Operating manual *(EN)*
Translation of the original German operating manual

Diaphragm Pumping Station

MXPC 303 Z - 230V
MXPC 603 T - 230V

117057
Vers.01/Rev.00 2021-12-16

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Imprint

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1 Important information

ATTENTION

- ▶ Read the operating instructions carefully before use.
- ▶ Keep the operating instructions for future reference.

1.1 Note for the user/personnel

Safety

- The user/personnel must have read and understood the operating instructions completely before starting work.
- The operating instructions must be kept at the place of use at all times and be available to the user/personnel.
- Transfer of the product without operating instructions is not permitted.
- Safe operation can only be guaranteed by proper, and sound use of the product. Safety instructions must be observed!

General information

- Vacuum equipment / vacuum system generally describes a combination of components for vacuum applications, such as a rotary evaporator with vacuum control device and a vacuum pump.
- The operator is responsible for the proper use of vacuum equipment/vacuum systems.

About the device

- Throughout the rest of this guide, the diaphragm pumping station is referred to as the "device".
- "Device" describes the entire product, consisting of the integrated vacuum pump, add on components and various other parts.
- Generally, the pneumatic connections are referred to as follows:
  - the inlet refers to the "suction side" and
  - the output refers to the "pressure side" for exhaust gas.
- Condensate catchpots are often referred to as separators.

1.2 Warnings and information

Warnings are illustrated as follows:

⚠ DEGREES OF RISK	
Additional symbols	☐ **Type and source of danger.** • Consequences if warning is not heeded. ▶ Measures for escaping/avoiding danger.

Degrees of risk

⚠ DANGER	▶ Indicates a grave danger that will result in dangerous injuries or have fatal consequences.
⚠ WARNING	▶ Indicates a potentially dangerous situation which, if not prevented, may result in serious injury or life-threatening consequences.
⚠ CAUTION	▶ Indicates a potentially dangerous situation. If not prevented, it could lead to minor injuries.

Safety instructions and information

Additional symbol	SIGNAL WORD
	▶ Important instructions/information for the user/operator.

1.3 Explanation of safety symbols

Symbol	Explanation
	▶ General warning sign
	▶ Danger: high voltage
	▶ Explosive atmosphere warning
	▶ Hot surface warning
	▶ Toxic substances warning
	▶ Low temperature warning

Symbol	Explanation
	▶ General prohibition sign
	▶ General mandatory sign
	▶ Turn off power when not in use
	▶ Protective clothing – Gloves
	▶ Protective clothing – Goggles
	▶ Follow the operating instructions
	▶ General information

1.4 Explanation of abbreviations

Abbreviation	Designation or meaning	Explanation
A	Ampere	Electrical unit
Fig.	Figure	Designation
abs.	absolute	Value
AC	Alternating current	Electrical unit
OD	Outer diameter	Dimension
ATM	Atmosphere	Pressure
DC	Direct current	Electrical unit
DN	Nominal size – inner diameter (French diamètre nominal)	Dimension
EPDM	Ethylene propylene diene rubber	Materials
EX	Exhaust	Connection designation
hh:mm:ss	Hour/minute/second	Time
hPa	Hectopascal (1 hPa = 1 mbar = 0.75 Torr)	Pressure unit
Hz	Hertz	Electric unit
IN	Inlet, suction connection	Connection designation
ID	Inner diameter	Dimension
SGJ	Spherical ground joint (DIN 12264)	Connection designation

Important information

Abbreviation	Designation or meaning	Explanation
max.	Maximum	Value
mbar	Millibar (1 mbar = 1 hPa = 0.75 Torr)	Pressure unit
min.	Minimum	Value
mm	Millimetre	Dimension
MXPC	Diaphragm pumping station (chemical resistant)	Device type
pneum.	Pneumatic	Connection designation
PP	Polypropylene	Materials
PTFE	Polytetrafluoroethylene	Materials
PVDF	Polyvinylidene fluoride	Materials
RH	Relative humidity in %	Environmental condition
Torr	Torr (1 Torr = 1.33 mbar = 1.33 hPa)	pressure unit
V	Voltage	Electrical unit
W	Watt	Electrical unit

2 Safety

2.1 General information

- The following safety and warning instructions must be read and understood by all users of the device.
- All operations may be carried out by trained personnel only. They must be familiar with and follow the particular hazards and understand how to operate the device and understand the operating instructions.
- The device may only be used when it is in a technically perfect condition.

2.1.1 Appropriate use

ATTENTION

▶ The design of the device must correspond to the conditions of use. The operator is solely responsible for this.

▶ Any use deviating from the above will be considered improper!

- The device may only be operated under the following conditions mentioned in the:
  - chapter *3 Technical data*
  - on the type plate and
  - in the technical specifications for each order.
- The device is intended exclusively for vacuum technology applications.
- Gaseous media only may be pumped.
- The device is intended for indoor use only.

The following shall also be deemed as intended:

- Observe these operating instructions including any safety/warning instructions.
- Define and enforce safety precautions (see chapter *2.3 Safety precautions*).
- Compliance with the operating instructions for connections.
- Use of approved spare parts and accessories from Gardner Denver Thomas GmbH.

2.1.2 Use contrary to the intended purpose

⚠ CAUTION

☐ **Risk of injury due to improper use!**

- Use for purposes other than those for which it is intended may result in personal injury.

▶ The operator must ensure operation is in accordance with *2.1.1 Appropriate use*!

The following shall be considered as use contrary to the intended purpose:

- Applications that do not correspond to the intended use (see chapter *2.1.1 Appropriate use*).
- Use outside the specifications stated:
  - the technical data,
  - on the type plate or
  - in the conditions set out in the delivery contract.
- Operation in an unsound technical condition.
- Outdoor operation.

ATTENTION

▶ The operator must prevent applications that are not in accordance with the intended use. Precautions must be taken to ensure operation is in accordance with the intended use!

2.1.3 Foreseeable misuse

ATTENTION

▶ Misuse is generally PROHIBITED. It is also considered contrary to the intended use!

The following is considered foreseeable misuse:

- Manipulation of the device, e.g., unauthorised additions or modifications.
- Leaving critical applications unattended.
- Operating the device with tools or other unauthorised objects.
- Conveying inadmissible or liquid media.
- Operation by untrained or non-expert personnel.
- Safety precautions are inadequate or non-existent.
- Failure to comply with the regulations applicable by law.
- Operation in an explosive application and environment.

2.2 Target groups

ATTENTION

▶ Use by untrained personnel may result in misuse.

▶ The operator must ensure that personnel is properly trained and that all the necessary safety precautions are observed!

2.2.1 Qualification of personnel

User	Field of activity
User	Laboratory personnel, e.g., chemists
Operator	Responsible representative (processes)
Specialist	Person with professional qualifications, e.g., mechanic, electrician, laboratory manager etc.
Manufacturer	Service and maintenance/servicing by the manufacturer or authorised service provider only

2.2.2 Overview of responsibilities

Activity	User	Specialist	Manufacturer
Set up/Connection	x	x	x
Commissioning/Operation	x	x	x
Analysis of operational malfunctions	x	x	x
Troubleshooting	(1)	x	x
External maintenance/inspection	x	x	x
Internal maintenance/inspection	(1)	x	x
Repair operator	(1)	x	

Activity	User	Specialist	Manufacturer
Damage report	x	x	
Decontamination			(2)
Disposal		x	x

(1) Implementation by specially trained users only.

