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Fraction Collector RediFrac



User Manual

56-1026-16
Edition AL

GE imagination at work

Important user information

All users must read this entire manual to fully understand the safe use of RediFrac™ Fraction Collector

Amersham Biosciences AB, which was previously known as Amersham Pharmacia Biotech AB, changed its name to the current name on 17th October 2001.

Safety symbols

The following **Warning** symbols highlights instructions that must be strictly followed in order to **avoid personal injury**. Be sure not to proceed until the instructions are clearly understood and all stated conditions are met.



WARNING! Read the instructions to avoid hazardous conditions.

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Caution! The Caution sign highlights instructions or conditions that must 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.

Notes

Note: The Note sign is used to indicate information important for trouble-free and optimal use of the product.

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This product meets all requirements of applicable CE-directives. A copy of the corresponding Declaration of Conformity is available on request.

The **CE** symbol and corresponding declaration of conformity, is valid for the instrument when it is:

- used as a stand-alone unit, or
- connected to other CE-marked GE Healthcare instruments, or
- connected to other products recommended or described in this manual, and
- used in the same state as it was delivered from GE Healthcare except for alterations described in this manual.

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1. Introduction

The fraction collector, RediFrac, Code No. 18-1003-64, is a versatile instrument for simple, straightforward fraction collection. In its standard form it will collect up to 95 fractions in 10-18 mm diameter tubes. It will also collect up to 175 fractions in 12 mm tubes and up to 45 fractions in 28 mm diameter vials, with the help of simple accessories.

Fractions may be collected in different ways, based either on time or drop counting, controlled via simple programs specified by the operator. For example, you can choose to collect uniform fractions of a fixed time period. The RediFrac will collect fractions until all the tubes are used and then switch itself off. Alternatively, fractions may be collected by specifying the number of drops per tube. Safe collection is ensured by using drop synchronisation combined with the unique tube sensor which means the instrument cannot collect into empty positions in the tube rack.

The RediFrac is designed primarily as a stand-alone instrument but can also work with other equipment from GE Healthcare, including Peristaltic Pump P-1, and chart recorders to form simple, integrated chromatographic systems adapted to your individual requirements.

2. General Description

2.1 Front panel

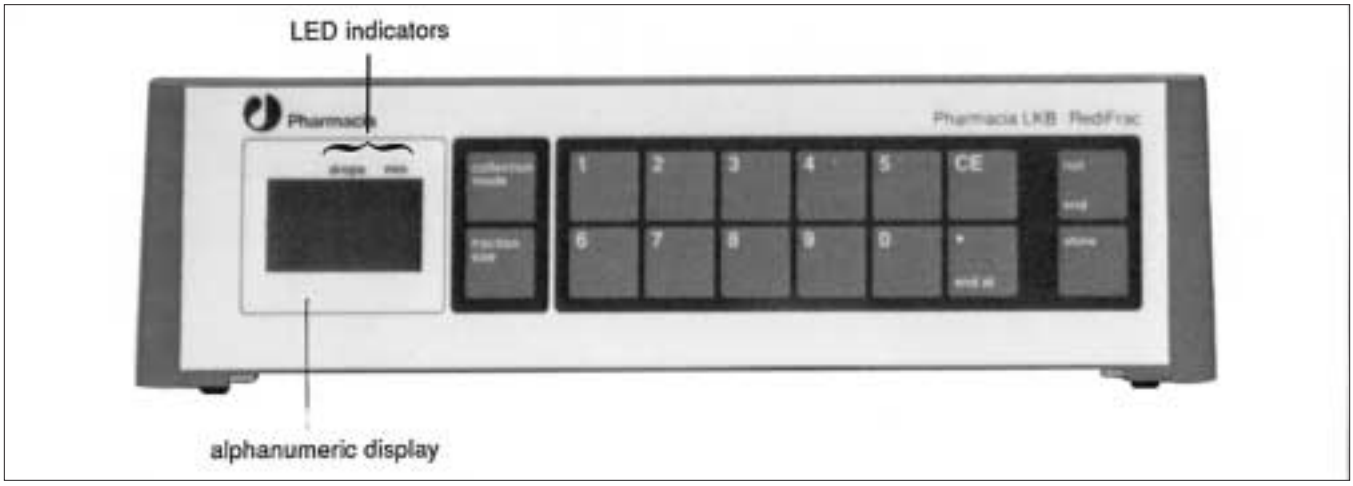


Fig. 1. Front panel.

