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MANUAL

- One supplier
- Craftmanship and relations
- Respect for food quality
- Sustainability and savings

DSI-Twin Accu

Hydraulic Station 5.5kW

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CONTENT

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1. INTRODUCTION

1.1 The arrangement and scope of this user manual

This user manual concerns a DSI-Twin Accu 5.5kW hydraulic station for installations with DSI-Horizontal Single Station Plate Freezers. The user manual provides instructions about installation, operation and maintenance etc. of the hydraulic station.

Furthermore, it states the general requirements regarding connection of the hydraulic station. An important section in this user manual is the section about safety instructions, which intend to protect both the operators and the equipment.

In order to obtain optimal performance and maximum benefit of the investment in a DSI hydraulic station, it must be ensured that all the procedures in this user manual and other supplied instructions etc. is compiled before the equipment is put into operation, as well it is not allowed to make modifications on the hydraulic station. If not, the factory warranty becomes void.

1.2 Prescribed use

The hydraulic station is used for DSI Horizontal Single Station Plate Freezers.

! Warning !

The hydraulic station must only be used for the specific purpose for which is designed for.

DSI-Twin Accu 5.5kW is from the factory adjusted to a pump pressure at 160 Bar on the P-string. The hydraulic stations maximum working pressure is specified on the name plate.

DSI-Twin Accu 5.5kW hydraulic station is equipped with 2 hydraulic pumps and 2 electric motors. The one hydraulic pump and electric motor are as standard always standby and functions as reserve for the other hydraulic pump or electric motor.

> ***Note:*** The hydraulic station is designed to provide installations with up to three freezers. However, it will be limited to only operate hydraulically with one freezer at the same time. If it is necessary to operate hydraulically with two freezers at the same time, the hydraulic station can as extra be equipped with a pressostat-function. This function automatically starts the hydraulic pump and electric motor that are standby, if a larger amount of oil is required for the freezers.

1.3 Functional description

The hydraulic station is equipped with fully hydraulic accumulator valve, which ensures that the hydraulic pump can run continuously, without significant wear and energy consumption. In most cases it is best to let the hydraulic pump run continuously without load, instead of starting and stopping the electric motor too often.

The hydraulic station works by the hydraulic pump automatically switching the hydraulic pump to a by-pass function when the desired accumulator pressure is reached, and the system is not operated hydraulically. When the amount of oil in the accumulator is consumed, either by that the system again being operated hydraulically, or to covering small leaks that always are in complex hydraulic systems, the hydraulic pump reconnects, and build up the pressure in the hydraulic system again.

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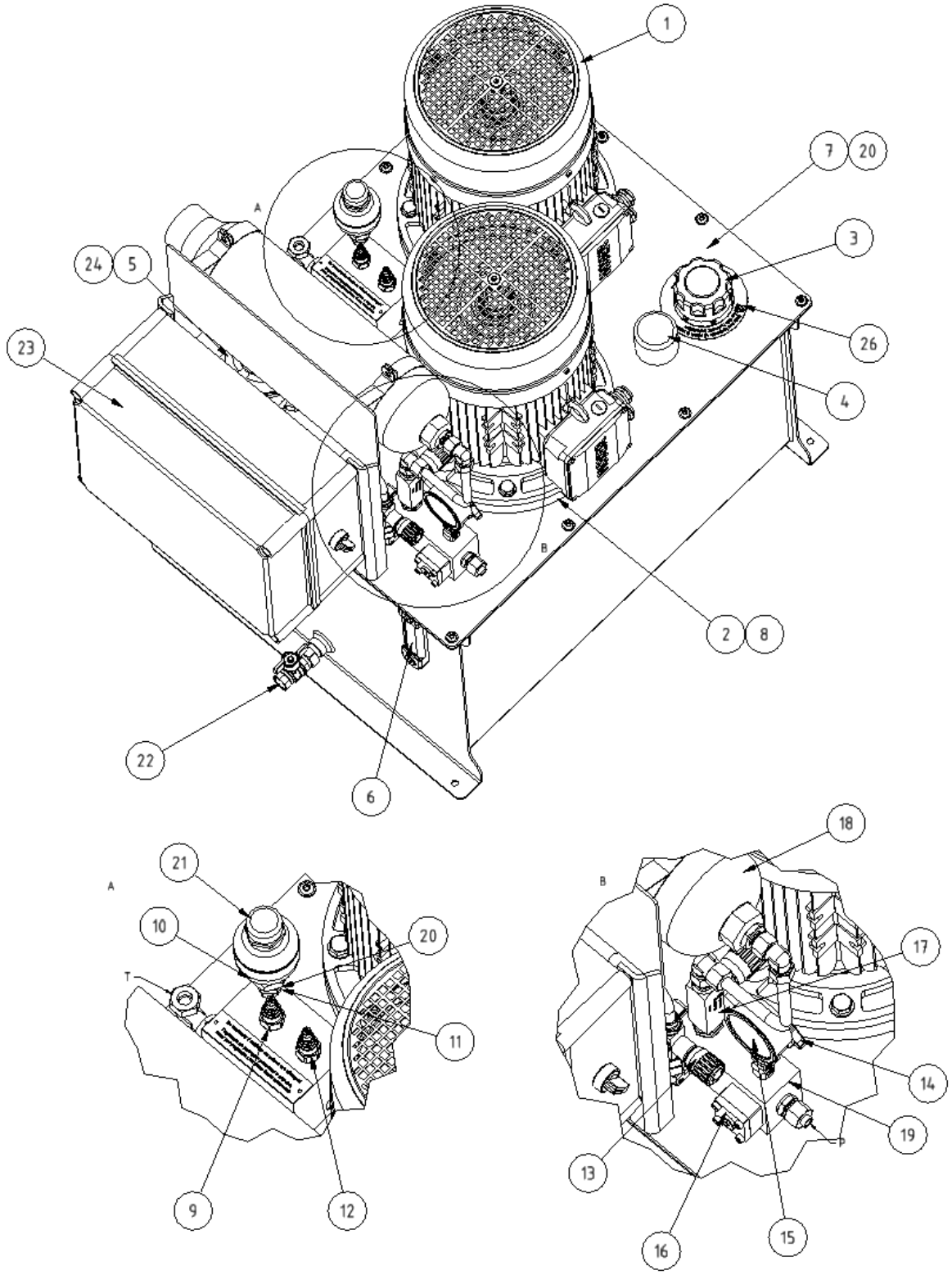
1.4 Design of the hydraulic station

