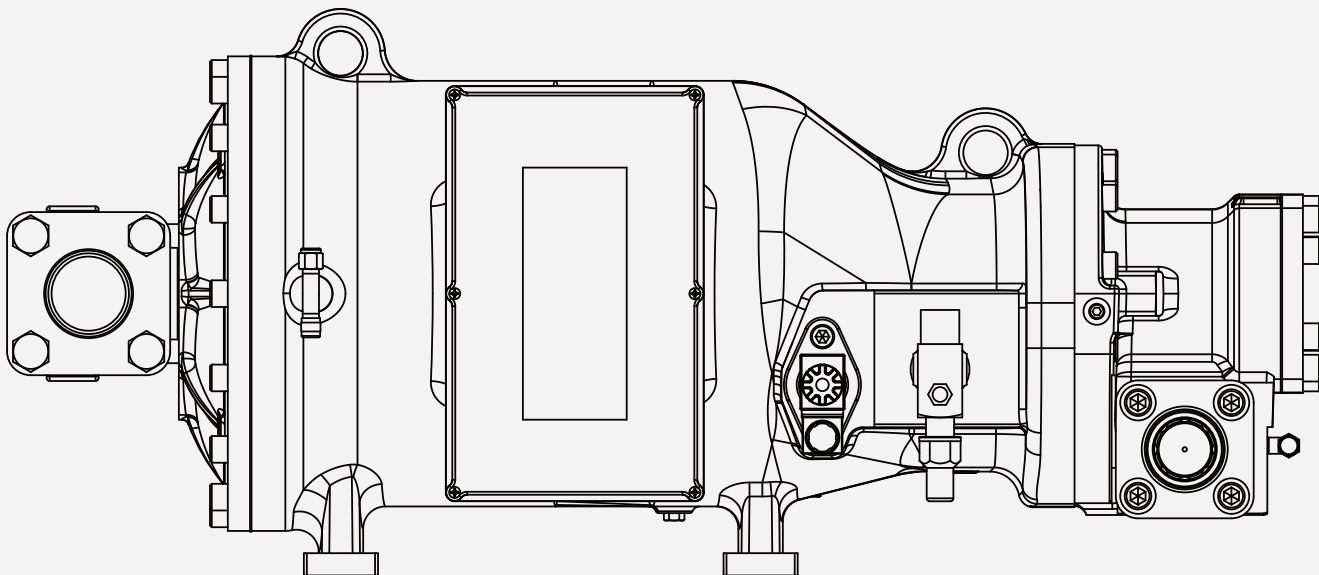


SEMI-HERMETIC SCREW COMPRESSORS

Installation and start-up instructions

半封闭螺杆压缩机 安装和启动说明书



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信息

安装和使用压缩机前，请仔细阅读此说明书，这样可以避免压缩机使用不当和装配不正确导致严重或致命的伤害，可防止损坏。请遵守此说明中包含的安全指南。此说明书必须始终随着压缩机从机组制造商到最终用户。

安全指南说明



危险！

用于警示潜在的危險情形，若不避免，可能会导致立即的致命或严重的人身伤害。



警告！

用于警示潜在的危險情形，若不避免，可能会导致致命或严重的人身伤害。



小心！

表示有危險的情况，如果不避免，可能会导致人员轻微伤害。



注意！

防止设备损坏的说明。



信息

便于操作的说明和建议。



危险！

电压危险，有触电危险。

INFORMATION

Before assembling and using the compressor please read carefully these instructions. This will avoid improper use and incorrect assembly of the compressor that can result in serious or fatal injury and prevent damage. Observe the safety guidelines contained in these instructions. These instructions must always accompany the compressor from the manufacturer to the end user.

Identification of safety instructions



DANGER!

Indicates a dangerous situation which, if not avoided, may cause immediate fatal or serious injury.



WARNING!

Indicates a dangerous situation which, if not avoided, may cause fatal or serious injury.



CAUTION!

Indicates a dangerous situation which, if not avoided, may cause minor injuries to persons.



ATTENTION!

Instructions on preventing possible damage to the equipment.



INFORMATION

Instructions and suggestions to facilitate operations.



DANGER!

Voltage hazard, risk of electric shock.

1. 信息

1. INFORMATION

型号范围

Models Range

High and medium temperature 中高温	Low temperature 低温	R134a application 应用于R134a
FVR-H-40-120	FVR-L-30-120	FVR-H-30-120
FVR-H-50-140	FVR-L-40-140	FVR-H-40-140
FVR-H-60-160	FVR-L-50-160	FVR-H-50-160
FVR-H-70-200	FVR-L-60-200	FVR-H-60-200
FVR-H-80-230	FVR-L-70-230	FVR-H-70-230
FVR-H-90-270	FVR-L-80-270	FVR-H-80-270
FVR-H-100-300	FVR-L-90-300	FVR-H-90-300
FVR-H-115-350	FVR-L-100-350	FVR-H-100-350
FVR-H-125-380	FVR-L-110-380	FVR-H-110-380
FVR-H-125-370	-	FVR-H-110-370
FVR-H-140-430	FVR-L-125-430	FVR-H-115-430
FVR-H-160-460	-	FVR-H-125-460
FVR-H-180-540	FVR-L-160-540	FVR-H-140-540

Compressor - 压缩机

FVR	L	50	160
-----	---	----	-----

Series 系列	
FVR	Semi-hermetic screw compressor 半封闭螺杆式压缩机
Application - 适用范围	
H	High/medium evaporating temperature 高/中蒸发温度
L	Low evaporating temperature 低蒸发温度
Motor size - 电机尺寸	
Nominal power (HP) 额定功率(HP)	
Displacement - 排量	
120~540 [m ³ /h 50Hz]	

铭牌

Name plate

Manufacturer
制造商

Compressor model
压缩机型号

FRASCOLD SPA

Type **FVR-L-50-160**

Nr. **8T000001**

Serial number
序列号

Maximum allowable pressure
允许最大运行排气压力

Maximum allowable standstill pressure
允许最大静止吸气压力

Frequency/ Displacement/ Speed
频率/排量/转速

Hz	Displ. m³/h	RPM
50	160	2900
60	192	3500

Max. Operating Disch. Pressure bar 30
Max. Static Suct. Pressure bar 20,5

Three-phase alternating current
三相交流电流

Motor type
电机启动方式

Specified voltages
额定电压

Specified frequencies
额定频率

3~

EAC CE

Volt	Hz	MRA	LRA
PW		PW	DOL
380-420	50	80	203 330
440-480	60	80	203 330

PW Locked rotor amperes
PW启动堵转电流

Direct on line locked rotor current
DOL 启动堵转电流

Maximum operating current
最大工作电流

Identification barcode
条形码

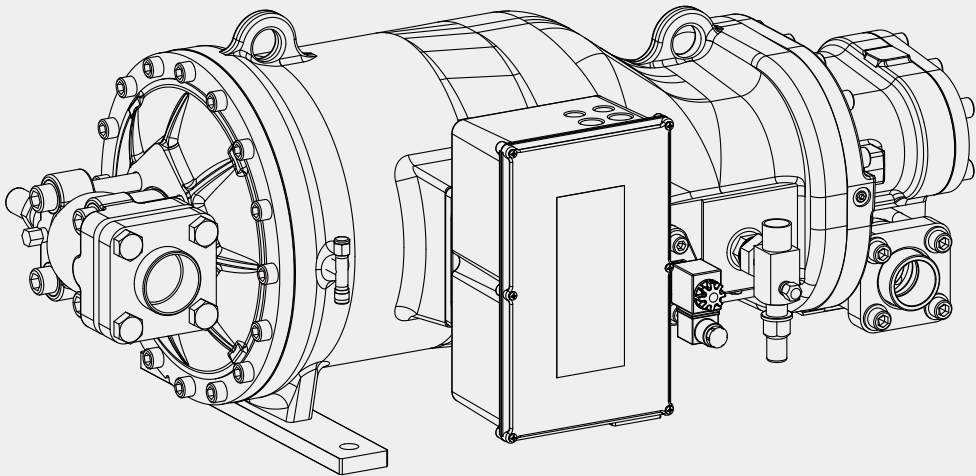
Identification code
识别码

Place of manufacturing
产地

FL0501608HT000001

MADE IN ITALY OR CHINA

FVR 系列



2. 供货状况

! 当压缩机收到后，检查包装是否有任何可见的损伤，确保其处于良好状态。如果有任何物品损坏，立即联系物流公司，并发送挂号信给航运公司，索赔所遭受的损害，并且抄送给富士豪公司。检查包装内容，确认与装箱单和/或您的订单相符。如果丢失任何物品，请立即联系富士豪或当地经销商/代理商。

2.1 单独提供的配件

标准供应包括油路套件交付在一个单独的纸箱。这些部件是压缩机正确运行所必需的，安装人员必须注意安装(见 6.4油路管理)。

如果这些额外的材料丢失，请联系供应商。

• FVR-H/L-120-140-160 - FVR-H/L-200-230-270 - FVR-H/L-300-350-380

序号	数量	油循环组合包配件
1	1	油过滤器
	2	接头ODS 22 mm (7/8")
	2	泰富龙垫圈
	2	O型圈
	2	锁紧接头ODS 22 mm (7/8")
2	1	流量开关
	2	锁紧接头ODS 22 mm (7/8")
	2	泰富龙垫圈
3	1	电磁阀 ODS 22 mm (7/8")
	1	线圈230V AC 50-60Hz
	1	线圈接头
4	1	视油镜 ODS 22 mm (7/8")

• FVR-H/L-370-430-460-540

序号	数量	油循环组合包配件
3	1	电磁阀 ODS 22 mm (7/8")
	1	线圈 230V AC 50-60Hz
	1	线圈接头
4	1	视油镜 ODS 22 mm (7/8")

2. SUPPLY CONDITIONS

! When the compressor is received, inspect the packing for any visible damage and make sure it is in good condition. In case any item is damaged, contact your forwarder immediately and send a registered letter to the shipping company, claiming the suffered damage, copy to Frascold for knowledge. Check the contents of the packing, verifying the correspondence with the packing list and/or your order. Contact Frascold SPA or local distributor/agent immediately if any item is missing.

2.1 Equipment provided separately

The standard supply includes the Oil circuit kit delivered in a separate carton box. These parts are necessary for the correct operation of the compressor and the installer must take care of the installation (see 6.5 Oil management).

Contact the supplier if this additional material is missing.

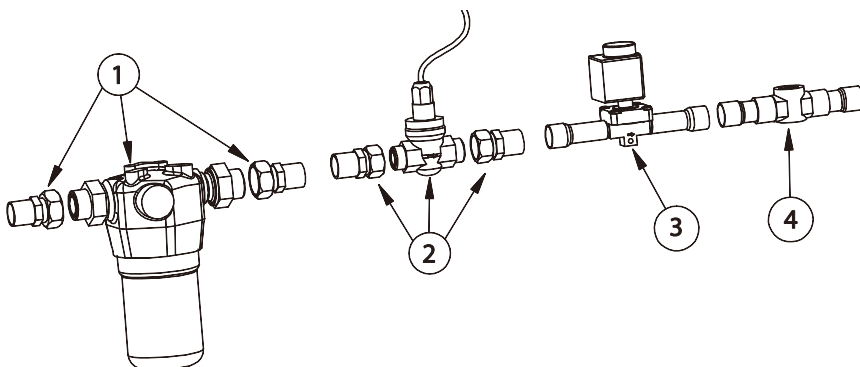
• FVR-H/L-120-140-160 - FVR-H/L-200-230-270 - FVR-H/L-300-350-380

POS	N.	OIL CIRCUIT KIT COMPONENTS
1	1	Oil Filter assembly
	2	Nut Fitting ODS 22 mm (7/8")
	2	Teflon ring
	2	O-ring
	2	Rotalock half union joint ODS 22 mm (7/8")
2	1	Flow switch
	2	Rotalock half union joint ODS 22 mm (7/8")
	2	Teflon ring
3	1	Solenoid valve ODS 22 mm (7/8")
	1	Coil 230V AC 50-60Hz
	1	Coil Connector
4	1	Oil sight glass ODS 22 mm (7/8")

• FVR-H/L-370-430-460-540

POS	N.	OIL CIRCUIT KIT COMPONENTS
3	1	Solenoid valve ODS 22 mm (7/8")
	1	Coil 230V AC 50-60Hz
	1	Coil Connector
4	1	Oil sight glass ODS 22 mm (7/8")

1	Oil filter assembly 油滤组合包
2	Oil flow switch assembly 油流开关组合包
3	Solenoid valve 电磁阀
4	Oil sight glass 视油镜



3. 开箱和处理

检查包装，检查是否有任何可见的损坏。检查包装内容，是否与装箱单相符。

请确保压缩机中仍含有正压氮气。



警告！

为避免受潮，压缩机提供高于大气压0.5-1bar的氮气充注。不正确的操作可能会导致眼睛和皮肤受伤，请佩戴安全护目镜。在压力完全释放之前，不要打开压缩机。



危险！

根据压缩机重量，使用适当的起重设备。压缩机是重型机械，在意外跌落时可能造成人身伤害或死亡。



注意！

使用吊装点(图1a、1b)进行搬运。一般情况下，应避免对压缩机、电磁阀、电气元件和管路发生碰撞。压缩机有损坏危险！

3. UNPACKING / HANDLING

Inspect the packing and check for any visible damage. Check the contents of the packing, verifying the correspondence with the packing list.

