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净化空气是我们的使命—禾益净化
Air Cleaning is Our Responsibility—Hefil Purifying



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WEBSITE



净化设备&过滤器中国一站式采购服务平台—禾益净化

Purification Equipment & Filters One-stop Purchasing Service Platform in China - HEFIL Purifying

BETTER AIR BETTER LIFE

EFU · FFU - FAN FILTER UNIT

EFU · FFU - 风机过滤单元



上海禾益净化设备制造有限公司

Shanghai HEFIL Purifying Equipment Manufacturing Co.,Ltd.

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上海禾益净化设备制造有限公司
Shanghai HEFIL Purifying Equipment Manufacturing Co.,Ltd.



公司简介 HEFIL INTRODUCTION

上海禾益净化设备制造有限公司创建于2001年，所拥有的禾益品牌享誉国内外。禾益致力于空气过滤器、化学过滤器、耐高温过滤器、自带风机过滤单元（FFU）及其他净化设备和洁净室产品的研发、制造、批发、零售及相关技术服务。禾益拥有最先进的全电脑控制的无隔板空气过滤器、有隔板空气过滤器和折叠式滤芯全自动生产线，具备完善的检测手段和无尘洁净室。禾益生产的各类净化过滤产品广泛应用于半导体、核工业、电子技术、医药卫生、生物实验、食品饮料、机电设备、环境保护、化工、涂装、汽车制造等各个领域。禾益的质量管理体系已成功获得ISO9001:2008认证；禾益的产品已通过UL、SGS、RoHS、BV、TUV认证；禾益公司已成功通过高新技术企业认证，正式成为高新企业之一。

Shanghai HEFIL Purifying Equipment Manufacturing Co., Ltd. was founded in 2001, HEFIL brand is famous both at home and abroad. HEFIL is devoted to the development, manufacturing, wholesale and retail of air filters, chemical filters, high temperature resistance filters, fan filter units, and other cleaning equipment and clean room products, and also provide the services of related technology and equipment. HEFIL has the most advanced computer-controlled automatic production lines for the production of Mini-pleat Panel Air Filters, Separator Air Filters and Cartridge Filters, and possesses perfect testing process and the dust-free workshops. All kinds of purification and filtration products made by HEFIL are widely used in semiconductor industry, electronics industry, nuclear industry, pharmaceuticals industry, biotic experiment, food and beverage industry, electromechanical device, environmental protection, chemical industry, painting industry, automobile industry and other fields. HEFIL has successfully obtained ISO 9001:2008 quality management system certification; the products of HEFIL have been certified by SGS, RoHS, BV and UL; HEFIL has successfully been nominated as high-tech enterprise.

部分合作伙伴 Parts of Our Clients



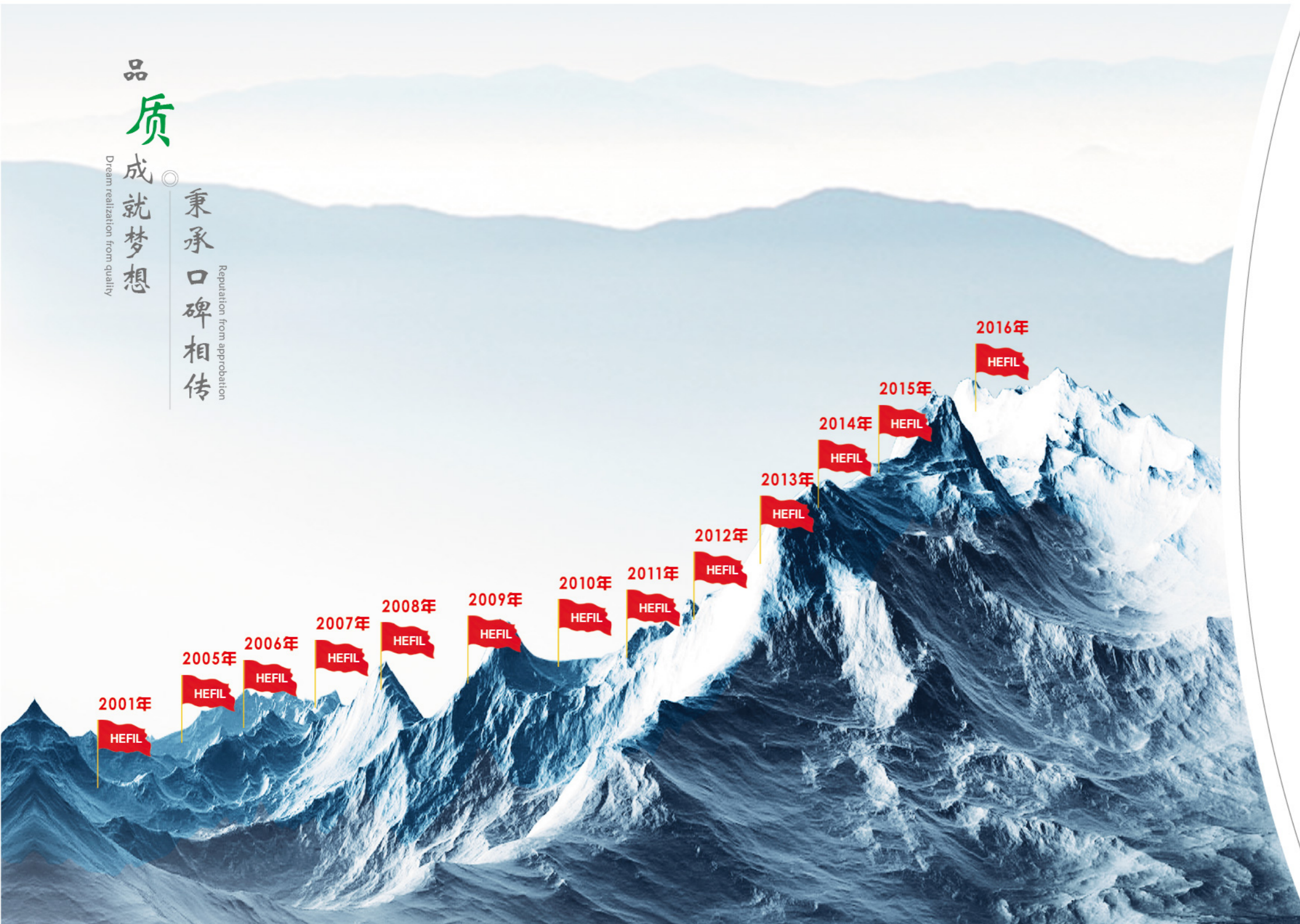
品质

成就梦想

Dream realization from quality

秉承口碑相传

Reputation from approbation



发展历程 DEVELOPMENT HISTORY

- 2001**
上海禾益公司正式成立于上海宝山区
HEFIL was originally founded in Baoshan, Shanghai.
- 2005**
禾益净化因扩建从上海宝山区迁至上海松江区
Due to expansion, HEFIL moved to Songjiang district, Shanghai.
- 2006**
禾益、禾益净化两家公司合并，注册资金壹仟万元
HEFIL's registered capital reach up to ten million RMB.
- 2007**
禾益净化因业务量涨幅新增德国进口MADA数控机床
Based on business increase, HEFIL imported MADA numerically-controlled machine tool from Germany.
- 2008**
禾益净化因追求更高端品质新增美国进口PAO检测设备
To provide much higher quality, HEFIL brought in America imported PAO testing equipment.
- 2009**
禾益净化年产值超5000万元
HEFIL's annual output value exceeds 50 million RMB.
- 2010**
禾益工厂再次扩建，拥有超过5000m²的自有厂房，并建造10万级净化等级的专业无尘生产车间
HEFIL further expanded to 5000m² and upgraded the air cleanliness workshop to class 100,000.
- 2011**
禾益净化正式成为上海室内环境协会理事会员
HEFIL was officially nominated as a member of Shanghai Association of Indoor Environment.
- 2012**
禾益净化引进韩国三星高折波、超幅宽的全自动折纸生产线
HEFIL brought in Korean Sumsung automatic origami production machine (folding height 120mm; folding width 1200mm).
- 2013**
禾益质量管理体系已成功获得ISO9001:2008认证
HEFIL quality management system successfully obtained ISO9001:2008 certification.
- 2014**
禾益产品通过SGS、RoHS、BV等认证
HEFIL products passed the certification of SGS RoHS etc.
- 2015**
禾益产品通过美国最高防火等级UL、TUV质量体系、高新技术企业认证，正式成为高新企业之一
HEFIL products passed certification of UL, BV etc. HEFIL was successfully nominated as high-tech enterprise.
- 2016**
禾益净化已申请天津工业园区20亩土地，拟建天津分工厂
HEFIL applied a land of 13,320m² in Tianjin Industrial Park, will establish a branch soon in Tianjin.

