User Guide

Millivac™ Mini Vacuum Pump

XX5411560, 115 V (60 Hz)
XF5423050, 230 V (50 Hz)

For research use only.

Introduction

The Millivac™ Mini Vacuum Pump is a compact, lightweight, and easy to use pump, designed for small volume/aqueous flask filtration applications. This diaphragm pump has premium, corrosion-resistant wetted parts and is fitted with a patented multi-port valve system that increases performance and tolerates liquids accidentally drawn into the system without loss of performance. The fan-cooled, ball-bearing motor is permanently lubricated and has a single-use (fuse) overload protector. The Millivac™ Mini Vacuum Pump is supplied with tubing and Millex®-FG_{50} filters.

Note: Only use a Millex®-FG50 filter or a vacuum-flask water trap in conjunction with the pump, as indicated in Installation (p.3). Use this pump to pump air or gas only, not liquids or particulates.

Symbol Definitions

Symbols below are used with this product.

	Caution or Warning, documentation must be consulted. Potential personal injury hazard. Obey all safety messages to avoid property damage, possible injury, or death.
I	On (Power)
O	Off (Power)
	Unplug the pump from the power source before opening.
REF	Catalogue Number
SN	Serial Number
	Manufacturer/ Legal Entity
	Waste Electrical and Electronic Equipment (WEEE) Directive, see page 7 for more information
CE	European Council Directive conformity marking (XF5423050 only)

Rules for Safe Operation

Read and understand the information in this user guide before operating the vacuum pump.

⚠ DANGER

- Do NOT pump flammable or explosive gases or vapors or operate this pump in or near an area containing flammable or explosive gases or vapors.
- Do NOT operate in an area where aerosol (spray) products are being used.
- Do NOT operate this product near flames.

⚠ WARNING

- For indoor use only.
- Do not operate in an area where the pump can fall or be pulled into water or any other liquids. Do not reach for this product if it has fallen into liquid. Unplug immediately.

⚠ CAUTION

- Inspect hose, plug, and cord for signs of damage before use. Do not use if a deficiency is found. Never operate a unit that has been dropped, damaged or has fallen into water. Contact us for information; see Technical Assistance (p.8) for details.
- Keep cord away from heated surfaces.
- Do not block the ventilation ports located on the housing and keep them free of dirt and foreign objects.
- The pump has a single-use (fuse) type of overload protector. If the motor overheats, the protector will shut the unit off. If this occurs, unplug the pump and contact Technical Service.
- Use only to pump air or gas, not liquids or particulates. Damage to the pump or loss of performance can occur if large amounts of liquid or particulates enter the system. The life of the pump can be prolonged if the formation of condensate within the pump is avoided. The vacuum trap should be emptied after each use.

Specifications

Performance

Vacuum pressure	10 kPa absolute (3.0 inHg absolute, 27 inHg gauge)
Ingress Protection	IP20

Dimensions

Length	22.6 cm (8.9 in.)
Width	9 cm (3.5 in.)
Height	14.1 cm (5.6 in.)
Weight	~1.9 kg (~4.2 lb)
Tubing Connectors	6 mm (⅛ inch NPT) x hose barb for 6.4 mm (¼ inch) ID tubing

Materials of Construction

Pump Wetted Parts	Polyphenylene sulfide (PPS) head, ethylene propylene diene monomer (EPDM) diaphragm, fluorinated polypropylene monomer (FPM) valves and seals
Tubing Connectors	Polyethylene

Electrical Specifications

XX5411560	115 V (60 Hz)
XF5423050	230 V (50 Hz)

One 3 conductor, grounded power cord (protection class IP20) included

See Safety Sheet for additional specifications.

Installation

- The vacuum pump should be operated in a clean, dry, well-ventilated area, in a location where the temperature remains between 5–40 °C (41–104 °F). This is particularly important when the unit is installed in a confined space. Protect external parts from direct or indirect moisture contact. Avoid operating the pump in very dusty conditions.
- To prevent liquids or vapors from entering the pump when applying vacuum, install the Millex®-FG50 filter in-line between the filter flask and pump (Figure 1).

