



冷冻冷藏压缩机组 安装使用说明书



专用号：0080501402

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

目录

目 录.....	2
一、机组简介.....	3
二、机组各主要部件名称.....	4
三、技术数据.....	6
四、机 组 安 装	10
五、制冷管路连接.....	13
六、开机程序.....	16
七、机组本身要求.....	21
八、机组的保养条件.....	25
九、电气说明.....	28

一、 机组简介

冷藏/冷冻并联压缩机动力机组适用于超市食品展示柜、冷库制冷机以及其他工业低温要求的场所。并联机组采用立式整体化机组设计，极大的提高了设备的运行效率，降低了用户的运行成本，提高了机组配件的使用寿命，使系统高效集成，便于用户的维修和管理。同时可以根据客户需要，使用 Dixell、Eliwell、Danfoss 压缩机控制器，智能化控制系统简单可靠，可以灵活的设定机组正常运行工况点和经济运行工况点，达到节能的目的。使用高效压缩机，有效降低压缩比，提高机组效率和可靠性。

二、 机组各主要部件名称

2.1 活塞压缩机并联机组组件图示：

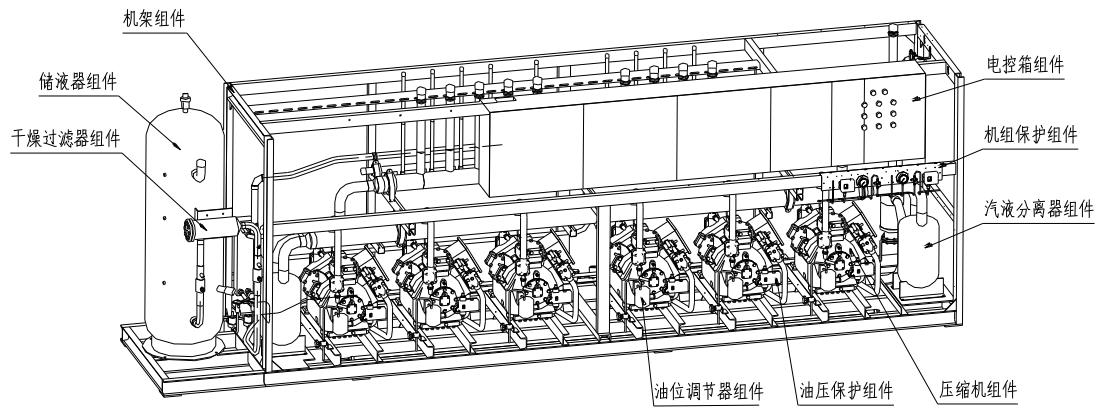


图 1 活塞压缩机机组正面视图

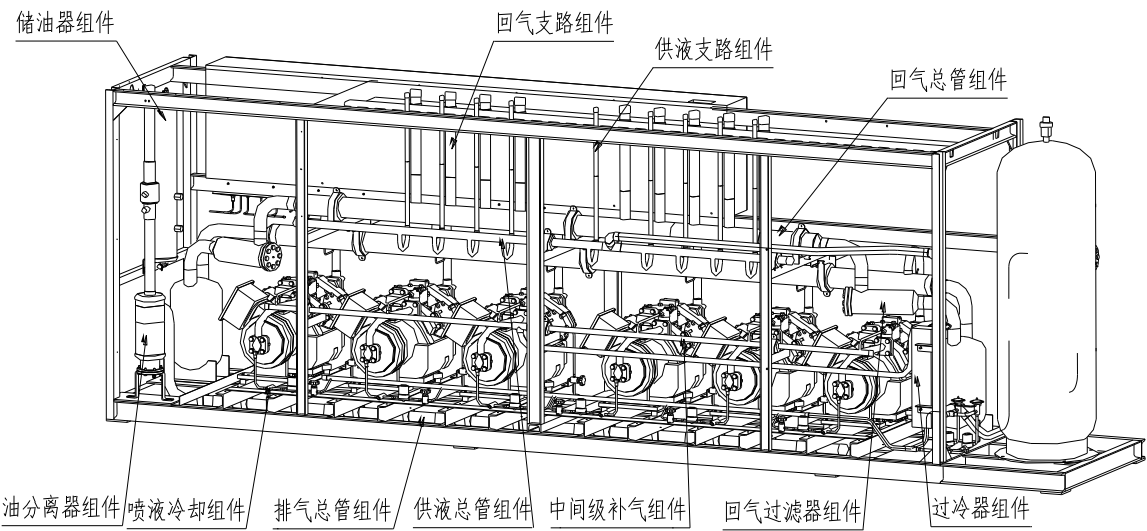


图 2 活塞压缩机机组背面视图

2.2 涡旋压缩机并联机组组件图示：

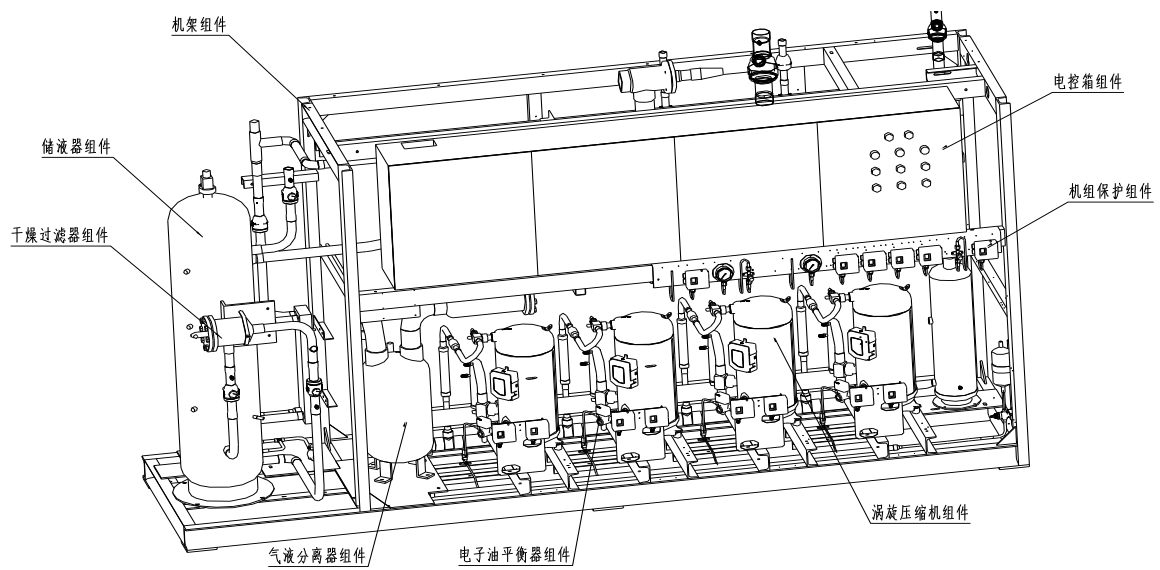


图 3 涡旋压缩机机组正面视图

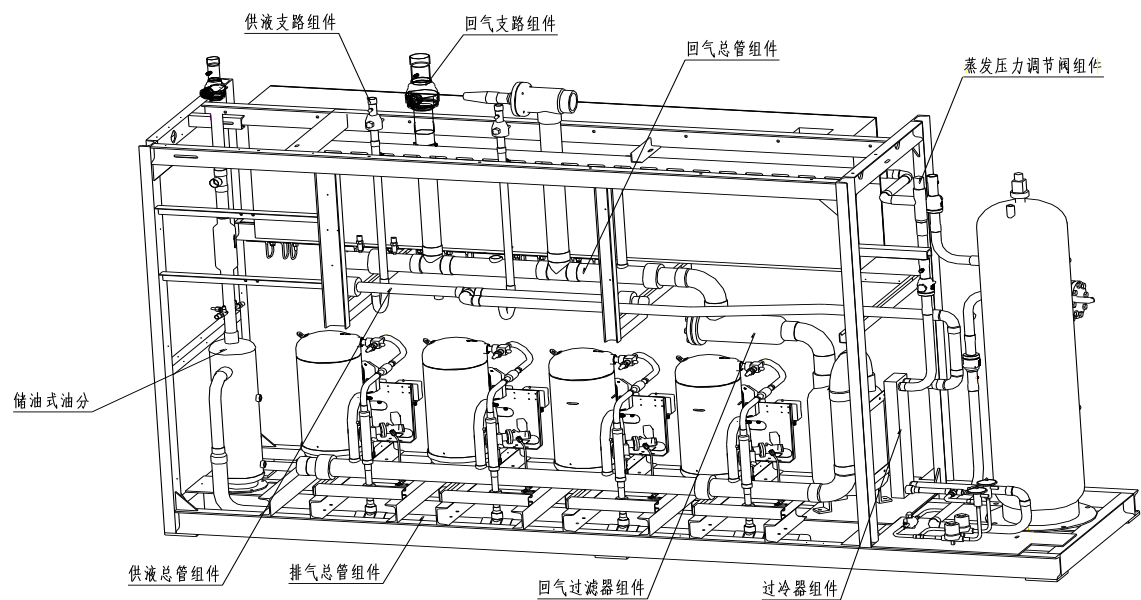
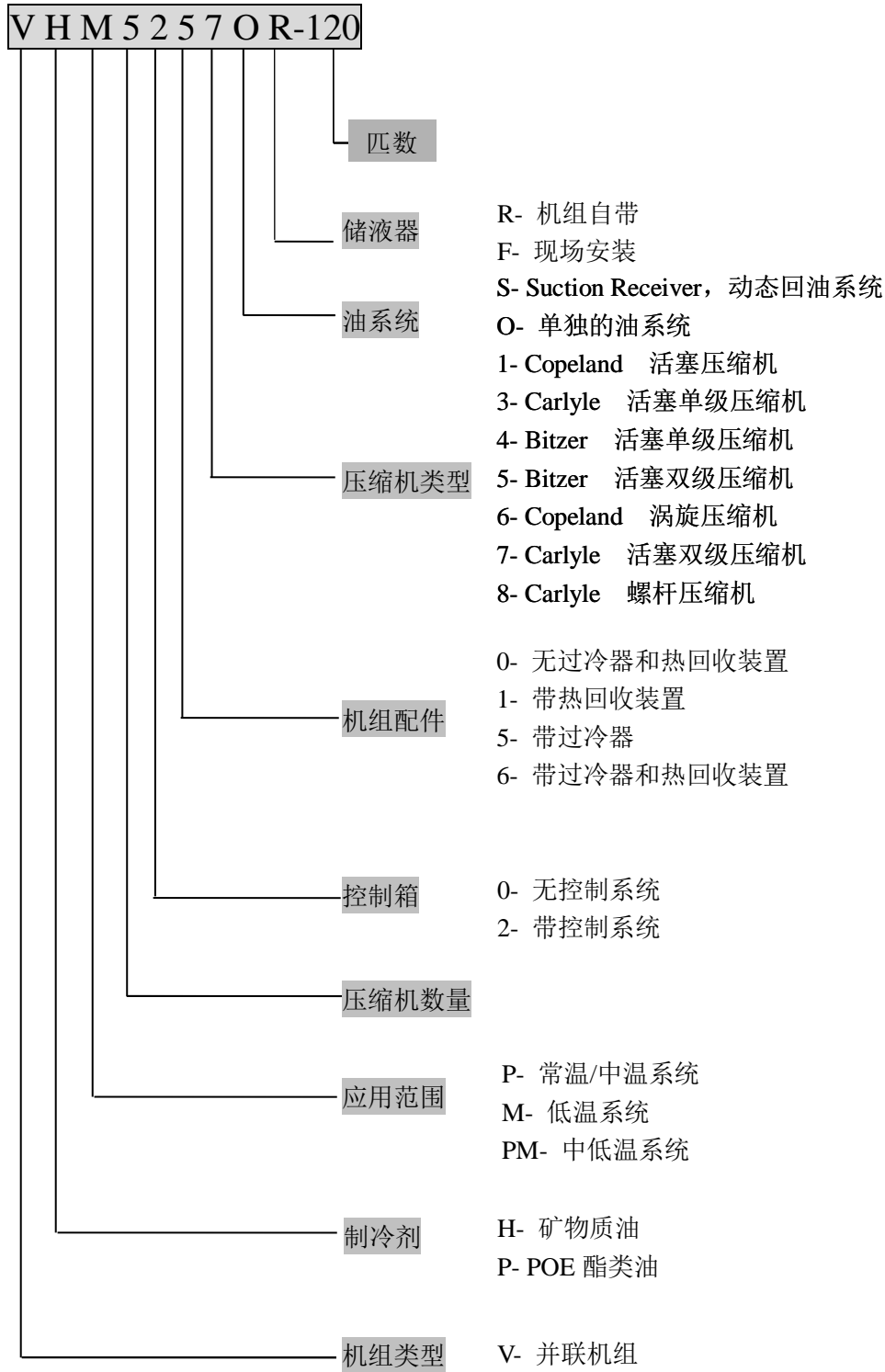


图 4 涡旋压缩机机组背面视图

三、技术数据

3.1 并联机组型号标识：



到货后请首先核对该机组型号是否与订货型号一致。

3.2 使用范围

3.2.1 活塞压缩机低温机组

压缩机 组类型	蒸发温度范围		制冷量范围 Q _o (KW)					
			To: -40℃		To: -38℃		To: -35℃	
	R22	R404A	R22	R404A	R22	R404A	R22	R404A
双级低温 06CC 压缩 机组	-50—-23℃	-50—-23℃	23—130	26—175	27—144	30—192	32—167	36—220
单级低温 06ER 压缩 机组	-37—-12℃	-40—-18℃		19—110		24—128	20—118	31—156

* 以上数据基于冷凝温度 45℃，吸气温度 18.3℃。

3.2.2 活塞压缩机中温机组

压缩机 组类型	蒸发温度范围		制冷量范围 Q _o (KW)					
			To: -12℃		To: -10℃		To: -5℃	
	R22	R404A	R22	R404A	R22	R404A	R22	R404A
单级中温 06EM 机组	-18—7℃	-18—4℃	80—429	86—533	89—471	95—569	113—590	120—670

* 以上数据基于冷凝温度 45℃，吸气温度 18.3℃。

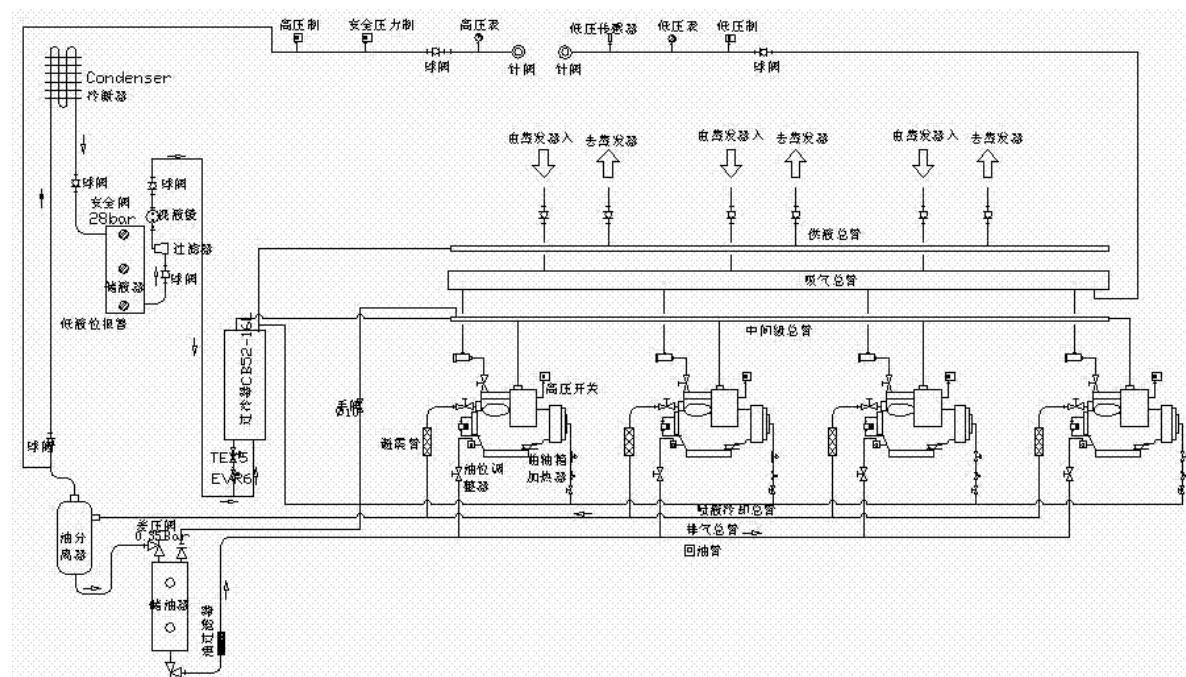
3.2.3 涡旋压缩机中温机组(制冷剂: R404A)

压缩机 组类型	蒸发温度范围	制冷量范围 Q _o (KW)		
		To: -12℃	To: -10℃	To: -5℃
ZB76/ ZB114	-20—10℃	45—110	50—120	61—149

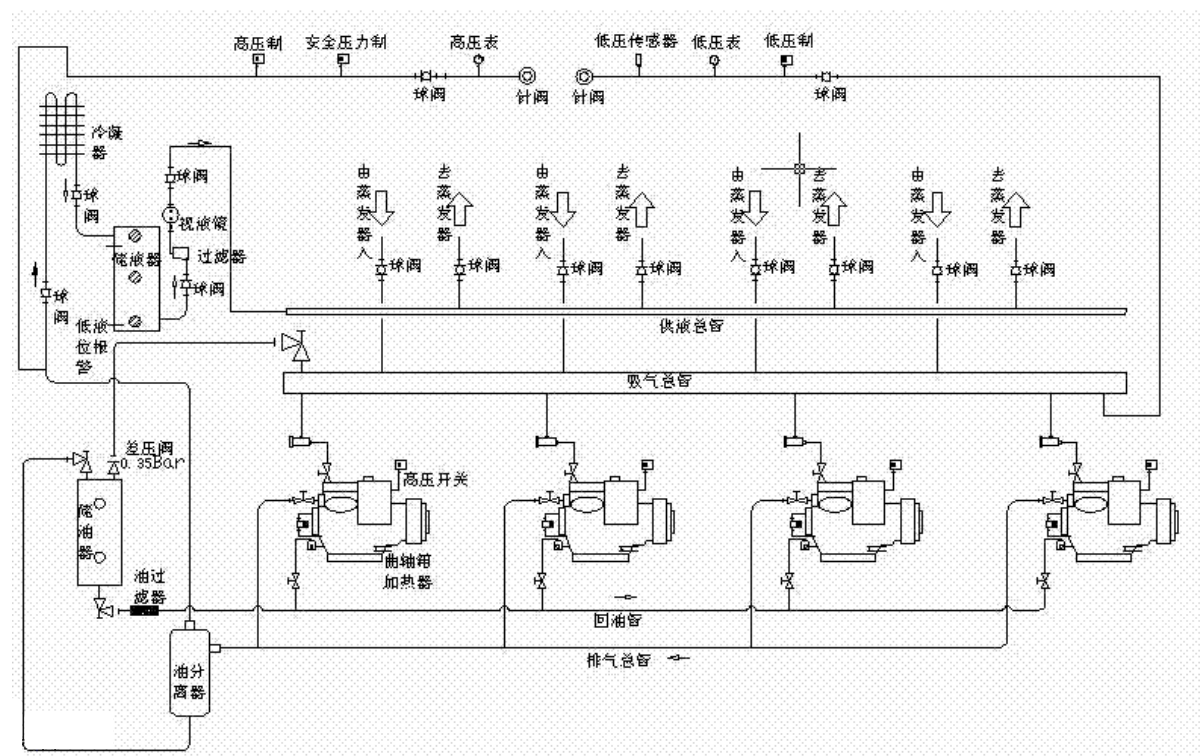
* 以上数据基于冷凝温度 45℃，吸气过热度 11K。

3.3 管路连接原理图

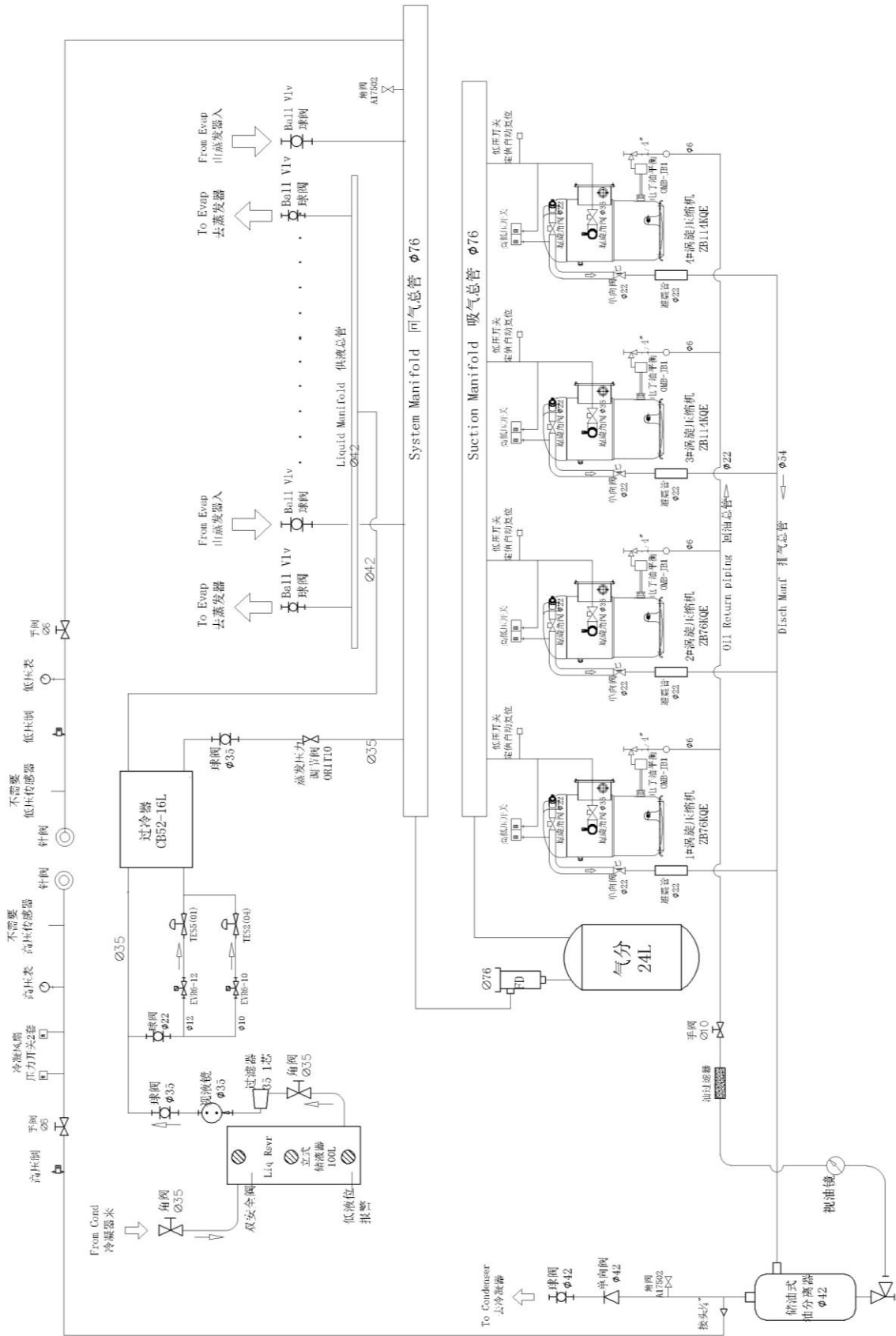
3.3.1 低温活塞双级机组



3.3.2 中温活塞单级机组



3.3.3 中温涡旋机组



四、机组安装

4.1 供电要求： 电源必须符合下述标准：

压缩机组电源电压应在 $380V \pm 10\%$ ； 频率： 50Hz；

4.2 机房通风：

由于并联压缩机组位于机房内，应保证足够通风以避免机房温升过高，夏季机房内温度不能超过室外温度 5°C ，尤其是在负荷较大且温度较高的夏季高温期。在北方的冬季，还要有适当的保温措施，使机房内温度不至于降到 10°C 以下。 对于我公司生产的带远置式冷凝器的并联压缩机组，必须依靠通风带走多余的热量，同时保持机房通风还可防止气体泄漏时因通风不良导致缺氧。请正确设置空气引入口位置，使空气流过机组，并严格遵循当地法规。下表为与单台并联压缩机组型号相对应的机房通风推荐值（表 2）。

