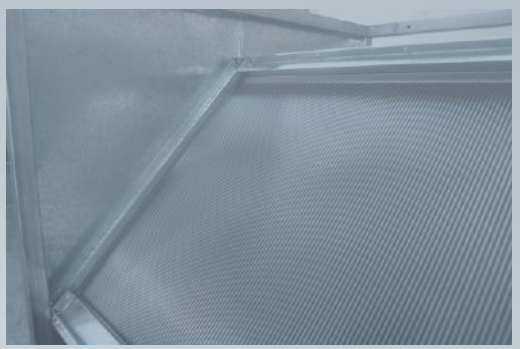
BENDIG TM
air handling unit

Quality Customs air handling unit



2019

Introduction

Place of Origin

BENDIG™ Model PTP air handling units are produced in Thailand. At our Samutprakarn factory, we have manufactured air handling units since 2008. BENDIG™ from Thailand houses the group's expertise for large air handling units. We focus on development, manufacturing, sales and consultations.

Standard and Certification

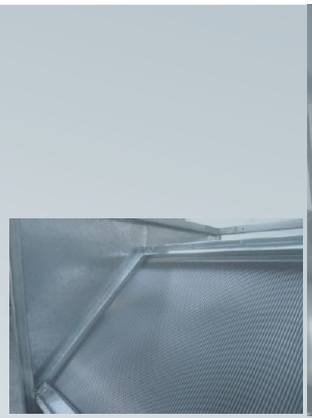
EN 1886 · EN 13053 · Hygiene-Institut des Ruhrgebiets ISO 846 · ISO9001:2015

Scope of application

1. Cooling air
2. Heating air
3. Humidifying air
4. Dehumidifying air
5. Filtration air
6. Mixing air
7. Sound attenuated
8. Integrate energy recovery

Area of operation

1. Operation theatre
2. Pharmaceutical plant
3. Health care facility
4. Electronic production plant
5. Cleanroom
6. Marine and off-shore condition
6. High-explosive area
7. Laboratory
8. Stemcell lab
9. Energy recovery purpose
10. Humidity control process
11. Ultra-low humidity control



BENDIG™ PTP model thermal-bridge-free central station air handling units are specially designed units in order to meet the needs of today's rapidly progressing air conditioning technology and to keep the heat losses at minimum level, and to eliminate surface condensation.
BENDIG™ PTP model units are in compliance with DIN EN- 1886. The framework is made of 40x40 and 40x60 steel profile. Framework is exposed behind the panels in order to eliminate the thermal bridge.
Double skin panels are used in **BENDIG™** PTP model .
The outer surfaces of the panels are manufactured from epoxy coated painted galvanize and the inner surfaces from galvanize or stainless steel sheets. The outer and the inner panels are connected to each other with minimum metal-to-metal conduction.

Eurovent Certified Performance

BENDIG™ PTP model is Eurovent Certified as Mechanical Strength Class **D1**, Casing Air Leakage Class **L1**, Thermal Transmittance Class **T2**, Thermal Bridging Class **TB1**, and Filter Bypass Leakage Class **F9** according to the result of tests performed in accordance with EN 1886. Eurovent Certification documents and technical specifications and performance of air conditioning and cooling products within the framework of European standards.

EN 1886

Mechanical performance test result

TECHNICAL SPECIFICATIONS ACCORDING TO EN 1886:2007		
Test Criterior	**Class**	**Description**
Mechanical Strength (mm/m)	D1/ D2 (M)	1mm./m / 6mm/m
Casing Air Leakage (l/ (s·m^2)	L1/L1	0.01 l/ (s·m^2)/ 0.02 l/(s·m^2)
Filter Bypass Leakage (%k)	F9	≤ 0.5%
Thermal Transmittance (W/m^2·K)	T2	0.8 (W/m^2·K)
Thermal Bridging	TB2	0.68 k_b

