



# APPLIED VACUUM TECHNOLOGY

## Vacuum Pumps and Systems



## General information

Gardner Denver Thomas GmbH is a global business unit of Gardner Denver Inc., dedicated to providing value-added Laboratory and Life Science products. We proudly offer environmentally responsible Welch vacuum products for use by the scientific community and for innovative vacuum system integration in light industrial applications.

Welch products are manufactured in Ilmenau, Germany - the heart of a region renowned for technical innovation - and at our Niles site, just outside of Chicago. We bring a passion for precision to the manufacture of every Welch pump, system, and component. With the latest in CAD design, CNC tooling stations, and advanced LEAN manufacturing practices, Welch stands at the forefront of progressive vacuum design and high quality vacuum product manufacturing.

## Sales and Technical Support

We look forward to working with you to make vacuum a utility perfectly matched to your need. For local sales and technical, please contact our sales and support team at the appropriate global location on the back cover.

## Service

Welch Service: comprehensive and customer-oriented

We have service and support centers, as well as qualified sales, service and support agents worldwide to ensure the best possible customer service experience. When you need after-sales support, service or repair please visit [www.ilmvac.com](http://www.ilmvac.com) for an appropriate contact in your area. See page 43 for further details on service, repair and warranty returns.

## A Complete Solution

With Welch brand products we can offer a wide range of vacuum pump technologies to provide the specific requirements for your application. Selecting the correct technology and a suitable pump size (flow rate) ensures cost effectiveness and minimal maintenance.













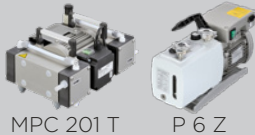


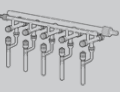



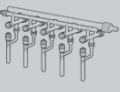



We can provide a solution tailored to your needs, with the combination of a pump, connection kit and other accessories. Our connection kits have been specially designed to include all required parts to connect your pump to your application.

We stock a wide range of KF, ISO-K and CF flange components including clamps, centring rings, adapter flanges and flexible steel tubes. We can also supply a range of vacuum valves with manual, electronic and pneumatic operation.

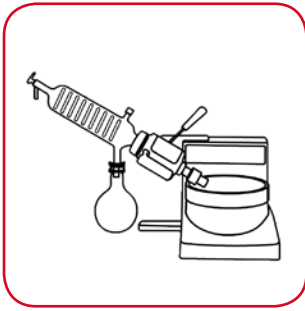
# Table of Contents

<p><b>1</b></p> <p><b>Application Overview</b> 4</p> <ul style="list-style-type: none"> <li>• Selection chart for common lab applications</li> <li>• Rotary Evaporation</li> <li>• Filtration / SPE</li> <li>• Aspiration</li> <li>• Freeze Drying</li> <li>• Schlenkline / Highlight ChemStar Dry</li> <li>• Vacuum oven</li> <li>• Glove Box</li> <li>• Gel Dryer</li> <li>• Desiccation</li> <li>• Vacuum Network</li> <li>• Configurations netvac</li> </ul>	<p><b>4</b></p> <p><b>Laboratory Vacuum Systems (LVS)</b> 27</p> <ul style="list-style-type: none"> <li>• Model options</li> <li>• Highlight LVS 105 T - 10 ef</li> <li>• Overview of Systems</li> <li>• Technical Data</li> <li>• Accessories &amp; Configurations</li> </ul>
<p><b>2</b></p> <p><b>OEM Products</b> 17</p>	<p><b>5</b></p> <p><b>Oil-Sealed Rotary Vane Pumps</b> 33</p> <ul style="list-style-type: none"> <li>• Fully accessorized Packages</li> <li>• Connection Kits</li> <li>• Chemvac</li> <li>• RVP-Trolley</li> <li>• Technical Data</li> <li>• Intake Pressure / Pumping Speed - Diagrams</li> <li>• Accessories</li> <li>• Oil</li> </ul>
<p><b>3</b></p> <p><b>Dry, oilfree Diaphragm Pumps</b> 18</p> <ul style="list-style-type: none"> <li>• Highlight NEW MPC 302 Z</li> <li>• Technical Data             <ul style="list-style-type: none"> <li>• Chemical Duty Diaphragm Pumps</li> <li>• Standard Duty Diaphragm Pumps</li> </ul> </li> <li>• Intake Pressure / Pumping Speed - Diagrams</li> <li>• Accessories</li> <li>• Connection Kits</li> </ul>	<p><b>6</b></p> <p><b>Additional Information</b> 42</p> <ul style="list-style-type: none"> <li>• Common Solvents</li> <li>• Repair/Warranty guideline</li> <li>• Index             <ul style="list-style-type: none"> <li>• Alphabetical</li> <li>• by CAT.No.</li> </ul> </li> <li>• Worldwide Sales &amp; Service Offices</li> </ul>

## Selection chart for common lab applications

Application	Overview of system	Flow rate/X Vacuum	Model
General vacuum work	Dry running pump, compact and portable	38 l/min 8 mbar	 MPC 301 Z 412722
Vacuum/pressure filtration Glass filtration assemblies SPE 	Filtration pump with dial gauge, regulator and separator	15 l/min 100 mbar	 MPC 090 E 412021
Degassing, Desiccation 	Dry piston pump with vacuum/pressure gauge, regulator, silencer and trap	18 l/min 133 mbar	 WOB-L 2522 2522C-02
Rotary Evaporation Non-Volatiles Boiling point 40 °C Samples 0-5 litres 	Economic PTFE dry pump with vacuum regulation	43 l/min < 5 mbar	 MPC 302 Z 414722
Rotary Evaporation Non-Volatiles Boiling point 40 °C Sample 0-1 litres 	Vacuum system with ecoflex speed control and built-in solvent library	20 l/min 2 mbar	 LVS 105 T - 10 ef 114184
Vacuum oven Drying Degassing 	For aqueous, acidic or basic samples	75 l/min 2 mbar	 MPC 601 T 412743
Vacuum Concentrator 	Minimum maintenance	36 l/min 2 mbar	 MPC 201 T P 6 Z 412543 322003
	With cold trap	77 l/min 2x10 <sup>-3</sup> mbar	
Freeze dryer Lyophilizing 	Combination pump system Completely mounted with oil mist separator and solvent trap	97 l/min 2x10 <sup>-3</sup> mbar	 Chemvac P 6 Z - 101 109030
Vacuum manifold Schlenkline 	Compact, oil free vacuum pump No trapping required	150 l/min 7x10 <sup>-2</sup> mbar	 ChemStar Dry 2070C-02
Aspiration 	Aspiration and filtration system with autoclavable container and handheld pipettor set	15 l/min 100 mbar	 Biovac 106 + Handvac, Biovac 106 41 PP-Bottle 112037, 112037-04
Molecular Distillation/ Sublimation 	For high vacuum and UHV applications	50 l/s 2x10 <sup>-7</sup> mbar	 CDK 180 101240
Vacuum controller		Measuring range 1050 - 1 mbar	 VCB 521 600053
Vacuum gauge	Multi range vacuum gauge with chemical resistant sensor	Measuring range 1050 - 10 <sup>-3</sup> mbar	 PIZA 111 cr-gold 600074

# Rotary Evaporation



ROdist professional package with LVS 105 T - 10 ef | 112033

## Description

Rotary evaporators are widely used in chemical laboratories as a way of evaporating solvents from a sample. A rotary evaporator needs to be partnered with a source of vacuum, with the vapour pressure of the solvent and the water bath temperature determining the vacuum level required.

A range of flask sizes can be used with a rotary evaporator and the size (flow rate) of the vacuum pump should be chosen based on the flask volume being used.

## Application note

Ensure the correct vacuum level and flow rate for your pump based on the solvents being and flask size being used. Use our model selector for guidance.

Use a vacuum regulator to stop your sample from foaming and bumping.

## Recommended Products

Welch produce a wide range of vacuum pumps and vacuum pump systems for use with rotary evaporators. With ultimate vacuum levels from 75 mbar to 1 mbar, flow rates up to 138 l/min and a variety of vacuum regulation options there's a pump for all applications.

Pumps can be regulated for better control. Regulation is available as manual and digital controller options. Some products come with vacuum regulators as standard.

- MPC chemical duty diaphragm pumps for an economical option. Available in a wide range of sizes and accessories available for vacuum regulation
- LVS systems, built on the MPC chemical duty diaphragm pump but with added glassware and options for built in regulation - manual or digital controller.
- 8890 Gem gear pump system. Designed for use with very high boiling point solvents. Includes vacuum regulator and oil mist eliminator as part part of the package.

## Model Selector | Rotary Evaporators

Boiling Point, Atmospheric Pressure	80°C		110°C		160°C		195°C	
Example Solvents	Methylene chloride Acetone Chloroform Ethanol		Trichloroethylene n-Propyl alcohol Heptane Water Toluene Acetic Acid		1,1,2,2-Tetrachloroethane DMF Pentachloroethane		DMSO Polymers	
RotoVap Flask Volume	Pump Models	System Models	Pump Models	System Models	Pump Models	System Models	Pump Models	System Models
<b>1 L</b>	↑	↑	↑	↑	↑	↑	↑	↑
<b>2 L</b>	↑	↑	MPC 101 Z	LVS 101 Z	MPC 105 T, MPC 105 T iQ-P	LVS 105 T-10 ef	↑	↑
<b>10 L</b>	↑	LVS 101 Z	↑	↑	MPC 201 T	LVS 210 T LVS 210 T ef	1400	8890C-70
<b>20 L</b>	MPC 110 E	LVS 301 Z	MPC 301 Z, MPC 302 Z	LVS 301 Z, LVS 310 Z	MPC 601 T	LVS 610 T LVS 610 T ef	1402	1402

## Rotary Evaporation



MPC 095 Z | 412422-10,  
MPC 105 T | 412443-10

### MPC 095 Z

MPC 095 Z rotary evaporator package is an economical option to partner with your rotary evaporator. The package includes the MPC 095 Z vacuum pump, DBR-P vacuum regulator with dial gauge and vacuum hose to connect the pump to your rotary evaporator.

Built from chemical duty components and with an ultimate vacuum of 5 mbar the MPC 095 Z is suitable for evaporating most common solvents. The addition of a vacuum regulator allows the vacuum level to be manually adjusted to control the evaporation rate and reduce bumping and foaming. The built in vacuum gauge allows the user to monitor the vacuum level of the evaporation process.

### MPC 105 T

MPC 105 T rotary evaporator package is designed to partner with your rotary evaporator when using non-volatile solvents. The package includes the MPC 105 T vacuum pump, DBR-P vacuum regulator with dial gauge and vacuum hose to connect the pump to your rotary evaporator. Built from chemical duty components and with an ultimate vacuum of 2 mbar the MPC 105 T is suitable for evaporating high boiling point solvents, such as DMF.

The addition of a vacuum regulator allows the vacuum level to be manually adjusted to control the evaporation rate and reduce bumping and foaming. The built in vacuum gauge allows the user to monitor the vacuum level of the evaporation process.



LVS 105 T - 10 ef | 114184



HBP 101 | 112036

### LVS 105 T - 10 ef

The LVS 105 T - 10 ef is the perfect partner for your rotary evaporator. It has been optimised for rotary evaporator application with an ultimate vacuum of 2 mbar and peak flow of 20 l/min, allowing non-volatiles such as DMF to be evaporated at 30°C. It combines a powerful built in chemical duty diaphragm vacuum pump with Ecoflex control principals. Heating of the pump heads allows a consistent clean vacuum without gas ballasting. The Ecoflex control continuously adjusts the pumping speed to match the vapour load of the process and allows the pump to exhibit single point control which reduces bumping and foaming whilst achieving increased evaporation rates.

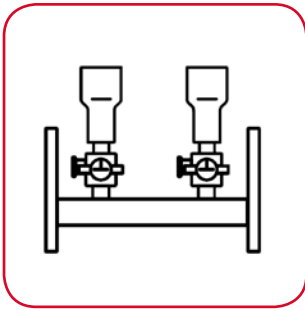
The built in digital vacuum controller allows easy adjustment of the desired vacuum level as well as the option to select common solvents from the built in solvent library.

An inlet trap protects the pump from ingesting liquids and particles and an exhaust vapour condenser for optimal solvent recovery.

### HBP 101

Hold Back Pumps create a fully-automatic distillation process without attention to fraction quantities, manual adjustment, or continuous regulation. The resultant distillation is considerably better and more economically sound than using a diaphragm pump system with a solenoid valve. Based on the rugged chemical resistant Welch MPC 301 Z, the Hold Back Pump utilises solvent flow to automatically regulate the diaphragm pump vacuum level. This means that the Hold Back Pump can be used to distil a mixture of solvents without knowledge of its composition.

## Filtration / SPE



MPC 090 E | 412021 + Filtration Flask

### Description

Vacuum and pressure filtration is widely used for sample preparation in chemistry, life science, environmental analysis and pharmaceutical QC. Filtration rates are greatly enhanced by creating a differential pressure across the filter unit by applying either vacuum or pressure. The ultimate differential pressure requirements are generally low. When filtering at 100 mbar, 90% of atmospheric pressure is available to assist the filtration. Improving the vacuum level to 50 mbar (95% vacuum) has little appreciable effect on the differential pressure.

Solid phase extraction (SPE) is a sample preparation technique which is growing in popularity. SPE gives better yields than traditional liquid to liquid methods and the wide range of available stationary phase forms allow for rapid processing and automation.

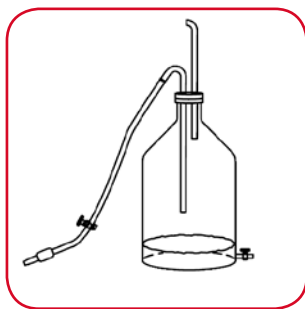
### Recommended Products

Diaphragm or WOB-L piston pumps are generally used for filtration applications as excessive vacuum (e. g. from a rotary vane pump) causes boiling of the liquid being filtered, which is undesirable. For most filtration applications a modest vacuum of 75 to 150 mbar absolute, or a positive pressure of 2 to 6 bar is required, with free air displacement of 10 to 60 l/min depending on the filter size, leak rate, condition of the filter cake and whether a filtration manifold is being used to operate multiple filters simultaneously. For filtration of aqueous solutions a WOB-L piston pump or standard duty diaphragm pump can be used. For filtration of acidic and basic solutions or organic solvents use a chemical duty MPC diaphragm pump. For SPE the requirement is similar to vacuum filtration, with a chemical duty diaphragm pump necessary. Pumps with regulator valves can be used when the filtration rate needs to be controlled or to stop evaporation of particularly volatile liquids.

