valve MV1 by the percentage programmed on the PLR.

➤ Steps to follow for manual start-up:

1º) Check that the magnetothermic switch F1 is armed and the PLR is on in monitoring status. The “automatic” supervision status appears by default.

2º) Connections to be made. A connection must be made:

- Remote equipment start-up connection: **ON/OFF REMOTE X2 (+,1).**

**NOTE:** Make sure the remote drain connection H2 is not connected. REMOTE DRAIN X2 (+,2)

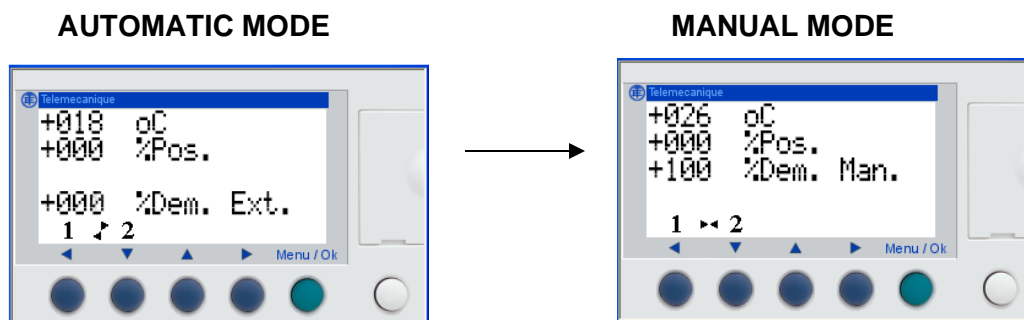
To check the machine status, the following potential-free “status indication” connections are available to the user:

- **RUNNING SIGNAL X2(3,4):** “Run” signal, free of max. voltage. 250V-6A AC1.
- **FAULT SIGNAL X2(5,6):** “Fault” signal, free of max. voltage. 250V-6A AC1.

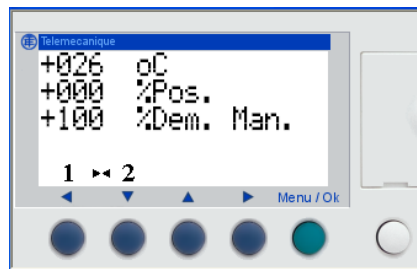
3º) Configuration to work manually:

Press the ▼ key (2 in the display) and the following display will appear with the % manual demand (% Dem. Man.); by default, this programmes a 20% valve opening. (percentage configurable according to parameter B009. See section “8. Parameter configuration protocol”)

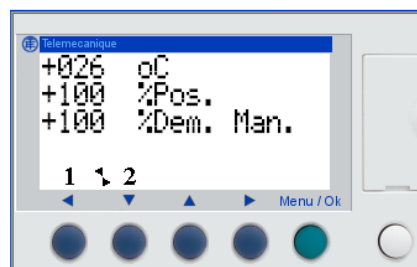
The display will change from % external demand (% Dem. Ext.) to % manual demand (% Dem. Man.)



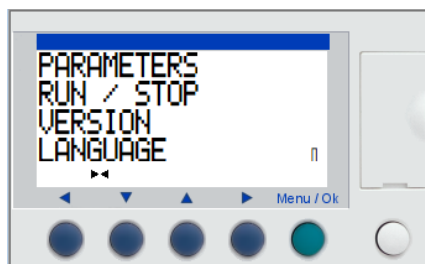
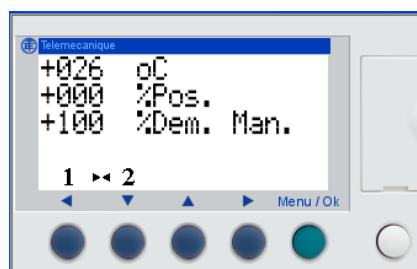
- Initial display before the MV1 opening response:



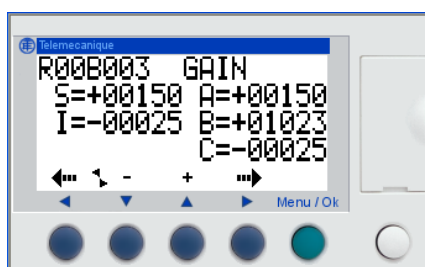
- Display after the MV1 motor valve opening response. The MV1 opening is adjusted to 100% demand.



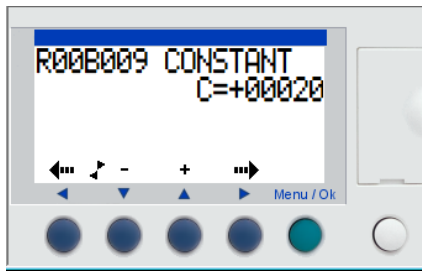
#### 4º) Manual demand adjustment (MV1 desired opening percentage):



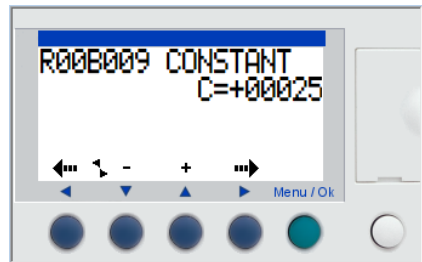
- Press the green “menu/OK” button once on the “manual” monitoring screen; the following display will appear with the word “PARAMETERS” flashing.



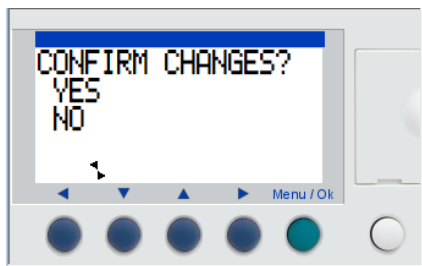
- Enter “PARAMETERS” by pressing the green key again. The following parameter screen from module R00B:003 will appear. The MV1 opening percentage setting is done in the module R00B:009.



c) Use keys ▲(+) and ▼(-) until the module R00B:009 is reached. It will be seen that it is programmed at 20%.



d) To change this value, press ► once until the value C = XXXX flashes. Use keys ▲(+) and ▼(-) until the desired value is reached. In this case, 75% opening. Press the green (Menu/OK) key to accept the change. (Enter a value between 0-100).



e) After pressing the Menu/OK key, "Yes" will appear flashing in this display. Press the Menu/OK key again to accept the change.

5º) It will work properly whenever:

- The safety thermostat ST1 value is not above 105°C.
- The water is at the minimum level required by the float level S1.
- The magnetothermic switch is armed and there is no problem in the lines and connections.

## 7.2 Automatic operation.

In this mode, the equipment will work by modulating the motor-valve MV1 opening in proportion to the external signal 0-10Vdc demanded.

### ➤ Steps to follow for automatic start-up:

**1º)** Check that the magnetothermic switch F1 is armed and the PLR is on in monitoring status.

**2º)** Connections to be made. The following connections have to be made:

- Remote equipment start-up connection: **ON/OFF REMOTE X2(+,1).**
- Connection of 0-10Vdc SIGNAL X2(0A, A1) from a humidity regulator/controller.

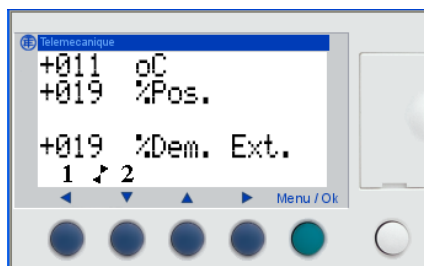
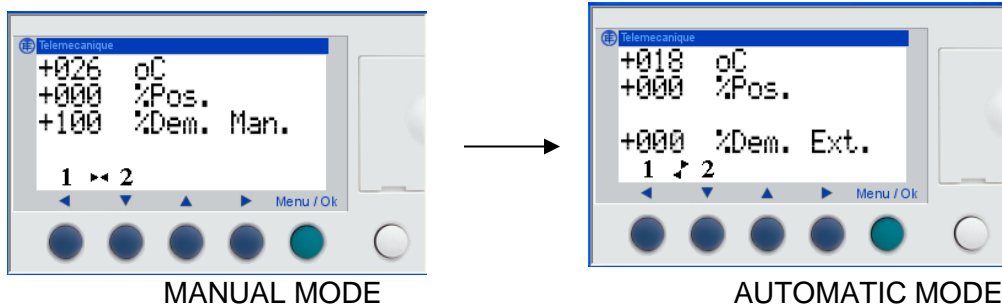
**NOTE:** Make sure the remote drain connection H2 is not connected. REMOTE DRAIN X2 (+,2)

To check the machine status, the following potential-free “status indication” connections are available to the user:

- **RUNNING SIGNAL X2(3,4):** “Run” signal, free of max. voltage. 250V-6A AC1.
- **FAULT SIGNAL X2(5,6):** “Fault” signal, free of max. voltage. 250V-6A AC1.

**3º)** Configuration to work “automatically”:

No configuration is required for this operation. If the equipment is in manual mode, the ▼ key (2 on the display) has to be pressed to change from manual to automatic mode. The display will change from % manual demand (% Dem. Man.) to % external demand (% Dem. Ext.).



- Display after the MV1 motor valve opening response. The MV1 opening is adjusted to 19% demand. (%Pos. = Feedback signal of actual MV1 position).

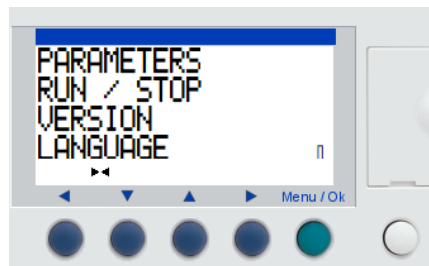
## 8 Parameter setting protocol

The following example shows how to modify any editable equipment operation parameter:

### Modification of the fault timer parameter 11:

To modify these values, follow the steps below:

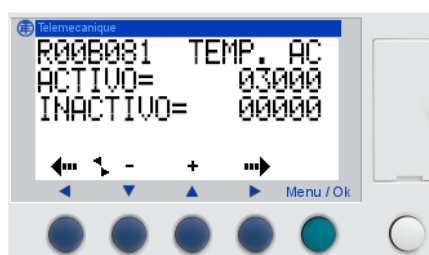
1. Access the main menu from the main screen with the green Menu/OK button.



