Presentation of GUCHEN

All-Electric Bus Air Conditionng System

Zhengzhou Guchen Industry Co., Ltd.

- DC Variable Frequency All-electric Bus Air Conditioner
- AC Variable Frequency All-electric Bus Air Conditioner

DC Variable Frequency All-electric Bus Air Conditioner - Models

GUCHEN's DC Variable Frequency All-electric Bus Air Conditioners can application for electric buses with 6~18 meter length, includes **EZDD-03, EZDS-04**, **EZDS-05** and **EZDS-06**.

Wight of 12M Electric Bus: **400KG** Decreased to **245KG**

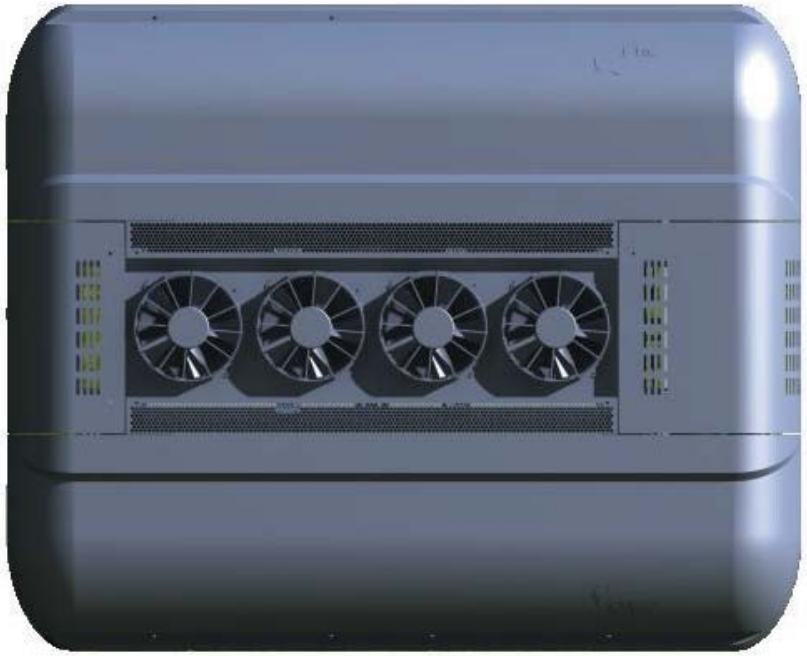
Length of 12M Electric Bus is controlled to: **< 3M**

DC Variable Frequency All-electric Bus Air Conditioner - Models

Model: EZDS-06
Application for: 10~13.7m Electric Bus
Weight: ⩽ 245KG
Rated Consumption: 8.8KW
Rated Evap. Air Vol.: 4,800M³/h
Energy Adjustment Range: 30%~100%
Dimension: **3,000**×1,920×285 mm

Appearance subject to material object

DC Variable Frequency All-electric Bus Air Conditioner - Models



Appearance subject to material object

Model: EZDS-05
Application for: 9~10m Electric Bus
Weight: ≤ 170KG
Rated Consumption: 7.0KW
Rated Evap. Air Vol.: 3,200M³/h
Energy Adjustment Range: 30%~100%
Dimension: 2,360×1,920×285 mm

DC Variable Frequency All-electric Bus Air Conditioner - Models

Model: EZDS-04
Application for: 8~9m Electric Bus
Weight: ≤ 150KG
Rated Consumption: 6.0KW
Rated Evap. Air Vol.: 3,200M³/h
Energy Adjustment Range: 30%~100%
Dimension: 1,960×1,920×285 mm

Appearance subject to material object

DC Variable Frequency All-electric Bus Air Conditioner - Models

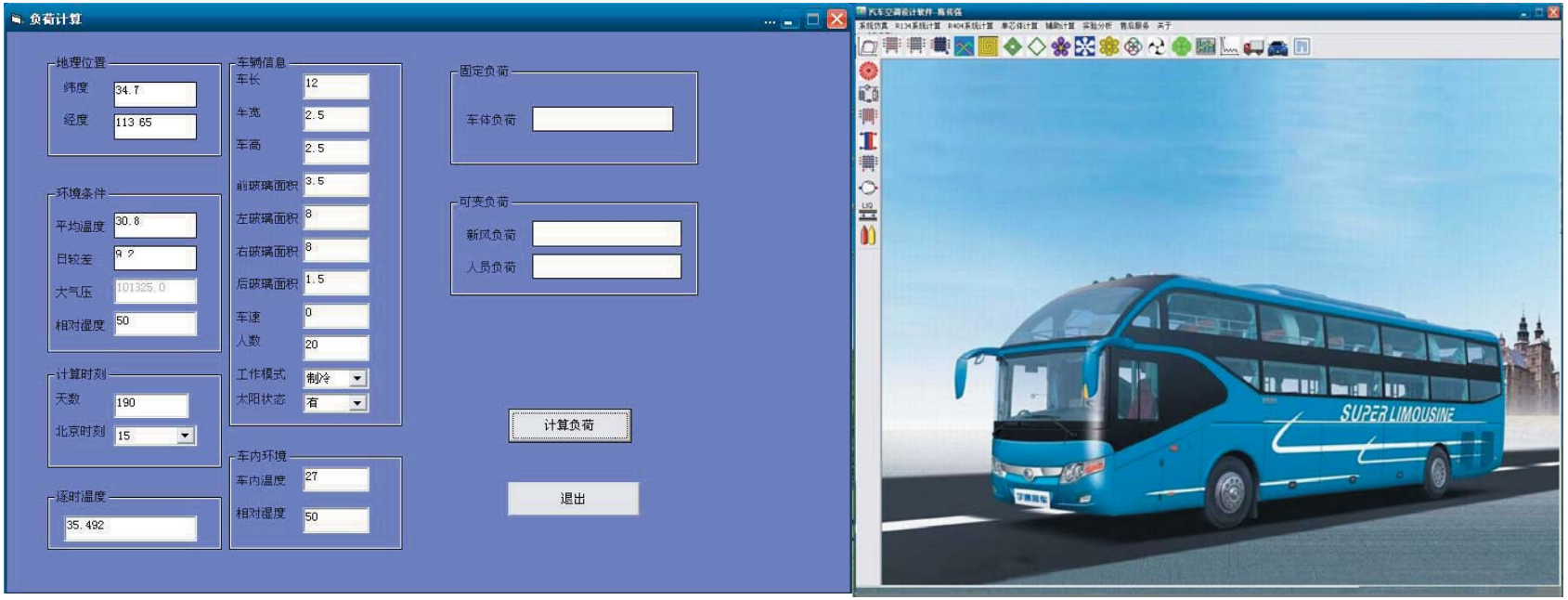
Appearance subject to material object

Model: EZDS-03
Application for: 6~7m Electric Bus
Weight: ≤ 115KG
Rated Consumption: 4.0KW
Rated Evap. Air Vol.: 3,000M³/h
Energy Adjustment Range: 30%~100%
Dimension: 2,399×1,620×245 mm

GUCHEN
Feel Your Drive

DC Variable Frequency All-electric Bus A/C, What GUCHEN did for it?

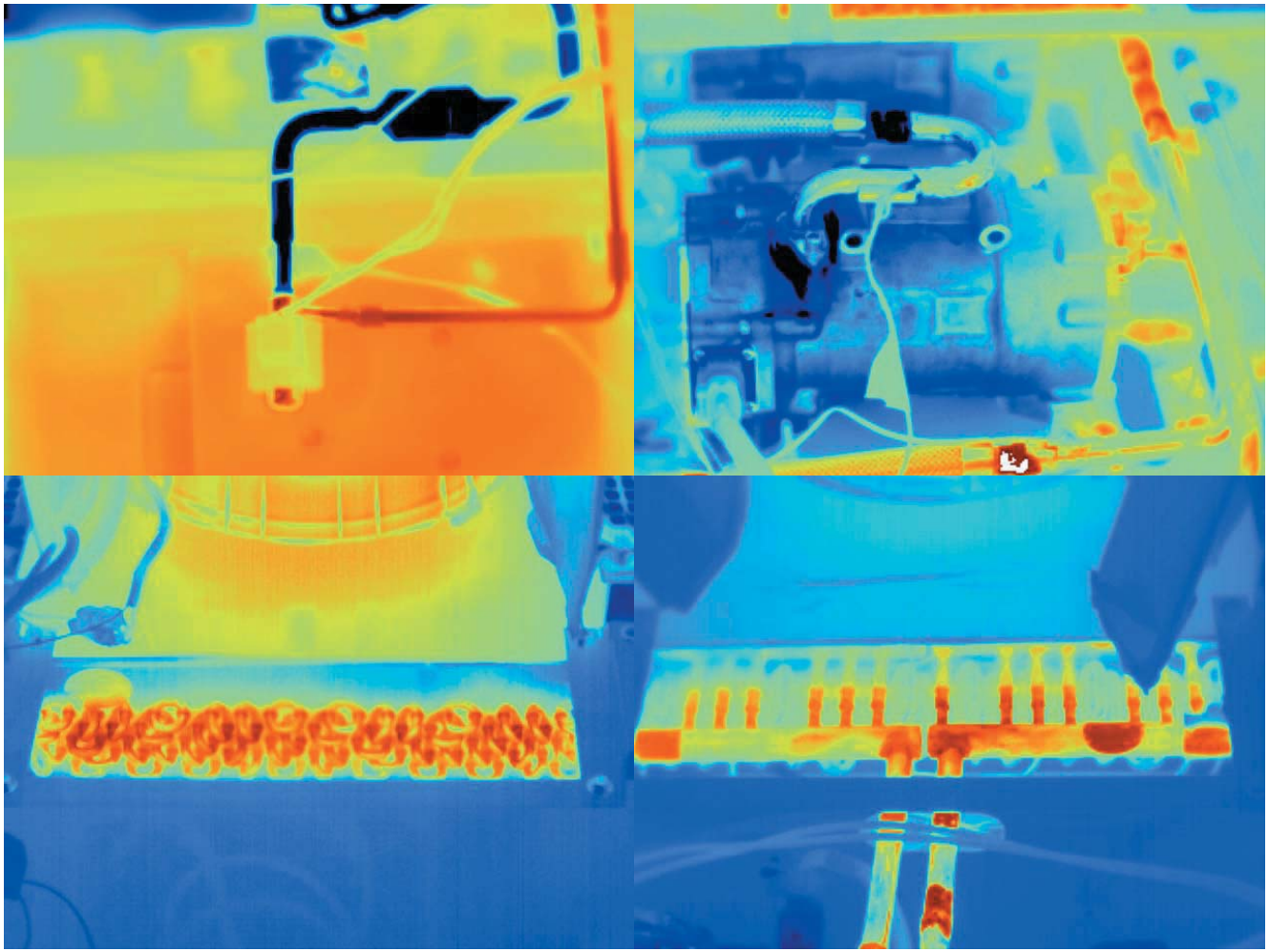
DC Variable Frequency All-electric Bus Air Conditioner - Energy Saving, Comfort



