BSR-V Series

使用手冊

Instruction Manual

INVERTER SCREW REFRIGERANT COMPRESSOR

變頻式螺旋冷媒壓縮機

SINCE 1953

復盛股份有限公司

Fu Sheng Industrial Co., Ltd.

M-BSR-V-9907

FUSHENG

目錄 CONTENTS

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。

順應節能時代潮流，特別開發出「BSR-V」系列變頻雙螺旋壓縮機，符合客戶的使用工況與應用場合。優化的產品性能，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：「美國實驗室國家認證」「UL」、「歐盟安全法規認證 CE mark」、「歐盟壓力容器認證 PED」、「ISO 9001 國際品質認證」、「臺灣精品獎」等。

「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、

Preface

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

In order to meet demands for various working condition from clients, Fu Sheng has particularly developed the 「BSR-V」 series of screw refrigerant compressors to satisfy each client's unique application condition and design specification. With BSR 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 UL(USA), CE mark(EU), PED(EU), ISO 9001 and “ Symbol of Excellence” Award (Taiwan), etc.

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

Our motto is to provide our value customers with screw refrigerant

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。

compressors bearing better competitive edge, performance and quality to increase satisfactions from customers or even to.

「復盛公司」為確保客戶能夠順利的啟用「BSR-V」變頻雙螺旋式冷媒壓縮機，特別在本使用手冊中，編寫有關BSR-V 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」「BSR-V」變頻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。

This instruction manual is prepared to ensure that users can operate or install Fu Sheng 「BSR-V」inverter screw refrigerant compressors correctly. Reader will find BSR-V 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.

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。

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.「BSR-V」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.
  - ■ 內置三個ＰＴＣ熱敏電阻保護，精確保護壓縮機，防止故障燒毀
  - ■ 內建特殊冷卻流道設計，不需額外外部冷卻，並可使電機穩定高效率運作
  - ■ 採用高成本絕緣材料，完全滿足變頻需求
- 耐久型軸承設計及充分潤滑.
  - ■ 五個軸向軸承，耐用性更佳
  - ■ 內建油路提供最好的潤滑
  - ■ 採用特殊專用軸承，完全適合高溫高速應用

I. FEARURES OF「BSR-V」SERIES

Mechanism:

- Newly asymmetrical rotor profile, best tooth ratio 5:6, the compressor provides high efficiency in operation.
- Precise cases and rotors are machined in a 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 to protect motor from damage.
  - ■ Special designed passage to increase motor cooling effect.
  - ■ High quality insulation material to cope with inverter application.
- Long service life of bearings with sufficient lubrication.
  - ■ Five axial bearings provide more durability.
  - ■ Built-in oil channel provides perfect lubrication.
  - ■ The bearings are suitable for high temperature & high speed application.

- 絕佳的低震動表現.
  - 每個轉子都通過嚴苛的動平衡校正，使壓縮機震動控制在最佳狀態
  - 採用特殊排氣流道，提供最少氣流干擾

- Excellent performance on low vibration and discharge pulse.
  - Every rotor is tested by a strictly dynamic balanced test to achieve lowest vibration
  - Special design for discharge channel to perform lowest current disturbance.

- 高效率的油分離器及大面積油過濾器.
  - 特殊設計的油分離器
  - 高效的精密油過濾器

- Built-in high efficiency oil separator with large filtration area.
  - Innovative design of oil separator.
  - Equipped with high efficiency oil filter.

- 變頻容調
  - 以變頻容調代替傳統的滑塊容調
  - 高 IPLV / NPLV 效率

- Inverter capacity control
  - Using inverter to replace slide valve capacity control.
  - High efficiency on IPLV / NPLV.

- 提高安裝便利性
  - 進氣接口位於馬達端蓋上可依需要旋轉角度
- 電氣控制及保護器部分
  - PTC 排氣溫度保護：預防過高排氣過熱導致壓縮機損毀
  - PTC馬達溫度保護：預防馬達溫度過高燒毀
  - 油位保護：確保潤滑油狀態，防止壓縮機失油燒毀

- Easy for installation
  - Suction port can be rotated to different piping angle.
- Electrical control and protection device.
  - PTC thermal sensor is used to protect compressor from damage due to high discharge temperature.
  - PTC motor thermal sensor is used to protect motor from damage.
  - Oil level protection

- 標準配備.
  - 排氣止回閥:防止停機長期逆轉
  - 油視窗：可視覺判斷油品狀況及液位高低
  - 潤滑油液位保護器：確保潤滑油狀態，防止壓縮機失油毀損
  - 油加熱器：關機時啟動，防止液啟動造成嚴重液/濕壓縮現象
  - 洩油閥：提高更換油品的便利性
  - 精密油過濾器：確保機油迴圈潔淨度
  - INT69 電器保護模組：保護馬達及排氣溫度過高
  - 預留中間壓與低壓液噴射接頭：使客戶可以直接使用，不需購買特殊機型
  - 節能器法蘭：標準化設計，僅需加購節能器轉接頭及可使用節能器，不需購買特殊機型

- 完善的選配件.
  - 液噴射電磁閥
  - 吸氣關斷閥
  - 排氣關斷閥
  - 液噴毛細管
  - 防震墊
  - 安全閥
  - 節能器接頭

- Standard fittings
  - Discharge check valve is used to protect compressor from reverse rotation.
  - Oil sight glass is used to check if oil level is enough or not.
  - Oil level switch is used to protect compressor from loss of lubrication.
  - Oil heater : to makes sure that refrigerant will not be dissolve into oil.
  - Oil drain valve
  - Precise oil filter
  - INT 69 motor protector.
  - Reserved liquid injection ports at middle pressure side and low pressure side
  - Economizer connection flange

- Complete optional fittings:
  - Liquid injection solenoid valve.
  - Suction stop valve.
  - Discharge stop valve.
  - Liquid injection capillary.
  - Anti-vibration pads
  - Safety valve
  - Economizer adapter.

1.1 高優化的機體結構

壓縮機結構如圖一所示.

● 高強度耐壓設計

利用結構力學的精密計算，使機殼不僅能符合耐壓需求，更進一步取得歐洲 PED 認證

展現工藝水準極致的精度

● 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。

BSR-V 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 is showed as Figure 1.

● High strength design

Casing is the major component of screw refrigerant compressor. The casing of BSR-V is fully complied with PED requirement.

● High precision

To reach high operation efficiency, the casing is processed 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.

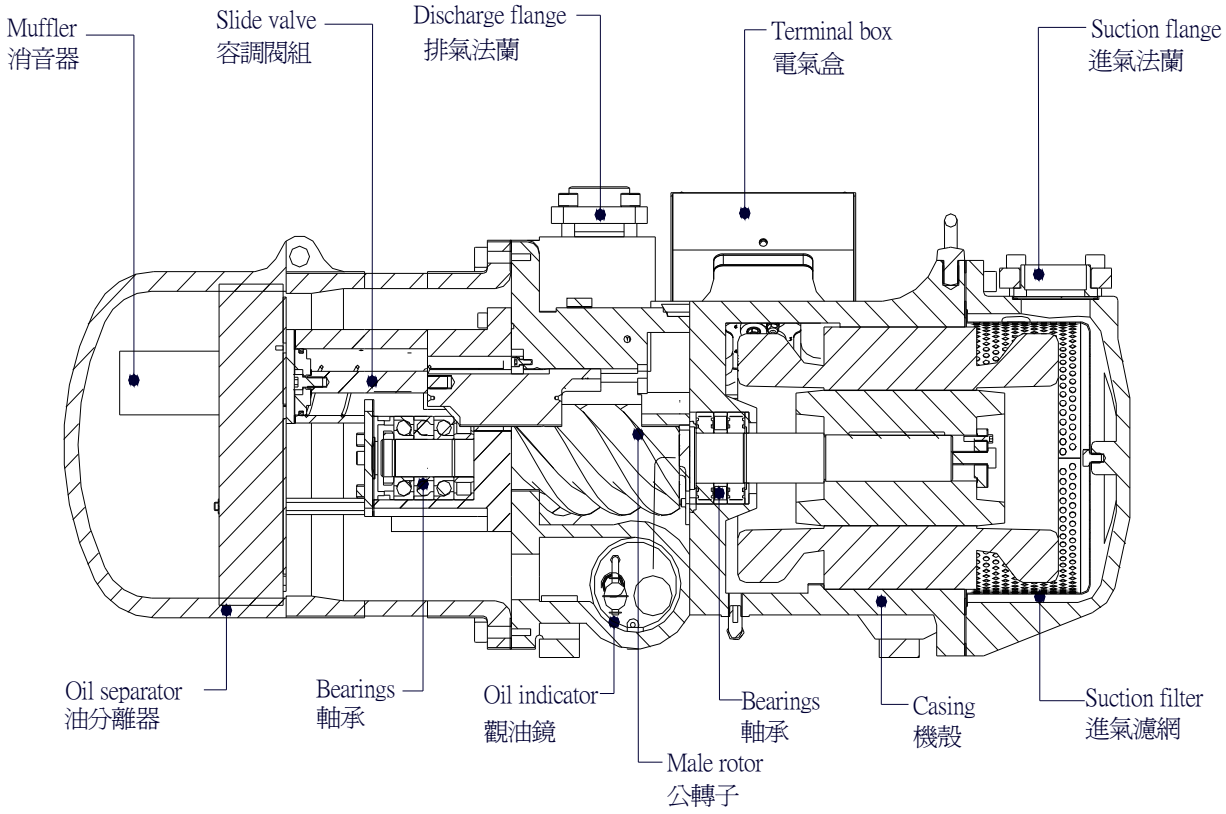
1.2 Rotors

■ Optimization

Fusheng compressor adopts 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。

採用的高級特殊軸承，不僅針對變頻機需要的高轉速，也一併克服高轉速所帶來的軸承高溫問題，使 BSR-V 系列可以在沒有油冷卻器的系統中一樣輕鬆運轉，不僅減少客戶在機組設計上的複雜度，更貼心的為我們重視的每個客戶省下油冷卻器的成本。

1.3 Bearing

- Long service life

High-precision large-sized axial and radial bearings are selected to support the male and female rotors for long lasting life. With 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.

The high accuracy bearings will overcome the high temperature, which caused by high rotation speed in inverter application. And also could work well without oil cooler to save customer’ s cost for oil cooler.

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。並使壓縮機在安全可靠及性能上取得絕佳的平衡。

1.4 Suction filter

- Large suction filter leads to low 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 compressor to ensure the ongoing normal operation and prolong operating lifetime.

1.5 油過濾器

- 精密過濾

位在機殼之下方的冷凍油儲槽內。所有進入軸承與轉子之潤滑油皆經過此油過濾器淨化，以防止異物進入容調室及

1.5 Oil filter

- Precise filtration

Oil filter is located in oil tank under the compressor casing. Any oil that passes through bearings and rotors

軸承內，損壞機件。

must be filtered and purified in order to prevent foreign objects or steel chips from entering and causing damages to the parts.

1.6 馬達及保護裝置

- 採用兩極三相，高效率變頻專用馬達，使變頻壓縮機在不同頻率下接能保持最佳效能。
- 內置 PTC 熱敏電阻搭配 INT69 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

1.6 Driving motor

- Equipped with a special designed high-efficient, two-pole, three-phase, inverter motor. The motor can remain in high efficiency under different speed.
- With built-in PTC thermistor INT69 electrical protection module to monitor the winding temperature of compressor motor closely, the compressor is insured to run under normal condition.

1.7 油分離器

- 內置式油分離器，內部構造採三段濾油機構，配合高密度油濾網，達到最佳的油氣分離效果，效率高達 99%以上
- 二次油分離器，BSR-V 建議使用復盛設計之油分離器，用以預防頻率超過 60Hz 時一次油分離器過負荷，兩者搭配後可使高頻狀態下，也可保持 99%以上效率。

1.7 Oil separator

- The internal of built-in oil separator utilizes three-stage filter mechanism with high-density filter element to achieve optimal oil separation effect and its efficiency is higher than 99%.
- For an external oil separator, we suggest using Fu Sheng designed external oil separator to prevent the overloading of internal oil separator while frequency is over 60Hz. The oil separation effect will be higher than 99% while two oil separators working together during the operation of high frequency.

1.8 變頻容調

- 簡易進行容調

1.8 Capacity control by an inverter

- The capacity control becomes easy

採用轉速變化控制製冷量，取消複雜的油路控制及滑塊控制邏輯。

- 絕佳的效率

  配合 ARI550/590 及 GB 規範,有最佳的部份負載設計。

as an inverter compressor is used. The traditional slide block capacity control is removed and the oil circulation control also becomes simple.

- The inverter compressor can bring the best part load efficiency to a chiller system.