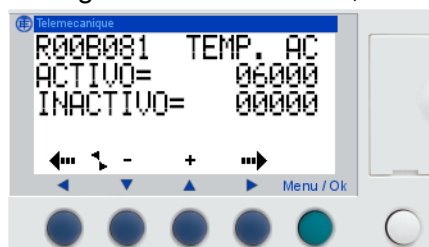
2. Enter PARAMETERS with the green Menu/OK button.



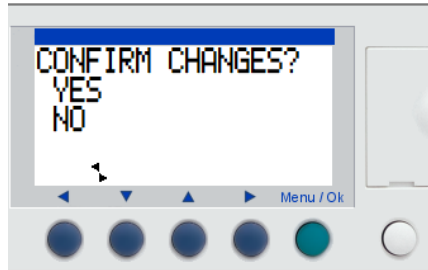
Using the up  $\triangle$  and down  $\nabla$  buttons, look for the parameter R00B081.



3. Change the ACTIVE value, to 06000 (600s), for example.



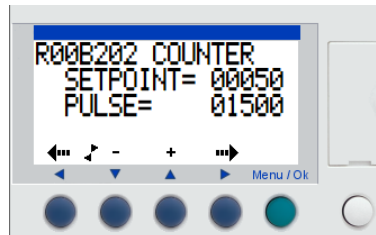
4. Confirm the change with YES and return to the main menu.



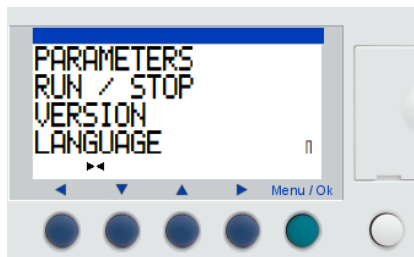
## 9 Drainage function / partial and total emptying

### 9.1 Drainage / partial emptying in operation

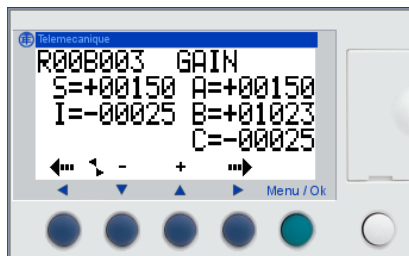
The DIPHUSAIR ASC is emptied or partially drained by opening the MV2 motor-valve during operation. This partial emptying is factory set at every 50 filling cycles and lasts for 150 s. Both the number of cycles (set points) and the emptying duration time (pulse) are set according to parameter B202. This parameter is modifiable. See section "8. Parameter configuration protocol".



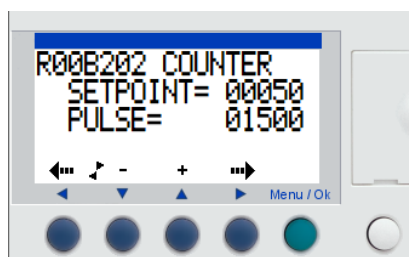
Adjustment of drainage/partial emptying cycles and time



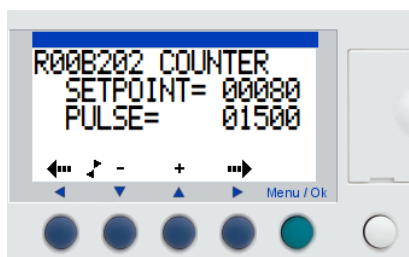
- a) Press the green "menu/OK" button once on the "manual" or "automatic" monitoring screen; the following display will appear with the word "PARAMETERS" flashing.



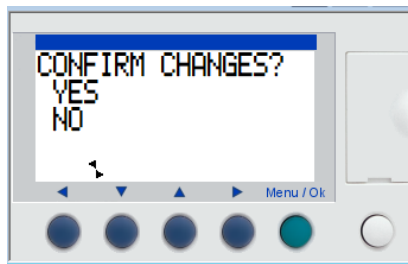
- b) Enter "PARAMETERS" by pressing the green key again. The following parameter screen from module F00B:003 will appear. The adjustment is made in module F00B:202.



- c) Use keys ▲(+) and ▼(-) until the module F00B:202 is reached. It will be seen that 150 cycles and 1200 dS (2min) are programmed.



- d) To change this value, press ► once until the value SETTING = 00150 flashes. Use keys ▲(+) and ▼(-) until the desired value is reached. Press the green (Menu/OK) key to accept the change. Follow the same procedure to change the drain time (PRESS).



- e) After pressing the Menu/OK key, “Yes” will appear flashing in this display. Press the Menu/OK key again to accept the change.

## 9.2 Complete drainage/emptying upon shutdown.

The DIPHUSAIR ASC will completely drain if the motor valve MV2 is opened when in shutdown by cutting the H1 ON/OFF signal. It is emptied 6 hours (modifiable according to parameter B158) after being stopped by the H1 signal cut-off and lasts for 2 hours (modifiable time according to parameter B163).

These parameters are modifiable and changed according to “8. Parameter configuration protocol”

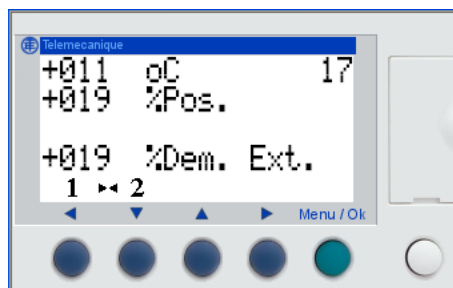
## 9.3 Complete drainage/emptying upon in operation.

The option of being able to drain at any time (while the equipment is running or stopped) is enabled by activating the external digital signal (H2) and turning the H1 ON/OFF signal off.

## 10 Troubleshooting.

### 10.1 Fault 17 (automatic reset).

DISPLAY EFFECT	CAUSE
17	<ul style="list-style-type: none"> <li>Filling is not effective. The minimum water level is not reached for the MV1 motor-valve to open.</li> </ul>



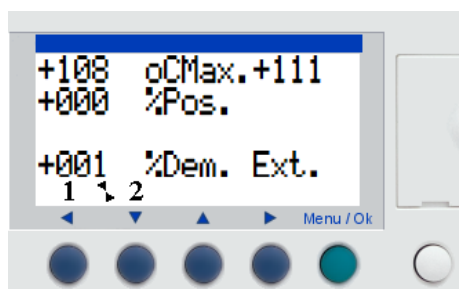
This safety feature is “*automatically reset*” as soon as the minimum water level is reached. The steam MV1 motor valve will reopen to the position demanded by the “External demand” or “Manual demand”.

The timer B132 controls the alarm activation time without the low level being reached and can be modified.

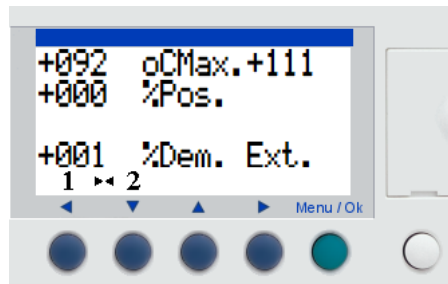
This parameter is modifiable and changed according to “8. Parameter configuration protocol”

### 10.2 Fault °C<sub>Max.</sub> (manual reset).

DISPLAY EFFECT	CAUSE
°C <sub>Max.</sub>	<ul style="list-style-type: none"> <li>The maximum housing temperature of 105°C has been exceeded.</li> </ul>



If the housing temperature exceeds the programmed 105°C, the steam motor valve MV1 will close immediately, and °CMax will appear on the screen and the maximum temperature reached by the housing will be seen on the upper display.



This safety feature is “*manually reset*”. Even if the temperature falls below the 105°C cut-off point, the MV1 motor steam valve will not re-open until the safety reset key ◀ (1) is pressed. As soon as the safety is reset, the “°CMax.” and the maximum temperature reached by the casing will disappear, and the steam valve will re-open to the position demanded by the “External demand” or “Manual demand”.

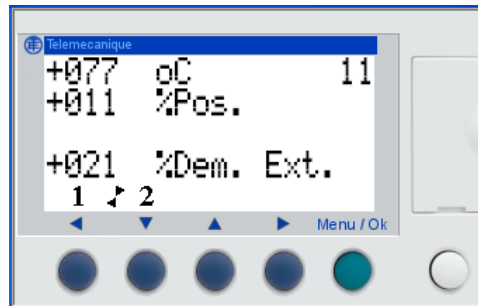
There are two maximum temperature parameters:

- **Cut-off maximum temperature: Parameter B022:** MV1 prevention cut-off temperature. Must be less than or equal to the alarm value (Factory value: 105°C)
- **MV1 alarm maximum temperature: Parameter B044:** High temperature alarm notification temperature (Factory value: 105°C)

These parameters are modifiable and are changed according to “8. Parameter configuration protocol”.

### 10.3 Fault 11 (automatic reset).

DISPLAY EFFECT	CAUSE
11	<ul style="list-style-type: none"> <li>➤ The feedback analogue signal 0-10Vdc (CN5 F) of the steam motor-valve MV1 opening exceeds the <math>\pm 5\%</math> margin, with the external demand signal from the humidity regulator/controller or the manual demand.</li> </ul>



If the programmed  $\pm 5\%$  margin is exceeded in a period  $< 1200s$  (\*), the steam motorcycle valve MV1 will close immediately, and '11' will appear on the upper part of the screen.

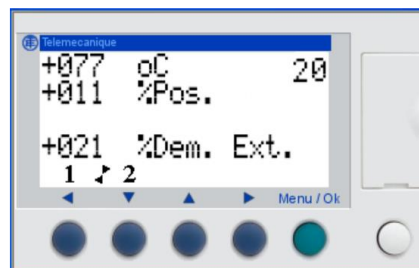
If the deposit water temperature does not reach  $85^{\circ}\text{C}$  (\*\*) within the time of  $1200s$ , the fault 11 will also appear on the screen.

This safety feature is "automatically reset" when the feedback analogue signal 0-10Vdc of the motor valve MV1 opening is within the  $\pm 5\%$  margin of difference with the external demand signal from the humidity regulator/controller or the manual demand signal; MV1 will re-open to the position demanded by the "External Demand" or "Manual Demand".

