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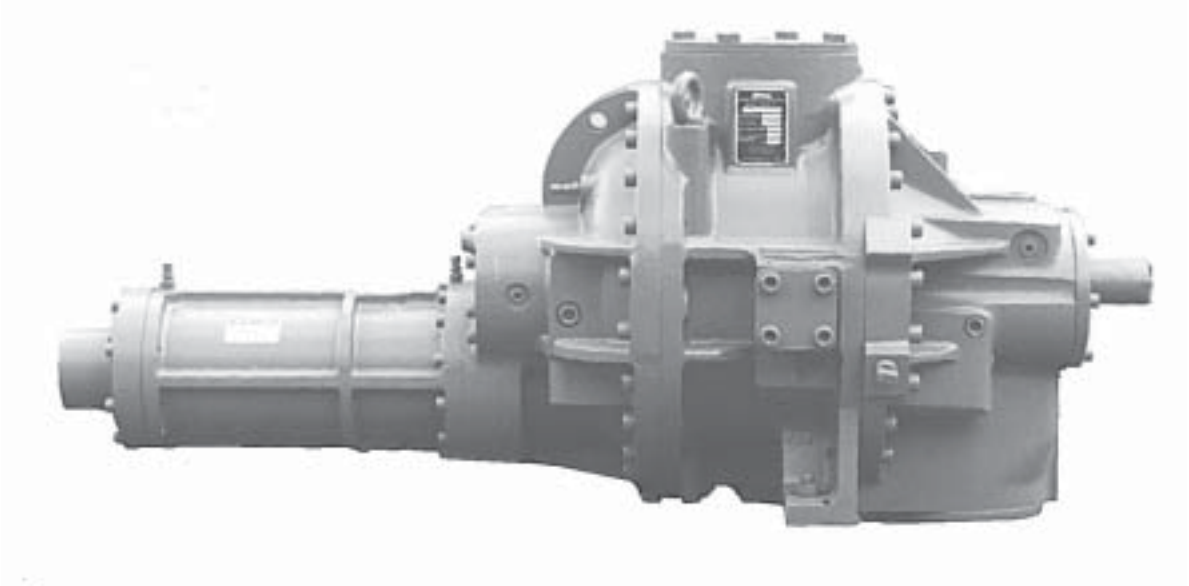
ROTARY SCREW COMPRESSORS
Models TDSH 163 through 355



SPECIFICATIONS

The Frick TDSH screw compressor is 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 or manually actuated slide valve moves axially along the rotor mesh line to provide unloading down to approximately 10% of full load capacity for models 163—283 and approximately 20% for model 355. Unloaded gas is bypassed back to suction before compression has begun, allowing the compressor to efficiently accommodate system requirements.

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

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, L10 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.

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.

Made in the USA - The entire compressor is designed and built by Frick in Waynesboro, PA. 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

Castings - ASTM A48 class 40 gray cast iron or equivalent is standard for pressure-retaining parts. Suction and discharge flanges comply with ANSI B16.1. A 150 class suction is standard on 163–283 sizes. A 300 class suction is standard on the 355 and is optional on all other models. A 300 class discharge flange is standard on all models. An alternate casing material is ASTM A536 grade 65-45-12 ductile (nodular) iron. ASTM A352 grade LCB cast steel is available for all models in this publication excluding 283SX and 355U.

Rotors - AISI 1141 low carbon steel. The 163 through 233 rotors are machined from hot-rolled bar stock. The 283 and 355 rotors are forgings.

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 - AISI 1141 low carbon steel.

Slide Valve Indicator Rod - Type 416 stainless steel.

Slide Stop Indicator Rod - Type 304 stainless steel.

Pistons, Spacers, Etc. - Gray cast iron, A516 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 (Ni-resist) floating seat. The assembly is fully balanced and capable of sealing up to 350 PSIG but 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-22 (HCFC)				Ammonia (R-717, 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
163S	122	429	138	103	126	443	146	109	0.359	0.423	31	23
163L	154	540	174	130	159	559	184	137	0.452	0.533	38	29
193S	206	724	229	171	213	749	235	175	0.644	0.759	47	35
193L	275	965	306	228	284	999	314	234	0.859	1.013	62	47
233S	365	1284	399	298	384	1351	410	306	1.000	1.178	82	61
233L	460	1617	503	375	483	1699	517	386	1.385	1.632	104	78
233XL	568	1998	621	463	598	2103	638	476	1.711	2.016	128	96
283S	654	2301	715	533	688	2420	736	549	1.990	2.344	149	111
283L	824	2897	901	672	866	3046	926	691	2.506	2.952	187	140
283SX	991	3486	1084	808	1044	3673	1117	833	3.015	3.552	225	168
355S	1014	3566	1142	852	1066	3748	1169	872	3.191	3.759	233	174
355L	1383	4863	1558	1162	1453	5111	1594	1189	4.352	5.127	318	237
355XL	1760	6190	1982	1478	1850	6505	2032	1515	5.539	6.525	405	302
355U	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.979	8.230	510	381

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-22 ratings based on 20°F (-6.7°C) suction and 95°F (35°C) condensing with 10°F(5.5°C) liquid subcooling and10°F(5.5°C) suction superheat 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 at 3550 RPM.

