

SRT

Series

# 使用手冊

Instruction Manual

TWO-STAGE SCREW REFRIGERATION COMPRESSOR

## 雙段螺旋式冷凍壓縮機

復盛股份有限公司  
Fu Sheng Industrial Co., Ltd.



R-SRT-EC1-201806

## 目錄 CONTENTS

前言 PREFACE .....	4
I. SRT 系列冷媒壓縮機特色 FEATURES OF SRT SERIES.....	6
1.1 高優化的機體結構 Superior compact structure.....	9
1.2 轉子 Rotors .....	9
1.3 軸承 Bearings .....	11
1.4 進氣濾清器 Suction filter .....	11
1.5 驅動馬達 Driving motor .....	11
1.6 容調控制及容調電磁閥 Capacity control and solenoid valves.....	12
2. 容調及控制系統 Capacity and control system .....	13
2.1 三段式容調(SRT31X~41X)Three steps capacity control(SRT31X~41X)....	15
2.2 無段容調(SRT31X~41X)Linear capacity control(SRT31X~41X).....	17
2.3 兩段式容調(SRT218)Two-step capacity control.....	19
II. 螺旋式冷媒壓縮機規範	
SCREW REFRIGERANT COMPRESSOR SPECIFICATION .....	21
1. 產品規範 PRODUCT SPECIFICATION .....	21
2. 安裝與試車規範 INSTALLATION AND COMMISSION SPECIFICATION .....	22
2.1 壓縮機安裝 Install the compressor .....	22
2.2 運轉前注意事項 Items to be checked before startup .....	25
2.3 運轉中注意事項 Notices in operation .....	27
2.4 機組出廠運轉注意事項 Notices during factory test .....	28
2.5 壓縮機 啟動/停機 控制建議	
Recommended control sequence of compressor START/STOP .....	28
3. 運轉規範 OPERATION SPECIFICATION .....	29
3.1 運轉規範 Operation range .....	29
3.2 運轉限制 Operation limitation .....	29
3.3 運轉電源 Power supply quality.....	29
3.4 運轉安全裝置 Safety device in operation.....	30
4. 電氣規範 ELECTRIC SPECIFICATION.....	31
4.1 電氣結線方式 Electric wiring configuration .....	31
4.2 啟動程序 Start-up process.....	39
4.3 進相電容使用注意事項 Notice when adopting capacitor .....	40
4.4 無熔絲開關(NFB)之選用 NFB selection .....	40
4.5 電磁接觸器 MC 之選用 Magnetic contactor(MC) selection .....	40
4.6 電氣資料 Electrical data.....	41
5. 故障分析與保養週期 TROUBLE SHOOTING AND MAINTENANCE PERIOD .....	43
5.1 故障分析與研判 Trouble shooting.....	43
5.2 保養週期建議表 Recommended maintenance period.....	45

5.3 壓縮機馬達燒毀之處理 When the motor is burnt out .....	46
5.4 PUMP DOWN 注意事項 Notices on pump-down.....	46
6. 應用規範 APPLICATION .....	46
6.1 液噴射 Liquid injection.....	47
6.2 油冷卻器 Oil cooler.....	49
6.3 節能器 Economizer.....	51
6.4 啟動旁通 Start-up by pass.....	53
6.5 雙單機迴路 .....	54
6.6 運轉範圍 Operation envelope .....	55
7. 產品配件 PRODUCT SCOPE .....	58
7.1 配件規格 Fitting specification .....	58
7.2 配件明細 Fitting list .....	59
7.3 潤滑油 Lubricant .....	60
7.4 壓縮機外觀尺寸 Compressor outline dimension .....	61
7.5 關斷閥尺寸 Service valve dimension .....	67
7.6 噪音值 Noise level.....	68

## 前言

「復盛公司」所生產的雙螺旋式冷媒壓縮機，從一般製冷空調，高科技無塵室，恆溫控制室到食品冷凍冷藏系統，都是各種應用系統的最佳搭配。

為配合各地區眾多客戶以及系統的需求，特別開發出「SRT」雙段螺旋冷凍壓縮機系列，以符合客戶的使用工況與應用場合。最佳化的產品性能，符合綠色環保高效率之需求。

在歷經客戶多年的使用與磨練，我們所生產的壓縮機已獲得國內外各機組廠家的肯定與讚賞，並榮獲多項國內外產品認證與品質認證，例如：「ISO 9001、ISO14000、OHSAS-18000、ISO1461-1 溫暖氣體盤查驗證及「TOSHMS 國際品質認證」、「臺灣精品獎」，「2010 年經濟部產業創新獎」等等。

## Preface

From air conditioning systems, hi tech clean rooms, climate control rooms to food refrigeration systems, Fu Sheng screw refrigerant compressors have been the best choice for various application systems.

In order to meet demands for various working condition from our clients, Fu Sheng has particularly developed the 「SRT」 series of screw refrigerant compressors to satisfy each client's unique application condition and design specification. With the SRT series, chiller makers can easily optimize their chiller performance and conformity to the environmental protection requirement of high energy efficiency.

After years of practice and working with clients, our compressors have acquired numerous appreciations from various domestic and international institutes; such as the ISO9001, ISO14000, OHSAS-18000, ISO1461-1, 「TOAHMS」 and 「Symbol of Excellence Award」 (Taiwan), 「2010 industry Innovation Achievement Award」 (Taiwan) etc.

「復盛公司」為在冷凍空調業更上一層樓，不惜投入更多資金，引進最新式的螺旋轉子加工研磨機與三次元精密量床，為的就是要製作出更高品質、高效率的螺旋式冷媒壓縮機，以讓客戶得到百分百的滿意度為期許。

「復盛公司」始終以提升客戶滿意度為宗旨，持續為客戶提供更具競爭力、性能更優越、品質更可靠的雙螺旋式冷媒壓縮機。並期待在未來與客戶一同成長與茁壯。

「復盛公司」為確保客戶能夠順利的啟用「SRT」雙螺旋式冷媒壓縮機，特別在本使用手冊中，編寫有關 SRT 系列的特色與功能，以及在安裝操作、使用、保養維修時，所應注意的各項要點與內容，來提醒與告知。在此特別提醒您，在安裝使用「復盛 SRT」雙螺旋式冷媒壓縮機之前，請先仔細閱讀本使用手冊，並確實遵守本手冊所陳述的各項注意事項與使用規範。

如果您還有不明白之處或是額外需求的特殊使用條件，可與我們公司聯絡；或是您在使用上需要我們協助，我們都將即時為您提供解答與服務，以符合您的需求。

In order to satisfy our client's prospect of compressors with high quality and efficiency, Fu Sheng Co. has invested significant resources to introduce state-of-art screw rotor grinding machines and coordinated measuring machines in the production process.

Our motto is to increase satisfaction and provide our valued customers screw refrigerant compressors that bear better performance, quality and competitive edge.

This instruction manual is to ensure that users can operate or install Fu Sheng 「SRT」 screw refrigerant compressors correctly. The reader will find SRT series information about the features, the principles of compressor installation, operation, trouble shooting, and limitation in operation. Please read this Manual carefully and follow the notes and specification illustrated in this Manual before operating the compressors.

Should you have any questions or need any help, please do not hesitate to contact us. We will provide you with assistance and answer immediately.

## I. 「SRT」系列冷媒壓縮機特色

### 機械部份：

- 使用「復盛公司」特有 ( 5 : 6 ) 非對稱齒型有最佳的效率。
- 在最佳的恆溫加工場所製造最好的機殼及轉子。
  - 新一代的齒型剛性高
  - 專業的加工技術確保最高精度
- 高效率的電動機。
  - 內置 3 個 PTC 熱敏電阻保護
  - 特殊設計的冷卻流道
- 耐久型軸承設計及充分潤滑。
  - 採用軸向軸承，耐用性更佳
  - 內建油路提供最好的潤滑
- 震動小及穩定的排氣。
  - 運轉動件少
  - 沒有閥門的機構設計
- 在可變 Vi 的容調裝置
  - 特有的無段及三段滑塊控制
  - 利用簡單的外置電磁閥進行控制加洩載

## I. FEARURES OF 「SRT」 SERIES

### Mechanism:

- New asymmetrical rotor profile, optimum tooth ratio 5:6, provides high efficiency in operation.
- Precise cases and rotors are machined in climate control room
  - New generation rotor profile provides high rigidity.
  - Professional manufacturing technology ensures high accuracy quality.
- High efficiency electrical motor
  - Built-in 3 PTC thermistor sensors.
  - Special design of refrigerant cooling flow passage.
- Long service life of bearings with sufficient lubrication
  - Axial bearings provide more durability.
  - Built-in oil channel provides perfect lubrication.
- Low vibration and discharge pulse.
  - Limited motion parts.
  - No need to use discharge valve.
- Flexible capacity control
  - Dedicated design of slider.
  - Precisely control the loading by solenoid valves.
  -

- 進氣接口位於一段機殼上可依需要旋轉角度。
  - 方便機組配管使用
- 搭配不同的冷媒(R-22, R-404A, R-507... ) 系統, 可發揮最佳的性能。
  - 最佳化容積比設定
  - 不同的冷凍油匹配
  - 馬達最佳匹配
  - 優異的 COP 值
  - 寬廣的應用範圍
- 壓縮機排氣量。
  - 60Hz ( 144~756m<sup>3</sup>/hr )
  - 50Hz ( 120~630m<sup>3</sup>/hr )
- Mounting suction port can be rotated to different piping angle.
  - Convenient for the piping of package.
- Suitable for each kind of refrigerant(R-22, R-404A, R-507...) making it possible for the package system to operate at its best efficiency.
  - Optimized volume ratio design.
  - Matched with different oil.
  - Optimized motor size.
  - Excellent COP.
  - Wide application range.
- Displacement range
  - 60Hz(267 to 759 m<sup>3</sup>/hr)
  - 50Hz(222 to 630 m<sup>3</sup>/hr)

#### 電氣控制及保護裝置部分:

- PTC 排氣溫度監控
- PTC 馬達溫度監控
- 逆相監控
- 欠相監控
- 電壓保護

#### Electrical control and protection device:

- PTC discharge temperature monitor sensor.
- PTC motor temperature monitor sensor.
- Power phase sequence monitor.
- Power phase loss monitor.
- Abnormal voltage detection.

#### 標準配件:

- 排氣止回閥
- 大面積的進氣濾網
- INT69FSY Diagnose 的電氣保護模組
- 預留中間壓與低壓液噴射接頭
- 節能器法蘭
- 吸氣關斷閥
- 排氣關斷閥
- 排氣溫度感應器

#### Standard fittings:

- Discharge check valve
- Large size suction filter.
- INT69FSY Diagnose electrical protection module.
- Reserved liquid injection adapters at middle pressure side and low pressure side.
- Economizer connection flange
- Suction service valve
- Discharge service valve
- Discharge temperature monitor sensor

#### 完善的選配件:

- 液噴射電磁閥
- 液噴毛細管
- 防震墊
- 節能器
- 安全閥
- 外部油分離器
- 洩油閥

#### Complete optional fittings:

- Liquid injection solenoid valve
- Liquid injection capillary.
- Anti-vibration mounting pad.
- Safety valve.
- Economizer adapter
- Oil separator
- Oil draining valve



## 1.1 高優化的機體結構

壓縮機結構如圖一所示。

### ■ 規格化

機殼為螺旋式冷媒壓縮機之主體。

SRT 系列分成 6 型，來滿足客戶需求。

### ■ 高精度

機殼是以精密之 M/C 加工機加工，並與三次元精密量測儀確認精度。

SRT 系列嚴格要求加工品質，以確保壓縮機之品質與精度能夠符合最佳效率。

### ■ 雙層機體設計

符合耐壓及降低噪音之功能。

## 1.2 轉子

### ■ 最佳化

轉子為螺旋式冷媒壓縮機之主要動件，採用「復盛」榮獲多國多項設計專利最新式的 (5 - 6) 非對稱轉子齒型，並由特殊高精度之轉子研磨機加工成形，精度佳，品質穩定。

### ■ 效率佳

在連續運轉狀況下，轉子可保持最佳間隙值，以達到最高效率之要求。

## 1.1 Superior compact structure

Compressor structure showed as figure 1.

### ■ Modular design

Casing is the major component of screw refrigerant compressor. The SRT series has 5 models which meet various demands and applications.

### ■ High Accuracy

To reach high operation efficiency, the casing is manufactured by precise machining centers and inspected by a coordinate measuring machine to make sure that the requested precision and quality can be retained in the compressor.

### ■ Double-layered design

The double-layered design casing made by high strength cast iron not only can endure intensive high pressure but also reduce noise level while in operation.

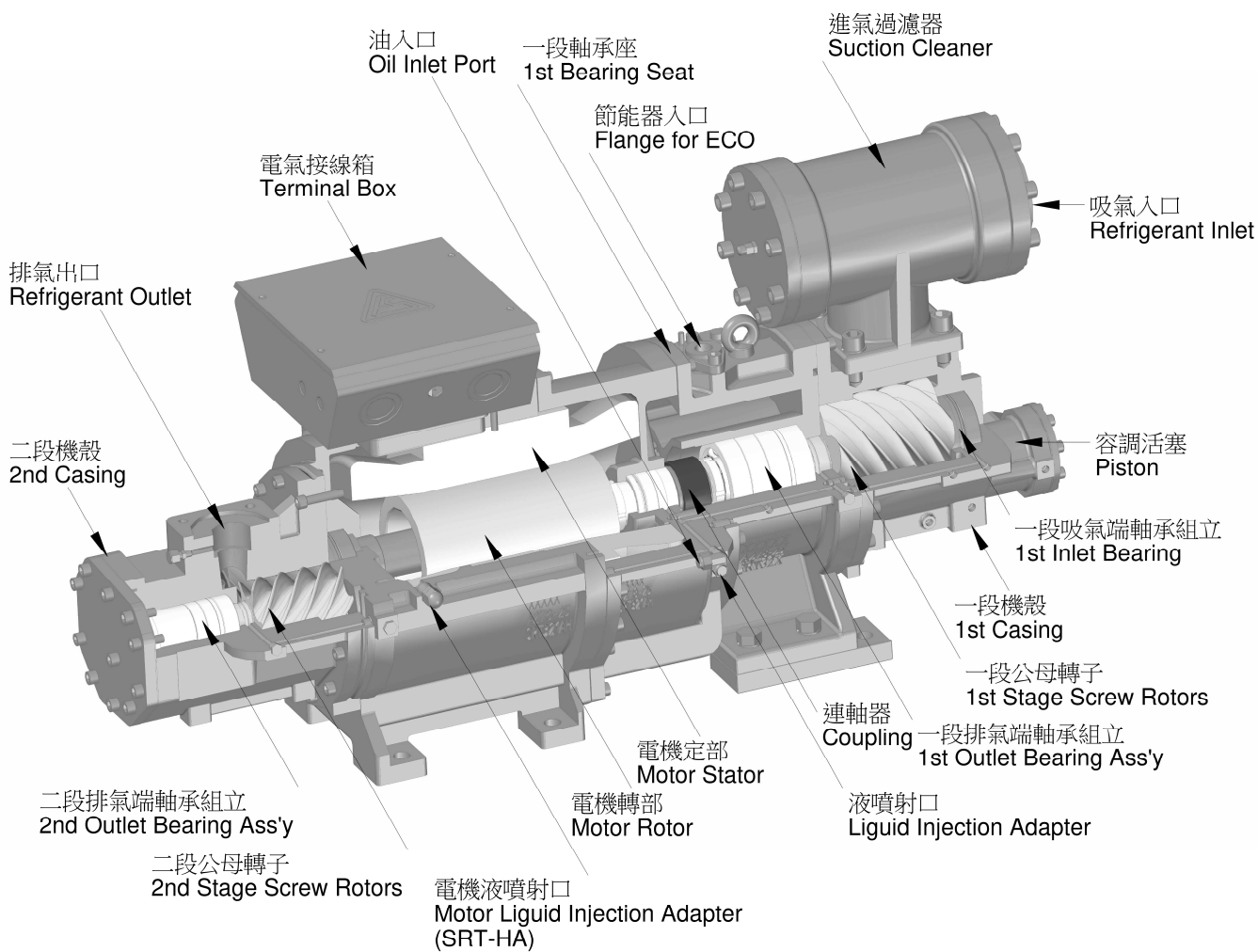
## 1.2 Rotors

### ■ Optimization

Fusheng compressors have the latest multi-national patented asymmetric rotor profile (tooth ratio 5:6). The rotors are machined by advanced CNC grinding machine to reach their accuracy and quality.

### ■ High efficiency

Under continuous operation, the rotors still keep their best clearance and achieve highest efficiency.



圖一：機體結構圖

Figure 1: Compressor structure

### 1.3 軸承

- 壽命長

以高精度大框號的軸向與徑向軸承穩固支撐公母轉子，穩定耐用壽命長。

並配合優良油路與機構設計，有效提高軸承壽命。

運轉中各軸承均有潤滑油以壓差方式注入，使軸承獲得充分之潤滑。

### 1.4 進氣濾網

- 大面積進氣濾網，可避免吸氣壓降耗損。

- 可靠安全的保護

裝設於在壓縮機入口處，可以將系統中不潔之顆粒與異物過濾，以防止被吸入壓縮機內，造成馬達與轉子故障。

### 1.5 馬達及保護裝置

- 高效率，兩極三相 F 級絕緣感應式馬達。

- 內置 PTC 熱敏電阻搭配 INT69FSY Diagnose 模組保護馬達，精確監控壓縮機馬達的線圈溫度，以確保壓縮機的正常運轉；適合降壓啟動 (star delta) 及直接啟動。

### 1.3 Bearings

- Long service life

High-precision large axials and radial bearings are selected to support the male and female rotors to extend the life of the compressor. With the effective lubrication system, the bearing service life can be further extended. While the compressor is running, lubricant is injected into all bearings due to pressure difference.

### 1.4 Suction filter

- Large suction filtration area to reduce pressure drop.

- Reliable and safe protection

Installed at the suction end of the compressor, the filter prevents foreign objects or contaminated particles from entering the compressor and guarantees the normal operation of compressor. We recommend dismantling and cleaning the filter completely shortly after the commission of the compressor to ensure the ongoing normal operation and prolong operating lifetime.

### 1.5 Driving motor

- High-efficient two-pole, three-phase, class F inductive motor.

- With built-in PTC thermistor INT69FSY Diagnose electrical protection module to monitor the winding temperature of compressor motor closely, the compressor is insured to run under normal condition. It's suitable for star-delta or direct-on-line start-up.

## 1.6 容調活塞及控制電磁閥

- 容調閥機構精準控制系統所需之容量調節。
- 可選用三段式或無段式設計，控制壓縮機的容量調節。
- 可配合多種內建式容積比，應用於各種不同冷媒不同工況，以作最高效率的運轉。

## 1.6 Capacity-control piston and solenoid valves

- The capacity-control slider valve mechanism accurately controls the required refrigerant flow responding to the system loading variation.
- The compressor provides 3-step capacity control as a standard. The linear capacity control is also available as an option.
- For special operating conditions, there are various built-in volume ratios that can be adopted. This leads to high energy efficiency.

## 2.容調系統

### 2.1 三段式容調(SRT31X~41X)

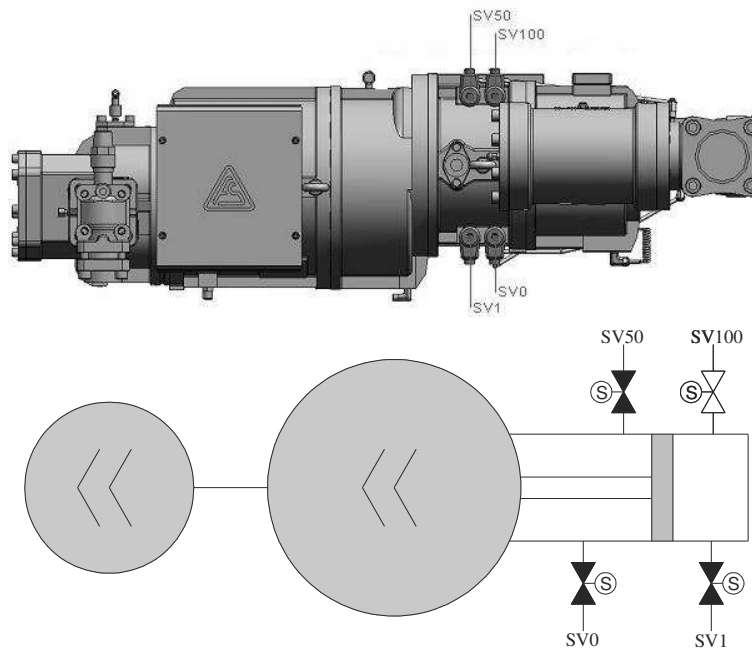
三段式容調系統由一個容調滑塊、4個電磁閥與一組容調活塞組成，可調節的範圍有25%、50%、100%。其原理系利用活塞帶動容調滑塊，當負載需求降低時，容調滑塊移動將部份冷媒傍通回吸氣端，使冷媒排氣量減少以達到降低負載之功能。

## 2. Capacity control system

### 2.1 Three-step capacity control (SRT31X~41X)

The 3-step capacity control system is made of one slider, four solenoid valves and one piston with adjustable range of 25%, 50%, and 100%.

The principle of capacity control is by moving the slider to allow partial refrigerant to bypass back to the intake and regulate the refrigerant flow.



容調系統圖 Capacity-control diagram

三段式容調電磁閥作動表  
(SRT31X~41X)

電磁閥 負載	SV1 (常閉)	SV50 (常閉)	SV100 (常開)	SV0 (常閉)
25%(啟動)	ON	OFF	ON	ON
50%	ON	ON	ON	OFF
100%	OFF	OFF	OFF	OFF
ON : 通電, OFF : 斷電				

Solenoid valve activating table of three-stage capacity control  
(SRT31X~41X)

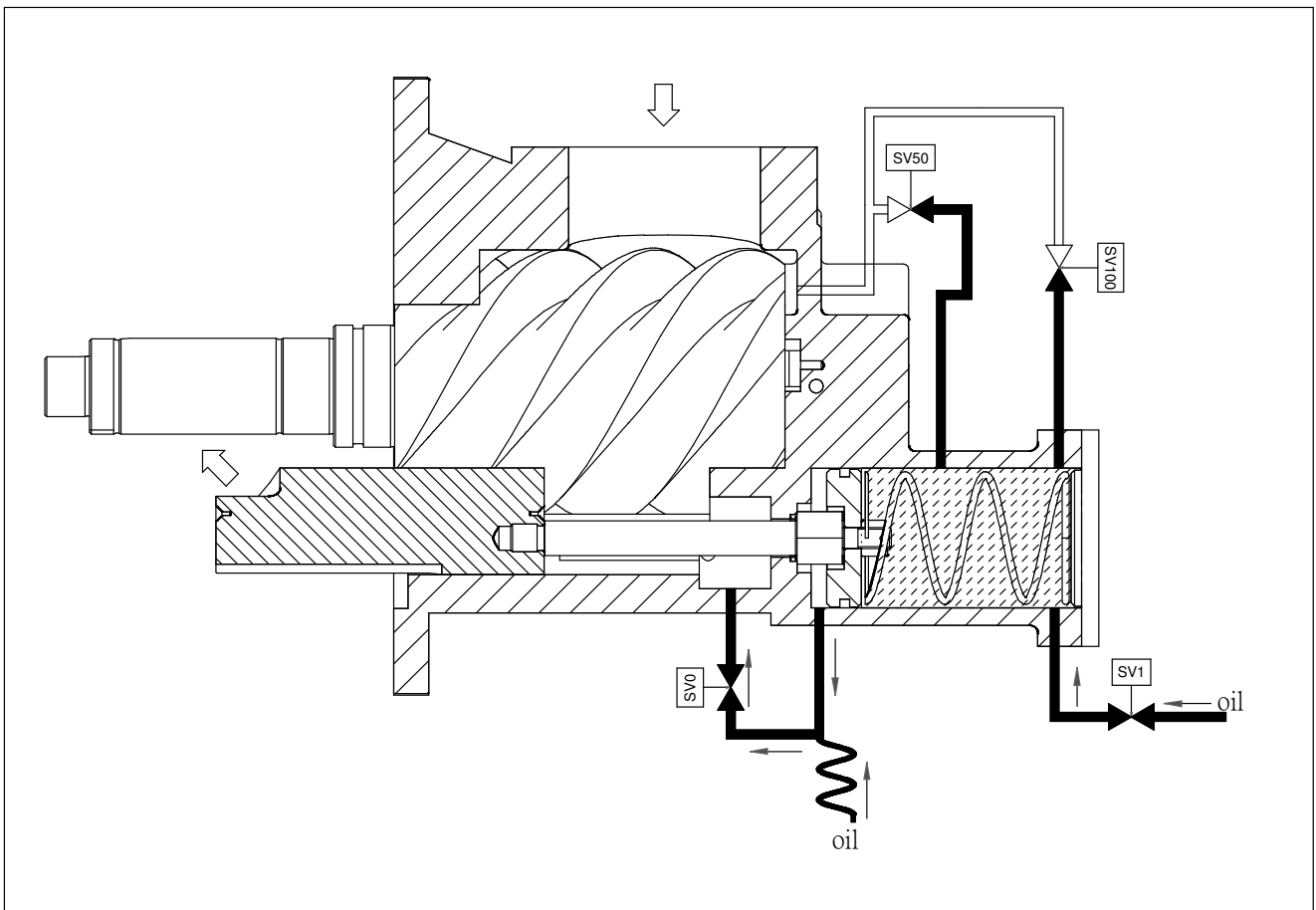
Status	s.v.	SV1 (NC)	SV50 (NC)	SV100 (NO)	SV0 (NC)
25%(startup)		ON	OFF	ON	ON
50%		ON	ON	ON	OFF
100%		OFF	OFF	OFF	OFF
ON: energize, OFF: de-energize					

### 2.1.1 啟動運轉：25%負載

壓縮機在起動時，必須使負載降到最低才容易起動。所以 SV0、SV1、SV100 通電作動，油直接旁通回到低壓側，此時容調滑塊旁通空間最大負載只有 25%，待起動完成後，壓縮機才可以逐漸加載，一般起動 25% 負載運轉時間約設 30 秒左右。

### 2.1.1 Startup: 25% loading

For easier startup of the compressor, the loading must be minimized. Therefore, SV1 is energized to bypass oil to the low-pressure side directly. The slider does not move and keep the maximum opening in suction end to bypass the refrigerant. After the completion of startup the compressor can then increase loading gradually by de-energizing the SV1 solenoid valve. It is recommended to run compressor at 25% loading for about 30 seconds before starting to increase loading.