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II.變頻螺旋冷媒壓縮機規範 specification of inverter screw refrigerant compressor

1. 產品規範表 Specification

系列 Series			BSRxxx-WAV				
機型 Model			213	216	311	314	316
基本規格 specificaiton	變位量 70Hz Displacement	m^3/hr	216	258	318	403	475
	變位量 30Hz Displacement	m^3/hr	84	103	127	161	190
	冷媒 Refrigerant		R134a				
	型式 Motor model		三相, 兩極, 感應馬達 3 phases, 2 poles, Induction motor				
馬達 Motor	額定電壓 Rated voltage	V	380				
	額定頻率 Rated frequency	Hz	70				
	啟動方式 Start		變頻器啟動 Inverter start-up				
	保護裝置 Protection devices		馬達高溫保護 Motor PTC thermistor				
變頻器 Inverter	建議廠商 Recommended supplier		台達電 Delta Electronics				
	建議系列 Recommended series		380V 三相, 3 phases, 380V				
	建議型號 Recommended series		VFD370F	VFD-450F	VFD-550F	VFD-750F	VFD-750F
	最高操作頻率設定 Maximum Output Frequency	0100	70	70	70	70	70
	最大電壓頻率設定 Maximum Voltage Frequency	0101	60	60	60	60	60
	最高輸出電壓設定 Maximum Output Voltage	0102	380	380	380	380	380
	中間輸出電壓頻率設定 Mid-point Frequency	0103	45	45	45	45	45
	中間輸出電壓設定 Mid-point Voltage	0104	285	285	285	285	285
	最低輸出頻率設定 Minimum Output Frequency	0105	12	12	12	12	12
	最低輸出電壓設定 Minimum Output Voltage	0106	76	76	76	76	76
	上限頻率 Upper Bound Frequency	0107	70	70	70	70	70
	下限頻率 Lower Bound Frequency	0108	30	30	30	30	30
	第一加速時間 Acceleration Time 1	0109	6	6	6	6	6
	第一減速時間 Deceleration Time 1	0110	6	6	6	6	6
	正反轉禁止 Forward/Reverse Enable	0204	01	01	01	01	01
	電機滿載電流 Full-load Current of Motor	0702	92	88	90	81	97
吸氣口尺寸 Suction size		Inch (mm)	2-5/8" (66.67)		3-1/8" (79.37)		
排氣口尺寸 Discharge size		Inch (mm)	1-5/8" (41.27)		2-5/8" (66.67)		
液壓測試 Liquid pressure test		bar(G)	42				
油加熱器 Oil heater		W	150				
潤滑油填充量 Oil charged		Liter	11		13		
重量 Weight		kg	481	486	600	609	615

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系列 Series			BSRxxx-WAV					
機型 Model			321	323	324	326	413	415
基本規格 specificaiton	變位量 70Hz Displacement	m^3/hr	503	553	614	661	776	866
	變位量 30Hz Displacement	m^3/hr	201	237	263	283	333	371
	冷媒 Refrigerant		R134a					
	型式 Motor model		三相, 兩極, 感應馬達 3 phases, 2 poles, Induction motor					
馬達 Motor	額定電壓 Rated voltage	V	380					
	額定頻率 Rated frequency	Hz	70					
	啟動方式 Start		變頻器啟動 Inverter start-up					
	保護裝置 Protection devices		馬達高溫保護 Motor PTC thermistor					
變頻器 Inverter	建議廠商 Recommended supplier		台達電 Delta Electronics					
	建議系列 Recommended series		380V 三相, 3 phases, 380V					
	建議型號 Recommended series		VFD900F	VFD1100F	VFD1100F	VFD1320F	VFD1600F	VFD1600F
	最高操作頻率設定 Maximum Output Frequency	0100	70	70	70	70	70	70
	最大電壓頻率設定 Maximum Voltage Frequency	0101	60	60	60	60	60	60
	最高輸出電壓設定 Maximum Output Voltage	0102	380	380	380	380	380	380
	中間輸出電壓頻率設定 Mid-point Frequency	0103	45	45	45	45	45	45
	中間輸出電壓設定 Mid-point Voltage	0104	285	285	285	285	285	285
	最低輸出頻率設定 Minimum Output Frequency	0105	12	12	12	12	12	12
	最低輸出電壓設定 Minimum Output Voltage	0106	76	76	76	76	76	76
	上限頻率 Upper Bound Frequency	0107	70	70	70	70	70	70
	下限頻率 Lower Bound Frequency	0108	30	30	30	30	30	30
	第一加速時間 Acceleration Time 1	0109	6	6	6	6	6	6
	第一減速時間 Deceleration Time 1	0110	6	6	6	6	6	6
	正反轉禁止 Forward/Reverse Enable	0204	01	01	01	01	01	01
	電機滿載電流 Full-load Current of Motor	0702	88	84	93	89	86	96
吸氣口尺寸 Suction size		Inch (mm)	4" (101.60)				4" (101.60)	
排氣口尺寸 Discharge size		Inch (mm)	3-1/8" (79.37)				3-1/8" (79.37)	
液壓測試 Liquid pressure test		bar(G)	42					
油加熱器 Oil heater		W	300					
潤滑油填充量 Oil charged		Liter	17				21	
重量 Weight		kg	726	736	762	777	849	899

系列 Series			BSRxxx-WAV			
機型 Model			421	423	424	426
基本規格 specificaiton	變位量 70Hz Displacement	m^3/hr	965	1064	1179	1319
	變位量 30Hz Displacement	m^3/hr	414	456	505	565
	冷媒 Refrigerant		R134a			
	型式 Motor model		三相, 兩極, 感應馬達 3 phases, 2 poles, Induction motor			
馬達 Motor	額定電壓 Rated voltage	V	380			
	額定頻率 Rated frequency	Hz	70			
	啓動方式 Start		變頻器啓動 Inverter start-up			
	保護裝置 Protection devices		馬達高溫保護 Motor PTC thermistor			
變頻器 Inverter	建議廠商 Recommended supplier		台達電 Delta Electronics			
	建議系列 Recommended series		380V 三相, 3 phases, 380V			
	建議型號 Recommended series		VFD-1850F	VFD-2200F	VFD-2200F	VFD-2200F
	最高操作頻率設定 Maximum Output Frequency	0100	70	70	70	70
	最大電壓頻率設定 Maximum Voltage Frequency	0101	60	60	60	60
	最高輸出電壓設定 Maximum Output Voltage	0102	380	380	380	380
	中間輸出電壓頻率設定 Mid-point Frequency	0103	45	45	45	45
	中間輸出電壓設定 Mid-point Voltage	0104	285	285	285	285
	最低輸出頻率設定 Minimum Output Frequency	0105	12	12	12	12
	最低輸出電壓設定 Minimum Output Voltage	0106	76	76	76	76
	上限頻率 Upper Bound Frequency	0107	70	70	70	70
	下限頻率 Lower Bound Frequency	0108	30	30	30	30
	第一加速時間 Acceleration Time 1	0109	6	6	6	6
	第一減速時間 Deceleration Time 1	0110	6	6	6	6
	正反轉禁止 Forward/Reverse Enable	0204	01	01	01	01
	電機滿載電流 Full-load Current of Motor	0702	92	82	88	97
吸氣口尺寸 Suction size		Inch (mm)	5" (127.00)			
排氣口尺寸 Discharge size		Inch (mm)	4" (101.60)			
液壓測試 Liquid pressure test		bar(G)	42			
油加熱器 Oil heater		W	300			
潤滑油填充量 Oil charged		Liter	25			
重量 Weight		kg	1115	1125	1135	1181

2. 產品規範表 Specification

FUSHENG

系列 Series			BSRxxx-HAV				
機型 Model			213	216	311	314	316
基本規格 specificaiton	變位量 70Hz Displacement	m^3/hr	216	258	318	403	475
	變位量 30Hz Displacement	m^3/hr	84	103	127	161	190
	冷媒 Refrigerant		R134a				
	型式 Motor model		三相, 兩極, 感應馬達 3 phases, 2 poles, Induction motor				
馬達 Motor	額定電壓 Rated voltage	V	380				
	額定頻率 Rated frequency	Hz	70				
	啟動方式 Start		變頻器啟動 Inverter start-up				
	保護裝置 Protection devices		馬達高溫保護 Motor PTC thermistor				
變頻器 Inverter	建議廠商 Recommended supplier		台達電 Delta Electronics				
	建議系列 Recommended series		380V 三相, 3 phases, 380V				
	建議型號 Recommended series		VFD450F	VFD-550F	VFD-750F	VFD-900F	VFD-1100F
	最高操作頻率設定 Maximum Output Frequency	0100	70	70	70	70	70
	最大電壓頻率設定 Maximum Voltage Frequency	0101	60	60	60	60	60
	最高輸出電壓設定 Maximum Output Voltage	0102	380	380	380	380	380
	中間輸出電壓頻率設定 Mid-point Frequency	0103	45	45	45	45	45
	中間輸出電壓設定 Mid-point Voltage	0104	285	285	285	285	285
	最低輸出頻率設定 Minimum Output Frequency	0105	12	12	12	12	12
	最低輸出電壓設定 Minimum Output Voltage	0106	76	76	76	76	76
	上限頻率 Upper Bound Frequency	0107	70	70	70	70	70
	下限頻率 Lower Bound Frequency	0108	30	30	30	30	30
	第一加速時間 Acceleration Time 1	0109	6	6	6	6	6
	第一減速時間 Deceleration Time 1	0110	6	6	6	6	6
	正反轉禁止 Forward/Reverse Enable	0204	01	01	01	01	01
	電機滿載電流 Full-load Current of Motor	0702	99	99	92	94	92
吸氣口尺寸 Suction size		Inch (mm)	2-5/8" (66.67)		3-1/8" (79.37)		
排氣口尺寸 Discharge size		Inch (mm)	1-5/8" (41.27)		2-5/8" (66.67)		
液壓測試 Liquid pressure test		bar(G)	42				
油加熱器 Oil heater		W	150				
潤滑油填充量 Oil charged		Liter	11		13		
重量 Weight		kg	481	486	600	609	615

FUSHENG

系列 Series			BSRxxx-HAV					
機型 Model			321	323	324	326	413	415
基本規格 specificaiton	變位量 70Hz Displacement	m^3/hr	503	553	614	661	776	866
	變位量 30Hz Displacement	m^3/hr	201	237	263	283	333	371
	冷媒 Refrigerant		R134a					
	型式 Motor model		三相, 兩極, 感應馬達 3 phases, 2 poles, Induction motor					
馬達 Motor	額定電壓 Rated voltage	V	380					
	額定頻率 Rated frequency	Hz	70					
	啟動方式 Start		變頻器啟動 Inverter start-up					
	保護裝置 Protection devices		馬達高溫保護 Motor PTC thermistor					
變頻器 Inverter	建議廠商 Recommended supplier		台達電 Delta Electronics					
	建議系列 Recommended series		380V 三相, 3 phases, 380V					
	建議型號 Recommended series		VFD1100F	VFD1320F	VFD1600F	VFD1600F	VFD2200F	VFD2200F
	最高操作頻率設定 Maximum Output Frequency	0100	70	70	70	70	70	70
	最大電壓頻率設定 Maximum Voltage Frequency	0101	60	60	60	60	60	60
	最高輸出電壓設定 Maximum Output Voltage	0102	380	380	380	380	380	380
	中間輸出電壓頻率設定 Mid-point Frequency	0103	45	45	45	45	45	45
	中間輸出電壓設定 Mid-point Voltage	0104	285	285	285	285	285	285
	最低輸出頻率設定 Minimum Output Frequency	0105	12	12	12	12	12	12
	最低輸出電壓設定 Minimum Output Voltage	0106	76	76	76	76	76	76
	上限頻率 Upper Bound Frequency	0107	70	70	70	70	70	70
	下限頻率 Lower Bound Frequency	0108	30	30	30	30	30	30
	第一加速時間 Acceleration Time 1	0109	6	6	6	6	6	6
	第一減速時間 Deceleration Time 1	0110	6	6	6	6	6	6
	正反轉禁止 Forward/Reverse Enable	0204	01	01	01	01	01	01
	電機滿載電流 Full-load Current of Motor	0702	99	99	92	99	84	92
吸氣口尺寸 Suction size		Inch (mm)	4" (101.60)				4" (101.60)	
排氣口尺寸 Discharge size		Inch (mm)	3-1/8" (79.37)				3-1/8" (79.37)	
液壓測試 Liquid pressure test		bar(G)	42					
油加熱器 Oil heater		W	300					
潤滑油填充量 Oil charged		Liter	17				21	
重量 Weight		kg	726	736	762	777	849	899

Remarks: The inverter is not available for BSR42x-HAV models.

