



RC Series Screw Compressors

Technical Manual



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HBME-RC-04-D

1. Compressor Specifications

1.1 **Scope** : RC series screw compressors are inclusive of several different range with the models of RC10~RC11, RC12~RC17, RC18~RC21 and RC22~RC24 .

1.2 RC series compressors' specifications

1.2.1 RC series design specifications

Compressor	Displacement	m^3 / hr	RC10	RC11	RC12	RC13	RC14	RC15	RC15L	RC16	RC17
			118/98	165/137	207/172	233/193	309/257	352/293	384/320	490/407	567/471
	Rated Speed	rpm	3550/2950								
	Volume Ratio	Vi	2.2, 2.4, 2.6, 3.0, 3.5, 4.8								
	Capacity Control	%	3-steps, or 33%~100% continuous	4-steps, or 25%~100% continuous capacity control system							
Lubrication		Differential pressure feed lubricant									
Motor	Type		3 Phase, 2 Pole, Squirrel-Cage, Induction Motor								
	Starting -up		Y-△ Starting								
	Frequency	Hz	60/50								
	Voltage	V	220, 380, 440, 460, 480 / 380, 400, 415								
	Insulation		Class F								
	Protection		PTC PROTECTION								
Lubricant Charge	Liter	7	7	7	8	14	16	16	15	18	
Oil Heater	W	150									
Hydrostatic Pressure T_{test}	kg / cm ² G	42									
Weight	kg	260	270	390	435	540	620	620	760	830	

Compressor	Displacement	m^3 / hr	RC18	RC19	RC20	RC21	RC22	RC23	RC24	-	-
			670/545	735/598	952/774	1024/832	1310/1089	1536/1277	1832/1522	-	-
	Rated Speed	rpm	3550/2950								
	Volume Ratio	Vi	2.2, 2.4, 2.6, 3.0, 3.5, 4.8								
	Capacity Control	%	4-steps, or 25%~100% continuous capacity control system								
Lubrication		Differential pressure feed lubricant									
Motor	Type		3 Phase, 2 Pole, Squirrel-Cage, Induction Motor								
	Starting -up		Y-△ Starting (RC 22~24 Direct starting/ Cross on line or Reactance Starting)								
	Frequency	Hz	60/50								
	Voltage	V	380, 440, 460, 480 / 380, 400, 415								
	Insulation		Class F								
	Protection		PTC PROTECTION								
Lubricant Charge	Liter	23	23	28	28	-	-	-	-	-	
Oil Heater	W	150									
Hydrostatic Pressure T_{test}	kg / cm ² G	42									
Weight	kg	880	990	1220	1240	1490	1580	1630	-	-	

1.2.2 RC series compressors' performance datum

Model Refrigerant		RC10	RC11	RC12	RC13	RC14	RC15	RC15L	RC16	RC17	
R22	Capacity	kW	116.1/96.5	156.7/130.2	198.5/164.9	223.8/186	296.7/251.3	349.5/290.4	380.6/316.3	476.6/396	572.8/475.9
	Power Input	kW	27.5/22.9	37/30.7	46.7/38.8	51.4/42.7	68.9/55.5	77.6/64.5	83.7/69.6	107.3/89.2	125.2/104
R134a	Capacity	kW	77.6/65.8	104.1/88.3	130.4/112.1	149.1/123.9	199.2/169.1	232.9/193.5	253.6/213	321.2/267	383/317.6
	Power Input	kW	17.6/14.8	23.4/19.6	29/24.5	32.3/26.9	43.4/36.6	49.1/40.8	53.5/45.4	68/56.5	80.7/67.1
R404A	Capacity	kW	114/94.7	152/126.3	191/158.7	218.4/182.3	292.1/242.8	336.9/280	366.9/304.9	468/388.9	551/457.9
	Power Input	kW	31.7/26.3	42/34.9	52.5/43.5	59/49.1	78.4/65.2	89.4/74.3	96.3/80.1	123.1/102.3	143.9/119.6
R407C	Capacity	kW	112.8/93.6	150.4/125	187.7/156	218.2/181.3	287/238.6	340/283.1	369.9/308	468/388.9	548.4/455.7
	Power Input	kW	27.3/21.9	36.2/29.1	44.2/36.3	50/40.9	67.1/54.3	74.7/62.1	81.4/67.4	104.6/85.2	119.9/99.6