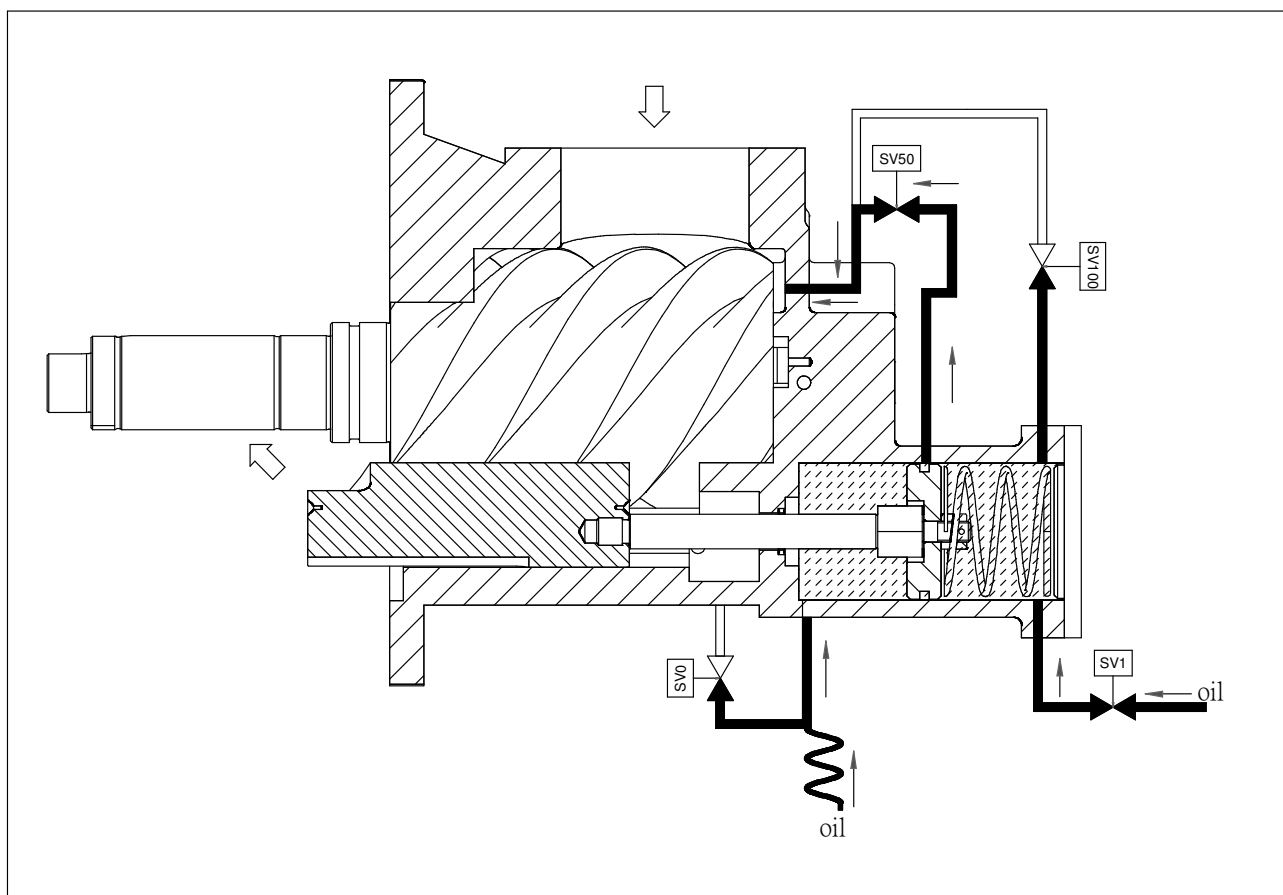
25% 容調啟動流程圖 Flowchart of 25% capacity(for startup)

### 2.1.2 部分負載: 50%運轉

依 25%相同之原理，SV1、SV50、SV100 通電作動，壓縮機即作 50%之負載運轉。

### 2.1.2 Partial load: 50% Operation

With the same principle as stated in 25% loading, SV1、SV50、SV100 are energized and SV0 is de-energized to achieve 50% loading.



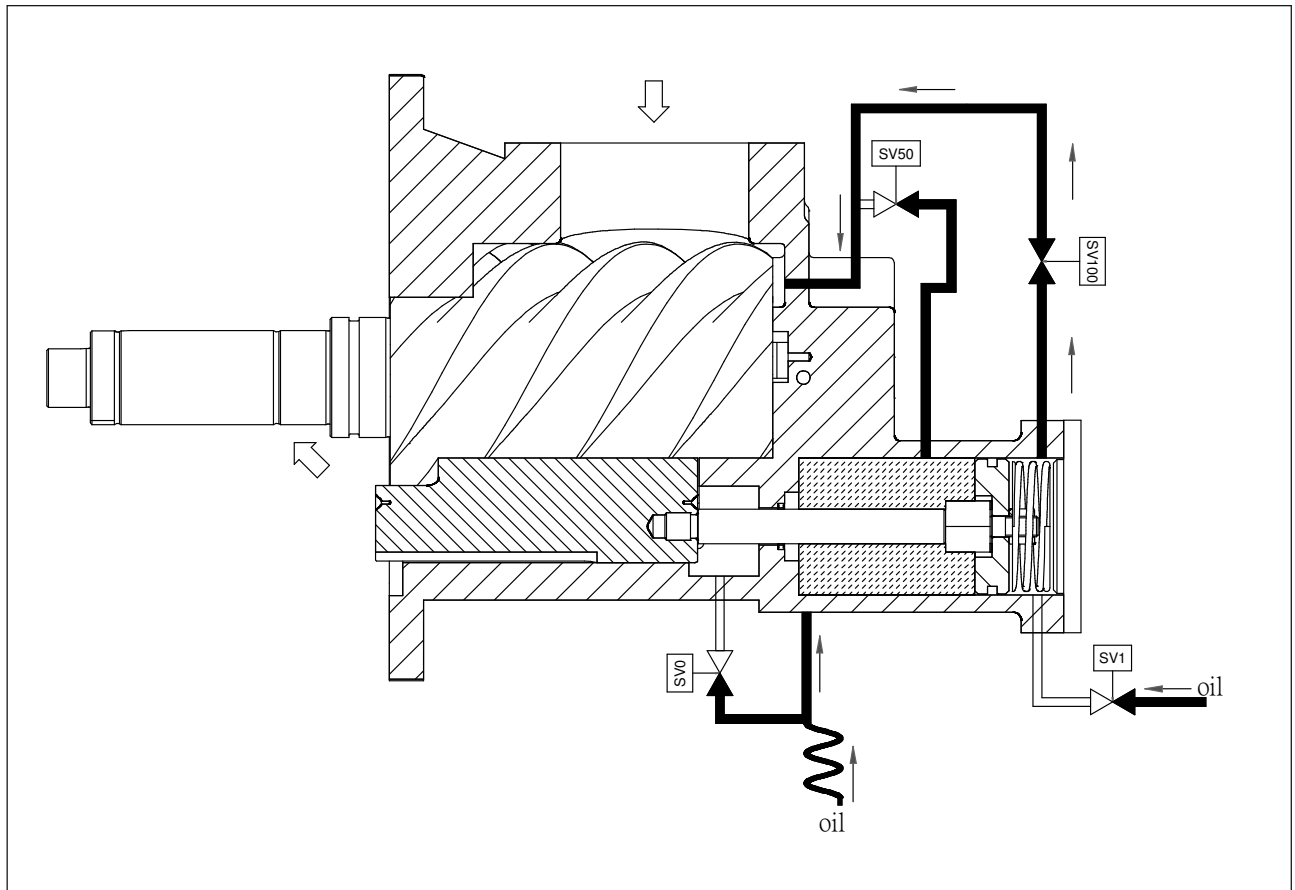
50% 容調流程圖 Flowchart of 50% capacity

### 2.1.3 全載：100%運轉

壓縮機起動完成後，SV0、SV1、SV50、SV100 均不通電，油直接進入油壓缸內推動容調活塞向前，容調活塞帶動容調滑塊，使冷媒 bypass 逐漸減小，直到容調滑塊完全推到底，此時壓縮機全負載 100% 運轉。

### 2.1.3 Full load: 100% operation

After the completion of startup, all valves are de-energized and oil flows straight to cylinder and pushes the piston forward, driving the slider to gradually reduce bypass opening. When the opening is closed completely, the compressor is running at 100% loading.



100% 容調流程圖 Flowchart of 100% capacity control



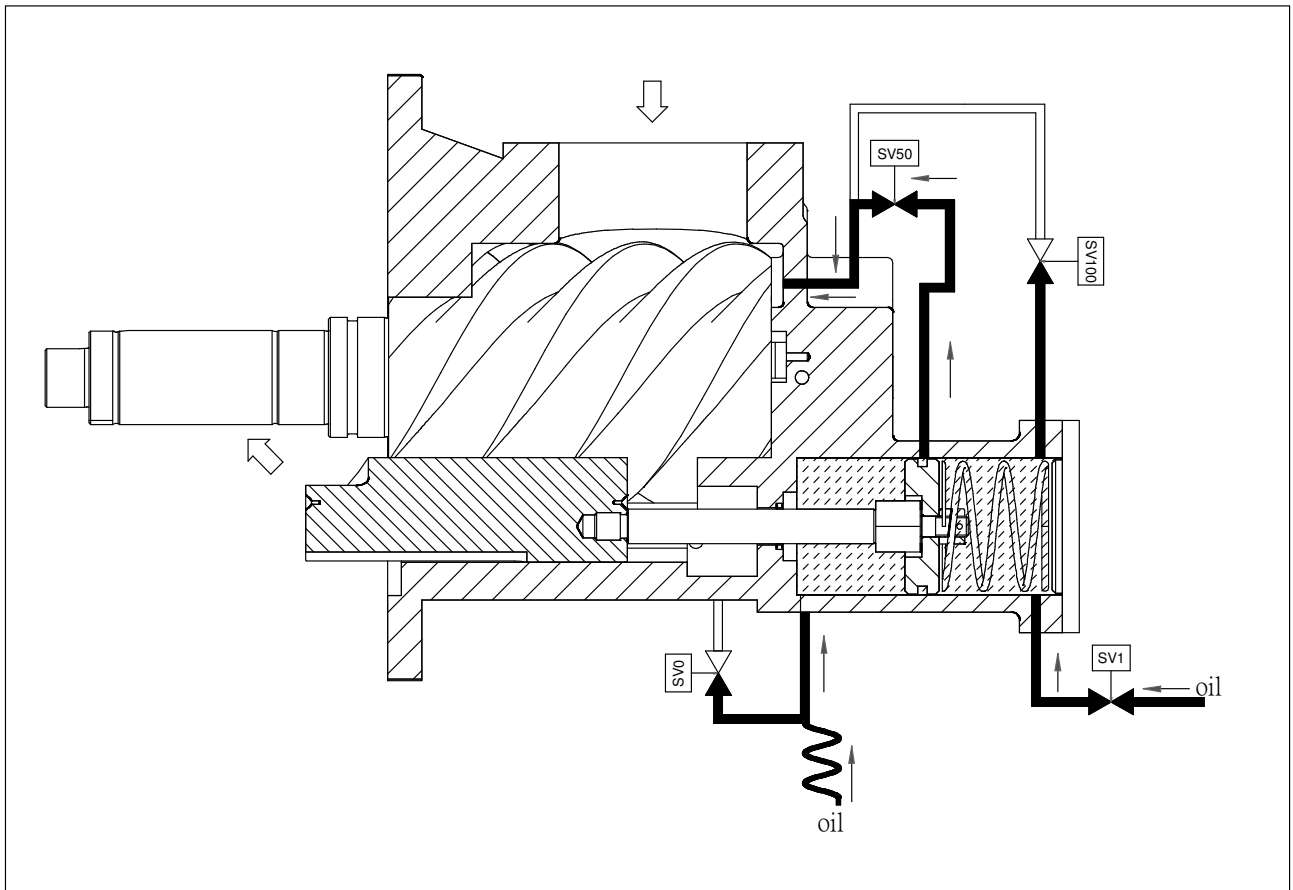
## 2.2 無段容調 ( 50%~100% )

壓縮機在起動時，必須使負載降到最低才容易起動。所以 SV0、SV1、SV100 通電作動，油直接傍通回到低壓側，此時容調滑塊傍通空間最大負載只有 25%，待起動完成後，壓縮機才可以逐漸加載，一般起動 25% 負載運轉時間約設 30 秒左右。電磁閥控制作動時間建議在 0.1~0.5 秒左右，依實際狀況調整。

## 2.2 Linear capacity control

( 50%~100% )

For easier startup of the compressor, the loading must be minimized. Therefore, SV1 is energized to bypass oil to the low-pressure side directly. The slider does not move and keep the maximum opening in suction end to bypass the refrigerant. After the completion of startup the compressor can then increase loading gradually by de-energizing the SV1 solenoid valve. It is recommended to run compressor at 25% loading for about 30 seconds before starting to increase loading. The recommended pulse time of solenoid valves is about 0.1~0.5 second and it shall be adjusted according to actual operating status.



無段容調流程圖(50%~100%)Flowchart of linear capacity control(50%~100%)

當壓縮機啟動時，SV0、SV1、SV100 需通電以便將液壓缸之冷凍油透過 SV1 油路，導回壓縮機之低壓端(SV1 通電)。容調滑塊因內部彈簧之作用力，確保壓縮機在 25%負載的位置；啟動之後 SV100、SV1 和 SV0 斷電，讓壓縮機加載到 100%負載運轉。

依 25%相同之原理，SV1、SV50、SV100 通電作動，壓縮機即作 50%之負載運轉。

當環境負荷增加時「所有電磁閥短暫斷電，使得少量冷凍油能夠流入油壓缸，使得容調滑塊往增加冷凍能力的方向移動；當環境負荷減少時 SV1、SV50、SV100 短暫通電，使得少量冷凍油能夠經由 SV0 流出油壓缸，使得容調滑塊往減少冷凍能力的方向移動。

無段容調(50%~100%)電磁閥作動表

電磁閥 負載	SV1 (常閉)	SV50 (常閉)	SV100 (常開)	SV0 (常閉)
啟動	ON	OFF	ON	ON
加載	OFF	OFF	OFF	OFF
卸載	ON	ON	ON	OFF
保持	OFF	OFF	ON	OFF

ON : 通電, OFF : 斷電

When starting the compressor, SV1, SV0 are energized to bypass the oil in hydraulic cylinder back to the low-pressure suction end while SV100 is de-energized. The slider remains in its initial position due to the spring force, and then the compressor can start at 25% loading. Once the startup process is completed, SV100 is energized while SV1 and SV0 are de-energized to increase the loading up to 100%.

With the same principle as stated in 25% loading, SV1, SV50, SV100 are energized and SV0 is de-energized to achieve 50% loading.

When loading increases, all solenoid valves energize shortly to allow small amount of oil to flow into hydraulic cylinder and force slider to move in the direction of increasing refrigeration capability. If loading decreases, SV1, SV50, SV100 de-energize shortly to allow small amount of oil to flow out of hydraulic cylinder and cause slider to move in the direction of decreasing the refrigeration capability.

Control sequence of linear capacity control(50%~100%)

S.V. Status	SV1 (NC)	SV50 (NC)	SV100 (NO)	SV0 (NC)
Startup	ON	OFF	ON	ON
Loading	OFF	OFF	OFF	OFF
Unloading	ON	ON	ON	OFF
Holding	OFF	OFF	ON	OFF

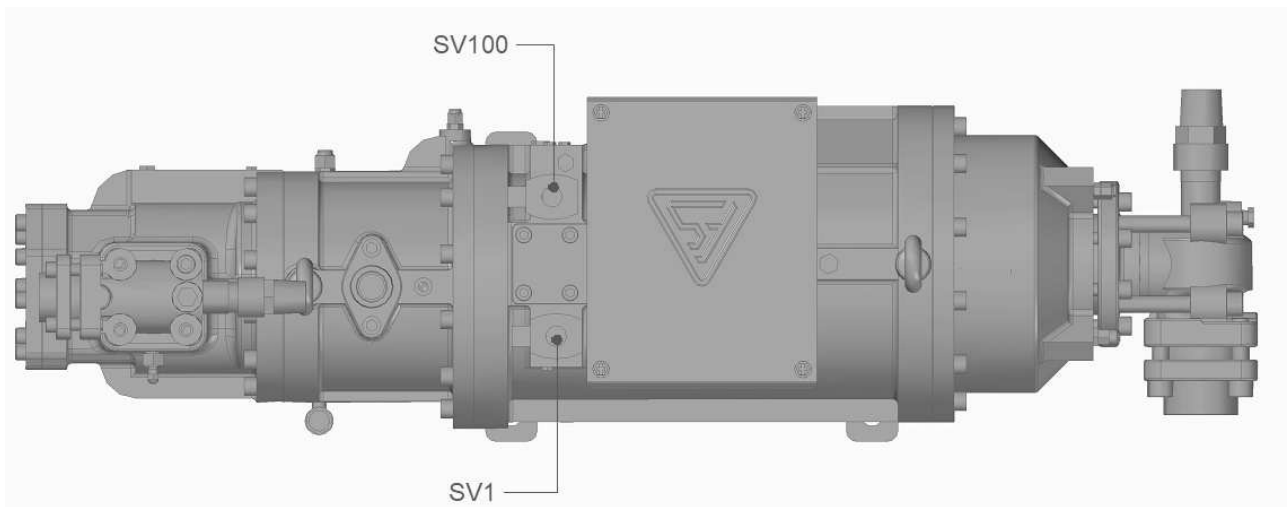
ON: energize, OFF: de-energize

### 2.3 二段式容調

二段式容調系統由一個容調柱塞、兩個電磁閥，可調節的範圍有 50%、100%。其原理系利用柱塞，當負載需求降低時，柱塞移動將部份冷媒傍通回吸氣端，使冷媒排氣量減少以達到降低負載之功能。

### 2.3 Two-step capacity control

The 2-step capacity control system is made of one piston, two solenoid valves with adjustable range of 50% and 100%. The principle of capacity control is by moving the pistons to allow partial refrigerant to bypass back to the intake and regulate the refrigerant flow.



SRT218

容調電磁閥作動表

電磁閥	SV100 (常開)	SV1 (常閉)
負載		
50%(啟動)	ON	ON
100%	OFF	OFF

ON : 通電, OFF : 斷電

SRT218

Solenoid valve activating table of three-stage capacity control

S.V.	SV100 (NO)	SV1 (NC)
Status		
50%(startup)	ON	ON
100%	OFF	OFF

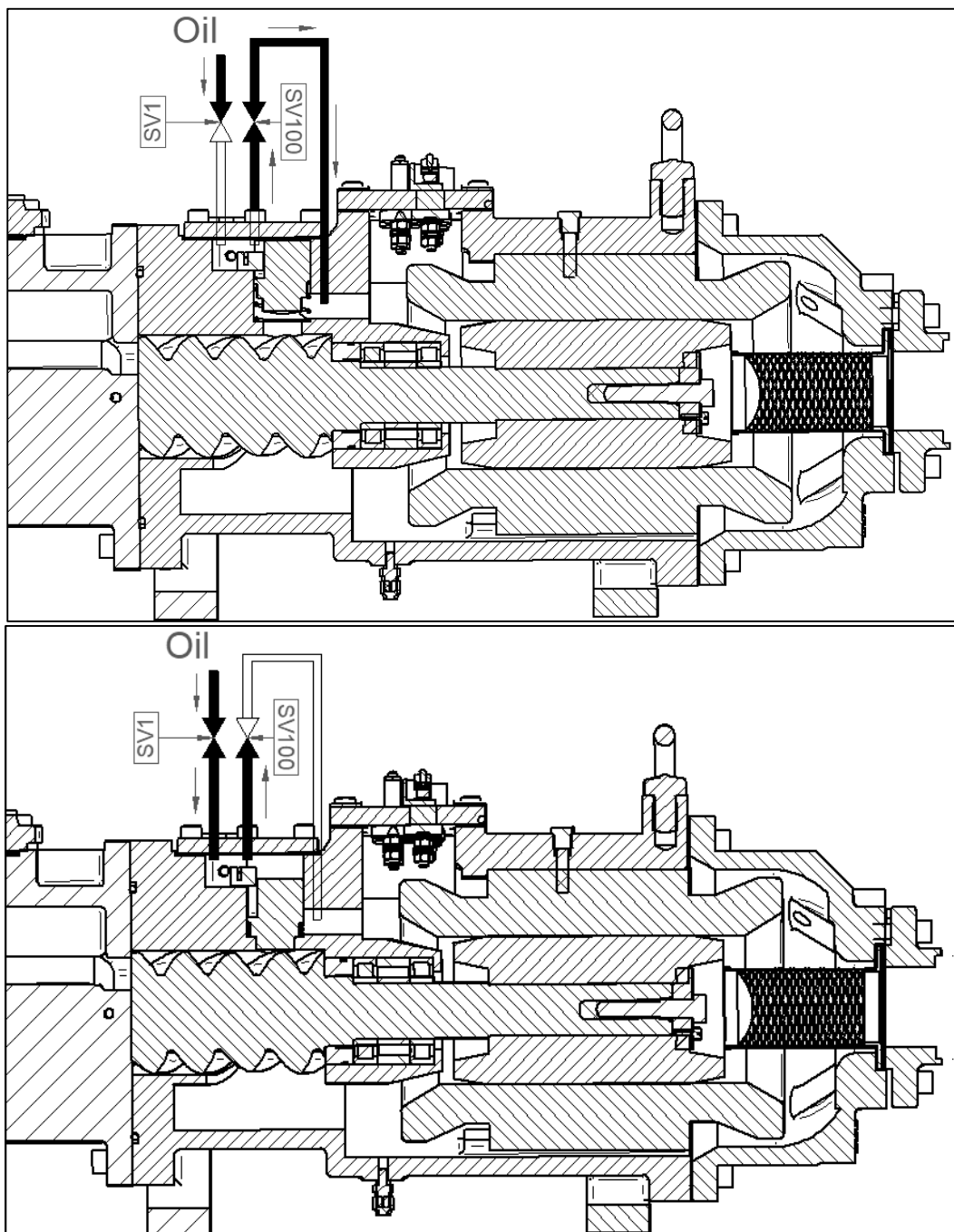
ON: energize, OFF: de-energize

### 2.2.1 二段式容調

壓縮機在起動時，必須使負載降到最低才容易起動。所以 SV1 和 SV100 電磁閥需作動進行調整控制，油直接傍通回到低壓側，此時柱塞旁通最大負載只有 50%，待起動完成後，壓縮機才可以載入 100%，此時 SV1 和 SV100 電磁閥均不通電。

### 2.2.1 Startup: 50% loading

It is easier to start up the compressor when loading is under minimized status. Therefore, SV1 and SV100 solenoid valves are energized, the lubricant will be bypassed to the low pressure side directly. At the same time, the maximum loading of plunger bypass is 50%, when the process of start-up is completed, the loading of compressor can be uploaded to 100%. The SV1 and SV100 are not energized.



