Copeland Scroll™

ZSI Compressor

Product Manual

EMERSON™
Climate Technologies

Pioneering Technologies for Best-in-Class Products

Emerson Climate Technologies is the world's leading provider of heating, ventilation, air-conditioning and refrigeration solutions for residential, commercial and industrial applications. Leveraging a vast global network of sales, engineering, and manufacturing, Emerson delivers advanced technologies and solutions along with superior technical support and training services to the HVACR industry.

For more than 80 years, Emerson has been introducing innovative technologies and solutions to the HVACR market. From the first semi-hermetic and hermetic compressors in the 1940s and 1950s, to the high efficiency Discus™ semi-hermetic and Copeland Scroll™ compressors of the 1980s and 1990s, Emerson has been an industry pioneer. Today, Emerson continues to build upon that success with new products such as the Copeland Scroll Fusion semi-hermetic scroll and Stream line-up of semi-hermetic reciprocating compressors, both equipped with CoreSense™ technology for optimal compressor protection and system diagnostics. Through this, Emerson has developed an unequalled range of solutions for the refrigeration, heating and air-conditioning markets.

Our Vision:

Emerson Climate Technologies, With Our Partners,
Will Provide Global Solutions To Improve Human Comfort,
Safeguard Food And Protect The Environment.

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Cold Chain Development Status

The current situation in Asia calls for the further development of the cold chain industry:

Asia is responsible for a significant portion of the world's output of perishable products: 60% of vegetables, 30% of fruits and meats, and 40% of eggs and seafood. These percentages necessitate the need for Asia to establish progressive cold chain coverage to help prolong the shelf life and safeguard the produce for regional and global consumption.

Presently, the cold chain industry in Asia is in a high-speed growth stage while still exhibiting a huge potential for further development. It is important for the region to implement a systematic, standardized and continuous cold chain-covering product harvest, processing, transport, storage and retail to the end user to maximize the amount and quality of produce made available for consumption.

	Vegetable & Fruit		Meat		Aquatic Products	
	Cold Chain Coverage	Food Spoilage	Cold Chain Coverage	Food Spoilage	Cold Chain Coverage	Food Spoilage
Current Status	5%		15%		23%	
Government Plan	20%	Below 15%	30%	Below 8%	36%	Below 10%

To deliver on these targets, governments are subsidizing investments to increase cold room capacity that will serve as a key link in the entire cold chain industry. This involves developing and building cold rooms with advanced equipment, energy-efficient and environment-friendly technology without compromising performance.

Thus, we can conclude that there is an urgent need for a sustainable cold chain solution, especially for regions that heavily rely on agriculture for livelihood and income.

Cold Rooms

A cold room is a storage area that helps maintain proper product temperature and humidity with the aid of refrigeration equipment including the store room, entry room and equipment room.

Based on the store room nominal volume, a cold room can be divided into large size (20,000 m^3), medium size (20,000–5,000 m^3) and small size (5,000 m^3).

The table below shows the types of food stored per cold room classification along with the necessary humidity and temperatures needed to maintain product freshness.

Cold Room Temperature and Humidity References

No.	Cold Room	Cold Room Temp (˚C)	Relative Humidity (%)	Food
1	Chilling Room	0 to 4	-	meat, egg
2	Freezing Room	-18 to -32	-	meat, poultry, frozen egg, vegetable
		-23 to -30	-	fish, prawn
3	Chilled Product Storage Room	0	85 to 90	chilled meat, poultry
		-2 to 0	80 to 85	fresh egg
		-1 to 1	90 to 95	fresh fish
		0 to 2	85 to 90	apple, pear
		-1 to 1	90 to 95	cabbage, garlic, onion, spinach, carrot, etc.
		2 to 4	85 to 90	potato, orange, lychee, etc.
		7 to 13	85 to 95	cucumber, tomato, pineapple, etc.
		11 to 16	85 to 90	banana, etc.
4	Frozen Product Cold Storage Room	-15 to -20	85 to 90	frozen meat, frozen poultry, frozen vegetable, ice cream
		-18 to -25	90 to 95	frozen fish, prawn, frozen beverage
5	Ice Storage Room	-4 to -6	-	ice cube

CO_2 Emission Reduction Drives Low GWP Refrigerant Use

There have been several initiatives to reduce CO_2 emission that encourage the use of low global warming potential (GWP) refrigerants:

- China: Emissions Trading Schemes in Seven Key Cities from 2013
- India: 50 Rupees per TOE[1] (Both Produced and Imported to India)
- AUS/NZ: Carbon Tax Starts from 2008, Emissions Trading Scheme Starts from January 2015
- Korea: CO_2 Emission Trading Schedule from January 2015
- Japan: CO_2 Reduction Plan to be Achieved in 2020
- Southeast Asia: Several Plans Associated with CO_2 Emission Mitigation L aunched

Note: 1. TOE - Ton of Oil Equivalent

Emerson Climate Technologies joins in the effort to help transition from traditional to low GWP refrigerants through offering solutions for low and medium temperature applications.

Low GWP Refrigerant Use Drives Product Transition to Liquid Injection Scroll in Low Temp Application

Today

Refrigerant	GWP	Hermetic Recip.		Hermetic Scroll	
		MT	LT	MT	LT
R22	1810		N/A	ZB	N/A
R404A	3922			ZB	ZB*

Note: ZB* - Limited Operation

In 5 Years

Refrigerant	GWP	Hermetic Recip.		Hermetic Scroll	
		MT	LT	MT	LT
R407F/A/C	~1530		N/A	ZB	ZSI
R404A	3922			ZB	ZSI

Future

- New Low GWP refrigerants will replace today's high/mid/low pressure refrigerants.
- New refrigerants will provide thermal and food safety at minimum environmental impact.
- Many of new refrigerants are warmer refrigerants that will require compressor cooling technology during compression process.
- This will drive CoreSense with injection technology as a refrigeration compressor's key feature.

The Solution: ZSI with CoreSense™

Electronic Steady State Liquid Injection
- Discharge Temperature Protection
- Self Diagnostic On Sensor Failure
- LEDs For Hardware Check
- Operation Status Monitoring

ZSI with CoreSense™

ZSI Scroll Compressor Design Benefits

Emerson's launch of scroll products revolutionized the industry and the company continues to innovate the technology leading it to what it is today:

- Design has inherent higher efficiency translating to annual electrical savings
- Fewer moving parts compared to traditional piston compressors, thus making it more reliable
- Continuous compression provides lower vibration and quieter operation
- Improved liquid handling capability due to axial and radial compliance technology
- No complex internal suction and discharge valves for quieter operation and higher reliability

Liquid Injection Technology controlled by CoreSense

The ZSI Scroll Compressor features Liquid Injection Technology controlled by an intelligent electronics platform—the CoreSense Control Board—which regulates liquid injection by sensing the Discharge Line Temperature (DLT). This combination both widens the operating envelope and enhances the product reliability. The CoreSense Control Board also features LED Display that alerts the user of sensor status and Electronic Expansion Valve (EEV) operation. This is Emerson's "smart compressor" strategy—allowing compressor protection, DLT and EEV status alert leading to less compressor downtime, thus providing more value to its customers.

Product Information

ZSI Scroll Compressor

Horsepower:	2 to 7.5 HP
Temperature Applications:	Full Range: Low/Medium Temperature Application
Refrigerants:	R22, R404A, R134a* and R407F*
Installation Applications:	A variety of low and medium temperature cold room applications including walk-in cold rooms

* R134a and R407F for future release

ZSI Scroll Compressor Key Product Advantages

Scroll Efficiency and Reliability

- COP improvement leads to annual electrical savings of 10%–30% or about $100–$500 per year as compared with reciprocating systems depending on model
- Has fewer moving parts than reciprocating compressors, thus making it more reliable
- Improved liquid handling capability due to axial and radial compliance technology

Smooth Scroll Movement

- Low sound and vibration leading to quieter operation
- No complex internal suction and discharge valves for higher reliability

Wide Range Operating Envelope

- LT to MT from -30°C to 5°C evaporating temperature
- Low temperature operation reliability due to liquid injection technology controlled by CoreSense
- Reduced inventory levels due to wide range application

Multi-refrigerant Capability

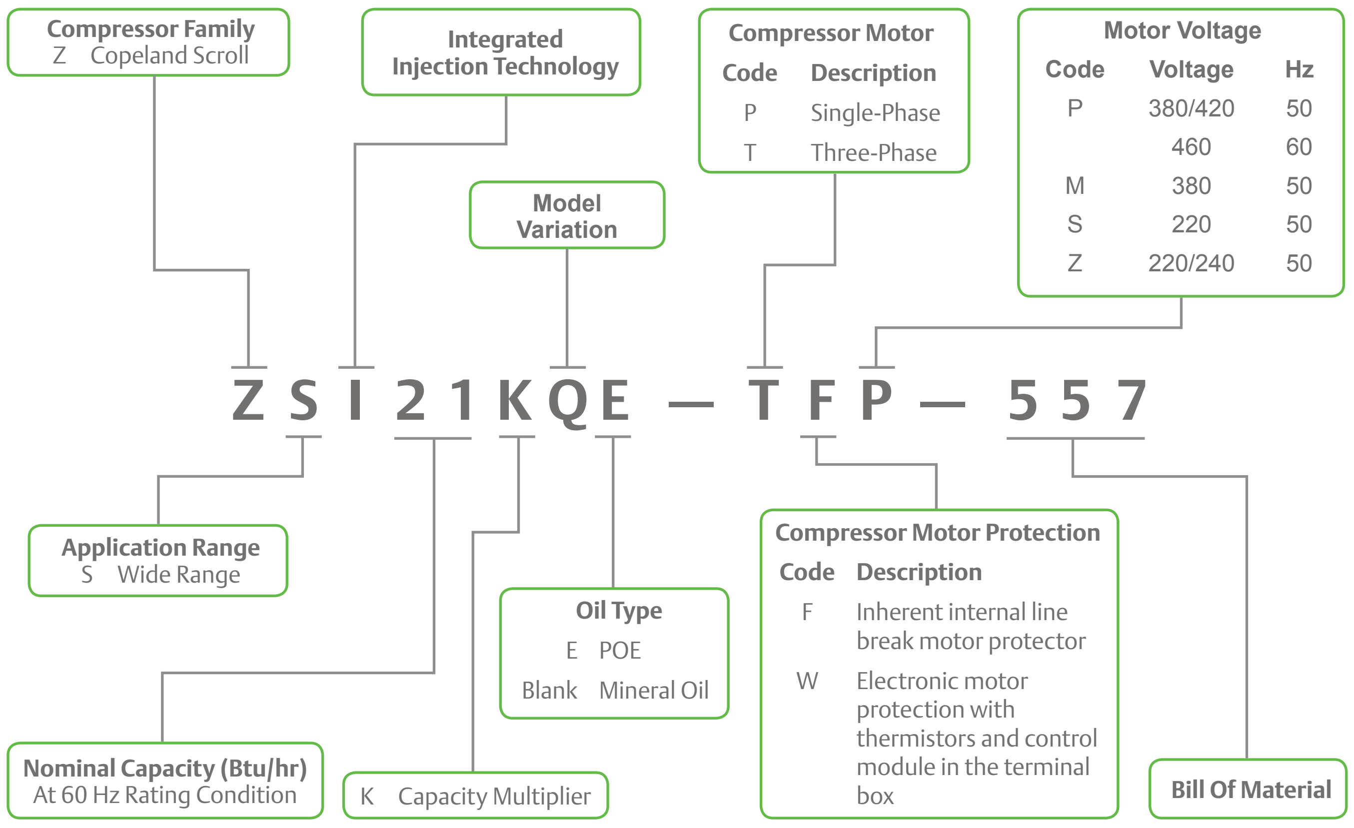
- One unit works with multiple refrigerants thus reducing inventory
- Qualified for R22, R404A, R134a* and R407F*

