Embracing Challenge

Analytical Diaphragm Pump Series MP®

MP47-Z-BPR150

Instruction Manual
Version 1.00.01

Contents

List of Illustrations

Dear customer,

we have made up this operating manual in such a way that all necessary information about the product can be found and understood quickly and easily.
Should you still have any question, please do not hesitate to contact **M&C** directly or go through your appointed dealer. Respective contact addresses are to be found in the annex to this operating manual.
Please also contact our homepage **www.mc-techgroup.com** for further information about our products. There, you can read or download the data sheets and operating manuals of all **M&C** products as well as further information in German, English and French.

Version: 1.00.01

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1 GENERAL INFORMATION

The product described in this operating manual has been examined before delivery and left our works in perfect condition related to safety regulations. In order to keep this condition and to guarantee a safe operation, it is important to heed the notes and prescriptions made in this operating manual. Furthermore, attention must be paid to appropriate transportation, correct storage, as well as professional installation and maintenance work.
All necessary information a skilled staff will need for appropriate use of this product are given in this operating manual.

2 DECLARATION OF CONFORMITY

CE - Certification

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

Please take care of the following basic procedures when mounting, starting up or operating this equipment:

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 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 pumps MP47-Z-BPR150 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

If the equipment fails, please contact **M&C** directly or go via your appointed **M&C** dealer.
We offer a one year warranty as of the day of delivery as per our normal terms and conditions of sale and assuming technically correct operation of the device. Consumables are hereby excluded. The terms of the warranty cover repair at the factory at no cost or the replacement at no cost of the equipment free ex user location. Reshipments must be sent in a sufficient and proper protective packaging.

5 USED TERMS AND SIGNAL INDICATIONS

DANGER!

This means that death, severe physical injuries and/or important material damages **will occur** in case the respective safety measures are not fulfilled.

WARNING!

This means that death, severe physical injuries and/or important material damages **may occur** in case the respective safety measures are not fulfilled.

CAUTION!

This means that minor physical injuries **may occur** in case the respective safety measures are not fulfilled.

CAUTION!

Without the warning triangle means that a material damage **may occur** in case the respective safety measures are not met.

ATTENTION

This means that an unintentional situation or an unintentional status **may occur** in case the respective note is not respected.

NOTE!

These are important information about the product or parts of the operating manual which require user's attention.

SKILLED STAFF

These are persons with necessary qualification who are familiar with installation, use and maintenance of the product.

6 INTRODUCTION

The diaphragm pump **MP47-Z-BPR150** is suitable for the 100 % oil-free delivery of corrosive gases with changing pressure conditions. The capacity and construction of the pump is especially designed for the problems in the analyze technique. The pump is gas-tight and operates without any maintenance.

7 RANGE OF APPLICATION

All sample contacting parts of the diaphragm pump **MP47-Z-BPR150** are made of PTFE, PVDF and Viton or Kalrez. The lifted gas remains analytically pure due to the fact that the pump works absolutely without any lubricant. A special diaphragm and valve system guaranties a long life time and no maintenance is necessary. The pump is available for 230V or 115V.

One problem in the analyze technique, when lifting gases via filters, is that the filters are clogged after a longer period of time. This causes an increasing differential pressure above the filter and subsequently, a higher suction pressure for the pump is necessary. This, however, results in a decrease of the adjusted pump capacity.

In order to avoid this negative influence, the **M&C** diaphragm pump **MP47-Z-BPR150** is equipped with a fully adequate bypass admission pressure regulator inside the pump head. Independent from the changing entry pressure, the bypass admission pressure regulator keeps the pressure at the pump outlet constant, so that the adjusted pump capacity resulting thereof remains constant as well.
For example, the entry pressure may vary from 0,46 bar abs. to 1,1 bar abs. for a pump capacity of 250Nl/h.
The outlet pressure is adjusted at works to 200mbar overpressure (adjustable up to 300mbar).

- Delivery of gases and vapors with a temperature of - 30 °C to + 80 °C.
- Maximum admissible operating overpressure, final vacuum, pump capacity: see technical data.
- Before using the pump in unknown mediums, check the compatibility of the pump head and valve materials with the respective medium.

NOTE!

The diaphragm pumps of the series MP47 must not deliver liquids.

8 AMBIANCE

Please keep the following ambient conditions during operation:

- Range of ambient temperature during operation: -10 °C to + 40 °C.
- The pumps must be protected against water and dust effects.
- During operation, a sufficient supply of cooling air must be provided.