Load calculation and system simulation in software

DC Variable Frequency All-electric Bus Air Conditioner - Energy Saving, Comfort

GUCHEN
Feel Your Drive



Testing the temperature field distribution of each components in order to precision matching

DC Variable Frequency All-electric Bus Air Conditioner - Energy Saving, Comfort

GUCHEN
Feel Your Drive

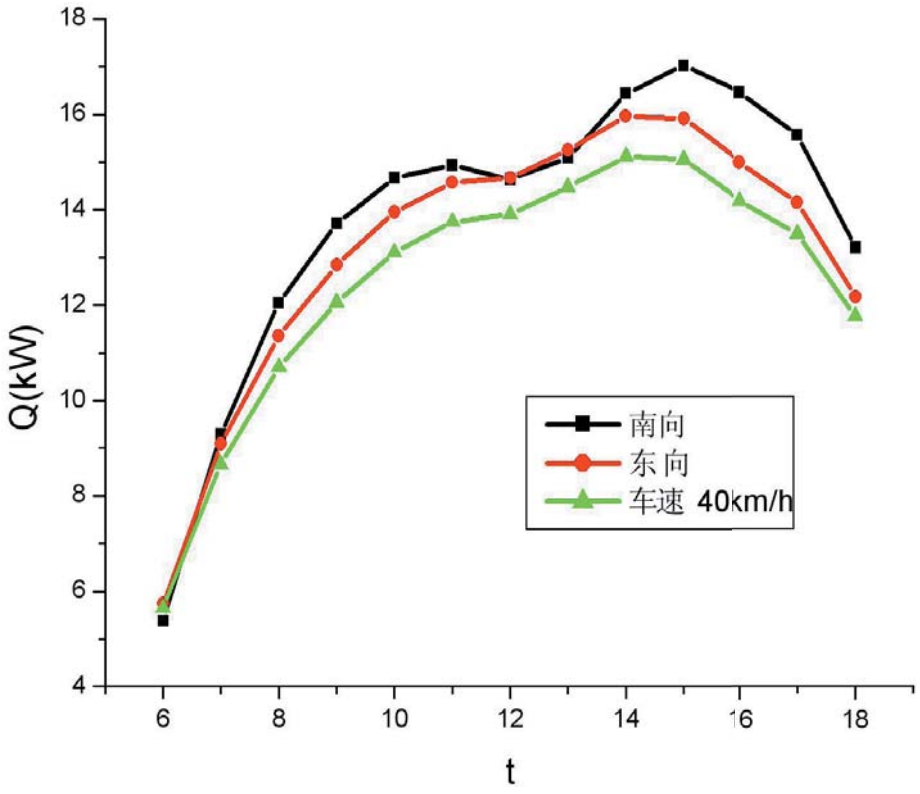
Precise control the flow of refrigerant, test in all kinds of environment conditions to get the best flow data, the data were fitted to determine the best control mode to ensure a precise control.

DC Variable Frequency All-electric Bus Air Conditioner - Energy Saving, Comfort

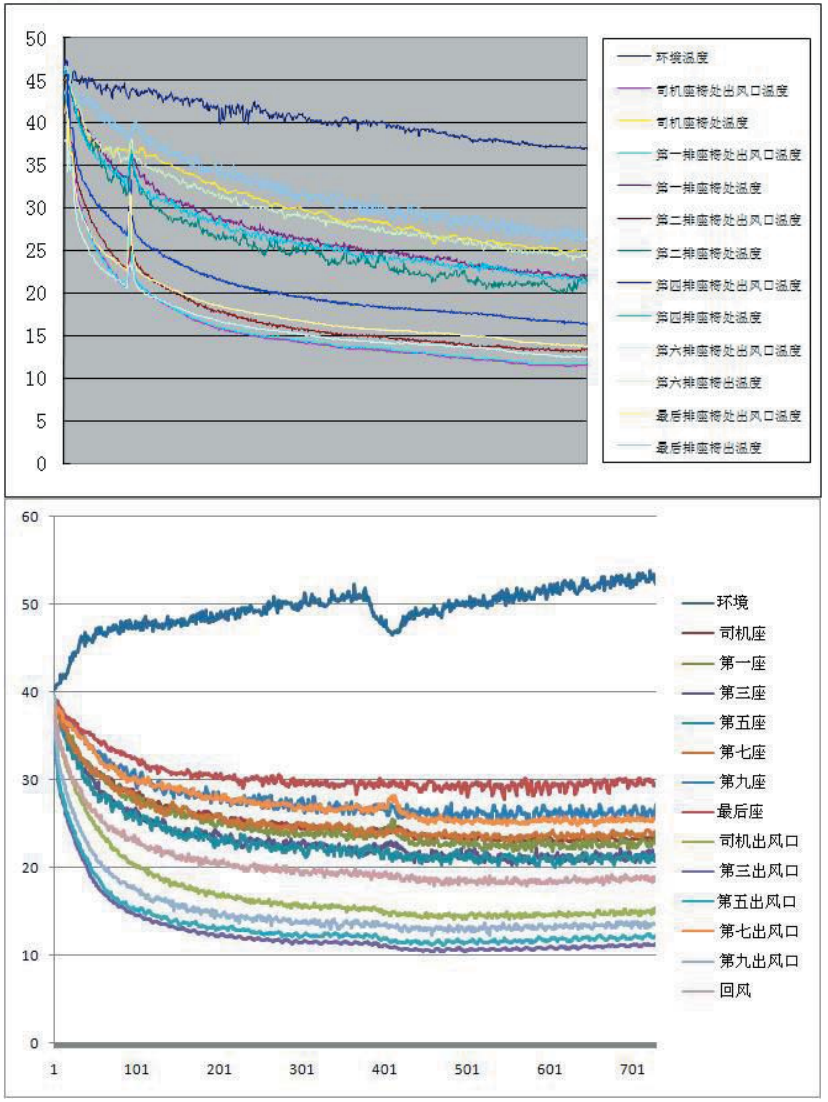
GUCHEN
Feel Your Drive

GUCHEN A/C TESTING CENTER

DC Variable Frequency All-electric Bus Air Conditioner - Energy Saving, Comfort



Vehicle load calculation simulation



Vehicle Cooling Test

DC Variable Frequency All-electric Bus Air Conditioner - Energy Saving, Comfort

GUCHEN Feel Your Drive

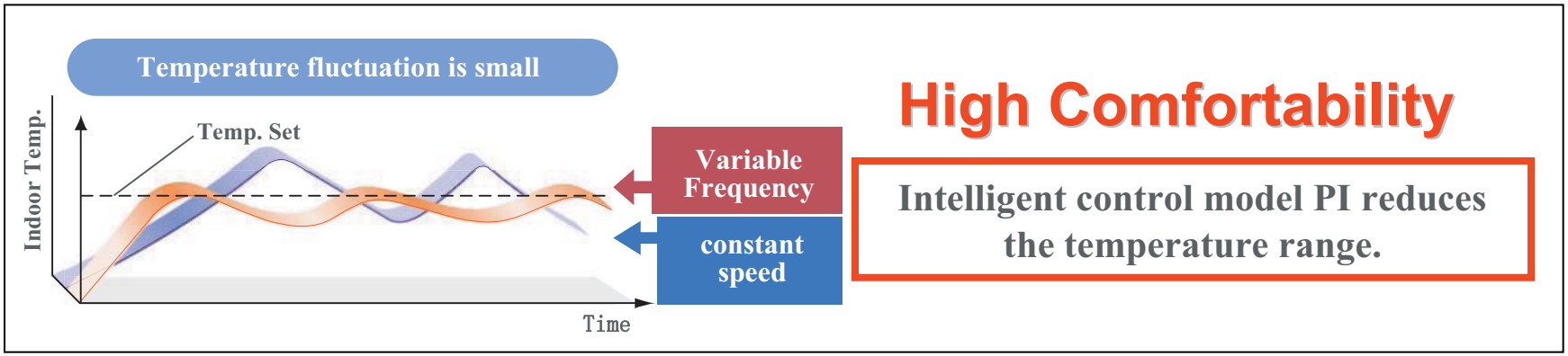
时间t	比例:	积分	(车内和设置差值)E_K	E_{K-1}	$\triangle Q_K$:	Q_K	制冷量	需求制冷量	差值KW
1	30	0.06	10	0	318	318	15.37	8.52	6.85
2	30	0.06	8	10	-45.6	272.4	15.37	9.419	5.951
3	30	0.06	6.262482	8	-40.85308029	231.5469197	15.37	10.83	4.54
4	30	0.06	4.936934	6.262482	-30.87994161	200.6669781	15.37	11.04	4.33
5	30	0.06	3.672701	4.936934	-31.31614599	169.3508321	15.87	11.37	4.5
6	30	0.06	2.358832	3.672701	-35.17016058	134.1806715	21.29447	11.892	9.402473
7	30	0.06	-0.38642	2.358832	-83.05297162	51.12769991	7.858327	12.342	-4.48367
8	30	0.06	0.922686	-0.38642	40.93387901	92.06157892	14.14986	12.387	1.762865
9	30	0.06	0.407981	0.922686	-14.70678451	77.35479442	11.88943	12.432	-0.54257
10	30	0.06	0.566395	0.407981	5.771932555	83.12672697	12.77658	12.445	0.331578
11	30	0.06	0.469584	0.566395	-2.059080962	81.06764601	12.4601	12.477	-0.0169
12	30	0.06	0.474519	0.469584	1.002188343	82.06983435	12.61413	12.513	0.101134
13	30	0.06	0.444991	0.474519	-0.084857153	81.9849772	12.60109	12.567	0.034091
14	30	0.06	0.435038	0.444991	0.484460377	82.46943758	12.67555	12.567	0.108553
15	30	0.06	0.403343	0.435038	-0.224807185	82.24463039	12.641	12.567	0.074
16	30	0.06	0.381738	0.403343	0.038955292	82.28358569	12.64699	12.567	0.079987
17	30	0.06	0.358384	0.381738	-0.055526363	82.22805932	12.63845	12.567	0.071453
18	30	0.06	0.337522	0.358384	-0.01832427	82.20973505	12.63564	12.567	0.068636
19	30	0.06	0.317482	0.337522	-0.02972634	82.18000871	12.63107	12.701	-0.06993
20	30	0.06	0.3379	0.317482	1.220769118	83.40077783	12.8187	12.701	0.1177

