



定频室外型风冷全封压缩冷凝机组 使用说明书



专用号：0080502658

使用前请仔细阅读本说明书

请妥善保管此说明书，以备参阅

本产品执行国家标准 GB/T 21363 《容积式制冷压缩冷凝机组》

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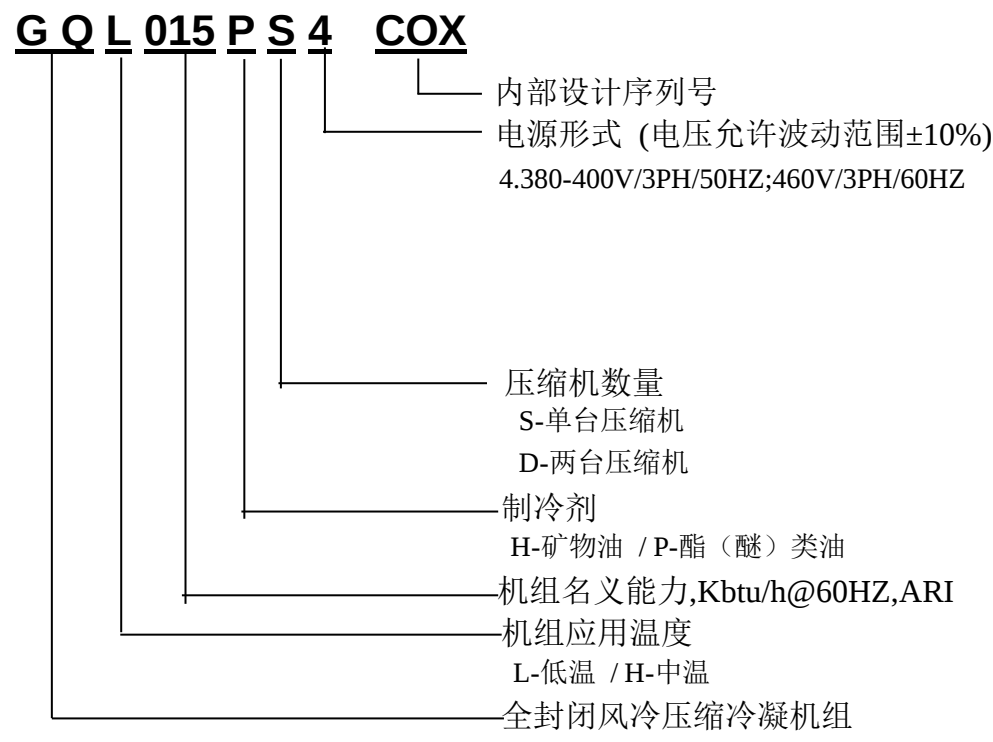
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1. 概述

低温涡旋定频室外型全封压缩风冷冷凝机组适用于便利超市食品展示柜、小型冷库食品冷藏冷冻等场所。现有 2~7HP 机组可供选择，满足用户多方位需求。冷凝机组主要有如下优点：

- 机组采用全球知名高效压缩机，具有节能高效，低振低噪音等优点。
- 机组采用电脑板控制，可控硅智能调节冷凝风机转速，实现稳定运行，压力及温度波动小，实现食品高品质存储。
- 电脑板数码管设置，可显示故障代码及系统参数查询，方便维护保养。
- 高低压保护、过热过载保护、排温过热保护、相序保护（涡旋）等多重保护，保障机组安全运行。
- 机组体积小、安装灵活便捷，无需特设机房，省时省工省投资。

2. 机组型号说明



对于标准低温涡旋定频 CDU，内部设计序列号末尾为 X；对于相应的低环温专用 CDU，内部设计序列号末尾为 L。

3. 机组性能参数

GQL			GQL006	GQL009	GQL011	GQL015	GQL018	GQL021
制冷剂 Refrigerant			R404A					
壳体规格 Size of casing			M3	M3	M3	M3	M4	M4
R404A	名义制冷量 Capacity	kW	2.28	2.67	3.47	4.39	6.09	7.01
	名义输入功率 Input power	kW	1.69	2.04	2.47	2.88	3.85	4.33
压缩机 Compressor	数量 Number		1	1	1	1	1	1
	型号 Model		ZSI06KQET	ZSI09KQET	ZSI11KQET	ZSI14KQET	ZSI18KQET	ZSI21KQET
曲轴箱加热带 Crankcase heater	数量 x 功率 No.x Power	W	1x65	1x65	1x65	1x65	1x75	1x75
噪音 Sound level	dB（A）		53	53	56	56	60	60
风扇电机 Fan motor	数量 x 直径 No.x Diameter	mm	1xØ500	1xØ500	1xØ500	1xØ500	2xØ500	2xØ500
	风量 Air flow	m³/h	4043	4043	4043	4043	7060	7060
总电流 Total current	风机额定电流 Rated I	A	0.6	0.6	0.6	0.6	1.2	1.2
	压缩机启动电流 LRA comp.	A	34.8	34.8	47	47	67	90.5
	压缩机运行电流 MOC comp.	A	5.7	6.7	7.5	9.2	13.2	14.6
过流保护出厂设定 Overcurrent trip setting		A	6	7	10	11	13	16
储液器容积 Receiver volume		L	6	6	6	6	8	8

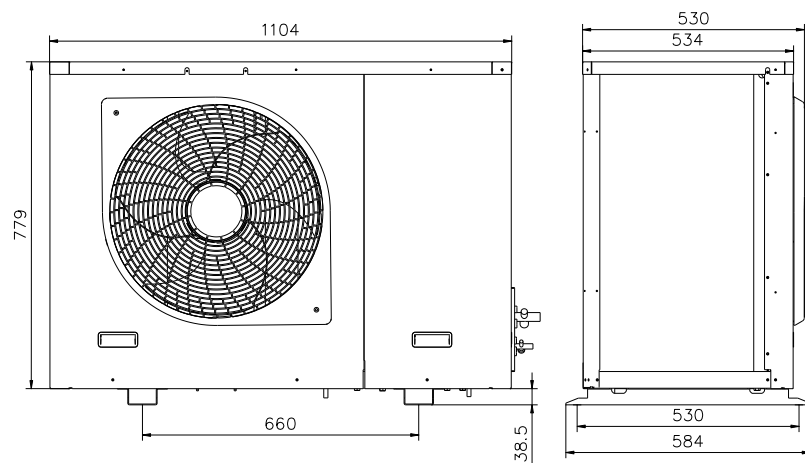
冷冻机油 Lubricant(R404A)			RL 32-3MAF/RL 32H					
压机注油 Oil charge of comp	L		0.74	0.74	1.36	1.36	1.89	1.89
接口尺寸 Connections/SAE	回气 Suction	inch	5/8"	5/8"	3/4"	3/4"	3/4"	3/4"
	供液 Liquid	inch	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
尺寸 Dimension	mm		1104X504X818				1064×448×1358	
重量 Weight	kg		99.2	99.2	103.2	110.9	140	142.3

表 1 低温机组参数表

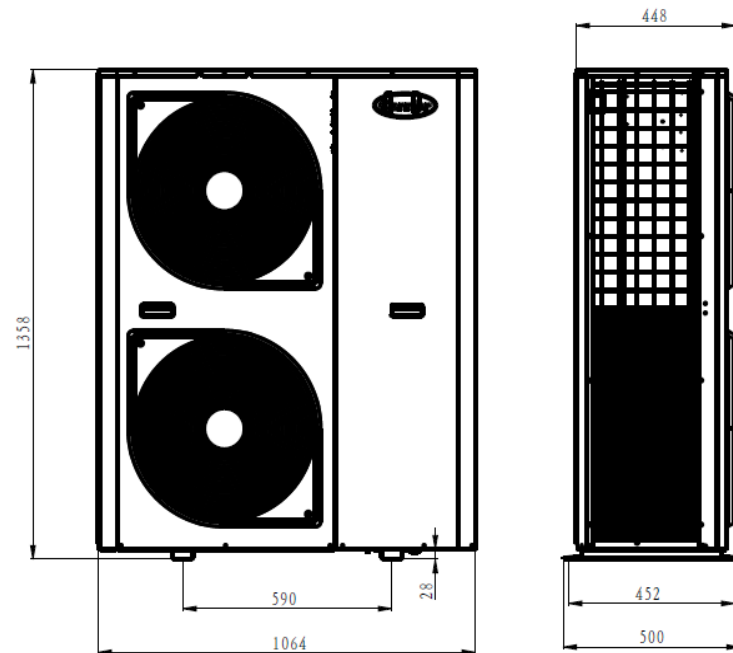
注：(1) 参数基于国标 GB/T 21363-2008 中温工况:蒸发温度-23℃，环境温度 32℃，吸气温度 5℃；

(2) 上表中，对于低环温专用 CDU，产品代码为 COL，除曲轴箱加热带相应要配备 2 根外，其余参数均与标准型号相同。

M3



M4



4. 机组运行

4.1 机组运行范围

4.1.1 机组运行范围方框图



图 1 低温机组运行范围方框图
(最大吸气温度 5℃)

注: 阴影部分为相对于标准型号, 在低环温下的扩展应用范围。

4.1.2 机组必须在安全范围内运行, 包括最高、最低环境温度和最高、最低蒸发温度, 对于机组应用最低环温低于-10℃地区, 建议选择低环温专用型号, 并咨询公司技术人员。

4.2 压力开关设定

4.2.1 压力开关设定如表 3 所示

4.2.2 特别注意: 由于低压控制器本身误差所致, 调节蒸发温度时请考虑余量

表 2 机组压力开关设定

开关类别	功能	应用范围	断开值/Barg	复位值/Barg
高压定值开关	保护压缩机安全	标准机组	28, R404a	22, R404a
		低环温专用机组	30, R404a	24, R404a
低压控制器	调节蒸发温度	标准/低环温	$1.0 \leq R \leq 2.65$, R404a	$R \leq d \leq 5$, R404a

以上设定仅作为特定温度下压力设定参考, 实际应用请根据系统不同、使用温度不同进行适当的调整, 以保证正常的压机开停和使用效果, 但低压可调开压力开关的设定值不得小于最小断开值!

