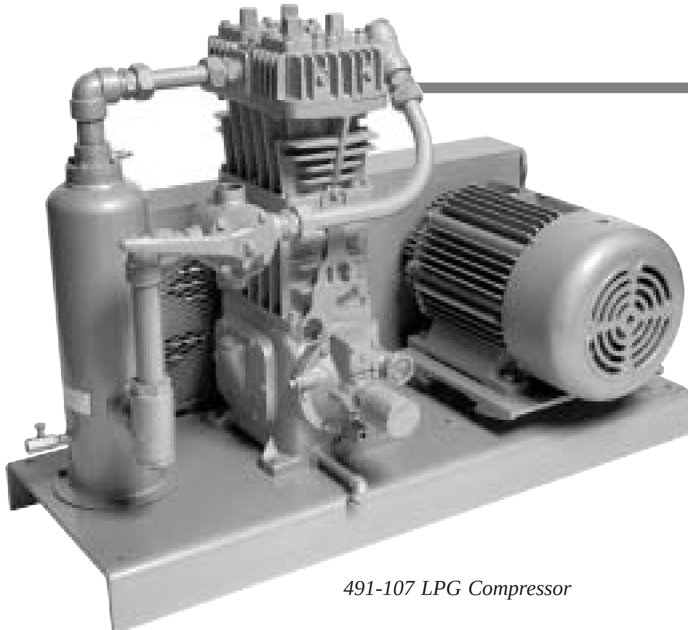
LPGC100

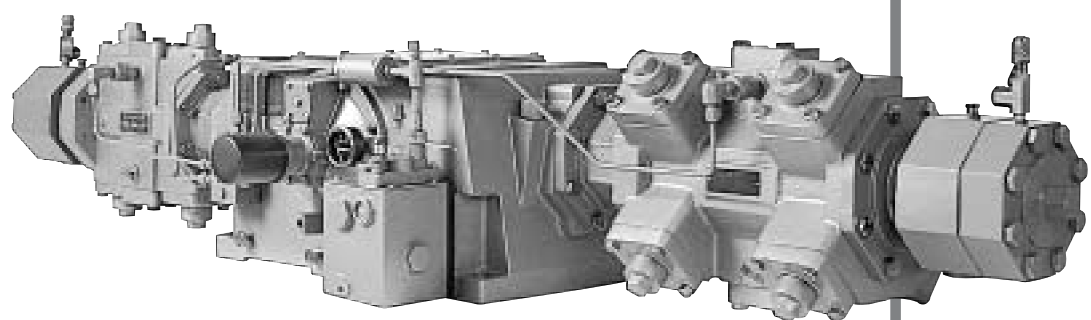
LPG Compressors

Sales Catalog



491-107 LPG Compressor

D891 LPG Compressor



HG601 LPG Horizontal Compressor

Solutions beyond products...

CORKEN®
IDEX

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What is a Corken LPG Compressor?

Corken LPG gas compressors are part of the reciprocating compressor family. Reciprocating compressors pull vapor into a cylinder through a suction valve by drawing back a piston to create a low pressure area in the cylinder. They pressurize the gas by pushing the piston back up into the cylinder to squeeze the gas out through the discharge valve. Figure 1, page 4 shows a cutaway view of an LPG gas compressor.

A compressor ***valve*** consists of four parts: a seat, bumper, disc and spring. The spring rests against a bumper and pushes the disc against the seat. The disc seals off the flow passage through the seat. If more pressure builds up on the seat side than the bumper side, the disc will be forced away from the seat and gas will flow through the valve, see figure 2, page 6. The suction valves are also equipped with a small ball and spring relief valve which is designed to relieve any condensation that takes place within the compressor ***cylinder***. The liquid relief valve is not intended to relieve liquid that enters the cylinder through the suction valve. This liquid would be handled by a liquid trap.

LPG / NH_3 Compressors

Reciprocating

Piston type

Single packed

High reliability

Easy maintenance

Vertical and horizontal machines

Single and double acting compression

Bulk transfer

Liquid transfer vapor recovery

Flow range: 4 (6.8) – 414 cfm (703.5 m^3/hr)

Driver range: 7.5 (5.6) – 75 hp (55 kW)

Connections: NPT or 300# ANSI

In order for compression to take place, the ***piston*** must be sealed against the cylinder wall. This seal is made with several ***piston rings***. Since LPG compressors must not be contaiminated by lubricating oils, the piston ring must be made of a self lubricating material. Corken standard piston rings are made of glass-filled Teflon®[1]. Gas pressure in the cylinder is used to press the piston rings against the cylinder wall, see figure 3, page 6. ***Ring expanders*** are used to push the rings towards the cylinder wall so high pressure gas may flow behind the rings.

Piston rings form a good dynamic seal but they are not tight enough to seal all the pressure and gas inside the cylinder; an additional seal is required to do this. This seal is the ***piston rod packing***. The piston rod packing is a seal that is located at the bottom of the cylinder. It is composed of several parts, the most important being the self-lubricating Teflon®[1] ***V-rings*** that tightly seal against the piston rod. A spring is included in the packing assembly which allows a slight amount of "float" to reduce friction. The rod packing also seals oil in the crancase out of the compression chamber to prevent contamination of the gas.

Corken standard LPG and NH_3 comrpessors contain one set of piston rod packing per rod. The compressor line is sometimes refered to as single packed or plain style. One set of packing controls leakage and oil contamination of the vapor to a satisfactory level for most commercial LPG/NH_3 applications. When leakage and contamination must be held to an absolute minimum, two or three packings sets separated by a distance piece may be utilized. See our I-Series Industrial Compressor sales brochure (Item I100) for more information on these double (D-style) and tripple (T-style) packed gas compressors.

The ***crankcase***, ***connecting rod*** and ***crosshead***, convert rotary motion from the motor to reciprocating motion at the pistion. All Corken compressors, except the model 91, use an ***oil pump*** to pressure lubricate the bearings and wrist pins to assure long service life. The oil pump is a gear type that may be run in either direction; for this reason Corken compressors may be run in either direction.

[1]*Teflon is a registered trademark of the DuPont company.*

Threaded and ANSI flanges:
Compressors are available in either threaded NPT, ANSI, or DIN flanged connections.

High-efficiency valves:
Corken valves offer quiet operation and high durability in oil-free gas applications. Specially designed suction valves which tolerate small amounts of condensate are available.

O-ring head gaskets:
Easy to install O-ring head gaskets providing highly reliable seals.

Ductile-iron construction:
All cylinders and heads are ductile iron for maximum thermal shock endurance.

Self-lubricating Teflon®[1] piston rings:
Corken provides a variety of state-of-the-art piston ring designs to provide the most cost-effective operation of compressors for non-lube service. The step-cut design provides higher efficiencies during the entire life of the piston ring.

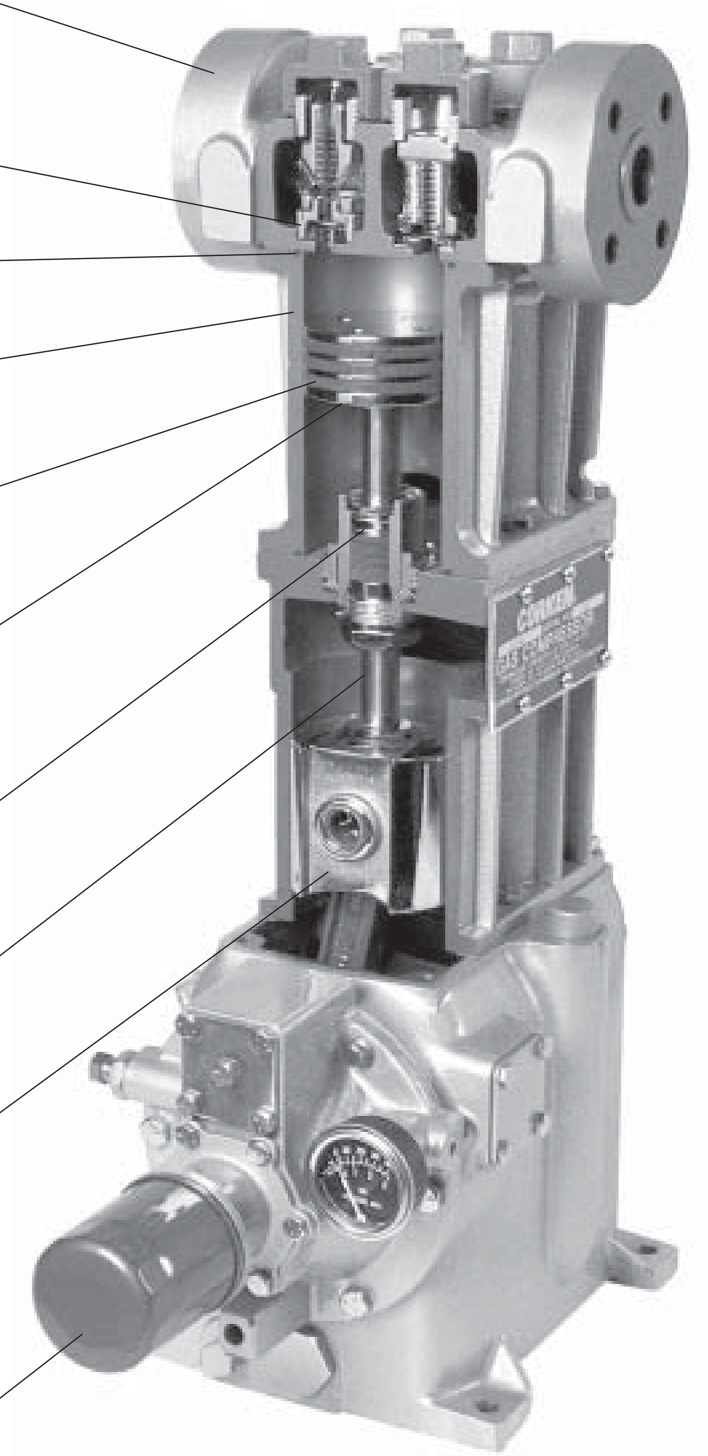
Positively locked piston:
Simple piston design allows end clearance to be precisely set to provide maximum efficiency and long life.

Self-lubricating piston rod seals:
Seals constructed of Teflon®[1] incorporating special fillers to ensure no oil carry over and maximize leakage control. Spring loaded seal design self adjusts to compensate for normal wear.

Nitride-coated piston rods:
Impregnated nitride coating provides superior corrosion and wear resistance.

Cast-iron crosshead:
Durable cast-iron crossheads provide superior resistance to corrosion and galling.

Pressure-lubricated crankcase with filter:
Self-reversing oil pump ensures proper lubrication regardless of directional rotation to main and connecting rod bearings. Standard 10-micron filter ensures long-lasting bearing life (not available on Model 91).



Model F291 Compressor

Figure 1

[1]*Teflon® is a registered trademark of the DuPont company.*

Markets Served by Corken LPG Compressors

Corken LPG gas compressors are designed for use in liquid tranfer, vapor recovery, scavenger applications, tank evaucations and portable applications for the LPG and agricultural ammonia industries. Whether it is gas recovery from cylinders or barge unloading, Corken has a compressor for your application. Our compressors are also used in many industrial applications with a few modifications to the compressor packing arangement. Contact the factory for information on moving gases other than LPG and NH_3.

Liquid Transfer / Vapor Recovery

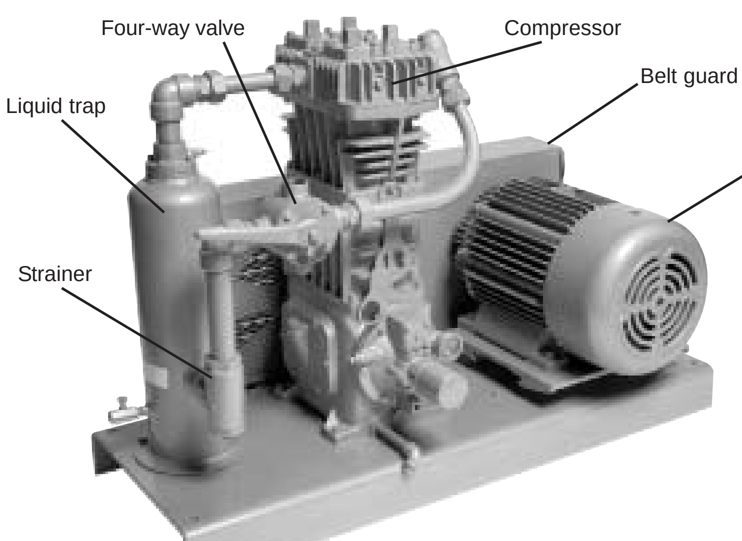
The most flexible method for moving liquid propane, butane and ammonia is with a compressor, a device designed to handle vapor and vapor only. How is this done? Any fluid, vapor or gas, may be moved by creating a different pressure between two points. A compressor may be used to create a pressure difference between the vapor spaces of two tanks. If the liquid spaces of the two tanks are connected, the pressure difference exerted by the vapor will cause the liquid to begin flowing from the higher pressure tank to the lower pressure tank (see figure 4, page 7).

Changes in internal pressure of a propane tank will result in condensation and boiling. Condensation and boiling will tend to negate the pressure difference created by the compressor. Liquid transfer using a compressor works because vapor may be moved more quickly that it boils off and condenses. The flow rate induced will equal the volume of gas discharged from the compressor if a large enough compressor is chosen to make the effect of boiling and condensation negligible. The pressure increase through the compressor will equal the pressure decrease due to friction in the liquid piping. Years of experience have shown that piping designed to create a pressure drop of 30 psi or less works best. Higher pressure drops result in more condensation and boiling and reduce the flow rates due to reduced discharge volume.

Compressors may also be used to evacuate tanks. High pressure propane vapor in a large tank has substantial economic value that makes it worth recovering. Tanks that must be unloaded through a dip tube (such as most railcars) leave a small liquid heel in the tank when liquid transfer is complete. A compressor can be used to reduce the pressure in the tank to boil the heel into recoverable vapor. The vapor recondenses when it is fed into the liquid section of another propane tank (see figure 5, page 7).

Corken LPG transfer compressors are the standard of the industry. Models 91, 291 and 491 are popular for truck and small railcar unloading. The model 691 is suitable for unloading large railcars. Corken horizontal compressors and the vertical double-acting D891 compressor are used for unloading barges or several railcars at a time.

Refer to the “Compressor Selection” section on page 14 of this sales catalog to determine the correct compressor for your application.



