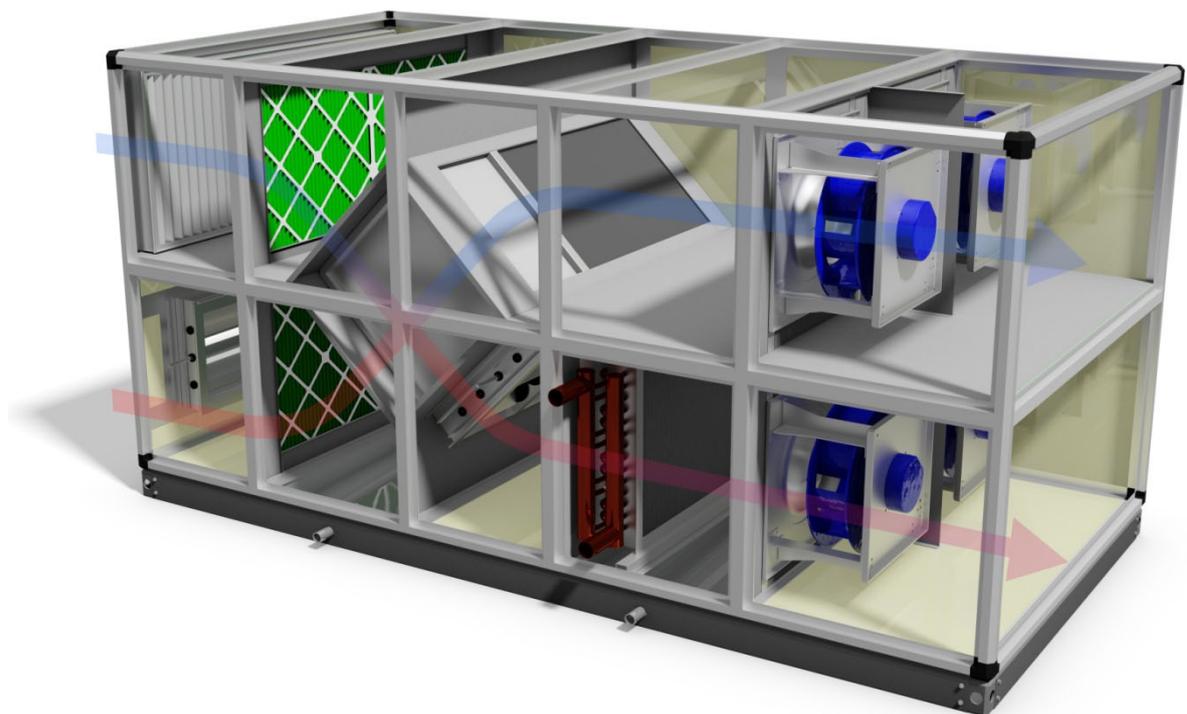


# clever

AIR HANDLING

## AIR HANDLING UNIT INSTALLATION, OPERATION & MAINTENANCE MANUAL



Produced Made in New Zealand by



# INDEX

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# INTRODUCTION

Temperzone is proud to provide the CLEVER air handling unit range throughout New Zealand. We endeavour to provide the highest quality and latest innovative solutions for our clients. Temperzone has been importing and manufacturing HVAC equipment for over 25 years and has a vast experience in this field. We guarantee the quality of our products and customer service.

We suggest that you read this handbook carefully and follow the recommendations and instructions within. This will ensure that you get the most out of our CLEVER air handling units. The final product may be different to drawings & details outlined in this manual and should only be treated as reference.

## SECTION 1 - Preliminary

### HANDBOOK PURPOSE

This handbook provides to users, fitters and maintenance personal with the necessary information to operate, install and maintain the CLEVER air handling unit. All instructions must in compliance with local safety regulations.

This handbook provides to users and fitters the necessary information in order to operate, install and maintain the CLEVER air handling unit correctly, always in compliance with safety equipment envisaged by the local safety regulations.

With this handbook, Temperzone explains what a CLEVER air handling unit is and how they are composed. User and fitters, before undertaking any operation, should carefully read this manual and clearly understand each section. Any operation undertaken on the CLEVER air handling unit that has not included with the instructions contained in this handbook are considered unsuitable. This will lead to the manufacturer disclaiming all responsibilities. Even though this handbook has been revised very carefully to ensure the comprehension and detail, if anything is unclear, missing, or the descriptions inexact, you are kindly requested to let us know.



This handbook is an integral part of the CLEVER air handling unit and it will accompany it throughout its operating life, and as such must be preserved in a protected and dry place where it is readily available. In case of damages or loss of this handbook, ask for another copy to:

temperzone ltd (Head Office & Factory)  
38 Tidal Rd, Mangere South, Auckland 2022.  
Private Bag 93303, Otahuhu, Auckland 1640.

Enquiries: 09-279 5250 [info@temperzone.com](mailto:info@temperzone.com)  
Sales: 09-279 5250 [nzsales@temperzone.com](mailto:nzsales@temperzone.com)  
Facsimile: 09-275 5637

This handbook reflects the CLEVER air handling unit condition at the time of sale, all modifications due to technological development or refinements are not binding, and therefore the manufacturer is not bound to update this handbook and the CLEVER air handling units previously manufactured.

## INSTRUCTIONS

All paragraphs preceded by the symbol  require great attention as they underline dangerous situations.

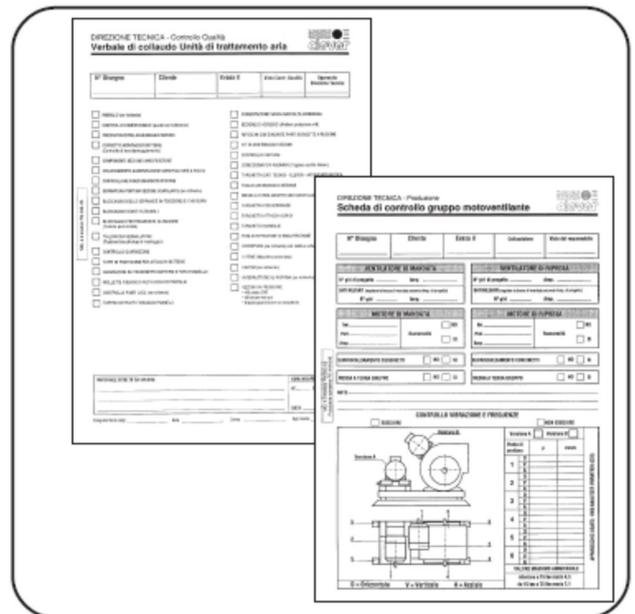
## PRECAUTIONS

Temperzone disclaims all responsibility in the following cases:

- The installation and maintenance of the CLEVER air handling unit that are not carried out by the qualified and authorized personnel.
- Use not in compliance with the specific national regulations.
- Use of non original spare parts.
- Power supply faults
- Removal of safety protections.
- Total or partial non- compliance with instructions.
- Modifications to the CLEVER air handling unit.
- Negligence

## TEST CERTIFICATE

All CLEVER air handling units undergo checking and supervision and are continuously evaluated by quality systems during manufacturing and assembly. Before despatch the CLEVER air handling units are thoroughly inspected and checked for: dimensions, components, assembly, identification, labelling, etc. A completion certificate, filled in and signed by the inspector, is kept in the technical file in Temperzone offices. A copy can be made available upon request.



## IDENTIFICATION

The CLEVER air handling units are provided with a metallic identification label, it mentions the following data: Model, Serial Number, Unit Number, Project Reference, etc. Every request of information should contain the above mentioned references.

## SECTION 2 - Warnings

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### AIR HANDLING UNIT DESCRIPTION & WARNINGS

CLEVER Air handling units are to be installed, operated and maintained only by qualified technical personnel. They are suitably designed for air conditioning, heating, cooling, and ventilation.

#### FAN SECTION



It is strictly forbidden to enter into the fan area while the fan is operating. When necessary, the operator should be equipped with proper safety equipment and clothes in compliance with local regulations. Once turned off, the fan will take time to come to a complete stop.



Other protective measures are optional such as; inspection door micro switch, belt guard, fan inlet door wire mesh

#### TREATMENT SECTIONS



##### HEATING COIL

Pay attention to the heating coil high temperature. The maintenance personnel should treat the surface as hot and be equipped with gloves and clothes to prevent accidents.



##### ELECTRICAL CONNECTIONS

Turn all isolators off before touching any electrical connections. The electric cables and cables sockets should be in compliance with local wiring regulations.



##### HUMIDIFIER WITH ELECTRIC PUMP SECTION

Turn the power supply off, before entering into the area.  
The maintenance personnel should be equipped with proper safety equipment and clothes. Carefully check water supply connections in order to avoid water leakage and consequent flooding and short-circuit



##### FILTER SECTION

Turn the power supply off, before entering into this area.  
The filter section should be treated as high flammable due to fine dust build-up present. As such it is forbidden to smoke or to light flames inside the filters area. Dirty filters are easily can easily ignite.

#### DAMPER SECTIONS



##### MOVING PARTS

Pay attention when the dampers are operating; do not place your hands on moving components such as blades, wheels, or shafts.

