772 Pump Unit

Manual

8.772.8001EN / 2019-11-29

Metrohm

Metrohm AG
CH-9100 Herisau
Switzerland
Phone +41 71 353 85 85
Fax +41 71 353 89 01
info@metrohm.com
www.metrohm.com

772 Pump Unit

Manual

8.772.8001EN / 2019-11-29

Technical Communication
Metrohm AG
CH-9100 Herisau
techcom@metrohm.com

This documentation has been prepared with great care. However, errors can never be entirely ruled out. Please send comments regarding possible errors to the address above.

Table of contents

Table of figures

1 Introduction

1.1 Instrument description

The 772 Pump Unit is a versatile peristaltic pump for conveying or evacuating liquid media. It was designed specifically for the production operation and laboratory environment and enables a wide range of applications. Unlike membrane pumps, pumping organic solvents or liquids with solids content is no problem for the 772 Pump Unit.

Therefore, the 772 Pump Unit is equally well suited for use in titration, e.g. for evacuating titration samples with silver halide precipitation and as a delivery pump in larger automation systems. By using the respective suitable tubing material, a wide variety of tasks can be managed.

The flow rate of up to 600 mL/min opens up a wide range of applications.

1.1.1 Model versions

The 772 Pump Unit is available in the following three versions:

2.772.0110	772 Pump Unit	
2.772.0120	772 Pump Unit	with aspiration equipment
2.772.0130	772 Pump Unit	with rinsing equipment

Each version includes different accessories according to its use *(see chapter 8, page 24)*.

1.1.2 Connectors

The 772 Pump Unit needs 16 - 24 V DC voltage.

Power is supplied to the pump via the direct connection to a Sample Processor (e.g. 814 or 815) or to the 731 Relay Box (connection via adapter cable 6.2160.010).

1.1.3 Intended use

The 772 Pump Unit is designed for usage in automated systems in analytical laboratories.

This instrument is suitable for pumping chemicals and flammable samples. Use of the 772 Pump Unit therefore requires the user to have basic knowledge and experience in handling toxic and caustic substances. Knowledge with respect to the application of the fire prevention measures prescribed for laboratories is also mandatory.

1.2 About the documentation

CAUTION

Please read through this documentation carefully before putting the instrument into operation. The documentation contains information and warnings which the user must follow in order to ensure safe operation of the instrument.

1.2.1 Symbols and conventions

The following symbols and formatting may appear in this documentation:

*(5-**12**)*	**Cross-reference to figure legend** The first number refers to the figure number, the second to the instrument part in the figure.
1	**Instruction step** Carry out these steps in the sequence shown.
Method	**Dialog text**, **parameter** in the software
File ▶ New	Menu or menu item
[Next]	**Button** or **key**
	**WARNING** This symbol draws attention to a possible life-threatening hazard or risk of injury.
	**WARNING** This symbol draws attention to a possible hazard due to electrical current.
	**WARNING** This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	**WARNING** This symbol draws attention to a possible biological hazard.
	**CAUTION** This symbol draws attention to possible damage to instruments or instrument parts.

NOTE

This symbol highlights additional information and tips.

1.3 Safety instructions

1.3.1 General notes on safety

WARNING

Operate this instrument only according to the information contained in this documentation.

This instrument left the factory in a flawless state in terms of technical safety. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

1.3.2 Electrical safety

The electrical safety when working with the instrument is ensured as part of the international standard IEC 61010.

WARNING

Only personnel qualified by Metrohm are authorized to carry out service work on electronic components.

WARNING

Never open the housing of the instrument. The instrument could be damaged by this. There is also a risk of serious injury if live components are touched.

There are no parts inside the housing which can be serviced or replaced by the user.

Supply voltage

WARNING

An incorrect supply voltage can damage the instrument.

Only operate this instrument with a supply voltage specified for it (see rear panel of the instrument).

Protection against electrostatic charges

WARNING

Electronic components are sensitive to electrostatic charges and can be destroyed by discharges.

Do not fail to pull the power cord out of the power socket before you set up or disconnect electrical plug connections at the rear of the instrument.

1.3.3 Tubing and capillary connections

CAUTION

Leaks in tubing and capillary connections are a safety risk. Tighten all connections well by hand. Avoid applying excessive force to tubing connections. Damaged tubing ends lead to leakage. Appropriate tools can be used to loosen connections.

