

Chemical pumps and pumping systems

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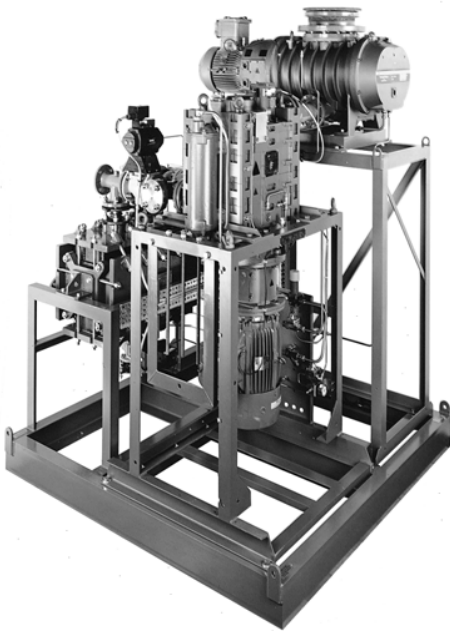
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Chemical dry pumping systems

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Chem-Dry™ series vacuum pumps

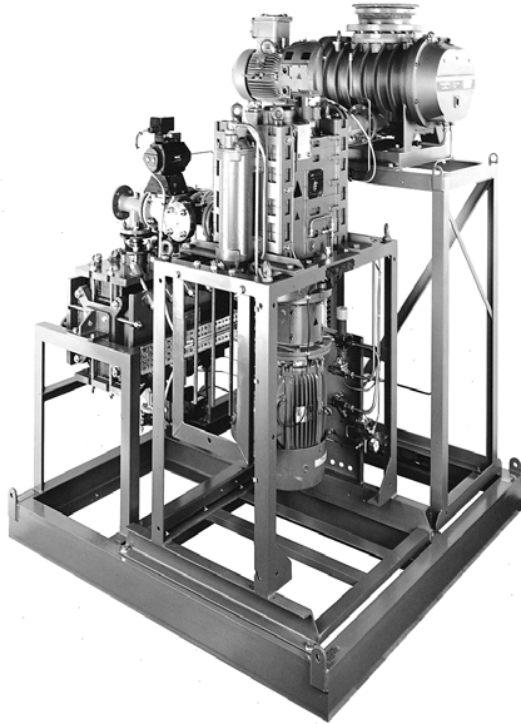
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CHEMICAL DRY PUMPS

BOC Edwards is a market leader in dry pump technology and pioneer of dry vacuum for the chemical process, pharmaceutical and fine chemical industries.

The DP and EDP ranges utilize the proven and patented reverse claw mechanism to provide a clean and robust vacuum solution.



The rugged, non contacting design includes the ability to control pump case and internal gas temperatures allowing a comprehensive range of solvents, flammables and corrosives to be pumped and systemized variants to address the EU's explosive atmospheres (ATEX) directive for Category 1 (Zone 0) T4 operation.

The mechanism can tolerate liquids and particles in the gas stream and is suited to many applications, including:

- Distillation
- Evaporation
- Filter/driers
- Solvent recovery
- Reactor service
- House/central vacuum

The product range is available from $80\text{m}^3\text{h}^{-1} / 47\text{ft}^3\text{min}^{-1}$ to $400\text{m}^3\text{h}^{-1} / 235\text{ft}^3\text{min}^{-1}$ with capacity expandable to $3000\text{m}^3\text{h}^{-1} / 1766\text{ft}^3\text{min}^{-1}$ and an ultimate pressure of $10^{-2}\text{mbar} / 0.015\text{ Torr}$.

Applications Engineering is a core competence and BOC Edwards are able to offer a comprehensive solutions package that includes

- Process design
- Equipment specification and selection
- Safety and operating procedures
- Vacuum system and control integration
- Commissioning advice

Dry technology

Dry running pumps have no oil, steam or water in the process volume. This eliminates, at source, the pollution traditionally associated with wet sealed vacuum systems and provides cost and materials handling benefits as the sealing medium does not have to be replenished:

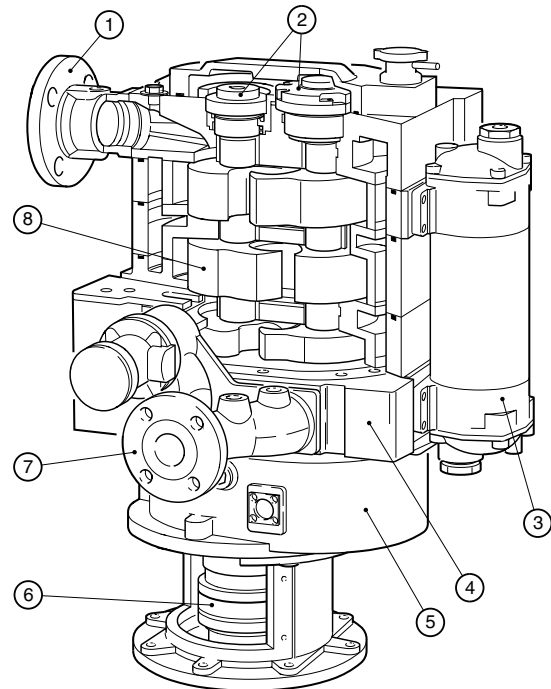
- NO contamination of the process stream
- NO polluted effluent
- NO messy oil drums
- Improved processing with reduced down time
- Low utility and consumable costs

Patented technology, proven design

BOC Edwards DP and EDP range are designed specifically for harsh chemical environments.

