RE Series

TECHNICAL MANUAL

Next generation of innovative design Screw compressor dedicated to:
R134a, R513A, R1234ze
R450A, R1234yf

High COP & IPLV Model

RE Series

Screw Compressor

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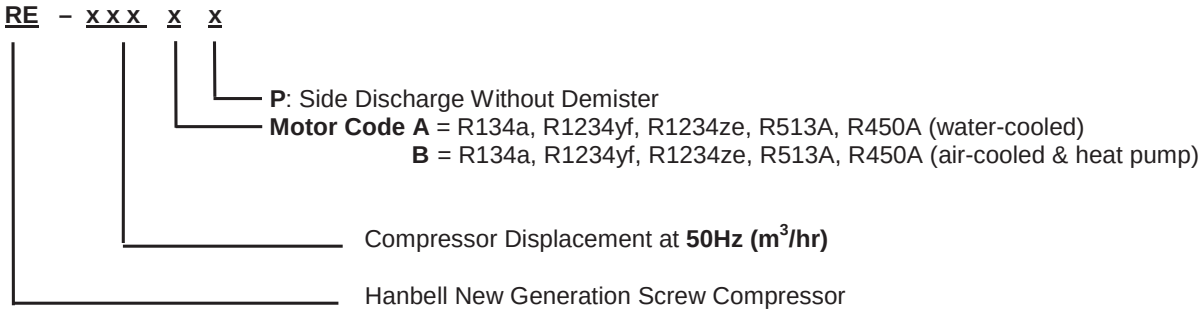
1. General

HANBELL series semi-hermetic screw compressor is developed especially for applications in air-conditioning and refrigeration. With high operating load design, each HANBELL compressor is of high efficiency and reliability in all operating conditions such as thermal storage, heat pump system & refrigeration. Each HANBELL compressor has the latest and advanced **5-to-6 Patented Screw Rotor Profile** designed to ensure high capacity and efficiency in all operating conditions. Each unit is carefully manufactured and inspected by high precision THREAD SCREW ROTOR GRINDING MACHINE, CNC MACHINING CENTER, and 3D COORDINATE MEASURING MACHINE. Each **HANBELL** compressor follows **ISO 9001** quality system. This certification assures that its quality is controlled under severe quality procedures and good service to all customers.
RE series compressor is equipped with separated radial and axial bearings, liquid injection or economizer connection, PTC motor temperature thermistors, discharge temperature thermistors, a motor protector, optical oil level switch, oil pressure differential switch connector, and other accessories. The complete accessories and their new designs guarantee the compressor has the best reliability, longest bearing life during heavy duty running and strict operating conditions.

This Technical Manual contains information about lifting, dimensions, installation, operation, applications and basic trouble-shooting. It is strongly recommended that contents of this manual should be referred carefully prior to lifting, installation, and commissioning of RE series compressor in order to prevent any accident or damage. Please contact HANBELL or its local distributors/agents for more information or further assistance.

2. Specifications and description of design

2.1 Compressor nomenclature



2.2 Compressor specifications

MODEL	COMPRESSOR					MOTOR					*LUBRICANT CHARGE	WEIGHT
	Displacement 60 / 50Hz	Rated Speed	Vi	Cap. Control (%)		Nominal Hp		Starting	Voltage (V)			
	m³/hr	60 / 50Hz		Step	Stepless	60Hz (A/B)	50Hz (A/B)		60Hz	50Hz	L	kg
RE-230A(P) / B(P)	280/232	3550/2950	2.2 2.6 3.0 3.5 4.4	25, 50, 75, 100	25~100	56/76	46/63	Y-Delta PWS DOL	380 440 460 480	380 400 415	14	380
RE-260A(P) / B(P)	320/266					63/82	52/68				16	440
RE-300A(P) / B(P)	369/307					69/97	58/80				16	480
RE-340A(P) / B(P)	423/352					81/108	67/90				16	550
RE-380A(P) / B(P)	471/392					90/123	75/102				16	570
RE-420A(P) / B(P)	501/417					96/132	80/110				16	600
RE-480A(P) / B(P)	579/481					108/146	90/122				17	630
RE-550A(P) / B(P)	666/554					132/166	110/138				19	670
RE-620A(P) / B(P)	752/625					146/197	122/164	Y-Delta DOL			23	870
RE-710A(P) / B(P)	857/712					166/214	138/178				26	920
RE-820A(P) / B(P)	987/820					197/233	164/194				28	1050
RE-920A(P) / B(P)	1112/924					214/258	178/215				28	1135

Note:
1. Motor type: 3 phase, 2 pole, squirrel cage, induction motor
2. Motor insulation: Class F
3. Motor protection: PTC motor temperature thermistor, Pt1000 motor temperature sensor (standard accessory), Pt100 motor temperature sensor (optional accessory)
4. Hydrostatic pressure test: 32kg/cm^{2}G
5. *: RE-AP / RE-BP without lubricant charge

Nominal Horse Power:
All above Nominal HP are not equal to the maximum compressors HP. Please refer to the output of Hanbell selection software for the operation current, Maximum continuous current-M.C.C according to various working conditions while selecting the switch contactor, cable, fuse and wire, etc…

2.3 Design features

HANBELL screw compressors feature simple and robust construction by elimination of some components such as pistons, piston rings, valve plates, oil pumps which are found in reciprocating compressors. Without these components, screw compressors run with low noise level, minimized vibration, high reliability, and durability. HANBELL screw compressors are of two-shaft rotary displacement design with the latest and advanced 5:6 patented screw rotors. Screw rotors are precisely installed with roller bearings, i.e. radial bearings at both of suction and discharge ends as well as angular contact ball bearings i.e. axial bearings at discharge end. A three-phase, two-pole squirrel-cage induction motor drives the compressor. The motor rotor is located on the shaft of the male screw rotor. Cooling of the motor is achieved with suction refrigerant vapor.

Compressor technical features:

Energy-efficiency Mechanism- Hanbell RE series compressor has upgraded screw rotors and optimized inner structure to achieve good and reliable working performance. Optimal volume ratio under part load reaches high working efficiency to save power consumption effectively.

Superior Capacity Control Mechanism- Optimal slide valve layout has strong support in all strokes and new internal structure for piston rod obtains additional support during capacity modulation.

Compact and Robust Structure- Combining motor casing and compression chamber in one iron casing creates compact size for easy installation. The design of ribbed casing and well-supporting feet for main body enhance compressor structure to reach high working performance.

Multinational patents of upgraded high-efficiency screw rotors- This new large-volume, upgraded high-efficiency rotor profile is designed especially for modern refrigerant characteristics to achieve less power consumption. Hanbell screw rotors are patented in Taiwan, UK, US, and China and accomplished by using precision CNC machining centers,

rotor milling machines, rotor grinding machines. Strict ISO 9001 process controlling and the application of precise inspection equipments, such as ZEISS 3D coordinate measuring machines, ensure high-efficiency, high-quality, low-noise and low-vibration HANBELL RE series screw compressors.

High efficiency motor- Premium grade low-loss core steel with special motor cooling slot, optimal internal casing design around the motor, and casted refrigerant guide vane which pilot the cold suction refrigerant gas through the motor. Above motor features provide the highest operating efficiency no matter how strict operating conditions are.

Double-walled rotor housing- Double casing structure with high strength inner ribs has been designed to minimize noise and ensure rigidity. The rotor housing is made of high-strength gray cast iron FC25 that is extremely stable, so no expansion will occur even at high-pressure condition. These casings are machined by computer aided machining centers and inspected by precision measuring machines to enhance reliability.

Direct flange-on oil separator- A vessel made of ductile material FCD specially designed to withstand high pressure and provide the highest efficiency of oil separation. Simple oil management and low-pressure-drop demister ensure the minimum refrigerant dilution in the oil and maintain high oil viscosity.

Precise capacity control- The slide valve for capacity control is located in the compressor chamber. The slide valve is actuated by injection of pressurized oil into the cylinder from the oil sump as well as bypass of oil through solenoid valves in each oil lines with pressure differential.

Perceptive protection modules- RE series screw compressors are equipped with PTC thermistors and Pt1000 motor temperature sensor as standard accessories. Motor protection module which could monitor discharge and motor coil temperatures as well as phase sequence and phase loss. Accessories also include optical oil level switch to monitor the level of oil, pressure differential switch, and pressure relief valve for optional application.

Adaptable with additional cooling- Liquid injection system to motor and compression chamber can be built in the system with RE series screw compressors. RE screw compressor also has oil cooler connection port and middle pressure economizer connection port for customer's desired application.

2.4 Compression process

(A) Suction and sealing:
At the beginning of the compression cycle, as the male rotor and female rotor unmesh, gas from suction port fills the interlobe space (refer to the dark area below). Refrigerant at suction pressure continues to fill it, until the trailing lobe crosses the suction area and the gas is trapped inside the interlobe space.
(B) Compression:
As the male rotor and female rotor meshes, the interlobe space moves towards to discharge end and its volume decreases so that gas pressure increases consequently.
(C) Discharge:
Gas is discharged from the interlobe space when the leading lobe crosses the discharge port whose volume ratio is designed differently for various applications.

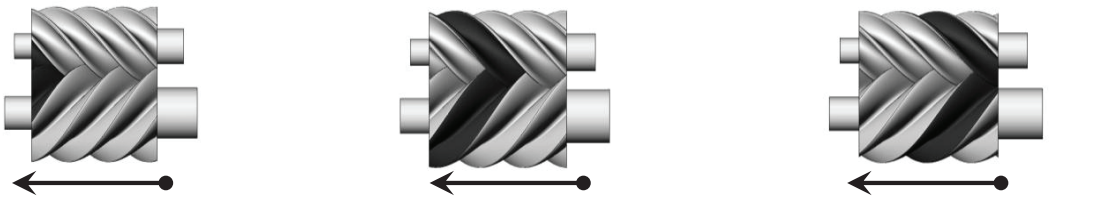


Figure 1 Compression process

2.5 Capacity control system

The RE series screw compressors are equipped with either 4-step capacity control system or continuous (step-less) capacity control system. Both of the capacity control systems consist of a modulation slide valve, piston rod, cylinder, piston, and piston rings. The slide valve and the piston are connected by a piston rod. The principle of operation is using the oil pressure to drive the piston in the cylinder.

See Figure 2, the positive pressure differential causes the piston to move in the cylinder. When the slide valve moves toward the right side, the effective compression volume increases in the compression chamber. This means the displacement of refrigerant gas also increases, as a result the refrigeration capacity also increases. However, when any one of the solenoid valve (for 4-step capacity control system) is opened, the high pressure oil in the cylinder bypasses to the suction side, which causes the piston and the slide valve to move toward the left side, and then some of the refrigerant gas bypasses from the compression chamber back to the suction end. As a result, the refrigeration capacity decreases. The modulation (step-less) solenoid valves (SV1&SV2) are controlled by the controller to modulate the piston position smoothly with stable output of capacity.

Before stopping the compressor, HANBELL strongly recommends that the unloading solenoid valve of step-less control system or 25% solenoid valve of 4-step control system should be kept opened for 60~90 seconds so that oil pressure in the cylinder could be released. When starting the compressor again, it is in minimum-load position for light duty start.

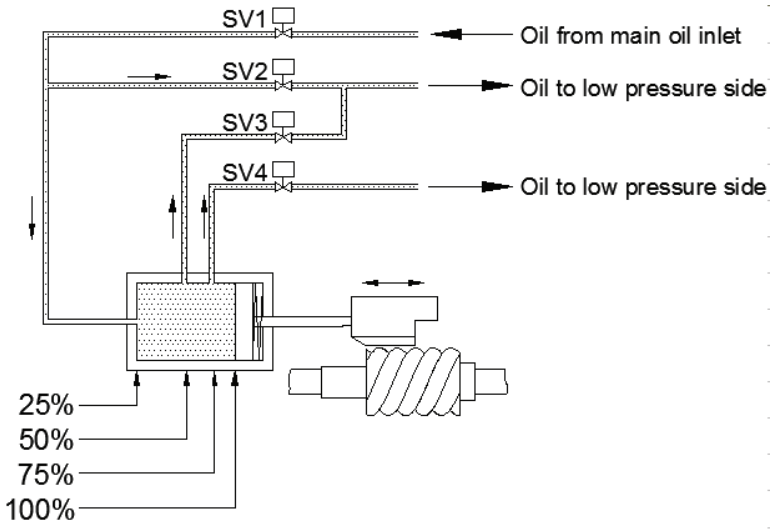
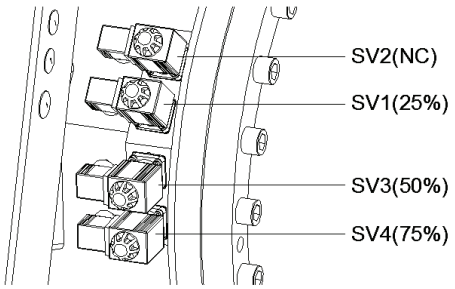


Figure 2 Capacity control system

2.6 4-step capacity control system

There are three normal closed (NC) solenoid valves installed on the compressor that control capacity from minimum capacity to full load (100%). 4-step capacity control system, it is usual to use the sequence of min.%-50%-75%-100% to load the capacity of compressor and to use the sequence of 100%-75%-50%-min% to unload the capacity. If part-load running is lasting for a long time, the problem of oil return, motor cooling, high discharge temperature need to be solved by adding accessories such as optical oil level switch for monitoring the oil level, liquid injection devices for cooling motor coil and controlling discharge temperature. **Min% is recommended for start and stop only, not for long-termed operation.**

Figure 3 4-step capacity control



Capacity system control module				
Solenoid valve	SV2	SV1	SV3	SV4
A. 4 step capacity control	—	●	●	●
B. Step-less capacity control	●	●	—	—
C. Dual capacity control	●	●	●	●

● : Installation — : No installation

4 step capacity control				
	SV2(NO)	SV1	SV3	SV4
100% load	—	△	△	△
75% load	—	△	△	▲
50% load	—	△	▲	△
25% load (For start only)	—	▲	△	△

▲: energized △ : not energized

Note: For 4-step capacity control system, Hanbell provides normally-closed (NC) solenoid valves as standard accessory. If normally-opened (NO) solenoid valves are preferred instead, please specify it to Hanbell when placing order.

a. min% capacity

When starting the compressor, SV1 25% solenoid valve is energized and the piston is in min% capacity position, so even the oil coming from the oil sump is continuously injecting into the cylinder through the internal orifice, the high-pressured oil in the cylinder bypasses directly into the suction port, so the piston is kept in its initial position.

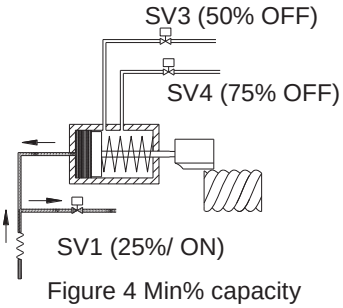


Figure 4 Min% capacity

※It is strongly recommended to energize SV1 25% solenoid valve for 1~3 minutes before compressor starts and for 60~90 seconds before compressor stops to ensure the slide valve is in min% position.

b. 50% capacity

When SV3 50% solenoid valve is energized by pressure, temperature, or other controllers, the high-pressure oil in the oil sump flows into the cylinder due to the closing of min% valve that pushes the piston moving toward the position where a hole at exactly 50% position drains the oil back to the suction side then the piston is held on that position.

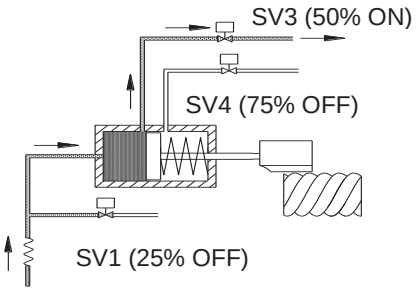


Figure 5 50% capacity

c. 75% capacity

When SV4 75% solenoid valve is energized, SV50% solenoid valve is not energized simultaneously, the high pressure oil will push the piston toward the position where a hole at exactly 75% position drains the oil back to the suction side and the piston will be held on that position.

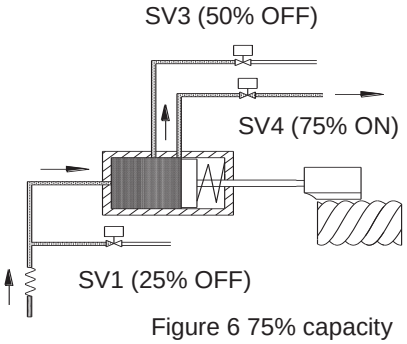


Figure 6 75% capacity

d. 100% full load

When all of three modulation solenoid valves are not energized, the high-pressured oil flows into the cylinder continuously to push the piston toward the suction side gradually until the slide valve touches the end of the compression chamber and the piston also reaches its dead end entirely where no bypass of compression gas occurred. Therefore, full load is achieved.

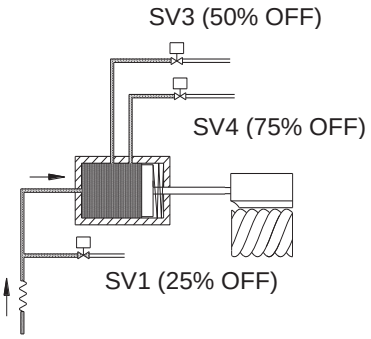


Figure 7 100% (Full load) capacity

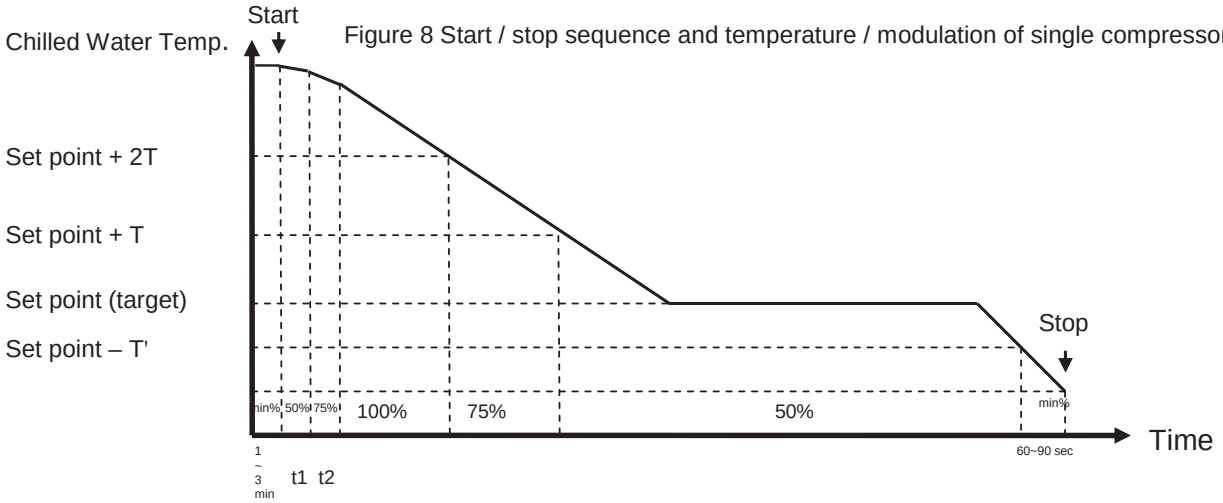


Figure 8 Start / stop sequence and temperature / modulation of single compressor

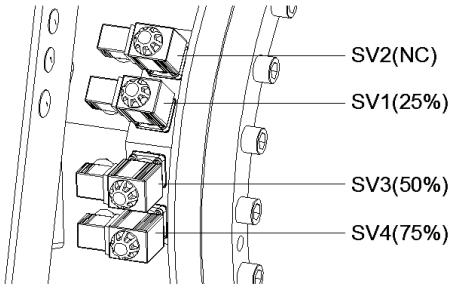
Note:

1. Above T & T' should be determined by system designer's experience and end user's application.
2. Above t1 & t2 should be longer than 60 sec as recommended.
3. Capacity control must be kept at min% capacity for 1~3 min before start and for 60~90 sec before stop.
4. Start the compressor at min% and SV3 50% can be energized right after start.

2.7 Continuous (step-less) capacity control system

In continuous (step-less) capacity control system, solenoid valve SV2 (for loading) and solenoid valve SV1 (for unloading) are equipped to inlet and outlet of piston cylinder respectively. These two solenoid valves are controlled by chiller temperature controller or micro controller so refrigeration capacity can be modulated anywhere within min% ~ 100%. Min% is recommended for start and stop only, not for long-termed operation. It is very important for any controller to control loading and unloading in stable condition.

Figure 9 Step-less capacity control



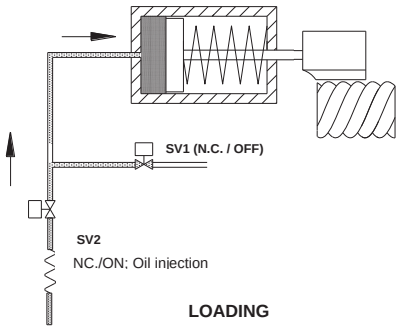
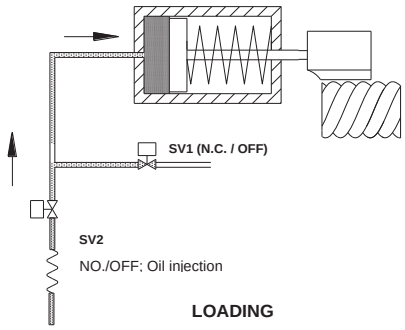
Capacity system control module				
Solenoid valve	SV2	SV1	SV3	SV4
A. 4 step capacity control	—	●	●	●
B. Step-less capacity control	●	●	—	—
C. Dual capacity control	●	●	●	●

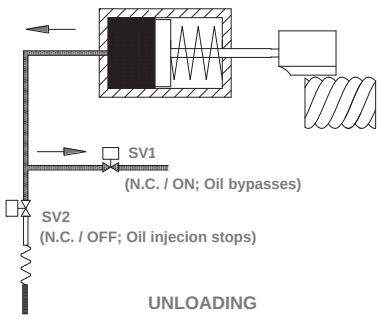
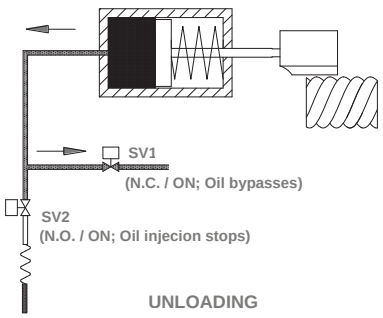
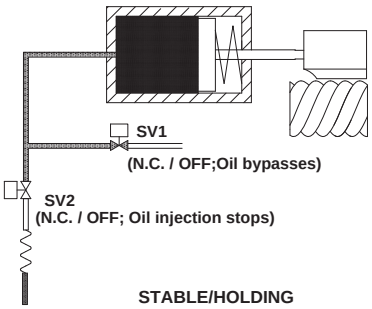
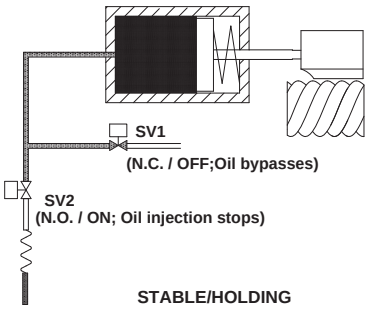
● : Installation — : No installation

Step-less capacity control				
	SV2	SV1	SV3	SV4
Start	△	▲	—	—
Loading	▲	△	—	—
Unloading	△	▲	—	—
Stable	△	△	—	—

▲: energized △: not energized

Note:
1. In continuous (step-less) capacity control system, Hanbell installs two normally closed solenoid valves as standard accessory. If it is necessary to be equipped with other type of solenoid valves, please specify it when placing orders.
2. If customers prefer to remove unloading orifice plug or equip with loading orifice plug for system applications, please specify it when placing orders
3. Normally opened solenoid valve SV2 (for loading) is an optional.

Capacity Modulation	NC SV2 (Standard)	NO SV2 (Option)
a. Loading Standard: When NC SV2 is energized but NC SV1 is not energized, oil will be injected continuously into piston cylinder and will not bypass through NC SV1 so compressor keeps loading. Option: When both NO SV2 and NC SV1 are not energized, oil will be injected continuously into piston cylinder and will not bypass through NC SV1 so compressor keeps loading.		

b. Unloading Standard: When NC SV1 is energized but NC SV2 is not energized, oil inside piston cylinder will bypass to suction port through NC SV1. Option: When both NO SV2 and NC SV1 are energized, oil inside piston cylinder will bypass to suction port through NC SV1.		
c. Stable/Holding Standard: When both NC SV2 and NC SV1 are not energized, piston can be held in stable/holding position. Option: When NO SV2 is energized but NC SV1 is not energized, piston can be held in stable/holding position.		

Continuous /step-less capacity control principle

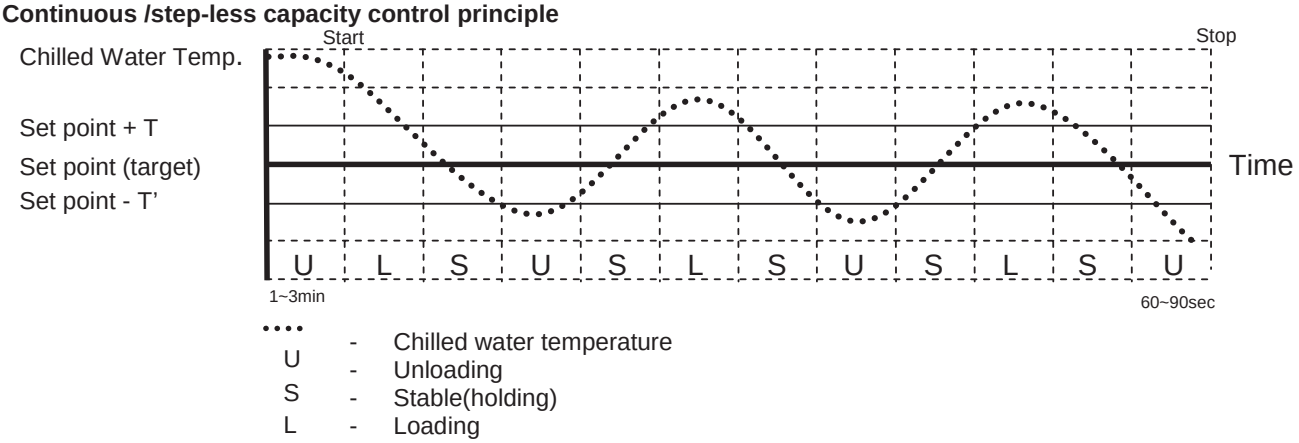


Figure 10 Continuous /step-less capacity control principle

Note: 1. Above T. & T' should be determined by system designer's experience and end user's application.
2. Capacity control must be kept at unloading for 1~3 min before start and for 60~90 sec before stop.

Loading/unloading functions

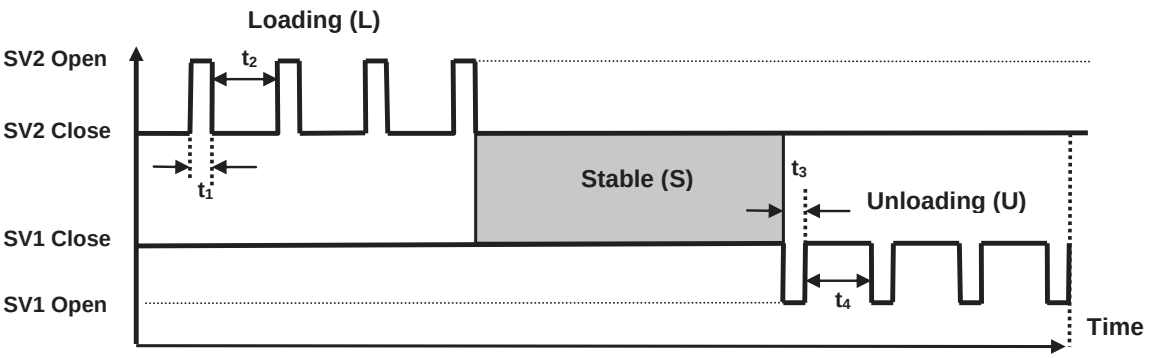
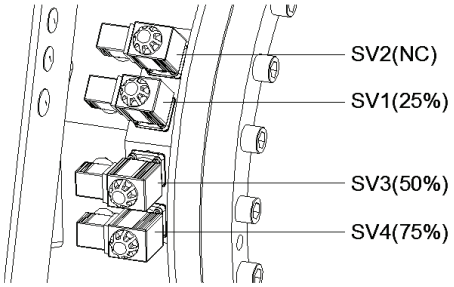


Figure 11 Loading and unloading functions

t_1, t_3: Pulse time 1 ~ 1.5 seconds
t_2, t_4: Pause time 15 ~ 20 seconds

2.8 Dual capacity control system (optional)



Capacity system control module				
Solenoid valve	SV2	SV1	SV3	SV4
A. 4 step capacity control	—	●	●	●
B. Step-less capacity control	●	●	—	—
C. Dual capacity control	●	●	●	●

● : Installation — : No installation

Figure 12 Dual capacity control

Hanbell can provide compressors with capacity as shown in the figure 12, and its control logic is the same as those shown in chapter 2.7 and 2.8.

2.9 Compressor volume ratio (Vi)

The volume ratio **(Vi)** of the compressor can be defined as the ratio of suction volume to discharge volume in the compressor. The smaller the concavity of slide valve in the discharge end, the larger the volume ratio. The volume ratio directly affects the internal compression ratio (Pi). Low Vi corresponds to low Pi and high Vi corresponds to high Pi. In the equation below, in order to prevent over or under compression, the system compression ratio **(CR)** should be equal to compressor's internal compression ratio **(Pi)**. Please refer to P-V (pressure – volume) diagram below to figure out this relation.

CR = Pd/Ps
Pi = Vi ^{k}
Vi = Vs/Vd

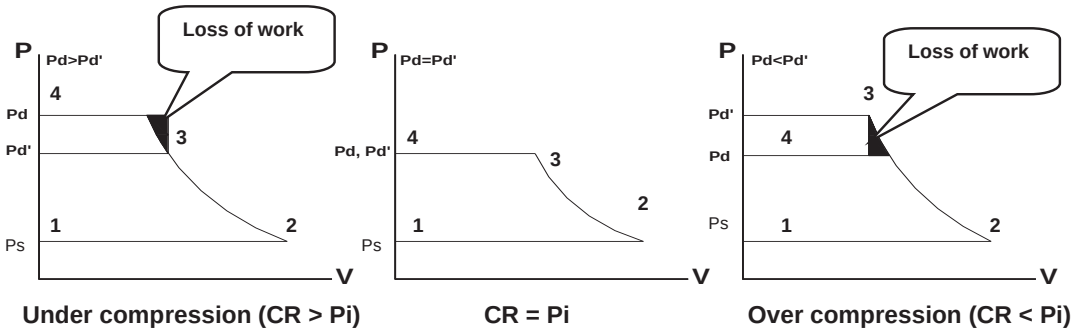
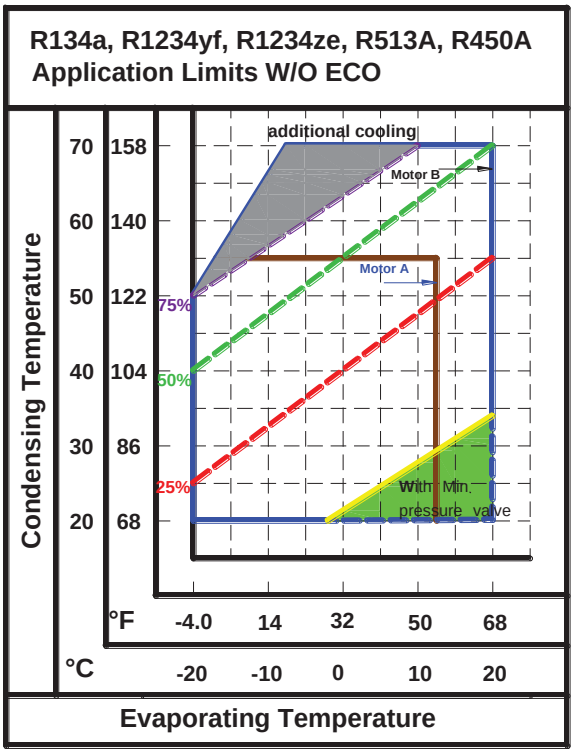


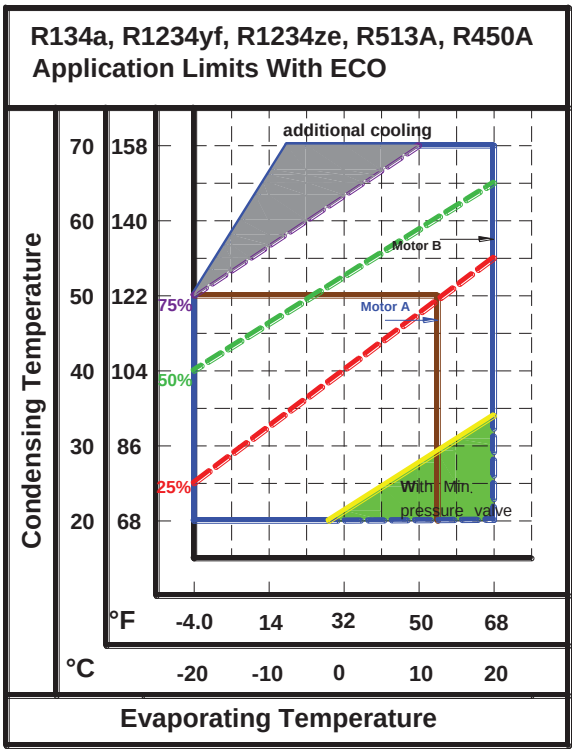
Figure 13 P-V Diagram

Where: **CR:** system compression ratio **Pi:** internal compression ratio
Vi: internal volume ratio **Pd:** system pressure (absolute pressure)
Pd': discharge pressure (absolute pressure) **Ps:** suction pressure (absolute pressure)
Vs: suction volume **Vd:** discharge volume **K:** refrigerant specific heat ratio

2.10 Application limits

Application limits of the compressor vary significantly with the type of refrigerant used. The operating limits shown below are based on saturated suction and discharge operating conditions, for continuous operation over extended periods of time. It is important to operate within these limits to maintain proper compressor life.





Note:

1. When Hanbell screw compressor operates in partial or full load within limits, temperature of motor coil and discharge will rise concurrently. In order to keep the safe running of compressor continuously, Hanbell recommends application of the following additional cooling devices :

   (1) Oil cooler or (2) Liquid injection to chamber or (3) Liquid injection to motor.

   Please refer to Hanbell selection software for application of additional cooling system.
   It is recommended to monitor oil supplied pressure and maintain it at least 4 kg/cm^{2}G higher than suction pressure for adequate sealing, lubrication and capacity control or by installation of oil pump or minimum pressure valve. Especially under operation conditions with low condensing temperature and high evaporating temperature like application in flooded water-cooled chillers, high-low pressure difference tends to be less than 4 kg/cm^{2}G installation of oil pump is recommended to ensure regular oil pressure. Contact with Hanbell to verify potential operating conditions outside the limits shown.
2. If compressors run continuously at partial load below 50%, failure of motor coils might happen due to insufficient cooling. Therefore, Hanbell emphasizes installation of liquid injection system to motor to make sure adequate cooling of motor coils for safe running of compressors. According to EN12900, suction superheat is 10°k and liquid sub-cooling is 0°k.
3. The minimum discharge superheat is recommended to be kept 10°k higher than the condensing temperature (normally discharge superheat is around 20°K for R134a) to avoid liquid filling back to the compressor and lubrication failure.
4. Please contact Hanbell for the Application Range for R22.

2.11 MCC and LRA

Note: Please contact Hanbell if the applied voltage is not shown below.