#### ALL SECTIONS



##### WARNING SHARP OBJECTS

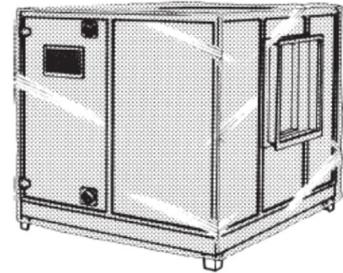
In access areas screw tips are provided with a cap to avoid clothes tearing and wounds. Also watch for projecting parts and sharp metal sheet edges. Dampers have moving wheel driven blades, and drive shafts.

## SECTION 3 - Packing & Transport

### PACKING

CLEVER air handling units are normally delivered completely assembled. On request for some specific cases such as: difficult transport conditions, difficult access in destination rooms, units can be supplied disassembled in various sections or completely disassembled as a kitset.

Temperzone disclaims all responsibilities concerning any damages once the goods have been received. Receivers are responsible to inspect the goods on delivery for damages. Upon finding damage, IMMEDIATELY notify the Freight Company and Temperzone. Failure to provide immediate notice will cause any warranty / damage claims to be invalid.



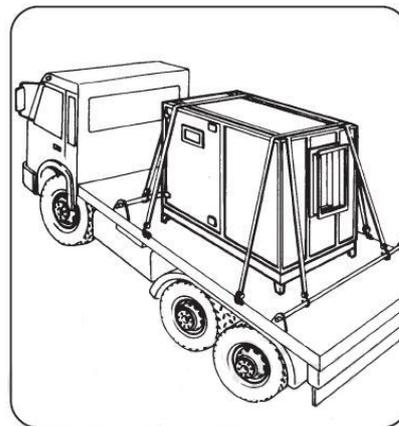
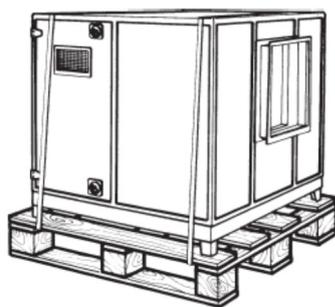
CLEVER air handling units are generally supplied with shrink wrapped plastic finish with heavy plastic covers on wooden pallets to provide weather / site protection. This will not prevent damage during transport and inspection. Un-wrapping should also be undertaken to indicate any damage. Disposal of packing materials is the responsibility of the customer and should be disposed of correctly under local regulations.

### TRANSPORT

Always fix section with straps (**never use chains**). For long or difficult transportation, sections should be fixed carefully considering factors such as: internal weight of the components, condition of the roads, etc, to ensure the CLEVER air handling unit suffers no damage. Temperzone disclaims all responsibilities concerning damages due to wrong loading and unloading.



The various sections should be loaded and unloaded with attention to the projecting parts: hinges, handles, drain trays & connections, pipe connections, and so on. Never use these points to move the CLEVER air handling unit.



## SECTION 4 - Loading & Un-loading

### LOADING AND UNLOADING

CLEVER air handling unit equipped with feet allow easy lifting through fork-lift trucks or through ropes. Air handling units without feet are provided with metal base in which holes have been made in order to use hooks or to use bars that can facilitate lifting through ropes.

STROPES AND SPREADER BARS ARE THE RECOMMENDED METHOD OF LIFTING AIR HANDLING UNITS.

To reduce the risk of damages we recommend that protection be added to the casing when unloading the CLEVER air handling unit using straps or spacing bars between lifting rods.



Never leave the load suspended in air



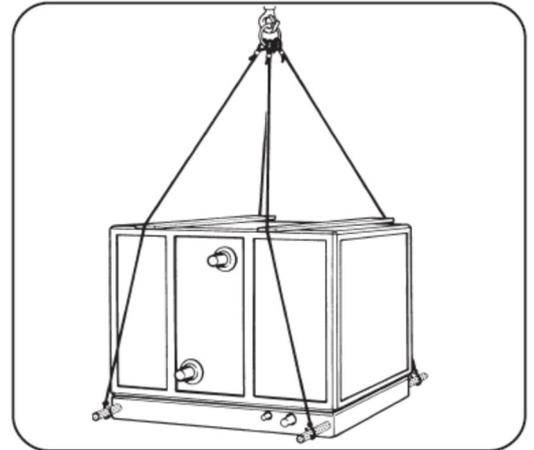
During lifts, go slowly paying attention to the allowed inclination?



Units must be managed with care especially during unloading and during assembly. This will avoid damages to the casing and to the most delicate component parts such as: impellers, bearings, coils and so on.



Gently maneuver unit to prevent damage due to impacts in order to avoid cracks to rivets, screws and so on.



## SECTION 5 - Positioning

### TEMPORARY WAREHOUSING



Air handling units should be stocked in dry rooms and protected from atmospheric conditions. Only with these precautions oxidation, etc can be avoided.

### POSITIONING

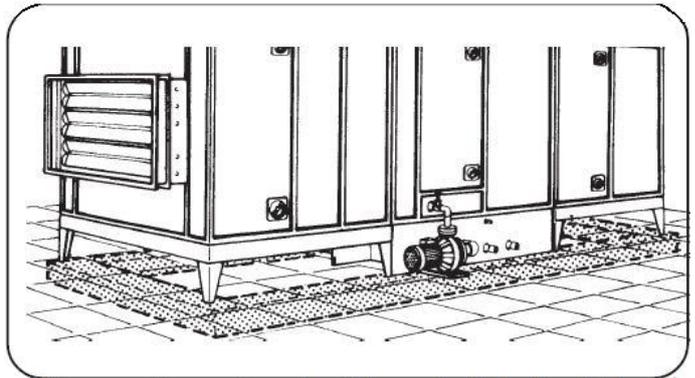
CLEVER air handling units supporting surface should be perfectly horizontal. This is to avoid harmful tensions on panels and frame during section assembly. A water level is required to position the CLEVER air handling unit, using wedges when necessary to ensure correct clearances for opening of inspection doors.



The CLEVER air handling unit can be installed directly on a floor able to support its weight. We however recommend advisable to build a base made of cement or sheet metal.



We recommend to place vibration absorbers between the CLEVER air handling unit base and the floor, even though the internal component parts are dynamically insulated from the structure.



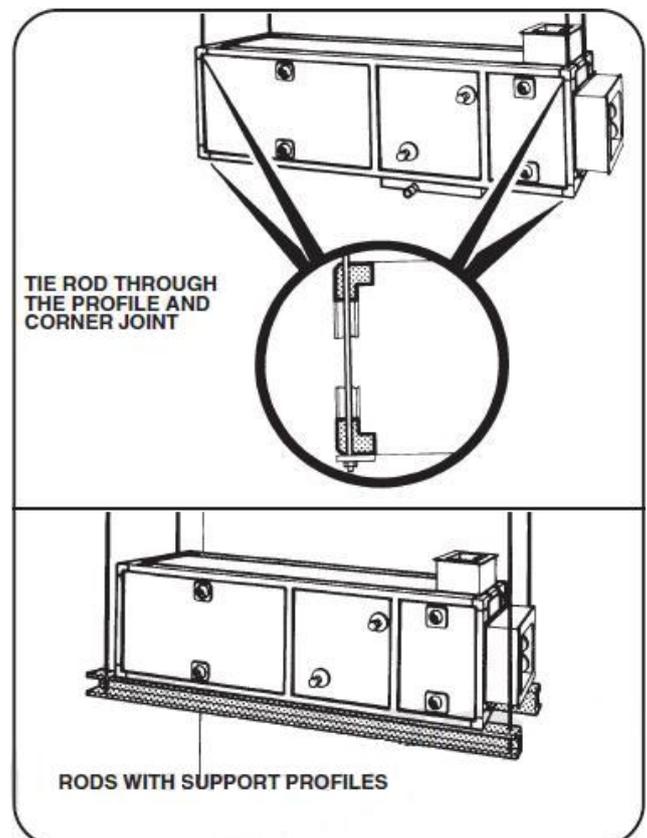
The CLEVER air handling unit fixed to ceiling should be installed through tie rods able to support the total weight. The protection, if supplied, should be removed during final positioning.

The fitter has to pay attention when establishing the position of the unit. It should be ideally placed for easy servicing and maintenance. Therefore it is advisable to foresee a sufficient space all around the unit.



#### PANEL CLEAR PROTECTIVE FILM

The external clear protection film on the external panels **MUST BE REMOVED WITHIN 30 DAYS OF DELIVERY**. The material is applied to protect the panel lining during panel manufacture and transportation. Failure to remove this protective film may cause damage of the lining surface. Claims for damage caused by prolonged time the film left on the panels are not the responsibility of Temperzone.

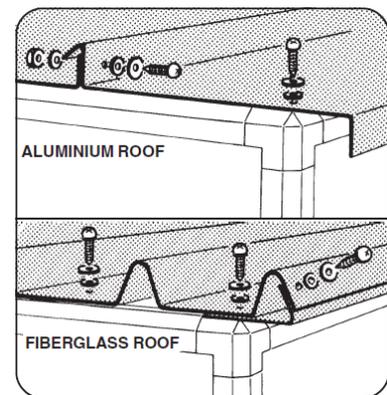


## SECTION 6 - Roofs

### PROTECTION ROOF

If the CLEVER air handling unit are provided with a protection roof fixed to the casing, it will be necessary to inspect for check cracks or screws loosening. Any joints should be sealed with silicone.