Please make sure the compressor still contains pressurized nitrogen.



WARNING!

The compressors are delivered with a holding charge of nitrogen of 0.5-1 bar above atmospheric pressure, to avoid moisture contamination. Incorrect handling may cause injury to eyes and skin wear safety goggles. Do not open the connections, before the pressure has been totally released.



DANGER!

Use proper lifting equipment, according to the compressor weight. Compressors are heavy machines which may cause injury or death in the event of an accidental drop.



ATTENTION!

Use the lifting points (fig.1a, 1b) for handling. Avoid any impact with the compressor, solenoid valves and electrical components and pipe work in general. Danger of compressor damage!

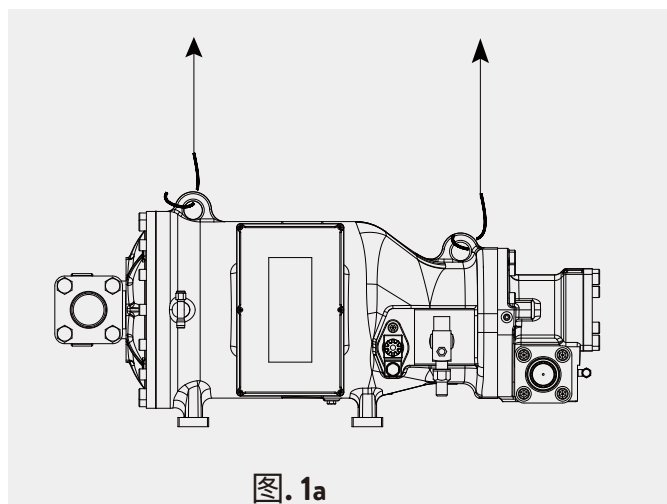


图. 1a

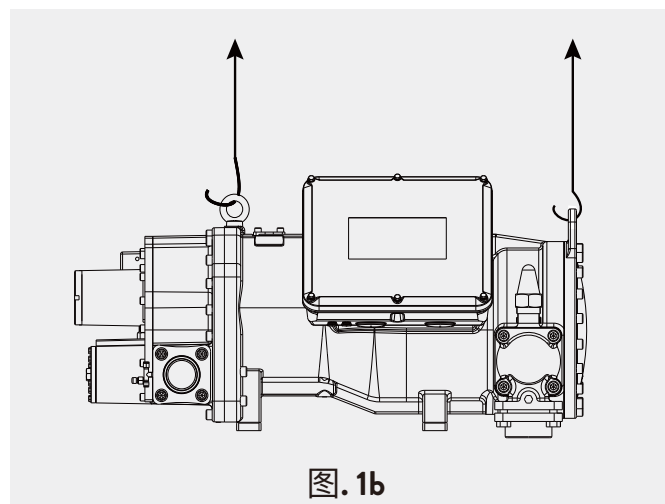


图. 1b

Model / 型号			Weight / 重量 (+/-10 [kg])
FVR-H-40-120	FVR-L-30-120	FVR-H-30-120	210
FVR-H-50-140	FVR-L-40-140	FVR-H-40-140	215
FVR-H-60-160	FVR-L-50-160	FVR-H-50-160	220
FVR-H-70-200	FVR-L-60-200	FVR-H-60-200	324
FVR-H-80-230	FVR-L-70-230	FVR-H-70-230	339
FVR-H-90-270	FVR-L-80-270	FVR-H-80-270	352
FVR-H-100-300	FVR-L-90-300	FVR-H-90-300	430
FVR-H-115-350	FVR-L-100-350	FVR-H-100-350	432
FVR-H-125-380	FVR-L-110-380	FVR-H-110-380	435
FVR-H-125-370	-	FVR-H-110-370	622
FVR-H-140-430	FVR-L-125-430	FVR-H-115-430	627
FVR-H-160-460	-	FVR-H-125-460	631
FVR-H-180-540	FVR-L-160-540	FVR-H-140-540	642

4. 安全须知

富士豪螺杆式压缩机适用于安装在制冷系统中。

机器或部分完成的机器应符合安装地点的当地安全法规和标准(在欧盟内根据欧盟指令2006/42/EC机械指令，2014/68/欧盟压力设备，2014/35/欧盟低电压指令)。

只有在压缩机按照这些安装说明安装后，它们才能投入运行。只有根据法律法规的规定对集成的整个系统进行了检查和批准，机组才可能进行被调试。

制造商声明，描述的要应用的标准。根据2006/42/EC，制造商的公司声明，可在 www.frascold.net 的文件，制造商的声明。



小心!

可能形成烧伤或冻伤。根据运行条件，压缩机表面温度可达60°C以上，或 0°C以下。

4. SAFETY

Frascold screw compressors are intended for installation in refrigeration systems.

The machines or partly completed machines shall comply with the local safety regulation and standards of the place of installation (within the EU according to the EU Directives 2006/42/EC Machinery Directive, 2014/68/EU Pressure Equipment, 2014/35/EU Low Voltage Directive).

They may be put into operation only if the compressor has been installed in accordance with these installation instructions.

The commissioning is only possible if the entire system into which are integrated has been inspected and approved in accordance to the provision of legal regulations.

The Manufacturer Declaration, describes the standards to be applied. The Manufacturer Declaration of incorporation, according to the 2006/42/ EC, is available at: www.frascold.it, documentation, manufacturer's declaration.



CAUTION!

Burns or frostbites are possible. According to operating conditions, compressor's surfaces may reach a temperature above 60°C and below 0°C.

**注意！**

压缩机有严重损坏的危险。请检查旋转方向，螺杆式压缩机只能在规定的方向运转。

**ATTENTION!**

Danger of major damage to the compressor. Check the specified rotating direction, a screw compressor can only operate in the prescribed direction.

残留的危害

与压缩机有关的某些残留危害不可避免。因此，只有读过此说明书的受过培训的人员才能进行任何操作或维护。在机器旁工作的人员应遵守所有适用于特定情况的具体安全规定和标准。

Residual Hazard

Certain residual hazards related to the compressor cannot be avoided. As a consequence, only trained personnel who has read these instructions shall perform any maneuvers or maintenance. The personnel working on the machine shall observe all the specific safety regulations and standards applicable in the specific case.

**危险！****技术人员资质**

操作压缩机和制冷系统的人员，必须经过适当的培训和具有合格的资质。人员必须能够评估要进行的维护，识别任何潜在的危险。

**DANGER!****TECHNICAL PERSONNEL QUALIFICATION**

The personnel working on the compressor and the refrigeration system, must be properly trained and qualified. Personnel must be capable of assessing the maintenance to be carried out, recognizing any potential dangers.

**警告！**

在蒸发压力低于大气时使用，可能会导致空气和水分进入制冷回路。有发生化学反应的风险，存在比预期更高的压力。

**WARNING!**

Usage at evaporating pressures lower than atmospheric may cause air and moisture entering the refrigerating circuit. Risk of chemical reactions and higher pressures than expected.

5. 适用范围/润滑油**5. APPLICATION RANGES & LUBRICANTS**

被授权的制冷剂：见FSS3选择软件中HFC、HCFC；其他制冷剂可根据要求被允许使用。

Authorised refrigerants: HFC and HCFC as indicated in FSS3 selection software; other refrigerants upon request

允许的压力值：

高压端30 bar
低压端20.5 bar

运行范围：

见选型软件 FSS3

环境温度：

-15°C ... +55°C

存储温度：

-30°C ... +60°C

主电压 (*)：

+/- 5% 长期运行

主电压 (*)：

+/- 10% 瞬间运行

频率 (*)：

+/- 2%

(*)相对于额定值

Allowable pressures:

High Pressure side 30 bar

Low pressure side 20.5 bar

Operating limits:

See FSS3 selection software

Ambient temperatures:

-15°C ...+55°C

Storage temperatures:

-30°C...+60°C

Main Voltage (*):

+/- 5% in steady operation

Main Voltage (*):

+/- 10% during transient

Frequency (*):

+/- 2%

(*) With reference to the nominal rated value

油的选择取决于油的性质、运行条件、制冷剂、系统的运行条件。使用以下所列之外的油的特殊应用可能需要不同粘度/油型：请联系富士豪。

The selection of the oil depends on the oil properties, operating conditions, the refrigerants, the operating conditions of the system. Oils other than those listed below may be used. Special applications may require different viscosity/oil type: please contact Frascold SPA.

Type of oil 油型	Alternative oil 可选用的油	Base 基础	Viscosity at 40°C 粘性40°C (cSt)	Refrigerant 制冷剂	Application 应用
富士豪 170POE	Lubrizol CPI Emkarate RL170H 或等同物	POE	170	R134a / R404A / R507A R407C / R407A / R448A R407F / R449A	LT / MT / HT
富士豪 150POE	CPI CP 4214-150 或等同物	POE	150	R22	MT
富士豪 100AB	Mobil Zerice S100 或等同物	AB	100	R22	LT / MT

POE: 脂类油

AB: 烷基苯

LT: 低温

MT: 中温

HT: 高温

POE: Polyolester

AB: Alkylbenzene

LT: Low temperature

MT: Medium temperature

HT: High temperature

6. 安装

操作方法请参阅第2章。半封闭压缩机必须水平安装。如需海上应用，请与富士豪联系。标准压缩机不适合安装在化学腐蚀性或腐蚀性环境中，以及易爆环境中。(如有特殊应用，请联系富士豪)。

压缩机不能安装在环境温度可能超过预先规定限制的
房间或区域。

信息!

确保压缩机通风充足。为压缩机维护提供足够的空间。

运输

压缩机可以固定在托盘上运输，也可以使用图1a、1b所示的吊装点进行吊装。

6. INSTALLATION

For handling, please refer to chapter 2. Semi-hermetic compressors must be installed horizontally. In case of marine applications, please contact Frascold **SPA**. The standard compressors are not suitable for installation in chemically aggressive or corrosive atmosphere, or as well as explosive atmosphere (Please contact Frascold **SPA** for special applications).

The compressors must never be installed in rooms or areas where the ambient temperature of the compressor can exceed the specified limits previously indicated.

INFORMATION

Ensure adequate compressor ventilation.
Provide adequate clearance for compressor maintenance.

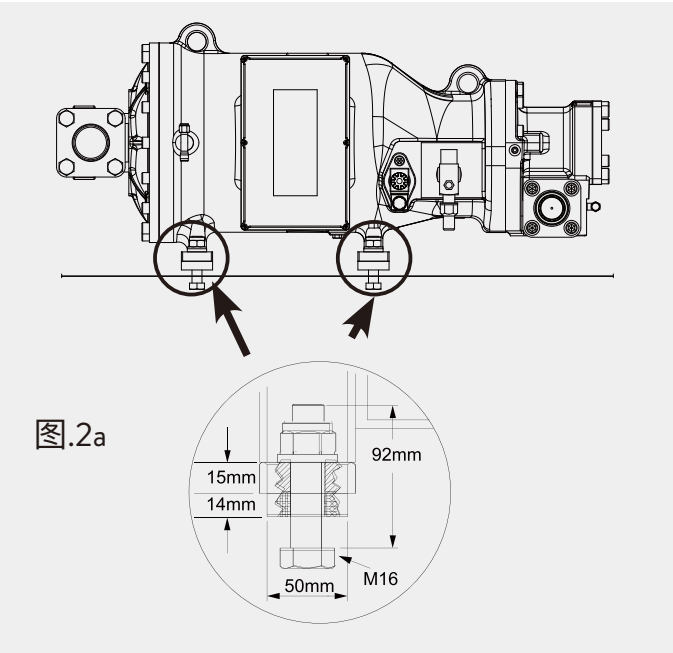
Transport

The compressor can be transported fixed on its pallet or lifted by using the lifting points as indicated in fig.1a, 1b.