5. 机组结构

5.1 标准型号

5.1.1 单风机机组结构图

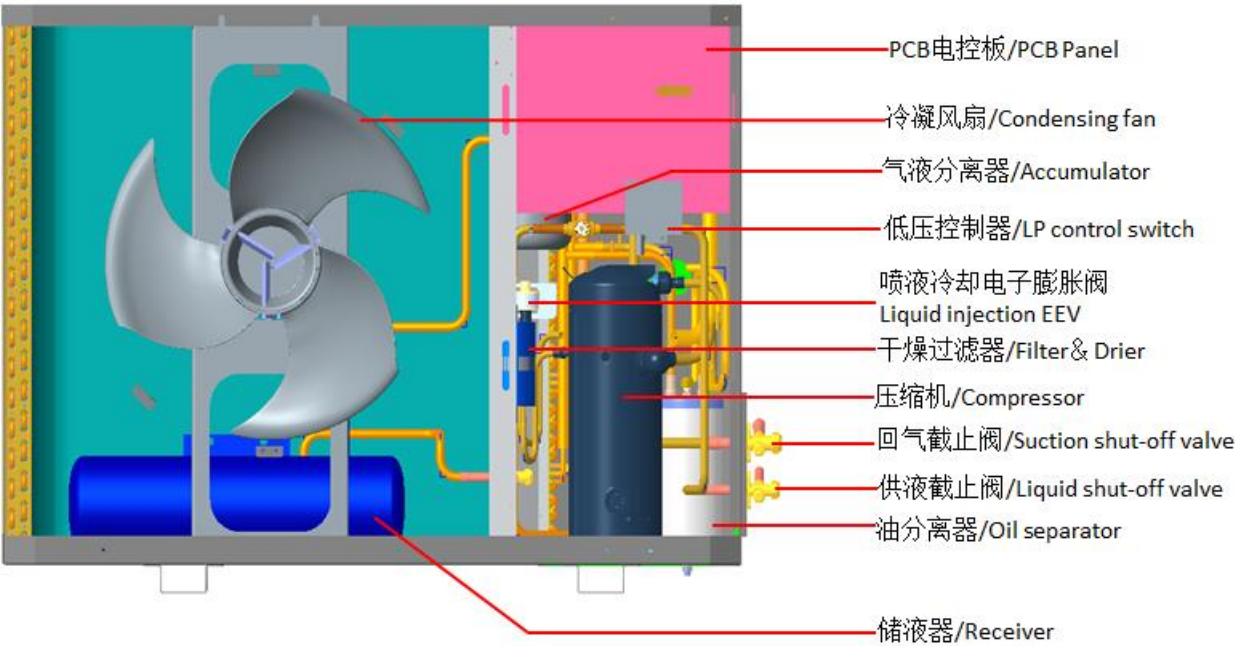


图 2

5.1.2 双风机机组结构图

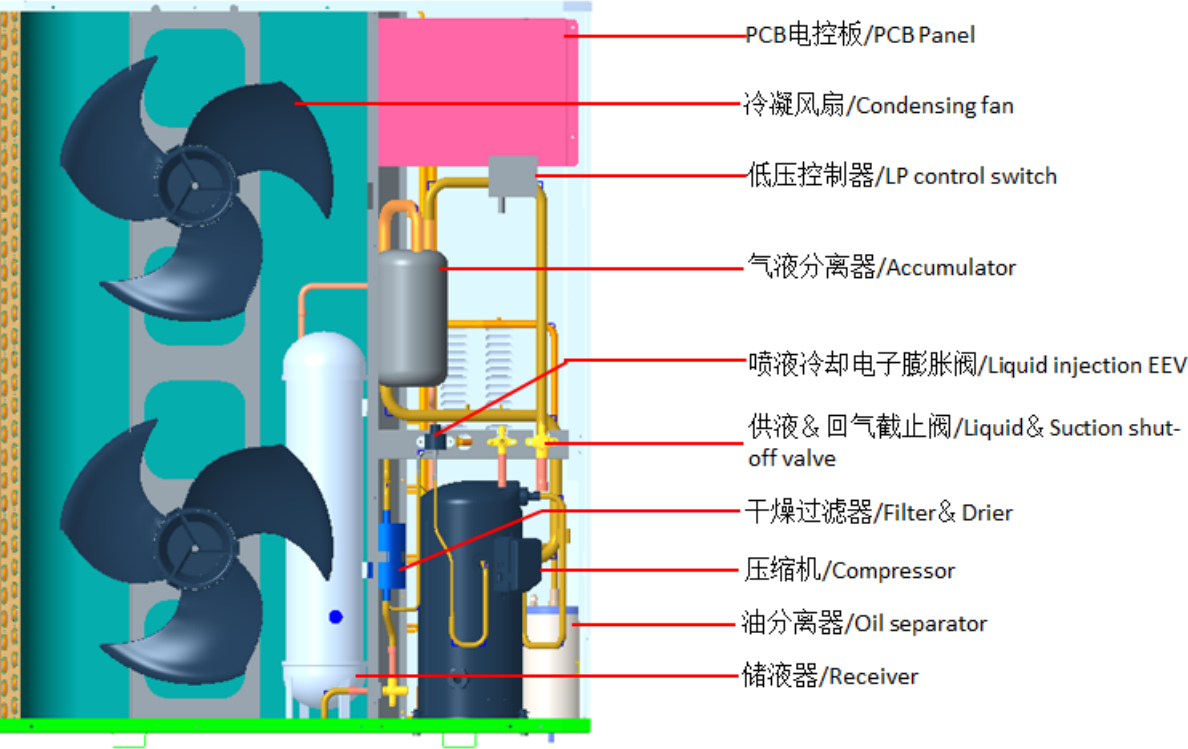


图 3

5.2 低环温专用型号

5.2.1 单风机机组结构图

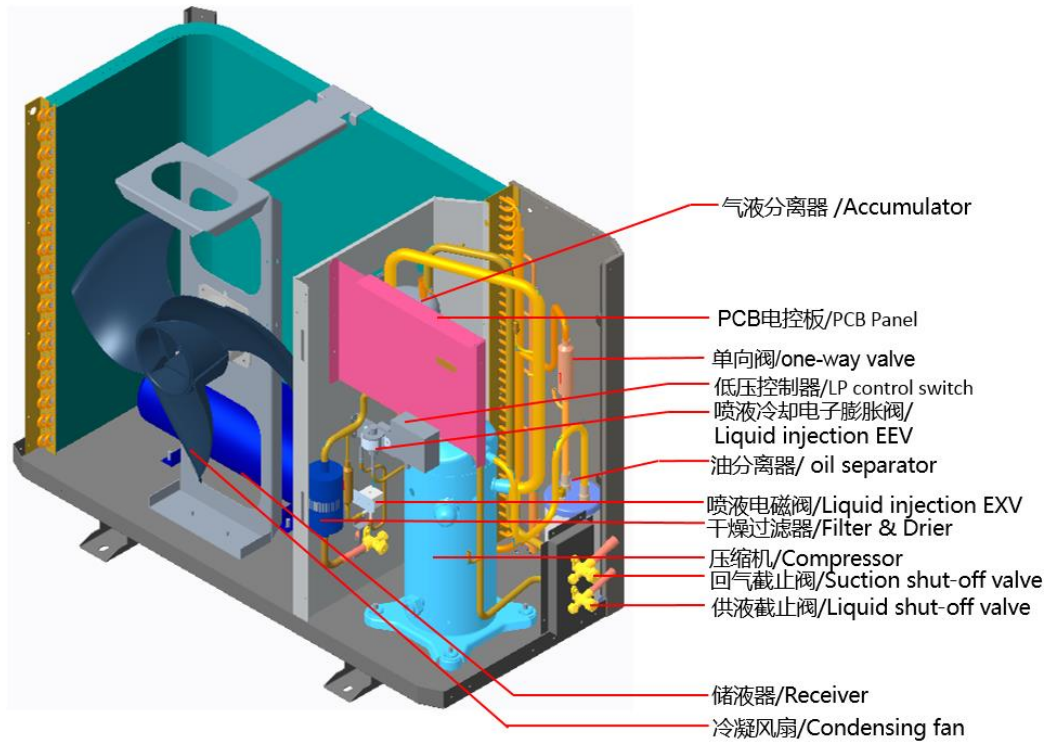


图 4

5.2.2 双风机机组结构图

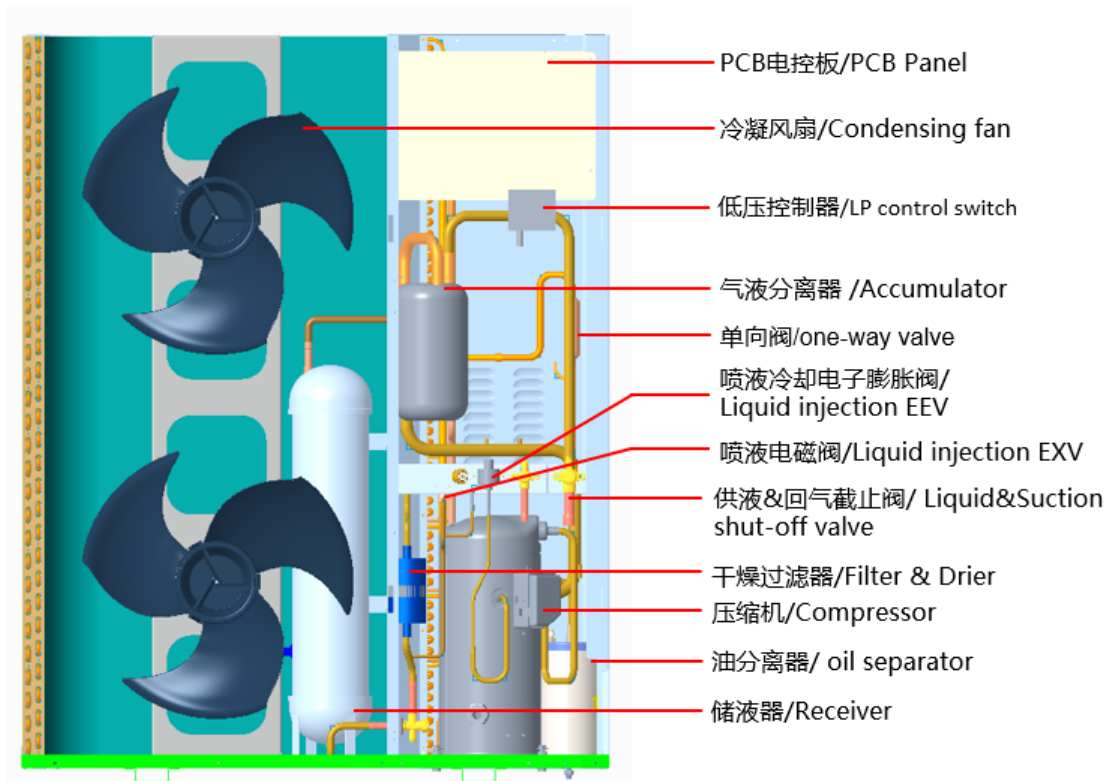


图 5

注意：海尔开利冷冻设备有限公司保留对产品外观及技术设计加以改进和改变的权利，恕不另行通知。

6.电气

6.1 电气安全

6.1.1 请勿将接地线与气体燃料管道、水管、避雷导体或电话的接地线相连，接地不当可引起意外触电，请经常检查接地线与机组接地终端和接地电极连接是否牢靠。

6.1.2 切勿使用锋利物件来操作手操器，以免损毁手操器。切勿扭曲或拉扯控制柜内电线，以免造成接线松动，引起控制失灵。

6.1.3 控制柜内带有强电，未切断机组电源之前，切勿接触除手操器之外的其他任何控制元件及端子部件，以免造成人身伤害。

敬告：整机务必做好接地工程，供电电路应配置断路器，其它未尽事宜请参照相关标准执行。

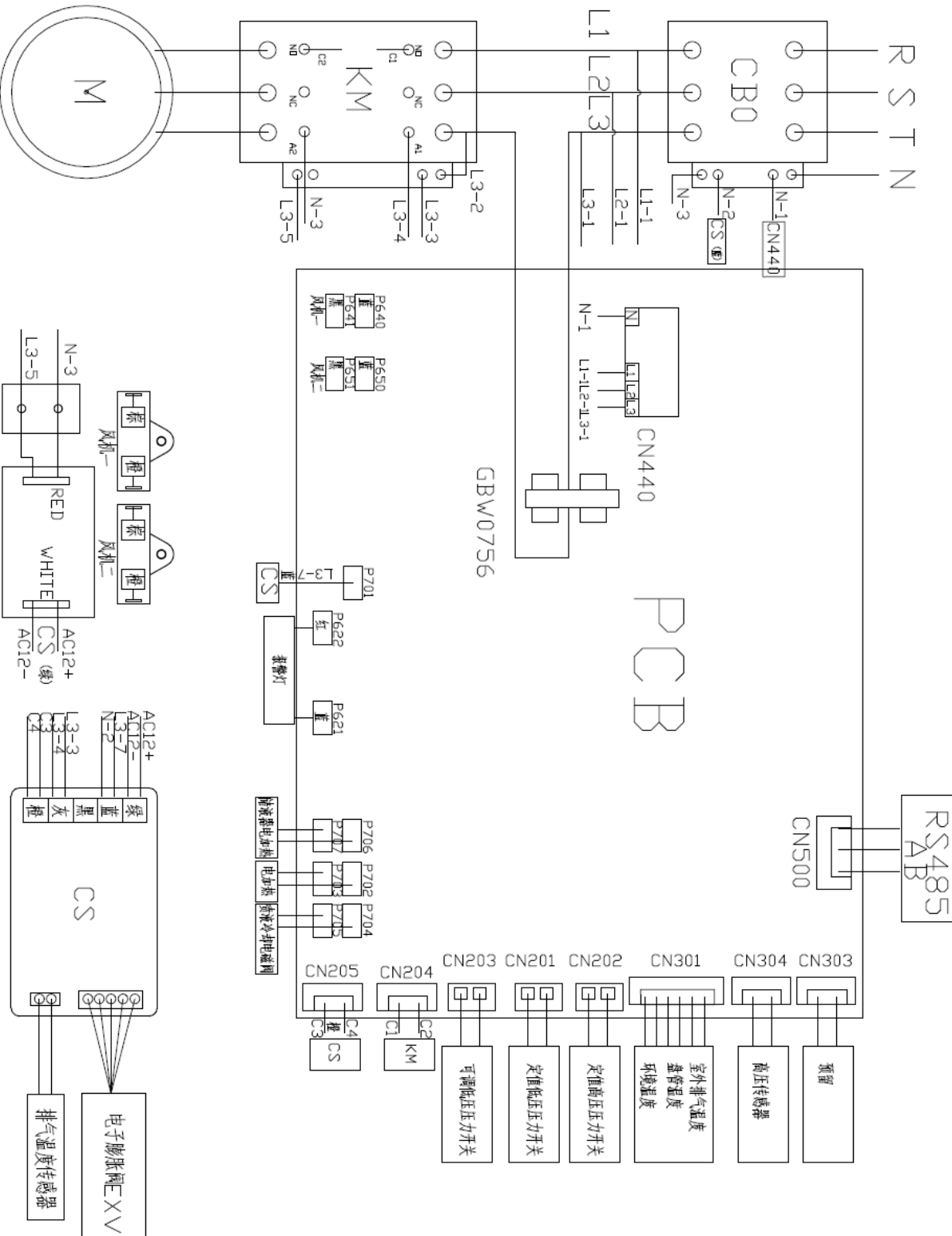


图 6 电源代码 4 电气接线图

注：对于标准机组，无储液器加热丝、高压传感器。对于低环温机组，需加装储液器加热丝、高压传感器。

7.压缩机正常运行功能

7.1 初始启动程序

7.1.1 第一次通电，机组会进入初始启动程序:三分钟延时.压缩机经历三次跳停，运行时间为3秒，时间间隔为20秒。

7.1.2 初始程序结束后，经过20秒延时后，压缩机开始正常运行。

7.2 正常运转

7.2.1 压缩机最短停机时间为3分钟，最短运行时间为2分钟。

7.2.2 压缩机运转过程中，冷凝风扇会根据冷凝盘管温度实现冷凝风扇转速的线性调节。

7.3 停机

7.3.1 当出现停机信号时，如低压下降到设定停机压力时，压缩机和冷凝风扇同时停止。

7.3.2 正常停机再次启动时，压缩机和冷凝风扇立即开始持续的正常运转。

7.4 断电

7.4.1 断电后机组内部所有部件马上停止运转。

7.4.2 断电后再次启动会进入初始启动程序。

8.自动保护功能及故障显示

8.1 当机组出现故障停机时，可通过按键查看故障代码，故障代码会显示在相应数码管上，具体方法如下：

8.1.1 控制器能够记录历史3次故障，优先记录最新发生的故障，且掉电之后也能够记忆之前的故障。

8.1.2 进入方式：运行或者待机过程中，长按K803-SET键3S后进入故障查询模式，LED801显示最近一次故障代码，并闪烁；再次按一下K804-ENTER键显示上一次故障代码，并闪烁；再次按一下K804显示更前一次故障码，并闪烁；再按一次K804显示盘管温度，并闪烁；再按一次显示最近一次故障码，依次循环。

8.1.3 退出方式：进入故障查询模式后，再次长按K803-SET键3S后可退出故障查询模式，或者连续10S无任何按键操作，自动退出故障查询模式。

8.1.4 进入故障查询模式时，仅第一位数码管显示状态更改，其余运行状态不变，维持当前运行状态。如在故障查询模式中出现故障停机，应立即退出该模式，显示当前故障码。

8.2 故障代码及对应的故障与复位方式见表3。