Model 491-107 compressor

Primary Markets

LPG bulk transfer

Tank evacuation

Vapor recovery

Barge unloading

Tank/railcar unloading

Agricultural ammonia

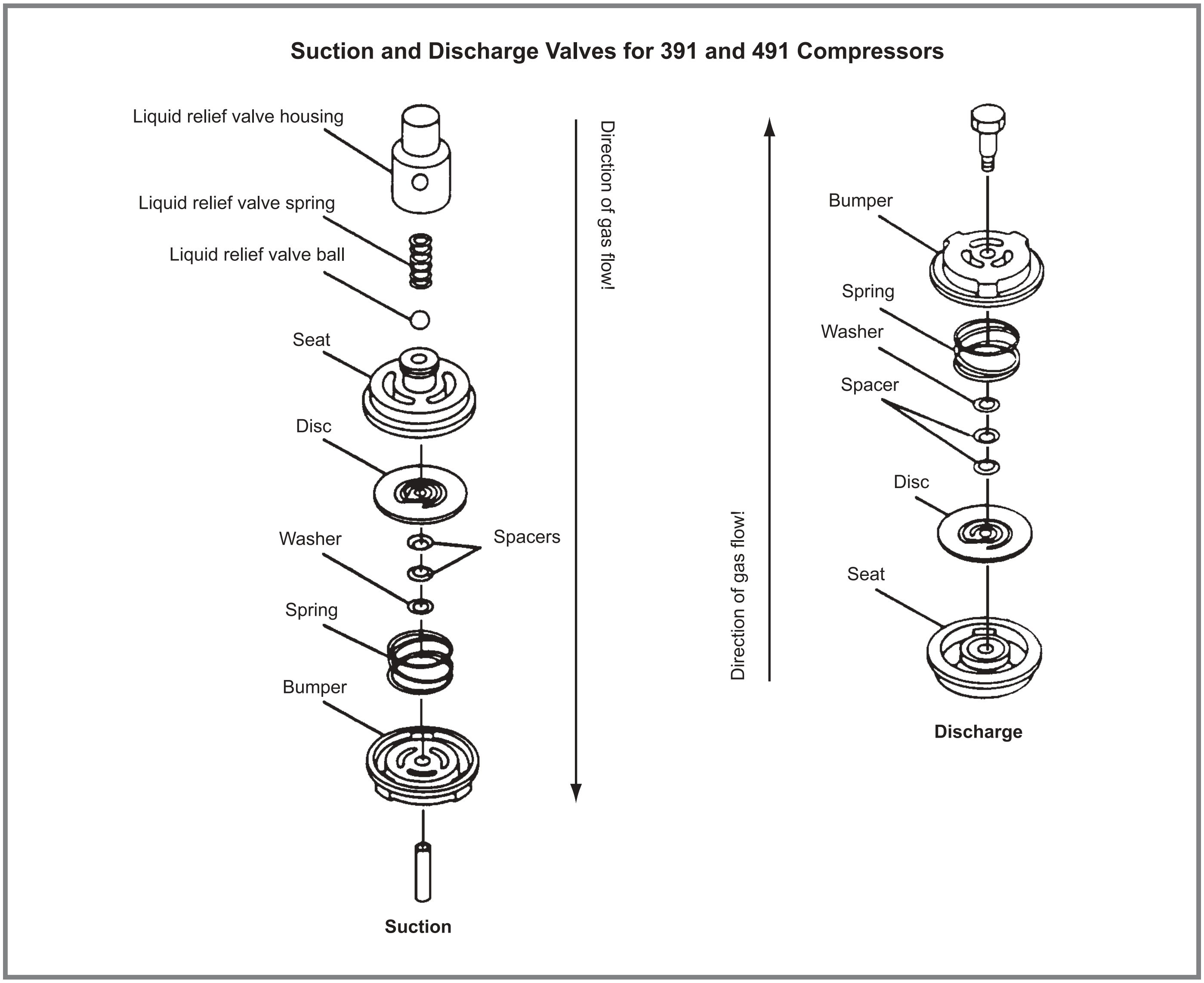


Figure 2

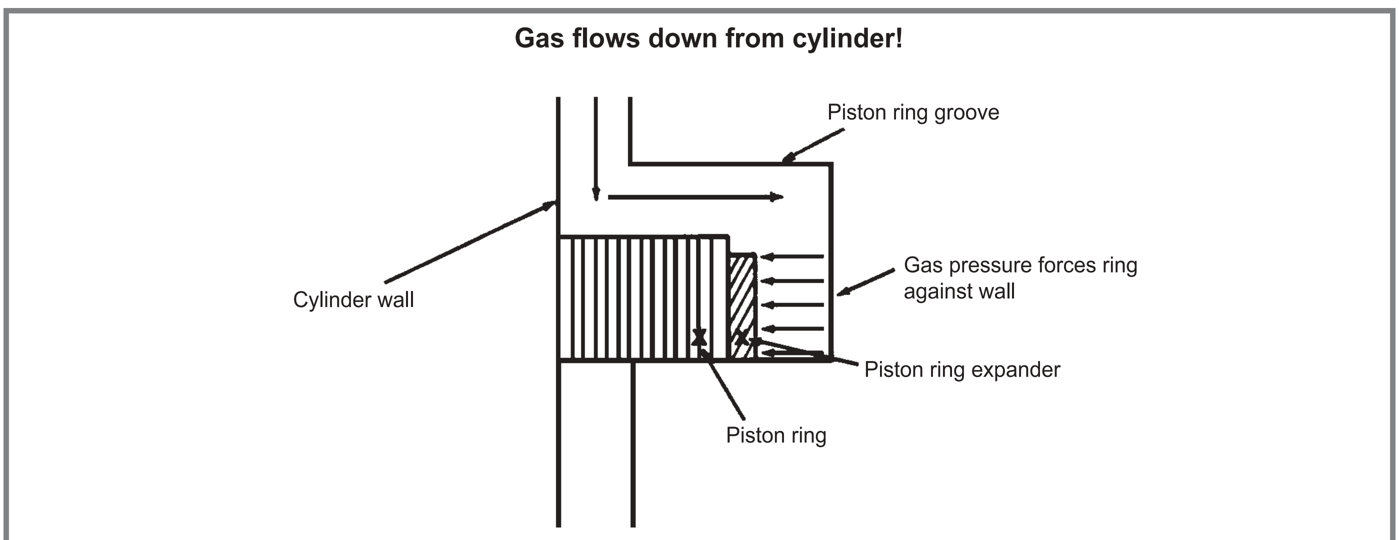


Figure 3

Liquid Transfer

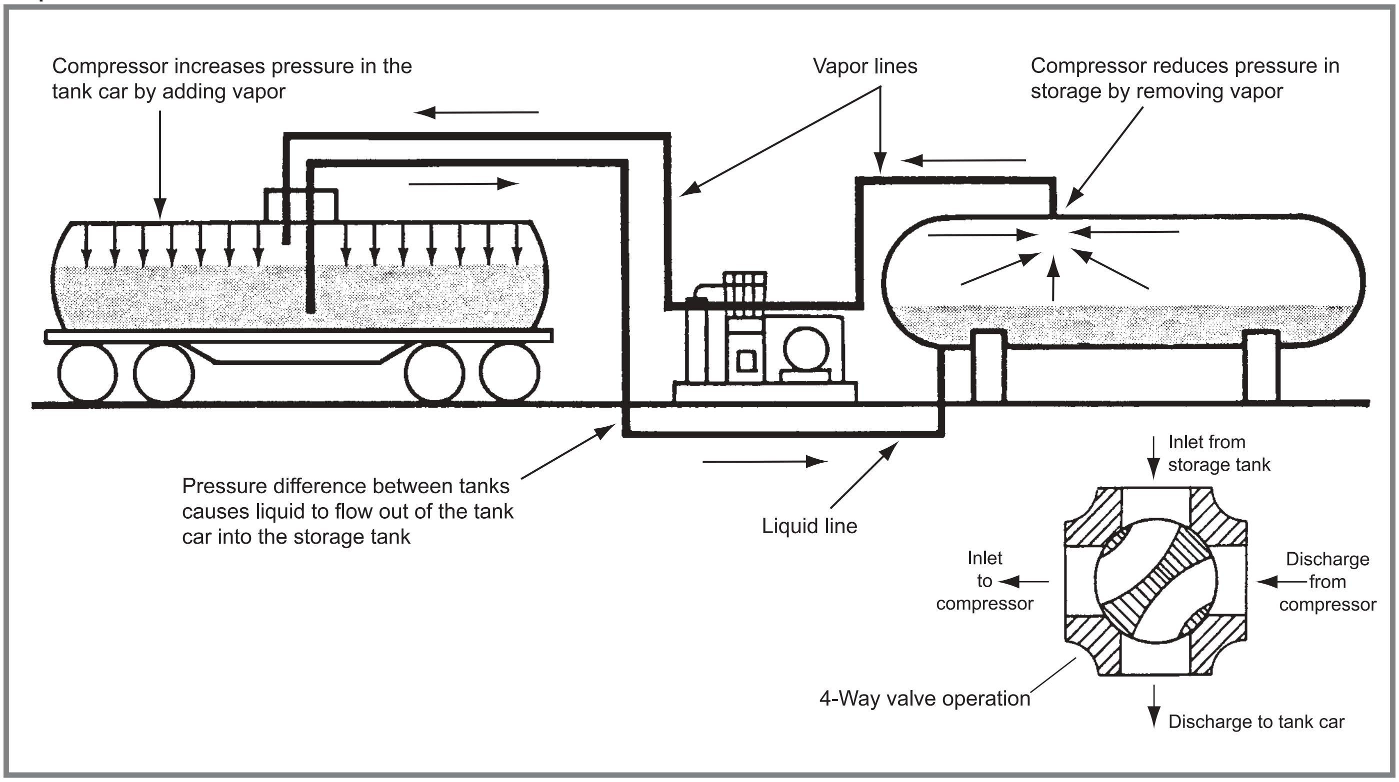


Figure 4

Vapor Recovery

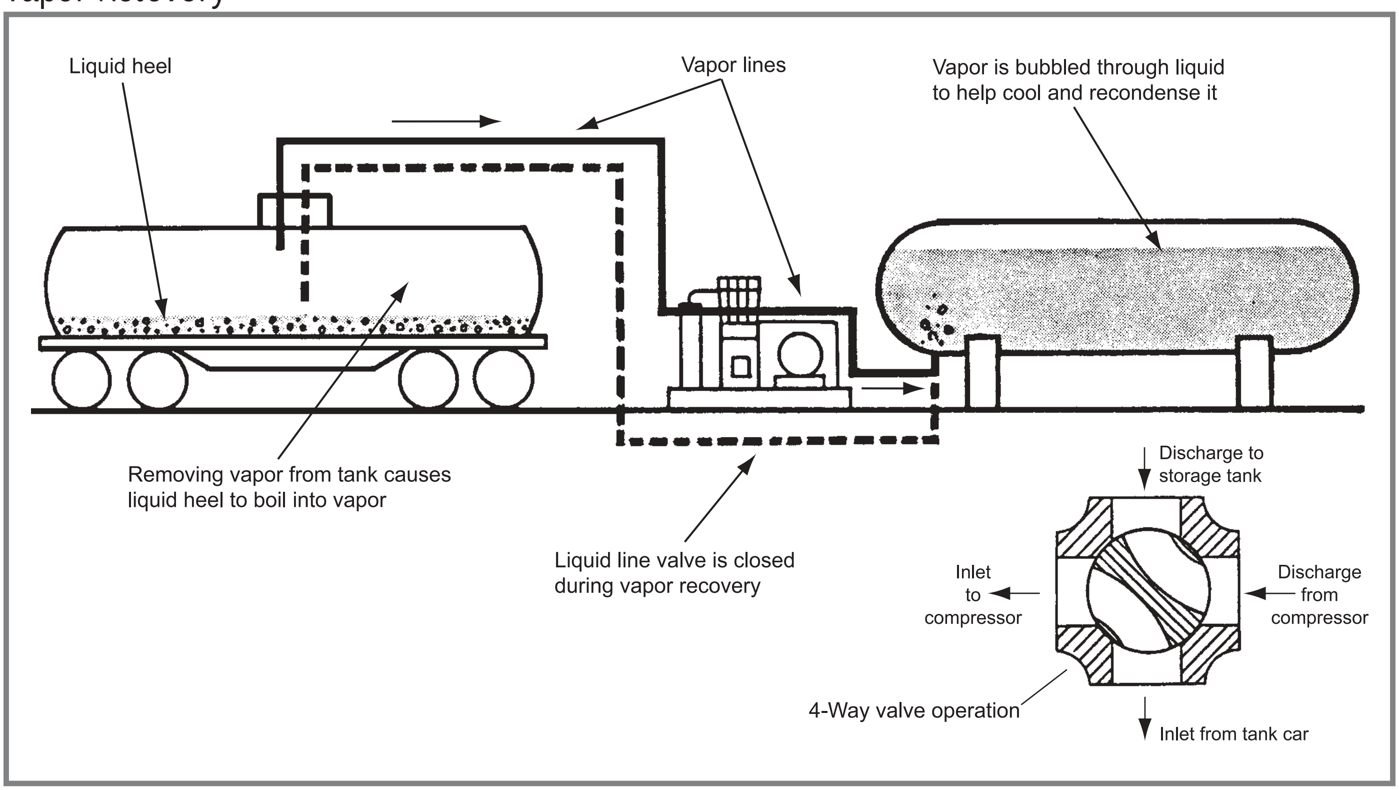


Figure 5

Vertical Single-Acting Compressor Features & Specifications

Models 91–691

Equipment Type & Options

Single-acting, vertical, reciprocating piston type vapor compressor
Single packed rod (D- & T-styles optional)
NPT or 300# ANSI connections

Applications

Bulk transfer
Vapor recovery
Tank evacuation
Gas scavenger

Features & Benefits

Self-lubricating piston rings:	Non-lubricated operation to minimize oil in gas
NPT or 300# ANSI connections:	Versatility for your application
Multiple mounting configurations:	Versatility for your application
High efficiency valves:	Quiet, reliable operation
Reversible oil pump:	Allows operation in either direction
Simplified top down design:	Routine maintenance is minimally invasive

Operating Specifications

Specifications \ Model	91	291	491	691
Bore of cylinder inches (mm)	3.0 (76.2)	3.0 (76.2)	4.0 (101.6)	4.5 (114.3)
Stroke inches (mm)	2.5 (63.5)	2.5 (63.5)	3.0 (76.2)	4.0 (101.6)
Piston displacement cfm (m^3/hr)				
minimum @ 400 RPM	4.0 (6.8)	8.0 (13.06)	17.2 (29.2)	29.2 (49.6)
maximum @ 825 RPM	8.3 (14.1)	16.5 (28.0)	35.5 (60.3)	60.2 (102.3)
Maximum working pressure psig (bar g)	350 (24.1)			
Maximum brake horesepower (kW)	7.5 (5.6)	15 (11)	15 (11)	35 (26.1)
Maximum rod load lb (kg)	3,600 (1,632.9)	3,600 (1,632.9)	4,000 (1,814.4)	5,500 (2,494.8)
Maximum outlet temperature °F (°C)	350 (177)			
Bare unit weight lb (kg)	115 (52.2)	160 (72.6)	260 (117.9)	625 (283.5)
Maximum flow—propane gpm (m^3/hr)	50 (11.4)	101 (22.9)	215 (48.8)	361 (82.0)

Models 91–691 Material Specifications

Part	Model	Standard Material	Model	Optional Material
Head, cylinder	All	Ductile iron ASTM A536		None
Crosshead guide Crankcase, flywheel Bearing carrier	All	Gray iron ASTM A48, Class 30		None
Flange	691	Ductile iron ASTM A536	691	Steel weld flange
Valve seat & bumper	91, 291	17-4 PH stainless steel		None
	491	Ductile iron ASTM A536		
	691	17-4 PH stainless steel		
Valve plate	91, 291	410 stainless steel		None
	491	17-7 PH stainless steel		
	691	Steel		
Valve spring	91, 291, 691	17-7 PH stainless steel		None
	491	Inconel		
Valve gaskets	All	Soft aluminum	All	Iron-lead
Piston	All	Gray iron ASTM A48, Class 30		none
Piston rod	All	C1050 steel Nitrotec coated	All	Chrome oxide
Crosshead	All	Gray iron ASTM 48, Class 30		None
Piston rings	All	Teflon®[1], glass and moly filled	All	Alloy 50
Ring expanders	All	302 stainless steel		None
Head gasket	All	O-ring, Buna-N	All	Teflon®[1], Viton®[1], Neoprene®[1]
Adapter plate				
Packing cartridge Connecting rod Packing rings	All All	Ductile iron ASTM A536 Teflon®[1], glass and moly filled	 All	None Alloy 50
Crankshaft	All	Ductile iron ASTM A536		None
Con. rod bearing	All	Bimetal D-2 Babbit		None
Wrist pin	All	C1018 steel		None
Wrist pin busing	All	Bronze SAE 660		None
Main bearing	All	Tapered roller		None
Inspection plate	All	Aluminum		None
O-rings	All	Buna-N	All	Teflon®[1], Viton®[1], Neoprene®[1]
Retainer rings	All	Steel		None
Misc. gaskets	All	Coroprene		None

[1] *Teflon®, Viton® and Neoprene® are registered trademarks of the DuPont company.*

Vertical Double-Acting Compressor Features & Specifications

Model D891

Equipment Type & Options

Double-acting, vertical, reciprocating piston type vapor compressor
Double packed rod
Slip-on weld connections

Applications

Bulk transfer
Truck, tank, railcar, barge unloading
LTVR and scavenger applications
Emergency evacuation

Features & Benefits

Self-lubricating piston rings:	Non-lubricated operation to minimize oil in gas
Multiple materials and configurations:	Versatility for your application
Multiple mounting configurations:	Versatility for your application
High efficiency valves:	Quiet, reliable operation
Reversible oil pump:	Allows operation in either direction
Simplified top down design:	Routine maintenance is minimally invasive

Operating Specifications

Bore of cylinder inches (mm)	4.5 (113)
Stroke inches (mm)	4.0 (101.6)
Piston displacement cfm (m^3/hr)	
minimum @ 400 RPM	56.6 (96.2)
maximum @ 825 RPM	113.2 (192.0)
Maximum working pressure psig (bar g)	465 (32.1)
Maximum brake horesepower (kW)	45 (34)
Maximum rod load lb (kg)	7,000 (3,175.2)
Maximum outlet temperature °F (°C)	350 (177)
Bare unit weight lb (kg)	855 (387.8)
Maximum flow—propane gpm (m^3/hr)	694 (157.6)

Model D891 Material Specifications

Part	Standard Material	Optional Material
Head, cylinder	Ductile iron ASTM A536	
Distance piece	Gray iron ASTM A48, Class 30	
Crosshead guide		
Crankcase, flywheel		
Bearing carrier		
Flange	ASTM A36 carbon steel	
Valve seat, bumper	17-7 PH stainless steel	
Valve plate	410 stainless steel	
Valve spring	17-7 PH stainless steel	
Valve gaskets	Soft aluminum	Copper, iron-lead
Piston	Ductile iron ASTM A536	
Piston rod	C1050 steel, Nitrotec	
Crosshead	Gray iron ASTM A48, Class 30	
Piston rings	Teflon®[1], glass and moly filled	Alloy 50
Piston ring expanders	302 stainless steel	
Head gasket	O-ring, Buna-N	Teflon®[1], Viton®[1], Neoprene®[1]
Adapter plate	Ductile iron ASTM A536	
Packing cartridge		
Connecting rod		
Packing rings	Teflon®[1], glass and moly filled	Alloy 50
Crankshaft	Ductile iron ASTM A536	
Connecting rod bearing	Bimetal D-2 Babbit	
Wrist pin	C1018 Steel	
Wrist pin bushing	Bronze SAE 660	
Main bearing	Tapered roller	
Inspection plate	Aluminum	
O-rings	Buna-N	Teflon®[1], Viton®[1], Neoprene®[1]
Retainer rings	Steel	
Miscellaneous gaskets	Coroprene	

[1] *Teflon®, Viton® and Neoprene® are registered trademarks of the DuPont company.*

All Models HG601

Equipment Type & Options

Single or double acting
Horizontal reciprocating piston compressor
Pressure and oil wiper packing
Slip-on weld connections

Applications

Bulk transfer
Truck, tank, barge, railcar unloading
Liquid Transfer/Vapor Recovery (LTVR)

Features & Benefits

Modular design:	Single or double acting
Multiple materials and configurations:	Versatility for your application
Multiple mounting configurations:	Versatility for your application
High efficiency valves:	Quiet, reliable operation
Lubricated and non-lube designs:	Versatility for your application

Operating Specifications

Double Cylinder Models (single or double acting)

Specifications \ Model	HG601AA	HG601BB	HG601CC	HG601DD	HG601EE
Bore of cylinders inches (mm)	8 (203.2)	6 (152.4)	5 (127)	4 (101.6)	3.25 (82.6)
Stroke inches (mm)	3.0 (76.2)				
Piston displacement cfm (m^3/hr)					
minimum @ 100 RPM	34.8 (58.6)	19.2 (32.7)	13.2 (22.4)	8.3 (14.1)	5.3 (9.1)
maximum @ 1,200 RPM	414.0 (703.5)	231.0 (392.5)	158.4 (268.8)	99.6 (169.2)	64.0 (108.7)
Maximum working pressure psig (bar g)	315.0 (21.7)	365.0 (25.2)	750 (51.7)	1,015.0 (7.0)	1,215.0 (83.8)
Maximum brake horesepower (kW)	75 (55)				
Maximum rod load lb (kg)	7,000 (3,175.2)				
Maximum outlet temperature °F (°C)	350 (176.7)				
Approximate weight lb (kg)	1,070 (485.3)	910(412.8)	890 (403.7)	870 (394.6)	845 (383.3)
Speed range	400–1,200 RPM				

All Models HG601 Material Specifications

Part	Model	Standard Material	Optional Material
Crankcase	All	Ductile Iron ASTM A538 Grade 65-45-12	
Adapters	All		
Cylinders	All		
Cylinder heads	All		
Valve caps	All		
Crankcase bearing carrier	All	Gray iron ASTM A48, Class 30	
Flanges	All	Steel slip-on welded	
Valve guard	All	Stainless steel	
Valve seat	4", 5"	Steel 4140	
	3-1/4", 6", 8"	Stainless steel	
Valve plates & springs	All	Stainless steel	
Valve gaskets	3-1/4", 4", 5"	Steel	
	6", 8"	Soft aluminum	Copper, iron-lead
Pistons	3-1/4", 4", 5"	Steel	Ductile Iron, A536 Grade 65-45-12
	6", 8"	Aluminum, A356-T6	
Piston rod	All	C-1050 Steel Nitrotec	
Crosshead	All	Gray iron ASTM A48, Class 30	
Connecting rod & packing cartridge	All	Ductile iron ASTM A536 grade 65-45-12	
Piston rings	All	Teflon®[1], glass & moly filled	
Rider rings	All	Teflon®[1], glass & moly filled	
Packing, segmented	4", 5"	Teflon®[1], carbon filled	
	3-1/4", 6", 8"	Teflon®[1], carbon filled	
Segmented wiper rings	4", 5"	Brass	
	3-1/4", 6", 8"	Teflon®[1], carbon filled	
Connecting rod bearings	All	Bimetal D-2 Babbit	
Crankshaft	All	Ductile iron ASTM A536 grade 80-55-06	
Wrist pin	All	C-1018 steel	
Wrist pin bushing	All	Bronze SAE 660	
Main bearings	All	Tapered roller	
Inspection plate	All	Carbon steel	
O-rings	All	Buna-N	Teflon®[1], Viton®[1], Neoprene®[1]
Retainer rings	All	Carbon steel	
Lubricator tubing	Lube models	Steel	

[1]*Teflon®, Viton® and Neoprene® are registered trademarks of the DuPont company.*

How to Select a Vertival Compressor?