### Model Selector | Filtration

Filtration Solvent / Media	Chemical Examples	Vacuum Regulation	Number of Filters	Model
Aqueous Vapors	Suspended solids samples Food slurry analysis	Yes	1-2	WOB-L 2522
		Yes	1-4	WOB-L 2534
		Yes	1-6	WOB-L 2546
		Yes	6 funnel manifold	WOB-L 2567
Mild Chemical Vapors	Weak acid /base solutions	Yes	1	MPC 090 E
	Field environmental Samples	Yes	1	MPC 090 E with auto adapter
Low-volume Organic Vapors	Alcohol Solutions Solid Phase Extractions	No	1	2019 C-20 MPC 090 E
Strong Chemical Vapors	Chlorinated solvents Strong acid /base solutions Ketones	Yes	1-2	MPC 301 E
		Yes	1-6	MPC 601 E
		Yes	6 funnel manifold	MPC 602 E

## Aspiration



handvac | 112580

### Description

Aspirators are used for the aspiration and disposal of liquids in biochemistry, microbiology and cell culture applications. The pump creates a vacuum in the collection receiver which allows liquids to be sucked into it due to the pressure differential. The liquid is collected in the receiver and can be disposed of when full.

### Application note

The most common reason for vacuum pump failure in aspiration applications is the ingestion of liquid into the pump mechanism. Welch Aspiration Stations integrate features that protect your pump and your application. Routinely empty the collection receiver to ensure continuous aspiration.

### Recommended Products

The Welch range includes aspiration stations with standard duty pumps for aqueous solutions including buffers and with chemical duty pumps for acidic, basic and organic solutions. All models come with autoclavable collection receiver, automatic flow stop and in-line hydrophobic filter.

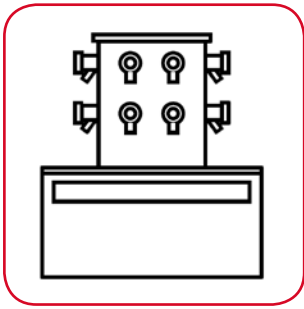
- biovac 106 for precise aspiration of chemical, biological and medical liquids. Includes HandVac pipettor as standard. Available with 2 litre glass or 4 litre PP collection receiver.
- 2511 for economical aspiration of aqueous liquids. Compact and portable with a 1.2 litre PP collection receiver.
- 2515 for high flow aqueous applications such as cell culture aspiration or use of multiple pipettors. Compact and portable with a 1.2 litre PP collection receiver.
- fluivac 105 for aspirating large volumes of chemical, biological and medical liquids. Includes a 5 litre glass collection receiver. Mounted on a trolley for portability.



biovac 106 | 112037



## Freeze Drying



### Description

Freeze drying, or lyophilisation, is the process of freezing a material and then sublimating any frozen liquid from a solid directly to a gas. Freeze drying is commonly used as a method of preservation in food and pharmaceutical industries. It allows products to be easily stored and transported without having to be constantly refrigerated.

### Application Note

Ensure that your vacuum pump is sized correctly for your freeze dryer. If the flow rate of the pump is too high then the vapour is pulled through the condenser too quickly which reduces the condensing efficiency.

Clean the freeze dryer's condenser after each run to prevent sublimation of frozen chemicals into the vacuum pump.

### Recommended Products

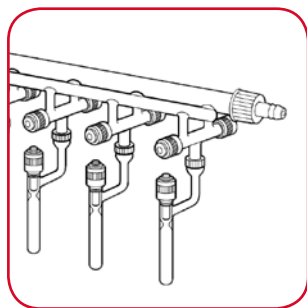
For freeze drying (lyophilisation) applications a high vacuum levels is required, typically between  $10^{-1}$  and  $10^{-3}$  mbar. There are different pump types can be employed; oil-sealed rotary vane pumps, Chemvac combination pumps, dry scroll pumps and specialist pump systems.

- Rotary vane pump for standard freeze drying applications.
- Chemvac combination pumps for freeze drying with high organic vapour or acidic vapour loads (e.g. TFA). A chemical duty diaphragm pump is used to degas the pump oil and keep the pump clean.
- Scrollvac scroll pumps for an oil-free solution when vacuum to  $10^{-1}$  mbar is required.
- ChemStar Dry for oil free chemical resistant solution with self cleaning programme. Peak flow rate in the range of 0.1 - 10 mbar.

### Model Selector | Pump Selection - Application Chart

Application		P 4 Z	P 6 Z / P 6 Z-101	P 8 Z	P 12 Z / P 12 Z-301	S 10	S 15	ChemStar Dry
Freeze dryer								
Ice holding capacity	up to 2 kg	X						
	up to 4.5 kg		X					
	up to 6 kg			X				X
	up to 8 kg				X	X		
	up to 12 kg				X		X	
	up to 24 kg							

## Schlenkline / Highlight ChemStar Dry



### Description

Schlenk lines, also known as vacuum manifolds, are a widely used piece of apparatus in many chemistry laboratories. They are commonly used for the final drying stage of samples from rotary evaporators. The vacuum pump is used to remove any solvents or acids which are remaining after the distillation process.

### Application note

It is generally not necessary to have a pump with a high flow rate for Schlenk Line applications. The flow rate of the application is restricted by the size of the manifold and stopcock. Using a pump which is too large can cause vapours to flow through the cold trap too quickly and not have time to condense. This contaminates the pump and will shorten pump life.

### Highlight - ChemStar Dry

The revolutionary new Welch ChemStar Dry vacuum system integrates a proprietary vacuum blower with patented PTFE diaphragm technology. ChemStar Dry pulls a deep vacuum without the risk of oil vapour contamination. The proprietary protective coatings mean that no trapping is required saving the cost, space and maintenance of a cold trap. A self-cleaning programme purges the pump system on shut down to remove residues and therefore extend the life of the pump.

### Recommended Products

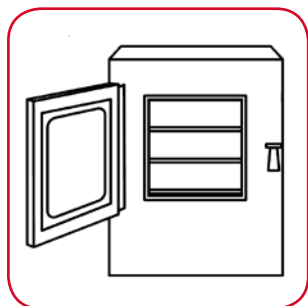
The traditional pump for Schlenk line applications is an oil sealed rotary vane pump due to their deep vacuum performance. A cold trap should be used to trap solvents before they enter the pump. A Chemvac combination pump can be used to achieve longer oil service intervals. New ChemStar Dry is a dry chemical resistant alternative.

- Rotary vane pump. Packages available with all required components.
- Chemvac corrosion optimised combination system for extended oil service intervals. Enjoy the same benefits as a rotary vane pump, but with longer life due to a chemical duty diaphragm pump distilling the pump oil.
- ChemStar Dry for oil free chemical resistant solution with self-cleaning programme and no cold trap required.



ChemStar Dry | 2070C-02

## Vacuum oven



### Description

Vacuum ovens are used for drying sensitive substances, which may be damaged by excess heat, and where extremely low residual moisture levels are demanded. Depending on the solvents used and the temperature limitations of the samples and chamber, a medium to high ultimate vacuum is generally required from the pump. The potentially large quantities of vapour generated from the chamber also mean that the pump should handle vapours well; these may be aqueous, basic or acidic. Piston and diaphragm pumps are most suitable, with PTFE constructed diaphragm pumps being employed where chemical resistance is most important. High flow rates may also be needed where vapour volumes are large.

### Recommended Products

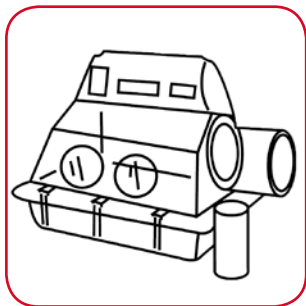
For most vacuum oven applications a dry pump can be used and this could be either a WOB-L piston pump for a diaphragm pump. When low volatility solvents are being removed at low temperatures then an oil-sealed rotary vane pump is required.

- WOB-L piston pumps for fast drying of aqueous samples. These oil free two stage pumps have a high flow rate, can create a deep vacuum below 10 mbar and come with an inlet trap, vacuum regulator and dial vacuum gauge as standard.
- MPC diaphragm pumps for chemical duty drying applications. With PTFE components these pumps are ideal when organic solvents are being removed from samples.
- LVS diaphragm pump systems for extra protection for your MPC pump and air quality with inlet separator and exhaust condenser. If vacuum level control is required then an LVS system is ideal.
- Rotary vane pumps for fast drying of low volatility solvents. One stage or two stage pumps depending on vacuum level requirement. Use AKS inlet separator to protect pump from ingestion of liquids or particles.

### Model Selector | Vacuum Ovens

Oven Volume	Oil-Free Vacuum 2 to 10 mbar		Oil-Seal Deep Vacuum 0.1 mbar to 10 <sup>-3</sup> mbar	
	Aqueous Vapours	Chemical Vapours	Single stage direct drive	Two stage direct drive
Up to 20 litres	2561C-50	MPC 301 Z	P 4 E	P 4 Z
Up to 50 litres	2561C-50	MPC 302 Z	P 4 E	P 4 Z
Up to 120 litres	2581C-50	MPC 602 T	P 6 E	P 6 Z
Up to 250 litres	2581C-50	S 15	P 8 E	P 8 Z

## Glove Box



### Description

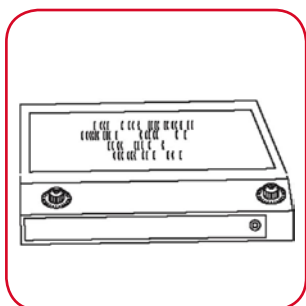
Glove boxes are used to house a controlled environment either for isolation of sensitive substances or to protect users from hazardous substances. They have built in gloves to allow users to manipulate the substances inside of the glove box. A vacuum pump is used to remove ambient air from the glove box and then it can be backfilled with an inert gas, such as Argon. This process can be repeated to achieve a lower oxygen concentration. Transfer chambers also need to be evacuated to ensure that the external atmosphere does not enter the glove box.

### Recommended Products

Standard glove boxes and transfer chambers are not normally evacuated much below 20 mbar due to plastic material limitations. Both acrylic and polycarbonate which are used in standard glove boxes are not suited for deep vacuum. High end glove boxes capable of deeper vacuum normally are constructed of stainless steel & heavy glass plates. These can generally be evacuated below 1 mbar.

- 2 stage oil free WOB-L piston pumps for vacuum down to 7 mbar. Suitable for aqueous vapours only.
- Scroll pumps for when a deeper oil free vacuum is required.
- 2 stage rotary vane pumps for when a deep vacuum is required. With a high pumping speed these pumps are suitable for larger glove boxes also. An anti suck back valve ensures that there is no back flow of oil into the glove box.

## Gel Dryer



### Description

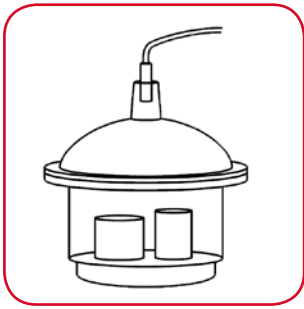
Vacuum drying of gels is a common preparation technique for gel electrophoresis applications. The gel is heated on a gel dryer and vacuum is applied to improve the drying. A medium vacuum level is required for gel drying.

### Recommended Products

There are two options of vacuum pump technology when it comes to gel drying; LVS diaphragm pump system or Gelmaster™ system.

- LVS 300 Z with a powerful chemical duty MPC 301 Z base diaphragm pump and inlet and exhaust separators to trap liquids and particles.
- The revolutionary Gelmaster™ gel dryer vacuum systems unique design uses a patented room temperature vapour trap with a built-in dry vacuum pump. Condensate is collected in liquid form and doesn't have an effect on performance, so the tenth drying run is as fast as the first. When the collector reaches capacity, simply drain the contents and begin again.

# Desiccation



MP 065 E | 411011

## Description

Vacuum desiccators are used frequently in laboratories for the removal of moisture in a sample, maintenance of a dust and moisture-free environment, vacuum testing, defoaming and storing samples under various atmospheres. Some substances oxidise when exposed to air. To reduce the reaction rate the substances can be kept under vacuum in a desiccator.

## Recommended Products

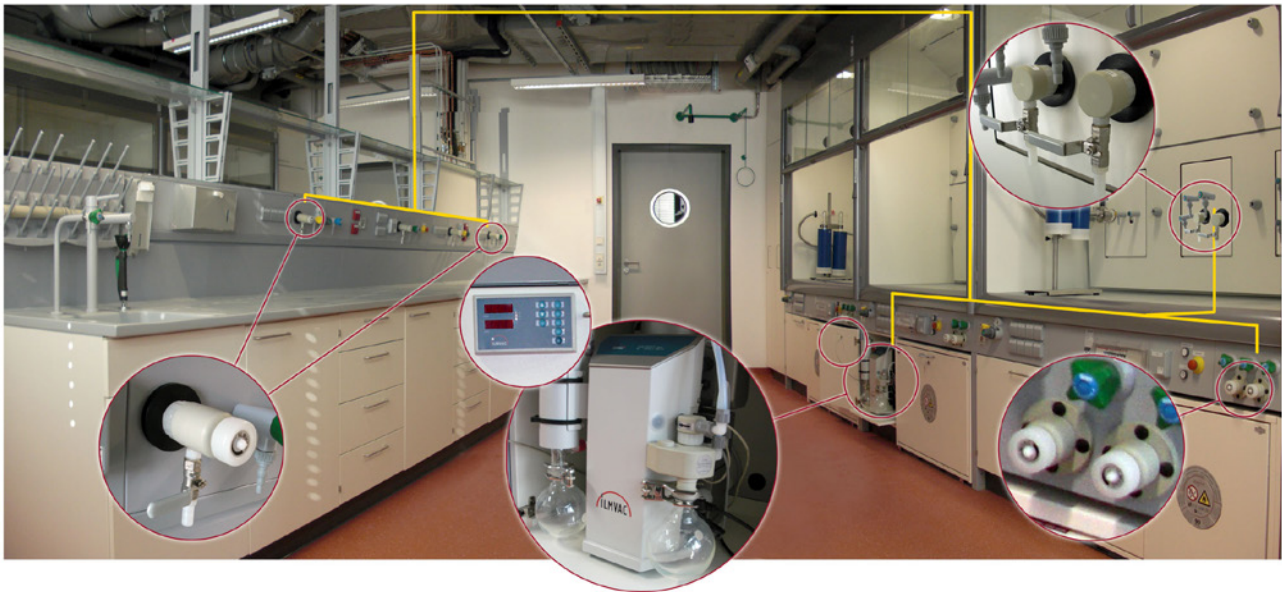
A WOB-L piston pump or diaphragm pump is the best option for use with a vacuum desiccator. Both technologies are oil free so there is no chance of any oil contamination. Generally a single stage pump is required for process applications and a two stage pump is required for storage applications. The free air displacement of the pump should be matched to the size of the desiccator to ensure a satisfactory pump down time.

- Use WOB-L piston pumps for standard duty aqueous applications, with a high pumping speed for quick evacuation of your desiccator. These pumps come with a vacuum regulator and dial vacuum gauge as standard for controlled evacuation and vacuum level monitoring.
- Use chemical duty MPC diaphragm pumps when solvents are being used. These rugged diaphragm pumps use PTFE and other chemical duty materials for protection against damage from solvents. Use the optional DRB regulator with dial gauge if vacuum regulation is required.

