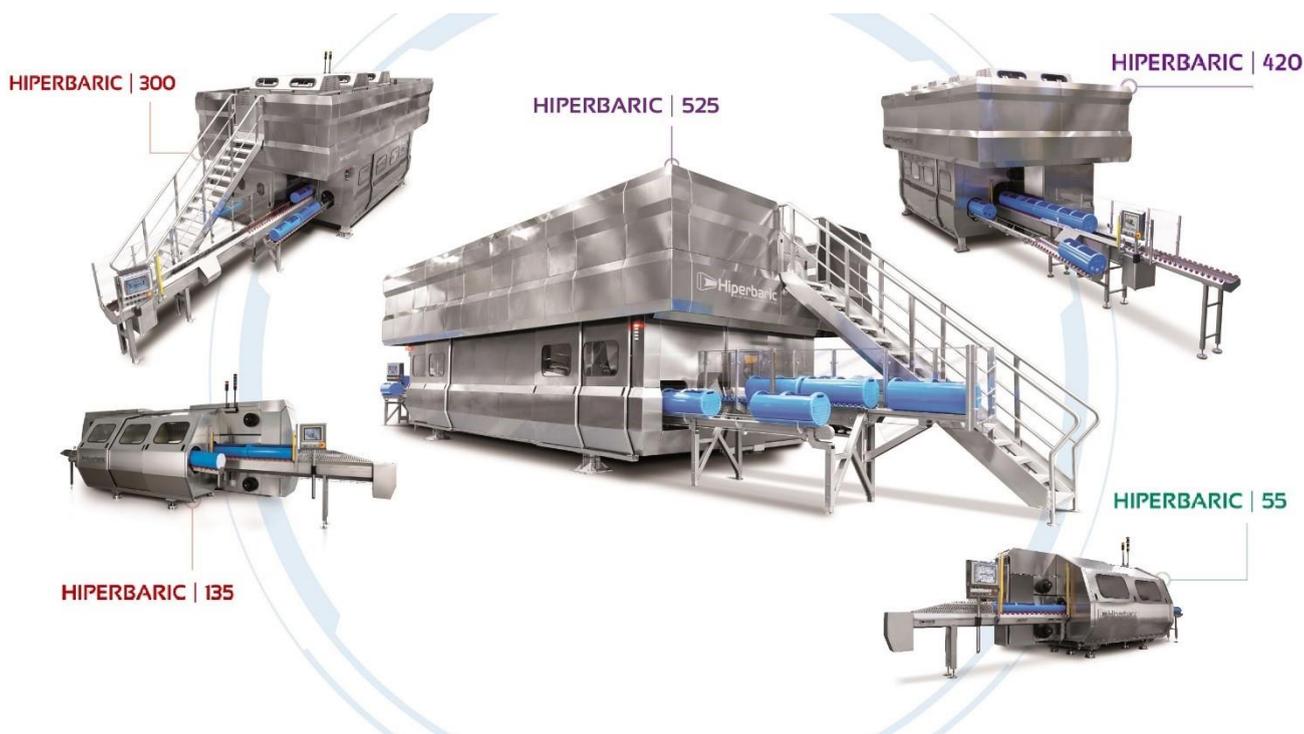


INSTALLATION MANUAL HIPERBARIC



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1. CIVIL WORKS

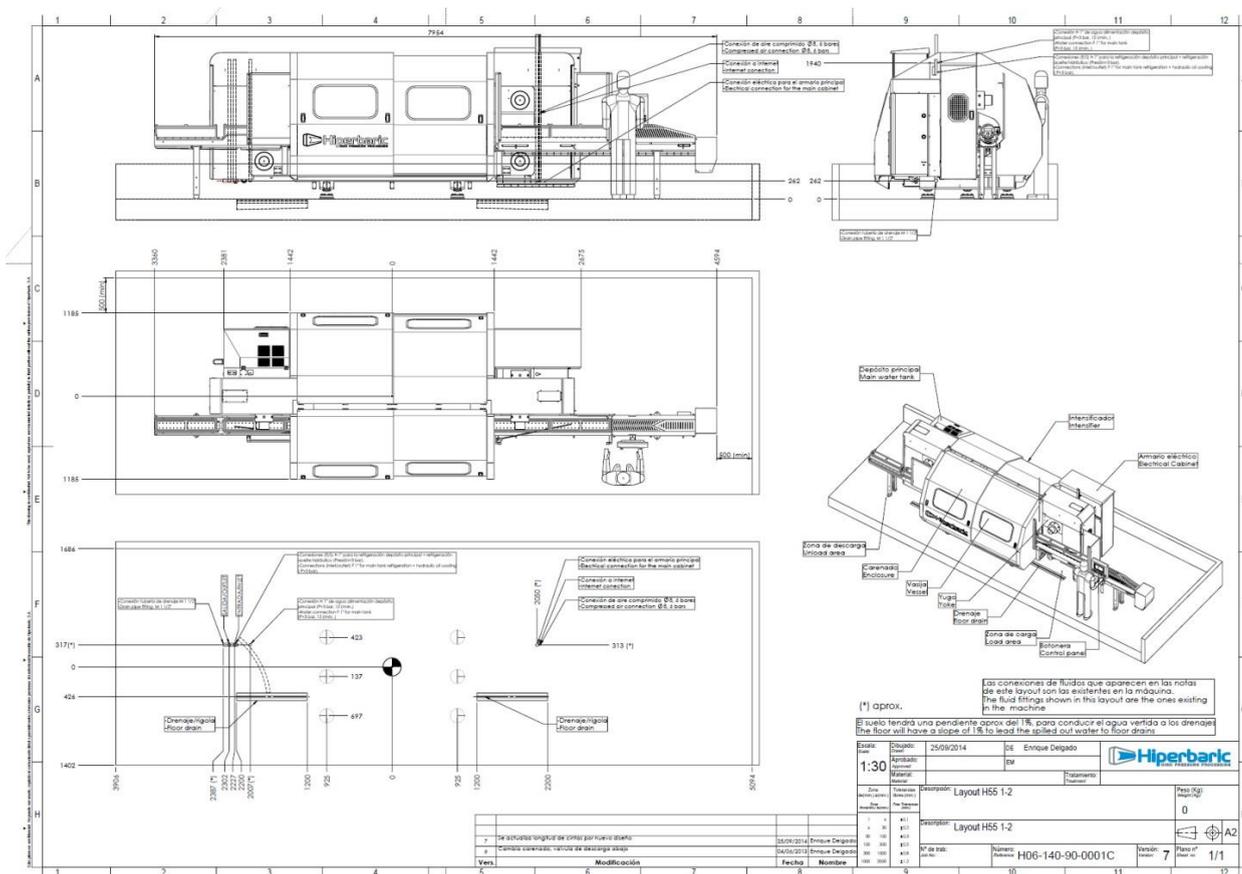
The installation of the high pressure unit starts by preparing the site where the machine is to be installed.

The customer must ensure the room where the unit to be installed has sufficient space not only for the physical dimensions of the machine but the subsequent operations that the unit will generate once it is fully operational. It is important that these spaces are carefully studied prior to the installation so they don't pose any threat to personnel during machine operation.

To prevent problems or delays during the installation, commissioning, and most importantly, during the operation of your machine it is important that you supply a layout, in CAD format, of your proposed site to Hiperbaric. It will prevent all the aspects that are likely to cause problems during normal operation such as but not limited to:

- Interferences with the building or other equipment.
- Opening doors.
- Accessibility for routine maintenance.
- Possibility of disassembling machine elements.

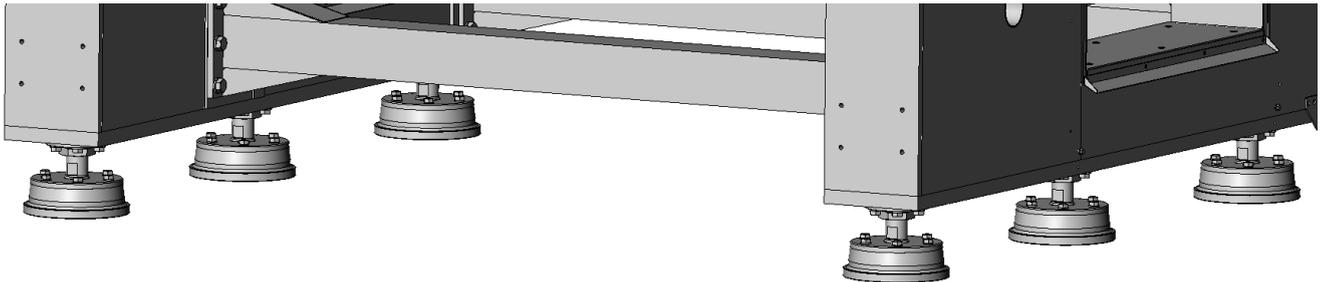
It is extremely important to consider supplying a layout of the pathway the machine has to travel inside the premises so all technicians and riggers responsible for the installation can review and be prepared with the gear required to prevent any issues prior and during the commissioning of the unit.



Layout Example

1.1. Foundations

The following table shows the approximate weights on each Hiperbaric machine model. These weights exclude all the peripheral devices including the intensifiers, as they are installed outside the main load application area. These weights are uniformly distributed on the floor by means of six supporting feet arranged in two rows of three feet each of Ø200mm (7.9"). This configuration facilitates the cleaning of the lower part of the machine.



The maximum possible load on each leg is also shown in the following chart. This calculations have been performed assuming the worst working conditions. These values show the highest possible value, so the real load will never surpass it.

Machine	Weight	Max. Load on each feet
Hiperbaric 55	20 Tn	7.4 Tn
Hiperbaric 135	45 Tn	15 Tn
Hiperbaric 300	62 Tn	20.6 Tn
Hiperbaric 420	72.5 Tn	25.2 Tn
Hiperbaric 525	82 Tn	28.3 Tn

Weight on the 6 feet of the machine

On Hiperbaric 55 a standard industrial floor would be sufficient to withstand the loading of the unit, however it is highly recommended to consult your structural engineer and ensure the conditions of the concrete slab are met.

For all our larger units (135, 300, 420 and 525) it is essential a proper foundation to guarantee the levelling of the machine throughout its lifespan. The foundations suggested for larger models consist of:

- A layer of reinforced concrete of 300 mm (11.8") in thickness and quality of at least HA25.
- Two reinforcements formed by meshes of steel Ø 12mm (0.5") of 300x300 (12"x12").

It is extremely important that the reinforced concrete slab is built on compacted ground. The suggested dimensions are available on each machine layout and are handed over prior the installation so customers could have enough time to prepare this, if necessary, prior the installation of the unit.

In any case, it is preferred a continuous floor, even if it is not 300 mm thick, rather than an isolated area. So, prior engaging with any civil works (digging to build a concrete slab) with the required characteristics, it is best to consult your structural engineer and ensure the conditions of the concrete slab are met.

1.2. Drainages

The machine requires drainages to collect and convey the water that needs to be thrown away. The origin of this water can be:

- Intensifiers feed the machine with water to raise the pressure. The amount of water transmitted to the vessel at high pressure (6,000 Bar) is approximately 15% of the total nominal volume of the vessel. When the machine decompresses the same volume of water gets disposed via the exhaust drain pipe. The water gets discharged at around 60°C (for cycles at 6,000 bars). This is the main water consumption of the machine. This hot water could be treated for later use in cleaning activities, resulting in energy savings.
- Possible splash areas. Small amounts of water can spill from the vessel area that need to be conveyed to avoid water puddles.
- Water from cleaning. Every tank in the machine has hand valves to completely empty them for an easy cleaning.

Customers are responsible for ensuring floors have the required pitch to properly convey the water towards the drains. Each machine layout specifies the positions of the drain pipes of the machine and also suggests a position for floor drains in order to collect the splash water. These drains should be reasonably away of the 6 supporting feet of the machine to ensure the structural properties of the concrete slab are not undermined.

The machine has adjustable legs to cope with a normal floor pitch if 1%, however if the pitch is higher than that it is recommended to consult Hiperbaric to determine whether the machine requires modification.

The machine works with hydraulic oil. The machine and intensifiers are equipped with pans and pipes to collect unexpected oil leaks. Mainly during maintenance operations related with the oil circuit, some amount of hydraulic oil could end in the drainages if appropriate measures are not taken.

2. CONNECTIONS.

All required connections for the proper functioning of the machine are detailed in this section.

A video with required machine supplies is available at this link: <https://youtu.be/NiqY7y5YjDY>

2.1. Water connections

Water is one of the main elements utilized in the functioning of the Hiperbaric unit. Treatment of food products is carried out by pressurizing water.

The life span of the components and wear parts of intensifiers and also of the unit itself is greatly affected by the quality of water utilized, so it is recommended to perform a chemical analysis to ensure properties of water similar to the ones expressed in the table below:

Chloride in the form of Cl (mg/l)	< 30
Free chlorine (mg/l)	< 1
Iron in the form of Fe (mg/l)	< 0.1
pH value	6.5 – 8.5
Total dissolved solid (mg/l)	200>TDS> 5
Total hardness in the form of CaCO ₃ (mg/l)	1 - 25
Min/Max input temperature (°C)	5 - 30
Electrical conductivity at 25° C μS	50 - 300

Table of chemical water properties.