(\*)(\*\*) The time of  $1200s$  and temperature of  $85^{\circ}\text{C}$  can be adjusted on the screen according to the equipment needs. See section "8. Parameter configuration protocol"

## 10.4 Fault 20 (automatic reset)

DISPLAY EFFECT	CAUSE
<b>20</b>	<p>The feedback from the MV2 drain valve is not effective due to two possible errors:</p> <ul style="list-style-type: none"> <li>➤ The final open feedback position is not reached during the motor valve opening. <b>Time parameter B179.</b></li> <li>➤ The final open feedback position is not turned off during the motor valve closing. <b>Time parameter B180.</b></li> </ul>



This safety feature is "automatically reset".

Time parameters B179 and B202 are modifiable. See section "8. Parameter configuration protocol".

## 10.5 Fault 21 (Automatic reset)

EFFECTO DISPLAY	CAUSA
<b>21</b>	<p>Fallo por rebosamiento de agua. Este fallo se produce por el mal funcionamiento del EV1. Se tienen dos situaciones:</p> <ul style="list-style-type: none"> <li>➤ H1 activo (On/Off): Informa del rebosamiento del agua por encima del nivel máximo durante el funcionamiento del equipo. Parámetro B114</li> <li>➤ H1 inactivo (On/Off)(*): Informa del rebosamiento del agua por encima del nivel máximo durante el apagado y drenaje. parámetro B165</li> </ul>

(\*) Esta alarma se produce una vez apagada la unidad, teniendo en cuenta el tiempo total de drenaje y el tiempo de espera posterior al drenaje. Este ultimo tiempo es definido por el parámetro B165.

Los parámetros de tiempo B114y B165 son modificables. Ver apartado “8. Protocolo de configuración de parámetros”.

## 10.6 Fault 22 (Automatic reset)

DISPLAY EFFECT	CAUSE
<b>22</b>	<p>Drainage fault caused by water level not falling below low level (S1).</p> <ul style="list-style-type: none"> <li>➤ The fault occurs if it does not fall below the low level after the time established by parameter B131, regardless of the type of drainage.</li> </ul>

Time parameter B131 is modifiable. See section “8. “8. Parameter configuration protocol”.

## 11 List of modifiable parameters in equipment operation

**Note:** ONLY MODIFY THE PARAMETERS THAT APPEAR IN THIS LIST. MODIFYING OTHER PARAMETERS MAY CAUSE IRREPARABLE DAMAGE TO THE EQUIPMENT DURING OPERATION



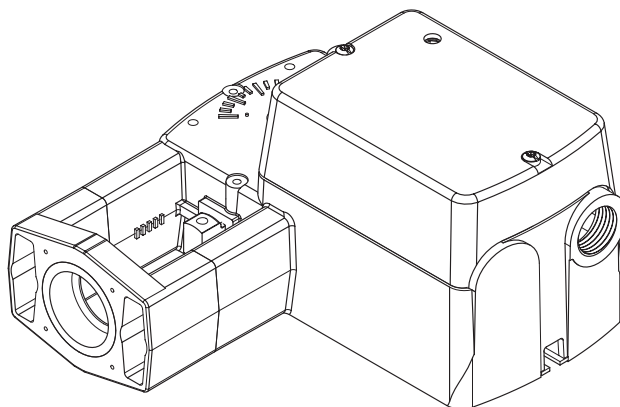
**Note:** Check the parameter measurement units to ensure their proper adjustment.

TYPE OF FUNCTION	NAME	DEFINITION	DEFAULT VALUE	ACTIVE/INACTIVE /CONSTANT Modify the one indicated in this column only!
TIMER	B081	Fault delay timer 11	12,000 deciseconds (1200 seconds)	ACTIVE
TIMER	B247	MV1 start delay timer with demand and low status	200 deciseconds (20 seconds)	ACTIVE
TIMER	B248	Delay timer, EV1 off	20 seconds	INACTIVE
TIMER	B114	Fault delay timer 21	10800 seconds	ACTIVE
TIMER	B132	Fault delay timer 17	900 seconds	ACTIVE
TIMER	B131	Fault delay timer 22	1800 seconds	ACTIVE
TIMER	B179	Fault delay timer 20 (feedback signal does not activate with MV2 fully open)	150 seconds	ACTIVE

TYPE OF FUNCTION	NAME	DEFINITION	DEFAULT VALUE	ACTIVE/INACTIVE /CONSTANT Modify the one indicated in this column only!
TIMER	B180	Fault delay timer 20 (feedback signal does not turn off after MV2 is closed)	20 seconds	ACTIVE
CONSTANT	B009	Manual demand opening value	20 (20%)	-
CONSTANT	B189	Regulation start temperature	85°C	-
CONSTANT	B022	Maximum temperature error, °C <sub>MAX</sub>	105°C	-
CONSTANT	B044	Maximum temperature for MV1 cut-off	105°C	-
CONSTANT	B163	Complete drainage time	7200 seconds	-
CONSTANT	B165	Wait time after complete drainage for overflow alarm without H1. Fault 21	7200 seconds	-
CONSTANT	B158	Complete drainage time (hours) after removing H1	6 hours	-
COUNTER	B202	Count value for partial emptying	50 cycles	SET POINT
		Partial drain time pulse value	1500 deciseconds (150 seconds)	PULSE

## Application

Linear SmartX Actuators are designed to mount directly onto two-way or three-way globe valves without the use of linkages. They provide linear travel to operate valves from 1/2" to 2" VB-7xxx and discontinued 1/2" to 1-1/4" VB-9xxx in chilled water, hot water and steam applications up to 366 °F (186 °C). Linear spring return actuators provide either two position, floating or proportional modulation control (depending on model selection) of valves in HVAC systems.



**Mx51-710x**

## Features

- Two position models controlled by SPST controller
- Floating models controlled by SPDT floating controllers
- Proportional models controlled by 0-3 Vdc, 6-9 Vdc, 0-10 Vdc, 0-20 mAdc, 2-10 Vdc, or 4-20 mAdc. Control function direct/reverse action is jumper selectable
- 105 lb force (467 newton) with 1/2" (13 mm) nominal linear stroke
- 24 Vac, 120 Vac, and 230 Vac models
- Rugged polymer housings rated for up to NEMA 2/ IP54
- Overload protection throughout stroke
- Automatically sets input span to match valve travel
- Compact size to allow installation in limited space
- Manual override to allow positioning of valve and preload
- Spring return operation
- Direct mount to valves without separate linkage
- Polymer housing rated for plenum use
- Five year warranty



## Applicable Literature

F-Number	Description	Audience	Purpose
F-26080	EN-205 Water System Guidelines	<ul style="list-style-type: none"> <li>Application Engineers</li> <li>Installers</li> <li>Service Personnel</li> <li>Start-up Technicians</li> </ul>	Describes Schneider Electric approved water treatment practices.
F-27252	Vx-7xxx-8xx Series Vx-7xxx-59x Series Vx-9xxx-8xx Series Vx-9xxx-59x Series Selection Guide	<ul style="list-style-type: none"> <li>Sales Personnel</li> <li>Application Engineers</li> <li>Installers</li> <li>Service Personnel</li> <li>Start-up Technicians</li> </ul>	Provides Mxx1-720x and Mx51-710x actuator, valve, and valve assembly selection data including specifications, close-off pressures, and dimensional information.
F-26895	AM-703 Input Scaling Module, AM-704 Pulse Width Modulation Interface, AM-705 Positioner, AM-706 Positioner, AM-708 Resistor	<ul style="list-style-type: none"> <li>Installers</li> <li>Service Personnel</li> <li>Start-up Technicians</li> </ul>	Provides step-by-step mounting instructions
F-27175	AM-756 Metric Conduit Adapter, AM-763 Hexcrank, AM-770 Replacement Valve Linkage Parts Kit	<ul style="list-style-type: none"> <li>Installers</li> <li>Service Personnel</li> <li>Start-up Technicians</li> </ul>	Provides step-by-step mounting instructions
F-27382	TAC Electric/Electronic Products Catalog	<ul style="list-style-type: none"> <li>Sales Personnel</li> <li>Application Engineers</li> </ul>	Comprehensive catalog containing TAC's electric/electronic actuators, thermostats, controllers, sensors, transmitters, and accessories

## SPECIFICATIONS

### Actuator Inputs

**Control Signal:** See Table-1 for actuator models and control type.

**Power Input:** See Table-1. All 24 Vac circuits are Class 2. All circuits 30 VAC and above are Class 1.

**Connections:** 3 ft (91 cm) appliance wire or plenum cables, enclosure accepts 1/2" (13 mm) conduit connectors. For M20 Metric connector, use AM-756 adaptor.

### Actuator Outputs

#### Electrical:

##### Position Feedback Voltage (proportional or floating only)

For voltage ranges, the feedback signal is the same range as the input signal. The 4-20 mAdc current range and floating actuators have a 2-10 Vdc position feedback signal. The position feedback signal can supply up to 0.5 mAdc to operate up to four additional slave actuators.

#### Mechanical:

**Linear Stroke,** 1/2" (13 mm) nominal.

**Approx. Stroke Timing,** See Table-1.

**Manual Override,** Allows positioning of valve and preload using manual crank.

**Right/Left Jumper,** Permits reverse acting/direct acting linear motion (MS51 only).

#### Environment:

##### Ambient Temperature Limits

**Shipping & Storage,** -40 to 160 °F (-40 to 71 °C).

**Operating,** -22 to 140 °F (-30 to 60 °C).

**Temperature Restrictions,** For maximum ambient 140 °F (60 °C) the maximum allowable fluid temperature should not exceed valve rating. See F-27252 Selection Guide for specific ratings.

**Humidity:** 5 to 95% RH, non-condensing.

#### Location:

NEMA 1. NEMA 2 (enclosure is air plenum rated), UL Type 2 (IEC IP54) with customer supplied water tight conduit connectors.

### Agency Listings

**UL 873:** Underwriters Laboratories (File #E9429 Category Temperature-Indicating and Regulating Equipment).

**CUL:** UL Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24-93.

**European Community:** EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC).

**Australia:** This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radio Communications Act 1992.

**Note:** All performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult Schneider Electric. Schneider Electric shall not be liable for damages resulting from misapplication or misuse of its products.