- RE-A 50Hz (Y-Δ)

Model	50 Hz Unit: Ampere							
	380 V		400 V		415V		440V	
	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)
RE-230A	95	120/ 360	91	127/ 380	87	115/ 345	82	107/320
RE-260A	110	133/ 400	105	140/ 420	101	123/ 370	95	120/360
RE-300A	125	155/ 465	120	162/ 485	115	148/ 445	108	133/400
RE-340A	145	200/ 600	139	208/ 625	133	180/ 540	125	173/520
RE-380A	160	218/ 655	153	230/ 690	147	207/ 620	138	193/580
RE-420A	184	232/695	176	243/730	168	220/660	159	202/605
RE-480A	205	262/785	196	275/825	188	243/730	177	223/670
RE-550A	232	320/960	222	337/1010	212	293/880	200	285/855
RE-620A	276	285/855	264	300/900	253	278/835	238	265/795
RE-710A	308	340/1020	295	358/1075	282	327/980	266	308/925
RE-820A	351	427/1280	336	448/1345	322	402/1205	303	370/1110
RE-920A	403	483/1450	385	508/1525	369	450/1350	348	410/1230

- RE-A 50Hz (PWS)

Model	50 Hz Unit: Ampere							
	380 V		400 V		415V		440V	
	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)
RE-230A	95	218/ 360	91	230/ 380	87	209/ 345	82	194/320
RE-260A	110	260/ 400	105	273/ 420	101	241/ 370	95	235/360
RE-300A	125	302/ 465	120	315/ 485	115	289/ 445	108	260/400
RE-340A	145	408/ 600	139	425/ 625	133	368/ 540	125	354/520
RE-380A	160	446/ 655	153	470/ 690	147	422/ 620	138	395/580
RE-420A	184	473/695	176	497/730	168	449/660	159	412/605
RE-480A	205	534/785	196	561/825	188	496/730	177	455/670
RE-550A	232	653/960	222	687/1010	212	598/880	200	581/855

- RE-A 60Hz (Y-Δ)

Model	60 Hz Unit: Ampere													
	220 V		230V		380V		400V		440 V		460 V		480 V	
	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)
RE-230A	190	240/ 720	182	253/ 760	110	152/ 455	105	160/480	95	120/ 360	91	127/ 380	87	115/ 345
RE-260A	220	253/ 760	210	265/ 795	127	162/ 485	121	173/520	110	133/ 400	105	140/ 420	101	123/ 370
RE-300A	251	310/ 930	240	323/ 970	145	192/ 575	138	208/625	125	155/ 465	120	162/ 485	115	148/ 445
RE-340A	290	375/1125	278	392/1175	168	245/ 735	160	258/775	145	200/ 600	139	208/ 625	133	180/ 540
RE-380A	320	436/1310	306	460/1380	185	267/ 800	176	280/840	160	218/ 655	153	230/ 690	147	207/ 620
RE-420A	367	465/1395	351	487/1460	213	282/845	202	297/890	184	232/ 695	176	243/730	168	220/660
RE-480A	410	525/1575	393	548/1645	238	317/950	226	333/1000	205	262/ 785	196	275/825	188	243/730
RE-550A	463	583/1750	443	610/1830	268	378/1135	255	398/1195	232	320/ 960	222	337/1010	212	293/880
RE-620A					320	363/1090	304	382/1145	276	285/ 855	264	300/900	253	278/835
RE-710A	-	-	-	-	357	460/1380	339	485/1455	308	340/1020	295	358/1075	283	327/980
RE-820A	-	-	-	-	406	513/1540	386	542/1625	351	427/1280	336	448/1345	322	402/1205
RE-920A	-	-	-	-	466	600/1800	443	632/1895	403	483/1450	385	508/1525	369	450/1350

- RE-A 60Hz (PWS)

Model	60 Hz Unit: Ampere													
	220 V		230V		380V		400V		440 V		460 V		480 V	
	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)
RE-230A	190	436/ 720	182	460/ 760	110	275/ 455	105	290/480	95	218/ 360	91	230/ 380	87	209/ 345
RE-260A	220	494/ 760	210	517/ 795	127	315/ 485	121	338/520	110	260/ 400	105	273/ 420	101	241/ 370
RE-300A	251	605/ 930	240	631/ 970	145	374/ 575	138	407/625	125	302/ 465	120	315/ 485	115	289/ 445
RE-340A	290	765/1125	278	799/1175	168	500/ 735	160	527/775	145	408/ 600	139	425/ 625	133	367/ 540
RE-380A	320	891/1310	306	938/1380	185	544/ 800	176	571/840	160	445/ 655	153	469/ 690	147	422/ 620
RE-420A	367	949/1395	351	993/1460	213	575/845	202	606/890	184	473/695	176	496/730	168	449/660
RE-480A	410	1071/1575	393	1119/1645	238	646/950	226	680/1000	205	534/785	196	561/825	188	496/730
RE-550A	463	1190/1750	443	1244/1830	268	772/1135	255	813/1195	232	653/960	222	687/1010	212	598/880

- RE-B 50Hz (Y-Δ)

Model	50 Hz Unit: Ampere							
	380 V		400 V		415V		440V	
	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)
RE-230B	119	173/ 520	114	182/ 545	109	167/ 500	103	155/465
RE-260B	133	207/ 620	128	218/ 655	122	192/ 575	115	177/530
RE-300B	155	255/ 765	148	268/ 805	143	245/ 735	134	238/715
RE-340B	179	300/ 900	172	317/ 950	164	275/ 825	155	268/805
RE-380B	203	320/ 960	194	337/1010	185	293/ 880	175	285/855
RE-420B	229	373/1120	219	393/1180	210	323/970	198	322/965
RE-480B	256	398/1195	245	420/1260	234	390/1170	221	373/1120
RE-550B	289	447/1340	276	470/1410	265	432/1295	250	407/1220
RE-620B	337	483/1450	323	508/1525	309	450/1350	291	410/1230
RE-710B	389	550/1650	372	578/1735	356	502/1505	336	453/1360
RE-820B	440	558/1675	421	588/1765	403	505/1515	308	478/1435
RE-920B	482	663/1990	461	698/2095	441	623/1870	416	582/1745

- RE-B 50Hz (PWS)

Model	50 Hz Unit: Ampere							
	380 V		400 V		415V		440V	
	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)
RE-230B	119	338/ 520	114	354/ 545	109	325/ 500	103	302/465
RE-260B	133	422/620	128	445/655	122	391/ 575	115	360/530
RE-300B	155	520/ 765	148	547/805	143	500/ 735	134	486/715
RE-340B	179	612/ 900	172	646/ 950	164	561/ 825	155	547/805
RE-380B	203	653/ 960	194	687/1010	185	598/ 880	175	581/855
RE-420B	229	762/1120	219	802/1180	210	660/970	198	657/965
RE-480B	256	813/1195	245	857/1260	234	796/1170	221	762/1120
RE-550B	289	911/1340	276	959/1410	265	881/1295	250	830/1220

- RE-B 60Hz (Y-Δ)

Model	60 Hz Unit: Ampere													
	220 V		230 V		380V		400V		440 V		460 V		480 V	
	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)	MCC	LRA (Y/△)
RE-230B	238	347/ 1040	228	363/ 1090	138	208/ 625	132	220/660	119	173/ 520	114	182/ 545	109	167/ 500
RE-260B	267	407/ 1220	255	427/ 1280	155	252/ 755	148	265/795	133	207/ 620	128	218/ 655	122	192/ 575
RE-300B	310	510/ 1530	297	537/ 1610	180	308/ 925	172	325/975	155	255/ 765	148	268/ 805	142	245/ 735
RE-340B	359	600/1800	343	633/1900	208	348/1045	199	368/1105	179	300/ 900	172	317/ 950	164	275/ 825
RE-380B	405	583/1750	387	610/1830	235	378/1135	224	398/1195	203	320/ 960	194	337/1010	186	293/ 880
RE-420B					265	458/1375	254	483/1450	229	373/1120	219	398/1180	210	323/970
RE-480B					296	498/1495	283	525/1575	256	398/1195	245	420/1260	234	390/1170
RE-550B					335	552/1655	320	580/1740	289	447/1340	276	470/1410	265	432/1295
RE-620B					390	600/1800	374	632/1895	337	483/1450	323	508/1525	309	450/1350
RE-710B					450	622/1865	431	655/1965	389	550/1650	372	578/1735	356	502/1505
RE-820B					510	675/2025	488	710/2130	440	558/1675	421	588/1765	404	505/1515
RE-920B					558	770/2310	533	810/2430	482	663/1990	461	698/2095	441	623/1870

- RE-B 60Hz (PWS)

Model	60 Hz Unit: Ampere													
	220V		230V		380V		400V		440 V		460 V		480 V	
	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)	MCC	LRA (△/△△)
RE-230B	238	676/1040	228	709/ 1090	138	406/ 625	132	429/660	119	338/ 520	114	354/ 545	109	325/ 500
RE-260B	267	830/1220	255	870/ 1280	155	513/ 755	148	540/795	133	422/ 620	128	445/ 655	122	391/ 575
RE-300B	310	1040/1530	297	1095/ 1610	180	629/ 925	172	663/975	155	520/ 765	148	547/ 805	142	500/ 735
RE-340B	359	1224/1800	343	1292/1900	208	711/1045	199	752/1105	179	612/ 900	172	646/ 950	164	561/ 825
RE-380B	405	1190/1750	387	1244/1830	235	772/1135	224	813/1195	203	653/ 960	194	687/1010	186	598/ 880
RE-420B					265	935/1375	254	986/1450	229	762/1120	219	802/1180	210	660/970
RE-480B					296	1017/1495	283	1071/1575	256	813/1195	245	857/1260	234	796/1170
RE-550B					335	1125/1655	320	1183/1740	289	911/1340	276	959/1410	265	881/1295

3. Lubricants

The main functions of lubrication oil in screw compressors are lubrication, internal sealing, cooling and capacity control. Positive oil pressure in the cylinder pushes the piston together with the slide valve that is connected by a piston rod to move forward and backward in the compression chamber. The design of positive pressure differential lubrication system makes RE series normally omit an extra oil pump which is necessary for reciprocating compressors. However, in some special applications, it is still necessary to install an extra oil pump to screw compressors for safety.

Bearings used in RE series compressors require small and steady volume of oil for lubrication. Oil injection into the compression chamber creates a film of oil for sealing in the compression housing to increase efficiency and also can dissipate part of compression heat. In order to separate oil from refrigerant gas, an external oil separator is required to ensure the least amount of oil carried into the system.

Please pay more attention to the oil temperature, which is crucial to compressor bearings' life. Oil is with much lower viscosity at high temperatures. Too low viscosity of oil will result in poor lubrication and heat dissipation in the compressor. Viscosity is recommended to keep over 10mm^2/s at any temperatures for oil. Oil temperature in the oil sump should be kept above the saturated condensing temperature to prevent refrigerant migration into lubrication system. Oil has a higher viscosity in low ambient temperature circumstances. When viscosity is too high, slow flow speed of oil into the cylinder may result in too slow loading of the compressor. To solve this problem, use of oil heaters can warm up oil before starting.

If the compressor operates under critical operating conditions, an extra oil cooler is required – please refer to Hanbell selection software for the required capacity and oil flow of the extra oil cooler. High-viscosity oil is recommended to apply in high operating conditions because high discharge temperature will make viscosity of oil lower. Oil return from the evaporator may be insufficient in refrigeration systems, flooded chillers…etc., in which it's difficult for oil to be carried back and it may cause oil loss in the compressor. If the system encounters the oil return problem then an extra 2nd oil separator is recommended to be installed between the compressor discharge side and condenser.

Each of HANBELL RE series screw compressor has a low oil sight glass. The oil level in the compressor oil sump should be full of the sight glass when compressor is running. It is recommended to install the optical oil level switch (optional accessory) to prevent the failure results from lose of oil.

3.1 Lubricants table

Applicable oil types (R134a)

SPECIFICATION		UNITS	HBR -B05	HBR -B08	HBR -B09	HBR -B04
COLOR, ASTM			–	–	–	–
SPECIFIC GRAVITY			0.945	0.94	0.95	0.95
VISCOSITY	40℃	mm^2/s (cSt)	64	131	175	215.9
	100℃		8.9	14.53	16.5	20.8
FLASH POINT		℃	266	254	265	271
POUR POINT		℃	-43	-36.5	-30	-25
T.A.N		mg KOH/g	–	–	–	–
COPPER STRIP 100℃/3hr			–	–	–	–
MOISTURE		ppm	–	–	–	–
FLOC POINT		℃	–	–	–	–
DIELETRIC STRENGTH 2.5mm		KV	–	–	46.6	–

Applicable oil types (R22)

SPECIFICATION		UNITS	HBR -B10	HBR -A02	HBR -A04	HBR -B09	HBR -B02	HBR -B01
COLOR, ASTM			1.5	L1.0	L1.0	–	–	–
SPECIFIC GRAVITY			0.883	0.914	0.925	0.95	1.01	1.05
VISCOSITY	40℃	mm^2/s (cSt)	56.0	54.5	96.5	175	168	298
	100℃		7.0	6.07	8.12	16.5	20.2	32.0
FLASH POINT		℃	220	188	198	265	290	271
POUR POINT		℃	-40	-35	-25	-30	-43	-35
T.A.N		MgKOH/g	0.01	0.00	0.01	–	–	–
COPPER STRIP		100℃/3hr	1a	1a	1a	–	–	–
MOISTURE		ppm	15	20	20	–	–	–
FLOC POINT		℃	-75	-45	-35	–	–	–
DIELETRIC STRENGTH (2.5mm)		KV	75	50	50	46.6	–	–

Note: For other applicable oil types (HFO Refrigerant), please consult HANBELL firstly for approval.

3.2 Pre-cautions of changing oil

1. Use only qualified oil and do not mix different brands of oil together. Selection of oil should match characteristics of the refrigerant used. Some types of synthetic oil are incompatible with mineral oil. Oil remained in the compressor should be totally cleaned up in the system before charging different brands of oil. Charge the compressor with oil for the first start and then change it into new oil again to ensure that there's no mix at all.

2. When using polyester oil for chiller systems, please make sure not to expose oil to the atmosphere for prevention of change in its property. Therefore, it is necessary to vacuum the system completely when installing the compressor.

3. In order to ensure no moisture inside the system, it is suggested to clean the system by charging it with dry Nitrogen and then vacuum it repeatedly as long as possible.

4. It is a must to change the oil in motor burned out case, because acid debris may still remain inside the system. Please follow the procedures mentioned above to change oil in the system. Check acidity of oil after 72 hours of operation and then change it again until acidity of oil becomes normal.

5. Please contact Hanbell local distributors/agents for selection of oil.

3.3 Oil change

1. Change oil periodically: Check lubrication oil every 10,000 hours of continuous running. For the first operation of the compressor, it is recommended to change the oil and clean the oil filter after running 2,000 hours. Check the system whether clean or not and then change oil every 20,000 hours or after 3 years' continuous running while the system operates in good condition.

2. Avoid clogging in oil filter with debris or swarf which may cause failure in bearings. An optional oil pressure differential switch is recommended to be installed. The switch will trip when the oil pressure differential between the primary and secondary sides reaches the critical point and then the compressor will automatically shut down to prevent the bearings from damage due to oil loss.

4. Compressor handling and installation

4.1 Compressor lifting

Each HANBELL screw compressor has been carefully tested at the factory and every precautionary measures have been taken to make sure that compressors will keep in perfect condition when reach customers' work. After the compressor arrives at your warehouse, please check if its crate is kept in good condition and check all the compressor accessories with shipping documents to see if there is any discrepancy.

When lifting the compressor, it is recommended to use a steel chain or steel wire which can be used for loading capacity of 1,500kgf as shown in the figure below. Make sure that chains, cables or other lifting equipments are properly positioned to protect the compressor and its accessories from damaging. Keep the compressor in horizontal position when lifting, and prevent it from crashing or falling on the ground, hitting the wall or any other accident that may damage it or its accessories.

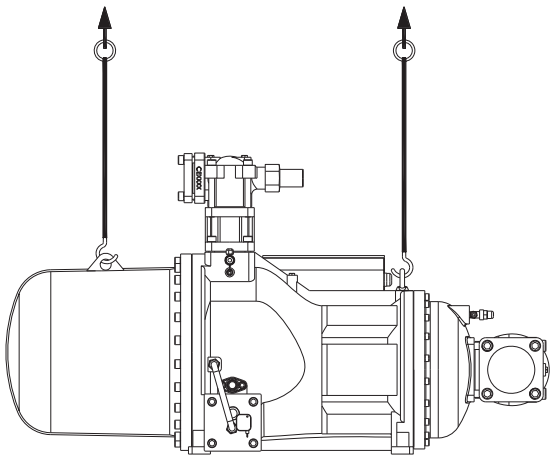


Figure 14 Lift the compressor with steel chain or steel cable

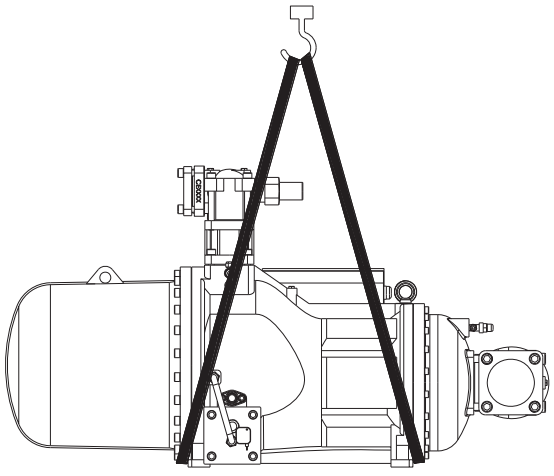


Figure 15 Lift the compressor with safety ropes

4.2 Mounting the compressor

The installation of the compressor in the refrigeration system should be accessible and make sure that the chiller base or site is far enough from the heat source to prevent heat radiation. The compressor should also be installed as close as possible to the electrical power supply for easier connection and must keep good ventilation and low humidity condition in the site. Make sure that the frame or supporter is strong enough to prevent excessive vibration and noise while the compressor is running and must reserve enough space for compressors' future overhauling work.
The compressor must be installed horizontally and in order to prevent excessive vibration transferred by the structure and piping of the chiller while in operation, the cushion or anti-vibration pad should be installed. The installation of the anti-vibration pad is shown in Figure 16. The screws should only be tightened until slight deformation of the rubber pad is visible. ※It is strongly recommended to position the compressor higher than the evaporator

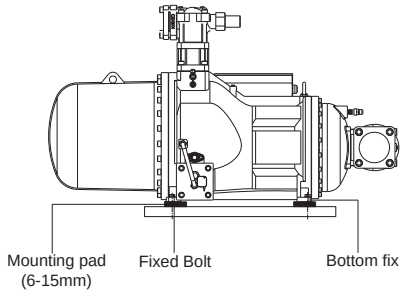


Figure 16 Installation of anti-vibration pads

Suggestions on piping works

The unsuitable piping works done to the compressor could cause abnormal vibration and noise that might damage the compressor. Take notice of the following pointers to prevent this situation from happening:
1. Cleanliness of the system should be kept after welding the piping to avoid any swarf or debris contained inside the system as it may cause serious damage to the compressor during operation.
2. In order to reduce the vibration on the piping tubes, it is recommended to use copper tube to be the suction and discharge piping tubes. Copper tubes are better to minimize the vibration in the piping while the compressor is in operation. In case steel tubes are used in piping system, the suitable welding works are very important to avoid any stress in the piping. This inner stress can cause harmonic vibration and noise that can reduce the life of the compressor. If a large-caliber copper tube is not easily accessible and a steel tube is used instead in suction port, Hanbell also recommends the use of a copper tube in discharge port to best minimize abnormal vibration and noise.
3. Remove the oxidized impurities, swarf or debris caused by welding in the piping tubes. If these materials fall into the compressor, the oil filter might be clogged and result in the malfunction of lubrication system, bearings and capacity control system.
4. The material of suction and discharge flange bushings is forged steel and it can be welded directly with piping connectors. After welding the flange bushing and pipes, it must be cooled down by ambient air. Do not use water to cool it down because water quenching is prohibited.

Installing the compressor in a sloping position

Figure 17 shows a 15° limit of oblique angle for installation of compressor. In case the oblique angle is higher than the limit, compressor will be shut down easily. For special applications like the installation in ships, fishing boats, etc…, where the oblique angle might exceed the limit, external oil separators, oil tanks and related accessories are recommended to be installed. Please contact HANBELL or local distributors for further layout recommendation.

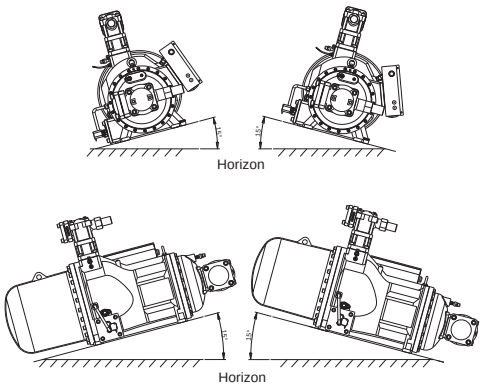
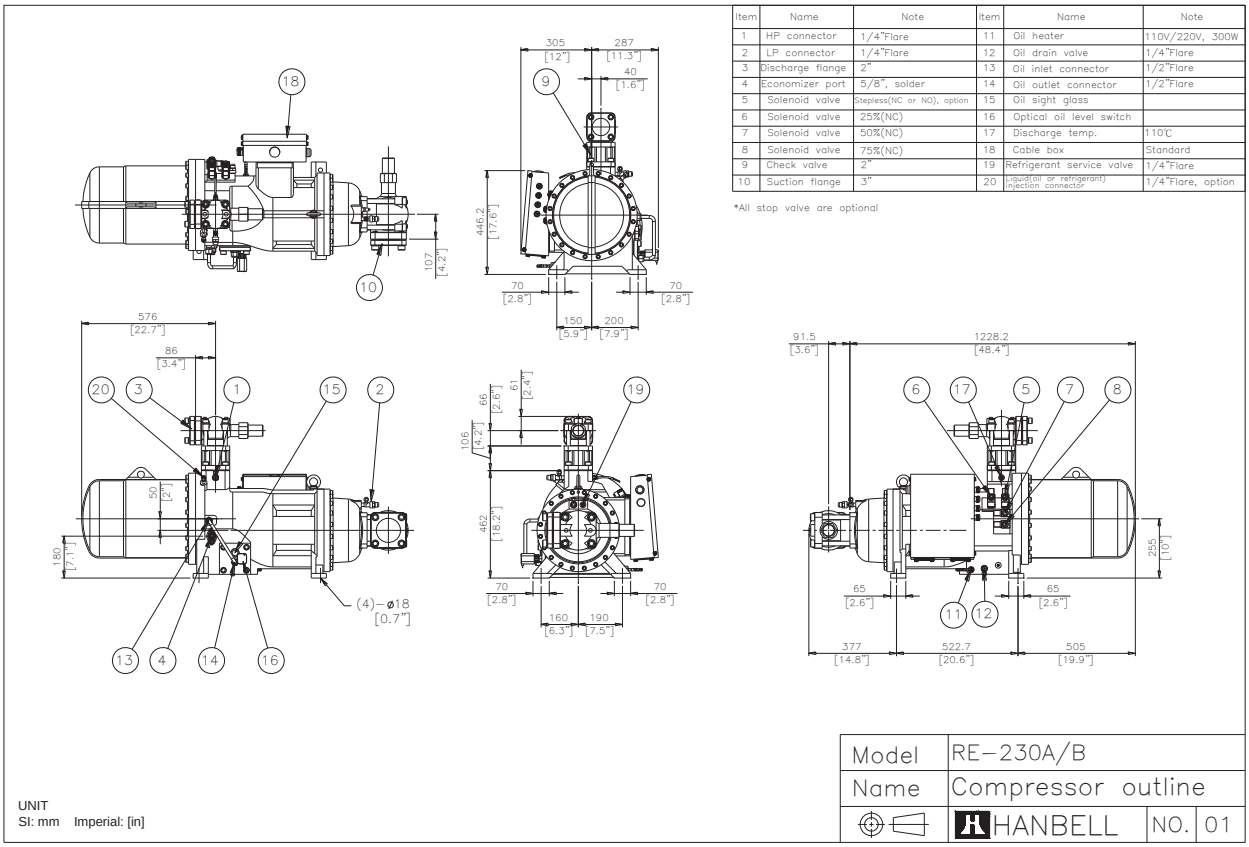


Figure 17 Limits of oblique angle for the installation of the compressor

4.3 RE & RE-P compressor outline drawing

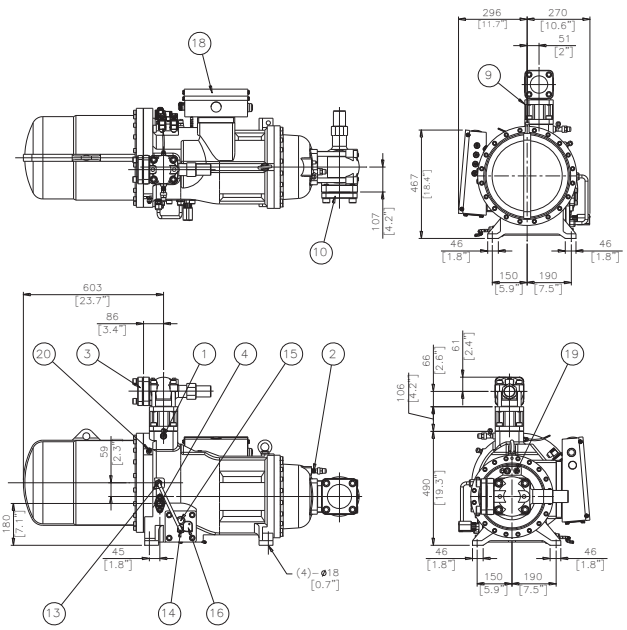


Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	11	Oil heater	110V/220V, 300W
2	LP connector	1/4"Flare	12	Oil drain valve	1/4"Flare
3	Discharge flange	2"	13	Oil inlet connector	1/2"Flare
4	Economizer port	5/8", solder	14	Oil outlet connector	1/2"Flare
5	Solenoid valve	Stepless(NC or NO), option	15	Oil sight glass	
6	Solenoid valve	25%(NC)	16	Optical oil level switch	
7	Solenoid valve	50%(NC)	17	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	18	Cable box	Standard
9	Check valve	2"	19	Refrigerant service valve	1/4"Flare
10	Suction flange	3"	20	Liquid(oil or refrigerant) injection connector	1/4"Flare, option

*All stop valve are optional

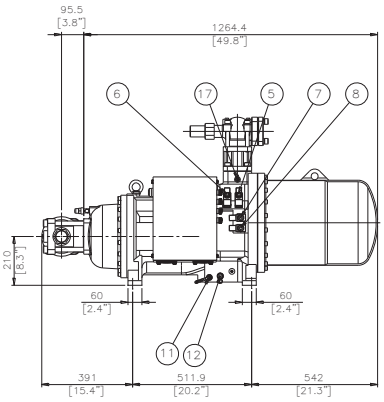
UNIT
SI: mm Imperial: [in]

Model	RE-230A/B		
Name	Compressor outline		
	HANBELL	NO.	01



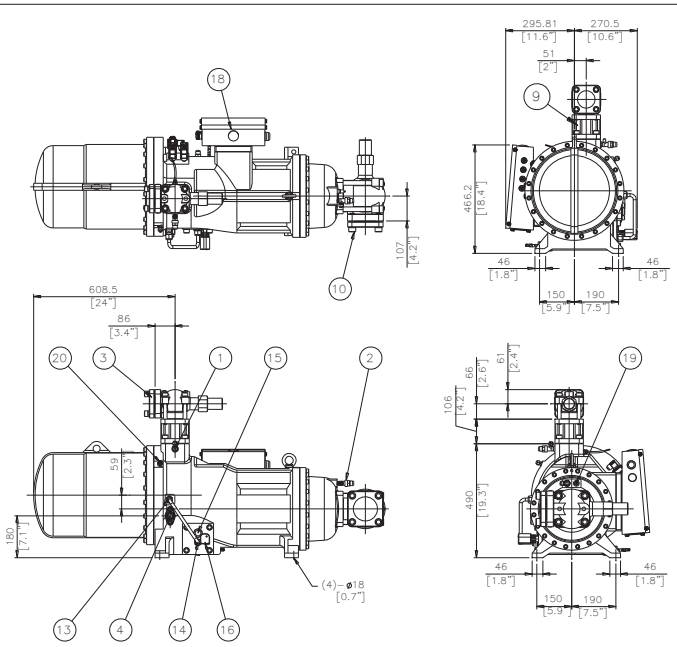
Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	11	Oil heater	110V/220V, 300W
2	LP connector	1/4"Flare	12	Oil drain valve	1/4"Flare
3	Discharge flange	2"	13	Oil inlet connector	1/2"Flare
4	Economizer port	5/8", solder	14	Oil outlet connector	1/2"Flare
5	Solenoid valve	Stepless(NC or NO), option	15	Oil sight glass	
6	Solenoid valve	25%(NC)	16	Optical oil level switch	
7	Solenoid valve	50%(NC)	17	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	18	Cable box	Standard
9	Check valve	2"	19	Refrigerant service valve	1/4"Flare
10	Suction flange	3"	20	Liquid(oil or refrigerant) injection connector	1/4"Flare, option

*All stop valve are optional



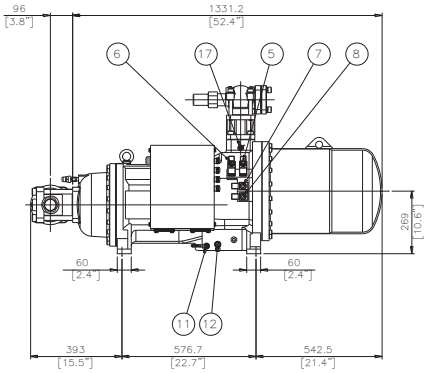
Model	RE-260A/B
Name	Compressor outline
	HANBELL NO. 01

UNIT
SI: mm Imperial: [in]



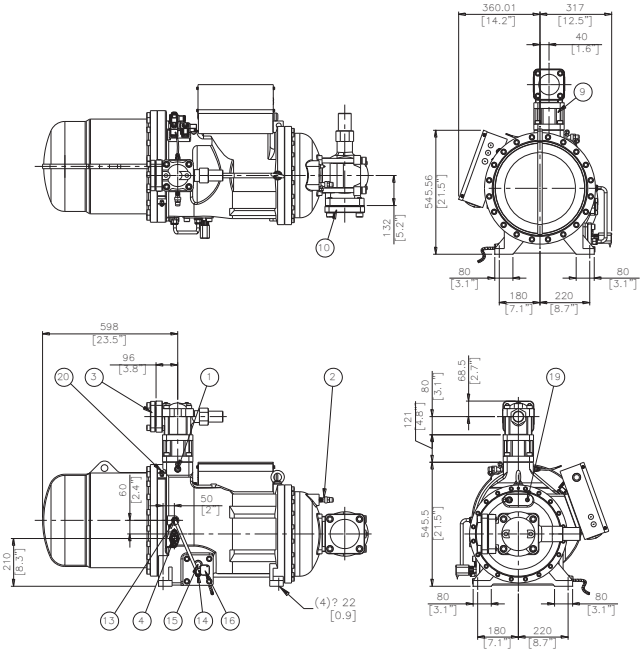
Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	11	Oil heater	110V/220V, 300W
2	LP connector	1/4"Flare	12	Oil drain valve	1/4"Flare
3	Discharge flange	2"	13	Oil inlet connector	1/2"Flare
4	Economizer port	7/8", solder	14	Oil outlet connector	1/2"Flare
5	Solenoid valve	Stepless(NC or NO), option	15	Oil sight glass	
6	Solenoid valve	25%(NC)	16	Optical oil level switch	
7	Solenoid valve	50%(NC)	17	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	18	Cable box	Standard
9	Check valve	2"	19	Refrigerant service valve	1/4"Flare
10	Suction flange	3"	20	Liquid(oil or refrigerant) injection connector	1/4"Flare, option

*All stop valve are optional



Model	RE-300A/B
Name	Compressor outline
	HANBELL NO. 01

UNIT
SI: mm Imperial: [in]

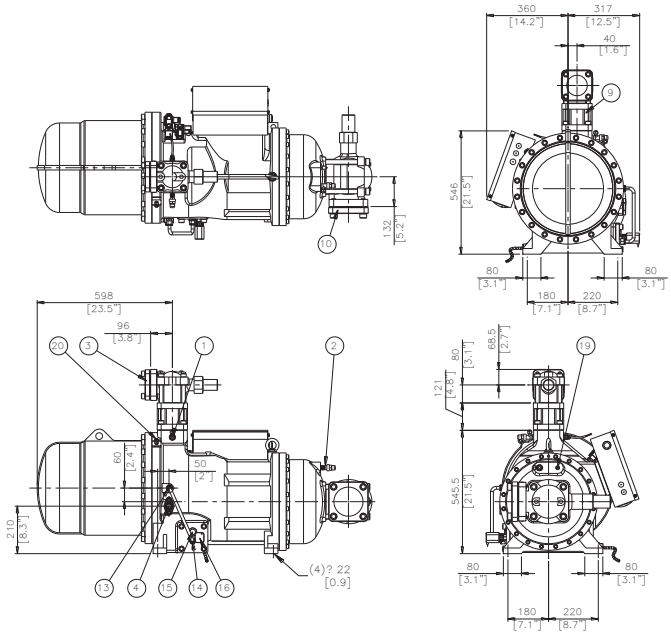


Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	11	Oil heater	110V/220V, 300W
2	LP connector	1/4"Flare	12	Oil drain valve	1/4"Flare
3	Discharge flange	2 1/2"	13	Oil inlet connector	1/2"Flare
4	Economizer port	7/8", solder	14	Oil outlet connector	1/2"Flare
5	Solenoid valve	Stepless(NC or NO), option	15	Oil sight glass	
6	Solenoid valve	25%(NC)	16	Optical oil level switch	
7	Solenoid valve	50%(NC)	17	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	18	Cable box	Standard
9	Check valve	2 1/2"	19	Refrigerant service valve	1/4"Flare
10	Suction flange	4"	20	Liquid(oil or refrigerant) injection connector	1/4"Flare, option

*All stop valve are optional

UNIT
SI: mm Imperial: [in]

Model	RE-340A
Name	Compressor outline
	HANBELL NO. 01



Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	11	Oil heater	110V/220V, 300W
2	LP connector	1/4"Flare	12	Oil drain valve	1/4"Flare
3	Discharge flange	2 1/2"	13	Oil inlet connector	1/2"Flare
4	Economizer port	7/8", solder	14	Oil outlet connector	1/2"Flare
5	Solenoid valve	Stepless(NC or NO), option	15	Oil sight glass	
6	Solenoid valve	25%(NC)	16	Optical oil level switch	
7	Solenoid valve	50%(NC)	17	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	18	Cable box	Standard
9	Check valve	2 1/2"	19	Refrigerant service valve	1/4"Flare
10	Suction flange	4"	20	Liquid(oil or refrigerant) injection connector	1/4"Flare, option

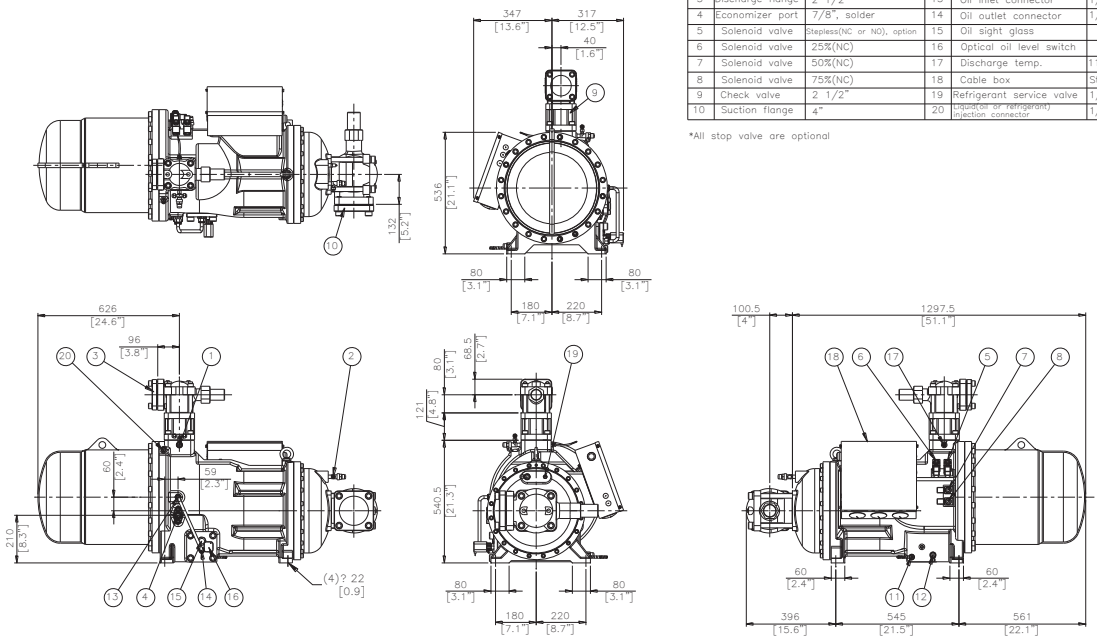
*All stop valve are optional

UNIT
SI: mm Imperial: [in]

Model	RE-340B
Name	Compressor outline
	HANBELL NO. 01

Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	11	Oil heater	110V/220V, 300W
2	LP connector	1/4"Flare	12	Oil drain valve	1/4"Flare
3	Discharge flange	2 1/2"	13	Oil inlet connector	1/2"Flare
4	Economizer port	7/8", solder	14	Oil outlet connector	1/2"Flare
5	Solenoid valve	Stepless(NC or NO), option	15	Oil sight glass	
6	Solenoid valve	25%(NC)	16	Optical oil level switch	
7	Solenoid valve	50%(NC)	17	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	18	Cable box	Standard
9	Check valve	2 1/2"	19	Refrigerant service valve	1/4"Flare
10	Suction flange	4"	20	Liquid(oil or refrigerant) injection connector	1/4"Flare, option