Water just treated by reverse osmosis (RO) or deionization (DI) shall not be used. After these processes, water becomes too aggressive, and therefore, it needs adding elements so that the quality is in the ranges of the previous chart. Water properties out of these ranges could decrease the lifespan of high pressure components.

Using water with a high lime content could clog the venting holes making the machine unsafe to work. In any case, it is advisable that the results of the test of the available water are sent to Hiperbaric. If a treatment is required, also the results of the test of the treated water should also be sent to Hiperbaric.

It is also important to notice that if the temperature of the recipe needs to be controlled, high temperature in the inlet water could cause a loss of productivity if there is not enough time between cycles to cool. The unit has one main water connection that feeds both main and intensifier tanks. The layout supplied with the machine shows the size and position of this connection.

- Water connections for the main tank of the machine.

The main tank stores the processing water. This water is pumped from the tank to the vessel where the product is treated and after the cycle it is pumped from the collecting tanks back to the main tank. To control it, the machine have a series of pipelines with 4 pneumatic valves known as the low pressure system.

As the water is re-used every cycle, the water consumption in this connection during normal production is negligible. It will just compensate the possible loses of water in the splash areas.

- Water connections for intensifiers tank.

The water supply by intensifiers comes from a storage tank with a water pump, both integrated in the machine. Water for intensifiers cannot be re-used. The amount of water that intensifiers need is the same than the amount of hot water thrown away in the discharge valves.

Water consumption in this connection depends on the machine model. See charts at the end of this manual.

2.2. Cooling connections

Machines have two systems that need cooling:

- The intensifiers utilize a hydraulic unit to work. It will heat the oil while working, therefore oil needs to be cooled properly or the machine will stop as soon as the oil gets a temperature that could damage parts of the equipment.
- Optionally, customers may need that the water temperature of the main tank is in a certain range defined in the recipe. In this case, also the water of the main tank needs to be cooled.

Customers are responsible for choosing the most effective way to fit these purposes. The most common solution is pumping a water-glycol mixture in a closed circuit. This fluid could come from the cooling installation of the factory or the customer could install a chiller for this purpose.

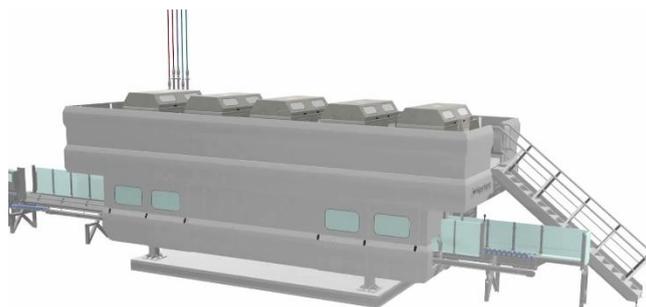
The lowest inlet temperature of this water/glycol mix allowed is:

- For Hiperbaric 55: +1°C (34°F). Lower temperatures will create frost in the outer surface of the coil, reducing sharply the heat exchange.
- For the rest of models: -4°C (25°F) to avoid freezing the heat exchangers.

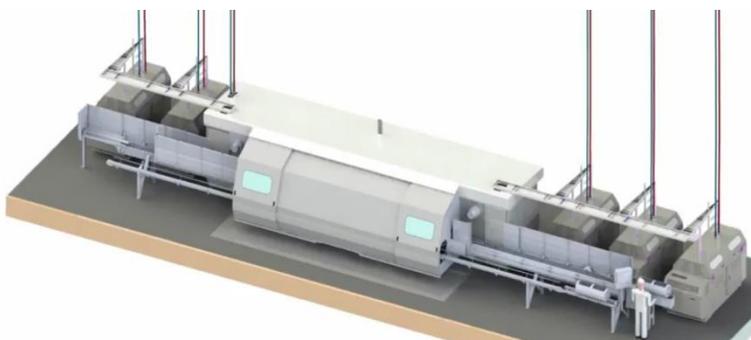
The position and size of the cooling connections are identified in the layout supplied with the machine. The advisable pressure will depend on the different heights and lengths of piping of the facilities, but as a general rule, it could be between 3 and 6 bars.

Depending on the model, cooling connections can be:

- H55: Has a single connection on the machine for both the water main tank and intensifier oil cooling.
- Integrated machines (H300i, H420i and H525i with intensifiers on a platform supplied by Hiperbaric). They have a single cooling connection for the main tank and a single cooling connection for all intensifiers that is internally diverged for each one.



- Not-integrated machines (H135, H300, H420 and H525 without a platform supplied by Hiperbaric). They need a cooling connection for the main tank and a cooling connection for each double intensifier. The customer will drop the inlet/outlet cooling pipes directly over each one.



2.2.1. Intensifiers oil cooling

Intensifiers are supplied with a heat exchanger to cool the oil. Heat load depends on the number of intensifiers of the machine.

Hiperbaric 55 has a single intensifier, and the rest of models use double intensifiers. The heat load required depends on the working conditions (room temperature, recipe...), but 25 kW for each double intensifier is a value that can be used as a rule to size the chiller.

In the following chart, the required heat load is presented for the standard number of intensifiers of each machine. When sizing the chiller make sure to use the actual number of intensifiers of the machine, bearing in mind also possible future expansions.

Machine	# single intensifiers STANDARD	# double intensifiers STANDARD	Heat load (kW)
Hiperbaric 55	1	-	12.5
Hiperbaric 135	-	1	25
Hiperbaric 300	-	2	50
Hiperbaric 420	-	4	100
Hiperbaric 525	-	5	125

Heat load of Hiperbaric machines in standard configuration

It is important not to confuse between heat load and consumed power. Depending on the performance of the chiller, the ratio between both could be around 3, it means, that the real electrical power consumption should be around a third of the heat load.

2.2.2. Main tank cooling

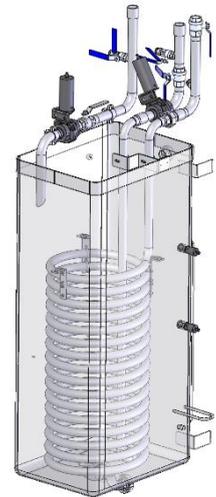
Depending on the model, each machine has different systems for cooling down the water of the main tank.

- Hiperbaric 55

As was previously said, Hiperbaric 55 has a single connection on the machine for both the water main tank and intensifier oil cooling.

The main tank of this machine is equipped with cooling coil, a valve, and a temperature probe. This system helps to keep the water temperature under control, as long as the water supplied to the machine has a temperature similar to the temperature of the recipe. The cooling power of this coil is limited, so if the temperature of the supplied water is clearly higher than the temperature indicated in the recipe, the coil may not be able to maintain the temperature within the defined range.

If an accurate control of temperature is required, consult Hiperbaric.



- Hiperbaric 135, 300, 420 and 525.

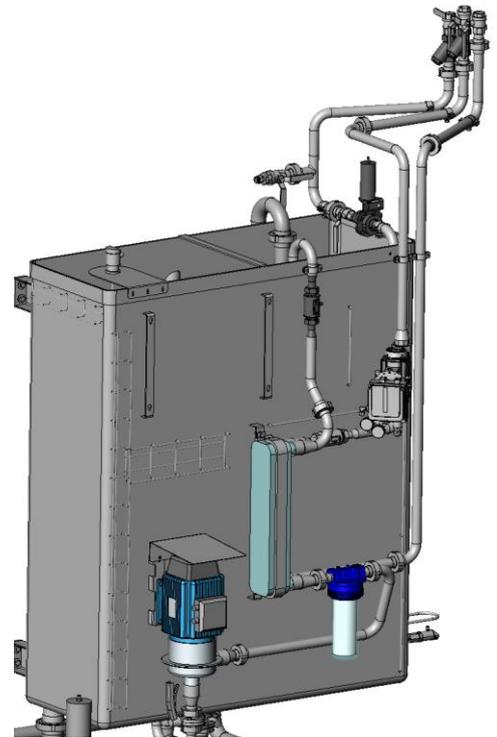
These models have an integrated system. They are equipped with:

- A plate heat exchanger, motor-pump and filter.
- Flow and temperature sensor to control the flow of water to avoid freezing it and also monitoring the filter.
- Flow and temperature sensor and a proportional flow valve to control and adjust the flow of coolant

It is desirable to have a thermal gap of at least 7°C (13°F) between the temperature of the coolant and the recipe to have a good performance.

The actual heat load dissipated depends on each case (room temperature, water temperature, environment, product temperature, etc.). Even within the same cycle, the power required could vary as the water temperature gets closer to the target.

In normal conditions, this system allows cooling the water to the target temperature without the machine stopping to achieve the desired temperature and causing stoppages between cycles until target temperature is reached. In extreme conditions of the working parameters (holding time of the recipe, water inlet temperature, room conditions, coolant flow and coolant temperature) it could lead to a situation in which the system needs some extra time. In these cases, it will be the customer's responsibility to change these extreme conditions to avoid a loss of productivity.



2.2.3. Example of chiller sizing

To size a cooling installation, a careful study should be carried out. Many parameters affect the final result:

- Recipe temperature.
- Holding time.
- Coolant temperature.
- Room temperature.
- Distance between chiller and machine, size of the pipes...

It is important to choose a chiller with a power at least 15% higher than the result of calculations in order to have a certain margin. The following chart shows some examples of the coolant requirements of machines that can help to have an idea of the specific requirements of each customer. When the coolant is too hot to reach the temperature of the recipe, the data is not displayed. Also coolant below 1°C is not allowed in Hiperbaric 55 to avoid freezing:

Model (# intens. standard)	Data	Recipe 6°C Inlet water 14°C			Recipe 5°C Inlet water 18°C		
		Coolant temp. (°C) % Glycol			Coolant temp. (°C) % Glycol		
		5°C 0%	0°C 0%	-4°C 15%	5°C 0%	0°C 0%	-4°C 15%
Hiperbaric 55	Intens. heat load (kW)	12.5	12.5	-	12.5	12.5	-
	Intens. coolant flow (l/min)	6.5	5.9	-	6.5	5.9	-
	Intens. return temp. (°C)	32.8	35.5	-	32.8	35.5	-
	Water tank heat load (kW)	-	11	-	-	14	-
	Water coolant flow (l/min)	-	50	-	-	50	-
	Water return temp. (°C)	-	3.2	-	-	4	-
Hiperbaric 135 (1 double intens.)	Intens. heat load (kW)	25	25	25	25	25	25
	Intens. coolant flow (l/min)	12.9	11	11.4	12.9	11	11.4
	Intens. return temp. (°C)	32.8	35.5	33.3	32.8	35.5	33.3
	Water tank heat load (kW)	-	10	9.4	-	16.2	15.3
	Water coolant flow (l/min)	-	20.6	12.4	-	34.8	20.2
	Water return temp. (°C)	-	7	6.7	-	6.7	6.7
Hiperbaric 300 (2 double intens.)	Intens. heat load (kW)	50	50	50	50	50	50
	Intens. coolant flow (l/min)	25.9	22	22.9	25.9	22	22.9
	Intens. return temp. (°C)	32.8	35.5	33	32.8	35.5	33
	Water tank heat load (kW)	-	16.6	15.9	-	27.5	25.8
	Water coolant flow (l/min)	-	30.6	19.2	-	54.8	30.1
	Water return temp. (°C)	-	7.8	7.6	-	7.2	8
Hiperbaric 420 (4 double intens.)	Intens. heat load (kW)	100	100	100	100	100	100
	Intens. coolant flow (l/min)	51.7	44	45.8	51.7	44	45.8
	Intens. return temp. (°C)	32.8	35.5	32.1	32.8	35.5	32.1
	Water tank heat load (kW)	-	23.2	21.7	-	38.2	35.9
	Water coolant flow (l/min)	-	40	24.6	-	73	39.7
	Water return temp. (°C)	-	8.3	8.5	-	7.5	8.6
Hiperbaric 525 (5 double intens.)	Intens. heat load (kW)	125	125	125	125	125	125
	Intens. coolant flow (l/min)	64.6	55	56.2	64.6	55	56.2
	Intens. return temp. (°C)	32.8	35.5	32.1	32.8	35.5	32.1
	Water tank heat load (kW)	-	16.6	15.9	-	27.5	25.8
	Water coolant flow (l/min)	-	30.6	19.2	-	54.8	30.1
	Water return temp. (°C)	-	7.8	7.6	-	7.2	8

2.2.4. Heat radiated to the room

During operation of the equipment and depending on the temperature of the room where the machine is installed, the machine will have heat irradiated to the environment on the hottest parts. (Intensifiers)

To provide an accurate figure of the heat load irradiated to the environment is not an easy task as there could be variables affecting this such as: room temperature, recipe parameters, type and quality of oil so as an example, the maximum values for a refrigerated room at 10°C are given in the following chart:

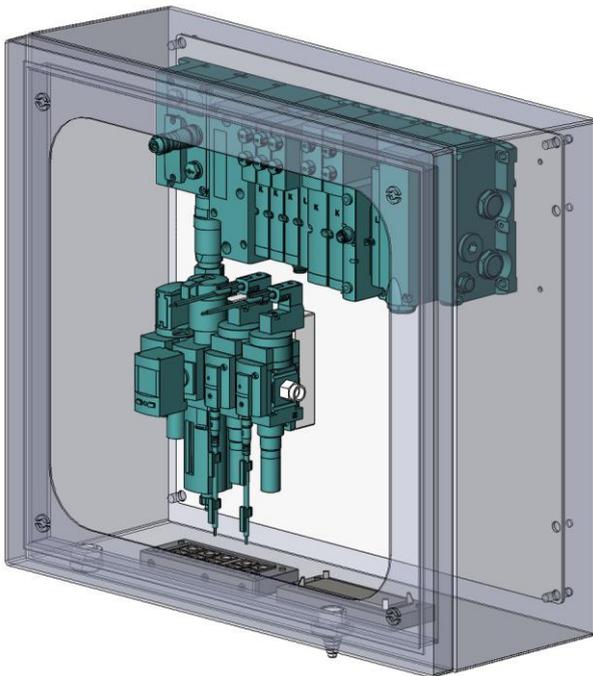
Equipment Model	Power dissipated by each double intensifier kW (HP)	Power dissipated by the machine kW (HP)
Hiperbaric 55	-	9 kW (12 HP)
Hiperbaric 135, 300, 420, 525	10 kW (13 HP)	3 kW (4 HP)

2.3. Compressed air connection.

All Hiperbaric models require a compressed connection to manipulate some of their components to function. Specifically:

- To drive the stop cylinders from the entry of the product and at both sides of the vessel (in all models but Hiperbaric 55).
- For driving the pneumatic valves.
- For the cylinders of the wedges (in all models but Hiperbaric 55).