**Table-1 Specifications.**

Part Number	Control Signal	Actuator Power Input						Approximate Stroke Timing in Seconds @ 70F (21°C)	
		Voltage	Wiring System	Running		DC Amps	Holding	Powered	Spring Return
				50/60 Hz			50/60 Hz		
				VA	W	W			
MA51-7103-000	Two Position SPST	24Vac ±20% 20-30 Vdc	Appliance Wire	5.3	4.1	0.15	1.2	44	19
MA51-7103-100			Plenum Cable	5.3	4.1	0.15	1.2		
MA51-7100-000		120 Vac ±10% 50/60 Hz	Appliance Wire	7.9	6.2	n/a	2.1		
MA51-7101-000		230 Vac ±10% 50/60 Hz	Appliance Wire	7.4	5.4	n/a	2.1		
MF51-7103-000	Floating	24Vac ±20% 20-30 Vdc	Appliance Wire	6.9	4.7	0.16	2.1	60	16
MF51-7103-100			Plenum Cable	6.9	4.7	0.16	2.1		
MS51-7103-000	2-10 Vdc Proportional		Appliance Wire	6.6	4.2	0.14	1.5		
MS51-7103-100 <sup>b</sup>			Plenum Cable	6.6	4.2	0.14	1.5		
MS51-7103-020 <sup>b</sup>	0-3 Vdc Proportional		Appliance Wire	6.6	4.2	0.14	1.5		
MS51-7103-120 <sup>b</sup>			Plenum Cable	6.6	4.2	0.14	1.5		
MS51-7103-030 <sup>b</sup>	6-9 Vdc Proportional		Appliance Wire	6.6	4.2	0.14	1.5		
MS51-7103-130 <sup>b</sup>			Plenum Cable	6.6	4.2	0.14	1.5		
MS51-7103-040 <sup>b</sup>			Appliance Wire	7.8	4.9	0.16	3.4		
MS51-7103-140 <sup>b d</sup>			Plenum Cable	7.8	4.9	0.16	3.4		
MS51-7103-050 <sup>b</sup>	0-10 Vdc Proportional		Appliance Wire	6.6	4.2	0.14	1.5		
MS51-7103-150 <sup>b</sup>			Plenum Cable	6.6	4.2	0.14	1.5		
MS51-7103-060 <sup>b</sup>	4-20 mAdc		Appliance Wire	6.6	4.2	0.14	1.5		
MS51-7103-160 <sup>b</sup>			Plenum Cable	6.6	4.2	0.14	1.5		

<sup>a</sup>Timing was measured with the actuator mounted on a VB-7xxx Series valve.

<sup>b</sup>Proportional (MS) models shipped with RA/DA jumper set for DA (actuator extends with increasing signal).

<sup>c</sup>4-20 mAdc with AM-708 500 ohm field-installed resistor.

<sup>d</sup>Has 20 Vdc power supply for System 8000 applications.

**Globe Valve Close-Off Pressures:** For close-off pressure ratings on globe valve assemblies, consult Linked Globe Valve Assemblies with SmartX Linear Series Actuators Selection Guide F-27252.x13

#### ACCESSORIES

AM-756	Metric Conduit Adapter M20 x 1.5 to 1/2" NPT
AM-770	Replacement valve linkage parts kit
AM-764	Linkage kit for damper applications

#### MS51-7103

AM-703	Input rescaling module, adjust signals to 2-10 Vac, zero and span adjust
AM-704	Interface, pulse width modulation (PWM)
AM-705	Positioner (NEMA 4 housing)
AM-706	Min and/or manual positioner for flush panel mount
AM-708	500 ohm resistor for 4 to 20 mA control signal

TYPICAL TWO POSITION CONTROL (wiring diagrams)

Figure-1 illustrates typical wiring diagrams for spring return **two-position MA51-710x** actuators. See Table-1 for model selection. See 8 for wiring diagrams notes guide.

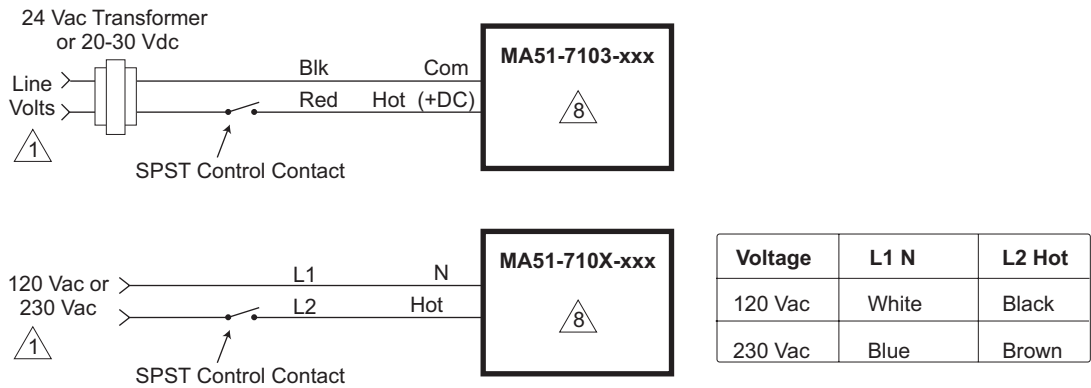


Figure-1 Typical Wiring Diagrams for Two Position Actuators

TYPICAL FLOATING CONTROL (wiring diagrams)

Figure-2 through Figure-5 illustrates typical wiring diagrams for spring return **floating MF51-7103** actuators. See Table-1 for model selection. See 8 for wiring diagrams notes guide.

**Caution:** This product contains a half-wave rectifier power supply and must not be powered off transformers used to power other devices utilizing non-isolated full-wave rectifier power supplies. Refer to EN-206, Guidelines for Power Multiple Devices from a Common Transformer, F-26363 for detailed information.

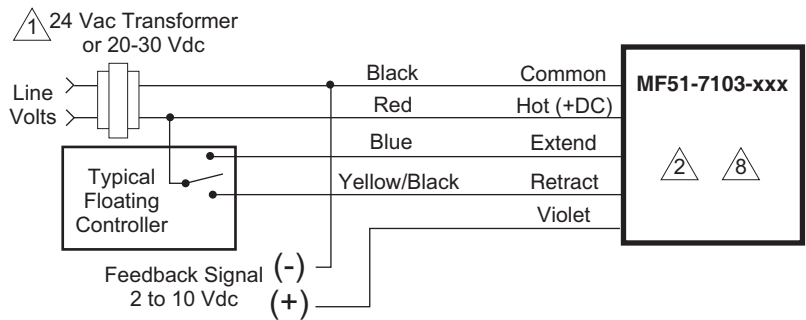


Figure-2 Floating Point Control

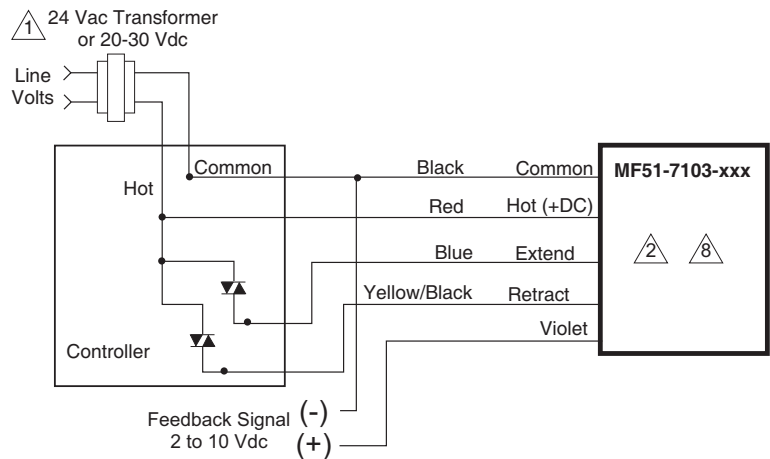
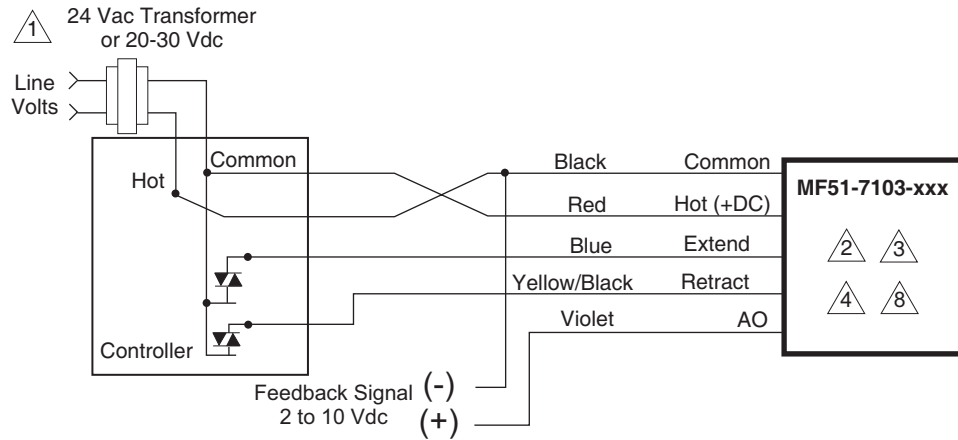
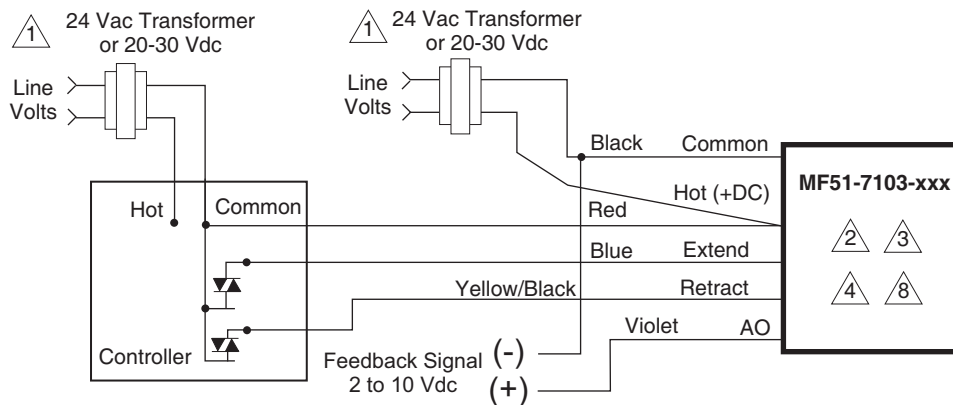