(2) Implementation by qualified and authorised service providers only.

2.3 Safety precautions

2.3.1 General safety precautions

ATTENTION

- ▶ For user safety, the operator must define and enforce the safety precautions.
- ▶ Failure to do so may endanger the health of the user.

All safety precautions must have the highest priority to ensure the life and health of persons. In the event of possible safety risks, these are to be assessed and precautions taken to avert danger. Applications with a risk to life and limb are not permitted.

Applicable operating instructions by the operator and statutory regulations for accident prevention, and occupational health and safety must be observed.

PROTECTIVE CLOTHING

- ▶ Protective clothing must be worn for applications requiring PPE.
- ▶ The operator must specify the type and use of protective clothing.

2.3.2 Safe operation

Observe the following!

- Operation in accordance with the safety requirements in chapter *2.1 General information*.
- Use according to chapter *6.2 Safe operation*.
- The separators can only be emptied after ventilation of the vacuum system (see chapter *2.4.5 Vacuum* and *6.3 End of process*).
- Beware of potential hazards due to substances being pumped (see chapter *2.4.1 Hazardous substances*).
- Pneumatic connections must be in accordance with chapter *5.4.1 Connecting pneumatics*.
- Check attachment for damage (see chapter *5.1 Unpack*).
- Exhaust pressure must be atmospheric.
- Do not exceed the device's maximum operating height (see chapter *3.2 Characteristic values*).

Vapour pumping

In vapour applications, condensate may form in the pump feed. If required by the application, a capacitor must be connected upstream to protect the pump. Usage must be defined by the operator.

ATTENTION

- ▶ Condensation can greatly reduce the service life of the components, especially the diaphragms.
- ▶ For vapour applications, the gas ballast must be used (see chapter *4.2.5 Gas* ballast).
- ▶ The device must be at the operating temperature before the application is started.

NOTE If the device is at the proper operating temperature, less condensate is formed in the feed.

2.4 Special hazards

EMERGENCY SHUTDOWN

- ▶ In hazardous situations, disconnect the device from the mains by pressing the main switch or pulling the mains plug (Fig. 5-2).

NOTE If no voltage is applied, the motor stops, and any valves are closed.

2.4.1 Hazardous substances

⚠ WARNING

☐ **Risk to health due to hazardous substances!**

- Hazardous substances in the medium can endanger the health of persons.
- ▶ Safety and warning instructions for handling hazardous substances must be observed!

HAZARDOUS SUBSTANCES

- ▶ For applications involving substances bearing a GHS label, precautions must be taken to protect human health and the environment.
- ▶ The operator must, in compliance with the applicable regulations, assess possible risks in order to prevent personal injury, or damage to the environment and property.

  This is the responsibility of the operator.

ATTENTION

- ▶ Operation with media that belong to a biological risk group that can endanger human health, e.g., viruses or bacteria, is generally prohibited.

Beware of applications using hazardous substances!

- The requirements laid down in the safety data sheets of the manufacturers must be complied with for hazardous substances.
- Prevent toxic and environmentally harmful substances escaping from the equipment.
- Use the attachment parts to protect the environment and equipment (see chapter *4.3 Attachment parts*).
- Check the tightness and strength of the connection lines and all other connected components.
- Hazardous substances should be separated as much as is technically possible before entering the pump.

	**MATERIAL RESISTANCE** ▶ For applications involving aggressive media, the user must assess the resistance of the wetted parts of the device (see chapter *4.2.3 Material*).

2.4.2 Electricity

	⚠ DANGER
	☐ **Danger to life due to electric current.** • There is an immediate danger to life from electric shock if live parts are touched. ▶ It is generally prohibited to open the device.

Observe the following instructions:

- It is prohibited to operate the device without the casing.
- If the device is defective, switch it off and disconnect the mains plug.
- The mains plug and the cable must be in perfect condition.
- Main protective conductor: The connection must comply with the legal requirements.
- Beware that the device is permanently connected and may not be considered portable.

2.4.3 Mechanics

	**ATTENTION** ▶ Improper use or manipulation of the device can cause material damage to the connected devices or the equipment! ▶ External mechanical stresses and vibrations must not be transmitted to the device. ▶ The device may be connected with a flexible laboratory hose only (e.g., a metal hose).

2.4.4 Temperatures

⚠ CAUTION

☐ **Hot surface: Do not touch, risk of injury!**

- High temperatures at the motor housing and surrounding areas (Fig. 2-1) during operation. Can cause burns, do not touch.

▶ If operating the main switch Fig. 5-2/2), avoid touching hot surfaces.
The operator must ensure safe operation and take precautions to protect the user, where necessary (see chapter *2.3 Safety precautions*).

MEDIA/OPERATING TEMPERATURE

▶ It is prohibited to exceed the permissible media temperature!

▶ Beware of the values for permissible operation (see chapter *3.2 Characteristic values*).

▶ There must be sufficient ventilation around the device (see chapter *5.2 Setting up*).

NOTE The device heats up due to the motor and the temperature of the medium, as well as compression.
The device is equipped with a thermal circuit breaker that switches off the device in the event of overheating (see chapter *4.2.4 Motor thermal protection*)

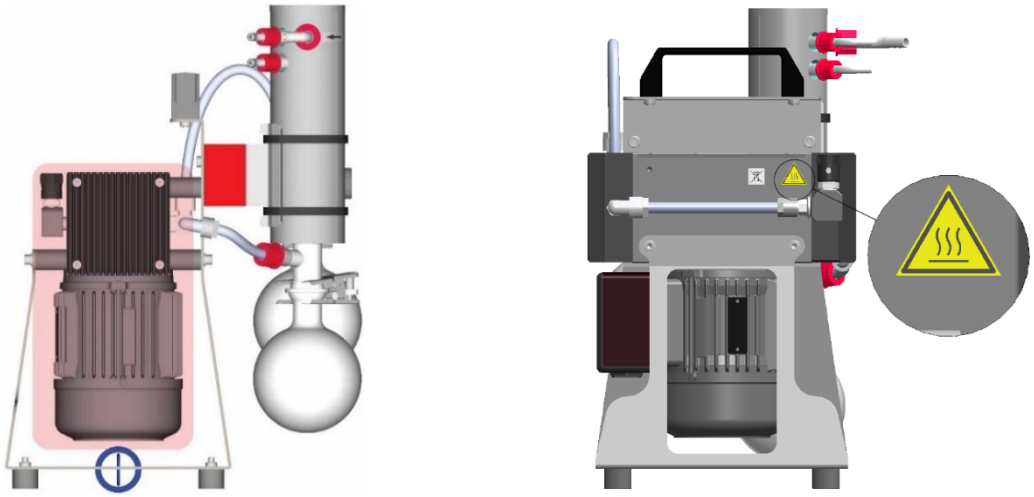


Fig. 2-1. 117047: Hot area on the device (left), rear view warning label (right)

