



CLCF Climate Changer™ Air Handling Units



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TRANE
TECHNOLOGIES™

Confidential and proprietary Trane information
Original instructions

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General information

Foreword

These instructions are given as a guide to good practice in the installation, start-up, operation, and maintenance by the user, of Trane CLCF Air Handling Units. They do not contain full service procedures necessary for the continued successful operation of this equipment. The services of a qualified technician should be employed through the medium of a maintenance contract with a reputable service company.

Read this manual thoroughly before unit start-up.

Warnings and cautions

Warnings and Cautions appear at appropriate sections throughout this manual. Your personal safety and the proper operation of this machine require that you follow them carefully. The constructor assumes no liability for installations or servicing performed by unqualified personnel.

WARNING! : Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION! : Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices or for equipment or property-damage-only accidents.

The following pictograms can be found on the unit. Take necessary precautions to avoid damage and injury.

Warning pictograms



- 1 = Risk that unit is powered up
- 2 = Risk hazard due to fan rotation
- 3 = Risk hazard of burns on compressors or refrigeration piping
- 4 = Unit contains refrigerant gas. See specific warnings.
- 5 = Risk of residual voltage when speed drive or softstarter options are present
- 6 = Unit under pressure
- 7 = Risk to cut, particularly on heat exchanger fins
- 8 = Read instructions before installation
- 9 = Disconnect all electric power before servicing
- 10 = Read technical instructions
- 11 = Ensure that unit is properly grounded
- 12 = Water inlet
- 13 = Water outlet
- 14 = Inflammable dust-clogged filters

Important recommendations

To avoid death, injury, equipment or property damage, the following recommendations should be observed during equipment operation:

1. The units are suitable for ambient air temperature between -20°C and +50°C and for air flow temperature between -20°C and +40°C. Different conditions need written confirmation from the manufacturer.
2. The usual measure against frost in coils and protection against temperatures have to be secured by the user.
3. Components - Some OEM products have specific manufacturer's service instruction documents. These are delivered with the Air Handling Unit. In this case, the indications in the OEM manual are valid and the service handbook in hand has only general or complementary character for the relating components.
4. Liquid and gas storage -Maximum working pressure for all coils is 15bar. In case of coil connections to higher working pressures, any warranty relating to coil tightness and personnel safety is excluded.

General information

5. Tubing filled with mediums with very high or low working temperatures are to be insulated with suitable materials to avoid burn or scald injuries caused by contact.
6. As fire prevention, fire dampers are to be provided where ducts cross firebreaks. Local fire prevention code is to be observed carefully.

To avoid death, injury, equipment or property damage, the following recommendations should be observed during maintenance and service visits:

1. The maximum allowable pressures for system leak testing on low and high pressure side are given in the chapter "Installation". Always provide a pressure regulator.
2. Disconnect all power supply including other energy sources (gas, air, ...) before any servicing on the unit.
3. The Air Handling Unit control system must guarantee that in case of breakdown or power interruption during maintenance or repair work, the unforeseen start-up of a shut off unit is impossible.
4. Service work on the air handling unit and the electrical system should be carried out only by qualified and experienced personnel.
5. For inspection on the Air Handling Units and to avoid risks, the units surroundings are to be sufficiently lighted.
6. Any components which contain refrigerant shall be handled only by Authorized personnel. The refrigerant shall be always recovered before any intervention on such component or before the end of life of equipment. The recovered refrigerant shall be disposed accordingly.

Any component; chemical or full equipment replaced shall be sorted and disposed in accordance with the appropriate local regulations.

7. Where units are installed in areas with high temperature and/or high humidity, the risks of external condensation on the casing have to be considered, especially when the internal air stream temperature is relatively low. Please contact your local Trane sales office to evaluate the potential condensation risks.

Reception

On arrival, inspect the unit before signing the delivery note.

Reception in France only:

In case of visible damage: The consignee (or the site representative) must specify any damage on the delivery note, legibly sign and date the delivery note, and the truck driver must countersign it. The consignee (or the site representative) must notify Trane Epinal Operations - Claims team and send a copy of the delivery note. The customer (or the site representative) should send a registered letter to the last carrier within 3 days of delivery.

Note: for deliveries in France, even concealed damage must be looked for at delivery and immediately treated as visible damage.

Reception in all countries except France:

In case of concealed damage: The consignee (or the site representative) must send a registered letter to the last carrier within 7 days of delivery, claiming for the described damage. A copy of this letter must be sent to Trane Epinal Operations - Claims team.

Warranty

Warranty is based on the general terms and conditions of the manufacturer. The warranty is void if the equipment is repaired or modified without the written approval of the manufacturer, if the operating limits are exceeded or if the control system or the electrical wiring is modified. Damage due to misuse, lack of maintenance or failure to comply with the manufacturer's instructions or recommendations is not covered by the warranty obligation. Corrosion is not covered by the warranty obligations. If the user does not conform to the rules of this manual, it may entail cancellation of warranty and liabilities by the manufacturer. Electrical motors are factory-tested and properly run when leaving the factory. Any wiring faults on motors will cause damage for which Trane cannot be held responsible.

General information

Controls

Electrical connections may become un-tightened during transport. All electrical connections should be checked and re-tightened prior to commissioning. All electrical connections shall be made according to the wiring diagrams provided on the components or in provided documents. Warranty is not valid if electrical components are not connected properly.

When the unit use a medium (water/refrigerant) with a temperature below than +2°C, The unit controls should be designed in order to protect the exchanger against freezing. Trane cannot be held responsible for damages coming from freezing / de-freezing operation.

Electrical motors

Electrical motors are factory-tested and properly run when leaving the factory. Any wiring faults on motors will cause damage for which Trane cannot be held responsible.

Electric heaters

The warranty does not cover overheating due to wrong use or improper control of electric heaters.

Warranty conditions

Dismounting or changing the units and/or components without Trane approval or assistance will invalidate the warranty.

The Trane units have been manufactured according to the selections and drawings provided with the order: Trane cannot be held responsible for eventual non-compliance to original specifications or specific requirements outside the order.

In order to avoid fan motor overloading, the units shall be started with filters and other components fitted correctly, the ductwork connected to the units and the access doors closed.

Make sure the units work at design (air flow/pressure) conditions. The sound levels of the units can vary a lot depending of the fan speed, the filter conditions or the actual duct pressure drops. Also, the given sound levels can be highly affected by the installation method, the peripheral components, the ductwork and the acoustic characteristics of the building/room.

The units must be controlled in order to not exceed the max differential pressure drops on plate heat exchangers indicated in the technical data sheets.

Unit drainage

Drain traps: When the units have more than one drain trap, each drain shall be connected to the drainage system separately with siphon.

Thermal wheels

The air leakage rate between fresh air and return air streams on thermal wheels and plate heat exchanger can go up to consistent value, even more than 5%, under normal working conditions. The exact value depends on composition, fan static pressure and pressurization/under pressurization of each side of the recuperator. In case of critical application concerning contamination and/or air leakage, to avoid air bypass, the pressures on the fresh air side shall be higher than on the return air side. The recuperator efficiencies are given for counter flow configuration.

The operation and the efficiency of thermal wheels can be deteriorated when they are stopped for a too long period of time. The thermal wheels should be regularly inspected.

Large thermal wheels may be provided in several sections due to transport constraints. In this case, they need to be re-assembled on site by trained people or with Trane Assistance (recommended).

Casing

Structure is designed so that it will not suffer permanent alteration up to a positive pressure and negative pressure of 2000.

Maximum temperature for the CLCF casing is 50°C. (40°C inside temperature for standard fan motors).

Extreme outdoor condition and/or internal air temperature may cause sweating on profile /Thermal bridge. In case of extreme internal/outdoor conditions, contact Trane.



General information

Maintenance contract

It is strongly recommended that you sign a maintenance contract with your local Service Agency. This contract provides Trane regular maintenance of your installation by a specialist in our equipment. Regular maintenance ensures that any malfunction is detected and corrected in good time and minimizes the possibility that serious damage will occur. Finally, regular maintenance ensures the maximum operating life of your equipment. We would remind you that failure to respect these installation and maintenance instructions may result in immediate cancellation of the warranty.

Training

To assist you in obtaining the best use of it and maintaining it in perfect operating condition over along period of time, the manufacturer has at your disposal a refrigeration and air conditioning service school. The principal aim of this is to give operators and technicians a better knowledge of the equipment they are using, or that is under their charge. Emphasis is particularly given to the importance of periodic checks on the unit operating parameters as well as on preventive maintenance, which reduces the cost of owning the unit by avoiding serious and costly breakdown.

Installation

Off loading and handling

Trane units are supplied in section modules, or as a complete unit, in accordance with the relevant assembly drawings.

Any necessary use of force during unloading or movement of the units must only be applied via the unit base frame or the shipping pallet.

The unit unloading and handling can be carried out easily with the use of a forklift or crane.

Refer to submittal and order specification sheet, to have the appropriate data.

The forks must only be applied under the unit base frame and not against it.

Note: The lift point should be as near as possible to the centre of gravity. The centre of gravity of each section is located at the centre of the unit length, with the exception of the fan sections for which the centre of gravity is located towards the motors (see Figures 1 and 2).

CAUTION! All lifting lugs included in the base frame must be used when lifting procedures are performed.

CAUTION!

Do not stand on the units. If this is unavoidable ensure a more even weight distribution by the use of boards.

Use battens to prevent damage of the top and sides of the units.

Figure 1 – Crane operation procedure

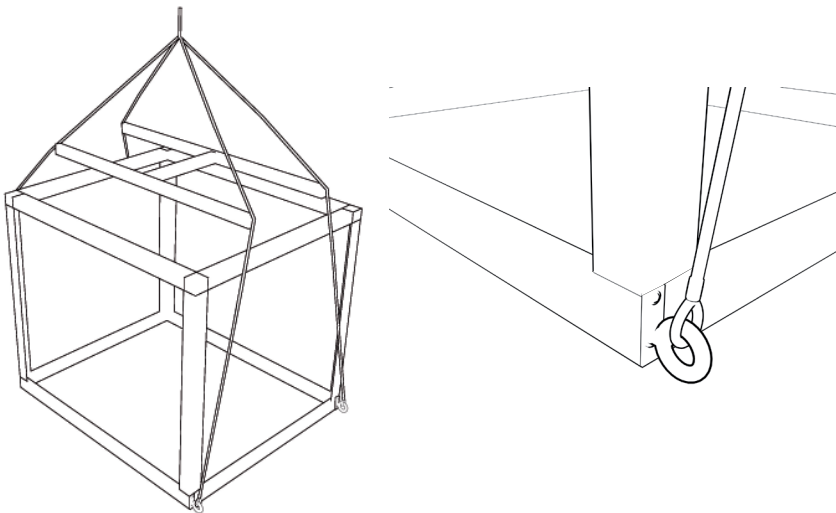
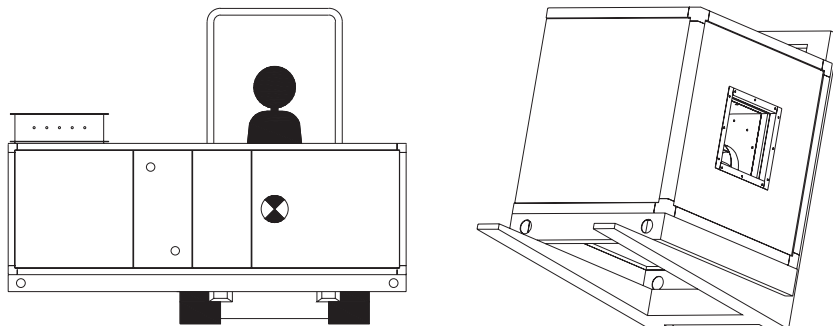


Figure 2 – Handling with forklift



Installation

CAUTION! Never lift the units by the heat exchanger connections or by any other projections. Do not tilt the fan module to avoid possible impingement on the dampers.