故障代码	故障/报警	控制器暂时停机自动复位	控制器停机锁定手动复位
E01	系统低压保护/报警	每次保护	无
E02	压缩机过载保护	1小时内出现次数≤5	1小时内第6次保护动作
E03	相序保护	无	每次保护
E04	排气温度超限	1小时内出现次数≤5	1小时内第6次保护动作
E05	高压压传故障	报警但不停机	
E06	低压压传故障	报警但不停机	
E08	环境温度传感器故障	不停机	

E09	外盘温度传感器故障	不停机	
E10	排气温度传感器故障	压缩机运行 2min, 停机 3min, 交替进行	
E11	接触器反馈故障	出现即停机, 30S 后恢复	1 小时内第 6 次保护动作
E12	调阀板故障	出现即停机, 调阀板故障 恢复时故障解除	1 小时内第 6 次保护动作永 久停机
E13	主控板 E2 故障	停机, 无法复位	
E14	无负载检测故障	1 小时内出现次数 ≤ 5	1 小时内第 6 次保护动作
E15	系统高压保护/报警	1 小时内出现次数 ≤ 5	1 小时内第 6 次保护动作

表 3 机组故障及复位

8.3 喷液冷却电子膨胀阀调节电脑板（调阀板）故障

如出现 E12 调阀板故障, 可根据调阀板上 LED 的闪烁来判定具体故障原因, 详见下表:

	状态	说明
指示灯 1	以 1 赫兹的频率闪烁 3 次, 等待 5 秒, 然后重复	排气管温度传感器开/短路
	以 1 赫兹的频率闪烁 5 次, 等待 5 秒, 然后重复	排气管温度传感器失效或低于、超出范围
指示灯 2 指示灯 3	指示灯 2 以 1 赫兹的频率闪烁, 指示灯 3 熄灭	电子膨胀阀开度增加中
	指示灯 3 以 1 赫兹的频率闪烁, 指示灯 2 熄灭	电子膨胀阀开度减小中
	指示灯 2 常亮, 指示灯 3 熄灭	电子膨胀阀处于全开状态
	指示灯 3 常亮, 指示灯 2 熄灭	电子膨胀阀处于关闭状态
指示灯 4	常亮	排气管温度传感器过热保护
		排气管温度传感器开/短路
		排气管温度传感器失效或低于、超出范围

表 4 EEV 故障代码

9. 电脑板拨码功能介绍及出厂设置

9.1 电脑板上设置八个拨码开关, 拨码开关功能介绍, 请参照表 5;

位号 K221	功能	位号 K223	功能
SW1	保留	SW1	OFF——标准 CDU ON——低环温型 CDU
SW2	OFF——EXV 喷液应用 ON——EXV 喷气增焓	SW2	保留
SW3	OFF——电磁阀 (EXV) 方案应用 ON——电磁阀 (毛细管) 方案应用	SW3	保留
SW4	OFF——曲加不受环温影响 ON——曲加受环温影响	SW4	手动复位全部故障

表 5 拨码开关定义

9.2 拨码出厂默认设置:

标准型号机组与低环温专用型号机组出厂拨码有所区别, 详见表 6~表 7。

K221				K223			
SW1	SW2	SW3	SW4	SW1	SW2	SW3	SW4
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

表 6 拨码出厂默认设置（标准型号）

K221				K223			
SW1	SW2	SW3	SW4	SW1	SW2	SW3	SW4
OFF	OFF	OFF	OFF	On	OFF	OFF	OFF

表 7 拨码出厂默认设置（低环温专用型号）

北方冬天等极低环境温度场所，通常机组启动前吸气压力已低于设定开机压力，为确保冷冻机在极低温度下可以启动，对于低环温专用机组，需将拨码开关 K223-SW1 拨到 ON，机组进入低环温工作模式，机组启动。