- Vertical orientation
 - allows condensates to drain
 - can handle liquid slugs
- A torque limiting clutch (can be reset) protects against hydraulic lock
- Indirect cooling circuit allows variable and controllable case temperatures
- Shortest gas paths prevent local condensation and particulate build up
- Suitable for outdoor installations

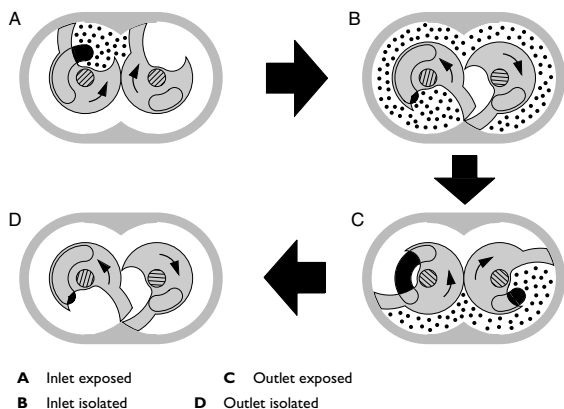
The pumps have a 20 year design life with a 3 year service interval and are easy to maintain in-situ.



- | | |
|-------------------------------|------------------|
| 1 Inlet | 5 Gearbox |
| 2 Sealed high vacuum bearings | 6 Torque limiter |
| 3 Indirect cooling | 7 Outlet |
| 4 Rugged modular construction | 8 Reversed claw |

The reverse claw mechanism

The DP and EDP range are multistage claw mechanisms. Each stage comprises of two claw shaped rotors on parallel shafts, which rotate in opposite directions. The claws trap and compress the process gas, which takes a zig-zag path between the stages, as it is moved along the axis of the shaft from the inlet at the top to the exhaust at the bottom.



During each complete rotation of the claws, first the inlet port of each pair is exposed (to admit gas to the pump), then both the inlet and outlet are isolated (to trap and compress the gas) and finally the outlet is exposed (to expel the compressed gas).

Cooling and temperature control Work done in compressing the process gases generates heat in the pump. It is necessary to cool the pump to control gas temperature to avoid polymerization or similar reactions and to remove the risk of auto-ignition. Standard DP and EDP pumps use an indirect cooling system. Circulation is by thermo-syphon and temperature is controlled via the primary cooling water flow through the external heat exchanger.

Safety

The dry claw DP/EDP ranges have been explosion proof tested and certified by an external notified body.

Within Europe this testing was carried out under the ATEX legislation that took effect in June 2003. All suppliers are required to assume that rotating machinery is a potential source of ignition and review expected process failures such as interruptions to gas or water supplies. This review and testing process has resulted in BOC Edwards being able to offer Zone0 protection for either T3 or T4 ratings. (see ATEX Section)

All electrical equipment is certified to Eex standards.

Outside of Europe, all pumps are built to the same standards as ATEX but certification is not required.

Systems are suitable for US Explosion Proof Class I, Division I, Groups C & D and all electrical equipment comes with a UL/FM, Ex or CSA approval rating.

Solutions engineering

It is a rare occasion that a plain pump is supplied to an end user. The range and complexity of chemical industry applications require an in-depth knowledge of the process, environmental and safety issues and a suite of optional accessories or modules to match.

Applications design & support

BOC Edwards comprehensive design service is based on in-depth knowledge of the industries and applications involved. This expertise is held in the, highly focussed, applications team, which consists of a Central Applications Group supported by a regional network of Applications Specialists.

Solutions could cover:

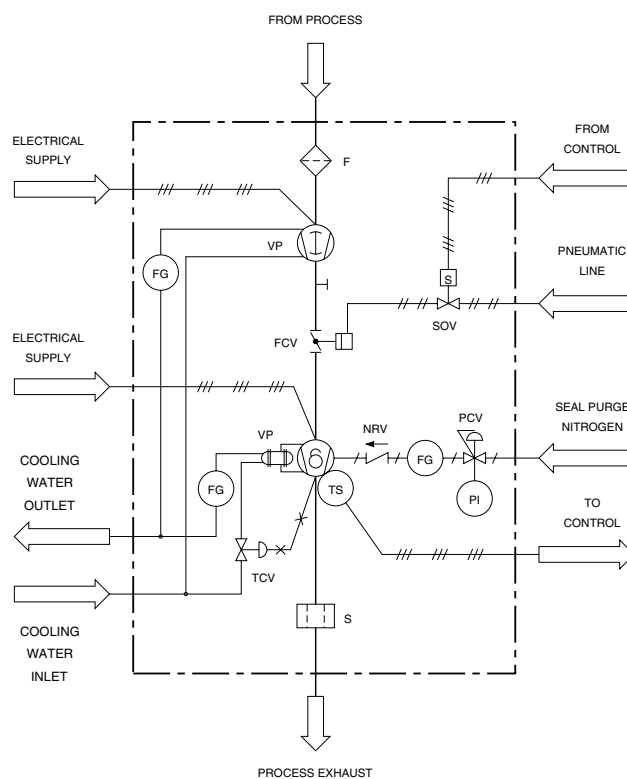
- Process design
- Equipment selection
- Safety and operating parameters
 - Includes assistance with ATEX zoning/philosophy
- Integration with plant control system(s)
- Commissioning advice and more.

Contact your local office to set up an initial discussion with an Applications Specialist. Typically discussions will include materials to be pumped, duty pressures and capacities, control systems, cycle (batch etc.), utilities, system footprint etc.

Modular & custom accessories

Where possible, BOC Edwards design each customer system from a suite of standard modules and accessories.

