Frick®
BY JOHNSON CONTROLS

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SPECIFICATIONS

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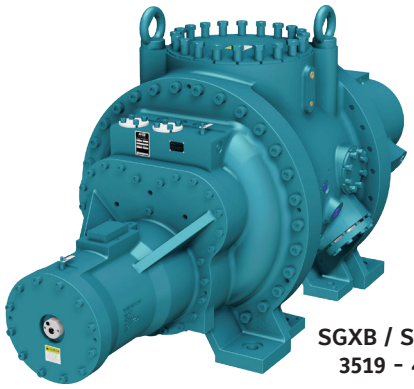
ROTARY SCREW COMPRESSORS
SGC 1913-2824 ▪ SGCB / SGCH 3511-3519
SGXB / SGXH 3519-4021

SGC 1913 - 2824

SGCB / SGCH
3511 - 3519



SGXB / SGXH
3519 - 4021

FEATURES AND BENEFITS

The Frick® SGC, SGCB/SGCH and SGXB/SGXH screw compressors are designed to compress a variety of gases in many different applications including refrigeration, air conditioning, water chilling, wellhead compression, gas gathering, and vapor recovery. Applications include booster duty (low temperature/pressure), high (single) stage, or swing duty compression.

Stepless Capacity Control - A hydraulically actuated slide valve moves axially along the rotor mesh line to provide infinite unloading down to approximately 10% of full load capacity for most models. Unloaded gas is bypassed back to suction before compression has begun, allowing the compressor to efficiently accommodate system requirements. External piping is dramatically reduced by cylinder mounted solenoid control valves.

Variable Volume Ratio - A hydraulically actuated slide stop adjusts slide valve position to optimize internal discharge pressure. This matches compressor volume ratio to system pressure ratio and eliminates the power penalties associated with under- or overcompression.

Indicator Transmitters - Hermetically sealed Indicator Transmitters eliminate contact with process gas.

Antifriction Bearings - Cylindrical roller bearings handle radial loads, and four-point angular contact ball bearings, aided by balance pistons, absorb thrust loads. No preloading is required. At design conditions, L_{10} life is in excess of 100,000 hours. Roller bearings also maintain superior rotor positioning to minimize internal leakage and provide excellent performance. System differential pressure is normally sufficient as the driving force to supply oil to the bearings, thereby eliminating the need for an oil pump. Antifriction bearings have lower frictional horsepower requirements for lower power consumption. Compressor housings are machined to provide static oil reservoirs for the bearings.

Built-In Suction Strainer - Model 19xx through 28xx has an integrated suction strainer with side access on left or right.

Drive and Motor Arrangement - As standard, these compressors have a tunnel for direct mounting to flange drivers. This supplies optimum alignment, maximum shaft seal life, and low noise. (Excludes 40xx models)

Dynamically Balanced - Rotors and rotating parts are dynamically balanced to demanding requirements providing low vibration from high speed rotation.

Oil Injection - Injected oil serves to lubricate the bearings, balance piston, and seal, fill any leakage paths between and around the rotors to prevent gas bypassing, and maintain superior efficiencies. Oil injection minimizes noise and vibration. It keeps the compressor cool to prevent overheating by absorbing much of the heat from compression.

Oil Passages - Internally machined oil passages reduce the risk of leaks inherent in external piping.

Quality Engineered - Designed and built to meet the exacting requirements of the Industrial Refrigeration Market. Expert engineering, automated machining centers, clean temperature controlled assembly, and stringent quality control requirements, all contribute to ensuring easy installation, reliable operation, and convenient servicing.

MATERIALS OF CONSTRUCTION

Standard screw compressor casings for 1913 through 3524 sizes are close grain, pressure tight, grey cast iron Class 40 per ASTM A48 with material certificate type 3.1. This ensures structural integrity and mechanical and thermal stability under application operating conditions.

Alternate casing material for these models is ductile iron – see specifications for 4013 - 4021 sizes below.