10. 机组安装施工

10.1 场地要求

10.1.1 地面应坚实、平整；机组最好高出地面 200mm 以上，以保持冷凝器清洁。

10.1.2 机组应留出足够的空间，以便机组能有足够的通风条件，同时也便于日后机组维护；机组后侧留出不少于 300mm 的通风空间，左右侧留出不少于 450mm、前侧留出不少于 1500mm、顶部留出不少于 1300mm 的维修空间。

10.2 搬运

机组搬运过程中严禁将机组倒立，应尽可能稳定、垂直的运输、搬运；搬运时倾角不得大于 45 度。

10.3 管路安装

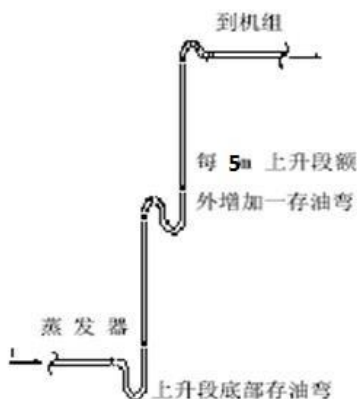
为了您的使用，请使用符合国家标准的制冷管件。管路设计请参考如下事项：

10.3.1 液管设计注意事项：

如果蒸发器比机组位置高出很多，会产生闪蒸气体，使制冷能力大大下降，因此应该控制蒸发器与机组的高度差，范围为 6m；如果超过 6m，应安装专用装置（如热交换器）以清除闪蒸气体和降低液管温度。

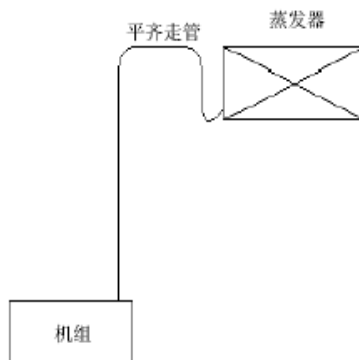
10.3.2 回气管设计注意事项：

a. 如果蒸发器比机组位置低，一方面水平管段应以 1:100~2:100 的斜度向下通至压缩机，以使油能尽可能多的从蒸发器回流到压缩机。因为油在氟利昂制冷剂中有一定的溶解度，因此油可能在液态制冷剂中与制冷剂一起流入到蒸发器中，如果管路设置不当，一些油将滞留在蒸发器中无法返回，这样有可能造成压机缺油。另一方面，为了克服高落差保证回油，回气管径的选择时应保证使冷媒气体流速的回油效果；且上升管路高度大于 5 米时，要每隔 5 米设置一个回油弯，如下图所示：



b. 如果蒸发器比机组高，回气管路应加防逆流弯，如果液管安装了电磁阀，则无此必要。

如下图所示：



10.3.3 系统补充冷冻油

当单程管路长度超过 20m 时，需要根据超出部分的长度和气管管径补充对应型号的润滑油。

管路规格 (inch/mm)	加油量 (ml/m)
1/2"(Φ12.7)	10
5/8"(Φ15.9)	20
3/4"(Φ19)	30
7/8"(Φ22)	40
1"(Φ25.4)	50

表 7 冷冻油补充说明

敬告：根据本说明书推荐的冷冻润滑油牌号，选用相应的润滑油，详见本说明书第 3、4 页！

11. 系统检漏及抽真空

11.1 保压检漏时，系统高压侧压力应小于 18barg；低压侧压力应小于 12barg；

11.2 也可用保真空的办法检漏；

11.3 严禁使用压机给系统抽空；

11.4 抽真空应从高压侧、低压侧同时进行；

11.5 真空度必须达到 30Pa（0.25mm Hg）以下，且不得以抽真空的时间长短来判断是否结束抽真空；

11.6 真空度的测量必须使用真空计，不得使用普通压力表度量真空度。

12. 制冷剂充注及过热度调整

12.1 开机前从高低压侧同时充注，系统充注液态制冷剂压力不小于 6barg，尽量在开机前完成最大冲注，最佳充注口应在液管截止阀处；

12.2 开机进行制冷剂补充时，可从回气管截止阀处充注，必须以液态制冷剂充注，同时保证压缩机无明显回液现象；

12.3 充注过程中可能出现多次压力保护而停机和启动延时的情况，在此期间禁止旁通低压控制器及低压保护器而强行充注。

12.4 系统过热度设置

12.4.1 过热度计算方法

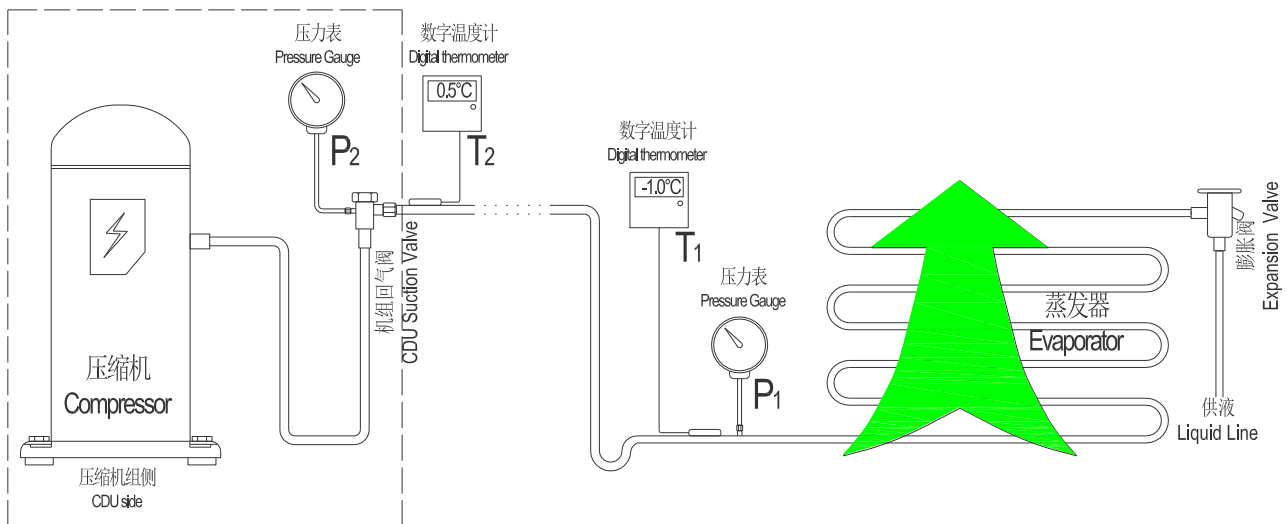
根据实际需要测量蒸发器回气管或机组回气管处对应蒸发压力(P_1/P_2)和实测温度(T_1/T_2)，根据蒸发压力(P_1/P_2)查找对应制冷剂物性参数表气态饱和蒸发温度(T_{s1}/T_{s2})，计算如下：

a. 蒸发器侧过热度 $\Delta t_1 = T_1 - T_{s1}$

b. 机组回气过热度 $\Delta t_2 = T_2 - T_{s2}$

12.4.2 过热度设定要求

蒸发器侧过热度 Δt_1 一般为蒸发器换热温差（蒸发温度与回风温度差值）的 0.5~0.7 倍；蒸发器出口至机组的回气阀口管路过热度（ $\Delta t_2 - \Delta t_1$ ）应控制在 3K 以下，由于系统差异，以上数值在实际应用中应根据调试情况做适当调整。



过热度采集位置示意图

13. 保养检查及处理

为了充分维护机组的性能与寿命，方便您的使用，请核实以下项目：

13.1 机组运行压力是否正常，温度有无异常；

13.2 压缩机视油镜油位是否可见；

13.3 压缩机及冷凝风扇有无异常声音及振动；

13.4 压缩机是否频繁启动；

13.5 保护装置、控制装置有无异常动作；

13.6 制冷剂是否泄露；

13.7 电线及电气元件有无老化或过热，线头有无松动；

13.8 冷凝器翅片附着灰尘是否过厚，冷凝器是否堵塞；

13.9 机组通风是否良好。

注意：

▲ 因修理、更换等原因需要抽出制冷剂时，一定要用专业设备回收处理，不得直接排放大气。

▲ 机组因维修需要抽出制冷剂时，因部分冷冻油溶解在制冷剂中，造成系统冷冻油减少；维修完

毕重新运行前，需要酌情补充冷冻油。

▲更换压缩机、冷凝器时，要同时更换过滤器；如压缩机电机烧毁导致管路严重污染时，必须彻底清除系统内制冷剂和冷冻机油。

▲所有的维修都需要专业人士进行处理，不要擅自拆卸机组。

■ 常见故障及排除方法

故障现象	故障原因	排除方法
压缩机不启动	电源没接通或保险丝断	接通电源或更换保险丝
	电气故障	查明原因并恢复
	某个保护起作用	查明原因，解除保护
	机组电脑板故障	修复或更换电脑板
	压缩机电机烧毁	查找原因、排除并更换压缩机
不制冷	制冷剂泄漏、过滤器或膨胀阀脏堵	查明原因，进行清理或更换
	蒸发器风机失效	维修更换
	压缩机失效	检查修复或更换压缩机
高压压力过高 高压控制器保护	冷凝风机未转	查明原因，启动风机
	冷凝器堵塞	清扫冷凝器
	环境温度过高或通风不良	改善环境或改善通风
	制冷剂过多或系统内有空气	排除过多制冷剂或空气
低压压力低	膨胀阀或过滤器堵塞	清洗膨胀阀，清理或更换过滤器
	制冷剂过少	补充制冷剂
	系统有泄漏	找出漏点进行修复
排气温度过高	吸气过热度过大	检查膨胀阀并调整
	制冷剂偏少	补充制冷剂
压缩机气缸盖结霜	膨胀阀开启度过大	减小膨胀阀开度
	蒸发器盘管结霜或脏堵	化霜、清洁蒸发器
	蒸发器风机未转	检查或更换蒸发风机
压缩机噪音异常	相序错误（涡旋压缩机）	调整相序
	压缩机机械故障	拆机检修或更换压缩机
机组振动较大	机组放置不平	将机组找平
	管路振动	固定好管路
	压缩机机械故障	拆机检修或更换压缩机
压机启动频繁	低压控制器设置不当	重新设定压控
	电气控制线路故障	排除电气控制线路故障
	末端温控器故障	维修更换
	电脑板故障	更换

青岛海尔开利冷冻设备有限公司



FIXED-SPEED Out-door Condensing Unit Manual



Part NO. 0080502658

Please read the Instruction carefully before installation.

