Leading the Future in Refrigeration Technology

EMERSON
ZB Scroll Compressor
Product Manual

Copeland Scroll™

EMERSON™
Climate Technologies

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ZB Series

Index

ZB Series

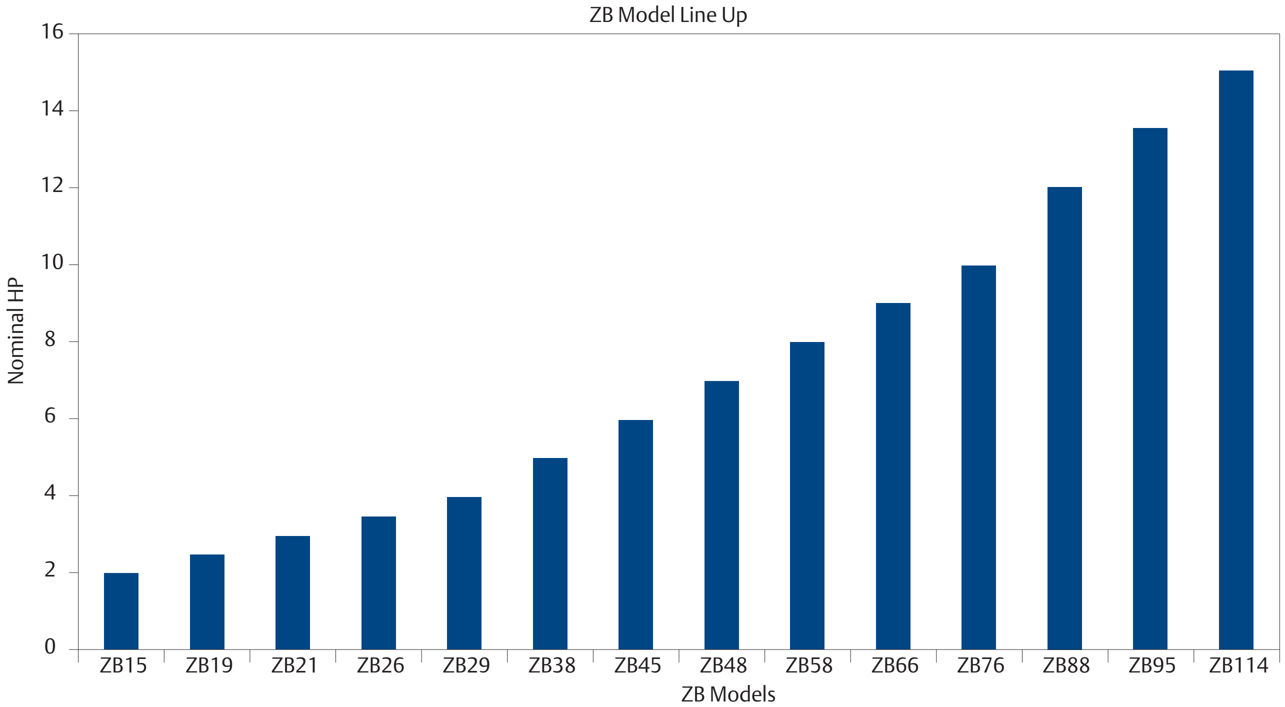
General Information

ZB Scroll Compressors For Refrigeration And Process Cooling:

In the years since Emerson Climate Technologies Introduced ZB scroll compressors for medium-high temperature refrigeration and process cooling applications, it has been well received by our customers. ZB scroll compressors are revolutionizing this segment of the industry by the providing following benefits to our customers.

* Complete range between 2-15 HP
* Proven reliability
* Superior efficiency
* Low sound levels
* Availability for HFC and HCFC refrigerants
* All voltage offering
* Oil sight glass & Rotalock features

Customers can be confident that ZB scroll compressors are coming from Emerson Climate Technologies experience of over 80 million scroll compressors. ZB scroll compressors are manufactured in our scroll factories in Suzhou, China and Rayong, Thailand. To our customers, this gives additional value by lower inventory and reduced shipping cost.



Description of Features

Dual Compliance

Compliance means sealing between the orbiting and fixed scroll involutes. Dual compliance means the sealing is on both the axial and radial directions. This prevents refrigerant leak back across successive scroll pressure pockets. Compliance design also allows the scroll involutes to separate in both the radial and axial directions. This allows debris or liquid refrigerant to pass through the scroll involutes without damaging the compressor. Benefits of Dual Compliance are:

* Increased efficiency
* Better liquid handling capability
* Better handling of debris

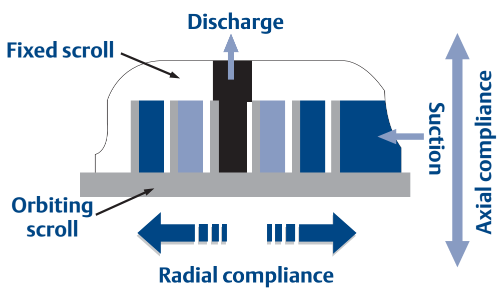


Figure 1

Scroll Wear In

The scroll involutes of Copeland scroll compressor wear in, rather than wear out. So unlike in other compressor technologies among similar categories, there is no constant degradation of performance with time due to wear out.

Lower sound, vibration and pulsation

The compression process in a scroll set is symmetrical and continuous. This inherently reduces the sound, vibration and pulsation. This eliminates the need for use of vibration absorbers and suction or discharge mufflers in most of the applications. In further, ZB scroll compressors are engineered to produce smooth sound spectrum which improves the quality of sound.

Unloaded Start

The scroll sets separate at the instant of compressor shutdown. This allows the scroll set internal pressures to equalize on compressor stops. In addition to this, the scroll sets are not engaged at the instant of starting. Scroll sets engage only after few milliseconds of startup. This allows easier startup of ZB scroll compressors. Due to this design feature, typically a start assist kit is not required even on single phase compressors.

DU bearings

A space age bearing material comprising of porous bronze with PTFE-lead overlay. These bearings are used in ZB scroll compressors in the scroll drive and main bearings. DU bearings work with exceptionally low friction between the load bearing surfaces. In addition, DU bearings can operate safely for a short time with loss of lubrication. This situations could happen on compressor applications due to oil pump out during a flooded start or heavy oil dilution after a defrost cycle.

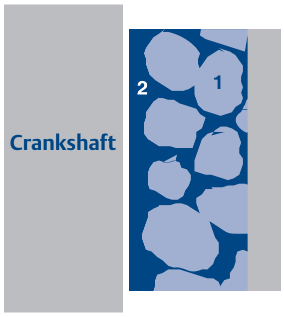
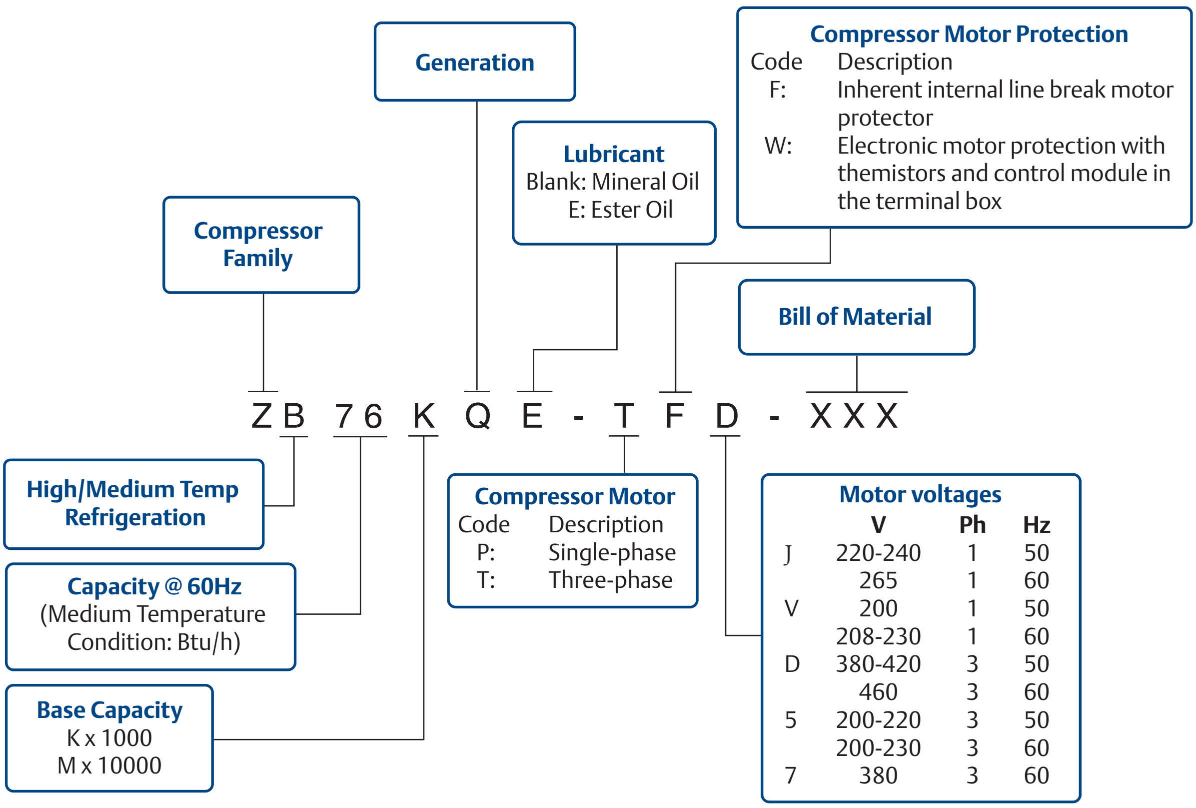


Figure 2

All specifications in this catalogue are subject to change without notice.

Nomenclature & BOM



Bill of Material (BOM)

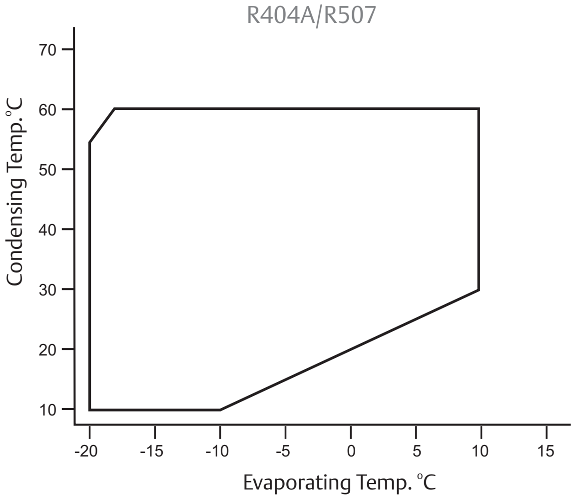
Compressor Model	BOM Number	Suction & Discharge Brazing Connection	Suction & Discharge Rotalock Connection	Oil Sight Glass	Schrader Valve
ZB15-ZB48	523		X		
	524	X			
	558	X		X	
	559		X	X	
ZB58-ZB114	523*		X		
	524*	X			
	550	X		X	X
	551		X	X	X

*Not applicable for ZB95/114 models.

Application Envelope

R404A/R507 & R134a

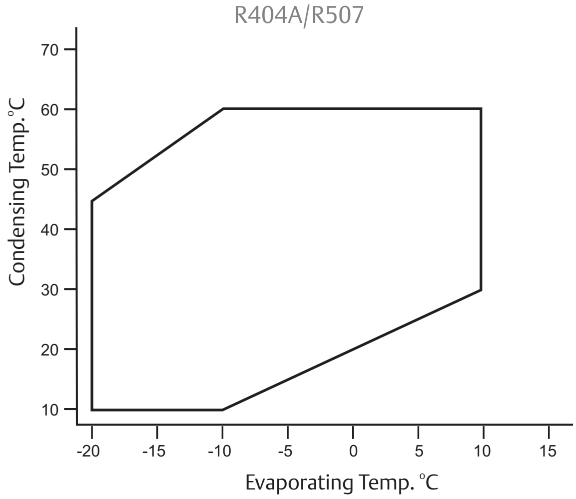
ZB15~ZB88
R404A/R507



Note:

1. Envelope In Non Shaded Region, max return gas temperature of 18.3°C
2. Envelope In Shaded Region, Max superheat of 11K only

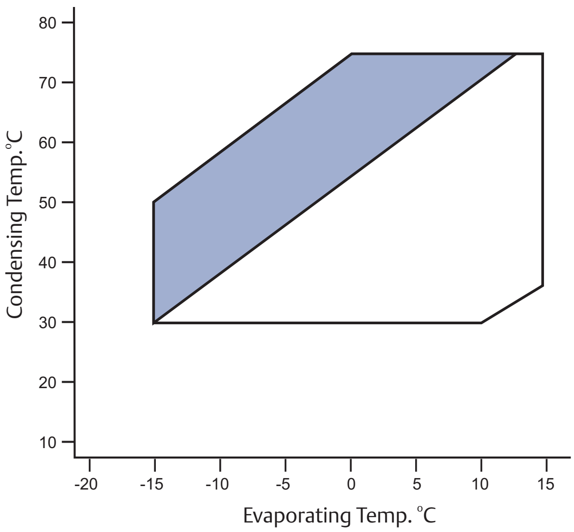
ZB95/ZB114
R404A/R507



Note:

1. Envelope In Non Shaded Region, max return gas temperature of 18.3°C
2. Envelope In Shaded Region, Max superheat of 11K only

ZB15~ZB76
R134a



Note:

1. Envelope In Non Shaded Region, max return gas temperature of 18.3°C
2. Envelope In Shaded Region, Max superheat of 11K only

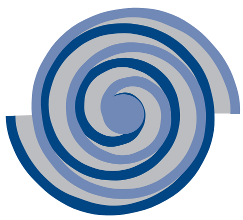
1. Scroll Compression process

Compression in the scroll is created by the interaction of an orbiting spiral and a stationary spiral. Gas enters the outer openings as one of the spirals orbits.

The open passages are sealed off as gas is drawn into the spiral.

As the spiral continues to orbit, the gas is compressed into two increasingly smaller pockets.

By the time the gas arrives at the center port, discharge pressure has been reached.



Actually, during operation, all six gas passages are in various stages of compression at all times, resulting in nearly continuous suction and discharge.

The scroll is a simple compression concept first patented in 1905. A scroll is an involute spiral which, when matched with a mating scroll form as shown above, generates a series of crescent-shaped gas pockets between the two members. During compression, one scroll remains stationary (fixed scroll) while the other form (orbiting scroll) is allowed to orbit (but not rotate) around the first form. As this motion occurs, the pockets between the two forms are slowly pushed to the center of the two scrolls while simultaneously being reduced in volume. When the pocket reaches the center of the scroll form, the gas, which is now at a hige pressure, is discharged out of a port located at the center. During compression, several pockets are being compressed simultaneouly, resulting in a very smooth process. Both the suction process (outer portion of the scroll members) and the discharge process (inner portion) are continuous.

2. Compressor Internal Protections

2.1 Internal Pressure Relief Valve:

Models ZB15- ZB48 has internal pressure relief valve, which open at a discharge to suction differential pressure of 375 to 450 psi. This action will trip the motor protector and remove the motor from the line.

Models ZB58 - ZB114 do not have internal pressure relief valves. To ensure safe operation, a high pressure control must be used in all applications.

The high pressure control should have a manual reset feature for the highest level of system protection. Maximum cut out settings are listed in **Table 1** If the compressor is fitted with a Rotalock valve the high pressure switch MUST be connected on the compressor side of the valve.

Compressors require a low pressure control for loss of charge protection. If allowed to go undetected, loss of system charge will result in overheating and damage to the scrolls and floating seal. Prolonged operation with low charge will result in decomposition of the oil that might require complete system replacement. Minimum cut out settings are listed in **Table 1**. The low pressure cut-out, if installed in the suction line to the compressor, can provide additional protection against a TXV failed in the closed position, a closed liquid line service valve, or a blocked liquid line screen, filter, orifice, or TXV. All of these can starve the compressor for refrigerant and result in compressor failure. The low pressure cut-out should have a manual reset feature for the highest level of system protection. If a compressor is allowed to cycle after a fault is detected, there is a high probability that the compressor will be damaged and the system contaminated with debris from the failed compressor and decomposed oil. If the compressor is fitted with a Rotalock valve the low pressure switch MUST be connected on the compressor side of the valve.

Table 1
Pressure Setting Recommendations

Model	Control Type	R404A/R507	R134a
ZB15-ZB48	Low	1.2Kg/cm² 17.06 Psi	0.3Kg/cm² 4.27 Psi
ZB58-ZB114	High	31.88Kg/cm² 453.33 Psi	23.9Kg/cm² 339.86 Psi
	Low	1.2Kg/cm² 17.06 Psi	0.3Kg/cm² 4.27 Psi

2.2 Internal Scroll Temperature Protection

Events such as loss of charge, condenser fan failure, or low side charging with inadequate pressure will cause the discharge gas to quickly rise. Excessively high discharge gas temperatures would affect the scroll compressor reliability. To prevent damage to scroll compressors ZBKQ/E scroll compressors are built- in with internal scroll temperature protection.

Compressor models ZB15-ZB48 incorporate a thermo disc which is a temperature-sensitive snap disc device located at the scroll discharge port. It is designed to open and route hot discharge gas back to the motor protector thus removing the compressor from the line.

Compressor models ZB58-ZB114 models incorporate ASTP feature (Advanced Scroll Temperature Protection). ASTP feature will cause the scrolls to separate and stop pumping but allow the motor to continue to run. After the compressor runs for some time without pumping gas, the motor protector will open.

Depending on the heat build up in the compressor, it may take up to two hours for the motor protector to reset.

2.3 Motor Protection

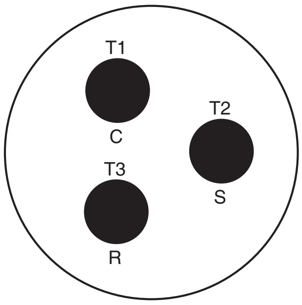
For the models with a motor protection code "**F**", an internal line break motor protector is located in the center of the Y of the motor windings. This protector disconnects all three phases in case of an overload or over-temperature condition. The protector reacts to a combination of motor current and motor winding temperature. The internal protector protects against single phasing. Time must be allowed for the motor to cool down before the protector will reset. If current monitoring to the compressor is available, the system controller can take advantage of the compressor internal protector operation. The controller can lock out the compressor if current draw is not coincident with contactor energizing, implying that the compressor has shut off on its internal protector. This will prevent unnecessary compressor cycling on a fault condition until corrective action can be taken.

Models ZB95KQ/E and ZB114KQ/E with motor protection code **"W"** use a combination of sensors and an electronic module (INT69SU) for motor protection. For the INT69SU, there are four PTC (positive temperature coefficient) internal thermisters connected in series that react with avalanche resistance in the event of high temperatures. All four are used to sense motor temperature. The thermister circuit is connected to the protector module terminals S1 and S2. When any thermister reaches a limiting value, the module interrupts the control circuit and shuts off the compressor. After the thermister has cooled sufficiently, the resistance will decrease, thus allowing the module to reset. However, the module has a 30-minute time delay before reset after a thermister trip. If the INT69SU module is applied in conjunction with a Programmable Logic Controller, it is important that a minimum load is carried through the M1-M2 control circuit contacts. The minimum required current through the module relay contacts needs to be greater than 100 milliamps but not to exceed 5 amps. If this minimum current is not maintained, this has a detrimental effect upon the long-term contact resistance of the relay and may result in false compressor trips. PLC operated control circuits may not always provide this minimum current. In these cases modifications to the PLC control circuit are required. Consult your application engineering department for details.

3. Compressor Information

3.1 Fusite (Terminal)

Fusite (Terminal) pin orientation for single-phase and three phase refrigeration scroll compressors are shown in **Figure 1** and inside the terminal box.



Motor Terminal (Fusite) Connections for
Single Phase and Three Phase Scrolls

Figure 1

3.2 Rotation Direction of Three Phase Scroll Compressors

Scroll compressors will only compress in one rotational direction. Direction of rotation is not an issue with single phase compressors since they will always start and run in the proper direction. Three phase compressors will rotate in either direction depending upon phasing of the power. Since there is a 50-50 chance of connecting power in such a way as to cause rotation in the reverse direction, it is important to include notices and instructions in appropriate locations on the equipment to ensure proper rotation direction when the system is installed and operated. Verification of proper rotation direction is made by observing that suction pressure drops and discharge pressure rises when the compressor is energized. Reverse rotation of a scroll compressor also results in substantially reduced current draw compared to specification sheet values. Suction temperature will be high, discharge temperature will be low and the compressor may be abnormally noisy There is no negative impact on durability caused by operating three phase Copeland Scroll compressors in the reversed direction for a short period of time (under one hour), In models ZB58 - ZB114 oil may be lost. This oil loss can be prevented during reverse rotation if the suction tubing is routed at least six inches (15 cm) above the compressor. After several minutes of operation in reverse, the compressor's motor protection system will trip the compressor off. If allowed to repeatedly restart and run in reverse without correcting the situation, the compressor will be permanently damaged.

All three phase scroll compressors are identically wired internally. As a result, once the correct phasing is determined for a specific system or installation, connecting properly phased power leads to the same terminals will maintain proper rotation direction.

Brief Power Interruptions

Brief power interruptions (less than ½ second) may result in powered reverse rotation of single-phase refrigeration scroll compressors. High-pressure discharge gas expands backward through the scrolls at power interruption causing the scroll to orbit in the reverse direction. If power is reapplied while this reversal is occurring, the compressor may continue to run noisily in the reverse direction for several minutes until the compressor internal protector trips. This has no negative effect on durability. When the protector resets, the compressor will start and run normally.

No time delay is required on three phase models to prevent reverse rotation due to power interruptions.

3.3 Oil Types

In HCFC R-22 applications, mineral oil is used in the compressor. Polyol ester lubricants must be used with HFC refrigerants (R404A, R507 and 134a).Compressors using polyol ester oil are identified with an "E" in the model number. A separate form may be requested **(Form 93-11)** which lists Emerson approved lubricants that may be used to recharge these compressors or if the addition of oil is required. See compressor nameplate for original oil charge. A complete recharge should be four ounces (118 ml) less than the original oil charge. If the oil level is above the sight glass, it may lead to oil circulation rates higher than 1.5% which may lead to decreased capacity as the oil coats the evaporator coils.

