



**Dear customer,**

Thank you for buying our product. In this manual you will find all necessary information about this M&C product. The information in the manual is fast and easy to find, so you can start using your M&C product right after you have read the manual.

If you have any question regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor. You will find all the addresses in the appendix of this instruction manual.

For additional information about our products, please go to M&C's website [www.mc-techgroup.com](http://www.mc-techgroup.com). There you can find the data sheets and manuals of our products in German and English.

This Operating Manual does not claim completeness and may be subject to technical modifications.

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**MP<sup>®</sup>** is a registered trade mark.

Version: 1.01.02

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## 1 GENERAL INFORMATION

The product described in this instruction manual has been built and tested in our production facility.

All M&C products are packed to be shipped safely. To ensure the safe operation and to maintain the safe condition, all instructions and regulations stated in this instruction manual need to be followed. This instruction manual includes all information regarding proper transportation, storage, installation, operation and maintenance of this product by qualified personnel.

Follow all instructions and warnings closely.

Read this manual carefully before commissioning and operating the device. If you have any questions regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor.

## 2 DECLARATION OF CONFORMITY



The product described in this operating manual complies with the following EU directives:

### EMV-Instruction

The requirements of the EU directive 2014/30/EU "Electromagnetic compatibility" are met.

### Low Voltage Directive

The requirement of the EU directive 2014/35/EU "Low Voltage Directive" are met.

The compliance with this EU directive has been examined according to DIN EN 61010.

### Declaration of conformity

The EU Declaration of conformity can be downloaded from the **M&C** homepage or directly requested from **M&C**.

### 3 SAFETY INSTRUCTIONS

#### **Follow these safety precautions during installation, commissioning and operation of the de-vice:**

Read this operating manual before starting up and use of the equipment. The information and warnings given in this operating manual must be heeded.

Any work on electrical equipment is only to be carried out by trained specialists as per the regulations currently in force.

Attention must be paid to the requirements of VDE 0100 (IEC 364) when setting high-power electrical units with nominal voltages of up to 1000 V, together with the associated standards and stipulations.

Check the details on the type plate to ensure that the equipment is connected to the correct mains voltage.

Protection against touching dangerously high electrical voltages:

Before opening the equipment, it must be switched off and hold no voltages. This also applies to any external control circuits that are connected.

The device is only to be used within the permitted range of temperatures and pressures.

Check that the location is weather-protected. It should not be subject to either direct rain or moisture.

The Diaphragm-sample pumps MP47, MP47/R, MP47-Z, MP47-Z/R, MP47/D must not be used in hazardous areas.

Installation, maintenance, monitoring and any repairs may only be done by authorized personnel with respect to the relevant stipulations.

### 4 WARRANTY

In case of a device failure, please contact immediately M&C or your M&C authorized distributor.

We have a warranty period of 12 months from the delivery date. The warranty covers only appropriately used products and does not cover the consumable parts. Please find the complete warranty conditions in our terms and conditions.

The warranty includes a free-of-charge repair in our production facility or the free replacement of the device. If you return a device to M&C, please be sure that it is properly packaged and shipped with protective packaging. The repaired or replaced device will be shipped free of delivery charges to the point of use. See also chapter 20 for returning the device.

## 5 USED TERMS AND SIGNAL INDICATIONS



**Danger**

The 'Danger' warning sign indicates that death, serious injury and/or significant material damage will be the consequence, if the appropriate precautions should not be taken.



**Warning**

The 'Warning' warning sign indicates that death, serious injury or damage to property may occur, if the relevant precautionary measures are not observed.



**Caution**

The 'Caution' warning sign indicates that slight personal injury can occur, if the appropriate safety precautions are not observed.

**Caution**

'Caution' indicates that damage to property can occur, if the appropriate safety precautions are not observed.



**Note**

'Note' indicates important information relating to the product or highlights parts of the documentation for special attention.

**Qualified Personnel**

'Qualified personnel' are experts who are familiar with the installation, mounting, commissioning and operation of these types of products.



High voltages!

Protect yourself and others against damages which might be caused by high voltages.



This is important information about the product in relation to explosive atmospheres.



Corrosive!

These substances destroy living tissue and equipment upon contact. Do not breathe vapors; avoid contact with skin and eyes.



Wear protective gloves!

Working with chemicals, pointed objects or extremely high temperatures requires wearing protective gloves.



Wear safety glasses!

Protect your eyes while working with chemicals or pointed objects. Wear safety glasses to avoid getting something in your eyes.



Wear protective clothes!

Working with chemicals, pointed objects or extremely high temperatures requires wearing protective clothes.

## 6 INTRODUCTION

This diaphragm pump **MP47 ...** is suitable for corrosive gases. It is constructed especially for problems in the analysis technique.

## 7 DESCRIPTION

The pump **MP47** has a PTFE-head. All sample contacting parts are out of PTFE. The pump works absolutely lubricant free, so gases remain analytically unchanged. Due to a special diaphragm and valve system, the pump operates maintenance-free.

The **MP47 ...** is available in 230 V or 115 V and can be equipped with an Ex motor for applications in hazardous areas as well.

The standard **MP47 ...** is designed for normal applications at a maximum gas flow of 6 NI/min. Up to flow rates of 17 NI/min we recommend the type **MP47-Z**.

With the option **MP .../R** a needle valve is build into the pump-head to adjust the flow rate (see data sheet 10.2).

**M&C** provides for the series **MP47 ...** pump as option a diaphragm breakage monitoring. **MP47 .../D** is equipped with a special double-membrane safety system (see data sheet 10.3).