8.1 SAFETY

The pumps **MP47-Z-BPR150** are executed according to protection **IP20** and do not provide any protection against touching and foreign bodies.

WARNING!

It is important to provide protection for persons against contact with life parts (e.g. electrical connections, eventually motor windings) or moving parts (e.g. fan).

The pumps are not protected against effects from water. If applicable, respective protection measures must be taken before starting the pump.

WARNING!

Aggressive medium is possible.
Wear protective glasses and appropriate protective clothes during disassembly, repair or cleaning the pump!

The pumps must only be used for their intended purpose.

NOTE!

Components to be 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 the lifted medium are to be observed.

9 TECHNICAL DATA

Diaphragm pump	**MP47-Z-BPR150-Viton**	**MP47-Z-BPR150-Viton**	**MP47-Z-BPR150-Kalrez**	**MP47-Z-BPR150-Kalrez**
Part No.	**02 P 1160**	**02 P 1160a**	**02 P 1165**	**02 P 1165a**
Voltage	230V 50Hz	115V 60Hz	230V 50Hz	115V 60Hz
Protection class	IP 20 - DIN 40050			
Pump capacity max.	**6,6 l/min*** in the range of adjustment (outlet pressure)			
Operating pressure max.*	1,1 bar abs.			
Operating pressure min.**	0,46 bar abs. for 250Nl/h / 0,62 bar abs. for 400Nl/h (outlet pressure 1,20 bar abs.)			
Outlet pressure	1,15 – 1,3 bar abs. / at works 1,20 bar abs.			
Gas temperature	-30 to +80°C			
Ambient temperature	-10 to +40°C			
Storage temperature	-15 to +60°C			
Power consumption	110W			
Current consumption	0,75A	1,7A	0,75A	1,7A
Gas connections	G1/4" i DIN ISO 228/1			
Electrical standard	EN 61010 Teil 1			
Material of sample contacting parts	PTFE, PVDF, Viton		PTFE, PVDF, Kalrez	
Weight	4,6 Kg			

Material mark according to ISO 1629 und 1043.1

* Maximum operating pressure for a constant outlet pressure and as a result a constant flow rate of the measuring gas.

** The minimum operating pressure that still guarantees a constant pump capacity is changing according to the necessary gas volume flow adjusted behind the pump and to the outlet pressure adjusted on the pressure regulator. The lower the necessary gas volume flow and the outlet pressure, the lower is the minimal possible operating pressure that still guarantees a constant outlet pressure and therefore a constant sample gas volume flow.

