HD Compressor Series

RECIPROCATING GAS COMPRESSORS | PRODUCT BROCHURE

PSG a DOVER company

Blackmer®

Where Innovation Flows

Blackmer® HD Series Reciprocating Gas Compressors

Oil-Free Gas Compressors for Industrial Gas Applications


HD942

Blackmer process compressors provide efficient and quiet delivery of oil-free industrial gas or air. These heavy-duty single and two-stage compressors combine advanced design technology and heavy-duty materials to give maximum performance with minimum maintenance.

HD Reciprocating Gas Compressors come in many different configurations and options, with multiple models available enabling choices between single or two-stage models, air-or liquid-cooled models, and single-, double- or triple-seal models.

Single-Stage & Two-Stage Models

Single-stage models are available in multiple sizes with piston displacements up to 125 cfm (212 m^3/hr) and working pressures to 1,000 psia (69 bar) for use on low to moderate compression ratio applications. Two-stage models are also available for higher compression ratio requirements.

Air-Cooled & Liquid-Cooled Models

The air-cooled models (HD) are suitable for most applications, especially for operation at lower compression ratios and for liquefied gas transfer applications. While liquid-cooled (HDL) models cool the head and cylinder for more demanding applications.

Single-, Double- & Triple-Seal

Double-seal models are constructed with a single distance piece between two sets of piston rod seals. The distance piece provides leakage control and prevents oil contamination of the compressed gas stream. Triple-seal models use two distance pieces for maximum leakage control and are well suited for handling toxic, hazardous or corrosive gases. Ports are provided in each distance piece chamber for purging, pressurizing or venting.

SUPERIOR COMPONENTS

Compared to competitive compressors, all HD Series Gas Compressors are equipped with superior components, that are better constructed, for longevity in even the most severe operating conditions. The HD Series Gas Compressors stand apart from the competition and operate longer between maintenance cycles due to the following:

- Piston Rings: Twice as thick as competitor models
- Crankshaft & Needle Bearings: Designed to last a lifetime
- High-Efficiency PEEK Valves: Move more gas
- Special Epoxy Coating: Protects the interior of the crankcase
- S3R Oil Control Seal: Prevents oil migration for a true oil-free compressor
- One-Piece Piston: Stronger and simpler than multi-piece designs
- No Yellow Metals: The unit can withstand the corrosiveness of gases

Additionally, the HD Series Gas Compressors come equipped with an array of features such as a ductile iron head and cylinders, steel pistons and self-adjusting piston rod seals. HD Gas Compressors provide maximum performance, energy efficiency, quiet operation, low maintenance cost and reliability under the most severe service conditions.

HD Series Reciprocating Gas Compressors | Design Features

High Efficiency, PEEK Valves

Blackmer valves are specifically designed for oil-free gas applications. Standard valve plates are constructed of self-lubricating PEEK (Poly Ether Ketone) material that provides superior sealing characteristics, high efficiency, and durability. Optional stainless steel valves are also available. Note: HD080, HD160, and HD170 Series have TNT-12 impregnated steel valves.

Live Loaded Piston Pod Seals

Filled PTFE seals are wear compensating and maintain a constant sealing pressure around the piston rods with minimum friction. This special seal design prevents crankcase oil contamination and cylinder blow-by.

Single or Double-Distance Piece

Single- or double-distance pieces (isolation chambers), are available in double-, and triple-seal models respectively, control contamination of the compressed gas from crankcase lubricant, even at high vacuum inlet conditions. Each isolation chamber may be independently purged, pressurized or vented for maximum containment and safety from toxic or hazardous gases.

Wrist Pin Needle Bearings

Free of yellow metals and designed to last a lifetime, Blackmer large roller needle bearings provide long life under high rod load applications and will not need to be replaced under normal operating conditions. Superior wrist pin lubrication is assured under all load conditions.

Heavy-Duty Crankshaft

The ductile iron crankshaft is precision ground with integral counterweights for smooth, quiet operation. Rifle drilling ensures positive oil distribution to the wrist pin and connecting rod bearings. Crankshaft main bearings are built to last and will not need to be replaced under normal operating conditions.

