



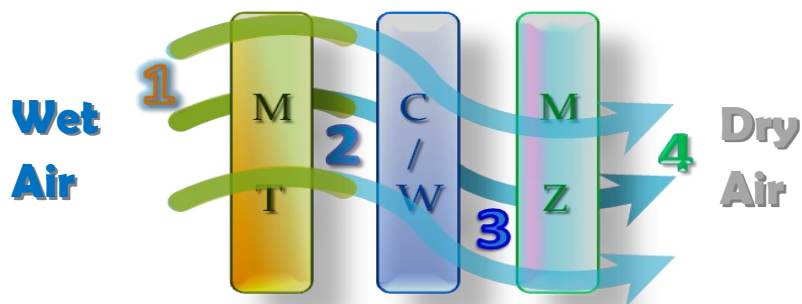
"Better Buildings. Better World"



**HEAT GENERATOR
DEHUMIDIFIERS**



AHU



HEAT GENERATORS and RECOVERY DeHUMIDIFIERS

ENERGY EFFICIENT HUMIDITY CONTROL SOLUTIONS

HEAT GENERATORS, HEAT RECOVERY CHILLERS

ASHRAE 15 Complaint

HRDe & Heat Generator Mechanical Dehumidifiers (HGMD)

ACMV's HRDe and HGMD standard and custom designed, are applicable for laboratories, indoor pool rooms, food processing rooms, fresh air make-up supply for commercial and industrial buildings, hospitals, warehouse, hotels, fitness centers and storage spaces that required humidity control lower than ordinary chilled water system can do.

From many years of experience HRDe and HGMD can be designed as built-in to High Quality Air Handling Units specially for humidity and temperature controls to meet specifications. HRDe and HGMD saves energy by generating heat while recovering the cooling. It controls humidity in many comfort and process applications. HRDe and HGMD chillers are either air and water cooled design to provide heat efficiently and generates chilled water for free or vice versa.

HRDe or HGMD for medium to large units are built on High Quality Air Handling units up to 100,000 cmh.

HUMIDITY CONTROL

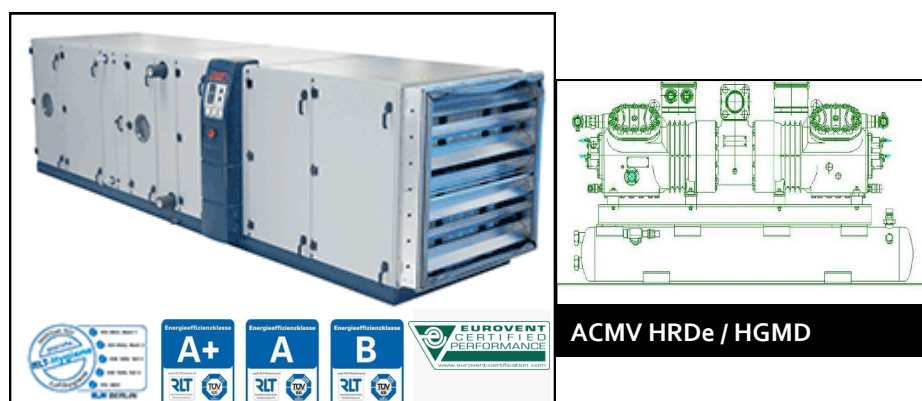
High humidity is always a problem in tropical countries with respect to comfort and processes applications. Treatment of the air is critical to achieve correct humidity conditions and if uncontrolled building materials, occupants comforts and productivity are affected by moisture.

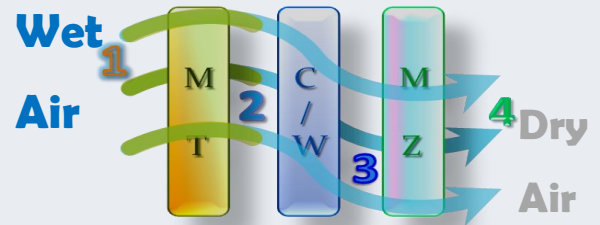
The biggest concern of controlling humidity is the energy consumption. Most of the energy usage is the process of removing the moisture from the air by condensation due to change of state of vapor. The science of Psychrometrics would explain the relationships of humidity parameters like temperatures, pressures, air moisture content and energy needed in humidity control.

Cooling the air stream either by the use of chilled water, expanded refrigerants, glycol solutions and other fluids shall pass through a heat exchanger. Low coil temperature will bring the air stream at a temperature below its dew point and the amount of moisture removed is relative to the temperature of the coil surface.

