Training for AHU Maintenance

Project: xxxx

Customer: xxxx

08th June 2020

The Company

What We Do

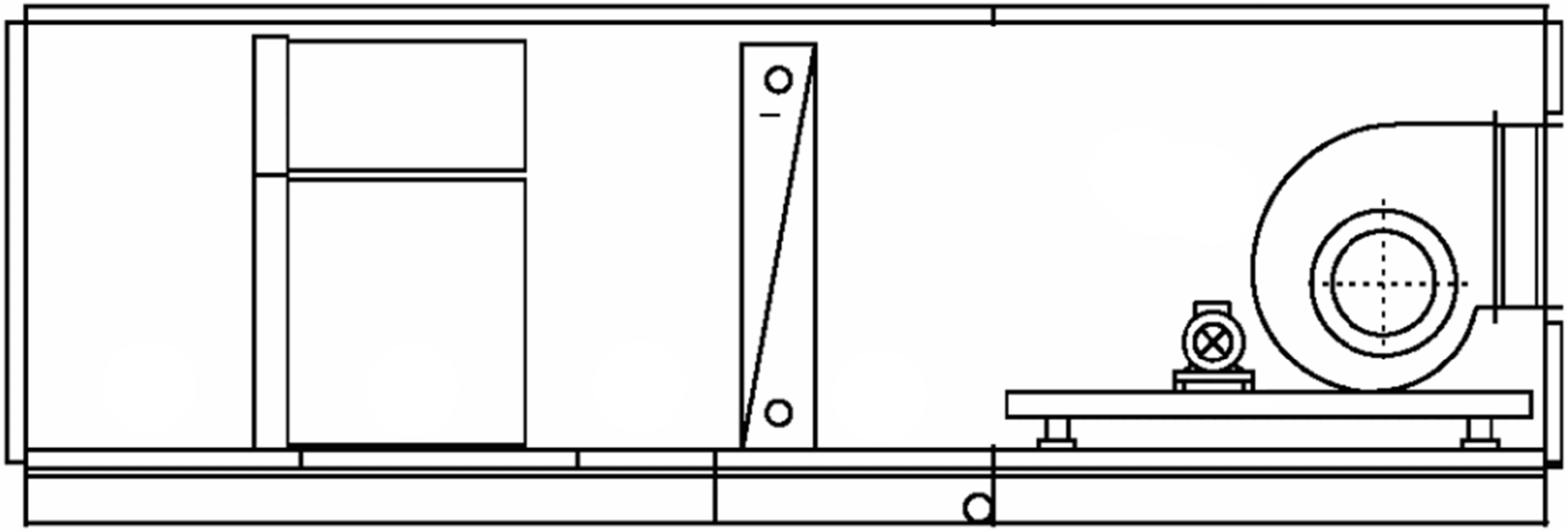
Dedicated and focused to meet all air conditioning needs with tailor made and energy efficient AHU solutions.

Our Services

Customized Products

- Equipment sizes in 102 mm modular dimensions
- Air output from 1000 m³/h to 320,000 m³/h
- Equipment versions:
  Interior, weatherproof, hygiene, and ATEX version

Basic Design of AHU



Components

- AHU Housing
- Filter
- Heat exchanger
- Fan and motor

Filter

Duplex Filter Frame

- Combination of pre-filter and main filter in a single frame
- With quick-lock system
- Galvanised and powder-coated
- Permanent seals
- Separate pressure reduction measure-ments per filter stage

Heat Exchanger

Material

- Tube material: Copper for high efficient of heat transfer
- Header material: Copper to prevent galvanic corrosion due to different of material
- Foot print: Stainless steel, wet part is always stand on condensate. Stainless steel is resist to rust