Model Refrigerant		RC18	RC19	RC20	RC21	RC22	RC23	RC24	
R22	Capacity	kW	668.8/555.8	736.3/611.8	962.2/799.6	1037.7/862.3	1404.6/1167.2	1653.9/1374.4	1889.7/1570.3
	Power Input	kW	147.7/122.8	162.2/134.8	209.8/174.4	225.8/187.7	302.9/251.7	354.9/294.9	401.4/333.6
R134a	Capacity	kW	451.2/375	495.5/411.8	645/536	694.8/577.4	918.6/763.3	1082.3/899.4	1227.4/1019.9
	Power Input	kW	95.3/79.2	104.5/86.9	135.3/112.4	145.6/121	190/157.9	222.9/185.2	250.1/207.8
R404A	Capacity	kW	643.5/534.7	708.4/588.7	924.4/771.2	998.3/829.6	1372.9/1140.9	1616.2/1343	1804/1499.1
	Power Input	kW	169.8/141.1	186.4/154.8	241/200.4	259.5/215.6	360.8/299.8	422.7/351.2	467.1/388.1
R407C	Capacity	kW	640.3/532.1	704.9/585.8	921.2/765.5	993.5/825.6	1371.9/1140	1615.3/1342.3	1802.8/1498.1
	Power Input	kW	141.5/117.6	155.3/129	200.9/167	216.2/179.7	298/247.6	349.1/290.1	385.8/320.6

RC series based on C.T.=40°C, E.T.=4°C, Sub cooling=5°C, Superheating=5°C

R404A, R407C C.T & E.T. indicate the dew point temperatures.

