edwardsvacuum.com

LIQUID RING VACUUM PUMPS FOR THE PROCESS INDUSTRIES

EDWARDS

EDWARDS
THE PARTNER OF CHOICE

Edwards is a world leader in the design, technology and manufacture of vacuum pumps with over 95 years' history and more than 75 years' manufacturing experience.

We believe in delivering results that bring value to our customers by using our breadth of industry experience to identify and apply solutions to your problems. Using the most innovative and up-to-date modelling techniques, we can optimise the pumping configuration for customers to provide a system design giving the maximum performance in the most reliable and cost-effective way.

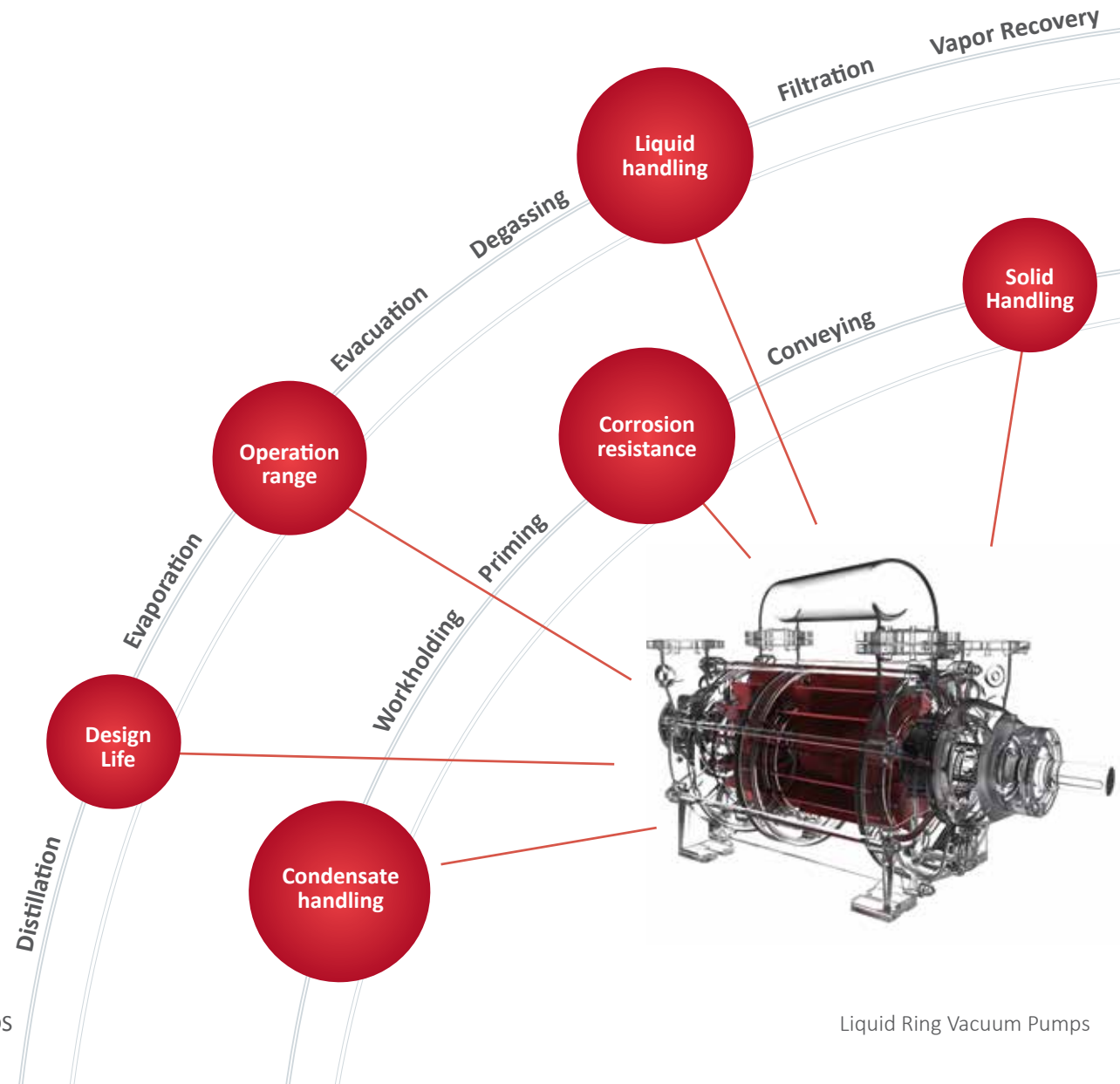
LIQUID RING VACUUM PUMPS

As a leader in vacuum technology, Edwards has developed a portfolio of products to meet the demanding applications in process industries.

The Edwards liquid ring pump range includes both one and two stage machines enabling optimum efficiency for processes operating across the vacuum range. Pump capacities up to 40,000 m^3/h are available in one stage and 7,500 m^3/h in two stage models.

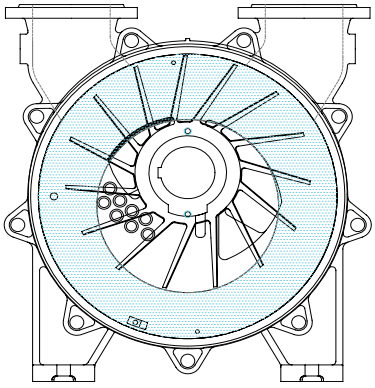
LR Series – Comprising of LR1A and LR1B models, these are one stage pumps designed for operation across the vacuum range, LR1A right down to 30 mbara whilst the LR1B pumps are optimised for applications at higher pressures above 300 mbara

HR Series – Includes EHR and SHR models, these are two stage construction for peak performance at low suction pressures below 150 mbara



HOW IT WORKS

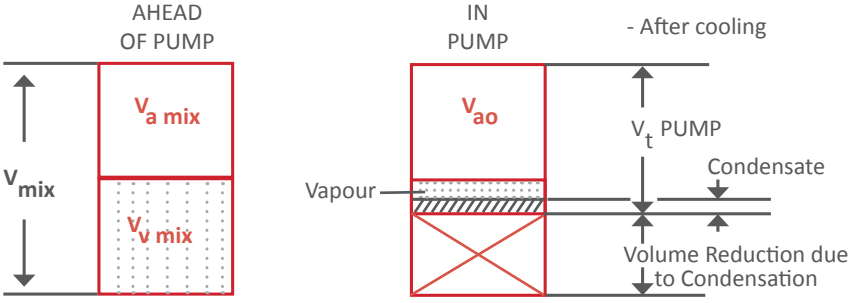
The pump impeller is mounted eccentrically to the axis of the pump casing, when the impeller is rotated at the appropriate speed and a supply of liquid is introduced into the pump chamber the liquid ring is created concentrically to the pump casing. As the impeller rotates a chamber is formed by the impeller blades and the inside of the liquid ring, as this chamber is open to the suction port gas is sucked into the pump. As the impeller continues to rotate the pumping chamber reduces in size because of the eccentricity the trapped gas is compressed, once the chamber reaches the outlet port the gas is discharged at an increased pressure along with some of the seal liquid which removes the heat of compression.



Wet process gases

Liquid ring pumps offer significant advantages when pumping wet gases and vapours and for applications requiring special materials of construction for corrosion resistance.

The volume of incoming wet gases is reduced by cooling and condensing, this reduces the volume enabling a smaller pump to be selected.



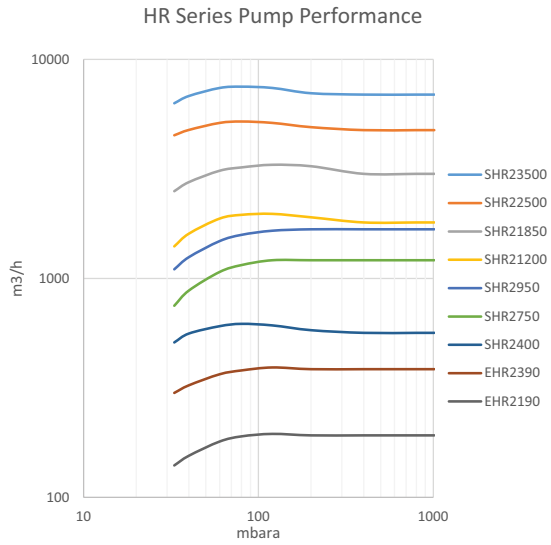
When pumping corrosive process gases or selected seal liquid is corrosive, pump materials of construction which are compatible can be selected. In addition to the standard options shown in the table below bespoke options combining different materials and special materials such as hastelloy.

Materials of Construction options

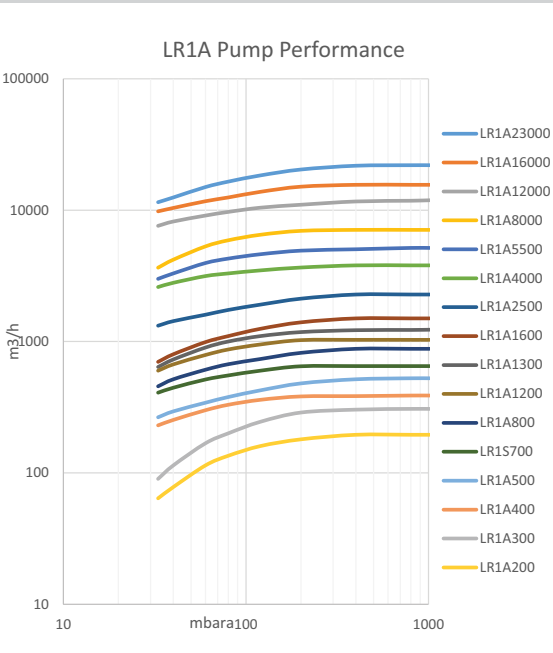
Liquid ring pumps are well suited to operation in hazardous environments without the need for flame arrestors, pumps can be supplied suitable for operation in environments which require ATEX compliance. Please contact your local sales office for details.

Component	Standard	Stainless Fitted	Stainless Steel	Seawater ALBR	Seawater Duplex
End Casing	Cast Iron	Cast Iron	Stainless Steel	Aluminium Bronze	Duplex StSt
Impeller	SG Iron	Stainless Steel	Stainless Steel	Aluminium Bronze	Duplex StSt
Centre Body	Cast Iron	Cast Iron	Stainless Steel	Aluminium Bronze	Duplex StSt
Port Plates	Cast Iron	Cast Iron	Stainless Steel	Aluminium Bronze	Duplex StSt
Shaft	Carbon Steel	Carbon Steel	Stainless Steel	Monel	Duplex StSt
Shaft Sleeve	Stainless Steel	Stainless Steel	Stainless Steel	Monel	Duplex StSt
Shaft Seal	Carbon/SiC/Viton	Carbon/SiC/Viton	Carbon/SiC/Viton	Carbon/SiC/Viton	Carbon/SiC/Viton

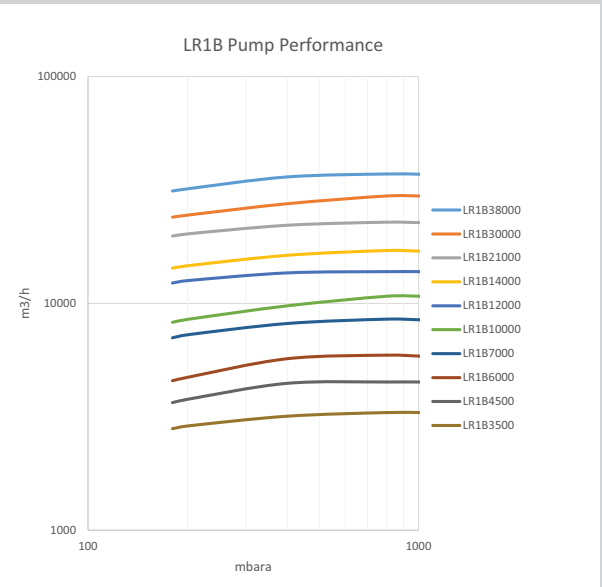
HR Series



LR1A Series



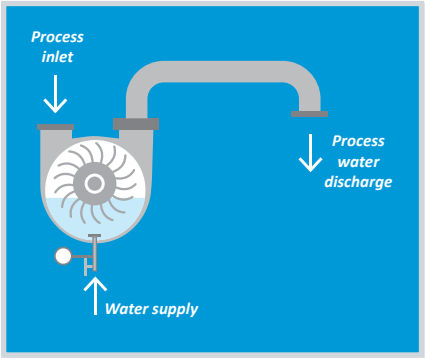
LR1B Series



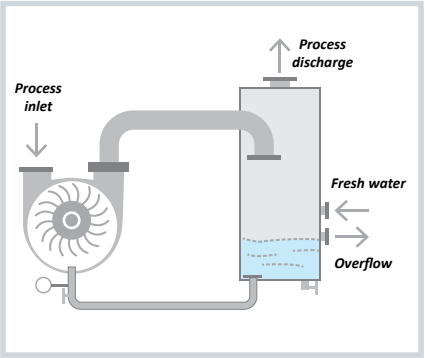
STANDARD LRP PACKAGES

Liquid ring vacuum pump performance is dependent upon the seal liquid properties; the seal liquid must be at a temperature which is low enough to enable the pump to operate at the desired suction pressure. To minimise the amount of seal water required it is often desirable to recycle the seal water back into the liquid ring pump, to enable this either some of the water must be replaced with fresh cooled water (partial re-circulation) or it should all be cooled by a heat exchanger (total re-circulation).

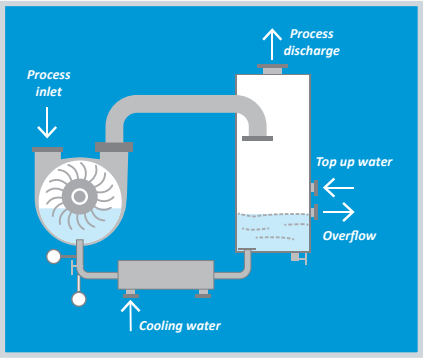
Edwards liquid ring vacuum pumps are offered as standard packages in three basic configurations, for operation in once through, partial or total re-circulation mode. Additionally, pumps are available in a selection of pump materials.



Once Through Operation
Used where an ample supply of service liquid which can be discharged to drain is available.



Partial Re-circulation Operation The discharged seal liquid and gas stream is separated in the discharge separator, fresh liquid is added is reduce the temperature of the recycled mixture and the excess liquid goes to drain. This will reduce seal liquid usage by up to 50%.



Total Re-circulation Operation Used when seal liquid is in short supply or contamination of drains is an issue. To enable total re-recirculation the separated liquid must be cooled before it is re-used. This is done by including a plate type heat exchanger in the return line.

Maximum Seal Water Temperature

When using water as the seal liquid the maximum temperature of seal water required to enable operation at a specific pressure is shown in the table below.

Inlet Water Temperature °C	Minimum Suction Pressure mbara
15	33
20	40
25	50
32	60
38	80
45	100

ENGINEERED TO ORDER SYSTEMS

Complex packages are designed to meet the customer or process licence specifications., generally requiring project specific quality assurance program and extensive documentation packages.

Edwards have many years experience in the design, engineering, assembly and testing of bespoke liquid ring pump and hybrid vacuum systems for the process markets, with equipment supplied for various process applications, including production of; aromatics, LAB, styrene, BPA, PTA, biofuels, fertilisers, adhesives and many others, providing customised solutions to meet customer requirements.

Petrochemical
Vacuum Distillation, Vapour Recovery

Power Generation
Condenser air extraction, Deaeration, Waterbox priming, Ash handling, Filtration

Chemical
Distillation, Evaporation, Filtration, Polymerisation, Deoderisation, Polymerisation

Offshore
Seawater deaeration, MEG recovery, Drilling mud recovery

Pharmaceutical & Fine Chemical
Filter drying, Degassing, Crystallisation, Conveying

Food Processing
Crystallisation, Evaporation, Filtration, Freeze Drying

For more information on specific applications please contact you local Edwards sales office.

edwardsvacuum.com

GLOBAL CONTACTS

EMEA	
UK	+44 1444 253 000 (local rate) 08459 212223
Belgium	+32 2 300 0730
France	+33 1 4121 1256
Germany	0800 000 1456
Italy	+ 39 02 48 4471
Israel	+ 972 8 681 0633

ASIA PACIFIC	
China	+86 400 111 9618
India	+91 20 4075 2222
Japan	+81 47 458 8836
Korea	+82 31 716 7070
Singapore	+65 6546 8408
Taiwan	+886 3758 1000

AMERICAS	
USA	+1 800 848 9800
Brazil	+55 11 3952 5000

Publication Number: 3602 602 6 01
© Edwards Limited 2017. All rights reserved
Edwards and the Edwards logo are trademarks of Edwards Limited

Whilst we make every effort to ensure that we accurately describe our products and services, we give no guarantee as to the accuracy or completeness of any information provided in this brochure.

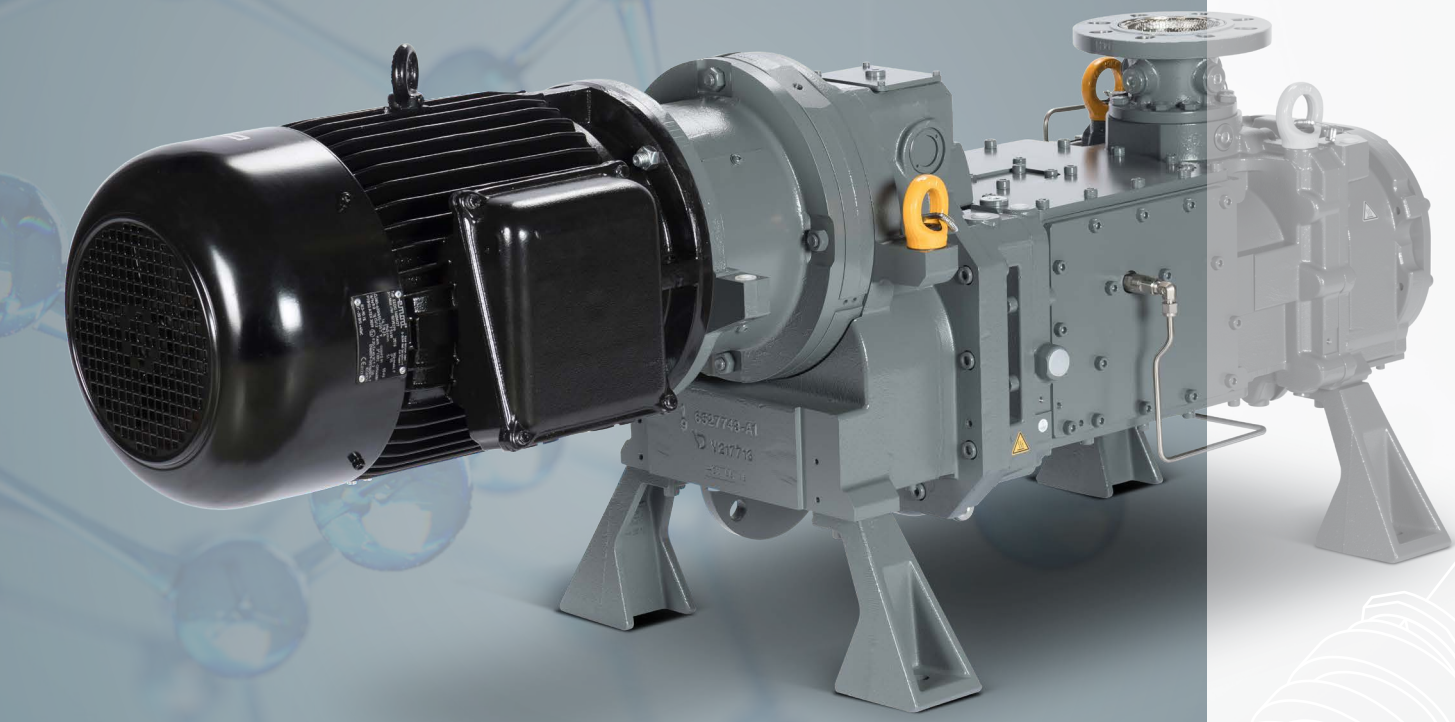
Edwards Ltd, registered in England and Wales No. 6124750, registered office: Innovation Drive, Burgess Hill, West Sussex, RH15 9TW, UK.