## Model selector | Dessication

	Desiccator Type	Application	Pumping speed & vacuum	Model	CAT. No.
Aqueous vapours	Small benchtop	Process	0,7 m <sup>3</sup> /h 100mbar	MP 065 E	411011
		Storage	0,5 m <sup>3</sup> /h <5 mbar	MP 055 Z	411422
	Small cabinet (<25 litres)	Process	1,7 m <sup>3</sup> /h 93 mbar	2534C-02	2534C-02
		Storage	3,0 m <sup>3</sup> /h 6,7 mbar	2561C-50	2561C-50
	Large cabinet (>25 litres)	Process	3,0 m <sup>3</sup> /h 6,7 mbar	2561C-50	2561C-50
		Storage	3,0 m <sup>3</sup> /h 6,7 mbar	2561C-50	2561C-50
Chemical vapours	Small benchtop	Process	1,0 m <sup>3</sup> /h 100 mbar	MPC 090 E	412021
		Storage	0,9 m <sup>3</sup> /h 5 mbar	MPC 095 Z	412422-02
	Small cabinet (<25 litres)	Process	2,3 m <sup>3</sup> /h <75 mbar	MPC 301 E	412711
		Storage	2,6 m <sup>3</sup> /h <5 mbar	MPC 302 Z	414722
	Large cabinet (>25 litres)	Process	3,8 m <sup>3</sup> /h <75 mbar	MPC 601 E	412721
		Storage	2,6 m <sup>3</sup> /h <5 mbar	MPC 302 Z	414722
			2,6 m <sup>3</sup> /h <5 mbar	MPC 302 Z	414722

## Vacuum Network



### Description

Make precision vacuum readily available for all users and applications in your lab – all from a single Netvac installation. Using Welch vacuum pumps, controllers, systems and components we can custom design a robust laboratory vacuum network to provide the right performance to each of your applications.

We provide a multi-user vacuum network that is:

- Precisely controlled at your point of application
- Cabinet concealed with accessible controls
- Energy efficient and environmentally responsible
- Oil-free, chemical resistant and low maintenance

### 5 Steps to your Personal Netvac

1. How many Netvac ports are required?
2. What ultimate pressure is required? (2 mbar or 8 mbar)
3. Will the Netvac ports be mounted on the bench or fume hood?
4. Will your Netvac ports be surface-mounted (R04) or integrated (R01) into lab furniture?



- Surface mounted - common solution for installation for existing laboratory furniture or on walls.



front



back

- For integration into laboratory furniture. Vacuum hose is hidden and out of the way.

5. Do you need manual regulated or controller regulated ports?



- **Manual Regulated**  
Manual on/off, vacuum regulator and dial gauge.



+



- **Controller Regulated**  
With digital vacuum controller VCZ 521.

### Advantages

- Ideal economical solution for new lab construction or lab renovations
- Single pump system serves multiple vacuum applications
- Modular construction enables incremental port and component addition
- Operate up to 30 vacuum ports with a single system
- Tailored system to your requirements
- Chemical duty components for pumping solvent and acidic vapours
- Oil free system - no oil changes required or waste oil to dispose of

## Vacuum Network

### Description

Netvac area vacuum systems provide vacuum on demand for all the users and applications in your lab - all from a single system.

### Univac MPKC Systems

The Univac systems are available with either 4 or 6 MPC diaphragm pumps mounted on a trolley with a microprocessor control system. With ultimate vacuum options of 75 mbar, 8 mbar and 2 mbar and with peak flow rates of up to 50 m<sup>3</sup>/h the Univac systems are designed to supply vacuum to your whole lab. The built in digital controller allows the vacuum level to be controlled and only runs the quantity of pumps necessary to achieve the requirement of the users, saving energy as well as wear on the pumps. When the demand is not 100% the controller cycles the pump(s) being used to ensure even wear.

### LVS 210 T ef

The LVS 210 T ef is an excellent solution for continuous, chemical resistant and oil-free proceeding with corrosive and aggressive gases and vapours. Besides the intelligent ecoflex control system, the connected chemical duty diaphragm pump is very quiet in operation and can be reached easily for cleaning or maintenance purposes.

With an ultimate vacuum of 2 mbar and a peak flow of 36 l/min the LVS 210 T ef has been optimised for applications in chemical, biological and pharmaceutical laboratories and is suitable for use in multi user network (Netvac) systems. The Ecoflex control continuously adjusts the pumping speed to match the vapour load of the process. An inlet trap protects the pump from ingesting liquids and particles and an exhaust vapour condenser for optimal solvent recovery.

### LVS 610 T ef

The LVS 610 T ef is an excellent oil-free, chemical resistant solution for multi user network (Netvac) systems. With an ultimate vacuum of 2 mbar and a peak flow of 81 l/min the LVS 610 T ef has been optimised for applications in chemical, biological and pharmaceutical laboratories and can pump corrosive and aggressive gases and vapours. The high flow rate and deep vacuum allow it to supply vacuum to approximately 10 individual ports.

It is designed for continuous duty and comes with the ecoflex control system which continuously adjusts the pumping speed to match the vapour load of the process and allows the pump to operate unattended. An inlet trap protects the pump from ingesting liquids and particles and an exhaust vapour condenser for optimal solvent recovery.

### Recommended Products

Using Welch pumps, controllers, systems and components, we can custom design your laboratory vacuum utility to provide the right performance to each of your applications.



Univac - MPKC 2403 T | 112223



LVS 210 T ef | 115234



LVS 610 T ef | 115254

## Configurations netvac

### Description

Netvac installations can be configured in a versatile manner either as a fully integrated (LVS) system or a separate vacuum pump and digital controller. Energy saving control options can be used with both configurations to make your Netvac system good for both the environment and your budget:

- Economic (en) control only runs the pump when there is a user demand
- Ecoflex (ef) control varies the speed of the pump to maintain the desired vacuum

Selecting separate pump and controller options creates flexibility in your Netvac installation. Choose from a wide range of PTFE vacuum pumps and add a precision controller - either table top or flush mounted. Selecting an integrated Laboratory Vacuum System (LVS) provides additional standard features, such as integrated inlet trap before the pump and a liquid-cooled exhaust condenser after the pump to capture any residual vapours prior to discharge into the atmosphere.

### Model Selector | Vacuum Network














#### Netvac Pump Selection Chart

This simple guide indicates the number of vacuum ports generally served by each available vacuum source. Contact your local representative to assess your own requirements.

Vacuum Pump Model	ultimate pressure	5 ports	10 ports	20 ports	30 ports
LVS 301 Z / 310 Z / en / ef	8mbar	x			
LVS 601 T / 610 T / en / ef	2mbar		x		
Univac - MPKC 2403 T	2mbar			x	
Univac - MPKC 3603 Z	8mbar				x
Customized Solution	2 or 8 mbar	x	x	x	x

#### Netvac Port and Controller Selection Chart - Netvac Ports with Integral Check Valves

This selection chart indicates the most common Netvac ports. If you do not see what you need, please contact your Welch representative.

	Bench-Top				Fume Hood			
	Manual Regulated On/Off			Controller Regulated		Manual Regulated		
Flush Mount (R01)								
	CAT. No.	700532	700535	700538	700532	700541	700531	
		No Vac. Reg.	Man. Vac. Regulated	Man. Vac. Reg. w/Dial	Use With 600053	Use With 600052-09	Use with 700519 or 700546	
Surface Mount (R04)								
	CAT. No.	700532-03	700535-03	700538-03	600053	600052-05	700519	700546
		No Vac. Reg.	Man. Vac. Regulated	Man. Vac. Reg. W/Dial	Table Top Controller	Flush Mnt Controller	Man. Vac. Regulated	Man. Vac. Reg. On/Off



### OEM Products

#### Expertise

At Welch we have the expertise to offer a custom solution for your OEM vacuum pump requirements. Whether your requirements are similar to one of our standard catalogue pumps or if you require a completely bespoke package we have a solution to offer.

We have a range of pumps specifically designed to be built in to OEM equipment. These pumps come with 24V BLDC motors and mounting brackets for installation inside equipment. They are available in 1, 2 and 3 stage configurations, offering a vacuum level suitable for your specification.

We can offer modifications of standard pumps, such as different motor voltage, colour, inlet and exhaust connectors, removal of features (e.g. carrying handle) and addition of accessories (e.g. vacuum regulator). We can use our wide range of KF, ISO-F and CF vacuum fittings and valves to either supply a pump with additional fittings already connected ready for drop in assembly on your production line or as a package of additional parts to be supplied along with the pump.

We can fabricate custom flange components, special length flexible steel vacuum hoses and bespoke vacuum receivers in our production facilities.

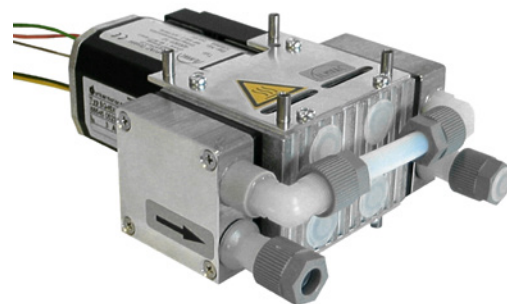
Our design, product development and production facilities have management systems certified according to ISO9001.

#### Individual Consultation

Contact your local sales and technical support team at the appropriate global location (see back cover for details) to discuss your specific requirements. We will discuss your specification requirements and the different pump options which may be suitable. We have extensive application knowledge and experience of working with OEMs.

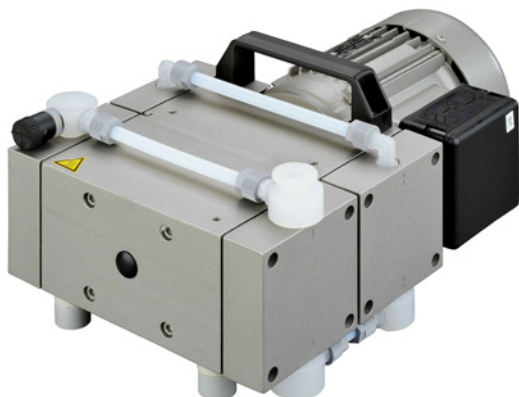


MPC 105 T | 412443-04



MP 030 Z | 420301-12

### Dry, oilfree Diaphragm Pumps



MPC 601 T | 412743

#### Advantages

- analytically pure, oil free vacuum
- user friendly
- light weight, rugged design
- designed for permanent operation
- maintenance-free drive system and proven long diaphragm life
- minimal operation vibration
- wide vacuum and flow range to match application
- superior chemical resistance (MPC models)

#### Scope of Delivery

- ON/OFF switch and internal protective thermal switch for the motor, mains cable and plug
- carry handle
- vibration isolating feet
- MP models come with and exhaust silencer
- MPC models come with a gas ballast valve

#### Range of Applications

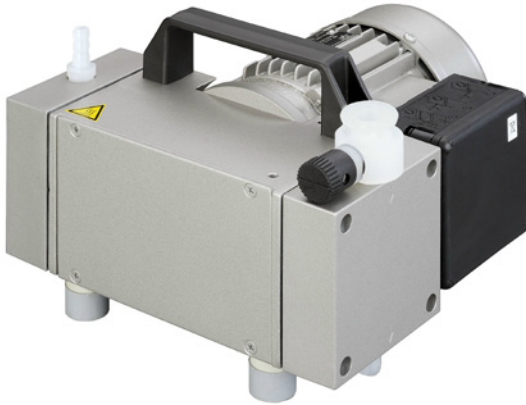
- rotary evaporators
- vacuum ovens
- degassing / desiccation
- vacuum distillation
- vacuum filtration
- solid phase extraction (SPE)
- gas sampling
- vacuum drying
- vacuum holding
- pick and place
- backing turbomolecular pumps

#### Description

Welch diaphragm pumps have been developed specifically to meet the requirement for oil-free vacuum generation. Their low weight and excellent ergonomics, make Welch diaphragm pumps the first choice for most laboratory applications. With ultimate vacuum from 75 to 1 mbar and peak flow rates up to 138 l/min there is a specific model configuration to suit almost all applications. Our proven diaphragm technology offers a double benefit to the user - out-

standing diaphragm life and market leading cost of ownership. Use MP models for standard duty applications and MPC models for chemical duty applications. The MPC models use PTFE and other fluorinated plastics for the wetted parts to allow aggressive solvent and acid vapours to be pumped. For extra harsh chemical vapours use X2 versions. Ecoflex versions with variable speed motors are also available.

## Highlight NEW MPC 302 Z



MPC 302 Z | 414722

### Advantages

- analytically pure, oil free vacuum
- user friendly
- light weight, rugged design
- designed for permanent operation
- maintenance-free drive system and proven long diaphragm life
- minimal operation vibration
- significantly improve flow and vacuum performance in the application critical range
- superior chemical resistance
- stabilised process flow
- enhanced repeatability

### Scope of Delivery

- ON/OFF switch and internal protective thermal switch for the motor, mains cable and plug
- carry handle
- vibration isolating feet
- gas ballast valve
- KF 16 inlet flange / 8mm hose nozzle

## NEW MPC 302 Z

No matter if for research and development applications or in the analysis field, the latest generation of Welch's diaphragm pumps are suitable for a wide range of laboratory applications. The new MPC 302 Z uses a patented pump head design to provide significantly improved performance, particularly in the application critical range. Optimised construction of the pump heads allows the MPC 302 Z to reach a 17% higher pumping speed in the application critical vacuum range compared

to similar products of the previous generation. Besides the pumping speed, the ultimate vacuum is improved as well to 5 mbar. These significant improvements directly influence the process flow and the repeatability. A more stable applied vacuum gives a more repeatable application and achieves more reliable results. The effectiveness and quality of chemical applications, especially distillation processes are improved.