Paremeter tuning calculation in control model

DC Variable Frequency All-electric Bus Air Conditioner - Energy Saving, Comfort

Guchen has developed intelligent inverter control model PI with independent intellectual property through extensive bench testing, theoretical calculations and actual vehicle validation, which has become the core competitiveness of Guchen.

The techs in Guchen's Pure electric bus air conditioners are far more better than domestic rivals in this field, for its all DC products can save more than 15% energy which has been verified in vehicle test.

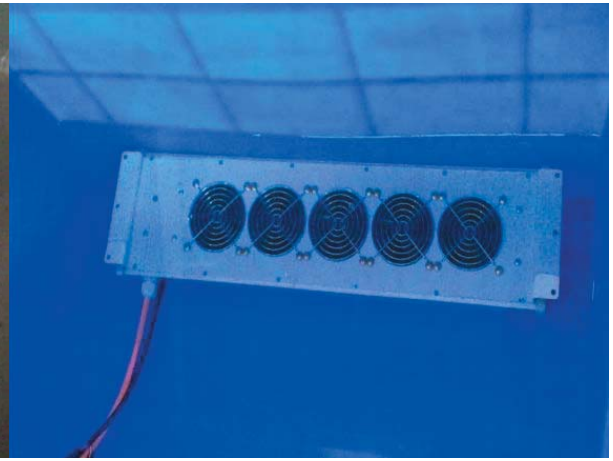


DC Variable Frequency All-electric Bus Air Conditioner - Energy Saving, Comfort

Intelligent pure electric heating system is R&D based on the rooftop heating pump technology, has developed a electric heater located in driver seat and wall-mounted electric heater. Temperature can be adjusted according to the climate in different regions, so as to improve heating performance in cold areas and comfort compartments.

Wall-mounted electric heater

Destructive testing



Water immersion test of electric heater

DC Variable Frequency All-electric Bus Air Conditioner - Energy Saving, Comfort

证书号第3502583号

实用新型专利证书

实用新型名称：一种冷暖舒适电动客车空调

发　明　人：时红臣；李奎；张红伟；闫斌

专　利　号：ZL 2013 2 0610429.3

专利申请日：2013年09月30日

专 利 权 人：郑州科林车用空调有限公司

授权公告日：2014年04月09日

本实用新型经过本局依照中华人民共和国专利法进行初步审查，决定授予专利权，颁发本证书并在专利登记簿上予以登记。专利权自授权公告之日起生效。

本专利的专利权期限为十年，自申请日起算。专利权人应当依照专利法及其实施细则规定缴纳年费。本专利的年费应当在每年09月30日前缴纳。未按照规定缴纳年费的，专利权自应当缴纳年费期满之日起终止。

专利证书记载专利权登记时的法律状况。专利权的转移、质押、无效、终止、恢复和专利权人的姓名或名称、国籍、地址变更等事项记载在专利登记簿上。

局长
申长雨

2014年04月09日

第1页(共1页)

证书号第3501319号

实用新型专利证书

实用新型名称：一种冷暖舒适电动客车空调控制系统

发　明　人：李奎；李新；郭洪斌；时红臣

专　利　号：ZL 2013 2 0610800.6

专利申请日：2013年09月30日

专 利 权 人：郑州科林车用空调有限公司

授权公告日：2014年04月09日

本实用新型经过本局依照中华人民共和国专利法进行初步审查，决定授予专利权，颁发本证书并在专利登记簿上予以登记。专利权自授权公告之日起生效。

本专利的专利权期限为十年，自申请日起算。专利权人应当依照专利法及其实施细则规定缴纳年费。本专利的年费应当在每年09月30日前缴纳。未按照规定缴纳年费的，专利权自应当缴纳年费期满之日起终止。

专利证书记载专利权登记时的法律状况。专利权的转移、质押、无效、终止、恢复和专利权人的姓名或名称、国籍、地址变更等事项记载在专利登记簿上。

局长
申长雨

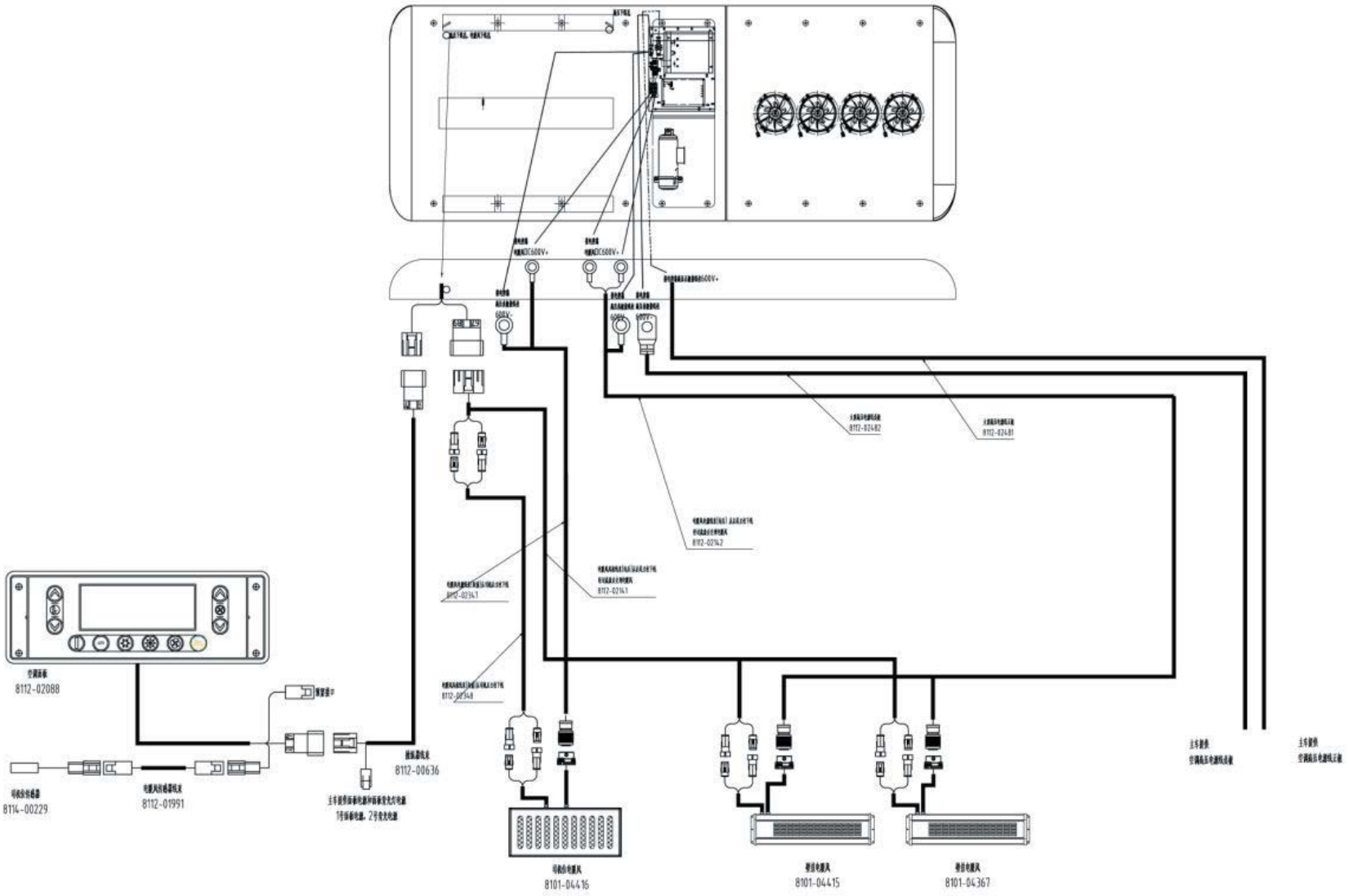
2014年04月09日

第1页(共1页)

Patent of Heat pump heating system in intelligent pure electric roof-top bus air conditioner system.