注意：当机房有多台并联压缩机组时，应计算各台通风量之和。

单台并联机组对应的机房通风推荐值

活塞压缩机并联机组			
低温机组型号	推荐通风量 (立方米/小时)	中温机组型号	推荐通风量 (立方米/小时)
VHM32070R-45	4500	VHP32030R-45	5200
VHM32070R-60	5200	VHP32030R-75	8000
VHM32070R-90	7200	VHP32030R-105	11000
VHM42070R-120	9600	VHP42030R-140	15000
VHM52070R-150	12000	VHP52030R-175	18000
VHM62070R-180	14400	VHP62030R-210	21600
VHM72070R-210	16800	VHP72030R-245	25200
VHM82070R-240	19200	VHP82030R-280	28800

涡旋压缩机并联机组			
		VHP32560R-30	3500
		VHP32560R-35	4000
		VHP32560R-40	4500
		VHP42560R-45	5000
		VHP42560R-50	5500
		VHP42560R-55	6000
		VHP52560R-60	6500
		VHP52560R-65	7000
		VHP52560R-70	7500
		VHP52560R-75	8000
		VHP52560R-90	9500

表 2

4.3 防止火灾：

机房内(尤其在机组、电控箱、冷凝器、管路附近)严禁存放易燃、助燃、易爆物品。

4.4 设备固定基础：

(1) 室内部分

该并联压缩机组应该水平安装于机房内，安装时应考虑到使日常维护尽量方便。安装开利并联压缩机组及冷凝器的基础需为约 152mm（6”）厚的水平加强钢筋混凝土，必须保证地基的水平性和表面平整度，机组的倾斜度应在 1° 以内。建议该机组的周围最小间隙为：背部 600mm，面板前部 1067mm,对于摆放成首尾相连的机组,建议机组间间隙为 610mm（以上数据以本国或当地法律法规为准）。机组的重量和外形尺寸请参见我公司产品目录。

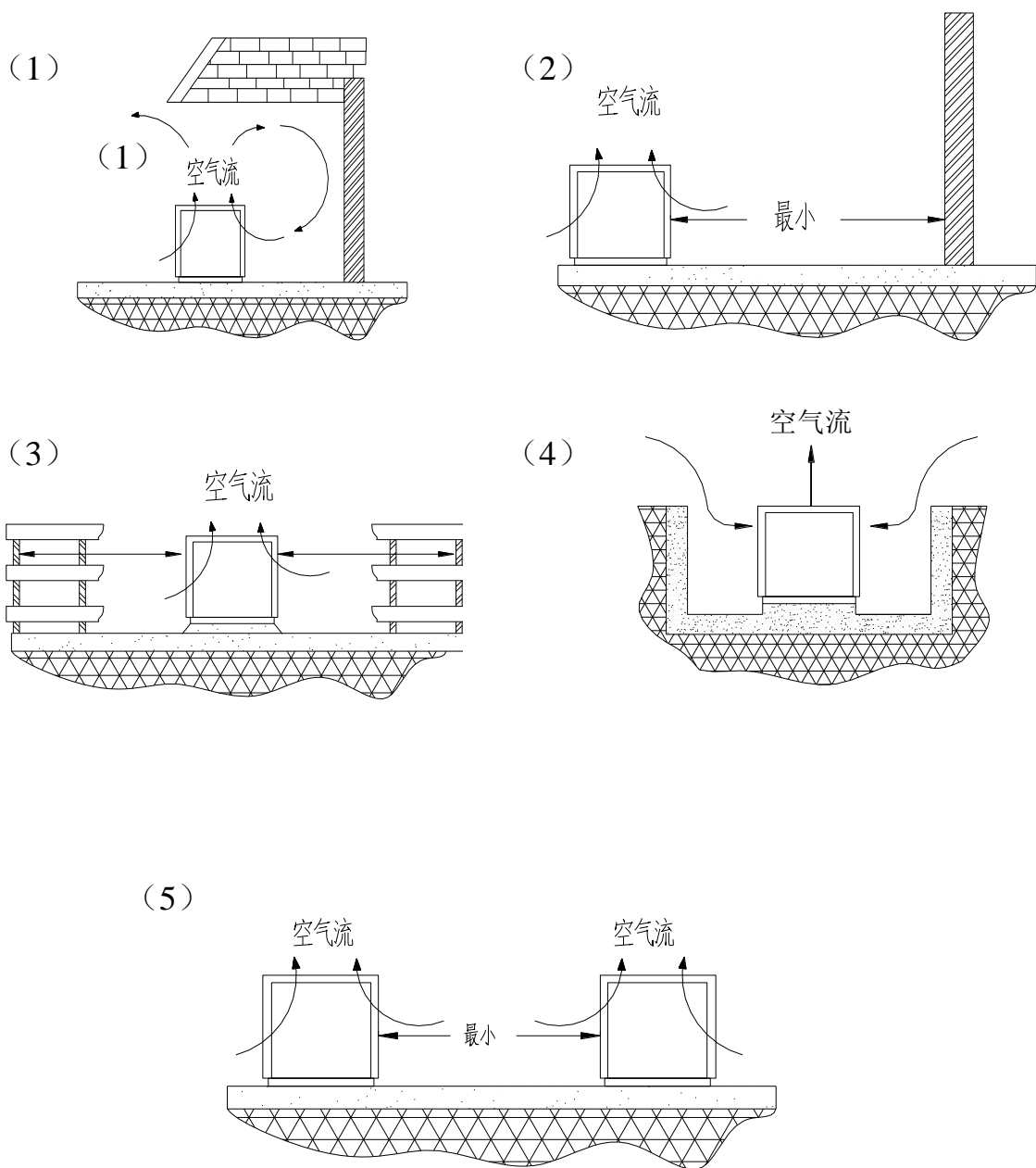
(2) 室外部分

室外冷凝器部分可水平或垂直方向安装，为用户大量节省安装空

间。但安装平台或基础应水平，所处位置应允许自由通风。决不允许把冷凝器置于邻近蒸气、热空气或烟气排放的区域。同时安装前应有建筑结构和声学专家进行指导，避免机组出现歪斜、受力不均、传递振动等现象。

应该给予冷凝器的维护与保养以足够的空间。绝大多数情况下所需的最小间隙描述如下（请注意这只是最小间隙，实际操作中应以本国或当地法律法规为准）：

- a、 冷凝器顶上不允许有障碍物。排出的竖直空气决不能遇到障碍而再循环回到进气侧。
- b、 冷凝器的摆放应使空气可以自由循环而不能再循环。为使空气能恰当流动及进出，四周距任何墙壁或障碍物至少 1.2m（4 英尺）（除控制面板侧以外）。若有可能，最好尽量增大该距离。应注意留有充足空间以通过进出门和面板作维护工作。当处于三面墙壁环抱时，冷凝器安装应遵循地坑机组安装指南。
- c、 装饰栅栏安装可以小于 1.2m（4 英尺）的侧面最小间隙（除控制面板侧以外），只要栅栏有足够面积允许空气流进冷凝器。应再次注意给维护留有充足空间。推荐的维护空间如上所述。
- d、 坑中冷凝器顶部应与地坑顶部齐平。如果顶部不与地坑顶部齐平，则坑中冷凝器顶部应与地坑顶部齐平。如果顶部不与地坑顶部齐平，则应采用更宽的地坑或排气管以将排放空气提升到地坑顶部，这是最低要求。
- e、 对并排放置的冷凝器，最小间隙是 2.4m（8 英尺）。



五、制冷管路的连接

5.1 管路连接注意事项

- 1) 接管的正确性。机组共有 4 个系统接口，分别是进出冷凝器和进出蒸发器的接口，请按图 2（第 4 页）和图 4（第 5 页）中的接管指示进行正确管路连接；

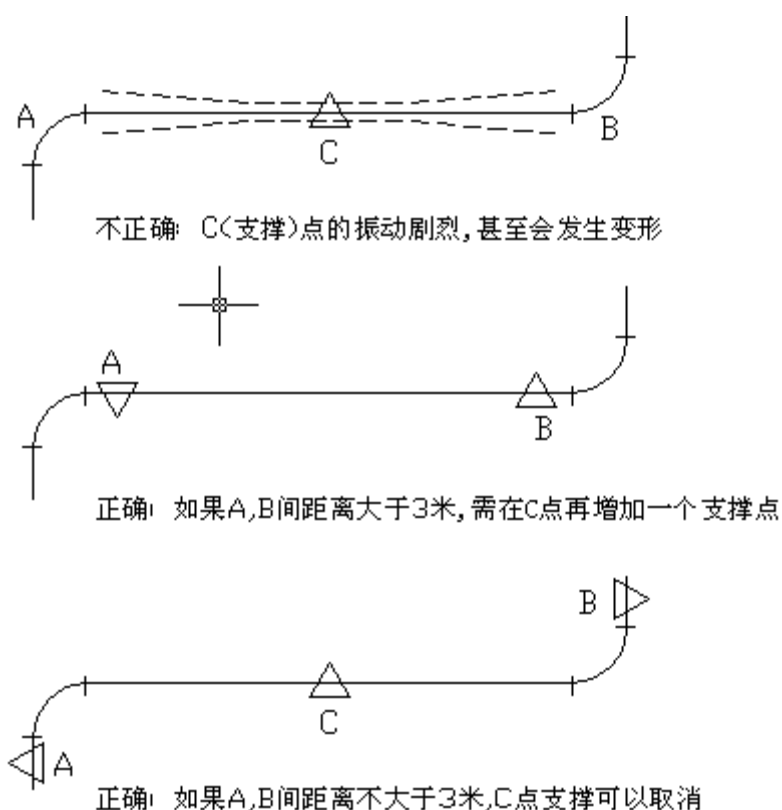
- 2) 请使用清洁的制冷级别的铜管，管内不得有灰尘及水份等；
- 3) 接管焊接之前，应将各台压缩机的吸排气截止阀关闭，并将储液器的进出口截止阀也关闭。焊接时请提供干燥氮气保护，以免管内产生氧化皮，同时应注意就近部件的降温保护工作；

- 4) 选择供液管和回气管时请考虑压力损失和回油：

为减小压力损失，请在管路的连接中尽量避免采用弯头，必要时应尽量采用弯曲半径较大的弯头；为确保回油，在回气管径的选择时应保证使冷媒气体流速在横向管路内达到 3.8m/s 以上，在垂直管路内达到 7.6m/s 以上，同时横向管路必须向下倾斜，且斜度需达到 1/200 以上。

- 5) 所有低温回/吸气管必须安装绝热材料。

- 6) 对管路进行合理的支撑，尽量减小振动。请参照下图所示：



5.2 若机组位置高于蒸发器时

如机组放置于 2 楼陈列柜放置于 1 楼，则蒸发器水平回气管与上升立管结合部位应按照规定设置回油弯，如机组位置大大高于蒸发器，需考虑在每一个 6m 左右的吸气上升段提供回油弯，如图 9 所示。

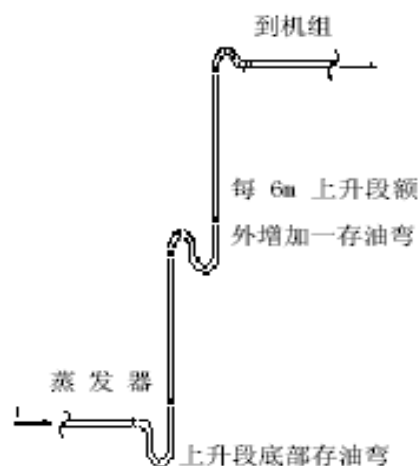


图 9. 机组位置高于蒸发器的情况

5.3 机组位置低于蒸发器时

若机组位置低于蒸发器（如机组放置于 1 楼，陈列柜放置于 2 楼），则应使回气管上升至与蒸发器上表面平齐，然后再向机组方向走管。如图 10 所示。

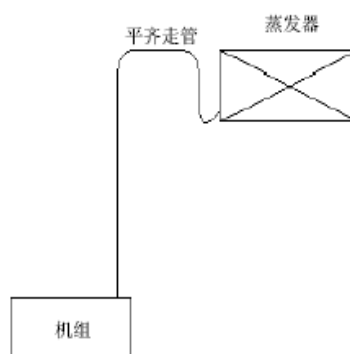


图 10. 机组位置低于蒸发器的情况

5.4 冷凝器的连接

一般来说，冷凝器位置高于压缩机组，则冷凝器每比压缩机组高出 6m，应在排气管上升段增设回油弯。另外，在排气部分没有安装单向截止阀的系统中，应使排气上升管升至风冷冷凝器的盘管水平面上方，然后接入冷凝器。如图 11 所示。

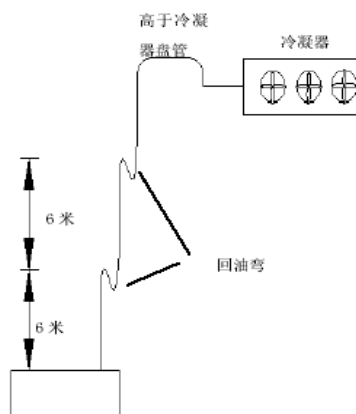


图 11. 冷凝器的接管系统

六、开机程序

注意： 不得随意切断曲轴箱加热器电源，除非机组正在进行维修，
或要停机相当长的时间。开机之前，电加热器至少要通电 24
小时。

开机程序包括三步：泄漏测试；抽真空；充注制冷剂并开机。

请严格遵循该三步骤以免开机过程中出现任何故障。

6.1 泄漏测试

只有系统没有泄漏，才能保证后续的抽真空，充注制冷剂，开机
及正常运行。

- *机房配电箱总开关应置于断开状态。

- *动力机组电源开关也应置于断开状态。

- *有以下阀门应处于打开状态：

 - 压缩机排气阀；

 - 压缩机吸气阀；

 - 储液器回液阀；

 - 储液器供液阀；

 - 所有现场安装的截止阀；

 - 所有油平衡系统的阀；

 - 所有内喷射冷却维修用阀；

- *合上动力机组电源开关。

- *合上机房配电箱总开关。

- *如需要接上抽真空/充注管路，以便对系统充注制冷剂和干燥

氮气，使用 3/8” 或更大的抽真空/充注管路。

*向系统加制冷剂至 50 psig (0.34MPa) 然后加氮气至 120 psig (0.83MPa)。如果使用的测试压力大于 120 psig (0.83MPa)，将低压压力探头取下，改用阀帽密封。如管路上有截止阀，则关闭截止阀，无须取下探头。主要目的是保护压力传感器以免损坏。

*用电子检漏仪仔细检查整个系统，仔细检查所有的管连接处。检查系统压力表示值是否改变，压力下降说明系统有泄漏。系统保压 12 小时。如压力不变，说明系统无泄漏。如发现泄漏，利用系统提供的截止阀，将系统相关部分的气体放掉，对泄漏处进行修复。

6.2 抽真空

系统经检验证明无泄漏后，对系统彻底地抽真空，要有足够的时间抽真空。将系统保持真空以便加制冷剂。

抽真空方法

- ✧ 用一个带新鲜油的高真空度真空泵对机组抽真空。建议利用所有可用端口进行抽真空以提高效率。
- ✧ 确保所有阀门处于打开状态。
- ✧ 将压力抽到 1.5mm 汞柱，向系统内充注制冷剂，将压力提升到 2—3Psig 表压处。
- ✧ 将真空抽至低于 0.5mm 汞柱(系统必须保持至少 0.5mm 汞柱的真空)

- ✧ 现在系统可以进行制冷剂充注。

注意：抽真空并不能对系统进行清洁，因此只有在系统连接时采取措施，保证系统的清洁度。

6.3 充注制冷剂及开机之前的准备工作

机组使用 R22 / R404A 制冷剂，请确保使用正确的制冷剂。

充注前和充注过程中需注意的问题：

- ✧ 所有充注管路必须清洁，确保没有空气和水分。
- ✧ 充注制冷剂前系统必须经过泄漏测试并抽真空。
- ✧ 转移和充注制冷剂时记住带上防护面具。
- ✧ 确保没有液体制冷剂进入压缩机。液体是不可压缩的，并会损坏压缩机。
- ✧ 所有的温度控制设定在预期的运行温度值。
- ✧ 高低压表应连接至总管路上。
- ✧ 开机前确保充注正确的油，并保证油位正确（视镜的 1/8 至 3/8）。

采用 R22 为制冷剂的活塞压缩机机组推荐使用 Suniso 3GS 润滑油，

采用 R404A 为制冷剂的活塞压缩机机组推荐使用 RL68H 润滑油，

采用 R404A 为制冷剂的涡旋压缩机机组推荐使用 EMKARATE RL 32 H 润滑油。

6.4 充注制冷剂并开机

- ✧ 关闭压缩机吸、排气阀以及所有机组维修阀，避免液体制冷剂进入压缩机，发生液击。

- ✧ 关闭供液管的现场维修阀，在干燥过滤器前的 3/8" 充注阀处连接一制冷剂罐，打开储液器出液阀。
- ✧ 向储液器内充入足够的制冷剂。
- ✧ 关闭储液器出液阀，更换一罐制冷剂（如果需要）连接到干燥过滤器前的 3/8" 充注阀处，打开供液管的现场维修阀。
- ✧ 慢慢打开制冷剂罐的阀门，向系统充注制冷剂。利用真空几乎可把所有的制冷剂充入系统。
- ✧ 再次确认压缩机油位是否正确，如有必要请抽出或补足冷冻油。
- ✧ 打开机组所有油平衡系统维修阀。选择一台压缩机，打开其排气阀和 1/2 至 1 转吸气阀。
- ✧ 对于水冷却式的冷凝器，打开供水阀，让冷却水进入冷凝器；对于风冷却式的冷凝器，打开冷却风扇。
- ✧ 打开展示柜（蒸发器）的进液阀和风扇。
- ✧ 确认电源是否符合压缩机要求，启动该台压缩机。
- ✧ 打开储液器出液阀。

注意：观察该压缩机在运行时有无异常情况，如有异常的声音立即关停该压缩机，进行检查。通常其原因有：

- (1) 冷冻油不足或过多。
 - (2) 机组安装或管路连接的不合理导致过度的振动。
 - (3) 压缩机液击。
- ✧ 在该压缩机正常运行 10 至 15 分钟后，完全打开其吸气阀。

- ✧ 监视压缩机内的油位，使油位恒定在满视镜的 1/8 到 3/8 (涡旋机组为 25%至 60%) 处。
- ✧ 每次启动一台压缩机，方法同上。
- ✧ 观察供液管视镜，继续向系统充注足够的制冷剂。如果供液管内有白色气泡说明制冷剂量不足，当供液管内只有液体流动，则停止充注。
- ✧ 检查储油器液位。如油位低于下视镜的下部，请将油加到可看到油位或油位高于视镜。

6.5 开机后的运行检查

- ✧ 系统无故障运行至少 2 小时后，检查以下项目后方可继续自动控制运行。
- ✧ 检查展示柜(蒸发器)所有风扇，是否运行正常，旋转方向是否正确。
- ✧ 检查所有热力膨胀阀的过热度设置是否正确。
- ✧ 检查压缩机运行参数：压头，吸气压力，电压，电流。如果参数不在预计范围内，查找原因并排除故障。
- ✧ 检查压缩机油位，应位于满视镜刻度的 1/8 到 3/8 (涡旋机组为 25%至 60%) 处。

6.6 控制参数设定

以下设置值是平均值，可根据具体不同的项目进行调整。设定时使用正确的量具。

1. 压力控制设定 (bar)

通常压力开关设定值见下图：

机组类型		机组高压 保护断开 bar	机组高压 保护接通	压缩机 高压断 开 bar	压缩机 高压接 通 bar	低压断 开 bar	低压接 通 bar
R22	中温机组	21	手动	20	16	1.42	1.85
	低温机组	21	手动	20	16	-0.2	0.1
R404A	中温机组	25	手动	24	20	2	2.5
	低温机组	25	手动	24	20	0.05	0.35

以上的设定仅仅作为压力设定的参考，在现场要根据系统的不同、使用温度的不同进行适当的调整，以保证正常的压机开停和使用效果，但低压开关的设定必须确保压机不在负压下运转。

2. 设定压力偏差范围

压力偏差范围是压缩机将维持的吸气压力范围。该范围可设定 1-10psia (0.007-0.07MPa)，建议开始时设定该值为 4psia (0.03MPa)。

七、对机组本身的要求

7.1 压机运转的基本要求：

- (1) 声音及振动：正常运转时，压机应运转平稳无异常噪音；
- (2) 压缩机开停机频率一般不超过 6 次/小时；最小运行时间应保证 5 分钟；
- (3) 低温压机的机头冷却风机应和压机本身同步运转；
- (4) 机组的每个压机在机组控制柜面板上装有运转和报警指示灯。绿

色指示灯亮，表示压机处于运行状态。红色指示灯亮，表示压机虽然电源到位，但系统有故障，必须叫维修点马上排除。

7.2 冷冻油：

机组使用的冷冻油必须是机组厂家指定的专用油，严禁添加任何其他其他规格的冷冻油。由于制冷压缩机用的润滑油都是高度精炼，脱蜡和脱水的，为了保证质量，冷冻机油应用严格密封的容器装运。长时间接触空气和潮气，油就会被污染，并且会对压缩机造成有害影响。因此油的容器一打开，应立即将其注入压缩机。不要将油从一个容器倒入另一个容器中，也不要将油储存在开口容器中。

1. 油位：

当压缩机正常运转时，压缩机油位应在视镜中央或稍偏下些为最佳（视镜的 $1/8$ 至 $3/8$ （涡旋机组为 25%至 60%））。但油位在压机运转过程中会出现波动，特别在化霜前后，但只要不超过压缩机规定的上下限都是允许的，每种压缩机对油位允许的上下限都在压机视油镜上做了明显标志；储油罐中油位应在上下视镜之间，即油位在下面的视镜中应是满的，在上面的视镜中应看不到或稍微看到一点油位。只要机组运转正常，冷冻油是不会变质和消耗掉的。

油位低于标准的原因有：

- （1）系统缺氟或制冷剂泄漏（包括漏油、漏氟）导致制冷剂流量不够，
冷冻油滞留在系统中；
- （2）管路脏堵，特别是油路系统出现脏堵，如油路过滤器，使供油不畅；

(3) 油位控制器失灵，不能正确的给压缩机补油；

(4) 系统设计原因导致回油不好，如回气管路过粗、回气上升管未变径或未加回油弯，导致冷冻油滞留在系统中。

当机组在初运转过程中，出现油位偏低的情况，应按照以下顺序进行排查：

- (1) 制冷剂是否加足；
- (2) 管路设计是否正确；
- (3) 储油罐油位是否正常；
- (4) 油路有无脏堵；
- (5) 油位控制器工作是否正常。

在机组正常运转半个月后，如再出现油位不正常的情况，应先分析其他可能原因，如泄漏、管路脏堵、蒸发器霜堵等。在没有查清原因前，不要随意补充或放掉油。

油位过低导致压缩机润滑不良，会产生以下后果：

- (1) 油压保护；
- (2) 压缩机出现过热保护；
- (3) 压缩机抱轴。

只要系统加油未过量，压缩机一般不会出现油量过多的情况。刚化完霜时，由于回气温度高、制冷剂流量大，系统带回的油较多，油位又可能偏高。随着温度的下降，油位又会恢复正常。油位过高会对压缩机产生油击，油击和液击一样会对压机产生致命危害，导致吸排气阀的破裂、压缩机头垫圈的损坏、连杆断裂以及其他类型的压缩机的损坏。

2、油况：

正常的润滑油应该是澄清的，无杂质、无异味，油色与新油一样。

油变脏变色的原因有：

- (1) 在安装维修时，烧焊未充氮气或系统进入了灰尘、铜屑等杂质；
- (2) 系统中存在空气和水份；
- (3) 排气温度过高；
- (4) 系统最近发生过压缩机故障，如抱轴、电机烧毁等。