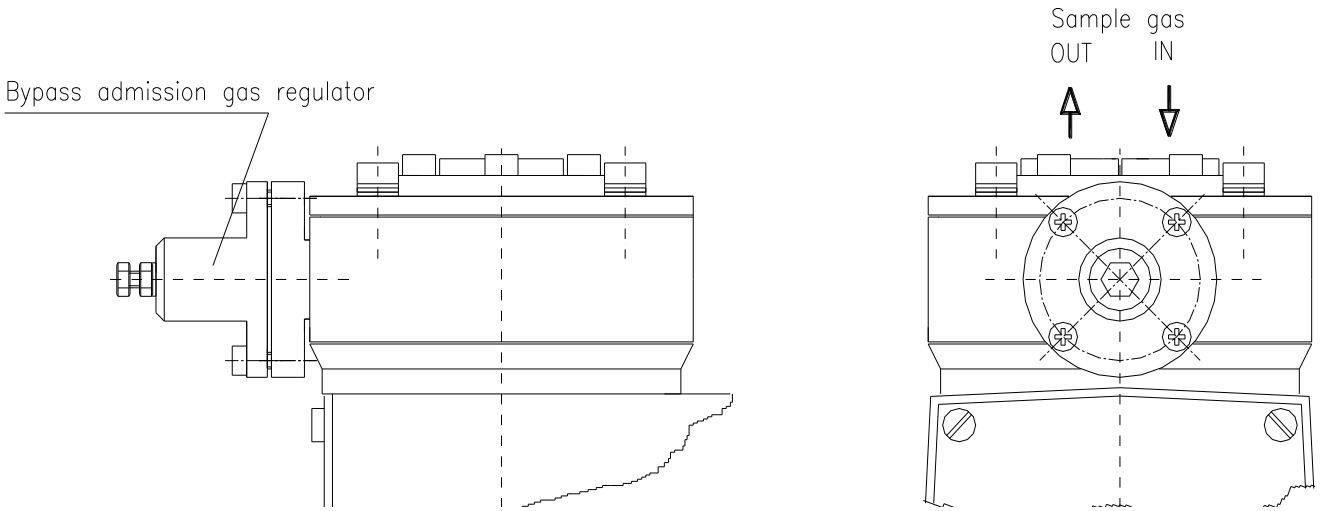

Illustration 1 Construction pump head

10 RECEIPT OF GOODS AND STORAGE

- Remove carefully the diaphragm pump and any accessories from the packaging and check immediately against the delivery note whether the consignment is complete.
- Check the goods for any damage incurred during transport and, if necessary, inform your transport insurer of any damage.

NOTE!

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

11 INSTRUCTIONS FOR INSTALLATION

During installation, the safety instructions as well as those for accident prevention must be heeded, also with regard to the later operation. Further, the safety instructions under chapter 3 must be kept.

NOTE!

Please comply with the respective safety instructions regarding the samples to be delivered.
In order to avoid any heat accumulation, the pump should be installed away from heat sources and should also be freely ventilated.
When mounting the pump outside, it must be installed in a protective housing, frost-protected in winter and sufficiently aerated in summer. Direct solar radiation must be avoided.

The pumps **MP47-Z-BPR150** are executed according to protection type IP20 and, therefore, do not supply any protection against contact and foreign bodies.

WARNING

It is very important to provide a protection for persons against contact of live parts (eg. electrical connections) or moving parts. It must also be taken care to protect the pump against penetration of foreign bodies.

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.

11.1 MECHANICAL INSTALLATION

- For the mounting dimensions, see illustration 7.
- Mount the pumps in such a way that the ventilator can suck sufficient cooling air.
- Make sure that nobody can touch the ventilator. Mount the pumps at the highest point in the system and/or mount them with the pump head downwards in order to avoid the collection of condensate inside the pump head. This measure increases the service life.

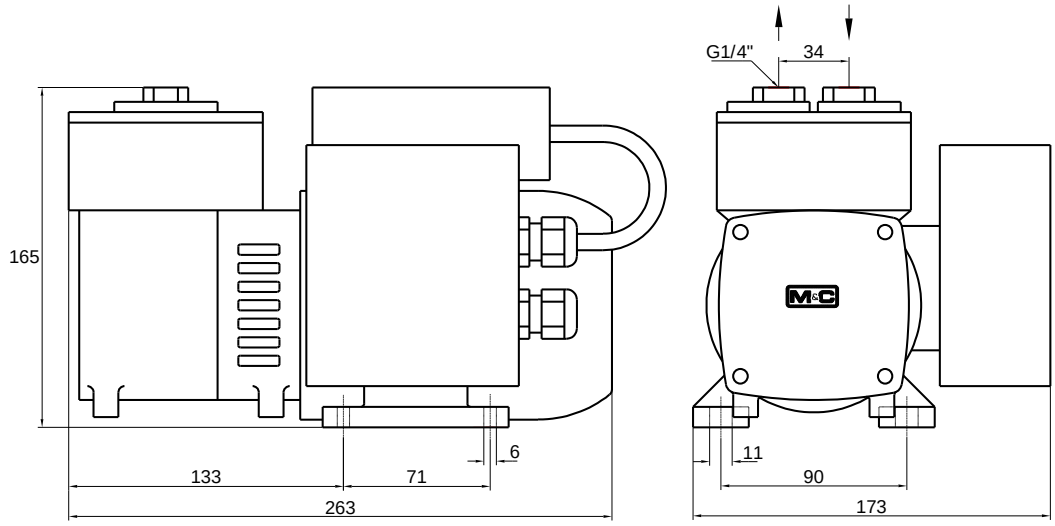

Illustration 2 Dimensions (mm) MP47-Z-BPR150

11.2 ELECTRICAL CONNECTION

When executing electrical mounting works, please respect the appropriate safety instructions. Before connecting the pump, take care that the electrical connection is voltage-free.

The diaphragm pumps MP47-Z-BPR150 must not be used in hazardous locations.

WARNING!

Wrong supply voltage can destroy the equipment.
When connecting the pump, please ensure that the supply voltage is identical with the information provided on the type plate! A deviation of max. +6 % or -10 % from the indication on the type plate is allowed.

NOTE!

