Liebert® AFC Screw
Adiabatic Cooling System Integration

User Manual

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1 - Introduction

This technology uses panels called PAD. A film of water is running on their surface and air partially makes it evaporate creating the wished cooling effect.
The PAD consists of corrugates cellulose sheets, reciprocally crossed and bonded with non-toxic adhesives. This configuration creates a large contact surface between air and water and achieves a highly efficient evaporation.
While the adiabatic system is operating, the water distribution system wets the whole panel uniformly, avoiding any dry area that would reduce both efficiency and life.
The humidifying efficiency mainly depends on the environmental operating conditions.
A cellulose panel, if drenched with water, tends to crumble. This crumbling is greatly minimized with the used system.

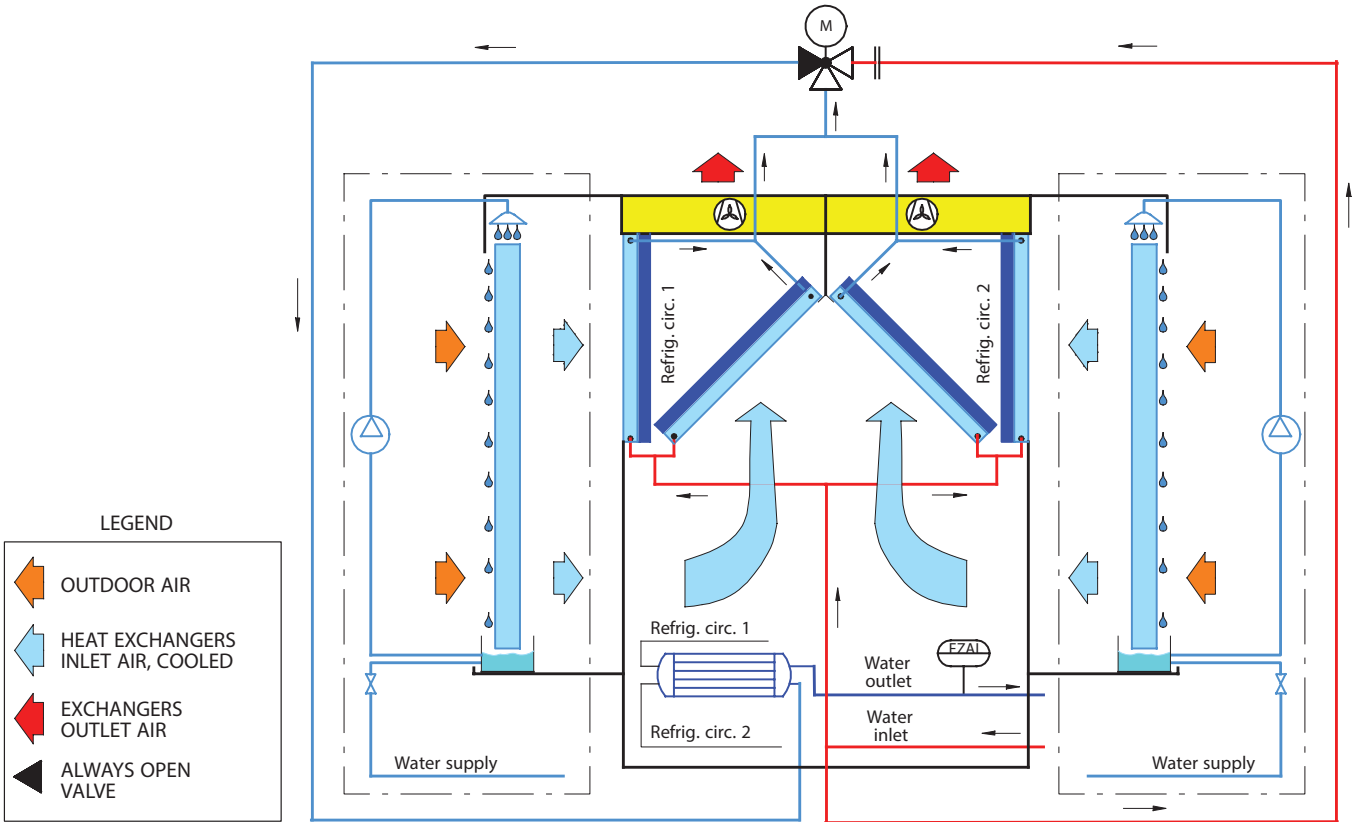
The cellulose soaking procedure ensures a self-bearing product, with high absorbency and protected from damage, thus with a longer life.
Furthermore, water tends to flow to the air inlet side of the panel: the most of evaporation occurs there.

The first centimetres of the PAD are treated with a special hardening paint to increase its resistance to the growth of algae and limescale, as well as its mechanical resistance. The water distribution panel, positioned above the cooling panel, ensures a uniform distribution so that no surface is left dry. It is therefore a basic part of a complete system: the distribution panel must be used together with the PAD panels.
The absence of irregular water flow is guaranteed and therefore no special protections on the exchangers of the chiller supporting this device are required.
The average life of the PAD panels (if operated according to the maintenance schedule) is approx. 3-5 years for a use of approx. 4000 h/year.
Other panel types are available and built with materials improving the cellulose features as for fire resistance (UL 900,Class II classified fiberglass), or for cleaning, was hability and other features (flocked PVC sheets).Contact Vertiv for any need for special uses.

2 - Chiller AFC: Integration of the Adiabatic System

Unlike the currently designed adiabatic pre-cooling systems, only aimed at extending the chiller operating range with higher external temperatures, the AFC is aimed at steadily decreasing the external air temperature so as to reduce the condensing temperature and/or increasing the freecooling capacity, for a higher unit efficiency.
As mentioned in the introduction, the used technology involves a PAD wetted with mains water, with external air flowing through it and water evaporating making the air fresher. The hydraulic diagram below explains the operating concept of the adiabatic system and its interaction with the chiller.

Fig. 1 - Operating principle of adiabatic system



Notes:

- The elements of the adiabatic kits are those enclosed in the dash-dot lines.
- The water pipes and the valve system for the circulation of water chilled and to be chilled are to be considered as entirely enclosed inside the machine volume.

While the adiabatic system is operating, the freecooling chiller has cooling air available at a temperature lower than the ambient temperature, in a degree depending on the external thermo-humidity conditions. The table below shows the performance of the adiabatic system, for various external air temperature and humidity values.

Tab. 1 - Adiabatic system performance

Air temperature before PAD [°C]	Air condition after PAD															
	Tdb [°C]	RH [%]	Tdb [°C]	RH [%]	Tdb [°C]	RH [%]	Tdb [°C]	RH [%]	Tdb [°C]	RH [%]	Tdb [°C]	RH [%]	Tdb [°C]	RH [%]	Tdb [°C]	RH [%]
50	30,9	56	34,3	65	37,2	72										
48	29,6	56	32,8	65	35,5	72										
46	28,3	56	31,3	65	33,9	72	36,3	78								
44	27	57	29,8	65	32,3	72	34,5	78								
42	25,7	57	28,4	65	30,7	72	32,8	78	34,7	83						
40	24,4	58	26,9	66	29,1	72	31,1	78	32,9	83	34,6	87				
38	23,1	58	25,4	66	27,5	73	29,4	78	31,2	83	32,8	87	34,2	91		
36	21,8	59	24.0	66	26.0	73	27,8	78	29,4	83	30,9	87	32,3	91	33,7	94
34	20,4	59	22,5	67	24,4	73	26,1	78	27,7	83	29,1	87	30,5	91	31,7	94
32	19,1	60	21.0	67	22,8	73	24,4	78	25,9	83	27,3	87	28,6	91	29,8	94
30	17,8	60	19,6	67	21,2	73	22,8	78	24,2	83	25,5	87	26,7	91	27,9	94
28	16,4	61	18,1	68	19,7	73	21,1	79	22,4	83	23,7	87	24,9	91	26.0	94
26	15,1	61	16,6	68	18,1	74	19,4	79	20,7	83	21,9	87	23.0	91	24.0	94
24	13,7	62	15,2	68	16,5	74	17,8	79	18,9	83	20,1	87	21,1	91	22,1	94
22	12,3	62	13,7	69	14,9	74	16,1	79	17,2	83	18,3	87	19,3	91	20,2	94
20	11.0	63	12,2	69	13,3	74	14,4	79	15,5	83	16,5	87	17,4	91	18,3	94
18	9,8	63	10,8	69	11,7	74	12,7	79	13,7	83	14,7	87	15,5	91	16,4	94
16	8,4	64	9,3	69	10,1	74	11,0	79	12,0	83	12,9	87	13,7	91	14,4	94
14	7,1	64	7,8	70	8,6	75	9,4	79	10,2	83	11,1	87	11,8	91	12,5	94
12	5,8	65	6,3	70	7,0	75	7,7	79	8,5	83	9,2	87	9,9	91	10,6	94
10	4,4	65	4,9	70	5,4	75	6,0	79	6,7	83	7,4	87	8,1	91	8,7	94
8	3,1	66	3,4	71	3,8	75	4,3	80	5,0	83	5,6	87	6,2	91	6,7	94
6	1,8	66	1,9	71	2,2	75	2,7	80	3,2	83	3,8	87	4,3	91	4,8	94
5	1,1	66	1,2	71	1,4	75	1,8	80	2,3	83	2,9	87	3,4	91	3,8	94

10	20	30	40	50	60	70	80
Air R.H. before PAD [%]							

LEGEND
T out > 35 °C
30°C < T out < 35 °C
25°C < T out < 30 °C
20°C < T out < 15 °C
15°C < T out < 20 °C
7°C < T out <15 °C
Freezing Risk !

The AFC chiller, configured for the installation of the PAD pre-cooling system, includes two independent adiabatic sections, one for each AFC side, with shared power supply and adjustment. The adiabatic system includes: curtain panels on the base (so that all the air sucked flows exclusively through the PADs); high efficiency fans (ensuring the air passage through the above panels in all operating conditions); a set of brackets and hooks arranged inside the chiller structure to ensure its fastening (to be made during the below described chiller commissioning); electronically controlled regulator installed on the machine, for both the right and left sections; hydraulic system (with or without tank, with recirculation or direct flow, better described later) for each AFC side.

The adiabatic system control, the electrical system and a part of the mechanical structure supporting the PADs are factory-installed on the unit, while the adiabatic panels, the water distribution panels, the additional mechanical structure and the hydraulic system are supplied as a separate kit to be ordered as accessory and installed on site.

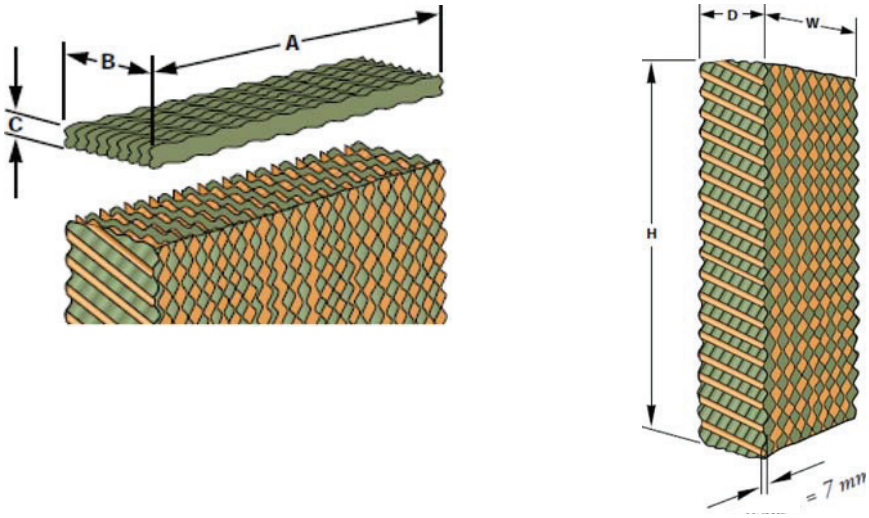
The following adiabatic kits are available:

- with direct flow, available with or without water flow rate meter (supplied not fitted on the unit). This system does not recirculate water; the water recirculation system can be shared among several units, but must be sized by the customer according to the design guidelines specified in Chap. 9.
- with autonomous built-in stand-alone pumping system(system with pump and built- in tanks), available with or without water consumption meter (supplied not fitted on the unit); the system operated with stand- alone adiabatic hydraulic circuit, including 2 or 4 tank modules and 2 o 4 recirculation pumps (one or two for each side of the unit)

The adiabatic kit must be selected carefully, according to the arrangements existing in the chosen unit configuration.
The AFC units equipped with adiabatic panels does not include the installation of coil protection metal filters and of compressor compartment protection grids, thanks to the protecting/filtering function by the PADs that are equipped with a special coating and ensure a protection both in summer and winter without any need to precautionary remove them.

2. 1 - Description of the PAD panels

The dimensions of the panels are H 2000 mm, W 600 mm, D 100 mm; their dry weight is approx. 3 kg, while the wet weight is approx. 11 kg.
The dimensions of the water distribution panels (to be installed between PAD and the drilled PVC pipe for water distribution) are C 30 mm, A 600 mm, B 100 mm; the dry/wet weight is negligible.



2. 2 - Hydraulic configuration of the adiabatic system

The adiabatic system is available in two configurations:

- direct-flow type: without tanks and pumps; in this case the adiabatic water recirculation system is not included.
- with BUILT-IN stand-alone recirculation system: which includes tanks, pumps and complete adiabatic water recirculation system, all integrated in the frame of the unit.

The adiabatic hydraulic circuit schematic is different depending on the type of configuration (as described above) and on the number of fans of the unit.

Description of the hydraulic section of the adiabatic system without tank (direct flow).

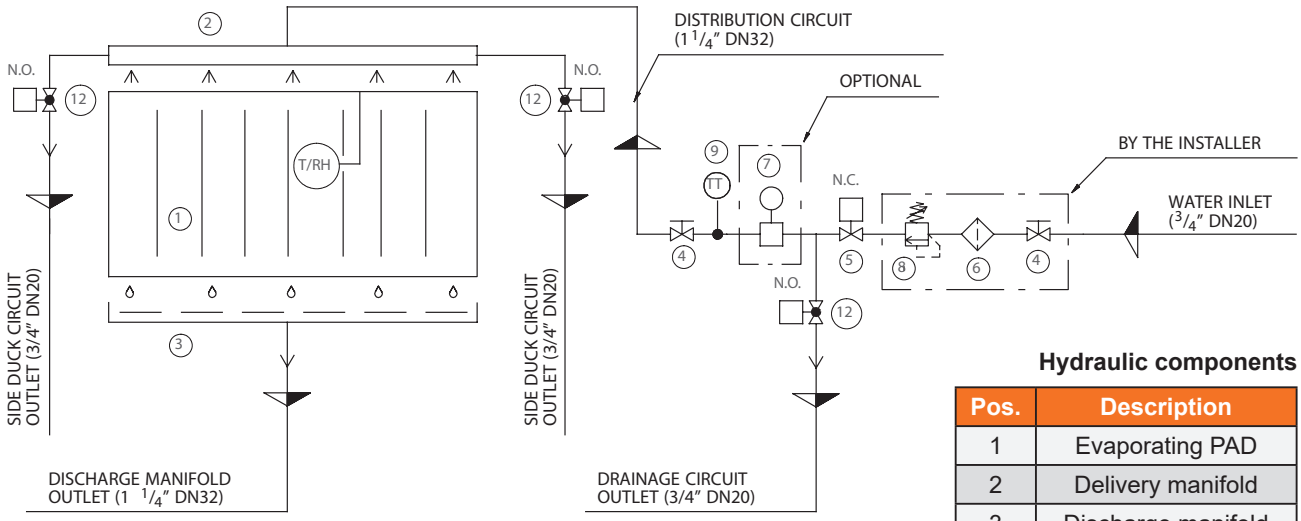
The components described in the hydraulic diagram below are present:

- Optional PAD supply flow meter according to the technical sheet par. 11. 3.
- NC solenoid valve for the system hydraulic supply according to the technical sheet par. 11. 7.
- Ball solenoid valves with servo-control, according to the technical data sheet par. 11. 6.
- Hydraulic section including flow rate adjusting manual shutter, pressure intake, pipes and connectors.

In order to optimize the water distribution on the PADs, the water distribution system changes depending on the number of fans.

The units without tank and pump are configured as follows:

Fig. 3 - Hydraulic section of the adiabatic system without tank and pump (12- 20 Fans)



Hydraulic components

Pos.	Description
1	Evaporating PAD
2	Delivery manifold
3	Discharge manifold
4	Gate valve
5	Solenoid valve
6	Filter
7	Flow meter
8	Pressure regulator
9	Pressure connection
10	-
11	-
12	Motorized ball valve

The system configuration depends on the number of fans also in the adiabatic systems with tank.
Description of the hydraulic section of the adiabatic system with tank (autonomous recirculation)
System with tank; on each bank there is a tank for collecting/distributing the water from/to the adiabatic system combined with each AFC; it includes:

- Water collection tank size and volume as Tab. 1, complete with pump support, cover, support legs, overflow, predisposition to various hydraulic connections.
- Circulation pump according to the technical sheet par.11. 4.
- Pump safety switch (level control) according to the technical sheet par. 11. 5.
- Hydraulic supply float cock according to the technical sheet par. 11. 1.

The components of the hydraulic diagram below are also present:

- Optional flow meter (water consumption) according to the technical sheet par. 11. 2.
- Ball solenoid valves with servo-control, according to the technical data sheet par. 11. 6.
- Hydraulic section including inspectable metal mesh filter, flow rate adjusting manual shutters, pressure intakes, pipes and connectors.

Description of the hydraulic section of the adiabatic system with built-in tanks

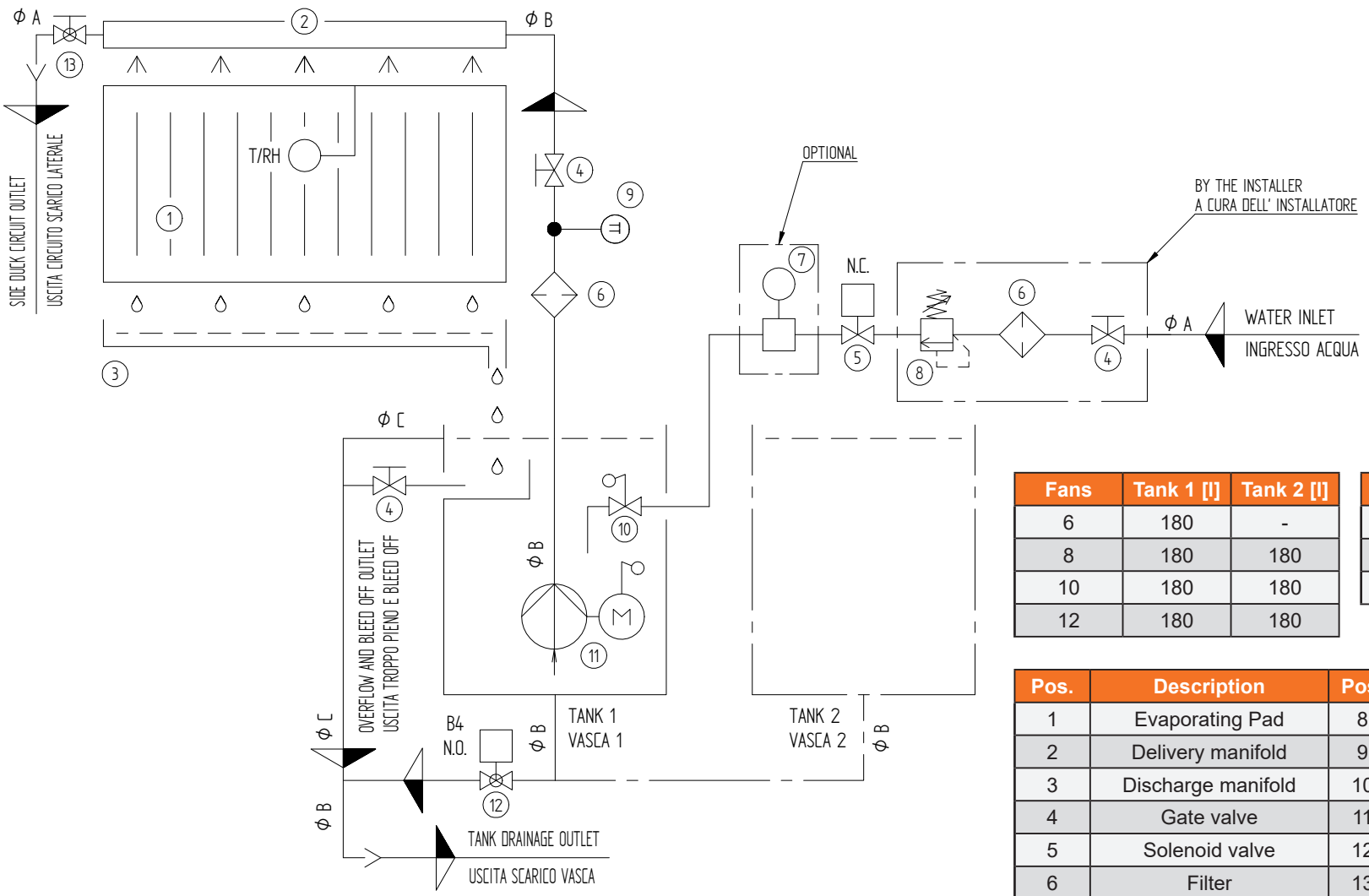
System with built-in tank; on each bank there is one or two tank modules for collecting the water from/to the adiabatic system combined with each AFC; it includes:

- Water collection modules size and volume as Tab. 1 complete with pump support, overflow, predisposition to various hydraulic connections.
- Circulation pump according to the technical data sheet par. 11.4.
- Pump safety switch (level control) according to the technical data sheet par. 11.5.
- Water supply cock float-operated according to the technical data sheet par. 11.1.

The components of the hydraulic diagram below are also present:

- Optional flow meter (water consumption) according to the technical data sheet par. 11.2
- Motorized ball valves according to the technical data sheet par. 11.6
- Hydraulic section including inspectable metal mesh filter, flow rate adjusting manual shutters, press intakes, pipes and connectors.

Fig. 6 - Adiabatic system hydraulic circuit with built-in tanks (12 fans)



Fans	Tank 1 [l]	Tank 2 [l]
6	180	-
8	180	180
10	180	180
12	180	180

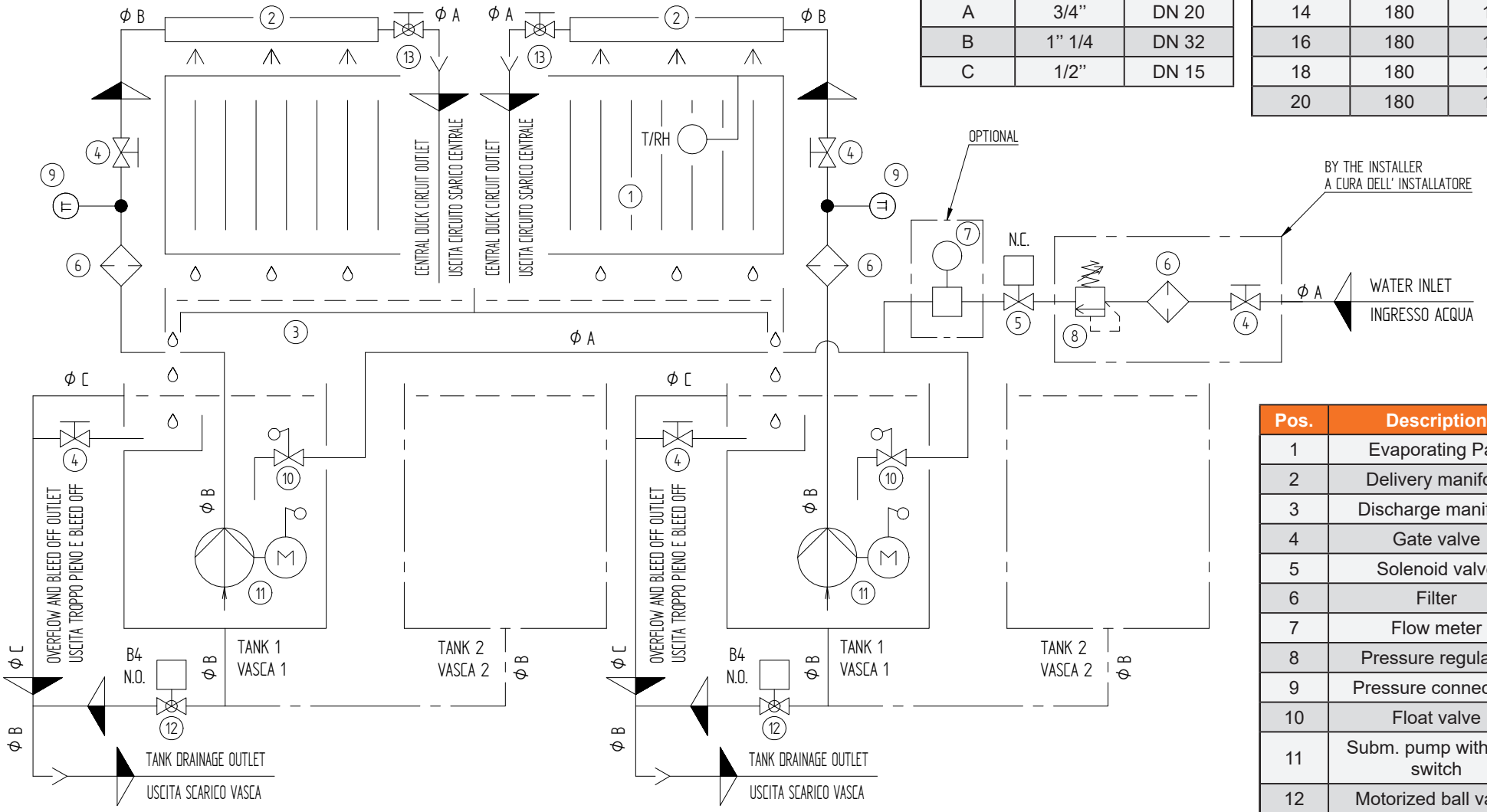
ØPipe	Threaded connections	
A	3/4"	DN 20
B	1" 1/4	DN 32
C	1/2"	DN 15

Pos.	Description	Pos.	Description
1	Evaporating Pad	8	Pressure regulator
2	Delivery manifold	9	Pressure connection
3	Discharge manifold	10	Float valve
4	Gate valve	11	Subm. pump with flow switch
5	Solenoid valve	12	Motorized ball valve
6	Filter	13	Ball valve
7	Flow meter	-	-

Fig. 7 - Adiabatic system hydraulic circuit with built-in tanks (14 ÷ 20 fans)

ØPipe	Threaded connections	
A	3/4”	DN 20
B	1” 1/4	DN 32
C	1/2”	DN 15

Fans	Tank 1 [l]	Tank 2 [l]
14	180	180
16	180	180
18	180	180
20	180	180



Pos.	Description
1	Evaporating Pad
2	Delivery manifold
3	Discharge manifold
4	Gate valve
5	Solenoid valve
6	Filter
7	Flow meter
8	Pressure regulator
9	Pressure connection
10	Float valve
11	Subm. pump with flow switch
12	Motorized ball valve
13	Ball valve

Tab. 3 - Water built-in tanks

AFC fan no.	PAD no. *	Number of tanks for side [No]	Nominal volume of tanks for single side [l]	Max volume of tanks for single side [l]	Total single side system volume [l]
12	25+	2	200	300	284
14	29+	4	400	600	511
16	33+	4	400	600	522
18	38+	4	400	600	533
20	42+	4	400	600	545

*. PAD section already cut to fill the whole length

Legend

Nominal volume of tanks for single side: water volume contained in all tanks for side, from the bottom to the level of the float cock. This is the water volume usually present in the tank while the adiabatic system is operating.

Max. volume of tanks for single side: water amount contained in all tanks for each side, from the bottom to the overflow level. This is the max. volume that can be contained in the entire adiabatic system (tanks, hydraulic circuit, lower channel, water in the pads…)

Total single side system volume: water volume contained in the entire adiabatic system (tanks, hydraulic circuit, lower channel, water in the pad…)

Caution:
To ensure the healthiness of the adiabatic system, the hydraulic system must be installed by the customer in a way preventing any stagnant water inside the whole system, nor even after emptying the circuit.

Caution:
Install the servomotor of the 2-way motorized valves so that the cable clamp is not facing upwards. It is recommended to install the servomotor of the 2-way valve for the side drain circuit with the cable clamp facing downwards.

Caution:
Plug on the drain: it is compulsorily forbidden to place any kind of plug or restriction that might prevent or limit (even momentarily) the tank drain. The customer is responsible for ensuring a correct routing of the adiabatic system drain ducts, for a fast drain of the system and the tank, without any water stagnation.

VDI Hygiene Certificate

Liebert® AFC, our adiabatic freecooling chiller is in compliance with the general and technical requirements of the Verein Deutscher Ingenieure (VDI), the Association of German Engineers, guideline 2047-2, securing hygienically sound operation of the evaporative cooling systems. Our units are thus evaluated and approved by an independent hygienic institute in order to operate in complete safety.

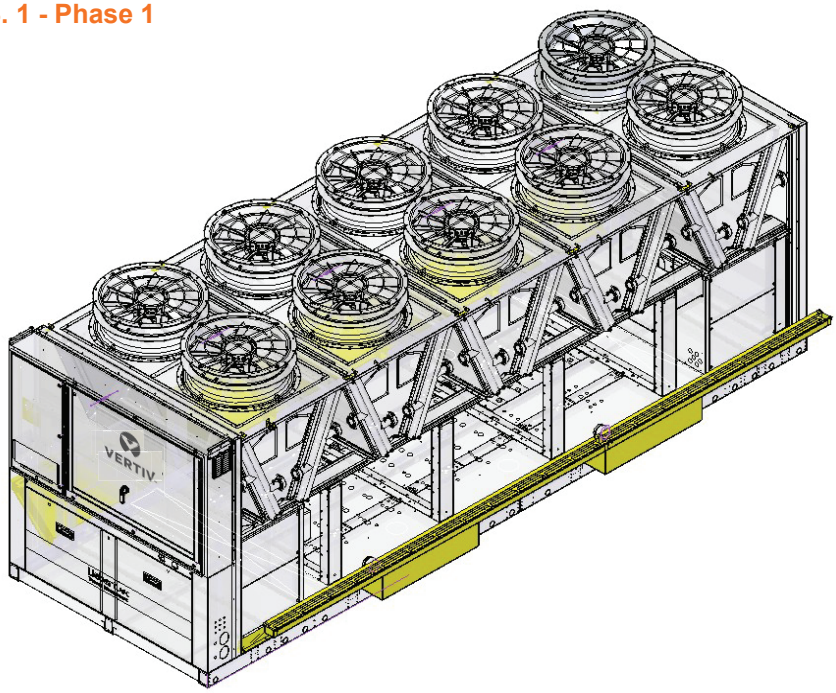
3 - Installation

CAUTIONS: Disconnect the chiller power supply before installing the adiabatic system. The PADS have sharp edges, especially in the treated (black) surface. It is necessary to handle them carefully wearing the suitable PPM.