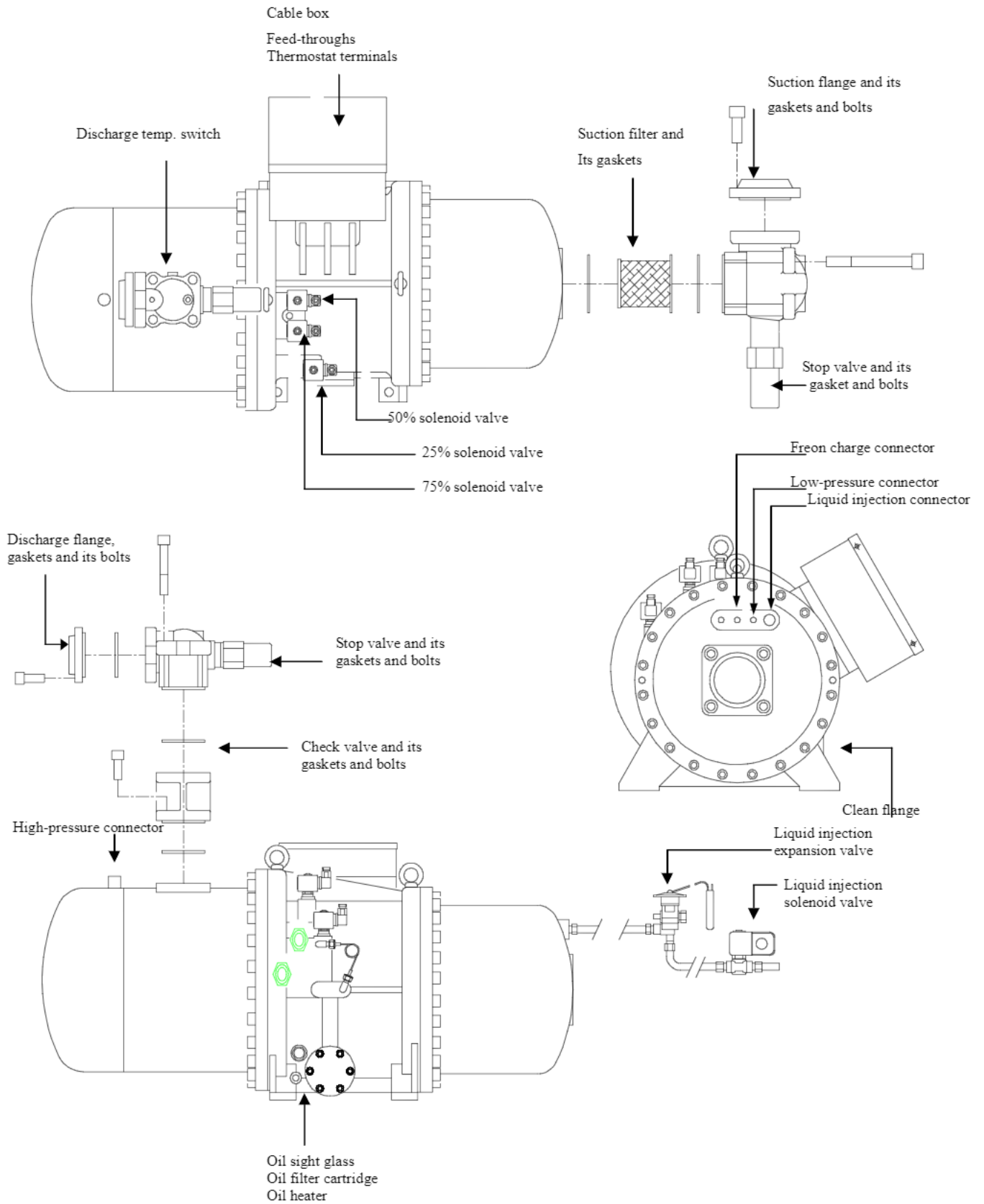
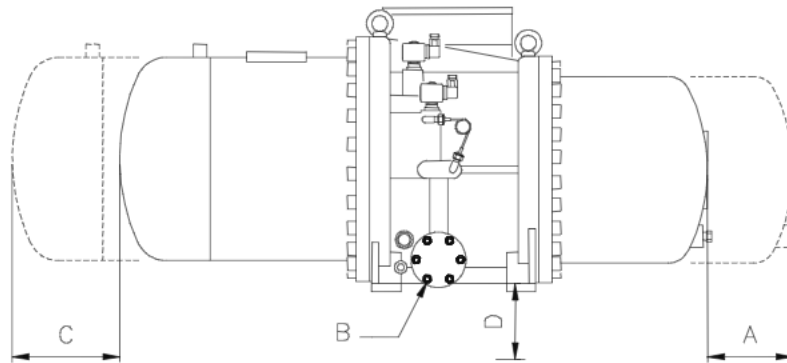


Fig 1.5 Compressor installation guide

1.3.4 Maintenance space

The required space for the compressor's future maintenance in the job site is recommended as shown in Table 1.1.



	RC10/ RC11	RC12	RC13	RC14	RC15/ RC15L	RC16	RC17	RC18	RC19	RC20	RC21
A (cm)	41	41	46	47	51	54	59	60	60	65	65
B. Outwards (cm)	28	28	28	28	28	28	28	35	35	35	35
C (cm)	26	26	30	28	33	30	35	37	37	45	45
D (cm)	15	15	15	15	15	15	15	---	---	---	---
E (Suction filter) (mm)	103			143	153			210			
F (Oil filter) (mm)	200							232			

Table 1.1 Compressor recommended space for maintenance

- Reserve enough space for the connection and installation of the electrical terminal box, service/stop valves and solenoid valves on the compressor.
- Consider the compressors' future overhauling can be performed easily, all compressors' outside parts and electrical controller lines and terminal connection can be disassembled and re-assembled easily.

1.3.5 Attention on the compressor piping work

The unsuitable piping works done to the compressor could cause abnormal vibration and noise, pay more attention to the following illustrations to avoid the trouble that may happen in the future.