内容索引
CONTENT INDEX



部分资质证书

PARTS of QUALIFICATIONS · HONORS



生产车间及设备

EFU · FFU Production Workshop and Equipment



折纸车间
Auto Folding Workshop



包装车间
Packing Workshop



FFU组装车间
FFU assembly plant



折弯设备
Bending Equipment



MADA高速数控机床
MADA high-speed Puncher



全自动无隔板空气过滤器生产线
Fully Automatic Mini-pleat Panel Filter Production Line



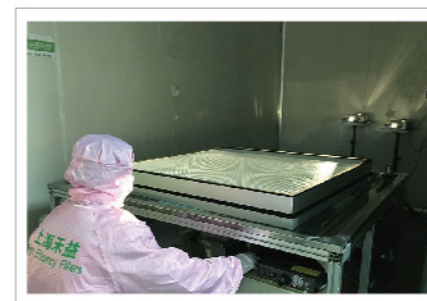
全自动有隔板空气过滤器生产线
Fully Automatic Separator Air Filter Production Line



进料检测
IQC Testing



PAO气溶胶检测
PAO Testing



气溶胶检测
DEHS Testing



DEHS检测设备
DEHS Test Equipment



FFU静音测试室
FFU Voice Activity Detection Room

EFU超薄设备风机过滤单元

EFU - Equipment Fan Filter Unit



产品介绍 / Introduction

EFU为英文缩写，全称为Equipment Fan Filter Unit，也可称为：超薄型设备用风机过滤器机组

EFU is abbreviations, the full name is Equipment Fan Filter Unit, also known as Ultra-thin Fan Filter Unit used in equipment.

优势 / Advantages

- 超薄型、低噪音、功耗低、震动小、强度高、免维护
- 风速均匀、运行平稳、安装方便、可无级调速
- Ultra thin, low noise, low power consumption, little vibration, strong intensity, no maintenance.
- Uniform air speed, stable operation, convenient installation. In addition, continuously variability of air speed is available.



工作原理 / Working Principle

独配电机与HEPA高效过滤器（或ULPA、超高效过滤器、化学过滤器）一起架构成的末端净化设备，是一种自带动力、高效率过滤功效的模块化末端送风装置。风机从EFU箱体顶部将空气吸入并经过滤器过滤，过滤后的洁净空气在整个出风面以0.45m/s的风速均匀送出，可达到1级及以下洁净等级

HEPA or ULPA filter works together with the build-in motor, constituting a final cleaning equipment, It is a modular and high efficiency final air supplying equipment that comes with power source. With the suction of power source (Fan), firstly air enters the box, then goes through the HEPA or ULPA filter, after that, the purified air evenly goes through the air outlet side with the speed of 0.45m/s, the purifying level will reach level 1 or below.

应用 / Application

广泛应用于无尘室、无尘操作台、无尘生产线和局部百级等应用场合，以提高局部微环境的洁净度。可严格控制空气中的悬浮颗粒物、化学及分子级污染物

Widely used in the clean room, clean bench, clean production line and some occasions need class 100 partly. Aiming at improving the cleanliness of micro-environment. Available to strictly control the suspended particles in the air, chemical and molecular pollutants.

EFU性能特点 / EFU Features

- 超薄型EFU箱体厚度可低至110mm，箱体材质由镀锌铝/航空铝/不锈钢板制成
- 采用强力风机，可在高静压下长期使用，同时又保持低噪音（50 dB (A)）
- 根据不同的工况，可以选择多款先进的EC/AC风机，以满足不同工况下风量与总压的要求，并采用与风机相适应的控制模式，以达到工况需求、机组配制、控制方式三者的最佳匹配
- 对于不同的风机，可以实现简洁、实用的现场手动控制；并针对大规模的控制，可以提供Elisa电子控制系统，实现网络集中控制
- 整个机组均选用极低挥发物的原材料制成，不会对用户现场产生其他异常气体；另外如对气态分子污染物控制有额外需求，也可选配PTFE过滤器或者化学过滤器
- The thickness of ultra-thin EFU box can be as thin as 110 mm, box is made of zinc with aluminum /aluminum/stainless steel plate.
- The special powerful fan makes it possible to work for a long time under high static pressure while maintaining low noise (50 dB (A)).
- Considering different working conditions, several kinds of advanced fans are available, EC/AC, will meet the requirements of air flow and total pressure under different working conditions. The control mode is specially designed for fan, thus meeting the perfect matching of working condition, unit configuration and control mode.
- For different kinds of fans, simple and practical manual control can be realized on the scene; Aiming at the large scale control, Elisa Electronic Control system will be supplied to meet the Network Centralized Control.
- The entire unit are made from extremely low volatile matter, which will not produce strange gases for customers' site; In addition, if there is additional requirements of the controlling of gaseous molecular contaminants, PTFE filter or chemical filter is optional.

EFU常用规格 / EFU Common Specifications

规格 Feet (ft)	2 × 2	4 × 2	4 × 4
外形尺寸 Dimensions (mm)	575 × 575 × 110	1175 × 575 × 110	1175 × 1175 × 110
总压 Total Pressure (Pa@0.45m/s)	190	230	280
功耗 Power Consumption (W)	60~80	130~150	210~235
电流 Current (A)	0.30~0.39	0.55~0.64	1.01~1.20
箱体材质 Casing Material (mm)	镀锌铝/航空铝/不锈钢板 galvalume sheet /aviation aluminum alloy/stainless steel plate		
风机 Fan	AC/EC		
电源 Power Supply	单相220V 1PH 50/60Hz		
温度范围 Temperature Range (°C)	-20°C~40°C		
面风速 Air Velocity (m/s)	0.35~0.55		
过滤器规格 Filter Specification (mm)	575 × 575 × 50/70	1175 × 575 × 50/70	1175 × 1175 × 50/70
过滤器滤料 Filter Media	超细玻璃纤维滤纸/PTFE膜 fiberglass/PTFE		
过滤器护网 Filter Guard Mesh	喷塑保护网/铝合金保护网 plastic spray / aluminum alloy guard mesh		
过滤效率等级 Filter Efficiency Classifications	H13-U17		
机外静压 External Static pressure (Pa)	90		
噪音 Noise (dBA)	48~53	48~53	51~55
机身重量 Host Weight (kg)	12~16	20~24	34~38
安装方式 Installation Mode	垂直安装/水平安装 Vertical and horizontal installation		
控制方式 Control Mode	EsiDrive II电脑群控/无级档手动调控 EsiDrive II computer group control/five manual shift control		
配件 Accessories	运行指示灯/故障指示灯/DOP取样口/压差测试口/压差报警装置 function indicator light/trouble light/DOP sampling mouth/pressure test mouth/pressure alarm device		

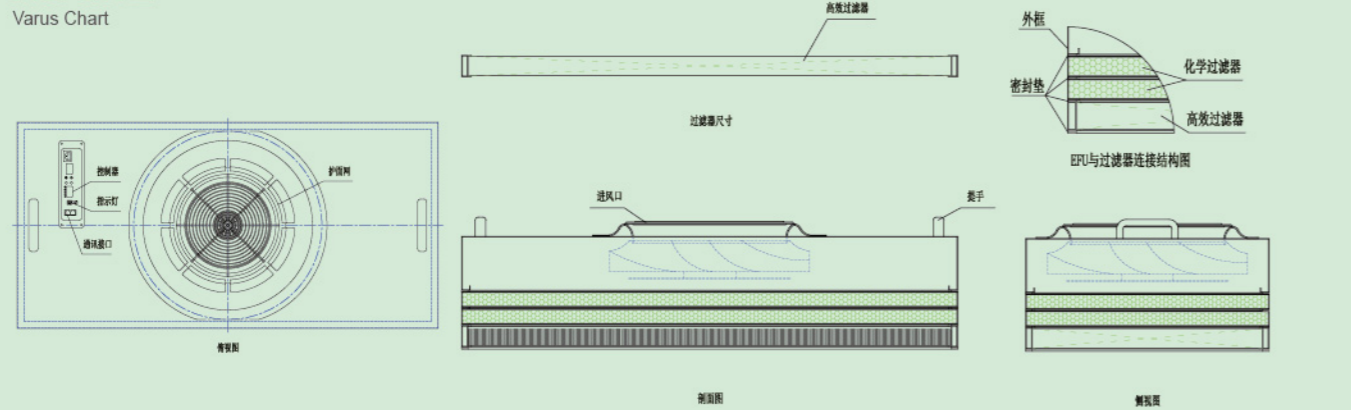
注：本公司接受非标产品的订制。
NOTE: accept customized non-standard dimensions.