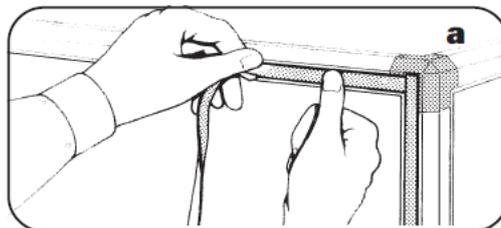
CLEVER air handling units installed outside require more care and attention to ensure protection from the weather. Pay particular attention to sealing gaskets.



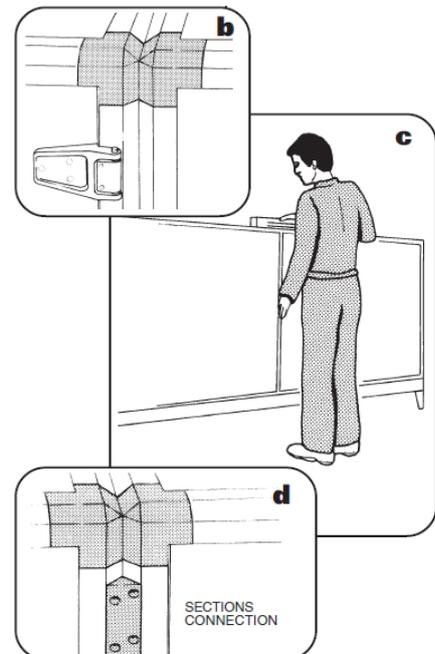
## SECTION 7 - Installation & Assembly

### SECTION ASSEMBLING

During the multi-section CLEVER air handling unit installation, pay attention to fixing clamp plates positioned on sections. Operations can be carried out only by personal who are authorised and qualified for the job. The connections are done outside the CLEVER air handling unit by the help of junction wedge clamps.



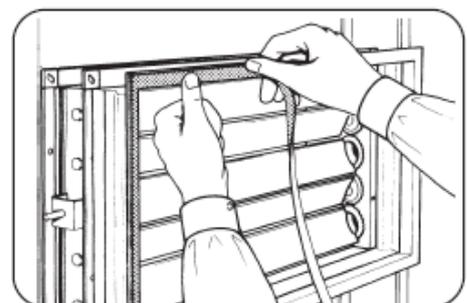
After the application of the self- adhesive gasket (a) connect the sections together for a perfect match(b) During this operation, keep the sections level with the help of a spirit level (c). Apply the junction brackets on the profiles bevel; the wedge shape of the brackets facilitates the perfect sections connections (d).



**The gasket, and fixation screws are supplied in the CLEVER air handling units to be fixed. Ensure silicon sealant are applied to the joint after connection to ensure air tightness.**

### CONNECTION TO DUCTS

Flexible connections should avoid transmitting vibration through the air duct from the CLEVER air handling unit and vice versa. The rubberized canvas / PVC should be sufficiently released, so never connects ducts directly to the CLEVER air handling unit. Place a gasket on flanges to avoid air leakage. Tighten screws, even those difficult to reach. Use silicone to seal slots.



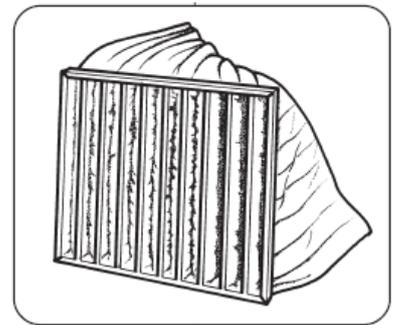
## SECTION 8 - AHU Components

### CELL FILTERS

Check that prefilters have been correctly installed, both cell filters or bag filters. Prefilters have to be installed in the CLEVER air handling unit from the initial start-up. Make sure that gaskets have been placed correctly to avoid air by-pass.

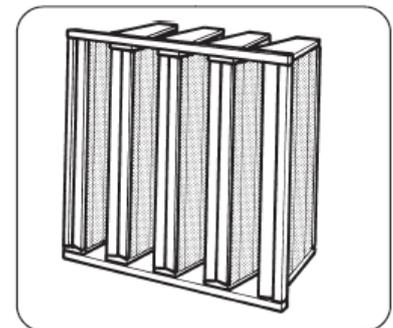
### SOFT BAGS FILTERS

Check that bags are free and that no obstacles block the airflow. Bags are easy perishable in the connection area to the main frame due to dust load.



### RIGID CARTRIDGE FILTERS

Pay attention when handling the filtering media because it is very fragile as it is made of paper and fibreglass.

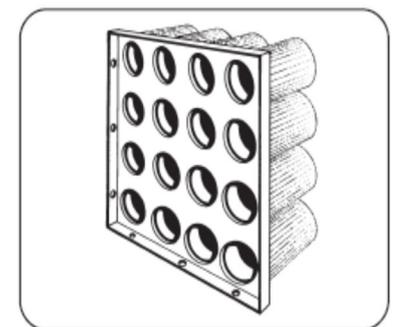


### ABSOLUTE / HEPA FILTERS

It is very important to inspect sealing gaskets, and also the filter frame to check that the components have not been bent during the CLEVER air handling unit positioning. Filter cartridges are very fragile, each crack of the filtering media which will require replacement of the damaged cell.

### ACTIVE CARBON FILTERS

Check the correct position and air flow direction of the cartridge containing carbon, and control sealing gaskets are in good conditions.



### FILTER PRESSURE GAUGES

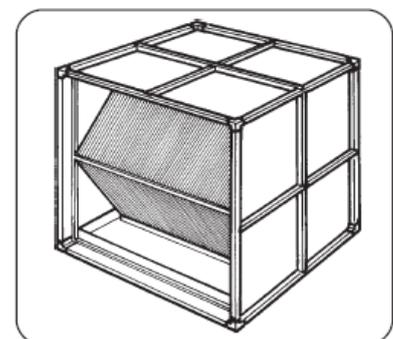
On request a magnelic differential pressure gauge can be installed on the panel & bag / rigid filters.

### HEAT EXCHANGERS

Pay attention when mounting the heat exchanger, as it has been made of fragile components. Check that gaskets and silicone sealing prevent air by-pass. Check that the air by-pass damper works perfectly and the blades closing are correct. Check that fins are not dampened or broken, because this would allow air by-pass or affect the exchange performance.

### WHEEL HEAT EXCHANGER

Check the position of the heat exchanger, it should be perfectly horizontal, and check the regular wheel movement. Check that fins have not been damaged.



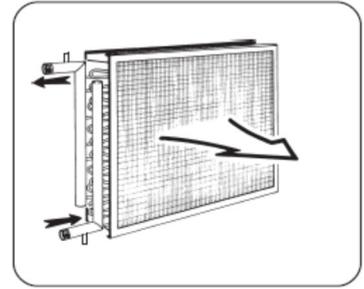
### COILS SUPPLIED BY WATER



All the personnel working near coils should be equipped with proper safety clothing.

#### WARNING - BURN DANGER

Pipes of coils supplied by water should be installed perfectly horizontal. The fluid should run through the coil in counter-current in drain headers to obtain the maximum heat output couplings. It is necessary to install an air vent on each coil, positioned on the upper part of the coil or in the pipe work connecting to the coils. When establishing the dimensions of the circuit pipes do not refer to the coil connections diameter. This dimension has been standardized and will not reflect the internal workings of the coil. Do not load coil connections with connection pipes weight. Provide pipe support where appropriate



When coils are supplied by water exceeding 90 deg C, a device is required to be used to interrupt hot water flow when the fan is not operating. In the case that a device is not install, should by chance the fan stops, the superheating of the air present in the unit would cause damages to motor, bearings, insulation coating and to component parts made of plastics.

### ANTI-FREEZE

To avoid coil cracks caused by freezing, when the temperature drops below 3 deg C, add anti freeze to water or completely drain the coil. This precaution is required for all units not operating continuously.

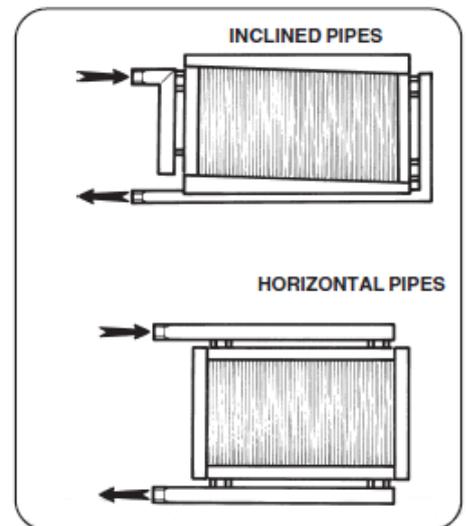
### COILS SUPPLIED BY STEAM

All coils are arranged with vertical pipes or with pipes inclined towards the outlet manifold in order to facilitate the condensate disposal.



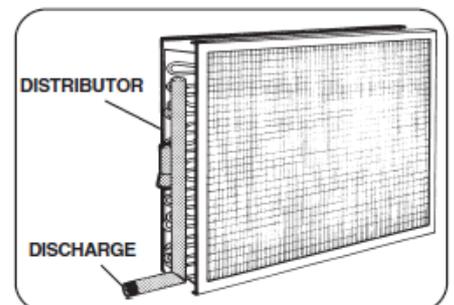
To avoid damaging the coil (watering hammering) pay attention when establishing the dimension and adjustment of valves and condensate traps.