在机组初运转中，系统中可能存在的氧化皮等杂质会使油变脏、变色。在机组运转一个月后应将油换掉，同时更换回气滤芯、供液滤芯、油路过滤器。如果机组初运转一个月后，冷冻油未变脏、变色，则无需更换，但仍需更换回汽滤芯、供液滤芯、油路过滤器。

如果系统最近发生过压缩机故障，如抱轴、电机烧毁等，也会使冷冻油变色、变脏，同时变质，有酸味。在这种情况下，要更换油、回气滤芯、供液滤芯、油路过滤器，这时最好选用临时性专用于“烧毁”后系统清洁的吸气滤芯，这种滤芯有超强的吸水能力、优化中和酸性物质和除蜡能力。让这个吸气滤芯在管道中使用 48h，如果油仍然变色，还要更换一个新的滤芯。这个过程要继续进行到油变得清洁、无异味、油色和新油一样为止并用永久性吸气管道滤芯来替换。本机组所用滤芯如下：

滤芯型号	品牌	适用过滤器	用途
F48	ALCO	吸气过滤器（吸气管）	过滤固体杂质
D48	ALCO	干燥过滤器（主液管）	吸除水分、酸，过滤固体杂质

油况变脏变色的主要危害有：

- (1) 会刮伤轴承、活塞、气缸等，造成压缩机制冷性能下降；
- (2) 酸性物质会导致电机烧毁；
- (3) 降低润滑效果，造成包轴；
- (4) 造成膨胀阀或过滤器油堵，造成制冷效果下降或不制冷。

3、油压保护器

为了避免压缩机因润滑不良引起的故障，机组带有油压安全保护器。油压保护器的动作压差是 0.65bar, 并有 90s 延时。油压保护器大都是一中不可调的手动复位型控制装置。在出现油压保护时，必须查清排除故障后，方可手动复位。

4、曲轴箱加热器

曲轴箱加热器的安装是为了防止压缩机带液启动，同时适当提高油温以保持润滑油良好的润滑性能。曲轴箱加热器必须使用压机厂家规定的型号规格。当曲轴箱加热器功率偏小时，达不到加热效果，功率偏大时，会使油温升高出现变质。

曲轴箱内油温最高不能超过 80℃，最低不能低于 40℃。

八、机组的保养条件

无偿保修期限及范围

无偿保修期限为：机组出厂之日起一年。无偿保修范围是：对发生故障的部件提供相应新的零件。

但对下述故障，即使在保修期内亦为有偿修理：

1. 因未遵守本说明书指定的使用范围而引起的故障；

2. 机型选定及冷冻装置设置不合理：

本公司认定系因未遵照使用说明书及本公司发行的手册等所载指导事项及注意事项进行施工，或所选机组能力相对于冷冻负荷明显过大或过小所致的故障（如：膨胀阀选择失误、安装失误、液管上未装电磁阀、机组未使用本公司指定的冷媒及冷冻机油）

3. 安装不合理：

- 1) 管路焊接不当造成截止阀、电磁阀动作不良时；
- 2) 因安装过程中操作不当造成的损伤；
- 3) 为安装追加零件等进行开孔时切屑侵入电气零件而引发的故障；
- 4) 认定在安装管路过程中系统内混有异物时；
- 5) 认定在安装管路过程中电气接线不合理时；
- 6) 虽经本公司有关人员指出施工的不合理之处但仍未改善时；
- 7) 因违反各种法规进行施工所造成的事故；
- 8) 虽已知振动过大或运转时噪音过大而仍未停机时；
- 9) 因基础、支架不牢固而发生的故障；
- 10) 因现场改造本公司产品或移装而引发的事故，或因未使用本公司产品附带的保护装置而发生的故障；
- 11) 因不遵守本产品指定的设置场所，使用温度及使用电压的范围而引发的故障。

4. 因运转环境（温湿度不合适）及保养检查不完备而引起的故障：

- 1) 因安装于多油（含机油）、多盐份（海岸地区等）、多硫化气

体（温泉地区等）的环境引起的故障；

- 2) 因安装场所引起的故障（风量不足、水压、化学药品等特殊环境）；
- 3) 因调整失误引起的故障（膨胀阀过热、压力保护器的低压设定）；
- 4) 因频繁启动引起的故障（启动、停止各在 5 分钟以下）；
- 5) 维修保养不善（未觉察漏气等）；
- 6) 修理失误（零件不对、缺件、安装不合理）；
- 7) 因冷媒充添过量或不足及冷冻机油不足引起的故障（启动不良、电机冷却不良、润滑不良）；
- 8) 因系统产生液击、油击或油变质引起的故障；
- 9) 因除霜不良引起的故障；
- 10) 因电压异常引起的故障；
- 11) 被认定系统内吸入了空气、水分时。

5. 因电源不完善引起的故障：

- 1) 因电源熔丝管熔断、线接头松动等造成单相通电或缺相引起的电机、电控件的故障；
- 2) 因停电而转换到备用电源后启动时发生电压异常降低（220V 电源在 170V 以下、380V 电源在 323V 以下）引起的电机、电控件的故障；
- 3) 因雷电等对电源的外加异常高压或电火花等过大的外来干扰引起的电机、电控件的故障；

- 4) 由规定电压以外的条件引发的事故及使用通用变频器等引发的事故。
- 6. 因为不遵守本产品所被指定的设置场所、蒸发温度、冷凝温度、使用环境温度、使用电压的范围而引起的故障；
- 7. 因火灾、地震、水灾、雷击及其他自然灾害引起的故障；
- 8. 在国外使用的；
- 9. 安装于车辆、船舶上使用的；
- 10. 其它因施工及使用方法忽视了机组在安装、运行、调整、保养方面的常识性内容而引起的故障概不保修，而且不赔偿因机组故障引起的冷藏物及营业方面等间接损失。因此，关于间接损失请安装警报系统或与本公司代理店协商后，事先参加损失保险。

九、电气说明

9.1 安全事项

9.1.1 概述

在所有的操作过程中，必须阅读并理解且遵循所有的产品安装维修手册中给出的指示和介绍（包括机组设备和散件上的标贴说明）及其它的安全规定。只有那些在该产品方面经过严格培训且合格的工程师和技师才能安装和启动此设备。

若忽视一些安装中的特殊因素诸如：运行压力、电气元件、电压及机组自身的安装位置，那么机组设备的安装、启动和维修将会变得十分

危险。


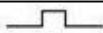





9.1.2 防止触电

只有通过 IEC (International Electrotechnical Commission) 考核的人员才允许操作使用电气元件。需特别指出的是在进行电控柜内任何操作之前所有联接至机组的电源必须先切断。可以通过断开主回路分断器来切断主电源供电。

1. 请正确连接地线于机组的接地螺丝上。
2. 接线后请测量电路与大地间及电线相互间的绝缘电阻，且应确认最低在 1 兆欧以上。
3. 即使当机组关机，只要供电回路分断器闭合，动力线电缆仍然带电。详情参考接线原理图，应采用相关安全操作方法。
4. 为防止漏电，检查、维修时拆下的零件（盖子、电气零件等）请一定照原样装好！
5. 机组请设置于水、雨淋不到的地方。
6. 为防止电线等的过热请勿使其通过冷媒管线等的绝热材料中。
7. 灼伤危险：电流会导致电气元件暂时或长时间发热，所以当触及动力线电缆、控制电缆、电缆套管、接线盒盖及电机外壳时请务必小心。

9.2 电气原理图

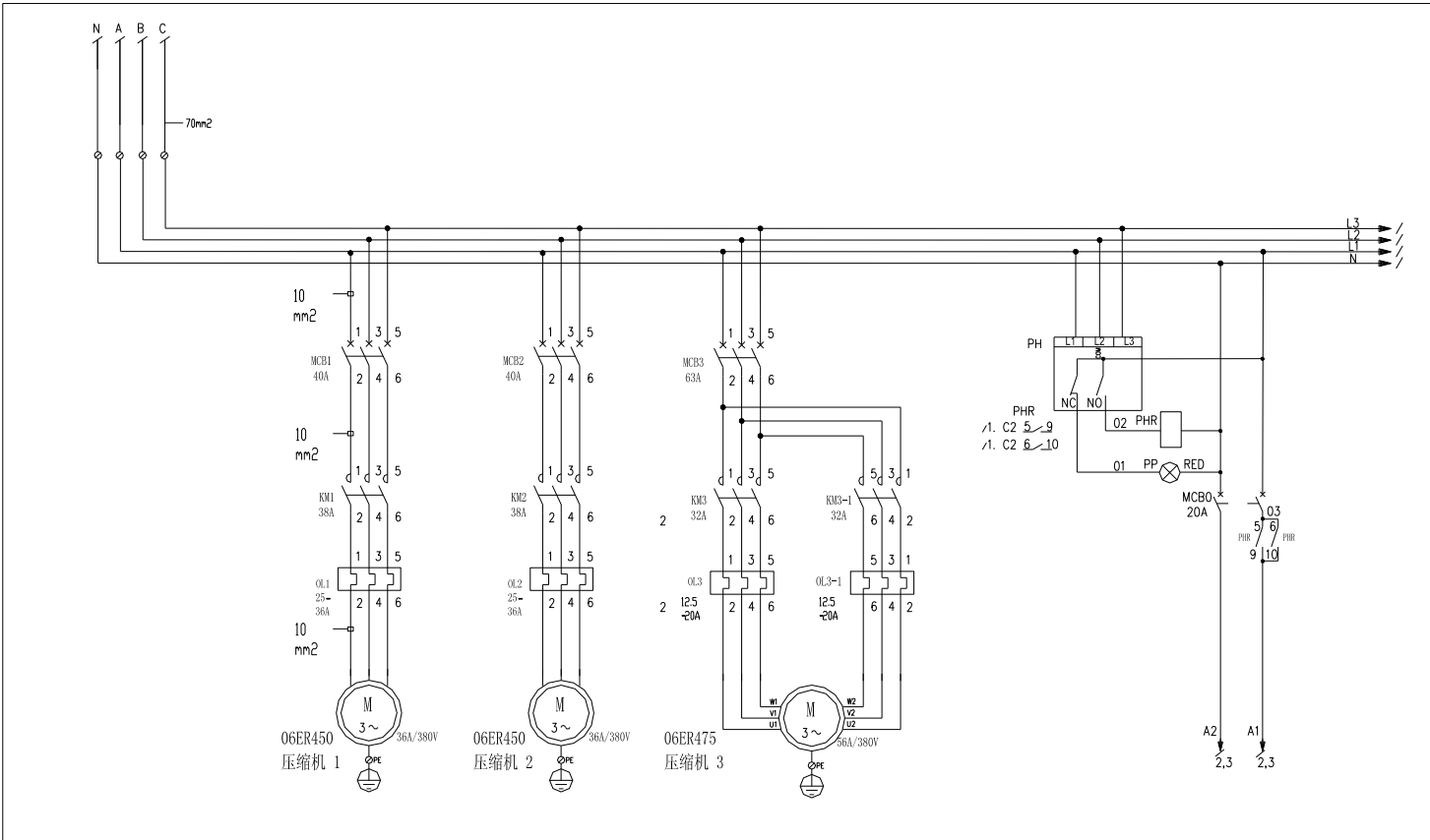
电气原理图中涉及的电气符号含义如下表所示：

主电路断路器/电路断路器	
过载继电器	
指示灯	
常闭触点	
常开触点	
接触器线圈	
高压开关	
低压开关	
延时闭合触点	
延时断开触点	
可选项	
只用于低温压缩机机组	
电磁阀线圈	

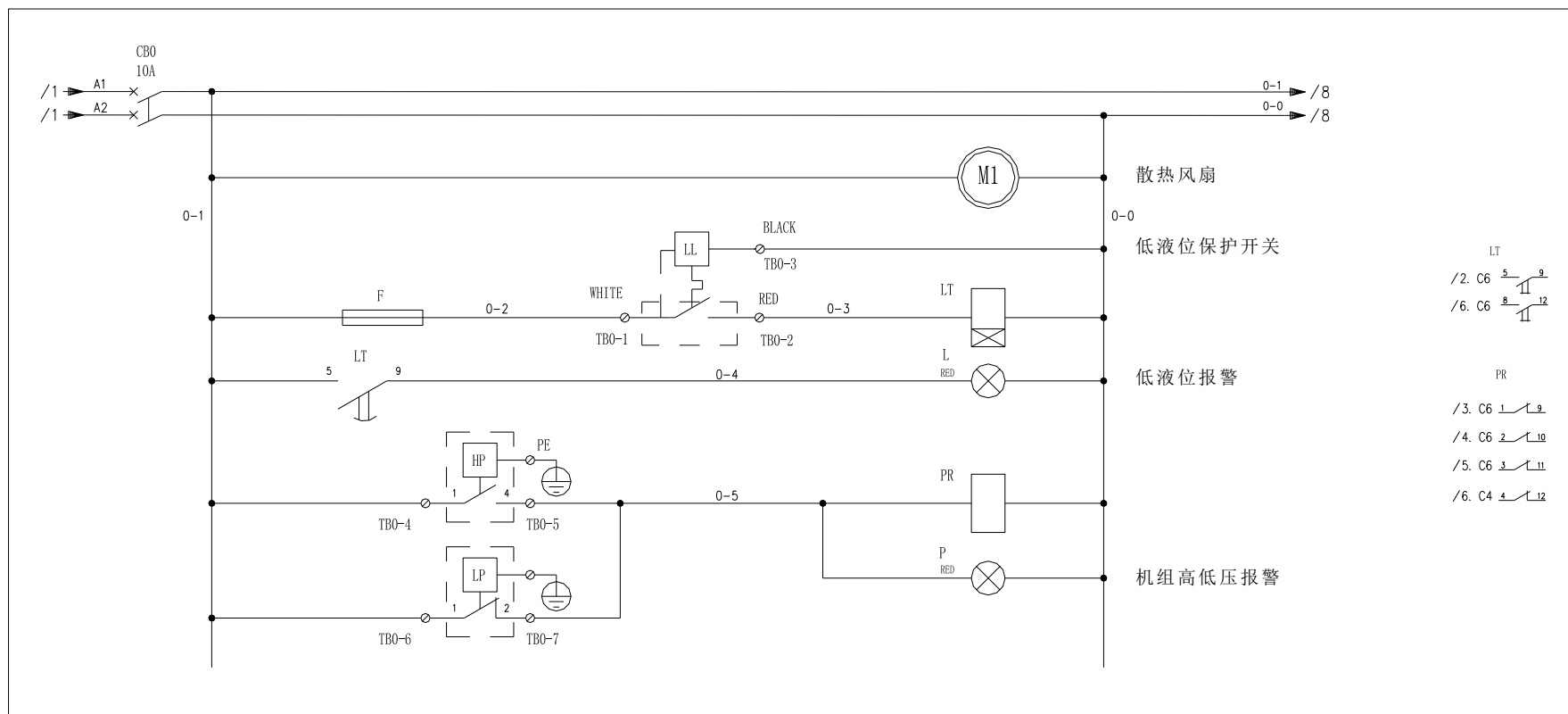
电气原理图的设计的字母符号含义如下表所示：

LT	低液位报警（通电）延时继电器	MCCB	主断路器
HP	手动复位高压开关	MCB	断路器
HP1~HP4	自动复位高压开关	SW	面板自动/手动开关
LP	低压开关	T1 - T4	压缩机 OFF/ON 延时继电器
LL	低液位开关	CR1 - CR4	压缩机手动控制继电器
OP	油压开关	C1 - C4	主线圈接触器
HT1~HT4	排气温度保护开关	C1-1~C4-1	辅线圈接触器
OL	过载继电器	EWCM	压缩机控制器
LR	低液位报警继电器	R1 - R4	报警指示灯
PR	压力保护继电器	W1 - W4	压缩机运行灯
FR	故障锁定继电器		

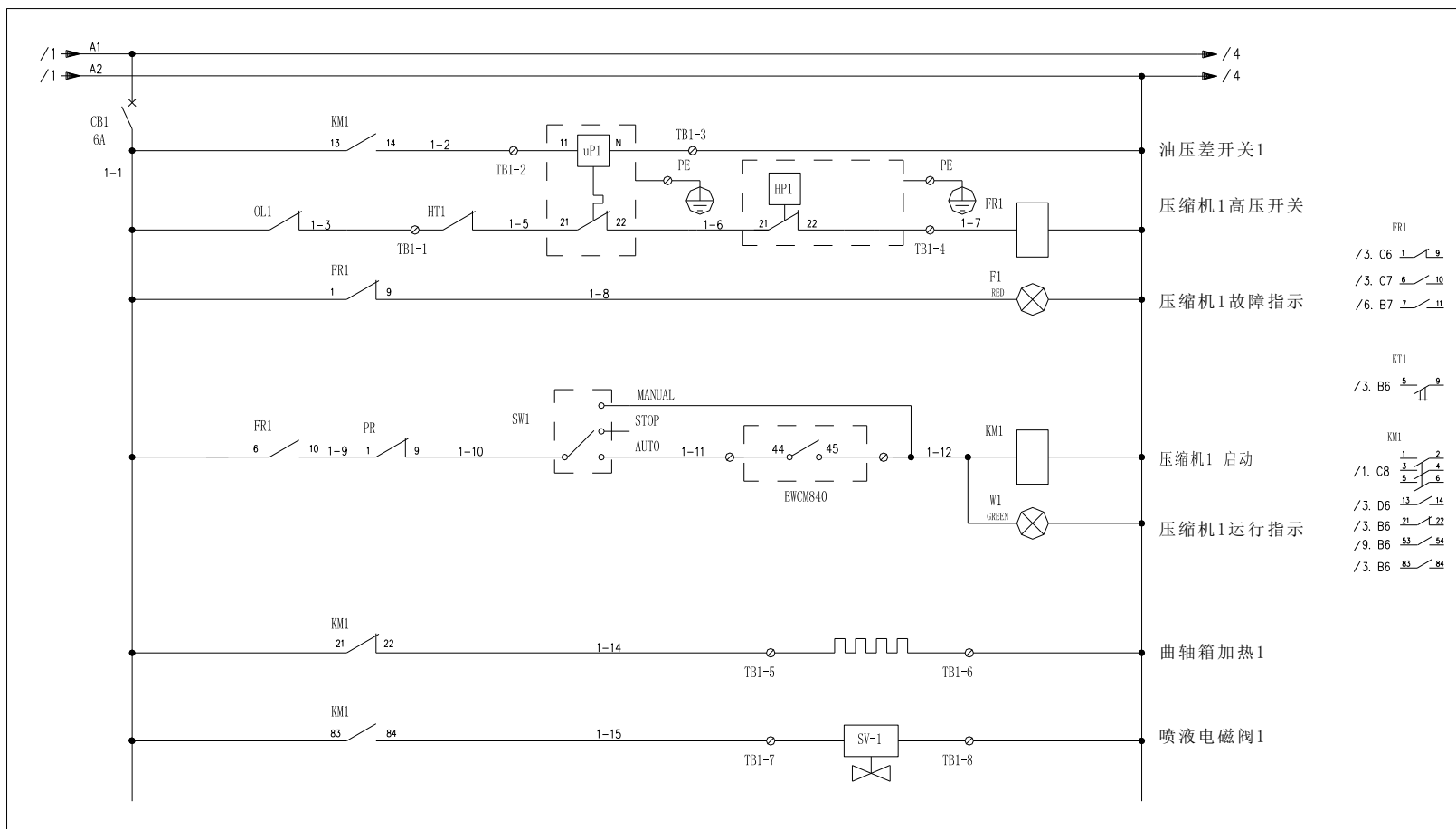
9.2.1 压缩机动力回路



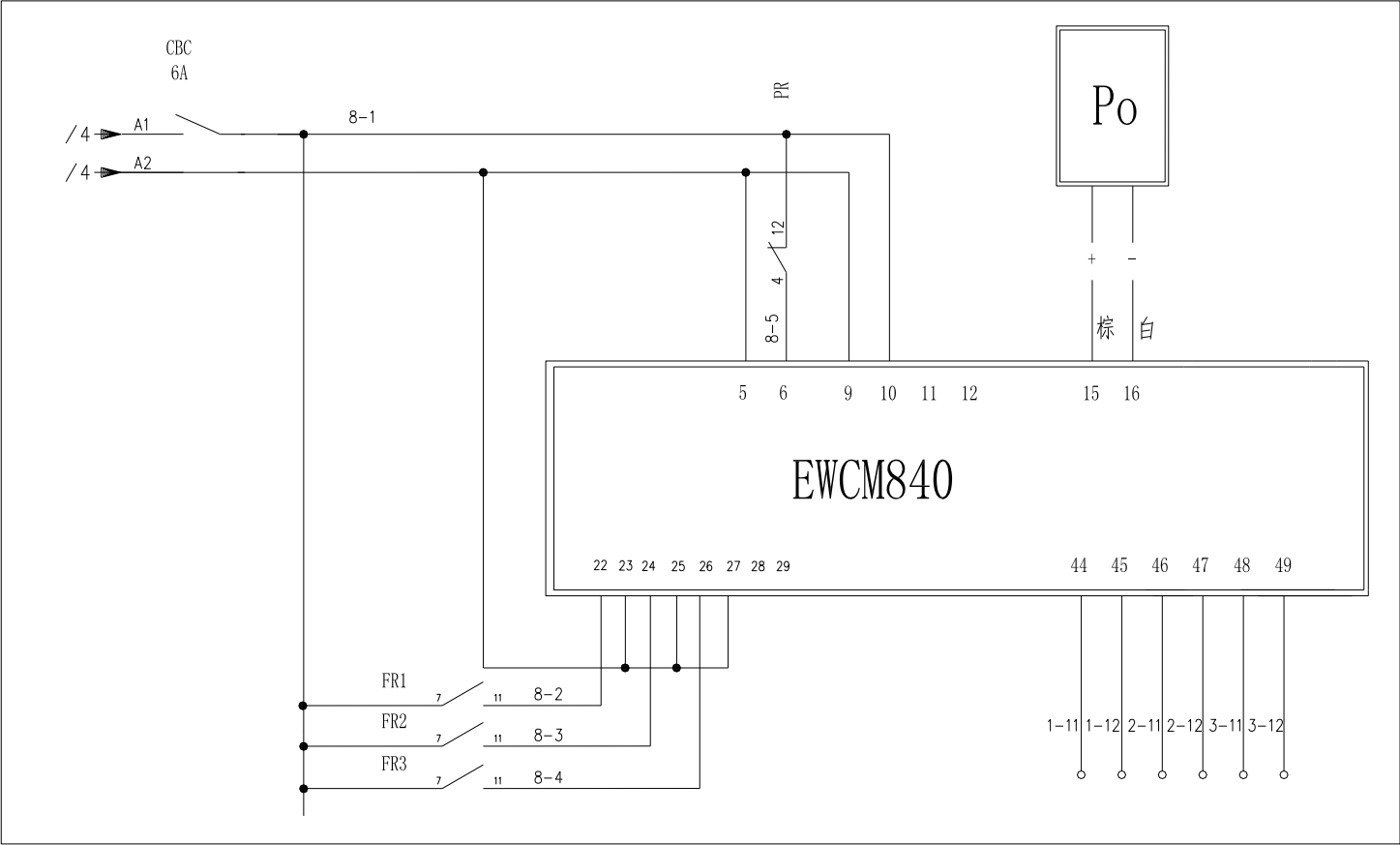
9.2.2 主控制回路



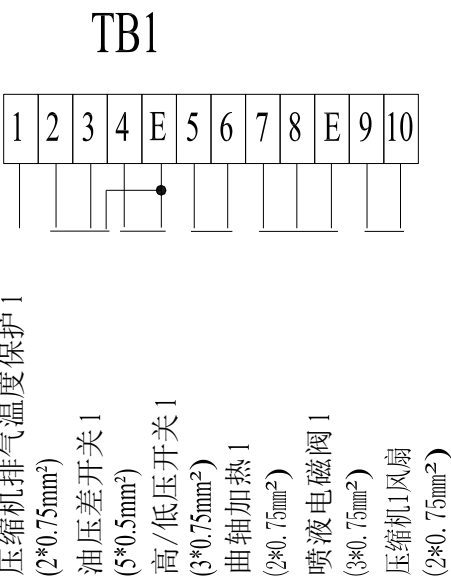
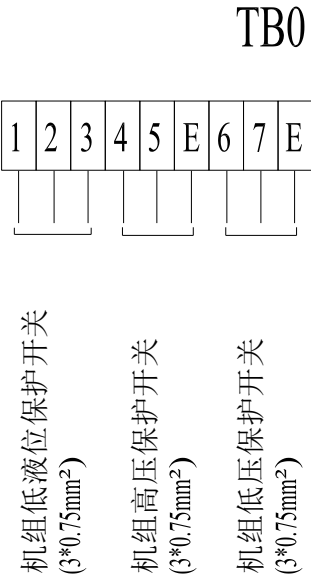
9.2.3 压缩机控制回路



