telsat srl

INSTRUCTION MANUAL

DEHYDRATOR

Model GIBSON X & Z F4

S/N .....

Operators Safety Information

WARNING!

Danger of electric shock in models working with alternate current (120 or 220Vac)

Protection against electric shock: Class I equipment.

Leakage current to earth: 3,5 mA max.

Connection to primary power: Use conductors with cross-sectional areas of 0,75 mm^2 with designation H05 VV-F or H05 VVH2-F2.
Before installing the dehydrator be sure that the voltage supply is provided with earth fault protection over 6A. Use earthing terminal of 16 mm^2.

Danger of scald: The dehydrator, during the regeneration cycle, produces heat in the desiccant salts tanks (about 150°C). Be careful you don't touch the tanks when you open the equipment.
We advise you to fix the dehydrator far from other sensitive to heat equipments and moisture!

IMPORTANT

The ESD sensitive electronic components are present inside the dehydrator, it may be damaged by possible electrostatic charges. Do not open the metal panels of the dehydrator if the earth cable isn't connected.

Particular care must be taken touching these components, when the ground connection of the equipment is not yet present.

The dehydrator is shipped in an antistatic envelope: if the equipment need to be sent back to the manufacturer, please use the same original packaging material or equivalent. Use only antistatic envelopes.

Inside the dehydrator there is a battery Ni-Mh to maintain the memory of the working cycle. Do not leave the dehydrator in stop time without power supply for more of 12 – 18 months. Risk of battery failure!

CE

DECLARATION OF CE and RoHS CONFORMITY

Dichiarazione di conformita' CE e RoHS

Herewith we Criotherm s.r.l.,
Noi Criotherm s.r.l.,

in quality of producer declare that the following Dehydrators for the protection of Wave Guides:
in qualità di produttore dichiariamo che i modelli di Pressurizzatori per la protezione di Guide d'Onda qui di seguito elencati:

Type:
Modello:

GIBSON X F4 & GIBSON Z F4

in all the possible configurations correspond to the basic requirements of:
in tutte le varie configurazioni ai quali questa dichiarazione si riferisce sono conformi alle seguenti direttive:

- **EC directive about the low voltage 2014/35/UE of February, 26th 2014 entered into force on April, 20th 2016;**
  Direttiva «Bassa Tensione» 2014/35/UE del 26 Febbraio 2014, recepita come Legge Italiana 20 Aprile 2016;

- **EC directive about the electromagnetic compatibility 2014/30/UE of February, 26th 2014 entered into force on April, 20th 2016;**
  Direttiva «Compatibilità Elettromagnetica» 2014/30/UE del 26 Febbraio 2014, recepita come Legge Italiana 20 Aprile 2016;

according to the following standards when applicable:
secondo le seguenti norme quando applicabili:

EN 61000-6-1, EN 61000-6-3, EN 60950-1

- **EC directive 2011/65/UE of the European Parliament of June, 8th 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) starting than January, 3th 2013.**
  Direttiva 2011/65/UE del Parlamento Europeo e del Consiglio del 8 Giugno 2011 con introduzione dal 03 Gennaio 2013 (Direttiva «RoHS») avente come scopo la Restrizione nell'uso di determinate sostanze pericolose nelle di apparecchiature elettriche ed elettroniche.

Milan, March, 15th 2017

Daniele Canepa
General Manager

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1. GENERAL INFORMATION

1.1. Technical characteristics

Air capacity	:	290 l/h ± 10%
Number of outlets [4]	:	4 with outlet cocks each
Total volume pressurized	:	950 liters
Applications	:	Wall and Rack 19”
Leakages monitor [F]	:	1 Flowmeter 0 ÷ 25 l/h general
Regeneration type	:	Automatic - more than 5 years before change salts
Dew point	:	<-40°C @ 20°C Tamb. e 80% R.H.
High Humidity presence	:	Humidity indicator with change of salt’s colour
Pressure working	:	Set at 12 kPa (2,5 kPa on request)
Air compression	:	2 diaphragm pumps with continuous alternatively working
Pressure indication	:	Pressure gauge 0 ÷ 16 kPa (0 ÷ 4 kPa on request)
Desiccant salts type	:	AA 35
Desiccant salts quantity	:	0,75 liters
Working temperature	:	-10 + 40°C
Storage temperature	:	-20 + 60°C

Power supply			
Voltage (order code Z)	:	48 ÷ 60 Vdc ± 20%	
Voltage (order code X)	:	230 Vac – 50 Hz	
Voltage (order code D)	:	110 Vac – 60 Hz	
Current absorption @ 55 Vdc	:	Normal working 0,16 A	Salts reactivation 2,2 A
@ 230 Vac	:	Normal working 0,15 A	Salts reactivation 0,80 A
@ 110 Vac	:	Normal working 0,17 A	Salts reactivation 1,30 A (for 30 min. every 3 hours)
Electrical connection	:	Vac on IEC connector - Vdc on 3W3C connector	
Power supply cable type	:	minimum cross-section of 1 mm² designation H05 VV-F or H05 VVH2-F2	

Alarms		
Alarms displayed	:	Lack of main supply
		Low pressure @ <7,0 kPa alarm and >8,0 kPa restore
(on request)		(Low pressure @ <1,2 kPa alarm and >1,7 kPa restore)
		Manual functioning when CP is switched
Tele alarms type	:	Grouped with dry contact switch (Nc-C-No)
Tele alarms connections	:	To the 9 poles cannon connectors
(pin on connector)		(5) No – (3) C – (1) Nc
Alarms cable type	:	Couple cable

Installation accessories included		
Power connector	:	n° 1 IEC socket or n°1 3W3C with plastic case
Alarms connector	:	n° 1 female connector with plastic case
Hose Ø8x10 mm	:	25 meters PR-5 or MB-PELD
Output angle adapters	:	n° 4 plastic L code H2291(dehydrator side)
Quick release union elbow	:	n° 4 H22106 (Wave guides side)
Adapter for Andrew connectors	:	n° 4 H0905

Directives		
EEC directives	:	2014/30/UE and 2014/35/UE
		2011/65/UE RoHS Compliance
Quality standard	:	Under UNI EN 29001

Sizes and weight		
Application wall	:	437 (l) x 132,5 (h) x 345 (p) mm
Application rack 19"	:	482,5 (l) x 132,5 (h) x 305 (p) mm
Net weight	:	11 kg

1.2. General description

The Desiccant Dehydrators series **GIBSON X F4** and **GIBSON Z F4** are automatic regeneration equipments, designed to protect volume wave-guides and air-dielectric cable systems up to **950 liters.** Able to supply **290 l/h** of dry air at a pressure set at **12 kPa** (2,5 kPa on request).