DC Variable Frequency All-electric Bus Air Conditioner - Energy Saving, Comfort

GUCHEN
Feel Your Drive



DC Variable Frequency All-electric Bus Air Conditioner - Lightweight

Wight of 12M Electric Bus: **400KG** → Decreased to **245KG**

Length of 12M Electric Bus is controlled to: **< 3M**

Wight of 9M Electric Bus: **300KG** → Decreased to **170KG**

Wight of 8M Electric Bus: **260KG** → Decreased to **150KG**

Wight of 7M Electric Bus: **200KG** → Decreased to **115KG**

DC Variable Frequency All-electric Bus Air Conditioner - Lightweight

Weight of compressor assy. reduced from 59kg (compressory body 44kg + converter 15kg) to 7.5kg and components have reached automobile grade.

New compressor can be Dustproof, waterproof, shockproof, and protection performance has met the IP67 standard.

DC Variable Frequency All-electric Bus Air Conditioner - Lightweight

Company has contacted an alliance with Hitachi Compressor and signed a strategic cooperation agreement. R&D focus on new energy electric vehicle air-conditioner compressor. Three advanced core technologies, such as scroll fluid compressor, permanent magnet synchronous motors, and 360 ° inverter control, have reached the international advanced level in reliability, energy conservation and environmental protection.

DC Variable Frequency All-electric Bus Air Conditioner - Lightweight

GUCHEN
Feel Your Drive

DC Variable Frequency All-electric Bus Air Conditioner - Lightweight

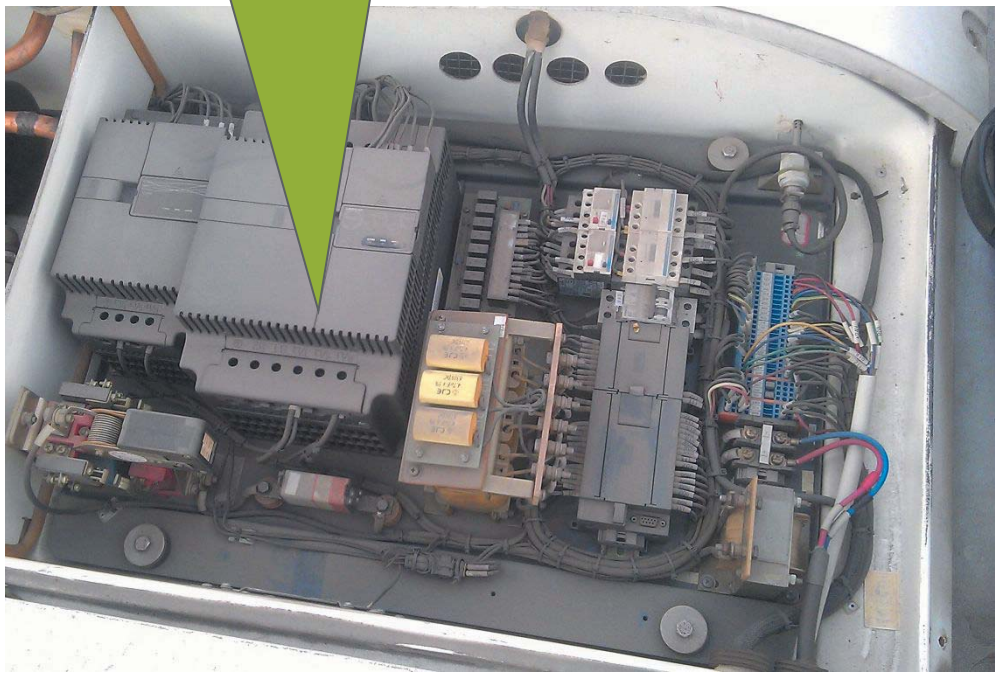
Frequency Changer 7.5kg + Condenser Fan 25kg + Evaporator Blower 25kg

DC Brushless Evaporator Blower 3kg + DC Brushless Condenser Fan 3kg

The DC brushless Blower or Fan with external rotor contains the characteristics of high efficiency, large air volume, long service life, low noise, stable performance and stepless speed regulation, which have reached the automotive-grade. The external rotor brushless DC motor is more stable and reliable than regular fans when working around the clock, neither AC interference, nor endanger personal safety.

DC Variable Frequency All-electric Bus Air Conditioner - Reliability

The external drive inverter is not dustproof and waterproof. It can hardly reach the automotive-grade by air-cooling. Meanwhile the inner control box will be dusty after a period of working.



Combined the drive model with compressor together as a whole part, the protection class has reached IP67 standard. The characteristics of dustproofing, waterproofing and anti-vibration make it reach the automotive-grade.

DC Variable Frequency All-electric Bus Air Conditioner - Reliability

GUCHEN Feel Your Drive

1. All components mets the automotive-grade standard. Power module and compressor have reached the IP67 standard.

2. Various protection functions: high-voltage alarm and cut-off function, low-voltage alarm and cut-off function, high-current protection, compressor over-heat discharge protection, high and low voltage protection of air conditioner systems, and temperature controlling, etc.

3. Passed a rigorous bench testing: rated capacity test (cold / hot), high-temperature cooling / heating, defrosting, intelligent temperature adjustment, inverter compressor oil and refrigerant volume confirmation test, vibration test, over-high temperature refrigeration start test, long operation room.

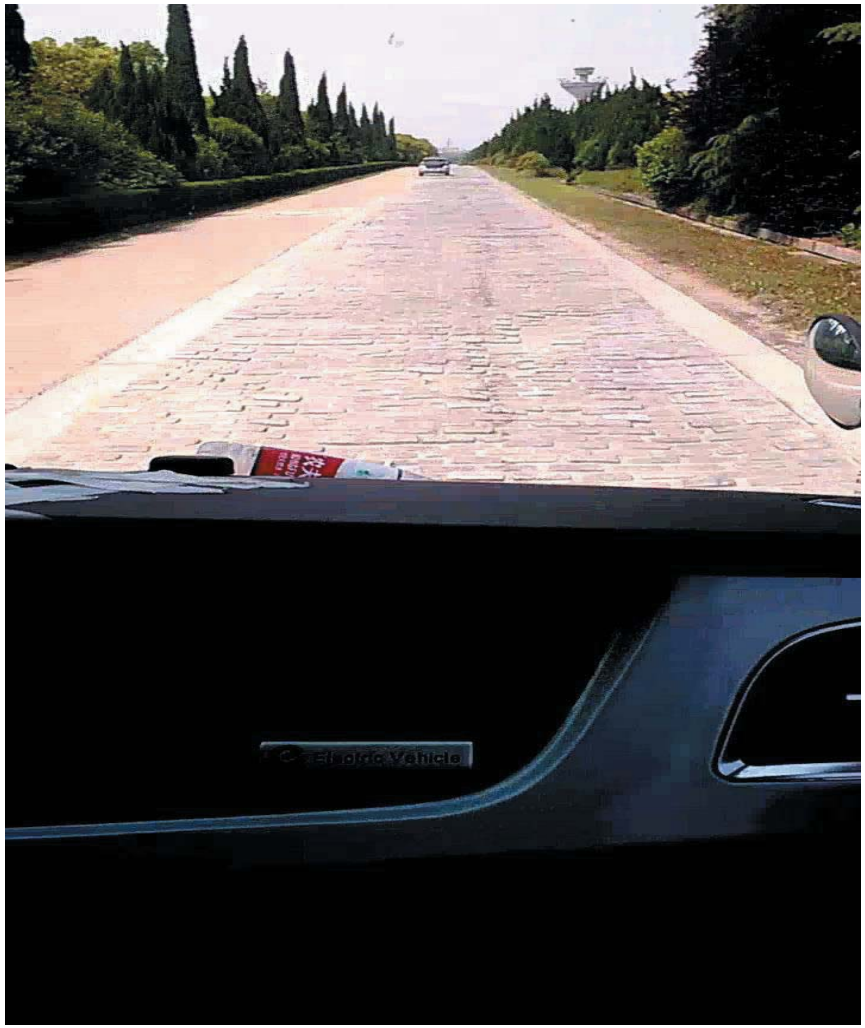
4. Vehicle test verification: the cooling, heating and other testing operating on different road conditions, like general highway, elevated road have reached 60,000km in total.

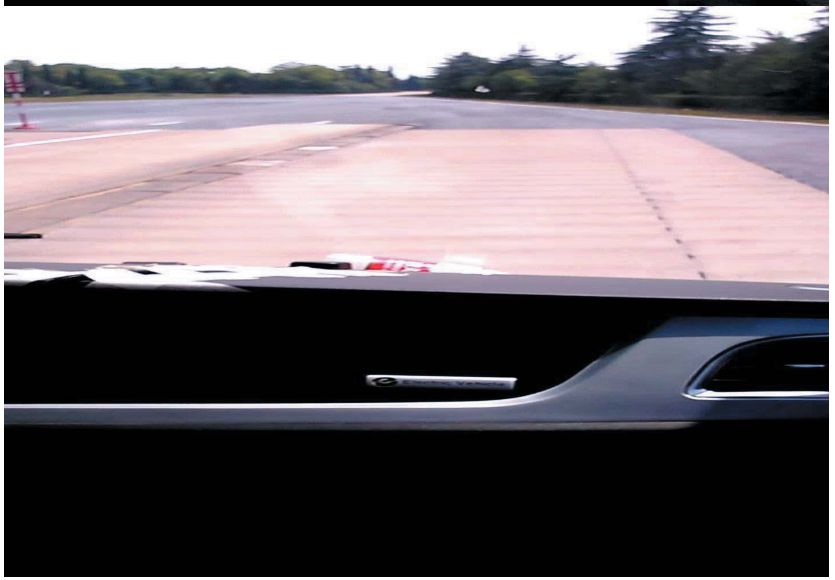
5. Both compressors and power module are waterproof, dustproof, shockproof, which have fully met the automotive grade. Fan with safe voltage level is more secure, and the protection level is more higher.