Equipment Floor

Pan as Equipment Floor

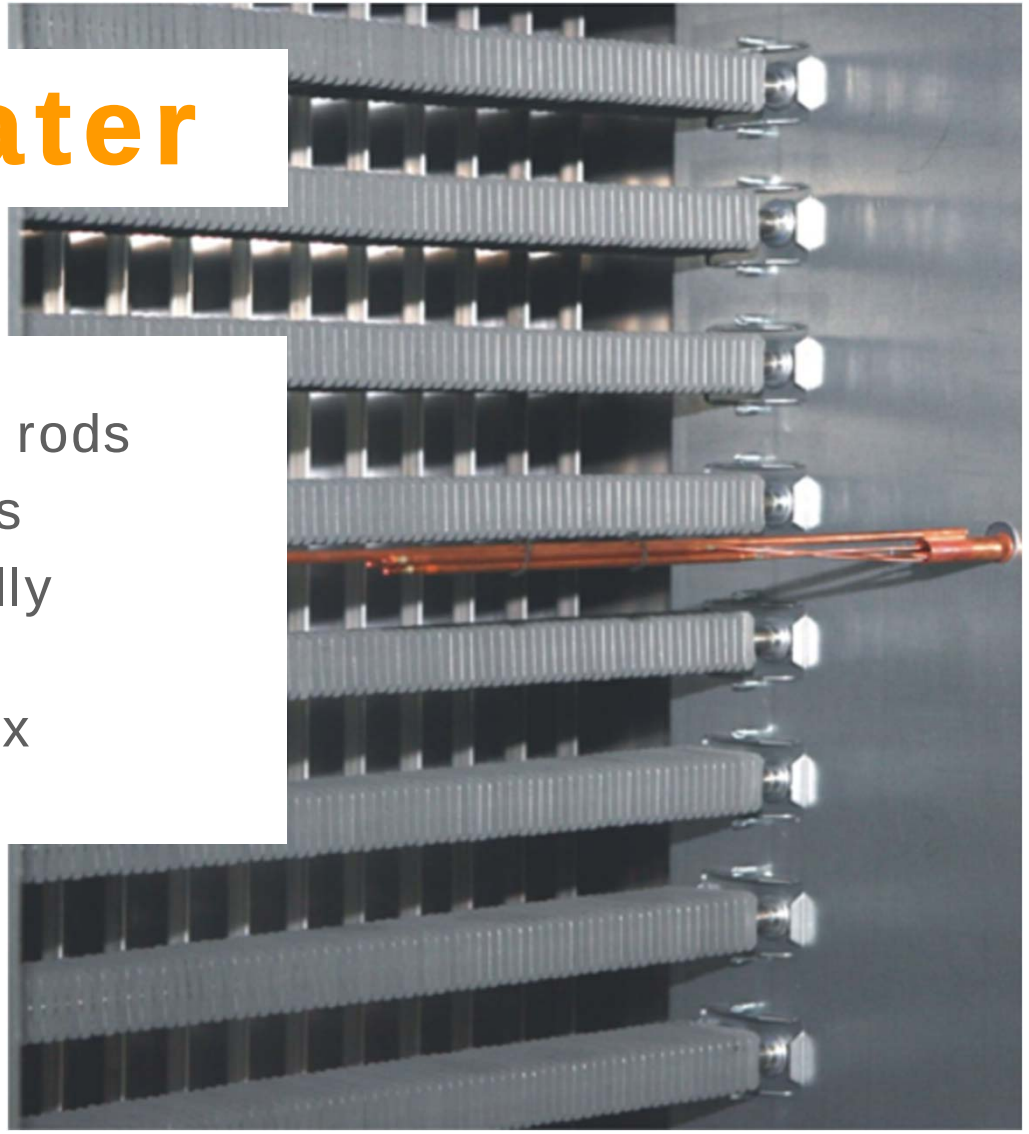
Floor pan with all-round slope

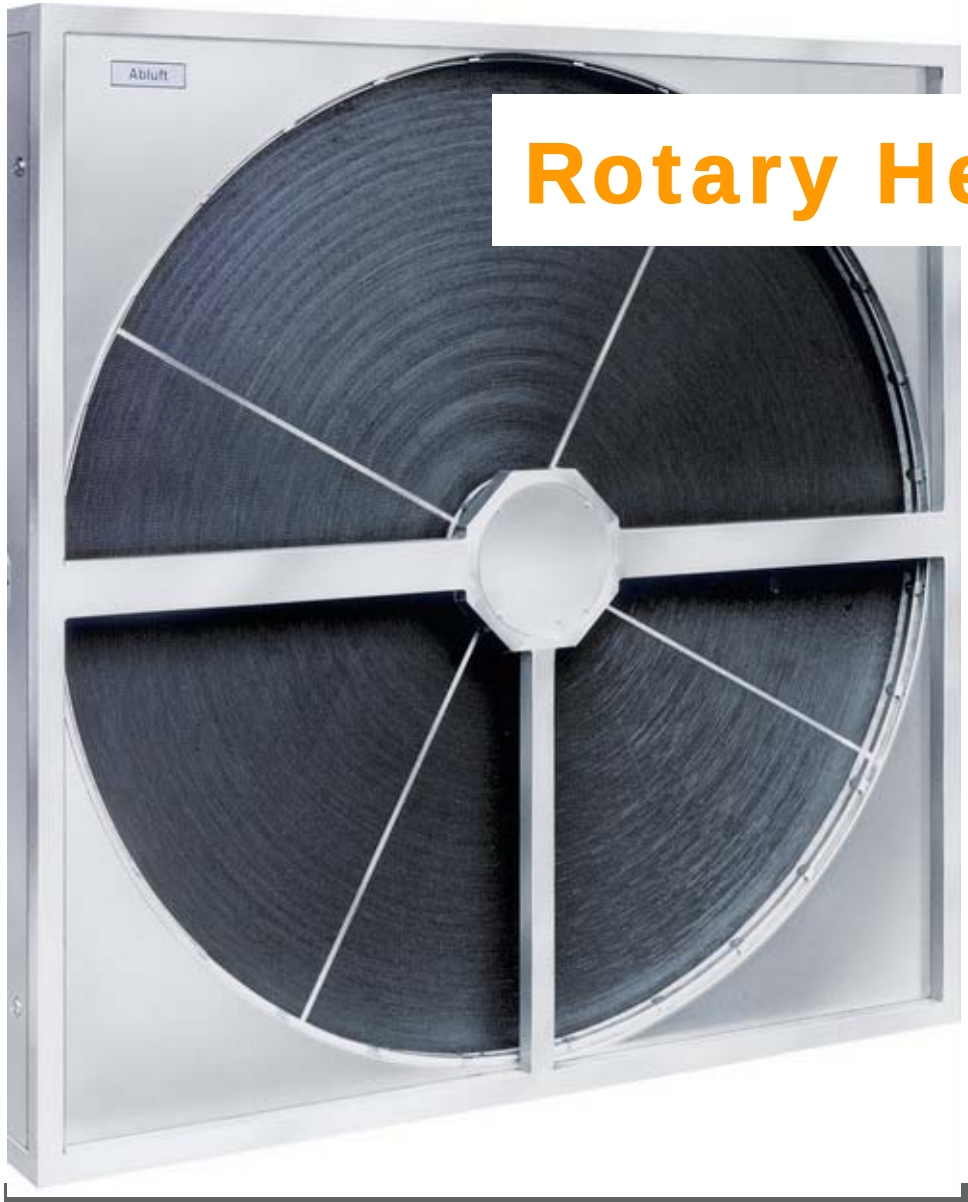
Stainless steel pan at wet part

Electric Heater

Benefit

- Stainless steel heating rods
- Galvanized steel blades
- Heating rods individually removable
- Integrated terminal box





Rotary Heat Exchanger

Benefit

- Sensible and latent heat transfer
- Short housing

Inspection Door

- Same Design as Thermal Panels
- Thermal decoupling of the interior and exterior shell
- Double-lever closure
- Integrated arrestor hook on high-pressure side hatches
- Lockable with cylinder lock or SW10/DB3

Plate Heat Exchanger

Benefit

- Separated air ways
- Integrated extract air bypass
- Integrated adiabatic moisturization

Ventilator

Belt-Driven Ventilator

Speed control alternatives:

- Pulley ratio
- Frequency converter

Ventilator

Freewheeling Ventilator

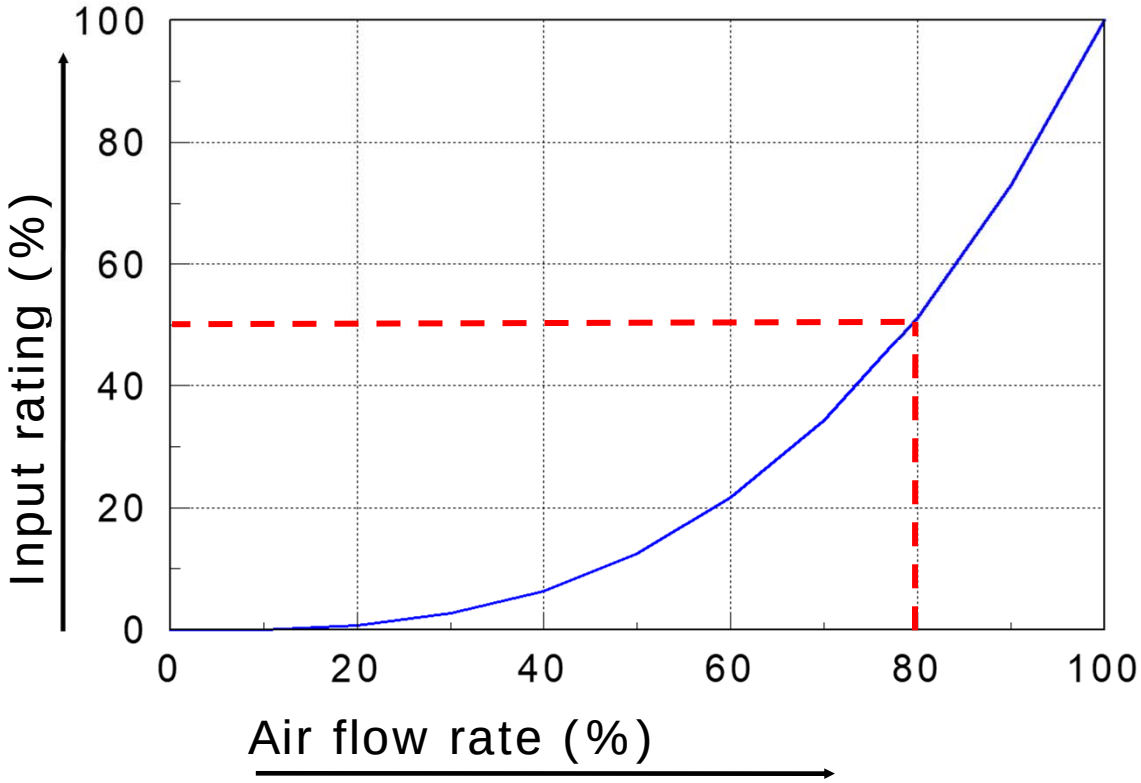
- Easy to clean
- Easy to maintain
- Reliable
- Precise flow rate control
- Measuring differential pressure at the ventilator inlet nozzle

Frequency Converter

Benefits

- Saves energy
- Optimum efficiency of the “fan curve”

Ventilator



Reduced energy consumption by adapting the air flow rate to actual requirements

Electrical steam humidifier

Benefit

- Steam humidifier safely
- High efficiently
- Friendly maintenance

Spray Humidifier

Nozzle Humidifier

- Stainless steel housing
- Cleaning nozzles along the edge of the pan
- Pan with all-round slope for optimum drainage

High-Performance Low-Pressure Nozzle

- Water pressure from 0.1 to 2.5 bar
- Self-cleaning
- Non-plugging
- Suitable for almost any water quality
- Low operating costs

Benifit

- Not located directly before filters/sound mufflers
- Inspection window and lightning
- Relative humidity max. 90 % RH

Refrigeration

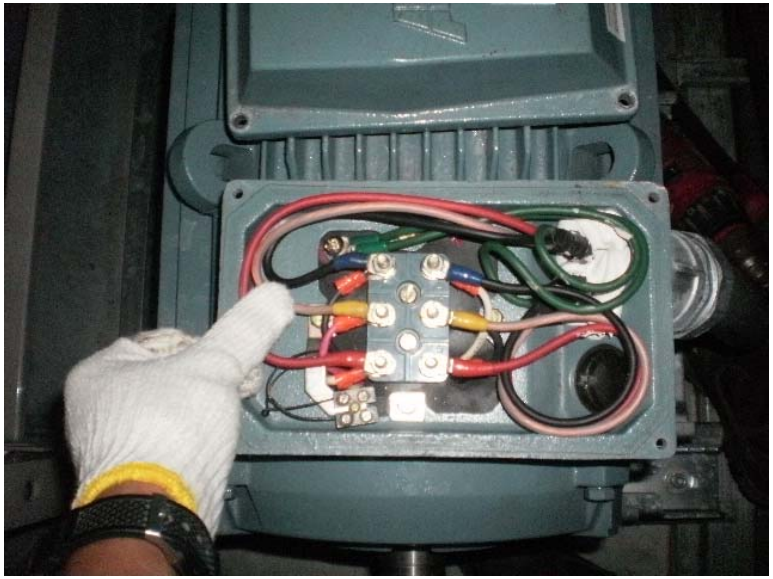
Refrigeration Components

- Optimized, harmonized components
- Energy-saving control system
- CFC-free R407c
- Fully hermetic condenser
- Complete condenser kits
- Single, tandem, or network installations
- Cooling controller or chilled water controller

Commissioning

Before operate Motor

- Power connection checking
- Cable tighten checking
- Leakage inside connecting box and seal if necessity



Crane truck

Crane track for easy removal and installation of motors

Atex-design

Equipment Housing

- Earthing of all metal parts avoids static loading
- Special powder coating (RAL colour 7024) discharges static loading