Special Epoxy Coating

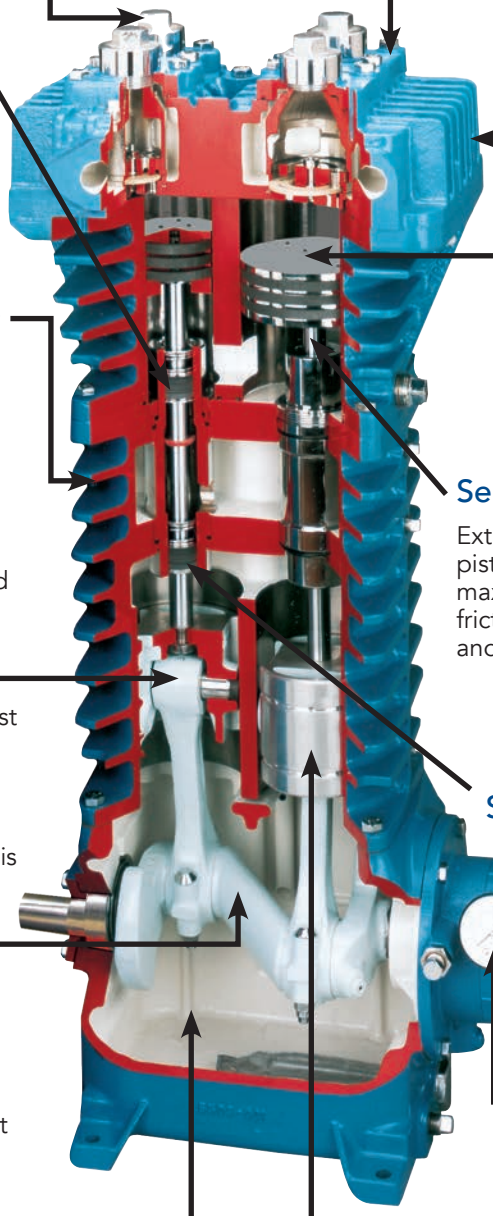
The entire interior of the crankcase is coated with a specially formulated epoxy coating, providing an added layer of protection.

ANSI Flanges

Many models are available with ANSI flanges for compatibility with CPI and refinery industry standards.

Ductile Iron Construction

All pressure parts are made of ductile iron for greater resistance to both thermal and mechanical shock. For extended wear and corrosion resistance, TNT-12 PTFE and nickel impregnation options are available.



O-Ring Seals

The head and cylinder are sealed with O-rings to ensure positive sealing under all operating conditions, eliminating leakage and maintenance problems. O-rings are available in Buna-N, FKM, neoprene, PTFE or ethylene-propylene.

One-Piece Piston

One-piece, heavy-duty, ductile iron pistons are connected to the rod with a single positive locking nut. The pistons are stronger and simpler than multi-piece designs with numerous fasteners which eliminates potential problems.

Self-Lubricating Piston Rings

Extra-thick, self-lubricating filled PTFE piston rings provide more wear surface for maximum sealing efficiency with minimal friction wear, resulting in peak performance and extended compressor life.

S3R Oil Control Seal

Available on all 600 and 900 Series configurations, the S3R seal delivers enhanced oil control providing even greater leakage control by keeping oil in the crankcase.

Pressure Lubricated Crankcase

A self-reversing oil pump provides positive oil distribution to all running gear components, including the crosshead, for long life and minimal wear. A full-flow spin-on filter is standard.

Wear-Resistant Crosshead Assemblies

The ductile iron crossheads feature special machine lube channels for maximum lubrication and wear resistance.

HD Compressor Series | Standard Features

Ductile Iron Cylinder and Head
Ductile iron is stronger, much more resistant to thermal shock, and more corrosion resistant than ordinary cast iron.