3.4 Deep Vacuum Operation

WARNING: DO NOT RUN A REFRIGERATION SCROLL COMPRESSOR IN A VACUUM. FAILURE TO HEED THIS ADVICE CAN RESULT IN PERMANENT DAMAGE TO THE COMPRESSOR.

A low-pressure control is required for protection against vacuum operation. See the section on pressure controls for the proper set points. (See Table 1)

Scrolls compressors (as with any refrigeration compressor) should never be used to evacuate refrigeration or air conditioning systems.

The scroll compressor can be used to pump-down refrigerant in a unit as long as the pressures remain within the operating envelope. Low suction pressures will result in overheating of the scrolls and permanent damage to the compressor drive bearing or cause the scroll temperature protection to activate.

3.5 Shell Temperature

Certain types of system failures, such as condenser or evaporator fan blockage or loss of charge, may cause the top shell and discharge line to briefly but repeatedly reach temperatures above 350°F (177°C) as the compressor cycles on its internal protection devices. Care must be taken to ensure that wiring or other materials, which could be damaged by these temperatures, do not come in contact with these potentially hot areas.

3.6 Suction and Discharge Fittings

Scroll compressors are available with stub tube or Rotalock connections. The stub tube version has copper plated steel suction and discharge fittings. These fittings are far more rugged than copper fittings used on other compressors. Due to the different thermal properties of steel and copper, brazing procedures may have to be changed from those commonly used. Assembly and brazing procedures are explained in the later part of application guide.

3.7 Starting Characteristics Of Single-Phase Compressors

Single-phase scroll compressors are designed with PSC type motors and therefore will start without the need of start assist devices in most applications. However, if low voltage conditions exist at start up, protector trips can result. Therefore, start assist devices (start capacitors and relays) are available to maximize starting characteristics under abnormal conditions.

3.8 Special handling consideration for ZB58-ZB114

ZB58- ZB114 model compressors have the suction fitting located low on the shell. Due to this, its recommended to leave the suction connection plug in place until the compressor is set into the unit. The discharge connection plug should be removed first before pulling the suction connection plug to allow the dry air pressure inside the compressor to escape. Pulling the plugs in this sequence prevents oil mist from coating the suction tube making the brazing difficult.. The copper coated steel suction tube should be cleaned before brazing. No object (example a swaging tool) should be inserted deeper than 50mm into the suction tube or it might damage the suction screen and motor.

4. System Protection Guidelines

4.1 Accumulator Requirement:

Due to the scrolls' inherent ability to handle liquid refrigerant in flooded start and defrost cycle operation conditions, accumulators may not be required. An accumulator is required on single compressor systems when the charge limitations exceed those values listed in **Table 2**. On systems with defrost schemes or transient operations that allow prolonged uncontrolled liquid return to the compressor, an accumulator is required.

Excessive liquid flood back or repeated flooded starts will dilute the oil in the compressor causing inadequate lubrication and bearing wear. Proper system design will minimize liquid flood back, thereby ensuring maximum compressor life.

Table 2
Charge Limitations

Models	Charge Limits
ZB15- ZB48	4.5 Kgs
ZB58-ZB114	7 Kgs

4.2 Crankcase Heaters Requirement

Single-phase models

No crankcase heaters are required on single-phase scroll compressors.

Three-phase models

ZB15–ZB48- outdoor only

Crankcase heaters are required on three phase compressors where the system charge exceeds 4.5 Kgs. Table 3 lists the specification of applicable crankcase heaters.

ZB58-ZB114

Crankcase heaters are required where the system charge exceeds 7 Kgs. The crankcase heater must be located below the suction inlet. Table 3 lists the specification of applicable crankcase heaters.

Table 3
Crankcase Heater

Model	Part No	Volts	Watts	Length
ZB15-ZB48	018-0072-04	240	70	48" (122 mm)
ZB58-ZB114	018-0067-01	240	90	48" (122 mm)

The listed crankcase heaters are intended for use only when there is limited access (Table 3). The heaters are not equipped for use with electrical conduit. Where applicable, electrical safety codes require lead protection, a crankcase heater terminal box should be used. Recommended crankcase heater terminal box and cover part kit numbers are available with Copeland Application Engineering Department.

The crankcase heater must remain energized during the compressor off cycles.

The initial start in the field is a very critical period for any compressor because all load bearing surfaces are new and require a short break-in period to carry high loads under adverse conditions. **The crankcase heater must be turned on a minimum of 12 hours prior to starting the compressor.** This will prevent oil dilution and bearing stress on initial start up. If it is not feasible to turn on the crankcase heater 12 hours in advance of starting the compressor, then use one of the techniques listed below to prevent possible flooded start damage to the compressor: 1) Direct a 500 watt heat lamp or other safe heat source at the lower shell of the compressor for approximately 30 minutes to boil off any liquid refrigerant prior to starting; or 2) Bump start the compressor by manually energizing the compressor contactor for about one second. Wait five seconds and again manually energize compressor for one second. Repeat this cycle several times until the liquid in the shell has been boiled off and the compressor can be safely started and run continuously.

4.3 Pump-Down Cycle

A pump-down cycle for control of refrigerant migration may be used instead of, or in conjunction with, a crankcase heater when the compressor is located so that cold air blowing over the compressor makes the crankcase heater ineffective. **A separate external check valve must be added to the discharge line if pump-down is used.** The built-in scroll discharge check valve is designed to stop extended reverse rotation and prevent high pressure gas from leaking rapidly into the low side after shut off. High side leak-back through the check valve may exceed amounts typically found in reciprocating compressors with reed valves. This can cause the compressor to recycle more frequently. Repeated short-cycling of this nature can result in low compressor oil and consequent damage to the compressor. The recommended external check valve will prevent the frequent recycling due to leak-back. The low pressure control cut-in and cut-out settings have to be reviewed since a relatively large volume of gas will re-expand from the high side of the compressor into the low side on shut down. Emerson recommends that the cut out setting of the pump-down pressure control be set no more than a few degrees of equivalent saturated pressure below the lowest expected normal operating pressure. It is not necessary to pump-down into nearly a vacuum to remove all liquid refrigerant for the low side. To achieve a fairly wide control differential the cut in setting should be set a few degrees of equivalent saturated pressure below the lowest expected temperature of the medium that is cooled. Copeland Scroll compressors trap a considerable volume of high pressure gas between the muffler plate and the top cap. When the compressor shuts down the trapped gas will expand back into the suction side of the system. This frequently causes a pulse of pressure to propagate down the suction line and can cause the low pressure switch to reset. The compressor must not be allowed to short cycle which may result in oil pump out. The electrical circuitry should be arranged so that compressor restart is triggered by demand from the thermostat rather than a reset low pressure switch. Setting a wider differential between the cutout and cut in pressures of a low pressure switch may solve the short cycling problem but may also result in unacceptable temperature swings in the cooled space. If short cycling cannot be avoided, using a 3 minute time delay will limit the cycling of the compressor to an acceptable level.

4.4 Filter Screens In System

The use of screens finer than 30 x 30 mesh (0.6 mm openings) anywhere in the system is not recommended. Field experience has shown that finer mesh screens used to protect thermal expansion valves, capillary tubes, or accumulators can become temporarily or permanently plugged with normal system debris and block the flow of either oil or refrigerant to the compressor. Such blockage can result in compressor failure.

5. Testing Guidelines

5.1 Compressor Hi-Pot Testing

Refrigeration scroll compressors are configured with the motor in the bottom of the shell. Unlike most other hermetic compressors, the motor of a scroll compressor can be immersed in refrigerant when liquid is present in the shell. Hi- Pot tests with liquid refrigerant in the shell can show higher levels of current leakage due to the higher electrical conductivity of liquid refrigerant vs. refrigerant vapor and oil. This phenomenon can occur with any compressor when the motor is immersed in refrigerant and does not present any safety issue. To lower the current leakage reading, operate the system for a brief period of time redistributing the refrigerant to a more normal configuration and test again. Under no circumstances should the Hipot test be performed while the compressor is in vacuum.

5.2 Scroll Compressor Functional Check

A functional compressor test with the suction service valve closed to check how low the compressor will pull suction pressure is not a good indication of how well a compressor is performing. Such a test will almost certainly damage a scroll compressor. The following diagnostic procedure should be used to evaluate whether a Copeland Scroll compressor is working properly.

1. Proper voltage to the unit should be verified.

2. The normal checks of motor winding continuity and short to ground should be made to determine if the inherent overload motor protector has opened or if an internal motor short or ground fault has developed. If the protector has opened, the compressor must be allowed to cool sufficiently to allow it to reset.

3. Proper indoor and outdoor blower/fan operation should be verified.

4. With service gauges connected to suction and discharge pressure fittings, turn on the compressor. If suction pressure falls below normal levels, the system is either low on charge or there is a flow blockage in the system.

5. In single Phase Compressors, if suction pressure does not drop and discharge pressure does not rise to normal levels the compressor is faulty. But in Three Phase compressors, reverse any two of the compressor power leads and reapply power to make sure compressor was not wired to run in reverse direction.

6. Before replacing, be certain that the compressor is actually defective. As a minimum, recheck a compressor returned from the field in the shop or depot for Hipot, winding resistance, and ability to start. Experience shows that more than one third of compressors are determined to have nothing found wrong. They were mis-diagnosed in the field as being defective. Replacing working compressors unnecessarily costs everyone.

7. **NEVER** test a scroll compressor by closing the suction valve or the liquid feed to the evaporator and pumping the compressor into a vacuum.

5.3 Electronic Motor Protection Module and Sensor Functional Check

The following field troubleshooting procedure can be used to evaluate the solid state control circuit: Refer to **Table** 4 for a technical data summary.

Module Voltage Supply Troubleshooting

- Verify that all wire connectors are maintaining a good mechanical connection. Replace any connectors that are loose.

- Measure the voltage across T1-T2 to ensure proper supply voltage.

- Determine the control voltage by using a voltmeter and then measure the voltage across the M1-M2 contacts:

  a. If the measured voltage is equal to the control volts then the M1-M2 contacts are open.

  b. If the measurement is less than 1 volt and the compressor is not running, then the problem is external to the INT69SU module.

  c. If the voltage is greater than 1 volt but less than the control voltage, the module is faulty and should be replaced.

Sensor Troubleshooting

- Remove the leads from S1-S2, and then by using an ohmmeter measure the resistance of the incoming leads.

CAUTION: Use an Ohmmeter with a maximum of 9 VDC for checking – do not attempt to check continuity through the sensors with any other type of instrument. Any external voltage or current may cause damage requiring compressor replacement.

  a. During normal operation, this resistance value should read less than 4500 ohms ±20%.

  b. If the M1-M2 contacts are open, the measured S1-S2 value is above 2750 ohms ±20% and the compressor has been tripped less then 30 minutes then the module is functioning properly.

- If the S1-S2 wire leads read less than 2750 ohms ±20% and the M1-M2 contacts are open, reset the module by removing the power to T1-T2 for a minimum of 5 seconds.

- Replace all wire leads and use a voltmeter to verify the M1-M2 contacts are closed.

- If the M1-M2 contacts remain open and S1-S2 are less than 2500 ohms, remove leads from the M1-M2 contacts and jumper together;

CAUTION: Compressor should start at this time. HOWEVER DO NOT LEAVE JUMPER IN PLACE FOR NORMAL SYSTEM OPERATIONS. THE JUMPER IS USED FOR DIAGNOSTIC PURPOSES ONLY.

- Go to Compressor Supply Voltage Troubleshooting.

Compressor Supply Voltage Troubleshooting

- Remove phase sensing leads from the module from L1/L2/L3.

- Use a voltmeter to measure the incoming 3 phase voltage on L1/L2/L3. *WARNING: L1/L2/L3 could be at a potential up to 600VAC.*

- Ensure proper voltage on each phase.

- Remove power to the module for a minimum of 5 seconds to reset and replace all wire leads. Reenergize the module. If the M1-M2 contacts are open with proper voltage to T1-T2, L1/L2/L3 and proper resistance to S1-S2 then the module is faulty and should be replaced.

Table 4
Technical Data Summary Of Module

Emerson P/N	071-0641-00
Manufacturer P/N Kriwan 69SU	Kriwan 69SU
T1-T2 Module Power	
Voltage Supply	120V & 240V
Frequency	50Hz & 60Hz
M1-M2 Module Output Contacts	
Maximum Voltage	250VAC
Maximum Current	5 Amps
Minimum Current	100 milliamps
Relay Output	5 A, 300 VA
Power Output	<3 VA
S1-S2 Thermal Protection	
Trip Out Resistance	4500W ± 20%
Reset Resistance	2750W ± 20%
Reset Time	30 min ± 5 min
Manual Reset	T1-T2 interrupt for minimum of 5 sec
L1-L2-L3 Phase Monitoring	
Phase Sensor	Non Phase Sensing
Phase Monitoring Circuit Rating	Non Phase Sensing
Trip Delay	Non Phase Sensing
Lockout	Non Phase Sensing
Reset For Lockout	Non Phase Sensing

6. Field & Installation Guidelines

6.1 Assembly Line And Field Brazing

ZB Scroll compressors are available with stub tube and Rotalock connections. The stub tube version has copper plated steel suction and discharge fittings. Due to the different thermal properties of steel and copper, brazing procedures may have to be changed from those commonly used The guidelines below gives a description for assembly line and field brazing procedures.

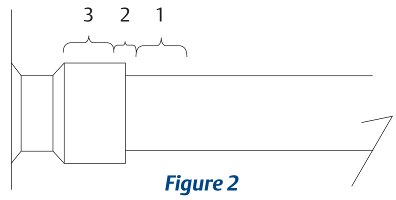


Figure 2

New Installations

- The copper-coated steel suction and discharge tubes on scroll compressors can be brazed in approximately the same manner as any copper tube.

- Recommended brazing materials: Any silfos material is recommended, preferably with a minimum of 5% silver. However, 0% silver is acceptable.

- Be sure compressor tube fittings I.D. and connecting tube O.D. are clean prior to assembly. If oil film is present wipe with denatured alcohol, Dichloro-Trifluoroethane or other suitable solvent.

- Using a double-tipped torch apply heat in Area 1. As tube approaches brazing temperature, move torch flame to Area 2.

- Heat Area 2 until braze temperature is attained, moving torch up and down and rotating around tube as necessary to heat tube evenly. Add braze material to the joint while moving torch around joint to flow braze material around circumference.

- After braze material fl ows around joint, move torch to heat Area 3. This will draw the braze material down into the joint. The time spent heating Area 3 should be minimal.

- As with any brazed joint, overheating may be detrimental to the final result.

Field Service

Unbrazing System Components

CAUTION!

If the refrigerant charge is removed from a scroll unit by bleeding the high side only, it is sometimes possible for the scrolls to seal preventing pressure equalization through the compressor. This may leave the low side shell and suction line tubing pressurized. If a brazing torch is then applied to the low side, the pressurized refrigerant oil mixture could ignite as it escapes and contacts the brazing flame. It is important to check both the high and low sides with manifold gauges before unbrazing. In the case of an assembly line repair, remove the refrigerant from both the high and low sides. Instructions should be provided in appropriate product literatures and assembly areas

- To disconnect: Reclaim refrigerant from both the high and low side of the system. Cut tubing near compressor.

- To reconnect. Recommended brazing material is Silfos with minimum 5% silver or silver braze material with flux. Insert tubing stubs into fitting and connect to the system with tubing connectors. Follow **New Installation** brazing instructions.

Brazing Procedure

Figure 2 discusses the proper procedures for brazing the suction and discharge lines to a Copeland Scroll compressor. It is important to flow nitrogen through the system while brazing all joints during the system assembly process. Nitrogen displaces the air and prevents the formation of copper oxides in the system.

If allowed to form, the copper oxide flakes can later be swept through the system and block screens such as those protecting capillary tubes, thermal expansion valves, and accumulator oil return holes. The blockage - whether it is of oil or refrigerant - is capable of doing damage resulting in compressor failure.

6.2 Compressor Replacement after Motor Burn

In the case of a motor burn, the majority of contaminated oil will be removed with the compressor. The rest of the oil is cleaned through use of suction and liquid line filter dryers. A 100% activated alumina suction filter drier is recommended but must be removed after 72 hours. Separate bulletins are available on request for clean up procedures and for liquid line filter drier recommendations. AE Bulletin 24-1105 for clean up procedures AE Bulletin 11-1297 for liquid line filter drier recommendations.

It is highly recommended that the suction accumulator be replaced if the system contains one. This is because the accumulator oil return orifice or screen may be plugged with debris or may become plugged shortly after a compressor failure. This will result in starvation of oil to the replacement compressor and a second failure.

6.3 System Charging Procedure

Systems should be charged with liquid on the high side to the extent possible. The majority of the charge should be pumped into the high side of the system to prevent hi pot failures, and bearing washout during first time start. If additional charge is needed, it should be added as liquid, in a controlled manner, to the low side of the system with the compressor operating. Pre-charging on the high side and adding liquid on the low side of the system are both meant to protect the compressor from operating with abnormally low suction pressures during charging.

Do not start the compressor while the system is in a deep vacuum. Internal arcing may occur when a compressor is started in a vacuum Do not operate compressor without enough system charge to maintain at least 7 psig (0.5Kg/cm²) suction pressure. Do not operate with a restricted suction. Do not operate with the low pressure cut-out jumpered. Allowing pressure to drop below 2°F(-16°C) for more than a few seconds may overheat scrolls and cause early drive bearing damage or cause the scroll temperature protection to activate. Do not use compressor to test opening set point of high pressure cutout. Bearings are susceptible to high load damage before they have had several hours of normal running for proper break in. Never install a system in the field and leave it unattended with no charge, or with the service valves closed without securely locking out the system. This will prevent unauthorized personnel from accidentally operating the system and potentially ruining the compressor by operating with no refrigerant flow.

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 1-Phase

50 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-20	-15	-10	-5	0	5	10
ZB15KQE	Q	10	3700	4500	5450				
		20	3350	4050	4900	5900	7000		
		30	2950	3600	4350	5250	6200	7300	8550
		40	2550	3150	3800	4550	5400	6350	7450
		50	2150	2600	3150	3800	4500	5350	6250
		60		2050	2500	3000	3600	4250	5050
	P	10	730	740	740				
		20	920	920	930	930	930		
		30	1150	1150	1160	1160	1160	1150	1140
		40	1440	1450	1450	1450	1450	1450	1440
		50	1800	1810	1810	1810	1810	1810	1800
		60		2250	2260	2260	2250	2250	2240
ZB19KQE	Q	10	4200	5100	6200				
		20	3850	4700	5700	6800	8150		
		30	3450	4200	5050	6100	7250	8600	10100
		40	3000	3650	4400	5300	6300	7450	8750
		50	2450	3000	3650	4400	5250	6200	7300
		60		2350	2850	3400	4100	4900	5800
	P	10	900	900	910				
		20	1140	1140	1140	1140	1140		
		30	1430	1430	1430	1430	1420	1410	1400
		40	1810	1810	1810	1800	1790	1780	1760
		50	2290	2290	2290	2280	2260	2240	2220
		60		2900	2890	2880	2860	2830	2800
ZB21KQE	Q	10	5350	6550	7950				
		20	4900	6000	7250	8700	10400		
		30	4400	5350	6500	7750	9250	10950	12900
		40	3800	4650	5600	6750	8050	9500	11200
		50	3150	3850	4650	5600	6700	7950	9350
		60		3000	3600	4350	5250	6250	7400
	P	10	1150	1150	1150				
		20	1450	1450	1450	1450	1450		
		30	1830	1830	1820	1820	1810	1800	1790
		40	2310	2310	2300	2290	2280	2260	2240
		50	2920	2920	2910	2900	2880	2860	2820
		60		3690	3680	3660	3640	3610	3570
ZB26KQE	Q	10	5950	7300	8900				
		20	5350	6600	8050	9800	11750		
		30	4700	5800	7100	8650	10400	12450	14800
		40	3950	4900	6050	7400	8950	10750	12850
		50	3100	3900	4900	6000	7350	8900	10750
		60		2800	3600	4500	5650	6950	8500
	P	10	1490	1470	1440				
		20	1880	1850	1810	1770	1730		
		30	2380	2330	2280	2230	2160	2100	2020
		40	3000	2950	2880	2810	2720	2630	2530
		50	3800	3730	3640	3550	3440	3320	3190
		60		4710	4600	4480	4350	4200	4040
ZB29KQE	Q	10	7100	8700	10600				
		20	6450	7900	9600	11550	13800		
		30	5700	7050	8550	10300	12250	14500	17000
		40	4900	6050	7400	8900	10650	12550	14750
		50	4000	5000	6150	7400	8850	10500	12350
		60		3800	4750	5800	7000	8300	9800
	P	10	1630	1660	1700				
		20	1930	1960	1990	2020	2070		
		30	2330	2350	2370	2400	2440	2480	2540
		40	2830	2850	2870	2890	2910	2950	2990
		50	3440	3470	3480	3500	3520	3550	3580
		60		4210	4240	4260	4270	4290	4320