The functioning principle of the automatic regeneration is based on the alternating use of two pumps in continuos operation and two drying columns. The air, sucked by a pump, is dehydrated through the drying tank and compressed in order to keep the pressure value corresponding to that necessary for protecting the wave guide or dieletctric cable.

By means of a pressure regulator and some sampling instruments as a pressure gauge, a humidity indicator, etc., the pressure is reduced and the dew-point of the air is controlled for putting it in the cables. A general Flowmeter allows to discover possible leakages in the cable.

The automatic reactivation system is based on two sections, each of them composed of one pump and a drying tank. The tanks contain a non-toxic chemical salt which is able to hold the moisture of the air and to push it out subsequently by heating. An electronic programmer handles in turn the activation of each section so that the reactivation of the salts in one tank is possible while the other one dehydrates the air. The exchange occurs cyclically every three hours in order to always have the system ready to release air at the right stage of drying in case of a sudden demand from the cables protected.

The presence of two alternating sections for the air compression gives more guarantee of operation, increases the life of the equipment and the possibility to detect in real time the status of the air leakage of the system.

The pumps are diaphragm-type with an arc swinging in a magnetic field. This kind of pump needs a very little energy to work, even at start and, because of the absence of lubricating oil, there's no risk of pollution of the air inflated into cables. Besides, since it works at low pressure, its haven't maintenance.

The bright Led display, the analogic Pressure Gauge and the analogic Flowmeter provides clear and immediate information in real time on device functioning without the use of buttons or drop-down menu.

1.3. Operation

Following scheme 1, the environment air passes through the filters (1), enters one of the two drying tanks (2), where the moisture falls on the salts, is sucked up by the pump (3), and compressed. Subsequently a pressure regulator-reducer (4) reduces the value to the level necessary to protect the cables.

About every 3 hours, a programmer (5) cyclically gives rise to commutation of the pumps (3) and the heating resistors (6) thus allowing the depleted salts to be regenerated. When this inversion occurs, the pump being used stops and the other one starts up, so that the air can pass through the second tank. The drying agent is regenerated by heating of the salts, which is achieved by means of the electrical heaters (6) for about 40 minutes at 150°C; simultaneously with an inverse flow of dry air, which causes the moisture in the column to be expelled. A system called Restriction (12) causes a small calibrated leak, which is used to expel, from the tank, the steam produced by heating the salts.

The pressure gauge (7) displays the value of the pressure in the protected system and any variations caused by various influences, such as cable leaks, manipulation of the regulator, etc.

The pressure switch (9), located in the low pressure zone, triggers an alarm in the event of an excessive lowering of pressure. Lowering of the latter below 7,0 kPa (1,2 kPa on request) caused by a leak in the cables or because the device is not working, is signalled by a red indicator light, and the exchange contact of a relay for a remote alarm, if any. The restoration of that alarm occurs when the pressure exceeds again 8,0 kPa (1,8 kPa on request).

Before to exit the dry air passes through the humidity indicator (10) which allows a visual check of the state of air drying, and then any of dysfunctions related to the regeneration of the salts.

Flow meter (13) allow the leaks in the wave guides to be measured.

1.4. Controls, alarms and display

For this section, refer to scheme 2 and scheme 3.

Main switch (16)

The main switch (16) activates/de-activates the devices; a green LED (25) indicates when it is ON. As the switch is a bi-polar power type, when it is OFF, both wires of the cable are disconnected.

Pressure gauge (7)

The pressure gauge provides analogue indication of the pressure of the dried air inlet in the cables with values referenced to the kPa scale.

Pressure regulator (4)

The pressure regulator adjusts high pressures to the optimal value for protecting the cables. By manually turning the regulator screw (4), the pressure value can be increased or decreased to a range between 7 to 13 kPa (1,3 kPa to 3,5 kPa on request). Any variation is displayed on the pressure gauge.

Humidity indicator (10)

The humidity indicator shows the degree of drying of the dehydrated air, on the basis of the change in the colour of the salts. By observing the colour of the salts through the frontal viewing glass, it is possible to check whether the drying salts are effective (Orange) or if there is a fault (Dark green).

Led Display (34)

This display provides complete information in real time on device functioning:

- ON (25) [green Led]

- Pressure alarm (26) [red Led]

- CP indicator (30) showing manual operating mode to force the pumps [yellow Led]

- Pump 1 or pump 2 in operation (29) [green Led]

- Tank 1 or tank 2 in regeneration phase (31) [green Led]

CP pumps switch (33)

The lever (33) is used to disengage automatic operation of the regeneration system, and to force switching of the pumps. Moving the lever to position 1 or 2 excludes the programmed cycle and pump 1 or 2, respectively.

This control can be used to check, one after the other, that the pumps are working correctly, without waiting for switching (every 3 hours) of the programmer.

In the event of a faulty pump, operation can be switched to the other one, so as to keep the protection system pressurized while repairs are carried out.

The switching from central position (automatic mode) to position 1 or 2 is indicated by yellow LED (30) located on the efficiency control display. If the indicator is ON, this means that the machine is in emergency state (manual operation).

Warning: This operation must be carried out after having checked the regeneration state: wait, if necessary, for the regeneration tank linked to the pump to be forced to cool. This is because on switching to a pump, during the phase of heating the drying salts contained in the tank connected to it, risks letting moisture into the cables.

Warning: in the event you have forced in manual position to repair a faulty pump do not exceed six hours of functioning. After this time, stop the dehydrator, risks letting moisture into the cables.

2. INSTALLATION AND STARTING

2.1. Installation

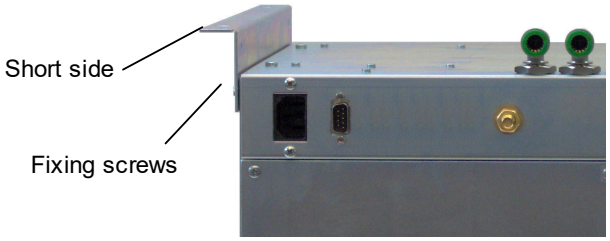
Warning: Install the dehydrator so as to have the Flowmeter at eye-level height. In this way there will be no possibility of the device sucking in dust from the ground, and there will be no danger of accidental knocks while the floor is being swept, or while objects are being transported nearby.