LED Indicators

min When this light is on, collection is by time (min).

drops When this light is on, collection is by drops.

Alphanumeric display

End "End" is displayed when the RediFrac is turned on indicating that the program is in its end position. "End" is also displayed to indicate that parameters have been correctly entered during programming and after clearing check codes when the collection sequence has finished or cannot continue.

Ch. The automatic status checking function is in operation. When the display flashes "Ch." followed by a number, check the number in the check code list in Section 4 in this manual for a description of the status of the RediFrac and appropriate action.

With the digital display, the RediFrac presents current information. If fractionation parameters need to be checked after they have been stored in the memory, the digital display will show each value as it is accessed. All these values will flash on and off while being displayed.

During a collection when no specific peak evaluation or fractionation parameter is being displayed, time or drop number remaining until the next tube will be displayed. This data does not flash.

Keyboard

The function of each key is described below.

collection mode

Collection mode keys

Causes the collection mode to be displayed and enables collection mode to be programmed. The different collection modes are described in Section 4.1.

Fractionation parameter keys

fraction size

Fraction size key causes programmed fraction size to be displayed and enables a new fraction size to be programmed. Numerals 0 through 9 allow programming of values as fractionation parameters.

•
end at

Causes the programmed end of the collection sequence (time or drop number) to be displayed and enables a new value to be programmed. The "end at" function is described in Section 4.2. It also enters a decimal point in the display.

CE

Clears incorrect entries in a program.

Control Keys

Starts and stops a collection. When collection is stopped, all data remains stored in the memory until "run/end" is pressed again to start a new collection. When collection starts, all data is cleared from the memory and the tube counter returns to 1.

Stores in memory all information entered during programming of fractionation parameters.

2.2 Rear panel

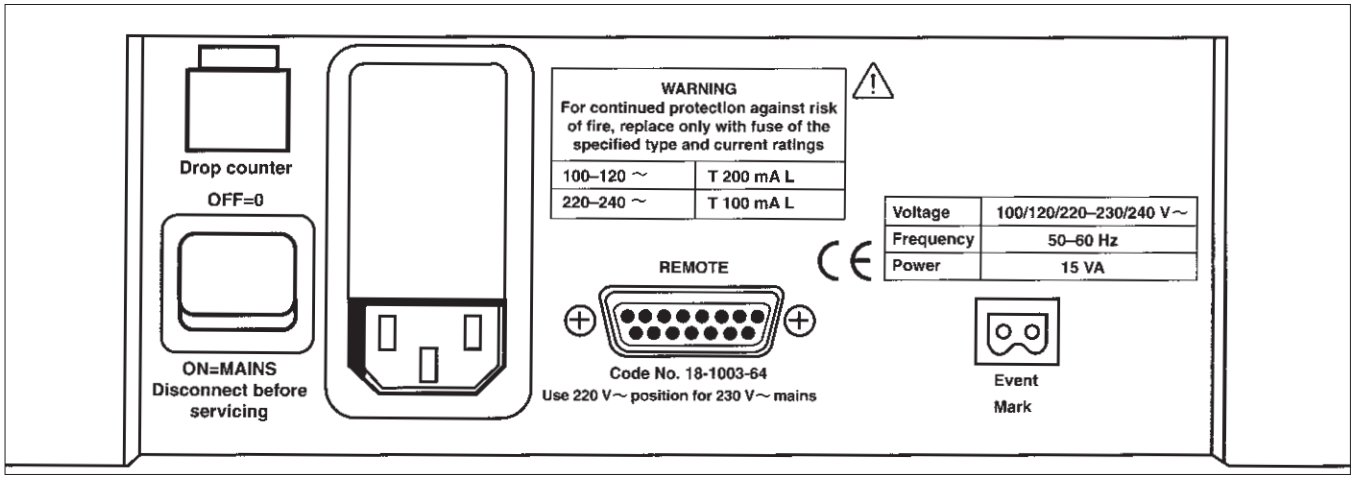


Fig. 2. Rear panel

Mains - ON/OFF switch. Turns the instrument on or off.

Mains connection - Mains power connection, fuse, fuse holder and rotary selector switch that adapts the instrument to different mains voltage (100/120/220-230/240 V~).

