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LG
Life's Good

LG AHU

E-AvgEG and E-AwgEG series

LG AHU

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AHU is an air conditioning solution for
wide areas that can control all four
air conditioning factors
(temperature, humidity, cleanliness and air flow)

CONTENTS

LG AHU System

About LG

Ever since manufacturing Korea's first homegrown air conditioner in 1968, LG has remained at the forefront of air conditioning innovation. In 2000, LG has been the world's top selling manufacturer of residential air conditioning solutions. And in 2008, LG became the first company to sell more than cumulative total 100 million air conditioners.

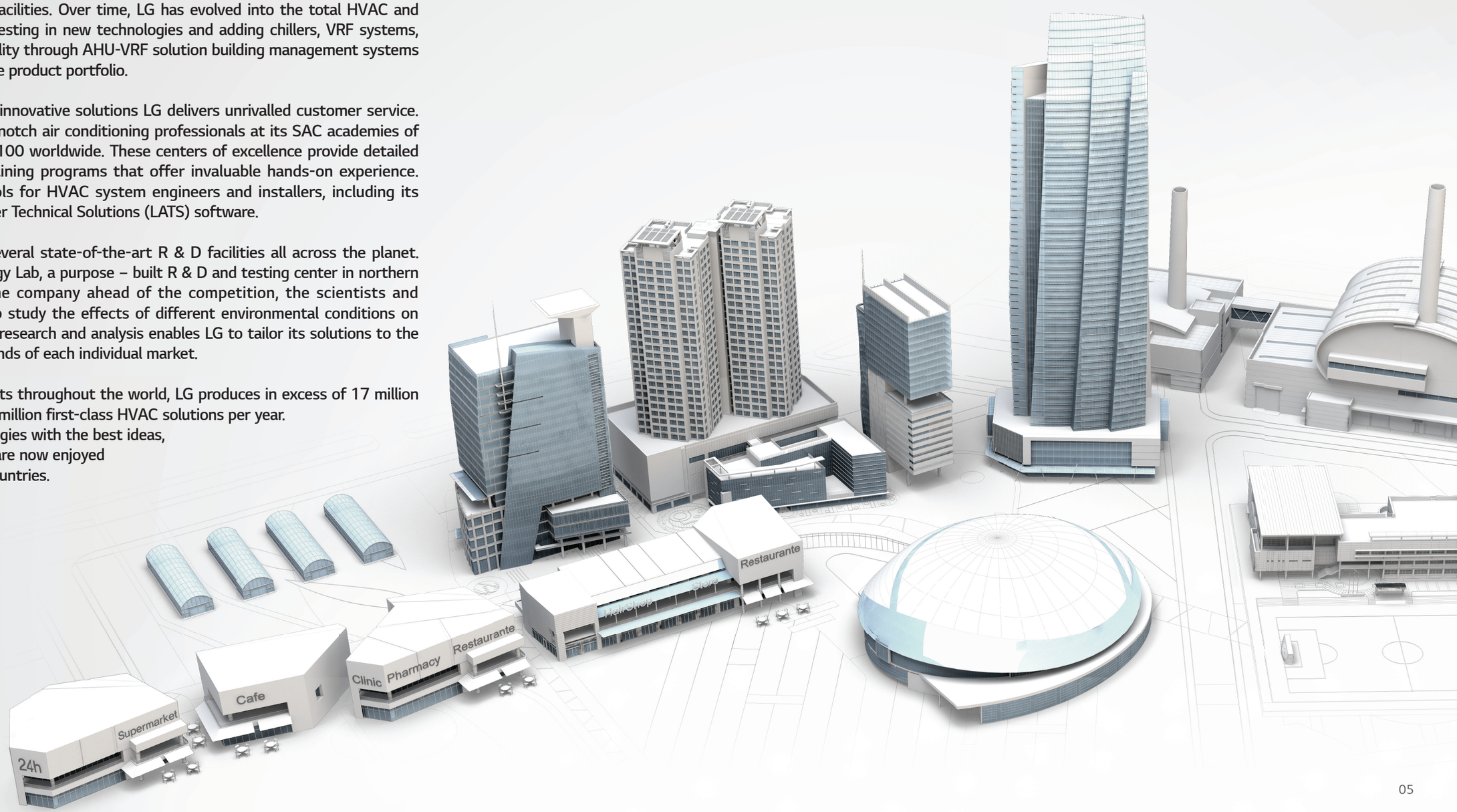
Building on its success and technological leadership in the residential air conditioning sector, LG has moved into system air conditioning as well. The company's range of high-performance system air conditioning products provides effective temperature control to large scale building and facilities. Over time, LG has evolved into the total HVAC and energy solution provider, investing in new technologies and adding chillers, VRF systems, and improving indoor air quality through AHU-VRF solution building management systems (BMS) into its comprehensive product portfolio.

Along with a wide range of innovative solutions LG delivers unrivalled customer service. The company produces top notch air conditioning professionals at its SAC academies of which there are more than 100 worldwide. These centers of excellence provide detailed product workshops and training programs that offer invaluable hands-on experience. LG also provides useful tools for HVAC system engineers and installers, including its timesaving LG Air Conditioner Technical Solutions (LATS) software.

Additionally, LG operates several state-of-the-art R & D facilities all across the planet. One such facility is the Energy Lab, a purpose – built R & D and testing center in northern France. Helping to keep the company ahead of the competition, the scientists and engineers at the Energy Lab study the effects of different environmental conditions on LG's products. This in-depth research and analysis enables LG to tailor its solutions to the specific environmental demands of each individual market.

With 10 manufacturing plants throughout the world, LG produces in excess of 17 million reliable compressors and 16 million first-class HVAC solutions per year.
Combining the best technologies with the best ideas,
LG's highly quality products are now enjoyed
by consumers in over 100 countries.

LG has evolved into the total HVAC and
energy solution provider, investing in new technologies



Understanding of Standards

Standards List

AHU Components standards

Components	Standard & Title	
AHU	EN 13053	Ventilation for buildings. Air handling units. Ratings and performance for units, components and sections
Casing	EN 1886	Ventilation for buildings – Air handling units – Mechanical performance
	ASTM A 653	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
	EN 71-3	Specification for migration of certain elements
Fan	AMCA 210	Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
	AMCA 300	Reverberant Room Method for Sound Testing of Fans
	AMCA 99-2408-69	Operating Limits for Centrifugal Fans
	AMCA 99-0098-76	Basic Series of Preferred Numbers
	AMCA 204-05	Balance Quality and Vibration Levels for Fans
	AMCA 205-12	Energy Efficiency Classification for Fans
	ISO 1940	Mechanical vibration — Balance quality requirements for rotors in a constant (rigid) state —
	AHRI 430	Performance Rating of Central Station Air-handling Unit Supply Fans
Motor	IEC 60034	Rotating electrical machines - Part 30-1: Efficiency classes of line operated AC motors (IE code)
	IEC 60072	Dimensions and output series for rotating electrical machines
	BS 5000	Specification for rotating electrical machines of particular types or for particular applications. Generators to be driven by reciprocating internal combustion engines
	BS 3979	Dimensions of Electric Motors (metric Series)
	BS 4999	General requirements for rotating electrical machines. Specification for rating and performance
Coil	AHRI 410	Forced-circulation Air-heating and Air-cooling Coils
Heat Exchanger	EN 308	Heat exchangers. Test procedures for establishing the performance of air to air and flue gases heat recovery devices
	AHRI 1060	Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment
Filter	EN 779	Particulate air filters for general ventilation - Determination of the filtration performance
	BS EN 1822	High efficiency air filters (EPA, HEPA and ULPA)
	ASHRAE 52.2	Method of Testing General Ventilation Air-Cleaning Devices for Removal by Particle Size
	DIN 24185-1	Method Of Testing Air Filters Used In General Ventilation - Terms, Units, Methods

Others standards

Items	Standard & Title	
Acoustics	EN ISO 3744	Acoustics -- Determination of sound power levels and sound energy levels of noise sources using sound pressure -- Engineering methods for an essentially free field over a reflecting plane
	EN ISO 3745	Acoustics -- Determination of sound power levels and sound energy levels of noise sources using sound pressure -- Precision methods for anechoic rooms and hemi-anechoic rooms
	AMCA 300	Reverberant Room Method for Sound Testing of Fans
	AMCA 311-05	Certified Ratings Program Product Rating Manual for Fan Sound Performance
	FND-AM-5	Acoustics in Air Conditioning
	ISO 11546-2	Acoustics -- Determination of sound insulation performances of enclosures --
	AHRI 260	Sound Rating of Ducted Air Moving and Conditioning Equipment
Fire protection	ISO 1182.2	Reaction to fire tests for products -- Non-combustibility test
	ASTM D 3014	Standard Test Method for Flame Height, Time of Burning, and Loss of Mass of Rigid Thermoset Cellular Plastics in a Vertical Position
	BS 476-7	Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products
IAQ	ASHRA 62.1	Ventilation for Acceptable Indoor Air Quality
Energy	ASHRAE 90.1	Energy Standard for Buildings Except Low-Rise Residential Buildings
TAB	ASHRAE 111	Testing, Adjusting, and Balancing of Building HVAC Systems

Understanding of Standards

AHU standards

EN 13053 (Ventilation for buildings. Air handling units. Ratings and performance for units, components and sections)

Average velocity class of internal casing

Class	Air velocity(m/s)
V1	Under 1.6
V2	1.6 ~ 1.8
V3	1.8 ~ 2.0
V4	2.0 ~ 2.2
V5	2.2 ~ 2.5
V6	2.5 ~ 2.8
V7	2.8 ~ 3.2
V8	3.2 ~ 3.6
V9	Above 3.6

Power consumption class of driving equipment(fan)

$Pm_{rel}=(\Delta P_{stat} / 450)^{0.925} \times (q_v + 0.08)^{0.95}$

Pm_{rel} : Relative value of power consumption [kW]
$\triangle P_{stat}$: Static pressure of fan [Pa]
q_v : Air flow rate [m³/h]

Class	Pm_{max} (kW)
P1	≤ Pm_{rel} x 0.85
P2	≤ Pm_{rel} x 0.90
P3	≤ Pm_{rel} x 0.95
P4	≤ Pm_{rel} x 1.00
P5	≤ Pm_{rel} x 1.06
P6	≤ Pm_{rel} x 1.12
P7	> Pm_{rel} x 1.12

Heat recovery class

In condition of dry air, temperature efficiency is as below.