安装

压缩机必须始终牢固地固定在机架上，机架须适合承受由压缩机产生的静、动力。

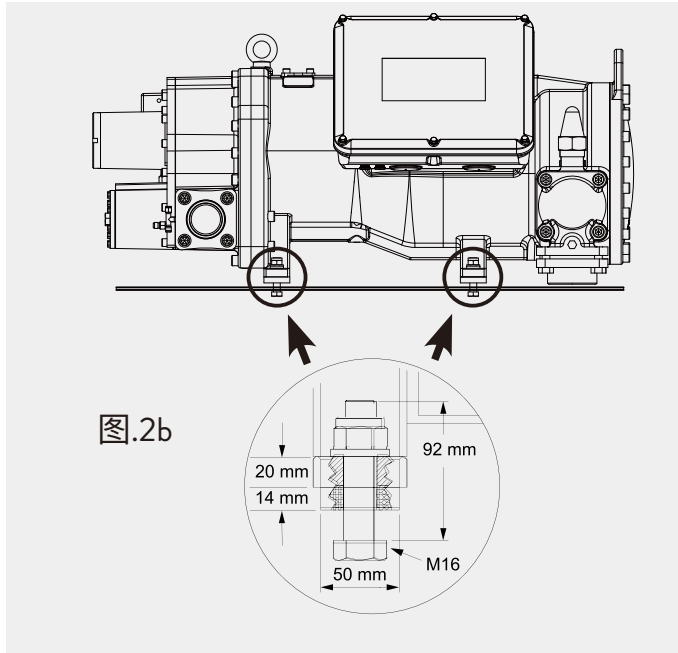
强烈建议使用减振器，以减少噪音/振动传递到机架。按照图2中的顺序安装减振器；只能观察到轻微的橡胶变形。



Mounting

Compressors must always be solidly fixed to a frame, suitable to withstand static and dynamic forces originated by the compressor.

The use of vibration dampers is strongly recommended in order to reduce noise/vibration transmission to the frame. Mount the vibration absorbers following the sequence in fig 2; only a slight rubber deformation should be observed.



Model 型号	Figure 图	Fixing 固定螺栓	Tightening torque 锁紧扭矩	Hardness 硬度
FVR-H/L-120-140-160 FVR-H/L-200-230-270	2a	M16	30Nm	90 Shore
FVR-H/L-300-350-380 FVR-H/L-370-430-460-540	2b	M16	30Nm	90 Shore

6.1 管道

管道连接件是为标准管设计的，单位是毫米(可根据要求提供单位是英寸的连接件)。使用焊接连接。根据阀门的尺寸，可以将管道插入衬套内。确保管道插入时与衬套同心。



警告！
为避免受潮，压缩机提供高于大气压0.5–1bar的氮气充注。不正确的操作可能会导致眼睛和皮肤受伤，请佩戴安全护目镜。在压力完全释放之前，不要打开压缩机。



6.1 Piping

The pipe connections are designed for standard tubes in millimetres (in inches upon request). Use solder connections. According to the size of the valve, pipes can be inserted inside the bushes. Make sure that the piping is inserted flush against the bushing.



WARNING!
The compressors are delivered with a holding charge of nitrogen of 0.5-1 bar above atmospheric pressure, to avoid moisture contamination. Incorrect handling may cause injury to eyes and skin. Wear safety goggles. Do not open the connections, before the pressure has been totally released.





注意!

过热可能会损坏压缩机阀门和垫圈。在进行焊接和钎焊时，一定要取下衬套。使用惰性气体保护防止氧化。管道和系统部件必须清洁、干燥，没有水垢和金属屑。还必须避免生锈和磷化层。



ATTENTION!

Overheating may damage the compressor valves and gaskets. Always remove the bushes for welding and brazing. Use inert gas to prevent oxidation. Pipes and system components must be clean, dry and free of scale and metal swarf. Also rust and phosphatization layers must be avoided.



注意!

建议在吸入管上安装一个25微米或更高精度的吸气过滤器。当管道较长，不能保证足够的洁净度时，额外的过滤器非常有必要。



ATTENTION!

It is advisable to install a molecular sieve filter with a 25 micron mesh or less on the suction line. The additional filter becomes necessary for long pipe layouts and when the correct cleanliness cannot be guaranteed.



注意!

液体管道上必须有一个大尺寸的干燥过滤器。



ATTENTION!

A generously sized filter dryer is mandatory on the liquid line.



信息!

为了保证整个系统的平稳运行和符合压缩机的振动特性，必须合理设计和布置吸气和排气管道。



INFORMATION

Suction and discharge piping must be laid out in order to guarantee a smooth running and vibration behaviour of the entire system.



注意!

管路布置或设计不当，可能会产生裂缝，导致制冷剂损失。



ATTENTION!

Incorrect piping layout or its placement may generate cracks and lead to refrigerant losses.

6.2 能量调节 / 卸载启动

不同型号压缩机的电磁阀的位置和控制逻辑如下表格/图纸中注明所示。

6.2 Capacity control / Start unloading

The position and the logic of the solenoid valves are indicated in the tables / drawings according to the models.



注意!

压缩机有重大损坏风险。
安装时请拆掉封板(图.3a 3 b)



ATTENTION !

Risk of major damage to the compressor.
Remove the discharge sealing plate
(fig.3a,3b)

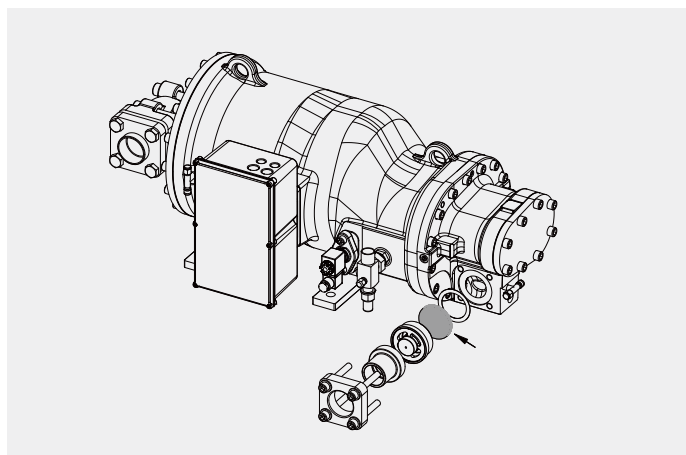


图. 3a

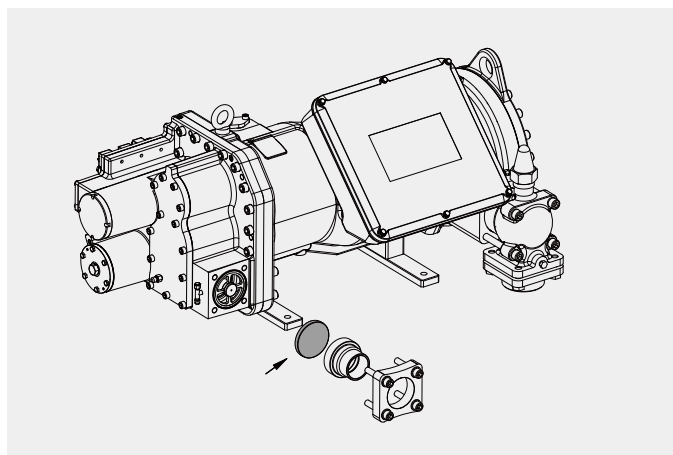


图. 3b

Type / 型号	Capacity Control 能调控制 (1)			启 / 停 (2)
	Full load 100% 100% 满载	75% 负载	50% 负载	
FVR-H/L-120-140-160	V1 = ●	V1 = ○	-	-
FVR-H/L-200-230-270 FVR-H/L-300-350-380	V1 = ● V2 = ●	V1 = ● V2 = ○	V1 = ○ V2 = ○	-
FVR-H/L-370-430-460-540	V1 = ● V2 = ○ V3 = ○	V1 = ● V2 = ○ V3 = ●	V1 = ● V2 = ● V3 = ○	V1 = ○ V2 = ○ V3 = ○

1. 各阶段的能调控制取决于运行工况。
2. 启停步骤只能在压缩机启动和停止阶段使用。

- (1) The effective capacity of the stages depends on operating conditions.
- (2) Start / Stop can only be used at start-up and shutdown.

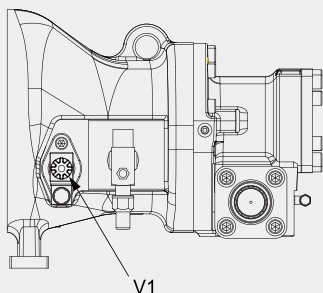
○ 线圈不得电

● 线圈得电

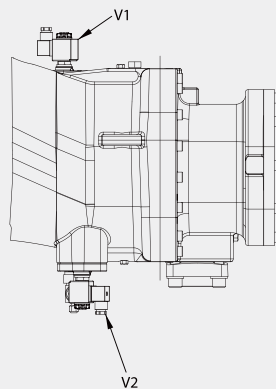
○ Coil de-energized

● Coil energized

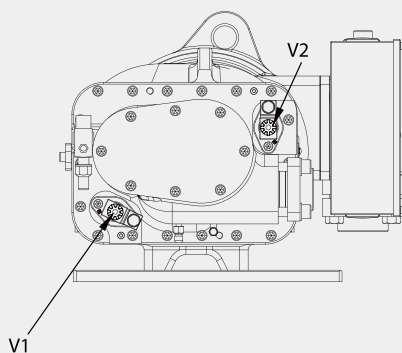
FVR-H/L-120-140-160



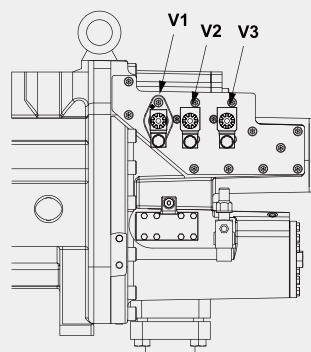
FVR-H/L-200-230-270



FVR-H/L-300-350-380



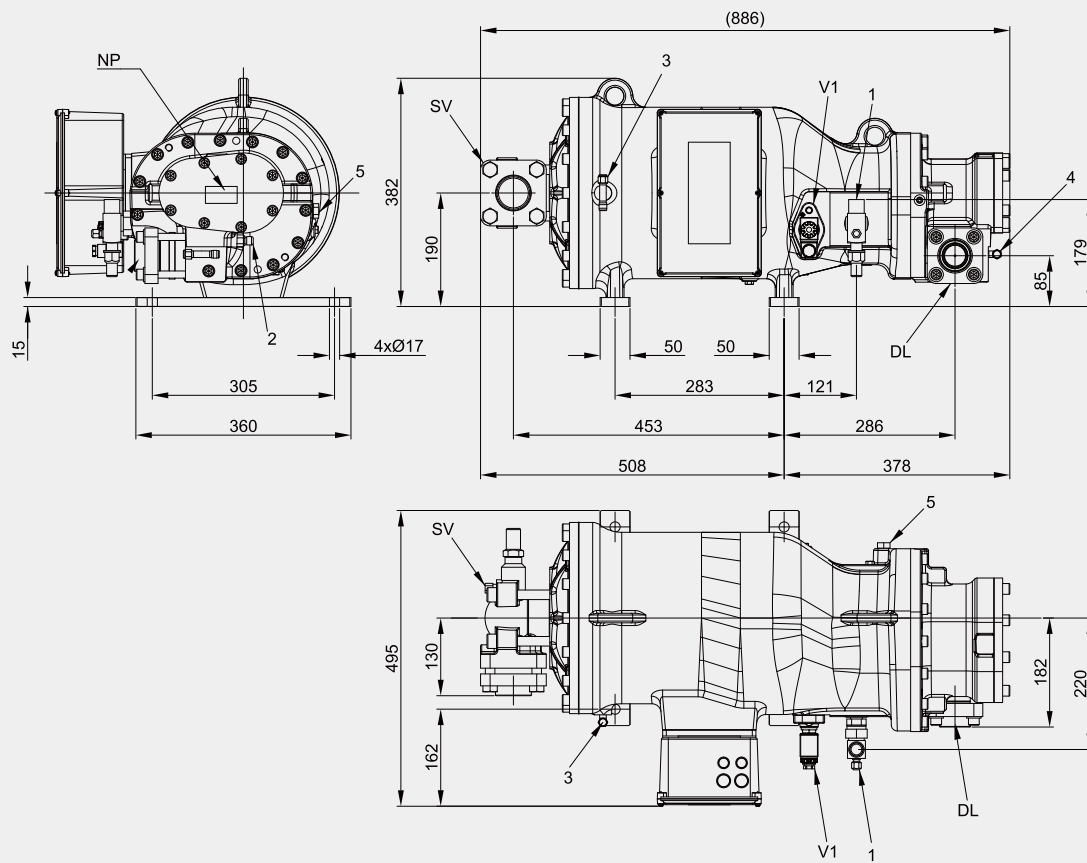
FVR-H/L-370-430-460-540



6.3 连接

6.3 Connections

FVR-H/L-120-140-160



- 1. 回油管接口
- 2. 排气温度传感器
- 3. 低压接头(LP)
- 4. 高压接头(HP)
- 5. ECO接口
- V1 能调电磁阀
- NP 铭牌
- DL 排气口 42.0mm
- SV 吸气口 2-1/8" 54.0mm