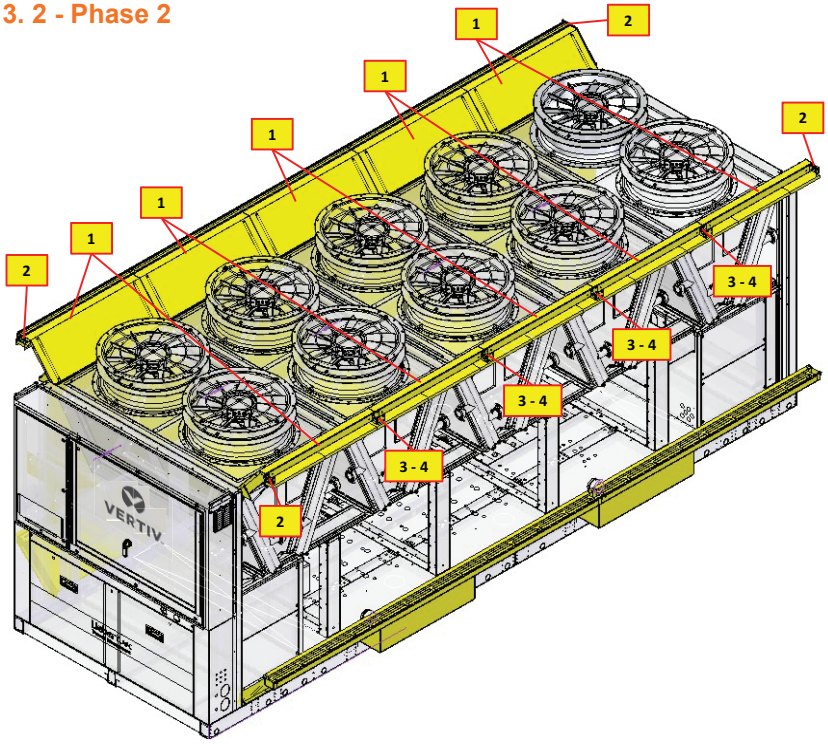
INSTALLATION OF THE ADIABATIC SYSTEM ON THE UNIT - INSTRUCTION WITH MATERIALS AND PICTURES FOR ASSEMBLING THE ADIABATIC SYSTEM ON THE UNIT ALREADY INSTALLED IN THE SITE.

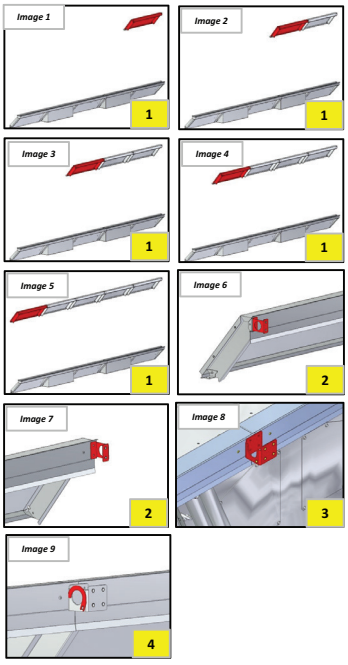
Instructions for units without tanks

3. 1 - Phase 1

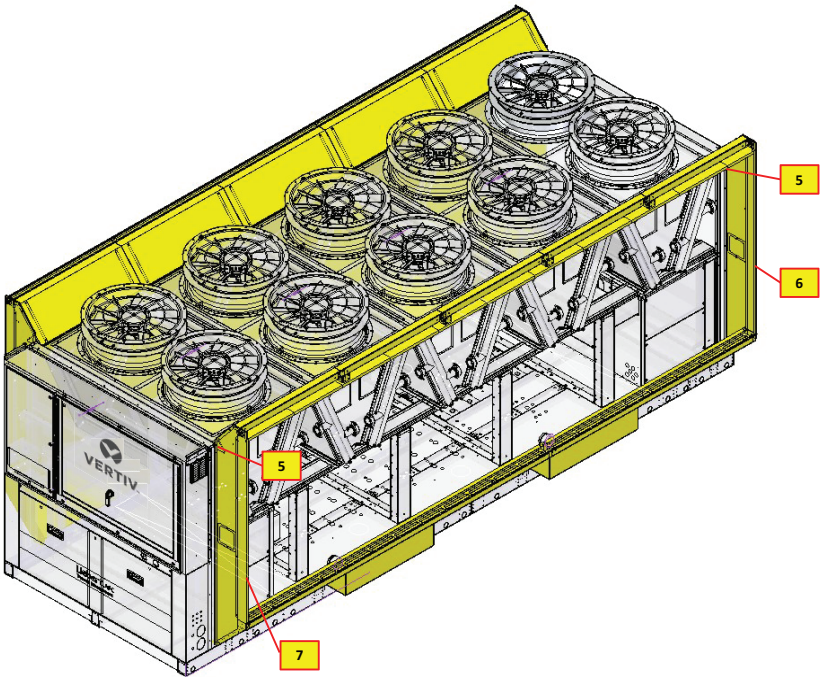


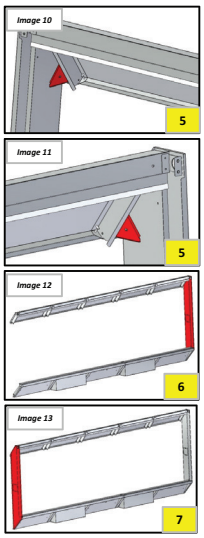
3. 2 - Phase 2



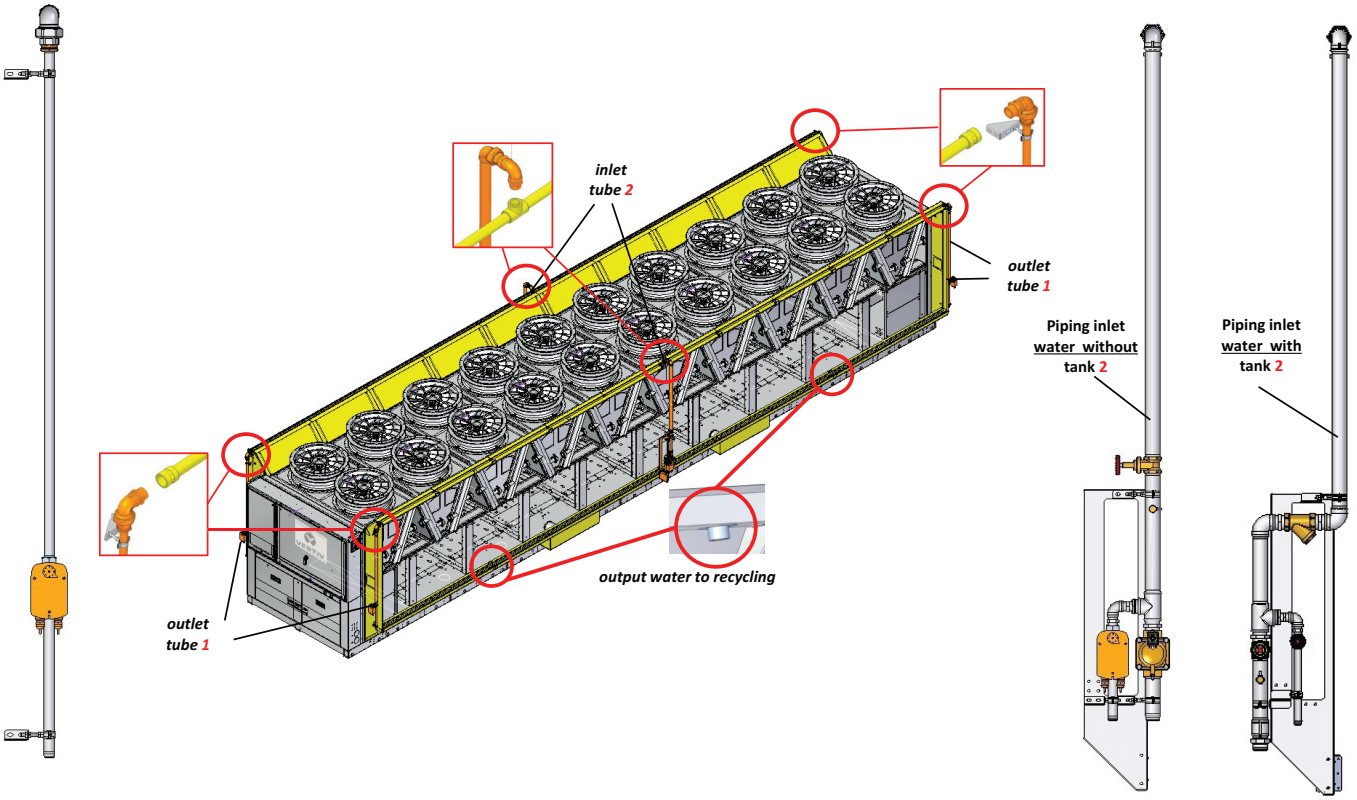


3. 3 - Phase 3

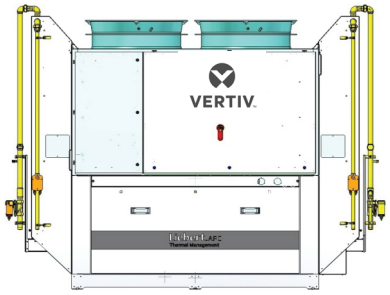




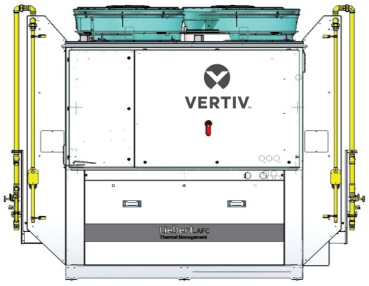
3. 4 - Phase 4



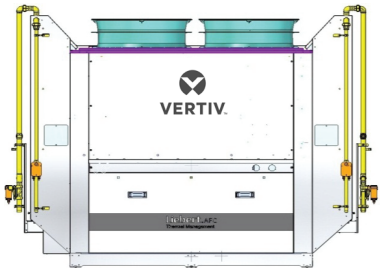
3. 5 - View front and back



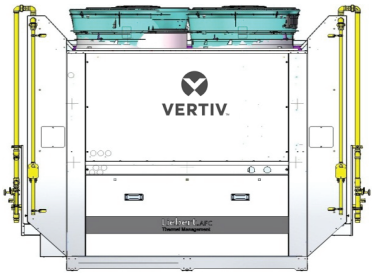
FRONT SIDE ALL UNITS FROM 12 TO 20 FANS WITHOUT TANK



FRONT SIDE ALL UNITS FROM 12 TO 20 FANS WITH TANK



BACK SIDE ALL UNITS FROM 12 TO 20

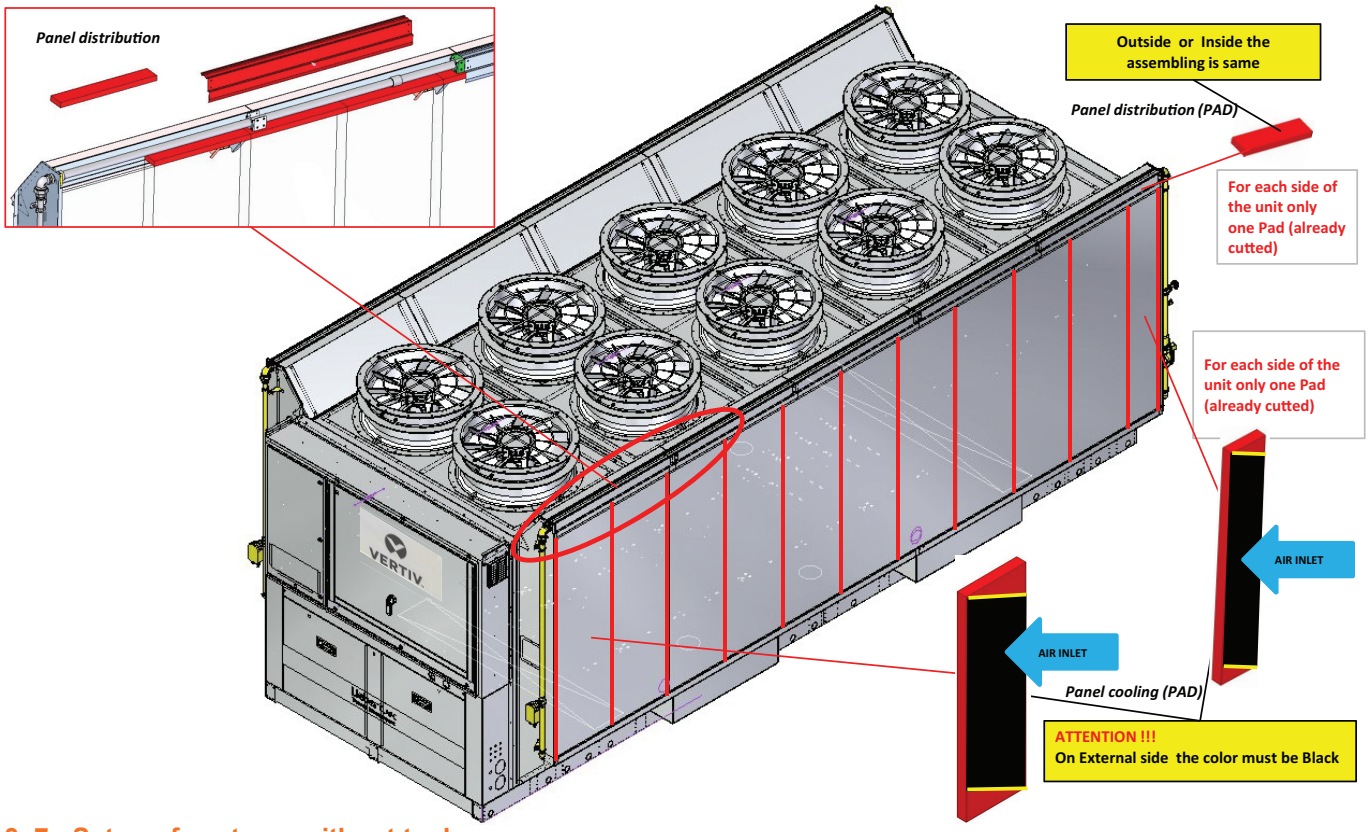


BACK SIDE ALL UNITS FROM 12 TO 20

NOTE:

If needed to do thread on piping, it is recommended to cover it after threading by a corrosion inhibitor zinc based.

3. 6 - Phase 5

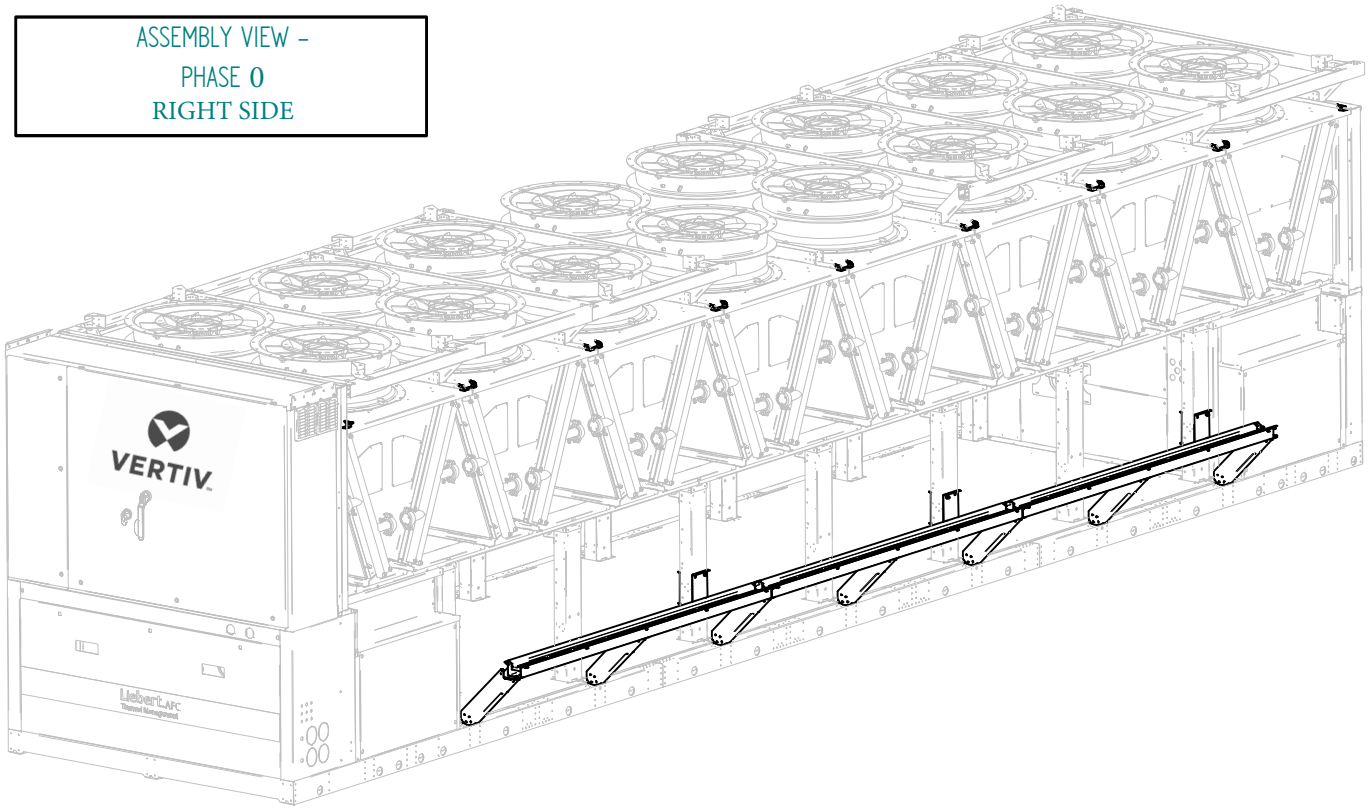


3. 7 - Setup of systems without tank

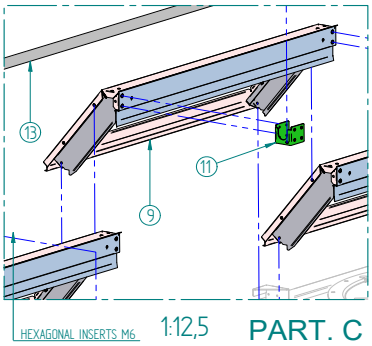
The components of the hydraulic section indicated on the diagram are pre-installed; they must be connected to the water distribution pipe in PVC (to the water flow meter, if present) and to the hydraulic supply system in point 4) of the previous paragraph is still to be respected. It is necessary to adjust the shutter down stream of the pressure intake to guarantee the correct supply to the PAD and to reduce water consumption and avoid drop carrying. The calibration procedure is described in the Chap. 4.

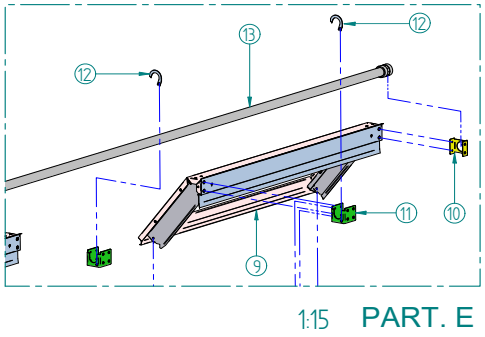
Instructions for units with built-in tanks

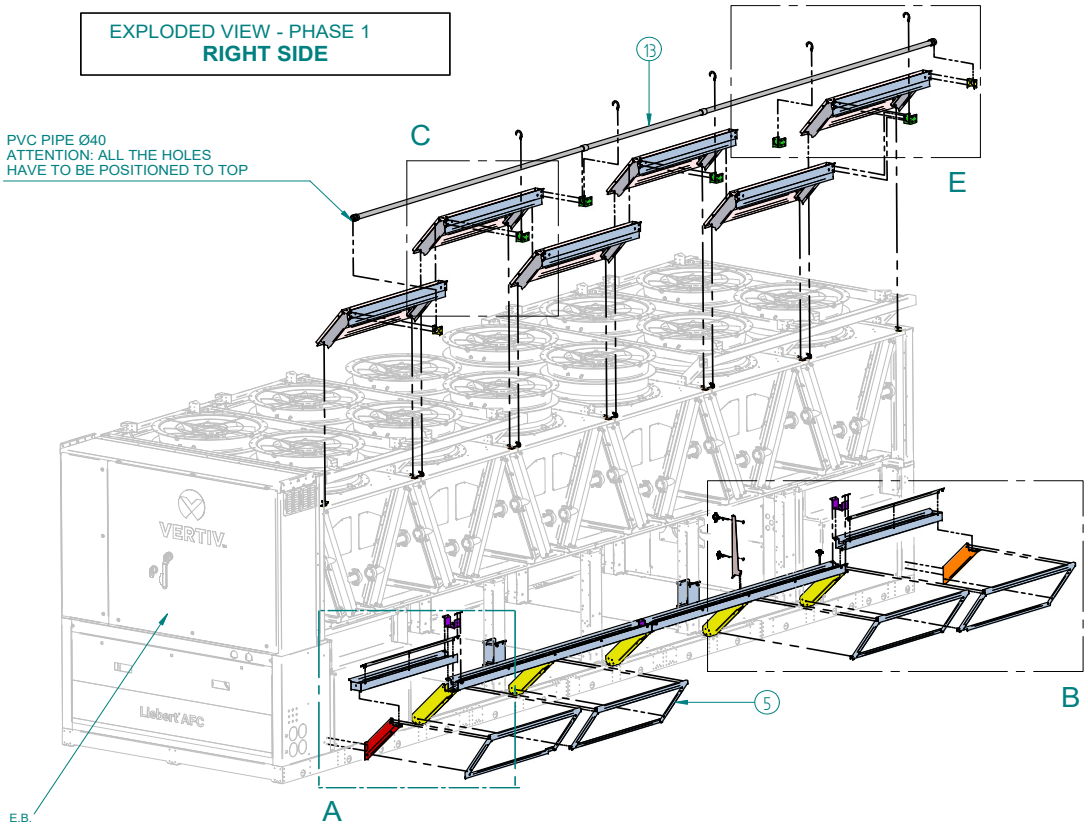
3.8 - Rotate the lower channel

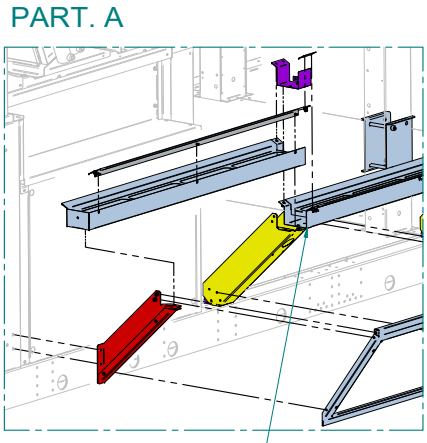


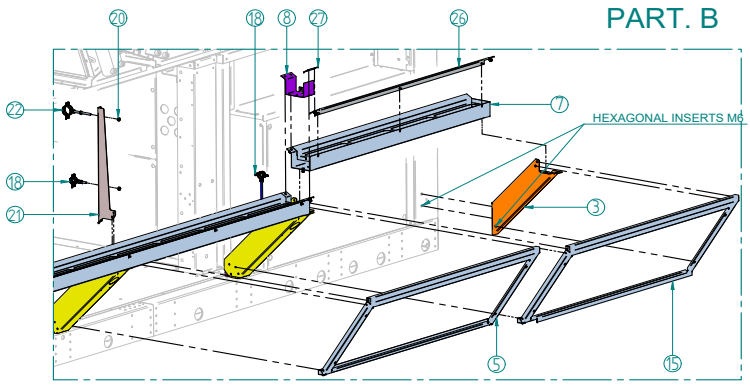
3.9 - Installation of the upper side and the lower channel near compressor cabinets