$\eta_t = (t_2''-t_2') / (t_1'-t_2')$

t_2'' : Supply air temperature [℃],
t_2' : Ambient air temperature [℃],
t_1' : Exhaust air temperature [℃]

Class	$\eta_{a\ 1:1}$ min [%]
H1	≥ 71
H2	≥ 64
H3	≥ 55
H4	≥ 45
H5	≥ 36

Class	η_t	ΔP_{HRS} [Pa]	ε	η_a
H1	0.75	2 × 280	19.5	0.71
H2	0.67	2 × 230	21.2	0.64
H3	0.57	2 × 170	24.2	0.55
H4	0.47	2 × 125	27.3	0.45
H5	0.37	2 × 100	26.9	0.36

Understanding of Standards

Casing standards

EN 1886 (Ventilation for buildings – Air handling units – Mechanical performance)

EN 1886 standard is a part of a series of standards for Air Handling Units used for ventilation and air conditioning of buildings for human occupancy. It considers the mechanical performance of an Air Handling Unit as a whole and will be supported by a standard for sections and components. This standard specifies test methods, test requirements and classification for Air Handling Units which are supplying and / or extracting air, via duct work for ventilating / conditioning a part or the whole of the building. Except for the thermal and acoustic performance of the casing, the test methods and requirements are applicable to both complete units and any separate sections. Filter bypass test is not applicable to the testing of HEPA filters.

Mechanical Strength of Casing

Mechanical strength of the casing shall be categorized into classes in accordance with the table given below:

Mechanical strength	Max. relative deflection (mm/m)
D1	4
D2	10
D3	Not required

Casing Air Leakage

Casing air leakage of the assembled Air Handling Units shall be tested at 400 Pa negative pressure and it shall not exceed the applicable rate given in the table below:

Casing air leakage	Max. leakage rate at 400Pa (ℓ/s . ㎡)	Filter class (EN 779)
L1	0.15	Better than F9
L2	0.44	F8 ~ F9
L3	1.32	G1 ~ F7

The air leakage from the sections subjected to 700 Pa positive pressure shall be in accordance with table given below:

Casing air leakage	Max. leakage rate at 700Pa(ℓ/s . ㎡)	Filter class (EN 779)
L1	0.22	Better than F9
L2	0.63	F8 ~ F9
L3	1.9	G1 ~ F7

Filter Bypass Leakage

Air bypass around filter cells will decrease the effective efficiency of the filter, especially a high efficiency one, because the bypass air is not filtered. The air tightness and area of the casing between the filter and the fan are the factors that can affect the filter bypass leakage rate. Filter bypass leakage rate related to different filter classifications shall be in accordance with table given below:

Filter bypass leakage	Max. filter bypass leakage rate k in % of the volume flow rate
G1-F5	6
F6	4
F7	2
F8	1
F9	0.5

Thermal Transmittance

The thermal transmittance, U shall be determined when the steady state temperature difference is 20K. The classification for thermal transmittance U for the casing of Air Handling Units shall be in accordance with table given below:

Thermal transmittance	U (W/㎡ . K)
T1	$U \leq 0.5$
T2	$0.5 < U \leq 1.0$
T3	$1.0 < U \leq 1.4$
T4	$1.4 < U \leq 2.0$
T5	Not required

Thermal Bridging Factor

The ratio between the lowest temperature difference and the mean air to air temperature difference determines the thermal bridging factor. The classification of thermal bridging factor of Air Handling Units shall be in accordance with table given below:

Thermal bridging factor	k_b
TB1	$0.75 < kb < 1.00$
TB2	$0.60 \leq kb < 0.75$
TB3	$0.45 \leq kb < 0.60$
TB4	$0.30 \leq kb < 0.45$
TB5	Not required

Understanding of Standards

Fan standards

AMCA 99-2408-69-R83 (Operating Limits for Centrifugal Fans)

AMCA Standard 99-2408-69-R83 categorizes centrifugal fans into three performance classes (Class I, II, and III) based on certain minimum operating criteria. A Class I fan offered by any particular manufacturer has a lower allowable minimum operating range than its Class II counterpart. As a result, it is often possible to construct a Class I fan with less mechanical design strength and with less expense than a Class II fan. The same concept applies to a Class II fan versus a Class III fan. Thus, the end result of the AMCA classification system is to allow for a less expensive fan to be constructed for low speed, low pressure applications.
Below figure is a reproduction of one chart from AMCA Standard 99-2408-69-R83. It specifies the operating limits of single width centrifugal fan classes (curves for other types of centrifugal fans are available as well). Note that the limits in this chart apply to fans handling air at 70°F and 29.92 inches Hg barometric pressure. When a high temperature application is required, the fan manufacturer should be consulted as to appropriate fan construction.

Example

Q. Given a performance level of 51/2" SP at 3200 FPM, which fan class is appropriate?
A. This operating point lies well within the boundaries of a Class II fan, and it is appropriate to specify a Class II fan for these conditions.

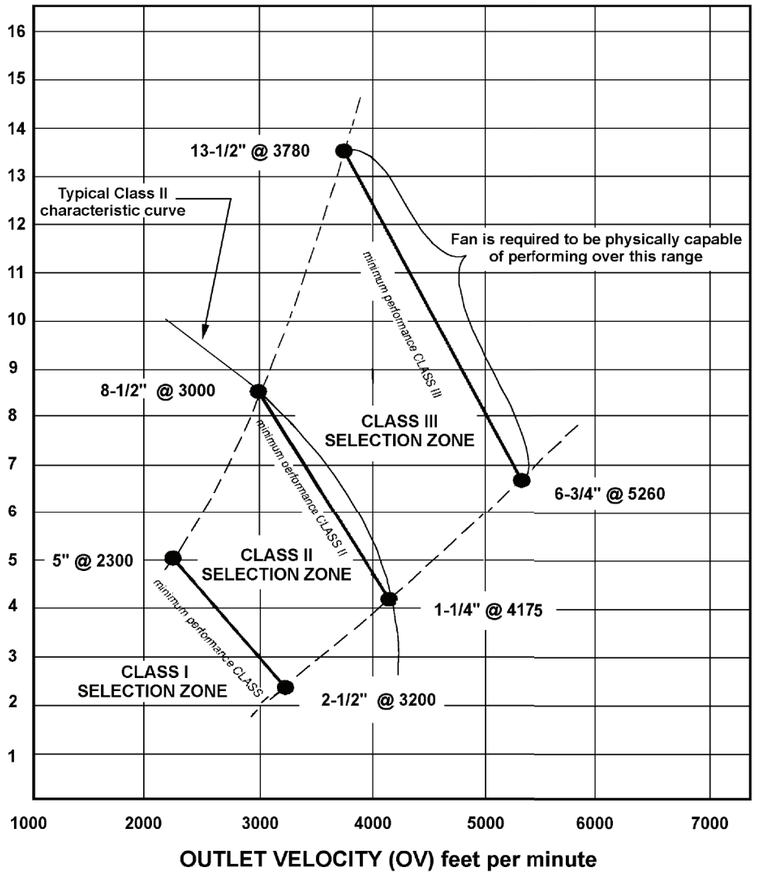


Figure. [Operating limits for single width centrifugal fans - ventilating airfoils & backwardly inclined]

AMCA 205 (Energy Efficiency Classification for Fans)

ANSI/AMCA Standard 205-12 defines the classification for fans. The scope includes fans having an impeller diameter of 125 mm (5 in.) or greater, operating with a shaft power of 750 W (1 HP) and above, and having a total efficiency calculated according to one of the following fan test standards.

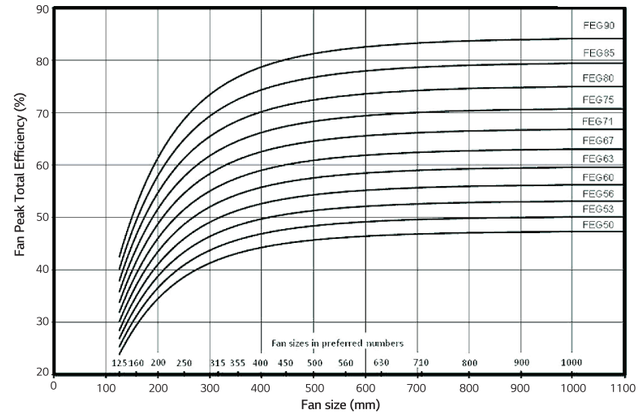


Figure. [Fan Efficiency Grades(FEG) for Fans without Drivers (SI) – AMCA 205]

AMCA 204-05(Balance Quality and Vibration Levels for Fans)

Many fan manufacturers produce a full line of products ranging from small ceiling fans to large industrial centrifugal fans. There are many application standards for different sizes and types of fans. Based upon its particular operation and performance, every fan belongs to a Fan Application Category. (See Fan Application Categories chart.)

Fan Application Categories			
Application	Examples	Driver Power kW(HP) Limits	Fan Application Category, BV
Residential	Ceiling fans, attic fans, window A/C	≤ 0.15(0.2) > 0.15(0.2)	BV-1 BV-2
HVAC & Agricultural	Building ventilation and air conditioning, commercial systems	≤ 3.7(5) > 3.7(5)	BV-2 BV-3
Industrial Process and Power Generation, etc.	Bag house, scrubber, mine, conveying, boilers, combustion air, pollution control, wind tunnels	≤ 298(400) > 298(400)	BV-3 BV-4
Transportation and Marine	Locomotives, trucks, automobiles	≤ 15(20) > 15(20)	BV-3 BV-4
Transit/Tunnel	Subway emergency ventilation, tunnel fans, garage ventilation, tunnel jet fans	≤ 75(100) > 75(100) ANY	BV-3 BV-4 BV-4
Petrochemical Process	Hazardous gases, process fans	≤ 37(50) > 37(50)	BV-3 BV-4
Computer Chip Mfg	Clean room	ANY	BV-5

Responsible fan manufacturers balance the fan impeller assemblies to allowable residual unbalance prior to assembly of the unit. These limits are based on ANSI S2.19 “Balance Quality of Rigid Bodies.” This standard establishes allowable residual unbalance based on the balance quality grade, impeller weight and impeller rotational speed. Refer to ISO 1940 and AMCA Standard 204-05 for further information on balancing standards.

Fan Application Category	Balance Quality Grade for Rigid Rotors/Impeller
BV-1	G 16
BV-2	G 16
BV-3	G 6.3
BV-4	G 2.5
BV-5	G 1.0

Understanding of Standards

Motor standards

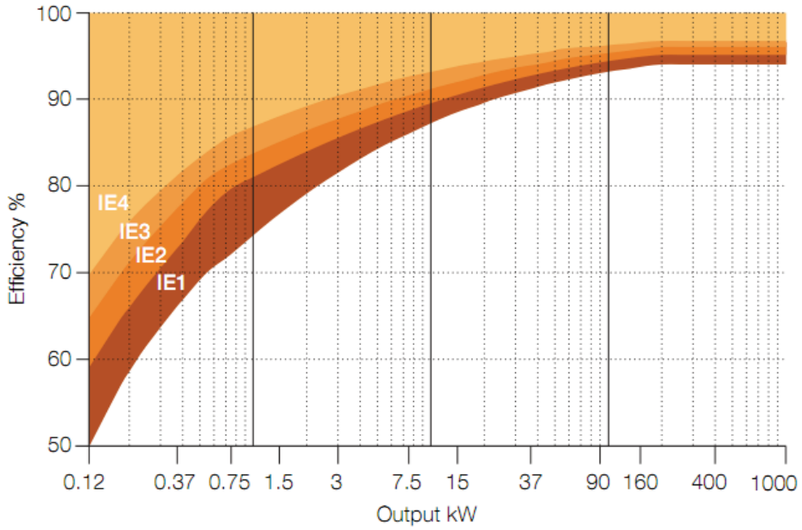
IEC 60034 (Rotating electrical machines - Part 30-1: Efficiency classes of line operated AC motors)

IE(International Efficiency) Class

The standard defines four IE classes for single speed electric motors that are rated according to IEC 60034-1 or IEC 60079-0 (explosive atmospheres) and designed for operation on sinusoidal voltage.

