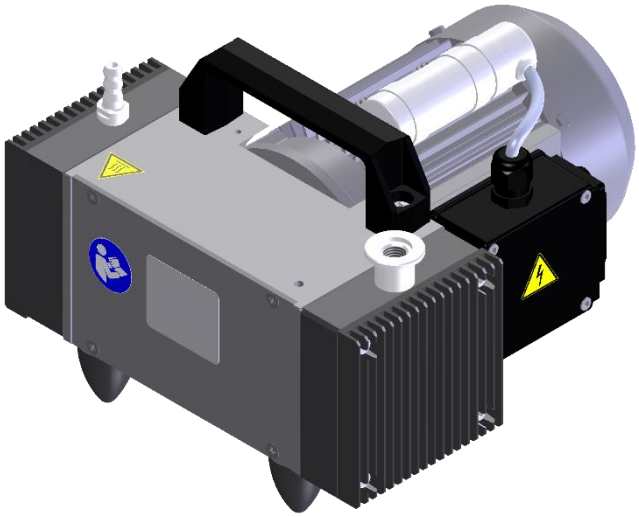
Operating Manual (EN)
Translation of the original Operating Manual in German

# Diaphragm Vacuum Pump (2 head)

MPC 303 Z
MPC 603 E



| | |
|---|---|
| | **OBSERVE** |
| | ► Read the Operating Manual carefully before use.<br>► Keep the Operating Manual for future reference. |

**41572x**
Vers.01 | Rev.00 2023-09-12

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# Content

# Content

# 1 Important Information

## 1.1 Note for the operator / user

**Safety**

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

**General information**

- Vacuum device/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 usage of vacuum apparatus / vacuum systems.

**About the device**

- The illustrations in the operating manual are based on design models and may differ from the original device.
- If illustrations are not displayed otherwise, then the illustration is configuration-independent. Please refer to deviations in device models.
- Throughout the rest of this document, Diaphragm Vacuum Pump (2 head) will be referred to as "device".
- "Device" describes the entire product, consisting of the built-in vacuum pump, add on components and various other parts.
- The operator is responsible for the proper usage of the device as well as vacuum apparatus / systems.
- Generally, the pneumatic connections are named as follows:
  - the inlet refers to the "suction side" and
  - the output refers to the "pressure side" for exhaust gas.

| | **Device model** |
|---|---|
| | ➢ The following devices correspond to the device model unless otherwise noted in this operating manual. |

| Article no. | Model | Corresponds to article no. / model | |
|---|---|---|---|
| **415721-40** | MPC 606 E China | **415721** | MPC 603 E |
| **415722-40** | MPC 303 Z China | **415722** | MPC 303 Z |

**Original version of the operating manual**

| Description | Display example |
|---|---|
| References to the chapter or figure are displayed in italics | see chapter *1 Important Information*<br>see *Fig. 2-1* |
| Hyperlinks (e.g. websites, e-mail, etc.) | www.welchvacuum.com |

## 1.2 Display

### 1.2.1 Warning and safety notice

**The warning notice are presented as follows:**

| ⚠ Signal word "HAZARD LEVEL" | |
|---|---|
| Indicator | ▲ **Nature and source of the hazard.**<br>△ Consequences of non-compliance.<br>☐ Escaping or avoiding the hazard. |

**Hazard level (signal word) and meaning**

| ⚠ DANGER |
|---|
| Indicates a grave hazard that will result in hazardous injuries or have fatal consequences. |

| ⚠ WARNING |
|---|
| Indicates a potentially hazardous situation, which, if not prevented, can lead to serious injuries or life-threatening consequences. |

| ⚠ CAUTION |
|---|
| Indicates a potentially hazardous situation. If not prevented, it could lead to minor injuries. |

**Safety Instructions**

| | SIGNAL WORD |
|---|---|
| Additional symbol | ► Important instructions for the user / operator.<br>⃠ Actions / activities that are not allowed. |

**Prohibition notes**

| | ATTENTION |
|---|---|
|  | ⃠ Description of the prohibited actions. |

### 1.2.2 Additional information

|  | Signal word |
|---|---|
| | ➢ Information for the user / operator. |

ⓘ Supplementary information for the user / operator.