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

- The ground conductor has to be connected to the pump motor.
- A device for separating the pump motor from the electrical supply voltage must be mounted into the electrical installation (according to EN 60335-1).
- Mount the pumps in such a way that any contact of the life parts (eg. electrical connection, motor windings) is impossible.

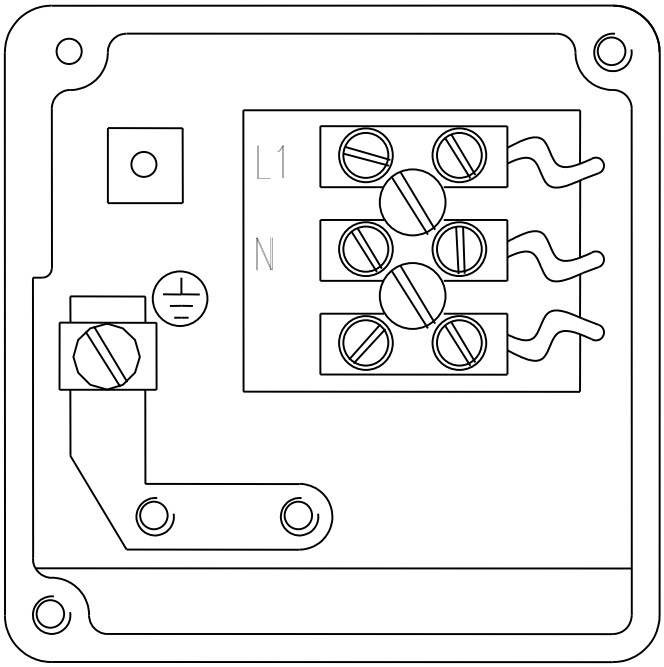

Illustration 3 Electrical connection of the pump

- Remove the lid with PG screwing;
- Insert the connecting cable though PG and connect it according to figure 8. The connections are indicated inside the connecting box.

11.3 PNEUMATICAL CONNECTION

- Remove the protection plug from the gas connection thread (thread size G1/4”).
- Accessories such as tube connections are screwed into the connection thread by means of a sealing tape (when using the screw fitting from **M&C,** no sealing tape is necessary).
- Connect the suction and pressure line.
- Mount the suction and pressure lines in a way to avoid condensate flowing into the pump.

NOTE!

The diaphragm pump is only to be used under the special conditions specified in the technical data. Do not place the diaphragm pump near to heat sources and provide sufficient aeration in order to avoid heat accumulation.
When mounting the pump outside, it must be installed in a protecting housing that is frost-protected in winter and sufficiently aerated in summer. Direct solar radiation must be avoided.

12 SUPPLY CONNECTIONS

12.1 HOSE CONNECTIONS

The connection is made on top of the pump. There are standard connections with G1/4” inside threads.

NOTE!

Do not twist the valve body when mounting the hose connections because it can influence the sampling capacity of the pump. Do not interchange the hose connections for the sample gas inlet and outlet. The connections are identified accordingly. After all lines being connected, check whether the connection is tight.
The tightness of the connection can only be guaranteed if the border of the connection hose is straight (use a hose cutter).

When connecting the hoses to the hose connection fittings to be supplied as option, please note the following:

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

The hose/tube is now mounted in such a way that it cannot slip and is resistant to pressure.
Connection fittings for DN 4/6 or DN 6/8 are optionally available from M&C.

13 START UP

Before starting up, please observe the safety measures related to the installation and the process! Also respect the respective safety prescriptions and measures related to the sampled gases. Before pumping the medium, please check the compatibility of the gas with the materials of pump head, diaphragm and valves (for pump materials: see technical data).

The following steps have to be executed for the initial start up:

- The pump must not start against pressure or vacuum.
- When switching on the pump, the pressure in the lines must be atmospheric. The same is valid when the pump is restarted after a power cut off for a short period.
- The maximum permissible operating pressure (see technical data, chapter 9) must not be exceeded.
- To prevent the maximum permissible operating pressure being exceeded, restriction or control of the gas flow should only be carried out in the suction line.
- If restriction or control of 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 lines must have got the 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 15.
- Ambient conditions: see technical data, chapter 9.

14 CLOSING DOWN

NOTE!

The location where the pump is installed must be free of frost also when it is not in use.

No special measures are to be taken when closing down the pump.

WARNING!

Aggressive condensate possible.
Wear safety glasses and appropriate protection clothes when dismounting, repairing or cleaning the pump!

15 MAINTENANCE

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

WARNING!

Dangerous tension.
Before carrying out any maintenance on the pump, disconnect the pump from the supply voltage!