CoreSense

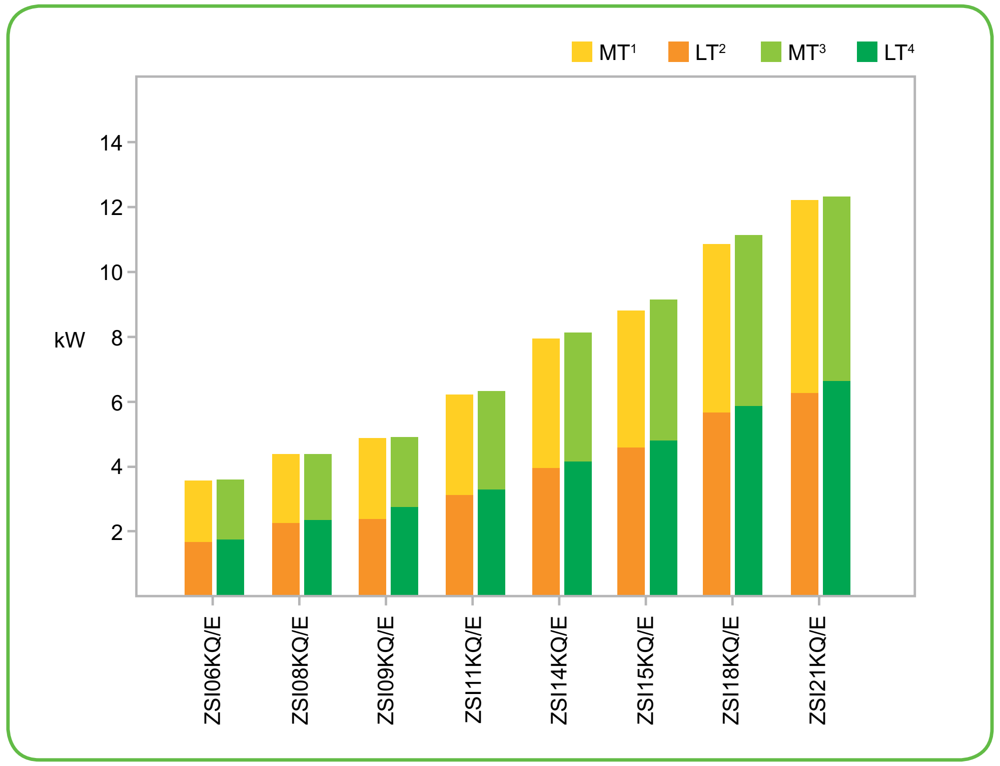
- Liquid Injection Technology—controlled by CoreSense—protects the compressor from high discharge temperature failure
- Onboard control for Liquid Injection by sensing Discharge Line Temperature (DLT)
- LED display alerts user of DLT sensor status and EXV operation enabling easier troubleshooting

* R134a and R407F for future release

Nomenclature



Product Line-up

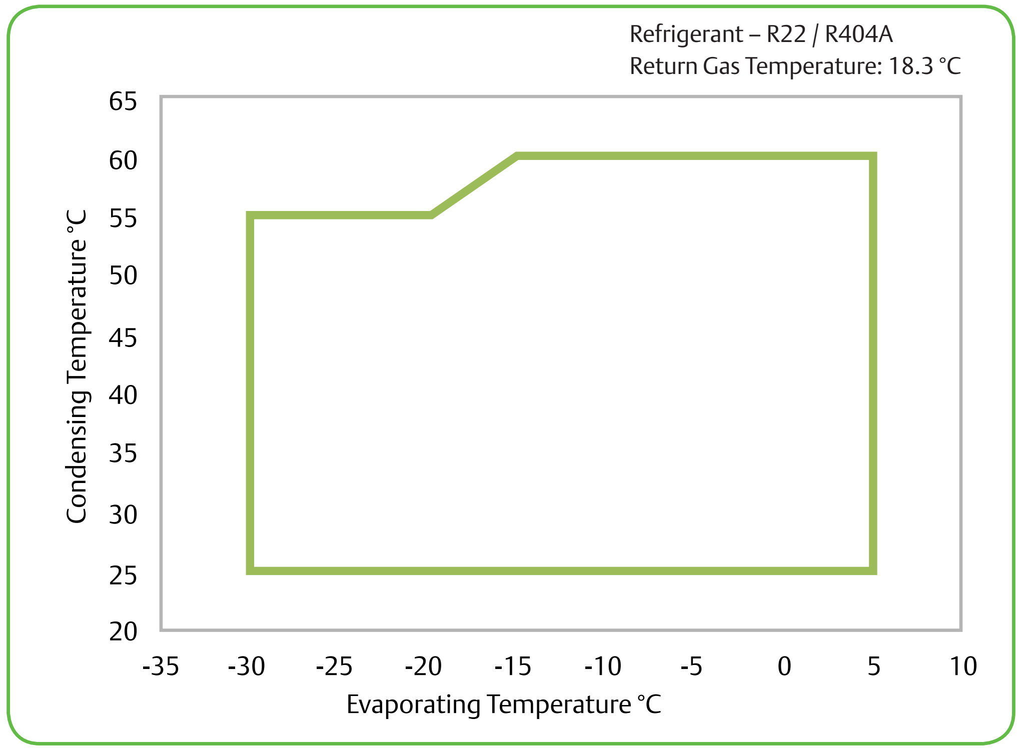


Notes: 1. R22, 3-Ph, MT: -7°C Evaporating, 50°C Condensing, 18.3°C Return Gas, 0 K Subcooling
2. R22, 3-Ph, LT: -25°C Evaporating, 45°C Condensing, 18.3°C Return Gas, 0 K Subcooling
3. R404A, 3-Ph, MT: -7°C Evaporating, 50°C Condensing, 18.3°C Return Gas, 0 K Subcooling
4. R404A, 3-Ph, LT: -25°C Evaporating, 45°C Condensing, 18.3°C Return Gas, 0 K Subcooling

Bill of Material

Compressor Model	ZSI06/08/09KQ(E)	ZSI11/14/15KQ(E)	ZSI18/21KQ(E)
BOM Code	527	527	537
CoreSense™	✓	✓	✓
Brazing Connection	✓	✓	✓
EXV/Coil	✓	✓	✓
Discharge Temp Sensors	✓	✓	✓
Oil Sight Glass	✓	✓	✓
IP54 Rating Enclosure	✓	✓	✓

Operating Envelope



Application Guide

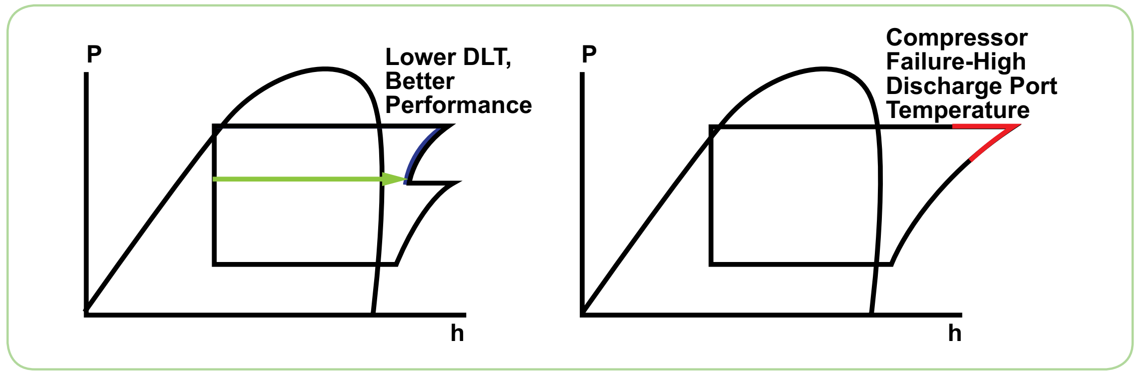
Liquid Injection for Discharge Temperature Protection

An Injection EXV must be applied when using the ZSI scrolls for liquid injection operation. This valve is approved for all refrigerants in this product range.

A sensor on the discharge line is used to determine the degree of opening of the Injection EXV, thus ensuring proper injection flow rate.

Liquid Injection Technology for Efficient Operation

With Liquid Injection | Without Liquid Injection

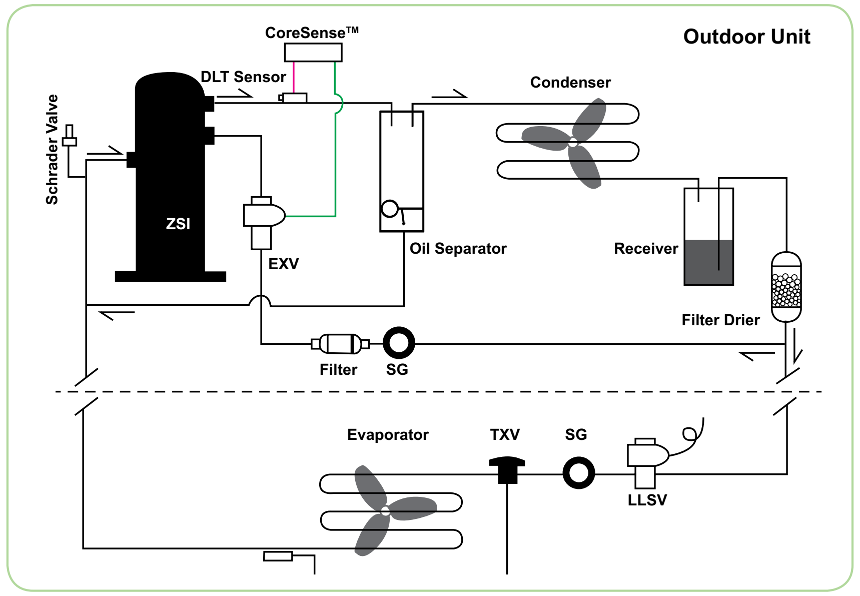


Extremely enhanced reliability compared to non-injection scroll compressors at LT application

System Configuration

ZSI compressor requires a liquid injection circuit from the system's liquid line to the compressor's injection fitting. Note that ensuring the injection circuit can pick up enough liquid is important for this function.

A sight glass can be installed before the injection circuit's EXV to allow visual inspection of the presence of liquid refrigerant.

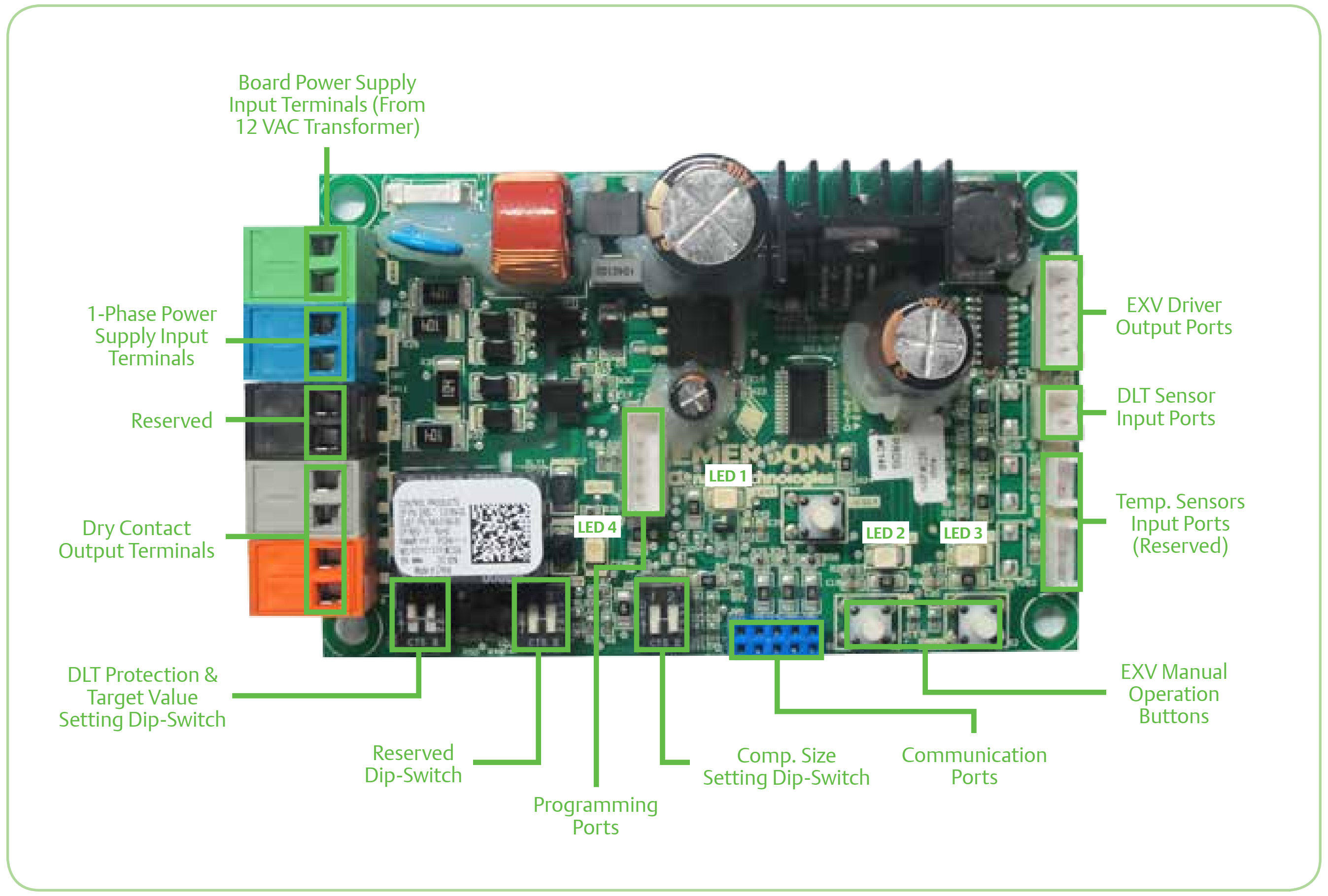


Liquid Injection controlled by CoreSense Module

DLT Sensor signals EXV to control the flow depending on Discharge Line Temperature (DLT)