Once an application has been reviewed, the system is assembled in CAD starting with the pump (and booster if required). A Process or Piping & Instrumentation Drawing (P&ID) is used to confirm customer requirements. (see example below).



P&ID example: system with mechanical boosters & seal purge options

Accessory modules offered include:

Mechanical boosters

Provide increased pumping speed & improved ultimate. Available with:

- Cooling options
- Sensors

Gas Purges

Used to dilute flammables and improve seal life

- Inlet purge*
- Shaft seal purge*
- Pressurized gearbox

Safety

BOC Edwards offer a comprehensive range of solutions to containment and constructional safety, to satisfy ATEX or your own requirements.

- Flame arrestors
- Solvent flush*
- Inlet isolation valves*

Vessels

Solvents and other liquids carried over in the process stream can be recovered upstream or downstream of the pump.

- Knock-out pot*
- Condenser*
- Receiver*

Acoustics

Silencers reduce pulsations in the exhaust and hence noise in the exhaust line. All silencers are drainable. Enclosures reduce system noise by >5dB(A).

- Silencers
- Full system enclosures

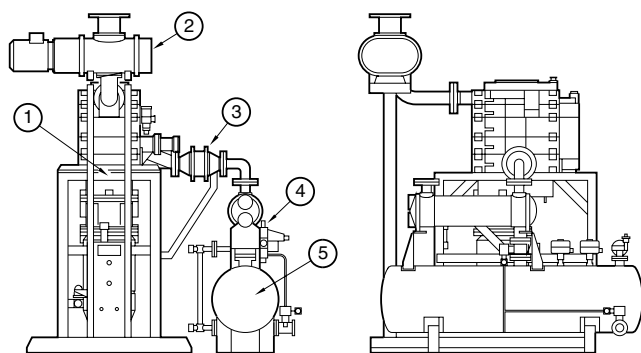
Monitoring & control

Offerings range from gauges and simple 4-20mA transmitters to fully enclosed bespoke control units.

- Temperature transmitters
- Pressure transmitters
- Pressure gauges
- Rotation sensors
- Inverter drives
- Control box

* Denotes item is available with solenoid/switch control/actuation.

All additional control and sensor requirements to achieve zoning are supplied with the flame arrestor module.



- 1 DP250 pump
- 2 Mechanical booster pump EH1200
- 3 Flame arrestor
- 4 Exhaust condenser
- 5 Receiver

Where no existing module exists, a solution can be developed in-house. This can be as simple as a change to a solenoid specification, to a custom filtration or control module. Specifications can be defined by the customer or set to industry standards, codes and practices and certified if necessary. This combination of off-the-peg and tailored engineering allows full flexibility without compromising quality or lead times. Regardless of the size or scope of a delivered system; it will be safe, fully engineered and matched to your process.

EH mechanical boosters for use with DP, DPS and EDP chemical dry pumps

BOC Edwards can supply a complete range of mechanical booster pumps suitable for use with chemical dry pumps. They are based on simple Roots principle and incorporate a unique hydrokinetic fluid drive. The advantages of which are discussed on page 2-69. The EH mechanical boosters are fully compliant with ATEX and are available in temperature classes T3 and T1160. BOC Edwards has chosen to offer T160 instead of the more usual T4 temperature classification as this improves pumping speed by as much as 50% at typical operating pressures compared to a mechanical booster classified to T4.

Combined pressure and vacuum pumping systems

There are a number of processes that require periods of pressure both above and below atmospheric. A prime example would be a filter/drier system where the cake is compressed in the presence of re-circulating Nitrogen until the solute level is suitable for vacuum drying.

BOC Edwards use a standard dry claw pump module, and many of the accessories listed earlier, to produce a robust yet flexible single pump execution of both the compression and vacuum steps in the application.

Use of such a system offers:

- A rapid and consistent cycle
- Single pumping system for the entire cycle
- Reduced nitrogen costs from re-circulation
- Reduced drying time
 - Lower ultimate pressure
- Ability to handle multiple solvents without cross-contamination
- BOC Edwards claw technology
 - No effluent from eliminating liquid ring pumps
 - Reduced maintenance -eliminates build up of particulates in re-circulating sealant

Service support and spares

BOC Edwards place particular emphasis on after-sales support and on site assistance to ensure correct operation of chemical dry pump systems. Strong local capabilities have been set up in all major territories for overhaul, repair technical support and spares provision.

All BOC Edwards chemical dry pumps are customer serviceable, with appropriate training and documentation. However, we recommend that our pump module service exchange program is used unless installed quantities merit the investment.

ORDERING INFORMATION

Contact BOC Edwards or your local supplier who will be able to assess your unique requirements for a DP dry pump system.

SPARES	ORDERING NUMBER
Routine maintenance kit	A70501825
Motor fitting kit	A70501805
Upper bearing kit	A70501826
Swept volume kit	A70501827
Lower bearing kit	A70501828
Replacement pressure relief valve	
Standard	A70501816
Bellows sealed	A70501820
Swing PRV chemical	A70501832
Bellows pressure relief valve conversion kit	A70501829
'O' ring kit	A70501821
Standard pressure relief valve overhaul kit	A70501831
Overhaul kit swing PRV	A70501833
Clutch reset tools	A21071082