- 1. Oil return line connection
- 2. Discharge temperature sensor
- 3. Low pressure connection (LP)
- 4. High pressure connection (HP)
- 5. Economizer connection
- V1 Capacity control valve
- NP Nameplate
- DL Discharge Bushing Ø42,0 mm
- SV Suction valve Ø2" 1/8 - 54,0 mm

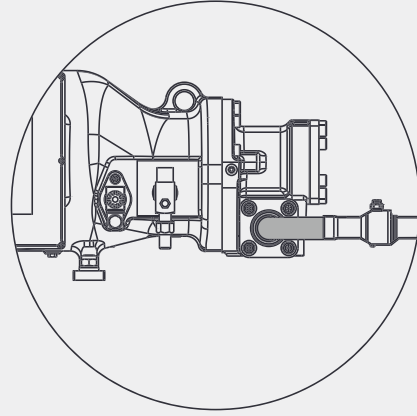
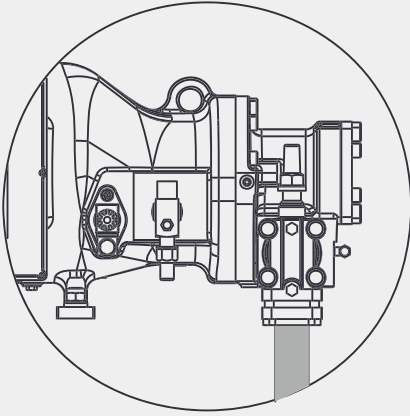


注意!

如果使用富士豪铸铁排气阀, 则只能向下布置排气管(图中左侧)。水平布置管道可以采用球阀(不是富士豪提供)(图中右侧)。

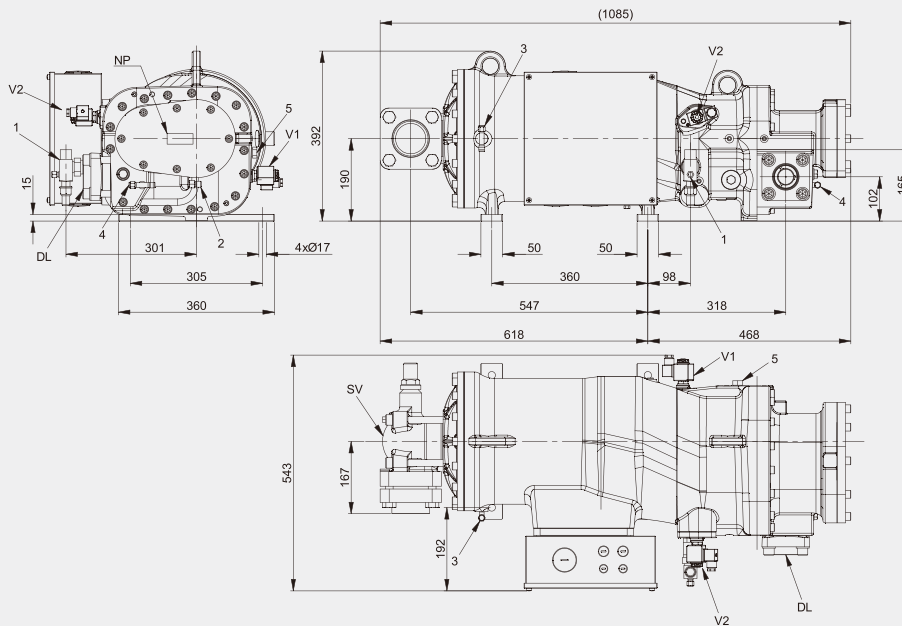


ATTENTION! If the Frascold cast iron discharge valve is used, only downwards discharge pipe arrangement is possible (Figure on the left). Horizontal piping may be achieved using a ball shut off valve (NOT SUPPLIED BY FRASCOLD) (Figure on the right).



6.3 连接

6.3 Connections

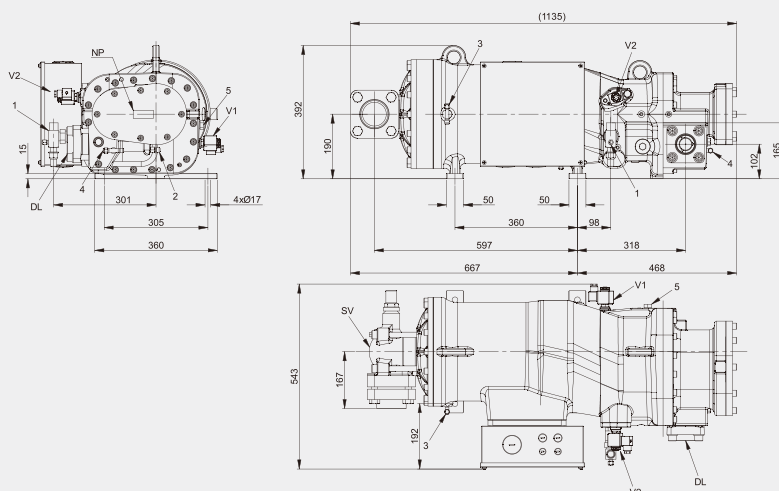


FVR-H/L-200-230
FVR-L-80-270
FVR-H-80-270

- 1. 回油管接口
- 2. 排气温度传感器
- 3. 低压接头(LP)
- 4. 高压接头(HP)
- 5. ECO接口
- V1 能调电磁阀
- V2 能调电磁阀
- NP 铭牌
- DL 排气口 2-1/8" 54.0mm
- SV 吸气口 80 mm

- 1. Oil return line connection
- 2. Discharge temperature sensor
- 3. Low pressure connection (LP)
- 4. High pressure connection (HP)
- 5. Economizer connection
- V1 Capacity control valve
- V2 Capacity control valve
- NP Nameplate
- DL Discharge Bushing \varnothing 2" $\frac{1}{8}$ - 54,0 mm
- SV Suction valve \varnothing 80 mm

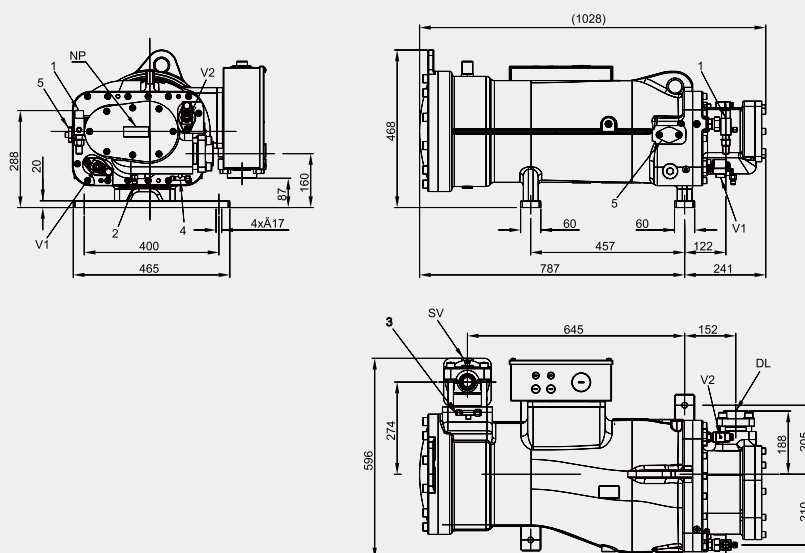
FVR-H-90-270



1. 回油管接口
2. 排气温度传感器
3. 低压接头(LP)
4. 高压接头(HP)
5. ECO接口
- V1 能调电磁阀
- V2 能调电磁阀
- NP 铭牌
- DL 排气口 2-1/8" 54.0mm
- SV 吸气口 80 mm

1. Oil return line connection
2. Discharge temperature sensor
3. Low pressure connection (LP)
4. High pressure connection (HP)
5. Economizer connection
- V1 Capacity control valve
- V2 Capacity control valve
- NP Nameplate
- DL Discharge Bushing \varnothing 2" $\frac{1}{8}$ - 54,0 mm
- SV Suction valve \varnothing 80 mm

FVR-H/L-300-350-380



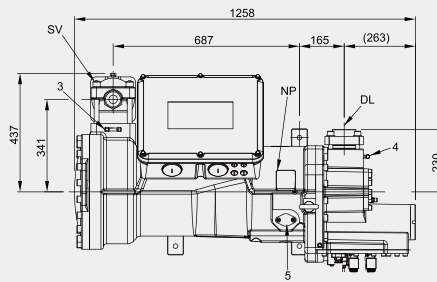
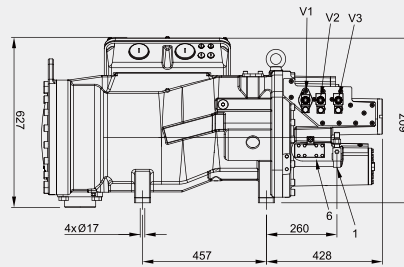
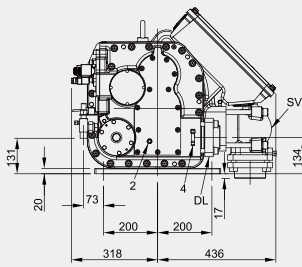
1. 回油管接口
2. 排气温度传感器
3. 低压接头(LP)
4. 高压接头(HP)
5. ECO接口
- V1 能调电磁阀
- V2 能调电磁阀
- NP 铭牌
- DL 排气口 67 mm
- SV 吸气口 80 mm

1. Oil return line connection
2. Discharge temperature sensor
3. Low pressure connection (LP)
4. High pressure connection (HP)
5. Economizer connection
- V1 Capacity control valve
- V2 Capacity control valve
- NP Nameplate
- DL Discharge Bushing \varnothing 67 mm
- SV Suction valve \varnothing 80 mm

6.3 连接

6.3 Connections

FVR-H/L-370-430-460-540



1. 回油管接口
2. 排气温度传感器
3. 低压接头(LP)
4. 高压接头(HP)
5. ECO接口
- V1 能调电磁阀
- V2 能调电磁阀
- V3 能调电磁阀
- NP 铭牌
- DL 排气口 80 mm
- SV 吸气口 4-1/8" 105 mm

1. Oil return line connection
2. Discharge temperature sensor
3. Low pressure connection (LP)
4. High pressure connection (HP)
5. Economizer connection
- V1 Capacity control valve
- V2 Capacity control valve
- V3 Capacity control valve
- NP Nameplate
- DL Discharge Bushing Ø 80 mm
- SV Suction valve Ø 4" 1/8 - 105 mm

6.4 油路管理

6.4 Oil management

为了给压缩机降温并保证润滑，随高压气态制冷剂一起排出去的润滑油必须在油分离器内和制冷剂分离后再回流到压缩机。

The oil leaving the compressor during running, must be properly separated from the refrigerant, in order to avoid heat exchange problems and correctly returned to the compressor, guaranteeing its lubrication.



注意！

可能造成压缩机损坏。

请始终保证正确的油流量和油的品质。



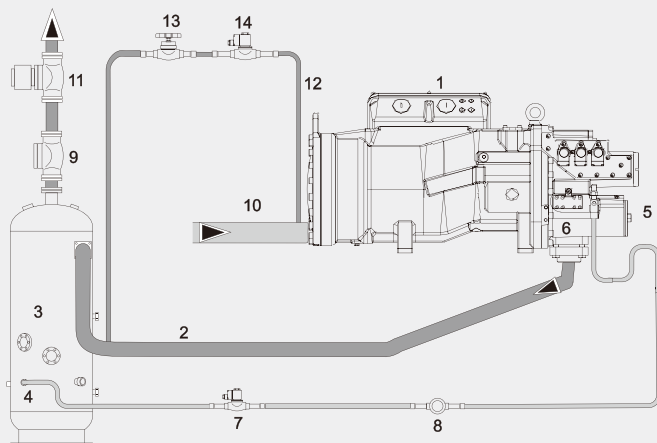
ATTENTION!