Remote - A 15-pin connector for operation of the instrument from a remote source or for control of a pump, e.g. Peristaltic Pump P-1. See also Section 3.1 Remote connection.

Event mark - Removable plug with screw contacts for connecting an event mark operated by contact closure, 0.2 sec.

Drop counter - Socker for drop counter cable from delivery arm.

2.3 Delivery arm

The delivery arm positions the delivery tubing over tubes in the rack. A tube is located by a tube sensor which rests against the top of the tube (see Section 3). The pressure of the sensor against the tube operates a switch which sends a signal to the control circuit. The sensor has two positions, a large white circle for use with large diameter tubes and a smaller circle for use with for smaller diameter tubes. These can be chosen by turning the red control on the top of the delivery arm, to position the liquid flow directly over the center of the collection tube. The delivery arm is spring-loaded and presses inwards to the center of the rack when there are no more tubes to be located or when tubes are missing. The height of the arm can be adjusted after releasing the lock knob. The tension that the arm exerts on the collection tubes can also be adjusted; please refer to a service manual. The arms can be held in two positions outside the rack by pulling it gently outwards until it passes over one of the stops.

Mid-way along the delivery arm is a tubing length guide for use with the crop conter. It is important to obtain the correct length of tubing so that drops form in the correct position with respect to the drop sensor. The tubing must be first passed through the tubing holder and then placed into the guide to its full length. The tubing holder may then be tightened and the complete assemble replaced in its correct position at the end of the delivery arm.

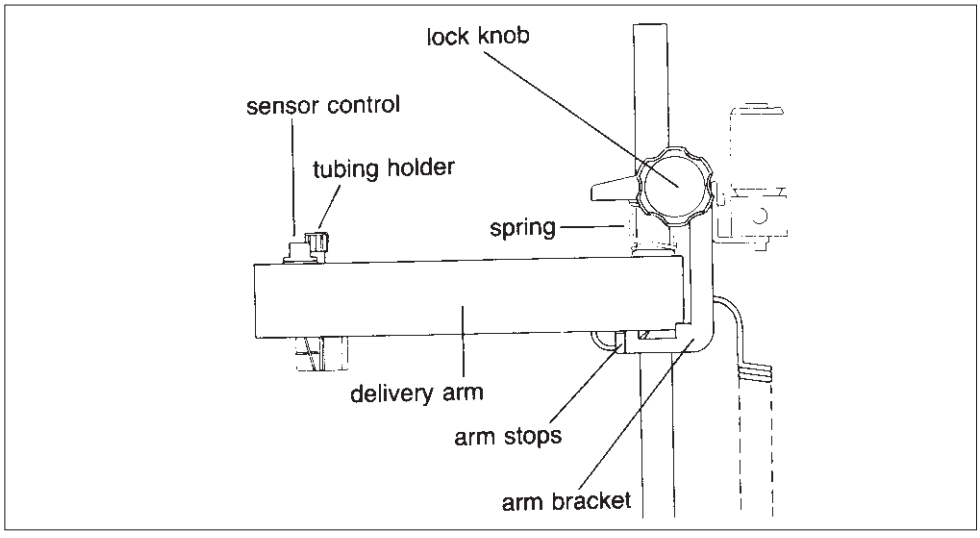


Fig. 3. Delivery arm.

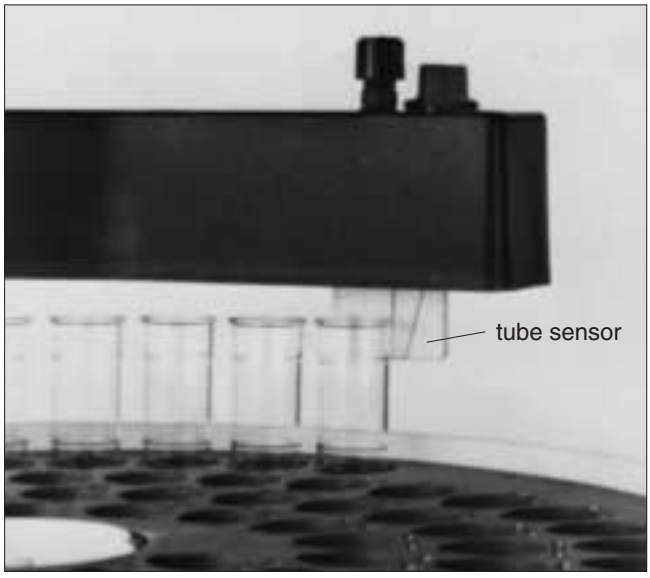


Fig. 4. Correct positioning of tube with tube sensor. The tube should always be below the horizontal marking on the tube sensor.