It is strongly recommended to have available air pressure between 6 and 7 bars. The machine will stop if the air pressure falls below 5 bars. The consumption of compressed air can be seen in the chart at the end of this manual.



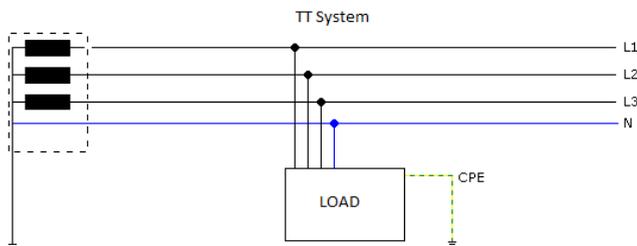
2.4. Electrical connections.

All Hiperbaric models require a series of electrical connection points to work. The position of these connections is detailed in the layout of the machine. The customer has to drop the connection cables directly on the detailed points.

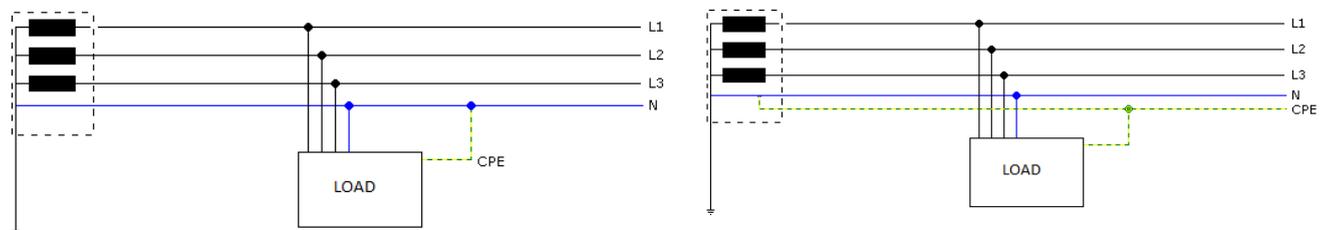
- Hiperbaric 55 needs a single connection. This model has the intensifier integrated in the machine, therefore its power supply is also integrated in the cabinet of the machine. That is the reason why the power required in this model for the main cabinet of the machine is much higher than the rest.
- Hiperbaric 135, 300, 420 and 525 have external intensifiers. The number of connections required are:
 - One connection for the main machine
 - One connection for each double intensifier

The machine and intensifiers are supplied with all the required protections in their electrical cabinets. Customers hold full responsibility to design and install their electrical supply (wiring and protections) according to the given data complying with local regulations.

TT Electrical system for machines with CE marking



TN electrical system for machines with UL marking



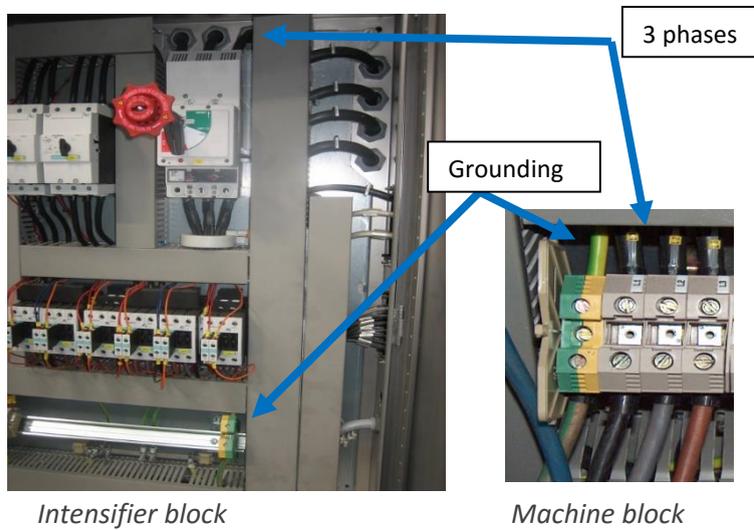
Other types of electrical system must be notified to Hiperbaric.

The connections required in all cases, consists of a three-phase line without neutral and with grounding. As standard, the terminal blocks enable maximum section cables of:

- Hiperbaric 135, 300, 420 y 525: 16 mm² (AWG 5)
- Hiperbaric 55: 50 mm² (AWG 1/0)
- Double intensifier: 185 mm² (Kcmil 350)

If required, the terminal blocks could be adapted to meet special requirements.

The terminal blocks of intensifier and machine are shown in the following figures. As mentioned, the connection will correspond to the 4 terminals: grounding and three phases respectively.



There is a wide range of different voltages and frequencies all over the world. The following displays the most representative ones to help the customer to design the installation. The specifications on cable sections are customer's responsibility and previously stated they must comply with the country's regulations for each type of installation and for voltage and frequency:

Full Load Amps (A)									
Standard	Nominal Power	CE	Nominal Power	UL	CSA	Inmetro	Korea	JIS	
Voltage (V)	<u>50 Hz</u>	400	<u>60 Hz</u>	480	575	380	380	200	380
Freq. (Hz)	(kW)	50	(kW)	60	60	60	60	60	60
Double HP pump	93 kW (125HP)	174 A	107 kW (143HP)	183 A	147 A	244 A	244 A	420 A	244 A
H55	55 Kw (74HP)	101 A	62 kW (83HP)	104 A	87 A	136 A	136 A	235 A	136 A
H135	13 Kw (17HP)	27 A	13 Kw (17HP)	25 A	22 A	30 A	30 A	48 A	30 A
H300	14 kW (19HP)	29 A	14 kW (19HP)	27 A	23 A	33 A	33 A	52 A	33 A
H420	14 Kw (19HP)	29 A	14 Kw (19HP)	27 A	23 A	33 A	33 A	52 A	33 A
H525	14 Kw (19HP)	29 A	14 Kw (19HP)	27 A	23 A	33 A	33 A	52 A	33 A

Full load current for different voltages and frequencies

Each double intensifier has 2 main pumps of 45 kW + 1 cooling pump of 3 kW working at 50 Hz, so the power will be $2 \times 45 \text{ kW} + 3 \text{ kW} = 93 \text{ kW}$. When these main pumps work at 60 Hz, the power is increased 15%, so it will be $2 \times 52 \text{ kW} + 3 \text{ kW} = 107 \text{ kW}$.

For the Hiperbaric 55 this one has the intensifier incorporated, the power calculation is similar. For 50 Hz we have $45 \text{ kW} + 10 \text{ kW (machine power)} = 55 \text{ kW}$. For 60 Hz the power of the main pump is increased 15%, so it will be $52 \text{ kW} + 10 \text{ kW} = 62 \text{ kW}$.

2.4.1. Example of electrical connection sizing

As an example, let's take a Hiperbaric 420 with 4 double intensifiers, installed under CE Standard for 400V and 50Hz, according to the Low voltage directive 2006/95/EC

5 electrical connections will be required:

- One connection for each double intensifier
- Another connection for the machine.

The position of these connections can be located in the layout of the machine.

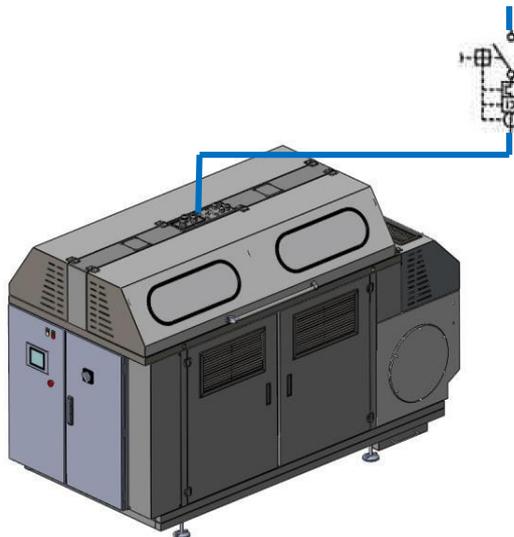
An example of calculation of the double intensifier will be developed next:

- "Rejiband" type tray, length of cables = 50m.
- $\cos \phi = 0.82$ $X_u = 0$ $R = 1$.
- Nominal power = $45 + 45 + 3 = 93$ kW.
- Maximum admissible power = 100.9 kW.
- Power for calculation = $(45 + 3) * 1.25 + 45 = 105$ kW (according to ITC-BT-47). Main motor pumps of 45 kW have a delay so that they cannot start at the same time.
- Current for wire calculation = $105000 / (1.732 * 400 * 0.82 * 1) = 184.83$ A.

Single wires are chosen: 3x95+TTx50mm² Cu, with an isolating level: XLPE, 0.6/1 kV. They have an admissible current of 222A (at a maximum environment temperature of 40°C, according to ITC-BT-19).

The calculations have been made so that the maximum voltage drop is below 1%, what is a good value to avoid problems: $50 * 105000 / (45.75 * 400 * 95 * 1) = 3.02$ V = 0.75 %.

- Thermal protection:
 - Automatic tri-phase switch: I = 250 A.
 - Thermal adjustable switch: I = 203 A.
- Residual current protection:
 - Relay and differential transformer with sensitivity of 300 mA.



Supposing the length of the cables could be longer than 50 m, some other arrangements are displayed in the following chart:

Length of cables	Type of cables	Voltage drop
50 m	3x95+TTx50mm ² Cu, with an isolating level: XLPE, 0.6/1 kV	0.75%
70 m	3x120+TTx70mm ² Cu, with an isolating level: XLPE, 0.6/1 kV	0.81%
100 m	3x150+TTx95mm ² Cu, with an isolating level: XLPE, 0.6/1 kV	0.91%
120 m	3x185+TTx95mm ² Cu, with an isolating level: XLPE, 0.6/1 kV	0.87%

The thermal protection installed in each double intensifier, is of course in accordance to the previous calculation:



2.5. Hydraulic oil

Prior shipping and in accordance with international transport regulations, the hydraulic components in the machine are drained out at the Hiperbaric factory. The volume of oil required varies depending how much oil the machine will require to fill the complete hydraulic circuit again. The chart below has taken that in consideration, but it is recommended to have some extra oil available.

The customer should have at least the oil quantities stated in the following table in order to fill the tanks of the intensifiers during the installation:

Hiperbaric 55	Hiperbaric 135, 300, 420 and 525
350 litres (92 gallons)	430 liters per double intensifier (114 gallons)

 **IMPORTANT:** In the unlikely event of hydraulic leaks in components nearby areas where product is exposed, Hiperbaric cannot guarantee that packages of the treated product could be absent of oil traces. To overcome risks to product, Hiperbaric recommends using food grade oil (options available at the end of this chapter). The customer has the responsibility to use at its sole discretion the suitable hydraulic oil of their choice leaving Hiperbaric exempt from any liability arising from this selection.

2.5.1. Recommended brands

- Room temperature >10°C

-Renolin HM 225 (HLP 46) by FUCHS (http://www.fuchs-oil.de/home_en.html)
-Tellus 46 (HLP 46) by SHELL (<http://www.shell.com/>)
-Hydraulic Oil AW 46 (HLP 46) by TEXACO (<http://www.texaco.com/>)
-Hydrex AW 46 (HLP 46) by PETRO-CANADA (<http://www.petro-canada.ca>)

- Room temperature <10°C

-Renolin B 520 (HLP 46_multigrade) by FUCHS (http://www.fuchsoil.de/home_en.html)
-Tellus T 46 (HLP 46) by SHELL (<http://www.shell.com/>)
-Mobil DTE 25 (HLP 46) by ESSO (www.mobil.com)

- Food option

-Cassida Fluid HF 46 de SHELL/FUCHS (<http://www.shell.com>)
-Geralyn SF 46 by FUCHS (http://www.fuchs-oil.de/home_en.html)

Any alternative employed by the customer shall be studied and assessed by the manufacturer of the unit. A copy of the technical documentation of the oil to be analyzed must be included.