Check the connections regularly for leakage. If the instrument is used mainly in unattended operation, then weekly inspections are mandatory.

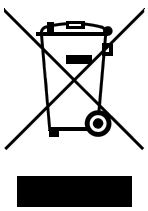
1.3.4 Flammable solvents and chemicals

WARNING

All relevant safety measures are to be observed when working with flammable solvents and chemicals.

- Set up the instrument in a well-ventilated location (e.g. fume cupboard).
- Keep all sources of flame far from the workplace.
- Clean up spilled liquids and solids immediately.
- Follow the safety instructions of the chemical manufacturer.

1.3.5 Recycling and disposal



This product is covered by European Directive 2012/19/EU, WEEE – Waste Electrical and Electronic Equipment.

The correct disposal of your old instrument will help to prevent negative effects on the environment and public health.

More details about the disposal of your old instrument can be obtained from your local authorities, from waste disposal companies or from your local dealer.

2 Overview of the instrument

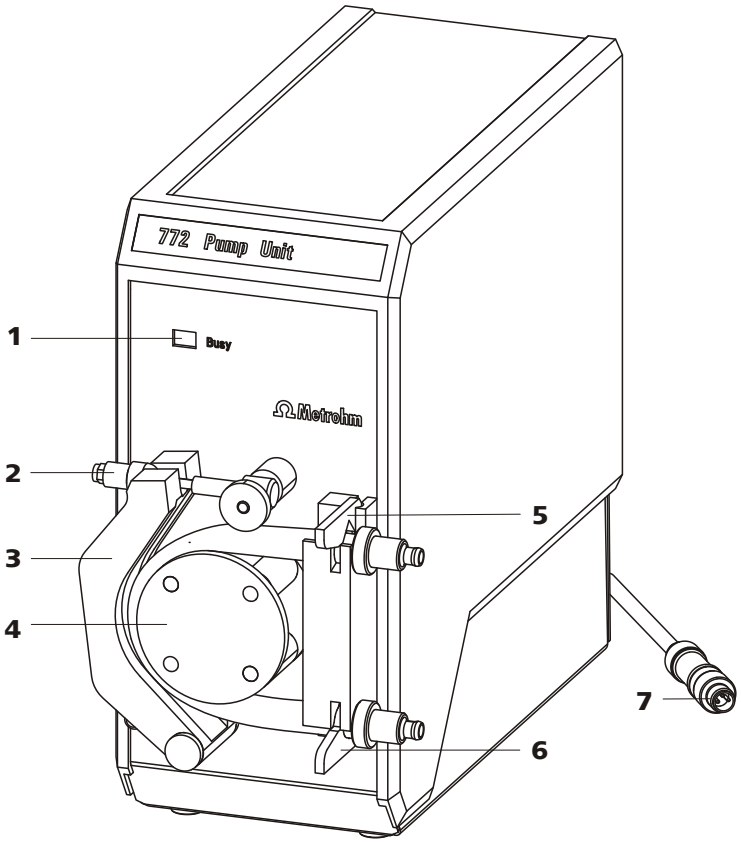


Figure 1 Front 772 Pump Unit

1 **Status LED** For displaying the operating state.	**2** **Locking lever with clamping screw**
3 **Pressure clamp** For the counterpressure to the pump tubing.	**4** **Rotor**
5 **Tubing clamp (outlet)**	**6** **Tubing clamp (inlet)**
7 **Connection cable** With M8 plug for connection to a Sample Processor.	

3 Installation

3.1 Setting up the instrument

3.1.1 Packaging

The instrument is supplied in protective packaging together with the separately packed accessories. Keep this packaging, as only this ensures safe transportation of the instrument.

3.1.2 Checks

Immediately after receipt, check whether the shipment has arrived complete and without damage by comparing it with the delivery note.

3.1.3 Location

The instrument has been developed for operation indoors and may not be used in explosive environments.

Place the instrument in a location of the laboratory which is suitable for operation and free of vibrations and which provides protection against corrosive atmosphere and contamination by chemicals.

The instrument should be protected against excessive temperature fluctuations and direct sunlight.

3.2 Mounting the tubings

3.2.1 Mounting the pump tubing

NOTICE

Selecting the correct pump tubing is very important for its function and lifetime *(see chapter 5, page 15)*.