### 1.2.3 Indicator / Symbols

**Safety Indicator**

| Icons | Explanation | Icons | Explanation |
|---|---|---|---|
|  | General warning sign |  | General mandatory sign |
|  | Warning of electrical voltage |  | Observe operating manual |
|  | Hot surface warning |  | Pull out the mains plug |
|  | Toxic substances warning |  | Use gloves |
|  | Warning of unexpected startup |  | Use eye protection |
|  | Low temperature warning |  | General prohibition sign |
|  | Explosive atmosphere warning | | |

**Additional symbols**

| Icons | Explanation |
|---|---|
|  | General information |

## 1.3 Abbreviations

**Legend**

| Abbreviation | Designation or meaning | Classification |
|---|---|---|
| **A** | Ampere | Electrical Parameter |
| **abs.** | absolute | Value |
| **AC**<br>**1~**<br>**3~** | Alternating current<br>Single-phase<br>Three-phase | Electrical Parameter |
| **OD** | Outer diameter | Dimension |
| **ATM** | Atmosphere | Pressure |
| **DC** | Direct current | Electrical Parameter |
| **DN** | Nominal size – inner diameter<br>(French diamètre nominal) | Dimension |
| **EPDM** | Ethylene propylene diene rubber | Materials |
| **EX** | Exhaust | Connection name |
| **Fig.** | Figure | Name |
| **hh:mm:ss** | Hour/minute/second | Time |
| **hPa** | Hectopascal (1 hPa = 1 mbar = 0.75 Torr) | Unit of pressure |
| **Hz** | Hertz | Electrical Parameter |
| **IN** | Inlet, suction connection | Connection name |
| **ID** | Inner diameter | Dimension |
| **max.** | Maximum | Value |
| **mbar** | Millibar (1 mbar = 1 hPa = 0.75 Torr) | Unit of pressure |
| **min.** | Minimum | Value |
| **mm** | Millimetre | Dimension |
| **MPC** | Membrane vacuum pump chemical resistant | Device model |
| **pneum.** | Pneumatic | Connection name |
| **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) | Unit of pressure |
| **MSL** | Height above Mean Sea Level | Parameter |
| **V** | Voltage | Electrical Parameter |
| **W** | Watt | Electrical Parameter |

# 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 manual.
- The device may only be used when it is in a technically perfect condition.

### 2.1.1 Appropriate use

**OBSERVE**

► 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:
  - According to the characteristic values in chapter *3 Technical data* and on the type plates (see *Fig. 4-1* and *Fig. 4-2*),
  - in the technical specifications for each order and
  - in perfect technical condition.
- 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 this operating manual including the safety/warning instructions.
- Compliance with the operating manuals incl. the safety/warning instructions for connected devices.
- Define and ensure safety measures (see chapter *2.3Safety* precautions).
- Compliance with the operating manuals for connected devices.
- Use of approved spare parts and accessories from Gardner Denver Thomas GmbH.

### 2.1.2 Use contrary to the intended purpose

**⚠ CAUTION**

▲ **Hazard 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*!

**OBSERVE**

► 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!

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

- Applications that do not correspond to the intended use (see chapter *2.1.1Appropriate 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.

### 2.1.3 Foreseeable misuse

**ATTENTION**

⃠ Misapplications are generally **PROHIBITED**. They are also considered to be contrary to the intended use!

**The following is considered foreseeable misuse:**

- Operating manual is not provided or read.
- Manipulation of the device, e.g. unauthorized 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 explosive application and environment (see chapter *2.4.6 ATEX* applications).

## 2.2 Target groups

**OBSERVE**

► 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 only by the manufacturer or authorized service providers |

### 2.2.2 Responsibilities

| Activity | User | Specialist | Manufacturer |
|---|---|---|---|
| Set up/Connection | X | X | X |
| Commissioning/Operation | X | X | X |
| Analysis of operational malfunctions | X | X | X |
| Troubleshooting | X[1] | X | X |
| External maintenance/inspection | X | X | X |
| Internal maintenance/inspection | X[1] | X | X |
| Repair operator | X[1] | X | - |
| Damage report | X | X | - |
| Decontamination | - | X[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

**OBSERVE**

- ► 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 hazard. Applications with a risk to life and limb are not permitted.

Applicable operating manuals by the operator as well as national regulations for accident prevention, safety and occupational health 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

**The following is mandatory!**

- Operation in accordance with the safety requirements in chapter *2.1 General* information.
- Use according to chapter *6.2 Safe operation*.
- Do not open the connected vacuum apparatus until it has been ventilated (see chapter *2.4.5Vacuum*).
- Beware of potential hazards due to substances being pumped (see chapter *2.4.1 Hazardous* substances).
- Pneumatic connections must be in accordance with chapter *5.5.1 Connecting pneumatics*.
- Check attachment for damage (see chapter *5.1 Storage*).
- Exhaust pressure must be atmospheric.
- Operate the device according to the technical data (see chapter *3.2Characteristic* values).

### Vapour pumping

In applications with vapors, condensation may form in the delivery area of the device. If the application requires it, a steam condenser must be connected upstream to protect the device. The use must be defined by the operator.