The illustration shows the main components which are included in the hydraulic station. Subsequently the components purpose, function etc. is described.



1. **Electric motor:** Runs the hydraulic pump.
2. **Hydraulic pump:** Generates the hydraulic pressure in the hydraulic system.
3. **Filler cap / filter:** Protects the hydraulic oil in the tank and filter it from impurities when filling. The sign describes which type of oil to be filled.
4. **Level/temperature sensor:** Monitoring the hydraulic oil level and the temperature. Switches off automatically if the level is too low, or the temperature reaches 70° C.
5. **Return filter:** Ensures that the return oil from the hydraulic system is clean.
6. **Temperature / oil level indicator:** Shows the level and the temperature at the hydraulic oil in the tank.
7. **Oil tank:** Ensures that the required amount of hydraulic oil is available.
8. **Check valve:** Prevents return of the hydraulic oil through the hydraulic pump.
9. **Pressure relief valve:** Protects the hydraulic system from overpressure and open for bypass when the hydraulic pump running without back pressure. It is set to open at **190 Bar**; furthermore, it opens at a pilot pressure at **port 3**.
10. **Valve block:** Used for mounting **Pos 9, 11, 12** and **21**.
11. **Cartridge valve:** Together with **Pos 21** it ensures a smooth switching on **Pos 9** and **12**.
12. **Accumulator valve:** It releases **port 3** on **Pos 9** when the pressure at the P-line reaches the maximum working pressure (**160 Bar**). This ensures free passages directly to the tank though **Pos. 9**, so the hydraulic pump is running bypass until the pressure at the P-line drops again.
13. **Needle valve:** Used for depressurization during repair and maintenance of the hydraulic system, as well for venting when start-up the hydraulic system.
14. **Manometer valve:** Used when replacing the manometer.
15. **Manometer:** Displays the current pressure at the P-line.
16. **Blind plug:** Prepared for X-MAP or pressostat.
17. **Throttle/check valve:** Protects **Pos 18** against sudden pressure variations. It is usually set between **3** and **4** on the scale.
18. **Accumulator (large):** Stores energy so the hydraulic pump can run bypass when the hydraulic system is not or only minimally operated. The accumulator is pre-charged with nitrogen to **90 Bar**. It does not function if working with a lower hydraulic pressure than **90 Bar**.
19. **Mounting block:** Used for mounting **Pos 14, 15, 16, 17** and **18**.
20. **Cover for oil tank:** Used for mounting hydraulic pumps, valve block, mounting block etc.

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21. **Accumulator (small):** Together with **Pos 11** it ensures a smooth switching on **Pos 9** and **12**. The accumulator is pre-charged to **130 Bar** with nitrogen. It does not function if working with a lower hydraulic pressure than **130 Bar**.
22. **Drain valve:** Used for draining of hydraulic oil.
23. **Control box:** Contains the hydraulic stations electrical components, controls etc.
24. **Filter element:** Ensures that the return oil from the hydraulic system is clean.
25. **Oil cooler (optional):** Cools the hydraulic oil if the oil temperature becomes too high.