2.安裝與試俥規範

2.1 壓縮機安裝

2.1.1 運送及安裝

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：洩油閥、銅接頭、接線盒組等)，並保持水平，嚴禁重落地。

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上防震腳墊變型為止。

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。

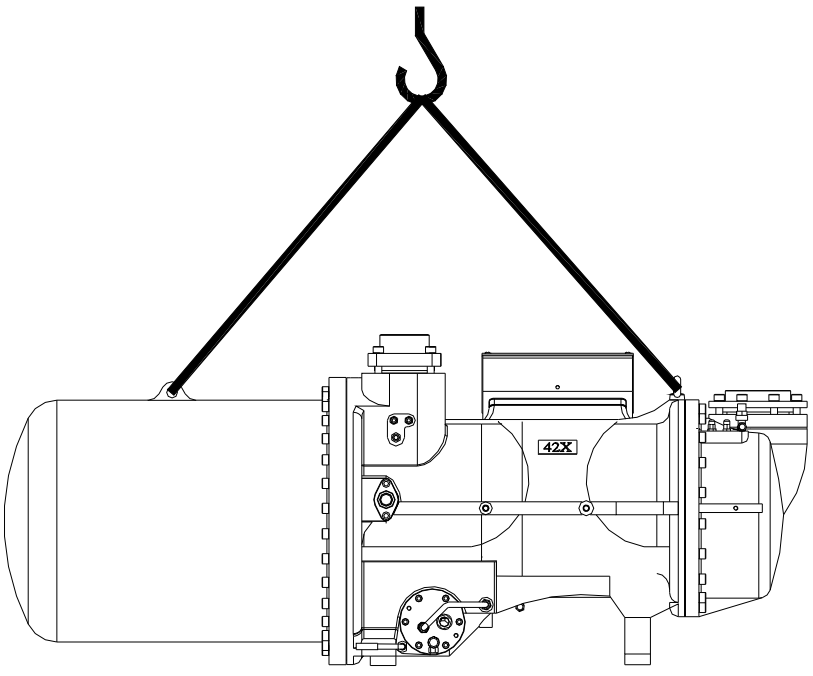
2. INSTALLATION AND COMMISSION SPECIFICATION

2.1 Installation of the compressor

2.1.1 Delivery and installation :

Use eyebolts attached to compressor body or two safety belts to wrap around the compressor body and hoist it up. Do not crash the compressor body during the transporting or hoisting process especially those parts assembled on compressor (ex. draining valve, copper connectors, and terminal box, etc.) Keep the compressor body leveled and avoid severe ground impact.

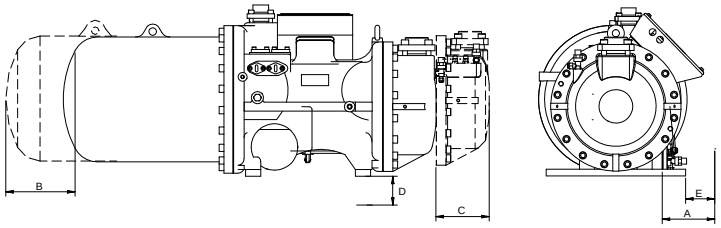
Install suitable anti-vibration pads (5-10mm) under the compressor seats to block out the vibration and noise generated by the compressor. The fixed bolt must be tightened until the upper rubber deformed. Keep compressor in a well-ventilated, low humidity and low heat environment with plenty of space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



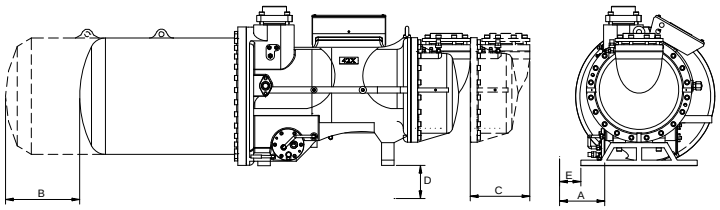
2.1.2 維修空間預留尺寸　　2.1.2 Required maintenance space

單位(Unit): cm

型 號 Model / 位置 Position	BSR21X	BSR31X	BSR32X	BSR41X	BSR42X
A(油過濾器)Oil filter	25	25	25	25	25
B(油分離器)Oil separator	35	40	40	45	45
C(進氣濾清器)Suction filter	20	20	20	20	20
D(垂直機台距離) Vertical distance from compressor body	15	15	15	15	15
E(水平機台距離) Horizontal distance from compressor body	10	10	10	10	10



BSR21x-xxV~BSR41x-xxV



BSR42x-xxV

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。而出廠之壓縮機已添加所須之冷凍油，由於冷凍油具有強烈之吸濕性，故壓縮機於開封後、配管安裝前，請勿使油品直接暴露在大氣中超過 15 分鐘。

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. The new compressor has been filled with lubricant in factory before delivery. Since the lubricant is very hygroscopic, do not expose the lubricant to the atmosphere over 15 minutes after the compressor is unsealed or before installation.

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。

2.1.4 Use of other lubricant

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

After oil change, please turn on oil heater to heat and vacuum. In addition, because the hygroscopic character of synthetic oil, do not expose the oil to the atmosphere after the oil barrel is unsealed.

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。

2.1.5 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、生銹、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 :

The contaminants in the refrigerant system affect the lifetime and efficiency of compressor directly. It is crucial to reduce non-condensed gas content in the refrigerant system. Moisture mixed with refrigerant tends to block the pipe line due to the frozen water, causes rust to components, and damages the winding insulation generates copper coating on the rotors. If the refrigerant pipeline is very 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 ΔP of suction filter is greater than 30 kpa (4.3 psi) it means that 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 ΔP of 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：

- 冷凍油油位是否填滿觀油鏡？
- 機油加熱器加熱時間是否足夠？(長時間停機後，需加熱 8hr 以上)
- 每一手動閥(冷卻水、冰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 10MΩ 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 500MΩ（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。

2.2 Items to be checked before startup

2.2.1 Compressor：

- Check if the refrigeration oil is filled up to the top level of oil indicator.
- Check if the oil heater is turned on to heat up the oil before startup. It is recommended to heat up oil for 8 hours if the compressor has been shut down for a long time.
- Check if all manual valves (service valves for the inlet/outlet cooling water, chilling water and refrigerant pipe) have been opened.
- Check if the power cables to compressor motor and discharge temperature switch have been connected firmly.

2.2.2 Electrical system

- Check if the voltages and frequencies of main and control power sources are correct.
- Check if the insulation resistances of phase to phase and phase to ground are higher than 10MΩ .

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 500MΩ（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 and then take corrective action to solve the problem.

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？

2.2.3 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。

2.2.5 變頻器設定注意：

- 設定前，請先詳閱變頻器使用手冊，並熟記設定及操作方式。
- 變頻器須先通電，才能進行參數設定，完成設定前請勿啟動壓縮機，避免壓縮機損壞。務必依照本手冊提供之相關參數進行設定，切勿隨意變更輸入值，或不設定就啟動壓

c. Use DC2.5V ohm meter to measure the insulation of motor protection device (PTC thermistor). It is not allowed to measure it by a mega ohmmeter.

- Check if the motor ground wire and terminal wires have been connected tightly.
- Check if the controller settings are correct.

2.2.3 Piping system

- Check if there is any leakage 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.

2.2.5 Notice when setting inverter :

- Before setting inverter, read the inverter manual carefully and follow the setting and operating process exactly.
- First of all, energize the inverter and then perform the parameter setting. Do not start the compressor before finishing the setting. Please perform the parameter setting according to the manual.

縮機。

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：
  R-134a:5~10℃
- 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。

2.3 Notices in operation

- Confirm the rotation direction right after the startup. Make sure that the suction pressure shall drop down and discharge pressure shall rise 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 5~10℃ for R-134a application.
- Any superheat beyond the range could cause damage to 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 also causes low oil level in 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 individual. Applying

insulation resin to the motor terminals can isolate the condensed water and eliminate possible short-circuit.

- 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:

- While running compressor in low temperature environment, the following actions are recommended to keep the minimum pressure difference between discharge and suction ends above 5 bar:

  - 用壓力開關控制冷凝器散熱風扇之啟動與停止。
  - Use pressure switch to control the start/stop of cooling fan for condenser.
  - 在壓縮機及冷凝器之間，加裝壓力維持閥。
  - 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、或軸承損壞等現象。

2.4 Notices during factory test

An extra filter is recommended to be installed 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 up 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, or bearings etc.

2.5 雙機變頻負載控制建議

2.5 Recommendation of loading control for twin compressor chiller

- 單變頻機搭配單定頻機：負載低於50%時啟動變頻機進行容調，負載高於 50%啟動雙機，並且依舊以變頻機進行容調，以確保壓縮機的效率保持再最佳狀態。
- 雙機變頻：將雙壓縮機在控制邏輯區分為兩部分。負載大於兩台最小負載和時，單純以總頻率進行比例容調，如需求負載小於兩台負載和之 30%時，就停止任一壓縮機改以單台進行容調。如果負載需求高於 50%,則啟動另一台壓縮機,雙機同時作加卸載動作。

- One inverter plus one fixed frequency compressor: if loading is less than 50%, turn on the inverter to perform capacity control. If loading is higher than 50%, switch on the fixed frequency compressor and control the loading by inverter to keep the compressors at best efficiency.
- Dual inverter compressors:
  Start both compressors together. Change the frequency of both compressors together when the loading is changed. The minimum frequency of inverter compressor is 30%. If total loading is less than 30% of full load, shut down one compressor. Use only one compressor to cover cooling demand. If the loading is higher than 50%, turn on the second one and then control the frequency together again.

3.運轉規範

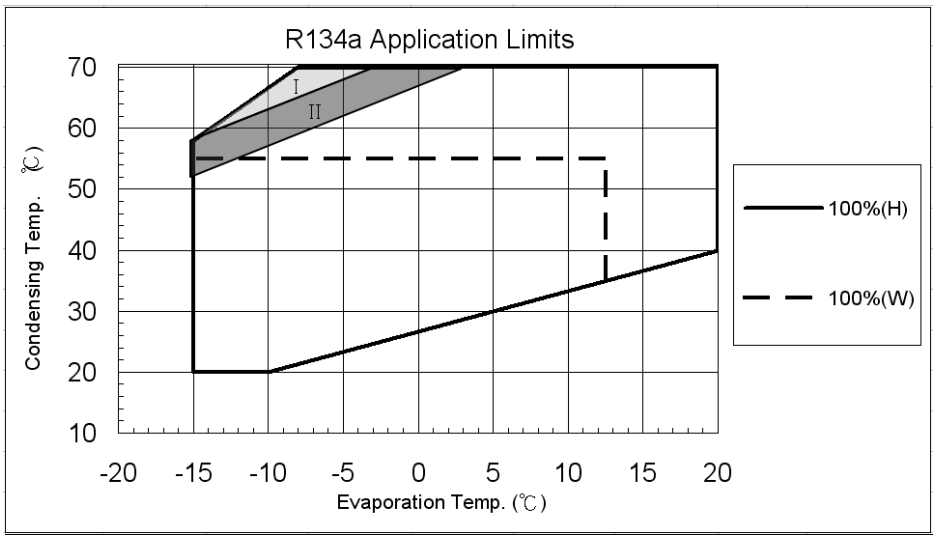
3.1 運轉範圍

- 容許操作環境：-10~55℃
- 容許操作壓力(表壓)：
  最高吸氣壓力:R-134a: 5 bar.
  最高排氣壓力:R-134a: 20.5 bar.
- 容許最高排氣溫度：110℃

3. OPERATION SPECIFICATION

3.1 Operation range

- Allowable ambient temperature: -10~55 ℃
- Allowable operating pressure (gauge) :
  The maximum suction pressure :
  R-134a: 5 bar.
  The maximum discharge pressure:
  R-134a: 20.5 bar
  The maximum allowable discharge temperature：110℃



Remarks : (H) indicates the range for BSRxxx-HAV and (W)indictes the operation range of BSRxxx-WAV

運轉範圍圖(圖五) Application limits (R134a)

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。

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.