**CONDENSATION FORMATION**

- ► Condensation can greatly reduce the service life of the components, especially the diaphragms.
- ► For vapour applications, the gas ballast must be used (see chapter *4.2.3 Gas* Ballast).
- ► The device must be at the operating temperature before the application is started.
- ► After use, the device must be run down so that residual vapors are removed from the device.

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

**Flushing**

➢ By completely opening the suction side, the device can be cleaned internally with max. volume flow and the residual vapors or condensate can be removed.

**OBSERVE**

► Flushing may cause droplets to be ejected on the discharge side and enter the surroundings (see chapter *2.4.1 Hazardous* substances)!

## 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. 5-1*).

ⓘ 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 to be pumped can cause personal injury and damage to property.

☐ 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 hazards 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 pumping device.
- Check the tightness and strength of the connection lines and all other connected components.
- Hazardous substances should be eliminated according to the technical possibilities before entering the device.

**MATERIAL RESISTANCE**

► For applications involving aggressive media, the user must assess the resistance of the wetted parts of the device (see chapter *3.4 Materials*).

### 2.4.2 Electricity

**HAZARD**

▲ **Life hazard due to electric current.**

△ There is an immediate life hazard 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, disconnect the mains plug and switch off the power supply.
- The mains plug and the cable must be in perfect condition.
- The connection must comply with the legal requirements.

**OBSERVE**

► The device is to be evaluated as portable equipment.

### 2.4.3 Mechanics

**OBSERVE**

► 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, hazard 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. 5-1/1*), 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).

**ATTENTION**

► It is **PROHIBITED** to exceed the permissible media temperature!

**MEDIA/OPERATING TEMPERATURE**

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

► There must be sufficient ventilation around the device (see chapter *5.3 Setting* up).

ⓘ The device heats up due to the motor and the temperature of the medium, and the compression.

ⓘ The device is equipped with a thermal circuit breaker that switches off the device in the event of overheating (see chapter *4.2.2 Motor* thermal protection)

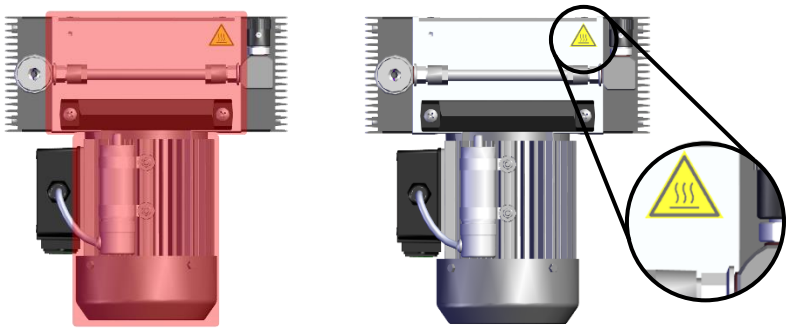


**Fig. 2-1. Hot zone on the device, warning label Top view (right)**

### 2.4.5 Vacuum

**⚠ WARNING**

**▲ Hazard of injury due to explosion!**

△ The vacuum device 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.

ⓘ The vacuum device 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.

### 2.4.6 ATEX applications

**ATTENTION**

⃠ Operation in an explosive application and surroundings is **PROHIBITED**!

**⚠ HAZARD**


▲ **Hazard of explosion due to critical applications!**

△ There is a life hazard when operating with explosive applications / environments.

⃠ Operation is not permitted and is considered a misapplication!

**OBSERVE**

► The device does not comply with Directive 2014/34/EU (ATEX).

► The device is not suitable for operation in potentially explosive surroundings or for conveying media that can form explosive mixtures.

# 3 Technical data

## 3.1 Dimensions

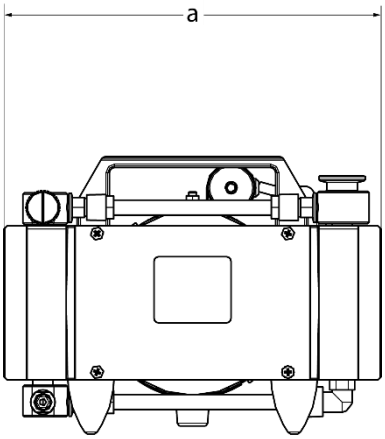



Fig. 3-1. Front view of device

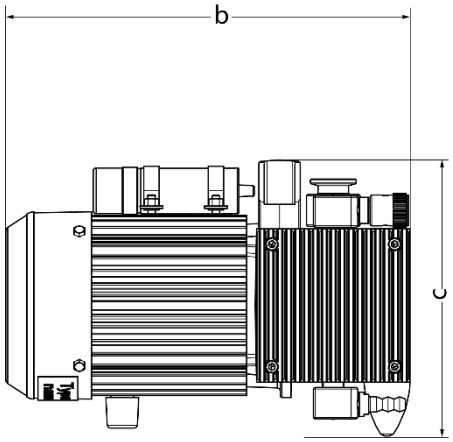



Fig. 3-2. Left view of device

ⓘ The main dimensions are identical for all models listed here.