Sections will be delivered with a base frame equipped with wooden blocks positioned on each corner. To remove the wooden blocks, the unit must be lifted from the ground, providing access to the screws. Damper movement is factory-tested. At unit reception, carefully check that dampers move freely. Refer to the "Reception" paragraph if there is a problem. Trane will not assume responsibility for damper movement after reception of the unit.

If a section is provided on a base frame without any fork holes or without feet, insert the fork of the lift below the section lifting it by a lever action. In this case, the bar must only bear against the base frame or profile (see Figure 2). Use the same instructions to extract forks or belts.

With larger units, the use of several forklifts may be required.

When rigging the unit by crane, follow these guidelines:

1. If lifting holes are provided on the unit base frame, always use sling spreader bars (see Figure 1).
2. If lifting points (eye bolts) are provided, crane belts can be connected directly to them. In this case, after handling and positioning, replace the eye bolt with bolts to avoid injury (see Figure 1).
3. The minimum rated lifting capacity (vertical) of each sling and spreader bar should be no less than the shipping weight.
4. The unit must be lifted with care, avoiding shock load by lifting the unit slowly and evenly.
5. All lifting points in one axis of the unit must be used when offloading and moving the unit.
6. Belts are to be provided by the rigger and attached to all lifting points.

CAUTION! Loading, unloading and removal of single sections have to be carried out by employing means able to support the unit weight indicated in the technical sheet. Ensure that the belts do not damage the top surface of the unit structure using proper devices.

When the unit is provided with an outdoor protection roof, reinforcement parts may have been added in the factory to avoid damage during transport. Remove the reinforcement parts after unloading.

Storage

In case of external storage, units must be protected from adverse weather conditions. Make sure that air ventilation and recirculation between the protective film wrapping and the section is warranted.

A protective wax can be applied to the unit casing to avoid corrosion due to condensate which can form between the film and the casing. Remove it using paper and a heptane-based solvent, taking care to not damage the paint and the profile.

With internal and external storage, the unit must also be protected against damage.

To avoid damage to the bearings, the motor and fans should be rotated once a month.

If the units do not operate for more than 18 months, the grease in the bearings must be changed. For long term storage, all electrical equipment and accessories delivered separately in a box (filters, humidifiers, etc) and fan belts must be removed and stored in a dry atmosphere. The unit shall be electrically grounded.

Unit assembly

When selecting and preparing the unit site, follow these guidelines:

1. Ensure that the site can support the total weight of the unit. Unit weight figures only provide total gross weights and do not include the additional weight for water in coils and humidifiers.
2. Confirm that the foundation of the mounting platform is large enough to include the unit dimensions plus a safe service access including anti-fall protection.
3. The floor or foundation must be level for correct assembly, coil drainage and condensate flow.
4. Provide adequate lighting for maintenance personnel to perform maintenance duties.
5. Provide sufficient clearance around the unit for correct installation of drain, overflow tubes, and for coil removal. Clearance should also be allowed around the unit to ensure that correct operation and effective and safe maintenance can be carried out.
6. If the unit has more than one section, ensure that all the air-handling unit sections are positioned in the correct order, as indicated in the drawings.
7. Adjoining sections must be perfectly aligned in height and depth. If necessary, minor corrections may be made using steel sheet pieces as underlay.

Installation

Inspect all gaskets for possible damage. Correct any noticed damage in accordance with manufacturer's instructions. Adjust the assembling clipper tensioning screws and lock the sections together, closing the clips. The clip tightening should only cause a very slight stress relaxation of the gasket.

If the assembling clips cannot be mounted on the unit section because of the presence of an electrical cabinet for instance, one of the following junction systems can be used, depending on the unit configuration:

- On the casing, nylon or aluminium angles are positioned on the inside or outside of each section. Pull together the unit sections, ensuring that the nylon or aluminium angles fit with the angles of the adjoining section. Secure the assembly with bolts.
- If a technical box needs to be joined to the rest of the unit, use the L-shaped aluminium profile located in the technical box to secure it to the unit with rivets or screws.

With stacked unit configuration, the frame or the base frame of the upper unit should be connected to the top panels of the lower unit using the supplied fixing device and screws, positioning proper gasket between top and bottom section.

If the recovery section is supplied in two parts, recuperator can be supplied dismantled.

For hospital, laboratory & pharmaceutical applications:

The connections between panels and corners are provided with a silicone-free sealant. Apply sealant (silicone-free) internally to connections between sections.

CAUTION! If a side panel needs to be dismantled, there is risk that other supporting panels may collapse.

When the unit is delivered in more than one section, guideways are mounted inside the corner of each section to allow for easy and proper connection. Be certain that each guideway is aligned to be inserted correctly into the adjoining section to be connected. If necessary, loosen the guideway to allow easier insertion. After, fasten the guideway securely again.

If units are provided in more than one section with an electrical cable channel integrated into the top panel: Before connecting the sections, place the supplied plastic cover beneath the cable channel and secure it using silicone or mastic to avoid air leakage.

Follow directions delivered with the unit to assembly it.

The needed screws and bolts are usually supplied with the unit.

If the unit is supplied with a roof, it can be factory mounted or supplied in kit.

In both cases, to assemble roof and sections, follow directions delivered with the unit.

If the unit is delivered in more than one section: After connecting each section, roof position should be adjusted on-site to compensate for the the gasket thickness between the two sections. To do that, gently unfasten the screws fixing the roof to the unit, and slide the roof until you have the correct connection and assembly (see Figure 3).

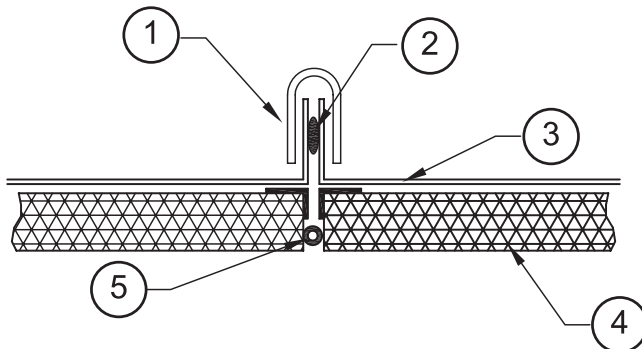
CAUTION!: Assembling clips must not be used to pull the sections together as this may cause the clips, the assembling rivets or screws to break.

To properly position the unit on the base, it can be manhandled over a centrally positioned bar using a lever action. In this event, the bar must only bear against the base frame.

The manufacturer assumes no responsibility for equipment damage or failure that results from this action.

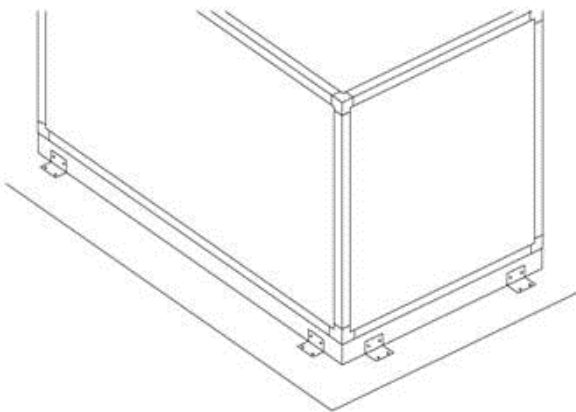
CAUTION!: If the unit sections are mounted outdoors and are subject to atmospheric conditions, ensure the sections are connected and well fixed to the ground. Check fixing every six months (see Figure 4).

Figure 3 – Gasket positioning



- 1 = Roof profile (supplied by Trane and to be installed on the jobsite)
- 2 = Silicone - not supplied by Trane
- 3 = Roof - factory-installed. The roof protrudes 20 mm on each side of the unit
- 4 = Panel
- 5 = Factory-installed gasket to be covered by a layer of Silicone (not supplied by Trane) for outdoor installation

Figure 4 – Fixing of the unit



Remove the mounting vibrator blocks before starting the unit. They are just used to ensure safe transportation.

To minimize noise transmission, depending on the site location, additional insulation material such as cork slabbing, Mafund slabbing or Sylomer strip insulation may be used as underlay. To obtain the maximum noise transmission absorption, the selected materials must withstand the inherent load carrying characteristics. The list of application requirements for these materials is provided by the products manufacturer. The load carrying capacities may be indicated on the data sheets.

CAUTION! Failure to provide a level plinth or support will result in doors jamming and air leaks from the casing.

CAUTION! In the case that the unit is supplied with base frame, it shall be positioned on the supporting structure/ floor with a continuous and uniform contact between the base and the floor.

CAUTION! For outdoor installation to avoid water inside the unit, it is mandatory to cover the gasket positioned between sections with a layer of silicone.

CAUTION! To avoid damage during transportation and handling, casing panels are supplied with a protective film which needs to be removed on job site, as soon as the units are in place. Cut the protection film with a cutter around the panels and remove it.

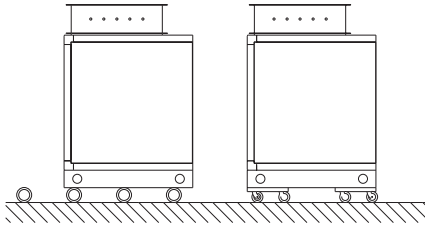
CAUTION! If the units have to be inspected by Consulting Engineers, contractors or any subsequent viewers at the final stage of the installation, we strongly recommend protecting the units with plastic covers from the assembly up to commissioning.

Installation

Roller Movement

Units fitted with base frames may be moved on roller trolleys or tubular rollers (see Figure 5).

Figure 5 – Roller movement



Foundation and positioning

Space requirements

There must be adequate space at the installation site to carry out effective and safe maintenance and to dismantle any of the unit modules as necessary. From the access panel side of the unit, a working area of the unit width plus 300 mm is required. On the rear side of the unit, an access gangway of 600 mm is necessary for assembly purposes.

Foundation

Complete reinforced concrete foundations are suitable (see Figure 6a). Strip foundations may also be used (see Figure 6b). In the case of strip foundations, concrete or steel supports must be provided under every unit base frame channels.

For steel support construction (see Figure 7), the foundation must be of adequate strength to match the unit size.

The foundations must be level with no slope or unevenness.

CAUTION!: Failure to provide a level plinth or support will result in doors jamming and air leaks from the casing.

