

专注、专业，引领行业新发展.....
Special, Professional, Lead the industry new development ...



SPL-S 系列蒸发式冷凝器

SPL-S SERIES EVAPORATIVE CONDENSER

☑ SPL-S SERIES 系列



宝丰传热
SPL COMPANY

专注
专业
引领行业新发展

Special
Professional
Lead the industry new development

公司使命

专注传热领域，持续创新，提升人类绿色生活。

Duty

Devote to heat transfer
Rely to continuous innovation
Ascend to green life

企业愿景

专注于传热领域，持续改进，优质服务，聚焦成为传热领域领先的品牌供应商，为人类绿色生活做出贡献。

Vision

Focus on the field of heat transfer,
Sustainable Innovation, Best service,
Become a leading manufacturer of heat transfer,
Contribute to the human green life.

荣誉值得衬托 Reputation follows naturally real distinction



专注 实现多方共赢

专注于传热设备的研发、设计、制造、销售及工程项目服务；
与上海交通大学、华南理工大学、上海海洋大学、华东理工大学、哈尔滨商业大学、浙江商业职业技术学院，建立了紧密协作关系；
国家发明专利 1 项，实用新型专利 22 项；是华南理工大学的传热强化与过程节能技术科研基地；
参与制定上海地方标准 6 项：《蒸发式冷凝器能效限定值及能效等级》、《冷库单位产品耗电量限定值及能源效率等级》、《企业能源管理标准体系》、《氨冷库安全生产规范》、《闭式冷却塔能效标准》、《挤拉截工艺成型轴流风机能效限定值和节能评价价值》；
参与全国制冷标准化技术委员会《远置式机械通风蒸发式制冷剂冷凝器试验室试验方法》的行业标准制定。

Special Achieve multi-win-win

Focus on the development, design, manufacturing, sales and project services of heat transfer equipment;
Establish close cooperative relations with Shanghai Jiao tong University, South China University of Technology, Shanghai Ocean University, South China University of Technology and Harbin University of Commerce;
Owns one national invention patent and 22 utility model patents;
Be the technology and research base of South China University of Technology in enhanced heat transfer and energy-saving;
Participate in the formulation of 6 local standards as:
"Evaporative condensers energy efficiency limit value and energy efficiency rating"
"Cold storage power consumption per unit limited value and energy efficiency rating"
"Enterprise energy management standard system"
"Ammonia cold storage production safety norms"
"Closed cooling tower energy efficiency standards"
"pulsation molding process axial fan energy efficiency and energy-saving evaluation limit values"
Participation in the standard "Far-mounted mechanical ventilation evaporative refrigerant condenser laboratory test methods" formulation for National Refrigeration Standardization Technical Committee.

专业 值得托付

拥有一批几十年专业经验的优秀研发人才及制造人才；
拥有国内外先进的全自动直管对接焊机、无对接高频焊接管线、钣金数控加工中心、全自动管板氩弧焊、蒸发式冷凝器与闭式冷却塔热性能指标测试平台等生产、检测设备。

通过GB/T19001-2008/ISO9001:2008质量管理体系认证；
GB/T24001-2004/ISO14001:2004环境管理体系认证；
GB/T28001-2011/OHSAS18001:2007职业健康安全管理体系认证。
获得D1、D2级压力容器设计及制造许可证
取得了GC2级压力管道安装资质；
上海市高新技术企业；
上海市技术发明奖二等奖；
上海市科技进步奖三等奖；
上海市节能协会理事单位；
上海科技企业联合会理事单位；
上海市科技成果转化促进会会员单位。

Professional Trusted

Own a number of excellent R&D and manufacturing personnel with decades of experience;
Own a number of product and testing equipment such as advanced automatic welding center and impact testing machine etc.
Own the most advanced automated pipe product line
Own D1, D2 Pressure vessel Design and Manufacture license
Acquire ISO9001-2008 quality management system certification
Achieve GC2 pressure pipe installation qualification
GB/T19001-2008/ISO9001:2008Quality management system certificate;
GB/T24001-2004/ISO14001:2004 Environmental management system certificate;
GB/T28001-2011/OHSAS18001:2007Certificate of conformity of occupational health and safety management system certificate.
Shanghai Science and Technology Invention second prize
Shanghai Science and Technology Progress third prize
Shanghai Energy Conservation Association Member
Shanghai Science and Technology Enterprises Association governing member
Shanghai Association for the Advancement of Science and Technology Achievements Transformation member

引领行业新发展

国内首例中海油天然气蒸发式冷却装置项目；
国内首例西部矿业二氧化硫冷凝回收装置项目；
国内首例鑫富生化乙酸乙酯冷凝装置项目；

Leading the industry new development

The first case of CNNOC Natural gas evaporative cooling device project
The first case of Western Mining SO₂ condensate recovery device project
The first case of Xin Fu biochemical ethyl condensing device project

测试平台 The test platform



SPL 系列蒸发式冷凝器 SPL Series Evaporative Condenser

上海宝丰机械制造有限公司在本公司内建立不同形式的蒸发式冷凝器测试平台。
Shanghai Baofeng machinery manufacturing Co., Ltd. established different forms of evaporative condenser test platform in the company.



SPL 系列闭式冷却塔 SPL Series Closed Cooling Tower

上海宝丰机械制造有限公司在上海华东理工大学建立不同管形式闭式冷却塔测试平台。
Shanghai Baofeng machinery manufacturing Co., Ltd. established different forms of closed cooling tower test platform in Shanghai East China University of Technology.



上海市高新技术企业
Shanghai City high-tech
Technology enterprise



中国石化一级
供应网络成员单位
Sinopec level
Supply network
member units



美国 CTI 冷却塔
学会团体会员
The United States of
America CTI cooling tower
Institute of group members



上海科技企业
联合会理事单位
Shanghai Municipal Science
and technology achievement
transformation of group
members



上海市质量
协会团体会员
The quality of
Shanghai City
Association of group
members



上海市制冷
学会团体会员
Shanghai City
Refrigeration
Institute of group
members



上海市节能
协会团体会员
Shanghai energy
conservation
Association of group
members



中国国家
知识产权局
Chinese national
Intellectual Property
Office



产品概述 PRODUCT OVERVIEW

■ 产品简介

Product introduction

该设备是按最优化的换热机理设计，并利用管外表的水膜蒸发，通过传质、传热使管内工质降温冷凝，同时设置冷却设备，与水冷式冷凝器相比平均流速提高 15% ~ 18% 左右。整体性能提高 25%，设备体积缩小，配置动力降低，制冷装置能耗以及运行费用均大幅减少。

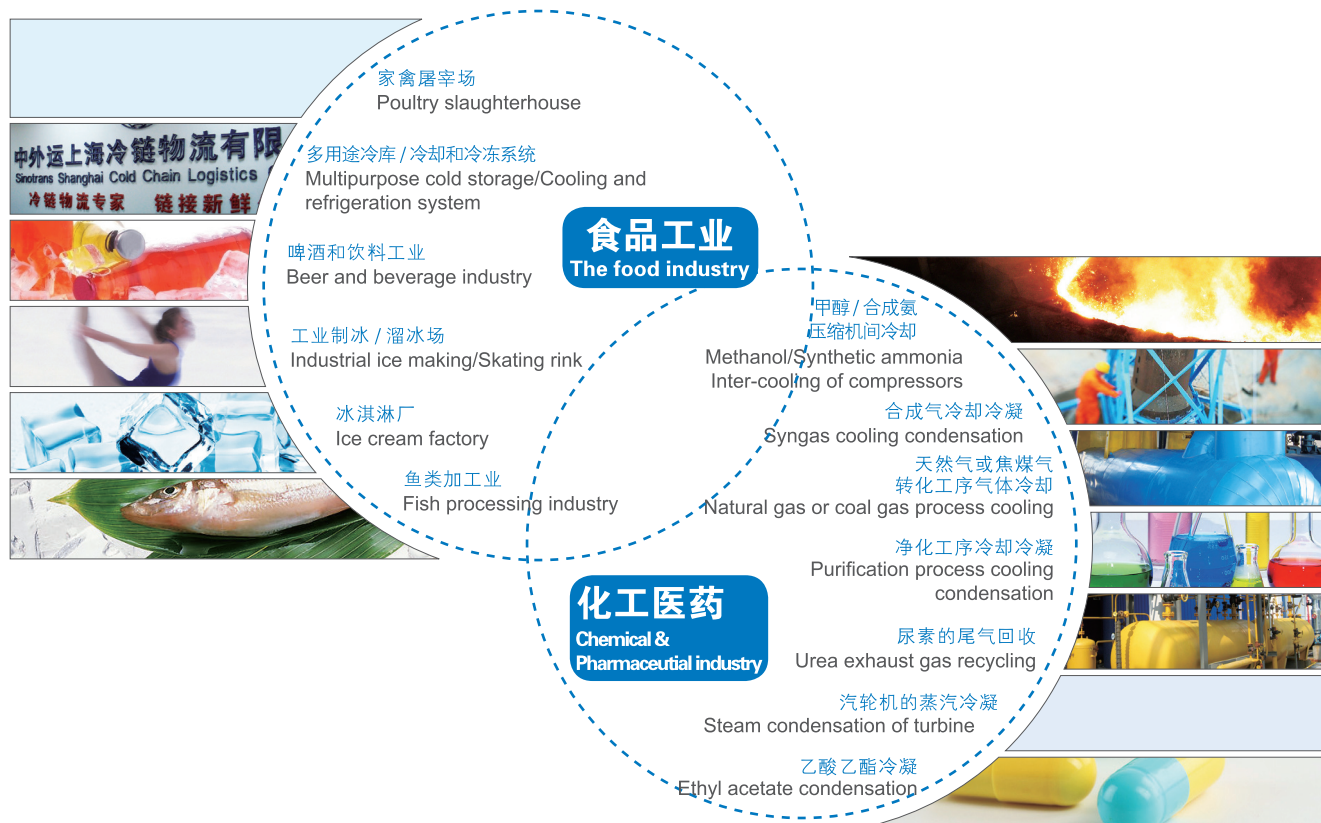
This equipment is designed on the basis of the optimization of heat transfer mechanism. The medium is condensed by the heat and mass transferred via the evaporation of water film on the tube outer surface, meanwhile set cooling equipment, compared to water cooling condenser, the average flow rate increases 15%~18% and the whole performance increases 25%. The equipment is smaller, power requirements is lower, both the refrigerating equipments energy consumption and operation cost are substantially reduced.