6. Air conditioner weight directly reduces by more than 40%, which lower the center of gravity of vehicle and improve vehicle safety. Light-weight air conditioner also benefits to reduce vehicle weight indirectly, which enhances the passenger capacity and mileage.

DC Variable Frequency All-electric Bus Air Conditioner - Reliability

GUCHEN
Feel Your Drive





Vehicle test verification

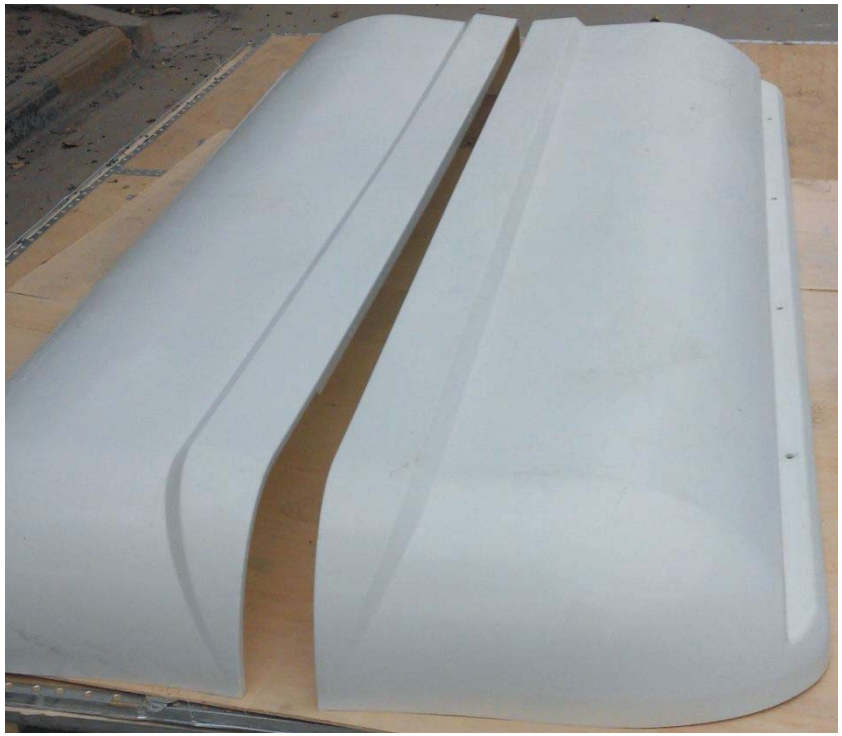
DC Variable Frequency All-electric Bus Air Conditioner - Environmental Protection

- Housing and cover are made of SMC and LFT material, meanwhile made by mould pressing technology, ensure that the emissions of harmful substances are below the national standard. It is unique in the industry.

- All components are passed the rigorous environmental testing.

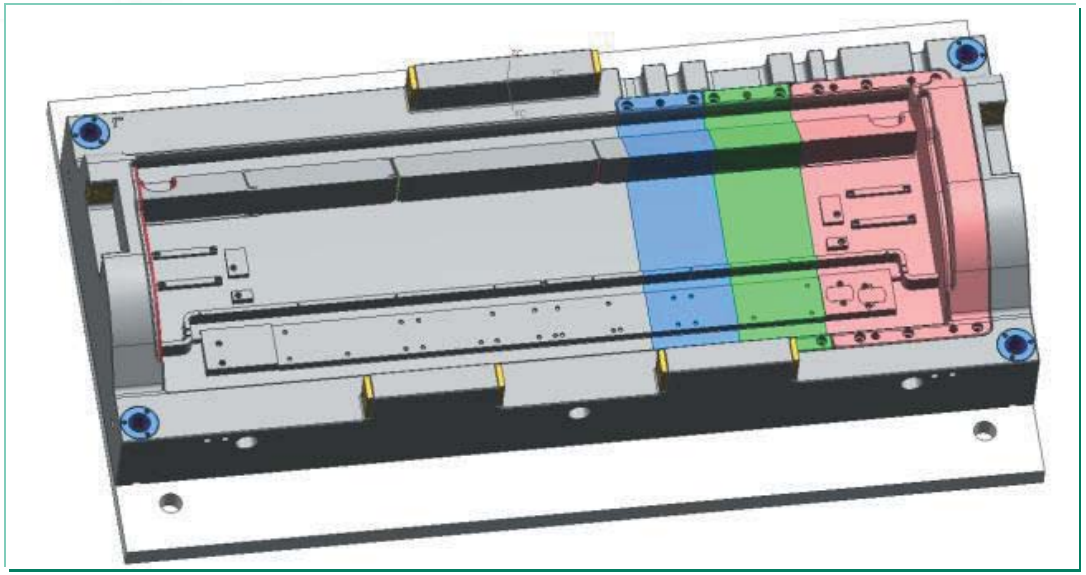
DC Variable Frequency All-electric Bus Air Conditioner - Environmental Protection

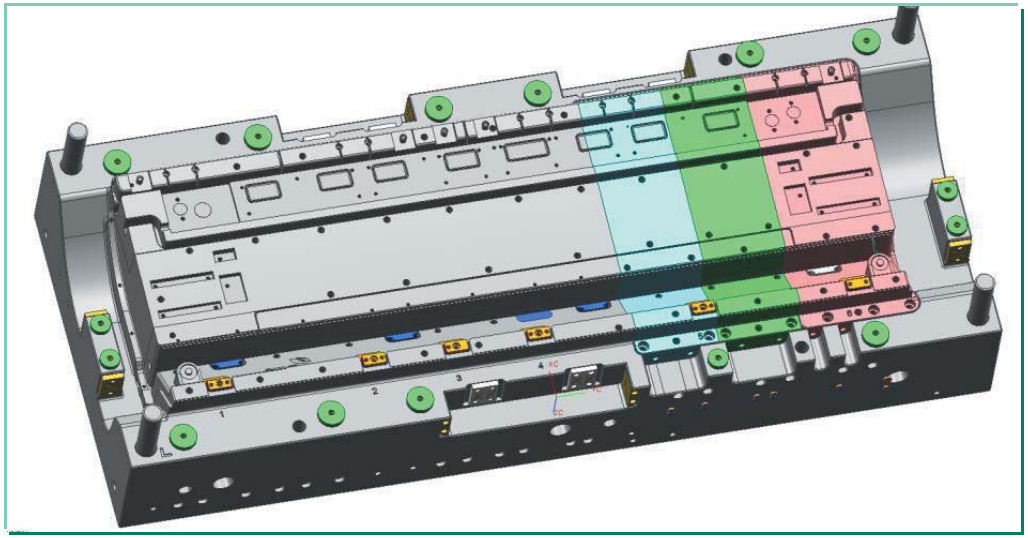
SMC Housing
(Mould Pressing)



SMC Cover
(Mould Pressing)

DC Variable Frequency All-electric Bus Air Conditioner - Environmental Protection





Housing Moulds

DC Variable Frequency All-electric Bus Air Conditioner - Environmental Protection

GUCHEN Feel Your Drive

Atomizing Experiments

测试条件	测试开始日期	2013.11.13	测试结束日期	2013.11.15
	样品尺寸及重量	Ø80mm 圆/28.246g	样品干燥时间	24h
	加热温度	100℃	加热时间	16h
	冷凝温度	21℃	/	/
测试结果	DIDP 值	样品一	样品二	报告值
	0.66mg	0.84mg	0.60mg	0.72mg
客户要求限值	＜2mg			
判定	PASS			

Formaldehyde Test

测试条件	测试开始日期	2013.11.14		测试结束日期	2013.11.18	
	样品尺寸/质量	40mm*100mm/ 26.363g		测试样品含水率	0.56%	
测试结果	样品一	样品二	样品三	样品四	样品五	报告值
	N.D.[1)]	N.D.	N.D.	N.D.	N.D.	N.D.
客户要求限值	＜10mg/kg					
判定	PASS					

注释: 1) N.D. 表示未检出(小于检出限)。

DC Variable Frequency All-electric Bus Air Conditioner - Environmental Protection