1 Cut the pump tubing to a length of approx. 17 cm.

2 Insert the tubing olives (6.1820.050) into the two tubing ends.

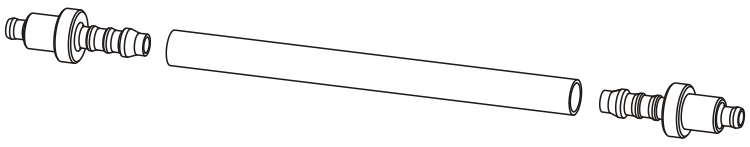
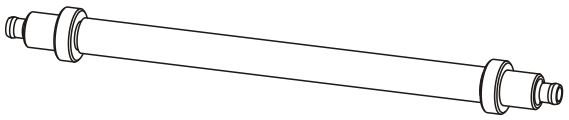


Figure 2 Inserting the tubing olives



3 Clamp the pump tubing **1** into the pump head according to the drawing below such that the tubing **and** the tubing olives are fastened by the tubing clips **2** and **3**. The tubing must be as centered on the roller as possible.

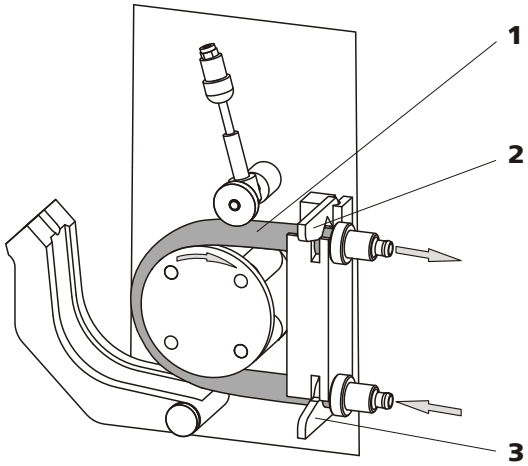


Figure 3 Installing the pump tubing

4 Press on the pressure clamp **5** and fasten it in place using the locking lever **4**.

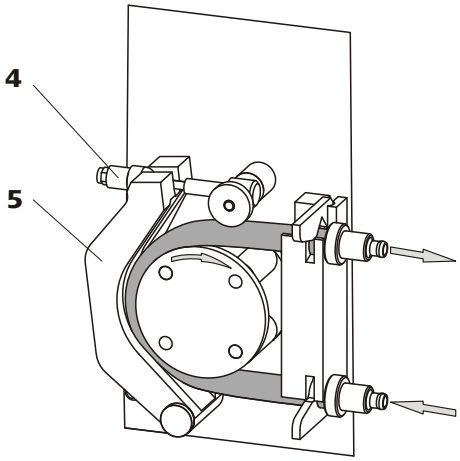


Figure 4 Fastening the pressure clamp in place

5 Tighten the clamping screw **4** so that the pump tubing cannot slip. With the pump running, gently tighten the clamping screw until the

liquid flows evenly. After a run-in period, correct the setting again if necessary.

NOTICE

Do not clamp the pump tubing too tightly or apply too much pressure, as this causes greater wear to the pump tubing and the pump will generate excessive pump pressure.

3.2.2 Installing the inlet tubing and outlet tubing

As the inlet tubing and outlet tubing, two different tubing types are available. Both tubings are included in the scope of delivery .

- PVC tubing (6.1801.120), 2 x 2 m
- PTFE tubing (6.1812.000), 1 x 4 m

NOTICE

Which of the two tubings to use depends largely on the solvent used. PVC tubing is more flexible and has the advantage of making less noise during the pumping operation. It must be noted that the PVC tubing is not resistant to solvents.

Install the inlet tubing and outlet tubing as follows:

1 Cut the inlet tubing and outlet tubing to the suitable length.

2 Connect the tubings to the tubing olives of the pump tubing using union nuts.

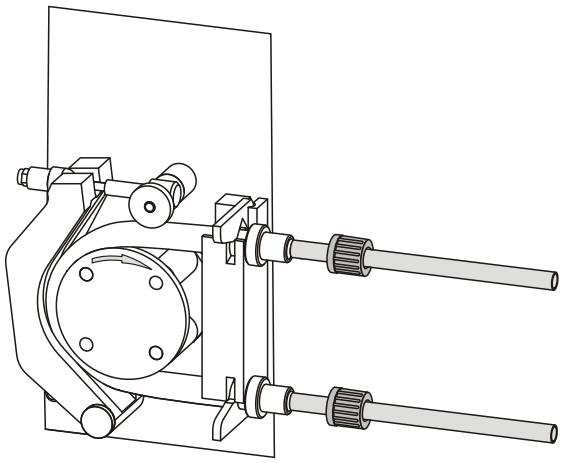


Figure 5 Connecting the tubings

NOTICE

To fasten PTFE tubings in place, you have to widen their openings (e.g. using a Phillips screwdriver). You can use a piece of sandpaper to make the PTFE tubing easier to handle.