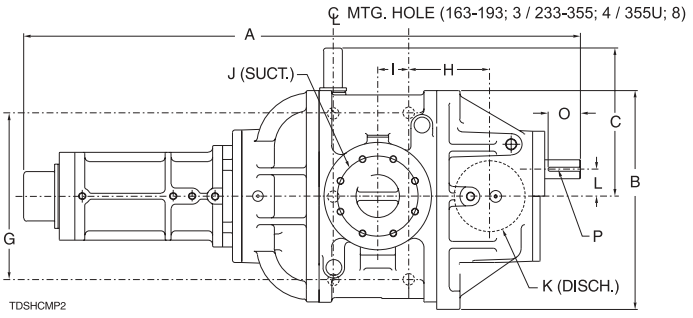
4. Natural gas ratings based on 25 PSIA (172 kPaA), 80°F (27°C) suction and 75 PSIA (517 kPaA) discharge at 1750 RPM.

DESIGN LIMITATIONS AND MECHANICAL CHARACTERISTICS

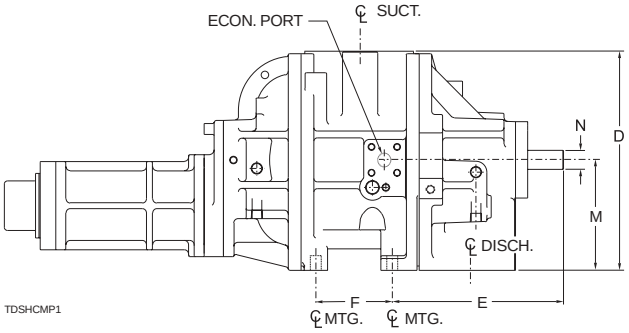
	COMPRESSOR MODEL													
	163S	**163L**	**193S**	**193L**	**233S**	**233L**	**233XL**	**283S**	**283L**	**283SX**	**355S**	**355L**	**355XL**	**355U**
Approx Compr. Wt. lb (kg)	1220 (555)	1280 (580)	1720 (780)	1895 (860)	2670 (1210)	2950 (1340)	3300 (1500)	4100 (1860)	4400 (2000)	4700 (2136)	7200 (3400)	8240 (3740)	9200 (4172)	10,200 (4625)
Rotor Dia. mm	163		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													
Maximum Driver Speed RPM	4500							3600						
Max. Input Power to Rotor Shaft BHP (KW)	250 (186)		450 (336)		750 (559)			1400 (1044)			3500 (2609)			
Min. Breakaway Torque ft-lb (Nm)	7 (9.5)		10 (13.5)		14 (19.0)			20 (27.1)			25 (33.9)			
Mass Moment of Inertia[3] ft^2-lb_m (m^2-kg)	2.2 (.093)	2.7 (.11)	5.1 (.21)	6.5 (.27)	13 (.55)	16 (.67)	18 (.77)	33 (1.4)	41 (1.7)	48 (2.0)	97 (4.1)	110 (4.8)	135 (5.7)	154 (6.5)
Suction Flange in. (mm)	4 (102)		5 (127)	6 (152)		8 (203)	10 (254)				14 (356)			
Discharge Flange in. (mm)	3 (76)		4 (102)		6 (152)			8 (203)			10 (254)			
Theoretical Displacement ft^3/rev. (m^3/rev.)	.10069 (.002851)	.12679 (.003590)	.16653 (.004716)	.22204 (.006240)	.29301 (.008297)	.36897 (.01045)	.45580 (.01291)	.52501 (.01487)	.66113 (.01872)	.79546 (.02253)	.82248 (.02329)	1.12160 (.03177)	1.42750 (.04042)	1.80316 (.05106)
Displ. at 3550 rpm Driver Speed ft^3/min (m^3/hr)	357 (607)	450 (765)	591 (1004)	788 (1339)	1040 (1767)	1310 (2225)	1618 (2749)	1864 (3167)	2347 (3988)	2824 (4798)	2920 (4961)	3982 (6765)	5068 (8610)	6401 (10,875)
Displ. at 2950 rpm Driver Speed ft^3/min (m^3/hr)	297 (505)	374 (636)	491 (835)	655 (1113)	864 (1468)	1088 (1849)	1345 (2284)	1549 (2631)	1950 (3314)	2347 (3987)	2426 (4122)	3309 (5621)	4211 (7155)	5319 (9037)
Displ. at 1750 rpm Driver Speed ft^3/min (m^3/hr)	176 (299)	222 (377)	291 (495)	389 (660)	513 (871)	646 (1097)	798 (1355)	919 (1561)	1157 (1966)	1392 (2365)	1439 (2445)	1963 (3335)	2498 (4244)	3156 (5361)
Displ. at 1450 rpm Driver Speed ft^3/min (m^3/hr)	146 (248)	184 (312)	242 (410)	322 (547)	425 (722)	535 (909)	661 (1123)	761 (1293)	959 (1629)	1153 (1960)	1192 (2026)	1626 (2763)	2072 (3517)	2615 (4442)
Capacity Control	Infinitely adjustable from 100% to aprox. 10% (20% for 355) by piston- or handwheel-actuated slide valve													
Volume Ratio	Infinitely adjustable from 5.0 to 2.2 (283SX - 4.15 to 2.2)													
Max. Inlet Press. psia (bara)	150.0 (10.3)													
Max. Outlet Press. psia (bara)	362.0 (25.0)													
Minimum Inlet Temp.[4] °F (°C)	-76.0 (-60.0)													
Maximum Inlet Temp. °F (°C)	200.0 (93.3)													
Maximum Outlet Temp. °F (°C)	250.0 (121.1)													
Maximum Temp. Dif. (Suct. to Disch.) °F (°C)	250.0 (138.9)													
Max. Bearing Oil Supply Temp. °F (°C)	230.0 (110.0)													