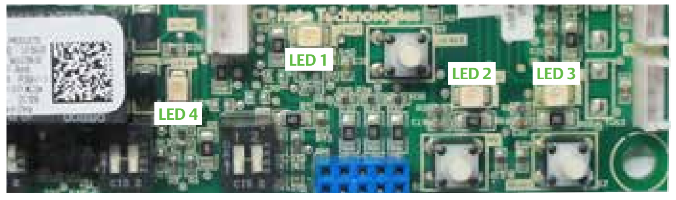
CoreSense Features and Functions

CoreSense is supplied as a standard together with the compressor. This controls the amount of liquid injection by measuring the discharge temperature through an electronic sensor mounted on the discharge line. With the CoreSense built-in program, it automatically calculates the EXV's opening and commands it to inject the optimized amount of liquid refrigerant into the compressor.

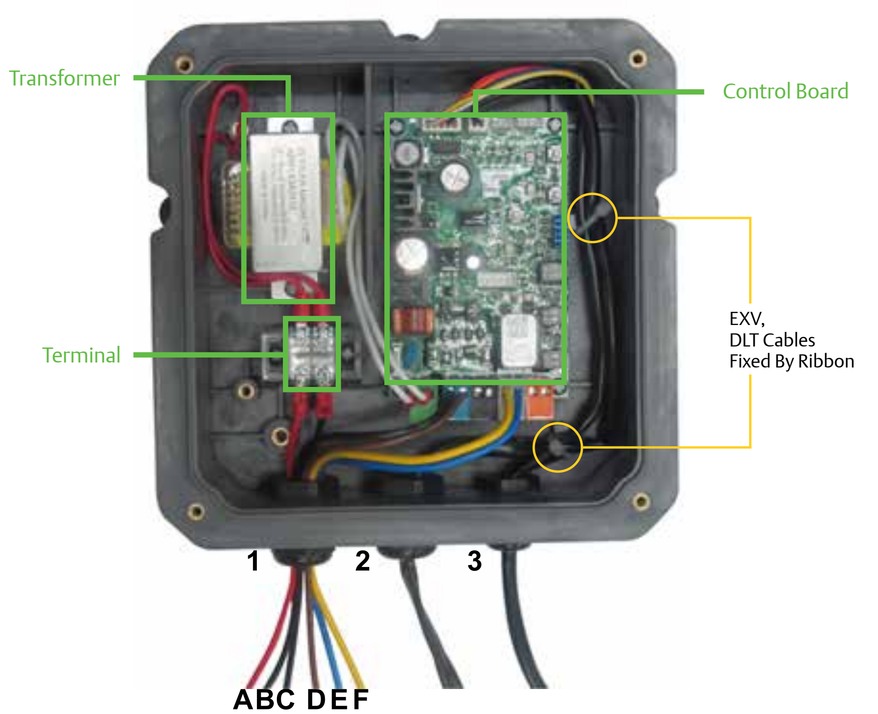


LED Display	Description
1 (Yellow Green)	LED blinking pattern indicates DLT Sensor status
2 (Yellow Green)	LED 2 & LED 3 combination and blinking patterns indicate EXV opening or closing
3 (Yellow Green)	LED 2 & LED 3 blink once when entering or exiting EXV manual operation
4 (Red)	LED 4 turns on as an alarm when triggered by any of the following: 1) DLT overheat protection 2) DLT sensor open circuit 3) DLT sensor short circuit 4) DLT sensor under detection range 5) DLT sensor over detection range 6) DLT sensor failure at 130°C or above

LED Display Alerts User of DLT Sensor Status and EXV Operation Enabling Easier Troubleshooting



ZSI Standard Control Box Wiring



Waterproof Gland No.	Gland 1	Gland 2	Gland 3
Wire Function	A (Red) and B (Black): Controller Power Supply Input (220–240 VAC 50/60 Hz)	EXV Coil	DLT Sensor
	C (Black) and D (Brown): Compressor Start/Stop Input (220–240 VAC 50/60 Hz)		
	E (Blue) and F (Yellow): Compressors Contactor Coil Control Output		
Wire Connection	Wires A and B: Connect to terminal	Connect to the EXV port at the top edge of the control board	Connect to the DLT port at the top edge of the control board
	Wires C and D: Connect to the blue connector on the control board		
	Wires E and F: Connect to the gray connector on the control board		
Gland Internal Diameter Range	2–3 mm		
Jacket Line Requirement	Internal wire size: 18 AWG		
	Rated voltage: 300 V/600 V		
	Rated temperature: 80/105 °C		
	Recommended: UL105, UL1011, UL1007		

Accumulator Requirements

Due to the Copeland Scroll™ compressor's inherent ability to handle liquid refrigerant in flooded start and defrost operation conditions, accumulators may not be required. An accumulator is required on single compressor systems when the system charge exceeds the charge limitations listed in Table 1. In systems with defrost schemes or transient operations that allow prolonged, uncontrolled liquid return to the compressor, an accumulator is required unless a suction header of sufficient volume is used to prevent liquid migration to the compressor.

Note: When using an accumulator, please ensure that the filter on the oil return hole is with screen < 30 mesh

Table 1. Charge Limitation

Model Family	Charge Limitation
ZSI06–15	4.09 kg
ZSI18–21	4.54 kg

Superheat Requirements

In order to assure that liquid refrigerant does not return to the compressor during the running cycle, attention must be given to maintaining proper superheat at the compressor suction inlet. Emerson recommends a minimum of 20°F (11°C) superheat, measured on the suction line 6 inches (152 mm) from the suction valve, to prevent liquid refrigerant floodback.

Another method to determine if liquid refrigerant is returning to the compressor is to accurately measure the temperature difference between the compressor oil crankcase and the suction line. During continuous operation we recommend that this difference be a minimum of 50°F (27°C). This "crankcase differential temperature" requirement supersedes the minimum suction superheat requirement in the last paragraph. To measure oil temperature through the compressor shell, place a thermocouple on the bottom center (not the side) of the compressor shell and insulate from the ambient.

During rapid system changes, such as defrost or ice harvest cycles, this temperature difference may drop rapidly for a short period of time. When the crankcase temperature difference falls below the recommended 50°F (27°C), we recommend that duration should not exceed a maximum (continuous) time period of two minutes and should not go lower than a 25°F (14°C) difference.

Under all application conditions, the return gas temperature should be less than 18°C, and the injection sub-cooling should be more than 1 K.

Contact your Emerson Climate Technologies representative regarding any exceptions to the above requirements.

Crankcase Heater

Crankcase heaters are required on outdoor systems when the system charge exceeds the charge limitations listed in Table 1.

Table 2 includes the cross reference of crankcase heaters and compressor models. If the customer purchases crankcase heater from other suppliers, its power rating should not go below the listed values in Table 2.

Table 2. Crankcase Heater

Crankcase Heater Power	ZSI06KQ	ZSI08KQ	ZSI09KQ	ZSI11KQ	ZSI14KQ	ZSI15KQ	ZSI18KQ	ZSI21KQ
33 W	✓	✓	✓					
40 W				✓	✓	✓	✓	✓

Pressure Controls

Both high and low pressure controls are required. The minimum and maximum pressure setpoints are shown in Table 3.

Table 3. Pressure Controls

Model	Control Type	R404A	R22
All ZSI	Suction Pressure	>1.02 bar(g)	>0.64 bar(g)
	Discharge Pressure	<28 bar(g)	<23 bar(g)

IPR Valve

ZSI compressors have **I**nternal **P**ressure **R**elief valves, which open at a discharge to suction differential pressure of 375 to 450 psi [25.86 to 31.03 bar(g)]. This action will trip the motor protector and remove the motor from the line.

Motor Protection

Motor protection in the ZSI compressor for refrigeration is by Internal Line Break (ILB). An "F" in the second character of the motor code indicates an internal line break. For example, a ZSI09KQE-T**F**D has ILB.

Rack Application

Currently, ZSI models are not yet approved for rack applications.

Discharge Mufflers

Gas flow through scroll compressors is continuous with relatively low pulsation. External mufflers applied to piston compressors may not be required on Copeland Scroll™ compressors. Due to system variability, individual tests should be conducted by the system manufacturer to verify acceptable levels of sound and vibration.

Rotation Direction of the 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), but oil may be lost. Oil loss can be prevented during reverse rotation if the 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.

Connection Fittings

Only stub fittings are available for the ZSI model. Detailed information is given in Table 4.

Table 4. Connection Fittings

	Suction Fitting	Discharge Fitting	Injection Fitting
ZSI06	3/4"	1/2"	3/8"
ZSI08	3/4"	1/2"	3/8"
ZSI09	3/4"	1/2"	3/8"
ZSI11	7/8"	1/2"	3/8"
ZSI14	7/8"	1/2"	3/8"
ZSI15	7/8"	1/2"	3/8"
ZSI18	7/8"	1/2"	3/8"
ZSI21	7/8"	1/2"	3/8"

Deep Vacuum Operation

WARNING: Do not run a Copeland Scroll compressor in a deep vacuum. Failure to heed this advice can result in arcing of the Fusite pins and permanent damage to the compressor.

A low pressure control is required for protection against deep vacuum operation. See Pressure Control section for proper setpoints (Table 3).

Scroll compressors (as with any refrigerant compressor) should never be used to evacuate a refrigeration or air-conditioning system. See AE-1105 for proper system evacuation procedures.

High Potential (Hipot) Testing

A hipot test is usually conducted on the production line by the manufacturer. This test can be conducted in the field, however, field technicians typically do not have the required equipment.

Copeland Scroll compressors are configured with the motor down and the pumping components at the top of the shell. As a result, the motor can be immersed in oil and refrigerant to a greater extent than hermetic reciprocating compressors when liquid refrigerant is present in the shell. In this respect, the scroll is more like semi-hermetic compressors which can have horizontal motors partially submerged in oil and refrigerant. When Copeland Scroll compressors are Hipot tested with liquid refrigerant in the shell, they can show higher levels of leakage current than compressors with the motor on top. This phenomenon can occur with any compressor when the motor is immersed in refrigerant. The level of current leakage does not present any safety issue. To lower the current leakage reading, the system should be operated for a brief period of time to redistribute the refrigerant to a more normal configuration and the system Hipot tested again. See AE Bulletin 4-1294 for Megohm testing recommendations. Under no circumstances should the Hipot test be performed while the compressor is under a vacuum.

Scroll Compressor Functional Check

A functional compressor test, with the suction service valve closed to check how low the compressor will pull suction pressure, 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. If suction pressure does not drop and discharge pressure does not rise to normal levels, reverse any two of the compressor power leads and reapply power to make sure compressor was not wired to run in reverse direction.

6. To test if the compressor is pumping properly, the compressor current draw must be compared to published compressor performance curves using the operating pressures and voltage of the system. If the measured average current deviates more than ±15% from published values, a faulty compressor may be indicated. A current imbalance exceeding 15% of the average on the Three-Phases should be investigated further. A more comprehensive troubleshooting sequence for compressors and systems can be found in Section H of the Copeland™ brand products Electrical Handbook.

7. Before replacing or returning a compressor: be certain that the compressor is actually defective. To be sure, recheck a compressor returned from the field in the shop or depot for Hipot, winding resistance, and ability to start before returning. More than one-third of compressors returned to Emerson for warranty analysis are determined to have no glitches. The units were misdiagnosed in the field as being defective. Replacing working compressors unnecessarily costs everyone.