- Maximum temperature for medium during operating: -30 to +80 °C [-22 to 176 °C].
- The pump must be protected from the effects of dust and water.
- Before use please check the compatibility of the material.



Note

The diaphragm pumps of the series MP47 are not allowed for liquid medium.

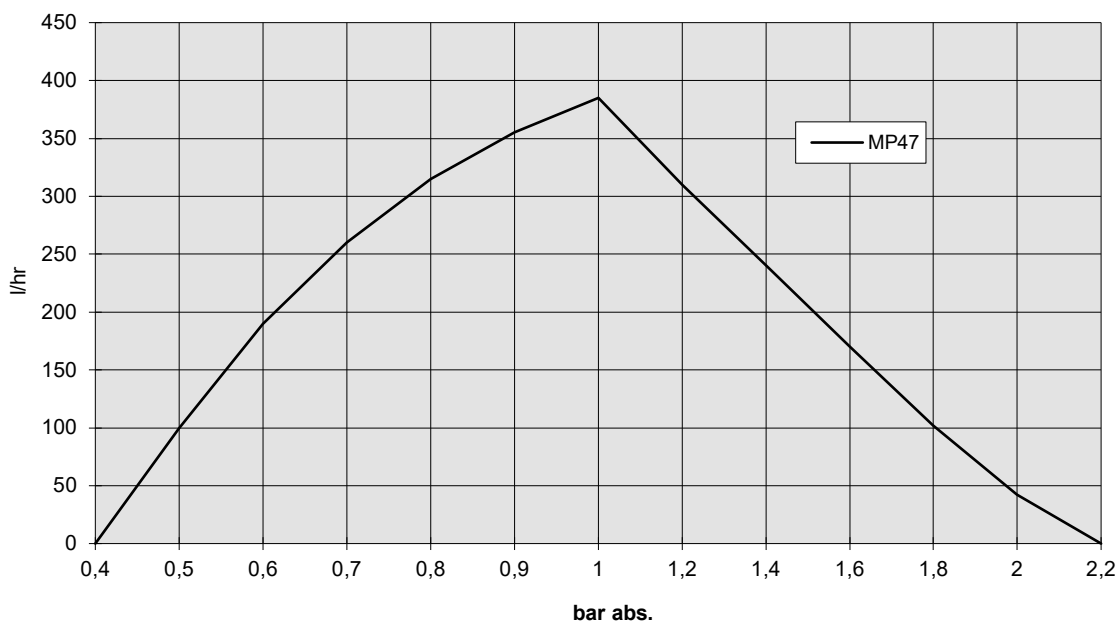


Figure 1 Pump capacity MP47



## 8 AMBIENT CONDITIONS

When the pump is operating the following ambient conditions must be maintained:

- Ambient temperature during operating: -10 to + 40 °C [14 to 104 °F].
- The pump must be protected from the effects of dust and water.
- During operating an adequate supply of air for cooling must be provided.

### 8.1 SAFETY

The protection class of the pumps **MP47/MP47-Z** is IP20 and so offer no protection against contact or foreign bodies.



It is therefore essential to provide protection for persons against contact with live parts (e.g. electrical connections, motor windings) and moving parts (e.g. fan). Protection against the entry of foreign bodies must also be provided.

The pumps have no protection against water. In this case too, as far as is relevant, measures to protect the pump must be taken before start-up.



Aggressive medium is possible.

Wear protective glasses and proper protective clothing during dis-assembly, repair or cleaning!

The pumps may only be used for their intended purpose.



Components connected to the pump must be designed according to the pneumatic performance of the pump (see technical data). Take care that safety regulations are observed when connecting the pump to the power supply. Specific safety instructions concerning sample must be observed.

## 9 TECHNICAL DATA

Diaphragm pump	MP47/230 V	MP47/115 V	MP47-Z/230V	MP47-Z/115V
Part No.	<b>02P1000</b>	<b>02P1000a</b>	<b>02P1100</b>	<b>02P1100a</b>
Power supply	230 V 50 Hz	115 V 60 Hz	230 V 50 Hz	115 V 60 Hz
Degree of protection	IP20 - DIN 40050			
Capacity max.	<b>6,0 NI/min</b> without pressure 0.85/1.25 bar abs., on suction/pressure side: 2.5 NI/min		<b>17 NI/min</b> without pressure	
Operating pressure	0.4 to 2.2 bar abs.		0.1 to 2.5 bar abs.	
Sample temperature	-30 to +80 °C [-22 to 176 °F]			
Ambient temperature	-10 to +40 °C [14 to 104 °F]			
Storage temperature	-15 to +60 °C [5 to 140 °F]			
Power consumption	110 W			
Current consumption	0.75 A	1.7 A	0.75 A	1.7 A
Gas connections	G1/4" female DIN ISO 228/1*			
Electrical standard	EN 61010 part 1			
Material of sample contacting parts	PTFE			
Operating mode	100 % continuous duty, start of the pump only without pressure			
Weight	4.4 kg [≈ 9.7 lbs]			

\*The dimensions and designation of the screw-in threads correspond to the respective applicable standard. The tolerances of the thread standards are matched to metal threads and cannot be applied to plastic threads.

Material mark according to ISO 1629 and 1043.1

Please note: NI/h and NI/min refer to the German standard DIN 1343 and are based on these standard conditions: 0 °C [32 °F], 1013 mbar.

## 10 MP47/R AND MP47-Z/R INCL. NEEDLE VALVE FOR FLOW ADJUSTMENT

The integrated needle valve type /R in the pump head is an internal bypass and allows to adjust the flow capacity. In case of the optimal needle form, flow adjustment in a wide range is possible. All parts in contact with sample are made out of PTFE and PVDF. No O-rings are necessary.