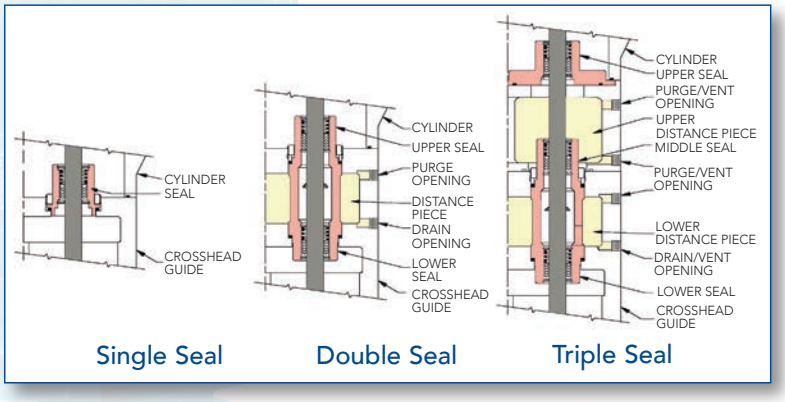
Water-Cooled Cylinder and Head
Water-cooled cylinders and head on HDL models reduce operating temperatures and extend wear life.

High Efficiency Valves
Standard high efficiency PEEK valve plates provide extended life due to the low mass and self-lubricating qualities of the PEEK material. In addition, the slight 'give' of a plastic versus a metal plate allows it to survive more abuse and provide better sealing throughout the life of the valve. Optional stainless steel valves are also available. Note: HD080, HD160 and HD170 Series have TNT-12 impregnated steel valves plates and bumpers.

Extra Thick PTFE Piston Rings for Positive Sealing
Extra thick PTFE piston rings are double the size of rings in competitive compressors and provide more wear surface to provide greater ring life.

O-Ring Seals Between the Cylinder and Head
Buna-N O-ring head seals come standard and provide positive sealing under all operating conditions. Other material options include, PTFE, FKM, neoprene, and ethylene-propylene.

Precise Leakage Control
Triple-Seal (double distance piece), Double-Seal (single distance piece) and Single-Seal (no distance piece) models allow precise leakage control and minimize product contamination.



No Head Bolt Gasket
The center head bolts do not pass through the gas chambers and thus do not require a head bolt gasket. No gasket means no leakage source.

One Piece Piston with Single Positive Locking Nut
The one-piece piston is attached to the piston rod via one positive locking nut, making both stronger and simpler than multi-piece designs with numerous fasteners found on competitor's equipment.

ANSI Connections
ANSI flanged connections allow maximum piping flexibility and are available on most HD Series Compressors.

Steel for Extra Life
Steel wrist pins ride on steel needle bearings for extra life under severe conditions.

PTFE Piston Rod Seals
Self-adjusting PTFE piston rod seals provide maximum sealing and minimum friction.

Wear Resistant Crosshead Assemblies
The ductile iron crossheads feature special machined lubrication channels and ports to provide extensive lubrication of the crosshead and guide. Wear is minimized and galling is eliminated.

Pressure Lubricated Crankcase
Crankcase is pressure lubricated via a self reversing oil pump directly driven by the crankshaft. Oil is fed to all bearing surfaces, including the crosshead. An automotive type spin-on oil filter is standard.

Special Epoxy Coating
The entire interior of the crankcase is coated with a specially formulated epoxy coating, providing an added layer of protection.

No Yellow Metal
No brass or copper is present in the compressor keeping the compressor safe from the corrosive nature of some gases.

BLACKMER® HD COMPRESSORS

HD080 Series | HD081, HD082

The HD080 Series Gas Compressors offer a flow rate of 8.45 CFM (14.35 m³/hr) at max rpm. This single-stage, air-cooled compressor is suitable for operation at lower compression ratios and for industrial liquefied gas transfer applications. Available in the HD081 a single-seal configuration and the HD082 model that has a double-seal configuration.

HD080 Series Technical Data:

Bore	3" (76.2 mm)
Stroke	2.5" (63.5 mm)
Piston Displacement @ Maximum rpm	8.45 CFM (14.35 m^3/hr)
Max. Power	7.5 BHP (5.5 kW)
Inlet/Outlet Connections	0.75" NPT

HD160 Series | HD161, HD162, HD163

Blackmer HD160 Series single-stage, two-cylinder, air-cooled reciprocating gas compressors feature flow rates of 16.9 CFM (28.7 m³/hr) at max rpm. For precise leakage control and to minimize product contamination, the HD160 Series gas compressors are available in single- (HD161), double- (HD162), or triple-seal (HD163) models.