The use of mineral white oil is not permitted on the hydraulic system of the machine.

2.5.2. Food option

The customer can decide on using a product compatible with the food industry depending on the type of process and internal specifications. However, the food option should not be detrimental to the above-mentioned parameters. Due to new interests on present days the oil industry has come up with a new generation of synthetic food oils based on polyalphaolefin, which are highly recommended as hydraulic oils. Moreover, these oils exceed requirements of the DIN 51 524 standard part 2 for HLP oils.

These are transparent liquid lubricants, which are biologically inert and certified to NSF H1 as they are manufactured fully compliant with the FDA requirements (US Food and Drugs Administration) for applications in which an incidental contact with a food product is possible.

Its properties are excellent:

- Rust proof
- Excellent behavior in extreme temperatures
- Trouble-free cold start-up because of its natural high viscosity index
- Entirely miscible with mineral oils
- The transformation from a mineral oil to a synthetic food does not take place over several stages, there are no undesired reactions, and material and seals of the mechanisms are not affected.
- Up to 2% of water could be absorbed without it affecting the properties.

2.5.3. Degree of cleaning

The cleaning of the hydraulic oil is one of the most important factors in the duration or degradation of the components involved in the circuit. More than $\frac{3}{4}$ of the problems generated in a hydraulic system are caused by contamination of the oil.

The oil ages over time due to oxidation corrosion and the presence of contaminants in suspension. It is extremely important to keep a quality check of the oil, for this reason it is recommended to carry out a periodic analysis every 6 months or 15000 cycles whichever happens first.

The degree of cleaning required for the recommended oils must be 18/16/13 according to ISO4406 or NAS1638-7 at the time of the machine filling.

2.5.4. Contaminant ingressions

A dusty environment of the machine can result in contaminants from entering the circuit through aerators and gaskets. Pollution from solid pollutants contributes to the degradation and abrasion of components.

The entrance of water is a key factor in the degradation of the components of the machine which generates the following problems:

- Oil acidity increases.
- It avoids proper lubrication.
- It generates premature oxidation
- It causes corrosion and heavy wearing on metal parts.
- It modifies the viscosity.
- It worsens filtering.

Shavings and particles in suspension can come from the manufacture of the equipment itself or the wear of components present in the equipment. A high content of bronze can be explained by the natural wear of the pumps. Piston pumps have bronze parts as antifriction elements.

Contamination by chemical elements can lead to premature degradation of joints or by-products that damage antifriction elements of the drive systems.

2.5.5. Periodic analysis and oil changes

All machines are tested at the factory, which means that a small amount of oil remains in the circuit that prevents the oxidation of internal pump components. Prior to shipment to the destination, a thorough cleaning of the tanks and components is carried out to ensure that it is perfectly operational at the time of commissioning. The machines should be stored in clean and dry environments at room temperature

It is highly recommended to perform periodic analysis to check the oil status. It is recommended to analyze the following parameters.

- a) Acidity index.
- b) Kinematic viscosity at 40°C.
- c) Viscosity index.
- d) Water content.
- e) Particle count.

Our recommendation is to follow a preventive schedule for the change the oil, in the manual of the machine you will find some recommendations to check the oil quality of the circuit through the time, Hiperbaric advice is to follow the suggested steps, this will make a thorough control of the oil machine. We also recommend to replace all the filter elements at each change.

Periodic analysis are recommended every 6 months, the oil change period can be extended if an analytical control is performed and the oil is in a cleaning parameters and suitable properties for the operation of the machine.

It is important to change the oil, clean the tanks and change the critical gaskets recommended in the machine manual, especially when the machine is stopped for longer periods of time more than 6 months. System drainage and air intake can result in oxidation and premature aging of the seals.

2.5.6. Temperature / viscosity

The normal service viscosity required for hydraulic operation of the Hiperbaric HPP machine is 46 mm²/s (cSt) a 40°C (104°F) pursuant to the ASTM-D 445 standard, bearing in mind that the fluid temperature affects the viscosity. Anything higher than 46 mm²/s 40°C (104°F) is not recommended to avoid problems during cold start. The chart below serves as a guide to choose the best product (approximate values).

Minimum ambient temperature	Kinematic viscosity at 0°C (32°F)	Kinematic viscosity at 40°C (104°F)	Kinematic viscosity at 100°C* (212°F)	Viscosity index
>10°C	500	42-50	6.8-8	120
<10°C	320	42-50	10.5-13	182**

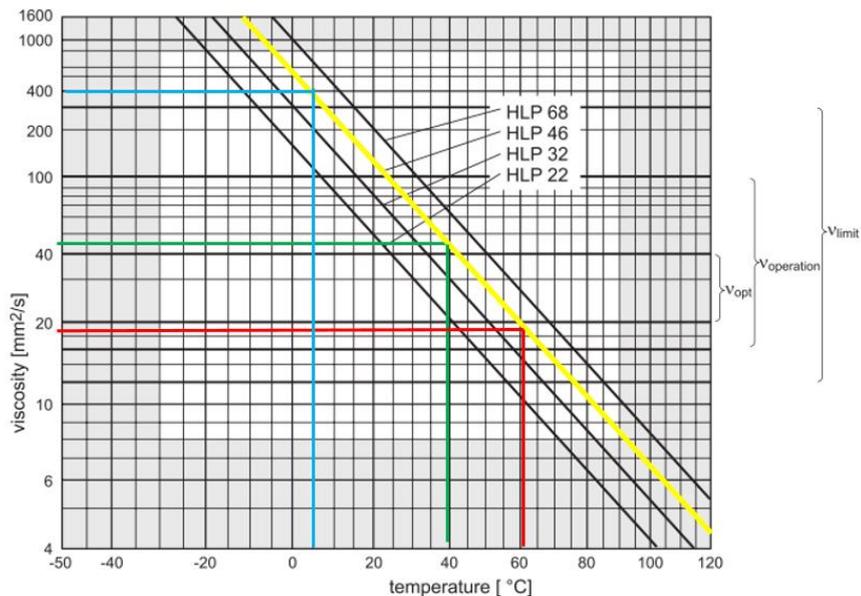
*Maximum operation temperature of the system is 60°C (140°F)

**Normally, the degree of cleanliness NAS7 that is required in the following point, is difficult to achieve in high viscosities (please consult Hiperbaric)

To start the machine in cold conditions it is recommended to use the heating process of the machine, until obtaining a suitable temperature.

The viscosity index of the oil defines its thermal stability. The higher the index, the better the thermal stability, as we get lower viscosity at low temperatures and higher viscosity at high temperatures. Both effects are positive as the pump will work with more steady viscosities in all the range of temperatures.

In the following graph, we are representing the operating conditions of our pump with oils with a viscosity index of 120. For a HLP46 oil with a temperature range between 5 and 60°C, the viscosities will be between 19,5mm²/s and 400mm²/s. The limiting kinematic viscosities of the pump are between 12 y 300 mm²/s, however, it is possible to start the heating cycle with the cooling pumps to temper the hydraulic fluid.



2.5.7. Compatibility with elements present in the circuit

The material used on hydraulic seals of the system of the machine, such as NBR, EPDM or VITÓN are compatible with any type of HLP anti-wear hydraulic oil. It is recommended to check this parameter in the technical documentation of the product prior to acceptance.

In any case, it should be taken into account that it is not advisable to mix oils with different additives, so that there may be reactions that lead to by-products that cause degradation in the components such as joints and internal parts of the machine. It is important to ensure that the additives are compatible with those previously used.

2.6. Teleservice

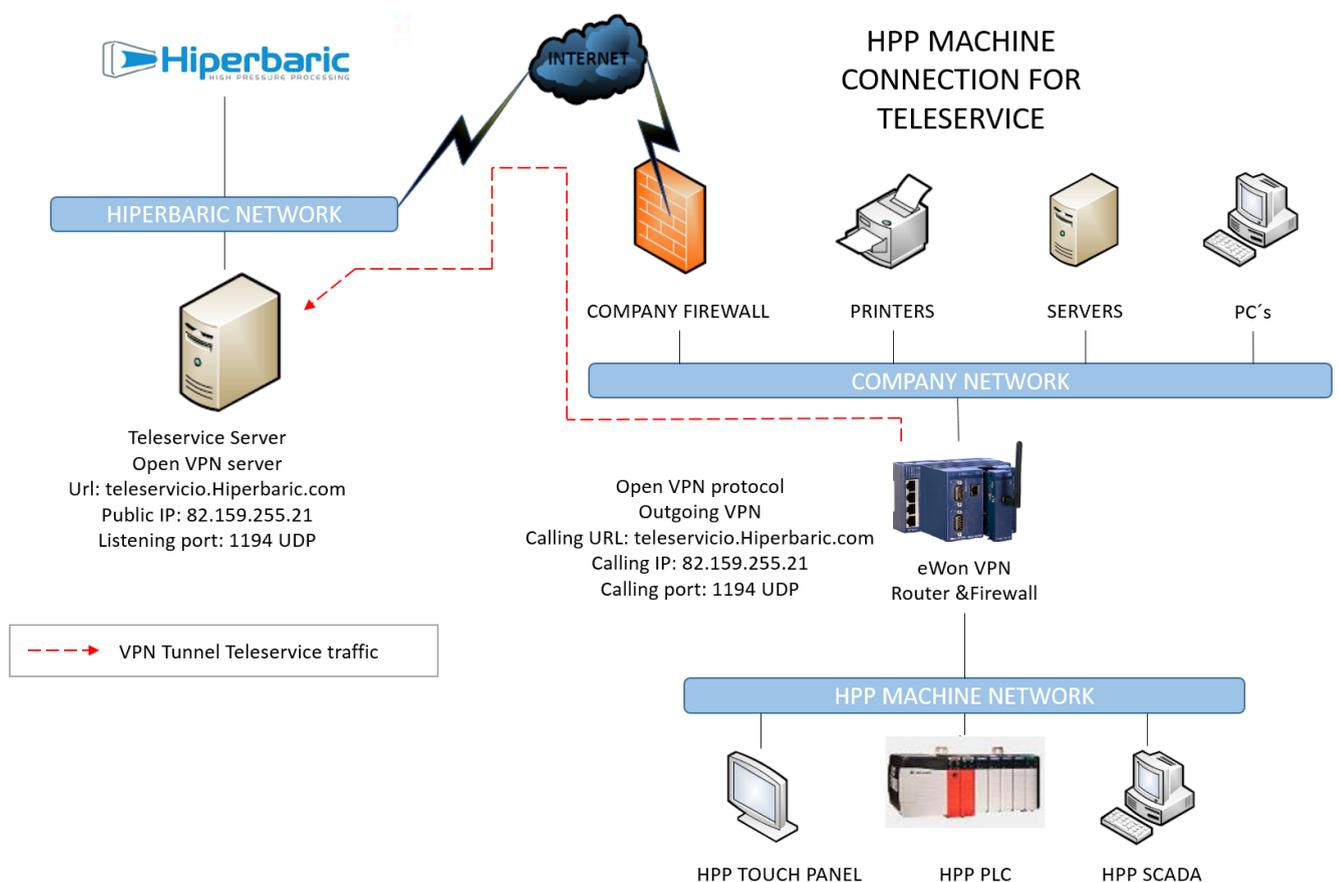
The teleservice enables a specialist technician to assist a customer remotely using an Internet connection.

The teleservice installation is very useful for assisting in all types of problems. It is of special interest during the first months of life of the machine, during its period of maturing, as this is when the machine requires more adjustment, and the operators are less accustomed to work and maintain it.

Therefore, in the case of customer approval, it would be essential for the fitter of the Hiperbaric to have an IP connection prior to installation which must be prepared by the customer. The position of this connection will be implemented in the plan issued by Technical Office.

A proper connection will ensure an effective after-sales service. The connection must be ready when the technicians from Hiperbaric arrive for the installation of the machine.

The Hiperbaric machine has a router installed so that the Ethernet network of the machine and the customer's network are separated completely. The customer's network will only be used for getting internet access for the machine and for sending notifications via email. This router will automatically establish a VPN connection to a server located at Hiperbaric's premises which will allow technicians access the machine remotely.



The internet connection may be done using the customer's internet access or either using a separate ADSL connection exclusively for the machine. In any case, the customer must install a shielded Ethernet cable (ABC+F/UTP 5e 4PR PVC), Straight-thru (Never crossover), with the IP address, subnet mask, default gateway and DNS configuration for that router.

Summary of network needed

- 1 Ethernet cable Cat 5e or above connected to the company network in which the machine can access Internet and in which is possible to access the Scada database.
- Set an IP address to allow the machine to connect Hiperbaric VPN through internet. The required configuration to keep the company safety (firewall) is:

teleservicio.hiperbaric.com (IP: 82.159.255.21/Port: 1194)

- Internet connection speed (upload / download) minimum 1 Mb/s / 1 Mb/s.
- If you have any doubt or question please do not hesitate to contact: service@hiperbaric.com.