## Accessories for MPC 302 Z

Accessoires	CAT.No.
Digital Vacuum Control Box VCB 521 cv, 1100 - 1 mbar, 90-260V, 50/60Hz with Schuko, UK and US plug leads	600053
Vacuum Regulator with Dial Gauge for MP/MPC 301 Z, 601 E, 601 T, 901 Z, 1201 E	700458
Vacuum Hose, Rubber red, 18/8x5, meter	828310-4

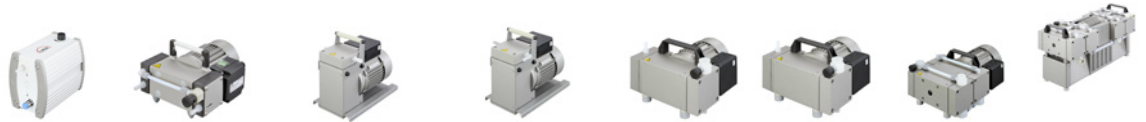
## Technical Data - Chemical Duty Diaphragm Pumps

### Premium selection Chemical Duty Diaphragm Pumps



Parameter	MPC 090 E	MPC 110 E	MPC 095 Z	MPC 155 Z	MPC 105 T	MPC 105 T IQ
Number of heads/stages	1/1	2/1	2/2	4/2	4/3	4/3
Free Air Displacement, m <sup>3</sup> /h	1,0	1,0	0,9	1,4	1,2	1,2
Free Air Displacement, l/min	16,7	16,7	15	23	20	20
Ultimate pressure, mbar	100	50	5	5	< 2	< 2
Intake connection	Hose nozzle DN 6	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8
Exhaust connection	Hose nozzle DN 6	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8
Sound level	<45	<45	<45	<45	<45	<45
Dimensions (B/T/H), mm	144/198(130) /244	235/140 /277	235/140 /277	235/145 /327	235/145 /327	235/145 /327
Weight, kg	2,7	6,15	6,15	6,5	6,5	6,5
<b>Ordering Information</b>						
90...260VAC	412021	412421-02	412422-02	412642	412443-02	412443-17

### One-Stage Direct-Driven Diaphragm Pumps, Ultimate pressure <75 mbar



Parameter	MPR 060 E-EC	MPC 201 E	MPC 301 E	MPC 302 E	MPC 601 E	MPC 602 E	MPC 1201 E	MPC 2401 E
Number of heads/stages	2/1	2/1	1/1	1/1	2/1	2/1	4/1	8/1
Free Air Displacement, m <sup>3</sup> /h	0,6	1,8/2	2,3/2,5	2,9/3,5	3,8/4,2	4,2/5,0	8,3/9,1	15,5/17,0
Free Air Displacement, l/min	10	30/33	38/41	48/58	63/70	70/83	138/151	258/283
Ultimate pressure, mbar	<60	< 75	< 75	< 40	< 75	< 30	< 75	< 75
Intake connection	Hose nozzle DN 6/8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF
Exhaust connection	Hose nozzle DN 6/8	Hose nozzle DN 8	Hose sleeve A 10 - 8 or optional (enclosed) Exhaust silencer A 10	Hose sleeve A 10 - 8 or optional (enclosed) Exhaust silencer A 10	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	DN 16 KF
Sound level	42	<44	<45	<45	<44	<44	<44	<44
Dimensions (B/T/H), mm	115/165/145	195/225/147	156/260/253	156/260/253	230/265/170	233/260/171	230/380/170	540/300/240
Weight, kg	2,3	6,5	8,9	8,9	11,2	11,2	18,3	32,8
<b>Ordering Information</b>								
90...260VAC	412121	-	-	-	-	-	-	-
230V 50/60Hz	-	412521	412711	414711	412721	414721	412741	412781
115V 50/60Hz	-	412521-01	412711-01	-	412721-01	414721-01	412741-01	412781-01
400V 50/60Hz	-	-	-	-	412721-02	414721-02	412741-02	412781-02

## Multi-Stage Direct-Driven Diaphragm Pumps



Parameter	Two-Stage Direct-Driven Diaphragm Pumps, Ultimate Pressure <8 mbar						Three-Stage Direct-Driven Diaphragm Pumps, Ultimate Pressure <2 mbar		
	MPR 030 Z-EC	MPC 101 Z	MPC 301 Z	MPC 302 Z	MPC 901 Z	MPC 1801 Z	MPC 201 T	MPC 601 T	MPC 1201 T
Number of heads/stages	2/2	2/2	2/2	2/2	4/2	8/2	4/3	4/3	8/3
Free Air Displacement, m <sup>3</sup> /h	0,35	1/1,1	2,3/2,5	2,6/3,1	6,8/7,5	12/13,3	2/2,2	4,5/4,9	8,3/9,1
Free Air Displacement, l/min	5,8	16,7/18	38/41	43/52	113/124	201/221	33/36	75/81	135/151
Ultimate pressure, mbar	<5	< 8	< 8	< 5	< 8	< 8	< 2	< 2	< 2
Intake connection	Hose nozzle DN 6/8	Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF	Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF
Exhaust connection	Hose nozzle DN 6/8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	DN 16 KF	Hose nozzle DN 8	Hose nozzle DN 8	DN 16 KF
Sound level	38	<44	<44	<44	<44	<44	<45	<44	<44
Dimensions (B/T/H), mm	115/165 /145	195/225 /147	230/265 /170	233/260 /171	230/380 /170	540/300 /240	200/260 /150	230/380 /170	540/300/240
Weight, kg	2,3	6,5	11,2	11,2	18,3	32,8	10,3	18,3	32,8
<b>Ordering Information</b>									
90...260VAC	412122	-	-	-	-	-	-	-	-
230V 50/60Hz	-	412522	412722	414722	412742	412782	412543	412743	412783
115V 50/60Hz	-	412522-01	412722-01	414722-01	412742-01	412782-01	412543-01	412743-01	412783
400V 50/60Hz	-	-	412722-02	414722-02	412742-02	412782-02	-	412743-02	412783-02

## High Chemical/Corrosion Duty Diaphragm Pumps



Parameter	MPC 301 E-X2	MPC 601 E-X2	MPC 1201 E-X2	MPC 2401 E-X2	MPC 301 Z-X2	MPC 901 Z-X2	MPC 1801 Z-X2	MPC 601 T-X2	MPC 1201 T-X2
Number of heads/stages	1/1	2/1	4/1	8/1	2/2	4/2	8/2	4/3	8/3
Free Air Displacement, m <sup>3</sup> /h	2,3/2,5	3,8/4,2	8,3/9,1	15,5/17,0	2,3/2,5	6,8/7,5	12/13,3	4,5/4,9	8,3/9,1
Free Air Displacement, l/min	38/41	63/70	138/151	258/283	38/41	113/124	201/221	75/81	135/151
Ultimate pressure, mbar	< 75	< 75	< 75	< 75	< 8	< 8	< 8	< 2	< 2
Intake connection	Hose nozzle DN8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF
Exhaust connection	Hose sleeve A 10 - 8 or optional (enclosed) Exhaust silencer A 10	Hose nozzle DN8	Hose nozzle DN8	DN 16 KF	Hose nozzle DN8	Hose nozzle DN8	DN 16 KF	Hose nozzle DN8	DN 16 KF
Sound level	<45	<44	<44	<44	<44	<44	<44	<44	<44
Dimensions (B/T/H), mm	156/260 /253	230/265 /170	230/380 /170	540/300 /240	230/265 /170	230/380 /170	540/300 /240	230/380 /170	540/300 /240
Weight, kg	8,9	11,2	18,3	32,8	11,2	18,3	32,8	18,3	32,8
<b>Ordering Information</b>									
230V 50/60Hz	412711-03	412721-03	412741-03	412781-03	412722-17	412742-07	412782-03	412743-03	412783-03

## Technical Data - Chemical Duty Diaphragm Pumps

### More Diaphragm Pumps



Parameter	ATEX		Ecoflex		
	MPC 301 Zp, ATEX Kat.2	MPC 601 Tp, ATEX Kat.2	MPC 301 Z ef	MPC 601 T ef	MPC 1201 T ef
Number of heads/stages	2/2	4/3	2/2	4/3	8/3
Free Air Displacement, m³/h	2,3	4,5	2,6	4,9	8,3
Free Air Displacement, l/min	38	75	43	75	138
Ultimate pressure, mbar	< 8	< 2	< 8	< 2	< 2
Intake connection	Hose nozzle DN8	DN 16 KF	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF
Exhaust connection	Hose nozzle DN 8	DN 16 KF	Hose nozzle DN 8	Hose nozzle DN 8	DN 16 KF
Sound level	<44	<44	<47	<47	<47
Dimensions (W/D/H), mm	240/300/260	240/425/272	260/310/190	260/390/170	540/262/390
Weight, kg	22,9	29,7	15,5	22,6	34,0
<b>Ordering Information</b>					
90...260VAC	-	-	-	-	-
230V 50/60Hz	-	-	412922	412943	412983
115V 50/60Hz	-	-	412922-01	412943-01	412983-03
400V 50/60Hz	4000481-04	4000511-04	-	-	-

## Technical Data - Standard Duty Diaphragm Pumps

### One-Stage Direct-Driven Diaphragm Pumps, Ultimate pressure <75 mbar



Parameter	MP 065 E	MP 065 E + Inlinefilter-Kit	MP 105 E	MP 201 E	MP 301 E	MP 601 E	MP 1201 E	MP 2401 E
Number of heads/stages	2/1	2/1	2/1	2/1	1/1	2/1	4/1	8/1
Free Air Displacement, m³/h	0,7	0,7	0,9/1,0	1,8/2	2,3/2,5	3,8/4,2	8,3/9,1	15,5/17,0
Free Air Displacement, l/min	11,6	11,6	15/16,6	30/33	38/41	63/70	138/151	258/283
Ultimate pressure, mbar	100	100	< 60	< 75	<75	< 75	< 75	< 75
Intake connection	Hose nozzle DN 6	Hose nozzle DN 6	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF
Exhaust connection	Hose nozzle DN 6, w/exhaust silencer (removable)	Hose nozzle DN 6, w/exhaust silencer (removable)	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	DN 16 KF
Sound level	<45	<45	<45	<44	<45	<44	<44	<44
Dimensions (B/T/H), mm	144/127/196	144/127/196	235/140/277	195/225/147	156/260/253	230/265/170	230/380/170	540/300/240
Weight, kg	2,3	2,3	6,25	6,5	8,9	11,2	18,3	32,8
<b>Ordering Information</b>								
90...260VAC	411011	411011-01	-	-	-	-	-	-
230V 50/60Hz	-	-	411421	411521	411711	411721	411741	411781
115V 50/60Hz	-	-	411421	411521-01	411711-01	411721-01	411741-01	411781-01
400V 50/60Hz	-	-	-	-	-	411721-02	411741-02	411781-02

# Technical Data - Standard Duty Diaphragm Pumps by Gardner Denver

## Two-Stage Direct-Driven Diaphragm Pumps, Ultimate Pressure <8 mbar



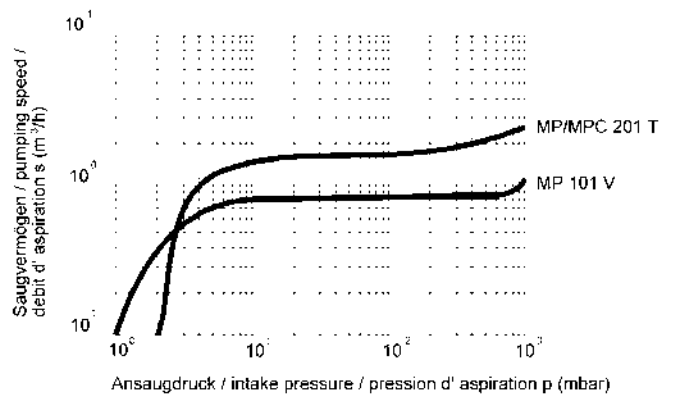
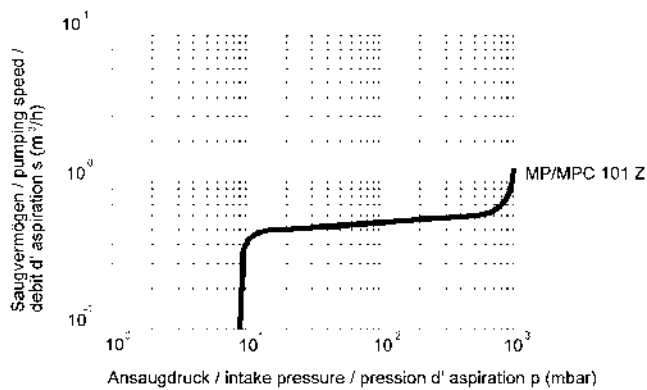
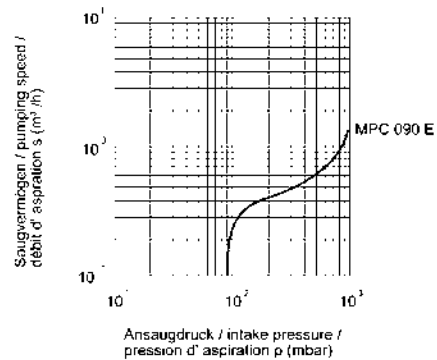
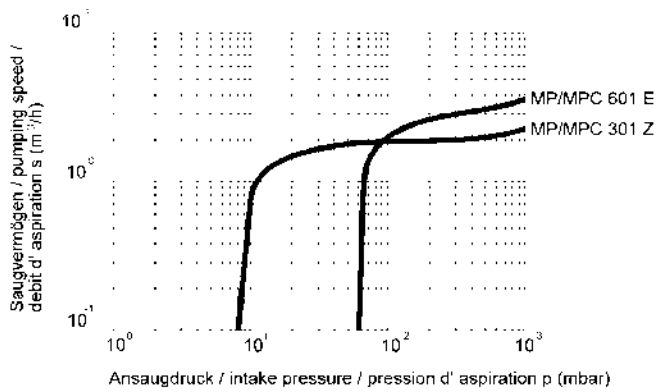
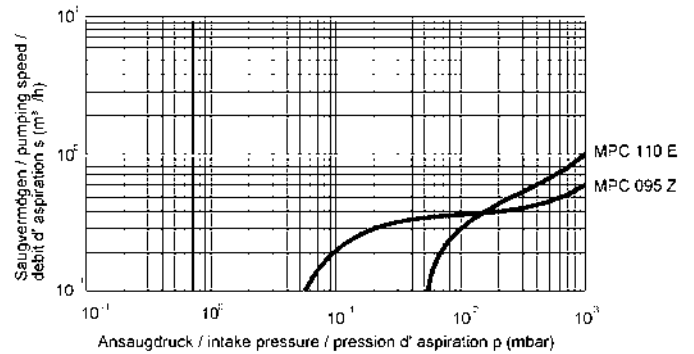
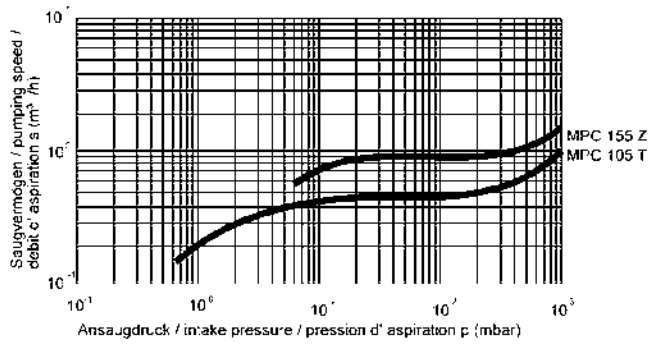
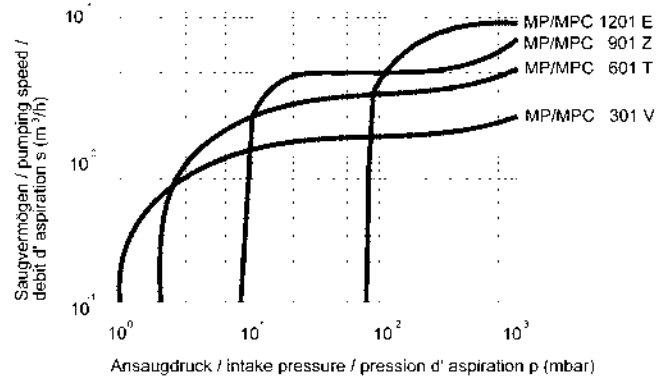
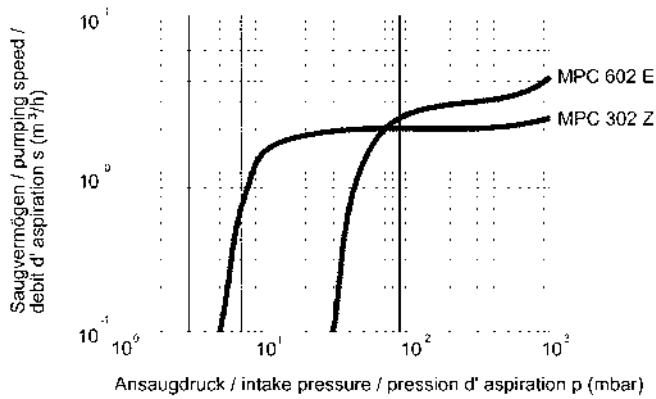
Parameter	MP 030 Z-EC	MP 055 Z	MP 101 Z	MP 301 Z	MP 901 Z	MP 1801 Z
Number of heads/stages	2/2	2/2	2/2	2/2	4/2	8/2
Free Air Displacement, m <sup>3</sup> /h	0,35	0,5/0,55	1/1,1	2,3/2,5	6,8/7,5	12/13,3
Free Air Displacement, l/min	5,8	8/9,1	16,7/18	38/41	113/124	201/221
Ultimate pressure, mbar	< 5	< 5	< 8	< 8	< 8	< 8
Intake connection	Hose nozzle DN6/8	Hose nozzle DN 8	Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF
Exhaust connection	Hose nozzle DN6/8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	Hose nozzle DN 8	DN 16 KF
Sound level	38	<45	<44	<44	<44	<44
Dimensions (B/T/H), mm	115/165 /145	235/140 /277	195/225 /147	230/265 /170	230/410 /170	540/300 /240
Weight, kg	2,3	6,25	6,5	11,2	18,3	32,8
<b>Ordering Information</b>						
90...260VAC	411122	-	-	-	-	-
230V 50/60Hz	-	411422	411522	411722	411742	411782
115V 50/60Hz	-	411422	411522-01	411722-01	411742-01	411782-01
400V 50/60Hz	-	-	-	411722-02	411742-02	411782-02

