



· PROJECT: AVANTE 2200
· SHIPYARD: NAVANTIA S.A.
· SYSTEM: HVAC



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Navantia

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UNIT COOLERS

REF.: D-MO5462-002

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SAFETY WARNING

***Before carrying out any operation on the machine, please read this installation and operation manual carefully.
Installation and maintenance must be carried out only by qualified personnel that is familiar with the provisions of law and local regulations and has been trained properly or has experience with this type of equipment.***

SAFETY WARNING

Avoid installing the machine in a place that could be dangerous during maintenance operations, such as (but not only) platforms without railings or areas not complying with the clearance requirements.



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1. Material specification

Unit part	Material
Basic casing with insulation	External painted sheet steel, insulated.
Cooling coil	Copper tube / aluminium fins
Single-speed motor	Various material
Fan with housing	Galvanised sheet steel
Main drip pan	Stainless steel, insulated
Filter element	Filter fleece, synthetic

Note: for “standar models” armaxflex type or similar insulation is used. For “silent” units acousting rockwool type insulation is used

Table 1-1 Material specification on the unit parts

2. Transport and hoisting

2.1 Safety prescriptions

In this section, general safety prescriptions are indicated for carrying out transport operations of the equipment. Other safety prescriptions are indicated in different sections of this document.

DANGER DUE TO OVERHEAD LOADS!



- It is extremely dangerous to stand under overhead loads.
- Make sure that no-one is standing under an overhead load!

DAMAGE TO THE UNIT!



- Improper transport can cause damage to the unit cooler.
- If damage has been caused by impacts to the unit or by dropping it, carefully check that the unit cooler is working correctly.
- Take care when transporting the unit!

2.2 Scope of delivery

As soon as the unit has been delivered, remove the packaging and check the unit for any damage caused in transit (if so, submit a complaint to the carrier), and check that the shipment is complete and correct. To do so, compare the details of the unit nameplate with the details on the delivery note.

This also applies to all accessories. Missing parts or damage in transit can only be claimed against the transport insurance if the damage has been confirmed by the carrier.



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2.3 Packaging

The unit is shipped on pallets and packaged in shrink wrap the protective cap on the unit discharge port should only be removed when the unit is installed.

2.4 Transport – Hoisting instructions

DAMAGE TO UNIT AND PERSONAL INJURY!



- Use protective gloves to avoid injury due to sharp edges.
- Ensure that at least two people carry the unit to avoid injury.
- In the case of palletized deliveries, use only lifting and transport vehicles with sufficient carrying capacity.
- Secure the load during transit to prevent it from tipping or falling

2.5 Preservation method

When storing the unit for a temporary period, the following points must be noted:

- Store the unit in its original packaging.
- The storage location must be protected from the elements, dry and free of dust.

DAMAGE TO THE UNIT!



- Any residual water must be removed from the heat exchanger! Frost risk!
- The unit must be protected from impacts, vibrations etc.

2.6 Disposal

RECYCLING

Ensure that operating supplies, packaging and replacement parts are disposed of in a safe and environmentally friendly manner. Use any available local recycling facilities and observe recycling regulations.

During disposal, the parts of the units should be separated as far is possible and sorted by material type.

3. Installation



DANGER FROM ELECTRICAL CURRENT!

Ensure that the intended drilling area is free from electrical cables or pipes before drilling.



PERSONAL INJURY!

There is a risk of accidents due to parts dropping down. When installing the unit, wear a helmet, safety footwear and protective gloves. Installations should always be performed at least by two people.

NOTE:

You must ensure that no mechanical deformation or twisting occurs during installation of all models in all installation locations.

3.1 Installation location

This paragraph gives the conditions under which the units may be stored:

The type, condition and ambient temperature of the installation location must be suitable for the unit in question.

Observe the following points:

- Only install the unit in enclosed spaces.
- Ceiling or mounting systems must be capable of bearing the weight of the unit, including any accessories.
- Ensure that suitable fixings (screws, plugs, etc.) are used which correspond.

3.2 Unit installation



DAMAGE TO THE UNIT!

The installation must provide for an unobstructed flow of air to and from the unit during subsequent operation.

- Make sure that there is sufficient room for the valve installation.
- Attach the unit with screw connections.
- Use a spirit level for precise vertical and horizontal alignment of the unit.
- Tighten the screws.

3.3 Connecting the chilled water

Before the on-site piping and the unit chilled water connection is set up, the chilled water system should be shut off and secured against being opened unintentionally.