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

ZB Series

R404A/R507

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 3-Phase

50 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-20	-15	-10	-5	0	5	10
ZB15KQE	Q	10	3650	4450	5450				
		20	3300	4050	4950	5950	7150		
		30	2900	3550	4350	5250	6300	7450	8800
		40	2400	3000	3700	4450	5350	6350	7450
		50	1850	2400	2950	3600	4300	5150	6100
		60		1650	2150	2650	3250	3900	4600
	P	10	780	750	700				
		20	1000	980	950	920	880		
		30	1270	1250	1230	1200	1170	1160	1160
		40	1670	1630	1590	1550	1510	1490	1490
		50	2260	2180	2100	2030	1970	1920	1900
		60		2970	2840	2710	2610	2520	2460
ZB19KQE	Q	10	4350	5350	6500				
		20	4000	4900	5900	7100	8500		
		30	3600	4350	5300	6350	7550	8950	10500
		40	3100	3800	4600	5500	6550	7750	9150
		50	2550	3150	3800	4600	5450	6500	7650
		60		2450	2950	3550	4300	5100	6050
	P	10	930	930	930				
		20	1170	1170	1170	1170	1170		
		30	1480	1480	1480	1470	1470	1460	1450
		40	1870	1870	1860	1860	1840	1830	1810
		50	2360	2360	2360	2350	2330	2310	2290
		60		2990	2980	2960	2940	2920	2890
ZB21KQE	Q	10	5250	6400	7800				
		20	4800	5850	7100	8550	10200		
		30	4300	5250	6350	7600	9050	10750	12600
		40	3700	4550	5500	6600	7850	9300	10950
		50	3100	3750	4550	5500	6550	7750	9150
		60		2900	3550	4300	5150	6100	7250
	P	10	1110	1110	1120				
		20	1400	1400	1400	1400	1400		
		30	1770	1770	1770	1760	1750	1750	1730
		40	2240	2240	2230	2220	2210	2190	2170
		50	2830	2830	2820	2810	2790	2770	2740
		60		3580	3570	3550	3530	3490	3460
ZB26KQE	Q	10	6100	7500	9100				
		20	5600	6850	8300	9950	11900		
		30	5000	6100	7400	8900	10600	12550	14750
		40	4350	5300	6400	7700	9200	10900	12800
		50	3600	4400	5350	6400	7650	9100	10700
		60		3400	4150	5000	6000	7150	8450
	P	10	1300	1300	1310				
		20	1640	1640	1640	1640	1640		
		30	2070	2070	2070	2060	2050	2040	2020
		40	2610	2610	2610	2600	2580	2560	2540
		50	3310	3310	3300	3280	3260	3240	3200
		60		4180	4170	4150	4120	4090	4040
ZB29KQE	Q	10	7100	8700	10550				
		20	6500	7950	9600	11550	13800		
		30	5800	7100	8600	10300	12300	14550	17100
		40	5050	6150	7450	8950	10650	12600	14850
		50	4150	5100	6200	7450	8900	10550	12400
		60		3950	4800	5800	6950	8300	9800
	P	10	1470	1480	1480				
		20	1860	1860	1860	1860	1860		
		30	2340	2350	2340	2340	2330	2310	2300
		40	2960	2960	2960	2950	2930	2910	2880
		50	3750	3750	3740	3730	3700	3670	3630
		60		4750	4730	4710	4680	4630	4580

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 3-Phase

50 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-20	-15	-10	-5	0	5	10
ZB38KQE	Q	10	8950	10950	13300				
		20	8200	10000	12150	14600	17400		
		30	7350	8950	10850	13000	15500	18350	21550
		40	6350	7750	9400	11300	13450	15900	18700
		50	5250	6450	7800	9400	11200	13300	15650
		60		4950	6050	7300	8750	10450	12400
	P	10	1860	1870	1870				
		20	2350	2350	2350	2350	2350		
		30	2960	2960	2960	2950	2940	2920	2900
		40	3740	3740	3730	3720	3700	3670	3630
		50	4740	4740	4720	4700	4670	4630	4580
		60	0	5990	5970	5940	5900	5850	5790
ZB45KQE	Q	10	10450	12800	15550				
		20	9600	11750	14200	17100	20400		
		30	8600	10500	12700	15250	18150	21500	25250
		40	7450	9100	11000	13200	15750	18650	21900
		50	6150	7550	9150	11000	13100	15550	18350
		60		5800	7100	8550	10250	12200	14500
	P	10	2110	2110	2120				
		20	2660	2660	2660	2660	2660		
		30	3350	3350	3350	3340	3320	3310	3280
		40	4240	4240	4230	4210	4190	4150	4110
		50	5360	5360	5350	5320	5290	5240	5190
		60		6780	6760	6730	6680	6620	6550
ZB48KQE	Q	10	11500	14100	17100				
		20	10550	12900	15650	18800	22400		
		30	9450	11550	13950	16750	20000	23650	27800
		40	8150	10000	12100	14500	17300	20500	24100
		50	6750	8300	10050	12050	14400	17100	20150
		60		6400	7800	9400	11300	13450	15950
	P	10	2320	2320	2330				
		20	2920	2930	2930	2930	2920		
		30	3690	3690	3680	3670	3660	3640	3610
		40	4660	4660	4650	4630	4600	4570	4530
		50	5900	5900	5880	5860	5820	5770	5700
		60		7460	7440	7400	7350	7280	7200
ZB58KQE	Q	10	13750	16750	20300				
		20	12450	15250	18500	22250	26600		
		30	11100	13650	16600	19950	23800	28200	33200
		40	9450	11850	14500	17450	20800	24600	28900
		50	7400	9650	12000	14600	17500	20700	24350
		60		6850	9000	11250	13700	16350	19300
	P	10	3000	3080	3140				
		20	3640	3730	3820	3870	3870		
		30	4480	4540	4620	4690	4730	4710	4600
		40	5630	5630	5670	5720	5770	5770	5720
		50	7210	7120	7080	7090	7100	7100	7060
		60		9130	8980	8900	8850	8800	8740
ZB66KQE	Q	10	15700	19200	23350				
		20	14300	17450	21150	25450	30400		
		30	12750	15550	18800	22550	26900	31900	37550
		40	11050	13500	16350	19550	23250	27500	32350
		50	9100	11250	13650	16350	19450	22950	27000
		60		8650	10650	12850	15350	18150	21400
	P	10	3370	3450	3550				
		20	4100	4170	4260	4370	4510		
		30	5030	5090	5160	5250	5350	5480	5620
		40	6240	6290	6340	6390	6460	6540	6630
		50	7830	7850	7880	7900	7920	7950	7990
		60		9890	9870	9850	9830	9800	9780

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

ZB Series

R404A/R507

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 3-Phase

50 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-20	-15	-10	-5	0	5	10
ZB76KQE	Q	10	18400	22400	27150				
		20	16700	20350	24700	29700	35450		
		30	14900	18250	22150	26600	31700	37450	44000
		40	12900	15900	19350	23250	27650	32650	38300
		50	10600	13250	16200	19500	23250	27450	32200
		60		10050	12550	15250	18300	21750	25550
	P	10	3930	4030	4110				
		20	4750	4870	4980	5070	5130		
		30	5820	5930	6030	6130	6220	6270	6300
		40	7230	7310	7390	7480	7560	7620	7650
		50	9100	9120	9160	9210	9260	9300	9330
		60		11480	11440	11430	11430	11430	11420
ZB95KQE	Q	10	22750	27700	33700				
		20	20800	25300	30500	36700	43900		
		30	18550	22700	27400	32750	38950	46150	54500
		40	15600	19600	23850	28550	33900	40000	47050
		50		15500	19500	23750	28350	33550	39400
		60			13950	17850	21900	26300	31150
	P	10	4880	5050	5220				
		20	5980	6120	6290	6450	6590		
		30	7440	7540	7670	7810	7940	8040	8110
		40	9400	9430	9500	9590	9690	9780	9830
		50		11940	11920	11940	11980	12020	12040
		60			15070	14990	14950	14920	14880
ZB114KQE	Q	10	27350	33300	40300				
		20	24850	30350	36700	44050	52450		
		30	21900	27000	32750	39350	46800	55350	65050
		40	18300	23050	28250	34100	40700	48200	56700
		50		18250	23000	28200	33950	40450	47800
		60			16750	21350	26350	31900	38100
	P	10	5930	6080	6240				
		20	7240	7390	7540	7710	7880		
		30	8940	9050	9170	9310	9450	9610	9780
		40	11220	11260	11310	11380	11470	11570	11690
		50		14200	14150	14120	14110	14130	14160
		60			17870	17710	17570	17460	17380

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

ZB Series

R134a

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 1 & 3-Phase

50 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-15	-10	-5	0	5	10	15
ZB15KQE	Q	30	1900	2400	3000	3700	4500	5400	
		35	1800	2300	2900	3500	4300	5200	
		45	1600	2000	2600	3200	3900	4700	5600
		55		1700	2200	2700	3400	4100	4900
		65			1800	2300	2900	3500	4200
		75				1900	2400	3000	3500
	P	30	800	800	800	800	800	800	
		35	800	800	800	900	900	900	
		45	1000	1000	1000	1100	1100	1100	1100
		55		1300	1300	1300	1300	1300	1300
		65			1600	1600	1600	1600	1600
		75				2000	2000	2000	2000
ZB19KQE	Q	30	2200	2800	3500	4300	5200	6300	
		35	2000	2700	3300	4100	5000	6000	
		45	1800	2300	3000	3700	4500	5400	6400
		55		2000	2500	3100	3900	4700	5700
		65			2100	2700	3300	4100	4900
		75				2200	2700	3400	4000
	P	30	900	900	900	900	900	900	
		35	1000	1000	1000	1000	1000	1000	
		45	1200	1200	1200	1200	1200	1200	1200
		55		1500	1500	1500	1500	1500	1500
		65			1800	1800	1900	1900	1900
		75				2300	2300	2300	2300
ZB21KQE	Q	30	2800	3500	4400	5400	6500	7900	
		35	2700	3300	4200	5100	6200	7500	
		45	2300	2900	3700	4600	5600	6800	8100
		55		2500	3200	4000	4900	6000	7200
		65			2700	3400	4200	5100	6200
		75				2700	3500	4300	5100
	P	30	1100	1100	1100	1100	1100	1100	
		35	1200	1200	1200	1200	1200	1200	
		45	1500	1500	1500	1500	1500	1500	1500
		55		1800	1800	1800	1900	1900	1900
		65			2200	2300	2300	2300	2300
		75				2800	2800	2800	2900
ZB26KQE	Q	30	3200	4100	5100	6200	7600	9100	
		35	3000	3900	4800	5900	7200	8700	
		45	2600	3300	4300	5300	6500	7800	9400
		55		2900	3700	4600	5700	6900	8300
		65			3100	3900	4900	5900	7100
		75				3200	4000	5000	5900
	P	30	1200	1200	1200	1200	1200	1300	
		35	1300	1300	1400	1400	1400	1400	
		45	1700	1700	1700	1700	1700	1700	1700
		55		2100	2100	2100	2100	2100	2100
		65			2600	2600	2600	2600	2600
		75				3200	3200	3200	3300
ZB29KQE	Q	30	3850	4750	5900	7200	8750	10500	
		35	3500	4500	5600	6850	8300	10050	
		45	3050	3900	5000	6100	7450	9000	10100
		55		3300	4200	5250	6550	7950	8950
		65			4000	4450	5550	6800	7650
		75				3600	4550	5600	6250
	P	30	1370	1380	1390	1400	1410	1420	
		35	1540	1550	1560	1570	1580	1590	
		45	1940	1940	1950	1960	1970	1980	1990
		55		2420	2430	2440	2440	2450	2460
		65			3020	3020	3030	3040	3050
		75				3750	3760	3770	3770

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 1 & 3-Phase

50 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-15	-10	-5	0	5	10	15
ZB38KQE	Q	30	4700	5900	7400	9100	11100	13300	
		35	4300	5600	7000	8600	10500	12700	
		45	3800	4900	6300	7800	9400	11400	13700
		55		4200	5400	6700	8300	10100	12100
		65			4600	5700	7100	8700	10400
		75				4600	5800	7200	8900
	P	30	1700	1700	1700	1800	1800	1800	
		35	1900	1900	1900	2000	2000	2000	
		45	2300	2400	2400	2400	2400	2500	2500
		55		3000	3000	3000	3000	3000	3100
		65			3700	3700	3700	3800	3800
		75				4700	4700	4700	4700
ZB45KQE	Q	30	5700	7100	8900	10900	13300	15900	
		35	5200	6800	8500	10400	12700	15200	
		45	4500	5800	7500	9300	11400	13700	16300
		55		5000	6300	8000	10000	12100	14400
		65			5300	6700	8400	10300	12300
		75				5400	6800	8500	10100
	P	30	2000	2000	2000	2000	2000	2000	
		35	2200	2200	2200	2200	2300	2300	
		45	2700	2700	2800	2800	2800	2800	2800
		55		3400	3400	3500	3500	3500	3500
		65			4300	4300	4300	4400	4400
		75				5400	5400	5400	5400
ZB48KQE	Q	30	6400	8050	9900	12150	14700	17600	
		35	5900	7650	9450	11550	14000	16900	
		45	5200	6600	8450	10350	12550	15100	17300
		55		5700	7200	8950	11050	13350	15250
		65			6050	7600	9450	11450	13100
		75				6200	7800	9600	10850
	P	30	2280	2290	2300	2310	2330	2370	
		35	2540	2560	2570	2590	2610	2650	
		45	3170	3190	3210	3220	3250	3290	3360
		55		4000	4010	4020	4040	4080	4150
		65			5020	5030	5040	5050	5120
		75				6280	6290	6300	6340
ZB58KQE	Q	30	8010	9880	12000	14370	17000	19880	
		35	6750	9380	11410	13690	16220	18990	
		45	5930	7550	10190	12270	14580	17120	19880
		55		6520	8240	10270	12850	15130	17600
		65			6950	8730	10840	13010	15160
		75				7110	8920	11050	12570
	P	30	2690	2710	2760	2820	2880	2910	
		35	3010	3030	3070	3130	3180	3190	
		45	3720	3750	3800	3850	3890	3880	3820
		55		4590	4660	4720	4760	4750	4670
		65			5640	5730	5790	5790	5710
		75				6880	6970	7000	6940
ZB66KQE	Q	30	9170	11280	13700	16430	19450	22740	
		35	7740	10720	13040	15670	18570	21740	
		45	6800	8630	11650	14040	16700	19610	22730
		55		7440	9390	11730	14690	17290	20090
		65			7910	9950	12370	14850	17290
		75				8130	10190	12620	14330
	P	30	3000	3020	3080	3150	3210	3250	
		35	3360	3380	3430	3490	3540	3560	
		45	4150	4190	4250	4300	4340	4340	4270
		55		5120	5210	5280	5320	5310	5220
		65			6300	6410	6470	6470	6390
		75				7690	7790	7820	7760

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

ZB Series

R134a

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 1 & 3-Phase

50 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-15	-10	-5	0	5	10	15
ZB76KQE	Q	30	10490	12930	15720	18850	22310	26050	
		35	8850	12280	14950	17970	21300	24910	
		45	7790	9880	13350	16090	19140	22470	26030
		55		8530	10760	13440	16830	19820	23030
		65			9070	11400	14160	17010	19810
		75				9300	11650	14420	16400
	P	30	3520	3550	3610	3700	3770	3800	
		35	3940	3960	4020	4100	4150	4160	
		45	4870	4900	4970	5040	5080	5070	4970
		55		5990	6080	6160	6200	6190	6080
		65			7350	7460	7540	7540	7440
		75				8950	9070	9110	9040

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 1-Phase

60 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-20	-15	-10	-5	0	5	10
ZB15KQE	Q	10	4400	5400	6550				
		20	4000	4900	5900	7050	8400		
		30	3550	4350	5250	6300	7450	8800	10250
		40	3100	3750	4550	5450	6450	7600	8900
		50	2550	3150	3800	4550	5400	6400	7500
		60		2450	3800	3600	4300	5100	6050
	P	10	940	950	950				
		20	1170	1180	1190	1190	1190		
		30	1470	1480	1490	1490	1490	1480	1470
		40	1840	1850	1860	1860	1860	1850	1840
		50	2310	2320	2320	2320	2320	2320	2300
		60		2890	2320	2890	2890	2880	2870
ZB19KQE	Q	10	5500	6750	8150				
		20	5000	6100	7350	8850	10500		
		30	4450	5400	6550	7850	9300	10950	12800
		40	3850	4700	5650	6800	8050	9500	11150
		50	3200	3900	4750	5700	6750	8000	9400
		60		3050	3700	4500	5350	6400	7550
	P	10	1170	1180	1190				
		20	1470	1480	1490	1490	1480		
		30	1840	1850	1860	1860	1860	1850	1830
		40	2300	2310	2320	2330	2330	2320	2300
		50	2890	2890	2900	2900	2900	2890	2880
		60		3610	3610	3610	3610	3600	3580
ZB21KQE	Q	10	6600	8050	9750				
		20	5950	7300	8800	10550	12550		
		30	5300	6450	7800	9350	11100	13100	15350
		40	4600	5600	6800	8100	9650	11150	13300
		50	3800	4650	5650	6800	8100	9550	11200
		60		3650	4450	5350	6400	7650	9000
	P	10	1410	1420	1430				
		20	1760	1770	1780	1790	1780		
		30	2200	2220	2230	2230	2230	2220	2200
		40	2760	2780	2790	2790	2790	2850	2760
		50	3460	3470	3480	3480	3480	3470	3450
		60		4330	4330	4330	4330	4320	4300
ZB26KQE	Q	10	7700	9400	11400				
		20	6950	8500	10300	12350	14650		
		30	6200	7550	9150	10950	13000	15300	17900
		40	5350	6550	7900	9500	11250	13300	15550
		50	4450	5450	6600	7950	9450	11150	13100
		60		4250	5200	6250	7500	8900	10500
	P	10	1640	1660	1660				
		20	2050	2070	2080	2080	2080		
		30	2570	2590	2600	2610	2600	2590	2560
		40	3230	3240	3250	3260	3260	3240	3220
		50	4040	4050	4060	4070	4060	4050	4030
		60		5050	5060	5060	5050	5040	5020

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 1-Phase

60 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C -20	-15	-10	-5	0	5	10
ZB29KQE	Q	10	8600	10550	12800				
		20	7800	9550	11600	13950	16650		
		30	6900	8500	10350	12450	14800	17500	20500
		40	5900	7350	8950	10750	12850	15150	17800
		50	4800	6050	7400	8950	10700	12700	14900
		60		4600	5750	7000	8450	10050	11850
	P	10	2070	2110	2160				
		20	2460	2500	2530	2580	2640		
		30	2970	3000	3030	3060	3110	3160	3240
		40	3610	3630	3660	3680	3720	3760	3820
		50	4390	4420	4440	4470	4490	4520	4560
		60		5370	5400	5430	5450	5470	5500
ZB38KQE	Q	10	10900	13200	15800				
		20	9900	12100	14600	17400	20450		
		30	8700	10750	13050	15650	18500	21650	25050
		40	7350	9150	11250	13550	16150	19000	22150
		50	6000	7500	9250	11200	13450	16000	18750
		60		5800	7150	8750	10550	12600	14950
	P	10	2550	2630	2750				
		20	3040	3090	3160	3270	3430		
		30	3680	3720	3770	3840	3950	4100	4300
		40	4480	4520	4560	4620	4690	4790	4940
		50	5440	5510	5560	5600	5660	5730	5840
		60		6670	6740	6800	6860	6920	7010

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

ZB Series

R404A/R507

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 3-Phase

60 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-20	-15	-10	-5	0	5	10
ZB15KQE	Q	10	4400	5400	6550				
		20	3950	4850	5900	7100	8550		
		30	3500	4300	5250	6300	7550	8950	10550
		40	2950	3650	4500	5400	6500	7700	9100
		50	2350	3000	3700	4450	5350	6400	7550
		60		2200	2800	3450	4150	5000	5900
	P	10	950	930	910				
		20	1210	1200	1190	1160	1140		
		30	1530	1530	1510	1500	1470	1440	1410
		40	1950	1940	1920	1910	1880	1850	1820
		50	2480	2470	2450	2420	2390	2360	2320
		60		3140	3110	3070	3040	3000	2950
ZB19KQE	Q	10	5450	6700	8100				
		20	4950	6050	7300	8750	10400		
		30	4400	5350	6500	7750	9250	10850	12700
		40	3800	4650	5650	6750	8000	9450	11050
		50	3150	3900	4700	5650	6700	7950	9300
		60		3000	3700	4450	5350	6350	7450
	P	10	1130	1140	1140				
		20	1410	1420	1430	1430	1430		
		30	1760	1780	1780	1790	1790	1780	1760
		40	2210	2220	2230	2240	2230	2230	2210
		50	2770	2780	2790	2790	2790	2780	2760
		60		3470	3470	3470	3470	3460	3440
ZB21KQE	Q	10	6550	8050	9750				
		20	5950	7250	8750	10500	12500		
		30	5300	6450	7800	9350	11100	13050	15250
		40	4600	5600	6750	8100	9600	11350	13250
		50	3800	4650	5650	6750	8050	9500	11150
		60		3600	4400	5350	6400	7600	8950
	P	10	1350	1360	1370				
		20	1690	1700	1710	1720	1710		
		30	2120	2130	2140	2150	2140	2130	2110
		40	2660	2670	2680	2680	2680	2670	2650
		50	3330	3340	3340	3350	3340	3330	3320
		60		4160	4160	4160	4160	4150	4130
ZB26KQE	Q	10	7650	9350	11350				
		20	6900	8450	10200	12250	14550		
		30	6150	7500	9050	10850	12900	15200	17800
		40	5350	6500	7850	9400	11200	13200	15450
		50	4400	5400	6550	7900	9400	11100	13000
		60		4200	5150	6200	7450	8850	10450
	P	10	1580	1590	1600				
		20	1980	1990	2000	2010	2000		
		30	2470	2490	2500	2510	2500	2490	2460
		40	3100	3120	3130	3130	3130	3120	3100
		50	3890	3900	3910	3910	3910	3900	3870
		60		4860	4870	4870	4860	4850	4820
ZB29KQE	Q	10	8700	10600	12850				
		20	7850	9600	11600	13900	16550		
		30	7000	8500	10300	12350	14650	17250	20200
		40	6050	7400	8950	10700	12700	15000	17550
		50	5000	6150	7450	8950	10650	12600	14750
		60		4750	5850	7050	8450	10050	11850
	P	10	1760	1770	1780				
		20	2200	2220	2230	2230	2230		
		30	2760	2770	2790	2790	2790	2770	2750
		40	3460	3470	3480	3490	3490	3480	3450
		50	4330	4340	4350	4360	4350	4340	4320
		60		5420	5420	5420	5410	5400	5370