Contents

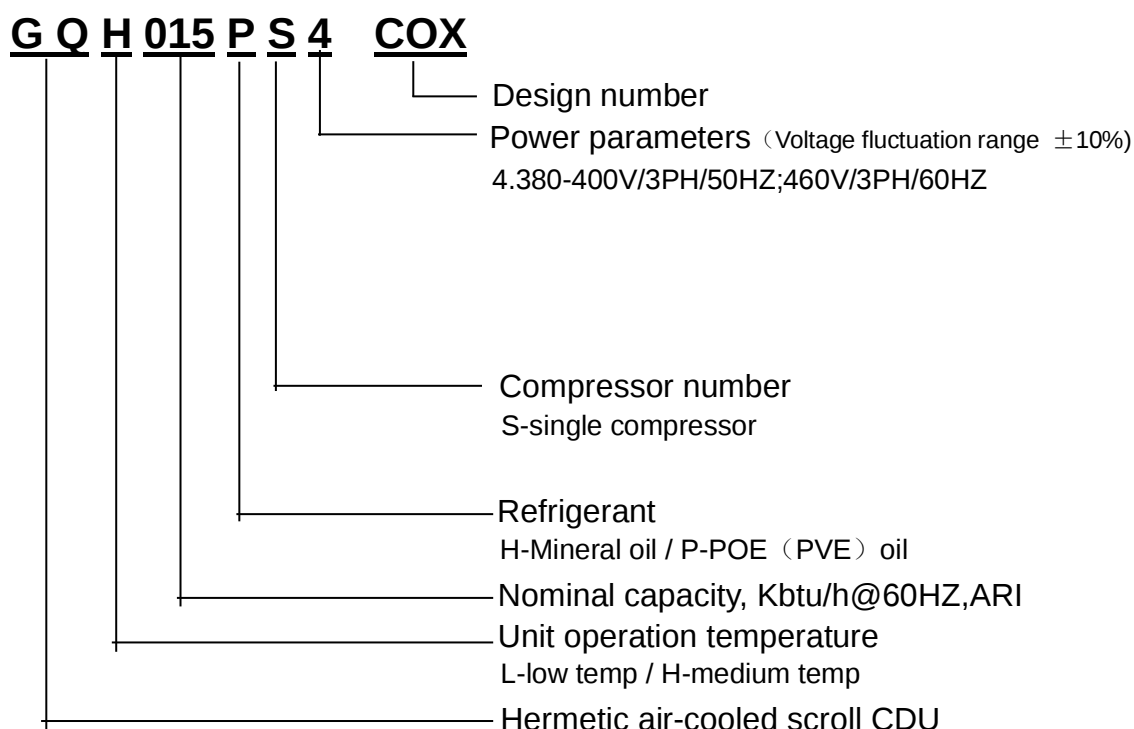
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1.Product Introduction

FIXED-SPEED Out-door Condensing Unit, which is very suitable for small Supermarket and Convenience store refrigeration system, capacity range from 2~7 HP, advantages is as following:

- Adopt famous top-brand compressor, high efficiency, good anti-vibration performance and low noise.
- PCB control system, adjust fan rotating-speed according to condensing temperature via SCR. Steady running, smaller fluctuation of system pressure and temperature to realize high-quality foods storage.
- PCB panel with digitron, which's used for malfunction code and operating parameters check, conveniently in maintenance & services.
- HP and LP pressure protection, compressor overload and overheat protection and phase sequence protection to guarantee system safety.
- Small size, easy installation and don't need special machine room.

2. Nomenclature



For standard low temperature fixed speed CDU, the end of internal design serial number is X; for the low ambient temperature application CDU , the end of internal design serial number is L.

3. Specification

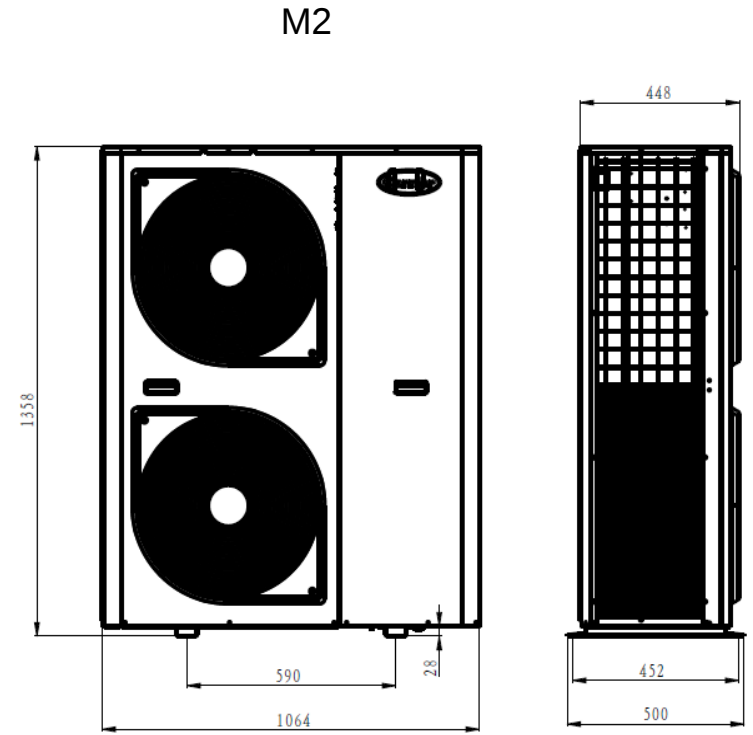
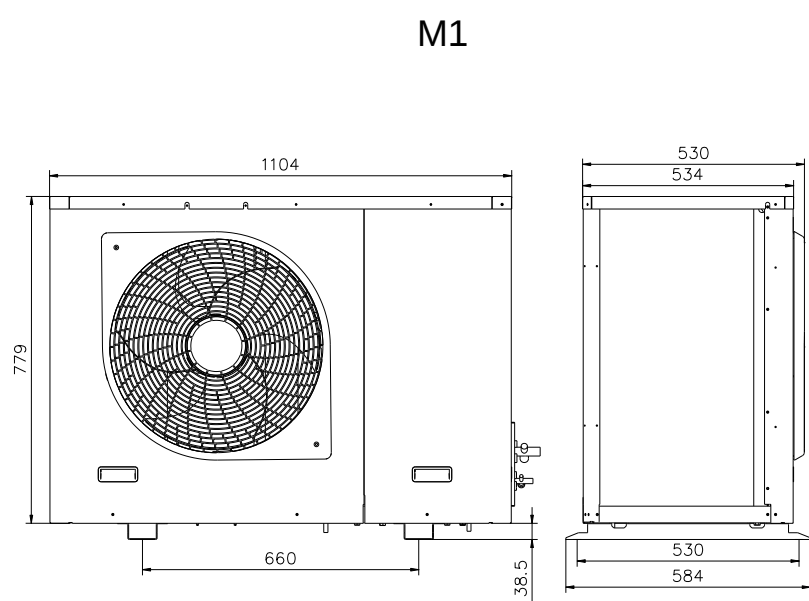
GQL			GQL006	GQL009	GQL011	GQL015	GQL018	GQL021
制冷剂 Refrigerant			R404A					
壳体规格 Size of casing			M3	M3	M3	M3	M4	M4
R404A	名义制冷量 Capacity	kW	2.28	2.67	3.47	4.39	6.09	7.01
	名义输入功率 Input power	kW	1.69	2.04	2.47	2.88	3.85	4.33
压缩机 Compressor	数量 Number		1	1	1	1	1	1
	型号 Model		ZSI06KQET	ZSI09KQET	ZSI11KQET	ZSI14KQET	ZSI18KQET	ZSI21KQET
曲轴箱加热带 Crankcase heater	数量 x 功率 No.x Power	W	1x65	1x65	1x65	1x65	1x75	1x75
噪音 Sound level	dB（A）		53	53	56	56	60	60
风扇电机 Fan motor	数量 x 直径 No.x Diameter	mm	1xØ500	1xØ500	1xØ500	1xØ500	2xØ500	2xØ500
	风量 Air flow	m³/h	4043	4043	4043	4043	7060	7060
总电流 Total current	风机额定电流 Rated I	A	0.6	0.6	0.6	0.6	1.2	1.2
	压缩机启动电流 LRA comp.	A	34.8	34.8	47	47	67	90.5
	压缩机运行电流 MOC comp.	A	5.7	6.7	7.5	9.2	13.2	14.6
过流保护出厂设定 Overcurrent trip setting		A	6	7	10	11	13	16
储液器容积 Receiver volume		L	6	6	6	6	8	8

冷冻机油 Lubricant(R404A)			RL 32-3MAF/RL 32H					
压机注油 Oil charge of comp		L	0.74	0.74	1.36	1.36	1.89	1.89
接口尺寸 Connections/SAE	回气 Suction	inch	5/8"	5/8"	3/4"	3/4"	3/4"	3/4"
	供液 Liquid	inch	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
尺寸 Dimension		mm	1104X504X818				1064×448×1358	
重量 Weight		kg	99.2	99.2	103.2	110.9	140	142.3

Sheet 1 LT Unit Specification

Note: (1)Data above is based on SST=-7℃, ambient temp=32℃,return gas temp=18℃; National Standard of China GB/T 21363;

(2) In the above table, for the low ambient temperature application CDU, the product code is COL. except that the Crankcase heater should be equipped with 2 pieces, the other parameters are the same as the standard model.



4. Unit operation

4.1 unit operation range

4.1.1 unit operation envelope



Pic.1 LT CDU Operation Envelope

(Max Return Gas Temp. 5°C)

Note: the shaded part is the extended application range at low ambient temperature relative to the standard model.

4.1.2 Unit must operate within the Envelope, including max. and min. ambient temperature, max. and min. evaporating temperature. For the area where the minimum ambient temperature of the unit is lower than -10 °C, it is recommended to select a low ambient temperature application CDU and consult the company's technical personnel.

4.2 Pressure switch settings

4.2.1 Pressure switch pre-setting as below sheet 3

4.2.2 Particularly Note: Due to the accuracy of LP control switch, ensure a reasonable margin for evaporating temperature setting.