■ 应用领域

Application field

SPL 系列产品广泛应用于能源化工、医药、煤炭、电力、工业制冷、啤酒、饮料、食品的低温加工、冷藏、建筑空调制冷等领域。

SPL series products are widely applied in energy chemical industry, pharmaceutical industry, coal, electricity, industrial refrigeration, beer, beverage, food processing, cold storage, and the building air conditioning, etc.



■ 自主知识产权汇集 9 项专利及 1 项发明专利

Independent intellectual property rights, bring together nine patents and one invention patent.

ZL 2008 2 0153159.7	ZL 2011 2 0494237.1	ZL 2008 2 0153161.4
ZL 2008 2 0153160.X	ZL 2012 2 0614941.0	ZL 2008 2 0153163.3
ZL 2008 2 0153164.8	ZL 2008 2 0153162.9	ZL 2013 2 0300080.3

■ 工作原理

Operating principle

SPL 系列蒸发式冷凝器是在吸收国外最先进的热交换技术上加以更新改进，研制开发的一种高效换热设备。

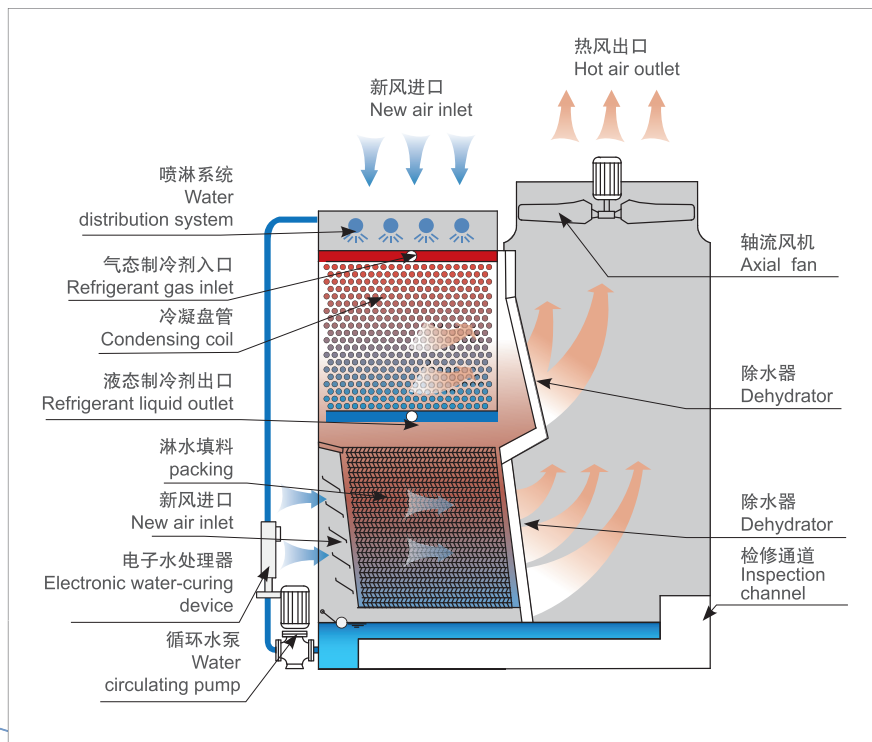
SPL 系列蒸发式冷凝器以水和空气为冷却介质，与盘管内的高温气态制冷剂进行热交换，制冷剂由气态冷凝成液态。内部设水分配系统、冷凝盘管组、填料热交换层、除水器等。外部设循环水泵、电子水除垢仪、盘管侧面顶部设轴流风机。在轴流风机的作用下，内部成负压状态。工作时，冷却水经水分配系统，在强劲的风力下均匀地完全覆盖在盘管表面，高温气态制冷剂从盘管上部进入，被冷凝的液态制冷剂

从盘管底部流出，在该过程中，高温制冷剂与盘管外的水、空气进行热交换，再借助风势，换热效果显著提高。冷却水和空气吸热后温度急剧升高，部分冷却水气化形成水蒸气，蒸发带走大量的热量由风机吸走排入大气，同时，热空气中的水分被除水器截止集水池中，没有被气化的高温冷却水流入填料热交换层被流经的空气带走热量使其冷却，经充分冷却后的冷却水流回集水池中供循环泵重新送入水分配系统继续循环工作。散失到大气中的水分由集水池内的浮球阀控制水位，给予及时补充。



SPL series evaporative condenser is a high efficient heat exchange equipment on the basis of absorbing and developing the heat exchange technology abroad.

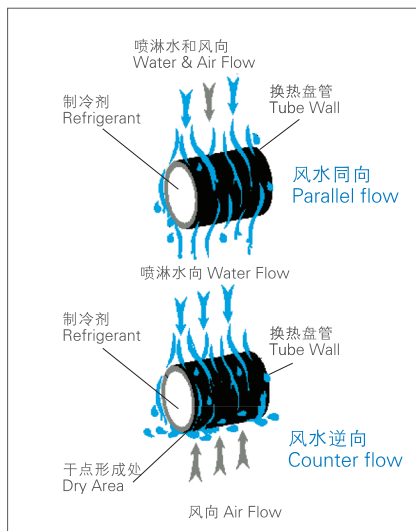
SPL series evaporative condenser makes use of water and air as cooling medium. The medium exchanges heat with the refrigerant gas in the coil, then the gas is condensed into liquid. The equipment internal consists of water distribution system, condensing coil, heat exchange packing and dehydrator, outside it sets up water circulating pump, electronic water-curing device, and axial fan. The internal operating pressure is negative due to the axial fan working. When operating, under strong blowing, the cooling water is sprayed fully on the coils' surface via water distribution system. Meanwhile, the refrigerant gas enters the upper inlet of coil, then the condensed liquid is discharged from the lower outlet. During this process, the heat exchange among the refrigerant, water and air, plus the fan blowing, makes the efficiency significantly improved. By absorbing the heat, the temperature of cooling water and air increases rapidly, some of water vapors into steam, deflated and exhausted by the fan, the evaporation takes away large amount of heat. Meanwhile, the steam in the hot air is collected into reservoir, the water not gasified flows down to reservoir and pumped into the circulating system. The reservoir water level is automatically controlled by the float ball valve to make up the water escaped into the atmosphere.





产品特点

PRODUCT FEATURES



■ 热交换性能卓越

Excellent heat exchange performance

SPL 系列产品运用了风水同向二次热交换的盘管与 PVC 填料组合技术，实现了高效换热。冷凝盘管是无焊缝的光管制作，最大程度减少泄漏点。

由于空气和喷淋水同向流经盘管，喷淋水能最大程度地覆盖在盘管表面，保证盘管外表面完全湿润。相比风水逆向的结构，大大减少了盘管壁上干点和结垢的形成。

SPL series products adopt the technology of the combination of twice heat exchange coil and PVC packing, to achieve high efficiency heat exchange. The condensing coil is made of seamless tube, to minimize the leakage point.

Because of the same direction of airflow and water flow, the spray water can cover the surface of coils furthest and keeps the surface completely wet. Compared with the reverse direction of water flow and airflow, this structure can reduce greatly the dry spot and scaling.

■ 方便清洗的倾斜式集水池

Slope basin with convenient cleanout

集水池底部向排污口端倾斜的结构设计，可方便的排放集水池的污水及沉淀杂质。

The slope of basin bottom to drain pipe can clean out the sewage and impurity conveniently.



■ 运输安装方便

Convenient transportation and installation

SPL 产品采用上、下箱体标准组件运输到现场组装的方式，大大方便产品的运输及安装。

SPL series products are assembled by the lower and upper main units on site, which makes the transportation and installation more convenient.

■ 故障率低

Low fault rate

轴流通风机和水泵均采用优质轴承，除此之外无其他运转磨损部件，噪音低，故障率少。

Both axial fan and water pump adopt high quality bearing which is the only wear part. The directly coupled structure of the axial fan has the advantages of low noise and low fault rate.