## more Multi-Stage Direct-Driven Diaphragm Pumps



Parameter	Three-Stage Direct-Driven Diaphragm Pumps, Ultimate Pressure <2 mbar			Four-Stage Direct-Driven Diaphragm Pumps, Ultimate Pressure <1 mbar	
	MP 201 T	MP 601 T	MP 1201 T	MP 101 V	MP 301 V
Number of heads/stages	4/3	4/3	8/3	4/4	4/4
Free Air Displacement, m <sup>3</sup> /h	2/2,2	4,5/4,9	8,3/9,1	1,0 / 1,1	2,3/2,5
Free Air Displacement, l/min	33/36	75/81	135/151	16,7/18	38/41
Ultimate pressure, mbar	< 2	< 2	< 2	< 1	< 1
Intake connection	Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8	DN 16 KF	Hose nozzle DN 8	DN 16 KF with optional Hose nozzle DN 8
Exhaust connection	Hose nozzle DN 8	Hose nozzle DN 8	DN 16 KF	Hose nozzle DN 8	Hose nozzle DN 8
Sound level	<45	<44	<44	<45	<44
Dimensions (B/T/H), mm	200/260 /150	230/380 /170	540/300 /240	200/260 /150	230/380 /170
Weight, kg	10,3	18,3	32,8	10,3	18,3
<b>Ordering Information</b>					
90...260VAC	-	-	-	-	-
230V 50/60Hz	411543	411743	411783	411544	411744
115V 50/60Hz	411543-01	411743-01	411783-01	411544-01	411744-01
400V 50/60Hz	-	411743-02	411783-02	-	411744-02

## Intake Pressure / Pumping Speed - Diagrams





## Accessories

### Vacuum Regulators, Gauges and Glassware

Vacuum regulators for mounting to the inlet of the MP/MPC pump to regulate the vacuum level by way of a bleed valve. There are different options depending on pump model and also glassware to protect pump from ingestion of liquids / particles and to condense and collect exhaust vapours.

CAT. No.	Accessories	for
700458	Vacuum regulator with dial gauge	MP/MPC 301 Z, 601 E, 601 T, 901 Z, 1201 E
700458-01	Vacuum regulator with dial gauge and liquid trap	MP/MPC 301 E
700458-02	Vacuum regulator with dial gauge	MP/MPC 095 Z, 110 E, MPC 105 T, MPC 155 Z
700459	Vacuum regulator with dial gauge	MP/MPC 095 Z, 110 E, MPC 105 T, MPC 155 Z
700459-01	Vacuum regulator with digital gauge and pressure release valve	MP/MPC 095 Z, 110 E, MPC 105 T, MPC 155 Z
700459-02	Digital vacuum gauge	MPC 105 T iQ
700460	Inlet separator	MP/MPC 095 Z, 110 E, MPC 105 T, MPC 155 Z
700461	Vacuum regulator with dial gauge and inlet separator	MP/MPC 095 Z, 110 E, MPC 105 T, MPC 155
700462	Exhaust condenser / solvent recovery unit	MPC 095 Z, 110 E, 105 T, 155 Z



700458



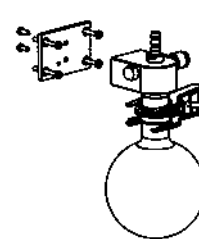
700458-01,  
700458-02



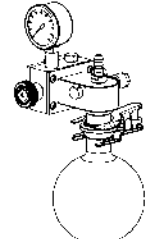
700459



700459-01,  
700459-02



700460



700461

### Vacuum Hose

Vacuum hose for connection between your vacuum pump and laboratory equipment. Please indicated the required length in metres.

CAT. No.	Accessories	Size
828310-3	Red rubber vacuum hose,	10mm ID, 5mm wall thickness
828310-4	Red rubber vacuum hose	8mm ID, 5mm wall thickness
828374	Silicone vacuum hose	6mm ID, 3mm wall thickness



828310-3,  
828310-4



828374

## Connection Kits

### Connection Kits

#### Vacuum Oven Kit

- For easy connection of diaphragm pump to vacuum oven with either DN 16 KF or DN 25 KF flange
- Vacuum oven kit includes 2.5m vacuum hose, hose connectors, hinged clamping rings and centering rings
- CAT. No. 404005



Vacuum Oven Kit | 404005

#### Advanced Vacuum Oven Kit

- For extra protection when connecting diaphragm pump to vacuum oven with either DN 16 KF or DN 25 KF flange
- Advanced vacuum oven kit includes 2.5m vacuum hose, hose connectors, hinged clamping rings, centering rings and in-line particle filter with spare element.
- CAT. No. 404006



Advanced Vacuum Oven Kit | 404006

#### Vacuum Filtration and Desiccation Kit

- Quick connection to vacuum filtration funnel / manifold or desiccator
- Kit includes in-line hydrophobic filter, 1.5 m silicone vacuum hose (6mm ID) and 1.5m silicone vacuum hose (8mm ID)
- CAT. No. 404008



Vacuum Filtration and Desiccation Kit | 404008

#### Rotary Evaporator Kit

- Quick and easy connection to rotary evaporators
- Kit includes 2m vacuum hose, cooling water hose and clamps
- CAT. No. 112575



Rotary Evaporator Kit | 112575

#### Other Accessories

- CAT. No. 112555-04 - In-line hydrophobic filter
- CAT. No. 829923 - Y-piece hose connector
- CAT. No. 825261 - Auto adapter for MP 065 E / MPC 090 E, 12 - 24 VDC for field use



112555-04



829923



825261

#### Exhaust silencers

CAT. No.	for Type
829901	MP 101 Z, MP 101 V, MP 201 T, MP 601 E, MP 601 T, MP 901 Z, MP 1201 E
400942	MP 060 E, MP 055 Z, MP 105 E
400596	MP 301 Z, MP 301 V
400941	MP 301 E



829901



400592

## Laboratory Vacuum Systems (LVS)



LVS 210 T ef | 115234

### Scope of Delivery

- Chemical duty diaphragm pump mounted on chassis
- ON/OFF switch and internal protective thermal switch for the motor, mains cable and plug
- vibration isolating feet
- inlet separator
- exhaust condenser (except for LVS 300 Z)
- gas ballast valve (except for LVS 105 T - 10 ef)
- 8mm inlet / exhaust hose nozzle

### Advantages

- analytically pure, oil free vacuum
- user friendly
- designed for permanent operation
- maintenance-free drive system and proven long diaphragm life
- wide vacuum and flow range to match application
- fully chemically resistant
- inlet separator to protect pump from liquid and particle ingestion
- exhaust condenser for optimal solvent recovery
- modular design to tailor the system to your application needs

### Range of Applications

- rotary evaporators
- vacuum ovens
- multi-user networks (Netvac)
- solvent concentration

### Description

LVS systems are specially designed for solvent distillation / evaporation applications. They comprise an oil-free chemical duty diaphragm pump (MPC) with optional control packages, liquid containment and exhaust vapour condenser. All wetted parts are made from high quality chemically resistant materials with clear plastic coated glassware to allow solvent and acid vapours to be pumped.

## Model options

---

The LVS systems are available with a range of vacuum control options; *unregulated*, *manually regulated* and *three different electronic control packages* are available.

### Unregulated

- When ultimate vacuum is required at all times.



LVS 300 Z

### Manually regulated

- A fine control valve is used to regulate the vacuum by acting as a bleed valve. Options available with one or two manual regulators.



LVS 301 Z

### Standard digital control (cv)

- The standard electronic control package uses a chemically resistant solenoid valve to control the process vacuum while the pump runs continually.
- The user defined vacuum and hysteresis levels are used to open and close the control valve thus maintaining vacuum at the process between the high and low control points. This is known as two point control.



LVS 310 Z

### Economic digital control (en)

- Economic control uses the same two point control system, but as cv replaces the control valve with a relay which turns the pump on and off to maintain the process vacuum between the user defined vacuum and hysteresis levels. This method greatly reduces power consumption and extends the lifetime of the pump.
- Economic control is particularly useful for multi-user vacuum networks where the pump is located away from the user.



LVS 310 Z en

### Ecoflex digital control (ef)

- Ecoflex control varies the speed of the pump constantly to maintain the user defined vacuum level regardless of changes in the process requirements.
- The Ecoflex method exhibits genuine single point (hysteresis-free) control and therefore a stable vacuum level.
- Single point control results in up to 40% increase in evaporation rates with minimal bumping or foaming of precious samples. This is particularly important in ultimate rotary evaporation.



LVS 310 Z ef

## Highlight LVS 105 T - 10 ef



LVS 105 T - 10 ef | 114184

### Scope of delivery

- Chemical duty diaphragm pump built inside casing
- ON/OFF switch and internal protective thermal switch for the motor, mains cable and plug
- Built in digital vacuum controller with ecoflex control software and solvent library
- vibration isolating feet
- inlet separator
- exhaust condenser
- pump head heating
- 8mm inlet / exhaust hose nozzle

### Description

The LVS 105 T - 10 ef is the perfect partner for your rotary evaporator, but can also be used for a range of other applications such as vacuum ovens, solvent concentration and multi-user vacuum networks. Its deep 2 mbar ultimate vacuum and high free flow of 20 l/min make it ideal for use with both high and low boiling point solvents - even allowing non-volatiles such as DMF to be evaporated at 30°C. It combines a powerful built in chemical duty diaphragm vacuum pump with Ecoflex control principals. Heating of the pump heads allows a consistent clean vacuum without gas ballasting.

### Advantages

- analytically pure, oil free vacuum
- deep 2 mbar ultimate vacuum
- Ecoflex vacuum control
- built in solvent library
- multi-lingual digital display
- user friendly
- heated pump heads to stop vapours condensing inside of the pump
- designed for permanent operation
- maintenance-free drive system and proven long diaphragm life
- fully chemically resistant
- compact design
- inlet separator to protect pump from liquid and particle ingestion
- exhaust condenser for optimal solvent recovery



ROdist professional package  
with LVS 105 T - 10 ef | 112033

The Ecoflex control continuously adjusts the pumping speed to match the vapour load of the process and allows the pump to exhibit single point control which reduces bumping and foaming whilst achieving increased evaporation rates. The built in multi-lingual digital vacuum controller allows easy adjustment of the desired vacuum level as well as the option to select common solvents from the built in solvent library. An inlet trap protects the pump from ingesting liquids and particles and an exhaust vapour condenser is included for optimal solvent recovery.

## Overview of Systems

Flow rate / Free Air Displacement m <sup>3</sup> /h @ 50Hz	Ultimate Pressure mbar	Manual Vacuum Control	Standard Two Point Vacuum Control	Ecoflex Vacuum Control	Economic Vacuum Control	Welch Model	Number of Unregulated Connections	Number of Manual Regulated Connections	Number of Controller Regulated Connections	With Dial Vacuum Gauge	With Digital VCZ 521 Controller	With LED VCZ 424 Controller	Ordering Information 230V, 50/60Hz, 1 Ph
1.2	2			x		LVS 105 T-10 ef			1		x		114184
1.0	8	x				LVS 101 Z w/ gauge		1		x			115027
↓	↓		x			LVS 110 Z			1		x		115024
2.0	2	x				LVS 201 T		1					115037
↓	↓	x				LVS 201 T w/ gauge		1		x			115037-10
↓	↓		x			LVS 210 T			1		x		115034
2.2	2			x		LVS 210 T ef			1		x		115234
2.3	8					LVS 300 Z	1						115041
↓	↓	x				LVS 301 Z		1					115047
↓	↓	x				LVS 301 Z w/ gauge		1		x			115047-10
↓	↓	x				LVS 302 Z		2					115043
↓	↓		x			LVS 310 Z			1		x		115044
↓	↓	x	x			LVS 311 Z		1	1		x		115045
↓	↓		x			LVS 320 Z			2			x	115046
2.6	8			x		LVS 310 Z ef			1		x		115244
4.5	2					LVS 600 T	1						115051
↓	↓	x				LVS 601 T		1					115057
↓	↓	x				LVS 601 T w/ gauge		1		x			115057-10
↓	↓	x				LVS 602 T		2					115053
↓	↓		x			LVS 610 T			1		x		115054
↓	↓	x	x			LVS 611 T		1	1		x		115055
↓	↓		x			LVS 620 T			2			x	115056
4.9	2			x		LVS 610 T ef			1		x		115254
8.3	2		x			LVS 1210 T			1		x		115064
9.1	2			x		LVS 1210 T ef			1		x		115264
<b>Netvac LVS Systems</b>													
2.3	8				x	LVS 310 Z en			1		x		115248-02
4.5	2				x	LVS 610 T en			1		x		115258-02

### Connection Types



Manual Regulated Connections



Controller Regulated Connections



With Dial Vacuum Gauge



With a Digital Vacuum Controller



Simultaneous operation of two independent vacuum processes

Every LVS system is supplied with a Chemical Duty Diaphragm Pump and a DN 8 hose connector. Some configurations also come with a vacuum control package and capture solvent recovery system depending on your needs. Comes pre-assembled and ready to use.