## II.螺旋式冷媒壓縮機規範

## II. Screw refrigerant compressor specification

### 1.產品規範

### 1.Product specification

系列 Series		SRT						
機型 Model		218	314	321	324	413	415	
基本規格 Specification	1st 排氣量 (50Hz) displacement	m3/hr	120	222	320	430	530	630
	2nd 排氣量 (50Hz) displacement	m3/hr	50	106	143	167	210	250
	1st 排氣量 (60Hz) displacement	m3/hr	144	267	384	516	636	756
	2nd 排氣量 (60Hz) displacement	m3/hr	60	127	172	200	252	300
	轉速 speed	rpm	2950 / 3550 for 50/60 Hz					
	容調調節 Capacity	%	50%、100%	三段容調 (25 / 50 / 100) 或 無段容調 (25~100) Step control (25 / 50 / 100) or linear control (25~100)				
	冷媒 Refrigerant	-	R-22 / R-404A / R-507					
馬達 Motor	型式 Type	-	三相, 兩極, 感應馬達 3 phases, 2 poles, Induction motor					
	電源 Voltage	-	380~415V, 50Hz / 220, 380, 440, 460V, 60Hz			380~415V, 50Hz / 380, 440, 460V, 60Hz		
	啟動方式 Start-up	-	Y-Δ啟動或直接啟動 Y-Δ start-up or direct-on-line start-up					
	保護裝置 Protection Device	-	供電欠相, 逆相保護及馬達高溫保護 phase loss, phase sequence, and motor PTC thermistor					
吸氣口尺寸 Dimension of suction port	Inch (mm)	2-5/8 ( 66.67 )	2-5/8 ( 66.67 )	4 ( 101.60 )	4 ( 101.60 )	4 ( 101.60 )	4 ( 101.60 )	
排氣口尺寸 Dimension of discharge port	Inch (mm)	1-5/8 ( 41.27 )	1-5/8 ( 41.27 )	2-5/8 ( 66.67 )	2-5/8 ( 66.67 )	3-1/8 (79.37)	3-1/8 (79.37)	
液壓試驗 Hydraulic test	bar (G)	31						
重量 Weight	kg	260	405	570	610	860	930	

## 2. 安裝與試俾規範

### 2.1 壓縮機安裝

#### 2.1.1 運送

請用安全鋼索勾著壓縮機機殼上方之環首螺栓與油氣桶上之吊孔；或利用二條安全吊帶，環繞壓縮機機體，而將其吊起安裝。搬運或吊運途中請勿碰撞壓縮機機體，尤其是機體上所安裝之零組件(例如：輸油銅管、電磁閥、洩油閥、銅接頭、接線盒組等)，並保持水平，嚴禁重落地。

#### 2.1.2 安裝

請安裝合適材質之防震腳墊(5~10mm)於壓縮機腳座之上下兩側，以阻絕壓縮機振動與噪音之傳遞。其固定螺栓需鎖緊至防震腳墊變形為止。

避免放置于通風不良、高濕度、高熱度的地方，並預留日後保養與維修之服務空間。

## 2. INSTALLATION AND COMMISSION SPECIFICATION

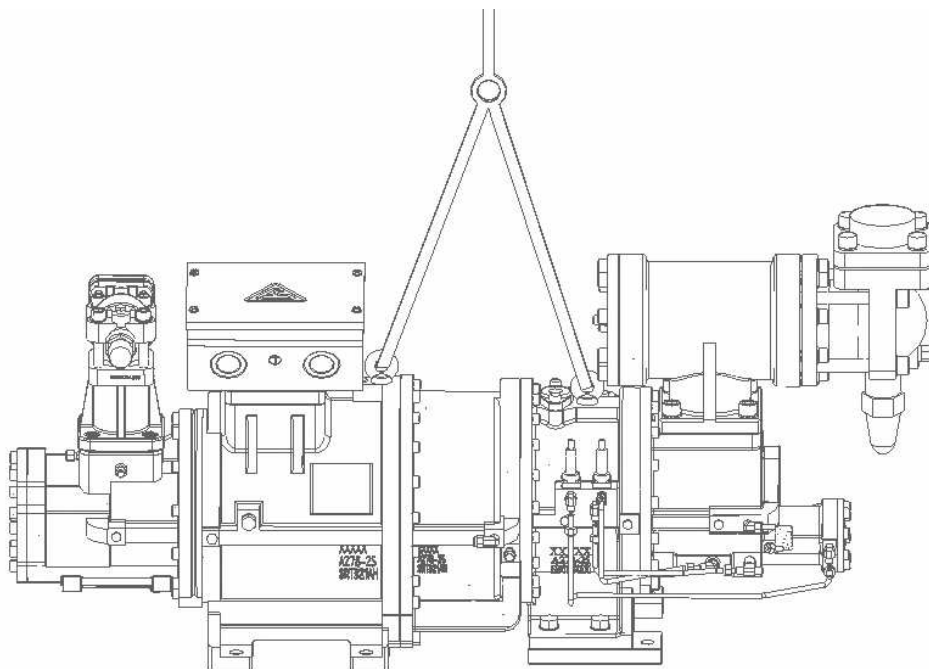
### 2.1 Installation of the compressor

#### 2.1.1 Delivery :

Use eyebolts attached to compressor body or two safety belts to wrap around the compressor body and hoist it up. Use caution to prevent damage to the compressor body during the transporting or hoisting process especially those parts assembled on the compressor (ex. copper oil tube, solenoid valves, draining valve, copper connectors, and terminal box, etc.) Keep the compressor body level and avoid severe ground impact.

#### 2.1.2 Installation :

Install suitable anti-vibration pads (5-10mm) between the compressor seats to block out vibration and noise generated by the compressor. The fixed bolt must be screwed until the upper rubber deformed. Keep compressor in a well-ventilated, low humidity, low heat environment with plenty of space for maintenance and service.



### 2.1.3 開封洩壓：

安裝相關之零附件時，請先行利用吸入端止回接頭將壓縮機內部充填之氮氣(0.5 bar)排出後，再進行下一步之安裝動作。

### 2.1.4 更換油品

若需更換油品請使用復盛壓縮機專用油品，並請將壓縮機內部所有潤滑油清理乾淨再添入新油，切記不可二種不同品牌之油品混合使用。若須使用特殊油品，請與復盛經銷商或服務人員連繫。

更換新油品後，請啟動油加熱器加熱抽真空。此外，合成油具有強烈的吸濕性，故開封後請勿使油品直接暴露在大氣中。

### 2.1.5 配管：

管路焊接部位，至少須承受 30 bar 以上之壓力測試，並於焊接後確實清理焊渣，以避免異物吸入壓縮機內，造成壓縮機損壞。

### 2.1.3 Release the sealed Nitrogen：

Before installing parts, open the check adaptor at the suction end to release the Nitrogen charged inside the compressor (0.5 bar) first.

### 2.1.4 Use of other lubricant oil

It is necessary to use Fu Sheng specified oil when replacing the compressor oil. Emptying and cleaning the interior of compressor completely is a must before adding new oil. Do not mix different brands of oil. Contact a FuSheng service representative before using any other special oil.

After oil change, turn on oil heater to heat and vacuum. In addition, be sure not to expose the unsealed barrel of synthetic oil to the environment.

### 2.1.5 Piping：

The welded parts of pipes must withstand pressure over 30 bar. Be sure to remove all the slag after welding to avoid any foreign objects from entering compressor and causing damages.

### 2.1.6 系統雜質與水份含量限制：

冷媒系統中各種雜質的含量直接與壓縮機的效率與運轉壽命有關。因此降低系統內不凝結氣體含量是十分重要的。水份在冷媒系統中易造成凍結阻塞、生鏽、破壞馬達線圈絕緣及鍍銅等現象。冷媒管路過長時必須考慮抽真空的位置，以達到相同的抽真空效率；冷媒管路中的乾燥劑與水份指示劑必要時，務須適時更換，以減少冷媒管路中水份的含量；雜質容許量，以壓縮機吸入口過濾網之壓降為基準，前後壓差不得大於 30 kpa (約 4.3 psi)。當壓差過大，則表示過濾器有過多異物，須拆下濾清器清洗。機組完成試車後，可量測進氣過濾網前後端之壓降，以確認熱交換器銅管及冷媒管路上相關零組件之清潔度。

### 2.1.6 Impurity limitation in system :

Contaminants in the refrigerant system will affect the lifetime and efficiency of the compressor. It is crucial to reduce non-condensed gas content in the refrigerant system. Moisture mixed with refrigerant can freeze and block the pipe line, causing rust to components, and damages the winding insulation generates copper coating on the rotors. If the refrigerant pipeline is long, it is essential to vacuum the system by connecting pipes to vacuum machine from different part of the chiller unit in order to reach the required vacuum level. It is also important to change the dryer-filter and moisture indicator in the refrigerant pipeline regularly to reduce the moisture concentration within the pipeline. The contaminants can block the suction filter and cause pressure drop over the filter. When the  $\Delta P$  of suction filter is greater than 30 kpa ( 4.3 psi) it means the filter is clogged by foreign particles and needs to be cleaned right away. Right after the compressor is installed and commissioned, it is recommended to measure the  $\Delta P$  of the suction filter to ensure the cleanness of copper tubes in heat exchanger and parts in refrigerant pipeline.



## 2.2 運轉前注意事項

### 2.2.1 壓縮機：

- 每一手動閥(冷卻水、滷水之出入口閥及冷媒側之進出口關斷閥)是否皆已開啟？
- 馬達線圈與排氣溫度保護開關之接線確實連接且並無作動？

### 2.2.2 電氣系統

- 壓縮機之主電源與控制電源之電壓與頻率是否正確？
- 馬達端子相間與對地之絕緣值是否  $10M\Omega$  以上？

#### 注意：

- a. 開始抽真空後直到冷媒充填完成之前，切勿量測絕緣。
  - b. 新機冷媒充填完成後絕緣量測至少有  $10M\Omega$  ( DC500V ) 以上，否則應確認是否有抽真空程序不良、冷媒含水量過高、洩漏等因素，並進行矯正。
  - c. 馬達溫度保護接點請以 DC2.5V 量測絕緣，切勿使用高阻計。
- 馬達端子與接地線是否固定確實？
  - 各項控制器之設定值是否正確？

## 2.2 Items to be checked before startup

### 2.2.1 Compressor：

- Check to ensure all manual valves (service valves for the inlet/outlet cooling water, brine and refrigerant pipe) have been opened.
- Check to ensure power cables to compressor motor and discharge temperature switch have been connected firmly.

### 2.2.2 Electrical system

- Check to ensure power cables to compressor motor and discharge temperature switch have been connected firmly.
- Check to ensure insulation resistances of phase to phase and phase to ground are higher than  $10M\Omega$ .

#### Warning:

- a. Do not measure the insulation between the period of starting vacuum process and the completion of refrigerant fill-up.
  - b. After the refrigerant fill-up is accomplished, the measured insulation shall be no less than  $10M\Omega$  ( measured by DC500V ) ; Otherwise it is necessary to verify if the system has been vacuumed to the required level, if moisture concentration is too high in refrigerant or if piping is leaking then take corrective action to solve the problem.
  - c. Use DC2.5V ohm meter to measure the insulation of motor protection device (PTC thermistor). It cannot be measured by a mega ohmmeter.
- Check to ensure the motor ground wire and terminal wires have been connected tightly.
  - Check to ensure the controller settings are correct.

### 2.2.3 管路系統

- 吸排氣端之配件與管路焊接處是否有洩漏？

### 2.2.4 抽真空注意事項：

- 儘可能使用大口徑接管抽真空。
- 高低壓兩側同時抽真空。
- 冬天或低溫地區抽真空時，儘可能提高周邊溫度以確保效果。
- 抽真空期間，絕對不得測量馬達絕緣，可能造成馬達線圈嚴重損壞。

### 2.2.3 Piping system

- Check for leaks from welded piping or accessories connected to pipelines of suction /discharge ends.

### 2.2.4 Notice when vacuuming system :

- Use largest pipe available to vacuum the system.
- Vacuum system on both suction and discharge ends.
- Elevate the surrounding temperature while vacuuming the system in winter or cold region.
- Do not measure motor insulation during the vacuuming process. It might severely damage the motor winding.

## 2.3 運轉中注意事項

- 啟動後確認轉向，注意吸氣壓力為下降、排氣壓力為上升，否則應立即關機，且變換馬達相序後再開機。
- 運轉中若有異常之振動及噪音出現，請立即停機，並與復盛維修單位聯繫。
- 壓縮機運轉過熱度最佳範圍在：  
10°C±2°C
- 過熱度太大或太小皆有不良影響。系統初啟動時可能因負載大而過熱太大，造成壓縮機馬達線圈溫度保護開關作動而停機。
- 過熱度不足，可能造成轉子液壓縮而損壞壓縮機。並且造成失油狀況，影響潤滑軸承之功能。
- 在濕度較高地區，壓縮機應用於低溫系統時，電氣接頭如有水份凝結而影響電氣安全時，請於端子接頭加附絕緣絕熱樹脂，以避免因環境露水造成相間電氣短路。
- 在低環境溫度下運轉，為確保最低壓力差在 5 bar 以上，建議採取下列方式因應：

## 2.3 Notices in operation

- Confirm the rotation direction right after the startup. Make sure that the suction pressure drops down and discharge pressure rises up gradually. Otherwise shut down the compressor immediately, change the phase sequence and then turn on compressor again.
- If any abnormal vibration or noise is detected during the operation, shut down the compressor immediately and contact Fu Sheng service representative.
- The recommended overheat range of compressor is 10°C±2°C
- Any superheat beyond the range could cause damage to the compressor. The overheating might become too high while compressor starts under heavy initial loading. And the high superheat could cause the motor protection device to trip off the compressor.
- Insufficient overheat could cause liquid compression and result in the damage of compressor. It can also cause low oil level in the compressor, which leads to insufficient lubrication to bearings.
- While the compressor is running in refrigeration system or located in a high-humidity region, it is very possible to find condensed water on the motor terminals that might cause electric shock to an individual. Applying insulation resin to the motor terminals can isolate the condensed water and eliminate possible shock or short-circuit.
- While running compressor in low temperature environment, the following actions are recommended to keep the

- 用壓力開關控制冷凝器散熱風扇之啟動與停止。
- 在壓縮機及冷凝器之間，加裝壓力維持閥。

minimum pressure difference between discharge and suction ends above 5 bar:

- Use pressure switch to control the start/stop state of condenser cooling fan.
- Add a pressure-maintaining valve between the compressor and condenser.

#### 2.4 初期運轉注意事項

建議機組廠商于廠內試車前，必要時於壓縮機吸入口前加裝前置過濾器，試車測試 2~4 小時後，再將其過濾器、進氣過濾器與機油過濾器拆下清洗，清除管路與蒸發器中之焊渣與異物，以避免吸入端壓降過大而破壞濾清器，造成馬達燒毀、轉子、軸承損壞、或滑塊作動不良等現象。

#### 2.4 Notices during factory test

It is recommended to install an extra filter on the suction end of compressor for factory test purpose. Remove and clean this filter, suction filter and oil filter after the compressor has run for 2 ~ 4 hours. Clean - the pipeline and evaporator. If welding slag or other particles exist in system, they might be carried back to the suction filter and block it in consequence. Eventually, the suction filter could be broken due to high pressure drop and then the foreign particles can enter compressor freely and damage the motor, bearings, or slider etc.

#### 2.5 壓縮機啟動/停機控制建議：

- 空重車設定溫度建議以滷水或熱水回水溫度為基準，運轉較穩定。
- 壓縮機每次到達設定溫度停機前務必以 25% 負載運轉 20~30 秒，確保下次啟動時滑塊在最低負載位置。

#### 2.5 Recommended control sequence of compressor start/stop

- It is recommended to use returned brine or hot water temperature as the basis of controlling loading/unloading in order to maintain stable operation.
- Before each shutdown, it is necessary to run the compressor at 25% loading for 20 ~ 30 seconds in order to ensure that the slider is brought back to its initial position for next start.

### 3. 運轉規範

#### 3.1 運轉範圍

- 容許操作環境：-10~55°C
- 容許操作壓力(表壓)：  
最高吸氣壓力：  
R-22/R-404A/R-507: 7 bar.  
最高排氣壓力：  
R-22/R-404A/R-507: 25bar
- 容許最高排氣溫度：110°C

#### 3.2 運轉限制

- 開機、停機頻率：停機後須待 10 分鐘後，才可再行開機。
- 每小時馬達之啟動次數不得超過六次。
- 每次開機運轉時間至少五分鐘以上。
- 壓縮機停止運轉前，需啟動 SV0、SV1 和 SV100 電磁閥，並維持洩載運轉 20~30 秒，以確保再次啟動時，壓縮機在最低負載狀況下啟動。壓縮機停止運轉後，須將機油加熱器保持通電持續加熱冷凍油，以待壓縮機的再次運轉。

#### 3.3 運轉電源

- 容許電壓範圍：額定電壓±10%
- 容許頻率範圍：額定頻率±2%
- 容許三相電壓不平衡量：±2.25%
- 容許三相電流不平衡量：±5%

### 3. OPERATION SPECIFICATION

#### 3.1 Operation range

- Allowable ambient temperature: -10~55°C
- Allowable operating pressure (gauge) :  
The maximum suction pressure :  
R-22/R-404A/R-507: 7 bar ;  
The maximum discharge pressure:  
R-22/R-404A/R507: 25bar;
- The maximum allowable discharge temperature : 110°C

#### 3.2 Operation limitation

- The start-up/stop cycle: restart the compressor at least 10 minutes after it is shut down.
- The motor start-up/stop frequency shall not exceed six times per hour.
- The minimum operating time after each startup shall be no less than five minutes.
- Before stopping the compressor, energize the SV0、SV1 and SV100 solenoid valves for 25% loading to unload the capacity for 20-30 seconds to move the slider back to its initial position for the next startup. This guarantees that compressor can restart in the minimum loading state. After compressor is shut down, energize the oil-heater to keep on heating the refrigeration oil and make compressor under standby condition for next start-up.

#### 3.3 Power supply

- Voltage variation: ±10% of rated voltage.
- Frequency variation: ±2% of rated frequency.
- Voltage unbalance between phases: ±2.25%.
- Current unbalance between phases: ±5%.

### 3.4 運轉安全裝置

建議使用以下基本安全裝置，以確保系統對壓縮機的運轉保護。

### 3.4 Safety devices in operation

The safety devices are the minimum requirements applied to protect compressor in operation.

項目 Item	安全裝置 Safety devices	建議設定值 Recommended setting
1	油位開關 Oil level switch	連續 15~30sec 呈現低油位時，強制壓縮機停機檢查低油位之原因。 Time-relay setting: 15 ~ 30seconds. If low-oil-level continuously exists for 15-30 sec, compressor will automatically shut down. Check the reason for such problem.
2	馬達線圈保護(搭配 PTC 溫度保護控制模組) Motor winding protection (connected to PTC temperature control module)	跳脫溫度：130±5°C； 復歸溫度：110±5°C。 Trip temperature: 130±5°C； Reset temperature: 110±5°C.
3	排氣高溫保護(搭配 PTC 溫度控制模組) High discharge-temperature protection (connected to PTC temperature control module)	跳脫溫度：110±5°C； 復歸溫度：90±5°C Trip temperature: 110±5°C； Reset temperature: 90±5°C.
4	逆相保護器，欠相保護器 Phase sequence protector, phase loss protector	電器接線圖參考第四章說明。 Electric wiring configuration is showed at Section 4.
5	高、低壓開關 High/low pressure switch	壓縮機排氣最高運轉壓力不得高於 25bar。 The maximum discharge pressure shall not exceed 25bar.
6	過電流保護電驛 Over-current protection relay	運轉電流可由性能曲線表查得機組允許操作狀態下的最大電流決定。設計機組運轉範圍請參考壓縮機允許運轉範圍。 The setting value can be determined from the maximum current indicated in the performance data under allowable operation range. Refer to performance data manual.
7	油過濾器壓差保護開關 Pressure differential protection switch at oil filter.	壓差設定: 0.5 bar. Pressure difference setting: 0.5 bar.
8	最低運轉高低壓差 Minimum pressure difference between discharge and suction ends in operation.	5 bar
9	外置式安全閥 Relief valve	壓縮機排氣壓力高於 28bar.須有最後的安全保護。 The maximum pressure of relief valve shall not exceed 28bar.

## 4. 電氣規範

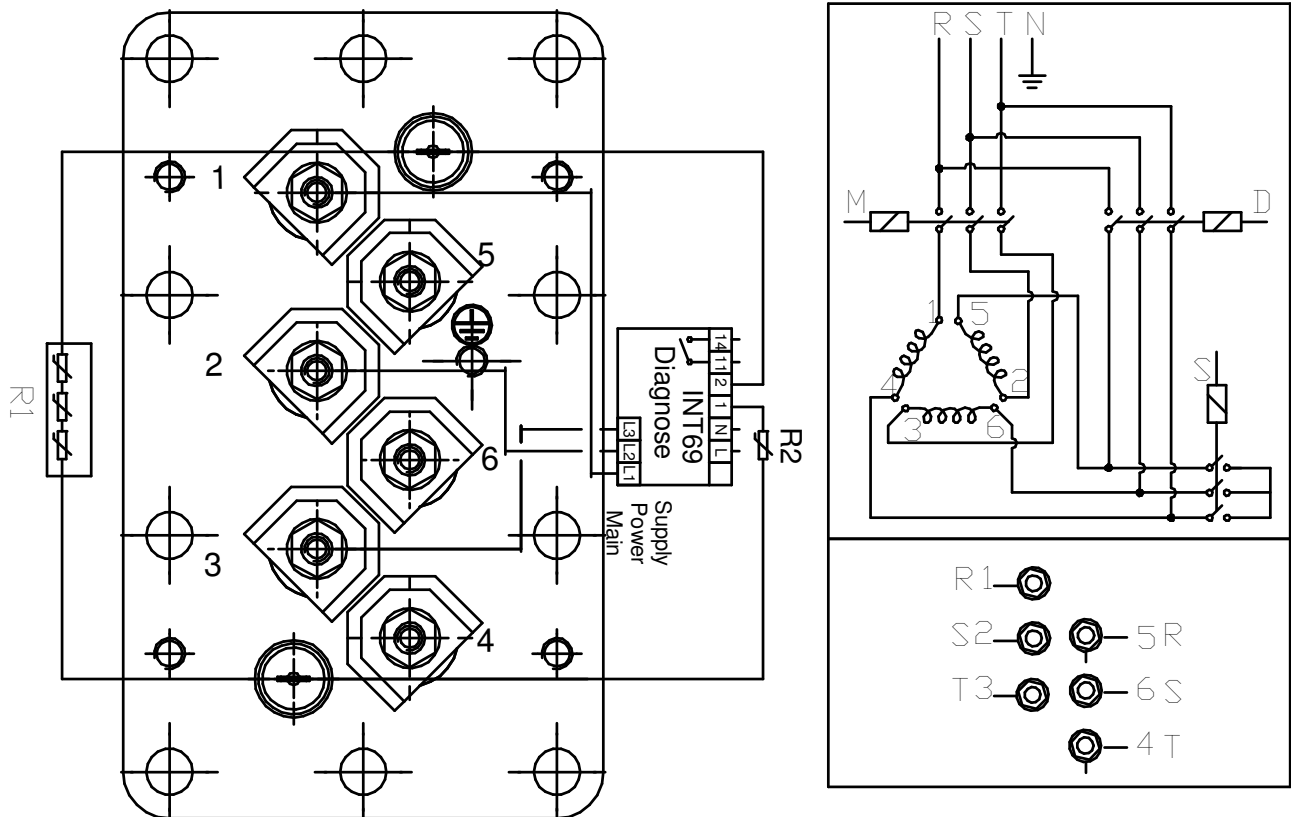
### 4.1 電氣結線方式

型號 Model: SRT218/314/321/324

## 4. ELECTRIC SPECIFICATION

### 4.1 Electric wiring configuration

Y - Δ啟動 startup



◆ 符號說明 Legend:

R.S.T	主電源	Main power supply
M	主電磁接觸器	Main contactor
S	啟動電磁接觸器	Start contactor
D	運轉電磁接觸器	Run contactor
11/14:	保護回路	Protection circuit
1 / 2 :	熱敏電阻接點	Thermistor contact
L/N:	控制電源接點	Power supply 230V(115V) - 50Hz/ 60Hz
L1-L2-L3:	電源欠逆相監視接點	Phase sequence / loss monitoring contact
R1:	馬達高溫熱敏電阻	Motor thermistor
R2:	排氣高溫熱敏電阻	Discharge temperature thermistor

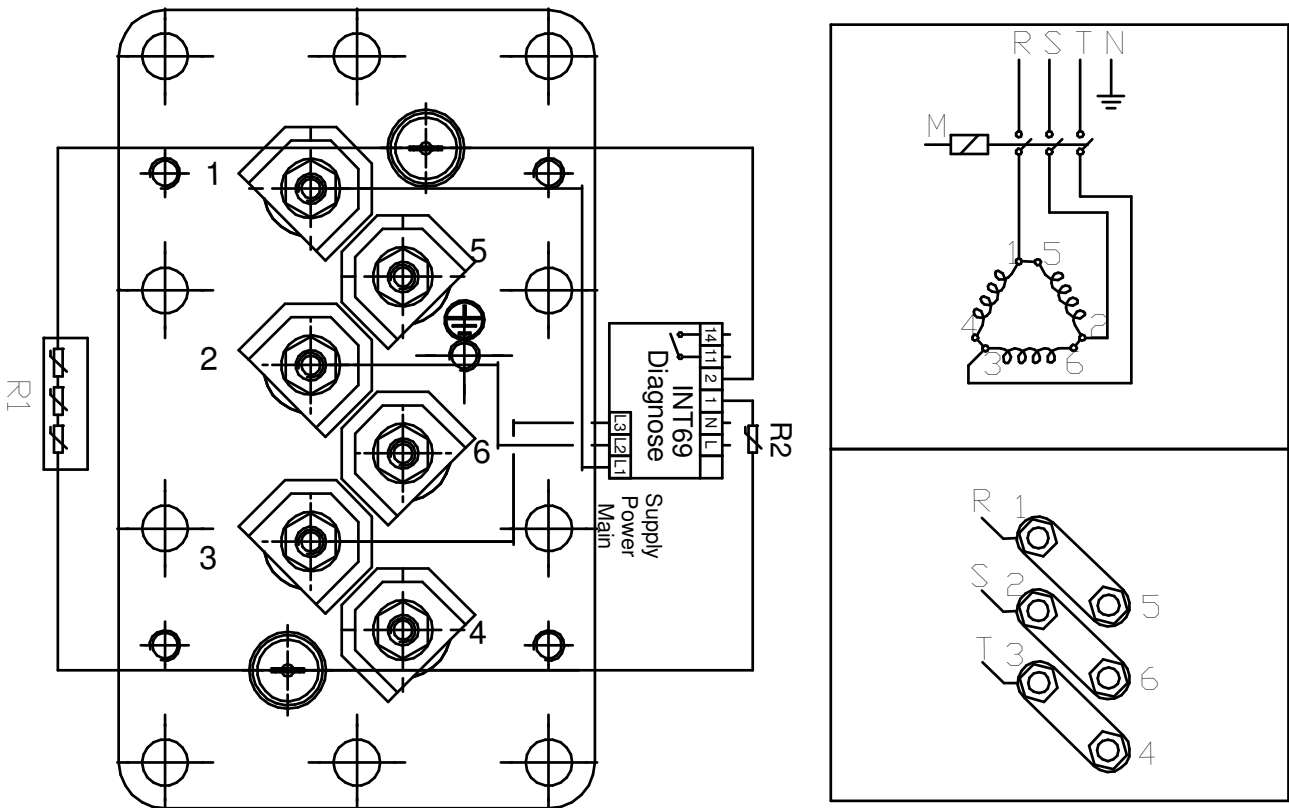


注意 Caution:

導柱銅螺帽最大容許鎖緊扭力: 20 N-m

The maximum allowed torque of terminal nuts: 20 N-m

直接啟動 Direct on line



◆ 符號說明 Legend:

R.S.T	主電源	Main power supply
M	主電磁接觸器	Main contactors
11/14	保護回路	Protection circuit
1 / 2	熱敏電阻接點	Thermistor contact
L/N	控制電源接點	Power supply 230V(115V) - 50Hz/ 60Hz
L1-L2-L3	電源欠逆相監視接點	Phase sequence / loss monitoring contact
R1	馬達高溫熱敏電阻	Motor thermistor
R2	排氣高溫熱敏電阻	Discharge temperature thermistor
PS	INT69 無 L1/L2/L3 接點	PS : INT69 without L1/L2/L3



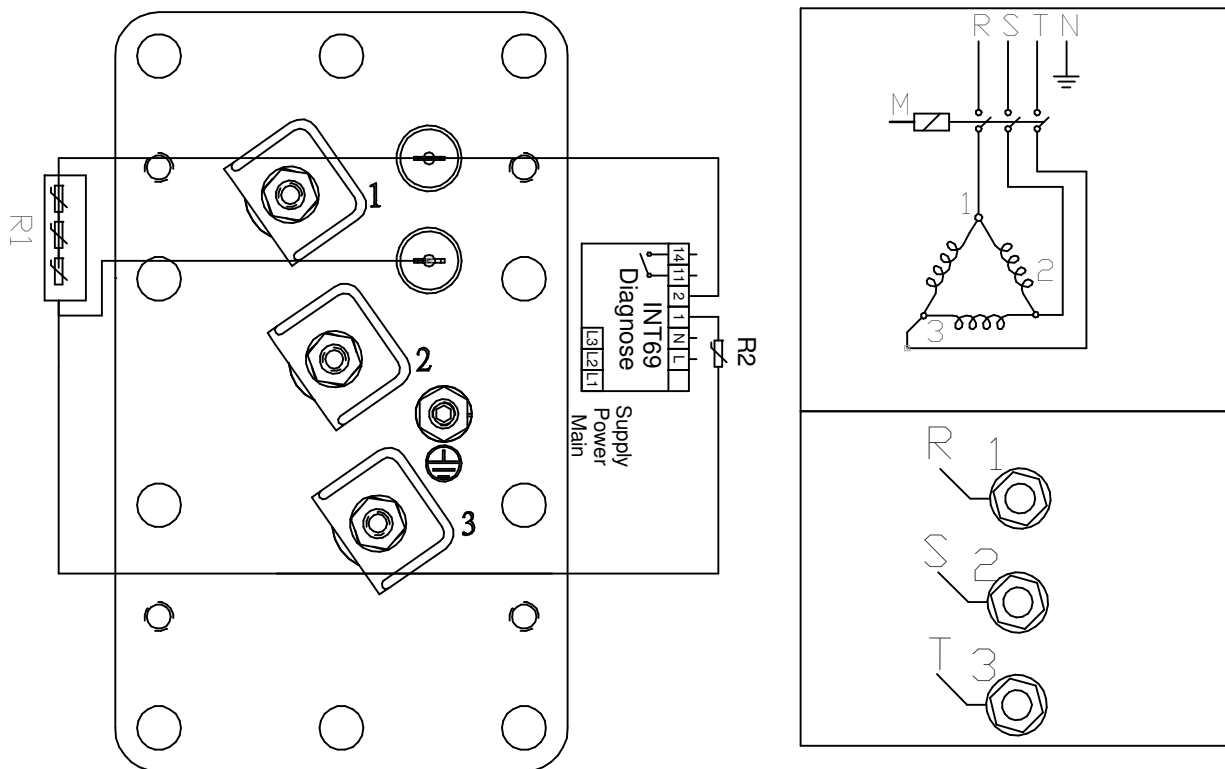
注意 Caution:

導柱銅螺帽最大容許鎖緊扭力: 20 N-m

The maximum allowed torque of terminal nuts: 20 N-m



直接啟動 Direct on line



◆ 符號說明 Legend:

R.S.T	主電源	Main power supply
M	主電磁接觸器	Main contactors
11/14	保護回路	Protection circuit
1 / 2	熱敏電阻接點	Thermistor contact
L/N	控制電源接點	Power supply 230V(115V) - 50Hz/ 60Hz
L1-L2-L3	電源欠逆相監視接點	Phase sequence / loss monitoring contact
R1	馬達高溫熱敏電阻	Motor thermistor
R2	排氣高溫熱敏電阻	Discharge temperature thermistor
PS	INT69 無 L1/L2/L3 接點	PS : INT69 without L1/L2/L3

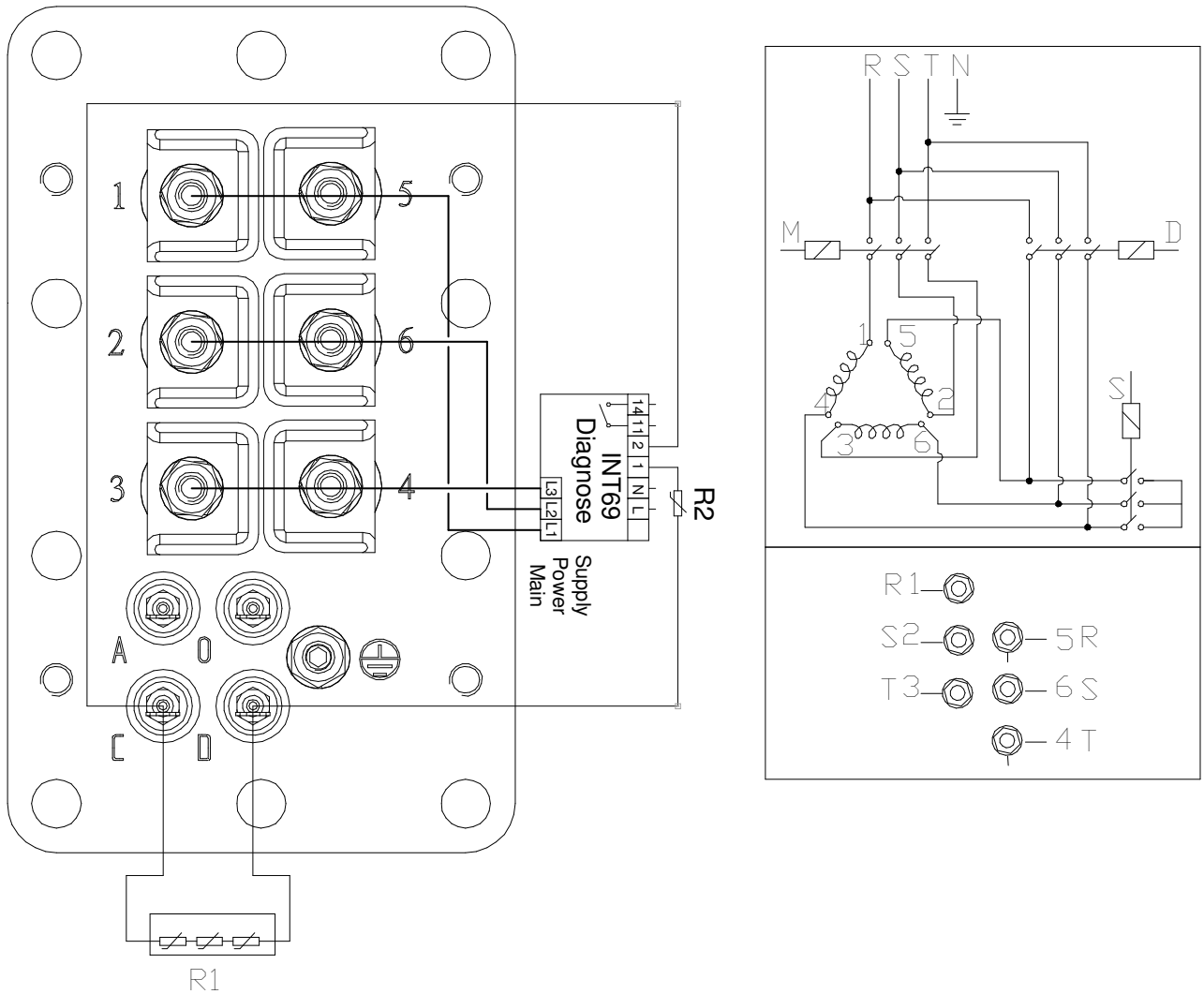


注意 Caution:

導柱銅螺帽最大容許鎖緊扭力: 20 N-m

The maximum allowed torque of terminal nuts: 20 N-m

Y - Δ啟動 startup



◆ 符號說明 Legend:

R.S.T	主電源	Main power supply
M	主電磁接觸器	Main contactor
S	啟動電磁接觸器	Start contactor
D	運轉電磁接觸器	Run contactor
11/14:	保護回路	Protection circuit
1 / 2 :	熱敏電阻接點	Thermistor contact
L/N:	控制電源接點	Power supply 230V(115V) - 50Hz/ 60Hz
L1-L2-L3:	電源欠逆相監視接點	Phase sequence / loss monitoring contact
R1:	馬達高溫熱敏電阻	Motor thermistor
R2:	排氣高溫熱敏電阻	Discharge temperature thermistor
PT100	電機溫度監控	PT100 : A-O

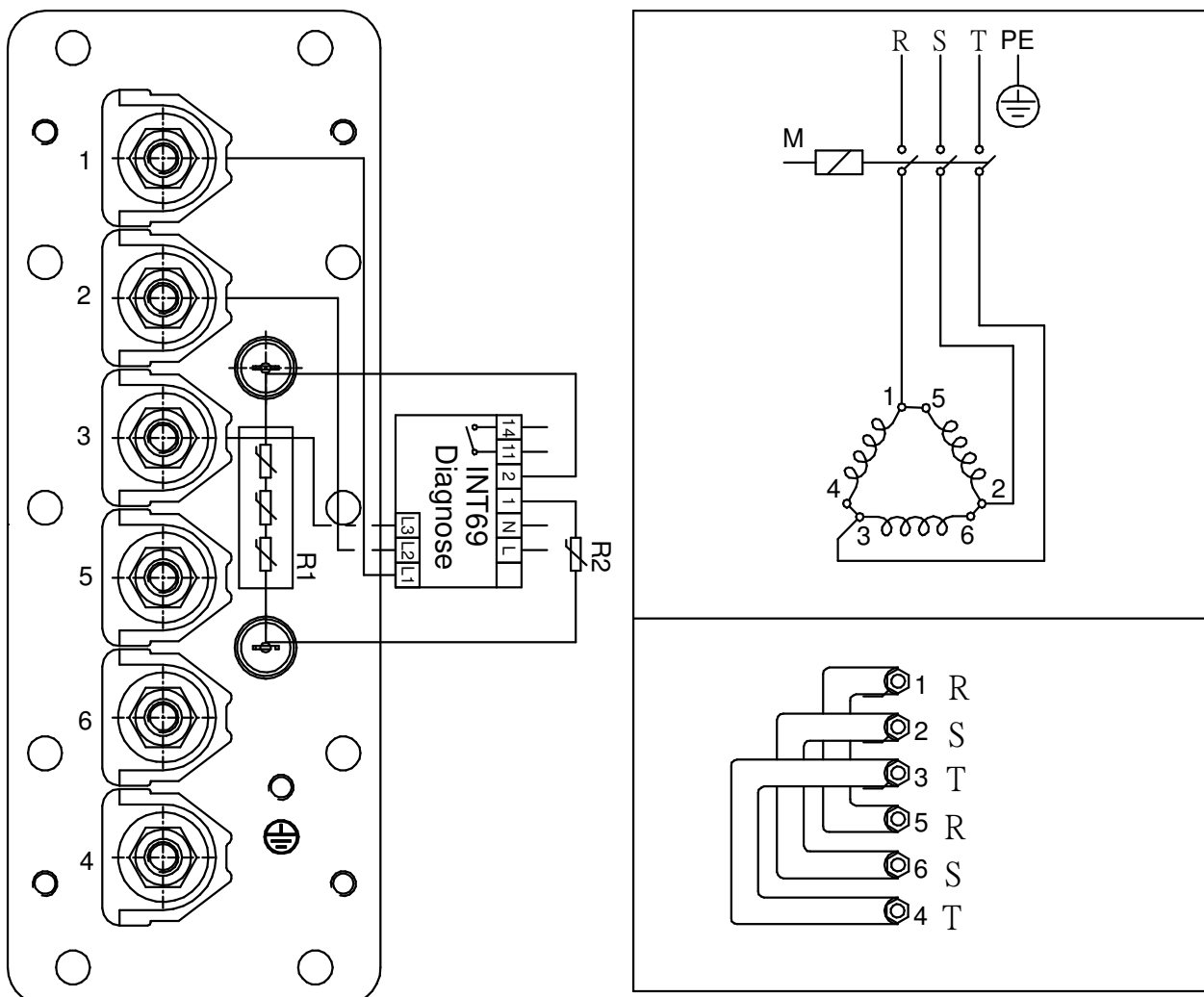


注意 Caution:

導柱銅螺帽最大容許鎖緊扭力: 20 N-m

The maximum allowed torque of terminal nuts: 20 N-m

直接啟動 Direct on line



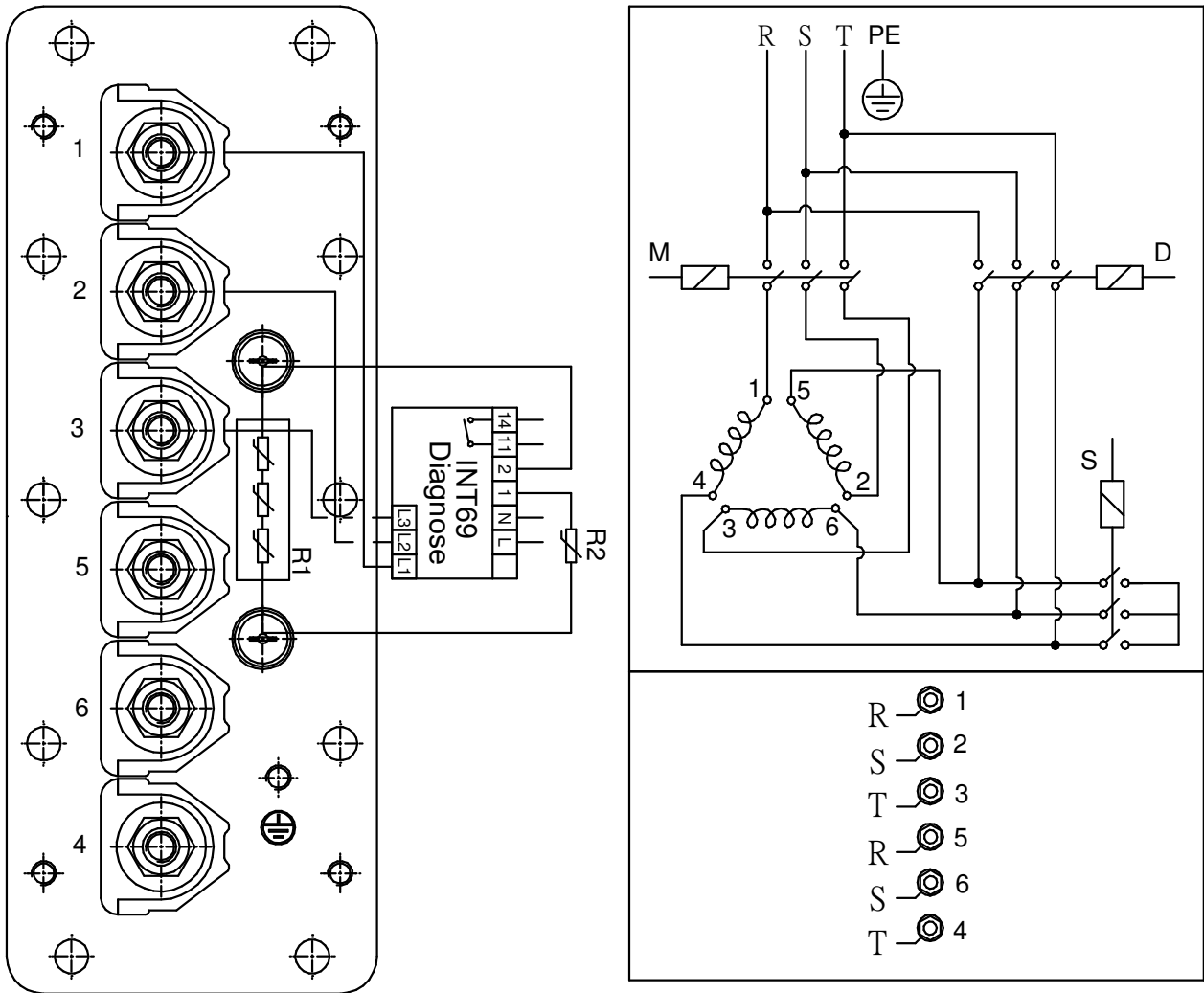
◆ 符號說明 Legend:

R.S.T	主電源	Main power supply
M	主電磁接觸器	Main contactors
11/14:	保護回路(NO)	Protection circuit(NO)
11/12:	保護回路(NC)	Protection circuit(NC)
1/ 2 :	熱敏電阻接點	Thermistor contact
L/N:	控制電源接點	Power supply 230V(115V) - 50Hz/ 60Hz
R1:	馬達高溫熱敏電阻	Motor thermistor
R2:	排氣高溫熱敏電阻	Discharge temperature thermistor
PS :	INT69 無 L1/L2/L3 接點	PS : INT69 without L1/L2/L3



注意 Caution:  
 導柱銅螺帽最大容許鎖緊扭力: 32 N-m  
 The maximum allowed torque of terminal nuts: 32 N-m

Y - Δ啟動 startup(INT69FSY Diagnose)



◆ 符號說明 Legend:

R.S.T	主電源	Main power supply
M	主電磁接觸器	Main contactor
S	啟動電磁接觸器	Start contactor
D	運轉電磁接觸器	Run contactor
11/14:	保護回路	Protection circuit
1/ 2 :	熱敏電阻接點	Thermistor contact
L/N:	控制電源接點	Power supply 230V(115V) - 50Hz/ 60Hz
L1-L2-L3:	電源欠逆相監視接點	Phase sequence / loss monitoring contact
R1:	馬達高溫熱敏電阻	Motor thermistor
R2:	排氣高溫熱敏電阻	Discharge temperature thermistor
PS :	INT69 無 L1/L2/L3 接點	INT69 without L1/L2/L3

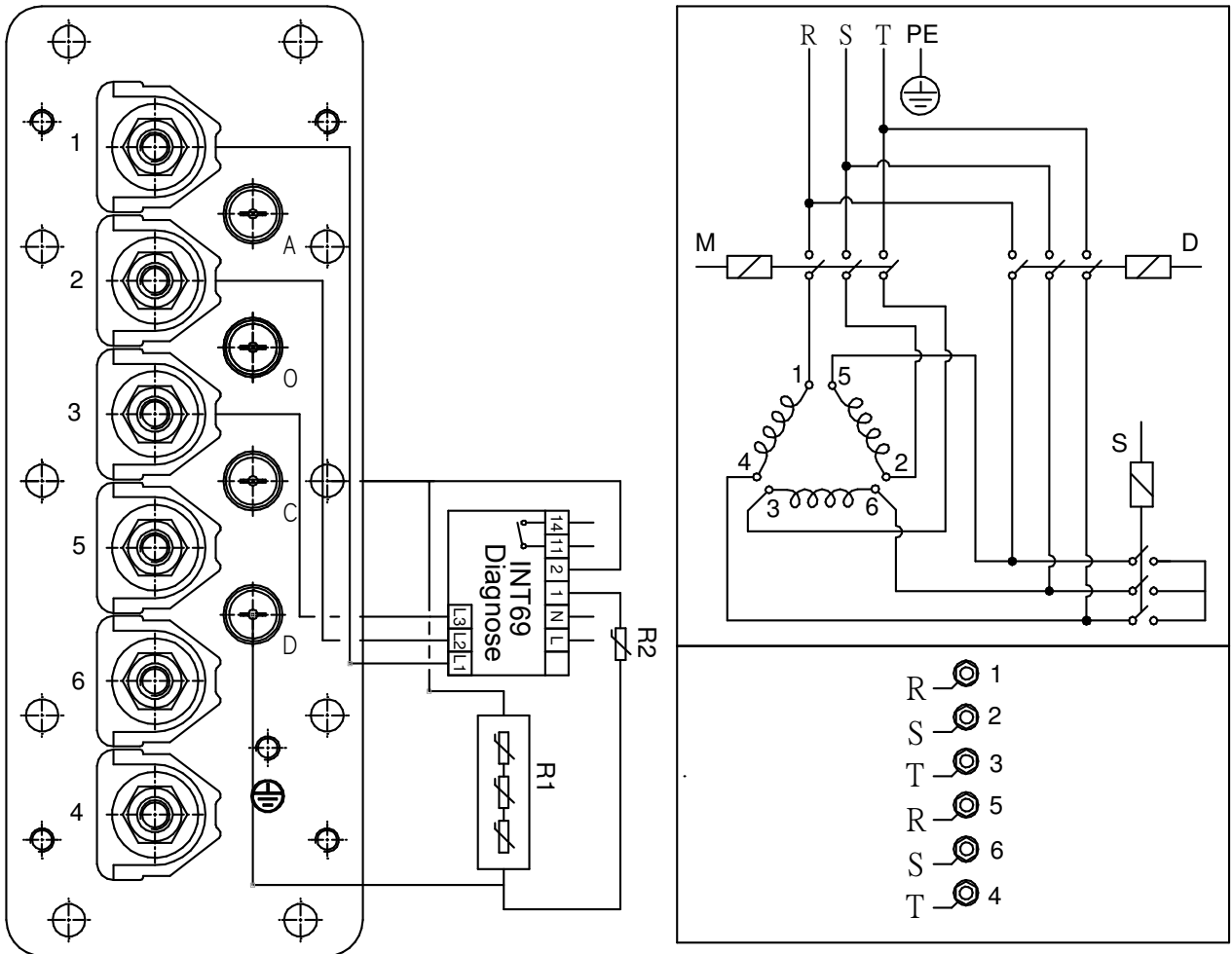


注意 Caution:

導柱銅螺帽最大容許鎖緊扭力: 32 N-m

The maximum allowed torque of terminal nuts: 32 N-m

### Y - Δ啟動 startup(INT69)



◆ 符號說明 Legend:

R.S.T	主電源	Main power supply
M	主電磁接觸器	Main contactor
S	啟動電磁接觸器	Start contactor
D	運轉電磁接觸器	Run contactor
11/14:	保護回路	Protection circuit
1 / 2 :	熱敏電阻接點	Thermistor contact
L/N:	控制電源接點	Power supply 230V(115V) - 50Hz/ 60Hz
L1-L2-L3:	電源欠逆相監視接點	Phase sequence / loss monitoring contact
R1:	馬達高溫熱敏電阻	Motor thermistor
R2:	排氣高溫熱敏電阻	Discharge temperature thermistor
PT100	電機溫度監控	PT100 : A-O



**注意 Caution:**

導柱銅螺帽最大容許鎖緊扭力: 32 N-m

The maximum allowed torque of terminal nuts: 32 N-m

INT69FSY Diagnose LED blink code: Fault signal (Red/Orange LED), Normal (Green LED)

INT69FSY Diagnose LED 閃爍燈號: 故障(LED 紅/橙燈); 正常(LED 綠燈)

Fault category	Blink impulse (long)	Blink impulse (short)	Fault description
PTC	1	1	Static(PTC>4.5 Ω)
		2	Dynamic(PTC>4.5 Ω)
		3	Static Time delay active(PTC<Rreset)
		4	Short/Open circuit
		5	Dynamic Time delay active(PTC<Rreset)
Phase monitoring	2	1	Phase sequence
		2	Phase loss
		4	Reset delay after” Motor voltage” error
故障種類	閃燈(長)	閃燈(短)	故障說明
PTC	1	1	靜態的(PTC>4.5 Ω)
		2	動態的(PTC>4.5 Ω)
		3	靜態的時間延遲(PTC<Rreset)
		4	線路短路 / 線路開路
相序監控	2	1	逆相
		2	欠相
		4	欠相保護後重新接通延遲

**Notes:**

1. Must remove the L1/L2/L3 connectors when check the Insulation Resistance of terminal.
2. Manual reset by removed terminal L/N over 10sec.

**注意：**

1. 使用高阻計量測馬達線間絕緣時，須將 L1,L2,L3 接線脫離 ( 1 , 2 , 3 ) 導柱

馬達保護器手動復歸，將 L/N 斷接 10 秒以上，  
再接回即可。建議配電線截面積 (Hypalon)

Recommended wire cross-  
section(Hypalon)

導線截面積 Wire cross-section area mm <sup>2</sup>	14	22	30	38	50	60	80	100	125	150	200	250	325
允許電流量 Allowable current Amp	105	140	180	210	250	290	350	410	480	520	630	720	840

註：以上導線數不包括中性線、接地線、控制線及訊號線等線路

Note: The conductors do not include the neutral wire, ground wire or signal wire.