There will be a time in the process that cooling the air stream will not reduce the humidity of the space due to lack of sensible heat load therefore introduction of heat becomes necessary. The source of heat though is a very important factor in relation to saving energy.

One of the positive solutions available to solve humidity problems is offered by ACMV's HRDe and HGMD lines of mechanical dehumidification equipment. Experience taught us that this technology saves energy and control humidity effectively and accurately.





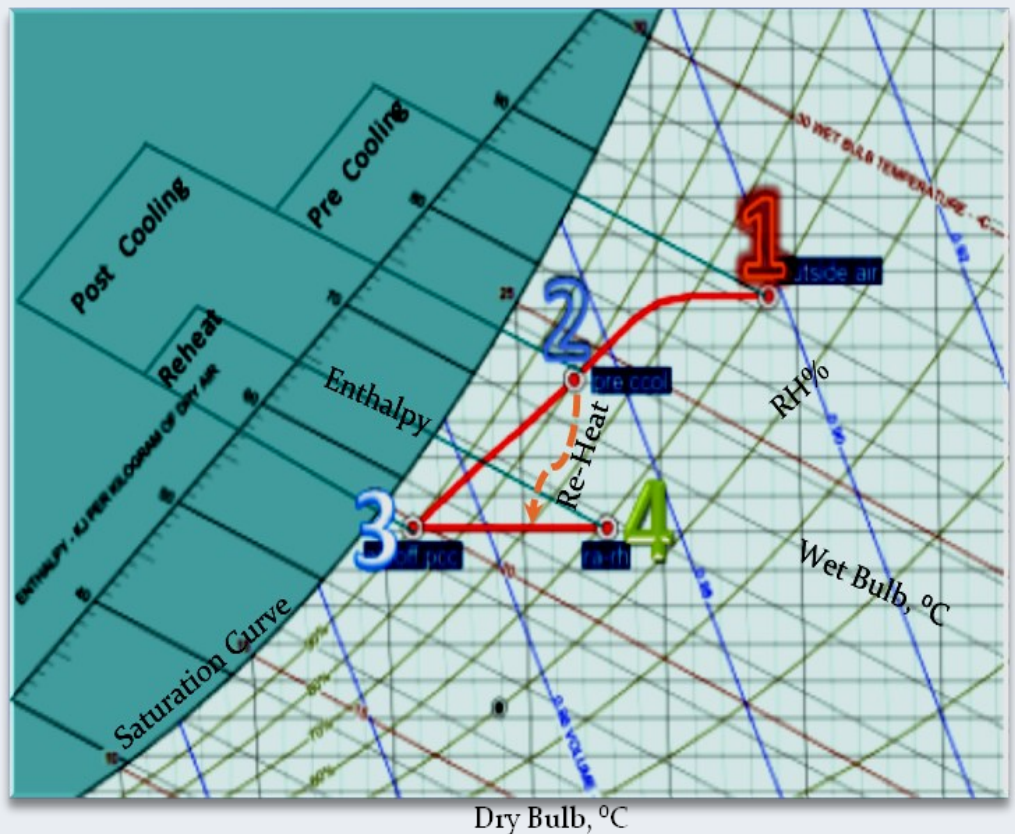
3-Steps to Efficiently Dry Air

- 1—2 Warm air passes through the Moisture Trap (M-T) heat exchanger to accomplish three tasks:
 - Pre-Cool the air
 - Reduce Moisture of the air
 - Absorbed energy from the air
- 2—3 Normal cooling coil (C/W) primary purpose is to provide cooling for the entire space as well as reduce moisture of the air but it has limitation to control low space relative humidity at all times.
- 3—4 To achieve lower humidity, the energy absorbed by the M—T from pre-cooling the incoming air is re-used by the Moisture-Zapper (M—Z) therefore no other energy source is necessary.

The energy save by the HRDe or HGMD is more than four times compared to when electric heaters are utilized.

PSYCHROMETRIC PROCESS

Control humidity efficiently



TYPICAL APPLICATIONS

- Laboratories
- Hospitals
- Libraries & Storage Archives
- Computer Rooms
- Food Processing Plants
- Warehouse Storage
- Lockers & Shower Rooms
- Health & Fitness Facilities

BENEFITS

- Low heat energy requirements
- Precise control of space humidity
- Less field works
- Matched system performance
- Compact
- Ease of installation
- Reduce cost of electrical controls
- Enhanced safety control

MODELS (HRDe and HGMD)