Description	Function	LT	Cut out/Barg	Cut in/Barg
HP safe switch	System protection	the standard model	28, R404a	22, R404a
		low ambient temperature model	30, R404a	24, R404a
LP control switch	SST adjustment	standard/low ambient temperature	$1.0 \leq R \leq 2.65$, R404a	$R \leq d \leq 5$, R404a

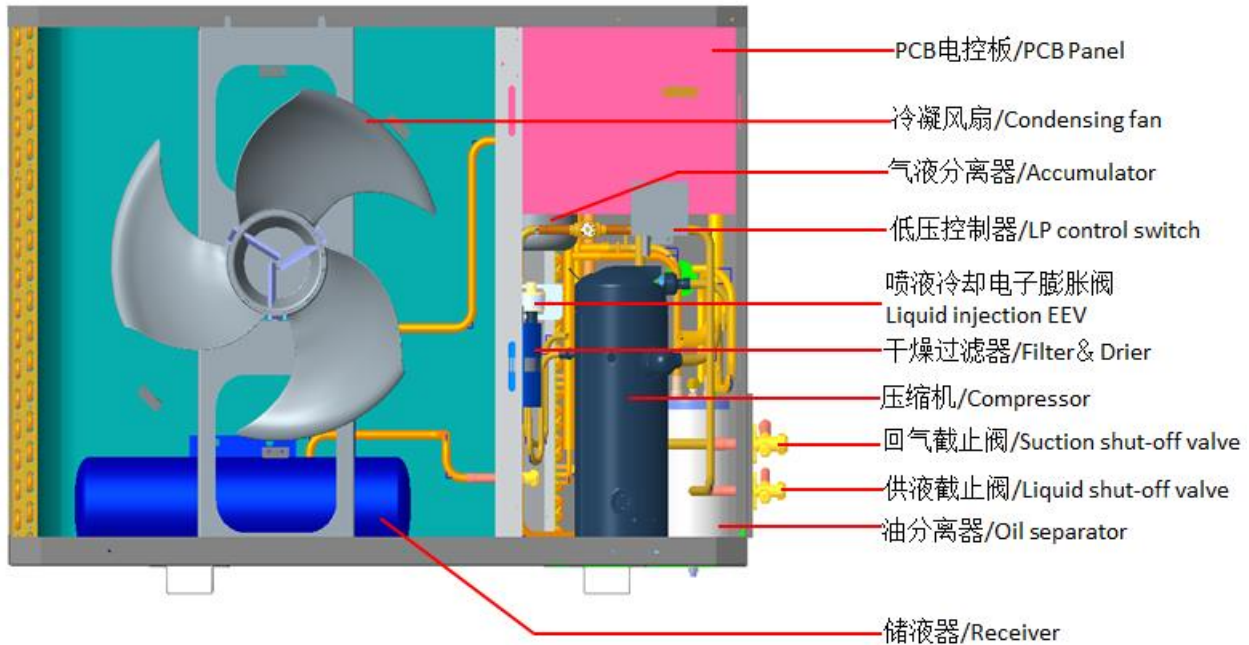
Sheet 2 Pressure Switch Settings

Above pressure switch settings for reference only, please adjust switch setting according to different application. Never in negative pressure operation and ensure the pressure setting for adjustable LP control switch no less than the low limit of Cut out.

5. Unit frame

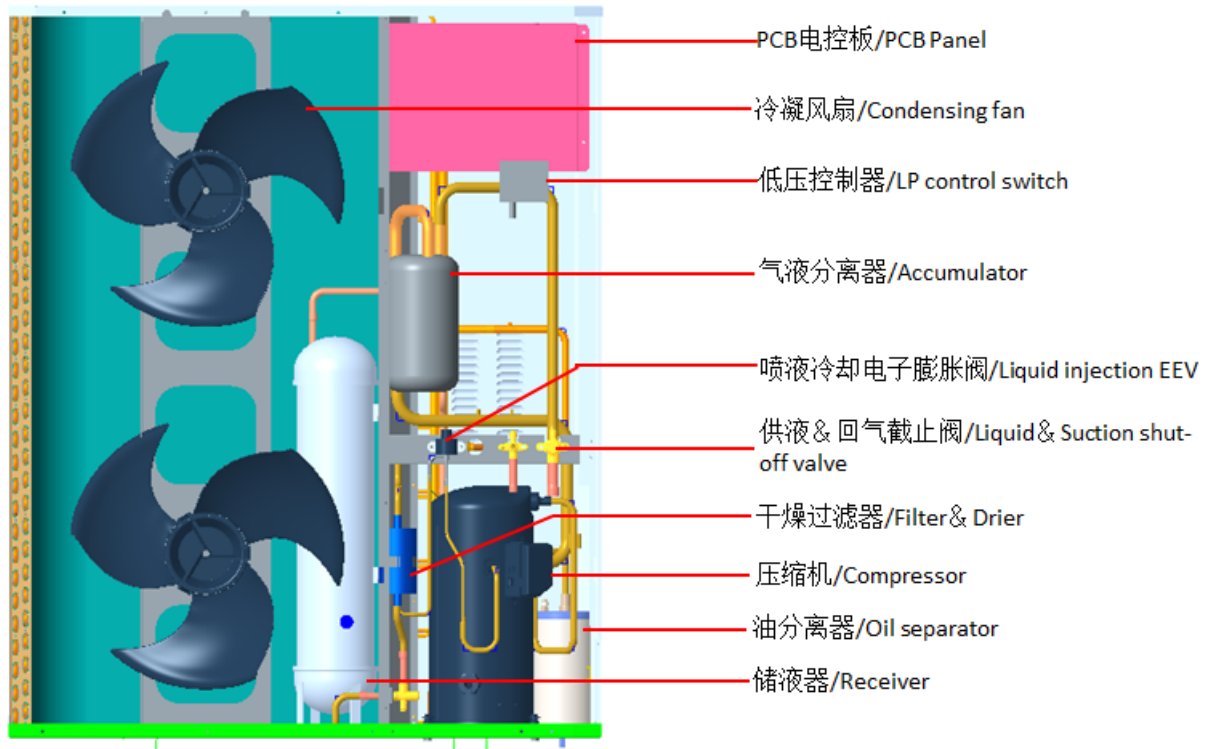
5.1 Frame of the standard CDU

5.1.2 Frame of single fans unit



Pic. 2

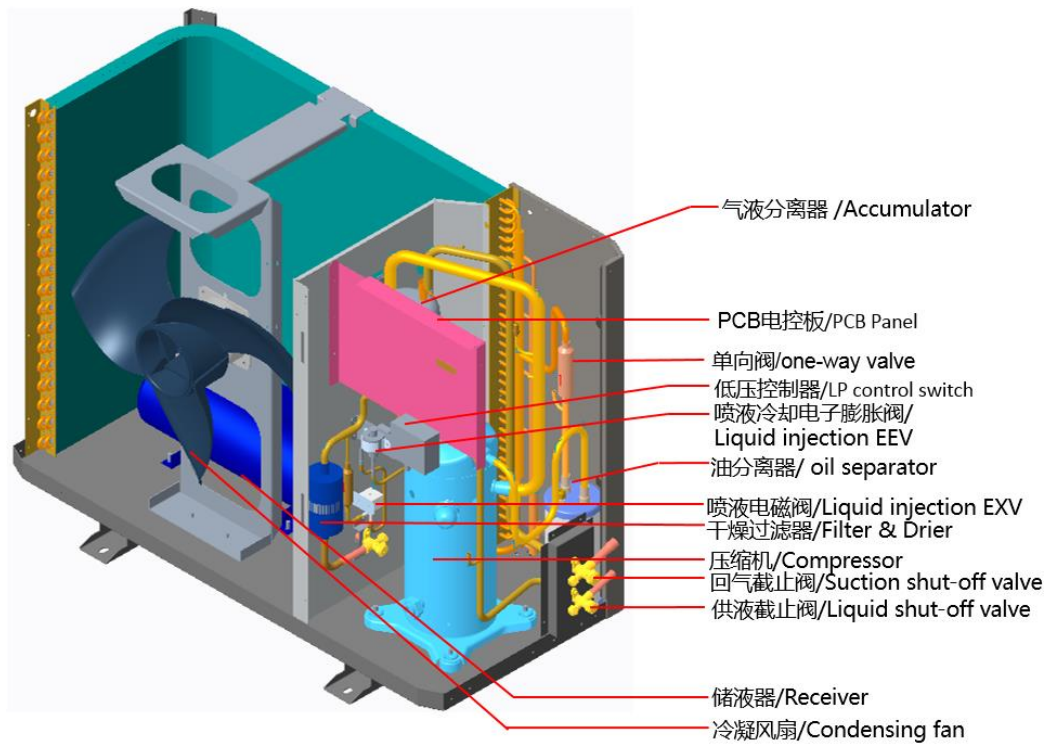
5.1.2 Frame of double fans unit



Pic. 3

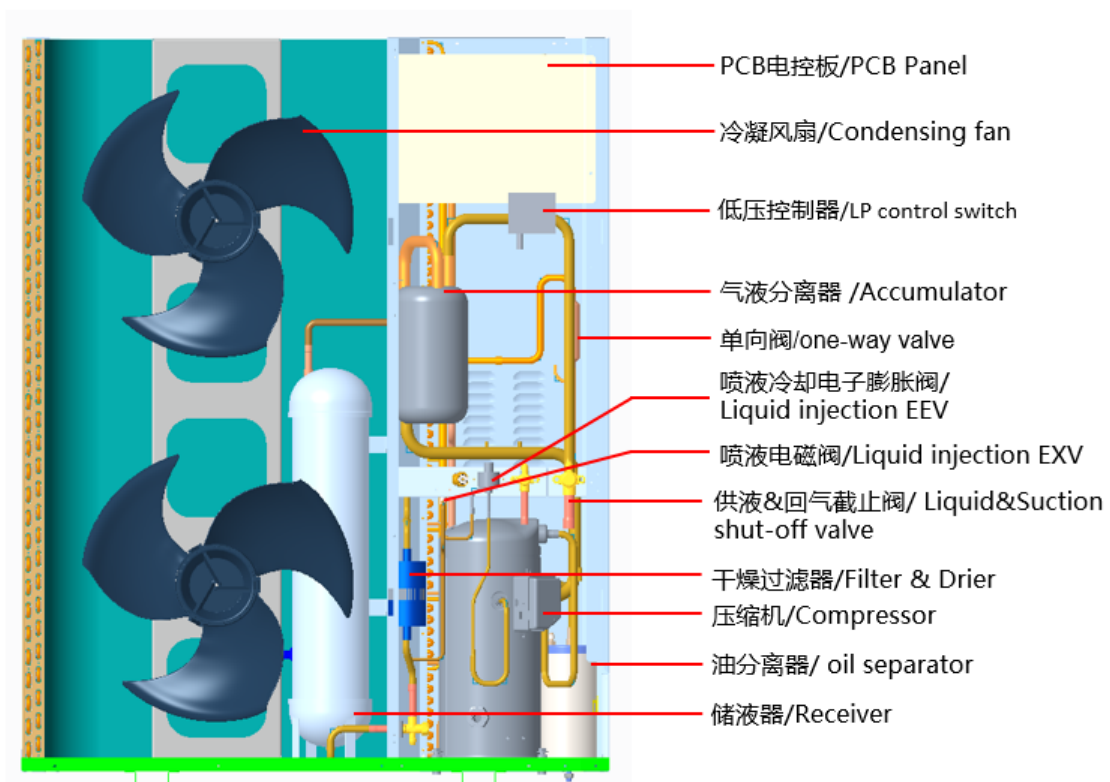
5.2 Frame of the low ambient temperature application CDU

5.2.1 Frame of single fans unit



Pic.4

5.2.2 Frame of double fans unit



Pic.5

Note: Manufacture reserves the right to change any product improvement/specifications without notice.