DP/DPS80 - DP/DPS400

TECHNICAL DATA

Construction	3 claw
Maximum back pressure	
Standard	1150 mbar
Optional*	1300 mbar
Standard motor†	50 Hz, 400 V, 3-ph 2940 rpm
Total gas input (seal purge)	20 l min ⁻¹
DP/DPS80	
Nominal capacity	80 m ³ h ⁻¹ / 47 ft ³ min ⁻¹
Capacity @ 10 mbar	80 m ³ h ⁻¹ / 47 ft ³ min ⁻¹
Ultimate vacuum	0.8 mbar / 0.6 Torr
Power consumption (@t 10 mbar)	40 kW / 5.4 hp
Motor rated power	5.5 kW / 7.4 hp
Cooling water flow rate	1.0 - 8.0 l min ⁻¹ / 0.2 - 2.6 gal min ⁻¹
Noise	<73 dB(A)
Weight	625 kg / 1375 lbs
Dimensions‡	700 x 850 x 1423 mm / 27 x 33.2 x 56 inch
DP/DPS160	
Nominal capacity	160 m ³ h ⁻¹ / 94 ft ³ min ⁻¹
Capacity @ 10 mbar	160 m ³ h ⁻¹ / 94 ft ³ min ⁻¹
Ultimate vacuum	0.8 mbar / 0.6 Torr
Power consumption (@ 10 mbar)	4.9 kW / 6.6 hp
Motor rated power	7.5 or 11.0 kW / 15 hp
Cooling water flow rate	1.0 - 8.0 l min ⁻¹ / 0.2 - 2.6 gal min ⁻¹
Noise	<78 dB(A)
Weight	720 kg / 1592 lbs
Dimensions‡	700 x 850 x 1458 mm / 27 x 33.2 x 57.4 inch
DP/DPS250	
Nominal capacity	250 m ³ h ⁻¹ / 147 ft ³ min ⁻¹
Capacity @ 10 mbar	255 m ³ h ⁻¹ / 150 ft ³ min ⁻¹
Ultimate vacuum	0.5 mbar / 0.4 Torr
Power consumption (@ 10 mbar)	6 kW / 8 hp
Motor rated power	11 or 15 kW / 15-20 hp
Cooling water flow rate	1.0 - 8.0 l min ⁻¹ / 0.2 - 2.6 gal min ⁻¹
Noise	<79 dB(A)
Weight	800 kg / 1764 lbs
Dimensions‡	1000 x 950 x 1681 mm / 39 x 37 x 66.2 inch
DP/DPS400	
Nominal capacity	400 m ³ h ⁻¹ / 235 ft ³ min ⁻¹
Capacity @ 10 mbar	380 m ³ h ⁻¹ / 224 ft ³ min ⁻¹
Ultimate vacuum	0.4 mbar / 0.3 Torr
Power consumption (@ 10 mbar)	7.0 kW / 9.4 hp
Motor rated power	18.5 kW / 24.8 hp
Cooling water flow rate	1.0 - 8.0 l min ⁻¹ / 0.2 - 2.6 gal min ⁻¹
Noise	<82 dB(A)
Weight	875 kg / 1925 lbs
Dimensions‡	1000 x 950 x 1730 mm / 39 x 37 x 68.1 inch

* Check details of application with BOC Edwards

† 60 Hz versions available

‡ Width x length x height

EDP60 - EDP300

TECHNICAL DATA

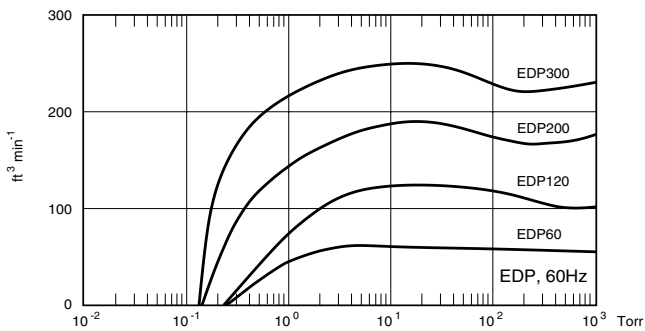
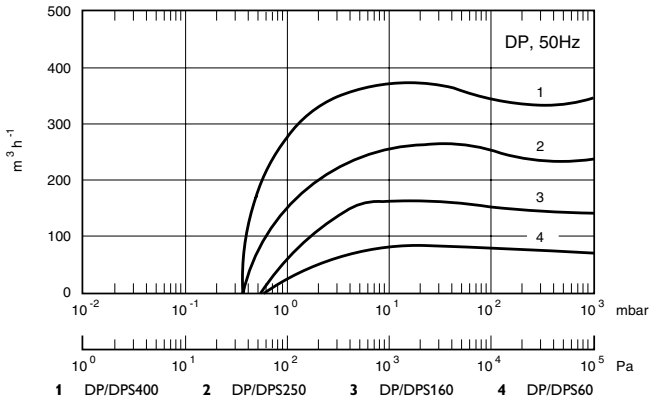
Construction	3 claw
Maximum back pressure	
Standard	2.2 psig (EDP300 1.5 psig)
Optional*	
Standard motor†	60 Hz, 460 V, 3-ph 3540 rpm
Total gas input (seal purge)	0.7 ft ³ min ⁻¹
EDP60	
Nominal capacity	102 m ³ h ⁻¹ / 60 ft ³ min ⁻¹
Capacity @ 7.5 torr	102 m ³ h ⁻¹ / 60 ft ³ min ⁻¹
Ultimate vacuum	0.33 mbar / 0.25 Torr
Power consumption (@ 7.5 Torr)	4.0 kW / 5.4 hp
Motor rated power (460 V, 60 Hz)	5.6 kW / 7.5 hp
Cooling water flow rate	1.0 - 8.0 l min ⁻¹ / 0.2 - 2.6 gal min ⁻¹
Noise	81 dB(A)
Weight	697 kg / 1540 lbs
Dimensions‡	700 x 850 x 1388 mm / 27 x 33.2 x 54.1 inch
EDP120	
Nominal capacity	204 m ³ h ⁻¹ / 120 ft ³ min ⁻¹
Capacity @7.5 torr	204 m ³ h ⁻¹ / 120 ft ³ min ⁻¹
Ultimate vacuum	0.33 mbar / 0.25 Torr
Power consumption (at 7.5 Torr)	4.9 kW / 6.6 hp
Motor rated power (460 V, 60 Hz)	11.0 kW / 15 hp
Cooling water flow rate	1.0 - 8.0 l min ⁻¹ / 0.2 - 2.6 gal min ⁻¹
Noise	81 dB(A)
Weight	796 kg / 1760 lbs
EDP200	
Dimensions‡	700 x 850 x 1423 mm / 27 x 33.2 x 55.5 inch
Nominal capacity	
Nominal capacity	323 m ³ h ⁻¹ / 190 ft ³ min ⁻¹
Capacity @ 7.5 torr	323 m ³ h ⁻¹ / 190 ft ³ min ⁻¹
Ultimate vacuum	0.2 mbar / 0.15 Torr
Power consumption (@ 7.5 Torr)	6.0 kW / 8 hp
Motor rated power	15.0 kW / 20 hp
Cooling water flow rate	1.0 - 8.0 l min ⁻¹ / 0.2 - 2.6 gal min ⁻¹
Noise	82 dB(A)
Weight	824 kg / 1820 lbs
Dimensions‡	1000 x 950 x 1540 mm / 39 x 37 x 64.6 inch
EDP300	
Nominal capacity	424 m ³ h ⁻¹ / 250 ft ³ min ⁻¹
Capacity @ 7.5 torr	424 m ³ h ⁻¹ / 250 ft ³ min ⁻¹
Ultimate vacuum	0.2 mbar / 0.15 Torr
Power consumption (@ 7.5 Torr)	7.0 kW / 9.4 hp
Motor rated power (460 V, 60 Hz)	22.0 kW / 30 hp
Cooling water flow rate	1.0 - 8.0 l min ⁻¹ / 0.2 - 2.6 gal min ⁻¹
Noise	82 dB(A)
Weight	1540 lbs
Dimensions‡	1000 x 950 x 1694 mm / 39 x 37 x 66.7 inch