Possible compressor damage.

Always guarantee the correct oil flow and oil characteristics.

油分离器配有油加热器和恒温器，以确保正确的油粘度和性能。油加热器、恒温器和油位控制的电气连接(参见7电气连接)。油加热器在压缩机停止时必须通电。请为低温环境下的油分离器提供隔热保温。

The oil separator is equipped with oil heaters and thermostat to ensure the right oil viscosity and properties. Follow the wiring diagram for electrical connections of the oil heaters, thermostat and oil level control (see 7. Electrical connection). The oil heaters must be energised during standstill. Provide thermal insulation of the oil separator for low ambient temperatures.



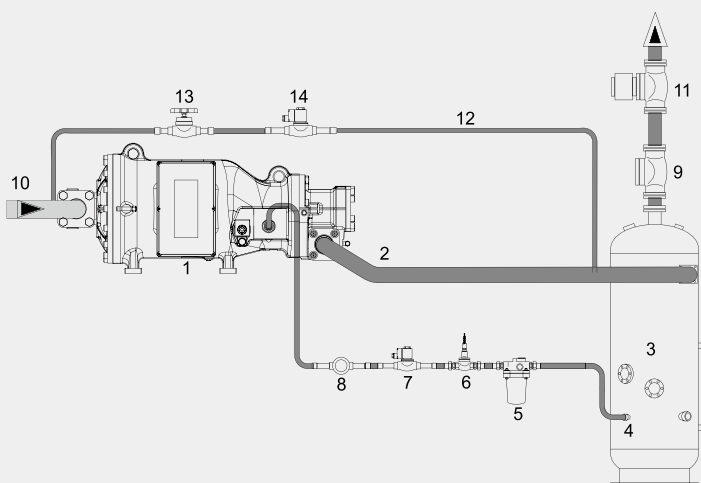
1. 压缩机
2. 排气管
3. 外置油分
4. 回油管
5. 油滤器
6. 油流开关(接线头的
螺栓锁紧扭矩 7NM)
7. 回油电磁阀
8. 视油镜
9. 单向阀
10. 吸气管
11. 排气压力调节阀

平衡管:

12. 压力平衡管
13. 截止阀
14. 电磁阀

其他型号的油循环

Oil circuit for all other models



1. 压缩机
2. 排气管
3. 外置油分
4. 回油管
5. 油滤器
6. 油流开关
7. 回油电磁阀
8. 视油镜
9. 单向阀
10. 吸气管
11. 排气压力调节阀

平衡管:

12. 压力平衡管
13. 截止阀
14. 电磁阀

如果系统长时间不运行，且高低压侧没有任何平衡压力的可能性，则应该安装平衡管。

The Equalization Line should be provided if the system is not operating for a long time without any possibility of high side and low side pressure equalization.

使用平衡管时，油分离器内的压力降低。这可以防止在停机期间油和制冷剂的迁移，减少油路组件内的压力，并确保在下一次重新启动时油分离器内的油达到最高的粘度。

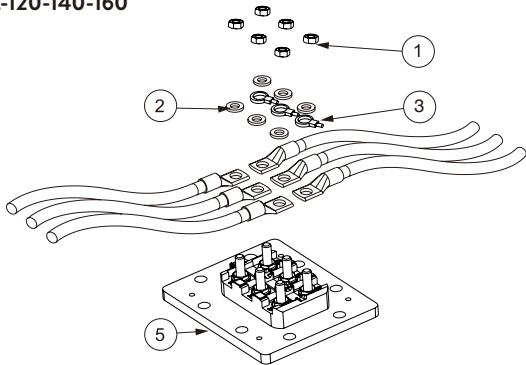
7. 电气连接

7.1 电缆

在电气维护和安装中，人员应遵守所有适用的当地安全条例和标准。所有电气连接必须按照接线图（图4、4b、5)进行。

FVR 分绕组启动 (PW)

FVR-H/L-120-140-160



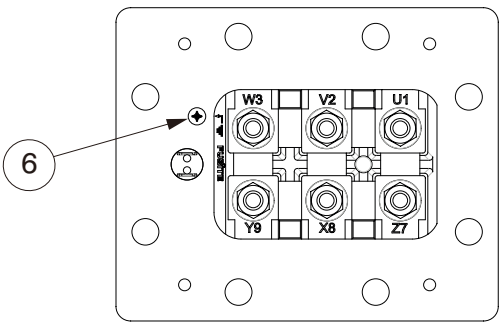
The Equalization Line should be provided if the system is not operating for a long time without any possibility of high side and low side pressure equalization. Operating the equalization line, pressure in the oil separator is reduced. This prevents the migration of oil and refrigerant during the off periods, reduces the stress of the oil line components and ensures the highest oil viscosity to the separator at the next restart.

7. ELECTRICAL CONNECTIONS

7.1 Power cables

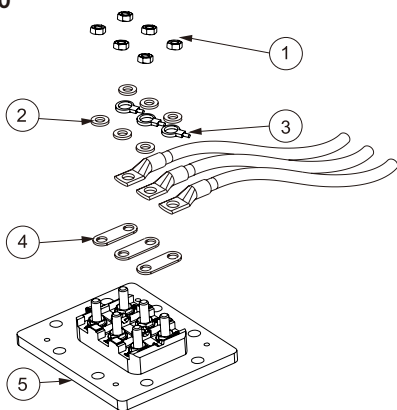
The personnel shall observe all the local safety regulations and standards applicable in the electrical maintenance and installation. All the electrical connections must be carried out according to the wiring diagrams (Fig. 4, 4b, 5).

FVR PART WINDING (PW) Configuration

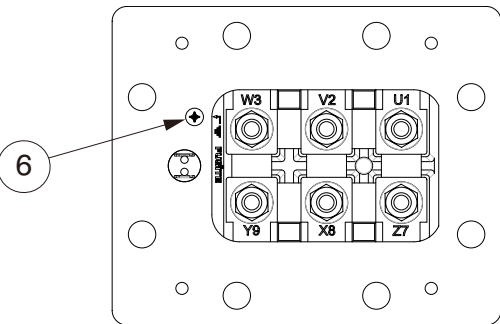


FVR 直接启动 (DOL)

FVR-H/L-120-140-160



FVR DIRECT ON LINE (DOL) Configuration



注释

序号	说明	数量
1	黄铜螺母 M8 (锁紧扭矩 15Nm)	6 个
2	黄铜垫片 8x17	6 个
3	电机保护模块的连接件	3 个
4	DOL启动用的铜搭片	3 个
5	接线板	1 个
6	接地 M6	1 个

LEGEND

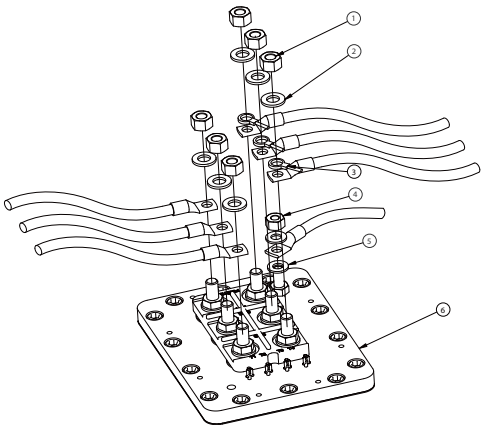
REF.	DESCRIPTION	Q.TY
1	Brass Nut M8 (tq 15Nm)	6 pcs
2	Brass Washer 8x17	6 pcs
3	Connection for Motor Protection Module	3 pcs
4	DOL Connection Bars	3 pcs
5	Terminal Plate	1 pcs
6	Ground Connection M6	1 pcs

! 请不要松开或拆下锁住绝缘块的六个螺母!

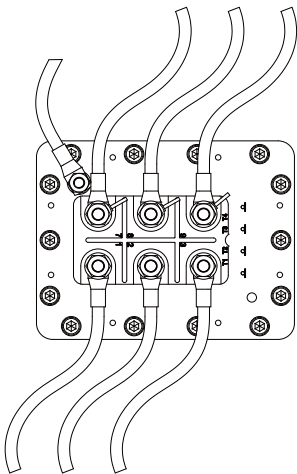
! DO NOT UNFASTEN OR REMOVE THE SIX NUTS LOCKING THE INSULATING BLOCK !

FVR 分绕组启动 (PW)

FVR-H/L-200-230-270
FVR-H/L-300-350-380

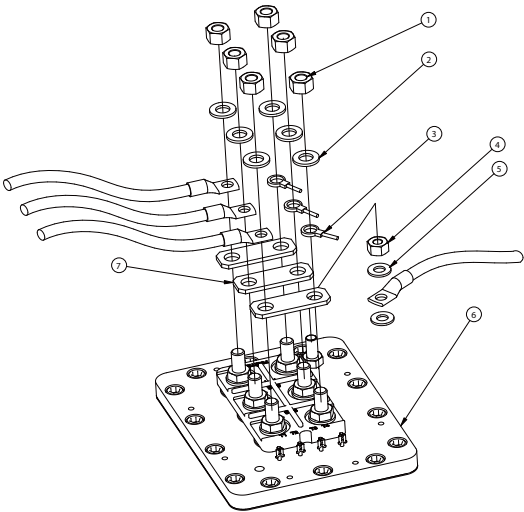


FVR PART WINDING (PW) Configuration

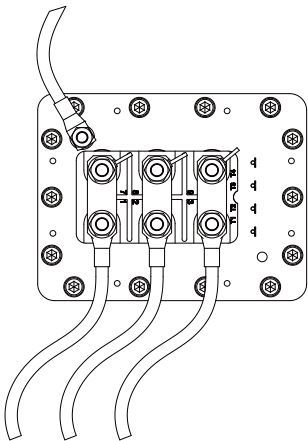


FVR 直接启动 (DOL)

FVR-H/L-200-230-270
FVR-H/L-300-350-380



FVR DIRECT ON LINE (DOL) Configuration



注意！ 压缩机有被卡住的风险。压缩机只能按规定的旋转方向运行。



ATTENTION! Risk of compressor seizure. The compressor can only operate with the rotating direction prescribed.



注意！ 电机有严重损坏的危险。两个绕组之间的两相接线错误，会导致转子处于锁定状态。



ATTENTION! Risk of motor severe damage. Wrong wiring of two phases between two windings results in a locked rotor condition.

注释

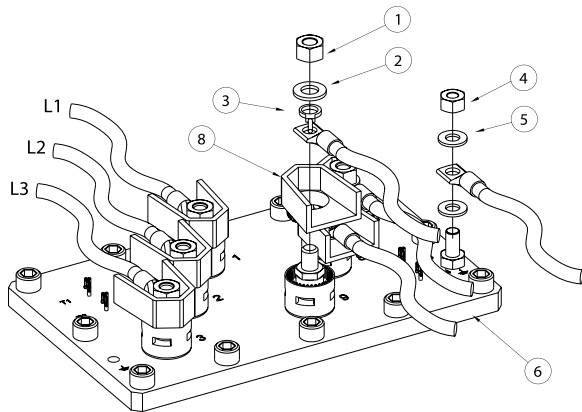
序号	说明
1	黄铜螺母 M12 (锁紧扭矩 30Nm)
2	黄铜垫片 12x24
3	电机保护模块的连接件
4	接地黄铜螺母 M10 (锁紧扭矩 20Nm)
5	接地黄铜垫片 10x20
6	接线板
7	DOL启动用的铜搭片 (选配件)

LEGEND

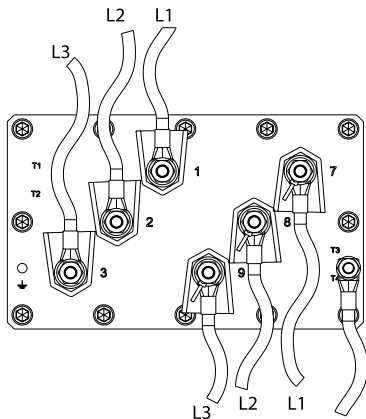
数量	REF.	DESCRIPTION	Q.TY
6 个	1	Brass Nut M12 (tq 30Nm)	6 pz.
6 个	2	Brass Washer 12x24	6 pz.
3 个	3	Connection for Motor Protection Module	3 pz.
1 个	4	Ground Connection Brass Nut M10 (tq 20Nm)	1 pz.
2 个	5	Ground Connection Brass Washer 10x20	2pz.
1 个	6	Terminal Plate	1 pz.
3 个	7	DOL Connection Bars (optional kit)	3 pz.