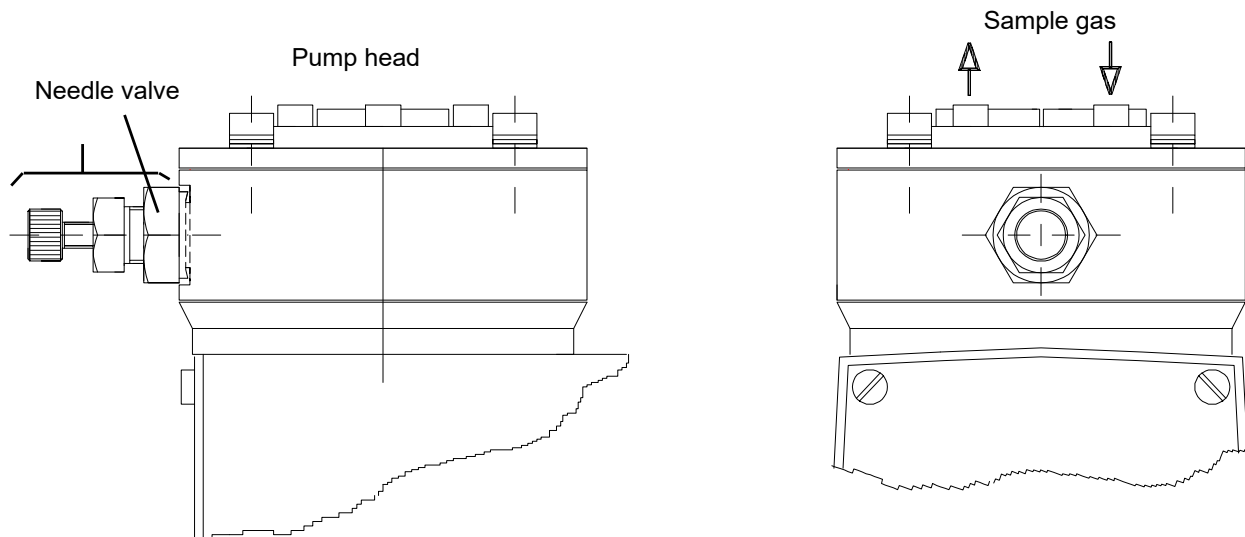


Figure 2 Pump type MP47/R

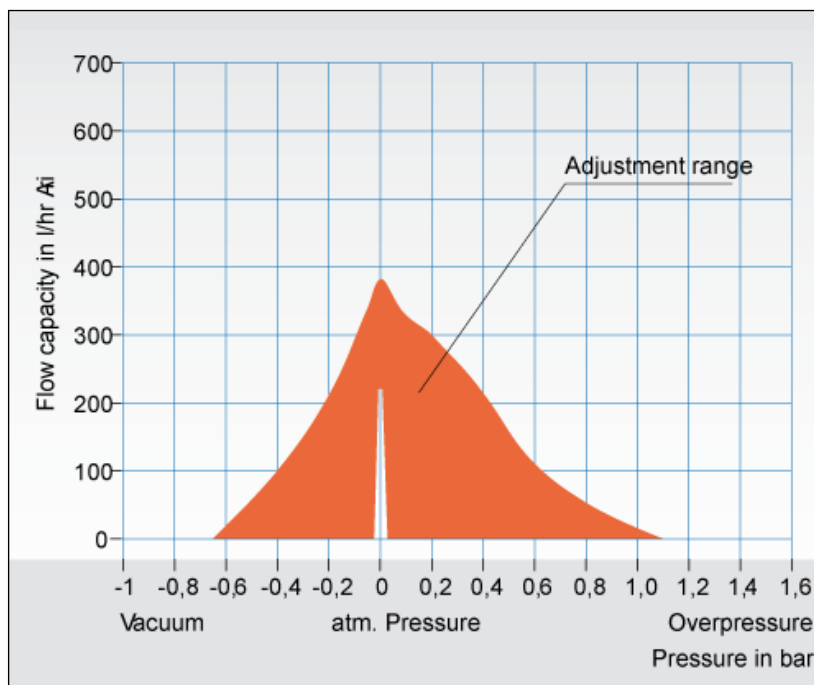


Figure 3 Flow capacity type MP47/R

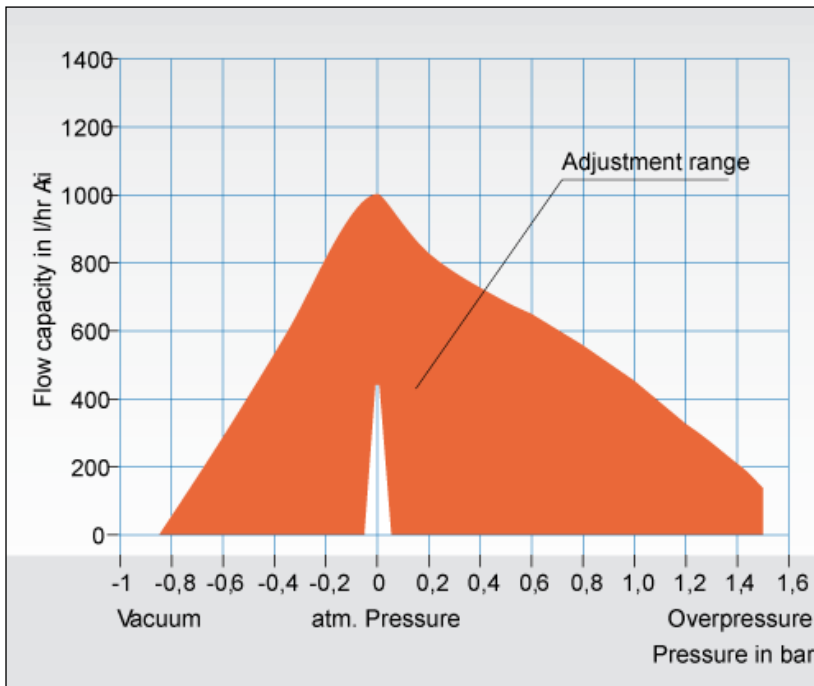


Figure 4 Flow capacity type MP47-Z/R

## 11 MP47.../D INCL. DOUBLE DIAPHRAGM SAFETY SYSTEM/DIAPHRAGM BREAKAGE MONITORING

### 11.1 APPLICATION

There are some applications - for example when processing with strong aggressive, high toxic or hydrocarbon contaminated gases, it is necessary to install a high-level safety system. For these applications, it is important to monitor continuously the tightness of the pump diaphragm.

### 11.2 DESCRIPTION

**M&C** provides for the series **MP47...