Compressor size and speed selection is a highly inexact process with complex interactions of a number of different variables such as ambient temperature, pressure drops in liquid lines and vapor suction lines, solar radiation, precipitation, size of the tank and the surface area of the tank and piping. With this many variables, the exact performance of the compressor cannot be precisely calculated. Corken's compressor selection tables are a quick and easy method to make an approximate selection for butane, propane and ammonia compressors. These charts show flows for different Corken compressors run at common speeds with a maximum tank temperature of 100°F and 80°F with a 30 psi pressure drop in the piping. In only the most extreme temperature conditions will tank temperature exceed 100°F. A large tank heats up and cools down much more slowly than the surrounding atmosphere. Although temperatures may frequently exceed 100°F on hot summer afternoons, tank temperatures will seldom rise this high. Therefore, the horsepower values shown in the charts are very conservative and may be lowered for milder climates. Your local Corken distributor is usually the best source of information for ideal motor sizes for the climate in your region. Corken can also supply a computer analysis showing the horsepower required for different tank temperatures.

If it is important that unloading operations be completed in a certain amount of time, a more complex analysis is required. When such an analysis is needed, or if a product other than butane, propane or ammonia is used, contact Corken so an application engineer (AE) may thoroughly review the situation. The application engineer will provide you with a printout of the analysis as shown in figure 6, page 16. This analysis is divided into three parts that clearly demonstrate how temperature affects flow rates and vapor recovery times.

The highest liquid flow rates are achieved on hot days, see figure 7, page 17. This is because the pressure drop in the piping remains relatively constant as the temperature changes, while the vapor pressure swings over a wide range. The vapor pressure of propane is 38 psia at 0°F and 215 psia at 110°F. The discharge pressure, P2 is the product vapor pressure plus the system differential pressure. In figure 6, page 16 the 30 psi pressure drop is added to the vapor pressure to yield the discharge pressure shown in column P2. You will notice that the compression ratio (the absolute inlet vapor pressure divided by the absolute discharge pressure) rises as the temperature falls. As the compression ratio rises with falling temperature, the gas passing through the compressor is reduced, the amount of liquid displaced by the vapor is also reduced.

When the liquid in a tank is unloaded through a dip tube, liquid transfer will cease when the liquid level falls beneath the bottom of this tube. The residual puddle is called a "liquid heel". By reversing the direction of vapor flow and blocking the liquid line as shown in the section on liquid transfer/vapor recovery (LTVR), liquid may be recovered. By withdrawing vapor from the tank, the liquid will begin to boil into vapor to replace that which is being removed. This process is called "boil-off". Boil-off is completed most rapidly on hot days, see figure 8, page 17. The high vapor pressure on hot days gives the gas a higher density than on cold days. It takes a larger quantity of liquid to replace a cubic foot of high density vapor than low density vapor.

When boil-off is completed a substantial amount of propane is left in the tank in a vapor state. This vapor is equivalent to a substantial amount of liquid propane of significant economic value. As a rule of thumb in the LPG industry, propane tank cars should be evacuated to 40 psia. Alternately, a final evacuation pressure of 25 to 30% of original tank car pressure is a good value for most any liquefied gas. Evacuation pressures lower than this may not pay for the energy required to run the compressor and generally should not be considered unless factors other than economics are being considered. The vapor recovery procedure requires the most time on hot days because the high initial vapor pressure requires more time to reduce, see figure 9, page 18. The recovered vapor should be bubbled up through the liquid section of the receiver tank to recondense the vapor to liquid. The maximum horsepower requirement for the compressor occurs when the tank has been evacuated to approximately 50% of full vapor pressure, see figure 10, page 18. Larger motors are required to do vapor recovery in hot climates.

Definitions of Column Headings for Liquefied Gas Transfer Compressor Worksheet on Page 16

Liquid Transfer and Boil-Off Phase

T1	Inlet temperature of gas, degrees Fahrenheit
VP	Vapor pressure, psia
P2	Discharge pressure, psia (vapor pressure + liquid line pressure drop)
T2	Discharge temperature of gas, degrees Fahrenheit
CR	Compression ratio (P2/P1)
VE	Volumetric efficiency
Gpm	Induced liquid flow rate, gallons per minute
Acfm (in)	Volume flow rate of gas at inlet, actual cubic feet per minute
Acfm (out)	Volume flow rate of gas at discharge, actual cubic feet per minute
Bhp	Brake horsepower
Time	Time to empty tank of liquid, minutes
Lb/hr	Mass flow rate of liquid, pounds per hour
Z (in)	Compressibility factor at inlet
Z (out)	Compressibility factor at discharge

Vapor Recovery Phase

T1	Inlet temperature of gas, degrees Fahrenheit
VP	Vapor pressure, psia
P2	Discharge pressure, psia (vapor pressure + vapor line pressure drop)
T2	Discharge temperature of gas, degrees Fahrenheit
VE (initial)	Volumetric efficiency at beginning of vapor recovery phase (inlet pressure = vapor pressure)
VE (final)	Volumetric efficiency at end of vapor recovery phase (inlet pressure = desired evacuation pressure or where VE = 0, whichever comes first)
Acfm (initial)	Volume flow rate at beginning of vapor recovery phase (inlet pressure = vapor pressure)
Acfm (final)	Volume flow rate at end of vapor recovery phase (inlet pressure = desired evacuation pressure or where VE = 0, whichever comes first)
Z (initial)	Initial compressibility
Z (final)	Final compressibility
Bhp	Highest brake horsepower that occurs during vapor recovery
P1 at VE = 0	Evacuation suction pressure when VE has fallen to 0 due to increase in compression ratio.
P1 at max bhp	Inlet pressure to compressor at the highest horsepower condition
Time	Time to complete evacuation of tank to desired evacuation pressure or to evacuate tank to point where VE falls to 0, whichever comes first-in minutes
Equivalent Liquid	The amount of liquid that would be formed by converting vapor in the tank to liquid
A) Actual	Equivalent amount of liquid of all the vapor in the tank
B) Recovered evacuation	Equivalent amount of liquid of vapor removed if tank is evacuated to desired pressure or until VE = 0, whichever comes first
C) Claimable	Equivalent amount of liquid of vapor removed if tank is evacuated until VE = 0
Total Time	Sum of time for liquid transfer phase and vapor recovery phase in hours

Liquefied Gas Transfer Compressor Worksheet

Model 691 Compressor on Propane

N = 1.13; RPM = 825; PD = 60.7; MAWP = 265 psia; Critical pressure = 619 psia; critical temperature = 666°R

Liquid Transfer Phase

Tank volume = 33,000 gallons; 30 psi drop in liquid transfer system; molecular weight = 44.1; total liquid volume to be transferred = 29,618 gallons or 89.8% of total tank volume

T1 (°F)	VP (psia)	P2 (psia)	T2 (°F)	CR	VE %	Gpm	Acfm (in)	Acfm (out)	Bhp	Time (min)	Lb/hour Liquid	Z (in)	Z (out)
0	38	68	32	1.8	85	216	51.8	28.9	12.3	137	55,229	0.92	0.89
10	46	76	38	1.7	87	238	52.7	31.9	13.1	124	60,864	0.91	0.88
20	55	85	45	1.5	88	258	53.4	34.5	13.9	115	65,938	0.90	0.87
30	66	96	52	1.5	89	278	54.0	37.1	14.8	107	70,841	0.89	0.86
40	78	108	59	1.4	90	294	54.4	39.3	15.6	101	75,048	0.88	0.85
50	92	122	67	1.3	90	309	54.8	41.3	16.6	96	78,903	0.86	0.83
60	107	137	75	1.3	91	322	55.1	43.0	17.5	92	82,154	0.85	0.82
70	124	154	83	1.2	91	333	55.3	44.6	18.5	89	85,064	0.83	0.80
80	144	174	92	1.2	91	344	55.5	46.0	19.6	86	87,748	0.81	0.79
90	165	195	101	1.2	92	353	55.7	47.1	20.7	84	89,966	0.80	0.77
100	189	219	110	1.2	92	360	55.8	48.2	21.9	82	91,969	0.78	0.75
110	215	245	119	1.1	92	367	55.9	49.1	23.2	81	93,687	0.76	0.73

Boil-Off Phase

Heel volume = 83 gallon liquid or 0.25% of total tank volume. 10 psi drop in vapor recovery system

T1 (°F)	V.P. (psia)	P2 (psia)	T2 (°F)	CR	VE %	bhp	acfm (in)	Equiv. Vapor Volume (FT1)	Liquid Recovery Rate (gpm)	Time (min)	Z (in)	Z (out)
0	38	48	13	1.3	92	9.4	55.8	955	5	17	0.92	0.91
10	46	56	21	1.2	92	10.0	56.0	797	6	14	0.91	0.91
20	55	65	29	1.2	93	10.5	56.2	673	7	12	0.90	0.89
30	66	76	38	1.2	93	11.2	56.4	564	8	10	0.89	0.88
40	78	88	47	1.1	93	11.9	56.5	480	10	8	0.88	0.87
50	92	102	56	1.1	93	12.7	56.6	408	11	7	0.86	0.85
60	107	117	65	1.1	93	13.5	56.7	352	13	6	0.85	0.84
70	124	134	75	1.1	93	14.4	56.7	304	15	5	0.83	0.82
80	144	154	84	1.1	93	15.4	56.8	261	18	5	0.81	0.81
90	165	175	94	1.1	94	16.5	56.8	227	21	4	0.80	0.79
100	189	199	103	1.1	94	17.6	56.8	197	24	3	0.78	0.77
110	215	225	113	1.0	94	18.9	56.8	171	27	3	0.76	0.75

Vapor Recovery Phase

30 psia desired evacuation pressure 10 psia drop in vapor recovery system

T1 (°F)	V.P. (psia)	P2 (psia)	T2 (°F)	VE (%) (initial)	VE (%) (final)	acfm (initial)	acfm (final)	Z in (initial)	Z in (final)	bhp (max)	P1@ VE = 0	P1@ Max Bhp	Time (min)	Equivalent Liquid (gallons) Actual	Recovered	Claimable	Total Time Hours
0	38	48	20	92	90	55	54	0.92	0.93	10.2	5	26	19	381	89	337	2.9
10	46	56	42	92	86	56	52	0.91	0.94	11.1	6	32	35	456	185	405	2.9
20	55	65	64	93	82	56	49	0.90	0.95	12.1	6	34	50	540	288	482	2.9
30	66	76	80	93	80	56	48	0.89	0.95	13.4	8	41	67	645	377	578	3.1
40	78	88	103	93	75	56	45	0.88	0.95	14.8	9	48	84	758	506	682	3.2
50	92	102	126	93	69	56	41	0.86	0.96	16.4	10	57	101	891	650	803	3.4
60	107	117	143	93	66	56	40	0.85	0.96	18.1	12	60	118	1,034	781	937	3.6
70	124	134	166	93	60	56	36	0.83	0.96	20.0	13	70	137	1,197	953	1,088	3.9
80	144	154	188	93	53	56	32	0.81	0.96	22.3	15	82	158	1,395	1,153	1,272	4.1
90	165	175	209	94	47	56	28	0.80	0.97	24.6	17	95	180	1,604	1,364	1,466	4.5
100	189	199	234	94	37	56	22	0.78	0.97	27.3	20	99	206	1,850	1,619	1,695	4.0
110	215	225	256	94	29	56	17	0.76	0.97	30.2	23	114	237	2,123	1,894	1,948	5.3

Assumptions for calculations:
1) Pressure drops remain constant
2) Included flow based on isothermal compression
3) Bhp and temperature are based on adiabatic compression
4) Compressibility effects are considered in calculations
5) Heat transfer is sufficient to maintain constant tank temperature during boilout