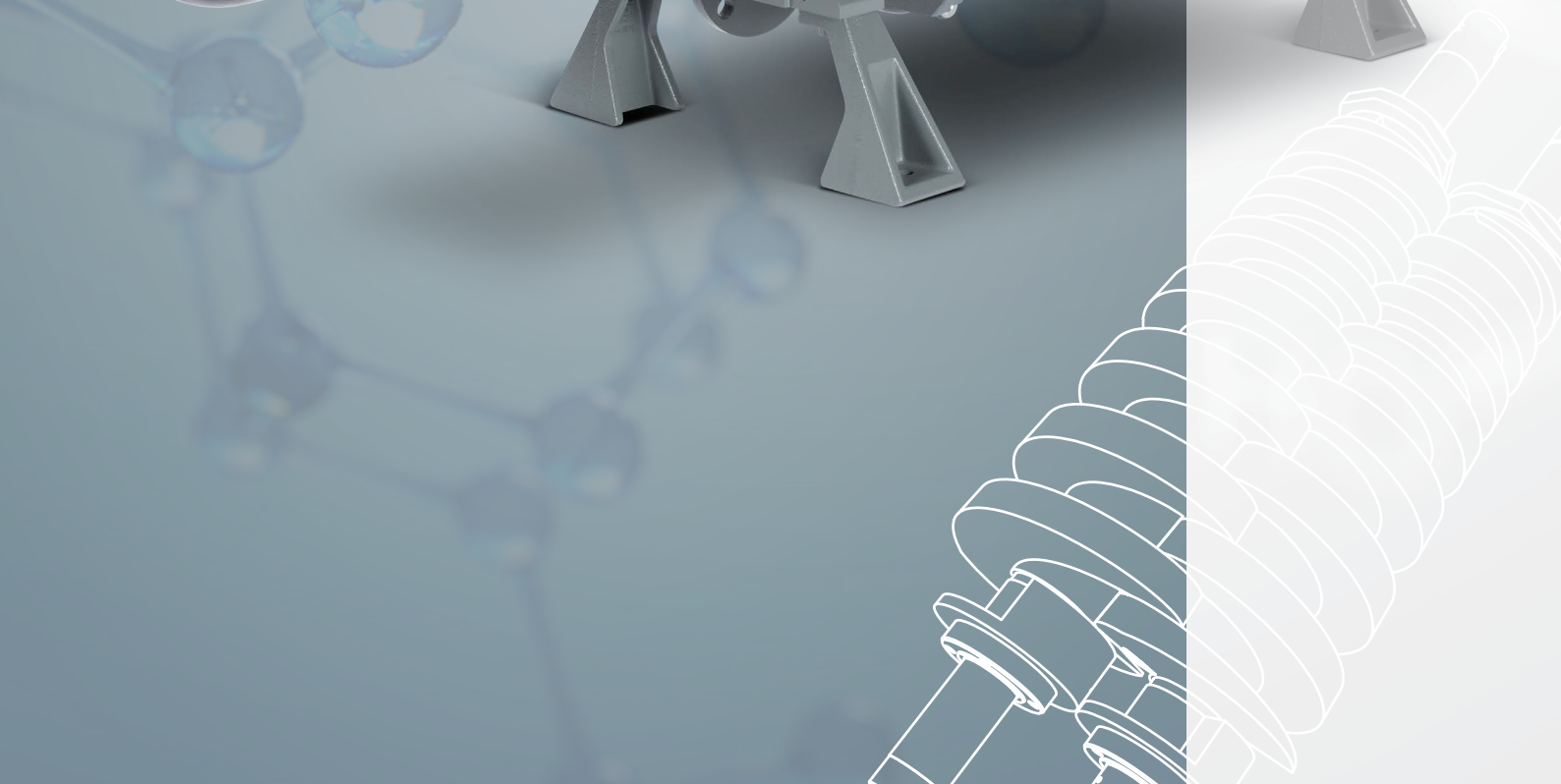
Part of the Atlas Copco Group

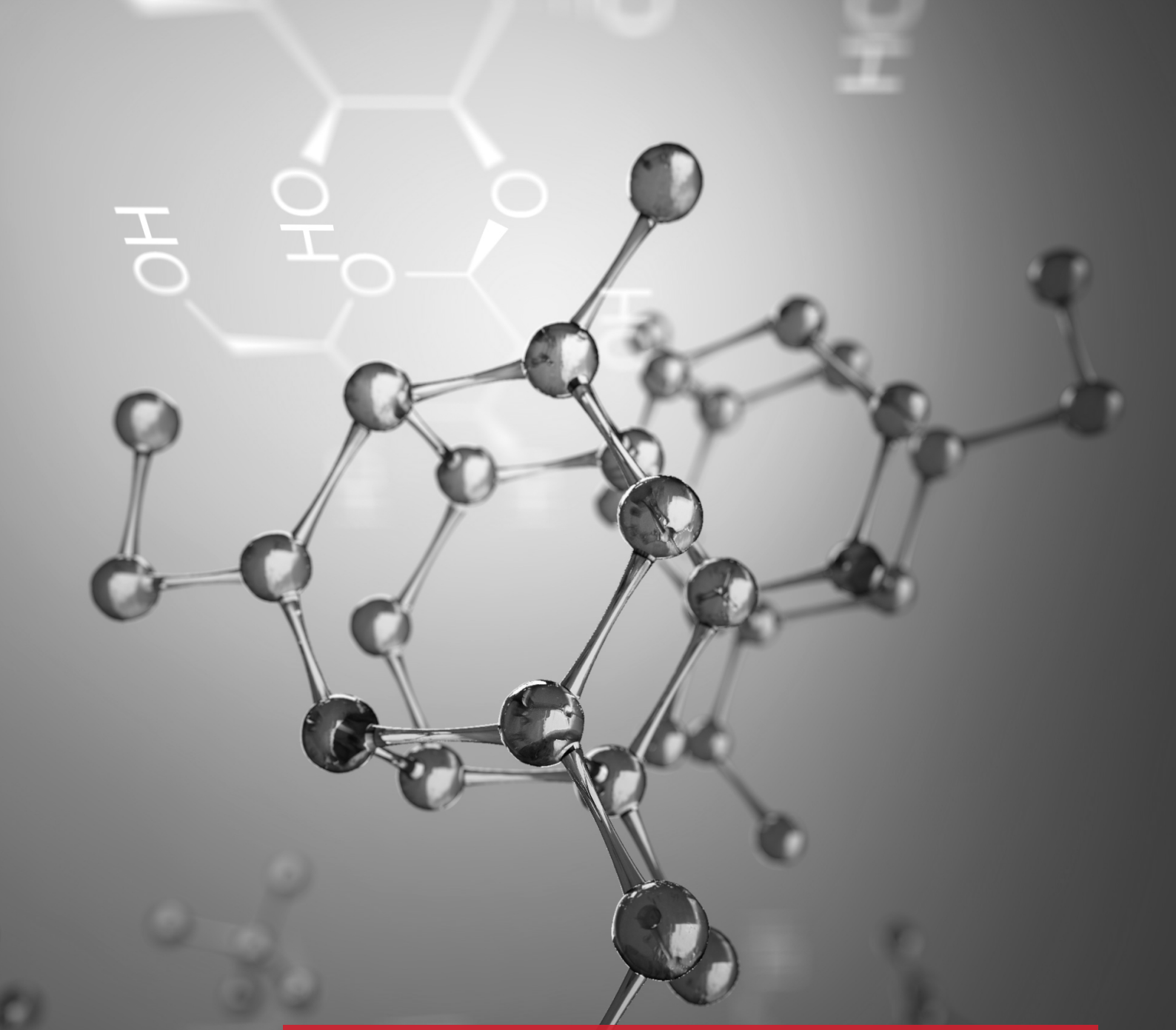
edwardsvacuum.com

EDS CHEMICAL DRY SCREW VACUUM PUMPS

EDWARDS







EDWARDS
THE PARTNER OF CHOICE

Edwards is a world leader in the design, technology and manufacture of vacuum pumps for industrial applications with over 100 years' history.

We believe in delivering results that bring value to our customers by using our breadth of industry experience to identify and apply solutions. Using the most innovative and up-to-date modelling techniques, we can optimise the pumping configuration for customers to provide a system design giving the maximum performance in the most reliable and cost-effective way.

CLEAN, ENERGY-EFFICIENT VACUUM SOLUTIONS FOR CHEMICAL PROCESS INDUSTRIES

Edwards installed its first dry pump for a pharmaceutical application in 1988. It is yet to be replaced. This is testament to the highest quality, safety and service standards. Our combination of applications expertise, diverse product portfolio, engineering strength and global presence puts us in a unique position to be able to design and maintain the best solution for Chemical Process Industries. Our latest offering, the EDS Dry Screw chemical vacuum pump offers the latest screw technology to provide a clean, effluent-free vacuum specifically for the chemical, pharmaceutical and petrochemical industries.

With rapid advances in technology, chemical processing industries place increasingly challenging demands on vacuum systems. Vacuum pumps need to handle increasingly complex chemicals, solvents and compounds in a reliable and safe, way while ensuring control and reduction of environmental pollution at a low cost of ownership.

It is crucial for systems to be “plug and play” with minimum setup or have configurable options available when required to suit specific chemical processes. The EDS Dry Screw chemical vacuum pump with its strong focus on the fine chemical and pharmaceutical markets serves a wide range of chemical applications.

PUMP TECHNOLOGY

SIMPLE

Industry leading state-of-the-art screw vacuum technology simply packaged

- Trouble-free peace of mind: Ease of installation, systemisation, support and service
- Pumping: Designed to be reliable

FASTER

Extra performance to meet modern day technologies

- Quick pump down times: Higher roughing speeds get the job done quicker
- High pumping speeds: Gives more throughput where it matters

FLEXIBLE

Designed for a changing global market

- Safe and compliant: Easily configured for hazardous area installations
- Engineer To Order: Basic modular building blocks for special pumping systems

PROCESS CAPABLE

Mechanism proven in the most demanding applications

- Extended MTBS: Purge protection options to prolong life on harsh processes
- Increased Process Uptime: Survives process mishaps and contaminant ingestion

ROBUST

Built for challenging chemical installations

- Installation options: Highly tolerant water-cooled standard products
- Protection: High IP ratings

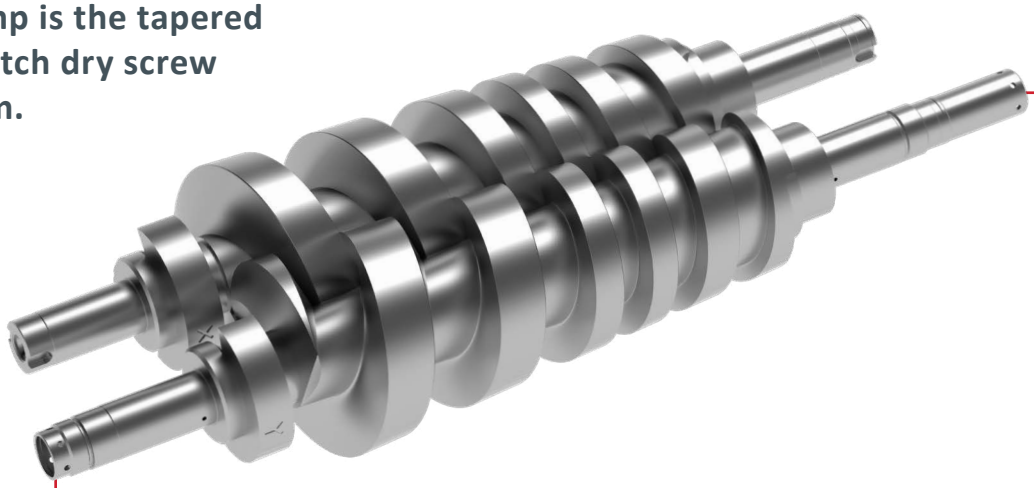
ATEX COMPLIANT

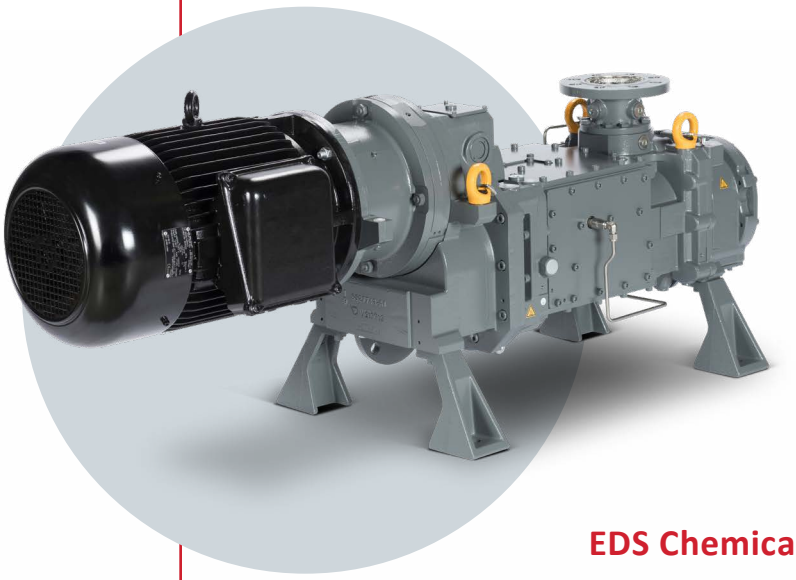
Safe for hazardous area installations

- Designed to be capable of handling gases: From a potentially explosive atmosphere
- Certified: Under the ATEX directive 2014/34/EU
- Global compliance: Flexible to adapt to all global explosion proof standards

EDS CHEMICAL SYSTEM AT A GLANCE

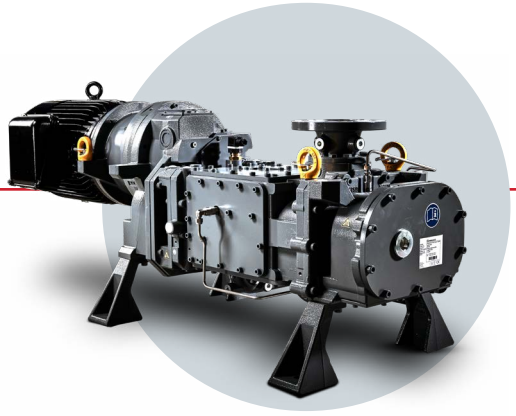
At the heart of the EDS Dry Screw pump is the tapered variable pitch dry screw mechanism.

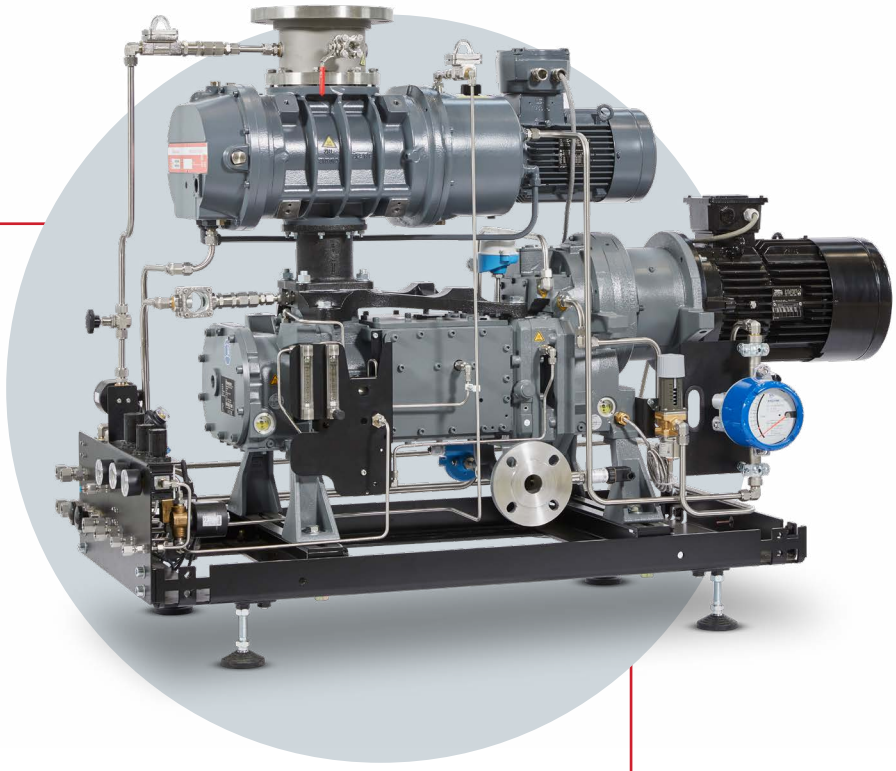




- Direct and Indirect shell and tube heat exchanger cooling options
- ATEX Cat 1 and Cat 2 standard variants to meet T3 and T4 temperature classes
- Bare-shaft variants available for flexibility to meet any global Ex Proof standards

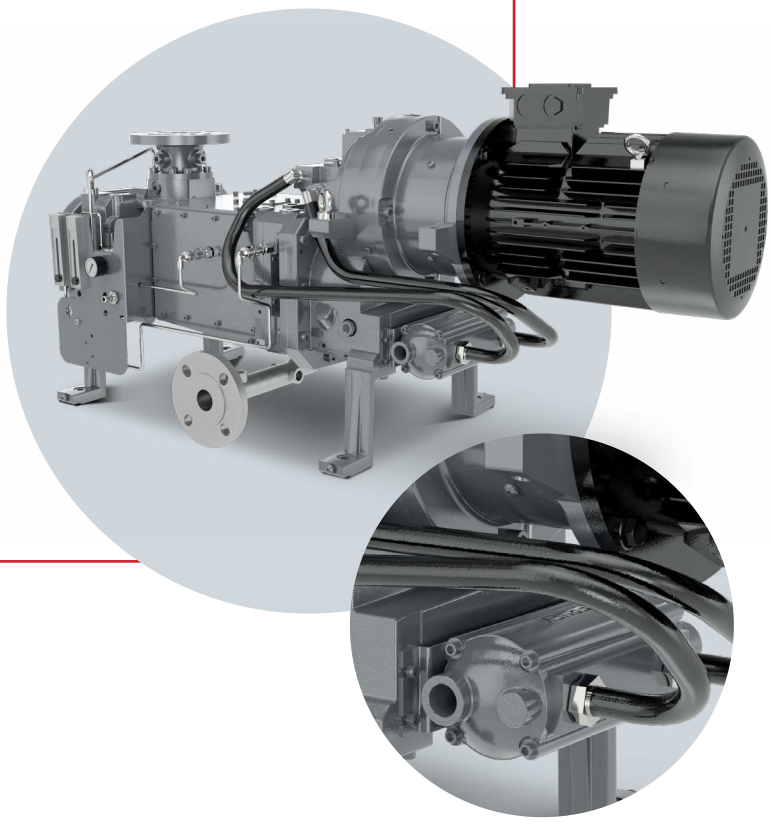
EDS Chemical (ATEX)