| Pos. | Parameters | Data |
|---|---|---|
| **a** | Width | ≤ 250 mm |
| **b** | Depth | ≤ 270 mm |
| **c** | Height | ≤ 190 mm |

## 3.2 Characteristic values

**Pumping speed**

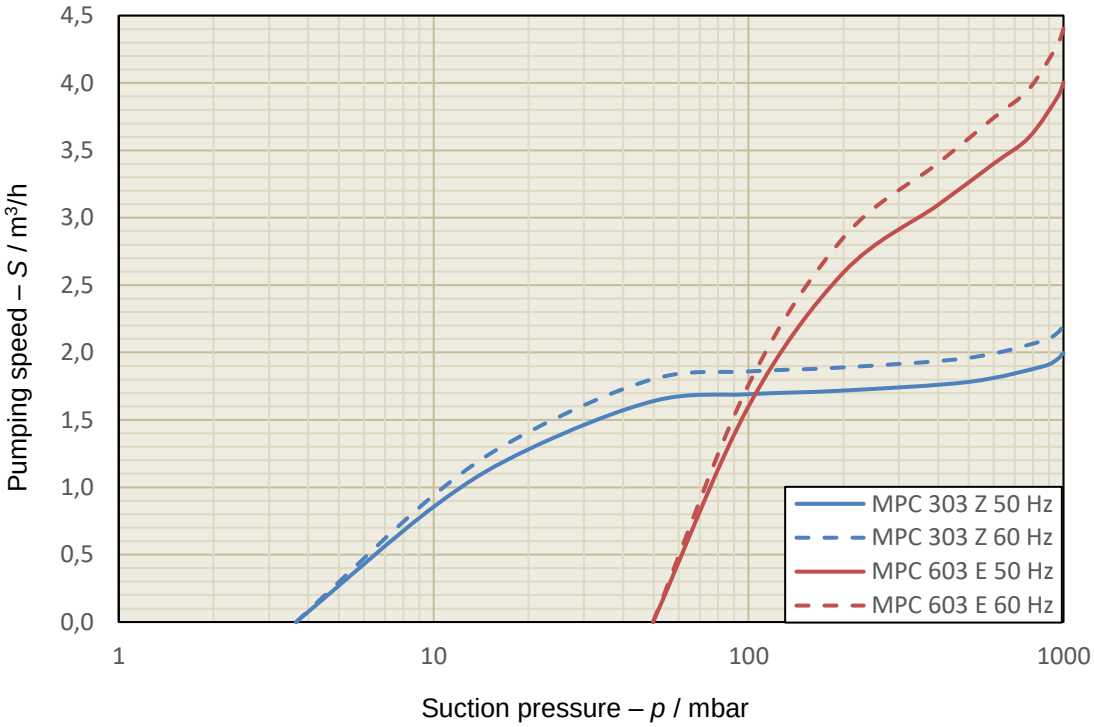



Fig. 3-3. Pumping speed characteristics *S(p)*

**Parameters**

| Parameter | Unit | Data | |
|---|---|---|---|
| **Article number**<br>**Model** | | **415721**<br>**MPC 603 E** | **415722**<br>**MPC 303 Z** |
| Pumping speed[1] (50/60 Hz) | $m^3/h$ | 4.0 / 4.4 | 2.0 / 2.2 |
| Ultimate pressure[1] (base pressure)<br>with gas ballast | mbar | ≤ 55.0<br>≤ 80.0 | ≤ 5.0<br>≤ 8.0 |
| Inlet/exhaust pressure (max.) | mbar | ≤ 1100 | |
| Protection dregree[2] | - | IP54/40 | |
| Sound pressure level[3] | db (A) | 44 | |
| Weight (net/gross) | kg | 11.2 / 13.0 | |
| Rated voltage | V | 230 (1~) | |
| Rated frequency | Hz | 50 / 60 | |
| Rated current (50/60 Hz) | A | 0.9 / 1.3 | |
| Operating temperature range | °C | +10...+40 | |
| Media temperature (max.) | °C | ≤ +40 | |
| Insertion height (max.) | MSL | ≤ 1000 | |
| Storage humidity | RH | < 90% | |