3. LOADING, UNLOADING AND INTERNAL MOVEMENTS

Each machine is disassembled in a series of parts in order to be dispatched. The total weight of the machine depends on the number of intensifiers. The weight of each intensifier is 2.5 Tn. All weights for machines with standard number of intensifiers and also packaging weights, are displayed in the following chart:

Model	PART 1	PART 2	PART 3	PART 4	TOTAL
Hiperbaric 55 (1 single intensifier)	Whole machine 20 Tn	---	---		Machine weight: 20 Tn
	 40' OT: 4 Tn				Total: 24 Tn
Hiperbaric 135 (1 double intensifier)	Yoke 37 Tn	Vessel + 1xi-DMB6 + misc: 13 Tn			Machine weight: 50 Tn
	 Crate: 3 Tn	 40' OT: 4 Tn			Total: 57 Tn
Hiperbaric 300 1 Floor (2 double intensifiers)	Yoke 46 Tn	Vessel + 2xi-DMB6 + misc: 24 Tn			Machine weight: 70 Tn
	 Crate: 4 Tn	 40' OT: 4 Tn			Total: 78 Tn
Hiperbaric 300 Integrated (2 double intensifiers)	Yoke 46 Tn	Vessel + misc: 20 Tn	Feeders + Intensifiers + Platform: 10 Tn		Machine weight: 76 Tn
	 Crate: 4 Tn	 40' OT: 4 Tn	 40' OT: 4 Tn		Total: 88 Tn
Hiperbaric 420 1 Floor (4 double intensifiers)	Yoke 51 Tn	Vessel + misc: 23.5 Tn	Feeders + Intensifiers + Enclosure: 11.5 Tn		Machine weight: 86 Tn
	 Crate: 4 Tn	 40' OT: 4 Tn	 40' OT: 4 Tn		Total: 98 Tn
Hiperbaric 420 integrated (4 double intensifiers)	Yoke 51 Tn	Vessel + misc: 23.5 Tn	Feeders + Intensifiers + Platform: 12 Tn	Enclosure + Platform: 5.5 Tn	Machine weight: 92 Tn
	 Crate: 4 Tn	 40' OT: 4 Tn	 40' OT: 4 Tn	 40' OT: 4 Tn	Total: 108 Tn
Hiperbaric 525 1 Floor (5 double intensifiers)	Yoke 55 Tn	Vessel + misc: 27 Tn	Feeders + Intensifiers + Enclosure: 14 Tn		Machine weight: 95 Tn
	 Crate: 4 Tn	 40' OT: 4 Tn	 40' OT: 4 Tn		Total: 107 Tn
Hiperbaric 525 integrated (5 double intensifiers)	Yoke 55 Tn	Vessel + misc: 27 Tn	Feeders + Intensifiers + Platform: 15 Tn	Enclosure + Platform: 7 Tn	Machine weight: 104 Tn
	 Crate: 4 Tn	 40' OT: 4 Tn	 40' OT: 4 Tn	 40' OT: 4 Tn	Total: 120 Tn

Machine / Packaging weights

 **IMPORTANT:** These guidelines are strictly informative and should be taken only as reference. Customer may choose to adopt, modify, or reject.

The information does not constitute a comprehensive safety program and should not be relied upon as such. The acceptance or use of these guidelines are completely voluntary, and are not intended to be used on top of any local or international standards or regulations that may apply to this chapter. Customer is solely responsible to comply with the applicable regulations, and Hiperbaric is exempt of any liabilities. All these operations must be carried out by the customer, a rigger company, or Hiperbaric staff. If required, Hiperbaric will supply a methods and risk assessment of crane and maneuvering operations.

A video showing the offloading and installation process is available at this link: <https://youtu.be/pmjLBck3Jqo>

Before taking out the components of the machine, the weight of the packaging itself must be taken in consideration (whether it is shipped in a wooden box or in a standard shipping container).

In regards of loading or unloading, the following section describes how these operations should be carried.

Handling of feeders, intensifiers, enclosures and other accessories don't have major complications. In any case it is preferred that staff from Hiperbaric takes part in this process.

3.1. Transporting the machine in a wooden box (only for maritime shipment)

The handling of the wooden box must be done extremely carefully, failing to do so may result in damages to the machine and pose risks to staff working around it. Therefore, these operations must be carried out following these instructions:

Normally it is not necessary to elevate the wooden box with the machine inside. The normal procedure is extracting the machine from the wooden box whilst still on the truck.

The following paragraphs explain lifting the box out the truck.

The lifting of the wooden box must be done by slipping a chain through the steel profiles under the box (the wooden box has clear marks to this in order to avoid any mistake) and holding the chains from 2 lifting beams. As shown in the picture below. With this we will ensure the load will be well balanced:



These beams will be lifted by a crane with enough capacity to lift the load according to the chart of weights. Trying to lift this load in any other way, may cause the box to fall or break, posing a risk for people and damaging the unit.

The wooden box also has some eyebolts to avoid the movement of the load during truck or ship transport. Using these eyebolts to lift the load would involve breaking the box and damaging the machine.

3.2. Transporting of the machine in a low loader gondola trailer

For terrestrial transport to final destination, the machine could be simply positioned and secured on a low loader trailer truck, and adequately protected as shown in the picture.



3.3. Unloading the machine with a crane:

Upon machine reception in customer premises, the roof and the walls of the wooden box can be unscrewed and taken apart. There is no need to unload the box from the truck to do so.

Once done the 4 + 4 nuts fixing the floor of the wooden box to the machine have to be removed and finally the machine is free to be lifted with the crane.

The machine must be lifted using 4 slings of the same length. These have to be placed around the 4 big upper nuts of the yoke, it is important to use the bars supplied with the machine to avoid the sling slipping out of the nuts, as picture shows in the upper right hand corner.

The lifting beams shown in left and circled in green on the picture are also supplied with the machine to avoid any damage on the parts.



3.4. Unloading the machine with Forklifts

Another option (if available) is the use heavy duty forklifts. The load requirements will obviously depend on the weight of the machine to be unloaded.



The main advantage of this system is that it can also be used inside the building to carry the machine to its final position.

3.5. Unloading the machine from a container

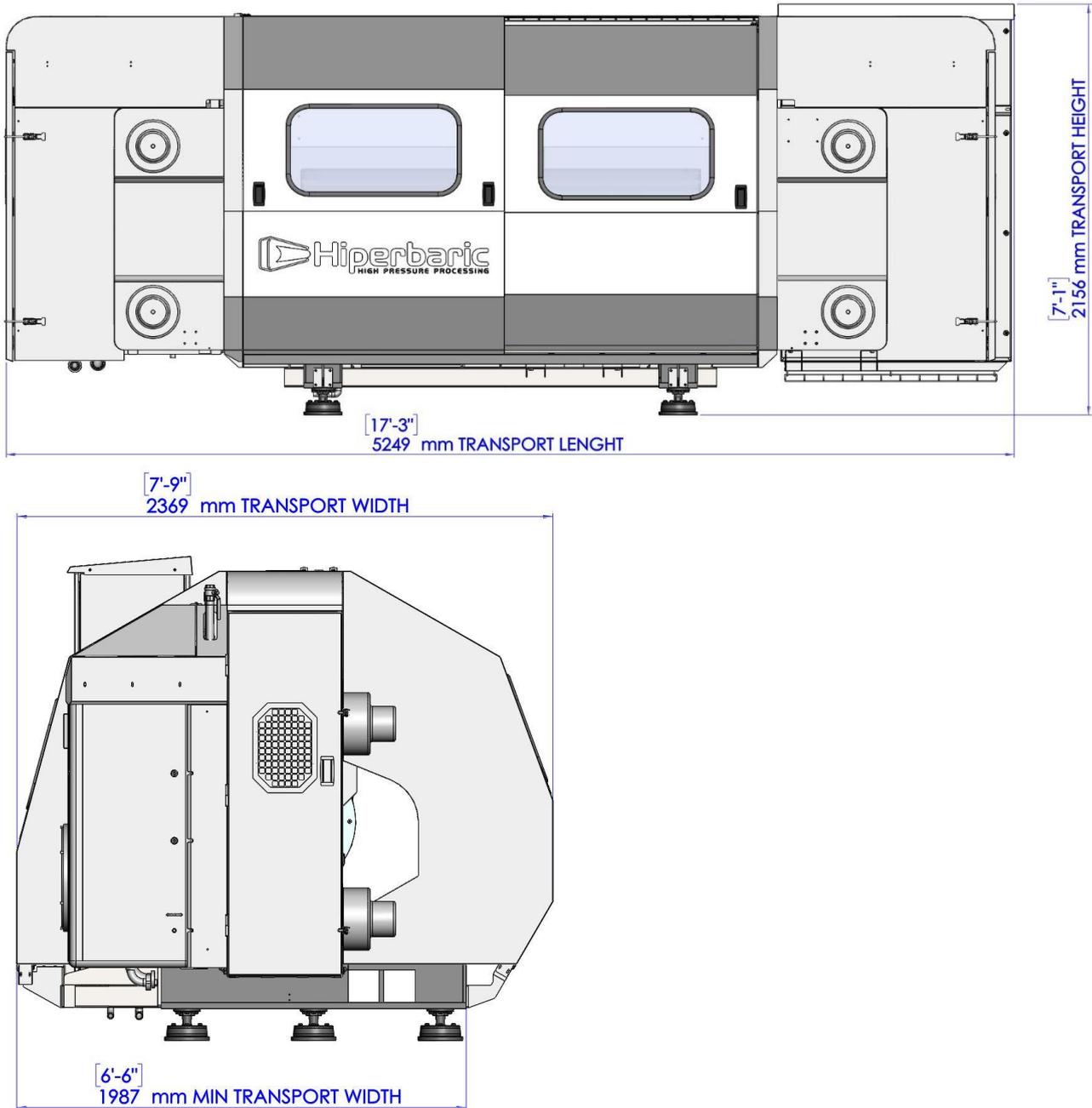
When the machine is shipped in a container Hiperbaric 55 the procedure will be similar to the previous case. With the container on the platform of the truck, the roof will be removed. All the parts that come with the machine will be unloaded using the crane. Finally, the machine will be unloaded following the same procedure previously described:



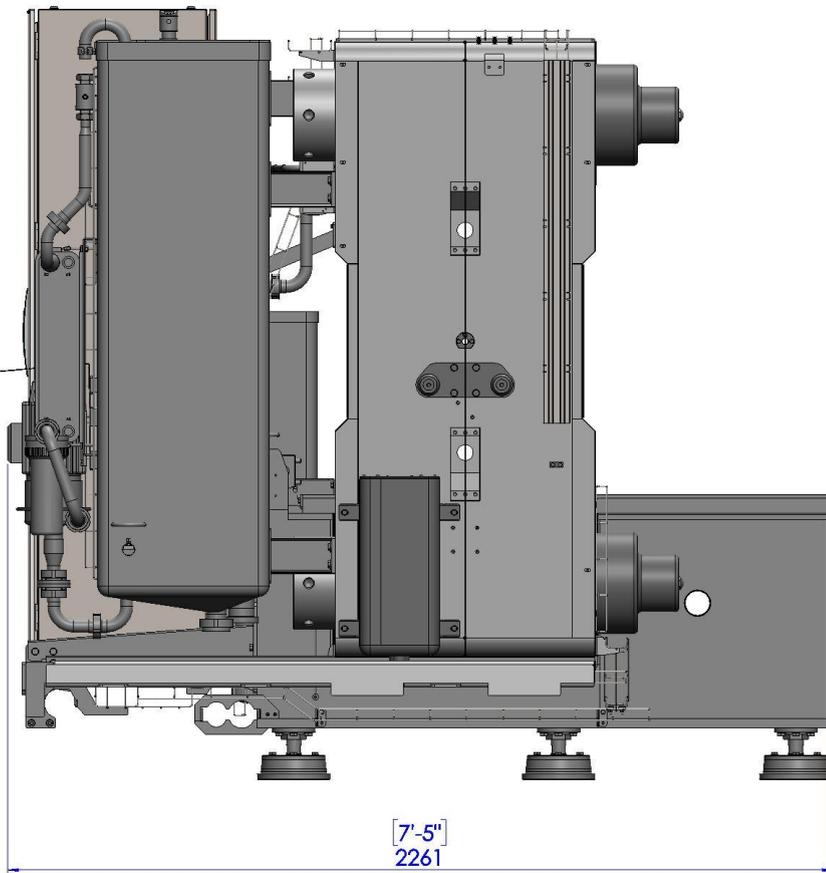
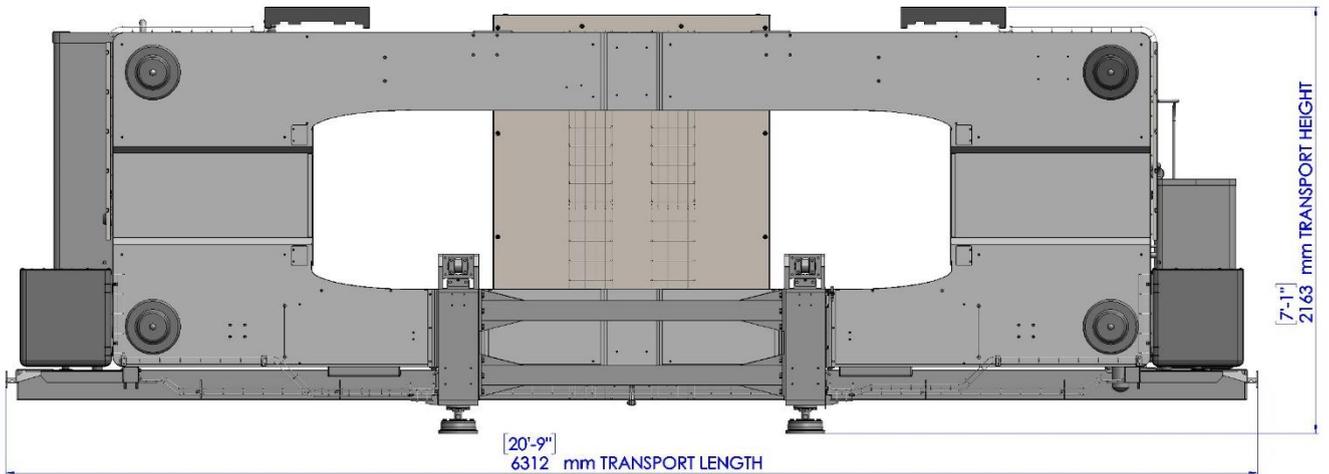
3.6. Transport dimensions

To enter the machine in the building, it is important to know the maximum dimensions of the biggest part, to check that gates are big enough. These dimensions of the different models, as they are shipped, are shown in the following pictures.