Figure 6

Liquid Transfer Phase—Propane

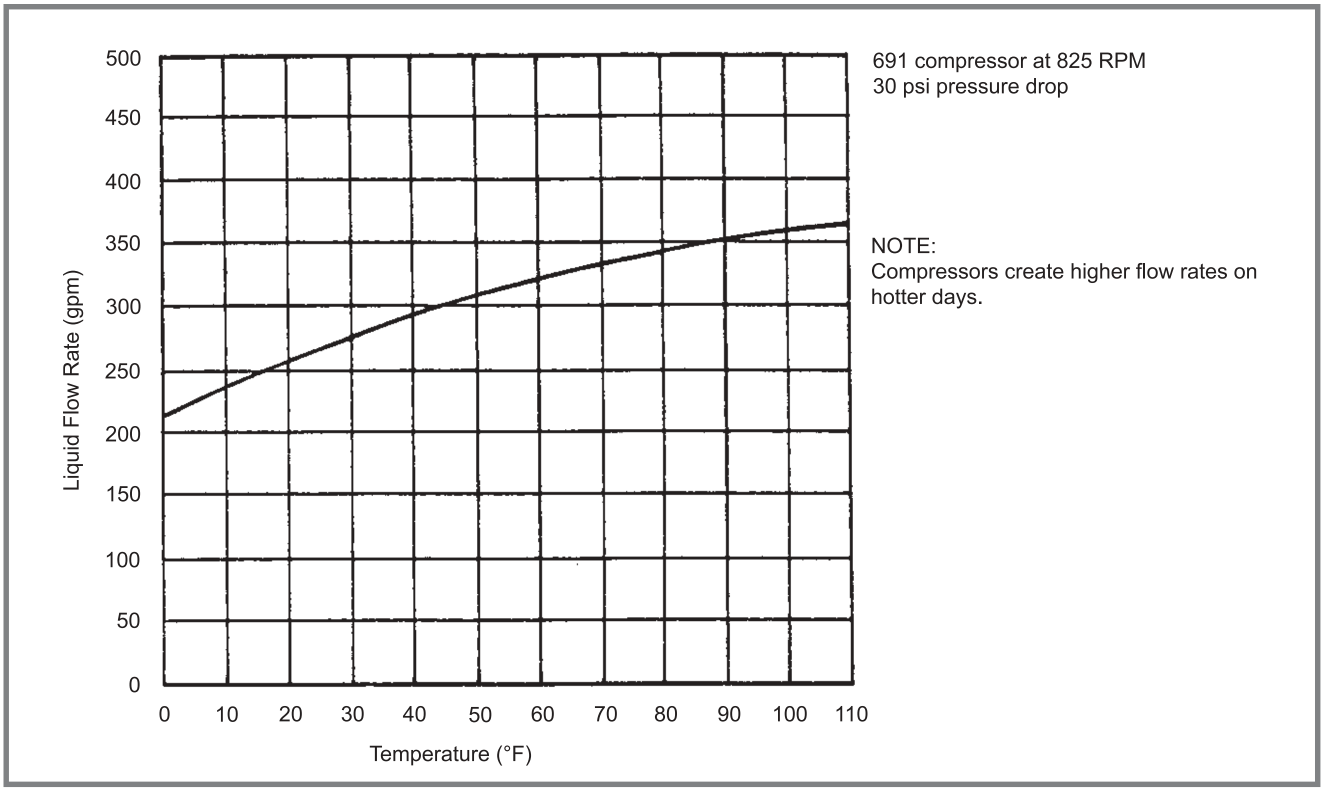


Figure 7

Boil-Out Phase—Propane

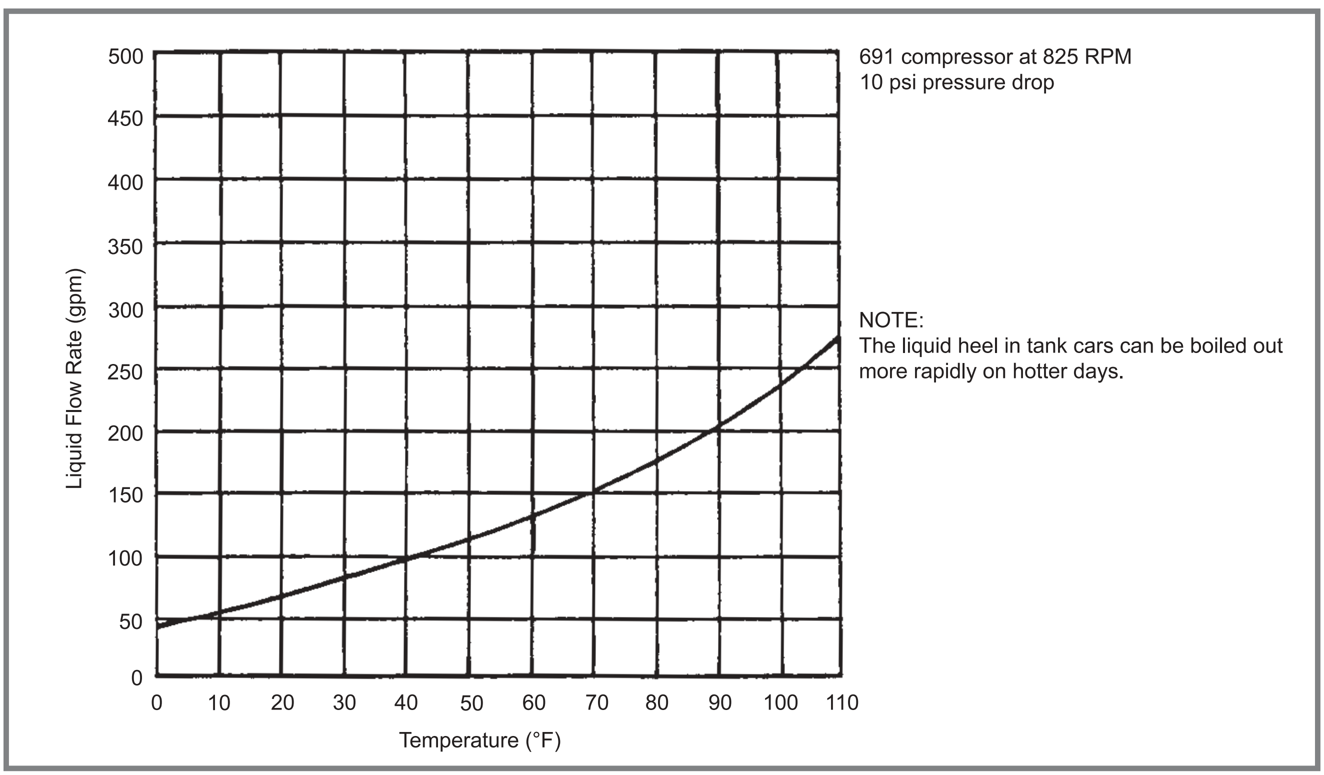
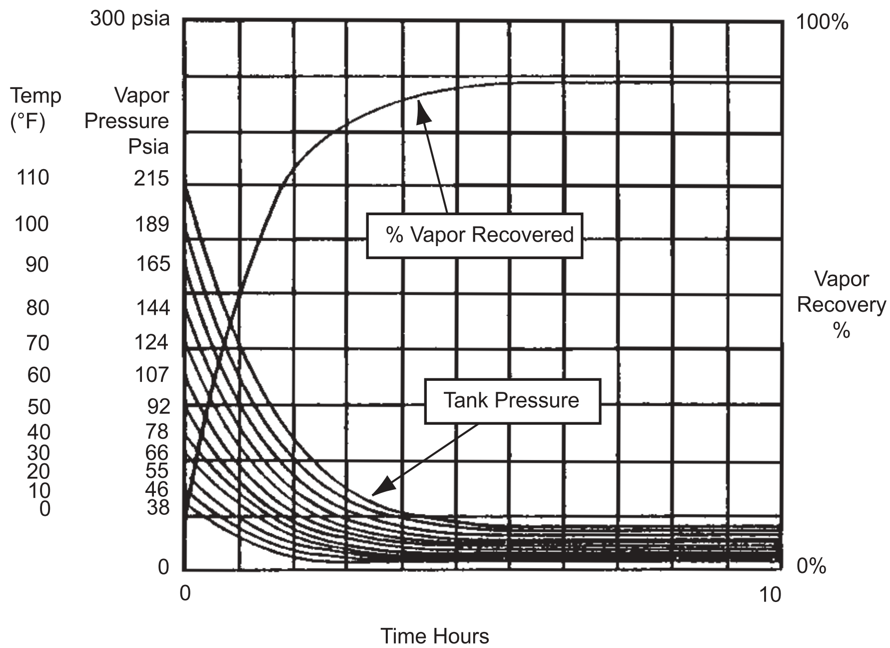


Figure 8

Vapor Recovery Phase—Propane

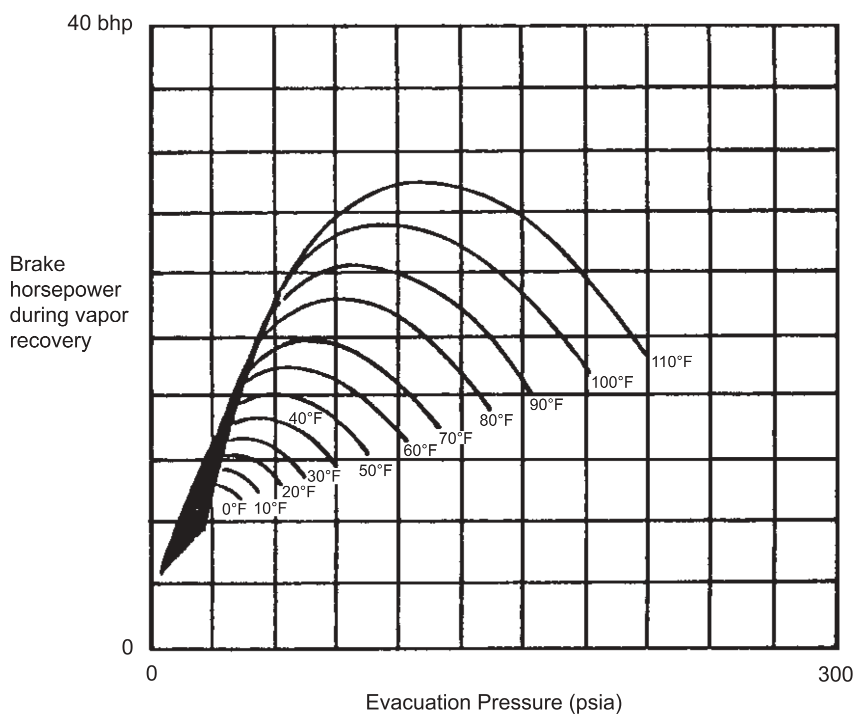


691 compressor at 825 RPM
Tank volume = 33,000 gallons
10 psi pressure drop in vapor piping

Note:
Vapor recovery can be completed most rapidly on cold days since intial vapor pressure is lower.

Figure 9

Vapor Recovery Phase—Propane



691 compressor at 825 RPM

Note:
Larger motors are required for vapor recovery in hot climates.

Figure 10

Butane Compressor Selection Table

Service	Capacity gpm[1]	Displacement cfm	Compressor Model	Compressor RPM	Driver Sheave Size Pitch Diameter (inches)[2] 1,750 RPM	Driver Sheave Size Pitch Diameter (inches)[2] 1,450 RPM	Driver Horsepower: Liquid Transfer & Residual Vapor Recovery 100°F	Driver Horsepower: Liquid Transfer & Residual Vapor Recovery 80°F	Driver Horsepower: Liquid Transfer Without Residual Vapor Recovery 100°F	Driver Horsepower: Liquid Transfer Without Residual Vapor Recovery 80°F	Piping Size[3] Vapor	Piping Size[3] Liquid
Small bulk plants	13	4	91	400	A 3.0	A 3.6	3	3	3	3	3/4	1-1/4
	17	5	91	505	A 3.8	B 4.6	3	3	3	3	3/4	1-1/4
	20	6	91	590	B 4.6	B 5.6	3	3	3	3	1	1-1/4
	24	7	91	695	B 5.4	B 6.6	5	5	5	5	1	1-1/2
	23	7	290, 291	345	A 3.0	A 3.6	2	2	2	2	1	1-1/2
Unloading single tank car or transport	27	8	91	795	B 6.2	B 7.4	5	5	5	5	1	1-1/2
	26	8	290, 291	390	A 3.4	B 4.0	2	2	2	2	1	1-1/2
	30	9	290, 291	435	A 3.8	B 4.6	3	3	3	3	1	1-1/2
	33	10	290, 291	490	B 4.4	B 5.2	3	3	3	3	1	2
	36	11	290, 291	535	B 4.8	B 5.8	3	3	3	3	1	2
	39	12	290, 291	580	B 5.2	B 6.2	5	3	5	3	1	2
	42	13	290, 291	625	B 5.6	B 6.6	5	5	5	5	1-1/4	2
	47	14	290, 291	695	B 6.2	B 7.4	5	5	5	5	1-1/4	2
	50	15	290, 291	735	B 6.6	B 8.0	5	5	5	5	1-1/4	2-1/2
	50	15	490, 491	345	A 3.0	A 3.6	5	5	5	5	1-1/4	2-1/2
	53	16	290, 291	780	B 7.0	B 8.6	7-1/2	5	7-1/2	5	1-1/4	2-1/2
	53	16	490, 491	370	A 3.2	A 3.8	5	5	5	5	1-1/4	2-1/2
Unloading two or more tank cars at one time or large transport with excess flow valves of adequate capacity	56	17	490, 491	390	A 3.4	B 4.0	5	5	5	5	1-1/4	3
	60	18	490, 491	415	A 3.6	B 4.4	5	5	5	5	1-1/4	3
	63	19	490, 491	435	A 3.8	B 4.6	5	5	5	5	1-1/4	3
	65	20	490, 491	445	B 4.0	B 4.8	5	5	5	5	1-1/4	3
	68	21	490, 491	470	B 4.2	B 5.0	5	5	5	5	1-1/4	3
	71	22	490, 491	490	B 4.4	B 5.2	7-1/2	5	7-1/2	5	1-1/4	3
	75	23	490, 491	515	B 4.6	B 5.6	7-1/2	5	7-1/2	5	1-1/4	3
	77	24	490, 491	535	B 4.8	B 5.8	7-1/2	7-1/2	7-1/2	7-1/2	1-1/4	3
	81	25	490, 491	560	B 5.0	B 6.0	7-1/2	7-1/2	7-1/2	7-1/2	1-1/4	3
	84	26	490, 491	580	B 5.2	B 6.2	7-1/2	7-1/2	7-1/2	7-1/2	1-1/4	3
	87	27	490, 491	605	B 5.4	B 6.4	7-1/2	7-1/2	7-1/2	7-1/2	1-1/4	3
	91	28	490, 491	625	B 5.6	B 6.6	7-1/2	7-1/2	7-1/2	7-1/2	1-1/2	3
	94	29	490, 491	650	B 5.8	B 7.0	10	7-1/2	10	7-1/2	1-1/2	3
	97	30	490, 491	670	B 6.0		10	7-1/2	10	7-1/2	1-1/2	3
	94	30	690, 691	400	B 4.4	B 5.2	7-1/2	7-1/2	7-1/2	7-1/2	1-1/2	3
	100	31	490, 491	695	B 6.2	B 7.4	10	7-1/2	10	7-1/2	1-1/2	3
	98	31	690, 691	420	B 4.6	B 5.6	10	7-1/2	10	7-1/2	1-1/2	3
	107	32	490, 491	740	B 6.6	B 8.0	10	10	10	10	1-1/2	3
	103	32	690, 691	440	B 4.8	B 5.8	10	7-1/2	10	7-1/2	1-1/2	3
	110	33	490, 491	760	B 6.8	B 8.0	10	10	10	10	1-1/2	3
	113	34	490, 491	780	B 7.0	B 8.6	10	10	10	10	1-1/2	3
	107	34	690, 691	455	B 5.0	B 6.0	10	10	10	10	1-1/2	3
	111	35	690, 691	475	B 5.2	B 6.2	10	10	10	10	1-1/2	3
	119	36	490, 491	825	B 7.4	B 8.6	15	10	15	10	1-1/2	3
	116	36	690, 691	495	B 5.4	A 6.4	10	10	10	10	1-1/2	3
Unloading large tank cars, multiple vessels, barges or terminals	120	38	690, 691	510	B 5.6	B 6.8	10	10	10	10	1-1/2	4
	124	39	690, 691	530	B 5.8	B 7.0	10	10	10	10	1-1/2	4
	129	41	690, 691	550	B 6.0	A 7.0	10	10	10	10	1-1/2	4
	133	42	690, 691	565	B 6.2	B 7.4	10	10	10	10	2	4
	137	43	690, 691	585	B 6.4	A 7.4	10	10	10	10	2	4
	142	45	690, 691	605	B 6.6	B 8.0	15	10	15	10	2	4
	145	46	690, 691	620	B 6.8		15	10	15	10	2	4
	150	47	690, 691	640	B 7.0	A 8.2	15	10	15	10	2	4
	158	48	690, 691	675	B 7.4	B 8.6	15	15	15	15	2	4
	171	54	690, 691	730	B 8.0	B 9.4	15	15	15	15	2	4
	184	58	690, 691	785	B 8.6		15	15	15	15	2	4
	193	60	690, 691	820	TB 9.0	A 10.6	15	15	15	15	2	4
	260	82.1	D891	580	5V 7.1	5V 8.5	20	20	20	20	3	6
	359	113.3	D891	800	5V 9.75	5V 11.8	25	25	25	25	3	6

[1]The capacities shown are based on 70°F, but will vary dependingupon piping, fittings used, product being transferred and temperature. The factory can supply a detailed computer analysis if required.
[2]Driver sheaves: 91 (2 belts); 290, 291, 490, 491 (3 belts); 690, 691 (4 belts).
[3]The piping sizes shown are considered minimum. If the length exceeds 100 ft, use the next larger size.
NOTE: Please consult factory for compressors with higher flows.

Propane Compressor Selection Table

Service	Capacity gpm[1]	Displacement cfm	Compressor Model	Compressor RPM	Driver Sheave Size Pitch Diameter (inches)[2] 1,750 RPM	Driver Sheave Size Pitch Diameter (inches)[2] 1,450 RPM	Driver Horsepower: Liquid Transfer & Residual Vapor Recovery 100°F	Driver Horsepower: Liquid Transfer & Residual Vapor Recovery 80°F	Driver Horsepower: Liquid Transfer Without Residual Vapor Recovery 100°F	Driver Horsepower: Liquid Transfer Without Residual Vapor Recovery 80°F	Piping Size[3] Vapor	Piping Size[3] Liquid
Small bulk plants	23	4	91	400	A 3.0	A 3.6	5	3	3	3	3/4	1-1/4
	29	5	91	505	A 3.8	B 4.6	5	5	5	5	3/4	1-1/4
	34	6	91	590	B 4.6	B 5.6	5	5	5	5	1	1-1/4
	40	7	91	695	B 5.4	B 6.6	5	5	5	5	1	1-1/2
	39	7	290, 291	345	A 3.0	A 3.6	3	3	3	3	1	1-1/2
Unloading single tank car or transport	45	8	91	795	B 6.2	B 7.4	7-1/2	7-1/2	7-1/2	7-1/2	1	1-1/2
	44	8	290, 291	390	A 3.4	B 4.0	5	3	3	3	1	1-1/2
	50	9	290, 291	435	A 3.8	B 4.6	5	5	3	3	1	1-1/2
	56	10	290, 291	490	B 4.4	B 5.2	5	5	5	5	1	2
	61	11	290, 291	535	B 4.8	B 5.8	5	5	5	5	1	2
	66	12	290, 291	580	B 5.2	B 6.2	7-1/2	5	5	5	1	2
	71	13	290, 291	625	B 5.6	B 6.6	7-1/2	5	7-1/2	5	1-1/4	2
	79	14	290, 291	695	B 6.2	B 7.4	7-1/2	7-1/2	7-1/2	7-1/2	1-1/4	2
	84	15	290, 291	735	B 6.6	B 8.0	10	7-1/2	10	7-1/2	1-1/4	2-1/2
	84	15	490, 491	345	A 3.0	A 3.6	7-1/2	7-1/2	5	5	1-1/4	2-1/2
	89	16	290, 291	780	B 7.0	B 8.6	10	10	10	10	1-1/4	2-1/2
	89	16	490, 491	370	A 3.2	A 3.8	7-1/2	7-1/2	7-1/2	5	1-1/4	2-1/2
Unloading two or more tank cars at one time or large transport with excess flow valves of adequate capacity	95	17	490, 491	390	A 3.4	B 4.0	7-1/2	7-1/2	7-1/2	7-1/2	1-1/4	3
	101	18	490, 491	415	A 3.6	B 4.4	10	7-1/2	7-1/2	7-1/2	1-1/4	3
	106	19	490, 491	435	A 3.8	B 4.6	10	7-1/2	7-1/2	7-1/2	1-1/4	3
	108	20	490, 491	445	B 4.0	B 4.8	10	7-1/2	7-1/2	7-1/2	1-1/4	3
	114	21	490, 491	470	B 4.2	B 5.0	10	7-1/2	7-1/2	7-1/2	1-1/4	3
	119	22	490, 491	490	B 4.4	B 5.2	10	10	7-1/2	7-1/2	1-1/4	3
	125	23	490, 491	515	B 4.6	B 5.6	10	10	10	7-1/2	1-1/4	3
	130	24	490, 491	535	B 4.8	B 5.8	15	10	10	10	1-1/4	3
	136	25	490, 491	560	B 5.0	B 6.0	15	10	10	10	1-1/4	3
	141	26	490, 491	580	B 5.2	B 6.2	15	10	10	10	1-1/4	3
	147	27	490, 491	605	B 5.4	B 6.4	15	10	15	10	1-1/4	3
	152	28	490, 491	625	B 5.6	B 6.6	15	15	15	15	1-1/2	3
	158	29	490, 491	650	B 5.8	B 7.0	15	15	15	15	1-1/2	3
	163	30	490, 491	670	B 6.0		15	15	15	15	1-1/2	3
	163	30	690, 691	400	B 4.4	B 5.2	15	15	10	10	1-1/2	3
	168	31	490, 491	695	B 6.2	B 7.4	15	15	15	15	1-1/2	3
	171	31	690, 691	420	B 4.6	B 5.6	15	15	10	10	1-1/2	3
	179	32	490, 491	740	B 6.6	B 8.0	15	15	15	15	1-1/2	3
	178	32	690, 691	440	B 4.8	B 5.8	15	15	10	10	1-1/2	3
	186	34	690, 691	455	B 5.0	B 6.0	15	15	15	10	1-1/2	3
	193	35	690, 691	475	B 5.2	B 6.2	15	15	15	10	1-1/2	3
	200	36	690, 691	495	B 5.4	B 6.4	15	15	15	15	1-1/2	3
Unloading large tank cars, multiple vessels, barges or terminals	208	38	690, 691	510	B 5.6	B 6.8	20	15	15	15	1-1/2	4
	215	39	690, 691	530	B 5.8	B 7.0	20	15	15	15	1-1/2	4
	223	41	690, 691	550	B 6.0	A 7.0	20	15	15	15	1-1/2	4
	230	42	690, 691	565	B 6.2	B 7.4	20	15	15	15	2	4
	237	43	690, 691	585	B 6.4	A 7.4	20	15	15	15	2	4
	245	45	690, 691	605	B 6.6	B 8.0	20	15	15	15	2	4
	252	46	690, 691	620	B 6.8		20	20	15	15	2	4
	260	47	690, 691	640	B 7.0	A 8.2	20	20	20	15	2	4
	275	48	690, 691	675	B 7.4	B 8.6	25	20	20	20	2	4
	297	54	690, 691	730	B 8.0	B 9.4	25	20	20	20	2	4
	319	58	690, 691	785	B 8.6		25	20	25	20	2	4
	334	60	690, 691	820	TB 9.0	A 10.6	30	25	25	20	2	4
	452	82	D891	580	5V 7.1	5V 8.5	30	30	30	30	3	6
	623	113	D891	800	5V 9.75	5V 11.8		40	40	30	3	6

[1]*The capacities shown are based on 70°F, but will vary depending upon piping, fittings used, product being transferred and temperature. The factory can supply a detailed computer analysis if required.*

[2]*Driver sheaves: 91 (2 belts); 290, 291, 490, 491 (3 belts); 690, 691 (4 belts).*

[3]*The piping sizes shown are considered minimum. If the length exceeds 100 ft, use the next larger size.*

NOTE: Please consult factory for compressors with higher flows.