Connection to the pipe system is made by the pipe contractor. Cooling coils must always be connected in counter flow (supply and discharge pipes are marked) and so that the expansibility or own weight of the pipe system does not load the pipe connections of the coils. The connections of the cooling coils are designed as flanged pipes and so they must be secured to

avoid distortion and damage to the internal pipe system of the coil.

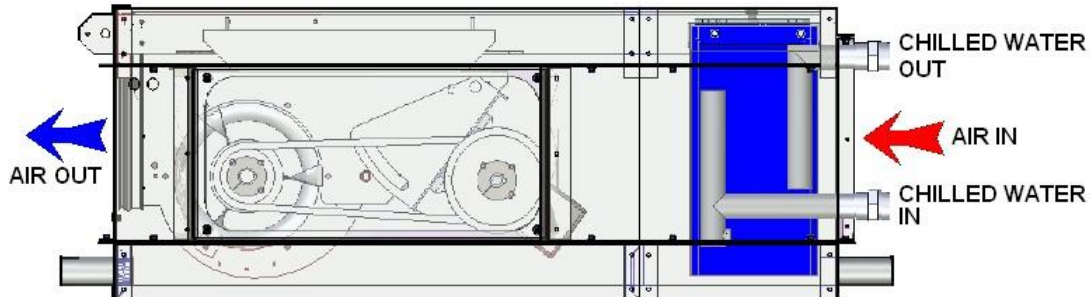


Figure 3.3-1 Chilled water connection

Cooling coils are provided with drip pan with drain through the base frame for condensate extended through the access side. Clean cooling coils by flushing with water, and drip pan as well as drain must be kept clean to avoid formation of algae.

All on-site pipes for the cooling medium must be insulated against condensate formation.

When all connections have been completed, all screw connections should be tightened and checked that they are free of mechanical stress.



DAMAGE TO THE UNIT!

During fitting, the connection nut on the cooling coil should be countered using a suitable tool.

- At the beginning of the fitting procedure, remove the covers of the water inlet and outlet pipes.
- Fit the connections, ensuring they are free of mechanical stress.
- Make sure that there is sufficient room for the valve installation.
- Lead the pipes off at a right angle to the side or to the rear.
- Seal the connections.
- Screw on the connections.

3.4 Connecting the condensate drain

In order for the condensate to be drained off properly, the condensate drain by others must be connected to the drip pan.

- Connect a hose or a copper pipe on to the appropriate drip pan connector and seal it.
- When connecting the condensate drain to the wastewater system, observe the wastewater regulations.

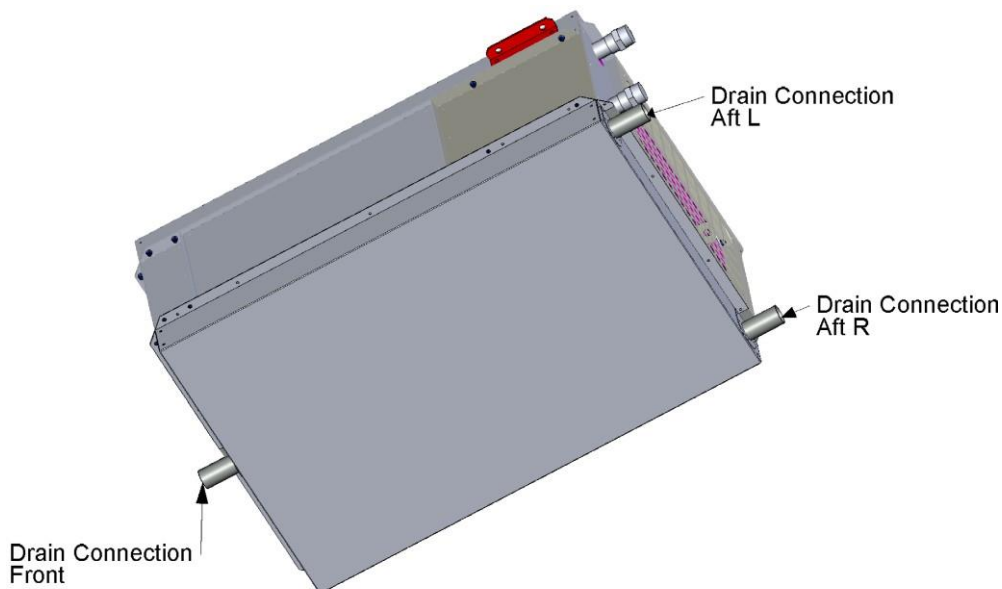


Figure 3.4-1 Drain connections

This must drain freely into a drain via a water trap with a sufficient liquid head under the bottom of the casing. The height of the head must be greater than the partial vacuum prevailing at the cooling coil. The water trap must be filled with water before the equipment is put into operation. Water trap with closing ball can be also used. Check this water level regularly, particularly when the cooling operation starts.