- The welding on the compressor with welding bar ingredient should include at least 15% of Argon, and the system should be charged inside over **28 Bar (R-22)** for the system pressure testing.
- To avoid the compressors' harmonic vibration transferred by the structure and piping of the chiller while in operation, the cushion or shock absorber should be installed in the suction and discharge tube. The **Cleanliness** of the system should be kept after welding the piping to avoid any swarf or debris contained inside the system, because it may cause serious damage to the compressor during operation. Figure 1.6 shows a **6 to 8 mm shock Absorber** installed under the compressor mounting pad to isolate the vibration and the noise transferred to other portions.

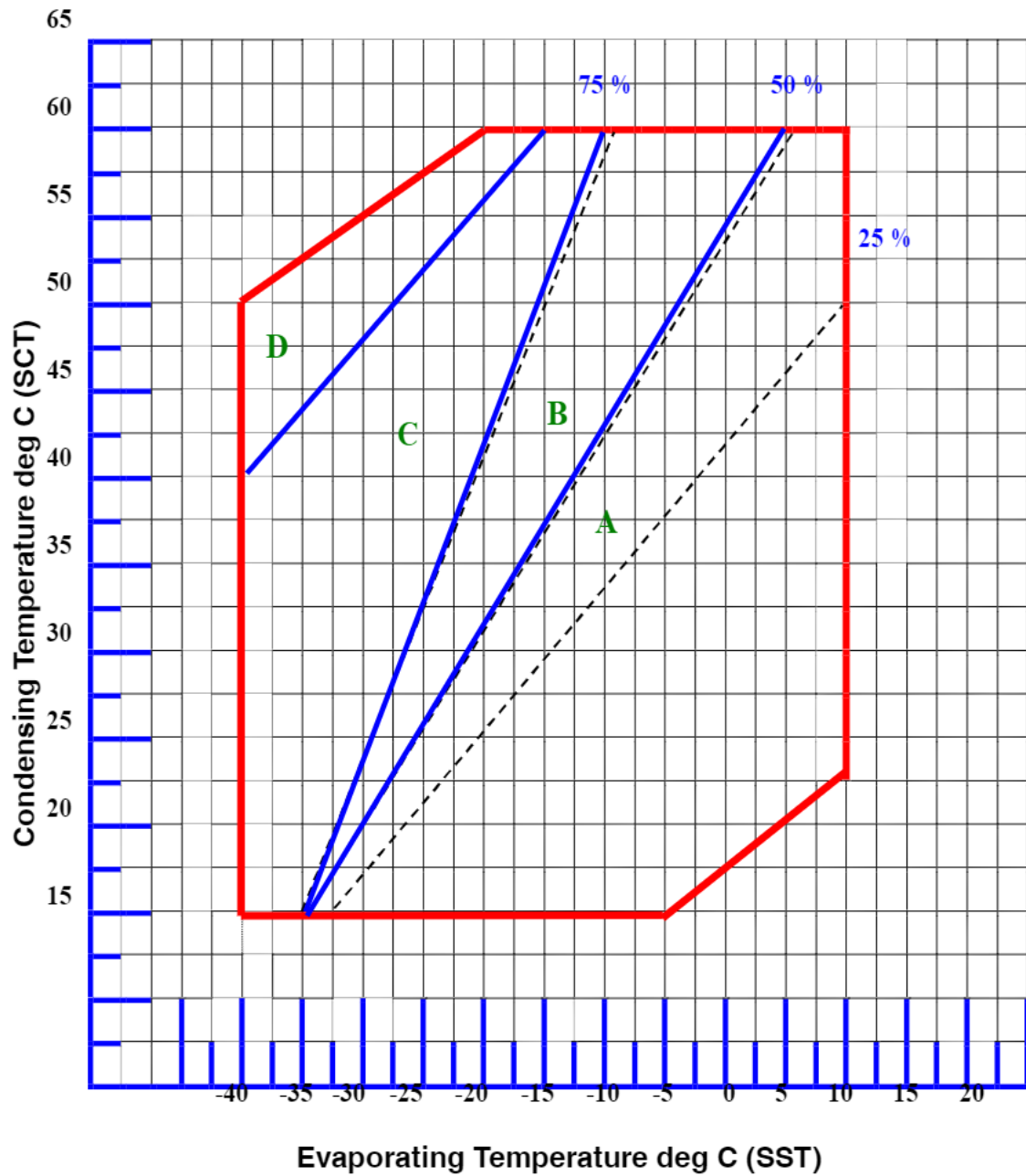


Fig. 1.7.3 R404A Limitation Diagram

- A: Normal Operation
- B: Oil Cooler or Liquid Injection
- C: Oil Cooler and Liquid Injection
- D: Check with HANBELL