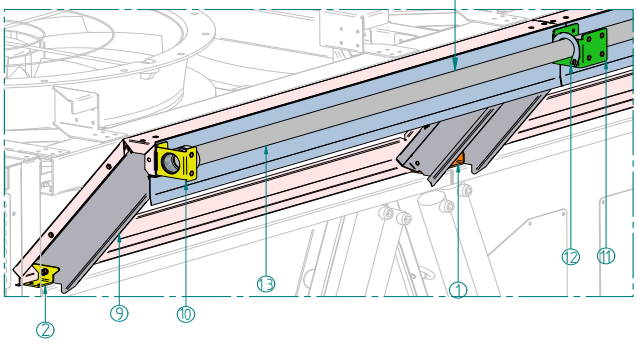


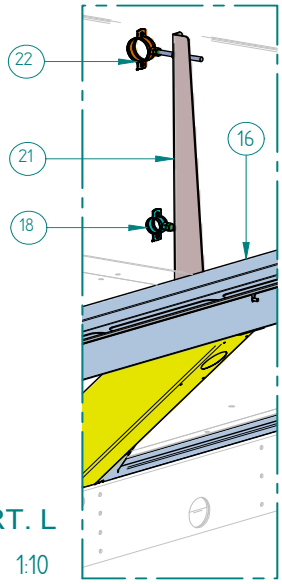




PVC PIPE Ø40
ATTENTION: ALL THE HOLES HAVE TO BE POSITIONED TO TOP

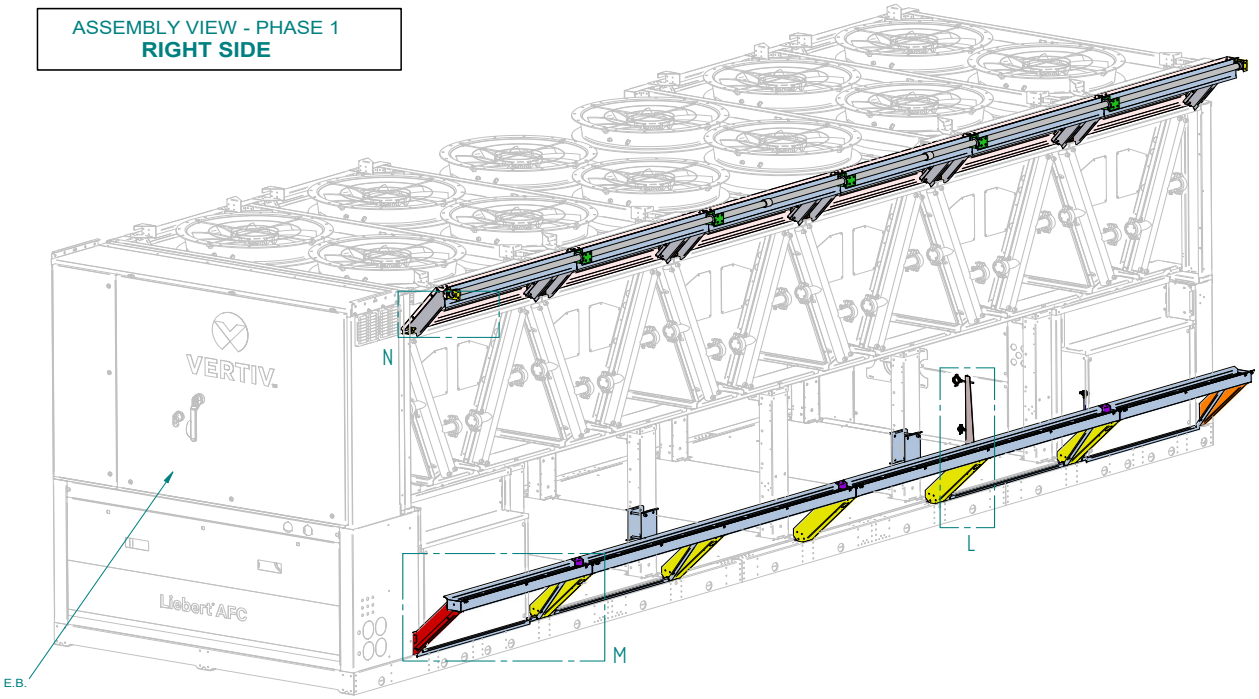
PART. N
1:10

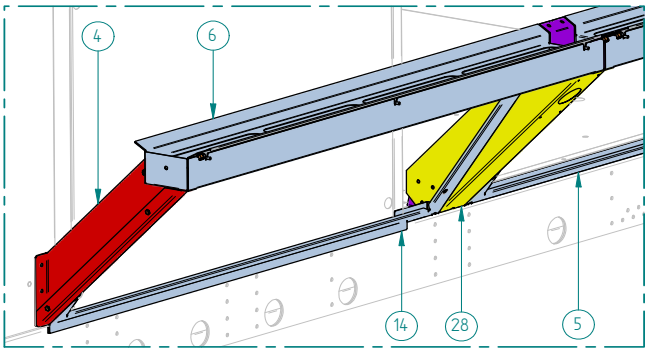




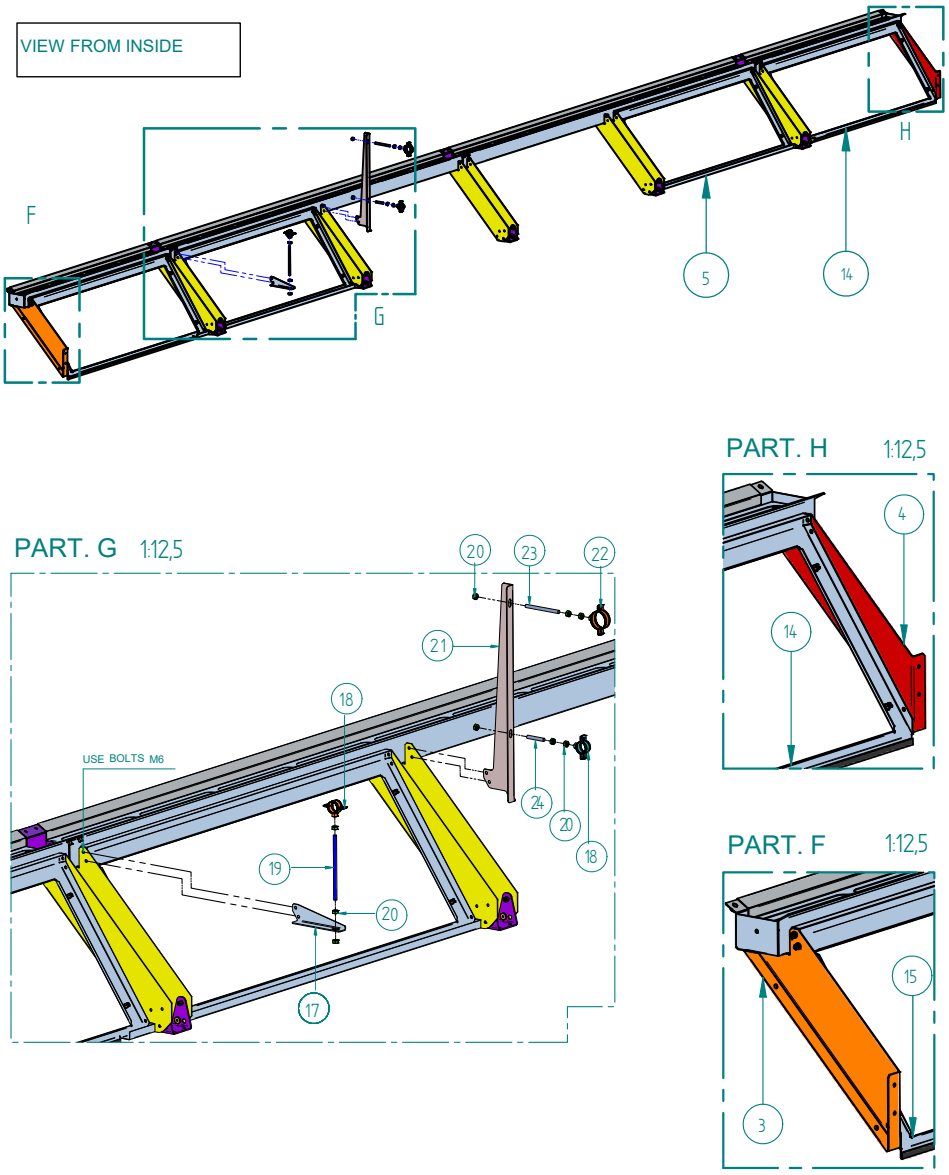
PART. L
1:10

ASSEMBLY VIEW - PHASE 1
RIGHT SIDE



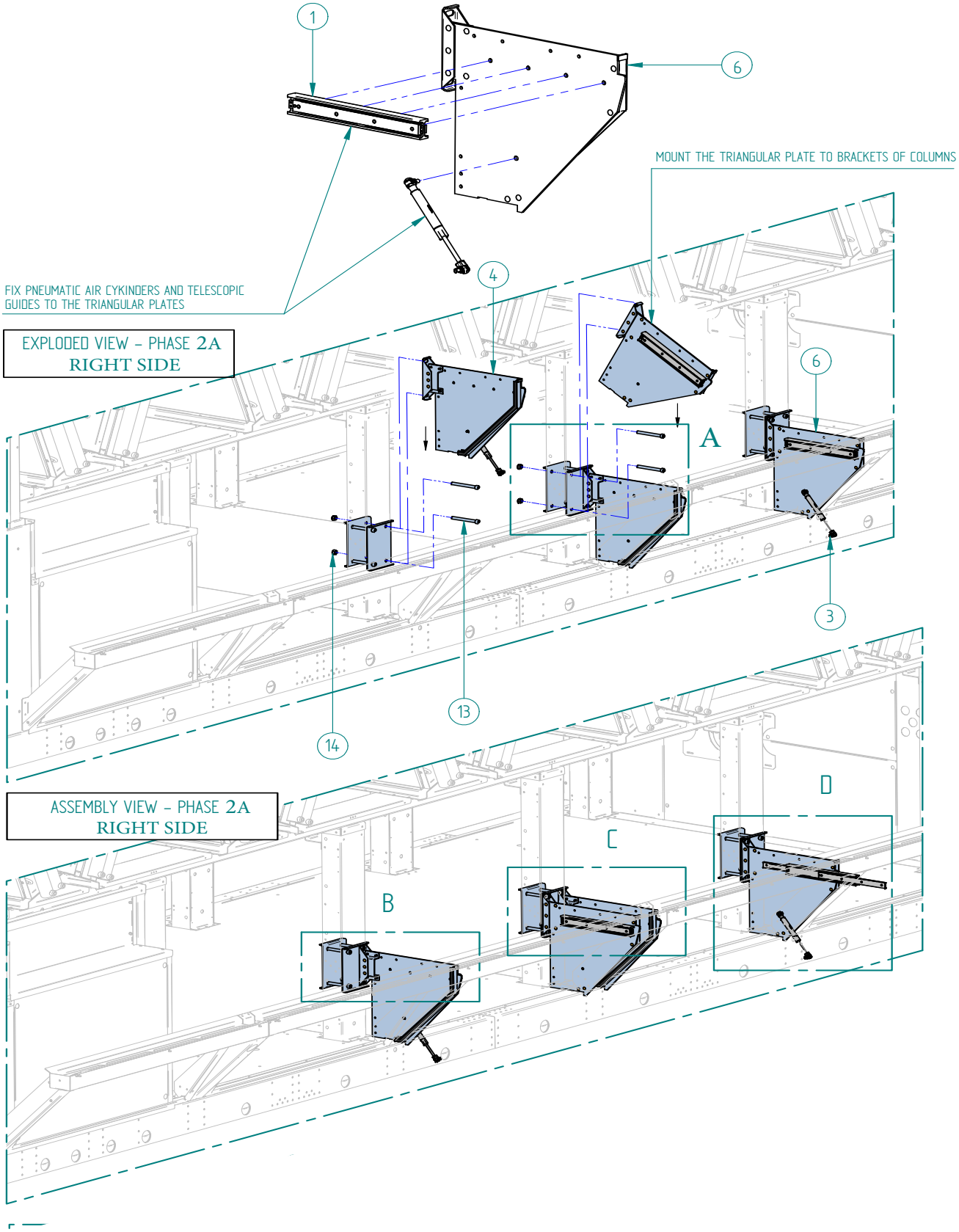


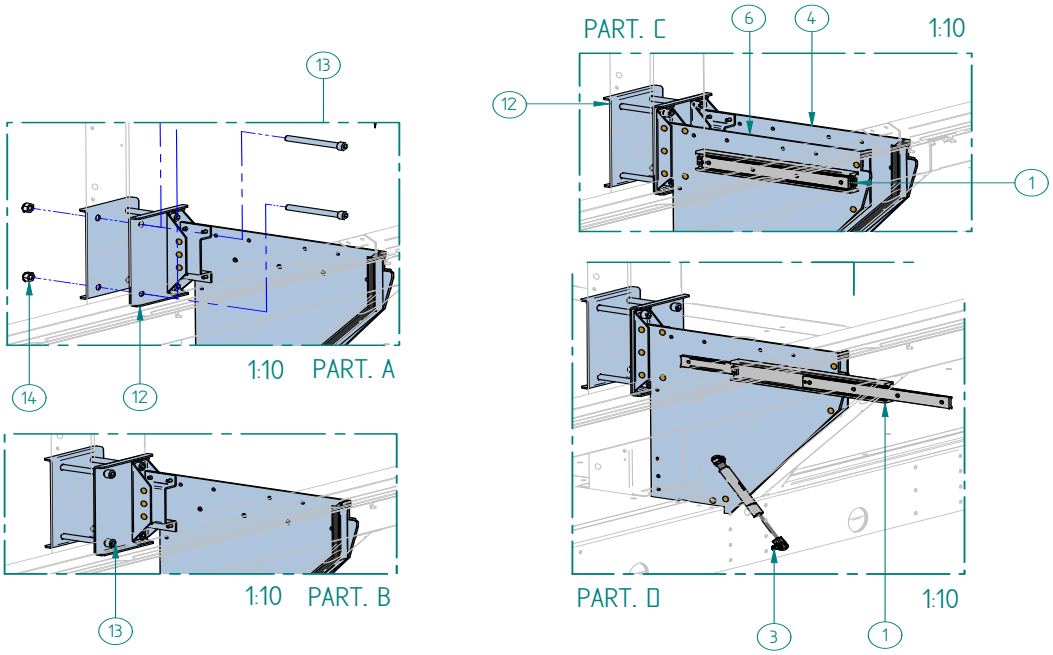
PART. M
1:10

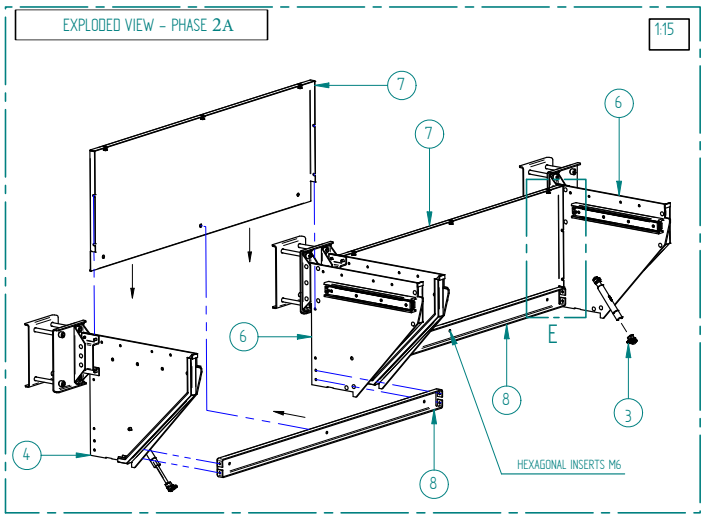


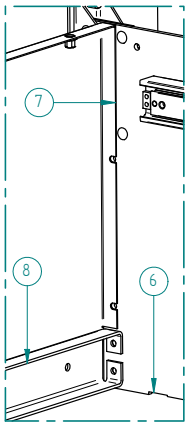
POS.	Description	POS.	Description
1	UPPER GUTTER DOUBLE BRACKET	15	RIGHT LOWER PLUGGING WITH OPENING
2	UPPER GUTTER SINGLE BRACKET	16*	LOWER GUTTER 2 FANS
3	RIGHT LOWER GUTTER SUPPORT	17	WATER INLET PIPE BRACKET
4*	LEFT LOWER GUTTER SUPPORT	18	STAINLESS STEEL PIPE HANGER 3/4”
5	LOWER PLUGGING WITH OPENING	19	THREAD ROD MALE M8X100 S. STEEL
6*	LEFT LOWER GUTTER 1 FAN	20	HEXAGONAL NUT M8 STAINLESS STEEL
7	RIGHT LOWER GUTTER 1 FAN	21	WATER DELIVERY/SUPPLY PIPE DOUBLE BRACKET
8	LOWER GUTTER JOINT	22	STAINLESS STEEL PIPE HANGER 1 1/4”
9	UPPER GUTTER SUPPORT WITH REAR PLATE	23	THREAD ROD MALE M8X100 S. STEEL
10	DISTRIBUTION PIPE LATERAL SUPPORT	24	THREAD ROD MALE M8X50 S. STEEL
11	DISTRIBUTION PIPE CENTRAL SUPPORT	25*	EDGE LOWER GUTTER 2 FANS
12	DISTRIBUTION PIPE LOCKING	26	EDGE LOWER GUTTER 1 FAN
13	PVC PIPE Ø40 INT.TANKS 12 FANS	27	EDGE LOWER GUTTER JOINT
14	LEFT LOWER PLUGGING WITH OPENING	28*	CENTRAL LOWER GUTTER SUPPORT
NOTE: QUANTITIES REFERRED FOR EACH SIDE MACHINE (THE RIGHT AND THE LEFT SIDE ARE SYMMETRICAL)			

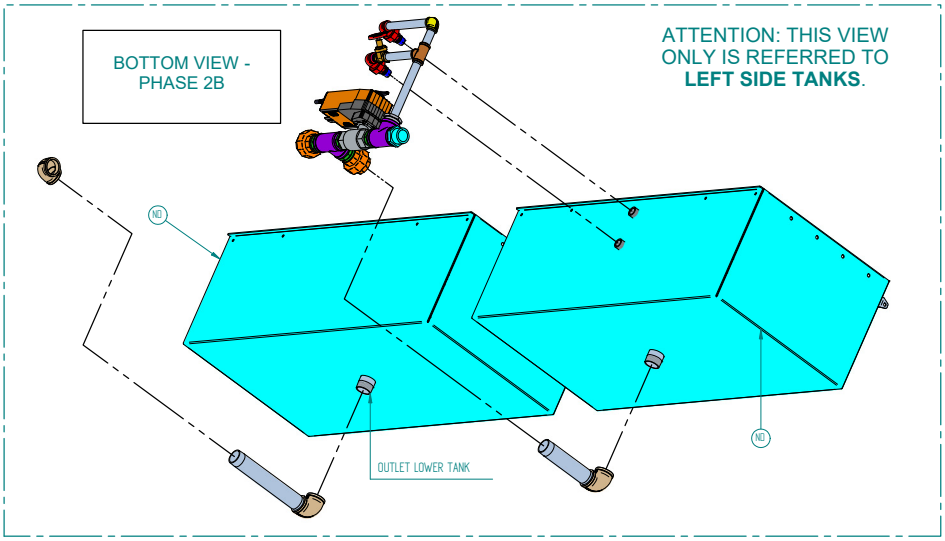
3.10 - Tanks supports mounting



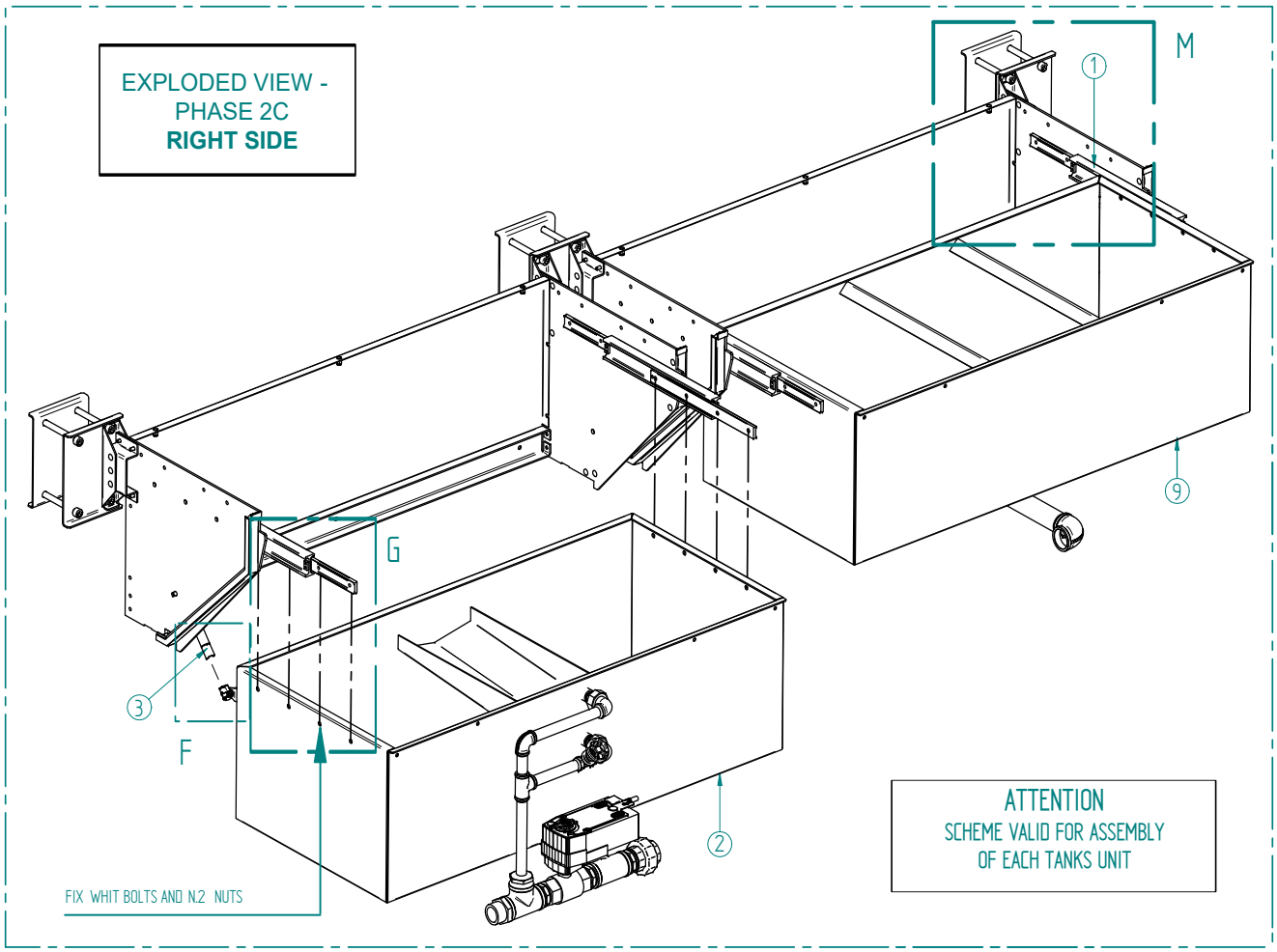

PART. C
1:10
PART. A
1:10
PART. B
1:10
PART. D
1:10

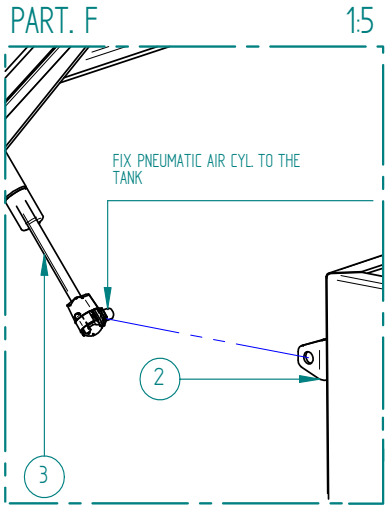

EXPLODED VIEW – PHASE 2A
1:15
HEXAGONAL INSERTS M6

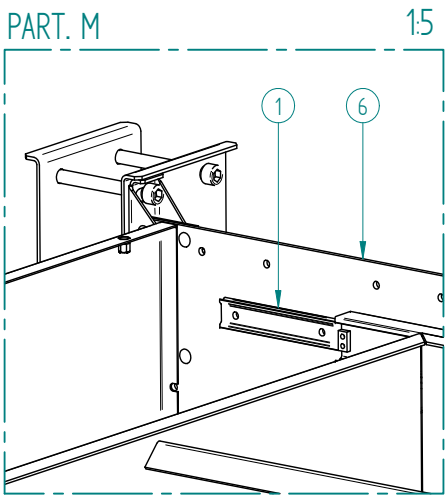

PART. E
1:5

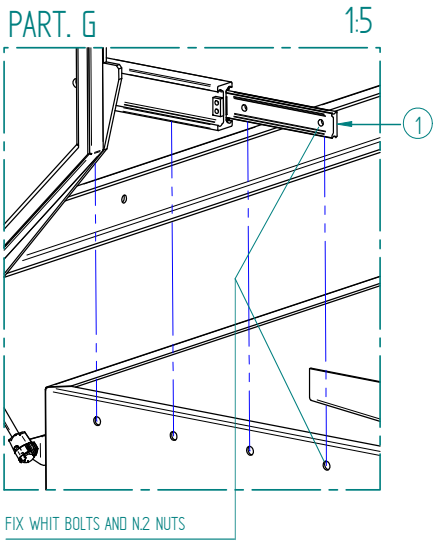

BOTTOM VIEW -
PHASE 2B
ATTENTION: THIS VIEW
ONLY IS REFERRED TO
LEFT SIDE TANKS.
OUTLET LOWER TANK

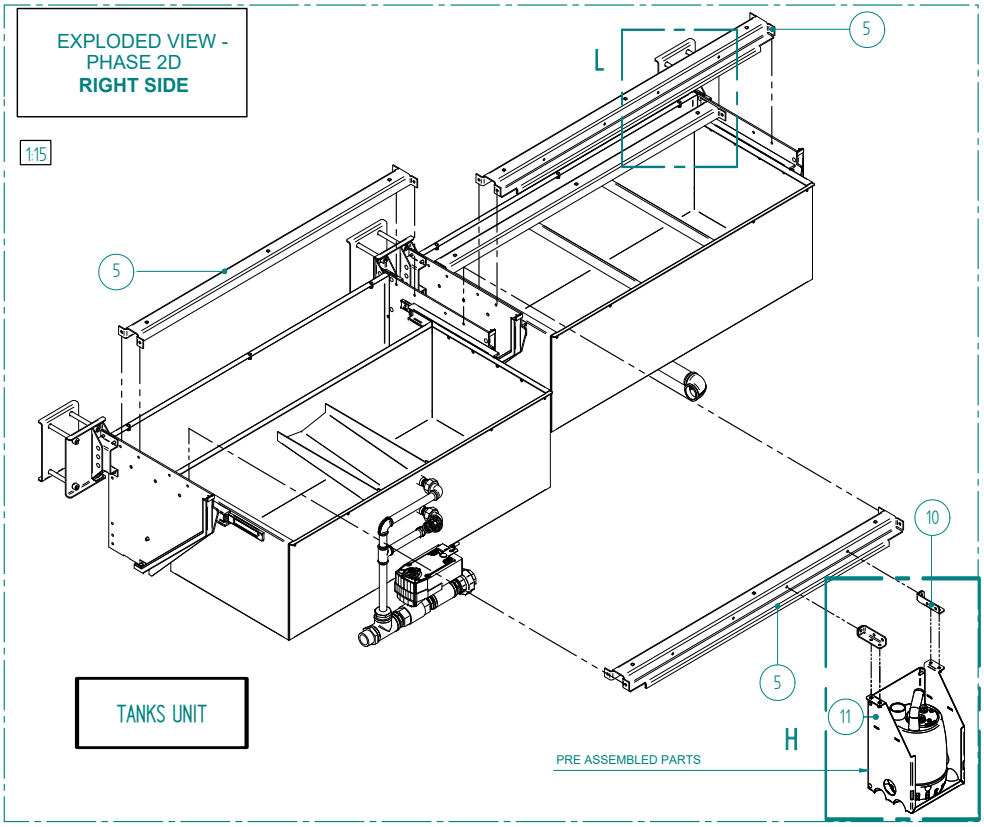
3.11 - Tanks mounting - step 1

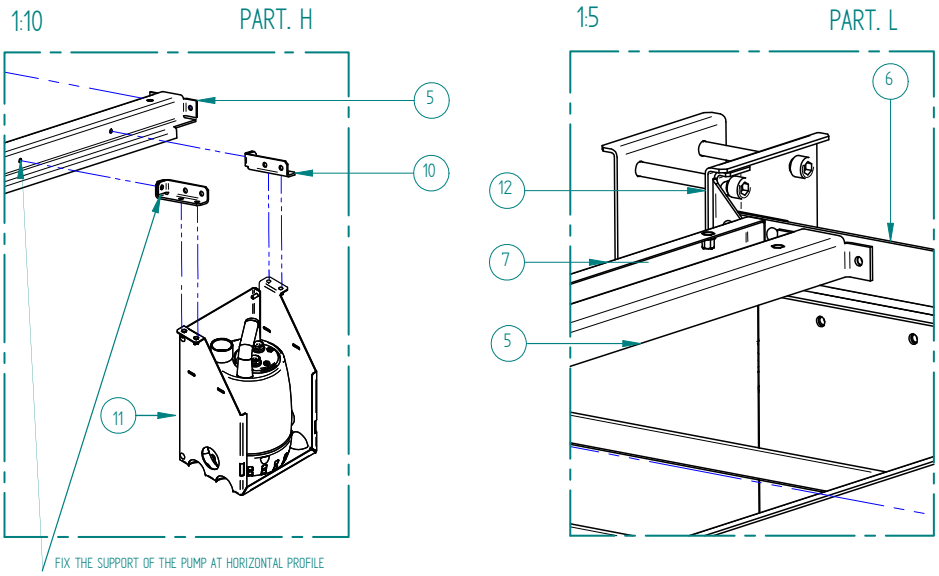






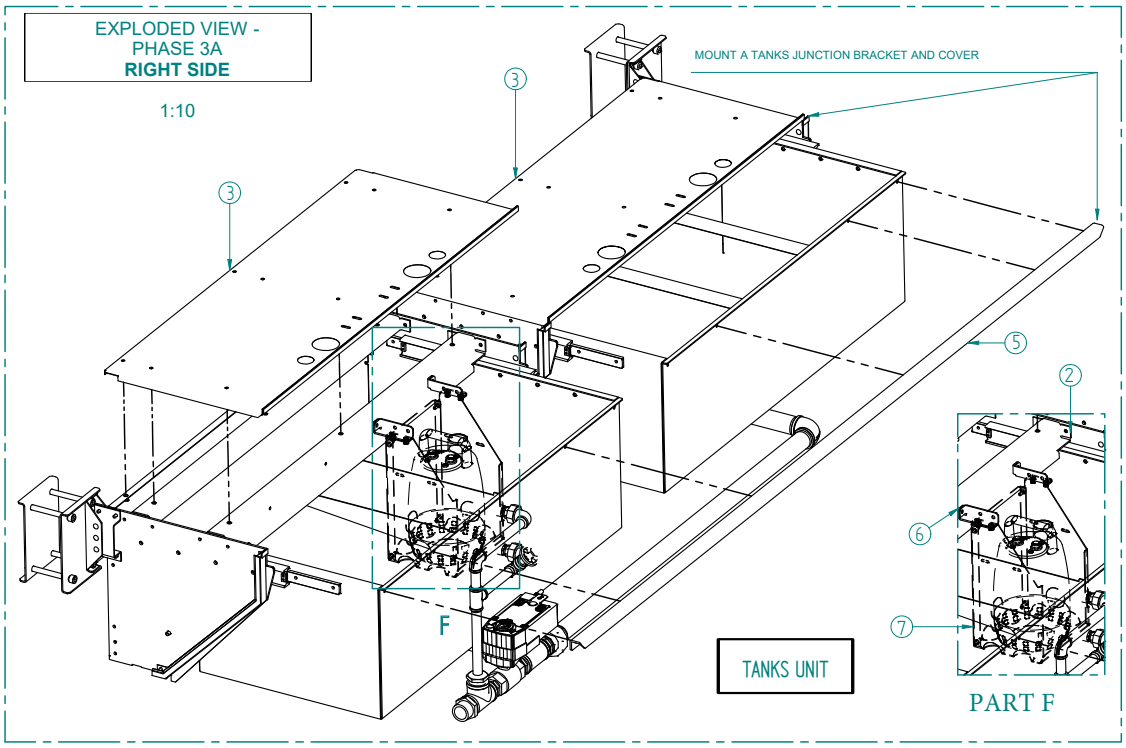




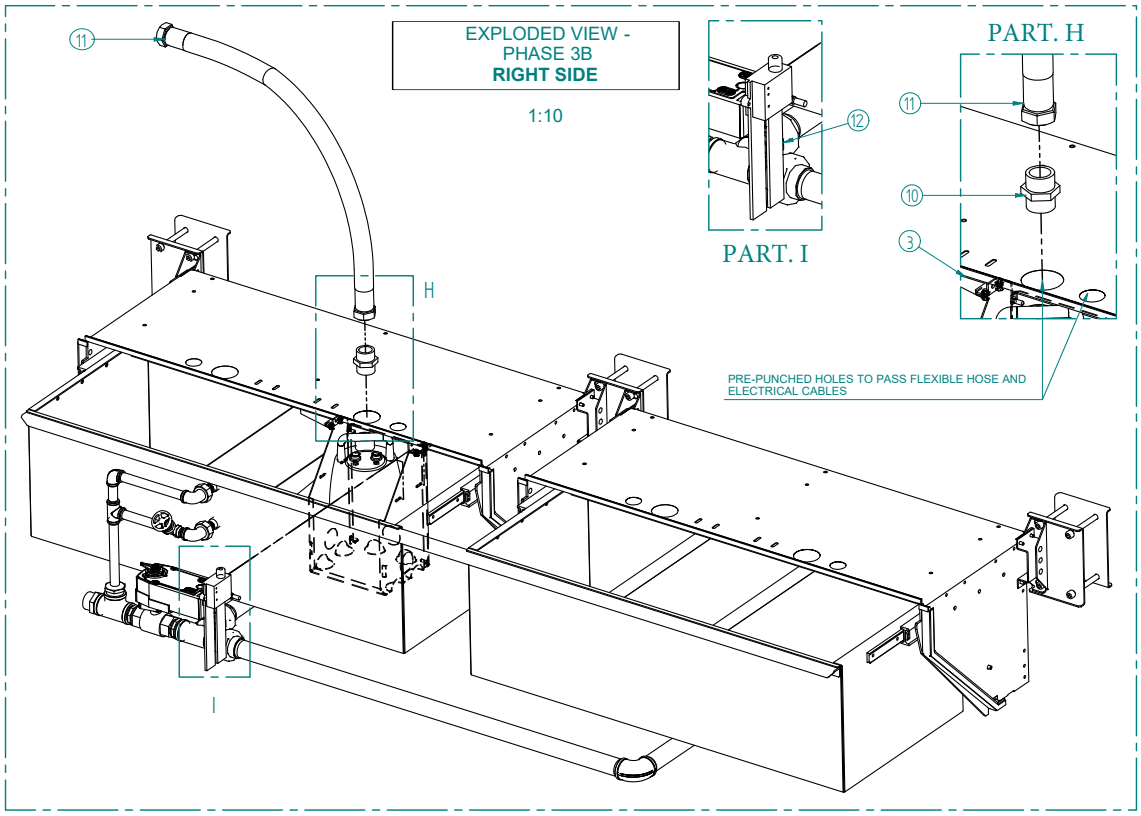


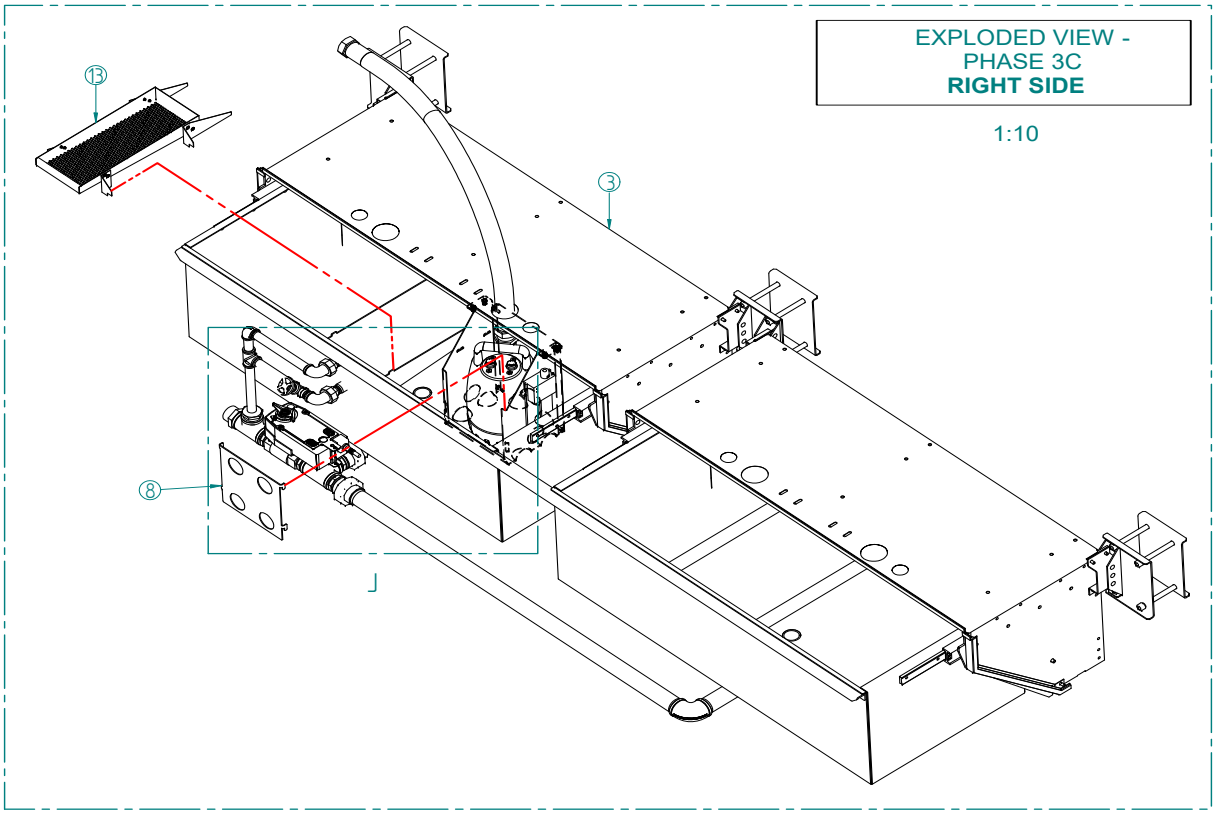
POS.	Description	POS.	Description
1	TELESCOPIC GUIDES LTH 45-0350	8	TANK STRUCTURE LOWER BEAM
2	MAIN TANK	9	SECONDARY TANK
3	PNEUMATIC AIR CYL. LIF-O-MAT 80-245	10	PUMP BRACKET SUPPORT
4	TANK STRUCTURE LEFT SUPPORT	11	PUMP FIXING BRACKET
5	TANK STRUCTURE UPPER BEAM	12	COLUMN REINFORCING PLATE
6	TANK STRUCTURE RIGHT SUPPORT	13	SCREW TCEI M12X120-8.8 ZN:5931
7	TANK STRUCTURE REAR CARTER	14	SELF LOCKING NUT-M12_CL.8_NZ
NOTE: QUANTITIES REFERRED FOR SINGLE UNIT TANKS			

