

Gradient Mixer GM-1

1. Introduction

The Gradient Mixer GM-1 (120 V, Code No. 19-0495-01, 230 V Code No. 19-0485-01) consists of two identical reservoirs mounted on a base plate; connection between the reservoirs is made via a valve. Mounted above the mixing reservoir is a motor unit which drives a stirrer blade. The outlet from the mixing reservoir to the column is fitted with a flow control valve, FCV-1. The Gradient Mixer is conveniently supported on a laboratory stand. Capillary tubing, 2 m, is also supplied.

2. Safety

Warning!

When using hazardous chemicals, all suitable protective measures such as protective glasses, must be taken.

3. Unpacking

Unpack the equipment carefully and check the contents of the carton against the packing list.

4. Description

THE BASE PLATE (11)* is a precision machined polypropylene block on which the reservoir cylinders (7) are mounted.

Sealing between the base plate and the cylinders is provided by O-rings (8).

THE RESERVOIR CYLINDERS (7) are straight polymethylpentene tubes threaded at one end and with air inlets at the other end. Each cylinder has a capacity of 300 ml and is graduated to 250 ml at 25 ml intervals to give a rapid check of the volume of liquid remaining in the reservoirs. The mixing reservoir carries the motor unit (1, 2) and the other reservoir is fitted with a snap-on lid (3).

THE MOTOR UNIT (1, 2) consists of a fully encapsulated low speed 250 or 300 rpm synchronous motor mounted in polypropylene housing. A phasing condenser ensures that the direction of stirring is always the same and that the

stirrer blade (6) lifts the liquid entering the mixing reservoir. The motor unit is supplied for operation from 100–120 or 220–240 V AC, 50 or 60 Hz.

THE STIRRER BLADE (6) is secured to the motor axle by a nylon screw (5). It is unnecessary to remove the screw to release the stirrer blade.

THE CONTROL VALVE (12) regulates the flow of liquid between the two reservoirs. It is fully open when screwed out one complete revolution from the closed position.

THE FLOW CONTROL VALVE (18) is a needle valve designed for shut-off as well as flow control. The valve nipple accepts capillary tubing 1.6–1.9 mm o.d. Eluent flow is regulated with the large knob (A). The line on this knob and the markings on the valve housing can be used as a flow rate guide. The valve can thus be opened to a previously determined position to obtain a given flow rate. To obtain reproducible flow rates the valve should always be returned to the shut position before setting.

THE STAND MOUNT (21) may be used to support the Gradient Mixer on a laboratory stand. When not required, it may be removed from the base plate (11) by unscrewing the retaining knob (20).

5. Installation

Connection of tubing to the flow control valve

1. Cut the tubing cleanly at a 45° angle.
2. Remove the screw cap and slip it over the tubing.
3. Remove the rubber cone with the help of the metal stopper.
4. Push the tubing through the rubber cone until it projects about 1 cm.
5. Seat the tubing in the nipple. Slide the cone along the tubing, into the nipple.
6. Finger tighten the screw cap.

* Numbers refer to the enclosed Spare Parts drawing.



Dismantling the Gradient Mixer

The reservoir cylinders (7), control valve (12) and flow control valve (18) may be removed from the base plate by unscrewing them. To remove the stirrer blade (6) from the motor unit (1, 2), unscrew the nylon screw (5) a few turns. It is not necessary to remove the screw completely. The lid of the motor unit should not be removed.

6. Operation

Operating the Gradient Mixer

1. Close the control valve (12) and flow control valve (18) and pour the required amount of starting solution into the mixing reservoir. The graduations may be used as an approximate guide to the volume of liquid in the reservoirs.
2. Mount the motor unit (1, 2), with the stirrer blade (6), on the mixing reservoir.
3. Open the control valve (12) slightly so that the channel between the reservoirs fills with solution and a small amount of liquid emerges into the other reservoir. Close the control valve.
4. Pour the gradient-forming solution into the empty reservoir until the liquid levels in the two reservoirs are nearly the same. The level in the mixing reservoir should be slightly higher than the level in the other reservoir to avoid a step at the beginning of the elution.
5. Open the control valve (12) fully, one complete revolution, start the motor and begin the elution by opening the flow control valve (18). If a pump is used to control the eluent flow, the flow control valve (18) should be fully open, one complete revolution .

The Gradient Mixer will give linear ionic strength gradients and reproducible, but non-linear, pH gradients. The exact shape of the pH gradient obtained will depend on the buffer salts used and the ionic strengths and pH's of the buffer solutions. The use of gradient elution in ion exchange chromatography is described in the booklet "Ion Exchange Chromatography – principles and methods."

7. Maintenance

Warning!

When using hazardous chemicals, all suitable protective measures such as protective glasses, must be taken.

Cleaning

Ordinary laboratory detergents may be used to clean the gradient mixer. Enzyme detergents are recommended for removing proteinaceous contaminants. The mixer, including

the stirrer blade but not the motor unit, may be autoclaved at 121 °C for 20 min.

Caution!

Do not autoclave the motor unit or drain the motor in strong detergents.