[1] according to ISO 21360-1
[2] according to EN 60034-5
[3] according to EN ISO 2151

## 3.3 General Connections

**MAINS CONNECTION**

► The electrical connection must be carried out in accordance with the legal requirements of the respective country.

| Type of connection | Version | Use for |
|---|---|---|
| **Pneumatic**<br>Inlet (suction)<br>Output (pressure side) | <br>Clamping flange DN 16 KF<br>Hose shaft DN 8 | <br>Clamping flange DN 16 KF<br>Hose ID = 8 mm |
| **Accompanying parts (optional)**<br>Inlet (suction) | Hose shaft DN 8-10 | Hose ID = 8-10 mm |
| **Mains connection** | IEC 60320 C14 | IEC 60320 C13 |

## 3.4 Materials

**OBSERVE**

- ► 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**<br>• Pump heads<br>• Diaphragm<br>• Valves<br>• Seals | <br>• PTFE<br>• PTFE coating on elastomer<br>• PEEK<br>• EPDM |
| **Pneumatic connections**<br>• Vacuum hoses<br>• Screw fittings<br>• O-ring seals | <br>• PTFE<br>• PVDF<br>• EPDM |

# 4 Description

## 4.1 General information

**OBSERVE**

The device must be connected in accordance with the legal requirements and operated in compliance with the technical data.

### Function

- The device is a dry-running diaphragm vacuum pump.
- By increasing and decreasing the displacement of the oscillating membrane in the pump head, gases are drawn in, compressed and expelled.

### Scope of application

- 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.

## 4.2 Design

The device is driven by an AC motor (1~) and consists of a pumping unit with two pump heads, which is designed in two pneumatic circuits.

| Article no. | Model | Wiring | Type of connection |
|---|---|---|---|
| **415721** | **MPC 603 E** | single-phase | parallel |
| **415722** | **MPC 303 Z** | Two-stage | series |

### 4.2.1 Device display

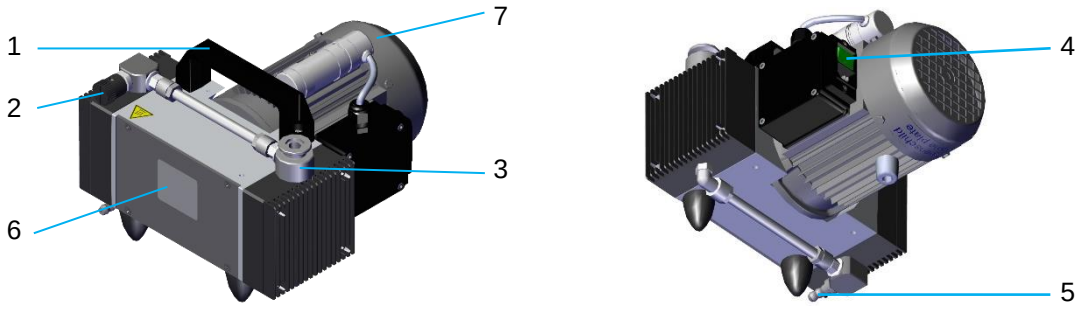



**Fig. 4-1. Model MPC 603 E, front (left) and rear (right) view**

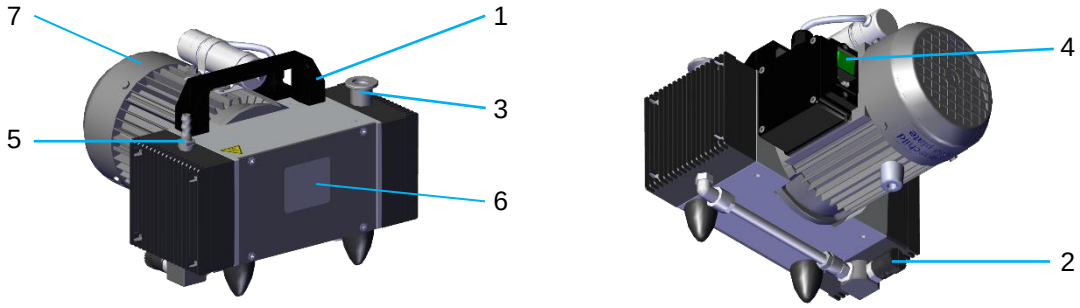



**Fig. 4-2. Model MPC 303 Z, front (left) and rear (right) view**

ⓘ Display without accompanying material at the inlet (see chapter *3.3 General Connections*).

| Pos. | Description |
|---|---|
| 1 | Carrying handle |
| 2 | Gas Ballast |
| 3 | Inlet (pneum.) suction port |
| 4 | Mains connection/ On/Off switch (see *Fig. 5-1*) |
| 5 | Output (pneum.) pressure side |
| 6 | Type plate overall device |
| 7 | Type plate motor |

### 4.2.2 Motor thermal protection

**OBSERVE**

- ► 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.