2.4 Tube rack

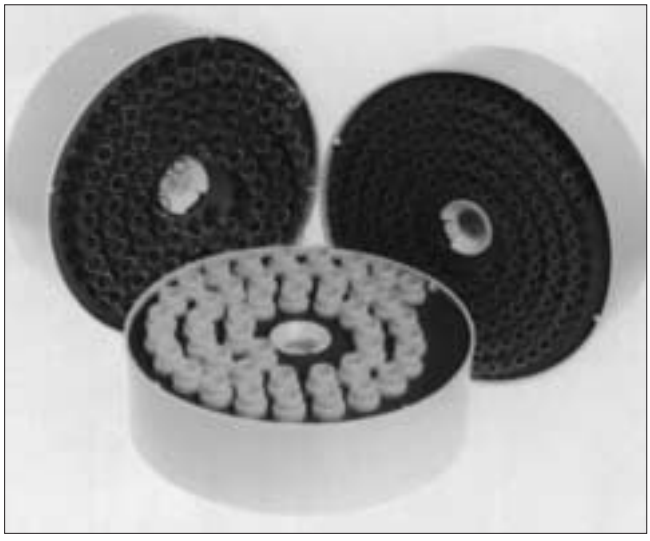


Fig. 5. Tube racks.

The tube rack consists of a bowl into which a tube support, a tube guide and a tube holder fit. The standard rack can hold up to

95 tubes with diameters of 10-18 mm and lengths of 50-180 mm. Two optional accessories are available to increase the range of tube sizes compatible with the RediFrac. Inserts are available for:

- 175 tubes of diameter 12 mm and length of 50-180 mm.

A further accessory for use with this support is a double-ended Eppendorf tube holder. In one end 1.5 ml Eppendorf tubes can be used while the other holds 0.6 ml Eppendorf tubes.

- 40 tubes of diameter 30 mm and lengths of 30-180 mm e.g. scintillation vials.

Tubes are held securely in the correct position in the tube. The tube support and the tube guide can be placed at different heights in the bowl to allow tubes of different lengths to be accommodated. All the tubes in a collection sequence must be of the same size for proper operation.

Note In the standard rack, tube heights greater than 100 mm should have diameters which are greater than 1/10 of the height of the tube. Otherwise, the tension from the delivery arm can force the top of the tube towards the rack's center.

The bowl has a capacity of about 3.5 litres, exclusive of tubes, to ensure that inadvertently spilled liquid, for example from a broken tube, is safely contained.

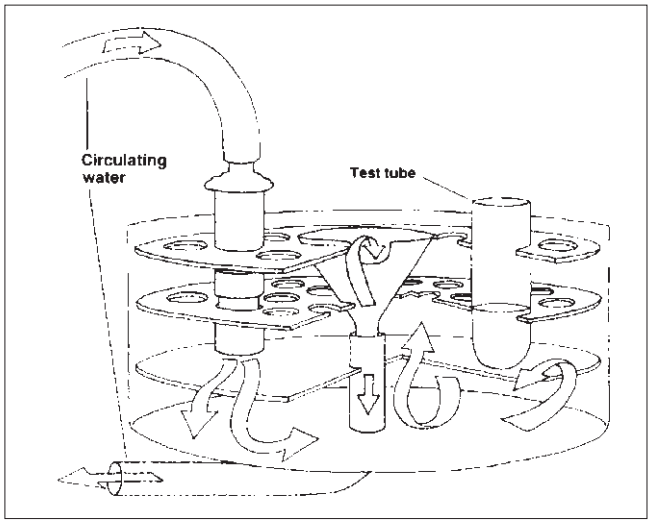


Fig. 6. An external cooling system can be connected to the 18 mm rack.