  Note: Replace the Millex®-FG_{50} filter (SLFG05010) if it gets wet or appears to be plugged.

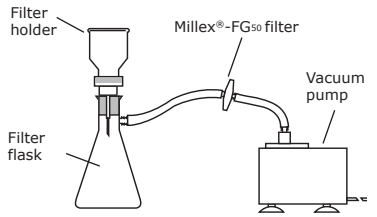

Figure 1. Millex®-FG_{50} filter pump protection.

- The pump can alternatively be protected by a flask vacuum trap consisting of a 1 liter filtering flask (XX1014705), No. 8 stopper and silicone tubing (Figure 2). When using the flask vacuum trap, it is not necessary to use the Millex®-FG_{50} filter. For best results, keep the tubing between the pump and equipment as short as possible. Additional accessories available in Product Ordering (p.8).

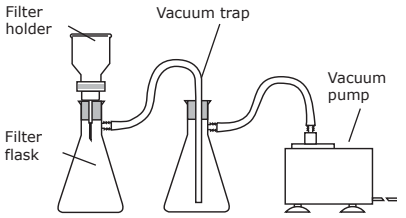

Figure 2. Vacuum trap pump protection.

Notes:

- When the unit is not in use, wrap the power cord around the vacuum/pressure pump and store in a dry place. Do not abuse the cord.
- This pump is 100% oil-free. All bearings are sealed and permanently lubricated. Lubrication should not be attempted.
- Be sure that the available electric power matches specifications of the electric motor listed on the identification plate. Serious damage may occur to the motor if connected to an improper voltage.
- This pump must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock. Do not remove the ground pin from the plug.
- This product is equipped with a cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local electrical codes and ordinances.
- This pump is designed to start against atmospheric pressure only, not under any vacuum load. Care must be taken to eliminate load after pump is turned off.
- Output flow should not be throttled or restricted for any reason.
- Be sure that the pump is installed at the highest point within the system to prevent large quantities of condensate from entering the unit.
- To avoid damaging polyphenylene sulfide (PPS) heads, use only plastic hose barb fittings.

How to Use the Millivac™ Mini Vacuum Pump

The Millivac™ Mini Vacuum Pump is shipped ready for use. See Installation (p.3) and Specifications (p.2) for required operating conditions.

1. Remove any protective plastic plugs supplied in the intake or pressure ports of the pump prior to applying power to the motor.
2. Plug pump into appropriate electrical outlet. Turn pump on with **On/Off** switch on front of unit.
3. Run the pump for a few minutes to warm it up before handling saturated or nearly saturated vapors.
4. Attach system tubing to the hose barb on the right of the pump top for vacuum applications.

Cleaning

- After use, purge the pump for 5 minutes with air under atmospheric conditions (if necessary for safety reasons: with an inert gas). This prevents crystalization and/or absorption of liquids by the pump materials, and prolongs pump life.
- Clean the exterior surfaces of the pump with a damp wipe and non-flammable cleaning products.
- When cleaning, ensure that no fluid enters the housing.

Maintenance

Under normal operating conditions, and using proper handling procedures, the Millivac™ Mini Vacuum Pump will provide hours of service-free operation. It requires no lubrication and the heads and valves can be easily disassembled for occasional cleaning and/or replacement of valve plate, seal ring, and diaphragm. Leakage and contamination are the general causes of problems associated with poor vacuum pressure. To operate at maximum efficiency, the pump must be thoroughly clean. If the system is completely clean and free from leaks, and unwarranted vacuum problems still exist, the valve plate, seal ring, and diaphragm may need to be replaced. Refer to instructions below for cleaning and part replacement.

Troubleshooting

Maximum vacuum is not reached

- Confirm that all system connections are gas-tight. To detect leaks, slightly pressurize the system and paint the suspected area with a thick soap solution. Escaping air will produce soap bubbles.
- Be sure that all screws on the head assembly are snug. To avoid damaging pump, do not over-tighten screws.
- Disassemble the valve assembly as described in Cleaning and Replacement of Valve Plate, Seal Ring, and Diaphragm (p.6). Look for any foreign matter, commonly bits of polytetrafluoro-ethylene (PTFE) tape or particulates carried into the valve system or crystallized residue from previously pumped vapors. All of the above must be cleaned out and the pump reassembled with clean or new parts.