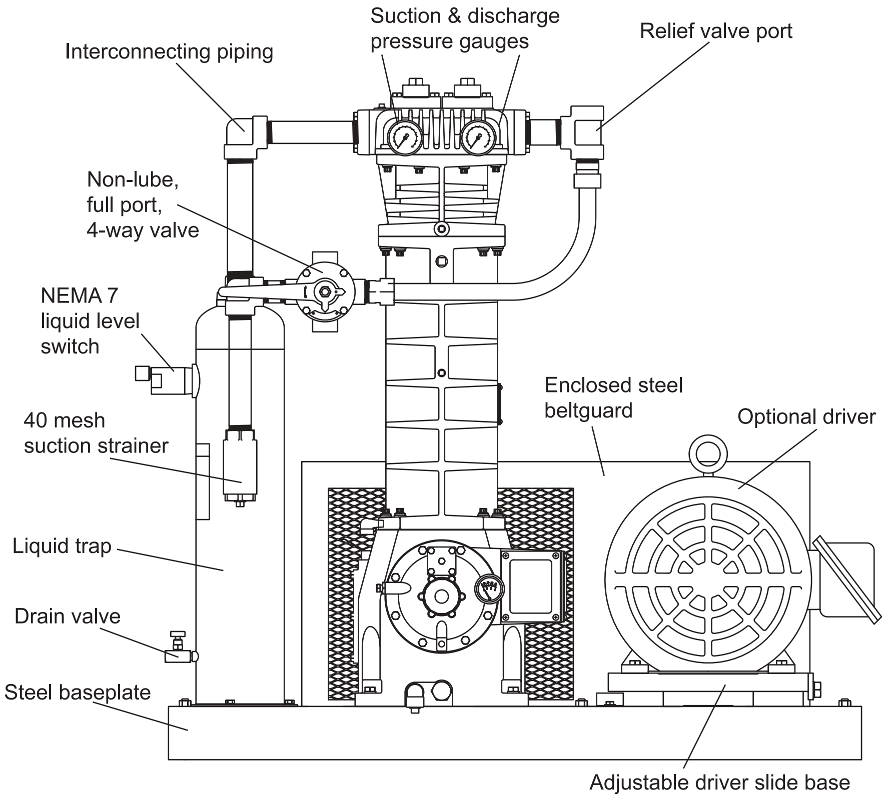
Ammonia Compressor Selection Table

							Driver Horsepower					
	Capacity	Displacment	Compressor		Driver Sheave Size Pitch Diameter (inches)[2]		Liquid Transfer & Residual Vapor Recovery		Liquid Transfer Without Residual Vapor Recovery		Piping Size[3]	
Service	gpm[1]	cfm	Model	RPM	1,750 RPM	1,450 RPM	100°F	80°F	100°F	80°F	Vapor	Liquid
Small bulk plants	23	4	91	400	A 3.0	A 3.6	5	3	3	3	3/4	1-1/4
	29	5	91	505	A 3.8	B 4.6	5	5	5	3	3/4	1-1/4
	34	6	91	590	B 4.6	B 5.6	5	5	5	5	1	1-1/4
	40	7	91	695	B 5.4	B 6.6	5	5	5	5	1	1-1/2
	43	7	290, 291	345	A 3.0	A 3.6	5	3	3	3	1	1-1/2
Unloading single tank car or transport	46	8	91	795	B 6.2	B 7.4	7-1/2	5	5	5	1	1-1/2
	45	8	290, 291	390	A 3.4	B 4.0	5	3	3	3	1	1-1/2
	50	9	290, 291	435	A 3.8	B 4.6	5	5	3	3	1	1-1/2
	56	10	290, 291	490	B 4.4	B 5.2	5	5	5	3	1	2
	62	11	290, 291	535	B 4.8	B 5.8	7-1/2	5	5	5	1	2
	67	12	290, 291	580	B 5.2	B 6.2	7-1/2	5	5	5	1	2
	72	13	290, 291	625	B 5.6	B 6.6	7-1/2	5	5	5	1-1/4	2
	80	14	290, 291	695	B 6.2	B 7.4	7-1/2	7-1/2	7-1/2	5	1-1/4	2
	85	15	290, 291	735	B 6.6	B 8.0	10	7-1/2	7-1/2	7-1/2	1-1/4	2-1/2
	85	15	490, 491	345	A 3.0	A 3.6	7-1/2	7-1/2	5	5	1-1/4	2-1/2
	90	16	290, 291	780	B 7.0	B 8.6	10	7-1/2	7-1/2	7-1/2	1-1/4	2-1/2
	90	16	490, 491	370	A 3.2	A 3.8	10	7-1/2	5	5	1-1/4	2-1/2
Unloading two or more tank cars at one time or large transport with excess flow valves of adequate capacity	96	17	490, 491	390	A 3.4	B 4.0	10	7-1/2	5	5	1-1/4	3
	102	18	490, 491	415	A 3.6	B 4.4	10	7-1/2	7-1/2	7-1/2	1-1/4	3
	107	19	490, 491	435	A 3.8	B 4.6	10	7-1/2	7-1/2	7-1/2	1-1/4	3
	110	20	490, 491	445	B 4.0	B 4.8	10	7-1/2	7-1/2	7-1/2	1-1/4	3
	115	21	490, 491	470	B 4.2	B 5.0	10	7-1/2	7-1/2	7-1/2	1-1/4	3
	120	22	490, 491	490	B 4.4	B 5.2	15	10	7-1/2	7-1/2	1-1/4	3
	126	23	490, 491	515	B 4.6	B 5.6	15	10	7-1/2	7-1/2	1-1/4	3
	131	24	490, 491	535	B 4.8	B 5.8	15	10	10	7-1/2	1-1/4	3
	138	25	490, 491	560	B 5.0	B 6.0	15	10	10	7-1/2	1-1/4	3
	142	26	490, 491	580	B 5.2	B 6.2	15	10	10	7-1/2	1-1/4	3
	148	27	490, 491	605	B 5.4	B 6.4	15	10	10	10	1-1/4	3
	153	28	490, 491	625	B 5.6	B 6.6	15	10	10	10	1-1/2	3
	160	29	490, 491	650	B 5.8	B 7.0	15	15	10	10	1-1/2	3
	165	30	490, 491	670	B 6.0		15	15	15	10	1-1/2	3
	165	30	690, 691	400	B 4.4	B 5.2	15	15	10	10	1-1/2	3
	170	31	490, 491	695	B 6.2	B 7.4	15	15	15	10	1-1/2	3
	173	31	690, 691	420	B 4.6	B 5.6	15	15	10	10	1-1/2	3
	181	32	490, 491	740	B 6.6	B 8.0	15	15	15	15	1-1/2	3
	180	32	690, 691	440	B 4.8	B 5.8	15	15	10	10	1-1/2	3
	188	34	690, 691	455	B 5.0	B 6.0	20	15	10	10	1-1/2	3
	195	35	690, 691	475	B 5.2	B 6.2	20	15	10	10	1-1/2	3
	203	36	690, 691	495	B 5.4	B 6.4	20	15	15	10	1-1/2	3
Unloading large tank cars, multiple vessels, barges or terminals	211	38	690, 691	510	B 5.6	B 6.8	20	15	15	10	1-1/2	4
	218	39	690, 691	530	B 5.8	B 7.0	20	15	15	15	1-1/2	4
	226	41	690, 691	550	B 6.0	A 7.0	20	15	15	15	1-1/2	4
	233	42	690, 691	565	B 6.2	B 7.4	20	15	15	15	2	4
	240	43	690, 691	585	B 6.4	A 7.4	20	20	15	15	2	4
	248	45	690, 691	605	B 6.6	B 8.0	20	20	15	15	2	4
	255	45	690, 691	620	B 6.8		25	20	15	15	2	4
	263	47	690, 691	640	B 7.0	A 8.2	25	20	15	15	2	4
	278	48	690, 691	675	B 7.4	B 8.6	25	20	15	15	2	4
	301	54	690, 691	730	B 8.0	B 9.4	25	20	20	15	2	4
	323	58	690, 691	785	B 8.6		30	25	20	20	2	4
	338	60	690, 691	820	TB 9.0	A 10.6	30	25	20	20	2	4
	459	82	D891	580	5V 7.1	5V 8.5	40	30	30	30	3	6
	633	113	D891	800	5V 9.75	5V 11.8		40	40	30	3	6

[1]The capacities shown are based on 70°F, but will vary depending upon piping, fittings used, product being transferred and temperature. The factory can supply a detailed computer analysis if required.
[2]Driver sheaves: 91 (2 belts); 290, 291, 490, 491 (3 belts); 690, 691 (4 belts).
[3]The piping sizes shown are considered minimum. If the length exceeds 100 ft, use the next larger size.

NOTE: Please consult factory for compressors with higher flows.

Compressor Mounting Selections



Standard 107 Items

- Steel baseplate
- V-Belt drive
- Adjustable driver slide base
- Enclosed steel beltguard
- Suction and discharge pressure gauges
- 40 Micron strainer
- Non-lube 4-way valve
- Interconnecting piping
- Liquid trap as specified below

107 Mounting

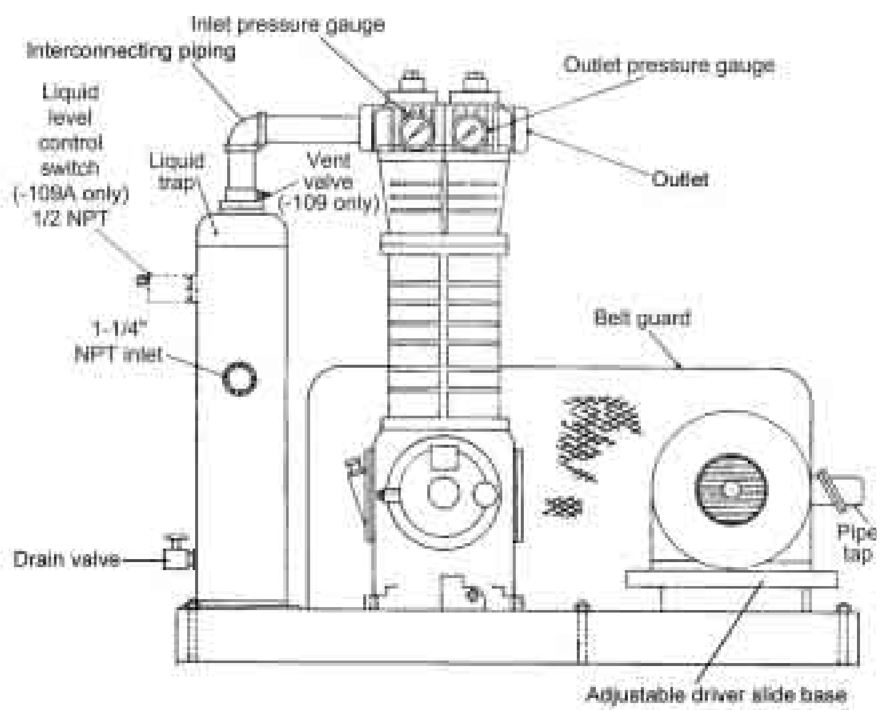
Mechanical liquid trap with ball float

107A Mounting

Automatic liquid trap with one NEMA 7 liquid level switch

107B Mounting

Automatic liquid trap with two NEMA 7 liquid level switches



Standard 109 Items

- Steel baseplate
- V-Belt drive
- Adjustable driver slide base
- Enclosed steel beltguard
- Suction and discharge pressure gauges
- Interconnecting piping
- Liquid trap as specified below

109 Mounting

Mechanical liquid trap with ball float

109A Mounting

Automatic liquid trap with one NEMA 7 liquid level switch

109B Mounting

Automatic liquid trap with two NEMA 7 liquid level switches

Vertical Single-Acting Model Number Identification Code

Model Number

Base X X X X X X X X X X

Base Model	91	291	491	691
Inlet	3/4" NPT	3/4" NPT	1-1/4" NPT	2" NPT
Outlet	3/4" NPT	3/4" NPT	1-1/4" NPT	1-1/2" NPT

Base Model	F91	F291	F491	F691
Inlet	3/4" ANSI	3/4" ANSI	1-1/4" ANSI	2" ANSI
Outlet	3/4" ANSI	3/4" ANSI	1-1/4" ANSI	2" ANSI

Packing Arrangement	Pressurized inlet	Standard				A
Crankcase Style	Splash lubricated	Standard	N/A	N/A	N/A	J
	Extended crankshaft	Extra cost	Extra cost	Extra cost	N/A	E
	Pressure lubricated	N/A	Standard	Standard	Standard	M
	Standard with heater	N/A	Extra cost	Extra cost	Extra cost	MH
Valves	Liquid relief suction	Standard				3
	Standard valves	No extra cost				4
Piston Rings and Packing	Teflon®[1]	Standard				F
Gasket Material	Aluminum	Standard				B
O-rings	Buna-N	Standard				A
	Neoprene®[1]	No extra cost				B
Intercooler	None	N/A for single stage compressor				N
Flywheel	14" flywheel used with extended crankshaft	No charge			N/A	E
	Heavy duty	Extra cost	Extra cost	Extra cost	Extra cost	H
	No flywheel	No extra cost				N
	Standard 14"	Standard				S
Protective Coating	No coating	Standard				N
Piston Rod Coating	Nitrotec	Standard				N

[1]Teflon® and Neoprene® are registered trademarks of the DuPont company.

See page 24 for mounting options.

Vertical Double-Acting Model Number Identification Code

Base Model Number	D891
Inlet Connection	2" Weld
Outlet Connection	2" Weld
Ship Weight (lb)	900

Model Number
Base X X X X X X X X X X

Packing Arrangement	Packing arranged for padding of distance piece	Standard	J
Crankcase Style	Pressure lubricated	Standard	M
	Standard with heater	Extra cost	MH
Valves	Standard suction and discharge valves	Standard	4
	Suction valve unloaders	Extra cost	9
Piston Ring and Packing Material	Teflon®[1]	Standard	F
Gasket Material	Aluminum	Standard	B
O-ring Material	Buna-N	Standard	A
	Neoprene®[1]	No charge	B
Intercooler	N/A for single stage compressor	Standard	N
Flywheel	No flywheel provided	No charge	N
	Standard flywheel	Standard	S
Protective Coating	None	Standard	N
Piston Rod Coating	Nitrotec	Standard	N

[1] *Teflon® and Neoprene® are registered trademarks of the DuPont company.*

Mounting Options For Models 91–891

103 Mounting includes: Steel baseplate, adjustable driver slide base, V-belt drive and enclosed steel beltguard. Pressure gauges are mounted on the compressor.[3]
107 Mounting includes: Steel baseplate, mechanical liquid trap, non-lube 4-way valve, interconnecting piping, strainer, adjustable driver slide base, V-belt drive and enclosed steel beltguard. Pressure gauges are mounted on the compressor.[3]
107A Mounting includes: All items on the 107 replacing the mechanical float in the liquid trap with a NEMA 7 liquid level switch.[3]
107B Mounting includes: All items on the 107 replacing the liquid trap with a larger ASME code liquid trap with 2 NEMA 7 liquid level switches set for alarm and shutdown.[3]
107TR Mounting includes: All items on the 107 set up to be used as a transport unit. Note that the compressor must have the optional 14" flywheel and extended crankshaft to use this mounting.[2,3]
109 Mounting includes: Steel baseplate, mechanical liquid trap, interconnecting piping, adjustable driver slide base, V-belt drive and enclosed steel beltguard. Pressure gauges are mounted on the compressor.[3]
109A Mounting includes: All items on the 109 replacing the mechanical float in the liquid trap with a NEMA7 liquid level switch.[3]
109B Mounting includes: All items on the 109 replacing the liquid trap with a larger ASME code liquid trap with 2 NEMA 7 liquid level switches set for alarm and shutdown.[3]
109TR Mounting includes: All items on the 109 set up to be used as a transport unit. Note the compressor must have the optional 14" flywheel and extended crankshaft to use this mounting.[2,3]

[2] *Not suitable for 691, D891 or horizontal models.*

[3] *Discharge relief valves are required but not included in these mountings.*

Horizontal Model Number Identification Code

Base Model	HG601AA	HG601BB	HG601CC	HG601DD	HG601EE	HG601FF[1]
Cylinders	8" x 8"	6" x 6"	5" x 5"	4" x 4"	3-1/4" x 3-1/4"	2-3/4" x 2-3/4"
Ship Wt (lb)	1,070	910	890	870	845	845

Model Number

Base X X X X X X X X X X X

		HG601AA	HG601BB	HG601CC	HG601DD	HG601EE	HG601FF	Code
Packing Arrangement	Standard	Standard						O
	Purge	No charge						P
Crankcase Style	Pressure lube	Standard						M
	Std with heater	Extra cost						MH
Valves	Standard	Standard						4
	Unloaders	Extra cost					N/A	9
Piston Ring and Packing Material	Teflon®[2]	Standard						F
Gasket Material	Aluminum	Standard		N/A				B
	Iron-lead	No charge		Standard				D
O-ring Material	Buna-N	Standard						A
	Neoprene®[2]	No charge						B
Intercooler	N/A single stage	Standard						N
Flywheel	None	Cost reduction						N
	Standard	Standard						S
Protective Coating	No coating	Standard						N
Piston Rod Coating	Nitrotec	Standard						N
Adjustable Head	None	Standard					NA	N
	Both stages	Extra cost					Standard	3

[1] *This cylinder used for 3 and 4 stage compressors—consult factory for applications.*