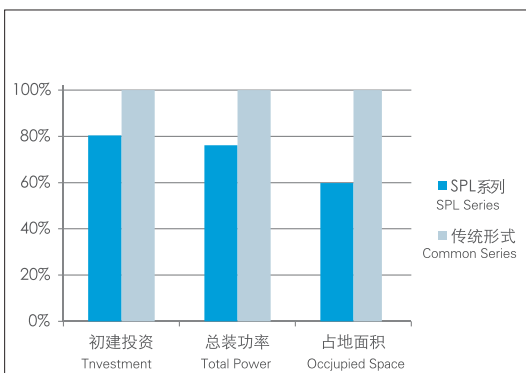
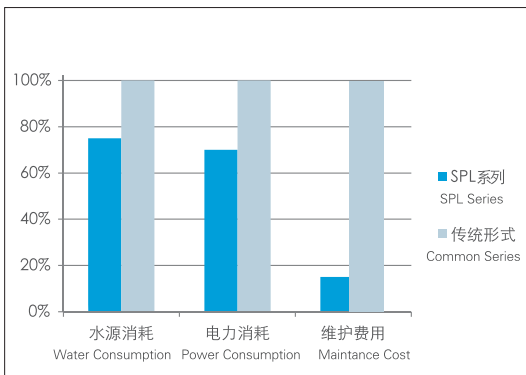
■ 盘管无对接缝

Coil without seam

冷凝器换热盘管由优质的 08AL 钢或不锈钢制成，无对接缝，最大程度减少泄漏点，减少了管壁氧化层的产生，特别适用于氢氟烃类（R22）及氢氟烃类（R134A）对制冷系统洁净度的高要求。

Condenser coils are made from high quality 08AL or SS steel without seam. The new process help minimize leakage points and reduce the oxide layer. It meets the high cleanliness requirements in R22 and R134a refrigerating system.





■ 检修方便

Convenient maintenance

采用人性化结构设计，超大检修门、内部空间宽敞，检修人员在产品内部能轻松地进行各种检修工作。

With large access door and sufficient inner room, maintainers can conveniently examine and repair the equipment inside it.

■ 运行成本低, 节能环保

Low operating cost and energy consumption

由于本产品独特的结构形式，及其特有的高热工性能，所以冷凝温度低，运行节水、节电、低噪音、不污染环境等优点，是真正的节能环保型产品。

Because of the unique structure, SPL series products have the advantages of high thermal technology performance low condensing temperature, low water and power consumption, low noises and low maintenance cost. It is the real energy-saved and environment protected product.

■ 实现不停机检修

Maintenance without downtime

SPL 产品可在不停机的情况下对浮球阀、滤网进行检修。由于产品采用风水同向设计结构，在设备运行时能方便地检修喷嘴。

The float valve and filter of SPL series products can be examined and repaired without stopping the operation of the machine. Because of the same direction of airflow and water flow it is very convenient to examine and repair nozzles and coils when the machine is running.

■ 占地面积少、投资少

Small occupied space and low whole investment

SPL 产品集冷凝盘管组、循环水泵、轴流通风机、集水盘和连接水管为一体。无需另添置设备即可投入正常运行。具有占地面积小，综合投资低等优点。

SPL series products combine traditional condenser, cooling tower, circulating water pump, basin and connected pipes together. They have the advantages of small floor space and low investment.



品质可靠的构造 (零部件)

HIGH QUALITY PARTS

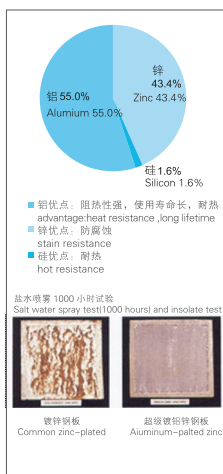


■ 直联式轴流风机

Direct-coupled axial fan

SPL 通风系统采用冷却塔专用轴流风机。前倾式风叶、流线型入口风筒，风阻小、风量大、性能佳、效率高。并采用全封闭自冷式低噪声专用电机。具有体积小、重量轻、启动性能佳、运行可靠、经久耐用等优点。

The ventilating system of SPL adopts dedicated axial fan for cooling tower with forward curved blades, streamlined entrance duct, low wind resistance, high blowing rate, good performance and high efficiency. The motor is closed and self cooling. It has the advantages of small size, light weight, good start ability, reliable operation, long lifetime and so on.



■ 采用镀铝锌钢板

Galvalume plate

SPL 产品外壳采用镀铝锌板或含锌量更高的镀锌板，它是当今耐腐蚀能力最强的板材之一，使用寿命是普通镀锌钢板的 3~6 倍，并且具有阻热性强、耐热性高、外表美观等优点。

The outer shell of SPL series products are all made of imported galvalume plate, or a higher degree of zinc galvanized sheet, with the best corrosion resistance. Its lifetime is 3 to 6 times of common ones. It has the advantages of high thermal resistance and aesthetic appearance.

■ 氮气封堵

Nitrogen filling

出厂前盘管组均经氮气封堵，减小管壁氧化层的产生，保证了冷凝盘管内的洁净度。

The coils were made nitrogen-fill protection before delivery, reducing the wall oxide layer produced to ensure the cleanliness of the condenser coil inside.

■ 配置电子水处理器

Electronic water-curing device

配置电子水处理器，其利用电子脉冲技术对循环水进行防垢除污、杀菌灭藻的处理。只需要接通 220V 电源即可对循环水水质进行处理，有效地避免了在盘管壁上结垢的可能。

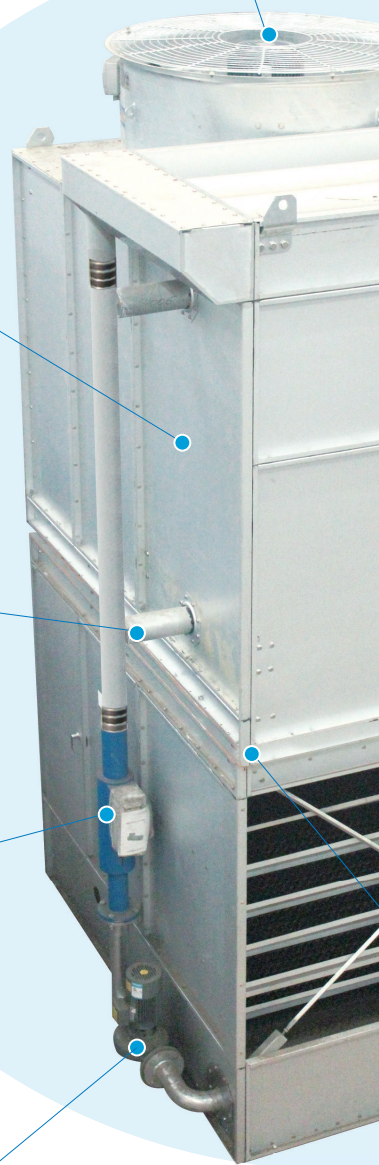
The electronic water-curing device is very advanced and works under 220V power supply. It can help the condenser to antiscaling, descaling, sterilize and eliminate algae, activating the circular cooling water.

■ 循环泵 (电机西门子)

Water circulating pump (Siemens motor)

循环泵采用不受转向限制的优质机械密封，无泄漏、寿命长。并选用户外型西门子专用电机，配置优质的轴承保证泵长期可靠运行，具有小功率，大流量，低噪音，性能优异等特点。

It is sealed by good machinery without any leakage. It adopts Siemens dedicated outdoor motor. And the imported bearing with special collocation can ensure the pump a long time steadily run. It has the advantages of low operating power, large discharge, low noises and excellent performance, etc.



■ 冷凝盘管组

Condensing coils

冷凝盘管由优质钢管制成，设计压力为 2.0MPa，盘管单组、整体组装及整体热浸锌后均在水中经 2.5MPa 的气密性试验以确保无泄漏。整体热浸锌处理，增强了盘管防腐能力，延长了使用寿命。

The condensing coils are made of high-quality steel pipes. The design pressure is 2.0 Mpa. All the coils have been tested at 2.5Mpa to avoid leakage. Integral hot-dip zinc treatment, The coils are galvanized to avoid being rotten.



■ 先进的水分配系统 (专利号: ZL201120494237.1)

Advanced water distribution system (Patent No. ZL201120494237.1)

SPL 产品冷却水喷淋系统采用大流量防堵塞的提篮式喷嘴，布水连续均匀，在引风的作用下，使得水膜完全覆盖盘管表面。使水、空气与制冷剂能充分进行热交换，从而提高了传热效率。

SPL cooling water spray system adopts large discharge and anti-blockage nozzles, which can ensure the cooling water furthest contact the condensing coil and hence overcome the fouling and promote the moisture to vaporize, thus improve the effect of heat transfer.



■ 可靠的紧固元件

Reliable fixing element

SPL 产品的箱体采用特克罗螺栓做连接，其耐腐蚀性是普通连接螺栓所无法比拟的，也给蒸发式冷凝器的长期稳定工作带来有效保障。

The cabinets of SPL production adopt dacromet bolt to connect. The inoxidability is more perfect than normal. Meanwhile it assures condenser's steadily working for a long time.

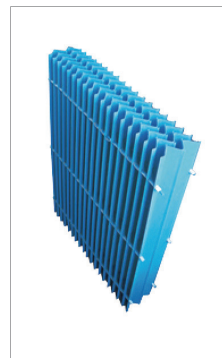


■ 可拆式除水器 (专利号: ZL 200820153162.9)

Removable dehydrator (Patent No. ZL200820153162.9)

SPL 产品独创的可拆式除水器采用耐腐蚀 PVC 材料，其结构通过改变气流流向，能有效去除从盘管中出来的湿空气水分，使水的飘逸率降到最低。可拆式的结构，可以方便对填料的清洗或更换。

The dehydrator for SPL series products is made of specially designed non-corroding PVC material. The special structure can get rid of the air moisture coming out from the coil pipe in order to change the air current. The structure of the detachable, clean or replace can be convenient.