Efficiency Class	Description
IE4	Super-Premium efficiency
IE3	Premium efficiency
IE2	High efficiency
IE1	Standard efficiency

IE efficiency classes for 4 pole motors at 50 Hz



Filter standards

EN 779 (Particulate air filters for general ventilation - Determination of the filtration performance)

Classification EN 779:2002

Filter type	EN 779:2002 classification	Average arrestance (%) (ASHRAE dust)	Average efficiency DEHS (%) at 0.4㎛	Final pressure drop (Pa)
Coarse Filter	G1 G2 G3 G4	50 ≤ Am < 65 65 ≤ Am < 80 80 ≤ Am < 90 90 ≤ Am		250 250 250 250
Fine Filter	F5 F6 F7 F8 F9		40 ≤ Em < 60 60 ≤ Em < 80 80 ≤ Em < 90 90 ≤ Em < 95 95 ≤ Em	450 450 450 450 450

Classification EN 779:2012

Filter type	New EN 779 classification	Average arrestance (%)	Average efficiency (%) at 0.4㎛	Final pressure drop (Pa)	Minimum efficiency at 0.4㎛
Coarse Filter	G1 G2 G3 G4	50 ≤ Am < 65 65 ≤ Am < 80 80 ≤ Am < 90 90 ≤ Am		250 250 250 250	
Medium Filter	M5 M6		40 ≤ Em < 60 60 ≤ Em < 80	450 450	
Fine Filter	F7 F8 F9		80 ≤ Em < 90 90 ≤ Em < 95 95 ≤ Em	450 450 450	35 55 70

In the new, revised version(EN 779:2012) of the standard, this method has also been incorporated in the filter classification. For this purpose, a media sample is immersed in isopropanol, then dried again, and the fractional collection efficiency is determined for particles measuring 0.4 µm. The aim of treating the media sample with isopropanol is to neutralize all electrostatic charges on the fibers. The “Minimum Efficiency” corresponds to the lowest value of all efficiencies measured during the test (efficiencies of the filter element before, during and after dust feed-in and efficiency of the media sample treated with isopropanol). The efficiencies and arrestance values measured are used to assign the air filters tested to a particular filter class in accordance with the table above.

Understanding of Standards

Filter standards

ASHRAE 52.2 (Method of Testing General Ventilation Air-Cleaning Devices for Removal by Particle Size)

The minimum efficiency reporting value (MERV) for an air cleaner shall be based on three composite average PSE(Particle size removal efficiency) points developed from tests at the manufacturer's specified airflow rate.
The minimum final resistance for an air cleaner shall be in accordance with below table, except that the final resistance shall always be the same as or greater than twice the initial resistance.
The minimum efficiency reporting value in the specified size ranges and final resistance for reporting purposes shall be in accordance with below table. Air cleaners with MERV1 to MERV4 shall also be tested in accordance with the arrestance method outlined in ANSI/ASHRAE Standard 52.1–1992 before using this system for reporting.

Minimum Efficiency Reporting Value(MERV) Parameters

Standard 52.2 Minimum Efficiency Reporting Value (MERV)	Composite Average Particle Size Efficiency(%)			Average Arrestance(%) by Standard 52.1 Method	Minimum Final Resistance	
	0.3~1.0㎛	1.0~3.0㎛	3.0~10.0㎛		Pa	In. of water
1	N/A	N/A	E3 < 20	Aavg < 65	75	0.3
2	N/A	N/A	E3 < 20	65 ≤ Aavg < 70	75	0.3
3	N/A	N/A	E3 < 20	70 ≤ Aavg < 75	75	0.3
4	N/A	N/A	E3 < 20	75 ≤ Aavg	75	0.3
5	N/A	N/A	20 ≤ E3 < 35	N/A	150	0.6
6	N/A	N/A	35 ≤ E3 < 50	N/A	150	0.6
7	N/A	N/A	50 ≤ E3 < 70	N/A	150	0.6
8	N/A	N/A	70 ≤ E3	N/A	150	0.6
9	N/A	E2 < 50	85 ≤ E3	N/A	250	1
10	N/A	50 ≤ E2 < 65	85 ≤ E3	N/A	250	1
11	N/A	65 ≤ E2 < 80	85 ≤ E3	N/A	250	1
12	N/A	80 ≤ E2	90 ≤ E3	N/A	250	1
13	E1 < 75	90 ≤ E2	90 ≤ E3	N/A	350	1.4
14	75 ≤ E1 < 85	90 ≤ E2	90 ≤ E3	N/A	350	1.4
15	85 ≤ E1 < 95	90 ≤ E2	90 ≤ E3	N/A	350	1.4
16	95 ≤ E1	95 ≤ E2	95 ≤ E3	N/A	350	1.4

NOTE: The minimum final resistance shall be at least twice the initial resistance, or as specified above, whichever is greater. The minimum final resistance specified is for test purposes to determine minimum efficiency, not as a recommendation for actual use. For example, air cleaners used in residences may be changed or cleaned at a lower final resistance than that required by this standard.

Fire protection standards

BS 476-7 Part 7(Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products)

The class limits for flame spread, detailed in BS 476: Part 7: are set out below

Class	Fire spread at 1.5 min (mm)	Final flame spread (mm)
1	165 (+25)	165 (+25)
2	215 (+25)	455 (+25)
3	265 (+25)	710 (+75)
4	Exceeding Class 3 limits	

A definitive classification is based on a sample of six specimens and the figure in brackets gives the tolerance by which only one specimen in six may exceed the class limit assigned.

LG AHU System

What is LG AHU

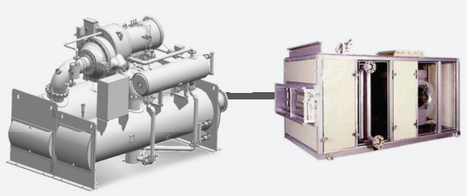
Concept of LG AHU

LG AHU has benefits of both chiller system's AHU and VRF system. Chiller system's AHU offer temperature & humidity modulation, ventilation through outdoor air intake, air cleanliness through various filter application, and proper air flow for occupants comfort. VRF system offers high energy efficiency at partial load using inverter compressor control, energy cost saving, individual control of indoor units, and integrated control of total VRF system.

LG AHU have EEV(electronic expansion valve) Kit for refrigerant control. For AHU control, Communication Kit and Control Kit is applicable. Communication Kit is simple type controller similar to indoor unit PCB. Control Kit can be connected with various sensors and actuators for more detail control(CO_2 damper control, fan inverter control, enthalpy damper control, supplementary electric heater control and so on).

EEV Kit can be connected with Communication Kit.

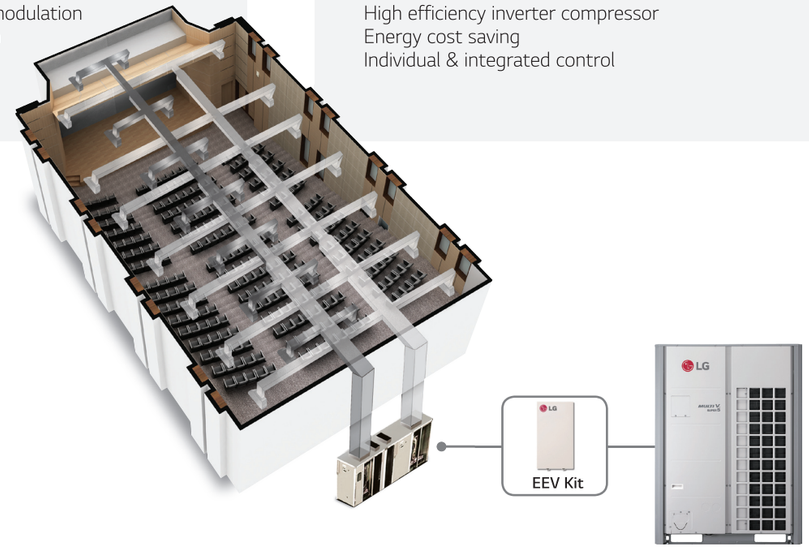
Chiller system



Features
Temperature & humidity modulation
Fresh air intake ventilation
Improving IAQ

VRF system

Features
High efficiency inverter compressor
Energy cost saving
Individual & integrated control



LG AHU

Benefits of LG AHU system

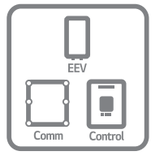
LG AHU system can be integrated with VRF central control system and BMS system, easy GUI based smart control, various system composition with refrigerant controller(EEV Kit) and AHU controller(Communication Kit, Control Kit), world top level high efficiency outdoor unit and return or supply air temperature control.

Integration of LG Central Control and BMS

- LG VRF central control system(AC Smart, ACP, AC Manager) can control indoor units and DX-AHU(VRF stand-alone control).
- ACP BACnet or Lonworks Gateway can be interlocked with BMS using open protocol (BACnet, Lonworks, Modbus).
- AC Manager and BMS can monitor and control simultaneously.