Certificate Number

N˚ 10.12.504

EUROVENT CERTIFIED PERFORMANCE www.eurovent-certification.com

Structure and Casing

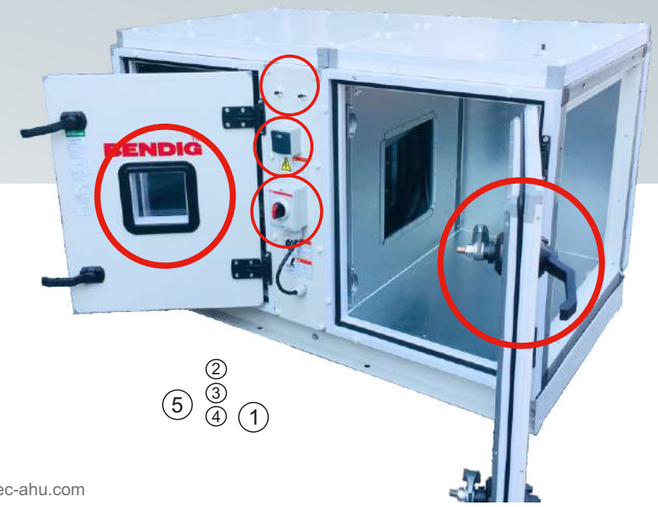
Enclosed structure frame works
Frame shall be covered by panel follow as concept PTP for minimize risk heat-bridge between in side and outside of AHU

Standard Frame works
Pre galvanise steel profile for BENDIG AHU frame-work. Deflection class shall be D1 as per EN1886

Thermal-Break Panel
Panel thickness 50 mm. as per PTP model standard guarantee TB1test according to EN1886

T-Profile
For special high pressure or the unit air flow start with 100.000 CMH, the special cross-section frame work shall be implement for high-pressure resistant

Pressure reduce design door frame, thanks for push-fits gasket which generate excellency casing air leakage rate class L1/L1 MB and RU



1. Heavy duty industrial lock
2. Differentail pressure tapping
3. IP65 lighting switch
4. Safety switch
5. Inspection glass

Customize configuration

BENDIG provide wide range of customize air handling unit base on the European requirement and testing standard. We can produce all range of air side properties use for HVAC and special require-condition start with cooling air, heating air, humidifying air, dehumidifying air, filtration, sound attenuated, mixing air and integrated energy-recovery function unit. All scopes we basically design is customization unit where start with air volume flow range 500 CMH up to more than 180.000 CMH. We are experienced in many kind of operating condition for instance Explosion-proof condition, small-foot prints design unit, high static pressure operating condition (3500 Pa. and above), Hygienic-grade air handling unit and food grade AHU. If you are looking for company who are able to provide you plenty of air handling unit design and solutions, we are one of the best answer in this field.

Double Deck

Vertical-Unit

Small-Foot print vertical design unit. This help to limit in installation area. Vertical unit more benefit in space saving and convenience in maintenance

Hygienic air handling unit-AHU

BENDIG™ is proud to announce to be the company who developed and manufactured truly hygienic air handling unit. We study relating standard and technical guide-lines such as HTM-2025, VDI-6022, DIN-1946-4 for . Hygienic-Air Handling Unit (H-AHU), the programme itself applies to configure This not only focus on Characteristic of AHU. but the AHU design software also need to be suitable with the hygienic requirement.

M-PTP range manage for high-corrosive condition such as marine off-shore application. This model can be applied for explosion proof design condition AHU. The standard of unit can be comply with ATEX or IEC-ex as an optional.

PTP-90

Hot and high humid-condition.
The unit grant for minimum kb-factor as 0.95, this unit appropriate for very high dewpoint operation which minimize risk of condensation.

MULTIPLE-FAN

Multiple-Fans systems create a fully integrated and engineered system of state-of-the-art fans, motors, cabinetry, controls, and accessories that can be easily combined to match new construction and retrofit application requirements.

Efficiency foot-print

Ideal for installation where space or access is limited, especially as retrofit or replacement. Overall air handler length can be reduced by 30% – 70% using a Multiple Fan.

Smart Cube configuration combines active control components that are factory installed and wired to save time and labor at the job site. Single-point power connection to all VFDs speeds installation.. MTP-FAN can be arranged in many different combinations to suit the space available.