■ PVC 填料热交换层 (专利号: ZL 200820153161.4)

PVC packing heat exchange layer (Patent No. ZL200820153161.4)

特殊设计的 PVC 蜂窝式横流填料，捷径的横进风结构，使空气能迅速带走水中的热量，独特的填料流道，使水流在填料表面能形成大面积的流动水膜，延长了水在填料里的冷却时间，提高了水冷却效果。具有风阻系数小、抗老化、不易变形等优点。

SPL series products adopt PVC honeycomb type packing. The short horizontal air-inlet design can help the cool air take away the heat of water immediately. Special packing channel can make water change to float water film. It will prolong the time of the water staying in pipe and it will have good heat exchanging effect. And it has the advantages of aging resistance, deforming resistance and low wind resistance coefficient, etc.

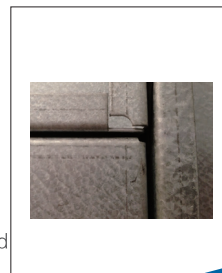


■ 新箱体板冲角排水口 (专利号: ZL 201320300080.3)

New type of wallboard drainage (Patent No. ZL201320300080.3)

SPL 产品的箱体拼接处，设置排水口，能及时排除箱体折弯处淤积的雨水等，从而减小结水对连接处的螺栓及墙板带来的腐蚀，减少了对设备整体密封性及设备外观的影响，延长了设备的整体使用寿命。

The new drainage hole at wallboard bent corner is designed to discharge the rainwater, reduce bolts and wallboard corrosion, make less effect on the seal and whole appearance, and extend the service life.





选型方法及校正系数表

SELECTION METHOD AND CORRECTION COEFFICIENT TABLE

■ 选型方法指导 Selection guide

1. 确认使用条件: 制冷剂、冷凝温度、湿球温度;
2. 计算系统排向冷凝器的总排热量;
3. 查表 1 或表 2, 选择排热量校正系数;
4. 总排热量乘以校正系数即为使用工况下的冷凝负荷;
5. 查表 3~18 选型, 选择其排热量大于或等于校正后的排热量数据。

1. Confirm the operating condition:
Refrigerant, condensing temperature, wet bulb temperature
2. Calculate the total heat rejection discharged by the system to the condenser.
3. Look up table 1 or 2 to choose the heat rejection correction coefficient.
4. The total heat rejection multiplies the correction coefficient equals the condensing load of operation.
5. Look up table 3~18 to select model, the heat rejection of selected model should not less than the corrected heat rejection.

■ 选型方法注意事项 Selection Notes

1. 表3~表18规格中的数据仅供参考, 如有修改不另行通知;
2. 充注量是标准工况运行下氨 (NH₃) 的充注量, 其他制冷剂的充注量可与技术部联系。
3. 表中的运行重量为设备重量加制冷剂量及底部水盘贮水的重量;
4. 用户非标准特殊要求, 可代为用户设计制造;
5. 表中的名义工况排热量是指冷凝温度 $T_k=36^{\circ}\text{C}$, 空气进口湿球温度 $T_s=26^{\circ}\text{C}$ 时的数据。

■ 举例 For instance

1. 使用条件: 氨、冷凝温度 36°C 、湿球温度 29°C ;
2. 制冷系统总排热量为 940KW。(压缩机制冷量 + 压缩机轴功率 = 总排热量);
3. 查表 1, 排热量校正系数为 1.35;
4. 计算冷凝器的负荷功率: $940\text{KW} \times 1.35 = 1269\text{KW}$;
5. 查表 7~8, 选 SPL-1285B 型蒸发式冷凝器, 其排热量 > 1269KW;

1. Operating condition: Ammonia, condensing temperature = 36°C , wet bulb temperature = 29°C ;
2. The total heat rejection is 940kW (the refrigerate capacity of compressor + shaft power = the total heat rejection);
3. Look up table 1, the correction coefficient is 1.35;
4. Calculate the load power of condenser: $940\text{kW} \times 1.35 = 1269\text{kW}$
5. Look up table 7~8, select SPL-1285B Evaporative condenser, its heat rejection > 1269kW.

1. The value in table 3~18 is just for reference, subject to change until further notice;
2. Filling quantity here is just for NH₃ in the standard condition, Other refrigerants filling quantity. Please contact the technical department
3. The operating weight in the table equals the weight of equipment plus the refrigerant and the water in the bottom reservoir.
4. To design and manufacture for clients' special requirements;
5. The heat rejection under nominal operating condition in the table refers to the data which condensing temperature (T_k) = 36°C , air inlet wet bulb temperature (T_s) = 26°C .

a) R717 排热量校正系数表

Heat rejection correction coefficient for R717

表 1 Table 1

冷凝温度 CONDENSING TEMPERATURE	空气进口湿球温度 (°C) Air inlet wet bulb temperature																	
°C	10	12	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
29	0.72	0.78	0.86	0.96	1.01	1.09	1.18	1.30	1.43	1.60	1.84	2.16	2.66	/	/	/	/	/
30	0.68	0.73	0.81	0.88	0.94	1.00	1.07	1.15	1.27	1.40	1.59	1.79	2.13	/	/	/	/	/
31	0.64	0.68	0.74	0.82	0.86	0.91	0.97	1.04	1.12	1.22	1.36	1.52	1.74	2.06	/	/	/	/
32	0.61	0.65	0.69	0.74	0.80	0.84	0.89	0.95	1.02	1.10	1.20	1.34	1.49	1.70	2.02	/	/	/
33	0.57	0.61	0.65	0.70	0.73	0.78	0.82	0.87	0.92	0.99	1.07	1.16	1.29	1.45	1.66	1.96	/	/
34	0.55	0.58	0.62	0.66	0.69	0.72	0.76	0.80	0.85	0.90	0.96	1.04	1.14	1.27	1.42	1.63	1.90	/
35	0.52	0.54	0.58	0.62	0.64	0.67	0.70	0.73	0.78	0.83	0.88	0.94	1.02	1.11	1.23	1.37	1.59	1.85
36	0.50	0.52	0.55	0.59	0.61	0.63	0.66	0.69	0.72	0.75	0.81	0.86	0.92	1.00	1.09	1.22	1.35	1.57
37	0.47	0.49	0.52	0.55	0.57	0.59	0.61	0.64	0.67	0.70	0.73	0.79	0.84	0.90	0.97	1.06	1.21	1.33
38	0.45	0.47	0.50	0.53	0.55	0.56	0.58	0.60	0.62	0.65	0.68	0.72	0.76	0.82	0.88	0.96	1.04	1.19
39	0.43	0.45	0.47	0.50	0.52	0.53	0.54	0.56	0.58	0.61	0.63	0.67	0.70	0.74	0.80	0.86	0.95	1.04
40	0.42	0.43	0.45	0.48	0.49	0.50	0.52	0.53	0.55	0.58	0.60	0.62	0.66	0.69	0.73	0.78	0.85	0.93
41	0.40	0.41	0.43	0.45	0.46	0.47	0.49	0.50	0.52	0.54	0.56	0.58	0.61	0.64	0.67	0.71	0.76	0.83
42	0.39	0.40	0.41	0.43	0.44	0.45	0.47	0.48	0.49	0.51	0.53	0.55	0.57	0.60	0.62	0.66	0.70	0.74
43	0.37	0.38	0.39	0.41	0.42	0.43	0.44	0.45	0.46	0.48	0.50	0.51	0.53	0.55	0.58	0.61	0.65	0.69
44	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.46	0.47	0.49	0.50	0.52	0.54	0.57	0.60	0.63
45	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.46	0.47	0.49	0.51	0.53	0.56	0.58

b) R22 和 R134a 排热量校正系数表

Heat rejection correction coefficient for R22 and R134a

表 2 Table 2

冷凝温度 CONDENSING TEMPERATURE	空气进口湿球温度 (°C) Air inlet wet bulb temperature																	
°C	10	12	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
29	0.89	0.97	1.07	1.19	1.30	1.35	1.46	1.61	1.77	1.98	2.28	2.68	3.30	/	/	/	/	/
30	0.84	0.91	1.00	1.09	1.17	1.28	1.33	1.43	1.57	1.71	1.97	2.22	2.64	/	/	/	/	/
31	0.79	0.84	0.92	1.02	1.07	1.13	1.20	1.29	1.39	1.51	1.69	1.88	2.16	2.55	/	/	/	/
32	0.76	0.81	0.86	0.92	0.99	1.04	1.10	1.18	1.26	1.36	1.49	1.66	1.85	2.11	2.50	/	/	/
33	0.71	0.76	0.81	0.87	0.91	0.974	1.02	1.08	1.14	1.23	1.33	1.44	1.60	1.80	2.06	2.43	/	/
34	0.68	0.72	0.77	0.82	0.86	0.89	0.94	0.99	1.05	1.12	1.19	1.29	1.41	1.57	1.76	2.02	2.33	/
35	0.64	0.625	0.72	0.77	0.79	0.83	0.87	0.91	0.97	1.03	1.09	1.17	1.26	1.38	1.53	1.70	1.97	2.29
36	0.62	0.64	0.68	0.73	0.76	0.78	0.82	0.86	0.89	0.93	1.00	1.07	1.14	1.24	1.35	1.51	1.67	1.95
37	0.58	0.61	0.64	0.68	0.71	0.73	0.76	0.79	0.83	0.87	0.91	0.98	1.04	1.12	1.20	1.31	1.50	1.65
38	0.56	0.58	0.62	0.66	0.68	0.69	0.72	0.74	0.77	0.81	0.84	0.89	0.94	1.02	1.09	1.19	1.29	1.48
39	0.53	0.56	0.58	0.62	0.64	0.66	0.67	0.69	0.72	0.76	0.78	0.83	0.87	0.92	0.99	1.07	1.18	1.29
40	0.52	0.53	0.56	0.60	0.61	0.62	0.64	0.66	0.68	0.72	0.74	0.77	0.82	0.86	0.91	0.97	1.05	1.15
41	0.50	0.51	0.53	0.56	0.57	0.58	0.61	0.62	0.64	0.67	0.69	0.72	0.76	0.79	0.83	0.88	0.94	1.03
42	0.48	0.50	0.51	0.53	0.55	0.56	0.58	0.60	0.61	0.63	0.66	0.68	0.71	0.74	0.77	0.82	0.87	0.92
43	0.46	0.47	0.48	0.51	0.52	0.53	0.55	0.56	0.57	0.60	0.62	0.63	0.66	0.68	0.72	0.76	0.81	0.86
44	0.45	0.46	0.47	0.481	0.50	0.51	0.52	0.53	0.55	0.57	0.58	0.61	0.62	0.64	0.67	0.71	0.74	0.78
45	0.42	0.43	0.45	0.46	0.47	0.48	0.50	0.51	0.52	0.53	0.55	0.57	0.58	0.61	0.63	0.66	0.69	0.72



