

Copeland Scroll Digital™ Compressor

ZBD for refrigeration applications



Product Manual

Copeland Scroll™


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, supporting the industry with advanced technology, technical support and training services.

For more than 80 years, we have been introducing innovative technology to the market, from the first semi-hermetic and hermetic compressors in the 1940s and 1950s, the high efficiency Discus™ semi-hermetic, air conditioning and heating scroll compressors in the 1980s and 1990s, to the new Stream semi-hermetic and the digital scroll compressor technology of today.

Based on this, we have developed an unequalled range of solutions for the refrigeration and air conditioning markets. In recent years, we have become a major solution provider to the air conditioning and refrigeration industry. Our range of Copeland™ brand products addresses the diverse needs of all of these markets. With scrolls and semi-hermetic compressors available for all main refrigerants, equipped with smart electronics and capable of modulation, Emerson Climate Technologies has taken compressor technology to new heights.

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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Leading Innovations in Digital Scroll Technology

Emerson Climate Technologies has revolutionized the industry with the introduction of its scroll technology, which was launched in 1987. In 2012, Emerson™ produced its 100 millionth scroll - a significant achievement and further demonstrating Emerson's position as a world leader in the development and application of scroll technology.

Energy-efficient Refrigeration Through Capacity Modulation

Today, Emerson is the world's largest manufacturer of refrigeration compressors, underscoring Emerson Climate Technologies' thrust of ensuring food safety and protecting the environment. Leveraging on Emerson's vast global network and R&D resources, the company also continues to develop the ultimate in climate technology for various businesses. Emerson helps provide solutions to achieve high efficiency systems for cold storage warehouses, supermarkets, quick service restaurants, meat trading and processing facilities, seafood import and export establishments, agricultural depots and retail outlets - green technologies with less environmental impact.

With today's growing need to address energy efficiency and precise temperature control, Emerson developed ZBD compressors – digital scroll technology in a simplified, compact design that is very reliable.

The ZBD features continuous capacity modulation range of 10-100%. This eliminates hot gas bypass which causes waste of electricity, and complications arising from variable speed drives. Precise capacity modulation control proves beneficial in a number of applications, including precise temperature control for precision cooling and humidity control as well as parallel compressor operations or rack systems – intermediate and more precise part load operation of a compressor to perfectly match varying evaporator loads. Compared to cycling compressors, smoother and more precise load matching is enabled by stepless capacity control with the ZBD.

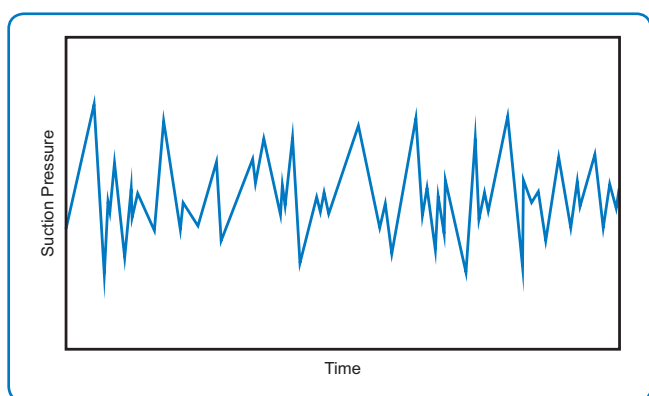
Features and Benefits

- Digital Scroll technology provides higher efficiency compared to hot gas bypass systems or compressor cycling
- Less complicated compared to variable speed technologies
- More reliable compared to other modulation technologies due to elimination of oil return issues
- Suitable for rack systems due to its varying load requirements
- Proven scroll technology paired with mechanical unloading system provides greater reliability and efficiency

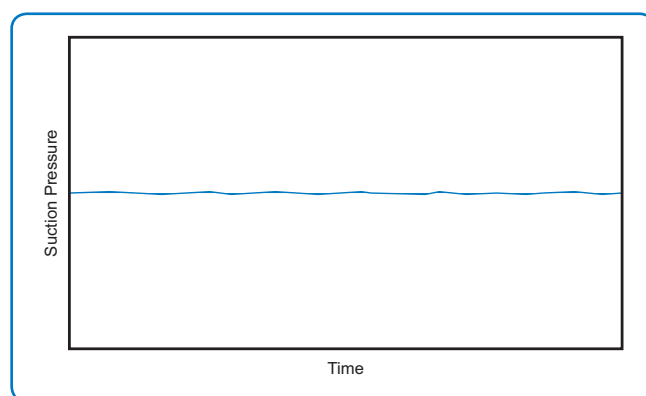


Digital Scroll Advantage for Rack Systems

Digital scroll compressors having modulation capabilities from 10%–100% naturally fit refrigeration rack systems. Rack systems need to fulfill varying evaporator load requirements due to changing case loads, not to mention variations due to cases undergoing routine defrost. This can be attained by complementing fixed-speed compressor racks with a digital scroll of the same capacity. The refrigeration load will be matched by running fixed-speed compressors to handle the base load and the peaks by the digital scroll. This leads to a smooth and almost constant system suction pressure (see charts below). Compared to fixed-speed scroll racks where unloading is achieved by cycling the lead compressor, this results in a saw tooth profile of the system suction pressure and will reduce the life of the lead compressor due to frequent on and off action. Fluctuating suction pressures lead to varying evaporator temperature and humidity conditions—a condition that is not advisable for refrigerated products.



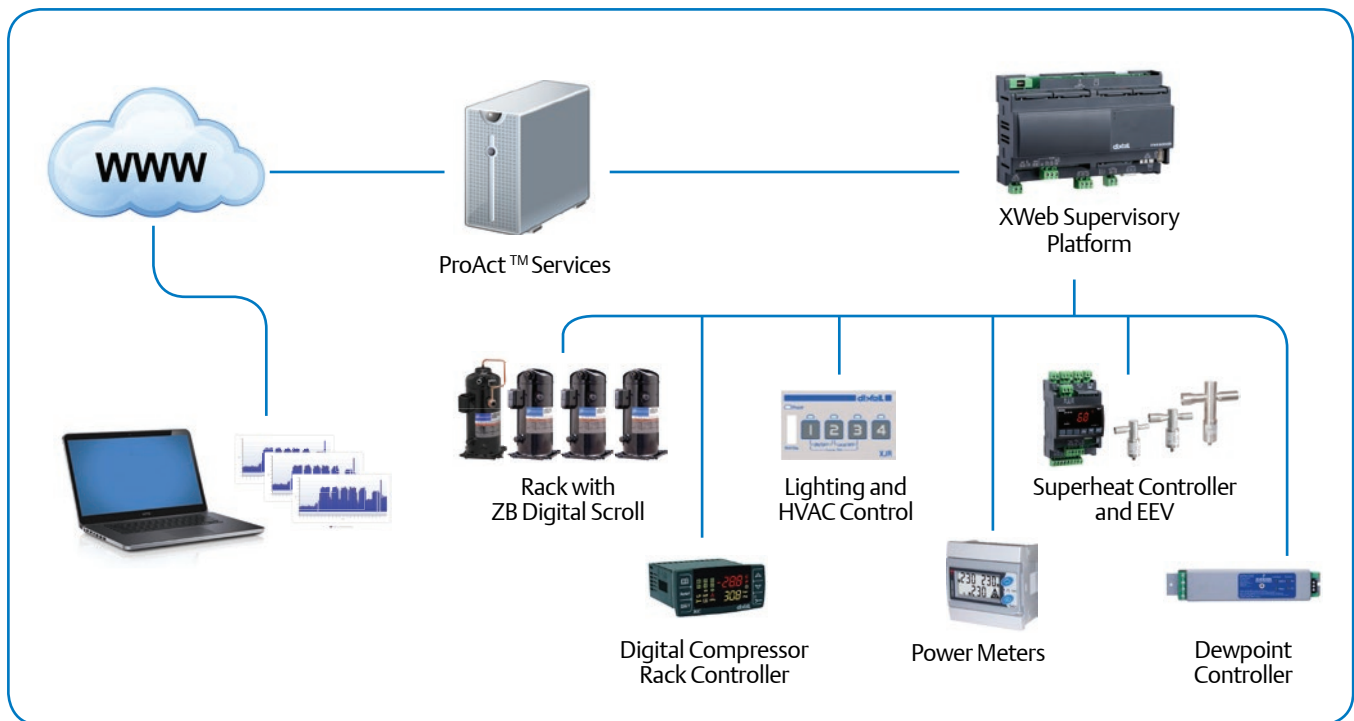
Compressor modulation by cycling compressor on and off
Saw tooth profile of suction pressure for
fixed speed compressor



Compressor modulation by digital scroll
Smooth system suction pressure



Intelligent Store™

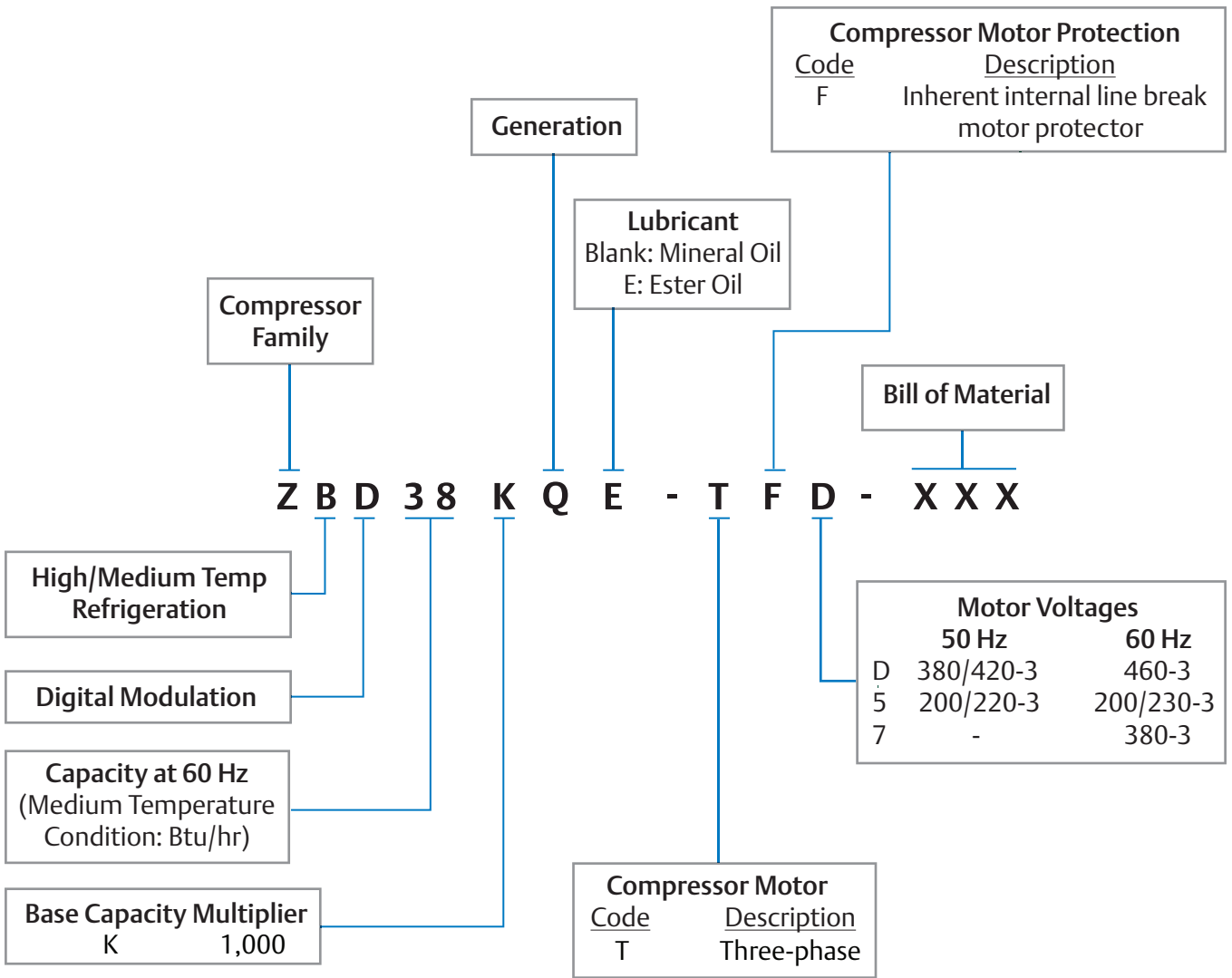


An innovative approach to enterprise facility management, Emerson's Intelligent Store architecture integrates hardware and services to help hyper mart, supermarket, convenience store, and box retail operators make better facility decisions while reducing operational costs. The Intelligent Store architecture implements best practices for facility management and transforms data from store equipment and controls into actionable insights. Designed to deliver value in both new and existing stores, the Intelligent Store architecture can help retailers significantly improve their bottom line results. The Intelligent Store solution constitutes:

- Energy efficient store infrastructure components
- State-of-the-art control technologies: XWeb Supervisory Platform
- Field services: Commissioning and project management
- Remote services: Alarm Management, Setpoint Management, Demand Response, Condition Based Maintenance, Energy Monitoring and Targeting, Smart Dispatch, Food Quality Reports and Site Administration



Nomenclature



Bill of Material

BOM	558	559	588	589
Sight Glass	✓	✓	✓	✓
Stub Tube	✓			
Rotalock		✓		✓
Digital Valve			✓	✓
Solenoid Coil			✓	✓
Digital Rack Controller Kit			✓	✓
Discharge Line Temperature Sensor			✓	✓
Condenser Mid Coil Temperature Sensor			✓	✓
OMB			✓	✓
OMB Adaptor			✓	✓

ZBD Rack Specification

Family	Items	Unit	ZBD Rack Package	ZBD Rack Recommendation	
			STD BOM	10HP	15HP
Compressor	Digital Scroll Compressor	EA	✓	ZBD38KQ	ZBD38KQ
	Standard Scroll Compressor	EA	-	ZB38KQ	ZB38KQ
-			-	ZB38KQ	
Digital Accessory	Thermistor ¹	EA	✓	043-0130-00	043-0130-00
	Valve Body	EA	✓	010-0125-00	010-0125-00
	Solenoid Coil ²	EA	✓	023-0088-00	023-0088-00
Rack Control Kit	Controller (XC645CX)	EA	✓	085-0254-00	085-0254-00
	4-20mA Suction Pressure Transducer	EA	✓	085-0233-00	085-0233-00
	Condenser Mid Coil Temperature Sensor	EA	✓	043-0168-02	043-0168-02
	4-20mA Condenser Pressure Transducer ³	EA	-	Optional	Optional
	TTL / RS485 Serial Converter ³	EA	✓	029-0502-00	029-0502-00
	Hot Key	EA	-	085-0234-00	085-0234-00
	Transformer	EA	✓	037-0025-00	037-0025-00
	Wiring Kit	3m	✓	029-0501-00	029-0501-00
Digital Input and Analog Out Connector	3m	✓	029-0472-01	029-0472-01	
System Protector	Oil Regulator, OMB-JB1 ASC 2 24/50	EA	✓	085-0245-00	085-0245-00
	Adapter for ZBD Sight Glass	EA	✓	034-0236-00	034-0236-00
	HP	EA	-	PS1-A5A	PS1-A5A
	LP	EA	-	PS1-A3A	PS1-A3A
	Oil Separator	EA	-	A-W55877	A-W55889
	Oil Filter Drier	EA	-	AOFD553	AOFD553
	Filter Drier	EA	-	Shell STAS-487T	Shell STAS-489T
		EA	-	Core H-48	Core H-48
	Sight Glass	EA	-	HMI	HMI
	Pulsation Damper	EA	-	APD	APD

Notes: 1. Thermistor: Only for ZBD29KQ, PCN 043-0130-00
 2. Solenoid coil part code
 3. Please contact Emerson sales representative if the part is required

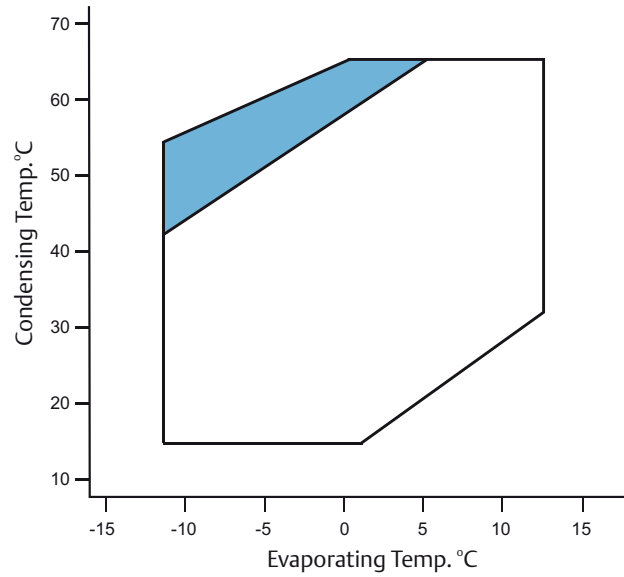
Solenoid Coil Part Code

Part Code	Description
023-0088-00	220V 50/60Hz
023-0088-04	240V 50/60Hz
023-0088-05	200V 50/60Hz
023-0088-07	24V 50/60Hz

Operating Envelopes

R22

ZBD29 - ZBD48

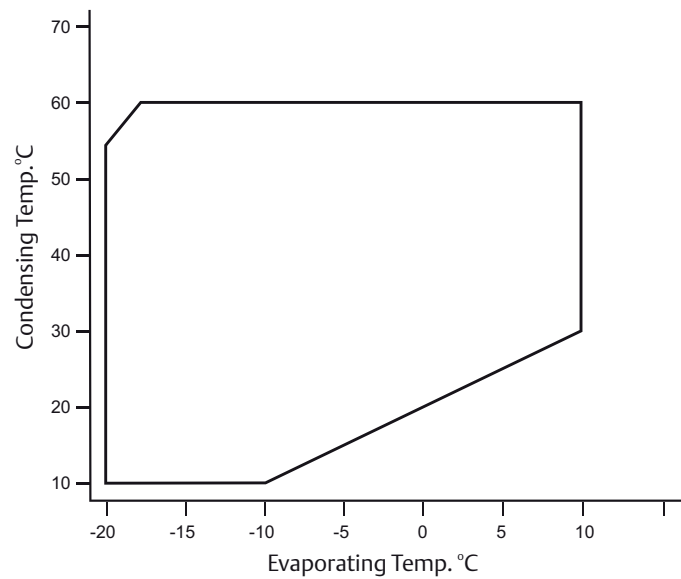


Notes:

1. Envelope in unshaded region, max return gas temperature of 18.3°C
2. Envelope in shaded region, max superheat of 11K only

R404A

ZBD29 - ZBD48



Note:

1. Envelope in unshaded region, max return gas temperature of 18.3°C

Performance Data

Q=Capacity (kW) P=Power input (kW) 3-Phase, 50 Hz

R22

Compressor		Condensing Temperature °C	Evaporating Temperature (°C)							
			-12	-10	-5	0	5	10	12.5	
ZBD29KQ	Q	15	7.90	8.53	10.30	12.40				
		20	7.58	8.19	9.89	11.90	14.20			
		30	6.99	7.55	9.11	10.90	13.00	15.45	16.75	
		40	6.37	6.89	8.32	9.98	11.90	14.10	15.30	
		50	5.60	6.09	7.45	8.96	10.70	12.70	13.80	
		55		5.62	6.91	8.41	10.05	11.95	13.00	
		60			6.34	7.75	9.38	11.20	12.20	
	65				7.07	8.62	10.35	11.30		
	P	15	1.46	1.48	1.52	1.57				
		20	1.62	1.64	1.68	1.74	1.80			
		30	1.98	2.01	2.06	2.11	2.17	2.24	2.28	
		40	2.44	2.46	2.52	2.57	2.62	2.67	2.69	
		50	3.05	3.08	3.14	3.18	3.21	3.24	3.25	
		55		3.46	3.52	3.56	3.58	3.60	3.60	
60				3.96	3.99	4.01	4.01	4.00		
65				4.49	4.50	4.49	4.47			
ZBD38KQ	Q	15	8.72	9.20	10.60	12.30				
		20	9.12	9.69	11.30	13.25	15.50			
		30	8.86	9.55	11.45	13.60	16.10	18.95	20.50	
		40	7.95	8.64	10.50	12.70	15.15	17.95	19.50	
		50	7.20	7.79	9.48	11.35	13.50	16.00	17.40	
		55		7.71	9.12	10.80	12.75	14.95	16.20	
		60			9.10	10.45	12.15	14.05	15.15	
	65				10.50	11.80	13.35	14.25		
	P	15	2.24	2.35	2.65	3.00				
		20	2.21	2.28	2.48	2.70	2.97			
		30	2.55	2.58	2.65	2.72	2.81	2.92	2.99	
		40	3.14	3.17	3.23	3.27	3.29	3.32	3.34	
		50	3.65	3.73	3.90	4.01	4.09	4.15	4.17	
		55		3.90	4.16	4.36	4.51	4.62	4.67	
60				4.32	4.63	4.88	5.08	5.16		
65				4.79	5.17	5.48	5.62			
ZBD45KQ	Q	15	10.25	10.85	12.50	14.50				
		20	10.75	11.45	13.35	15.60	18.30			
		30	10.50	11.30	13.55	16.10	19.00	22.40	24.20	
		40	9.48	10.30	12.50	15.05	17.95	21.30	23.10	
		50	8.70	9.40	11.40	13.60	16.15	19.10	20.70	
		55		9.35	11.00	13.00	15.30	17.90	19.40	
		60			11.05	12.65	14.65	16.90	18.20	
	65				12.80	14.30	16.15	17.20		
	P	15	2.63	2.76	3.12	3.52				
		20	2.61	2.70	2.93	3.19	3.50			
		30	3.02	3.06	3.15	3.23	3.34	3.48	3.57	
		40	3.73	3.77	3.85	3.90	3.94	3.98	4.00	
		50	4.36	4.46	4.66	4.80	4.91	4.98	5.01	
		55		4.68	4.99	5.23	5.42	5.56	5.62	
60				5.20	5.57	5.88	6.12	6.22		
65				5.79	6.24	6.62	6.79			

Notes: Suction Return Temperature 18.3°C
 Suction Superheat 11.0K
 Liquid subcooling 0.0K

Performance Data

Q=Capacity (kW) P=Power input (kW) 3-Phase, 50 Hz

R22

Compressor		Condensing Temperature °C	Evaporating Temperature (°C)						
			-12	-10	-5	0	5	10	12.5
ZBD48KQ	Q	15	11.55	12.20	14.05	16.30			
		20	12.10	12.85	15.05	17.60	20.60		
		30	11.80	12.75	15.25	18.15	21.40	25.20	27.30
		40	10.65	11.60	14.10	17.00	20.30	24.00	26.00
		50	9.79	10.60	12.85	15.35	18.25	21.60	23.40
		55	-	10.55	12.45	14.70	17.30	20.30	22.00
		60	-	-	12.50	14.35	16.60	19.15	20.60
	65	-	-	-	14.45	16.20	18.30	19.50	
	P	15	2.96	3.11	3.51	3.97			
		20	2.92	3.01	3.28	3.58	3.93	-	-
		30	3.35	3.39	3.49	3.59	3.71	3.86	3.96
		40	4.11	4.16	4.24	4.29	4.33	4.37	4.40
		50	4.76	4.87	5.10	5.25	5.37	5.45	5.48
		55		5.07	5.43	5.70	5.90	6.06	6.13
60				5.62	6.04	6.38	6.65	6.77	
65				6.23	6.74	7.17	7.35		

Notes: Suction Return Temperature 18.3°C
 Suction Superheat 11.0K
 Liquid subcooling 0.0K

Performance Data

Q=Capacity (kW) P=Power input (kW) 3-Phase, 60 Hz

R22

Compressor		Condensing Temperature °C	Evaporating Temperature (°C)						
			-12	-10	-5	0	5	10	12.5
ZBD48KQ	Q	15	13.85	14.60	16.85	19.55			
		20	14.45	15.40	17.95	21.00	24.60		
		30	14.05	15.15	18.15	21.60	25.60	30.10	32.60
		40	12.55	13.65	16.70	20.10	24.00	28.50	31.00
		50	11.30	12.30	14.90	18.00	21.50	25.40	27.70
		55		12.10	14.40	17.15	20.20	23.80	25.80
		60			14.35	16.55	19.25	22.30	24.10
	65				16.60	18.65	21.20	22.60	
	P	15	3.69	3.88	4.39	4.96			
		20	3.64	3.77	4.10	4.47	4.92		
		30	4.20	4.25	4.38	4.50	4.65	4.85	4.97
		40	5.19	5.24	5.35	5.41	5.47	5.52	5.55
		50	6.04	6.18	6.46	6.66	6.81	6.91	6.96
		55		6.46	6.90	7.24	7.51	7.71	7.79
60				7.17	7.70	8.13	8.48	8.63	
65				7.97	8.62	9.16	9.40		

Notes: Suction Return Temperature 18.3°C
 Suction Superheat 11.0K
 Liquid subcooling 0.0K

Performance Data

Q=Capacity (kW) P=Power input (kW) 3-Phase, 60 Hz

R22

Compressor		Condensing Temperature °C	Evaporating Temperature (°C)							
			-12	-10	-5	0	5	10	12.5	
ZBD29KQ	Q	15	9.49	10.25	12.35	14.85				
		20	9.11	9.84	11.90	14.25	17.00			
		30	8.40	9.07	10.95	13.10	15.60	18.50	20.10	
		40	7.66	8.27	9.98	11.95	14.25	16.90	18.35	
		50	6.75	7.32	8.94	10.75	12.80	15.20	16.55	
		55		6.79	8.30	10.10	12.05	14.35	15.60	
		60			7.65	9.31	11.25	13.40	14.60	
	65				8.52	10.35	12.45	13.55		
	P	15	1.76	1.77	1.82	1.89				
		20	1.95	1.97	2.02	2.09	2.17			
		30	2.38	2.41	2.47	2.54	2.61	2.69	2.74	
		40	2.93	2.96	3.03	3.09	3.15	3.21	3.24	
		50	3.67	3.70	3.77	3.82	3.86	3.90	3.91	
		55		4.16	4.23	4.28	4.31	4.33	4.33	
60				4.76	4.80	4.82	4.82	4.82		
65				5.40	5.41	5.40	5.40	5.38		
ZBD38KQ	Q	15	10.45	11.05	12.70	14.75				
		20	10.95	11.65	13.60	15.90	18.65			
		30	10.65	11.45	13.75	16.35	19.35	22.80	24.70	
		40	9.56	10.40	12.65	15.25	18.20	21.60	23.40	
		50	8.67	9.39	11.40	13.70	16.30	19.30	21.00	
		55		9.29	11.00	13.05	15.40	18.10	19.60	
		60			11.00	12.65	14.65	17.00	18.30	
	65				12.70	14.25	16.15	17.25		
	P	15	2.68	2.81	3.17	3.58				
		20	2.65	2.74	2.97	3.24	3.55			
		30	3.06	3.09	3.18	3.27	3.38	3.52	3.60	
		40	3.76	3.80	3.88	3.93	3.96	4.00	4.02	
		50	4.38	4.48	4.68	4.82	4.92	5.00	5.03	
		55		4.68	5.00	5.24	5.42	5.57	5.62	
60				5.20	5.57	5.87	6.12	6.22		
65				5.77	6.22	6.61	6.77			
ZBD45KQ	Q	15	12.45	13.10	15.10	17.55				
		20	13.00	13.85	16.15	18.90	22.10			
		30	12.65	13.65	16.35	19.45	23.00	27.10	29.30	
		40	11.40	12.40	15.10	18.15	21.70	25.70	27.90	
		50	10.40	11.25	13.65	16.35	19.45	23.00	25.00	
		55		11.15	13.20	15.65	18.40	21.60	23.40	
		60			13.20	15.20	17.60	20.30	21.90	
	65				15.30	17.15	19.40	20.70		
	P	15	3.17	3.33	3.75	4.23				
		20	3.15	3.25	3.53	3.84	4.22			
		30	3.64	3.69	3.79	3.90	4.03	4.20	4.30	
		40	4.49	4.54	4.63	4.69	4.74	4.79	4.82	
		50	5.23	5.35	5.59	5.77	5.89	5.99	6.03	
		55		5.61	5.98	6.28	6.50	6.67	6.75	
60				6.23	6.68	7.05	7.34	7.47		
65				6.94	7.48	7.94	8.14			

Notes: Suction Return Temperature 18.3°C
 Suction Superheat 11.0K
 Liquid subcooling 0.0K

Performance Data

Q=Capacity (kW) P=Power input (kW) 3-Phase, 50 Hz

R404A

Compressor		Condensing Temperature °C	Evaporating Temperature (°C)							
			-20	-15	-10	-5	0	5	10	
ZBD29KQE	Q	10	7.13	8.67	10.45					
		20	6.49	7.90	9.54	11.45	13.65			
		30	5.80	7.06	8.53	10.20	12.15	14.40	17.00	
		40	5.04	6.14	7.40	8.86	10.55	12.50	14.75	
		50	4.21	5.11	6.15	7.36	8.76	10.40	12.30	
		60		3.97	4.77	5.70	6.80	8.10	9.62	
	P	10	1.39	1.36	1.35					
		20	1.83	1.85	1.86	1.87	1.91			
		30	2.19	2.25	2.29	2.32	2.35	2.42	2.52	
		40	2.63	2.72	2.78	2.82	2.86	2.91	2.98	
		50	3.28	3.41	3.50	3.55	3.58	3.61	3.66	
		60		4.47	4.57	4.63	4.66	4.67	4.69	
ZBD38KQE	Q	10	9.18	11.00	13.10					
		20	8.14	9.82	11.85	14.15	16.75			
		30	7.19	8.75	10.55	12.65	15.05	17.70	20.80	
		40	6.28	7.64	9.23	11.05	13.15	15.50	18.20	
		50	5.33	6.46	7.77	9.29	11.05	13.05	15.30	
		60		6.15	6.14	7.30	8.66	10.25	12.05	
	P	10	1.84	1.88	1.90					
		20	2.37	2.46	2.53	2.58	2.60			
		30	2.85	2.97	3.09	3.18	3.25	3.30	3.31	
		40	3.37	3.52	3.67	3.79	3.90	3.99	4.05	
		50	4.01	4.18	4.35	4.50	4.64	4.75	4.84	
		60		5.03	5.21	5.38	5.53	5.67	5.79	
ZBD45KQE	Q	10	10.90	13.05	15.60					
		20	9.69	11.70	14.05	16.80	19.90			
		30	8.56	10.40	12.55	15.05	17.85	21.10	24.70	
		40	7.47	9.09	10.95	13.15	15.65	18.45	21.60	
		50	6.35	7.69	9.24	11.05	13.15	15.50	18.20	
		60		6.12	7.30	8.68	10.30	12.15	14.30	
	P	10	2.20	2.25	2.27					
		20	2.82	2.93	3.01	3.07	3.10			
		30	3.40	3.55	3.68	3.79	3.88	3.93	3.95	
		40	4.02	4.20	4.37	4.52	4.65	4.76	4.82	
		50	4.78	4.99	5.18	5.37	5.53	5.67	5.78	
		60		6.01	6.22	6.42	6.61	6.77	6.91	
ZBD48KQE	Q	10	12.30	14.70	17.50					
		20	10.90	13.15	15.85	18.90	22.40			
		30	9.63	11.70	14.15	16.90	20.10	23.70	27.80	
		40	8.40	10.25	12.35	14.80	17.60	20.80	24.30	
		50	7.14	8.65	10.40	12.45	14.75	17.45	20.50	
		60		6.89	8.21	9.77	11.60	13.70	16.10	
	P	10	2.42	2.47	2.50					
		20	3.10	3.22	3.31	3.38	3.41			
		30	3.73	3.90	4.04	4.17	4.26	4.32	4.34	
		40	4.41	4.61	4.80	4.97	5.11	5.23	5.30	
		50	5.25	5.48	5.69	5.89	6.07	6.23	6.35	
		60		6.60	6.83	7.05	7.25	7.43	7.58	

Notes: Suction Return Temperature 18.3°C
Liquid subcooling 0.0K

Performance Data

Q=Capacity (kW) P=Power input (kW) 3-Phase, 60 Hz

R404A

Compressor		Condensing Temperature °C	Evaporating Temperature (°C)							
			-20	-15	-10	-5	0	5	10	
ZBD29KQE	Q	10	8.57	10.45	12.60					
		20	7.76	9.46	11.45	13.70	16.35			
		30	6.98	8.51	10.25	12.30	14.60	17.30	20.30	
		40	6.13	7.47	8.99	10.75	12.75	15.05	17.65	
		50	5.10	6.24	7.51	8.97	10.65	12.55	14.75	
		60		4.71	5.72	6.87	8.19	9.70	11.45	
	P	10	1.66	1.63	1.61					
		20	2.18	2.21	2.22	2.25	2.30			
		30	2.63	2.70	2.75	2.79	2.84	2.92	3.06	
		40	3.17	3.29	3.36	3.41	3.45	3.50	3.59	
		50	3.96	4.12	4.21	4.27	4.29	4.31	4.35	
		60		5.36	5.47	5.53	5.53	5.52	5.50	
ZBD38KQE	Q	10	11.15	13.35	15.95					
		20	9.91	12.00	14.40	17.20	20.40			
		30	8.75	10.65	12.85	15.40	18.30	21.60	25.30	
		40	7.63	9.30	11.25	13.45	16.00	18.90	22.10	
		50	6.49	7.86	9.46	11.30	13.45	15.85	18.65	
		60		6.27	7.47	8.89	10.55	12.45	14.70	
	P	10	2.22	2.27	2.30					
		20	2.85	2.96	3.05	3.11	3.14			
		30	3.43	3.59	3.72	3.83	3.92	3.98	3.99	
		40	4.06	4.25	4.42	4.57	4.71	4.81	4.88	
		50	4.83	5.04	5.24	5.43	5.59	5.73	5.84	
		60		6.07	6.28	6.49	6.67	6.84	6.98	
ZBD45KQE	Q	10	13.30	45.90	18.95					
		20	11.80	14.25	17.10	20.40	24.20			
		30	10.40	12.65	15.30	18.30	21.70	25.60	30.00	
		40	9.08	11.05	13.35	16.00	19.00	22.40	26.30	
		50	7.71	9.35	11.25	13.45	16.00	18.85	22.10	
		60		7.45	8.88	10.55	12.55	14.80	17.45	
	P	10	2.66	2.74	2.75					
		20	3.41	3.54	3.64	3.72	3.75			
		30	4.11	4.29	4.45	4.59	4.69	4.75	4.77	
		40	4.86	5.08	5.29	5.47	5.63	5.75	5.84	
		50	5.78	3.03	6.27	6.49	6.69	6.86	6.99	
		60		7.26	7.52	7.76	7.99	8.19	8.35	
ZBD48KQE	Q	10	14.75	17.65	21.00					
		20	13.10	15.80	19.00	22.70	26.90			
		30	11.55	14.05	16.95	20.30	24.10	28.50	33.30	
		40	10.10	12.25	14.80	17.75	21.10	24.90	29.20	
		50	8.57	10.40	12.50	14.95	17.75	20.90	24.60	
		60		8.27	9.86	11.75	13.90	16.45	19.36	
	P	10	2.92	2.99	3.02					
		20	3.75	3.89	4.01	4.09	4.13			
		30	4.52	4.72	4.89	5.04	5.16	5.23	5.25	
		40	5.34	5.59	5.81	6.02	6.19	6.33	6.42	
		50	6.36	6.63	6.90	7.14	7.35	7.54	7.68	
		60		7.99	8.27	8.53	8.78	9.00	9.18	

Notes: Suction Return Temperature 18.3°C
Liquid subcooling 0.0K

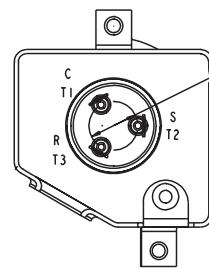
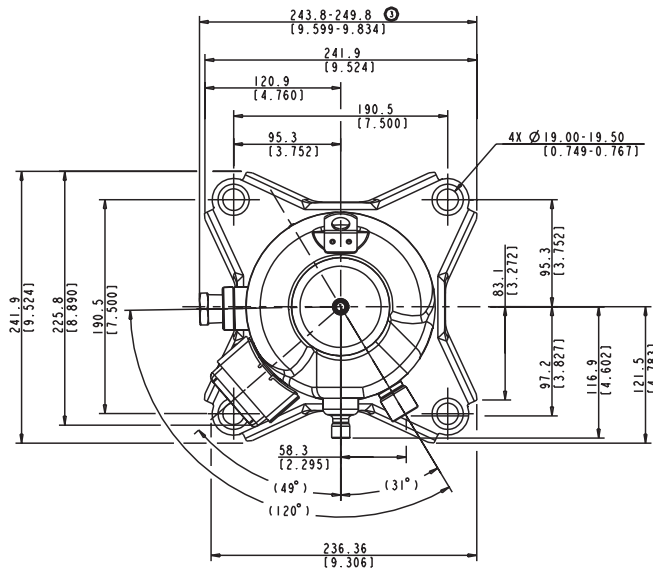
Technical Data

3-Phase

Model		ZBD29KQ ZBD29KQE	ZBD38KQ ZBD38KQE	ZBD45KQ ZBD45KQE	ZBD48KQ ZBD48KQE	
Motor type	50Hz	TF5	TF5	TF5	TF5	
		TFD	TFD	TFD	TFD	
	60Hz	TF5	TF5	TF5		
		TF7	TF7	TF7	TF7	
Displacement (m ³ /hr)		50Hz	11.4	14.4	17.1	18.8
		60Hz	13.8	17.3	20.6	22.6
LRA	50Hz	TF5	115.0	150.0	156.0	
		TFD	48.0	64.0	74.0	100.0
	60Hz	TF5	110.0	137.0	172.0	
		TF7	54.0	64.0	70.0	78.0
		TFD	46.0	62.0	70.0	100.0
Max Operating Current	50Hz	TF5	18.5	24.7	22.7	
		TFD	7.9	12.8	12.5	15.2
	60Hz	TF5	18.5	24.7	22.7	
		TF7	10.0	12.8	13.6	18.1
		TFD	10.0	12.8	12.5	15.2
Max Continuous Current	50Hz	TF5	22.0	29.0	29.0	
		TFD	10.8	14.0	14.0	17.0
	60Hz	TF5	24.0	29.0	29.0	
		TF7	13.0	15.0	17.5	20.0
		TFD	11.0	14.0	14.0	18.0
RLA	KQ	TF5	17.1	20.7	20.7	
		TF7	9.3	10.7	12.5	14.3
		TFD	7.9	10.0	10.0	12.9
	KQE	TF5	16.7	23.7	25.4	
		TF7	9.6	11.6	12.9	14.7
		TFD	7.7	11.3	9.6	12.8
Oil Charge, L	TF5	1.36	1.89	1.89	1.89	
	TF7	1.36	1.89	1.89	1.89	
	TFD	1.36	1.89	1.89	1.89	
Oil Recharge, L	TF5	1.24	1.77	1.77	1.77	
	TF7	1.24	1.77	1.77	1.77	
	TFD	1.24	1.77	1.77	1.77	
Nominal power(HP)		4	5	6	7	
Crankcase Heater(W)		70	70	70	70	
Connection Tube size (inch)						
Discharge Tube outer Diameter		1/2	1/2	1/2	3/4	
Suction Tube outer Diameter		7/8	7/8	7/8	7/8	
Dimension(mm)						
Length		241	241	241	241	
Width		241	246	246	246	
Height		479	494	494	494	
Mounting parts installation size (hole size, mm)		190x190(8.5)				
Net Weight (kg)		33	38	40	41	
Sound Power (dBA)		78	78	78	78	