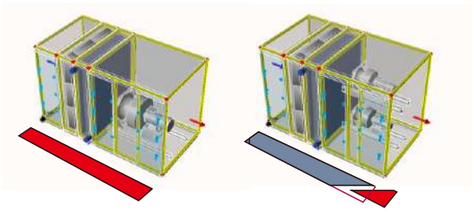
2x2 Multiple fan + Back-up
3 Multiple fans with 1-back-up inside of AHU fan section

Flexible Configuration

·Both AMCA Certified™ stainless steel fans and high-performance polymer fans are available in multiple sizes to efficiently meet system performance or application requirements.
·Choice of motors to meet project efficiency requirements, including explosion proof, IE-1 to 3 and EC-

Redundancy and Reliability

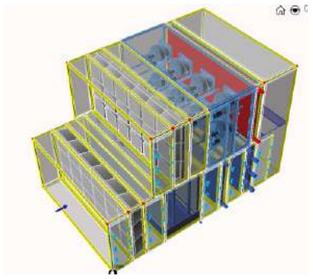
If a fan or motor failure occurs in a AHU with Multiple-Fan configuration, the remaining operating fans can compensate to maintain airflow and static pressure until the failed component(s) can be repaired or replaced. Dedicated VFD for each fan and motor combination. A fan, motor, or VFD failure is inherently isolated, eliminating the need for a bypass VFD or potential for a ground fault failure of the entire array.



15 - 20% shorter in foot-print

AMCA Certified product SUS304 Fan as per optional

Explosion proof motor and or IE-1.2. and 3 as per optional for MTP-Fan configuration



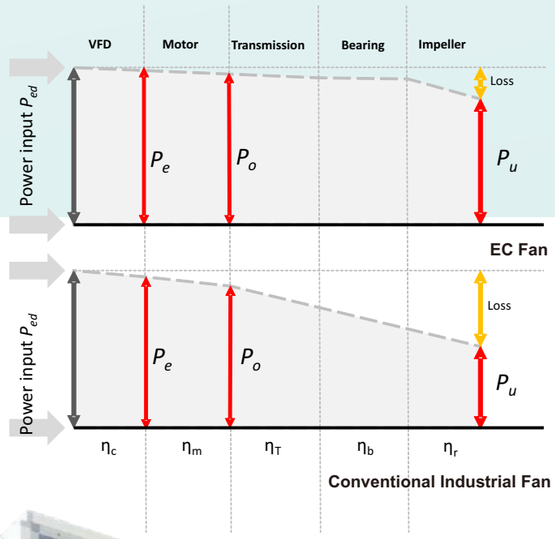
EC-Fan

Benefits of EC motor

- **Integrated power electronics**
- **Integrated motor protections**
- **Continuous speed control**
- **Out standing efficiency**
- **Active temperature management**

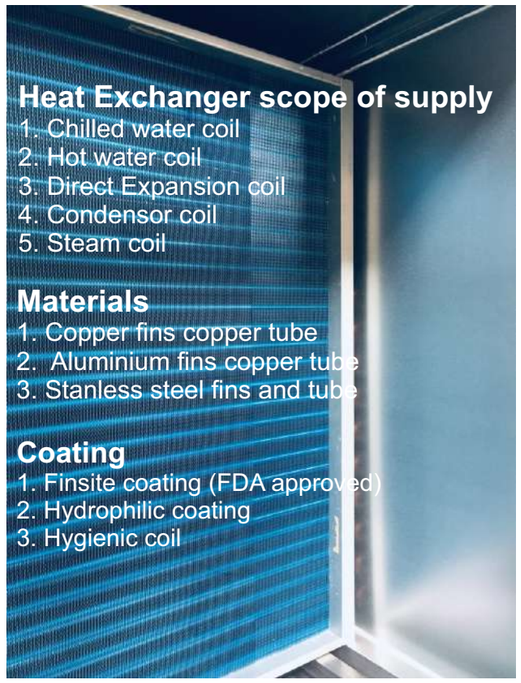
These EC motors are external rotor DC motors that are fitted with permanent magnets. When the motor turns, the electronics determine the position of the rotor, which is then used to actuate the motor windings. This form of actuation is know as communication. The inherent advantage of the compact external rotor motor is combine with the gain in efficiency resulting from the DC motor. This intern ensures that only the exact amount of energy required to induce rotary motion is actually supplied, resulting in a highly efficient form of operation. The motor itself is not operated directly from the mains, but rather has electronics connected upsteam. The electronic supply variable voltage in the right frequency and voltage level for the respective operating point. Contemporary EC motors often have these electronics integrated directly in the motor.