SPL-145S~290S 外形尺寸和技术数据

SPL-145S~290S dimensions and technical parameters

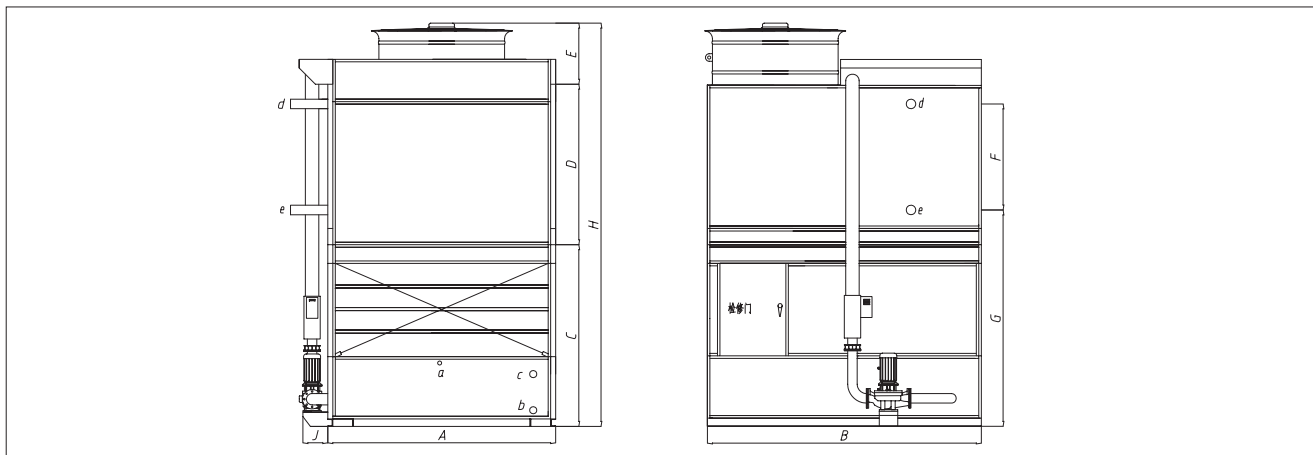


表 3 Table 3

型号 Model	名义工况排热量 Heat rejection under operating condition	轴流风机 Axial fan			循环水泵 Water circulating pump			NH ₃ 冲注量 Filling quantity	重量 Weight	
		台数 QTY	风量 Air flow	功率 Power	台数 QTY	流量 Water flow	功率 Power		运输 Transportation	运行 Operating
			m ³ /h	kW		m ³ /h	kW		kg	kg
SPL-145S	145	1	1×20000	1×0.75	1	1×28	1×0.75	17	1685	2685
SPL-155S	155	1	1×22000	1×1.1	1	1×28	1×0.75	17	1690	2690
SPL-170S	170	1	1×28000	1×1.5	1	1×28	1×0.75	17	1700	2700
SPL-195S	195	1	1×35000	1×2.2	1	1×28	1×0.75	17	1710	2710
SPL-215S	215	1	1×28000	1×1.5	1	1×28	1×0.75	25	1870	2870
SPL-235S	235	1	1×35000	1×2.2	1	1×28	1×0.75	25	1880	2880
SPL-250S	250	1	1×40000	1×3.0	1	1×28	1×0.75	25	1890	2890
SPL-270S	270	1	1×35000	1×2.2	1	1×28	1×0.75	34	2050	3050
SPL-290S	290	1	1×40000	1×3.0	1	1×28	1×0.75	34	2060	3060

表 4 Table 4

型号 Model	尺寸 Dimensions									补水管 Makeup pipe	排水管 Discharge pipe	溢流管 Overflow pipe	进气管 Gas inlet pipe	出液管 Liquid outlet pipe
	A	B	C	D	E	F	G	H	J					
	mm	mm	mm	mm	mm	mm	mm	mm	mm					
SPL-145S	1830	2210	1475	1280	460	376	2212	3215	280	DN25	DN50	DN50	DN65	DN65
SPL-155S	1830	2210	1475	1280	480	376	2212	3235	280	DN25	DN50	DN50	DN65	DN65
SPL-170S	1830	2210	1475	1280	500	376	2212	3255	280	DN25	DN50	DN50	DN65	DN65
SPL-195S	1830	2210	1475	1280	500	376	2212	3255	280	DN25	DN50	DN50	DN65	DN65
SPL-215S	1830	2210	1475	1280	500	614	1974	3255	280	DN25	DN50	DN50	DN65	DN65
SPL-235S	1830	2210	1475	1280	500	614	1974	3255	280	DN25	DN50	DN50	DN65	DN65
SPL-250S	1830	2210	1475	1280	500	614	1974	3255	280	DN25	DN50	DN50	DN65	DN65
SPL-270S	1830	2210	1475	1280	500	852	1736	3255	280	DN25	DN50	DN50	DN65	DN65
SPL-290S	1830	2210	1475	1280	500	852	1736	3255	280	DN25	DN50	DN50	DN65	DN65

SPL-300S~940S 外形尺寸和技术数据

SPL-300S~940S dimensions and technical parameters

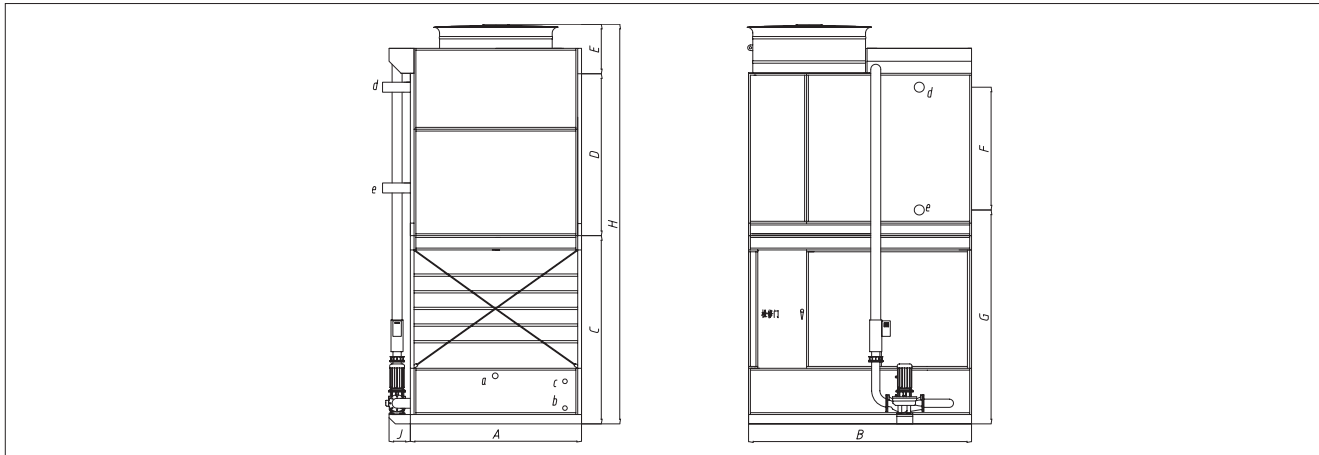


表 5 Table 5

型号 Model	名义工况排热量 Heat rejection under operating condition	轴流风机 Axial fan			循环水泵 Water circulating pump			NH ₃ 冲注量 Filling quantity	重量 Weight	
		台数 QTY	风量 Air flow	功率 Power	台数 QTY	流量 Water flow	功率 Power		运输 Transportation	运行 Operating
			m ³ /h	kW		m ³ /h	kW		kg	kg
SPL-300S	300	1	1 × 37000	1x2.2	1	1 × 28	1 × 0.75	34	2320	3660
SPL-330S	330	1	1 × 46000	1x3.0	1	1 × 28	1 × 0.75	34	2330	3670
SPL-390S	390	1	1 × 65000	1x4.0	1	1 × 28	1 × 0.75	34	2340	3680
SPL-430S	430	1	1 × 65000	1x4.0	1	1x53	1x1.1	41	2490	3830
SPL-475S	475	1	1 × 65000	1x4.0	1	1x53	1x1.1	49	2700	4050
SPL-495S	495	1	1 × 71000	1x5.5	1	1x53	1x1.1	49	2710	4060
SPL-550S	550	1	1 × 63500	1x4.0	1	1x70	1x1.5	66	3310	4980
SPL-595S	595	1	1 × 78000	1x5.5	1	1x70	1x1.5	66	3320	4990
SPL-670S	670	1	1 × 78000	1x5.5	1	1x70	1x1.5	79	3700	5380
SPL-700S	700	1	1 × 78000	1x5.5	1	1x70	1x1.5	79	3800	5890
SPL-735S	735	1	1 × 87000	1x7.5	1	1x70	1x1.5	79	3810	5900
SPL-780S	780	1	1 × 80000	1x5.5	1	1x70	1x1.5	87	4040	6200
SPL-870BS	870	1	1 × 100000	1x7.5	1	1x70	1x1.5	87	4050	6210
SPL-940S	940	1	1 × 125000	1x11	1	1x70	1x1.5	87	4060	6220