EFU结构图

EFU Structure

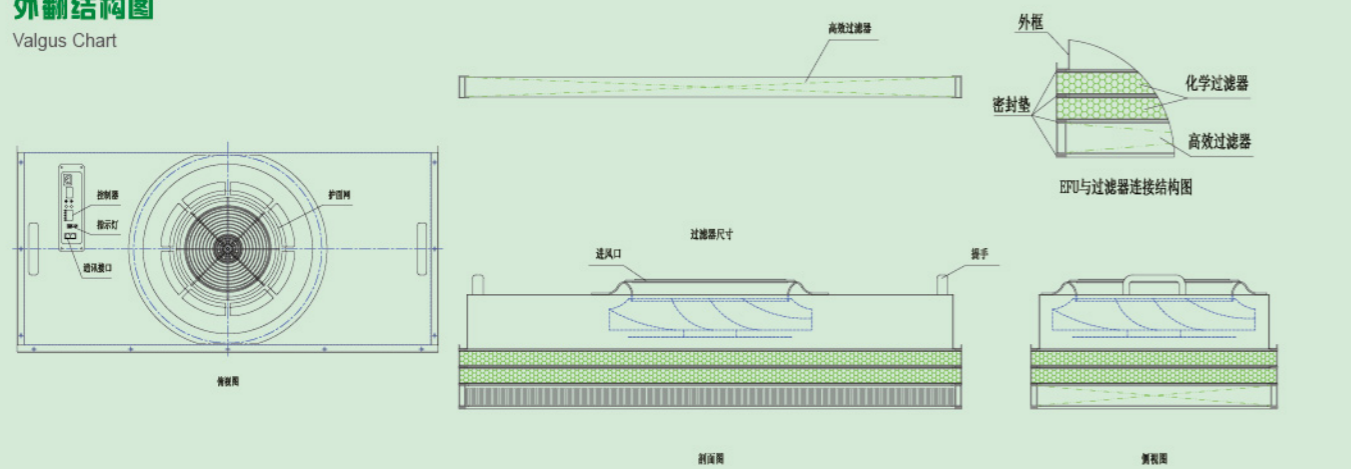
内翻结构图

Varus Chart



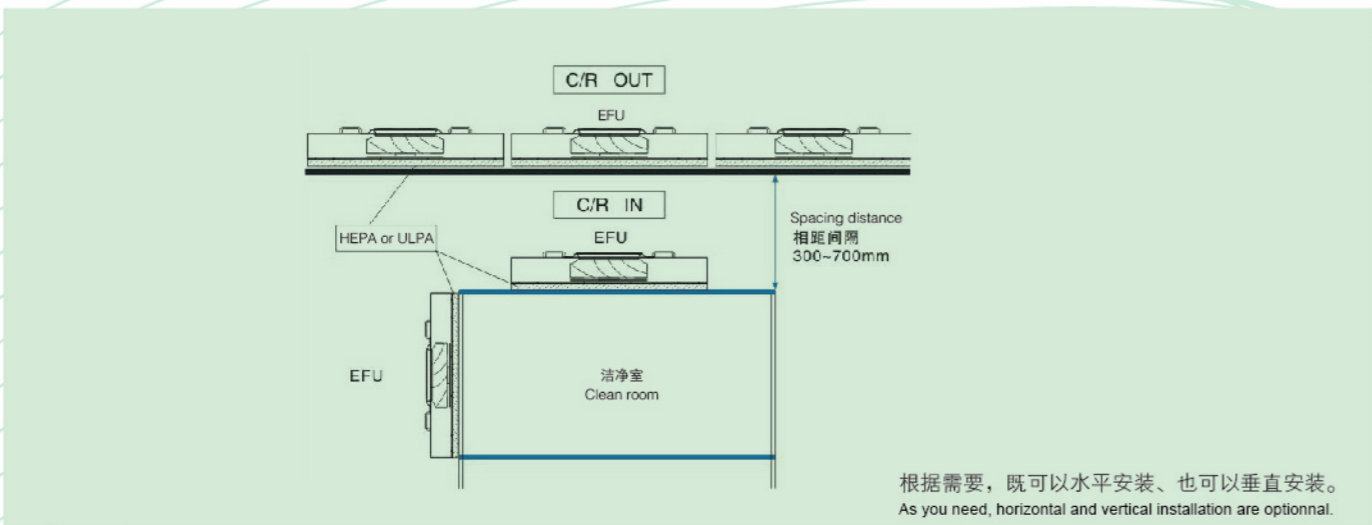
外翻结构图

Valgus Chart



EFU安装示意图

EFU Installation



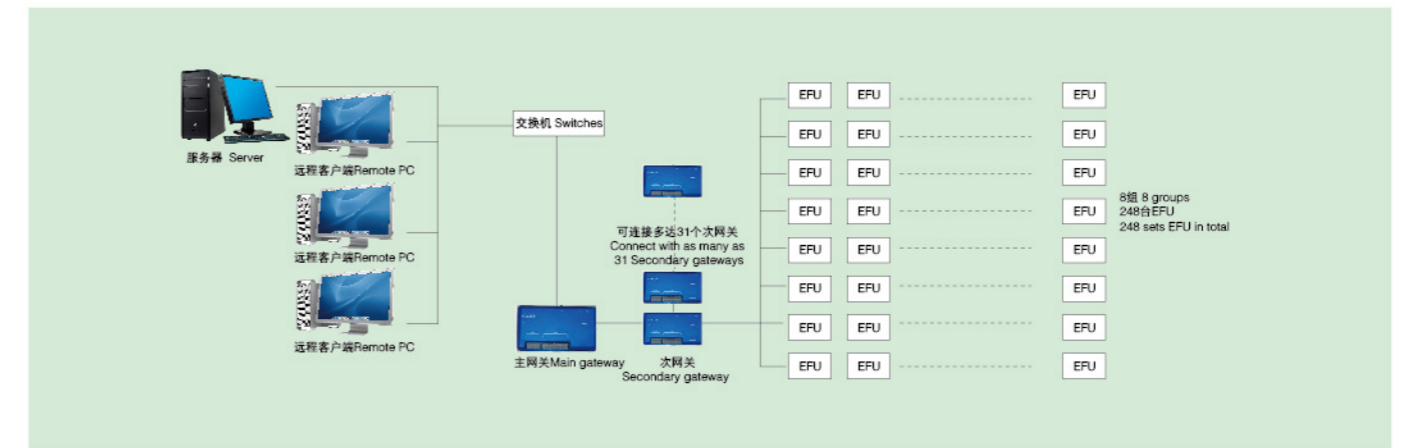
EFU直流群控系统介绍 / EFU Group Control System Introduction

- 采用eLisa控制系统，实现了大规模网络化集成控制
- 连线数量少，更小的安装体积
- 每台主网可连接31台次网关，多达7688台
- 可连接到多台远程控制终端上，实现远程、分层控制
- 单台次网关可连接8组EFU，多达248台



- Adopts Elisa control system to realize large-scale network integrated control.
- less connection lines smaller installation volume.
- For each main net, over 31 sets of secondary gateways can be connected, totally 7,688 sets of FFU connected.
- It can be connected to multiple control terminal to realize remote and hierarchical control.
- Each secondary gateway can be connected with 8 groups of FFU, up to 248 sets totally.

EFU直流群控系统图 / EFU Group Control System

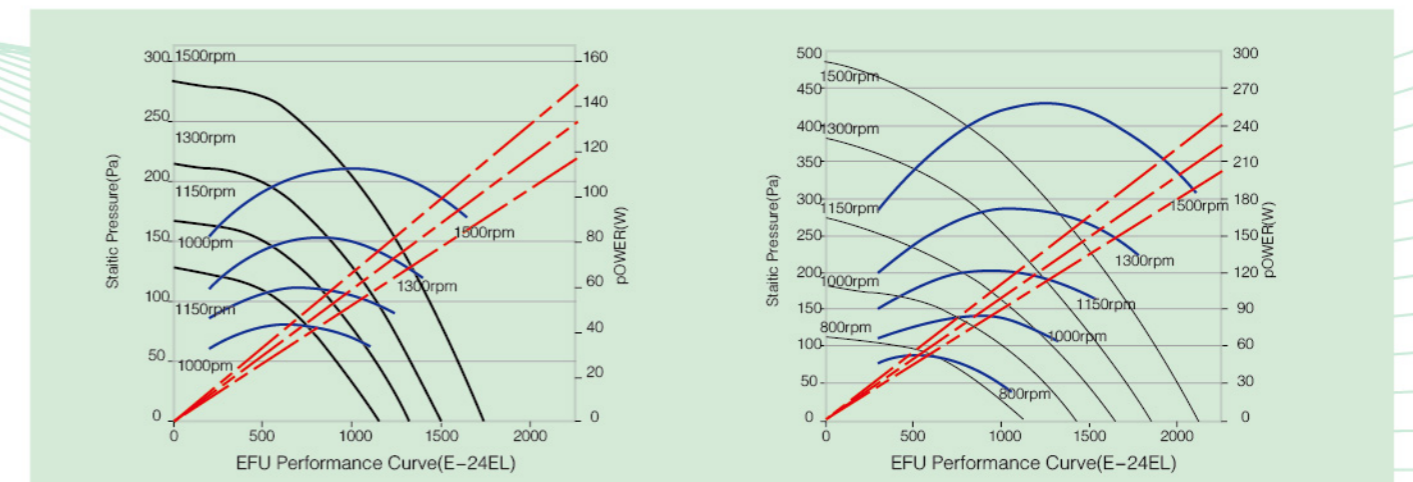


EFU可单台手动控制，也可采用eLisa电子控制系统。通过系统主机及远程控制终端（PC），可将系统中所有EFU的运行状态直观地展示出来，并根据实际情况进行逐台或区域控制。

EFU can be controlled manually one by one or adopts eLisa electronic control system. The working condition of all EFU are clearly visible through the system host and remote control terminal (PC), one-by-one or area control is available according to actual needs.