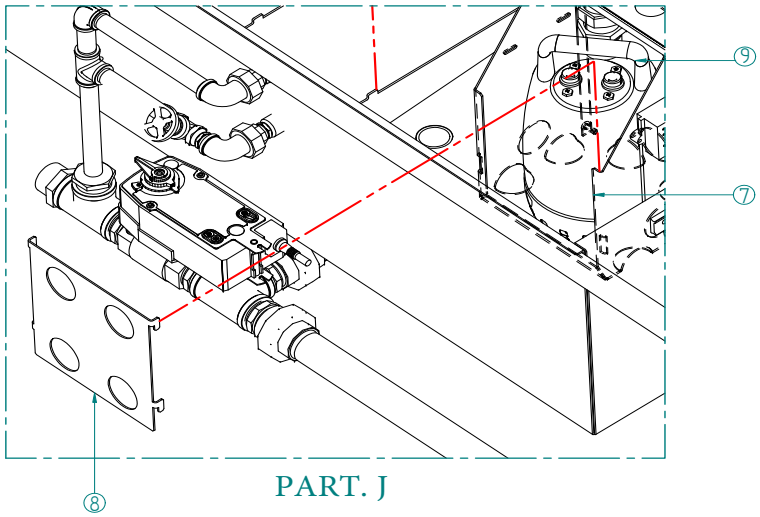
3.12 - Tanks mounting - step 2



ATTENTION
SCHEME VALID FOR ASSEMBLY
OF EACH TANKS UNIT



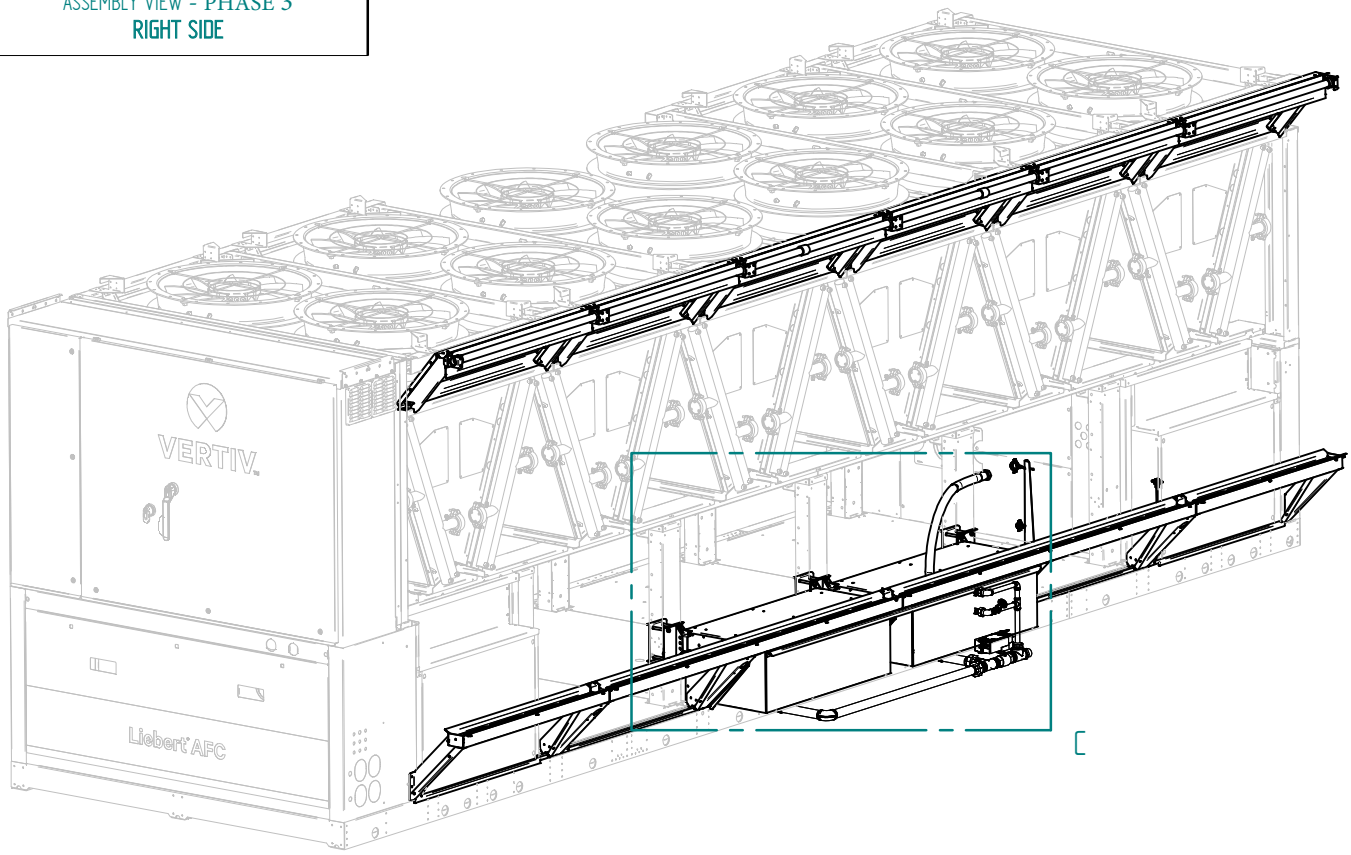


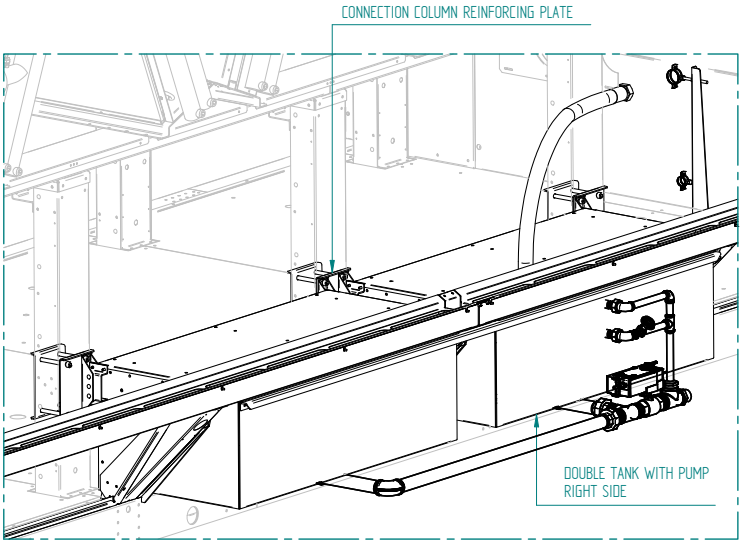


PART. J

POS.	Description	POS.	Description
1	MAIN TANK	8	PUMP BRACKET CLOSING
2	TANK STRUCTURE UPPER BEAM	9	PUMP CALPEDA GXR 13 (CE VERSION)
3	TANK STRUCTURE COVER	10	NIPPLE 1.1/4” FLAT SEAT BRASS
4	SECONDARY TANK	11	FLEXIBLE HOSE WITH FITTINGS (1,5 m)
5	TANKS JUNCTION BRACKET	12	LEVEL REGOLAT. REKA 2000
6	PUMP BRACKET SUPPORT	13	FILTER BLEED-OFF TANK
7	PUMP FIXING BRACKET		
NOTE: QUANTITIES REFERRED FOR SINGLE UNIT TANKS			

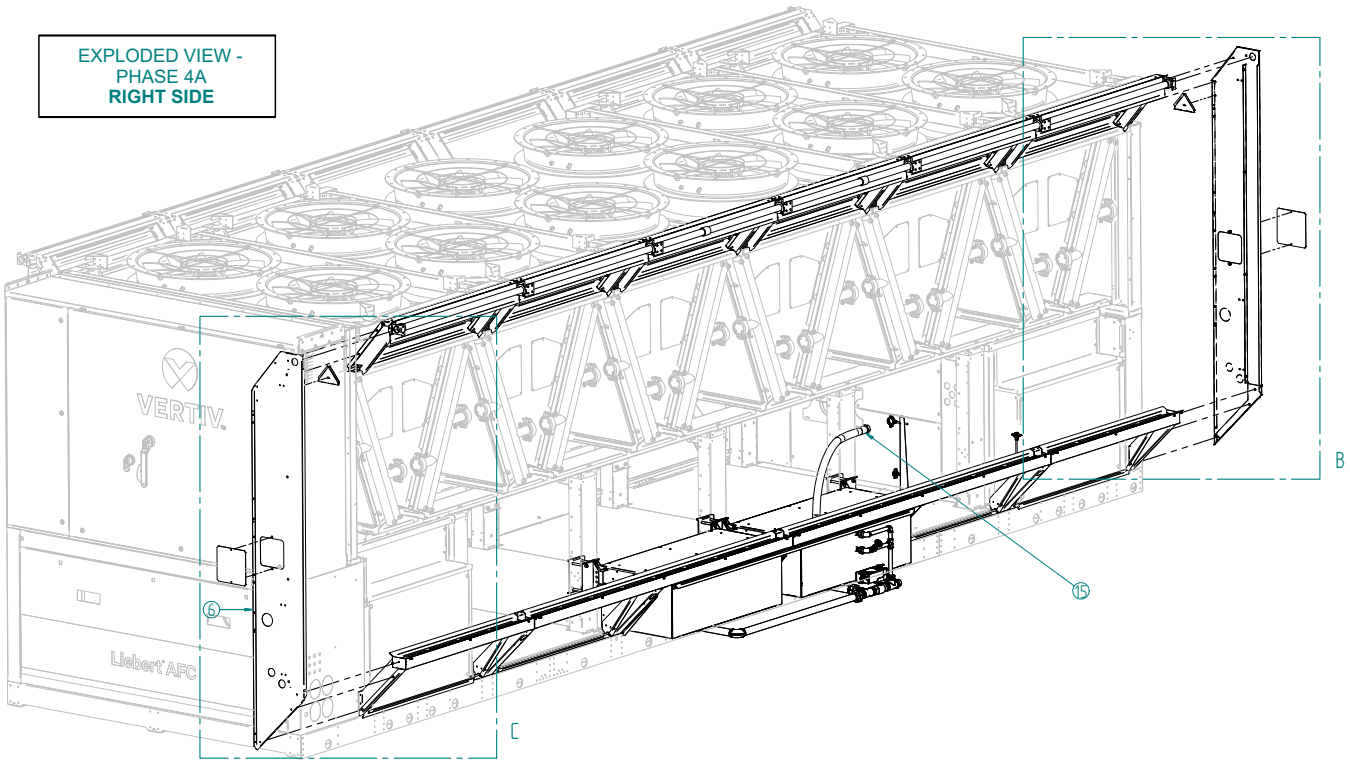
ASSEMBLY VIEW - PHASE 3
RIGHT SIDE

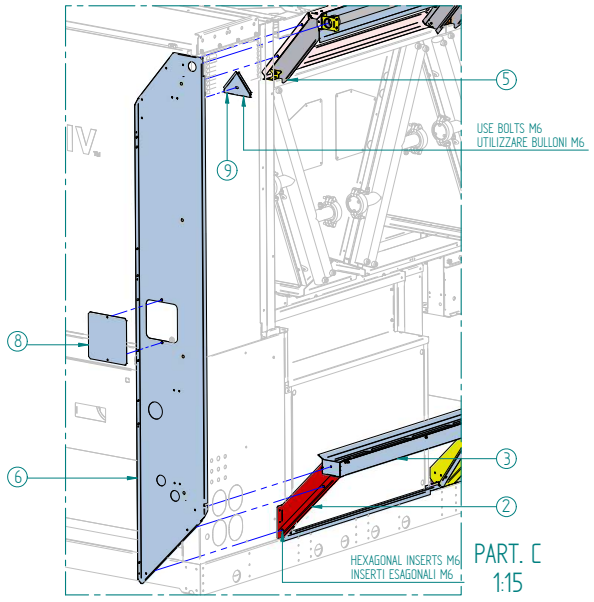


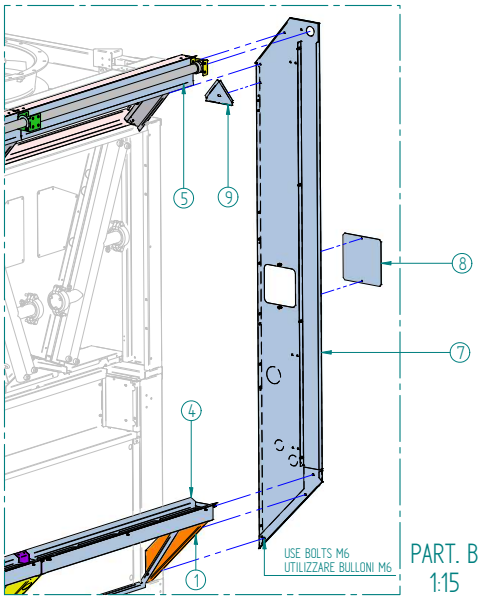


PART. C
1:12,5

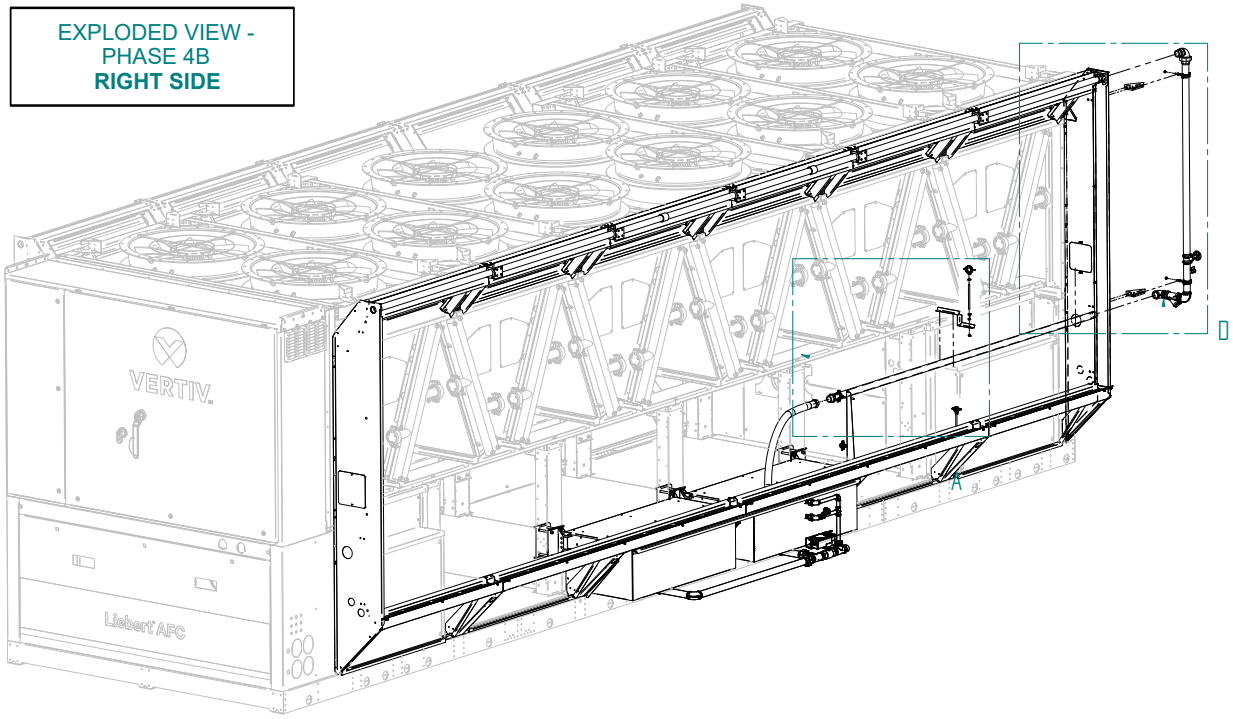
3.13 - Installing lateral part and hydraulics

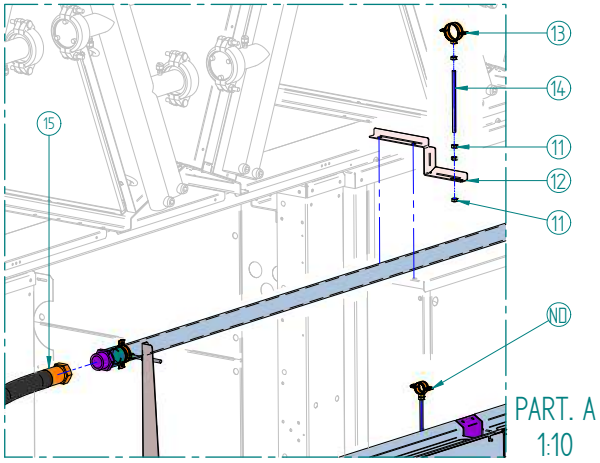




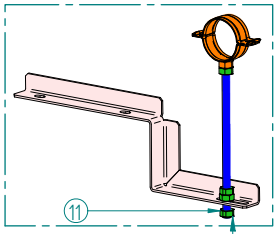


EXPLODED VIEW -
PHASE 4B
RIGHT SIDE

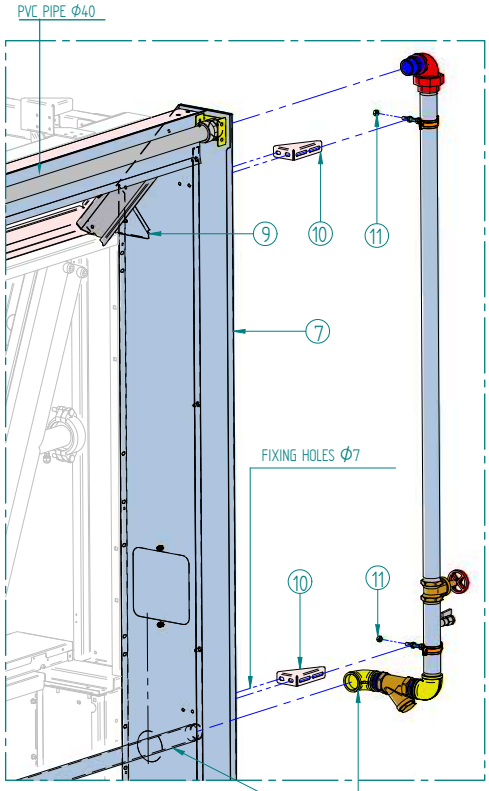




PART. A
1:10



ATTENTION: DURING LIFTING OPERATIONS MAKE SURE THAT THE LOWER NUT IS NOT FIXED TO SUPPORT BRACKET.



PART. D
1:10

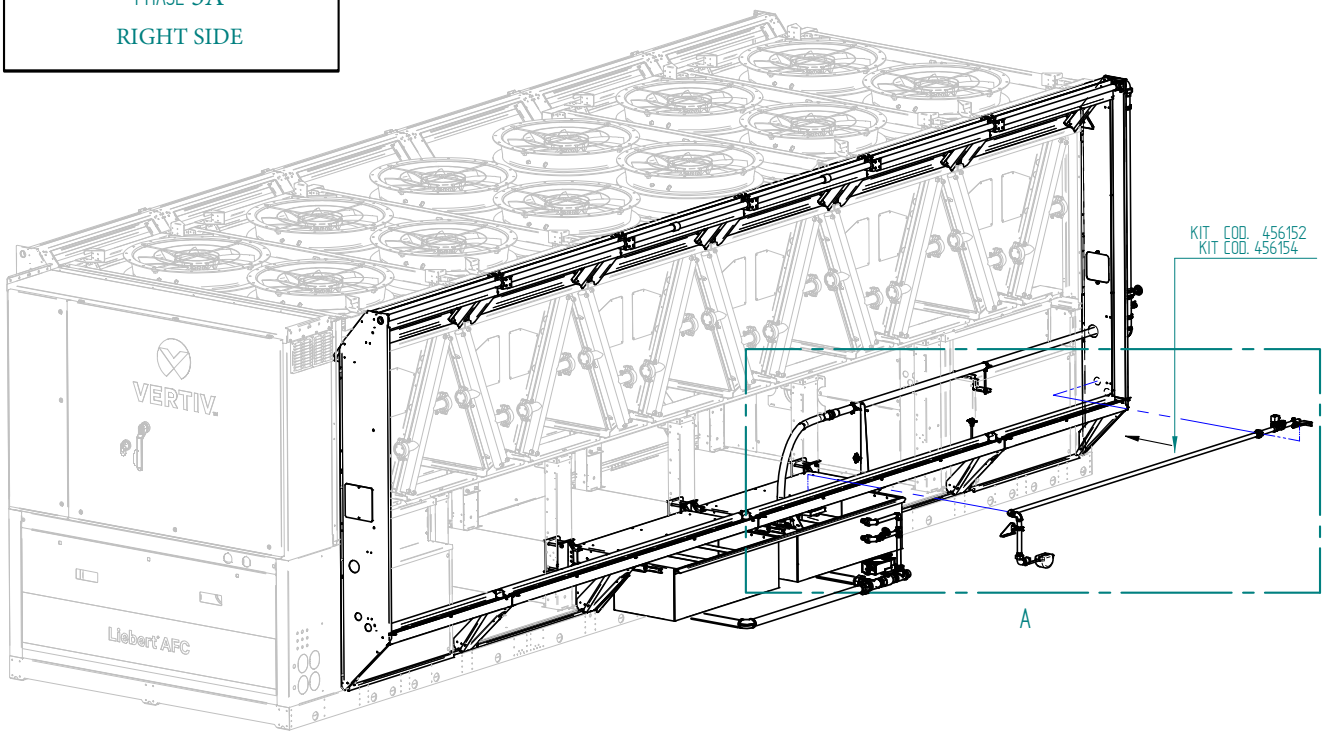
CONNECT THE INDOOR AND OUTDOOR PIPES

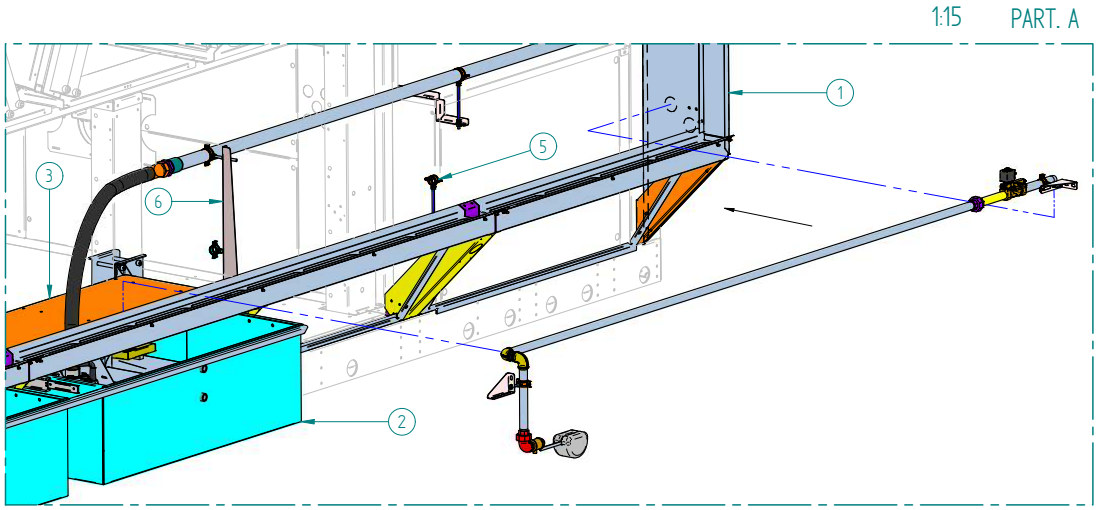
POS.	Description	POS.	Description
1	RIGHT LOWER GUTTER SUPPORT	9	UPPER PLUGGING
2	LEFT LOWER GUTTER SUPPORT	10	PIPE SUPPORT BRACKET
3	LEFT LOWER GUTTER 1 FAN	11	HEXAGONAL NUT M8 STAINLESS STEEL
4	RIGHT LOWER GUTTER 1 FAN	12	WATER SUPPLY PIPE BRACKET
5	UPPER GUTTER SUPPORT WITH REAR PLATE	13	STAINLESS STEEL PIPE HANGER 1 1/4”
6	LEFT LATERAL PLUGGING - HYDRAULIC PIPING	14	THREAD ROD MALE M8x100 S. STEEL
7	RIGHT LATERAL PLUGGING - HYDRAULIC PIPING	15	FLEXIBLE HOSE WITH FITTINGS (1,5 m)
8	LATERAL INSPECTION PANEL		
NOTE: QUANTITIES REFERRED FOR EACH SIDE MACHINE (RIGHT AND LEFT SIDE ARE SYMMETRICAL)			