Since the bowl is self-contained it can be filled with ice to form a cooling bath. When using the 18 mm rack the spring clips holding the tubes in place ensure that the tubes will not float when using a liquid-filled bowl. A water bath connector can be used to link the 18 mm rack to an external cooling system (Fig. 6), especially useful with labile fractions. In the center of the fraction collector there is a funnel that acts as a drain for effluent between collections (Fig. 7). Liquid from the funnel is drained to the outside through EPDM tubing and collected in a separate container.

The racks withstand exposure to organic solvents, strong acids, bases and aqueous buffers in the pH range 1-14 (see Section 7).

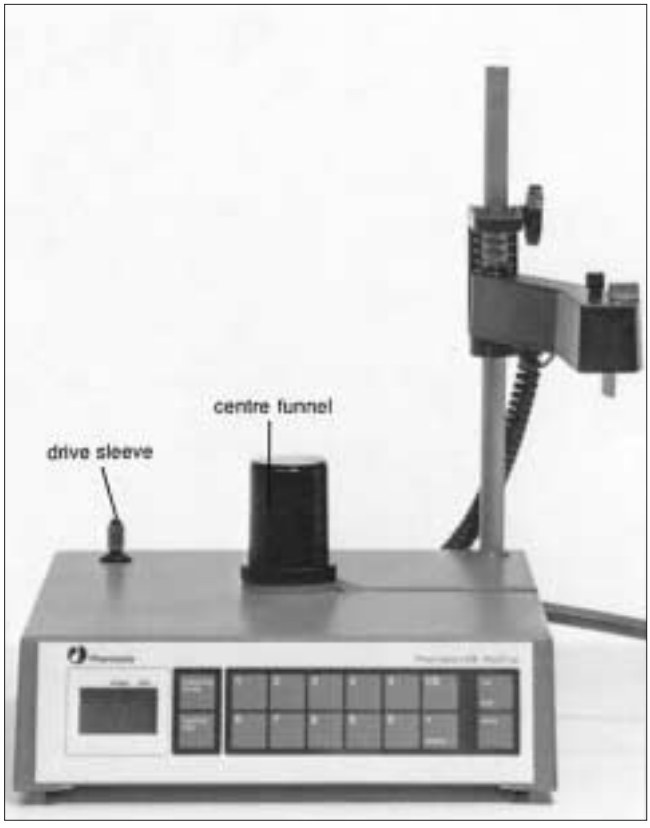


Fig. 7. Center funnel for drainage to waste or separate container.

2.5 Event mark cable

Optional accessory
(Signal/event mark cable, Code No. 19-6006-01).

The event mark cable connects the fraction collector with the event mark input of a recorder to indicate a tube change on the chromatogram.

2.6 Communication cables

Optional accessory for remote control
(Communication cable, Code No. 19-6005-02).

The Communication cable connects the RediFrac to a pump e.g. Peristaltic Pump P-1 for remote operation. Connecting the RediFrac directly to a pump allows the pump to be started and stopped from the fraction collector.

3. Installation

3.1 Unpacking

Carefully unpack the RediFrac. Check the contents against the packing list supplied. Inspect for any damage that may have occurred during transit. Report any damage immediately to the local GE Healthcare representative and to the transport company concerned. Save the packing material if future transport can be foreseen.

Accessory equipment and spare parts list may be found in Section 8.

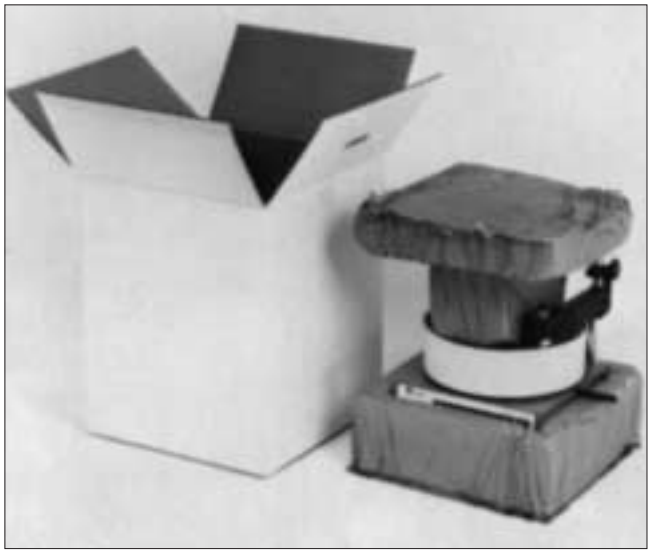


Fig. 8. Cut-away view of a properly packaged RediFrac.