GUCHEN Feel Your Drive

Total Carbon Volatilization

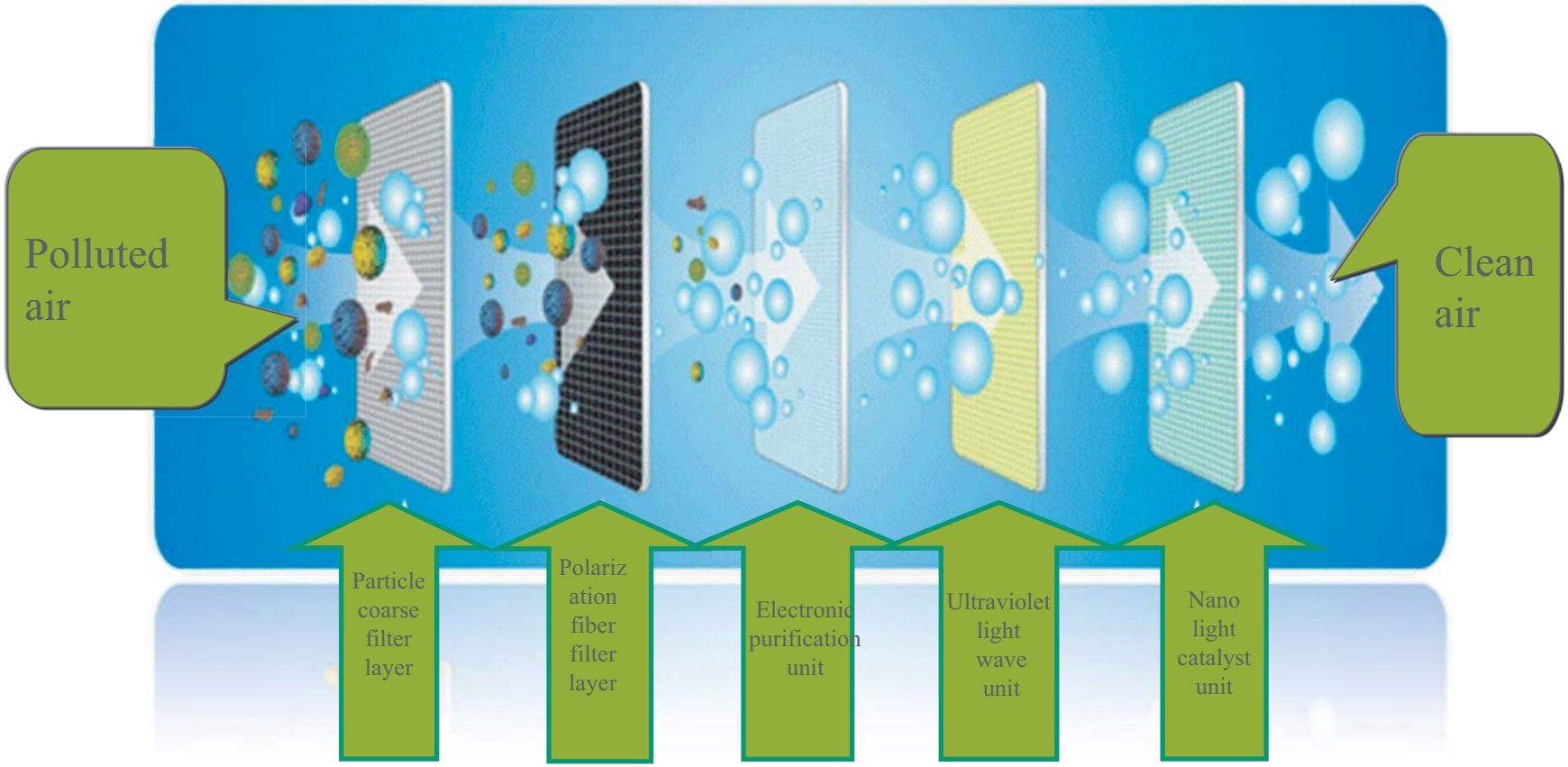
测试条件	测试开始日期	2013.11.15	测试结束日期	2013.11.19
	样品取样量	1.000g	样品干燥时间	/
测试结果	样品一	样品二	样品三	报告值
	9.9μgC/g	9.3μgC/g	9.0μgC/g	9.9μgC/g
客户要求限值	≤50μgC/g			
判定	PASS			

Benzene, Toluene, Xylene Volatilization

测试条件	测试开始日期	2013.11.15		测试结束日期		2013.11.19	
	样品取样量	1.000g		样品干燥时间		/	
测试结果	项目名称	样品一	样品二	样品三	报告值	客户要求限值	判定
	苯	N.D.	N.D.	N.D.	N.D.	＜5μg/g	PASS
	甲苯	N.D.	N.D.	N.D.	N.D.	＜5μg/g	PASS
	二甲苯	N.D.	N.D.	N.D.	N.D.	＜15μg/g	PASS

Efficient Air Purification System

Guchen has air purification devices with intellectual property rights, which contain functions of effective dust collection, sterilization and odor removal action. Patent No.: ZL201220481896.6



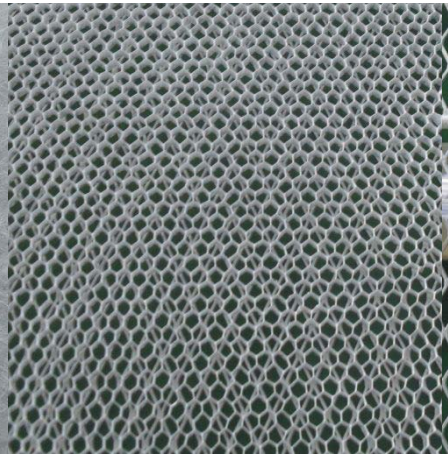
DC Variable Frequency All-electric Bus Air Conditioner - Environmental Protection

GUCHEN Feel Your Drive

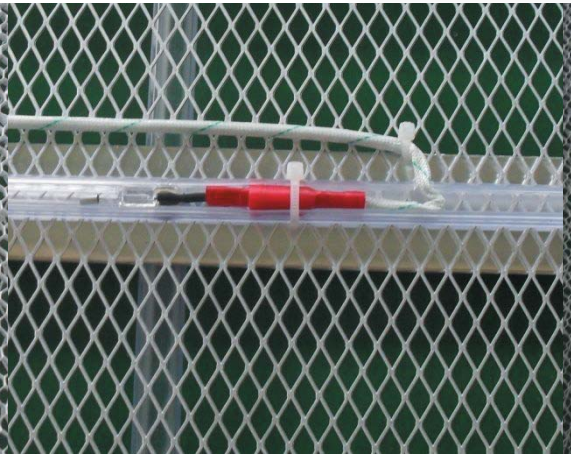
Efficient air purification system

This aire purification system is specially design for the city bus with high capacity of passengers and complex internal environment. It enhances degradation of organic volatile gases function, also strengthens the PM2.5, sterilization and deodorization function. Modified air purification system can efficiently make the dust particles, bacteria, viruses and harmful microbes attach the polarization fiber adsorption layer which is located on the upstream. The nanomaterial photocatalysis device and the adsorbed layer are closely linked, to obtain sufficient contact surface and adequate treatment time. And the polarized fiber adsorption layer protects the nano-material from dust covering so as to maintain its stable photaocatalytic effects.