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%

3.3 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。

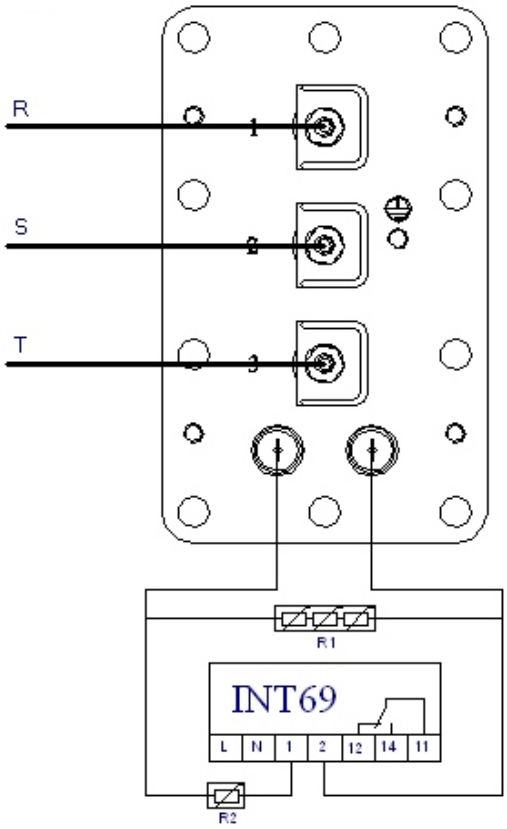
3.4 Safety devices in operation

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 shall be compulsorily 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℃； 復歸溫度: 110±5℃。 Trip temperature: 130±5℃; Reset temperature: 110±5℃.
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℃; 復歸溫度：90±5℃ Trip temperature: 110±5℃; Reset temperature: 90±5℃.
4	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.
5	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.
6	油過濾器壓差保護開關 Pressure differential protection switch at oil filter.	壓差設定: 1~1.5 bar. Pressure difference setting: 1~1.5 bar.
7	最低運轉高低壓差 Minimum pressure difference between discharge and suction ends in operation.	5 bar

4.電氣規範	4. ELECTRIC SPECIFICATION
4.1 電氣結線方式	4.1 Electric wiring configuration

型號Model: BSR21x-xxV ~BSR31x-xxV



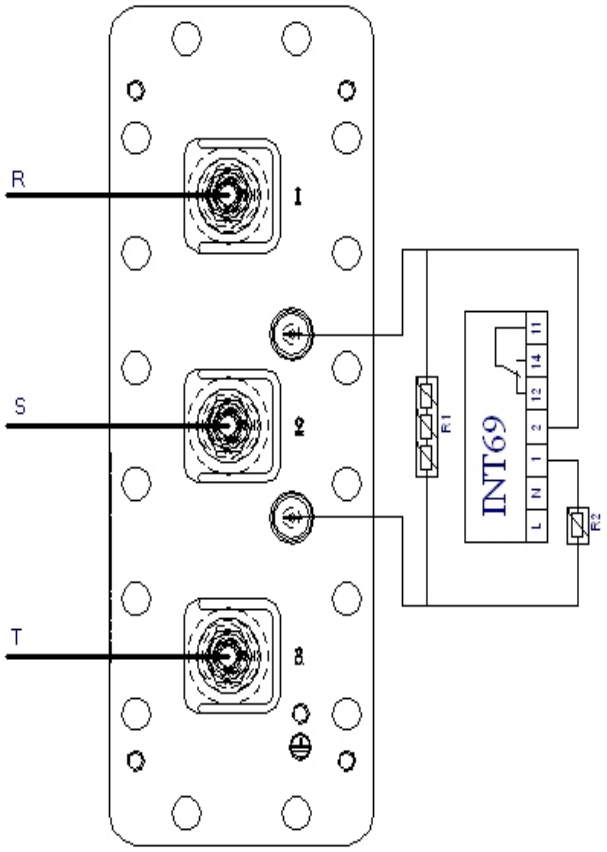
符號說明 Legend:		
1.2.3	主電源	Main power supply
11/14 (INT69):	保護回路	Protection circuit
1 / 2 (INT69) :	熱敏電阻接點	Thermistor contact
L/N (INT69) :	控制電源接點	Power supply 230V(115V) - 50Hz/ 60Hz
R1:	馬達高溫熱敏電阻	Motor thermistor
R2:	排氣高溫熱敏電阻	Discharge temperature thermistor

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

型號 Model: BSR32x-xxV~42X



符號說明 Legend:		
1.2.3	主電源	Main power supply
11/14 (INT69):	**保護回路**	Protection circuit
1 / 2 (INT69) :	熱敏電阻接點	Thermistor contact
L/N (INT69) :	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

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

建議配電線截面積(Hypalon)				Recommended wire cross-section(Hypalon)									
導線截面積 Wire cross-section area mm^2	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 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.

4.2 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.

5. 故障分析與保養週期

5.1 故障分析與研判

5 TROUBLE SHOOTING AND MAINTENANCE PERIOD

5.1 Trouble shooting

故 障 狀 況 Malfunction status	原 因 Possible causes
壓縮機馬達線圈，保護開關作動 Motor winding temperature-protecting switch is activated.	1. 負載大造成低壓側入口過熱度過高。 High compressor superheat due to heavy loading. 2. 高壓過高，負載過大。 Discharge pressure is too high that causes overload. 3. 線圈保護開關故障。 Motor winding temperature-protecting switch is out of order. 4. 電氣系統不良或故障。 Electric system is failed. 5. 馬達線圈不良，溫升過高。 Defective motor winding that causes high temperature rise-up.
馬達無法啟動 Unable to start motor or operate	1. 電壓過低。 Voltage is too low. 2. 電壓錯誤。 Voltage is not correct. 3. 馬達故障。 Motor fails 4. 欠相、逆相運轉。 Phase loss or phase sequence reverse. 5. 馬達保護開關作動。 Motor protection switch is activated. 6. 馬達線圈接線錯誤。 Motor is not connected correctly. 7. 排氣關斷閥未開(高壓開關作動)。 Discharge service valve is closed (high pressure switch is activated).
異常振動或噪音 Abnormal vibration or noise	1. 軸承損壞故障。 Bearing fails. 2. 機體內部固定螺絲鬆動。 Inner fixed screws become loose. 3. 轉子相互摩擦或與機殼摩擦。 Rotor scrapes against the other one or casing. 4. 失油。 Oil loss. 5. 內部機件鬆動。 Inner parts become loose. 6. 電磁聲。 Electrical magnetic noise. 7. 有異物進入。 Foreign particles enter compressor.

排氣溫度過高 High discharge temperature	1. 過熱度過高。 Superheat is too high. 2. 高壓過高，負載過大。 Discharge pressure or loading is too high. 3. 失油。 Low oil level. 4. 軸承損壞。 Bearing fails. 5. 電動機過熱。 Motor is overheated. 6. 壓縮比過大。 Compression ratio is too high. 7. 系統不可壓縮氣體含量太高 Uncompress red gas ratio in system is too high.
壓縮機失油 Oil loss	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. 2. 系統流速設計不足，匹配不合理。 Low designed flow velocity causes poor oil circulation. 3. 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.

5.2 保養週期建議表

5.2 Recommended maintenance period

Unit: hour

時間 Time / 項目 Item	100	1000	2500	5000	10000	15000	20000	25000	30000
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：

1. 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.
2. 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 vibration and noise. If abnormity is found, contact Fu-Sheng to bring instrument and make detailed check to figure out the reason.
3. 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.
4. 軸承壓換時須整組同時更換，不可只更換其中部份軸承。
   All bearings shall be replaced 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，回收系統髒冷媒避免污染環境，並更換乾燥過濾器。新機尚未裝機之前，請先將系統抽直空、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含酸度是否合格，若否則反覆上述動作。

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 then charge with nitrogen first to block it out of ambient moisture. After replacement, run the new compressor for one hour, stop it and replace system with new refrigeration oil and dry-filter. Run for another one-hour run to confirm that the system purity and oil are well qualified. If not, repeat the above procedure till acceptable.

5.4 PUMP DOWN 注意事項

- 除非有停機檢測或維修之必要，請勿於標準控制中作 PUMP DOWN。
- 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 0.5 bar(表壓)。

5.4 Notices on pump-down

- Do not conduct pump-down during the standard control process unless it is really essential to shutdown for making inspection or maintenance,
- Keep monitoring the discharge temperature. Once the discharge temperature switch is activated, stop pump-down at once.
- The minimum pump-down suction pressure shall be 0.5 bar (gauge).

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

6.Application

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

6.1 Liquid injection application

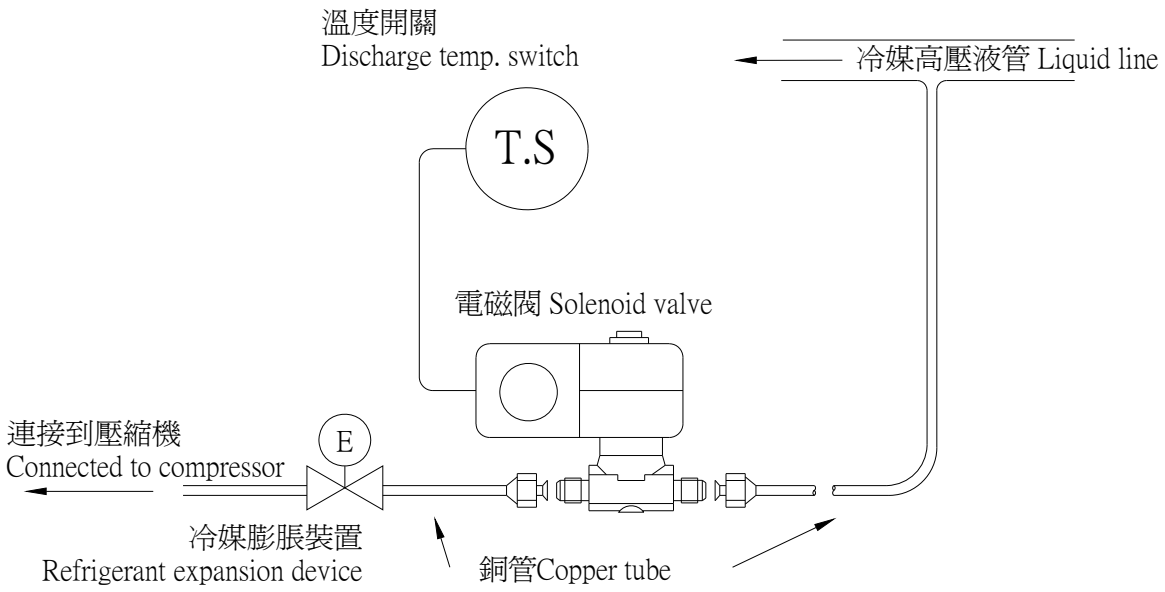
The application is made by introducing

範圍中之額外冷卻。

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 100℃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，議建使用液噴專用膨脹閥(如：Danfoss TEAT20，Alco series 935-100，Sporlan Y1037)。

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 100℃, 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 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 make the system stable. It is recommended to use specific expansion valves (ex. Danfoss TEAT20, Alco series 935 or Sporlan Y1037, etc.) to control the liquid injection.



螺旋壓縮機液噴射有兩個噴射點可以利用

There are two ports where liquid can be injected into compressor.

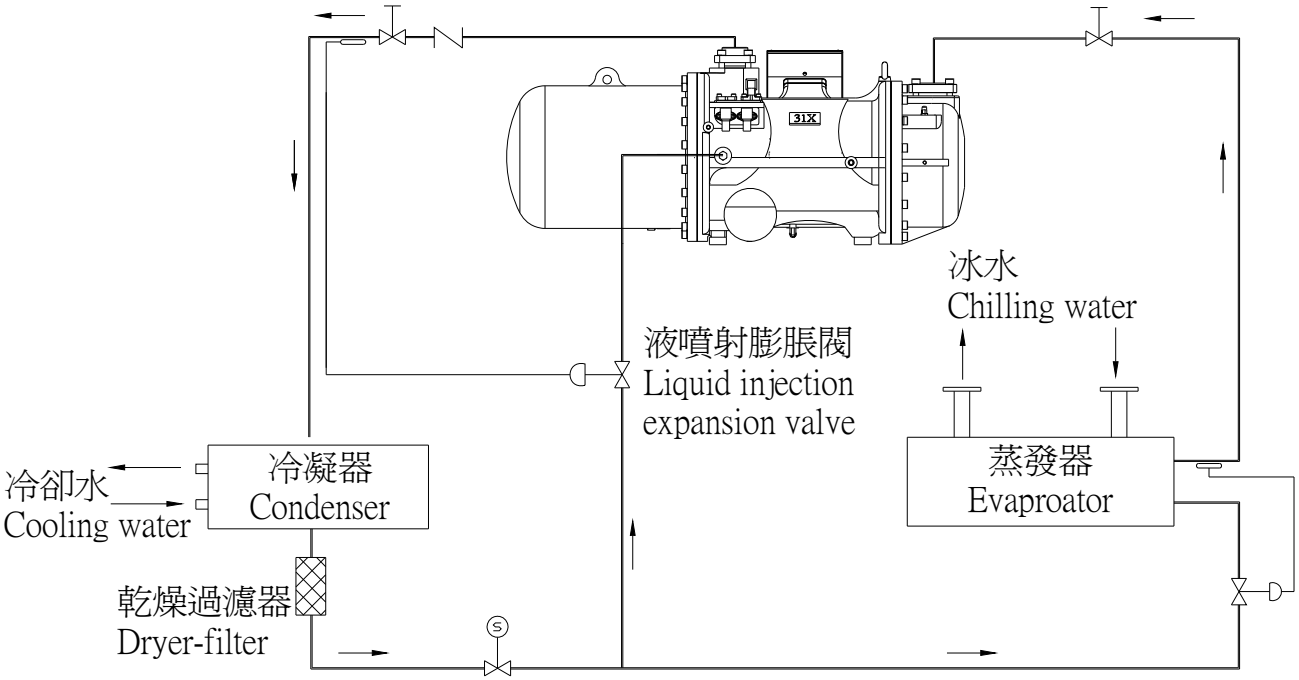


Fig. 7 液噴射應用 Liquid injection

(中間壓) (Middle pressure)

中間壓液噴射是將液態冷媒直接注入較低壓的壓縮腔，因為是在轉子密封後才噴入，所以不會影響壓縮機的變位量，缺點為無法提供馬達額外的散熱。噴射量過大時容易導致壓縮機損壞。

For middle pressure liquid injection, the liquid refrigerant is injected directly to the compression chamber in low pressure side. As the compression groove has been sealed by rotors, it will not reduce the displacement of compressor. Since it is injected into the compression chamber, this layout can not provide extra cooling to the motor. It is necessary to control the injected volume because it will damage the compressor when over injected.