AHU Monitoring & Control with Control Kit

- LG central control system supports various AHU monitoring & control points.
- Monitoring : fan on/off, RA temp, mode(cooling/heating, fan ventilation, dehumidification, CO_2 level auto control), damper angle, sensors(temperature, humidity, CO_2 etc)
- Control : fan on/off, schedule, set RA temp, mode(cooling, fan ventilation, dehumidification, auto control), CO_2 target setting, damper angle

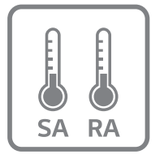


Various & Wide Range Kit Composition

- Refrigerant controller : EEV Kit (3.6 ~ 168kW)
- AHU controller : Communication Kit and Control Kit
- Kit Combination available : EEV Kit + Control Kit or Communication Kit

World Top Class High Efficiency Multi V Outdoor Unit

- High efficiency inverter scroll compressor
- High Pressure Oil Return(HiPOR™) technology minimize energy loss
- Active Refrigerant Control improve energy efficiency through adjusting refrigerant circulation volume



SA or RA Temperature Control

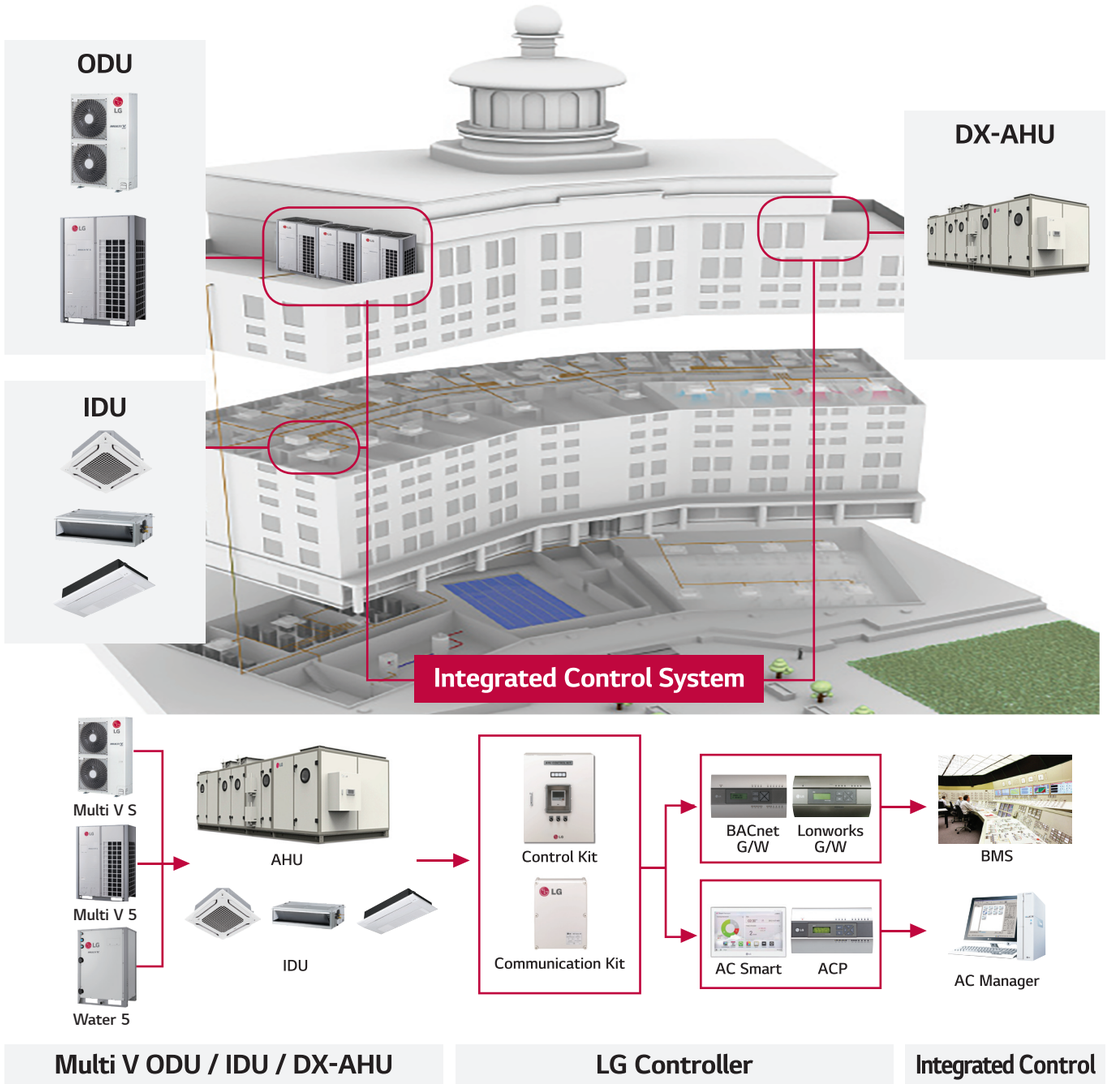
- LG AHU can be controlled by Supply or Return Air temperature on demands.
- In case of SA temperature control, Communication Kit is connected with DDC that control ODU capacity for maintaining target SA temperature.
- In case of RA temperature control, Communication Kit is sensing RA temperature and modulating refrigerant flow rate.

LG AHU System

Benefits of LG AHU system

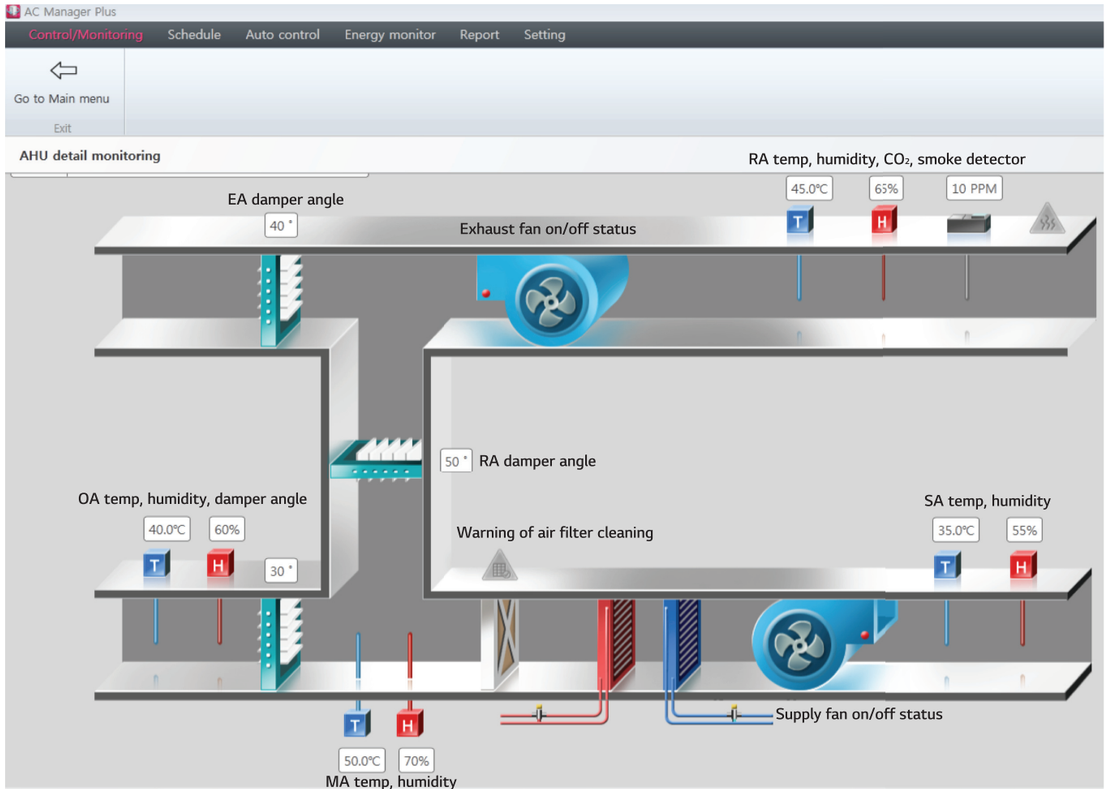
Integration of LG Central Control and BMS

LG VRF central control system(AC Smart, ACP, AC Manager) can control outdoor units, indoor units and DX-AHU etc for LG air conditioning. If user wants to use BMS system for integrated control including HVAC, lighting, fire protection, security, sanitary etc, LG can supply ACP BACnet or Lonworks Gateway for interlocking with BMS. ACP BACnet Gateway support BACnet and Modbus open protocol. ACP Lonworks Gateway support Lonworks open protocol. ACP BACnet or Lonworks Gateway can be connected AC Manager and/or BMS through TCP/IP LAN cable. Especially AC Manager and BMS can monitor and control
simultaneously.



AHU Monitoring & Control with Control Kit

LG Control Kit is embedded with many monitoring and control points seems like DDC functions. LG central control system(AC Smart, ACP, AC Manager) can monitor and control various AHU functions with Control Kit. Fan start & stop, room temperature, mode(cooling/heating, fan ventilation, dehumidification, CO_2 level auto control etc), damper angle can be monitored and controlled with status, setting and values. Various sensor values(temperature, humidity, CO_2 level, differential static pressure etc) can be monitored. Schedule and inverter(need 3rd party inverter driver) control are also available.
Below picture is AHU detail monitoring(GUI) screen from AC Manager. User or operator can understand AHU's status easily.



LG AHU System

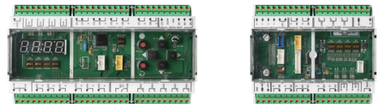
LG AHU Kits

Features & Benefit

A solution to connect LG's high efficiency system to the DX coil of an air handling unit for the maximum energy savings.

COMMUNICATION KIT

PAHCMR000 PAHCMS000



CONTROLLER MODULE

PAHCMM000 PAHCMC000

CONTROL KIT

PAHCNM000

EEV KIT

PRLK048A0 PRLK096A0

PRLK396A0

PRLK594A0

Specifications

Control Application Kit

Type	Model	Dimensions (mm)			Power Supply	IP Rating	Description
		W	H	D			
Communication Kit	PAHCMR000	300	300	155	1Ø, 220 ~ 240 V, 50/60 Hz	IP66	Return / Room air temperature control by DDC or LG individual / centralized controller
	PAHCMS000	380	300	155	1Ø, 220 ~ 240 V, 50/60 Hz	IP66	Discharge air / Supply air temperature control by DDC or LG individual / centralized controller
Controller Module	PAHCMM000	162	90	61	DC 12V	IP20	Main Controller module
	PAHCMC000	108	90	61	DC 12V	IP20	Communication Controller module
Control Kit	PAHCNM000	500	500	210	1Ø, 220 ~ 240 V, 50/60 Hz		Various AHU control functions with multiple DX coils (Maximum connectable ODU is 3 units)