9.2.4 控制器回路



9.2.5 控制回路端子排

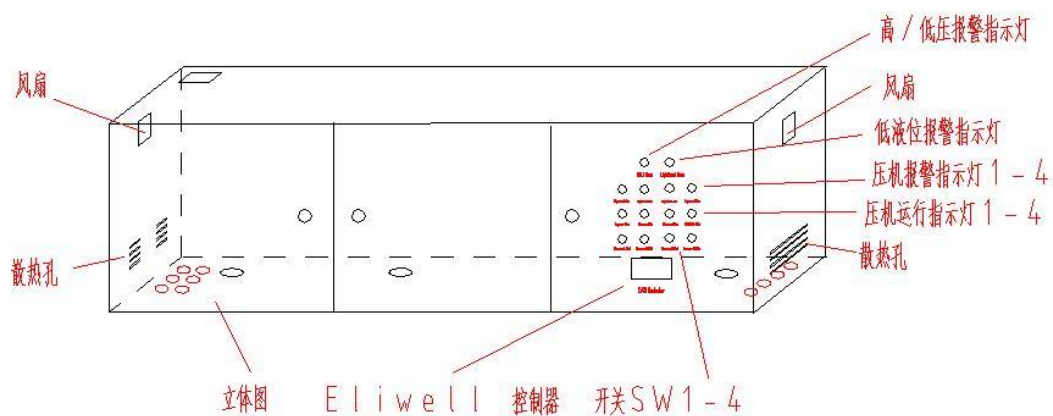


9.3 机组保护及报警

机组报警如下表所示：

异常项目	电控箱警报灯	压缩机停止 /运转	复位 类型	清除 方法
机组吸气压力	高/低压报警（红）	机组停车	自动	
机组排气压力	高/低压报警（红）	机组停车	手动	
压缩机排气温度	无	压缩机停止	自动	
压缩机排气压力	无	压缩机停止	自动	
油压保护	#压缩机报警 1-4（红）	压缩机停止	手动	
压缩机过电流	#压缩机报警 1-4（红）	压缩机停止	手动	
低液位保护	低液位报警（红）	无动作	自动	

报警指示灯位置如下图所示（以 ELLIWELL 控制器为例）：



9.4 压缩机机组控制器

9.4.1 通用描述

并联机组系列的冷冻机组是由控制器控制。该控制器是用于控制并行压缩机动力机组。

机组的控制输入量为 4 ~20 mA 压力变送器信号或者温度探头信号。机组提供四个继电器输入，每个输出都提供相应的连锁报警输入。

EWCM 控制器提供高低压报警功能和压力变送器报警功能。

可以设定两个可调节的控制点用以设定“正常”运行和“经济”运行状态。可以选择使用 Bar、C 或者 F 来显示运行值和设定点。

控制器持续诊断系统，一旦出现故障，机组将会将该故障回路关停，等待维修人员进行维修。

9.4.2 人机界面

控制器界面如下图所示（下面以 ELLIWELL 控制器为例）：



按钮和指示灯含义如下表所示：

“PRG”	进入设置状态	“MUTE”	重置报警
“HRS”	显示/重设压缩机运行时间	“LOCK” 灯	显示键盘处于锁定状态
“MAINT”	显示/修改每台压缩机的 “在工作”、“维修” 状态	“ALARM” 灯	显示故障报警
“SET”	显示/修改“正常运行”，“经济运行” 状态设定点。	“COMPR/STEP” 灯	显示压缩机的级数
“向上”	增加数值	“数码管”	显示机组数值。
“向下”	减少数值		

9.4.3 输入和输出

报警继电器输出：远程报警输出，当机组出现故障时，端子 1、2 将闭合。

安全继电器输出：当 EWCM 出现故障，端子 3、4 将打开。

压力报警输入：端子 5、6 为高低压报警输入。

电源输入：端子 9、10 输入 220V，50Hz 交流电。

经济运行开关：端子 13、14 用于激活机组处于经济运行状态。（详细说明参见“rSIP”）。

吸气压力传感器：端子 15、16。

Televis System：RS485 接口，端子 19、20、21。

压缩机报警输入：端子 22-29（参见“ALIP”说明）。

压缩机输出继电器：端子 44-51。

9.4.4 进入编程模式

EWCM 提供两种参数设定模式：运行“oPr”，配置“CnF”。

进入“oPr”菜单，按下放开“prg”按钮，然后按下“向上”按钮；

进入“ ”菜单，按下两次“prg”按钮，然后按下“向上”按钮。

如果密码保护被激活，将显示“PAS”。

退出编程模式，按下“prg”按钮，所有设定将被自动存储。

9.4.5 显示/修改参数

在编程模式下，按动“向上”、“向下”按钮来显示参数行。

-显示参数数值，按动“set”按钮。

-修改参数，按动“向上”、“向下”按钮。

-退出参数设定，按“set”按钮。

9.4.6 密码保护

“Psc”、“Pso”分别用于进入配置和运行程序的设定。

激活密码保护模式，选择密码栏并设定相应的数值。

9.4.7 配置参数说明

CPnU：压缩机台数。

CtyP：压缩机形式。0=压缩机有不同的电源供电（中性区控制）；1=压缩机由同一电源供电（比例控制）。

CPSt：压缩机级数。每台压缩机的级数（只用于CtyP=1）。

PC1…PC4：压缩机电源容量设定。

FtyP：氟利昂的种类。0=R134A；1=R22；2=R502；3=R404A。

PA04：压力传感器 0-4mA。

PA20: 压力传感器 0-20mA。

CAL: 校准。

SEP: 报警输入的极性。0=无源；1=有源。

rSIP: 经济运行开关极性设定。0=常开激活；1=常闭激活。

ALIP: 报警输入极性。0=无源；1=有源。

StPP: 压缩机级数输出。0=无源；1=有源。

Psc: 密码保护。

t AB: 不可以修改。

Pbd: 比例带。

onon: 同一台压缩机连续两次启动的延时，单位分钟。

oFon: 同一台压缩机关机以后开机的延时，单位分钟。

don: 级延时开，单位为秒。

doF: 级延时关，单位为秒。

donF: 延时级开关，单位为分钟。

FdLy: 第一次启动延时开，0=否，1=是。

Fdlf: 第一次延时关。

odo: 输出延时。

LSE: 最低设定点下限。

HSE: 最高设定点上限。

StrS: 经济运行点开启时间设定。

SPrS: 经济运行点结束时间设定。

RSd1...rSd7: 经济运行点星期设定（0=不采用经济运行状态，1=采用

经济运行状态，rSd1=星期天，rSd7=星期六）。

UAro: 取消机组报警（0=分钟，1=小时）。

Aro: 取消报警。

PA0: 启动时压力延时报警，单位为分钟。

LAL: 低压报警，低压报警设定，如果压力低于-LAL，机组将显示“Er03”报警代码。

HAL: 高压报警，高压报警设定，如果压力高于+HAL，机组将显示“Er04”报警代码。

tA0: “Er03”、“Er04”报警延时设定，单位为分钟。

SEr: 每台压缩机的最大运行时间设定，当压缩机运行时间达到“Er14”，提示进行压缩机检修。

PEn: 端子5、6上出现的高压和低压报警的次数。

PEI: 压力报警采样周期。

CPP: 压缩机传感器报警，显示代码为“Er01”。

SPr: 压力探头的步进保护。

PoPr: 电源的级数。

rELP: 相对压力，0=相对压力，1=绝对压力。

Loc: 键盘锁，0=键盘上锁，1=键盘不上锁。

Pso: 密码保护。

FAA: 群控时，地址设定。

dEA: 设备地址。

tAB: 不能修改。

EL1: 不能修改。

EL2: 不能修改。

9.4.8 用户使用信息

1. 如何显示/修改设定点

EWCM 控制器提供两种工况设定点：正常工况和经济运行工况（夜间或者节假日使用）。按下并释放“set”按钮来显示正常运行工况设定。连续按动“set”按钮来进入经济运行工况，这时控制器面板上的 LED 绿灯将由“N”转到“R”通过按动“向上”或者“向下”按钮来设定设定点。

2. 压缩机运行状态

在压缩机继电器输出前，控制器面板上相应的 LED 灯将闪亮，闪亮的时间取决于压缩机启动延时时间。当输出接通该绿灯就会燃亮。

注意：压缩机运行一开机运行时，压力数值可能超出机组运行的范围，控制器将根据“PAO”的延时参数来运行，如果传感器感受到的信号仍然超出范围，EWCM 控制器将按照“CPP”、“SPPr”和“PoPr”的参数来设定。

3. 如何显示压缩机运行时间

按下并放开“hrs”按钮将显示地一台压缩机的运行时间，这时“hrs”LED 灯将燃亮，通过按动“向上”和“向下”按钮来选择其他压缩机，可以通过按动“mute”按钮来复位运行时间。推出该操作可以按下并释放“hrs”按钮。

4. 如何显示/修改“维修”和“在服务”运行状态

按下并放开“maint”按钮将显示第一台压缩机的状态，相应的红灯将燃亮，“maint”绿灯将燃亮。“onLn”说明该继电器输出，按下“mute”按钮5秒钟将显示“oFln”机组将处于维修状态，相应的红灯将闪亮。

5. 报警输入数值/传感器高低压报警

端子5和6以及“SEP”参数。当报警的时候该端子被激活。控制器禁止所有的输出。该报警不需要手动复位，如果在“PEI”的间隔时间内压力传感器的报警次数达到“PEn”数值，“ErOL”或者“ErOH”报警信号将显示“ErOL”为传感器低压报警，“ErOH”为传感器高压报警。按下“mute”按钮5秒钟可以消除以上报警代码。可以通过设定 $PEn = 0$ 来忽略该报警。

6. 报警的输入输出

端子22到39，和“ALIP”参数。每台压缩机的报警输入应该连接到相应的端子排上。如果该报警被激活，该回路的压缩机将会故障停机。警报红灯将显示并显示报警代码“Er02”。该报警不需要手动复位。

7. 复位报警

当报警激活，报警继电器将输出端子1和2闭合。

复位一个报警信号可以按下并放开“mute”按钮。报警继电器将复位报警灯将燃亮。该时间取决于“Uaro”和“Aro”参数设定。

9.4.9 报警信息

报警代码含义如下表所示：

Er0L...Er0H	Error 高低压报警	关停所有压缩机
Er01	Error 01 传感器报警	见“CPP”，“SPr”和“PoPr”参数设定。
Er02	Error 02 输入报警	关停相应的压缩机
Er03	Error 03 低压报警	当传感器的数值小于 Set - LAL 时报警
Er04	Error 04 高压报警	当传感器高于 Set + HAL 报警。
Er11	Error 11 时间错误	检查“Pri”、“HoUr”和“dAY”参数。
Er12	Error 12 错误参数	多于 9 个输出，需要手动复位。
Er13	Error 13 数据错误	需要手动复位。
Er14	Error 14 维修报警	

9.5 控制器参数初始设置列表

控制器参数初始设置表如下表所示，此处以 140HP 的单级中温机组为例。

Rack EWCM840 设置表（140HP Single Stage Medium Temp）

	功能	参数	描述	设定范围	默认设置	设定值	单位
配置参数数	系统容量配置	CPnU	压缩机个数	1...4 / 6 / 9	4 / 6 / 9	4	number
		Ctyp	压缩机控制方式	0 / 1（死区/比例控制）	1	0	number
		CPSt	压缩机比例控制步数设置	1...6	1	1	number
		PC1	压缩机 1 动力	1...255		35	HP
		PC2	压缩机 2 动力	1...255		35	HP
		PC3	压缩机 3 动力	1...255		35	HP
		PC4	压缩机 4 动力	1...255		35	HP
		rot°	压缩机运行顺序	0 / 1（固定/轮换）	0	1	number
		Sat°	饱和算法设置	0 / 1（不使用/使用）	0	/	number
		nCPC°	主压缩机号	0 ... Cpnu	0	/	number
		FtyP	冷冻剂设置	0 / 1 / 2 / 3 / 4 / 5	1	1	number
		PSI°	压力显示方式	0 / 1（标准/PSI 模式）	0	/	number
	吸气压力传感器设置	PA04	传感器测量下限值（PTC）	0...8	0.5	-0.5	Bar
		PA20	传感器测量上限值（PTC）	0...31	8	7	Bar
		CAL	校准值（PTC）	-0.5...0.5	0	0	Bar
	其它输入设置	SEP	压力报警输入极性	0 / 1（掉/上电报警）	1	1	number
		rSIP	节能模式输入极性	0 / 1（掉/上电节能）	1	1	number
		ALIP	一般压缩机报警输入极性	0 / 1（掉/上电报警）	1	0	number
		StPP	step 输出极性	0 / 1（掉/上电输出）	1	1	number
	密码设置	Psc	配置参数密码设置	0...255	0	0	number
		tAb	参数表	/	/	/	/
运行参数数	节能模式时钟设置	Pri	分钟设置	0...59	0	0	minutes
		HoUr	小时设置	0...23	0	0	hours
		daY	星期设置	1...7	0	0	number
	控制周期设置	dEU	单位设置	0 / 1 / 2（Bar/°C/°F）	0	0	number
		Pbd	缓冲带宽设置	0.1...5	0.4	0.5	Bar
		onon	开开延时	0...255	5	1	minutes
		oFon	停开延时	0...255	5	1	minutes
		don	step 开开延时	0...5000	15	60	seconds
		doF	step 停停延时	0...255	5	30	seconds
		donF	step 开停延时	0...255	15	30	seconds
		FdLy	首次 don 延时	0 / 1（不使用/使用）	1	1	number
		FdLF	首次 dof 延时	0 / 1（不使用/使用）	1	1	number
		odo	仪表上电后输出延时	0...255	0	5	seconds

运行参数	设定值	LSE	设定值下限	0.1 / HSE	0.2	1	Bar
		HSE	设定值上限	LSE / 25	5	5.5	Bar
		StrS	节能模式启动时间	0...24	0	0	hours
		SPrS	节能模式停止时间	0...24	0	0	hours
		rSd1...rSd7	节能模式天数设定	0 / 1 （不使用/使用）	0	0	number
	报警设置	Uaro	报警旁通时间单位	0 / 1 （min/hour）	1	0	number
		Aro	报警静音旁通时间	0...255	15	15	minutes
		PAO	上电后压力报警旁通时间	0...255	30	30	minutes
		LAL	低压力报警差值	0.01...25	5	1	Bar
		HAL	高压报警差值	0.01...25	5	2	Bar
		tAo	压力报警延时	0...255	0	1	minutes
		Ser	累计运行时间上限	1...9999	3000	3000	hours
		Pen	压力报警次数	0...15	5	5	number
		PEIs	压力出错间隔	0...15	15	15	minutes
		CPP	压缩机探头保护	0 / 1	0	0	number
		SPr	step 探头保护	0 / CPnU	1	1	number
		PoPr	故障电源功率设置	0 / n	0	0	number
	用户界面设置	rELP	压力显示类型	0 / 1 （绝对/相对值）	1	1	number
		Loc	键盘锁定	0 / 1 （不使用/使用）	1	1	number
		Pso	运行参数设置密码	0...255	0	0	number
	通讯助手	FAA	系列编号	13...14	13	13	number
		dEA	设备地址	0...14	0	0	number
		tAb	参数表	/	/	/	/
		EL 1	eliwel1	/	/	/	/
		EL 2	eliwel2	/	/	/	/

特别警告及提示：

此系有关安全的重要内容，请仔细阅读并严格遵守！

这里所提示的注意事项，是为了是您安全、正确地使用本产品，防止给您及他人造成危害及损失。以下把操作失误时引起死亡、重伤等重大事故可能性较大的内容归纳于《警告》栏，把根据情况可能造成重大事故的内容归纳于《注意栏》，所载均为有关安全的重要内容，务请遵守！说明书请置于使用者随时可见处！

警 告

1. 安装施工

1.1 安装请委托专业部门！

自行安装若不完善，可能发生漏水、触电、火灾等。

1.2 安装施工请切实依照说明书进行！

若安装若不完善，可能发生漏水、触电、火灾等，请依照高压气体管理法规说明书进行施工！

1.3 请安装于具有足够承重能力处！

若不完善则机组会翻倒、掉落、造成损伤。通常以重量为机组 3 倍左右的混凝土基础为准。

1.4 机组请用地脚螺栓等确实固定！

整机配备有减震脚，机组可以直接放置在做好的平台上，可以根据实际情况采用地脚螺栓固定机组。

1.5 请勿使指定冷媒以外的东西混入制冷系统管路内！（空气等）

会使制冷系统管路内产生异常高压，使管路破裂，使人受伤。

1.6 安装施工请使用指定部件及附件！

不使用本公司指定部件可能发生机组翻倒、漏水、火灾、触电等。

1.7 请进行气密性试验！

冷媒泄露会造成缺氧。冷冻机和冷却器连接完毕后，请采用 20bar 的压力进行气密性试验以确认管路是否有泄露。同时请确认关闭低压开关旁的球阀以保护机组低压开关。

1.8 请勿在室外使用！

若在淋雨处使用，会发生漏电、触电。

1.9 请勿安装于可能淋雨处！

会造成起火及触电。

1.10 请勿安装于潮湿及易被水淋处！

会降低绝缘性能，造成漏电、触电。

1.11 机组请装上安全罩，以防用手触摸！

用手触摸会受伤。

2. 电气施工

2.1 请使用专用电路！

请依照《电气工程技术标准》，《内线规范》及说明书进行施工！请使用专用电路并按安装断路器！若不完善，可能会引起触电、火灾等。

2.2 与机组连接的电线，请切实接好！

请使用指定的电缆并正确连接，电线连接部请切实固定以免传递电缆所受外力。连接及固定不良，会引起发热、火灾等。

2.3 请安装接地线！

应由电气施工部门实施接地施工，接地线请勿与煤气管道、自来水管管道避雷针、电话的接地线相连！接地不良会造成触电。

2.4 机组零件请正确安装！

电控箱的盖子及盘面等应正确安装，安装不完善会引起火灾、触电等。

3. 使用上的注意

3.1 请勿变更安全装置的设顶值

冷凝机组上装有多种安全、保护装置。请勿随便变更安全、保护装置的设定值。变更设定值有可能引起机组的破裂、起火等。

3.2 漏电保护器动作后请与专业部门联系！

勉强恢复可能引起触电、火灾等。

3.3 请勿直接向机组淋水或用水清洗！

会引起短路、触电等。

4. 修理

4.1 请勿进行分解、修理、改造！

除专业人员以外，任何人不得进行分解、修理、改造！若分解、修理、改造不完善，可能会因异常动作引起受伤、触电、火灾等事故。

4.2 异常时请停止运转！

异常时请停止运转，切断漏电保护器，若继续运转，可能会引起触电、火灾等。

5. 移动、移装

如需移动请与专业部门联系！

安装不当会引起漏水、触电、火灾等。

注 意

1. 安装施工

1.1 请勿安装于可燃性气体可能泄露处！

万一气体泄露并积存于机组周围，会引起火灾。

1.2 请在规格范围内制作冷媒循环管路！

脱离规格范围会引起破裂、冒烟、起火、漏电等。

1.3 吸气管有时会冻结、结霜！

请进行绝热处理，结露的水分会把周围弄湿。

1.4 请慎重搬运机组，切勿使其翻倒！

机组系重物，用叉车搬运时应保持垂直，切勿使其翻倒，以免造成损伤。

另外，人力搬运时请注意不要扭伤腰部。

1.5 操作者以外人员请勿触动！

请标明“操作者以外人员请勿触动！”，或对可能被触动的机组用护栏围起来，错误操作会引起受伤等。

1.6 请做好排水施工！

给排水等浸于室内，会弄湿安装环境。

1.7 吊装时请委托专业起重公司！

吊装时请按图纸使用支撑杆，并利用下部的 4 个 $\phi 30$ 吊装孔。用吊钩钩住吊装孔，接上钢丝绳。若吊钩会与罩板直接接触，则请用布垫上，以免罩板变形。请找准重心，以使机组保持水平。钢丝绳及吊钩应足够承受机组重量。

1.8 请保持通风良好！

万一冷媒泄露，将导致缺氧。

1.9 请勿将可熔栓出口朝向通道！

万一可熔栓（安全阀）动作，会伤害人。

1.10 排气侧管路温度较高，若可能接触则需绝热处理！

万一手或电线直接接触，会引起烫伤或漏电。

2. 电气施工

2.1 请安装指定容量的漏电保护器 1

若不安装指定容量的漏电保护器，可能会引起触电及火灾等。

2.2 请勿使电线等通过冷媒管路的绝热材料！

电线过热会引起漏电、火灾等。

3. 使用上的注意

3.1 若开放冷媒管道则冷媒会喷出！

若通过辅助阀接口等开放冷媒管路，则冷媒会喷出。此时若淋上冷媒或冷媒遇到明火，会使人受伤等。

3.2 请勿用湿手接触电气部件！

请勿用湿手操作开关等，以免触电。

3.3 请定期检查漏电保护器的动作！

若漏电保护器有故障而继续使用，则漏电时不动作，会引起触电。

3.4 请勿践踏或置物于机组上！

翻倒、掉落等会使人致伤。

3.5 请勿在近处使用可燃性喷枪或放置可燃物！

会被开关的电火花引燃起火。

3.6 检查清扫时请切断电源！

清扫及检查清理时务请切断开关及漏电保护器，以防漏电及烧伤等。

3.7 请勿直接触摸机组内部的高温部位！

压缩机及排气管温度较高，直接触摸会烫伤。

3.8 请定期检查是否因长期使用导致安装支架受伤！

若支架受伤，会导致机组掉落、翻倒、使人致伤。

3.9 请勿触摸裸露的管路及导线！

4. 弃置

4.1 弃置机组时请委托专业部门！

机组内部注有冷媒及机油，直接弃置会引起火灾、爆炸及环境污染。

4.2 机组内的冷媒请务必回收！

冷媒必须回收，并再次利用或委托处理厂家弃置。排入大气会污染环境。



XK06-015-02300

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版本：01



Commercial Refrigeration and Cold Room Parallel Compressor Unit



P/N: 0080501402

Please read the Instruction carefully before installation

Keep the Instruction properly for reference

Contents

Contents.....	54
The introduction.....	55
Unit Parts Identification.....	56
Technical Data.....	58
Unit installation.....	62
Refrigeration pipeline connection.....	64
Compressor Rack Start-up Instructions.....	67
The requirements for the unit.....	71
Maintaining Conditions of Unit.....	75
Instruction for Electrical.....	77

I. The introduction to compressor unit

The parallel compressor rack is suitable for use in Commercial Refrigeration to cool food display cases, cold rooms, and also for other industrial cooling medium and low temperature applications. Carrier parallel compressor rack is specially designed for energy savings, low operating cost, and at the same time with longer operational life span.

Carrier's parallel compressor racks are also built for easy operation, management, and convenient maintenance. Users can choose from out options of rack controllers, such as Dixell, Eliwell or Danfoss, to meet their control needs. The intelligent control system is easy to operate and very safe, which can set both the point of normal working condition and economic point for energy-saving purpose.

The use of high efficiencies compressor can greatly decrease the compression ratio and increase the efficiency and reliability of the unit.