3.14 - Filling circuit installation

EXPLODED VIEW - PHASE 5A

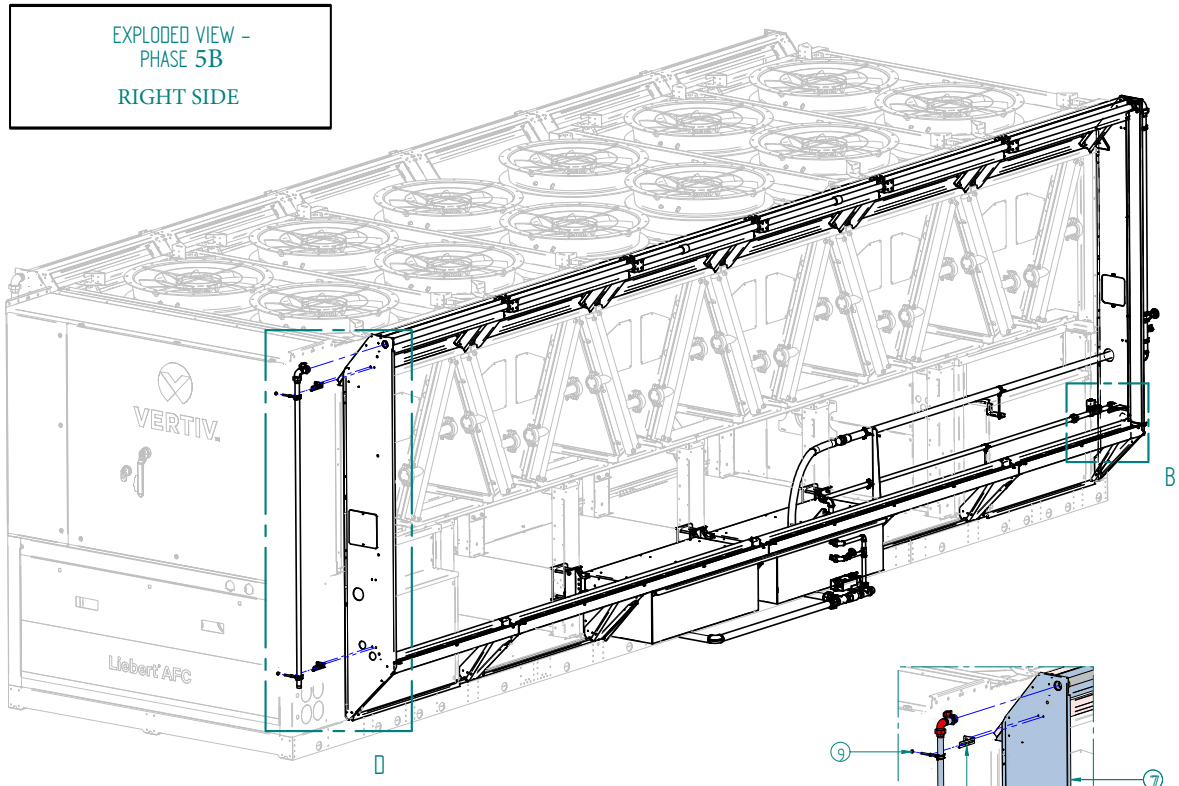
RIGHT SIDE

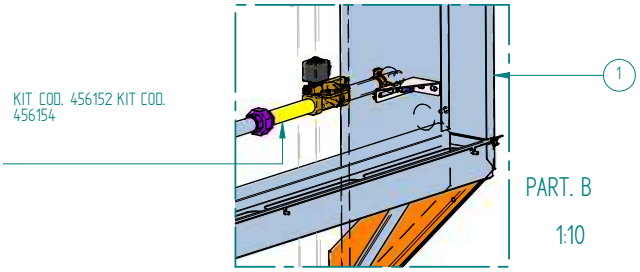




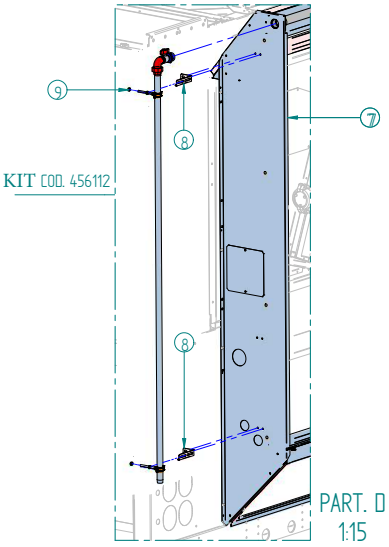
EXPLODED VIEW –
PHASE 5B

RIGHT SIDE

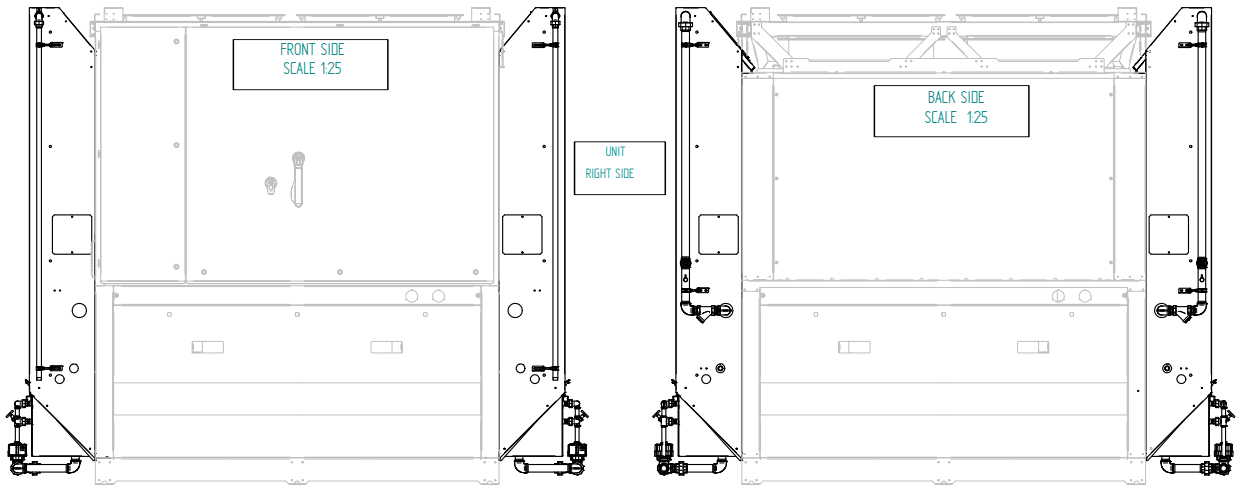




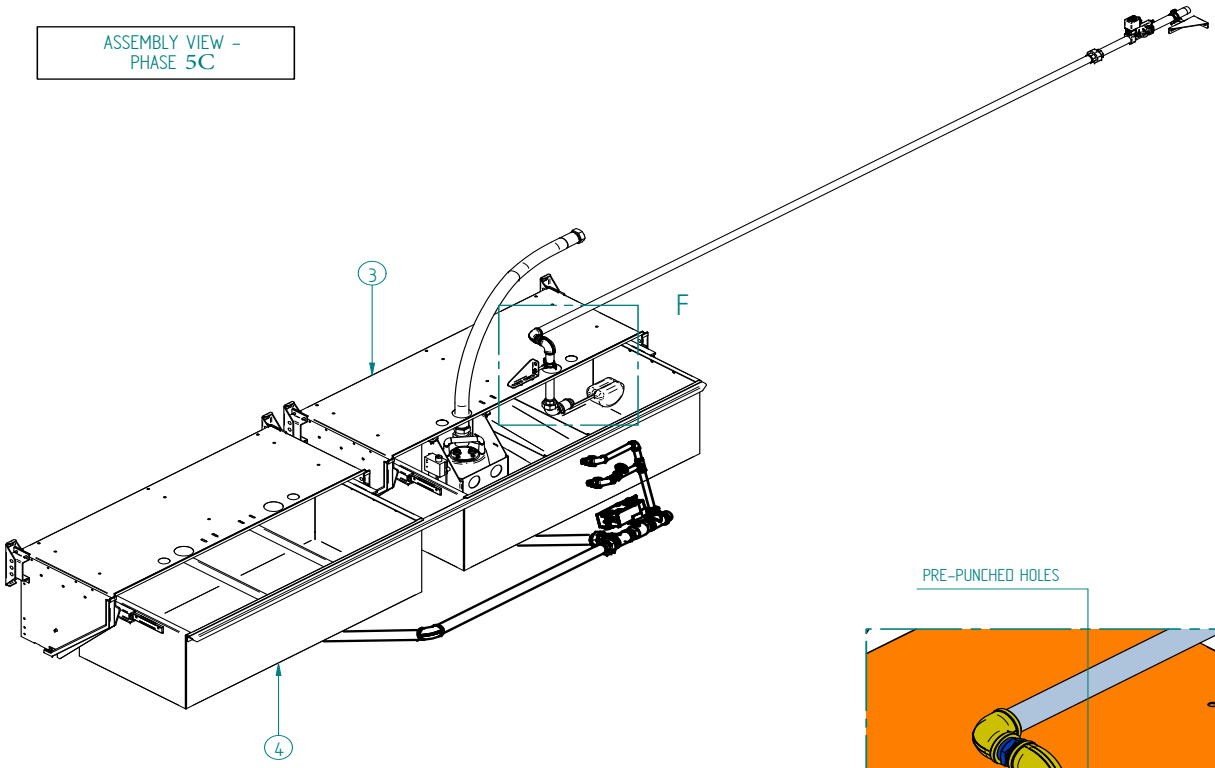
PART. B
1:10

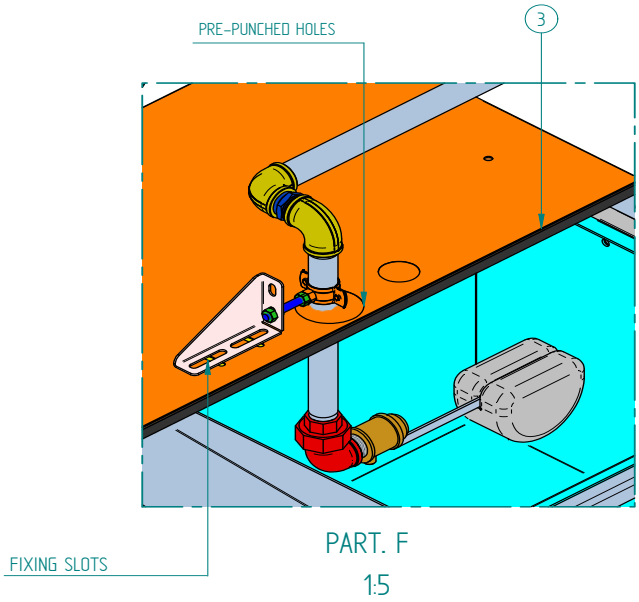


PART. D
1:15



ASSEMBLY VIEW - PHASE 5C

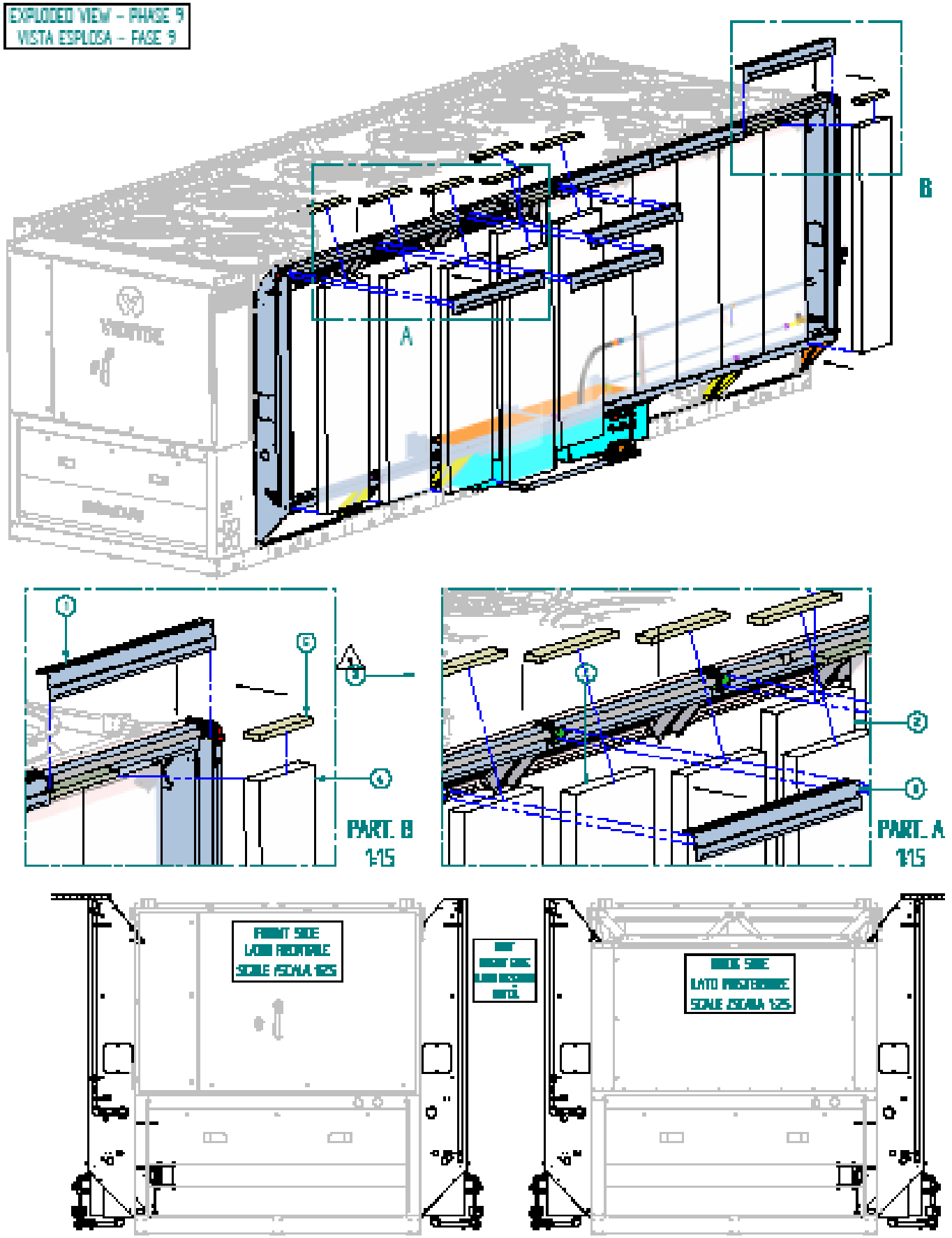




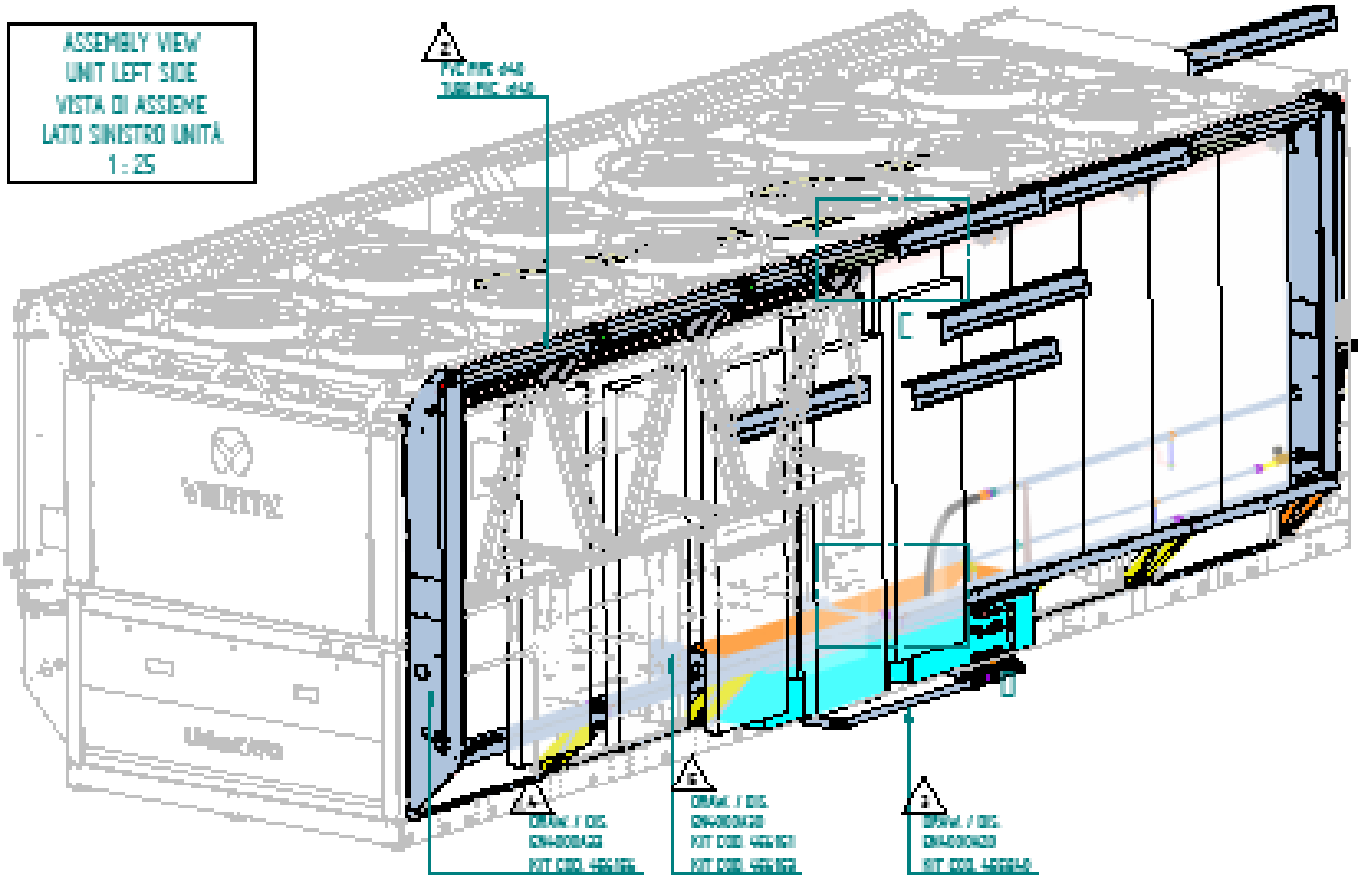
PART. F
1:5

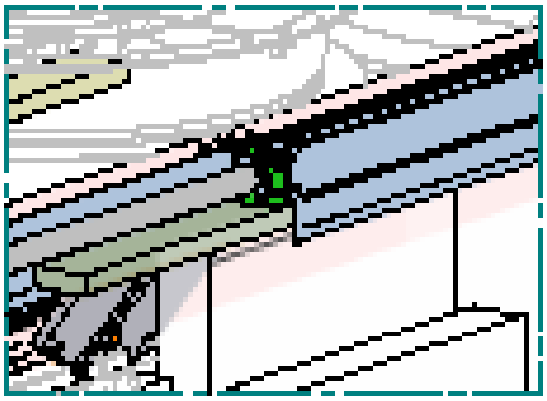
POS.	Description	POS.	Description
1	RIGHT LATERAL PLUGGING - HYDRAULIC PIPING	6	WATER DELIVERY/ SUPPLY PIPE DOUBLE BRACKET
2	MAIN TANK	7	LEFT LATERAL PLUGGING - HYDRAULIC PIPING
3	TANK STRUCTURE COVER	8	PIPE SUPPORT BRACKET
4	SECONDARY TANK	9	HEXAGONAL NUT M8 STAINLESS STEEL
5	SUPP. BRACKET INLET WATER PIPE		
NOTE: QUANTITIES REFERRED FOR EACH SIDE MACHINE (RIGHT AND LEFT SIDE ARE SYMMETRICAL)			

3.15 - Draw circuits mounting

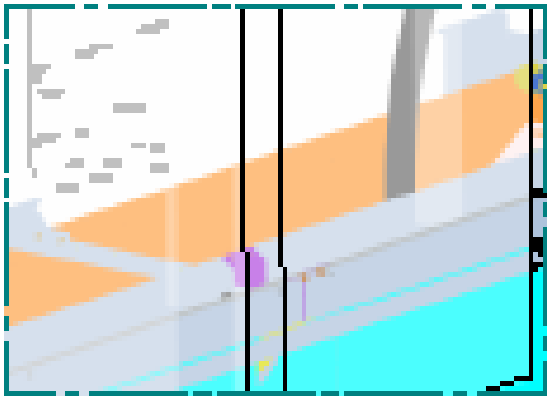


ASSEMBLY VIEW
UNIT LEFT SIDE
VISTA DI ASSIEME
LATO SINISTRO UNITÀ
1 : 25





PART. C

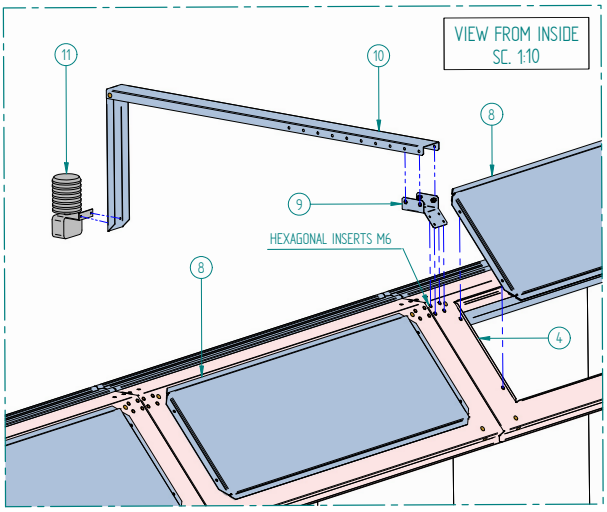


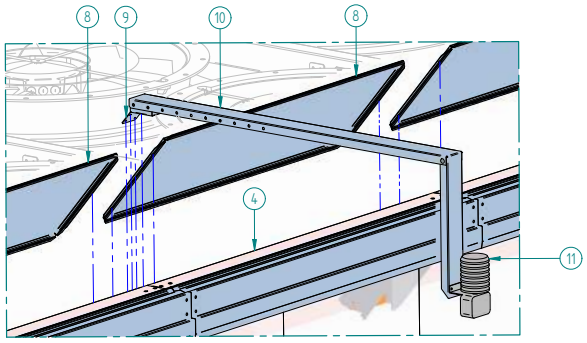
PART D

POS.	Description
1	UPPER GUTTER FRONT PLATE
2	COOLING PANEL 5090 BL.PR. 2000X600
3	DISTRIBUTION PANEL 5090 L=600
4	COOLING PANEL 5090 BL.PR. 2000X416
5	DISTRIBUTION PANEL 5090 L=416
NOTE: QUANTITIES REFERRED FOR EACH SIDE MACHINE (RIGHT AND LEFT SIDE ARE SYMMETRICAL)	

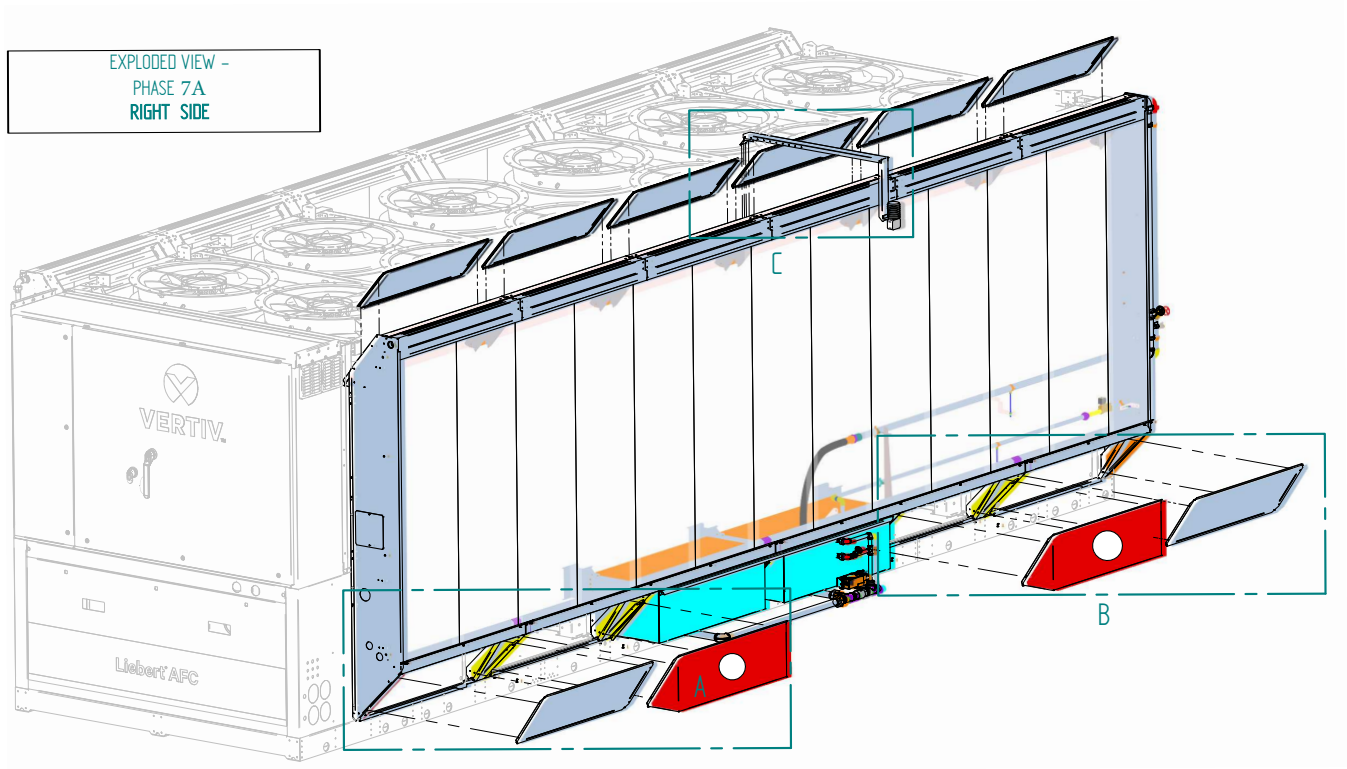
RIVETS		
type	Description	Th. range [mm]
A	MONOBOLT 2771-817 D.6.4	2 : 9.5

3.16 - Panel installation

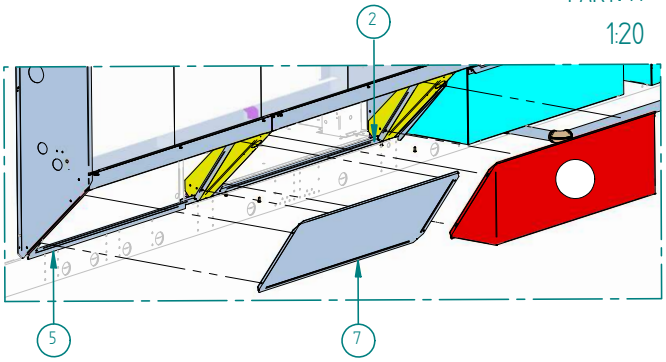




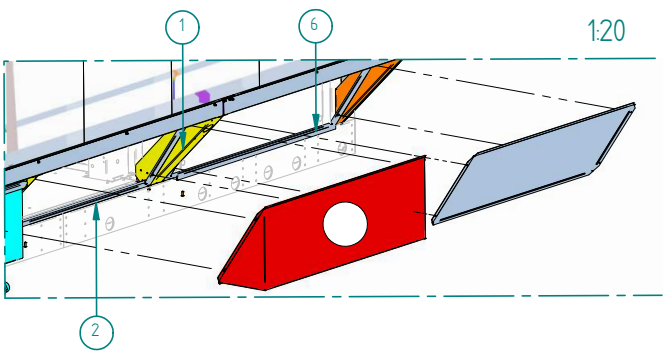
PART. C
1:10

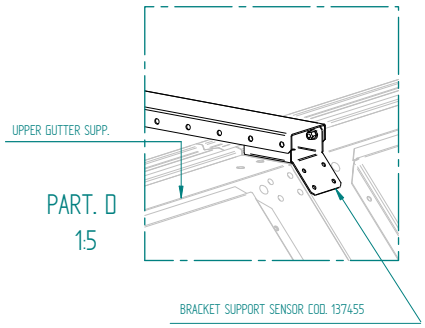


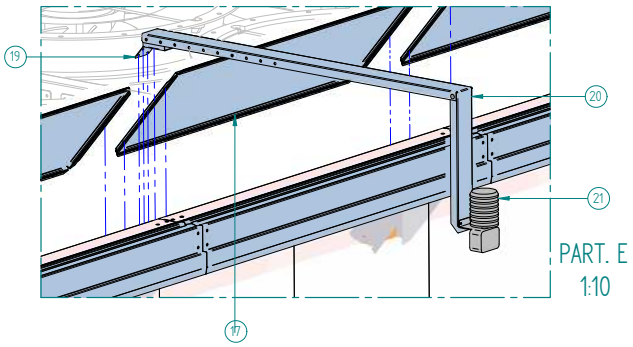
PART. A
1:20



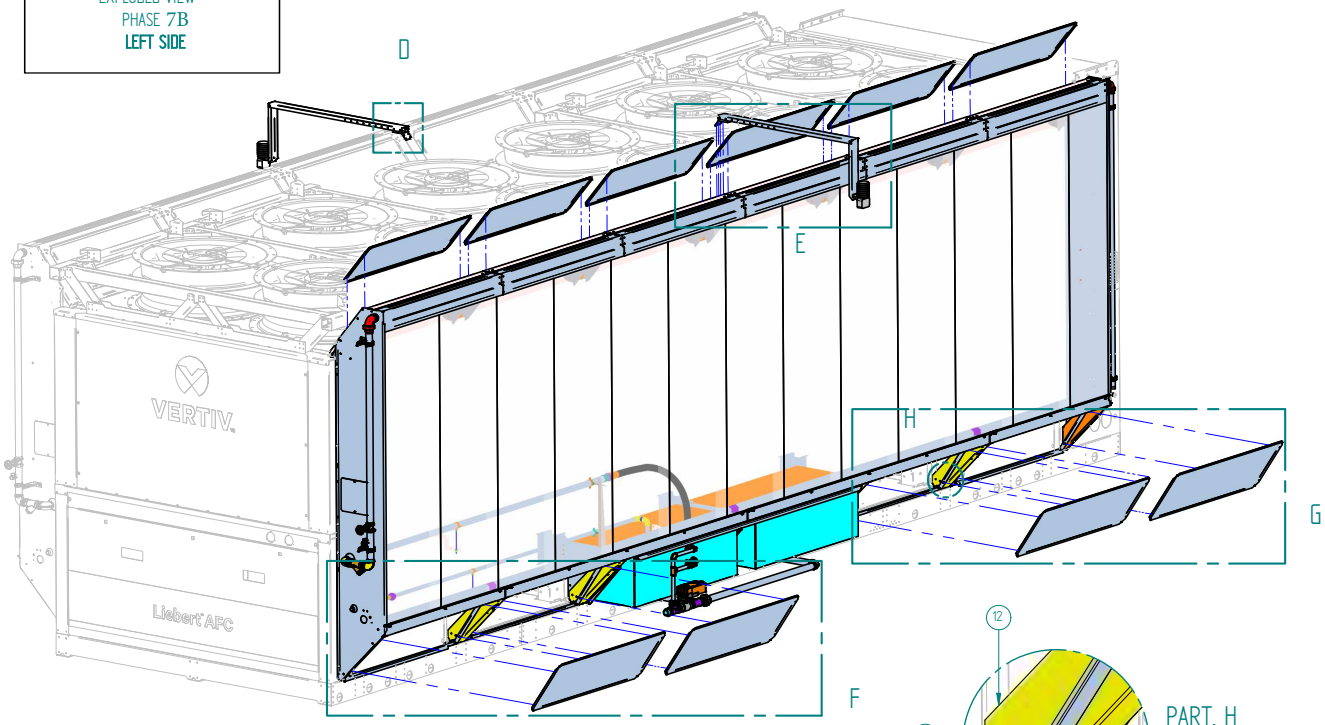
PART. B
1:20

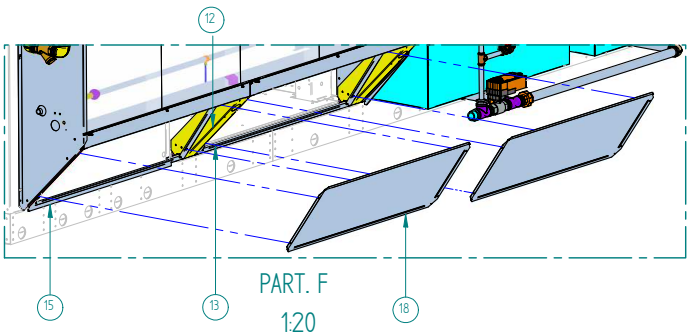


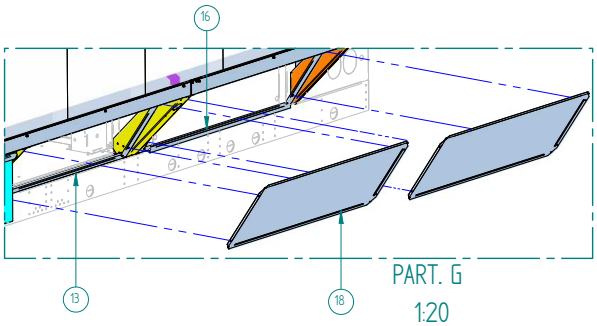


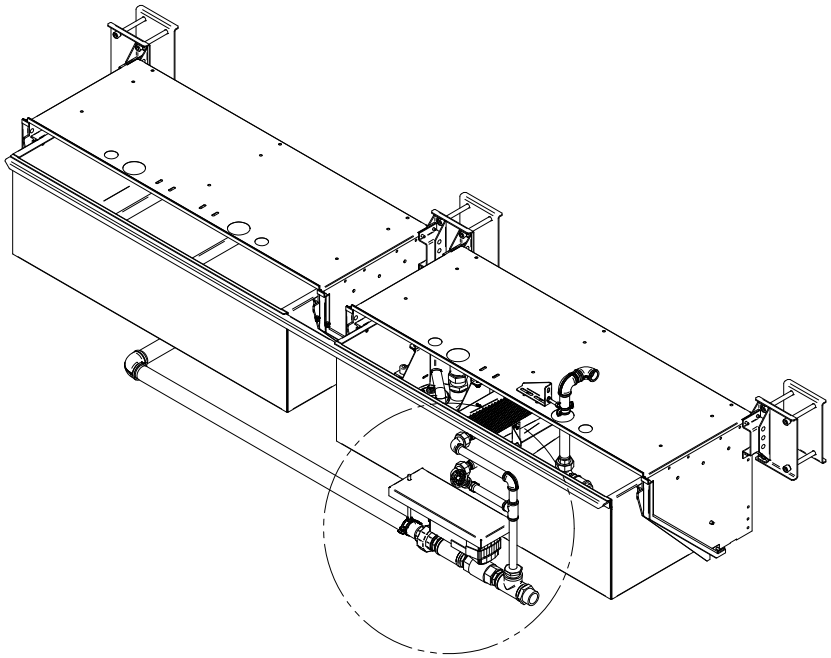


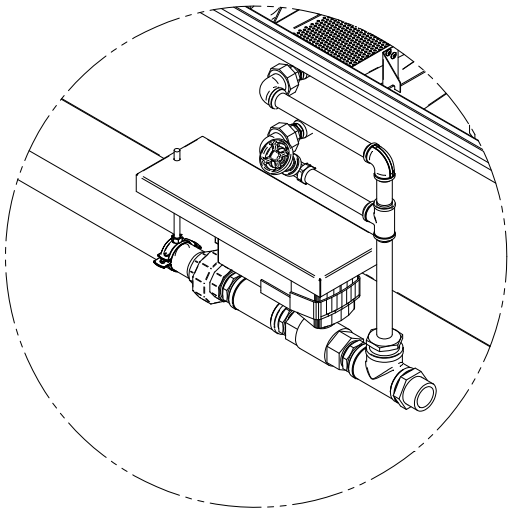
EXPLODED VIEW –
PHASE 7B
LEFT SIDE











POS.	Description (UNIT RIGHT SIDE)	POS.	Description (UNIT LEFT SIDE)
1	CENTRAL LOWER GUTTER SUPPORT	12	CENTRAL LOWER GUTTER SUPPORT
2	LOWER PLUGGING WITH OPENING	13	LOWER PLUGGING WITH OPENING
3	HYDRAULIC CONNECTIONS PLUGGING	14	UPPER GUTTER SUPPORT WITH REAR PLATE
4	UPPER GUTTER SUPPORT WITH REAR PLATE	15	LEFT LOWER PLUGGING WITH OPENING
5	LEFT LOWER PLUGGING WITH OPENING	16	RIGHT LOWER PLUGGING WITH OPENING
6	RIGHT LOWER PLUGGING WITH OPENING	17	UPPER INSPECTION PANEL
7	LOWER INSPECTION PANEL	18	LOWER INSPECTION PANEL
8	UPPER INSPECTION PANEL	19	BRACKET SUPPORT SENSOR QFA3171
9	BRACKET SUPPORT SENSOR QFA3171	20	SENSOR BRACKET QFA3171
10	SENSOR BRACKET QFA3171	21	SENSOR QFA3171 4.20 mA
11	SENSOR QFA3171 4.20 mA		