### 4.2.3 Gas Ballast

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

The gas ballast is intended to prevent the formation of condensate in the pump delivery area in applications with vapors (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.

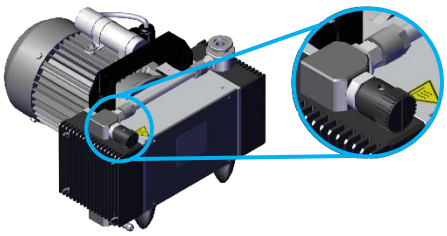


**Fig. 4-3. MPC 603 E - 415721**

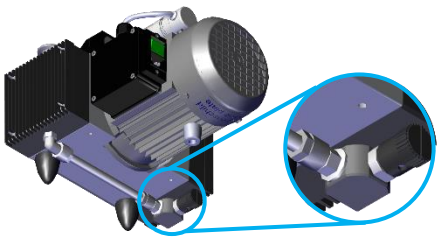


**Fig. 4-4. MPC 303 Z - 415722**

ⓘ Illustrations indicate gas ballast in closed condition.

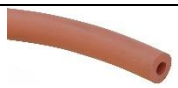
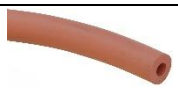
## 4.3 Accessories

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

### 4.3.1 Accompanying material

| Figure | Description |
|---|---|
|  | Hose shaft (see chapter *3.3 General Connections*) |

### 4.3.2 Optional fittings

| Order no. | Name | Figure |
|---|---|---|
| **600100** | **Vacuum controller VCpro 601 table-top device**<br>• Measuring/control device operation range 1100…1 mbar<br>• Regulation via vacuum control/vent valve<br>• Operating modes: manual, automatic and programme |  |
| **828310-3** | **Vacuum hose**<br>Red rubber, 20/10 x 5 mm |  |
| **828310-4** | **Vacuum hose**<br>Rubber 18/8 x 5mm |  |
| **404005** | **Vacuum furnace connector set**<br>• DN 16+25 KF<br>• DN 8 vacuum hose made from red rubber<br>• Adapter flange/hose nozzle. |  |
| **828332** | **Vacuum hose**<br>PTFE, 10/8 x 1mm |  |

# 5 Setting up and connecting

**OBSERVE**

- ► Beware of the safety/warning instructions (see chapter *2 Safety*).
- ► The device must be connected in accordance with the legal requirements and operated in compliance with chapter *3 Technical data*.
- ► Check the device for electrical safety to exclude any possible damage during transport.

- ➢ 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.

## 5.1 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).

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

## 5.2 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 manuals and enclosed material from the packaging.

When making a warranty claim, the device must be returned in suitable packaging that is safe for transportation.

## 5.3 Setting up

**OBSERVE**

- ► Ensure sufficient ventilation or cooling.
- ► The distance between adjacent parts and surfaces must be sufficient to prevent the device from overheating. The distance between the motor air inlet and walls, components, etc. must be at least 40 mm!
- ► Place the device on a flat horizontal surface.

## 5.4 Assembly

There is no need to assemble the device, as it is already fully assembled. The device only needs to be connected (see chapter *5.5 Connect*).

## 5.5 Connect

### 5.5.1 Connecting pneumatics

**OBSERVE**

► 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.
- They must always be free.
- 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 *4.3.2 Optional* fittings).

**Procedure**

1. Connect input (*Fig. 4-1/3*, *Fig. 4-2/3*).
2. Connect output (*Fig. 4-1/5*, *Fig. 4-2/5*) if required.

### 5.5.2 Electrical connection

**HAZARD**

▲ **Life hazard from electric shock!**

△ If the device is <u>not</u> connected according to the legal requirements, it can lead to serious injuries and even death in the event of a fault during operation due to contact.

☐ The electrical connection must be carried out in accordance with the legal requirements of the respective country.

**Procedure**

The device is supplied with a standard power cable that is connected at the mains connection *(Fig. 5-1/2*).