* Check details of application with BOC Edwards

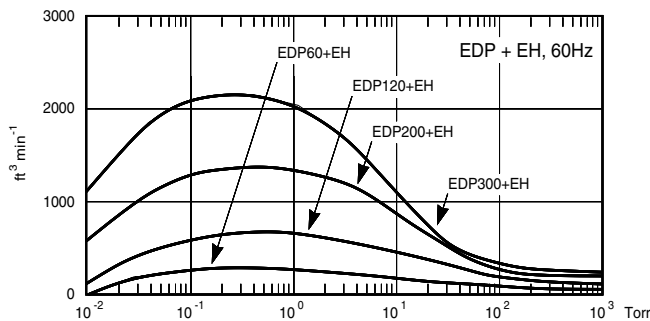
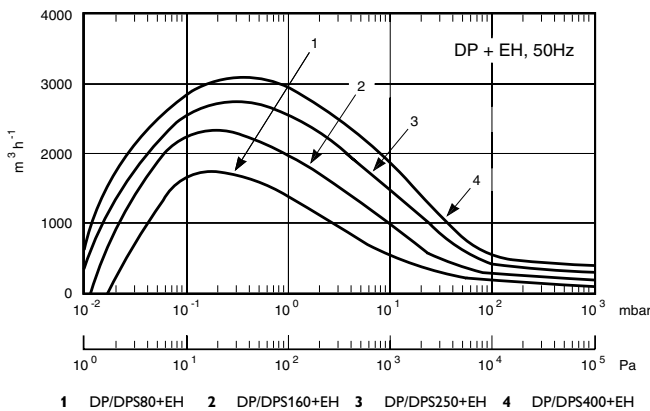
† 60 Hz versions available

‡ Width x length x height

Typical pump speed, DP/DPS pump only



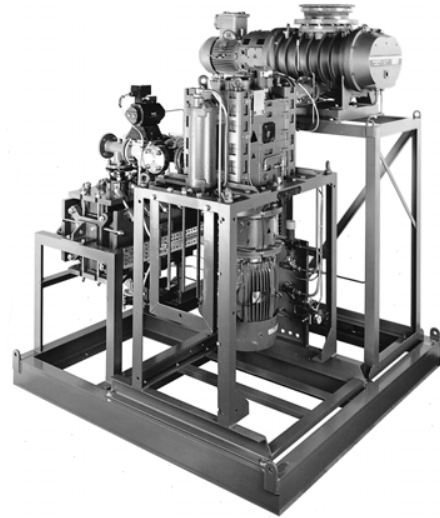
Typical pump speed, DP/DPS pump in combination with one EH mechanical booster pump.



ATEX SYSTEMS

(Europe only)*

Safety has long been an issue in industries & applications where potentially explosive atmospheres exist and the chemical and pharmaceutical sector is no exception.



ATEX requires pump manufacturers to consider 'malfunctions' (Category 2/Zone 1) and where pumping-continuously in the flammable zone, 'rare malfunctions' (Category 1/Zone 0). How to prevent ignition by pumping outside the flammable range (controlling concentrations, temperature and speed) and containing internal explosions or sustained burns (flame arrestors) have been understood for many years, indeed flame arrestors make use of the same principle as the Davy Lamp. What the vacuum pump industry has been wrestling with is how to guarantee safety without loss of performance.