Transformation of power



EC-Fan with Multiple configuration: Electronic commutate fan withMultiplefanconfiguration. It create laminar flow pattern and moreeasilytoreplacement and service.

Heat Exchanger



Heat Exchanger Advantage

BENDIG Heat Exchanger is used to cool down the supply air either with cold water, or directly evaporation. Dimensioning the PTP coil is done using the design program BENDIG - Climatestation, where the coil will be determined optimally to solve the current task. Our selection software calculations are TÜV tested according to EN 13053.

BENDIG PTP coils are made with copper tubes and aluminium fins. The tubes are ø3/8" to ø5/8" , depending on the capacity required. As light corrosion protection the cooling coils can be supplied with fins in aluminium -Hygroscopic or Finsite coating coated aluminium.

Cooling coils for direct evaporation have the liquid distributor located in the unit. The expansion valve can be fitted on the connection pipe outside the unit. Cooling coils are fitted with drip tray. The drain outlet must be connected to a water trap with sufficient locking height. The cooling coil can be supplied with a built-in droplet eliminator. The coil is fully built -in in the unit as standard, but also comes in a MAX version where the coil section is wider than the standard unit width. This will reduce the air velocity. Read more.

Multiple circuits
Split fin
Split row
Interlace circuit

Finsite coating make our heat-exchanger operate longer life-time. FDA compliance shall be as an optional.

Hydrophilic coating benefits for better remove condensate comparing with bare-aluminum fins

TÜV NORD

Heat Exchanger Rating and performance tested by EN 13053 TUV-NORD

Heat Pipe

Scope of application
Air Dehumidification
Energy recovery air
BSRIA-Certified performance

Configuration provided
1. Wrap-around heat-pipe
2. Monoflat
3. Capacity control heat-pipe (Optional)

Coating
1. Finsite coating (FDA approved)
2. Hydrophilic coating

Refrigerant
1. R407c, R22, R134a
2. Ammonia

If your requirement above company scope please contact company contact person.

Advantage of Heatpipe

- No direct energy input
- No need reheat or desiccant systems
- Can be installed in duct or in AHU
- Totally passive
- Easy drainage of condensation
- Environmentally safe
- No moving parts
- Low air pressure drop
- Zero cross contamination
- Virtually maintenance free
- Create healthy environment by providing better indoor air quality.

Monoflate-Heatpipe
for 2 air steam
operating configuration

Plate-Heat Exchanger

Scope of application:
1. Energy recovery
2. Pre-cooled and reheated with moisture remove
3. Dehumidification purpose

Provided scope:
1. Cross flow (single of double air steam)
2. Counter-flow
3. High air volume flow
4. Epoxy coating PHE

Advantage of PHE

- High efficiency for energy recovery
- Eliminate moving part or energy input
- Can be use as precooled and reheat
- Can be installed in duct or in AHU
- Totally passive
- Easy drainage of condensation
- Environmentally safe
- Low air pressure drop
- Low cross contamination
- Create healthy environment by providing better indoor air quality.

The principle of PHE

The principle of PHE request 2 neighboring plates create channels for the air to pass through. The supply air passes on one side of the plate and the exhaust air on the otherside. The heat in the exhaust air is transferred through the plate from the warmer air to the colder air. The exhaust air is contaminated with humidity and pollutants, but the two airflows never mix, leaving the supply air fresh and clean.

ENERGY RECOVERY WHEEL

Features and Benefits

Energy recovery

Latent heat remove absorptions as an optional

Double rotors configuration

Rotor+ Heatpipe

Principle of product

The rotating heat exchanger consist of a rotating wheel, casing and drive unit. As the wheel rotates slowly, the heat from the exhaust air is picked up by the aluminium in the matrix and transferred to the cool supply air. Their small foot-print and the high sensible efficiency that they provide. The possibility of adding coating to wheel, which allow latent transfer, is another factor favoring these products.