Figure-3 Triac Source



#### Figure-4 Triac Sink

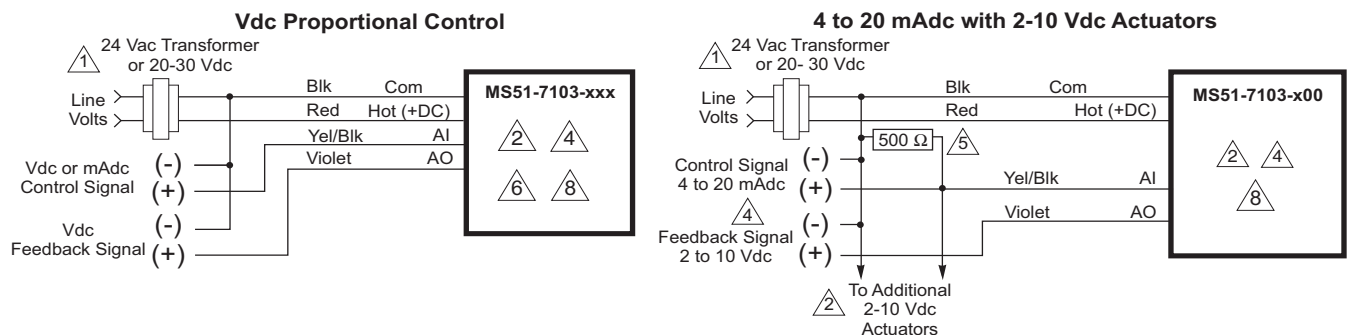


### Figure-5 Triac Sink With Separate Transformers

## TYPICAL PROPORTIONAL CONTROL (wiring diagrams)

Figure-6 illustrates typical wiring diagrams for spring return **proportional MS51-7103** actuators. See Table-1 for model selection. See 8 for wiring diagrams notes guide.

**Caution:** This product contains a half-wave rectifier power supply and must not be powered off transformers used to power other devices utilizing non-isolated full-wave rectifier power supplies. Refer to EN-206, Guidelines for Powering Multiple Devices from a Common Transformer, F-26363 for detailed information.



### Figure-6 Typical Wiring Diagrams for Proportional Control 24 Vac Basic Models

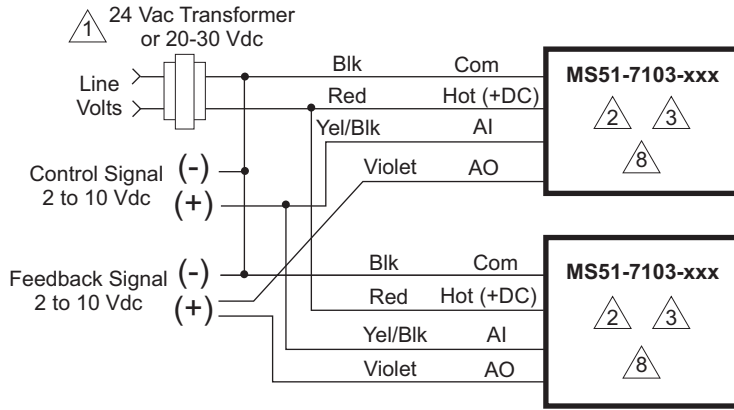


Figure-7a Typical Wiring Diagrams for Proportional Control 24 Vac Models Wired in Parallel

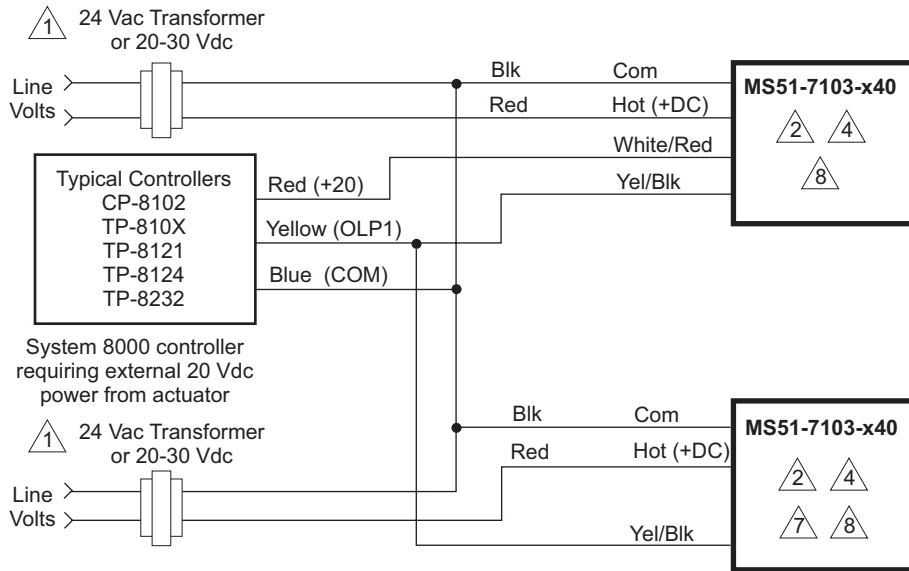


Figure-7b Typical Control Wiring for Two MS51-7103-x40 to System 8000 Controllers Requiring External 20 Vdc Power from Actuator

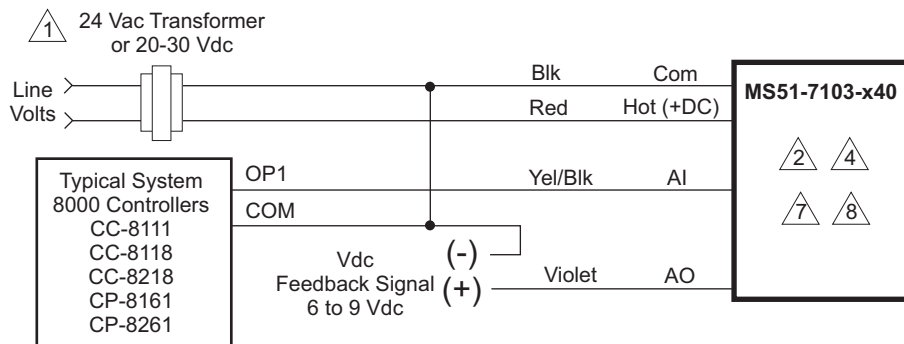


Figure-7c Typical Control Wiring for MS51-7103-x40 to Controllers not Requiring External 20 Vdc Power from Actuator

- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be wired (120V mA does not have red wire and 230V mA does not have red or black wires) in parallel. All actuator black wires are connected to the transformer common and all red wires are connected to the hot lead. Power consumption must be observed.
- 3 The Common connection from the actuator must be connected to the Hot connection of the controller. The actuator Hot must be connected to the controller Common.
- 4 If the controller uses a full-wave power supply and does not provide isolated outputs, a separate transformer is required.
- 5 A field-supplied 500 ohm resistor (AM-708) is required for this application.
- 6 On MS51-7103-X60 (4-20 mAdc) models a 500 ohm resistor is incorporated in the product. Do not use an external resistor.
- 7 If using multiple MS51-7103-040's with TAC System 8000 controller requiring 20 Vdc power; tape off red +20 Vdc power supply leads on all but one actuator.
- 8 Cable on some models contains more wires than are used in applications. Only those wires actually used are shown.

Figure-8 Wire Diagram Notes Guide

## INSTALLATION

### Inspection

Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

### Requirements

- Job wiring diagrams
- Appropriate accessories
- Pliers for removing and inserting connecting pin
- Installer must be a qualified, experienced technician
- TOOL-37, 1 5/8" open end wrench for valve mounting nut
- 5/16" and 7/16" open-end wrench for stem jam nuts and stem extension
- #8 Torx screwdriver (not provided)

### Precautions

#### General

##### Warning:

- Electrical shock hazard! Disconnect the power supply (line power) before installation to prevent electric shock and equipment damage.
- Make all connections in accordance with the job wiring diagram and in accordance with national and local electrical codes. Use copper conductors only.
- Floating and Proportional Models: These products contain a half-wave rectifier power supply. They must not be powered with transformers that are used to power other devices utilizing non-isolated full-wave rectifier power supplies. Refer to EN-206, Guidelines For Powering Devices From A Common Transformer, F-26363 for detailed information.

##### Caution:

- Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.
- Manual override to be used only when power is not applied to unit.
- When operating manual override (observe position indicator), back off 5° from full extended mechanical stop to ensure proper release.
- Use with fluid temperatures above 100°C requires insulation on the pipe and control valve.

#### Federal Communications Commission (FCC)

**Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This

equipment generates, uses, and can radiate radio frequency energy and may cause harmful interference if not installed and used in accordance with the instructions. Even when instructions are followed, there is no guarantee that interference will not occur in a particular setting—Which can be determined by turning the equipment off and on—the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

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### Canadian Department of Communications (DOC)

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**Note:** This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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### European Standard EN 55022

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**Warning:** This is a Class B digital (European Classification) product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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## Location

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**Caution:** Avoid locations where excessive moisture, corrosive fumes, vibration, or explosive vapors are present.

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## Mounting

- Mount the linear actuator directly on the valve in locations that clear the maximum dimensions of the actuator case (see Figure-12).
- Ensure that the valve body is installed correctly. The arrow must point in the direction of flow. With three-way valves observe stem position (stem up or stem down) for proper flow characteristics. See Table 3.
- It is preferable that the actuator is mounted above the valve body. This will minimize the risk of damage to the actuator in the event of condensation or a valve leak. Refer to Figure-10.

### Changing Control Function (proportional units only)

These actuators are equipped with a jumper to control the function of the signal as received. See Figure-9. Factory setting is for direct acting. Remove cover to change jumper setting.