EFU性能曲线

EFU Performance Curve



FFU风机过滤单元

FFU - Fan Filter Unit



产品介绍 / Introduction

FFU为英文缩写，全称为FFU - Fan Filter Unit，也可称为：风机过滤机组、风机过滤单元、风机净化机组、净化送风机组、洁净送风系统等

FFU is abbreviations, the full name is FFU-Fan Filter Unit, also known as Fan filter units, Fan filter units, Fan purification units, Purifying air supplying units, Clean air supplying systems, etc.

优势 / Advantages

- 低噪音、功耗低、震动小、强度高、免维护
- 风速均匀、运行平稳、安装方便、可无级调速
- Low noise, low power consumption, little vibration, strong intensity, no maintenance.
- Uniform air speed, stable operation, convenient installation. In addition, continuously variability of air speed is available.



工作原理 / Working Principle

独配电机与HEPA高效过滤器（或ULPA超高效过滤器）一起架构成的末端净化设备，是一种自带动力、高效率过滤功效的模块化末端送风装置。风机从FFU箱体顶部将空气吸入并经HEPA或ULPA过滤，过滤后的洁净空气在整个出风面以0.45m/s的风速均匀送出，可达到1级及以下洁净等级。

HEPA or ULPA filter works together with the build-in motor, constituting a final cleaning equipment, It is a modular and high efficiency final air supplying equipment that comes with power source. With the suction of power source (fan), firstly air enters the box, then goes through the HEPA or ULPA filter, after that, the purified air evenly goes through the air outlet side with the speed of 0.45m/s, the purifying level will reach level 1 or below.

应用 / Application

广泛应用于无尘室、无尘操作台、无尘生产线和局部百级等应用场合，以提高局部微环境的洁净度。可严格控制空气中的悬浮颗粒物、化学及分子级污染物。

Widely used in the clean room, clean bench, clean production line and some occasions need class 100 partly. Aiming at improving the cleanliness of micro-environment. Available to strictly control the suspended particles in the air, chemical and molecular pollutants.

FFU性能特点 / FFU Features

- FFU风机过滤器机组是由一台高性能交流风机、专业设计的箱体和HEFIL HEPA/ULPA过滤器组成
- FFU风机过滤器机组采用单相或三相高效率、长寿命、免维护马达，并提供备选的变压调速器和电子整流调速器，降低能力耗损及冷负荷，从而降低整个运行成本
- 专业设计的箱体外壳，结构稳定强度高，避免泄漏，消除大量的FFU同时运转时的共振。采用不锈钢材质的箱体，可使用消毒剂，非常适用于消毒设备。可选用镀锌锌或航空铝箱体，可外加初效过滤器
- 采用低阻力的RadiCel II过滤器，并结合风机的高静压，在额定气流下能提供50到150Pa机外静压
- FFU可选配手动三档或五档调速控制器，也可选配最新EsiDrive II电脑端群控控制器，实现灵活操控
- FFU is made up with high performance AC fan, professionally designed box and HEFIL HEPA or ULPA filter.
- FFU filter use single-phase or three-phase with high efficiency, long working life and maintenance-free features motor. There also are alternative pressure governor and electronic rectifier governor to reduce consumption and cooling load, thus reducing overall operating costs.
- Professional designed outer casing is strong and stable, avoid any leakage and eliminate a lot of noise when large number of FFU work at the same time. The stainless steel material casing is ideal for sterilizing equipment if treated with disinfectant. The optional material are galvanized steel or aviation aluminum alloy. Pre-filter can be added.
- It adopts low pressure RadiCel II filter, combines with high static pressure, will provide 50~150pa external static pressure under rated airflow.
- For speed controller, manual three gears or five gears are available, or equipped with the latest EsiDrive II computer terminal group to achieve agile handling.

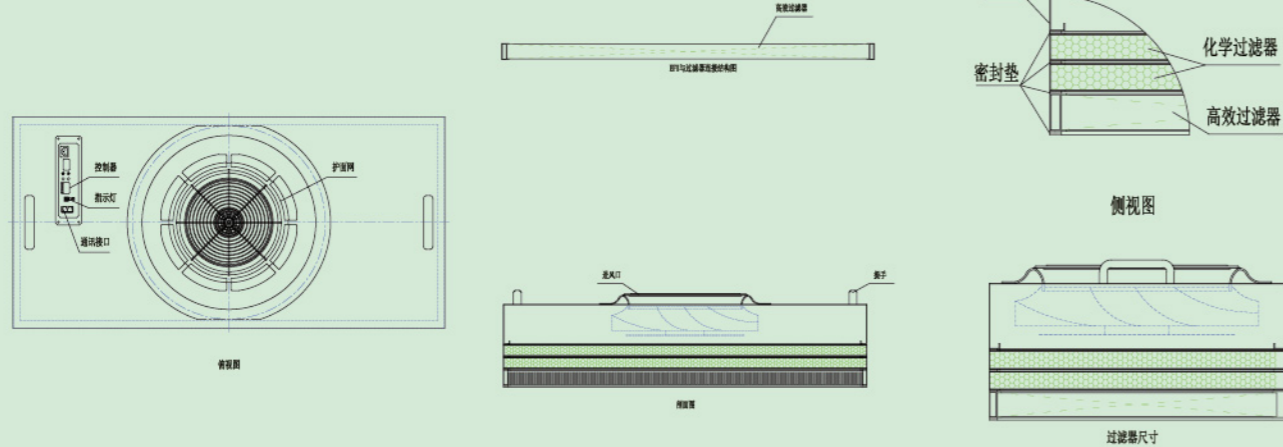
FFU常用规格 / FFU Common Specifications

规格 Feet (ft)	2 × 2	4 × 2	4 × 4
外形尺寸 Dimensions (mm)	575 × 575 × 275	1175 × 575 × 275	1175 × 1175 × 275
总压 Total Pressure (Pa@0.45m/s)	190	230	280
功耗 Power Consumption (W)	70~90	145~165	228~255
电流 Current (A)	0.32~0.41	0.59~0.68	1.06~1.25
箱体材质 Casing Material (mm)	镀锌锌/航空铝/不锈钢板 galvalume sheet / aviation aluminum alloy / stainless steel plate		
风机 Fan	AC/EC		
电源 Power Supply	单相220V 1PH 50/60Hz		
温度范围 Temperature Range (°C)	-20°C~40°C		
面风速 Air Velocity (m/s)	0.35~0.55		
过滤器规格 Filter Specification (mm)	570 × 570 × 50/70	1170 × 570 × 50/70	1170 × 1170 × 50/70
过滤器滤料 Filter Media	超细玻璃纤维滤纸/PTFE膜 fiberglass/PTEF		
过滤器护网 Filter Guard Mesh	喷塑保护网/铝合金保护网 plastic spray / aluminum alloy guard mesh		
过滤器效率等级 Filter Efficiency Classifications	H13-U17		
机外静压 External State Pressure	90		
噪音 Noise (dBA)	49~54	49~54	52~58
机身重量 Host Weight (Kg)	18~24	32~36	52~56
安装方式 Installation Mode	垂直安装/水平安装 Vertical and horizontal installation		
控制方式 Control Mode	EsiDrive II电脑群控/三档或五档手动调控 EsiDrive II computer group control/five manual shift control		
配件 Accessories	运行指示灯/故障指示灯/DOP取样口/压差测试口/压差报警装置 function indicator light/trouble light/DOP sampling mouth/pressure test mouth/pressure alarm device		