** pump as option a diaphragm breakage monitoring. Below the pump diaphragm, a monitoring area integrated as a pressure close area with a second diaphragm. Both diaphragms form a sealed safety area. Via an optional flow sensor and an external compressed medium, i.e. air or  $N_2$ , it is possible to monitor continuously the tightness of the diaphragm.

Dimensions of analytical diaphragm pump with a double diaphragm safety system type **MP47.../D**.

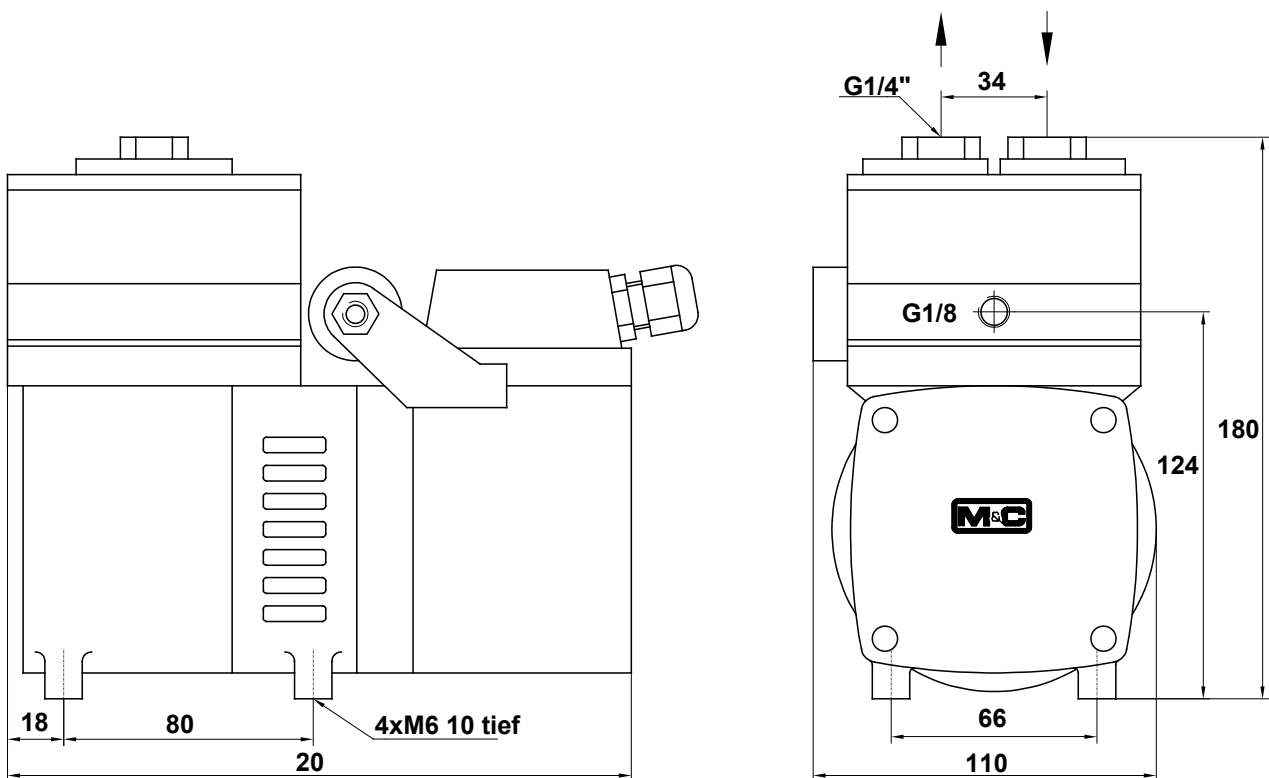
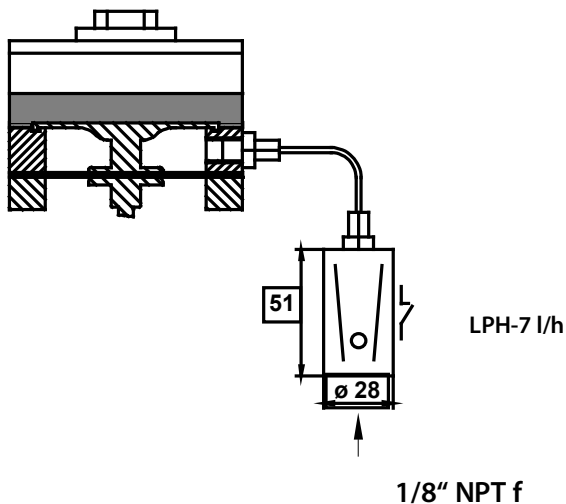


Figure 5 Pump MP47 .../D with the standard motor

## 12 FLOW SENSOR LPH 125-1-A-SPST INCL. CONNECTION SET MOUNTED ON MP47.../D

The optional available flow sensor LPH is provided with a mounting clip, 2 x male connectors 1/8"- 2 mm and 0.5 m PTFE tube 1 x 2 mm.