EDS Chemical System

- Wide range of standard accessories available
- Purge flow rotameters as standard
- Compressed air gas ballast

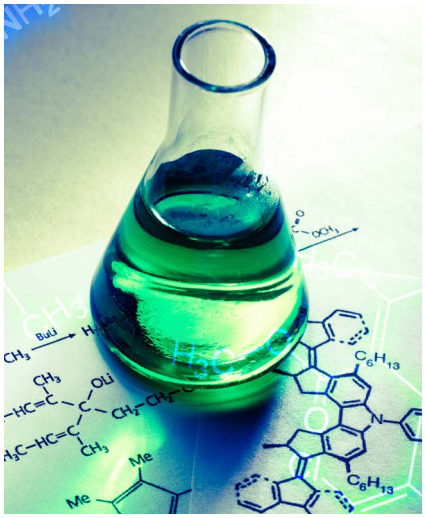


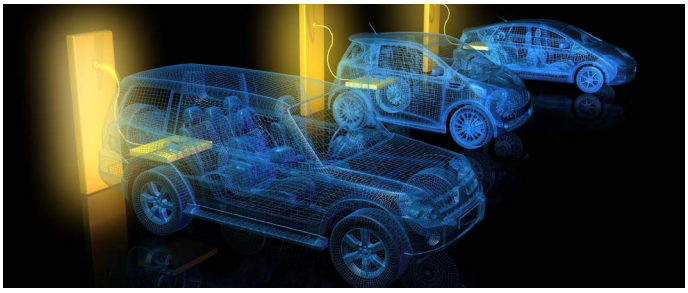
Compact Heat Exchanger for indirect cooling options

APPLICATIONS

The EDS range is suitable for a wide range of chemical applications including:

- Lithium Ion batteries
- Distillation applications
- Solar crystal pulling
- Fine Chemicals
- Oil treatment plants
- Pharmaceuticals
- Petrochemicals
- Flammable & corrosive gases
- Degassing
- Dewatering & Filtration
- Polymers & Plastics production

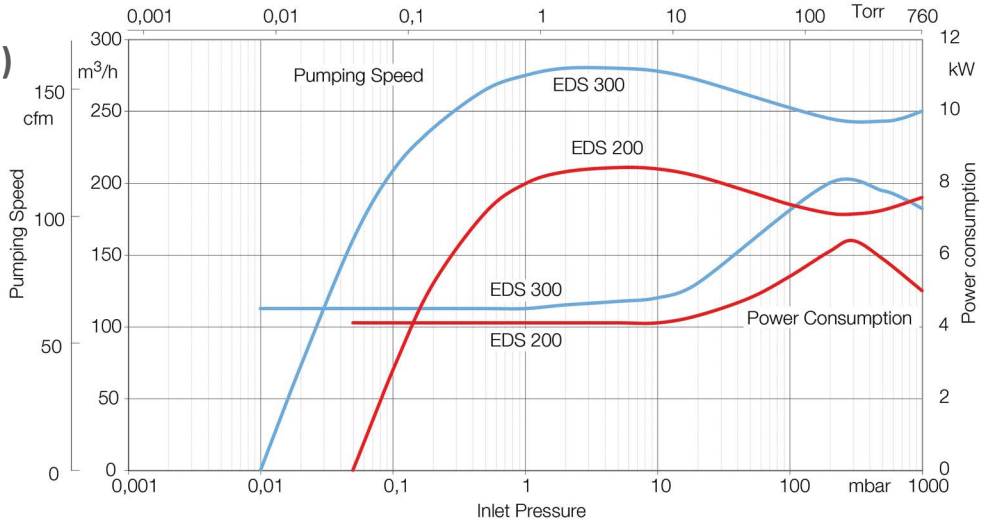




For a complete list of chemical applications and processes, please contact your local Edwards representative.

PERFORMANCE CURVES

EDS 200 and 300 (IMPERIAL AND METRIC)

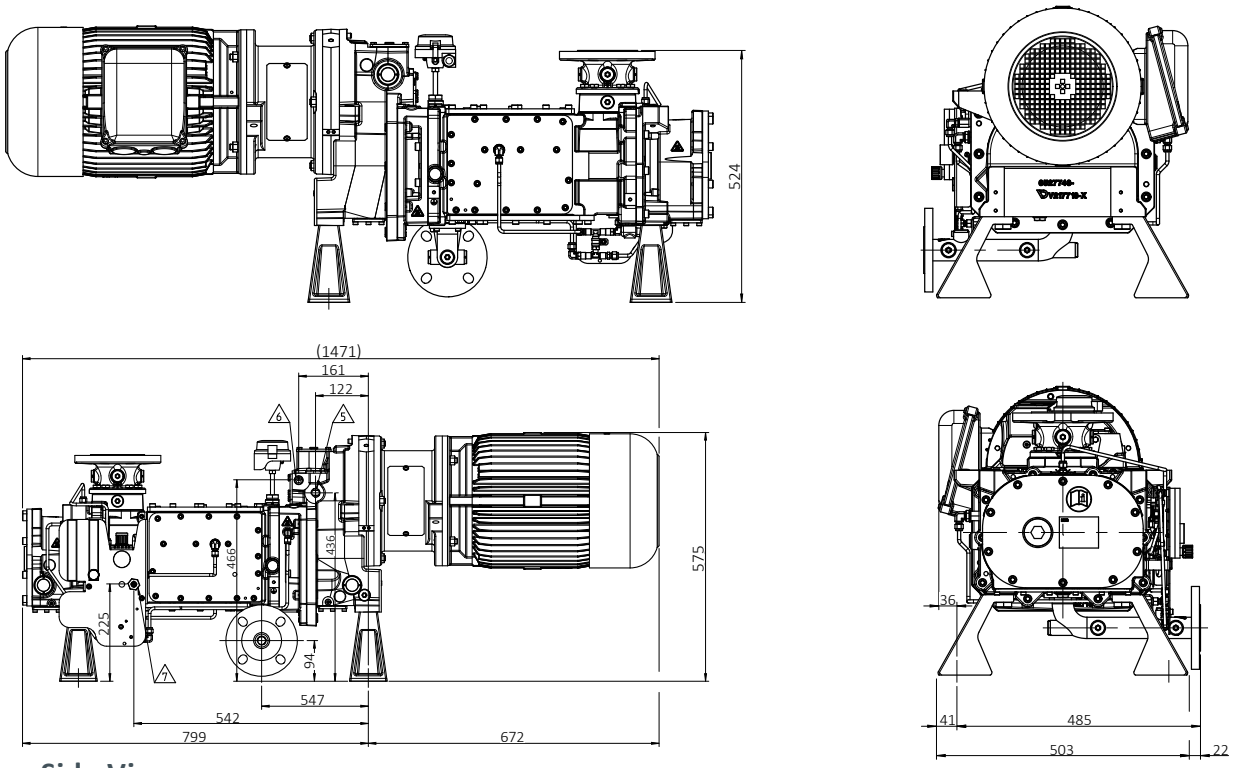


TECHNICAL SPECIFICATIONS

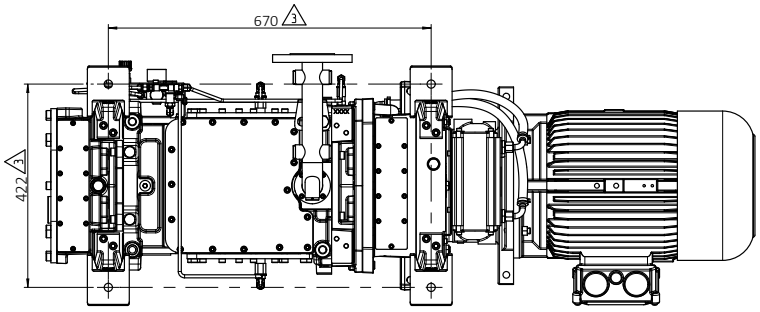
			Metric			Imperial		
			Chemical			Chemical		
			200	300		200	300
Performance	Peak Pumping Speed	m^3h^{-1}	210	>280	CFM	124	>165
	Ultimate Pressure	mbar	<0.05	<0.01	Torr	<0.04	<0.008
Full Load Power	@ ultimate pressure	kW	4.1	4.5	hp	5.5	6
	@ peak pumping load	kW	6.4	8.2	hp	8.6	11
Vacuum Connections	Inlet connection		DIN80/3”ANSI			DIN80/3”ANSI	
	Exhaust connection		DIN50/2”ANSI			DIN50/2”ANSI	
Cooling Water	Connection		G1/2” female			G1/2” female	
	Flow	L/min^{-1}	<8		Gal/min^{-1}	<2.1	
	Supply pressure (max)	bar	7		psig	100	
	DP across pump (min)	bar	0.5		psig	7.25	
	Temperature	°C	5-40		°F	41-104	
Purge Gas	Connection		G1/4” female threads			G1/4” female threads	
	Pressure	bar	2.5-6.9		psig	36-100	
	SSP flow	$lmin^{-1}$	<12		$lmin^{-1}$	<12	
	Gas Ballast flow*	$lmin^{-1}$	0-50		$lmin^{-1}$	0-50	
Operating data	Noise	dB(A)	<76		dB(A)	<76	
	Operating Temperature	°C	-20 to +40		°F	-4 to +104	
	Exhaust Back Pressure (Max)**	mbar	1200		psia	17.4	
	System IP rating		IP54			IP54	
	Lubrication (as supplied)		Extend 110			Extend 110	

DIMENSIONS

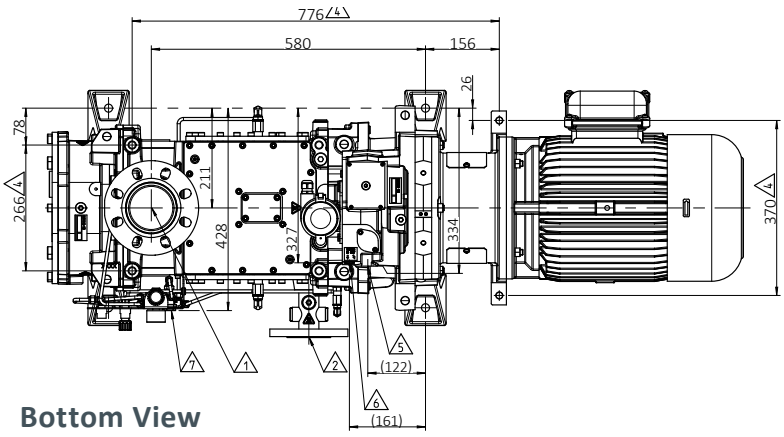
EDS Chemical Direct



Side View

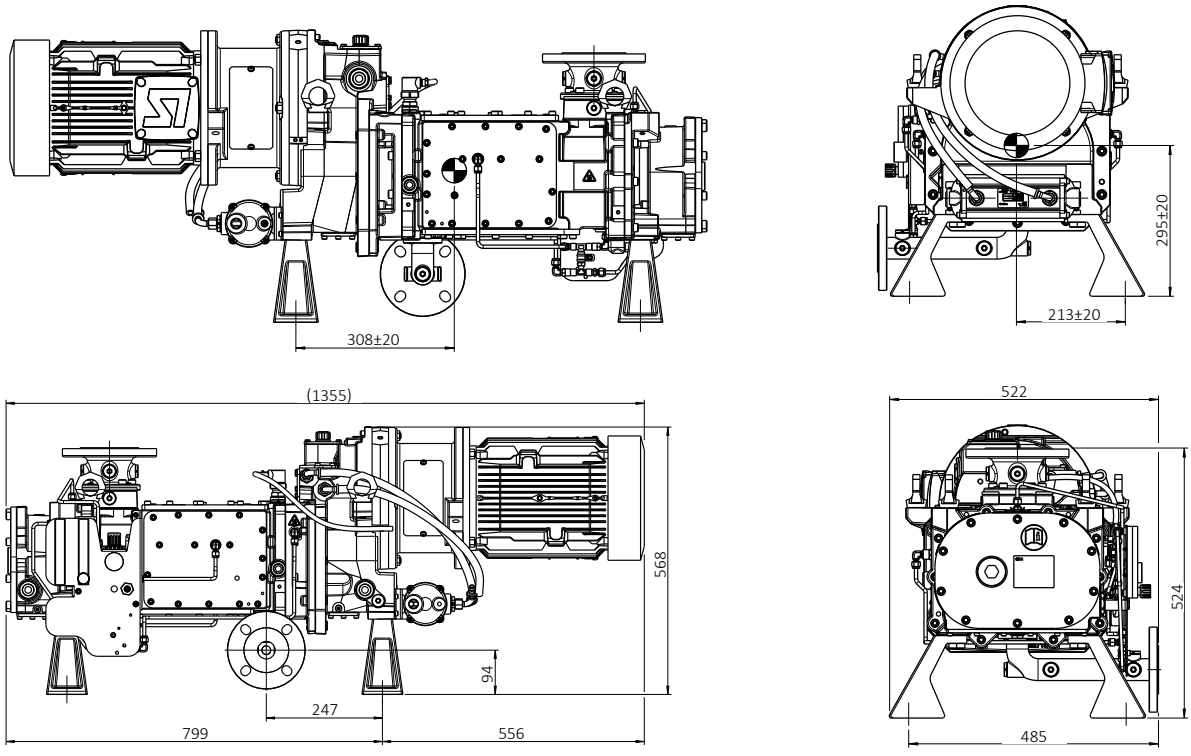


Top View

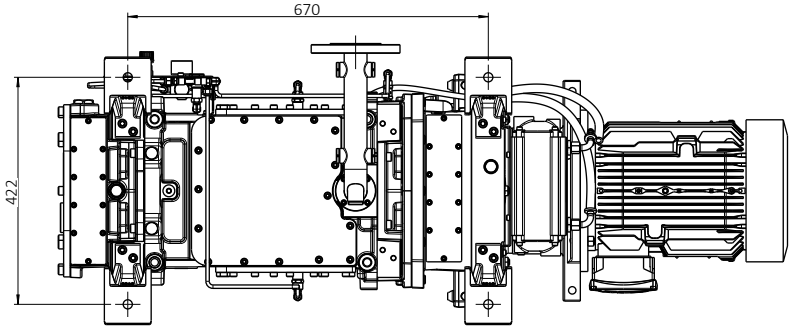


Bottom View

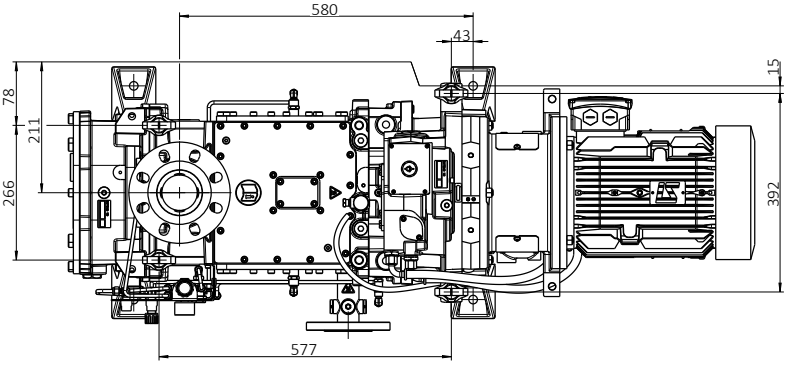
EDS Chemical Indirect



Side View



Top View



Bottom View

ORDERING INFORMATION

Part Number	Size	Cooling	Motor Voltage	Motor Desc.	Freq
A41822945	200	Direct Water	230/400V 50Hz	ATEX IIC T3	50Hz
A41824945	200	Indirect Water	230/400V 50Hz	ATEX IIC T3	50Hz
A41823945	200	Direct Water	230/400V 50Hz	ATEX IIC T4	50Hz
A41825945	200	Indirect Water	230/400V 50Hz	ATEX IIC T4	50Hz
A41826945	200	Direct Water	230/400V 50Hz	ATEX IC T3, T4	50Hz
A41827945	200	Indirect Water	230/400V 50Hz	ATEX IC T3, T4	50Hz
A41824985	200	Indirect Water	B/S	IEC ready	50Hz
A41824986	200	Indirect Water	B/S	NEMA ready	60Hz
A41832945	300	Direct Water	230/400V 50Hz	ATEX IIC T3	50Hz
A41834945	300	Indirect Water	230/400V 50Hz	ATEX IIC T3	50Hz
A41833945	300	Direct Water	230/400V 50Hz	ATEX IIC T4	50Hz
A41835945	300	Indirect Water	230/400V 50Hz	ATEX IIC T4	50Hz
A41836945	300	Direct Water	230/400V 50Hz	ATEX IC T3, T4	50Hz
A41837945	300	Indirect Water	230/400V 50Hz	ATEX IC T3, T4	50Hz
A41834985	300	Indirect Water	B/S	IEC ready	50Hz
A41832985	300	Direct Water	B/S	IEC ready	50Hz
A41834986	300	Indirect Water	B/S	NEMA ready	60Hz

ACCESSORIES

Part Number	Accessories	Pump Compatibility
A41890000	TCV Kit Direct Cooled	All direct cooled EDS pumps
A41890001	TCV Kit Indirect Cooled	All indirect cooled EDS pumps
A41891001	Solenoid Valve Accessory	All EDS pumps
A41893000	EDS to EH 1200/2600/4200 Connection Kit	All EDS pumps
A41893001	EDS to EH500 Connection Kit	All EDS pumps
A41894000	Exhaust Pressure Transmitter	All EDS pumps
A41895000	Pt100 Stator Temperature Transmitter	All EDS pumps
A41895001	Pt100 Exhaust Temperature Transmitter	All EDS pumps
A41897000	BoV plug Kit	All EDS pumps

SERVICE AND SUPPORT

To ensure your EDS Dry Screw vacuum pump maintains optimal performance and reliability, we offer a wide range of service solutions, tailored to meet your needs. From Field Service intervention, Managed Maintenance agreements and Overhaul service in our Service Technology Centres (STC), we will take care of your pump to ensure that it continues to deliver clean, consistent, efficient performance, with lower running costs and optimum total cost of ownership for its operating life.

Selecting original spare parts, maintenance kits and oil means that every critical part performs as it was intended. Our services engineers only fit 100% genuine parts to ensure you receive the best result from each service.

Our Preventative Maintenance service packages include:

- Health Check and Routine Service Check - Various flexible service to keep your pump running in an optimal condition for your application, including visual inspections, pump vitals checks and replacement/cleaning of components.
- Overhaul - The overhaul service includes multiple service options to ensure high performance and minimal downtime.
  - » Complete Remanufacturing including full decontamination of the pump, replacement of consumables and components tested to factory specifications.
  - » Clean and Overhaul including cleaning of pump interior, repair/replacement of pipework, replacement of consumables and reassembly.
  - » Module Exchange including removal and assembly of motor, gearbox, gas and water systems onto replacement pump module.
  - » Pump Exchange includes exchange of whole pump (including motor, gear box, gas and water systems) replaced with remanufactured pump.

edwardsvacuum.com

GLOBAL CONTACTS

EMEA	
UK	+44 1444 253 000 (local rate) 08459 212223
Belgium	+32 2 300 0730
France	+33 1 4121 1256
Germany	0800 000 1456
Italy	+ 39 02 48 4471
Israel	+ 972 8 681 0633

ASIA PACIFIC	
China	+86 400 111 9618
India	+91 20 4075 2222
Japan	+81 47 458 8836
Korea	+82 31 716 7070
Singapore	+65 6546 8408
Taiwan	+886 3758 1000

AMERICAS	
USA	+1 800 848 9800
Brazil	+55 11 3952 5000

Publication Number: 3602 112 9 01
© Edwards Limited 2019. All rights reserved.
Edwards and the Edwards logo are trademarks of Edwards Limited.