RUN AROUND COIL

Like the thermal wheel the run-around coil system of energy recovery is somple both in concept and in operation. This system consists of two heat exchanger interconnected by a forced circulation thermofluid network. One coil is mounted in the exhaust air handling unit and the other in the supply air handling unit. Ebnergy contained in the exhaust air is removed by the flow of glycol and water solution, and transffered to the incoming fresh air. This continual heating and cooling of the solution, together with its repetitive cycling, gives this form of heat transfer efficiency depends on the number of coil rows. Typical sensible heat thermal efficiencies are 50 to 55%. If a dew point condition is reached on the coil and condensation occurs the efficiency may increase by 5 percent. These efficiencies are based on equal air mass flow rates in the fresh and exhaust air handling units. So that the fresh and exhaust air fans do not have excessively large electric motors, the coil face velocity should be around 2.5 to 3.0 m/s, which for an eight-rows coil, will give a static pressure frop of about 250 Pa. In most cases the position of the coil in the sequence of the air conditioning plant will be in place of the pre-cooling or heating. The standard practice of placing the filter before any of the conditioning plant is all that is required. Althought this system is less efficiency than the thermal wheel, its main advantage is that the suply and exhaust air handling unit s do not have to be brought together. However, it is desirable to have the coils reasonably close to one another in order to avoid excessive costs for pipewotk, insulation and large pumps.

Silencer

Principle of product

The fan component is the major sound sources transmitted through the HVAC system. Effort should be made at the beginning to minimize the magnitude of this sound. BENDIG selection software is able to select the optimal fan to operate at or near peak efficiency. This will result in minimum sound power levels. Different choice of air volume control would also have differenct impact to the resulant noise. While each will have its merit, they must be chosen with consideration of sound. The sturdy construction of PTP offers suporb barrier to noise impact on the surrounding. The sound reduction index on the unit casing is tested to meet En1886 European standard.

Sirencer from BENDIG comply with H-AHU requirement according to Rating and Standard of Eurovent Hygienic Air Handling Unit

HOT GAS REHEAT

Hot-Gas reheat function in Air Handling Unit: Mostly for humidity control operation, this functional provide many benefits when operating. First of all they bring artificial load from hot-gas return back to maintain sensible heat before air delivery to the occupied area. This manage COP of compressor higher than 100% purge out at condenser. The next benefit of hot gas reheating from CDU shall be reduce risk of fire comparing with Electric-Heater. Because Electric-Heater possibly occur mal-fuction of protection sensor, this might be cause of flamable occur. Lastly, Hot-gas reheat help to bring waste energy and recover back to control the humidity. This help over-all system energy saving comparing with Electric heater and other artificial load.

Heating Coil: mostly place on down steam of the air side components. This help for reheating the air and control supply air temperature and humidity.

FILTER SECTION

Combine filter frame
The combine filter frame grant FBL9 according EN 1886 testing standard, the material can be implemented depend on operating condition.

BENDIG provides variety range of filtration section in our air handling unit. We can supply start from G4 to H14 filter class regarding to EN:1822 and EN:779. For media filter section, we can provide several options of media cartridge.

Our Filter frame granted FBL9 classification according to EN:1886 and certified testing result from Eurovent Certification Program

Rollmatic air filter or automatic pre-filter can also as an optional this application help to reduce interval time to replace pre-filter

Media filter: Carbon activated media and or Chemical filter are also available for this type of filter-section.

Mixing Chamber
Up steam of Filter section.

AIR WASHER

Spray humidifiers, also known as air washers or jet chambers, the air is brought into direct contact with flowing or atomized water. There is thus a transfer of material in addition to the transfer of heat. Depending on the temperature of the water, this means that any changes in the air condition are possible: heating, cooling humidification and drying. Given that there are so many possible changes in the air condition, air washer are primarily used in air-conditioning systems, in which it is adiabatic change of state (Humidification and cooling) of the air that is of maximum importance. In contrast, washing or cleaning f the air in air washers only applies to coarse dust particles and a few gases, such as SO2, So4

Scope of application

- Hall ventilation and deaeration
- Printing plants
- Paper mills
- Wastewater treatment plants
- Composting plants
- Animal rendering plants
- Tobacco, polymers, grain and oil-mills
- Automobile industry
- Aircraft industry
- Cleanroom constructions
- Hotels
- Airports
- Banking – office building
- Public facilities
- Government buildings.