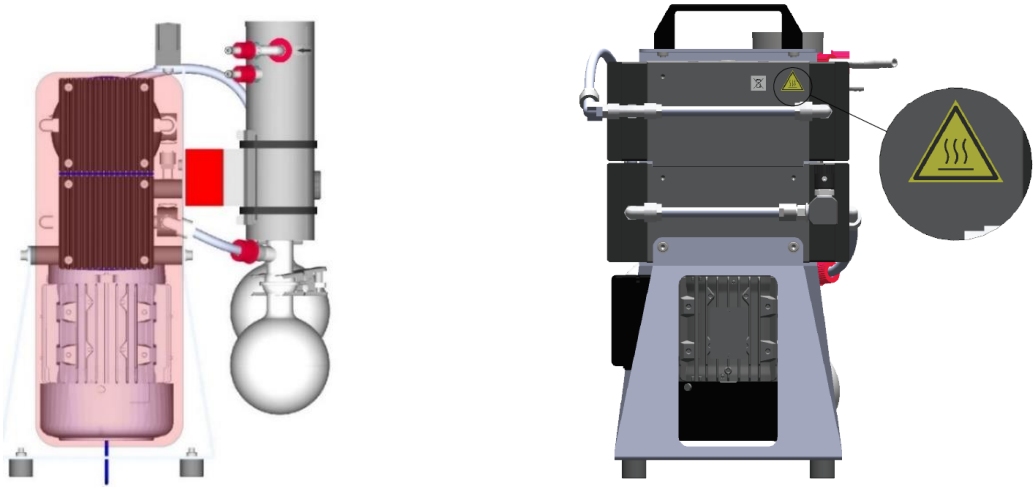


Fig. 2-2. 117057: Hot area on the device (left), rear view warning label (right)

Equipment

⚠ CAUTION

☐ **Cold surfaces: do not touch, risk of injury!**

- If an extremely cold coolant is used, surfaces such as those on the emission condenser, can reach dangerously low temperatures and lead to frostbite.

▶ The operator must ensure safe operation and take precautions to protect the user, where necessary (see chapter *2.3 Safety precautions*).

2.4.5 Vacuum

⚠ CAUTION

☐ **Risk of injury due to explosion!**

- The vacuum equipment can explode due to a rise in pressure after a sudden intake of air. The splinters can seriously injure the user.

▶ Check the pressure of the vacuum pump before disconnecting the pneumatic connections.

NOTE The vacuum equipment can be under vacuum even when it is switched off.

GLASSWARE

▶ Glassware is particularly high risk.
Make sure that glassware is shatter-proof and unbreakable!

▶ Glassware must be suitable for the intended application.

3 Technical data

3.1 Dimensions

MXPC 303 Z - 117047

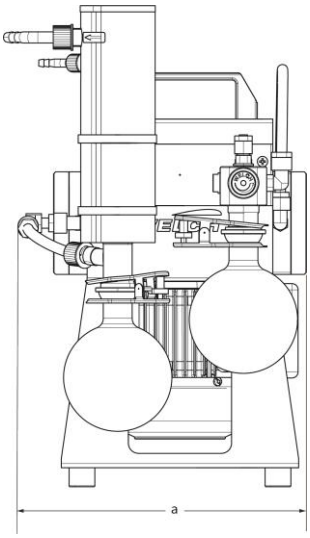


Fig. 3-1. Front view of device

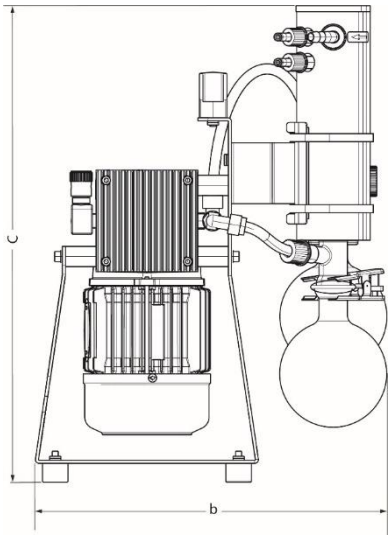


Fig. 3-2. Left view of device

MXPC 603 T - 117057

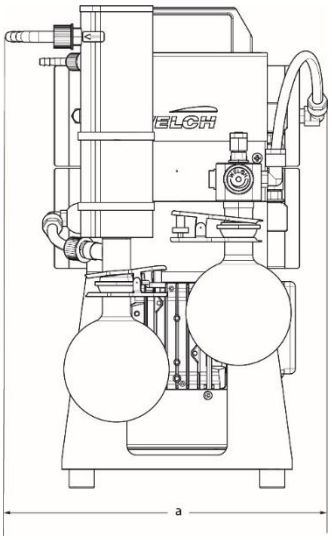


Fig. 3-3. Front view of device

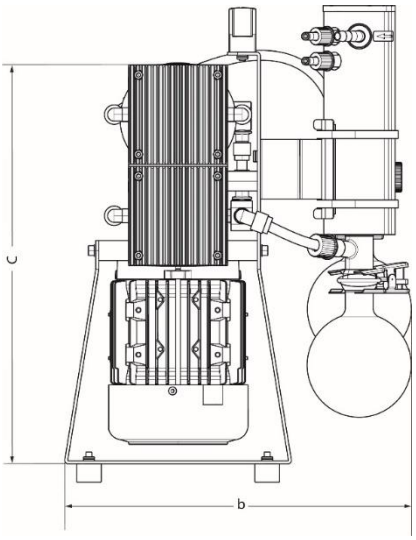


Fig. 3-4. Left view of device

Parameters	Data	
Article number	**117047**	**117057**
Width (a)	250 mm	280 mm
Depth (b)	350 mm	350 mm
Height (c)	440 mm	500 mm