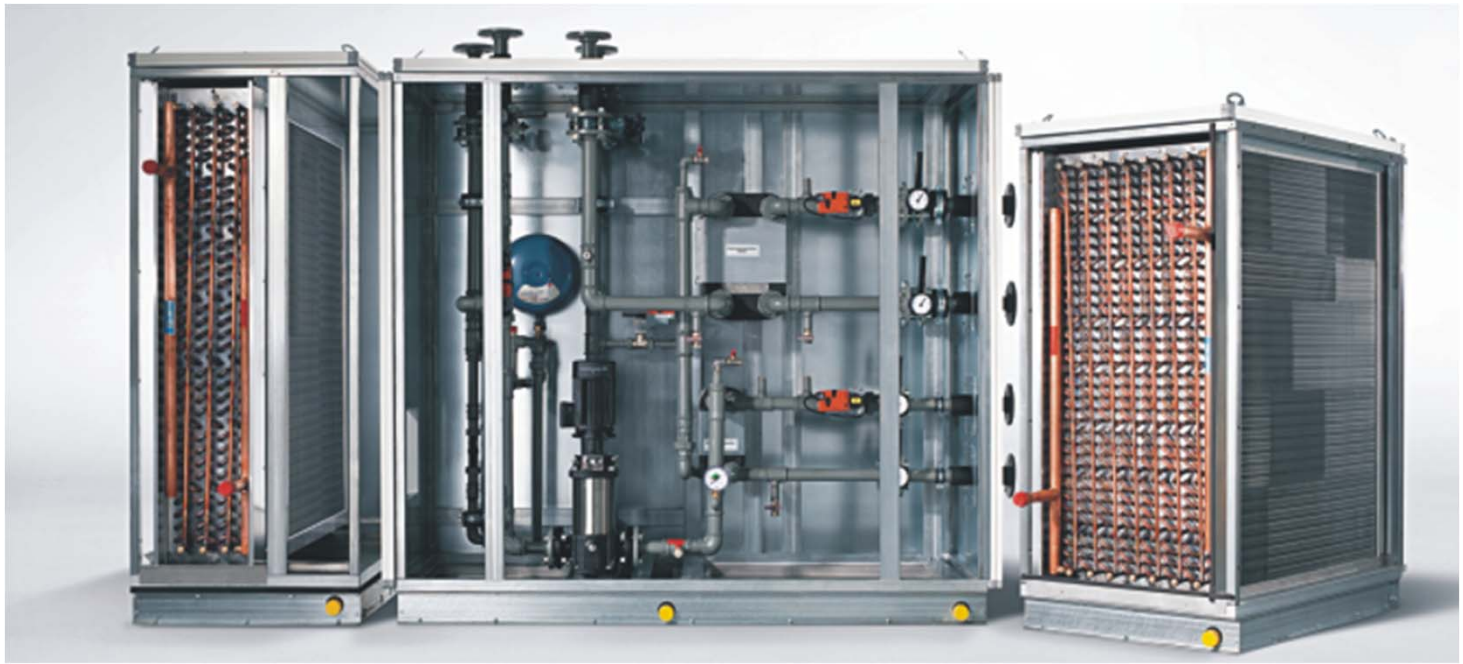
Components

- Fans with direct drive or electric dischargeable drive belts
- Impeller and inlet nozzle with special mating materials
- Motors pressure resistant capsulated or with increased safety

Run-Around Coil System

Benifit

- Locally independent assembly
- Completely separated air ways
- Compact length
- HE-RAC-Controller



Commissioning

Before operate Fan

- Transportation locked has removed
- Check motor bearing has no noise
- Check springs have no damage and straight.
- Pulley alignment
  (tolerance <0.4º ; i.e. <7mm/m)
- Belt tension
- Fan rotation checking

Commissioning

Before operate Fan

- Transportation locked has removed
- Check motor bearing has no noise
- Check springs have no damage and straight.
- Check pressure measuring for pressure over nozzle has well connected.
- Fan rotation correctly by jog run

Commissioning

Frequency Convertor

- Check for wiring diagram and feedback signal
- Check and correct power supply
- Check for parameter via screen
- Check for work function and screen readable
- Check for ventilation

Ventilator

Benefits

- Saves energy
- Integrated motor with controller
- Optimum efficiency of the “fan curve”

Smart Control

Custom software optimized for air conditioning systems

- Modular structure
- User-oriented interface
- Maintenance management
- Comprehensive communication options
- Universal program components
- System management

Interfaces

- Open communication via Modbus, BACnet, OPC or LON
- Local network via RS 485 (pLAN)

Commissioning

Before operate Fan

- Check for wiring diagram and controller
- Check gap between nozzle and impeller is even
- Check pressure measuring for pressure over nozzle has well connected.
- Fan rotation correctly by jog run

Commissioning

Heat Exchanger

- Heat exchanger checking water connection
- Release air away from coil
- Check inlet and outlet temperature

Commissioning

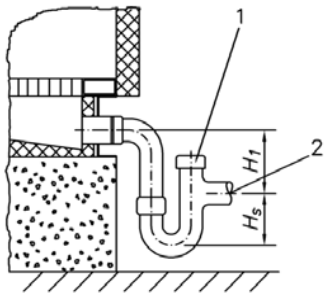
Autoroll filter

- Power supply correctly to nameplate
- Direction and media end switch work function
- Pressure switch, timer and media feeding system

Commissioning

Before operate

- Siphon trap height and water inside
- To prevent air leakage to siphon



Under pressure in the device:
H_1 (mm) = p/10
H_S (mm) = p x 0.075

Overpressure in the device:
H_1 (mm) = 35 mm
H_S (mm) = (p/10) + 50
P = Unit pressure in Pa (always enter positive value)

Commissioning

While operate

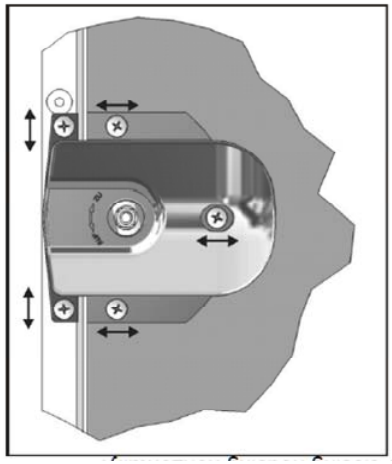
Duct connection is tight,
no air leakage

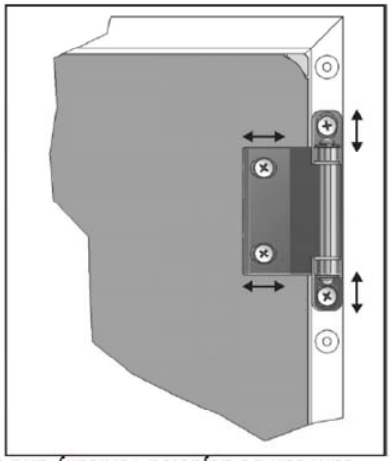
Commissioning

Access door

•Check gab between door and frame must even.

•Adjust if necessity





Commissioning

Electric heater

- Check function of safety temperature limiter
- Check function of air flow switch
- Check firm seat of terminals

Commissioning

Spray Humidifier

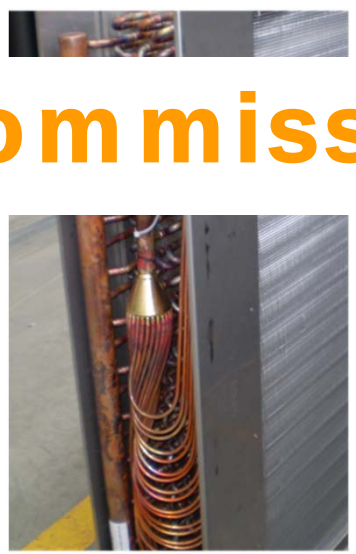
- Check function of run dry protection
- Fill with fresh water
- Check pump including bearing, pump jacket for heating, pump rotation
- Pressure during running

Commissioning

Electrical steam humidifier

- power supply and control function
- good water supply into device
- basic parameter set up
- drainage and insulation system

Commissioning



NOTE: This step must handle by robatherm in factory

- Check for components and wiring are assembling correctly with diagram
- Leakage test for pipeline and every components connection or jointing
- Check refrigerant R407 and lubricant level are enough
- Check for parameters to correct with work sequences
- Check for operation, performance and safety function

NOTE: Site commissioning

- Check and confirm for power supply and control signal
- Check for control sensor correctly in location and work function
- Check and adjust for components and parameter to achieve design

Maintenance

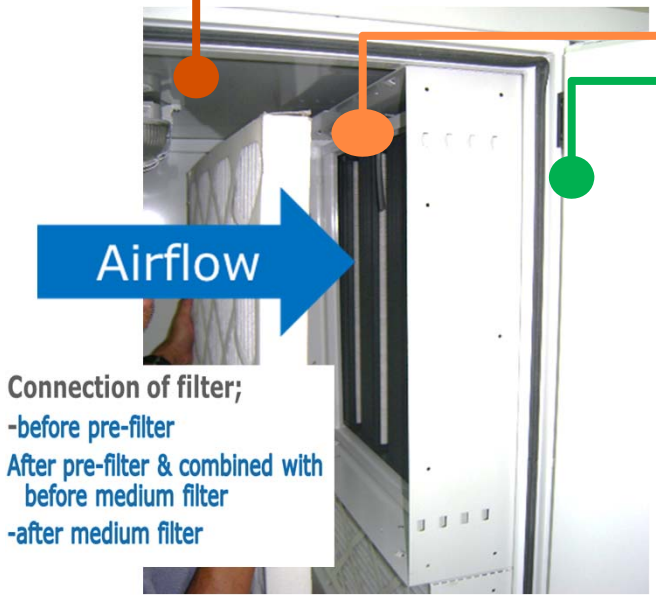
Housing

- Coarse fouling is to be removed dry with an industrial vacuum cleaner
- Other fouling: Use damp cloth, if necessary with grease- and oil-dissolving cleaners.
- Treat all moving parts, such as door handles with greasing spray regularly
- Treat gasket, particularly door gasket, with Vaseline regularly