#### 4.2 啟動程序

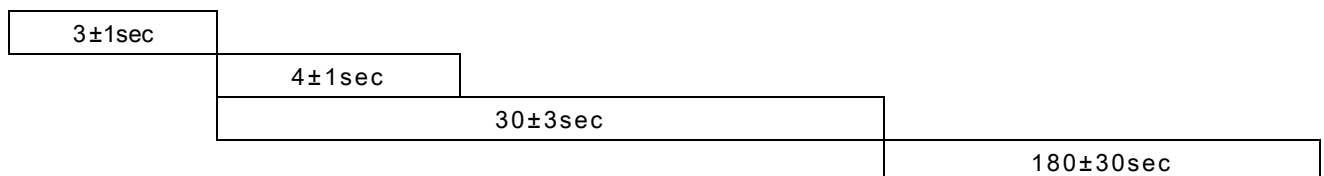
Y-Δ轉換時之電磁接觸器切換時間須控制在 40msec 以下，設定切換值時須注意電磁接觸器消弧能力。完成整個起動程式後，壓縮機載入須注意回水溫度。若季節變換，系統負載小，壓縮機直接加載至 100%易造成壓縮機起動次數頻繁而降低壓縮機壽命(參照 2.5 壓縮機啟動/停機控制建議)。

#### 4.2 Start-up sequence

While converting Y-Δ, the setting of magnetic contactor switchover time should be 40 ms or shorter. It is necessary to consider the electrical-arc eliminating capability when setting up the switchover time. After completing the entire starting process, keep an eye on the returned chilling water temperature. Low returned chilling water temperature means the system loading is lower than designed capacity. Under this circumstance, it would cause frequent startup and shorten compressor's operation lifetime if the compressor is running at full loading (100%) right after the startup. (Refer to Sec. 2.5: Recommended control sequence of compressor start/stop)

電磁閥啟動 (SV0、SV1 and SV100 energized)	Y 投入 Y operation	Δ運轉 Δ Operation	SV1、SV50 和 SV100 電磁閥啟動 SV1、SV50 or SV100 energized
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	25% loading	25% loading	50% loading
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#### 4.3 進相電容使用注意事項：

- 壓縮機起動完成後至少 0.5 秒，再連接進相電容。
- 功因補償上限為 0.95。
- 停機前一秒(至少)，先切離進相電容。
- 原則上進相電容僅在運轉中作用。

#### 4.4 無熔絲開關(NFB)之選用

無熔絲開關的選用主要考慮框架容量 AF(KVA)、額定跳脫電流 AT、額定電壓(V)三項電氣特性，低電壓配線器具建議選用標準，可將選用容量估算方式為：框架容量 AF 取大於起斷電流 AT 一等級之值。

額定跳脫電流 AT(A) = 起動電流乘率 (1.5~2.5) × 電動機額定電流

此外，當同一冷凍機組有多台壓縮機時不允許同時啟動壓縮機，而不同時序啟動之額定跳脫電流 AT 估算，建議低電壓配線器具選用標準，可將選用容量估算方式：

額定跳脫電流 AT(A) = 起動電流乘率 × 最大電動機額定電流 + 其餘電動機額定電流總和

#### 4.5 電磁接觸器 MC 之選用

電磁接觸器的選用除考慮使用電壓、控制電壓外，最重要的是考慮連續電流  $I_{th}$  之大小 (亦即接點承受之電流大小)，連續電流  $I_{th}$  的估算方式建議為  $I_{th} = \text{馬達額定電流} \times 1.25 / \sqrt{3}$ 。

#### 4.3 Notice when adopting capacitor:

- Connect phase-leading capacitor at least 0.5 sec after compressor starts up.
- The upper limit of power factor compensation is 0.95.
- Cut off the phase-leading capacitor at least one second before shutting down compressor.
- Basically the phase-leading capacitor is activated only while compressor is in operation.

#### 4.4 NFB selection

Selection of NFB is based on the Frame capacity AF and Interrupting Current AT(A). After the AT is decided, choose the next larger grade frame capacity AF.

AT(A) = starting current multiple factor (1.5-2.5) x motor rated current

It cannot support the start of two or more compressors concurrently in a multi-compressor package. To select the AT under different starting sequence, follow the formula:

AT(A) = starting current multiple factor x rated current of the largest motor + sum of all other motors' rated currents

#### 4.5 Magnetic contactor (MC) selection

Except the operation voltage and control voltage, the most important factor in MC selection is the scale of  $I_{th}$  (current flowing through the contacting point). The formula is:  $I_{th} = \text{motor's rated current} \times 1.25 / \sqrt{3}$ .



4.6 電氣資料

4.6 Electrical data

- 50Hz , R-22/R-404A,R507 water-cooled, models (SRT218/314/321/324/413/415)

系列 Series 機種 Model		SRT						
		218	314	321	324	413	415	
額定功率 Rated Power (kW)		21	40	57	77	95	113	
50Hz 380V	Y 接線堵住電流 Star -LRA (A)	73	137	224	331	459	506	
	Δ接線堵住電流 Delta -LRA (A)	236	438	717	1023	1437	1568	
	最大運轉電流 I <sub>max</sub> (A)	58	108	164	231	291	350	
	導線選用 Wire selected	需求安培容量 Maximum capacity(A)	42	78	118	167	210	253
		參考線徑 Nominal cross section(mm <sup>2</sup> )	14	14	22	30	50	80
	NFB AF		100	125	225	400	400	400
	NFB AT (A)		75	125	200	300	350	400
	M、D 接觸器電流 Magnetic contact current(A)		50	80	125	180	220	300
S 接觸器電流 Magnetic contact current(A)		35	50	80	100	125	150	
50Hz 400V	Y 接線堵住電流 Star -LRA (A)	68	137	213	314	422	493	
	Δ接線堵住電流 Delta -LRA (A)	207	410	670	956	1341	1529	
	最大運轉電流 I <sub>max</sub> (A)	55	103	157	223	277	333	
	導線選用 Wire selected	需求安培容量 Maximum capacity(A)	40	74	113	161	200	240
		參考線徑 Nominal cross section(mm <sup>2</sup> )	14	14	22	30	38	50
	NFB AF		100	125	225	250	400	400
	NFB AT (A)		75	125	175	250	350	400
	M、D 接觸器電流 Magnetic contact current(A)		50	100	125	180	220	300
S 接觸器電流 Magnetic contact current(A)		35	50	80	100	125	150	
50Hz 415V	Y 接線堵住電流 Star -LRA (A)	65	124	203	300	403	470	
	Δ接線堵住電流 Delta -LRA (A)	196	387	633	903	1266	1444	
	最大運轉電流 I <sub>max</sub> (A)	53	100	154	220	267	321	
	導線選用 Wire selected	需求安培容量 Maximum capacity(A)	38	72	111	159	193	232
		參考線徑 Nominal cross section(mm <sup>2</sup> )	14	14	22	30	38	50
	NFB AF		100	125	225	250	300	400
	NFB AT (A)		75	125	175	250	300	400
	M、D 接觸器電流 Magnetic contact current(A)		50	80	125	180	220	300
S 接觸器電流 Magnetic contact current(A)		35	80	80	100	125	150	

● 60Hz, R-22/R-404A,R507 water-cooled, models (SRT218/314/321/324/413/415)

系列 Series 機種 Model		SRT						
		218	314	321	324	413	415	
額定功率 Rated Power (kW)		25	48	69	93	114	136	
60Hz 220V	Y 接線堵住電流 Star -LRA (A)	153	310	471	-	-	-	
	Δ接線堵住電流 Delta -LRA (A)	493	990	1460	-	-	-	
	最大運轉電流 I <sub>max</sub> (A)	98	230	351	-	-	-	
	導線選用 Wire selected	需求安培容量 Maximum capacity(A)	71	166	253	-	-	-
		參考線徑 Nominal cross section(mm <sup>2</sup> )	14	30	60	-	-	-
	NFB AF		125	400	400	-	-	-
	NFB AT (A)		125	300	400	-	-	-
	M、D 接觸器電流 Magnetic contact current(A)		100	180	300	-	-	-
S 接觸器電流 Magnetic contact current(A)		80	125	180	-	-	-	
60Hz 380V	Y 接線堵住電流 Star -LRA (A)	88	182	265	424	545	649	
	Δ接線堵住電流 Delta -LRA (A)	286	582	840	1311	1717	2045	
	最大運轉電流 I <sub>max</sub> (A)	57	135	203	290	358	430	
	導線選用 Wire selected	需求安培容量 Maximum capacity(A)	50	94	142	200	252	303
		參考線徑 Nominal cross section(mm <sup>2</sup> )	14	14	30	38	60	60
	NFB AF		100	225	225	400	400	600
	NFB AT (A)		100	225	225	400	400	600
	M、D 接觸器電流 Magnetic contact current(A)		50	100	150	220	300	400
S 接觸器電流 Magnetic contact current(A)		35	80	100	125	150	180	
60Hz 440V	Y 接線堵住電流 Star -LRA (A)	76	155	241	320	494	586	
	Δ接線堵住電流 Delta -LRA (A)	247	495	747	1018	1592	1790	
	最大運轉電流 I <sub>max</sub> (A)	49	117	176	244	309	372	
	導線選用 Wire selected	需求安培容量 Maximum capacity(A)	35	84	127	176	223	268
		參考線徑 Nominal cross section(mm <sup>2</sup> )	14	14	22	30	50	60
	NFB AF		100	225	250	400	600	600
	NFB AT (A)		75	200	250	350	500	600
	M、D 接觸器電流 Magnetic contact current(A)		50	80	125	180	300	300
S 接觸器電流 Magnetic contact current(A)		35	80	80	125	150	180	
60Hz 460V	Y 接線堵住電流 Star -LRA (A)	73	138	233	355	466	514	
	Δ接線堵住電流 Delta -LRA (A)	236	441	722	1095	1458	1593	
	最大運轉電流 I <sub>max</sub> (A)	47	112	168	235	296	356	
	導線選用 Wire selected	需求安培容量 Maximum capacity(A)	34	81	121	170	214	257
		參考線徑 Nominal cross section(mm <sup>2</sup> )	14	14	22	30	50	60
	NFB AF		100	125	225	400	400	400
	NFB AT (A)		75	125	200	300	350	400
	M、D 接觸器電流 Magnetic contact current(A)		50	80	100	125	150	180
S 接觸器電流 Magnetic contact current(A)		50	80	100	125	150	180	

<p>5. 故障分析與保養週期</p> <p>5.1 故障分析與研判</p>	<p>5 TROUBLE SHOOTING AND MAINTENANCE PERIOD</p> <p>5.1 Trouble shooting</p>
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<p>故障狀況</p> <p>Malfunction status</p>	<p>原因</p> <p>Possible causes</p>
<p>壓縮機馬達線圈，保護開關作動</p> <p>Motor winding temperature-protecting switch is activated.</p>	<ol style="list-style-type: none"> <li>1. 負載大造成低壓側入口過熱度過高。 High compressor superheat due to heavy loading.</li> <li>2. 高壓過高，負載過大。 Discharge pressure is too high that causes overload.</li> <li>3. 線圈保護開關故障。 Motor winding temperature-protecting switch is out of order.</li> <li>4. 電氣系統不良或故障。 Electric system is failed.</li> <li>5. 馬達線圈不良，溫升過高。 Defective motor winding that causes high temperature rise-up.</li> </ol>
<p>容調動作不確實</p> <p>Modulation slider fails to move properly.</p>	<ol style="list-style-type: none"> <li>1. 溫度過低，潤滑油黏度高。 Low temperature causes high oil viscosity.</li> <li>2. 限流孔阻塞。 Orifice is clogged.</li> <li>3. 容調電磁閥阻塞。 The solenoid valve is clogged.</li> <li>4. 容調電磁閥線圈故障。 The solenoid valve coil is failed.</li> <li>5. 容調活塞環磨損無法完全氣密，冷媒大量進入容調油壓缸中。 The piston ring is worn out.</li> <li>6. 容調油路阻塞。 Oil passage is clogged.</li> <li>7. 油過濾器阻塞。 Oil filter is clogged.</li> <li>8. 潤滑油量不足(油位不足)。 Insufficient oil(Low oil level).</li> <li>9. 系統之溫度開關故障。 System temperature switch is failed.</li> </ol>
<p>馬達無法啟動或 Y-△無法啟動</p> <p>Unable to start motor or operate</p>	<ol style="list-style-type: none"> <li>1. 容調閥無法回復空車狀態，造成重車起動 The slider cannot return back to no-load state that results in loaded startup.</li> <li>2. 電壓過低。 Voltage is too low.</li> <li>3. 電壓錯誤。 Voltage is not correct.</li> <li>4. 馬達故障。 Motor fails</li> <li>5. 欠相、逆相運轉。 Phase loss or phase sequence reverse.</li> <li>6. 馬達保護開關作動。</li> </ol>

	<p>Motor protection switch is activated.</p> <p>7. 馬達線圈接線錯誤。 Motor is not connected correctly.</p> <p>8. 排氣關斷閥未開(高壓開關作動)。 Discharge service valve is closed (high pressure switch is activated).</p>
<p>異常振動或噪音 Abnormal vibration or noise</p>	<p>1. 軸承損壞故障。 Bearing fails.</p> <p>2. 機體內部固定螺絲鬆動。 Inner fixed screws become loose.</p> <p>3. 轉子相互摩擦或與機殼摩擦。 Rotor scrapes against the other one or casing.</p> <p>4. 失油。 Oil loss.</p> <p>5. 內部機件鬆動。 Inner parts become loose.</p> <p>6. 電磁聲。 Electrical magnetic noise.</p> <p>7. 有異物進入。 Foreign particles enter compressor.</p>
<p>排氣溫度過高 High discharge temperature</p>	<p>1. 過熱度過高。 Superheat is too high.</p> <p>2. 高壓過高，負載過大。 Discharge pressure or loading is too high.</p> <p>3. 失油。 Low oil level.</p> <p>4. 軸承損壞。 Bearing fails.</p> <p>5. 電動機過熱。 Motor is overheated.</p> <p>6. 壓縮比過大。 Compression ratio is too high.</p> <p>7. 系統不可壓縮氣體含量太高 Uncompress red gas ratio in system is too high.</p>
<p>壓縮機失油 Oil loss</p>	<p>1. 過熱度不足，液態冷媒回流過多，引起回油不良。 Insufficient superheat and too much liquid refrigerant returning to compressor cause poor oil circulation in system.</p> <p>2. 系統流速設計不足，匹配不合理。</p> <p>3. Low designed flow velocity causes poor oil circulation.</p> <p>4. 系統較大或有彎角處儲存積油，致使冷凍油不足，需補充冷凍油。 Piping is too long or oil is accumulated at elbows of piping system, which causes insufficient oil. Need to charge more oil.</p>

5.2 保養週期建議表

5.2 Recommended maintenance period

Unit: hour

時間 Time	100	1000	2500	5000	10000	15000	20000	25000	30000
項目 Item									
電氣絕緣 Electrical insulation			△	△	△	△	△	△	△
油過濾器 Oil filter	△/○			△					△/○
進氣過濾器 Suction filter				△					△
潤滑油 Lubricant	△			△	△/○		△/○		△/○
油位 Oil level		△	△	△	△	△	△	△	△
振動噪音 Vibration/noise		△	△	△	△	△	△	△	△
軸承 Bearing									△/○
接頭部位洩漏 Leakage									△

△檢查 Check ; ○更換 Replace.

注意事項 Note :

- 馬達電氣絕緣除了表中之定期檢查外，每年在新啟動運轉前檢查其絕緣狀況。  
After a long period of shutdown, an electrical insulation check should be conducted before start-up.
- 振動、噪音之檢查以人為方式檢查即可，若發現有異常狀況，可聯繫復盛公司。詳細以儀器檢查，以確定原因。  
Check for vibration and noise. If abnormality is found, contact Fu-Sheng for diagnosis.
- 每次大修後，整台壓縮機須重做一次耐壓試漏，以確定各部位無洩漏。  
Conduct a pressure test on compressor after each overhaul to ensure no leakage is occurred.
- 軸承更換時須整組同時更換，不可只更換其中部份軸承。  
Replace all bearings concurrently rather than replacing part of them.

### 5.3 壓縮機馬達燒毀之處理

當馬達不慎燒毀時，請將燒毀之壓縮機拆下，回收系統冷媒避免污染環境，並更換乾燥過濾器。新機尚未裝機之前，請先將系統抽真空、充氮氣封存，以免系統受環境濕氣腐蝕。更換新機試運轉一小時後，請停機更換新的冷凍油與乾燥過濾器後再運轉一小時，確認系統之清潔度及油酸度是否合格，若否則反覆上述動作。

### 5.4 PUMP DOWN 注意事項

- 請注意壓縮機之排氣溫度，如排氣溫度開關作動時，應立即停止 PUMP DOWN 之動作。
- PUMP DOWN 之最低吸氣壓力不得低於運轉範圍。

## 6. 應用規範

依據復盛壓縮機之許用運轉範圍，如使用于風冷及熱泵機組，其使用之狀態均較水冷機組嚴苛，負載約提高 15%~30%，將造成排氣高溫，馬達線圈溫度過高及油溫太高等現象。為使機組可以正常達到運轉要求，需配置液噴射或油冷卻器，使其得到運轉範圍中之額外冷卻。

### 5.3 Handling a burnt out motor

If the motor is burnt out, disassemble the compressor, recycle the polluted refrigerant and change the dry-filter. Before the new compressor is assembled, vacuum the system and charge with nitrogen to block out ambient moisture. After replacement, run the new compressor for one hour, stop it, and replace new refrigeration oil & dry-filter and make another one-hour run to confirm whether the system purity and oil are well qualified. If not, repeat the above procedure till acceptable.

### 5.4 Notices on pump-down

- Please be alert of monitoring the discharge temperature. Once the switch of discharge temperature is activated, it is necessary to stop the pump-down immediately.
- The minimum suction pressure of pump-down can't be lower than operation envelope.

## 6. Application

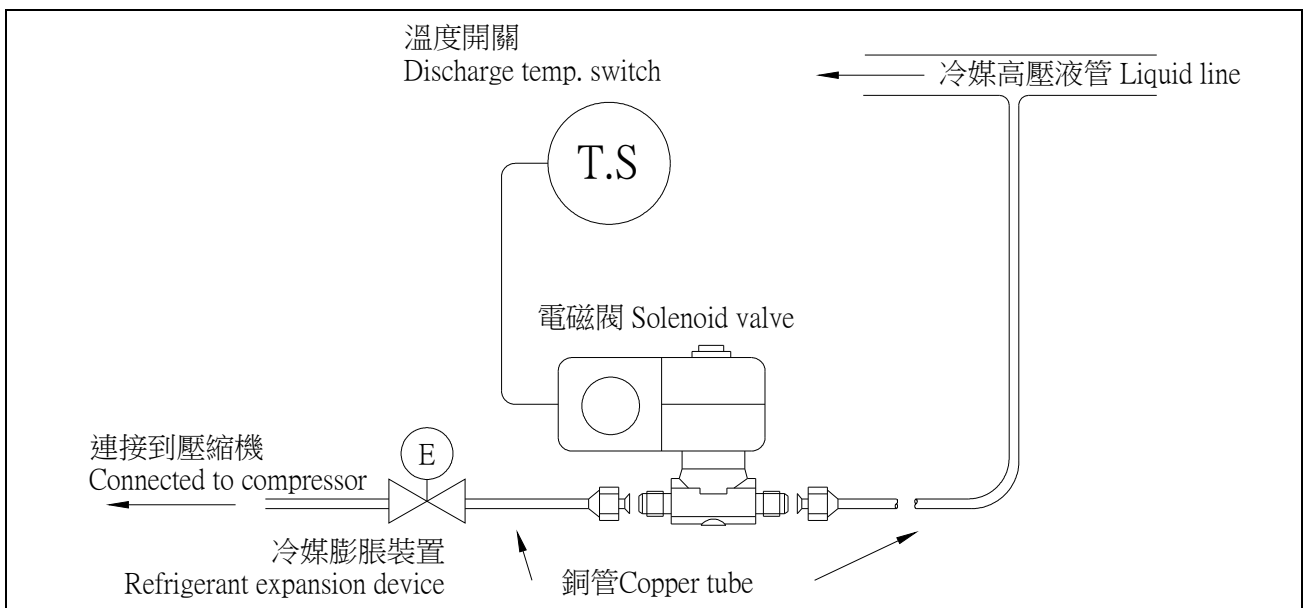
According to the allowed operation range, the operation condition under air-cooled or heat-pump applications is more critical than water-cooled; the loading of the former condition is about 15%-30% higher than the later, which would make discharge temperature, motor winding temperature and oil temperature high. To allow the compressor run normally, it's essential to install a liquid injection system or oil cooler to get additional cooling to the compressor

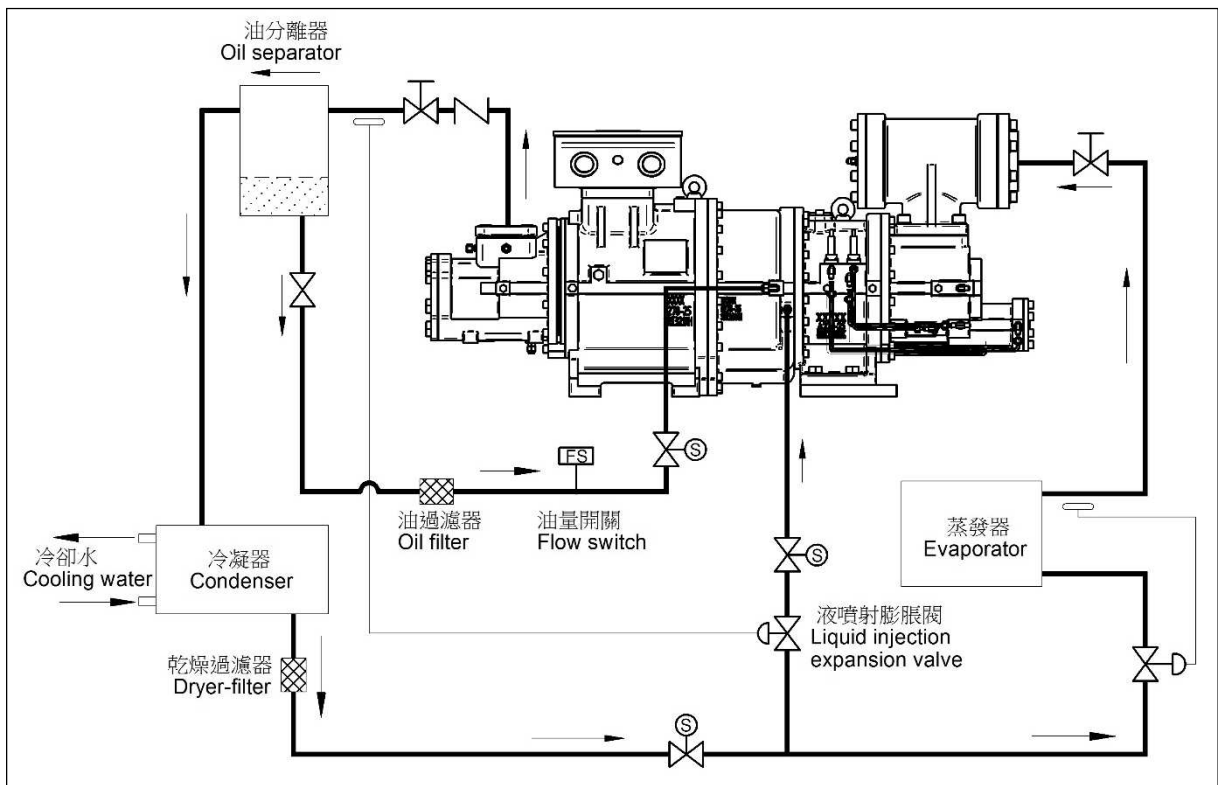
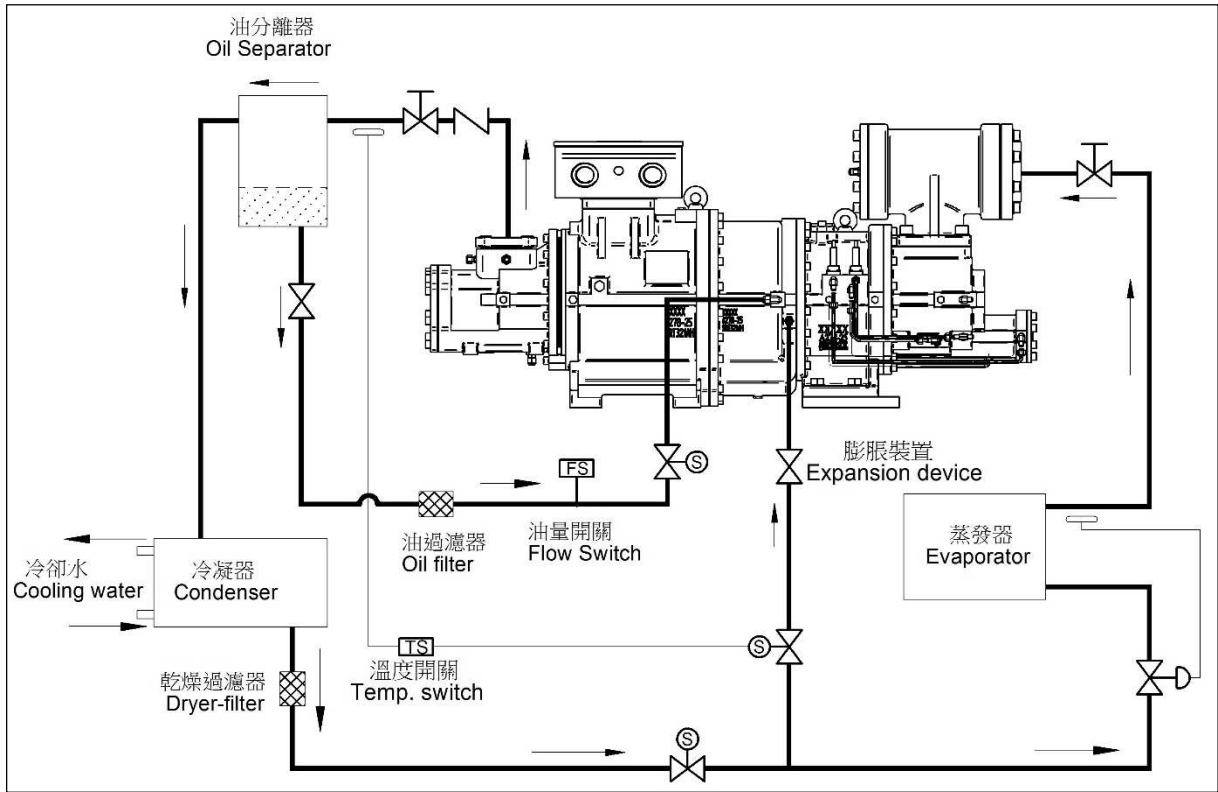
### 6.1 液噴射應用