3.2 Characteristic values

3.2.1 Pumping speed

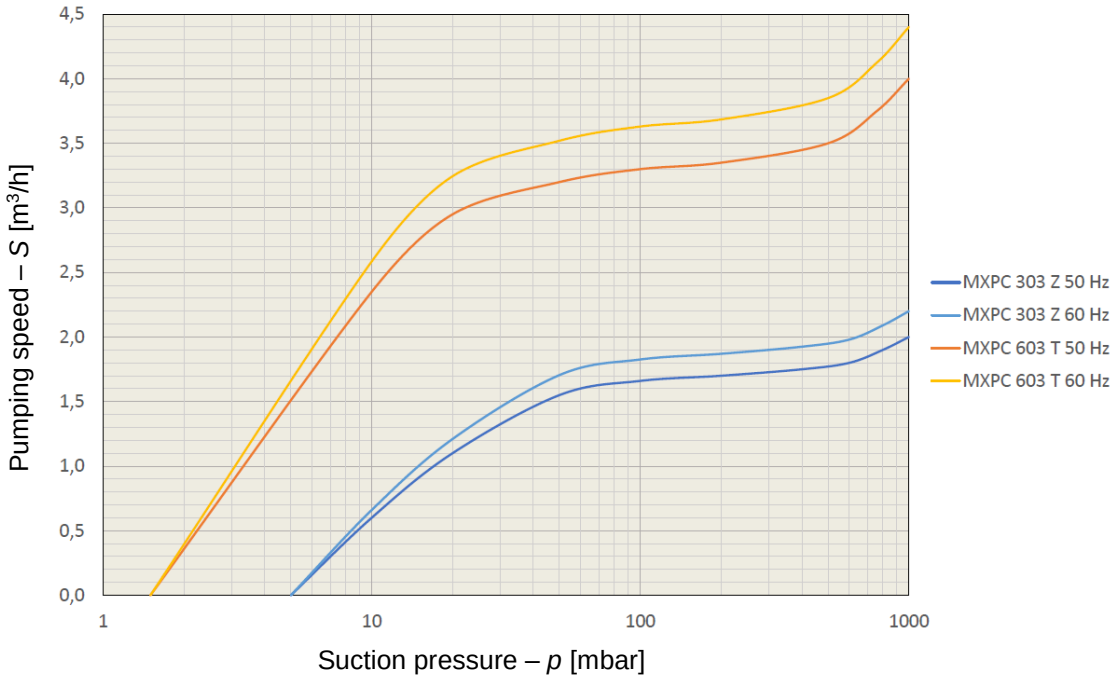


Fig. 3-5. Pumping speed characteristics *S(p)*

3.2.2 Parameters

Parameters	Unit	Data	
Article number	-	117047	117057
Designation	-	MXPC 303 Z	MXPC 603 T
Pumping speed ISO 21360-1* (50/60 Hz)	m³/h	2.0 / 2.2	4.0 / 4.4
Ultimate pressure (base pressure) ISO 21360-1* with gas ballast	mbar	≤ 5 ≤ 8	≤ 1.5 ≤ 3.0
Max. inlet/exhaust pressure	mbar	1100	
Degree of protection according to EN 60529	-	IP40	
Sound pressure level EN ISO 2151	db (A)	≤ 44	≤ 40
Weight (net / gross)	kg	14.7 / 18.5	25.4 / 28.9
Rated voltage	V	230	
Rated frequency	Hz	50 / 60	
Rated current	A	1.6	3.1
Operating temperature range	°C	+ 10 to + 40	
Max. media temperature	°C	+ 40	
Max. insertion height	m MSL	2000	
Storage humidity	RH	< 90%	
Coolant flow	l/min	> 5	
Max. coolant temperature	°C	+ 12	

NOTE * Technical data correspond to the basic units.

3.3 General Connections

Type of connection	Version	Use for
Pneumatic Inlet (suction) Output (pressure side)	 Hose nozzle DN 8-10 Hose nozzle GL 18	 Hose ID = 8-10 mm Hose ID = 8-10 mm
Accompanying parts (optional) Inlet (suction)	Hose nozzle DN 8-10 Compression fitting DN 10	Hose ID = 8-10 mm Tube 10/8 mm (AD/ID)
Equipment Cooler input/output	 Hose nozzle GL 14	 Hose ID = 8 mm
Mains connection	IEC 60320 C14	IEC 60320 C13

3.4 Materials

ATTENTION

- ▶ The operator must ensure that the application with the installed materials is not critical
- ▶ Beware of the safety/warning instructions (see chapter *2.4.1 Hazardous substances*)!

Components in contact with media

Components	Material
Pumping unit	
➢ Pump heads	➢ PTFE
➢ Diaphragm	➢ PTFE coating on elastomer
➢ Valves	➢ PEEK
➢ Seals	➢ EPDM
Pneumatic connections	
➢ Vacuum hoses	➢ PTFE
➢ Screw fittings	➢ PVDF
➢ O-ring seals	➢ EPDM
Attachment parts	
➢ Separator/emission condenser	➢ Glass (shatter proof)
➢ Connector for hose	➢ PTFE
➢ Connection block incl. hose fitting	➢ PVDF

4 Description

4.1 Scope of application

General description

- The device is suitable for conveying neutral gaseous media.
- The device is suitable for use in laboratories and industry when working in rough vacuum conditions.
- Gases enter the device, they are compressed, and finally expelled via the vacuum diaphragm pump.
- The glassware separates condensate media.
- The device must be connected in accordance with the legal requirements and operated in compliance with the technical data.

4.2 Structure

The device consists of a vertically mounted vacuum diaphragm pump (pump for short) and glassware.

The vacuum diaphragm pump consists of a pumping unit with two or four pump heads, a drive with a 1-phase electric motor and mechanical elements.

4.2.1 Device display

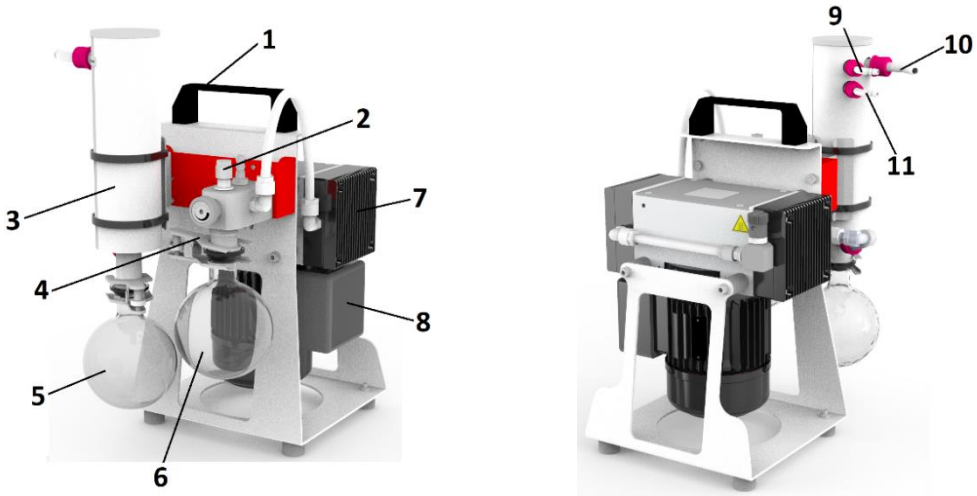


Fig. 4-1. 117047: view front (left) and back (right)

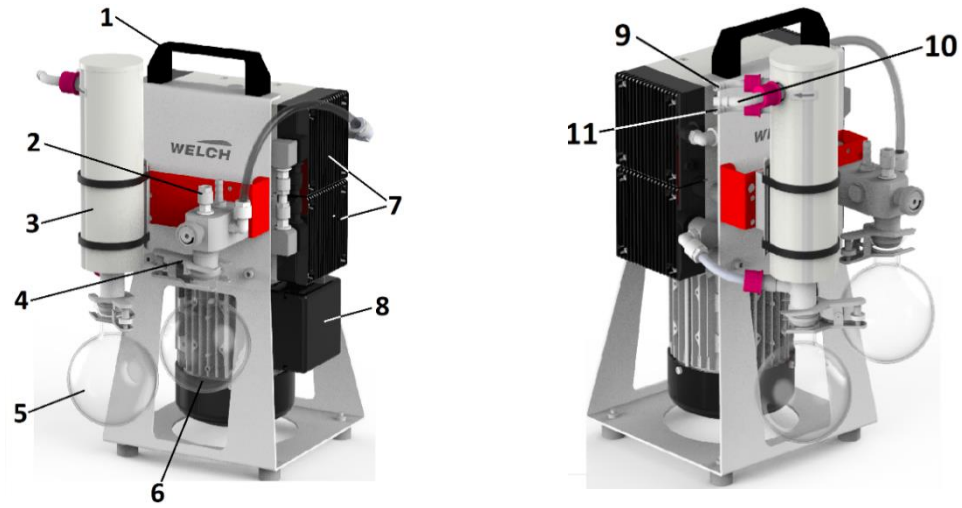


Fig. 4-2. 117057: view front

NOTE Display with accompanying material at the inlet (see chapter *3.3 General Connections*).