Do not heat the tubing ends to widen them, as otherwise the connecting nipples can be damaged.

3 Screw the union nuts tightly to ensure a secure tubing connection.

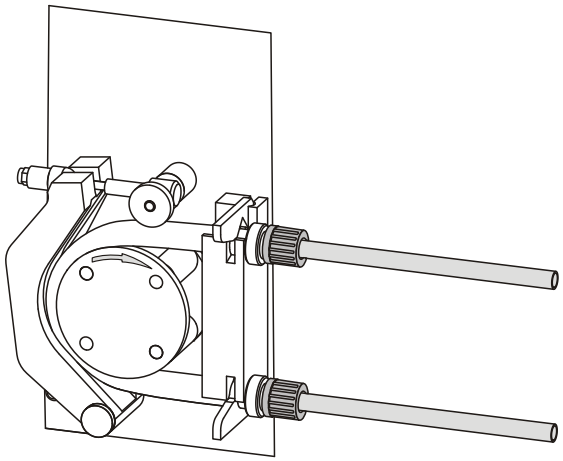


Figure 6 Screwing the union nuts tightly

3.3 Connecting the peristaltic pump

WARNING

Follow the instructions listed below for connecting to a control device. The instrument can be damaged if operated with the wrong supply voltage.

Voltage

The 772 Pump Unit needs 16 - 24 V DC voltage. It can be connected directly to Sample Processor models 814, 815, 855 or 864.

When using the 772 Pump Unit in an automation system with remote control, we recommend using a 731 Relay Box for the power supply.

3.3.1 Connection to a Sample Processor

- Plug the M8 plug into the socket on the Sample Processor provided for this purpose.

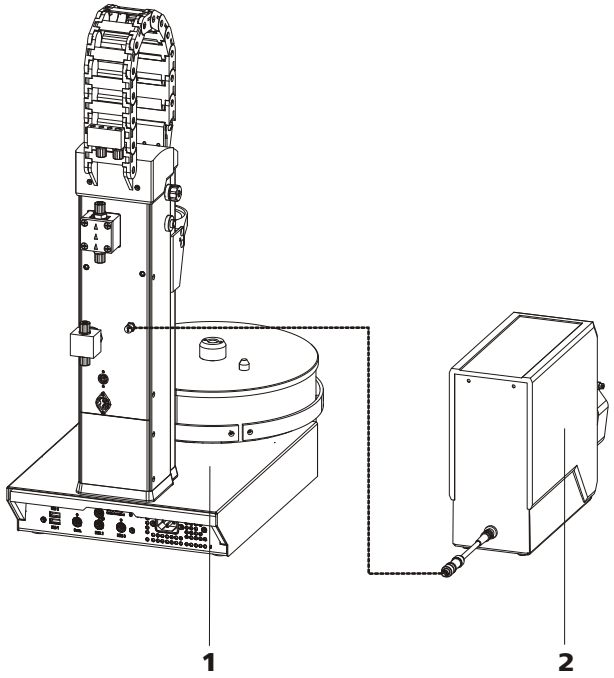


Figure 7 772 Pump Unit directly on the Sample Processor

1 Sample Processor 814, 815, 855, 864 Instruments with Pump Connector.	**2 772 Pump Unit** Peristaltic pump with M8 connector.

NOTICE

The Sample Processor 824 Easy Sample Changer does not have an M8 socket. However, the adapter cable 6.2160.010 can be used for the connection. For details about connecting the 772 Pump Unit to the adapter cable, refer to the manual for the 824 Easy Sample Changer.

3.3.2 Connection to the 731 Relay Box

Connect the 772 Pump Unit with connection via the Remote Box (6.2148.010) and the 731 Relay Box to a remote interface.