Dimensional Drawings

ZBD29KQ/E (BOM558)



\varnothing 17.45 PIN CIRCLE
(0.687)
MODELS: TFD, TF7

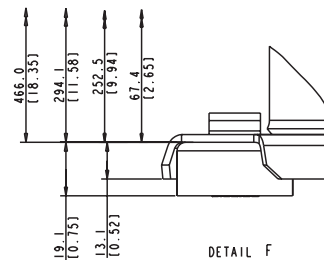
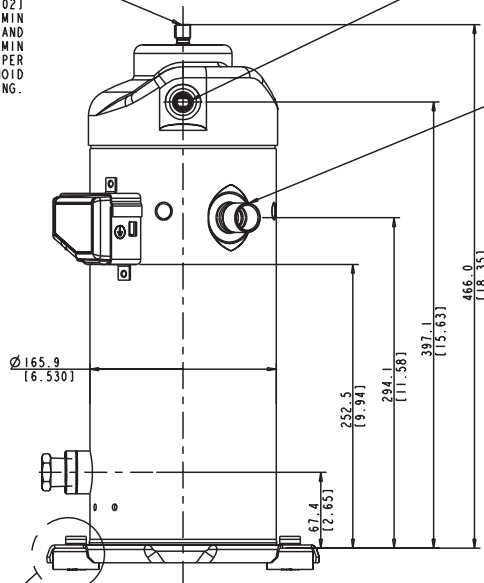
\varnothing 13.46 PIN CIRCLE
(0.530)
MODELS: TF5

SCALE 1.500

\varnothing 9.65-9.77 (0.380-0.382)
I.D. ∇ 10.20 (0.402)
MIN. 0.038 (0.0015) MIN THICK EXTERIOR AND
0.038 (0.0015) MIN THICK INTERIOR COPPER
PLATED STEEL SOLENOID
FITTING.

\varnothing 12.78-12.95 (0.503-0.510) I.D.
 ∇ 10.10 (0.398) MIN. 0.038
(0.0015) MIN THICK EXTERIOR
AND 0.038 (0.0015) MIN THICK
INTERIOR COPPER PLATED STEEL
DISCHARGE FITTING.

\varnothing 22.30-22.48 (0.878-0.885) I.D.
 ∇ 20.40 (0.803) MIN.
0.038 (0.0015) MIN THICK EXTERIOR
AND 0.038 (0.0015) MIN THICK
INTERIOR COPPER PLATED STEEL
SUCTION FITTING.

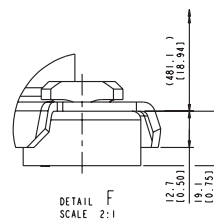
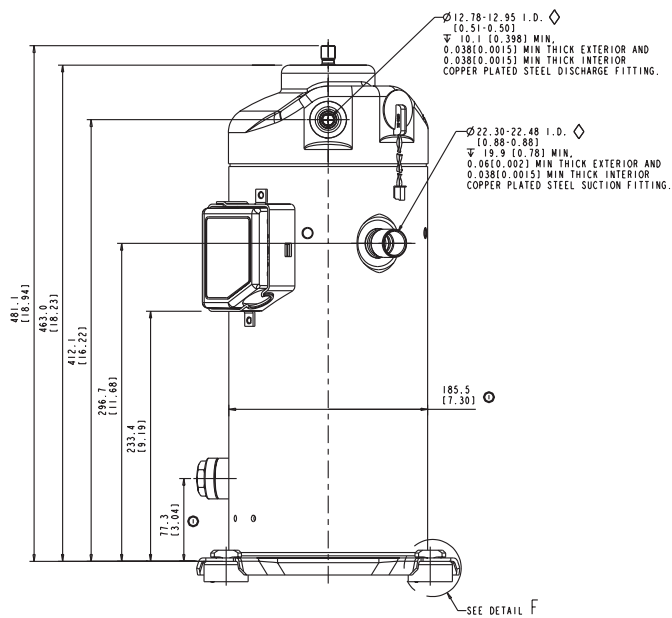
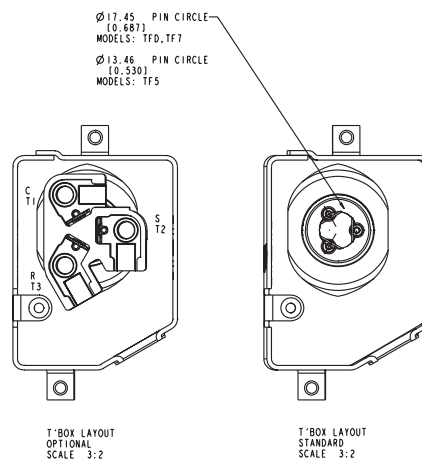
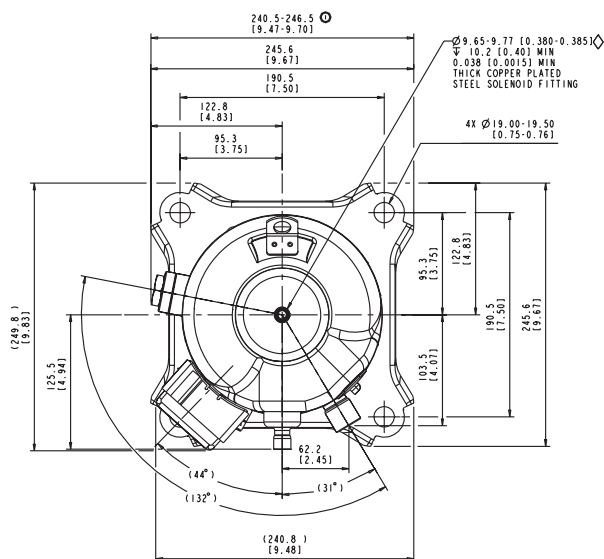


DETAIL F

SEE DETAIL F

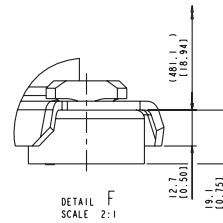
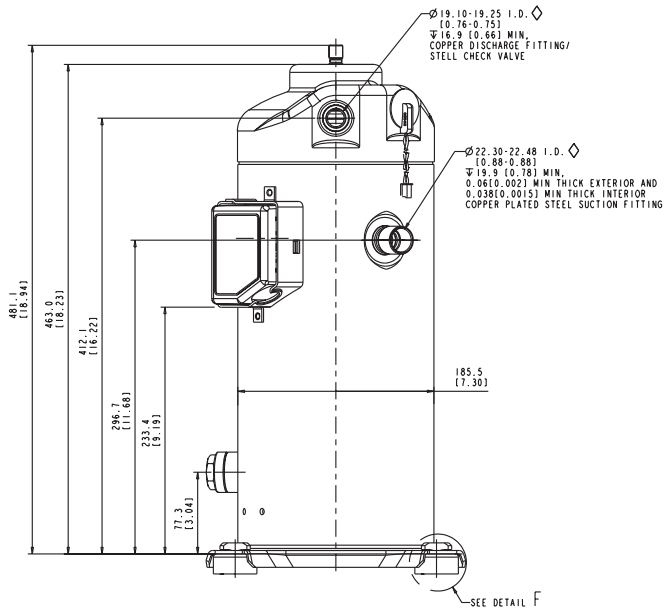
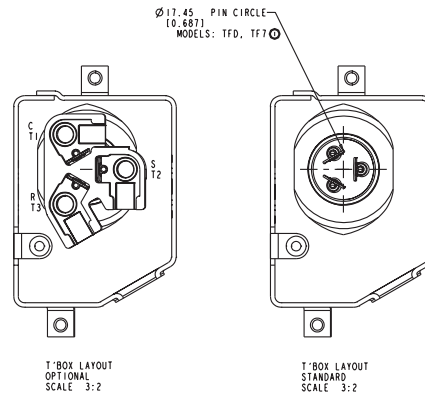
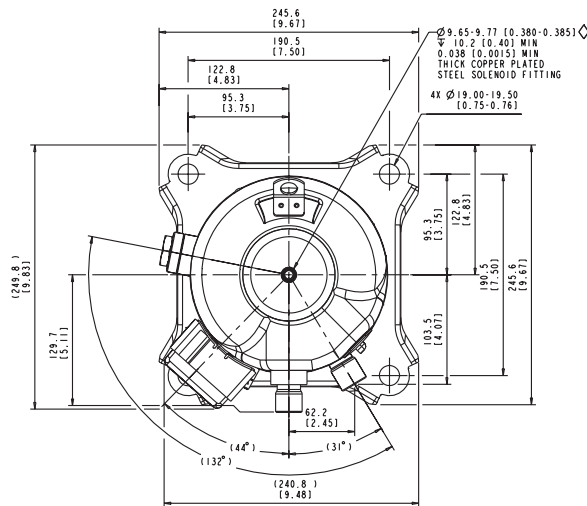
Dimensional Drawings

ZBD38-45KQ/E (BOM 558)



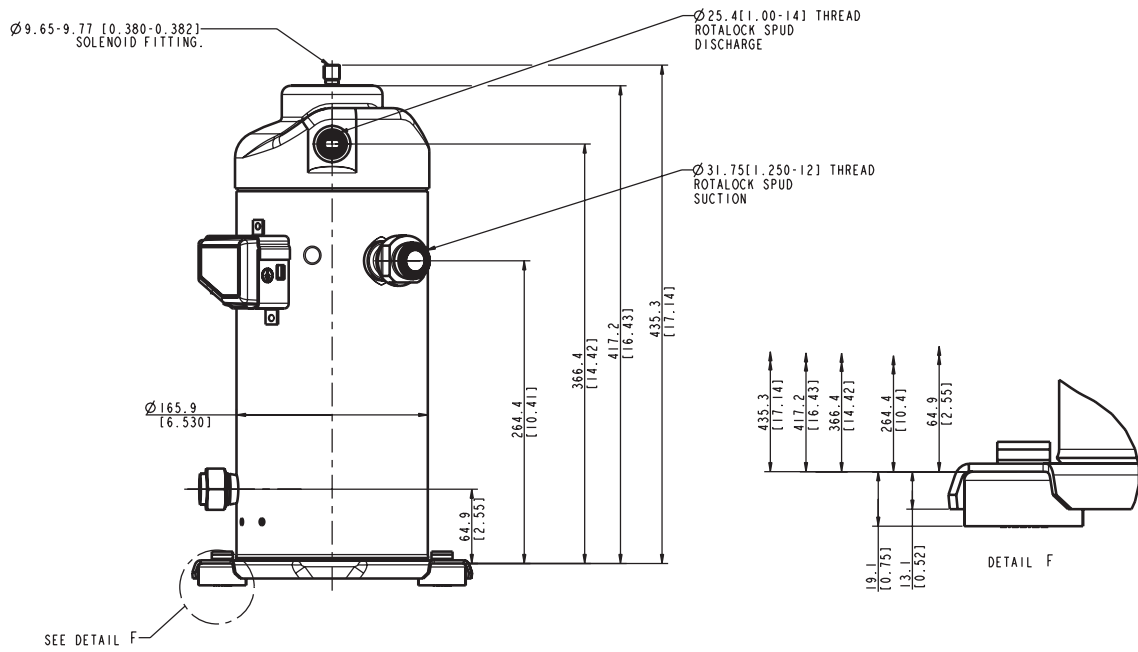
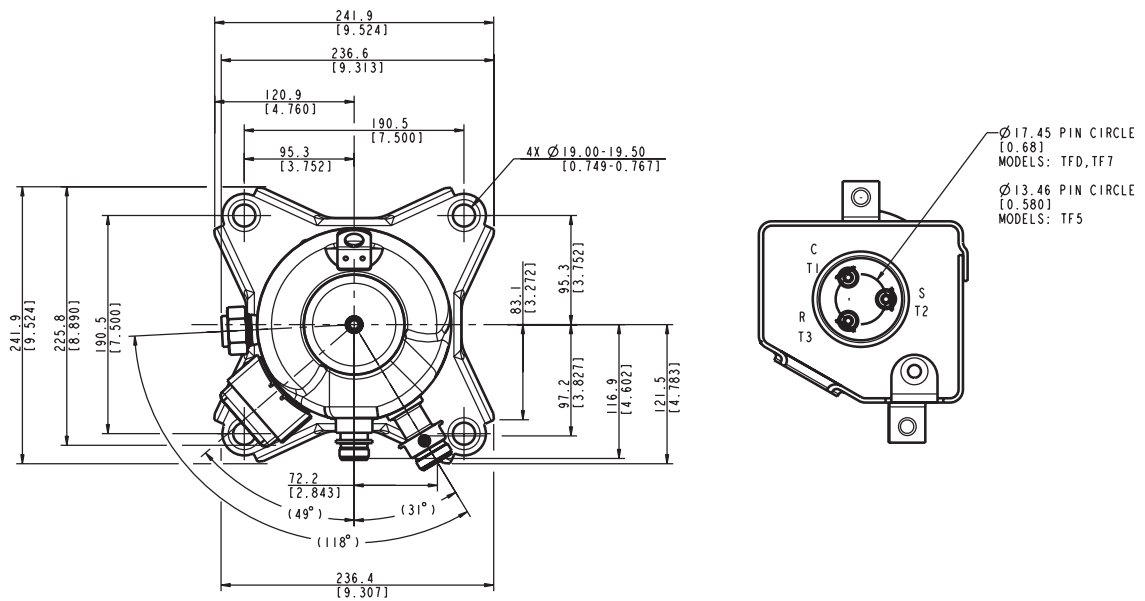
Dimensional Drawings

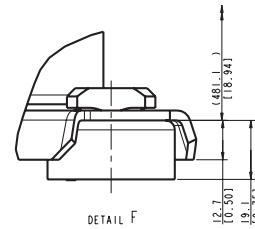
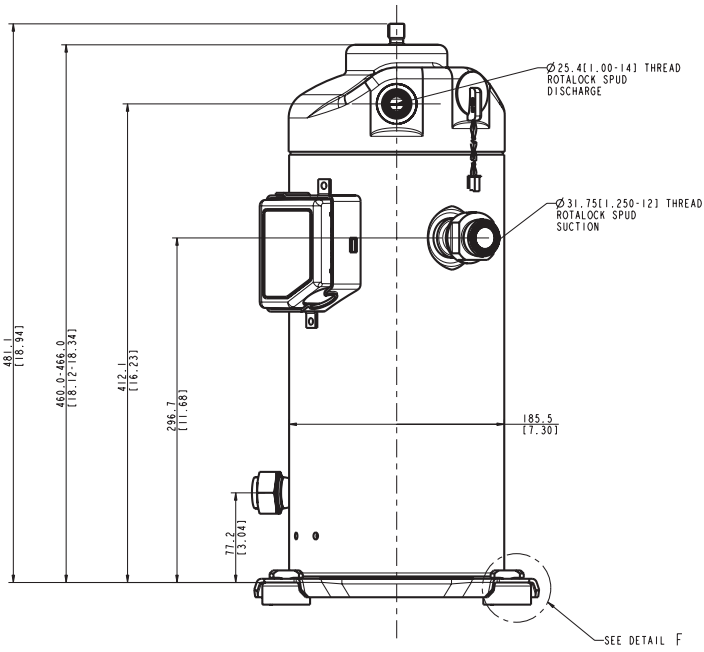
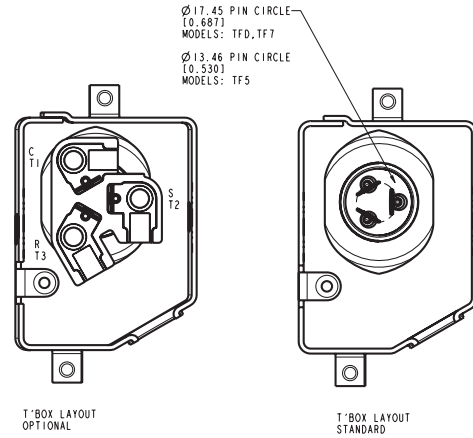
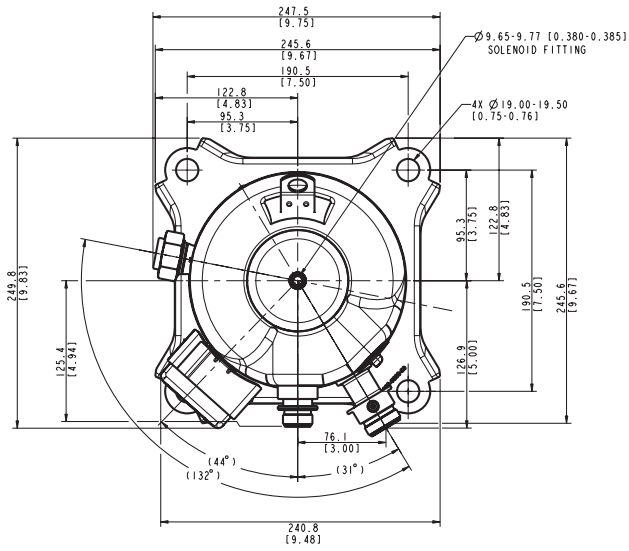
ZBD48KQ/E (BOM 558)