1.6.5 Capacity control system

The RC series compressors have two kinds of capacity control i.e. 3-step (RC10~RC11 only)/4-step (RC12~RC24) and step-less (continuous) modulating capacity control design; 3-step/4-step capacity control means 100%-66%-33%/100%-75%-50%-25%; the 25% capacity step are normally for starting the compressor only, but if it is required to run the compressor at 25% capacity longer (RC12-RC24), then the liquid injection devices are essential for cooling the motor. Continuous modulating (step-less) capacity control which range from 100%-33% (RC10-RC11)/100%-25% (RC12-RC24). (The controller for step/step-less are exclusive to the compressor standard accessories, i.e. it is optional for customer to select. Hanbell also offers micro controller for customers' application in chillers, contact Hanbell local agent/distributor for more information)

1.6.6 Starting current of compressor

Definition of the Starting Current : The current of motor coil (stator) energized with rated frequency and voltage during locked the motor rotor, so the starting current is the same as so-called locked rotor ampere (LRA).

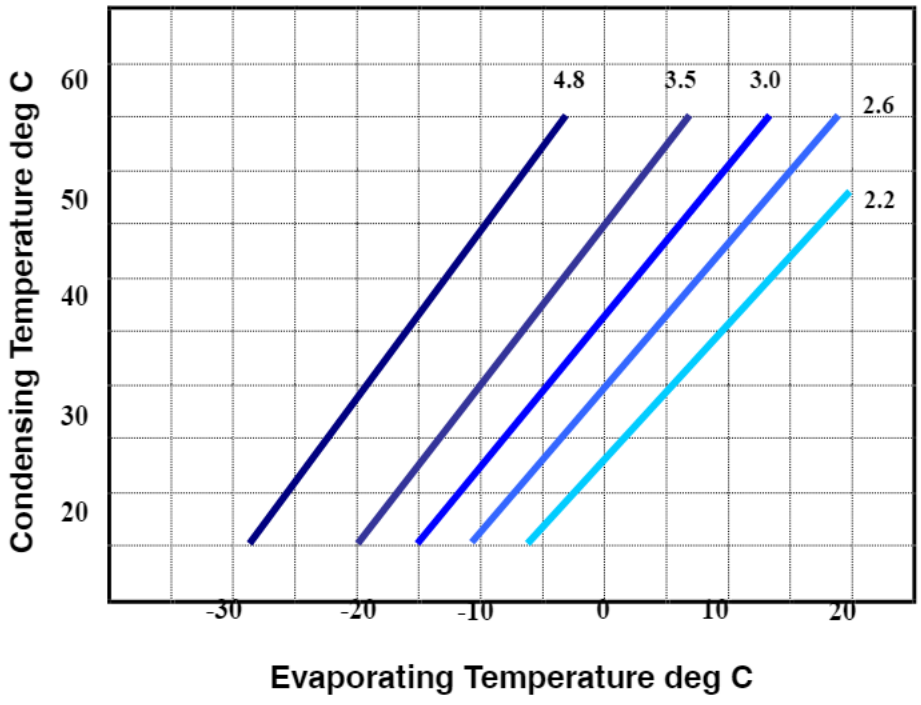
Starting current of RC compressors (LRA):