3.2 Assembling the tube rack

Standard tube rack, 10-18 mm diameter tubes

Accessory rack, 12 mm diameter tubes

Tube lengths 50 to 85 mm (Fig. 9)

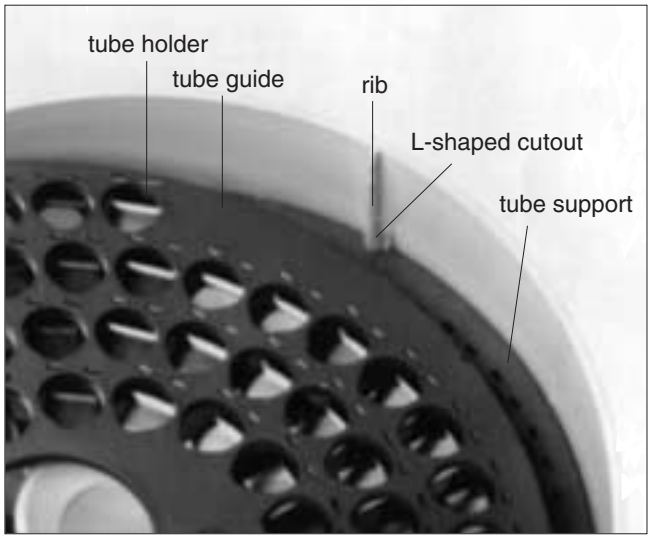


Fig. 9. Standard tube rack assembly for tube lengths 50-85 mm.

Insert the tube support in the bowl by engaging the L-shaped cotouts in the ribs round the edge of the bowl. The support should be in the lower of the two positions and the circular marks on the support plate face the inside bottom of the bowl.

Insert the tube guide in the bowl, with the tube numbers uppermost, by engaging the single cutouts in the ribs. The guide should come to rest about 1 cm above the support. Insert the tube holder in the bowl so that tube position 1 is directly above tube position 1 in the tube guide. The bowl is flexible. To insert the tube holder, push out at each rib and snap the holder under the top overlip of the rib. Do not force the holder into place as this may damage the overlip. The sur-face of the holder should be level when correctly inserted (Fig. 10).



Fig. 10. Snapping the tube holder into place.

Tube lengths 85-180 mm

Remove the tube support; it is not required.

Insert the tube guide into the bowl, tube numbers uppermost, by engaging the L-shaped cutouts in the ribs. The guide should be in the lower of the two positions.

Insert the tube holder so that tube position 1 is directly above tube position 1 in the tube guide (Fig. 10).

Accessory tube rack, 30 mm diameter tubes

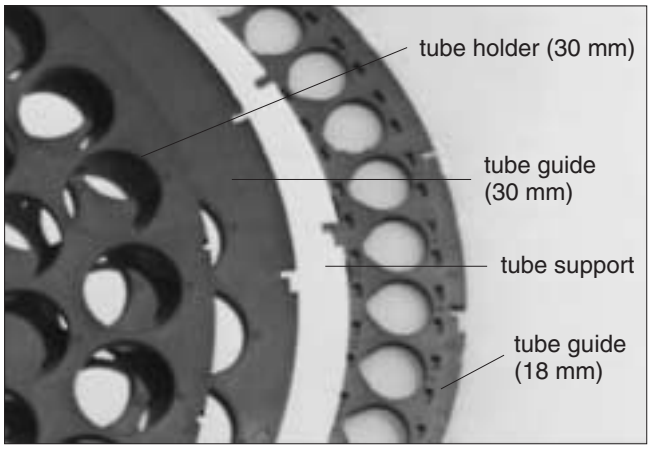


Fig. 11. Accessory tube rack assembly for tube lengths 30-50 mm.

Tube lengths 30-50 mm (Fig. 11)

Insert the tube guide from the standard rack by engaging the single cutouts in the ribs. On top of that, insert the tube support, which comes with the standard rack, by engaging the single cutouts in the ribs. Layering the tube guide and tube support on top of each other gives the extra height necessary to use short tubes.