Standard screw compressor casings for 4013 - 4021 sizes Ductile iron grade 60-40-18 per ASTM A395 and ASME SA 395 including a Charpy V-notch test at room temperature and a material certificate type 3.1 per EN 10204. Material is similar to European standard EN 1563, material designation EN-GJS-400-18.

Flanges - Suction and discharge flanges comply with ANSI B16.5. A 300 class suction and a 300 class discharge flange are standard on most models. The 4013 model has 400 class suction and discharge as standard.

Rotors - Made from the highest quality carbon steel to exacting tolerances of the latest Frick rotor profile design.

Rotor Dampers - SGXB/SGXH compressors have rotor dampers to inhibit vibration, providing smooth operation.

Bearings - Rolling elements and rings are AISI 52100 medium carbon alloy steel. Cages are brass, polyamide, or steel. Tolerance quality complies with ABEC 1 through 3.

Slide Valve Spindle - Low carbon steel

Slide Valve Indicator Rod - Stainless Steel

Slide Stop Indicator Rod - Aluminum with steel tip

Slide Stop Indicator Well - Stainless Steel

Pistons, Spacers, Etc. - Gray cast iron, steel plate, regular carbon steel plate, or various types of hot rolled, cold rolled or cold drawn steel bar

Retaining (Snap) Rings & Spring Washers - High carbon spring steel

Bolts - Grade 8.8, heat treated, medium carbon steel, socket head cap screws

Static Seals - HNBR O-rings. Viton® also available.

Dynamic Seals - Carbon filled teflon

Shaft Seal - Spring-loaded stationary carbon end face rides in a stainless steel carrier against a rotating nonmagnetic cast iron alloy floating seat. The assembly is vented to low pressure to extend seal life. Secondary seals are HNBR or Viton® O-rings. Alternate seal designs and materials are available for some applications.

TYPICAL PERFORMANCE

Model		R-290 (Propane)				R-717 (Ammonia / NH_3)				Natural Gas (SG=.65, k=1.26)			
		Capacity		Power		Capacity		Power		Capacity		Power	
		TR	kW	BHP	kW	TR	kW	BHP	kW	MMSCFD	MSCMH	BHP	kW
SGC	1913	183.7	646	198	148	216	759	236	176	0.656	0.774	46	34
	1918	244.9	861	264	191	288	1012	314	234	0.874	1.031	61	45
	2313	326.1	1147	346	258	389	1367	411	306	1.129	1.332	81	60
	2317	410.6	1444	435	325	490	1722	517	386	1.422	1.678	103	77
	2321	507.3	1784	538	401	605	2126	639	477	1.757	2.073	127	95
	2813	584.3	2055	620	462	697	2449	736	549	2.044	2.412	147	110
	2817	735.8	2588	780	582	878	3085	927	691	2.574	3.037	185	138
	2821	885.3	3113	939	700	1056	3711	1115	831	3.097	3.654	223	166
	2824(5)	1006.1	3538	1,067	796	1200	4217	1267	945	3.519	4.152	253	189
SGCB/H	3511	905.7	3185	999	745	1079	3792	1170	872	3.146	3.712	223	166
	3515	1235.1	4344	1,362	1,016	1472	5173	1595	1189	4.290	5.062	304	227
	3519	1529	5377	1,882	1,403	1873	6582	2030	1514	5.460	6.442	387	289
SGXB/H	3519	1572	5528	1,882	1,403	1873	6582	2030	1514	5.460	6.442	387	289
SGXB	3524(5)	1985.7	6983	2,377	1,773	2308	8110	2562	1910	6.897	8.138	490	365
SGXH	4013	1527.3	5371	1,715	1,279	1,792	6,302	2,006	1,495	5.601	6.605	401	299
	4018	2114.7	7437	2,375	1,771	2,482	8,729	2,777	2,070	7.756	9.146	555	413
	4021	2502.4	8801	3,052	2,276	2,937	10,329	3,286	2,450	9.178	10.823	701	522

NOTES:

1. SG=Specific Gravity, k=Ratio of Specific Heats (Cp/Cv), TR=Tons Refrigeration, kW=Kilowatts, BHP=Brake Horsepower, MMSCFD=Million Standard Cubic Feet per Day, MSCMH=Thousand Standard Cubic Meters per Hour.
2. R-290 ratings based on 20°F (-6.7°C) suction and 95°F (35°C) condensing with 10°F (5.5°C) liquid subcooling and 10°F (5.5°C) suction superheat contributing to refrigeration effect at 3550 RPM.
3. R-717 ratings based on 20°F (-6.7°C) suction and 95°F (35°C) condensing with 10°F (5.5°C) liquid subcooling and 10°F (5.5°C) suction superheat contributing to refrigeration effect at 3550 RPM.
4. Natural gas ratings based on 25 PSIA (172 kPaA), 80°F (27°C) suction and 75 PSIA (517 kPaA) discharge at 1800 RPM.
5. SGC 2824 and SGX 3524 are used mainly as a booster but can also run certain high stage applications.

DESIGN LIMITATIONS AND MECHANICAL CHARACTERISTICS

This information is intended to be used in conjunction with CoolWare™ to establish that an application is within the operating envelope for the compressor. Consult Johnson Controls for the latest CoolWare™ version.

	SGC MODEL									SGCH / SGCB MODEL		
	1913	1918	2313	2317	2321	2813	2817	2821	2824	3511	3515	3519
Approx. Compr. Weight lb (kg)	1830 (830)	2050 (930)	2690 (1220)	2990 (1356)	3115 (1413)	4505 (2043)	4585 (2080)	6030 (2735)	6440 (2921)	8525 (3867)	9000 (4083)	9500 (4309)
Rotor Dia. mm	193		233			283				355		
Drive Arrangement	Directly driven by the male rotor in the clockwise direction as viewed from the driver											
Minimum Driver Speed(1)(2) RPM	600(1)(2)											
Maximum Driver Speed RPM	4500					4200 (4500 w/High Temp Bearings)				3600		
Min. Breakaway Torque ft-lb (Nm)	10 (13.5)		14 (19.0)			20 (27.1)				25 (33.9)		
Mass Moment of Inertia(3) ft²-lbm (m²-kg)	5.1 (0.21)(3)	6.5 (0.27)(3)	13 (0.55)(3)	16 (0.67)(3)	18 (0.77)(3)	33 (1.4)(3)	41 (1.7)(3)	48 (2.0)(3)	56 (2.4)(3)	97 (4.1)(3)	110 (4.8)(3)	135 (5.7)(3)
Suction Flange in. (mm)	5 (127)	6 (152)		8 (203)			10 (254)			14 (356)		
Discharge Flange in. (mm)	4 (102)		6 (152)			8 (203)				10 (254)		
Theoretical Displacement ft³/rev. (m³/rev.)	0.16653 (.004716)	0.22204 (.00624)	0.29301 (.008297)	0.36897 (.01045)	0.4558 (.01291)	0.52501 (.01487)	0.66113 (.01872)	0.79546 (.02253)	0.89857 (.02545)	0.82248 (.02329)	1.1216 (.03177)	1.4275 (.04042)
Displ. at 3550 rpm Driver Speed ft³/min (m³/hr)	591 (1004)	788 (1339)	1040 (1767)	1310 (2225)	1618 (2749)	1864 (3167)	2347 (3988)	2824 (4798)	3190 (5420)	2920 (4961)	3982 (6765)	5068 (8610)
Displ. at 2950 rpm Driver Speed ft³/min (m³/hr)	491 (835)	655 (1113)	864 (1468)	1088 (1849)	1345 (2284)	1549 (2631)	1950 (3314)	2347 (3987)	2651 (4504)	2426 (4122)	3309 (5621)	4211 (7155)
Displ. at 1750 rpm Driver Speed ft³/min (m³/hr)	291 (495)	389 (660)	513 (871)	646 (1097)	798 (1355)	919 (1561)	1157 (1966)	1392 (2365)	1573 (2673)	1439 (2445)	1963 (3335)	2498 (4244)
Displ. at 1450 rpm Driver Speed ft³/min (m³/hr)	242 (410)	322 (547)	425 (722)	535 (909)	661 (1123)	761 (1293)	959 (1629)	1153 (1960)	1303 (2214)	1192 (2026)	1626 (2763)	2072 (3517)
Capacity Control	Infinitely adjustable from 100% to aprox. 10% (15% for 2824)											
Volume Ratio	Infinitely adjustable from 5.0 to 2.2 (2824 - 4.1 to 2.0) (7)											
Max. Inlet Press. psia (bara)(4)	150.0(4) (10.3)											
Max. Outlet Press. psia (bara)(4)	414.7(4) (28.6) or 614.7(5) (42.4)											
Minimum Inlet Temp.(6) °F (°C)	-76.0(6) (-60.0)											
Maximum Inlet Temp. °F (°C)	200.0 (93.3)											
Maximum Outlet Temp. °F (°C)	300.0 (148.9)											
Maximum Temp. Dif. (Suct. to Disch.) °F (°C)	282.0 (138.9)											
Max. Bearing Oil Supply Temp. °F (°C)	230.0 (110.0)											