Figure 6a – Reinforced concrete foundation

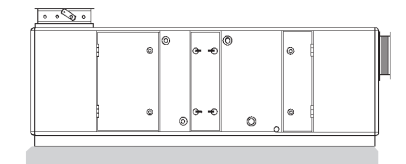


Figure 6b – Strip foundation

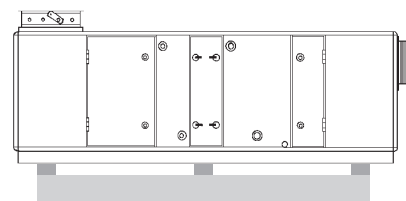
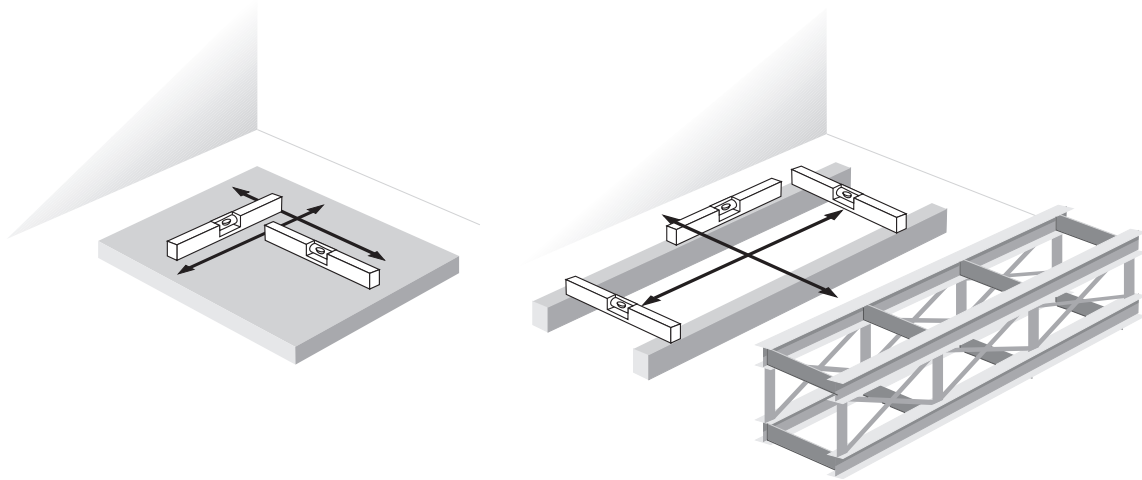


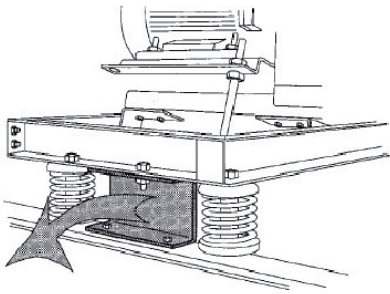
Figure 7 – Steel support construction



Transportation parts

Any isolator blocking device fitted to the fan motor supports for transport purposes should be removed. (see Figure 8).

Figure 8 – Isolator blocking device



Doors

The Trane hinged doors have the following noteworthy constructional features:

- Space saving construction
- Internal or external operation according to the option chosen.
- Doors can be optionally ordered with lockable handles. Fan sections are always supplied with lockable handles.

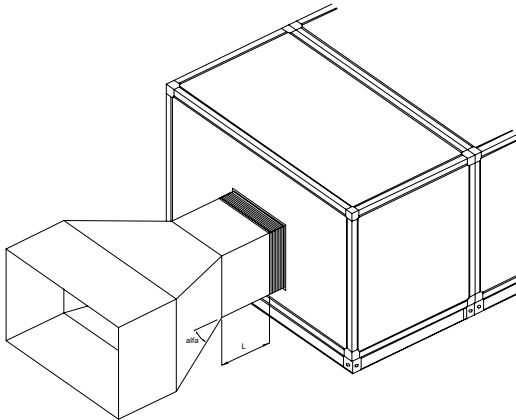
Installation

Duct connection

The air handling connections must be made symmetrically and stress free.

To avoid noise transmission, the fitting of an intermediate flexible connection of at least 140 mm depth, between duct work and the unit is recommended. This should be unstressed when initially positioned. To ensure the best possible performance of the units whilst avoiding excessive pressure loss in the duct system and minimizing air stream noise, compliance with good practice in duct assembly and acoustic layout, is essential.

Figure 9 – Duct connection



Generally, the length 'L' of the first duct section should be greater than 1½ times the size of the fan diameter. The angle 'a' of the transition duct should be less than 30° and shall be avoided section reduction just after the connection of duct to the unit (see Figure 9).

Note: If the air inlet and/or outlet on the ducts are very close to the air handling unit and if there are no bends along this section, the fitting of a sound attenuator is recommended.

CAUTION! Ducts must never be disconnected during fan operation. The fan must never be run when ducts are disconnected. The absence of pressure drops would increase current absorption causing the motor windings to burn.

CAUTION! Ducts must be self supporting and must not load the air handling unit or its components (damper, flanges, etc) with their weight.

Trane cannot be held responsible of any damages on casing, dampers, structure due to direct connection of duct to the unit without placing a flexible connection between duct and unit.

Damper movement is factory-tested. At unit reception, carefully check that dampers move freely. If they do not move freely, they have been damaged during handling or duct connection.

CAUTION! Never drill into the machine casing on-site. Risk of electrical shock.

Electrical connection

The unit is designed to run with 400 V +/- 5%/50 Hz/ 3 ph.

Over current protection

The branch circuit feeding the unit must be protected in accordance with national or local codes and maximum unit amps indicated unit documentation provided.

Power wiring

The unit's power supply must be provided by 5-wire cable with crosssectional areas complying with legislation.

Note:

1. Earthing must be executed in compliance to national and local legislation.
2. The machines are designed for a short-circuit current of 10 kA. In the event of a higher application, contact your local Trane sales office.

The electrical work must be carried out in accordance with all international, national, and local regulations. Electrical connections passing from the casing to the fan motor should be carried out in a flexible conduit. Cables passing through the casing must be made with a gland or grommet. Glands can be already installed in the unit as option. All wiring to other accessories must be carried out in the same manner. If you have any queries, please contact your local Trane sales office.

Installation

CAUTION! After wiring is complete, ensure that grounding between the fan motor assembly and casing is suitable for the electrical supply wire. If the unit is provided with an electric heater, interlock the heater contactors with a normally closed contact to the fan contactors to avoid overheating. Switch off the fan only after leaving sufficient time after the heater is switched off, to allow it to cool down. Electrical grounding is required between the unit and the ductwork.

The fan-motor base is electrically insulated from the rest of the unit and the connections must be made with the proper section copper wire. In order to warranty electrical continuity between sections, each section must be grounded. Ground bolts are not provided. To ground the unit, use a bolt already on the unit or screw it onto the base.

The operator safety can be ensured by either a belt guard or a factory-mounted micro-switch on the fan section door. The electrical connection of this micro-switch made by the contactor will cut off the electrical feeding to the motor and stop the fan-motor group when the door of the fan section is opened.

Motor connection

As a safety measure against overload, short circuit, high or low voltage, a faulty connection or phase failure impeding the cooling effect, excessively high ambient temperature, e.g. warmth from external sources, excessive braking of the rotor, frequent switching and uncontrolled start up and stop procedures, the use of full motor protection is necessary to protect motor windings. Use thermal protection devices to protect the motor that includes a complete motor protection control system. Only in this manner is the manufacturer's guarantee secured.

In instances where a motor protection cut out is fitted, the correct power rating for the setting may be noted from the product name plate.

CAUTION! If motor is equipped with a safety thermistor or similar devices (PTC, PTO, Klixon, etc...), it is mandatory to connect them to protect the motor.

The connection must be carried out in accordance with the motor nameplate and the wiring diagrams as shown in the inside of the motor terminal box or, generally, in accordance with the wiring diagram as shown in Table 1.

Special care should be taken in the connection of motors, especially if multi-speed motors are involved.

For fan sections equipped with double fans and motors, interlock both motors so that one motor stop command causes the second motor to stop. Please see the Pre-start checklist section for additional information.

Following the connection of the motor, a test run should be carried out to check the motor performance data. Please refer to the Commissioning Procedure section in this manual.

CAUTION! In the event of motor damage resulting from faulty connection of the motor, we will not accept any related claims.

Table 1 – Motors with thermistors

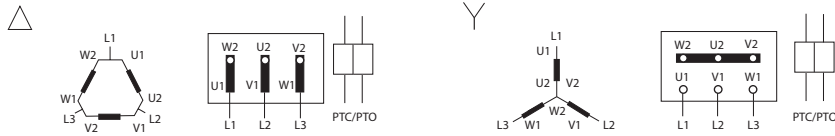
Single speed	
4 poles	1500 min ⁻¹
2 poles	3000 min ⁻¹

CAUTION! With a star-delta starter, the motor must start with the star connections for a short period of time (approximately 3 seconds) and then switch to the delta connections.

Installation

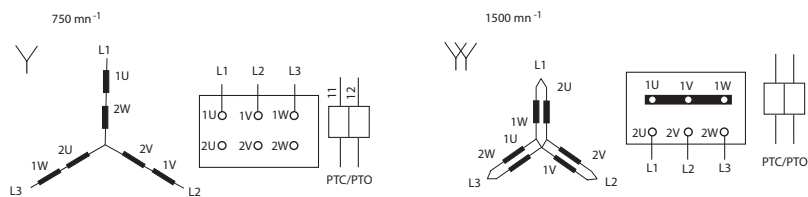
Dual voltage supply

up to 4 kW 230V in Δ , 400V in Y
 from 5,5 kW 400V in Δ , 690V in Y



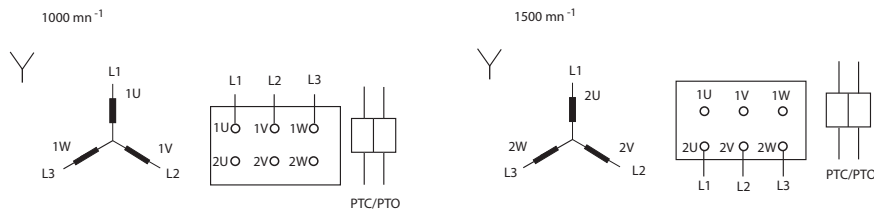
Dual speed with Dahlander winding

4/8 Poles 1500/750 min^{-1}
 2/4 Poles 3000/1500 min^{-1}



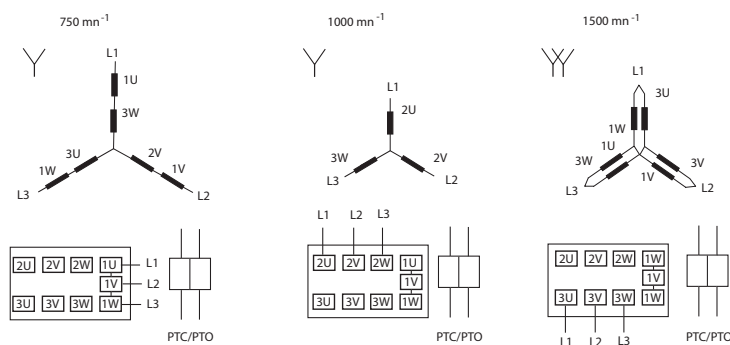
Two speed, 2 separate windings

4/6 Poles 1500/1000 min^{-1}



Three speed Dahlander winding and single separate winding

4/6/8 Poles 1500/1000/750 min^{-1}
 2/4/6 Poles 3000/1500/1000 min^{-1}

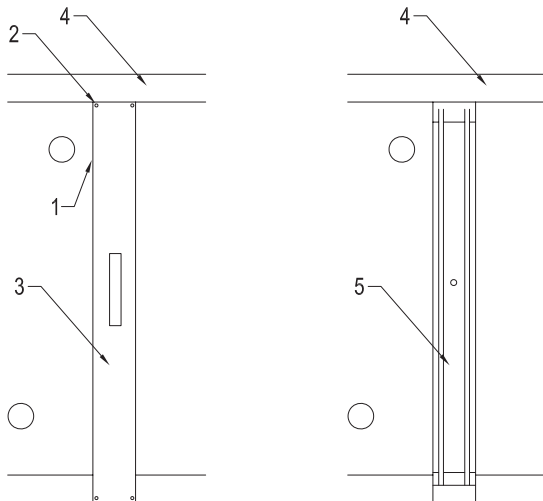


Frostat frame access

To access the Frostat frame (if present), it is necessary to remove the small side panel provided with a handle. (see Figure 10).