**Figure 6** Pump MP47 .../D with flow sensor

Fitting position: vertical

Alarm level: 7 l/h

Switching function: NC or NO depending on mounting position,

NC = lead of flow sensor in position at the top

Contact rating: DC max. 200 V, 50 W, 1 A;

AC max. 150 V, 70 VA, 0.7 A

Material: Acrylic, PTFE, nickel-plated brass

As monitoring gas, it can be used N<sub>2</sub> or with max. 1.7 bar,

depending on the application (at least, however, sample pressure plus 0.2 bar compressed air).

In case of a correctly functioning diaphragm pump, no monitoring gas will be consumed.

## 13 RECEIPT OF GOODS AND STORAGE

- Please take the sample pump and possible special accessories carefully out of the packaging material immediately after arrival, and compare the goods with the items listed on the delivery note!
- Check the goods for any damage caused during delivery and, if necessary, notify your transport insurance company without delay of any damage discovered.



Note

**The equipment should be stored in a protected, frost-free room!**

## 14 INSTALLATION INSTRUCTIONS

When installing the pump make certain that accident prevention regulations and safety instructions including those for subsequent operation are observed. The safety instructions in chapter 8.1 Safety must be observed.



Note

**The pump must only be used in the conditions specified in the technical data. The pump should be installed away from heat sources and freely ventilated to prevent any accumulation of heat. For outdoor installation, the pump must be installed in a housing protected from frost in the winter and sufficiently ventilated in summer. Exposure to direct sunlight must be avoided.**

The protection class of the pumps **MP47, MP47-Z, MP47/R, MP47-Z/R, MP47D** is IP20 and so offer no protection against contact or foreign bodies.



Warning



**It is therefore essential to provide protection for persons against contact with live parts (e.g. electrical connections, motor windings) and moving parts (e.g. fan). Protection against the entry of foreign bodies must also be provided.**



Note

**Pumps have mechanical moving parts that can induce vibrations. To prevent damages at the pump or at peripheral components / facilities as well as minimizing noise development an appropriate vibration decoupling is necessary. For this M&C can deliver e.g. anti-vibration pads. This explicit is also valid for the connection of the sample lines at the pump head.**

## 14.1 MECHANICAL

- The dimensions of the mountings are given in figure 7 and figure 8.
- The pump is provided for assembly and therefore it has to be fastened with screws.
- Install the pump so that the fan can draw in sufficient cooling air.
- Install the pump so that accidental finger contact with the fan is impossible.
- Mounting the pump at the highest place in system and/or with pump head downside so that condensate cannot be assembled inside the head - this increases the operating time.

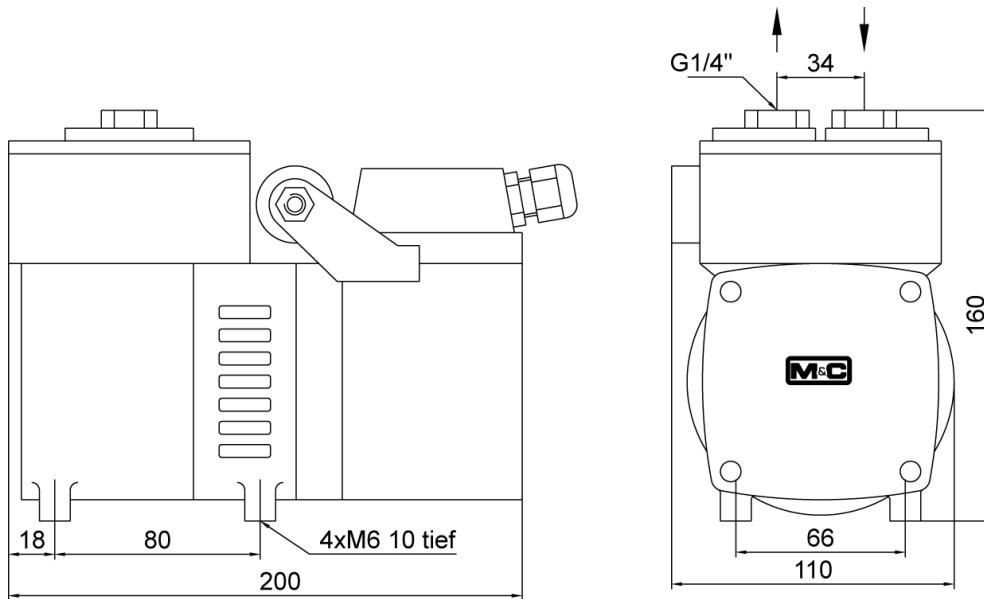


Figure 7 Dimensions (mm) pump MP47..

## 14.2 ELECTRICAL

When making the electrical installation the safety regulations must be observed. In particular make sure that the electricity supply is isolated before trying to connect the pump.