表 6 Table 6

型号 Model	尺寸 Dimensions									补水管 Makeup pipe	排水管 Discharge pipe	溢流管 Overflow pipe	进气管 Gas inlet pipe	出液管 Liquid outlet pipe
	A	B	C	D	E	F	G	H	J					
	mm	mm	mm	mm	mm	mm	mm	mm	mm	a	b	c	d	e
SPL-300S	1830	2410	2035	1280	580	852	2296	3895	280	DN25	DN50	DN50	DN65	DN65
SPL-330S	1830	2410	2035	1280	580	852	2296	3895	280	DN25	DN50	DN50	DN65	DN65
SPL-390S	1830	2410	2035	1280	530	852	2296	3845	280	DN25	DN50	DN50	DN65	DN65
SPL-430S	1830	2410	2035	1755	530	1090	2534	4320	280	DN25	DN50	DN80	DN80	DN80
SPL-475S	1830	2410	2035	1755	530	1328	2296	4320	280	DN25	DN50	DN80	DN80	DN80
SPL-495S	1830	2410	2035	1755	530	1328	2296	4320	280	DN25	DN50	DN80	DN80	DN80
SPL-550S	1930	3010	2035	1755	530	1090	2534	4320	280	DN25	DN50	DN80	DN100	DN100
SPL-595S	1930	3010	2035	1755	530	1090	2534	4320	280	DN25	DN50	DN80	DN100	DN100
SPL-670S	1930	3010	2035	1755	530	1328	2296	4320	280	DN25	DN50	DN80	DN100	DN100
SPL-700S	1930	3010	2635	1755	530	1328	2896	4920	280	DN25	DN50	DN80	DN100	DN100
SPL-735S	1930	3010	2635	1755	580	1328	2896	4970	280	DN25	DN50	DN80	DN100	DN100
SPL-780S	1985	3210	2635	1755	530	1328	2896	4920	280	DN25	DN50	DN80	DN100	DN100
SPL-870BS	1985	3210	2635	1755	580	1328	2896	4970	280	DN25	DN50	DN80	DN100	DN100
SPL-940S	1985	3210	2635	1755	790	1328	2896	5180	280	DN25	DN50	DN80	DN100	DN100



SPL-960S~1490S 外形尺寸和技术数据

SPL-960S~ 1490S dimensions and technical parameters

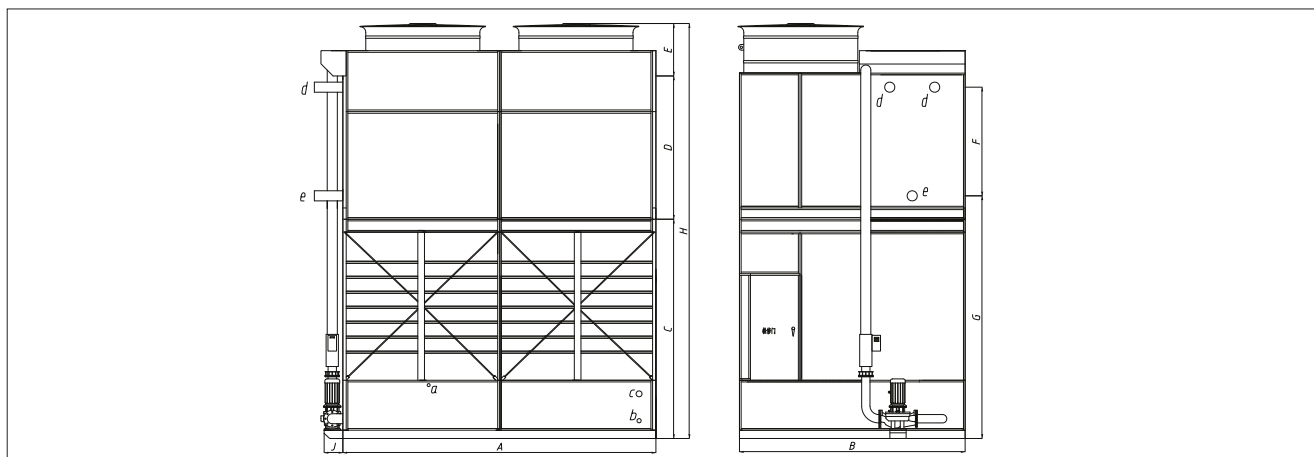


表 7 Table 7

型号 Model	名义工况排热量 Heat rejection under operating condition	轴流风机 Axial fan			循环水泵 Water circulating pump			NH ₃ 冲注量 Filling quantity	重量 Weight	
		台数 QTY	风量	功率	台数 QTY	流量	功率		运输	运行
			m ³ /h	kW		m ³ /h	kW		kg	kg
SPL-960S	960	2	2 × 65000	2 × 4.0	1	1x84	1x2.2	100	4920	7590
SPL-1000S	1000	2	2 × 71000	2 × 5.5	1	1x84	1x2.2	100	4940	7610
SPL-1050S	1050	2	2 × 79000	2 × 7.5	1	1x84	1x2.2	100	4960	7630
SPL-1165BS	1165	2	2 × 63500	2 × 4.0	1	1x150	1x3.0	128	6070	10210
SPL-1285BS	1285	2	2 × 78000	2 × 5.5	1	1x150	1x3.0	128	6090	10230
SPL-1335BS	1335	2	2 × 87000	2 × 7.5	1	1x150	1x3.0	128	6110	10250
SPL-1420S	1420	2	2 × 78000	2 × 5.5	1	1x150	1x3.0	160	7050	11250
SPL-1490S	1490	2	2 × 87000	2 × 7.5	1	1x150	1x3.0	160	7070	11270

表 8 Table 8

型号 Model	尺寸 Dimensions									补水管 Makeup pipe	排水管 Discharge pipe	溢流管 Overflow pipe	进气管 Gas inlet pipe	出液管 Liquid outlet pipe
	A	B	C	D	E	F	G	H	J					
	mm	mm	mm	mm	mm	mm	mm	mm	mm	a	b	c	d	e
SPL-960S	3575	2410	2035	1755	530	1328	2296	4320	280	DN25	DN50	DN80	2DN100	DN100
SPL-1000S	3575	2410	2035	1755	530	1328	2296	4320	280	DN25	DN50	DN80	2DN100	DN100
SPL-1050S	3575	2410	2035	1755	580	1328	2296	4370	280	DN25	DN50	DN80	2DN100	DN100
SPL-1165BS	3775	2710	2635	1755	530	1328	2896	4920	300	DN25	DN50	DN80	2DN100	DN100
SPL-1285BS	3775	2710	2635	1755	530	1328	2896	4920	300	DN25	DN50	DN80	2DN100	DN100
SPL-1335BS	3775	2710	2635	1755	580	1328	2896	4970	300	DN25	DN50	DN80	2DN100	DN100
SPL-1420S	3775	3010	2635	1755	530	1328	2896	4920	300	DN25	DN50	DN80	2DN100	DN100
SPL-1490S	3775	3010	2635	1755	580	1328	2896	4970	300	DN25	DN50	DN80	2DN100	DN100

SPL-1575S~2010S 外形尺寸和技术数据

SPL- 1575S ~ 2010S dimensions and technical parameters

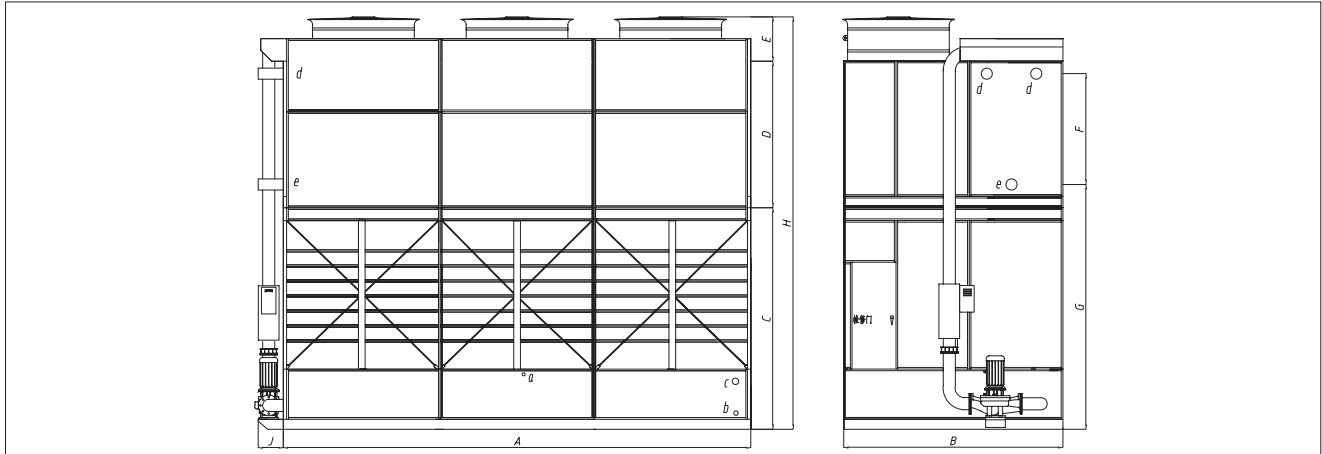


表 9 Table 9

型号 Model	名义工况排热量 Heat rejection under operating condition	轴流风机 Axial fan			循环水泵 Water circulating pump			NH ₃ 冲注量 Filling quantity	重量 Weight	
		台数 QTY	风量 Air flow	功率 Power	台数 QTY	流量 Water flow	功率 Power		运输 Transportation	运行 Operating
			m ³ /h	kW		m ³ /h	kW		kg	kg
SPL-1575S	1575	3	3 × 65000	3 × 4.0	1	1 × 150	1 × 3.0	151	7600	13450
SPL-1620S	1620	3	3 × 71000	3 × 5.5	1	1 × 150	1 × 3.0	151	7630	13480
SPL-1690S	1690	3	3 × 79000	3 × 7.5	1	1 × 150	1 × 3.0	151	7660	13510
SPL-1765CS	1765	3	3 × 71000	3 × 5.5	1	1 × 180	1 × 4.0	165	8050	13920
SPL-1935CS	1935	3	3 × 71000	3 × 5.5	1	1 × 180	1 × 4.0	197	8800	14700
SPL-2010CS	2010	3	3 × 79000	3 × 7.5	1	1 × 180	1 × 4.0	197	8830	14730