Dimensional Drawings

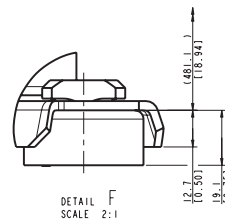
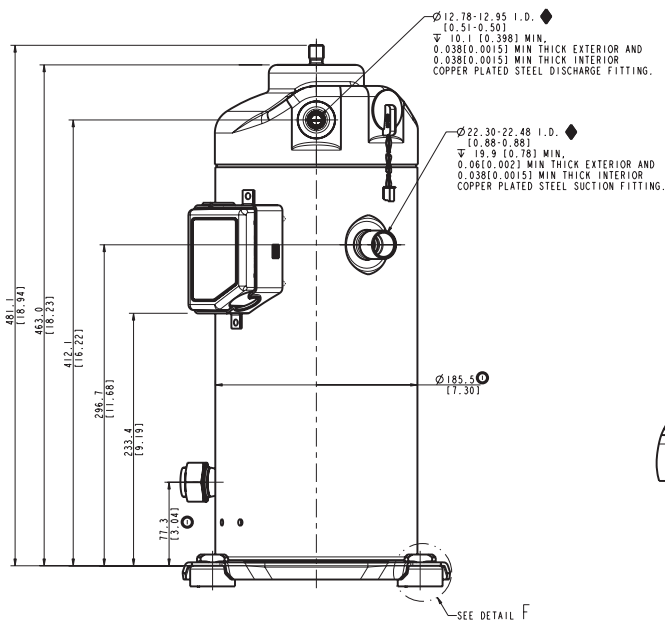
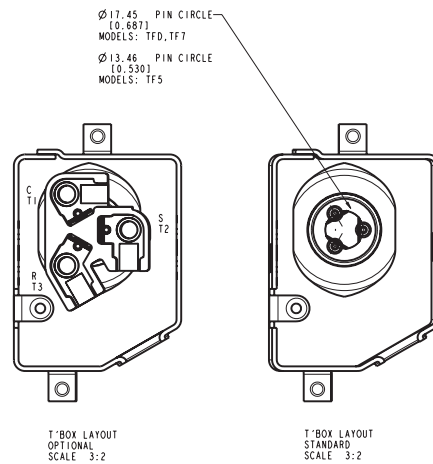
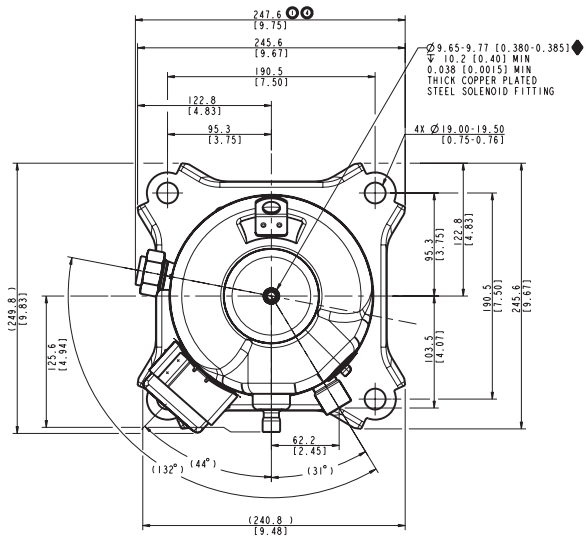
ZBD29KQ/E (BOM 559)





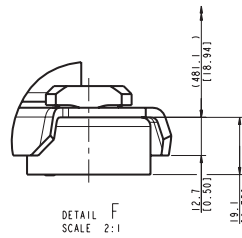
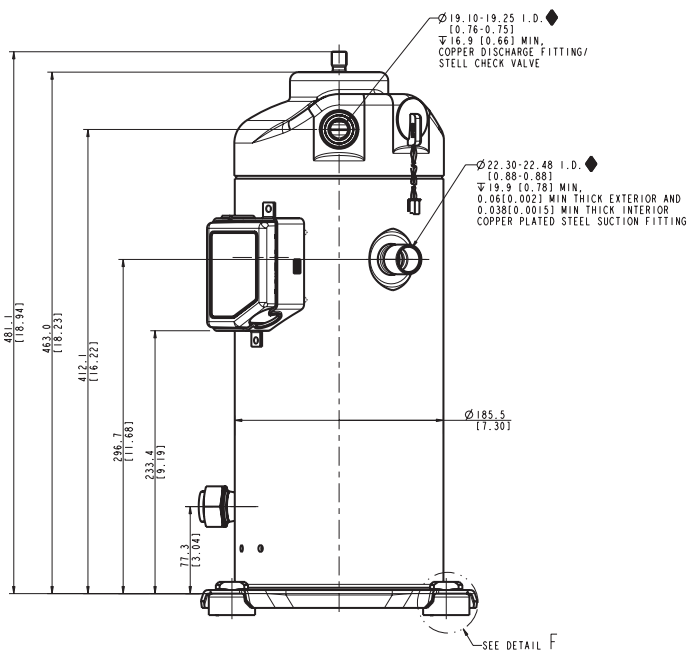
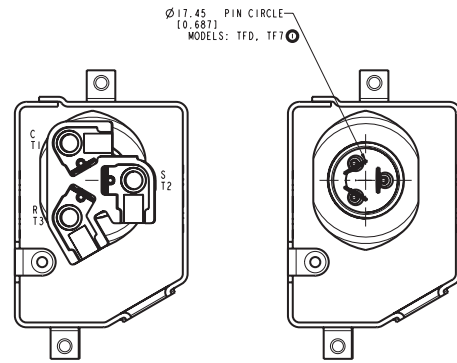
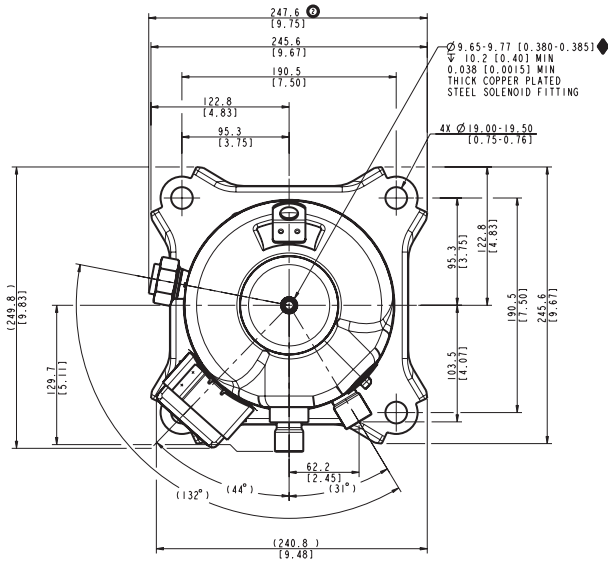
Dimensional Drawings

ZBD38-45KQ/E (BOM 588)



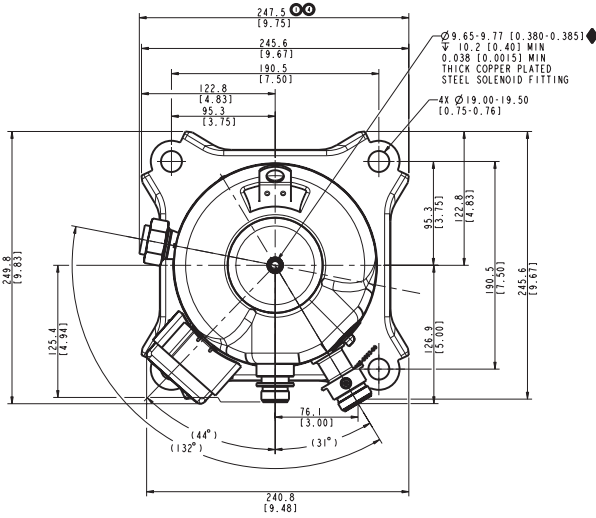
Dimensional Drawings

ZBD48KQ/E (BOM 588)

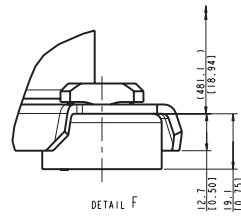
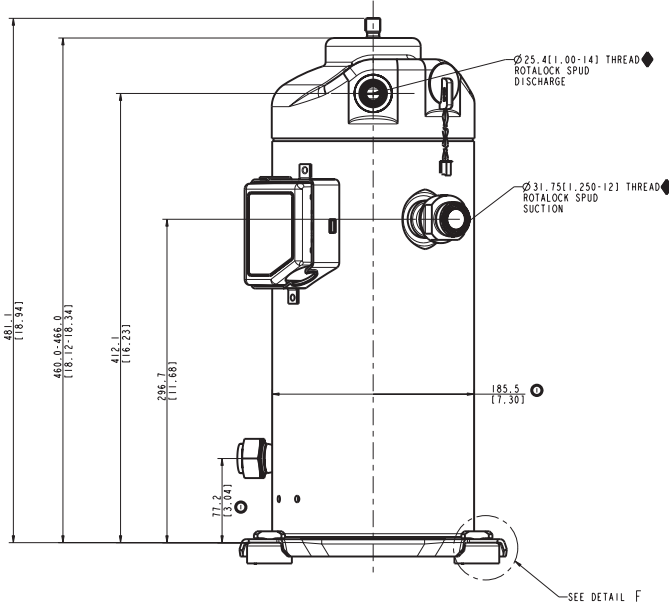
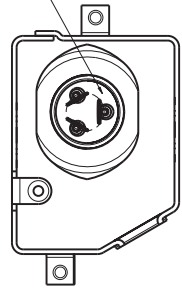
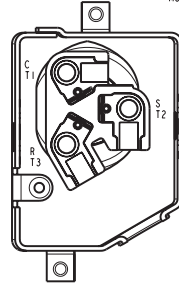


Dimensional Drawings

ZBD38-48KQ/E (BOM 589)



$\varnothing 17.45$ PIN CIRCLE (0.687)
 MODELS: TFD, TF7
 $\varnothing 13.46$ PIN CIRCLE (0.530)
 MODELS: TFS



Flow Controls Parts

OMB Crankcase Oil Level Protective Control

The OMB is a compressor crankcase oil level protective control ideal for use with Copeland Scroll™ models ZF, ZB, ZR and ZS. It is also recommended for Copeland™ brand products, Carlyle, Bitzer, and other semi-hermetic compressors.



OMB Series

Features

- Precision oil level measurement for maximum protection
- Easy monitoring with alarm and status lights
- Foam resistant design prevents nuisance trips unlike optical sensor designs
- Contaminant proof operation ensures accurate control
- Only approved oil level control for Copeland Scroll Compressors
- 5-time lockout feature protects compressor from repeated low oil level condition
- Self-contained unit with oil lever sensor and integral solenoid to manage oil level supply
- Reverse Hall-effect sensor for precise measurement of oil level and protection from sensor magnetic debris contamination
- SPDT output contact for compressor shut-down and alarming
- Easy installation by sightglass replacement
- Adapters suitable for various types of scroll compressors (not required for reciprocating compressors)
- UL Recognized (File Number: MP604)
- Fluorescent floating ball
- Integral sight glass
- Debris retention magnet for reliable operation

Ordering Information

PCN	Description
	Oil Management Control
065365	OMB-JB1 ASC 2 24/50-60 - STD
065366	OMB-MO1 ASC 2 24/50-60 - STD
	Adapters (to attach OMB to Copeland Scroll compressor for new installation only)
065668	OMB-ACA ADAPTER (3/4" x 14 NPTF) Copeland Glacier, ZF, ZS, ZB
065667	OMB-ACB ADAPTER (1 1/8" x 12 UNF) Copeland A/C ZR
066077	OMB-ACD ADAPTER (1 1/4" x 12 UNF) Copeland A/C Summit Series
066078	OMB-ACE ADAPTER (1 3/4" x 12 UNF) Copeland Specter Series
063521	OMB-AUA Copeland 6D Semi-Hermetic
065982	OMB-ASA Carlyle Compressors DA, DR, 5F, 5H, 06D and 06E
	Service parts
048638	Inlet Flare Screen
020877	Sight Glass O-Ring
064812	Mounting O-Rings (3 pieces)
049191	KS-30112 Solenoid Repair Kit

Specifications

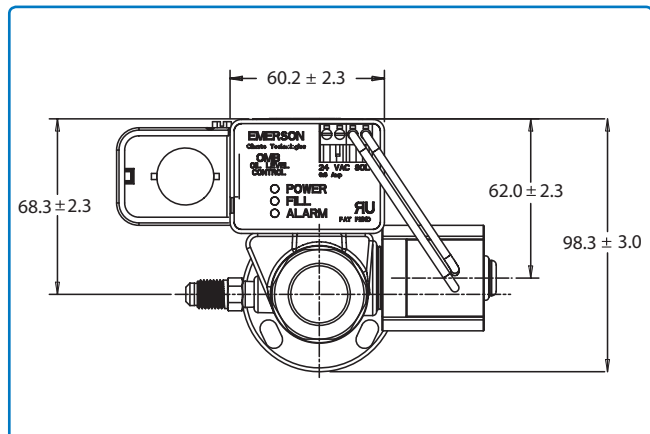
- Maximum working pressure: 640 psi
- Solenoid MOPD: 350 psi
- Supply voltage: 24 VAC, 50/60 Hz
- Solenoid coil: ASC 2L 24 VAC, 50/60 Hz
- Current consumption: 0.6A
- Time delay for low level signalling: 5–10 seconds
- Time delay for after setpoint recovery: 5–10 seconds
- Alarm delay time: 120 seconds
- Alarm switch: SPDT
- Alarm contact rating: 10A at 125; 5A at 220 VAC 50/60 Hz
- Refrigerant compatibility: HFC, HCFC, CFC
- Oil temperature: 180°F Max.
- Storage and transport temperature: 140°F Max.
- Operating ambient temperature: 120°F Max.
- Oil supply fitting: 1/4" Male SAE
- UL/CUL file number: SA8547
- Transformer VA requirements * 25"

*NOTE: Field supplied transformer should always be of the same primary voltage as the electrical supply system.

Nomenclature example: OMB-JB1 ASC2 24 50/60

OMB	JB1	ASC 2 24 50/60
Oil Management Control	JB1 - Junction Box MO1 - Series Relief Connector	Solenoid Coil Model Number Voltage, Frequency (Included)

Dimensional Drawing



A-W/A-F Oil Separators

The A-W and A-F are used for multiple compressor racks in supermarkets and air conditioning systems for use with HCFCs, HFCs and their lubricants.

Features

- Hermetic welded or accessible bolted flange construction
- Solid copper connections
- Corrosion resistant epoxy powder paint

Nomenclature

A	W	5582	4
Series	W = Welded F = Flanged	Model Number	Connection Size (in 1/8")



A-F Series

Ordering Information and Capacity Table

Description				R-12				R-22/R-407C				R-502				R-134a				R-404A/R-507			
FLANGED	PCN	SEALED	PCN	-40°C		40F (4C)		-40F/C		40F (4C)		-40F/C		40F (4C)		-40F/C		40F (4C)		-40F/C		40F (4C)	
				Tons	kW	Tons	kW	Tons	kW	Tons	kW	Tons	kW	Tons	kW	Tons	kW	Tons	kW	Tons	kW	Tons	kW
A-F 58824	060877	A-W 55824	060933	1.0	3.5	1.5	5.3	1.5	5.3	2.0	7.1	1.5	5.3	2.0	7.1	1.0	3.5	1.8	6.2	1.5	5.3	2.0	7.0
A-F 58855	060878	A-W 55855	060934	3.0	10.6	4.0	14.2	4.5	15.9	5.5	19.5	4.8	16.8	5.8	20.4	3.3	11.5	4.5	15.9	4.0	14.2	5.5	19.0
A-F 58877	060879	A-W 55877	060931	4.5	15.9	5.5	19.5	7.0	24.8	8.0	28.3	7.5	26.6	8.5	30.1	4.8	16.8	6.5	23.0	6.5	23.0	8.5	30.0
A-F 58889	060759	A-W 55889	060974	6.0	21.2	7.5	26.6	9.0	31.9	11.0	37.2	9.5	33.6	11.5	40.7	6.5	23.0	8.5	30.1	8.5	30.1	11.0	38.0
A-F 589011	060760	A-W 559011	060930	7.5	26.6	10.0	35.4	11.5	40.7	14.0	47.8	12.0	42.5	14.5	51.4	8.0	28.3	11.5	40.7	10.5	37.2	14.0	49.0
A-F 589213	060761	A-W 559213	060975	9.0	31.9	11.5	40.7	14.0	49.6	18.0	62.0	16.0	56.6	17.5	62.0	9.5	33.6	13.3	46.9	14.0	49.6	17.0	60.0
-	-	A-W 569011	060978	9.0	31.7	12.0	42.3	13.0	45.8	14.0	49.8	15.0	52.8	20.0	70.0	9.5	33.4	13.7	48.2	11.0	38.7	19.0	66.9
A-F 579213	060875	A-W 569213	060979	11.0	38.9	14.0	49.6	16.0	56.6	18.0	63.7	20.0	70.8	24.0	83.0	11.8	41.6	16.0	56.6	17.5	62.0	23.0	81.0
A-F 579417	060876	A-W 569417	060980	17.0	60.2	22.0	77.9	25.0	88.5	30.0	106.0	30.0	106.0	35.0	124.0	18.0	63.7	25.6	89.4	26.0	92.0	34.0	121.0

*See replacement parts page. Repair kits for style 2 only.

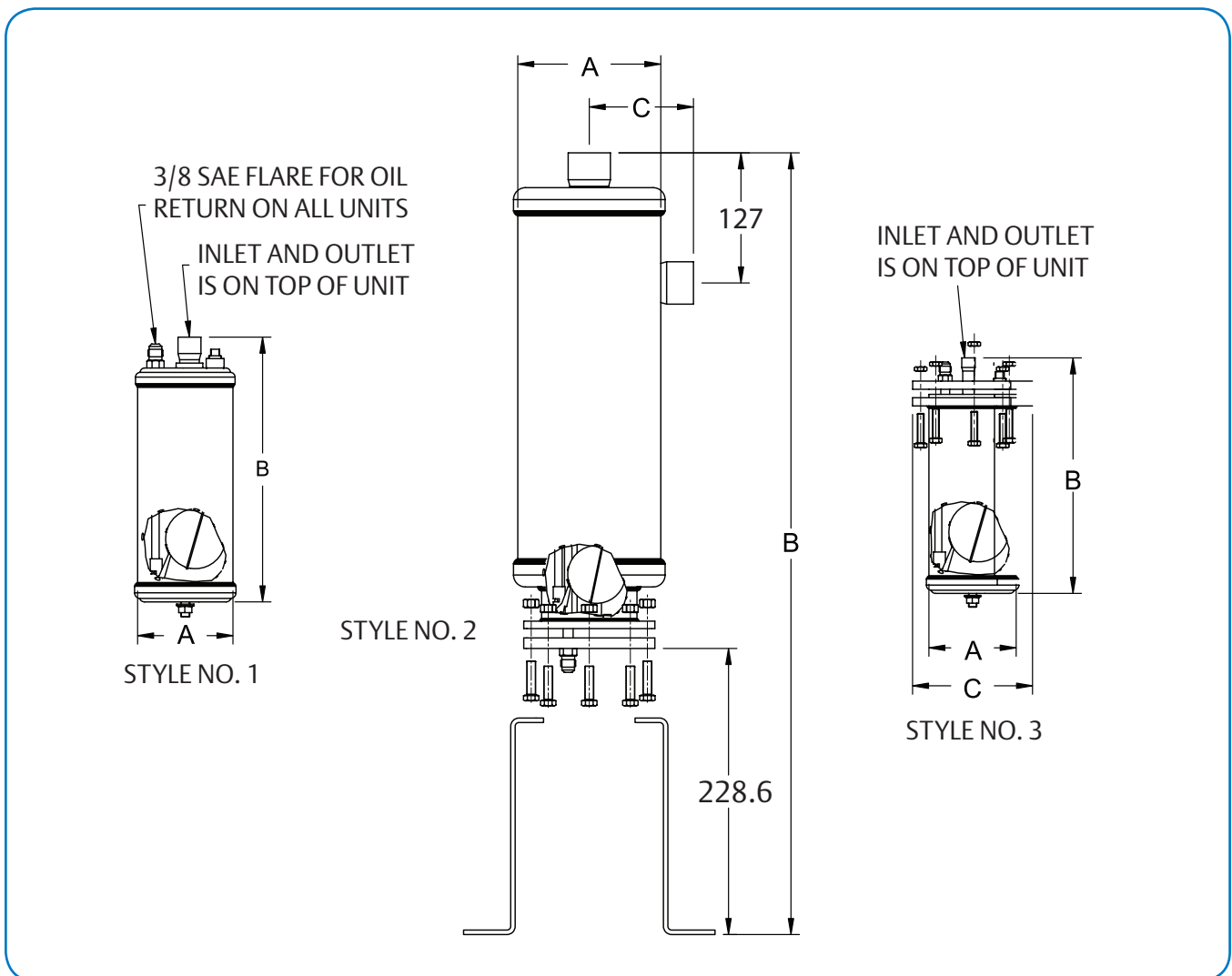
Seal Units: A-W

Description	Style No.	Connection Size (inch)	Dimensions (in)		Replaceable Float PCN	Oil Pre-charge Amount (0%)
			A	B		
A-W 55824	1.0	1/2 ODF	4.0	10.8	N/A	17.0
A-W 55855		5/8 ODF		13.2		
A-W 55877		7/8 ODF		15.0		
A-W 55889		1-1/8 ODF		16.3		
A-W 559011		1-3/8 ODF		19.5		
A-W 569213		1-5/8 ODF		19.9		
A-W 569011		1-3/8 ODF		15.8		
A-W 569213	6.0	1-5/8 ODF	19.0	N/A	20.0	
A-W 569417		2-1/8 ODF	49.3			

Flanged Units: A-F

Description	Style No.	Connection Size (inch)	Dimensions (in)			Replaceable Float PCN	Oil Pre-charge Amount (0%)
			A	B	C		
A-F 58824	3.0	1/2 ODF	4.0	10.5	5.5	N/A	17.0
A-F 58855		5/8 ODF		15.0			
A-F 58877		7/8 ODF		18.0			
A-F 58889		1 1/8 ODF		21.3			
A-F 589011		1 3/8 ODF		21.4			
A-F 589213		1 5/8 ODF		21.8			
A-F 579213	2.0	1 5/8 ODF	6.0	20.1	4.4	065847	20.0
A-F 579417		2 1/8 ODF		20.3			

Dimensional Drawing



AOFD-553 Oil Filter Drier

The AOFD is designed specifically for refrigerant systems that use POE oil. POE oil is hygroscopic in nature, which means that it attracts and absorbs water. Moisture in a closed system can produce acid and will harm the compressor. The AOFD protects compressors by removing moisture and trapping contaminants.