**The diaphragm pumps type MP47, MP47/R, MP47-Z, MP47-Z/R, MP47/D must not be used in hazardous areas.**



Warning



**When connecting the equipment, make sure that the supply voltage is identical with the information provided on the model type plate. The supply voltage is only allowed to deviate max. +6 % respectively -10 % from the indication on the model type plate.**





Note

Attention must be paid to the requirements of IEC 364 (DIN VDE 0100) when setting high-power electrical units with nominal voltages of up to 1000 V, together with the associated standards and stipulations.

The main circuit of the pump type MP47 ... (230 V) must be equipped with a protective motor switch 0,63 - 1 A corresponding to the nominal current (over current protection).

The main circuit of the pump type MP47 ... (115 V) must be equipped with a protective motor switch 1 - 1,6 A corresponding to the nominal current (over current protection).

- The ground wire (protective earth) must be connected to the motor.
- A device for disconnecting the pump motor from the electrical mains must be included in the electrical installation (according to EN 60335-1)
- The pump must be installed so that contact with live parts (connections, or any motor windings) is impossible.

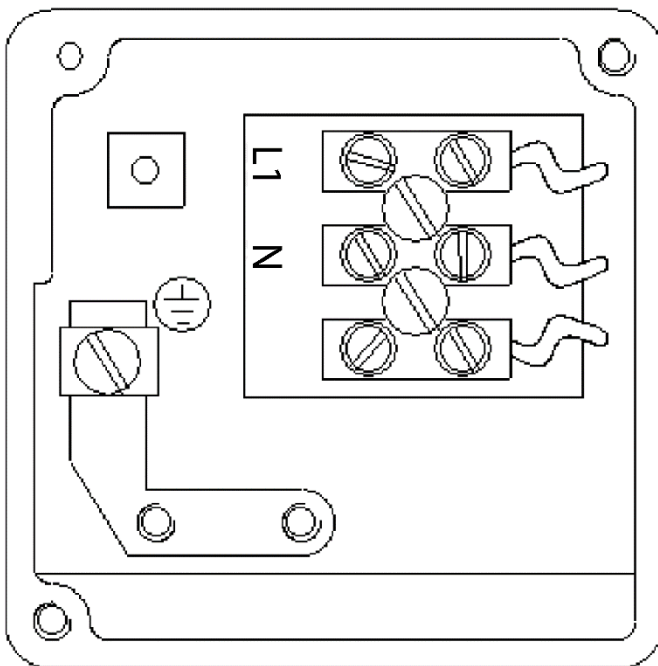


Figure 8 Electrical connection of the pump

- Unscrew the cover of the connection box with the PG cable gland.
- Put the cable through the cable gland and connect it according to figure 8. The connections are marked in the connection box.

### 14.3 PNEUMATIC

- Remove the protection plugs from the port threads (thread size G 1/4").
- Accessories like hose connections are screwed into the port threads by sealing tape (using **M&C** connectors sealing tape is not necessary).
- Connect the suction and pressure lines.
- Arrange the suction and pressure lines so that condensate cannot run into the pump.



Note

**The pump must only be used in the conditions specified in the technical data. The pump should be installed away from heat sources and freely ventilated to prevent any accumulation of heat.**

**For outdoor installation, the pump must be installed in a housing protected from frost in the winter and sufficiently ventilated in summer. Exposure to direct sunlight must be avoided.**

## 15 SUPPLY LINE CONNECTIONS

### 15.1 HOSE-/TUBE CONNECTIONS

The gas inlet and outlet hoses/tubes are connected on the top of the pump. Standard G 1/4" threaded joints are available for the connection of the gas sample lines.



Note

**The valve body must be fixed while mounting the fittings because moving may change the pump capacity. Do not confuse hose-/tube connections for sample gas inlet and outlet; the connections are labeled accordingly! Check for tightness of all sample lines after connection!**

**The tightness of the connections can only be guaranteed if the end section of the connection hose/tube is flat (use a hose-cutter)!**

When connecting the sample gas supply hoses or tubes to the corresponding threaded connections, pay attention to the following points:

- Loosen the sleeve nut of the clamping-ring threaded joint by turning to the left. Take care that the nut is removed carefully from the body of the threaded joint to avoid losing the clamping ring which is mounted loose in the nut.
- Push the sleeve nut over the connection hose/tube.
- Push the clamping ring onto the connection hose/tube with the thicker bulge pointing to nut.

- Push the hose/tube onto the supporting nipple in the threaded joint.
- Tighten the sleeve nut by hand.

The tube is now mounted in a non-slip and pressure-resistant manner.

Connection fittings for DN 4/6 or DN 6/8 are optionally available from M&C.

## 16 START UP

Before commissioning, the plant- and process-specific safety measures must be observed!

The relevant safety regulations and measures must be observed for the media to be pumped. Before using a medium, the compatibility of the materials of the pump head, diaphragm and valves with the medium must be checked (for pump materials: see technical data). The following steps must be carried out during initial commissioning:

- The pump must not start against pressure or vacuum. When it is switched on the pressure in the suction and pressure lines must be atmospheric. This must be so even when the pump restarts after the power have been cut off for a short period.
- The maximum permissible operating pressure (see technical date) must not be exceeded, even when the flow is restricted.
- To prevent the maximum permissible operating pressure being exceeded, restriction or control of the air or gas flow should only be carried out in the suction line.
- If restriction or control of the air or gas flow is made on the pressure side, ensure that the maximum permissible operating pressure is not exceeded.
- When the pump is at a standstill the inlet and outlet must be at normal atmospheric pressure.
- Diaphragm and valve plates are the only parts subject to wear. Wear is usually indicated by a drastic reduction in the pneumatic performance. When replacing parts proceed as described in chapter 18.
- Ambient conditions: see technical data.