- Remove the black gasket placed around the frostat frame.
- Remove the screws that fix the panel.
- Using the handle, remove the frostat panel.
- Access the frostat frame sliding it on the side of the unit.

Figure 10 – Frostat frame access



- 1 = Panel gasket
- 2 = Screws
- 3 = Frostat panel with handle
- 4 = Plastic profile
- 5 = Internal frostat frame to slide out

Pipe connections to coil

A correct pipe work installation is essential for trouble-free coil operation. Figures 13 and 14 show an example for piping water coils. (The diagrams do not limit the type of control system used.)

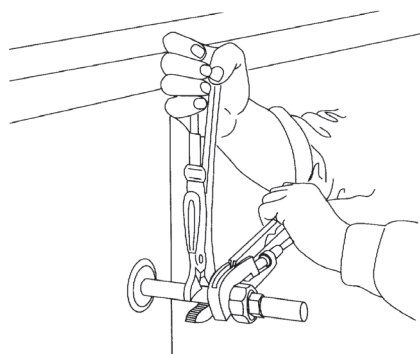
To prevent coil damage:

- All pipe work must be supported independently from the coils, locating a flexible joint directly on the coil connection.
- All connections must be made in such a way that the expansion and contraction of pipes do not impose forces on the coil headers.
- Over tightening of coil connections must be avoided to prevent any damage to headers and header connections.

Control the correct direction of liquid flow as indicated on the unit nameplate. To ease all maintenance operations, it is recommended to fit all coil connections with a flange/pipe assembly and a shut-off valve. To ensure thermal efficiency and air vent, the pipe must be connected to the coil, as indicated on respective labels.

CAUTION! To avoid damaging the coil connections, it is essential to grip the union in a pipe wrench whilst applying counter pressure to tighten the joint (see Figure 11).

Figure 11 – Coil connection



Installation

Water coils

Air venting of the system should not be carried out through the coil but through the pipe work.

Coil vent should only be used to vent the coil itself.

In case of negative incoming air temperatures, do not modulate the water flow through the coils to avoid freezing.

In case of water temperature close to or below +2°C, install a proper antifreeze system.

Steam coils

Overhead condensate return systems should not be used. Set up vacuum breakers as close as possible to the coil. Include a float or thermodynamic trap on all steam coils (following trap manufacturer's recommendations).

CAUTION! Correct trapping is very important. Failure to properly remove condensate will result in water hammer and possible coil failure.

Refrigerant coils

The DX coils are delivered with distributors which are located inside the unit. The side panel fitted on the coil section must be removed to allow the installation of additional equipment. Refrigerant pipe work installation requires specialist design and trained refrigeration engineers for correct installation. If you have any queries, please contact your local Trane office.

In case of refrigerant low temperature, install a proper antifreeze system.

Coil removal

If it is necessary to remove the coil from the casing, contact your local Trane sales office.

Condensate Drain

On each of the condensate drain pan, a free-flow syphon must be fitted.

The effective syphon height H must be the maximum internal static pressure in the unit in mm w.g. + 15 mm (at least) (see Figure 12)

Example:

Total pressure = 1196 Pa (see data sheet)

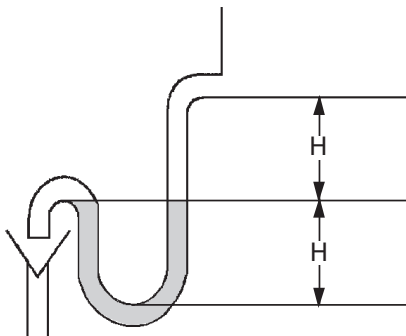
Dynamic pressure = 2 x 83 Pa (see data sheet)

Total pressure - Dynamic pressure = Static pressure = 1030 Pa

1mm wg = 9.81 Pa

H = 1030: 9.81 + 15 mm = 120 mm

Figure 12 – Condensate drain and drain traps

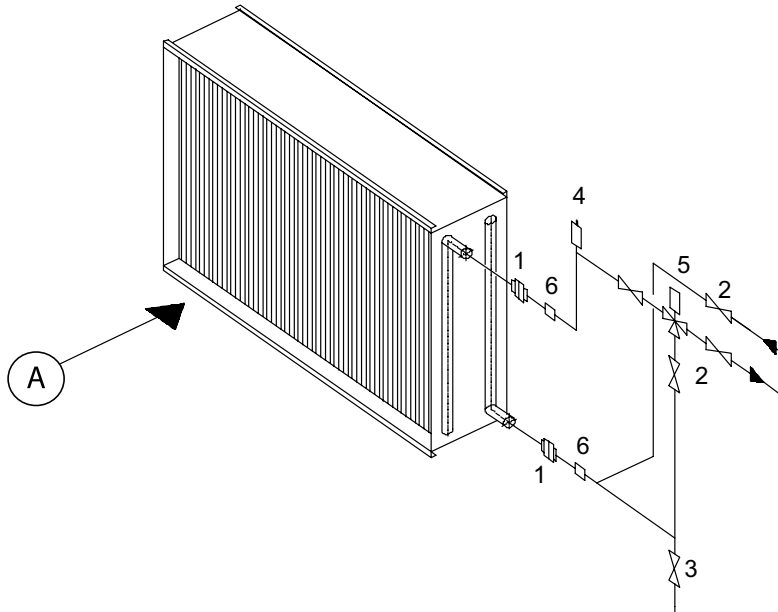


Drain traps

When the units have more than one drain trap, each drain shall be connected to the drainage system separately with a siphon.

Water connections

Figure 13 – Water coil connections



- A = Airflow
- 1 = Connections
- 2 = Gate valve
- 3 = Discharge gate valve
- 4 = Automatic air vent valve
- 5 = Automatic 3-way actuated valve
- 6 = Flexible joints

Referring to Figures 14-17, it is important to note that:

1. The cooling coil sections and the evaporative (or honeycomb) humidifier sections without recirculating pump are equipped with a condensate drain pipe. (Item 1, Figure 14 (A, B)).
2. For evaporative humidifier sections equipped with are circulation pump, the drain pipe (used typically for cleaning purposes, item 3, Figure 16 (A, B)) needs to be connected to a shut off valve without siphon. There is also an additional overflow pipe which needs to be connected to a siphon. (Item 1, Figure 15 (A, B)).

Figure 14 A indicates the siphon height for coil section located on negative pressure side.

Figure 14 B indicates the siphon height for coil section located on positive pressure side.

Figure 15 A indicates the siphon height for evaporative humidifier section located on negative pressure side.

Figure 15 B indicates the siphon height for evaporative humidifier section located on positive pressure side.

Figure 16 indicates the fresh water inlet for wasted water type or steam type humidifier sections. The freshwater flow control in the section is ensured with a solenoid valve. It is recommended to fit a shut off valve to facilitate the maintenance and a pressure regulator on the water entry for proper operation. The fresh water inlet must be connected to the supply line with a flanges set.

Figure 15 indicates the fresh water inlet for evaporative humidifier sections equipped with a recirculating pump. The fresh water flow is controlled with a floating valve located into the internal water tank. It is recommended to fit a shutoff valve on the fresh water inlet to facilitate maintenance. The freshwater inlet must be connected to the supply line with a flanges set.

The height of the U-trap varies upon the pressure inside the section and is given in mm of water column.

Installation

Hot/chilled water coils and humidification system

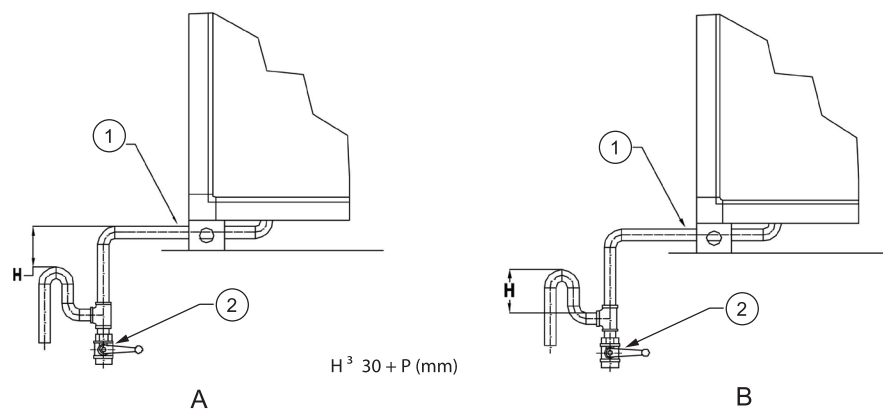
The quality of the water used in humidifiers and coils is very important to ensure proper operation.

Note: If a steam humidification with high steam pressure is used, provide a proper condensate drain system on the steam pipe condensate outlet or condensate drain system.

CAUTION! The use of incorrectly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae, or slime. The bacteria flora may contaminate the humidifiers and decrease the heat transfer to the coils. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The manufacturer assumes no responsibility for equipment damage or failure that results from the use of aggressive water, or saline, or brackish water. Please refer to the individual supplier's installation, operation, and maintenance manual for additional information.

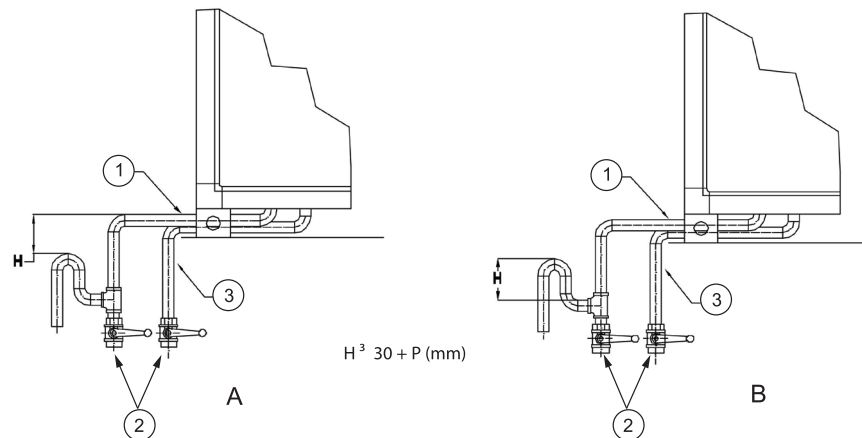
CAUTION! In all drain pipes is mandatory to install a siphon properly designed to allow correct water drainage.