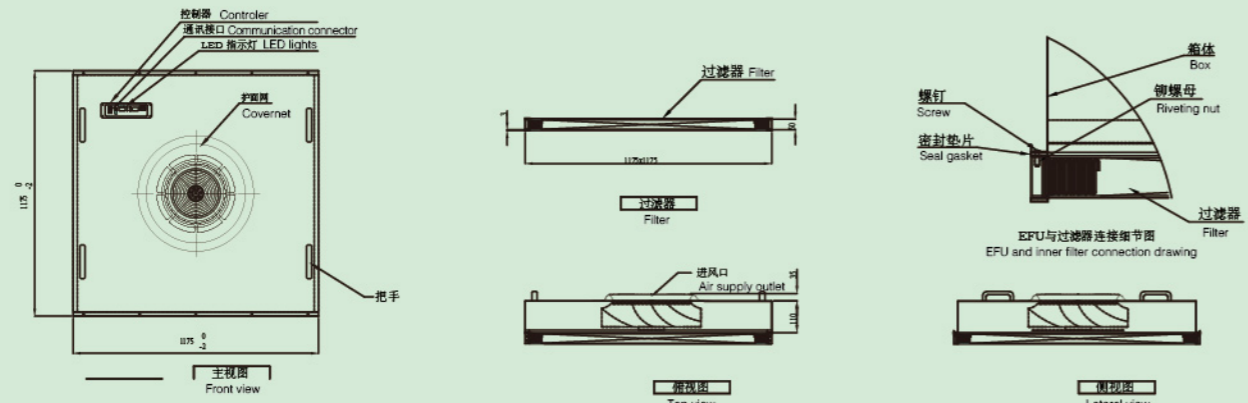
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Note: accept customized non-standard products.

FFU结构图
FFU Structure

4×2尺寸图



4×4尺寸图

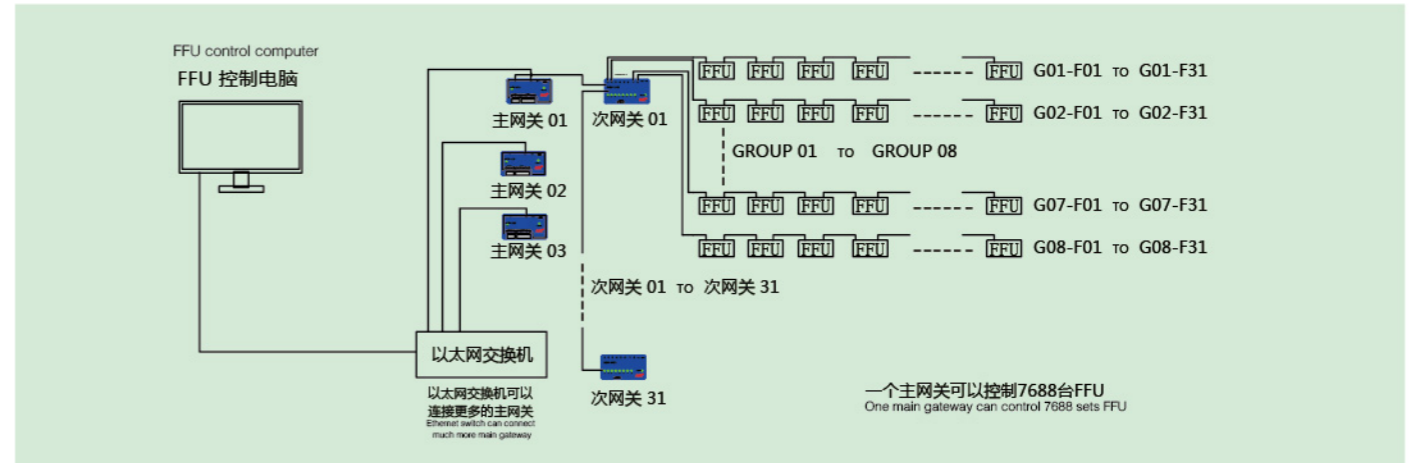


FFU直流控制系统介绍 / FFU Group Control System Introduction

- 采用eLisa控制系统，实现了大规模网络化集成控制
- 连线数量少，更小的安装体积
- FFU分为AC和EC, EC FFU系统扫描速度较AC FFU系统快90%
- 可连接到多台控制终端上，实现远程、分层控制
- 单台网关可连接8组FFU，多达248台
- 每台主网关可连接31台次网关，多达7688台
- Adopts eLisa control system to get a large-scale network integrated control.
- Less connection lines, smaller installation volume.
- FFU includes AC and EC, EC FFU system's scanning speed is faster than AC FFU.
- LT can be connected to multiple control terminals to get remote hierarchical control.
- Single secondary gateway can be connected to 8 groups FFU, up to 248 sets FFU.
- Each main gateway can be connected to over 31 sets secondary gateway, as many as 7688 sets FFU.



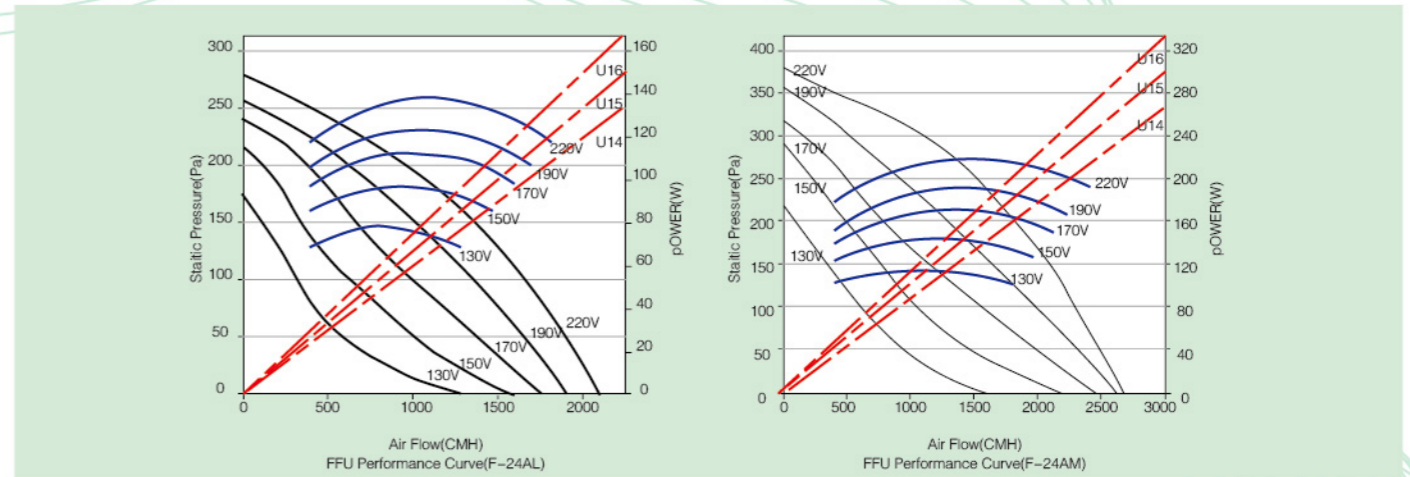
FFU直流群控系统图 / FFU Group Control System



FFU采用的是eLisa电子控制系统。通过系统主机及远程控制终端(PC)，可将系统中所有FFU的运行状态直观地展示出来，并根据实际情况进行逐台或区域控制。

FFU adopts eLisa electronic control system. The working condition of all FFU are clearly visible through the system host and remote control terminal (PC), one-by-one or area control is available according to actual needs.

FFU性能曲线 / FFU Performance Curve



FFU现场安装图
FFU Installation



水平安装
Horizontal Installation



垂直安装
Vertical Installation

风机过滤单元机组过滤器的选型 Filter Configuration and Selection in EFU

高效及超高效过滤器选型:

For HEPA filter and ULPA filter, filter media can be selected from table as below.

过滤器 Filter Name	滤料材质 Filter Media	硼的产生量 Boron Contents	材质特点 Material Characteristics
HMH 高效过滤器 HMH Mini-pleat HEPA Panel Filter	玻璃纤维 Fiberglass	<5%	传统技术, 应用广泛 Traditional technology; Wide application
HMU超高效过滤器 HMU Mini-pleat ULPA Panel Filter	低硼玻璃纤维 Low boron fiberglass	<0.02%	硼产生量比普通玻纤低阻力与普通玻纤相比较 Boron contents is much lower than ordinary fiberglass; Got higher pressure drop than ordinary fiberglass
HMU超高效过滤器 HMU Mini-pleat ULPA Panel Filter	PTFE	<0.001% 几乎不含硼 <0.001% (almost no boron)	效率超高, 阻力超低, 性能优越耗能超低, 与普通玻纤相比节能可超过45%抗腐蚀能力强, 适用于强酸、强碱等恶劣环境下使用滤纸强度高, 可抵抗安装或运输过程中的碰撞极低的化学气体渗透性(如: 硼、钠、钾、硅等气体)防水性高 superior performance, ultrahigh efficiency with ultra low pressure drop; Low energy consumption, saves more than 45% energy compared with ordinary glass fiber; Strong corrosion resistance, applies to harsh environments such as strong acid, strong alkali; High strength, will resist the collision in installation or transportation; Super low diffusibility towards chemical gases, such as boron, sodium, potassium, silicon; Good Water proofing property.