Insert the rack tube guide by engaging the single cutouts in the ribs. The tube guide has both single and L-shaped cutouts on it. Finally insert the tube holder for the accessory rack onto the top of the bowl. Tube position 1 should be directly above tube position 1 in the tube guide.

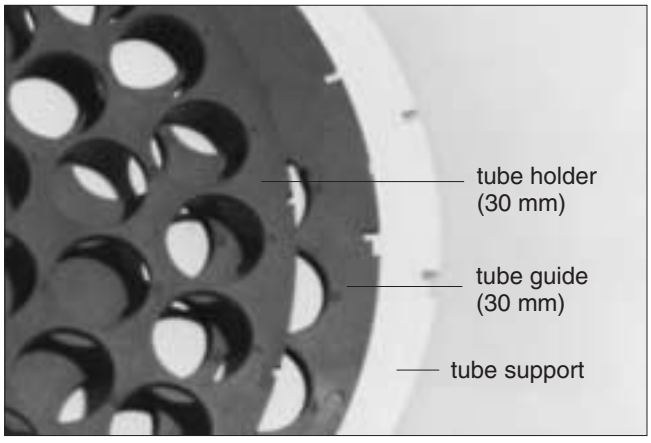


Fig. 12. Accessory tube rack assembly for tube lengths 50-85 mm.

Tube lengths 50-85 mm (Fig. 12)

Insert the tube support into the bowl by engaging the L-shaped cutouts in the ribs around the edge of the bowl. The tube support should be in the lower of the two positions.

Insert the accessory tube guide into the bowl, with the tube numbers uppermost, by engaging the single cutouts in the ribs.

Insert the tube holder into the bowl so that tube position 1 is directly above tube position 1 in the tube guide.

Tube lengths 85-180 mm (Fig. 13)

Remove the tube suport; it is not required.

The guide should be in the lower of the two positions.

Insert the tube holder so that tube position 1 is directly above tube position 1 in the tube guide.

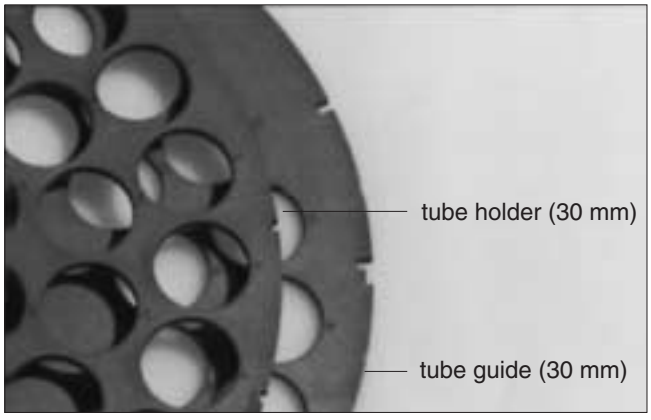


Fig. 13. Accessory tube rack assembly for tube lengths 85-180 mm.

3.3 Mounting the rack

Move the delivery arm gently out of the second stop. Place the rack over the central spindle and pull the spring-loaded drive sleeve out so that the rack comes to rest.

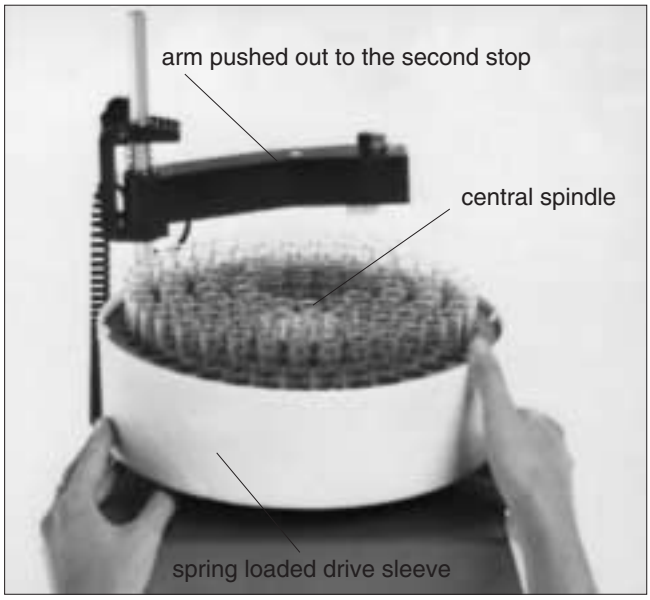


Fig. 14. Mounting the tube rack on to the RediFrac.