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 3-Phase

60 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-20	-15	-10	-5	0	5	10
ZB38KQE	Q	10	10950	13400	16200				
		20	9900	12100	14600	17550	20850		
		30	8800	10750	13000	15550	18450	21750	25450
		40	7600	9300	11250	13500	16000	18900	22100
		50	6300	7750	9400	11250	13400	15850	18600
		60		6000	7350	8900	10650	12650	14950
	P	10	2220	2240	2250				
		20	2780	2800	2820	2820	2810		
		30	3480	3500	3520	3530	3520	3500	3470
		40	4360	4380	4400	4410	4400	4390	4360
		50	5470	5480	5500	5500	5500	5480	5450
		60		6840	6840	6840	6840	6820	6790
ZB45KQE	Q	10	13000	15900	19250				
		20	11750	14350	17350	20800	24750		
		30	10450	12750	15400	18450	21900	25850	30250
		40	9050	11050	13350	16000	19000	22400	26250
		50	7500	9200	11150	13400	15950	18850	22100
		60		7150	8750	10550	12650	15050	17750
	P	10	2590	2620	2630				
		20	3240	3270	3290	3290	3290		
		30	4060	4090	4110	4120	4110	4090	4050
		40	5090	5120	5140	5150	5140	5120	5090
		50	6380	6400	6420	6420	6420	6400	6360
		60		7980	7990	7990	7980	7960	7920
ZB48KQE	Q	10	14300	17450	21150				
		20	12900	15750	19100	22900	27200		
		30	11500	14000	16950	20300	24100	28400	33250
		40	9950	12150	14700	17600	20900	24650	28850
		50	8250	10100	12250	14700	17500	20700	24300
		60		7850	9600	11600	13900	16550	19500
	P	10	2850	2880	2890				
		20	3570	3600	3620	3620	3610		
		30	4470	4500	4520	4530	4520	4500	4460
		40	5600	5630	5650	5660	5660	5640	5600
		50	7020	7040	7060	7060	7060	7040	7000
		60		8780	8790	8790	8780	8760	8710
ZB58KQE	Q	10	16500	20100	24400				
		20	15100	18350	22200	26700	31950		
		30	13550	16550	19950	23900	28500	33850	40100
		40	11600	14400	17450	20950	24900	29500	34850
		50	9050	11750	14550	17600	21000	24950	29450
		60		8350	10950	13650	16600	19900	23700
	P	10	3680	3800	3910				
		20	4460	4580	4690	4790	4840		
		30	5480	5570	5680	5770	5840	5850	5810
		40	6780	6850	6930	7020	7080	7110	7080
		50	8460	8480	8530	8590	8640	8670	8650
		60		10530	10540	10570	10600	10610	10580
ZB66KQE	Q	10	18950	23200	28200				
		20	17250	21050	25550	30750	36750		
		30	15400	18800	22750	27300	32500	38500	45300
		40	13400	16350	19800	23700	28150	33250	39050
		50	11150	13700	16600	19850	23550	27800	32600
		60		10700	13100	15700	18650	22000	25850
	P	10	4110	4250	4420				
		20	5020	5150	5310	5480	5650		
		30	6130	6260	6400	6550	6700	6840	6950
		40	7520	7640	7770	7900	8020	8120	8200
		50	9240	9350	9460	9570	9660	9740	9780
		60		11440	11540	11620	11690	11740	11740

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 3-Phase

60 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C						
			-20	-15	-10	-5	0	5	10
ZB76KQE	Q	10	22250	27100	32800				
		20	20200	24650	29850	35850	42800		
		30	18050	22050	26650	32000	38150	45150	53100
		40	15850	19300	23300	27900	33200	39250	46200
		50	13600	16450	19750	23550	27950	33000	38850
		60		13500	16000	19000	22450	26450	31150
	P	10	4800	4960	5150				
		20	5860	6000	6140	6290	6450		
		30	7170	7320	7460	7580	7690	7800	7920
		40	8710	8910	9080	9210	9320	9400	9460
		50	10450	10750	10990	11180	11310	11400	11450
		60		12820	13170	13450	13650	13790	13870
ZB95KQE	Q	10	27350	33350	40450				
		20	25000	30450	36850	44250	52800		
		30	22300	27300	33000	39550	47050	55700	65550
		40	19150	23700	28750	34450	40950	48350	56850
		50		19500	23950	28850	34350	40550	47650
		60			18400	22500	27050	32100	37850
	P	10	6180	6440	6750				
		20	7500	7720	7980	8260	8580		
		30	9240	9400	9600	9830	10080	10350	10620
		40	11500	11610	11750	11910	12100	12290	12480
		50		14430	14510	14610	14720	14840	14950
		60			18010	18040	18080	18110	18150
ZB114KQE	Q	10	32800	40150	48750				
		20	29800	36450	44200	53100	63300		
		30	26500	32550	39450	47350	56350	66550	78050
		40	22750	28150	34250	41200	49000	57900	67900
		50		23200	28500	34450	41150	48700	57200
		60			21950	27000	32550	38800	45800
	P	10	7490	7740	8000				
		20	9070	9330	9600	9860	10100		
		30	11050	11300	11560	11810	12040	12250	12410
		40	13570	13790	14010	14240	14440	14620	14760
		50		16940	17120	17290	17450	17580	17670
		60			21010	21110	21210	21270	21300

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

ZB Series

R134a

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 1 & 3-Phase

60 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C -15	-10	-5	0	5	10	15
ZB15KQE	Q	30	2300	2900	3600	4450	5400	6500	
		35	2200	2800	3500	4200	5200	6250	
		45	1950	2400	3150	3850	4700	5650	6750
		55		2050	2650	3250	4100	4950	5900
		65			2200	2800	3500	4200	5050
		75				2300	2900	3600	4200
	P	30	960	960	960	960	960	960	
		35	960	960	960	1080	1080	1080	
		45	1200	1200	1200	1320	1320	1320	1320
		55		1560	1560	1560	1560	1560	1560
		65			1920	1920	1920	1920	1920
		75				2400	2400	2400	2400
ZB19KQE	Q	30	2650	3400	4200	5200	6250	7600	
		35	2400	3250	4000	4950	6000	7200	
		45	2200	2800	3600	4450	5400	6500	7700
		55		2400	3000	3750	4700	5650	6850
		65			2550	3250	4000	4950	5900
		75				2650	3250	4100	4800
	P	30	1080	1080	1080	1080	1080	1080	
		35	1200	1200	1200	1200	1200	1200	
		45	1440	1440	1440	1440	1440	1440	1440
		55		1800	1800	1800	1800	1800	1800
		65			2160	2160	2280	2280	2280
		75				2760	2760	2760	2760
ZB21KQE	Q	30	3400	4200	5300	6500	7800	9500	
		35	3250	4000	5050	6150	7450	9000	
		45	2800	3500	4450	5550	6750	8200	9750
		55		3000	3850	4800	5900	7200	8650
		65			3250	4100	5050	6150	7450
		75				3250	4200	5200	6150
	P	30	1320	1320	1320	1320	1320	1320	
		35	1440	1440	1440	1440	1440	1440	
		45	1800	1800	1800	1800	1800	1800	1800
		55		2160	2160	2160	2280	2280	2280
		65			2640	2760	2760	2760	2760
		75				3360	3360	3360	3480
ZB26KQE	Q	30	3850	4950	6150	7450	9150	10950	
		35	3600	4700	5800	7100	8650	10450	
		45	3150	4000	5200	6400	7800	9400	11300
		55		3500	4450	5550	6850	8300	10000
		65			3750	4700	5900	7100	8550
		75				3850	4800	6000	7100
	P	30	1440	1440	1440	1440	1440	1560	
		35	1560	1560	1680	1680	1680	1680	
		45	2040	2040	2040	2040	2040	2040	2040
		55		2520	2520	2520	2520	2520	2520
		65			3120	3120	3120	3120	3120
		75				3840	3840	3840	3960
ZB29KQE	Q	30	4600	5700	7050	8650	10450	12600	
		35	4150	5400	6700	8200	10000	12050	
		45	3650	4650	5950	7350	8950	10800	12100
		55		3950	5050	6300	7850	9500	10700
		65			4750	5350	6650	8150	9150
		75				4300	5450	6750	7500
	P	30	1640	1660	1670	1680	1690	1700	
		35	1850	1860	1870	1880	1900	1910	
		45	2330	2330	2340	2350	2360	2380	2390
		55		2900	2920	2930	2930	2940	2950
		65			3620	3620	3640	3650	3660
		75				4500	4510	4520	4520

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

R134a

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 1 & 3-Phase

60 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C -15	-10	-5	0	5	10	15
ZB38KQE	Q	30	5650	7100	8900	10950	13350	16000	
		35	5200	6750	8400	10350	12600	15250	
		45	4600	5900	7600	9400	11300	13700	16450
		55		5050	6500	8050	10000	12150	14550
		65			5550	6850	8550	10450	12500
		75				5550	7000	8650	10700
	P	30	2040	2040	2040	2160	2160	2160	
		35	2280	2280	2280	2400	2400	2400	
		45	2760	2880	2880	2880	2880	3000	3000
		55		3600	3600	3600	3600	3600	3720
		65			4440	4440	4440	4560	4560
		75				5640	5640	5640	5640
ZB45KQE	Q	30	6850	8550	10700	13100	16000	19100	
		35	6250	8200	10200	12500	15250	18250	
		45	5400	7000	9000	11200	13700	16450	19600
		55		6000	7600	9600	12000	14550	17300
		65			6400	8050	10100	12400	14800
		75				6500	8200	10200	12150
	P	30	2400	2400	2400	2400	2400	2400	
		35	2640	2640	2640	2640	2760	2760	
		45	3240	3240	3360	3360	3360	3360	3360
		55		4080	4080	4200	4200	4200	4200
		65			5160	5160	5160	5280	5280
		75				6480	6480	6480	6480
ZB48KQE	Q	30	7700	9650	11900	14550	17600	21150	
		35	7100	9150	11300	13850	16800	20250	
		45	6250	7950	10150	12450	15100	18150	20750
		55		6850	8650	10750	13300	16000	18300
		65			7250	9150	11300	13750	15750
		75				7450	9350	11500	13050
	P	30	2740	2750	2760	2770	2800	2840	
		35	3050	3070	3080	3110	3130	3180	
		45	3800	3830	3850	3860	3900	3950	4030
		55		4800	4810	4820	4850	4900	4980
		65			6020	6040	6050	6060	6140
		75				7540	7550	7560	7610
ZB58KQE	Q	30	9810	12090	14670	17520	20630	23970	
		35	8280	11500	13960	16710	19710	22950	
		45	7290	9260	12470	14980	17730	20720	23910
		55		7980	10050	12510	15600	18290	21170
		65			8440	10580	13110	15690	18210
		75				8590	10750	13280	15060
	P	30	3230	3250	3310	3390	3460	3500	
		35	3610	3630	3690	3760	3810	3830	
		45	4470	4500	4560	4630	4670	4660	4580
		55		5500	5590	5670	5710	5700	5610
		65			6760	6870	6940	6950	6860
		75				8250	8360	8390	8330
ZB66KQE	Q	30	11130	13640	16540	19770	23290	27080	
		35	9380	12970	15760	18870	22290	25950	
		45	8220	10440	14080	16940	20080	23460	27020
		55		8970	11340	14150	17670	20720	23930
		65			9520	11980	14860	17770	20580
		75				9730	12190	15050	17010
	P	30	3600	3630	3690	3780	3850	3900	
		35	4030	4050	4120	4190	4250	4270	
		45	4980	5030	5100	5170	5210	5200	5120
		55		6150	6250	6340	6380	6370	6270
		65			7560	7690	7770	7770	7670
		75				9220	9350	9390	9310

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

R134a

Performance Data

Q=Capacity (Watts) P=Power input (Watts) 1 & 3-Phase

60 Hz

Model		Condensing Temperature °C	Evaporating Temperature °C -15	-10	-5	0	5	10	15
ZB76KQE	Q	30	12820	15700	18990	22680	26750	31150	
		35	10820	14950	18130	21680	25600	29840	
		45	9490	12060	16260	19520	23110	27000	31130
		55		10370	13120	16350	20390	23880	27590
		65			10980	13840	17160	20510	23740
		75				11170	14030	17340	19610
	P	30	4220	4250	4340	4440	4520	4560	
		35	4730	4750	4830	4920	4980	5000	
		45	5840	5890	5960	6040	6090	6080	5970
		55		7190	7290	7390	7450	7430	7300
		65			8820	8960	9040	9040	8930
		75				10740	10880	10930	10840

* Max return gas temperature of 18.3°C in non shaded region
* Max Suction superheat of 11K only in shaded region
* Sub cooling 0K

ZB Series

Technical Data

Model			ZB15KQ ZB15KQE	ZB19KQ ZB19KQE	ZB21KQ ZB21KQE	ZB26KQ ZB26KQE	ZB29KQ ZB29KQE	ZB38KQ ZB38KQE	ZB45KQ ZB45KQE
Motor type	50Hz		PFJ	PFJ	PFJ	PFJ	PFJ		
			TF5	TF5	TF5	TF5	TF5	TF5	TF5
			TFD	TFD	TFD	TFD	TFD	TFD	TFD
	60Hz		PFV	PFV	PFV	PFV	PFV		
			TF5	TF5	TF5	TF5	TF5	TF5	TF5
			TF7	TF7	TF7	TF7	TF7	TF7	TF7
			TFD	TFD	TFD	TFD	TFD	TFD	TFD
Displacement (M^3/HR)		50Hz	5.9	6.8	8.6	9.9	11.4	14.4	17.1
		60Hz	7.1	8.2	10.4	12.0	13.8	17.3	20.6
LRA	50Hz	PFJ	58.0	61.0	82.0	97.0	114.0		
		TF5/TW5	56.0	70.0	83.0	95.0	98.0	139.0	172.0
		TFD	26.0	32.0	40.0	46.0	50.0	65.5	74.0
	60Hz	PFV	61.0	72.5	95.0	109.0	137.0		
		TF5/TW5	55.0	63.0	77.0	88.0	91.0	128.0	156.0
		TF7/TW7	27.0	30.0	39.0	41.0	54.0	64.0	70.0
		TFD	27.0	31.0	39.0	44.0	50.0	63.0	75.0
RLA	KQ	PFJ	11.4	12.9	16.4	17.1	19.3		
		PFV	13.6	15.0	18.4	20.4	22.1		
		TF5/TW5	8.9	10.0	11.4	13.9	16.4	20.7	20.7
		TF7/TW7	5.0	5.8	7.5	7.3	9.3	10.7	10.7
		TFD	4.3	4.3	5.7	7.1	7.9	10.0	11.5
	KQE	PFJ	13.2	14.6	15.4	18.9	20.0		
		PFV	15.7	17.1	20.7	23.6	25.0		
		TF5/TW5	8.9	10.0	12.1	13.2	17.1	24.0	26.0
		TF7/TW7	5.1	5.9	7.4	7.6	9.6	12.4	12.6
		TFD	5.0	5.0	7.4	6.4	7.9	9.6	10.1
Max Continuous Current	KQ	PFJ	16.0	18.0	23.0	24.0	27.0		
		PFV	19.0	21.0	25.8	28.6	31.0		
		TF5/TW5	12.5	14.0	16.0	19.4	23.0	29.0	29.0
		TF7/TW7	7.0	8.1	10.5	10.2	13.0	15.0	15.0
		TFD	6.0	6.0	8.0	10.0	11.0	13.5	16.1
	KQE	PFJ	18.5	20.5	21.5	26.5	28.0		
		PFV	22.0	24.0	29.0	33.0	35.0		
		TF5/TW5	12.5	14.0	17.0	18.5	24.0	33.6	32.4
		TF7/TW7	7.2	8.3	10.3	10.7	13.5	17.4	17.7
		TFD	7.0	7.0	10.3	9.0	11.0	14.0	14.2
Run Capacitor (1 phase)	50Hz	PFJ	40/440	45/370	60/370	60/370	60/370		
Run Capacitor (1 phase)	60Hz	PFV	40/370	45/370	50/370	60/370	60/440		
Nominal power(HP)			2	2.5	3	3.5	4	5	6
Crankcase Heater(W)			70	70	70	70	70	70	70
Connection Tube size(inch)									
Discharge Tube outer Diameter			1/2	1/2	1/2	1/2	1/2	1/2	1/2
Suction Tube outer Diameter			3/4	3/4	3/4	3/4	7/8	7/8	7/8
Dimension(mm)									
Length			242	242	243	243	242	242	242
Width			242	242	244	244	242	242	242
Height			383	389	412	425	430	457	457
Mounting pants installation size (hole size)			190x190(8.5)	190x190(8.5)	190x190(8.5)	190x190(8.5)	190x190(8.5)	190x190(8.5)	190x190(8.5)
Oil Recharge(L)									
PFJ/PFV			1.24	1.30	1.45	1.45/1.48	1.36		
TFD/TF5/TF7			1.24	1.36	1.45	1.48	1.36	2.07	1.89
Weight(kg)									
Net			23	25	27	28	33	38	40
Gross			26	29	30	31	37	41	44

ZB Series

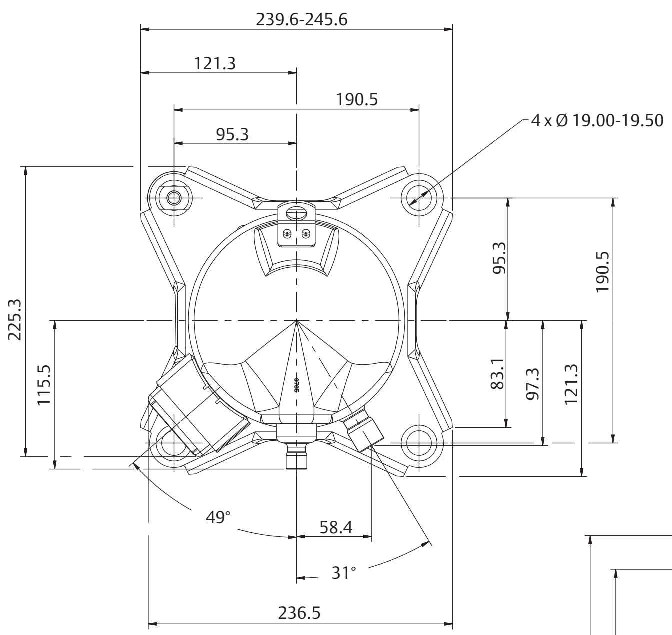
Technical Data

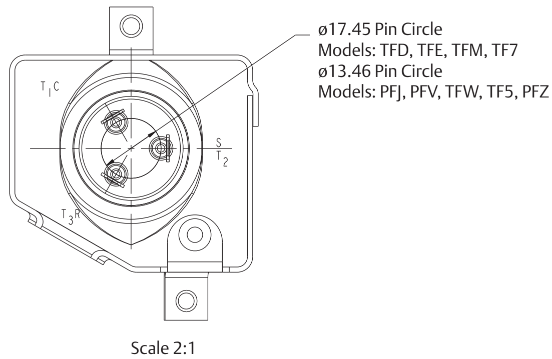
Model			ZB48KQ ZB48KQE	ZB58KQ ZB58KQE	ZB66KQ ZB66KQE	ZB76KQ ZB76KQE	ZB88KQ ZB88KQE	ZB95KQ ZB95KQE	ZB114KQ ZB114KQE
Motor type		50Hz							
			TF5	TF5	TF5	TF5	TF5		
			TFD	TFD	TFD	TFD	TFD	TFD	TFD
								TW5	TW5
		60Hz							
			TF5	TF5	TF5	TF5	TF5		
			TF7	TF7	TF7	TF7	TF7		
			TFD	TFD	TFD	TFD	TFD	TFD	TFD
								TW5	TW5
								TW7	TW7
Displacement (M³/HR)		50Hz	18.8	22.1	25.7	28.8	33.2	36.4	43.3
		60Hz	22.6	26.7	31.0	34.8	40.1	43.9	52.3
LRA	50Hz	PFJ							
		TF5/TW5	179.0	203.0	231.0	239.0	273.0		
		TFD	101.0	95.0	111.0	118.0	118.0	140.0	174.0
	60Hz	PFV							
		TF5/TW5	164.0	195.0	225.0	239.0	245.0	300.0	340.0
		TF7/TW7	100.0	123.0	140.0	145.0	145.0	139.0	196.0
		TFD	100.0	95.0	114.0	125.0	125.0	150.0	179.0
RLA	KQ	PFJ							
		PFV							
		TF5/TW5	25.0	32.1	33.6	41.4	47.1	53.6	58.6
		TF7/TW7	12.1	16.7	18.6	23.6	24.4	28.6	35.7
		TFD	12.1	16.4	17.3	20.0	22.1	25.0	27.9
	KQE	PFJ							
		PFV							
		TF5/TW5	26.0	32.1	33.6	41.4	47.1	61.4	65.0
		TF7/TW7		17.1	18.6	23.6	24.4	35.0	42.9
		TFD	13.6	16.4	17.3	20.0	22.1	26.4	28.6
Max Continuous Current	KQ	PFJ							
		PFV							
		TF5/TW5	35.0	45.0	47.0	54.0	66.0	75.0	82.0
		TF7/TW7	17.0	23.4	26.0	33.1	34.2	40.0	50.0
		TFD	17.0	23.0	24.2	26.9	31.0	35.0	42.0
	KQE	PFJ							
		PFV							
		TF5/TW5	36.4	43.0	44.0	58.0	66.0	86.0	91.0
		TF7/TW7		24.0	29.0	33.0	34.2	49.0	60.0
		TFD	19.1	23.0	24.5	28.0	31.0	37.0	40.0
Run Capacitor (1 phase)	50Hz	PFJ							
Run Capacitor (1 phase)	60Hz	PFV							
Nominal power(HP)			7	8	9	10	12	13	15
Crankcase Heater(W)			70	90	90	90	90	90	90
Connection Tube size(inch)									
Discharge Tube outer Diameter			3/4	7/8	7/8	7/8	7/8	7/8	7/8
Suction Tube outer Diameter			7/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
Dimension(mm)									
Length			242	264	264	264	264	264	264
Width			242	284	284	284	284	285	285
Height			457	477	546	546	546	552	553
Mounting pants installation size (hole size)			190x190(8.5)	190x190(8.5)	190x190(8.5)	190x190(8.5)	190x190(8.5)	190x190(8.5)	190x190(8.5)
Oil Recharge(L)									
TFD/TF5/TF7			1.80	2.51	3.25	3.25	3.25	3.30	3.30
Weight(kg)									
Net			40	57	59	62	62	62	63
Gross			44	60	62	65	65	65	66