Polarized fiber



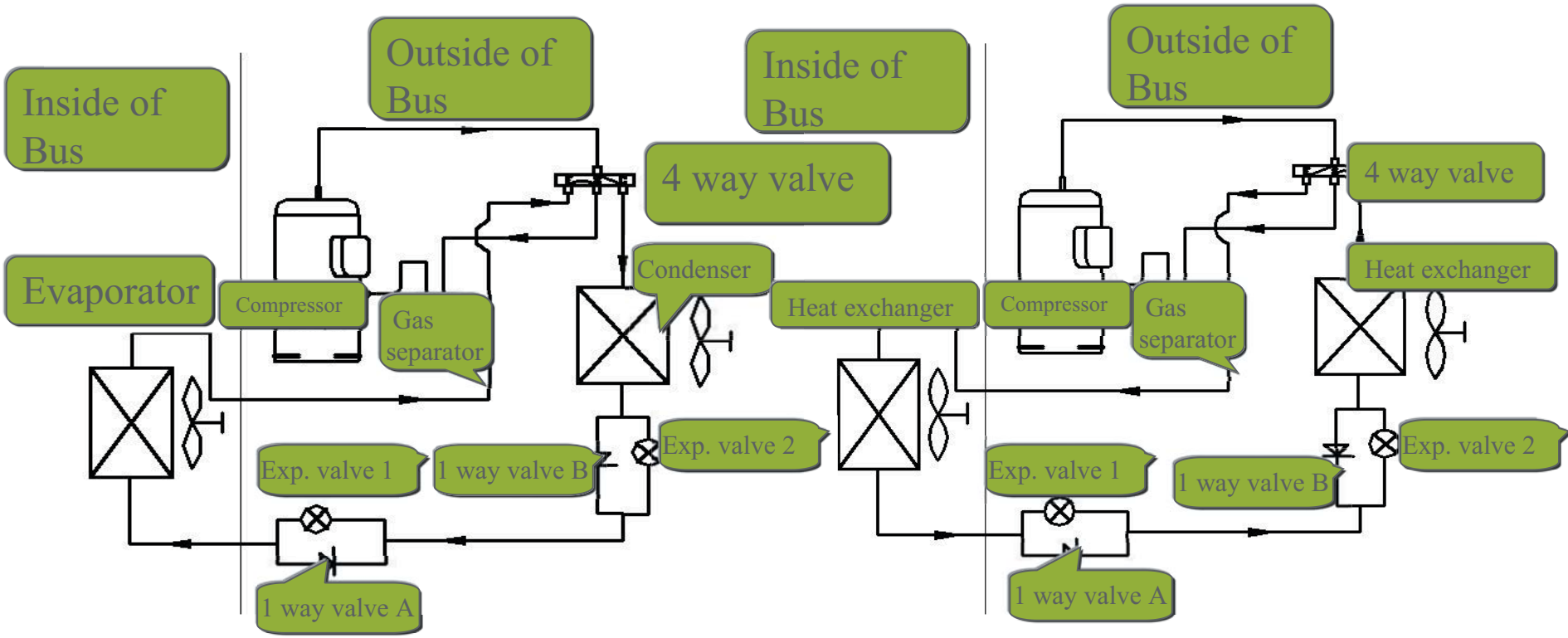
Photocatalyst



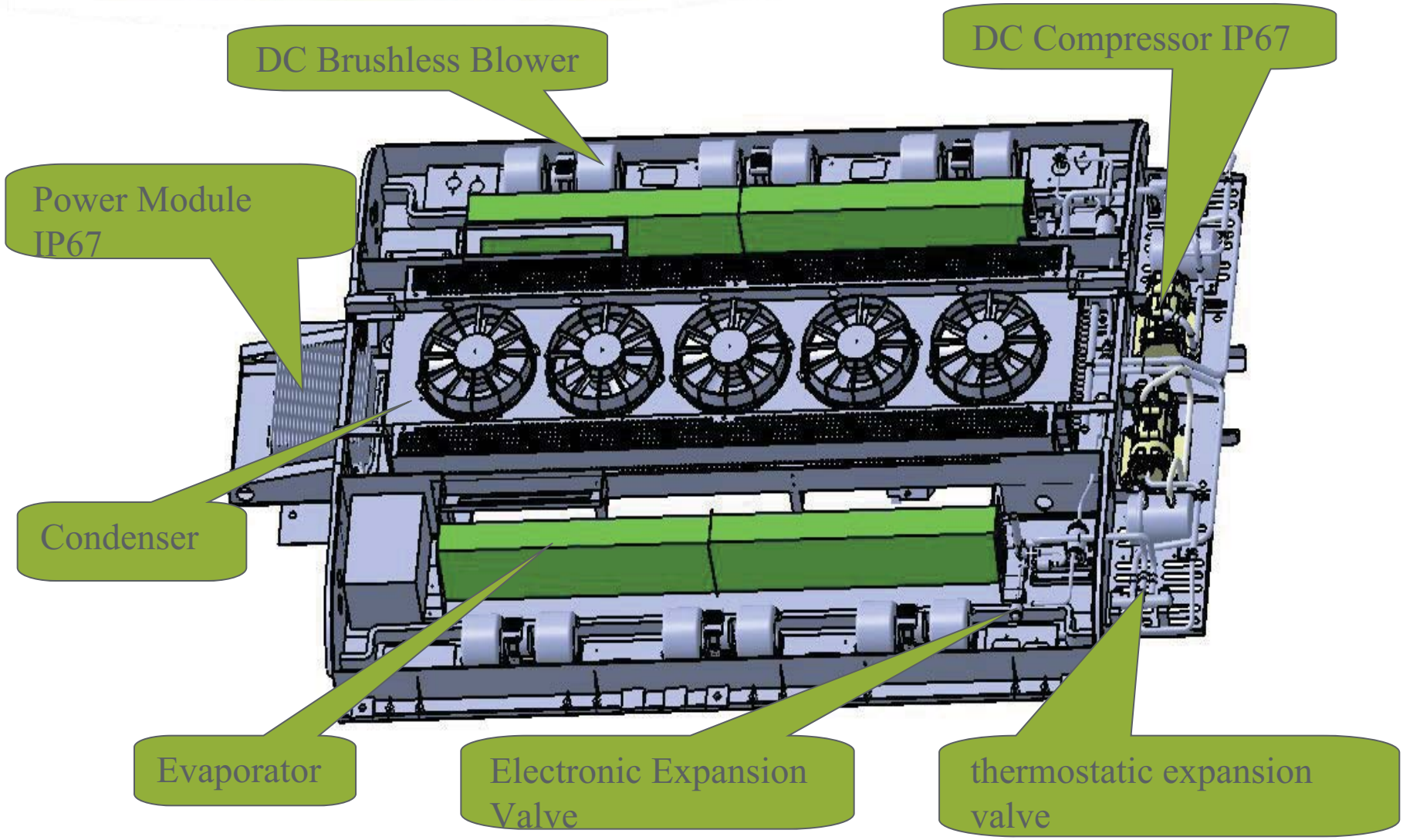
Light pipe

Power netting

DC Variable Frequency All-electric Bus Air Conditioner - Flow Diagram

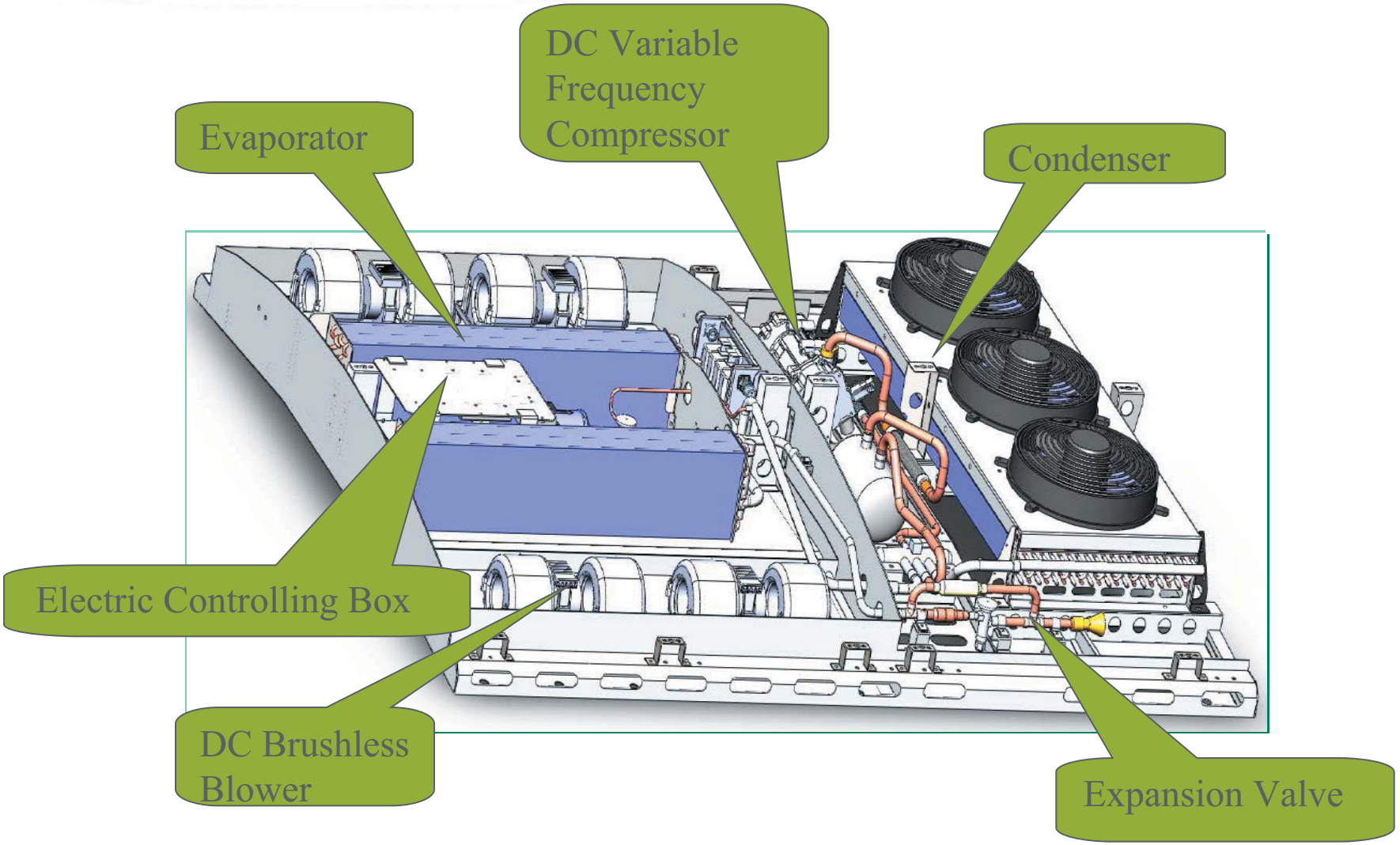


DC Variable Frequency All-electric Bus Air Conditioner - Internal Structure



EZDS-06 Internal Structure

DC Variable Frequency All-electric Bus Air Conditioner - Flow Diagram



EZDD-03 Internal Structure

DC Variable Frequency All-electric Bus Air Conditioner - Leaders Visit

Minister of China Science and Technology Visit Us

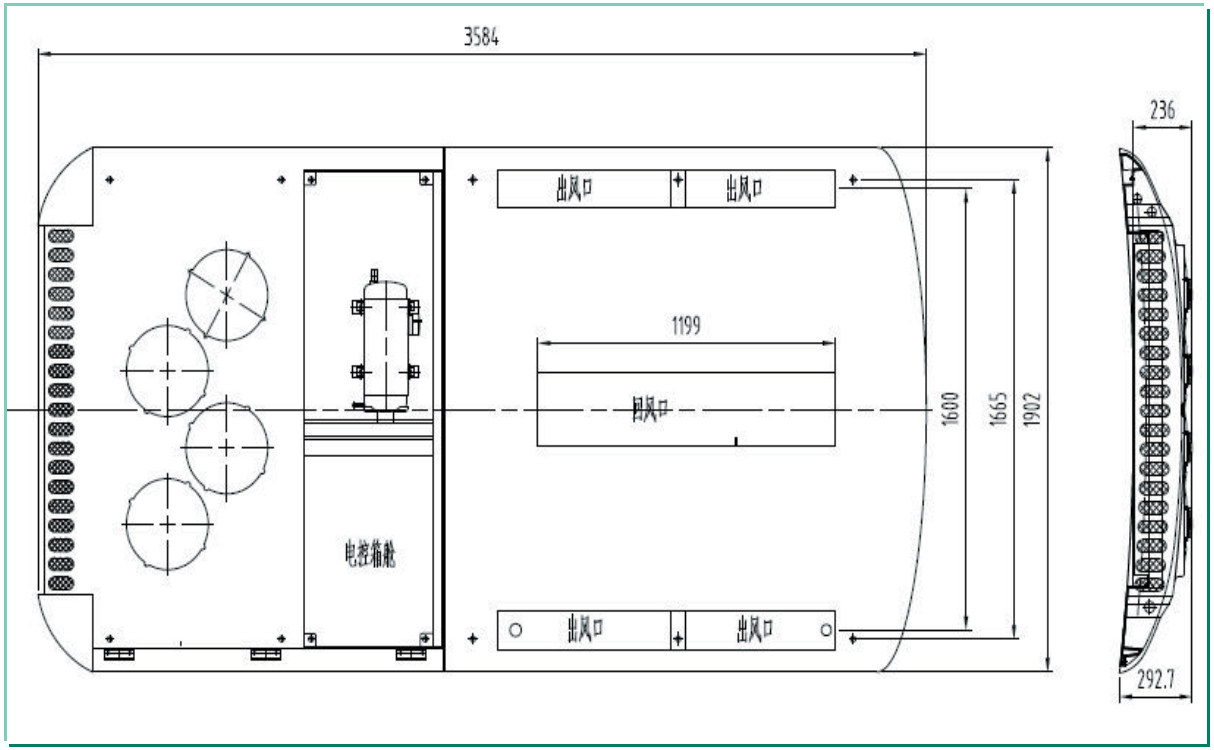
AC Variable Frequency All-electric Bus Air Conditioner - Products