Features

- Designed to clean and dry POE Oil
- 3/8" male flare connections for easy replacement
- Large filter surface area to provide maximum filtration
- Contains desiccant for moisture removal
- Designed to operate at a very low pressure drop
- 10 micron filtration for optimum oil cleaning
- Dual access valves for pressure drop monitoring



AOFD-553 Series

Specifications

- UL/CUL file number: SA3124
- Maximum working pressure: 680 psig

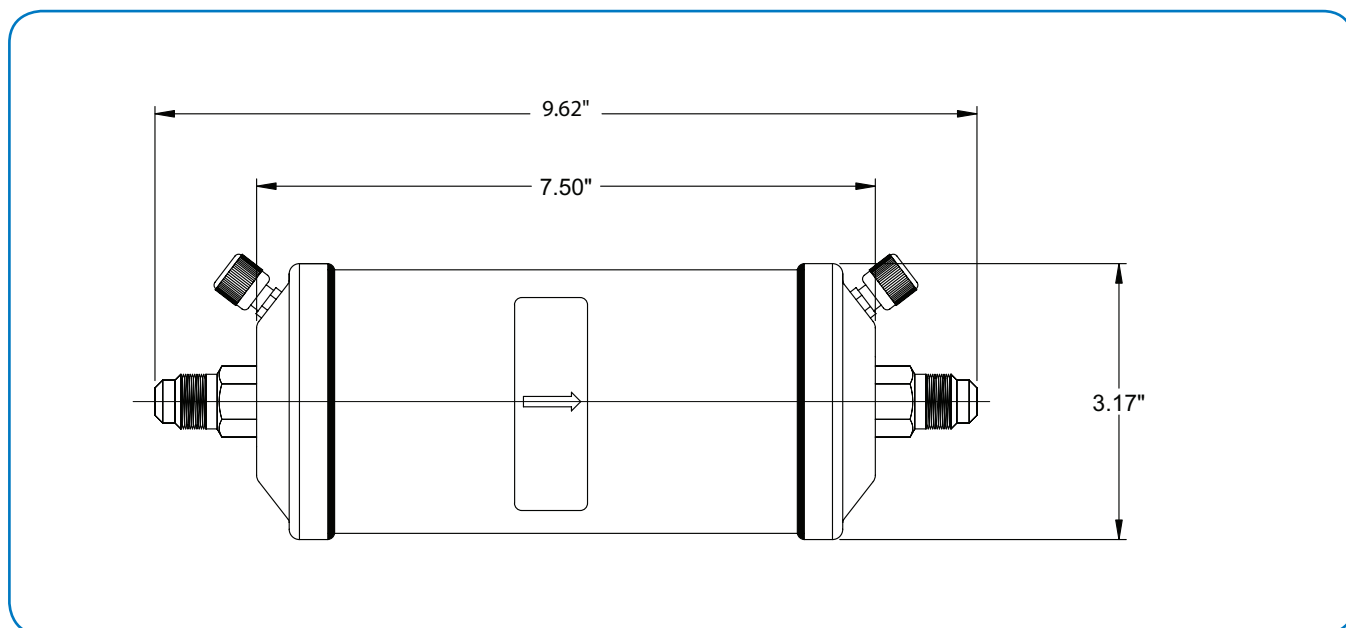
AOFD Water Capacity Table

Refrigerant Type	Drops at 125°F
R-22	497
R-134A	518
R-404A	518
R-407C	435

Ordering Information

PCN	Description
062829	AOFD-553 Oil Filter Drier

Dimensional Drawing



STAS Steel Liquid and Suction Line Filter Drier

The STAS is a replaceable core Filter Drier for CFC, HCFC, and HFC refrigerants for use in large commercial air conditioning and refrigeration systems.

Features

- Slotted cover/unique internal hardware for hassle-free installation
- Full flow fittings for low pressure drop
- Corrosion resistant epoxy powder paint finish
- Sturdy steel shells for long life
- Solid copper connections
- 100 mesh outlet screen
- Filtration (with core): 40 microns
- Maximum working pressure: SV version= 34.5 bar T version = 47 bar
- UL/CUL file number: SA7175



STAS Series

Nomenclature

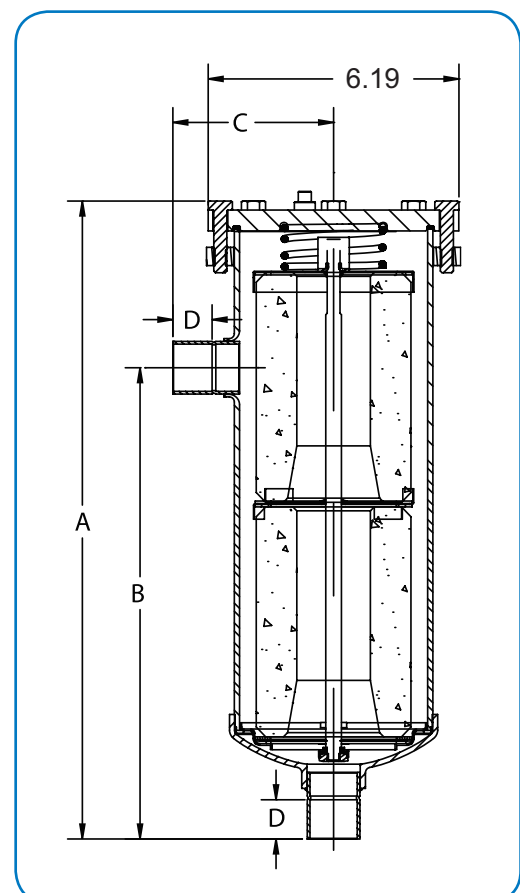
STAS	48	9	T
Steel Take-Apart Series	Unit Size (in ³)	Connection Size (in 1/8")	System Service T = Liquid Line Service SV = Suction Line Service

Ordering Information

PCN	Description	Size (mm)				Number of 48 in ³ Cores
		A	B	C	D	
053001	STAS-485T	252.5	152.4	96.0	16.0	1
053003	STAS-487T	246.1	158.8	95.3	19.8	
053005	STAS-489T	247.7	160.3	97.5	23.9	
053007	STAS-4811T	249.9	163.6	100.8	23.9	
053043	STAS-4813S-V ¹	251.0	152.9	102.3	28.7	
053044	STAS-4817S-V ¹	255.5	166.6	115.8	34.0	
053045	STAS-4821S-V ¹	265.2	178.6	120.7	26.4	
053375	STAS-4813T	251.0	165.1	102.4	28.7	
053938	STAS-4811SV	250.0	163.6	100.8	23.9	
053010	STAS-967T	385.8	297.7	95.3	19.8	
053012	STAS-969T	386.6	299.2	97.5	23.9	
053014	STAS-9611T	388.9	302.5	100.8	26.2	
053017	STAS-9613T	390.7	304.0	102.4	28.7	
053018	STAS-9617T	395.2	305.6	115.8	34.0	
053047	STAS-9617S-V ¹	395.2	305.6	115.8	34.0	
053048	STAS-9621S-V ¹	404.9	317.5	120.7	38.1	
059739	STAS-9625 SV	420.1	320.8	138.2	42.2	
053020	STAS-1449T	539.8	441.5	97.5	23.9	3
053022	STAS-14411T	542.0	445.3	100.8	26.2	
053024	STAS-14413T	543.1	446.8	102.4	28.7	
053025	STAS-14417T	547.6	447.8	115.8	34.0	
053028	STAS-19211T	683.5	584.2	100.8	26.2	4
053030	STAS-19213T	684.3	588.5	102.4	28.7	
053031	STAS-19217T	689.1	587.5	115.8	34.0	
056213	STAS-1927/5T	673.1	152.4	93.7	19.8/16.0	

Note: 1. SV style include stainless steel bolts and access valve

Dimensional Drawing



ADKS Liquid And Suction Line Filter Drier

The ADKS is a replaceable core Filter Drier for use with CFC, HCFC, and HFC refrigerants in very large commercial air conditioning and refrigerant systems

Features

- Full flow fittings for low pressure drop
- Corrosion resistant epoxy powder paint finish
- Sturdy steel shells for long life durability

Specifications

- Filtration (with core): 40 microns
- Maximum working pressure: 500 psig*
- UL/CUL file number: SA 3124
- Bolt Torque: 35 ft-lbs

*Note: Not suitable for R-410A applications above 500 psig.



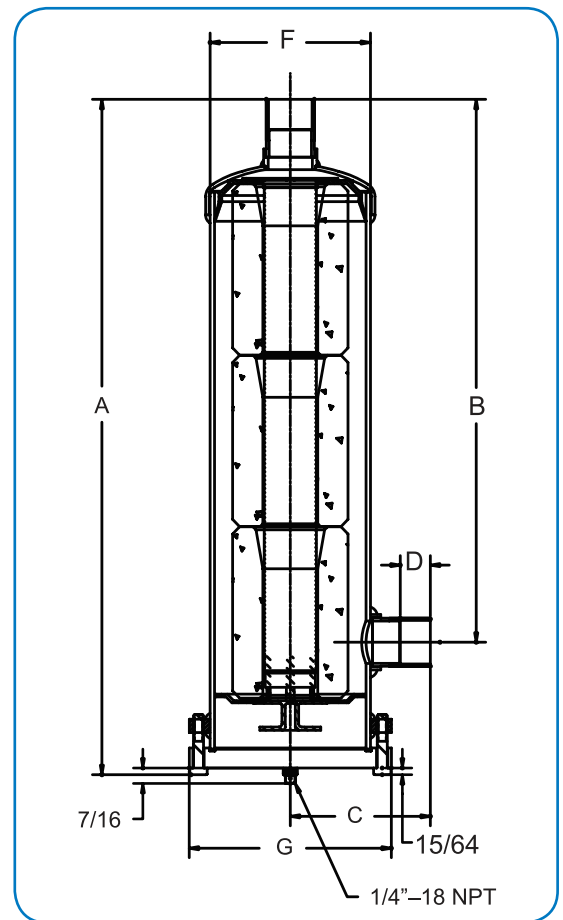
ADKS Series

Nomenclature

ADKS	300	13	T
System Protector Series	Unit Size (in cu. in.)	Connection Size (in 1/8")	T = Tap Access Connection

ADKS Models are shipped without filter cores or filter drier cores. See filter or filter drier cores for availability.

Dimensional Drawing



Ordering Information

PCN	Description	Connection Size	Number Of 100 in ³ Cores	Dimensions (mm)								Weight (kg)
				A	B	C	D	E	F ²	G	H ¹	
026570	ADKS-30013T	1 5/8 ODF	3.0	647.7	494.5	106.4	28.7	589.0	152.4	192.0	565.2	17.7
037978	ADKS-30017T	2 1/8 ODF		650.0	482.6	96.0	42.9					
032105	ADKS-40017T	2 1/8 ODF	4.0	815.1	647.7	96.0	42.2	761.2	152.4	192.0	733.6	20.9
037570	ADKS-40021T	2 5/8 ODF		841.5	678.7	122.2	37.3					

Notes: *Does not include weld bead
¹ "H" Dimension is the clearance required to change the internal hardware assembly
 T = 1/4" FPT access connection

Capacity Table (in Tons)

Liquid Line for Replaceable Block Type ADKS Filter Driers

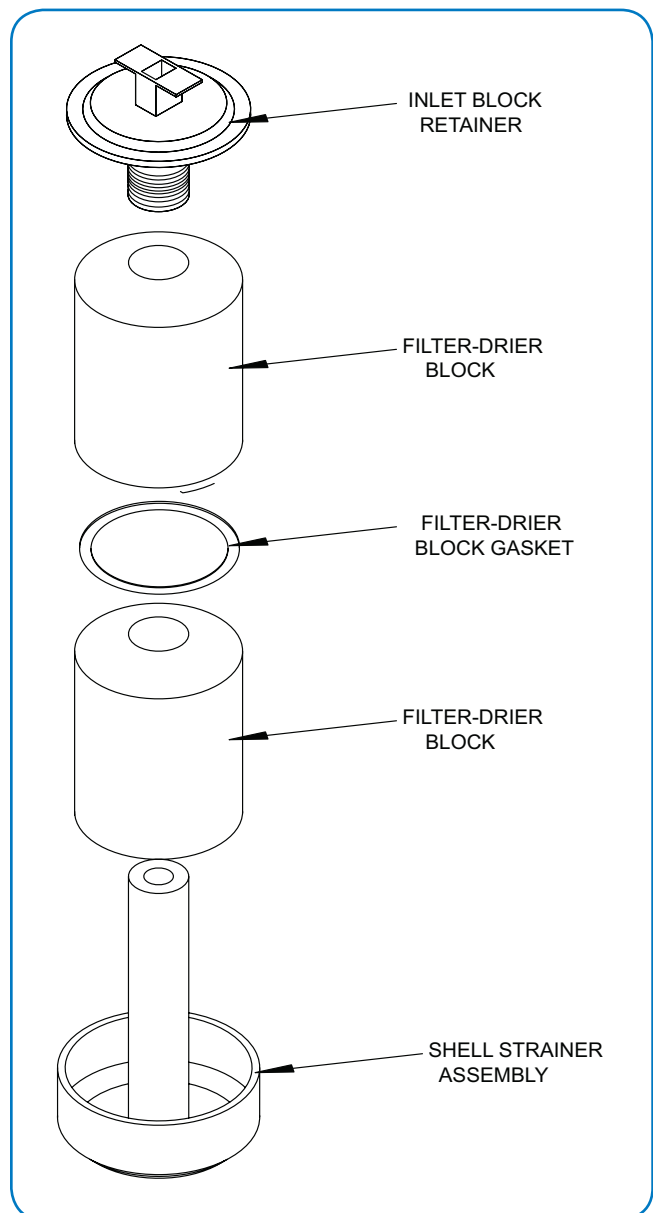
Type	Connection Size (inch)	Flow Capacity at 0.07 bar pressure drop ^{1,2} (kW)					
		R-12	R 134a	R 22/R 410A	R 407C	R 404/507	R-502
ADKS 30013T	1 5/8 ODF	83	102	110	108	73	49
ADKS 30017T	2 1/8 ODF	121	148	160	157	107	59
ADKS 40017T	2 1/8 ODF	128	157	170	167	114	63
ADKS 40021T	2 5/8 ODF	136	166	180	177	120	71

Notes: ¹All ratings in accordance with ARI Standard 710-04. 86°F liquid refrigerant temperature
 5°F saturated vapor temperature
 3.1 lbs./min./ton for R-134a
 2.9 lbs./min./ton for R-22 and R-407C
 4.0 lbs./min./ton for R-404A/507 and R-12
²For 2 PSI ΔP. Multiply values by 1.4

Replacement Parts

Flange Cover	Description	PCN
ADKS-300 ADKS-400	X12176-2	027467
ADKS 30017T	2 1/8 ODF	121
Shell	Strainer	Assembly
ADKS-300	X10574-5	039967
ADKS-400	X10574-6	038315
Miscellaneous Parts		
Gasket Set (Includes cover gasket)	X-11983-2	027454

Exploded View



Filter-Drier Cores And Filters

Universal replacement cores and filter cores for use in our ADKS and STAS shells and similar competitive Take-Apart type Filter Drier shells. May not be used for BTAS.

Features

- Water capacities to suit specific system conditions
- Exceptional acid capacities for normal system protection, or to effectively clean-up following a compressor burnout
- Activated carbon blend for soluble contaminant and wax removal (W-HH Series)



Cores And Filters

Nomenclature

H	48
Series	(in ³)

Ordering Information

PCN	Type	Refrigerant	Function	Water Capacity ¹ (g)									
				R 134a		R 22		R 407C		R 404A/R 507		R 410A	
				24°C	52°C	24°C	52°C	24°C	52°C	24°C	52°C	24°C	52°C
059541	D-48	HCFC	High Acid Removal	20.8	17.0	18.2	12.7	11.3	4.8	22.9	17.2	10.5	4.3
059542	H-48	HCFC	High Acid and Water Removal	33.8	26.9	29.9	21.8	22.3	14.3	36.1	26.8	19.0	11.3
061235	W-48-HH	HCFC, HFC	Burnout Cleanup	19.4	14.7	16.8	11.3	14.5	8.3	20.9	14.5	12.5	6.5
061617	UK-48	CFC, HCFC, HFC	Universal Replacement	1272	1168	1181	1072	1033	786	1319	1241	976	707
089338	H-100	HCFC	High Acid and Water Removal	55.6	41.7	48.1	33.7	36.3	20.9	60.0	42.0	33.6	18.2
043582	W-100-HH	HCFC, HFC	Burnout Cleanup	53.9	40.6	46.9	31.1	31.5	18.2	58.1	39.6	28.7	15.4
089559	F-48	HCFC, HFC	Filter (Suction Only)	-									
095762	F-100	HCFC, HFC	Filter (Suction Only)	-									

Note: 1. Water Capacities are based on Equilibrium Point Dryness (EPD) of: 50 parts per million for R 134a, R 404A/R 410A and R 407C, 60 parts per million for R22

Dimensional Drawings

Filter drier block size	Dimensions (mm)			Weight (kg)
	A	B	C	
42	152.4	40.1	79.2	0.5
48	139.7	45.0	94.5	0.7
100	165.1	52.3	122.2	2.0

Filter drier block size	Dimensions (mm)			Weight (kg)
	A	B	C	
F48/F48R	140.0	71.4	98.6	0.3
F100	165.0	95.3	122.2	0.7

HMI-Hermetic Moisture Indicators

The HMI is designed to provide an accurate method of determining the moisture content of a system's refrigerant. The HMI has a unique high accuracy moisture indicator for CFC, HCFC, and HFC refrigerants.