R22, R404A, R407C, R507A

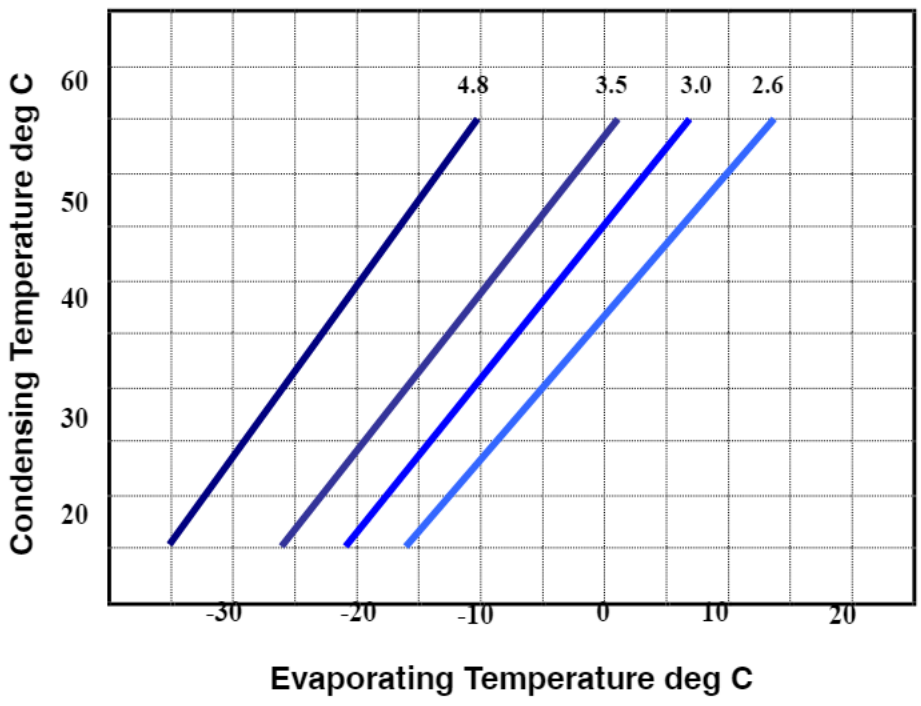
Model	380V, 60Hz	380V, 50Hz	Model	380V, 60Hz	380V, 50Hz
RC10	300	250	RC17	1120	1030
RC11	330	275	RC18	1350	1195
RC12	410	340	RC19	1805	1385
RC13	540	445	RC20	2365	1650
RC14	600	510	RC21	2365	2100
RC15	815	710	RC22	2345	2255
RC15L	815	710	RC23	2945	2830
RC16	885	765	RC24	3065	2945

Please refer to the latest HANBELL SELECTION PROGRAM for more information!

The current value measured by the ampere meter during starting the compressor are different to the above corresponding value, because the starting peak value while starting the compressor can not be caught by the ampere meter easily and precisely. Normally the value of **LRA Will Be approximately 3.0~3.5 Times** the rated current, it is available to catch the starting peak value by using the clamp which has the peak hold function button.