※ ○ : Applied, - : Not Applied

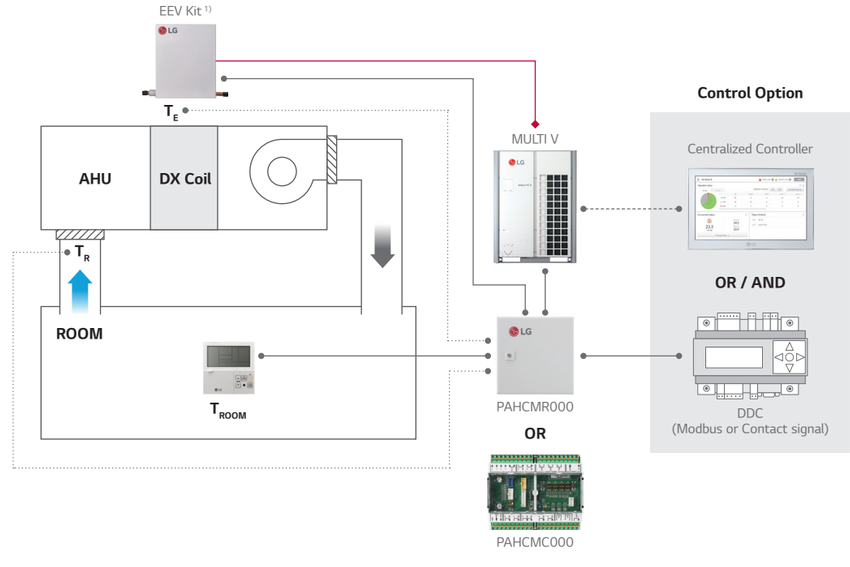
Expansion Application Kit

Type	Model	Dimensions (mm)			Pipe Diameter (mm)	Capacity Index Range
		W	H	D		
EEV Kit	PRLK048A0	217	404	83	12.7	3.6 ~ 28 kW
	PRLK096A0	217	404	83	12.7	28.1 ~ 56 kW
	PRLK396A0	349.5	345.5	180	19.05	56.1 ~ 112 kW
	PRLK594A0	409.5	345.5	180	19.05	112.1 ~ 168 kW

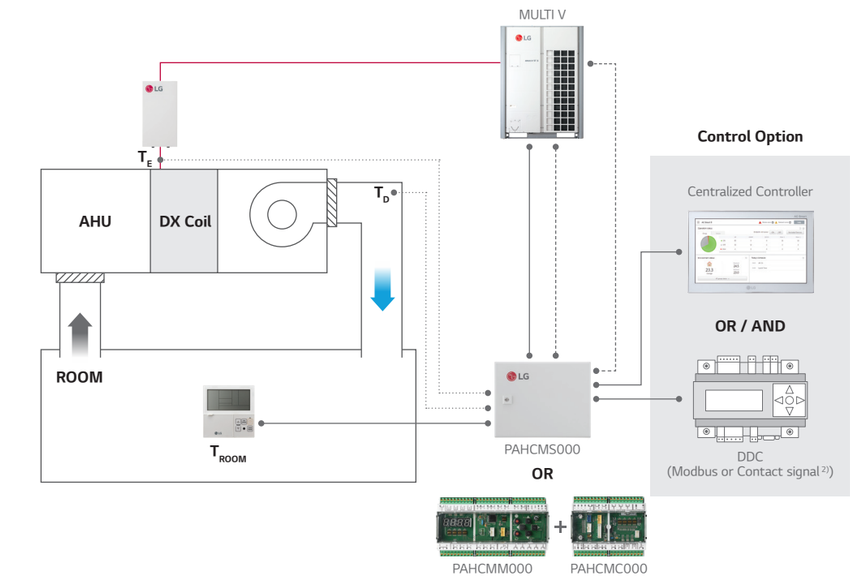
※ ○ : Applied, - : Not Applied

MULTI V Application (Communication Kit & Controller Module)

MULTI V + EEV Kit + IDU + Return / Room Air Temperature Control



MULTI V + EEV Kit + Discharge Air Temperature Control



1) Multiple EEV kits can be applicable with multiple DX Coils and PAHCMR000s.
2) In case of applying DDC with contact signal, discharge air temperature should be measured and controlled by DDC.
Note : For more detail, please refer to the PDB.

LG AHU System

LG AHU Kits

Control Kit

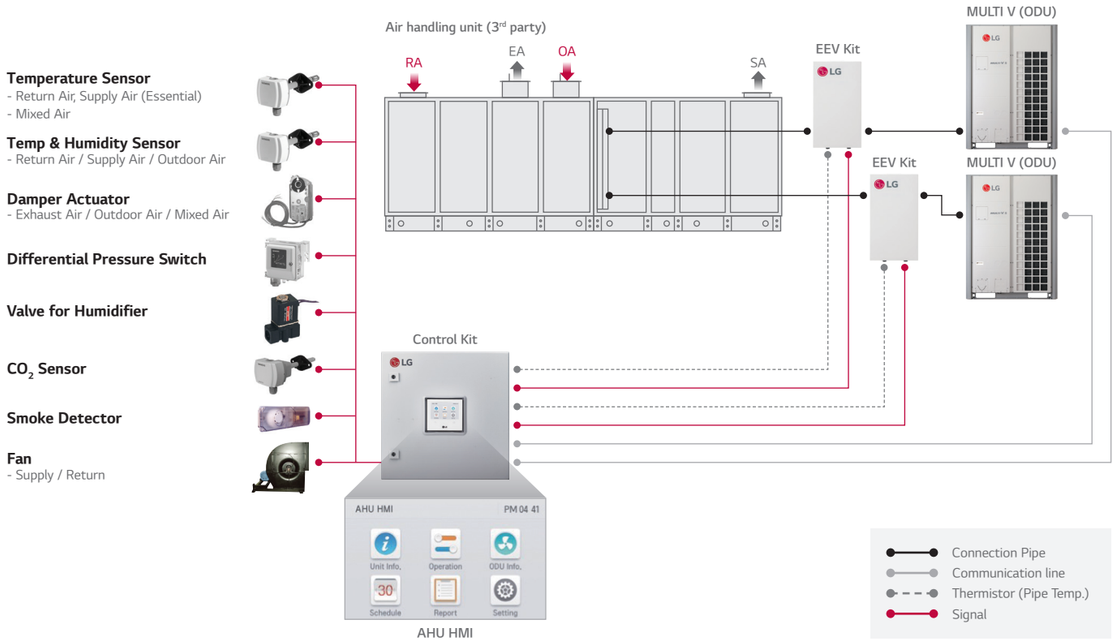
List	Required Item
Heating / Cooling	SA / RA temperature sensor (or SA / RA temperature & humidity sensor)
Automatic Ventilation	SA / RA temperature, CO_2 sensor, Damper actuator (OA, EA, MA)
Energy Saving (Cooling Mode Only)	SA temperature, OA / RA temp&humidity sensor, Damper actuator (OA, EA, MA)
Humidification	SA temperature, RA temperature & humidity sensor, Humidifier
Inverter Fan Control	SA / RA temperature, Static pressure sensor, Inverter driver for fan control
Filter Alarm	Difference pressure sensor
Smoke Detecting	Smoke detection sensor

※ RA : Return Air, EA : Exhaust Air, OA : Outdoor Air, SA : Supply Air, MA : Mix air (RA + OA)

Field Supplied Item

List	Required Specification	Apply Location
Temperature Sensor	- Power : AC 24V, Output signal : DC 0 ~ 10V - Temperature boundary : -50 ~ 50℃	- Apply to MA, SA, RA
Temperature & Humidity Sensor	- Power : AC 24V, Output signal : DC 0 ~ 10V - Temperature boundary : -40 ~ 70℃ - Humidity boundary : 0 ~ 95% RH	- Apply to SA, RA, OA - Can not be applied to MA
Damper Actuator	- Power : AC 24V, In/Output signal : DC 0 ~ 10V - Rotation angle : 90°	- Apply to OA, EA, MA damper
Difference Pressure Sensor (for Filter)	- Power : AC 24V, Output signal : DC 0 ~ 10V - Boundary : 0 ~ 1,000Pa - Switch type : Relay Open / Close	- Apply to filter
Static Pressure Sensor	- Power : AC 24V, Output signal : DC 0 ~ 10V - Boundary : 0 ~ 1,000pa	- Apply to SA (for inverter control)
CO_2 Sensor	- Power : AC 24V, Output signal : DC 0 ~ 10V - Boundary : 0 ~ 2,000ppm	- Apply to RA duct
Smoke Detection Sensor	- Power : AC 24V, From : Contact point type	- Apply to RA duct

Various Control with Control kit – Multiple MULTI V + EEV Kits



AHU HMI

LG AHU System

Summary

LG AHU

AHU Catalogue presents basic information to select our standard range of AHUs.

Range

The standard range consists of many sizes with a wide range of nominal airflows.

Dimensional Data Standard Units

Unit size	Air flow rate (m³/hr)			LG Width X Height		Coil Dimensions	
	V=2.2 m/s	V=2.5 m/s	V=2.8 m/s	Width	Height	Width	Height
2.25	1,940	2,200	2,470	830	830	500	480
2.5	2,200	2,500	2,800	830	930	500	540
3	2,640	3,000	3,360	1,040	830	700	480
3.5	3,080	3,500	3,920	1,040	930	700	540
4.3	3,790	4,300	4,820	1,345	830	1,000	480
5	4,400	5,000	5,600	1,345	930	1,000	540
6	5,280	6,000	6,720	1,345	1,040	1,000	660
7.2	6,340	7,200	8,070	1,345	1,190	1,000	780
8.6	7,570	8,600	9,640	1,345	1,345	1,000	960
11.5S	10,120	11,500	12,880	1,650	1,345	1,300	960
11.5V	10,120	11,500	12,880	1,345	1,650	1,000	1,260
14	12,320	14,000	15,680	1,960	1,345	1,600	960
15	13,200	15,000	16,800	1,650	1,650	1,300	1,260
18.2	16,020	18,200	20,390	1,960	1,650	1,600	1,260
22.5	19,800	22,500	25,200	1,960	1,960	1,600	1,560
25.5	22,440	25,500	28,560	2,780	1,680	2,200	1,260
32	27,280	31,000	34,720	2,780	1,990	2,200	1,560
32.5	28,160	32,000	35,840	2,290	2,290	1,900	1,860
36	32,120	36,500	40,880	2,910	1,990	2,500	1,620
38	32,560	37,000	41,440	2,600	2,290	2,200	1,860
41	36,080	41,000	45,920	3,220	1,990	2,800	1,620
42	36,960	42,000	47,040	2,910	2,290	2,500	1,860
44	38,280	43,500	48,720	2,600	2,600	2,200	2,160
47	41,360	47,000	52,640	3,220	2,290	2,800	1,860
48	42,680	48,500	54,320	2,910	2,600	2,500	2,160
50	43,560	49,500	55,440	2,600	2,910	2,200	2,490
55	47,960	54,500	61,040	3,220	2,600	2,800	2,160
56.5	50,160	57,000	63,840	2,910	2,910	2,500	2,520
63	55,880	63,500	71,120	3,220	2,910	2,800	2,520
70	61,900	70,300	78,800	3,530	2,910	3,100	2,520
77	67,900	77,100	86,400	3,830	2,910	3,400	2,520
84	73,850	83,900	94,000	4,130	2,910	3,700	2,520
91	79,850	90,700	101,750	4,430	2,910	4,000	2,520

All dimensions are only approximate intended as guidance only and can be changed without any prior notice.