FVR 分绕组启动 (PW)

FVR-H/L-370-430-460-540

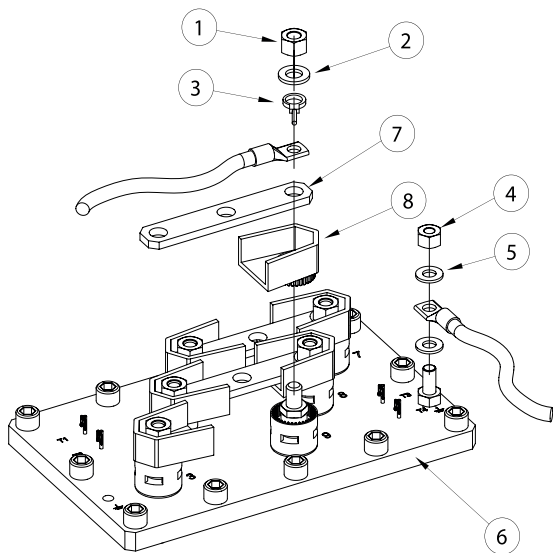


FVR PART WINDING (PW) Configuration

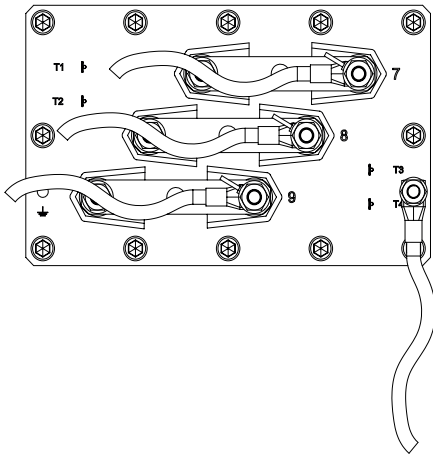


FVR 直接启动 (DOL)

FVR-H/L-370-430-460-540



FVR DIRECT ON LINE (DOL) Configuration



注释

序号	说明	数量	REF.	DESCRIPTION	Q.TY
1	黄铜螺母 M12 (锁紧扭矩 30Nm)	6 个	1	Brass Nut M12 (tq 30Nm)	6 pcs
2	黄铜垫片 12x24	6 个	2	Brass Washer 12x24	6 pcs
3	电机保护模块的连接件	3 个	3	Connection for Motor Protection Module	3 pcs
4	黄铜螺栓 M10 (锁紧扭矩 20Nm)	1 个	4	Ground connection Brass Nut M10 (tq 20Nm)	1 pcs
5	接地黄铜垫片10x20	2 个	5	Ground connection Brass Washer 10x20	2 pcs
6	接线板	1 个	6	Terminal Plate	1 pcs
7	DOL启动用的铜搭片 (选配件)	3 个	7	DOL Connection Bars (optional kit)	3 pcs
8	上方绝缘件	6 个	8	Insulator Upper part	6 pcs

LEGEND



注意!
请不要松开或拆下锁住绝缘块的六个螺母!



ATTENTION!
Do not unfasten or remove the nuts locking each insulator !

注释: 电机PTC连接至端子针 T1和T2
从1到8的部件 (6 除外) 是散装供应的, 位于接线盒内。

Note: Motor PTCs are connected to terminal pins T1 and T2.
The parts from 1 to 8 are supplied loose and located in the terminal box (ref.6 excluded).

7.2 接线图

PWS分绕组启动（标配）

7.2 Wiring diagrams

Part Winding Start (standard supply)

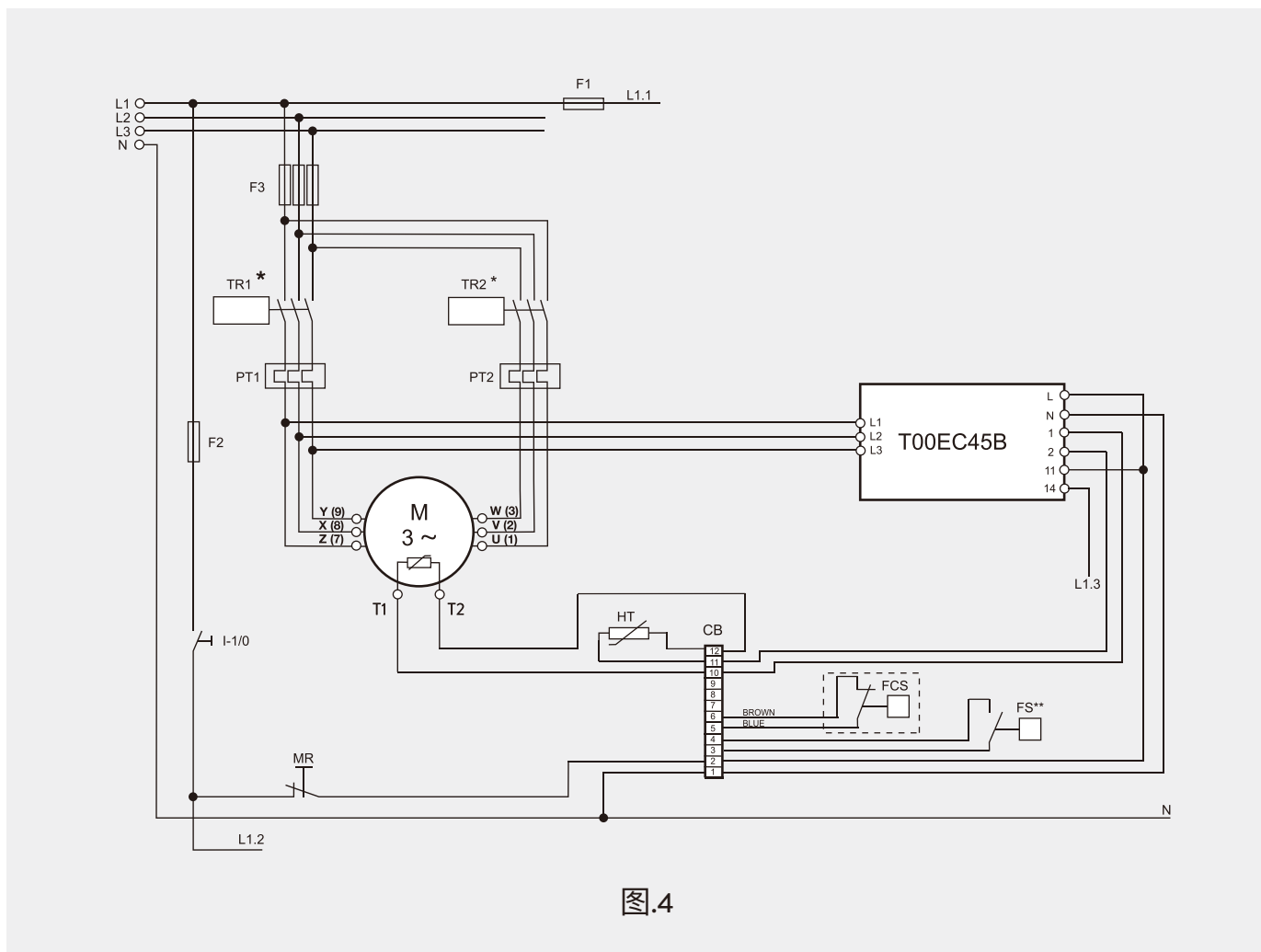


图.4

*请按顺序接线:

TR1 – Z(7) X(8) Y(9) 和 TR2 – U(1) V(2) W(3)

*Comply with the wiring sequence:

TR1 - Z(7) X(8) Y(9) and TR2 - U(1) V(2) W(3)

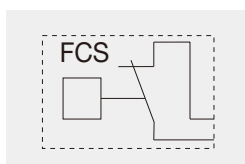
**压缩机标配件。

**Standard equipment supplied with the compressor.

为了避免油流开关误报警，需要在启动和运行时安装延时装置(继电器不由富士豪提供)。如果要把流量开关连接到接线盒内，请参阅下一页的接线图。油流延时设置:压缩机启动时延时20秒，运行时延时3秒报警。

To avoid false alarms, installation of delays is required (relays not supplied by Frascold **SPA**) at the start-up and while in operation. In case of connection of the flow switch inside the electrical box, see the wiring diagrams in the next pages. Delays up to: 20 seconds at startup, 3 seconds when running.

选配件:可直接与PLC连接。



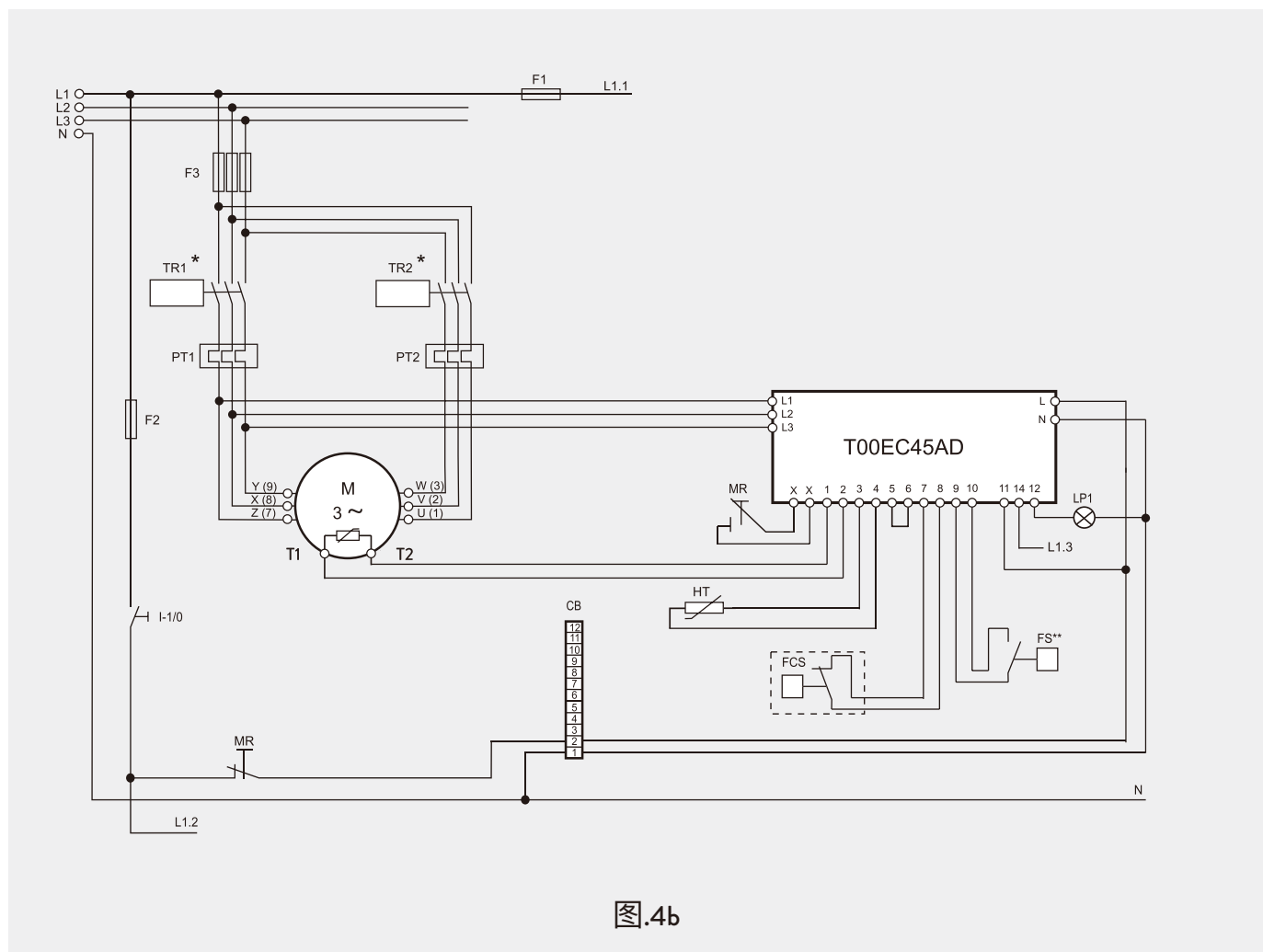
Optional equipment: it can be wired directly to the PLC.