NOTES:

1. Contingent upon compression ratio, bearing L_{10} limitations, oil viscosity, and other operating conditions.
2. Compressor suction flow may be zero at full unload slide valve position below 1800 RPM (1200 for 355).
3. Does not include coupling. Resolved to drive shaft.
4. Standard close grain, pressure tight, grey cast iron housings.
5. ASTM A395 grade 60-40-18 ductile iron housings.
6. At compressor suction flange. Minimum evaporator temperature can be lower.
7. Available with a 1.7 - 3.0 volume ratio.

DESIGN LIMITATIONS AND MECHANICAL CHARACTERISTICS

This information is intended to be used in conjunction with CoolWare™ to establish that an application is within the operating envelope for the compressor. Consult Johnson Controls for the latest CoolWare™ version.

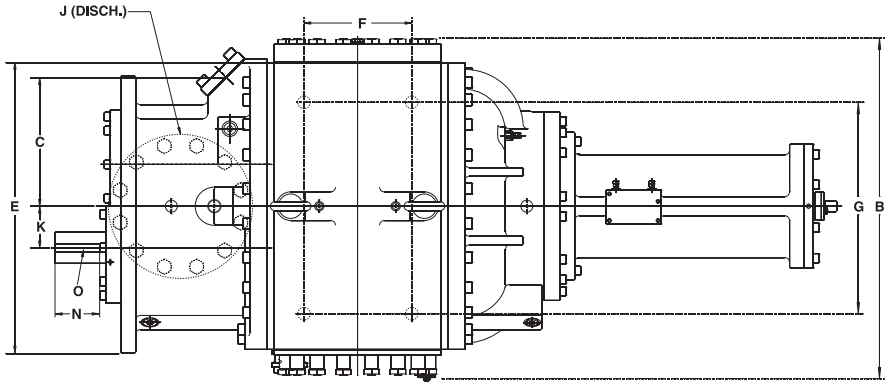
	SGXB MODELS		SGXH MODELS			
	3519	3524	3519	4013	4018	4021
Approx. Compr. Weight lb (kg)	9,715 (4,407)	10,155 (4,606)	9,715 (4,407)	14,000 (6,350)	15,500 (7,030)	16,400 (7,438)
Rotor Dia. mm	355			408		
Drive Arrangement	Directly driven by the male rotor in the clockwise direction as viewed from the driver					
Minimum Driver Speed(1)(2) RPM	600(1)(2)					
Maximum Driver Speed RPM	3,600					
Min. Breakaway Torque ft-lb (Nm)	25 (33.9)			31 (42.0)		
Mass Moment of Inertia(3) ft²-lbm (m²-kg)	135 (5.7)(3)	154 (6.5)(3)	135 (5.7)(3)	154 (6.5)(3)	214 (9.0)(3)	251 (10.6)(3)
Suction Flange in. (mm)	14 (356)			12 (305)	16 (406)	
Discharge Flange in. (mm)	10 (254)			12 (305)		
Theoretical Displacement ft³/rev. (m³/rev.)	1.4275 (.04042)	1.80316 (.05106)	1.4275 (.04042)	1.41180 (.03998)	1.95481 (.05535)	2.31319 (.06550)
Displ. at 3550 rpm Driver Speed ft³/min (m³/hr)	5,068 (8,610)	6,401 (10,875)	5,068 (8,610)	5,012 (8,515)	6,940 (11,790)	8,212 (13,952)