HD160 Series Technical Data:

Bore	3" (76.2 mm)
Stroke	2.5" (63.5 mm)
Piston Displacement @ Maximum rpm	16.9 CFM (28.7 m^3/hr)
Max. Power	10 BHP (7.5 kW)
Inlet/Outlet Connections	0.75" NPT

HD170 Series | HD172/HDL172, HD173/HDL173

Available in air-cooled and liquid-cooled models, the Blackmer HD170 Series two-stage reciprocating gas compressors feature flow rates of 8.42 CFM (14.3 m³/hr) at max rpm. The HD170 Series gas compressors have four models available, the air-cooled (HD172/173), and liquid-cooled (HDL172/173) models. The HD170 Series gas compressors offer double- (HD172/HDL172), or triple-seal (HD173/HDL173) models.

HD170 Series Technical Data:

	1st Stage	2nd Stage
Bore	3" (76.2 mm)	1.75" (44.5 mm)
Stroke	2.5" (63.5 mm)	
Piston Displacement @ Maximum rpm	8.42 CFM (14.3 m^3/hr)	
Max. Power	10 BHP (7.5 kW)	
Inlet/Outlet Connections	0.75" NPT	

BLACKMER® HD COMPRESSORS

HDL320 Series | HDL322

The liquid-cooled Blackmer HDL320 Series single-stage, two-cylinder reciprocating gas compressors feature flow rates of 9 CFM (15.3 m³/hr) at max rpm. The HDL320 Series gas compressors features a double-seal (HDL322) model.

HDL320 Series Technical Data:

Bore	2" (51 mm)
Stroke	3" (76 mm)
Piston Displacement @ Maximum rpm	9.0 CFM (15.3 m^3/hr)
Max. Power	15 BHP (11 kW)
Inlet/Outlet Connections	1.5" 600# ANSI

HDL340 Series | HDL342, HDL343

The liquid-cooled Blackmer HDL340 Series single-stage, two-cylinder reciprocating gas compressors feature flow rates of 16.25 CFM (27.6 m³/hr) at max rpm.The HDL340 Series gas compressors have both double- (HDL342), or triple-seal (HDL343) models.

HDL340 Series Technical Data:

Bore	2.69" (68 mm)
Stroke	3" (76 mm)
Piston Displacement @ Maximum rpm	16.25 CFM (27.61 m^3/hr)
Max. Power	15 BHP (11 kW)
Inlet/Outlet Connections	1.5" 600# ANSI

HD360 Series | HD361, HD362/HDL362, HD363/HDL363

Available in five models, the HD360 Series of reciprocating gas compressors feature flow rates of 36 CFM (61.2 m³/hr) at max rpm. These single-stage, two-cylinder gas compressors are available in both air-cooled (HD361/362/363), and liquid-cooled (HDL362/363) models. The HD360 Series gas compressors are available in single- (HD361), double- (HD362/HDL362), or triple-seal (HD363/HDL363) models.

HD360 Series Technical Data:

Bore	4" (102 mm)
Stroke	3" (76 mm)
Piston Displacement @ Maximum rpm	36.0 CFM (61.2 m^3/hr)
Max. Power	15 BHP (11 kW)
Inlet/Outlet Connections	1.5" 300# ANSI

HD370 Series | HD372/HDL372, HD373/HDL373

Designed with both air-cooled and liquid-cooled models, the Blackmer HD370 Series two-stage reciprocating gas compressors feature flow rates of 24.1 CFM (40.8 m³/hr) at max rpm. The HD370 Series gas compressors have four models available, the air-cooled (HD372/373), and liquid-cooled (HDL372/373) models, and are offered in both double- (HD372/HDL372), or triple-seal (HD373/HDL373) configurations.