6. Electrical Control

6.1 Electrical safety

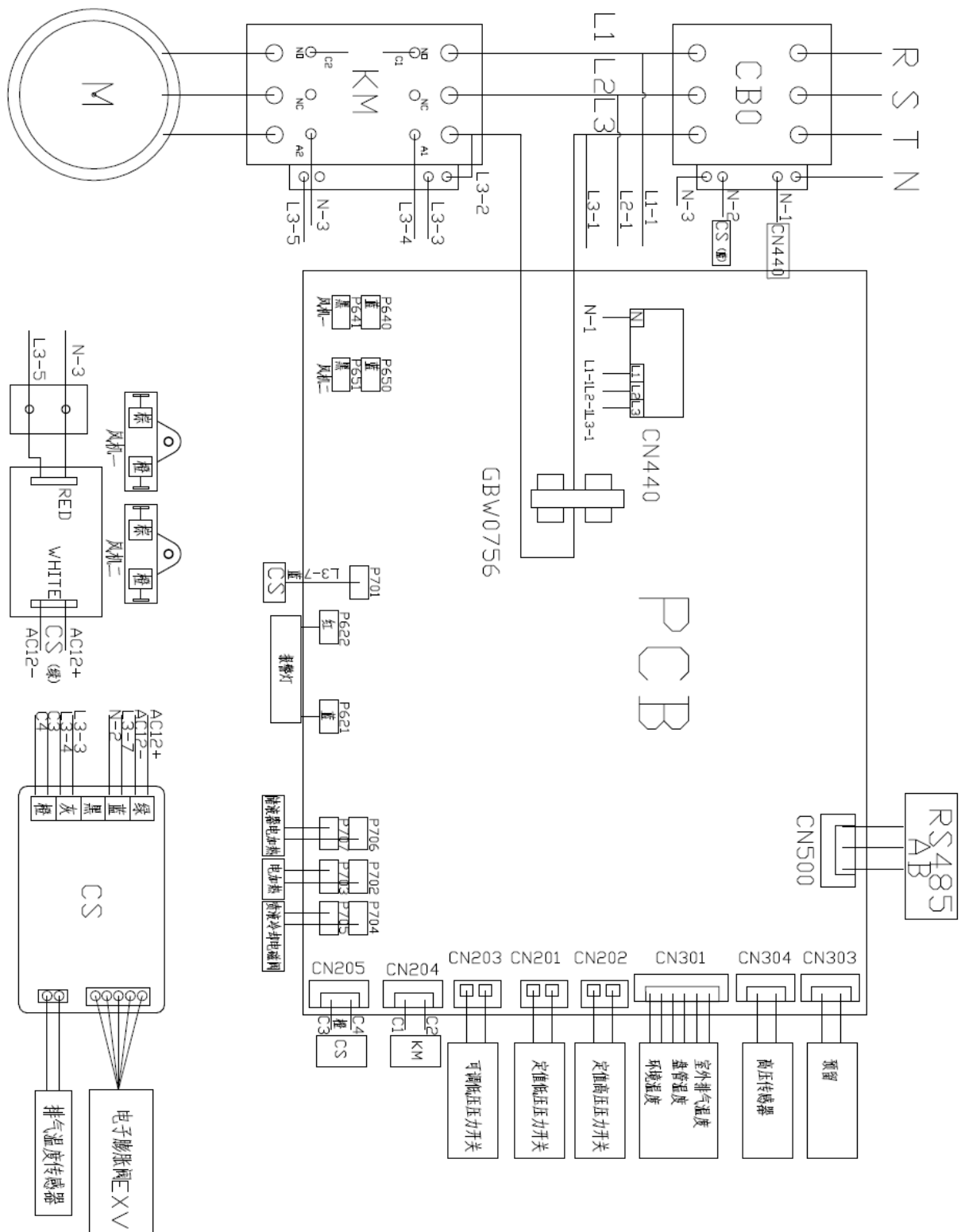
6.1.1 Please connect ground-wire correctly, otherwise it's dangerous to get electric shock. And please check the ground-wire and control circuit frequently in daily maintenance.

6.1.2 Don't operate the wired remote control via sharp metal and similar tool, and don't pull the wire to avoid wire connection failure, which could lead to unit malfunction.

6.1.3 Make sure to Switch off the power before touch any electrical component in the control panel to guarantee human safety.

Caution: out-door unit is easy to be exposed in rain, so it's necessary to do the wire-ground connection work. Please install leakage circuit breaker according to relevant electrical standard or local law.

6.2 Electrical Diagram



Pic.6 Electrical Diagram

Note: for the standard CDU, there is no reservoir heating wire and high pressure sensor. For the low ambient temperature CDU, it is necessary to install the reservoir heating wire and high pressure sensor.

7. Running Logic Function

7.1 Initial start-up procedure

7.1.1 First start, unit will operate the initial start-up procedure: After 3 minutes delay, compressor will run and stop for 3 times, running 3 seconds and stopping 20 seconds every time

7.1.2 When the first start procedure processed, compressor will run normally after 20s delay.

7.2 Steady running

7.2.1 Compressor min. halt time is 3 minutes and min. running time is 2 minutes.

7.2.2 During unit running, Condensation fan rotating speed can be adjusted linearly according to the temperature of condensation coil.

7.3 Unit stop

7.3.1 When get stop signal, such as suction pressure meet LP switch setting, compressor and fan will stop together.

7.3.2 When unit restart, compressor and fan will start running immediately.

7.4 Power supply failure

7.4.1 When power switch off, unit will stop immediately, PCB data will be cleared.

7.4.2 When power switch on, unit will operate initial start-up procedure.

8. Protection and Malfunction Code

8.1 When malfunction happened, you could check the malfunction code via digitron & button. The detailed method as follow:

8.1.1 PCB could save 3 historical malfunction code, and the latest malfunction will be show in priority.

8.1.2 Operation method: press the K803(set button) for 3s, enter into the alarm code check status, LED801 will show the latest alarm code in blinking; press the button K804(enter button), LED801 will show the former alarm code of latest one, press the button K804 again, LED801 will show the second former alarm code of latest one, press the button K804 again, LED801 will show the coil condensing temp in blinking, press the button K804, LED801 will show the latest alarm code cycle in turn.

8.1.3 Exit method: in malfunction check status, press K803 for 3s to exit malfunction check status, or without any operation for 10s, exit malfunction check status automatically.

8.2 Malfunction code as below:

Code	Malfunction/alarm	Unit stop temporarily and recovery start	Unit stop and locked Recovery manually
E01	System LP alarm	Every time	N/A
E02	Compressor overload protection	Every time & ≤5times an hour	6 th time in an hour
E03	Phase sequence protection	N/A	Every time

E04	Discharge temp protection	≤5times an hour Restart after 2mins delay	6 th time in an hour
E05	High pressure sensor, failure	Unit keep running	
E06	Low pressure sensor, failure	Unit keep running	
E08	Ambient temp sensor failure	Unit keep running	
E09	Condenser temp sensor failure	Unit keep running	
E10	Discharge temp sensor failure	Compressor running 2 mins, stop 3 mins, alternately	
E11	Contactor failure	Every time & ≤5times an hour	6 th time in an hour
E12	Liquid injection PCB failure	Every time & ≤5times an hour	6 th time in an hour
E13	PCB E2 failure	Unit stop and recovery manually	
E14	Load free failure	Every time & ≤5times an hour	6 th time in an hour
E15	System HP alarm	Every time & ≤5times an hour	6 th time in an hour

Sheet 3 unit malfunction code

8.3 Liquid injection PCB failure

If liquid injection PCB failure E12 occurred, we can infer the root cause according to the LED status as below:

	Status	Instruction
LED 1	Scintillate 3 times at 1 Hz, wait 5 seconds, and repeat	Discharge temp sensor open/short circuit
	Scintillate 5 times at 1 Hz, wait 5 seconds, and repeat	Discharge temp sensor failure or below/beyond the range
LED 2 LED 3	LED 2 scintillating at 1 Hz, LED 3 goes out	The opening of EEV is in increasing
	LED 3 scintillating at 1 Hz, LED 2 goes out	The opening of EEV is in decreasing
	LED 2 always on, LED 3 goes out	The EEV opens fully
	LED 3 always on, LED 2 goes out	The EEV closes fully
LED 4	always on	Discharge temp sensor overheat protection
		Discharge temp sensor open/short circuit
		Discharge temp sensor failure or below/beyond the range

Sheet 4 EEV malfunction code fault setting

9. PCB Circuit Setting

9.1 Eight DIP switch on the PCB. See below sheet 4

NO K221	Function	NO K223	Function
SW1	reserved	SW1	OFF--- the standard CDU ON--- the low ambient temperature application CDU
SW2	OFF----EXV liquid injection application ON----EXV air injection application	SW2	reserved
SW3	OFF----ERV (EXV) application ON----ERV (capillary) application	SW3	reserved
SW4	OFF--- crankcase heater not adjusted by ambient temp ON--- crankcase heater adjusted by ambient temp	SW4	Reset all fault manually

Sheet 5 DIP switch setting instruction

9.2 Factory fault setting of DIP switch

There are some differences between the standard CDU and the low ambient temperature application CDU. See Table 6 ~ 7 for details.

K221				K223			
SW1	SW2	SW3	SW4	SW1	SW2	SW3	SW4
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Sheet 6 DIP Ex-factory fault setting(the standard CDU)

K221				K223			
SW1	SW2	SW3	SW4	SW1	SW2	SW3	SW4
OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF

Sheet 7 DIP Ex-factory fault setting(the low ambient temperature application CDU)

In northern winter and other places with extremely low ambient temperature, the suction pressure of the unit is usually lower than the set starting pressure. In order to ensure that the chiller can be started at extremely low temperature, for the low ambient temperature application CDU, the dial switch K223-SW1 can be set to ON, and the unit enters the low ambient temperature working mode, and the unit starts.