### Comments Vacuum Control

#### Manual

- Vacuum is adjusted by user turning the regulator

#### Standard Two Point Control

- Vacuum is automatically controlled at set point using on/off solenoid valve

#### Ecoflex

- Pump speed is automatically varied to control vacuum

#### Economic

- Pump automatically turns on/off based on demand for vacuum

# Technical Data

Final pressure <8 mbar	LVS 101 Z w/ gauge	LVS 110 Z	LVS 300 Z	LVS 301 Z	LVS 301 Z w/ gauge	LVS 302 Z	LVS 310 Z	LVS 311 Z	LVS 320 Z (424)
<b>Parameter</b>									
Free Air Displacement, m <sup>3</sup> /h @ 50Hz	1,0	1,0	2,3	2,3	2,3	2,3	2,3	2,3	2,3
Free Air Displacement, l/min	16,7	16,7	38	38	38	38	38	38	38
Ultimate pressure, mbar	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8
Intake/Exhaust connection	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8
Sound level	< 44	< 44	< 44	< 44	< 44	< 44	< 44	< 44	< 44
Dimensions (W/D/H), mm	360/310/445	360/310/445	360/310/395	360/310/445	360/310/445	360/310/445	360/310/445	360/310/445	360/310/445
Weight, kg	11,60	11,70	16,1	16,30	16,30	16,3	17,8	18,1	18,4
<b>Ordering Information</b>									
230V 50/60Hz	115027	115024	115041	115047	115047-10	115043	115044	115045	115046
115V 50/60Hz	115027-01	115024-01	115041-01	115047-01	115047-11	115043-01	115044-01	115045-01	115046-01

Final pressure <2 mbar	LVS 201 T	LVS 201 T w/ gauge	LVS 210 T	LVS 600 T	LVS 601 T	LVS 601 T w/ gauge	LVS 602 T	LVS 610 T	LVS 611 T	LVS 620 T (424)	LVS 1210 T
<b>Parameter</b>											
Free Air Displacement, m <sup>3</sup> /h @ 50Hz	1,8	1,8	1,8	4,5	4,5	4,5	4,5	4,5	4,5	4,5	8,3
Free Air Displacement, l/min	33	33	33	75	75	75	75	75	75	75	138
Ultimate pressure, mbar	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Intake/Exhaust connection	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8
Sound level	< 44	< 44	< 44	< 44	< 44	< 44	< 44	< 44	< 44	< 44	< 44
Dimensions (W/D/H), mm	360/310/445	360/310/445	360/310/445	360/310/395	360/310/445	360/310/445	360/310/445	360/310/445	360/310/445	360/310/445	540/310/445
Weight, kg	15,0	15,3	15,7	23,2	23,50	23,50	23,5	24,7	25,0	25,3	36,1
<b>Ordering Information</b>											
230V 50/60Hz	115037	115037-10	115034	115051	115057	115057-10	115053	115054	115055	115056	115064
115V 50/60Hz	115037-01	115037-11	115034-01	115051-01	115057-01	115057-11	115053-01	115054-01	115055-01	115056-01	115064-01

Ecoflex	LVS 310 Z ef	LVS 105 T - 10 ef	LVS 210 T ef	LVS 610 T ef	LVS 1210 T ef
<b>Parameter</b>					
Free Air Displacement, m <sup>3</sup> /h @ 50Hz	2,6	1,2	2,2	4,9	9,1
Free Air Displacement, l/min	43	20	36	81	151
Ultimate pressure, mbar	< 8	< 2	< 2	< 2	< 2
Intake/Exhaust connection	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8	Hose nozzle DN8
Sound level	< 44	< 44	< 44	< 44	< 44
Dimensions (W/D/H), mm	360/310/445	250/260/435	360/310/445	360/310/445	540/310/445
Weight, kg	19,9	9,5	19,0	26,8	37,1
<b>Ordering Information</b>					
90...260VAC	-	114184	-	-	-
230V 50/60Hz	115244	-	115234	115254	115264
115V 50/60Hz	115244-01	-	115234-01	115254-01	-

## Accessories & Configurations



700183-11



828857-18



828839



620637-01



### Glassware

CAT. No.	Accessories	for
700183-08	Exhaust condenser complete	all LVS models
700183-11	Exhaust condenser complete	LVS 105 T - 10 ef
828857-18	Drain	all LVS condenser, with hose nozzle DN 10, with KS 35
828839	Receiving flask coated, 500ml	

### Software Connection Kit

- For connection of PC to digital controller in LVS systems
- Kit includes CD with software and RS232 connection cable
- CAT. No. 620637-01



112575



828310-4



700300-02

### Rotary Evaporator Kit

- Quick and easy connection to rotary evaporators
- Kit includes 2m vacuum hose, cooling water hose and clamps
- CAT. No. 112575

### Vacuum Hose

- Red rubber vacuum hose, 8mm ID, 5mm wall thickness
- CAT.No. 828310-4

### Water Valve

- 2 way water flow valve for the demand-responsive cooling water supply.
- Input: G 3/4 inch sleeve nut,
- output: hose nozzle for hose inside diameters 8 mm
- CAT. No. 700300-02



### Oil-Sealed Rotary Vane Pumps



P 4 Z | 322002

#### Advantages

- high water vapour tolerance for chemical applications
- compact, robust and functional construction
- low noise emission
- no oil contamination of the chamber by migration or suck-back
- high pumping speed
- free of non ferrous metals
- low, ultimate pressures are reached quickly
- long service intervals
- low energy consumption
- designed for permanent operation
- rotary vanes made of a special plastic which are not affected by corrosion or damaged by dirt particles and have very good sliding properties

#### Scope of Delivery

- rotary vane vacuum pump ready-to-use with oil charging
- motor protection switch, main power switch, mains cable and plug
- centering ring and clamping ring for inlet and exhaust
- gas ballast valve
- carrying handle
- special oils available on request

#### Range of Applications

- vacuum drying
- freeze drying
- vacuum concentration
- Schlenk lines
- backing turbomolecular pumps

#### Fully reliable rotary vane pumps

The two-stage rotary vane pumps of the P - Z series from Welch are characterized by their high water vapour tolerance and reliability. Welch Rotary Vane Pumps are designed to withstand large amounts of water vapour in the vacuum pump's inlet vapour stream. This "water vapour tolerance" is the maximum inlet pressure point at which the pump is able to operate with pure water / fluids and at the same time prevents them of condensing inside the pump.

Due to their low weight, high pumping speed and compact housing construction for wipe cleaning these pumps are ideally suited for use in laboratories for applications within rough and fine vacuum ranges from 1 to  $10^{-3}$  mbar.

### Fully accessorized Packages

Two Stage direct-driven rotary vane pump lab & freeze dryer packages



P 4 Z SL package | 330041

#### P 4 Z

- bench top with Dewar vessel, 77l/min,  $2 \times 10^{-3}$  mbar, 230V, 50/60Hz, 1 Ph with Schuko, UK and US plug leads
- CAT. No. 110009

#### P 6 Z FD package

- with oil mist filter AKD, 2-way ball valve, hose adapter, PVC vacuum hose (1.5m), oil drain kit, 1 Liter spare oil
- CAT. No. 330036

#### P 8 Z FD package

- with oil mist filter AKD, 2-way ball valve, hose adapter, PVC vacuum hose (1.5m), oil drain kit, 1 Liter spare oil
- CAT. No. 330037

#### P 12 Z FD package

- with oil mist filter AKD, 2-way ball valve, hose adapter, PVC vacuum hose (1.5m), oil drain kit, 1 Liter spare oil
- CAT. No. 330038

#### P 4 Z VC package

- with oil mist filter AKD, inlet Separator, hose adapter, vacuum hose rubber red DN10 (3m), 1 Liter spare oil and oil drain kit
- CAT. No. 330039

#### P 6 Z SL package

- with PIZA 111 cr-gold, 2-way ball valve, oil mist filter OME 10/16, T-piece, hose adapter and rubber vacuum hose (3m), oil drain kit
- CAT. No. 330040

#### P 4 Z SL package

- with PIZA 111 cr-gold, 2-way ball valve, oil mist filter OME 10/16, T-piece, hose adapter and rubber vacuum hose (3m), oil drain kit
- CAT. No. 330041

\* FD - Freeze Dryer, VC- Vacuum Concentrator, SL - Schlenk Line

## Connection Kits

### Kit 3, 4 Freeze Dryer Adapter Kits

- All in one kit for connection to freeze dryer
- Adapter kits include 2-way ball valve, hose connector, hinged clamping ring, centering ring, AKD oil mist separator and 1.5m vacuum hose



Kit 3 | DN 16 | Cat. No. 330031

Kit 4 | DN 25 | Cat. No. 330032

### Kit 7, 8 Vacuum Measurements Packages

- Reliable and accurate measuring for a wide range of application
- Vacuum measurement package includes PIZA 111 cr-gold handheld gauge with stand, T-connection, hinged clamping rings and centering rings



Kit 7 | DN 16 | Cat. No. 330051

Kit 8 | DN 25 | Cat. No. 330052

### Kit 9, 10 Vacuum Control Packages

- A cost-effective package for controlling vacuum pressure up to  $10^{-3}$  mbar (0.001 torr). Easy to adapt to two-stage rotary vane pumps.
- Vacuum control package includes MRV 100 gauge with PIZA 111 cr-gold vacuum sensor, T-connection, solenoid valve, hinged clamping rings and centering rings



Kit 9 | DN 16 | Cat. No. 330053

Kit 10 | DN 25 | Cat. No. 330054

### Kit 11, 12 Vacuum Pump Protection Package

- Protect your rotary vane pump from harmful vapours by trapping them in Dewar vessels
- Vacuum pump protection package includes AKS inlet separator, 2 Dewar vessels, connectors and flexible steel hose

Kit 11 | DN 16 | Cat. No. 330055

Kit 12 | DN 25 | Cat. No. 330056

### Kit 13, 14 Chemical Trap Packages

- Protect your rotary vane pump from harmful vapours by trapping them in Dewar vessels
- Chemical trap package includes acid neutralisation trap, elbow connection, hinged clamping ring and centering rings

Kit 13 | DN 16 | Cat. No. 330057

Kit 14 | DN 25 | Cat. No. 330058

### Kit 15 Vacuum Oven Kit

- For easy connection of rotary vane pump to vacuum oven
- Vacuum oven kit includes 2.5m vacuum hose, hose connectors, hose clamps, oil mist filter, 1 litre Labovac 10 oil, hinged clamping rings and centering rings

Kit 15 | DN 16 | Cat. No. 330059

### Kit 16 Hose Kit with Hose Adapter

- Hose kit for connection of rotary vane pump to various apparatus
- Hose kit includes 8mm ID and 20mm ID vacuum hose (1.5m length each), hose connectors and hose clamps

Kit 16 | DN 16 | Cat. No. 330060

## Chemvac



6 Z-101 | 109030



12 Z-301 | 109031

23 Z-301 | 109032

### Chemvac

The combination of a diaphragm pump with a rotary vane pump was developed to take advantage of the strong points of each type of pump. The two stage chemical duty diaphragm pump can withstand corrosive gasses and remove the resulting condensate prior to its absorption in the two stage rotary vane pump oil by constantly distilling the oil during operation. The rotary vane pump provides a much lower ultimate vacuum and will have a long life with the pump oil being free of contaminants.

### Advantages

- corrosion optimised combination system
- minimal oil contamination
- extended oil life
- high chemical resistance
- Labovac 14 oil for pumping solvent vapours

### Scope of Delivery:

- rotary vane & diaphragm combination vacuum pump ready-to-use with oil charging
- motor protection switch, main power switch, mains cable and plug
- centering ring and clamping ring for inlet and exhaust
- safety valve
- oil mist separator
- dial vacuum gauge for oil box
- solvent trap

### Packages & Accessoires

Accessoires	CAT.No.
Kit 5, Freeze Dryer & Vacuum Concentrator Adapter kit for Chemvac, DN 16 KF	330044
Kit 6, Freeze Dryer & Vacuum Concentrator Adapter kit for Chemvac, DN 25 KF	330045
Replacement Filter Element	800160
Labovac 10 oil, 1 litre (see page 37 for all vacuum pump oils)	800135

## RVP-Trolley

### RVP-Trolley

The mobile laboratory rotary vane pump system has been specifically designed for use in chemistry laboratories. Its construction has intentionally been kept simple, compact and clearly arranged.

The upstream cold traps enable even larger quantities of condensable vapours to be pumped without any additional pump load. A PIZA 111 cr-gold Multi-Range Vacuum Gauge for measuring the pressure can be easily attached to the to the stand rod.

### Advantages

- trolley mounted for portability
- Dewar vessels to protect pump from chemical vapours
- AKD oil mist separator to capture any oil mist

### Scope of Delivery:

- rotary vane vacuum pump ready-to-use with oil charging and mounted on the trolley
- motor protection switch, main power switch, mains cable and plug
- gas ballast valve
- oil mist separator
- two Dewar vessels
- PIZA 111 cr-gold handheld gauge (selected models)
- connectors, flanges and flexible steel hose

### Types



Rotary Vane Pump System, mobile

Description	CAT.-No.
P 4 Z - trolley with Dewar vessel, 77l/min, $2 \times 10^{-3}$ mbar, 230V, 50/60Hz, 1 Ph with Schuko, UK and US plug leads	110008
P 4 Z - trolley system with Dewar vessel and vacuum gauge PIZA 111 cr-gold, 77l/min, $2 \times 10^{-3}$ mbar, 230V, 50/60Hz, 1 Ph with Schuko, UK and US plug leads	110008-01
Trolley system with Dewar vessel and vacuum gauge PIZA 111 cr-gold for various rotary vane pump sizes (use your own or choose one from our range)	110008-02
Trolley system with Dewar vessel for various rotary vane pump sizes (use your own or choose one from our range)	110008-03
*Trolley Systems are equipped with the new advanced chemical resistant vacuum gauge PIZA 111 cr-gold	