Applications

LG AHU is able to meet all system requirements. In fact, it produces air handling units for a wide range of sectors such as:

- CIVIL ENGINEERING
- AIRPORTS
- COMMERCIAL
- LARGE-SCALE RETAIL TRADE
- HOTELS
- MUSEUMS, THEATRES, CINEMAS AND AUDITORIUMS
- TELEVISION AND RECORDING STUDIOS
- LIBRARIES
- DATA PROCESSING CENTRES
- PHARMACEUTICAL
- FOOD
- HOSPITALS
- ELECTRONICS
- CLEAN ROOMS
- CONTROLLED TEMPERATURE AND CONTAMINATION PRODUCTION PROCESSES
- Etc.....

LG AHU System

Casing

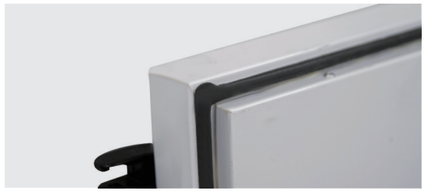
Construction

Frame and Load-Bearing Strucure

Frame is made with high resistance antivirus aluminum alloy extruded section (70 x 70) size; coupling is made of with 3-way joints in glass filled nylon. Profiles are of concealed screw type with double vacuum finning, a solution that guarantees there are no protrusions within the unit and profiles are uniform thus making the structure highly rigid. Basement runs under all sections ; standard basement height is 100 mm, however any other height is available on request

Gasket

The standard gasket type is fixed by pressure, that guarantee continuity even in the corners, are used with the newly designed thermally insulated panels, for both doors and panels.



Profile Types and Profile-Panel Coupling

Standard profile is available in 60 mm thick cold bridge free profile, made separating the metal sheets and placing an extruded plastic layer of more than 40 mm in thickness in between, have rounded internal corners and are also used on sanitized units to make a proper wading of the internal surfaces, is able to achieve an appropriate overall casing U-value with special structural features and innovative heat insulation materials.

Cold bridge free profiles are made of two aluminum elements, one external and the other internal They are joined mechanically; it can be separated thermally by polyurethane as panels if it is requested. This configuration significantly reduces heat loss through the AHU casing and possible condensation on the external face of the section. Typical applications could be, for example, low temperature treatment or when high casing heat insulation values are requested. The 60 mm thick cold bridge free profile, that has recently undergone extensive modification, both as regards the two aluminum elements, and polyamide bar shape and coupling, is able to achieve an appropriate thermal bridge factor.

Panels

Panels are of the sandwich type made in double box folded metal sheet with two types of insulation:
• Hot injected polyurethane with an average density of 40/45kg/m^3 and flame resistance.
• Positioned and glued fiber glass panel, with a density of 90/100kg/m^3 and flame resistance.

Stepped Panels are used when a unit with a smooth internal wall is requested so that internal surface between panels and profiles is uniform.

Standard Panels (cold bridge free panels) are fixed with selfdrilling screws housed in nylon bushes fitted with a plug. Inside and outside of paneling can be made with different types of metal sheet depending on choice:
• Galvanized sheet
• Hot galvanized sheet coated with colored plastic film (plasticized- sheet).
• Aluzinc sheet

Door panel can be opened from both sides and easily removed for easy maintenance.

Coil

Coils

Geometrical Specifications

• Pipe diameter. 3/8" and 5/8"
• Thickness: 0.33 mm (3/8") and 0.41 mm (5/8")

Material

• Pure Copper

Test

All coils are tested after being welded and before being installed in the AHU to guarantee no leakage from any weld joint. This test is carried out with air pressure of 30 bar with the coil immersed under water for 30 minutes.

Fins

• Geometrical Specifications:
• Thickness: 0.12 mm
• Spacing: 2-2.5 mm (5/8") and 2 mm (3/8")

Material

• 99.5% Aluminum with special properties in terms of mechanical resistance, good heat conductivity, low specific weight and duration in critical environmental conditions.
• In addition to standard aluminum fins, hydrophilic painted and gold-plated fins can be ordered upon request.

Features

• Self-spacing collars, with double fold, to guarantee fins at the same distance and reduce the risk of corrosion, because the treated air is not in contact with copper pipes.
• Ribs, impressed on fins, contribute to create turbulence on the treated air improving the heat transfer coefficient; Moreover, they enable the condensate to scroll easily downwards obstructing.

Condensate Collection Tanks

Condensate Collection Tanks are located at the bottom of the air handling units. LG has developed these tanks in an effective way for better condensation and more protection from fungi.

LG Collection Tanks have the following advantages

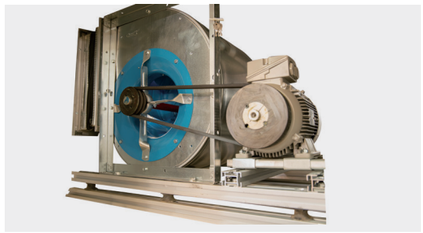
• Better design, in which inclination of the tank is taken into consideration, in such a way to guarantee a full disposal of condensate water, hence, a better protection from fungi and mold is guaranteed.
• Material used:
  - Galvanized Steel (standard)
  - Stainless-Steel AISI 304 (upon request)
• Stainless-Steel AISI 316 (upon request)
• Better exterior isolation (using Armaflex) to prevent water condensation on the exterior surfaces.
• Professional welding techniques using Argon weld that are accurately tested to guarantee no leakage.

LG AHU System

Fan & Motor

FAN Section

Standard units use double inlet rotary fans, Forward blade and backward blade fans manufactured in galvanized steel sheet, with steel shaft and ball bearings.

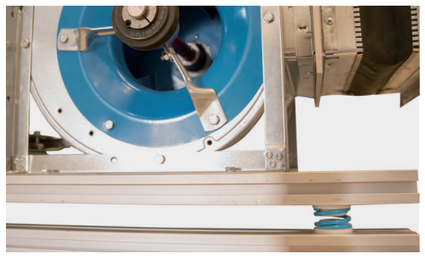


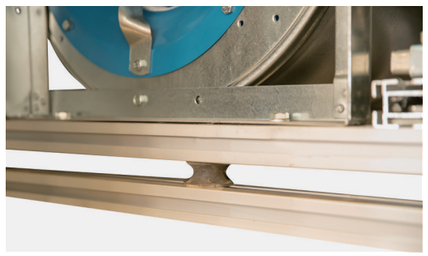
Belt & Motor Pulley

- The fan drive is driven by belts trapezoidal shape
- The motor pulley is made from aluminum or cast iron.
- Fixed and variable pulleys are available.

Vibration isolators

The complete fan motor assembly will be mounted on a base constructed of extruded aluminum profiles and mounted on vibration isolators. Standard vibration isolators are of rubber, with spring type available on request





The Anti- vibration connection

The Anti- vibration connection mounted between the fan outlet and the casing is made of an aluminum profile frame with self-extinguishing cloth. The foregoing characteristic apply also to the return and exhaust air fan sections* The units with twin fans operating in parallel are equipped with non-return dampers to prevent air recirculation in the case of one fan not running.

Alignment Motor Slide for Belt Tension

For tension of belt safety screw of spindle or sliding rail to be loosened and spindle turned clockwise until recommended belt tension is reached.

These fans basically consist of the following parts:

Scrolls

Made of 'Sendzimir' galvanized steel sheet.
Side-back is closed with Pittsburgh system. There are series of standard holes in the sides to enable frame and base supports to be applied.

Suction and delivery sections are the same size, allowing dynamic losses due to variations in speed to be eliminated. Scrolls are made of sheet steel welded with reinforced profiles and divided horizontally for very large fans.

Shafts

All shafts are sized with a high safety coefficient and critical speed well over the maximum permitted operating speed. They are made of turned and milled carbon steel. Shafts have tab housing in correspondence with impeller hub and another at each end. All shafts are coated with protective paint.

Impellers

As mentioned above, impellers are divided into various categories:
High effidency flat profIle backward curved blade impellers in corrosion-resistant steel with welded and EPOX enamel painted blades. Impellers are statically and dynamically balanced with allowed tolerance level of G = 25 in accordance with DIN ISO standards 1940-1(VDI 2060). High efficiency backward curved airfoil blade impellers in corrosion-resistant steel, with welded and EPOX enamel painted blades.

Impellers are statically and dynamically balanced with a tolerance level of G = 2.5 in accordance with DIN ISO standards 1940-1 (VDI 2060). Forward curved blade impellers of the Tab-lock type, in 'Sendzimir galvanized steel, statically and dynamically balanced according to ISO 1940 standards with level G4.

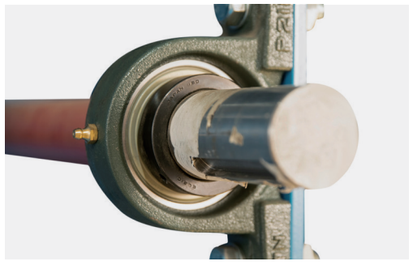
LG AHU System

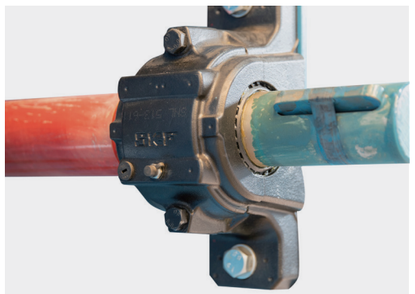
Fan & Motor

Bearings

Bearings are a very important aspect of fan construction. The following types of supports and bearings can be used depending on the operational features and type of fan:

- Self-aligning supports which contain single row ball bearings, with eccentric fixing collar.
- Cast iron supports in two halves with double row aligning ball bearings.
- Cast iron supports in two halves with double row aligning needle roller bearings.
- Water-tight bearings, lubricated for life, housed in a rubber damper ring supported by a steel three- or four-armed spider.
- Bearings for some types of fans require supports fitted onto steel sections welded to the frame. They are equipped with greasers to lubricate bearings periodically.
- Bearings are of a size that guarantees a minimum duration L10 of 20,000 hours or 40,000 at maximum speed.





All fans assembled with their own motor are tested individually in the factory and an appropriate certificate issued. PLUG-FANs are widely used in all sectors; there are significant advantages that can be summarized as follows:

- Completely eliminating transmission and, as a result, relative maintenance due to belt wear resulting in periodic belt replacement and tension adjustment.
- Machines are much cleaner internally than traditional fans; in fact, internal dirt caused by 'black smoke' generated by belt wear is prevented by eliminating transmission.
- Significant reduction in fan maintenance as directly coupled with motor, they do not have any type of bearing thus eliminating maintenance and risk of breakdowns.
- Perfect balancing level guaranteed as all fans/motors are tested (as a unit) in the manufacturer's workshop.
- Eliminating vibration generated by transmission.
- Motor bearings last longer, motor bearing life in the PLUGFAN configuration cannot be compared with that of the transmission driven configuration as bearings are not stressed by belt traction and the resulting variable load.
- Significantly lower rotation speeds are obtained with the same total static pressure and air flow.
- Possibility of a uniform air distribution on the next component, or free choice of the exhaust outlet flow direction (high, low, side), without having to add plenums with further space problems. Upon request, PLUG-FANs can be equipped with an electronic air flow measuring device. This makes it easy to determine fan capacity, and to check and keep it constant once installed.