BOC Edwards dry claw pumps offer a breakthrough. The unique design of the dry claw pump mechanism creates turbulence, ensuring that no gas or solvent is in contact with the internal surfaces long enough to cause a hazard. For Zone 1 systems this means the BOC Edwards dry claw is able to pump T4** solvents and gases, at full speed, without compromising on safety or the risk of corrosive internal condensation.

In the event of ignition, flame arrestors with integral sensors linked to central control system initiate protective action and provide endurance burn protection for up to two minutes.

Benefits:

- Independent certification by external test house
- Zone 0 package can operate continuously in the flammable range
- No need for frequency inverters (to control speed) in Zone 1
- No inert gases - dilution of hazardous materials - cooling gas for rotors
- Indirect cooling as standard - no addition of coolant devices to the pump itself
- No gas coolers
- Lower capital and running costs

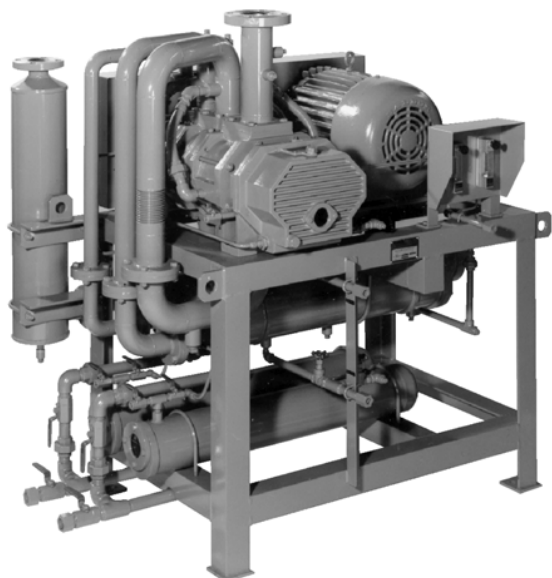
* On 30th June 2003 ATEX 100a of the EU directive 94/9/EC became mandatory. ATEX (ATmospheres EXplosive) 100a considers the internal environment of electrical and mechanical equipment. It imposes on suppliers the requirement to categories and certify equipment for use in customer defined flammable zones. Certification is by an external notified body.

** T4 - Materials with an auto-ignition temperature of 135°C and above.

BOC EDWARDS CHEM-DRY™ VACUUM PUMPS

Your Alternative for Efficient, Non-Contaminating Process Pumping

CD Chem-Dry™ series

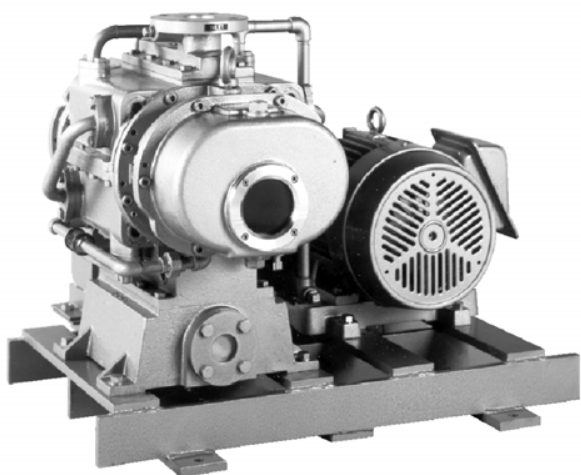


CD250 dry pump

Our CD Series dry pump operates much like a vacuum blower, with three pumping stages. Gas transfers from one phase to the next through external piping and intercoolers. This gas transfer principle permits cooling, condensing, and clean recovery of process condensables through a receiver system.

The CD dry pump can operate reliably from atmospheric pressure to blank-off because of its built-in backflow cooling arrangement. Unlike most pumps, the Chem-Dry™ pump has a flat horsepower curve.

Chem-Dry Eagle™ series



CDE120 dry pump

The Chem-Dry Eagle™ series is based on the same operating principle of the CD Series. The Chem-Dry Eagle™ series replaced the CD's external interstage piping and coolers in favor of a compact cooling water jacket around the same tri-lobe roots-type blower design. The peripheral passages in the casing transfer most of the compressed gas between stages.

The outer wall of the peripheral gas passage is cooled by water circulating through a jacket. The gas in the peripheral gas passage prevents the chamber walls from being directly cooled by water in the jacket. An important advantage, as compared to directly cooled designs, is that tight control of operating temperature is not needed to maintain correct thermal expansion. The temperature of the pump can then be adjusted for process requirements by controlling the water flow rate and temperature.

Over the years we continue to improve our technology to result in better performance and lower costs for our customers. The Chem-Dry Eagle™ Series is one of those improvements, which is a direct result of our 2001 acquisition of Stokes Vacuum. The Chem-Dry™ vacuum pump has been successfully used to solve the problem of process and environmental contamination caused by "wet" pumps that use oil, water, or other sealing fluids in the chemical processing industry. From 75 to 50000 ft³min⁻¹, our Chem-Dry Eagle™ Series vacuum pumps can be used anywhere clean, reliable process vacuum is required.

Boosted Chem-Dry™ vacuum systems

Generally without taking up one more inch of floor space, you can add capacity to your system by combining our Chem-Dry™ pump and our vacuum booster. In most sizes, the blower mounts above the pump. Standard systems are available with blower displacements up to 2000 ft³min⁻¹ with an operating range of 760 Torr to 25 microns. Other combinations can be supplied with up to 50000 ft³min⁻¹ displacement. BOC Edwards combination blower, dry pump systems are matched to take advantage of both the blower's and the dry pump's maximum performance.