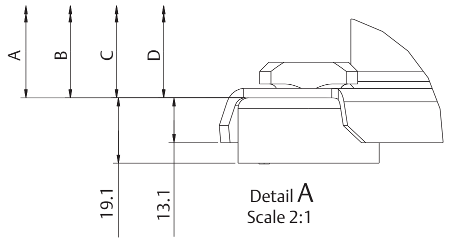
Dimensions

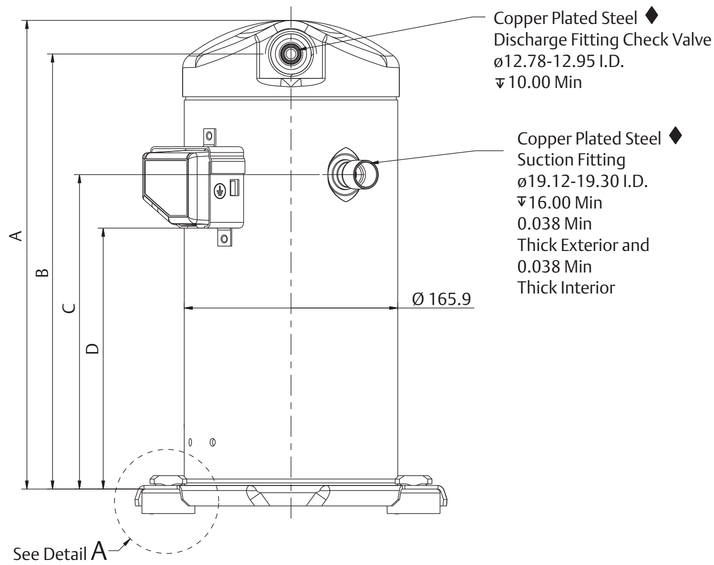
Brazing Connection

ZB15~ZB29 (BOM 524)







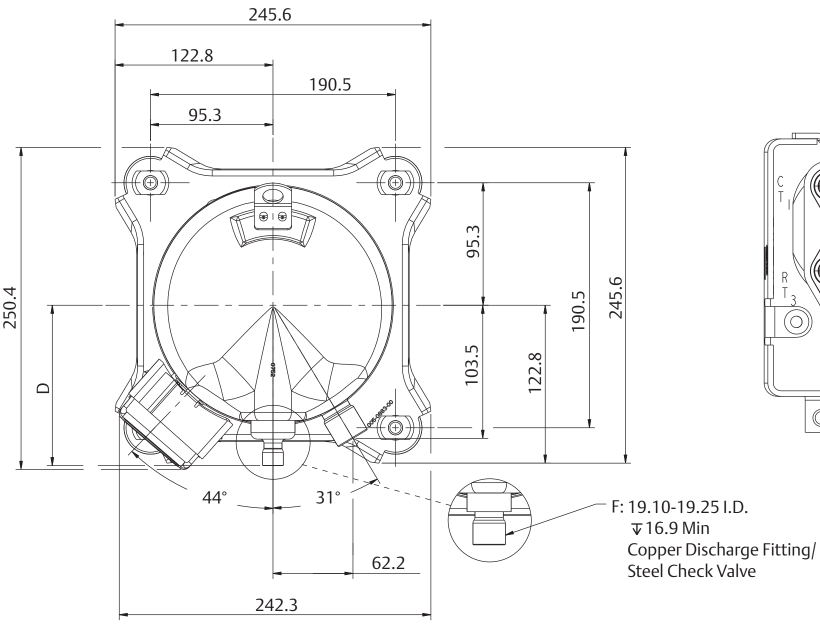


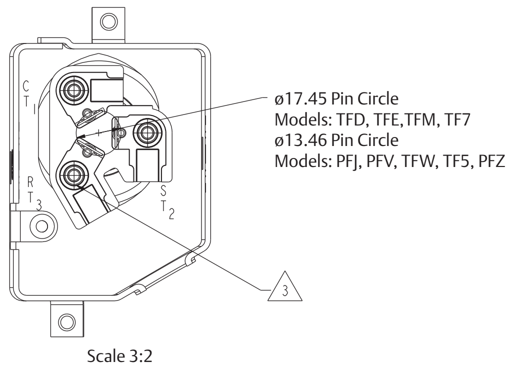
Compressor model	A±3	B±3	C±3	D±3
ZB15KQ/ZB15KQE ZB19KQ/ZB19KQE	363.8	338.3	244.5	202.9
ZB21KQ/ZB21KQE	386.4	360.9	264.4	222.8
ZB26KQ/ZB26KQE	400.2	374.6	277.1	235.5
ZB29KQ/ZB29KQE	417.8	389.9	294.1	252.5

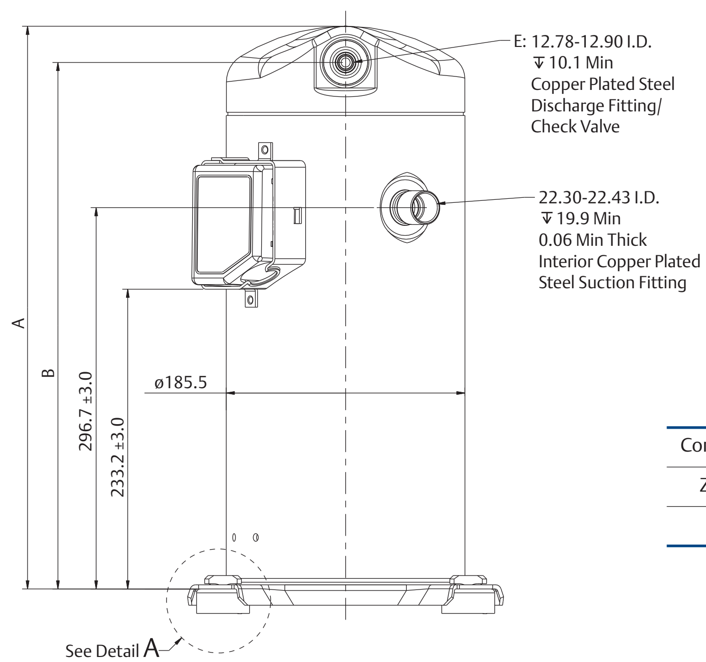
Dimensions

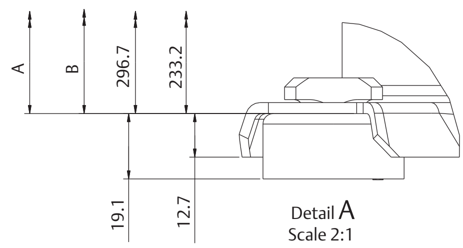
Brazing Connection

ZB38~ZB48 (BOM 524)







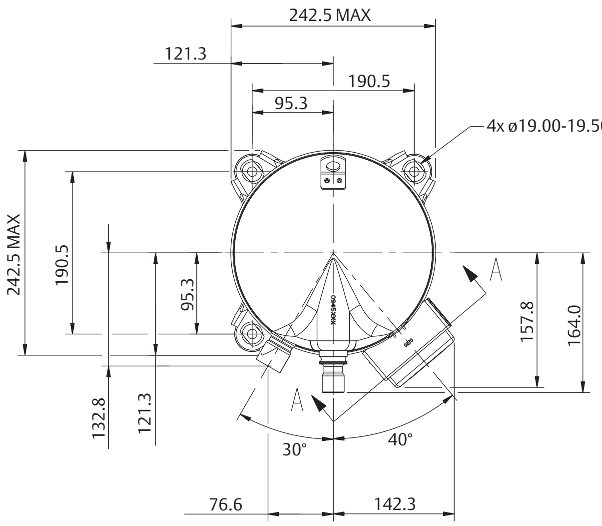


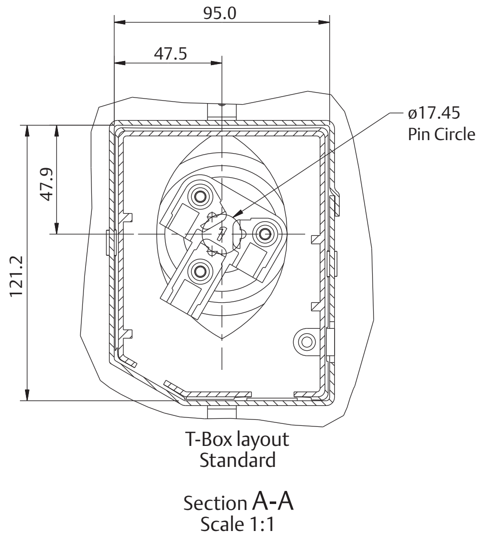
Compressor model	A±3	B±3	D
ZB38/45KQ(E)	437.7	409.6	124.7
ZB48KQ(E)	443.4	413.7	128.7

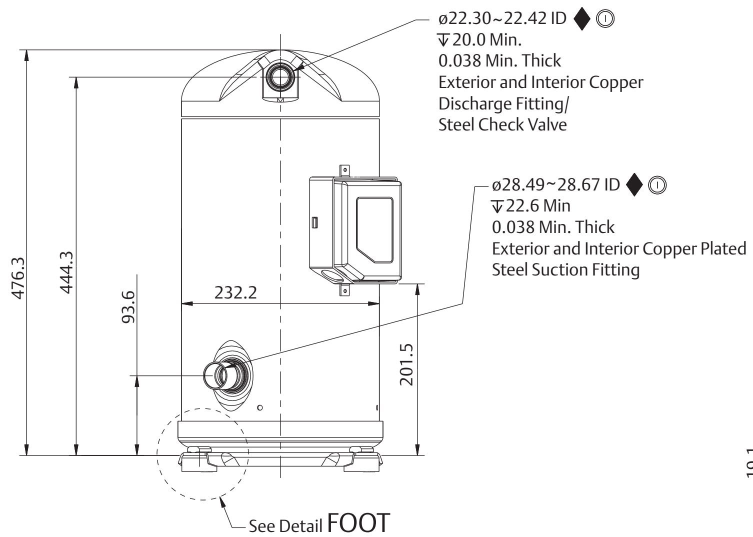
Dimensions

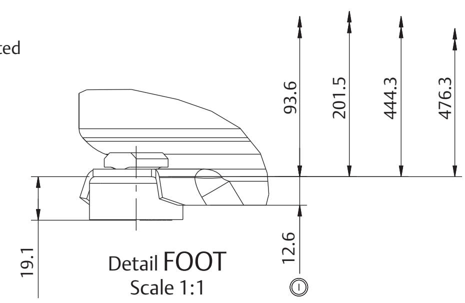
Brazing Connection

ZB58 (BOM 524)







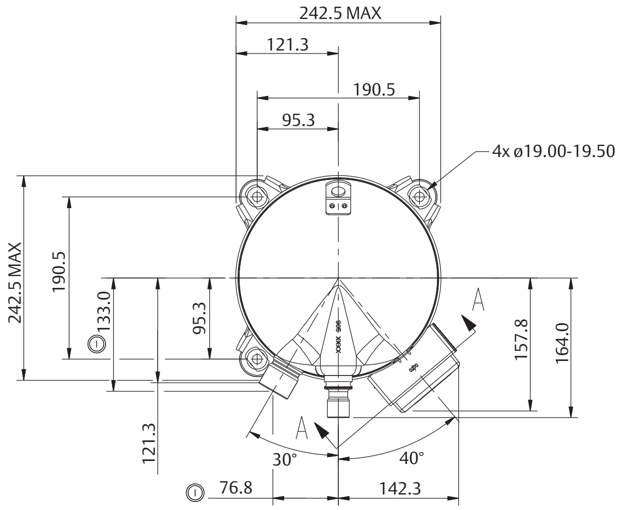


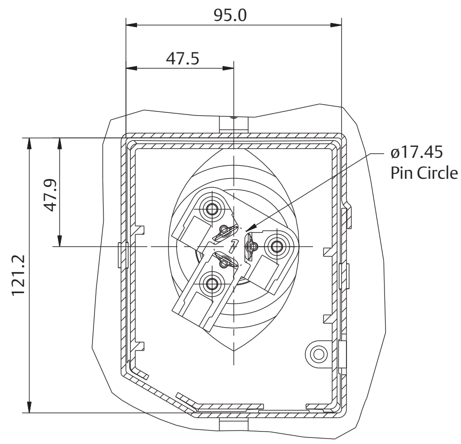
ZB Series

Dimensions

Brazing Connection

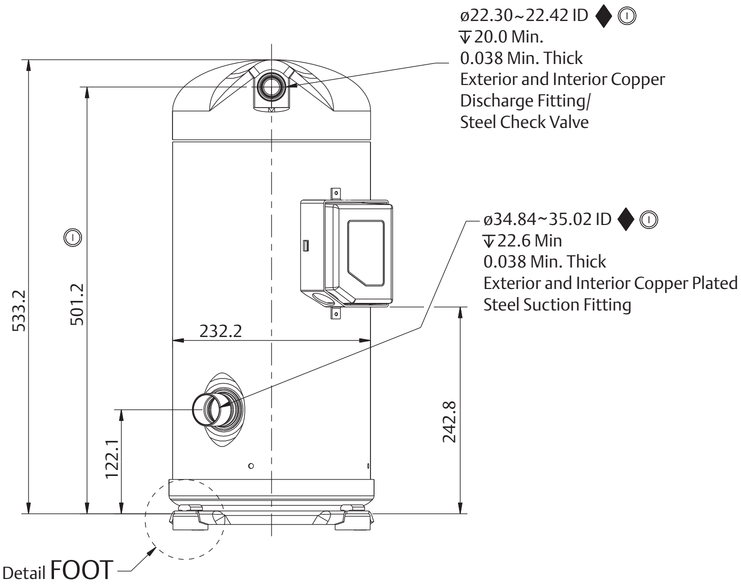
ZB66~ZB88 (BOM 524)



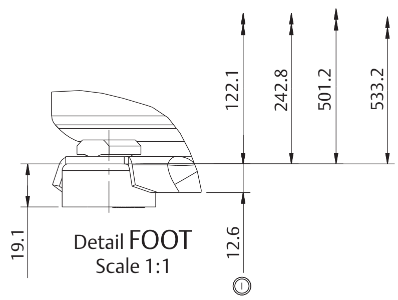


T-Box layout
Standard

Section A-A
Scale 1:1



See Detail FOOT

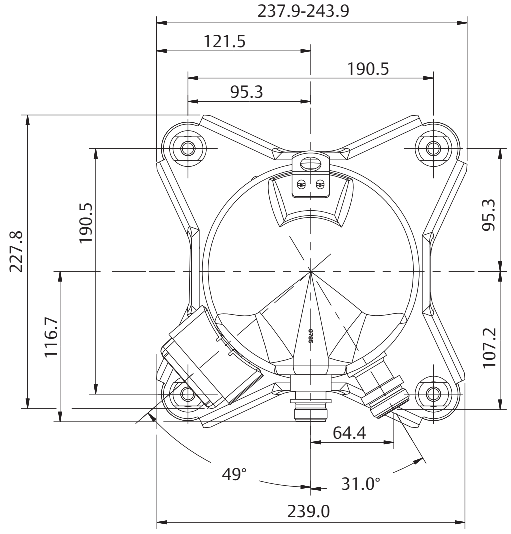


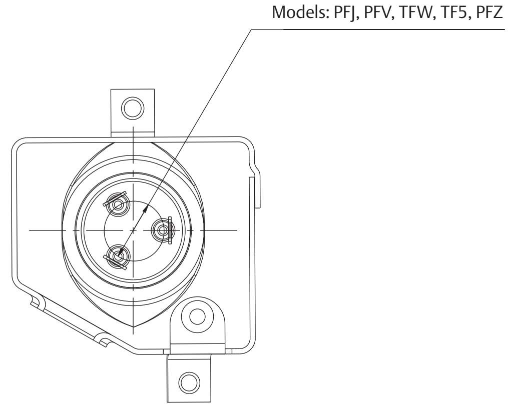
Detail FOOT
Scale 1:1

Dimensions

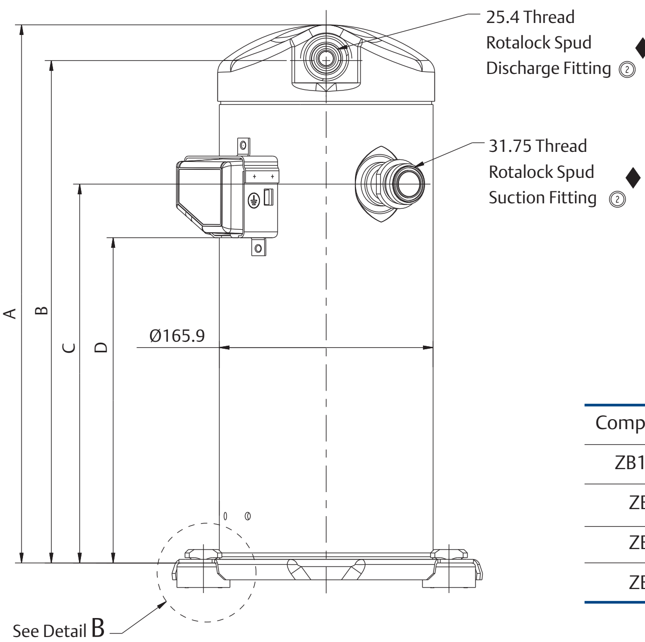
Rotalock Connection

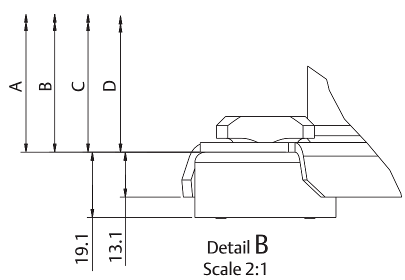
ZB15~ZB29 (BOM 523)





Scale 2:1





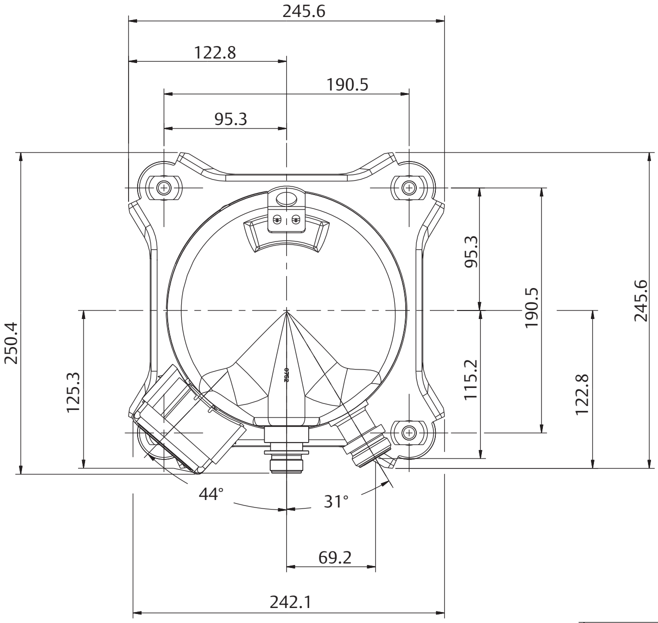
Detail B
Scale 2:1

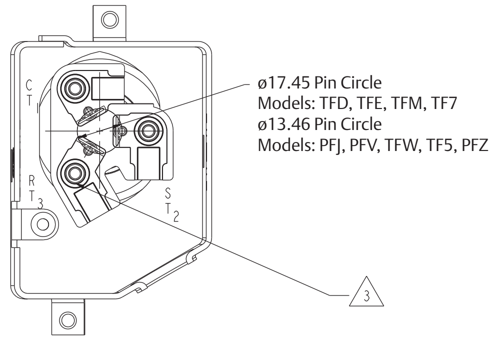
Compressor model	A±3	B	C	D±3	
ZB15/19KQ(E)	363.8	338.3	244.5	202.9	①
ZB21KQ(E)	386.4	360.9	264.4	222.8	①
ZB26KQ(E)	400.8	372.9	277.1	235.5	① ②
ZB29KQ(E)	417.8	389.9	294.1	252.5	①

Dimensions

Rotalock Connection

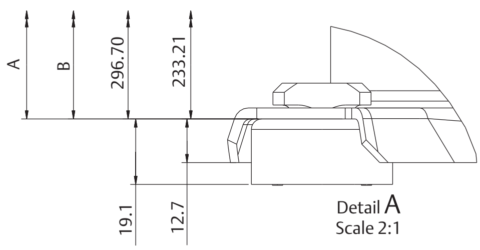
ZB38~ZB48 (BOM 523)