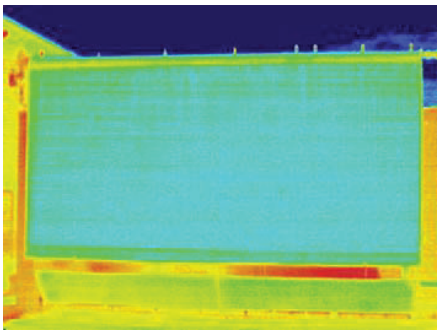
4 - Calibration of the hydraulic circuit

The PAD must be wetted with a water flow rate not lower than a certain value to ensure the best operation and increase the PAD's life.
The min. flow rate for wetting the PAD depends on the total length of the installed PAD type and of the pack. For standard PADs, the min. flow rate is:

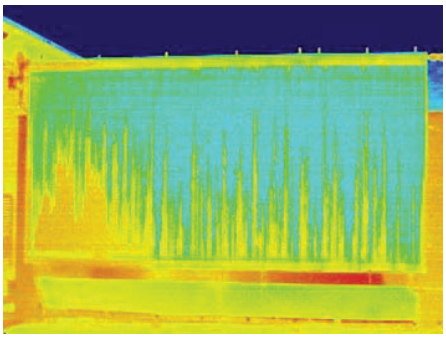
$$Q_{min}[l/min] = \frac{7.62 \times \text{number of fans}}{2}$$

where **Q** min is for each chiller side

If this flow rate is guaranteed the distribution of the water fall is uniform in the whole PAD, as the picture taken by a thermo-camera shows.



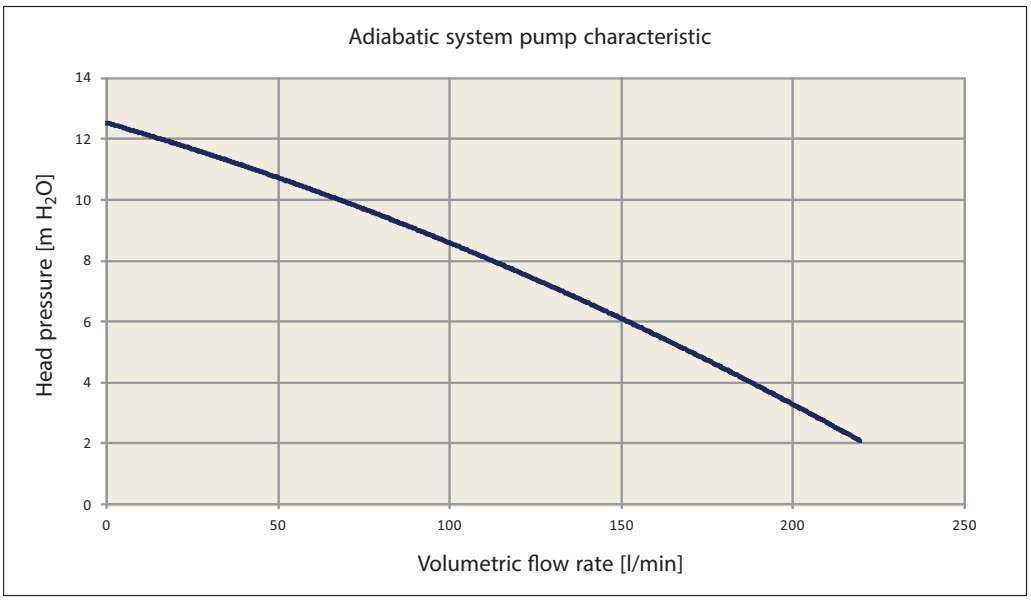
If the flow rate is lower than the minimum value, a few parts of the PAD are not wetted and remain dry, as the following picture shows.



Too high flow rates are not acceptable as too much water to the PAD may cause drops from the same, and the bottom channel may overflow. As a result, water is wasted unacceptably.

Therefore, the flow rate for the PAD supply must be balanced by the suitable adjustment valve (shutter) so that there is no drop formation and water does not overflow.

The system equipped with tank, to aid flow rate calibration, has a pressure intake just after the pump; in this way, as the characteristic curve of the pump is known; the working point and thus the PAD supply flow rate can be determined.



Tab. 4 - Electric data for submersible pump on each tank

Power supply	I [A]	Nominal power
400 V +/- 10 % / 3 Ph / 50 Hz	1.6	0.45 kW / 0.6 HP

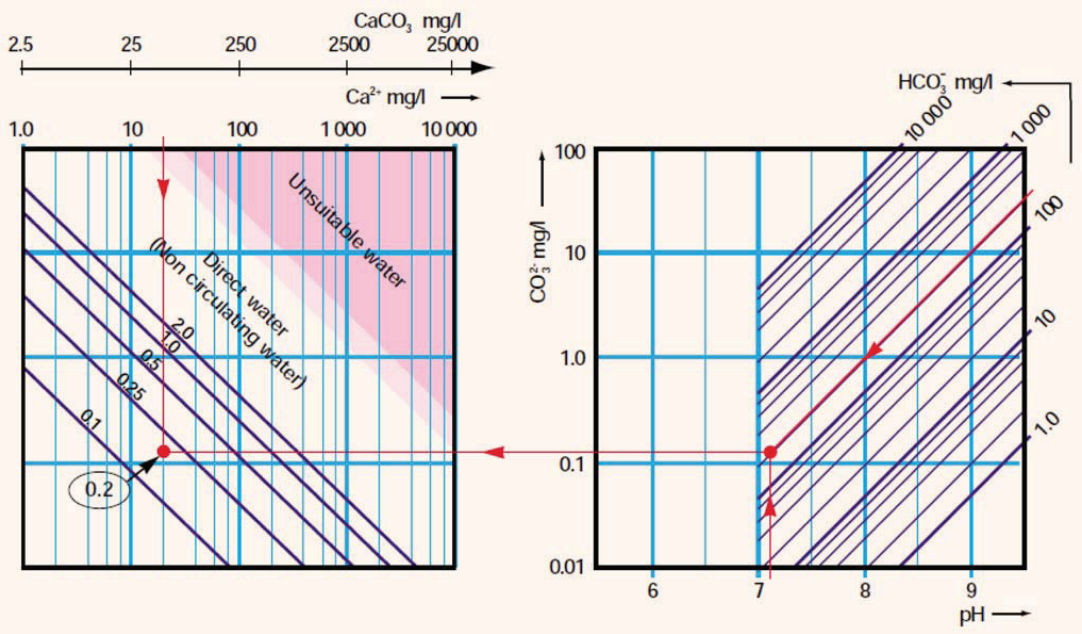
In the case of a system without tank, if the optional flow meter is installed, the flow rate can be read directly on the display and the shutter can be calibrated, otherwise operate as described for the system with tank by measuring the pressure from the pressure intake.
A leak of a few drops is normal if the PAD is started when perfectly dry. When the PAD is completely wet, leaks of water drops naturally decrease and then stop completely. Otherwise, adjust the shutter till eliminating the drop leaks. If the water leaks continue, check the following:

- Make sure the PAD has not been damaged during the installation. Check if there are bumps. If the PAD is damaged replace it.
- Check if there are leaks from the lower channel. If so, seal the leak points with silicone.
- Check for the correct installation of the upper channel.

In the same way, adjust also the bleed-off flow rate which is available for the system with tank only, so as to control the mineralization degree of the water in the tank. The bleed-off flow rate depends on the flow rate evaporated in the PADs and on the chemical features of the refill water. The bleed-off flow rate is very important, as a too low value would increase the limescale concentration in the tank water, with problems of deposit in the various components and a subsequent reduction of the system life (PAD included). On the other hand, a too high value would cause an excessive water consumption.
The bleed-off flow rate can be calculated as:

$$B\ [^{l}/_{min}] = C_B \times \frac{E}{2}$$

(C_B coefficient that can be determined from the diagram below, according to the water chemical features, and E: evaporated flow rate that can be taken as equal to 1 l/min for each fan arranged on a machine side)



Example

Chiller with 14 fans (thus 7 fans per side), the water has the following chemical features:

- pH = 7.1
- HCO_3^- ion concentration = 200 mg/l
- Ca_2^+ ion concentration = 20 mg/l

The bleed- off flow rate, for built- in tanks, will therefore be:

$$B\left[{}^{l}\!/_{min}\right] = \frac{c_B \times E}{2} = \frac{0{,}2 \times (1 \times 7)}{2} = 0{,}7\frac{l}{min}$$

After having calibrated the bleed-off flow rate, check that the current PAD supply flow rate is higher than the min. one and that there is no water leak or incorrect distribution. If necessary, adjust again the PAD supply shutter.

After adjusting the flow rates, seal the valve to prevent unauthorized staff from tampering with the adjustment.

5 - Microprocessor Control and Adjustment

The microprocessor controls two adiabatic pre-cooling systems for each chiller: on the right side and on the left side. The descriptions below refer to the whole system.

The microprocessor offers the possibility of manually controlling each component of the hydraulic circuit for maintenance needs. Using this mode, the operator can make special washing cycles if necessary and/or check the functions of the single components.

For more information, see Chap. 12.

Adiabatic Cooling - Rev. S.W. 1.6.3								
Configuration Mask	**Parameter Name**	**Description**	**Values**	**Default (Set to Default = YES)**	**Visibility**	**Min. Admitted Value**	**Max. Admitted Value**	**Unit of Measure**
System Configuration	System type	System type with tank or without according to hydraulic circuit	With tank Without tank	With tank	Always	N.A	N.A	N.A
	Working mode	Adiabatic Kit working mode	Stand Alone Integrated Manual	Integrated	Always	N.A	N.A	N.A
	Pump mode	Pump working mode: set to always on as default	On/Off Always On (PAD Type = Cellulose)	Always On	Always	N.A	N.A	N.A
	Regulation type	Regulation type: On/Off according to Psycro-metric diagram, otherwise Psycrometric diagram + Setpoint thresold	On/Off Setpoint	On/Off	Always	N.A	N.A	N.A
	Setpoint	If Regulation type = Setpoint, the value of desired setpoint		0	If Regulation type=Set-point	0	60	°C
	Differential	Differential used for regulation type = Setpoint		0	If Regulation type=Set-point	0	20	°C
	Side number	Number of active side of PAD		7	If Regulation type= Setpoint	1	2	N.A
	Valves presence - BleedOff	Bleed Off valve presence (optional)	Yes No	No	Always	N.A	N.A	N.A
	Valves presence - Distribution	Distribution valve presence (optional)	Yes No	Yes	Always	N.A	N.A	N.A
	Valves presence - FlowMeter	Flow meter presence (optional)	Yes No	No	Always	N.A	N.A	N.A

Adiabatic Cooling - Rev. S.W. 1.6.3								
Configuration Mask	**Parameter Name**	**Description**	**Values**	**Default (Set to Default = YES)**	**Visibility**	**Min. Admitted Value**	**Max. Admitted Value**	**Unit of Measure**
Probe Configuration	Flow meter Side 1/2	Type of flow meter	NTC PTC 0...20mA 4...20mA 0...10V 0...1V 0...5V Digital CPC/ ERS	4...20mA	If FlowMeter = Yes	N.A	N.A	N.A
	Lower limit	Flow meter manufacturer parameter for lower read value		0	If FlowMeter = Yes			L/H
	Upper limit	Flow meter manufacturer parameter for upper read value		1800	If FlowMeter = Yes	0	10000	L/H
	Offset	Flow meter calibration		0	If FlowMeter = Yes			N.A
	Humidity Side 1/2	Type of humidity probe	NTC PTC 0...20mA 4...20mA 0...10V 0...1V 0...5V Digital CPC/ ERS	0...10V	Always	N.A	N.A	N.A
PAD Configuration	Number of PAD Side 1/2	Numeber of PAD installed		0	Always	0	12	N.A
	Air Flow for PAD	m^3/h of air flow		10000	Always	0	32767	mc/h
	PAD efficiency	Efficiency of PAD		70	Always	0	100	%
	PAD type	Type of used PAD: only Cellulose available	Cellulose Other	Cellulose	Always	N.A	N.A	N.A
Pump Configuration	Nominal pump Flow Side 1/2	Nominal pump flow (lt/min)		140	Always	0	240	lt/min
	Time period Side 1/2	Time period		300	Always	60	540	sec
Water Param-eter	Bleed Off constant	Bleed Off constant		0.25	Always	10	200	
Antifreeze Parameter	Cold temperature	Thresold for Cold Temperature-antifreeze alarm		10	Always	- 200	200	°C
	Differential	Differential for Cold Temperature alarm activation		1	Always	0	20	°C
	Time delay	Delay for cold temperature alarm activation		30	Always	0	60	sec
	Intensive cold temperature	Thresold for Intensive cold Tempera-ture-antifreeze alarm		5	Always	- 200	200	°C
	Differential	Differential for Intensive cold Temperature alarm activation		1	Always	0	20	°C
	Time delay	Delay for intensive cold temperature alarm activation		30	Always	0	60	sec

Adiabatic Cooling - Rev. S.W. 1.6.3								
Configuration Mask	**Parameter Name**	**Description**	**Values**	**Default (Set to Default = YES)**	**Visibility**	**Min. Admitted Value**	**Max. Admitted Value**	**Unit of Measure**
Antilegionella Parameter	Pipes	Time to empty pipes during antilegionella procedure		300	Always	0	3600	sec
	Tank	Time to empty tank during antilegionella procedure		1200	Always	0	3600	sec
	Days between 2 cycles	Days between two antilegionella cycles		1	Always	1	7	day
	Starting hour	Starting hour for antilegionella cycle		00:00	Always			
Date - Time Settings	DD/MM/GG - HH:MM	Date - time for the controller			Always	N.A	N.A	N.A
Set to Default	YES / NO	If YES starts the default settings install procedure		No	Always			

The change of the controller parameters by non-authorized staff may result in an incorrect device operation, with oscillation, too early pre-cooling activation (and therefore higher water consumption) or too late pre-cooling activation (and therefore higher electricity consumption).
Refer to the appendix at the end of this manual for the Guide to the programming with Display for the adiabatic system, refer to Appendix of Chapter 12, reported at the end of this manual.

6 - Control Logic

The control types of the adiabatic system are the following:

- **Stand-alone:** the system can start if:
  - fans are active;
  - the dry bulb temperature and the relative humidity of the external air are in the ON range (see Fig. 6 in Chap. 7).

When the adiabatic system is operating the pump is active (or the solenoid valve is open in circuits without tank). If the fans are stopped or the temperature of the dry bulb and the relative humidity of the external air are in the OFF range the adiabatic system is switched off.

- **Integrated:** information is shared over the Modbus with AFC controller, activation is given over Modbus, information about fan running is coming from AFC controller.
- **With set point:** this control type includes entering a set point temperature to be set in addition to what specified in the above point. If the dry bulb air temperature read by the sensor upstream the PAD is lower than the set temperature the machine remains off or is turned off independently of the relative humidity. If the dry bulb air temperature is higher than the set temperature and the relative humidity is in the hysteresis or OFF range, the machine remains off. If the temperature instead is in the ON range, the adiabatic system receives the switching-on control according to the mode previously described (pump/solenoid valve ON).
- **Manual:** to allow the operator to make maintenance interventions on the adiabatic system.

7 - Adiabatic System Operation and Adjustment

7. 1 - Pump management

In systems with tank, the operating logic of the water distribution pump for each section is the following:

- The pump steadily supplies the PAD with a flow rate that prevents drops from being carried by the PAD.
- The bleed-off flow rate is discharged simultaneously with the PAD supplying. It is anyway necessary to calibrate the shutters to guarantee the correct supply and bleed-off flow rates.

The flow rate that must be guaranteed with the pump will be:

$$Q\left[{}^{l}\!/_{min}\right] = \frac{7.62 \text{ x number of fans}}{2}$$

7. 2 - On-off automatic system

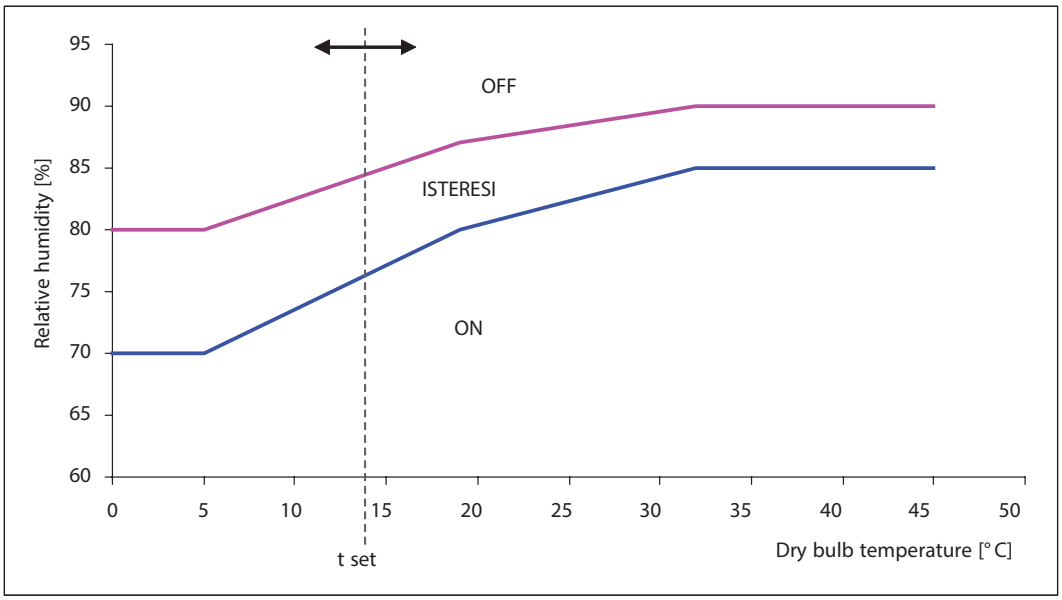
Independently of the adjustment logic, inside the control board, the ON/OFF limits of the adiabatic system are enclosed by a broken line in the psychometric diagram. The points are summed up in the table below:

ON	
t_{BS} [° C]	U.R. [%]
5	70
19	80
32	85

OFF	
t_{BS} [° C]	U.R. [%]
5	80
19	87
32	90

The points in the table are by default and other values can thus be set directly in the control. They reflect high humidity environmental conditions (rain and/or fog) where the adiabatic cooling is useless.

Fig. 8 - Principle of operation adiabatic system



7. 3 - PAD daily drying

In any adjustment type the PAD must be dried completely every 24 hours to lengthen its life and reduce the growth of algae, moss, etc. There are two drying methods:

1. If the fans are on, there are 30minutes during which the PADs are not wetted. In this way, the PADs dry completely.
2. If the fans are stopped there is no PAD wetting for at least 10 hours, for example from 11 p.m. until 9 a.m., to allow the PADs to dry completely.

7. 4 - Anti-legionella draining system

This option is included for systems with tank; the draining is necessary to prevent all risks of legionella formation.

Independently of the system type (with or without tank), it is necessary to empty the pipes every 24 hours for cleaning reasons, at the same time as the PAD daily drying.

The tank drying occurs by default every 3 days. This parameter can be changed on the display.

Allowed values range between 1 and 7 days, anyway the default value is strongly recommended, or lower values can be possibly used.

IT IS RECOMMENDED NOT TO SET TANK EMPTYING INTERVALS LONGER THAN THE DEFAULT VALUES, AS THE LAW SPECIFIES THAT TANKS MUST BE EMPTIED AT LEAST EVERY 3 DAYS IN SOME COUNTRIES.

The next filling will occur only when the adiabatic system is activated. Draining occurs at the same time as the PAD daily drying (at night).

The customer is responsible for maintaining the safety and healthiness of the adiabatic system in every part. The customer is responsible for cleaning the adiabatic system from limescale, biofilm or other residues and to sanitize it if necessary.

Using mains water with a temperature near to 20°Cor lower reduces all health issues, due to Legionella bacterium.

In fact it is dormant in this temperature range.

The risk of airborne transmission of the bacterium is reduced by the use of the adiabatic pre-cooling with PAD, as this involves a flow of air without aerosols.

7. 5 - Water quality

The temperature of the water must not be higher than 20° C, to reduce microbiologic proliferation.

The mains water distributed to the PADs must have the required min. features.

The quality of the water must be periodically checked in compliance with the table below:

Tab. 5 - Water quality

Constituent	Make Up	Recirculating
Calcium Hardness (as $CaCO_3$)	50 – 150 mg/l	100 – 300 mg/l
Total Alkalinity (as $CaCO_3$)	50 – 150 mg/l	100 – 300 mg/l
Chlorides (as Cl)	< 50 mg/l	< 400 mg/l
Silica (as SiO_2)	< 25 mg/l	< 100 mg/l
Iron (as Fe)	< 0.2 mg/l	< 1.0 mg/l

Constituent	Make Up	Recirculating
Conductivity	< 750 µs	< 4000 µs
Suspended solids	< 5 mg/l	< 5 mg/l
pH	6.0 – 8.5	7 - 9
Chlorine or Bromine	0 – 1.5 mg/l	0.0 mg/l
Sodium (as Na)	< 50 mg/l	< 400 mg/l

7. 6 - Anti-freeze protection

In every adjustment type, the ice protection includes two alarm levels for systems with tank:

1. Moderate cold: the adiabatic system pipes only are protected. All valves are open to drain the water from the pipes.
2. Severe cold: the tank must be protected draining the water; the automatic control drains the whole system (pipes and tank).

The ice protection includes a single alarm level for systems without tank. The whole hydraulic system of the adiabatic system is emptied.

CAUTION: To avoid continuous emptying at night and filling in the day of the tanks, starting from season conditions often included in the “Freezing risk” range of the diagram in Table 1, it is strongly recommended to empty the system completely and, for particularly cold climate, to remove the pump.

CAUTION: The customer must ensure the anti-freeze protection for the hydraulic circuit section he is responsible for. During the winter stop, the installer is responsible for correctly emptying all system parts, carefully avoiding any water accumulation in every component.

8 - Maintenance

To ensure a correct operation of the adiabatic system and the longest possible PAD's life, it is necessary to consider the following aspects:

- **Water quantity:** the PAD must be wetted uniformly, and there must be no non-wet area (see indication on the flow rate calibration). The water flow rate can be adjusted by the cock valve (shutter). Check that the holes in the PVC pipe are not clogged with limescale or dirt. In this case, clear them with a punch.
- **Check of the water quality:** the water must be clean and have the min. chemical features already indicated in table 1. Clean the tank (if any), the mechanical filter and the hydraulic system every month or more frequently, depending on the environmental use conditions.
- **Check of the leaks:** if water leaks are observed from the PAD, check if the water flow rate is too high (in this case adjust the shutter valve), if the PAD is damaged or if the connections are damaged. If there is a leak from the PAD the adiabatic system must be switched off and the leaking point must be sealed with silicone. A light dripping at the start with completely dry PAD is normal, but must stop when the PAD is completely wetted.
- **Daily maintenance:** dry the PAD (automatically by the control) every day; remove the coarsest dirt from the PAD surface.
- **Monthly maintenance:** clean regularly the distribution circuit and the PVC pipe, particularly if there are areas with incorrect distribution, removing the dirt and pumping clean water. Open the clogged holes of the PVC pipe with a punch; dry the PAD completely. Brush the PAD downwards. It is recommended to try brushing on a small section of PAD. When you are sure the PAD cannot be damaged by the brush, clean completely.

After brushing, rinse the PAD with a low pressure jet.

DO NOT USE HIGH PRESSURE OR STEAM NOZZLES TO WASH THE PAD!

After brushing and then rinsing, switch the adiabatic system on so that the PAD wetting removes all residual dirt traces.

After the final PAD wetting, remember to empty the tank so that the dirt accumulated inside does not circulate again in the system.

If present, clean also the tank, emptying it and removing organic and inorganic residues from the walls, the bottom and any other part and clean thoroughly the level gauge. After that, wash the tank by clean water.

These interventions may be required more often in the case of harsh environmental conditions.

- **Winter arrangement:** the PAD can remain installed outdoors. In any case, it is necessary to make sure that under frozen rain the PADis not clogged. In order to avoid it, in very cold climates, remove 10% of PAD surface during the maintenance of winterization.

If a correct maintenance is not performed, the adiabatic system can become a breeding ground for bacteria, fungi, moulds, etc. The expected PAD life is therefore significantly decreased, with a deterioration shown in the pictures below.

PADS MUST BE REPLACED IN THESE CONDITIONS!

On the unit with built-in tanks, in order to avoid hand injuries, open and close the tanks maintaining the hands like shown:

Opening

Closing

On the unit with built-in tanks, avoid to open and close the tanks using the drain circuit as handle.

Before any maintenance on the adiabatic system, switch-off the main switch disconnecter of the pump and chiller power supply.

Bacteriological analysis is needed to be done periodically, according with local regulations.

8. 1 - PAD removal and replacement

The expected operating life of the pre-cooling PADs is 3 to 5 years, depending on the application and maintenance conditions. If low efficiency in the pre-cooling is experienced together with a significant decrease of the air flow, the PADs need to the replaced.

PAD removal/replacement procedure

1. Remove the panel of the upper channel
2. Remove the water distribution PADs
3. Remove the pre-cooling PADs

To re-install the PADs, reverse steps 1-2-3.

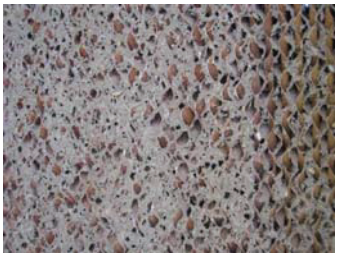
Important:

The used PADs are non- hazardous waste and must to be disposed according with the local norms in force.

Important:

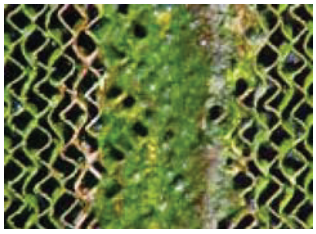
The pre-cooling PADs have a front and a back; they must be re-installed in the correct position to ensure their full operation in the whole section and their full efficiency. The black section must be positioned from the outer side; be careful with the sloping angle of the channels inside the PAD as shown here below.