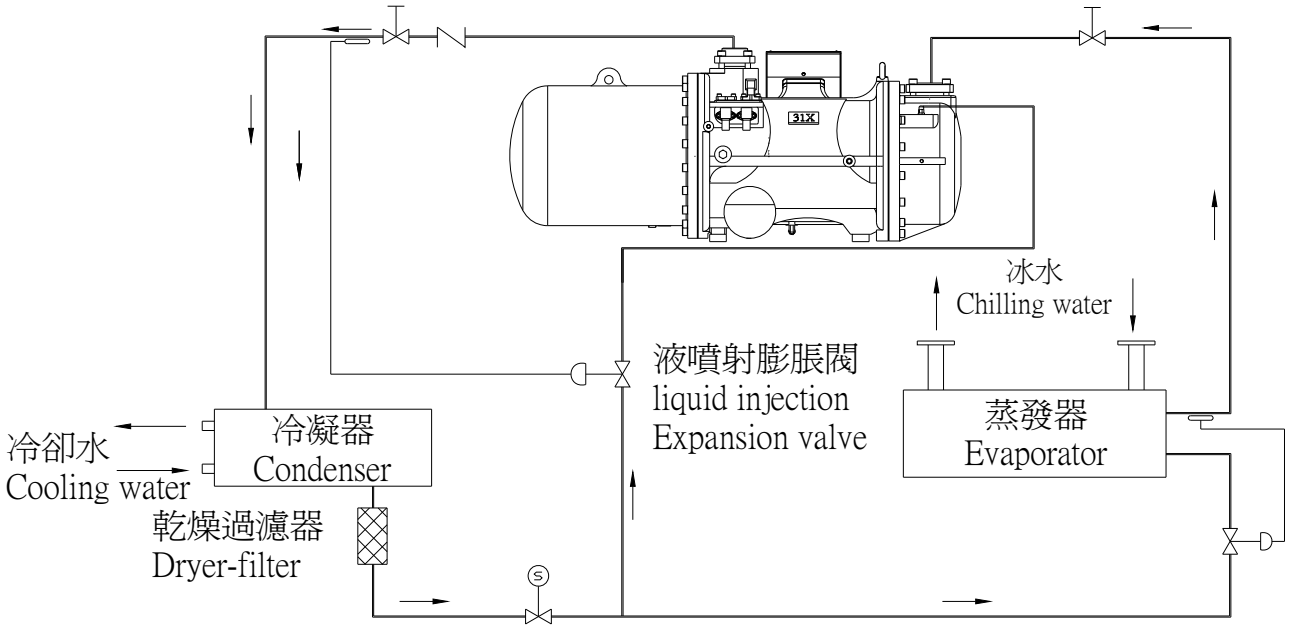


Fig. 8 液噴射應用 Liquid injection

(吸氣端) (Suction end)

吸入口液噴射是將液態冷媒混入吸氣管路，將吸入氣體的狀態移到零過熱或是約略的液氣混和狀態，由於壓縮機的設計特性，所以這個較冷的冷媒，可以提供馬達相對一般使用下更好的散熱條件，由於轉子的變位量為固定值，所以相對於一般使用條件下，蒸發器內的冷媒流量將會下降，造成較差的性能

For suction end liquid injection, some liquid refrigerant will be re-directed to the suction port to cool down the motor and rotor. Since the suction volume is fixed, this layout will reduce the refrigerant flow rate to the evaporator. Therefore, it will cause the reduction of compressor performance.

若是以電磁閥開關控制來代替膨脹閥，則請以排氣溫度超過 110℃開始噴射，低於 90℃終止噴射以免造成噴射量不足使排氣溫度過高，或是過量噴射導致壓縮機損壞。

If an solenoid valve instead of expansion valve is used, the injection temperature shall be set at 110℃ and the shut down temperature shall be set at 90℃. Too much injection will damage compressor due to liquid compression while insufficient injection can not bring down the discharge temperature.

6.2 油冷卻器應用

在風冷及熱泵條件運轉下，使用油冷卻器有其必要性，尤其在排氣溫度超過 100℃時。油冷卻器之給油溫度條件：50℃~70℃。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 70℃以下，旁通閥開通；超過 70℃，旁通閥關閉使油冷卻器工作。

6.2 Oil cooler

Under air-cooled or heat-pump operation, it’ s essential to add oil cooler, particularly when the discharge temperature is over 100℃. The outlet oil temperature of oil cooler is 50℃~70℃, 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 70℃ to bypass the oil back to compressor. Otherwise, close it to lead the oil into oil cooler.

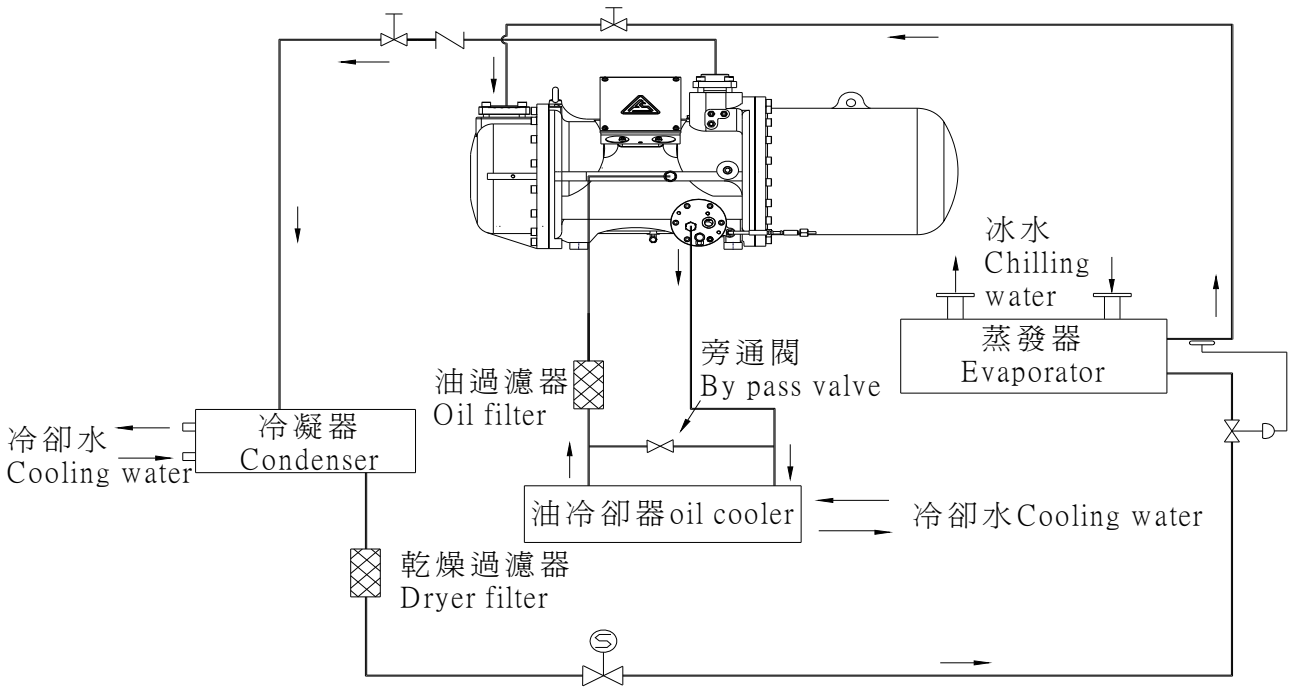


Fig. 9 油冷卻器應用-水冷式 Oil cooler - water-cooled type

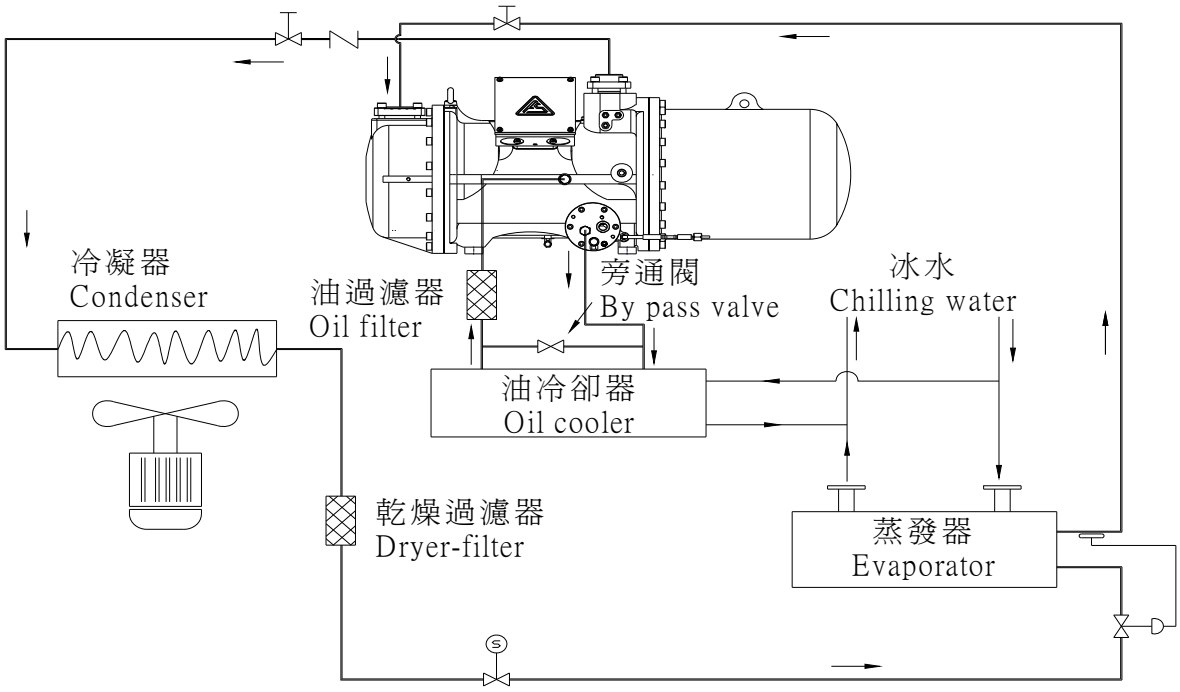


Fig. 10 油冷卻器應用- 氣冷式 Oil cooler - air-cooled type

6.3 高壓縮比應用條件之應用

隨著節能的需求，使用壓縮機進行熱回收來製作熱水，以及節約電費而受歡迎的儲冰系統都是屬於非一般空調的特殊用法，在這些應用條件中，共通的都在於會產生較高的操作壓縮比，(熱水/熱泵機會有較高的冷凝溫度，以及一般或較低的蒸發溫度；儲冰系統則是會產生較低的蒸發溫度。)，而高操作壓縮比條件都會伴隨著高排氣溫度現象，為了解決此類應用問題，建議使用液噴射或油冷卻器(請參考6.1及6.2)降低排氣溫度，除了上述手段及各項保護器外，請考慮加裝二次油分離器，確保在某些應用下有較佳的回油效果，回油管接到節能器接點或是吸入口等低壓側均可。

6.3 Application of high compression ratio

Due to the consideration of energy saving, some chillers also provide function of heat recovery or thermal storage. In this application, the compression ratio is higher than that of normal air conditioning application. Hot water/heat pump needs to have higher condensing temperature while thermal storage system runs at lower evaporating temperature. When compressor runs at high compression ratio, it means a higher discharge temperature. In order to overcome this problem, a liquid injection or external oil cooling system is required to reduce the discharge temperature of the compressor. (refer to 6.1 and 6.2) For low evaporating temperature application, an external oil separator is recommended to make sure the oil can be carried back to compressors. The returned oil from the external oil separator can be connected to the suction port or economizer inlet port where pressure is lower.