High efficiency PLUG-FANs can be divided into three categories

- Fans with painted sheet steel impeller with backward curved blaeds.
- Fans with painted sheet steel impeller with backward curved airfoil blades.
- Fans with fiberglass reinforced polyamide impeller with backward curved blades.

A great deal of attention is paid to the impeller balancing grade that is carried out in accordance with DIN ISO 1940 standards with G = 2.5 tolerance. Impellers are fitted with aluminum or steel hubs provided with tab housing and clamping screws. Nozzles for different types of impellers are optimized to achieve high performance and aerodynamically shaped to ensure uniform air distribution on impeller. Spring shock absorbers equipped with an anti-vibration connector on the fan suction vent are applied between the common base and internal fan section base to prevent any vibrations being transmitted to the external structure. Fan performance is guaranteed by appropriate tests and inspections in accordance with DIN24163/BS 848 Part 1/ISO 5801/AMCA 210.

LG AHU System

Fan & Motor

System consists of

• Ring with pressure tubes on the nozzle.
• Static pressure tubes upstream from fan.
• Flexible hose to connect two pressure tubes to the instrument.
• Pressure measuring device.

Static pressure in suction side chamber and average nozzle pressure must be measured to calculate air flow. Care must be taken not to allow static pressure, measured in front of nozzle, to be altered by percentages of dynamic pressure. Signal can also be used for adjustment purposes if differential pressure is measured with a pressure sensor.

PLUG-FANs must be equipped with an inverter to make the most of their features and operational flexibility.
LG equips its air handling units with an inverter that has been especially designed for this specific use, already programmed for various applications, including macro supply and return fan applications. Control panel intelligence provides users direct and understandable instructions at any time. The main advantages
of the inverters used by LG can be summarized as follows:

• Built in EMC filter
• Variable saturation reactors - up to 25% less harmonic distortion.
• Maximum yield at 40°C and beyond.
• Real time clock and calendar.
• Built in timer.
• Series built in B AC net, N2, FNL and Modbus as standard.
• Two PID standard controllers.
• 'Book' installation.
• Traceability fault
• Custom HVAC software.

Technical data and models are shown below

Power supply
Voltage and Three phase, from 380 to 480 V ; +10/-15% (from 0.75 to 355 kW)
Power range Three phase, from 200 to 240 V, +10/-15% (from 0.75 to 75 kW)
Single phase, from 200 to 240 V, +10/-15% (50% derating)
Input self-identification
Frequency from 48 to 63 Hz
Power factor 0.98

Motor connection
Voltage Three phase, from 0 to U nom.
Frequency from 0 to 500 Hz
Rated current (both for IP 21 and IP 54)
With room temperature between -15 and +40°C
Rated output current (I2N), without derating
With room temperature between +40 and +50°C
Derating of 1%/°C above 40°Cz max. derating 10%
Adjustable switching frequency from 0.75 to 110 kW 1 kHz, 4 kHz,
8 kHz,12 kHz from 132 to 355 kW 1 kHz or 4 kHz

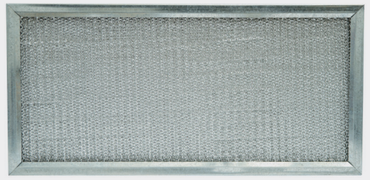
Environmental limits
Environmental temperature and humidity
Transport and storage from -40 to 70°C
Operation from -15 to 50°C (without ice) Altitude
Output current rated current available between 0 and 1000 m, 1% reduction every 100 m between 1000 and 2000 m
Relative humidity less than 95% (without condensate)
Protection classes IP21 or IP 54
IP21 for walls or floor unit
IP54 for wall units
Inputs and outputs
2 analogue inputs that can be set by current or voltage
Voltage signal from 0 (2) to 10 V, Rin > 312 kΩ single impulse
Current signal from 0 (4) to 20 mA, Rin = 100 Ω single impulse
Potentiometer reference values 10 V } 2 % max. 10 mA, R < 10 Ω
2 analogue outputs from 0 (4) to 20 mA, load < 500 Ω
Auxiliary internal voltage 24 V DC }10 %, max. 250 mA
6 digital inputs from 12 V to 24 V DC with internal or external power supply
3 relay outputs Max switching voltage 250 V AC/30 V DC
Max direct current 2 A rms
PTC and PT 100 PTC each of 6 digital or analogue inputs can be reconfigured for PTC PT 100, both digital outputs can be used to power the sensor
Field bus Built in as standard (RS 485), BACnet, Modbus, N2 and FLN Connection options available Lon Works, Profib us, Device Net, etc.

Protection functions
Overvoltage control
Under voltage control
Dispersion to earth supervision
Motor short circuit protection
Inputs and output supervision
Over current protection
Phase loss identification
Load loss supervision, also used to detect belt breakage.
Overload supervision
Stall protection
Product compliance
Low voltage Directive 73/23/EEC and supplements
Machine Directive 98/37/EC
EMC Directive 89/336/EEC and supplements
Quality System ISO 9001
Environmental System ISO 14001
CE, UL, clIL and GOST R markings
Galvanic insulation compliance with PELV
EMC Distribution limited to 1 standard environment
(Conform EN61800-3)

LG AHU System

Filter

Cleanable metallic filters



Applications

Vastly used in Plants for, paint spraying, air conditioning, filtration in electronic and pharmaceutical industries, domestic and industrial ventilation. Also, as Pre-Filters to higher filtration.

Filtering Media

Filter panels are constructed from multiple layers of expanded aluminum foil mesh, the layers being corrugated or plain and arranged alternately at right angles one to the other.

Technical Data

According to ASHRAE Standard 52.2-2017

Unit size	Air flow rate (m^3/hr)		
Thickness	50 mm 2”	25 mm 1”	12.5 mm ½”
Maximum efficiency	78	70	56
Average efficiency	73	67	52
Dust holding g/m^2	1.550	1.500	1.450
Clean panel resistance at 2 m/sec (pa)	50	35	20
mm wg	5	3.5	2

Carbon filter

Features

Used to remove odorous gases and harmful vapors and traces of inorganic compounds, its suitable for wall and in duct mounting in ventilation and air conditioning systems and panels can be changed from either side depending on the installation position.

Frame

Made from Galvanized steel sheet, with activated carbon filter panels arranged in wedge shape.

Sealing

Filter panels slide into u-channels in the casing and sealed by a face plate with quick release fasteners.

Filter media

Panels are manufactured from galvanized steel frames and expanded galvanized metal side screens perforated. The filter is available upon request.

Technical Data

Activated carbon filter type	F401	F400
Air volume(m^3/h)	1,700	3,400
Pressure deferential (pa)	40	115
Casing dimensions (mm)	610 x 610 x 307	610 x 610 x 687
Cell dimensions(mm)	600 x 300 x 25	600 x 680 x 25
Number of cells per unit	10	10
Net weight(kg)	60	112

LG AHU System

Filter

Synthetic fiber

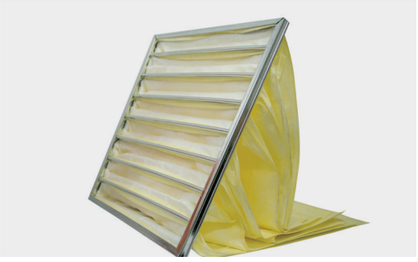
General Features
Used in air handling and filtering systems thanks to their large filtering surface area, excellent mechanical resistance and low pressure losses at high air flow rates.

Filtering Media
Filtering media is in gauged density synthetic fiber with high performance.

Frame
Made with galvanized sheet steel U section with electro welded galvar“zed steel thread mesh protection.

Technical Data
- Synthetic filter ISO coarse 50% gravimetric.
- Clean filter's pressure-drop 45 pa
- Average filter pressure-drop 97 pa
- Dirty filter pressure-drop 150 pa.

Bag filter



General features
Used in air conditioning and ventilation systems, both as final and pre-filters, thanks to their strong structure, large filtering surface area and special welding of filtering panel guaranteeing a perfect seal.

Filtering media
High quality synthetic fiber with variable grade of filtration.

Frame
From galvanized sheet steel with sealing strips and quick release clamps, available in sizes.

Applications
Filtering air in those civilian climate control systems and industrial applications that require a highly efficient system.

Standard
Based on EN 779/ASHRAE Standard 52.2-2017

Classifications

Filter class	Efficiency (%)	Color
G4	30-35	White
F6	60-65	Green
F7	80-85	Pink
F8	90-95	yellow
F9	95-98	Off white color
Net weight(kg)	60	112

Characteristics
- Humidity resistance upto 100% R.H
- Temperature resistant up to max 80°C
- Dirty filter pressure-drop 250 Pa
- Operational reliability in high airflow and high dust loading conditions
- Standard dimensions for all types available in filter catalogue
- Filters also available in special size

LG AHU System

Filter

HEPA Absolute Filters

General Features

Absolute filters are used in conditioning installations, even to replace traditional deep pleated filters, due to their high surface filtering, low pressure loss and excellent dust collecting ability.

Filtering Media

Filter packs are made of high-quality, moisture-resistant glassfiber paper which is folded into closely spaced shallow pleats. Spacers made of thermoplastic hot-melt adhesive provide a uniform spacing of the pleats. Joint sealing compound made of permanently elastic two component polyurethane adhesive.

Applications

Controlled contamination environments for the pharmaceutical, photographic, electronic and food industries, laboratories and hospitals.

Technical data

- Particulate filters are classified according to the values determined for the local filtration efficiency and the overall filtration efficiency as EPA (filter classes E10, E11, E12), HEPA (filter classes H13, H14)
- Clean filter pressure-drop 163 Pa
- Average filter pressure-drop 306 Pa
- Dirty filter pressure-drop 450 Pa

Multi-Dihedral Deodorization Filters

General features

Multi-dihedral deodorization filters can be installed in air handling units and ventilation and conditioning installations to deodorize external air.

AHU counter frame

Filtering elements are fixed inside AHUs without cladding, directly coupling filter counter frame to internal sections that make up AHU frame.

Filtering media

Activated carbon micro-granules trapped in two layers of unwoven fabric. Filter packs obtained from a special pleating process results in a large contact surface area for substances to be captured.

Applications

These types of filters are suitable for climate control systems in offices, banks, clinics, theatres and commercial complexes where absorption of pollutant gases and organic fumes of various types and origins is required.

The filter is available upon request.

LG AHU System

Heat Recovery System

Heat Recovery Units

In compliance with the laws in force and in response to the continuous demand for energy savings, LG air handling units can be fitted with heat recovery units aiming to achieve the high energy efficiency goals set by ASHRAE standards, as well as the LEED green-building certification system.