Features & benefits

- Safety
 - Leak-tight pumping system uses no oil or sealing fluid to produce vacuum. Workers do not have to change or handle contaminated oil or other seal fluids.
- Reliability
 - Chem-Dry™ pumps have rugged, gear-driven pumping lobes that do not require spring-loaded vanes, oil metering pumps or plugged sealant lines, reducing failure modes.
- Clean effluent
 - Since the pump operates sealant-free, the chance of contamination of the cooling or seal fluid with the process gases is eliminated. Also, there's no possibility of carryover of the cooling fluid to the pump exhaust.
- Solvent recovery
 - The CD's built-in inter- and after-condensers and the Chem-Dry Eagle™ Series compact design both result in clean solvent recovery and reduced vapor phase emissions.
- Wide operating range
 - Pump operates from atmosphere to a base pressure of 3 to 0.6 Torr. Tri-lobed design permits stable performance at any inlet pressure from atmospheric to blank-off.
- Low-level operation
 - Chem-Dry™ intercondenser drain tanks allow the pump to operate at ground level without the need for a hot well or special drain pumps for condensate.
- Handles liquids
 - Can accommodate up to 1/4 gal min⁻¹ slugs of liquid on a continuous basis and can handle process liquid upsets without need for costly rebuilds.
- Low maintenance
 - The pump is designed for continuous, unattended operation with infrequent maintenance.
- Can run dead headed
 - The BOC Edwards Chem-Dry™ Pump is capable of operation with the inlet valve closed and is not damaged by process upsets.

APPLICATIONS

- Vacuum distillation:
Stripping and drying operations where solvents must be isolated and recovered untainted at very high yields.
- Pharmaceuticals & food:
Chem-Dry™ pump provides both oil-free operation and clean, consistent performance.
- Medical devices:
Containment and recycling of ethylene oxide sterilants.
- Fatty acids:
Enhanced solvent recovery and elimination of water pollution and drain blockage often experienced by steam ejector systems.
- Flavors & fragrances:
Improved process economies through enhanced recovery of essential oils, aromatic hydrocarbons, and complex flavor concentration.
- Specialty gases:
Pumping and recovery without oil contamination of SF₆, xenon, tritium, etc.
- Polymer processing:
Plastic extruding and similar operations where product or un-reacted monomers foul fluid-sealed pumps.
- Solid state reactors:
Where process uptime and minimum maintenance is an advantage.

TECHNICAL DATA

CD75	
Nominal pump speed	75 ft ³ min ⁻¹
Ultimate vacuum*	3 Torr
Pump	2850 rpm
Motor	1725 rpm
	5 hp
Backpressure	0.75 psig standard motor / up to 5 psig up one motor size
Inlet flange size	1.5 inch
Exhaust flange size	1 inch
Cooling water rate [†]	3 gal min ⁻¹
Nitrogen purge flow ^{††}	0.1 scfm
Water connection	1/2 inch NPT
	3/8 inch NPT
Noise	80 dB(A)
Dimensions [‡]	32 x 52 x 48 inch
Approximate weight	650 lbs
CD120	
Nominal pump speed	120 ft ³ min ⁻¹
Ultimate vacuum*	1.5 Torr
Pump	3000 rpm
Motor	1725 rpm
	7.5 hp
Backpressure	0.75 psig standard motor / up to 5 psig up one motor size
Inlet flange size	2 inch
Exhaust flange size	1.25 inch
Cooling water rate [†]	3.5 gal min ⁻¹
Nitrogen purge flow ^{††}	0.1 scfm
Water connection	1/2 inch NPT
	3/8 inch NPT
Noise	80 dB(A)
Dimensions [‡]	35 x 52 x 48 inch
Approximate weight	875 lbs
CD180	
Nominal pump speed	180 ft ³ min ⁻¹
Ultimate vacuum*	1 Torr
Pump	2500 rpm
Motor	1725 rpm
	10 hp
Backpressure	0.75 psig standard motor / up to 5 psig up one motor size
Inlet flange size	2.5 inch
Exhaust flange size	1.5 inch
Cooling water rate [†]	4.75 gal min ⁻¹
Nitrogen purge flow ^{††}	0.2 scfm
Water connection	1/2 inch NPT
	3/8 inch NPT
Noise	80 dB(A)
Dimensions [‡]	38 x 60 x 55 inch
Approximate weight	1350
CD250	
Nominal pump speed	250 ft ³ min ⁻¹
Ultimate vacuum*	0.9 Torr
Pump	2550 rpm
Motor	1725 rpm
	15 hp
Backpressure	0.75 psig standard motor / up to 5 psig up one motor size
Inlet flange size	3 inch
Exhaust flange size	2 inch
Cooling water rate [†]	6 gal min ⁻¹
Nitrogen purge flow ^{††}	0.2 scfm
Water connection	1/2 inch NPT
	3/8 inch NPT
Noise	80 dB(A)
Dimensions [‡]	42 x 65 x 60 inch
Approximate weight	1675 lbs

CD500	
Nominal pump speed	500 ft ³ min ⁻¹
Ultimate vacuum*	0.7 Torr
Pump	1960 rpm
Motor	30 hp
Backpressure	0.75 psig standard motor / up to 5 psig up one motor size
Inlet flange size	4 inch
Exhaust flange size	2.5 inch
Cooling water rate [†]	8.75 gal min ⁻¹
Nitrogen purge flow ^{††}	0.4 scfm
Dimensions [‡]	55 x 65 x 65 inch
Approximate weight	2975 lbs