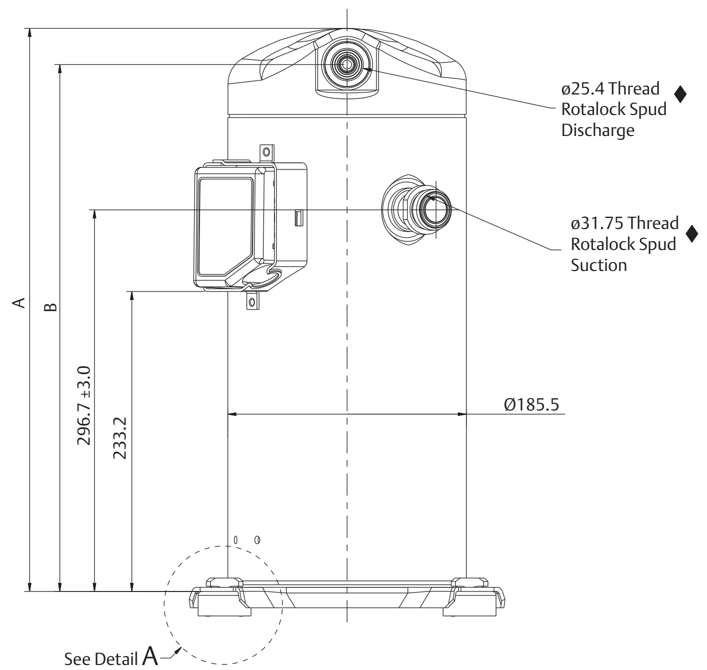


Terminal Box Layout Options
Terminal Box Cover Not Shown

View A-A
Scale 3:2



Detail A
Scale 2:1

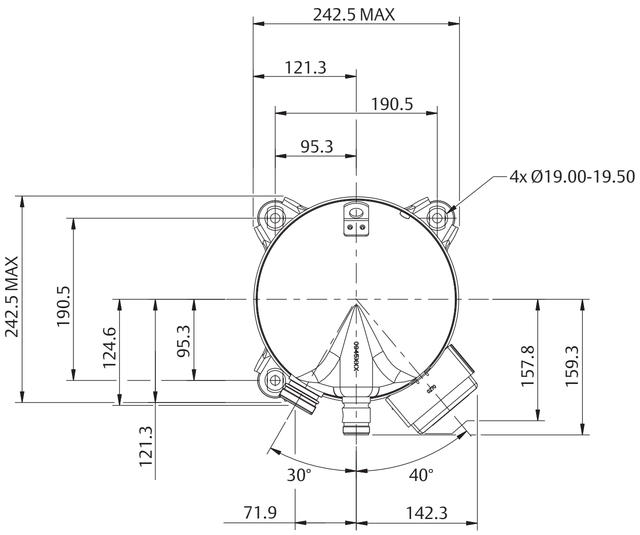


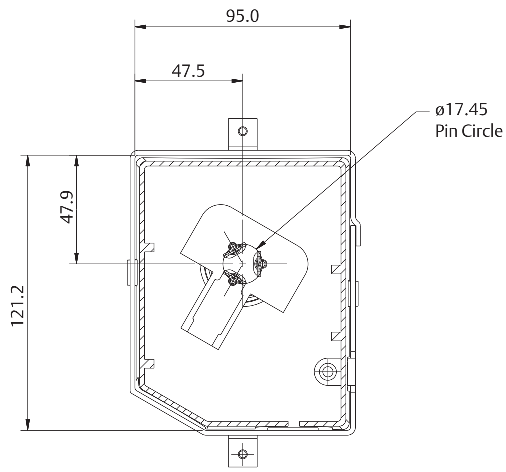
Compressor model	A±3	B±3
ZB38/45KQ(E)	437.7	409.6
ZB48KQ(E)	443.4	413.7

Dimensions

Rotalock Connection

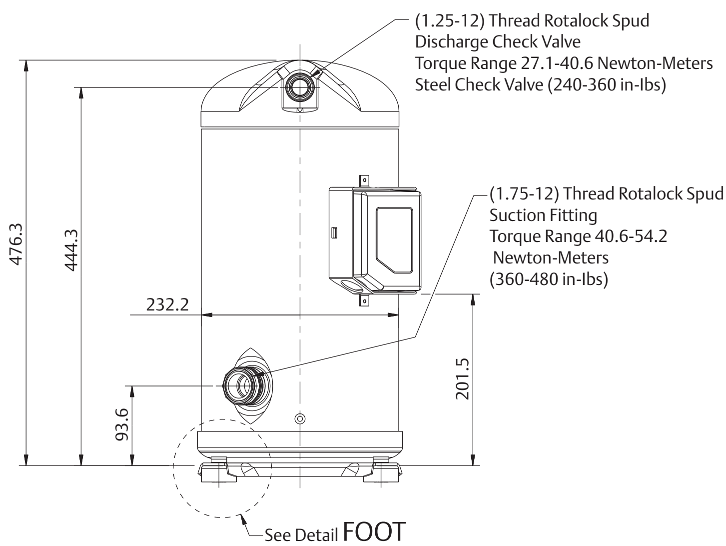
ZB58 (BOM 523)

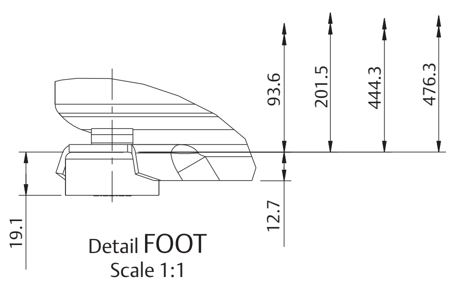




T-Box layout
Standard

Section A-A
Scale 1:1



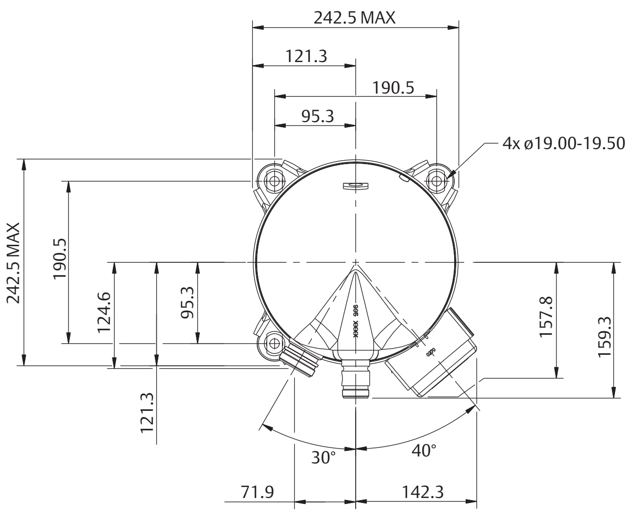


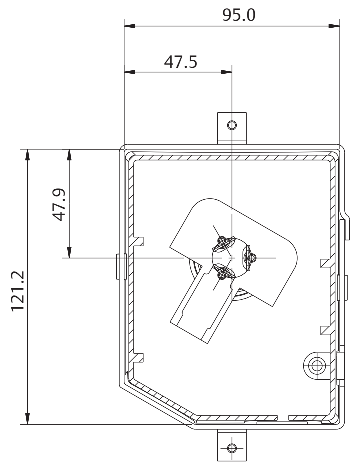
Detail FOOT
Scale 1:1

Dimensions

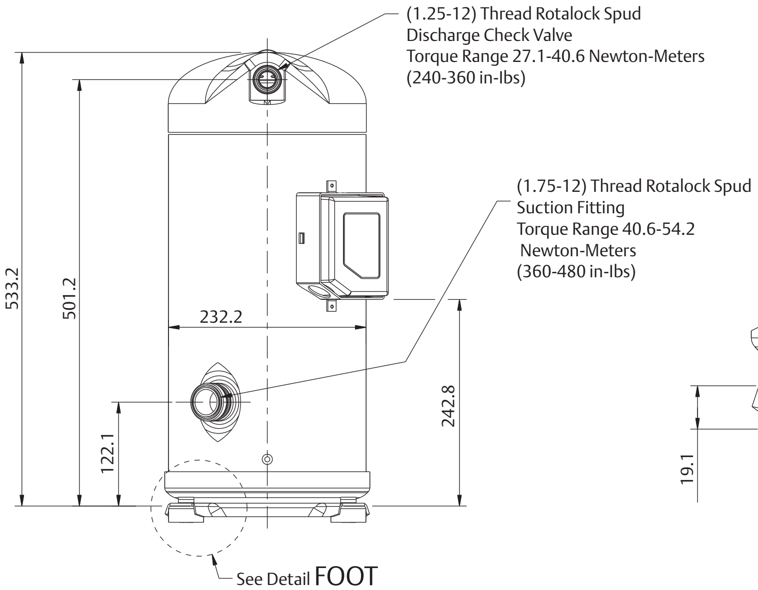
Rotalock Connection

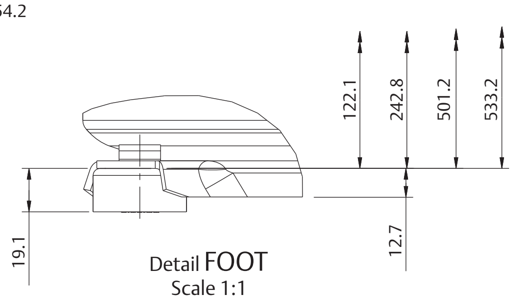
ZB66~ZB88 (BOM 523)





Section A-A
Scale 1:1



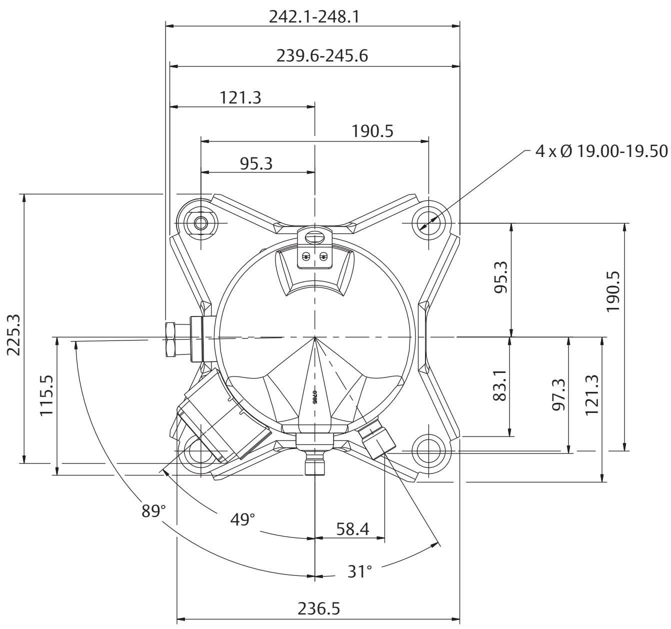


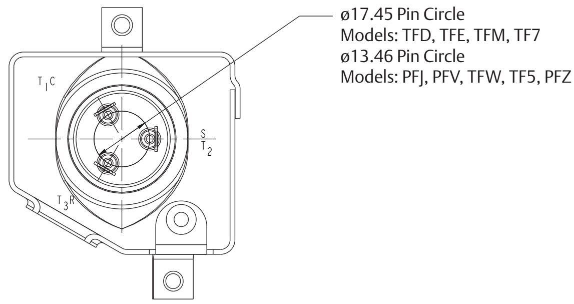
Detail FOOT
Scale 1:1

Dimensions

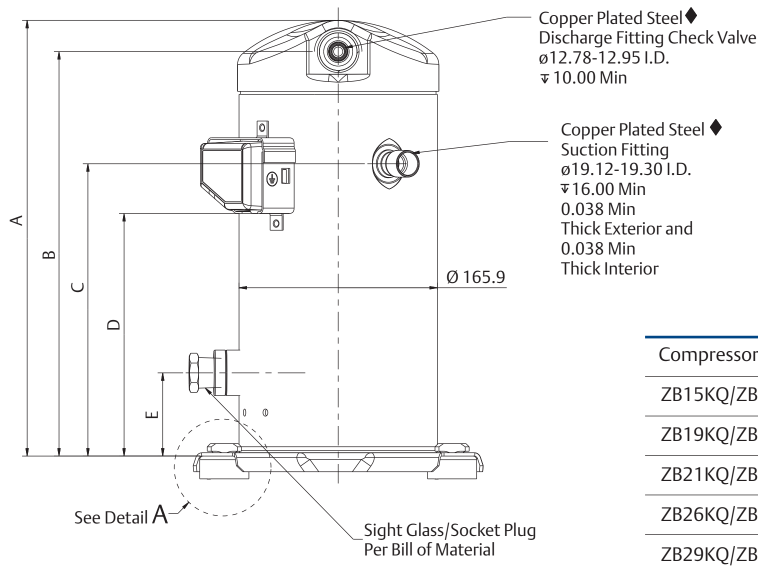
Brazing & Sight Glass

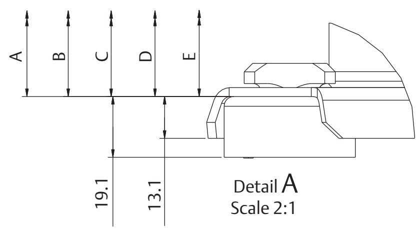
ZB15~ZB29 (BOM 558)





Scale 2:1





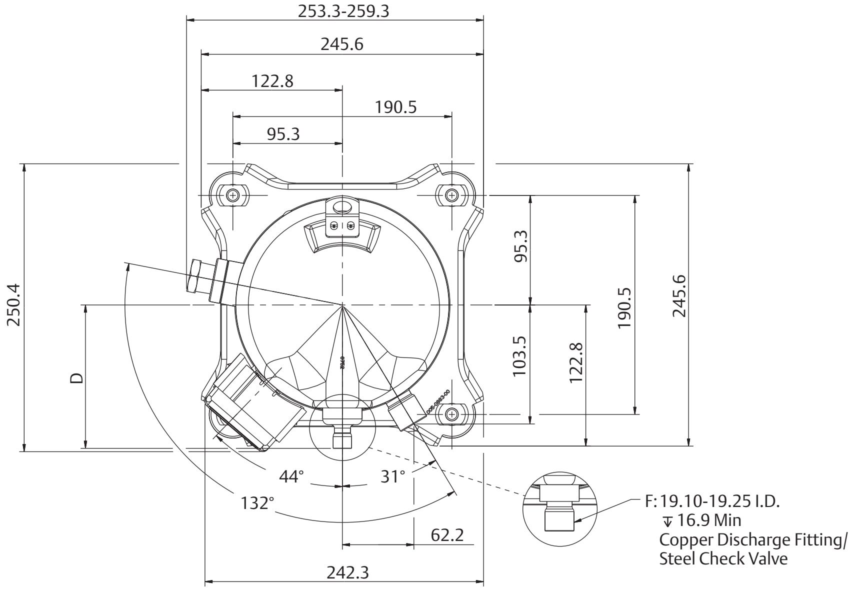
Detail A
Scale 2:1

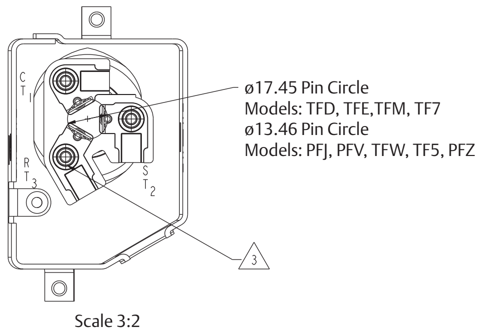
Compressor model	A±3	B±3	C±3	D±3	E±3
ZB15KQ/ZB15KQE ZB19KQ/ZB19KQE	363.8	338.3	244.5	202.9	69.6
ZB21KQ/ZB21KQE	386.4	360.9	264.4	222.8	64.9
ZB26KQ/ZB26KQE	400.2	372.9	277.1	235.5	77.6
ZB29KQ/ZB29KQE	417.8	389.9	294.1	252.5	67.4

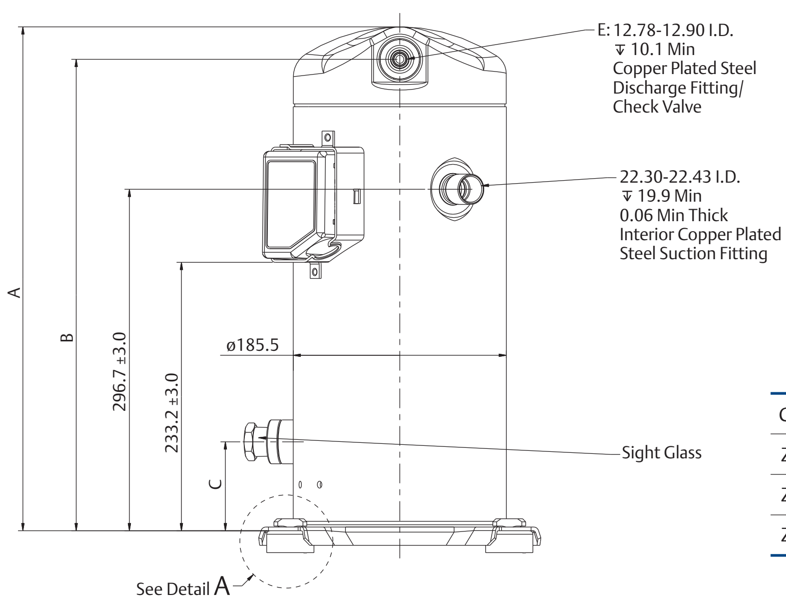
Dimensions

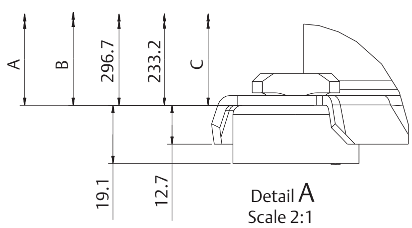
Brazing & Sight Glass

ZB38~ZB48 (BOM 558)







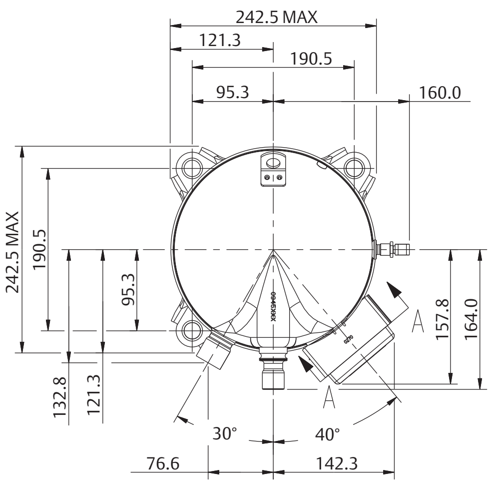


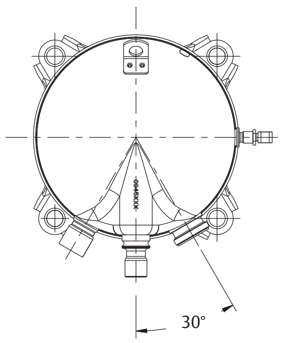
Compressor model	A±3	B±3	C±3	D
ZB38KQ/ZB38KQE	437.7	409.6	91.3	124.7
ZB45KQ/ZB45KQE	437.7	409.6	77.2	124.7
ZB48KQ/ZB48KQE	443.4	413.7	77.2	128.7

Dimensions

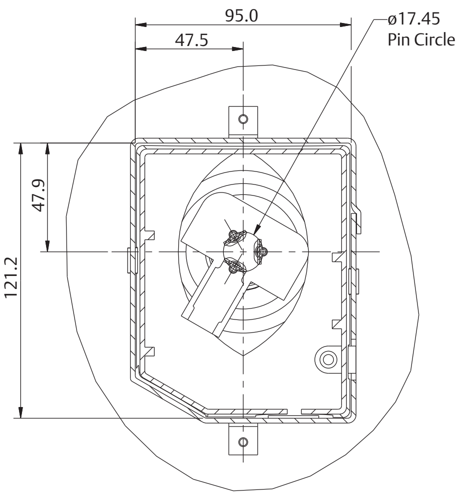
Brazing, Sight Glass & Oil Schrader Valve

ZB58 (BOM 550)