*All stop valve are optional

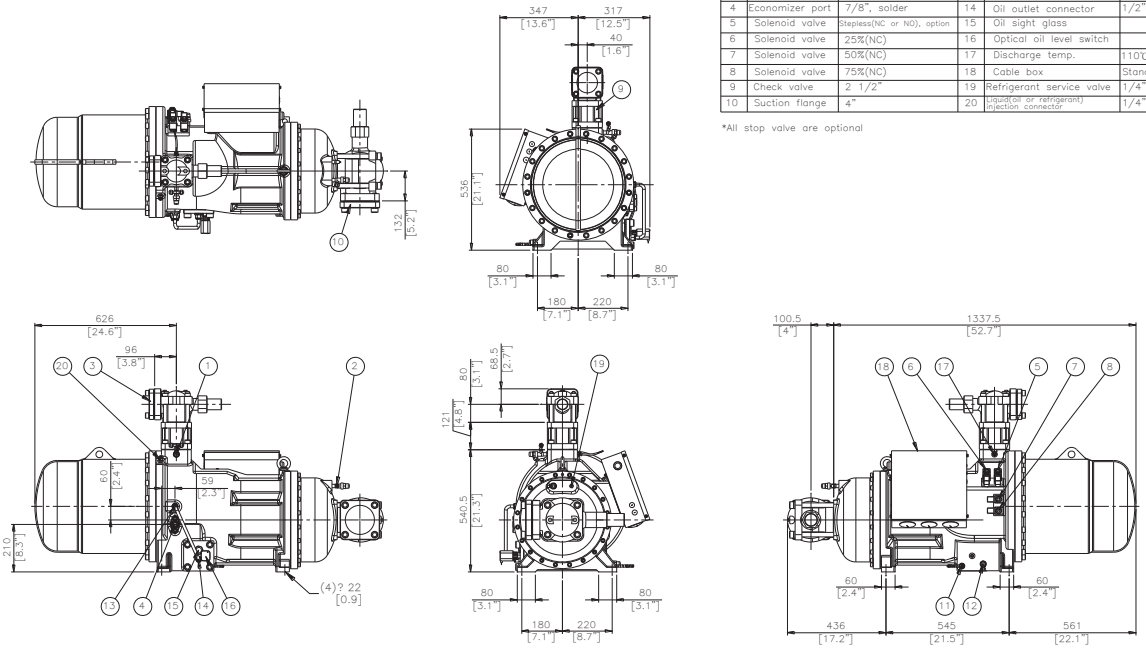


Model	RE-380A
Name	Compressor outline
	HANBELL NO. 01

UNIT
SI: mm Imperial: [in]

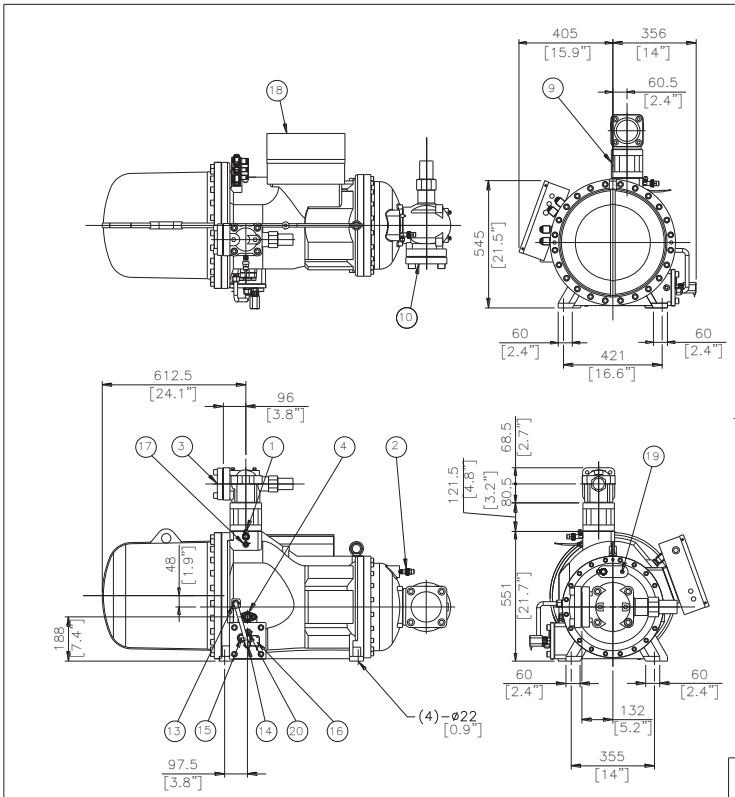
Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	11	Oil heater	110V/220V, 300W
2	LP connector	1/4"Flare	12	Oil drain valve	1/4"Flare
3	Discharge flange	2 1/2"	13	Oil inlet connector	1/2"Flare
4	Economizer port	7/8", solder	14	Oil outlet connector	1/2"Flare
5	Solenoid valve	Stepless(NC or NO), option	15	Oil sight glass	
6	Solenoid valve	25%(NC)	16	Optical oil level switch	
7	Solenoid valve	50%(NC)	17	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	18	Cable box	Standard
9	Check valve	2 1/2"	19	Refrigerant service valve	1/4"Flare
10	Suction flange	4"	20	Liquid(oil or refrigerant) injection connector	1/4"Flare, option

*All stop valve are optional



Model	RE-380B
Name	Compressor outline
	HANBELL NO. 01

UNIT
SI: mm Imperial: [in]

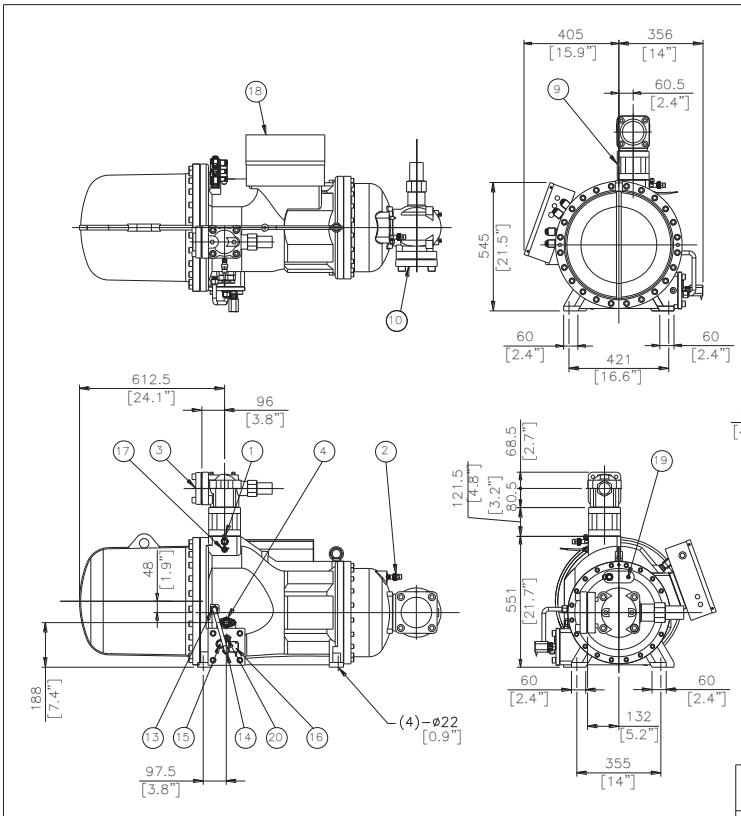


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	1/4"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	1/2"Flare
3	Discharge flange	2 1/2"	14	Oil outlet connector	1/2"Flare
4	Economizer port	7/8", solder	15	Oil sight glass	
5	Solenoid valve	Stepless(NC or NO),option	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	2 1/2"	20	Over flow valve	1/2"Flare
10	Suction flange	4"	21		
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

Model	RE-420A
Name	Compressor outline
	HANBELL NO. 05

UNIT
SI: mm Imperial: [in]

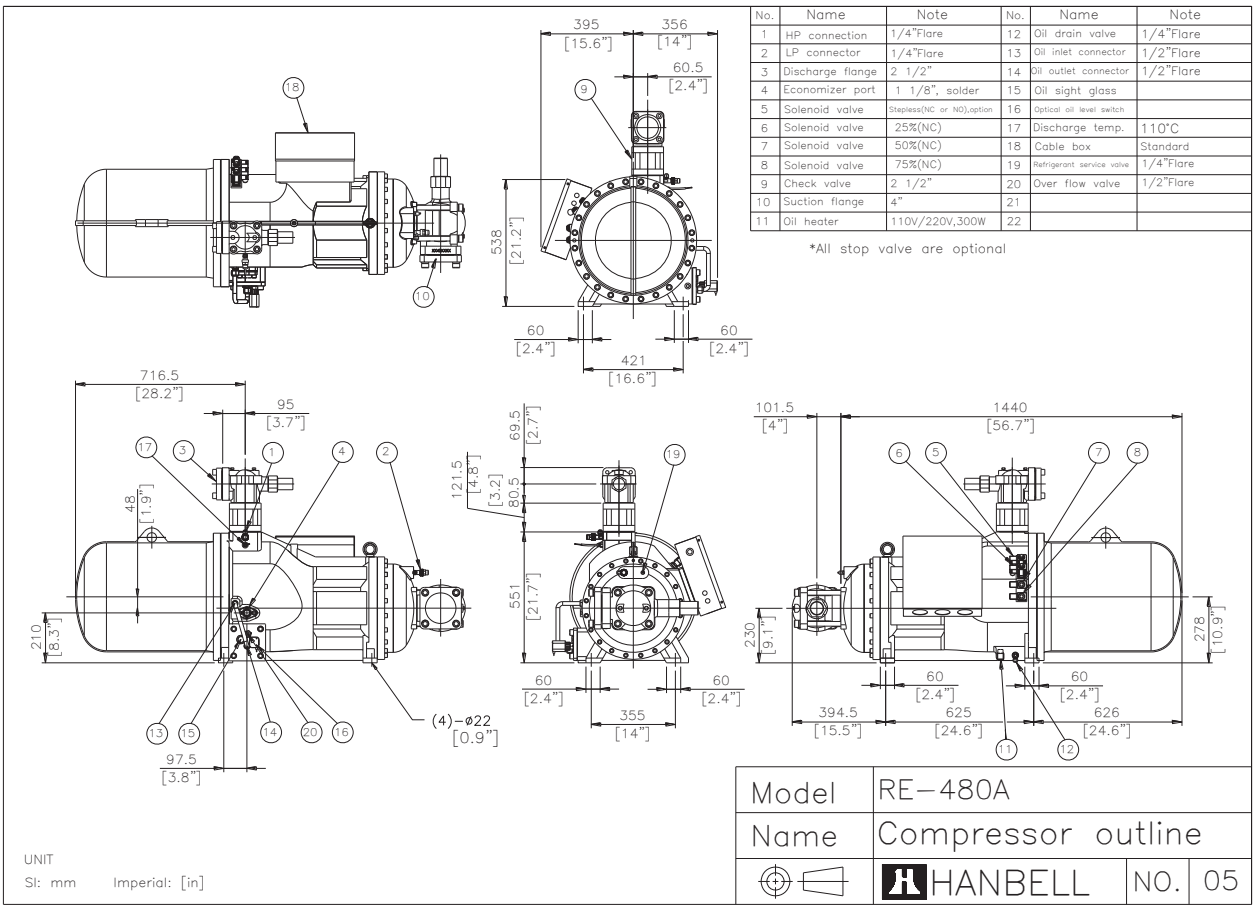


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	1/4"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	1/2"Flare
3	Discharge flange	2 1/2"	14	Oil outlet connector	1/2"Flare
4	Economizer port	7/8", solder	15	Oil sight glass	
5	Solenoid valve	Stepless(NC or NO),option	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	2 1/2"	20	Over flow valve	1/2"Flare
10	Suction flange	4"	21		
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

Model	RE-420B
Name	Compressor outline
	HANBELL NO. 05

UNIT
SI: mm Imperial: [in]

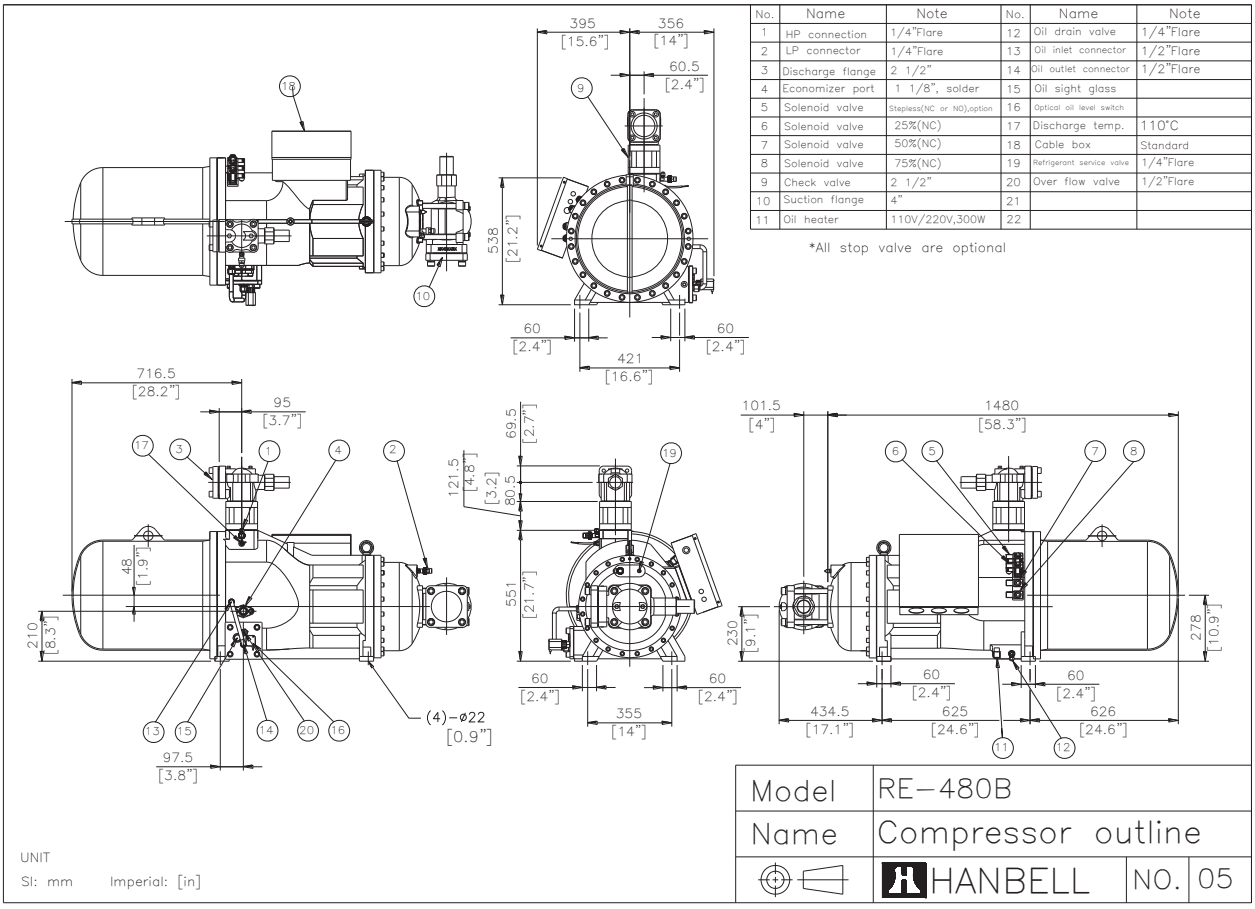


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	1/4"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	1/2"Flare
3	Discharge flange	2 1/2"	14	Oil outlet connector	1/2"Flare
4	Economizer port	1 1/8", solder	15	Oil sight glass	
5	Solenoid valve	Stepless(NC or NO),option	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	2 1/2"	20	Over flow valve	1/2"Flare
10	Suction flange	4"	21		
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

Model	RE-480A
Name	Compressor outline
	HANBELL NO. 05

UNIT
SI: mm Imperial: [in]

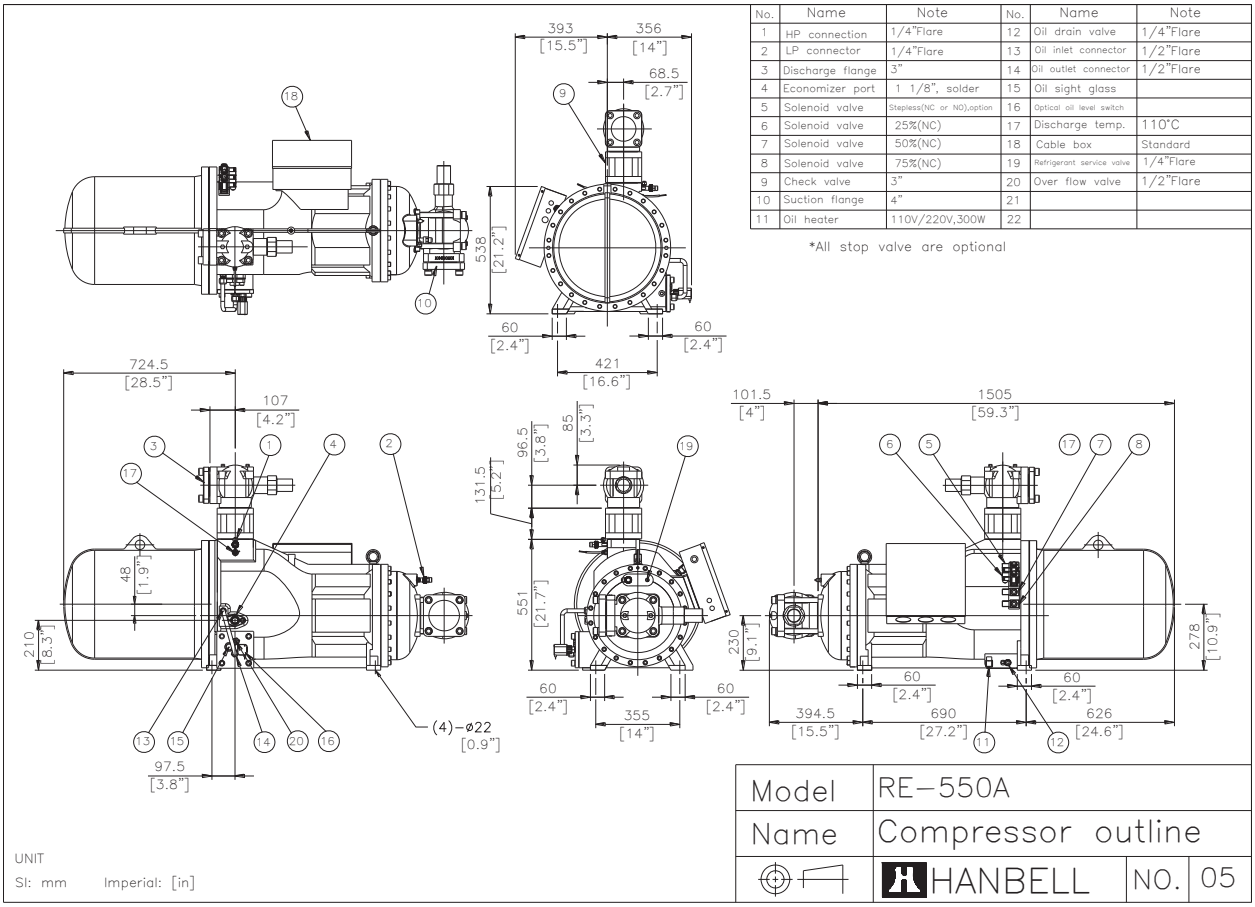


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	1/4"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	1/2"Flare
3	Discharge flange	2 1/2"	14	Oil outlet connector	1/2"Flare
4	Economizer port	1 1/8", solder	15	Oil sight glass	
5	Solenoid valve	Stepless(NC or NO),option	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	2 1/2"	20	Over flow valve	1/2"Flare
10	Suction flange	4"	21		
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

Model	RE-480B
Name	Compressor outline
	HANBELL NO. 05

UNIT
SI: mm Imperial: [in]

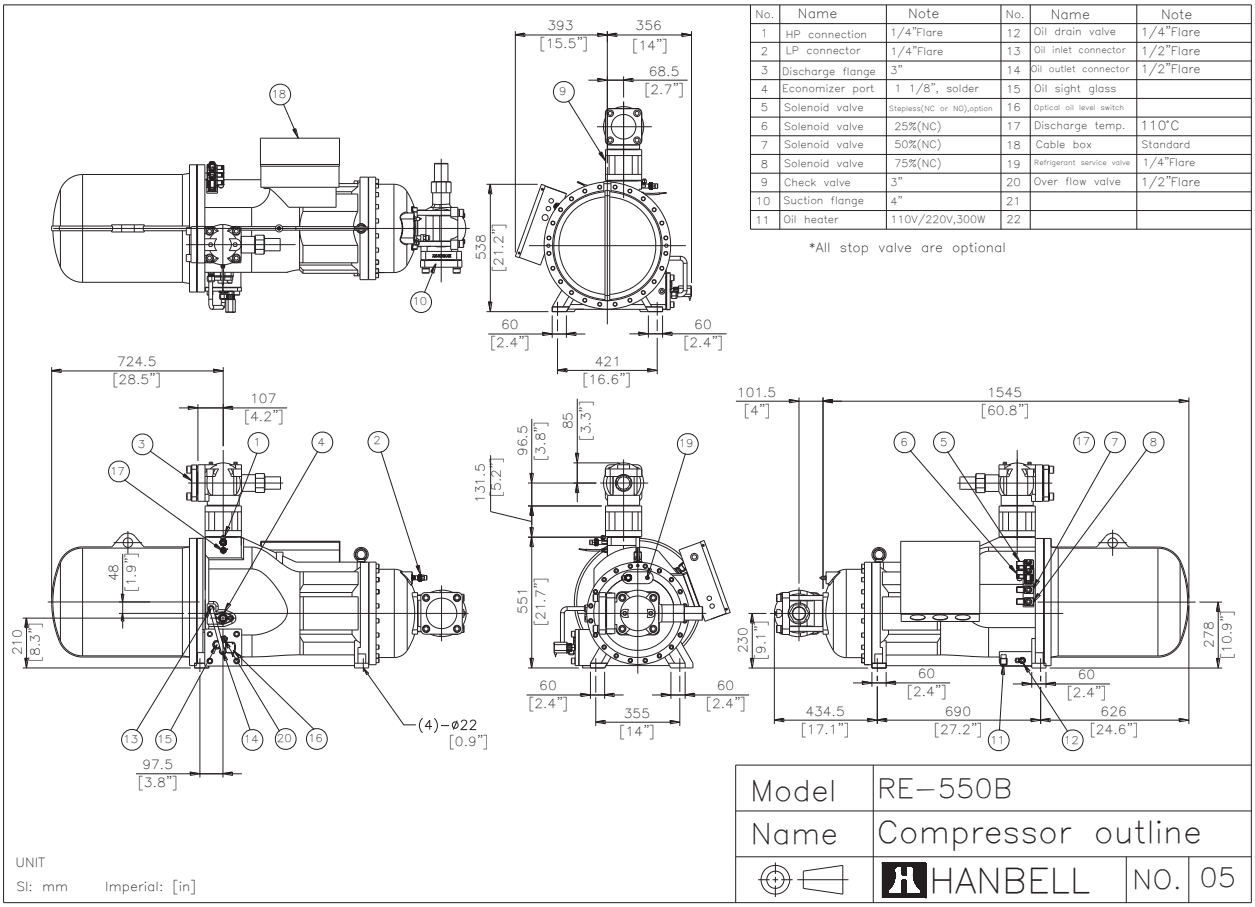


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	1/4"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	1/2"Flare
3	Discharge flange	3"	14	Oil outlet connector	1/2"Flare
4	Economizer port	1 1/8", solder	15	Oil sight glass	
5	Solenoid valve	Stepless(NC or NO),option	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	3"	20	Over flow valve	1/2"Flare
10	Suction flange	4"	21		
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

Model	RE-550A
Name	Compressor outline
	HANBELL NO. 05

UNIT
SI: mm Imperial: [in]

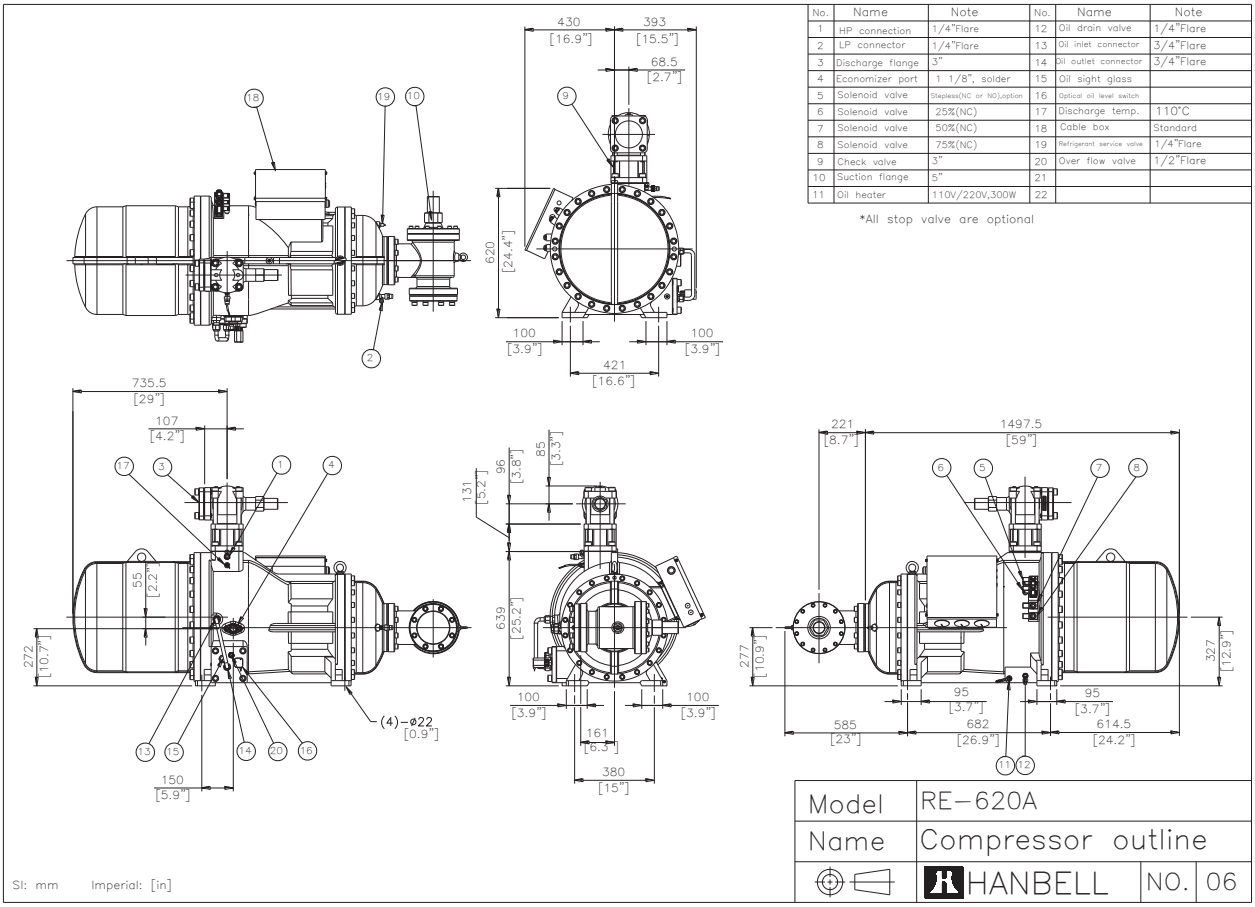


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	1/4"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	1/2"Flare
3	Discharge flange	3"	14	Oil outlet connector	1/2"Flare
4	Economizer port	1 1/8", solder	15	Oil sight glass	
5	Solenoid valve	Stepless(NC or NO),option	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	3"	20	Over flow valve	1/2"Flare
10	Suction flange	4"	21		
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

Model	RE-550B
Name	Compressor outline
	HANBELL NO. 05

UNIT
SI: mm Imperial: [in]

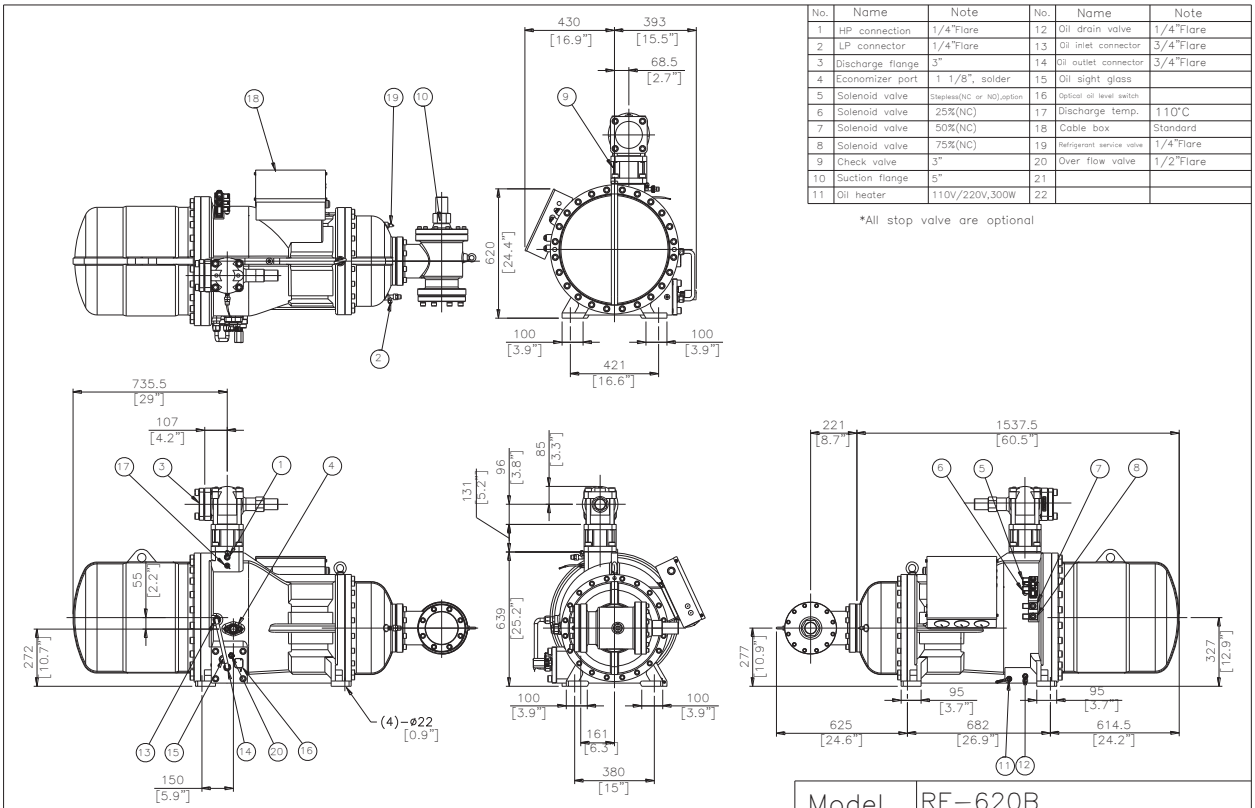


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	1/4"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	3/4"Flare
3	Discharge flange	3"	14	Oil outlet connector	3/4"Flare
4	Economizer port	1 1/8", solder	15	Oil sight glass	
5	Solenoid valve	Stepless(NC or NO),option	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	3"	20	Over flow valve	1/2"Flare
10	Suction flange	5"	21		
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

Model	RE-620A
Name	Compressor outline
	HANBELL NO. 06

SI: mm Imperial: [in]



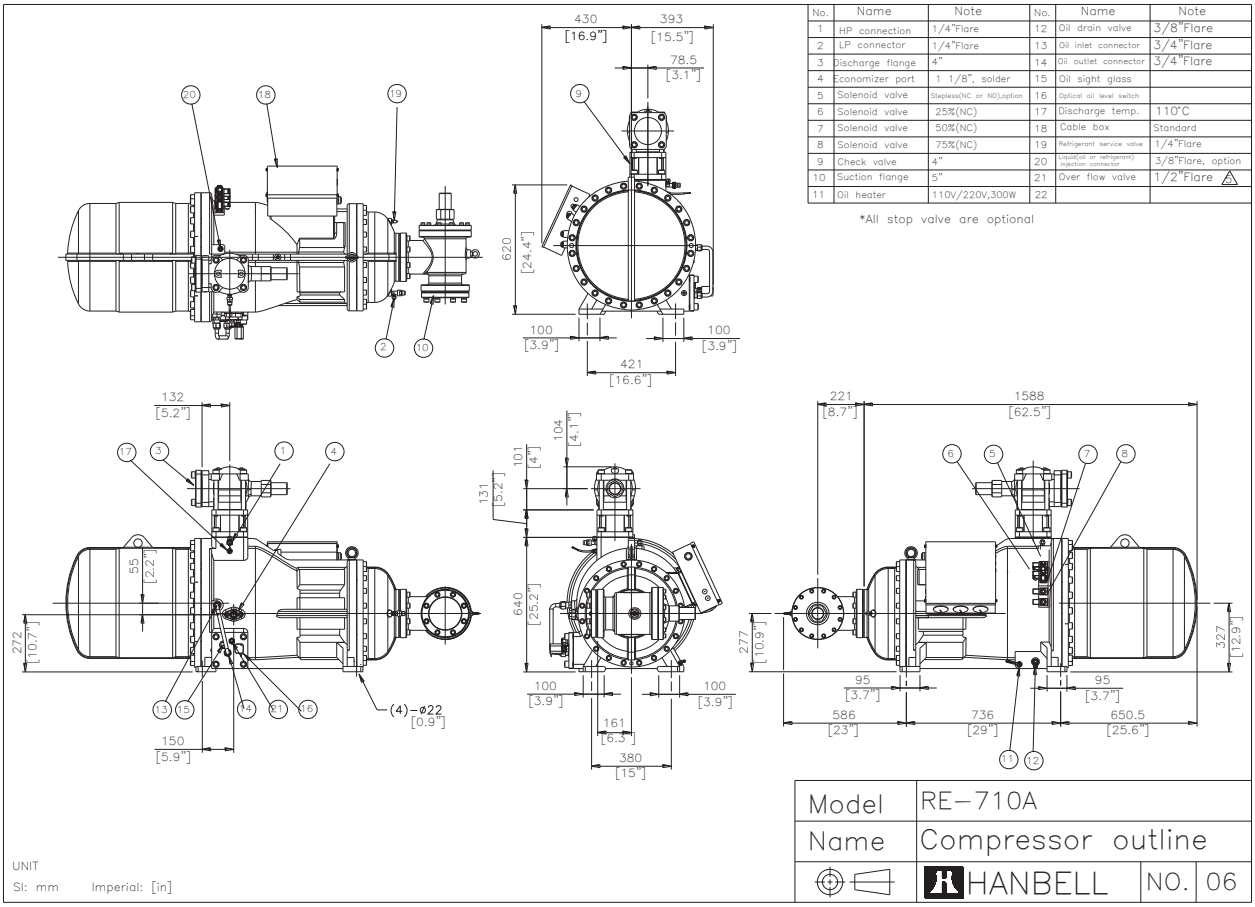
No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	1/4"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	3/4"Flare
3	Discharge flange	3"	14	Oil outlet connector	3/4"Flare
4	Economizer port	1 1/8", solder	15	Oil sight glass	
5	Solenoid valve	Stepless(NC or NO),option	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	3"	20	Over flow valve	1/2"Flare
10	Suction flange	5"	21		
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

Model	RE-620B
Name	Compressor outline
	HANBELL NO. 06

UNIT

SI: mm Imperial: [in]