HMI Series

Features

- Highest sensitivity moisture indicator available
- Hermetic, leak-free construction
- Single indicator for all common refrigerants
- Accurate color calibration at low ppm levels and higher temperatures
- Wide angle viewing/high visibility window for ease of monitoring
- All brass corrosion resistant body for fewer leaks
- Solid copper connections

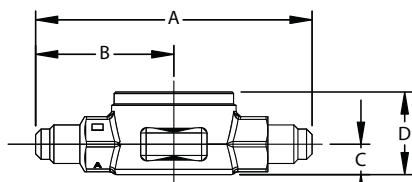
Specifications

- Maximum working pressure: 680 psig
- UL/CUL file number: SA 9566

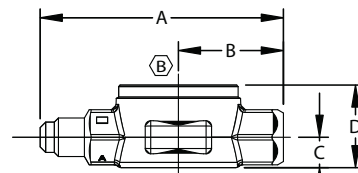
Nomenclature

HMI	1	TT	4
Hermetic Moisture Indicator	Series	Connection Style TT = Sweat x Sweat	Connection Size (in 1/8")

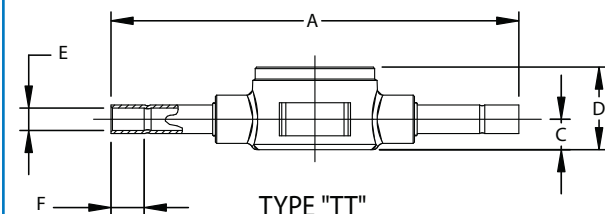
Dimensional Drawings



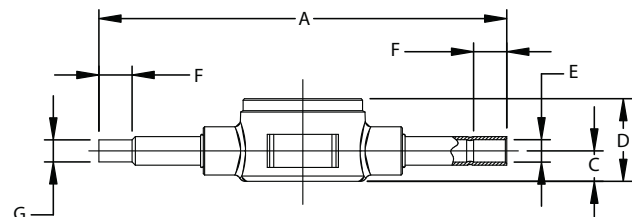
TYPE "MM"
MALE FLARE X MALE FLARE



TYPE "FM"
FEMALE FLARE X MALE FLARE



TYPE "TT"
TUBE STUB X TUBE STUB



TYPE "TTMF"
TUBE STUB MALE X TUBE STUB FEMALE

Dimensional Data

PCN	Description	Series	Connection Size (inch)	
065391	HMI-1MM2	Male Flare x Male Flare	1/4	
065392	HMI-1MM3		3/8	
065393	HMI-1MM4		1/2	
065394	HMI-1MM5		5/8	
065395	HMI-1MM6		3/4	
065405	HMI1-1TT2		Sweat x Sweat (ODF)	1/4
065406	HMI1-1TT3	3/8		
065407	HMI1-1TT4	1/2		
065408	HMI1-1TT5	5/8		
065409	HMI1-1TT6	3/4		
065410	HMI1-1TT7	7/8		
065411	HMI1-1TT9	1 1/8		
065396	HMI-1FM2	Female Flare x Male Flare		1/4
065397	HMI-1FM3			3/8
065398	HMI-1FM4		1/2	
065622	HMI-1TT2MF	Sweat x Sweat (ODM x ODF)	1/4	
065814	HMI-1TT3MF		3/8	
065979	HMI-1TT4MF		1/2	
065980	HMI-1TT5MF		5/8	

Moisture Content Color Code (ppm H₂O)

Indication Liquid Temperature	Dry (Dark Blue)			Caution (Purple)			Wet (Salmon)		
	75°F	100°F	125°F	75°F	100°F	125°F	75°F	100°F	125°F
R-12	1.4	2.5	4	5	9	15	25	43	70
R-134A	20	35	60	35	55	85	130	160	190
R-22	25	35	50	40	65	90	145	205	290
R-407C	26	40	64	42	68	109	150	230	370
R-410A	30	55	75	50	85	120	165	290	420
R-404A/507	15	25	45	33	50	80	120	150	180

PS1 Single Pressure Controls

PS1 Single Pressure Controls are designed for use on high and low pressure applications in refrigeration, airconditioning, and heat pump systems, providing single-device control of the compressor or other electrical device.

Features

- Adjustable pressures and differentials
- Narrow adjustable differential depending on model
- Range and differential pointer in units bar and psig
- Range and differential individually lockable by tab
- High rated SPDT contacts for all versions
- Captive terminal and cover screws
- Manual toggle for system checkout and override



PS1 Series

Options

- Different pressure connections
- Automatic and manual reset versions
- Factory set to customer specification

Specifications

- SPDT switch rated for 12FLA and 72LRA at 240VAC and 16FLA and 96LRA at 120VAC
- Agency approvals include:
UL/CUL file number E85974
CE per (LVD) low voltage directive

Nomenclature

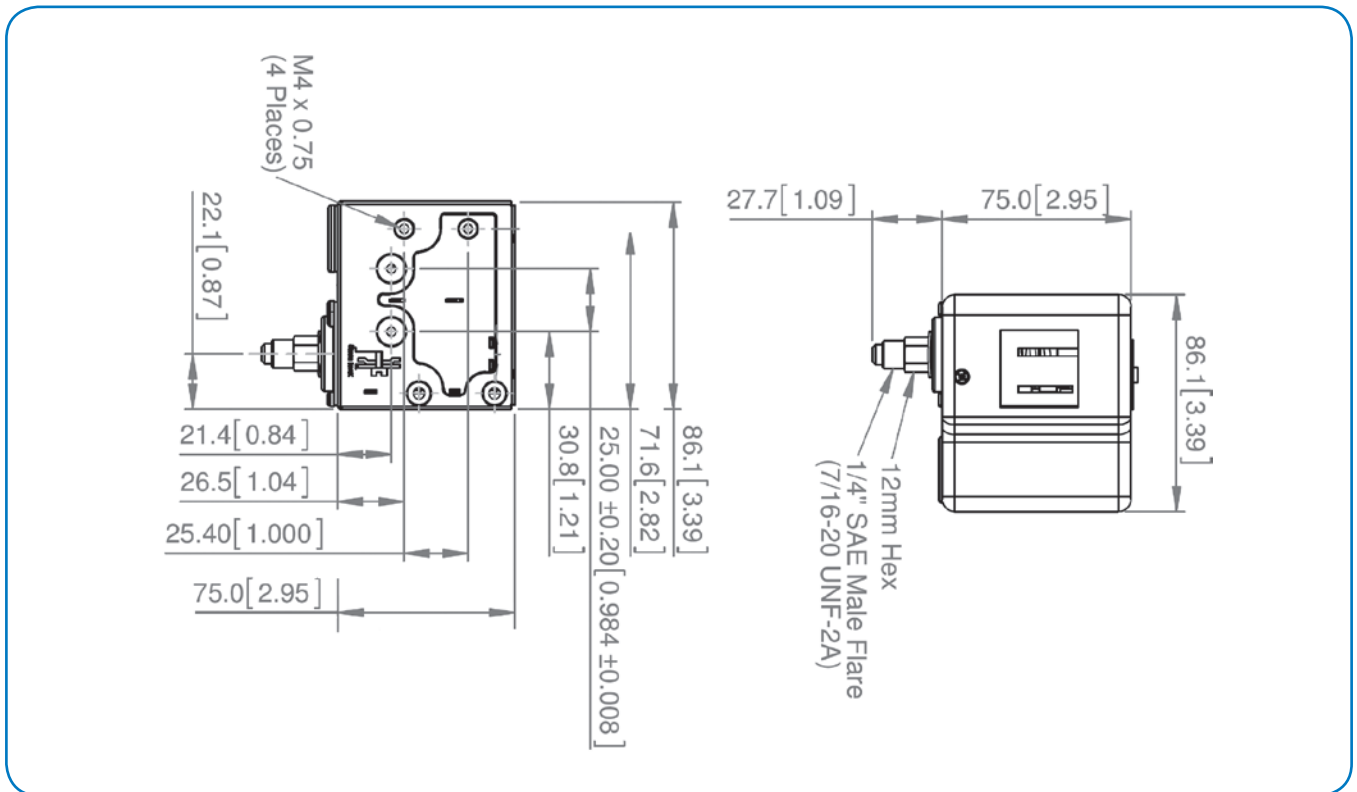
PS1	A	5	K
Product Name	Housing Variant/function	Pressure Range	Sensor Type
PS1 = Adjustable single Pressostat	A = Pressure control, automatic B = Pressure cut out, external manual reset EN 12263 R = Pressure control, external manual reset W = Pressure limiter, automatic, DIN/EN 12263	3 = -0.3 to 7 bar 4 = 2 to 20 bar 5 = 6 to 31 bar	A = 7/16" - 20 UNF male for 1/4" SAE male flare K* = 7/16" - 20 UNF flare nut with 1 meter (3 ft.) cap tube U = 6mm ODF solder, 80mm length R = 1/4" male, brass for 1/4" BSPP Fitting

Ordering Information

Single Pressure Control	PCN	Pressure Range (bar)	Differential (bar)	Factory Setting (bar)	Function	Pressure Connection
PS1 - A3A	99035	-0.3 to 7	1 to 5	3.4	Automatic	1/4" SAE male flare
PS1 - A3K	99041	-0.3 to 7	1 to 5	3.4	Automatic	1m cap tube with nut
PS1 - A3R	99014	-0.3 to 7	1 to 5	3.4	Automatic	1/4" BSPP fitting
PS1 - A3U	99015	-0.3 to 7	1 to 5	3.4	Automatic	6mm tube, 80mm length
PS1 - A4A	99016	2 to 20	3 to 15	10	Automatic	1/4" SAE male flare
PS1 - X4A	99043	2 to 20	3 to 15	10	Automatic	1/4" SAE male flare
PS1 - A5A	99036	6 to 31	3 to 15	20	Automatic	1/4" SAE male flare
PS1 - A5K	99039	6 to 31	3 to 15	20	Automatic	1m cap tube with nut
PS1 - B5U	99020	6 to 31	3 to 15	20	External Manual Reset	6mm tube, 80mm length
PS1 - R5A	99037	6 to 31	Fixed	20	External Manual Reset	1/4" SAE male flare
PS1 - W5U	99033	6 to 31	3 to 15	20	Automatic	6mm tube, 80mm length
Bracket	99019	—	—	—	—	—

Note: Bracket not included with controls. Sold separately. 100 brackets per box.

Dimensional Drawings



APD Pulsation Dampener/Muffler

The APD series is designed to reduce noise and vibration on the compressor discharge lines.

Features

- Compact size
- Full flow fittings
- Solid copper connections
- Corrosion resistant epoxy powder paint finish
- Rugged steel shells for vibration resistance
- Shock resistant steel shell construction



APD Series

Specifications

- Maximum working pressure: 680 psig
- Operating Range: -40°F to +250°F
- UL/CUL file number: SA 5760

Nomenclature

APD	05	3	S	B
Pulsation Dampener	Cubic Inches	Fitting Size in 1/8"	ODF Fittings	With Baffles (omit for standard)

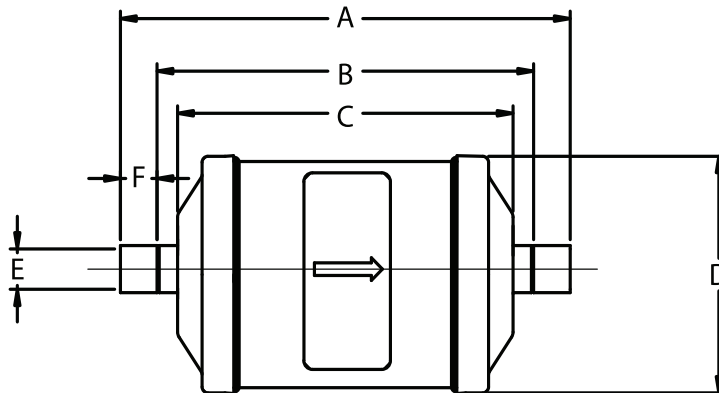
Flow Capacity

Fitting Size	Tons
1/4	1-5
3/8	5-10
1/2	10-20
5/8	15-25
7/8	25-35
1 1/8	35+

Ordering Information

Fitting Size	Tons	Dimensions (in)					
		A	B	C	D	E	F
061862	APD 1R	6.00	5.00	4.47	3.02		
049651	APD 054 S-B	4.56	3.56	3.00		0.50	0.50
059144	APD 163 S	6.25	5.38	4.75	2.63	0.38	0.38
060119	APD 165 S-B	6.56	5.31			0.63	0.63
056989	APD 309 S	10.25	8.44	7.50	3.13	1.13	0.88

Dimensional Drawing



Scroll Rack Application Guidelines

1. Introduction

Parallel operation happens when several compressors are operating on one common refrigeration system. These installations require a special design to achieve a maximum possible operating capacity and reliability. Only the system design engineer can make the decision which configuration of installation is to be used in view of the particular requirements. The concept of scroll compressors for refrigeration in parallel operation brings several benefits:

- **Efficient capacity control**
With several compressors in parallel, if one of the compressors is turned off, one can achieve a simple method of capacity control combined with a maximum possible saving of energy. If the load or ambient conditions change, compressors can be switched on and off to match capacity requirements. This method of capacity control provides the advantage that the application limitations are not altered as when the plant is equipped with capacity control. The use of unequal compressors allows many capacity possibilities.
- **Standby operation**
If one compressor cannot run for any reason, the load can often be met by the remaining compressors. If the stoppage is caused by a compressor breakdown, the other compressors could be damaged as well. One has to take immediate action to protect the whole installation if acid / dirt is generated. The cause has to be detected in order to be able to decide on the urgency of repair. This is especially required on plants having oil and refrigerant vapour pressure equalization lines, and on plants having no oil level regulating system with filters in the suction and oil return lines.
- **Changing compressors**
If a compressor needs to be changed for any reason the small lightweight nature of the scroll makes this a much less costly operation and causes much less disruption. This is particularly true for the smaller models.
- **Matching several evaporating conditions**
If there are two or more temperatures to be controlled individual compressors can be matched to each evaporator while working on a single condenser circuit. This will give power savings compared with an alternative system working at the lowest suction pressure.

Scroll compressors have no positive displacement oil pump and therefore no oil pressure switch. The high performance Teflon® bearings provide protection for short periods in case of oil losses. However sustained running at high-pressure differences without lubricant will fail the bearings. In order to ensure adequate protection it is necessary to observe the following guidelines.

2. Parallel application considerations

If compressors are required to operate in parallel it is normally necessary to stop and start them independently for capacity control purposes. There are three major considerations in this type of application:

- **Oil return**
With all capacity controlled refrigeration plant the oil circulation has to be perfectly correct especially under part-load operation. This means that the maximum possible capacity reduction will be limited by the means of guaranteeing the correct oil circulation. An adequate oil level at all times is necessary to maintain lubrication of the bearings. Too much oil can result in inefficient operation and excessive oil carry over to the system.
- **Tubing stress**
If compressors are mounted close together, care must be taken to ensure that there is sufficient flexibility in the tubing. If this is not done the starting pulse may result in excess stress directed at the mounting positions and may give rise to a leak. Tube resonance should be avoided.
- **Running sequence**
A certain logical sequence control is recommended so that each compressor runs for the same amount of time.

3. Active oil control

Individual oil control for each compressor can be attained when each compressor has Flow Controls OMB oil level regulator fitted using an adaptor at the sight glass location. The regulator is fed from an oil reservoir which is itself fed from an oil separator. Filters can be installed in the oil feeding line. The reservoir allows variations in oil quantity in the system to be accommodated. Oil carried over from the compressor to the system is replaced when insufficient oil is being returned. There is a sight glass on each oil level regulator where the oil level can be visually checked approximately 10 seconds after switching off the compressor. This method is recommended by Emerson Climate Technologies provided that certain design points are observed. Because the scroll compressor has no positive displacement oil pump and therefore no oil pressure switch, it is recommended that the oil control system incorporates protection. It will be necessary to add oil to the system and the Emerson Climate Technologies approved lubricants are Emkarate RL 32-3MAF and Mobil EAL Arctic 22 CC. The oil level regulating system for applications should be installed on site. Well tested oil level regulating systems are available from refrigeration wholesalers.

3.1 Low pressure oil reservoir

The oil reservoir is maintained at a pressure slightly above the compressor sump pressure and this limits the amount of refrigerant dissolved in the oil in the reservoir. The pressure drop is low when the oil enters the compressor and the amount of flash gas formed in the sump is small.

Float switches or other devices can be used as regulators. It is recommended that the regulator has an electrical output which can be wired into the control circuit and stop the compressor if the oil level falls below the minimum level and remains below the minimum level for a period of time (maximum 2 minutes). This protects against failure of the oil supply to the individual compressor. A level switch in the reservoir will only protect against insufficient oil in the receiver, but not against loss of oil supply to an individual compressor or against a fault on an individual regulator.

Regulators currently on the market which meet these requirements include Flow Controls OMB oil level regulator. The OMB requires the oil reservoir to be pressurized to 3.5 bar above suction pressure for reliable operation.

When using a regulator care must be taken to set the oil level in the upper half of the sight glass. If an adapter is used to connect the regulator this may have a smaller internal diameter than the glass and this could give rise to a false oil level reading.

When commissioning these systems it is important to allow sufficient time for equilibrium running conditions to be attained. Because the oil carry over rate from the scroll compressors is low it may take some time for stable oil quantities to build up in the coolers. Until this has happened the total oil requirement of the system cannot be determined.

3.1 High pressure oil reservoir

The need for a separate oil receiver may be avoided if a combined separator/receiver is used, but in this case the oil will be stored at discharge pressure. It will therefore cause much more disturbance and foaming when it enters the compressor sump. For this reason it is advisable to limit the quantity of oil entering the sump when the valve opens. Flow Controls OMB oil level regulator is suitable for this type of application and has been proven to operate satisfactorily with a high-pressure oil supply.

4. Passive oil control

4.1 Equalisation lines with passive oil control

The need for a separate oil receiver may be avoided if a combined separator/receiver is used, but in this case the oil will be stored at discharge pressure. It will therefore cause much more disturbance and foaming when it enters the compressor sump. For this reason it is advisable to limit the quantity of oil entering the sump when the valve opens. Flow Controls OMB oil level regulator is suitable for this type of application and has been proven to operate satisfactorily with a high-pressure oil supply.

Simple systems which link the compressor sumps via tubes with no control are obviously attractive. They are quite common on air conditioning applications, but in refrigeration additional considerations apply. They can of course only be considered for compressors working at a common suction condition.

If there are large variations in oil quantity in the system due to changing conditions or defrost, this may result in too much or too little oil in the compressors. Usually the only means of checking oil level is via the sight glass connection. Once the oil level is above the sight glass it is not possible to determine if the maximum oil quantity is reached. Likewise if no oil is visible in the sight glass there is a danger of operation below the minimum quantity.

A tube connecting the oil level adjustment valves on the compressors is not adequate because when a compressor is stopped, the pressure in the shell rises and oil will transfer to the running compressor(s). The adjustment valve is located below sight glass level and therefore the stationary compressor will show no oil level. Even if all compressors run together at all times, there will be small pressure differences which will cause the same effect.