[2] *Teflon® and Neoprene® are registered trademarks of the DuPont company.*

Mounting Options

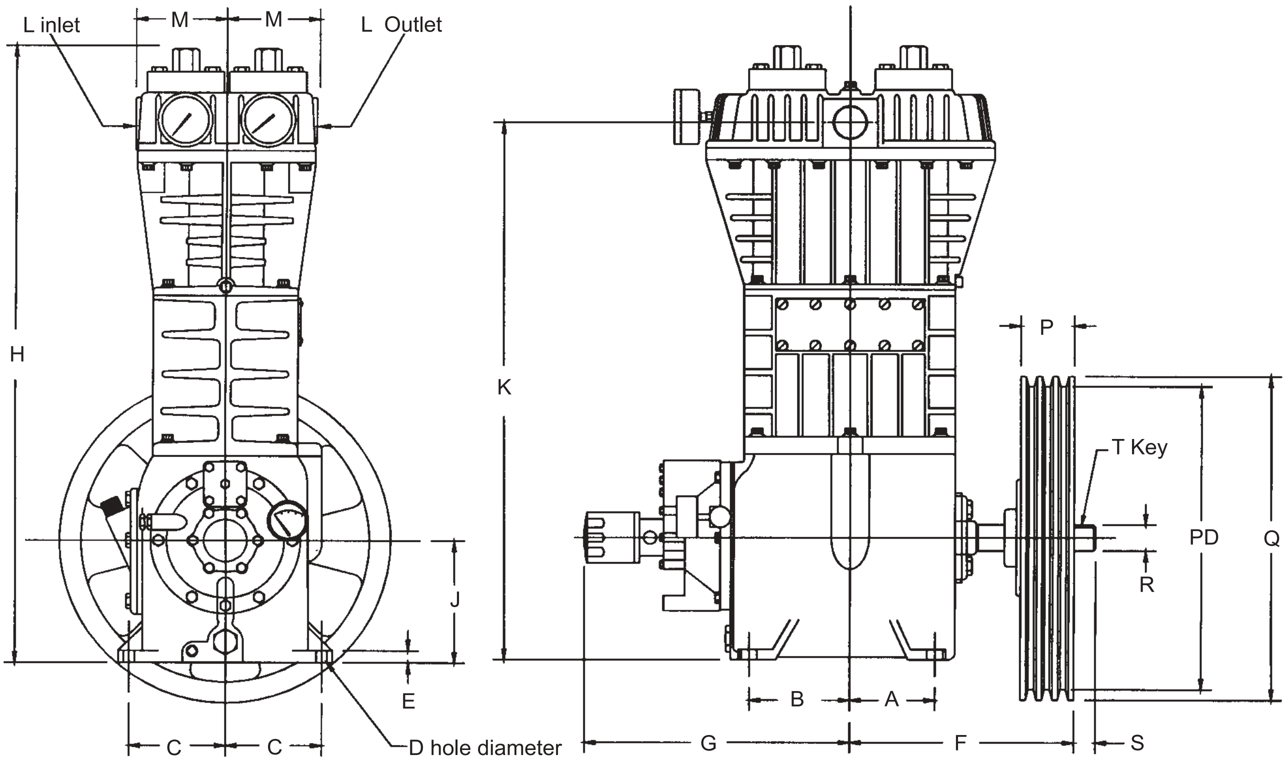
103 Mounting includes: Structural steel skid, welded interconnecting piping, packing vent tank, ANSI flanged gas connections, high discharge temperature switches, low oil pressure switch, adjustable driver slide base, V-belt drive and enclosed steel belt guard. Pressure gauges are mounted on the compressor.[3]
107C Mounting includes: Structural steel skid, ASME Code automatic liquid trap with 2 NEMA 7 liquid level switches for alarm and shut down, liquid trap pipe away relief valve, flanged non-lube 4-way valve. Welded interconnecting piping, packing vent tank, ANSI flanged gas connections, high discharge temperature switches, discharge temperature gauge, low oil pressure switch, adjustable driver slide base, V-belt drive and enclosed steel belt guard. Pressure gauges are mounted on the compressor.[3]
109C Mounting includes: Structural steel skid, ASME Code automatic liquid trap with 2 NEMA 7 liquid level switches for alarm and shut down, liquid trap pipe away relief valve. Welded interconnecting piping, packing vent tank, ANSI flanged gas connections, high discharge temperature switches, discharge temperature gauge, low oil pressure switch, adjustable driver slide base, V-belt drive and enclosed steel belt guard. Pressure gauges are mounted on the compressor.[3]

[3] *Discharge relief valves are required but not included in these mountings.*

CORKEN®
A Unit of IDEX Corporation

Vertical Single-Acting Compressors—Outline Dimensions

Models 91–691 Bare With Flywheel



Outline Dimensions—Inches (Centimeters)										
Model	A	B	C	D	E	F	G	H	J	K
91	1-13/16 (4.6)	2-3/8 (6.0)	3-11/16 (9.4)	13/32 (1.03)	5/8 (1.59)	6-1/4 (15.9)	3-7/8 (9.8)	25-5/16 (64.3)	5 (12.7)	22-11/16 (57.6)
291	3-3/8 (8.6)	4-1/8 (10.5)	3-11/16 (9.4)	13/32 (1.11)	5/8 (1.59)	9-13/16 (24.9)	12 (30.4)	25-13/16 (65.2)	5-3/8 (13.7)	23-3/8 (59.4)
491	4-1/8 (10.5)	5 (12.7)	4-11/16 (11.9)	1/2 (1.27)	11/16 (1.75)	10-11/16 (27.2)	13 (33.1)	29-11/16 (75.4)	5-7/8 (14.9)	26-3/16 (66.5)
691	4-3/4 (12.1)	5 (14.0)	5-3/8 (13.7)	9/16 (1.5)	1 (2.5)	14 (35.6)	14-3/8 (35.6)	39-1/8 (99.4)	8-1/4 (21.0)	35-1/8 (89.2)

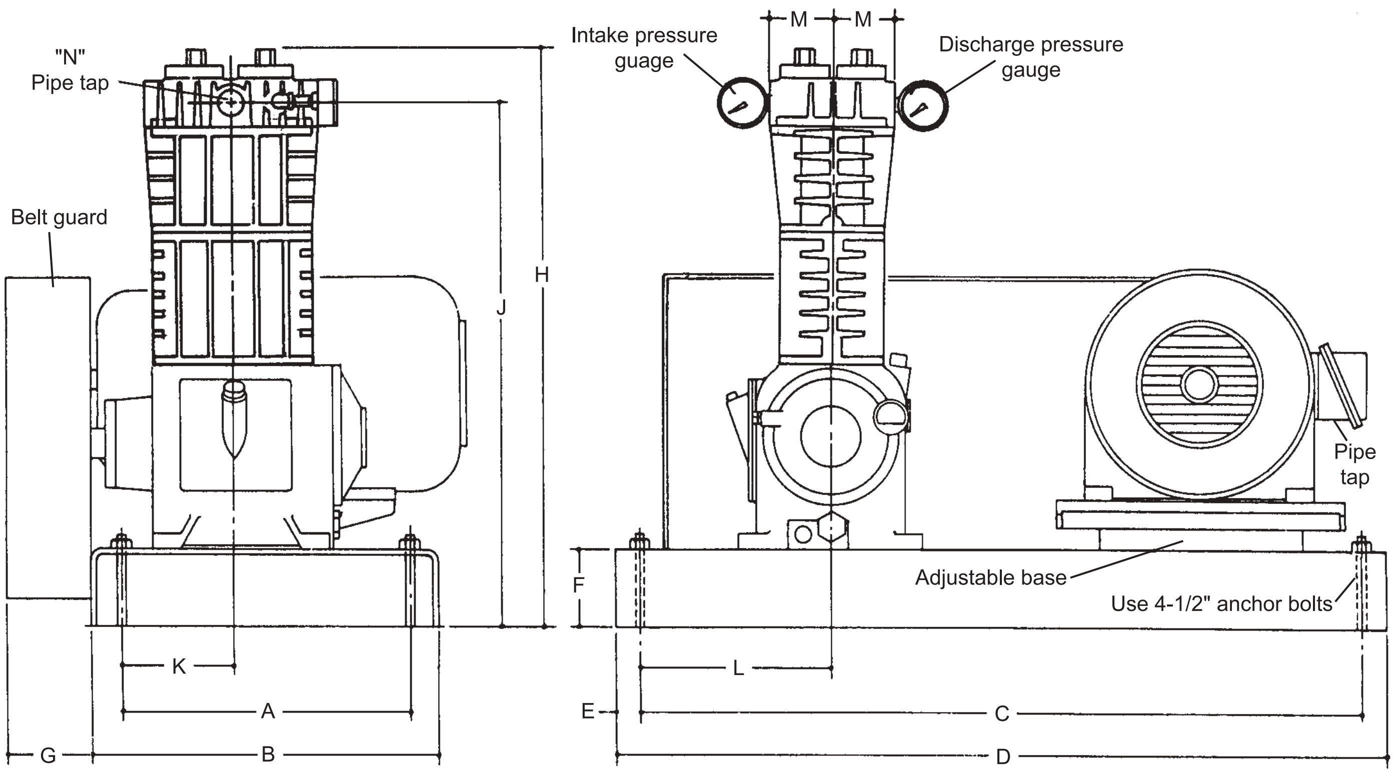
								"PD" Flywheel Pitch Diameter			
Model	L	M	P	Q	R	S	T	A-belt	Groove	B-belt	Groove
91	3/4 NPT	2-3/8 (6.0)	3 (7.6)	14 (35.6)	1-1/8 (2.8)	1-1/4 (3.2)	1/4 (0.63)	13.2 (33.5)	2	13.6 (34.5)	2
291	3/4 NPT	2-11/16 (6.8)	3 (7.6)	16 (40.6) 14[1] (35.6)	1-1/4 (3.2)	1-1/4 (3.2)	1/4 (0.63)	15.2 (38.6) 13.2[1] (33.5)	3 2	15.6 (39.6) 13.6[1] (34.5)	3 2
491	1-1/4 NPT	3-15/16 (10.1)	3 (7.6)	16 (40.6) 14[1] (35.6)	1-3/8 (3.5)	1-1/4 (3.2)	5/16 (0.79)	15.2 (38.6) 13.2[1] (33.5)	3 2	15.6 (39.6) 13.6[1] (34.5)	3 2
691	2[2] NPT	6-3/8 (16.1)	3-13/16 (9.7)	19-1/2 (49.5)	2-1/8 (5.4)	—	1/2 (1.27)	—	—	19-1/8 (48.5)	4

[1]*Optional flywheel*

[2]*Optional flanges: 1-1/4", 1-1/2" NPT, 1-1/4", 1-1/2" or 2" Weld*

Vertical Single-Acting Compressors—Outline Dimensions

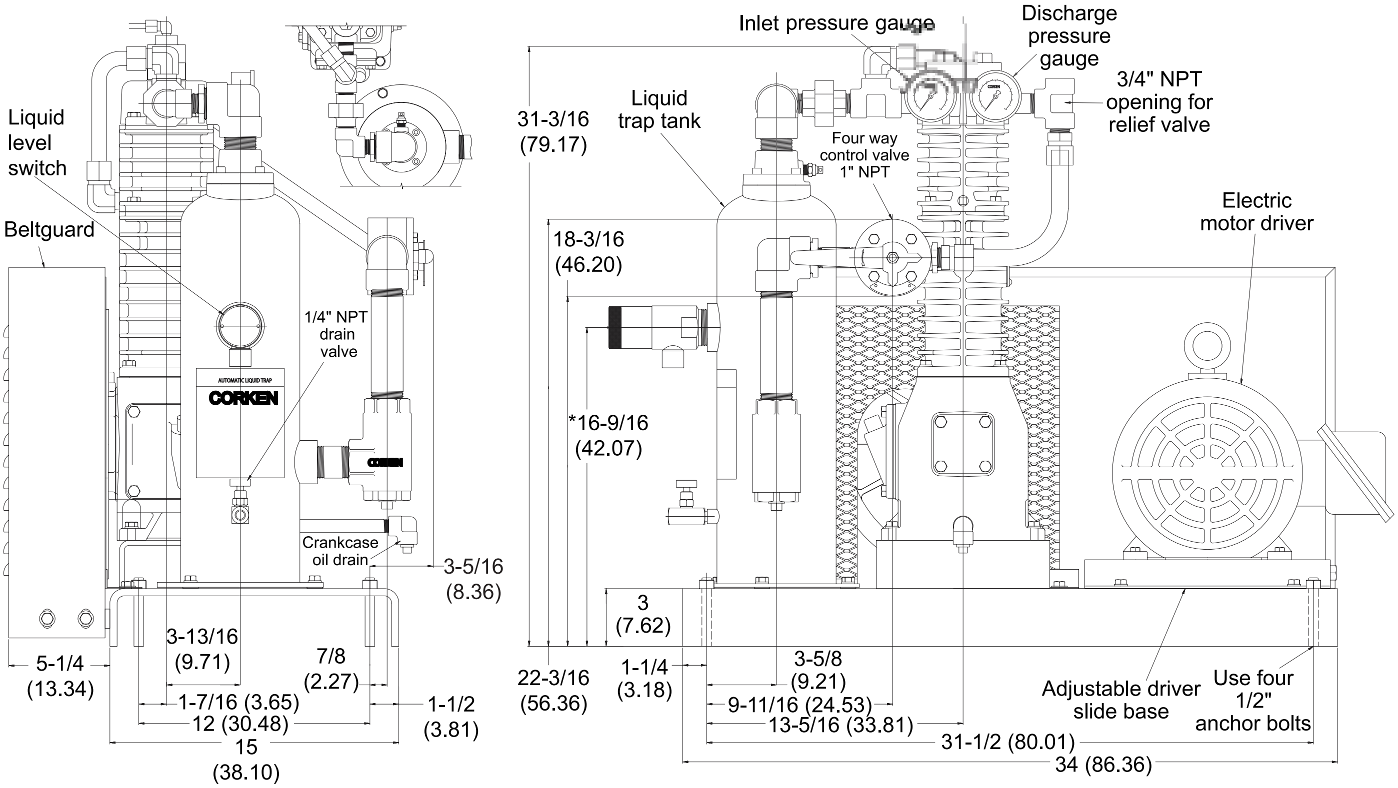
Models 91–691 With -103 Mounting



Outline Dimensions—Inches (Centimeters)							
Model	A	B	C	D	E	F	G
91-103	12 (30.4)	15 (38.1)	27-1/2 (69.8)	30 (76.2)	1-1/4 (3.1)	3 (7.6)	?? (??)
291-103	12 (30.5)	15 (38.1)	31-1/2 (80.0)	34 (86.4)	1-1/4 (3.2)	3 (7.6)	5 (12.7)
491-103	15 (38.1)	18 (45.7)	37-1/2 (95.3)	40 (101.6)	1-1/4 (3.2)	4 (10.2)	5-1/4 (13.3)
691-103	17 (43.2)	20 (50.8)	39-1/2 (100.3)	42 (106.7)	1-1/4 (3.2)	4 (10.2)	5.5 (14.0)

Model	H	J	K	L	M	N
91-103	28-11/16 (72.9)	26-3/8 (67.0)	4-15/16 (12.5)	7.75 (19.7)	2-11/16 (6.8)	3/4 NPT
291-103	28-22/32 (72.9)	26-6/16 (67.0)	4-15/16 (12.5)	7-3/4 (19.7)	2-11/16 (6.8)	3/4 NPT
491-103	33-11/16 (85.6)	30-3/16 (76.7)	5-3/4 (14.6)	10 (25.4)	3-15/16 (10.0)	3/4 NPT
691-103	43-1/8 (109.5)	39-1/8 (99.4)	8.25 (21.0)	9.25 (23.5)	6-3/8 (16.2)	2 NPT

Model 91 With -107 Or -107A Mounting (model -107A shown below)

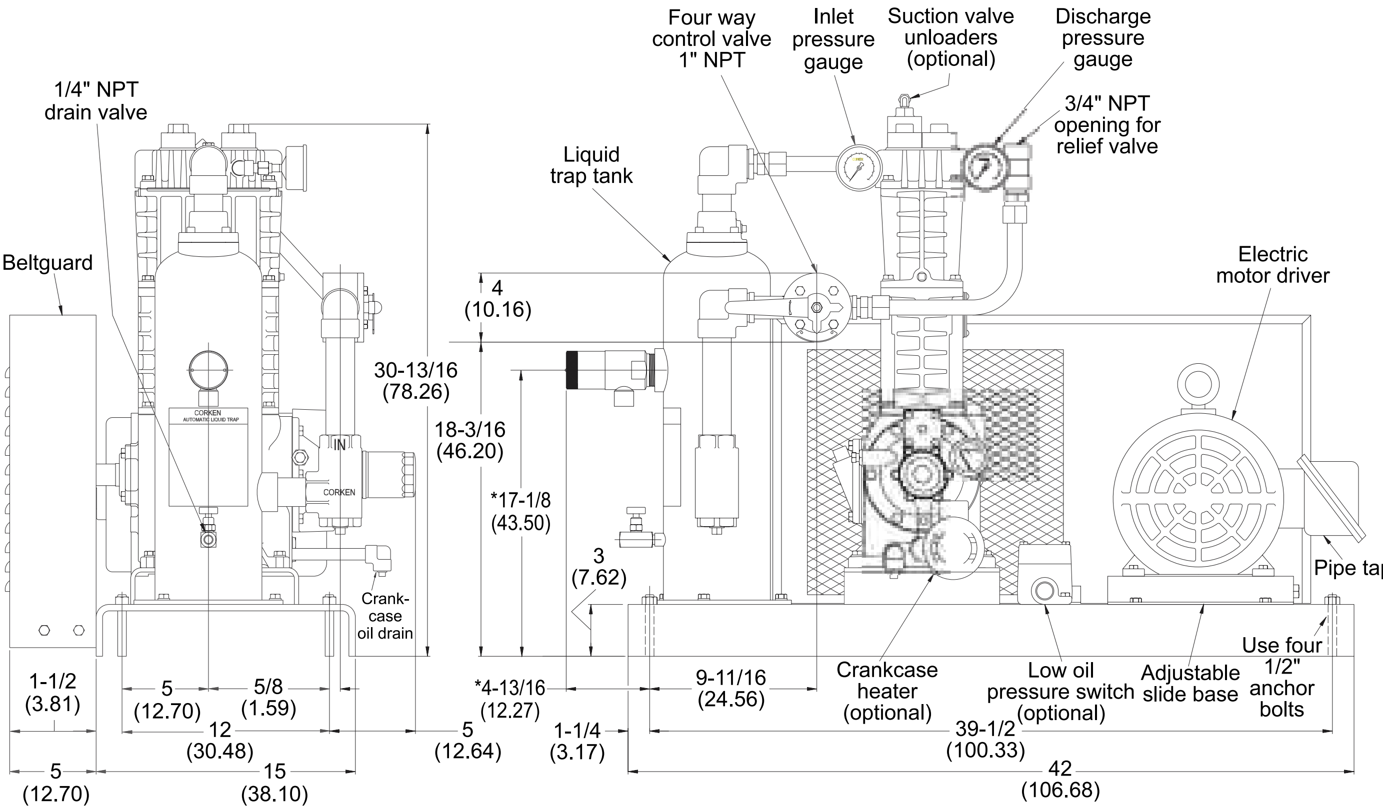


Inches (Centimeters)