Dirt and incorrect distribution



Limescale

Alga growth



Limescale and mould

9 - Guidelines for Designing a Centralized System Tank

The water collection tanks for the adiabatic system are used to centralize the recovery and simplify the installation; these tanks are very often positioned in closed rooms, repaired from weather agents, which proves particularly advantageous in winter. Similarly to the tanks installed on each side of the AFC, the tank shall be equipped with:

1. Pump support, cover
2. Presetting for the various hydraulic connections (tank draining, tank filling connection, connection for water returning from PADs, overflow)
3. Circulation pump
4. Pump safety switch (level check)
5. Hydraulic supply float cock or similar system
6. Flow meter (water consumption meter)

The tank volume must be able to receive all the system water drained when the system is stopped, as well as the volume needed for filling the system; the tank volume must therefore be the sum of:

1. Min. volume needed to ensure a safe pump operation (intervention point of the pump safety level gauge)
2. Hydraulic volume which is the sum of all the volumes of the adiabatic systems interlocked to each AFC (see Tab. 1) → transient compensation while filling the system (start)
3. Volume of the supply-drain-connection hydraulic system between the tank and all interlocked adiabatic systems → transient compensation when filling the system (start)
   - The MAX float level of the hydraulic supply cock (or equivalent system for water supply from the mains) must be positioned at a level at least equal to the sum of the three previous volumes (1+2+3)
4. Water volume sum of the points 2 + 3 → transient compensation while draining/emptying the system (stop)
   - The overflow level must be positioned at a level at least equal to the sum of the four previous volumes (1+2+3+4)

NOTE:
If the tank volume is determined correctly, the water level must never reach the overflow nor the pump safety intervention for min. level

NOTE:
Consider a 5-10% safety margin while calculating the single volumes.

CAUTION: the overflow level of the tank must always be lower than the lowest point of the discharge channel!
The pump to be combined with the hydraulic system must ensure a water flow rate higher than the minimum specified value (sum of the single contributions, see par. 7. 1), and the head necessary to overcome the load losses of the hydraulic circuit, the losses of the distribution system, the losses of the valves, the geodetic value of the highest point for PAD supply.

CAUTION: a correct pump sizing (with the necessary safety margins) prevents problems caused by undersized flow rates (with poor water distribution on the PADs, low efficiency, earlier deterioration of the PADs, see Chap. 4) or those linked with too oversized flow rates (losses in the distribution system, excessive flow rates with dripping from PADs, see Chap. 4).

10 - FAQ-Answers to Frequently Asked Questions

How long is the PADs' life ?

The design life is 3-5 years, with a typical use of 5-6 months/year, if the maintenance and supply specifications for the PADs are complied with.

Can vinegar be used to sanitize the system ?

Vinegar is an organic substance and can cause bacteria and alga growth on the PAD. Moreover, it can decrease the pH too much.

When are the PADs to be replaced ?

PADs are to be replaced when their efficiency (cooling capacity, as indicated in Tab. 1) decreases. This occurs practically when the PAD is worn, when it crumbles, or with dirt or clogging that cannot be removed with the previously described cleaning operation. The best time to replace them is at the end of the usage season.

The water in the storage tank is now greenish-yellow. Does this indicate problems ?

This is normal indeed with completely new PADs. It is a temporary condition that disappears after approximately fifteen days of continuous operation of the adiabatic system.

11 - Features of the Installed Components

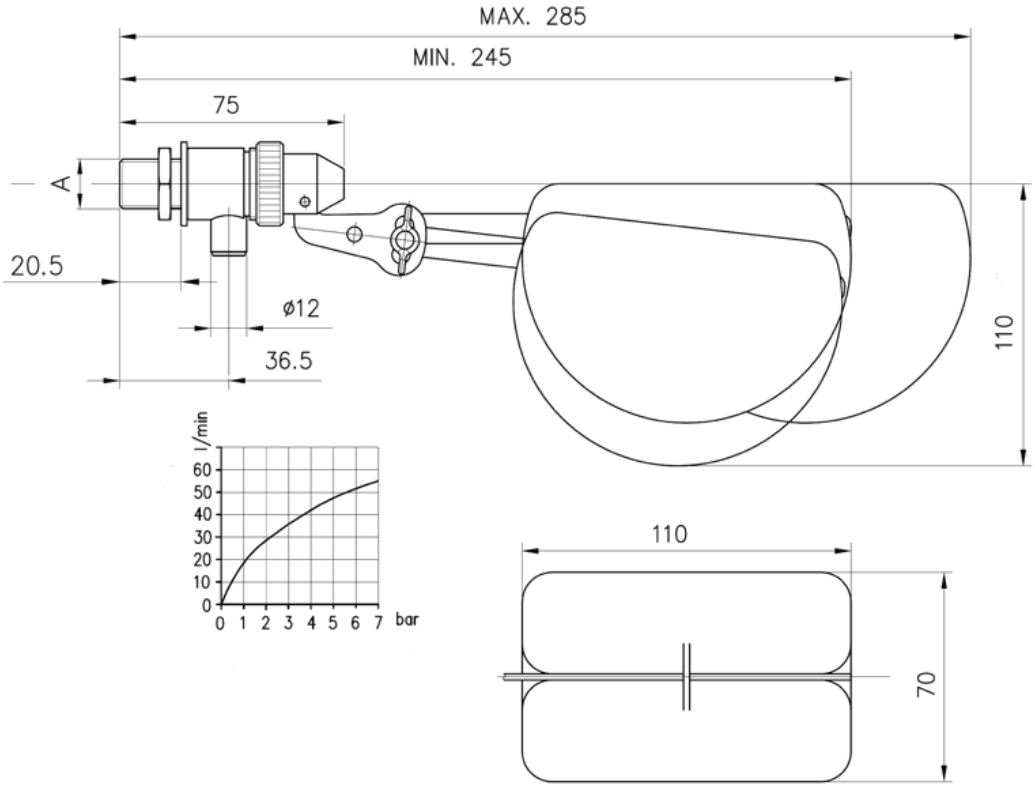
11. 1 - Data sheet - No. 1: Float valve

The adjustment of the water flow in the systems with tank takes place through a float valve. See following hydraulic characteristics.

Specifications

- Working: . . . . . Flow ON-OFF direct
- Max. pressure: . . . .10 bar - 1 MPa (145 psi)
- Flow rate at 1 bar: . . . . . .20 l/min. (5.3 USG p.m.)
- Flow rate at 2 bar: . . . . . .29 l/min. (7.5 USG p.m.)
- Max. working temperature: . . . . .60 °C (140 ° F)

Overall dimensions (mm)



11. 2 - Data sheet - No. 2: Flowmeter SIKA VTH 20

(for systems with tanks)

In the versions with the flowmeter, you can read directly from the display the actual flow of water consumed by the adiabatic system.

In the case with system with tank, it is placed in input to the tank, as shown in the hydraulic diagrams.

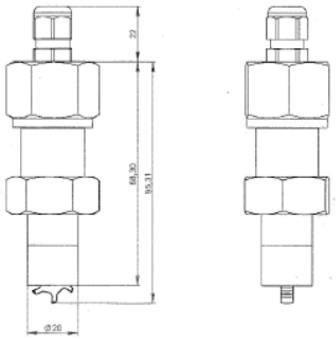
Specifications

Model	SIKA VTH 20
Turbine capsules	PPO Norly GFN 1630V
Rotor	PC Mackolon
Rotor mounting	Hard ferrite magnets
Bearings	Sapphire / PA / st. Steel 1.4436
Body	Brass
Flow range	1 - 42 l/min. (with continuous operation) Max. 25 l/min.
Accuracy	+/- 1% of range (up to 15 l/min. +/- 3% of range (up to 15 l/min.
Temperature	Max. 60 ° C
Nominal diameter	DN 20
Pressure drop	< 250 mbar at 45 l/min.
Signal output	4- 20 mA

11. 3 - Data sheet - No. 3: Flow transmitter HSW DW- FS
(for direct flow systems)

In the versions with the flow transmitter, you can read directly from the display the actual flow of water consumed by the adiabatic system.

In the case with system without tank, it is placed along the distribution circuit, as shown in the hydraulic diagrams.



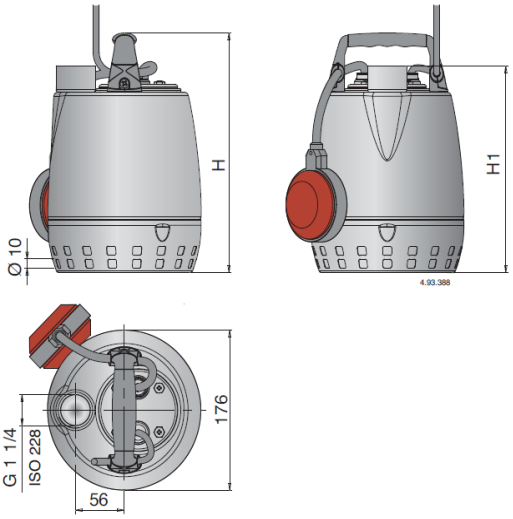
Technical data

Model	HSW Type DW- FS
Measuring principle	Paddle wheel
Mechanical connection	Welding socket(for mounting instruction see enclosed DW- D manual, pont 2.3)
Housing	Stainless steel(parts in touch with liquid)
Paddle wheel	POM
Bearing	Sapphire / Ruby
Axle	Carbide
Protection class	IP 65
Signal transfer system	Hall sensor / magnet
Accuracy	+/- 2 % from end range
Power supply	12 - 26 VDC
Signal output	4- 20 mA (analogue)
Working temperature	from - 40 ° C to - 80 ° C (inc. cable)
Max. pressure	25 bar
Measuring flow range	From 0.3 m/s to 5.0 m/s
Power consumption	Max. 50 mA
Connection cable	3.2 m length 2x twisted pair, shielded, UL approved Flame retarded according to IEC 60332 - 1 - 2 LVD IEC 60664 - 1 Fixed installation from - 40 ° C . . . +75 ° C Flexing from - 25 ° C . . . +70 ° C
Electrical connection	White: + of power supply (24 Vdc) Brown: - of power supply (24 Vdc) Green: - of analog output (Brown and green have the same ground)

11. 4 - Data sheet - No. 4: Pump GXR 13

Materials

Component	Material
Pump casing Strainer Impeller Motor jacket Pump jacket	Chrome- nickel steel 1.4301 EN 10088 (AISI 304)
Handle	Polypropylene
Shaft	Chrome- nickel steel 1.4305 EN 10088 (AISI 303)
Mechanical seal	Silicon carbide
Seral lubrification oil	Olio for food/pharmaceutical machinery



Characteristics

Dimensions (mm)		Weight (kg)
H	H1	
300	265	6.7

Electric data for submersible pump on each tank

Power supply	I [A]	Nominal power
400 V +/- 10 % / 3 Ph / 50 Hz	1.6	0.45 kW / 0.6 HP

Construction

Single-impeller submersible pump in chrome- nickel stainless steel, with vertical delivery port.

Motor cooled by the pumped water passing between the motor jacket and the external jacket.

Double shaft seal with oil chamber.

Minimum dimensions and high levels of performance, for use in many different applications, head up to 12.7 m and flow rates up to 220 liters/min.

GXR: For clean water containing solid up to 10 mm grain size.
For outdoor use a power supply cable of not less than 10 m should be used in accordance with: EN 60 335- 2- 41.

Operating conditions

Liquid temperature up to 50 °C.
Maximum immersion depth: 5 m.
Minimum water level manual operation: 30 mm.
Continuous duty.

Motor

2-pole induction motor, 50 Hz (no. = 2900 rpm).
Insulation class F.
Protection IP X8 (for continuous immersion).
Double impregnation humidity- proof dry winding.
Constructed in accordance with: EN 60034- 1; EN 60335- 1; EN 60335- 2- 41.

NOTE:

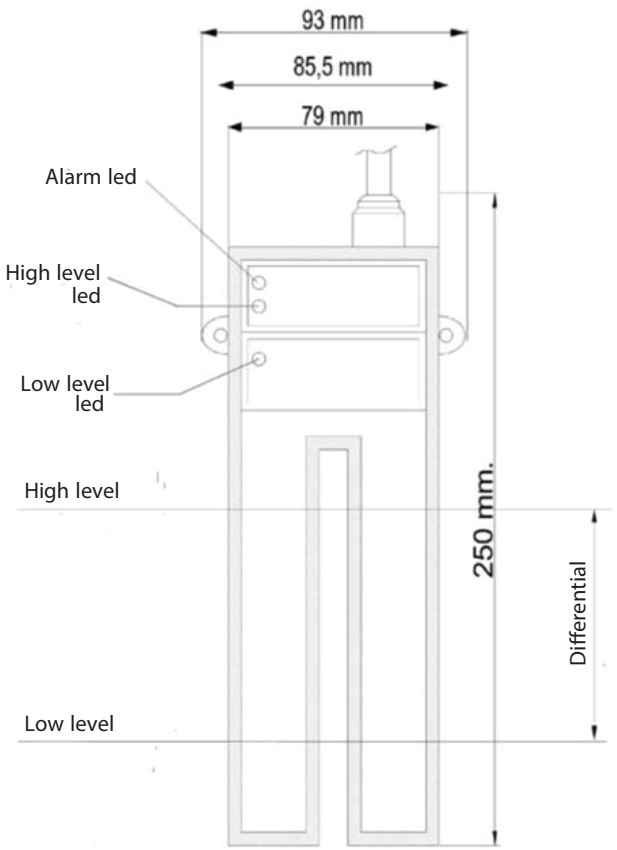
The pump adopted for the application does not provide the float type in figure but a level switch.

11. 5 - Data sheet - No. 5: Level gauge

On the inside of the regulator you will find three Leds for various diagnostic controls which are visible through the plastic container. The first Led, at the bottom which is very bright, turns on when the low level has been reached.
The second Led turns on when the high level has been reached or at the same time when the relay has been acticated.

Connections and electrical characteristics

Model	TKZC4000F0
Power supply	24 Vdc
Power consumption	100 mA
Delay time	0 ÷ 8 sec.
Difference threshold	9 +/- 1 cm (*)
High level	12 +/- 2 cm
Output relay	250 V - 10(4) A
Max. load	240 W
Dielectric strength	1500 V
Operating temperature	Max. 50 ° C
Storage temperature	from - 20 ° C to +50 ° C
Pollution index	IP 68
Housing	Non toxic polypropylene (PP)
Cable color	Yellow
Weight	190 gr
Dimensions	93 x 250 mm
Mounting	Vertical position
Power supply output	Cable H07RN- F 4G1
Approved certificates	CE - EN 60730



11. 6 - Data sheet - No. 6: Motorized 2- way valve

Mechanical and hydraulic characteristics

Open-close ball valves, 2-way, with internal thread

- For open and closed cold and warm water systems.
- For shut-off functions on the water side and 2-point controls in AHU and heating systems.
- Air bubble tight.

Overview of types

Type	kvs(m3/h)	DN(mm)	Rp(*)	ps(kPa)
R2020 - S2	32	20	3/4	1600

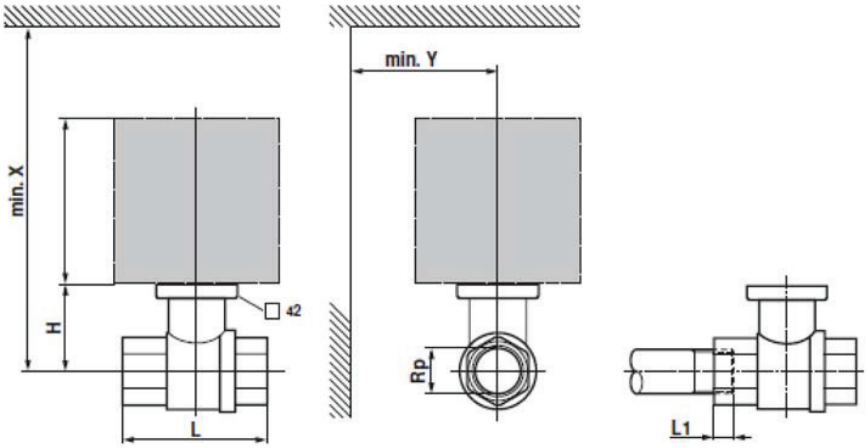
Technical data

Model	R2020 - S2 / R2032 - S3
Media	Cold and hot water, water with glycol up to max. 50% vol.
Medium temperature	-10 ° C . . . 120 ° C
Medium temperature note	The allowed media temperature can be limited, depending on the type of actuator. The correct values can be found in the respective actuator sheets.
Closing pressure Δps	1400 kPa
Differential pressure Δpmax	350 kPa
Differential pressure note	(200 kPa for low-noise operation)
Leakage rate	A, Air bubble-tight (EN 12266-1)
Pipe connectors	Internal thread in accordance with ISO 7/1
Angle of rotation with limitation	90 ° , (operating range 15 ... 90°)
Installation position	Upright to horizontal (in relation to the spindle)
Maintenance	Maintenance-free
Valve	Forged, nickel-plated brass body
Valve cone	Stainless steel
Spindle	Stainless steel
Stem seal	O-ring EPDM
Valve seat	PTFE, O-Ring EPDM (DN20 Viton)

Recommended installation positions

The ball valve can be installed upright to horizontal. The ball valve may not be installed in a hanging position, i.e. with the spindle pointing downwards.

Dimensions / Weight



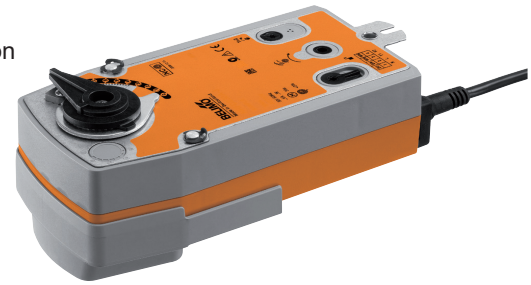
DN	Type	Weight approx.(kg)	Rp(*)	L(mm)	L1(mm)	H(mm)	X(mm)	V(mm)
20	R2020 -S2	0.42	3/4	78	14	46	235	90
32	R2032 -S3	0.78	1/4	105	19	50.5	240	90

L1: Maximum screwing depth.
X/Y: Minimum distance with respect to the valve centre.

Characteristics of the NRF24A-MP(-O)

Comunicative rotary actuator with emergency function for 2- and 3-way control ball valves

- Torque 10 Nm
- Nominal voltage AC/DC 24 V
- Control: modulating DC 0 ... 10 V or variable
- Position feedback DC 0 ... 10 V or variable
- Communication via BELIMO MP-Bus
- Conversion of sensor signals
- NRF24A-MP: Deenergised NC
- NRF24A-MP-O: Deenergised NO



Technical data

Electrical data				
Nominal voltage		AC 24 V, 50/60 Hz / DC 24 V		
Nominal voltage range		AC 19.2 ... 28.8 V / DC 21.6 ... 28.8 V		
Power consumption	In operation	7 W @ nominal torque		
	At rest	3.5 W		
	For wire sizing	9.5 VA		
Connection		Cable 1 m, 4 x 0.75 mm2		
Functional data		Factory settings	Variable	Setting
Torque (nominal torque)	Motor	Min. 10 Nm @ nominal voltage		
	Spring return	Min. 10 Nm		
Control	Control signal Y	DC 0 … 10 V, input impedance 100 kΩ	Open-close, 3-point (only AC), modulating (DC 0 ... 32 V)	.....
	Operating range	DC 0.5 ... 10 V	Start point DC 0.5 ... 30 V End point DC 2.5 ... 32 V	.....
Position feedback (measuring voltage U)		DC 0.5 ... 10 V, max. 0.5 mA	Start point DC 0.5 ... 8 V End point DC 2.5 ... 10 V	.....
Position accuracy		±5%		
Direction of rotation	Motor	Reversible with switch /		
	Spring return			
	– NRF24A-MP	Deenergised NC, ball valve closed (A – AB = 0%)		
	– NRF24A-MP-O	Deenergised NO, ball valve open (A – AB = 100%)		
Direction of rotation Y = 0 V		At switch position 1, resp. 0	Electronically reversible	.....
Manual override		With hand crank and interlocking switch		
Angle of rotation		Max. 90°		
Running time	Motor	≤90 s / 90°	40 ... 220 s	.....
	Spring return	≤20 s @ –20 ... 50°C / max. 60 s @ –30°C		
Automatic adjustment of running time,operating range and measuring signal U to match the mechanical angle of rotation		Manual triggering of the adaption by pressing the «Adaption» button		
Override control		MAX (maximum position) = 100%	MAX = (MIN + 32%) ...100%	.....
		MIN (minimum position) = 0%	MIN = 0% ... (MAX – 32%)	
		ZS (intermediate position, only AC) = 50%	ZS = MIN ... MAX	
Sound power level	Motor	≤45 dB (A) @ 90 s running time		
	Spring return	≤62 dB (A)		
Service life		Min. 60,000 emergency positions		
Position indication		Mechanical		
Safety				

Protection class	III Extra low voltage
Degree of protection	IP54
EMC	CE according to EMC: 2014/30/EU
Certification	Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
Mode of operation	Type 1.AA
Rated impulse voltage	0.8 kV
Control pollution degree	3
Ambient temperature	–30 ... +50°C
Media temperature	+5 ... +120°C (in ball valve)
	–10°C with stem heating upon request
Non-operating temperature	–40 ... +80°C
Ambient humidity	95% r.h., non-condensating
Maintenance	Maintenance-free
Dimensions / Weight	
Dimensions	See «Dimensions» on page 6
Weight	Approx. 2 kg (without ball valve)

Safety notes

- The actuator has been designed for use in stationary heating, ventilation and air conditioning systems and is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- It may only be installed by suitably trained personnel. All applicable legal or institutional installation regulations must be complied with.
- The device may only be opened at the manufacturer's site. It does not contain any parts that can be replaced or repaired by the user.
- The cable must not be removed from the device.
- The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Product features

Mode of operation Conventional operation: The actuator is controlled with a standard signal of DC 0...10 V and moves the ball valve to the operating position at the same time as tensioning the return spring.
The ball valve is turned back to the emergency position by spring force if the supply voltage is interrupted. Operation on the MP-Bus: The actuator receives its digital positioning signal from the higher level controller via the MP-Bus and travels to the position defined. Connection U serves as communication interface and does not supply an analogue measuring voltage. The ball valve is turned back to the emergency position by spring force if the supply voltage is interrupted.

Converter for sensors: Connection option for a sensor (passive or active sensor or switching contact). The MP actuator serves as an analogue/digital converter for the transmission of the sensor signal via MP-Bus to the higher level system.

Parameterisable actuators: The factory settings cover the most common applications. Input and output signals and other parameters can be altered with the BELIMO Service tool MFT-P or the adjustment and diagnostic tool ZTH-GEN

Simple direct mounting Straightforward direct mounting on the ball valve with only one screw. The mounting position in relation to the ball valve can be selected in 90° steps.

High operational reliability The actuator is overload-proof, requires no limit switches and automatically stops when the end stop is reached.

Home position When the supply voltage is switched on, the actuator automatically detects its emergency position (zero initialisation). This process, which takes place with the actuator stationary, lasts <15 s.

Combination valve actuators Refer to the valve documentation for suitable valves, their permitted media temperatures and closing pressures.

Accessories

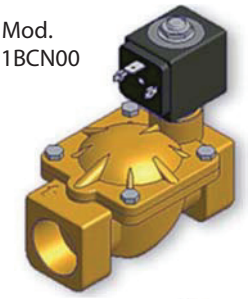
Description of Electrical accessories:

BELIMO Service tool MFT-P

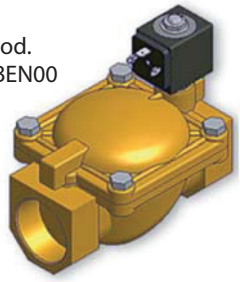
Adjustment and diagnostic tool ZTH-GEN

11. 7 - Data sheet - No. 7: Solenoid water valves 7321B
(Normally Closed)

Mod.
7321BCN00



Mod.
7321BEN00



Material specifications

Valve body	CW617N UNI EN 12165:98 Forged Brass
Enclosing tube	AISI 304 stainless steel
Plunger	AISI 430F St. Steel
Spring	AISI 302 St. Steel
Seals	NBR (Buna N) - EPDM FKM (Viton)
Shading ring	Cooper

Installation

The valves can be mounted in any position. It is however recommended to install them with the coil in vertical position above the body.

Media

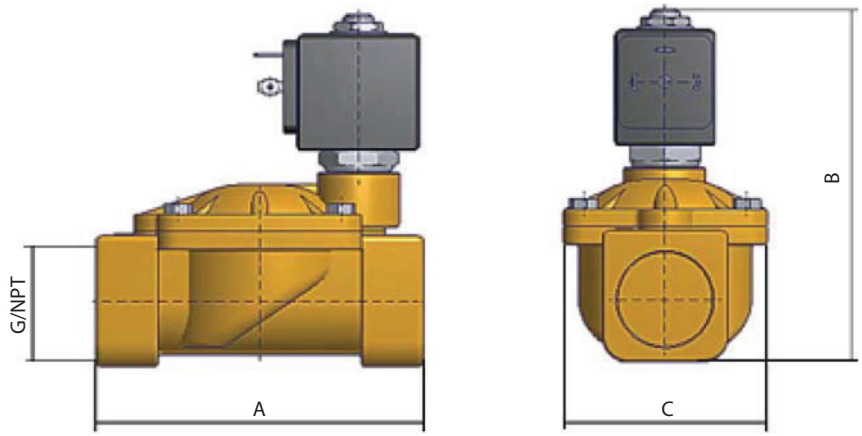
These valves have been developed to achieve the best performances for water, steam, light oils (up to 2°E).

Therefore these valves are not usable with gas and air.
We recommend to choose NBR versions for plumbing mkt (max. temp. 90°C), FKM version for water/ light oils control applications up to 140°C, EPDM version for superheated water and steam (up to 140°C).

Operating characteristics for Mod. 7321BCN00 (system with tank)

Port size G	Kv [m3/h]	Min. Press. [bar]	Max. diff. Pressure [bar]	Weight [kg]
3/4”	8.4	0.1	20	1.02

Dimensional data

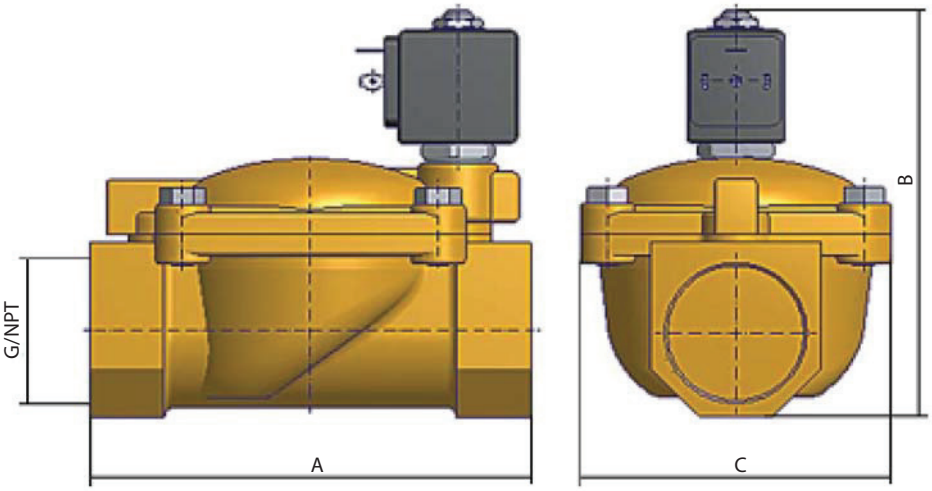


G NTP	A mm	A inch	B mm	B inch	C mm	C inch
3/4"	100	3.83	107	4.21	65	2.55

Operating characteristics for Mod. 7321BEN00 (system without tank)

Port size G	Kv [m3/h]	Min. Press. [bar]	Max. diff. Pressure [bar]	Weight [kg]
1 1/4”	25.2	0.1	10	3.15

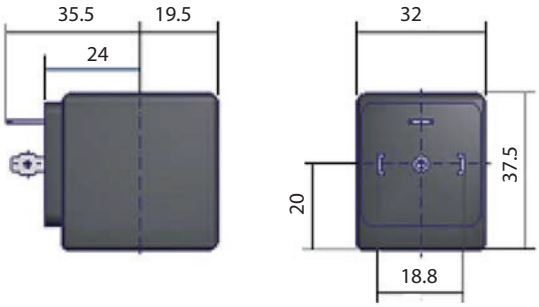
Dimensional data



G NTP	A		B		C	
	mm	inch	mm	inch	mm	inch
1-1/4"	145	5.70	134	5.27	102	4.01

Standard coil mono-frequency, F class

Encapsulated in synthetic material, Connector for 2P + E DIN 43650 A plug, IP 65 rate can be achived using a DIN plug connector only.



El. supply	Power [W]
24 V / 50 Hz	8

11. 8 - Data sheet - No. 8: Thermo- humidity sensor

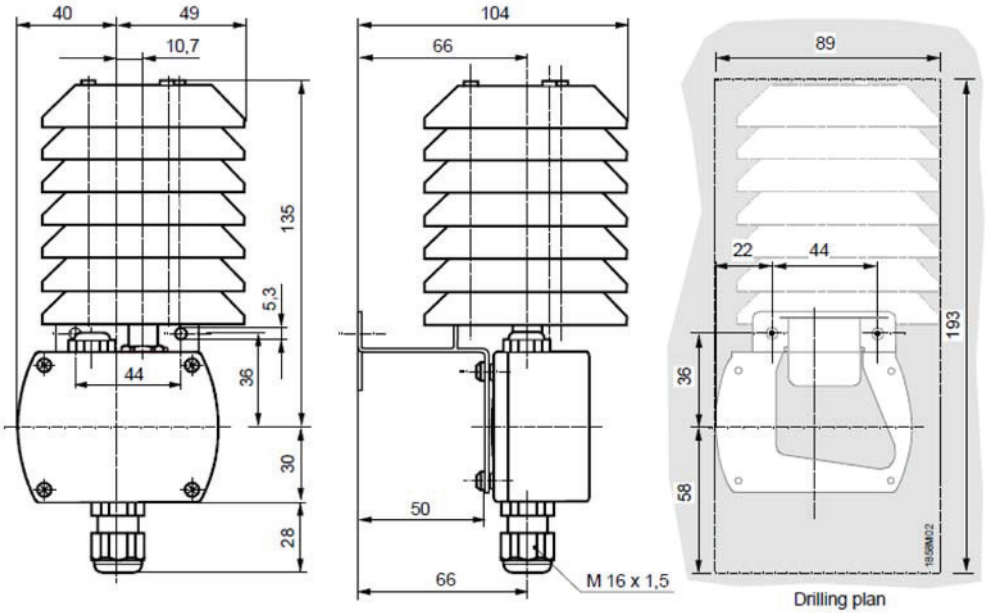
General description

The conditions of temperature and humidity of the outside air, are read by a shielded from solar radiation thermo - hygrometric sensor. It is installed, by a bracket at the centerline to each bank of the PAD at a distance of about one meter.