注: 除以上过滤器外, 还可配置其它类型过滤器
Notes: in addition to the filters above, other types of filters can be configured if needed.

化学过滤器选型 (主要去除化学性气体AMC污染物)

For chemical filters, mainly to remove chemical gases & AMC pollutants

名称 Filter Name	滤料 Filter Media	去除气体种类 Gases Types to be Removed	主要目标气体 Aiming Gases
化学过滤器 (结构请参考我司空 气过滤器样本资料) Chemical filters (the detailed structures of filters are available in our catalog)	活性炭 Activated carbon	有机气体 Organic gas	PGMEA, Toluene
	浸渍活性炭 Impregnated activated carbon	酸性气体 Acid gases	硫氧化物 (SOX), 盐酸, 氟酸, 硼酸 Sulfur oxides (SOX), hydrochloric acid, the fluorine acid, boric acid
		碱性气体 Alkaline gases	氨、胺类 Ammonia and amine

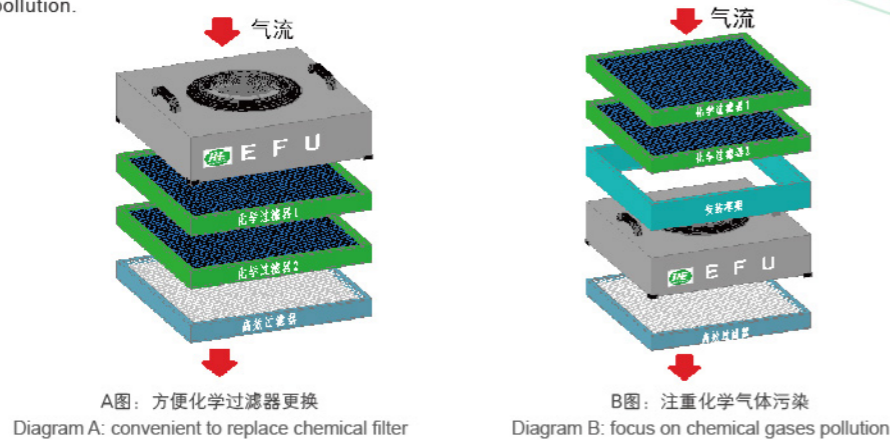
注: 祛除酸性或碱性气体时, 浸渍活性炭可和离子交换树脂可以混合使用。
Notes: when removes Acid or Alkaline gases, impregnated activated carbon can be used mixed with ion exchange resin.

过滤器配置顺序示意图

Filter configuration sequence diagram

通常情况下, 化学过滤器的更换周期要比高效过滤器短, 为方便化学过滤器的更换, 我司建议按照以下A图所示安装。但考虑到化学过滤器的气体产生情况, 注重化学气体污染时, 也可按照以下B图进行安装。

Normally, the replacement cycle of chemical filter is shorter than high efficiency filter, considering the convenience of replacement, we suggest installing according to diagram A. The alternative diagram B is optional when much more attention should be paid to chemical gases pollution.

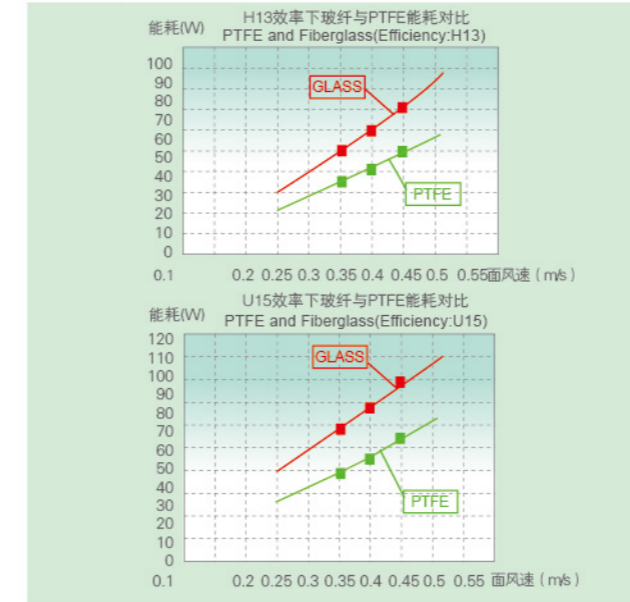


采用PTFE过滤器与玻纤过滤器能耗对比

Comparison between PTFE filter and fiberglass filter in face velocity and energy consumption

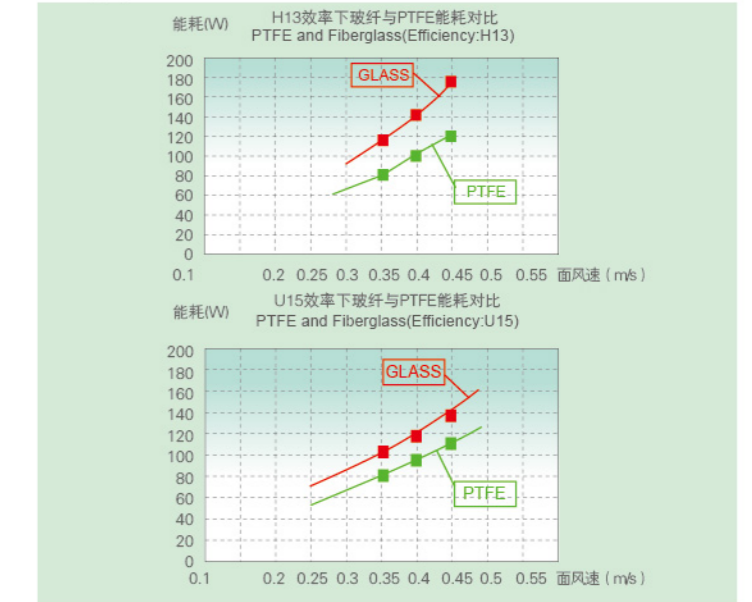
PTFE过滤器与玻纤过滤器面风速与能耗对比曲线图 (HEFIL EC FFU1175×575)

Curve graph based on HEFIL EC FFU1175×575



PTFE过滤器与玻纤过滤器面风速与能耗对比曲线图 (HEFIL EC FFU1175×1175)

Curve graph based on HEFIL EC FFU1175×1175



通过实验室测试的数据对比, 一般PTFE过滤器比玻纤过滤器节能在20%~35%。

According to the comparison of laboratory experiment, generally, the energy-saving of PTFE filter is 20%~35% more than fiberglass filter.

工程分析 / Case analysis

为充分研究玻纤过滤器与PTFE过滤器在实际工程应用中的能耗, 专门对已经使用了我司生产的HEFIL EC风机过滤单元的某光电生产企业进行了现场跟踪测试。该公司购入禾益公司2万台HEFIL EC风机过滤机组, 其中部分选用PTFE过滤器, 于2011年8月投入运行, 运行了3年后, 在2014年8月进行实际测试, 并对测试数据进行了列表分析:

For the full research of energy consumption in practical application, we have specially tracked a photoelectric production enterprise who has been using HEFIL EC. The company purchased twenty thousand pieces of HEFIL EC Units, part of the Units was equipped with PTFE filters, and put them into operation in August, 2011. After three years' operation, in August 2014, we randomly selected 10 pieces to test and made graphs for analyzing purpose.

测试条件 / Test conditions

区域 Area	百级洁净车间A Class 100 clean room A	百级洁净车间B Class 100 clean room B
FFU规格 FFU Specification	HEFIL EC FFU 1175×1175	
过滤器型号 Filter Model	HMH-1170×1170×70 (GLASS)	HMH-1170×1170×70 (PTFE)
效率等级 Filter Efficiency Classifications	H14	
抽样方式 Sampling Method	随机选取10台FFU, 分别在0.35m/s、0.40m/s、0.45m/s三档常用的面风速下测试FFU功率损耗, 并取算术平均值 Randomly select 10 pieces HEFIL EC, test the energy consumption separately under the frequently used face velocity of 0.35m/s, 0.40m/s and 0.45m/s.	