Pump does not run and pump On/Off switch is dark

- Confirm that power is being supplied to the pump from the power source and the pump switch is in the On position.
- An over-current or other problem may have blown the fuses. The fuse holder is located next to power socket.
    1. Before checking fuses, shut off all power to pump and unplug pump's power cord from electrical source.
    2. Pull out the fuse holder while depressing the small tab, and determine if the fuses are good. The proper replacement fuses should always be used. Consult the nameplate or call Technical Service for the proper rating and type of fuse.

Pump does not run and pump On/Off switch is lit

⚠ **WARNING**

Motor is thermally protected and will automatically restart automatically when overload device resets.

- It is possible that the thermal protective device has activated. Turn off the pump and let it cool for 15 minutes before trying again.
- If the pump starts, determine the cause of the overload before using the pump. Possible causes are:
    - Electrical power source does not match motor requirements
    - Insufficient ventilation of the motor caused by blockage or dirt
    - Defective pump assembly or motor
    - Application is exceeding the pressure rating of the pump

Cleaning and Replacement of Valve Plate, Seal Ring, and Diaphragm

Materials needed: Replacement kit XF5423055 (includes 1 structured diaphragm, 2 valve plates, and 2 seal rings)

Tools required: Small Phillips-head screwdriver, marking pencil, mild solvent to clean residue from heads.

Replace the Valve Plate and Seal Ring

1. Be sure pump is dry and free of hazardous materials by operating it for 5 minutes in free air.
2. Shut off all power to pump before disassembly. Unplug pump's power cord from electrical source.
3. Mark the relative position of the head parts with a pencil line to ensure correct assembly later. It is not necessary to remove the hose barbs.
4. Remove the 4 perimeter head screws **B** on the pump head.
5. Lift the head assembly and rubber skirt straight up and place on a clean, flat work surface.
6. Carefully separate the headplate **A** from the intermediate plate **C**. Two seal rings and two valve plates are now exposed.
7. Remove seal rings **E** and valve plate **D**. Carefully clean any residue from the valve seats with a mild solvent. Do not scratch the PPS surfaces. The area around the valve plate must be smooth and dry. If pitting of the pump parts or tearing of the diaphragm is observed, it is possible that the gas/vapor being pumped is attacking the wetted parts of the pump. Chemical resistance charts should be consulted if you are in doubt. Generally, replacement of the diaphragm, seal rings and valve plates will restore the pump to operating specifications.
8. Install new seal rings **E** and valve plates **D** from the spare parts kit, if required. Skip to Replace the Diaphragm step 4, to reassemble head without replacing diaphragm.

Replace the Diaphragm

There are a number of small shim rings **J** located between the diaphragm and the diaphragm support cup **G** and between the diaphragm support cup **G** and the connecting rod **M**. Use care when disassembling the diaphragm so that you can note the quantity, position, and thickness of the shim rings. These shim rings must be reinstalled in the original quantity and position for proper pump operation (see expanded view).

1. Carefully lift the diaphragm **F** edge from the circular groove, and begin to unscrew the diaphragm from connecting rod **M** by hand.

   Before completely unscrewing the diaphragm place it on a flat surface, upside down or on its switch end. Remove the diaphragm. Changing the orientation of the pump prevents the small shims on the diaphragm's threaded stud from falling into the chamber.
2. Assemble all of the components according to the diagram, over the threaded stud end of replacement diaphragm **F** and align the stud with the threaded hole of connecting rod **M** in the chamber. Be sure all parts are centered. Screw the new diaphragm into the connecting rod by hand. Do not over-tighten.
3. Once installed, press down on the diaphragm until the lip on the edge of the diaphragm fits into the groove on the rim of the mounting flange.
4. Return the pump to its normal position.
5. Reassemble the head plate **A** (note guide pin), and intermediate plate **C** in accordance with the mark you made previously.
6. Replace the pump head assembly and tighten head screws **B** snugly in a crosswise pattern. Do not over-tighten screws.
7. Replace rubber protective boot.