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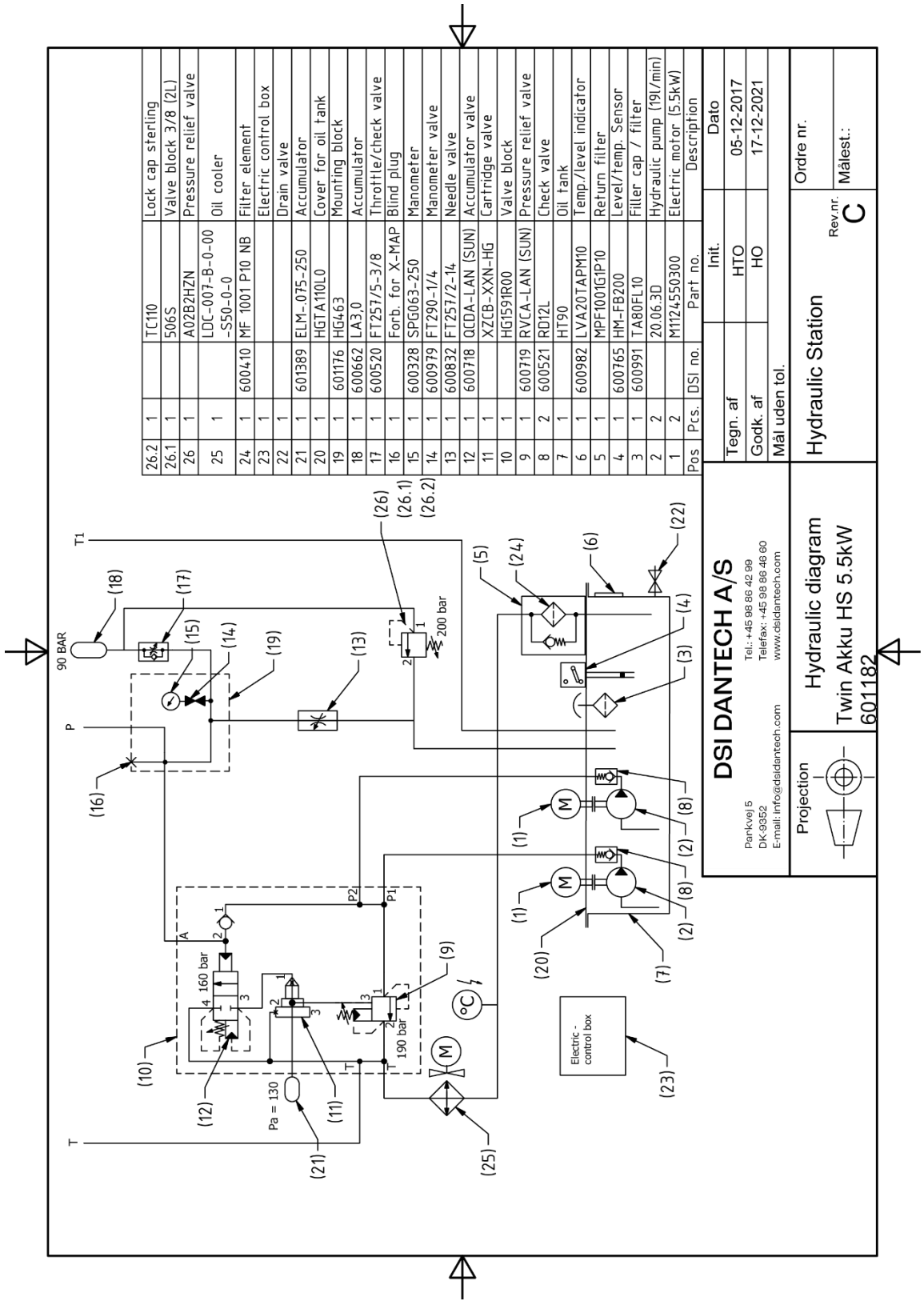
1.5 Hydraulic diagram