Whilst we make every effort to ensure that we accurately describe our products and services, we give no guarantee as to the accuracy or completeness of any information provided in this brochure.

Edwards Ltd., registered in England and Wales No. 6124750, registered office: Innovation Drive, Burgess Hill, West Sussex, RH15 9TW, UK.

Part of the Atlas Copco Group

edwardsvacuum.com

ELRi-INTELLIGENT LIQUID RING VACUUM PUMPS

EDWARDS

EDWARDS
THE PARTNER OF CHOICE

Edwards is a world leader in the design, technology and manufacture of vacuum pumps for industrial applications with over 100 years' history.

We believe in delivering results that bring value to our customers by using our breadth of industry experience to identify and apply solutions. Using the most innovative and up-to date modelling techniques, we can optimise the pumping configuration for customers to provide a system design giving the maximum performance in the most reliable and cost-effective way.

PROVEN TECHNOLOGY AND INTELLIGENCE IN A CLEVERLY ENGINEERED PACKAGE

Edwards range of liquid ring pumps continue to provide the optimum solutions for many rough vacuum applications in the chemical and process industries. Built to last, the general reliability and low maintenance of these pumps offer the best solution when it comes to pumping wet gases or particulates.

We have taken this proven liquid ring technology one-step further. By adding intelligence and an injecting innovation, we have now developed a new range of liquid ring pumps- ELRi series.

The ELRi is a single-stage, total recovery liquid ring vacuum pump available in pumping capacities - 750, 950 and 1050 m^3/h. Based on proven Hick Hargreaves technology, the ELRi series is a compact powerhouse with improved performance.

The ELRi is available in two variants – Standard variant with Plates-type heat exchanger and the Heavy-Duty variant with a Tube and Shell heat exchanger for the more corrosive and dirty applications.

PUMP TECHNOLOGY

Revolutionising conventional Liquid Ring vacuum pump technology.

RELIABLE AND ROBUST

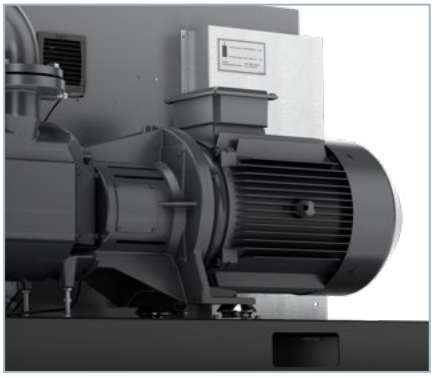
Cleverly engineered in a smart design

- Stainless steel impellers and end plates supplied as standard
- Integrated non-return valve protects against backflow

INNOVATIVE INTERNAL DESIGN

Highest degree of design build and quality

- Internal injection channels and mechanical seals for a stable sealing arrangement
- Lantern flange arrangement for ease of service



BUILT-IN INTELLIGENCE

Twin Variable Speed Drives (VSD) with patented algorithm

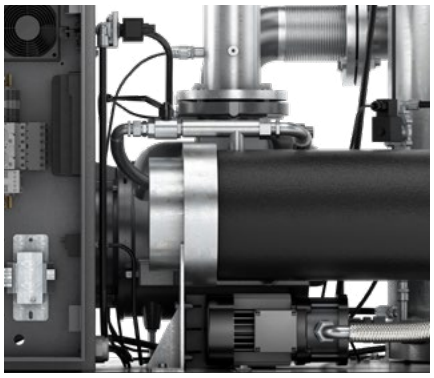
- VSD motor with set point control to maintain and match vacuum levels
- VSD for the water circulation pump to optimise water flow and maintain stable vacuum

HIGH DEGREE OF PROTECTION

Patented Anti-Cavitation Algorithm

- Prevents the ELRi from operating in areas of cavitation
- Increases pump lifetime, reduces process downtime and maintenance costs

- Set point control
- VSD on main motor
- VSD driven circulation pump
- Spray nozzles
- Cavitation prevention
- Automatic seizure prevention
- Icon box and connectivity



IP RATED COMPACT CANOPY

Compact canopy without sacrificing performance

- Ergonomically designed IP 54 rated canopy with a small footprint
- Dust and splash-proof with noise containment up to 69 dB

REMOTE MONITORING VIA ICON BOX

Easily identify service requirements and plug gaps

- ICONS SERVICE - Remote information of machine status
- ICONS UPTIME – Be informed of pump performance and maintenance requirements via SMS/email notification
- ICONS ENERGY - Energy savings report provided monthly

IDEAL FOR HUMID APPLICATIONS

Integrated Spray Nozzles

- Water spray cools and condenses the inlet gas and vapour from the process
- Reduces energy consumption, increases impeller life and ensures stable pump temperature

PATENTED ANTI-SEIZURE ALGORITHM

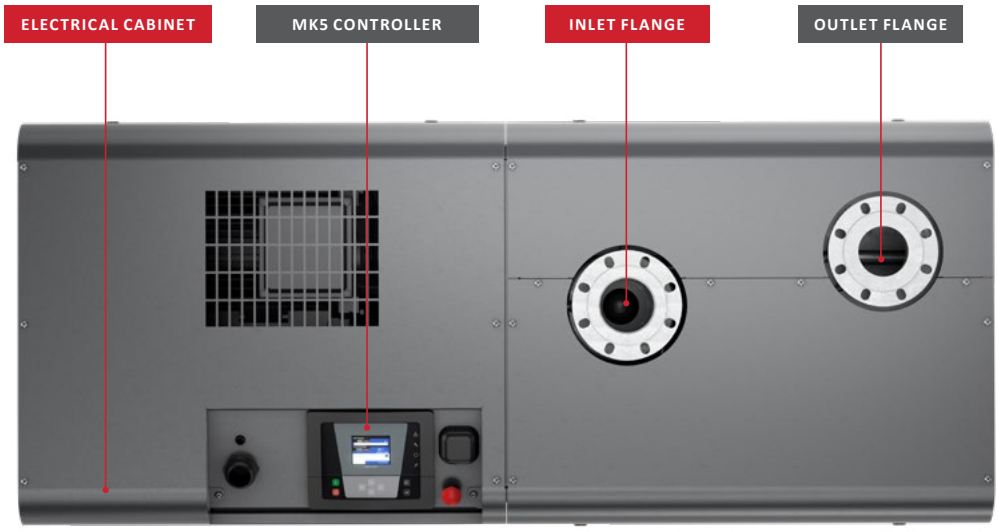
Seizure Prevention after long periods of inactivity

- Automatic turning off the pump for few seconds after long periods of inactivity
- Auto-restart after voltage failure

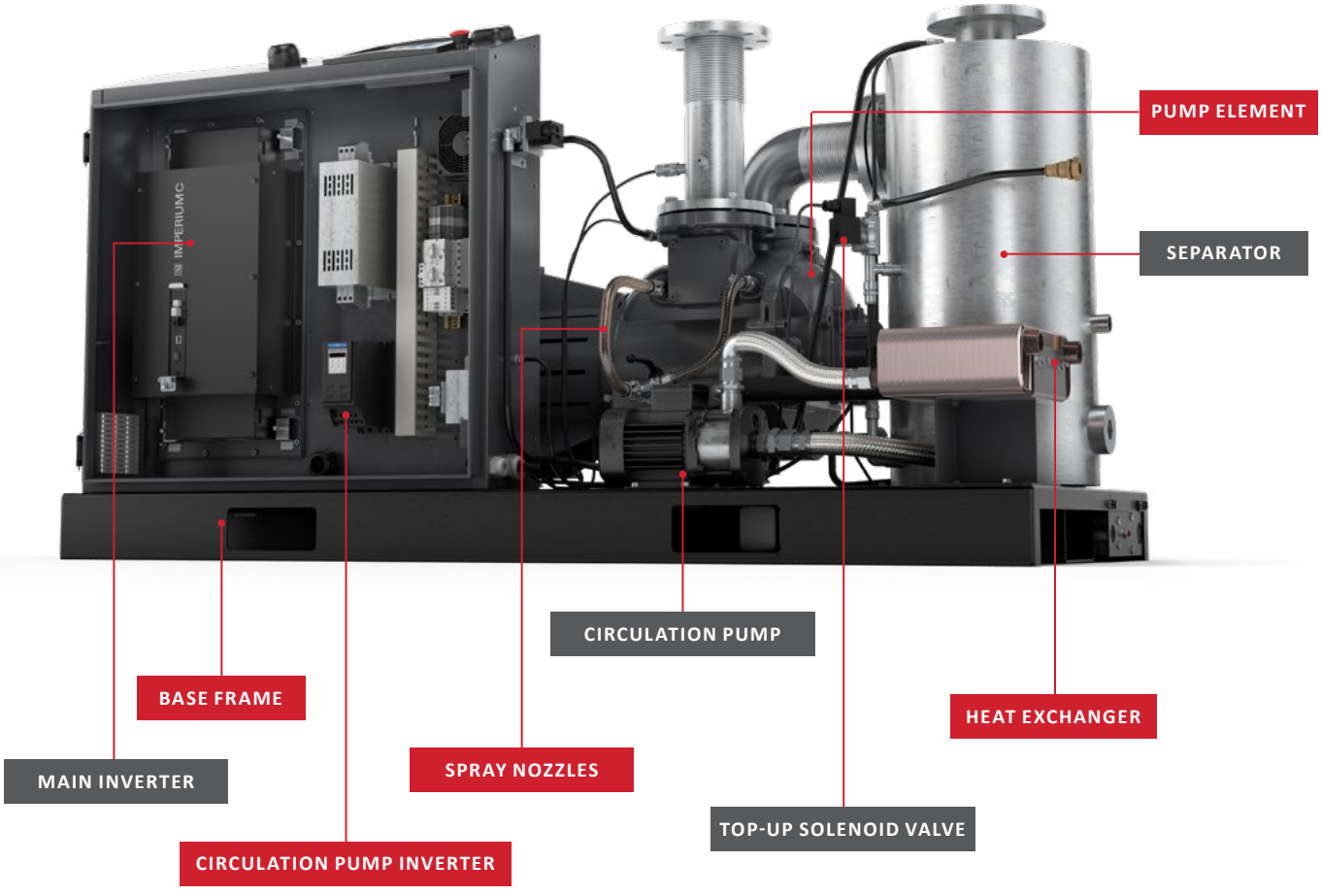
INTELLIGENCE AND AN INNOVATIVE DESIGN WITH AIRLOGIC® CONTROL

ELRi PUMP MAIN COMPONENTS

Top canopy



Internal



*For the Heavy Duty ELRi vacuum pump, the plates-type heat exchanger is replaced with the Tube and Shell. The plugs, solenoid valves and connecting pipes are stainless steel. This is suited for the more corrosive and dirty applications.

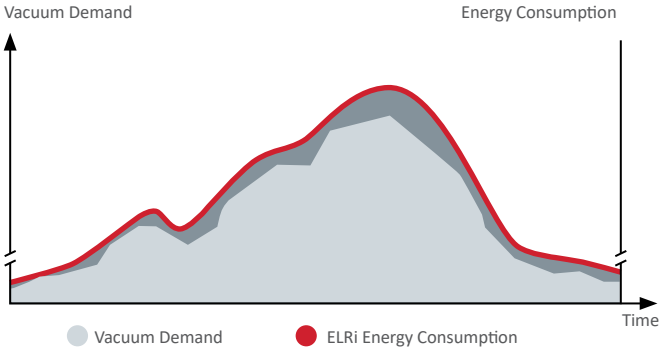
EControl

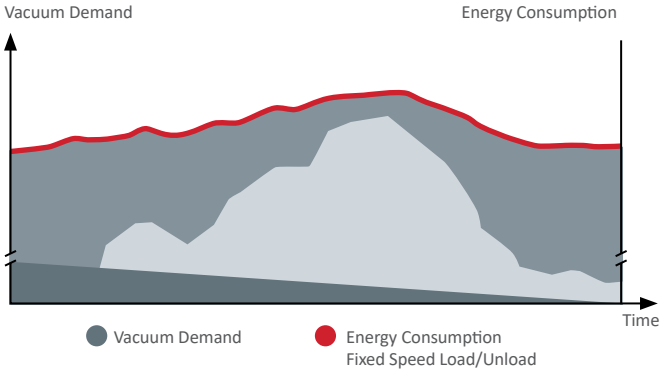
With our EControl Box, you can connect, monitor and control multiple ELRi pumps as well as competitor pumps. You get all the information for the everyday management of your vacuum pump as well as the alarms, safety shutdowns and maintenance:

- **Monitoring:** Vacuum pump operating status, recording of running/stopped hours, programmable timers, temperature/pressure read-outs, set point control and other settings
- **Safety:** Warning indications, fault and shutdown indications
- **Service:** Service operations, remote control (optional)

Fixed speed versus VSD

The need for vacuum fluctuates depending on different factors such as process changes, the time of day, week or even month. The intelligent ELRi can deliver peak performance only when required enabling significant energy and maintenance cost reductions. Optimising the energy used to maintain process vacuum level results in improved process efficiency and performance.

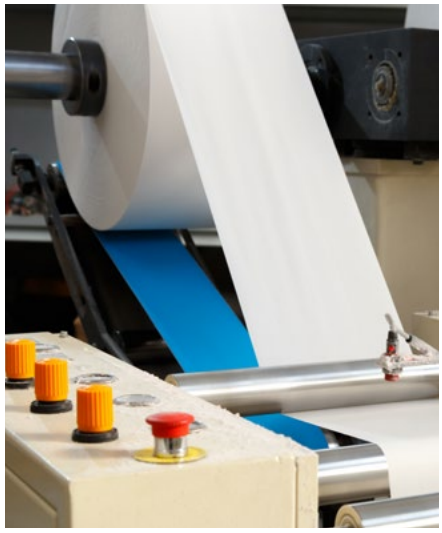




APPLICATIONS

The ELRi pumps are suitable for a range of applications in various industries including:

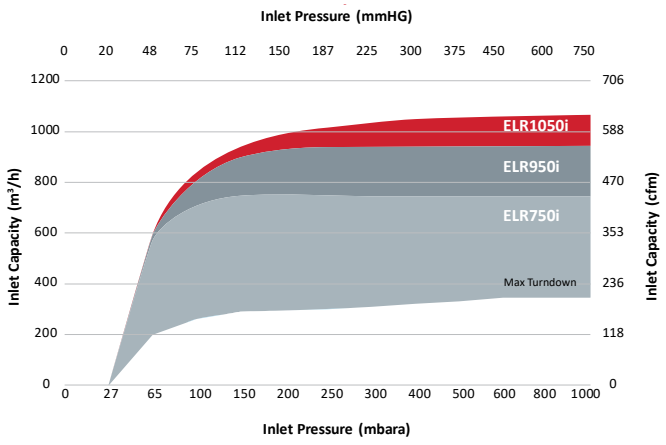
- Plastic Extrusion
- Rubber Vulcanisation
- Pulp and paper
- Drying
- Sterilisation
- Evaporation
- Filtration
- Pneumatic Conveying
- Chemical industry
- Pet food industry
- EPS Forming



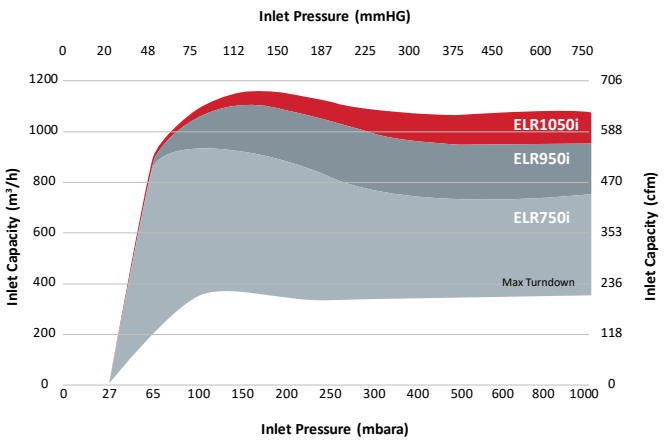
PERFORMANCE CURVES

ELRi PERFORMANCE CURVES

Dry



Saturated



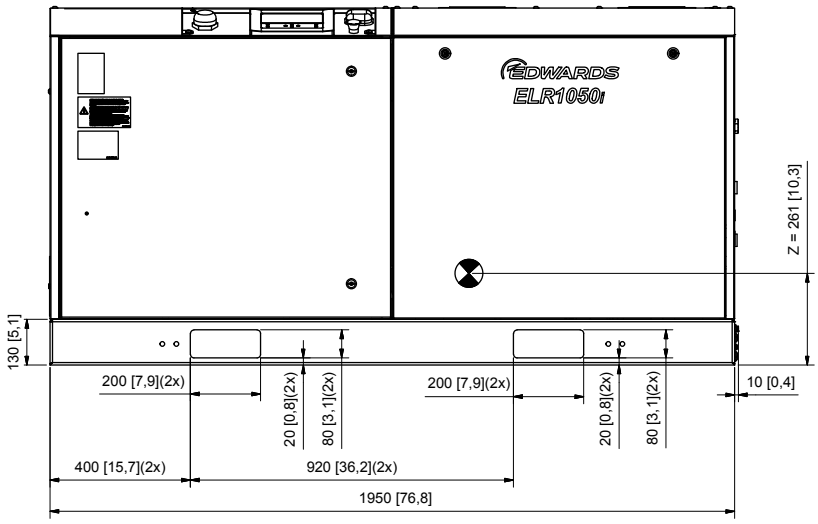
With increased water vapour load

TECHNICAL SPECIFICATIONS

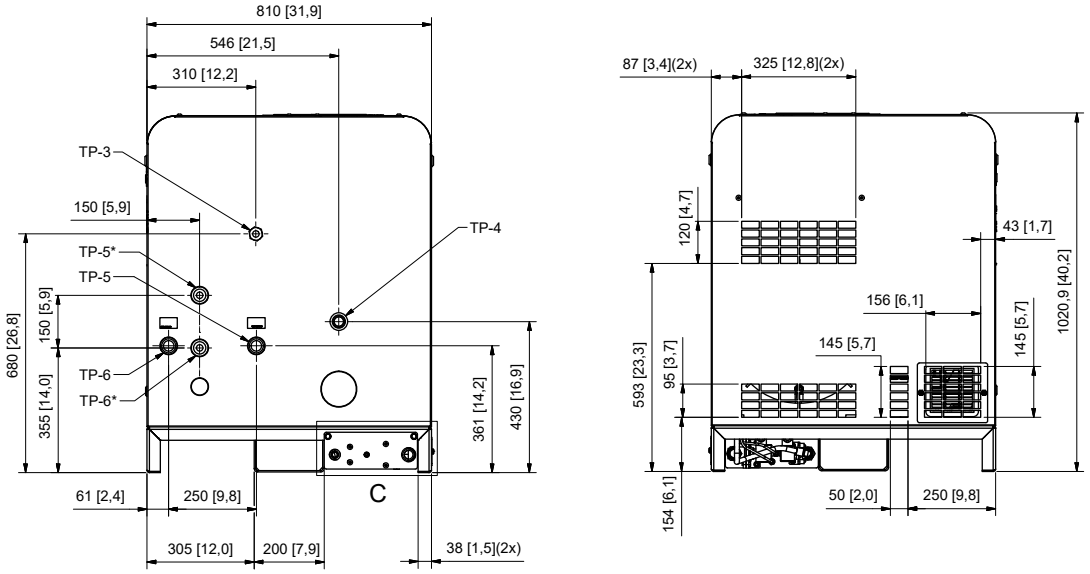
		ELR750i	ELR950i	ELR1050i
Nominal capacity	Dry-m³/h	740	940	1050
	Dry-cfm	436	553	618
	Saturated-m³/h	910	1090	1140
	Saturated-cfm	536	642	671
Ultimate pressure(Absolute)	mbar		25	
	inch Hg		0.7	
Nominal installed motor	kW	18.5	26	37
	hp	24.8	34.9	49.6
Footprint (WxDxH)	mm		1950 x 810 x 1020	
	inch		76,8 x 31,9 x 40,2	
	Inlet / Outlet		EN1092-1/01/B1/DN100/PN10	
Connection	Liquid fill / Manual drain		G 1/2" BSP(F)	
	Overflow		G 1/2" BSP(F)	
	Cooler inlet / Outlet		ISO 228/1-G1"	
Dry weight	kg	820	885	900