The water must be prevented from stagnating in the coil, manifolds and in the supply pipes. Each coil must be equipped with a condensate trap. When the fan does not operate, superheating inside the coil will be very dangerous.



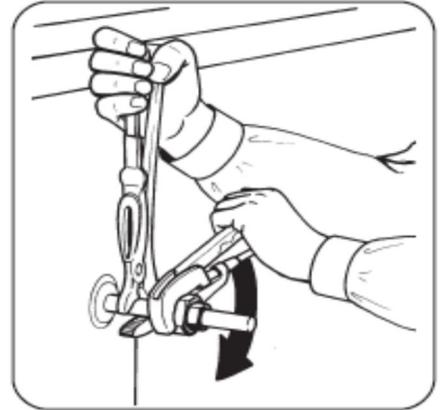
### DIRECT EXPANSION COIL

Before connecting the coil, ensure the pipes are perfectly horizontal and in counter-current and all control devices should be installed.



## WATER CONNECTIONS REGULATIONS

Hydraulic system should not transfer vibrations to coils. Preventive measures should be taken to isolate the transfer of vibrations; otherwise damage caused by work hardening will lead to early failure. Be careful when connecting the coil connections, as if they are twisted, you may damage copper pipes and drain tanks pan discharge couplings. During pre-test operations, carefully check the coil for possible cracks.

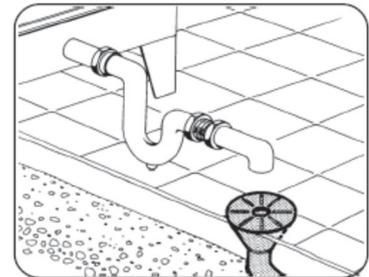


## DRAIN TRAYS

Drain trays, both in cold coils and humidifiers, are equipped with male threaded pipe.



It is necessary to equip the discharge with an anti-siphon in order to prevent the fan from not allowing drainage because it has sucked miasmas or bacteria's coming from sewers decomposition.

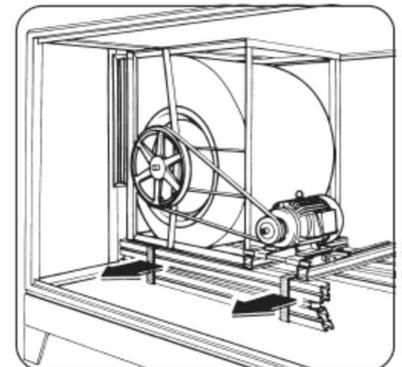


## SUPPLY FAN



Remove the safety transportation brackets, if fitted, of the motor- ventilating section. Leave the vibration absorbers operating and un-obstructed.

Check pulleys alignment and belts tension.



## SECTION 9 - Wiring

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### GENERAL



Ensure all electrical connections are fastened and continuous.

Check motor starter and overloads for correct rating and trip setting.

All circuit breakers, HRC fuses or protective devices associated with the motor must be rated to suit motor running current and starting characteristics.

Supply cables must be appropriately selected considering the voltage drop.

When using long supply cables with VVVF drive, check with motor supplier recommendations to avoid high voltage transients occurring at motor terminals.

Check the connection diagram on the motor terminal box and make sure the supply leads are properly connected considering the supply phase sequence.

Ensure that the supply cable terminations on to the motor terminal board are firm, without loss of strands while using crimped lugs.

Ensure enough clearances are provided between supply cable lugs and to earth.

Ensure that proper earthing connections are made.

If using conduit for the supply leads, ensure the conduit are completely threaded in and seal the threads appropriately.

### THREE PHASE AC MOTOR CONNECTION

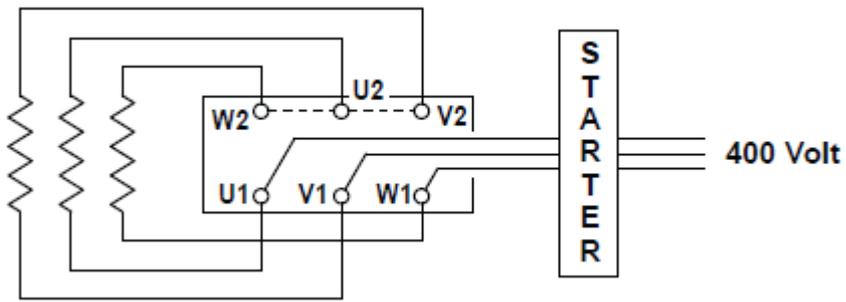
A motor's rated voltage must agree with the power supply line-to-line voltage. Care must therefore be taken to ensure the correct connection to the motor terminals.

#### Internal connections, voltages and VF drive selection

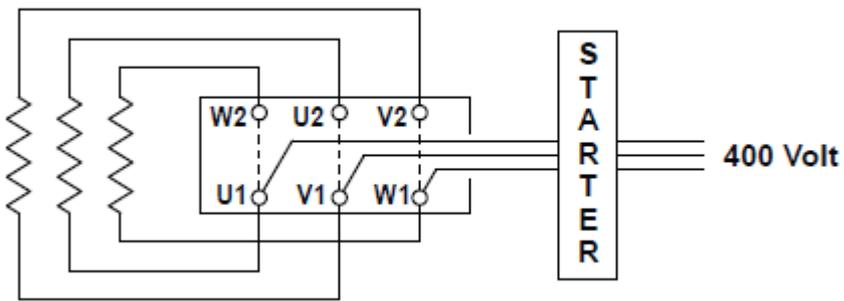
Standard terminal connections for motors 3.0kW and below are 230V delta / 400V star. These motors are designed for 400V Direct On Line (D.O.L.) starting, when connected in the star configuration. They are also suitable for operation with 230V three phase variable frequency drives, when connected in the delta configuration.

Standard terminal connections for motors 4.0kW and above are 400V delta / 690V star. These motors are designed for 400V Direct On Line (D.O.L.) starting, when connected in the delta configuration. They are also suitable for operation with 400V three phase variable frequency drives. Alternatively they can be operated D.O.L. in the star configuration from a 690V supply or with a 690V variable frequency drive. In this case the drive must be supplied with an output reactor to protect the winding insulation. These size motors are also suitable for 400V star-delta starting as described below.

Motor connected for D.O.L. starting with bridges in place for star connection (3.0kW and below)

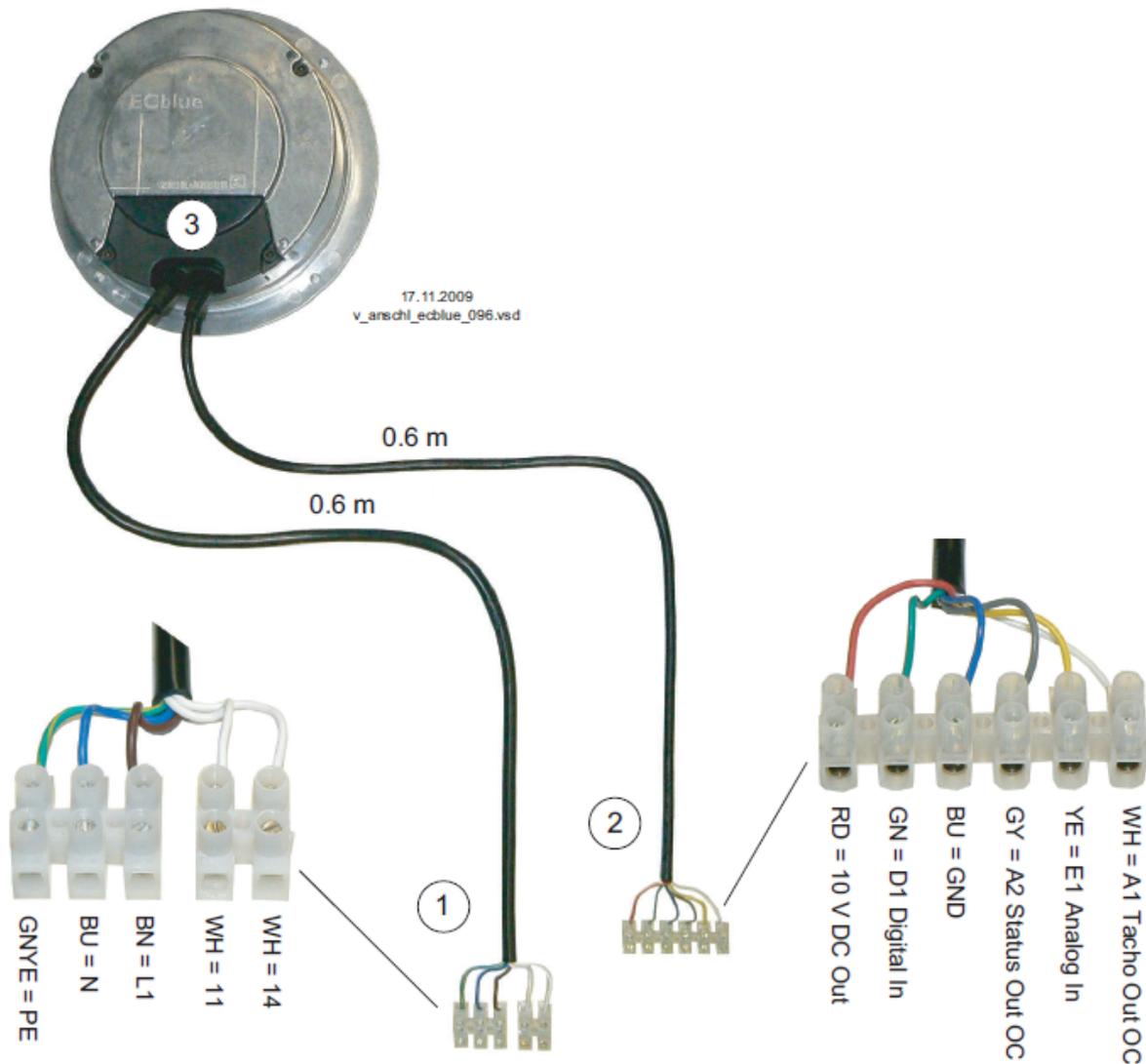


Motor connected for D.O.L. starting with bridges in place for delta connection (4.0kW and above).