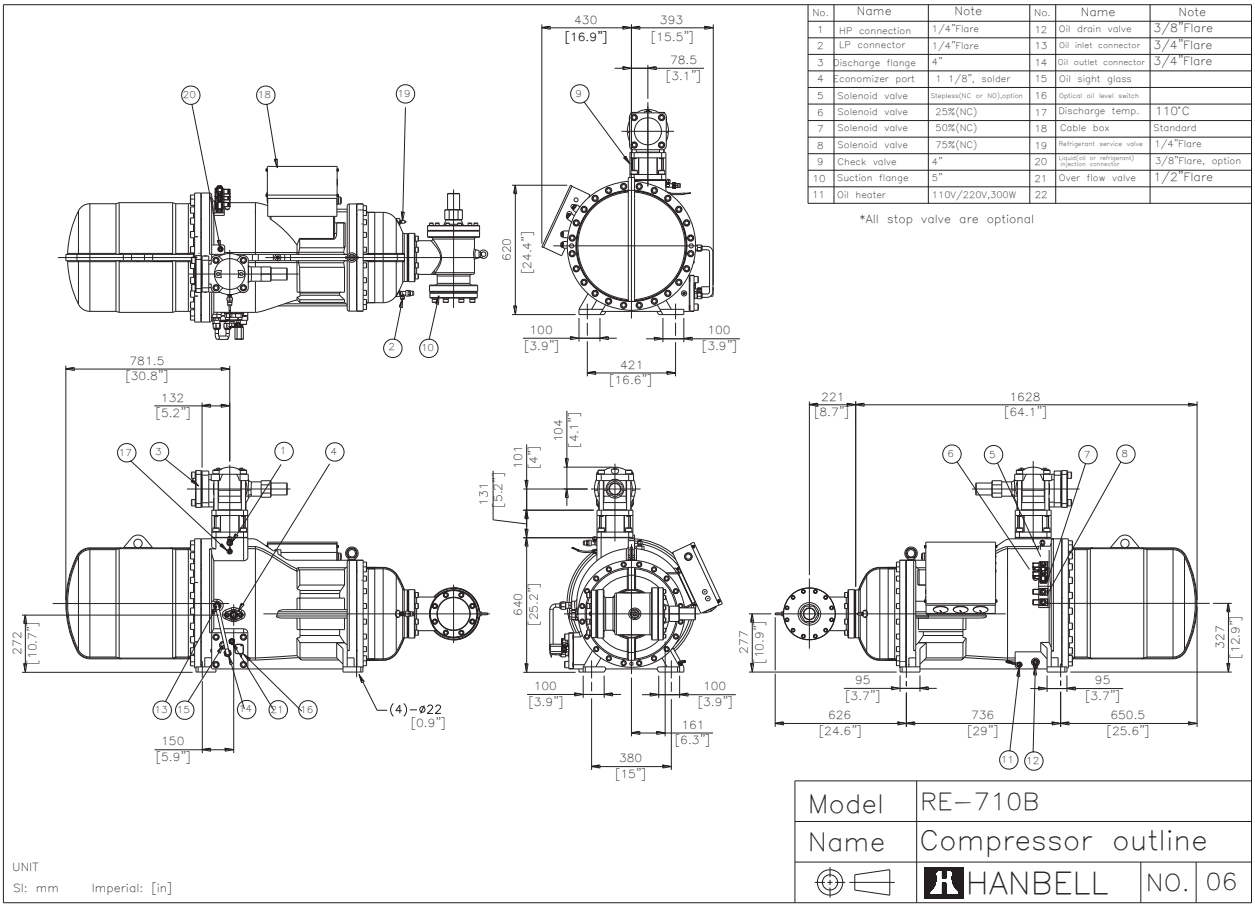


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	3/8"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	3/4"Flare
3	Discharge flange	4"	14	Oil outlet connector	3/4"Flare
4	Economizer port	1 1/8", solder	15	Oil sight glass	
5	Solenoid valve	Stepless(NC or NO),option	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	4"	20	Liquid(oil or refrigerant) injection connector	3/8"Flare, option
10	Suction flange	5"	21	Over flow valve	1/2"Flare △
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

Model	RE-710A
Name	Compressor outline
	HANBELL NO. 06

UNIT
SI: mm Imperial: [in]

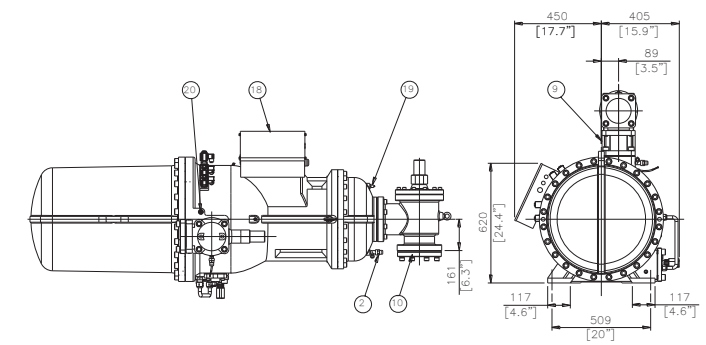


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	3/8"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	3/4"Flare
3	Discharge flange	4"	14	Oil outlet connector	3/4"Flare
4	Economizer port	1 1/8", solder	15	Oil sight glass	
5	Solenoid valve	Stepless(NC or NO),option	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	4"	20	Liquid(oil or refrigerant) injection connector	3/8"Flare, option
10	Suction flange	5"	21	Over flow valve	1/2"Flare
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

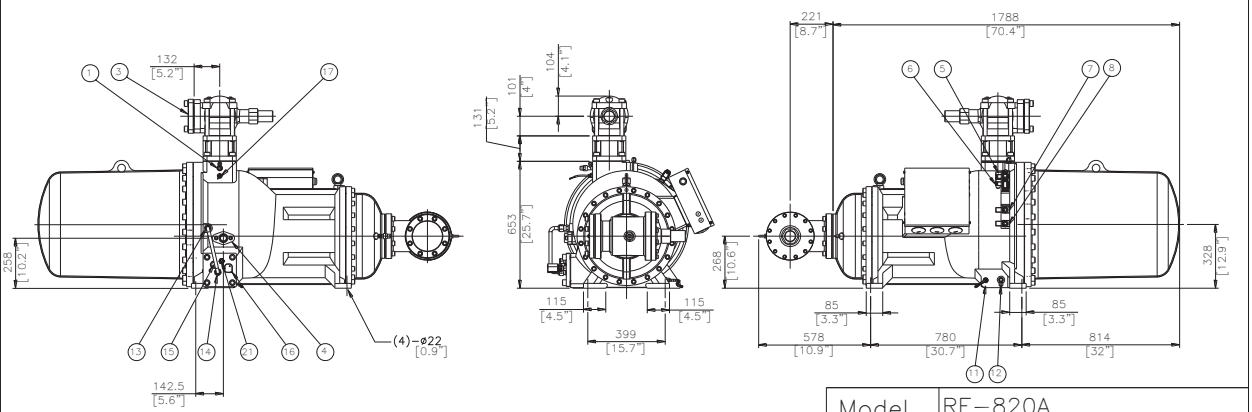
Model	RE-710B
Name	Compressor outline
	HANBELL NO. 06

UNIT
SI: mm Imperial: [in]



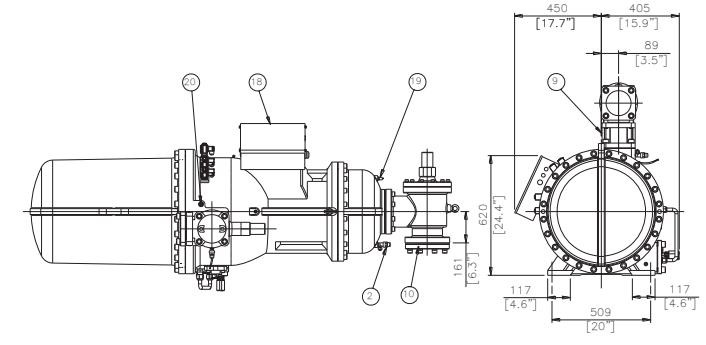
No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	3/8"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	3/4"Flare
3	Discharge flange	4"	14	Oil outlet connector	3/4"Flare
4	Economizer port	1 3/8",for copper tube	15	Oil sight glass	
5	Solenoid valve	Stepless(NC)	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp. sensor	110℃
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	4"	20	Liquid(oil or refrigerant) injection connector	3/8"Flare, option
10	Suction flange	5"	21	Over flow valve	1/2"Flare
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional



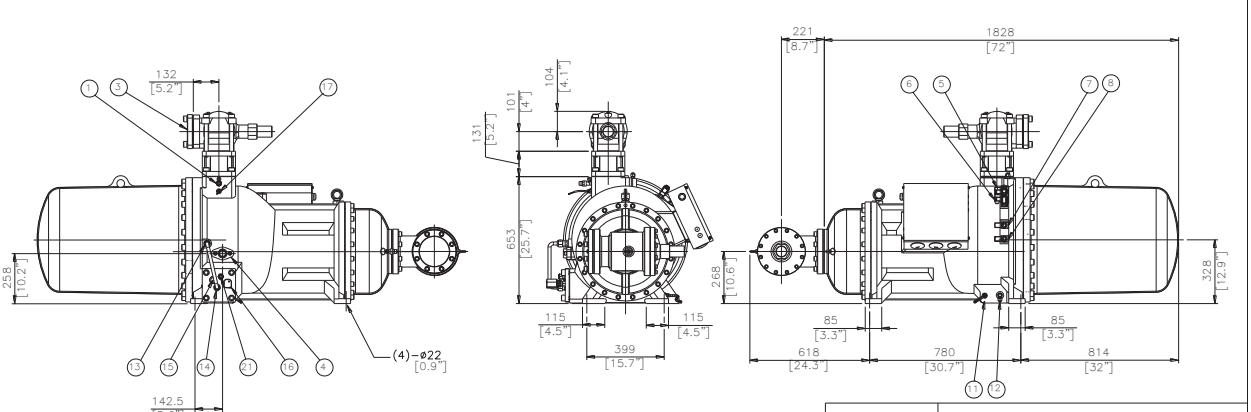
Model	RE-820A
Name	Compressor outline
	HANBELL NO. 08

UNIT
SI: mm Imperial: [in]



No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	3/8"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	3/4"Flare
3	Discharge flange	4"	14	Oil outlet connector	3/4"Flare
4	Economizer port	1 3/8",for copper tube	15	Oil sight glass	
5	Solenoid valve	Stepless(NC)	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp. sensor	110℃
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	4"	20	Liquid(oil or refrigerant) injection connector	3/8"Flare, option
10	Suction flange	5"	21	Over flow valve	1/2"Flare
11	Oil heater	110V/220V,300W	22		

*All stop valve are optional

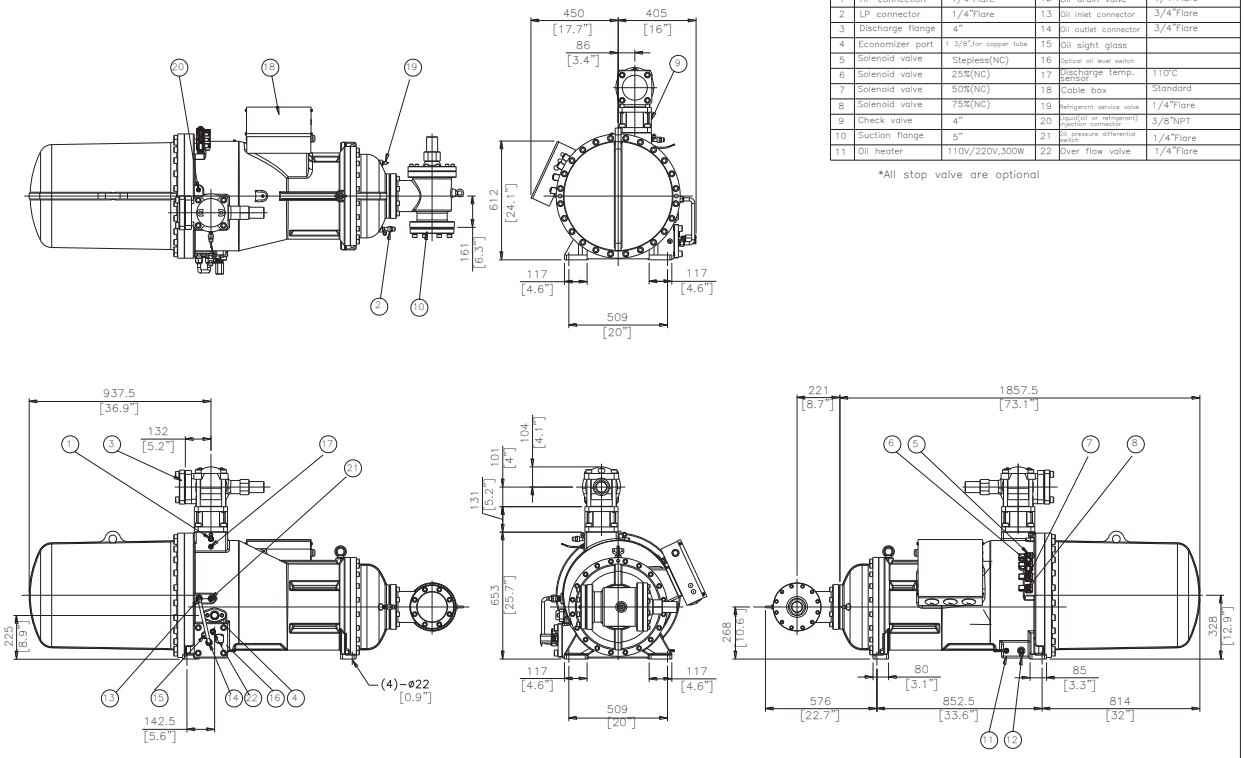


Model	RE-820B
Name	Compressor outline
	HANBELL NO. 08

UNIT
SI: mm Imperial: [in]

No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	1/4"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	3/4"Flare
3	Discharge flange	4"	14	Oil outlet connector	3/4"Flare
4	Economizer port	1 3/8",for copper tube	15	Oil sight glass	
5	Solenoid valve	Stepless(NC)	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp. Sensor	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	4"	20	Liquid(oil or refrigerant) injection connector	3/8"NPT
10	Suction flange	5"	21	Oil pressure differential switch	1/4"Flare
11	Oil heater	110V/220V,300W	22	Over flow valve	1/4"Flare

*All stop valve are optional

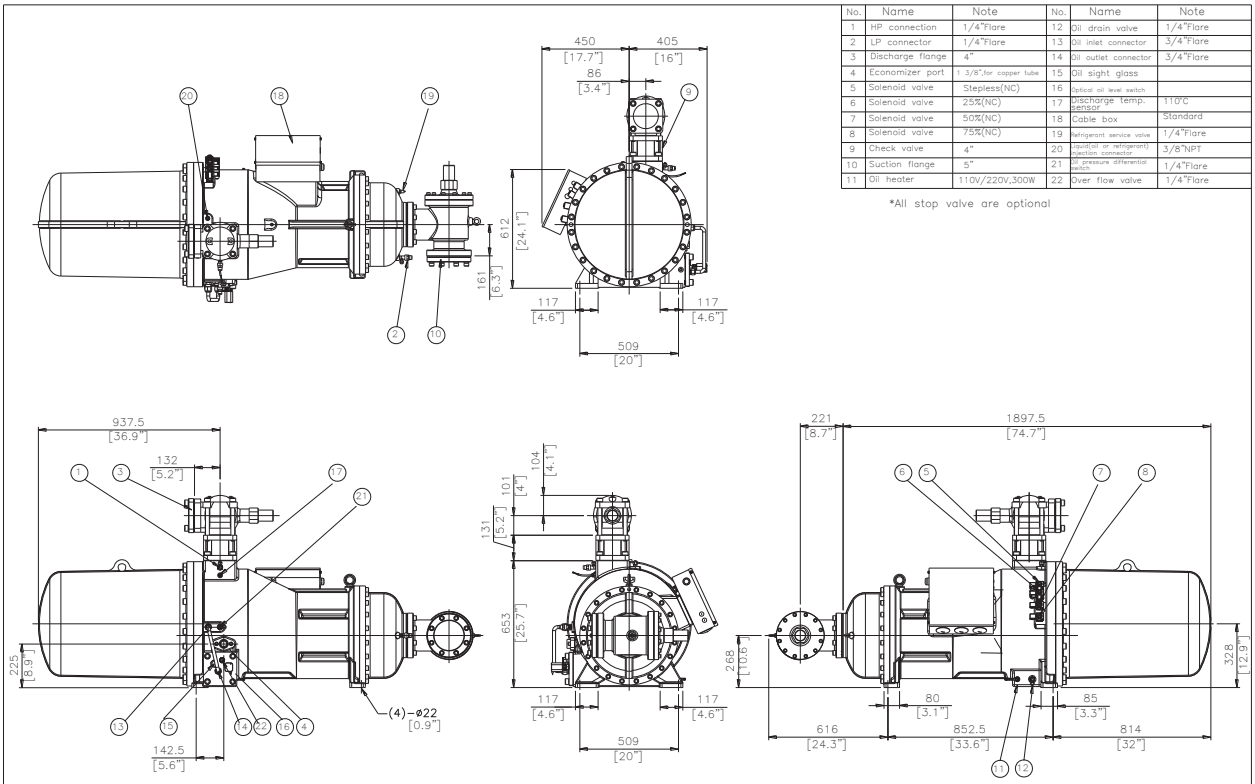


Model	RE-920A
Name	Compressor outline
	HANBELL NO. 07

UNIT
SI: mm Imperial: [in]

No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	12	Oil drain valve	1/4"Flare
2	LP connector	1/4"Flare	13	Oil inlet connector	3/4"Flare
3	Discharge flange	4"	14	Oil outlet connector	3/4"Flare
4	Economizer port	1 3/8",for copper tube	15	Oil sight glass	
5	Solenoid valve	Stepless(NC)	16	Optical oil level switch	
6	Solenoid valve	25%(NC)	17	Discharge temp. Sensor	110°C
7	Solenoid valve	50%(NC)	18	Cable box	Standard
8	Solenoid valve	75%(NC)	19	Refrigerant service valve	1/4"Flare
9	Check valve	4"	20	Liquid(oil or refrigerant) injection connector	3/8"NPT
10	Suction flange	5"	21	Oil pressure differential switch	1/4"Flare
11	Oil heater	110V/220V,300W	22	Over flow valve	1/4"Flare

*All stop valve are optional

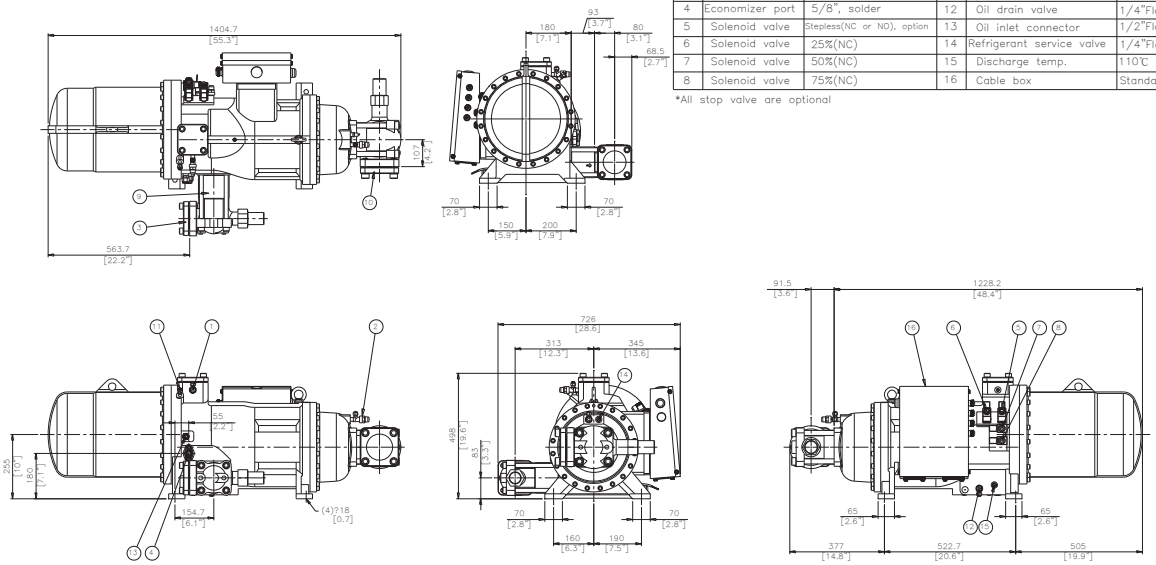


Model	RE-920B
Name	Compressor outline
	HANBELL NO. 07

UNIT
SI: mm Imperial: [in]

Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	9	Check valve	2 1/2"
2	LP connector	1/4"Flare	10	Suction flange	3"
3	Discharge flange	2 1/2"	11	Liquid(oil or refrigerant) injection connector	1/4"Flare, option
4	Economizer port	5/8", solder	12	Oil drain valve	1/4"Flare
5	Solenoid valve	Stepless(NC or NO), option	13	Oil inlet connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Refrigerant service valve	1/4"Flare
7	Solenoid valve	50%(NC)	15	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	16	Cable box	Standard

*All stop valve are optional

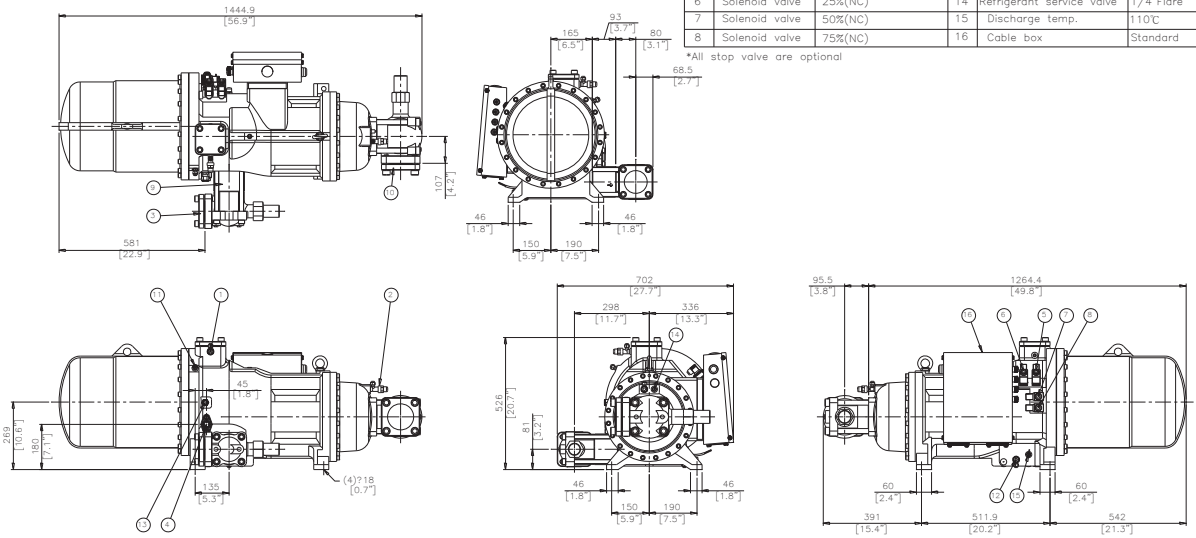


UNIT
SI: mm Imperial: [in]

Model	RE-230AP/BP
Name	Compressor outline
	HANBELL NO. 01

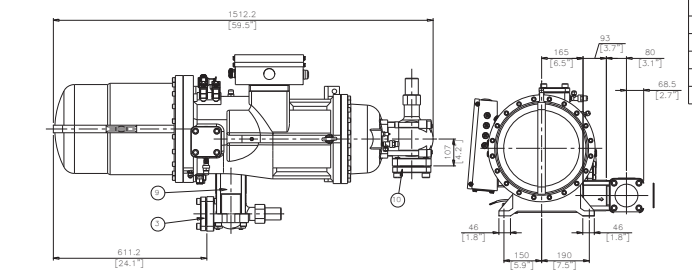
Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	9	Check valve	2 1/2"
2	LP connector	1/4"Flare	10	Suction flange	3"
3	Discharge flange	2 1/2"	11	Liquid(oil or refrigerant) injection connector	1/4"Flare, option
4	Economizer port	5/8", solder	12	Oil drain valve	1/4"Flare
5	Solenoid valve	Stepless(NC or NO), option	13	Oil inlet connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Refrigerant service valve	1/4"Flare
7	Solenoid valve	50%(NC)	15	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	16	Cable box	Standard

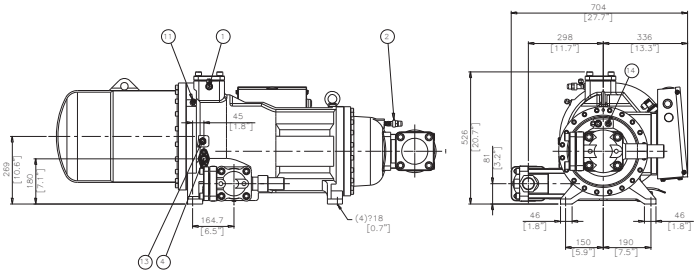
*All stop valve are optional

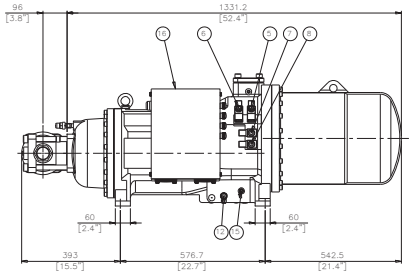


UNIT
SI: mm Imperial: [in]

Model	RE-260AP/BP
Name	Compressor outline
	HANBELL NO. 01







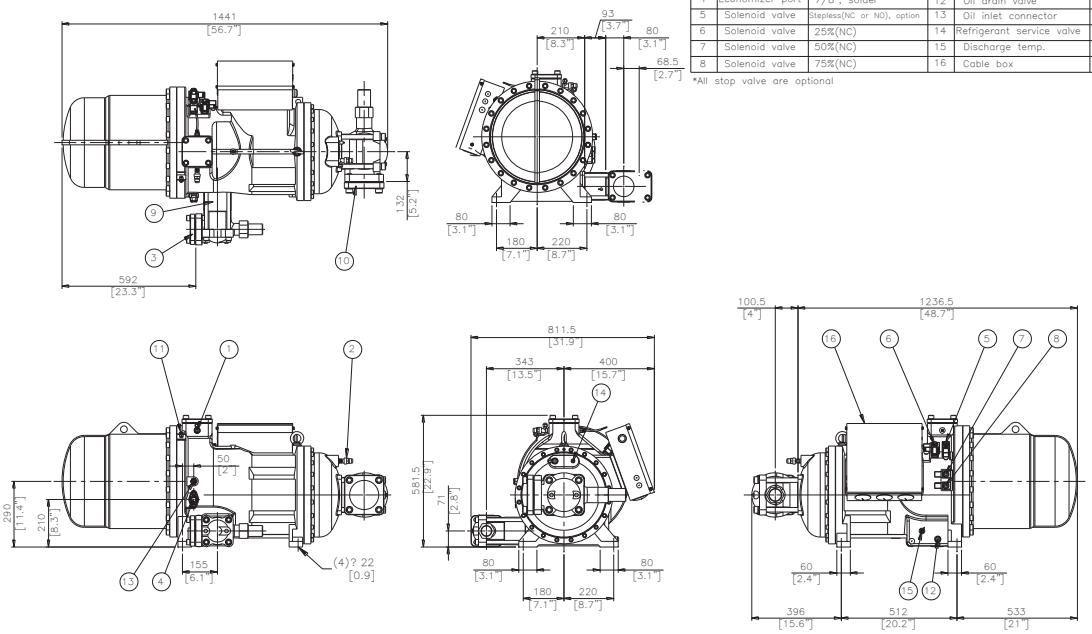
Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	9	Check valve	2 1/2"
2	LP connector	1/4"Flare	10	Suction flange	3"
3	Discharge flange	2 1/2"	11	Liquid(oil or refrigerant) injection connector	1/4"Flare, option
4	Economizer port	5/8", solder	12	Oil drain valve	1/4"Flare
5	Solenoid valve	Stepless(NC or NO), option	13	Oil inlet connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Refrigerant service valve	1/4"Flare
7	Solenoid valve	50%(NC)	15	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	16	Cable box	Standard

UNIT
SI: mm Imperial: [in]

Model	RE-300AP/BP		
Name	Compressor outline		
	HANBELL	NO.	01

Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	9	Check valve	2 1/2"
2	LP connector	1/4"Flare	10	Suction flange	4"
3	Discharge flange	2 1/2"	11	Liquid(oil or refrigerant) injection connector	1/4"Flare, option
4	Economizer port	7/8", solder	12	Oil drain valve	1/4"Flare
5	Solenoid valve	Stepless(NC or NO), option	13	Oil inlet connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Refrigerant service valve	1/4"Flare
7	Solenoid valve	50%(NC)	15	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	16	Cable box	Standard

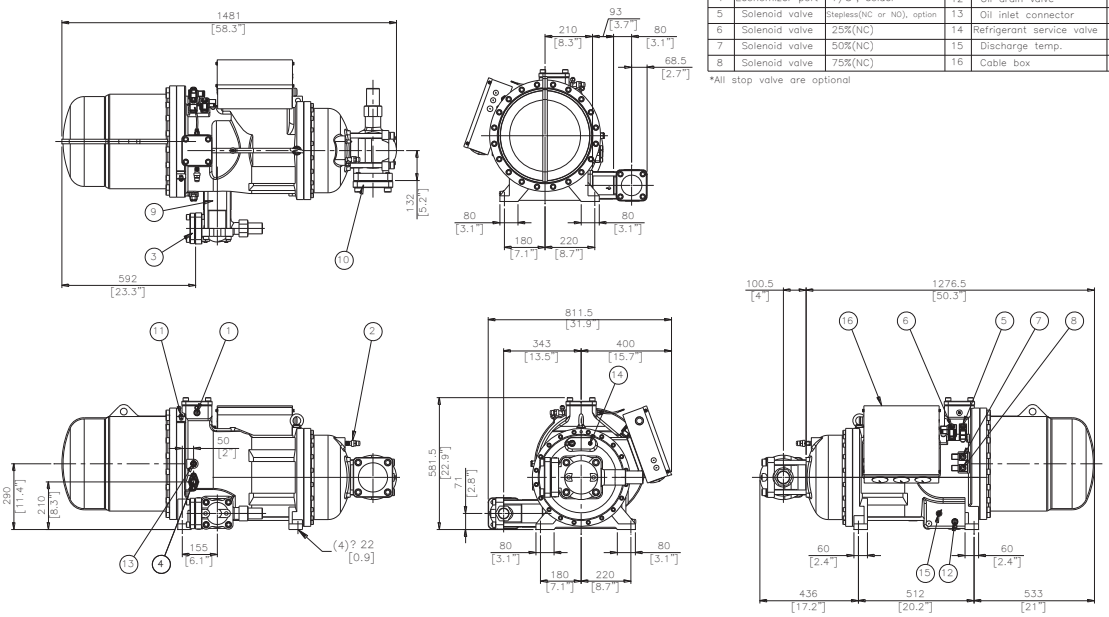
*All stop valve are optional



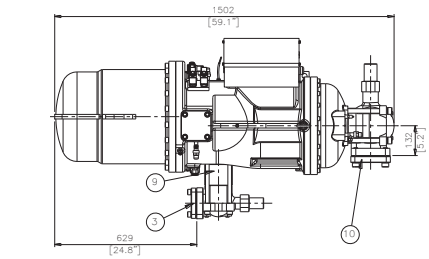
Model	RE-340AP
Name	Compressor outline
	HANBELL NO. 01

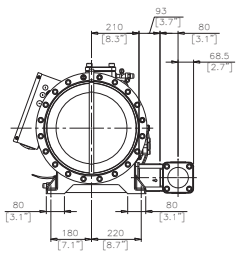
Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	9	Check valve	2 1/2"
2	LP connector	1/4"Flare	10	Suction flange	4"
3	Discharge flange	2 1/2"	11	Liquid(oil or refrigerant) injection connector	1/4"Flare, option
4	Economizer port	7/8", solder	12	Oil drain valve	1/4"Flare
5	Solenoid valve	Stepless(NC or NO), option	13	Oil inlet connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Refrigerant service valve	1/4"Flare
7	Solenoid valve	50%(NC)	15	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	16	Cable box	Standard

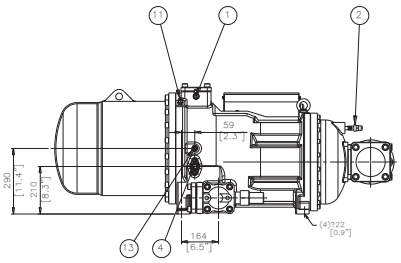
*All stop valve are optional

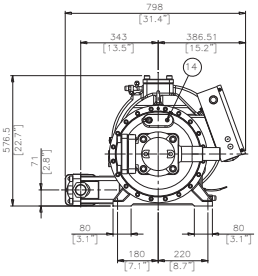


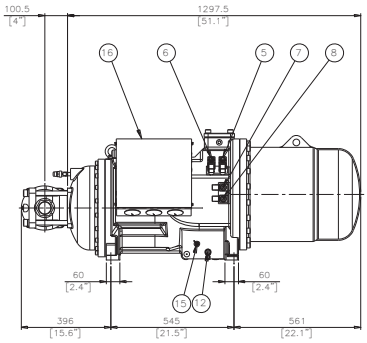
Model	RE-340BP
Name	Compressor outline
	HANBELL NO. 01









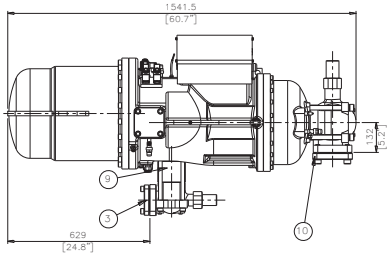


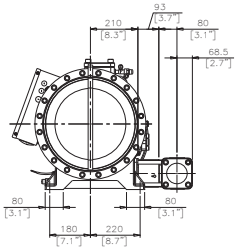
Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	9	Check valve	2 1/2"
2	LP connector	1/4"Flare	10	Suction flange	4"
3	Discharge flange	2 1/2"	11	Liquid(oil or refrigerant) injection connector	1/4"Flare, option
4	Economizer port	7/8", solder	12	Oil drain valve	1/4"Flare
5	Solenoid valve	Stepless(NC or NO), option	13	Oil inlet connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Refrigerant service valve	1/4"Flare
7	Solenoid valve	50%(NC)	15	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	16	Cable box	Standard

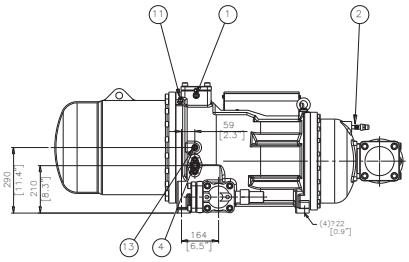
*All stop valve are optional

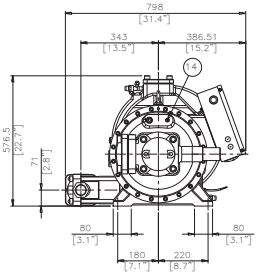
UNIT
SI: mm Imperial: [in]

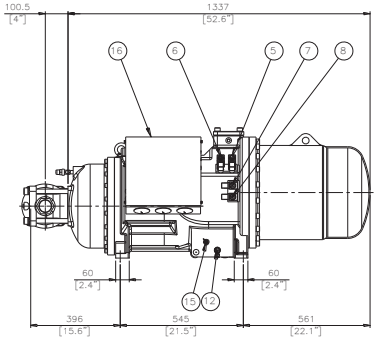
Model	RE-380AP
Name	Compressor outline
	HANBELL NO. 01









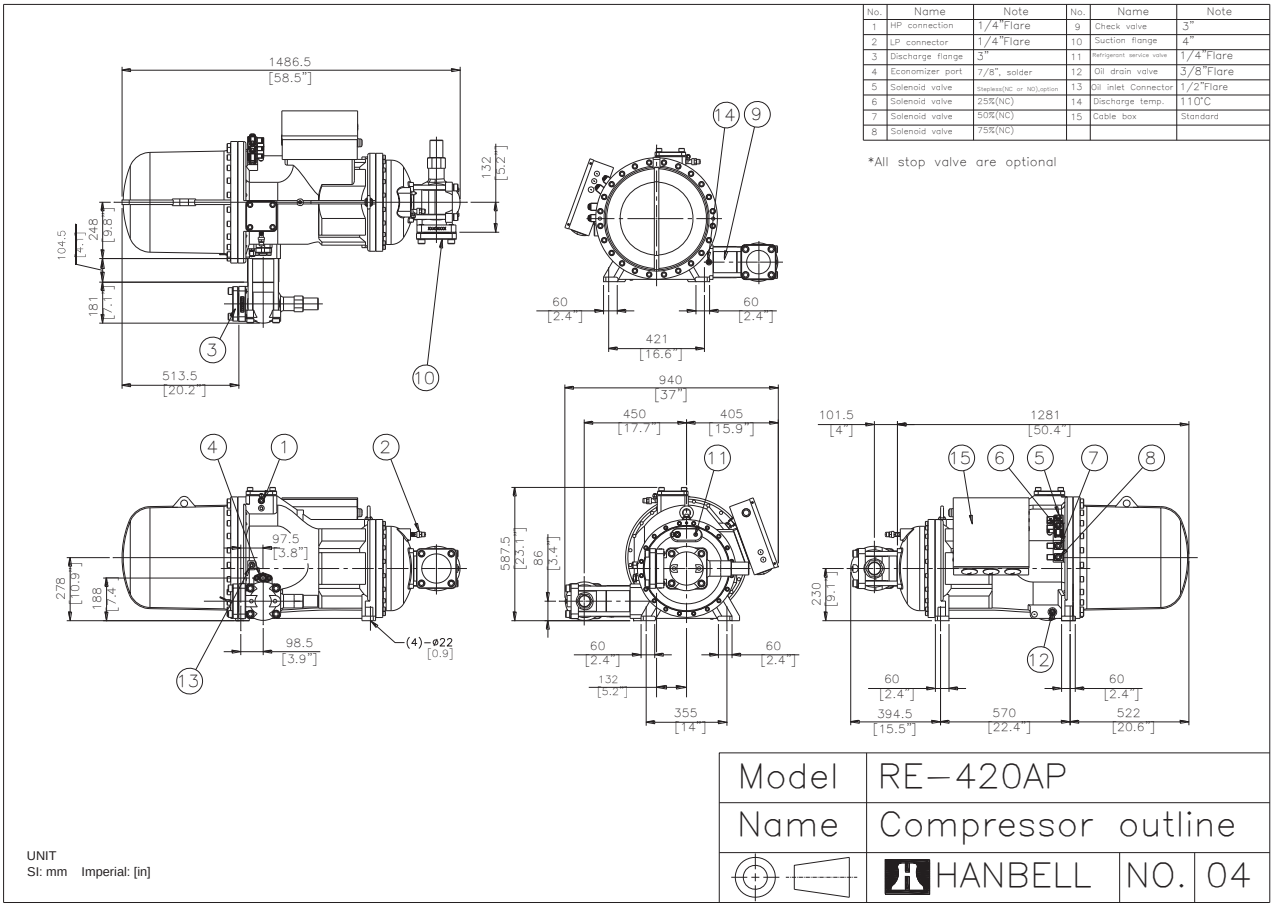


Item	Name	Note	Item	Name	Note
1	HP connector	1/4"Flare	9	Check valve	2 1/2"
2	LP connector	1/4"Flare	10	Suction flange	4"
3	Discharge flange	2 1/2"	11	Liquid(oil or refrigerant) injection connector	1/4"Flare, option
4	Economizer port	7/8", solder	12	Oil drain valve	1/4"Flare
5	Solenoid valve	Stepless(NC or NO), option	13	Oil inlet connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Refrigerant service valve	1/4"Flare
7	Solenoid valve	50%(NC)	15	Discharge temp.	110℃
8	Solenoid valve	75%(NC)	16	Cable box	Standard