## Technical Data

### Two-Stage Direct-Driven Rotary Vane Pumps



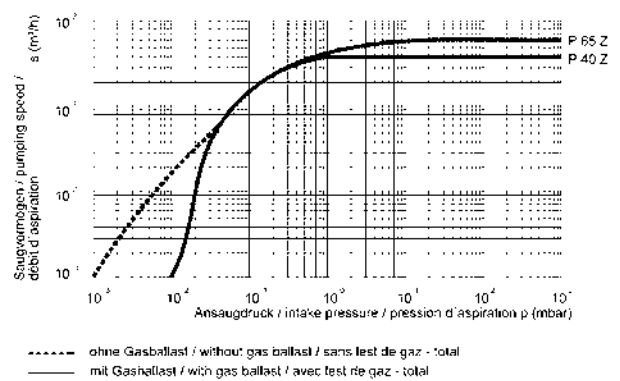
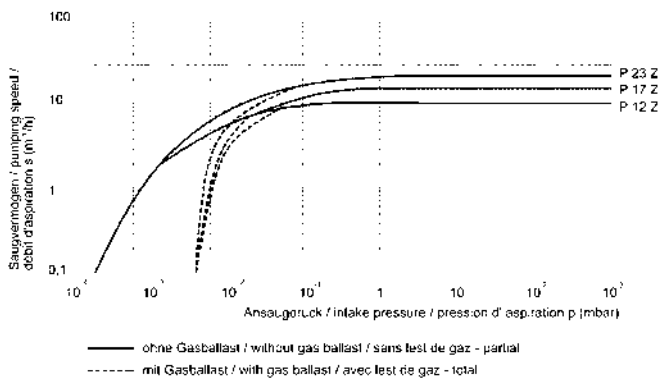
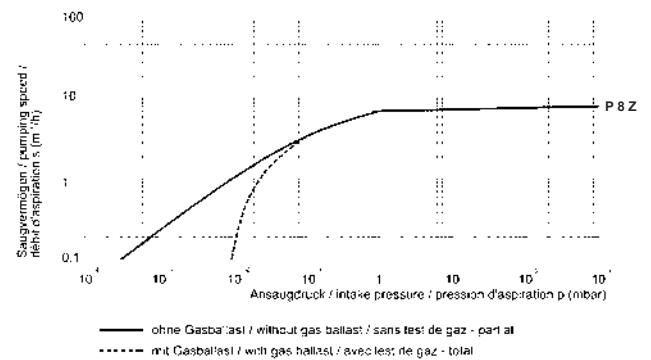
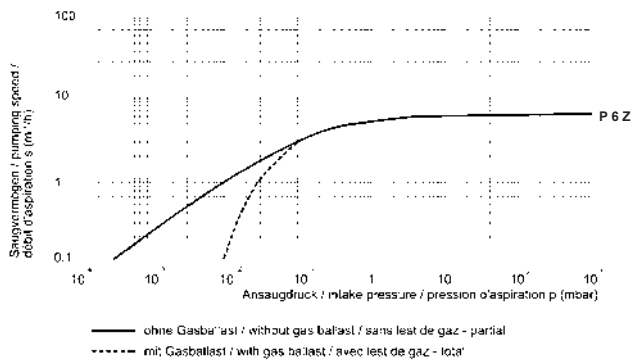
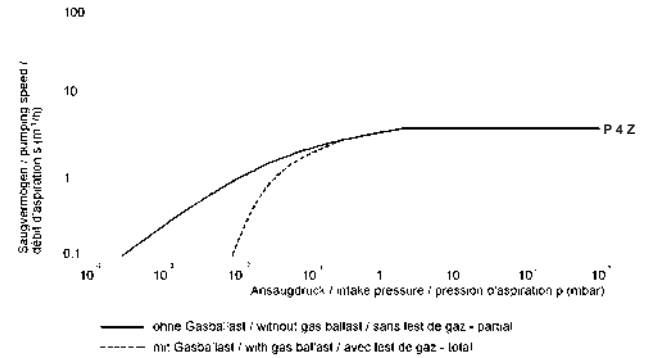
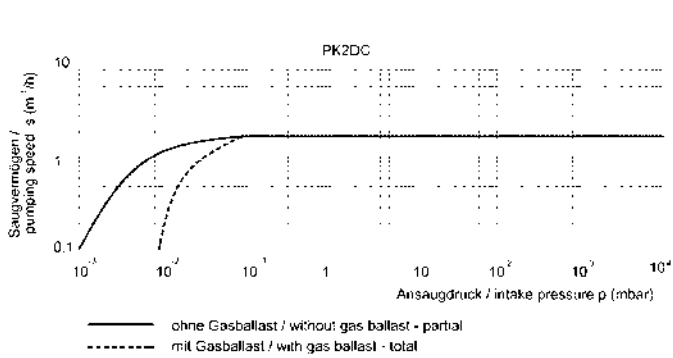
Parameter	Unit	PK 2DC	P 4Z	P 6Z	P 8Z	P 12Z	P 17Z	P 23Z	P 40Z	P 65Z
<b>Pumping speed 50/60 Hz</b> <i>to DIN 28426 part 1 (pneurop)</i>	m <sup>3</sup> /h l/min	1,8 / 2,2 30 / 36	4,6 / 5,5 77 / 92	5,8 / 7,0 97 / 116	7,2 / 8,6 120 / 144	11,0 / 13,2 183 / 220	16,0 / 19,2 267 / 320	21,0 / 25,2 350 / 420	38 / 45,6 633 / 760	60 / 72 1000/1200
<b>Ultimate pressure @ 50 Hz</b>										
- without gas ballast total	mbar	1 x 10 <sup>-2</sup>	2 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>	2 x 10 <sup>-3</sup>	4 x 10 <sup>-4</sup>	4 x 10 <sup>-4</sup>
- with gas ballast total		0,5	1 x 10 <sup>-2</sup>	1 x 10 <sup>-2</sup>	1 x 10 <sup>-2</sup>	3 x 10 <sup>-3</sup>	3 x 10 <sup>-3</sup>	3 x 10 <sup>-3</sup>	1 x 10 <sup>-2</sup>	1 x 10 <sup>-2</sup>
<b>Water vapour tolerance</b>	mbar	33	60	60	60	35	35	35	33	50
<b>IN connection</b>		DN 16 KF	DN 16 KF	DN 16 KF	DN 25 KF	DN 25 KF	DN 25 KF	DN 25 KF	DN 40 KF	DN 40 KF
<b>EX connection</b>	-	DN 16 KF	DN 16 KF	DN 16 KF	DN 25 KF	DN 25 KF	DN 25 KF	DN 25 KF	DN 25 KF	DN 40 KF
<b>Sound level</b>	dB (A)	< 40	< 48	< 48	< 48	< 50	< 50	< 50	< 52	< 56
<b>Oil filling</b>	ml	250	530	550	600	1000	800	820	1800	5500
<b>Frequency</b>	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
<b>Dimensions (W/D/H)</b>	mm	330 / 165 / 170	415 / 150 / 235	430 / 150 / 235	445 / 150 / 235	540 / 170 / 260	540 / 170 / 260	540 / 170 / 260	565 / 205 / 296	738 / 280 / 423
<b>Weight</b>	kg	8,0	17,5	19,5	21,5	35,0	37,0	38,0	39,0	83,0
<b>Ordering information</b>										
100/115/230V	-	-	322002	322003	322004	322005	322006	322007	-	-
300/400V	-	-	322002-01	322003-01	322004-01	322005-01	322006-01	322007-01	322008	322009
230V		322001	-	-	-	-	-	-	-	-
115V		322001-03	-	-	-	-	-	-	-	-
• Seal kit		302011	302081	302081	302081	302082	302082	302082	340006	340008
• Service kit	-	302012-1	302075	302076	302077	302079	302080	302080	340007	340009
<b>Accessories</b>										
• Separator AKD (pressure side)		-	320015	320015	320017	320017	320017	320017	-	-
• Separator AKS (suction side)		-	320016	320016	320018	320018	320018	320018	-	-
• Oil mist filter OME (pressure)		700010	700010	700010	700011	700011	700011	700011	700013	700009
• Freeze Dryer Adapter Kit	-	330044	330031	330031	330032	330032	330032	330032	-	-

### Chemvac pumps



Parameter	P 6 Z - 101	P 12 Z - 301	P 23 Z - 301
Number of heads/stages	2/2	2/2	2/2
Free Air Displacement, m <sup>3</sup> /h	5,8	11	21
Free Air Displacement, l/min	97	183	350
Ultimate pressure, mbar	2x10 <sup>-3</sup>	2x10 <sup>-3</sup>	2x10 <sup>-3</sup>
Water vapor tolerance, mbar	70	80	45
Intake/Exhaust connection	DN 16 KF	DN 25 KF	DN 25 KF
Sound level, dB	50	50	50
Dimensions (W/D/H), mm	500/330/340	590/345/420	590/345/420
Weight, kg	25,5	42,5	46
<b>Ordering information</b>			
230V 50/60Hz	109030	109031	109032

# Intake Pressure / Pumping Speed - Diagrams



## Accessories

Description	Size	CAT. No.
Oil Mist Separator AKD 16	DN 16 KF	320015
Oil Mist Separator AKD 25	DN 25 KF	320017



Description	Size	CAT. No.
Inlet Condensor AKS 16	DN 16 KF	320016
Inlet Condensor AKS 25	DN 25 KF	320018



Description	Size	CAT. No.
Oil Mist Filter OME 10/16	DN 16 KF	700010
Oil Mist Filter OME 10/25	DN 25 KF	700011



Description	Size	CAT. No.
Condenser SS, water cooling	SKS 40/25	700066
Condenser SS, water cooling	SKS 40/16	700261



Description	Size	CAT. No.
Hose Connector Adapter SS	DN 16 KF - DN 12	701702
Hose Connector Adapter SS	DN 25 KF - DN 20	701704
Hose Connector Adapter SS	DN 25 KF - DN 12	710209
Hose Connector Adapter SS	DN 16 KF - DN 20	701712-02



Description	Size	CAT. No.
Fine Vacuum Adsorption Trap, SOF 16	DN 16 KF	705179
Fine Vacuum Adsorption Trap, SOF 25,	DN 25 KF	705180



Description	Size	CAT. No.
Exhaust Separator with Oil Return Kit	DN 16 KF	705181
Exhaust Separator with Oil Return Kit	DN 25 KF	705182



Description	Size	CAT. No.
Male Hose Adapter Al	DN 16 KF / 16mm I.D. for PVC Hose	710052
Male Hose Adapter Al	DN 25 KF / 25mm I.D. for PVC Hose	710053



Description	Size	CAT. No.
PVC Cord-Reinforced Flexible Vacuum Hose, DN 16	16mm ID, 3.5mm wall thickness	710058
PVC Cord-Reinforced Flexible Vacuum Hose, DN 25	25mm ID, 5mm wall thickness	710059



Description	CAT. No.
Replacement element for OME 10/16, OME 10/25, AKD 16 and AKD 25	800160
Oil Drain/Change Starter Kit for One and Two-stage Rotary Vane Pumps (P*Z and P*E line)	340003





## Labovac

Use Welch pump oils to reduce oil change cycles and maximize performance. The warranty is only effective when using Welch qualified vacuum pump oils.

Please note that for demanding applications not all types of Welch vacuum pump oil can be used. please contact your local Welch representative for further details.

### Labovac 10 - Mineral oil

Standard oil for One and Two-Stage Welch Rotary Vane Pumps and chemvac's . To pump air, inert gas and noble gas.

Remarks:

Oil service cycles can be extended by using an oil filter.

### Labovac 11 - Synthetic oil

Used for high operating temperatures > 100°C, specially in One-Stage rough vacuum rotary vane pumps.

Remarks:

Do not pump any inorganic acids. Ultimate pressure up to 0.5 mbar.

### Labovac 12S - Paraffin based mineral oil

For pumping air, chemically inert permanent gases - water vapour, solvent vapors.

Remarks:

Oil service cycles can be extended by using a chemical oil-filter. Pump should operated with a cold trap.

### Labovac 13 - PFPE oil

For pumping strong oxidants like oxygen, ozone and reactive substances (halogens).

Remarks:

Mixing with other types of oil must be absolutely avoided. we recommend to order the rotary vane pump directly with these vacuum oil to ensure best performance.

### Labovac 14 - Polyalphaolefin oil (PAO)

For pumping of chemically inert permanent gases - water vapor and solvent vapors. Improved cold starting at low temperatures.

Remarks:

A oil-filter is strongly recommend. Ultimate pressure up to 10<sup>-2</sup>mbar.

### Vacuum Pump Oil Condition Color

Vacuum Pump oil can become contaminated with ingested fluids and vapors. Use recommended pump oil and change your pump oil regularly. Cloudy and discolored oil will lead to premature pump failure. Make the clear choice and change your oil regularly.

Good



Bad (Possible Pump Damage)



## Ordering information

	Labovac 10 Mineral oil	Labovac 11 Synthetic oil	Labovac 12S Paraffin based mineral oil	Labovac 13 PFPE oil	Labovac 14 Polyalphaolefin (PAO) oil
1 Liters (1.1qt)	800122	800125	800128	800131	800135
2 Liters (2.1qt)	-	-	-	800132	800136
5 Liters (3.5qt)	800120	-	-	800133	800137
10 Liters (10.6qt)	800123	800126	800129	800134	800138
20 Liters (21.2qt)	800124	800127	800130	-	-
200 Liters (1.2ba)	800119	-	-	-	-

## Common Solvents

## Solvent Table

Table indicates the required level of vacuum for evaporation at 40°C

Solvent	Formula	Vacuum (mbar) at 40 °C
acetone	C <sub>3</sub> H <sub>6</sub> O	556
N-amylalcohol, n-pentanol	C <sub>5</sub> H <sub>12</sub> O	11
benzene	C <sub>6</sub> H <sub>6</sub>	236
butanol	C <sub>4</sub> H <sub>10</sub>	25
tert. Butanol, 2-methyl-2-propanol	C <sub>4</sub> H <sub>10</sub> O	130
carbon tetrachloride	CCl <sub>4</sub>	271
chlorobenzene	C <sub>6</sub> H <sub>5</sub> Cl	36
chloroform	CHCl <sub>3</sub>	474
cyclohexane	C <sub>6</sub> H <sub>12</sub>	235
diethyl ether	C <sub>4</sub> H <sub>10</sub> O	vacuum
1,2-dichloro ethane	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	210
1,2-dichloro ethylene (cis)	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>	479
1,2-dichloro ethylene (trans)	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>	751
diisopropylether	C <sub>6</sub> H <sub>14</sub> O	375
dioxane	C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>	107
DMF di methyl foramide	C <sub>3</sub> H <sub>7</sub> NO	11
alcohol	C <sub>2</sub> H <sub>6</sub> O	175
ethyl acetate	C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>	240
heptane	C <sub>7</sub> H <sub>16</sub>	120
hexane	C <sub>6</sub> H <sub>14</sub>	335
isopropanol	C <sub>3</sub> H <sub>8</sub> O	137
isoamyl alcohol, 3-methyl-1-butanol	C <sub>5</sub> H <sub>12</sub> O	14
ethylmethylketone	C <sub>4</sub> H <sub>8</sub> O	243
methanol	CH <sub>4</sub> O	337
methylene chloride, dichlormethane	CH <sub>2</sub> Cl <sub>2</sub>	vacuum
pentane	C <sub>5</sub> H <sub>12</sub>	vacuum
n-propyl alcohol	C <sub>3</sub> H <sub>8</sub> O	67
pentachloro ethane	C <sub>2</sub> HCl <sub>5</sub>	13
1,1,2,2, tetrachloroethane	C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub>	35
1,1,1, trichlorethylene	C <sub>2</sub> H <sub>3</sub> Cl <sub>3</sub>	300
tetrachloroethylene	C <sub>2</sub> Cl <sub>4</sub>	53
toluene	C <sub>7</sub> H <sub>8</sub>	77
trichlorethylene	C <sub>2</sub> HCl <sub>3</sub>	183
water	H <sub>2</sub> O	72
xylene	C <sub>8</sub> H <sub>10</sub>	25

## Repair/Warranty guideline

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### All Returns

#### - Warranty and Non-Warranty

A Return Authorization (RA) number is required for all returns. Product returns without an RA will be refused at dock.

1.

Go to [www.ilmvac.com](http://www.ilmvac.com) to obtain a Return Request (Damage Report) Form. Use this form to list all chemicals that the equipment could be contaminated with. This information is required for the safety of repair personnel. A Return Authorization can not be issued until the risk of contamination has been assessed by Welch.

2.

After reviewing your Return Request form, the Welch Repair Department will provide you with the RA number and shipping instructions.

3.

Decontaminate the equipment as indicated and package it in a suitable manner for transit. Damage caused by improper equipment packaging is the customer's responsibility. Insure the equipment against loss or damage. Prominently write the RA number on the outside of the packaging and again on the packing slip inside. Please also include a copy of the Return Request form with the package. Ship the equipment to the address provided by the Repair Department.