6.4 節能器之應用

節能器之應用類似二段壓縮原理，可以提升效率，所以用於高壓縮比下其效益較明顯，(例如儲冰系統)。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。

6.4 Economizer

The principle of economizer is similar to 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:

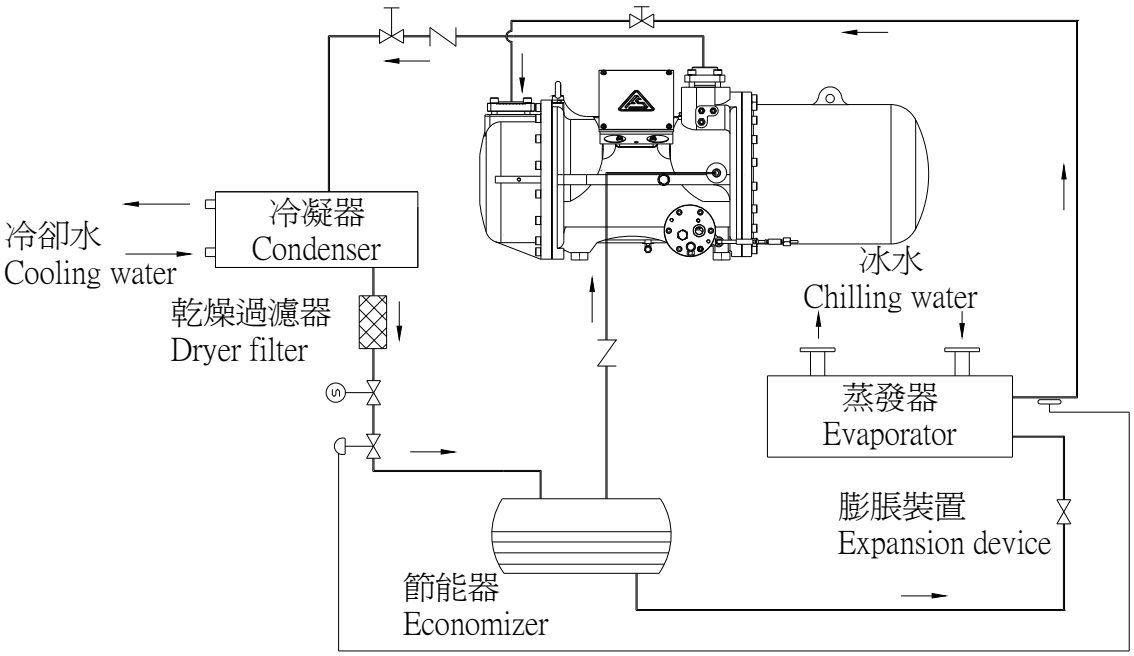


Fig. 11 節能器應用 - 閃蒸桶 Economizer - Flash tank

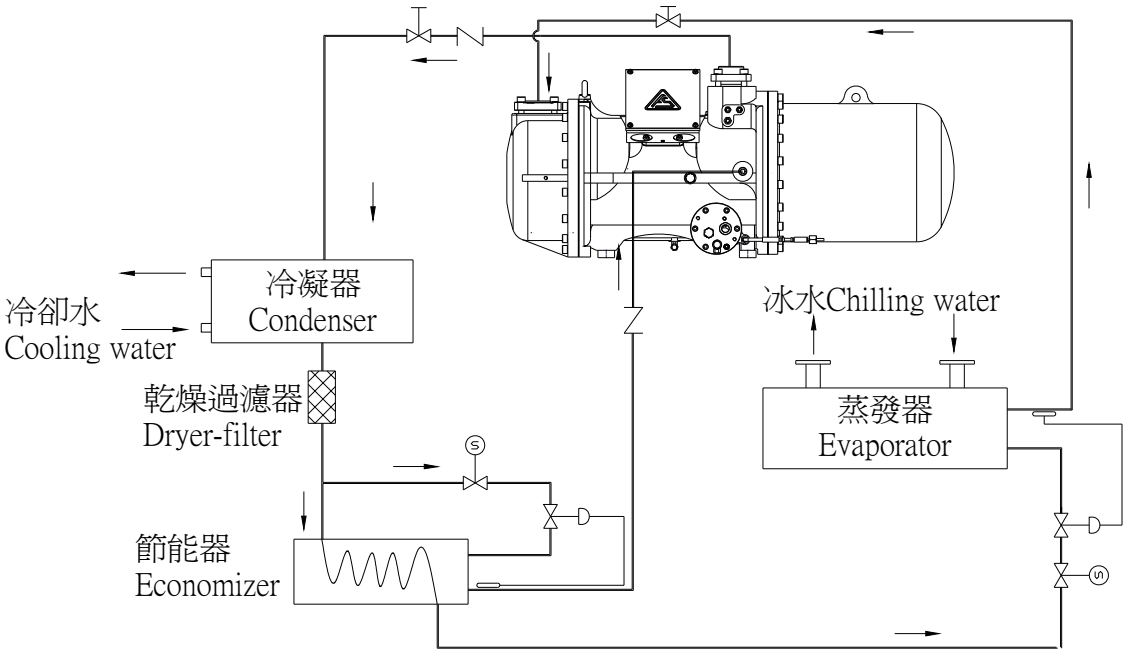


Fig. 12 節能器應用 - 過冷卻 Economizer - Liquid sub-cooler

6.5 變頻應用

變頻空調系統將變頻壓縮機以變頻器變速調節冷媒流量，以滿足負載需求，為使系統操作於最佳的條件下，系統設計選用各部品元件須考慮能涵蓋各所有操作條件下的冷媒流率及冷凍能力為重。管路的流速設計需能兼顧低速運轉的回油性及高速運轉時不致有太大的流速噪音。

膨脹閥

于變頻系統選用膨脹閥時，需考慮變頻操作時，系統壓差及冷媒流率的變化，膨脹閥必須能於各操作條件時不會有 Hunting 的現象，電子式膨脹閥的反應速度及控制範圍優於傳統的感溫式膨脹閥，更適用于此變頻容調系統。

油位管理及控制

變頻壓縮機的拋油量與轉速成至正比，此為變頻系統設計必須考慮的重要項目，壓縮機操作于不同頻率時，壓縮機油位元皆須維持於視窗的 1/3 油位以上，以避免壓縮機失油的風險。若過量的冷凍油迴圈/積存於系統中，會降低熱交換器的熱傳效率及干擾系統部品的功能-如膨脹閥。

壓縮機保護

變頻壓縮機馬達應具備過電流及過熱保護。

過電流保護-變頻器內建有過電流

6.5 Inverter Application

Variable refrigerant volume air conditioning system uses an inverter to control the revolution speed of an inverter compressor to achieve the purpose of changing refrigerant flow rate in order to meet different loading demand. The selection of system components shall be able to cover the operation range of critical condition. When designing an inverter system, flow rate of refrigerant in pipelines must be high enough to carry back the oil to the compressors while the noise can be kept in the minimum.

Expansion valve

The system pressure difference and the change of refrigerant flow rate must be considered when selecting an expansion valve. The specification of expansion valve shall cover the whole range of operation and not cause any “ hunting” . Electronic expansion valve responds fast and has wider control range than thermostatic expansion valve. It’ s more suitable in the inverter system.

Oil level management

The oil carryover rate of a VRV compressor is proportional to the revolution speed of the compressor. It is necessary to make sure that the oil level of the compressor must be kept higher than 1/3 position of the oil sight glass from the bottom. Lower oil level will cause insufficient lubrication on bearings and rotors of the compressor and lead to the serious damage of compressors. Too much oil in the system will reduce the efficiency of heat transfer and interfere with the function of system components

Compressor protection

Inverter compressor shall be protected by over current and over temperature.

Over current protection: Inverter is equipped with an internal over current

保護功能，當操作電流超過設定值(例如冷凝壓力過高、液啟動、堵轉...)，則變頻器會停機並輸出異警訊號。至於異警消除後，壓縮機是手動重置或直接自動再起動，可由變頻器的參數功能設定，請參見變頻器技術手冊。

過熱保護-復盛變頻壓縮機內部安裝馬達溫度開關保護馬達過熱，此訊號可直配接於變頻器的異警輸入點，整合於變頻器的保護功能內，相關功能及參數設定，請參見變頻器技術手冊。

protector. When the operation current exceed setting point (when compressor runs at higher condensing temperature, starts with loading or has too much liquid in compression chamber when starting, etc.), the inverter shall stop the compressors and send alarm to controller. After the alarm is removed or cleared, compressor can be auto or manually re-started. The parameter setting of selected inverter, please refer to the manual of inverter provided by the manufacturers.

Motor over temperature

The compressor is equipped with an internal motor temperature protection thermistor. It is connected to the INT69 control module. The signal from INT69 can be integrated to the protection system of inverter. For setting of inverter, please refer to the manual of selected inverter.

啟動轉速控制

為確保壓縮機啟動初期的穩定性，建議先以 60Hz 運轉 10 分鐘，使系統迴圈狀態正常後再讓控制器進行轉速容調控制

Revolution speed control when starting

To assure the stability of compressor after starting, it is necessary to run the compressor at 60Hz for 10 minutes and perform the regular capacity control.

7.產品配件

7.1配件規格

7.1.1 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 50MΩ 以上。

7.1.2 油位開關規格

- 絕緣值：以 DC200V 高阻計量測，絕緣值 10MΩ 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

7.1.3 馬達及排氣溫度 PTC 控制模組:INT69

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

7.1.4 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 750Ω
- 絕緣強度： 600VAC

7.1.5 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550Ω
- 絕緣強度： 600VAC

7. PRODUCT SCOPE :

7.1 Parts specification

7.1.1 Heater

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

7.1.2 Oil level switch

- Insulation value: 100MΩ 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.

7.1.3 PTC control module INT69 for motor and discharge temperature

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

7.1.4 PTC thermistor for motor winding protection

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

7.1.5 PTC Thermistor for discharge temperature protection

- Maximum allowable voltage for measuring resistance: DC 2.5V
- Resistance under ambient temperature: less than 550 Ω
- 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	s
5	馬達線圈溫度熱敏電阻 Motor winding PTC thermistor	s
6	冷凍油 Refrigerant oil	s
7	油加熱器 Oil heater	s
8	油位開關 Oil level switch	o
9	排氣高溫熱敏電阻 Discharge temperature PTC thermistor	s
10	洩油閥 Draining valve	s
11	壓縮室節能器噴射接口 Economizer injection port-compression chamber	s
12	中間壓與低壓端液噴射接頭 Liquid injection adapters – motor side and compression chamber	s
13	非石棉墊片 Non-asbestos gasket	s
14	排氣止回閥 Discharge check valve	s
15	安全閥 Safety valve	o
16	進氣關斷閥 Suction service valve	o
17	排氣關斷閥 Discharge service valve	o
18	防震墊 Rubber mounting pads	o
19	液冷媒噴射用毛細管或電磁閥 Liquid refrigerant injection capillary tube or solenoid valve	o
20	INT69 電氣保護模組 INT69 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

HFC/R-134a/R-407C

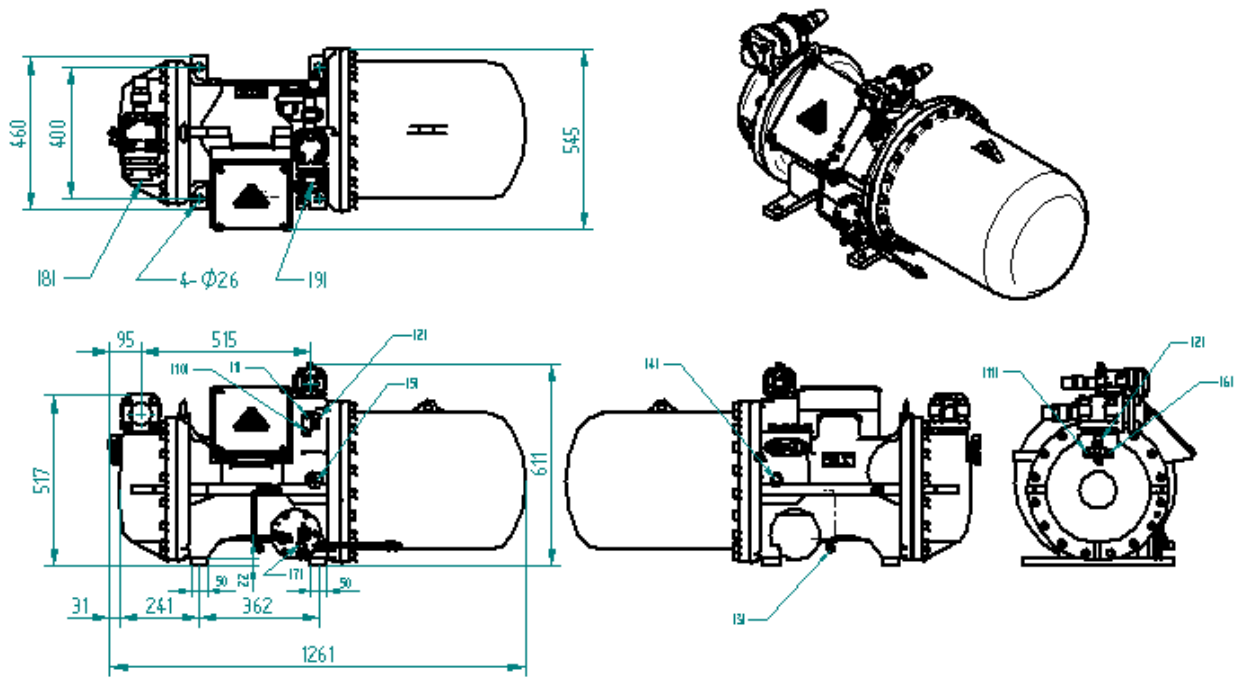
冷凍油特性 Lubricant characteristics	油品名稱 Lubricant	
	FS 070R	FS 120R
黏度(viscosity)，cst@40℃ ASTM D445	66.3	127.7
黏度(viscosity)，cst@100℃ ASTM D445	8.9	12.7
黏度指數(viscosity index) ASTM D2270	108	90
比重(Specific weight)　ASTM D4052	0.957	0.951
流動點(Flow point)(℃)ASTM D97	-43	-33
閃火點(Flash point)(℃)ASTM D92	263	251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