- **PR** models are packaged units installed direct in air conditioned room spaces and operate to reduce moisture. This model can also be used as dryers for grains and fruits. Capacity range 1-45 kW. RH range 60 to 40%.
- **PNR** models are self contained packaged air cooled units with remote fan-coils installed in spaces that has restrictions of refrigerant leakage in the air stream. Capacity Range 1-45 kW. RH range from 60 to 30%.
- **AR** models which are called Adapto-Drives and are supplied with the AHU complete with chilled water coil, DX and reheat coils. Standard capacity range from 6 to 50 kW and large systems from 50 to 500 kW for AHUs up to 100,000 CMH. RH range from 60 to 40%.
- **ANR** models are supplied with AHU and are also called Adapto-drives designed to serve spaces that has restrictions of refrigerant leakage in the air stream. Capacity range 5 to 500 kW for AHU up to 100,000 CMH. Multiple units are available as custom design. RH range from 60 to 30%
- **GNR** are large capacity units that heat liquids efficiently. It can be used as additional capacity for the building chiller or processes cooling. Capacity range 50 to 500 kW and multiple units up to 2000 kW. RH down to 30%.
- **GS** generates chilled and hot water for special applications using popular refrigerants and natural refrigerant CO2 for potable water heating. Capacity range from 20 to 170 kW multiple units design. RH down to 30%

CAPACITY CONTROL OPTIONS

- **On-Off** capacity control are for small capacity models that close control of humidity set points is not required. Optional models are available with 0-50%-100% capacity regulation.
- **Step Unloading** capacity controls are available as 0-50-100%, 0-33-66-100% and 0-25-50-75-100% depending on the capacity. Higher capacity models normally are fitted with 4 to 6 cylinders compressor thereby more steps unloading are available. Multiple compressors would normally feature at least 0-50-100% unloading.
- **Variable Speed Drives (VSD)** capacity control have been more effective to achieve better accuracy of controlling humidity set points than steps unloading controls. VSD controls are mainly applied to semi-hermetic compressors.
- **Combination of Steps and VSD** capacity control are applied for multiple compressors where only one compressor is fitted with VSD.

STANDARD FEATURES

- Proven high reliability semi-hermetic compressors
- Single or dual circuit evaporators
- Shell and tube condensers
- Discreet controls
- R-134a
- Step control capacity
- Steel galvanized frames
- Single or multiple compressors
- Double wall heat exchangers for potable water heating

OPTIONAL FEATURES

- PLC Control with MODBUS protocol
- Remote user interphase and remote monitoring
- Screw and scroll compressors
- VSD for capacity control
- Other refrigerants, i.e., R407, R-507 etc.
- Stainless steel or painted steel frame
- IP 65 Control panel
- Open drive compressor
- Casing with sound proofing



Scroll Compressor



Screw Compressor



Braze Plate Heat Exchanger

PARTIAL LIST OF CUSTOMERS (Singapore)

- Hydrogen fuel cell laboratory— Temasek Polytechnic
- Library—Supreme Court
- Laboratory and Office—Jurong Island
- Data Storage company
- Burn Center Singapore General Hospital
- Ngee-Ann Polytechnic Theater and Instruments Room
- Storage Rooms—UPS
- Laboratory—Sniff & Sensory P&G

PR

Model	Capacity	Power	COP	Air Flow (nom.)	Amps	V/Ph/Hz
	kWo	kWi		CMH		
01PR	1	0.3	3.2	152	2.5	220/1/50
05PR	5	1.6	3.2	758	5.0	
10PR	9	2.3	3.9	1365	7.6	
12PR	11	2.9	3.9	1687	9.6	
15PR	14	3.7	3.9	2071	11.5	
20PR	19	4.9	3.9	2852	13.3	400/3/50
25PR	23	5.9	3.9	3359	14.9	
35PR	36	8.6	4.2	5554	12.5	
45PR	44	10.5	4.2	6821	17.9	400/3/50



PNR

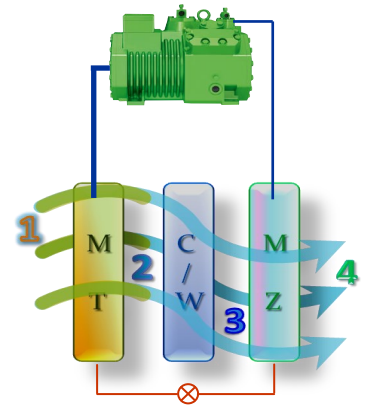
Model	Capacity	Power	COP	Air Flow (nom.)	Amps	V/Ph/Hz
	kWo	kWi		CMH		
01PNR	1	0.4	2.9	152	3.8	220/1/50
05PNR	5	1.9	2.9	758	6.0	
10PNR	9	2.5	3.6	1365	8.1	
12PNR	11	3.2	3.6	1687	10.3	
15PNR	14	4.1	3.6	2071	12.2	
20PNR	19	5.4	3.6	2852	14.1	440/3/50
25PNR	23	6.5	3.6	3359	15.8	
35PNR	36	9.5	3.9	5554	13.1	
45PNR	44	11.6	3.9	6821	18.8	400/3/50



PNR models are applicable to No-Refrigerant on air stream restrictions as per ASHRAE 15.