II. Unit Parts Identification

2.1 The Piston Parallel compressor unit

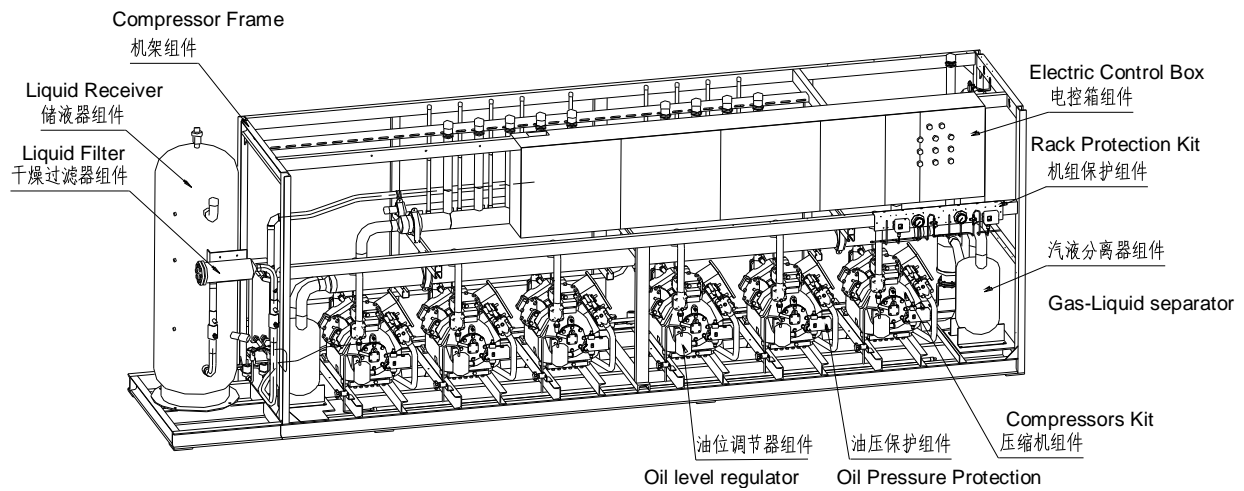


Figure 1: Front view of Piston Parallel compressor Unit

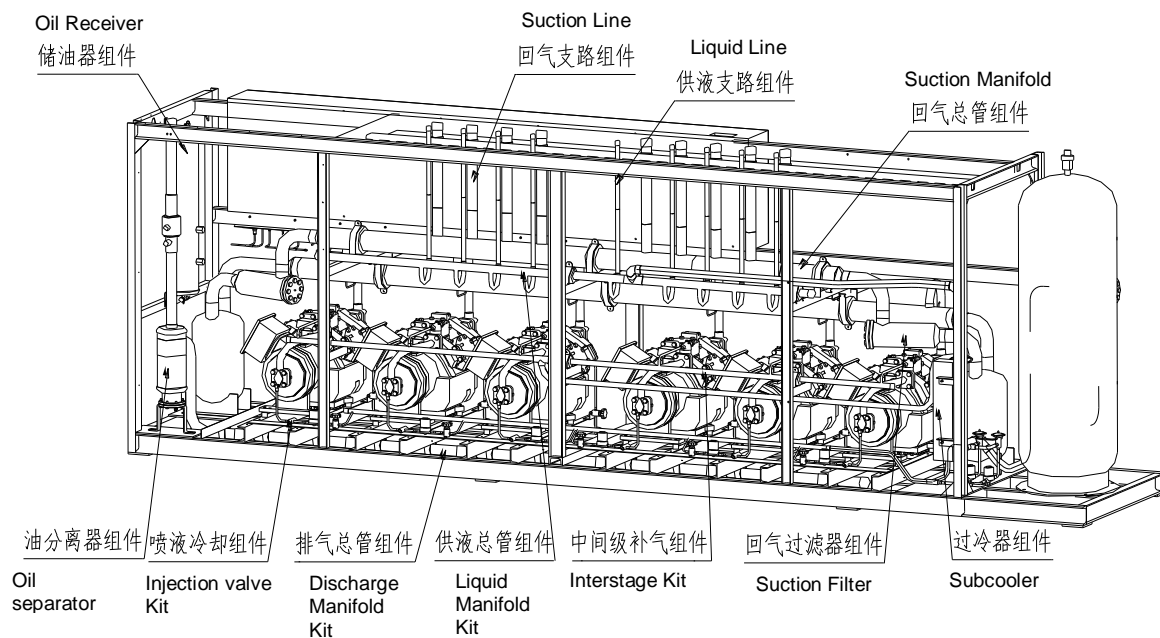


Figure 2: Back view of Piston Parallel compressor Unit

2.2 The Scroll Parallel compressor unit

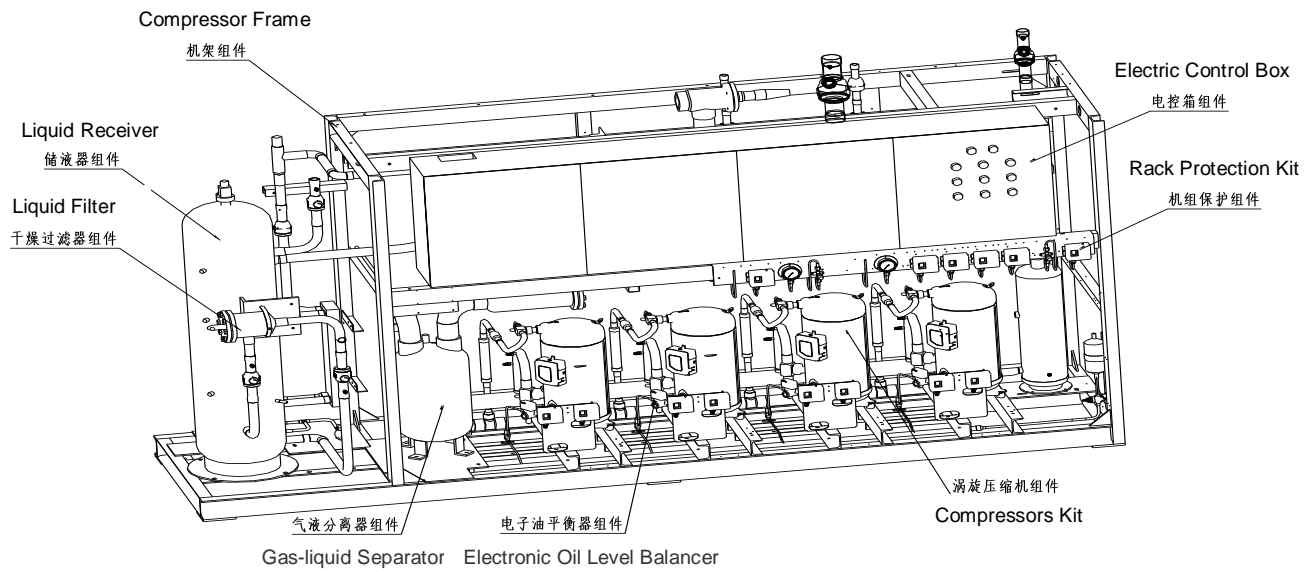


Figure 3: Front view of Scroll Parallel compressor Unit

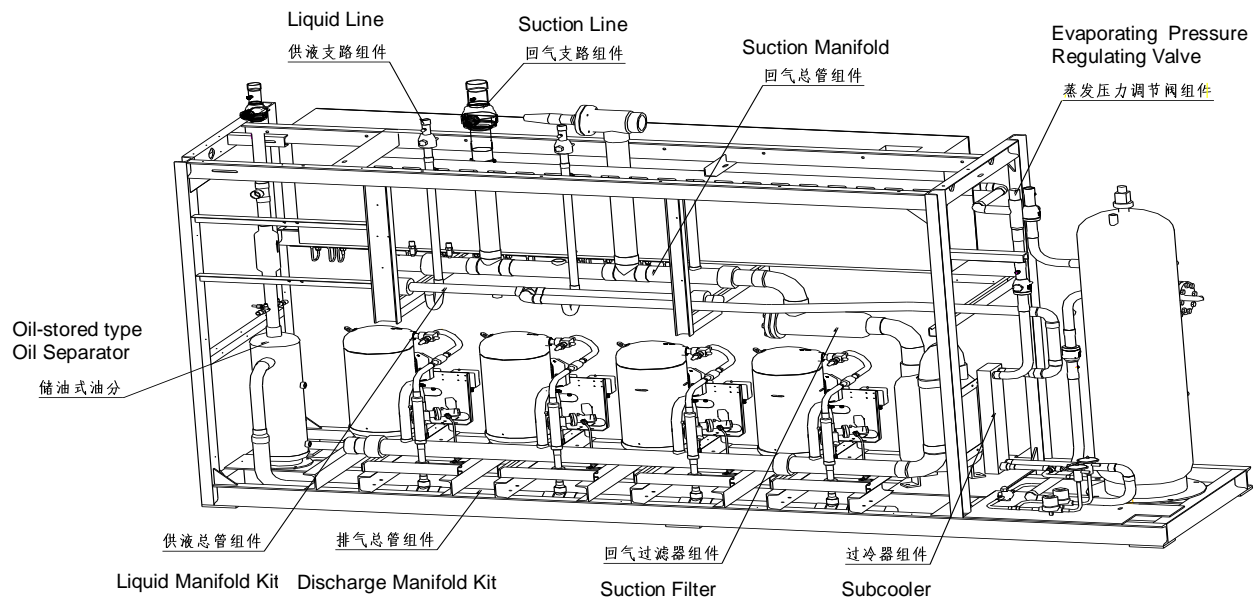


Figure 4: Back view of Scroll Parallel compressor Unit

III. Technical Data

3.1 Models Selection

	V	P	P	3	2	0	4	O	R	—	120
	1	2	3	4	5	6	7	8	9		10
1. Rack Type V-Parallel Rack											
2. Refrigerant Oil H- Mineral oil P- POE											
3. Application Temperature P-Medium Temp M-Low temp PM- medium-low temperature											
4. Compressor Quantity											
5. Control Panel 0-No Control Panel 2-With Control Panel											
6. Accessories 0-No Heat Reclaim or Subcooler 1-Heat Reclaim Only 5-Subcooler 6-With Subcooler & heat reclaim											
7. Compressor Type 1-Copeland Piston compressor 3-Carrier Piston Single Stage Compressor 4-Bitzer Piston Single Stage compressor 5-Bitzer Piston Two Stage Compressor 6-Copeland Scroll compressor 7-Carrier Piston Two stage compressor 8-Carrier screw compressor											
8. Oil Return System S-Suction Receiver Dynamic oil return system O-Reservoir/Separator Mechanical oil return system											
9. Receiver R-Mounted on Rack F-Mounted in Field											
10. Horse Power											

NOTE: Please check the model number of your unit upon receiving of product to ensure that you are received the correct rack model.

3.2 Application data for Parallel Compressor Unit

3.2.1 Piston compressor low temperature unit

The type of compressor unit	The range of evaporating temperature		The range of refrigerating output Qo (KW)					
			To: -40℃		To: -38℃		To: -35℃	
	R22	R404A	R22	R404A	R22	R404A	R22	R404A
Low Temp 06CC compound compressor unit	-50~-23℃	-50~-23℃	23— 130	26— 175	27— 144	30— 192	32— 167	36— 220
Low Temp 06ER single-stage compressor	-37~-12℃	-40~-18℃		19— 110		24— 128	20— 118	31— 156

* The above capacities are calculated based on 45 °C condensing temperature and 18.3 °C suction temperatures.

3.2.2 Piston compressor medium temperature unit

The type of compressor unit	The range of evaporating temperature		The range of refrigerating output Qo (KW)					
			To: -12℃		To: -10℃		To: -5℃	
	R22	R404A	R22	R404A	R22	R404A	R22	R404A
Medium Temp 06EM single-stage compressor	-18~7℃	-18~4℃	80— 429	86— 533	89— 471	95— 569	113— 590	120— 670

* The above capacities are calculated based on 45 °C condensing temperature and 18.3 °C suction temperatures.

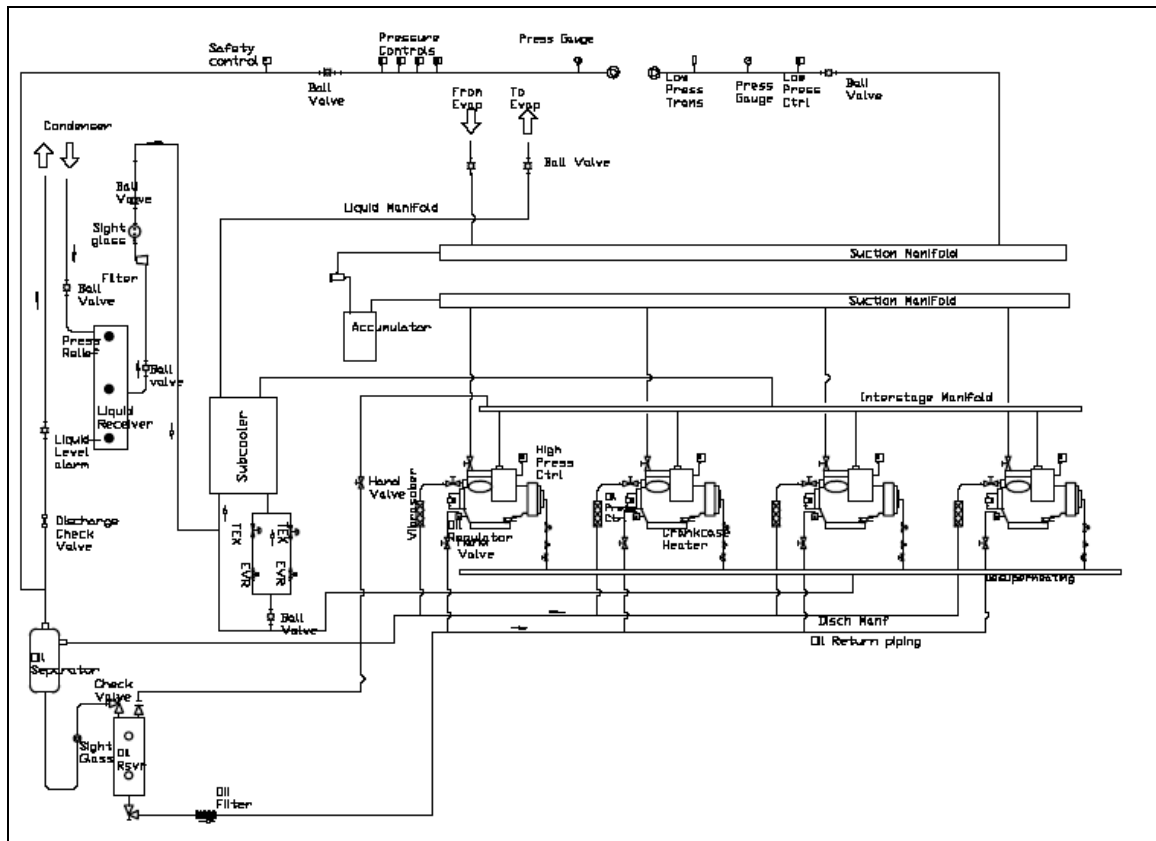
3.2.3 Scroll compressor medium temperature unit(R404A Refrigerant)

The type of compressor unit	The range of evaporating temperature	The range of refrigerating output Qo (KW)		
		To: -12℃	To: -10℃	To: -5℃
ZB76/ ZB114	-20~10℃	45—110	50—120	61—149

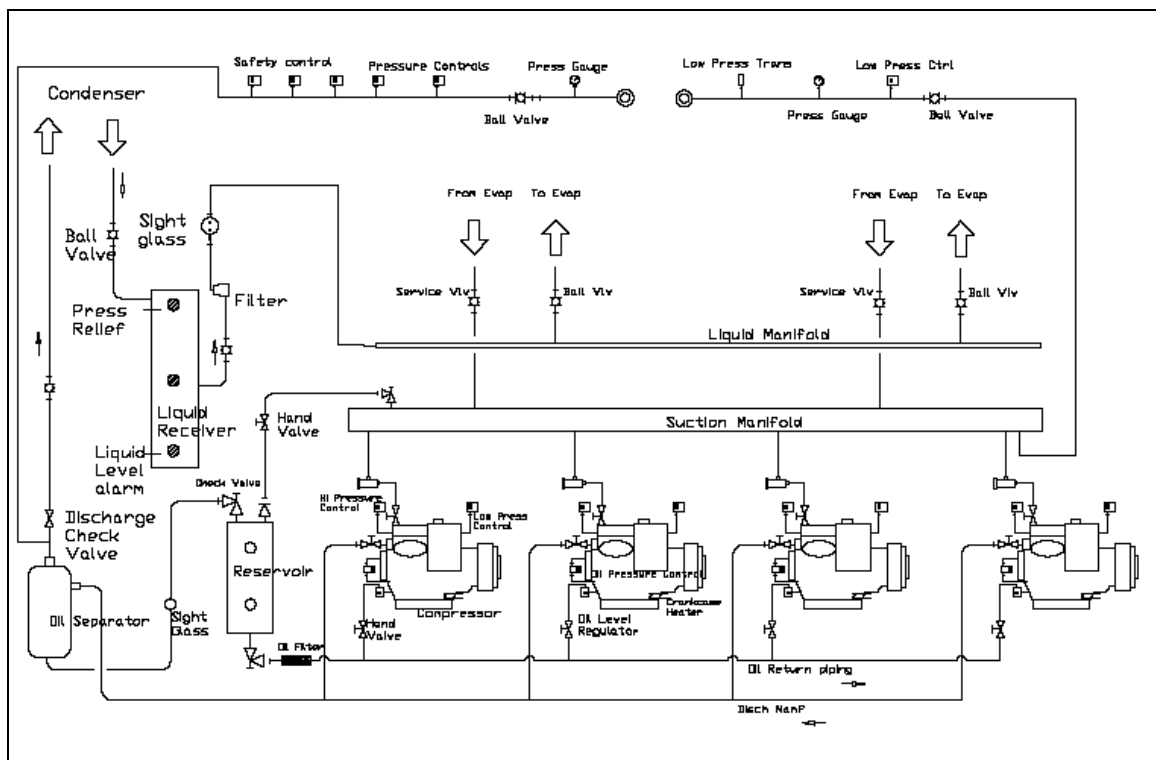
* The above capacities are calculated based on 45 °C condensing temperature and 11 K superheat of suction vapour.

3.3 The schematic diagram of pipeline linkage

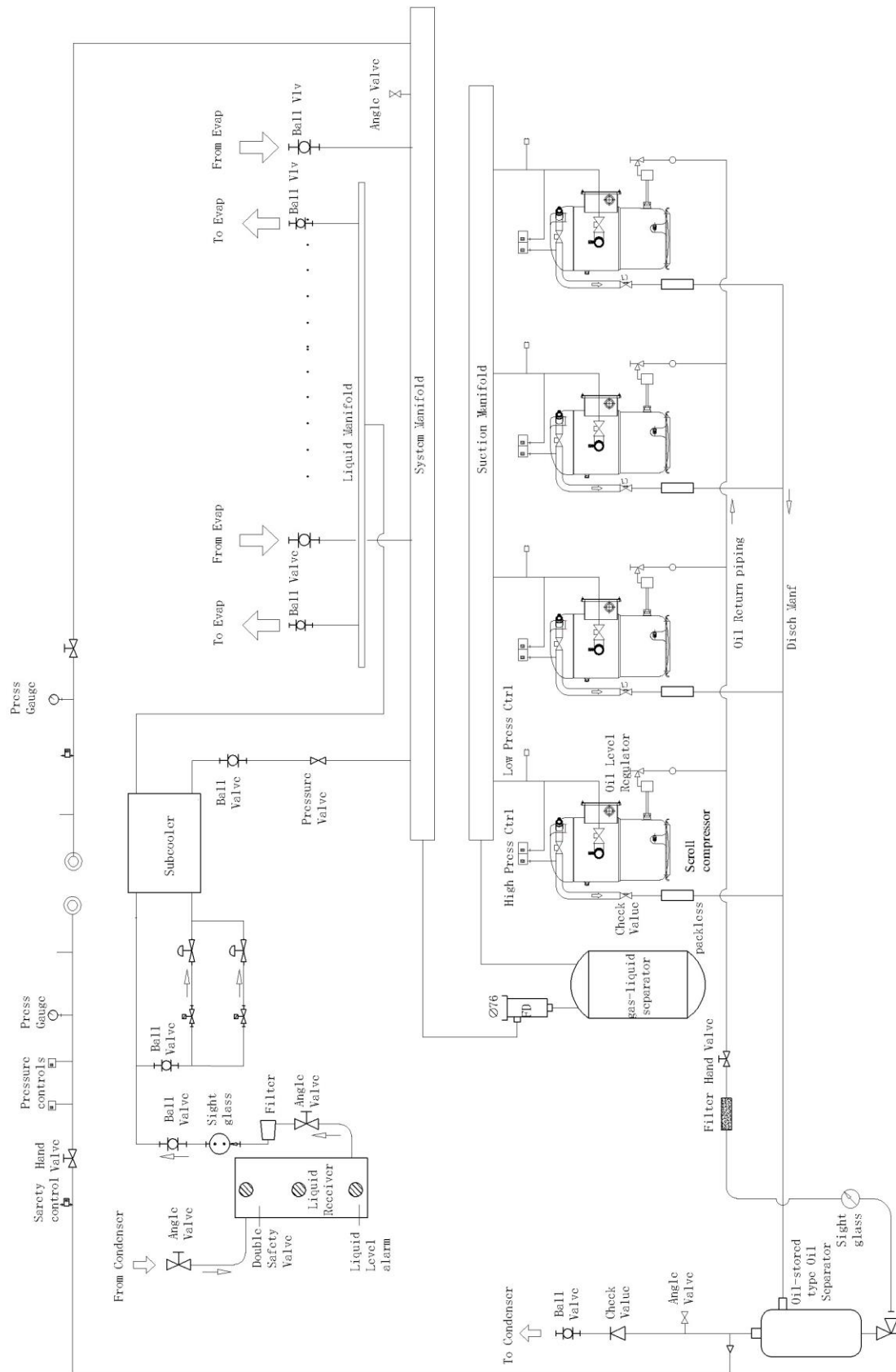
3.3.1 Low temperature and Compound Piston Compressor unit



3.3.2 Medium temperature and single-stage Piston Compressor unit



3.3.3 Medium temperature Scroll Compressor unit



IV. Unit installation

4.1 Voltage requirement:

Compressor Voltage: 380V 3PH 50HZ, $\pm 10\%$ or 460V 3HP 60HZ, $\pm 10\%$

Control Voltage: 220V Single Phase 50Hz or 208V Single Phase 60Hz

4.2 Engine room ventilation

Machine room temperature is critical to the proper operation of parallel compressor rack. In the Summer time, during period of extreme high temperature, the temperature of machine room must not exceed 5°C as compared to outside temperature. Proper ventilation can be achieved by using exhaust fan system to remove heat from the machine room. In the northern regions, machine room should be properly insulated so that machine room temperature does not fall below 10°C.

Good machine room ventilation can also prevent oxygen deficit as a result of refrigerant leakage. Please set the air entrance correctly so that air can flow over the units, and at the same time meeting your local governmental regulations and codes. Refer to the chart below for recommended ventilation values of machine rooms corresponding to each parallel compressor rack model (see Table 2).

Note: In cases where there are more than one parallel compressor unit, the recommended ventilation should be calculated by summing the total ventilation of each unit.

The Piston Parallel compressor unit			
Low temperature unit model	Recommended ventilation volume (m ³ /h)	Moderate temperature unit model	Recommended ventilation volume (m ³ /h)
VHM3207OR-45	4500	VHP3203OR-45	5200
VHM3207OR-60	5200	VHP3203OR-75	8000
VHM3207OR-90	7200	VHP3203OR-105	11000
VHM4207OR-120	9600	VHP4203OR-140	15000
VHM5207OR-150	12000	VHP5203OR-175	18000
VHM6207OR-180	14400	VHP6203OR-210	21600
VHM7207OR-210	16800	VHP7203OR-245	25200
VHM8207OR-240	19200	VHP8203OR-280	28800
The Scroll Parallel compressor unit			
		VHP3256OR-30	3500
		VHP3256OR-35	4000
		VHP3256OR-40	4500
		VHP4256OR-45	5000
		VHP4256OR-50	5500
		VHP4256OR-55	6000
		VHP5256OR-60	6500
		VHP5256OR-65	7000
		VHP5256OR-70	7500
		VHP5256OR-75	8000
		VHP5256OR-90	9500

Table 2: Recommended Ventilation values of engine room corresponding to parallel compressor rack model

4.3 Fire hazard prevention

Do not store any inflammable, combustion-supporting, or explosive materials in machine rooms, especially next to parallel compressor racks, electric cabinets, condensers and pipeline.