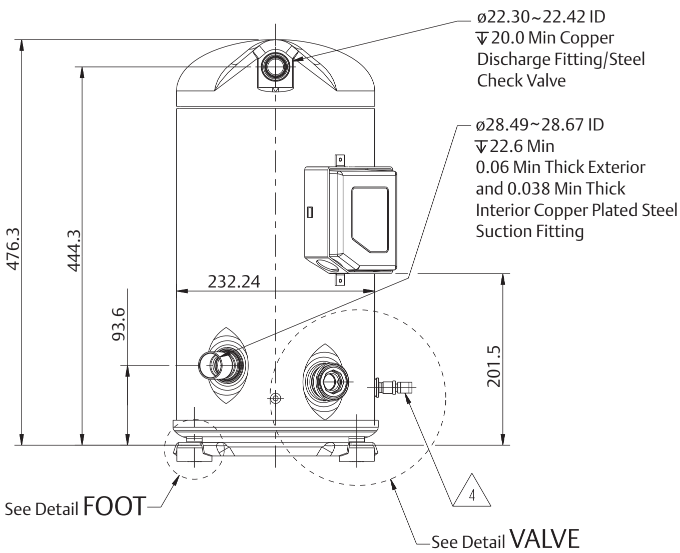


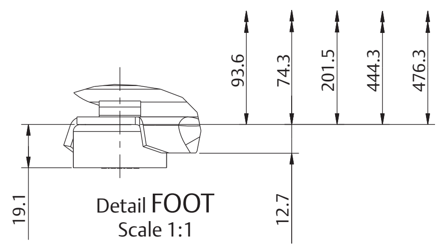
Sight glass Layout
T-box Removed



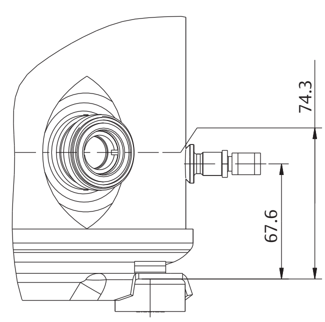
T-Box layout
Standard

Section A-A
Scale 1:1





Detail FOOT
Scale 1:1

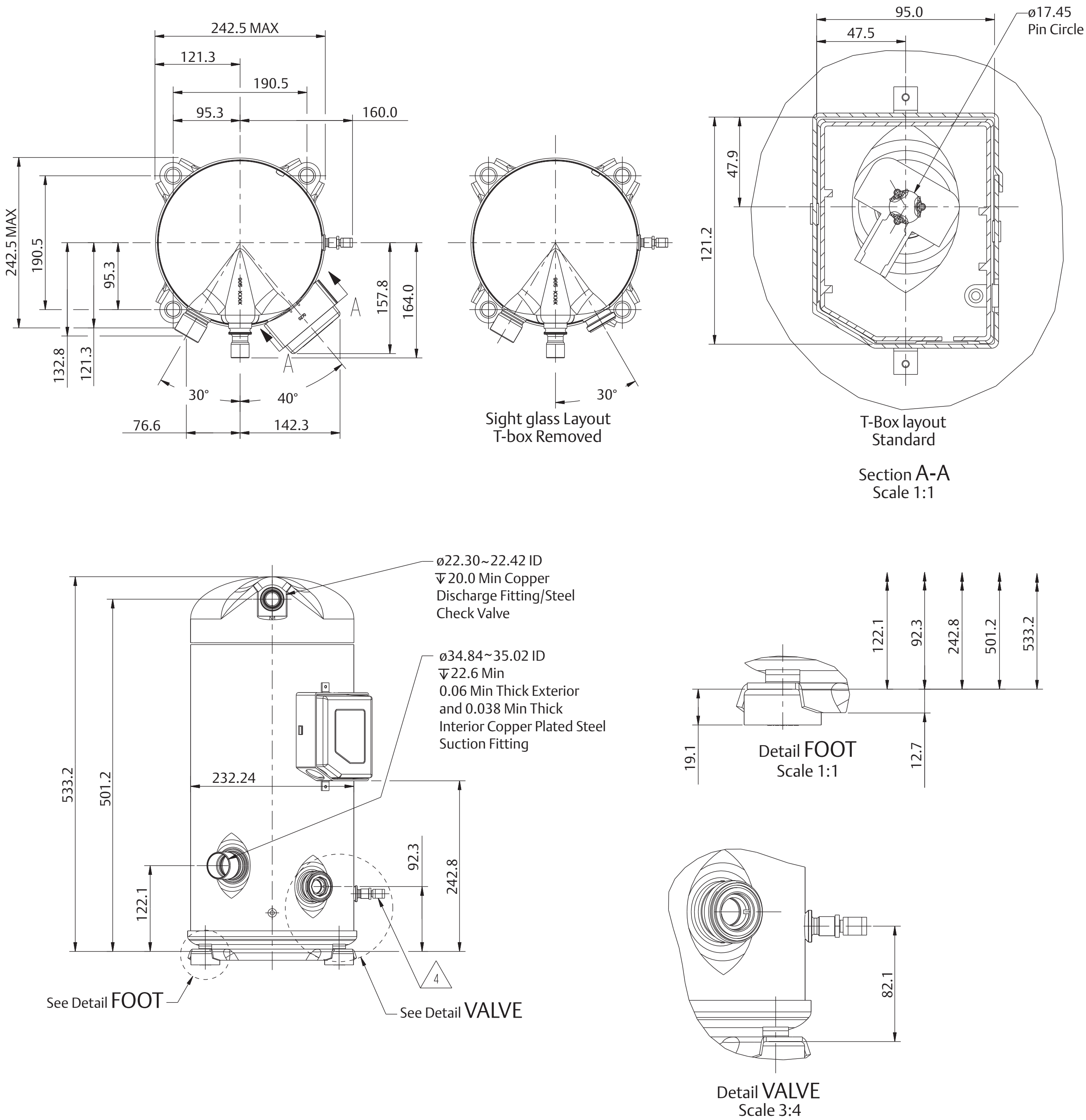


Detail VALVE
Scale 3:4

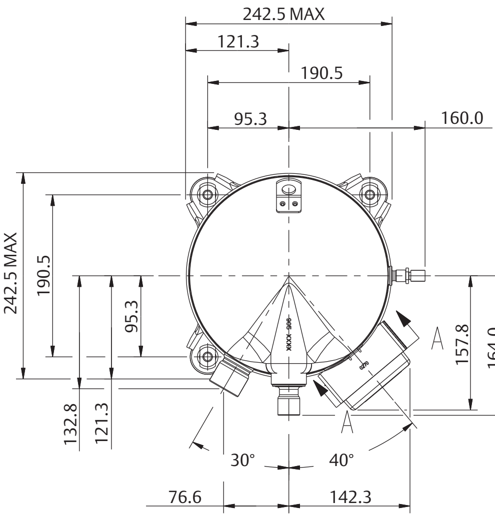
Dimensions

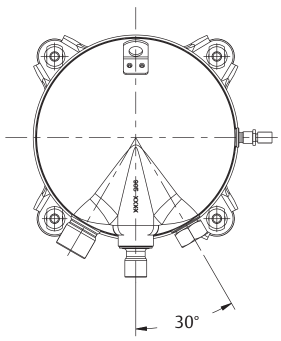
Brazing, Sight Glass & Oil Schrader Valve

ZB66~ZB88 (BOM 550)

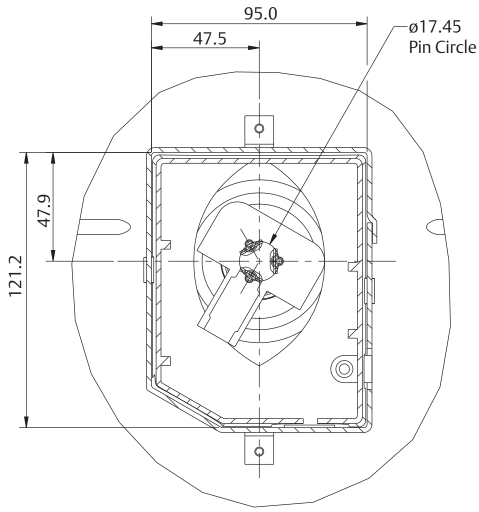


ZB95~ZB114 TFD (BOM 550)

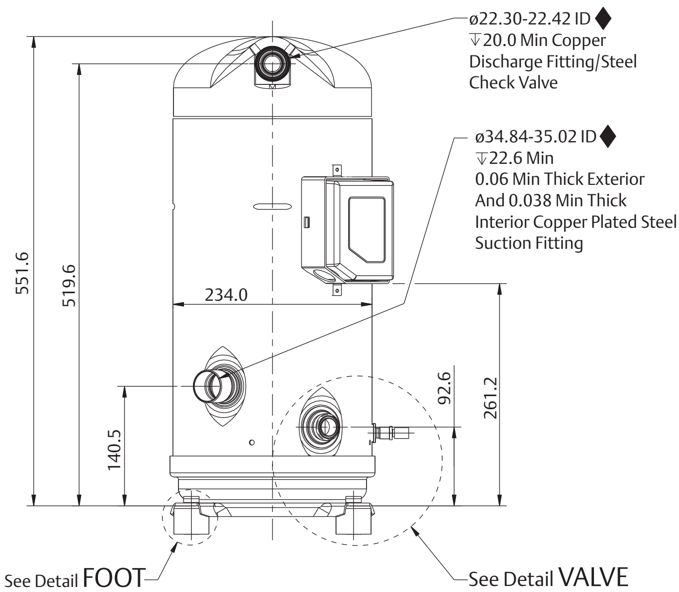


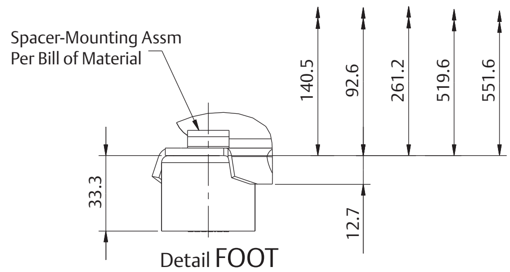


Sightglass Layout
T-Box Removed

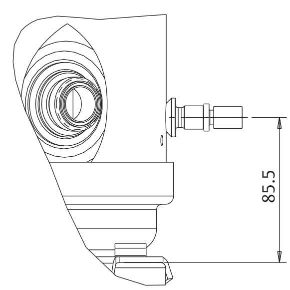


T-Box Layout
Standard
Section A-A
Scale 1:1





Detail FOOT
Scale 1:1

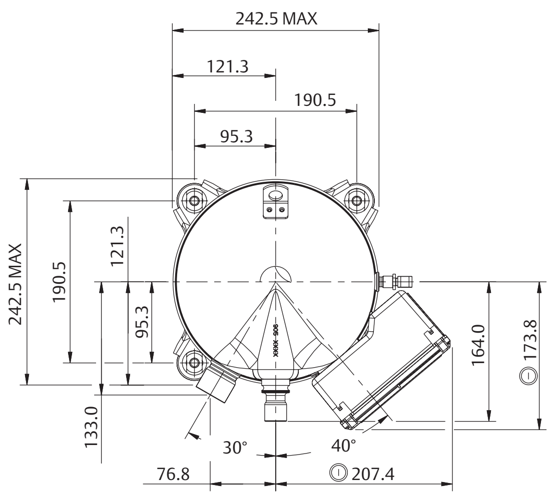


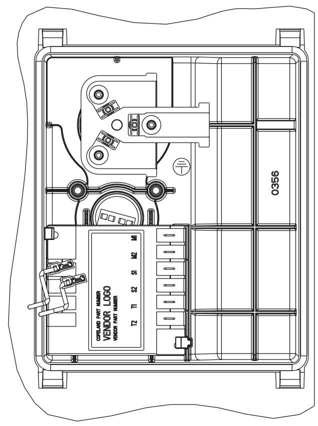
Detail VALVE
Scale 3:4

Dimensions

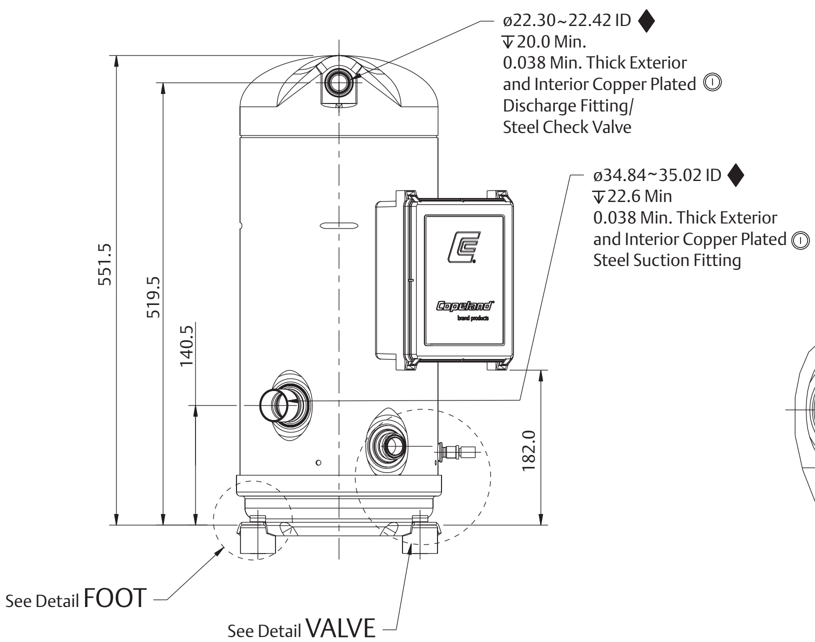
Brazing, Sight Glass & Oil Schrader Valve

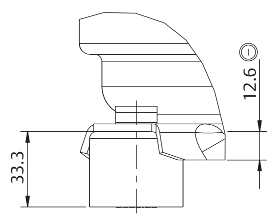
ZB95~ZB114 TW7/TW5 (BOM 550)



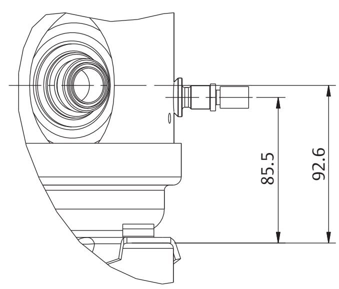


Terminal Box layout Standard
Scale 3:4





Detail FOOT
Scale 1:1

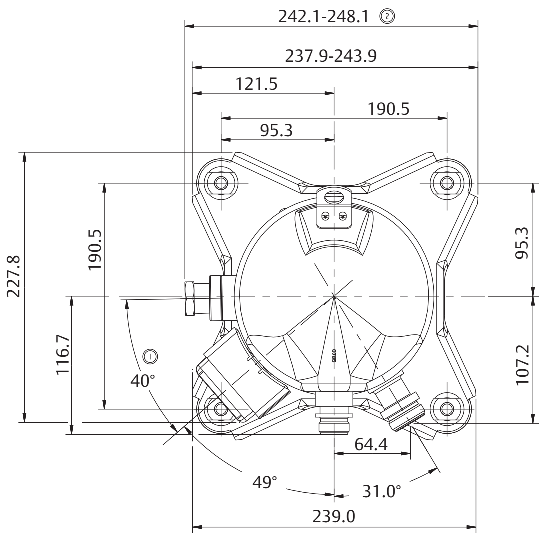


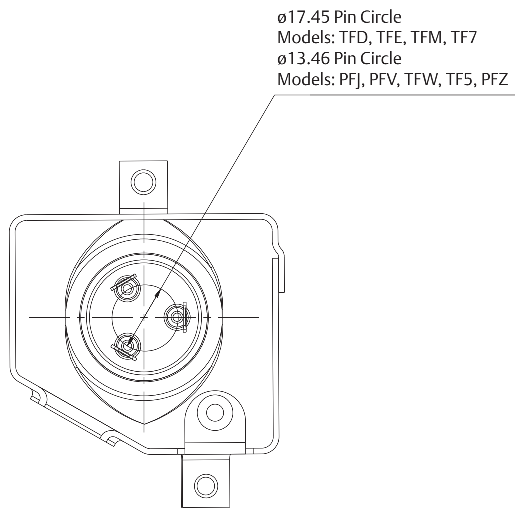
Detail VALVE
Scale 3:4

Dimensions

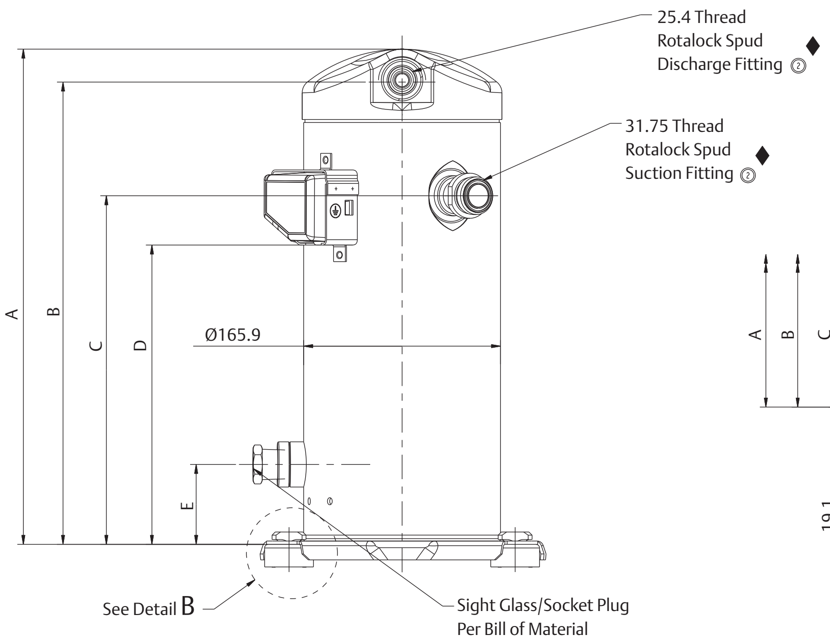
Rotalock & Sight Glass

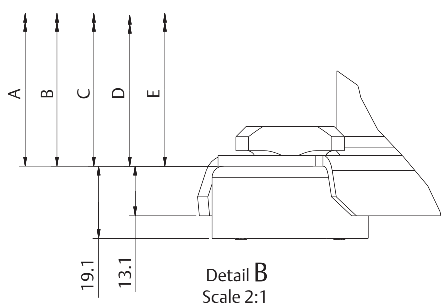
ZB15~ZB29 (BOM 559)





Scale 2:1



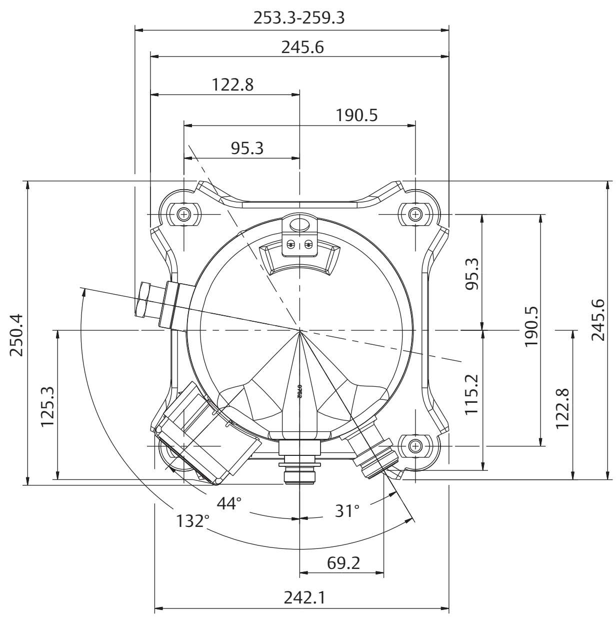


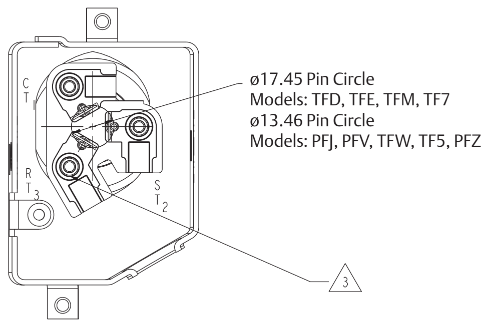
Detail B
Scale 2:1

Dimensions

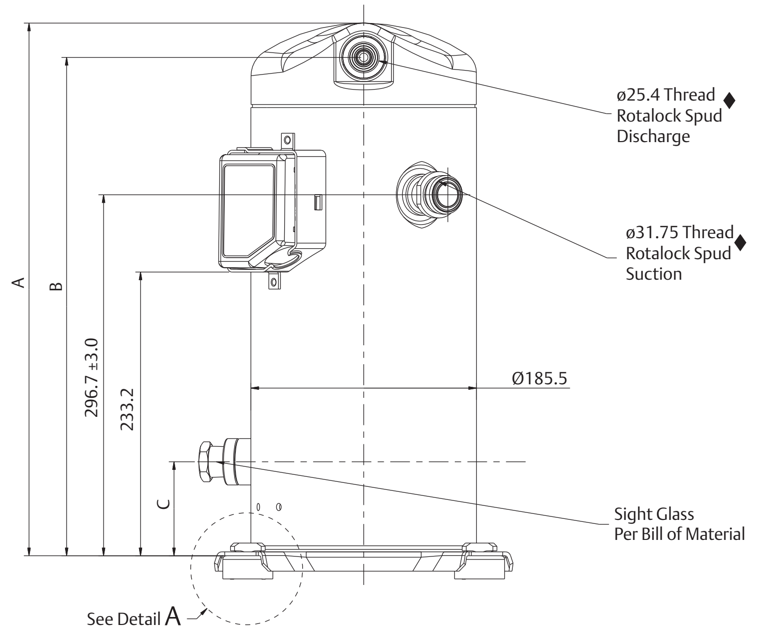
Rotalock & Sight Glass

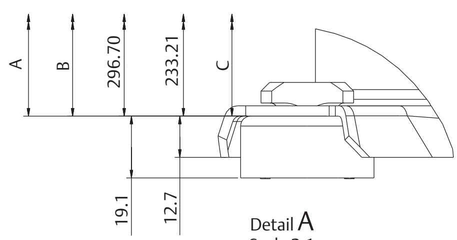
ZB38~ZB48 (BOM 559)