HD370 Series Technical Data:

	1st Stage	2nd Stage
Bore	4.625" (117 mm)	2.687" (68 mm)
Stroke	3" (76 mm)	
Piston Displacement @ Maximum rpm	24.1 CFM (40.8 m^3/hr)	
Max. Power	15 BHP (11 kW)	
Inlet/Outlet Connections	1.25" NPT / 1" NPT	

BLACKMER® HD COMPRESSORS

HD600 Series | HD602/HDL602, HD603/HDL603

Available in four models, the HD600 Series of reciprocating gas compressors feature flow rates of 64.2 CFM (109 m³/hr) at max rpm. These single-stage, two-cylinder gas compressors are available in both air-cooled (HD602/603), and liquid-cooled (HDL602/603) models, and are available in double- (HD602/HDL602), or triple-seal (HD603/HDL603) configurations. The HD600 Series also features the S3R oil control seal that keeps oil in the crankcase and prevents oil migration.

HD600 Series Technical Data:

Bore	4.625" (117 mm)
Stroke	4" (102 mm)
Piston Displacement @ Maximum rpm	64.2 CFM (109.0 m³/hr)
Max. Power	40 BHP (30 kW)
Inlet/Outlet Connections	2" 300# ANSI

HD610 Series | HD612/HDL612, HD613/HDL613

Available in air-cooled and liquid-cooled models, the Blackmer HD610 Series two-stage reciprocating gas compressors feature flow rates of 53.7 CFM (91.2 m³/hr) at max rpm. The HD610 Series gas compressors have four models available, the air-cooled (HD612/613), and liquid-cooled (HDL612/613) models, and has offerings is available in double- (HD612/HDL612), or triple-seal (HD613/HDL613) configurations. The HD610 Series also features the S3R oil control seal that keeps oil in the crankcase and prevents oil migration.

HD610 Series Technical Data:

	1st Stage	2nd Stage
Bore	6" (152 mm)	3.25" (83 mm)
Stroke	4" (102 mm)	
Piston Displacement @ Maximum rpm	53.7 CFM (91.2 m³/hr)	
Max. Power	40 BHP (30 kW)	
Inlet/Outlet Connections	2" NPT/1.5" NPT	

HDL640 Series | HDL642, HDL643

The liquid-cooled Blackmer HDL640 Series single-stage, two-cylinder reciprocating gas compressors feature flow rates of 31.7 CFM (53.8 m³/hr) at max rpm. The HDL640 Series gas compressors offer double- (HDL642), or triple-seal (HDL643) options. The HDL640 Series also features the S3R oil control seal that keeps oil in the crankcase and prevents oil migration.

HDL640 Series Technical Data:

Bore	3.25" (83 mm)
Stroke	4" (102 mm)
Piston Displacement @ Maximum rpm	31.7 CFM (53.8 m³/hr)
Max. Power	40 BHP (30 kW)
Inlet/Outlet Connections	2" 600# ANSI

HD940 Series | HD942/HDL942, HD943/HDL943

The HD940 Series is the largest offering of Blackmer reciprocating gas compressors, and features flow rates of 125.2 CFM (212 m³/hr) at max rpm. These single-stage, double acting two-cylinder gas compressors are available in both air-cooled (HD942/943), and liquid-cooled (HDL942/943) models and are vailable in double- (HD942/HDL942), or triple-seal (HD943/HDL943) models. The HD940 Series also features the S3R oil control seal that keeps oil in the crankcase and prevents oil migration.

HD940 Series Technical Data:

Bore	4.625" (117 mm)
Stroke	4" (102 mm)
Piston Displacement @ Maximum rpm	125.2 CFM (212 m³/hr)
Max. Power	50 BHP (37 kW)
Inlet/Outlet Connections	2" 300# ANSI

BLACKMER® HD COMPRESSORS

HD Compressors | Applications

HD Series Reciprocating Gas Compressors have numerous applications for industrial gas handling.