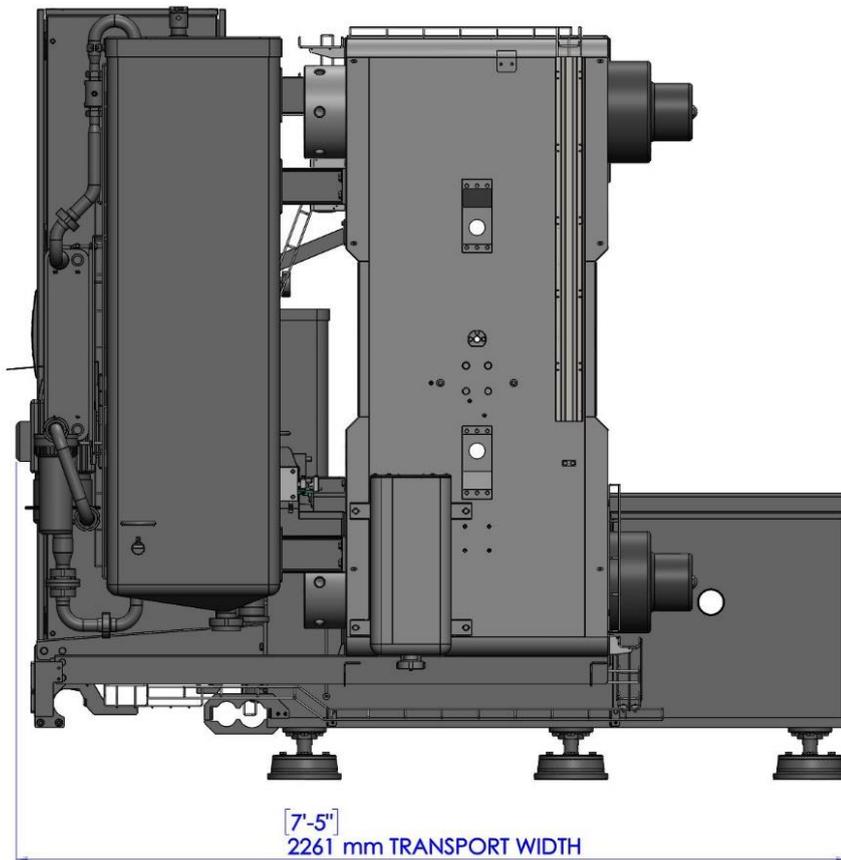
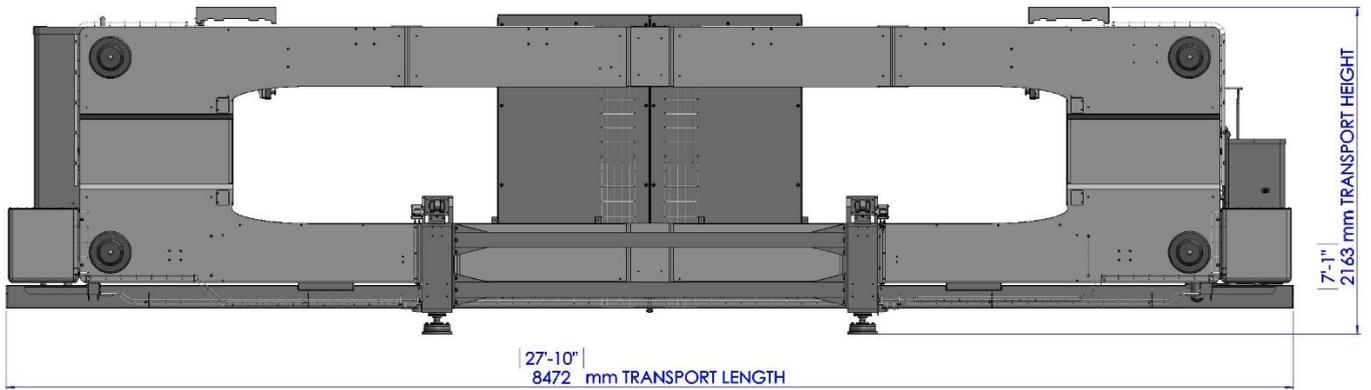
3.6.1. Transport dimensions H55



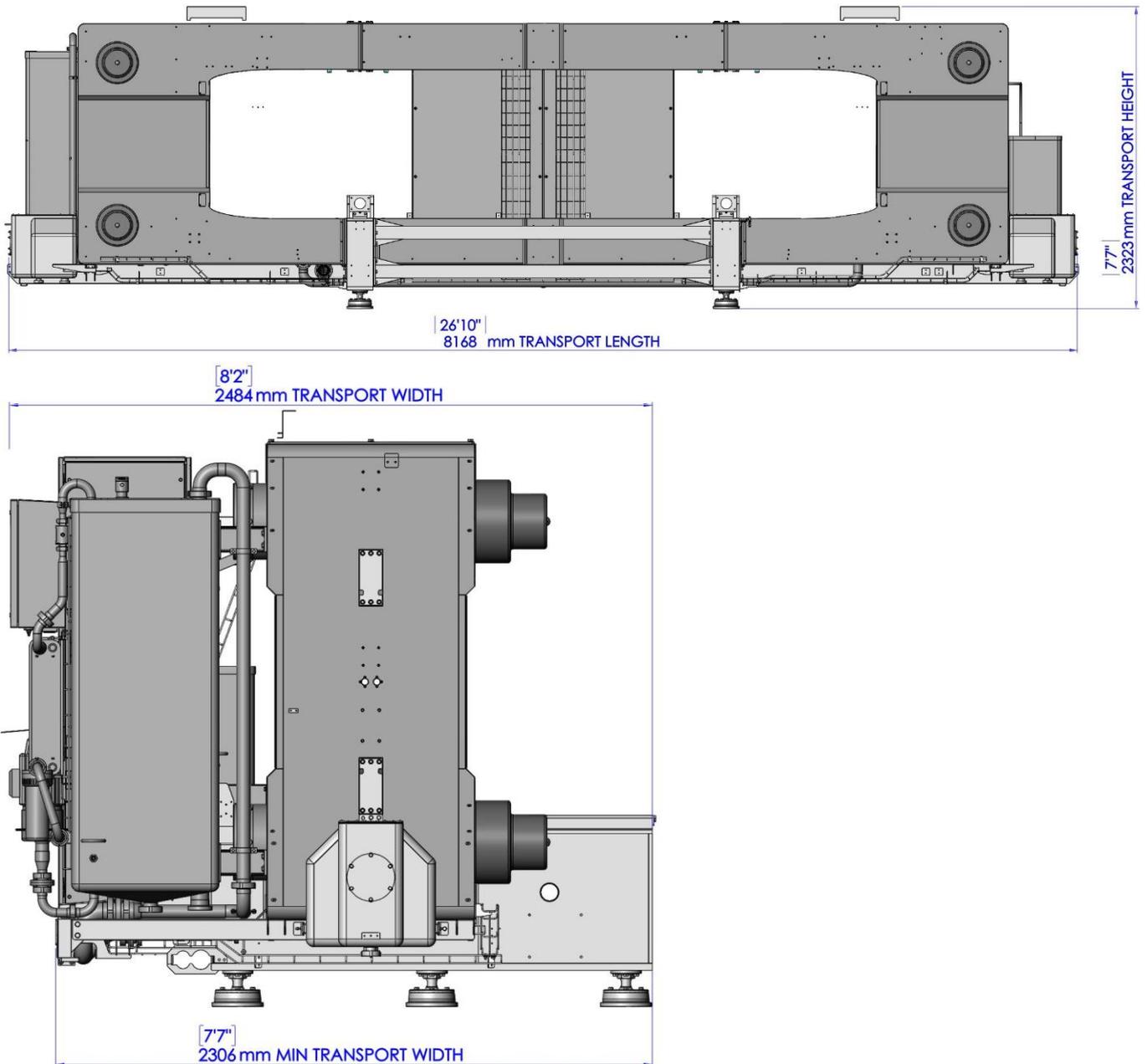
3.6.2. Transport dimensions H135



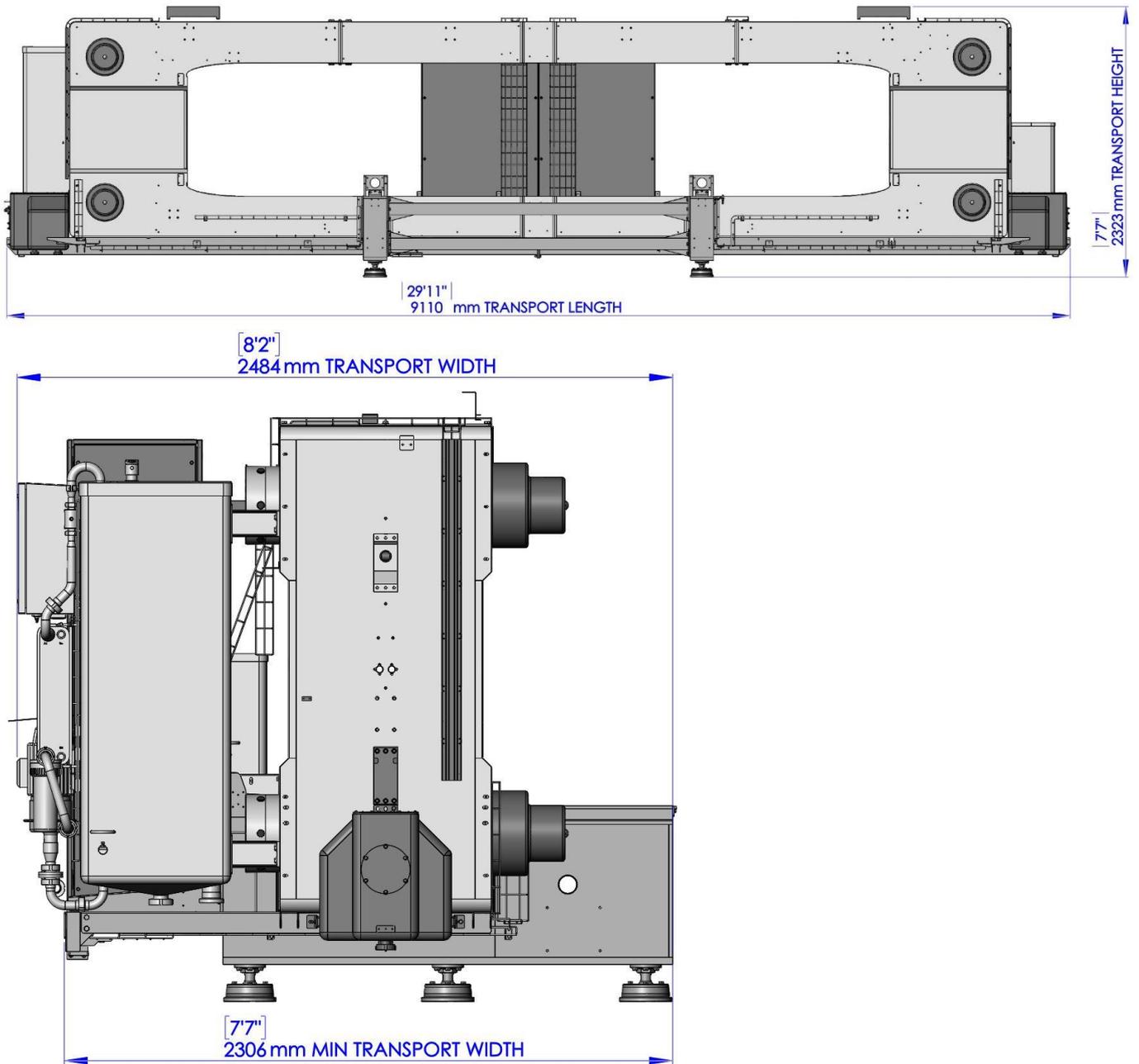
3.6.3. Transport dimensions H300



3.6.4. Transport dimensions H420



3.6.5. Transport dimensions H525



3.7. Handling of the vessel

Vessels of machines Hiperbaric 135, 300, 420 and 525 will be shipped separately from the rest of the machine, due to the weight of the vessel itself. To unload from the container the slings supplied with the machine must be used, as shown in the following picture:



It is important that the slings go around the vessel but not on top of the longitudinal tubes. Failing to do so will cause irreparable damages to these. (Picture shows the correct method).