Attention: The dehydrator, during the regeneration cycle, produces heat in the desiccant salts tanks (about 150°C) and high moisture. Install the dehydrator far from very sensitive equipments.

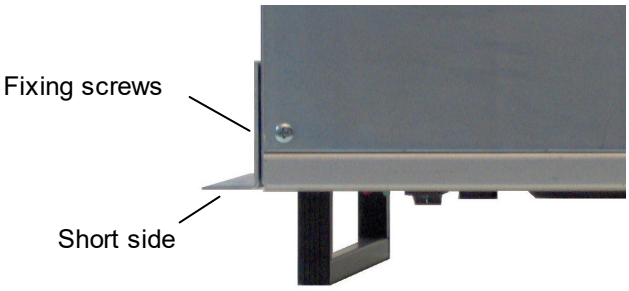
1) Carefully remove the device from the package.

2) Fit the fixing fins in accordance with one of the two arrangements described below:

- WALL APPLICATION: Turn the fins over so that the shorter side is turned towards the outside, and tighten the fixing screws.



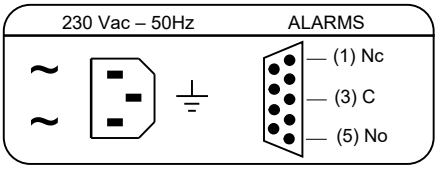
- 19" RACK APPLICATION: Arrange the fins so that the shorter side is turned outwards, and tighten the fixing screws



3) Connect the ground wire, the power cables to the connecting plug (20) (scheme 2) and connect the remote alarms cables to the connector (19) supplied with the device, as follows:

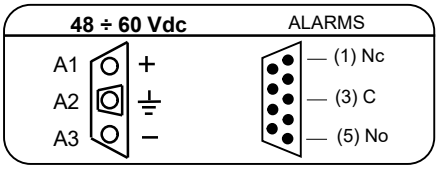
Vac power supply

IEC plug - Cannon plug



Vdc power supply

3W3C plug – Cannon plug



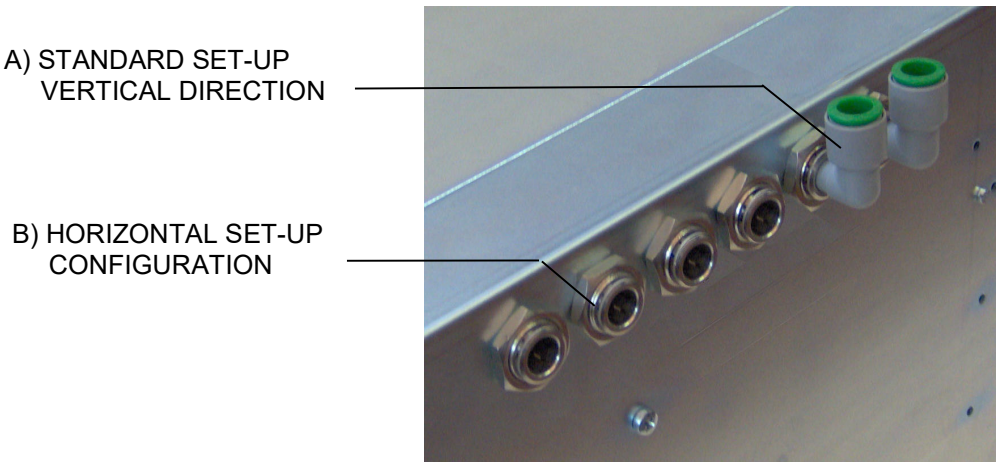
Warning: Power supply cables use a cross-section of 1 mm² minimum and 1,5 mm² max.

Warning: For Vdc power supply, take special care with polarity.

NB: Alarms are transmitted by changes in the state of a relay contact. In normal operating conditions, therefore, the contact will be closed between C and Nc. In case of an alarm, or dehydrator switched off, the contact between C and No will be closed. All alarms are summarized on a single relay.

4) Arrangement of the dried air output connectors (21):

The dehydrator is delivered set up to use semi-rigid tubes PR-5 with vertical output (standard set-up). If an alternative solution is required, the dehydrator can be configured in one of the following ways.



A) STANDARD SET-UP: vertical outlet with rotating elbow at quick-release union for tube PR-5 when the applications are Wall;

B) HORIZONTAL CONFIGURATION: quick-release union output for tube PR-5 when the application is in Rack 19";

N.B: If you wish to modify a configuration, just press the ring on the elbow or the output connector and simultaneously remove the accessory connected (tube, elbow).

5) Insert the dehydrator's connecting tubes to the cables in the connectors output connectors (21). When inserting the semi-rigid tube in the quick-release unions, you should press the part right in;

6) Insert the remote alarm connector in the socket (19) and tighten the fixing screws;

7) Insert the power connector in the socket (20);

8) Insert the dehydrator in the housing provided and fix it.

2.2 Starting

1) Turn the main switch (16) to ON;

2) Using the pressure gauge (7), check that the pressure increases and the red alarm Led (26) goes out when the pressure exceeds 8,0 kPa (1,8 kPa on request);

   N.B.: Illumination of this Led, on switching on, is slightly delayed so that negative pressure peaks do not trigger spurious alarms.

3) Let the equipment work, with the output valves (14) closed, for one day (at least 6 hours) so that the moisture absorbed by the drying agent during the storing period, can be discharged. During this working period, check the colour of the salts through the humidity indicator (10) and, in case it is not already Orange, you should observe the changing of the colour from light Dark green to Orange.

   NB: The display provides complete information in real time on device functioning.

4) Open the dehydrator's air output valves (14);

5) Once the cables are completely full, you can check any leakages from them using the dehydrator's flow meter (13).

2.3 Adjustments

All the adjustments and calibrations are carried out at the factory before the device is shipped. The settings may have to be re-adjusted if the values do not correspond with those required for protecting the wave guide.

If the pressure value should be incorrect (it is set at the factory at 12 kPa or 2,5 kPa on request), adjust the pressure regulator (4). To access the regulating screw, remove the cap; the pressure increases when the screw is turned clockwise.

Warning: Do not calibrate the operating pressure too close to the max working point; max working pressure 13 kPa (3,5 kPa on request).