Maintenance

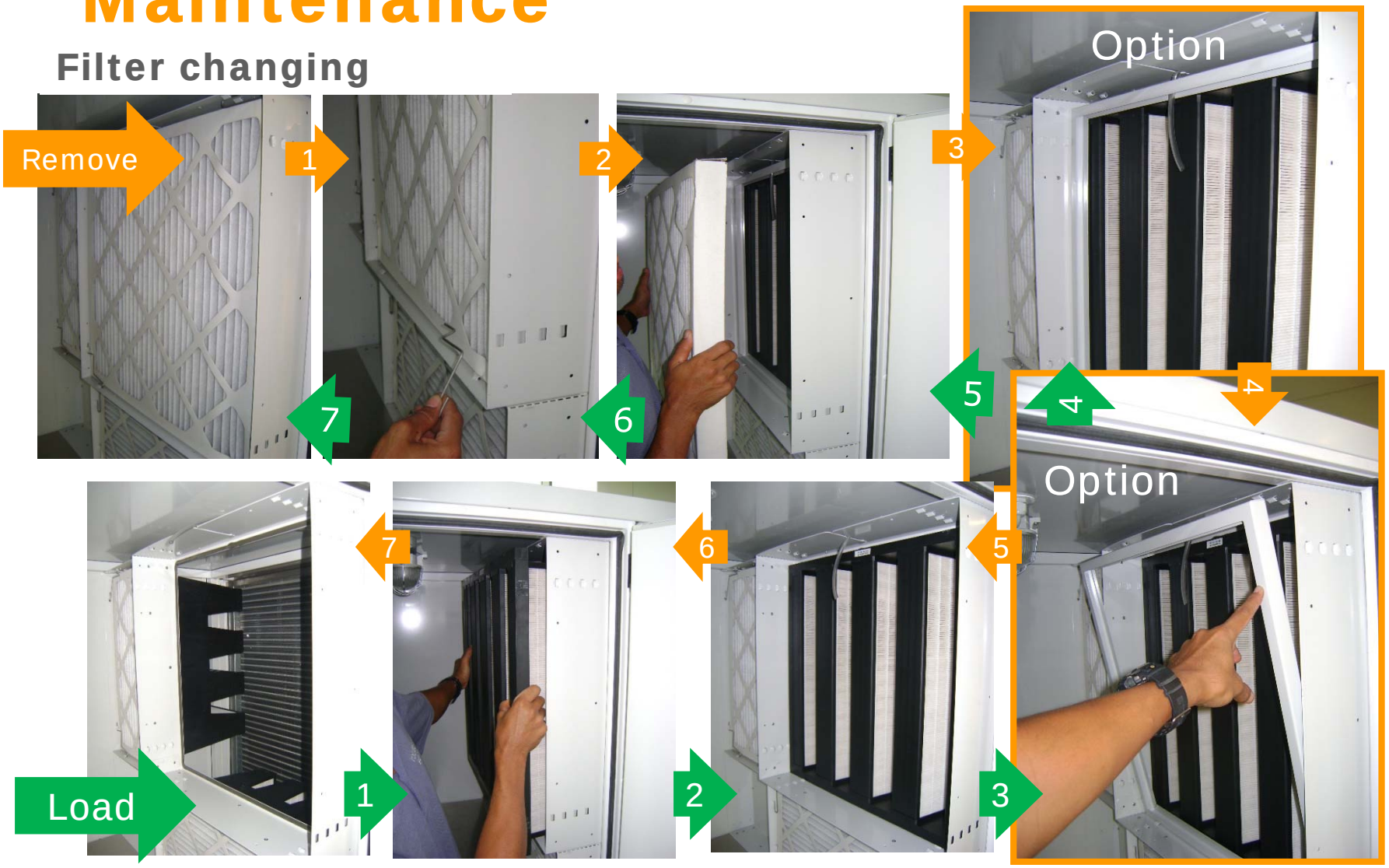
Filter

- Check filter pressure drop
- Change filter when pressure drop reach to final pressure drop value
- Remove filter lock grip from 4 corners
- Remove filter out from filter wall in reverse direction.



Maintenance

Filter changing



Maintenance

Heat Exchanger Coil

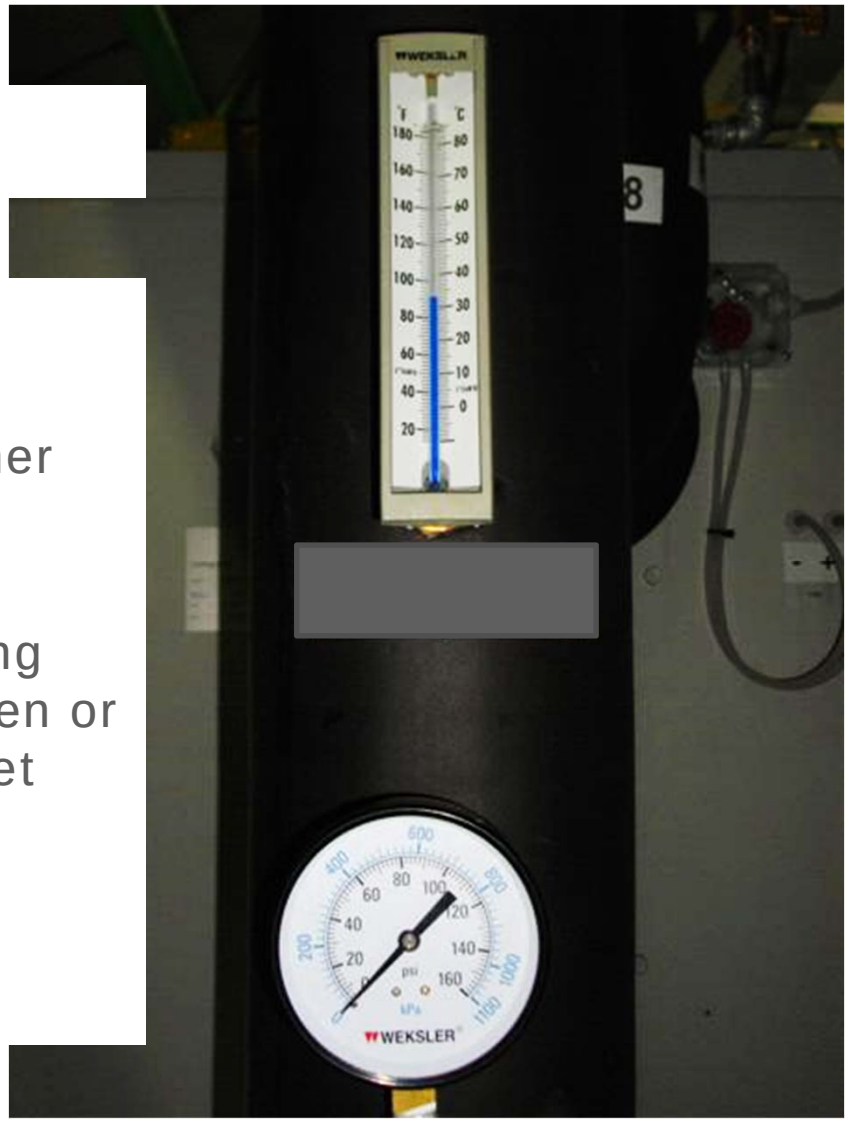
- Check coil for hygiene, damage, air-side fouling
- Clean coil on air side, remove damper, corrosion if necessary
- Check and clean condensate pan if necessary
- Check water outlet and siphon trap function,
  refill water and clean if necessary
- Re-combing if necessity

Maintenance

Heat Exchanger Coil

Trouble shooting

- If leaving air temperature is higher than set point
- Check chilled water temperature
- Check chilled water flow to cooling coil by seeing control valve is open or water pressure drop between inlet outlet.