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

New Installation

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

2. Recommended brazing material – any brazing material with a minimum silver content of 5% is preferred. However, 0% silver is acceptable.

3. Use of a dry nitrogen purge to eliminate possibility of carbon buildup on internal tube surfaces is recommended.

4. Be sure process tube fitting I.D. and process tube O.D. are clean prior to assembly.

5. Apply heat in Area 1. As tube approaches brazing temperature, move torch flame to Area 2 (See Figure 1).

6. 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 circumference.

7. After braze material flows 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.

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

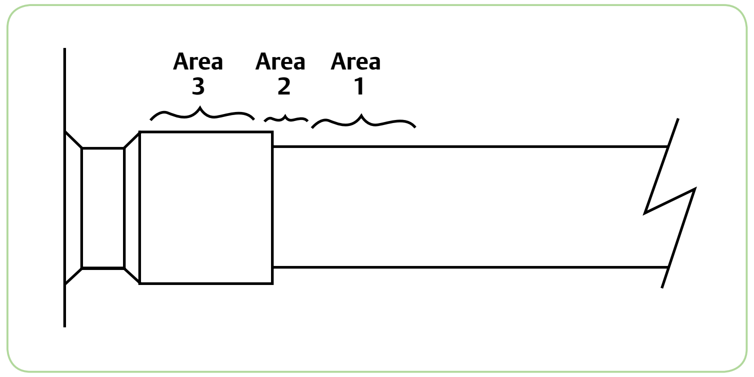


Figure 1. Scroll Tube Brazing

Field Service

1. To disconnect: recover refrigerant from both high and low sides of the system. Cut tubing near compressor.

2. To reconnect: recommended brazing materials – any material with a minimum of 5% silver or silver braze material with flux.

3. Reinsert tubing fitting.

4. Heat tube uniformly in Area 1, moving slowly to Area 2. When joint reaches brazing temperature apply brazing material (See Figure 1).

5. Heat joint uniformly around the circumference to flow braze material completely around the joint.

6. Slowly move torch in Area 3 to draw braze material into the joint.

Do not overheat joints.

WARNING
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 and 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 or in the case of assembly line repair, remove refrigerant from both the high and low sides. Instructions should be provided in appropriate product literature and assembly (line repair) areas.

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 driers. A 100% activated alumina suction filter drier is recommended but must be removed after 72 hours. See AE Bulletin 24-1105 for clean up procedures and 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.

System Charging Procedure

Systems should be charged with liquid on the high side to the maximum possible extent. This will avoid running the compressor under conditions where there is insufficient gas. Sufficient suction gas is available to cool not only the motor but also the scrolls.

The majority of the charge should be pumped into the high side of the system to prevent hipot 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.

NOTICE: Do not use compressor to test opening setpoint of high pressure cutout. Bearings are susceptible to high load damage before they have had several hours of normal running for proper break-in.

Performance Table

R22 50 Hz

Q = Capacity (kW) P = Power Input (kW) 1-Phase

Model		Condensing Temperature °C	Evaporating Temperature °C							
			-30	-25	-20	-15	-10	-5	0	5
ZSI06KQ	Q	25	1.80	2.27	2.79	3.40	4.12	4.99	6.06	7.35
		30	1.67	2.13	2.62	3.19	3.87	4.70	5.71	6.93
		35	1.60	2.05	2.52	3.06	3.70	4.48	5.43	6.60
		40	1.57	2.00	2.45	2.96	3.57	4.30	5.21	6.31
		45	1.53	1.95	2.39	2.88	3.45	4.15	5.00	6.05
		50	1.47	1.89	2.31	2.78	3.32	3.98	4.78	5.78
		55	1.36	1.77	2.18	2.63	3.14	3.77	4.53	5.47
		60				2.41	2.90	3.49	4.21	5.11
	P	25	1.08	1.09	1.10	1.11	1.11	1.10	1.09	1.07
		30	1.16	1.18	1.19	1.19	1.20	1.19	1.17	1.15
		35	1.28	1.30	1.31	1.32	1.32	1.32	1.30	1.27
		40	1.42	1.44	1.46	1.48	1.48	1.48	1.46	1.43
		45	1.58	1.61	1.64	1.66	1.67	1.66	1.65	1.62
		50	1.75	1.80	1.83	1.86	1.87	1.87	1.86	1.83
		55	1.94	1.99	2.03	2.06	2.08	2.09	2.08	2.05
		60				2.27	2.30	2.31	2.30	2.28
ZSI08KQ	Q	25	2.08	2.60	3.25	4.02	4.89	5.85	6.89	7.98
		30	2.07	2.55	3.16	3.89	4.73	5.65	6.64	7.69
		35	2.01	2.46	3.04	3.74	4.54	5.42	6.37	7.38
		40	1.92	2.34	2.90	3.56	4.33	5.17	6.08	7.05
		45	1.81	2.21	2.73	3.37	4.10	4.91	5.79	6.71
		50	1.68	2.06	2.56	3.17	3.87	4.65	5.49	6.38
		55	1.55	1.91	2.38	2.97	3.64	4.39	5.20	6.05
		60				2.78	3.43	4.15	4.93	5.75
	P	25	1.38	1.40	1.43	1.48	1.52	1.54	1.52	1.46
		30	1.53	1.55	1.58	1.62	1.66	1.68	1.66	1.59
		35	1.67	1.68	1.71	1.75	1.78	1.80	1.78	1.72
		40	1.79	1.80	1.83	1.87	1.91	1.92	1.91	1.84
		45	1.93	1.94	1.97	2.01	2.04	2.06	2.05	1.99
		50	2.09	2.10	2.13	2.17	2.21	2.24	2.23	2.17
		55	2.30	2.31	2.34	2.39	2.43	2.46	2.45	2.40
		60				2.66	2.71	2.75	2.75	2.71

Note: Based on 18.3°C Return Gas, 0 K Subcooling

Performance Table

R22 50 Hz

Q = Capacity (kW) P = Power Input (kW) 3-Phase

Model		Condensing Temperature °C	Evaporating Temperature °C							
			-30	-25	-20	-15	-10	-5	0	5
ZSI06KQ	Q	25	1.73	2.15	2.68	3.31	4.07	4.95	5.96	7.10
		30	1.69	2.09	2.59	3.19	3.91	4.74	5.70	6.79
		35	1.63	2.01	2.48	3.06	3.74	4.53	5.44	6.48
		40	1.56	1.92	2.37	2.92	3.57	4.32	5.18	6.17
		45	1.48	1.82	2.25	2.77	3.39	4.10	4.92	5.86
		50	1.38	1.71	2.12	2.61	3.20	3.88	4.66	5.55
		55	1.26	1.58	1.98	2.45	3.01	3.66	4.40	5.24
		60				2.28	2.82	3.43	4.14	4.94
	P	25	1.02	0.98	0.99	1.02	1.06	1.07	1.03	0.91
		30	1.17	1.14	1.15	1.19	1.22	1.23	1.18	1.05
		35	1.31	1.28	1.30	1.34	1.37	1.37	1.32	1.19
		40	1.45	1.43	1.45	1.49	1.52	1.53	1.47	1.33
		45	1.59	1.57	1.60	1.65	1.69	1.69	1.63	1.49
		50	1.74	1.74	1.78	1.83	1.87	1.88	1.82	1.68
		55	1.92	1.93	1.98	2.04	2.09	2.10	2.05	1.90
		60				2.29	2.35	2.37	2.32	2.18
ZSI08KQ	Q	25	2.14	2.67	3.29	4.01	4.88	5.89	7.09	8.49
		30	2.00	2.51	3.10	3.79	4.61	5.58	6.72	8.06
		35	1.92	2.41	2.97	3.63	4.40	5.32	6.41	7.69
		40	1.86	2.33	2.87	3.49	4.23	5.11	6.15	7.36
		45	1.80	2.26	2.77	3.37	4.08	4.91	5.90	7.06
		50	1.71	2.16	2.66	3.23	3.90	4.70	5.64	6.75
		55	1.58	2.01	2.50	3.05	3.69	4.45	5.35	6.41
		60				2.80	3.41	4.14	5.00	6.02
	P	25	1.13	1.13	1.14	1.16	1.19	1.21	1.24	1.26
		30	1.18	1.19	1.20	1.22	1.24	1.26	1.28	1.29
		35	1.32	1.33	1.35	1.37	1.39	1.41	1.41	1.41
		40	1.51	1.54	1.56	1.59	1.61	1.62	1.62	1.61
		45	1.75	1.78	1.82	1.85	1.87	1.87	1.87	1.85
		50	1.99	2.04	2.08	2.12	2.14	2.15	2.14	2.10
		55	2.22	2.28	2.33	2.37	2.40	2.41	2.39	2.35
		60				2.59	2.62	2.63	2.61	2.57
ZSI09KQ	Q	25	2.24	2.87	3.60	4.45	5.45	6.61	7.96	9.51
		30	2.14	2.74	3.44	4.25	5.21	6.33	7.62	9.12
		35	2.05	2.62	3.29	4.07	4.98	6.05	7.29	8.73
		40	1.96	2.50	3.14	3.88	4.75	5.77	6.96	8.34
		45	1.87	2.38	2.98	3.69	4.51	5.49	6.63	7.95
		50	1.77	2.25	2.82	3.48	4.26	5.19	6.27	7.54
		55	1.64	2.10	2.63	3.25	3.99	4.86	5.89	7.10
		60				2.99	3.68	4.51	5.48	6.63
	P	25	1.26	1.28	1.32	1.35	1.38	1.40	1.41	1.38
		30	1.41	1.43	1.46	1.50	1.53	1.55	1.54	1.51
		35	1.58	1.60	1.63	1.66	1.69	1.70	1.70	1.67
		40	1.76	1.78	1.81	1.84	1.87	1.89	1.88	1.85
		45	1.96	1.98	2.02	2.05	2.08	2.10	2.10	2.06
		50	2.18	2.21	2.25	2.29	2.33	2.35	2.34	2.31
		55	2.44	2.48	2.52	2.57	2.60	2.63	2.63	2.60
		60				2.88	2.92	2.95	2.96	2.94

Note: Based on 18.3°C Return Gas, 0 K Subcooling

Performance Table

R22 50 Hz

Q = Capacity (kW) P = Power Input (kW) 3-Phase

Model		Condensing Temperature °C	Evaporating Temperature °C							
			-30	-25	-20	-15	-10	-5	0	5
ZSI11KQ	Q	25	3.12	3.88	4.73	5.72	6.91	8.34	10.05	12.11
		30	3.00	3.74	4.56	5.52	6.66	8.04	9.70	11.70
		35	2.86	3.56	4.35	5.27	6.37	7.70	9.30	11.23
		40	2.69	3.36	4.11	4.99	6.04	7.32	8.87	10.73
		45	2.52	3.16	3.87	4.71	5.71	6.92	8.41	10.20
		50	2.37	2.97	3.64	4.42	5.37	6.53	7.94	9.67
		55	2.25	2.81	3.43	4.16	5.05	6.15	7.49	9.14
		60				3.94	4.77	5.79	7.07	8.64
	P	25	1.53	1.57	1.59	1.60	1.62	1.65	1.72	1.82
		30	1.78	1.84	1.89	1.92	1.96	2.02	2.11	2.24
		35	1.96	2.03	2.09	2.14	2.20	2.27	2.37	2.52
		40	2.11	2.19	2.25	2.31	2.37	2.45	2.56	2.71
		45	2.30	2.37	2.43	2.48	2.54	2.61	2.72	2.88
		50	2.57	2.63	2.67	2.71	2.75	2.82	2.92	3.06
		55	2.99	3.02	3.03	3.05	3.07	3.11	3.19	3.31
		60				3.55	3.54	3.55	3.60	3.69
ZSI14KQ	Q	25	3.71	4.74	5.90	7.23	8.80	10.65	12.85	15.43
		30	3.60	4.60	5.71	6.98	8.48	10.24	12.34	14.82
		35	3.44	4.41	5.47	6.68	8.11	9.79	11.79	14.16
		40	3.26	4.19	5.20	6.36	7.71	9.31	11.21	13.47
		45	3.07	3.96	4.93	6.02	7.30	8.81	10.62	12.77
		50	2.89	3.75	4.66	5.69	6.89	8.32	10.03	12.07
		55	2.74	3.55	4.42	5.39	6.51	7.85	9.46	11.39
		60				5.12	6.17	7.42	8.93	10.75
	P	25	1.83	1.84	1.89	1.96	2.03	2.09	2.12	2.09
		30	2.03	2.04	2.10	2.17	2.24	2.30	2.31	2.26
		35	2.26	2.29	2.35	2.43	2.50	2.55	2.55	2.49
		40	2.53	2.57	2.65	2.73	2.80	2.84	2.84	2.77
		45	2.84	2.90	2.99	3.07	3.15	3.19	3.18	3.09
		50	3.19	3.27	3.37	3.46	3.54	3.58	3.57	3.47
		55	3.58	3.68	3.79	3.90	3.99	4.03	4.01	3.90
		60				4.38	4.48	4.52	4.50	4.39
ZSI15KQ	Q	25	4.46	5.56	6.81	8.27	10.00	12.07	14.53	17.45
		30	4.37	5.44	6.65	8.05	9.72	11.71	14.08	16.90
		35	4.18	5.21	6.36	7.71	9.30	11.20	13.48	16.19
		40	3.93	4.91	6.01	7.28	8.79	10.60	12.77	15.36
		45	3.67	4.60	5.63	6.83	8.24	9.95	12.01	14.47
		50	3.45	4.32	5.27	6.38	7.70	9.30	11.23	13.56
		55	3.31	4.11	4.98	6.00	7.21	8.69	10.49	12.68
		60				5.72	6.82	8.17	9.84	11.87
	P	25	2.08	2.09	2.14	2.23	2.32	2.40	2.45	2.46
		30	2.33	2.35	2.42	2.51	2.60	2.68	2.72	2.72
		35	2.59	2.63	2.71	2.80	2.90	2.97	3.01	2.99
		40	2.86	2.92	3.01	3.12	3.22	3.29	3.33	3.30
		45	3.17	3.25	3.35	3.47	3.57	3.65	3.68	3.64
		50	3.51	3.61	3.73	3.86	3.97	4.05	4.08	4.04
		55	3.91	4.03	4.17	4.31	4.43	4.52	4.54	4.50
		60				4.83	4.96	5.05	5.08	5.03