1. Contingent upon compression ratio, bearing L10 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. At compressor suction flange. Minimum evaporator temperature can be lower.

ROTARY SCREW COMPRESSORS
MODELS TDSH 163 THROUGH 355



TOP VIEW



SIDE VIEW

DIMENSIONAL OUTLINE

APPROXIMATE DIMENSIONS		COMPRESSOR MODEL													
		163S	**163L**	**193S**	**193L**	**233S**	**233L**	**233XL**	**283S**	**283L**	**283SX**	**355S**	**355L**	**355XL**	**355U**
A	**in.**	49.60	51.85	58.23	61.65	66.52	69.72	74.36	71.95	75.85	80.31	84.81	90.39	95.99	102.96
	(mm)	(1260)	(1317)	(1479)	(1566)	(1690)	(1771)	(1889)	(1828)	(1927)	(2039)	(2154)	(2296)	(2438)	(2615)
B	**in.**	20.39		22.76		25.00			29.50			38.47			36.94
	(mm)	(518)		(578)		(635)			(749)			(977)			(938)
C	**in.**	13.81		14.75		16.13		16.25	18.43			21.67			
	(mm)	(351)		(375)		(410)		(413)	(468)			(550)			
D	**in.**	21.46	20.32	24.02	22.68	26.72	25.63	26.72	28.75			35.88			
	(mm)	(545)	(516)	(610)	(576)	(679)	(651)	(679)	(730)			(911)			
E	**in.**	15.87		18.82		20.97			18.30			10.36			10.32
	(mm)	(403)		(478)		(533)			(465)			(263)			(262)
F	**in.**	4.84	7.09	6.10	9.52	6.52	9.72	13.4	22.84	26.74	31.19	36.55	42.13	47.73	21.00
	(mm)	(123)	(180)	(155)	(242)	(166)	(247)	(340)	(580)	(679)	(792)	(928)	(1070)	(1212)	(533)
G	**in.**	14.96		16.54		20.12			22.24			27.00			28.50
	(mm)	(380)		(420)		(511)			(565)			(686)			(724)
H	**in.**	7.44		8.19		9.58			5.12			8.13			12.25
	(mm)	(189)		(208)		(243)			(130)			(207)			(311)
I	**in.**	1.89	2.99	2.44	4.17	3.26	4.86	6.70	24.21	28.11	32.56	40.40	45.98	51.58	38.22
	(mm)	(48)	(76)	(62)	(106)	(83)	(123)	(170)	(615)	(714)	(827)	(1026)	(1168)	(1310)	(971)
J	**in.**	4.00		5.00	6.00		8.00	10.00				14.00			
	(mm)	(102)		(127)	(152)		(203)	(254)				(356)			
K	**in. (mm)**	3.00 (76)		4.00 (102)		6.00 (152)			8.00 (203)			10.00 (254)			
L	**in. (mm)**	2.52 (64)		2.98 (76)		3.60 (91)			4.37 (111)			5.47 (139)			
M	**in. (mm)**	10.24 (260)		11.42 (290)		12.88 (327)			15.25 (387)			19.12 (486)			
N	**in. (mm)**	1.75 (44)		2.25 (57)		2.50 (64)			3.25 (83)			3.75 (95)			
O	**in. (mm)**	3.00 (76)		3.75 (95)		3.81 (97)			5.00 (127)			5.00 (127)			
P	**in. (mm)**	.38 (10)		.50 (13)		0.63 (16)			.88(22)			0.88 (22)			

Notes:
1. A TDSH163 is shown for illustrative purposes only. Configurations of other compressor sizes vary slightly.
2. The economizer port in model 233-355 compressors is located on the outlet housing.
3. The suction flange on model 283 and 355 compressors is located on the inlet housing.
4. 355 size compressors have a side discharge arrangement. The flange is located on the right side of the outlet housing as viewed from the driver.
5. The drive-end mounting holes in model 355 compressors are located inboard of the discharge flange with respect to the drive shaft.

YORK Refrigeration Systems
100 CV Avenue, P.O. Box 997 Waynesboro, Pennsylvania USA 17268-0997
Phone: 717-762-2121 • Fax: 717-762-8624 • www.frickcold.com