Alternative methods using the sight glass connections for oil equalisation connections have been shown to work on specific systems. Notes are given below on some possible methods, but because of wide variations in system design and operating conditions, these methods cannot be given general approval by Emerson Climate Technologies. The user has to verify operation in each system type.

4.2 Gas and oil equalization tube at sight glass position

Emerson Climate Technologies has conducted tests to prove the satisfactory operation of up to three compressors in parallel using a gas and oil equalising tube. The configuration of suction line and equalization line should be as described below (see sections 4.3 and 4.4).

This method can be used for:

- Two or three ZF, ZS, ZB refrigeration Scroll compressors
- They must all be the same model, not uneven sizes
- All voltages
- Refrigerants R404A, R507, R22
- Same operating envelope as single compressor with injection where required
- Adequate liquid floodback protection must be provided
- Any sequence of compressors is allowed



Figure 1: Scrolls in parallel

Compressor models approved		
Low temperature	Medium temperature	
ZF09K* to ZF48K*	ZB15K* to ZB114K*	ZS21K* to ZS11M*

Table 2: Model applicability

4.3 Suction line configuration

An adequately sized suction header providing equal distribution of returning refrigerant and oil to each individual compressor must be used. The non-symmetrical design as shown below is acceptable and does not create oil level problems between the compressors.

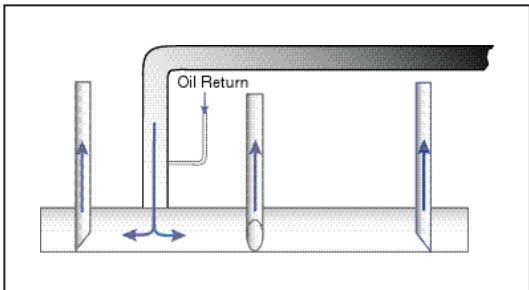


Figure 2: Oil return



Figure 3: Suction line configuration

4.4 Oil equalization line

The oil equalization line between the two or three compressors must be at least 7/8" (22 mm) with a minimum inner diameter of 19 mm. On no account must the internal diameter of any fitting in this line be less than 19 mm. It is strongly recommended that a sight glass be fitted using adaptors. Kits consisting of the adaptor shown below, plus conversion to brazed connections are available (see spare parts lists for details). The equalization tube must be level, and the compressors must be mounted level. Tests have shown that smaller tube diameters do not provide proper oil balancing. An oil separator may be used and the oil return line from the separator should be connected to the oil equalization line.

If no oil separator is installed the oil returns into the suction header and is picked up there from the individual compressor suction lines.

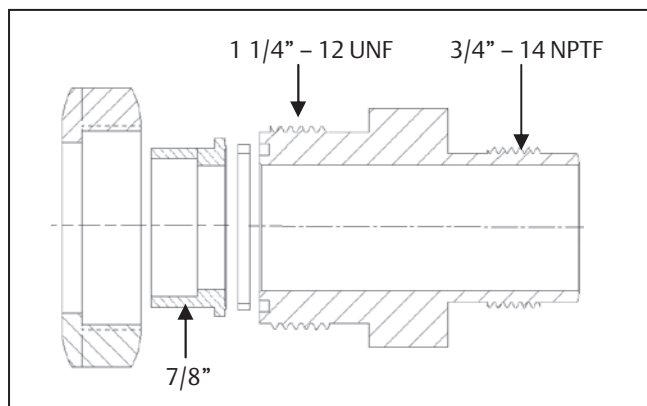


Figure 4: Adaptor for oil sight glass connection

NOTE: Tightening torque: 41-54 Nm. Use Loctite string or Everseal 483 White Pipe Sealant.

4.5 Oil and gas equalization plus oil regulator

If the OMB or other device is fitted to the equalization line, one device serving 2 or 3 compressors, the proper functioning of the system has to be checked to ensure that no nuisance tripping occurs. The OMB sight glass, remote from the sump, does not always accurately follow the sump oil level. The oil separator must be of the combined separator/reservoir high-pressure type, or alternatively a separate oil reservoir may be used if the separator has its own float valve. The separator float valve outlet must not be connected directly to the OMB.

5. Oil return to running compressors

If oil returns to the compressor at approximately the same rate as it leaves then the oil level will be maintained. It is always preferable to design the suction manifold in such a way that oil returning with the suction gas can only enter the running compressor(s). This can be done in a number of ways. Perhaps the most common is to use a suction header with vertical pick-ups to each compressor which induces sufficient velocity to lift the oil. Again certain designs have been shown to be satisfactory but each one has to be proven by testing. With some system designs this is sufficient to ensure adequate oil level at all times but there is no fail-safe pressure switch if one compressor loses oil.

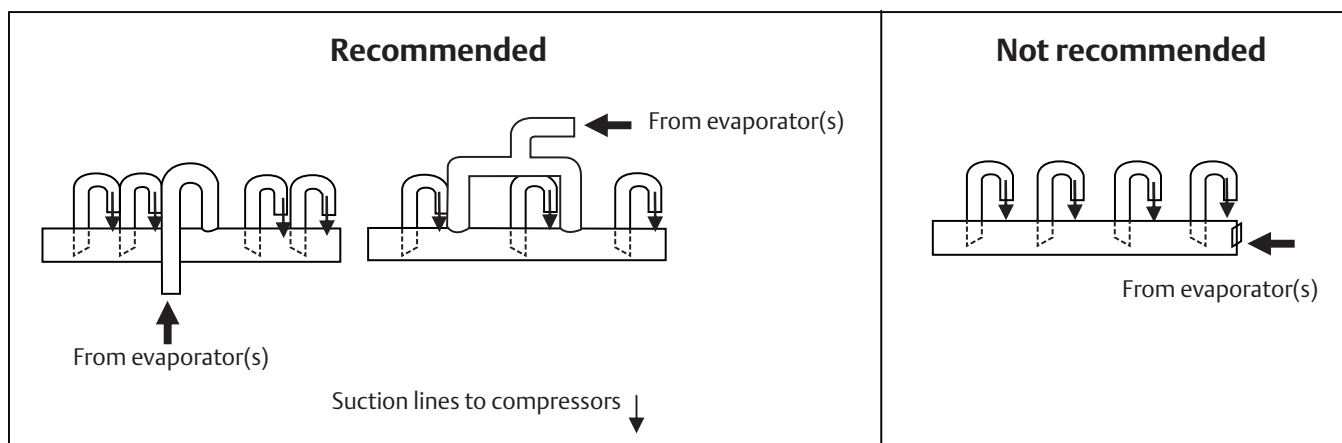


Figure 5: Suction header/lines to compressors – Recommendation

6. Tubing and mounting considerations

6.1 Starting pulse

The standard mount for the scroll compressor is a soft rubber mount. It is designed to transmit the lowest possible disturbance to the mounting frame. Because of the flexibility of this mount, it is essential that tubing to each compressor be designed to accommodate the movement which will occur, particularly upon start-up.

The three phase motors used in the refrigeration scroll compressors exhibit a high starting torque characteristic. The reaction of the stator is directly on the shell because there are no internal spring mounts. This reaction causes easily observable movement of the shell when the standard mounts are used and this is normal. However, if the suction and discharge tubing of the compressor is closely clamped to the frame or linked to another compressor, the tubing will restrain the movement and the motor reaction force will be taken by the tubing. This may cause excessive stress and premature failure of tubing joints.

6.2 Resonance

The discharge pulse can in some configurations give rise to resonance of tubing. It is advisable to avoid a natural frequency of between 45 and 55 Hz for the section of tubing between the compressor and the first clamp. It is often not possible to determine this in advance but in the unlikely event of a resonance problem arising a change in tube configuration will usually resolve it.

6.3 Recommendations for tubing and mounting

Always allow some flexibility in the tubing to the suction and discharge connections. If the standard mounts are used there should be at least two bends and a vertical section before the tube joins a header. Test the finished assembly by rocking the compressor on its mounts. Vibration eliminators may be used but are not essential if the tubing has sufficient flexibility. Vibration eliminators should be fitted in the vertical plane.

An alternative harder mount as detailed in Figure 7 is recommended. This will allow more loads to be transmitted via the feet, and the very small additional vibration transmission is not usually a problem in refrigeration applications. It is still advisable to incorporate a vertical section of tube between the compressor and the first rigid mount. This will give flexibility and minimise the risk of resonance.

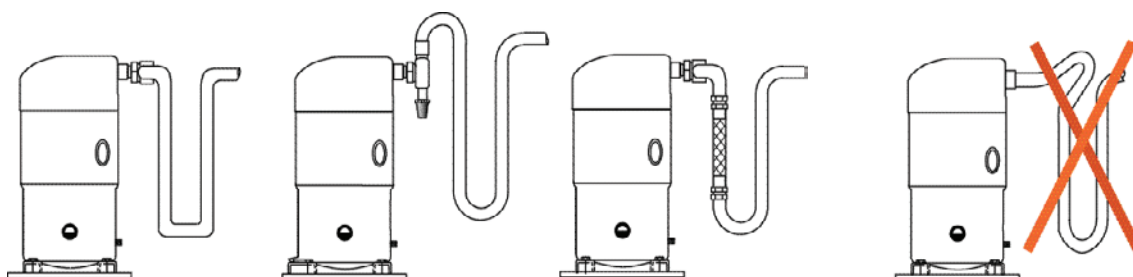
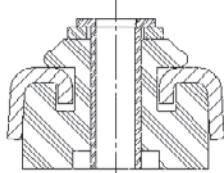
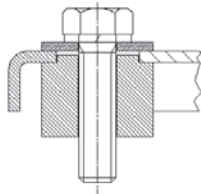


Figure 6: Tubing recommendation

Compressors	Ident Number	Characteristics	Drawing
ZB15K* to ZB45K* ZF09K* to ZF18K* ZF13KVE to ZF18KVE ZS21K* to ZS45K*	8030450 527-0157-00	60-70 Durometer	
ZB56K* to ZB11M* ZF24K* to ZF48K* ZF24KVE to ZF48KVE ZS56K* to ZS11M*	8522911 527-0168-00 Variation = 8516741	Hard steel	

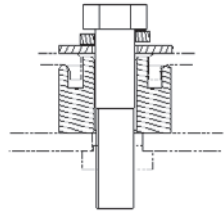
Compressors	Ident Number	Characteristics	Drawing
ZB50K* to ZB114K* Summit	8609592 527-0206-03 Variation = 8602466	Hard steel	

Figure 7: Mounting parts for multiple operation

7. Design points

7.1 Suction line header

The suction lines running from the evaporators to the compressors should be led to a common main suction header in which the suction pressures can equalize. From the main suction header to the compressors, preferably short and similarly constructed pipes have to be provided symmetrically arranged. This serves to achieve a most perfect pressure equalization necessary for the crankcases already at the compressor inlet. Naturally, the lower the speed in the suction line header the more perfect the pressure equalization. Pipes running into the suction line header must not be right opposite outgoing pipes, so that an equalization of the returning oil quantities can take place in the suction line header.

According to the capacity requirement of the system, compressors will be switched on or off. Occasionally however liquid refrigerant can possibly flow into the compressors operating. Therefore, the suction line header should be designed in a manner to simultaneously serve as a liquid separator. Consequently, one has to construct each pipe from the suction line header to the compressor so that the oil return is guaranteed by using additional bores or capillaries. Liquid refrigerant should not return to the compressors when not operating via the oil returning device.

Since installations with parallel compressors mostly have long pipe runs fitted on site, suction filters are commonly used. These filters may just as well be equipped with drier cores as with dust filters only. The filter housings will be rigidly fitted into the system during first installation before the common suction line header. Thus one can employ the appropriate filter core according to the individual requirement, ie, acid absorbing driers too if necessary.

7.2 Discharge line header

The discharge line should slope downwards from the compressor to a lower positioned discharge line header. This is so any liquid returning to the compressor from the condenser on the off cycle does not enter the compressor discharge port.

7.3 Oil separator

One of the features of a parallel compressor installation is the higher refrigeration capacity. With an increasing capacity generally the entire pipe work is extended, more complex and not easy to survey, sometimes resulting in problems with the oil return. It is therefore recommended to install oil separators regardless of the refrigerant and evaporating temperature. Pay careful attention and obey the rules on how to install the pipe work. With the installation using an oil level regulating system the oil separator is already included in this system hence the oil return line has to be fitted to the oil reservoir.

7.4 Oil supply

The more complex a system pipe work is the more influence the installation has on oil return. The extreme possibilities of capacity control resulting in frequent changes of gas velocities inside the suction line will render the oil return difficult as well. Particular attention should be paid to the lubrication problems involved. The oil level in the compressor crankcase should be controlled by using an OMB oil level regulator having oil level detection. This device interrupts the compressor control circuit when insufficient oil is in the compressor crankcase.

7.5 Installation

All compressors should be installed as close as possible to each other in order to keep the lines as short as possible. By changing the priority of compressors in operation and keeping running time constant the compressors oil temperature can be kept at a certain level which will reduce the amount of refrigerant absorbed into the compressor oil. Refrigerant flowback into the compressor during standby periods is not possible because the suction line header is below the compressor inlet port. If there is a requirement for isolating the installation against vibrations the frame should be mounted on vibration absorbers. Of course the connecting pipes on suction and discharge sides have to be flexible as well.

Digital Compressor Rack Controller-XC645CX

General Description

The XC645CX is designed to manage both compressors and fans in a condensing system such as a pack. The compressors can be digital scroll, simple, multistage.

Control is by means of a neutral zone or proportional band and is based on the pressure or temperature sensed in the LP suction (compressors) and HP (condenser) circuits. A special algorithm balances the run hours of the compressors to distribute the work load uniformly.



The controllers can convert both LP and HP pressures and displays them as temperatures. The front panel offers complete information on the system's status by displaying the suction and condenser pressure (temperatures), the status of the loads, possible alarms or maintenance conditions. Each load has its own alarm input that is able to stop it when activated. To guarantee the total system's safety, there are also two inputs for low and high pressure switches: when these are activated, the system is stopped.

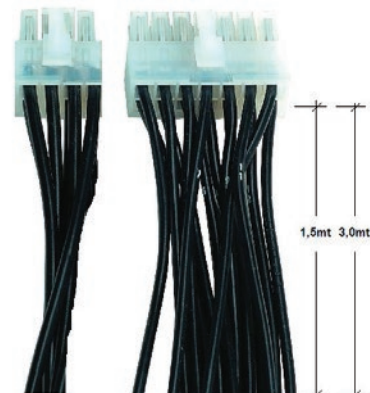
By means of the HOT KEY the controller can be easy programmed at power on. The controller can be connected to the X-WEB, controlling and monitoring system, thanks to the serial TTL output, using the standard ModBus RTU protocol.

Components Related to the XC645CX

Name	Description	Part Number
Transformer	TF5 230V/12Vac	CD050010 00
Wiring kit 1.5m and 3m	CWC15-Kit (1,5m) CWC30-Kit (3,0m)	DD500101 50 DD500103 00
Female disconnect able connector for digital input or analog output (4pcs)	CABCJ15 (1,5m) CABCJ30 (3,0m)	DD200101 50 DD200103 00
TTL /RS485 serial converter	XJ485CX+CABRS02	J7MAZZZ9AA
4-20mA suction pressure transducer	PP11 (-0.5-11bar)	BE009302 07
4-20mA condenser pressure transducer	PP30 (0-30bar)	BE009302 04
Hot key for programming	HOT KEY 4K	DK00000100

- **CWC15KIT and CWC30KIT: wiring kits**

The XC645CX is provided with 2 socket connectors with 14 and 6 pins. For the wiring the CWC15KIT (1.5m cable length) or CWC30KIT (3.0m cable length) have to be used.



- CAB CJ15 or CAB CJ30: 2 PIN connectors

Note:

Use the connection cable CAB CJ15 (1.5m length) or the CAB CJ30 (3.0m length) for the:

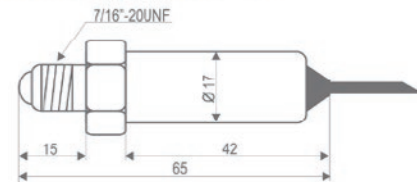
- HP digital input (25-26),
- i2F configurable digital input (27- 28),
- 0-10Vdc or 4-20mA analogue output (23-24)
- oA6, 12Vdc/40mA digital output (21- 22):



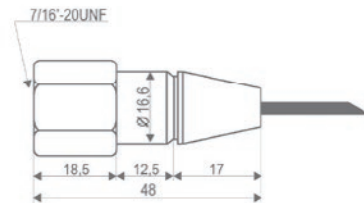
- PP07, PP11, PP30 PP50: 4–20mA pressure transducers

PP07	2.0MT cod BE009302 00	-0.5 + 7bar rel FE
PP11	2.0MT cod BE009302 07	-0.5 + 11bar rel FE
PP30	2.0MT cod BE009302 04	0 + 307bar rel FE
PP50	2.0MT cod BE009002 07	0 + 507bar rel Male

PP07 - PP11 - PP30 - PP50 Bar



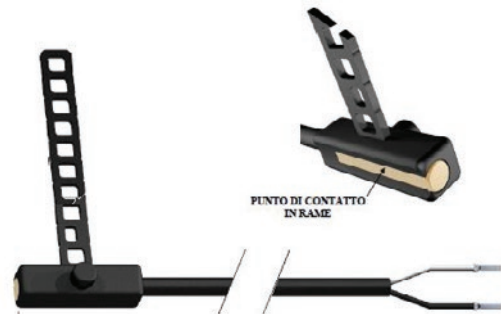
PP30FE



- NP4-67: pipe mounting temperature probe

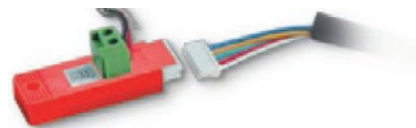
The NP4-67 temperature probe can be used on the discharge line to monitor the discharge temperature of the Digital Scroll compressor.

NP4-67 1.5MT NTC probe Measurement range: -40+110°C, Cable 1,5mt
Code BN609001 52



- XJ485CX: TTL / RS485 serial converter

The XJ485CX is a TTL/RS485 external converter. Insert it into the TTL receptacle to convert the TTL output into a RS485 (+) and (-) signal for the monitoring system MODBUS_RTU compatible. (XWEB).

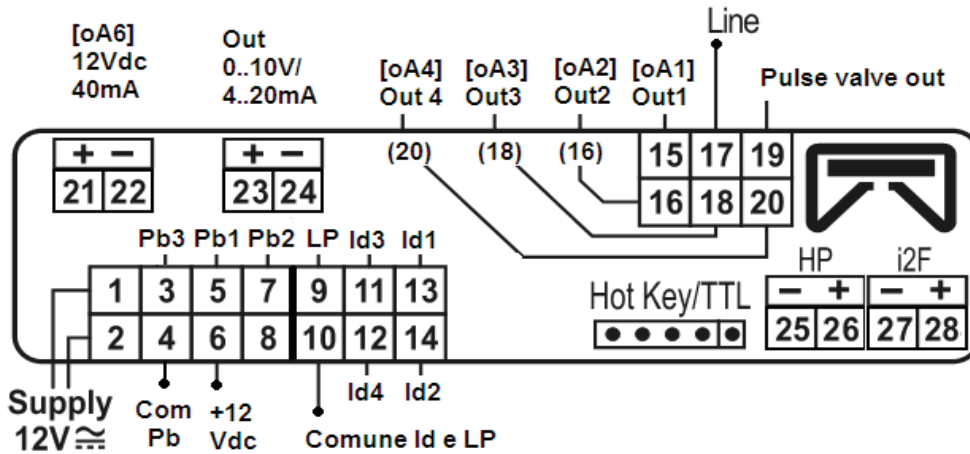


Wiring and Electrical Connections

- General warnings

Before connecting cables make sure the power supply complies with the instrument's requirements. Separate the probe cables from the power supply cables, from the outputs and the power connections. Do not exceed the maximum current allowed on each relay 5A resistive, in case of heavier loads use a suitable external relay.