The pressure switch (9) intervene, generating an alarm, when the pressure goes below 7,0 kPa (1,2 on request) and is restored when the pressure exceeds 8,0 kPa (1,8 kPa on request). Illumination of the red Led and the exchange of contacts of the remote alarm is slightly delayed, so that negative pressure peaks do not trigger spurious alarms.

2.4 Stop

The dehydrator is stopped by turning the main switch (16) to the OFF position.

N.B.: Switching off of the dehydrator, before the output valves are closed, causes an emptying of the wave guides. By closing the output valves, the guides aren't any more protected from the safety valve, danger of increase of pressure!

3. ORDINARY MAINTENANCE

3.1. Procedure for replacement of the desiccant salts

The replacement of the desiccant salts should be performed every five years to ensure the proper air drying.

To replace the desiccant salts contained in the tanks (2) proceed as follows, according to scheme 2:

1) Switch off the dehydrator by means of the main switch (16) and remove it from its location;

2) Disconnect the power connector (20), the remote alarms connector (19) and the ground cable (18);

3) Disconnect the tubes connecting to the cables from the output connectors (21);

N.B.: To disconnect the tubes press the coloured ring on the quick-release-union and simultaneously remove the tube.

Warning: Danger of burn! If the dehydrator is switched off, while it was regenerating, wait the cooling of the tank.

4) Unscrew the air inlet filters (1), empty the tank and replace the salts;

N.B.: Use CRIOTHERM desiccant salts - type AA35, see the spare parts code at the section 6; During the filling gently tap on the tank to cram good salts avoiding empty space.

5) Clean the filters with compressed air and fit them back, or replace them if replace clogged by the dust of salts.

6) Reassemble all parts repeating the described operations in reverse (make sure you push the air tubes all the way in).

4. EXTRA-ORDINARY MAINTENANCE

In case of damage, please contact the repair center TELSAT srl by writing to the telsat@telsat.it or contact your seller directly.

CAUTION: When replacing the fuses used solely and exclusively fuses of equal value and characteristics of interruption. The use of fuses of higher value due to electrocution and fire hazard.

NOTE: In the event of intervention by unauthorized personnel will void the warranty automatically. Each type of intervention must still be performed by highly qualified personnel.

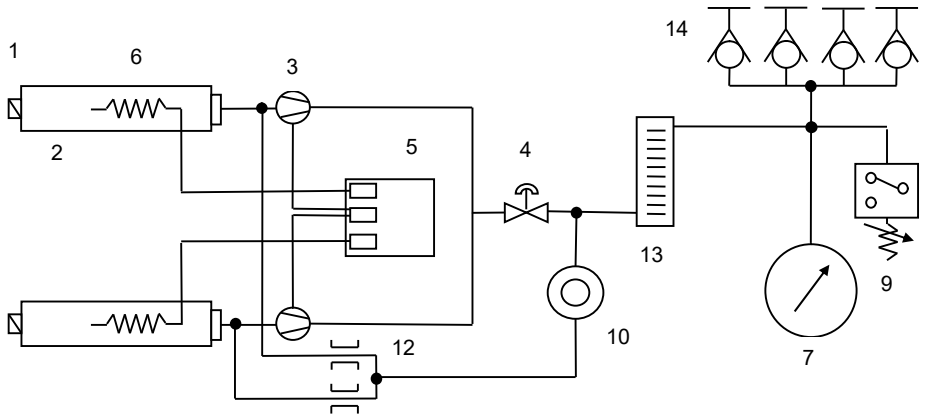
5. TROUBLES SHOOTING

SYMPTOM	CAUSE	OPERATION
The dehydrator doesn't work	The main switch is OFF	Turn the main switch to ON
	The main fuse is broken	Replace the fuse.
	Wrong power connection or lack of power.	Check the equipment connection and the supply voltage efficiency. Check the right polarity for Z version
	The main board is broken	Replace the main board
	No possibility of finding or removing the problem.	Contact the builder
Low pressure alarm	Considerable leakages in the cables under protection.	Check the cables and remove the leakages.
	Wrong pneumatic connections or perforated tube.	Connect correctly the tubes of the dehydrator. Locate the leakage zone, check the tubes are completely insert in the quick-release unions and aren't punctured.
	The pumps don't work.	Check connections and power on the connectors. At the start time the CP must be in automatic position. Replace the pump and/or the board.
	The pump flow capacity is not sufficient.	Replace the pumps.
	The alarm circuit is broken.	Replace the electronic board.
	The pressure switch is broken.	Replace the pressure switch.
Humidity alarm **(colour Dark green)**	Desiccant salts exhausted.	Replace the desiccant salts in the tanks.
	Regeneration cycle wrong.	Replace the electronic board.
	Suction hoses with holes or reversed.	Replace or reverse correctly the hoses.
	Regeneration resistor/s is/are faulty.	Replace the Regeneration resistor/s
Remote alarm always presents	Presence of some alarm.	Remove the cause.
	Main board is broken.	Replace the electronic board.
	Incorrect connections on the terminal block.	Reset the connections.