Displ. at 2950 rpm Driver Speed ft³/min (m³/hr)	4,211 (7,155)	5,319 (9,037)	4,211 (7,155)	4,165 (7,076)	5,767 (9,798)	6,824 (11,594)
Displ. at 1750 rpm Driver Speed ft³/min (m³/hr)	2,498 (4,244)	3,156 (5,361)	2,498 (4,244)	2,471 (4,198)	3,421 (5,812)	4,048 (6,878)
Displ. at 1450 rpm Driver Speed ft³/min (m³/hr)	2,072 (3,517)	2,615 (4,442)	2,072 (3,517)	2,047 (3,478)	2,834 (4,816)	3,354 (5,699)
Capacity Control	Infinitely adjustable from 100% to aprox. 10% (15% for 3519 & 4021; 20% for 3524)					
Volume Ratio	Infinitely adjustable from 5.0 to 2.2 (3524 - 4.5 to 2.4) (7)					Adj. from 4.3 to 2.2
Max. Inlet Press. psia (bara)(4)	150.0(4) (10.3)					
Max. Outlet Press. psia (bara)(4)	414.7(4) (28.6) or 614.7(5) (42.4)			*See Note 8*	414.7(4) (28.6) or 614.7(5) (42.4)	
Minimum Inlet Temp.(6) °F (°C)	-76.0(6) (-60.0)					
Maximum Inlet Temp. °F (°C)	200.0 (93.3)					
Maximum Outlet Temp. °F (°C)	300.0 (148.9)					
Maximum Temp. Dif. (Suct. to Disch.) °F (°C)	282.0 (138.9)					
Max. Bearing Oil Supply Temp. °F (°C)	230.0 (110.0)					

NOTES:

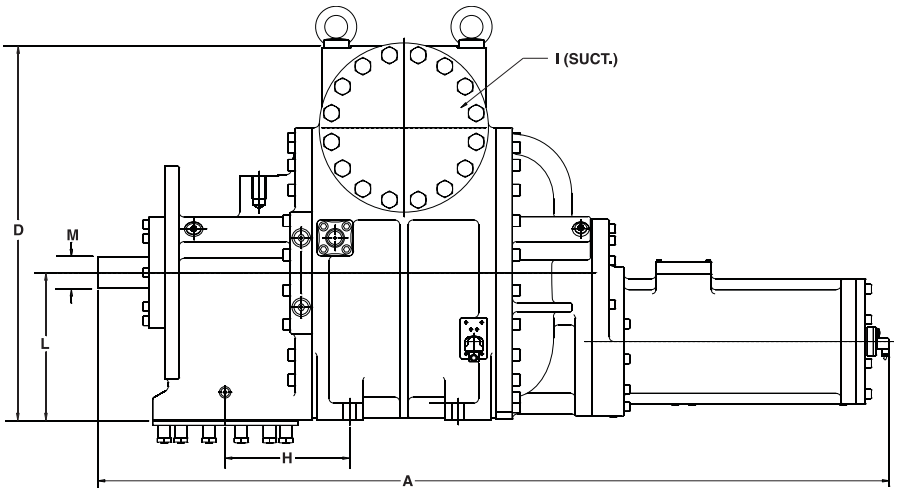
1. Contingent upon compression ratio, bearing L_{10} limitations, oil viscosity, and other operating conditions.
2. Compressor suction flow may be zero at full unload slide valve position below 1800 RPM (1200 for 355).
3. Does not include coupling. Resolved to drive shaft.
4. Standard close grain, pressure tight, grey cast iron housings. Some compressors capable of higher pressures. Consult Factory.
5. ASTM A395 grade 60-40-18 ductile iron housings.
6. At compressor suction flange. Minimum evaporator temperature can be lower.
7. Available with a 1.7 - 3.0 volume ratio.
8. SGXH 4013 design pressure is 700 psig (48.3 barg).