Diaphragm and valve plates are the only parts subject to wear. They are simply to be exchanged.

WARNING!

Aggressive medium residues possible.
Wear safety glasses and appropriate protection clothes when dismounting, repairing or cleaning the pump!

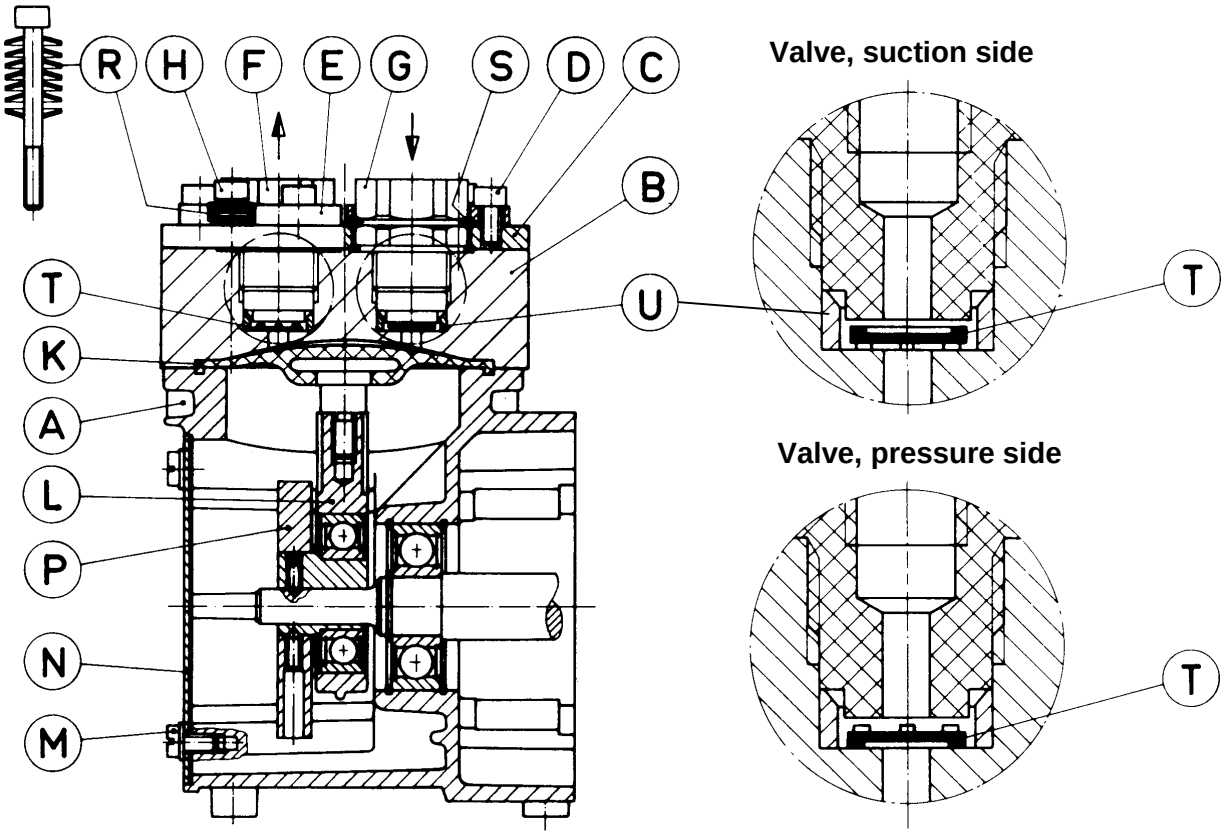

Illustration 4 Sectional drawing

Parts and tools required:

- Valve plates, sealing rings (2 per each pump head) and structured diaphragms (1 per pump head) according to spare parts list, chapter 17.

NOTE! **It is recommended to change the valve plates and diaphragms always at the same time.**

Change the diaphragm(s) and the valve plates in the following sequence:

15.1 CHANGE OF THE PUMP DIAPHRAGM

- Mark the position between the housing A , the diaphragm head B and the pressure plate C with a pencil.
- Loosen the 4 hexagon screws H and remove the pressure plate C and the diaphragm head B.
- Unscrew the diaphragm K by hand out of the tapping hole of the rod L (counter-clockwise).
- Loosen the 4 screws M and remove the cover N.
- Screw in the new diaphragm K into the rod L and tighten by hand.
- Turn the fly wheel P until rod L is in central position. Control that the bulge of the diaphragm K is placed inside the groove of the housing A.
- Put on the diaphragm head B and the pressure plate C according to the pencil marks. Tighten the 4 hexagon screws H crosswise until the disc springs R are flat. Control the easy running when turning the disk flywheel P and mount the cover N.