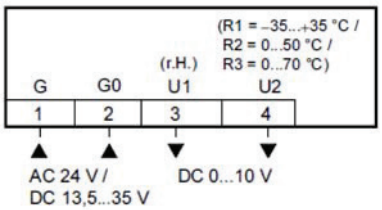
The purpose of this sensor is to read the thermo - hygrometric conditions of the outside air and transmit the signal to the controller.

The dimensional drawings of the sensor complete with sunscreen are shown below.

Dimensional data



Diagrams of the connections

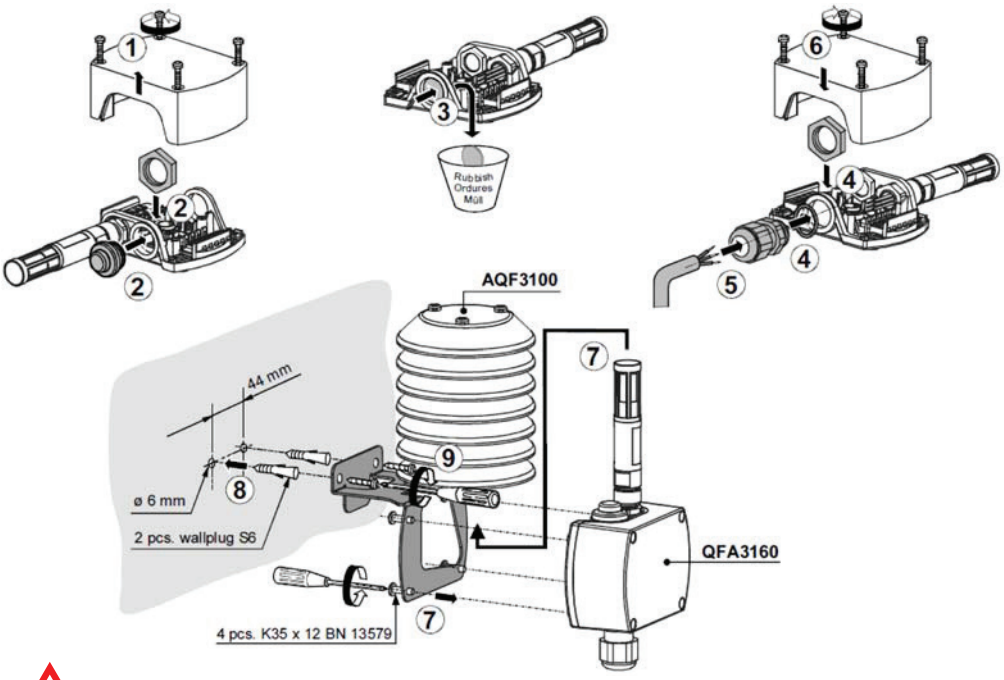


Technical data

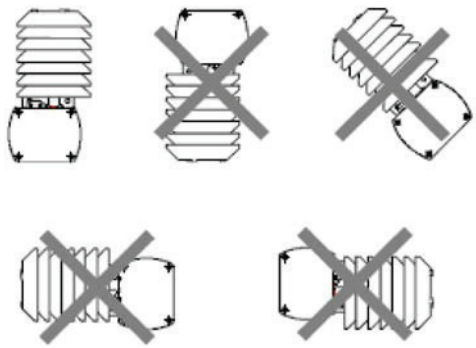
Power supply		
Operating voltage		AC 24V +/- 20% or DC 13.5 . . . 35V
Frequency		50/60Hz at AC 24V
Power consumption		≤ 1VA
Cable lengths for the measuring signal		
Max. perm. cable lengths		refer to Data Sheet of the device handling the signal
Functional data "Humidity sensor"		
Measuring range		0 . . . 100% R.H.
Measuring accuracy at 23 ° C and AC/DC 24V in 0 . . . 100 % R.H.		+/- 2% R.H.
Temperature dependency		≤ 0.05 % R.H. / ° C
Time constant		< 20 s
Output signal, linear (terminal U1)		DC 0 . . . 10V ≙ 0 . . . 100% R.H. Max. +/- 1mA
Output signal, linear (terminal I1) Burden		4 . . . 20mA ≙ 0 . . . 100% R.H. refer to "Function"
Functional data "Temperature sensor"		
Measuring range		0 . . . 50° C (R2 = factory setting), - 35 . . . +35° C (R1), - 40 . . . +70° C (R3)
Sensing element		Pt 1000
Measuring accuracy at AC/DC 24V in: - 35 . . . +70 ° C	23 ° C 15 . . . 35 ° C	+/- < . . . 0.5K +/- 0.6K +/- 0.8K
Time constant		8.5 min. (according to airflow and wall coupling)
Output signal, linear (terminal U2)		DC 0 . . . 10V ≙ 0 . . . 50% / - 35 . . . +35 / - 40 . . . +70° C, Max. +/- 1mA
Output signal, linear (terminal I2) Burden		4...20mA ≙ 0...50%/- 35...+35/- 40...+70° C refer to "Function"
Degree of protection		
Housing degree of protection Base unit Measuring tip Unit with outdoor mounting kit		IEC 60 529 IP 65 IP 40 IP 65
Safety class		III to EN 60 730
Electrical connections		
Screw terminals		1 x 2.5mm2 or 2 x 1.5mm2
Cable entry gland (enclosed)		M 16 x 1.5
Environmental conditions		
Operation to:	Climatic conditions Temperature (housing with electron-ics) LCD - display readable Humidity Mechanical conditions	Class 4K2 to IEC 60 721 - 3 - 4 - 40 . . . +70° C - 25 . . . +70° C 0 . . . 100% R.H. (with condensation) Class 3M2 to IEC 60 721 - 3 - 3
Transport to:	Climatic conditions Temperature Humidity Mechanical conditions	IEC 60 721 - 3 - 2 Class 2K3 - 40 . . . +70° C < 95% R.H. Class 2M2
Materials and color		
Base		polycarbonate, RAL 7001 (silver - grey)
Housing cover		polycarbonate, RAL 7035 (light - grey)
Measuring tip		polycarbonate, RAL 7001 (silver - grey)
Filter cap		polycarbonate, RAL 7001 (silver - grey)
Mounting bracket		PA, RAL 7035 (light - grey)

Sensor (entirely)		silicon - free
Packaging		corrugate cardboard
Standards and directives		
Product standard: Automatic electric. controls for household and similar use		EN 60 730 - 1
Electromagnetic compat-ibility	Immunity Emissions	EN 61 000 - 6 - 1 EN 61 000 - 6 - 3
CE conformity to:		EMC directive EMC: 2014/30/EU
C- tick conformity (EMC) to:		EN 61 000 - 6 - 3
Conformity		UL 873
Environmental compatibility		
Environmental product declaration CE1E1858en provides information on environmentally compatible product design and assessment (RoHS compliance, composition of substances, packaging, environmen-tal benefit, disposal).		ISO 14001 (environment) ISO 9001 (quality) SN 36350 (environment comp. products) RL 2002/95/EC (RoHS)
Weight		
Incl. packaging	Without LCD- display	0.152kg
	With LCD- display	0.175kg
	AQF3150	0.050kg
	AQF3153	0.066kg

Mounting instructions



WARNING: The sensor must be mounted with the screen facing upwards, as shown in the following figure.

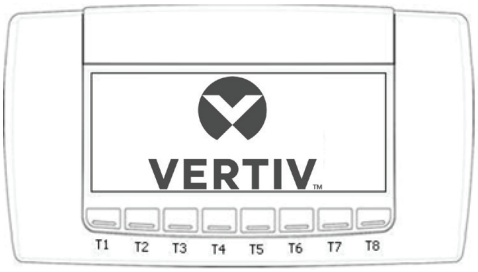


12 - Adiabatic Cooling Controller

12. 1 - Display Documentation

Home Page

Press any key to move to main unit page;control switches back to home if any key is pressed for a time of 5 minutes.



Main Unit Page:

it shows the general overview status of unit

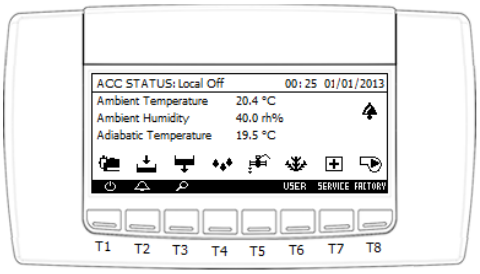
HEADER LINE:
Shows the status of unit and the current local time.

BODY:
Shows the main unit information which sensors value and status of devices.

BOTTOM LINE:
Shows the meaning of T keys:

T1 = On/Off key: switches On / Off the unit.
T2 = Events Log: display moves to Main Event Log page.
T3 = Display moves to first Overview page.
T4 = Not used.
T5 = Not used.
T6 = Display moves into USER area (level 0).
T7 = Display moves into SERVICE area (level 1).
T8 = Display moves into FACTORY area (level 3).

Note: Display does not move to User, Service or Factory area if the right Pin is not entered.



Event Log Page:

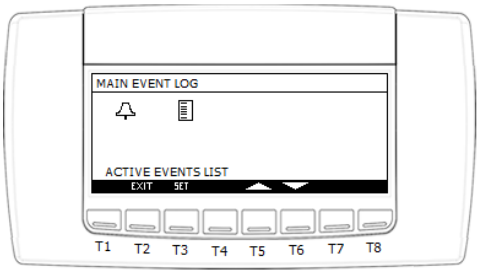
It shows the list of icons used to enter into event overview

HEADER LINE:
Describes the meaning of page.

BODY:
Shows the selectable icons and the description of the selected icon.

BOTTOM LINE:
Shows the meaning of T keys:

T1 = Not used.
T2 = Display moves to Main Unit page or deselects the icon.
T3 = Allows entering into the area of the selected icon.
T4 = Not used.
T5 = Up key used to move between lines or pages.
T6 = Down key used to select the first icon and to move between lines or pages.
T7 = Not used.
T8 = Not used.

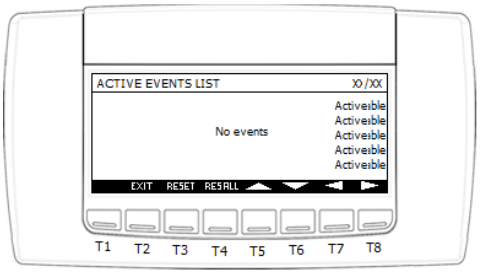


HEADER LINE:
Describes the meaning and the number of page.

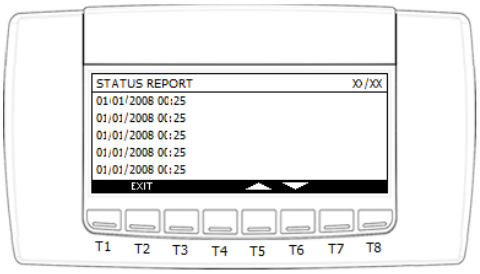
BODY:
Shows the active events list (ID and description).

BOTTOM LINE:
Shows the meaning of T keys:

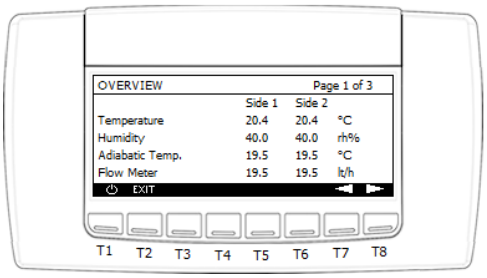
T1 = Not used.
T2 = Display moves to Main Event Log page.
T3 = Resets the single resettable events.
T4 = Resets all resettable events.
T5 = Browse between events.
T6 = Browse between events.
T7 = Browse between pages.
T8 = Browse between pages.

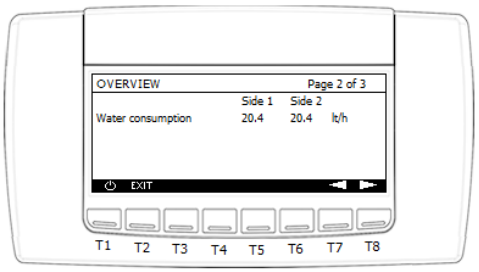


HEADER LINE:
Describes the meaning and the number of page.
BODY:
Shows the event list which includes data, time, number code and description of the activated event.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Event Log page.
T3 = Not used.
T4 = Not used.
T5 = Up key used to move between pages.
T6 = Down key used to move between pages.
T7 = Not used.
T8 = Not used.

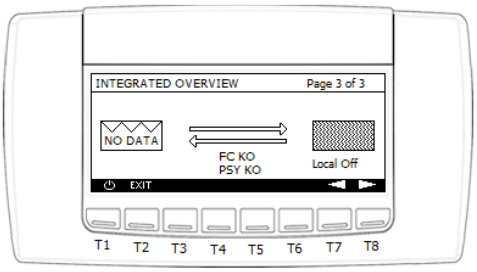


Unit Overview Page:
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Shows the status of devices.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = On/Off key: switches On / Off the unit.
T2 = Display moves to Main Unit page.
T3 = Not used.
T4 = Not used.
T5 = Not used.
T6 = Not used.
T7 = Up key used to move between pages.
T8 = Down key used to move between pages.

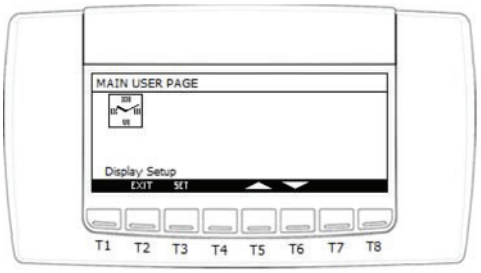




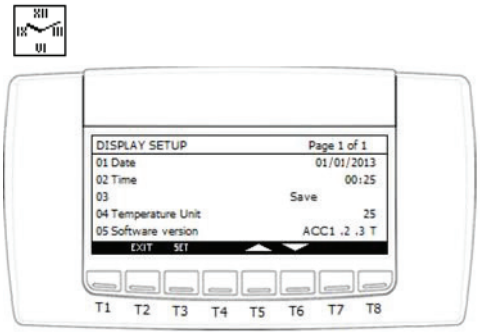
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Shows the status of devices.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = On/Off key: switches On / Off the unit.
T2 = Display moves to Main Unit page.
T3 = Not used.
T4 = Not used.
T5 = Up key used to move between pages.
T6 = Down key used to move between pages.
T7 = Not used.
T8 = Not used.



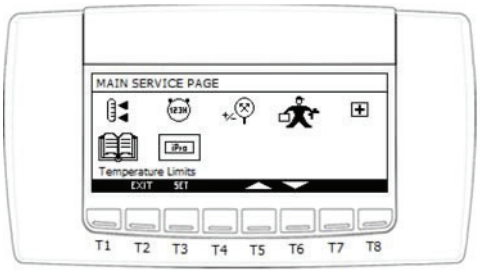
Main User Page:
Shows the list of selectable icons
HEADER LINE:
Describes the meaning of page.
BODY:
Shows the selectable icons and the description of the selected icon.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Unit page or deselects the icon.
T3 = Allows entering into the area of the select icon.
T4 = Not used.
T5 = Up key used to move between lines or pages.
T6 = Down key used to select the first icon and to move between lines or pages.
T7 = Left key used to move between icons of the same line.
T8 = Right key used to move between icons of the same line.



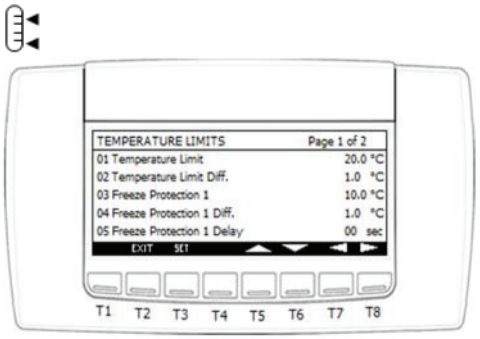
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main User page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Increases the value of the selected parameter.
T6 = Decreases the value of selected parameter.
T7 = Not used.
T8 = Not used.



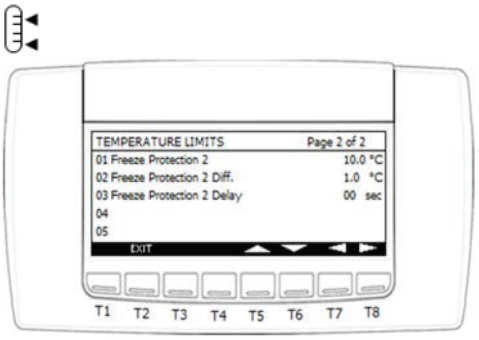
Main Service Page:
Shows the list of selectable icons
HEADER LINE:
Describes the meaning of page.
BODY:
Shows the selectable icons and the description of the selected icon.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Unit page or deselects the icon.
T3 = Allows entering into the area of the select icon.
T4 = Not used.
T5 = Up key used to move between icons.
T6 = Down key used to select the first icon and to move between lines or pages.
T7 = Not used.
T8 = Not used.



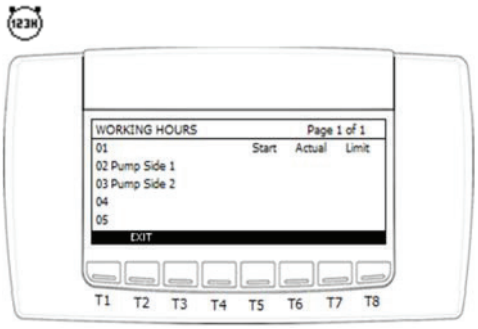
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters .
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



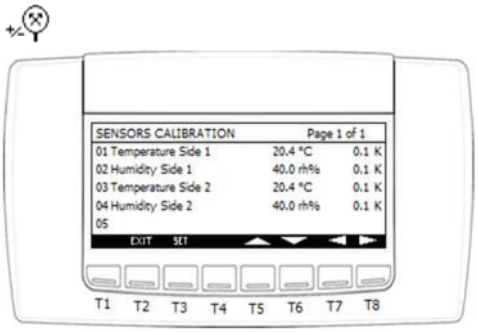
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



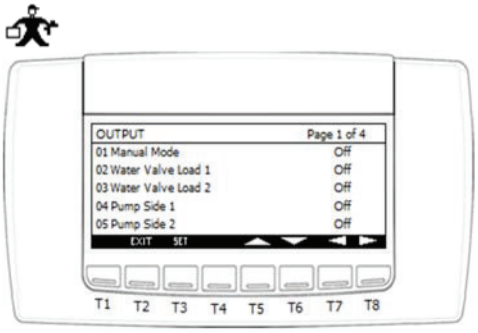
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



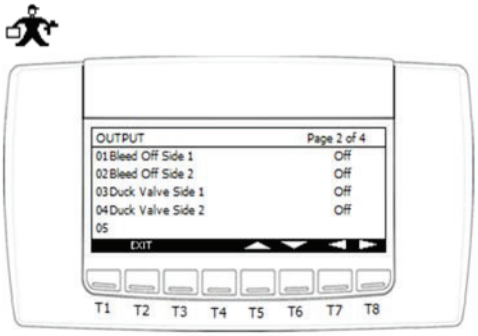
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



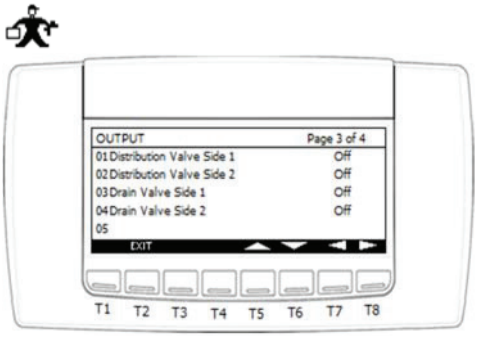
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



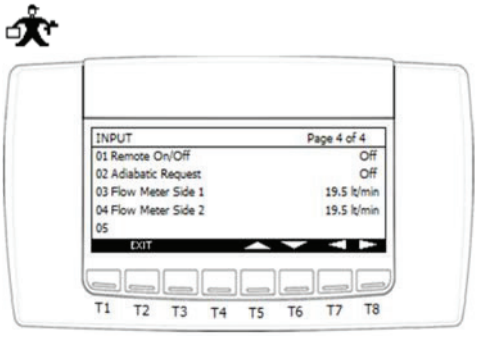
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



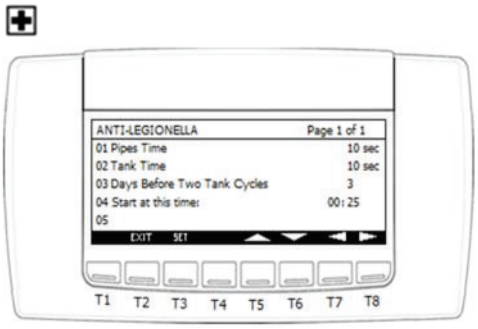
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



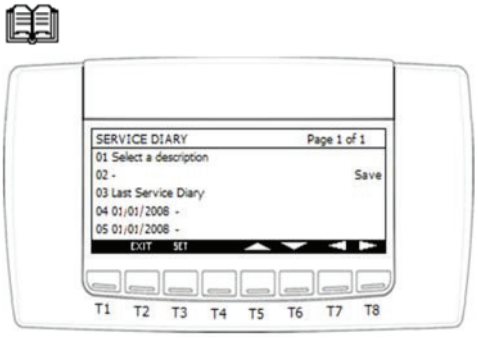
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
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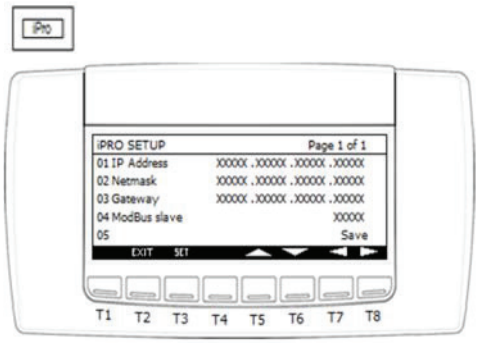
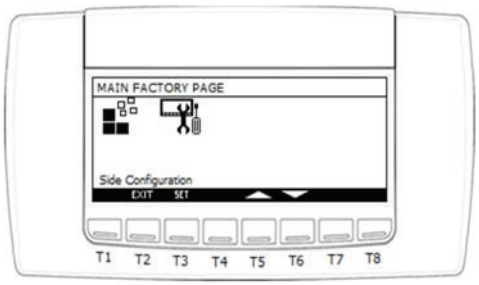
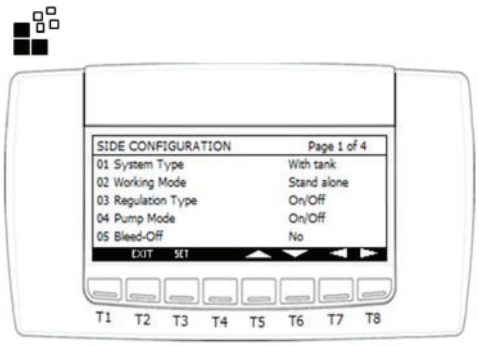
T1 = Not used.
T2 = Display moves to Main Service page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



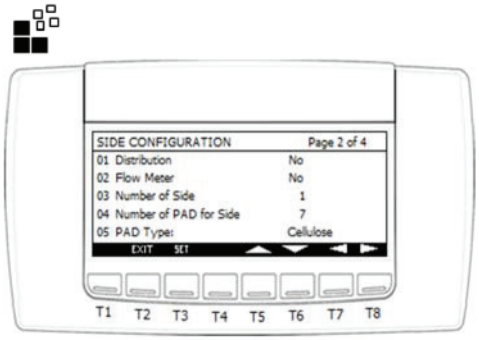
Main Factory Page:
Shows the list of selectable icons
HEADER LINE:
Describes the meaning of page.
BODY:
Shows the selectable icons and the description of the selected icon.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Unit page or deselects the icon.
T3 = Allows entering into the area of the select icon.
T4 = Not used.
T5 = Up key used to move between icons.
T6 = Down key used to select the first icon and.
T7 = Not used.
T8 = Not used.



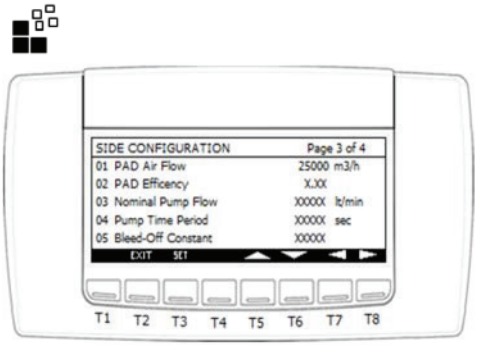
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Factory page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



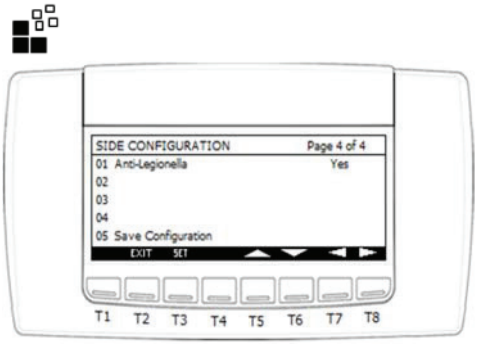
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Factory page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



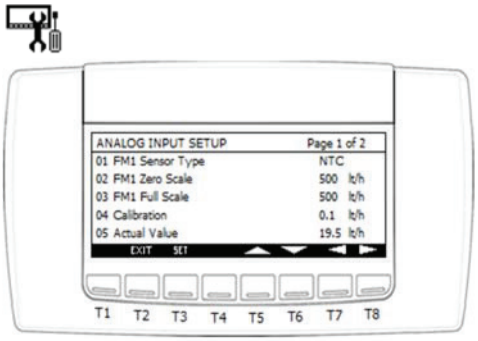
HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Factory page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Factory page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Factory page or deselect the parameter.
T3 = Enables the configuration of parameter.
T4 = Not used.
T5 = Up key used to move between parameters or pages.
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



HEADER LINE:
Describes the meaning and the number of page.
BODY:
Contains the list of parameters.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Factory page or deselect the parameter.
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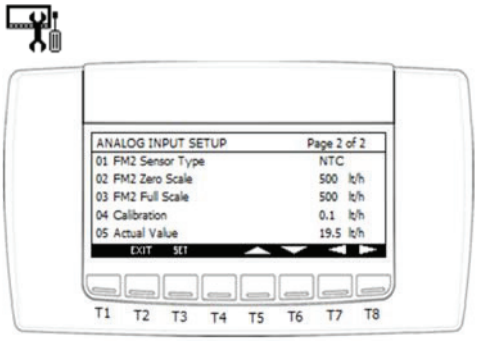
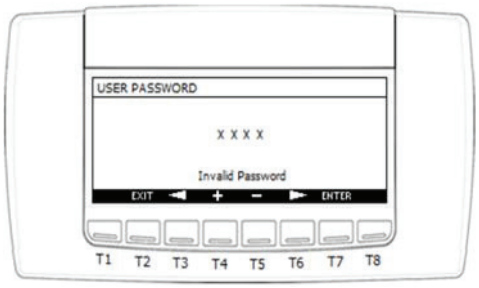
T6 = Down key used to select the first parameter and to move between parameters or pages.
T7 = Decreases the value of selected parameter.
T8 = Increases the value of the selected parameter.



Password Page:

HEADER LINE:
Shows the meaning of page.
BODY:
Contains the 4 digit for password AND shows the text ”Invalid
Password” in case of wrong password.
BOTTOM LINE:
Shows the meaning of T keys:
T1 = Not used.
T2 = Display moves to Main Unit page.
T3 = Moves between digits.
T4 = Increases the value.
T5 = Decreases the value.
T6 = Moves between digits.
T7 = Confirms the entered PIN.
T8 = Not used.



Symbols Description:

ON/OFF symbol

Event symbol

Overview symbol

Symbol appears when Pump/s is/are ON

Symbol appears when Inlet Valve/s is/are ON

Symbol appears when Drain Valve/s is/are ON

Symbol appears when Distribution is active

Symbol appears when Duck Valve/s is/are activate

Symbol appears when Freeze Protection is active

Symbol appears when the Anti- Legionella function is active

Symbol appears when the PAD function is active

Symbol appears when an Event is active

ID	Event Description	Type	Delay	Reset	Notes / Effect
001	Local OFF	Message	No	-	-
002	Remote OFF	Message	No	-	-
003	Alarm Off	Message	No	-	-
004	Standby	Message	No	-	-
005	Working	Message	No	-	-
006	Temperature Sensor Side 1 Failure	Warning	10 sec	AUTO	Activated when sensor is not available. Adiabatic is kept On using the sensor of side 2
007	Temperature Sensor Side 2 Failure	Warning	10 sec	AUTO	Activated when sensor is not available. Adiabatic is kept On using the sensor of side 1
008	Humidity Sensor Failure Side 1	Warning	10 sec	AUTO	Activated when sensor is not available. Adiabatic is kept On using the sensor of side 2
009	Humidity Sensor Failure Side 2	Warning	10 sec	AUTO	Activated when sensor is not available. Adiabatic is kept On using the sensor of side 1
010	Temperature Sensor Failure	Alarm	10 sec	AUTO	Activated when any sensor is available. Adiabatic is switched Off
011	Humidity Sensor Failure	Alarm	10 sec	AUTO	Activated when any sensor is available. Adiabatic is switched Off
012	Flow Meter Side 1 Failure	Alarm	1 min	AUTO	Activated when sensor is not available. Adiabatic is switched Off
013	Flow Meter Side 2 Failure	Alarm	1 min	AUTO	Activated when sensor is not available. Adiabatic is switched Off
014	Future Use	-	-	-	-
015	Future Use	-	-	-	-
016	Emergency Drain 1	Alarm	5 sec	MAN	Drain flow switch 1 active Adiabatic is switched Off
017	Emergency Drain 2	Alarm	5 sec	MAN	Drain flow switch 2 active Adiabatic is switched Off
018	Pump 1 Failure	Alarm	1 sec	MAN	Activated when pump is not working Adiabatic is switched Off
019	Pump 2 Failure	Alarm	1 sec	MAN	Activated when pump is not working Adiabatic is switched Off
020	Future Use	-	-	-	-
021	Future Use	-	-	-	-
022	Future Use	-	-	-	-
023	Working Hours Pump Side 1	Alarm	No	AUTO	Activated when the limit is exceeded Adiabatic continues to run
024	Working Hours Pump Side 2	Alarm	No	AUTO	Activated when the limit is exceeded Adiabatic continues to run
025	Missing AFC Adiabatic	Warning	1 min	AUTO	Activated when the AFC is not sending data Adiabatic is forced to be in stand-by

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