4.4 The basic requirements of Equipment settlement

1. Indoor Installation

The parallel compressor unit should be installed in the engine room leveled horizontally, taking the convenience of daily maintenance into consideration. The base on which CARRIER parallel compressor unit and condenser are installed is required to be level reinforced steel concrete , approximately 152mm (6") thick. The surface should be smooth, leveled and with a slant of the unit less than 1°. Suggested minimum clearance of the unit is: 600mm from the back, 1067mm from the front of the electrical panel. The suggested distance between two compressor parallel racks is 610mm (Installer/contractors are responsible to check the requirement local laws and regulations for proper placement of racks). For the weight and size of the units, please refer to Carrier's rack product catalogue.

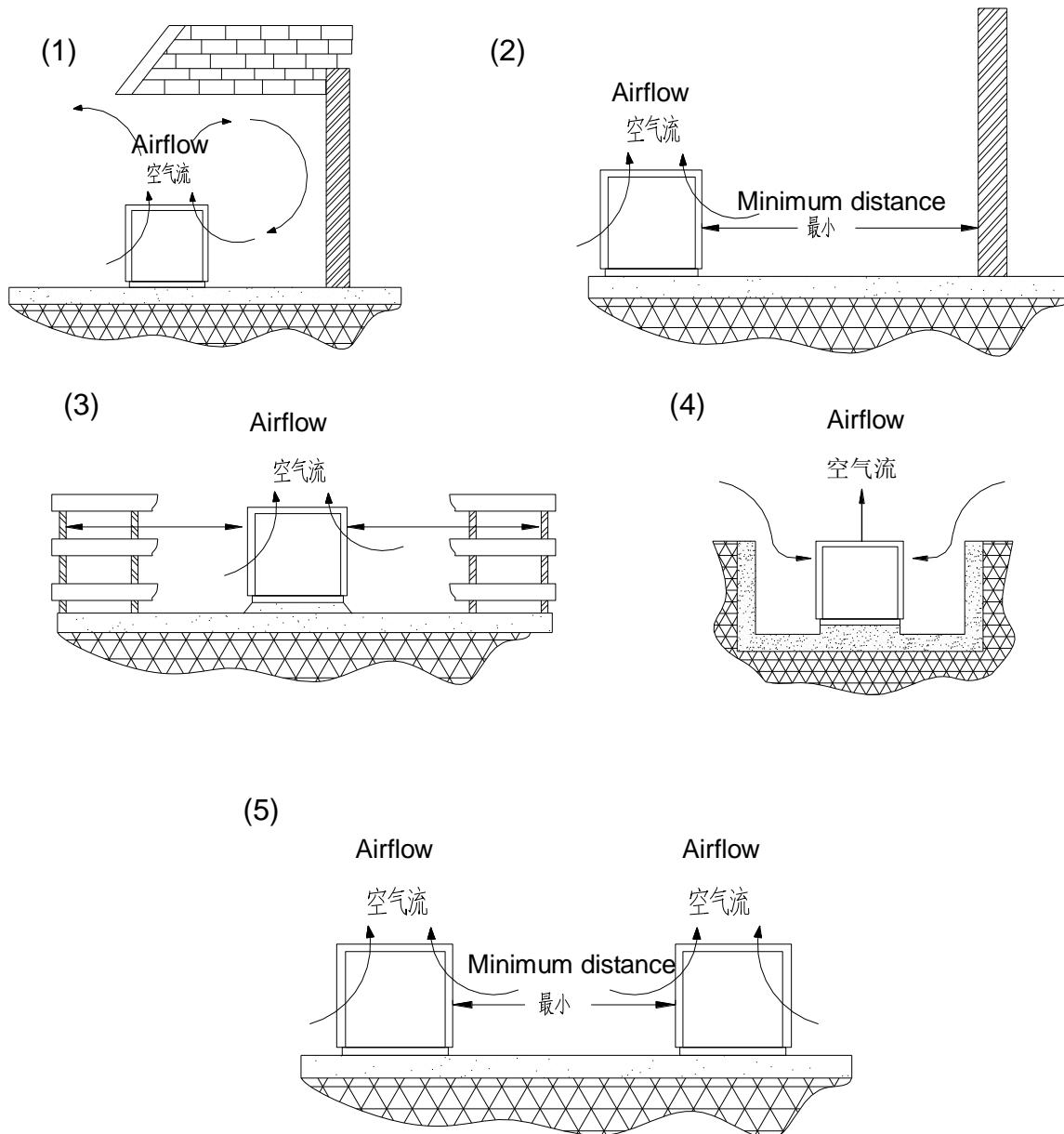
2. Outdoor Installation

The outside condenser can be installed either horizontally or vertically based on your space availability. The platform or base for condensers must also be level with sufficient ventilation for the condensers. There should not be any evaporator, hot air or fumed components nearby the condenser. Condensers should be installed under the direction of structural engineering and acoustic experts in order to avoid obliqueness, uneven stress, vibration transmission and so on.

Condensers should be installed with enough room left for its maintenance. In most cases, the minimum space requirements are as follows. (please note that this is only the minimum space, your practical operation should follow your country's or local law and regulation):

- 1) There must not be obstruction above the condenser because the discharge air discharged will return back to air return side of condenser when meeting obstacle.
- 2) Condenser's position can allow air to cycle freely but to recirculation. In order to let air flow in and out smoothly, the condenser must be at least 1.2m (4 inch) from any wall or obstacle (apart from control panel side). If possible, the distance should be enhanced for best result. Pay attention to leave sufficient room for service personnel to access condenser control panel. When surrounded in three walls, condenser should be installed on a recessed ground for proper ventilation.

- 3) The minimum side gap can be smaller than 1.2 m (4 feet) if condenser is placed near a fence, as long as the fence has sufficient area to allow air to flow into a condenser. Again be reminded that sufficient space should be left for service personnel (the recommended space is mentioned above).
- 4) The top of the condenser should be flush with that of the pit. If not, we should adopt broader pit or exhaust pipe so as to lift the air discharged up to the top of pit, which is the minimum requirement.
- 5) Between the two parallel condensers, the minimum gap is 2.4 m (8 feet).



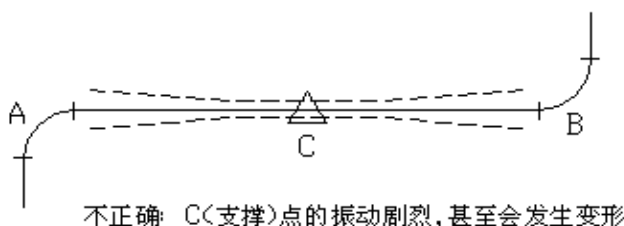
V. Refrigeration pipeline connection

5.1 Piping Instructions

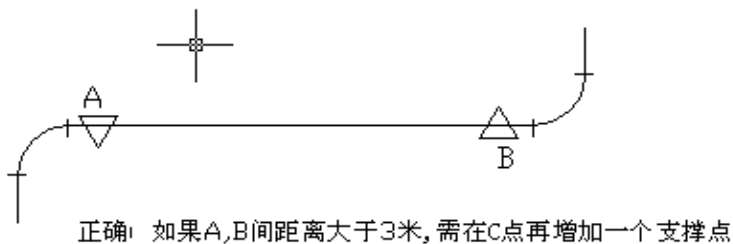
- 1) Correct pipe joint. The compressor rack has two inlet and outlet connections

condenser, and at least two inlet and outlet connections to the evaporator. Please follow the pipe joint direction in Figure 2 (page4) and Figure 4(page5).

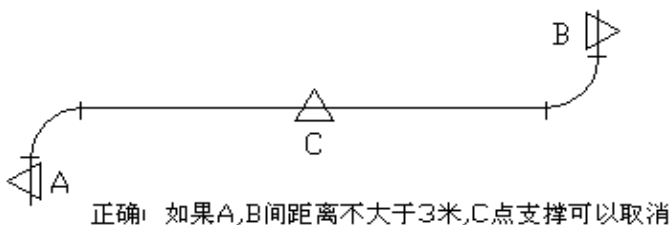
- 2) Use refrigerating cooper tube to link; the tube shall be clear of debris, dust, water, etc.
- 3) Shut down the stop valves of each compressor respectively serving to suction, discharge, and liquid receiver before piping and brazing. During brazing, purge piping with nitrogen to prevent from oxidation formation inside copper pipe. Also pay attention to protect and cool the parts nearby.
- 4) Carefully consider pressure loss and oil return in system into when choosing liquid and discharge piping.
- 5) In order to minimize pressure loss in the system, minimize the use of elbows in the system. If needed, the bending radius should be as large as possible. To make sure oil return, the diameter of discharge chosen should be large enough that refrigerant gas can flow through at a rate of 3.8m/s or more, and through the vertical pipeline at 7.6m/s or more. The piping should be installed at a slope of 1/200.
- 6) All low temperature suction and liquid lines must be properly insulated
- 7) Make support on pipeline appropriately in order to reduce vibration. Look at the following diagram:



Bad Practice: the point C will be violently vibrating and even be distorted.



Good Practice: if the distance between A and B is larger than 3m, add another support point C



Good Practice: if the distance between A and B is shorter than 3m, there is no need to add support point C.

5.2 Compressor Rack is higher than the evaporator

If a unit is placed on the second floor while the showcases are on the first, the vertical piping connection for suction line should include proper oil trap. If the unit is much higher than the evaporators, the elbow should be set every 6m, see figure 9.

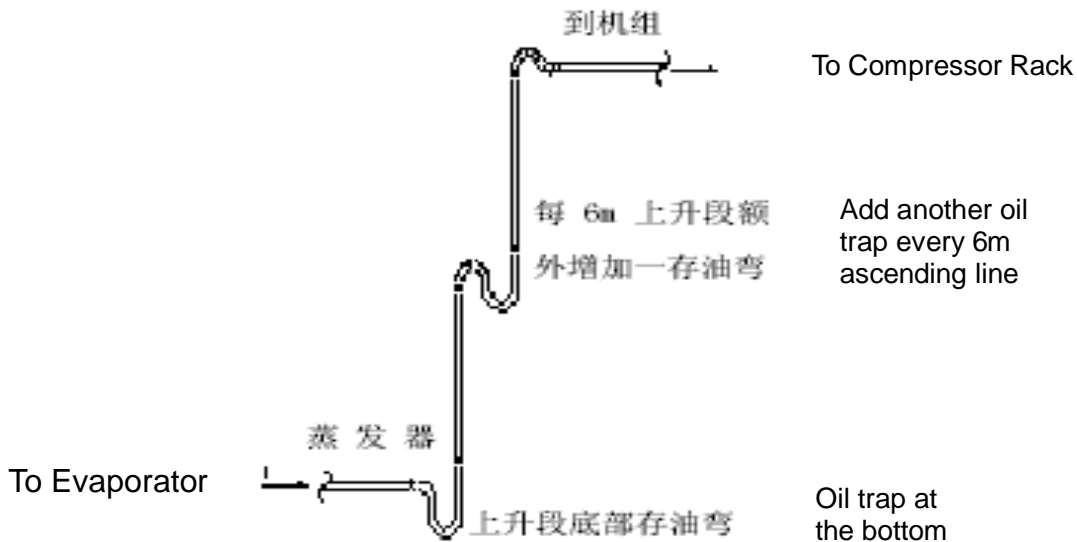


Figure 9: Piping for compressor rack higher than evaporator

5.3 Compressor rack lower than Evaporator

If showcase is on the second floor while the unit on the first floor, flush the height of suction with the surface of evaporator by elevation, then arrange pipes towards unit, as shown in figure 10.

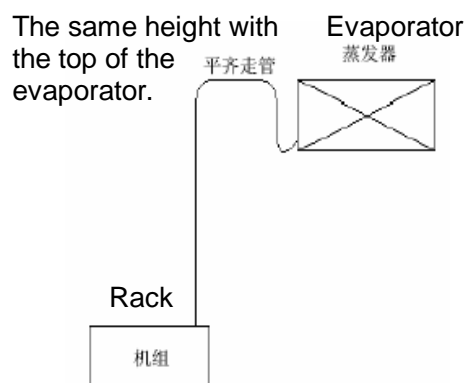


Figure 10: Piping for compressor rack lower than evaporator

5.3 Condenser Piping

If condenser is placed at a location higher than the compressor rack, install an elbow every 6 m piping. If the main discharge line is not equipped with a check valve, the discharge piping should be elevated up to be above the coil of condenser, as shown in figure 11.

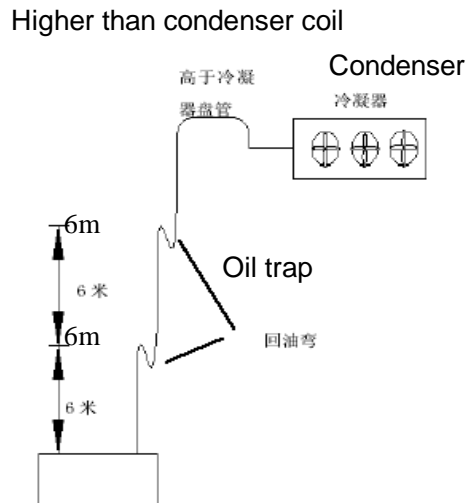


Figure 11: Condenser Piping

VI. Compressor Rack Start-up Instructions

Note: Turn on the crankcase heater at least 24 hour prior to startup of compressor rack. **DO NOT** disconnect the crankcase heater unless the unit is under repair, or will stop operation for a period of time.

The startup procedure of compressor rack should include the follow steps:

1. Leak test
2. Vacuum supply
3. Fill refrigerant

Please follow rigidly the three steps to avoid any impairment when starting up.

6.1 Leak Test

Check to make sure that the rack is not leaking before performing vacuum and refrigerant fill for the rack. The main switch of electric distribution box in engine room should be cut off. The power switch of compressors should also be cut off. There are some valves that should be open as follows:

1. Liquid Inlet (Return) valve on receiver
2. Liquid Outlet valve on receiver
3. All field mounted ball valve
4. All valves in oil equalization system

5. All injection cooling valves

Performing leak test:

1. Shut down the power switch of the motor unit
2. Shut down the power switch of distribution box in the machine room
3. Use 3/8" or larger vacuum pumping line (filler line) when it is needed to connect to vacuum pumping line (filler line) to fill the system with refrigerating medium and dry nitrogen conveniently.。
4. Add refrigeration medium of 50psi (0.34MPa) and nitrogen of 120 psi (0.83MPa) to the system. When the testing pressure is above 120 psig (0.83MPa), protect the low pressure control by closing the ball valves prior to low pressure control. When there is a ball valve in the pipeline, shut off the ball valve without taking off the low pressure control. The purpose is to prevent the low pressure control from being damaged.
5. Check the whole system with the electronic leak detector, and check all the pipe joints carefully to see whether there the pressure is falling, which indicate that the system has some leakage. The system can keep the pressure for 12 hours, so if the pressure doesn't change, there will not be any leakage. Once the leakage is found, release the gas of the related part with the stop valve provide by the system, and repair the leakage point.

6.2 Vacuum pumping

A complete vacuum pumping should be performed with ample time after leak test is completed and no leak is found. It can help to add refrigeration into the system if the system in kept in vacuum.

Performing Vacuum Pumping:

1. Pump the unit with a vacuum pump of a high vacuum degree with fresh oil. Use all the ports on compressor rack to increase efficiency.
2. Make sure that all the valves are open.
3. Pump till the pressure is 1.5mm mercury column, pour refrigeration into the system, and make the pressure rise to the level of 2-3 Psig.
4. Then, pump the vacuum to the level that is below 0.5mm mercury column (The system should contain vacuum of at least 0.5mm mercury column)
5. Then inject the refrigeration into the system again.

Note: the system can't be cleaned during the vacuum pumping, so measures must be taken to keep the cleanliness of the system when it is connected.

6.3 Filling Refrigerant

Preparation work before injecting refrigeration into the system, and turning on the machine are as follows:

1. Please make sure that the right refrigeration is used for the unit, the model number of R-22 or R404A
2. Take the following precautions when filling refrigerant into the system
 - Make sure the injecting pipeline is clean, without air and water.
 - Before injecting the system should be leakage-tested, and then vacuum pumped.
 - Remember to wear a mask when handling refrigeration.
 - Make sure that no liquid refrigeration can flow to the compressors because liquid refrigerant is incompressible and can damage the compressors.
 - All the controlling temperature should be set as the expected operating temperature.
 - High-low pressure gauge should be connected to the main headres.
 - Make sure that the machine is injected with correct oil before it is turned on and the oil level is correct.(Oil level should be between 1/8 to 3/8 of compressor sight glass)
 - Suniao 3GS lubricating oil is recommended for the unit who using R22 refrigerant of Piston compressor, while RL68H lubricating oil is recommended for the unit operating with R404A refrigerant of Piston compressor.
 - EMKARATE RL 32 H lubricating oil is recommended for the unit operating with R404A refrigerant of Scroll compressor.

6.4. Fill Refrigerant and system startup

1. Close suction and discharge valves of the compressor and maintenance valves of all units to avoid liquid slugging resulted from the flow of the liquid refrigerant into the compressors
2. Close the field installed main liquid line valve. Connect refrigerant bottle into the 3/8" service valve connection near the liquid filter and at the same time turn on the liquid outlet valve.
3. Gradually open the valve of the refrigerant bottle, and inject refrigeration into the system. With the help of vacuum, all refrigerating medium can be easily injected into the system.
4. Reassure the oil level of the compressor is correct, if it is needed, draw some oil out or put some in.
5. Open all valves for the equalization line of oil system of the unit. Pick one compressor and open the discharge and suction valve by 1/2 to 1 turns.
6. For water-cooled condenser, open the water valve, and let the cooling water

flow into the condenser; as for air cooled condenser, turn on the cooling fan.

7. Open the liquid valve and electric fan of the refrigerated display cases (evaporator).
8. Make sure that the power supplies to the compressors are correct, and then start the compressor up.
9. Open receiver liquid outlet valve

Note: Observe whether there is some abnormal condition, if there is some unusual noise, shut the condenser immediately check the following:

1. Check whether refrigeration oil is insufficient or excessive
2. The unreasonable setting up of the unit and connecting of the pipeline leads to the over-vibration.
3. Liquid-slugging of the compressor

After the compressor has operated normally for 10 to 15 minutes, open up all discharge valves.

Check compressor oil level again to make sure that oil level is always correct.

Use the same method listed above to turn on a compressor rack

Observe the sight glass mounted on main liquid line, and make sure that the system is fully charged. If refrigerant level is too low, there will be some white bubbles showing on the liquid sight glass. Stop charging the system with refrigerant when the liquid is flowing in the liquid line sight glass.

Check the oil-level of the oil reservoir. If the oil level is below the lower sight glass, add oil to the oil reservoir until the oil-level can be seen or it is above the viewing mirror.

6.5 Running check after the machine is turned on

After the system has been running normally for at least 2 hours, check the following item and continue to control the operation automatically.

Check all electric fans in the remote display cases/evaporator to see whether they run normally and whether the rotation direction is correct

Check the thermostatic expansion valve to see whether the setting of the degree of superheat is correct.

Check the working parameter of the compressor: pressure head, suction pressure, voltage,

electric current. If the parameter is beyond the expecting range, try to find the reason and resolve the problem.

Check the oil level of the compressor, which should be at 1/8 to 3/8 of the observing mirror scale.

6.6. Setting controlling parameters

The following parameter is the mean value, which can be adjusted according to different items. When setting the parameters, use correct measuring tool.

1. Pressure Control Setting (Bar)

The general setting value for pressure switch can be seen from this chart:

		Cut-out Unit high pressure protection	Cut-in Unit high pressure protection	Cut-out compressor high pressure protection	Cut-in compressor high pressure protection	Cut-in Low Pressure	Cut-out Low Pressure
R22	Med Temp	21	Manual	20	16	1.42	1.85
	Low Temp	21	Manual	20	16	-0.2	0.1
R404A	Med Temp	25	Manual	24	20	2	2.5
	Low Temp	25	Manual	24	20	0.05	0.35

The above values setting are for references only. In actual, adjust pressure controls according to the system and temperature to ensure that the pressure controls will work under normal pressure.

2. Setting the range of pressure deviation

The range of pressure deviation is also the range of suction pressure that the compressor keeps. It can be set from 1 to 10 psia (0.007-0.07MPa). At the beginning ,the setting value of 4 psia (0.03MPa) is recommended.

VII. The requirements for the unit

7.1 The basic requirement for the compressor operation are as follows

1. Noise and vibration: when the unit is running normally, the compressor should be stable without any uncommon noises
2. Generally, the frequency of the compressor should not surpass 6 times per hour, make sure that the shortest operation time is no less than 5 minutes.
3. The compressor head cooling fan of the low temperature compressor should run

synchronously with the compressor.

4. Every compressor of the unit is equipped with indicating light for operation and alarming in the controlling panel. If the green light is on, it shows the compressor is in operation; if the red light is on, it shows that the system has some malfunction. This is true even if the power supply is on.

7.2. Refrigeration oil

The refrigeration oil for the unit should be the special oil recommended by the unit factory.

DO NOT use generic brand of oil to lubricate compressors. The reason is because the lubricant for the compressor is highly refined, dehydrated and dewaxed, the refrigerant oil should be loaded and transported with high air-tight coating to ensure the quality. If it is exposed in the air for a long time, the oil will be easily contaminated and the compressor will be damaged. Once the oil container is opened, inject it into another container. Container with an opening cannot be used.

1.Oil level:

When the compressor unit is in working order, the optimal oil level of compressor should be in the middle of the observing mirror or a little lower ($1/8$ to $3/8$ of the mirror). However, the oil level may fluctuate in operation, especially before or after defrost.

This fluctuation of oil is alright as long as it does not exceed the upper and lower limit of sight glass, which is labeled clearly on the oil observing mirror in every type of compressor. The oil level in oil reservoir should be in the middle observed from both the upper and lower sight glass. In the normal running condition, refrigeration oil does not deteriorate or get used up.

Low oil level problem may be caused by the following:

- a. The lack of refrigerant in the system because of refrigeration leak, refrigeration oil will reside in the system and cannot return to the compressor rack.
- b. Dirt in the system can cause system blockage. When the oil pipe line are blocked, for example, the filter in oil pipe line, the oil feeding will not be smooth or sufficient.
- c. Defective Oil level controller can cause no oil feed to the compressors
- d. Bad system design can also cause oil return problems. For example if piping is too large; the fact that the diameter is not changed or oil-return elbow is not added in the ascending pipe for air-return will cause refrigeration oil to reside in the system.
- e. If oil level is lower than the standard level in compressor rack within normal

working condition, please check the following:

- i. Whether refrigerant is enough;
 - ii. Whether pipe arrangement is correct;
 - iii. Whether the oil level of oil storage vessel is in normal condition;
 - iv. Whether oil way is blocked by dirtiness;
 - v. Whether oil controller works well.
- f. If oil is not at standard level after half mouth of compressor racks normal running, you should seek out other reasons, such as leakage, pipe blockage, evaporator blocked by frost, etc. Before finding out the possible reason, DO NOT fill or remove oil.
- g. Extremely low oil level's can cause compressor's lubricating deficiency, and cause following results.
- i. Oil pressure protection trip
 - ii. Overheat in compressor
 - iii. Compressor breakdown

As long as oil is not excessively charged into the system, compressor will not have any oil flooding problem. During defrost, oil level may be high because the temperature of return air is high and the flow refrigerant is big causing larger oil return in the system.

With the decline of temperature, the oil level can also recover normal. Excessive oil the system can be damaging to the compressors, especially if the oil is mixed with liquid refrigerant. This can cause valves damage, compressor breakdown due to rupture of valves, connecting rods, etc.

2. Conditions of Oil

Normal lube should be clear, with no impurities, and the color of oil is the same as that of new oil.

The following reasons can cause **dirty oil** in the system:

- a. Nitrogen purging is not used, or dust, copper scale etc, enters system, during the set-up and repair.
- b. There is air and moisture in system.
- c. The temperature of air-outside is excessive.
- d. Some failure of the compressor occurs in the system, such as electric motor burnout, etc.