表 10 Table 10

型号 Model	尺寸 Dimensions									补水管 Makeup pipe	排水管 Discharge pipe	溢流管 Overflow pipe	进气管 Gas inlet pipe	出液管 Liquid outlet pipe
	A	B	C	D	E	F	G	H	J					
	mm	mm	mm	mm	mm	mm	mm	mm	mm	a	b	c	d	e
SPL-1575S	5320	2410	2655	1755	530	1328	2916	4940	300	DN25	DN50	DN80	2DN100	DN100
SPL-1620S	5320	2410	2655	1755	530	1328	2916	4940	300	DN25	DN50	DN80	2DN100	DN100
SPL-1690S	5320	2410	2655	1755	580	1328	2916	4990	300	DN25	DN50	DN80	2DN100	DN100
SPL-1765CS	5320	2710	2655	1755	530	1090	3154	4940	300	DN25	DN50	DN80	2DN100	DN100
SPL-1935CS	5320	2710	2655	1755	530	1328	2916	4940	300	DN25	DN50	DN80	2DN100	DN100
SPL-2010CS	5320	2710	2655	1755	580	1328	2916	4990	300	DN25	DN50	DN80	2DN100	DN100



SPL-2140S~2830S 外形尺寸和技术数据

SPL-2140S~2830S dimensions and technical parameters

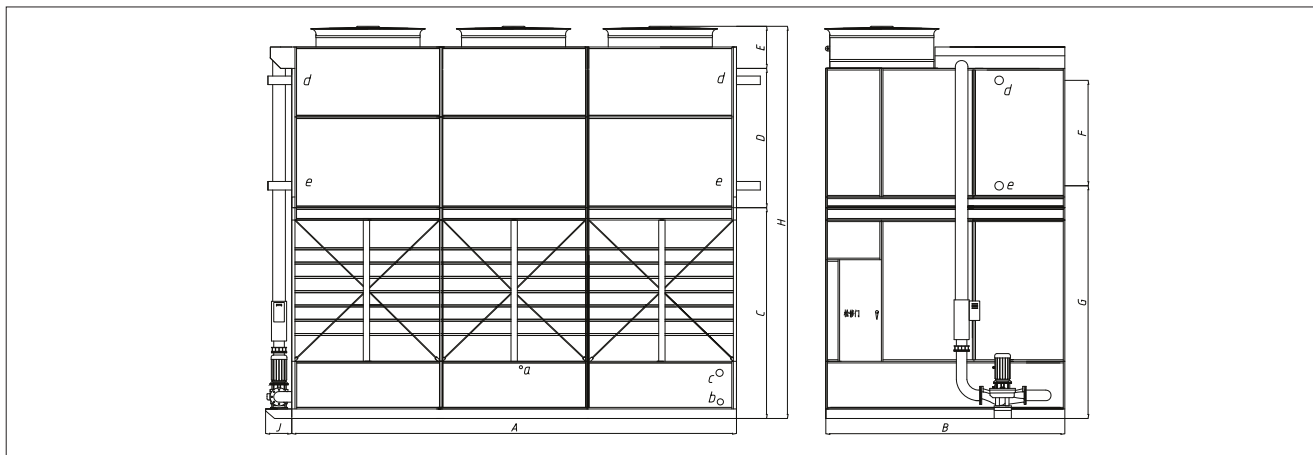


表 11 Table 11

型号 Model	名义工况排热量 Heat rejection under operating condition	轴流风机 Axial fan			循环水泵 Water circulating pump			NH ₃ 冲注量 Filling quantity	重量 Weight	
		台数 QTY	风量 Air flow	功率 Power	台数 QTY	流量 Water flow	功率 Power		运输 Transportation	运行 Operating
			m ³ /h	kW		m ³ /h	kW			
SPL-2140S	2140	3	3×78000	3×5.5	1	1x180	1x4.0	241	9760	16050
SPL-2245S	2245	3	3×87000	3×7.5	1	1x180	1x4.0	241	9790	16080
SPL-2350S	2350	3	3×80000	3×5.5	1	1x233	1x5.5	266	11030	17350
SPL-2620S	2620	3	3×100000	3×7.5	1	1x233	1x5.5	266	11060	17380
SPL-2830S	2830	3	3×125000	3×11	1	1x233	1x5.5	266	11090	17410

表 12 Table 12

型号 Model	尺寸 Dimensions									补水管 Makeup pipe	排水管 Discharge pipe	溢流管 Overflow pipe	进气管 Gas inlet pipe	出液管 Liquid outlet pipe
	A	B	C	D	E	F	G	H	J					
	mm	mm	mm	mm	mm	mm	mm	mm	mm	a	b	c	d	e
SPL-2140S	5620	3010	2655	1755	530	1328	2916	4940	300	DN25	DN50	DN80	2DN100	2DN100
SPL-2245S	5620	3010	2655	1755	580	1328	2916	4990	300	DN25	DN50	DN80	2DN100	2DN100
SPL-2350S	5780	3210	2655	1755	530	1328	2916	4940	310	DN25	DN50	DN80	2DN100	2DN100
SPL-2620S	5780	3210	2655	1755	580	1328	2916	4990	310	DN25	DN50	DN80	2DN100	2DN100
SPL-2830S	5780	3210	2655	1755	790	1328	2916	5200	310	DN25	DN50	DN80	2DN100	2DN100

SPL-2860S~3740S 外形尺寸和技术数据

SPL- 2860S~3740S dimensions and technical parameters

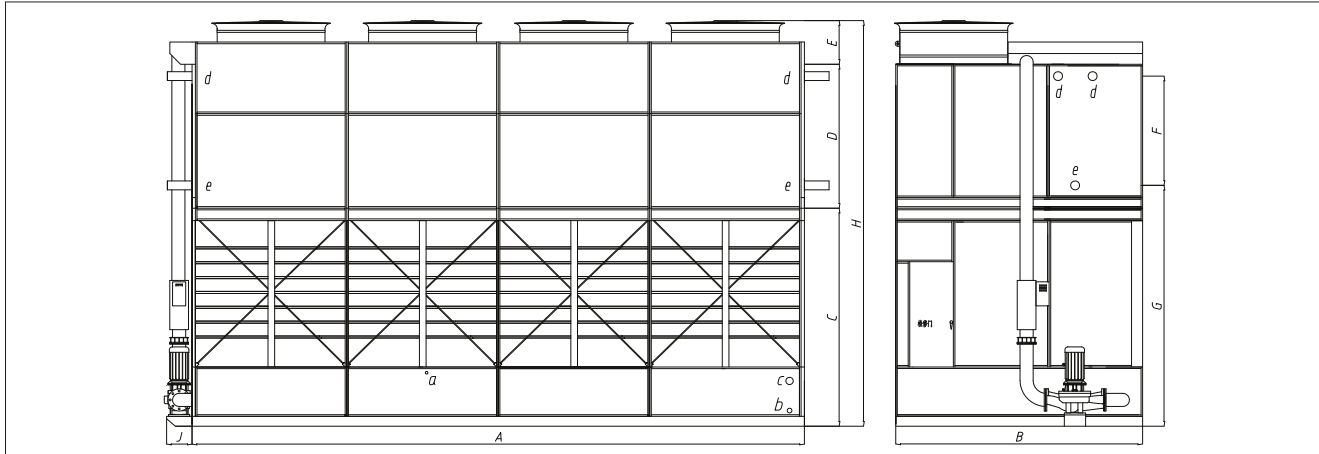


表 13 Table 13

型号 Model	名义工况排热量 Heat rejection under operating condition	轴流风机 Axial fan			循环水泵 Water circulating pump			NH ₃ 冲注量 Filling quantity	重量 Weight	
		台数 QTY	风量	功率	台数 QTY	流量	功率		运输 Transportation	运行 Operating
			Air flow m ³ /h	Power kW		Water flow m ³ /h	Power kW			
SPL-2860S	2860	4	4 × 78000	4 × 5.5	1	1X233	1X5.5	322	13850	20550
SPL-3000S	3000	4	4 × 87000	4 × 7.5	1	1X233	1X5.5	322	13890	20590
SPL-3120S	3120	4	4 × 80000	4 × 5.5	1	1X233	1X5.5	353	14500	21500
SPL-3470S	3470	4	4 × 100000	4 × 7.5	1	1X233	1X5.5	353	14540	21540
SPL-3740S	3740	4	4 × 125000	4 × 11	1	1X233	1X5.5	353	14580	21580