DRAWINGS AND DIMENSIONS

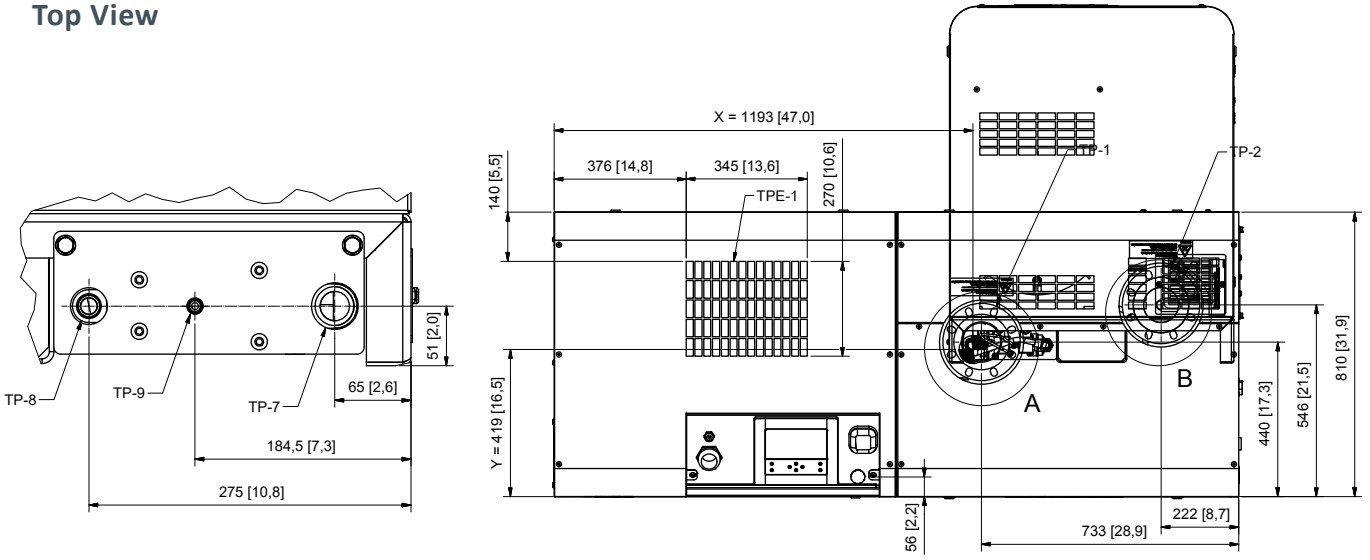
Front View



Side View



Top View



SERVICE AND SUPPORT

To ensure your ELRi Liquid Ring vacuum pump maintains optimal performance and reliability, we offer a wide range of service solutions, tailored to meet your needs. Our Preventative Maintenance service packages are designed to keep your pump optimised at all times.

Thanks to the incorporated AirLogic® controller and ICON box connectivity, many servicing and maintenance actions can now be performed by the operator. The modular and accessible design of the pump makes these actions simple and saves you time.

Annual Service

A more comprehensive Annual Service ensures that the heat exchanger and separator remain clean. We fine-tune performance to ensure operating costs are minimised.

Overhaul

When required, the pump element can be overhauled with the replacement of bearings, port plates and mechanical seals. This can be achieved with minimal impact to you and your operations.

Spare Parts

Kits are available to aid routine maintenance. Selecting original spare parts ensures reliability is never compromised. Our service engineers only fit 100% genuine parts to ensure you receive the best result from each service provided.

ORDERING INFORMATION

Part Number	Description
A75167100	ELR 750i Standard
A75167101	ELR 950i Standard
A75167102	ELR 1050i Standard
A75167110	ELR750i Heavy Duty, Stainless Steel version
A75167111	ELR950i Heavy Duty, Stainless Steel version
A75167112	ELR 1050i Heavy Duty, Stainless Steel version
A50862719	EControl6v IEC
A50862720	EControl6v UL,cUL
A50862721	EControl16v IEC
A50862722	EControl16v UL,cUL

edwardsvacuum.com

GLOBAL CONTACTS

EMEA	
UK	+44 1444 253 000 (local rate) 08459 212223
Belgium	+32 2 300 0730
France	+33 1 4121 1256
Germany	0800 000 1456
Italy	+ 39 02 48 4471
Israel	+ 972 8 681 0633

ASIA PACIFIC	
China	+86 400 111 9618
India	+91 20 4075 2222
Japan	+81 47 458 8836
Korea	+82 31 716 7070
Singapore	+65 6546 8408
Taiwan	+886 3758 1000

AMERICAS	
USA	+1 800 848 9800
Brazil	+55 11 3952 5000

Publication Number: 3602 700 0 01
© Edwards Limited 2020. All rights reserved.
Edwards and the Edwards logo are trademarks of Edwards Limited.

Whilst we make every effort to ensure that we accurately describe our products and services, we give no guarantee as to the accuracy or completeness of any information provided in this brochure.

Edwards Ltd., registered in England and Wales No. 6124750, registered office: Innovation Drive, Burgess Hill, West Sussex, RH15 9TW, UK.

Part of the Atlas Copco Group

edwardsvacuum.com

LIQUID RING VACUUM PUMPS FOR THE PROCESS INDUSTRIES

EDWARDS

EDWARDS
THE PARTNER OF CHOICE

Edwards is a world leader in the design, technology and manufacture of vacuum pumps with over 95 years' history and more than 75 years' manufacturing experience.

We believe in delivering results that bring value to our customers by using our breadth of industry experience to identify and apply solutions to your problems. Using the most innovative and up-to-date modelling techniques, we can optimise the pumping configuration for customers to provide a system design giving the maximum performance in the most reliable and cost-effective way.

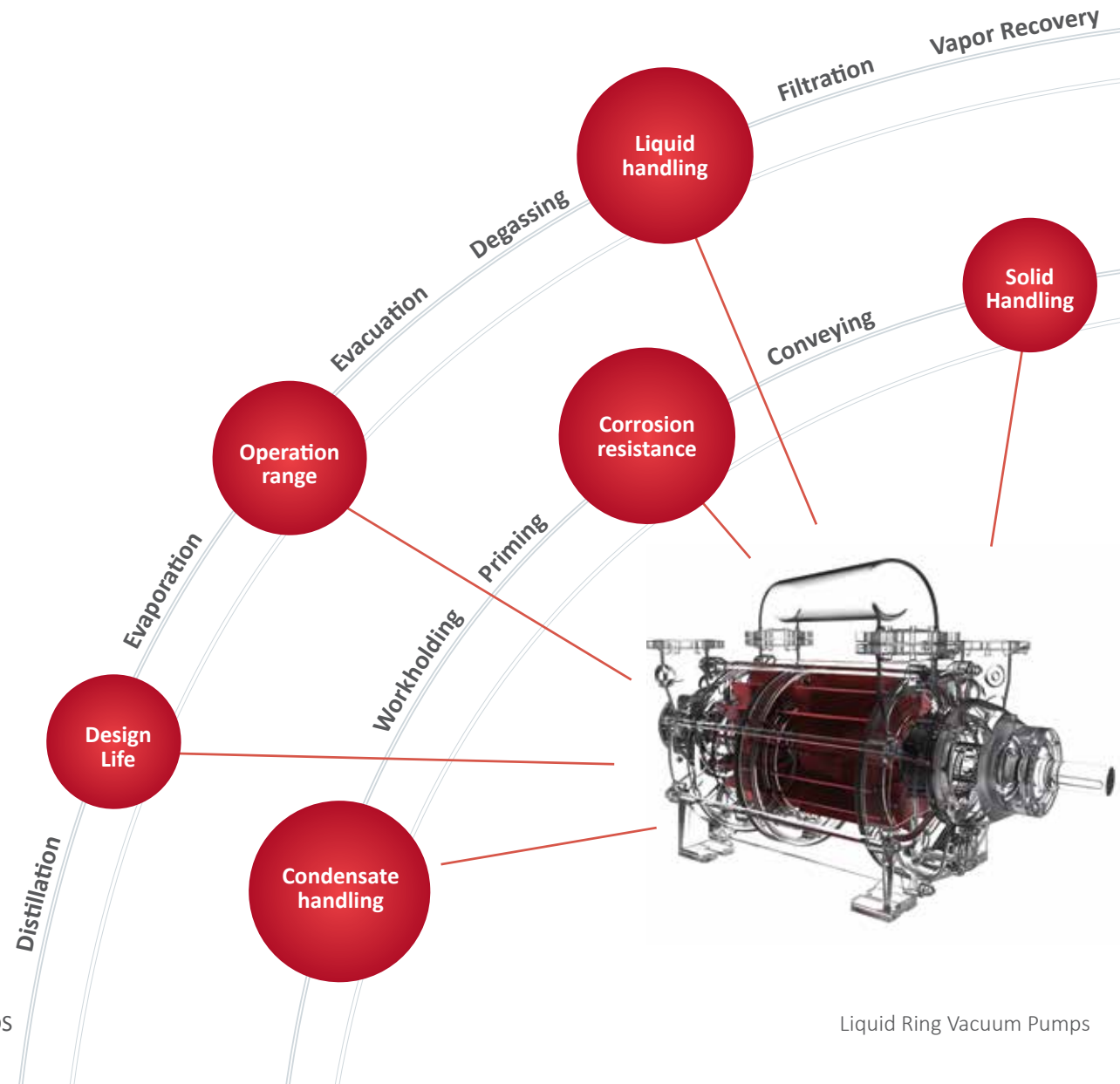
LIQUID RING VACUUM PUMPS

As a leader in vacuum technology, Edwards has developed a portfolio of products to meet the demanding applications in process industries.

The Edwards liquid ring pump range includes both one and two stage machines enabling optimum efficiency for processes operating across the vacuum range. Pump capacities up to 40,000 m^3/h are available in one stage and 7,500 m^3/h in two stage models.

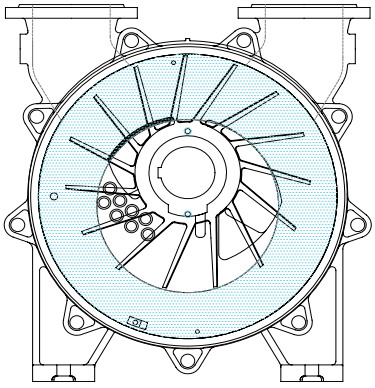
LR Series – Comprising of LR1A and LR1B models, these are one stage pumps designed for operation across the vacuum range, LR1A right down to 30 mbara whilst the LR1B pumps are optimised for applications at higher pressures above 300 mbara

HR Series – Includes EHR and SHR models, these are two stage construction for peak performance at low suction pressures below 150 mbara



HOW IT WORKS

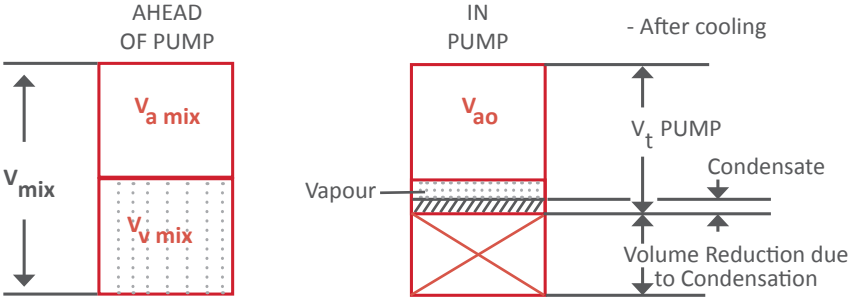
The pump impeller is mounted eccentrically to the axis of the pump casing, when the impeller is rotated at the appropriate speed and a supply of liquid is introduced into the pump chamber the liquid ring is created concentrically to the pump casing. As the impeller rotates a chamber is formed by the impeller blades and the inside of the liquid ring, as this chamber is open to the suction port gas is sucked into the pump. As the impeller continues to rotate the pumping chamber reduces in size because of the eccentricity the trapped gas is compressed, once the chamber reaches the outlet port the gas is discharged at an increased pressure along with some of the seal liquid which removes the heat of compression.



Wet process gases

Liquid ring pumps offer significant advantages when pumping wet gases and vapours and for applications requiring special materials of construction for corrosion resistance.

The volume of incoming wet gases is reduced by cooling and condensing, this reduces the volume enabling a smaller pump to be selected.



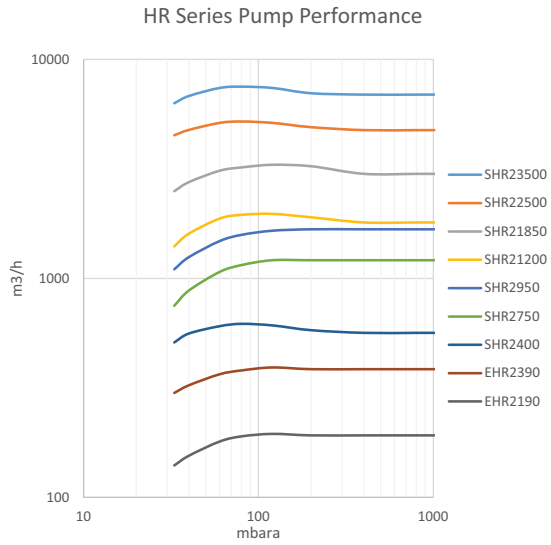
When pumping corrosive process gases or selected seal liquid is corrosive, pump materials of construction which are compatible can be selected. In addition to the standard options shown in the table below bespoke options combining different materials and special materials such as hastelloy.

Materials of Construction options

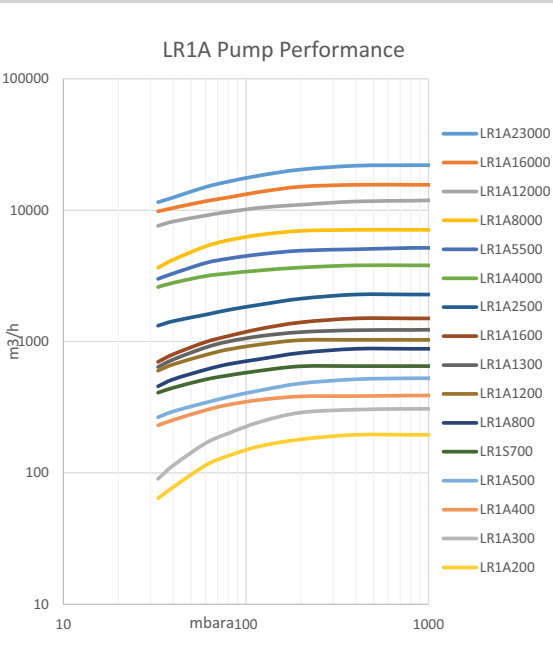
Liquid ring pumps are well suited to operation in hazardous environments without the need for flame arrestors, pumps can be supplied suitable for operation in environments which require ATEX compliance. Please contact your local sales office for details.

Component	Standard	Stainless Fitted	Stainless Steel	Seawater ALBR	Seawater Duplex
End Casing	Cast Iron	Cast Iron	Stainless Steel	Aluminium Bronze	Duplex StSt
Impeller	SG Iron	Stainless Steel	Stainless Steel	Aluminium Bronze	Duplex StSt
Centre Body	Cast Iron	Cast Iron	Stainless Steel	Aluminium Bronze	Duplex StSt
Port Plates	Cast Iron	Cast Iron	Stainless Steel	Aluminium Bronze	Duplex StSt
Shaft	Carbon Steel	Carbon Steel	Stainless Steel	Monel	Duplex StSt
Shaft Sleeve	Stainless Steel	Stainless Steel	Stainless Steel	Monel	Duplex StSt
Shaft Seal	Carbon/SiC/Viton	Carbon/SiC/Viton	Carbon/SiC/Viton	Carbon/SiC/Viton	Carbon/SiC/Viton

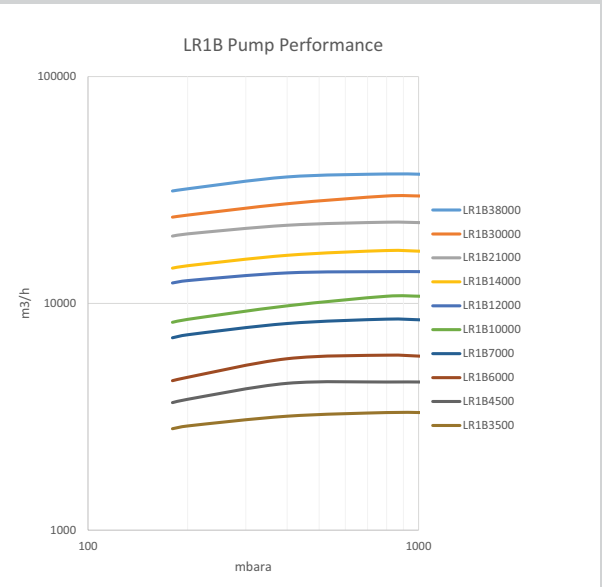
HR Series



LR1A Series



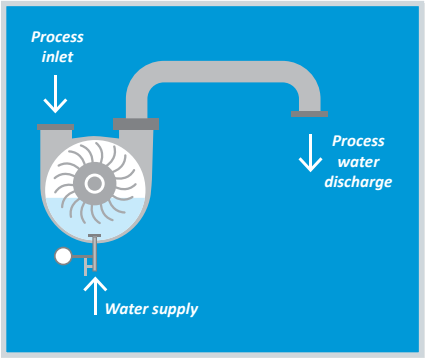
LR1B Series



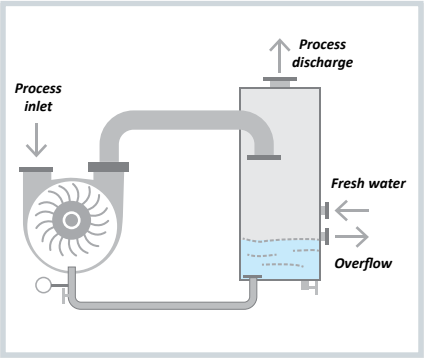
STANDARD LRP PACKAGES

Liquid ring vacuum pump performance is dependent upon the seal liquid properties; the seal liquid must be at a temperature which is low enough to enable the pump to operate at the desired suction pressure. To minimise the amount of seal water required it is often desirable to recycle the seal water back into the liquid ring pump, to enable this either some of the water must be replaced with fresh cooled water (partial re-circulation) or it should all be cooled by a heat exchanger (total re-circulation).