Note: Based on 18.3°C Return Gas, 0 K Subcooling

Performance Table R22 50 Hz

Q = Capacity (kW) P = Power Input (kW) 3-Phase

Model		Condensing Temperature °C	Evaporating Temperature °C -30	-25	-20	-15	-10	-5	0	5
ZSI18KQ	Q	25	5.34	6.56	8.04	9.81	11.90	14.34	17.17	20.42
		30	5.13	6.32	7.74	9.43	11.43	13.76	16.47	19.57
		35	4.93	6.07	7.44	9.06	10.96	13.19	15.77	18.74
		40	4.72	5.82	7.13	8.68	10.49	12.61	15.07	17.89
		45	4.50	5.56	6.81	8.28	10.01	12.02	14.35	17.04
		50	4.26	5.28	6.47	7.86	9.50	11.40	13.61	16.16
		55	3.98	4.96	6.09	7.42	8.96	10.76	12.85	15.25
		60				6.92	8.38	10.07	12.04	14.30
	P	25	2.60	2.63	2.68	2.75	2.84	2.95	3.07	3.20
		30	2.75	2.78	2.83	2.90	2.97	3.05	3.15	3.25
		35	3.07	3.11	3.17	3.23	3.30	3.37	3.44	3.51
		40	3.51	3.57	3.64	3.71	3.77	3.83	3.89	3.93
		45	4.02	4.11	4.20	4.27	4.34	4.40	4.44	4.48
		50	4.55	4.67	4.78	4.88	4.96	5.02	5.06	5.09
		55	5.05	5.21	5.35	5.47	5.57	5.64	5.69	5.71
		60				6.01	6.13	6.22	6.28	6.30
ZSI21KQ	Q	25	5.98	7.33	8.94	10.88	13.23	16.06	19.47	23.51
		30	5.44	6.75	8.28	10.10	12.31	14.97	18.17	21.99
		35	5.19	6.46	7.93	9.66	11.74	14.24	17.25	20.85
		40	5.09	6.34	7.76	9.41	11.38	13.74	16.57	19.96
		45	5.01	6.26	7.64	9.22	11.09	13.33	16.00	19.20
		50	4.83	6.09	7.44	8.97	10.76	12.87	15.40	18.43
		55	4.40	5.68	7.03	8.52	10.23	12.25	14.65	17.51
		60				7.73	9.39	11.32	13.61	16.32
	P	25	2.91	2.98	3.05	3.13	3.24	3.38	3.56	3.79
		30	3.16	3.24	3.32	3.40	3.50	3.63	3.79	4.01
		35	3.50	3.59	3.67	3.76	3.85	3.97	4.13	4.32
		40	3.91	4.01	4.10	4.19	4.29	4.40	4.54	4.73
		45	4.38	4.49	4.60	4.69	4.79	4.90	5.04	5.21
		50	4.89	5.03	5.15	5.25	5.36	5.47	5.60	5.76
		55	5.45	5.61	5.74	5.86	5.97	6.08	6.21	6.37
		60				6.51	6.63	6.75	6.87	7.02

Note: Based on 18.3°C Return Gas, 0 K Subcooling

Performance Table R404A 50 Hz

Q = Capacity (kW) P = Power Input (kW) 1-Phase

Model		Condensing Temperature °C	Evaporating Temperature °C -30	-25	-20	-15	-10	-5	0	5
ZSI06KQE	Q	25	2.09	2.60	3.22	3.95	4.79	5.77	6.87	8.12
		30	2.03	2.52	3.10	3.78	4.58	5.50	6.54	7.71
		35	1.92	2.38	2.92	3.56	4.31	5.16	6.14	7.24
		40	1.78	2.20	2.71	3.30	3.99	4.78	5.69	6.71
		45	1.62	2.01	2.47	3.02	3.65	4.38	5.21	6.16
		50	1.47	1.82	2.24	2.73	3.31	3.97	4.73	5.60
		55	1.34	1.65	2.02	2.46	2.98	3.57	4.26	5.04
		60				2.23	2.68	3.20	3.81	4.51
	P	25	1.15	1.19	1.22	1.24	1.25	1.24	1.22	1.18
		30	1.31	1.35	1.38	1.41	1.43	1.43	1.42	1.40
		35	1.44	1.48	1.52	1.55	1.57	1.58	1.58	1.56
		40	1.57	1.61	1.64	1.67	1.70	1.71	1.71	1.70
		45	1.72	1.75	1.78	1.80	1.83	1.84	1.85	1.84
		50	1.90	1.92	1.95	1.97	1.99	2.00	2.00	2.00
		55	2.15	2.16	2.17	2.18	2.19	2.20	2.20	2.20
		60				2.47	2.47	2.47	2.47	2.46
ZSI08KQE	Q	25	2.41	3.02	3.74	4.60	5.59	6.74	8.05	9.53
		30	2.35	2.92	3.61	4.41	5.35	6.43	7.66	9.06
		35	2.23	2.77	3.42	4.17	5.05	6.05	7.20	8.51
		40	2.07	2.58	3.18	3.88	4.70	5.63	6.70	7.92
		45	1.90	2.37	2.93	3.57	4.32	5.18	6.16	7.29
		50	1.72	2.15	2.66	3.25	3.93	4.71	5.61	6.64
		55	1.55	1.95	2.41	2.93	3.54	4.25	5.06	5.99
		60				2.64	3.18	3.81	4.53	5.36
	P	25	1.46	1.48	1.51	1.55	1.58	1.60	1.59	1.54
		30	1.65	1.67	1.70	1.75	1.78	1.80	1.80	1.76
		35	1.79	1.82	1.85	1.90	1.94	1.96	1.96	1.93
		40	1.93	1.95	1.99	2.03	2.07	2.10	2.10	2.07
		45	2.08	2.09	2.13	2.17	2.20	2.23	2.24	2.21
		50	2.27	2.27	2.30	2.33	2.36	2.39	2.39	2.36
		55	2.51	2.51	2.52	2.55	2.57	2.59	2.59	2.56
		60				2.84	2.86	2.87	2.86	2.82

Note: Based on 18.3°C Return Gas, 0 K Subcooling

Performance Table R404A 50 Hz

Q = Capacity (kW) P = Power Input (kW) 3-Phase

Model		Condensing Temperature °C	Evaporating Temperature °C							
			-30	-25	-20	-15	-10	-5	0	5
ZSI06KQE	Q	25	1.99	2.46	3.05	3.78	4.65	5.67	6.85	8.19
		30	1.90	2.35	2.90	3.59	4.40	5.35	6.45	7.69
		35	1.79	2.21	2.73	3.37	4.12	5.00	6.02	7.17
		40	1.65	2.05	2.54	3.13	3.82	4.63	5.56	6.62
		45	1.50	1.87	2.33	2.87	3.51	4.25	5.09	6.06
		50	1.33	1.69	2.11	2.60	3.18	3.85	4.62	5.49
		55	1.16	1.49	1.88	2.33	2.85	3.45	4.13	4.91
		60				2.05	2.51	3.04	3.65	4.33
	P	25	1.10	1.14	1.17	1.20	1.21	1.20	1.17	1.11
		30	1.27	1.32	1.36	1.39	1.41	1.41	1.40	1.36
		35	1.41	1.46	1.50	1.54	1.56	1.57	1.57	1.54
		40	1.55	1.59	1.63	1.66	1.69	1.71	1.71	1.69
		45	1.70	1.73	1.76	1.80	1.82	1.84	1.84	1.83
		50	1.90	1.92	1.94	1.96	1.98	2.00	2.00	1.99
		55	2.17	2.17	2.17	2.18	2.20	2.20	2.20	2.19
		60				2.49	2.49	2.49	2.48	2.46
ZSI08KQE	Q	25	2.41	3.00	3.72	4.58	5.57	6.70	7.97	9.40
		30	2.38	2.94	3.62	4.42	5.36	6.43	7.63	8.97
		35	2.26	2.78	3.42	4.18	5.05	6.05	7.18	8.44
		40	2.09	2.57	3.16	3.86	4.68	5.61	6.65	7.83
		45	1.89	2.34	2.88	3.52	4.27	5.12	6.09	7.17
		50	1.71	2.11	2.59	3.17	3.85	4.63	5.51	6.50
		55	1.56	1.91	2.34	2.86	3.46	4.16	4.95	5.84
		60				2.60	3.13	3.74	4.44	5.23
	P	25	1.27	1.31	1.36	1.39	1.41	1.42	1.42	1.39
		30	1.44	1.49	1.53	1.58	1.61	1.63	1.64	1.63
		35	1.59	1.63	1.68	1.72	1.76	1.80	1.82	1.83
		40	1.73	1.77	1.81	1.86	1.90	1.94	1.97	1.99
		45	1.89	1.92	1.96	2.00	2.05	2.09	2.13	2.15
		50	2.10	2.12	2.15	2.18	2.22	2.26	2.30	2.34
		55	2.37	2.38	2.39	2.42	2.45	2.49	2.52	2.56
		60				2.73	2.75	2.78	2.82	2.85
ZSI09KQE	Q	25	2.78	3.49	4.31	5.26	6.35	7.60	9.04	10.67
		30	2.76	3.43	4.21	5.09	6.12	7.29	8.63	10.16
		35	2.60	3.24	3.97	4.80	5.75	6.84	8.09	9.51
		40	2.36	2.96	3.64	4.41	5.29	6.30	7.45	8.76
		45	2.07	2.64	3.27	3.98	4.78	5.71	6.76	7.97
		50	1.80	2.32	2.90	3.55	4.29	5.12	6.08	7.18
		55	1.58	2.07	2.59	3.18	3.84	4.59	5.45	6.44
		60				2.91	3.50	4.16	4.92	5.80
	P	25	1.39	1.49	1.54	1.56	1.57	1.58	1.62	1.71
		30	1.51	1.62	1.68	1.70	1.72	1.74	1.79	1.90
		35	1.68	1.78	1.84	1.87	1.89	1.92	1.98	2.10
		40	1.88	1.98	2.03	2.06	2.08	2.12	2.19	2.31
		45	2.12	2.21	2.26	2.28	2.30	2.34	2.41	2.53
		50	2.41	2.49	2.53	2.54	2.55	2.58	2.65	2.77
		55	2.75	2.81	2.83	2.83	2.83	2.84	2.90	3.02
		60				3.15	3.13	3.14	3.18	3.29