Maintenance

Fan

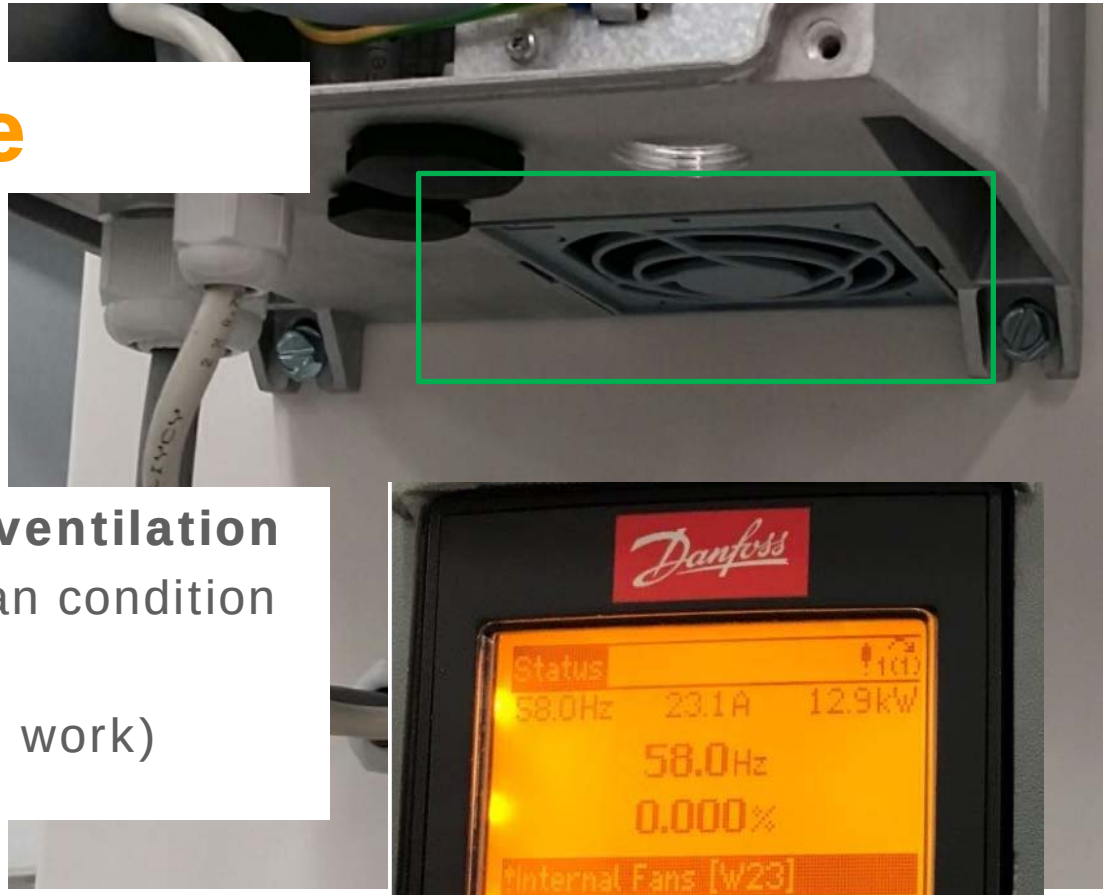
- Check fan for hygiene, fouling, damage, corrosion, fastening
- Check impeller for imbalance and vibration

Maintenance

Frequency Converter

- Check for Alarm historical and work hour
- Check and re-view parameter
- Check and re-tightening cables if loose
- Check for screen function
- Check and clean for ventilation

Maintenance



Frequency Converter ventilation

- Check for ventilation fan condition
- Clean if necessary
- Change new fan (if not work)

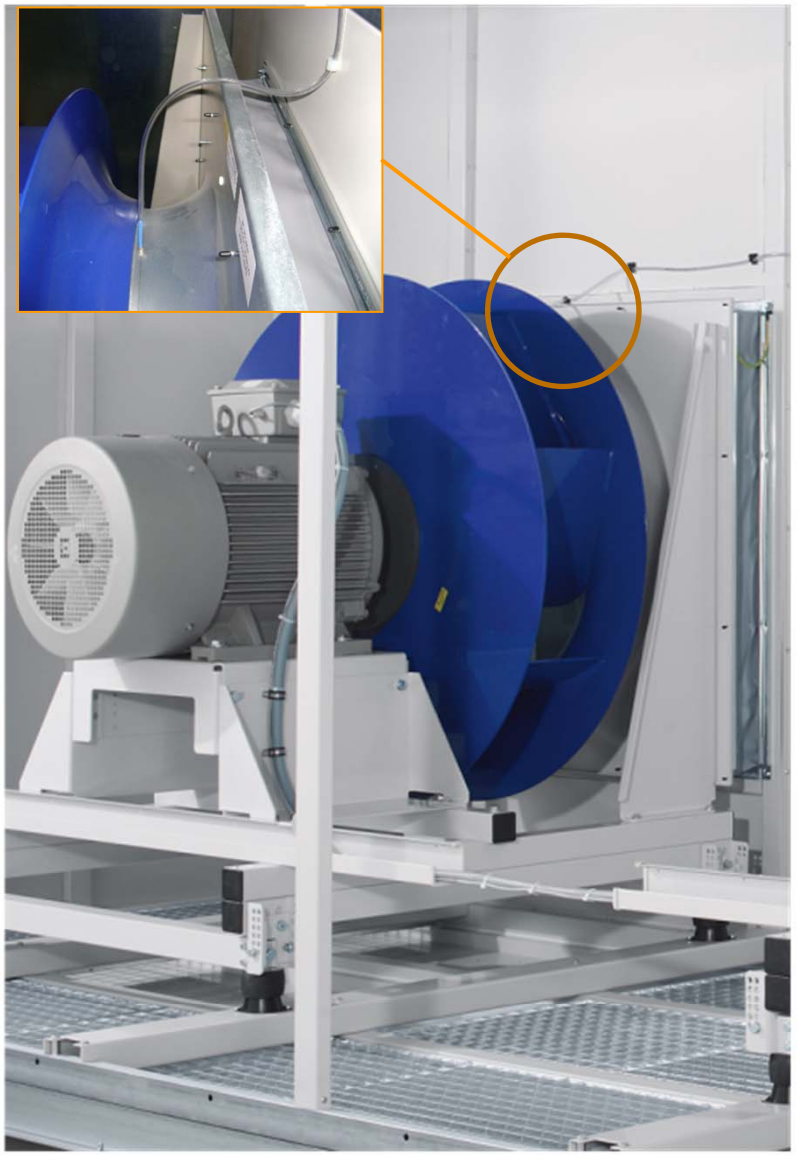
Note: If ventilation not work, it cause of high temperature >95 Deg.C then trip off

Maintenance

Fan

- Check flexible coupling leak
- Check function of vibration isolator
- Check gap width of open impellers