FUSHENG

7.4 壓縮機外觀尺寸　　7.4 Compressor outline dimension

Model: BSR21x-xxV

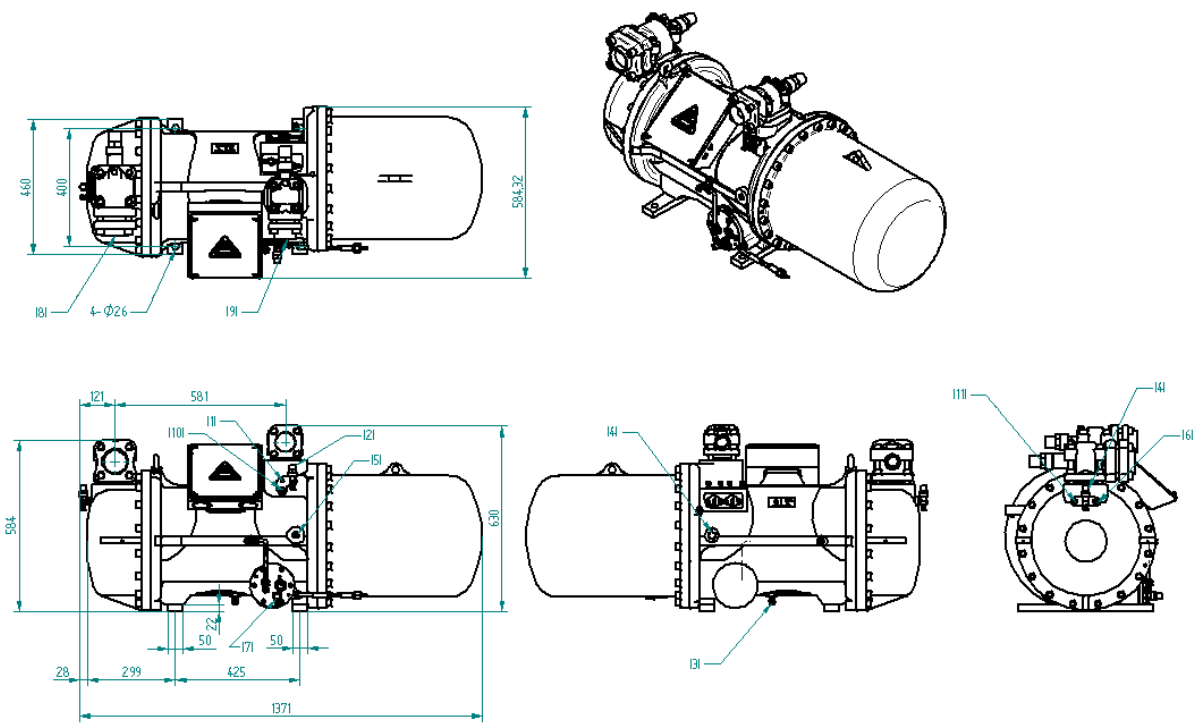
單位(unit):mm



No.	品名	Parts	Remark
(1)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(2)	備用接頭	Spare adapter	1/4" Angle Valve
(3)	泄油接頭	Draining adaptor	3/8" Flare
(4)	液噴射接頭	Liquid injection adapter	LI-1/2" Flare
(5)	節能器介面	Economizer port	ECO-3/4" NPT
(6)	低壓端偵測接頭	Low pressure adapter	LP-1/4" Flare
(7)	泄油閥	Draining valve	Drain-3/8" Angle Valve
(8)	活動式套管	Suction sleeve	SL, 67(2-5/8")
(9)	活動式套管	Discharge sleeve	DL, 42(1-5/8")
(10)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor
(11)	備用孔位	Spare port	3/8"NPT

Model：BSR31x-xxV

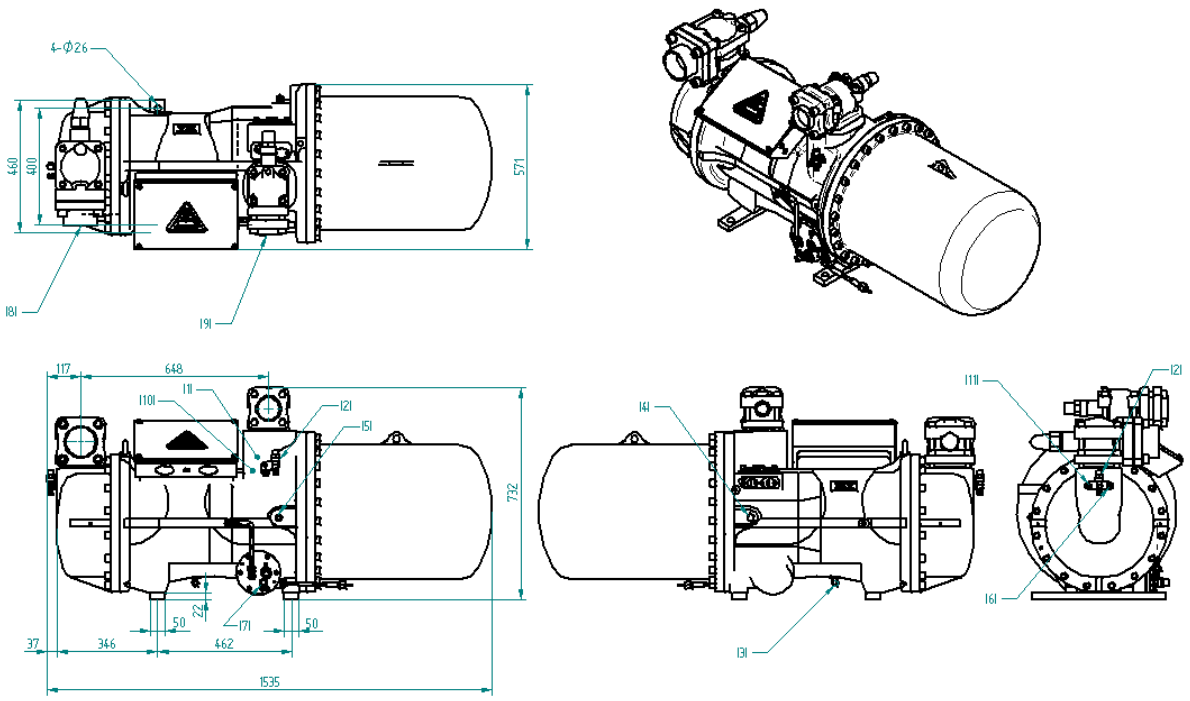
單位(unit):mm



No.	品名	Parts	Remark
(1)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(2)	備用接頭	Spare adapter	1/4" Angle Valve
(3)	泄油接頭	Draining adaptor	3/8" Flare
(4)	液噴射接頭	Liquid injection adapter	LI-1/2" Flare
(5)	節能器介面	Economizer port	ECO-3/4" NPT
(6)	低壓端偵測接頭	Low pressure adapter	LP-1/4" Flare
(7)	泄油閥	Draining valve	Drain-3/8" Angle Valve
(8)	活動式套管	Suction sleeve	SL, 80(3-1/8")
(9)	活動式套管	Discharge sleeve	DL, 67(2-5/8")
(10)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor
(11)	備用孔位	Spare hole	3/8"NPT

Model：BSR32x-xxV

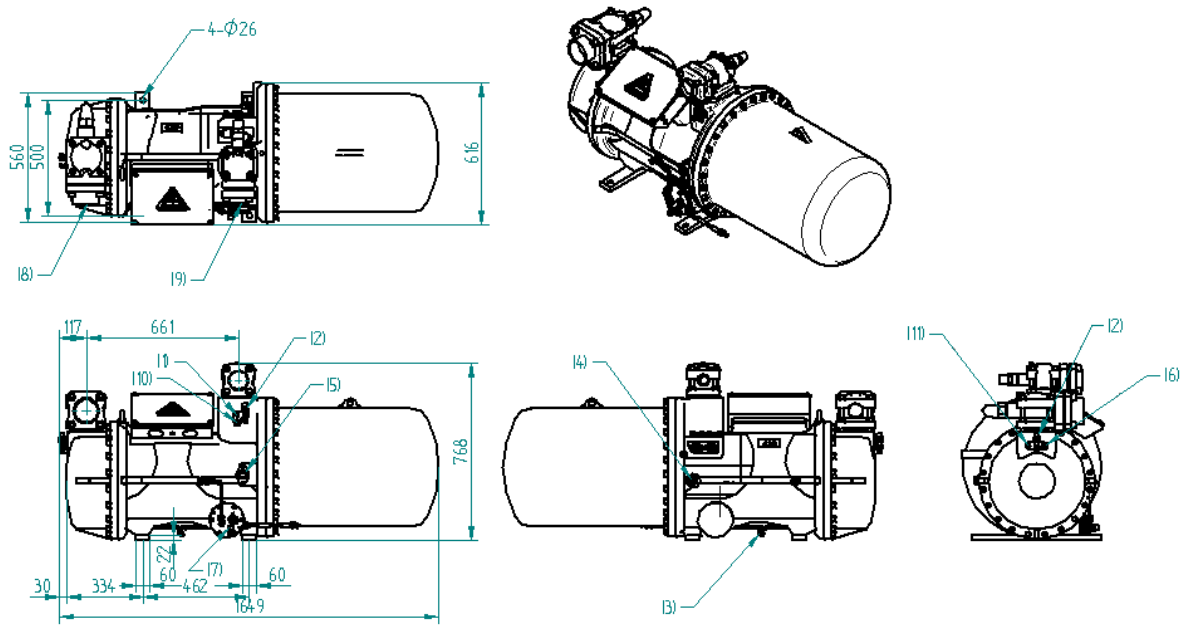
單位(unit):mm



No.	品名	Parts	Remark
(1)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(2)	備用接頭	Spare adapter	1/4" Angle Valve
(3)	泄油接頭	Draining adaptor	3/8" Flare
(4)	液噴射接頭	Liquid injection adapter	LI-1/2" Flare
(5)	節能器介面	Economizer port	ECO-3/4" NPT
(6)	低壓端偵測接頭	Low pressure adapter	LP-1/4" Flare
(7)	泄油閥	Draining valve	Drain-3/8" Angle Valve
(8)	活動式套管	Suction sleeve	SL, 104(4")
(9)	活動式套管	Discharge sleeve	DL, 80(3-1/8")
(10)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor
(11)	備用孔位	Spare hole	3/8"NPT

Model :BSR41x-xxV

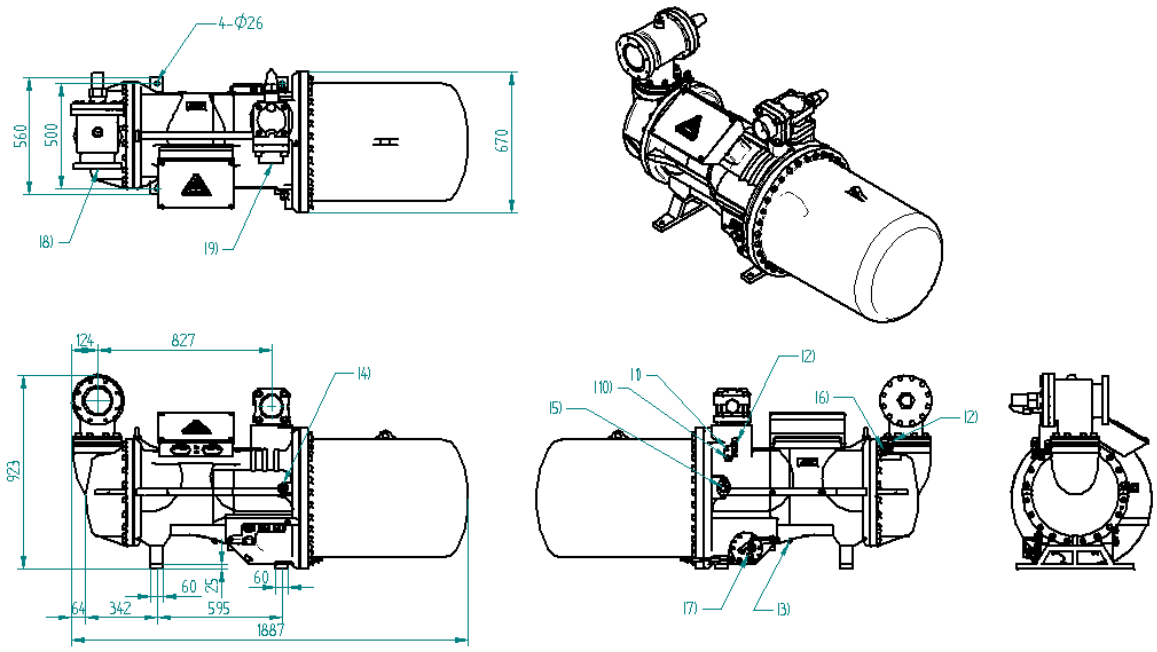
單位(unit):mm



No.	品名	Parts	Remark
(1)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(2)	備用接頭	Spare adapter	1/4" Angle Valve
(3)	泄油接頭	Draining adaptor	3/8" Flare
(4)	液噴射接頭	Liquid injection adapter	LI-3/4" Flare
(5)	節能器介面	Economizer port	ECO-1"
(6)	低壓端偵測接頭	Low pressure adapter	LP-1/4" Flare
(7)	泄油閥	Draining valve	Drain-3/8" Angle Valve
(8)	活動式套管	Suction sleeve	SL, 104(4")
(9)	活動式套管	Discharge sleeve	DL, 80(3-1/8")
(10)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor
(11)	備用孔位	Spare hole	3/8"NPT