Terminal Box Layout Options
Terminal Box Cover Not Shown
View A-A
Scale 3:2





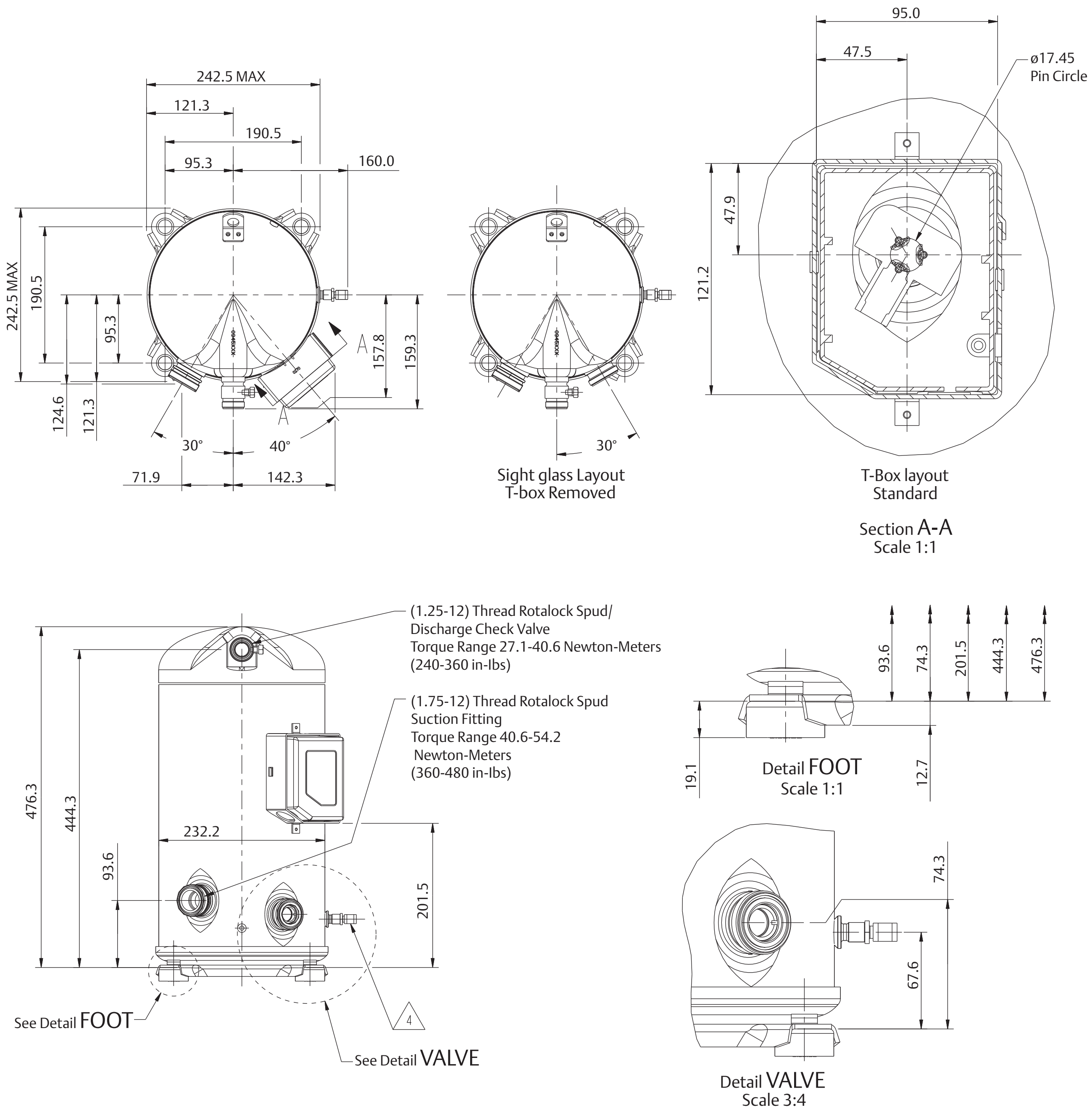
Detail A
Scale 2:1

ZB Series

Dimensions

Rotalock, Sight Glass & Oil Schrader Valve

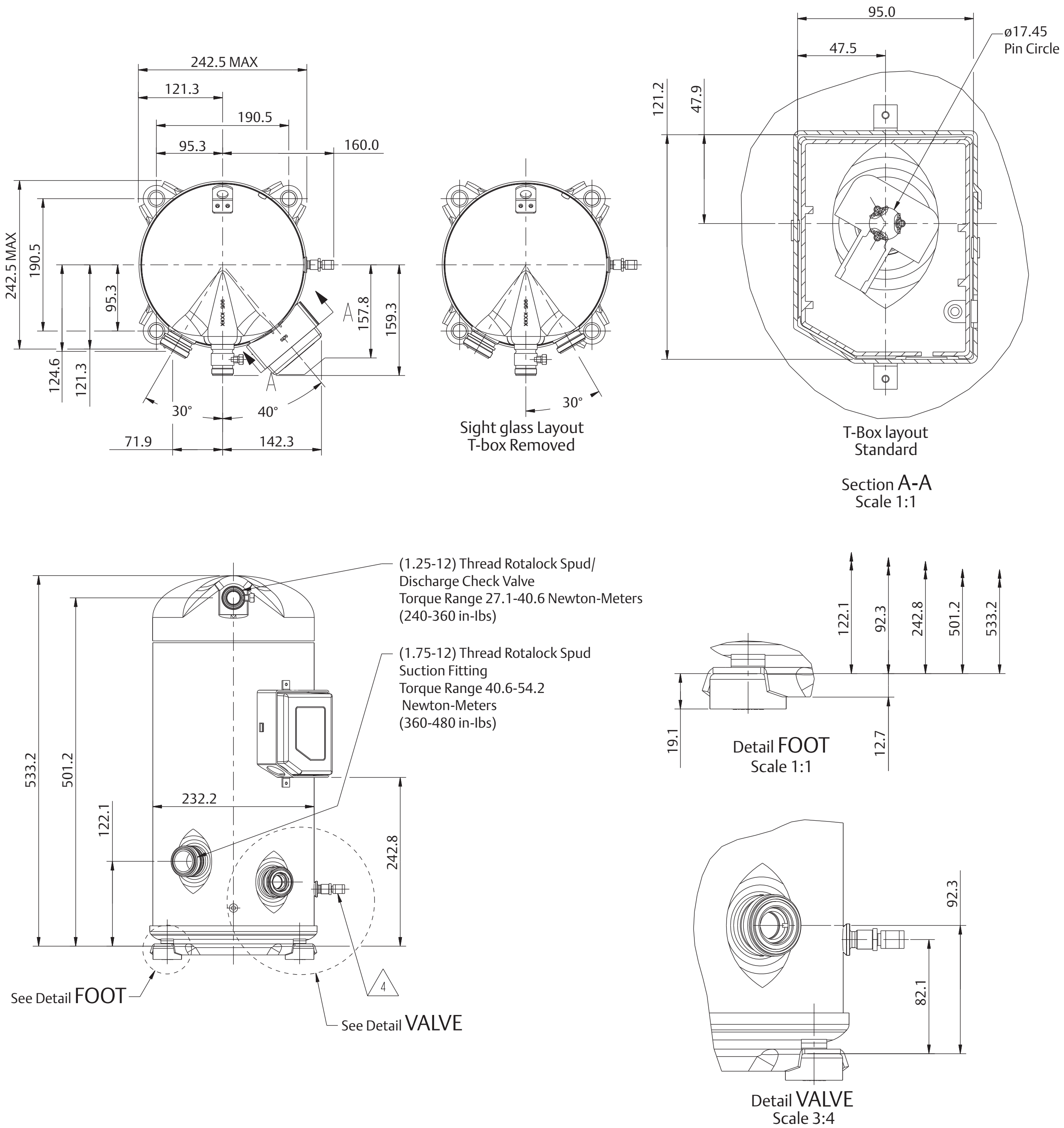
ZB58 (BOM 551)



Dimensions

Rotalock, Sight Glass & Oil Schrader Valve

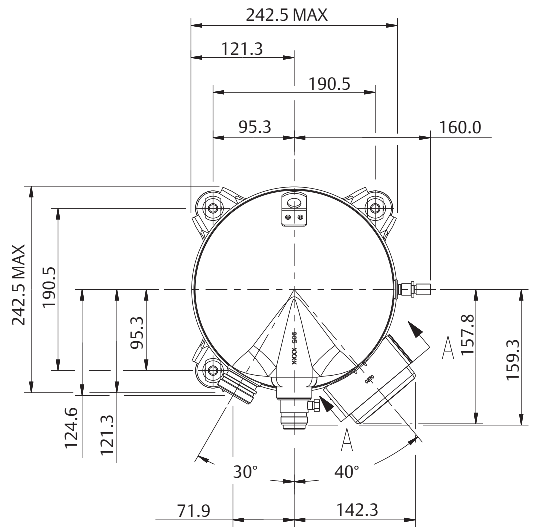
ZB66~ZB88 (BOM 551)

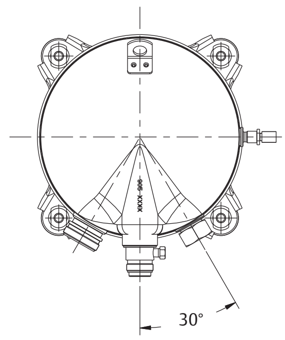


Dimensions

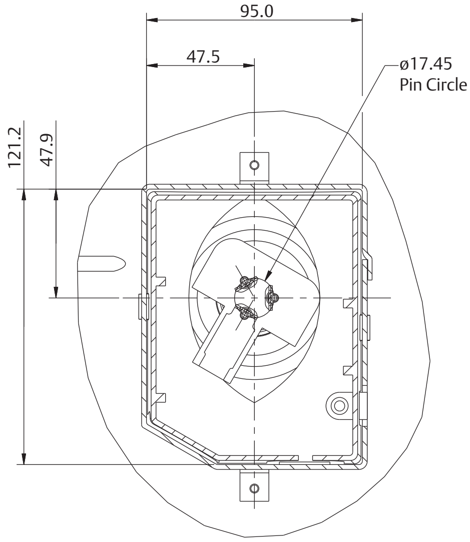
Rotalock, Sight Glass & Oil Schrader Valve

ZB95~ZB114 TFD (BOM 551)

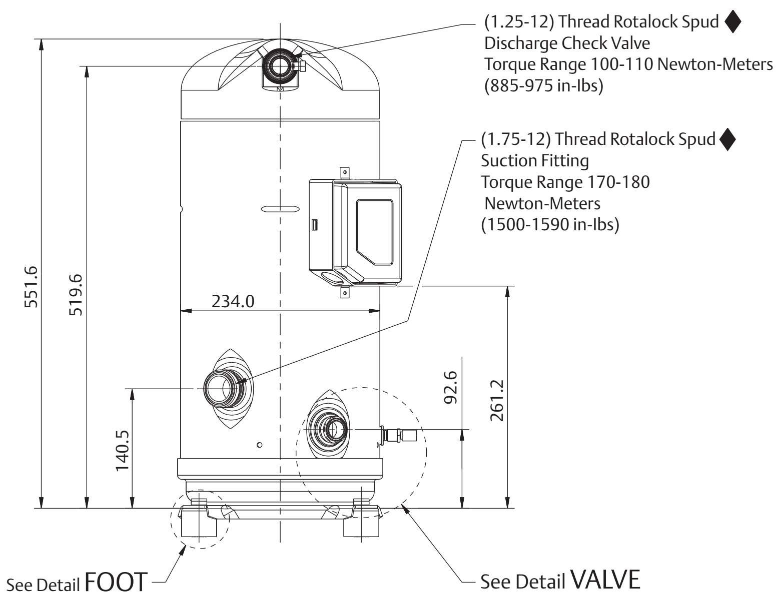


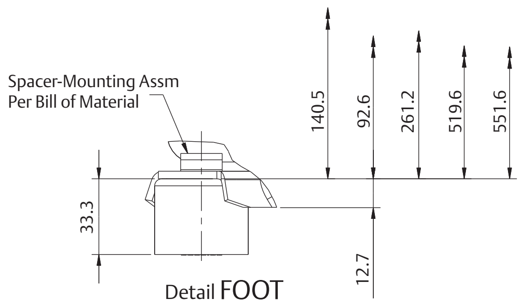


Sightglass Layout
T-Box Removed

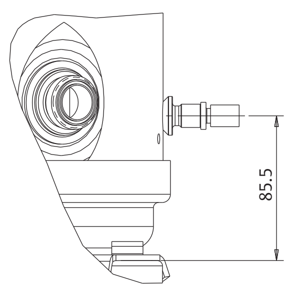


T-Box Layout
Standard
Section A-A
Scale 1:1





Detail FOOT
Scale 1:1

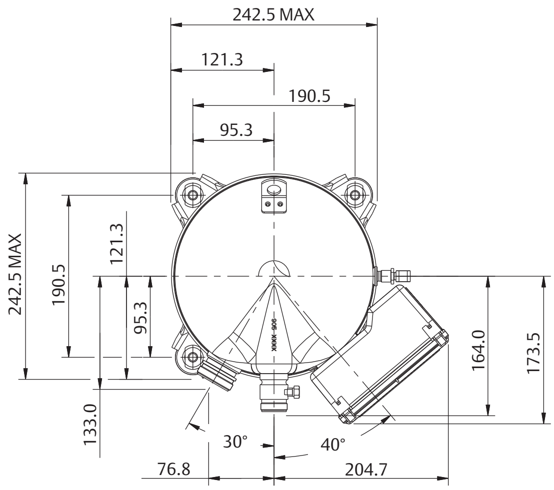


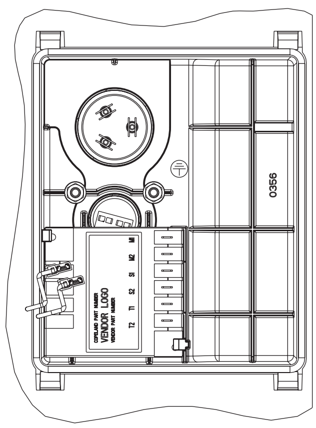
Detail VALVE
Scale 3:4

Dimensions

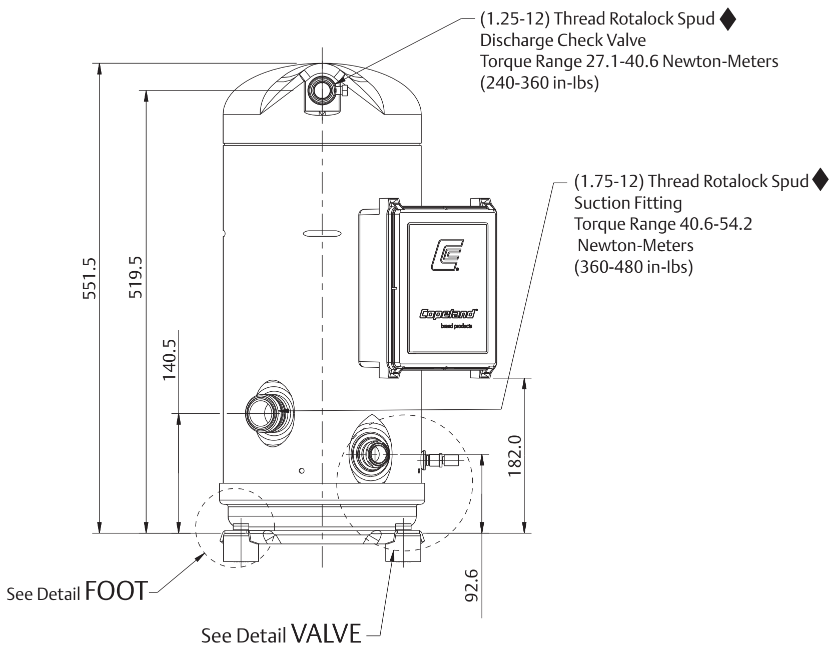
Rotalock, Sight Glass & Oil Schrader Valve

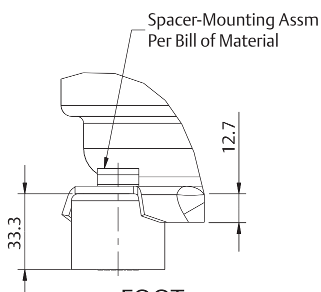
ZB95~ZB114 TW7/TW5 (BOM 551)



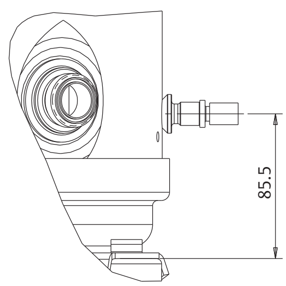


Terminal Box Layout Standard
Scale 3:4





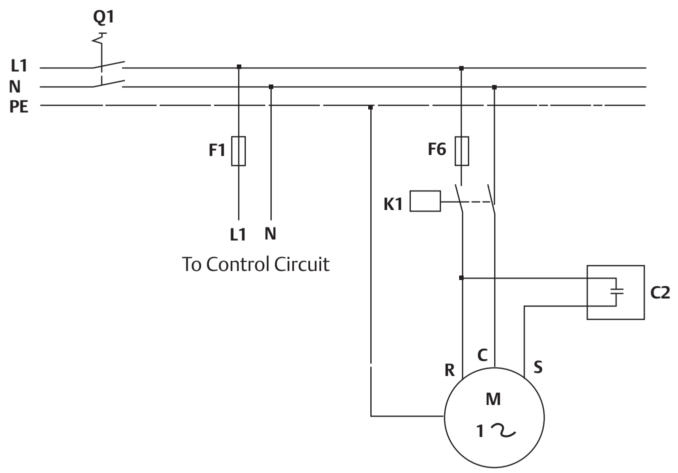
Detail FOOT
Scale 1:1



Detail VALVE
Scale 3:4

Electrical Wiring Diagram

ZB15~ZB114



Single Phase Circuit (ZB15-ZB29)

Electrical Schematics

L1/N/PE: Single Phase Lines (line/neutral/ground)

Q1: Manual Switch

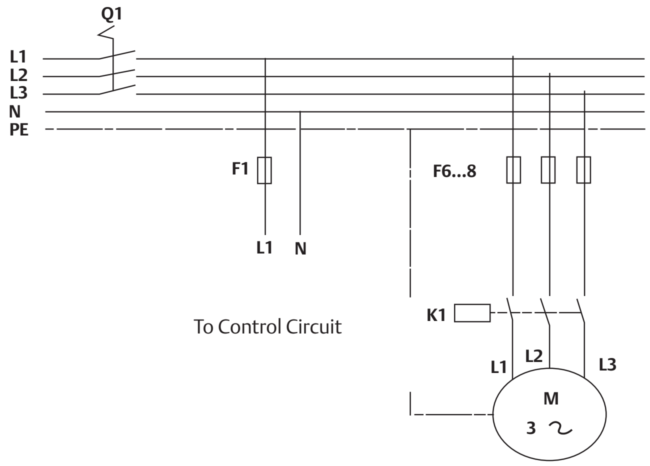
F1/F6: Fuse

K1: Compressor Contactor

C2: Run Capacitor

M: Compressor Motor

R/C/S: Compressor Terminal



3 Phase (ZB15-ZB114)
(with Motor Protection Code "F")

Electrical Schematics

L1/L2/L3/N/PE: 3 Phase Lines (line/neutral/ground)

Q1: Manual Switch

F1/F6..8: Fuse

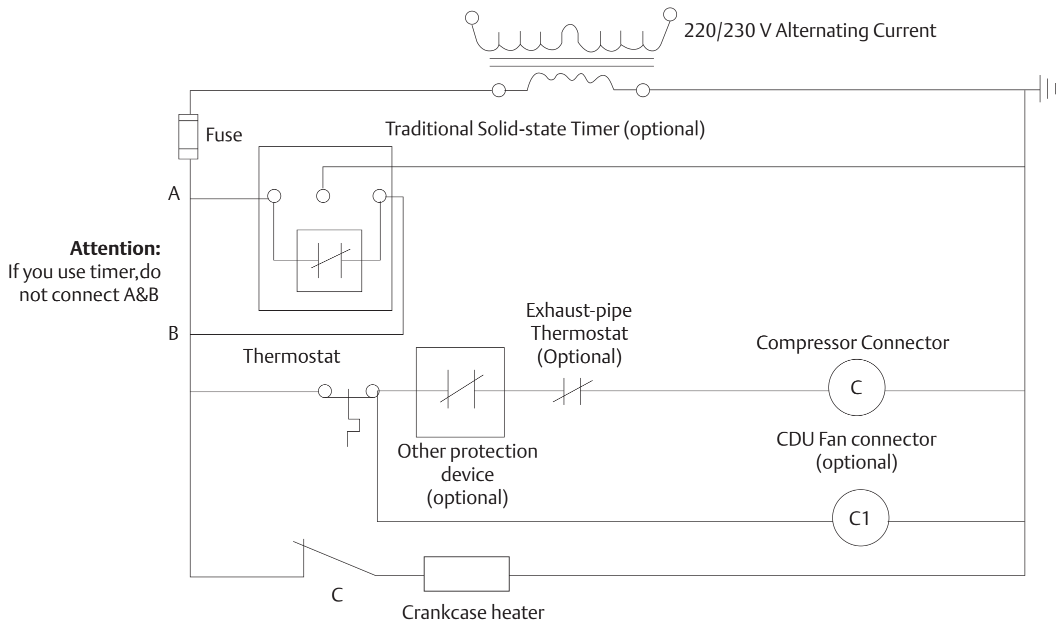
K1: Compressor Contactor

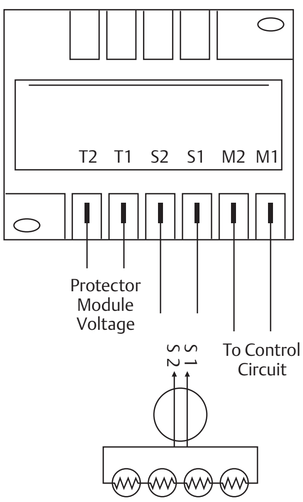
M: Compressor Motor

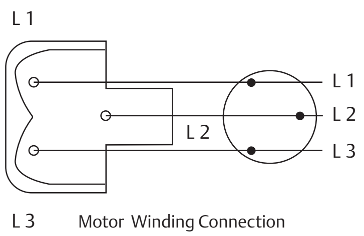
L1/L2/L3: Compressor Terminal

Electrical Wiring Diagram

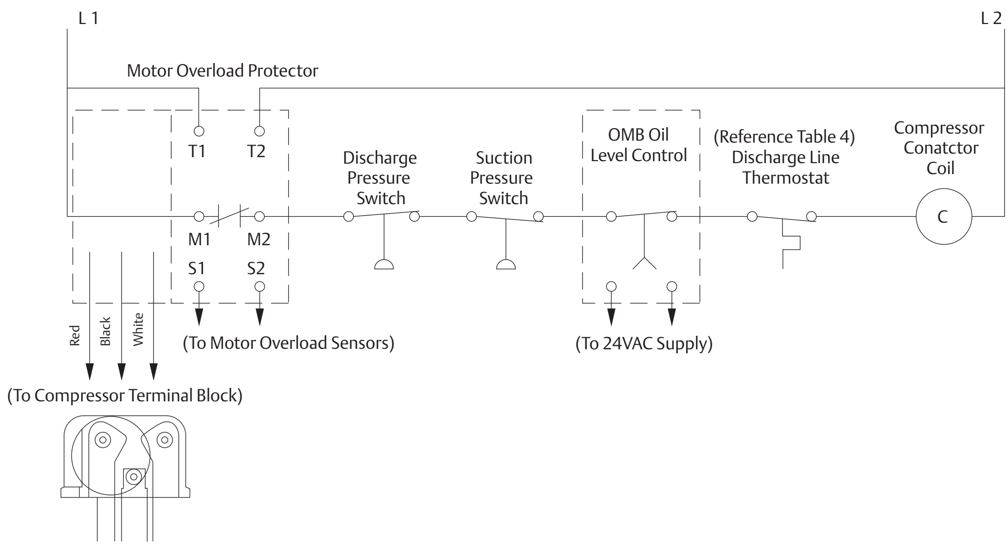
ZB15~ZB114 Control Circuit







3 Phase (ZB95-114 TW*)
(with Motor Protection Code "W")



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