表 14 Table 14

型号 Model	尺寸 Dimensions									补水管 Makeup pipe	排水管 Discharge pipe	溢流管 Overflow pipe	进气管 Gas inlet pipe	出液管 Liquid outlet pipe
	A	B	C	D	E	F	G	H	J	a	b	c	d	e
	mm	mm	mm	mm	mm	mm	mm	mm	mm					
SPL-2860S	7465	3010	2655	1755	530	1328	2916	4940	310	DN25	DN50	DN80	4DN100	2DN100
SPL-3000S	7465	3010	2655	1755	580	1328	2916	4990	310	DN25	DN50	DN80	4DN100	2DN100
SPL-3120S	7680	3210	2655	1755	530	1328	2916	4940	310	DN32	DN50	DN80	4DN100	2DN100
SPL-3470S	7680	3210	2655	1755	580	1328	2916	4990	310	DN32	DN50	DN80	4DN100	2DN100
SPL-3740S	7680	3210	2655	1755	790	1328	2916	5200	310	DN32	DN50	DN80	4DN100	2DN100



SPL-3880S~4420S 外形尺寸和技术数据

SPL-3880S~4420S dimensions and technical parameters

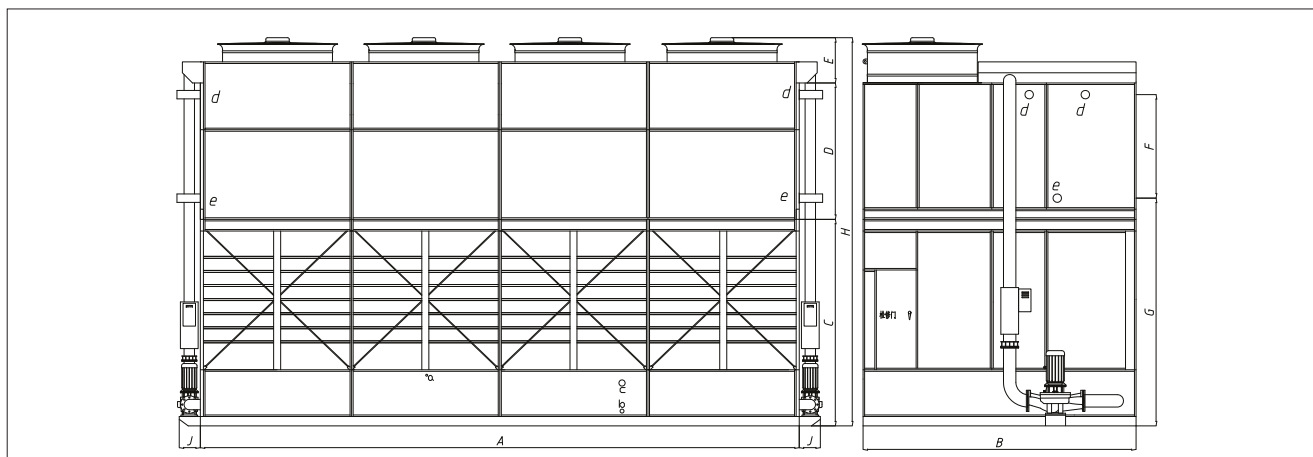


表 15 Table 15

型号 Model	名义工况排热量 Heat rejection under operating condition	轴流风机 Axial fan			循环水泵 Water circulating pump			NH ₃ 冲注量 Filling quantity	重量 Weight	
		台数 QTY	风量 Air flow	功率 Power	台数 QTY	流量 Water flow	功率 Power		运输 Transportation	运行 Operating
			m ³ /h	kW		m ³ /h	kW		kg	kg
SPL-3880S	3880	4	4 × 100000	4 × 7.5	2	2X150	2X3.0	398	15300	23000
SPL-4100S	4100	4	4 × 100000	4 × 7.5	2	2X150	2X3.0	420	15700	23700
SPL-4420S	4420	4	4 × 125000	4 × 11	2	2X150	2X3.0	420	15740	23740

表 16 Table 16

型号 Model	尺寸 Dimensions									补水管 Makeup pipe	排水管 Discharge pipe	溢流管 Overflow pipe	进气管 Gas inlet pipe	出液管 Liquid outlet pipe
	A	B	C	D	E	F	G	H	J					
	mm	mm	mm	mm	mm	mm	mm	mm	mm	a	b	c	d	e
SPL-3880S	7680	3410	2655	1755	580	1328	2916	4990	300	DN32	DN50	DN80	4DN100	2DN100
SPL-4100S	7680	3510	2655	1755	580	1328	2916	4990	300	DN32	DN50	DN80	4DN100	2DN100
SPL-4420S	7680	3510	2655	1755	790	1328	2916	5200	300	DN32	DN50	DN80	4DN100	2DN100

SPL-4580S~6000S 外形尺寸和技术数据

SPL- 4580S~6000S dimensions and technical parameters

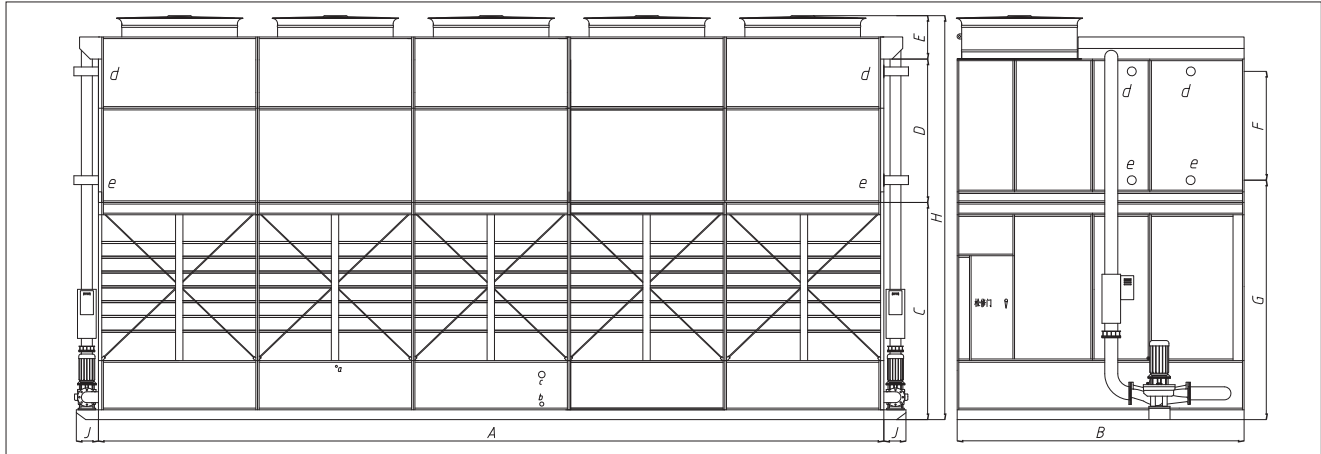


表 17 Table 17

型号 Model	名义工况排热量 Heat rejection under operating condition	轴流风机 Axial fan			循环水泵 Water circulating pump			NH ₃ 冲注量 Filling quantity	重量 Weight	
		台数 QTY	风量 Air flow	功率 Power	台数 QTY	流量 Water flow	功率 Power		运输 Transportation	运行 Operating
			m ³ /h	kW		m ³ /h	kW		kg	kg
SPL-4580S	4580	5	5 × 80000	5 × 5.5	2	2×180	2×4.0	526	19200	29200
SPL-5100S	5100	5	5 × 100000	5 × 7.5	2	2×180	2×4.0	526	19250	29250
SPL-5520S	5520	5	5 × 125000	5 × 11	2	2×180	2×4.0	526	19300	29300
SPL-6000S	6000	5	5 × 125000	5 × 11	2	2×180	2×4.0	640	21300	31800

表 18 Table 18

型号 Model	尺寸 Dimensions									补水管 Makeup pipe	排水管 Discharge pipe	溢流管 Overflow pipe	进气管 Gas inlet pipe	出液管 Liquid outlet pipe
	A	B	C	D	E	F	G	H	J					
	mm	mm	mm	mm	mm	mm	mm	mm	mm	a	b	c	d	e
SPL-4580S	9580	3510	2655	1755	530	1328	2916	4940	300	DN32	DN50	DN80	4DN100	4DN100
SPL-5100S	9580	3510	2655	1755	580	1328	2916	4990	300	DN32	DN50	DN80	4DN100	4DN100
SPL-5520S	9580	3510	2655	1755	790	1328	2916	5200	300	DN32	DN50	DN80	4DN100	4DN100
SPL-6000S	9580	3610	2655	1995	790	1566	2916	5440	300	DN32	DN50	DN80	4DN100	4DN100

部分案例 CASES



上海宝丰机械制造有限公司

Shanghai Baofeng Machinery Manufacturing Co., Ltd.

地址：上海市宝山城市工业园区工业路458号

Add: No.458 Industry Rd Baoshan City Industry
Area Shanghai PRC

邮编 (P.C) : 200444

电话 (Tel) : +86-21-36161585

传真 (Fax) : +86-21-36161225

售后服务电话: +86-13681991255

+86-21-36160364

售后服务传真: +86-21-36160364

Http://www.baofeng.com.cn

E-mail:spl@baofeng.com.cn

营销中心联系电话: 4000 873 883

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