Figure 14 – Standard drain pan for coil sections



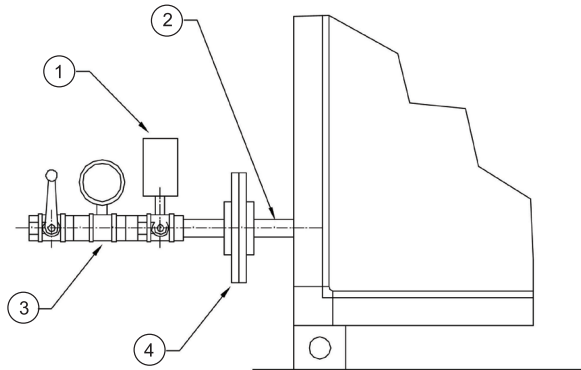
- 1 = Drain pipe
- 2 = Drain valve
- A = Negative pressure side
- B = Positive pressure side

Figure 15 – Water tank for evaporative humidifier sections



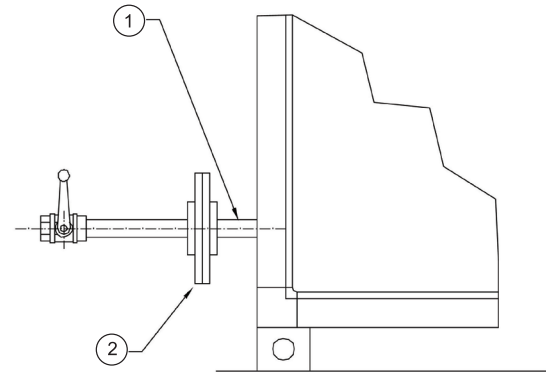
- 1 = Overflow pipe
- 2 = Drain valve
- 3 = Additional drain for cleaning
- A = Negative pressure side
- B = Positive pressure side

Figure 16 – Water connection for water or steam humidification



- 1 = Electronic valve
- 2 = Feeding pipe
- 3 = Pressure regulator
- 4 = Flanges

Figure 17 – Feeding water connection for water pump humidification



- 1 = Feeding pipe
- 2 = Flanges

Commissioning procedure

Figure 18

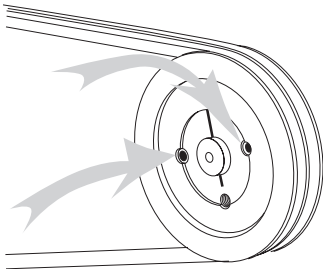
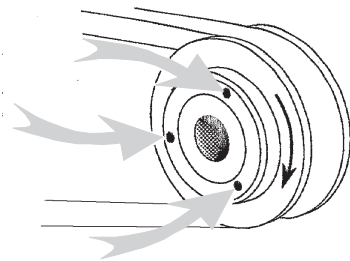


Figure 19



Pre-start checklist

- Initially the complete unit and all components should be thoroughly cleaned and all dust and other deposits completely removed.
- The unit must be maintained in a clean condition.
- Prior to dispatch, each unit is thoroughly checked. Nevertheless, as part of the commissioning procedure, it is imperative to recheck certain items as listed below.
- Check that there are no foreign bodies in the unit or in the duct system and that air inlet and outlets are not blocked.
- Some of the settings on the unit may have changed during transportation and installation process.
- Make sure all bolts and screws are tightened, especially moving parts such as fan pulleys, bearings etc.
- Make sure electrical connections are tightened.
- For units with variable air volume devices, check that dampers are fully open.
- Make sure that the dampers move freely in their correct positions and that they operate correctly.
- If the unit is provided with a cross flow heat recovery exchanger, it is designed to resist at the nominal differential pressure indicated on the technical sheet, so all dampers and interception devices must be opened.
- This action should be interlocked to the control system.

Fan motor

- Check that the fan revolves freely by turning the impeller manually and verify that no foreign bodies are lodged in the fan scroll.
- Remove the locking block under the motor-fan base frame.
- Check that the fixing screws on the belt pulleys are tight (see Figures 18 and 19).
- Check the fan belt tension and pulleys alignment. Realign and retighten if necessary (See Maintenance section).
- Make sure that the dampers move freely and that any transport packing has been removed.
- Check the motor connections and make sure that the correct voltage supply is being used. Verify the lubrication of fan and motor bearings (See Maintenance section and follow the motor manufacturer's recommendations).
- Bearings could be pre-lubricated. Start-up may be noisy until grease is evenly distributed. Please refer to the individual supplier's installation, operation, and maintenance manuals for additional information.
- If adjustable pulleys have been fitted, ensure they are positioned in the correct ratio. The setting is done at the factory and should not require further adjustment. If adjustment must be made, refer to the section about pulleys in this manual.
- Fan must not work with interception device closed, like dampers, in order to avoid permanent deformation of the structure. Dampers must be open during fan operation. Trane cannot be held responsible of structural damages due to that.

Commissioning procedure

Vibration isolators

- Check that vibration isolators are free to operate and that there is no contact existing between the fan/motor chassis and the support.

Frequency inverter

1. The VFD must be compatible with HVAC applications, such as fans with quadratic torque.
2. The electric power output of the VFD shall be compatible with the nominal power of the motor.
3. The VFD shall be compatible with its environment (IP rate, type of ventilation, ambient temperature, electromagnetic environment...)
4. All recommendations indicated in the Installation/Operation/Maintenance manual of the VFD manufacturer must be respected.
5. The VFD comes with default values which may have to be fine-tuned during commissioning.

CAUTION!

In some cases, mechanical issues may affect the fan or motor, and may be caused by the inverter settings (vibration, excessive noise, lower efficiencies, motor overheating...). If the inverter is removed and the mechanical issues do not persist, the inverter settings must be reconfigured. Inverter settings to verify can include: attenuated resonance, quadratic torque, frequency regulation, etc.

Unit connections

- All electrical, water, and duct work connections of the unit must be completed by a qualified person.
- Check that electrical connections comply with the wiring diagram and that the thermal protection is operational.
- Completely stress-free connections are essential.
- The pipe work of the coils should be arranged to facilitate easy removal of the coil for maintenance purposes.

Coils

- Check that the coil connections and valves are not leaking. If there are leaks, rectify the problem.
- Cooling coil sections are fitted with condensate drains. Check that these are properly fitted to allow draining and avoid air suction and water carry-over.

Water coil filling

In general, heating and cooling coils are filled with water and standard additives to protect against freezing and corrosion:

- open the air vent
- slightly open the water supply valve so that the heater battery fills slowly. This avoids thermal stress
- as soon as the heater coil is full, close the air vent
- open the water valve fully and switch on the fan
- finally, the entire piping system must be completely vented.

Steam coil filling

- Open gradually the air vent and drain valve on the condensate drain
- Slightly open the steam valve until steam penetrates through the condensate drain valve and air vent
- Close the condensate drain valve and air vent and open the steam valve fully
- Vent regularly during operations

CAUTION! If the installation is switched off temporarily, condensate must not be stopped temporarily to remain in the pipes to avoid freezing and corrosion risk.

For steam, overheated, high temperature coils, to prevent overheating inside the unit, the fan stop must be delayed by 3 to 5 minutes after the steam valve has been closed.

Electrical heaters

Electric air heaters are provided with automatic and/or manual reset overheat thermostats.

CAUTION! To prevent overheating inside the unit when the heater is being switched off, the fan may be switched off after an over run period of 3 to 5 minutes.

The same shall be done when the unit is installed any other type of high temperature source.



Commissioning procedure

Filters

The filter cells or media (bag filters, heap filters, and roll filters) delivered separately must be installed into the unit prior starting the unit.

Check that the filter is correctly fitted and that the entering air side of the filter is exposed to the contaminated air stream. Refer to the certified submittals which maybe different.

If roll filters are used, check that the filter unit drive motor and the switch control are working correctly.

Humidifiers

The evaporative humidifiers with or without recirculating pump are provided with a water flow control valve.

During fan operation, with the door closed, adjust the water flow control valve to prevent water leakage from the pump hydroscopic plastic honeycomb humidifier.

The following safety procedures are strongly recommended:

- Connect the power supply to the pump.
- Check that pump rotation is correct.
- Check that access doors of all sections, but the one being used, are closed. The door of the section in use should be kept in open position with a shim.
- Slightly open the water flow control valve towards the humidifier.
- If the humidifier is with honeycomb, ensure there is no water leakage from the honeycomb humidifier. If you notice leakage, close the valve and check again. If it is operating correctly, open the control valve until the system reaches its best balance.
- If the humidifier is with nozzles, check that water is not coming out from the limit of humidification section and do not spray on the casing.
- Measure the absorbed power and check that it matches the data indicated on the pump name plate.

CAUTION! The above mentioned operations should be performed from outside of the unit. Do not enter the sections.

CAUTION! The pump must not be dry run to avoid any risk of overheating.

No warranty claims will be acknowledged if pump or pump motor damage is caused by a dry run.

Note: If installation and start-up do not occur immediately after delivery, take the following precautions:

- Store the equipment in an area that is not exposed to excessive humidity.
- Take special care to protect electrical components.
- Periodically, manually turn all moving parts to avoid any blocking risks.

CAUTION! for other type of humidifier (steam, compressed water, water and compressed air, others), refer to Manufacturer instruction and IOM.

Water quality for humidifiers and air washers

The information hereunder which refers to the water treatment is given for reference only. Water quality is of prime concern to ensure proper operation of humidifier and air washer.

The water hardness of the freshwater has to be measured before considering any water treatment.

CAUTION! The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required.

The Trane warranty specifically excludes liability for corrosion or deterioration.

Trane assumes no responsibility for equipment damage or failure which results from the use of untreated or improperly treated water or saline or brackish water.

Commissioning procedure

Start-up

Following the completion of all check list items, start up the unit for a test run.

CAUTION! To conduct a run test that involves the measurement of motor and fan performances, the unit must be connected to the complete installation.

CAUTION! All access doors must be closed to avoid overflow in the installation that could result in motor damage and to avoid safety risks to people.

CAUTION! Before starting the fan, open all dampers. The fan must not be started if the dampers are closed. After switching on power, check that the direction of the fan rotation is correct. In addition, the running power consumption should be checked on all phases and compared with the power data indicated on the motor nameplate. If the running power is too high, there is probably a faulty connection and the unit must be switched off immediately.

Check the fan and motor bearings for undue noise.

Measure the air volume and external pressure.

The following two situations may arise:

1. The air volume is too low as the real external static pressure is higher than the specified one.

Recommended action: increase the air volume by changing or adjusting the belt drive pulleys.

Please contact your local Trane sales office to get a proper belt drive selection.

CAUTION! Do not increase the fan speed beyond the motor power rating allowed limit.

CAUTION! Increasing the fan speed should be done only after a careful study of the operating point on the appropriate fan curve.

Contact your local Trane sales office for a proper selection.

2. The air volume is too high. The reason is that the real external static pressure is lower than the specified one.

Result: Higher air volume involves a high motor absorbed power increase.