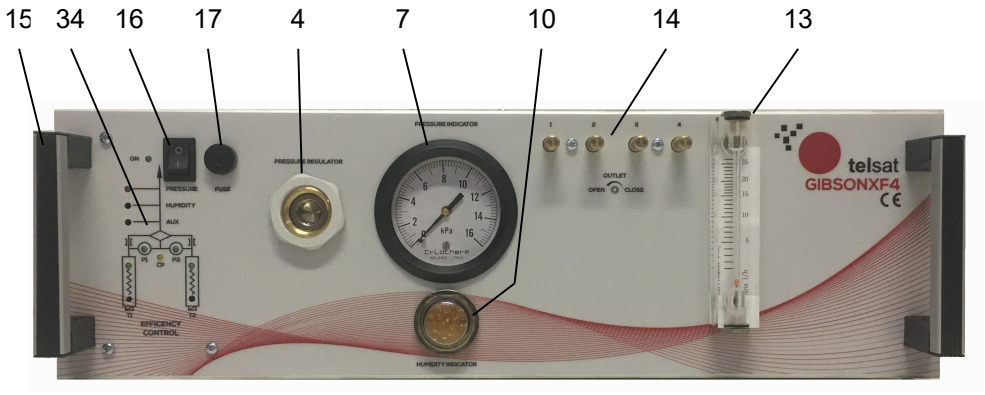
6. SPARE PARTS REFERENCE

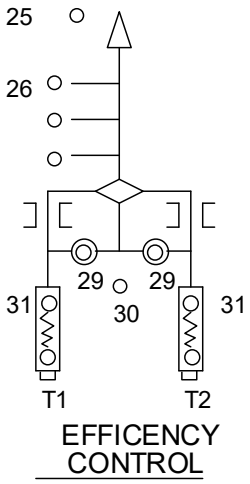
Item	Description	Quantity n°	Packet n°	Code
1a	Pumps for X version	2	1	P 1203
1b	Pumps for Z & D versions	2	1	P 1201
2	Desiccant salts type AA35	0,75 lt	1 lt	M 1833
3a	Regeneration heaters for X version	2	1	F 0118.01
3b	Regeneration heaters for Z & D versions	2	1	F 0120.02
4	Inlet filters	2	1	H 2502
5	Calibrated restrictions with O-Ring	2	1	L 3703
6	Pressure gauge	1	1	D 0201
7	Pressure switch	1	1	D 0514
8	Pressure regulator	1	1	D0830
9	Humidity indicator	1	1	H2021.01
10	Fuses kit	3	3	G 0625
11a	Vac Main board	1	1	E 80111.RIP
11b	Vdc Main board – versions Z & D	1	1	E80110.RIP
12	Display board	1	1	E 8099
13	Electronic Timer board (only X version)	1	1	E80112.RIP
14	Tube Ø 4x6 black	3 m	1	M0317
15	90° elbows with release union	4	1	H 2291
16a	Plug and connector poles kit version X	1+1	2	M 3312
16b	Plug and connector poles kit version Z	1+1	2	M 3312.01
17	Tube Certified Ø10 mm.	25m	1	M0331
18	Quick release union elbow WG side	4	1	H22106
19	Adapter for Andrew connectors up to 23GHz	4	1	H0905
20	AC/DC Converter for version D – 150W	1	1	E2028
21	EMI Filter	1	1	E3005

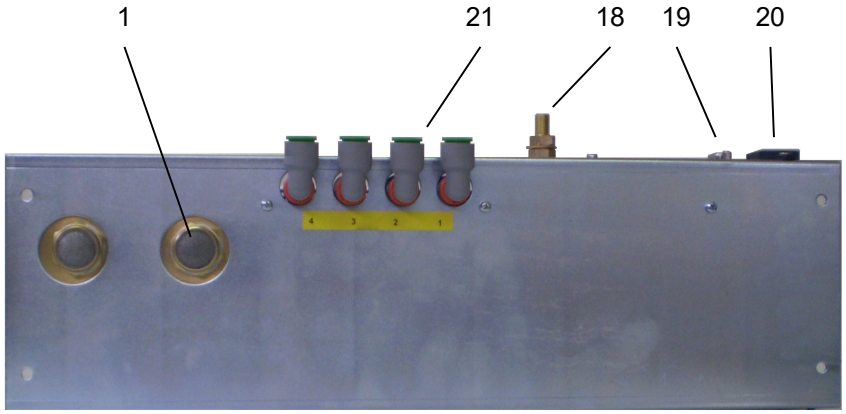
7. ILLUSTRATIONS AND SCHEMES



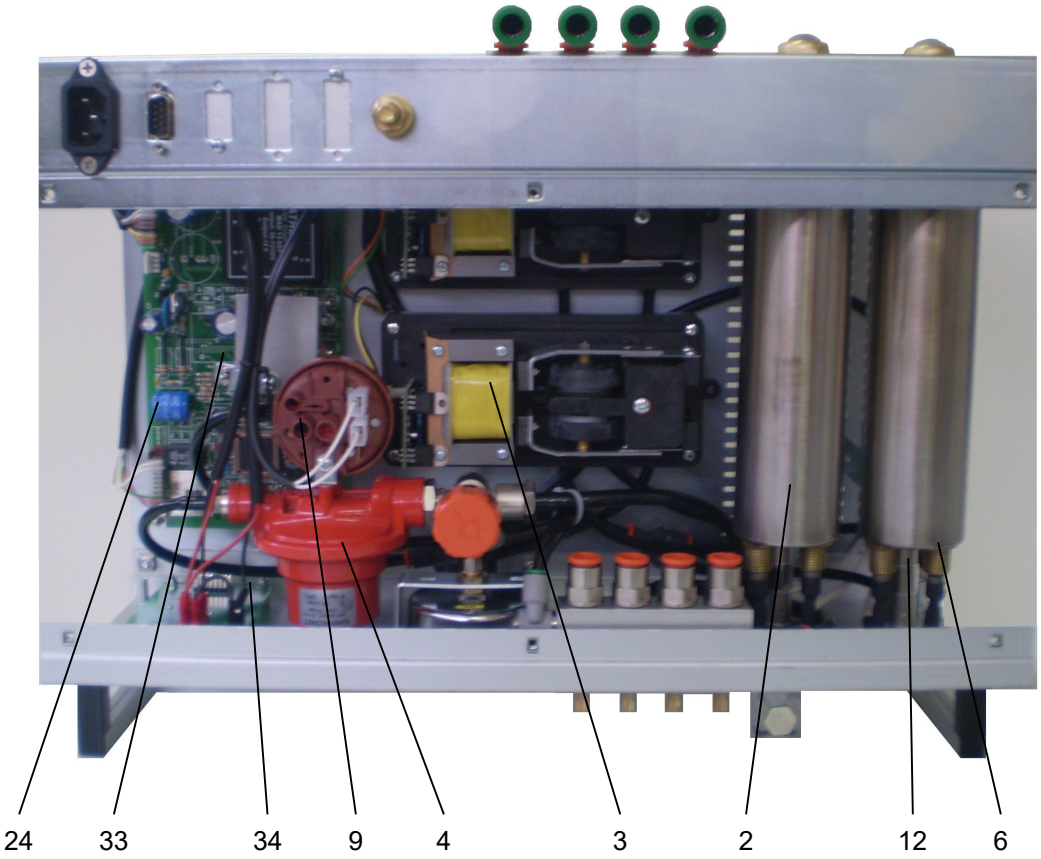
1) Air inlet filters
2) Drying columns
3) Pumps
4) Pressure regulator
5) Electronic boards
6) Regenerations heaters
7) Pressure gauge
9) Pressure switch
10) Humidity indicator
12) Regeneration restrictions
13) Flowmeter
14) Output shut-off valves