*All stop valve are optional

UNIT
SI: mm Imperial: [in]

Model	RE-380BP
Name	Compressor outline
	HANBELL NO. 01

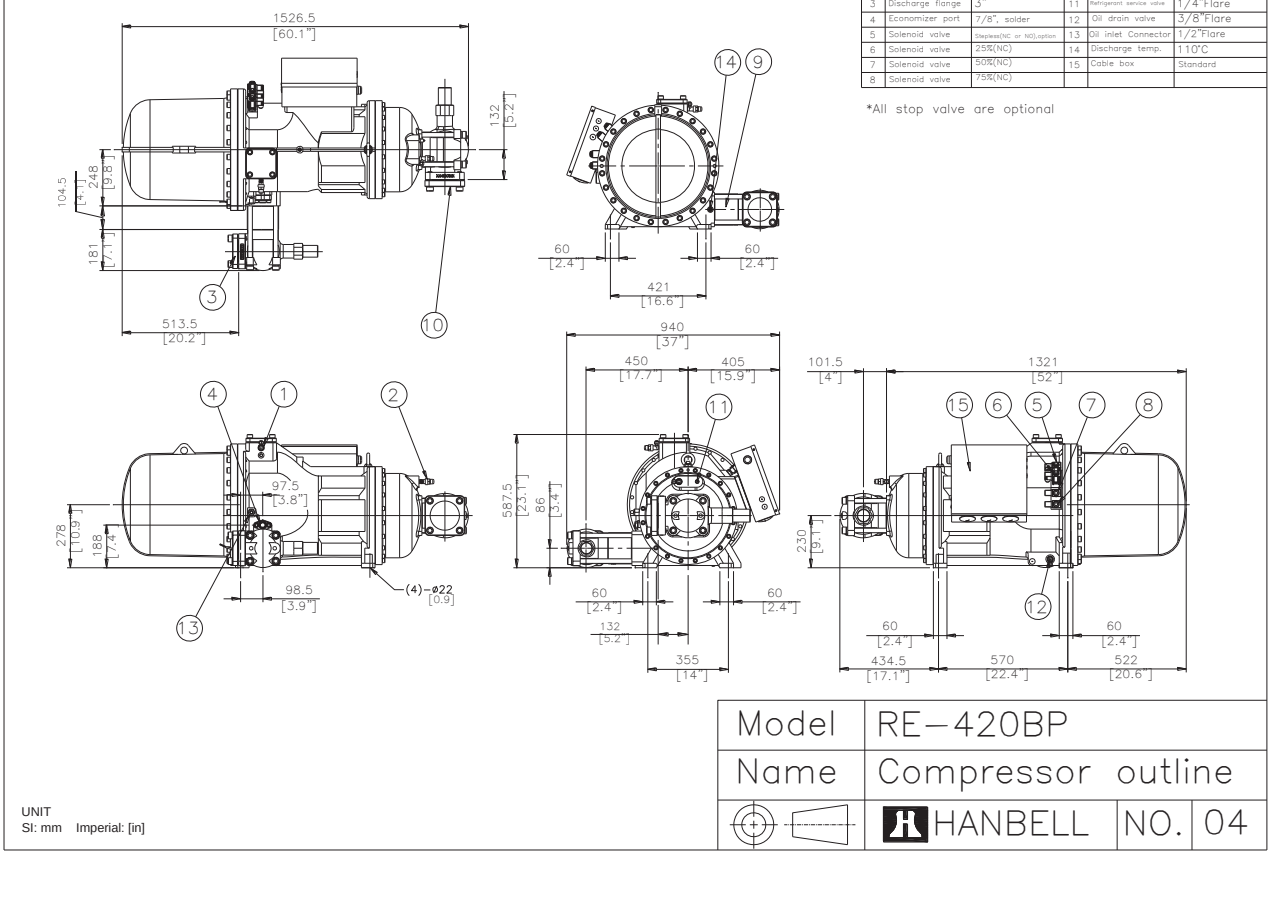


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	9	Check valve	3"
2	LP connector	1/4"Flare	10	Suction flange	4"
3	Discharge flange	3"	11	Refrigerant service valve	1/4"Flare
4	Economizer port	7/8", solder	12	Oil drain valve	3/8"Flare
5	Solenoid valve	Stepless(NC or NO),option	13	Oil inlet Connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	15	Cable box	Standard
8	Solenoid valve	75%(NC)			

*All stop valve are optional

Model	RE-420AP
Name	Compressor outline
	HANBELL NO. 04

UNIT
SI: mm Imperial: [in]



No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	9	Check valve	3"
2	LP connector	1/4"Flare	10	Suction flange	4"
3	Discharge flange	3"	11	Refrigerant service valve	1/4"Flare
4	Economizer port	7/8", solder	12	Oil drain valve	3/8"Flare
5	Solenoid valve	Stepless(NC or NO),option	13	Oil inlet Connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	15	Cable box	Standard
8	Solenoid valve	75%(NC)			

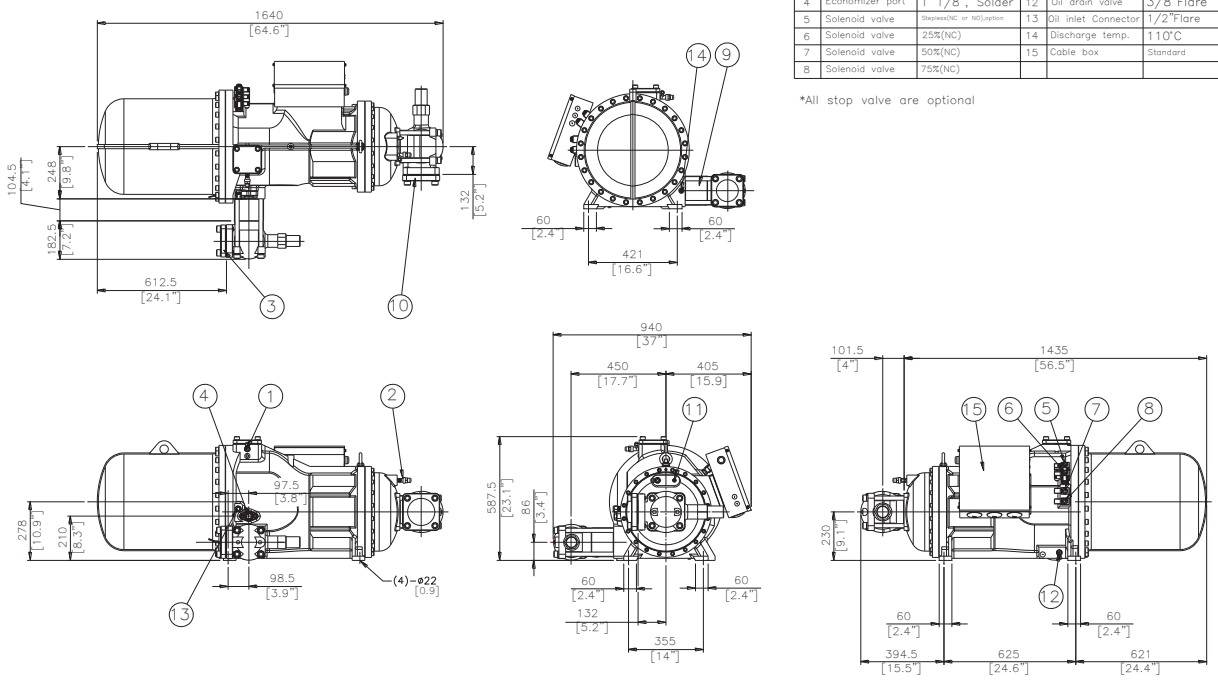
*All stop valve are optional

Model	RE-420BP
Name	Compressor outline
	HANBELL NO. 04

UNIT
SI: mm Imperial: [in]

No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	9	Check valve	3"
2	LP connector	1/4"Flare	10	Suction flange	4"
3	Discharge flange	3"	11	Refrigerant service valve	1/4"Flare
4	Economizer port	1 1/8", Solder	12	Oil drain valve	3/8"Flare
5	Solenoid valve	Stepless(NC or NO),option	13	Oil inlet Connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	15	Cable box	Standard
8	Solenoid valve	75%(NC)			

*All stop valve are optional

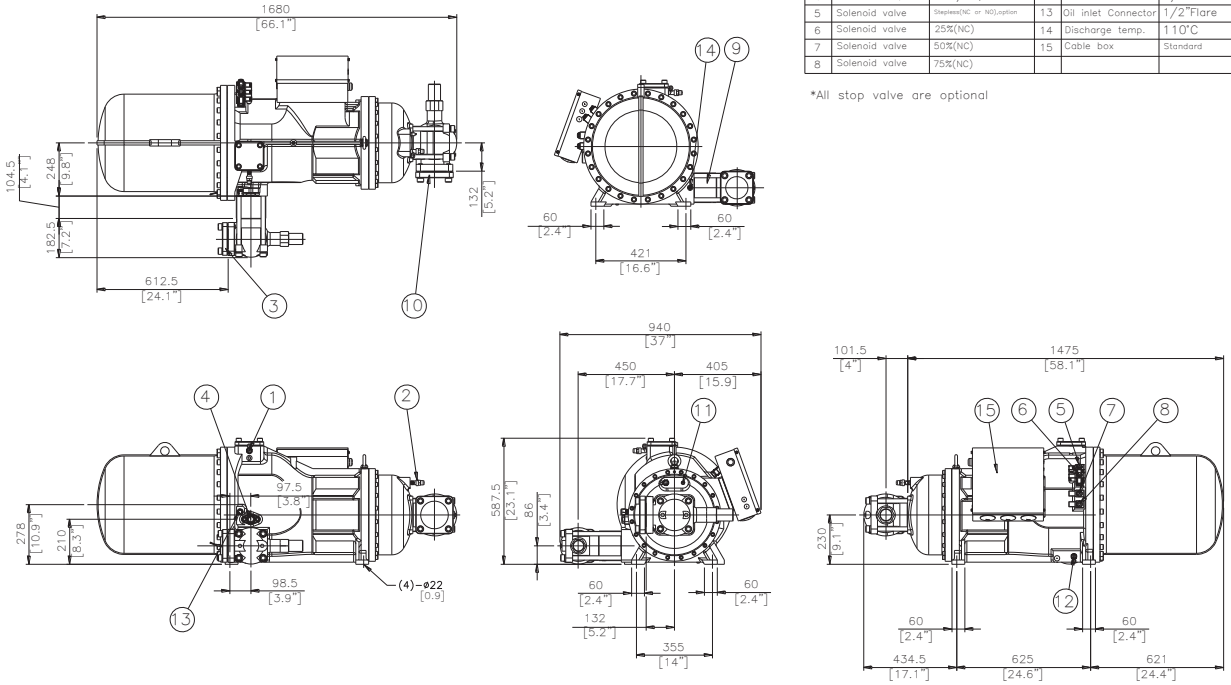


UNIT
SI: mm Imperial: [in]

Model	RE-480AP
Name	Compressor outline
	HANBELL NO. 04

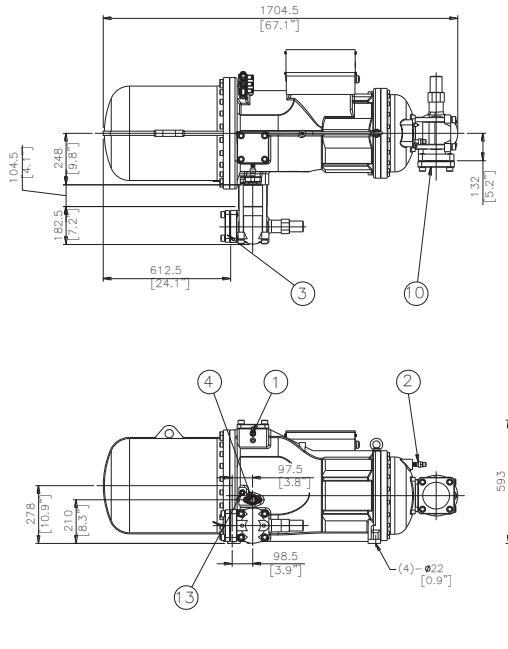
No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	9	Check valve	3"
2	LP connector	1/4"Flare	10	Suction flange	4"
3	Discharge flange	3"	11	Refrigerant service valve	1/4"Flare
4	Economizer port	1 1/8", Solder	12	Oil drain valve	3/8"Flare
5	Solenoid valve	Stepless(NC or NO),option	13	Oil inlet Connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	15	Cable box	Standard
8	Solenoid valve	75%(NC)			

*All stop valve are optional



UNIT
SI: mm Imperial: [in]

Model	RE-480BP
Name	Compressor outline
	HANBELL NO. 04

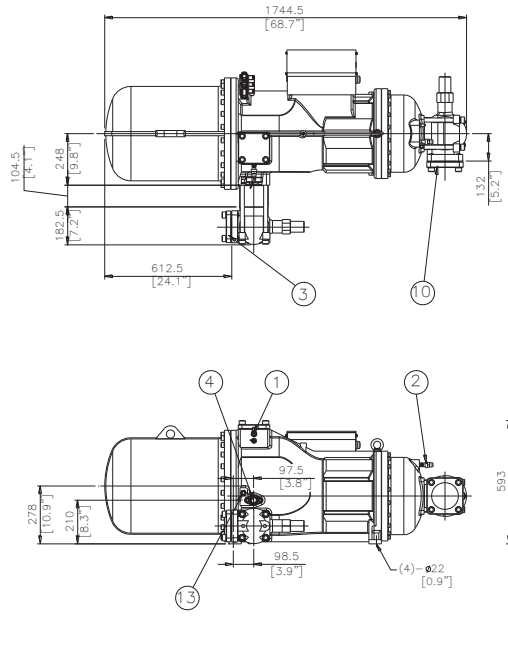


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	9	Check valve	3"
2	LP connector	1/4"Flare	10	Suction flange	4"
3	Discharge flange	3"	11	Refrigerant service valve	1/4"Flare
4	Economizer port	1 1/8", Solder	12	Oil drain valve	3/8"Flare
5	Solenoid valve	Stepless(NC or NO),option	13	Oil inlet Connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	15	Cable box	Standard
8	Solenoid valve	75%(NC)			

*All stop valve are optional

UNIT
SI: mm Imperial: [in]

Model	RE-550AP		
Name	Compressor outline		
	HANBELL	NO.	04



No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	9	Check valve	3"
2	LP connector	1/4"Flare	10	Suction flange	4"
3	Discharge flange	3"	11	Refrigerant service valve	1/4"Flare
4	Economizer port	1 1/8", Solder	12	Oil drain valve	3/8"Flare
5	Solenoid valve	Stepless(NC or NO),option	13	Oil inlet Connector	1/2"Flare
6	Solenoid valve	25%(NC)	14	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	15	Cable box	Standard
8	Solenoid valve	75%(NC)			

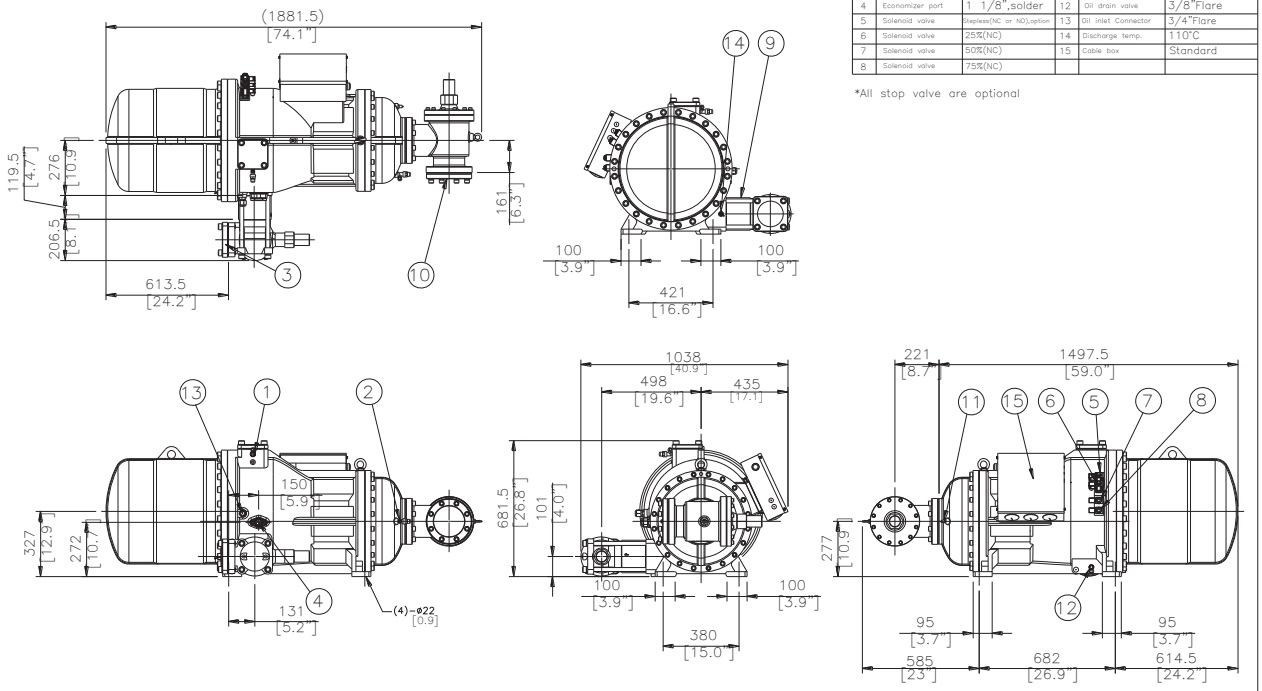
*All stop valve are optional

UNIT
SI: mm Imperial: [in]

Model	RE-550BP		
Name	Compressor outline		
	HANBELL	NO.	04

No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	9	Check valve	4"
2	LP connector	1/4"Flare	10	Suction flange	5"
3	Discharge flange	4"	11	Refrigerant service valve	1/4"Flare
4	Economizer port	1 1/8",solder	12	Oil drain valve	3/8"Flare
5	Solenoid valve	Stepless(NC or NO),option	13	Oil inlet Connector	3/4"Flare
6	Solenoid valve	25%(NC)	14	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	15	Cable box	Standard
8	Solenoid valve	75%(NC)			

*All stop valve are optional

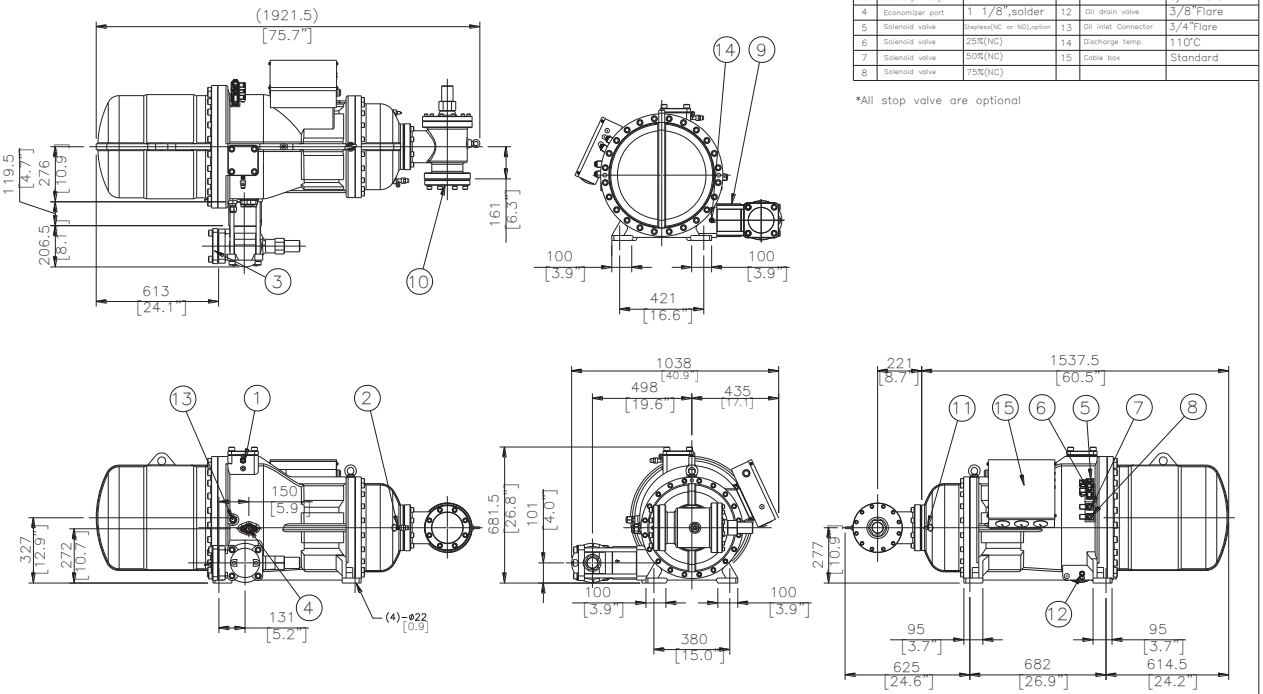


Model	RE−620AP
Name	Compressor outline
	HANBELL NO. 04

UNIT:
SI: mm Imperial: [in]

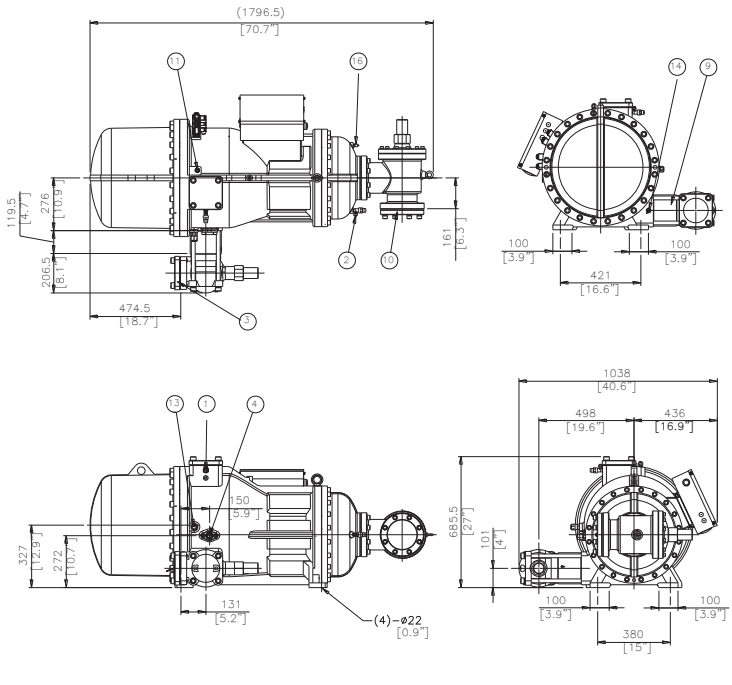
No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	9	Check valve	4"
2	LP connector	1/4"Flare	10	Suction flange	5"
3	Discharge flange	4"	11	Refrigerant service valve	1/4"Flare
4	Economizer port	1 1/8",solder	12	Oil drain valve	3/8"Flare
5	Solenoid valve	Stepless(NC or NO),option	13	Oil inlet Connector	3/4"Flare
6	Solenoid valve	25%(NC)	14	Discharge temp.	110°C
7	Solenoid valve	50%(NC)	15	Cable box	Standard
8	Solenoid valve	75%(NC)			

*All stop valve are optional



Model	RE−620BP
Name	Compressor outline
	HANBELL NO. 04

UNIT:
SI: mm Imperial: [in]

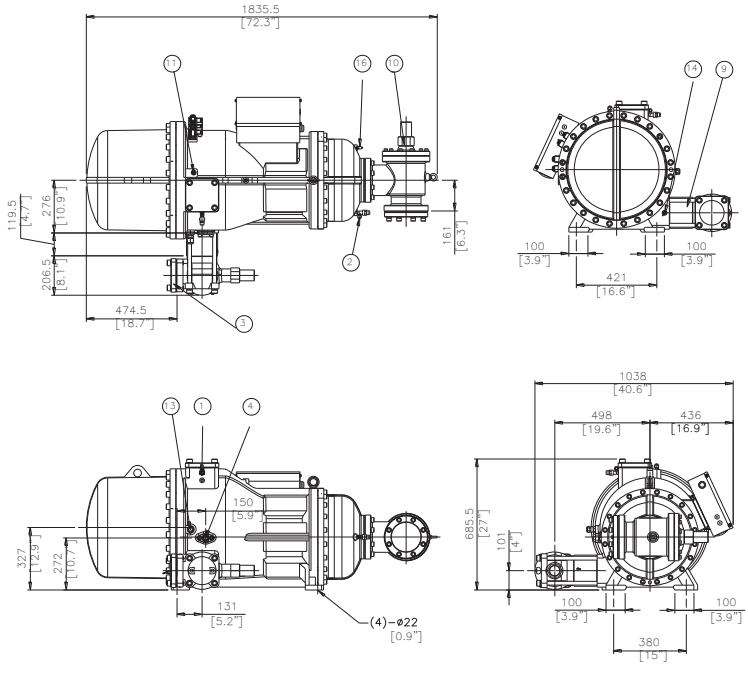


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	10	Suction flange	5"
2	LP connector	1/4"Flare	11	Liquid(oil or refrigerant) injection connector	3/8"Flare, option
3	Discharge flange	4"	12	Oil drain valve	3/8"Flare
4	Economizer port	1 1/8",solder	13	Oil inlet Connector	3/4"Flare
5	Solenoid valve	Stepless(NC or NO),option	14	Discharge temp.	110°C
6	Solenoid valve	25%(NC)	15	Cable box	Standard
7	Solenoid valve	50%(NC)	16	Refrigerant service valve	1/4"Flare
8	Solenoid valve	75%(NC)			
9	Check valve	4"			

*All stop valve are optional

Model	RE-710AP
Name	Compressor outline
	HANBELL NO. 06

UNIT
SI: mm Imperial: [in]

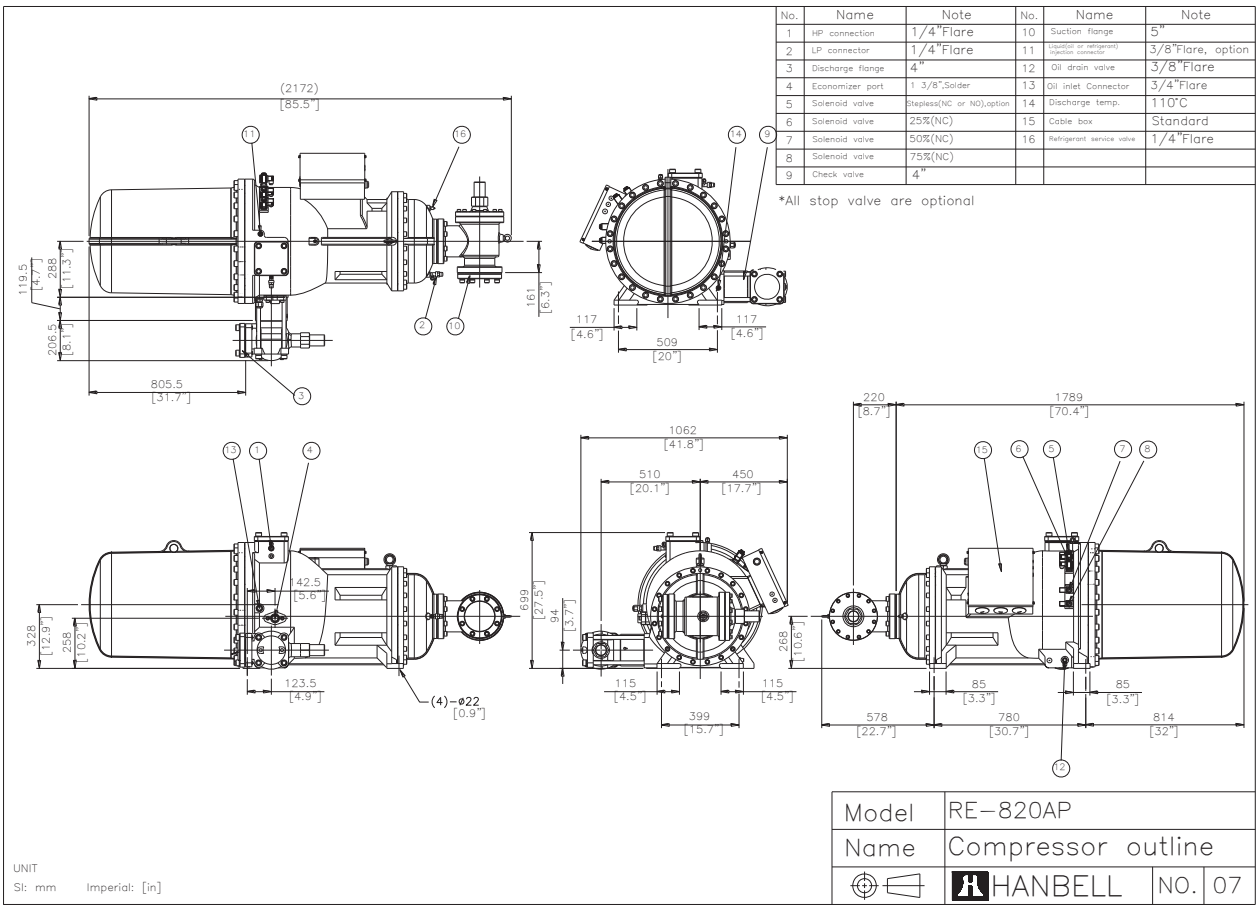


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	10	Suction flange	5"
2	LP connector	1/4"Flare	11	Liquid(oil or refrigerant) injection connector	3/8"Flare, option
3	Discharge flange	4"	12	Oil drain valve	3/8"Flare
4	Economizer port	1 1/8",solder	13	Oil inlet Connector	3/4"Flare
5	Solenoid valve	Stepless(NC or NO),option	14	Discharge temp.	110°C
6	Solenoid valve	25%(NC)	15	Cable box	Standard
7	Solenoid valve	50%(NC)	16	Refrigerant service valve	1/4"Flare
8	Solenoid valve	75%(NC)			
9	Check valve	4"			

*All stop valve are optional

Model	RE-710BP
Name	Compressor outline
	HANBELL NO. 06

UNIT
SI: mm Imperial: [in]

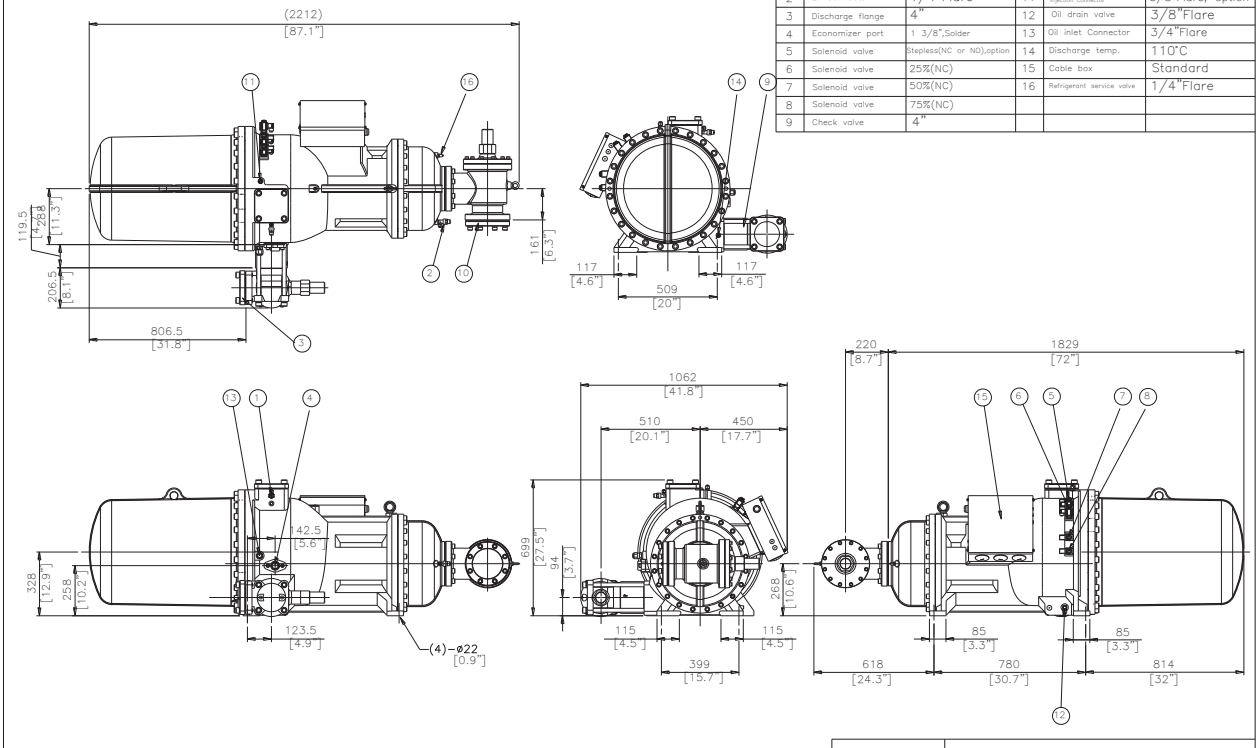


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	10	Suction flange	5"
2	LP connector	1/4"Flare	11	Liquid(oil or refrigerant) injection connector	3/8"Flare, option
3	Discharge flange	4"	12	Oil drain valve	3/8"Flare
4	Economizer port	1 3/8",Solder	13	Oil inlet Connector	3/4"Flare
5	Solenoid valve	Stepless(NC or NO),option	14	Discharge temp.	110°C
6	Solenoid valve	25%(NC)	15	Cable box	Standard
7	Solenoid valve	50%(NC)	16	Refrigerant service valve	1/4"Flare
8	Solenoid valve	75%(NC)			
9	Check valve	4"			