The spray nozzle, type HL, is made of shatter resistant synthetic material resistant up to 130oC, constructed as centrifugal-Hollow-cone nozzle, self-cleaning and non-clogging with size 8mm mouth opening. The connection to the nozzle tree is effected by means of mounting clamps and screws. No tools are required for maintenance of the nozzles. If desired, nozzles of other marks can be used. The nozzle tree consists of the header pipe and the vertical nozzle pipes. All connections made with easy removable screws.

All bracketing and spacer profiles for the fixing of the profiles are in standard design made of stainless steel.

DESICCANT PACKAGED AHU

DP-AHU be able to operate with direct expansion system. This helps us avoid to lack of cooling-resource in case of Chilled-water supply lackage.

Range of dewpoint supply:

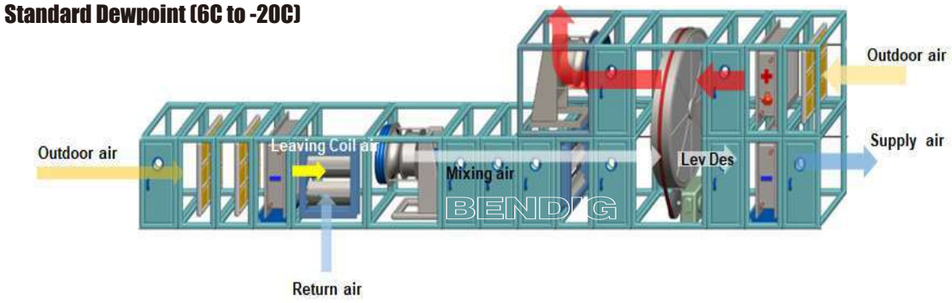
1. standard dewpoint between 6C to -20C
2. Ultra-low dehumidification -20C to -60C

Features and Benefits

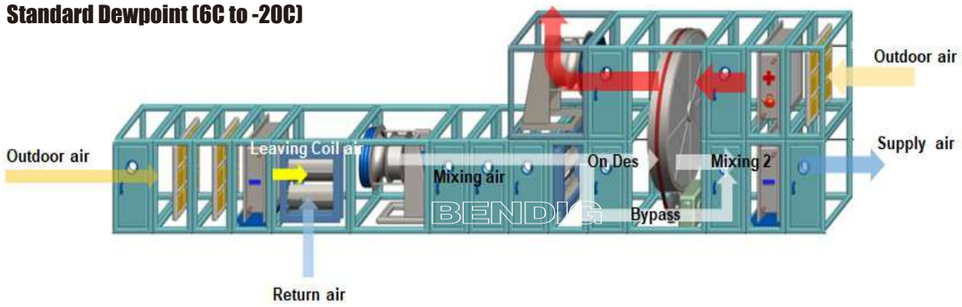
Space saving
Low humidity control (Below 35%RH or Lower 6C Dew-point)
Double skin casing cabinet
None combustion casing insulation
Controller system complete set from factory
Energy recovery regeneration

Air flow configuration

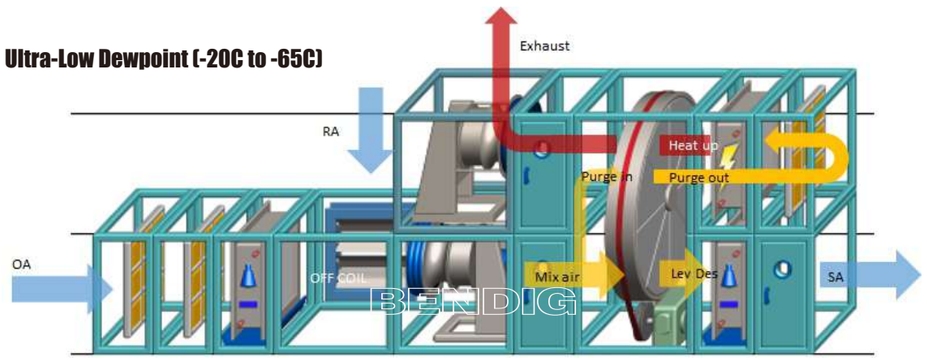
Standard Dewpoint (6C to -20C)



Standard Dewpoint (6C to -20C)



Ultra-Low Dewpoint (-20C to -65C)



Marine application and Explosion proof

M-PTP Range

BENDIG M-PTP Air Handling Units (AHU) are flexible and individually designed for Marine / Offshore HVAC system and supplied certain amount of fresh air and mixed with the return air, cooling down or heating up treatment and distribute to the cabins/ rooms at the desired temperature.
M-PTP has a wide range of standard AHU with airflow capacity from 2,000 m3/hr to 30,000m3/hr and also designs customised units with all the components used based on our customer's requirements including Ex-Proof features and components or specific size to meet space constraint. The units are built according to the specifications, delivered with all necessary accessories and minimize installation work onboard.