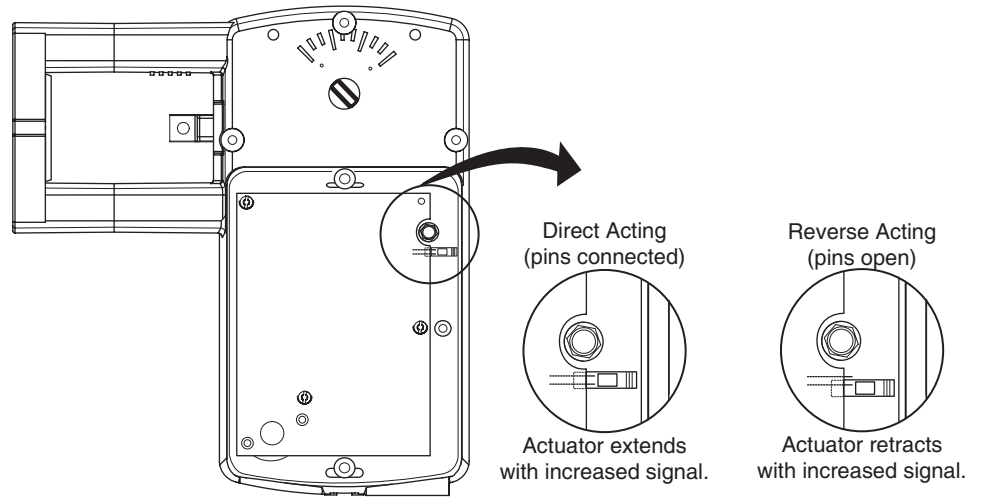


Figure-9 RA/DA Jumper Setting for Proportional Models

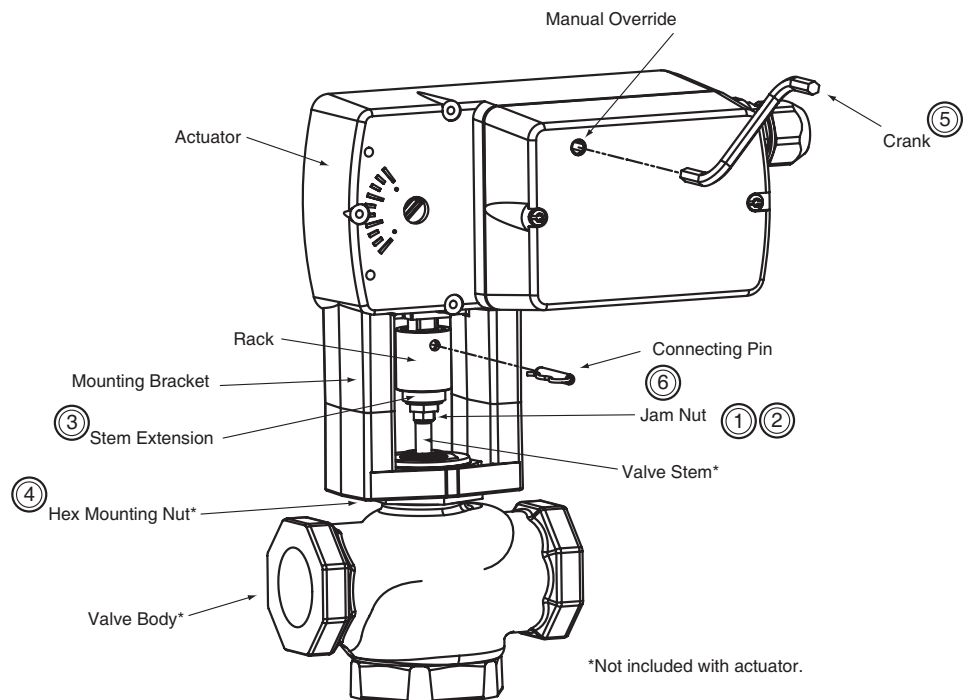


Figure-10 Mx51-710x Series Actuator Exploded View

### Installation: Mx51-710x Series Actuator to 1/2" to 2" VB-7xxx Series Valve Bodies, 2-Way Stem-Up Closed and 3-Way Mixing or Diverting Applications

- A. Preload the valve to insure proper close-off according to the numbered steps in Figure-10 and the text below. (Remove power before proceeding.)
1. Locate the steel jam nut that came packaged with the actuator. (Do not re-use the brass jam nut present on an existing valve.)
  2. Screw the nut onto the valve stem all the way as far as it will go (you may need to use a TOOL-20-1 or a 5/16" open-end wrench). At least 1/2" of the valve stem should extend above the nut.
  3. Thread the stem extension onto the valve stem, making contact with the jam nut. Raise the valve stem to the full up position.

4. Orient the actuator mounting bracket on the valve and tighten the hex mounting nut securely against the bracket using TOOL-37.
  5. Insert the crank provided in the actuator cover. Wind two turns counterclockwise. Press in the turn crank 1/8 turn counterclockwise to lock in position.
  6. Rotate the stem extension until the through holes in the stem extension and rack line up. Insert connecting pin to secure stem extension and tighten jam nut against stem extension using TOOL-20-1 or a 5/16" open end wrench.
- B. Apply power to the actuator and check the system operation for heating or cooling output in response to the control signal.

### **Installation: Mx51-710x Series Actuator to 1/2" to 2" VB-7xxx Series Valve Bodies, 2-Way Stem-Up Open**

- A. Preload the valve to insure proper close-off according to the numbered steps to 10 and the text below. (Remove power before proceeding.)
1. Locate the steel jam nut that came packaged with the actuator. (Do not re-use the brass jam nut present on an existing valve.)
  2. Screw the nut onto the valve stem as far as possible (use TOOL-20-1 or a 5/16" open-end wrench if needed). At least 1/2" of the valve stem should extend above the nut.
  3. Thread the stem extension onto the valve stem, making contact with the jam nut. Push the valve stem to the full down position.
  4. Orient the actuator mounting bracket on the valve and tighten the hex mounting nut securely against the bracket using TOOL-37.
  5. Insert the crank provided in the actuator cover. Wind the crank counterclockwise until the actuator fully extends, then unwind 2 turns and press in and turn crank 1/8 turn counterclockwise to lock in position.
  6. Rotate the stem extension until the through holes in the stem extension and rack lineup. Insert connecting pin to secure stem extension and tighten jam nut against stem extension using TOOL-20-1 or a 5/16" open end wrench.
- B. Apply power to the actuator and check the system operation for heating or cooling output in response to the control signal.

## **Valve Mounting**

The valve should be mounted in a weather-protected area, in a location that is within the ambient temperature limits of the actuator. The installation of the actuator assembly should provide clearance on all sides to allow for any maintenance that may be needed (see Figure-10 and Figure-11).

1. Following general piping practices is recommended.
2. Apply pipe sealant sparingly to all but the last two threads of a properly threaded, reamed, and cleaned pipe. Make sure the pipe chips, scale, etc. do not get into the pipe since this material may lodge in the valve seat and prevent proper closing and opening of the valve. The valve must be piped with an inlet and an outlet.
3. Start the joint hand-threading the pipe into the valve. If the thread alignment feels normal, continue to turn the pipe by hand as far as it will go.
4. Use a pipe wrench to fully tighten the pipe to the valve.

---

**Caution:** Do not over-tighten the pipe, which may cause stripped threads. Avoid twisting or crushing the valve while tightening the pipe.

---

5. Insulate only the valve body and associated piping, not the actuator.
  6. In chilled or cold water systems where the environment is humid, use a drip pan under the valve to catch condensate.
- 

**Caution:** The SmartX linear actuator is designed to effectively support its own weight. No load or weight should be resting on the actuator, long term damage may occur to the actuator, mounting connection or the valve.

- Do not insulate the actuator/linkage. Doing so will result in excess heat buildup within the actuator.

- For non-steam application the globe valve assembly must be mounted so that the actuator is at least 5° above the horizontal (Figure-11) to ensure that any condensate that forms will not travel into the mounting bracket or actuator.
- On steam applications, the globe valve assembly must be mounted approximately 45° from horizontal.
- Temperature Restrictions: For maximum ambient 140 °F (60 °C) the maximum allowable fluid temperature should not exceed valve rating. See F-27252 Selection Guide for specific ratings.