*All stop valve are optional

Model	RE-820AP
Name	Compressor outline
	HANBELL NO. 07

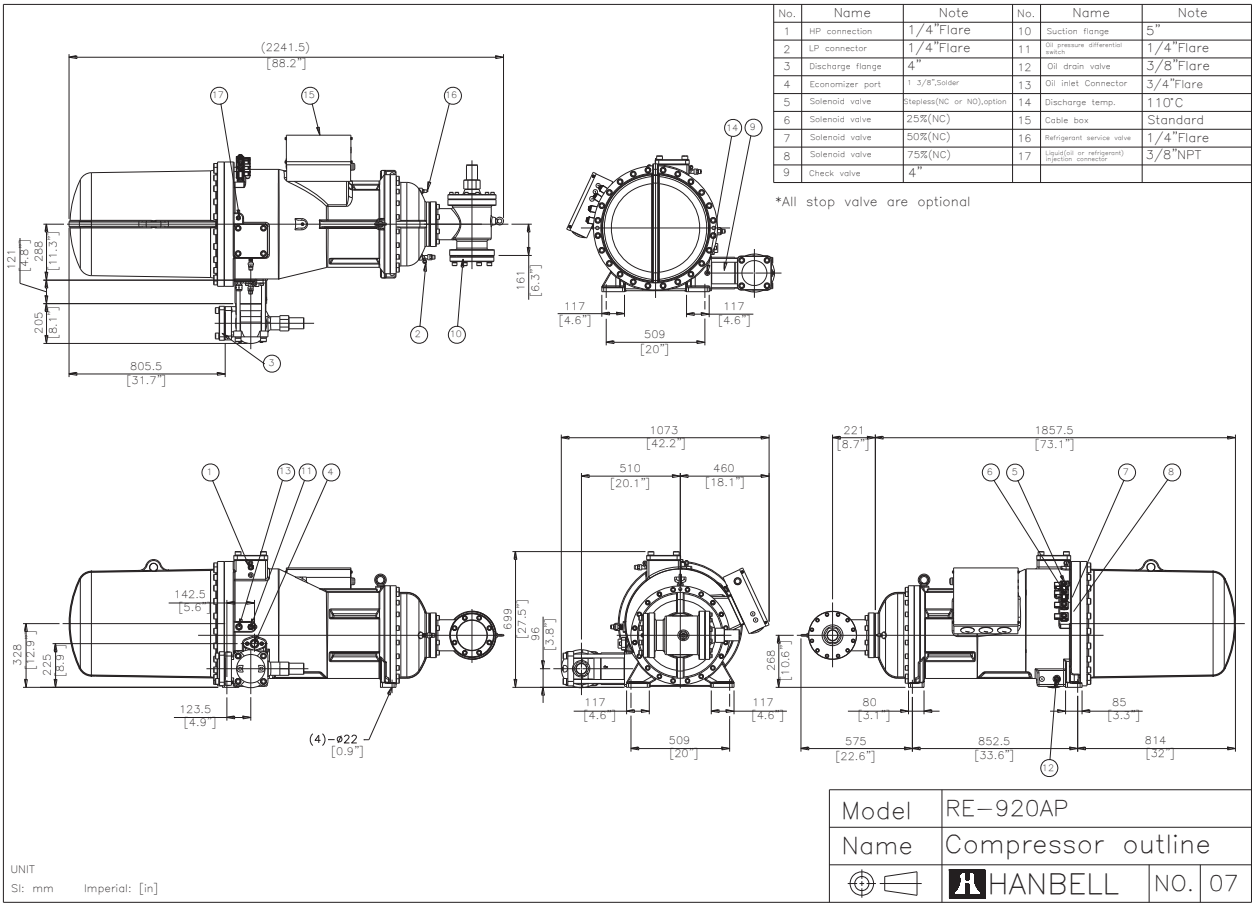
UNIT
SI: mm Imperial: [in]



No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	10	Suction flange	5"
2	LP connector	1/4"Flare	11	Liquid(oil or refrigerant) injection connector	3/8"Flare, option
3	Discharge flange	4"	12	Oil drain valve	3/8"Flare
4	Economizer port	1 3/8",Solder	13	Oil inlet Connector	3/4"Flare
5	Solenoid valve	Stepless(NC or NO),option	14	Discharge temp.	110°C
6	Solenoid valve	25%(NC)	15	Cable box	Standard
7	Solenoid valve	50%(NC)	16	Refrigerant service valve	1/4"Flare
8	Solenoid valve	75%(NC)			
9	Check valve	4"			

Model	RE-820BP
Name	Compressor outline
	HANBELL NO. 07

UNIT
SI: mm Imperial: [in]

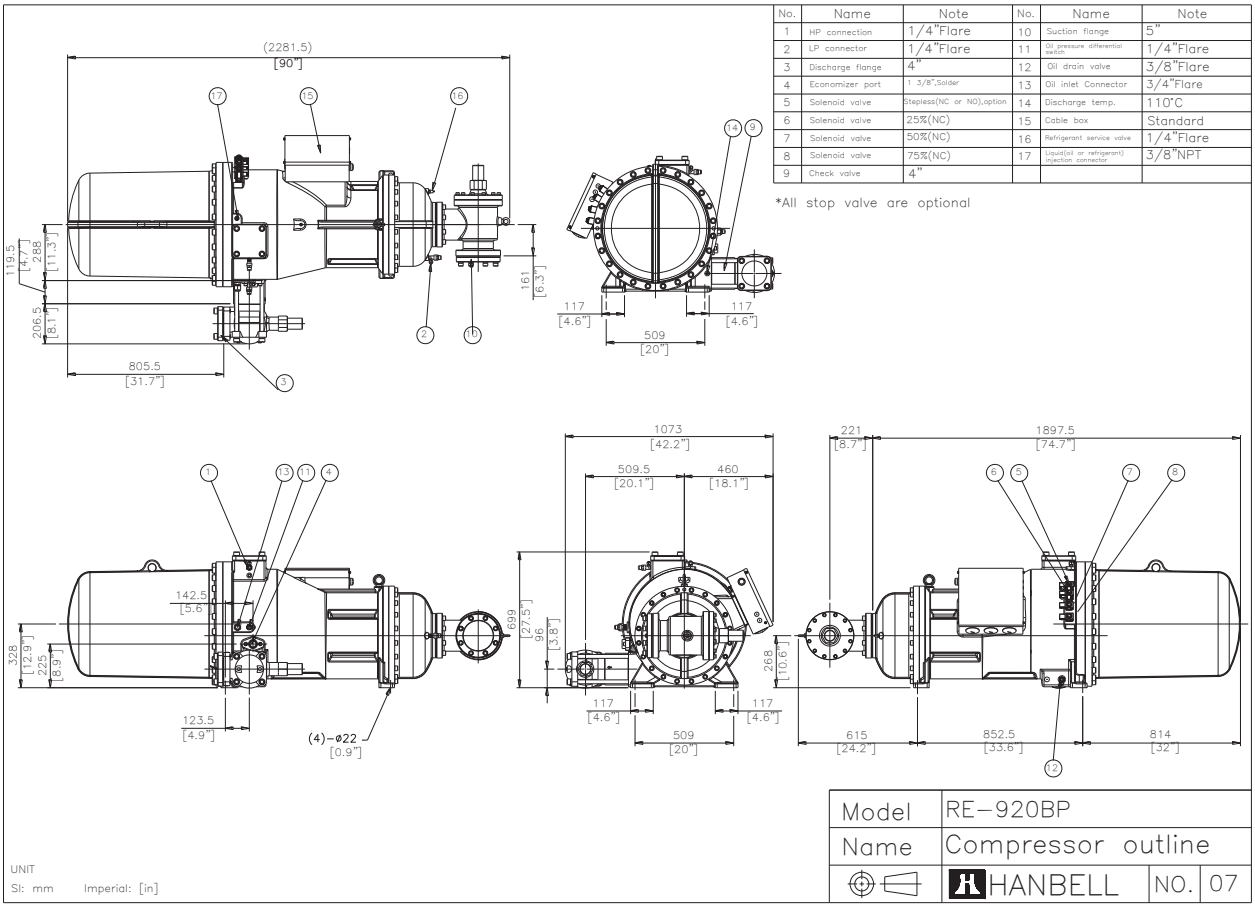


No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	10	Suction flange	5"
2	LP connector	1/4"Flare	11	Oil pressure differential switch	1/4"Flare
3	Discharge flange	4"	12	Oil drain valve	3/8"Flare
4	Economizer port	1 3/8",Solder	13	Oil inlet Connector	3/4"Flare
5	Solenoid valve	Stepless(NC or NO),option	14	Discharge temp.	110°C
6	Solenoid valve	25%(NC)	15	Cable box	Standard
7	Solenoid valve	50%(NC)	16	Refrigerant service valve	1/4"Flare
8	Solenoid valve	75%(NC)	17	Liquid(oil or refrigerant) injection connector	3/8"NPT
9	Check valve	4"			

*All stop valve are optional

Model	RE-920AP
Name	Compressor outline
	HANBELL NO. 07

UNIT
SI: mm Imperial: [in]



No.	Name	Note	No.	Name	Note
1	HP connection	1/4"Flare	10	Suction flange	5"
2	LP connector	1/4"Flare	11	Oil pressure differential switch	1/4"Flare
3	Discharge flange	4"	12	Oil drain valve	3/8"Flare
4	Economizer port	1 3/8",Solder	13	Oil inlet Connector	3/4"Flare
5	Solenoid valve	Stepless(NC or NO),option	14	Discharge temp.	110°C
6	Solenoid valve	25%(NC)	15	Cable box	Standard
7	Solenoid valve	50%(NC)	16	Refrigerant service valve	1/4"Flare
8	Solenoid valve	75%(NC)	17	Liquid(oil or refrigerant) injection connector	3/8"NPT
9	Check valve	4"			

*All stop valve are optional

Model	RE-920BP
Name	Compressor outline
	HANBELL NO. 07

UNIT
SI: mm Imperial: [in]

4.4 Compressors accessories

To supply “Total Solution” to customers, Hanbell designs complete standard and optional accessories according to various application requirements for safe and steady running and best performance of compressors

1. Compressors standard and optional accessories

● : Standard, △ : Optional

Model	RE											
	230	260	300	340	380	420	480	550	620	710	820	920
Step or continuous capacity control system	●	●	●	●	●	●	●	●	●	●	●	●
Compatible Step & continuous capacity control system	△	△	△	△	△	△	△	△	△	△	△	△
Discharge check valve	●	●	●	●	●	●	●	●	●	●	●	●
Suction & discharge connection bushings	●	●	●	●	●	●	●	●	●	●	●	●
Discharge stop valve	●	●	●	●	●	●	●	●	●	●	●	●
Suction stop valve	△	△	△	△	△	△	△	△	△	△	△	△
Suction filter	●	●	●	●	●	●	●	●	●	●	●	●
Suction & discharge flanges	●	●	●	●	●	●	●	●	●	●	●	●
Discharge temperature thermistor	●	●	●	●	●	●	●	●	●	●	●	●
Motor temperature thermistor	●	●	●	●	●	●	●	●	●	●	●	●
INT69HBY motor proctetor	●	●	●	●	●	●	●	●	●	●	●	●
IP54 cable box	●	●	●	●	●	●	●	●	●	●	●	●
Oil filter	●	●	●	●	●	●	●	●	●	●	●	●
Oil heater	●	●	●	●	●	●	●	●	●	●	●	●
Optical oil level switch sensor	△	△	△	△	△	△	△	△	△	△	△	△
Oil drain valve	●	●	●	●	●	●	●	●	●	●	●	●
Pt1000 motor temperature sensor	●	●	●	●	●	●	●	●	●	●	●	●
Pt100 motor temperature sensor	△	△	△	△	△	△	△	△	△	△	△	△
The accessories of liquid injection system	△	△	△	△	△	△	△	△	△	△	△	△
Horizontal check valve	△	△	△	△	△	△	△	△	△	△	△	△
External oil separator	△	△	△	△	△	△	△	△	△	△	△	△
External oil filter	△	△	△	△	△	△	△	△	△	△	△	△
Oil flow switch	△	△	△	△	△	△	△	△	△	△	△	△
Economizer	△	△	△	△	△	△	△	△	△	△	△	△
Economizer connection stop valve	△	△	△	△	△	△	△	△	△	△	△	△
Oil cooler	△	△	△	△	△	△	△	△	△	△	△	△
Oil pump	△	△	△	△	△	△	△	△	△	△	△	△
Oil filter pressure differential switch connector	△	△	△	△	△	△	△	△	△	△	△	△
Safety valve	△	△	△	△	△	△	△	△	△	△	△	△
Explosion proof accessories	△	△	△	△	△	△	△	△	△	△	△	△
Mounting pad	△	△	△	△	△	△	△	△	△	△	△	△
Mineral lubricant	●	●	●	●	●	●	●	●	●	●	●	●
Synthetic lubricant	△	△	△	△	△	△	△	△	△	△	△	△
Micro controller	△	△	△	△	△	△	△	△	△	△	△	△
Sound jacket	△	△	△	△	△	△	△	△	△	△	△	△

Note: The accessory table is just for reference only. Actual specification and accessories enclosed might vary with different quotation and agreement respectively. If any optional accessory is required and out of above mentioned standard accessory, please contact Hanbell for detailed specification and price.

2. Description of accessories

a. Steps or step-less capacity control system
Please refer to chapter 2.6 and 2.7 for the detail of step or step-less capacity control system.

b. Compatible steps and step-less capacity control system
For customers' ease of stock control, possible modification of capacity-control logic in the future, or other special requirements of capacity control, Hanbell deliberately designs devices for step-less/step dual capacity control as nonstandard accessory for customers' choices. Logic of step-less/step dual capacity control is basically identical to those of step-less or step capacity control respectively. Please refer to Chapter 2.6, 2.7, & 2.8 for further details.

c. Suction and discharge check valve
Hanbell standard check valve (vertical type) is gravity-driven with characteristics of large flow volume and low pressure differential. After shut-down of compressor, Teflon taper guider inside can simultaneously seal up the precisely machined base of check valve by gravity force to effectively prevent return of high-pressured gas to compressor. The gravity-driven check valve is equipped vertically. Due to limitation of space or piping requirements, alternative horizontal check valve is also available.

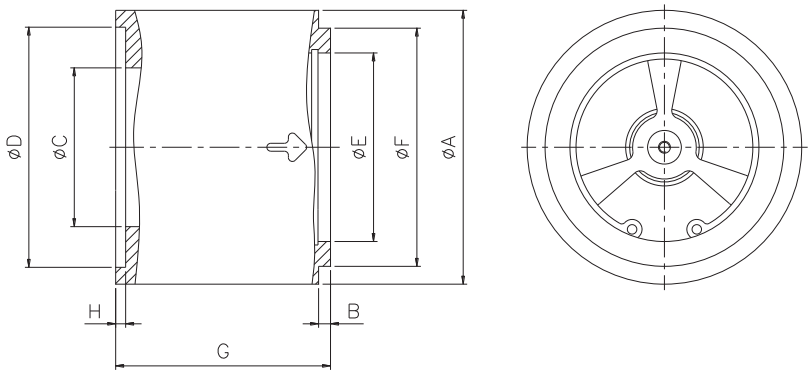


Figure 18 Suction check valve outline drawing (Horizontal type)

Dia.	Dimension unit: mm							
	A	B	C	D	E	F	G	H
3″	138	6	80	121	95	120	108	5
4″	163	6	96	146	125	145	123	5

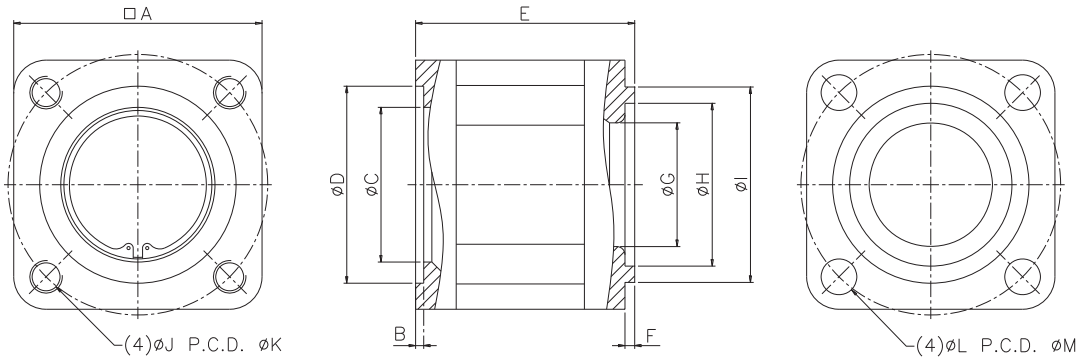


Figure 19 Discharge check valve outline drawing (Vertical type)

Dia.	Dimension unit: mm												
	A	B	C	D	E	F	G	H	I	J	K	L	M
2"	122	5	66	91	110	6	53	70	90	M16x2	120	18	120
2 1/2″	134	5	80	111	125	6	64	90	110	M16x2	140	18	140
3″	153	5	95	121	135	6	76	100	120	M20x2.5	160	22	160
4″	171	5	106.5	146	135	6	88	125	145	M20x2.5	185	22	185

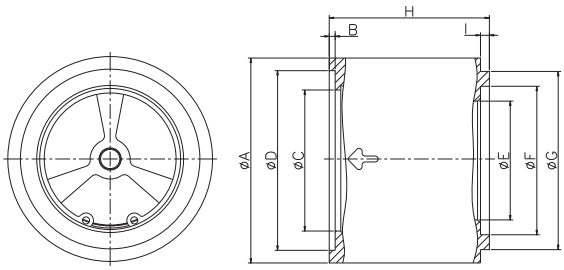


Figure 20 Discharge check valve outline drawing (Horizontal type)

Dia.	Dimension unit: mm								
	A	B	C	D	E	F	G	H	I
2"	102	4	65	91	53	70	90	85	6
2 1/2"	122	4	85	111	67	90	110	97	6
3"	138	4	95	121	80	100	120	108	6
4"	163	4	120	146	96	125	145	123	6

d. Suction and discharge connection bushings

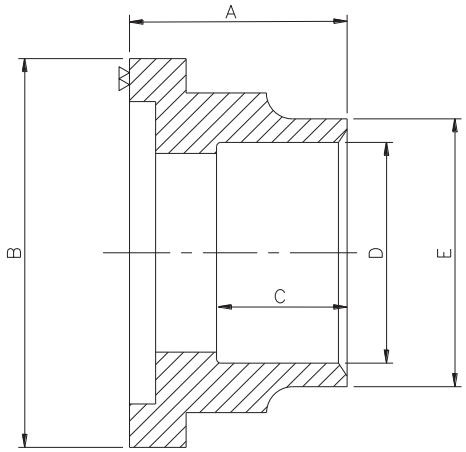


Figure 21 Flange bushing dimensions

Model	Standard Discharge Flange Bushing		Standard Suction Flange Bushing	
	Steel pipe	Copper pipe	Steel pipe	Copper pipe
RE-230	2"	2 1/8"	3"	3 1/8"
RE-260	2"	2 1/8"	3"	3 1/8"
RE-300	2"	2 1/8"	3"	3 1/8"
RE-340	2 1/2"	2 5/8"	4"	4 1/8"
RE-380	2 1/2"	2 5/8"	4"	4 1/8"
RE-420	2 1/2"	2 5/8"	4"	4 1/8"
RE-480	2 1/2"	2 5/8"	4"	4 1/8"
RE-550	3"	3 1/8"	4"	4 1/8"
RE-620	3"	3 1/8"	5"	5 1/8"
RE-710	4"	4 1/8"	5"	5 1/8"
RE-820	4"	4 1/8"	5"	5 1/8"
RE-920	4"	4 1/8"	5"	5 1/8"

Note: The above table lists specification of standard bushing for every model of Hanbell compressors. Their dimensions correspond to flange bushing dimensions and the table below. If bushing dimensions are not indicated in purchasing order, Hanbell will provide standard type. Suitable piping of customers' choice is also shown in the table below. If non-standard bushing is needed, please double-check with Hanbell sales representatives when placing order for compressors.

Specification and dimension of optional flange bushing

Model	Discharge / Suction port	Materials and Sizes of pipes		Dimension of flanges bushing				
				A	B	C	D	E
RE-230 RE-260 RE-300	Discharge	Copper	1 5/8"	50	90	30	41.6	55
			2 1/8"				54.3	65
			2 5/8"				67	74
		Steel	2"				61.3	74
	Suction	Copper	2 1/8"	66	120	45	54.3	65
			2 5/8"				67	77
			3 1/8"				79.8	90
		Steel	2 1/2"				77.2	92
			3"				90.2	103
RE-340 RE-380	Discharge	Copper	2 1/8"	60	110	35	54.3	65
			2 5/8"				67	77
			3 1/8"				79.8	90
		Steel	2 1/2"				77.2	90
	Suction	Copper	3 1/8"	76	145	50	79.8	90
			3 5/8"				92.4	103
			4 1/8"				105.1	116
		Steel	3"				90.2	105
			3 1/2"				102.8	117
			4"				115.6	128
RE-420 RE-480	Discharge	Copper	2 1/8"	60	110	35	54.3	65
			2 5/8"				67	77
			3 1/8"				79.8	90
		Steel	2 1/2"				77.2	90
	Suction	Copper	3 1/8"	76	145	50	79.8	90
			3 5/8"				92.4	103
			4 1/8"				105.1	116
		Steel	3"				90.2	105
			3 1/2"				102.8	117
			4"				115.6	128
RE-550	Discharge	Copper	2 1/8"	66	120	45	54.3	65
			2 5/8"				67	77
			3 1/8"				79.8	90
		Steel	2 1/2"				77.2	92
			3"				90.2	103
	Suction	Copper	3 1/8"	76	145	50	79.8	90
			3 5/8"				92.4	103
			4 1/8"				105.1	116
		Steel	3"				90.2	105
			3 1/2"				102.8	117
			4"				115.6	128
RE-620	Discharge	Copper	2 1/8"	66	120	45	54.3	65
			2 5/8"				67	77
			3 1/8"				79.8	90
		Steel	2 1/2"				77.2	92
			3"				90.2	103
	Suction	Copper	4 1/8"	80	174	35	105.1	121.2
			5 1/8"	75			130.5	146.5
		Steel	5"	75			141.3	154

RE-710 RE-820 RE-930	Discharge	Copper	3 1/8"	76	145	50	79.8	90
			3 5/8"				92.4	103
			4 1/8"				105.1	116
		Steel	3"				90.2	105
			3 1/2"				102.8	117
			4"				115.6	128
	Suction	Copper	4 1/8"	80	174	35	105.1	121.2
			5 1/8"	75			130.5	146.5
		Steel	5"	75			141.3	154

e. Suction and discharge stop valves
For maintenance and service of compressor, it is recommended to install the suction and discharge stop valves. Please refer to following detail of Hanbell stop valves.

Model		RE-230	RE-260	RE-300	RE-340	RE-380	RE-420	RE-480	RE-550	RE-620	RE-710	RE-820	RE-920
Stop Valve Size	Discharge	2”	2”	2”	2 1/2”	2 1/2”	2 1/2”	2 1/2”	3”	3”	4”	4”	4”
	Suction	3”	3”	3”	4”	4”	4”	4”	4”	5”	5”	5”	5”

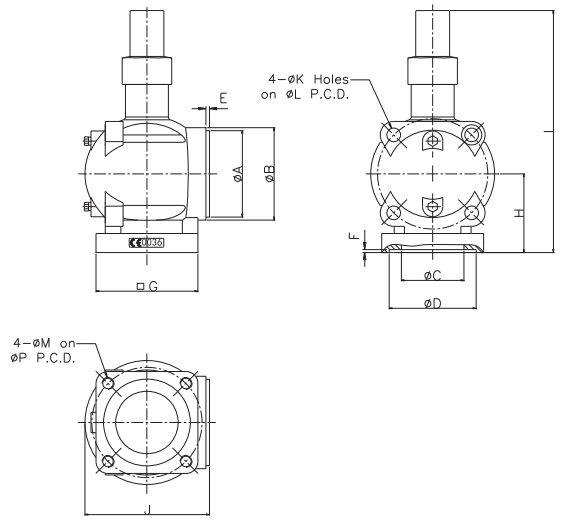


Figure 22 Dimension of stop valve

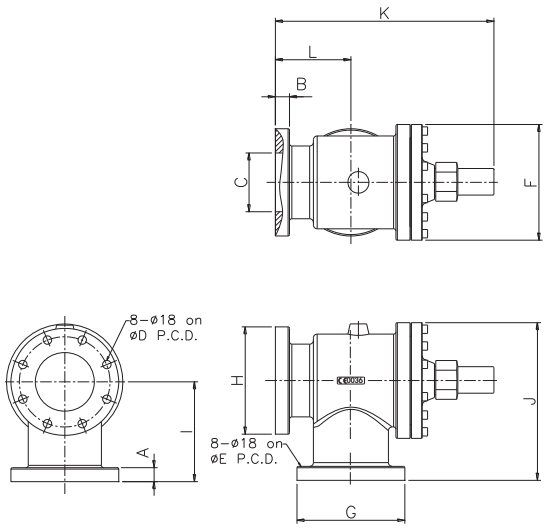


Figure 23 5” Suction stop valve

Dia.	Dimensions unit: mm													
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
2”	90	100	60	91	6	5	122	86	291	131	18	120	M16x2	120
2 1/2”	110	120	67	111	6	5	137	96	297	152.5	18	140	M16x2	140
3”	120	135	80	121	6	5	154	107	349	185	22	160	M20x2.5	160
4”	145	155	105	146	6	5	171	132	406	209	23	185	M20x2.5	185

Dia.	Dimensions unit: mm											
	A	B	C	D	E	F	G	H	I	J	K	L
5”	30	30	126	194	194	248	230	230	214	338	466	161

Specification of stop valve

Maximum working pressure	Hydrostatic pressure test	Refrigerant	Temperature range
21kg / cm² G	32kg / cm² G	HFC, HCFC,	–40˚C~150˚C

f. INT69HBY diagnose control module and PTC temperature sensor

To protect compressor, each RE series compressor has been installed three PTC temperature sensors inside motor coil and another one at the discharge side of compressor. These sensors are connected to an INT69HBY diagnose control module to monitor the motor and discharge temperature. If the temperature in one of the positions monitored exceeds the nominal response temperature of the respective PTC thermistor, the sensor resistance increases and the INT69HBY diagnose control module output relay trips. The module resets when the temperature drops below the response temperature by approx. 5K. The output replay provides a potential-free change-over contact and is energized as long as the nominal response temperature is not exceeded.

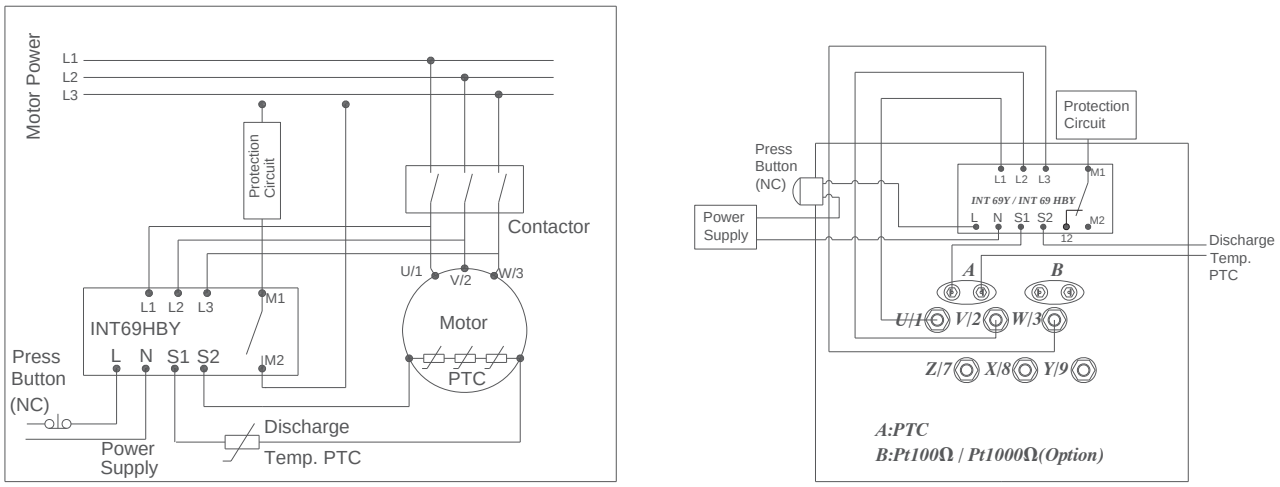


Figure 24 INT69HBY & PTC connection diagram

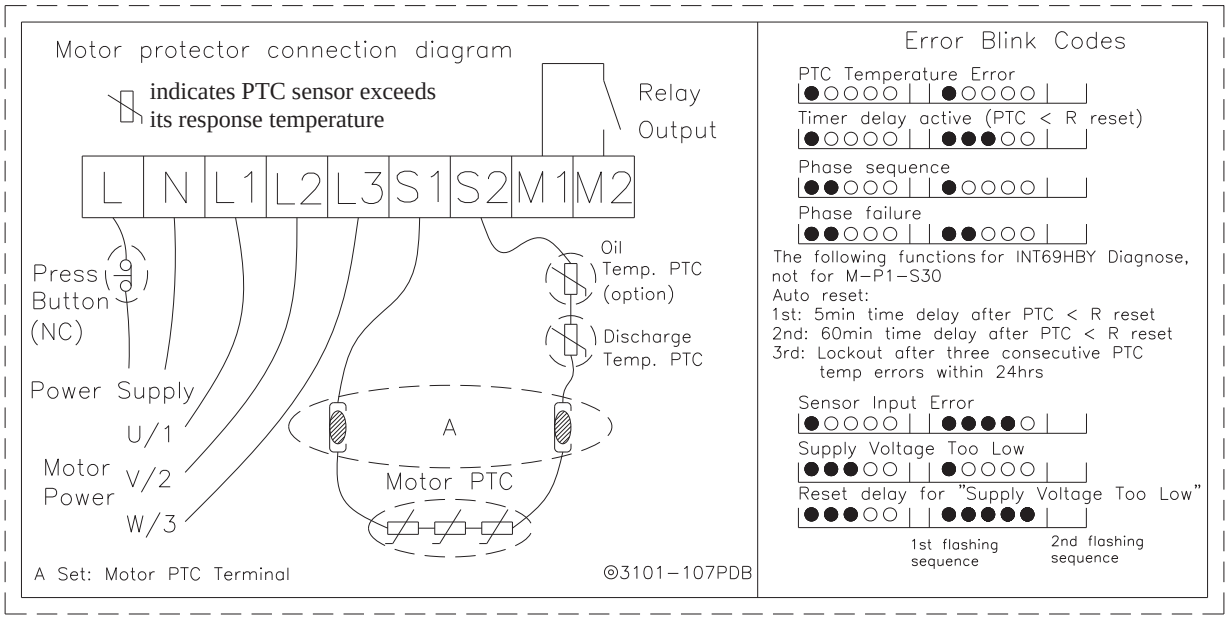
Other major functional descriptions are as follow:

1. The temperature monitoring in the motor winding is done according to the static evaluation process; the motor is switched off immediately if the nominal response temperature of the built-in AMS or PTC sensors is reached.
2. A short circuit at an AMS or PTC input also leads to a switch-off. A short cycling leads to a reset delay.
3. After cooling down or elimination of the error and a subsequent reset delay, the compressor can be restarted; restarting after locking only after reset.
4. The phase monitoring of the motor voltage is active 1s after the start of the motor. The correct phase sequence is monitored for 5s, the phase failure is monitored for the total motor running time. If a wrong phase sequence is detected or there is a phase failure, the motor protector will lock switch off.
5. For operation in the specified manner, the supply voltage has to be on permanently on the INT69 HBY Diagnose.
6. A dual LED (red, orange/ green) provides additional information about the motor protector and compressor status.

Technical data:

- ●Supply voltage
  AC 50/60 Hz 115/240V-15 …+10% 3VA
- ●Ambient temperature
  -30 … +70 ℃
- ●Relay output
  max. AC 240V, max. 2.5A, C300
- ●Phase monitor
  3 AC, 50/60Hz, 200 ~ 690 V ± 10%

Blink code display & diagram:



g.Oil heater

An UL approved oil heater has been installed in every compressor as a standard accessory.

Before restart of compressor after shutdown for a long time, please turn on oil heater at least 8 hours to make the temperature inside compressor higher than system temperature and ambient temperature and then it can prevent condensation of refrigerant inside oil sump of compressor which may result in liquid compression in next start and poor lubrication due to too low viscosity of lubricant oil.

Green / Yellow line – 1.5m x 1 (Grounding)

Figure 25 Oil heater

Specification： 300W; 110V or 220V; IP 54; UL approval

Note: If compressor is installed in low ambient temperature, it is recommended to insulate oil separator against cold ambience.

h. Optical oil level switch (optional accessory)

To prevent from optical oil level switch trip caused by oil foaming or surging in the sump, a time delay around 10 ~ 15 seconds is recommended before shut down the compressor.

Operating Power, or	AC 50/60Hz 230V
Motor Power Sense Line Voltage, or	AC 50/60Hz 230V
Ambient Temperature Range	- 30°C …+ 85°C
Maximum temperature at prism	+ 120°C
Delay on power on	< 1 second
Delay until relay off from detection of oil loss	3 second
Relay rating data	5A/250V AC
Connection Cable	5 x 0.5mm², length=1 meter, color coded

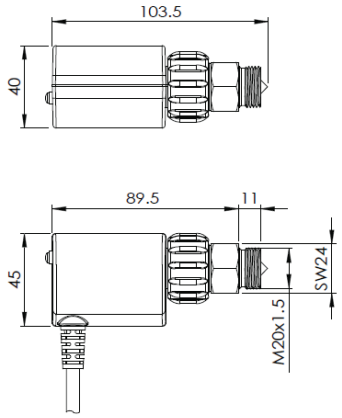


Figure 26 Optical oil level switch

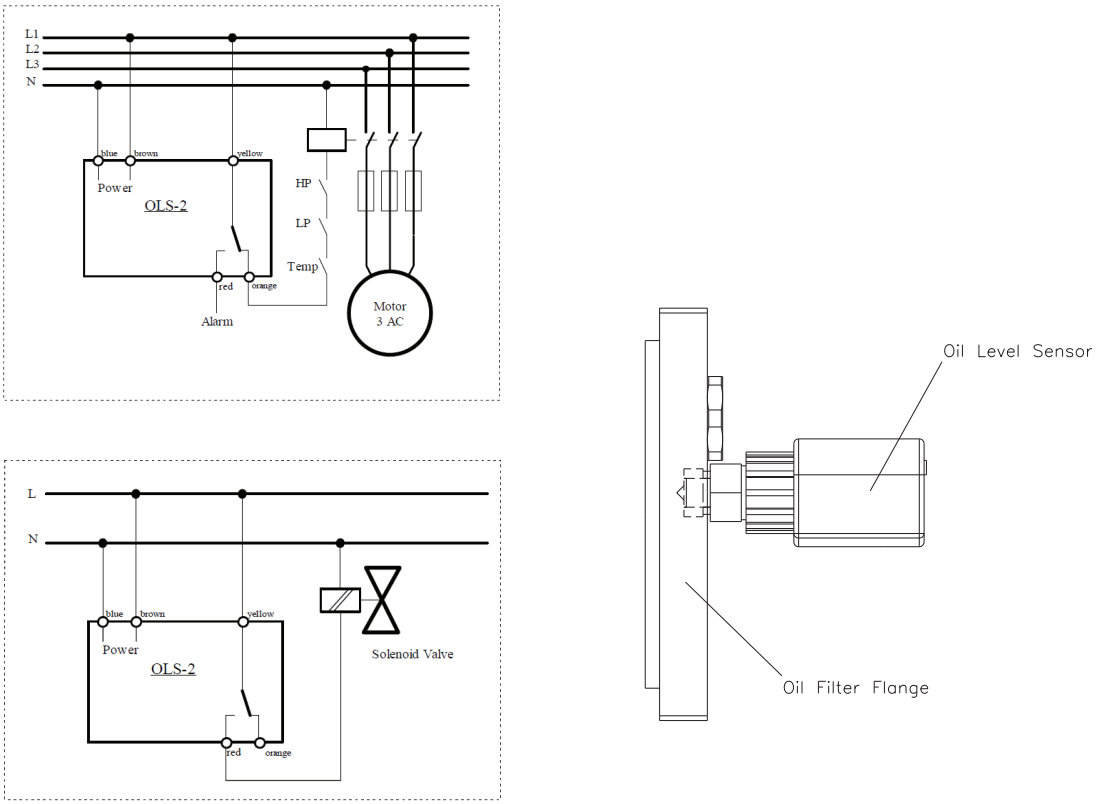


Figure 27 The installation & connection diagram of optical oil level switch

i. Oil drain valve
Oil drain valve is installed in compressor to drain out oil for maintenance.

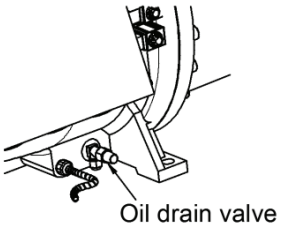


Figure 28 Oil drain valve

j.IP54 cable box
Hanbell designs and makes the cable box which meets IP54 protection degree.
Dimensions of cable (for motor power line and control power line) refer to the drawing below

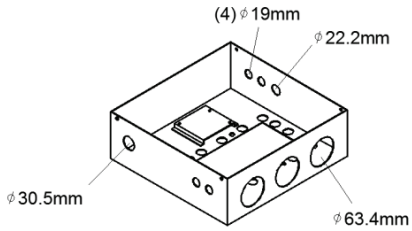


Figure 29 Cable box

k. Liquid injection system (solenoid valve + expansion valve)
In high-condensing-temperature or low-evaporating-temperature applications liquid injection system is recommended to cool motor coil auxiliary. In high-compression-ratio applications, liquid injection system to compression chamber is also recommended to cool down high compression heat due to high compression ratio to maintain normal discharge temperature. Please refer to Chapter 7 for detailed introduction of additional cooling. Hanbell provides the following liquid injection expansion valves for customers' options. Please refer to capacity recommended in selection program to choose appropriate liquid injection expansion valves.