测试数据 / Test result

面风速 Face Velocity (m/s)	HEFIL EC FFU 1175×1175 (GLASS)	HEFIL EC FFU 1175×1175 (PTFE)	数据处理 The data analysis	
	功率 Power (W)	功率 Power (W)	功率差 Power difference (W)	平均节能比例 The Average Energy-Saving Rate (%)
0.45	109.7	71.2	38.5	35.1
0.40	137.5	83.6	53.9	39.2
0.35	172.8	108.2	64.6	37.4

HEFIL EC FFU规格表 / HEFIL EC FFU Specification Sheet

表一：HEFIL EC FFU规格表（玻纤过滤器） Sheet 01. Specifications with fiberglass filter

型号 Filter name	HEFIL EC FFU-HA24	HEFIL EC FFU-HA44
模组尺寸（长×宽×高） Unit Dimension (L×W×D) (mm)	1175×575×275	1175×1175×275
重量（镀锌箱体） Weight (based on Galvanized box) (Kg)	35.5	54.6
箱体材质 Material of Box	不锈钢/航空铝/镀锌 Stainless steel/Aluminum/Galvanized	
适用温度范围 Operating Temperature (°C)	-25~40	
面风速 Face Velocity (m/s)	0.45	
过滤器滤料 Filter Media	玻纤	
过滤器规格 Filter Specification (mm)	1170×570×70	1170×1170×70
过滤器效率 Filter Efficiency Classifications	99.99~99.999%@0.3	
电源 Power	220V 1-φ 50H/60H	

表二：HEFIL EC FFU规格表（PTFE过滤器） Sheet 02. Specifications with PTFE filter

型号 Model	HEFIL EC FFU-HA24	HEFIL EC FFU-HA44
模组尺寸（长×宽×高） Unit Dimension (L×W×D) (mm)	1175×575×275	1175×1175×275
重量（镀锌箱体） Weight (based on galvanized box) (kg)	33.5	52.6
箱体材质 Material of Box	不锈钢/航空铝/镀锌 Stainless steel/Aluminum/Galvanized	
适用温度范围 Operating Temperature (°C)	-25~40	
面风速 Face Velocity (m/s)	0.45	
过滤器滤料 Filter Media	PTFE	
过滤器规格 Filter Specification (mm)	1170×570×70	1170×1170×70
过滤器效率 Filter Efficiency Classifications	99.99~99.999%@0.3	
电源 Power	220V 1-φ 50H/60H	

HEFIL EC FFU性能参数表 / HEFIL EC FFU Performance Sheet

表三：HEFIL EC FFU性能参数表（1175×575 mm 面风速0.45m/s）
Sheet 03. Performance with specification 1175×575mm under face velocity 0.45m/s

型号 Model#	HEFIL EC FFU-HA24G (玻纤过滤器) HEFIL EC FFU-HA24G (fiberglass filter)						HEFIL EC FFU-HA24P (PTFE过滤器) HEFIL EC FFU-HA24P (PTFE filter)					
	0		50		100		0		50		100	
机外静压 External Static Pressure (Pa)	0											
效率 Efficiency	H13	U15	H13	U15	H13	U15	H13	U15	H13	U15	H13	U15
总压 Total Pressure (Pa)	105.0	120.0	155.0	170.0	205.0	220.0	60.0	80.0	110.0	130.0	160.0	180.0
初阻力 Initial Pressure Drop (Pa)	105.0	120.0	105.0	120.0	105.0	120.0	60.0	80.0	60.0	80.0	60.0	80.0
能耗 Energy Consumption (W)	53.0	62.5	69.2	83.0	93.0	102.0	40.2	52.0	57.0	76.0	77.0	88.0
电流 Electric Current (A)	0.25	0.29	0.32	0.382	0.429	0.478	0.199	0.253	0.293	0.351	0.377	0.420
噪音 Noise (dBA)	42.7	46.3	46.8	48.7	47.4	50.4	41.0	42.1	43.7	45.0	46.0	46.9

表四：HEFIL EC FFU性能参数表（1175×1175 mm 面风速0.45m/s）
Sheet 04. Performance with specification 1175×1175mm under face velocity 0.45m/s

型号 Model#	HEFIL EC FFU-HA44G (玻纤过滤器) HEFIL EC FFU-HA24G (fiberglass filter)						HEFIL EC FFU-HA44P (PTFE过滤器) HEFIL EC FFU-HA24P (PTFE filter)					
	0		50		100		0		50		100	
机外静压 External Static Pressure (Pa)	0											
效率 Efficiency	H13	U15	H13	U15	H13	U15	H13	U15	H13	U15	H13	U15
总压 Total Pressure (Pa)	105.0	120.0	155.0	170.0	205.0	220.0	60.0	80.0	110.0	130.0	160.0	180.0
初阻力 Initial Pressure Drop (Pa)	105.0	120.0	105.0	120.0	105.0	120.0	60.0	80.0	60.0	80.0	60.0	80.0
能耗 Energy Consumption (W)	100.0	109.0	135.0	140.0	168.0	190.0	95.0	105.0	111.0	118.0	148.0	166
电流 Electric Current (A)	0.461	0.504	0.621	0.638	0.744	0.864	0.438	0.484	0.511	0.540	0.680	0.760
噪音 Noise (dBA)	46.3	46.5	49.7	50.4	51.5	52.4	47.2	47.7	49.6	49.7	50.5	51.2

注：以上数据均在HEFIL实验室测试：表三数据基于使用EBM355风机，表四数据基于EBM400风机。

Note: The above data are tested in HEFIL laboratory. Sheet 03 is based on using EBM355, and sheet 04 EBM400 motor

HEFIL EC FFU优势 / HEFIL EC FFU Advantages

电流逐放功能，有效保护电网系统

Current gradually-release function , protect the network system effectively

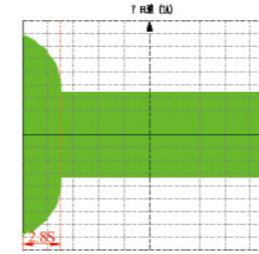


图1 普通AC FFU启动电流示意图

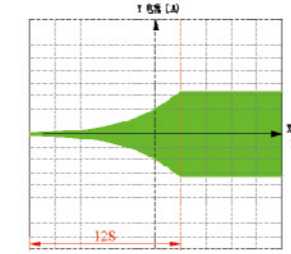


图2 HEFIL EC FFU启动电流示意图

图1是普通AC及国内部分直流系统FFU的启动电流示意图，启动后的2.8秒内产生非常大的冲击电流，约是正常运行电流的3.5倍。对电网和电力开关系统造成很大的冲击。Diagram 1 is the ordinary AC and parts of domestic FFU AC system. Within 2.8 seconds from setup, a very large impulse current will be generated, about 3.5 times larger than normal current, causing great impact on power and power network.

HEFIL的EC FFU采用德国原装进口电机（EBM），具备电流逐放功能。FFU启动后12秒内电流逐渐增大，最后达到运行电流。有效地保护了电网和开关系统，如图2所示。HEFIL EC FFU adopts Germany imported EBM motor under original packing, the current gradually-release function of it makes the current largen gradually within 12 seconds after setup until reach the operation current, effectively protecting the network and switching systems, eg diagram 2.

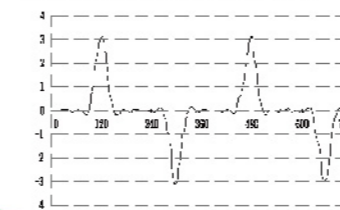
HEFIL的EC FFU还具备软刹车软启动功能，如图3所示。开始时风机处于反向965转（250Pa机外压力）。电源接通后，风机进入软刹车程序，经过4.3秒，反向电流被吸收，转速降至反向38转，实现转速的软着陆。随后进入软启动程序，12.1秒后风机转速缓慢提升至正向1612转，达到正常运转状态。

HEFIL EC FFU also have soft booting function, eg diagram 3. At the beginning, the fan is at reverse 965 RPM (external pressure:250Pa). Connected to power, the fan comes into soft brake procedure, after 4.3 seconds, the reverse current is absorbed and reduces to 38 RPM, realizing soft landing of rotating speed. Soon afterwards, soft booting starts, after 12.1 seconds, the rotating speed slowly increases to 1612 RPM, achieving normal operation state at last.

PFC主动滤波系统 / PFC Active Filtering System

谐波电流损耗数据表与对比图

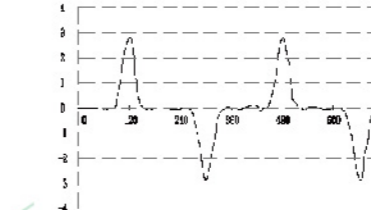
Harmonic current loss comparison.