## SINGLE PHASE EC MOTOR CONNECTION – “Ziehl Abegg”

Fans with cable connection (type: \_\_\_\_\_ - I . B \_\_\_\_\_)



### LEGEND:

1. Connection line and relay: light plastic-sheathed cable 18 AWG (length ca. 0.6 m)
2. Connection control: light plastic-sheathed cable 22 AWG (length ca 0.6 m)
3. 3 Connection cover

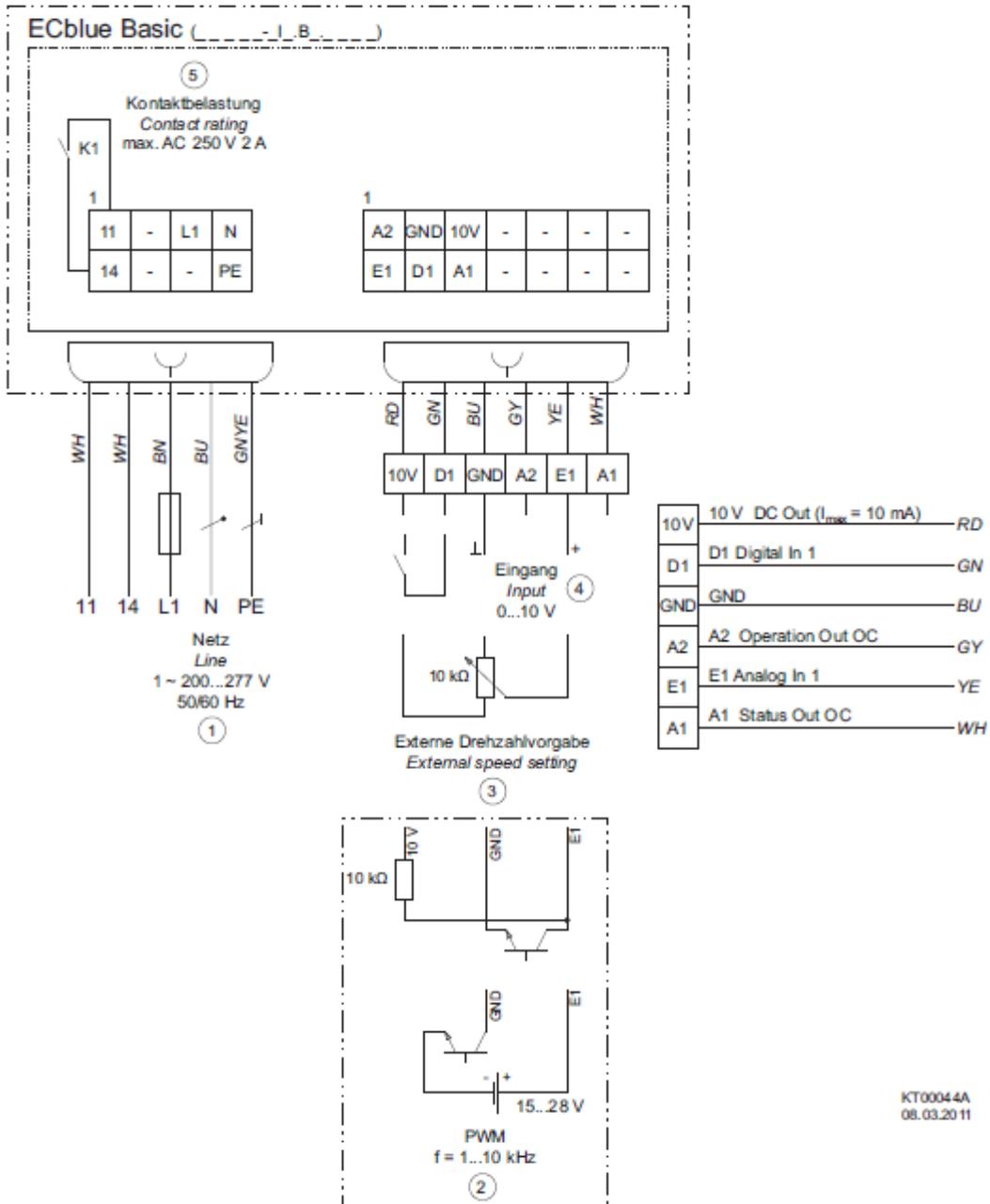


The leads in this illustration are assigned to terminal designations with reference to their function.

Extension through separate connecting box for each connecting line only.

## WIRING DIAGRAM

Motor size "B" (type: \_\_\_\_\_ - I \_ B \_ \_ \_ )

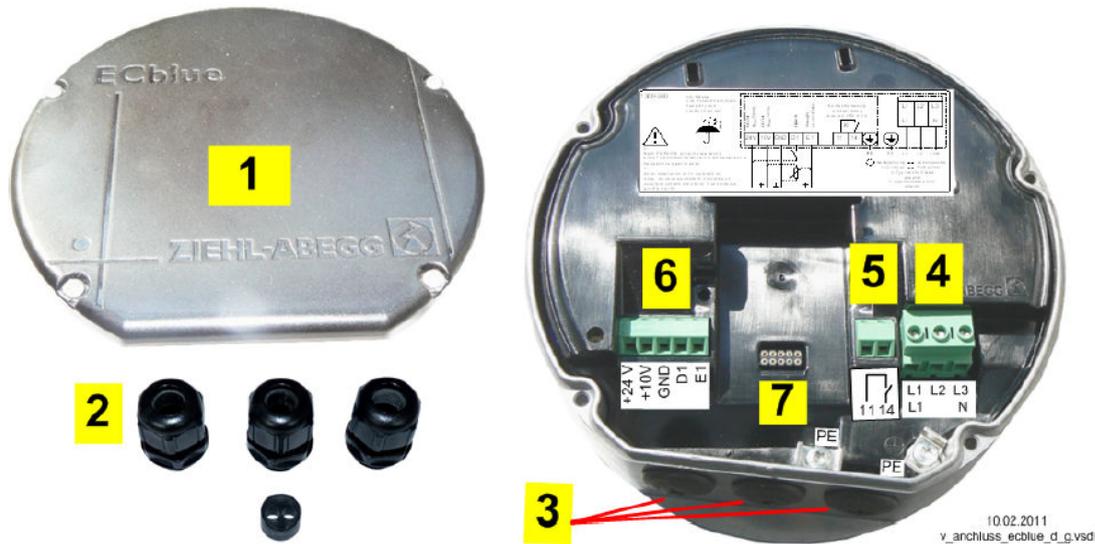


KT00044A  
08.03.2011

- 1 Line voltage 1 ~ 200...277 V, 50/60 Hz
- 2 PWM input, f = 1...10 kHz
- 3 External speed setting
- 4 Input 0...10 V
- 5 Contact rating max. AC 250 V 2 A

## THREE PHASE EC MOTOR CONNECTION – “Ziehl Abegg”

Fans with connection box (type: \_\_\_\_\_ - I . D \_\_\_\_\_), (type: F \_\_\_\_\_ - I . G \_\_\_\_\_)



### LEGEND:

1. Cover of controller housing
2. Cable glands + seal insert for two cables (applicable only if necessary)
  - motor size “D”: 3 x M16 + 1 x seal insert with two holes 5 mm
  - motor size “G”: 3 x M20 + 1 x seal insert with two holes 6 mm
3. Cable entry points with plastic fastener
4. Mains connection
5. Connection alarm relay
6. Connection controls