引用系統中一部份液態冷媒，直接進入壓縮室或馬達吸氣側藉以降低排氣溫度和馬達線圈溫度，若排氣溫度達到 80°C 時，溫度開關感應排氣溫度而控制液冷媒之電磁閥，而液冷媒通過電磁閥和膨脹裝置，進入壓縮室或馬達吸氣側，利用液冷媒潛熱，得到冷卻效果，其配置如下圖。如採用感溫式膨脹閥，需留意膨脹閥控制會有不穩定現象，要依使用狀況加以調整，建議使用液噴專用膨脹閥(如：Danfoss TEAT20, Alco series 935-100, Sporlan Y1037)。

### 6.1 Liquid injection application

The application is made by introducing a portion of liquid refrigerant directly into the compression chamber or compressor suction end for the purpose of reducing the discharge and motor winding temperature. When the discharge temperature is up to 80°C, the temperature switch sends a signal to the solenoid valve to let the liquid refrigerant enter compression chamber or motor suction end through the solenoid valve and refrigerant expansion device. The latent heat of refrigerant provides required cooling capacity to cool down the temperature of the compressor when running at critical condition. Illustrated piping layout is shown below. If a thermal expansion valve is not specially designed for the liquid injection application, a solenoid valve is required to control the open/close of the expansion valve and





液噴射應用 Liquid injection  
(中間壓) (Middle pressure)



## 6.2 油冷卻器應用

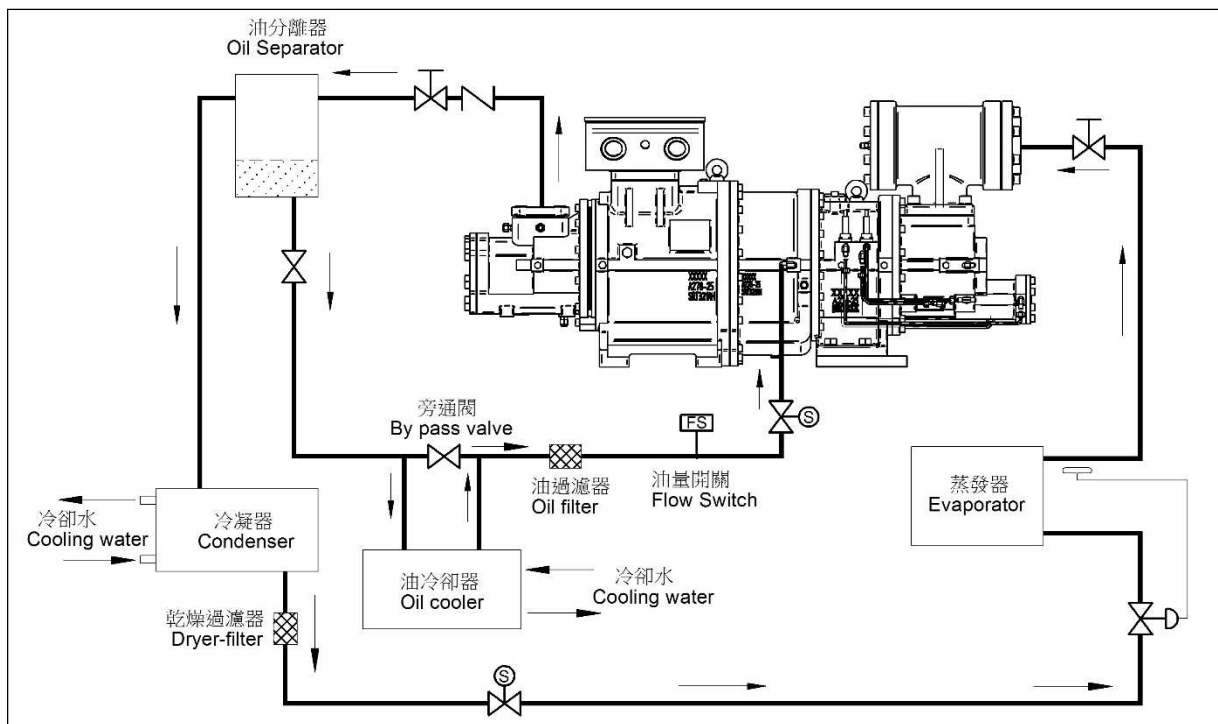
在嚴苛條件運轉下，使用油冷卻器有其必要性，尤其在排氣溫度超過 100°C 時。油冷卻器之給油溫度條件：50°C±5°C。油冷卻器的容量可依據不同的運轉條件，由復盛選型軟體取得。

如果油溫過低時，則可設置旁通閥或冷熱混合閥。油冷卻器應用有空氣冷卻法、冷媒冷卻法、水冷卻法等等。無論那種方法均須考慮油壓降(壓降需小於 0.5bar)，以免造成容調動作不良及軸承潤滑不足，排氣溫度於 55°C 以下，旁通閥開通；超過 55°C，旁通閥關閉使油冷卻器工作。

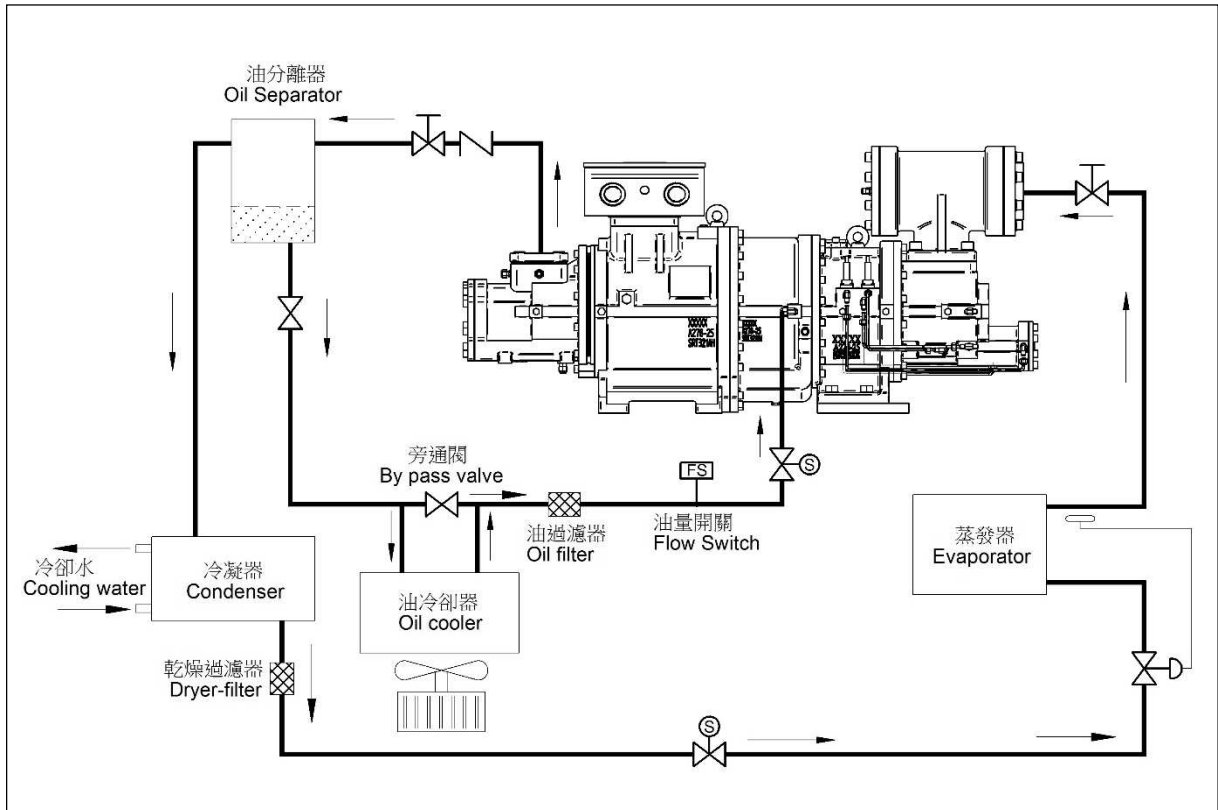
## 6.2 Oil cooler

Under critical operation, it is essential to add a oil cooler, particularly when the discharge temperature is over 100°C. The outlet oil temperature of oil cooler is 50°C±5°C, which varies according to the cooler capacity and compressor operation condition. The recommended oil cooler capacity can be calculated from Fu Sheng selection software.

If the oil temperature is too low, install an oil bypass valve or mixing valve (mix up cold & hot oil). The oil cooler can be cooled down by air, refrigerant or water. No matter what cooling method is applied, the maximum pressure drop through the oil cooler shall not exceed 0.5bar. Higher pressure drop could lead to malfunction of capacity control and insufficient lubrication of bearings. Open the bypass valve if the discharge temperature is lower than 55°C to bypass the oil back to compressor. Otherwise, close it to lead the oil into oil cooler.



油冷卻器應用-水冷式 Oil cooler - water-cooled type



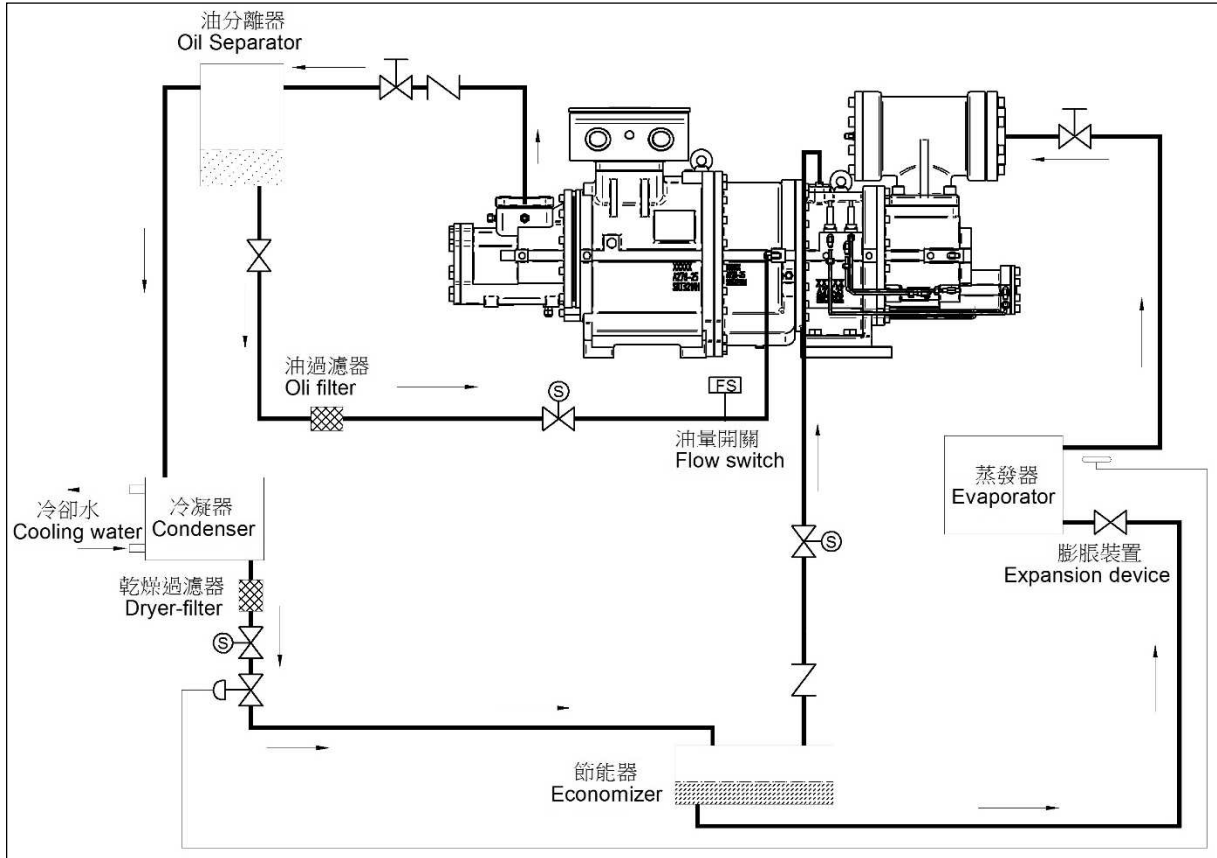
油冷卻器應用- 氣冷式 Oil cooler - air-cooled type

### 6.3 節能器之應用

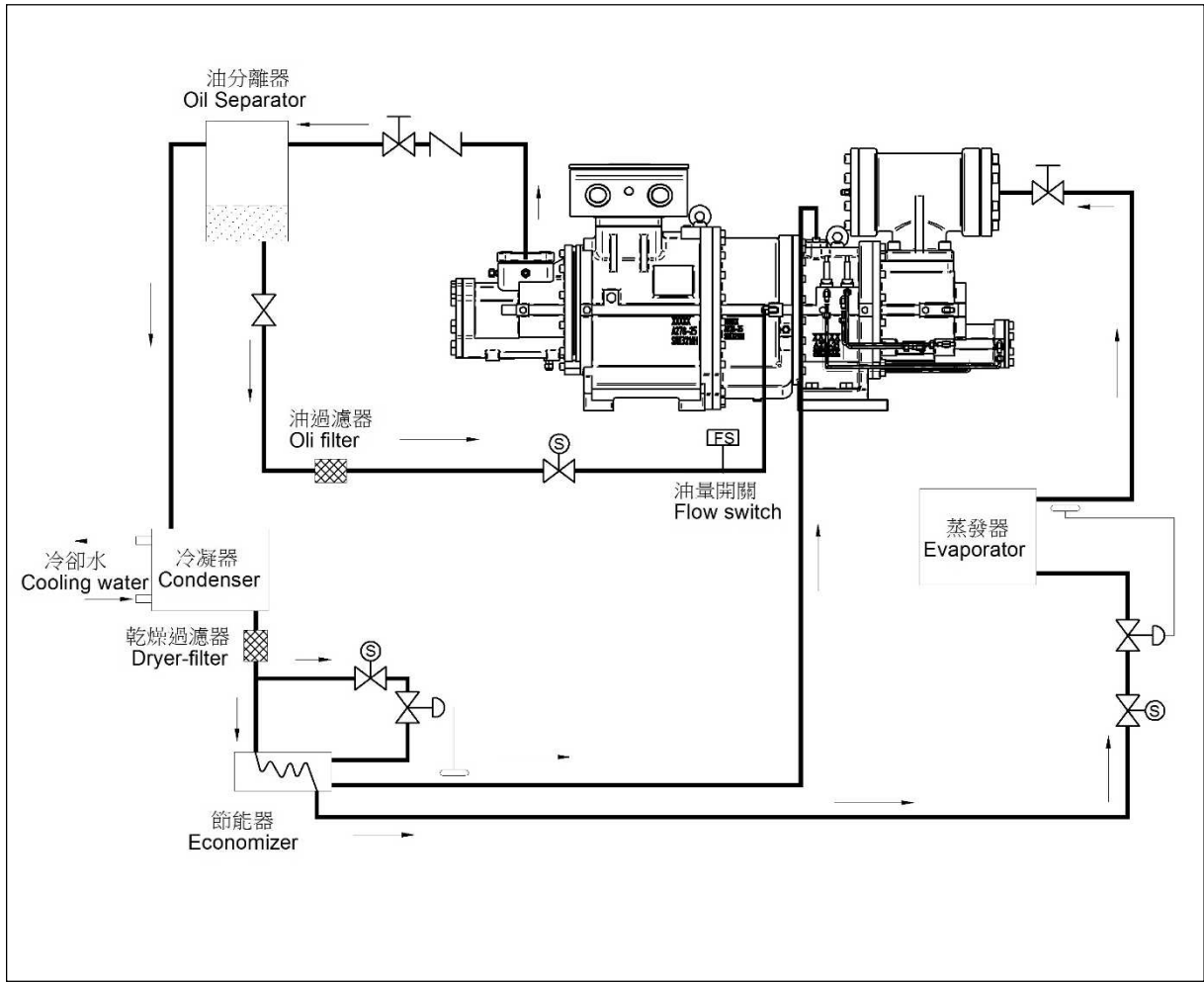
節能器之應用如二段壓縮原理，可以提升效率，所以用於高壓縮比下其效益較明顯，(例如低溫系統)。其系統配置有閃蒸桶(Flash tank)與過冷卻器(Liquid sub-cooler)兩種。請參考下圖。

### 6.3 Economizer

The principle of an economizer is that of two-stage compression. It can increase the efficiency of compressor especially under high compression ratio condition. The flash tank and liquid sub-cooler system layouts are illustrated as follows:



節能器應用 - 閃蒸桶 Economizer - Flash tank



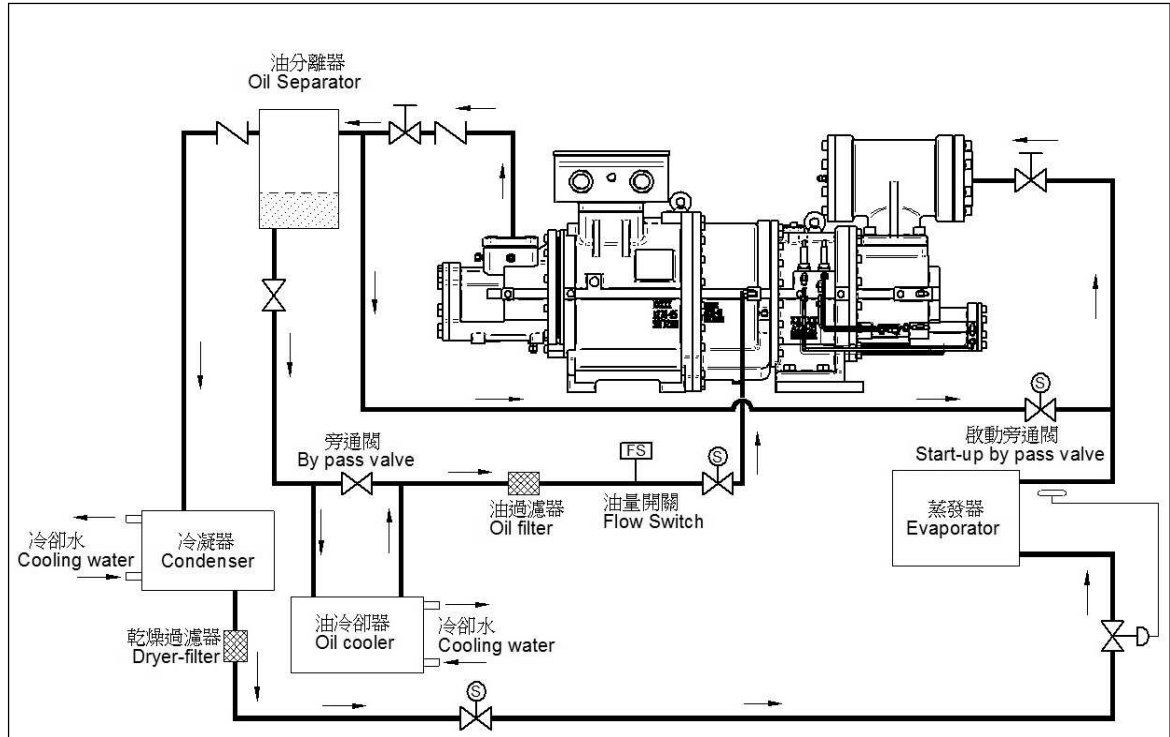
節能器應用 - 過冷卻 Economizer - Liquid sub-cooler

### 6.4 啟動旁通

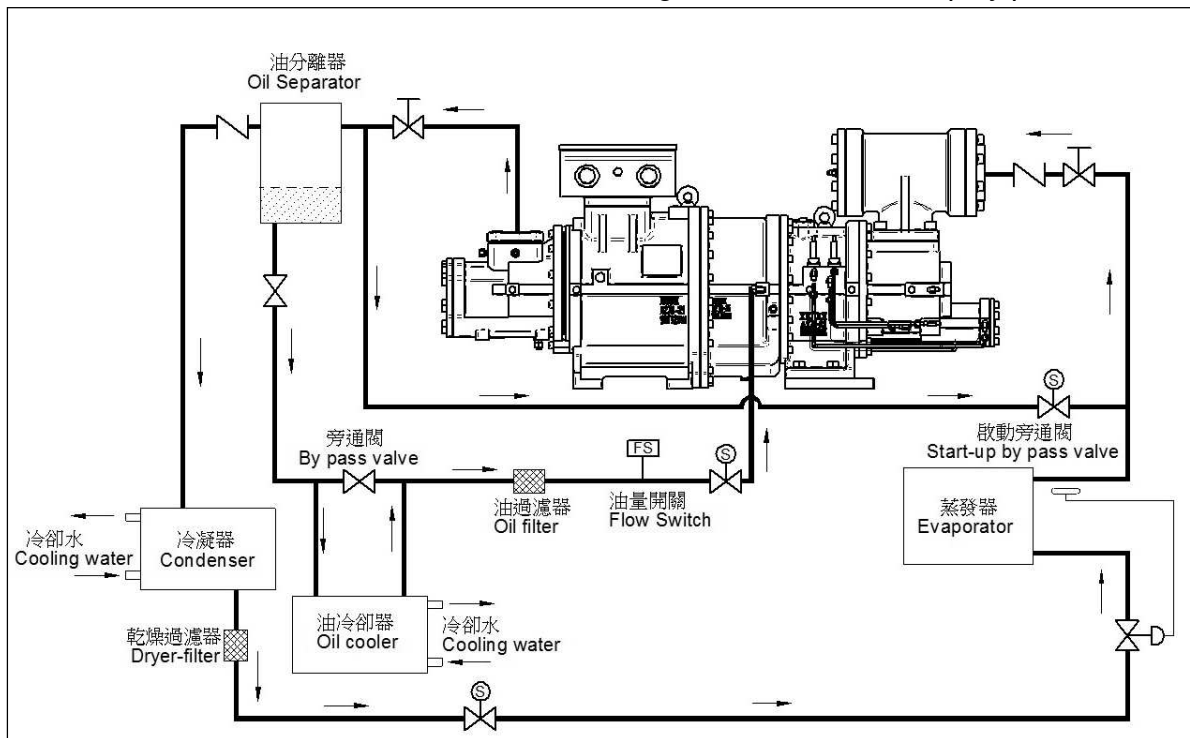
當壓縮機停機在啟動前開啟啟動旁通閥，將油分離器內高壓冷媒旁通到低壓側，降低高壓壓力減輕啟動負荷，且在壓縮機啟動後馬上關閉。

### 6.3 Start-up bypass

To make the start-up bypass operation when starting the compressor. It will bring the high-pressured refrigerant in oil separator to the lower pressured end and reduce the loading of start-up of compressor. The start-up bypass will shut immediately after above serial action.