Position	Description
1	Carrying handle
2	Inlet (pneum.) suction port
3	Exhaust vapour condenser
4	Fork clamp
5	Pressure side separator
6	Suction side separator
7	Pumping unit
8	Mains connection/ On/Off switch (see Fig. 5-2)
9	Cooling water condenser outlet
10	Cooling water condenser inlet
11	Exhaust pressure connector

4.2.2 Pneumatic inlet

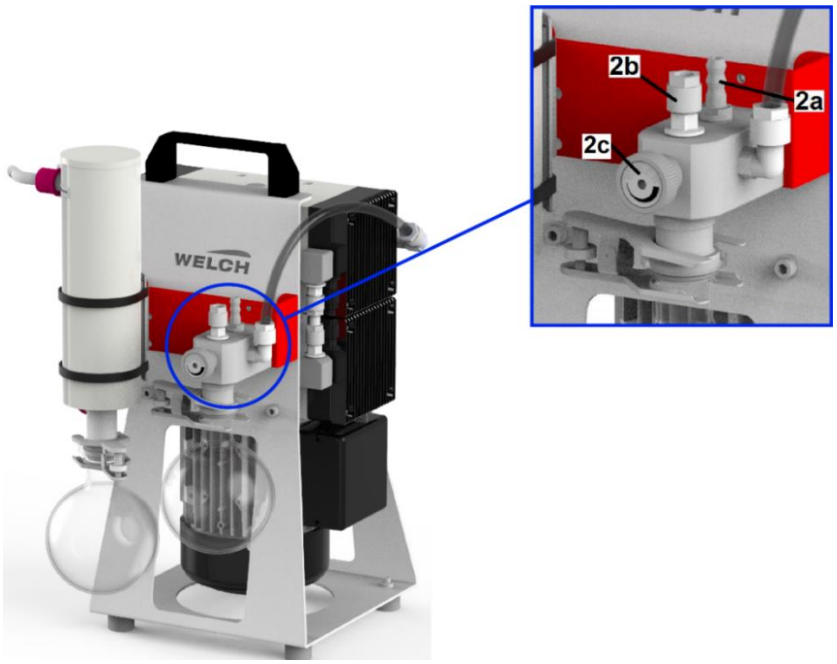


Fig. 4-3. Pneumatic inlet detail view (suction side)

NOTE Display with accompanying material at the inlet (see chapter *3.3 General Connections*).

Position	Description
2a	Inlet (pneum.) suction port, 1st application
2b	Optional port for: ➢ 2nd application (see chapter *4.4.1 Accompanying material*) ➢ Pressure gauge (see chapter *4.4.2 Optional fittings*)
2c	Control valve

The device is supplied as standard with a hose nozzle at the suction port (2a) and an optional connection (2b) is closed with a blind plug. A second application can be connected to the optional port using the accompanying material. Alternatively, a pressure gauge can be installed. The inlet pressure can be regulated with the control valve (2c).

NOTE Ambient air is sucked into the chamber via the control valve.

4.2.3 Material

The vertical beam is made of steel and a powder coating has been applied to all the edges/corners.

For pump part materials in contact with the medium (see chapter *3.4 Materials*).

4.2.4 Motor thermal protection

ATTENTION

- ▶ Do not reset the thermal circuit breaker until the fault has been analysed.
- ▶ Notify Support if the fuse trips again (see chapter *8.4 Repairs carried out by* the *manufacturer*).

The device is equipped with a thermal circuit breaker on the motor. This self-hold bimetal switch disconnects the entire device from the power supply in the event of overheating (see chapter *2.4 Special hazards*).

Reset thermal circuit breaker:

1. Switch off the device
2. Allow the engine to cool down completely
3. Switch on the device

4.2.5 Gas ballast

The device is equipped with a gas ballast valve. When the gas ballast is opened, ambient air is sucked into the chamber at the last stage.

In vapour applications, the gas ballast is intended to prevent the build-up of condensate in the pump feed (see chapter *2.3.2 Safe operation*).

Open/close gas ballast

- Open: the marking on the black valve cap must face the same direction as the hose connection.
- Close: The marking on the black valve cap must be at a right angle to the hose connection.

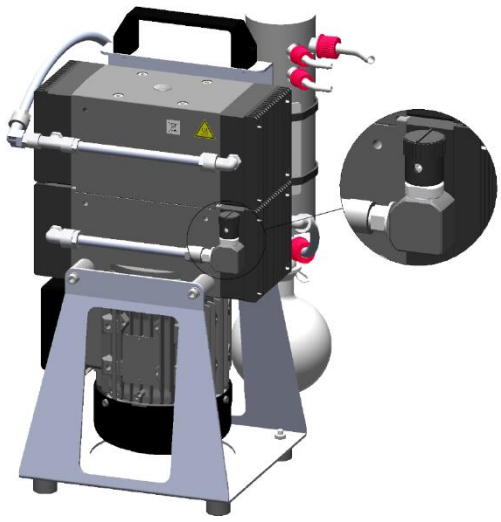


Fig 4.4 Gas ballast valve (detail view)

NOTE Fig. shows a closed gas ballast.

4.3 Attachment parts

ATTENTION

- ▶ Beware of the safety/warning instructions according to chapter *2.4.5 Vacuum*.
- ▶ To ensure safe operation, the attachment parts must always be used (see chapter *2.3.2 Safe operation*).

Side separator inlet

The separator connected upstream on the suction side protects the diaphragm pump. Condensate and liquid media are collected in the catchpot.

Exhaust vapour condenser

The exhaust vapour condenser filters out the residual vapours and catches them in the separator at the exhaust.

PNEUMATIC EXHAUST

- ▶ The device's suction connection must not be closed during operation (see Fig. 4-1/10 and Fig. 4-2/10).

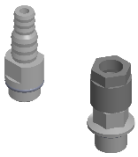
Safety valve

The gas inlet on the emission condenser contains a safety valve. It opens in case of overpressure, e.g., if it is clogged by deposits. Check the valve seals at regular intervals.

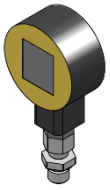
4.4 Accessories

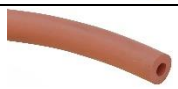
NOTE The scope of delivery is defined by the supply contract.

4.4.1 Accompanying material

Figure	Description
	**Optional suction port, 2nd application** ➢ Connector for hose ➢ Compression fitting See chapter *3.3 General Connections*

4.4.2 Optional fittings

Order no.	Designation	Figure
600100	**Vacuum controller VCpro 601 table-top device** ➢ Measuring/control device Working range 1100 – 1 mbar ➢ Regulation via vacuum control/vent valve ➢ Operating modes: manual, automatic and programme	
600203	**Vacuum pressure gauge with swivel adapter** ➢ Measuring range 1000 – 1 mbar ➢ 360° display ➢ G1/4" threaded connection	
600204	**Vacuum pressure gauge (digital) with swivel adapter** ➢ Measuring range 1000 – 1 mbar ➢ 360° display ➢ G1/4" threaded connection	

Order no.	Designation	Figure
828310-3	**Vacuum hose** Red rubber, 20/10 x 5 mm	
828310-4	**Vacuum hose** Rubber 18/8 x 5mm	
112575	**Rotary evaporator connection kit** contains connections and hoses for vacuum and cooling water.	
404005	**Vacuum furnace connector set** ➢ DN 16+25 KF ➢ DN 8 vacuum hose made from red rubber ➢ Adapter flange/hose nozzle.	
828346	**PVC-coated fabric coolant hose** ID = 8mm x wall thickness = 3	
828332	**Vacuum hose** PTFE, 10/8 x 1mm	
710116-01	**Inlet adapter** DN 16 KF - 1/4", PVDF	

5 Setting up and connecting

ATTENTION

- ▶ Beware of the safety/warning instructions (see chapter *2 Safety*).
- ▶ Check the device for electrical safety to exclude any possible damage during transport.