R407C Vi Selection Diagram



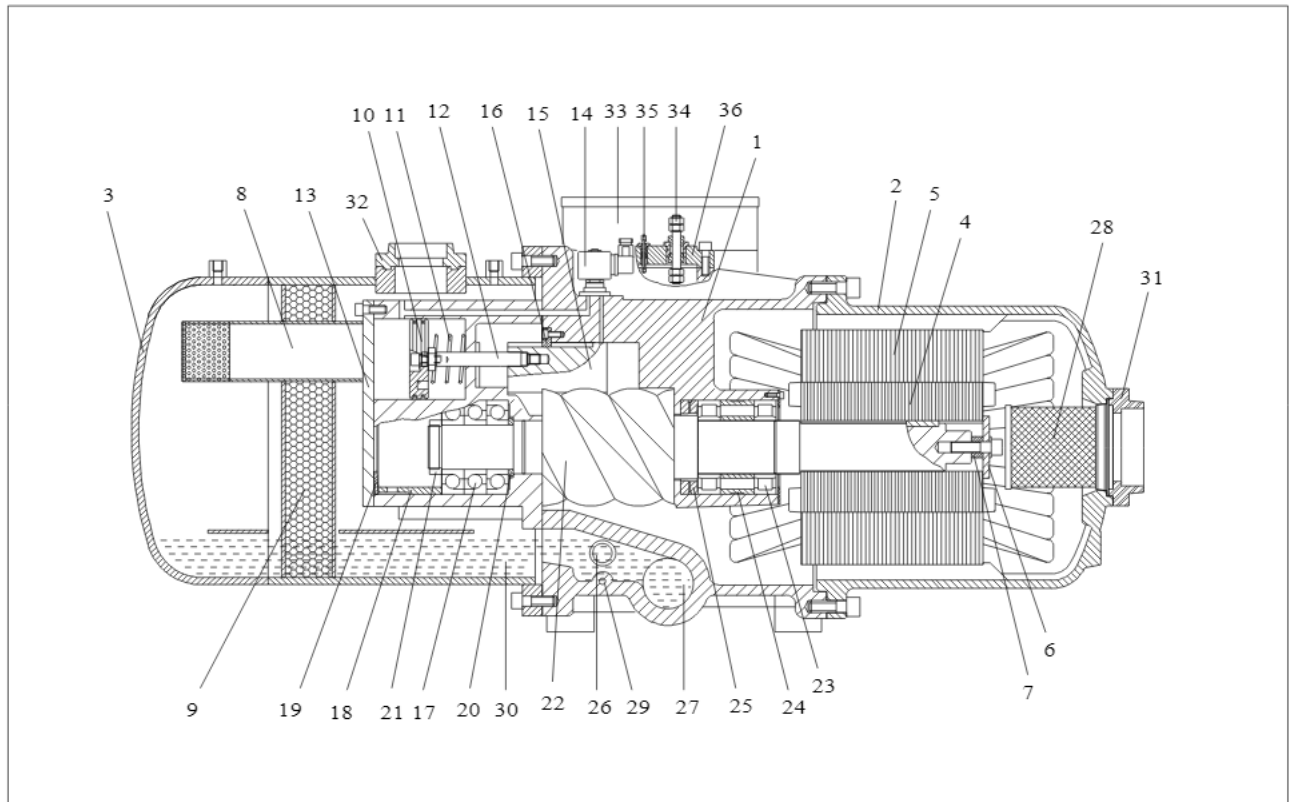
R404A Vi Selection Diagram

2. General Description

2.1 Construction

Fig. 2.1 shows Hanbell screw compressor construction with index.