Note: Based on 18.3°C Return Gas, 0 K Subcooling

Performance Table R404A 50 Hz

Q = Capacity (kW) P = Power Input (kW) 3-Phase

Model		Condensing Temperature °C	Evaporating Temperature °C							
			-30	-25	-20	-15	-10	-5	0	5
ZSI11KQE	Q	25	3.39	4.32	5.35	6.53	7.90	9.50	11.39	13.61
		30	3.18	4.07	5.04	6.16	7.45	8.96	10.74	12.83
		35	2.99	3.83	4.75	5.79	6.99	8.40	10.07	12.04
		40	2.81	3.59	4.45	5.41	6.52	7.84	9.39	11.23
		45	2.62	3.35	4.14	5.02	6.04	7.25	8.68	10.39
		50	2.42	3.10	3.82	4.61	5.54	6.63	7.95	9.51
		55	2.22	2.83	3.47	4.18	5.01	5.99	7.17	8.60
		60				3.73	4.44	5.31	6.36	7.65
	P	25	1.60	1.72	1.77	1.77	1.75	1.75	1.80	1.94
		30	1.66	1.79	1.85	1.87	1.87	1.90	1.97	2.13
		35	1.83	1.97	2.04	2.07	2.08	2.11	2.20	2.37
		40	2.10	2.24	2.31	2.34	2.35	2.39	2.49	2.67
		45	2.45	2.58	2.64	2.66	2.68	2.71	2.80	2.98
		50	2.86	2.98	3.02	3.03	3.03	3.05	3.13	3.31
		55	3.32	3.41	3.43	3.41	3.39	3.40	3.46	3.62
		60				3.80	3.75	3.73	3.77	3.90
ZSI14KQE	Q	25	4.35	5.46	6.79	8.34	10.15	12.23	14.60	17.27
		30	4.15	5.21	6.46	7.93	9.64	11.60	13.83	16.35
		35	3.91	4.90	6.07	7.45	9.05	10.88	12.98	15.34
		40	3.63	4.55	5.64	6.92	8.40	10.11	12.06	14.26
		45	3.35	4.19	5.19	6.36	7.72	9.29	11.09	13.12
		50	3.07	3.83	4.73	5.79	7.02	8.45	10.08	11.94
		55	2.81	3.48	4.28	5.22	6.32	7.59	9.06	10.74
		60				4.67	5.63	6.75	8.04	9.54
	P	25	1.98	2.04	2.14	2.26	2.36	2.42	2.41	2.30
		30	2.31	2.37	2.48	2.60	2.72	2.79	2.80	2.72
		35	2.58	2.63	2.74	2.87	2.99	3.08	3.10	3.03
		40	2.82	2.87	2.97	3.10	3.22	3.32	3.35	3.30
		45	3.10	3.13	3.22	3.34	3.47	3.56	3.60	3.56
		50	3.44	3.45	3.53	3.65	3.76	3.86	3.90	3.86
		55	3.90	3.89	3.95	4.05	4.16	4.24	4.28	4.24
		60				4.60	4.69	4.77	4.80	4.76
ZSI15KQE	Q	25	5.03	6.30	7.72	9.38	11.34	13.66	16.43	19.69
		30	4.58	5.79	7.15	8.71	10.55	12.73	15.32	18.39
		35	4.25	5.42	6.69	8.15	9.86	11.89	14.31	17.18
		40	4.00	5.11	6.30	7.65	9.23	11.11	13.34	16.01
		45	3.78	4.82	5.93	7.17	8.61	10.32	12.37	14.83
		50	3.54	4.51	5.52	6.64	7.93	9.48	11.34	13.59
		55	3.22	4.11	5.02	6.02	7.17	8.54	10.20	12.23
		60				5.26	6.25	7.45	8.91	10.71
	P	25	2.23	2.10	2.06	2.12	2.26	2.49	2.80	3.17
		30	2.51	2.41	2.40	2.47	2.60	2.81	3.07	3.40
		35	2.82	2.76	2.77	2.84	2.97	3.16	3.39	3.67
		40	3.15	3.13	3.16	3.25	3.37	3.54	3.74	3.97
		45	3.50	3.52	3.58	3.68	3.80	3.95	4.12	4.31
		50	3.87	3.93	4.02	4.13	4.26	4.39	4.53	4.67
		55	4.25	4.36	4.48	4.61	4.73	4.86	4.97	5.07
		60				5.10	5.23	5.35	5.44	5.50

Note: Based on 18.3°C Return Gas, 0 K Subcooling

Performance Table

R404A 50 Hz

Q = Capacity (kW) P = Power Input (kW) 3-Phase

Model		Condensing Temperature °C	Evaporating Temperature °C -30	-25	-20	-15	-10	-5	0	5
ZSI18KQE	Q	25	6.11	7.57	9.31	11.35	13.73	16.47	19.62	23.18
		30	5.83	7.21	8.85	10.77	13.01	15.59	18.54	21.90
		35	5.51	6.81	8.35	10.14	12.23	14.64	17.40	20.55
		40	5.15	6.37	7.80	9.47	11.41	13.64	16.20	19.12
		45	4.77	5.90	7.22	8.76	10.53	12.59	14.95	17.64
		50	4.38	5.41	6.62	8.01	9.63	11.50	13.65	16.11
		55	3.97	4.91	5.99	7.24	8.69	10.37	12.31	14.54
		60				6.45	7.73	9.22	10.94	12.93
	P	25	2.76	2.87	3.01	3.17	3.32	3.44	3.50	3.48
		30	3.11	3.22	3.38	3.55	3.71	3.85	3.93	3.94
		35	3.44	3.55	3.71	3.89	4.06	4.21	4.31	4.33
		40	3.79	3.90	4.05	4.23	4.40	4.55	4.66	4.69
		45	4.20	4.29	4.43	4.60	4.77	4.92	5.02	5.05
		50	4.71	4.77	4.90	5.05	5.20	5.34	5.44	5.47
		55	5.34	5.38	5.48	5.61	5.74	5.86	5.94	5.96
		60				6.31	6.42	6.52	6.58	6.58
ZSI21KQE	Q	25	6.79	8.38	10.30	12.58	15.24	18.28	21.74	25.61
		30	6.49	7.99	9.81	11.96	14.46	17.32	20.56	24.20
		35	6.14	7.56	9.27	11.28	13.62	16.29	19.31	22.71
		40	5.76	7.09	8.68	10.55	12.72	15.19	18.00	21.16
		45	5.34	6.58	8.05	9.78	11.77	14.05	16.63	19.54
		50	4.91	6.05	7.39	8.97	10.78	12.86	15.21	17.86
		55	4.46	5.49	6.71	8.13	9.76	11.63	13.75	16.14
		60				7.27	8.72	10.37	12.25	14.38
	P	25	3.08	3.23	3.40	3.58	3.76	3.93	4.07	4.18
		30	3.51	3.66	3.83	4.03	4.22	4.41	4.57	4.69
		35	3.87	4.02	4.19	4.39	4.59	4.78	4.96	5.10
		40	4.21	4.36	4.53	4.72	4.92	5.12	5.30	5.44
		45	4.60	4.73	4.89	5.08	5.27	5.46	5.64	5.78
		50	5.08	5.19	5.33	5.50	5.68	5.86	6.03	6.17
		55	5.71	5.79	5.91	6.06	6.22	6.38	6.53	6.66
		60				6.79	6.93	7.07	7.20	7.31

Note: Based on 18.3°C Return Gas, 0 K Subcooling

Technical Data

1-Phase

Model			ZSI06KQ	ZSI06KQE	ZSI08KQ	ZSI08KQE
Refrigerant			R22	R404A	R22	R404A
Motor Code			PFS/PFZ	PFS/PFZ	PFS/PFZ	PFS/PFZ
Capacity (MT[1] / LT[2])		kW	3.78/1.96	3.83/2.01	4.44/2.21	4.54/2.37
Power (MT[1] / LT[2])		kW	1.83/1.62	1.96/1.75	2.19/1.94	2.34/2.09
Current (MT[1] / LT[2])			8.45/7.5	9.1/8.15	10.05/8.95	11.05/9.95
COP (MT[1] / LT[2])			2.1/1.2	2.0/1.2	2.0/1.1	1.9/1.1
Motor Type			Single-Phase Induction Motor		Single-Phase Induction Motor	
Phase		(ph)	1		1	
Frequency		(Hz)	50		50	
Rated Voltage		(V)	PFS:220, PFZ:220/240		PFS:220, PFZ:220/240	
Minimum Spec Voltage		(V)	220		220	
Maximum Spec Voltage		(V)	PFS:220, PFZ:240		PFS:220, PFZ:240	
Locked Rotor Amps		(A)	PFS:51.2, PFZ:56.6		PFS:63.9, PFZ:71.5	
Maximum Continuous Current (MCC)		(A)	14.4	17.2	15.7	18.0
Rated Load Amps (MCC/1.4)		(A)	10.3	12.3	11.2	12.9
Rated Load Amps (MCC/1.56)		(A)	9.2	11.0	10.1	11.5
Maximum Operating Current		(A)	11.5	13.6	13.1	15.6
No. Of Poles			2	2	2	2
Motor Speed		(rev/min)	2900	2900	2900	2900
Displacement		(cm^3/rev)	35.0	35.0	41.0	41.0
		(m^3/h)	6.10	6.10	7.10	7.10
Oil Type			MIN	POE	MIN	POE
Oil Charge	Initial	(cm^3)	739	739	739	739
	Recharge	(cm^3)	562	562	562	562
Sound Power Level		Avg [dB(A)][2]	71	71	68	68
		Max [dB(A)][2]	76	76	73	73
Weight (Including Oil)		Net Inc Oil (kg)	22.2	22.2	22.2	22.2
Components			Internal Inherent Protector		Internal Inherent Protector	
Mounting Kit		Part Code	527-0044-15		527-0044-15	
Mounting size L x W, (hole size)		(mm)	190 x 190, (8.5)		190 x 190, (8.5)	
Height, Including Mounting		(mm)	407		407	
Connection Tube Size		(inch)				
Suction Tube ID			3/4 ST		3/4 ST	
Discharge Tube ID			1/2 ST		1/2 ST	

Notes: 1. MT: -7°C Evaporating, 50°C Condensing, 18.3°C Return Gas, 0 K Subcooling
2. LT: -25°C Evaporating, 45°C Condensing, 18.3°C Return Gas, 0 K Subcooling

Technical Data 3-Phase

Model			ZSI06KQ	ZSI06KQE	ZSI08KQ	ZSI08KQE
Refrigerant			R22	R404A	R22	R404A
Motor Code			TFP/TFM	TFP/TFM	TFP/TFM	TFP/TFM
Capacity (MT[1] / LT[2])		kW	3.69/1.82	3.71/1.88	4.47/2.26	4.47/2.34
Power (MT[1] / LT[2])		kW	1.84/1.58	1.96/1.73	2.08/1.79	2.21/1.93
Current (MT[1] / LT[2])			3.61/3.31	3.75/3.51	3.95/3.55	4.05/3.72
COP (MT[1] / LT[2])			2.01/1.16	1.90/1.08	2.15/1.26	2.02/1.21
Motor Type			Three-Phase Induction Motor		Three-Phase Induction Motor	
Phase		(ph)	3		3	
Frequency		(Hz)	50		50	
Rated Voltage		(V)	TFP:380, TFM:380/420		TFP:380, TFM:380/420	
Minimum Spec Voltage		(V)	380		380	
Maximum Spec Voltage		(V)	TFP:380, TFM:420		TFP:380, TFM:420	
Locked Rotor Amps		(A)	TFP:34.8, TFM:39.2		TFP:34.8, TFM:39.2	
Maximum Continuous Current (MCC)		(A)	6.8	7.9	6.7	7.9
Rated Load Amps (MCC/1.4)		(A)	4.9	5.6	4.8	5.6
Rated Load Amps (MCC/1.56)		(A)	4.4	5.0	4.3	5.1
Maximum Operating Current		(A)	5.2	5.7	5.6	6.1
No. Of Poles			2	2	2	2
Motor Speed		(rev/min)	2900	2900	2900	2900
Displacement		(cm^3/rev)	35.0	35.0	41.0	41.0
		(m^3/h)	6.10	6.10	7.10	7.10
Oil Type			MIN	POE	MIN	POE
Oil Charge	Initial	(cm^3)	739	739	739	739
	Recharge	(cm^3)	562	562	562	562
Sound Power Level		Avg [dB(A)][2]	71	68	68	68
		Max [dB(A)][2]	76	73	73	73
Weight (Including Oil)		Net Inc Oil (kg)	22.2	22.2	22.2	22.2
Components			Internal Inherent Protector		Internal Inherent Protector	
Mounting Kit		Part Code	527-0044-15		527-0044-15	
Mounting size L x W, (hole size)		(mm)	190 x 190, (8.5)		190 x 190, (8.5)	
Height, Including Mounting		(mm)	407		407	
Connection Tube Size		(inch)				
Suction Tube ID			3/4 ST		3/4 ST	
Discharge Tube ID			1/2 ST		1/2 ST	