CAUTION! Motor overload may result in motor damage.

Recommended action: change the belt drive pulleys or reduce the fan rpm according to the fan curve or reduce the air volume by the use of dampers.

Ask a proper transmission selection from your local sales office.

In extreme cases, changing the motor, fan, and drive may be necessary.

The adjustment of variable belt drive pulleys must be carried out only when the unit is electrically disconnected, ensuring that the system is not restarted unexpectedly.

Remove the pulley safety screws and turn through half of the pulley circumference. Then retighten the screws and readjust the pulley belt tension (see Figure 21.)

Following any change in the pulley ratio, the motor power consumption must be rechecked. The nominal output rating quoted on the name plate must not be exceeded.

If airflow does not conform to the specifications, please contact your local Trane sales office.

Note: The unit structure is designed so that it will not suffer permanent deformation up to a positive pressure or negative pressure of 2000 Pa. To respect these limits, fan operation should be controlled depending on all interception devices installed in the plant and/or in the air handling unit.

Evaporative Humidifiers/air washers

Water tanks must be thoroughly cleaned. Any building grit in the system may result in subsequent pump failure. Any warranty claims in this context will not be accepted. Check that the pump suction filter basket, spray pipes, washer nozzles are correctly seated. Check the washer sieve and clean as necessary.

Fill the tank and siphon with clean water and adjust the float valve so that closure occurs 2-3 cm below the overflow level. In any case the suction pipe must be effectively vented. Then check that the pump rotation direction is correct. Measure the absorbed power and check that it matches the data indicated on the pump name plate.

CAUTION! : The pump must not be dry run to avoid any risk of overheating.

No warranty claims will be acknowledged if pump or pump motor damage is caused by a dry run.

Commissioning procedure

The regulating valve in the pressure side must be adjusted to the correct water quantity. The water purging volume should be roughly equivalent to the amount of water evaporated from the system. On request we will advise you in choosing the suitable volume. Check the correct setting with a manometer. The volume of water for sediment flushing should be set by adjusting the flushing bleed off valve. Check the correct installation of humidifier and moisture separator modules. The arrow must show in the direction of the airflow (see Figure 20).

Check the tightness of the seals of the air washer and humidifier units, ie between the modules. If necessary apply additional sealant.

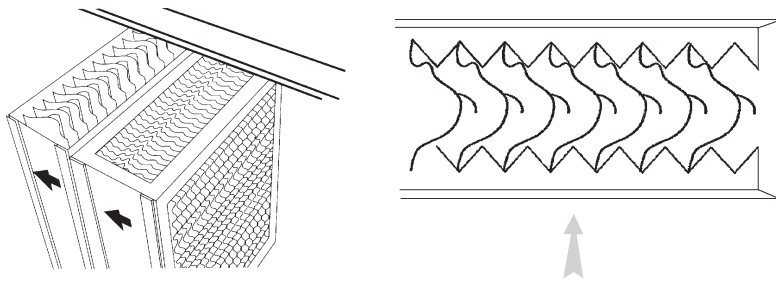
Water Quality for humidifiers and air washers.

The information hereunder which refers to the water treatment is given for reference only. Water quality is of prime concern to ensure proper operation of humidifier and air washer.

The water hardness of the fresh water has to be measured before considering any water treatment.

In accordance with the inherent degree of hardness in the water and the operational priority of the air conditioning installation, appropriate water treatment can then be selected.

Figure 20



CAUTION! :The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The Trane warranty specifically excludes liability for corrosion or deterioration. Trane assumes no responsibility for equipment damage or failure which results from the use of untreated or improperly treated water or saline or brackish water.

Note: Honeycomb material made of cellulose may emit a certain smell during the first working hours. The is absolutely normal and will disappear quickly.

To ensure a reasonable level of operational reliability, the quality of the supply water should be within the following parameters (See tables 2 and 3).

Table 2

Appearance	clear, colorless and free of sediment
pH Value	7 to 8.5
Conductivity	max. 30 mS/m
Total Hardness	max. 8.1
Carbonate hardness	max. 3.5 mol/m ³
Total salt content	max. 250 g/m ³
Chloride content	0 g/m ³
Sulphate	0 g/m ³
Manganese	max. 0.01 g/m ³
Aggressive Carbonic Acid	0 g/m
KMnO4 usage	max. 20 g/m ³

Table 3 – Conversion factors for grades of hardness

Grade of hardness		° F H.	° D H.	° GB H.
France	1° F H	1	0,562	0,702
Germany	1° D H	1,78	1	1,25
Great Britain	1° GB H	1,424	0,8	1

Factory engineered controls

System controller options

Units are available with factory engineered controls as a "plug and play" package. Therefore, the units are provided with all components including control components (sensors and actuators), controller, and power wiring. In this case, the unit commissioning is performed by a Trane qualified engineer.

Trane multipurpose controller

Please refer to the Installation Guide for information regarding the controller.

Central connection module

If Factory Engineered Controls are required but a non-compatible BMS is to be used, a Central Connection Module can be selected. All the Low Voltage end devices are factory installed on the unit and wired back to a central terminal strip where connections to the BMS controller can be easily made on site.

Central connection module plus *

If Factory Engineered Controls are required but a non-compatible BMS (Building Management System) is to be used, a Central Connection Module Plus can be selected. This includes all the standard CCM features with the addition of Power Wiring, A Starter Panel and the installation of a Free-Issued Controller compatible with the BMS is to be installed. If a different control is installed, please refer to its user guide or manual.

Shipping

The controls enclosure will normally be factory fitted on the fan section of the air handling unit. Please check the condition of the enclosure on unloading on site. Also check that all factory-mounted controls fitted inside the unit in the locations indicated in the control sales order are intact and that all loose control items to be supplied with the unit are present.

Installation

The unit will need to be sited so that there is adequate access to the control panel for commissioning and maintenance purposes. The minimum clearance is 1 meter wide and 2 meters high. The following site wiring will be required:

- Mains incoming supply.
- Outgoing supply to other power devices installed.
- External loose items of control.
- Reconnection of wiring inside the unit if the system was delivered in sections. If internal wiring to motors, electric heaters, etc. was not factory wired, during installation ensure power wiring is not run too close to the existing control wiring so as not to impair the electromagnetic immunity of the controller.

* Available in selected countries only.

Loose control items

The following components are supplied with the unit but must be mounted and wired on site:

Heating and cooling valves

Each actuator is supplied with a flying lead which needs to be connected on site to a connection box fitted on the unit.

For outdoor installations, please provide proper protective cover for the valves. If possible, the control valves should be mounted indoors to maximize the service life. Refer to the data sheet for specific Valve/Actuator project information.

Room temperature sensor

The room temperature sensor should be wall mounted at a height of approximately 1.5 m inside the occupied space of average zone temperature. Do not mount the sensor near a heat source, door, direct sunlight or in the supply air stream. It requires a single pair of screened cables.

Return air temperature sensor

The return air temperature sensor should be mounted in the common return air duct, ahead of the fan, so as to sense average return air temperature. It requires a single pair of screened cables. When possible, the return air temperature sensor should be fitted onto the return air inlet.

Factory engineered controls

Duct static pressure sensor

The duct static pressure sensor should be mounted in the supply ductwork, approximately two thirds of the distance from the fan to the end of the longest run of ductwork. The sensor requires two pairs of screened cable to the control panel.

One pair supplies power to the device and the other is the pressure signal from the device to the controller.

Outside temperature sensor

The outside temperature sensor should be mounted on a Northfacing wall. It requires a single pair of screened wires. The sensor can be factory mounted in the fresh air inlet. Other items are supplied loose on a project specific basis and data sheets are available for these items.

Mains connection

Mains connections are normally made through the bottom of the control panel. All the cables should be suitably arranged so as not to put excessive strain on the terminals. They should be fitted with suitable glands to prevent water ingress.

Reconnection of sectionalized units

If the unit is supplied in sections, the internal control wiring will have been disconnected in the factory between sections using break point connectors and the cables will be marked with identifiers. Site reconnection is to be done by a contractor.

Wiring requirements

Running sensor wires in the same conduit or bundle with any AC power wires other than 24VAC may cause a malfunction. With on site fitted items, the screened wire should be covered with insulation tape at the sensor terminal box. Site mounted sensor cables should be Belden 8760 for 2 core devices and Belden 9402 for 4 core cables.

Fire signal (option)

The AHU unit may be interfaced to a fire alarm shut down by connecting a normally closed contact to the designated terminals. If this is not required, the fire contacts are replaced by a link. Remote fireman's override switches can be connected to allow operation of the extract fan after a fire alarm has been actuated. Where a mixing box is fitted, the exhaust air damper will be driven to the fully open position while the mixed air and fresh air dampers are driven closed.

Override contacts can be connected to the designated terminals where this option has been ordered.

Filter section

Depending on the order, a common or an individual filter switch is provided to indicate when the filter section differential pressure is excessive. The filters may need to be changed.

Frost protection thermostat

In the event that the coil air on temperature drops below 5°C, a thermostat is provided to switch off the supply fan on units with water coils. It is a hard-wired form of protection and can only be monitored by the controller. This prevents hot water coils from freezing and would typically operate in cold weather if the hot water coil supply has failed.

Fan section

A pressure differential switch is provided across each fan to provide a proof of airflow indication. All fan / motor are belt and pulley driven.

Frequency of inspections

It is recommended to inspect all end devices supplied with the unit for correct operation and calibration on an annual basis.

Recommended spare parts list

If required, a list of recommended components to be kept on site can be provided.

Factory engineered controls

Trouble analysis

This section contains information about the following:

- Unit control problems.
- Symptoms, probable causes, and recommended actions.

Note: Refer to the unit Installation and Operation Manual for AHU unit trouble analysis and other information on electrical connection. Use the tables in this section to assist in identifying the cause or causes of a malfunction in the unit controls. The column header 'Recommended Action' suggests repair procedures. Some problems may be caused by software and operator screen settings. These tables are intended as a diagnostic aid only. For detailed repair procedures, contact your local Trane office.

WARNING! Hazardous Voltage with Capacitors!

Disconnect all energy sources, including remote disconnects, and discharge all capacitors before servicing.

Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized.

After power is off, allow five minutes for all motor or compressor start or run capacitors to discharge.

For Trane provided variable frequency drives wait 20 minutes.

For other manufacturer's variable frequency drives or energy storing components, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors are discharged. Failure to disconnect power and/or discharge capacitors before servicing could result in death or serious injury.

Note: For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN or PROD-SVB06A-FR.

WARNING!: Disconnect all energy sources and allow all rotating equipment to stop completely. Allow hot and cool surfaces enough time to reach safe surface temperatures before inspecting or servicing the unit. Failure to do so may result in personal injury or death from electrical shock or moving parts.

WARNING!: Disconnect all energy sources prior to access fan sections or ductwork. Even when locked out electrically, fans may cause injury or damage if the impeller is subject to 'wind-milling'. The impeller should be secured to physically restrict rotational movement.

Failure to secure the impeller could cause severe personal injury or death.

Variable Frequency Drives

Variable Frequency Drives (VFD) are used more and more often to control fan speeds in order to optimize the operation and the energy consumption of the units.