- Check pressure tube at impeller

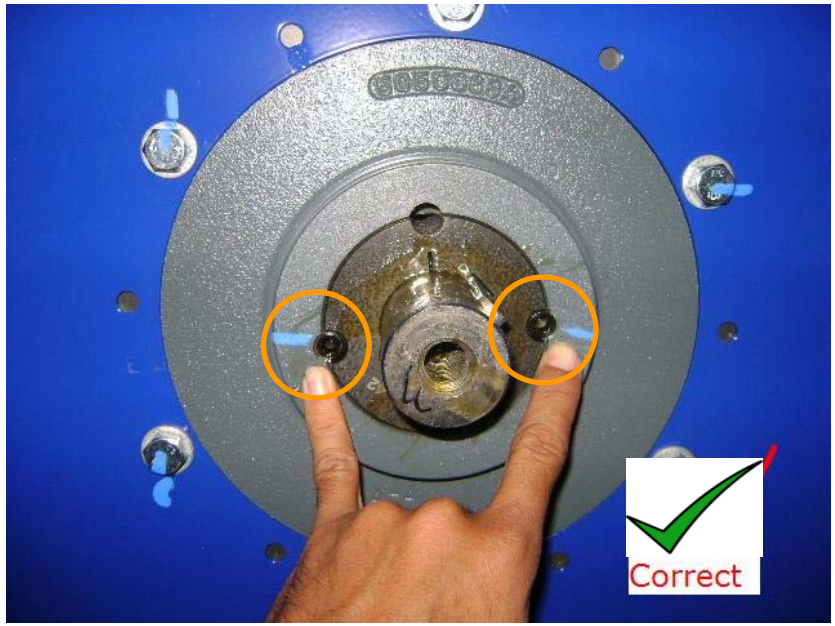


Maintenance

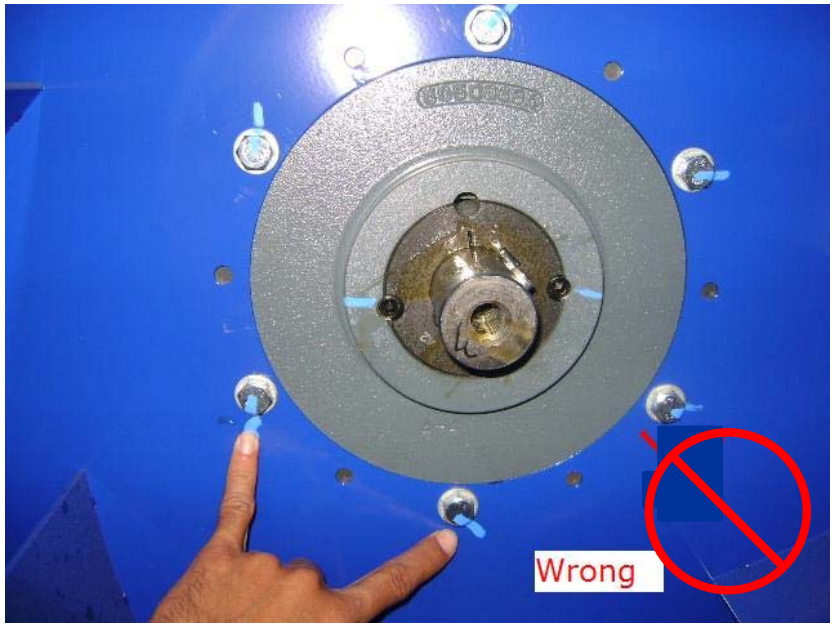
Fan

If remove impeller out from motor

Remove nut at bush



Do not remove at hub



Maintenance

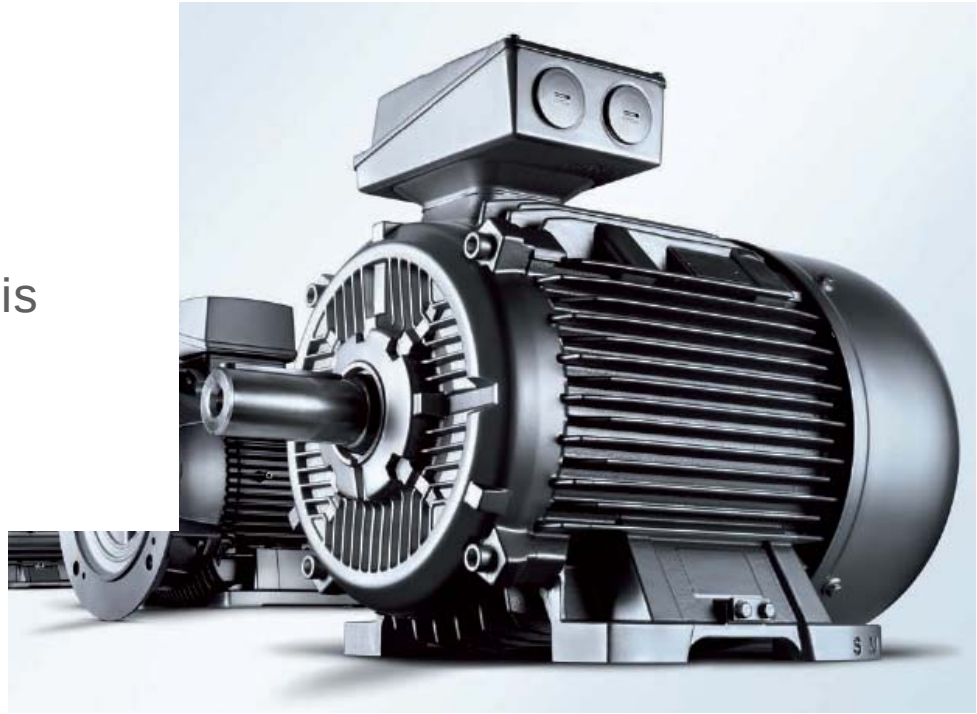
Belt-driven Fan

- Check Fan bearing for noise
- Pulley alignment
  (tolerance <0.4º ; i.e. <7mm/m)
- Belt tension
- Greasing (when necessary)

Maintenance

Motor

- Check electric motor for fouling, damage, corrosion, fastening, smooth running, heating and rotational direction
- Check bearing for noise
- Grease bearing if necessary
- Check firm seat of terminals is terminal block



Maintenance

Transmission

- Well maintain static belt tension
- Check for corrosion of pulleys, bushes

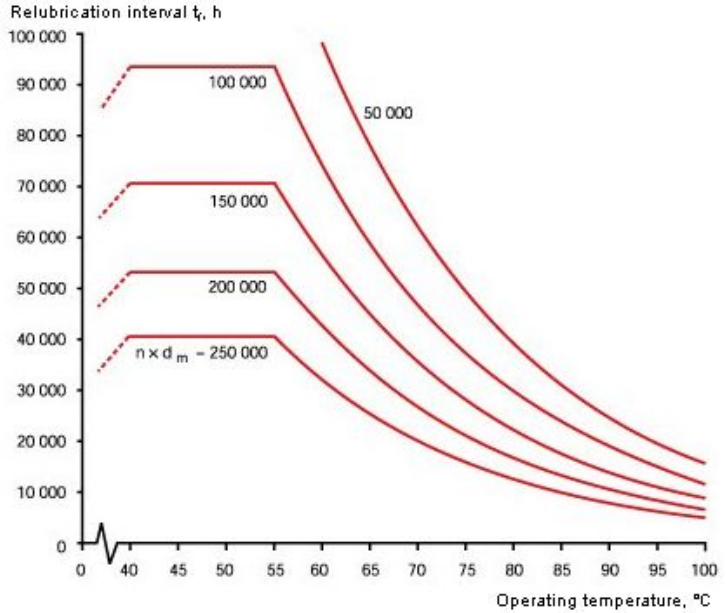
Belt type	Small pulley (mm)	Static tension
SPZ	**≥ 70**	150
	> 71 ≤ 90	200
	> 90 ≤125	250
	>125 *	-
SPA	**≥ 100**	250
	> 100 ≤ 140	300
	> 140 ≤ 200	400
	> 200 *	-
SPB	**≥ 160**	500
	> 160 ≤ 224	550
	> 224 ≤ 355	700
	> 355 *	-
SPC	**≥ 250**	800
	> 250 ≤ 355	1100
	> 355 ≤ 560	1400
	> 560 *	-

Tension Values of V-belts (N)
*Tension values must be calculated.

Maintenance

Republication interval

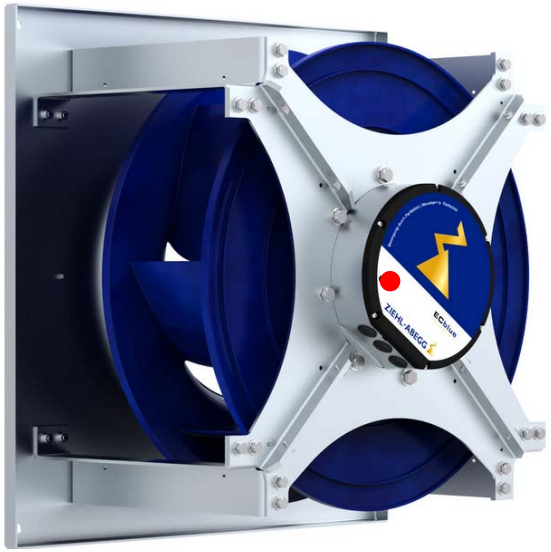
- For Motor and Fan shall follow manufacture's recommendation



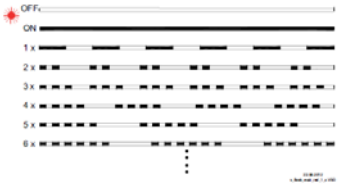
Maintenance

Fan

- Check for Alarm figure to define problem and solving
- Check fan for hygiene, fouling, damage, corrosion, fastening
- Check impeller for imbalance and vibration



Status Out with flash code



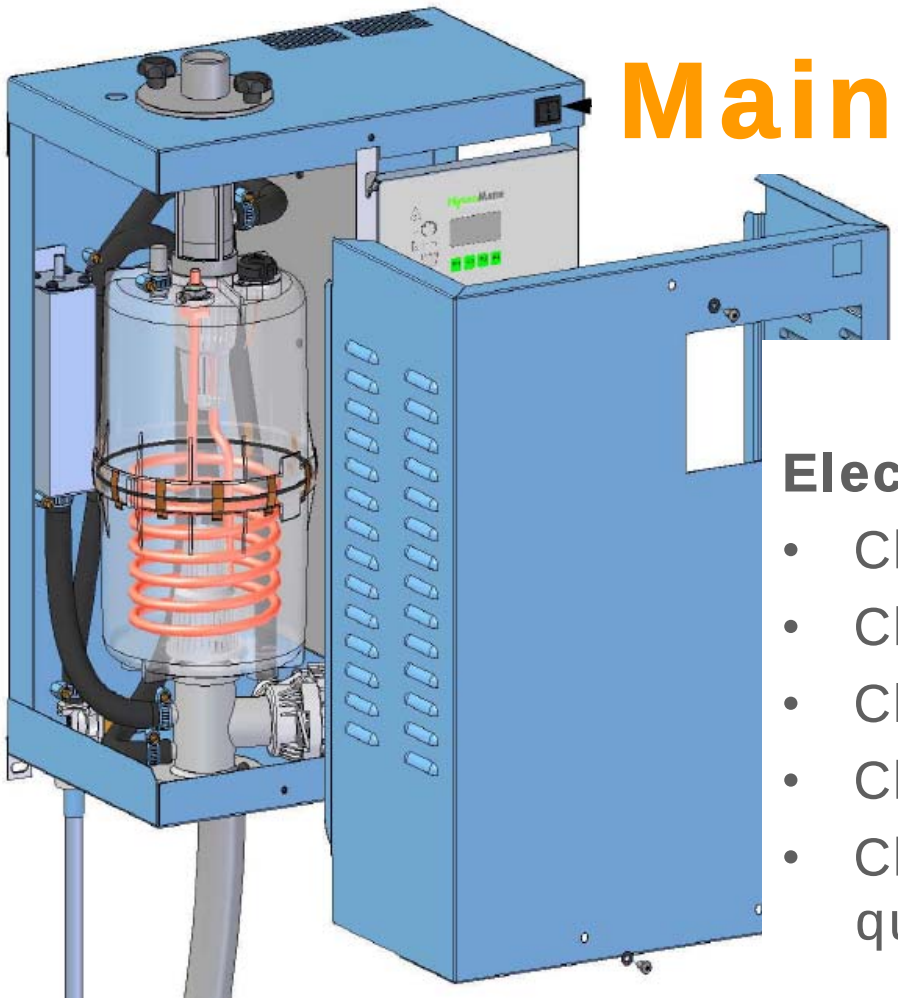
LED Code	Relays K1*	Cause
OFF	de-energized, 11 - 14 interrupted	No line voltage
ON	energized, 11 - 14 bridged	Normal operation without fault
1 x	energized, 11 - 14 bridged	No enable = OFF
2 x	energized, 11 - 14 bridged	Temperature management active
3 x	de-energized, 11 - 14 interrupted	HALL-IC error
4 x	de-energized, 11 - 14 interrupted	Line failure (only for 3 ~ types)
5 x	de-energized, 11 - 14 interrupted	Motor blocked
6 x	de-energized, 11 - 14 interrupted	IGBT Fault
7 x	de-energized, 11 - 14 interrupted	Intermediate circuit undervoltage
8 x	de-energized, 11 - 14 interrupted	Intermediate circuit overvoltage
9 x	energized, 11 - 14 bridged	IGBT cooling down period
11 x	de-energized, 11 - 14 interrupted	Error motor start
12 x	de-energized, 11 - 14 interrupted	Line voltage too low
13 x	de-energized, 11 - 14 interrupted	Line voltage too high
14 x	de-energized, 11 - 14 interrupted	Error Peak current
17 x	de-energized, 11 - 14 interrupted	Temperature alarm