5.1 Unpack

Carefully unpack the device and check for:

- damage during transport,
- conformity with the specifications of the supply contract (type, connected loads),
- completeness of the delivery!

Inform us immediately if there are differences to the contractually agreed scope of delivery or if damage is apparent.

Remove all transport locks and adhesives from the device and remove the operating instructions and enclosed material from the packaging.

If a warranty claim is made, the device must be returned in suitable packaging that is safe for transport.

INFORMATION

- ▶ The General Terms and Conditions of the manufacturing company apply.
- ▶ The scope of delivery is determined by the delivery contract.
- ▶ Keep the packaging if the device is to be returned to the manufacturer's site or authorised workshops for repair.

5.2 Setting up

ATTENTION

- ▶ Ensure sufficient ventilation or cooling.
- ▶ The distance between adjacent parts and surfaces must be sufficient to prevent the device from overheating.
- ▶ Place the device on a flat horizontal surface.

5.3 Assembly

There is no need to assemble the device, as it is already fully assembled. The device only needs to be connected (see chapter *5.4 Connect*).

5.4 Connect

5.4.1 Connecting pneumatics

ATTENTION

- ▶ The pneumatic connection must be sound so that no leaks occur.

The following requirements apply to pneumatic connections:

- They must comply with chapter *3.3 General Connections*.
- They must be flexible (see chapter *2.4.3 Mechanics*).
- They must be suitable for vacuum application.
- The hose dimensions must be the correct size and the pumping capacity must not be impaired.
- Select the shortest connection length possible.

- Condensate in the pneumatic connections must always be capable of draining into the separators.

	OPTIONAL
	▶ Only use ready-made cables produced by the manufacturer. This eliminates the possibility of incorrect connections (see chapter *4.4.2 Optional fittings*).

Procedure

1. Connect inlet (Fig. 4-3/2a or 2b)
2. Connect output (Fig. 4-1/10, Fig. 4-2/10)

5.4.2 Connecting cooling water

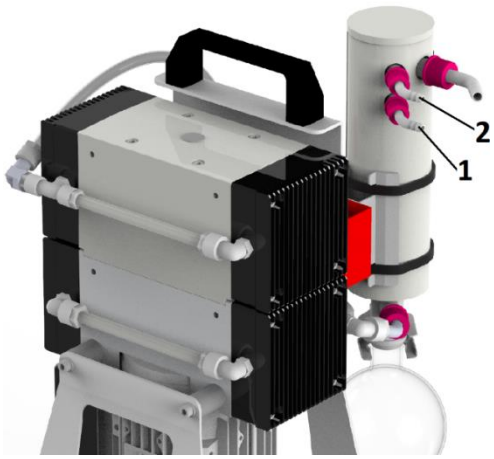


Fig. 5-1. Cooling water inlet and outlet (rear view)

NOTE We recommend you use fresh water as coolant (see chapter *3.2 Characteristic* values).

Procedure

1. Connect inlet (1)
2. Connect outlet (2)

5.5 Electrical connection

	⚠ DANGER
	☐ **Danger: electric shock risk!**
	• If the device is not connected in accordance with the legal requirements, it can cause serious injury and even death through contact during operation in the event of a fault.
	▶ The electrical connection must be made in accordance with the statutory requirements in your country and may only be carried out by a specialist.

Procedure

The device is supplied with a standard power cable that is connected at the port (Fig. 5-1/1).

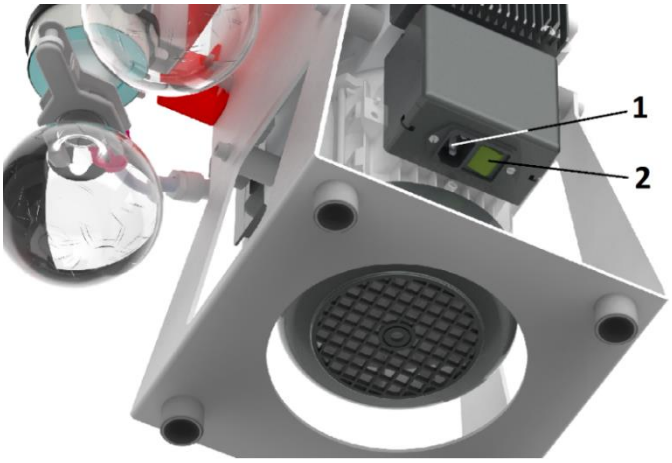


Fig. 5-2. Main switch and mains connection (rear view)

5.6 Storage

The device must be stored in a dust-free and closed interior space. The conditions for storage must be observed (see chapter *3.2 Characteristic* values).

	INFORMATION
	▶ During storage, all connections must be sealed with the protective caps supplied. ▶ A different but equivalent closure can also be used for storage.

6 Operation

6.1 Commissioning

ATTENTION

- ▶ Beware of the safety/warning instructions before commissioning (see chapter *2 Safety*).

STORAGE

- ▶ When the device is brought to the installation site for commissioning after storage in a cold environment, condensation may occur.
- ▶ Wait at least one hour before switching on until the device has reached ambient temperature and is absolutely dry.

Procedure

1. Check that the attachment parts are intact.
2. Check all connections according to chapter *5.4 Connect*.
3. Open the coolant.
4. Turn on the device at the main switch (Fig. 5-2/2).
5. Check the tightness of the pneumatic connections and equipment.
6. Check operating behaviour, e.g., for unusual running noises.

6.2 Safe operation

SAFE OPERATION

- ▶ Safe operation can only be guaranteed if the device is operated in accordance with chapter *2 Safety* and *3 Technical data*.

ATTACHMENT PARTS

- ▶ Attachment parts must always be used!
- ▶ The separator fill levels must be monitored.
- ▶ The separators must be emptied regularly (see chapter *2.3.2 Safe operation*).
- ▶ If different vacuum applications are connected, media may mix. This mixture of media must not endanger persons, the environment and/or equipment!

Checking equipment regularly

- Unusual running noises
- Ensure all electrical and pneumatic connections are sealed tightly
- Check pneumatic connection for tightness
- Pneumatic connection free of deposits
- Integrity of attachment parts

6.3 End of process

Removing and emptying the separators

The cycle and the procedure for emptying must be determined by the operator. Safe emptying must be guaranteed.

	SEPARATOR
	▶ Empty the separator no later than when it is ¾ full. ▶ When removing the separator, take care not to spill its contents. ▶ Wear protective clothing if required when handling the condensed media (see chapter *2.3 Safety precautions*).

Procedure (Fig. 6-1)

1. Hold the separator (3)
2. Unscrew the knurled screws (2)
3. Loosen the clamp for the spherical ground joint (1)
4. Remove the separator

NOTE Fastening in reverse order

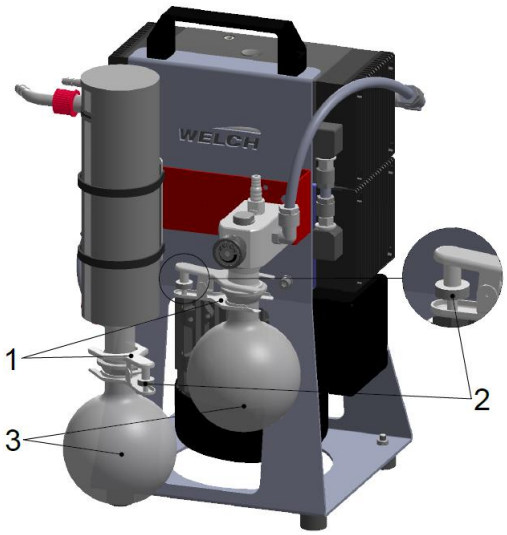


Fig. 6-1. Changing the separator

7 Operating faults

OPERATING FAULTS INSIDE THE DEVICE

► To eliminate operating malfunctions inside the device, follow the instructions and notes in chapter *8 Maintenance* and *8.3 Repairs carried out by* the *operator* must be observed!