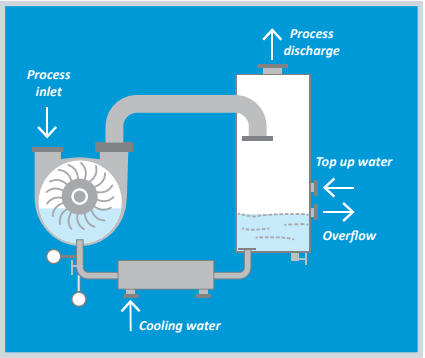
Edwards liquid ring vacuum pumps are offered as standard packages in three basic configurations, for operation in once through, partial or total re-circulation mode. Additionally, pumps are available in a selection of pump materials.



Once Through Operation
Used where an ample supply of service liquid which can be discharged to drain is available.



Partial Re-circulation Operation The discharged seal liquid and gas stream is separated in the discharge separator, fresh liquid is added is reduce the temperature of the recycled mixture and the excess liquid goes to drain. This will reduce seal liquid usage by up to 50%.



Total Re-circulation Operation Used when seal liquid is in short supply or contamination of drains is an issue. To enable total re-recirculation the separated liquid must be cooled before it is re-used. This is done by including a plate type heat exchanger in the return line.

Maximum Seal Water Temperature

When using water as the seal liquid the maximum temperature of seal water required to enable operation at a specific pressure is shown in the table below.

Inlet Water Temperature °C	Minimum Suction Pressure mbara
15	33
20	40
25	50
32	60
38	80
45	100

ENGINEERED TO ORDER SYSTEMS

Complex packages are designed to meet the customer or process licence specifications., generally requiring project specific quality assurance program and extensive documentation packages.

Edwards have many years experience in the design, engineering, assembly and testing of bespoke liquid ring pump and hybrid vacuum systems for the process markets, with equipment supplied for various process applications, including production of; aromatics, LAB, styrene, BPA, PTA, biofuels, fertilisers, adhesives and many others, providing customised solutions to meet customer requirements.

Petrochemical
Vacuum Distillation, Vapour Recovery

Power Generation
Condenser air extraction, Deaeration, Waterbox priming, Ash handling, Filtration

Chemical
Distillation, Evaporation, Filtration, Polymerisation, Deoderisation, Polymerisation

Offshore
Seawater deaeration, MEG recovery, Drilling mud recovery

Pharmaceutical & Fine Chemical
Filter drying, Degassing, Crystallisation, Conveying

Food Processing
Crystallisation, Evaporation, Filtration, Freeze Drying

For more information on specific applications please contact you local Edwards sales office.

edwardsvacuum.com

GLOBAL CONTACTS

EMEA	
UK	+44 1444 253 000 (local rate) 08459 212223
Belgium	+32 2 300 0730
France	+33 1 4121 1256
Germany	0800 000 1456
Italy	+ 39 02 48 4471
Israel	+ 972 8 681 0633

ASIA PACIFIC	
China	+86 400 111 9618
India	+91 20 4075 2222
Japan	+81 47 458 8836
Korea	+82 31 716 7070
Singapore	+65 6546 8408
Taiwan	+886 3758 1000

AMERICAS	
USA	+1 800 848 9800
Brazil	+55 11 3952 5000

Publication Number: 3602 602 6 01
© Edwards Limited 2017. All rights reserved
Edwards and the Edwards logo are trademarks of Edwards Limited

Whilst we make every effort to ensure that we accurately describe our products and services, we give no guarantee as to the accuracy or completeness of any information provided in this brochure.

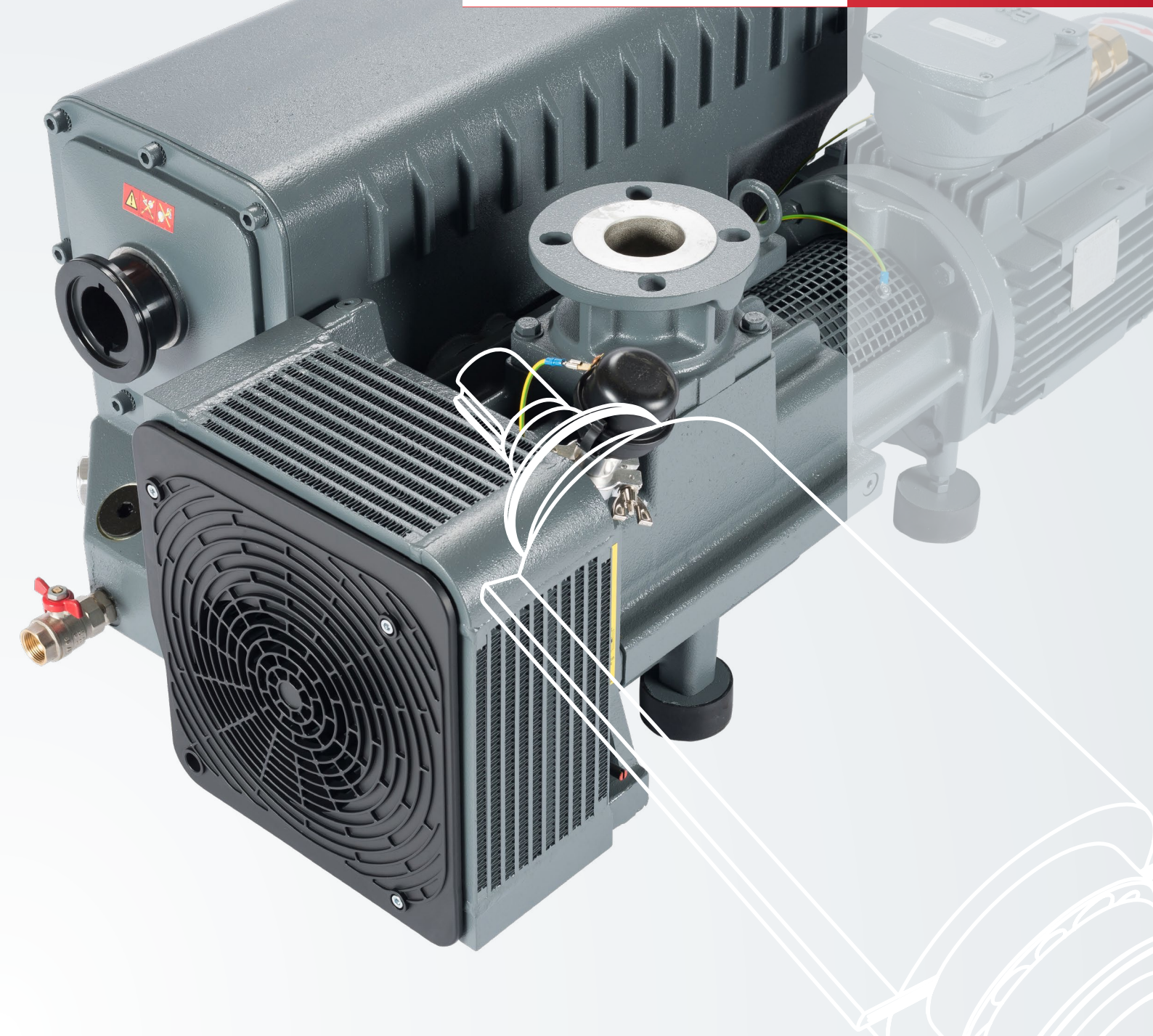
Edwards Ltd, registered in England and Wales No. 6124750, registered office: Innovation Drive, Burgess Hill, West Sussex, RH15 9TW, UK.

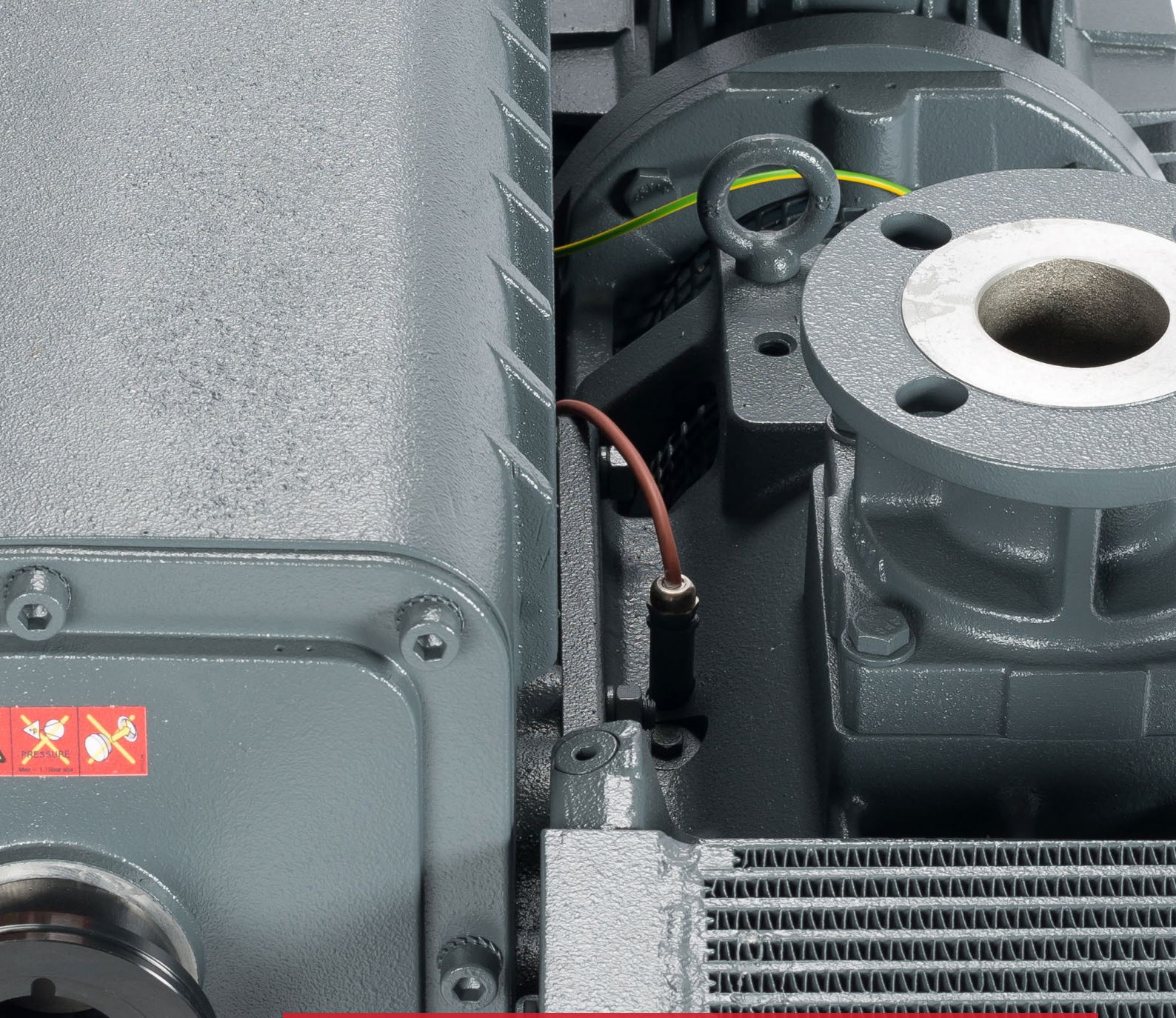
Part of the Atlas Copco Group

edwardsvacuum.com

nES SINGLE STAGE EX SERIES ROTARY VANE PUMPS FOR EXPLOSIVE ENVIRONMENTS

EDWARDS





EDWARDS
THE PARTNER OF CHOICE

Edwards is a world leader in the design, technology and manufacture of vacuum pumps for industrial applications with over 100 years' history.

We believe in delivering results that bring value to our customers by using our breadth of industry experience to identify and apply solutions. Using the most innovative and up-to-date modelling techniques, we can optimise the pumping configuration for customers to provide a system design giving the maximum performance in the most reliable and cost-effective way.

nES SINGLE STAGE EX SERIES

NEXT GENERATION SINGLE STAGE ROTARY VANE PUMPS

The Edwards nES single stage EX series represents the next advance in single stage oil sealed rotary vane vacuum pumps for use in explosive environments.

EXPLOSIVE ENVIRONMENTS

Edwards nES single stage EX series rotary vane pumps have been specifically designed to be capable of handling gases from a potentially explosive atmosphere and to operate in environments where a potentially explosive atmosphere can be present. Pumps have been certified under the ATEX directive 2014/34/EU.

nES single stage EX series pumps are equipped with a variety of sensors:

PUMP TEMPERATURE

PRESSURE IN OIL CASING

OIL LEVEL

PTC MOTOR THERMISTORS

nES single stage EX series pumps are also supplied with:

- ATEX rated exhaust mist filter
- FPM seals
- Oil filter bypass
- ATEX rated motor and coupling
- Approved oil
- Gas ballast facility

BENEFITS

1. PROTECTION

Equipment with a range of sensors providing protection in-line in with ATEX directive 2014/34/EU.

2. INTERNAL MECHANISM

Designed for minimal hot spots ensuring lowest possible temperature class. The pump mechanism is designed with attention to detail that guarantees a class-leading ultimate vacuum level without the pressure fluctuations.

3. INTEGRATED OIL MIST FILTER

The improved integrated exhaust mist filter is effective in preventing oil mist from being exhausted into the environment. It is user serviceable and gives the pump a much cleaner operation with low maintenance.

4. AIR COOLING

The pump is provided with an efficient air flow management system that enables a low operating temperature and increased oil life, without the need for water cooling.

5. OIL RETURN SYSTEM

The enhanced oil return system gives an excellent vacuum stability. Use of Edwards Ultragrade Extend 110 Oil not only gives an improved vacuum performance but also enables the pump to withstand high operating temperatures without oil degradation thus extending intervals between oil changes.

6. INLET CONNECTION

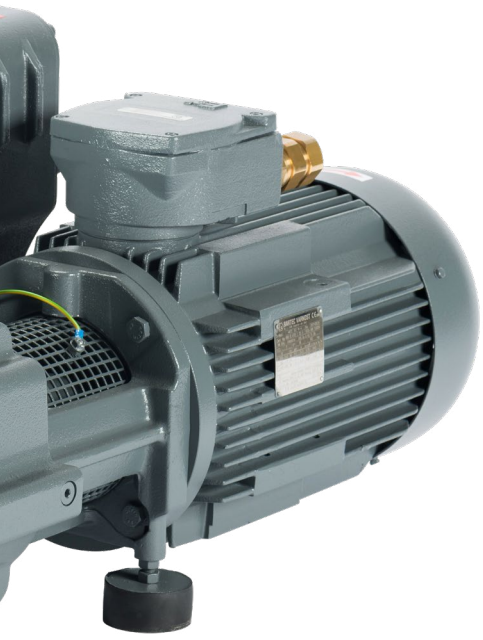
Inlet connections are compatible with DN ISO and ANSI flanges providing the user with installation flexibility.

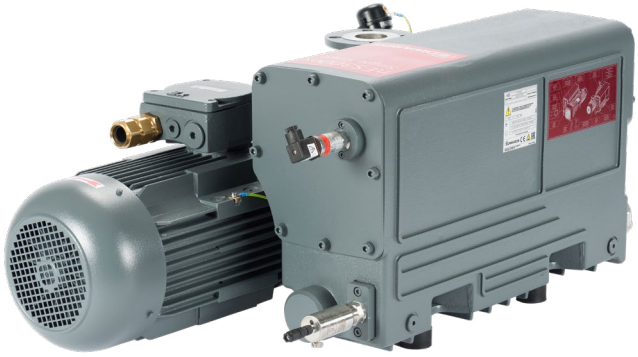
7. DIRECT DRIVE TECHNOLOGY

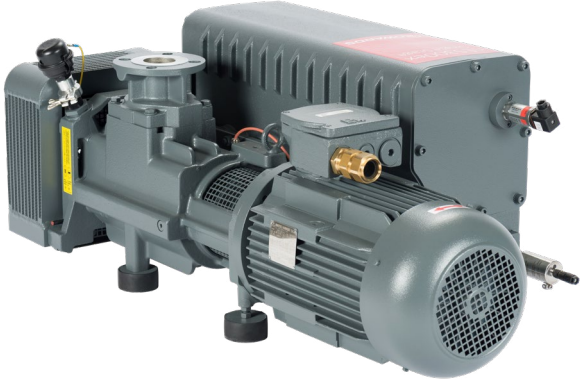
Motors are certified to ATEX directive 2014/34/EU. Variants are also available for the US market.

ADVANTAGES

- Built-in sensors and monitoring providing added protection
- Suitable for a wide range of applications
- High pumping speed at low pressures
- Stable vacuum performance with no pressure fluctuation
- Good condensable vapour handling capability with gas ballast
- High reliability through proven technology
- Low noise and vibration
- Space efficient through compact design
- Optimised oil return system and integrated exhaust mist filter
- Efficient air cooled motor
- Low and easy maintenance - therefore high productivity





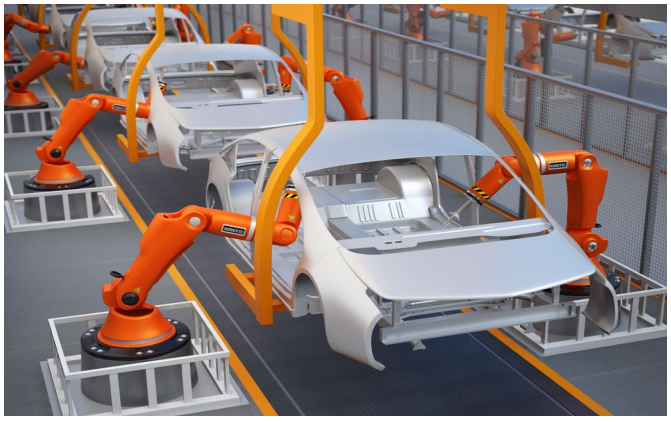


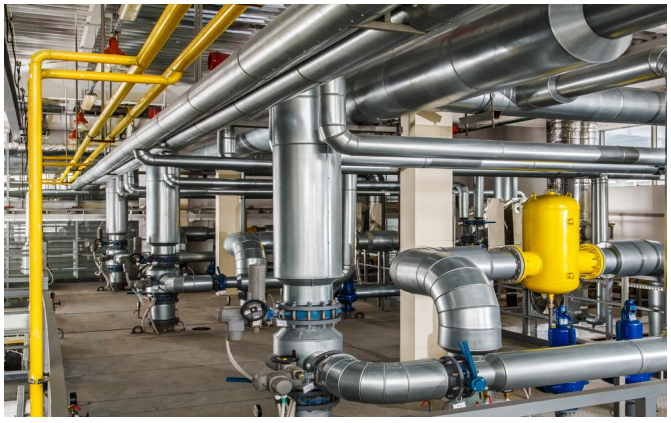
APPLICATIONS

The nES single stage EX series pumps are suitable for use in a broad range of applications where protection in explosive environments is required.