There are some impurities such as oxide-skin in system which makes oil become dirty, change color, during the initial running of compressor racks. Oil should be replaced, and return-oil strainer, liquid line filter, and suction filter must be changed after one month running during the initial setup. If the refrigeration oil does not become dirty, only change

color after one month running, oil does not need to be replaced, but return-oil strainer, feed liquid strainer, and oil circuit filter must be changed.

Recent compressor breakdown due to broken parts or electric motor burnout etc. can also change the color of compressor oil, get dirty and become useless. In such circumstances, oil, oil return strainer, liquid line filter, and suction filter must be changed. At this time, it is wise to choose the temporary air-breathing strainer, mainly used in system-clean after burning. This strainer has the ultra-strong ability to absorb water, and can neutralize acidic materials, and remove wax in the system. If the oil still changes color after using air-breathing strainer for 48 hours, the oil strainer must then be replaced. This process can not be stopped until the oil becomes clean, have no peculiar smell and the color of oil is the same as that of new oil.

The filter cores the used in the unit are as follows:

Model of strainer	Brand	Filter-Appling	Usage
F48	ALCO	Suction Filters Compressor suction	Solid-filter
D48	ALCO	Drying filter (liquid main)	Moisture and acid removal Solid-filter

Main harms of **oil-color-changing** are as follows:

- It can shave mechanical bearing, plunger and cylinder etc. and affect the operating efficiency of the compressor.
- Acidic materials lead to the burnout of electric motor.
- Volume changing which eventually dry out
- It can bring about oil block of expansion valve or filter, and cause the decline of refrigeration effect.

3. Oil-pressure Protection

The compressor rack is equipped with an oil-pressure safeguard protector to protect the system from any malfunction caused by bad compressor lubrication. The acting differential pressure of oil-pressure protector is 0.65 bars, with the time-lag of 90s. Oil-pressure protection is mainly an adjustable controlling device which is based on hand movement rest type. When oil-pressure protection occurs, the hand movement reset can be operated only after malfunction is cleared.

4. Crankcase heater

Crankcase heater's installation is prevent compressor startup with liquid, and at the same time, raise the oil temperature to ensure proper oil flow. Crankcase heater must employ the special model and specification stipulated by the manufacturer. When the power of the crankcase heater is relatively small, it won't reach the heat-up effect. On the other hand, if the power is too big, the oil temperature will increase and damage the oil properties

The oil temperature in the crankcase heater, at most, can not be above 80°C, and cannot be under 40°C.

VIII. Maintaining Conditions of Unit

Term and scope covered under warranty

The warranty dateline without paying is one year from the leave factory day, and the range of guaranteeing without paying is: providing the new accessories for parts with malfunction. Malfunction as follows can not be compensated, even if the equipment is within warranty period:

1. Damage caused by improper use of equipment
2. The choice of compressor racks and setting of refrigeration installation is unreasonable.
3. The set-up is unreasonable.
4. The piping is improperly installed, which lead to abnormally operation of stop valve and magnetic valve.
5. Injuries caused by improper installation and startup.
6. Malfunctions are caused by chip intruding into the electrical parts when setting up additional parts.
7. Impurity is mixed in system in the process of setting up pipping.
8. The electric connecting wire is unreasonable in the process of set-up pipeline.
9. The improper construction is pointed out but not followed under the help of our employee.
10. Accidents caused by construction violating the regulations of any kinds.
11. The project is not stopped, when knowing concuss and noise are extremely big.
12. Accidents caused by modifying our company's products, or malfunctions caused by not using accessory protection equipment of our company's products.
13. Malfunctions are caused by employing temperature and voltage at will, not obeying by the regulated sites specified by this product.
14. Malfunctions caused by running environment and maintenance imperfection.
15. Malfunctions are caused by the environment of setting up oily (contain engine oil), much salt (coast areas etc.), much vulcanization gas (hot spring areas etc.)
16. Malfunctions are caused by system liquid feeding back, oil slug or oil metamorphose
17. Malfunctions are caused by setting-up scene (wind rate, water pressure,

chemicals etc. special environment)

18. Malfunctions are caused by adjusting bust (expansion valve, low-voltage of pressure protector)
19. Malfunctions are caused by frequent enablement (enablement, stop are below 5 minutes respectively)
20. The improper maintenance and repair (do not notice gas leakage)
21. Repair error (parts not right, lack of parts, unreasonable assembling)
22. Malfunctions are caused by adding too much refrigerant and lack of refrigeration oil (enablement deficiency, electric motor cooling deficiency and lubricating deficiency)
23. Malfunctions are caused by bad defrosting sequence
24. Malfunctions are caused electric pressure abnormality
25. System inhaling air and moisture was held
26. Malfunctions caused by electric source incompleteness
 - Electric motor malfunctions are caused by one-way electricity which was brought about fuse tube of electric source burning out, and wire terminal rap.
 - Electric motor malfunctions are caused by the abnormal fall of electric pressure during enablement because of transferring reserved electric source when cut-off.
 - Electric malfunctions are caused by extrinsic interfere from abnormal high pressure or electric spark, brought about thunder streak influence on electric source.
 - Accidents are caused by the conditions out of regulated electric pressure and accidents caused by using all-around converter.
 - Malfunctions are caused by not obeying the installing location, evaporation temperature, and the range of using environment temperature and electric pressure.
 - Malfunctions are caused by fire hazard, earthquake, flood and some other natural disaster.
 - Assembling in buses with bad craftsmanship

Some other malfunctions do not guarantee to repair caused by neglecting the common details of set unit in set-up, running, adjustment, and maintenance in the installation/maintenance process.

Moreover, do not amend indirect losses in frozen products and operating caused by set unit malfunctions. Therefore, on the indirect losses, please set up alarm system or take part in loss insurance in advance after consulting with our company's agency.

IX. Instruction for Electrical

9.1. General

It must be read, understood and complied during all operation processes that the instruction, introduce and other security items being list in the produce installation and maintenance manual, including labels on equipment and accessories. Only engineers and technicians, who had strict training and experience, and who are proven to be eligible, are allowed to install and start-up the equipment

The installation, start-up and maintenance of the equipment would become serious danger if some special installation factors been ignored, such as: operation compress, electric elements, voltage and the installation position, etc.


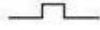

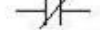
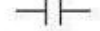

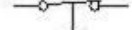
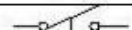



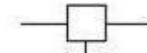

Electric shock prevention

Only personal with IEC (International Electro technical Commission) qualification are allowed to operate electric element. It's necessary to especial indicated that all electric sources connected to the equipment must be shut off before any operation action in the electric control box. Main electric supply can be shut off though main circuit breaker.

- a) Please connect ground wire to ground screws of the equipment correctly.
- b) Please measure the insulation between circuit and the ground and the insulation among circuits after wire connection. Confirm that the mini insulation is not less than $1M\Omega$.
- c) Even though the equipment is shut off, power cable will still be electrified if only the circuit breaker is closed. More details can be found in wire connection schematic diagram. Please use relative safe operation methods
- d) Please restore all the accessories(cover, electric accessories, etc) that has been removed for inspection and maintain complied with original to prevent leakage
- e) Please place the equipment near a suitable locations to avoid water and rain
- f) Please don't put wire to insulated materials such as refrigerant pipes to prevent wire overheating.
- g) Burn danger: electric current will make elements hot temporarily or for a long term. So please be careful when touching power cable, control cable, junction box and the shell of electric engine.

9.2 Electrical Schematic Diagram

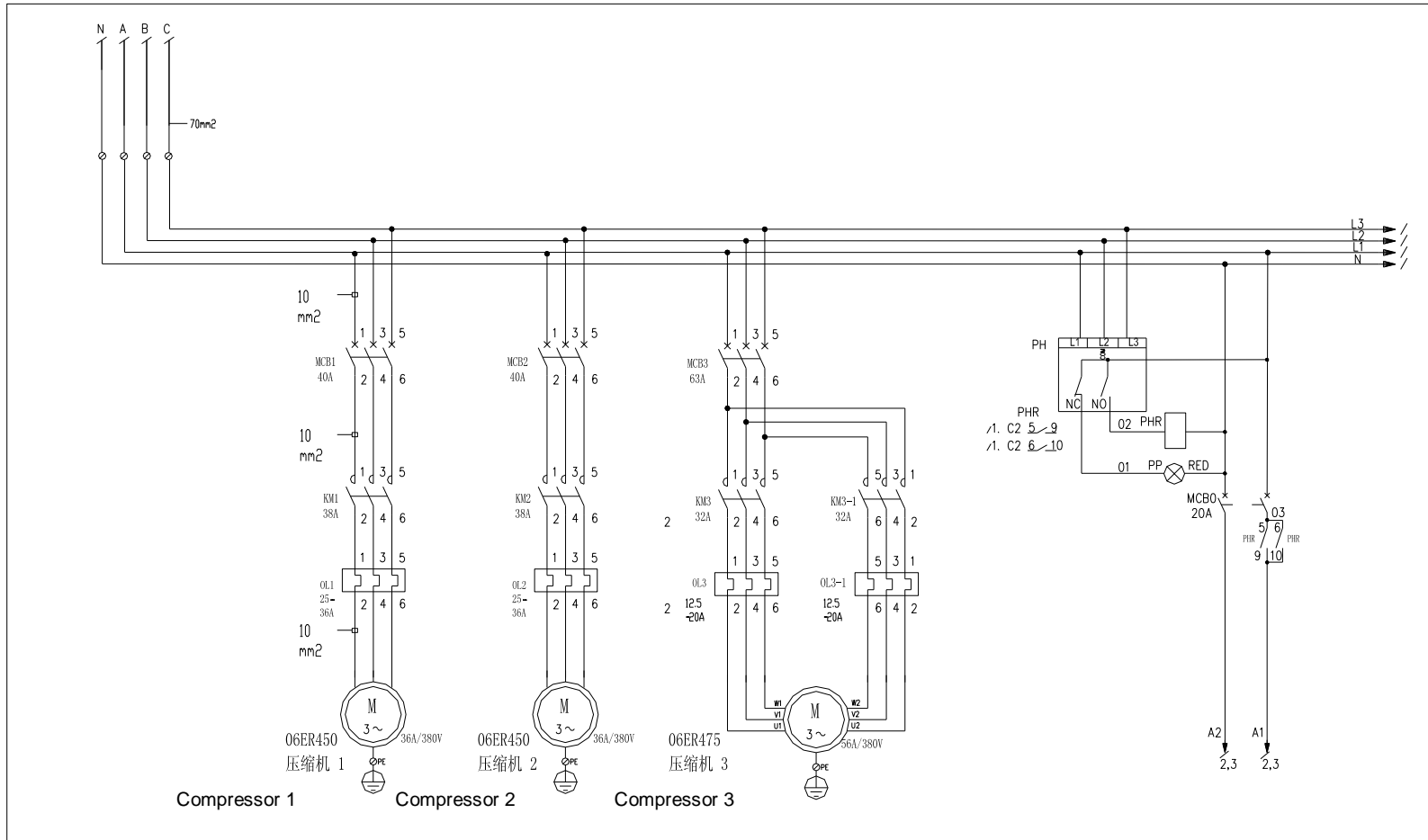
Electric symbols in this diagram is indicated as follow

Main circuit breaker/circuit breaker	
Overloading relay	
Indicating light	
Normally-closed contact	
Normally-open contact	
Contactor coil	
High pressure switch	
Low pressure switch	
Time closing contact	
Time breaking contact	
Optional items	
Only for low temperature compressor	
Electric valve coil	

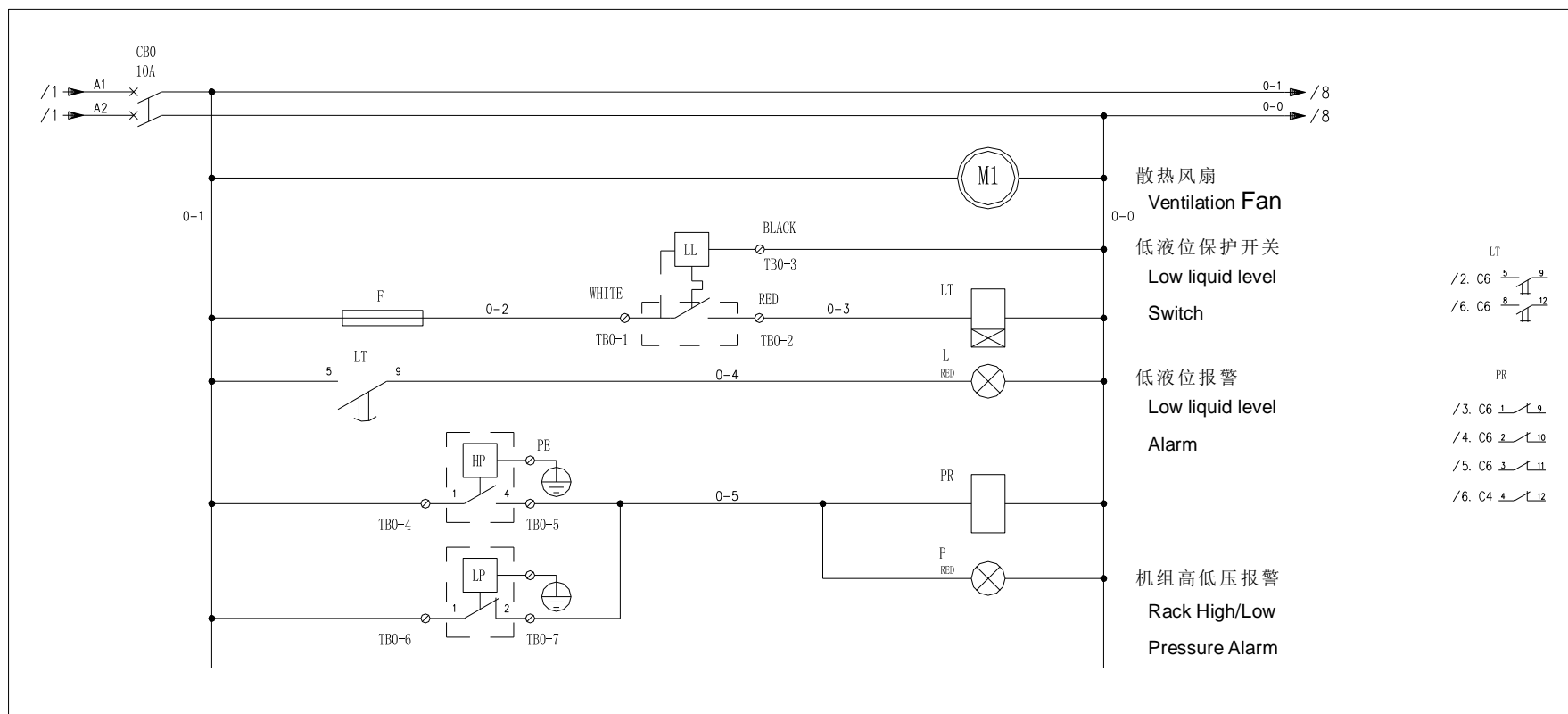
Letter symbols in this diagram are indicated as follow:

LT	Low liquid level alarm (electrified) time closing relay	MCCB	Main circuit breaker
HP	Manual reset high pressure switch	MCB	Circuit breaker
HP1~HP4	Automatic reset high pressure switch	SW	Panel automatic/manual switch
LP	Low pressure switch	T1 - T4	Compressor OFF/ON time closing relay
LL	Low liquid level switch	CR1 - CR4	Compressor manual-control relay
OP	Oil pressure switch	C1 - C4	Main coil contract
HT1~HT4	Gas discharge temperature protection switch	C1-1~C4-1	Auxiliary contract
OL	Overloading relay	EWCM	Compressor controller
LR	Low liquid alarm relay	R1 - R4	Alarm indicating light
PR	pressure protection relay	W1 - W4	compressor operation light
FR	error locking relay		