After unloading the vessel this must be placed on the special tooling and moved it inside the premises. The tooling then will be placed aligned with the yoke to be slid into final position.



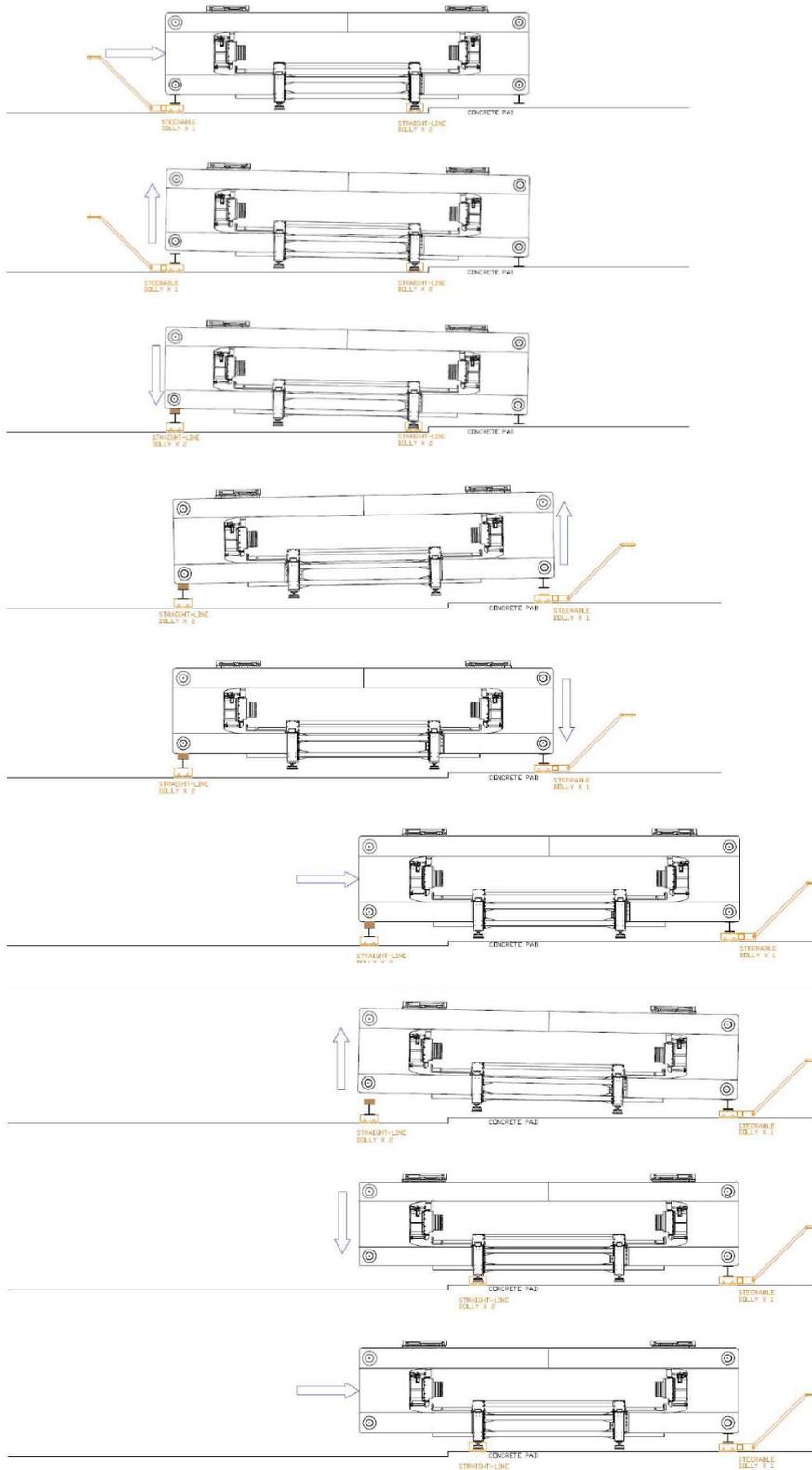
3.8. Movements inside the premises

The transporting of the Hiperbaric inside customer's premises is carried out with the use of skates capable of bearing the weight of the machines (see table of weights).



3.9. Movements to pass a step

Sometimes, the machine needs to go up a step on its way to its final position. The procedure to deal with these obstacles could be as shown in the following pictures:

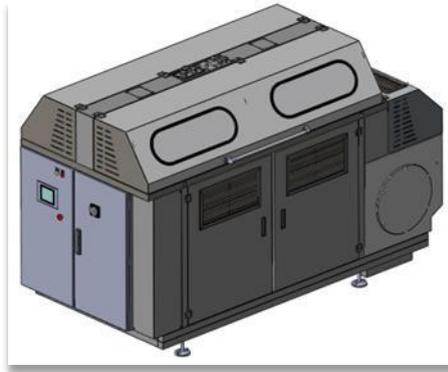


3.10. Handling of Intensifier Cabinets and Machine Conveyors

Intensifier cabinets weigh 2,400Kg (model DMB6 double intensifier cabinet) and stand on 4 feet.

They are transported either in OT containers (in the event of maritime shipment) or in a standard OT trailer (road transport).

Intensifier cabinets can be either slinged and lifted/downloaded with the crane used for the rest of the equipment, or downloaded directly from the container or the trailer with a suitable forklift (5Ton capacity forklift is recommended)



Intensifier cabinet DMB6

Intensifier cabinets can be lifted with the forklift from below (normal operation) or can be slinged and lifted from above.

Conveyor belts for the Hiperbaric machine are lightweight structures and can be downloaded either manually or with a forklift, and be moved to final position carried by a simple forklift (even a pedestrian forklift).

3.11. Structural Assembly of Hiperbaric Integrated Equipment

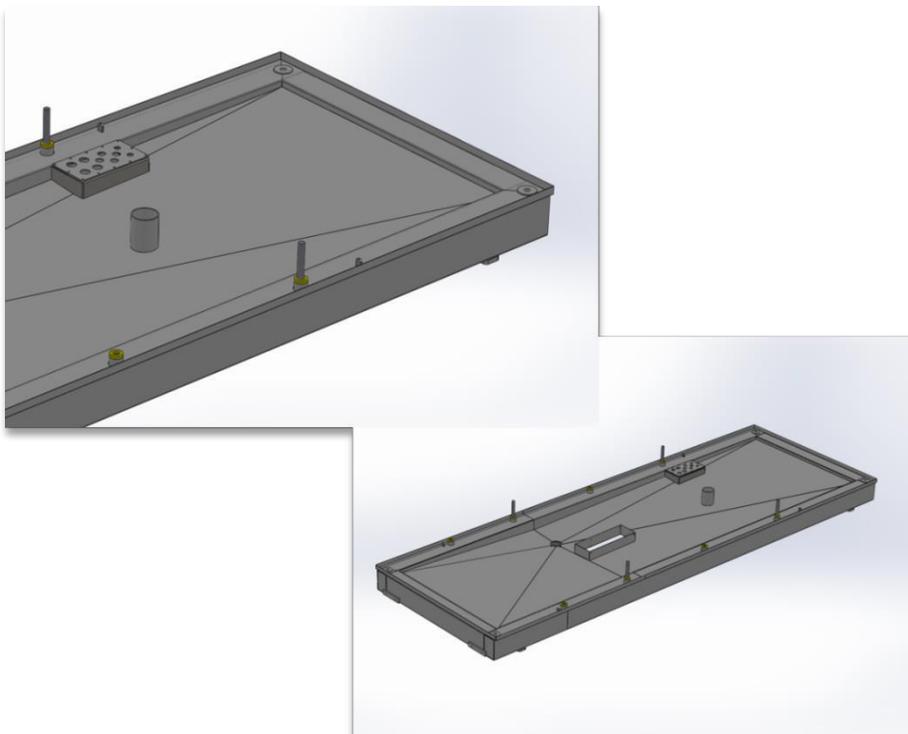
For Hiperbaric Integrated machines (Hiperbaric systems with a two-floor configuration) the intensifier cabinets are positioned on top of its specifically designed platform. Hiperbaric personnel supervise and/or action the assembly of such platform:



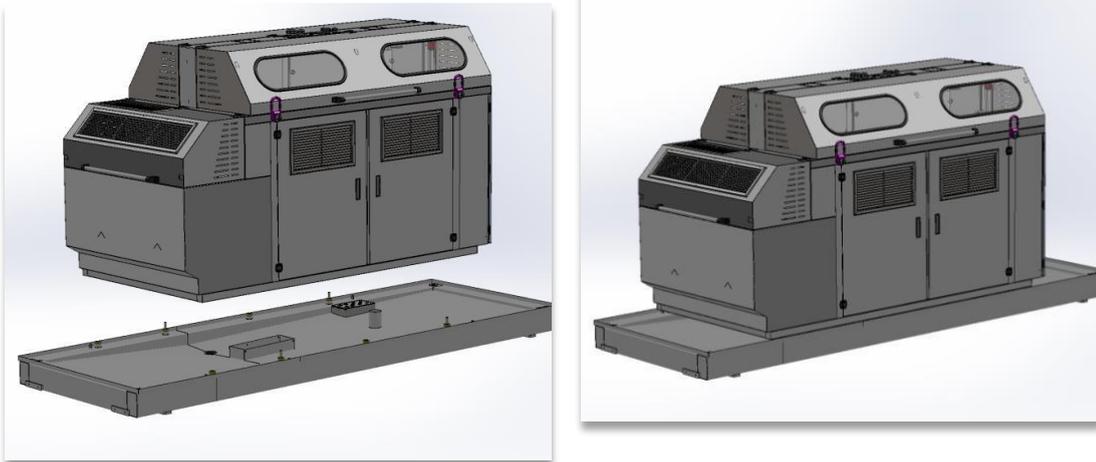
Captions: a safe movable staircase or moving platform will be required for the assembly of the platform structure, depicted right.

The intensifier cabinets are positioned on top of its platform. The method to prepare the intensifier cabinets and lifting them into position is as follows:

- Prepare Intensifier Trays – Assembly Trays with the four bolts the will hold the intensifier cabinets in place



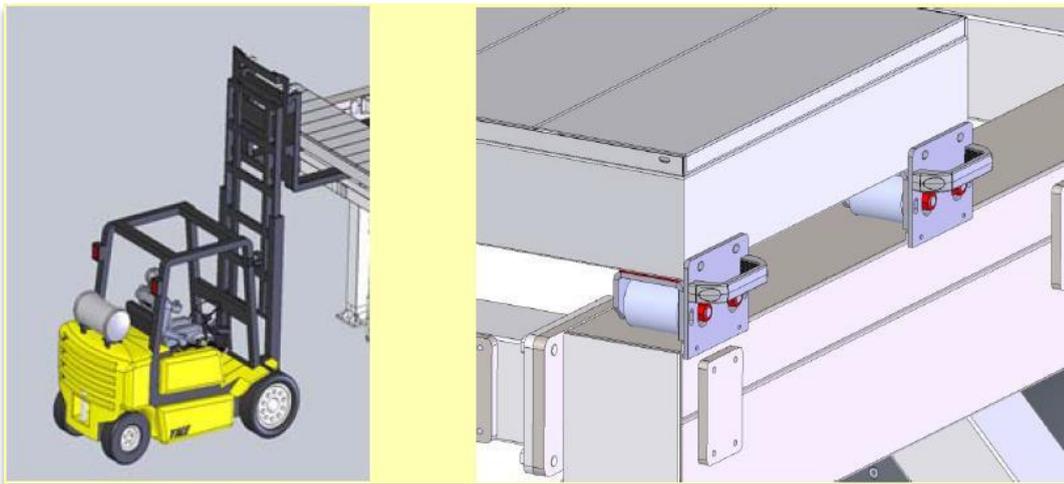
- Position and assembly Intensifier Cabinet on its tray



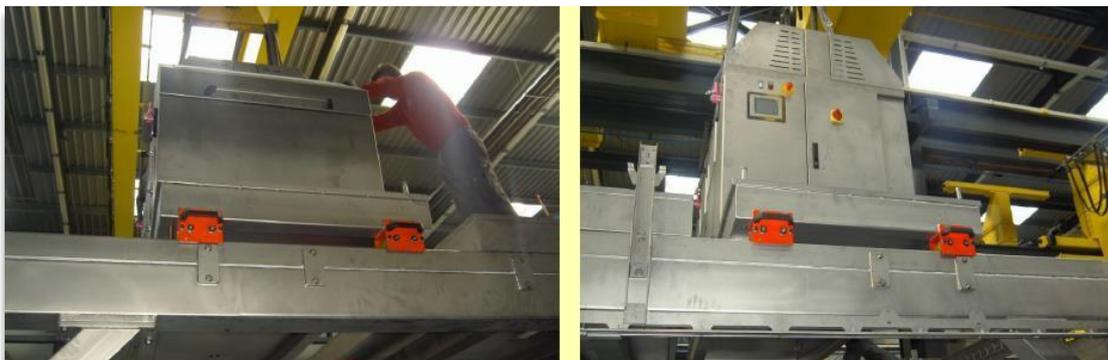
Views of intensifier cabinet assembly on Tray

- Lifting, Option 1: Intensifier cabinets Assembly on platform using forklift

The intensifier cabinet Assembly (intensifier cabinet positioned on its tray) are held from below and safely lifted. Skates can be used to roll them to final position in the platform.