雙排氣止回閥 - 啟動旁通 - Dual-discharge check valve Start-up by pass



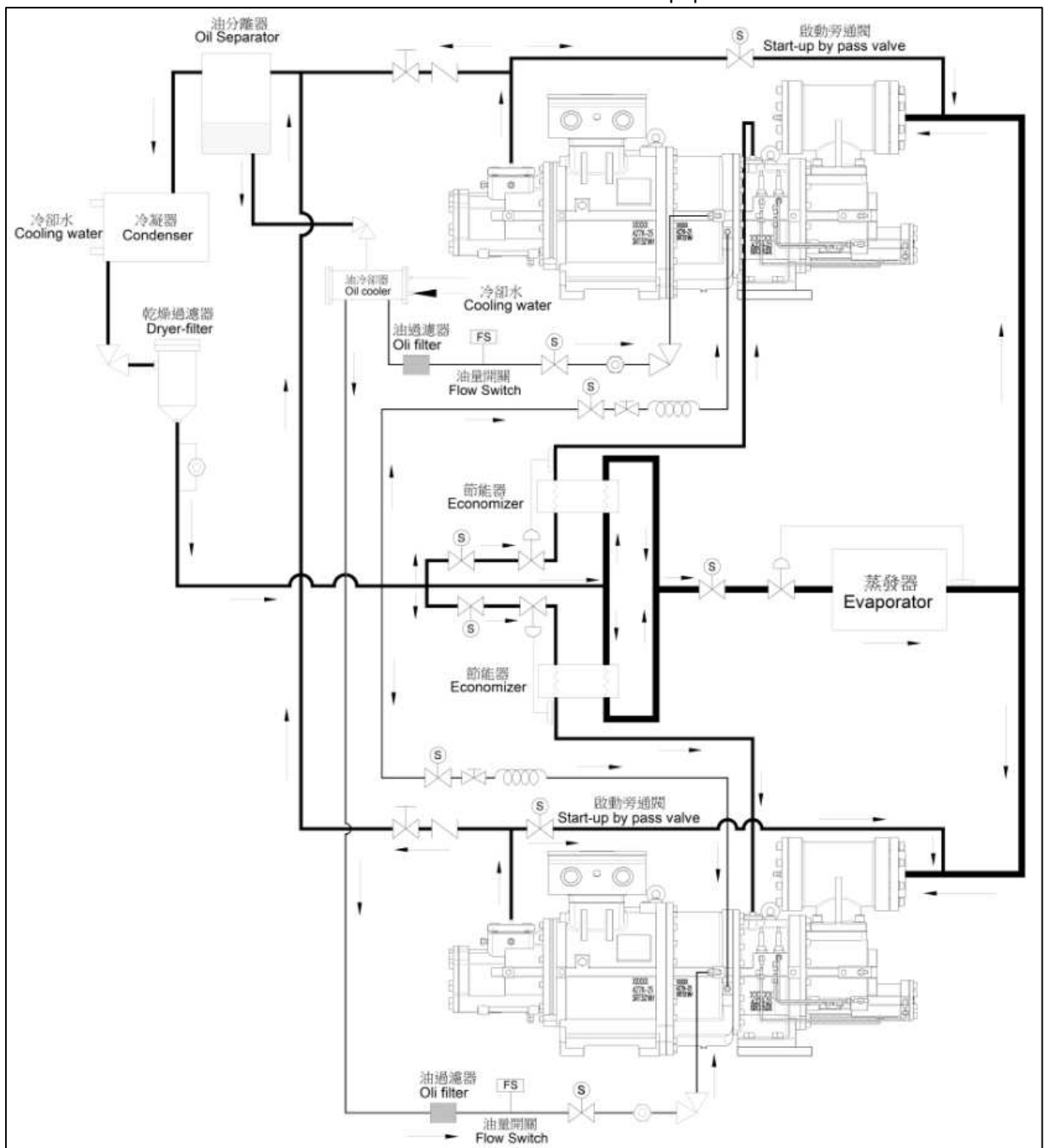
吸排氣止回閥 - 啟動旁通 - Suction and discharge check valve Start-up by pass

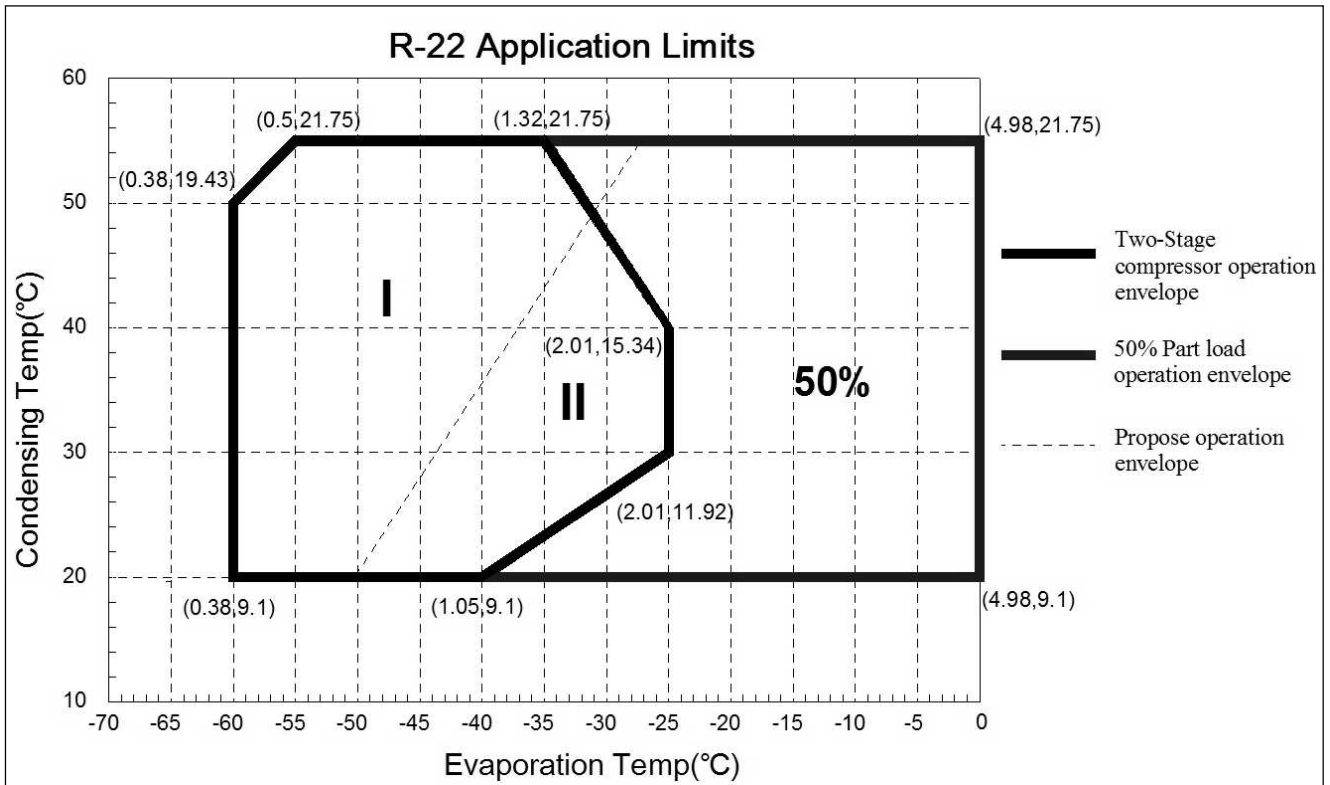
### 6.5 雙機單迴路應用

1. 請注意回油管尺寸或直接從油冷卻器下方分開兩管個別供油，確保壓縮機供油量足夠。
2. 請注意冷媒管路管徑配置需滿足機組各部元件之流動需求(例如:流量,流速與壓損等)
3. 請依照下圖配置啟動旁通管，壓縮機排氣出口到止回閥之間請預留一定高度之腔室，啟動前壓縮機高低壓均壓使用，如有安裝緩啟動設備則無需配置。

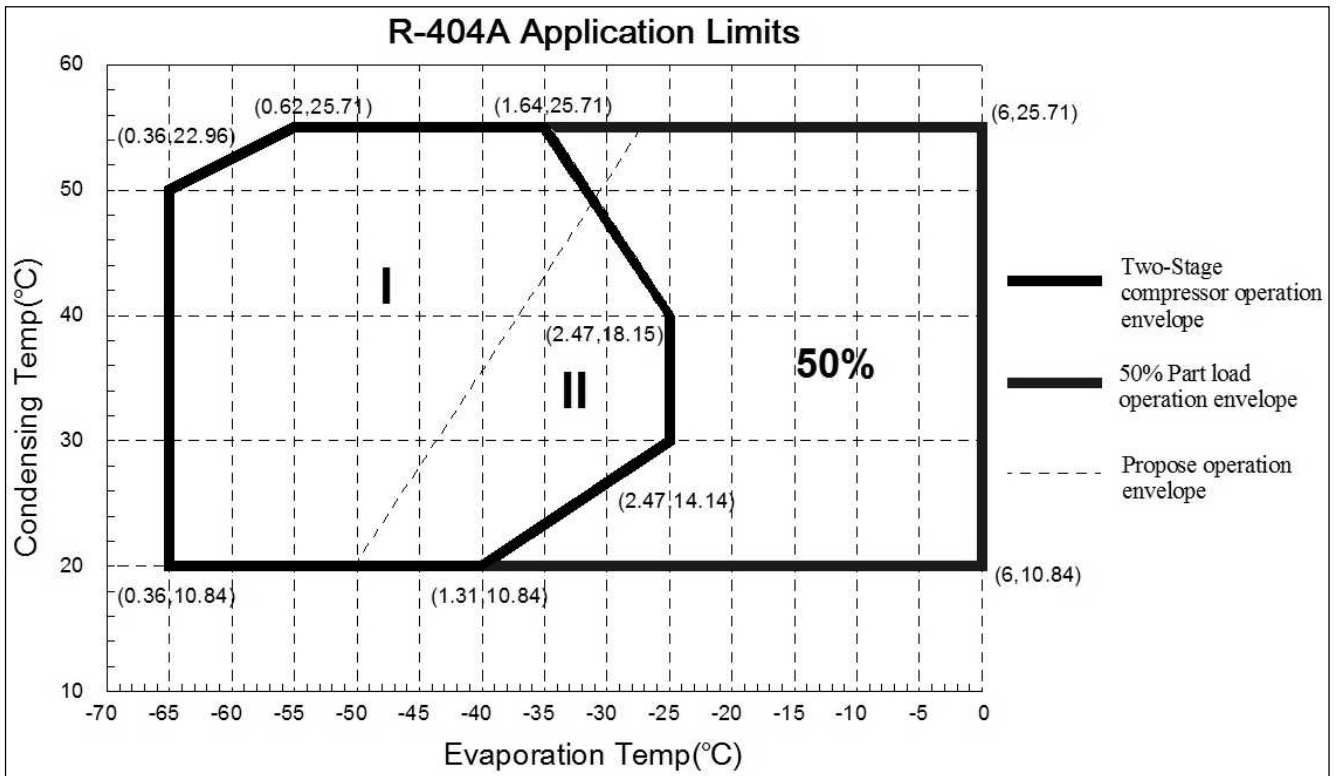
### 6.5 Parallel compressor system for refrigeration

1. To make sure the sufficient supply of the lubricant, please be alert of the size of returning pipe, or supplying the lubricant in separated pipe which is under the oil cooler.
2. Please be alert about the dimension of the refrigerant pipes, the dimension should meet the flow demand of all accessories, such as oil flow volume, speed, pressure loss and so forth.
3. Please follow the allocation, in below, to activate the bypass pipes. It's necessary to leave the appropriate space for it between the compressor discharge end and check valve. Please make the pressure in balance between high pressure end and low pressure end. It's no need to add the equipment of soft-start.



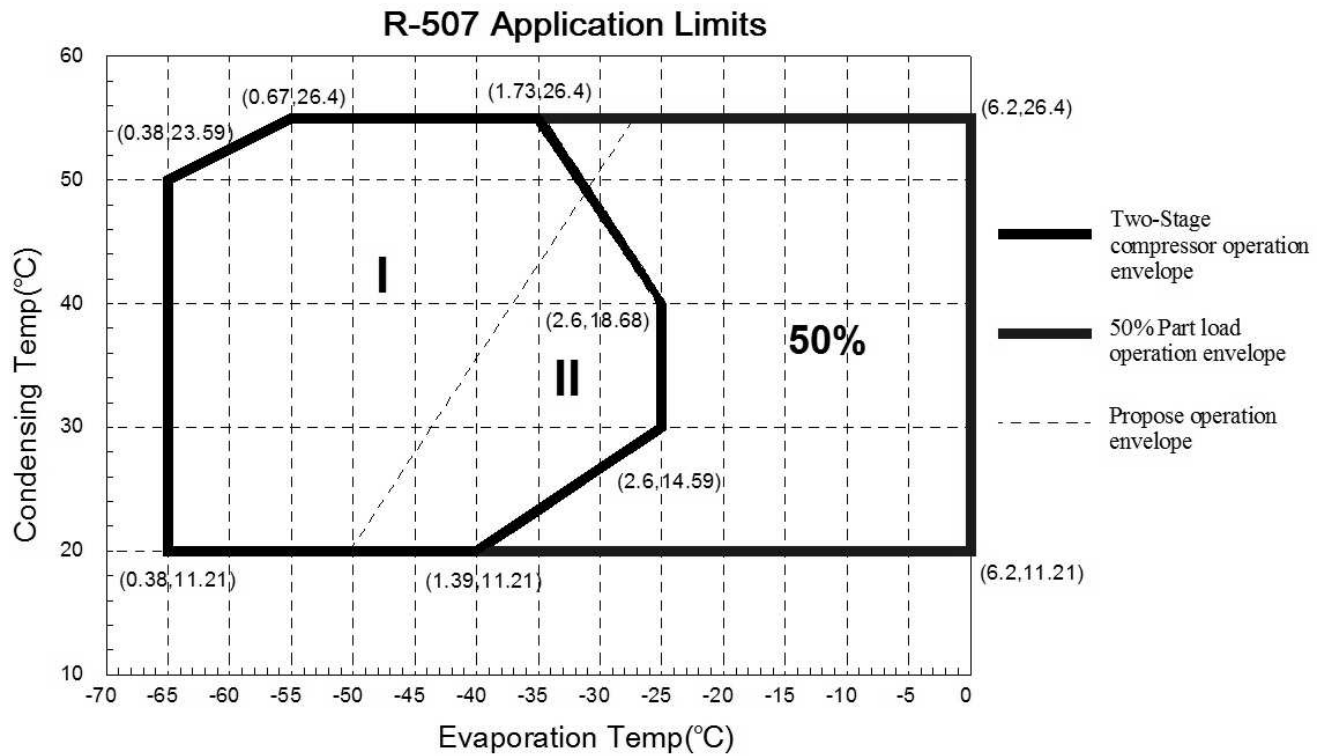


1. (X,Y) 即表示:	1. (X,Y) indicate:
X: 為蒸發壓力 Bar(a)	X: Evaporating pressure Bar(a)
Y: 為冷凝壓力 Bar(a)	Y: Condensing pressure Bar(a)
2. 各運轉範圍說明:	2. Range of application:
區域 I: 壓縮機運轉需加裝液噴射和油冷卻裝置。	Region I: Need to operate with liquid injection and oil cooling.
區域 II: 壓縮機運轉需加裝液噴射或油冷卻裝置。	Region II: Need to operate with liquid injection or oil cooling.
—— 100%運轉範圍	—— 100% operation envelope
—— 50%部份負載運轉範圍	—— 50% Part load operation envelope



1. (X,Y) 即表示:	1. (X,Y) indicate:
X: 為蒸發壓力 Bar(a)	X: Evaporating pressure Bar(a)
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區域 I: 壓縮機運轉需加裝液噴射和油冷卻裝置。	Region I: Need to operate with liquid injection and oil cooling.
區域 II: 壓縮機運轉需加裝液噴射或油冷卻裝置。	Region II: Need to operate with liquid injection or oil cooling.
<b>100%運轉範圍</b>	<b>100% operation envelope</b>
<b>50%部份負載運轉範圍</b>	<b>50% Part load operation envelope</b>





1. (X,Y) 即表示:	1. (X,Y) indicate:
X: 為蒸發壓力 Bar(a)	X: Evaporating pressure Bar(a)
Y: 為冷凝壓力 Bar(a)	Y: Condensing pressure Bar(a)
2. 各運轉範圍說明:	2. Range of application:
區域 I: 壓縮機運轉需加裝液噴射和油冷卻裝置。	Region I: Need to operate with liquid injection and oil cooling.
區域 II: 壓縮機運轉需加裝液噴射或油冷卻裝置。	Region II: Need to operate with liquid injection or oil cooling.
100%運轉範圍	100% operation envelope
50%部份負載運轉範圍	50% Part load operation envelope

## 7. 產品配件

### 7.1 配件規格

#### 7.1.1 容調電磁閥規格

容調電磁閥之控制電壓系採 220V，不適用異於 220V 電壓輸入；若有特殊需求 110V 之控制電壓，請與復盛公司聯繫更換電磁閥線圈。

#### 7.1.2 加熱器規格：

- 種類：150W 或 300W；110V 與 220V 兩種電壓選擇。
- 絕緣值：以 DC500V 高阻計量測絕緣值 50M $\Omega$  以上。

#### 7.1.3 油位開關規格

- 絕緣值：以 DC200V 高阻計量測，絕緣值 10M $\Omega$  以上。
- 最高使用電壓：AC230V
- 最高允許電流：0.5A, 10VA
- 乾接點：低油位開路，高油位閉路

#### 7.1.4 馬達及排氣溫度 PTC 控制模組:INT69FSY Diagnose

- 電壓：230V，1PHASE(其他電壓 115V)
- 電驛 AC240, 2.5A, 360VA, SPST, 自動復歸

#### 7.1.5 馬達線圈溫度保護 PTC Thermistor

- 量測電阻最高容許電壓: DC 2.5V
- 環境溫度下電阻值：小於 750 ohms
- 絕緣強度：600VAC

#### 7.1.6 排氣溫度保護 PTC Thermistor

- 量測電阻最高容許電壓: DC 2.5V
- 環境溫度下電阻值：小於550 ohms
- 絕緣強度：600VAC

## 7. PRODUCT SCOPE :

### 7.1 Parts specification

#### 7.1.1 Solenoid valve

The standard control voltage is 220V. Other voltage is available on request.

#### 7.1.2 Heater

- Model: 150W or 300W, Standard voltage : 220V. Other voltage is available on request.
- Insulation value: 50M $\Omega$  or above measured by DC500V Mega-ohm meter.

#### 7.1.3 Oil level switch

- Insulation value: 100M $\Omega$  or above measured by DC200V Mega-ohm resistance meter.
- Maximum allowable voltage: AC230V
- Maximum allowable current: 0.5A, 10VA
- Dry contact: open at low oil level, close at high oil level.

#### 7.1.4 PTC control module INT69FSY Diagnose for motor and discharge temperature

- Voltage: 230V，1PHASE (115V is available on request)
- Relay: Max Amp: AC240, 2.5A, 360VA, SPST, auto reset.

#### 7.1.5 PTC thermistor for motor winding protection

- Maximum allowable voltage for measuring resistance: DC 2.5V
- Resistance under ambient temperature: less than 750  $\Omega$
- Insulation strength: 600VAC

#### 7.1.6 PTC Thermistor for discharge temperature protection

- Maximum allowable voltage for measuring resistance: DC 2.5V
- Resistance under ambient temperature: less than 550  $\Omega$
- Insulation strength: 600VAC

## 7.2 配件明細 Fitting list

序號 No.	配件名稱 Parts name	機型 Model
1	排氣法蘭、墊片、擋板 Discharge flange, gasket and sealing plate	S
2	進氣法蘭、墊片、擋板 Suction flange, gasket and sealing plate	S
3	進氣過濾器 Suction filter	S
4	油過濾器 Oil filter	O
5	電磁閥四只 (有段容調) 或三只 (無段容調) Solenoid valves 4 pieces for step capacity control, or 3 pieces for linear capacity control	S
6	馬達線圈溫度熱敏電阻 Motor winding PTC thermistor	S
7	冷凍油 Refrigerant oil	O
8	油加熱器 Oil heater	O
9	油位開關 Oil level switch	O
10	排氣高溫熱敏電阻 Discharge temperature PTC thermistor	S
11	洩油閥 Draining valve	O
12	壓縮室節能器噴射接口 Economizer injection port-compression chamber	S
13	中間壓與低壓端液噴射接頭 Liquid injection adapters – motor side and compression chamber	S
14	非石棉墊片 Non-asbestos gasket	S
15	排氣止回閥 Discharge check valve	S
16	安全閥 Safety valve	O
17	進氣關斷閥 Suction service valve	S
18	排氣關斷閥 Discharge service valve	S
19	防震墊 Rubber mounting pads	O
20	液冷媒噴射用毛細管或電磁閥 Liquid refrigerant injection capillary tube or solenoid valve	O
21	INT69FSY Diagnose 電氣保護模組 INT69FSY Diagnose Electrical protection module	S

S : 標準配備 O : 選用配備 - : 無此配置

S : Standard, O: Optional, - : Not applicable.

## 7.3 潤滑油

## 7.3 Lubricant

## HCFC/R-22

冷凍油特性 Lubricant characteristics	油品名稱 Lubricant		
	FS 150R	FS 300R	FS 055M
黏度(viscosity) cst@40°C ASTM D445	168	298	54.9
黏度(viscosity) cst@100°C ASTM D445	20.2	32	5.97
黏度指數 (viscosity index) ASTM D2270	150	149	0
比重 (Specific weight) ASTM D1298/D1250	1.01	1.05	0.916
流動點 (Flow point) ( °C ) ASTM D97	-43	-35	-35
閃火點(Flash point) ( °C ) ASTM D92	290	271	188
耐電壓強度 (Voltage strength) ( kV ) ASTM D877	42.0	42.5	>30

## HFC/R-404A/R-507

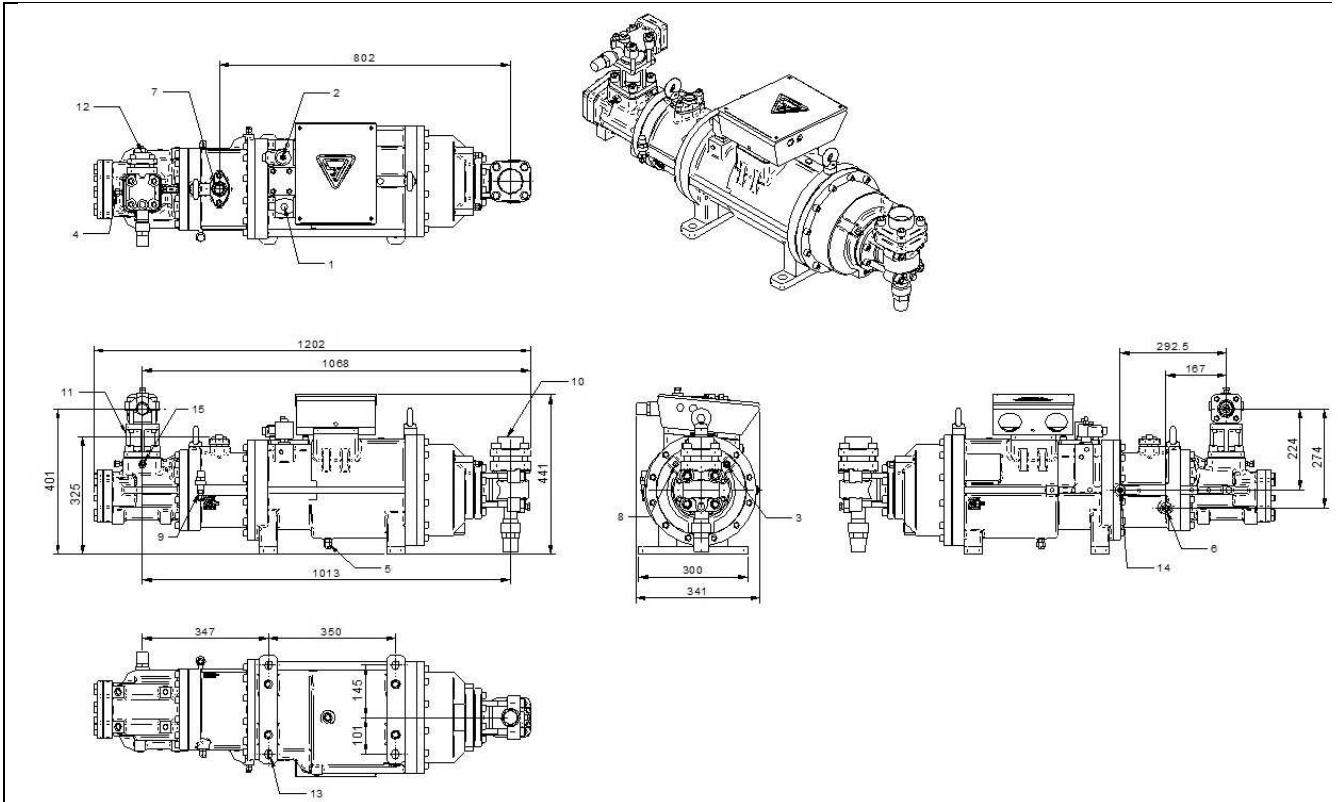
冷凍油特性 Lubricant characteristics	油品名稱 Lubricant		
	FS 035R	FS 070R	FS 120R
黏度(viscosity) , cst@40°C ASTM D445	31.5	66.3	127.7
黏度(viscosity) , cst@100°C ASTM D445	5.62	8.9	12.7
黏度指數(viscosity index) ASTM D2270	118	108	90
比重(Specific weight) ASTM D4052	0.971	0.957	0.951
流動點(Flow point) ( °C ) ASTM D97	-51	-43	-33
閃火點(Flash point) ( °C ) ASTM D92	252	263	251
耐電壓強度(Voltage strength) ( kV ) ASTM D877	49.4	49.4	47.0