Notes: 1. MT: -7°C Evaporating, 50°C Condensing, 18.3°C Return Gas, 0 K Subcooling
2. LT: -25°C Evaporating, 45°C Condensing, 18.3°C Return Gas, 0 K Subcooling

Technical Data 3-Phase

Model			ZSI09KQ	ZSI09KQE	ZSI11KQ	ZSI11KQE
Refrigerant			R22	R404A	R22	R404A
Motor Code			TFP/TFM	TFP/TFM	TFP/TFM	TFP/TFM
Capacity (MT[1] / LT[2])		kW	4.94/2.39	4.95/2.64	6.21/3.17	6.39/3.36
Power (MT[1] / LT[2])		kW	2.28/1.99	2.51/2.22	2.74/2.37	2.96/2.58
Current (MT[1] / LT[2])			4.19/3.80	4.45/4.00	4.85/4.35	5.15/4.65
COP (MT[1] / LT[2])			2.30/1.20	1.97/1.19	2.27/1.34	2.16/1.30
Motor Type			Three-Phase Induction Motor		Three-Phase Induction Motor	
Phase		(ph)	3		3	
Frequency		(Hz)	50		50	
Rated Voltage		(V)	TFP:380, TFM:380/420		TFP:380, TFM:380/420	
Minimum Spec Voltage		(V)	380		380	
Maximum Spec Voltage		(V)	TFP:380, TFM:420		TFP:380, TFM:420	
Locked Rotor Amps		(A)	TFP:34.8, TFM:39.2		TFP:47.0, TFM:51.5	
Maximum Continuous Current (MCC)		(A)	7.0	7.8	10.0	11.2
Rated Load Amps (MCC/1.4)		(A)	5.0	5.6	7.1	8.0
Rated Load Amps (MCC/1.56)		(A)	4.5	5.0	6.4	7.2
Maximum Operating Current		(A)	6.2	6.7	6.6	7.5
No. Of Poles			2	2	2	2
Motor Speed		(rev/min)	2900	2900	2900	2900.0
Displacement		(cm^3/rev)	46.1	46.1	57.2	57.2
		(m^3/h)	8.03	8.03	9.95	9.95
Oil Type			MIN	POE	MIN	POE
Oil Charge	Initial	(cm^3)	739	739	1360	1360
	Recharge	(cm^3)	562	562	1242	1242
Sound Power Level		Avg [dB(A)][2]	68	68	74	74
		Max [dB(A)][2]	73	73	79	79
Weight (Including Oil)		Net Inc Oil (kg)	22.2	22.2	29.9	29.9
Components			Internal Inherent Protector		Internal Inherent Protector	
Mounting Kit		Part Code	527-0044-15		527-0116-00	
Mounting size L x W, (hole size)		(mm)	190 x 190, (8.5)		190 x 190, (8.5)	
Height, Including Mounting		(mm)	407		436	
Connection Tube Size		(inch)				
Suction Tube ID			3/4 ST		7/8 ST	
Discharge Tube ID			1/2 ST		1/2 ST	

Notes: 1. MT: -7°C Evaporating, 50°C Condensing, 18.3°C Return Gas, 0 K Subcooling
2. LT: -25°C Evaporating, 45°C Condensing, 18.3°C Return Gas, 0 K Subcooling

Technical Data

3-Phase

Model		ZSI14KQ	ZSI14KQE	ZSI15KQ	ZSI15KQE
Refrigerant		R22	R404A	R22	R404A
Motor Code		TFP/TFM	TFP/TFM	TFP/TFM	TFP/TFM
Capacity (MT[1] / LT[2])	kW	7.91/3.97	8.15/4.19	8.88/4.60	9.12/4.82
Power (MT[1] / LT[2])	kW	3.48/2.90	3.76/3.13	3.94/3.24	4.24/3.52
Current (MT[1] / LT[2])		5.90/5.10	6.35/5.42	6.59/5.55	7.01/5.91
COP (MT[1] / LT[2])		2.27/1.37	2.17/1.34	2.25/1.42	2.15/1.37
Motor Type		Three-Phase Induction Motor		Three-Phase Induction Motor	
Phase	(ph)	3		3	
Frequency	(Hz)	50		50	
Rated Voltage	(V)	TFP:380, TFM:380/420		TFP:380, TFM:380/420	
Minimum Spec Voltage	(V)	380		380	
Maximum Spec Voltage	(V)	TFP:380, TFM:420		TFP:380, TFM:420	
Locked Rotor Amps	(A)	TFP:47.0, TFM:51.5		TFP:47.0, TFM:51.5	
Maximum Continuous Current (MCC)	(A)	10.9	12.1	11.8	12.7
Rated Load Amps (MCC/1.4)	(A)	7.8	8.6	8.4	9.1
Rated Load Amps (MCC/1.56)	(A)	7.0	7.8	7.6	8.1
Maximum Operating Current	(A)	8.2	9.2	10.1	11.9
No. Of Poles		2	2	2	2
Motor Speed	(rev/min)	2900	2900	2900	2900
Displacement	(cm^3/rev)	73.1	73.1	82.6	82.6
	(m^3/h)	12.70	12.70	14.40	14.40
Oil Type		MIN	POE	MIN	POE
Oil Charge	Initial (cm^3)	1360	1360	1360	1360
	Recharge (cm^3)	1242	1242	1242	1242
Sound Power Level	Avg [dB(A)][2]	76	76	76	76
	Max [dB(A)][2]	81	81	81	81
Weight (Including Oil)	Net Inc Oil (kg)	29.9	29.9	29.9	29.9
Components		Internal Inherent Protector		Internal Inherent Protector	
Mounting Kit	Part Code	527-0116-00		527-0116-00	
Mounting size L x W, (hole size)	(mm)	190 x 190, (8.5)		190 x 190, (8.5)	
Height, Including Mounting	(mm)	436		436	
Connection Tube Size	(inch)				
Suction Tube ID		7/8 ST		7/8 ST	
Discharge Tube ID		1/2 ST		1/2 ST	

Notes: 1. MT: -7°C Evaporating, 50°C Condensing, 18.3°C Return Gas, 0 K Subcooling
2. LT: -25°C Evaporating, 45°C Condensing, 18.3°C Return Gas, 0 K Subcooling