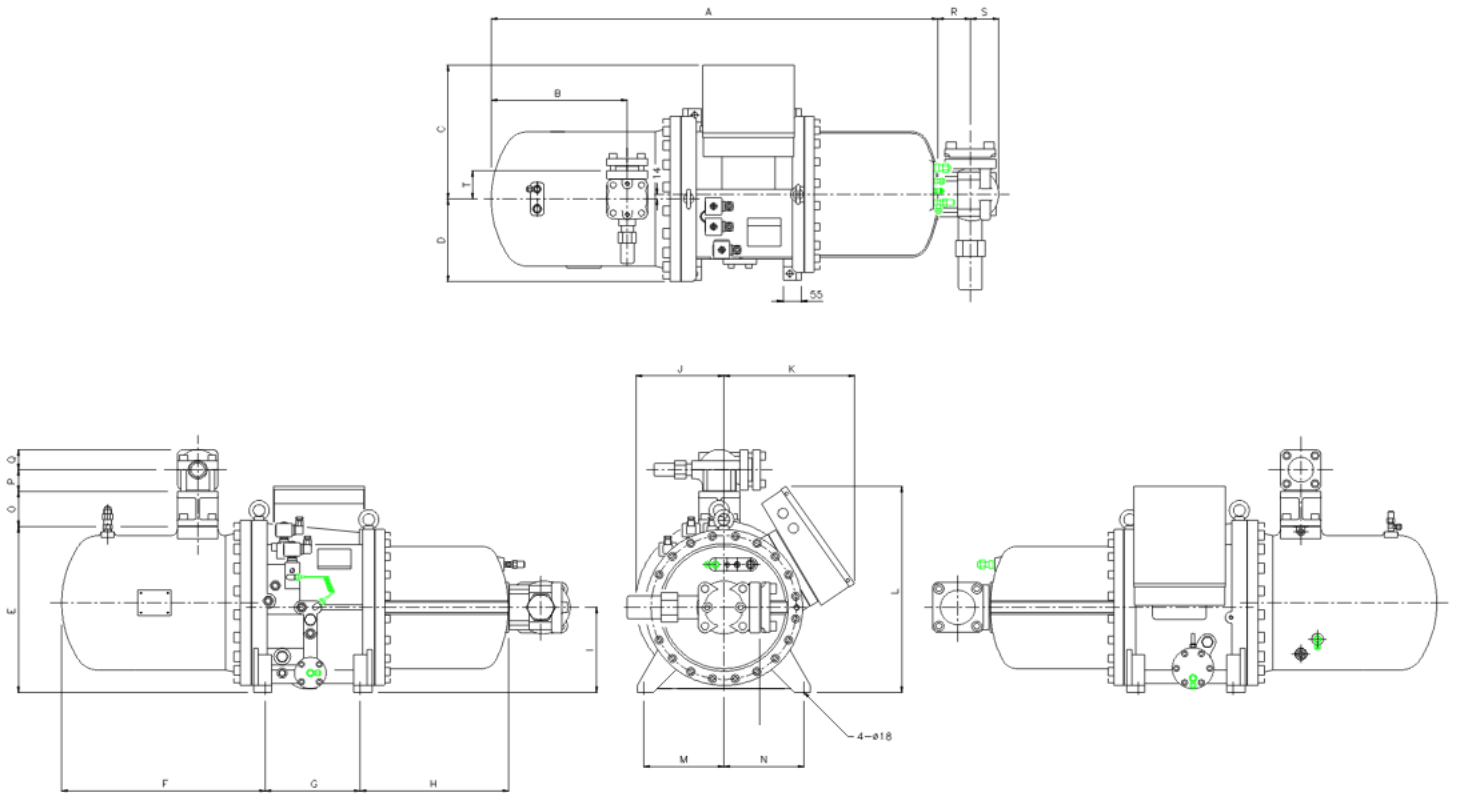
FIG. 2.1 Construction Of Compressor



Index to fig. 2.1

- | | |
|--------------------------------|--|
| 1. Compressor casing | 20. α -Balance piston |
| 2. Motor casing | 21. Bearing slot nut |
| 3. Oil separator | 22. Male rotor |
| 4. Motor rotor assembly | 23. Suction bearings |
| 5. Motor stator assembly | 24. Suction bearings inner/outer spacer ring |
| 6. Motor rotor washer | 25. Oil guiding ring |
| 7. Motor rotor spacer ring | 26. Oil level sight glass |
| 8. Oil separator baffle | 27. Oil filler cartridge |
| 9. Oil separator cartridge | 28. Suction filter |
| 10. Piston | 29. Oil heater |
| 11. Piston spring | 30. Refrigeration Lubricant |
| 12. Piston rod | 31. Suction flange |
| 13. Bearing seat's cover plate | 32. Discharge flange |
| 14. Modulation solenoid valve | 33. Cable box |
| 15. Modulation slide valve | 34. Power bolt |
| 16. Slide valve key | 35. Thermostat terminals |
| 17. Discharge bearings | 36. Motor cable cover plate |
| 18. Discharge fixed ring | |
| 19. Disc spring | |

3.1.1 RC 12~RC17 Outline drawing



DIMENSION										UNIT: mm
Model	A	B	C	D	E	F	G	H	I	J
RC12	1042	310	378	229	447	501	200	341	225	245
RC13	1150	345	378	229	447	536	228	386	225	245
RC14	1217	365	405	250	502	567	251	399	257	264
RC15/15L	1339	408	405	250	502	610	285	444	257	264
RC16	1334	392	453	275	553	613	288	433	275	315
RC17	1459	440	453	275	553	661	320	478	275	315
DIMENSION										UNIT: mm
Model	K	L	M	N	O	P	Q	R	S	T
RC12	362	592	225	225	101	57	53	82	69	75
RC13	362	592	225	225	101	57	53	82	69	75
RC14	391	624	240	240	106	67	61	97	85	86
RC15/15L	391	624	240	240	106	67	61	97	85	86
RC16	413	655	270	230	120	82	68	103	105	95
RC17	413	655	270	230	120	82	68	103	105	95