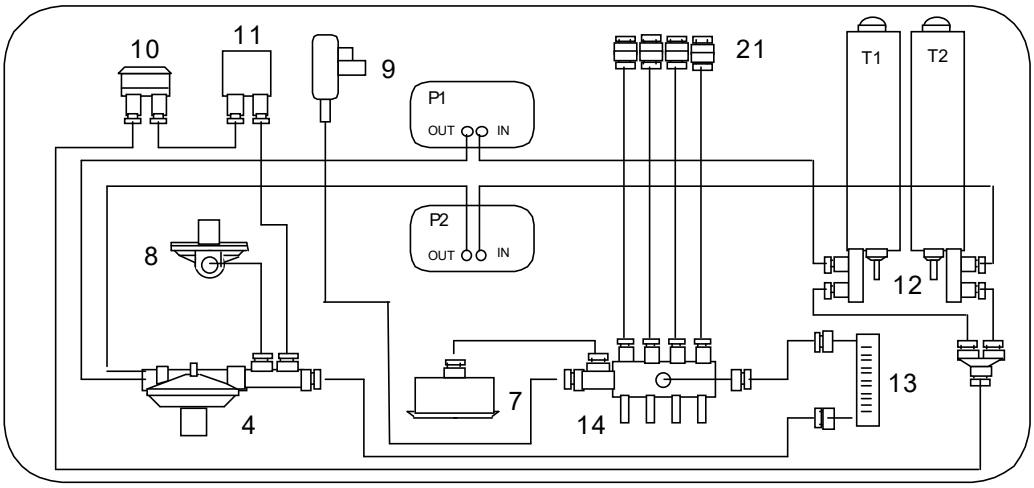


1) Air inlet filters	16) Main switch	25) Dehydrator ON/OFF Led
4) Pressure regulator	17) Main fuse	26) Low pressure alarm Led
7) Pressure gauge	18) Ground point	29) Working pumps Led
10) Humidity indicator	19) Remote alarms connector	30) Manual function alarm Led
13) Flow meter	20) Power supply connector	31) Indication regeneration phase
14) Output shut-off valves	21) Air output connectors	34) Display board
15) Handles	22) Fixing fins	



2) Drying columns
3) Pumps
4) Pressure regulator
6) Regenerations heaters
9) Pressure switch
12) Regeneration restrictions
24) Electronic boards
33) Control pump CP switch
34) Display board

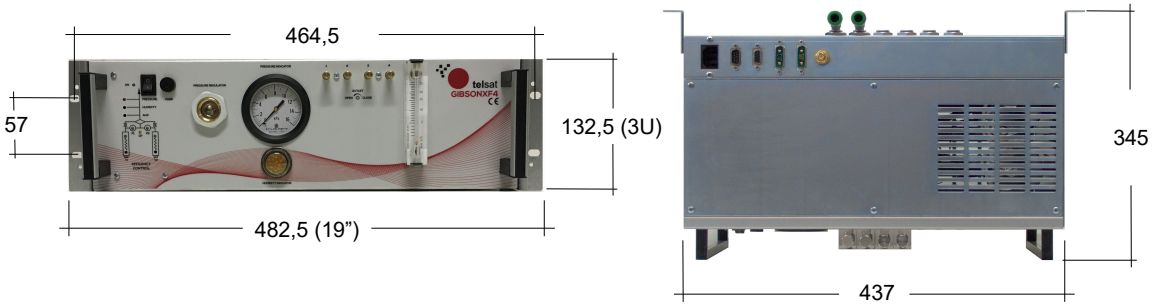
Dehydrator mod. #. HE. F4



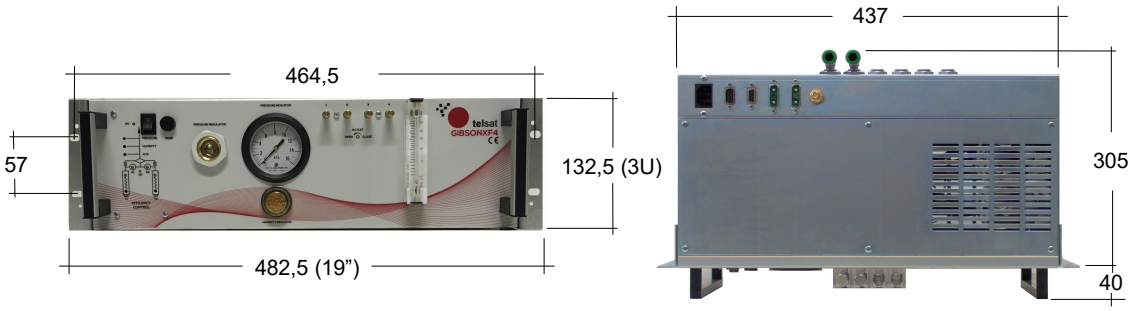
4) Pressure regulator
7) Pressure gauge
9) Pressure switch
10) Humidity indicator
11) Calibrated valve
12) Salts tank In/Out
13) Flow meter
14) Output shut-off valves
14) Output shut-off valves