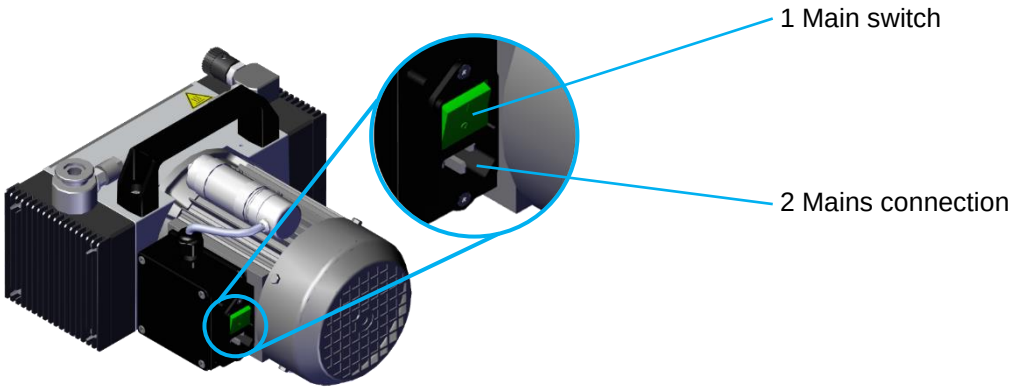



**Fig. 5-1. Main switch and mains connection (rear view)**

ⓘ Applies to both device models.

# 6 Operation

## 6.1 Commissioning

**OBSERVE**

► 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. Inspection of the attachment parts for intactness.
2. Check all connections according to chapter *5.5 Connect*.
3. Turn on the device at the main switch (*Fig. 5-1/1*).
4. Check the tightness of the pneumatic connections.
5. 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*.

**Checking equipment regularly**

- Unusual running noises
- Ensure all electrical and pneumatic connections are sealed tightly
- Pneumatic connection:
  - check for leaks
  - free from deposits
- Intactness of attachment parts

**OBSERVE**

► In applications with vapors, the device must run down (see chapter *2.3.2Safe operation*)

# 7 Operational 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!
- ► Authorization for the elimination of operational faults must be taken into account in accordance with the chapter *2.2Target groups*. The operator must enforce this!

**Responsibilities**

| No. | Agent (authorised) |
|---|---|
| **1** | User |
| **1a** | Users specially trained |
| **2** | Specialist |
| **3** | Manufacturer |

**Eliminate operational faults**

| Type of error | Cause: | Action | Authorised |
|---|---|---|---|
| **Vacuum pump does not start** | Device switched off | Switch on the device (*Fig. 5-1*) | **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 | Replacing the mains cable [1] | **2** |
| | Thermal switch has been triggered | Reset according to chapter *4.2.2 Motor* thermal protection | **1** |
| | Blocked drive | Change diaphragm[2] | **1a** |
| | Defective drive | Notify Support[1] | **3** |
| | Defective motor | Notify Support[1] | **3** |
| **Vacuum pump generates no or only insufficient vacuum** | Connected apparatus, connection elements leaking | • Detect leaks<br>• Seal the gaskets/hoses and replace if necessary. | **1** |
| | Pumping unit leaking | Check if necessary seal / change pneumatic connections | **1a** |
| | Leaking pump head | Notify Support[1] | **3** |
| | Defective diaphragm | Change diaphragm[2] | **1a** |
| | Defective valves | Change valve[2] | **1a** |
| | Pumping unit dirty | General maintenance / cleaning[3] | **1** |
| | Dirty valves | Clean valves[3] | **1a** |
| **Noise coming from the pumping unit** | Pumping unit dirty | General maintenance / cleaning[3] | **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

[3] see chapter *8.2 Maintaining by cleaning*

# 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)!

**OBSERVE**

► The device must be disconnected from the mains before any repair work is carried out!

ⓘ Additional safety precautions may be required for repair work (see chapter *2.3Safety* precautions). The specific measures are defined by the operator.

## 8.1 Maintenance and inspection

**MAINTENANCE/INSPECTION**

► The device must be serviced regularly in applications with media that affect the service life of materials.

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

ⓘ 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 connections are tight.
- Check the functionality of the vacuum pump, e.g. abnormal operating noises.

## 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.

ⓘ We recommend using only the cleaning agents specified in the operating manual.

**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** | 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 *2.2.2Responsibilities*).
- ► The operator is responsible for ensuring that the repair is carried out properly.

**OBSERVE**

- ► The device must be disconnected from the mains before any repair work is carried out!