### PROCEDURE:

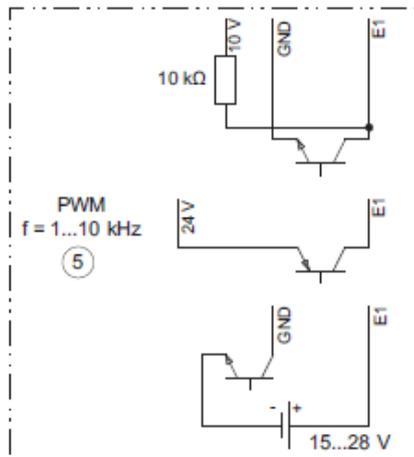
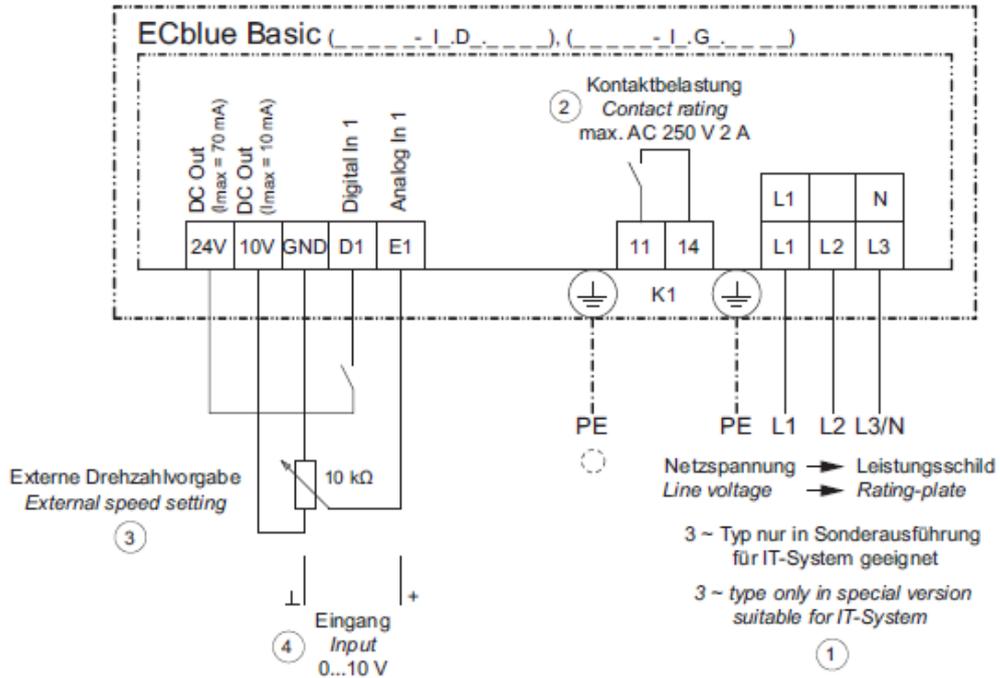
1. Remove the cover from the controller housing for the connection.
2. All 3 cable entry points are in a sealed condition at delivery. Remove plastic fastener if necessary, and insert enclosed cable glands, entry points that are not
3. Used must remain sealed!
4. When using the seal insert for two cables it is not permissible to use the corresponding
5. Cable gland with only one cable.
6. Insert and connect lines correctly.
7. Attach cover of controller housing again carefully in correct position before start-up.
8. 7 Slot for add-on module



Temperatures up to 80 °C can be present on the controller housing.  
To connect, always use heat resistant wires or, as an alternative, silicon tubes.  
Remnants from installation and foreign object may not remain on the inside

**WIRING DIAGRAM**

Motor size "D" and "G" (type: \_\_\_\_\_ - I \_ D \_\_\_\_\_), (type: \_\_\_\_\_ - I \_ G \_\_\_\_\_)



MOEA03K0  
 08.03.2011

- 1 Line voltage rating plate (3 ~ type only in special version suitable for IT-System)
- 2 Contact rating max. AC 250 V 2 A
- 3 External speed setting
- 4 Input 0...10 V
- 5 PWM input, f = 1...10 kHz

## SECTION 10 - Operation

### MOTOR



Before running the motor make sure that the terminal box lid are closed and secured with appropriate clearance to live parts.

Make sure that appropriate earthing are done.

Make sure that the coupling and/or transmission are adequately guarded for safety.

Check the mounting bolts and/or flanges are firmly secured.

Make sure of no loose objects around that may be sucked by the cooling fan on the motor.

Make sure that the load applied is within the nameplate specification.

Avoid frequent starting of motor. Check motor supplier recommendation on frequency and duration of starts,

Check that the running current on no load and full load are reasonably balanced within 10% of the average and record the figures in the log book for future reference.

### FAN – PLENUM & DIDW



The impellers are only intended for the transfer of air or air like mixtures.

Only operate the fan up to the maximum permissible speed. Exceeding the maximum permissible speed can lead, as a result of the high kinetic energy, to a hazard situation.

#### THE IMPELLOR CAN DISINTEGRATE – LETHAL HAZARD

### WHILE THE FAN IS OPERATING CHECK!

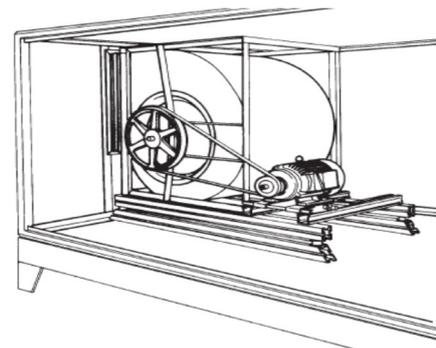
The correct direction of rotation of the impeller, it should be the same as shown by the arrow.



When the fan is operating, the inspection door must be closed, in this way the motor overload is avoided as well as the overload thermal relay intervention.



Doors can be opened only when the unit is disengaged. Handles can be damaged if exposed to high suction pressure, while the fan is operating



Check the fan support profiles temperature after the first hour service; it should not exceed 60deg C.

Measure the effective motor running current and compare this value with the motor rating plate data. An excessive air volume due to lower air resistances can cause electric motor overload. On the contrary, a lower air volume due to higher air resistances than expected with consequent lower electric motor current draw. Alteration of the fan speed via pulley change or frequency adjustment maybe necessary.

## SECTION 11 - Maintenance

### MAINTENANCE PROCEDURES

Maintenance operations should only be undertaken **BY AUTHORIZED TECHNICAL PERSONNEL**. All maintenance shall strictly comply with local and national safety regulations. Before any service is begun, the person responsible for it should switch off the power supply and switch off the unit. A safety sign with maintenance operation should be displayed as a warning.

Before you start:

#### TURN OFF POWER



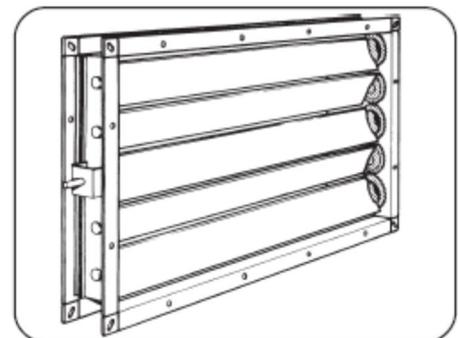
#### AVOID ELECTRICAL SHOCK and ROTATING MACHINERY



### AIR MIXING DAMPERS

CLEVER opposed blade dampers are manufactured from extruded aluminium profiles with nylon gear wheels. This type of damper does not normally require lubrication, but only normal cleaning. If the damper environment is dusty or dirty, cleaning of the damper gears are necessary and regular lubrication will help prevent binding. Silicon based lubricants are recommended.

Ensure the dampers are always installed square without any additional twisting pressure from connecting ductwork, etc. Excessive external pressure can cause damper binding and premature failure of the nylon gear wheels.



### AIR FILTERS

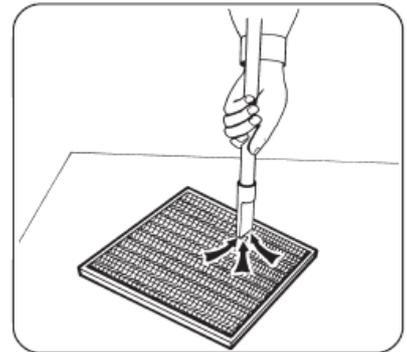
Flow resistance values increase proportionally to the dust accumulation. The filter should be cleaned or replaced periodically and according to dust concentration in the air.

A differential filter pressure gauge can be installed to signal flow resistances. This can help determine when the filter should need cleaning or replacing. The air handling unit should always be turned off during maintenance to avoid operating without filters.

## CELL / PANEL FILTERS

Slide the filter out of the air handling unit via the channel or unhook the clips in the filter holding frame to remove the filter from the unit. To clean cell / panel filters:

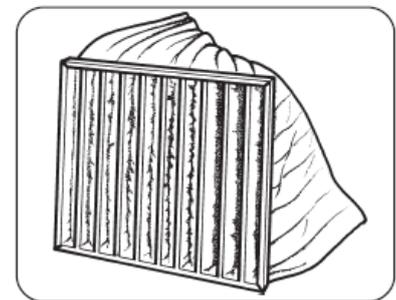
- DISPOSABLE cell / panel filters should be disposed off correctly in a local rubbish collection facility
- WASHABLE cell / panel filter simply shake excessive debris off surface; use a vacuum cleaner, paying attention to use it in the opposite direction to the airflow. Use running water and detergents to clean, always in the opposite direction to the airflow.



Replacement filter media substitution should be carried out in accordance with the filter supplier's literature.

## SOFT / RIGID BAGS

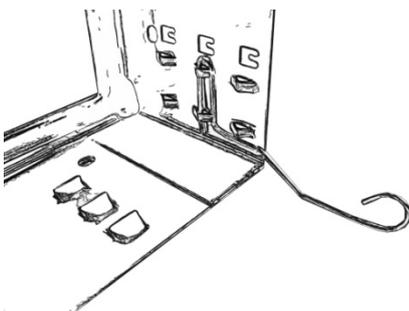
Synthetic pre-filter bags are not regenerable, so they can be cleaned by shaking only a few times, and then they have to be substituted with new media. High efficiency bags, not being regenerable, have to be substituted. To improve the operating life, we recommend using a cell / panel pre-filter. The bag full of dust should be extracted trying to keep the air inlet close (i.e. with a sheet of paper) so that the dust cannot get out.