NOTE Authorisation to remove the operating malfunctions (see chapter *2.2.2 Overview of responsibilities*).

1: User/(1): only specially trained users

2: Skilled worker

3: Manufacturer

Type of error	Cause:	Action	Authorised
Vacuum pump does not start	Device switched off	Switch on the device at the main switch (Fig. 5-2/2)	**1**
	Incorrect operating voltage	Check operating voltage according to chapter *3.2 Characteristic values*	**2**
	No power supply	Check mains connection	**2**
	Mains cable defective or brittle	Replacing the mains cable [1]	**2**
	Thermal switch has been triggered	Reset according to chapter *4.2.4 Motor thermal protection*	**1**
	Blocked drive	Change diaphragm[2]	**(1)**
	Defective drive	Notify Support[1]	**3**
	Defective motor	Notify Support[1]	**3**
Vacuum pump generates no or only insufficient vacuum	Leaking connected equipment and/or elements	➢ Detect leaks ➢ Seal the gaskets/hoses and replace if necessary.	**1**
	Pump unit is leaking	Check seal/replace if necessary: ➢ Hose connections ➢ Screw connections.	**(1)**
	Pump head is leaking	Notify Support[1]	**3**
	Faulty diaphragm	Diaphragm replacement[2]	**(1)**
	Faulty valves	Valve replacement[2]	**(1)**
	Soiled pump unit	General maintenance/cleaning	**1**
	Soiled valves	Clean valves	**(1)**
Noise coming from the device	Soiled pump unit	General maintenance/cleaning	**1**

[1] See chapter *9.2 Contact details for Support or to place an order*

[2] See chapter *8.3 Repairs carried out by the operator*

8 Maintenance

⚠ WARNING

☐ **Risk to health due to hazardous substances!**

- Components that come into contact with media can be contaminated with hazardous substances through applications, which can endanger the health of persons.

▶ Affected components must be decontaminated before maintenance (servicing, inspection and repair); if necessary, further safety precautions must be taken.

▶ The operator must enforce decontamination and safety precautions (see chapter *2.3 Safety* precautions and chapter *2.4.1 Hazardous* substances)!

8.1 Maintenance and inspection

MAINTENANCE/INSPECTION

▶ In applications using media that affect the service life of materials, the device must be serviced regularly.

▶ For the safe operation of the device, the operator must prepare an application maintenance/inspection plan and enforce maintenance cycles.

NOTE Malfunctions and damage can occur due to blocked pipes at the exhaust or inlet. All connections must be free of deposits.

General information

- Regularly check the tightness of the system.
- Check flow can pass through the pneumatic connection, especially the exhaust.
- Change the seals if necessary.
- Check that all the connections are tight.
- Check the integrity of the glassware.
- Check the functioning of the vacuum pump, e.g., for abnormal operating noises.
- Empty the separator without delay.

8.2 Maintaining by cleaning

⚠ WARNING

☐ **Danger to health due to unintentional chemical reactions!**

- Unsuitable cleaning agents can cause a health hazard by reacting with components in the device or the coating material.

▶ Do not use cleaning agents that react with components in the device or the coating material.

▶ The operator must assess the usability of cleaning agents.

CLEANING AGENTS

▶ There is a risk of corrosion if cleaning agents containing acids or halides are used.

▶ Clean the device after each use to avoid possible corrosive damage caused by chemicals in the feed material.

INFORMATION

▶ We recommend using only the cleaning agents specified in the operating instructions.

Procedure

1. Switch off the device.
2. After cleaning, remove cleaning agents completely from surfaces with a damp cloth.
3. After any cleaning and decontamination precautions are taken, allow the device to dry completely before using it again.
4. Depending on the degree of contamination, clean components in contact with the media at regular intervals with a suitable solvent (such as acetone).
5. Wipe surfaces with a damp cloth. Additionally, we recommend the following cleaning agents:

Part of the device	Cleaning agents
Outer surfaces and motor housing	Standard commercial cleaning agents with no acid and halogenides, alcohol solutions
Hoses for tanks to collect condensate	Standard commercial cleaning agents with no acid and halogenides
Valves, pump head and diaphragm	Acetone with a soft cloth

8.3 Repairs carried out by the operator

AUTHORISATION

▶ Repair work may only be carried out by specialist personnel or specially trained users (see chapter *2.2.2 Overview of responsibilities*).

▶ The operator is responsible for ensuring that the repair is carried out properly.

ATTENTION

▶ The device must be disconnected from the mains before any maintenance work is carried out.

NOTE Additional safety precautions may be necessary during repair work (see chapter *2.3 Safety precautions*). The specific measures are defined by the operator.

Maintenance cycle

We recommend changing the diaphragm annually or every 8,000 operating hours. The operator must enforce monitoring procedures.

Spare parts

MAINTENANCE KIT

▶ The replacement parts for the pumping unit can be ordered as a maintenance kit (see chapter *9.1 Spare parts overview*).

The following tools are needed:

- SW17 open-end spanner
- 4 and 5 mm allen key

8.3.1 Disassembly

ATTENTION

▶ The glassware must be removed and the separators must be emptied (see chapter *6.3 End of process*) before dismantling.

Removing the pump from the carrier (Fig. 8-1)

1. Loosen and disconnect the pneumatic connection to the pump.
2. Turn the rear of the device upwards to position horizontally:
   a. Loosen the screws (2x) on the pump/carrier,
   b. Remove spacers and screws.
3. Turn the front of the device upwards to position horizontally:
   a. Loosen screws on pump/carrier
      MXPC 303Z (2x)
      MXPC 603T (4x)
   b. Remove spacers and screws.
4. Separate pump and carrier.

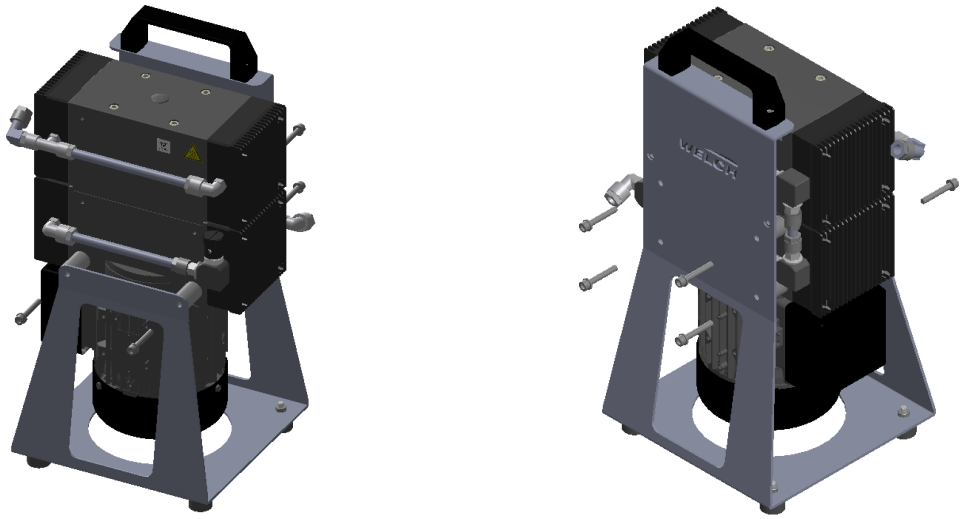


Fig. 8-1. Loosening the screw connections: rear(left), front (right)

Pumping unit (Fig. 8-2)

1. Loosen the compression fittings (2) at the hoses (1).
2. Loosen the cap screws (7).
3. Remove the heat sink (8).
4. Pull the valve insert (6) out of the pump head (4).
   NOTE M5 threaded insert.
5. Remove valves (5) and O-rings (9/10).
6. Remove the pump head (4).
7. Loosen the diaphragm (3).
   NOTE counter clockwise
8. Clean the pump head (3) if necessary (see chapter *8.2 Maintaining by cleaning*).
9. Drive function check.