** Dimensions apply to -107A mounting only*

Vertical Single-Acting Compressors—Outline Dimensions

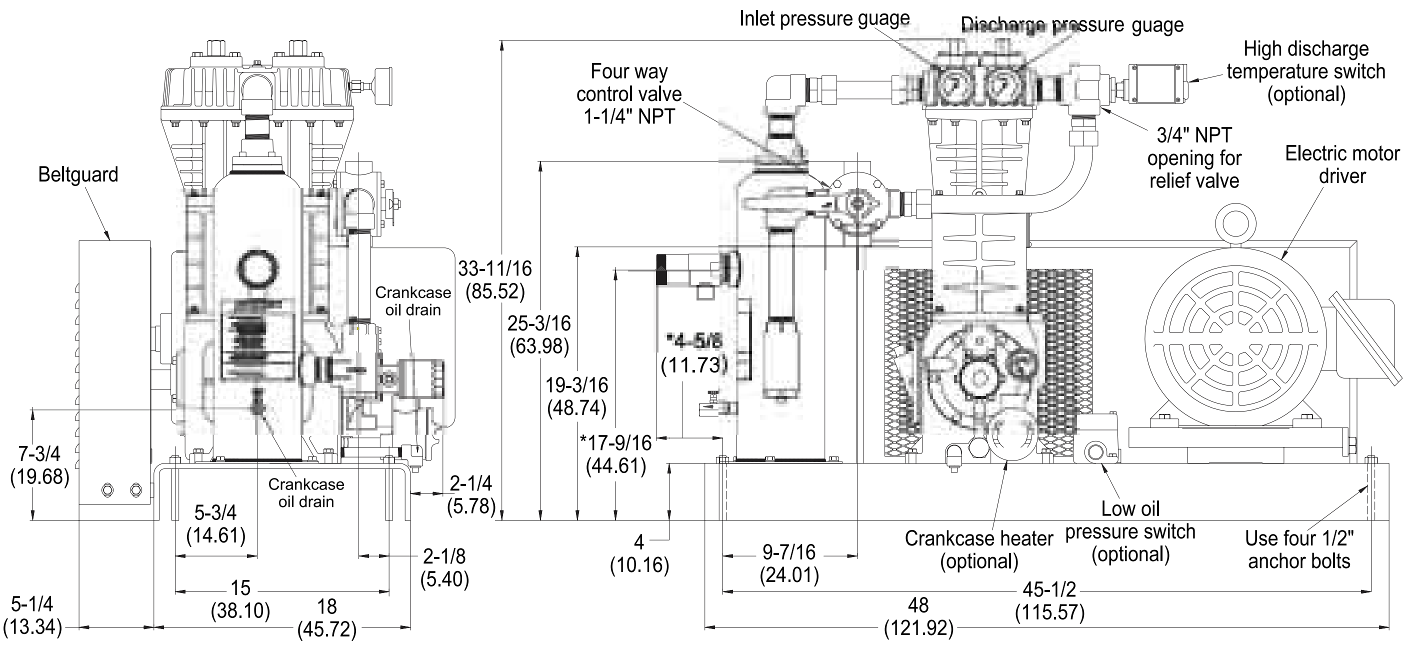
Model 291 With -107 Or -107A Mounting (model -107A shown below)



Inches (Centimeters)

** Dimensions apply to -107A mounting only*

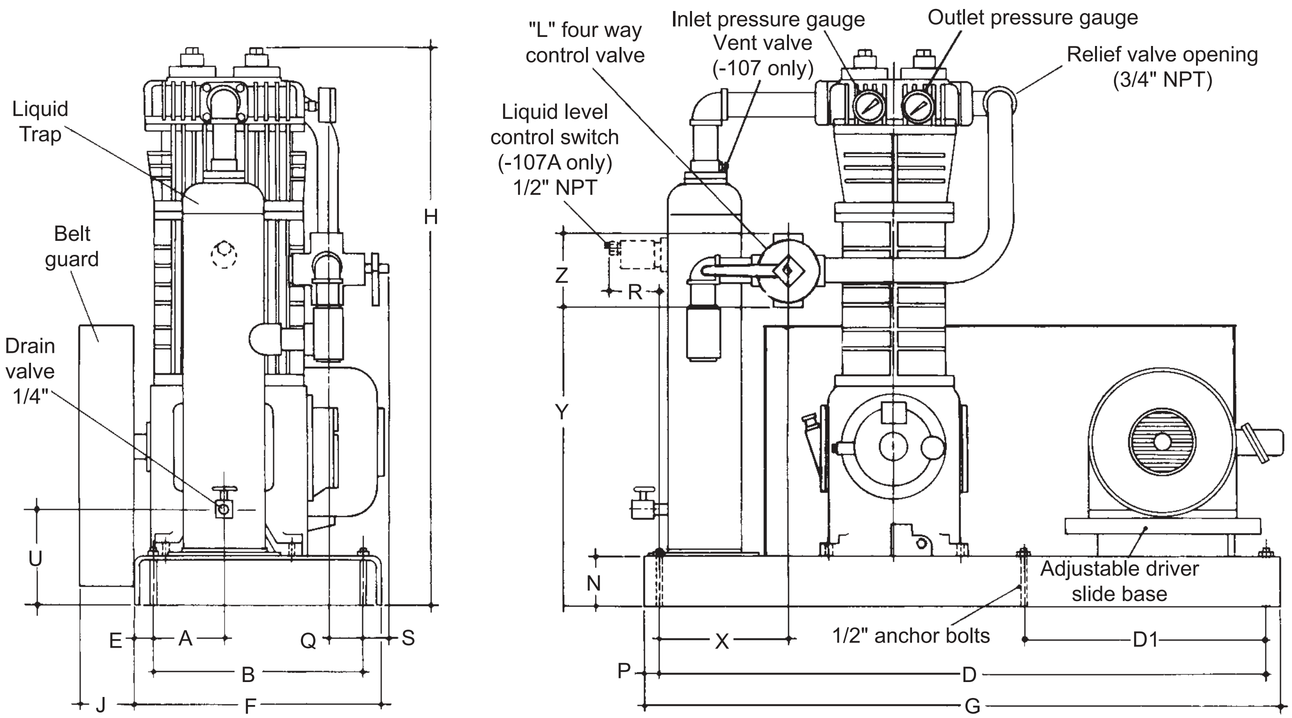
Model 491 With -107 Or -107A Mounting (model -107A shown below)



Inches (Centimeters)

** Dimensions apply to -107A mounting only*

Model 691 With -107 Or -107A Mounting (model -107A shown below)



Inches (Centimeters)

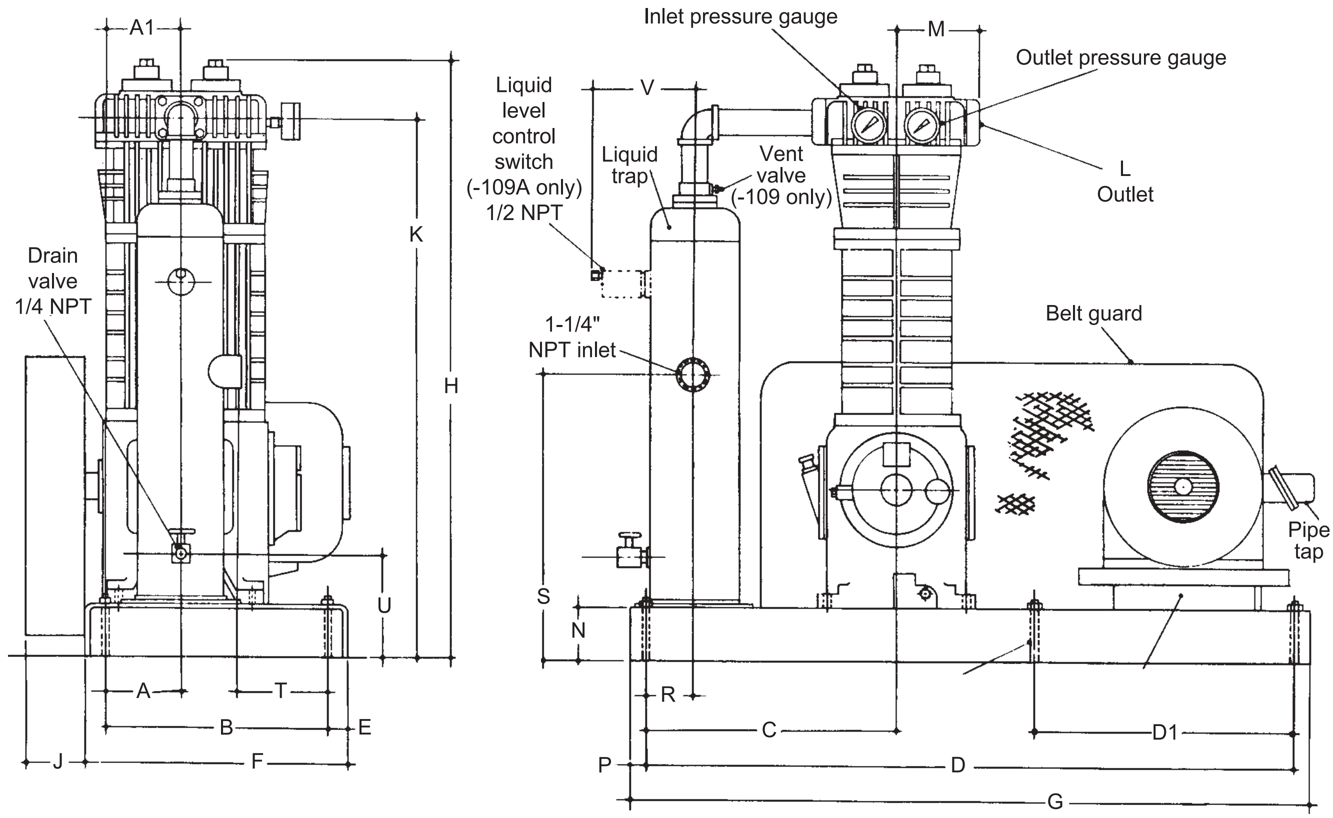
Outline Dimensions—Inches (Centimeters)										
Model	A	B	D	D1	E	F	G	H	J	L
691-107, -107A	8-1/4 (21.0)	17 (43.1)	49-1/2 (126)	19-3/4 (50.1)	1-1/2 (3.8)	20 (50.8)	52 (132)	43-1/4 (110)	5-1/2 (14)	1-1/4 NPT

Model		N	P	Q	R	S	U	X	Y
691-107, -107A	4 (10.1)	1-1/4 (3.2)	1/4 (0.63)	4-1/8 (10.4)	2-11/16* (6.8)*	7-3/4 (19.6)	29 (73.0)	24-1/4 (61.0)	6 (15.0)

** Dimensions apply to -107A mounting only*

Vertical Single-Acting Compressors—Outline Dimensions

Models 91–691 With -109 Or -109A Mounting (model -109A shown below)

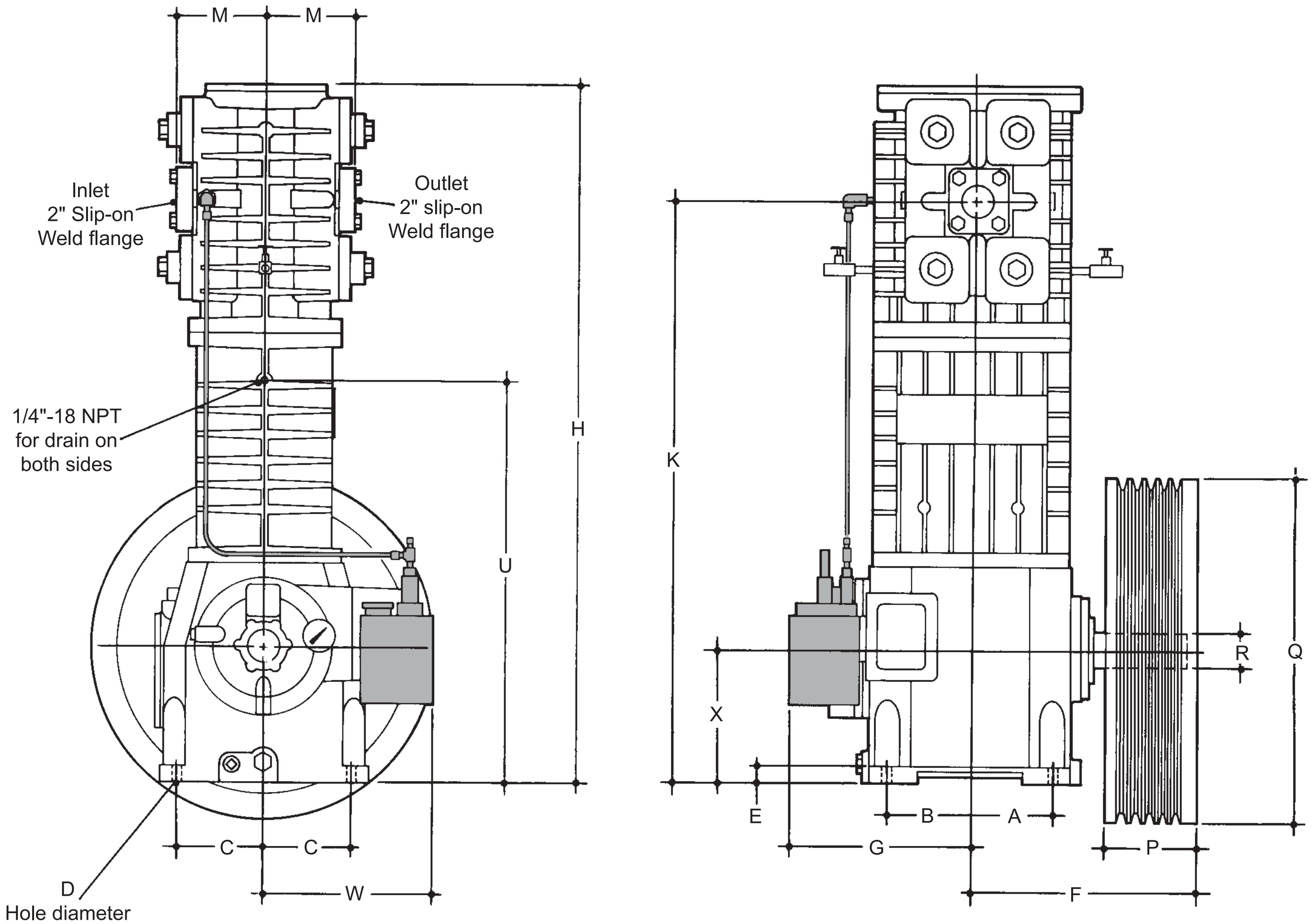


Outline Dimensions—Inches (Centimeters)											
Model	A	A1	B	C	D	D1	E	F	G	H	J
91-109, -109A	1-3/16 (3.7)	5-1/4 (13.4)	12 (30.5)	13-5/16 (33.8)	31-1/2 (80.0)	—	1-1/2 (3.8)	15 (38.1)	34 (86.4)	31-3/16 (79.2)	5-1/4 (13.3)
291-109, -109A	5 (12.7)	— —	12 (30.5)	15-3/4 (40.0)	39-1/2 (100.3)	— —	1-1/2 (3.8)	15 (38.1)	42 (106.7)	30-7/8 (78.4)	5-1/4 (13.3)
491-109, -109A	5-3/4 (14.6)	— —	15 (38.1)	18 (45.7)	45-1/2 (115.6)	— —	1-1/2 (3.8)	18 (45.7)	48 (121.9)	33-3/4 (85.7)	5-1/4 (13.3)
691-109, -109A	8-1/4 (30.0)	— —	17 (43.2)	19-1/4 (48.8)	49-1/2 (125.7)	19-3/4 (50.1)	1-1/2 (3.8)	20 (50.8)	52 (132)	43-3/16 (109.6)	5-1/2 (14.0)

Model	K	L	M	N	P	R	S	T	U	V
91-109, -109A	28-3/16 (71.6)	3/4 NPT	2-5/16 (5.9)	3 (7.6)	1-1/4 (3.2)	3-5/8 (9.2)	9-1/2 (24.1)	2-3/4 (6.9)	6-3/4 (17.1)	8 (20.3)
291-109, -109A	28-1/2 (72.4)	3/4 NPT	2-11/16 (6.8)	3 (7.6)	1-1/4 (3.2)	3-7/8 (9.9)	9-1/2 (24.1)	4-1/2 (11.4)	6-3/4 (17.1)	8 (20.3)
491-109, -109A	30-1/8 (76.5)	1-1/4 NPT	4 (10.2)	4 (10.2)	1-1/4 (3.2)	4 (10.2)	10-1/2 (26.7)	5.25 (13.3)	7-3/4 (19.7)	8 (20.3)
691-109, -109A	39-1/8 (99.3)	1-1/2 NPT	6-3/8 (16.1)	4 (10.2)	1-1/4 (3.2)	4-1/8 (10.4)	21-7/16 (54.4)	7-1/4 (18.4)	7-3/4 (19.7)	8 (20.3)