SGC DIMENSIONAL OUTLINE

TOP VIEW



SIDE VIEW



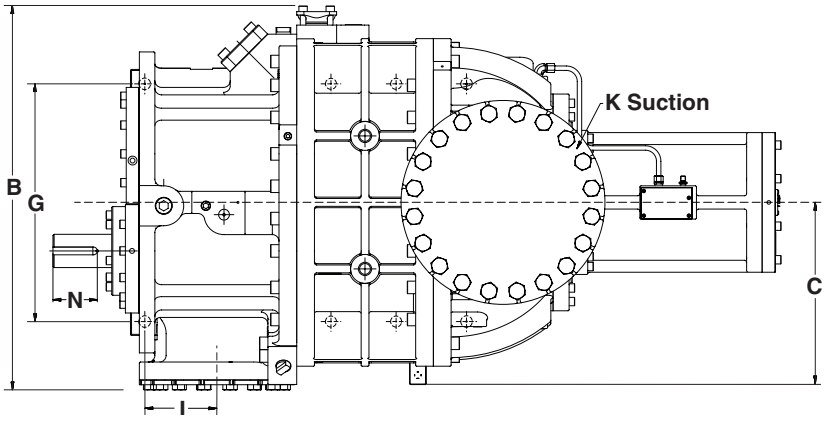
APPROXIMATE DIMENSIONS		SGC COMPRESSOR MODELS								
		1913	1918	2313	2317	2321	2813	2817	2821	2824
A	in. (mm)	56.90 (1445.3)	60.32 (1532.1)	65.18 (1655.6)	68.39 (1737.1)	78.76 (2000.6)	77.94 (1979.7)	81.84 (2078.8)	93.80 (2382.5)	98.46 (2500.9)
B	in. (mm)	27.50 (698.5)	28.04 (712.2)	28.60 (726.4)	29.83 (757.7)	29.89 (759.2)	34.71 (881.6)	35.46 (900.7)	35.53 (1346.2)	
C	in. (mm)	9.98 (253.5)		10.98 (278.8)			13.46 (341.9)			
D	in. (mm)	26.30 (668.0)	27.80 (706.1)	32.12 (815.8)	33.12 (841.2)	33.12 (841.2)	37.00 (939.8)	39.00 (990.5)		
E	in. (mm)	22.86 (580.7)		26.10 (662.9)			26.29 (667.7)			
F	in. (mm)	4.92 (125.0)	8.34 (211.8)	6.52 (165.6)	9.72 (246.9)	13.4 (340.4)	7.31 (185.7)	11.21 (284.7)	15.67 (397.9)	19.02 (483.1)
G	in. (mm)	16.54 (420.1)		20.12 (511.0)			22.00 (558.8)			
H	in. (mm)	8.19 (208.1)		9.58 (243.2)			12.88 (327.2)			
I	in. (mm)	5.00 (127.0)	6.00 (152.4)	8.00 (203.2)			10.00 (254.0)			
J	in. (mm)	4.00 (101.6)		6.00 (152.4)			8.00 (203.2)			
K	in. (mm)	2.98 (75.7)		3.60 (91.4)			4.37 (111.0)			
L	in. (mm)	11.42 (290.1)		12.87 (326.9)			15.25 (387.3)			
M	in. (mm)	2.25 (57.2)		2.50 (63.5)			3.25 (82.6)			
N	in. (mm)	3.75 (95.3)		3.81 (96.8)			5.00 (127.0)			
O	in. (mm)	.50 (12.7)		.63 (15.9)			.88 (22.2)			