* *K1: programmed function at factory: Fault indication not inverted*

Maintenance

Electric heater

- Check electric heater for function, hygienic condition, damage, corrosion and fastening
- Check function of safety temperature limiter
- Check cables and re-tighten if necessity



Maintenance

Electrical Steam Humidifier

- Check/clean heating element
- Check and clean tank
- Change O-ring
- Check drainage solenoid valve
- Check and confirm water supply quality

Maintenance

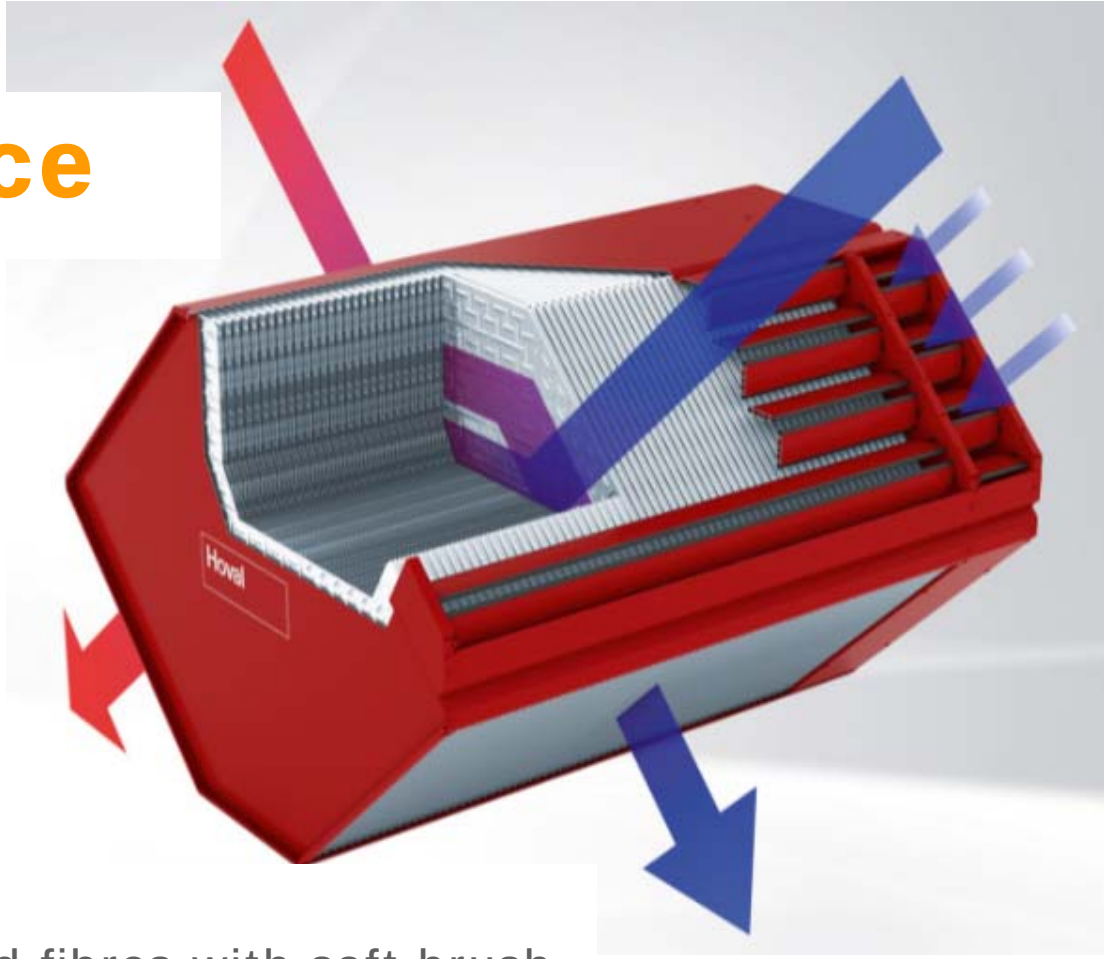
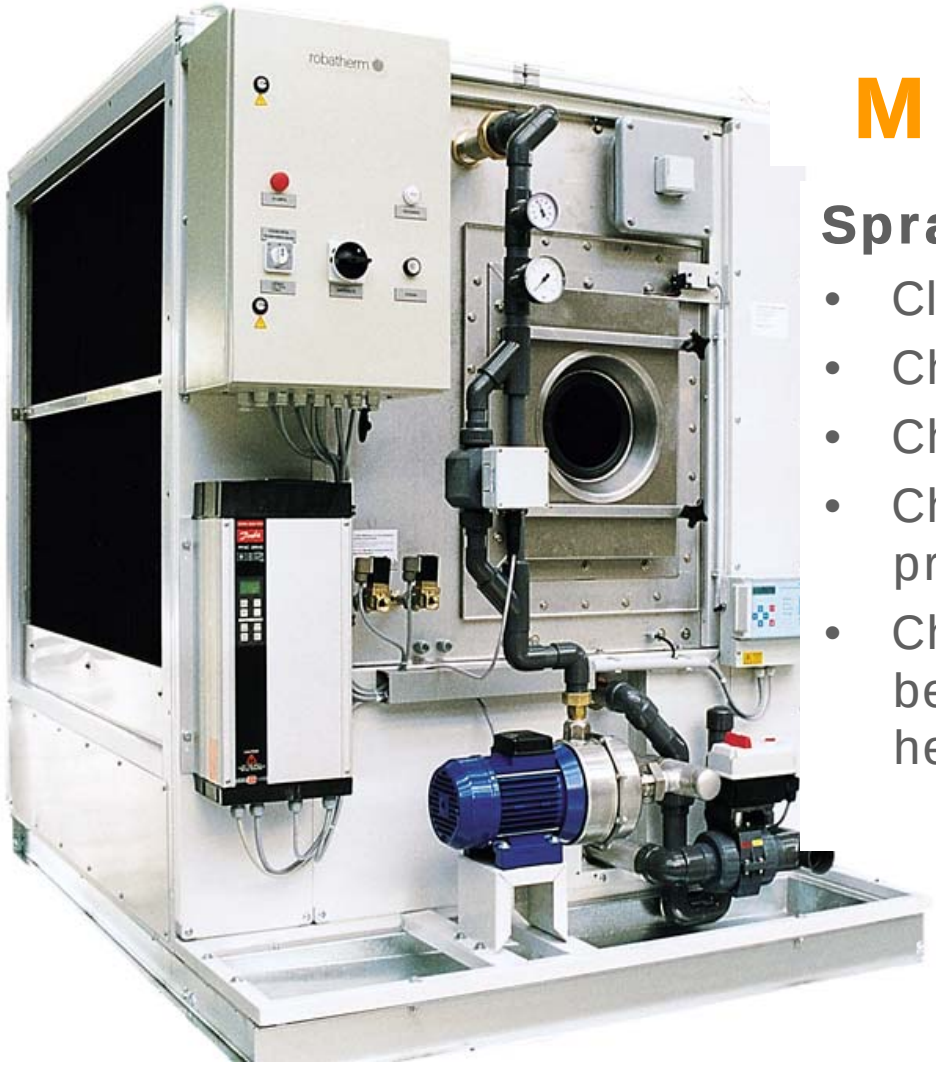


Plate Heat Exchanger

- clean/remove dust and fibres with soft brush
- Remove oil with hot water, grease solvent or high pressure device (if necessary)



Maintenance

Spray Humidifier

- Clean with fresh water
- Check filling water
- Check spray nozzle condition
- Check function of run dry protection
- Check pump including bearing, pump jacket for heating, pump rotation