3.5 Electrical connection



DANGER FROM ELECTRICAL CURRENT!

The electrical installation of the unit cooler unit must only be carried out by qualified electricians in observance of these operation manual and the regulations in force:

- National or local regulations, including safety regulations.
- Accident prevention regulations.
- Installation instructions.

The unit is supplied with a terminal box and the box contains a terminal strip.

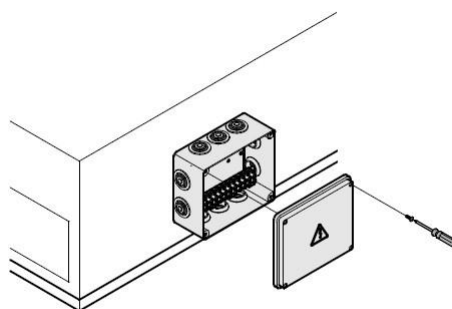


Figure 3.5-1 Opening the terminal box

4. Commissioning

DANGER FROM ELECTRICAL CURRENT!



Before performing any work on the unit, ensure that it is powered down. Ensure that the unit is secured against being switched back on at an appropriate point of the on-site power supply.

DANGER FROM ROTATING UNIT PARTS!



Rotating fan wheels can cause injury! Before performing any work on the unit, ensure that it is powered down. Ensure that the unit is secured against being switched back on at an appropriate point of the on-site power supply.

4.1 Safety inspection

Before commissioning, ensure that the following conditions are true:

- The entire system of which this unit is part has been installed both mechanically and electrically.
- The system, and thus this unit, is powered down.
- All medium pipes have been rinsed and are free from residues and foreign bodies.
- The system is properly filled with the correct chilled water.
- The filter is clean.

4.2 Checking the unit

The following checks should be made before commissioning:

- Check that the unit has been properly mounted (ceiling fixings).
- Check that all connections on the water side and on the air side are properly sealed.
- Tighten all screw connections of the coil connections.
- Check all electrical connections and check the terminal strip screws for tightness.
- Remove the protective cover from the air outlet of the unit (already possibly removed during installation of ducting or accessories).
- Check that any devices used to secure the equipment in transit have been removed from vibration absorbers, batteries, etc.
- Check that the belt transmission is still properly aligned and that belts are correctly tensioned. It must be possible to turn belt a quarter turn between the thumb and index finger.
- Make sure there is no rubbish left in the fan and that the impeller turns freely.
- Check whether the shut-off valves if any, is open.
- Any valves fitted on site should be checked in accordance with the manufacturer's guidelines.
- Check that the connection of the drip pan is laid such that the condensate water can drain away without obstruction. You should ensure that the pipe is laid at a suitable incline and the siphon is installed.

4.3 Switch on unit

DANGER FROM ELECTRICAL CURRENT!



The electrical control box (terminal box) is open.
 Direct interventions in the electrical terminal box are not permitted!
 Before finishing with the unit, ensure that the electrical terminal box is properly closed.

- Switch the supply voltage on.



5. Troubleshooting

Deviations from normal operating states of the unit cooler units are evidence of malfunctions and must be investigated by maintenance personnel.

The following table should serve as a starting point for maintenance personnel regarding possible causes of trouble and their correction:

Fault	Possible cause of fault	Remedy
Fan does not work	Unit not switched on	Switch on unit
	No electrical voltage	Check fuse/power supply (technical personnel only)
	Electrical cables not connected	Connect electrical cables (technical personnel only)
	Protection defective	Replace protection device (technical personnel only)
	Broken belt	Replace belt (technical personnel only)
Unit too noisy/ excessive vibration	Noisy fan bearings	Replace the faulty fan (technical personnel only)
	Pulley not aligned	Align pulleys
	Filter dirty	Clean/replace the filter
Unit does not cool/ cools insufficiently (chilled water)	Fan not switched on	Switch on the fan
	Air intake or discharge area blocked	Unobstruct or clean airways
	Fan blocked/faulty	Check fan, replace if necessary (technical personnel only);
	Filter dirty	Clean/replace the filter
	Cooling medium is not cold	Check chilled water system



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Fault	Possible cause of fault	Remedy
	Water flow rate too low	Check chilled water system
	Set point temperature too high	Check chilled water system
	Control valve does not open	Check chilled water system
Water leakage in unit area	Main drip pan drain blocked	Clean the main drip pan and the condensate drain
Water leakage in unit area	Drip pan drain blocked	Clean condensate drain and check for sufficient gradient, clean and fill the the water trap if necessary (performed by technical personal, if required)
	Chilled water pipes not (correctly) insulated	Insulate the chilled water pipes (performed by technical personal, if required)
	Unit not suspended horizontally	Align the unit and hang it horizontally (technical personnel only)
	Cooling coil or hydraulic connections leaking	Check the cooling coil, bleeding and valve connections for leaks. If necessary, retighten connections, clean screw insert or reseal the connections

Table 5-1 Causes of malfunction and possible remedies

If the malfunction cannot be remedied by the maintenance personnel, please consult FRIZONIA.