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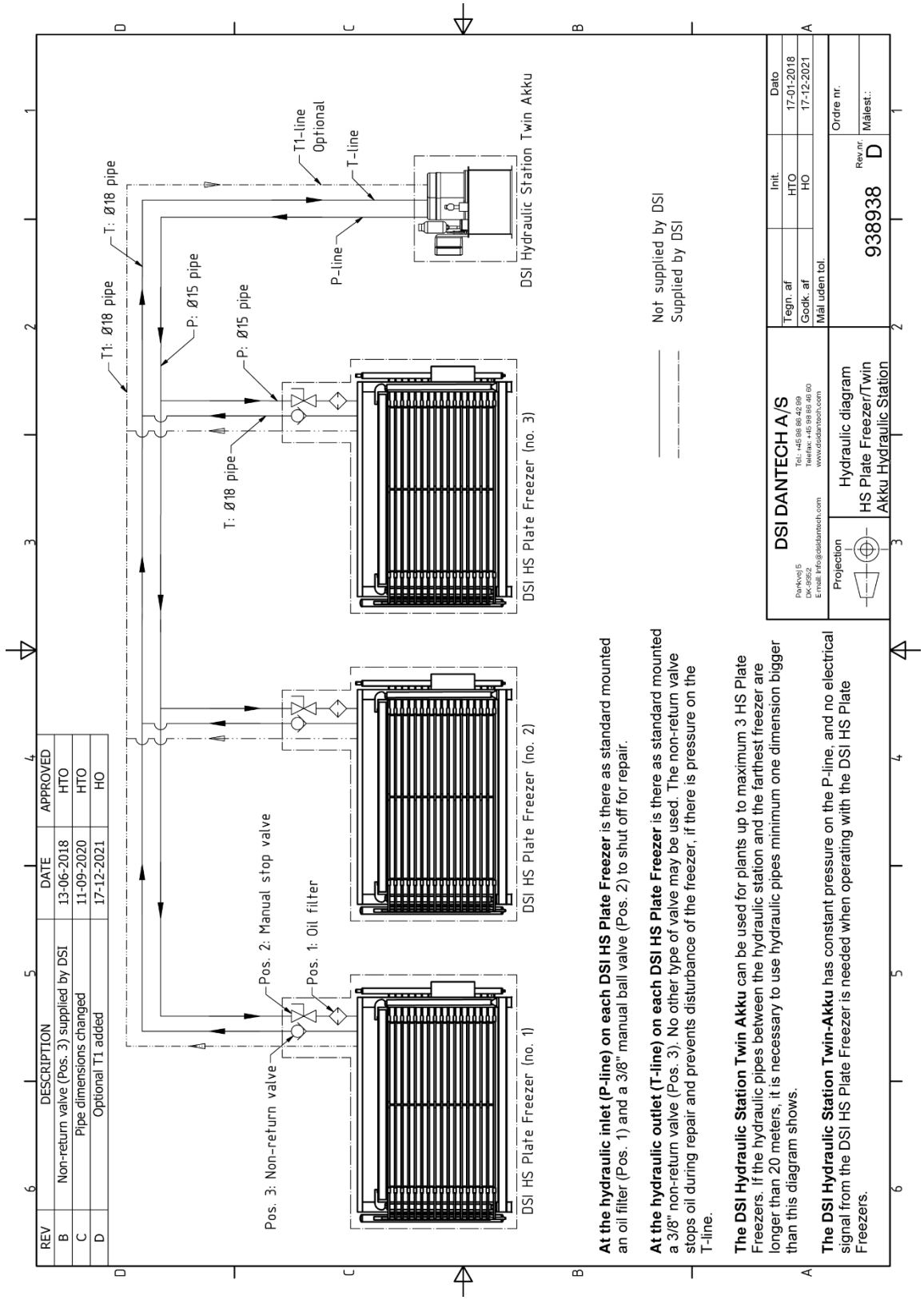
1.6 General hydraulic pipe diagram



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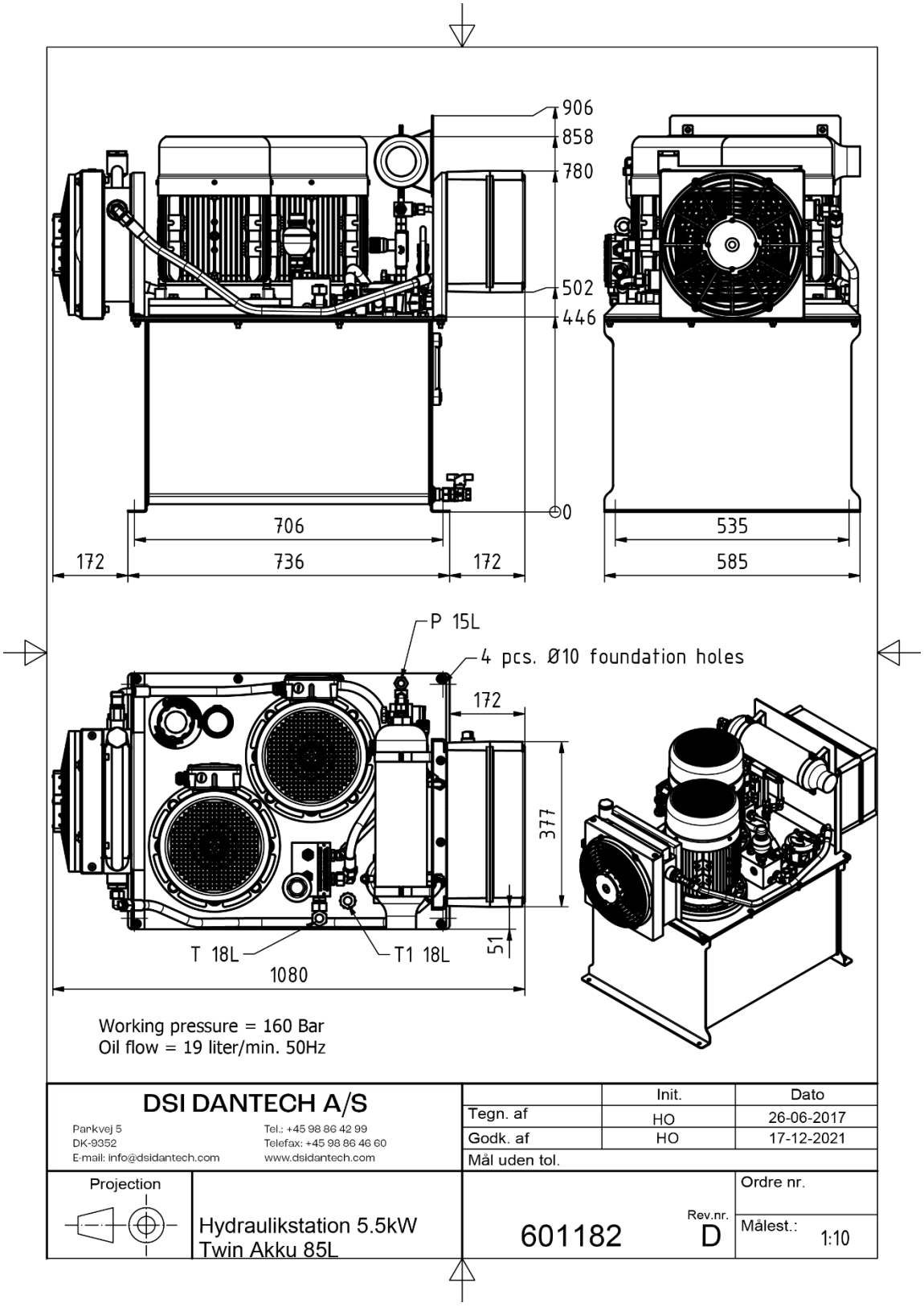
1.7 Dimension drawing