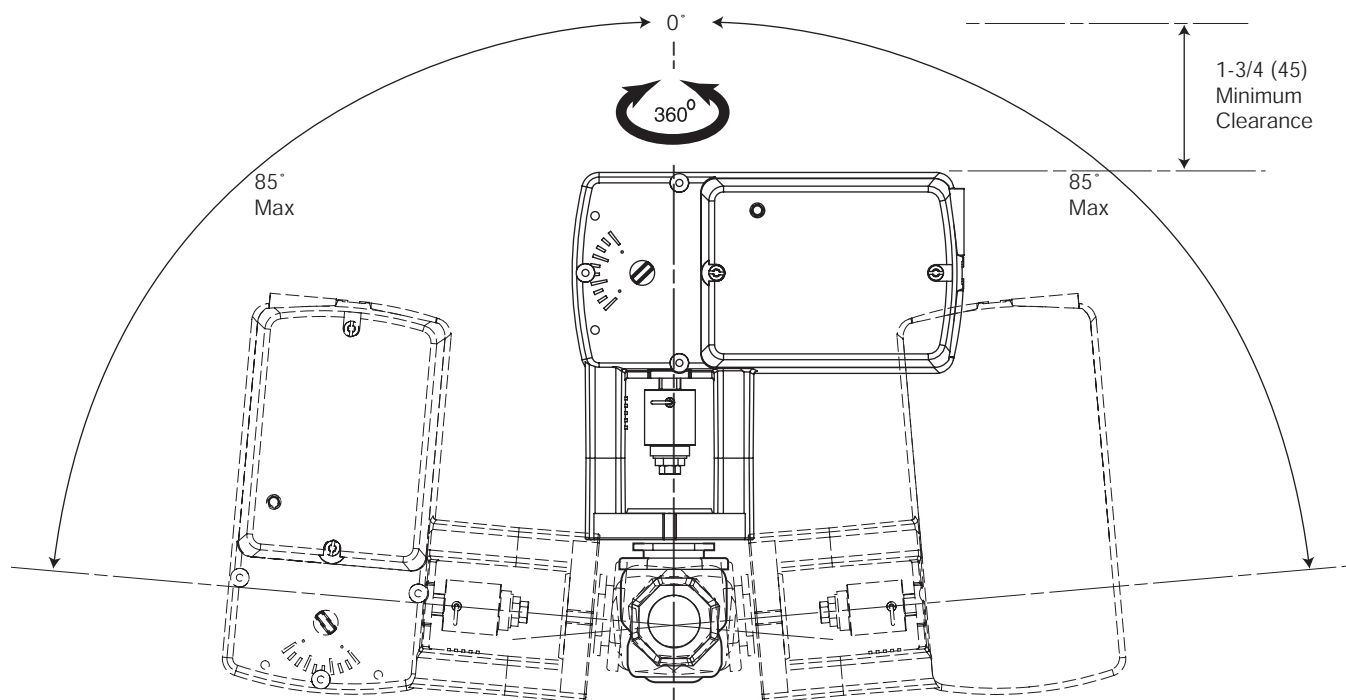


Figure-11 Acceptable Mounting Orientations for Non-Steam Applications

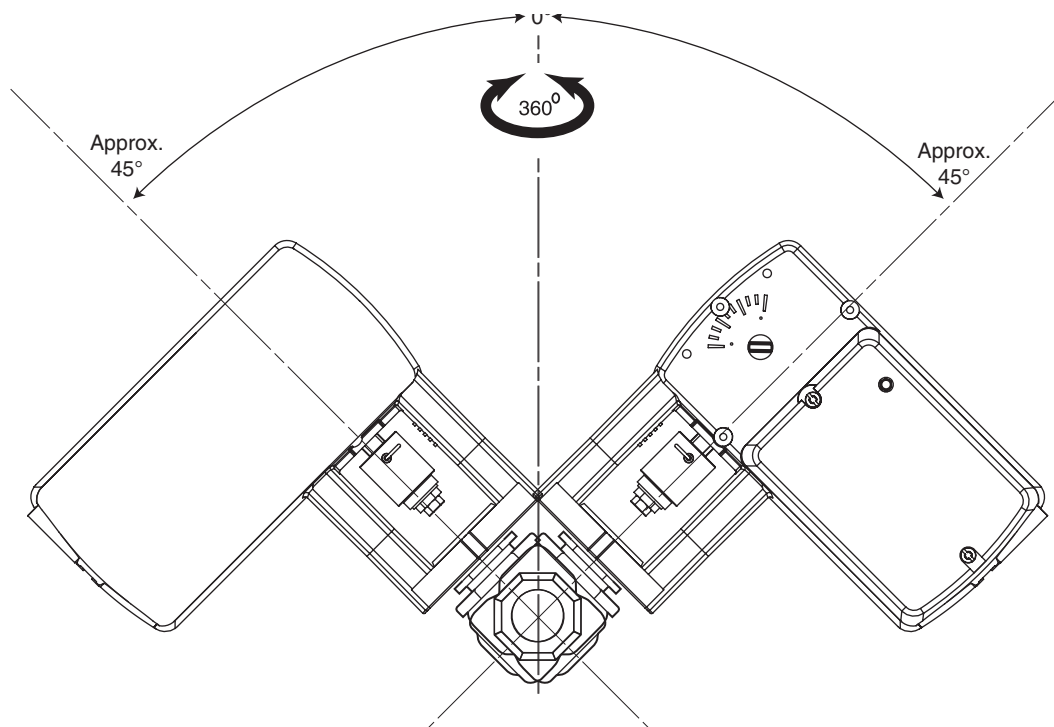


Figure-12 Acceptable Mounting Orientation for Steam Applications

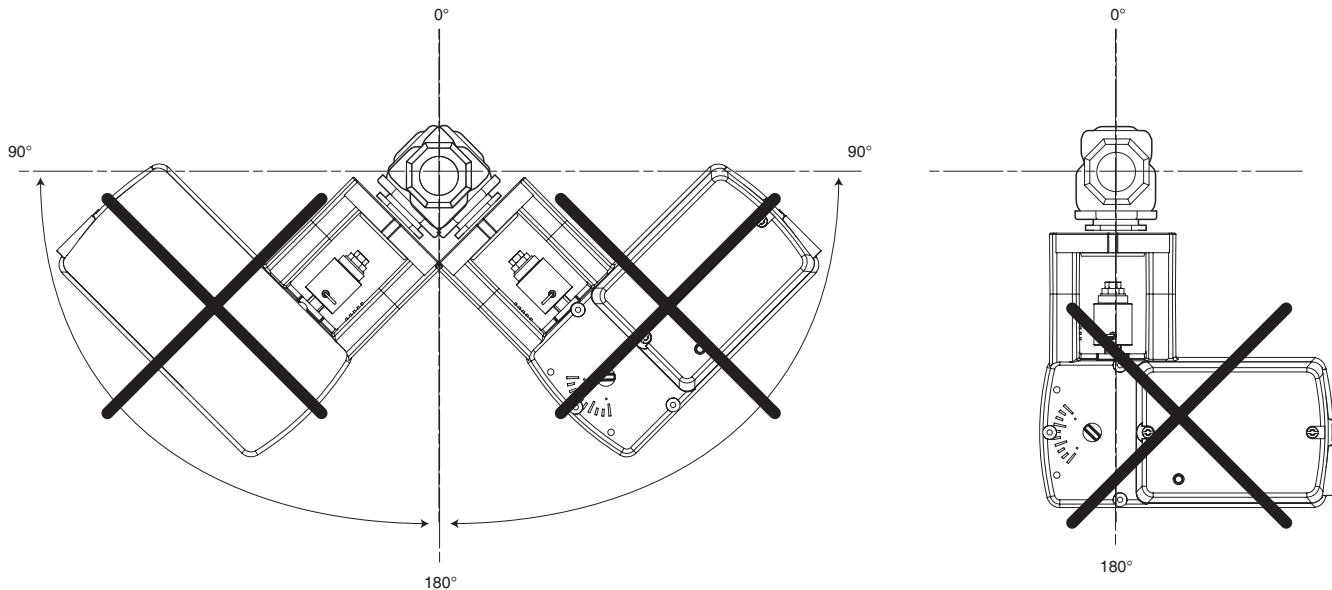


Figure-1 Unacceptable Mounting Orientation

## MANUAL OVERRIDE OPERATION

When necessary, the actuator's output shaft can be repositioned using the manual override mechanism as follows:

1. Disconnect power from the actuator. The actuator will fully retract.
2. Without pushing down on the crank, crank the manual override counterclockwise until the actuator extends to the desired position. Push in until the mechanism locks in position. (The manual override lock will release the next time power is applied.)
3. If you desire to reposition the actuator manually from a locked position, turn the crank 1/8 turn counterclockwise and pull out to release. Adjust position as desired.

### Caution:

- Only use manual override when the actuator drive motor is not powered.
- Engaging the manual override when the actuator is powered may cause damage to the gears.
- Using power tools to adjust the override will cause damage to the gears.

## Wiring Requirements

### Control Leads

See Table-2 for power wiring data. Refer to Figure-1 through Figure-7 for typical wiring.

Table-2 Power Wiring

Actuator Voltage	Part Number	Maximum Wire Run in ft. (m)					
		12 AWG	14 AWG	16 AWG	18 AWG	20 AWG	22 AWG
24 Vac 20-30 Vdc	MA51-7103	1678 (512)	1055 (322)	664 (202)	417 (127)	263 (80)	208 (63)
	MF51-7103	1289 (393)	810 (247)	510 (155)	321 (98)	202 (61)	160 (49)
	MS51-7103	1140 (348)	717 (219)	451 (137)	284 (86)	178 (54)	141 (43)

## CHECKOUT

After the entire system has been installed and the actuator has been powered up, the following check can be made for proper system operation. Check for correct operation of the valve while actuator is being stroked.

1. Apply power to the actuator. Actuator and valve should be driven to their powered position as determined by the control signal. Refer to Table-3 for valve flow.

2. Break power to the actuator. Actuator and valve should return to the spring return position (retracted position).

**Table-3 Assembly Configuration Chart**

Valve Body	Valve Body Action	Normal Position		Action <sup>a</sup>
		Valve Stem	Flow	
VB-721x VB-921x	Two-Way Stem Up Open	Up	Open	A to AB flow decreases as actuator extends
VB-722x VB-922x <sup>b</sup>	Two-Way Stem Up Closed	Up	Closed	A to AB flow increases as actuator extends
VB-731x VB-931x <sup>b</sup>	Three-Way Mixing	Up	B to AB	A to AB flow increases as actuator extends B to AB flow decreases as actuator extends
VB-732x VB-932x <sup>b</sup>	Three-Way Diverting	Up	B to AB	B to A flow increases as actuator extends B to AB flow decreases as actuator extends

<sup>a</sup>Proportional models shipped with RA/DA jumper set for DA (actuator extends with increasing signal).

<sup>b</sup>Discontinued 1/2" to 1-1/4" VB-9xxx.

**Note:** Check that the transformer(s) are sized properly.

- If a common transformer is used with multiple actuators, make sure that polarity is observed on the secondary. This means connecting all black wires to one leg of the transformer and all red wires to the other leg of the transformer.
- If multiple transformers are used with one control signal, make sure all black wires are tied together and tied to control signal negative (-).
- If the controller uses a full-wave power supply and does not provide isolated outputs, a separate transformer is required.

## THEORY OF OPERATION

The MA, MF and MS series actuators are directly mounted onto the valve without the use of a separate linkage. They are equipped with true mechanical spring return operation for reliable, positive close-off on valves. When power is applied, the actuator moves to its powered position, at the same time tensing the spring return safety mechanism. When the power is removed, the spring returns the actuator to its normal position (retracted position). The spring return system provides consistent close-off force to the valve.

MA series two-position actuators use a DC motor controlled by on board electronics. When the actuator encounters a stall or end of travel position, the motor current is automatically reduced, preventing damage to the actuator or motor.

MF or MS series floating or proportional actuators use a DC motor which is controlled by a microprocessor. The microprocessor supplies the intelligence to provide a constant speed and to know the actuator's exact position. The microprocessor monitors and controls the DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition.