- Gas Transfer
- Liquefied Gas Transfer
- Vapor Recovery
- Gas Gathering
- Gas Evacuation
- Gas Blanketing
- Pressure Boosting
- Flare Elimination
- Leak Test Recovery
- Enhanced Recovery

Specially designed with no yellow metals, the HD Series Reciprocating Gas Compressors are designed to work with all the following gases and more:

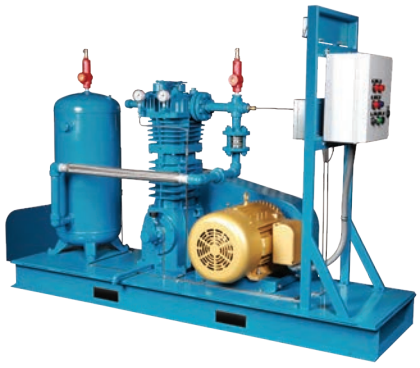
- Air
- Ammonia
- Argon
- Butadiene
- Butane
- Carbon Dioxide
- Carbon Monoxide
- CFCs
- Chlorine
- Cyclohexane
- Cyclopropane
- Dimethylamine
- Dimethyl Ether
- Ethane
- Ethyl Alcohol
- Ethyl
- Chloride
- Ethylene
- Ethylene Oxide
- HCFCs
- Helium
- n-Heptane
- n-Hexane
- Hydrogen
- Hydrogen Chloride
- Hydrogen Sulfide
- Isobutane
- Isobutene
- Isobutylene
- Isopentane
- Methane
- Methanol
- Methyl Chloride
- Methyl Mercaptan
- Monoethylamine
- Natural Gas
- Nitrogen
- Nitrogen Dioxide
- Nitrous Oxide
- Ozone
- n-Octane
- n-Pentane
- Propane
- Propylene
- Refrigerants
- Sulfur Dioxide
- Sulfur Hexafluoride
- Trichlororethane
- Tetrafluorethylene
- Trimethylamine
- Vinyl Chloride
- Xenon
- and other gases

HD Compressors | Custom Made Units

Complete custom gas compressor packages are available. Engineering, fabrication and drawings are all provided per specifications to meet the application requirements.

HD942 compressor with explosion-proof control panel and electrically actuated 4-way flow control valve for LPG transfer.

Duplex HD613 two-stage triple-seal compressors with control panel for natural gas pressure boosting operation.



HD602 compressor with ASME Code receiver vessel, TEFC motor, and NEMO 4 safety devices and controls for nitrogen boosting.

HD Compressors | Options & Ancillary Equipment

4-Way Valves	For piping, in aiding for easy transition from liquid transfer to vapor recovery - comes with handle and easy-to-read flow direction indictor
Wear & Corrosion-Resistant Components (TNT-12)	Wear and corrosion resistant treatment for compressor, with TNT-12 impregnated parts
Pressure Switches	Activates alarms and/or shutdown equipment for suction, discharge, differential, and/or oil pressure
Temperature Switches	Activates alarms and/or shutdown equipment for discharge and/or oil temperature
Heat Exchanger	Used to maintain adequate oil temperature in cold and severe climates. Pre-coolers, inter-coolers and after-coolers available
Liquid Traps, ASME Code	Liquid traps available with mechanical valve or electric float switch (or both). ASME code construction also available
Strainer	Vapor strainer assembly features 30-mesh stainless steel screen
O-Ring Materials	Optional O-ring materials available include PTFE, FKM, neoprene, ethylene-propylene
Pressure Gauges	Visual confirmation of pressure - typically on the suction, discharge, and oil locations
Suction Valve Unloaders & Systems	Prevents the compression of gas in the cylinder by holding the suction valves open, allowing the compressor to be started without a load and to control compressor's capacity
Relief Valves	Overpressure safety devices required on the compressor discharge and any associated ASME code vessels
Shutoff Valves	Available in either manual or powered
Motor or Engine Drives	Available in various classifications and can be customized for any application
Control Panels & Starters	Junction box and full turn-key functionality available in required classifications
Thermowells	Protects temperature monitoring devices from harsh process gas conditions
Extended Crankshaft	Extended crankshaft available for direct drive mounting
Piston Rings	Poly-filled PTFE piston rings for dry-gas service
Piping	Threaded or welded steel piping systems available
Tests	Test certificates available for each compressor