NOTES:

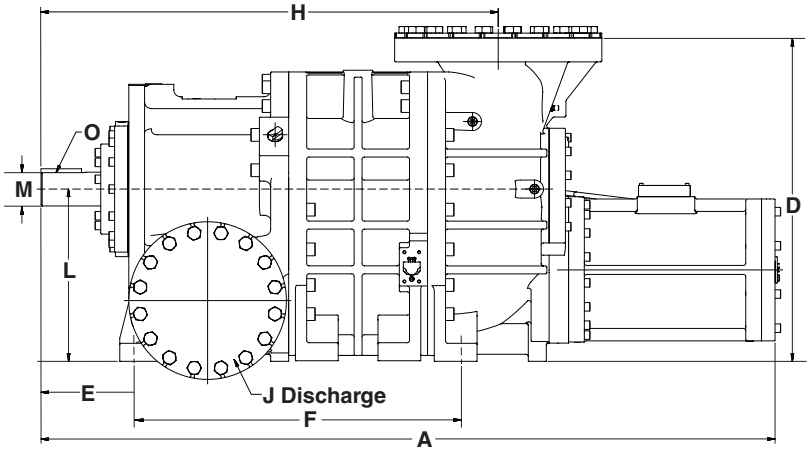
1. SGC 2817 is shown for illustrative purposes only. Configurations of other compressor sizes vary slightly.
2. Models 19xx - 28xx have an integrated suction strainer with side access on left or right.

355MM DIMENSIONAL OUTLINE

TOP VIEW



SIDE VIEW



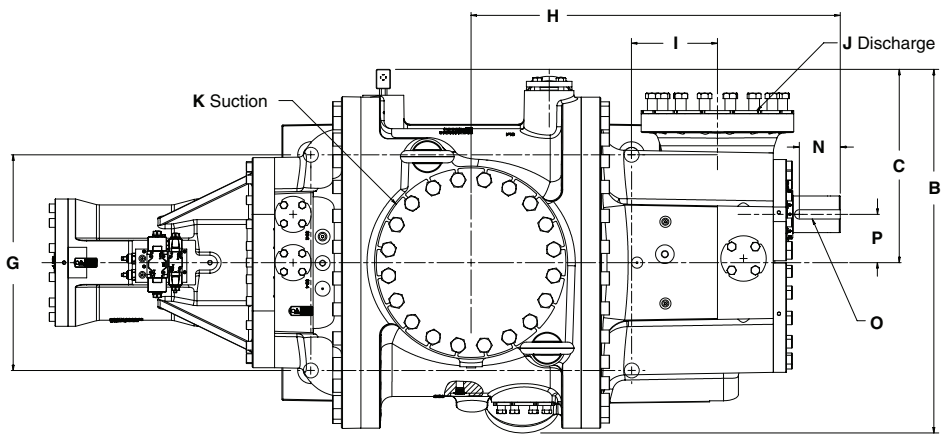
APPROXIMATE DIMENSIONS		SGCH / SGCB			SGXB		SGXH			
		3511	3515	3519	3519	3524	3519	4013	4018	4021
A	in. (mm)	81.49 (2069.7)	87.08 (2211.8)	92.68 (2353.9)		99.69 (2532.2)	92.68 (2353.9)	98.32 (2497)	106.34 (2701)	111.64 (2836)
B	in. (mm)	43.32 (1100.3)	42.07 (1068.6)					50.64 (1286)	48.88 (1242)	48.88 (1242)
C	in. (mm)	20.54 (521.8)						23.12 (587)		
D	in. (mm)	35.87 (911.2)						47.00 (1194)		
E	in. (mm)	10.36 (263.2)		10.37 (263.3)				28.06 (713)		
F	in. (mm)	36.55 (928.2)	42.14 (1070.3)	47.73 (1212.4)		54.75 (1390.6)	47.73 (1212.4)	35.10 (892)	43.13 (1096)	48.42 (1230)
G	in. (mm)	27.00 (685.8)						29.00 (737)		
H	in. (mm)	50.76 (1289.2)	56.36 (1431.3)	61.95 (1573.5)		68.97 (1751.7)	61.95 (1573.5)	47.30 (1201.4)	49.62 (1260.3)	52.27 (1327.6)
I	in. (mm)	8.13 (206.5)						11.56 (294)		
J	in. (mm)	10.00 (254.0)						12.00 (305)		
K	in. (mm)	14.00 (355.6)						12.00 (305)	16.00 (406)	
L	in. (mm)	19.12 (485.7)						26.00 (660)		
M	in. (mm)	3.75 (95.3)						4.937 (125)		
N	in. (mm)	5.00 (127.0)						5.50 (140)		
O	in. (mm)	0.875 (22.2)						1.25 (32)		
P	in. (mm)	-						6.50 (165.1)		