When VFDs are provided and installed by other non-Trane suppliers on site, please follow these specific recommendations to ensure correct and safe operation.

1. The VFD must be compatible with HVAC applications, such as fans with quadratic torque.
2. The electric power output of the VFD shall be compatible with the nominal power of the motor.
3. The VFD shall be compatible with its environment (IP rate, type of ventilation, ambient temperature, electromagnetic environment...)
4. All recommendations indicated in the Installation/Operation/Maintenance manual of the VFD manufacturer must be respected.

Although the use of VFDs does not create any problem, some undesirable phenomena can occur: vibration, excessive noise, lower efficiencies, motor overheating...

You can easily check if these problems come from the VFD by connecting the motor directly to the main supply. Most of the VFD drives available on the market include some specific functions to allow them to overcome these kinds of problems.

In all cases, read the VFD manual carefully and if necessary contact your local Trane sales office.

Factory engineered controls

Table 4 – Trouble analysis

Symptom(s)	Probable Cause(s)	Recommended Action(s)
Any Low Voltage Device not Working	Breakpoint Connector	Check Correct Connection
		Tighten Connection
		Repair Wiring
Differential Pressure Switch not Working	Tubes not connected	Connect Tubes
	DPS failed	Blow down Positive Tube and hear click
		Replace DPS
Damper not Working	Damper linkage is loose	Tighten damper linkage
	Damper blade hitting an obstruction	Remove obstruction
	Damper blade bent	Replace damper
	Damper actuator is malfunctioning	See symptoms for mixed air damper actuator not working
Damper actuator not working 24 VAC power supply not present at the actuator	Control transformer furnishing the damper actuator 24 VAC has failed	Check transformer
	24 VAC power wiring is broken or shorted	Repair wiring
Damper actuator not working. 0 to 10 VDC input signal to acuator not present	0 to 10 VDC input signal wiring broken or shorted	Repair wiring
Valve not working	Valve not piped per recommended flow arrangement	Re-pipe valve to recommended flow arrangement
	Valve seat hitting an obstruction in pipe	Remove obstruction
	Valve actuator is malfunctioning	See symptoms for valve actuator not working
Valve actuator not working. 24 VAC power supply not present at the actuator	Control transformer furnishing the cooling valve actuator 24 VAC power has failed	Check transformer
	24 VAC power wiring broken or shorted	Repair wiring
Valve actuator not working. 0 to 10 VDC input signal to actuator not present	0 to 10 VDC input signal wiring broken or shorted	Repair wiring

Maintenance

General information

Units have been designed to minimize maintenance. A maintenance interval plan is provided as guidelines for standard machine operation. Any strong deviations in the usage pattern may require additional maintenance. This must be checked in individual cases.

WARNING! During maintenance procedures, the installation must be completely isolated and precautions taken to prevent any premature re-start.

Maintenance, inspection and cleaning operations should be carried out by qualified personnel. The manufacturer does not take any responsibility for system cleaning.

Fan and motor

Long-term storage (3 months) of a fan-motor assembly may cause damage to the bearings (brinelling); in case of long term storage, it is necessary to turn the fan wheel from time to time.

Every six months:

- Check for soiling, damage, corrosion and any tendency to bind and clean as necessary.
- Touch up any spot damage to the unit casing and the fan impeller using a zinc based paint.
- Check the air tightness of any flexible connectors.
- Check the function of any anti-vibration dampers.
- Check the cleanness of any weather protective grills.
- Check all fan bearings for sign of wear and/or grease leakage.
- Lubricate the fan bearings (if not sealed for life type).
- Check bearing locking set screw and other setscrews for proper tightness. All bearing races must be secured.
- Lubricate fan motors.
- Align pulleys and check level of shafts.
- Check fan belt tension. Adjust if belt slips.
- Replace worn or frayed belts with a new matched set. Do not force belts onto pulleys.

Once a year:

- Inspect electrical wiring for condition. Tighten all connections.
- Inspect the unit casing and accessories for chipping and corrosion. If damage is found, clean and repair.
- Clean fan wheels and shaft.
- Remove rust from fan shaft with an emery cloth, and recoat the shaft with a suitable varnish.
- For external units, check the access door seals are in good condition and replace if necessary. Adjust the hinges to take up any looseness.
- Bearings lubrication. Use only lithium grease, without chemical impurity. Recommended lubricants:

ALVANIA (Shell)

MOBILUX 3 (Mobil)

BEACON 3 (Esso)

SKF 28 (ball bearing grease)

CAUTION! Do not over lubricate bearings. Grease with hot bearing if possible, rotating slowly the fan by hand. Excessive pressure caused by over lubrication may displace bearing grease seals or cause grease to overheat the bearing, resulting in premature bearing failure.

If there is any irregular noise or clanging renew both bearings. In the case of extreme running conditions, lubricate in accordance with the following recommendations.

WARNING! All above checks and operation shall be done first time after the 10 first working hours.

Maintenance



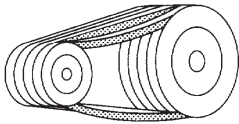
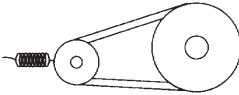
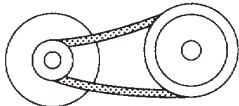
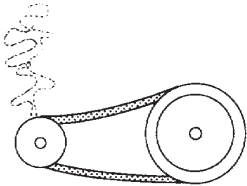
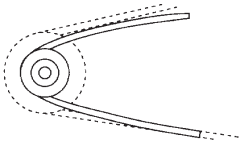
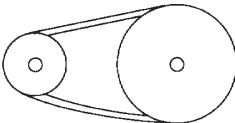
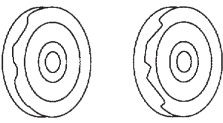
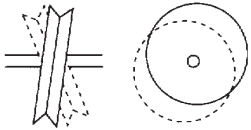
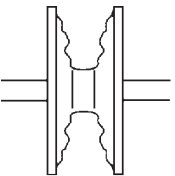

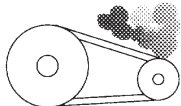
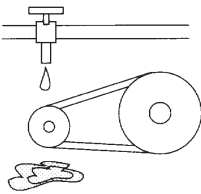
Table 5 – Lubrication guidelines

Ambient conditions	Temperature range °C	Lubrication intervals
Clean	T < 50	6-12 months
	50 < T < 70	2-4 months
	70 < T < 100	2-6 weeks
	100 < T	1 week
Dusty	T < 70	1-4 weeks
	70 < T < 100	1-2 weeks
	100 < T	1-7 days
Extreme humidity	-	1 week

Belt drive and pulleys

The belt drive is a reliable and low maintenance component knowing that unfavourable working conditions which may reduce the working life and result in reduced efficiency are to be avoided (see Table 6 and Figure 19).

Table 6 – Belt conditions

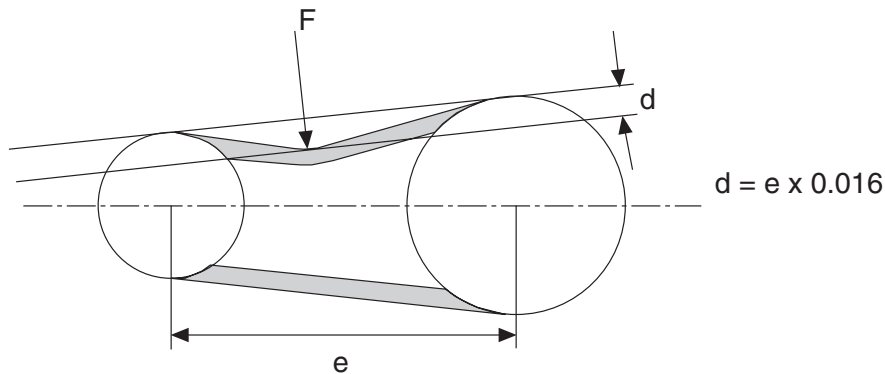
				
Belt not positioned in groove	Belt impinging on groove	Belt not uniform	Over tensioned	Too slack
				
Slip	Pulley too small	Overload	Damaged pulley	Eccentric distortion of pulley
				
Worn pulley	V-grooves not uniform	Dust, dirt	Moisture, dampness	

Belt maintenance

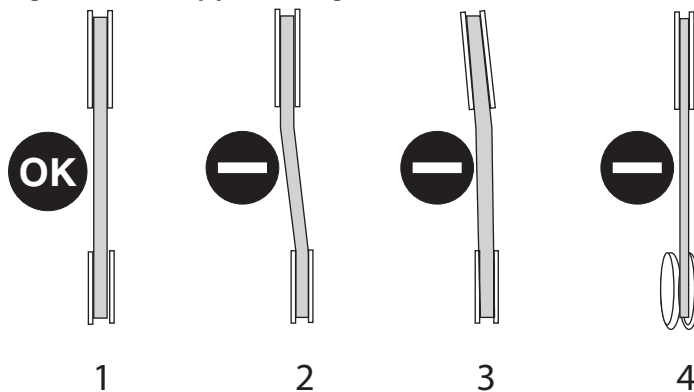
Clean fan belts with a dry cloth. Oil and grease must be kept off the belts. The use of a belt dressing is not recommended. When replacing belts, use a matched set. Do not force belts onto pulleys but adjust motor position to allow mounting and retighten.

Belt tensioning

The tensioning of the drive belt is achieved by moving the motor slide support.

Figure 21 – Belt tensioning


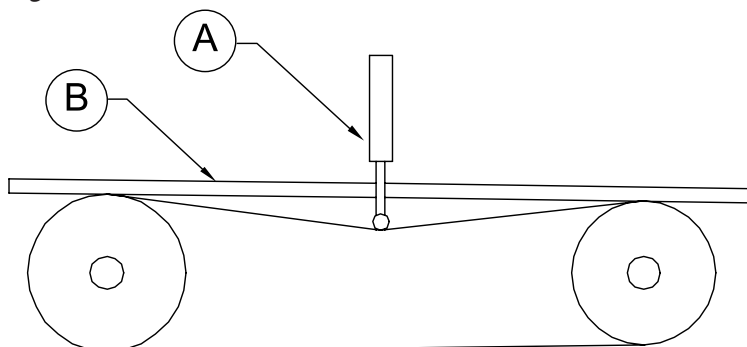
Deflection d
 Centre distance e
 Power F
 $d = e * 0.016$

Figure 22 – Pulley positioning


- 1 = Correct position
- 2 = Pulleys out of line
- 3 = Pulleys not parallel
- 4 = Twisted pulleys

CAUTION! The belt drive should be re-tensioned following the first 10 hours of operation. The correct tensioning of the belt is established independently from the belt cross section and the axial clearance (see Figure 22).

Alternatively a belt tensioning meter may be used (see Figure 23).

Figure 23 – Belt tension measurement


CAUTION! Damage to the motor and fan bearings can result from the belt being over tightened. A belt that is too slack will result into early wear and poor efficiency (caused by slippage.)

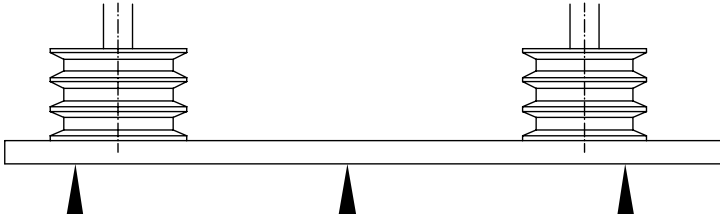
Maintenance

Pulley alignment

Check using a straight edge along both pulleys (See Figure 24). It is recommended to use a metal ruler instead of a string.