Mounting and size

- Application on wall –

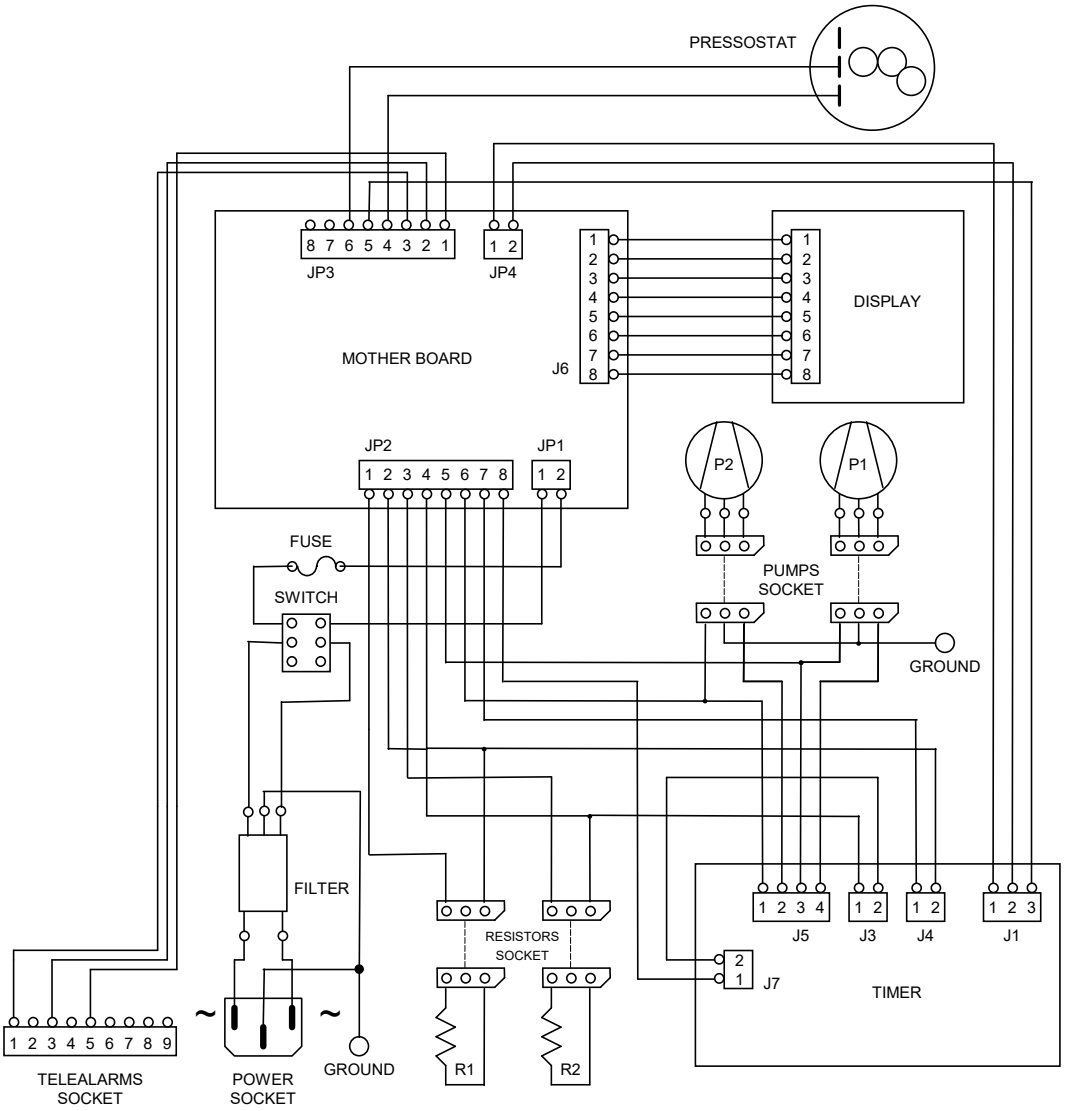


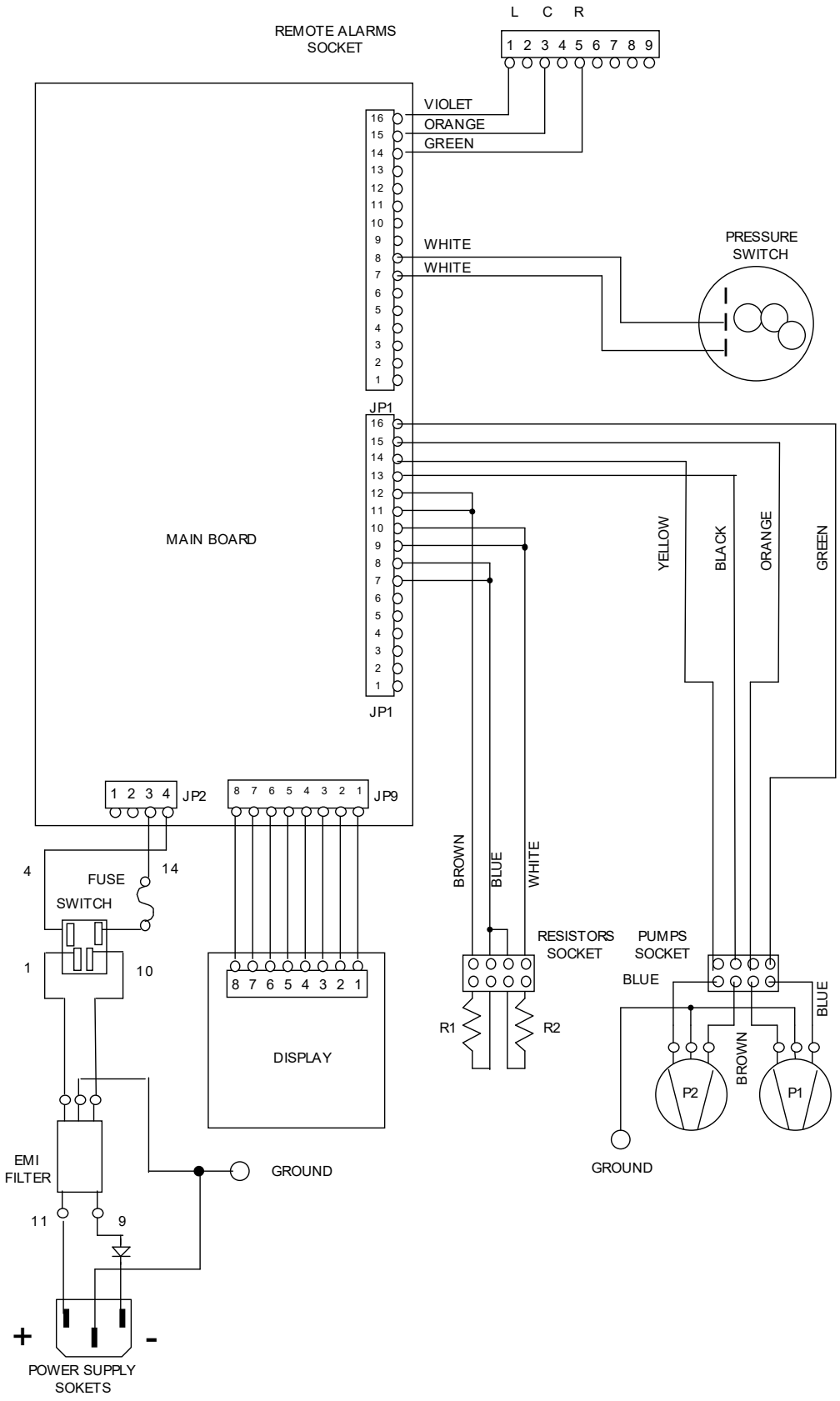
- Application in rack 19" -

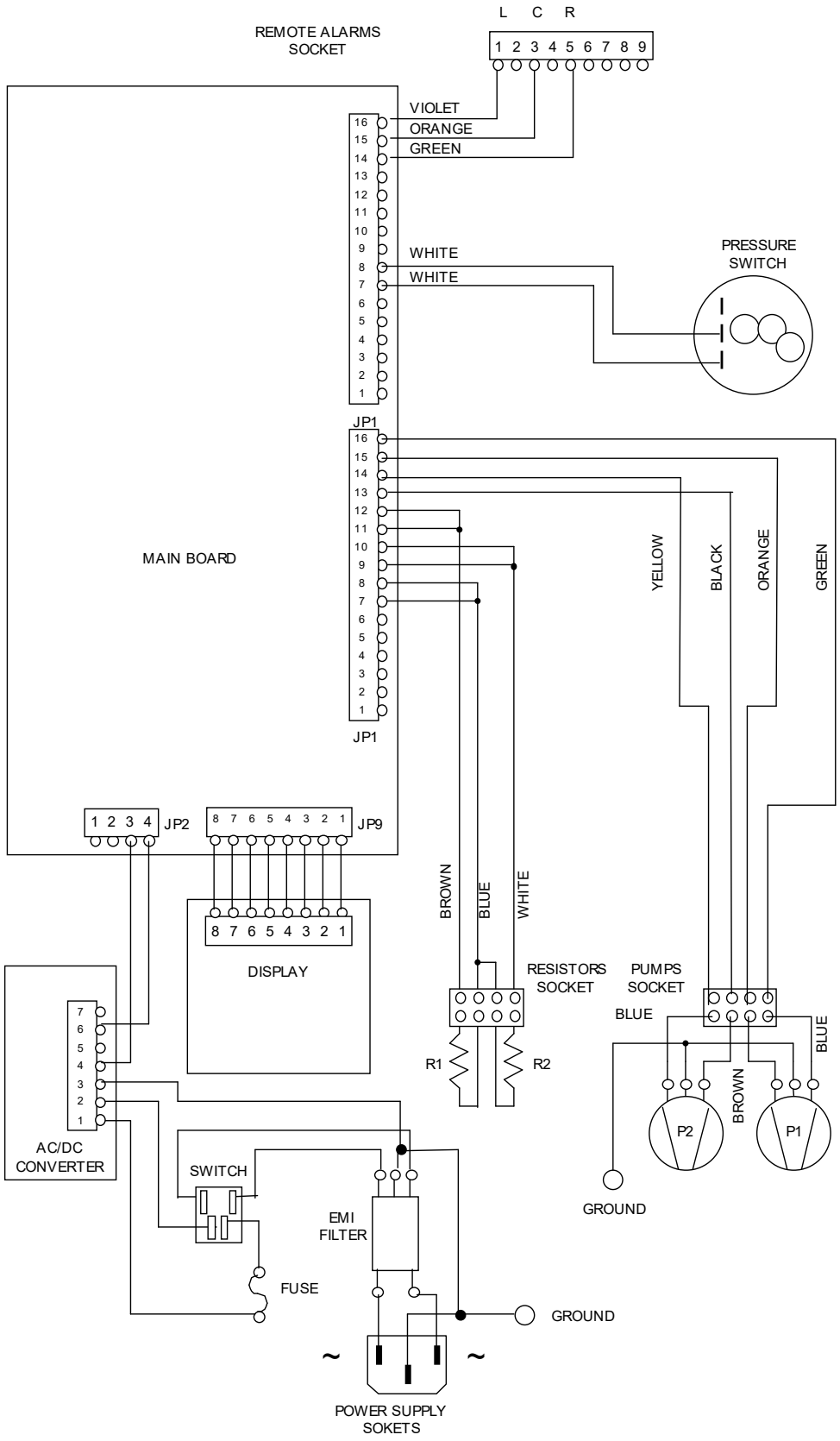


Sizes in mm.

Net weight 11 kg.


PRESSOSTAT
8 7 6 5 4 3 2 1
JP3
1 2
JP4
MOTHER BOARD
J6
1 2 3 4 5 6 7 8
DISPLAY
JP2
1 2 3 4 5 6 7 8
JP1
1 2
P2
P1
PUMPS SOCKET
FUSE
SWITCH
GROUND
FILTER
RESISTORS SOCKET
R1
R2
1 2 3 4
J5
1 2
J3
1 2
J4
1 2 3
J1
2 1
J7
TIMER
1 2 3 4 5 6 7 8 9
TELEALARMS SOCKET
POWER SOCKET
GROUND


L C R
REMOTE ALARMS SOCKET
1 2 3 4 5 6 7 8 9
VIOLET
ORANGE
GREEN
WHITE
WHITE
PRESSURE SWITCH
JP1
MAIN BOARD
YELLOW
BLACK
ORANGE
GREEN
JP1
1 2 3 4 JP2
8 7 6 5 4 3 2 1 JP9
BROWN
BLUE
WHITE
4
FUSE
SWITCH
14
1
10
RESISTORS SOCKET
PUMPS SOCKET
BLUE
BLUE
8 7 6 5 4 3 2 1
DISPLAY
R1
R2
BROWN
P2
P1
EMI FILTER
GROUND
GROUND
11
9
+
-
POWER SUPPLY SOKETS


L C R
REMOTE ALARMS SOCKET
1 2 3 4 5 6 7 8 9
VIOLET
ORANGE
GREEN
WHITE
WHITE
PRESSURE SWITCH
JP1
MAIN BOARD
YELLOW
BLACK
ORANGE
GREEN
1 2 3 4 JP2
8 7 6 5 4 3 2 1 JP9
BROWN
BLUE
WHITE
8 7 6 5 4 3 2 1
DISPLAY
RESISTORS SOCKET
PUMPS SOCKET
BLUE
R1
R2
BROWN
BLUE
P2
P1
GROUND
AC/DC CONVERTER
SWITCH
EMI FILTER
FUSE
GROUND
POWER SUPPLY SOKETS

8. MAINTENANCE REGISTER

8.1 Installation data

- Installer Company : _____

- Installation date : _____ Signature: _____

- Note : _____

_____

_____

8.2 Ordinary and extra-ordinary maintenance register

Date	Description and Spare parts replaced	Signature

Date	Description and Spare parts replaced	Signature

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