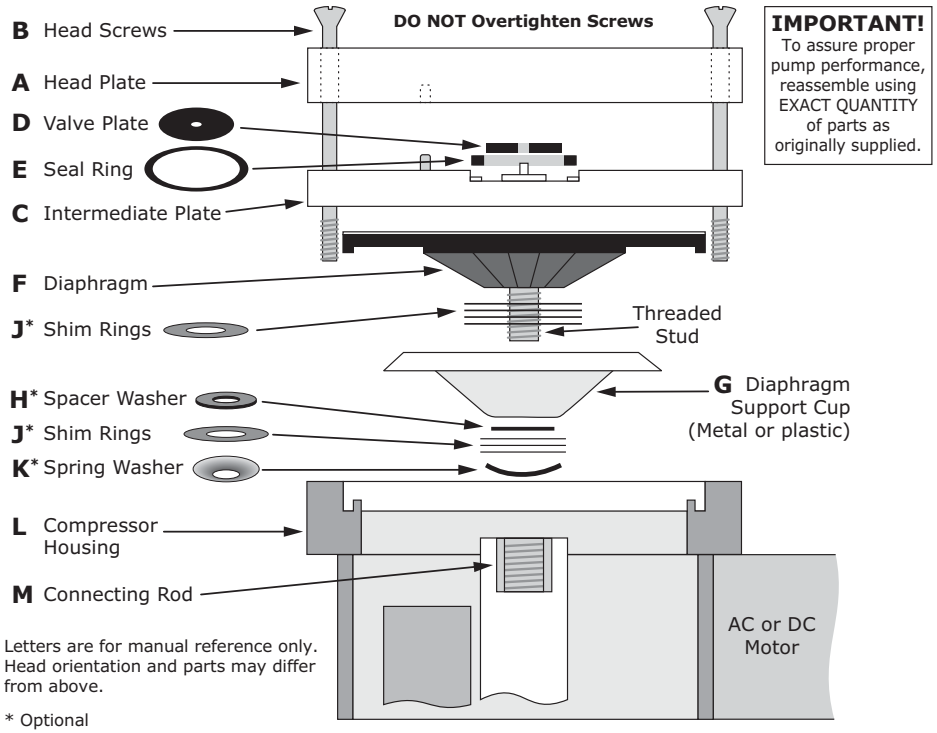

Figure 3. Expanded view of pump head

End of Life Instructions WEEE Directive

In accordance with European Union directive on the management of waste electrical and electronic equipment (WEEE), this product must not be disposed of in unsorted municipal waste at the end of its life. It must be taken to a collection and recycling center. For further information, go to SigmaAldrich.com/weee.

This product utilizes consumable materials for its intended use. Any safety critical information regarding the consumable materials is in the Safety Sheet included in the device packaging. It can also be downloaded from the product page at SigmaAldrich.com.

Product Ordering

Description	Catalogue Number
Millivac™ Mini Vacuum Pump, 115 V (60 Hz)	XX5411560
Millivac™ Mini Vacuum Pump, 230 V (50 Hz)	XF5423050
Accessories	
Millex®-FG_{50} filter unit, 0.2 µm hydrophobic PTFE, 10/pk	SLFG05010
Tubing, 4.8 mm ID x 140 cm ($^{3}/_{16}$ in. x 4.6 ft), silicone	XX7100004
Vacuum filtering flask, 1 L	XX1014705
No. 8 stopper for use with glass accessories only. 9.5 mm ($^{3}/_{8}$ in.) hole, silicone with parylene coating, 5/pk (blue stopper replacement)	XX2014718
EPDM Membrane Kit for Millivac™ Mini Pumps	XF5423055

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XX5411560, 115 V (60 Hz)
Made in U.S.A.

XF5423050, 230 V (50 Hz)
Made in Germany.