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2. GENERAL SAFETY INFORMATION

2.1 Approvals

The **DSI-Twin Accu 5.5kW** hydraulic station is manufactured according to **DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery and amending Directive 95/16/EC (recast)**.

The **DSI-Twin Accu 5.5kW** hydraulic station must be considered as a partial machine according to the Machinery Directive.

! Warning !

Before using the entire machine which the hydraulic station is a part of, it must be ensured that it is made in accordance with the Machinery Directive.

2.2 Electrical safety

! Warning !

The hydraulic station may be connected to high voltage. Protection panels etc. may only be removed by qualified staff; there is a risk of electric shock.

2.3 Operator safety

! Warning !

If hydraulic components are installed near people, there has to has to be mounted protection covers against oils splashes, in case that hydraulic hoses are bursting etc. which can be extremely dangerous.

Important: Pay attention to, and always repeat the local safety procedures for hydraulically moveable parts. All new operators must be instructed by the local security staff before they are allowed to operate the hydraulic station.

Note: All protection panels must be mounted correctly before the hydraulic station is operated.

2.4 Accumulator

! Warning !

The hydraulic station contains a pressurized accumulator which is charged with nitrogen. A pressurized accumulator must under no circumstances be changed during machining, welding or otherwise.

Hydraulic stations with pressurized accumulators may only be maintained by qualified staff, and the pressure must always be relieved before maintenance may begin.

Note: It requires special equipment to pre-charge an accumulator with nitrogen.

Important: Hydraulic systems with accumulators must always be marked with: **"Warning – The system contains accumulators"**.

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2.5 Noise level

The equivalent continuous A-weighted sound pressure level measured at the hydraulic station during operation is **75 dB(A)** +3/-2 dB, but maximum 77 dB (C).

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3. INSTALLATION GUIDE

3.1 General

! Warning !

Installation of the hydraulic station must be done in accordance with applicable standards and must only be performed by qualified engineers.

Always check the hydraulic station for transport damage before installation.

> ***Important:*** Always read the entire user manual before starting the installation; especially pay attention on the sections regarding safety.

3.2 Placement of the hydraulic station

The hydraulic station must always be installed indoor in a clean and dry environment. The room temperature must be between 10° and 20° C. The hydraulic station must always be equipped with an oil cooler if it must supply more than 1 freezer.

> ***Important:*** The hydraulic station must always be fastened to the floor or deck, in order to avoid random forces being transferred to the external installation; hydraulic pipes and electric cables etc.

Be aware that there is enough space around the hydraulic station for cleaning as well as maintenance and repair.

> ***Note:*** The hydraulic stations electric motor is designed to operate in ambient temperatures between minus 15° – to plus 45° C.

3.3 Connection the electrical system

! Warning !

The Electrical installations must only be carried out by a qualified electrician.

> ***Important:*** A repair switch must be inserted between the electrical supply and the hydraulic station.
>
> ***Note:*** The electrical installation at the hydraulic station can be customized to the customer special wishes and needs. The electrical diagram of the hydraulic station can be obtained from DSI, by informing the plate freezers serial numbers that the hydraulic station supplies.

Always check when installing the hydraulic station that the connection requirements for the hydraulic stations electrical motor correspond with the power supply to which the hydraulic station must be connected too.

3.4 Connecting the hydraulic system

! Warning !

Persons who install the hydraulic station are recommended to be skilled hydraulic engineer or to have other relevant education or training.

The hydraulic station is from the factory ready for operation. This means that it is adjusted to operate with correct hydraulic pressure.

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- The P-line connection on the hydraulic station is 1/2” RG internal.
- The T-line connection on the hydraulic station is equipped with a union nut and cutting ring for Ø15mm pipe.
- For pipelines up to 20 meters must Ø15x1,5mm pipe for P-line and Ø18x1,5mm pipe for T-line be used. For long main pipes dimensions must be determined taking into consideration of pressure drop.
- If there are more than 20 meters between the freezers and the hydraulic station, pipes in minimum a size larger must always be used.
- On the freezers P-line a ball valve is mounted as standard, so it can be disconnected for repairs etc.
- On the freezers T-line a check valve is mounted as standard. This prevents backflow of hydraulic oil from other freezers in the hydraulic system. No other type of valve may be used for this purpose.
- It is strongly recommend using stainless steel pipes for the installation.
- If it is wanted to have a lower pressure on the freezers than the pressure that the hydraulic station supplies, there must be mounted a pressure-reducing valve on the P-line just before the freezers. Contact DSI for further information.