Brand	Model	Low Temp. Type	High Temp. Type
SPORLAN	Y1037-FV-3-180,3/8"SAE		○
	Y1037-FV-5-180,3/8"SAE		○
ALCO	TCLE-3HW-6A	○	
	TCLE-5HW-6A	○	
	TCLE-10HW-6A	○	
FUJIKOKI	JBE-E60HFKT-1		○

l. Liquid injection system (solenoid valve + angle valve)
This simple liquid injection system adjusts amount of liquid injection by angle valve, suitable for application with level load and ambient temperature but it's not recommended. Opening ratio of angle valve could not vary with system loading and change of temperature. Therefore, frequent check of discharge temperature can prevent damage of compressor due to over cooling or insufficient cooling.

m. Horizontal check valve installation
Horizontal check valve is standard accessory of RE-F Series compressor. Considering limitation of clearance for installation, horizontal check valve would be alternative to aforementioned vertical check valve for RE Series compressor. Please refer to section C. for dimension of horizontal check valve. The installation drawing is as below:

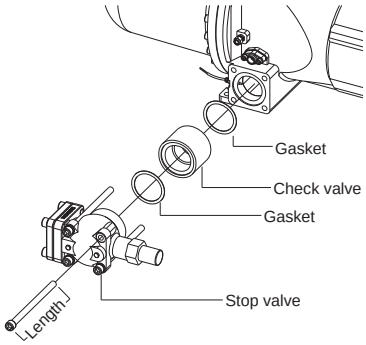


Figure 30 Installation of horizontal check valve

n. External oil separator
For improvement of oil return in flooded-type, low-temperature and parallel systems, and system with long piping, Hanbell specially designs a complete series of external oil separators – OS series with characteristics of high filtration efficiency and low pressure drop. The following table shows details of OS series:

Note : It is recommended to install a muffler before the external oil separator to avoid noise and vibration which caused by resonance.

(Ⅰ) Technical data：

Model	Type	Oil Volume (Liter)		Range of application based on Displacement (m^3/hr) (Recommended)	Shell Diameter
		High level	Low level		
OS50	Vertical	22	12	206~270	16"
OS65	Vertical	31	18	271~440	18"
OS80	Horizontal	33	20	441~705	20"
OS100	Horizontal	40	27	706~1120	20"

(Ⅱ) Accessories：

No.	Description	OS65	OS80	OS100
1	Refrigerant inlet	2 1/2"	3"	4"
2	Refrigerant outlet	2 1/2"	3"	4"
3	Oil outlet	5/8" Flare	1" PF	1" PF
4	Oil charge valve	1/4" Flare		
5	High oil S.G.	1 PCS		
6	Low oil S.G.	1 PCS		
7	Oil level switch	1 PCS		
8	Oil heater	150W	150W	150W
9	Oil drain valve	1/4" Flare		
10	Oil temp. protection (option)	1/8" NPTF		
11	Safety valve (option)	1/2"	1"	1"

(Ⅲ) Dimensions：

No.	OS65	OS80	OS100
A	1110	1297	1637
B	595	650	1000
C	300	359	354
D	350	300	300
E	22	23	23
F	360	688	698

(Ⅳ) Drawing：

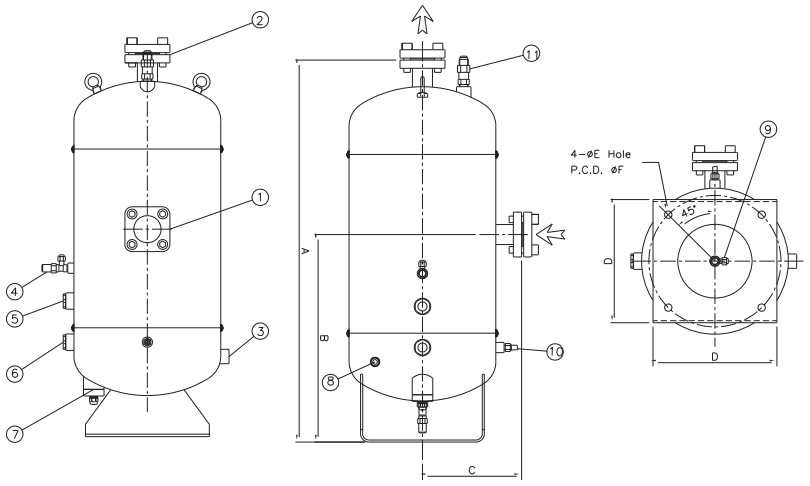


Figure 31 Vertical -OS65

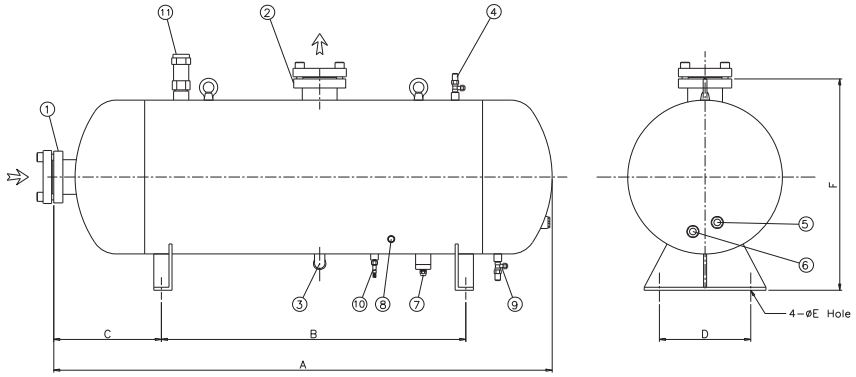


Figure 32 Horizontal -OS80 & OS100

o. Oil level switch of external oil separator

There are 2 wires for the interlock to main control circuit or any micro controller's independent circuit. To prevent from oil level switch trip caused by oil foaming or surging in the sump, a time delay around 10 ~ 15 seconds is recommended before shut down the compressor.

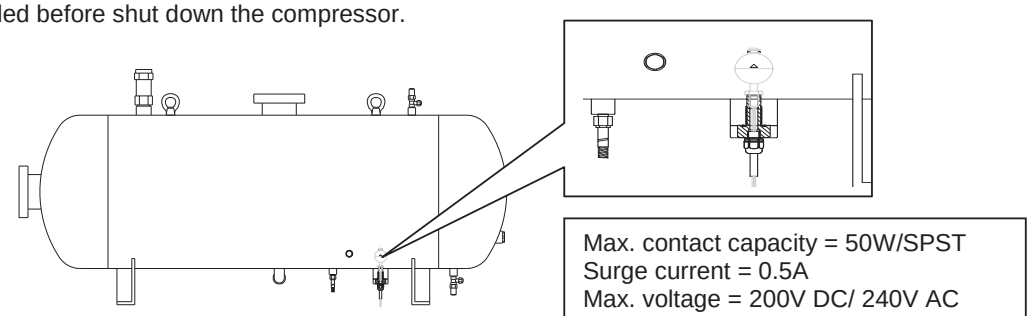


Figure 33 Oil level switch in an external oil separator

Note:

1. On the float ball there is a triangle mark which tells you its sensor direction. Therefore, before you install an oil level switch in an external oil separator, please use the triangle mark as your reference before install any oil level switch in an external oil separator.
2. Please check this triangle mark and modify the oil level switch if needed.
5. If you have any other question, don't hesitate to contact with Hanbell representatives for help.

p. External oil filter

External oil filter is optional accessory of external oil separator. It is suggested to install external oil filter in oil return line before oil inlet port of compressor for safe running of compressor.

*Flow Rate: max 50 (l/m)		*Weight:1.4KG/Set	
*Working Pressure: 40 bar		(the weight is not including element)	
*Material: Aluminum alloy		*Operating Temp.: from -25℃to 110℃	
*Seal: VITON			
Compressor Model	Material Code	Inlet Size	Outlet Size
RE-230/260/300/340/380/420/480	3130-3240AA	5/8"	5/8"
RE-550/620/710/820/920	3131-3240AA	3/4"	3/4"

q. Oil flow switch

Oil flow switch operates with external oil separator to prevent oil deficient compressor. Specifications and installation of oil flow switch are shown as below:

	G	Type	PN bar	Qmax. Recom. l/min	switch value l/min selectable range for fixed switch	L mm	H mm	SW mm	X mm	Weight kg
Bronze	G 1/2	FF-015GR012	200	20	0.4-12	68	79	29	13	0.6
	G 3/4	FF-020GR025	25	40	0.6-25	73	79	32	11	0.7
	G 1	FF-025GR040	25	60	1.5-40	87	90	41	14	1

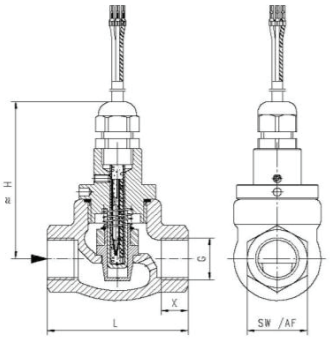


Figure 34 Outline of oil flow switch

(1)Tolerance: ±0.3l/min
(2)Media temperature: max 110 ℃
(3)Average pressure loss: 0.4 bar at Qmax
(4)Hysteresis: depending on switch value minimum 0.4 l/min
Note: Switch value is indicated for horizontally decreasing flow

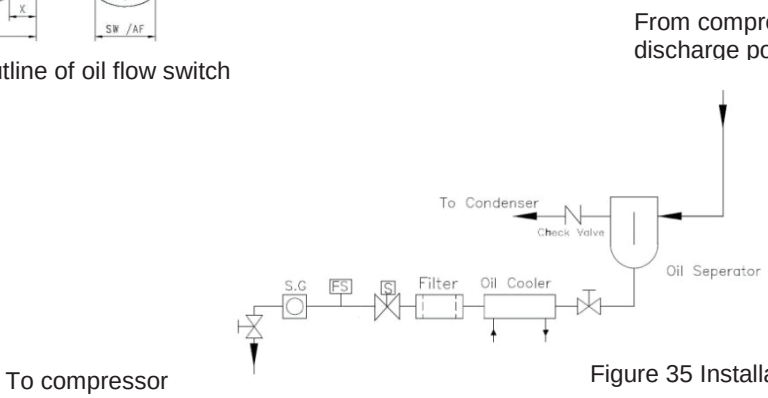


Figure 35 Installation of oil flow switch

r. Economizer connection muffler

When economizer is used, it is recommended to install a muffler and check valve before middle-pressure returned gas port in compression chamber to effectively mitigate pulsation noise in middle pressure as shown in the drawing below:

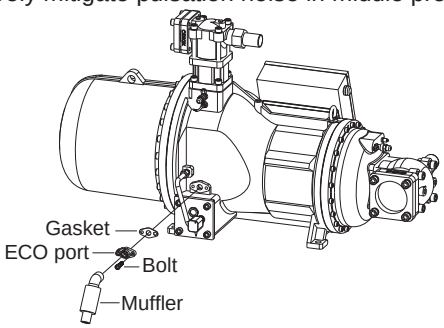


Figure 36 Installation of ECO muffler

s. Mounting pad

To avoid extra vibration and noise which comes from direct contact between compressor feet and the base, it is recommended to add mounting pads in between as the drawing below shown.

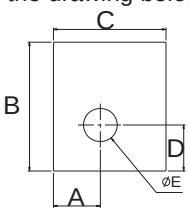
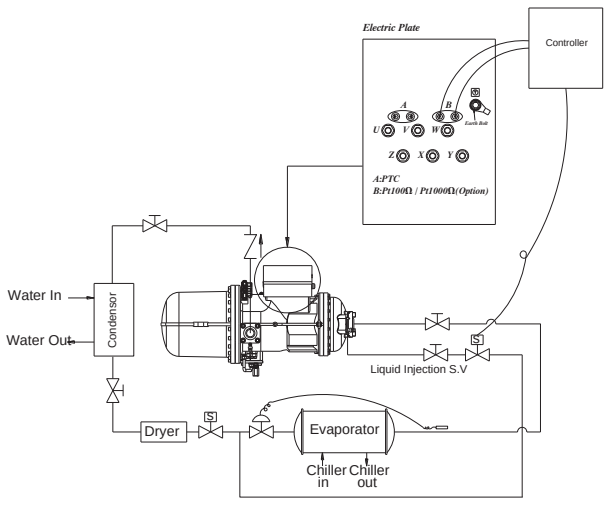


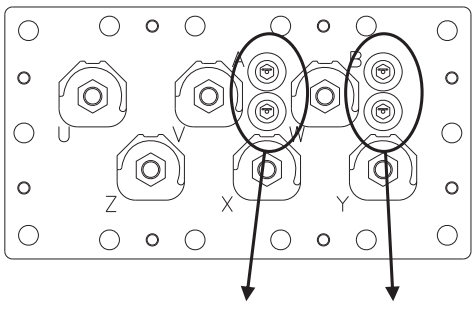
Figure 37 Compressor mounting pad (optional)

Model	Part No.	A	B	C	D	E	Thickness	Req. Q'ty
RE-230, RE-260, RE-300, RE-340, RE-380	3131-9815B	20	55	50	20	22	20 mm	4
RE-420, RE-480, RE-550	3136-9815B	26	100	70	25	22	20 mm	4
RE-620, RE-710, RE-820, RE-920	3139-9815B	25	100	80	25	22	20 mm	4

t. Temperature sensors Pt1000 (Standard) or Pt100 (Optional)

RE models utilize suction return gas to cool down the motor coil. To effectively detect temperature of motor coil and adequately adjust volume of liquid injection by measured temperature, Hanbell specially mounts Pt1000 or Pt100 temperature sensor on motor coil to protect the motor coil. This temperature sensor along with controller of the system monitor motor coil temperature and then control on/off of liquid injection valve accordingly to provide suitable liquid injection as shown in the diagram below.





A: PTC B: PT1000 or PT100

Figure 38 Liquid injection connection diagram

Note:

Hanbell suggests to control temperature of motor coil at 60℃ (not higher than 60℃)

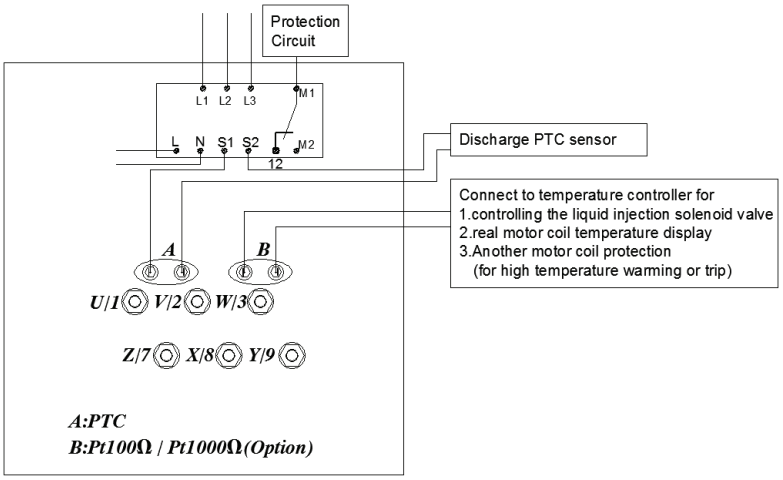


Figure 39 Connection diagram of Pt1000/Pt100 sensor

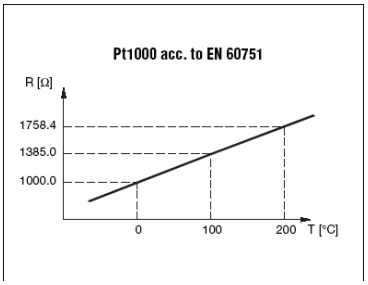


Figure 40 Pt1000 sensor

Specification : Pt1000 sensor (Standard)

- Recommended max. meas. Current for heat coefficient < 0.1K – DC0.2 ~ 2mA
- Sensor resistance at 0℃ - 1000Ω±1.20Ω
- Change of resistance 0 ~ 100℃ - 3.85Ω/K
- Insulation test voltage U is – AC 1.5kV

Specification : Pt100 sensor (Optional)

- Recommended max. meas. Current for heat coefficient <0.1K - DC 1 ~ 3 mA
- Heating coefficient - 10mΩ/K
- Sensor resistance at 0℃ - 100Ω±0.12Ω
- Change of resistance 0 ~ 100℃ - 0.385Ω/K
- Insulation test voltage U is – AC 1.5kV

Note: Please specify Pt100 sensor when placing orders to Hanbell

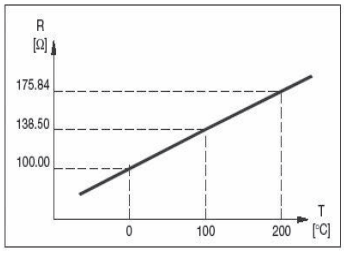


Figure 41 Pt100 sensor

u. Minimum pressure valve (MPV)

Minimum pressure valve is useful in cold start condition. During the cold start period, because the system condensing temperature is still low, the discharge pressure will stay at a quite low level which means the pressure differential between discharge and suction side will not be enough for compressor to act normally. Under such working condition, compressor might have difficulties to load itself. Oil supply to bearings and internal cooling might be not enough which will cause severe damage to those moving parts in the end. With minimum pressure valve, the pressure differential can be built shortly after the start up, so the capacity control and oil supply to those moving parts won't be a problem. Therefore, the compressor protection can be achieved. In addition to protection function, it can also act as check valve to reduce the reverse running time after compressor stops.

Flange on minimum pressure valves are provided for the ease of installation. It can be installed on either compressor discharge port or external oil separator discharge port (F type compressor only). The installation and specification are shown as below:

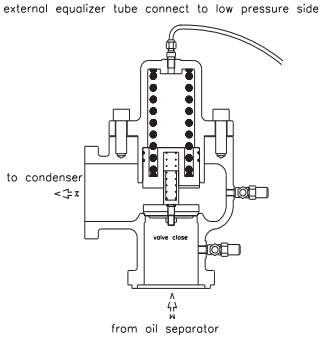


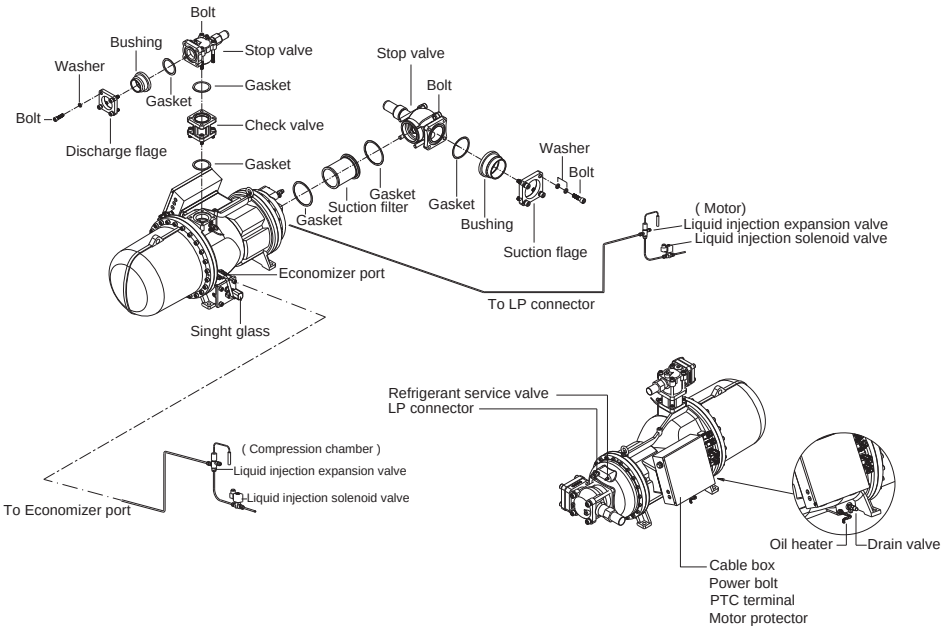
Figure 42 Installation of MPV

Model	Opening pressure	Max. pressure	Working temperature	Pressure drop
1 1/2"	3.6±0.3Bar	28Bar	<120℃	<0.1Bar
2"				
2 1/2 "				
3"				
4"				
5"				
6"				

Please consult Hanbell representatives for the detailed outline and application

4.5 Installation and connection of compressor

The diagrams below show the installation and connection of compressors



5. Electrical data and design

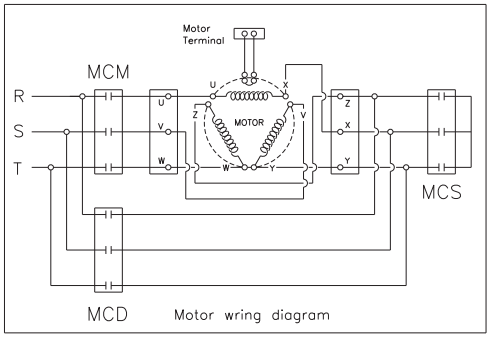
5.1 Motor design

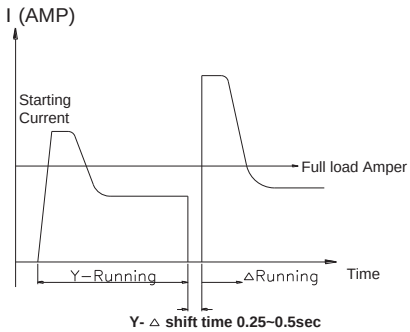
HANBELL RE series screw compressors are fitted with Y-Δ motor as standard and Δ/ΔΔ motor (Part Winding Starting – PWS) is also available for model RE-230~RE-550

Y-Δ starting

Y-Δ motor connects motor coil by Y connection during starting therefore reducing voltage on coils to 1/√3 of input voltage and reconnects motor coil by △ connection after starting. By doing so, we can decrease starting current thorough voltage drop, i.e., so-called voltage-drop starting.

In Y connection, MCM, MCS are inductive while motor leads Z, X, Y are tied together as a neutral connecting as Y fashion. A few seconds later (3~5 sec is recommended), MCM, MCS become deductive. Around 0.25 sec later, MCM, MCD are inductive, it turns out △ run connection.





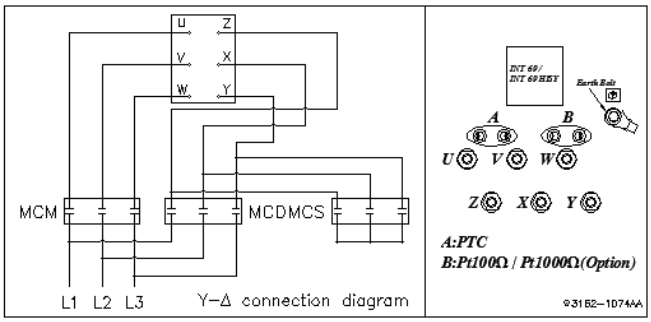


Figure 43 Y-Δ Starting diagram

Attention! :
After Y start, MCM & MCS are deductive for 0.25 sec and then MCM & MCD are inductive for Δ run. Within as transient as 0.25 sec, pseudo short circuit might occur due to inappropriate action of contactors, causing trip of compressors.

When it occurs, we recommend usage of adjustable Y-Δ dedicated timer or slightly lengthen span of time for MCM & MCS deduction – MCM & MCD re-induction from 0.25 sec to 0.5 sec directly in the micro controller or PLC program.

Please refer to Y-Δ shift time diagram for details. Because motor is not powered during Y-Δ shift, shorter Y-Δ shift span is suggested to prevent second start due to decreased rotation speed. However, if Y-Δ shift span is too short aforementioned pseudo short circuit might occur.

Characteristics of Y-Δ starting

1. Starting current in Y connection is 1/3 of lock rotor ampere.
2. Starting torque in Y connection is 1/3 of lock rotor torque.
3. Acceleration of motor rotor becomes smaller at full-load starting. Therefore compressors require starting at partial load.

Δ/ΔΔ (PW) starting

RE-230~RE-550 are available to be fitted with PWS motor for customer's application as an optional accessory. Please refer to the follow diagram for the wiring of PWS motor.

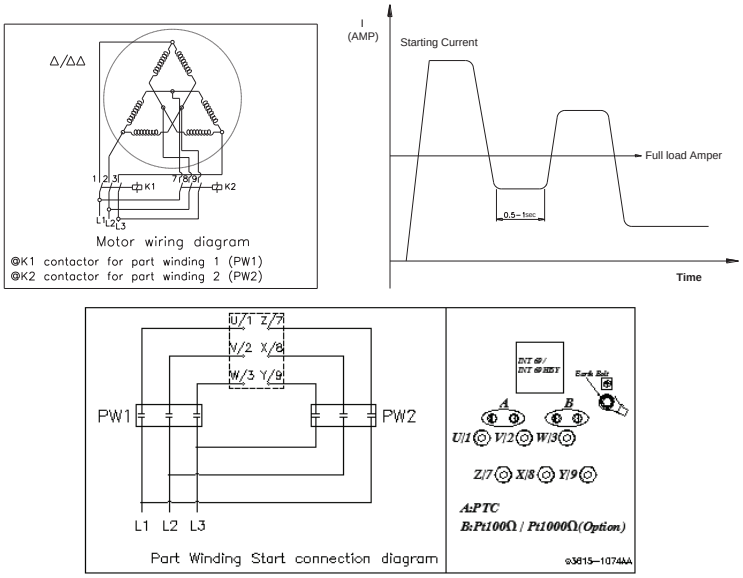


Figure 44 Δ/ΔΔ (PW) starting diagram

The selection of both of the motor contactors (k1/k2) is each for approx. 60% of the max. running current. The recommended time delay of the switching relay k1 is to be set at 0.5 second and not more than 1 second.

PWS starting features

The starting current is around 40% ~ 70% of full-winding Locked Rotor Current. It depends on the design and motor size, and low starting torque.

Direct on line features

The starting equipment consists of only a main contactor and thermal or electronic overload relay. During a direct-on-line start, the starting torque is very high, and is higher than necessary for most applications. The disadvantage with this method is that it gives the highest possible starting current. Please refer to the follow diagram for the wiring of DOL starting

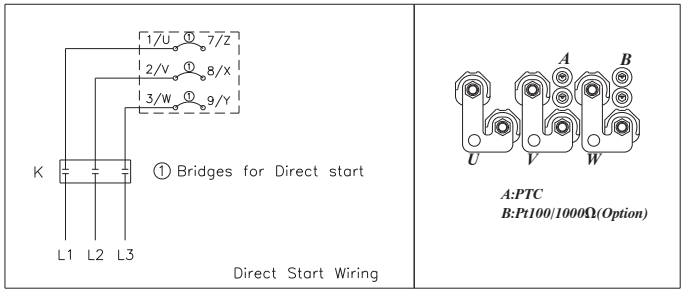


Figure 45 DOL starting diagram

Soft starting features

A soft starter is different from other starting methods in characteristics. It has thyristors in the main circuit, and the motor voltage is regulated with a printed circuit board. The soft starter's advantage is that when the motor voltage is low during start, the starting current and starting torque is also low. Please refer to the following diagram for wiring of soft starting.

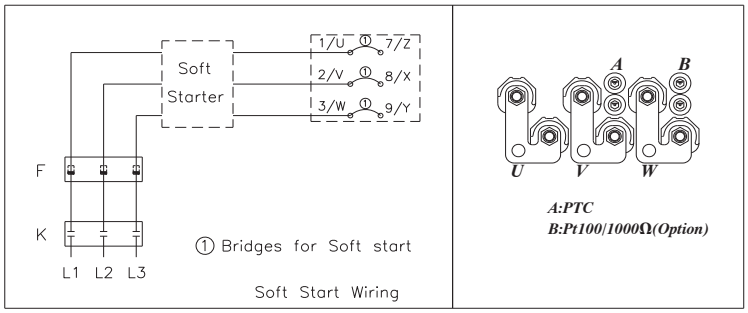


Figure 46 Soft starting diagram

Besides Y-Δ and PWS start, if there were any inquiry of direct on line start、soft start、inverter start or series reactance reduced voltage start, please contact Hanbell for further information.

Attention:
Ensure the power supply wiring and output motor wiring are connected to the correct terminals. Any mistake could cause catastrophic failure to compressor motor.

5.2 Compressor protection devices

The table below shows the list of protection devices which are essential to protect the compressor and operate safely. Follow the protection devices listed in the below table to ensure the compressor running under normal condition.

Protection device	Set point	Remark
Motor wiring temperature protector (PTC sensor)	Trip at 110℃, 100℃ ※	Standard
Discharge temperature protector (PTC sensor)	Trip at 110℃, 100℃ ※	Standard
Phase reversal protector (INT69HBY)		Standard
Phase failure protector (INT69HBY)		Standard
Oil temperature sensor	Cut in 100℃, cut out 90℃ (Air-cooled, heat pump, or refrigeration system) Cut in 80℃, cut out 70℃ (Water-cooled or flooded system)	Optional
Optical oil level switch	Time delay setting: 10~15 seconds	Optional
Oil filter pressure differential switch	Trip at 1.5 kg/cm^{2}g	Optional
Oil pressure differential switch	Oil inlet pressure should be 4 kg/cm^{2}g higher than the suction pressure. When it is not 4kg/cm^{2}g higher than the suction pressure, it is necessary to add a minimum pressure valve or an oil pump to ensure proper oil supply	Optional
Oil flow switch	Time delay setting: 10~15 seconds	Optional
Pt1000 (standard) or Pt100(optional) for liquid injection to motor chamber.	Depends on customer's application. Suggest Cut in 60℃, cut out 50℃	Standard /Optional

※Manual reset suggested

Motor thermistors and discharge thermistors are temperature sensors with quick response while the temperature approach to their set point; thermistors must be connected in series to a controller (INT69HBY) in terminal box as a guardian to protect compressor. Alarm lamp for this protector is required to be embedded on control panel as indicator. Any intention to short controllers for starting of compressors is prohibited. It is beyond Hanbell warranty of compressors if there is any action above mentioned found.

Note:
When any protection device trips, please do troubleshooting and reset manually. Do not let the compressor reset automatically after abnormal trip.

5.3 Power supply

1. Limitation of power supply

a. Voltage limitation
Long-term running: rated voltage ±5%
Instant running: rated voltage ±10%

b. Frequency :
Rated frequency ±2%

Note:
In the region where the electricity power is unstable, install an additional hi-low voltage protector with ± 5% tolerance of normal voltage to ensure safe operating of the compressor.

2. Unbalanced voltages :

Unbalanced voltages usually occur because of variations in the load. When the loading on one or more of the phases are different from the others, unbalanced voltages will appear. This can be due to different impedances, type, and value of loading in each phase. Unbalanced voltages may cause serious problems, particularly to the motor.

NEMA defines voltage unbalance as follows:

$$\text{Percent voltage unbalance} = 100 \times \frac{\text{(Maximum voltage deviation from average voltage)}}{\text{(Average voltage)}}$$

NEMA states that poly-phase motors shall operate successfully under running conditions at rated load when voltage unbalance at the motor terminals does not exceed 1%. Furthermore, operation of a motor with over 5% unbalance is not recommended for it probably results in motor damage.

Unbalanced voltages at motor terminals cause phase current unbalance ranging from 6 to 10 times the percent of voltage unbalance for a fully loaded motor. This causes motor over current resulting in excessive heat that shortens motor life, and hence, eventual motor burnout. If the voltage unbalance is great enough, the reduced torque capability might not be adequate for the application and the motor will not attain rated speed.
Some of the more common causes of unbalance voltages are :

- ●Unbalanced incoming utility supply
- ●Open delta connected transformer banks
- ●Large single phase distribution transformer in the system
- ●Open phase on the primary 3-phase transformer in the distribution system
- ●Blow fuse on 3 phase bank of power factor improvement capacitors
- ●Unequal impedance in conductors of power supply wiring
- ●Unbalanced distribution of single phase loads such as lighting
- ●Unequal transformer tap settings
- ●Faults or grounds in power transformer
- ●Heavy reactive single phase loads such as welders

A 3-phase unbalanced voltages protector is upon request as optional accessory. Please contact Hanbell for more details.

5.4 Grounding

There is a grounding terminal inside cable box. Please accurately connect it to grounding of control panel for the system.

Suggestions:

a. The regular setting of electric leak protection should be greater than 50mA; for a humid location, 25mA is better.
b. Grounding voltage of casing should be no greater than 50V; for a humid location, the limit is 25V.
c. Grounding resistance should be no greater than 500 Ohm.
d. Air cut board (ACB) is regularly equipped with electric leak protection. Please refer to related settings for its normal action.
e. If electric leak protection is active, please check if insulation of equipments is normal and if its wiring and setting are correct.

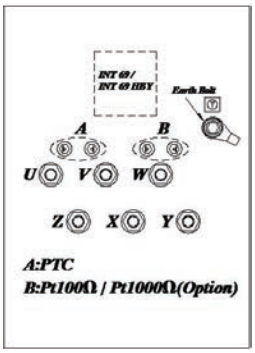


Figure 47 Grounding Terminal

Note:
Please make sure nothing is wrong before turning on the power. If there are any questions, please contact the supplier of equipments.

5.5 Torque value for power bolts

Torque Value for power bolts		
Model	Bolt size	Torque value (kgf.cm)
RE-230~380	M12	350
RE-420~920	M12	350
RE-1150	M16	500

6. Operation and maintenance

6.1 Compressor start-up

PRE-START CHECKING- Table below shows the required procedures and checkpoints before starting-up the compressor during commissioning or initial operation of the unit.

Items	Things to be checked	States or standard values
1. Accessories	1. Oil level	1. Higher than the middle line of oil level sight glass
	2. Oil heater	2. Should be kept energizing after compressor shut down.
	3. System valves status	3. Opened
	4. Solenoid valves	4. Fixed
2.Electrical system	1. Voltage of main power	1. Electricity voltage should be kept within 5% to the rated voltage, instant maximum voltage drop while starting should be less than 10% to the rated voltage.
	2. Voltage of control circuit	2. Standard voltage is 220V. Maximum voltage is 230V. If there is other demand, please contact HANBELL.
	3. Insulation resistance value of the motor between phase to phase and phase to ground.	3. Insulation resistance value should be above 5MΩ.
	4. Cable and terminal connection.	4. Power terminals are firmly fixed on terminal block and well insulated. Keep wire cables away from heat source and sharpened metal. Power terminals are fixed firmly and well insulated. Terminal screw and block are both required.
	5. Grounded	5. (Ruled by the local Electricity Regulations.)
	6. Capacity of electrical accessories	6. Properly selected (or inquired by the system designer.)
	7. Settings of switches, sensors and controllers.	7. Properly set (or inquired by the system designer.)
3. Piping system	1. Outer piping system	1. Fixed firmly.
	2. Leakage test	2. No leakage.
	3. Bolts to fix the compressor.	3. Fix the compressor tightly.
4. Safety devices	1. Motor coil sensor (thermistor)	1. Connected in series with discharge sensor to controller.
	2. Discharge sensor (thermistor)	2. Connected in series with motor sensor to controller.
	3. Controller	3. Closed circuit with N.C. & N.O.

In addition to the pre-start checking given in the above table, please also consider the following:

a. It is necessary to pay more attention to the auxiliary facilities while the chiller is commissioning at the job-site and the periodic maintenance after the initial start-up.

b. In order to keep the capacity control smoothly under the low ambient temperature with the normal viscosity of oil, oil heater should be kept energizing after compressor has been shut down for preparation for the next start-up.

c. Check that all the settings on each pressure switch are correct.

d. Check if all the stop valves in the system are already open.
e. Check the rotating direction of the compressor by starting the compressor for approx. 0.5…1sec. and check the suction and discharge pressure gauges. The correct rotating direction is: suction pressure drops immediately and the discharge pressure will go up.

f. Compressor lubrication oil should be checked immediately after starting. Oil level should be full of the sight glass.

g. Oil foaming can be generated during starting phase, but it should reduce when the compressor is under stable operating conditions. Otherwise this can indicate excessive liquid in the suction gas.

h. The running condition of compressor after commissioning at the job-site should be adjusted as; the discharge temperature will be at least 20^0K above the saturated condensing temperature and the suction vapor superheat should be within 10^0K to the saturated evaporating temperature.

i. The pipelines must be checked for abnormal vibrations. Please contact HANBELL or local distributor if any abnormal vibrations or noise found while compressor is running.

j. Regularly check the chiller unit according to national regulations and the following items should also be checked:
●Operating data of the machine
●Check the lubrication / oil level
●All compressor protection devices
●Check electrical cable connections and tightness

6.2 Troubleshooting

The table below shows some problems that might have at the jobsite during commissioning or upon operation of compressor. This table will only serve as a guide for engineers to understand the situation once the problem occurs in the site.