Few applications areas where an appropriate level of protection is required:

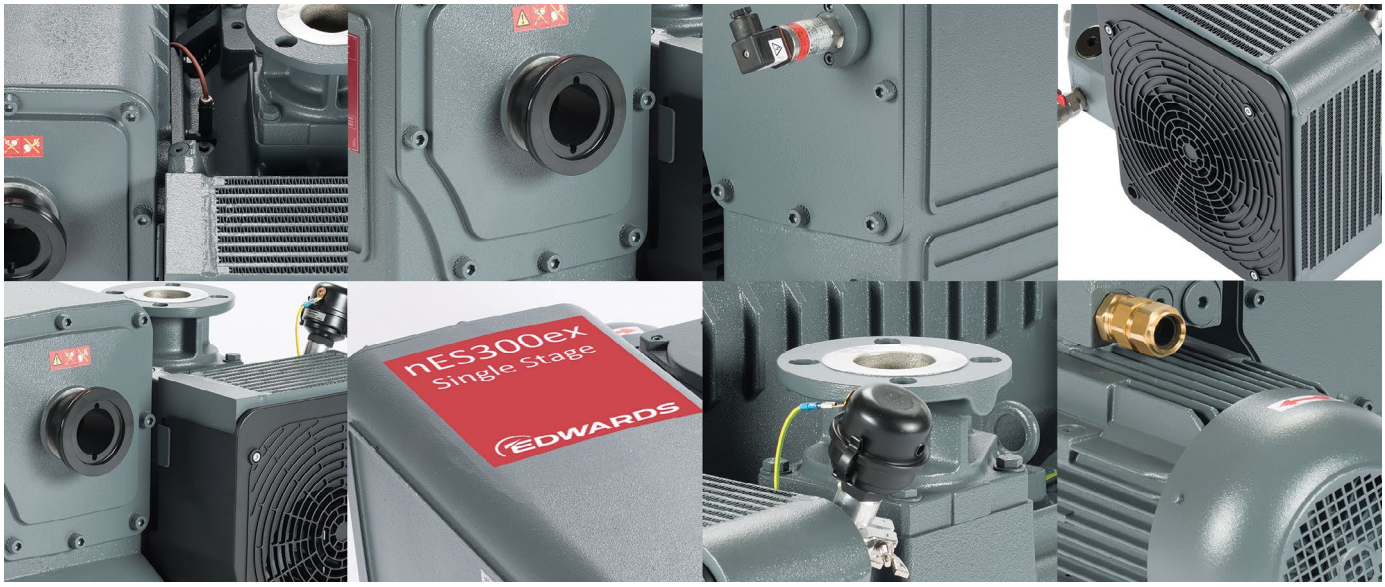
- Chemical
- Pharmaceutical
- Sterilising with ethylene oxide
- Recovery of air conditioning gases
- Degassing of power plant alternator oil
- Automotive
- Gas vapour recovery
- Gas bottle filling





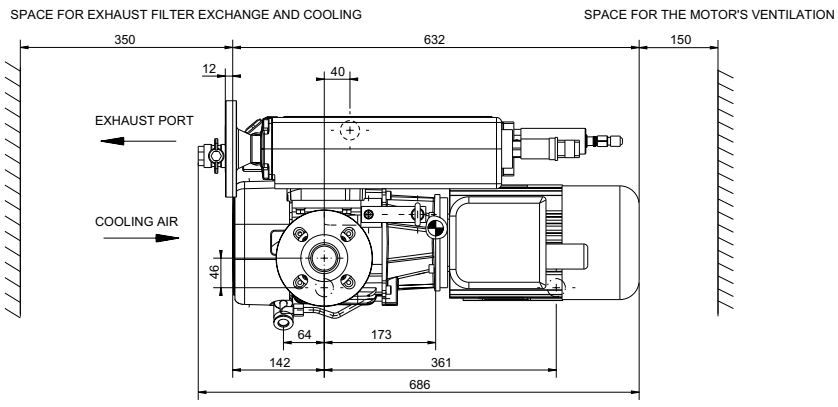
TECHNICAL DATA

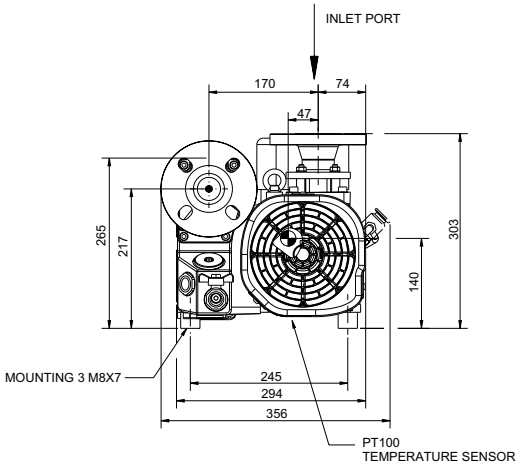
	Units	nES40ex	nES65ex	nES100ex	nES200ex	nES300ex	nES630ex
Maximum displacement (50 Hz)	m^3h^{-1} / cfm	44.0 / 25.9	59.0 / 34.8	98.0 / 57.4	180 / 106	280 / 165	700 / 412
Maximum displacement (60 Hz)	m^3h^{-1} / cfm	53.0 / 31.2	71.0 / 41.8	117 / 68.9	220 / 130	340 / 200	-
Pumping Speed (50 Hz)	m^3h^{-1} / cfm	38.5 /22.7	54.0 /31.8	87.5 / 51.5	170 / 100	240 / 141	640 / 377
Pumping Speed (60 Hz)	m^3h^{-1} / cfm	47.0 /27.7	64.0 /37.7	105 / 61.8	200 /118	290 / 171	-
Ultimate vacuum (total pressure) no gas ballast	mbar / torr	0.5 / 0.4	0.5 / 0.4	0.5 / 0.4	0.15 / 0.13	0.15 / 0.13	0.15 / 0.13
Ultimate vacuum (total pressure) with gas ballast	mbar / torr	1.5 / 1.1	1.5 / 1.1	1.5 / 1.1	0.7 / 0.5	0.7 / 0.5	0.7 / 0.5
Inlet connection	ISO / ANSI	DN40 / ANSI 1"1/2	DN40 / ANSI 1"1/2	DN40 / ANSI 1"1/2	DN50 / ANSI 2”	DN50 / ANSI 2”	DN100 ISO-K / ANSI 4"
Outlet connection	ISO / ANSI	DN40 / ANSI 1"1/2	DN40 / ANSI 1"1/2	DN40 / ANSI 1"1/2	DN50 / ANSI 2”	DN50 / ANSI 2”	DN100 ISO-K / ANSI 4"
Max permitted outlet pressure	bar (abs)	1.15	1.15	1.15	1.15	1.15	1.15
Max water vapour pumping rate (50 Hz)	kgh^{-1} / lbh^{-1}	0.76 / 0.80	1.0 / 1.1	1.60 / 1.69	3.4 / 3.6	1.3 / 1.4	17 / 18
Max water vapour pumping rate (60 Hz)	kgh^{-1} / lbh^{-1}	0.90 / 0.95	1.25 / 1.32	1.70 / 1.80	5.4 / 5.7	1.8 / 1.9	-
Dimensions (L, W, H)	mm	686 / 356 / 303	748 / 386 / 349	810 / 434 / 319	1084 / 535 / 435	1143 / 573 / 450	1568 / 989 / 740
Weight	kg / lb	67 / 148	86 / 190	104 / 230	142 / 313	244 / 539	695 / 1534
Motor Protection rating		IP55	IP55	IP55	IP55	IP55	IP65
Motor Power (50 Hz)	kW / hp	1.5 / 2.0	2.2 / 3.0	3.0 / 5.0	5.5 / 8	7.5 / 10	18.5 / 26
Motor Power (60 Hz)	kW / hp	1.8 / 3.0	2.6 / 4.0	3.6 / 6.0	6.6 / 10	9 / 13	-
Noise level (50 Hz)	dB(A)	58	60	61	69	72	72
Noise level (60 Hz)	dB(A)	60	64	64	73	76	-
Oil Refill Capacity	litre	1	2	2	5 - 9	8.5–11.5	20 - 23
Recommended oil	Ultragrade Endurance Extend 110						



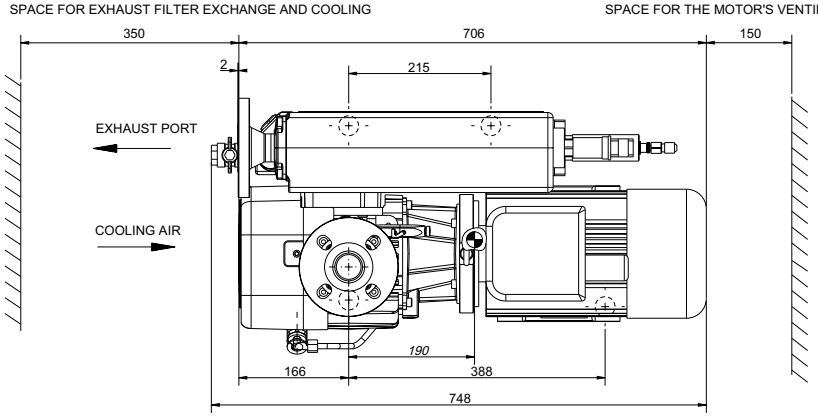
DRAWINGS AND DIMENSIONS

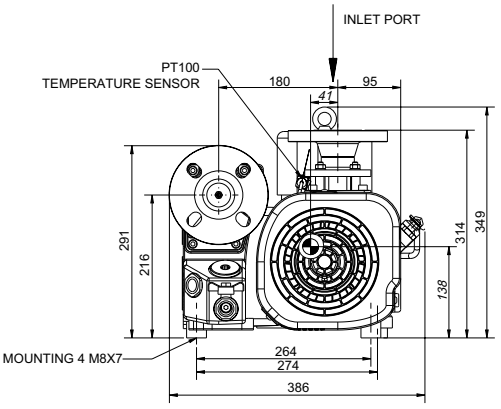
nES40ex



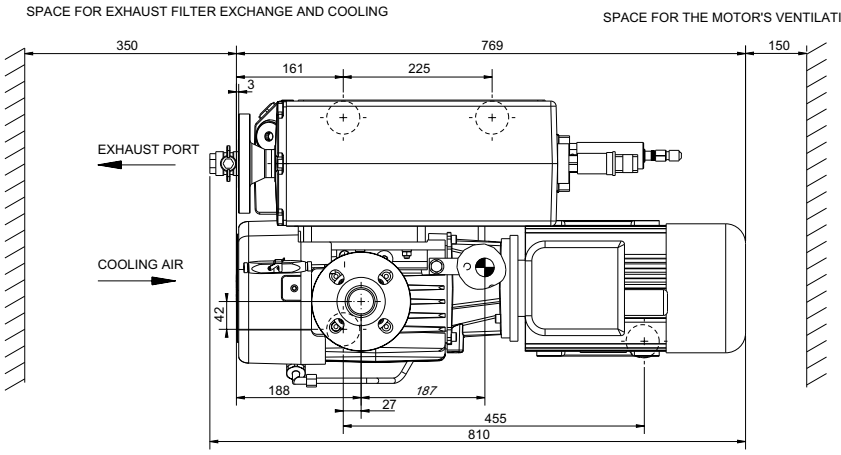


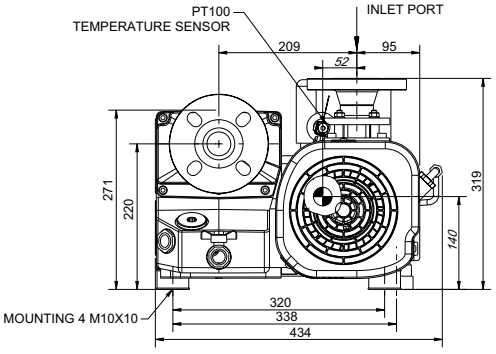
nES65ex



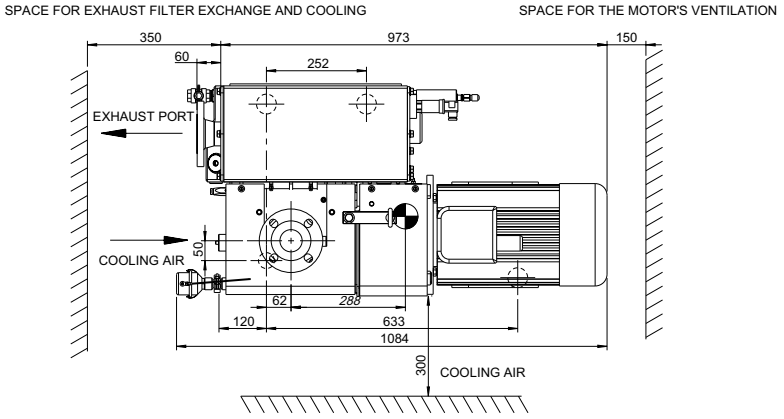


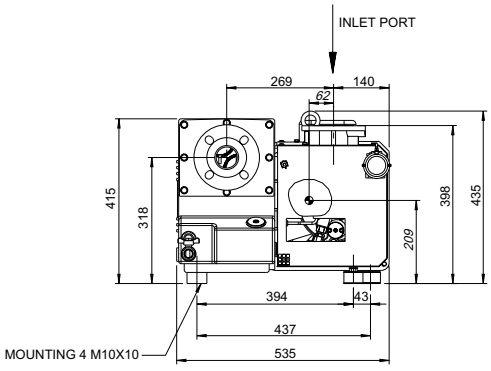
nES100ex



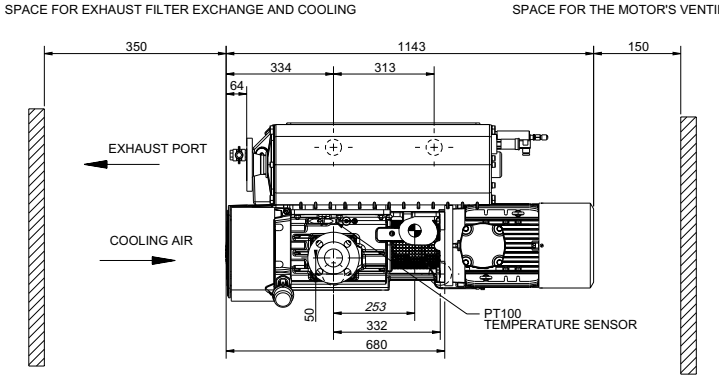


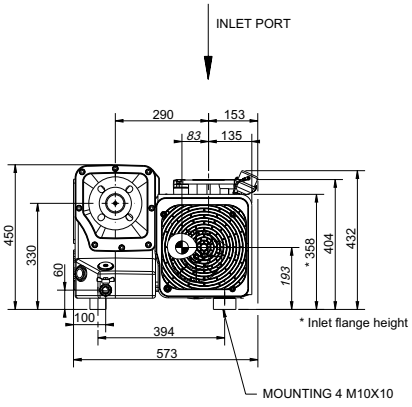
nES200ex



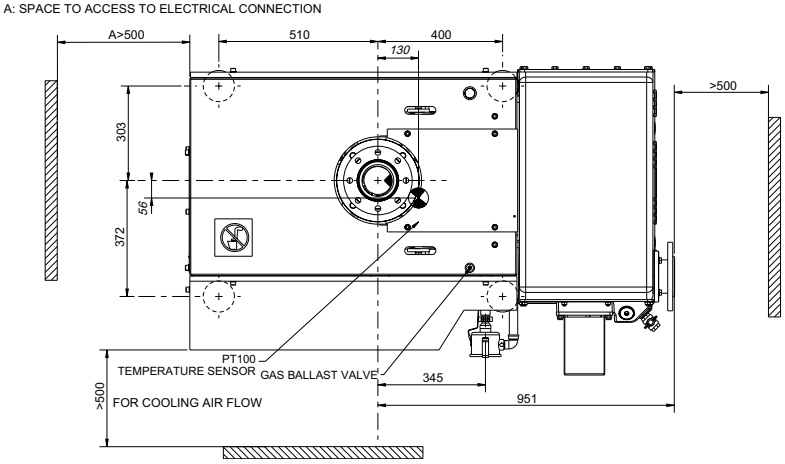


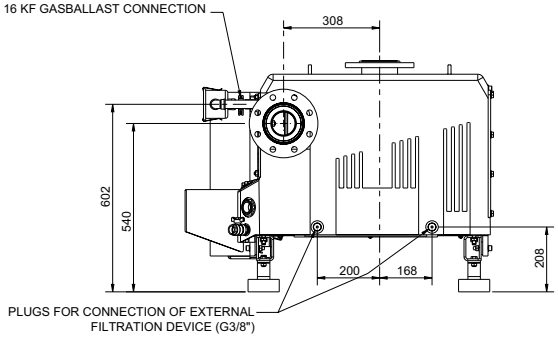
nES300ex





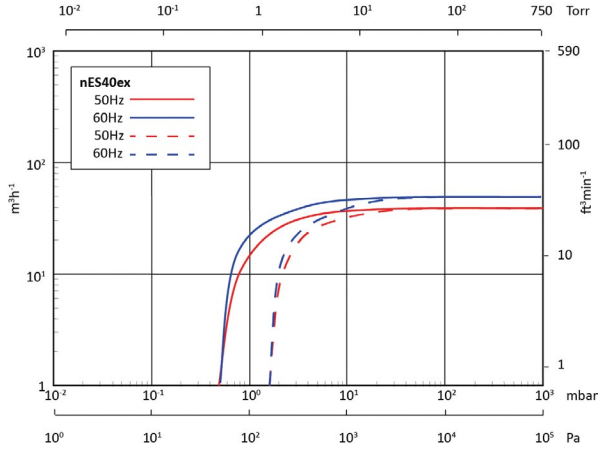
nES630ex



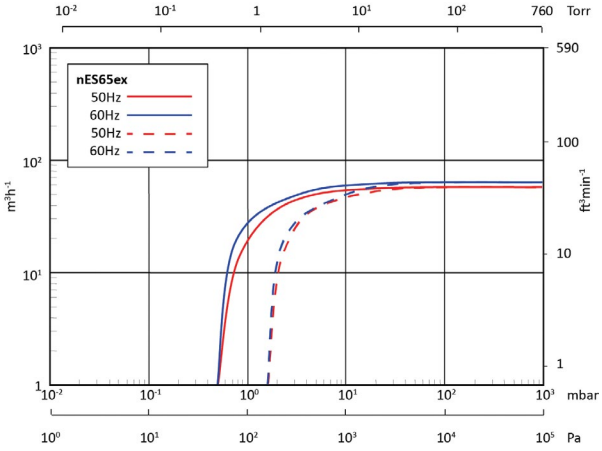


PERFORMANCE CURVES

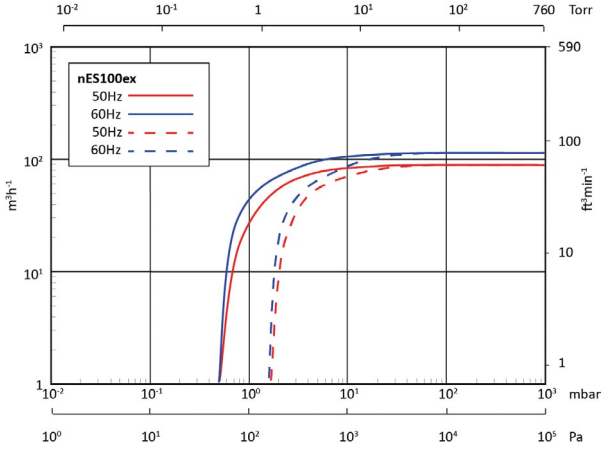
nES40ex



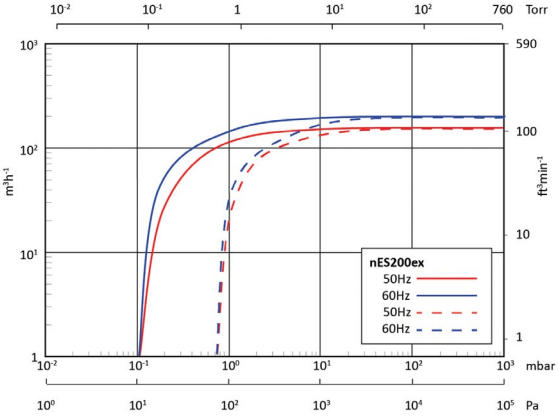
nES65ex



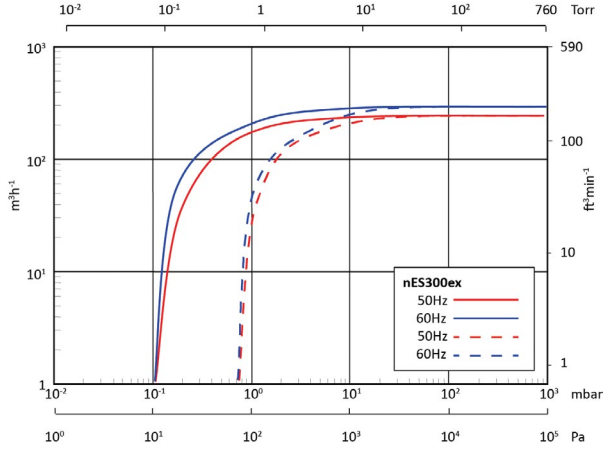
nES100ex



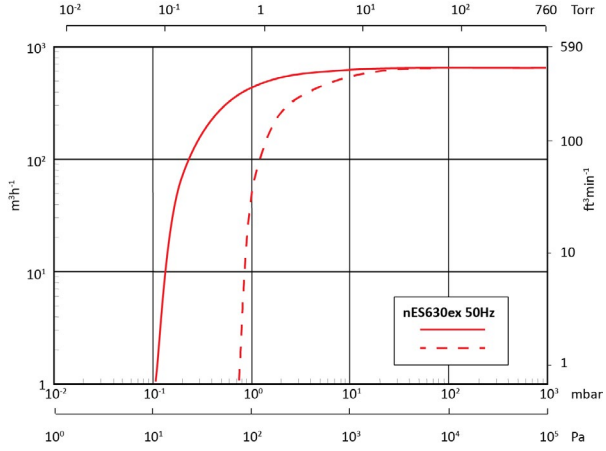
nES200ex



nES300ex



nES630ex



Without gas ballast

With gas ballast

SERVICE AND SUPPORT

nES single stage EX series pumps are designed with a number of features which enable both routine maintenance to be conducted with minimal specialised tooling and knowledge. Scheduled routine maintenance shall include activities deemed beneficial to the continued performance and longevity of the product. All work must be done by suitably trained ATEX personnel. Before any maintenance operations are carried out on the pump, it should be ensured that the pump and its surroundings are free from flammable atmospheres and dust deposits.