Correct position is showed on Figure 24.

Figure 24 – Pulley alignment



Pulley removal

Pulleys are generally mounted with a conic joint.

To remove pulleys, follow the manufacturer's directions.

Pulleys not provided with a conic joint are mounted by forcing them onto the shaft.

To remove them, heat the pulley hub and use a pulley extractor.

Belt replacement

To change the belt, the belt tensioning device is slackened off until the worn belt can be removed.

Before the replacement, clean the pulleys and check them for damage and wear.

Never use tools or force on the pulley edges as invisible damage can significantly reduce the life of these items.

If multi pulleys are in use all belts must be replaced simultaneously.

Check that the number of belts matches the number of pulley grooves.

During the tensioning of multiple belts in parallel, it is important that they are all slack on the same side of the drive mechanism otherwise damage can result.

Finally, when the belts are tensioned, the drive must be turned for a few revolutions by hand and then the state of tension, the shaft and pulley layout are checked (see Drive belt tensioning section).

Coils

If a unit is not run for an extended period of time, it is recommended to completely drain off the coil. When refilling is undertaken, check that the unit is effectively vented.

Periodic verification of coil cleanliness is required. Dirty coil shave increased air side pressure drops and reduced heat transfer potential, disturbing the complete system balance.

Hot water, cold water, and steam coils

Coils do not require any special maintenance except regular cleaning.

Depending on the amount of operational usage and filter servicing, check the coil finned area for dust and deposits, roughly every 3 months and clean as necessary.

Also check that the pipe work is watertight.

Cleaning

The cleaning is carried out with the coil in place using a powerful vacuum cleaner on the dust contaminated side.

If the coil is very dirty it will need to be removed and wet cleaned. Zinc plated steel heat exchangers maybe cleaned with a steam jet or the fins washed through with a powerful water jet and finally blown out with pressurized air.

If required, soft cleaning brushes may be used ensuring that the heat exchanger fins are not damaged.

CAUTION! Coils with copper or aluminium fins are particularly vulnerable and must therefore only be cleaned with a low pressure water jet. In case of specific clogging, call a cleaning specialist; Trane cannot be held responsible for improper cleaning of the coils. Any damage to the fins by the use of undue force will result in premature failure of the heater coil.

Any points corroded or rusted should be cleaned off and coated with a zinc-based protective paint.

Maintenance

Frost Protection

Check that the frost protection system is working before the beginning of each winter period. Ensure that the frost thermostat is working within the correct temperature range.

Condensate drain tank

The cooling coil condensate drain pan and the drain connection should be checked for sediment and deposits and cleaned as required.

Filters

Use Table 7 as a recommendation for filter cleaning or replacement. Each unit maintenance should be adapted depending on filter type and on air quality. Filter clogging causes higher air pressure drops resulting in lower air volume and performance change.

WARNING! If a damper or intake/discharge hole is positioned on the bottom panel and the section is equipped with inspection access, safety devices must be provided to cover the damper hole when entering in the section.

Note: It is recommended to install the gauge or the differential pressure switch, if necessary, with a visible indicating light, to have a constant control over filter cleaning. It is also recommended to adjust the dirty filter setting to the final air pressure drop indicated in the selection data sheets.

Note: The unit must not be run without filters.

Clean the filter after the first 2 hours of unit operation. The bag and absolute filters must be replaced when filter air pressure drop reaches the final air pressure drop indicated in the selection datasheets. The washable filters must be cleaned with air pressure going in the direction opposite the normal air flow and then washed in hot water with the addition of a small quantity of detergent.

Refer always to filter manufactures cleaning instruction.

The new filters must be installed in the air flow direction as indicated by the arrow on the external frame and as described in Installation section.

Electrical air heaters

Check the heater for dirt accumulation, the ignition and any build up of corrosion. If required, clean the heating elements. Check the safety controls and the fan control.

Humidifier/air washer

CAUTION! The whole humidifier section including the drain pan must be cleaned and disinfected regularly. It must also be thoroughly cleaned after each operating season.

To optimize the unit life cycle and operation, we strongly recommend the use of a water specialist to verify and adjust the hardness and quality of the water used in the humidifier systems.

Pumps

The circulating pump and motor maintenance must be carried out in accordance with the manufacturer's instructions.

As a general rule:

- The pump must never be run dry to avoid any pump damage.
- Ingress of sediment into the pump must be avoided.
- The pump should be run a few minutes every other day to avoid jamming. The installation of an automatic actuator for this purpose is recommended.

Maintenance

Air washers

- Check that the fresh water supply is working correctly and that the water level is correct. Adjust as necessary.
- Depending upon the extent of water contamination, the degree of hardness and water treatment, any scale deposits or other impurities must be cleaned off from the air washers. Any severe calcium deposits on components such as spray pipes, droplet separators or strainers indicate that the treatment is inadequate.
- Deposits on spray pipes, strainers, air strengtheners and droplet separators may be treated with diluted formic acid and subsequently rinsed off with clear water. In the case of droplet eliminators or air straightener blades of plastic construction, any deposits may be occasionally removed by carefully flexing the components i.e. after they have been dried off and removed from the module. Corroded or damaged droplet separator blades should be replaced.
- Any strainers or sediment accumulations should be inspected and cleaned as necessary. Dismantle spray pipes and clean. Check the fresh water feed, the overflow, siphon and the water tank for any sediment accumulation and clean as necessary.
- Any spray pipes with erosion damage should be replaced.
- Never ream out spray pipe nozzles with sharp instruments. Flush out the spray pipe with a high pressure water jet, with the spray pipe nozzles removed.
- Check that the setting of the sediment flushing valve (bleed-off) is correct.

Evaporative (Honeycomb) humidifier

Follow the instructions given in the Air Washers section. Any Honeycomb module strongly encrusted with calcium deposits should be replaced. In the case of lightly contaminated components, with the air handling unit powered off, add a suitable decalcifying agent to the circulating water and operate the pump until the deposits are dissolved. Thoroughly wash off and flush through the system following this operation.

Trane cannot be held responsible for improper cleaning of the Honeycomb humidifiers. In order to avoid any excess clogging of the honey comb humidifiers, it is recommended to interlock the spray pipe operation with the fan operation.

Other humidification

For humidification with or without steam generator, atomizing nozzles or feeding cabinet, it is mandatory to follow the manufacturer's instructions.

Dampers

Check for dirt and deposits, for any damage or signs of corrosion. Clean with pressurized air or steam. Check the easy movement and correct operation of the dampers. If there is any tendency to jam, check the unit is not misleveled.

CAUTION! Check that the linkage is firmly in place and tighten the screws if necessary.

Sound attenuators

Check for any dust deposits and clean with a vacuum cleaner as needed.

Weather louvers and hoods

Check for dirt and deposits, for any damage or signs of corrosion. Remove any leaves or foreign matter which may have been drawn in.

Energy recovery components

Plate type heat exchangers

Plate type heat exchangers are typically made of aluminium. Their service life is virtually unlimited. Maintenance is limited to cleaning operations.

- Clean the condensate drain pan, check the siphon and fill up as necessary.
- Any accumulation of fibres or dust on the exchanger may be removed with a hair broom or vacuum cleaner.
- Any oil or greasy deposits must be removed. Make sure the bypass damper (if any) is operating properly.
If a bypass damper is fitted, maintain as suggested in above Dampers section.

Heat wheel

Refer to the manufacturer's instructions for proper maintenance of the wheel, wheel drive and motor. The construction of the matrix is such that it is virtually completely self-cleaning. The rotor may be cleaned with pressurised air, water or steam jet and domestic household detergents as necessary.

Heat pipe exchangers

Heat pipe exchangers have no drive mechanisms or moving parts. Maintenance consists in cleaning operations, cleaning of the condensate drain, checking the siphon and filling as required.

To clean the fins:

- Blow out with pressurised air against the direction of the air stream or spray with low pressure water. If necessary add house hold detergents.
- If a bypass damper is fitted, maintain as suggested in above Dampers section.

Unit waste disposal

A standard air handling unit is made up of 95% recycling metal materials. Unit insulation is performed with foam polyurethane injected into the unit panels. Air filters made of synthetic fibres are available. The special materials employed are listed in the attached technical sheet relating to the unit.

The unit or part disposal must be performed in accordance with application regulations.

Note: Regular maintenance is critical for the long lifecycle of all air handling units. Trane Service is available for any problem or advice.

Maintenance Plan

The following table lists suggested maintenance intervals for the CLCF air handling unit based on experience and under normal running conditions. They are based on continuous running operation per 24 hour period in moderate climatic zones with minimal dust pollution as would normally occur in reception areas or office accommodation. Widely different operating conditions, particularly in respect to air temperature, humidity and dust pollution will considerably shorten the maintenance intervals.

Maintenance

Table 7 – Maintenance plan

System component	Activity	Component	Weekly	Monthly	Every 3 months	Every 6 months	Annually
Fan-Motor	V / C / M	General considerations	X				
	V	Check for corrosion		X			
	V	Flexible connections		X			
	V	Anti-vibration isolators				X	
	V	Protective grill		X			
	V	Inlet guide-vane controller (option)		X			
	V	Drainage		X			
	V / C / M	Fan bearing		See Fan maintenance section			
	V / C / M	Motor, in general		X			
	C / M	Motor bearing		See Motor maintenance section			
	V	Power consumption, Measurements		X			
	V	Belt drive, in general		X			
	V / M	Belt tensioning		1st time after 10 hours of operation			
	M	Replacement of belt		As necessary			
Filter components	V / C / M	Dry layer filters	X				
	V / C / M	Bag filters	X				
	V / M	Absolute filters	X				
	M	Autoroll filters		See Motor maintenance, Auto roll filters section			
Heat exchanger	V / C	Heat exchanger fins		X			
	V	Frost protection					X
	V / C	Condensate drain pans & water tanks	X				
	V / C	Droplet separator			X		
	V	Steam heater coils		X			
E-Batterie	V / C	Electrical heater coils				X	
Humidifiers	V / M	Pump		X			
	V	Water feed, Air washer		X			
	C	De-scaling and cleaning		As necessary			X
	C	Spray nozzles		X			
	M	Water tank	X				
	V	Sediment purge arrangements		X			
	M	Steam humidifier		See Humidifier/Air washer maintenance, Steam humidifier section			
	V / C / M	Evaporative (Honeycomb) humidifier		See Humidifier/Air washer maintenance, Honeycombe humidifier section			
	V / C / M	Spray pipe humidifier			X		
Louvre dampers	V / C	Dampers				X	
Sound attenuators	C	Sound attenuators		As necessary			
Weather protective grills	V / C	Weather louvers, grills and hoods		X			
Energy recovery comp	V / C	Plate type heat exchangers					X
	V / C	Rotational heat exchangers		X			
	V / C	Heat pipe components					X

V = Verify
C = Clean
M = Maintenance



Notes

Trane - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice. We are committed to using environmentally conscious print practices.

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