AR

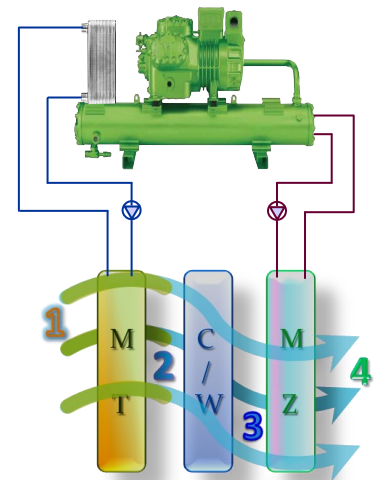
Model	Cooling	Heating	Power In
	kWo	kW _R	kW _i
010AR	6.3	8.2	1.9
012AR	8.9	11.6	2.7
020AR	12.6	16.2	3.5
025AR	19.5	23.9	4.4
030AR	29.5	35.9	6.5
045AR	37.2	45.3	8
065AR	53.8	65.3	11.5
075AR	62.4	76.5	14.1
085AR	69.5	85	15.5
100AR	80.3	98.7	18.4
130AR	108	131	23
170AR	139	170	31.1
200AR	161	197	36.8
250AR	208	254	45.6
300AR	241	296	54.4



Power supply (V/Ph/Hz): 230/3/50 or 400/3/50; Large units from 50 to 500 kW are available.

ANR

Model	Cooling	Heating	Power In
	kWo	kW _R	kW _i
010ANR	5.1	7	1.8
012ANR	7.3	9.7	2.57
020ANR	10.3	13.6	3.4
025ANR	15.9	20.2	4.3
030ANR	24	30.3	6.3
045ANR	30.5	38.2	7.7
065ANR	44	55	11
075ANR	51.1	64.5	13.4
085ANR	56.8	71.8	15
100ANR	65.9	83.5	17.6
130ANR	88.1	110	21.9
170ANR	114	144	30
200ANR	132	167	35.2
250ANR	171	214	43.6
300ANR	198	250	52.4



ANR models are applicable to No-Refrigerant on air stream restrictions as per ASHRAE 15.

Power supply (V/Ph/Hz): 230/3/50 or 400/3/50; Large units from 50 to 500 kW are available.

Notes:

- Design Conditions: 25°C DB / 50% RH
- For other operating conditions or power supply consult the factory
- The Manufacturers reserves the right to change data without prior notice.

GNR

Model	Cooling	Heating	Power In
	kW _o	kW _R	kW _i
020GNR	14.1	18	3.9
030GNR	23.9	30.5	6.6
040GNR	30	38	8
050GNR	38.8	49.3	10.5
060GNR	46.1	58.6	12.5
080GNR	61.5	78.3	16.8
100GNR	65.9	83.5	17.6
130GNR	88.1	110	21.9
170GNR	114	144	30
200GNR	132	167	35
250GNR	171	214	43
300GNR	198	250	52
350GNR	262	332	70
375GNR	289	367	78
400GNR	312	397	85
450GNR	351	446	95
500GNR	391	496	105
650GNR	500	634	134



Water Cooled



Air Cooled

GNR models are applicable to No-Refrigerant on air stream restrictions as per AHSRAE 15.

GS

Model	Cooling	Heating, 45°C Water	Power In
	kW _o	kW _R	kW _i
010GS	65.9	83.5	17.6
015GS	88.1	110	21.9
020GS	114	144	30
030GS	132	167	35
050GS	171	214	43
075GS	198	250	52
080GS	262	332	70
100GS	289	367	78
150GS	312	397	85
200GS	351	446	95
300GS	391	496	105

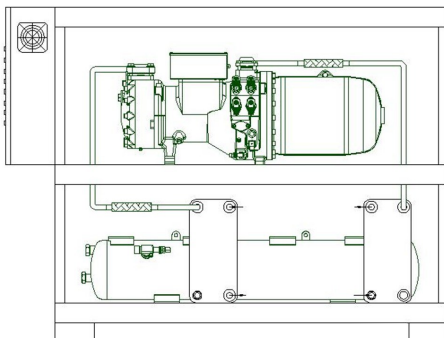


Air or Water Cooled DX or Chiller Outdoor unit

Power supply (V/Ph/Hz): 230/3/50 or 400/3/50; Customer required capacities not found are selected separately. CO2 charged units capacity range from 9 to 25 kW. Consult factory for specifications.