LG provides several options for energy saving in air handling units such as

- Heat Pipe
- Run Around Coil System
- Static (Fixed Plate) Heat Exchanger
- Rotary Heat Exchanger

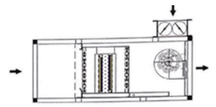
Heat Pipe

LG heat pipes are heat transfer devices that are several hundred times faster than the conventional methods. These devices are used in hot and humid climates for passive dehumidification ranging for different capacities in industrial and commercial HVAC applications.

Technical Features

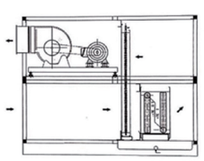
- Free pre-cool and reheat
- High energy saving
- No heat added into conditioned spaces
- Increases latent capacity without additional energy consumption.
- Dehumidifies air entering ductwork, which helps meeting the ASHRAE 62-2019 standard.
- Allows downsizing the entire HVAC systems.
- Allows entire system to work more efficiently ,
- Helps preventing indoor air quality problems associated with high humidity.
- Can be easily added to any already existing AHU.
- No moving parts to break down or wear out.

Horse Shoe type



Horse Shoe type (elevation view)

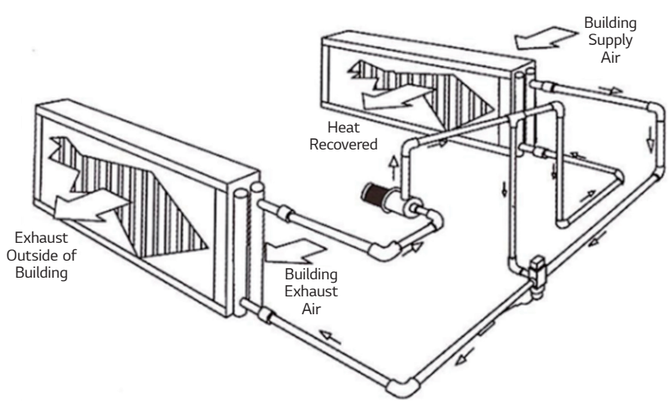
Vertical type



Vertical type (elevation view)

Run Around Coil Systems

LG run-around coil system is a type of energy recovery systems that is often positioned in the supply and exhaust air streams in AH systems or in the exhaust gases of an industrial process.



Operation

Run-around coil system generally refers to any intermediate stream used to transfer heat between two streams that are not directly connected for any reason of safety or practicality. A matched pair of coil heat exchangers are piped together in a continuous loop through which the heat exchange medium water flows; in some cases (if required), water is mixed with antifreeze material. A pump is used in the system to ensure that the water keeps flowing in the pipe at a constant rate.

Technical Features

- High annual utilization ratios of 80% in multiple counter current circuits.
- Reduction of annual heating and cooling energy consumption.
- A three-way valve with controls is placed in the circuit to prevent freezing during winter (if required).
- Prevention of contamination and germs by using heat exchangers with one only mode of air flowing through (fresh or extract air).

Static (Fixed Plate) Heat Exchanger

These are static recovery units without moving parts thus very reliable and safe. Using this equipment in air conditioning systems significantly reduces running costs.

Operation

On entering recovery unit, regenerated air and exhaust air are divided into passages between two plates, bringing, in turn, hot and cold air. These passages are sealed to prevent possible contamination between two airflows.

Technical Features

- Heat recovery can be up to 85% of flue and exhaust gas heat
- Operating temperature can be up to 65°C, with minimum pressure drop.
- The advantage of having total fresh air systems with minimum energy consumption.
- Custom size and thickness are available depending on the customer requirements.

LG AHU System

Heat Recovery System

Material

Thick, self-spaced aluminum sheet metal with variable spacing depending on type of use.
Exchanger unit material is of fundamental importance for corrosion resistance as well as for heat transmission. In environments with an aggressive atmosphere, Aluminum is protected by a coat of non-toxic, corrosion-resistant paint. Golden plates or copper plates can be used as well if needed.

Fields of application

LG proposes use of these recovery units for varied many applications: hospitals, swimming pools, painting cabins, kitchens/air extraction equipment, etc.

Mechanical resistance

Delivery and recovery circuits are at different pressures during recovery unit operation; this is due to system power, fan positioning and system load losses. LG makes a special model with supplementary sealing for greater resistance, guaranteed for pressure drop up to 2,500 Pa, for applications requiring high speeds and/or high pressure drop (for examples hospital structures).

Maintenance and Cleaning

Mechanical maintenance is not necessary for this type of recovery unit Using filtering benches upstream from delivery and discharge flows is necessary if there is dust or pollutants. Equipment can be cleaned with compressed air (for dust deposits), or with spraying a detergent solution (e.g.z Decade, ND-150, Chem Zyme, Primasept, Poly-Det, Oakite 86M or similar) for fatty deposits, avoiding aggressive solutions.

Rotary Heat Exchanger

These rotary air-air heat exchangers made of aluminum, are used to exchange sensible heat and to recover sensible and latent heat as well. These systems guarantee the highest performance, depending on operating conditions, thanks to a large exchange surface area.

Operation

Heat exchange in rotary heat recovery units takes place accumulating heat within the rotor. While the rotor turns slowly ; exhaust air passes through one half of the casing and releases heat to the matrix of the rotor that accumulates it. The replacement air that passes through the other half absorbs the accumulated heat. Parts that absorb and transfer heat continuously invert with rotation and process can continue indefinitely.

Technical Features

- Rotation speed can be constant or adjusted using a speed control so that high efficiency is reached.
- Heat recovery can be up to 27000 kWh per month.
- Operating temperature can be up to 65°C.

Material

Aluminum foil with custom size and thickness for different applications.
Exchange unit rotor is the main part of the machine; aluminum is generally used as its physical characteristics (corrosion resistance, inflammability and long life) are suitable in almost all applications the recovery unit is used for (AL version). Rotor is protected with a nontoxic corrosion-resistant paint for environments with an aggressive atmosphere. Painted rotor is obtained winding aluminum tape already equipped with protection. Moreover, pre-painted aluminum exchange unit can be included in a standard or pre-painted frame. Seal between rotor and frame is guaranteed by an adjustable brush seal installed on rotor and flow separating crossbeam.

Types

Condensation rotors, enthalpy rotors, sorption rotors and epoxy coated rotors.

Hygroscopic Treatment
The main feature of this type of recovery unit is the hygroscopic treatment, i.e., the ability to recover latent heat. In this case, the standard aluminum or prepainted aluminum matrix that makes up rotor can be chemically treated with an alkaline potassium carbonate solution so as to create an oxidized surface able to make the rotor hygroscopic The oxidation makes the surface porous at a microscopic level, thus allowing moisture to be transferred between the two air currents.

Absorption treatment
This is a new type of rotary heat recovery unit that can be classified as a sorption rotor. In this case, the standard aluminum or pre-painted aluminum matrix is covered with a layer of silica gel that guarantees high moisture transfer Moreover, coating contains anti-bacterial and fungicide products that prevent mold and fungi from forming on rotor surface. The result of this treatment is more than double the output of a traditional rotary hygroscopic recovery unit. This not only results in savings in the running costs but also a reduction in installation costs by adapting other components (chillers, batteries, boilers, steam producers, etc.) to the new, reduced heat load. Therefore, the overall installation cost is often less, despite the cost of the heat recovery unit.

Cleaning

A small quantity of replacement air allows continuous cleaning of rotor. Exhaust air dirties the rotor during rotation and could contaminate replacement air after half a turn. Recovery unit is fitted with a cleaning sector on the incoming air side, downstream of the rotor, at the point where the latter passes from discharge to intake, to eliminate this phenomenon. Positioning it in such a way that replacement air pressure is higher than that of exhaust air, a certain amount of replacement air can be transferred into the discharge air channels, enabling the rotor to be cleaned.

LG AHU System

Heat Recovery System

Applications and Comparison of Saving Energy and Heat Recovery Systems

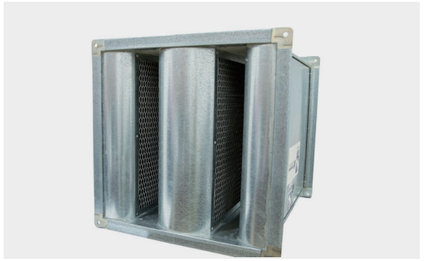
Choosing the optimal heat recovery system depends on which specific benefits are more relevant in the case in hand. Moreover, the ordinances, standards, rules and regulations stipulate minimum values for heat recovery, which also have an impact on system selection.
The following table gives characteristics of each energy saving system in comparison to other systems.

Characteristics	Energy Saving Systems				
	Heat Pipe	Run-Around Coil System	Rotary Heat Exchanger	Cross-Flow Heat Exchanger	Counter-Flow Heat Exchanger
Heat Recovery Coefficient (Wet) up to Approx.	0.65	0.6	0.9	0.7	0.85
Reduced Overall Length		Optional	Optional		
Separate Arrangement		Optional			
Separate Airflows		Optional		Optional [1]	Optional [1]
Adiabatic Extract-Air Humidification		Standard	Standard [2]	Standard	Standard
Transfer of Air Humidity			Optional [3]		
Supply of Heat and Cooling Energy					
Variable Brine Quantity		Optional			
Outdoor-Air Bypass			Standard	Optional	Optional
Variable Speed Control			Optional		

1) Leakage of up to 0.5% of volume flow possible (depending on the pressure conditions between supply and extract airflows).
2) Only reasonable with non-hygroscopic rotors.
3) With non-hygroscopic rotors only in case of condensation.

Accessories

Sound attenuators (Silencers)



Type

DK splitters can be supplied for inclusion in an AHU section or builders work duct.

Construction

- Splitters are manufactured from galvanized sheet metal 1 mm thick to BS 2989 Grade Z2 G275.
- Casings are formed with either stand-up or lock formed seams with a mastic sealant, the construction complies with DW 142 class B.
- The splitters Contain acoustic infill which complies with technical requirements.
- The infill has a glass tissue facing and is contained behind perforated metal, this dual protection prevents damage and fiber erosion up to 30 m/s airway velocity.
- The splitters are radiused at both ends to minimize air pressure loss and regenerated noise.

Ultra-Violet Lamps System

Germicidal Lamps Section

- For specific application requirements.
- Internal walls are provided with reflected surface, manufactured in aluminum, plain or white painted finish.
- The tube shape lamps are installed in the required number.

Water eliminator

Water eliminator is used whenever condensate is generated in order to separate water droplets from the airstream which guarantee the prevention of corrosion as well as the growth of bacteria, hence, higher air quality is provided. Normally, it is made of Aluminum fins and installed downstream the cooling coil. The fins shape and steps depend on the application.

Internal Lighting System

For the filter section, the humidifier section and the fan section.

Also available:

Sight Glass
Grids (Deflectors)
Anti-vibration joints