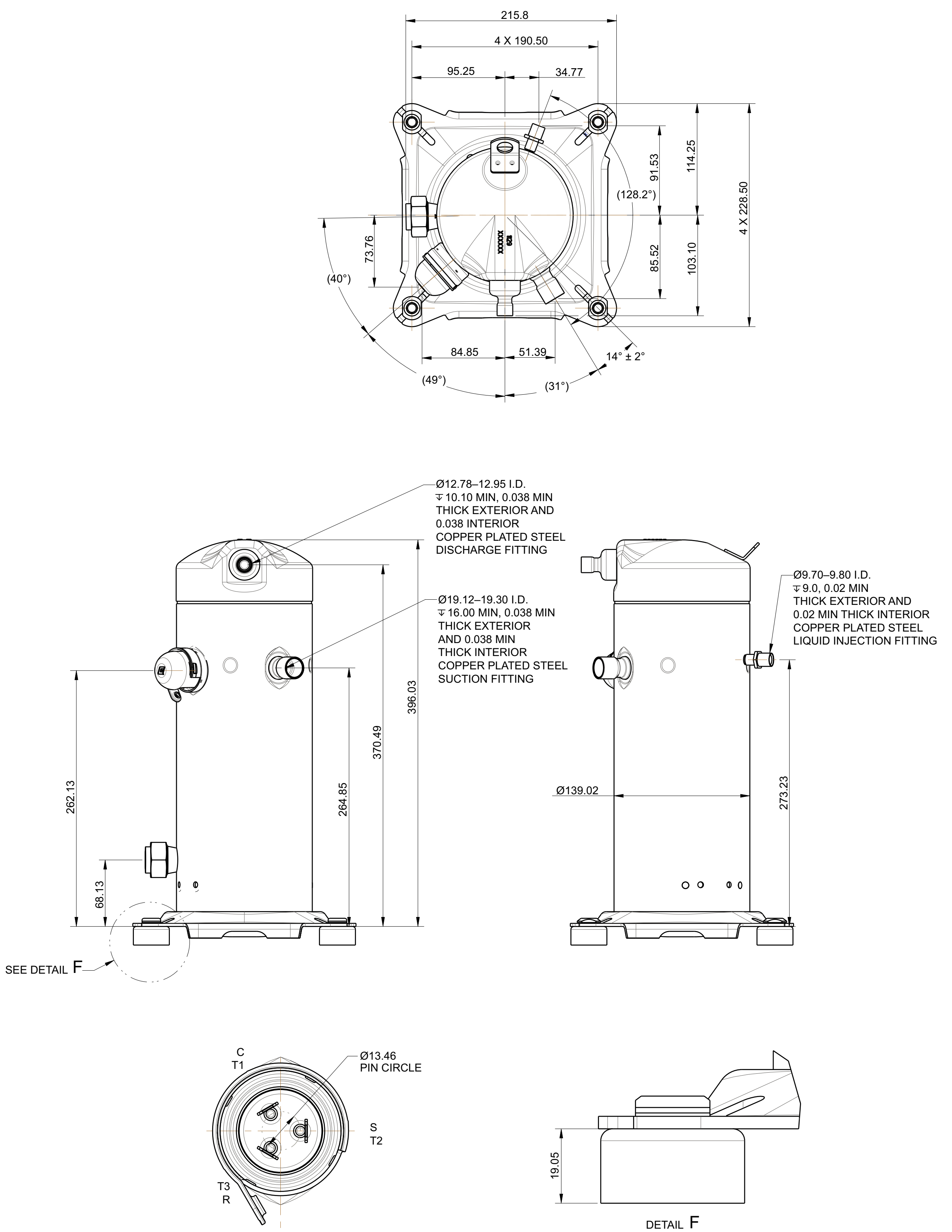
Technical Data

3-Phase

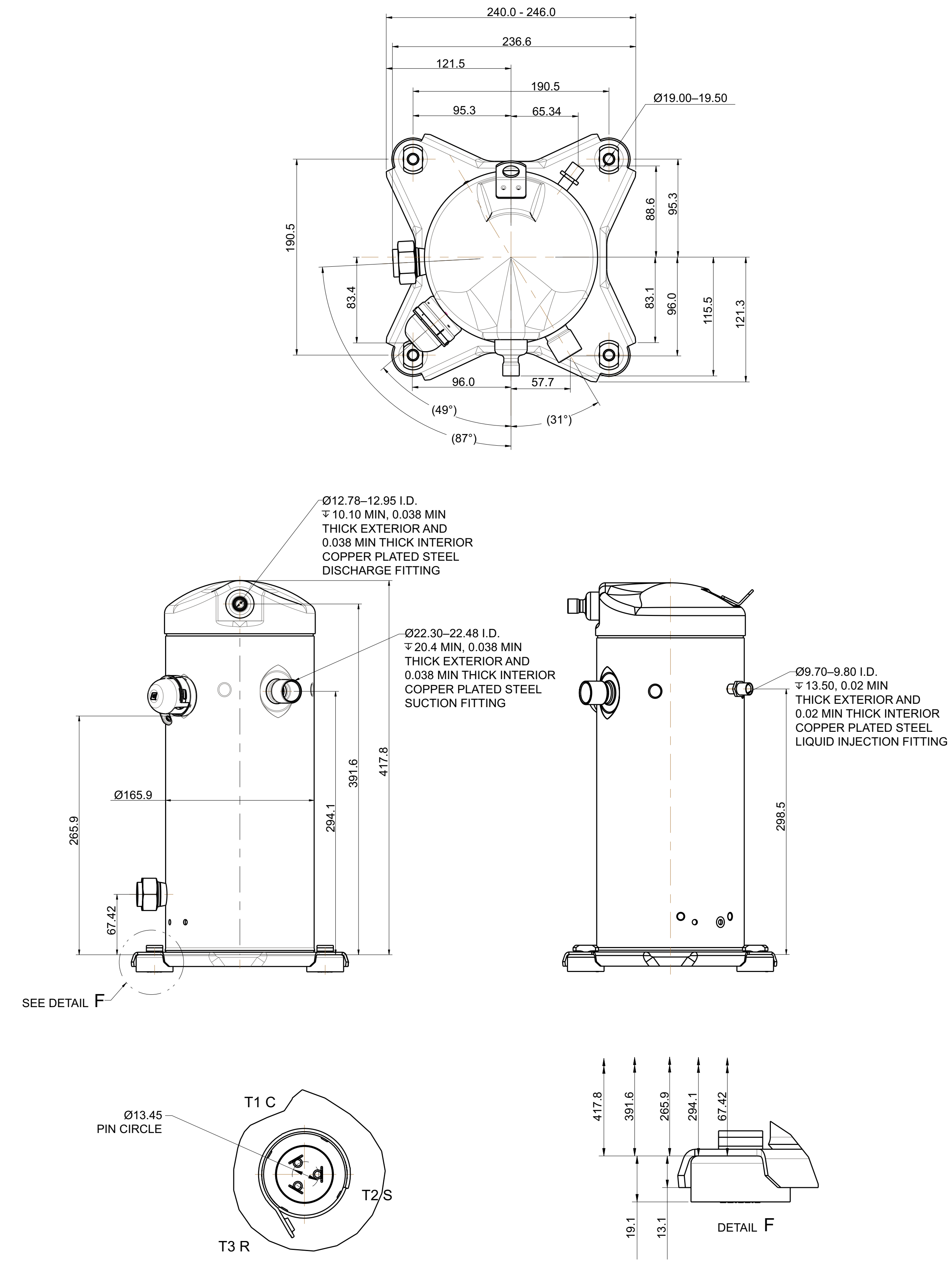
Model		ZSI18KQ	ZSI18KQE	ZSI21KQ	ZSI21KQE
Refrigerant		R22	R404A	R22	R404A
Motor Code		TFP/TFM	TFP/TFM	TFP/TFM	TFP/TFM
Capacity (MT[1] / LT[2])	kW	10.87/5.57	11.08/5.92	12.25/6.27	12.40/6.59
Power (MT[1] / LT[2])	kW	4.86/4.11	5.20/4.29	5.30/4.49	5.71/4.73
Current (MT[1] / LT[2])		8.55/7.55	9.05/7.75	10.25/9.25	10.80/9.55
COP (MT[1] / LT[2])		2.24/1.35	2.13/1.38	2.31/1.40	2.17/1.39
Motor Type		Three-Phase Induction Motor		Three-Phase Induction Motor	
Phase	(ph)	3		3	
Frequency	(Hz)	50		50	
Rated Voltage	(V)	TFP:380, TFM:380/420		TFP:380, TFM:380/420	
Minimum Spec Voltage	(V)	380		380	
Maximum Spec Voltage	(V)	TFP:380, TFM:420		TFP:380, TFM:420	
Locked Rotor Amps	(A)	TFP:67.0, TFM:74.0		TFP:90.5, TFM:101.0	
Maximum Continuous Current (MCC)	(A)	13.3	15.0	16.2	19.3
Rated Load Amps (MCC/1.4)	(A)	9.5	10.7	11.6	13.8
Rated Load Amps (MCC/1.56)	(A)	8.5	9.6	10.4	12.4
Maximum Operating Current	(A)	11.2	13.7	13.6	14.6
No. Of Poles		2	2	2	2
Motor Speed	(rev/min)	2900	2900	2900	2900
Displacement	(cm^3/rev)	98.0	98.0	107.8	107.8
	(m^3/h)	17.10	17.10	18.75	18.75
Oil Type		MIN	POE	MIN	POE
Oil Charge	Initial (cm^3)	1893	1893	1893	1893
	Recharge (cm^3)	1774	1774	1774	1774
Sound Power Level	Avg [dB(A)][2]	78	78	78	78
	Max [dB(A)][2]	83	83	83	83
Weight (Including Oil)	Net Inc Oil (kg)	37.4	37.4	39.7	39.7
Components		Internal Inherent Protector		Internal Inherent Protector	
Mounting Kit	Part Code	527-0116-00		527-0116-00	
Mounting size L x W, (hole size)	(mm)	190 x 190, (8.5)		190 x 190, (8.5)	
Height, Including Mounting	(mm)	457		457	
Connection Tube Size	(inch)				
Suction Tube ID		7/8 ST		7/8 ST	
Discharge Tube ID		1/2 ST		1/2 ST	

Notes: 1. MT: -7°C Evaporating, 50°C Condensing, 18.3°C Return Gas, 0 K Subcooling
2. LT: -25°C Evaporating, 45°C Condensing, 18.3°C Return Gas, 0 K Subcooling

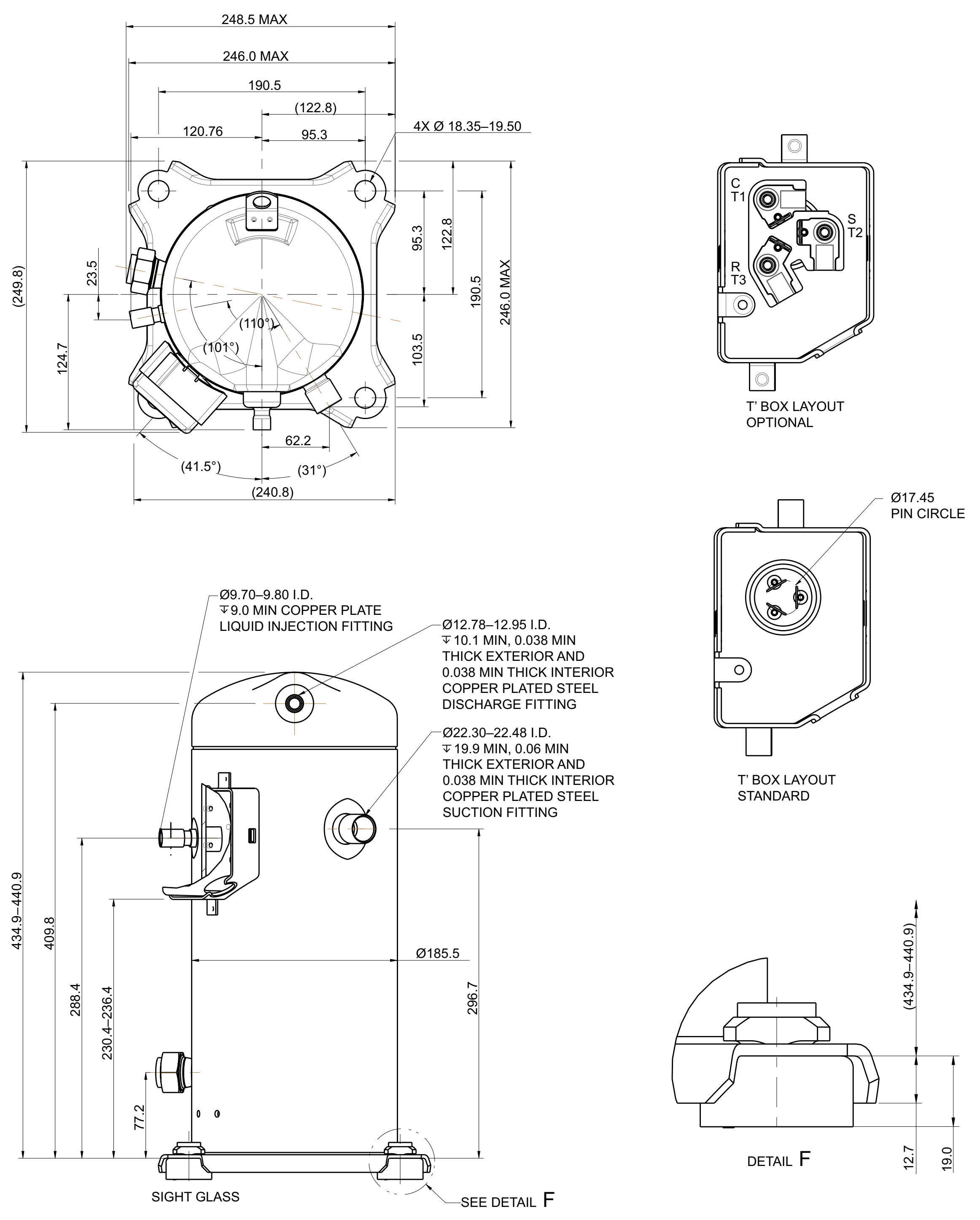
Dimensional Drawings
ZSI06 to ZSI09



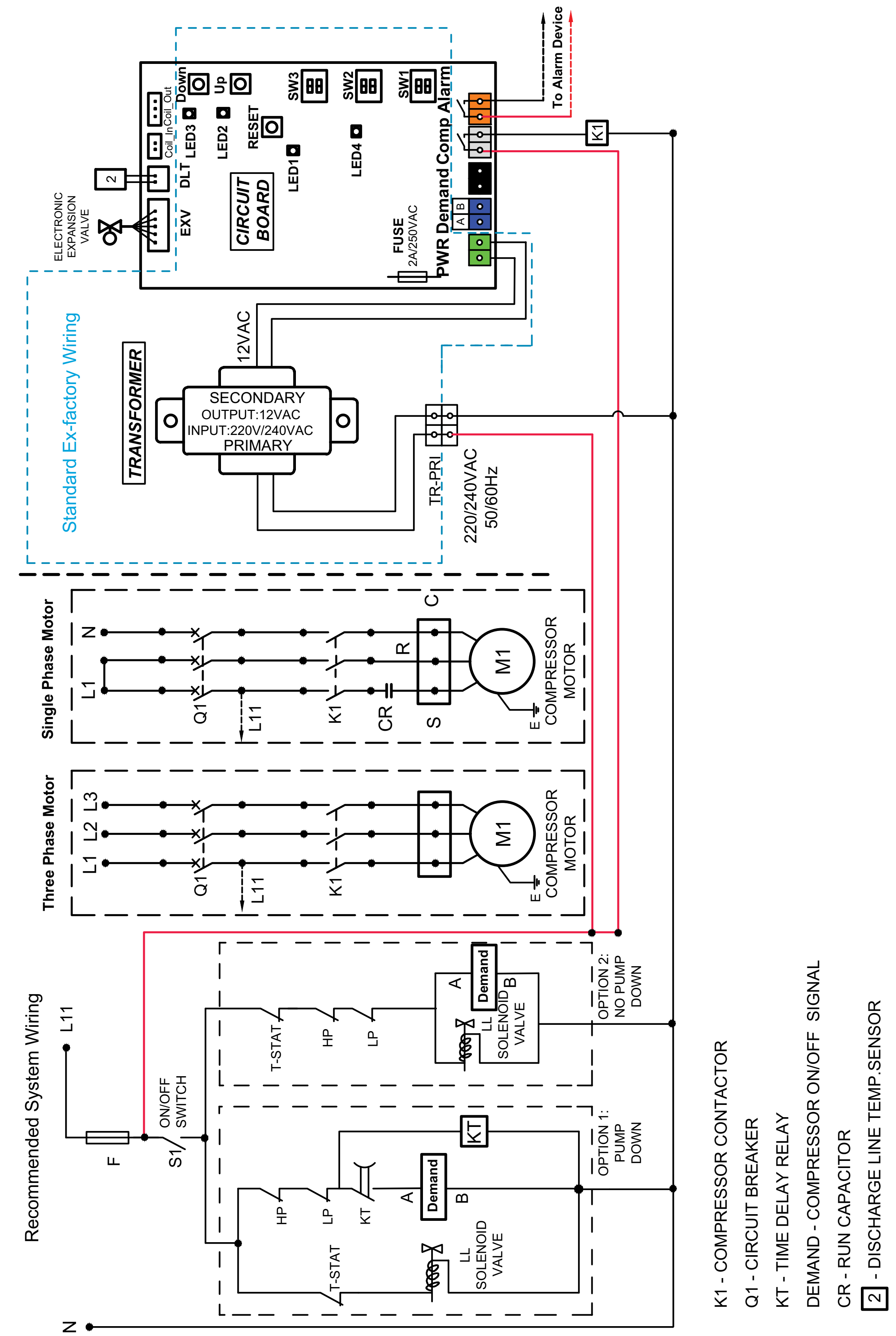
Dimensional Drawings
ZSI11 to ZSI15



Dimensional Drawings
ZSI18 to ZSI21



Wiring Diagram



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