CD750	
Nominal pump speed	750 ft ³ min ⁻¹
Ultimate vacuum*	0.6 Torr
Pump	1560 rpm
Motor	40 hp
Backpressure	0.75 psig standard motor / up to 5 psig up one motor size
Inlet flange size	5 inch
Exhaust flange size	3 inch
Cooling water rate [†]	11.75 gal min ⁻¹
Nitrogen purge flow ^{††}	0.5 scfm
Dimensions [‡]	62 x 72 x 75 inch
Approximate weight	4575 lbs

- * Lower ultimate vacuum and higher pumping capacity are attainable with vacuum boosters.
- † Total cooling water flow to intercondensers shown.
- †† Total nitrogen flow shown (gear end plus drive end purges). Add 120 SCFH for inlet start/stop purge. Clean dry air may be substituted if the process allows the presence of oxygen.
- ‡ Width x length x height

ORDERING INFORMATION

PRODUCT DESCRIPTION	ORDERING NUMBER
CD75 pump module	906075MOD
CD75 pump, complete with motor	906075334
1 year maintenance kit, CD75	432061001
2 year maintenance kit, CD75	432062001
CD120 pump module	906120MOD
CD120 pump, complete with motor	906120334
1 year maintenance kit, CD120	432063001
2 year maintenance kit, CD120	432064001
CD180 pump module	906180MOD
CD180 pump, complete with motor	906180334
1 year maintenance kit, CD180	432065001
2 year maintenance kit, CD180	432066001
CD250 pump module	906250MOD
CD250 pump, complete with motor	906250334
1 year maintenance kit, CD250	432067001
2 year maintenance kit, CD250	432068001
CD500 pump module	906500MOD
CD500 pump, complete with motor	906500334
1 year maintenance kit, CD500	432069001
2 year maintenance kit, CD500	432070001
CD750 pump module	906750MOD
CD750 pump, complete with motor	906750334
1 year maintenance kit, CD750	432061001
2 year maintenance kit, CD750	432072001

TECHNICAL DATA

CDE75	
Nominal pump speed	70 ft ³ min ⁻¹
Ultimate vacuum*	3 Torr
Pump	2850 rpm
Motor	1725 rpm
	5 hp
Backpressure	0.75 psig standard motor / up to 5 psig up one motor size
Inlet flange size	1.5 inch
Exhaust flange size	1 inch
Cooling water rate [†]	1.8 gal min ⁻¹
Nitrogen purge flow ^{††}	0.1 scfm
Water connection	1/2 inch NPT
	3/8 inch NPT
Noise	80 dB(A)
Dimensions [‡]	29 x 51 x 32 inch
CDE120	
Nominal pump speed	106 ft ³ min ⁻¹
Ultimate vacuum*	2.5 Torr
Pump	3000 rpm
Motor	1725 rpm
	7.5 hp
Backpressure	0.75 psig standard motor / up to 5 psig up one motor size
Inlet flange size	2 inch
Exhaust flange size	1.5 inch
Cooling water rate [†]	2.6 gal min ⁻¹
Nitrogen purge flow ^{††}	0.1 scfm
Water connection	1/2 inch NPT
	3/8 inch NPT
Noise	80 dB(A)
Dimensions [‡]	32 x 51 x 33 inch
CDE180	
Nominal pump speed	166 ft ³ min ⁻¹
Ultimate vacuum*	2 Torr
Pump	2550 rpm
Motor	1725 rpm
	10 hp
Backpressure	0.75 psig standard motor / up to 5 psig up one motor size
Inlet flange size	2.5 inch
Exhaust flange size	1.5 inch
Cooling water rate [†]	3.7 gal min ⁻¹
Nitrogen purge flow ^{††}	0.2 scfm
Water connection	1/2 inch NPT
	3/8 inch NPT
Noise	80 dB(A)
Dimensions [‡]	32 x 66 x 62 inch
CDE250	
Nominal pump speed	236 ft ³ min ⁻¹
Ultimate vacuum*	1.5 Torr
Pump	2600 rpm
Motor	1725 rpm
	15 hp
Backpressure	0.75 psig standard motor / up to 5 psig up one motor size
Inlet flange size	3 inch
Exhaust flange size	2 inch
Cooling water rate [†]	5.3 gal min ⁻¹
Nitrogen purge flow ^{††}	0.2 scfm
Water connection	1/2 inch NPT
	3/8 inch NPT
Noise	80 dB(A)
Dimensions [‡]	37 x 63 x 65 inch

* Lower ultimate vacuum and higher pumping capacity are attainable with vacuum boosters.

† Total cooling water flow shown (seal housing plus pump body).

†† Total nitrogen flow shown (gear end plus drive end purges). Add 120 SCFH for inlet start/stop purge. Clean dry air may be substituted if the process allows the presence of oxygen.

‡ Width x length x height

ORDERING INFORMATION

PRODUCT DESCRIPTION	ORDERING NUMBER
CDE75 pump module	90607500E
CDE75 pump, complete with motor	90607533E
1 year maintenance kit, CDE75	906366001
2 year maintenance kit, CDE75	906367001
CDE120 pump module	90612000E
CDE120 pump, complete with motor	90612033E
1 year maintenance kit, CDE120	432368001
2 year maintenance kit, CDE120	432369001
CDE180 pump module	90618000E
CDE180 pump, complete with motor	90618033E
1 year maintenance kit, CDE180	432370001
2 year maintenance kit, CDE180	432371001
CDE250 pump module	90625000E
CDE250 pump, complete with motor	90625033E
1 year maintenance kit, CDE250	906372001
2 year maintenance kit, CDE250	906375001