Explosion proof Electric Heater

All SUS316L casing and casing components, available for oil-rig condition and high-explosive area.

Explosion proof lamp For eliminate risk of explosion, all possible spark equipment shall be minimize risk of explosive.

ATEX Certified Fan can be optional

SUS304 and or 316L Eliminator Guarantee C6 corrossivity class according to EN12944-2 SUS 316LDripEliminator

www.metadec-ahu.com

Hygienic Air Handling Unit (H-AHU)

BENDIG H-PTP Range compliant with hygienic requirement of H-AHU according to Hygienic rating and standard. The model guarantee inside material pass standard test action of microbe and hygiene AHU characteristic. The range H-PTP can be provide all range of hygienic catagories start with Single-star,Double-stars and Three-stars Hygienic. Selection software of BENDIG also pass the requirement of Hygienic certification. If you are looking for AHU which maximize your cleanliness area H-PTP should be one of the best option for this field of air handling unit.

EUROVENT CERTIFIED PERFORMANCE AIR HANDLING UNITS www.eurovent-certification.com

Hygiene-Institut des Ruhrgebiets

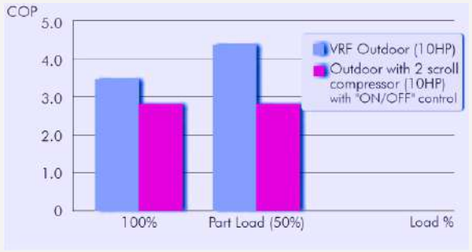
Refrigerant Packaged AHU

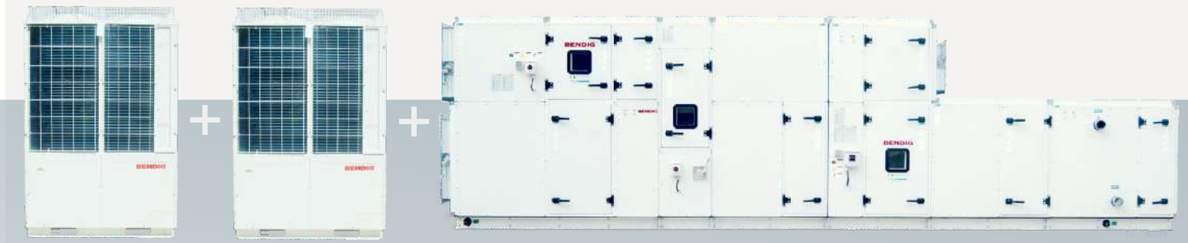
Refrigerant Packaged Air Handling Unit (RP-AHU) are suitable for Roof-top installation and integrate refrigerant system in one packaged of AHU. This unit neither request refrigerant piping installation nor AHU installation area inside of the building. The AHU shall be designed for out door operation. The Outdoor-air conditioning, recirculation air unit all possible for this RP-AHU.

Integrated Variable Refrigerant AHU,OAC

No water pump, No cooling tower and No cooling / chilled water piping
Simple control system, built-in controls for VRF outdoor unit plus field installed
Refrigerant control-board for AHU/PAU
Integrated package with VRF system
Easy installation and maintenance
Simple cable and refrigerant piping connection
Maximum capacity 258 kW (88HP)
Long pipe run available for greater design flexibility
Excellent full load COP for VRF outdoor unit (10HP) is 3.6, 50% COP is 4.3
Custom design of AHU/OAC arrangement to improve IAQ

Compare VRF AHU with On/Off DX AHU





BENDIG TM

air handling unit

EN 1886

EN 13053

Hygiene-Institut des Ruhrgebiets ISO 846

ISO9001:2015

Metadec Ltd.
2230 soi waddansamrong samrong nua muang samutprakarn 10270
wwww.metadec-ahu.com T: 662 - 3941662, 7573080-2