无滤波系统电网电压波形图，由上图可以看出，没有滤波系统电网中的波形畸变严重。

Network voltage oscillogram-no filtering system

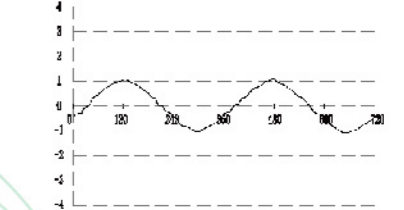
From oscillogram, no-filtering system produces serious wave distortion.



普通滤波系统下电网电压波形图，普通FFU被动滤波系统只是将电网中的波形震动去除，波形的大体畸变没有改变，效率约为60%

Network-voltage oscillogram-ordinary filtering system

Ordinary filtering system is passive, aiming at removing waveform agitation, the general waveform distortion will not be changed much (60% at most).



HEFIL滤波系统下电网电压波形图，HEFIL的EC FFU主动滤波系统将电网波形重新计算，使其波形逼近标准正弦波，转化效率高达99%。

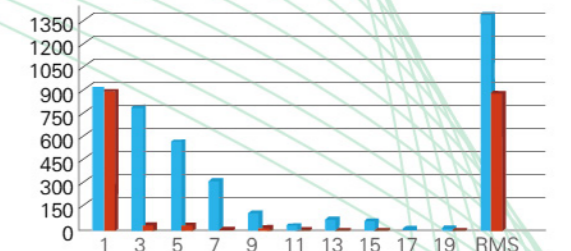
HEFIL filtering system network voltage oscillogram HEFIL EC FFU active filtering system recalculate network waveforms to make it close to normal sine wave, transform efficiency reaches up to 99%.

谐波电流损耗数据表与对比图
Harmonic current loss comparison.

谐波次数	无滤波系统	被动滤波系统	主动滤波系统
1	100%	100%	100%
3	87%	82%	5%
5	63%	54%	4%
7	33%	28%	1%
9	11%	11%	3%
11	5%	4%	1%
13	8%	1%	1%
15	7%	2%	1%
17	3%	3%	0%
19	1%	2%	1%

除第一次谐波外，其他所有奇数次谐波都会造成能量损耗，HEFIL EC FFU 的主动滤波系统能将这些损耗降到最低。In addition to the first harmonic, rest of others oddharmonics will be caused energy loss.HEFIL EC FFU active filtering system reduce the loss to minimum.

电流 (mA)



如上图所示，蓝色柱体电网中表示无滤波系统时的电流波形畸变，而经过有主动滤波系统的HEFIL EC FFU过滤后的畸变接近于0，从而将能耗降到最低。

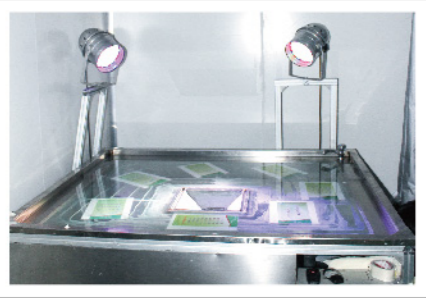
As shown in the chart, the blue bar is showing current waveform agitation of no-filtering system, very serious, however, after going through HEFIL EC FFU active filtering system, it reduces to nearly zero, making the energy loss down to the minimum.

风机过滤单元机组检测流程图

EFU · FFU Testing Process

过滤器检测 / HEPA/ULPA Testing

出厂前进行100%检漏测试 100% ex-factory leakage testing.



检测箱体尺寸 / Dimensions Testing



检测马达接线 / Motor Wiring Testing



检测调速器接线 / Governor Wiring Testing



检测产品划伤 / Product Scratch Testing



检测马达运转 / Motor Running Testing



通电测试 / Power-on Testing



测试电参数 / Electric Parameter Testing



1. 电压 1.Voltage
2. 电流 2.Current
3. 功率 3.Power

测试风参数 / Wind Parameters Testing



1. 风速 1.Speed
2. 风速均匀度 2.Speed Evenness

测试静压参数 / Static Pressure Parameters Testing

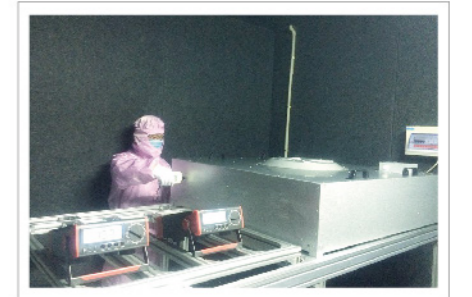


1. 过滤器压损 1.Pressure loss of the filter
2. 机箱外静压 2.External Static pressure

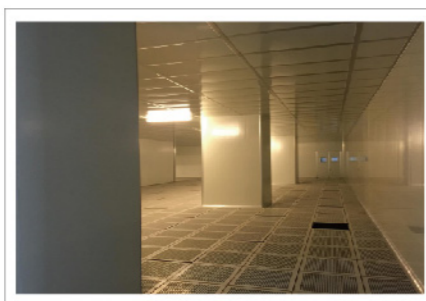
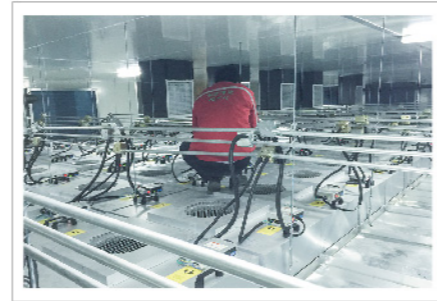
震动测试 / Vibration Testing



噪音测试 / Noise Testing



部分客户现场案例 Customer Cases



售后服务 After-sales Service



售后服务网络

目前在中国设立32个销售服务办事处，一对一服务国内市场代理分销商覆盖全国各地，以便稳定直接服务分销地区拥有经验丰富的技术支持团队，提供专业的技术咨询和服务第一时间快速高效回应客户问题，满足客户合理需求

After-sales Service Network

32 sales and service offices in China, realizing one-to-one service in domestic market. Distributors and agents covers all over the country, providing stable and direct service to each area. Specialized and experienced technical team will provide professional advisory service. Timely response will meet any reasonable requirement from customers.

售后服务承诺 & 质量承诺

Quality Commitment & After-sales Service Commitment

质量承诺书

质量要求技术标准、供方对质量负责的条件和期限：按国家相关标准及客户要求标准。过滤器等消耗品通常按使用寿命定期更换。

质量保证：
外购品质异议：货到后开箱检查外观品质，确认过滤器外观完好无损再签收(如有过滤器外观损坏，承诺于4个工作日内免费更换)。
内部品质异议：如对产品内部性能(效率、阻力、风量等)有异议请于收货后两个月内以书面形式提出异议，如确属过滤器本身品质问题(如：现场安装方式合理，过滤器外观完好无损，但效率测试不达标)，承诺于问题发生起3个工作日内安排技术人员上门确认处理，如证实过滤器内部性能不达标，承诺于5个工作日内免费更换不合格过滤器并承担由此给客户造成的经济损失。

售后服务承诺书

售后服务承诺：
1、服务宗旨：快速、准确、准确、周到、细致
2、服务目标：客户满意度
3、服务效率：保修期内维修材料如设备故障，供方在接到通知后，维修人员24小时内可到达现场并处理。
4、服务原则：产品质保期为十二个月，在质保期内供方提供免费维修和更换属质量问题造成内部性能损坏，质保期内的外购品质问题，由客户人为因素造成的损坏，供方维修或提供配件按成本价计。

Quality Commitment

Quality control and technical standard are based on national standard and customers' requirement. For filters and other consumables, the storage time is one year at ambient temperature and moisture.

Quality Objective:
Buyers are supposed to inspect and sign off that the appearance of products are in good condition. In case any appearance damage occur, HEFIL will replace free of charge within four working days.

Internal Quality Objection:
Any objection on internal performance of product, such as filter efficiency, pressure drop, air flow, etc., please put forward in writing within one month after receiving. If problems do come from the filter itself, that is, installation is conformed to reasonable method and there is no artificial damage on the appearance, but the efficiency testing still fail, HEFIL will arrange technician within three working days to handle and retesting. If confirmed unqualified product within the HEFIL's warranty period, HEFIL will bear the economic loss caused to the customers.

AFTER-SALES SERVICE COMMITMENT

We hereby commitment:

- Service tenet:** quick, decisive, accurate, thoughtful and thorough
- Service target:** customers' satisfaction of service quality
- Service efficiency:** In case any equipment malfunction, no matter under warranty or after, our maintenance crews will arrive the scene within 24 hours.
- Service principle:** for the products in storage, has not yet been used, the warranty is 12 months. Under warranty, if any performance and appearance damage, we will repair or replace free of charge. But in case they are out-of-warranty period or the damage caused by the buyer's side, any maintenance repair or replacement will be at buyer's cost.