For non-warranty returns and repairs the Customer pays for freight charges to and from Welch; freight charges must be prepaid. In addition to an RA number, all paid repairs require a purchase order for the repair work required. All paid repairs come with a 90 day warranty. A nominal fee is assessed for equipment that is inspected but not repaired at the Customer's discretion.

For warranty returns and repairs freight charges to Welch are prepaid by the customer; Welch pays for return freight charges. Please explain observed performance issues on the Return Request form along with purchase details. Your Welch product is warranted to be free from material and workmanship defects; warranty determinations are made at the time of inspection at your Welch repair facility.

## Index - Alphabetical

6 Z-101 .....	36	LVS 301 Z w/gauge .....	30, 31
12 Z - 301 .....	36	LVS 302 Z .....	30, 31
23 Z - 301 .....	36	LVS 310 Z .....	5, 28, 30, 31
Accessories .....	19, 25, 26, 32, 38, 40	LVS 310 Z ef .....	28, 30, 31
Advanced Vacuum Oven Kit .....	26	LVS 310 Z en .....	28, 30
Aspiration .....	4, 8	LVS 311 Z .....	30, 31
biovac 106 .....	8	LVS 320 Z .....	30, 31
Chemical Duty Diaphragm Pumps .....	20, 21, 22	LVS 600 T .....	30, 31
Chemical Trap Packages .....	35	LVS 601 T .....	18, 30, 31
ChemStar Dry .....	4, 9, 10	LVS 601 T / 610 T / en / ef .....	16
Chemvac .....	9, 10, 36	LVS 601 T w/gauge .....	30, 31
Condenser SS, water cooling .....	40	LVS 602 T .....	30, 31
Condensor .....	40	LVS 610 T .....	5, 15, 30, 31
Configurations netvac .....	16	LVS 610 T ef .....	5, 15, 30, 31
Connection Kits .....	26, 35	LVS 610 T en .....	30
Customized Solution .....	16	LVS 611 T .....	30, 31
Diaphragm Pumps .....	18-21	LVS 620 T .....	30, 31
Exhaust silencers .....	24	LVS 1210 T .....	30, 31
Filtration / SPE .....	7	LVS 1210 T ef .....	30, 31
Fine Vacuum Adsorption Trap .....	40	MP 030 Z .....	17, 23
Freeze Dryer Adapter Kits .....	35	MP 030 Z-EC .....	23
Freeze Dryer & Vacuum Concentrator Adapter kit for Chemvac .....	36	MP 055 Z .....	23, 26
Gauges .....	25	MP 065 .....	26
Gel Dryer .....	12	MP 065 E .....	13, 22, 26
Glassware .....	25, 32	MP 101 V .....	23, 24, 26
Glove Box .....	12	MP 101 Z .....	23, 24, 26
handvac .....	8	MP 105 E .....	22, 26
HBP .....	6	MP 201 E .....	22
HBP 101 .....	6	MP 201 T .....	23, 24, 26
Hose Connector Adapter .....	40	MP 301 E .....	22, 26
Hose Kit with Hose Adapter .....	35	MP 301 V .....	23, 24, 26
LVS .....	27-32	MP 301 Z .....	23, 24, 26
Labovac 10 .....	35, 41	MP 601 E .....	22, 24, 26
Labovac 11 .....	41	MP 601 T .....	23, 24, 26
Labovac 12S .....	41	MP 901 Z .....	23, 24
Labovac 13 .....	41	MP 1201 E .....	22, 26, 24
Labovac 14 .....	36, 41	MP 1201 T .....	23
LVS 101 Z w/gauge .....	30, 31	MP 1801 Z .....	23
LVS 105 T - 10 ef .....	4, 6, 29, 30, 31, 32	MP 2401 E .....	22
LVS 110 Z .....	30, 31	MPC 090 E .....	4, 7, 20, 24, 26
LVS 201 T .....	30, 31	MPC 095 Z .....	6, 11, 20, 24, 25
LVS 201 T w/gauge .....	30, 31	MPC 101 Z .....	5, 11, 21, 24
LVS 210 T .....	5, 15, 27, 30, 31	MPC 105 T .....	5, 6, 17, 20, 24, 25
LVS 210 T ef .....	5, 15, 27, 30, 31	MPC 105 T iQ .....	5, 20, 25
LVS 300 Z .....	28, 30, 31	MPC 110 E .....	5, 20, 24
LVS 301 Z .....	5, 16, 28, 30, 31	MPC 155 Z .....	20, 24, 25
LVS 301 Z / 310 Z / en / ef .....	16	MPC 201 E .....	20
		MPC 201 T .....	4, 5, 21, 24

## Index - Alphabetical

MPC 301 E .....	7, 20, 21, 25	P 12 Z FD package .....	34
MPC 301 E-X2 .....	21	P 17 Z .....	38, 39
MPC 301 V .....	24	P 23 Z .....	38, 39
MPC 301 Z .....	4, 5, 6, 11, 12, 19, 21, 22, 24, 25	P 23 Z - 301 .....	38
MPC 301 Z ef .....	22	P 40 Z .....	38, 39
MPC 301 Zp, ATEX .....	22	P 65 Z .....	38, 39
MPC 301 Z-X2 .....	21	PK 2 DC .....	38, 39
MPC 302 E .....	20	PVC Cord-Reinforced Flexible Vacuum Hose .....	40
MPC 302 Z .....	4, 5, 19, 21, 24	Repair/Warranty guideline .....	43
MPC 601 E .....	7, 20, 21, 24	Replacement element .....	40
MPC 601 E-X2 .....	21	ROdist professional package .....	5, 29
MPC 601 T .....	4, 5, 11, 18, 21, 22, 24	Rotary Evaporation .....	5
MPC 601 T ef .....	22	Rotary Evaporator Kit .....	26, 32
MPC 601 Tp, ATEX .....	22	Rotary Vane Pump .....	9, 10
MPC 601 T-X2 .....	21	RVP-Trolley .....	37
MPC 602 E .....	7, 20, 24	Schlenkline / Highlight ChemStar Dry .....	10
MPC 901 Z .....	21, 24	Scrollvac .....	9
MPC 901 Z-X2 .....	21	Software Connection Kit .....	32
MPC 1201 E .....	20, 21, 24	Solvent Table .....	42
MPC 1201 E-X2 .....	21	TKC-M60 .....	9
MPC 1201 T .....	21	Trolley system .....	37
MPC 1201 T ef .....	21	Univac - MPKC 2403 T .....	15, 16
MPC 1201 T-X2 .....	21	Univac - MPKC 3603 Z .....	16
MPC 1801 Z .....	21	Univac MPKC Systems .....	15
MPC 1801 Z-X2 .....	21	Vacuum Control Packages .....	35
MPC 2401 E .....	20, 21	Vacuum Filtration and Desiccation Kit .....	26
MPC 2401 E-X2 .....	21	Vacuum Hose .....	25, 32, 40
MPR 030 Z-EC .....	21	Vacuum Measurements Packages .....	35
MPR 060 E-EC .....	20	Vacuum Network .....	14, 15, 16
OEM Products .....	17	Vacuum Oven .....	4, 11, 26, 35
Oil Drain/Change Starter Kit for One and Two-stage Rotary Vane Pumps .....	40	Vacuum Oven Kit .....	26, 35
Oil Mist Filter .....	40	Vacuum Pump Protection Package .....	35
Oil Mist Separator .....	40	Vacuum Regulators .....	25
Oil-Sealed Rotary Vane Pumps .....	33-39	Vacuum Regulators, Gauges and Glassware .....	25
Other Accessories .....	26	Water Valve .....	32
P 4 Z .....	33, 34, 37, 38, 39		
P 4 Z SL package .....	34		
P 4 Z - trolley .....	37		
P 4 Z VC package .....	34		
P 6 Z .....	38, 39		
P 6 Z - 101 .....	4, 38		
P 6 Z FD package .....	34		
P 6 Z SL package .....	34		
P 8 Z .....	38, 39		
P 8 Z FD package .....	34		
P 12 Z .....	38, 39		
P 12 Z - 301 .....	38		

## Index - by CAT.No.

2070C-02 .....	10	115057-01 .....	31	330044 .....	36, 38
109030 .....	26, 35, 36, 38	115057-10 .....	30, 31	330045 .....	36
109031 .....	36, 38	115057-11 .....	31	330051 .....	35
109032 .....	36, 38	115064 .....	30, 31	330052 .....	35
110008 .....	37	115064-01 .....	31	330053 .....	35
110008-01 .....	37	115234 .....	15, 27, 30, 31	330054 .....	35
110008-02 .....	37	115234-01 .....	31	330055 .....	35
110008-03 .....	37	115244 .....	30, 31	330056 .....	35
112033 .....	5, 29	115244-01 .....	31	330057 .....	35
112036 .....	6	115248-02 .....	30	330058 .....	35
112037 .....	4, 8	115254 .....	15, 30, 31	330059 .....	35
112223 .....	15	115254-01 .....	31	330060 .....	35
112555-04 .....	26	115258-02 .....	30	340003 .....	40
112575 .....	26, 32	115264 .....	30, 31	340006 .....	38
112580 .....	8	302011 .....	38	340007 .....	38
114184 .....	4, 6, 29, 31	302012-1 .....	38	340008 .....	38
115024 .....	30, 31	302075 .....	38	340009 .....	38
115024-01 .....	31	302076 .....	38	400596 .....	26
115027 .....	30, 31	302077 .....	38	400941 .....	26
115027-01 .....	31	302079 .....	38	400942 .....	26
115034 .....	30, 31	302080 .....	38	404005 .....	26
115034-01 .....	31	302081 .....	38	404006 .....	26
115037 .....	30, 31	302082 .....	38	404008 .....	26
115037-01 .....	31	320015 .....	38, 40	411011 .....	13, 22
115037-10 .....	30, 31	320016 .....	38, 40	411011-01 .....	22
115037-11 .....	31	320017 .....	38, 40	411122 .....	23
115041 .....	30, 31	320018 .....	38, 40	411421 .....	22
115041-01 .....	31	322001 .....	38	411422 .....	13, 23
115043 .....	30, 31	322001-03 .....	38	411521 .....	22
115043-01 .....	31	322002 .....	33, 38	411521-01 .....	22
115044 .....	30, 31	322002-01 .....	38	411522 .....	23
115044-01 .....	31	322003 .....	38	411522-01 .....	23
115045 .....	30, 31	322003-01 .....	38	411543 .....	23
115045-01 .....	31	322004 .....	38	411543-01 .....	23
115046 .....	30, 31	322004-01 .....	38	411544 .....	23
115046-01 .....	31	322005 .....	38	411544-01 .....	23
115047 .....	30, 31	322005-01 .....	38	411711 .....	22
115047-01 .....	31	322006 .....	38	411711-01 .....	22
115047-10 .....	30, 31	322006-01 .....	38	411721 .....	22
115047-11 .....	31	322007 .....	38	411721-01 .....	22
115051 .....	30, 31	322007-01 .....	38	411721-02 .....	22
115051-01 .....	31	322008 .....	38	411722 .....	23
115053 .....	30, 31	322009 .....	38	411722-01 .....	23
115053-01 .....	31	330031 .....	35, 38	411722-02 .....	23
115054 .....	30, 31	330032 .....	35, 38	411741 .....	22
115054-01 .....	31	330036 .....	34	411741-01 .....	22
115055 .....	30, 31	330037 .....	34	411741-02 .....	22
115055-01 .....	31	330038 .....	34	411742 .....	23
115056 .....	30, 31	330039 .....	34	411742-01 .....	23
115056-01 .....	31	330040 .....	34	411742-02 .....	23
115057 .....	30, 31	330041 .....	34	411743 .....	23

## Index - by CAT.No.

411743-01 .....	23	412743-01 .....	21	701712-02 .....	40
411743-02 .....	23	412743-02 .....	21	705179 .....	40
411744 .....	23	412743-03 .....	21	705180 .....	40
411744-01 .....	23	412781 .....	20, 21	705181 .....	40
411744-02 .....	23	412781-01 .....	20	705182 .....	40
411781 .....	22	412781-02 .....	20	710052 .....	40
411781-01 .....	22	412781-03 .....	21	710053 .....	40
411781-02 .....	22	412782 .....	21	710058 .....	40
411782 .....	23	412782-01 .....	21	710059 .....	40
411782-01 .....	23	412782-02 .....	21	710209 .....	40
411782-02 .....	23	412782-03 .....	21	800119 .....	41
411783 .....	23	412783 .....	21	800120 .....	41
411783-01 .....	23	412783-02 .....	21	800122 .....	41
411783-02 .....	23	412783-03 .....	21	800123 .....	41
412021 .....	4, 7, 13, 20	412922 .....	22	800124 .....	41
412121 .....	20	412922-01 .....	22	800125 .....	41
412122 .....	21	412943 .....	22	800126 .....	41
412421-02 .....	20	412943-01 .....	22	800127 .....	41
412422-02 .....	13, 20	412983 .....	22	800128 .....	41
412422-10 .....	6	412983-03 .....	22	800129 .....	41
412443-02 .....	20	414711 .....	20	800130 .....	41
412443-04 .....	17	414721 .....	20	800131 .....	41
412443-10 .....	6	414721-01 .....	20	800132 .....	41
412443-17 .....	20	414721-02 .....	20	800133 .....	41
412521 .....	20	414722 .....	4, 13, 19, 21	800134 .....	41
412521-01 .....	20	414722-01 .....	21	800135 .....	36, 41
412522 .....	21	414722-02 .....	21	800136 .....	41
412522-01 .....	21	420301-11 .....	17	800137 .....	41
412543 .....	4, 21	420301-12 .....	17	800138 .....	41
412543-01 .....	21	600053 .....	4, 16	800160 .....	36, 40
412642 .....	20	620637-01 .....	32	825261 .....	26
412711 .....	13, 20, 21	700009 .....	38	828310-3 .....	25
412711-01 .....	20	700010 .....	38, 40	828310-4 .....	25, 32
412711-03 .....	21	700011 .....	38, 40	828374 .....	25
412721 .....	13, 20, 21	700013 .....	38	828839 .....	32
412721-01 .....	20	700066 .....	40	828857-18 .....	32
412721-02 .....	20	700183-08 .....	32	829901 .....	26
412721-03 .....	21	700183-11 .....	32	829923 .....	26
412722 .....	4, 21	700261 .....	40	1141845 .....	30
412722-01 .....	21	700300-02 .....	32, 34	4000481-04 .....	22
412722-02 .....	21	700458 .....	25	4000511-04 .....	22
412722-17 .....	21	700458-01 .....	25		
412741 .....	20, 21	700458-02 .....	25		
412741-01 .....	20	700459 .....	25		
412741-02 .....	20	700459-01 .....	25		
412741-03 .....	21	700459-02 .....	25		
412742 .....	21	700460 .....	25		
412742-01 .....	21	700461 .....	25		
412742-02 .....	21	700462 .....	25		
412742-07 .....	21	701702 .....	40		
412743 .....	4, 18, 21	701704 .....	40		



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