Model：BSR42x-xxV

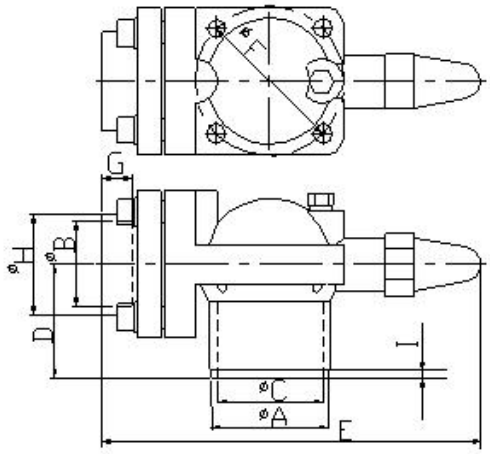
單位(unit):mm



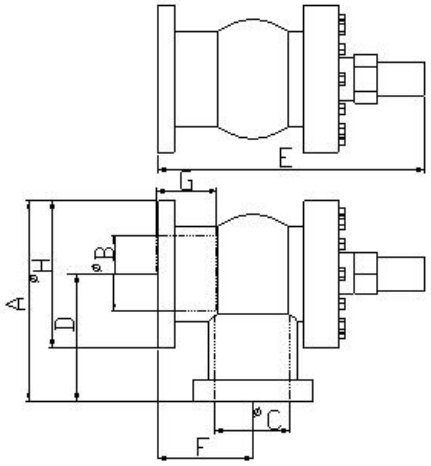
No.	品名	Parts	Remark
(1)	高壓端偵測接頭	High pressure adapter	HP-1/4" Flare
(2)	備用接頭	Spare adapter	1/4" Angle Valve
(3)	泄油接頭	Draining adaptor	3/8" Flare
(4)	液噴射接頭	Liquid injection adapter	LI-3/4" Flare
(5)	節能器介面	Economizer port	ECO-1"
(6)	低壓端偵測接頭	Low pressure adapter	1/4" Angle Valve
(7)	泄油閥	Draining valve	Drain-3/8" Angle Valve
(8)	活動式套管	Suction sleeve	SL, 125(5")
(9)	活動式套管	Discharge sleeve	DL, 104(4")
(10)	排氣溫度熱敏電阻	Discharge temp. PTC Thermistor	PTC Sensor

7.5 關斷閥尺寸

7.5 Valve dimensions



關斷閥 service valve (1-5/8”、2-5/8”、3-1/8”、4”)



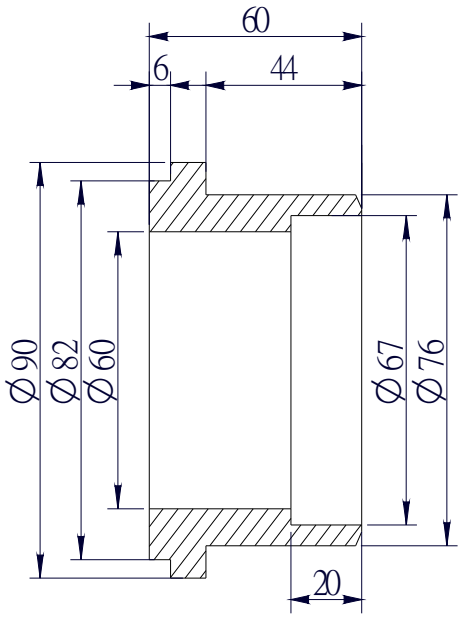
關斷閥 service valve (5”)

尺寸 Dimensions	1-5/8"	2-5/8"	3-1/8"	4"	5"
A	70	81.5	105	130	338
B	42	67	80	105	135
C	54	65	85	111	126
D	47	64	79	95	214
E	257	317	357	440	450
F	90	110	140	173	161
G	24	28	32	50.5	35
H	48.5	77	88.5	114.5	154
I	8	8	6	6	-

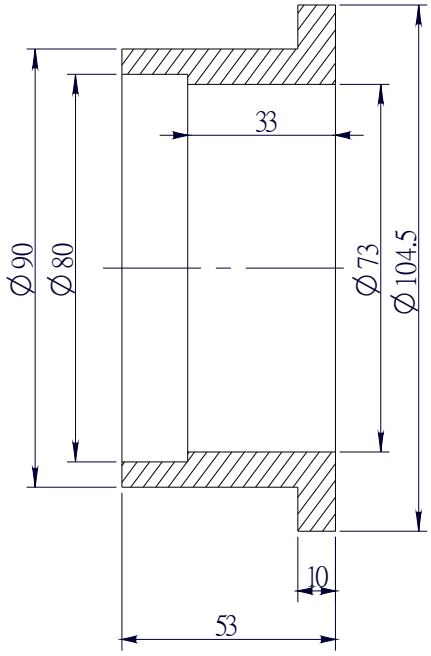
關斷閥公稱尺寸 Valve selection table

型號 Model	吸氣關斷閥 Suction service valve	排氣關斷閥 Discharge service valve
BSR213-xxV BSR216-xxV	2-5/8"	1-5/8"
BSR311-xxV BSR314-xxV BSR316-xxV	3-1/8"	2-5/8"
BSR321-xxV BSR323-xxV BSR324-xxV BSR326-xxV	4"	3-1/8"
BSR413-xxV BSR415-xxV BSR421-xxV BSR423-xxV BSR424-xxV BSR426-xxV	5"	4"

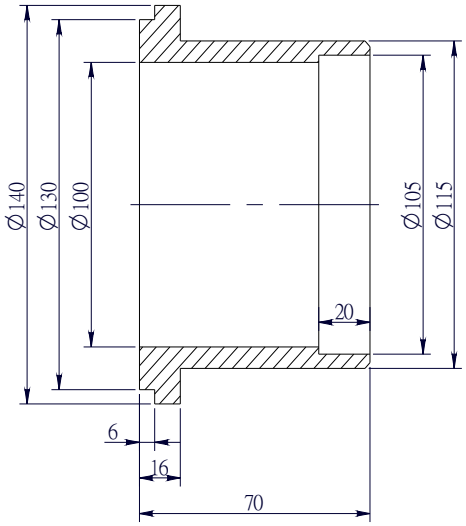
.7.6 吸氣套管尺寸　　7.6 Suction sleeve dimension



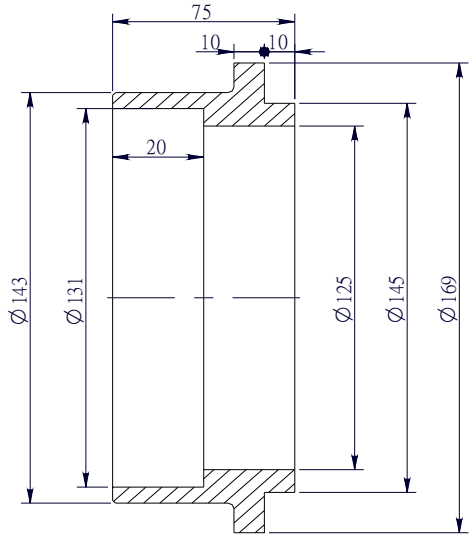
BSR21x-xxV



BSR31x-xxV



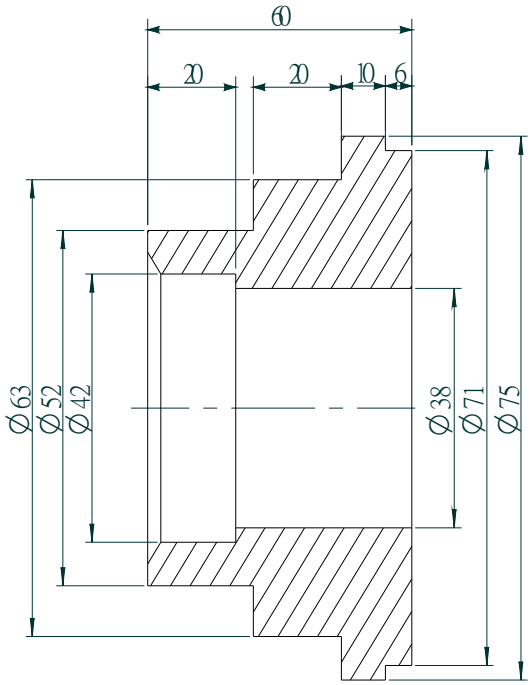
BSR32x~41x-xxV



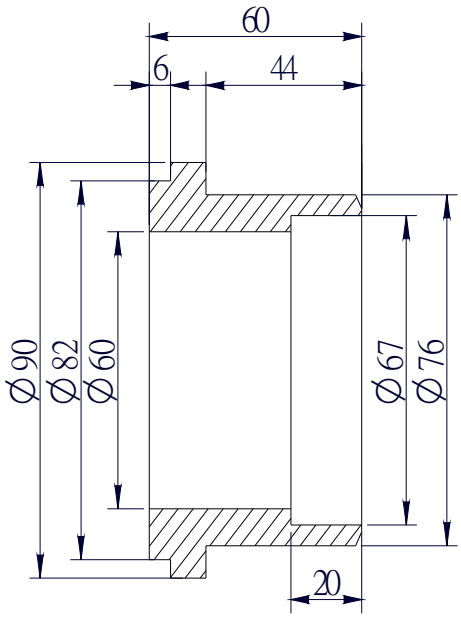
BSR42x-xxV

7.7 排氣套管尺寸

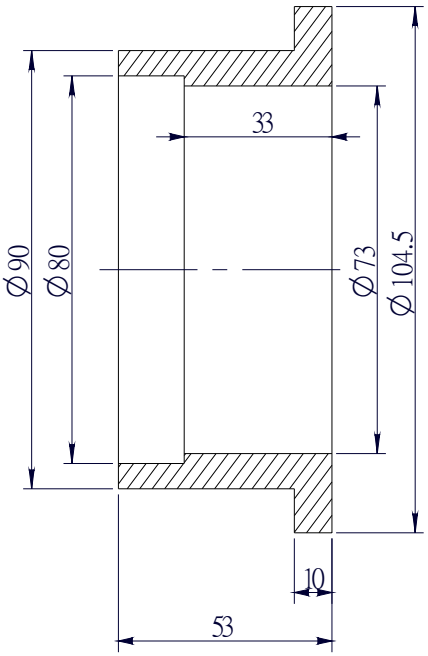
7.7 Discharge sleeve dimension



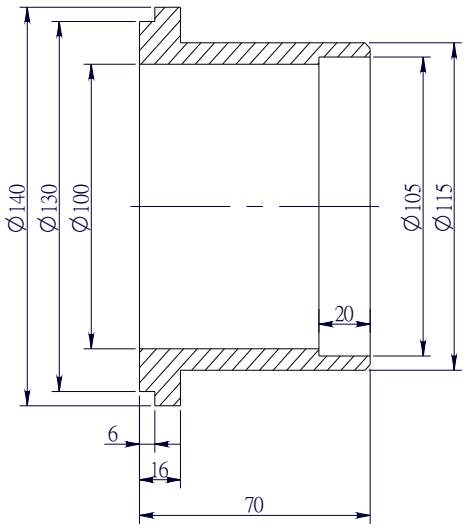
BSR21x-xxV



BSR31x-xxV



BSR32x~41x-xxV



BSR42x-xxV

7.8 型號編碼原則　　7.8 Model designation

冷媒壓縮機機體編碼原則：