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6. Maintenance

The unit is a high-quality and reliable unit. However, to guarantee the permanent functioning and performance of the unit, regular maintenance and inspection by technical experts is necessary.

Maintenance must only be performed by trained technical personnel in observance of this operation manual and the regulations in force.



DANGER FROM ROTATING UNIT PARTS!

The rotating fan wheel poses a risk of injury!

Before performing any work on the unit, ensure that it is powered down. Ensure that the unit is secured against being switched back on at an appropriate point of the on-site power supply.



DANGER FROM ELECTRICAL CURRENT!

Power the unit down before undertaking any work that involves the unscrewing of covers. Ensure that the unit is secured against being switched back on at an appropriate point of the on-site power supply.

The warranty will be invalidated by damage which is attributable to the non-performance of regular essential inspections.

6.1 Preventive maintenance. The following maintenance tasks must be performed at the indicated time intervals.

Task	Frequency	Time estimate	Skill of personnel	Required special tools	Remarks
Observe fan/motor for noise and vibration	Quarterly	15 min.	Qualified Technician	None	
Visually inspect air filters				None	Replace filter as required
Check V-belt tension					Tighten only if required
Inspect fan, motor, belts pulleys, and motor vibration mounts	Half-yearly	30 min.	Qualified Technician	Spanner/ Screwdriver	Service only if required
Check the electrical connections				Screwdriver	Fasten when required
Visually inspect for corrosion of casing components	Annual	45 min.	Qualified Technician	None	
Inspect and clean coil				Brush	Clean only if required
Inspect and clean drain pan				Vacuum cleaner	Clean only if required

Table 6-1 Regular maintenance tasks

6.1.1 Quarterly maintenance

6.1.1.1. Check noise and vibration

The unit cooler should be observed during operation. There should be an observational inspection for any unusual noise or vibration emanating from the unit. Increased vibrations always constitute a warning signal. A squealing noise may point to a slipping belt that requires tightening.

6.1.1.2 Clean or replace the filter

To clean or replace the filter, proceed as follows:

- Release the screws on the inlet by turning them anticlockwise.
- Release the filter assembly from the casing guide rail upwards.
- Pull the inlet grid.
- Remove the filter material from the filter frame.
- Clean the filter material in lukewarm water with a mild detergent or replace it.



Do not use any solvents, aggressive cleaning agents or abrasives to clean the filter element!

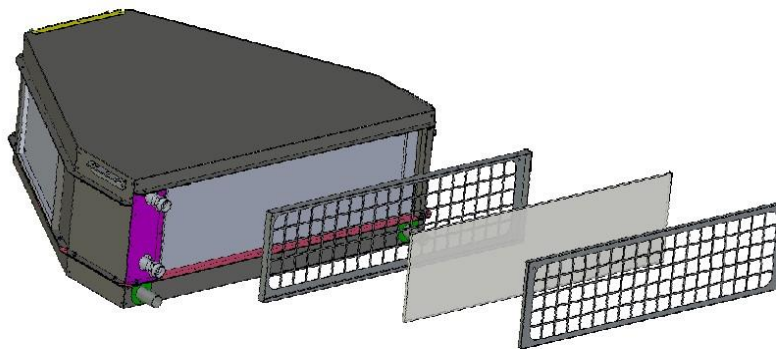


Figure 6.1-1 Removing the filter

- Replace the filter with the cleaned or new filter element by repeating the above sequence in reverse.

For best results, use a new filter element. A spare filter set can be ordered from FRIZONIA.

6.1.1.3 Check the V-belt tension.

The belts must be correctly tensioned to ensure good contact with the pulleys. If insufficiently tensioned, the belts may slip, and if excessively tensioned, the motor and fan bearings may be overloaded.



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6.1.1.4 Check the alignment of motor and fan pulleys.

Misalignment of the pulleys may cause:

- Noise and/or vibration.
- Wear on pulleys or V-belts.

To check the alignment of the pulleys, use a straight edge.