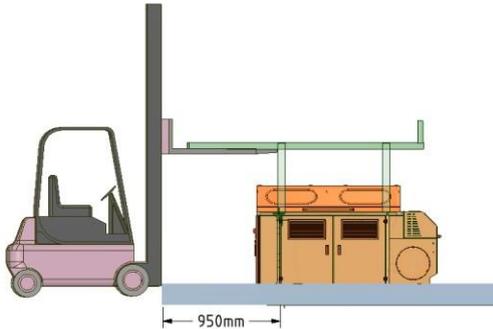
Schematic view of forklift positioning the Intensifier + Tray assembly on toPlatform; and skates to roll them into final position.



Intensifier + Tray assembly being put into position on the platform

- Lifting, Option 2: Lift Whole Intensifier +Tray Assembly with slings

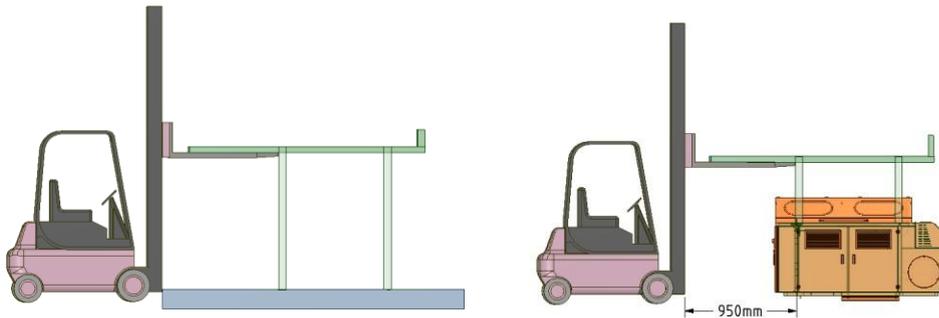
For this lifting operation, a forklift with a 5 Ton minimum capacity and a minimum 4.5 m operating & lifting height is required. The Intensifier+Tray assembly is slinged using the lifting nuts of the intensifier, and lifted to



final position on the machine platform.

Schematic view of forklift lifting intensifier. The distance between the forklift structure and the first sling holding the intensifier needs to be minimum 950mm. Extensions to the forklift nails will be necessary.

- Lifting Option 3: Upload Trays first, then Intensifier Cabinet



Schematic view of lifting the tray and the intensifier separately. Assembly will take place on top of the platform.



Lifting of intensifier cabinet for assembly on top of platform. The pictured forklift beam is optional and forklift nail extensions suffice.

4. TOOLINGS REQUIRED FOR INSTALLATION

Some tools will be required to install the machine in the customer's premises. The customer will ensure these are available during commissioning and installation.

4.1. Elements to raise and move loads

A crane suitable for the loads specified in a previous point will be required. The distance between load and crane will be given to the supplier to calculate the necessary size of the crane. This crane will require to be equipped with slings, wooden blocks, etc.

Suitable skates for the load specified in a previous point, will be required to move the machine inside the workshop.

For loading and unloading the machine from the skates inside the premises two hydraulic jacks will be required. The size of these jacks will totally depend on the machine size (see machine weights chart). Wooden blocks will also be required in order to make the hydraulic jacks and/or skates fit the right size.

To pull the machine to get the skates going, a fork lift with enough power will be required. It is advisable to place some steel plates on the floor not only to make a path but to protect the floor from scratches. These plates should be at least 2 mm (1/16") thick. And 50 mm (2") wider than the width of the skates and at least 20 m (65 feet) of total length in parts of about 1.5 m (5 feet).

To pull the machine, the force of one or two powerful forklifts (of at least 2 Tn each) will be required. It is also possible to do so using a ratchet strap, if a fixed point is available. The number of forklifts and their required power will depend on the size of the machine to be installed, and also on the slope of the floor inside the facilities.



4.2. Assembly tooling

The standard required tools to assembly the machine can be seen in the following pictures. These are supplied by Hiperbaric and sent with the machine:



Hiperbaric will also supply initial kit of spares for the machine and some specific tools required for the maintenance of the equipment.

Maintenance on all the high pressure circuits of the machine, from intensifiers to the machine, requires an accurate tightening of all bolts and fittings. Therefore it is mandatory that the maintenance staff has available an adjustable torque wrench and follow the chart of torques that is supplied with the manual of the machine. This tool will be necessary when installing the machine.

High pressure fittings need an open end wrench, so we advise to buy an adjustable torque wrench with removable ratchet with sets of accessories, including open ends and sockets. An example is shown in the picture.

The range of torques should be at least between 100-350 Nm.



5. SUMMARY OF REQUIREMENTS AND SERVICES

This point is a check list, or a summary to have a quick view of all the requirements and services that should be taken into account before the installation of the machine. For detailed information, please check the related point of this manual.

Consumptions have been calculated for a cycle of 6.000 bars 3 minutes of holding time. Changing this parameters will change these consumptions.

- A.C: Average Consumption in normal working
- M.C: Maximum point Consumption to size the supply

5.1. Hiperbaric 55

Layout	Customer supplies CAD of the facilities and Hiperbaric send back the CAD with the machine, position and size of every required supply.	
Foundation	A standard industrial floor would be enough.	
Drainages	Suggested position detailed in the layout.	
Water connection	Check water quality requirements. Size and position detailed in the layout. Pressure between 3 and 6 bars. A.C. 85 l/h. M.C. 1.000 l/h.	
Oil cooling	One single connection on the machine, size and position detailed in the layout	Heat load 12.5 kW. Check calculations.
Water cooling (Optional)		Heat load depends completely on customer requirements and conditions.
Compressed air	Pressure between 6 bars and 7 bars (bellow 5 bars the machine stops). Size and position detailed in the layout. A.C. 20 l/h M.C. 100 l/h.	
Electrical connection for main machine	One single connection. Position detailed in the layout. Power at 50Hz: 55 Kw. Power at 60Hz: 62 Kw.	Power consumption: 2 kW-h /cycle
Electrical connection for single intensifier		
Internet connection	Check requirements	
Hydraulic oil	Check requirements. Volume: 350 l	
Offloading material	Check requirements	

5.2. Hiperbaric 135

Layout	Customer supplies CAD of the facilities and Hiperbaric send back the CAD with the machine, position and size of every required supply.	
Foundation	Reinforced area for the 6 feet of the machine detailed in the layout.	
Drainages	Suggested position detailed in the layout.	
Water connection	Check water quality requirements. Size and position detailed in the layout. Pressure between 3 and 6 bars. A.C. 184 l/h. M.C. 1.000 l/h.	
Oil cooling	One connection on each double intensifier. Size and position detailed in the layout. Heat load 25 kW/double intensifier.	
Water cooling (Optional)	One connection on the machine. Size and position detailed in the layout. Heat load depends completely on customer requirements and conditions.	
Compressed air	Pressure between 6 bars and 7 bars (bellow 5 bars the machine stops). Size and position detailed in the layout. A.C. 120 l/h M.C. 2.500 l/h.	
Electrical connection for main machine	One single connection. Position detailed in the layout. Power 13 kW.	Power consumption: 5 kW-h /cycle
Electrical connections for intensifiers	One connection for each double intensifier. Positions detailed in the layout. Power at 50Hz: 93 Kw/double intensifier. Power at 60Hz: 107 Kw/ double intensifier	
Internet connection	Check requirements	
Hydraulic oil	Check requirements. Volume: 430 l/double intensifier	
Offloading material	Check requirements	

5.3. Hiperbaric 300

Layout	Customer supplies CAD of the facilities and Hiperbaric send back the CAD with the machine, position and size of every required supply.		
Foundation	Reinforced area for the 6 feet of the machine detailed in the layout.		
Drainages	Suggested position detailed in the layout.		
Water connection	Check water quality requirements. Size and position detailed in the layout. Pressure between 3 and 6 bars. A.C. 405 l/h. M.C. 1.000 l/h.		
Oil cooling	Integrated machine	Single connection internally diverged for each double intensifier. Size and position detailed in the layout	Heat load 25 kW/double intensifier.
	Not integrated machine	One connection on each double intensifier. Size and position detailed in the layout.	
Water cooling (Optional)	One connection on the machine. Size and position detailed in the layout. Heat load depends completely on customer requirements and conditions.		
Compressed air	Pressure between 6 bars and 7 bars (bellow 5 bars the machine stops). Size and position detailed in the layout. A.C. 120 l/h M.C. 2.500 l/h.		
Electrical connection for main machine	One single connection. Position detailed in the layout. Power 13 kW.		Power consumption: 11 kW-h /cycle
Electrical connections for intensifiers	One connection for each double intensifier. Positions detailed in the layout. Power at 50Hz: 93 Kw/double intensifier. Power at 60Hz: 107 Kw/ double intensifier		
Internet connection	Check requirements		
Hydraulic oil	Check requirements. Volume: 430 l/double intensifier		
Offloading material	Check requirements		

5.4. Hiperbaric 420

Layout	Customer supplies CAD of the facilities and Hiperbaric send back the CAD with the machine, position and size of every required supply.		
Foundation	Reinforced area for the 6 feet of the machine detailed in the layout.		
Drainages	Suggested position detailed in the layout.		
Water connection	Check water quality requirements. Size and position detailed in the layout. Pressure between 3 and 6 bars. A.C. 605 l/h. M.C. 1.000 l/h.		
Oil cooling	Integrated machine	Single connection internally diverged for each double intensifier. Size and position detailed in the layout	Heat load 25 kW/double intensifier.
	Not integrated machine	One connection on each double intensifier. Size and position detailed in the layout.	
Water cooling (Optional)	One connection on the machine. Size and position detailed in the layout. Heat load depends completely on customer requirements and conditions.		
Compressed air	Pressure between 6 bars and 7 bars (bellow 5 bars the machine stops). Size and position detailed in the layout. A.C. 200 l/h M.C. 4.800 l/h.		
Electrical connection for main machine	One single connection. Position detailed in the layout. Power 14 kW.		Power consumption: 15 kW-h /cycle
Electrical connections for intensifiers	One connection for each double intensifier. Positions detailed in the layout. Power at 50Hz: 93 Kw/double intensifier. Power at 60Hz: 107 Kw/ double intensifier		
Internet connection	Check requirements		
Hydraulic oil	Check requirements. Volume: 430 l/double intensifier		
Offloading material	Check requirements		

5.5. Hiperbaric 525

Layout	Customer supplies CAD of the facilities and Hiperbaric send back the CAD with the machine, position and size of every required supply.		
Foundation	Reinforced area for the 6 feet of the machine detailed in the layout.		
Drainages	Suggested position detailed in the layout.		
Water connection	Check water quality requirements. Size and position detailed in the layout. Pressure between 3 and 6 bars. A.C. 756 l/h. M.C. 1.000 l/h.		
Oil cooling	Integrated machine	Single connection internally diverged for each double intensifier. Size and position detailed in the layout	Heat load 25 kW/double intensifier.
	Not integrated machine	One connection on each double intensifier. Size and position detailed in the layout.	
Water cooling (Optional)	One connection on the machine. Size and position detailed in the layout. Heat load depends completely on customer requirements and conditions.		
Compressed air	Pressure between 6 bars and 7 bars (bellow 5 bars the machine stops). Size and position detailed in the layout. A.C. 200 l/h M.C. 4.800 l/h.		
Electrical connection for main machine	One single connection. Position detailed in the layout. Power 14 kW.		Power consumption: 20 kW-h /cycle
Electrical connections for intensifiers	One connection for each double intensifier. Positions detailed in the layout. Power at 50Hz: 93 Kw/double intensifier. Power at 60Hz: 107 Kw/ double intensifier		
Internet connection	Check requirements		
Hydraulic oil	Check requirements. Volume: 430 l/double intensifier		
Offloading material	Check requirements		

5.6. Electrical requirements chart

The most common configurations of Voltage and Frequency are:

- 50 Hz / 400 V
- 60 Hz / 480 V

To have a quick view of the electrical requirements of a particular machine, the following chart shows the power and current required for these most common voltage / frequency configurations. It is important to see in detail the chapter about electrical supply to have a full understanding of the required calculations and the different points of electrical connection that the machine needs:

	# Intensifiers		50 Hz / 400 V		60 Hz / 480 V	
	# double	Total intensifiers	Total Power (kW)	Total Current (Amps)	Total Power (kW)	Total Current (Amps)
H55	-	1 single integrated	55	101	62	104
H135	1 double	2	106	201	120	208
	2 double	4	199	375	227	391
H300	1 double	2	107	203	121	210
	2 double	4	200	377	228	393
	3 double	6	293	551	335	576
H420	2 double	4	200	377	228	393
	3 double	6	293	551	335	576
	4 double	8	386	725	442	759
H525	3 double	6	293	551	335	576
	4 double	8	386	725	442	759
	5 double	10	479	899	549	942