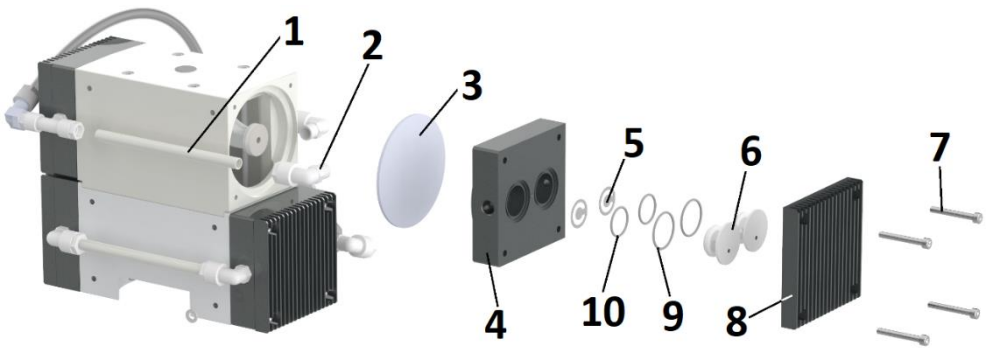


Fig. 8-2. Pumping unit (exploded view)

NOTE To change the diaphragm, turn the pump heads upwards to a horizontal position.

Position	Description
1	Hoses
2	Compression fittings
3	Diaphragm
4	Pump head
5	Valves
6	Valve inserts
7	Cheese head screws
8	Heat sink
9	O-rings 28x2
10	O-rings 22x2

8.3.2 Assembly

Pumping unit (Fig. 8-2)

1. Mount the diaphragm (3) tightly by hand.
2. Move the connecting rod/diaphragm (3) to the centre position.
3. Put on the pump head (4).
   NOTE Position the hose connection in the compression fitting.
4. Insert the O-rings (9/10).
5. Insert valves (5):
   NOTE Insert correctly, otherwise leaks will occur!
   a. Ensure continuous support
   b. Do not insert the burr side of the valve in the direction of the sealing surface.
6. Insert the valve inserts (6).
7. Put on the heat sink (8).
8. Tighten the cap screws (7) symmetrically.
9. Tighten the compression fitting (2).

Pump in the carrier (Fig. 8-1)

1. Put the pump and carrier together.
2. Position the front side upwards.
   a. Bring the spacers and screws together.
   b. Fit the screws on the pump/carrier.
      MXPC 303Z (2x)
      MXPC 603T (4x)

3. Turn the rear upwards to position horizontally.
   a. Bring the spacers and screws together.
   b. Mount the screws (2x) on the pump/carrier.
4. Connect pneumatic connection to pump inlet/exhaust.
5. Tighten the compression fitting.

8.3.3 Functional test

ATTENTION

- ▶ The device must not produce any abnormal noise or vibration.
- ▶ Switch off the device immediately if it does not work properly.

Procedure

1. Connect a vacuum gauge to the suction side of the device.
2. Measure and calibrate the final pressure (see chapter 3.2Characteristic values)
   NOTE The value will be reached within 1 minute with proper functionality.

8.4 Repairs carried out by the manufacturer

⚠ WARNING

- ☐ **Health hazard due to contaminated components!**
- • Incomplete or incorrect damage reports can endanger the health of support personnel.
- ▶ Provide full details in the damage report, especially with regard to the possible contamination of components in contact with media.

SERVICE/REPAIR

- ▶ Service and repair at the manufacturer's site or in authorised workshops will only be carried out if the completed damage report including a decontamination declaration is submitted.
- ▶ An indication of contamination or complete cleaning is a legally binding part of the contract.

NOTE For transferring the device to the manufacturer, see chapter *9.2 Contact details for Support or to place an order*.

Damage report

You can download the damage report form from our website www.welchvacuum.com in the "Service" →"Damage reports" section.

If you do not have access to the internet, you can call us to request the form: +49 3677 6040.

8.5 Disposal

NOTE

- ▶ Incorrect disposal can lead to environmental damage.
- ▶ Disposal must be carried out in accordance with the legal requirements as per Directive 2012/19/EU.
- ▶ Contaminated equipment must be decontaminated in accordance with legal requirements.

9 Spare parts

The spare parts list contains all the spare parts with the information required to place an order.

When placing an order with us, please state the designation, number of pieces, serial number, and the order number.

LIABILITY

► We are not liable for damage caused by the installation of parts not provided by the manufacturer Gardner Denver Thomas GmbH.

9.1 Spare parts overview

Designation	Order numbers
Maintenance kit (O-rings, valves, diaphragms)	
➢ MXPC 303 Z	402052
➢ MXPC 603 T	402054
Emission condenser (complete)	700183-08
Dosing spindle	117502
Separator components	
➢ Round bottom flask 500 ml KS 35	828839
➢ Ball joint clamp stainless steel KS 35	828845

9.2 Contact details for Support or to place an order

Manufacturer

Gardner Denver Thomas GmbH
Am Vogelherd 20
98693 Ilmenau
Germany

Contact

Tel: +49 3677 604 0 (Customer Support)
Fax: +49 3677 604 131
E-mail: welch.emea@gardnerdenver.com
Website: www.welchvacuum.com

10 Annex

10.1 EU Declaration of Conformity

Translation of the original declaration (German)

Gardner Denver Thomas GmbH
Am Vogelherd 20
98693 Ilmenau
Germany

We hereby declare that we are responsible for the following product and due to its design and construction, and the documents which we have placed on the market, complies with the EU directives and standards listed below. In the event of a product modification to which we have not agreed, this declaration shall lose its validity.

Product description	
Device type	**Diaphragm pumping station**
Designation	**MXPC 303 Z - 230V, MXPC 603 T - 230V**
Article number	**117047, 117057**

This product meets the following directives and applied, harmonized standards	
2006/42/EC	EN ISO 12100:2011 / EN 1012-2: 1996+A1:2009
2014/30/EU	EN IEC 61000-6-2:2019 / EN 61000-6-3:2007 + A1:2011
2011/65/EU	EN IEC 63000:2018

Person authorised to produce this declaration on behalf of the manufacturer:

Place, date: Ilmenau, 16.12.2021

Robert Goetz
Plant Manager

Person established in the European Union authorised to compile the technical file.

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10.2 Notes

Annex

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