BLACKMER® HD COMPRESSORS

HD Compressors | Specifications – Single-Stage Models

Single-Seal Double-Seal Triple-Seal	HD081 HD082	HD161 HD162 HD163	HDL322	HDL342 HDL343	HD361 HD362/HDL362 HD363/HDL363	HDL642 HDL643	HD602/HDL602 HD603/HDL603	HD942/HDL942 HD943/HDL943
Number of Cylinders	1	2	2	2	2	2	2	2 (Double Acting)
Bore - in. (mm)	3.0 (76)	3.0 (76)	2.0 (51)	2.69 (68)	4.0 (102)	3.25 (83)	4.625 (117)	4.625 (117)
Stroke in. (mm)	2.5 (64)	2.5 (64)	3.0 (76)	3.0 (76)	3.0 (76)	4.0 (102)	4.0 (102)	4.0 (102)
Maximum Allowable Working Pressure - psia (bar)	350 (24.1)	350 (24.1)	1,000 (69)	750 (51.7)	350 (24.1)	750 (51.7)	350 (24.1)	350 (24.1)
Minimum/Maximum rpm	350 / 825	350 / 825	350 / 825	350 / 825	350 / 825	350 / 825	350 / 825	350 / 825
Piston Displacement **@100 rpm - CFM (m^3/hr)** **@Min rpm - CFM (m^3/hr)** **@Max rpm - CFM (m^3/hr)**	1.02 (1.74) 3.58 (6.1) 8.45 (14.35)	2.05 (3.48) 7.16 (12.2) 16.9 (28.7)	1.09 (1.85) 3.81 (6.49) 9.00 (15.3)	1.97 (3.34) 6.89 (11.71) 16.25 (27.61)	4.36 (7.41) 15.3 (26.0) 36.0 (61.2)	3.84 (6.5) 13.4 (22.8) 31.7 (53.8)	7.78 (13.2) 27.2 (46.3) 64.2 (109.0)	14.99 (25.47) 52.46 (89.1) 125.2 (212)
Max. bph (kW)	7.5 (5.5)	10 (7.5)	15 (11)	15 (11)	15 (11)	40 (30)	40 (30)	50 (37)
Approximate Weight w/Flywheel - lb (kg)	215 (97)	225 (102)	385 (175)	375 (170)	365 (166)	705 (320)	705 (320)	905 (410)
Inlet/Outlet Connections	0.75" NPT	0.75" NPT	1.5" 600# ANSI	1.5" 600# ANSI	1.5" 300# ANSI	2" 600# ANSI	2" 300# ANSI	2" 300# ANSI

Compression ratios are normally limited by discharge temperature. High compression ratios and certain gases can cause excessive heat, i.e. over 350°F (177°C). The duty cycle must provide for adequate cooling time between periods of operation to prevent excessive operating temperature.

HD Compressors | Specifications – Two-Stage Models

Double-Seal Triple-Seal	HD172 / HDL172 HD173 / HDL173		HD372 / HDL372 HD373 / HDL373		HD612 / HDL612 HD613 / HDL613	
	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage
Number of Cylinders	1	1	1	1	1	1
Bore - in. (mm)	3.0 (76.2)	1.75 (44.5)	4.625 (117)	2.687 (68)	6 (152)	3.25 (83)
Stroke in. (mm)	2.5 (63.5)		3.0 (76)		4.0 (102)	
Maximum Allowable Working Pressure - psia (bar)	615 (42.4)		615 (42.4)		415 (28.6)	
Minimum/Maximum rpm	350 / 825		350 / 825		350 / 825	
Piston Displacement @100 rpm - CFM (m^3/hr) @Min rpm - CFM (m^3/hr) @Max rpm - CFM (m^3/hr)	1.02 (1.73) 3.57 (6.07) 8.42 (14.3)		2.92 (4.96) 10.2 (17.3) 24.1 (40.8)		6.54 (11.1) 22.9 (38.9) 53.7 (91.2)	
Max. bph (kW)	10 (7.5)		15 (11)		40 (30)	
Approximate Weight w/Flywheel - lb (kg)	290 (132)		405 (184)		775 (352)	
Inlet/Outlet NPT - in.	0.75/0.75		1.25/1.00		2.00*/1.50* *Weld type flanges available	

Compression ratios are normally limited by discharge temperature. High compression ratios and certain gases can cause excessive heat, i.e. over 350°F (177°C). The duty cycle must provide for adequate cooling time between periods of operation to prevent excessive operating temperature.

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