## 17 CLOSING DOWN



Note

**The area in which the pump is situated when not in use must be kept free of frost at all times!**

No further special measures need to be taken when decommissioning.



**Aggressive medium is possible.**



**Wear protective glasses and proper protective clothing during disassembly, repair or cleaning!**

## 18 MAINTENANCE

Before the maintenance work is carried out, it is necessary that the specific safety procedures pertaining to the system and operational process are observed!



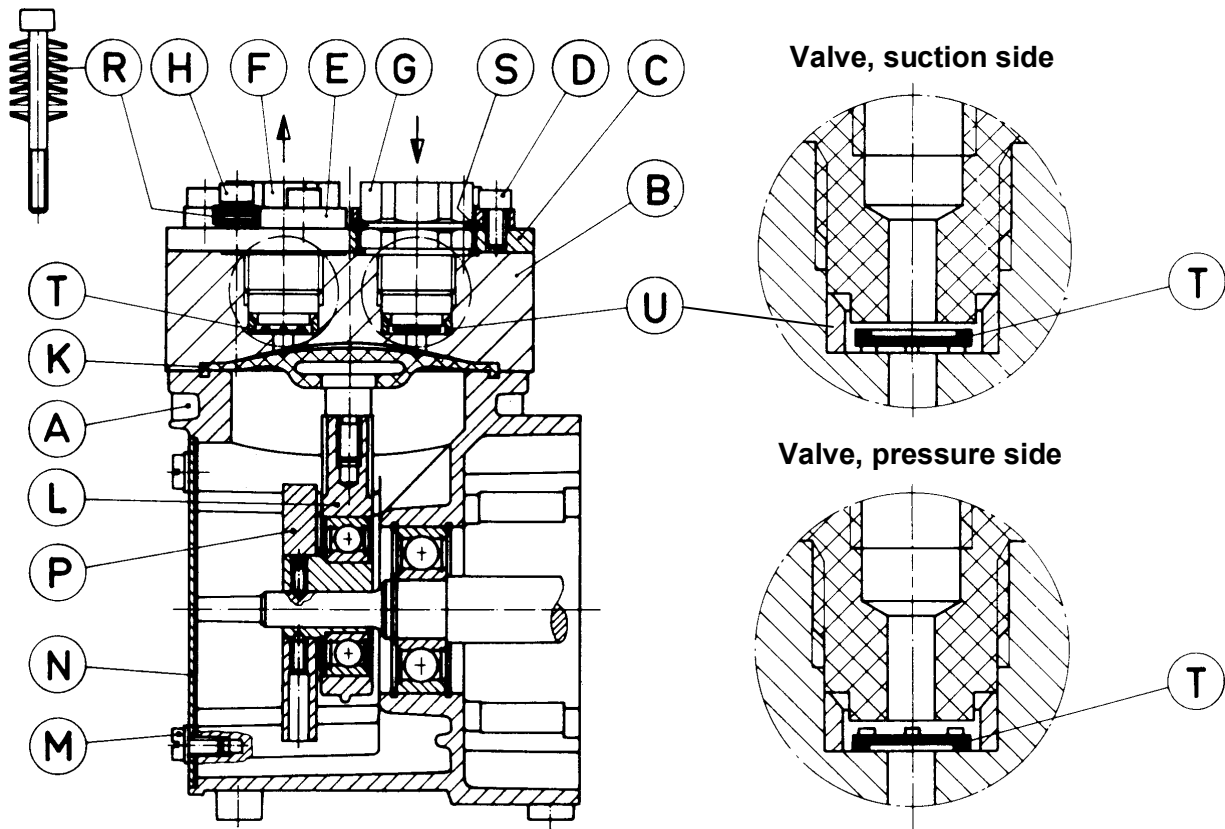
**It is necessary to take the pump off the mains before any assembly, maintenance or repair work is carried out!**

Diaphragm and valve plates are the only parts of the pump subject to wear. They are simple to change.



**Aggressive medium is possible.**

**Wear protective glasses and proper protective clothing during disassembly, repair or cleaning!**



**Figure 9** Sectional drawing pump MP47

Parts and tools required:

- Valve plates and structured diaphragm (see spare parts list, chapter 22).



**Note**

**Always change valve plates, diaphragm and sealing rings at the same time.**

Change the diaphragm and valve plates in the following sequence:

### 18.1 EXCHANGE OF THE DIAPHRAGM

1. Mark the position between housing A , diaphragm B and pressure plate C ;
2. Loosen the 4 hexagon screws H and remove the pressure plate C and the diaphragm head B ;
3. Unscrew the diaphragm K by hand out of the tapping hole of the rod L (counter clockwise);
4. Loosen the 4 screws M and remove the cover N ;
5. Screw the new diaphragm K into the rod L hand-tight;

6. Turn the flywheel P until the rod L is in a central position. Control that the bulge of the diaphragm K fits to the groove of housing A ;
7. Fix the diaphragm head B and the pressure plate C according to the mark;
8. Fix the 4 hexagon screws H constantly over cross until the plate springs R are flat;
9. Turn the flywheel P and check whether it works proper;
10. Mount the cover N ;

## **18.2 EXCHANGE OF THE VALVE PLATES**

1. Loosen the 6 hexagon screws D and remove the pressure ring E ;
2. Change the o-ring S at the valve body F on the pressure side;
3. Change the valve plate T . Check whether the protection ring U is in the right position and the 6 layers of the valve plate T point to the top;
4. Screw in the valve bodies F and tighten them in a moderate way;
5. Change the o-ring S on the sucking side;
6. Remove the valve plate T and change it with a new one. Check whether the protection ring U is in the right position and the 6 layers of the valve plate T point to the bottom;
7. Screw in the valve bodies G and tighten them in a moderate way;
8. Put on the pressure ring E and tighten the 6 hexagon screws.