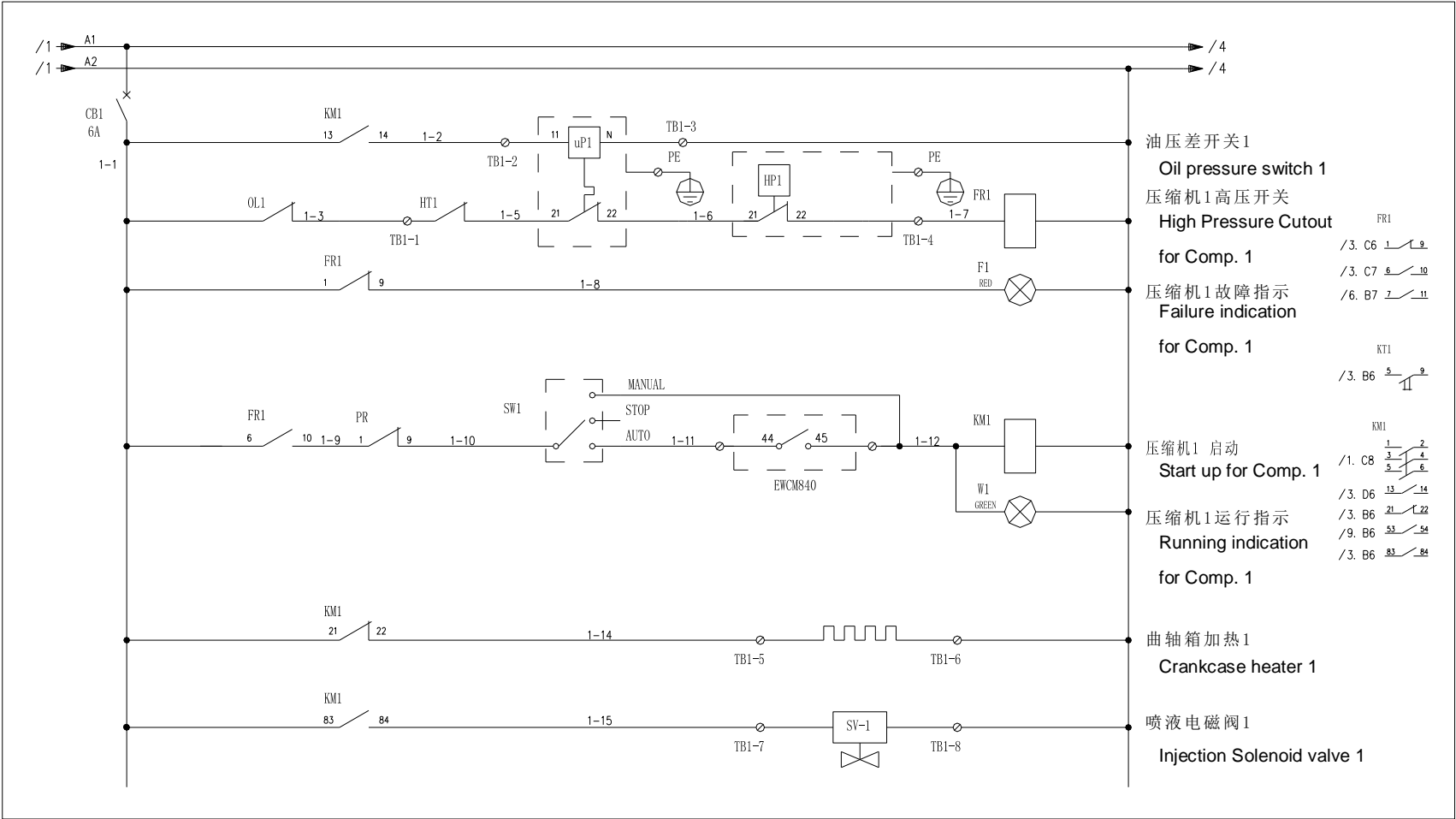
9.2.1 Compressor power circuit



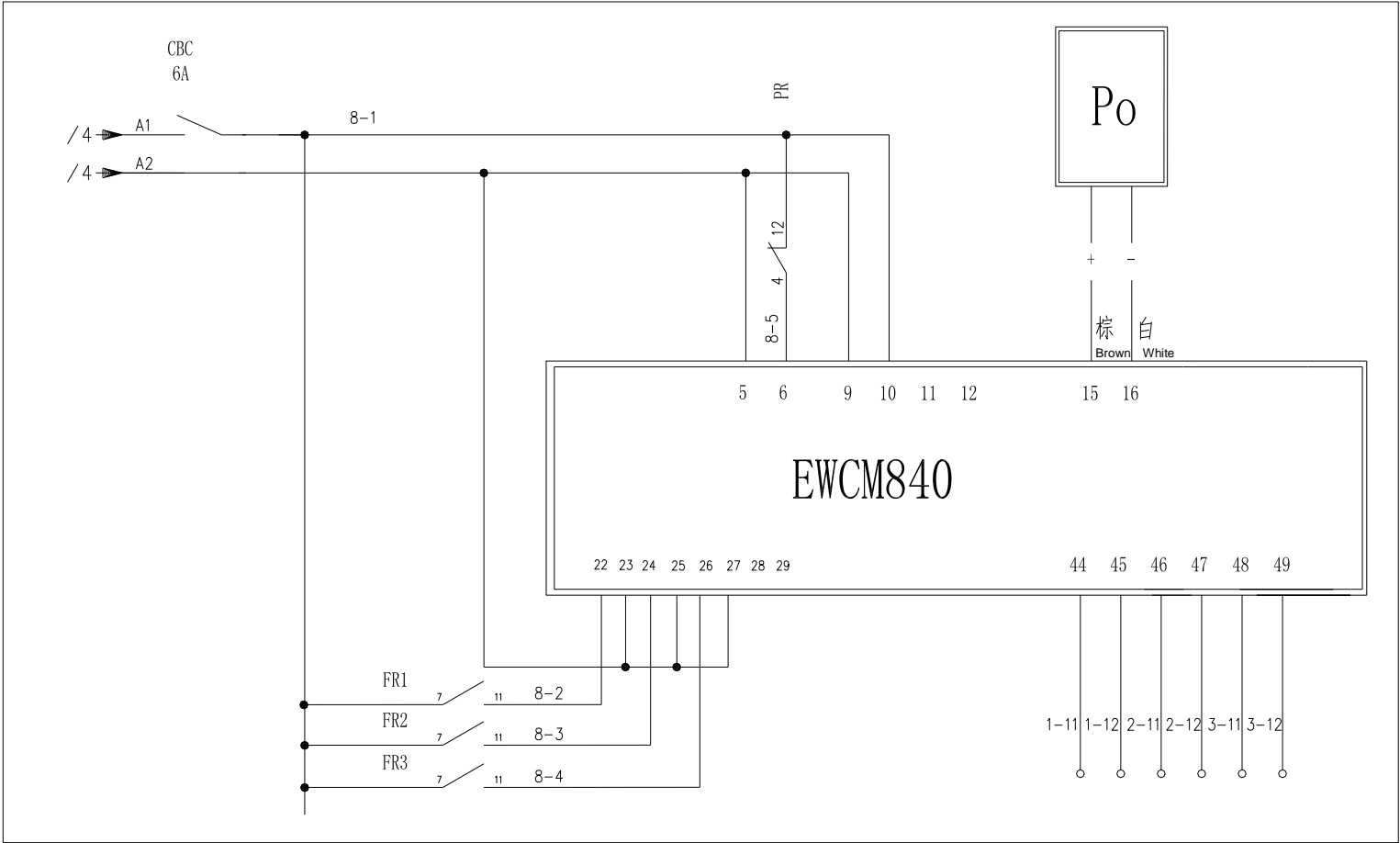
9.2.2 Controller circuit



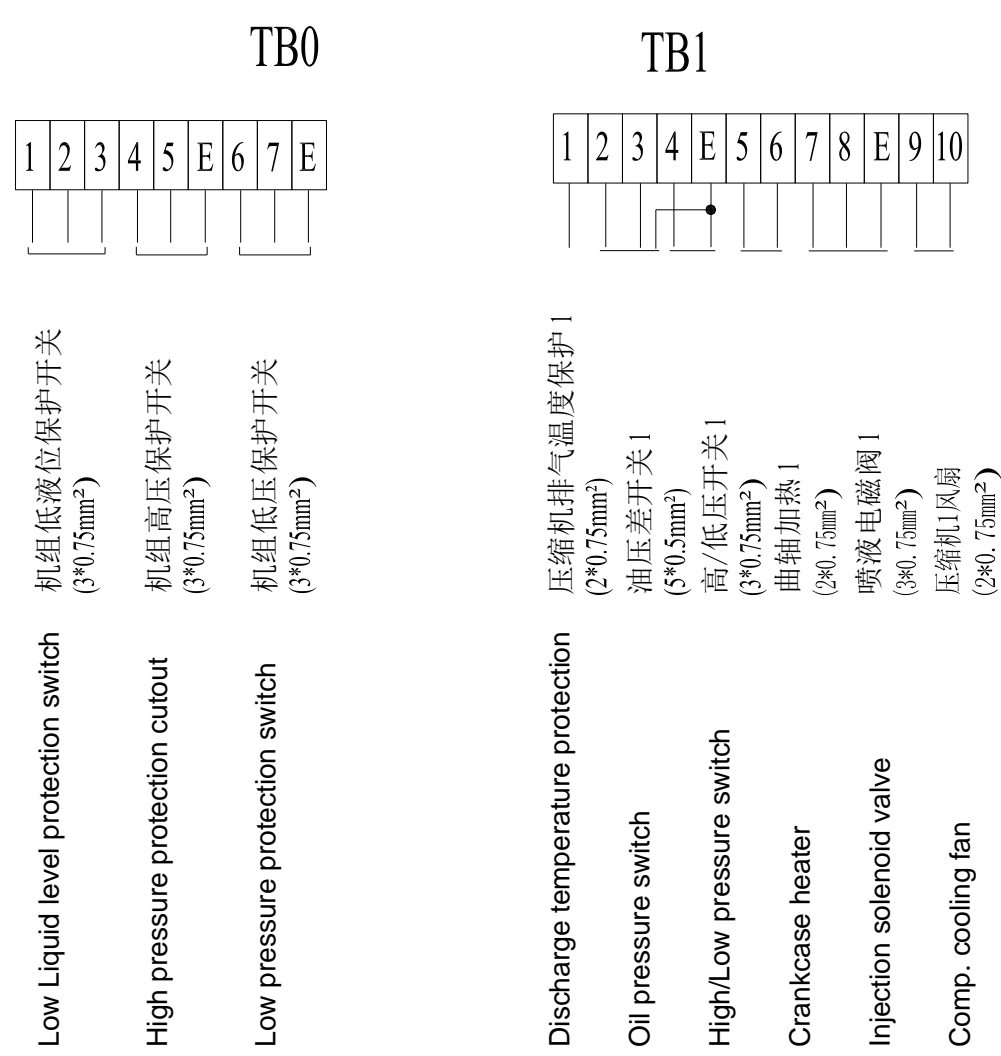
9.2.3 Compressor control circuit



9.2.4 Controller Circuit



9.2.5 Control circuit terminal arrangement

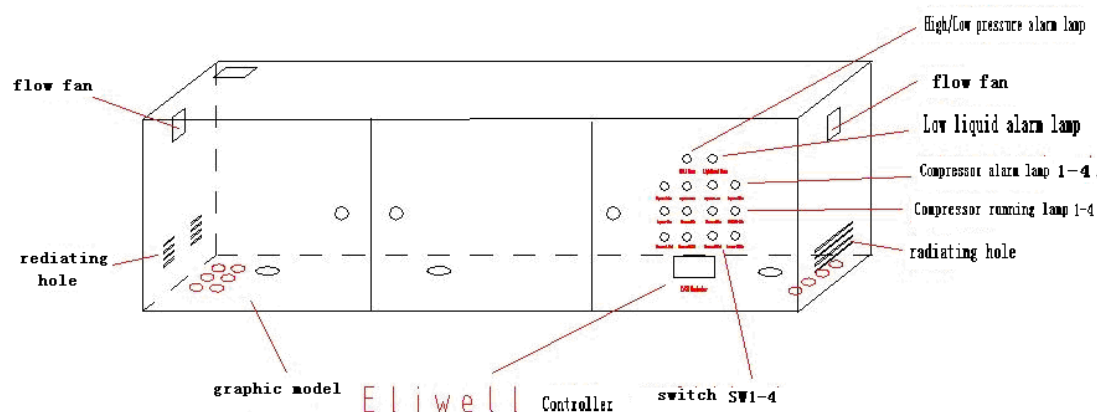


9.3 Equipment protection and alarm system

Equipment alarm system is described as follow:

Abnormal items	Alarm light in electric control box	Compressor stop/run	Reset type	Clean method
Equipment gas inspiration pressure	High/low pressure alarm(red)	Equipment stop	Automatic	
Equipment gas discharge pressure	High/low pressure alarm(red)	Equipment stop	Manual	
Compressor gas discharge temperature	None	Compressor stop	Automatic	
Compressor gas discharge pressure	None	Compressor stop	Automatic	
Oil pressure protection	1-4# Compressor alarm(red)	Compressor stop	Manual	
Compressor overcurrent	1-4# Compressor alarm(red)	Compressor stop	Manual	
Low liquid level protection	Low liquid alarm(red)	No action	Automatic	

The position of alarm indicating lights is as follow:



9.4 compressor unit controller

9.4.1 General description

The refrigerator unit is controlled by controller. The controller is used to control parallel compressor power unit.

The control input signal of the unit is 4 ~20 mA pressure transmitter signal or temperature detector signal. The unit has four relays to input, which can provide relative chain alarm input.

EWCM controller can provide high/low pressure alarm function and pressure transmitter alarm function.

Two adjustable control points can be set to show “normal” and “economic” running status

The controller can diagnose the unit system persistently. The unit will shut off the error circuit waiting for repair in the case of accident

9.4.2 Interface

Controller interface is as following chart:



Significations of buttons and indicating lights are described in following list:

“PRG”	in set status	“MUTE”	reset alarm
“HRS”	display/reset compressor running time	“LOCK” light	show that the keyboard is at lock status
“MAINT”	display/modify “at work” or “maintenance” status of each compressor	“ALARM” light	show error and alarm
“SET”	display/modify “normal” or “economic” running status set point	“COMPR/STEP” light	show steps of compressors
“up”	add value	“nixie tube”	Show the value of the unit
“down”	reduce value		

9.4.3 Input and output

Alarm relay output: long-distance alarm output, the NO 1, 2 terminals will close when the unit is out of service.

Security relay output: the NO 3, 4 terminals will open when EWCM are out of service

Pressure alarm input: the NO 3, 4 terminals are for high/low alarm input

Electric source input: 220V, 50Hz alternative current is input though the NO 3, 4 terminals.

Economic running switch: the NO 13, 14 terminals are used to make the unit in economic running status (see more details in “rSIP”).

Inspiration pressure transmitter: the NO 15, 16 terminals

Televis System: RS485 interface, the NO 19, 20, 21 terminals

Compressor alarm input: terminals for NO 22 to NO 29.

Compressor output relay: terminals for NO 44 to NO 51.

9.4.4 in program model

EWCM proposes two parameter set models: operation “**oPr**”, configuration “**CnF**”

Enter into “**oPr**” menu, press “**oPr**” button and release it., then press “**up**” button ; enter into “” menu, press “**prg**” twice and then press “**up**” button

If the code guard is enabled, it will show “**PAS**”.

Exit the program model, press button, all of enactment will be stored automatically.

9.4.5 display/modify parameters

In program model, press “up”, “down” button to display parameters line

- Show parameters value, press “set” button
- Modify parameters, press “up”, “down” button
- Exit parameters setting, press “set” button

9.4.6 Code protection

“Psc”、 “Pso” are separately used to enter into collocation setting and program operation setting

Active code protection model, select code column and set relative value.

9.4.7 Specification for collocation parameters

CPnU: Compressor number

CtyP: Compressor type .0=compressors have different power to supply (neutral area control); 1=compressors are supplied by the same power (scale control)

CPSt: Compressor step. The step of each compressor (only for CtyP=1)

PC1...PC4: Compressor power capacity setting

FtyP: Freon type. 0=R134A; 1=R22; 2=R502; 3=R404A

PA04: Pressure sensor 0-4mA.

PA20: Pressure sensor 0-20mA.

CAL: Calibration

SEP: Alarm input polar. 0= no source; 1= having source

rSIP: Polar setting for economic operational switch. 0= normally opening activation; 1=normally closing activation

ALIP: Alarm input polar. 0= no source; 1= having source

StPP: Compressor step output. 0= no source; 1= having source

Psc: Code protection

t AB: No modification

Pbd: Proportional band

onon: Delay for twice continuously start up, unit "minute"

oFon: Delay for stop, unit "minute"

don: Open delay, unit "second"

doF: Close delay, unit "second"

donF: Delay open and close, unit "minute"

FdLy: First open delay, 0=no, 1=yes

Fdlf: First close delay

odo: Output delay

LSE: Lowest setting limit

HSE: Highest setting limit

StrS: Open time setting of economic operational point

SPrS: Ending time setting of economic operational point

RSd1...rSd7: weekly setting of economic operational point (0= no usage of economic operation status, 1= usage of economic operation status, rSd1=Sunday, rSd7=Saturday)

UAro: Cancel unit alarm

Aro: Cancel alarm

PAO: Pressure delay alarm when starting up, unit "minute"

LAL: Low pressure alarm, low pressure alarm setting, if the pressure is lower than -LAL, it will display "Er03"alarm code in the unit

HAL: high pressure alarm, high pressure alarm setting, if the pressure is higher than -HAL, it will display "Er04"alarm code in the unit

tAO: "Er03"、"Er04"alarm delay setting, unit "minute"

SEr: Maximal operation time setting for each compressor, when time reach "Er14", prompt to maintain the compressor

PEn: The high pressure and low pressure alarm frequency arising from the NO 5, 6 terminals
PEI: Sampling period of pressure alarm
CPP: Compressor sensor alarm, display code " Er01"
SPr: Step protection for pressure probe
PoPr: Power step
rELP: Relative pressure, 0=relative pressure, 1= absolute pressure
Loc: Key board lock, 0= lock, 1= unlock
Pso: Code protection
FAA: Address setting under group control
dEA: Equipment address
tAB: No modification
EL1: No modification
EL2: No modification

9.4.8 User information

8. How to display/modify setting point

EWCM controller proposes two working condition setting point: normal working condition and economic working condition (use at night or in holiday). Press and release "set" button to display normal working condition setting. Continuously press "set" button to enter into economic working condition. At this time, the LED green light on controller panel will convert from "N" to "R". Press "up" and "down" button to set setting point.

9. compresor operation status

Before the compressor relay outputs information, relative LED light in controller panel will blink, the time depends on the time of compressor start-up delay . The green light will blink when output interface is connected.

Attention: When the compressor start running, the pressure may exceed the operation range, and the controller will work according to time-delayed parameter of "PAO", if the sensor still get higher signal than the range, EWCM controller will be set based on the parameter of CPP, SPPr, PoPr.

10. How to display compressor's operation time

Press and release "hrs" button, it will show first compressor's operation time, and "hrs" LED will be turned on, you can select other compressors' time by "up" and "down" button, and you can also click "mute" to reset the time. Please press "hrs" and release to quit the operation.

11. How to display/modify "maintaince" and "in service"

Press "maint" button, it will show first compressor's status, related red light will be turned on, and "maint" button also turn to green. "onLn" means the relay is outputting, press "mute" for 5 seconds, it will turn to "oFln", which means the equipment in maintenance, and related red light will be turned on.

12. Alarm input value/Sensor's high/low pressure alarm.

Connector 5, 6 and the parameter of "SEP". The connector will be

sensitized when equipment alarms, and the controller will forbid all the output. The alarm does not need manual reset, during the interval of “PEI”, if the pressure sensor’s alarm count amounts to “PEn”, the displayer will show “ErOL” or “ErOH”. “ErOL” means low pressure, and “ErOH” means high pressure. Press “mute” for 5 seconds, previous alarm will be cleaned. And you can also set PEn=0 to ignore all the alarms.

13. Input/Output of alarms

Connector 22 to 39, and the parameter of “ALIP”. Each compressor’s alarm input should be connected to related line. If the alarm is sensitized, the loop’s compressor will stop running. And the red light for alarm will show the alarm code as “Er02”. The alarm does not need manual reset.

14. Alarm reset

When alarm system is active, alarm relay will close NO 1,2 output terminals

Press and release “mute” button to reset an alarm signal. Alarm relay will turn on reset alarm light. The time depends on “Uaro” and “Aro” parameters setting.

9.4.9 alarm information

The signification of alarm code is described as follows:

Er0L...Er0H	Error high/low pressure alarm	Shut off all compressor
Er01	Error 01 sensor alarm	See “CPP”, “spr” and “popr” setting
Er02	Error 02 input alarm	Shut off relative compressor
Er03	Error 03 low pressure alarm	Alarm when sensor value less than Set – LAL
Er04	Error 04 high pressure alarm	Alarm when sensor value high than Set – HAL
Er11	Error 11 time error	Check “Pri” 、 “hour” and “day” parameters
Er12	Error 12 parameter error	Need reset manually when over 9 parameters
Er13	Error 13 data error	Need reset manually
Er14	Error 14 Maintain alarm	

9.5 controller parameters primary setting list

Controller parameters primary setting list is as follows. Here is 140HP single moderate temperature equipment

RACK EWCM840 Setting List (140HP Med Temp)

	function	parameter	description	setting range	Default setting	setting value	unit
Configuration parameter	System capacity setting	CPnU	Compressor number	1...4 / 6 / 9	2009-4-6	4	number
		Ctyp	compressor control type	0 / 1 (dead zone/scale control)	1	0	number
		CPSt	Compressor proportional control step setting	1...6	1	1	number
		PC1	Power of compressor 1	1...255		35	HP
		PC2	Power of compressor 2	1...255		35	HP
		PC3	Power of compressor 3	1...255		35	HP
		PC4	Power of compressor 4	1...255		35	HP
		rot	operation sequence of compressor	0 / 1 (fixed/alternated)	0	1	number
		Sat	Saturation arithmetic setting	0 / 1 (unused/used)	0	/	number
		nCPC	Number of main compressor	0...Cpnu	0	/	number
		FtyP	Freezing agent type	0 / 1 / 2 / 3 / 4 / 5	1	1	number
		PSI	Pressure display modes	0 / 1 (Standard/PSI mode)	0	/	number
	Inspiration pressure sensor setting	PA04	Lower spec of sensor measurement (PTC)	0...8	0.5	-1	Bar
		PA20	Upper spec of sensor measurement (PTC)	0...31	8	7	Bar
		CAL	Calibrated value (PTC)	-0.5...0.5	0	0	Bar
	Other input setting	SEP	Pressure alarm input polar	0 / 1 (power-fail/on alarm)	1	1	number
		rSIP	Energy saving mode input polar	0 / 1 (power-fail/on energy saving)	1	1	number
		ALIP	Normal compressor alarm input polar	0 / 1 (power-fail/on alarm)	1	0	number
		StPP	Step output polar	0 / 1 (power-fail/on output)	1	1	number
	Password setting	Psc	Set parameter Password	0...255	0	0	number
		tAb	parameter table	/	/	/	/
Operation parameter	Energy saving mode time setting	Pri	Minute setting	0...59	0	0	minutes
		HoUr	Hour setting	0...23	0	0	hours
		daY	Week setting	1...7	0	0	number
	Control period setting	dEU	Unit setting	0 / 1 / 2 (Bar/°C/°F)	0	0	number
		Pbd	Buffer bandwidth setting	0.1...5	0.4	1	Bar
		onon	On-on delay	0...255	5	1	minutes
		oFon	Off-on delay	0...255	5	1	minutes
		don	step on-on delay	0...5000	15	60	seconds
		doF	step off-off delay	0...255	5	30	seconds
		donF	step on-off delay	0...255	15	30	seconds
		FdLy	first don delay	0 / 1 (No use/use)	1	1	number
		FdLF	first dof delay	0 / 1 (No use/use)	1	1	number
		odo	Meter output delay	0...255	0	5	seconds
	设定值Setting value	LSE	Low spec setting	0.1 / HSE	0.2	1	Bar
		HSE	High spec setting	LSE / 25	5	6	Bar
		StrS	Energy saving mode start time	0...24	0	0	hours
		SPrS	Energy saving mode stop time	0...24	0	0	hours
		rSd1...rSd7	Energy saving mode days setting	0 / 1 (No use/use)	0	0	number
	Alarm setting	Uaro	Alarm by-pass time unit	0 / 1 (min/hour)	1	0	number
		Aro	Alarm mute by-pass time	0...255	15	15	minutes
		PAO	Pressure alarm by-pass time	0...255	30	30	minutes
		LAL	D-value of low pressure alarm	0.01...25	5	1	Bar
		HAL	D-value of high pressure alarm	0.01...25	5	2	Bar
		tAo	pressure alarm delay	0...255	0	1	minutes
		Ser	upper total operation time	1...9999	3000	3000	hours
		Pen	pressure alarm count	0...15	5	5	number
		PEIs	pressure error interval	0...15	15	15	minutes
		CPP	compressor probe protection	0 / 1	0	0	number
		SPr	step probe protection	0 / CPnU	1	1	number
		PoPr	error power setting	0 / n	0	0	number
		rELP	Pressure display type	0 / 1 (absolute/relative)	1	1	number
		Loc	Keyboard lock	0 / 1 (No use/use)	1	1	number
	Communication assistant	Pso	Operation parameter setting password	0...255	0	0	number
		FAA	Serial No.	13...14	13	13	number
		dEA	Equipment address	0...14	0	0	number
		tAb	Parameter table	/	/	/	/
		EL 1	eliwel1	/	/	/	/
		EL 2	eliwel2	/	/	/	/

Special Warning & Attention:

The content is important and related to safety, please read carefully and strictly follows it!

Matters mentioned here is to help you properly and safely to use our product, to prevent you, as well as other people from the hazard and loss. Those mis-operations which have high possibility to cause death or grievous bodily injury will be classified in < Warning> field; and those content which may lead to heavy accident will be concluded in <Attention> field, all the pasted content is important to safety, please strictly follow it! Please put the instructions at the places invisible to the users.

Warning

Installation & Construction

Please relegate the installation to professional service.

Incomplete installation may result in water leakage, electroshock, fire hazard etc.

Installation & Construction should adhere faithfully in accordance with the instruction.

Incomplete installation may result in water leakage, electroshock, fire hazard etc, please execute the installation according to high-pressure gas management rule.

Installation place should have enough gravity bearing ability.

Insufficient gravity may make equipment overturn, drop and be damaged. Generally the concrete footing should be about 3 times of the equipment's gravity.

Please keep the equipment fixed with foundation bolt!

The appliance is equipped with buffer footing, and the equipment can be directly laid on built platform, can fix the equipment with foundation bolt according to the practical situation.

Keep others except cooling medium away from the pipe of refrigeration system (i.e. air)

This will make abnormal high pressure occur in the refrigerating system pipe, thus lead to pipe broken and people hurt.

Please install with the accessories and assigned parts!

Not use assigned parts may cause equipment overturn, water leakage, fire and electroshock etc.

Please go along with air-tight test

Refrigerant leak may result in oxygen deficit. Please conduct air-tight test with 20bar pressure to confirm Whether any leakage after the cooler and cooling units connection finished. At same time please make sure to shut down the ball valve nearby the low-pressure switch, aims to protect equipment low-pressure switch.

Do not install equipment outdoor!

If use in raining area, may cause electro-leakage and electroshock.

Do not install in potential raining area!

It will cause fire hazard and electroshock.

Do not install in humid or easy-to-be-water-sprayed area!

It will decrease the insulation property, cause electro-leakage and electroshock.

Please install safety guard for the equipment, to keep from touching by hand.

Touching by hand may lead to serious injuries.

Electricity construction

Please use exclusive circuit.

Please follow Electrical Engineering Technical Criterion, Indoor Wiring Standard and the instruction to install! Please use exclusive circuit and install circuit breaker! If not complete, it may cause electroshock, fire etc.

Please make sure the wire well connected with the equipment!

Please use assigned cable and connect properly, make sure the cable link is fixed, for fear that it transfers the external force on cable. Poor connection or fixation may cause heat generation and fire hazard.

Please install ground wire!

Ground connection should be carried out by electricity construction organization; ground wire should not be connected with gas piping, city water pipe, lightening arrester and telephone's ground wire! Imperfect earth may cause electroshock.

Please properly install the components!

Cover and plate of electric cabinet should be properly installed, incomplete installation may cause fire, electroshock etc.

Attention for usage

Do not change the default setting for security system.

Various securities, protection devices are installed on condensation tool. Do not change the default setting of security and protection devices. The default setting change may cause the tool broken and fire hazard.

Please contact with professional department if electro-leakage protector start up!

Forcedly recovery may cause electroshock and fire.

Do not directly spray or clean with water!

This will cause short and electroshock.

Maintenance

Do not crack, repair and modify!

Nobody except professional person can conduct cracking, repair and modification! Incomplete action may cause injury, electroshock or fire for abnormal behavior.

Please stop running equipment if you sense abnormality of equipment

Please stop running if abnormal happen, and shut down electro-leakage protector, if keep running, it may cause electroshock, fire hazard, etc.

Movement and Relocation

Please contact professional department to move!

Incomplete installation may cause water leakage, electroshock, fire hazard, etc.

Attention

Installation & Construction

Do not install on the potential leakage area of flammable gas!

Leak gas may accumulate around the equipment, and cause fire hazard.

Please make cooling medium circulation pipeline in the range of specs.

Out of specs may cause pipeline broken, smoking, firing or electro-leakage, etc.

Inspiration pipe will be frozen and frosting at times.

Please do thermal insulation, condensation of moisture may moisten the around area.

Please move the equipment carefully, do not make it overturn!

The equipment is so heavy, that the fork lifter should keep vertical to move it, do not make it overturn, lest making it damaged. And the person should pay attention, not to have waist sprained.

Non-operator does not touch the equipment!

Please mark with "No touching", or surround the possible to be touched equipment with safety gates, mis-operation may lead to injury, etc.

Please make up drainage construction

Water supply and drainage system installed indoor will moisten the installation environment.

Please instruct to professional lifting company for equipment lift operation.

Please use stand bar according to the drawing when lifting, and utilize the 4* ø30 lift holes in the bottom. Hook the holes with suspension hook, and connect with steel cable. Please use a pad to isolate the suspension hook and cover, to prevent the cover from deformation.

Please keep good ventilation!

Cooling medium leakage may cause oxygen lack.

Do not make fusible slug oriented to the entryway!

The fusible slug start up may cause injury.

Exhaust side pipe temperature is high, need thermal insulation if possible to be touched.

Direct touch by hand or by wire may cause scalded or electro-leakage.

***Electricity Construction**

Please install specified volume electro-leakage protector.

If not may cause electroshock, fire hazard, etc.

Make sure the wire does not pass through insulation material of cooling medium

pipeline.

Over heating wire may cause electro-leakage, fire, etc.

*** Attention for usage****Cooling medium may eject if the pipeline is open.**

Cooling medium may eject if the pipe is opened through assistant valve interface. It will hurt people if the cooling medium touches people or meets naked flame.

Do not touch the electrical units with wet hands!

Do not manipulate switches with wet hands, in case of electroshock.

Please routinely check the action of electro-leakage protector!

If continue to use failed electro-leakage protector, it will not start up when electron-leakage occurs, and cause electroshock.

Do not stand or place things on the equipment!

Overturn or drop will cause injury.

Do not use flammable ejection or lay-aside combustible matters nearby!

It will be inflamed by the switches' spark.

Please shut off the power when cleaning & inspecting!

Please shut off the switches, electro-leakage protector when cleaning or inspecting, keep away from electro-leakage or fire burn.

Do not directly touch high-temp unit in the equipment!

Compressor & exhaust's temperature is high, direct touch may lead to scald.

Please routine check Whether the brackets are hurt for long time usage.

If the brackets are hurt, it will cause the equipment drop, overturn and make people injured.

Do not touch naked pipeline and wire!*** Abandon****Please instruct to professional department to abandon the equipment.**

The equipment contains refrigerant and oil, direct disposal may cause fire hazard, explosion & environment pollution.

Please recycle the refrigerant in the equipment.

The cooling medium should be recycle, and re-used or instruct treatment plant to abandon. Discharge into the atmosphere directly will pollute the environment.



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