Vertical Double-Acting Compressors—Outline Dimensions

Model D891 Bare With Flywheel

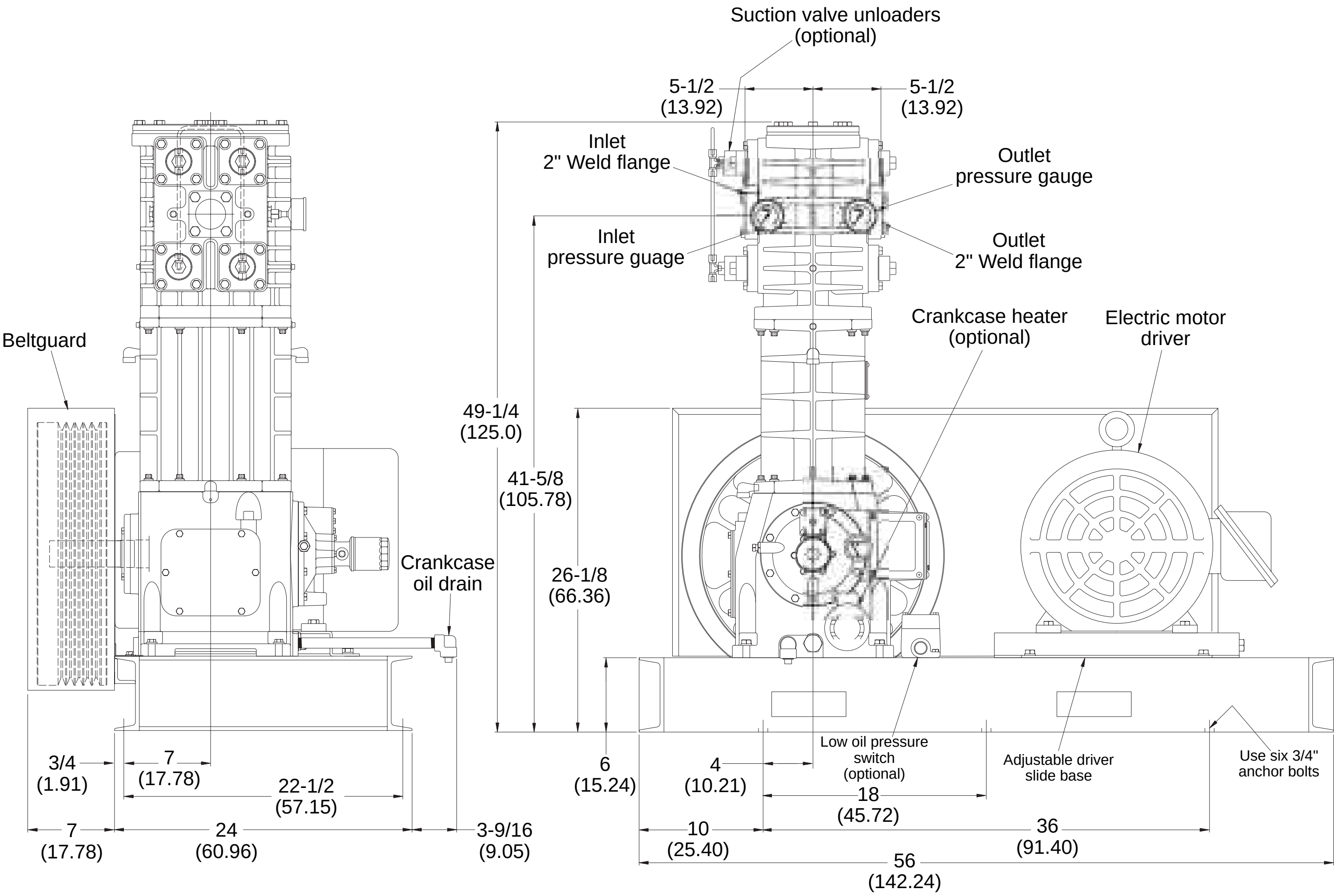


Note: The lubricator marked in gray is optional.

Outline Dimensions—Inches (Centimeters)								
Model	A	B	C	D	E	F	G	H
D891	4-3/4 (12.0)	5-1/2 (13.9)	5-3/8 (13.6)	9/16 (1.4)	1 (2.5)	13-1/4 (33.6)	11-5/8 (29.5)	42-7/8 (108.9)

Model	K	M	P	Q	R	U	W	X
D891	35-5/8 (90.4)	5-1/2 (13.9)	5-5/8 (14.3)	21.2 (53.8)	2-1/8 (5.3)	24-15/32 (62.1)	10-1/4 (26.0)	8-1/4 (20.9)

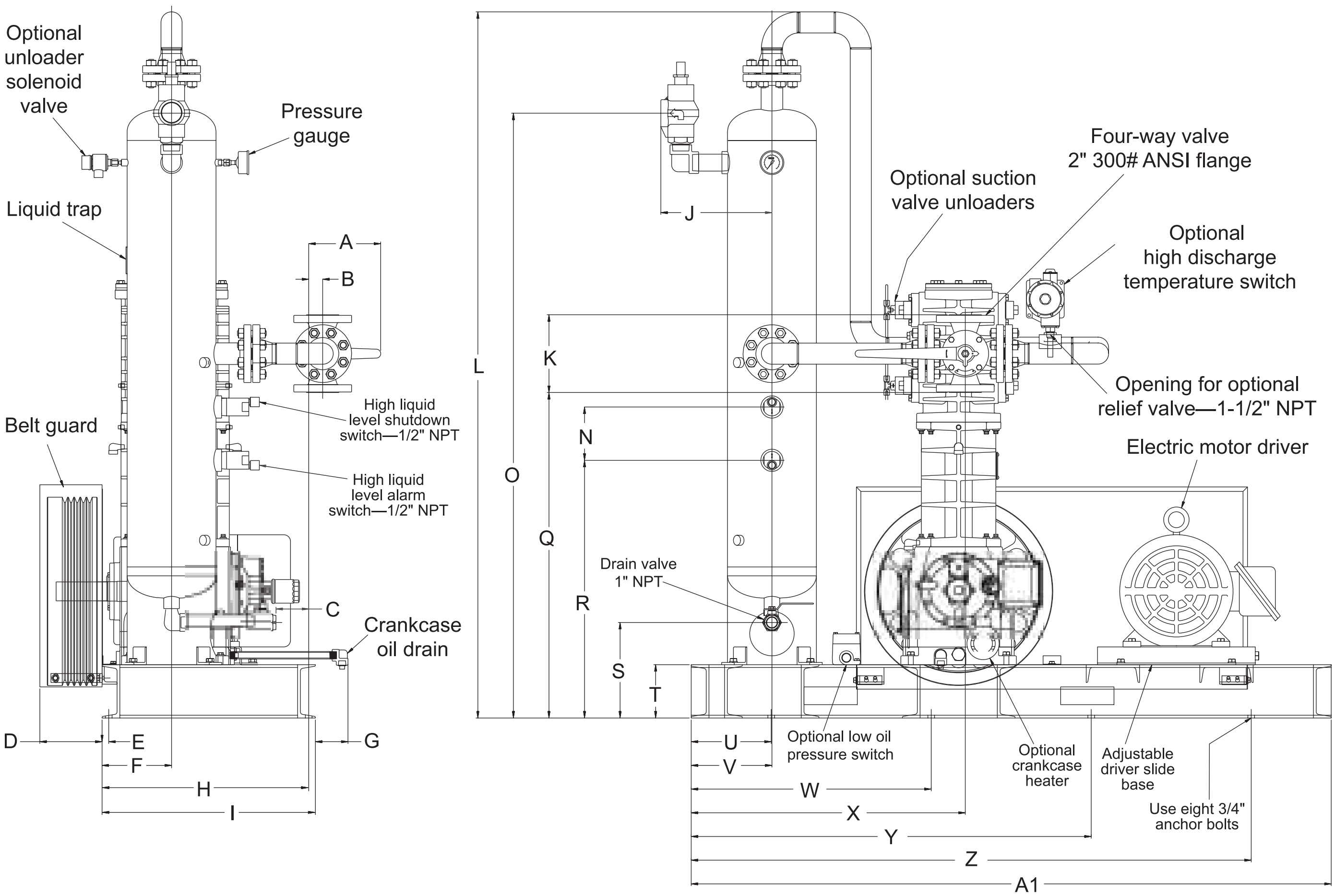
Model D891 With 103 Mounting



Outline Dimensions—Inches (Centimeters)								
Model	A	B	C	D	E	F	G	H
D891-103	3/4 (1.9)	7 (17.8)	22-1/2 (57.2)	7 (17.8)	24 (61.0)	3-9/16 (9.1)	5-1/2 (13.9)	5-1/2 (13.9)

Model	I	J	K	L	M	N	O	P	Q
D891-103	49-1/4 (125.0)	41-5/8 (105.8)	26-1/8 (66.4)	6 (15.2)	4 (10.2)	18 (45.7)	10 (25.4)	36 (91.4)	56 (142.2)

Model D891 With 107B Mounting



Outline Dimensions—Inches (Centimeters)									
Model	A	B	C	D	E	F	G	H	I
D891-107B	8-3/32 (20.6)	1-9/16 (4.0)	3-11/16 (9.4)	7 (17.8)	3/4 (1.9)	7-13/16 (19.9)	3-21/32 (9.3)	23-1/4 (59.1)	24 (61.0)

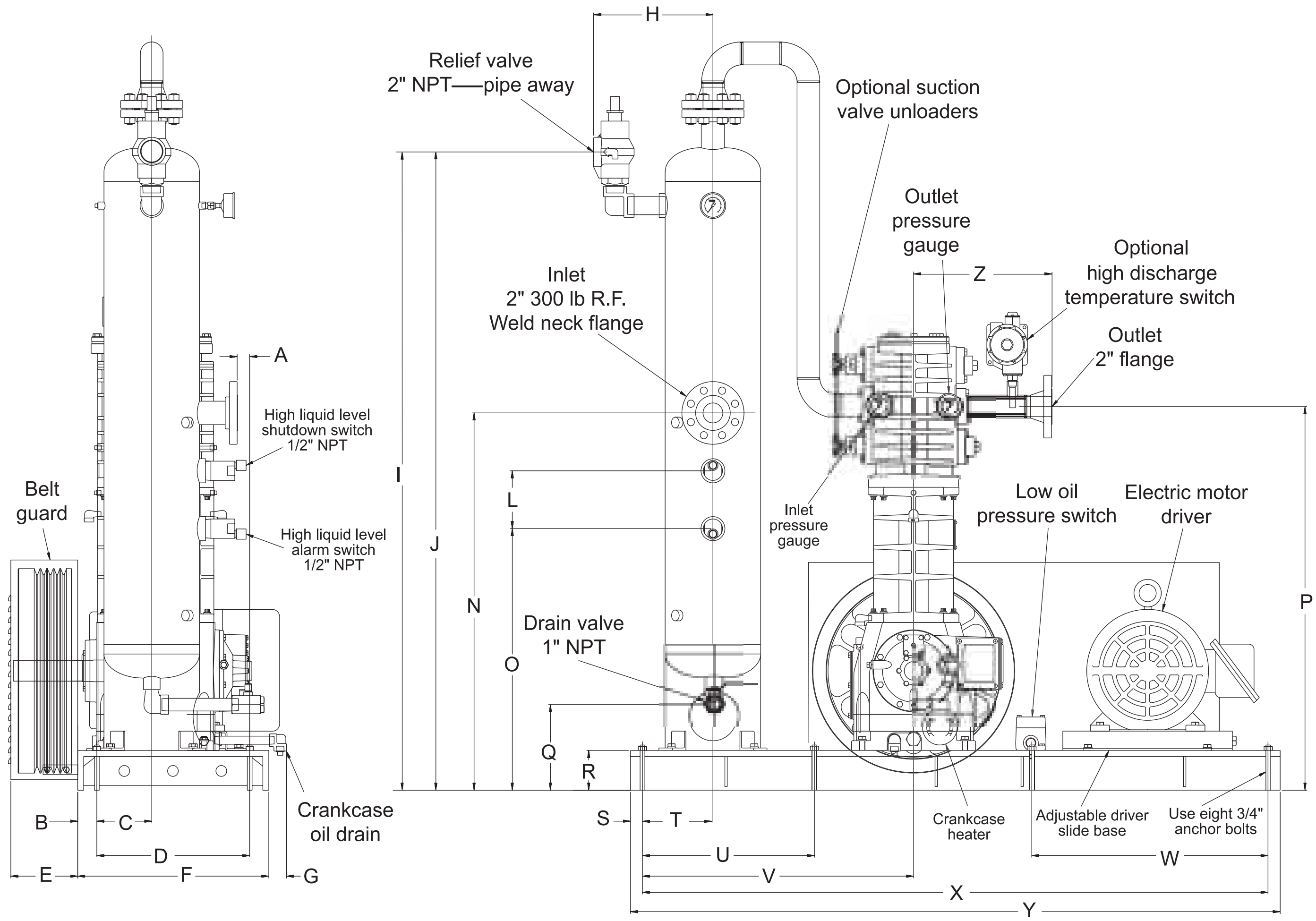
Model	J	K	L	N	O	Q	R
D891-107B	12-1/2 (31.8)	8-3/4 (22.2)	79-7/16 (201.8)	6 (15.2)	68-1/16 (172.9)	36-5/8 (93.0)	29 (73.7)

Model	S	T	U	V	W	X	Y	Z	A1
D891-107B	10-3/4 (27.3)	6 (15.2)	9 (22.9)	9-1/16 (23.0)	27 (68.6)	30-13/16 (78.3)	45 (114.3)	63 (160.0)	72 (182.9)

CORKEN® A Unit of IDEX Corporation

Vertical Double-Acting Compressors—Outline Dimensions

Model D891 With 109B Mounting



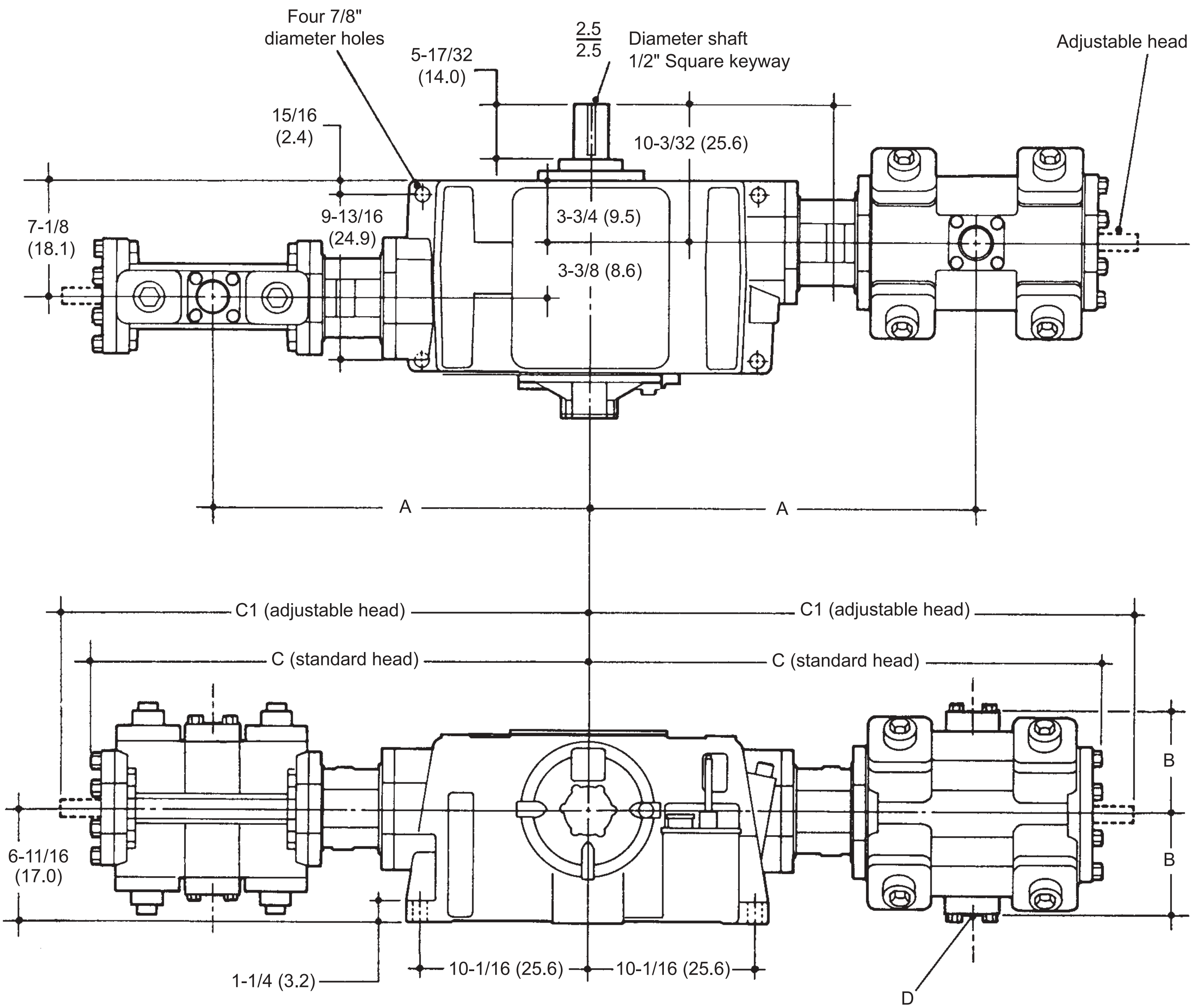
Outline Dimensions—Inches (Centimeters)									
Model	A	B	C	D	E	F	G	H	I
D891-109B	1-5/16 (3.3)	2 (5.1)	5-3/4 (14.6)	16 (40.6)	7 (17.8)	20 (50.8)	1-13/16 (4.7)	12-1/2 (31.8)	77-9/16 (197.1)

Model	J	L	N	O	P	Q	R
D891-109B	66-3/16 (168.1)	6 (15.2)	39-1/8 (99.4)	27-1/8 (68.9)	39-13/16 (101.1)	8-7/8 (22.5)	4-1/8 (10.5)

Model	S	T	U	V	W	X	Y	Z
D891-109B	1-1/4 (3.2)	7-3/8 (18.7)	18 (45.7)	28-3/8 (72.1)	24-3/4 (62.8)	65-1/2 (166.3)	68 (172.7)	14-1/2 (36.8)

Horizontal Double-Acting Compressors—Outline Dimensions

Model HG601 Double Cylinder Bare Unit



Outline Dimensions—Inches (Centimeters)					
Cylinder Size	A (nozzle C_L)	B (flange height)	C (standard head)	C1 (adjustable head)	D (flange size)
2-3/4	23-7/16 (59.5)	4-3/8 (11.1)	— —	33-15/16 (86.2)	[1]1-1/2" ANSI Flange
3-1/4	22-1/2 (57.2)	5 (12.7)	29-5/16 (74.5)	32-1/8 (81.6)	2" Slip on
4	22-15/16 (58.3)	5-15/16 (15.1)	30-1/4 (76.8)	33-1/16 (84.0)	2" Slip on
5	23-3/8 (59.4)	7-5/16 (18.6)	31-3/16 (79.2)	34 (86.4)	2" Slip on
6	22-15/16 (58.3)	5-15/16 (15.1)	30-1/4 (76.8)	33-1/6 (84.0)	2" Slip on
8	23-5/8 (60.0)	7-1/4 (18.4)	32-1/8 (81.6)	34-15/16 (88.7)	3" Slip on

[1]1-1/2" 1,500 lb ASA companion flange not supplied

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