Maintenance-spray washer(1)

- Drain dirty water from tank
- Remove dirties particles
- Clean/wash tank

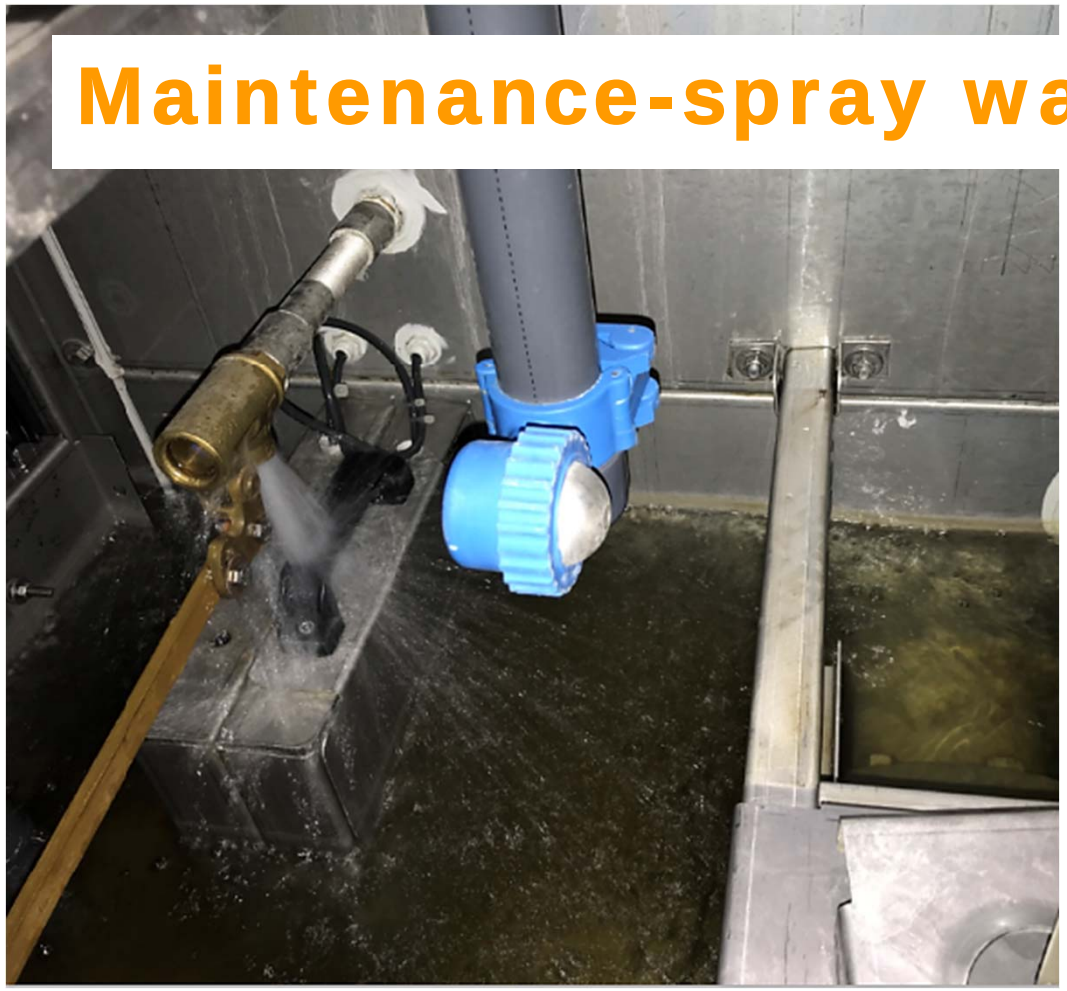
Maintenance-spray washer(2)

- Clean water distribution tubes
- And nozzle holder and inside nozzle jet

Maintenance-spray washer(3)

- Clean blades with jet water spray (P<150bar) from inside though out to ensure and remove dirties particle

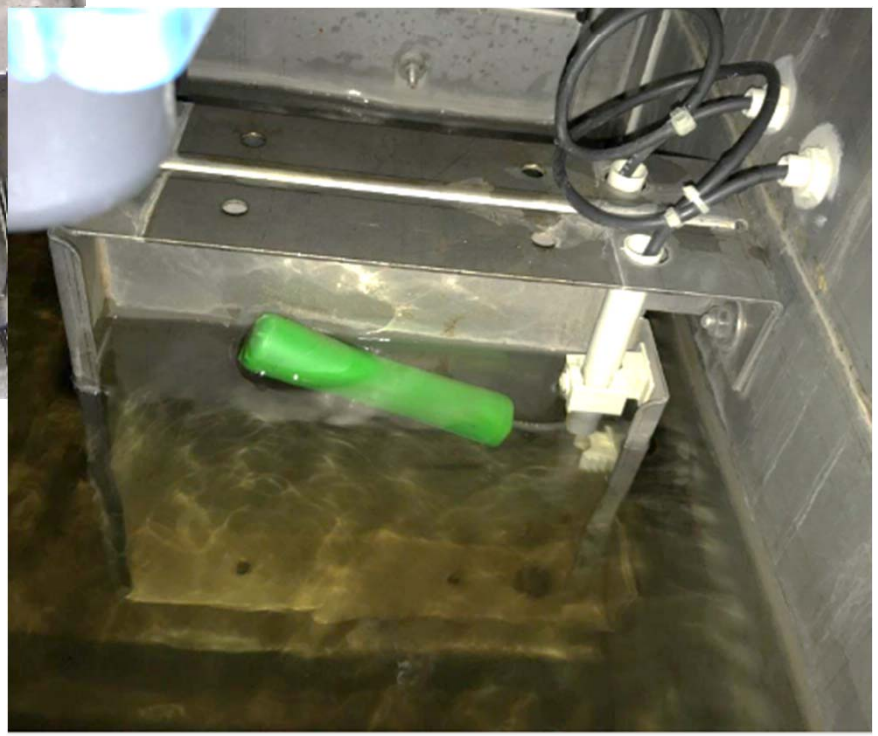
Maintenance-spray washer(4)



Check and re-check/adjust for water filling to ensure have full level in tank

Check to ensure supply (supply) water has good in quality

Maintenance-spray washer(5)



Check dry run protection of motor pump to ensure if no water then pump must “OFF”

Maintenance-spray washer(6)

- Check and ensure no noise or high vibration of pump set
- Motor ventilation work function
- Water drainage work function

Maintenance

- Check for function, hygienic condition, damage, corrosion and clean to get better air flow through
- Adjust chain tension (if necessity)
- Check for controller parameter and alarm
- Check for motor condition

Maintenance

- Check water pressure and air tank
- Fill water and air pressure (if necessary)
- Vent air away from system
- Check pump running condition

Maintenance Schedule

robatherm
the air handling company

Schedule. Maintenance Schedule and Record

Equipment	Details of Work	Frequency	Month											
			1	2	3	4	5	6	7	8	9	10	11	12
Fan	Check fan for hygiene, fouling, damage, corrosion and fastening	Quarterly												
	Check impeller for imbalance and vibration; Balance if necessary	Quarterly												
	Check bearings for noise	Quarterly												
	Grease bearings	Quarterly												
	Check flexible coupling for leaks	Quarterly												
	Check functioning of vibration dampers	Quarterly												
	Check fastening of protective devices for function	Quarterly												
	Check gap width of open impellers(For Plug fan)	Quarterly												
Motor	Check electric motor for fouling, damage, corrosion, fastening, smooth running, heating and rotational direction	Quarterly												
	Check bearings for noise	Quarterly												
	Grease bearings (manufacturer recommend)	Recommend												
	Measure tension, current input and phase symmetry	Quarterly												
	Check firm seat of terminals in terminal block	Quarterly												
Belt drive	Check belt drive for fouling, damage, wear, tension, alignment of motor and fan pulley, function and fastening, Change if necessary	Quarterly												
	Adjust alignment of motor and fan pulley, Change if necessary	Quarterly												
	Adjust belt tension	Quarterly												
Filter	Check filter cartridges for hygiene, fouling, odours, damage and corrosion	Quarterly												
	Measure differential pressure with manometer	Quarterly												
	Replace and clean filter if necessary	Quarterly												
	Check filter seat for leakage	Quarterly												
Cooling coil (chilled water, direct-expansion)	Check cooling coil for hygiene, air-side fouling, damage, impermeability and corrosion	Quarterly												
	Purge cooling coil	Quarterly												
	Check water outlet and siphon trap function, clean if necessary	Quarterly												
	Check water level in siphon trap, refill if necessary	Quarterly												
	Check inlet and outlet for function	Quarterly												
Electric heater	Check functioning of air flow control; To do this, remove pressure measurement tubes from air pressure control. A switching operation must take place	Quarterly												
	Check electric heater for function, hygienic condition, fouling, damage, corrosion and fastening	Quarterly												
	Clean electric heater , scaling, damage, remove corrosion, retighten fixing (when necessary)	Quarterly												
	Check function of safety temperature limiter	Quarterly												

Cooperate with robatherm

- Order number is available beside unit.
- Refer to order number for cooperation with robatherm

Service Organization

Service Team

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