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

**Maintenance cycle**

We recommend changing the diaphragm annually or every 8000 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

**Pumping unit (*Fig. 8-1*)**

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

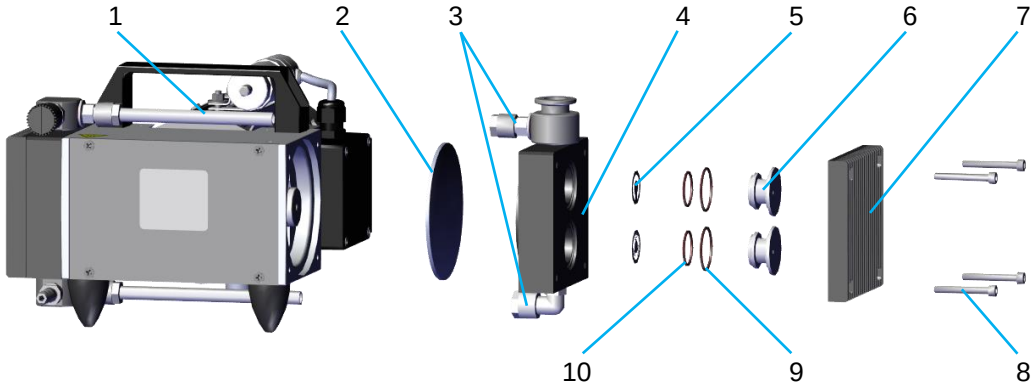



**Fig. 8-1. Pumping unit (exploded view)**

ⓘ To change the diaphragm, turn the pump heads upwards to a horizontal Position.

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

### 8.3.2 Assembly

**Pumping unit (*Fig. 8-1*)**

1. Mount the diaphragm (2) tightly by hand.
2. Move the connecting rod/diaphragm (2) to the centre position.
3. Put on the pump head (4).
   ⓘ Position the hose connection in the compression fitting.
4. Insert the O-rings (6/7).
5. Insert valves (5): ⓘ 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 (8).
7. Put on the heat sink (9).
8. Tighten the cap screws (10) symmetrically. ⓘ Tighten with a torque of 3 to 4 Nm!
9. Tighten the compression fitting (3).

### 8.3.3 Functional test

| | |
|---|---|
|  | **OBSERVE**<br>► The device must not produce any abnormal noise or vibration.<br>► Switch off the device immediately if it does not work properly. |

**Procedure**

1. Connect the vacuum gauge directly to the suction connection of the device.
2. Measure and calibrate the end pressure (see chapter *3.2 Characteristic* values).
   ⓘ Achieving the value within 1 min with proper function.

## 8.4 Repairs carried out by the manufacturer

| | |
|---|---|
| | **⚠ WARNING** |
|  | ▲ **Health hazard due to contaminated components!**<br>△ Incomplete or incorrectly completed damage reports can endanger the health of service personnel.<br>☐ Provide full details in the damage report, especially with regard to the possible contamination of components in contact with media. |

| | |
|---|---|
|  | **SERVICE/REPAIR**<br>► 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.<br>► The indication of contamination or complete cleaning is a legally binding part of the contract. |

ⓘ 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 604 0

## 8.5 Disposal

**OBSERVE**

- ► 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 name, 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 / Content | Order Numbers |
|---|---|
| **Maintenance kit (O-rings, valves, diaphragms)** | 402052 |

ⓘ Maintenance kit is for both device models

## 9.2 Contact details for Support or to place an order

**Manufacturer**

Gardner Denver Thomas GmbH
Am Vogelherd 20
98693 Ilmenau
Germany

**Contact**

| | |
|---|---|
|  | +49 3677 604 0 (Customer Support) |
|  | +49 3677 604 131 |
|  | welch.emea@irco.com  |
|  | www.welchvacuum.com  |

# 10 Annex

## 10.1 EU Declaration of Conformity

| Translation of the original declaration (German) |
|---|
| **Gardner Denver Thomas GmbH**<br>**Am Vogelherd 20**<br>**98693 Ilmenau**<br>**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 | |
|---|---|
| **Type of device** | **Diaphragm Vacuum Pump (2 head)** |
| **Model** | **MPC 303 Z**<br>**MPC 603 E** |
| **Article number** | **415722**<br>**415721** |

| The product complies with the following directives and standards | |
|---|---|
| **2006/42/EC** | EN ISO 12100:2010 / EN 1012-2:1996+A1:2009 |
| **2011/65/EU** | EN IEC 63000:2018 |

| | |
|---|---|
| Person authorised to produce this declaration on behalf of the manufacturer:<br>Place, date: Ilmenau, 12.09.2023 | Person established in the European Union authorised to compile the technical file.<br>**Gardner Denver Thomas GmbH**<br>Am Vogelherd 20<br>98693 Ilmenau<br>Germany |
| **Tobias Kraft**<br>Plant Manager<br>ppa. | +49 3677 604 0<br>+49 3677 604 131<br>welch.emea@irco.com<br>www.welchvacuum.com |

Additional information:

The device described above is inherently harmless with regard to electromagnetic compatibility and thus does not fall within the scope of Directive 2014/30/EU according to Article 2(2) d).

## 10.2 Notes

# Annex

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German