15.2 CHANGE OF THE VALVE PLATE

- Loosen the 6 hexagon screws D and remove the pressure rings E . Loosen the valve bodies F and G .
- Replace the O-ring S on the valve body F (pressure side) by a new one. Remove the valve plate T and replace it by a new one. Take care that the protection ring U is placed in the right position and that the 6 supports of the valve plate T show upwards. Screw the valve body F in again and tighten moderately.
- Replace the O-ring S on the valve body G (suction side) by a new one. Remove the valve plate T and replace it by a new one. Take care that the protection ring U is placed in the right position and that the 6 supports of the valve plate T show downwards. Screw the valve body G in again and tighten moderately.
- Put on the pressure rings E and tighten the 6 hexagon screws D.

15.3 CLEANING

- When exchanging the valve plates and diaphragms, please check all parts for dirt and clean them if necessary before assembling the pump head.

- As far as possible, clean the parts with a dry cloth. Do not use any solvents for cleaning because they can attack the plastic parts. If oil free compressed air is available, blow the parts out with it.

WARNING!

Aggressive medium residues possible.
Wear safety glasses and proper protection clothes when disassembling, repairing or cleaning the pump!

Please read our recommendations for spare parts in the spare parts list, chapter 17.

16 TROUBLE SHOOTING

Before working on the pump, disconnect the power supply securely. Check that the lines are not alive.

Problem/Indication	Possible cause	Action/Check
Pump does not lift.	No mains supply.	Check power supply; check the correct fitting of the mains cable.
	Connections of lines are blocked.	Remove blockade.
	The internal or an external valve is closed or a filter is blocked.	Open the valve or clean the dirty/blocked filter.
	Liquid (condensate) is collected inside the pump head.	Operate the pump with air for a few minutes; mount it at the highest point of the system.
Pump capacity, pressure or vacuum are too low.	Diaphragm or valve plates are worn out.	Exchange the respective parts.
	Compare the actual performance with the technical data in chapter 9.	Pump is possibly not designed for this condition.
	The vacuum on the suction side is too high.	Pump is not designed for this condition.
	The cross section of pneumatic lines or connected components is too small, or they are restricted.	To measure the performance, disconnect the pump from the system; even one single line with a too small cross section can influence significantly the measuring value, the same is valid for a valve installed in the system.
	A leak on the connections, the lines or the pump head. Diaphragms or valve plates are defective or head parts are dirty.	Insulate the leak. Tighten the screws. Change the defective parts, clean or exchange the dirty parts.

NOTE!

Before any work on the pump, disconnect the supply voltage and check that no parts are alive.

17 SPARE PARTS LIST

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

Diaphragm pump MP47-Z-BPR150

V) Consumable parts (E) Recommended spare parts (T) Spare parts

			Recommended quantity after operation of the pump [years]		
Part No..	Description	V/E/T	1	2	3
90P1108	Back-up ring type U f. valve chamber MP47	E	-	-	1
90P1105	Diaphragm type K f. MP47 Material: Viton, PTFE coated	E	1	2	3
90P1110	Valve plate type T for MP47, 1 piece Material: PTFE (2 pcs. required)	E	2	4	6
90P1111	Valve body type F/G 1/4”i for MP47 Material: PTFE	E	1	2	3
90P3025	Rod for MP47 type L	T	-	-	1
90P4020	Regulation valve BPR 150 for MP47-Z-BPR150 Viton	T	-	-	1
90P4022	Regulation valve BPR 150 for MP47-Z-BPR150 Kalrez	T	-	-	1
PVDF Male connectors with G thread (ISO 1010031)					
05V1045	Male connector DN 4/6-G1/8” Material: PVDF	T	-	-	2
05V1050	Male connector DN 6/8-G1/8” Material: PVDF	T	-	-	2
05V6600	Ferrule DN 4/6, PVDF	T	2	2	4
05V6602	Ferrule DN 6/8, PVDF	T	2	2	4
05V6605	Union nut DN 4/6, PVDF	T	2	2	4
05V6607	Union nut DN 6/8, PVDF	T	2	2	4

18 ANNEX

For additional information, please look on our home page under:
www.mc-techgroup.com