- Connect the M8 plug *(1-**7**)* of the 772 Pump Unit to the corresponding socket on the adapter cable.
- Plug the adapter cable into low-voltage DC current output DC1 or DC2 of the 731 Relay Box.

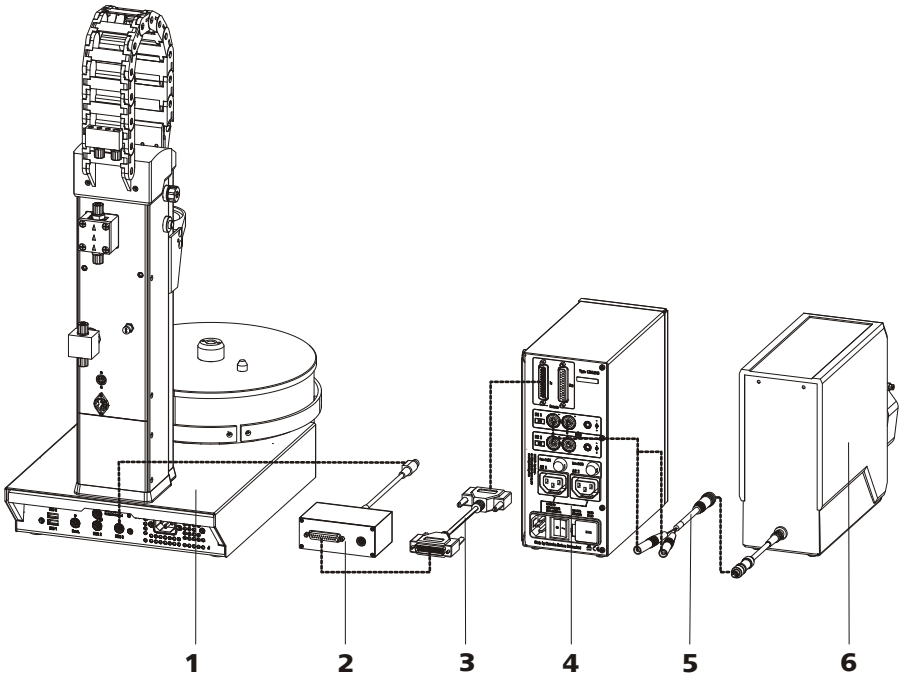


Figure 8 772 Pump Unit via the Remote Box and 731 Relay Box

1	**Sample Processor 814, 815, 855, 864** Connection via remote interface.	**2**	**Remote Box (6.2148.010)**
3	**Remote cable (6.2125.100)**	**4**	**731 Relay Box (2.731.0010)**
5	**Adapter cable (6.2160.010)**	**6**	**772 Pump Unit**

NOTICE

Ensure the correct polarity of the banana plugs.

The red plug (positive pole) belongs in the red socket, the black plug (negative pole) belongs in the black socket. Reversing the polarity of the connecting plugs also reverses the direction of pumping.

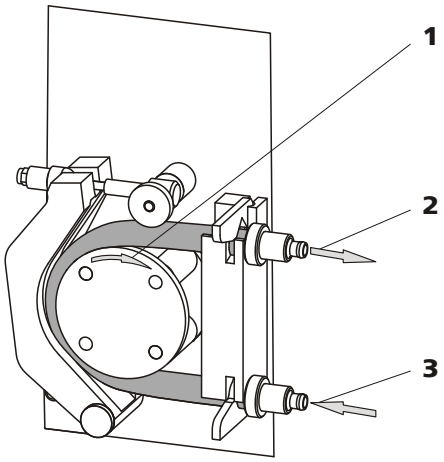


Figure 9 Direction of rotation

1 Direction of rotation Correct direction of rotor rotation with correct polarity (clockwise).	**2 Outlet**
3 Inlet	

NOTICE

For information on controlling the 772 Pump Unit using the 731 Relay Box and a suitable control device, refer to the manual of the 731 Relay Box.

4 Operation

The 772 Pump Unit does not have its own operating units. It is operated and controlled via the main instrument in the linked system.

5 Operation and maintenance

5.1 General notes

5.1.1 Care

The 772 Pump Unit requires appropriate care. Excess contamination of the instrument may result in functional disruptions and a reduction in the lifetime of the sturdy mechanics and electronics.