7.2 接线图

PWS分绕组启动（选配件带诊断功能）

7.2 Wiring diagrams

Part Winding Start (optional Diagnose version)



*请按顺序接线：

TR1 – Z(7) X(8) Y(9) 和 TR2 – U(1) V(2) W(3)

**压缩机标配件。

油流可直接连接到T00EC45AD（拆除短接线后），模块内部固定逻辑的油流延时为：启动时延时10秒，运行时延时3秒保护。

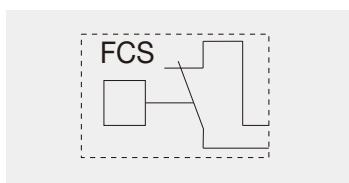
*Comply with the wiring sequence:

TR1 - Z(7) X(8) Y(9) and TR2 - U(1) V(2) W(3)

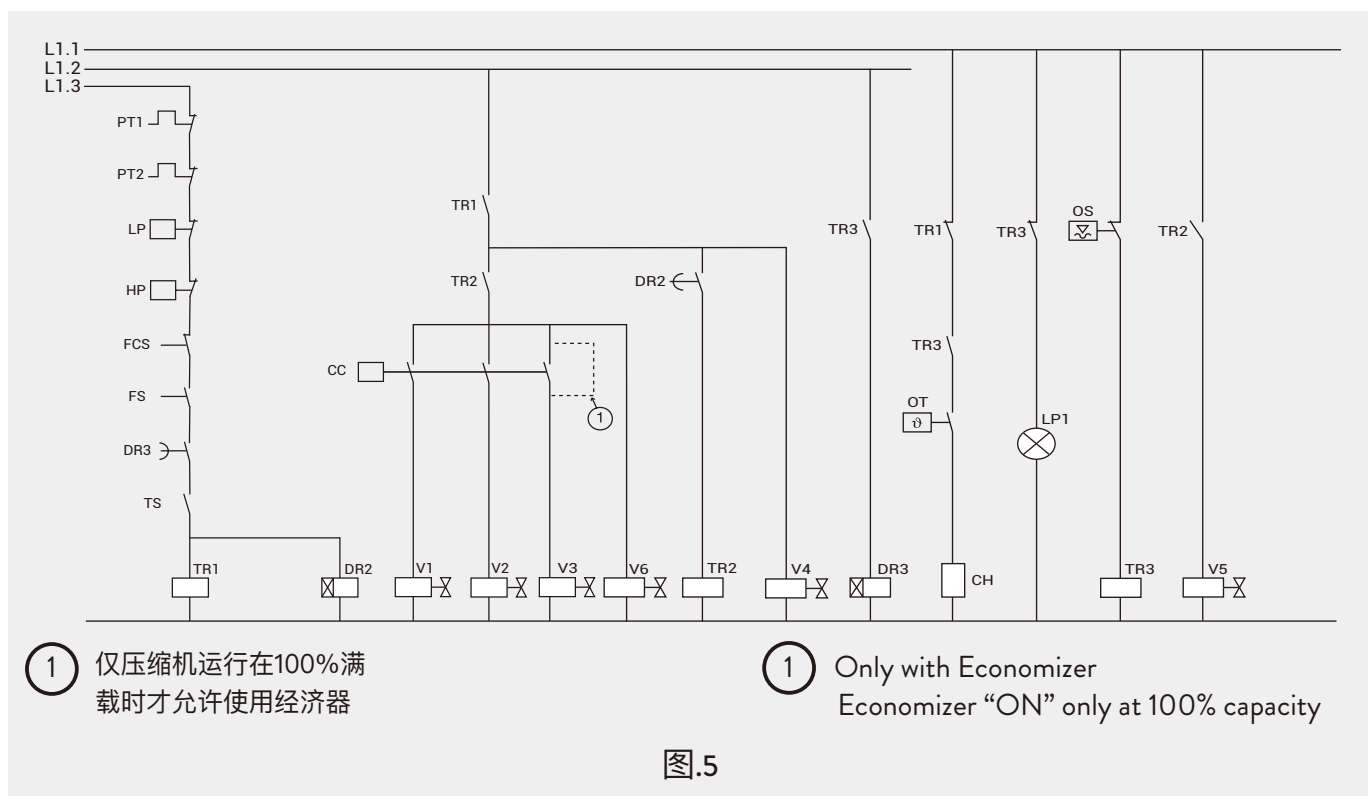
**Standard equipment sent with the compressor.

It can be wired directly to the T00EC45AD after the removal of the bridge, the internal logic of the delays fixed are: 10 seconds at startup, 3 seconds when running.

选配件：它可以直接连接到T00EC45AD或PLC。



Optional equipment: it can be wired directly to T00EC45AD or to the PLC.



CB 压缩机接线板
CC 能量调节执行器
CH 油加热器
DR2 PWS绕组启动时间延时继电器 (0,5 ~ 1秒)
DR3 油位控制延时继电器 (120 秒)
F1 辅助电路保险丝
F2 压缩机接线板电路保险丝
F3 压缩机保险丝
FCS 油过滤器堵塞传感器
FS 流量开关
HP 高压开关
HT 最大排气温度传感器
I ON / OFF 开关
LP1 LED 灯“报警”
LP 低压开关
M 电机
MR 手动复位
OS 油位开关
OT 油恒温器
PT 过载保护器
TR1 PWS启动1#接触器
TR2 PWS 启动2#接触器
TR3 油位控制接触器
TS 安全恒温器
V1 能调控制阀V1
V2 能调控制阀V2
V3 能调控制阀V3
V4 回油电磁阀
V5 经济器电磁阀
V6 供液电磁阀

CB Compressor's terminal board
CC Capacity control actuator
CH Crankcase oil heater
DR2 Time delay relay on PWS (0,5 ÷ 1 sec.)
DR3 Time delay on level control (120 sec.)
F1 Auxiliary circuit fuse
F2 Compressor's terminal board circuit fuse
F3 Compressor fuses
FCS Oil filter clogging sensor
FS Oil flow switch
HP High pressure switch
HT Max discharge temperature sensor
I ON / OFF switch
LP1 "Alarm" LED
LP Low pressure switch
M Electric motor
MR Manual reset
OS Oil level switch
OT Oil thermostat
PT Overload protector
TR1 1st PWS start contactor
TR2 2nd PWS start contactor
TR3 Oil level control contactor
TS Safety thermostat
V1 Capacity control valve V1
V2 Capacity control valve V2
V3 Capacity control valve V3
V4 Oil injection solenoid valve
V5 Economizer solenoid valve
V6 Liquid line solenoid valve

7.3 分级保护

交流接触器必须选择 AC3等级。

PWS分绕组启动时 交流接触器TR1 和 TR2 (图. 4, 4b, 5) 的额定电流至少为MRA(最大运行电流)的60%。

请经常检查您安装现场的电源是否匹配压缩机铭牌上的电压和频率。

7.4 绝缘测试

根据EN60034-1, 我们工厂已经进行了绝缘测试, 没必要重复测试。

如需重复测试, 请向压缩机充氮气或制冷剂, 最大电压不超过 1000 VAC。



注意!

马达有严重损坏的风险。
严禁在真空状态下对压缩机进行绝缘测试。



注意!

马达有严重损坏的风险。
严禁用超过1000V的电压对压缩机进行测试。

7.5 电子保护模块

压缩机出厂时提供标配版 INT69 FRY®保护模块(代码 T00EC45B)。

模块安装在接线盒内, 主要部件已接线。用户必须完成排气温度探头的布线连接, 布线需宽松, 并附上说明。

保护模块 INT69-FRYL® (代码T00EC45AD) 可作为选配件提供; 该模块携带诊断工具, 可记录不同的工作参数和警报。请参阅富士豪公告FBUL0033 (www.frascold.net) 和图4b中的所有信息和线路。有了这个保护模块, 下面列出的每个保护装置都有它的专用的连接端口:

- 电机热敏电阻 PTC (1, 2)
- 油 (排) 温传感器 (3, 4)
- 油滤芯堵塞传感器 (7, 8)
- 油流开关 (9, 10)

7.3 Sizing of protections

Contactors must be chosen in AC3 category.

Each of the PWS contactors TR1 and TR2 (Fig. 4, 4b, 5) must be sized for nominal current of at least 60% of the MRA (Maximum Rated Current).

Always check that voltage and frequency on the compressor plate meets the requirement of the power supply of your installation.

7.4 Insulation test

Insulation test has already been performed in our factory according to EN 60034-1 and it is not necessary to repeat it.

If you need to repeat it anyway, please charge the compressor with nitrogen or refrigerant gas and use a maximum voltage of 1000 VAC.



ATTENTION!

Risk of motor severe damage.
Do not run the insulation test with the compressor under vacuum.



ATTENTION!

Risk of motor severe damage.
Do not test the compressor with a voltage over 1000V.

7.5 Electronic protection module

The compressors are factory supplied with the INT69 FRY® protection module (code T00EC45B).

The module is installed inside the terminal box with the main parts already wired. The cabling has to be completed connecting the discharge temperature probe, supplied loose, accompanied by instructions.

Protection module INT69-FRYL® (code T00EC45AD) can be supplied as optional accessory unassembled; this module carries diagnostic tools that allows to record different working parameters and alarms. Refer to Frascold SPA bulletin FBUL0033 (www.frascold.it) and in Fig. 4b for all information and wirings. With this protection module, each protection device listed here below has its

dedicated connection port:

- Motor PTC thermistors (1, 2)
- Oil (discharge) temperature sensor (3, 4)
- Oil filter clogging sensor (7, 8)
- Oil flow switch (9, 10)

**注意！**

电机PTC有烧毁的风险。
禁止在热敏PTC电阻终端上施加电压 (T1, T2)。

**ATTENTION!**

Risk of motor PTC burn out.
Never apply voltage to thermistor terminals (T1,T2).

**注意！**

保护模块有烧毁的风险。
请依图接线 (图 4, 4b, 5)。

**ATTENTION!**

Risk of protection module burn out.
Follow the wiring diagram (Fig 4, 4b, 5).

**信息**

由于操作不当，未安装或未使用保护模块，压缩机将不受保修服务。

**INFORMATION**

Not installing or manipulating the protection module voids the product warranty.

7.6 高低压开关

高、低压开关必须安装在压缩机吸、排气侧的专用连接处 (见6.3)。

7.6 High and low pressure switch

High and low pressure switches must be installed on the dedicated connections of the suction and discharge sides of the compressor (see 6.3).

**警告！**

未使用适当的安全装置会引起爆炸。严禁在截止阀上安装或连接压力开关。

**WARNING!**

Inhibiting pressure safety devices can cause explosions. It is strictly forbidden to install pressure switches on the shut off valves connections.

8. 试运转**8. COMMISSIONING****8.1 压力测试**

压缩机在出厂前已经通过耐压和检漏试验，因此无需重复压力强度试验。如果整个制冷系统要进行压力测试，则必须按照EN378-2或相应的安全标准进行测试。

8.1 Pressure test

The compressor has undergone a factory test for pressure resistance and leak detection, therefore it is not necessary to repeat the strength pressure test. If the entire refrigeration circuit is subject to a pressure test, the test must be done according to EN 378-2 or a corresponding safety standard.

**危险！**

爆炸危险。
禁止超过压缩机铭牌上标明的压力。

**DANGER!**

Burst hazard.
Never exceed the pressures indicated in the name plate of the compressor.

8.2 泄露测试

整个制冷回路的泄漏测试必须按照EN378-2或相应的安全标准进行。

8.2 Leak test

A leak test of the entire refrigeration circuit must be performed in accordance to EN 378-2 or a corresponding safety standard.

**危险！**

爆炸危险。
禁止用含氧工业气体给压缩机加压。只使用无氧干燥的氮气。请勿将制冷剂与氮气混合使用！

**DANGER!**

Burst hazard.
Never pressurise the compressor with industrial gases containing oxygen. Use only oxygen free dry nitrogen. Do not mix refrigerant and nitrogen!

**危险！**

爆炸危险。
禁止超过压缩机铭牌上标明的压力。

**DANGER!**

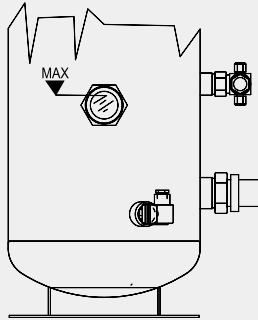
Burst hazard.
Never exceed the pressures indicated in the name plate of the compressor.