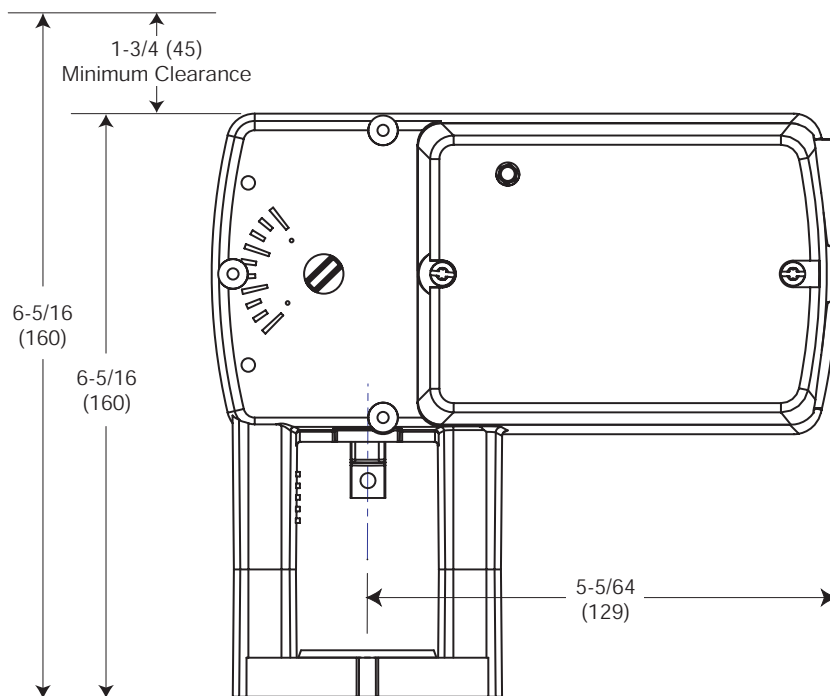
All actuators may be stalled anywhere in their normal rotation without the need of a mechanical end switch.

## MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained optimum performance. The Linear series actuators are maintenance free.

## FIELD REPAIR

None. Replace with a functional actuator.



Dimensions shown  
are in inches (mm).

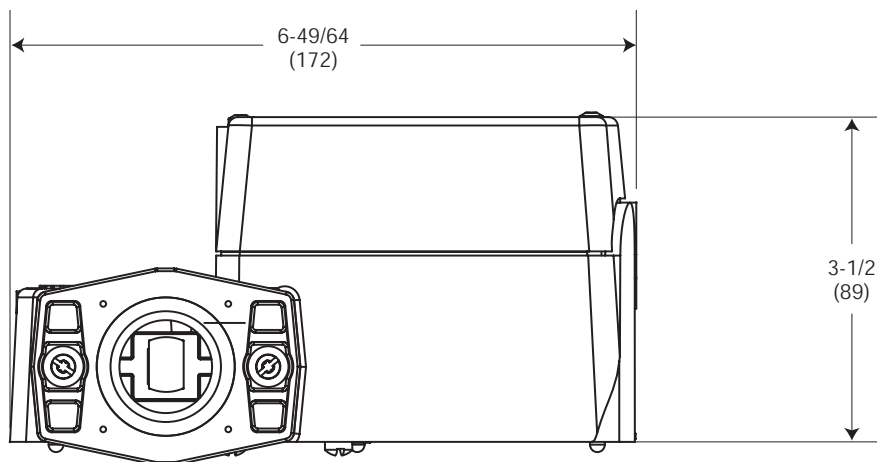



Figure-14 Mx51-710x Spring Return Valve Actuator Dimensions

Commercial Reference	Range Brand		Product Description				
MA51-71XX MS51-71XX MF51-71XX	SMARTX LINEAR ACTUATORS		MA51 2-POSITION LINEAR 105-INLBF SPRING-RETURN MS51 PROPORTIONAL LINEAR 105-INLBF SPRING-RETURN MF51 FLOATING LINEAR 105-INLBF SPRING-RETURN				
	有害物质 - Hazardous Substances						
部件名称 Part Name	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚(PBDE)	
属部件 Metal Parts	X	O	O	O	O	O	
塑料部件 Plastic Parts	O	O	O	O	O	O	
电子件 Electronic	X	O	O	O	O	O	
线缆和线缆附件 Cables & cabling acces- sories	O	O	O	O	O	O	
<p>本表格依据 SJ/T11364 的规定编制。</p> <p>O: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。</p> <p>X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。</p> <p>(企业可在此处, 根据实际情况对上表中打“X”的技术原因进行进一步说明。)</p> <p>This table is made according to SJ/T 11364.</p> <p>O: indicates that the concentration of hazardous substance in all of the homogeneous materials for this part is below the limit as stipulated in GB/T 26572.</p> <p>X: indicates that concentration of hazardous substance in at least one of the homogeneous materials used for this part is above the limit as stipulated in GB/T 26572</p>							



**DECLARACIÓN CE DE CONFORMIDAD**  
 EC CONFORMITY DECLARATION  
 EG KONFORMITÄTSERLÄRUNG  
 DECLARATION CE DE CONFORMITÉ



**Departamento de Dirección de Calidad**  
 Quality Management Department

**Qualitätsmanagement-Abteilung**  
 Département de gestion de la qualité



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**La presente declaración de conformidad se expide bajo exclusiva responsabilidad del fabricante.**

This declaration of conformity is issued under the sole responsibility of the manufacturer.  
 Diese Konformitätserklärung wird in der alleinigen Verantwortung des Herstellers ausgestellt.  
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**Descripción/ Product description/ Produktbeschreibung/ Description du produit: ASC**

**Tipo de máquina/ Machine type/ Maschinentyp/ Type de machine: MÁQUINA/ MACHINE/ MASCHINE/ MACHINE**

**Marca/ Brand/ Marke/ Marque: FISAIR**

**Es conforme con la legislación de armonización pertinente a la unión europea:**

It complies with the harmonization legislation relevant to the European Union:

Es entspricht den für die Europäische Union relevanten Harmonisierungsgesetzen

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**Es conforme con las siguientes normas:**

It complies with the following standards:

Es entspricht den folgenden Normen:

Il est conforme aux normes suivantes:

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With no liability for the parts or components added or assembled by the customer.

Unter Ausschuß der Verantwortung über die vom Kunden bereitgestellten und/oder angebaute Teile.

Avec exclusion des responsabilités concernant les parties ou les composants ajoutés ou assemblés par le.



# FISAIR S.L.U. WARRANTY POLICY



Quality Department  
Departamento de Calidad



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## Two-year Limited Warranty

FISAIR warrants to the original purchaser that its products will be free from defects in materials and parts for a period of two (2) years after installation or twenty-seven (27) months from the date FISAIR ships such product, whichever date is the earlier.

If any FISAIR product is found to be defective in material or assembly during the applicable warranty period, FISAIR's entire liability, and the purchaser's sole and exclusive remedy, shall be the repair or replacement of the defective product or part.

## Warranty disclaimer

FISAIR shall not be liable for any costs or expenses, whether direct or indirect, associated with the installation, removal or reinstallation of any defective product.

The Limited Warranty does not include any consumer part such as joints, pulleys, filters or media.

FISAIR's Limited Warranty shall not be effective or actionable if:

- a) All related product invoices have been paid in time and terms.
- b) Unless there is compliance with all installation and operating instructions furnished by FISAIR, or if the products have been modified or altered without the written consent of FISAIR, or if such products have been subject to accident, misuse, mishandling, tampering, negligence or improper maintenance. Such situations could be an incorrect power supply connection, crashed with inappropriate objects, security protection devices unblocked and so.
- c) Components and/or manufactures are affected or damaged by the effects of corrosion (gradual wear of the metal bodies by the action of external actors not controlled by FISAIR).

Any warranty claim must be submitted to FISAIR in writing within the stated warranty period.

## Parts Warranty

Defective parts may be required to be returned to FISAIR. In case any part is claimed as a faulty one, FISAIR will ask the customer to send the part back to the factory in order to analyze if the part is failing due to any of above referred actions (see warranty disclaimer) or due to effective part failing.

If the part must be replaced immediately, FISAIR will ship the part to the customer immediately and invoice the part with a 30 days delay payment for the faulty part to be returned. If the part is returned in this period, the part fail analysis would be made to emit a technical report for the warranty coverage based in this Warranty Statement document.

In case that the part is failing due to a lack of quality, FISAIR will credit this invoice in order to stop the payment. In case FISAIR does not receive the part in this period, or if the failure is due to the reasons covered in the Warranty disclaimer paragraph, the invoice will be effective.

In case any part from the product / shipment is missing, the customer should notify FISAIR before 3 days from the shipment date of arrival.



## FISAIR S.L.U. WARRANTY POLICY



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### Service Covered by Warranty

In case that there is any FISAIR product that should be serviced in order to recover its proper used designed, FISAIR will select the person (s) in charge of this operation. These qualified technicians should have the enough knowledge to service FISAIR units.

No company should practice a warranty service without the writing FISAIR notice giving the authorization to do it and if any cost should be cover by FISAIR should be advised in advance to the service job. In case that FISAIR should send FISAIR staff to solve the solution, trip expenses are not covered by the warranty.

FISAIR's Limited Warranty is made in lieu of, and FISAIR disclaims all other warranties, whether express or implied, including but not limited to any implied warranty of merchantability, any implied warranty of fitness for a particular purpose, any implied warranty arising out of a course of dealing or of performance, custom or usage of trade.

FISAIR shall not, under any circumstances be liable for any direct, indirect, incidental, special or consequential damages (including, but not limited to, loss of profits, revenue or business) or damage or injury to persons or property in any way related to the manufacture or the use of its products. The exclusion applies regardless of whether such damages are sought based on breach of warranty, breach of contract, negligence, strict liability in tort, or any other legal theory, even if FISAIR has notice of the possibility of such damages.

By purchasing FISAIR's products, the purchaser agrees to the terms and conditions of this Limited Warranty.


### Extended Warranty

The original user may extend the term of the FISAIR Limited Warranty for a limited number of months past the initial applicable warranty period and term provided in the first paragraph of this Limited Warranty. All the terms and conditions of the Limited Warranty during the initial applicable warranty period and term shall apply during any extended term.

Each case should be valued in terms of type of product, equipment application, use and location of the product operation site.

Any extension of the Limited Warranty under this program must be in writing, signed by FISAIR, and paid for in full by the purchaser.

Quality Manager:



Hugo J. López Álvarez  
San Martín de la Vega, February 2016