Spilled chemicals and solvents should be removed immediately. Above all, the plug connections on the rear of the instrument (in particular the mains connection socket) should be protected from contamination.

CAUTION

Although this is extensively prevented by design measures, the mains plug should be unplugged immediately if aggressive media have penetrated the inside of the instrument, so as to avoid serious damage to the instrument electronics. In such cases, Metrohm Service must be informed.

5.1.2 Maintenance by Metrohm Service

Maintenance of the 772 Pump Unit is best carried out as part of an annual service, which is performed by specialist personnel of the Metrohm company. If working frequently with caustic and corrosive chemicals, a shorter maintenance interval could be necessary.

Metrohm Service offers every form of technical advice for maintenance and service of all Metrohm instruments.

5.2 Pump tubings

WARNING

Aggressive liquids

Leaking liquids can pose a risk of injury and damage instruments.

- Use suitable tubing only.
- Regularly check tubing for proper fastening and for damage and wear.

NOTICE

In every case, the user has sole responsibility with regard to suitability and safety of pump tubing. Therefore, it is extremely important that before each use, the safety and effectiveness of tubing is tested based on application-specific laboratory, field or clinical tests.

5.2.1 Selecting the pump tubing

The most important decision when using peristaltic pumps is the selection of suitable tubing material. Always use tubings particularly intended for peristaltic pumps.

The 772 Pump Unit is shipped with PharMed® pump tubing (6.1826.100, ø 6.4/9.6 mm, *see Chapter 5.2.5*) made of thermoplastic polypropylene, which is highly suitable for aqueous media.

If you need other tubings for your application, take care to ensure the following points when evaluating the pump tubings:

- Chemical resistance
- Pressure build-up in the pump tubing
- Sterilizability
- Temperature of the pump medium and the environment
- Viscosity of the liquid
- Permeability of the pump tubing
- Demanded flow rate
- Tubing dimensions

We recommend using PVC, silicone, Viton® and PharMed® as the tubing materials. Contact your laboratory dealer for information on suitable products and their data sheets.

5.2.2 Suitability test for tubing materials

Place a piece of the tubing in question for 48 hours in a closed container filled with the liquid in question. Then examine the piece of tubing for signs of swelling, embrittlement or other damage.

5.2.3 Tubing dimensions

NOTICE

Use tubing with a wall thickness of 1.6 mm only.

The largest usable inner diameter is 6.4 mm.

5.2.4 Tubing lifetime

The pump tubing has a limited lifetime and therefore has to be replaced regularly. The following are examples of factors that can influence the lifetime of tubing in peristaltic pumps:

- Chemical resistance of the pump tubing
- Pump rate (rotational speed)
- Properties of the pumped liquid
- Outlet pressure
- Ambient temperature
- Shearing force of the rollers
- Twisted or kinked tubing
- Tubing too long
- Wall thickness of 1.6 mm not complied with

NOTICE

- If the tubing is not tightened sufficiently around the rotor, this has a negative impact on the lifetime of the tubing, as in this case the tubing tends to fold up. If the tubing is tightened too much, the flow is restricted.
- The tubing will last longer if the pressure clamp is detached when the pump is not in use.
- In order to achieve good repeatability of flow rate following a change in tubing, it is imperative that you always select the same tubing length.

Before changing tubing:

- Pump all of the liquid out of the tubing so that none remains.
- Pull out the connection cable of the peristaltic pump to prevent accidental starting of the pump.
- Detach the pressure clamp, open the tubing clamps and remove the tubing.

5.2.5 PharMed® pump tubing data sheet

Physical properties	Polypropylene-based thermoplastic elastomer, contains plasticizer	
Dimensions	Inner diameter = 6.4 mm	
	Wall thickness 1.6 mm	
Advantages	Ideal for aqueous media	
	Impermeable to normal light and UV radiation	
	Tubing can be welded, glued and thermoformed.	
	Very long lifetime	
Restrictions	Additives can be dissolved out by the pumped medium.	
Applications:	**Acids**	Good resistance
	Bases	Good resistance
	Solvents	Not suitable
	Pressure	Well suited
	Vacuum	Very well suited
	Viscous media	Well suited
	Sterile media	Very well suited
Temperature range	–60 - +130 °C	