NOTES:

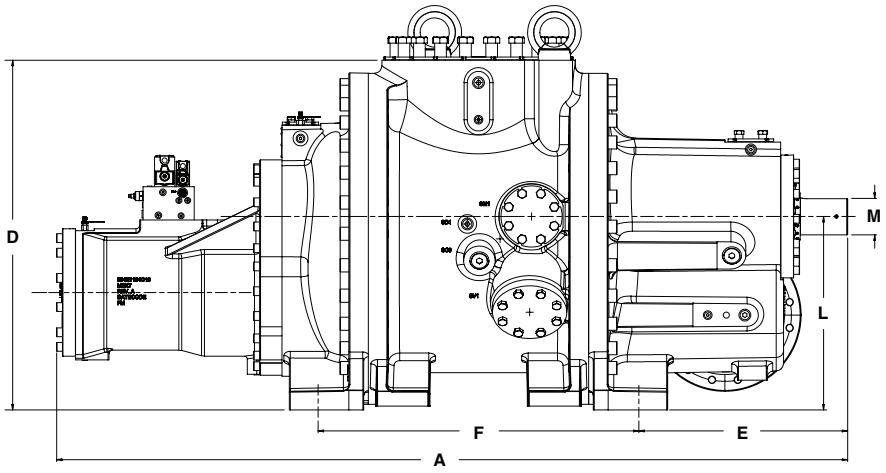
1. 3511 (p.6) and 4018 (p.7) compressors are shown for illustrative purposes only. Configurations of other compressor sizes vary slightly.
2. 355mm compressors have a side discharge arrangement. Flange is located on the right side of the outlet housing as viewed from the driver.
3. The drive end mounting holes in model 355 compressors are located inboard of the discharge flange with respect to the drive shaft.
4. Suction strainer and housing not integrated in models 35xx.

408MM DIMENSIONAL OUTLINE

TOP VIEW



SIDE VIEW



SG__ SERIES MODEL NUMBER EXPLANATION

Example: SGXH 3519

SG X H 35 19

HOUSING MATERIAL

SG - Grey Cast Iron MSK-2 *or* Ductile Cast Iron MSK-7

(Model/Series: SGC, SGCB, SGCH, SGXB, SGXH)

ROTOR BLOCKING DIAMETER CONFIGURATION

X - Squeeze Film Damper
C - Conventional Clearance

AXIAL BEARING TYPE (mm)

B - QJ or 4-point Ball Bearings
H - Angular Contact Ball Bearings

ROTOR LENGTH DESIGNATION

11
13
15
17
18
19
21
24

ROTOR LENGTH ÷ DIAMETER x 10

(Measured In Decimeters)

Model Numbers By Rotor Sizing: 1913, 1918, 2313, 2317, 2321, 2813, 2817, 2821, 2824, 3511, 3515, 3519, 3524, 4013, 4018, 4021

ROTOR DIAMETER

19 - 193mm
23 - 233mm
28 - 283mm
35 - 355mm
40 - 408mm

Form 070.650-SPC (2014-11)
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