Notes:

- Design Air Conditions: 25°C DB / 50% RH (GNR models)
- Design Hot Water = 45°C; Hot water Flow Rate = kW_R/4200 (45 - T_{wr}) ; T_{wr} = water return temperature.
- For other operating conditions consult the factory
- Models PNR, GNR and GS are all Plug-N-Play category.
- The Manufacturers reserves the right to change data without prior notice.



Typical Arrangement

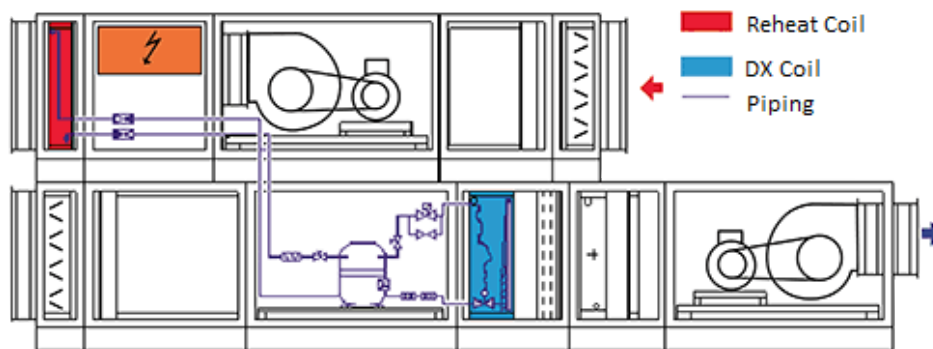


AHU Mounted Design

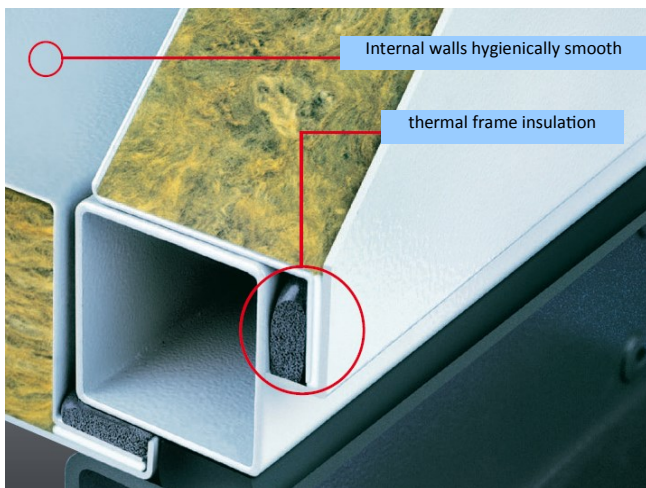


Unit construction totally smooth inner surfaces without edges, joints & grooves.

Thermal optimized casing structure by GRP (glass reinforced plastics) profile



Typical arrangement of WHR for Humidity Control (Consult ACMV for the required design configuration)



Efficiency and economy

- Reduced energy consumption and minimized internal pressure losses by optimized air flow through the treatment components
- Selection of fans adapted to the operating point
- Use of all conventional heat recovery systems; layout to the actual application
- "Life-Cycle-Costs" – optimized air handling units

Top quality for all applications

- Suitable for interior and exterior installations
- Hygienic finish
- Integrated cooling units
- Various material versions designed to be dismantled
- Large and special units
- DCS (Desiccant Cooling System)

Air to air Heat Recovery and High Efficiency motors



ACMV HRDe / ACMV Tech AHU

OPTIONS

- Electronic Air Filters and carbon filters
- UV Lights
- VSD drive fans
- Plug-Fans or Belt-Driven Fans
- Humidifiers
- Screw, scroll compressors
- All VSD drive compressors
- All copper fins/tubes coils
- Heat Pipes
- Refrigerants other than R-143a
- 60 Hz to 75 Hz

TYPICAL BUILT:

- HRDe or HGMD, Electronic Filters and UV-lamps are factory installed on AHU with separate dedicated control panels. All controls are interlock with AHU and HRDe
- AHU controls are included and interlock with HRDe or HGMD. MCCB are included.
- HRDe / HGMD controls are included and interlock with AHU. MCCB are included.
- HRDe / HGMD is assembled on galvanized steel frames either at AHU end or top side depending on site conditions.

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