Permeability (C) for:	**CO_2**	1,200
(see figure 10, page 19)	**O_2**	200
	N_2	80
Corresponds to the following standards:	USP Class VI	
	FDA 21CFR177.2600	
	NSF (Standard 51)	
Cleaning/sterilization	The tubing can be sterilized in the autoclave without being damaged.	

$$C = \left(\frac{cm^3 \cdot mm}{s \cdot cm^2 \cdot cmHg} \right) \cdot 10^{-10}$$

Figure 10 Calculation formula for the permeability (C)

5.2.6 Viton® pump tubing data sheet

Physical properties	Viton®; rigid, impermeable, black	
Dimensions	Inner diameter = 6.4 mm	
	Wall thickness 1.6 mm	
Advantages	High chemical resistance	
	Low gas permeability	
	Wide temperature range	
Restrictions	Limited lifetime	
Applications:	**Acids**	Outstanding
	Bases	Outstanding
	Solvents	Limited
	Pressure	Not recommended
	Vacuum	Good
	Viscous media	Good
	Sterile media	Satisfactory
Temperature range	–31 °C - +204 °C	
Permeability (C) for:	**CO_2**	38
	O_2	14
	N_2	5
Corresponds to the following standards:	None	
Cleaning/sterilization	Not recommended	

5.3 Tubings

The tubing requires regular inspection in order to work properly:

- Do not kink PTFE tubing.
- Ensure resistance to solvents.
- Check the tubing regularly for any damage.

6 Troubleshooting

6.1 Problems

Problem	Cause	Remedy
The flow is not set correctly.	*The flow is too strong or too weak.*	Loosen or tighten the locking lever with the clamping screw.
The liquid is not aspirated, but just "bubbles" instead.	*The inlet tubing and the outlet tubing have been switched.*	Switch the tubings so that the inlet tubing goes into the solution and the outlet tubing goes into the waste canister.
The peristaltic pump is not running.	*The connecting cable is not connected.*	Connect the connecting cable.
The peristaltic pump is pumping too little or not at all.	*The pressure clamp is set insufficiently or not at all.*	Set the correct pressure using the locking lever and clamping screw.
	The tubing clamp is pinching off the tubing.	Fasten the tubing end piece and the tubing olive in the tubing clip correctly. The tubing clamp must clamp the tubing in the area of the tubing olive.
The tubing connection of the inlet tubing and/or outlet tubing is dripping.	*The tubings are not screwed on correctly.*	Check the screw connectors.
The tubing connection of the pump tubing is dripping or spraying.	*The pressure is too high.*	Loosen the locking lever of the pressure clamp slightly. If necessary, also use a cable tie to tie down the cable ends at the tubing olives.

7 Technical specifications

7.1 Peristaltic pump

Direction of rotation	Clockwise
Rotational speed	160 - 250 rpm, at 20 V / 200 mA
Flow rate	400 - 600 mL/min (depending on the supply voltage and the selection of pump tubing)
Pump tubings	
Wall thickness	1.6 mm
Inner diameter	0.8 - 6.4 mm
Material	Depending on the medium.

7.2 Power supply

Voltage	16 - 24 V DC
Power consumption	≤ 550 mA

7.3 Interfaces and connectors

The 772 Pump Unit does not have any control interfaces. It is operated and controlled via the power supply.

7.4 Ambient temperature

Nominal function range	+5 - +45 °C
Transport and storage	–40 - +70 °C

7.5 Reference conditions

Ambient temperature	+25 °C (±3 °C)
Relative humidity	≤ 60%

7.6 Dimensions/material

Width	100 mm
Height	210 mm
Depth	260 mm
Weight	3.20 kg (without accessories)
Material	
Housing, upper part	Polyurethane, coated
Bottom part of housing	Steel sheet, stove-enameled

8 Accessories

Up-to-date information on the scope of delivery and optional accessories for your product can be found on the Internet. You can download this information using the article number as follows:

Downloading the accessories list

1. Enter *https://www.metrohm.com/* into your Internet browser.
2. Enter the article number (e.g. **Variable Produktnummer**) into the search field.

   The search result is displayed.
3. Click on the product.

   Detailed information regarding the product is shown on various tabs.
4. On the **Included parts** tab, click on **Download the PDF**.

   The PDF file with the accessories data is created.

NOTICE

Once you have received your new product, we recommend downloading the accessories list from the Internet, printing it out and keeping it together with the manual for reference purposes.

Index