3.5 Filling hydraulic oil

Before filling hydraulic oil, the hydraulic station and all connections must be totally clean. At the same time ensure that all dust caps, filters, etc. that had been removed during the installation, are correctly fitted again.

Important: To ensure the cleanliness of the hydraulic oil being filled on the hydraulic station, it is recommended to fill it through a filter unit with a nominal filtration of 10 micron.

3.6 Recommended hydraulic oil

! Warning !

There are completely specific requirements for the hydraulic oil at the facility which includes the hydraulic station, and therefore must only the type of hydraulic oil that the facility is delivered with be used.

Note: The type of hydraulic oil for the facility is described on the sign at the filler cap. If it is wanted to use another type of hydraulic oil, it must always be done in consultation with DSI.

Important: By using the wrong hydraulic oil, serious malfunction of the hydraulic system can occur, and in worst cases it can lead into increased wear or damage to the hydraulic components.

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4. START-UP AFTER INSTALLATION

! Warning !

Start-up the hydraulic station should only be carried out by persons who have knowledge of hydraulic equipment.

4.1 General

Check that all joints in the hydraulic system is correctly mounted and tightened before starting up.

4.2 Cleaning before start-up

Always make sure that the hydraulic station is clean and free from foreign objects before start-up.

4.3 Check the electrical installation

Always check before starting that the electrical installation is carried out in accordance with the electrical diagram and the voltage on the electric motor and electric valves are in accordance with the specifications.

4.4 Check the hydraulic installation

Always check before starting that the hydraulic installation is carried out in accordance with the hydraulic diagram.

4.5 Check the direction of rotation for the hydraulic pump

! Warning !

The tank must always be filled with hydraulic oil before the direction of rotation is checked otherwise the pump may be damaged.

At the hydraulic pump and the electrical motor is there an arrow that shows the direction of rotation. The hydraulic station must be started shortly and the direction of rotation checked. If the direction is wrong the pump does not work.

4.6 Flushing the hydraulic system

Before starting it is important that all pipes in the facility is flushed thoroughly for avoiding impurities in the hydraulic system. This is best done by disconnecting hydraulic blocks, cylinders, etc. and instead connects hoses whereby the oil can pass by these without pressure. The flushing should take place for at least 2 hours, and subsequently all filters must be replaced.

Note: It is recommended to change the direction of the flow several times during the flushing.

4.7 Venting the hydraulic system

It is important that the hydraulic system is vented before it is used, otherwise it may cause unintentional movements of e.g., cylinders etc.

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Note: If the hydraulic system is not vented properly, the commissioning of the system can be very difficult afterwards.

Important: The oil level at the hydraulic station must regularly be checked during the venting. If necessary, top-up with more hydraulic oil.

4.8 Check the oil level

Always check that there is the correct amount of the recommended hydraulic oil before starting the hydraulic station. The tank must be filled to the top level of the oil level indicator.

Note: The freezers must always be in closed position when checking the oil level.

Important: Lack of hydraulic oil can damage the hydraulic pump.

4.9 Check the hydraulic pump pressure

Always check during start-up that the manometer shows 160 Bar.

Important: If pump pressure is higher than 160 Bar, there will be an unnecessary wear on the hydraulic pump as well as higher energy consumption.

4.10 Function control

Check that all directional valves have the correct function and voltage.

Check that all flow control valves are adjusted to the correct speed.

Check that all pressure relief valves, pressure reduction valves and sequence valves are adjusted to the correct pressure.

4.11 Check the temperature

In connection with the start-up and commissioning, the temperature of the system must be checked. This is done by letting the plant run 6-8 hours under normal operating conditions, and then check the temperature of the hydraulic oil, coils, hydraulic pump, electric motor etc.

Note: The recommended operation temperature of the hydraulic oil is 40° to 50° C.

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5. OPERATING THE HYDRAULIC STATION

5.1 Work area for the operator

! Warning !

Moving parts such as hydraulic motors, cylinders, actuators etc., must be secured and covered with protection panels so there can be no personal contact that can cause any personal injury.

Important: Always keep the work area clean and free from foreign objects. Pay special attention to tools that are left behind.

5.2 Check the hydraulic station

Check regularly during operation that the hydraulic stations oil pressure and oil level is correct, and that the temperature of the hydraulic oil, electric motors, pumps etc. are normal.

5.3 Check the hydraulic system

Check regularly during operation the entire hydraulic systems pipelines, hoses etc. for leakages, fixing and wear.

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6. MAINTENANCE

6.1 50-hour inspection

After the first 50 hours of operation, carry out the following:

Inspect all hydraulic components and connections as well as all bolt and screw connections, tighten if required.