### 18.3 CLEANING

- When changing valve plates and diaphragm, inspect all parts for dirt before assembling the pump head and clean them if necessary.
- As far as possible clean the parts with a dry cloth. Solvents should not be used as they can attack the plastics and synthetic rubber parts. If a compressed air line is available, blow the parts out with it.



**Aggressive medium is possible.**

**Wear protective glasses and proper protective clothing during disassembly, repair or cleaning!**

For recommended spare parts please see chapter 22.

## 19 TROUBLE SHOOTING

Before working on the pump isolate the power supply securely, then check that the lines are not live. The following tips for fault-finding are best employed in the sequence shown.

Problem/Indication	Possible cause	Check/Action
Pump produces no flow	No main supply	Check power supply; Check plug for correct fit
	Connections or lines are blocked	Remove blockade
	An external valve is closed or a filter is blocked	Open valve or clean dirty/blocked filter
Flow, pressure or vakuuum too low	Liquid (condensate) has collected in the pump head	Let the pump for a few minutes pumping air;
	Diaphragm or valves are worn out	Change diaphragm or/and valves
	Compare the actual performance with the figures in the technical data	The pump is not designed for this condition
	There is pressure on the pressure side and at the same time vacuum or a pressure above atmospheric on the suction side	The pump is not designed for this condition
	The cross-section of the pneumatic lines or connected components is too small, or they are restricted	To measure the performance, disconnect the pump from the system (smaller diameter tubing or a valve can significantly affect performance)
	A leak at a connector, in a diaphragm/valve plate is damaged or pump heads dirty	Insulate the leak, tighten the screws, clean or exchange dirty parts



Note

**If the pump does not operate properly and you cannot find any of the above mentioned faults, send it back to M&C.**

**If you have been handling dangerous or highly aggressive gases please clean the pump before dispatch.**





## 20 Returns

If you send your diaphragm pump to M&C Customer Service for repair, then we require a fully completed RMA Service Receipt. You can find the RMA Service Receipt on our website [www.mc-techgroup.com](http://www.mc-techgroup.com) under Service & Support → Returns.

There you enter information about the pumped medium, especially about aggressive pumped media.

If hazardous or highly aggressive gases have been pumped with the pump, the pump must be cleaned before shipment.

## 21 Proper disposal of the device

At the end of the life cycle of our products, it is important to take care of the appropriate disposal of obsolete electrical and non-electrical devices. To help protect our environment, please follow the rules and regulations of your country regarding recycling and waste management.

## 22 SPARE PARTS LIST

Wear, tear and replacement part requirements depend on specific operating conditions. The recommended quantities are based on experience and they are not binding.

### Diaphragm pump MP47, MP47/R, MP47-Z, MP47-Z/R, MP47/D

(C) Consumable parts (R) Recommended spare parts (S) Spare parts

Recommended quantity  
being in operation [years]

Part No.	Description	C/R/S	Recommended quantity being in operation [years]		
			1	2	3
90P1108	Ring type U for valve chamber MP47	R	-	-	1
90P1105	Diaphragm type K for MP47 Material: FPM, PTFE coated	R	1	2	3
90P1113	O-Ring 25 f. MP47/Z/R, Material: NBR	R	1	2	3
90P1110	Valve type T f. MP47, 1 pc. Material: PTFE (required 2 pcs.)	R	2	4	6
90P1111	Valve body type F/G 1/4" female for MP47 Material: PTFE	R	1	2	3
90P1112	Valve type F/G 1/4" female for MP47/R, MP47-Z/R Material: PTFE	R	1	2	3
90P3025	Connecting rod for MP47 Type L	S	-	-	1
90P3027	Pump head top part for MP47 Material: PTFE	S	-	-	1
90P3028	Pump head top part for MP47/R, MP47-Z/R with boring for needle valve Material: PTFE	S	-	-	1
90P6000	Needle from PTFE with screw part out of PTFE for needle valve MP47-Z-NV (until 9.93)	S	-	-	1
90P6005	Needle from PTFE for needle valve MP47-Z-NV (until 9.93)	S	-	-	1
90P6010	Seal ring out of PTFE for needle valve MP47-Z-NV (until 9.93)	S	-	-	1
90P6030	Needle valve for MP47/R, MP47-Z/R (from 10.93) seal ring and needle out of PTFE	S	-	-	1
90P6015	Needle out of PTFE for MP-Z/R (from 10.93)	S	-	-	1
90P6020	Seal ring out of PTFE for needle valve MP47-Z/R (from 10.93)	S	-	-	1
90P6025	Adapter out of PTFE for needle valve MP47-Z/R (from 10.93)	S	-	-	1

**PVDF Male connectors with G-thread (ISO 1010031)**

05V1045	Male connector DN 4/6-G 1/8" Material: PVDF	S	-	-	2
05V1050	Male connector DN 6/8-G 1/8" Material: PVDF	S	-	-	2
05V6600	Verrule DN 4/6, PVDF	S	2	2	4
05V6602	Verrule DN 6/8, PVDF	S	2	2	4
05V6605	Union nut DN 4/6, PVDF	S	2	2	4
05V6607	Union nut DN 6/8, PVDF	S	2	2	4

**23 ANNEXE**

Further product documentation can be seen and downloaded from our home page:  
[www.mc-techgroup.com](http://www.mc-techgroup.com)