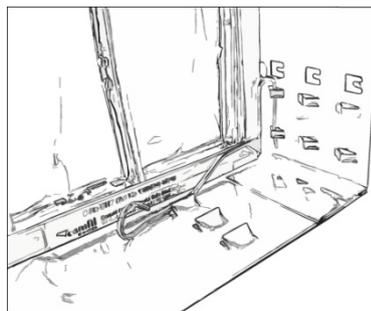
## HOLDING FRAMES & CLIPS

CLEVER air handling unit can be fitted with stainless steel holding frames. The holding frames are provided with a gasket in order to ensure a perfect airtightness and avoid air by-pass. The four retaining clips should be fitted and clipped in the correct position. Incorrectly fitted clips or missing of one of them could cause air by-pass. For a correct tight seal the gasket should not be damaged, so it should be checked every time you replace a filter. If the seal is damaged replace or repair it.

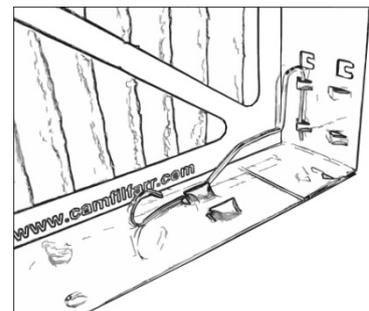
CLIPS OPEN



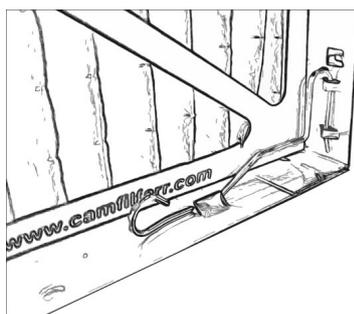
1" BAG FILTER



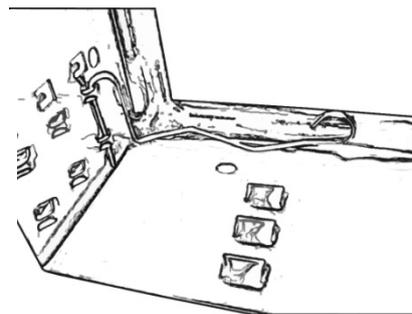
2" BAG FILTER



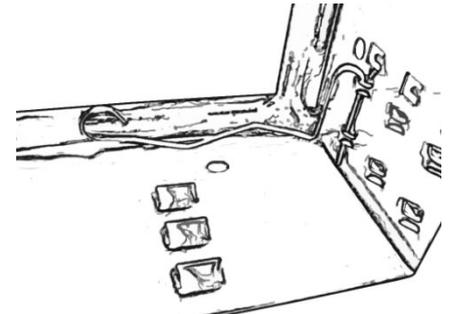
3" PANEL & BAG FILTER



LEFT HAND CLIP



RIGHT HAND CLIP



## HEPA / ABSOLUTE FILTERS

H10 to H14 absolute filters are provided with gasket and are fitted in proper metallic holding frame. The fixation is carried out through four tie rods with retaining angle frame and nuts. Ensure the filters are fitted well to avoid any loss of filtration. The filter should be rigidly and perfectly fixed to the holding frame. Every time you substitute it check the seal of the holding frame and media if fitted.

## ACTIVE CARBON

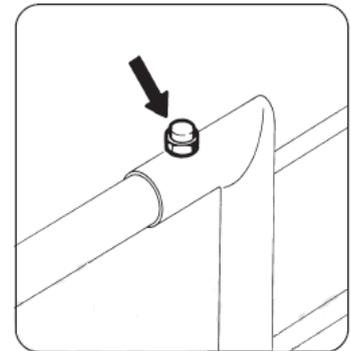
It can be difficult to establish the active carbon filter clogging rate. The type of gas, its concentration, the characteristics and quantity of carbon, all determine the replacement frequency. Consultation with the filter media supplier will help determine the correct replacement period.

## HEAT EXCHANGERS

To keep optimum performance of the heat exchanger the coil fins must be clean to avoid any loss of efficiency. Care must be taken during cleaning, as fins are fragile and easy dented. Use fin combs to straighten fins, light brushes, vacuum cleaner. Wash the heat exchanger with light water jets at the beginning of the working session to avoid deposits build-up. To remove deposits at best, use a brush and proper detergents with great care. This difficult operation should be performed slowly and very carefully.

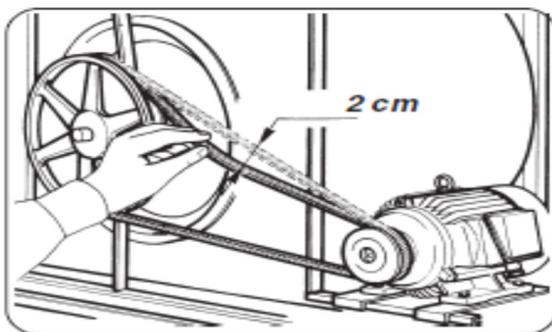
## COILS SUPPLIED BY WATER

Coils are fitted with air bleed nipples. Release all the air present in pipes through the air valve, and repeat the operation periodically when servicing.



## DIDW CENTRIFUGAL FAN – BELT DRIVE

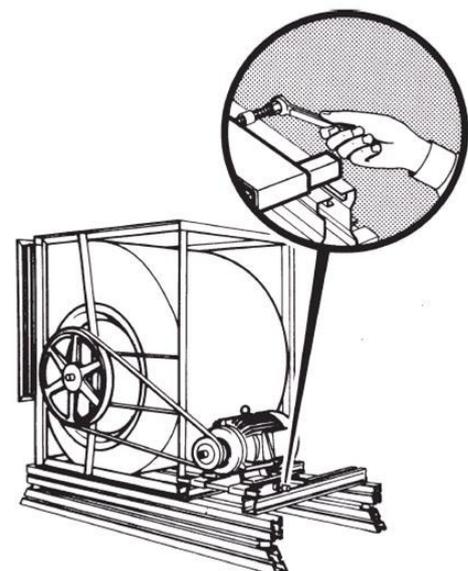
Before undertaking any operation, make sure that the power supply switch is off, and the fan has stopped rotating. Belt tension should be checked at regular intervals as the belts will stretch during normal operation. Check belt tension after two days working, then 1 week, then 1 month, then every 3 months.

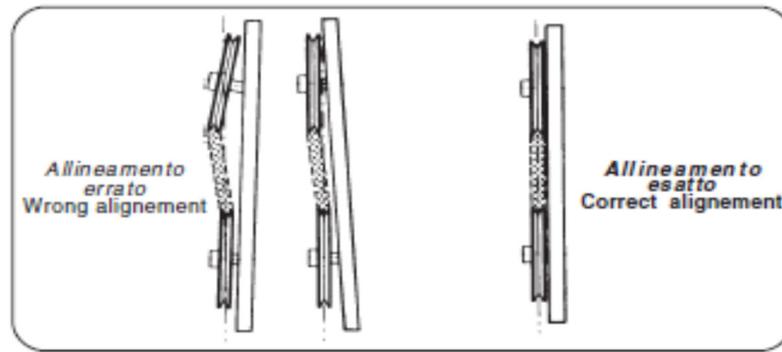


With a spanner regulate the worm screw on the motor sliding base of the belt tightening pulley. In case of scroll mounted motors, make one centimetre flexion acting halfway between the two pulleys. Note

- An excessive belt tension damages bearings
- Too loose belt tension causes over heating of the belts

Check that motor shafts are parallel and pulleys alignment has been preserved.





Fans equipped with split bearings, [pillow block bearings], require periodical lubrication (approx. every 6 months). Oil less bearing, [sealed for life bearings]; do not require maintenance till a maximum operating life of 20,000 hours.

An increasing bearings noise level and superheating, with liquid grease leakage, signal bearing deterioration.

## MOTORS

Reliable, trouble free operation of a motor needs regular maintenance. Exact maintenance needs vary based on the site conditions. To obtain reliable service life from the motor, the following maintenance schedule may be used as a guide.

- A. Ensure air intake spaces are unobstructed.
- B. On a weekly basis use an air hose to ensure all air ways are clear and free of dust.
- C. Once every month, check motor for condensation. Replace drain plugs before starting if they are blocked or found missing.
- D. Do not wash the motor down unless it is IP66 rated.
- E. On a quarterly basis-
  - Check the motor terminals for tightness and proper contact,
  - If terminal lug/s are discoloured, re-terminate with fresh lugs,
  - Check operation of starting equipment, ensuring all terminations are tight.
  - Check mechanical operation of thermal overload relays, if any,
  - Check mechanical operation of thermistor relays, if fitted,
- F. On a six monthly basis, in addition to the items in 'E' -
  - Check winding resistance between supply terminals.
  - Check bearings for abnormal noise/overheating
- G. On an annual basis, in addition to the items in 'E' and 'F' -
  - Frames 71-180 use sealed bearings. Frames 200-315 use open re-greaseable bearings. When re-greasing bearings ensure that the correct type of grease is being used. **WARNING: NEVER MIX GREASE OF DIFFERENT TYPES.** Use lithium based grease such as Shell Alvania R3 or equivalent.
  - Completely disassemble stator, rotor apart and clean thoroughly.
  - Check bearings for wear/damage – replace as necessary.
  - Check all bolts and nuts for cracks or damage – replace as necessary.
  - Check all holding down bolts for signs of fatigue or damage – replace as necessary
  - Check and ensure that the cooling fans are operational.