## 7.4 壓縮機外觀尺寸

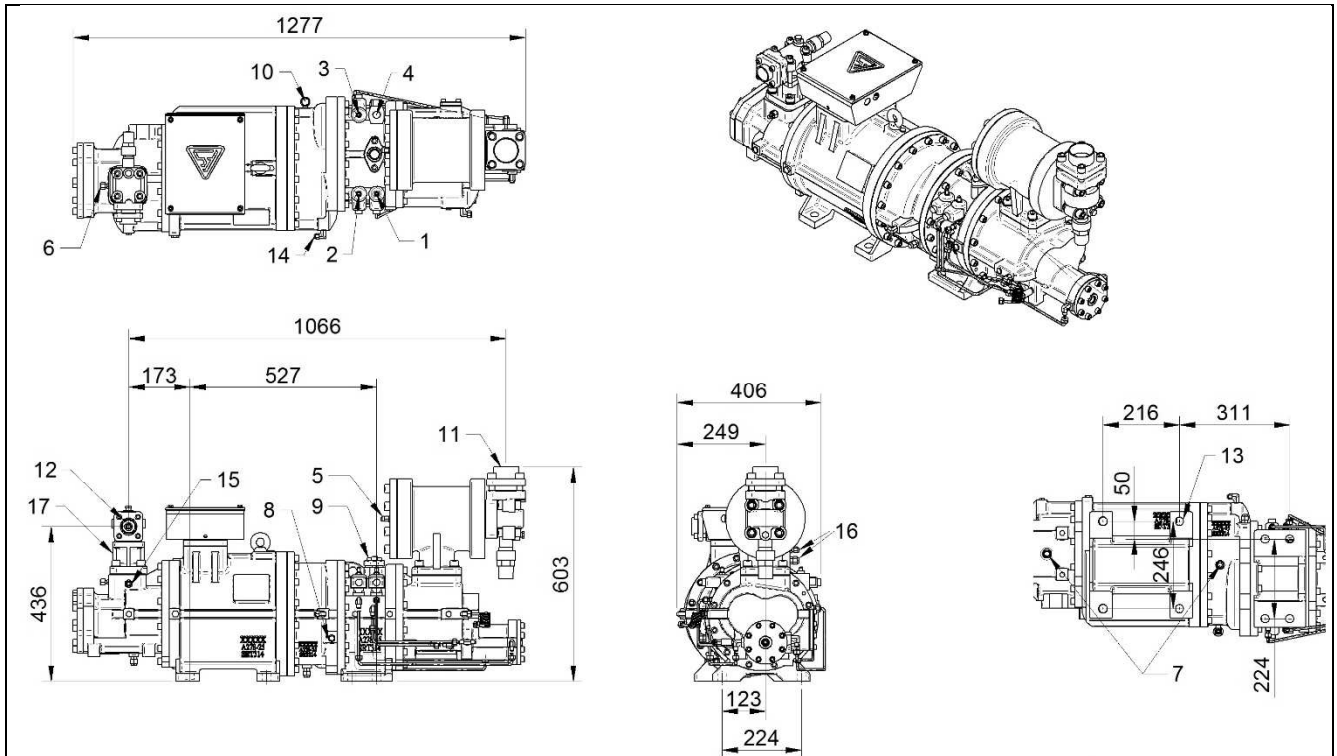
## 7.4 Compressor outline dimension

Model: SRT218

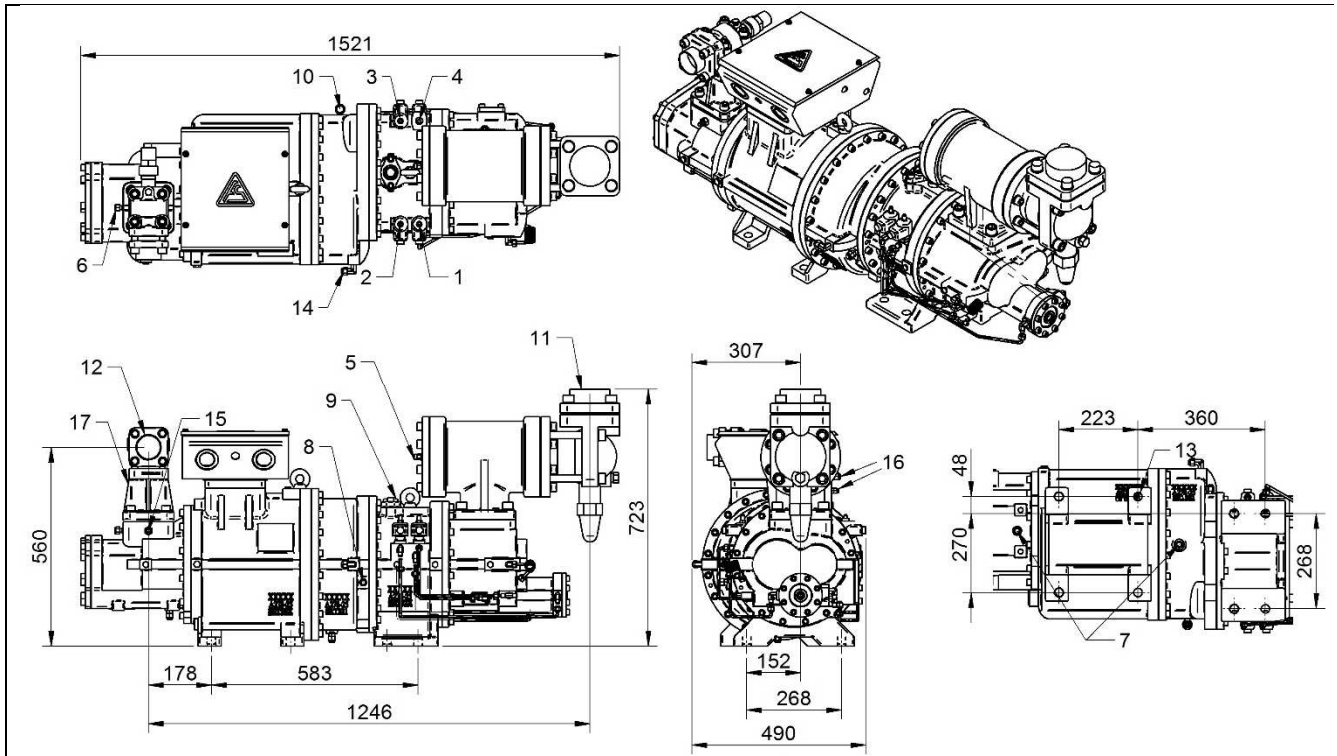
Unit : mm



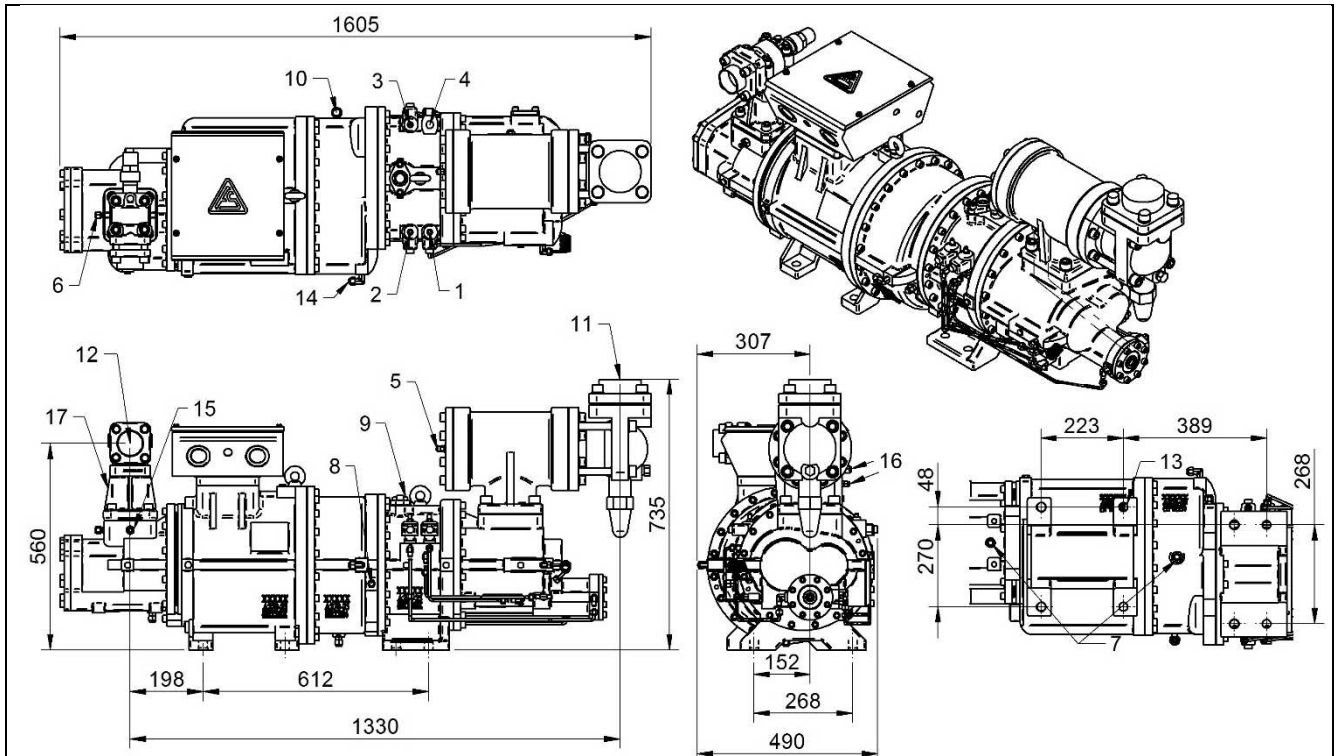
No.	品名	Parts	Remark
(1)	容調用電磁閥	Solenoid valve	SV0
(2)	容調用電磁閥	Solenoid valve	SV1
(3)	低壓端偵測接頭	Low pressure adapter	LP-1/4" Flare
(4)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(5)	洩油接頭	Draining adapter	3/8" Flare
(6)	液噴射接頭	Liquid injection adapter	3/8" Flare
(7)	節能器接口	Economizer port	ECO-3/4"
(8)	備用接頭	Spare adaptor	1/4" Flare, 3/8" Flare
(9)	中壓端偵測接頭	Middle pressure adapter	MP-1/4" Flare
(10)	吸氣關斷閥	Stop valve	2-5/8"
(11)	排氣止回閥	Check Valve	1-5/8"
(12)	排氣關斷閥	Stop Valve	1-5/8"
(13)	固定孔	Fixing Hole	D24
(14)	入油孔	Oil inlet port	1/4"
(15)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor



No.	品名	Parts	Remark
(1)	容調用電磁閥	Solenoid valve	SV0
(2)	容調用電磁閥	Solenoid valve	SV1
(3)	容調用電磁閥	Solenoid valve	SV50(50%)
(4)	容調用電磁閥	Solenoid valve	SV100(100%)
(5)	低壓端偵測接頭	Low pressure adapter	LP-1/4" Flare
(6)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(7)	洩油接頭	Draining adapter	3/8" Flare
(8)	液噴射接頭	Liquid injection adapter	3/8" Flare
(9)	節能器接口	Economizer port	ECO-3/4"
(10)	中壓端偵測接頭	Middle pressure adapter	MP-1/4" Flare
(11)	吸氣關斷閥	Stop valve	2-5/8"
(12)	排氣關斷閥	Stop Valve	1-5/8"
(13)	固定孔	Fixing Hole	D24
(14)	入油孔	Oil inlet port	3/8"
(15)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor
(16)	備用接頭	Spare adaptor	1/4" Flare, 3/8" Flare
(17)	排氣止回閥	Check Valve	1-5/8"

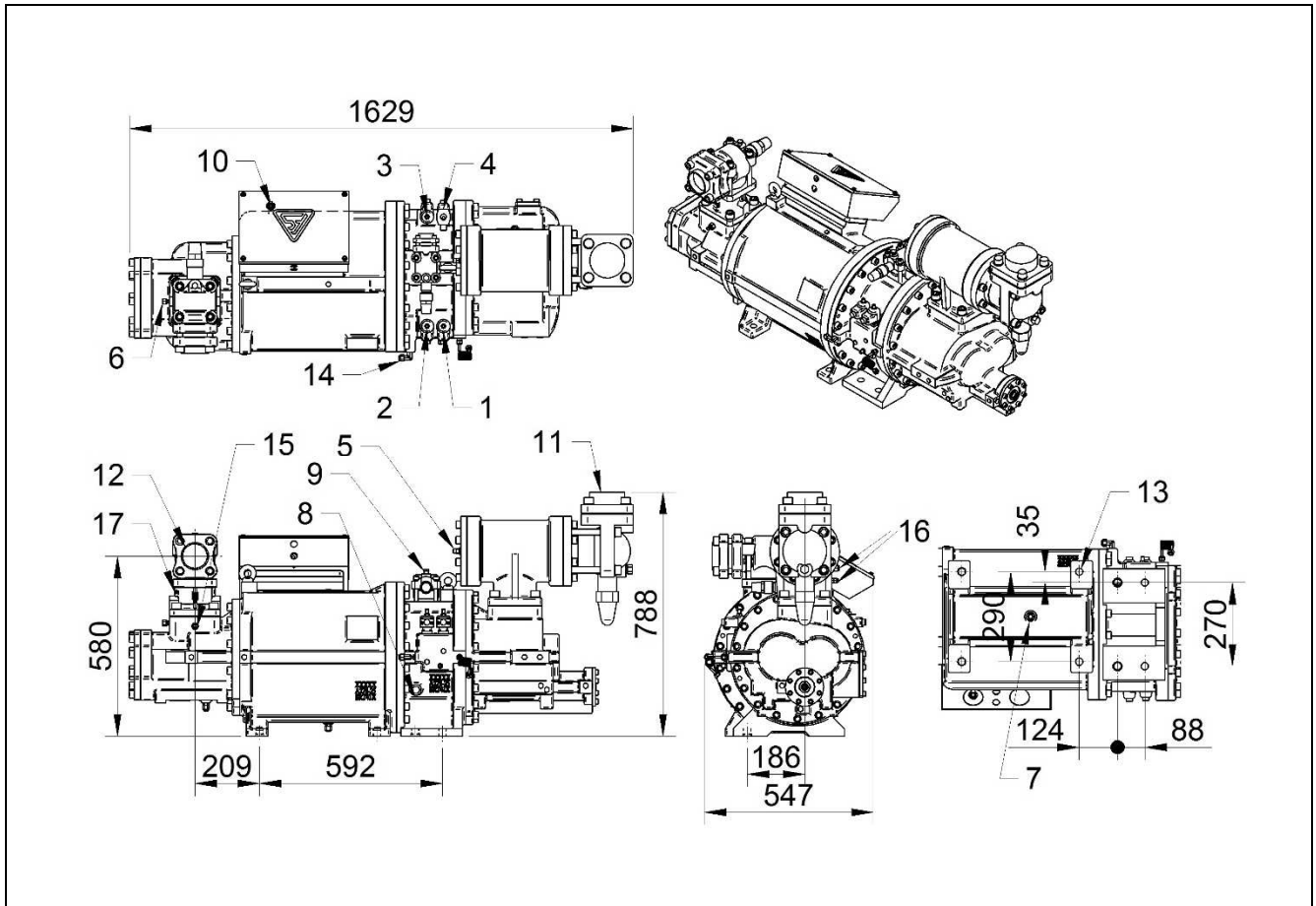


No.	品名	Parts	Remark
(1)	容調用電磁閥	Solenoid valve	SV0
(2)	容調用電磁閥	Solenoid valve	SV1
(3)	容調用電磁閥	Solenoid valve	SV50(50%)
(4)	容調用電磁閥	Solenoid valve	SV100(100%)
(5)	低壓端偵測接頭	Low pressure adapter	LP-1/4" Flare
(6)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(7)	洩油接頭	Draining adapter	3/8" Flare
(8)	液噴射接頭	Liquid injection adapter	3/8" Flare
(9)	節能器接口	Economizer port	ECO-3/4"
(10)	中壓端偵測接頭	Middle pressure adapter	MP-1/4" Flare
(11)	吸氣關斷閥	Stop valve	4"
(12)	排氣關斷閥	Stop Valve	2-5/8"
(13)	固定孔	Fixing Hole	D24
(14)	入油孔	Oil inlet port	3/8"
(15)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor
(16)	備用接頭	Spare adaptor	1/4" Flare, 3/8" Flare
(17)	排氣止回閥	Check Valve	2-5/8"

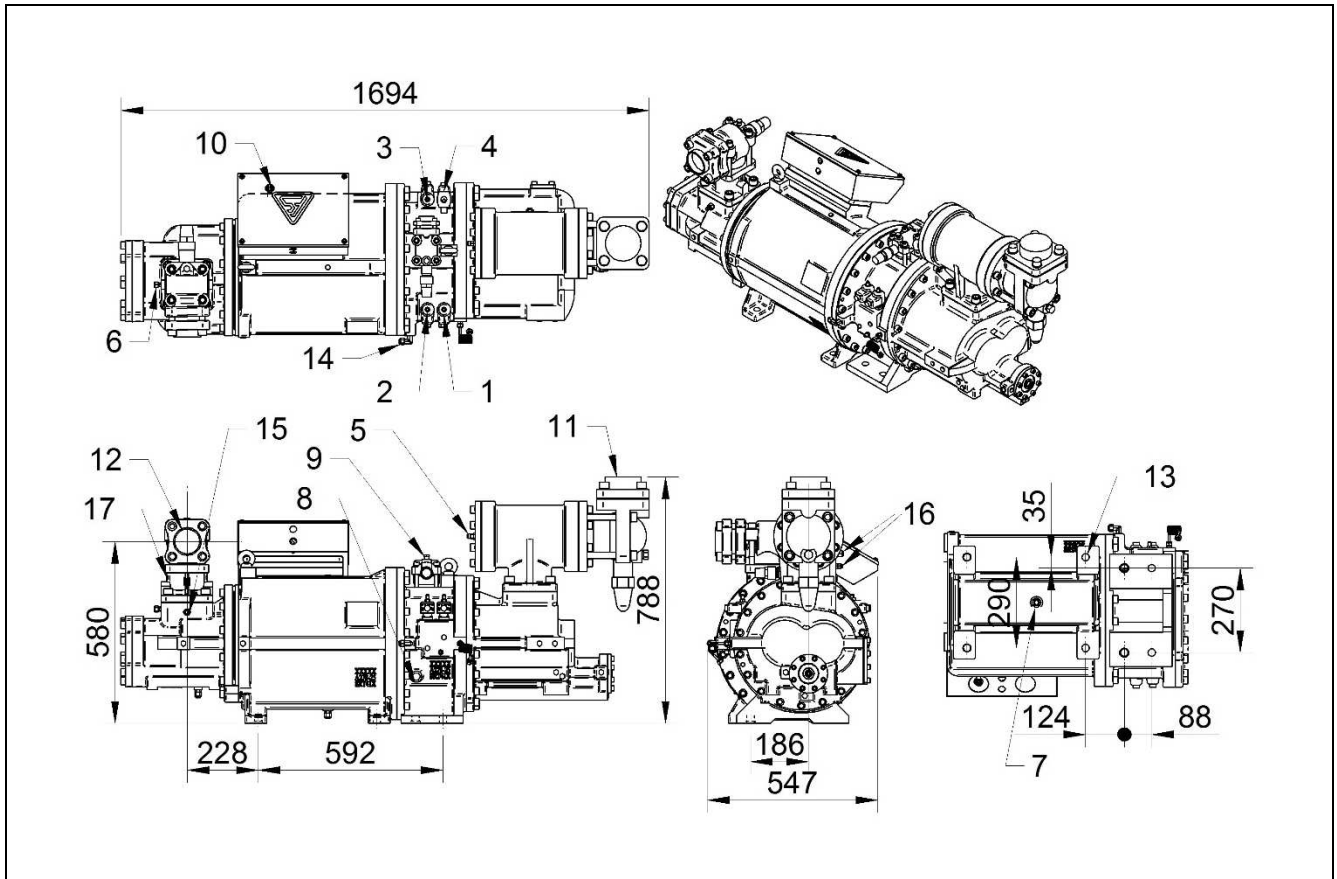


No.	品名	Parts	Remark
(1)	容調用電磁閥	Solenoid valve	SV0
(2)	容調用電磁閥	Solenoid valve	SV1
(3)	容調用電磁閥	Solenoid valve	SV50(50%)
(4)	容調用電磁閥	Solenoid valve	SV100(100%)
(5)	低壓端偵測接頭	Low pressure adapter	LP-1/4" Flare
(6)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(7)	洩油接頭	Draining adapter	3/8" Flare
(8)	液噴射接頭	Liquid injection adapter	3/8" Flare
(9)	節能器接口	Economizer port	ECO-3/4"
(10)	中壓端偵測接頭	Middle pressure adapter	MP-1/4" Flare
(11)	吸氣關斷閥	Stop valve	4"
(12)	排氣關斷閥	Stop Valve	2-5/8"
(13)	固定孔	Fixing Hole	D24
(14)	入油孔	Oil inlet port	3/8"
(15)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor
(16)	備用接頭	Spare adaptor	1/4" Flare, 3/8" Flare
(17)	排氣止回閥	Check Valve	2-5/8"





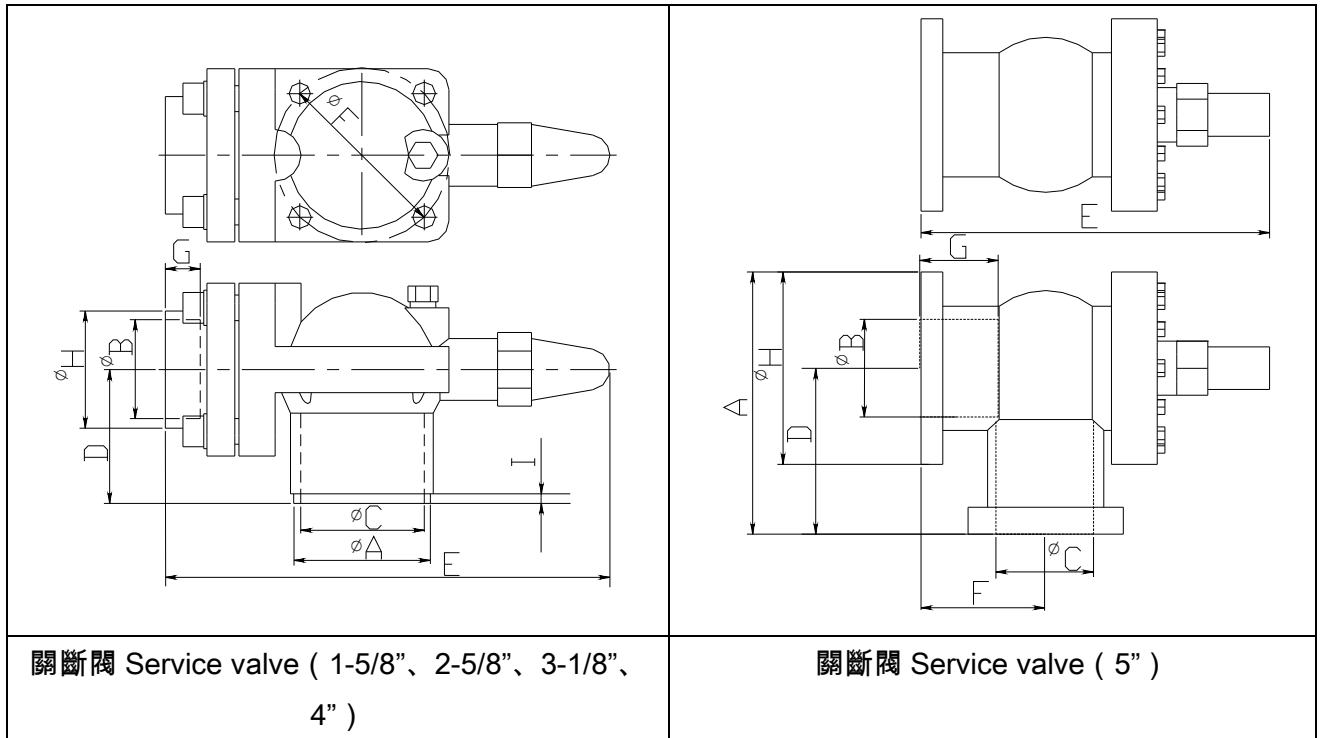
No.	品名	Parts	Remark
(1)	容調用電磁閥	Solenoid valve	SV0
(2)	容調用電磁閥	Solenoid valve	SV1
(3)	容調用電磁閥	Solenoid valve	SV50(50%)
(4)	容調用電磁閥	Solenoid valve	SV100(100%)
(5)	低壓端偵測接頭	Low pressure adapter	LP-1/4" Flare
(6)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(7)	洩油接頭	Draining adapter	3/8" Flare
(8)	液噴射接頭	Liquid injection adapter	1/2" Flare
(9)	節能器接口	Economizer port	ECO 1-5/8"
(10)	中壓端偵測接頭	Middle pressure adapter	MP-1/4" Flare
(11)	吸氣關斷閥	Stop valve	4"
(12)	排氣關斷閥	Stop Valve	3-1/8"
(13)	固定孔	Fixing Hole	D24
(14)	入油孔	Oil inlet port	3/8"
(15)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor
(16)	備用接頭	Spare adaptor	1/4" Flare, 3/8" Flare
(17)	排氣止回閥	Check Valve	3-1/8"



No.	品名	Parts	Remark
(1)	容調用電磁閥	Solenoid valve	SV0
(2)	容調用電磁閥	Solenoid valve	SV1
(3)	容調用電磁閥	Solenoid valve	SV50(50%)
(4)	容調用電磁閥	Solenoid valve	SV100(100%)
(5)	低壓端偵測接頭	Low pressure adapter	LP-1/4" Flare
(6)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(7)	洩油接頭	Draining adapter	3/8" Flare
(8)	液噴射接頭	Liquid injection adapter	1/2" Flare
(9)	節能器接口	Economizer port	ECO 1-5/8"
(10)	中壓端偵測接頭	Middle pressure adapter	MP-1/4" Flare
(11)	吸氣關斷閥	Stop valve	4"
(12)	排氣關斷閥	Stop Valve	3-1/8"
(13)	固定孔	Fixing Hole	D24
(14)	入油孔	Oil inlet port	3/8"
(15)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor
(16)	備用接頭	Spare adaptor	1/4" Flare, 3/8" Flare
(17)	排氣止回閥	Check Valve	3-1/8"

7.5 關斷閥尺寸

7.5 Service valve dimension



Unit: mm

尺寸 Dimension	1-5/8"	2-5/8"	3-1/8"	4"
A	70	81.5	105	130
B	42	67	80	105
C	54	65	85	111
D	47	64	79	95
E	257	317	357	440
F	90	110	140	173
G	24	28	32	50.5
H	48.5	77	88.5	114.5
I	8	8	6	6

關斷閥公稱尺寸 Nominal dimension of service valve

型號 Model	吸氣關斷閥 Suction service valve	排氣關斷閥 Discharge service valve
SRT218	2-5/8"	1-5/8"
SRT314	2-5/8"	1-5/8"
SRT321	4"	2-5/8"
SRT324	4"	2-5/8"
SRT413	4"	3-1/8"
SRT415	4"	3-1/8"

7.6 噪音值

7.6 Noise level

SRT Sound pressure level (dBA)						
Model Hz	SRT218	SRT314	SRT321	SRT324	SRT413	SRT415
63	25.7	29.5	31.5	33.5	40.8	33.9
125	30.6	34.5	36.4	38.3	43.1	37.6
160	41.9	42.1	42.1	40.3	45.2	46.2
200	44.2	48.3	44.6	45.4	48.6	52.4
250	59.7	61.9	62.1	54.8	64.0	59.1
315	53.4	55.2	57.2	52.1	59.7	58.7
400	60.1	64.7	66.4	63.1	58.4	64.1
500	71.9	75.8	73.4	73.1	72.1	79.0
630	62.8	62.3	61.5	66.7	65.3	72.9
800	63.1	67.1	70.8	72.0	76.5	79.2
1000	68.2	69.0	68.4	67.7	70.4	69.6
1250	70.6	72.7	73.4	73.5	75.9	69.0
1600	64.2	65.5	66.8	67.0	71.4	65.3
2000	66.2	65.4	67.1	69.4	70.3	69.2
2500	67.3	68.6	72.4	76.2	66.3	68.1
3150	59.2	60.8	62.1	63.4	62.7	64.9
4000	60.7	61.3	63.4	68.1	67.1	70.3
5000	58.2	57.1	60.7	61.7	63.1	69.0
6300	60.7	58.8	59.4	61.6	57.9	66.8
8000	51.8	52.2	55.4	57.3	59.3	66.3
總值						
Total	77.5	79.7	80.2	81.4	82	84.4
(dBA)						

1. 距離壓縮機體 1m 處測量，運轉條件：  
R134a 冷媒，冷凝溫度 45°C，蒸發溫度 -15°C

2. 其他冷媒如 R-22 以及 R404A 或運轉條件下噪音值變化在 ±2 dBA 以內

3. 噪音量測標準根據 ISO2151

1. The above 1/3 octave data are based on condensing temp. at 45°C, evaporating temp at -15°C and measured 1-m from the compressor with R-134a refrigerant.

2. For all other compatible refrigerants such as R-22, R-404A and other working conditions within the allowed operation range, the sound pressure level varies within ±2dBA.

3. The above data was measured according to ISO2151.