8. Technical specification

| | |
|--------------------------|---|
| Mixing chamber volume | 300 ml |
| Environment | +4–40 °C 20–95% relative humidity |
| Material of wetter parts | Polymethylpentene, Polypropylene, glass fibre reinforced polypropylene and fluororubber. |
| Chemical resistans | The wetted parts are resistant to aqueous and organic solvents commonly used in ion change chromatography and solutions containing inorganic and organic acids, alkalis and alcohols. |
| Power requirements | 100–120 VAC or 220–240 VAC, 50–60 Hz |
| Power consumption | 7 VA |
| Safety standards | This products meets the requirements of the Low Voltage Directive (LVD) 73/23/EEC through the harmonized standards EN61010-1 and EN60742. |

Note: The declaration of conformity is valid for the instrument when it is:

- used in laboratory locations,
- used in the same state as it was delivered from **GE Healthcare Bio-Sciences AB** except for alterations described in the user manual,
- used as a "stand alone" unit or connected to other CE labelled **GE Healthcare Bio-Sciences AB** instruments or other products as recommended.

9. Spare parts

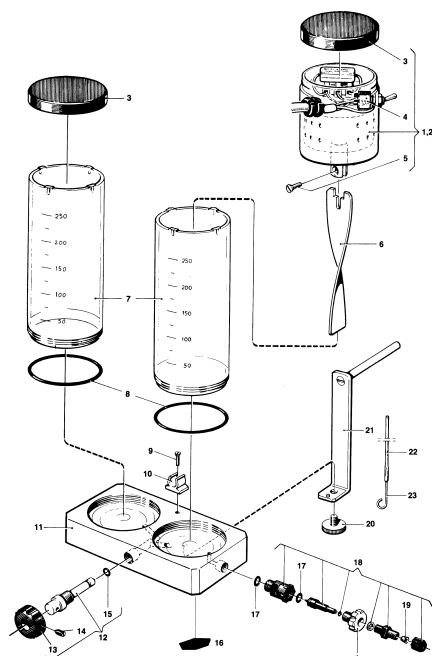
Caution!

Only spare parts approved or supplied by GE Healthcare Bio-Sciences AB may be used for maintaining and servicing of Gradient Mixer GM-1.

The figure indicates the correct locations of the different parts of the Gradient Mixer. For replacements please order according to the spare part list below using the appropriate code number.

| Detail No. | Designation | Code No. | Material | No. per pack |
|------------|--|------------|----------|--------------|
| 1 | Motor unit (complete with detail Nos. 3, 4, 5) 110 V | 18-1121-66 | A* | 1 |
| 2 | Motor unit (complete) 230 V | 18-1121-67 | A* | 1 |
| 3 | Lid | 19-0452-01 | B | 1 |
| 4 | Switch | | | |
| 5 | Screw | | | |
| 6 | Stirrer blade | 19-0455-01 | A | 1 |
| 7 | Reservoir cylinder | 19-0457-01 | D | 1 |
| 8 | O-ring | 19-0364-01 | E | 2 |
| 11 | Base plate | | | |
| 12 | Control valve (complete) | 19-0462-01 | A* | 1 |
| 13 | Knob | | | |
| 14 | Screw | | | |
| 15 | O-ring | | | |
| 16 | Foot | 19-7320-01 | F | 4 |
| 17 | O-ring | 19-0680-01 | E | 10 |
| 18 | Flow control valve FCV-1 (complete) | 19-0049-01 | A* | 1 |
| 19 | Sealing plug | 19-0039-01 | E | 5 |
| 20 | Retaining knob | 19-0489-01 | G | 1 |
| 21 | Stand mount | 19-0463-01 | H | 1 |
| 22 | Tubing | 19-0040-01 | I | 10 m |
| 23 | Stopper | 19-0752-01 | H | 10 |

* material of main component.



Materials

- A Polypropylene
- B Polyvinylchloride
- C Polyamide
- D Polymethylpentene (TPX09)
- E Fluororubber
- F Polyurethane
- G Superpolyoxymethylene
- H Stainless steel
- I Polyethylene

10. Important user information



Meaning:

Consult the instruction manual to avoid personal injury or damage to the product or other equipment.

Warning!

The Warning sign is used to call attention to the necessity to follow an instruction in detail to avoid personal injury. Be sure not to proceed until the instructions are clearly understood and all stated conditions are met.

Caution!

The Caution sign is used to call attention to instructions or conditions that shall be followed to avoid damage to the product or other equipment. Be sure not to proceed until the instructions are clearly understood and all stated conditions are met.

Note:

The Note is used to indicate information important for trouble free or optimal use of the product. Should you have any comments on this instruction, we will be pleased to receive them at:

GE Healthcare Bio-Sciences AB
S-751 82 Uppsala, Sweden

Warranty and liability

GE Healthcare Bio-Sciences AB guarantees that the product delivered has been thoroughly tested to ensure that it meets its published specifications. The warranty included in the conditions of delivery is valid only if the products has been installed and used according to the instructions supplied by GE Healthcare Bio-Sciences AB.

GE Healthcare Bio-Sciences AB shall in no event be liable for incidental or consequential damages, including without limitations, lost profits, loss of income, loss of business opportunities, loss of use and other related exposures, however caused, arising from the faulty and incorrect use of the product.

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