6.1.2 Half-yearly maintenance

6.1.2.1 Checking the fan

Open the inspection cover.

Check the fan wheel(s) for ease of movement by manually rotating the wheel.

Visually inspect the quality of the belt.

Visually inspect the pulley surfaces for any damages, cleanliness and free of grease

Remove dirt from the interior of the casing by vacuuming.

Remove dirt from the interior of the casing by vacuuming.

Close the inspection cover.

6.1.2.2 Checking the electrical connections



DANGER FROM ELECTRICAL CURRENT!

Before performing the following work, you must ensure that the unit is powered down and that the mains voltage is secured against being switched back on. Before finishing with the unit, ensure that the electrical terminal box is properly closed.

This paragraph gives a description of general maintenance tasks which must be performed during repairs or replacement of components.

Open the terminal box.

Check that all of the electrical connections are securely seated in the terminal strips.

Close the terminal box again.

6.1.3 Annual maintenance

On a yearly basis the coil and drain pan should be visually inspected for debris build-up, corrosion, leakage, and damages. The casing should also be inspected for corrosion and repaired/strengthened if required in extreme cases.

6.1.3.1 Inspect and clean coil

Disconnect power from unit.

Open inspection cover and remove filter.

Inspect and remove excessive dirt or debris as appropriate.



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Carefully inspect both sides of the coil. Also inspect coil and headers for dirt/debris, bent, damaged fins, damaged or distorted frame.

With chilled water running through the coil, check the coil for leakage at fins and headers.

If leaks are found, notify qualified technician to repair leak. If coil is leaking, or is damaged in other ways, it may need to be removed from the unit to be serviced or replaced.

If no leaks found, turn off chilled water supply

Remove any excessive dirt or debris on coil using bristle brush and mild soap and water solution and/or compressed air. Be careful not to push any dirt into the coil fins.

6.1.3.2 Inspect and clean drain pan

Inspect drain pan for any signs of dirt or debris accumulation, corrosion, leakage. Clean the drain pan.

Check the drain pan piping for any blockages or debris accumulation, clean as required.

If coil and drain pan are fine, proceed to close the inspection cover.

6.2 Corrective maintenance

6.2.1 Replacing pulley

- Remove the V-belt.
- Release the old pulley and fix the new one.
- Before installation, check that all components are undamaged.
- Refit the V-belt.

6.2.2 Replacing V-belts

- To change the belt, first move the motor towards the fan using the tensioning screw.
- Move the motor until the belt is slack and it can be removed without prising.
- Remove old belt, check it for unusual wear. Excessive wear may indicate with drive or maintenance procedure.
- Inspect pulley for wear or damage.



Always place V-belts carefully on pulleys, do not force them over the edge of the pulleys.

V-belts installed by force will often only work for a few weeks and then they will have to be replaced again!

- Install a new belt.
- Tension the V-belt.

6.2.3 Tensioning V-belts

- Loosen fixing bolt
- Adjust the belt tension by moving the motor using the tensioning screw.
- Rotate the drive by hand for a few revolutions until proper tension is obtained.



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6.2.4 Replacing fan

- Unbolt the drain pan.
- Remove the V-belts.
- Remove the pulley.
- Unbolts the four mounting bolts.
- Replace the faulty fan with the new one.
- Retighten the mounting bolts.
- Refit the pulley.
- Refit the V-belts.
- Tensioning the V-belts.

6.2.5 Replacing motor

- Unbolt the drain pan.
- Remove the V-belts.
- Remove the pulley.
- Unbolts the four mounting bolts.
- Replace the faulty motor with the new one.
- Retighten the mounting bolts.
- Refit the pulley.
- Refit the V-belts.
- Tensioning the V-belts.

7. Maintenance data record

7.1 General

For adequate maintenance management a data record should be maintained. A maintenance data record comprises:

- All inspections.
- All executed repairs and replacements of components.
- Particular events like:
 - Deviations from the normal management/operation.
 - Dangerous situations.

7.2 Periodical inspections

Records of periodical inspections could contain:

- What periodical inspections should be carried out.
- The executor who should carry out these inspections.
- The time interval between which the inspections should be carried out.
- Persons who should be informed about these inspections.



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7.3 Repair and maintenance

Repairs should only be carried out by skilled personnel and after permission of the management.

Each repair and case of maintenance should be recorded in the equipment maintenance data record sheet.

7.4 Replacement of components and revision of installation

Revisions and replacement of components of the refrigerating installation should be recorded in the equipment maintenance data record sheet.

7.5 Particular events

Faults, accidents, deviations of normal management and other particular events should be recorded in the equipment maintenance data record sheet.