- Wiring connections



24Vac/dc supply: use terminals 1-2

- Always use a class 2 transformer with minimum power 5VA such as TF5.
- Terminals [21-22], [23-24], [25.26], [27-28] are provided with JST 2 PINS connectors, they require the CABCI15 (1,5mt) or CABCI30 (3mt) wiring cables

- Probes connection

If using terminal ends be sure there are no burr parts which could cause short circuiting or introduce noise disturbance at high frequencies. To minimize the induced disturbances use shielded cables with the shield connected to earth.

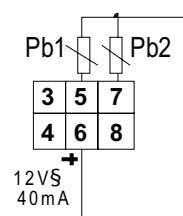
Pressure probe (4 - 20 mA): respect the polarity. If using terminal ends be sure there are no burr parts which could cause short circuiting or introduce noise disturbance at high frequencies. To minimize the induced disturbances use shielded cables with the shield connected to earth.

Temperature probe: it is recommended to place the temperature probe away from direct air streams to correctly measure the temperature.

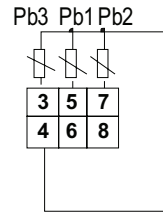
Low voltage side (14PINs connector): Keep the cables away from the power cables. Use shielded cable to lengthen the cables.

- Notes:
1. The PIN 4 is the common line for the temperature probes
 2. The PIN 3 gives a 12Vdc supply for the 4-20mA pressure transducers

PP07 PP11, PP30, PP50 4+20mA pressure transducers respect the polarity.
 Suction (P1C = Cur)
 Brown (+) to terminal 6 ; white (-) to terminal 5
 Condenser (P2C = Cur)
 Brown (+) to terminal 6 ; white (-) to terminal 7



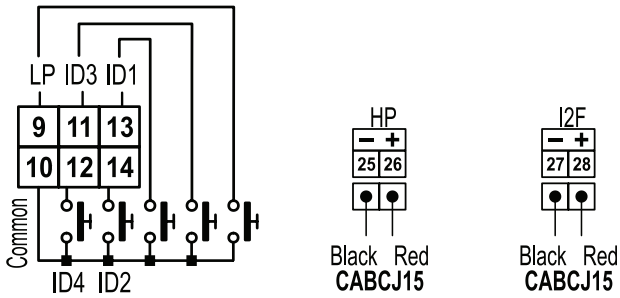
Temperature probes (NTC 10K)
 Suction: 4-5 (P1C = NTC)
 Condenser: 4-7 (P2C = NTC) Pb3 (P3C = NTC): 4-3



• Safety Digital Inputs and Pressure Switches

!!!WARNING: free voltage inputs!!!!

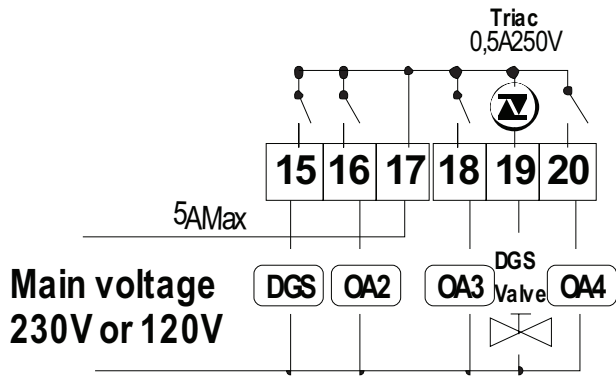
Note: The PIN 10 is the common line for all the digital inputs.



• Load Connections

!!!WARNING: Digital Scroll valve coil MUST operate at main voltage (230Vac or 115Vac)!!!!

Note: Main voltage side (6PINs connector): the PIN 17 is the common line for all the relay outputs and for the TRIAC.

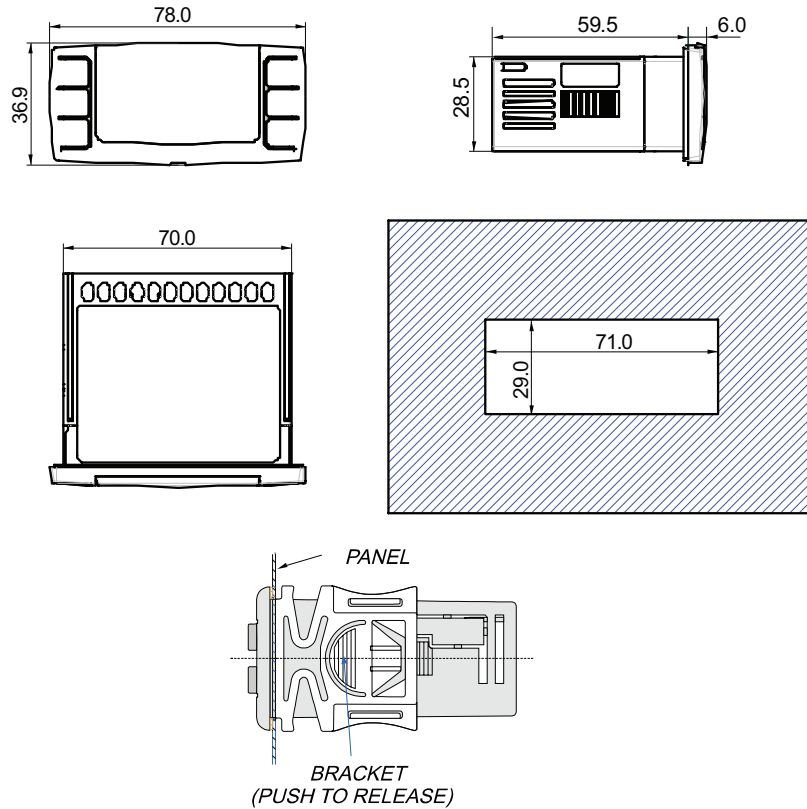


Mounting and Installation

The instruments are suitable only for internal use. Instruments shall be mounted on panel, in a 29x71 mm hole, and fixed using the special brackets supplied.

The ambient operating temperature range is between -10–60°C.

Avoid locations subject to heavy vibration, corrosive gases or excessive dirt. The same applies to the probes. Ensure ventilation around the instrument.



First installation

At first installation, it's necessary to do the following:

1. Select the kind of gas.
2. Set the range of the pressure probes.

- **How to set the kind of gas**

The controller has memorized the relation between temperature and pressure for some gases.

The pre-set gas is: R404.

If another gas is used, act as in the following:

1. Enter the Programming mode by pressing the Set and DOWN key for 3s.
2. Select the "Pr2" parameter. Then enter the password 3 2 1 0.
3. Select the FtyP, kind of gas, parameter.
4. Press the "SET" key: the value of the parameter will start blinking.
5. Use "UP" or "DOWN" to change the gas among the following: r22= R22; r404=R404A; 507=R507; 134=134; r717= ammonia.
6. Press "SET" to store the new value and move to the following parameter.

To exit: Press SET + UP or wait 30s without pressing a key.

Note: the set value is stored even when the procedure is exited by waiting the time-out to expire.

• How to set the range of the pressure probes

If an instrument with the following part number is used: XC645CX – xxxxF, it is pre-set to work with pressure probe with the following range:

Probe 1: -0.5 –11.0 bar (relative pressure);

Probe 2: 0–30.0 bar (relative pressure)

If the probes you're using have a different range act as in the following:

To set the pressure range of the Probe 1 (suction probe) use the parameter:

PA04: Adjustment of read out corresponding to 4mA

PA20: Adjustment of read out corresponding to 20mA

Practically these parameters have to be set with the start and end scale of the probe range.

How to do:

1. Enter the Programming mode by pressing the Set and DOWN key for 3s.
2. Select the "Pr2" parameter. Then enter the password 3 2 1 0.
3. Select the PA04, adjustment of read out corresponding to 4mA, parameter.
4. Press the "SET" key: the value of the parameter will start blinking.
5. Set the lower value of the probe range.
6. Push the SET key to confirm the value. The PA20: adjustment of read out corresponding to 20mA parameter will be displayed.
7. Set the higher value of the range.
8. Push the SET key to confirm the value. Next parameter will be displayed.

Do the same things for the Probe 2, FA04, FA20 parameters.

User interface



• Display

Upper Display	Lower Display	Icons
Suction temperature or pressure	Discharge temperature or pressure	<ul style="list-style-type: none"> - Working loads - Measurement unit - Alarm or status Icons

• Keyboard

SET (SET)
Standard visualization: to see or modify the set point. In programming mode it selects a parameter or confirms an operation.
Alarm menu: By holding it pressed for 3s, the current alarm is erased.

o (UP) In programming mode: it browses the parameter codes or increases the displayed value.
With Hot key inserted: it starts the Hot key programming procedure.
To access the INFO menu: push and release it to access the INFO menu.

n (DOWN) In programming mode: it browses the parameter codes or decreases the displayed value.



Manual restart of loads: By holding it pressed for 3s, it switches on again loads previous locked by a safety digital input alarm.



Maintenance/Clock: To display the loads running hours By holding it pressed for 3s the Maintaining menu is entered



To enter the Alarm menu

Key Combinations

o + n To lock and unlock the keyboard.

SET + n To enter the programming mode.

SET + o To exit the programming mode.

• Icons

LED	Function	Meaning
°C	ON	Celsius degrees
°F	ON	Fahrenheit degrees
bar	ON	bar displaying
PSI	ON	PSI displaying
kPa	ON	KPA displaying
1	ON	Digital scroll compressor (DGS) on
1	Flashing	DGS is waiting to start (1Hz) or digital input alarm for DGS (2Hz). or DGS in maintenance status (2Hz).
2	ON	Load 2 on
2	Flashing	Load 2 is waiting to start (1Hz). or digital input alarm for Load 2 (2Hz). or Load 2 in maintenance status (2Hz).
3	ON	Load 3 on
3	Flashing	Load 3 is waiting to start (1Hz). or digital input alarm for Load 3 (2Hz). o Load 3 in maintenance status (2Hz).
4	ON	Load 4 on
4	Flashing	Load 4 is waiting to start (1Hz). or digital input alarm for Load 4 (2Hz). o Load 4 in maintenance status (2Hz).
6	ON	Load 6 on
6	Flashing	Load 6 is waiting to start (1Hz). or digital input alarm for Load 6 (2Hz). o Load 6 in maintenance status (2Hz).
⚡	ON	The valve of the Digital scroll compressor is energized
🔑	ON	The Maintenance menu has been entered
🔑	Flashing	One or more loads have been placed in maintenance status
LP	ON	Low pressure switch alarm
HP	ON	High pressure switch alarm
!	ON	Alarm is happening
📖	ON	All the stored alarms have been seen.
📖	Flashing	A new alarm has happened

Pressure-Temperature Chart

Pressure bar (g)	R134A	R22	R404A	R407F		
	Mean °C	Mean °C	Mean °C	Dew °C	Mean °C	Bubble °C
0.0	-26.4	-41.1	-46.2	-39.7	-42.9	-46.1
0.1	-24.3	-39.0	-44.2	-37.8	-41.0	-44.1
0.2	-22.3	-37.1	-42.4	-36.0	-39.2	-42.3
0.3	-20.5	-35.3	-40.6	-34.3	-37.5	-40.6
0.4	-18.8	-33.7	-39.0	-32.7	-35.9	-39.0
0.5	-17.1	-32.1	-37.5	-31.2	-34.4	-37.5
0.6	-15.6	-30.6	-36.0	-29.8	-33.0	-36.1
0.7	-14.1	-29.1	-34.6	-28.5	-31.6	-34.7
0.8	-12.7	-27.8	-33.3	-27.2	-30.3	-33.4
0.9	-11.4	-26.4	-32.0	-26.0	-29.1	-32.1
1.0	-10.1	-25.2	-30.8	-24.8	-27.9	-30.9
1.1	-8.8	-24.0	-29.6	-23.6	-26.7	-29.8
1.2	-7.6	-22.8	-28.4	-22.5	-25.6	-28.7
1.3	-6.5	-21.7	-27.3	-21.5	-24.6	-27.6
1.4	-5.4	-20.6	-26.3	-20.5	-23.5	-26.5
1.5	-4.3	-19.5	-25.2	-19.5	-22.5	-25.5
1.6	-3.2	-18.5	-24.2	-18.5	-21.6	-24.6
1.7	-2.2	-17.5	-23.3	-17.6	-20.6	-23.6
1.8	-1.2	-16.5	-22.3	-16.7	-19.7	-22.7
1.9	-0.3	-15.6	-21.4	-15.8	-18.8	-21.8
2.0	0.7	-14.7	-20.5	-14.9	-17.9	-20.9
2.1	1.6	-13.8	-19.6	-14.1	-17.1	-20.1
2.2	2.5	-12.9	-18.8	-13.3	-16.3	-19.2
2.3	3.3	-12.0	-17.9	-12.5	-15.5	-18.4
2.4	4.2	-11.2	-17.1	-11.7	-14.7	-17.6
2.5	5.0	-10.4	-16.3	-10.9	-13.9	-16.9
2.6	5.8	-9.6	-15.5	-10.2	-13.2	-16.1
2.7	6.6	-8.8	-14.8	-9.4	-12.4	-15.4
2.8	7.4	-8.0	-14.0	-8.7	-11.7	-14.6
2.9	8.2	-7.3	-13.3	-8.0	-11.0	-13.9
3.0	8.9	-6.6	-12.6	-7.3	-10.3	-13.2
3.2	10.4	-5.1	-11.2	-6.0	-9.0	-11.9
3.4	11.8	-3.7	-9.8	-4.7	-7.6	-10.5
3.6	13.2	-2.4	-8.5	-3.5	-6.4	-9.3
3.8	14.5	-1.1	-7.3	-2.3	-5.2	-8.1
4.0	15.7	0.1	-6.1	-1.1	-4.0	-6.9
4.2	17.0	1.3	-4.9	0.0	-2.9	-5.7
4.4	18.2	2.5	-3.7	1.1	-1.8	-4.6
4.6	19.3	3.7	-2.6	2.2	-0.7	-3.5
4.8	20.5	4.8	-1.5	3.2	0.4	-2.5
5.0	21.6	5.9	-0.5	4.2	1.4	-1.4
5.2	22.6	6.9	0.6	5.2	2.4	-0.4
5.4	23.7	8.0	1.7	6.2	3.4	0.6
5.6	24.7	9.0	2.6	7.1	4.3	1.5
5.8	25.7	10.0	3.6	8.0	5.3	2.5
6.0	26.7	10.9	4.6	8.9	6.2	3.4
6.2	27.7	11.9	5.5	9.8	7.1	4.3
6.4	28.6	12.8	6.4	10.7	8.0	5.2
6.6	29.5	13.7	7.3	11.5	8.8	6.0
6.8	30.4	14.6	8.2	12.3	9.6	6.9
7.0	31.3	15.5	9.0	13.2	10.5	7.7
7.2	32.2	16.3	9.9	14.0	11.3	8.5
7.4	33.1	17.2	10.7	14.7	12.0	9.3
7.6	33.9	18.0	11.5	15.5	12.8	10.1

Pressure-Temperature Chart

Pressure bar (g)	R134A	R22	R404A	R407F		
	Mean °C	Mean °C	Mean °C	Dew °C	Mean °C	Bubble °C
7.8	34.7	18.8	12.3	16.2	13.6	10.9
8.0	35.5	19.6	13.1	17.0	14.3	11.6
8.2	36.3	20.4	13.8	17.7	15.1	12.4
8.4	37.1	21.2	14.6	18.4	15.8	13.1
8.6	37.9	21.9	15.3	19.1	16.5	13.8
8.8	38.6	22.7	16.1	19.8	17.2	14.5
9.0	39.4	23.4	16.8	20.5	17.9	15.2
9.2	40.1	24.1	17.5	21.2	18.6	15.9
9.4	40.9	24.9	18.2	21.8	19.2	16.6
9.6	41.6	25.6	18.9	22.5	19.9	17.3
9.8	42.3	26.3	19.6	23.1	20.5	17.9
10.0	43.0	27.0	20.2	23.8	21.2	18.6
10.5	44.7	28.6	21.9	25.3	22.8	20.2
11.0	46.3	30.3	23.5	26.8	24.3	21.7
11.5	47.9	31.8	25.0	28.2	25.7	23.2
12.0	49.5	33.4	26.5	29.6	27.2	24.7
12.5	51.0	34.9	27.9	31.0	28.6	26.1
13.0	52.4	36.3	29.3	32.3	29.9	27.5
13.5	53.8	37.7	30.7	33.6	31.2	28.8
14.0	55.2	39.1	32.1	34.9	32.5	30.1
14.5	56.6	40.4	33.4	36.1	33.8	31.4
15.0	57.9	41.7	34.6	37.3	35.0	32.6
15.5	59.2	43.0	35.9	38.5	36.2	33.9
16.0	60.5	44.3	37.1	39.6	37.3	35.0
16.5	61.7	45.5	38.3	40.7	38.5	36.2
17.0	62.9	46.7	39.5	41.8	39.6	37.3
17.5	64.1	47.9	40.6	42.8	40.7	38.5
18.0	65.2	49.0	41.7	43.9	41.8	39.6
18.5	66.4	50.2	42.8	44.9	42.8	40.6
19.0	67.5	51.3	43.9	45.9	43.8	41.7
19.5	68.6	52.4	45.0	46.9	44.8	42.7
20.0	69.6	53.4	46.0	47.8	45.8	43.7
20.5	70.7	54.5	47.0	48.8	46.8	44.7
21.0	71.7	55.5	48.0	49.7	47.7	45.7
21.5	72.7	56.5	49.0	50.6	48.7	46.7
22.0	73.7	57.5	50.0	51.5	49.6	47.6
22.5	74.7	58.5	50.9	52.4	50.5	48.6
23.0	75.7	59.5	51.8	53.3	51.4	49.5
23.5	76.6	60.4	52.7	54.1	52.3	50.4
24.0	77.6	61.4	53.6	55.0	53.2	51.3
24.5	78.5	62.3	54.5	55.8	54.0	52.2
25.0	79.4	63.2	55.4	56.6	54.8	53.0
25.5	80.3	64.1	56.2	57.4	55.7	53.9
26.0	81.2	65.0	57.1	58.2	56.5	54.7
26.5	82.0	65.9	57.9	59.0	57.3	55.6
27.0	82.9	66.7	58.7	59.7	58.1	56.4
27.5	83.7	67.6	59.5	60.5	58.9	57.2
28.0	84.6	68.4	60.3	61.2	59.6	58.0
28.5	85.4	69.2	61.1	61.9	60.4	58.8
29.0	86.2	70.0	61.9	62.7	61.2	59.6
29.5	87.0	70.8	62.7	63.4	61.9	60.3
30.0	87.8	71.6	63.4	64.1	62.6	61.1
30.5	88.6	72.4	64.2	64.8	63.4	61.9
31.0	89.3	73.2	64.9	65.5	64.1	62.6

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