10. Unit installation

10.1 Space requirement

10.1.1 Installation foundation should be flat, better 200mm higher than ground to keep unit clean.

10.1.2 Enough space should be reserved for maintenance and unit ventilation. No less than 300mm at back side, no less than 450mm at left and right sides, no less than 1500mm at front side and no less than 1300mm at top side.

10.2 Transportation

Unit should keep vertically as much as possible. Inclination angle should not exceed 45°

10.3 Pipes installation

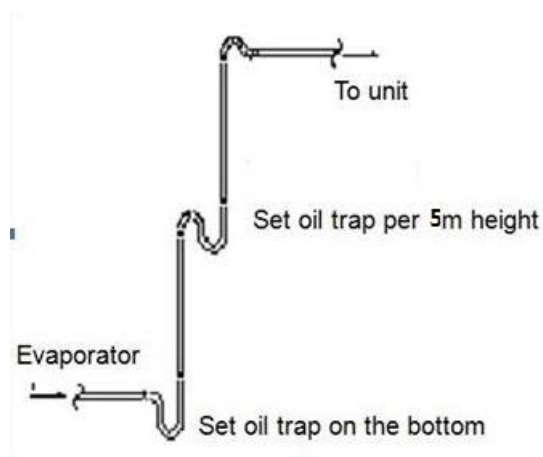
For your system safety, please use national standard refrigeration pipe. Pay attention to:

10.3.1 Refrigeration liquid tube design:

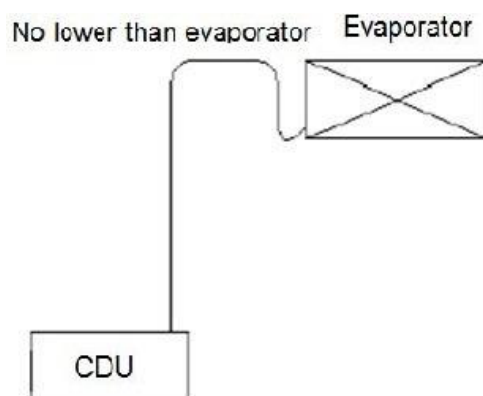
If evaporator placed much higher than unit, with the pressure drop, part liquid refrigerant would turn into flash gas which would decrease the refrigeration capacity. So the height gap should be within 6m. Beyond this limits, special equipment(heat exchange or subcooler ig.)should be adopt to cool the liquid and avoid refrigeration flash gas.

10.3.2 Refrigeration gas tube design:

a: If evaporator placed much lower than unit, we should set the tube with slope 1:100~2:100 down to compressor, in which the oil could as much as possible return compressor. If the gas tube doesn't set properly, the refrigeration oil couldn't return compressor smoothly, which will result in compressor faults; on the other hand, select proper copper tube to get reasonable refrigerant flow speed to ensure oil return. And when the height gap exceeds 5 m, oil trap should be set on the gas tube every 5m to overcome height gap to realize oil return smoothly, as follows:



b: If the evaporator placed higher than unit, return gas tube should set trap as below to avoid much refrigerant flow to compressor except that solenoid valve installed on liquid tube.



10.3.3 Oil Supplement

If refrigeration tube length for one-way exceeds 20m, please add additional lubricating oil into system according to sheet below.

Tube (inch/mm)	Lubricating oil (ml/m)
1/2"(Φ12.7)	10
5/8"(Φ15.9)	20
3/4"(Φ19)	30
7/8"(Φ22)	40
1"(Φ25.4)	50

Sheet 7 lubricating oil supplement

Caution: please use corresponding oil according to system refrigerant, see sheet 1 on page 3&4.

11. System leak detection and vacuum

- 11.1 Leakage test pressure should be less than 18barg on HP side and 12barg on LP side.
- 11.2 Vacuum holding pressure test is available also.
- 11.3 Vacuum system via compressor is forbidden.
- 11.4 Vacuum system should operate at HP and LP sides meanwhile.
- 11.5 Vacuum should be below 30Pa (0.25mm Hg) .
- 11.6 Vacuum degree should be measured by special vacuum gauge, Ordinary pressure gauge is forbidden.

12. Refrigerant Charge and Superheat Adjustment

12.1 Refrigerant charge should be doing at high pressure side and low pressure side same time and finished before the unit starts, refrigerant pressure should be no less than 6 barg. Liquid line shut-off valve is the best charge inlet port.

12.2 If refrigerant charge added during unit operation, Suction line shut-off valve is the best inlet port and ensure no-significant liquid return. The refrigerant must be liquid in charging.

12.3 Maybe it will be happened that compressor stop and restart with several time during the Refrigerant charging. It is forbidden to force the refrigerant into system with the shortage of the LP or HP switch.

12.4 Refrigeration system superheat setting

12.4.1 Calculation method of superheat

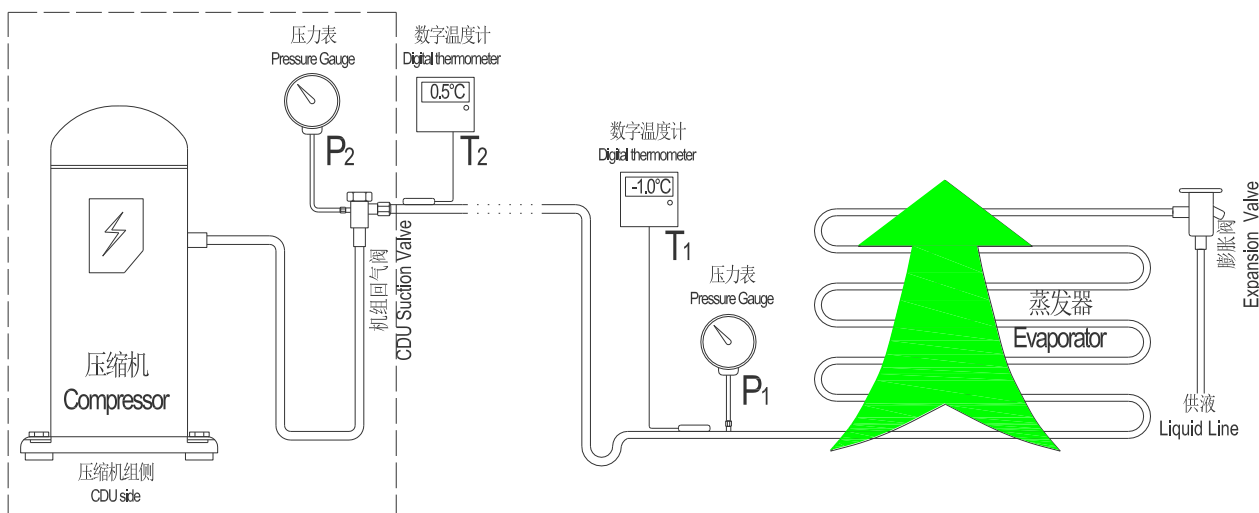
Measure the pressure(P_1/P_2) and temperature(T_1/T_2) at evaporator outlet and unit inlet, and get the saturated evaporation temperature(TS_1/TS_2)based on the pressure P_1/P_2 according to the refrigerant thermal parameters, calculation method as below:

(1) Superheat of evaporator $\Delta t_1 = T_1 - TS_1$;

(2) Superheat of CDU $\Delta t_2 = T_2 - TS_2$.

12.4.2 Superheat setting

For reference that superheat of evaporator should be 0.5~0.7 times of evaporation temperature difference; and the superheat between evaporator outlet and suction line rotalock valve of CDU should be below 3K. Please adjust superheat flexibly in actual application.



Superheat Data Acquisition Location

13. Maintenance and Failure mode analysis

Maintenance could improve unit performance and product life, please check items as follow.

- 13.1 Weather unit pressure and temperature is normally?
- 13.2 Weather compressor oil level of sight glass is visible?
- 13.3 Weather compressor and condenser fan is running normally?
- 13.4 Weather compressor restart frequently?
- 13.5 Weather protection and control components are operating abnormally?
- 13.6 Weather the system is leak?
- 13.7 Weather any electrical component aging or overheat, and wire connection loose?
- 13.8 Weather condenser is dirty with thick dust and jammed?
- 13.9 Weather unit ventilates well?

Notes:

- ▲When repair or replace components, don't exhaust refrigerant to atmosphere directly, make sure to recover refrigerant with professional equipments.
- ▲When need to let off parts of refrigerant as repairing, add additional oil before unit restart, because parts of oil lost during exhausting refrigerant.
- ▲If compressor or condenser was replaced, make sure to change filter at the same time, when compressor burnt, system refrigerant would be polluted seriously, refrigerant and oil must be cleared thoroughly.
- ▲All repair work should be operated by professional engineer.

■ Failure Solution

Failure	Reason	Solution
Compressor can't start up	Not connect power supply or the fuse broken	Power on or change the fuse
	Electrical failure	Find out the reason and solve them
	Some protection procedure running	Find out the reason, restored it and release manually
High pressure is too high, high pressure controller protection	Condensing fan doesn't work	Find out the reasons and start it
	Condenser is blocked	Clean condenser
	Ambient temperature is too high or the ventilation is not good	Improve surrounding or ventilation
	Too much refrigerant or the internal system has air	Discharge overfull refrigeration or air
High pressure is not high enough	Ambient temperature is too low	Add auxiliary pressure switch controller, our company is in charge of detailed operation
Low pressure is very low	Expansion valve or filter is blocked	Clean expansion valve or filter or replace filter
	Refrigeration is not enough	Add refrigerant
	system leakage	Find out leakage place and repair it
Compressor cover frosting	Open expansion valve too much	Turn down expansion valve
Discharge pipe is not hot	Refrigerant enter compressor crankcase	Shut off compressor suction valve and Open it again slowly
Compressor voice is abnormal	Wrong Power Phase connection	Check and Adjust the phase sequence
	Compressor mechanical failures	Repair compressor or change compressor
Unit vibration is too large	Unit set not horizontally	Set it horizontally
	Compressor locking device is not displaced	Displace locking device
	Pipeline vibration	Fix pipeline
	Compressor mechanical failures	Repair compressor or change compressor
Compressor Start and stop frequently	Settings is wrong for High or low pressure switch	Re-set pressure switch
	Electrical control circuit failure	Manage these failures

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