Except DC air conditioners, GUCHEN also supply the AC (variable frequency all-electric) bus air conditioners:

EZDD-04 AC Electric Air-conditioenr

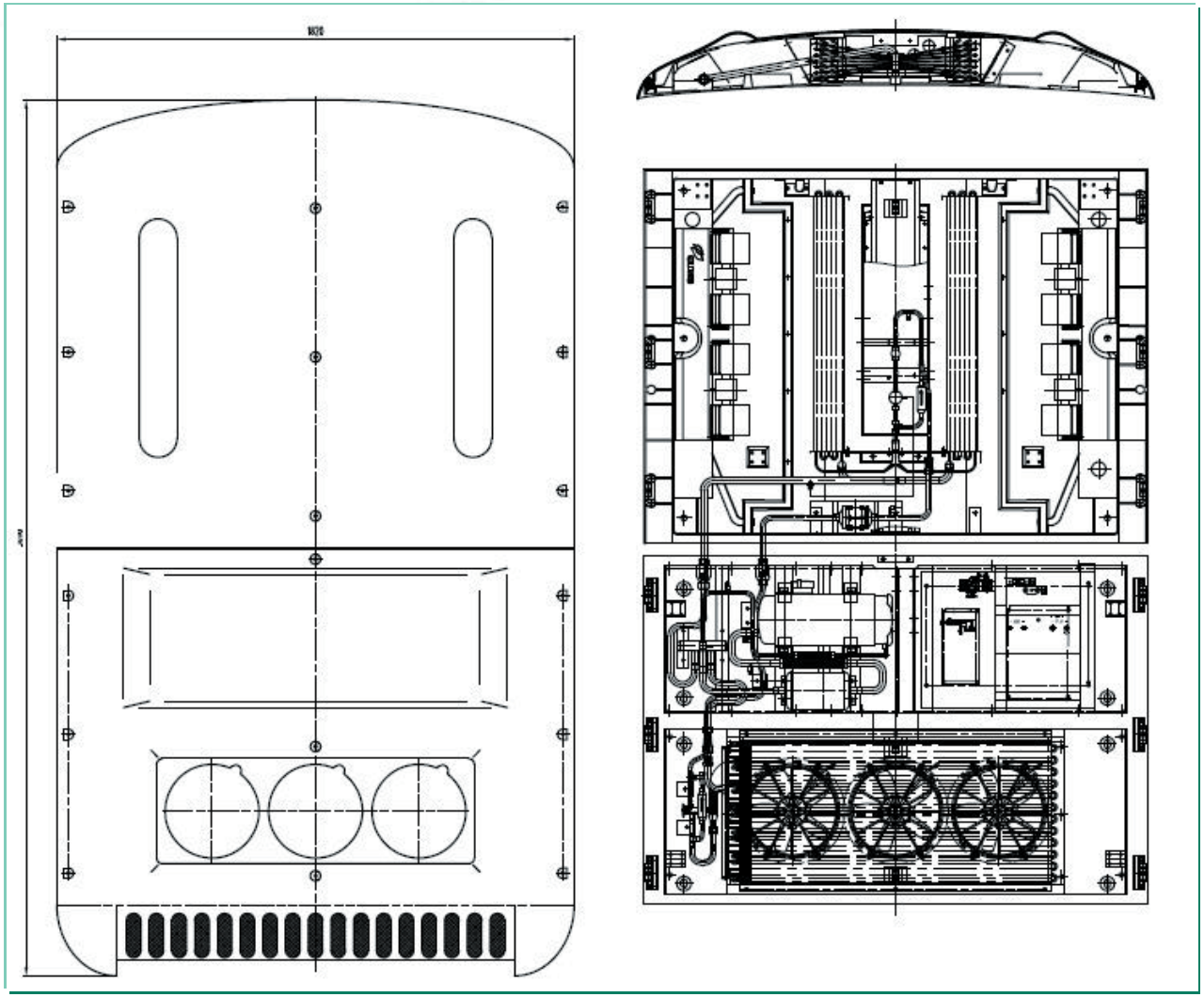
EFDD-06 AC Electric Air-conditioner

DC Variable Frequency All-electric Bus Air Conditioner - Products



EFDD-05 Installation Drawing

AC Variable Frequency All-electric Bus Air Conditioner - Products



EFDD-03 Structure

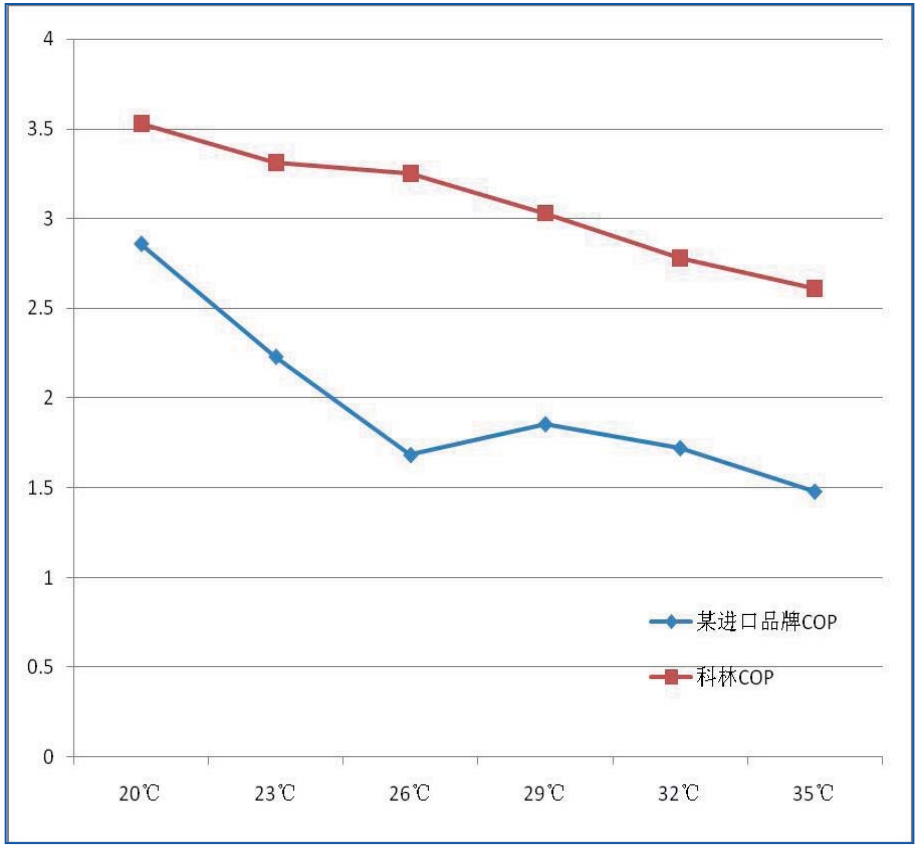
AC Variable Frequency All-electric Bus Air Conditioner - Products

GUCHEN Feel Your Drive

Model	EFDD-03	EZDD-04	EFDD-05	EFDD-06
Dimension	3068×1820×231	3380×1820×227	3600×1901×227	5000×1901×233
Cooling Capacity	21,000 Kcal/h	28,000 Kcal/h	30,000 Kcal/h	32,000 Kcal/h
Heating Capacity	18,000 Kcal/h	26,000 Kcal/h	28,000 Kcal/h	28,000 Kcal/h
Refrigerant	R407C	R407C	R407C	R407C
Controlling	CAN	CAN	CAN	CAN
$T_{emp.}$ Range	-20~50 ℃	-20~50 ℃	-20~50 ℃	-20~50 ℃
Application	6~7m EV Bus	8~10m EV Bus	10~11m EV Bus	12~13.7m EV Bus

GUCHEN Feel Your Drive

Superior Performance



The experimental data comparison between the third-generation variable frequency electric air conditioner EZDD-06G and the well-known foreign brands, @the same testing conditions:

- The COP of EZDD-06G is 1.77 times of the well-known international brand products
- Cooling capacity is 1.16 times of international brands
- Shaft power consumption only is 65% of international brands

GUCHEN Feel Your Drive

Superior Performance

EFDD-06 A/C System testing on the road bewteen city Zhengzhou and Kaifeng, Vehicle: 13.7m Electric Bus：
Date & Time: 2013-07 11:50~16:10
Ambient Climate: Fine, $T_{emp.}$30℃
A/C $T_{emp.}$ Set: 24℃
Power Consumption:

GUCHEN	P = 4.3 KW
Domestic Brand	P = 6.3 KW
International Brand	P = 5.3 KW

GUCHEN Variable Frequency All-electric Bus Air Conditioner - Application

1. EZDS-06GA Variable Frequency Electric A/C system (cooling+heating) OEM for Yutong City Bus ZK6100EGAA, ZK6125HG. Thereinto, ZK6125HG - steady operation over 4 years.
2. EZDS-06GAE AC Electric A/C sysem OEM for ZK6125BEVG1、ZK6122H.

Application for Tourism Coach

GUCHEN Variable Frequency All-electric Bus Air Conditioner - Application

Application for 7m Electric Bus

GUCHEN
Feel Your Drive

Thanks for your attention!

郑 州 金 相 机 电 科 技 有 限 公 司

ZHENGZHOU GUCHEN INDUSTRY CO., LTD.

地址：郑州市黄河路129号
电话：0371-69152893
传真：0371-69182594
邮箱：info@guchen.com
网址：www.guchen.com

Add: No.129 HUANGHE ROAD, ZHENGZHOU, CHINA
Tel: 0371-69152893
Fax: 0371-69182594
E-mail: info@guchen.com
Website: www.guchen.com