## SECTION 12 - Potential Dangers

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### WARNING LABELS

Potential dangers are dangers not evident that cannot be avoided through safety equipment. All the CLEVER air handling units are equipped with pictograms that warn you against dangers. Units are reliable, but they should not be used incorrectly and safety devices should not be removed.

You can operate the CLEVER air handling unit in a safety way by complying with the instructions contained in this handbook and warnings placed on the units. All operations must have the power supply off. The power supply can only be turned back on having checked nobody and no foreign bodies are inside it.

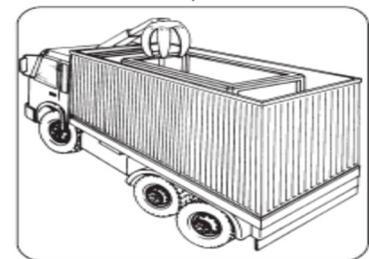


## SECTION 13 - Scrapping

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Before dismantling the unit, it can be stored outside as weather and changes in temperature cannot damage it. We recommend taking the labels off and destroying them, then inform the Temperzone of the serial number of the unit being dismantled. Fan, motor, coil can be recycled for possible reuse.

While dismantling the unit, before disconnecting it, check if there is still some gas or liquids located in the coils. If so you should disposal according to the local regulations.



## SECTION 14 - Spare Parts List

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### SPARE PARTS

To purchase spare parts please supply the information as detailed in the section "IDENTIFICATION". Spare parts include those component parts that wear and can be easily damaged. This may include;

#### CASING

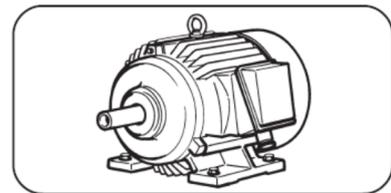
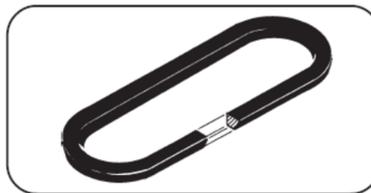
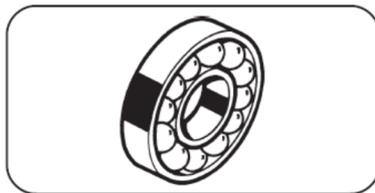
- Hinge
- Handle
- Door panel

#### FILTERS

- Model, grade of the cell / panel filter
- Model, grade of the soft bag or rigid cartridge filter
- Model, grade of the Absolute / Hepa filter
- Filter Clips, specify left or right hand

#### FAN

- Ball bearings
- Belt drive
- Electric motors



## SECTION 15 - Periodical Visual Checks

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Visual checks should be carried out with each service to ensure that the CLEVER air handling unit is working as required

Anti-vibration joints, panels and inspection doors may have been damaged and cause leakage.

Electrical cables have not been damaged or worked loose.

Possible water leakage of drain tray, or inside on floor panels

Periodically lubricate nylon component parts (handles, hinges) by using spray Teflon



**REMEMBER INSPECTION DOORS CAN BE OPENED ONLY WHEN THE UNIT IS NOT OPERATING.**

## SECTION 16 - Trouble Shooting

### CAUSE- EFFECTS AT THE STARTING

<b>INSUFFICIENT AIR FLOW RATE</b>	Dampers have not been adjusted
	Impeller rotation opposite to direction shown by the arrow
	Too loose belts
	Too low supply Voltage
	Accidental coil / filter clogging
<b>EXCESSIVE AIR FLOW RATE</b>	Heating elements more powerful than design
	Dampers have not been adjusted
	Filters are not installed
<b>ELECTRIC MOTOR</b>	Inspection doors are opened or some panels are missing
	Electrical input higher than the one reported on the motor label.
<b>COIL INSUFFICIENT HEAT OUTPUT</b>	Motor rotation
	Temperature or water supply rate lower than design
	Incorrect water connections
	Air blockages (upper part of the coil is cold), adjust the discharge air vent
	External control systems are not setup correctly
<b>NOISE</b>	Condensate trap unsuitable
	Faulty bearings
	Foreign materials inside the fan scroll
	Damper blades vibration
	Hissing due to pipes, baffles and inlet vibrations from leakage. Likely excessive air flow rate
Fan “pumping”, over loading forward curved blade fan	

### EFFECT – CAUSE DURING OPERATION

<b>AIR FLOW RATE DECREASE</b>	Increasing flow resistance in the fan system caused by:
	Filters clogged by dust, debris, etc
	Coil fins deposits
	Dampers have not been adjusted
	Faulty fan belt drive
<b>AIRFLOW RATE INCREASE</b>	Heat wheel exchanger pad, dirty or clogged
	Circuit pipes, inlet grilles and water pipes and so on are clogged
	Dampers have not been adjusted
	Filters have not been installed
	Inspections doors are opened or some panels are missing
<b>COIL HEAT OUTPUT DECREASE</b>	Inlets have not been properly regulated
	Water temperature lower than design
	Water flow rate decrease, control devices have not been adjusted, lime deposits
	Airflow rate decrease and air temperature increase
<b>NOISE</b>	Air bubbles inside the coil
	Bearing worn
	Transit brackets on the fan assembly still in place. Remove brackets.
	Belt sliding
	The impeller does not match the shaft
	Foreign material in the fan scroll
	Cut-off loosened
	Motor cooling impeller is not working properly
Dampers blade vibration due to wrong service and to wear	

## SECTION 17 - Condensate Discharge

### CONDENSATE DRAIN AND TRAP

Condensate drain pans are provided with a discharge pipe. It will be necessary to provide the discharge with a discharge “P” trap. The discharge trap helps avoid the sucking in miasma or bacteria from the sewerage system. Sewerage decomposition can create favourable conditions for the pathogen bacteria, fungi and microorganisms to grow inside the unit. This can help the spread of the “Legionella Pneumophila” causing the Legionnaires disease.

A discharge without a trap or with unsuitable trap leads to an air intake. This will lead to condensate drainage becoming difficult. Given time this will lead to the condensate overflowing in the adjacent sections inside the air handling unit. When the fan stops any liquid will drain out from the handling unit, flooding the surrounding area.

Regular maintenance checks of the trap should be undertaken to ensure no obstruction to the air and not to be clogged by debris.

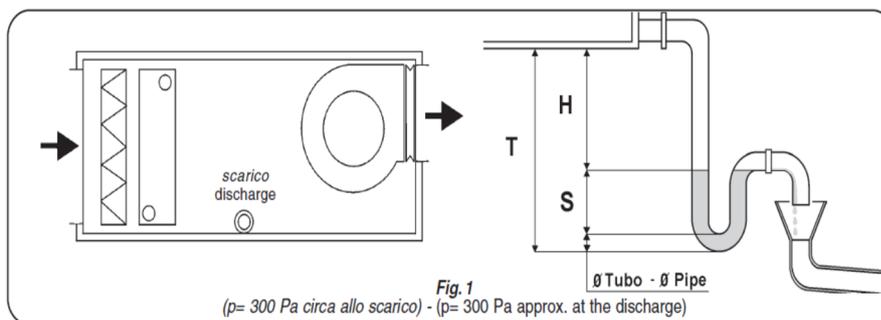
### IMPORTANT NOTES

The discharge “P” trap MUST BE fitted with an air break and not connected to the sewerage in a sealed way. This will stop the possibility of sewerage return. The connecting pipe, downstream the trap, has to be sufficiently sloped towards the sewerage and its diameter has larger or the same size as the discharge pipe. Drain lines can be made of many materials: steel, copper, PVC. The drain should be checked to ensure there is a good condensate outflow to the sewerage. The drain pan has to be periodically cleaned to avoid condensate stagnation, debris and algae formation.

### DRAIN TRAP THEATRICAL CALCULATION

To determine the trap height we must consider the trap position respect the fan. Example:

DRAW-THROUGH SYSTEM DISCHARGE [Fig.1]

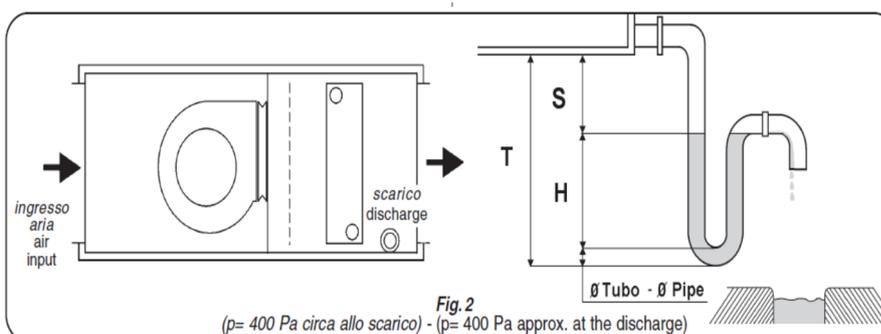


H = 60mm  
[Discharge static 300 Pa] +  
Safety margin 30 mm

S = ½ H = 30 mm

T = H + S = 85 mm + ø pipe

BLOW-THROUGH SYSTEM DISCHARGE [Fig.2]



H = 70mm  
[Discharge static 400 Pa] +  
Safety margin 30 mm

S = 20 mm

T = H + S = 90 mm + ø pipe

The non compliance with the H values leads to the trap emptying and therefore to the non operation

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