PROBLEMS	PROBABILITY CAUSES	REMEDY / CORRECTIVE ACTION
Sudden trip of motor thermistor / sensor	Low suction pressure cause low refrigerant flow rate	Install liquid injection to motor coil
	Refrigerant shortage	Charge refrigerant
	Suction filter clogged	Clean filter
	High suction temperature	Install liquid injection to motor coil
	High suction superheat	Adjust the superheat less than 10°K
	Unstable electricity system or failure	Check electricity power supply
	Motor overload	
	Bad motor coil causing temperature rising rapidly	
Compressor unable to load	Low ambient temperature or high oil viscosity.	Turn on the oil heater before compressor start.
	Capillary clogged.	Clean or replace capillary
	Modulation solenoid valve clogged or solenoid valve coil burnt.	Clean / purge solenoid valve core or replace the solenoid valve coil
	Internal built-in oil line clogged.	Check and clean the compressor oil circuit
	Piston stuck-up.	Change piston or piston ring
	Oil filter cartridge clogged.	Clean oil filter (replace if needed)
	Too small the high-low pressure differential.	Minimum pressure differential is 4 bar. Consider to install an oil pump.
Compressor unable to unload.	Modulation solenoid valve clogged or burnt.	Clean or replace the solenoid valve
	Piston rings worn off or broken, or cylinder damaged resulting leakage.	Change piston (if cylinder damaged severely, change the cylinder)
	Lubrication oil insufficient.	Check the oil level of the compressor if enough, add some oil if necessary
	Leakages at internal discharge cover plate end side.	Check or replace the gasket and tighten the bolts.
	Solenoid valve voltage misused.	Check the control voltage
	Piston stuck-up.	Change the piston set, and check the cylinder and slide valve.
	Capacity control logic unsuitable.	Check
Poor insulation of motor	1. Bad compressor motor coil.	Check the coil or change the motor stator
	2. Motor power terminal or bolt wet or frosty.	
	3. Motor power terminal or bolt bad or dusty.	
	4. Bad insulation of magnetic contactors.	
	5. Acidified internal refrigeration system.	
	6. Motor coil running long time continuously under high temperature.	
	7. Compressor restart counts too many times.	
Compressor starting failure or Y-Δ starter shifting failure	Slide valve piston unable to go back to its lowest % original position.	Check if the unloading SV is energized once the compressor shut down. Unload the compressor before shot down.
	Voltage incorrect.	Check the power supply
	Voltage drop too big when starting the compressor or magnetic contactor failure or phase failure.	Check the power supply and the contactor.
	Motor broken down	Change the motor
	Motor thermister sensor trip.	See “sudden trip of motor sensor” above
	Incorrect supply power connection.	Check and re-connect
	Y-Δ timer failure.	Check or replace.
	Discharge or suction stop valve closed.	Open the stop valve
	Improper connection between node terminals of Y-Δ wiring.	Check and re-connect the wiring
	Rotor locked	Check and repair
	Earth fault	Check and repair
	Protection device trip	Check
Abnormal vibration and noise of compressor	Damaged bearings.	Change bearing.
	Phenomenon of liquid compression.	Adjust proper suction superheat
	Friction between rotors or between rotor and compression chamber.	Change screw rotors or/and compression chamber.
	Insufficient lubrication oil.	Check the oil level of the compressor if enough, add some oil if necessary.
	Loosen internal parts.	Dismantle the compressor and change the damaged parts.
	Electromagnetic sound of the solenoid valve.	Check

PROBLEMS	PROBABILITY CAUSES	REMEDY / CORRECTIVE ACTION
	System harmonic vibration caused by improper piping system.	Check the system piping and if possible improve it using copper pipe.
	External debris fallen into the compressor.	Dismantle the compressor and check the extent of the damage.
	Friction between slide valve and rotors.	Dismantle the compressor and change the damaged parts.
	Motor rotor rotates imbalance.	Check and repair.
Compressor does not run	Motor line open	Check
	Tripped overload	Check the electrical connection
	Screw rotors seized	Replace screw rotors, bearings etc.…
	Motor broken	Change motor.
High discharge temperature	Insufficient refrigerant.	Check for leaks. Charge additional refrigerant and adjust suction superheat less than 10°K
	Condenser problem of bad heat exchange.	Check and clean condenser
	Refrigerant overcharge.	Reduce the refrigerant charge
	Air / moisture in the refrigerant system	Recover and purify refrigerant and vacuum system
	Improper expansion valve.	Check and adjust proper suction super heat
	Insufficient lubrication oil.	Check the oil level and add oil.
	Damaged bearings.	Stop the compressor and change the bearings and other damaged parts.
	Improper Vi value.	Change the slide valve.
	No system additional cooling (Liquid injection or oil cooler)	Install additional system cooling (liquid injection or oil cooling or both base on working condition limitation)
Compressor losses oil	Lack of refrigerant	Check for leaks. Charge additional refrigerant.
	Improper system piping	Check and correct the piping or install an external oil separator
	Liquid fills back	Maintain suitable suction superheat at compressor
Low suction pressure	Lack of refrigerant	Check for leaks. Charge additional refrigerant.
	Evaporator dirty or iced	Defrost or clean coil
	Clogged liquid line filter drier	Replace the cartridge
	Clogged suction line or compressor suction strainer	Clean or change suction strainer
	Expansion valve malfunctioning	Check and reset for proper superheat
	Condensing temperature too low	Check means for regulating condensing temperature

Note:
The replacement of compressor internal parts should be performed only by certified service technician with full knowledge of HANBELL screw compressors.

6.3 Compressor checking list

Please fill in the compressor checking list and send it to Hanbell, if any failure of compressor happened. Hanbell will reply and suggest solutions to solve the failure.

CHECK LIST FOR TROUBLESHOOTING OF HANBELL SCREW COMPRESSOR

Compressor model：　　Compressor S/N：
System design condition (SCT/SST)：　　Evaporator type：
Refrigerant type：　　Liquid injection：☐ Motor ☐ Chamber
Voltage：R-S:　　S-T:　　R-T:　　Over load setting：　　A
Y–Δ setting:　　Sec　　Δ–Δ setting：　Sec
Starting current：　　A　　Δ current：　　A（end of starting）
Operating current (full load)：R:　　S:　　T:
Description of problem：

- ☐ A：abnormal noise　　dBA at　　% capacity
- ☐ B：abnormal vibration
- ☐ C：over current
- ☐ D：motor burnout
- ☐ E：unable to load
- ☐ F：unable to unload
- ☐ G：leakage（Photo would be a plus）
- ☐ H：accessory parts damaged（Photo would be a plus）

Suction pressure	Discharge pressure	Suction temp.	Discharge temp.	Liquid line temp.	Condenser water temp.		Chiller water temp.		Oil cooler temp.		Economizer temp.	
					inlet	outlet	inlet	outlet	inlet	outlet	inlet	outlet

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7. Applications

7.1 Additional cooling

When compressors operate in the following application conditions, installation of an additional auxiliary cooling apparatus is recommended to lower discharge temperature, maintain proper temperature of lubricant and additional cooling for motor coil… to ensure safe running of compressors with efficiency.

- Air-cooled system
- High compression ratio system such as heat pump, low temperature and refrigeration system
- High discharge temperature system such as heat recovery system
- If compressors have to run at partial load below 50% continuously in a long term.
- Any other heavy duty application

There are two type of additional cooling of compressor that described separately as below.

a. Liquid injection applications

In areas with high condensing temperature and/or low evaporating temperature as in the limitation diagram, additional cooling is required in order for the compressor to work properly. A relatively simple method of additional cooling is direct refrigerant injection in the motor side.

The purpose of installing a liquid injection system is to prevent the compressor from overheat. The system installed a liquid injection expansion valve between the liquid line and compressor for cooling down the motor to ensure the continuous and safe running of the compressor. The suction superheat should be controlled between 5K~10K for the application of air-cooled and heat pump chillers by means of expansion valve devices. These devices can be adjusted to control the suction superheat by means of refrigerant flow rate. When the initial startup, the loading of the chiller is heavy due to the high temperature of chilled water, so the liquid injection devices capacity should be selected or calculated enough to reduce the overheat of the compressor.

Calculating the cooling capacity of liquid injection devices

Liquid injection devices can be calculated with the **HANBELL selection software** or manually. For manual calculation, consider the most extreme conditions to be expected during actual operations i.e. minimum evaporating temperature, maximum suction gas superheat and condensing temperature.

Liquid injection applied with low temperature expansion valve

When the compressor applied in the low temperature system (E.T. ≦ -10°C) the compression ratio is high at this condition, also the discharge temperature will be very high. The design of the liquid injection system for low temperature application is similar to the illustration shown in figure below. There are two connectors for the liquid injection in the compressor, one is in the motor side to cool down the motor temperature and reduce the discharge temperature. The other is the ECO port in the compression chamber side and its function is to reduce the discharge temperature and increase the compression efficiency. However, when additional cooling in compression chamber like economizer operation, oil cooler application is used or when condensing temperature is low, discharge temperature will be kept low and liquid injection may not be turned on, although motor load is severe and motor coil temperature is high. This may lead to motor failure. Therefore, in application mentioned above Pt1000 or Pt100 for liquid injection to motor is recommended instead.

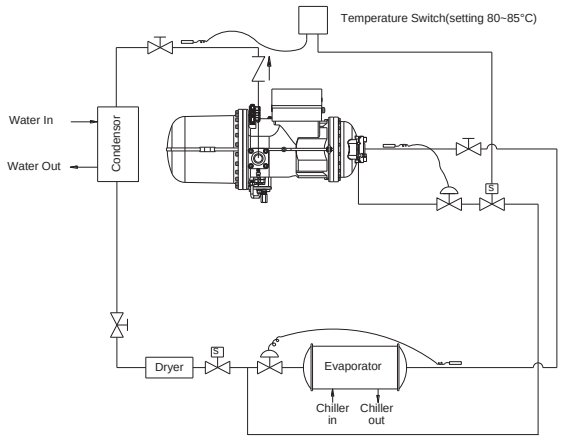


Figure 48 Liquid injection to motor

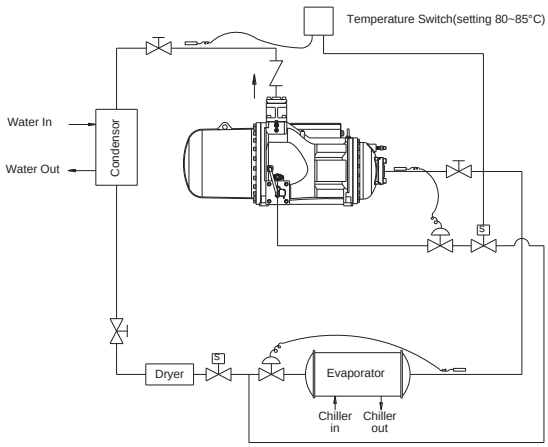


Figure 49 Liquid injection to chamber

Liquid injection applied with high temperature expansion valve

Select the high temperature expansion valve, which can sense the discharge temperature with its remote bulb. This can control the opening of expansion valve proportionally, and can reach the best cooling effect; it will control the compressor discharge temperature at an optimal situation of around 80°C.
It can also be installed with an additional solenoid valve or service valve in front of the high temperature expansion valve for the maintenance purposes. The solenoid valve will be opened while starting the compressor. The equilibrium tube of high temperature expansion valve should be connected to the high-pressure side to counter the internal pressure. However, when additional cooling in compression chamber like economizer operation, oil cooler application is used, or when condensing temperature is low, discharge temperature may be kept low and liquid injection may not be turned on, although motor load is severe and motor coil temperature is high. This may lead to motor failure. Therefore, in applications mentioned above, Pt1000 or Pt100 for liquid injection to motor is recommended instead.

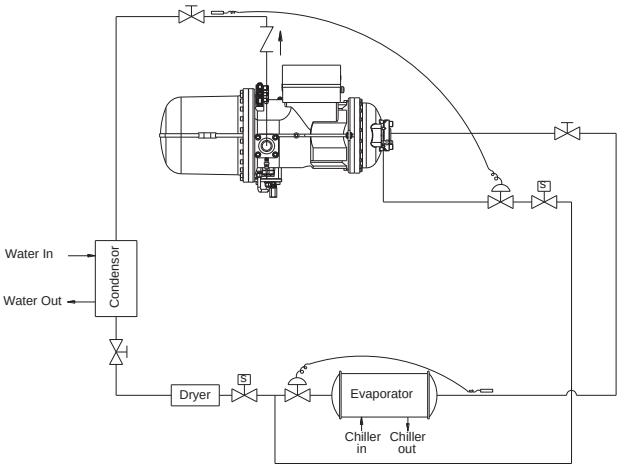


Figure 50 connected to motor

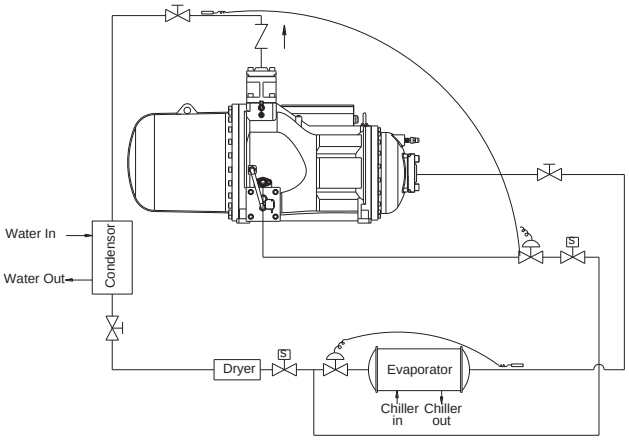


Figure 51 connected to chamber (ECO port)

b. Oil cooler applications

Compared to liquid injection applications, external oil cooler applications reduces the discharge temperature and at the same time gives better efficiency. Oil cooler application can be classified into 3 types: cooling by refrigerant, cooling by ambient air, cooling by cooling water. Oil cooler capacity can be calculated manually or using HANBELL selection software. When calculating manually, worst case operating conditions must be considered: minimum evaporating temperature, maximum suction gas superheat, maximum condensing temperature and the operation mode.

Cooling by refrigerant

The cooler uses refrigerant as the cooling medium. A basic refrigerant-cooled oil cooling system is shown in Figure 53.

In the oil cooler, solenoid valve for refrigerant circuit is controlled by oil temperature of the oil outlet of compressor.

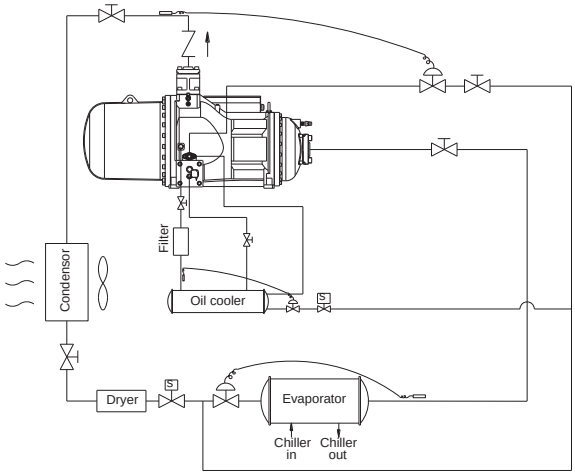


Figure 52 Oil cooling by refrigerant

Air-cooled oil cooling (cooling by ambient air)

The basic air-cooled oil cooling system is shown in Figure 54. This method of cooling is indirect cooling which uses ambient air to cool down the oil, which circulates in the oil cooler.

In the oil cooler, fan is controlled by oil temperature of the oil outlet of compressor.

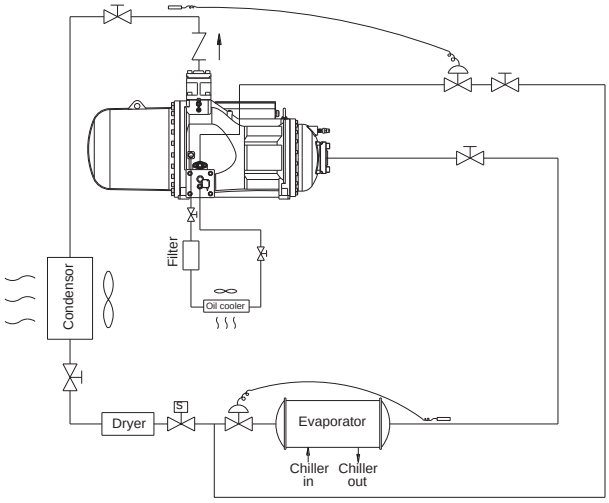


Figure 53 Oil cooling by ambient air

Water-cooled oil cooling (cooling by water)

This cooling method utilizes a shell and tube heat exchanger and a source of cooled liquid from an external cooling tower or closed loop evaporative cooler. Once-through water can be used but results in high water usage. An indirect cooling system uses a pump to circulate the cooling medium and a cooling tower or evaporative cooler to reject heat from the cooling medium. The basic water-cooled oil cooling system is shown in Figure 55.

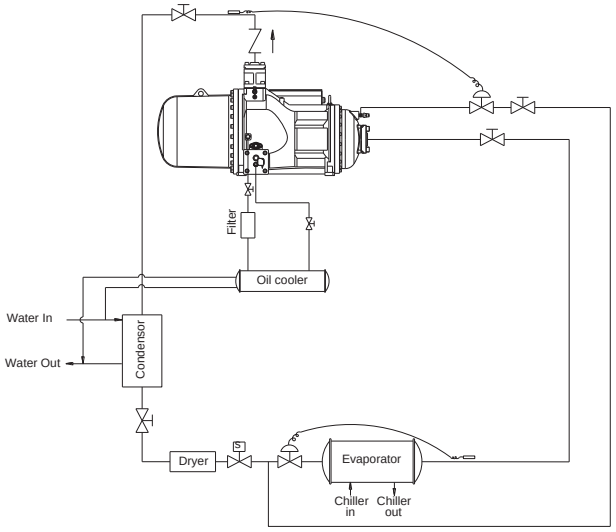


Figure 54 Oil cooling by water

Note:
1. Please decide appropriate oil cooler capacity by referring to HANBELL selection software.
2. The max. pressure drop allowed in external oil cooler is 1.5 kg/cm^2.
3. When applying an oil cooler with a compressor, please add appropriate refrigeration oil in accordance with the size of oil cooler as well as the length of piping.

7.2 Economizer applications

HANBELL screw compressor can be fitted with an additional middle connection for economizer operation. With this form of operation, refrigeration capacity and also system efficiency can be improved by means of a sub-cooling circuit or two-stage refrigerant expansion.
Please refer to Hanbell selection software for calculation of economizer capacity at different operating conditions.

Principle of operation

As opposed to the reciprocating operation of a piston compressor, the compression in a screw compressor takes place only with one flow direction. When the rotors turn, refrigerant vapor is pressed into the rotor grooves by the opposing rotor teeth and transported to end wall of the corresponding working space. In this phase, the volume is steadily reduced and the vapor is compressed from suction pressure to condensing pressure.
The pressure at the additional middle connection is at a similar level to the intermediate pressure with a two-stage system. As a result of these features, a screw compressor of this design can be combined with an additional sub-cooling circuit or an intermediate pressure vessel (flash type sub-cooler) for two-stage expansion. These measures result in a clearly increased refrigeration capacity due to additional liquid sub-cooling, especially with high-pressure ratios. The power consumption of the compressor increases slightly compare to the additional work that takes place at a better level of efficiency.

System with Economizer (sub-cooler)

With this form of operation, a heat exchanger (refrigerant sub-cooler) is used to sub-cooled liquid refrigerant. The sub-cooling is achieved by injecting a part of the refrigerant from the condenser through an expansion device in counter flow into the sub-cooler, which then evaporates due to the absorption of heat. The superheated vapor is pulled into the compressor at the Economizer connection and mixed with the vapor, which is already slightly compressed from the evaporator.
The sub-cooled liquid is at condensing pressure with this form of operation, the pipeline to the evaporator does not therefore require any special features, aside from insulation. The system can be generally applied. Figure 57 shows the system with economizer, **sub-cooler.**

System with economizer (flash type)

The liquid sub-cooling is achieved with this form of operation by reducing the boiling point pressure in an intermediate pressure vessel **(flash type sub-cooler)** arranged between condenser and evaporator. This physical effect leads to the cooling of the liquid down to the boiling point, due to evaporation of part of the liquid. To stabilize the pressure of the vessel, a regulator is used which at the same time controls the quantity of vapor flowing to economizer connection of the compressor.
This form of operation gives the most economical thermodynamic performance due to direct heat exchanging. As the intermediate pressure is reduced to the boiling point temperature this system should only be used with flooded evaporators. Figure 58 shows the system with economizer,
flash type sub-cooler.

Note:
1. When economizer is used, it is recommended to install a muffler before middle-pressure returned gas port in compression chamber to effectively mitigate pulsation noise in middle pressure as shown in Figure 56 below.

2. A filter and check valve are also recommended to install before ECO port of compressor.

3. If ECO port is applied to ECO applications, the compressor cannot be connected with the line for liquid injection to chamber.

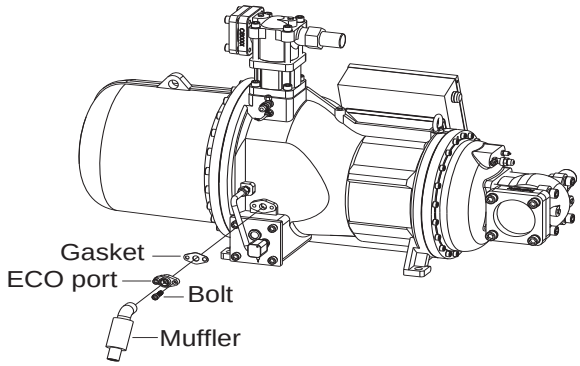


Figure 55 Installation of ECO buffer

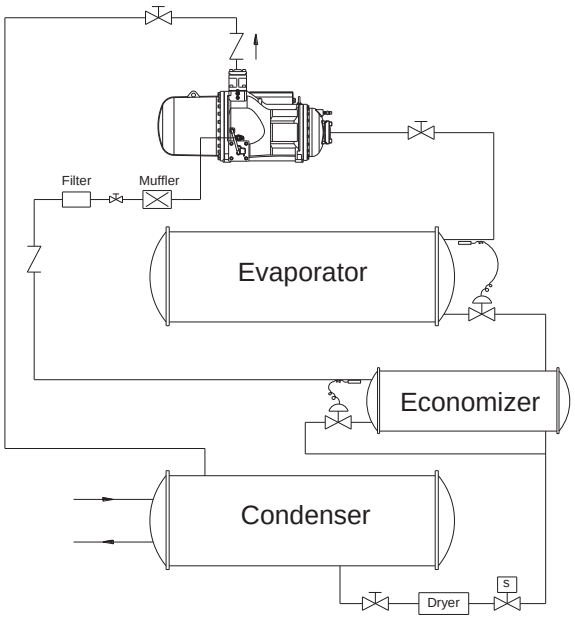


Figure 56 System with economizer (sub-cooler)

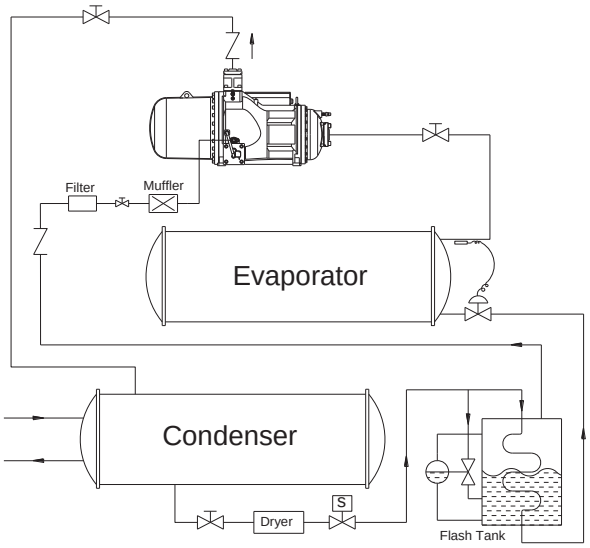


Figure 57 System with economizer (flash type sub-cooler)

7.3 Parallel system applications

In the rack or parallel system, it is possible that the unequal-distribution of returned oil from the evaporator that could cause low oil level in one or more of the compressors. Be sure to install the oil level switch inside each compressors and oil flow switch installed in each oil return line to ensure the returned oil in each compressor with normal oil level.
The basic design of the system is shown in Figure 59, twin compressor parallel system connections. The accessories installed are the basic and if there are more applications or protection required, contact HANBELL or local distributor/agent for more information or further confirmation.

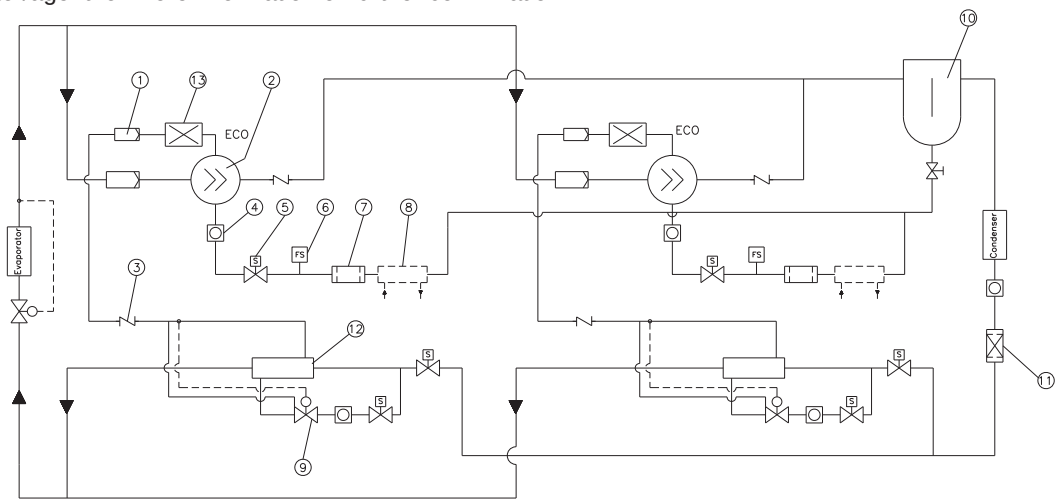


Figure 58 Parallel system with two compressors

Item	Description	Item	Description	Item	Description
1	Filter	6	Flow switch	11	Dryer
2	Compressor	7	Oil filter	12	Secondary cooler
3	Check valve	8	Oil cooler	13	Muffler
4	Sight glass	9	Expansion valve		
5	Solenoid valve	10	Oil separator		

7.4 Oil pump application

An additional oil pump is recommended to install to the system when the differential pressure of oil pressure and suction pressure is less than 4bar (for example: water cooled flooder chiller). If compressor is operating at the mentioned condition, the failure of modulation and lubrication will be happened and will seriously damage the compressor. Besides the installation of additional oil pump, a high – low pressure differential switch is also recommended to install to this kind of system. Please contact with Hanbell for more detailed information of oil pump.

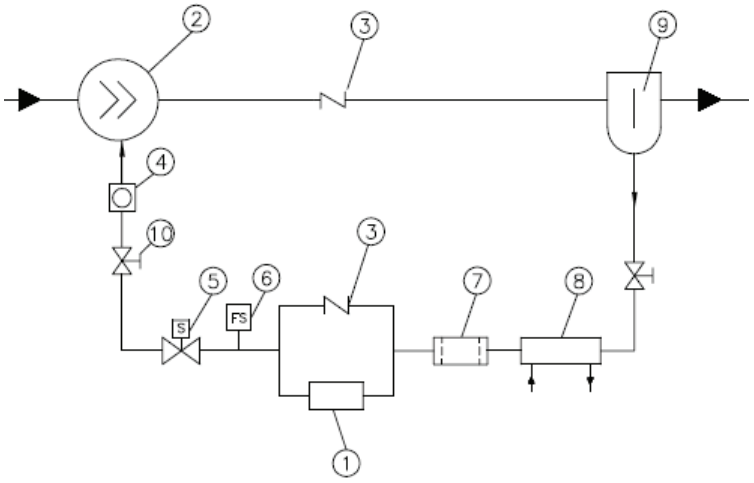


Figure 59 Additional oil pump

Item	Description	Item	Description	Item	Description
1	Oil pump	5	Solenoid valve	9	External oil separator
2	Compressor	6	Flow switch	10	Service valve
3	Check valve	7	Oil filter cartridge		
4	Sight glass	8	Oil cooler		

7.5 Important note of applications of compressor

1. Pump down

Do not pump down the compressor on the chiller as a routine operation except only for temporary maintenance or a long term shut down. Because pump down will cause extremely high temperature in the compression chamber and overheat of the motor as well due to less amount of refrigerant in the suction side. When doing the pump down, be sure to take notice of the items listed below :

a. Pump down should be done once each time, as it may be dangerous to the compressor, compression chamber for pumping down repeatedly.
b. The minimum suction pressure when doing the pump down should be over 15 psig for R-134a and 25 psig for R22.
c. Take notice of compressor running noise. If there is any abnormal noise happened, then emergently stop the pump down.

2. Long term partial load operation

If compressors have to run at partial load below 50% continuously, though maybe within operation limits under such operation condition and with temperature of motor below trip setting for overheating, insufficient dissipation of heat in motor will occur due to lower flow rate of suction gas at partial load. If compressors operate under high temperature for a long time, insulation of motor will deteriorate gradually at risk of serious motor damage finally. In such severe operation conditions, Hanbell strongly recommends installation of liquid injection system to cool motor coil and use of Pt1000 or Pt100 sensor to effectively control temperature of motor while running. It is suggested to switch on liquid injection when temperature of motor coil is higher than 60℃ and turn off liquid injection when it's lower than 50℃.

3. Low pressure receiver

When a compressor operates in the following application conditions, installation of a low pressure receiver is recommended in order to prevent massive liquid refrigerant from returning to the compressor under momentary changes of operation condition.

●Heat pump ●Parallel system ●system with long piping
●operating in the low ambient temperature area ●system heating load varies extremely

8 Selection software

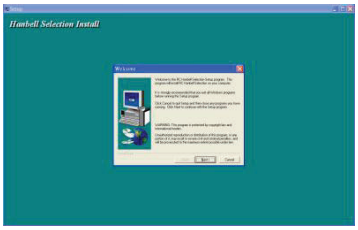
Selection software installation procedure

Step
1. This compressor model selection software is suitable for the operating system of Windows 98, NT or the above edition (Windows ME, 2000, XP)
   Systematic demand: The magnetic disc space should be at least 300MB.

2. Please use the whole screen 800x600 degree as best.

3. Before installing the software, please close all works and browser windows firstly.

4. To the selection software files, please move the cursor to **"setup.exe"** and double click.



5. And then it will present 「**welcome**」window, please select **"next"**
   Then, 「**users information**」window appears, please select **"next"** again and then the window appears 「**choose the purpose position**」
   Finally please choose the file position, click the **"next"** button. (Default recommends)

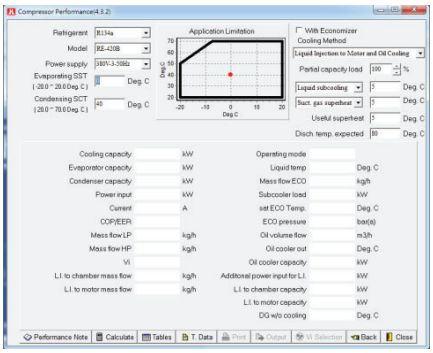
6. The software will decompress automatically.

Operating Procedure:

Step:
1. Before operating our selection software, please check any upgrade of selection software at Hanbell website.

2. Enter the main window and it will present products of 「RC2-A」, 「RC2-B」, 「RC2-AF」, 「RC2-BF」, 「**RE-A**」, 「**RE-B**」 「LB」, 「RC2-AV」, 「RC2-AVI」, 「RG」, 「RT」 button of ten series of Hanbell compressors.

3. After selecting 「**RE**」, will present several function buttons:
   (3.1) choose the unit, 「**SI**」or 「**Imperial**」. **(default unit is SI)**
   (3.2) 「**PERFORMANCE**」button shows the performance sheet of the compressor



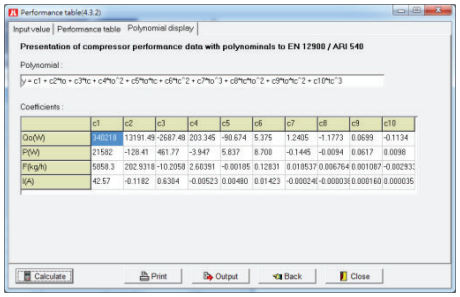
The window is the operating mode of a compressor, just key-in the following condition and then click the 「**Calculate**」button.
- Refrigerant type
- With economizer (yes/no)
- Compressor model
- Oil cooler or liquid injection
- Power supply (default is 380V 3 50Hz)
- Partial load percent (%)
- Evaporating SST (˚C,˚F)(default is 0 ˚C)
- Condensing SCT (˚C,˚F)(default is 40 ˚C)

Showed the calculated performance data in the middle of the window.

In the lower part of the window, there are several kinds of buttons:
「**Calculate**」: Must click this key to calculate the value.
「**Tables**」： Calculate the coefficient of performance by means of polynomial.

「**T.Data**」：The technical data is the same with function key of technical data
「**Print**」： Copying the calculated performance data
「**Vi selection**」：After calculating, different Vi value can be chose by clicking this button.

(3.2.1) Click「**Tables**」button and the window will appear right one (default window), it can calculate the coefficient of performance using polynomial.



(3.2.2) Click the polynomial display button and then「**Calculate**」. Presentation of compressor performance data using polynomial calculation.

(3.3)「***SELECTION***」by clicking this button, it will help the customer how to choose screw compressor model.

After clicking the「***SELECTION***」button, the right window is customer's necessary operating mode. Just key-in the following data.

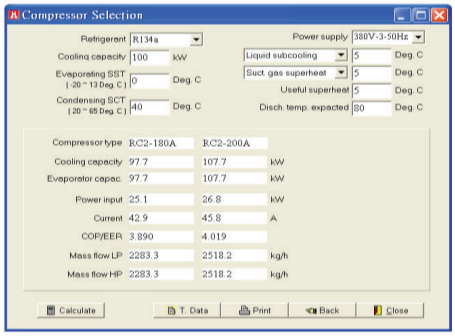
- Refrigerant type
- Evaporating SST
- Cooling Capacity (KW)
- Condensing SCT
- Power supply

The data shown in the middle of the window is the compressor model and its performance

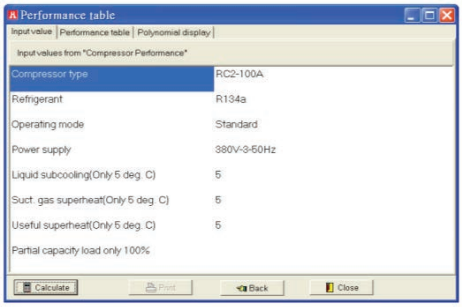
「**Calculate**」: Must click this button to calculate the value. After keying the required data click this button and will show the compressor model and the performance.

「**T.Data**」: The technical data is the same with function key of technical data (3.4).

「**Print**」: Copying the calculated performance data

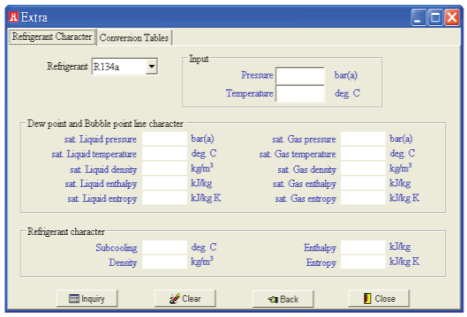


(3.4)「***T.DATA***」button is for the detailed technical information that the customer needs to know about the compressor.



(3.5)「**EXTRA**」**Refrigerant** Contrast sheet (Pressure – Temperature) and unit conversion. Entering the window, it will present the following information:

「**Refrigerant Characteristic**」(R134a, R22, R407C)
「**Conversion Tables**」：
Temperature, length, area, volume, Mass
Pressure, Specific Volume, density, Velocity
Flow rate, power, Specific Enthalpy, Specific Entropy
(specific heat)



(3.6)「**ABOUT**」Shows the edition of this software and technical support.

(3.7)「**EXIT**」Leave current window

9. Warranty

All HANBELL screw compressors are put through strict quality and performance testing prior to shipping from the factory. The screw compressors are manufactured from the finest quality material and are warranted for one year after the completion of installation and commissioning at the jobsite or up to 18 months from the original date of sales by HANBELL or designated sales agent, whichever comes first.

However, HANBELL will not be responsible if the compressor does not work properly for any of the following reasons:

1) damaged caused by others including shipping, natural disaster, war, etc.
2) damage caused by improper installation, operation or maintenance that is not in accordance with the HANBELL Technical Manual or instruction,
3) damaged caused by modification of any part on or connected to the compressor, and/or
4) damage caused by the improper maintenance or repair by a non-authorized technician.
5) HANBELL will also not responsible for any accident, which may happen to personnel while installing, setting up, operating, maintaining, and/or repairing the compressor.

North American Distributor of Hanbell Compressors

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