8.3 油充注

油必须直接充入油分离器(如图), 油要加到如图所示的油位。需要充注的油量可在选型软件或文档中查询。如果使用油冷却器, 必须在油冷却器和油管中充满润滑油。

8.3 Oil charge

Oil must be charged directly into the oil separator (as shown in figure). The oil level to be reached is indicated in the figure. The oil quantity to be charged is specified in the selection software or documentation. In case an oil cooler is used, this must be filled with oil as well as the oil line piping.



注意!

压缩机有损坏的风险。
不要把润滑油直接充注到压缩机内。



ATTENTION!

Risk of compressor damage.
Do not fill the oil directly into the compressor.



注意!

压缩机有损坏的风险。
在此加油状态下, 保持回到压缩机的油路是关闭状态(电磁阀不通电, 回油角阀被关闭)。



ATTENTION!

Risk of compressor damage.
In this phase, keep the oil line returning to the compressor shut (not energising the solenoid valve and closing the oil valve).



信息

根据制冷系统的类型, 必须加入与制冷剂充注量成正比的适量的润滑油。



INFORMATION

According to the system type, a certain amount of oil, directly proportional to the refrigerant charge must be added.

8.4 抽真空

首先对系统抽真空, 然后对压缩机进行抽真空。保持油加热器通电。抽真空应达到低于20Pa的真空度, 达到该真空度后, 继续抽真空至真空度稳定。

8.4 Evacuation

Evacuate the system first, then the compressor. Keep the oil heater energised. A vacuum level lower than 20 Pa, shall be reached. After reaching the vacuum level, continue evacuating the circuit until the vacuum level is kept steady after the pump is switched off.



注意!

电机有损坏的风险。严禁在真空状态下启动压缩机。严禁在真空状态下给电机供电。



ATTENTION!

Risk of motor damage. It is strictly forbidden to start the compressor when under vacuum. Never supply voltage to the motor under vacuum.

8.5 充注冷媒

保持压缩机的阀门关闭状态, 给油加热器通电。充注液体制冷剂, “打破真空”进入储液器。

8.5 Refrigerant charge

Keep the compressor switched off and the oil heaters energized. Charge the refrigerant in liquid phase, “breaking the vacuum” into the liquid receiver.



信息!

非共沸制冷剂只能以液态形式充注。



INFORMATION

Zeotropic mixtures can only be charged in liquid phase.

**注意！**

压缩机有损坏的风险。严禁将液态制冷剂直接充注到压缩机内。充注过程中，禁止液态制冷剂接触到压缩机机体。

**ATTENTION!**

Risk of compressor damage.
Do not charge the liquid refrigerant directly in the compressor. Do not allow liquid refrigerant to reach the compressor body during charging operations.

8.6 最后检查

检查压缩机的阀门是否全部打开。
检查油分离器内的油处于正确的水平(最高油位)，油温高于环境温度20–25K。
检查所有时间延迟的设置。
检查所有的安全开关。
检查油路截止阀是否全部打开(如果有)。

8.6 Final check

Verify that the compressor valves are all open.
Verify that the oil in the oil separator is at the right level (maximum) and at the correct temperature 20–25K above the ambient temperature.
Check the settings of all the time delays.
Verify all the safety switches.
Verify that the oil line stop valve is open (if present).

8.7 检查旋转方向

即使 INT69FRY 作为标配件供应，也要检查压缩机的旋转方向。将压力表连接在压缩机的吸气端，在压缩机启动的1秒内，需要确认该压力表的压力指示值是立即下降的。

8.7 Rotation check

Verify the compressor rotation, even if the INT69FRY is supplied as standard. Connect a pressure gauge on the compressor suction side. Verify that the pressure indicated in the installed pressure gauge decreases immediately within one second of compressor power on.

错误的旋转方向会导致压力表显示的压力值没有变化或增加。压缩机反向运行时间不要超过1–1.5秒。按图4、4b、5接线图固定电源线。

Wrong rotation leads to no change or an increase of the pressure indicated by the gauge. Do not let the compressor run for more than 1-1.5 seconds. Fix the power wiring by following the wiring diagram Fig 4,4b, 5.

**注意！**

压缩机有严重损坏的风险。必须检查旋转方向。螺杆式压缩机只能按规定的方向运转。

**ATTENTION!**

Danger of major damage to the compressor.
Check the rotating direction. A screw compressor can only operate in the prescribed direction.

如果需要调整制冷剂充注量，可从蒸发器进口的低压管道添加少量气态(推荐)或液体制冷剂。

If the refrigerant charge needs to be adjusted, a small quantity of vapour (preferably) or liquid refrigerant can be added from the low pressure line at the evaporator inlet.

**注意！**

压缩机有损坏的风险。
确保只有过热制冷剂气体进入压缩机。检查过热度 and 排气温度。

**ATTENTION!**

Risk of compressor damage.
Make sure that only superheated gas is entering the compressor. Check superheat and discharge temperature.

**危险！**

请不要向制冷系统中充注过多制冷剂，有爆炸的危险。

**DANGER!**

Do not overcharge the system with refrigerant, burst hazard.

**注意！**

压缩机有损坏的风险。
制冷剂充注量低，会引起吸排气侧的压差值变低，会导致吸气温度高和润滑不足。

**ATTENTION!**

Risk of compressor damage.
Low refrigerant charge can cause high suction temperature and insufficient lubrication due to low pressure difference between suction and discharge side.

9. 运行/维护

9.1 运行数据

定期检查并记录以下数据：

- 蒸发压力
- 吸气温度
- 排气温度
- 回油温度
- 油位
- 压缩机启停次数 (每小时最多 8次)
- 单次运行最短时间 (>5 分钟)
- 供电状态 (电压/电流/频率，必须与压缩机铭牌上的电气数据一致)
- 经济器参数 (特别注意喷射口的过热度)

检查膨胀阀进口和ECO膨胀阀 (如果有的话) 处的视镜内有无气泡。始终保证压缩机吸入口和ECO (如果有的话) 入口的过热度是正确的。

9.2 油流量

压缩机启动时，在数秒内应在油视镜中看到油在流动。如果看不到，请立即停止运行压缩机。油中可能存在气泡，但启动2-3秒后应该消失。由油流开关监控的油必须在10-20秒内达到最低流量。

如果没有达到指定的流量，请检查/修改冷凝压力调节阀的设置，并检查油中是否有液态制冷剂。

9.3 建议

压缩机标配了内部止回阀。请定期检查压缩机停机时的反转时间，以确认密封性。该内部止回阀仅用于压缩机停机时的反转保护，在高压差下的长期停机期间的密封性不提供保证。

停机时，始终避免制冷剂从高压侧向低压侧迁移，或从低压侧迁移进入压缩机内。特别是当蒸发器温度高于压缩机时，应根据时间或压力进行泵降。停机时蒸发侧的隔热通常是必要的，特别是当蒸发侧比吸力侧更能获取热源时。

强烈建议使用气液分离器在吸气管路中。

9. OPERATION / MAINTENANCE

9.1 Operating parameters

Verify and record the following data periodically:

- Evaporating pressure.
- Suction temperature.
- Discharge temperature.
- Oil return temperature
- Oil level.
- Number of compressor start/stop (max 8 per hour).
- Minimum ON operating time (>5 min).
- Power quality (voltage/current/frequency, must be in accordance with the electrical data in the compressor name plate).
- Economiser parameters (pay particular attention to the superheat at the injection port).

Verify that the liquid sight glasses at the expansion valve inlet and ECO expansion valve (if present) are bubble free. Always guarantee the correct superheat at the compressor suction and ECO inlet (if present).

9.2 Oil flow

At compressor start up, the oil should be seen in the oil sight glass within a few seconds. If not, switch off the compressor immediately. Foam in the oil can be present but must disappear 2-3 seconds after start-up. The correct oil flow, controlled by the oil flow switch must be reached in 10 - 20 seconds.

If the correct flow is not reached, check/modify the setting of the condenser pressure regulating valve and verify the presence of liquid in the oil.

9.3 Recommendations

The compressor is equipped as standard with an internal check valve. Verify periodically its tightness by checking the counter-rotation period during compressor switch off. The internal check valve is intended only for the compressor protection against backward rotation and does not guarantee the sealing during long shut off periods with high pressure difference.

Always avoid refrigerant migration from high to low pressure side, or from low pressure side into the compressor. Time or pressure pump down should be performed in particular when the evaporator can get warmer than the compressor. Insulation of the evaporator is often necessary in particular when the evaporator can get warmer than the suction side.

The use of a suction line accumulator is strongly recommended.

**注意！**

液击会造成压缩机的损坏。

特别是低温工况中多回路共用蒸发器时，需要一个外部止回阀。

**ATTENTION!**

Risk of compressor damage due to liquid slugging. Low temperature application in particular multiple circuits with common evaporator, may require an external check valve.

9.4 维护

定期保养检查包括：

- 检查油分离器内的油位
- 检查电缆连接是否紧固
- 检查压缩机保护装置

压缩机初次运行工作时间满100小时后，需更换油过滤器内的滤芯。

通常在工厂试运行之后的已更换油过滤芯和干燥过滤芯的整体式冷水机不需要（在初次工作100小时后）立即更换滤芯。如果通过油品分析，检测到油的性质发生了变化，则需要更换油。电机烧坏后必须更换油和所有滤芯。

**危险！**

高压电，有触电的危险。

在低蒸发温度和/或高环境湿度下工作，可能会导致接线盒内有冷凝水。

为了防止潮气进入接线盒，必须安装防护等级为IP65或更高的电缆密封套。如有需要，可在接线盒中使用加热元件或在电气端子上使用接触绝缘脂。

9.4 Maintenance

Regular maintenance checks are:

- visual control of the lubricant level inside the oil separator
- check of cable and connections tightening
- check of compressor protection devices

After approx. 100 working hours from the initial compressor start, replace the cartridge of the oil filter

Oil replacement is not normally necessary for chiller and package unit with oil filters and filter driers. The oil replacement is necessary in case of its properties decay, detectable via an oil analysis. Replacement is mandatory after a motor burn out.

**DANGER!**

High voltage, hazard of electrical shock.

Operating at low evaporating temperatures and/or high ambient humidity may result in water condensation inside the terminal box.

It is mandatory to install cable glands with protection grade IP65 or higher in order to prevent air entering the terminal box. The use of a heating element in the terminal box or contact grease on the terminals may be required.

**注意！**

接线盒内产生的冷凝水有导致电源短路的危险。不要拆下或损坏标配的绝缘板！

**警告！**

内部有压力的油分离器可能会对皮肤和眼睛造成伤害。打开/拆卸油分前请先释放内部压力。配戴防护眼镜。

**ATTENTION!**

Risk of short circuit due to condensing water into the terminal box. Do not remove or damage the insulator pins supplied!

**WARNING!**

Possible injuries to skin and eyes might be caused by an oil separator under pressure. Release the pressure before opening. Wear safety goggles.

**每工作5000小时**

- 分析油的品质
- 检查电磁阀的密封性
- 检查油流开关的工作是否正常
- 检查吸气过滤网的洁净度
- 检查油滤芯的洁净度

每工作40000小时

- 更换轴承

Every 5000 working hours

- perform oil quality analysis
- check tightness of solenoid valve
- check correct operation of oil flow switch
- check cleanliness of suction filter
- check cleanliness of oil filter

Every 40000 working hours

- replace the bearings

10. 拆卸

10. 拆卸

关闭压缩机的截止阀、油路阀，拧紧填料螺母(如有)。

将压缩机内的制冷剂回收，并妥善处理。
将压缩机内的油排空，使用合适的储油容器存放已排出的润滑油。



警告！

压缩机内可能有压力。



在打开任何连接口之前请先释放压力。配戴防护眼镜。

请妥善处理废油。

如压缩机将来需要被维修，请关闭吸、排气截止阀，并充入0.5-1bar的干燥氮气。如果将来不需要维修，请以适当的方式处理压缩机。

10. DECOMMISSIONING

10. Decommissioning

Close the compressor shut off valves, oil line valve and tighten the stuffing nuts (if present).

Recover the refrigerant from the compressor, dispose it in the proper way Drain the oil from the compressor, use a proper oil container suitable for exhausted lubricants.



WARNING!

Compressor could be under pressure.



Release the pressure before opening any connection.
Wear safety goggles.

Dispose the waste oil in a proper way.

If the compressor will be repaired, close the suction and discharge valve and charge with 0.5-1 bar of dry nitrogen. If not, dispose it in the proper way.

信息

请参阅www.frascold.net，了解当前的所有富士豪产品对根据EC机器指令的公司声明。

INFORMATION

Please see www.frascold.it for current declaration of incorporation according to EC Machines Directive off all Frascold products

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