All filter elements in the hydraulic system must be replaced.

6.2 General maintenance

Maintenance of the hydraulic station is important in order to avoid breakdowns. Routinely maintenance should be done on basis of operation hours or at fixed intervals. The need for maintenance varies all from the use of and the environment around the hydraulic station and the design of the plant. Routinely inspection and maintenance of the hydraulic station should be done with short intervals, which usually can be done during operation. Depending on the use major overhauls of the hydraulic station should be done with 1-5 years intervals.

Important: By disassembling the hydraulic station it is important that the plant is cleaned before starting, in order to ensure no impurities comes in the hydraulic system.

It is recommended that data as spare parts, operating conditions, date, etc. systematically is registered during maintenance.

6.3 Annual maintenance

- Clean the Hydraulic station thoroughly according to the section about **"Cleaning the hydraulic station"**.
- Check all hose and pipe connections for leaks and corrosion.
- Change the hydraulic oil or take a sample for analysis. See the section **"Filling hydraulic oil"**.

Important: Use only the recommended hydraulic oil. Be careful not to contaminate the hydraulic system when filling.

6.4 Filters

All filter elements must be replaced after the first 50 operating hours after start-up the plant. The same applies if major repairs or rebuilding is carried out at the plant.

Subsequently the filter elements should be changed at intervals which are very dependent on the operation conditions. A normal interval is typical 500 operation hours.

Important: The plant must be stopped and depressurized when replacing filter elements. Besides that, no other precautions are required.

Note: Used filter elements must be disposed according to the local environmental regulations.

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6.5 Hydraulic oil

The oil level at the hydraulic station must regularly be checked. If any loss of oil occurs during operation, the cause must be found and eliminated.

> ***Important:*** To ensure the cleanliness of the hydraulic oil being filled on the hydraulic station, it is recommended to fill it through a filter unit with a nominal filtration of 10 micron.

6.6 Hydraulic pumps

Hydraulic pumps in operation are checked by measuring the operation temperature. By abnormally high operating temperature, the hydraulic pump must be inspected and possibly repaired.

Breakdown of the hydraulic pump can also be prevented by regularly checking the hydraulic pumps noise level, vibrations etc.

6.7 Pressure relief valves (on the plate freezer)

Pressure relief valves at the plate freezer are usually checked for tightness. This is done by registering the temperature at the pressure relief valves outlet side. At a pressure relief valve that normally must be closed, the pipe must be cold. The reason of leakage at the pressure relief valves can also be a wrong setting pressure on the valve.

> ***Important:*** Adjustment screws must always be locked probably, to avoid the pressure is changing due vibrations etc.

6.8 Directional valves (on the plate freezer)

Directional valves on the plate freezer must be checked if unintended movement of cylinders etc. occurs. The reason for this can be caused by leakage or impurities in the directional valves. If there is excessive leakage at the directional valves of the plate freezer, it may result in a too fast pressure drop at the hydraulic station, which leads to increased wear and tear and a higher energy consumption.

> ***Important:*** Directional valves with solenoids may breakdown if there are impurities in the directional valve and the slides cannot switch completely.

6.9 Accumulators

! Warning !

Hydraulic stations with accumulators must only be maintenance by qualified staff. Accumulators may never be dismounted before the pressure is completely relieved on both the oil- and the nitrogen side.

The accumulators pre-charging pressure must be checked regularly. This is done by confine the oil into the accumulator by closing all valves and stopping the hydraulic pump. Then open the relief valve at the accumulator slowly while observing the manometer. In the same moment the accumulator is totally empty, the pressure drops to 0 Bar immediately. In the moment just before the manometer drops to 0 Bar, it shows the accumulators pre-charging pressure.

> ***Note:*** The accumulators pre-charging pressure is shown on the accumulators.
>
> ***Important:*** If the accumulators pre-charging pressure is decreased, it must be refilled with nitrogen.

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6.10 Pipes and hoses

All pipelines, hoses and connections in the hydraulic system must regularly be checked for leakage, fixation, wear etc.

6.11 Cleaning the hydraulic station

! Warning !

Since electrical and hydraulic components are vulnerable to direct water spraying, this must be avoided.

The hydraulic station is best cleaned using dry and clean rags.

Protection guards for hydraulic and electrical installations should never be removed during normal cleaning.

> ***Important:*** Power should always be switched off, if the protection guards for the electrical components are removed.

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7. REPAIRING THE HYDRAULIC STATION

! Warning !

Repair of the hydraulic station requires qualified staff, as it requires knowledge of both hydraulic and electrical installations.

Repair of the hydraulic station must always be done according to the local safety regulations which are applicable for hydraulic and electrical installations. Always make sure that all mechanical and hydraulic movements are in “rest position”, and the hydraulic system is without pressure before starting the work, in order to prevent accidents and oil leakage if the hydraulic system being dismounted.

> ***Important:*** Power must always be switched off if protection guards for electrical components are removed.

Be aware that there is an increased risk for personal injury when the protection guards for hydraulic and electric installations are removed.