We provide the following fast and effective service solutions for nES single stage EX series pumps.

- Our field service teams carry out essential maintenance, repair and commissioning service at your site. We invest in the tools, training and inventory that enable our teams of service engineers to deliver quality service in a safe and consistent manner. We can assist site staff in performing routine maintenance or troubleshoot a specific problem.
- We also support module exchange to facilitate rapid and cost effective turnaround, and minimise disruption to installed and configured systems. We maintain comprehensive inventory of service exchange products. Every pump has been tested and is ready for immediate installation.
- Alternatively you can return the pump to Edwards STC for overhaul as required.

If you wish to conduct more complex maintenance or overhaul tasks it is necessary to be trained by fully qualified Edwards engineers and be supplied with the correct maintenance and inspection tooling.

- Dedicated spares kits containing everything required in one simple package for maintenance.
- Low cost dedicated tooling to perform removal and replacement of the critical bearing and shaft seals.

ORDERING INFORMATION

nES single stage EX series: ATEX Category 2

Compliant to ATEX Directive 2014/34/EU

Model	Motor rating	ATEX Category 2	Part Number
nES40ex	230 & 400 V +- 10 %; 50 Hz and 460 V +- 10 %; 60 Hz. Air cooled.	Ex II (internal) 2 G b IIB+H2 T3 / (external) 2 G IIC T4 (10 <Ta< 40 °C) X	A35118940
nES65ex	230 & 400 V +- 10 %; 50 Hz and 460 V +- 10 %; 60 Hz. Air cooled.	Ex II (internal) 2 G b IIB+H2 T3 / (external) 2 G IIC T4 (10 <Ta< 40 °C) X	A35318940
nES100ex	230 & 400 V +- 10 %; 50 Hz and 460 V +- 10 %; 60 Hz. Air cooled.	Ex II (internal) 2 G b IIB+H2 T3 / (external) 2 G IIC T4 (10 <Ta< 40 °C) X	A35418940
nES200ex	230 & 400 V +- 10 %; 50 Hz and 460 V +- 10 %; 60 Hz. Air cooled.	Ex II (internal) 2 G b IIB+H2 T3 / (external) 2 G IIC T4 (10 <Ta< 40 °C) X	A35518940
nES300ex	230 & 400 V +- 10 %; 50 Hz and 230 V +- 10 %; 60 Hz. Air cooled.	Ex II (internal) 2 G b IIB+H2 T3 / (external) 2 G IIC T4 (10 <Ta< 40 °C) X	A35618940
nES630ex	400 & 690 V +- 10 %; 50 Hz only. Air cooled.	Ex II (internal) 2 G b IIB+H2 T3 / (external) 3 G IIC T3 (T150 °C)(10 <Ta< 40 °C) X	A35818940

nES single stage EX series: Bare shaft

Edwards nES single stage EX series bare shaft pumps have the same pump protection features, excluding motor related components. Pumps are supplied ready for local motor fitting.

*Bare shaft IEC flange available on request.
*Bare shaft pumps are not ATEX compliant.

Bare shaft pump (Non ATEX compliant)	Motor mounting flange (NEMA)	Part Number
nES40ex - without motor	145TC	A35118986
nES65ex - without motor	145TC	A35318986
nES100ex - without motor	184TCH	A35418986
nES200ex - without motor	213TC	A35518986
nES300ex - without motor	215TC	A35618986

edwardsvacuum.com

GLOBAL CONTACTS

EMEA	
UK	+44 1444 253 000 (local rate) 08459 212223
Belgium	+32 2 300 0730
France	+33 1 4121 1256
Germany	0800 000 1456
Italy	+39 02 48 4471
Israel	+972 8 681 0633

ASIA PACIFIC	
China	+86 400 111 9618
India	+91 20 4075 2222
Japan	+81 47 458 8836
Korea	+82 31 716 7070
Singapore	+65 6546 8408
Taiwan	+886 3758 1000

AMERICAS	
USA	+1 800 848 9800
Brazil	+55 11 3952 5000

Publication Number: 3602 008 9 01
© Edwards Limited 2019. All rights reserved
Edwards and the Edwards logo are trademarks of Edwards Limited

Whilst we make every effort to ensure that we accurately describe our products and services, we give no guarantee as to the accuracy or completeness of any information provided in this brochure.

Edwards Ltd, registered in England and Wales No. 6124750, registered office: Innovation Drive, Burgess Hill, West Sussex, RH15 9TW, UK.

Part of the Atlas Copco Group

Rugged Belt Drive Vacuum Pumps | DuoSeal®

Model 1400

Models 1405 / 1402

Model 1376

Models 1397 / 1374

CE

Specifications	Two-Stage Vacuum Pumps					
Model	**1400**	**1405**	**1402**	**1376**	**1397**	**1374**
Free Air Displacement						
cfm	0.9	3.2	5.6	10.6	17.7	23
l/min.	25	90	160	300	500	650
Ult. Vac. Pressure, torr (mbar) [1,2]	1 x 10^{-4} (0.00013)	1 x 10^{-4} (0.00013)	1 x 10^{-4} (0.00013)	1 x 10^{-4} (0.00013)	1 x 10^{-4} (0.00013)	1 x 10^{-4} (0.00013)
Gas Ballast	Yes	Yes	Yes	Yes	Yes	Yes
Discharge Pressure (PSIG)	---	---	---	---	---	---
Pump RPM	580	525	525	525	400	510
Motor Horsepower (watts)	1/3 (250)	1/2 (370)	1/2 (370)	1 (750)	1 (750)	1-1/2 (1120)
Oil Capacity, qt.(liters)	0.62 (0.59)	2.25 (2.1)	2.25 (2.1)	2.5 (2.4)	1.25 (1.2)	1.25 (1.2)
Tubing Needed, I.D. in.	7/16 (11)	7/16 (11)	13/16 (21)	13/16 (21)	1-5/8 (41)	1-5/8 (41)
Intake, Nipple Thread	3/4-20	1-20	1-20	1-20	1.75-20	1.75-20
Exhaust, Thread Type	3/4-20	1-20	1-20	1-20	1.75-20	1.75-20
Weight, lbs. (kg)	58 (26)	112 (51)	112 (51)	156 (71)	205 (93)	220 (100)
Overall Dimensions LxWxH in.(cm)	17.8x9x12.6 (45.1x32.1x31.8)	20x12x15 (51x30.5x60)	20x12x15 (51x30.5x60)	20x14.1x15.4 (51x35.9x39)	26x13.7x18.8 (66x34.8x47.6)	26x13.7x18.8 (66x34.86x47.6)
Ship Weight, lbs. (kg)	70 (31.8)	132 (60)	132 (60)	180 (81.8)	213 (96.8)	215 (97.7)
Shipping Carton Dimensions LxWxH in.(cm)	20.5x13.8x14.5 (52.1x35.1x36.8)	22.5x15.5x19.5 (57.2x39.4x49.5)	22.5x15.5x19.5 (57.2x39.4x49.5)	22x18x19 (55.9x45.7x48.3)	27.3x18x22 (69.3x45.7x55.9)	27.3x18x22 (69.3x45.7x55.9)
Ordering Information [3,4]						
Wired for 115V, 60Hz, 1 Ph with N. American 115V Plug	1400B-01	1405B-01	1402B-01	1376B-01	1397B-01	1374B-01[5]
Wired for 230V, 60Hz, 1 Ph with N. American 230V Plug	1400C-01	1405C-01	1402C-01	---	---	---
Wired for 220V, 50Hz, 1 Ph w/Cont. Euro. (Schuko) Plug	1400C-02	1405C-02	1402C-02	1376C-03	1397C-03	---
Explosion Proof Motor, 115V, 60 Hz	1400W-01	1405W-01	1402W-01	---	---	---
3-Phase Motor 230V, 460V, 60Hz	---	---	1402M-01	1376M-01	1397M-01	1374M-01
Wired for 115V, 60Hz, 1 Ph with N. American 115V Plug, CSA	1400B-80	1405B-80	1402B-80	---	1397B-80	---

Applications

	page
1. Freeze Drying	17
2. Glove Box	26
3. Vacuum Manifold / Schlenk Line	11
4. Vacuum Ovens	23
5. Refrigeration Servicing	24 - 29

DuoSeal Pumps

Rugged oil-seal pumps for a wide variety of vacuum needs, including Schlenk drying lines, freeze drying, degassing, concentrations, distillations, and more. Pulley drive enables low pump rpm operation – reduces friction, oil temperature, and oil degradation. Large oil reservoir minimizes contamination effects and extends maintenance intervals. Use of a cold trap is recommended to protect the pump and enhance vacuum levels.

Refrigeration Servicing Pumps

Special Welch DuoSeal pumps are fitted with components designed to withstand refrigerant contact. Models 1402B-46 and 1397B-46 include integrated handles.

Notes:
1. Two-stage pumps should not be operated continuously at pressures above 10 torr. Ultimate pressure measured with a trapped McCleod gauge.
2. One-stage pumps should not be operated continuously at pressures above 50 torr.

Model 1399N

Model 1402B-46

Model 1376B-46

Model CRR-1A

One-Stage Vacuum Pumps w/o plate	One-Stage Vacuum Pumps w/bell jar plate	Refrigeration Servicing Pumps			CAPTURE Refrigerant Recovery
1399	**1399N**	**1402B-46**	**1376B-46**	**1397B-46**	**CRR-1A**
1.2	1.2	5.6	10.6	17.7	10.6
35	35	160	300	500	300
1.5 x 10^{-2} (0.019)	1.5 x 10^{-2} (0.019)	1 x 10^{-4} (0.00013)	1 x 10^{-4} (0.00013)	1 x 10^{-4} (0.00013)	3x10^{-2} (0.04)
No	No	Yes	Yes	Yes	---
---	---	---	---	---	30
750	750	525	525	400	525
1/3 (250)	1/3 (250)	1/2 (370)	1 (750)	1 (750)	1 (750)
0.5 (0.47)	0.5 (0.47)	2.25 (2.1)	2.5 (2.4)	1.25 (1.2)	2.5 (2.4)
7/16 (11)	7/16 (11)	13/16 (21)	13/16 (21)	1-5/8 (41)	----
3/4-20	3/4-20	1-20	1-20	1.75-20	1 NPT
3/4-20	3/4-20	1-20	1-20	1.75-20	1 NPT
51 (23)	63 (28.6)	112 (51)	156 (71)	205 (93)	122 (55.4)
17x9x10 (43.x22.9x25.42)	17x9x10 (43.x22.9x25.42)	20x12x15 (51x30.5x60)	20x14.1x15.4 (51x35.9x39)	26x13.7x18.8 (66x34.8x47.6)	19.25x12.3x11.1 (48.9x31.3x28.1)
62 (28.2)	74 (33.6)	132 (60)	180 (81.8)	213 (96.8)	136 (61.8)
20.5x13.8x14.5 (52.1x35.1x36.8)	20.5x13.8x14.5 (52.1x35.1x36.8)	22.5x15.5x19.5 (57.2x39.4x49.5)	22x18x19 (55.9x45.7x48.3)	27.3x18x22 (69.3x45.7x55.9)	22x14.8x18 (55.9x37.6x45.7)
1399B-01	1399N-01	1402B-46	1376B-46	1397B-46	CRR-1A
---	---	---	---	---	----
1399C-02	---	1402C-46	1376C-46	1397C-46	CRR-1B
---	---	---	---	---	----
---	---	---	---	---	----
---	1399B-80	---	---	---	---

3. All 115V and 230V single phase motors include thermal overload protection.
4. Models 1400C-02, 1405C-02 and 1402C-02 provided with CE marking.
5. Conduit wiring installation required. No cord, plug or switch provided.
6. CSA approved models are 1400B-80, 1405B-80 and 1402B-80.

DuoSeal™ Vacuum Pump Oil

Tested to high vacuum levels, this oil meets rigid requirements for vapor pressure, stability and viscosity.

Size	CAT. No.
Quart	1407K-11
Gallon	1407K-15
5 Gallon	1407K-20

Exhaust Filter

A replaceable filter element captures oil mist from the exhaust port of the pump and reduces pump noise.

Pump	CAT. No.
1399, 1400	1417
1376, 1402, 1405	1417P-10
1397, 1374	1417P-20

For a Complete System

Component	page
• Traps	69
• Inlet / Exhaust Accessoies	69 - 71
• Fittings / Hose	66 - 68
• Gauges	76 - 77
• Regulators / Controllers	75 - 76
• Service Kits	81
• Oil	72 - 73

Apply deep vacuum to your system in the toughest conditions. ChemStar® pumps are built to withstand corrosive chemical vapor environments - durable performance over the long haul. ChemStar® is designed to minimize the effects of harmful chemicals:

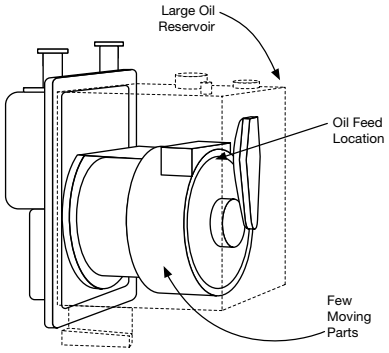
Rugged Rotary Vane Design
Built to the renowned performance standards of Welch DuoSeal® pumps, ChemStar® utilizes vapor contact components that are tough and chemical resistant. The belt-drive mechanism gears the pump down, enabling slow pump operation to reduce friction and keep operating temperatures low.

Lubrication System
The oil capacity is large for excellent dilution of contaminants. Oil is fed to the pump from the top of the reservoir, allowing sludge to settle without compromising lubrication. The recommended lubricant ("Gold Oil") is a synthetic oil designed to reduce chemically active sites. Use the nitrogen purge to drive elimination of corrosive gases.

Key Accessories
Welch also provides the system add-ons that further protect your pump and your environment. Select the equipment that augments your vacuum system needs – traps, oil mist eliminators, and system components.

The Five Defining Features Needed For Pumping Corrosive Gases

1. **High Contamination Tolerance**
   - Contaminants diluted
   - Fewer moving parts
   - Top oil feed for cleaner oil



2. **Vital Parts Corrosion Resistant**
   - Fluoroelastomer seals and gaskets
   - PTFE
   - Stainless Steel
   - Nickel Plated or Anodized
   - Chemical Resistant Grade of Cast Iron
3. **Reduced Frictional Wear**
   - Less than 580 RPM vs. typical 1750 RPM direct drive
4. **Nitrogen Purge Standard**
   - Degasses and cools oil
5. **Easy Attachment of Accessories**
   - Complete accessory package for corrosive gases

- HCl
- O_3
- H_2SO_4
- HBr
- HOAc
- SO_x
- Br_2
- F_3CCO_2H
- H_2S
- Cl_2
- CH_2O
- HNO_3
- SF_6, CF_4 fragments and other gases

Model 1402N

Specifications & Ordering - See Below

Specifications

Model	1400N	1402N	1376N
Free Air Displacement			
cfm (l/min.)@60 Hz	0.9	5.6	10.6
m^3/hr (l/min.)@50 Hz	25	160	300
Ultimate Pressure, torr(mbar)[1]	1 x10^{-4} (0.00013)	1 x 10^{-4} (0.00013)	1 x 10^{-4} (0.00013)
Gas Ballast	Yes	Yes	Yes
Pump RPM	580	525	525
Motor Horsepower (watts)	1/3 (250)	1/2 (370)	1 (750)
Oil Capacity, qt.(liters)	0.62 (0.59)	2.25 (2.1)	2.5 (2.37)
Tubing Needed, I.D. in.	7/16 (11)	13/16 (21)	13/16 (21)
ISO Exhaust & Intake Flange [5]	NW 16	NW 25	NW 25
Overall Dimensions LxWxH in.(cm)	17.8x9x12.6 (45.2x22.9x32)	19.3x14.1x15.4 (49x35.3x39.1)	19.3x12.3x15.6 (49x31.2x39.6)
Weight, lbs.(kg)	58(26)	112(51)	156(71)
Ship Weight, lbs.(kg)	71(32.3)	133(60.5)	181(82.3)
Shipping Carton Dimensions LxWxH in.(cm)	20.5x13.8x14.5 (52.1x35.1x36.8)	22.5x15.5x19.5 (57.2x39.4x49.5)	22x18x19 (59.5x45x48)
Ordering Information [2, 4]			
Wired for 115V, 60Hz, 1 Ph w/N. American 115V Plug	1400N-01	1402N-01	1376N-01
Explosion Proof Motor 115V, 60Hz, 1 Ph	1400N-90[3]	1402N-90[3]	---
Wired for 230V, 60Hz, 1 Ph w/ N. American Plug	---	1402N-60	1376N-60
Wired for 220V, 50Hz, 1 Ph w/ Cont. Euro. (Schuko) Plug	1400N-50[6]	1402N-50[6]	1376N-49
Wired for 100V, 50/60Hz, 1 Ph for Japan	1400N-53	1402N-53	1376N-53

Notes:
1. ChemStar pump should not be operated continuously at pressures above 10 torr. Ultimate pressure measured with a trapped McCleod gauge.
2. All single phase motors have overload protection.
3. Conduit wiring installation required. No cord, plug or switch provided.
4. Hinged clamp, centering ring assembly and hose adapter are included with all ChemStar Pumps.
5. Standard filter option possible if the exhaust flange is removed, but not chemically resistant.
6. Units supplied with CE marking.