7.1 Repairing the electrical system

! Warning !

Repair of the electrical system must only be performed by an authorized electrician. Also see the section about “Connecting the electrical system”.

7.2 Repairing the hydraulic system

! Warning !

Repair of the hydraulic system must always be carried out by qualified staff, to ensure the parts or components which are dismounted or replaced are being properly connected.

Always check that all parts that have been dismounted or are being replaced are mounted and fastened properly again before generating pressure on the hydraulic system.

7.3 Troubleshooting

Review below points in the following order, during troubleshooting on the hydraulic station and the hydraulic system.

1. Check that the manometer valve **Pos. 14** is open, so the correct pressure is displayed at the manometer.
2. Check that the needle valve **Pos. 13** for de-pressurization the hydraulic system is closed.
3. Check that the throttle/check valve **Pos. 17** below the accumulator is set between **3** and **4** on the scale.
4. If the hydraulic pump is trying to build up pressure, without changing to by-pass, it will use unnecessary energy and the oil will be hot. When the hydraulic oil reaches 70° C, will the level/temperature sensor **Pos. 4** shut off the hydraulic pump.

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There might be several reasons for the error, but typical it is a pressure relief valve at the plate freezer that the hydraulic station supplies that is adjusted too low. The error can be localized by closing the stop valve on the P-line between the hydraulic station and the plate freezer, and then determine whether the hydraulic pump change to by-pass.
If the hydraulic pump switches to by-pass, the error is not on the hydraulic station. It will therefore typical be a pressure relief valve on the plate freezer that is the reason to the error. In this case the hydraulic pipes to the plate freezer will be warm. Normally it will be possible to hear if there is a flow of oil through a pressure relief valve.
If there are more units connect to the hydraulic station, the stop valve at the P-line must be closed on each unit. Subsequently open one stop valve at the time to locate which unit is causing the error.
The problem can be solved by screwing the adjusting screw at the unit's pressure relief valve until it can be heard that the oil flow stops. Typically, a half round on the adjusting screw is enough. Alternatively, the adjustment can be done as described in point 6.e.

5. Errors on the hydraulic station can also be caused by impurities in the valve blocks valves. The problem can be solved by relieving the hydraulic pressure at the system by open the needle valve **Pos. 13**, whereby each valve is dismounted, cleaned with compressed air and remounted.
6. Are there still errors on the hydraulic station, the cause could be that the valves are not adjusted correct. Therefore, it might be necessary to calibrate the setting of the valves. This is done in the following way.
    a. To ensure that there is no oil consumption all stop valves at the P-line between the hydraulic station and the hydraulic systems units must be closed.
    b. Adjust the pressure up on the accumulator valve **Pos. 12**, until the manometer shows **190 Bar**. This does that the pressure relief valve opens, and then turn the accumulator valves adjusting screw a half round more to ensure it comes over **190 Bar**.
    c. If the manometer does not show **190 Bar**, the pressure relief valve **Pos. 9** must be adjusted. If the pressure must be reduced, it is necessary to use the needle valve **Pos. 13** at the same time, to ensure the manometer shows the correct pressure.
    d. The accumulator valve **Pos. 12** must be adjusted to **160 Bar**. This is done by screwing the adjusting screw out until the feeling is that it is under **160 Bar**. Then relieve the hydraulic pressure by opening the needle valve **Pos. 13**. Subsequently

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tighten the adjusting screw on the accumulator valve until the manometer shows **160 Bar**.

e. It is also possible to adjust the pressure relief valves on the units that are connected to the hydraulic station, by open the stop valve at the P-line to the chosen unit, an then afterwards adjust it to the desired pressure. This must always be done before point d. is made.

7.4 Maintenance plan

Maintenance	Daily	After 50 hours	Each month	Each year	As needed
Inspect the hydraulic system for leaks	X				
Changing all hydraulic filters		X			
Check hydraulic hoses for damage and wear		X			
Check cables, connectors etc. for damage and wear		X			
Retighten hydraulic joints		X			
Check hydraulic hoses for damage and wear			X		
Check cables, connectors etc. for damage and wear			X		
Changing all hydraulic filters				X	
Analysis of hydraulic oil				X	
Retighten hydraulic joints				X	
Changing the hydraulic oil					X

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8. DISASSEMBLY

1. Make sure that the hydraulic system is without pressure, to prevent accidents or oil leakage when the pipe system being dismounted. All stop valves must be closed, and the electrical power must be switched off.
2. If the hydraulic station must be stored, all pipe connections must be tightly closed. It is important that the hydraulic station is stored in a dry place.
3. If the hydraulic station is to be scrapped, it must be done in accordance with the applicable environmental rules. It is important always to empty it from hydraulic oil etc., which must be stored or destroyed securely.

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9. ORDERING SPARE PARTS

To ensure that your order for spare parts is handled without delay, please provide us with the following details:

1. **Machine number (name plate on freezer)**
2. **Spare part position number and description from the spare part list**
3. **Number of units**
4. **Number of stations on the freezer**

Please order your spare parts here:

After sales: info@dsidantech.com

Phone: +45 2115 4299

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