3.4 Inserting collection tubes

Insert sufficient collection tubes into the rack, starting from position 1, pushing them down as far as they will go. All the tubes must be of the same length and diameter for proper operation and there should be no empty spaces in the sequence.

3.5 Adjusting the delivery arm

Figures 3 and 4.

Move the arm to the center position and lower the arm bracket so that the bottom of the white tube sensor is about 5 mm below the top of the tubes. Lock the arm bracket at this height with the lock knob. Lift the arm up carefully from underneath the spring, so that the sensor clears the collection tubes, and move the arm out over the edge of the rack. Lower the arm and allow it to move in so that the sensor touches the collection tubes in the track furthest from the center. Rotate the rack by hand, anticlockwise, until the sensor rests against tube 1 exactly as in Fig. 4.

Check that the sensor is in the appropriate position for the tube size. The eluent tubing should be over the center of the collection tube so that the drops collect directly into the tube.

Adjusting the spring tension of the delivery arm

Improper spring tension can cause the fraction collector to skip tubes. It tends to have the greatest effect as the arm moves in towards the center. Spring tension is affected by temperature. Low temperature will reduce the tension. Therefore, it may be necessary to re-adjust the tension if the collector is used in a cold room.

1. Pull out the arm bracket from the stand of the fraction collector (Fig. 3).
2. Dismantle the delivery arm from the arm bracket.
3. The top of the spring is in one of two holes at the top of the arm bracket. Looking at the arm bracket from the front of the unit:
   If the top of the spring is in the right hole, moving it to the left-hand hole will increase the tension;

If it is in the left-hand hole, moving it to the right hole will decrease the tension.

To adjust the top of the spring, hold the spring near the top and pull or prise it down and out of the top hole. Insert the top of the spring into the other hole.

4. The bottom of the spring is in one of 4 holes equally spaced 1/4 turn apart. To adjust the bottom of the spring, hold it near the lower end and lift or prise the bottom of the spring out of hole.

   * To increase the tension, turn the spring anti-clockwise.

   * To decrease the tension, turn the spring clockwise and insert it into the next hole.

3.6 Remote connection

Optional
Connect the communication cable to the remote socket on the rear panel (see Fig. 2). The following functions and signals are available. All signals are TTL compatible.

Name	Active voltage	Function	Pin
OUTPUTS (all open-collector)			
Operable (out)	0	Indicates that the RediFrac is operable.	9
Event mark	0	Pulse at tube change. Pulse width 0.2 s.	6
Pump stop	0	Stops the pump or chart drive at “End” and at “Pause”	11, 12

3.7 Connection to a pump

Connect the 15-pin communication cable between the remote socket in the rear panel (Fig. 2) and the remote socket on the pump. Switch the pump on. The pump will only run when the RediFrac is collecting. If the RediFrac is switched off pump control comes directly from the ON/OFF switch on the pump. During a collection sequence the pump starts when “run/end” is pressed. During a run the pump stops at a programmed “end at” or when “run/end” is pressed. In drop counting mode, the flow rate may be changed without affecting the volume collected in each fraction.

3.8 Mains installation

Before connecting this instrument to the mains supply, read the following instructions carefully:

1. Two Mains Kits are supplied with the instrument, one for 100-120 V and one for 220-240 V. Choose the kit appropriate to your mains supply voltage, and discard the other kit.



Installing the wrong mains kit can endanger personal safety and cause irreparable damage to the pump. Always connect the instrument to a properly grounded mains supply.

2. Remove the yellow warning label covering the fuse/voltage selector on the rear panel.
3. Open the fuse/voltage selector with the key provided or with a thin screwdriwer (Fig. 15a).

4. Place the fuse appropriate to your mains supply voltage in the fuse holder and insert it into the right-hand position (Fig. 15b). The left hand position is a holder for a spare fuse (included in the Mains Kit).
5. Remove the voltage selector switch, select the correct voltage, and replace the switch with the correct voltage showing (Fig. 15c).
6. Close the fuse/voltage selector cover and make sure the chosen voltage is shown in the window.

Note: Use 220 V position for 230 V mains supply.

7. Connect the instrument to a grounded mains supply using the cable included in the Mains Kit.

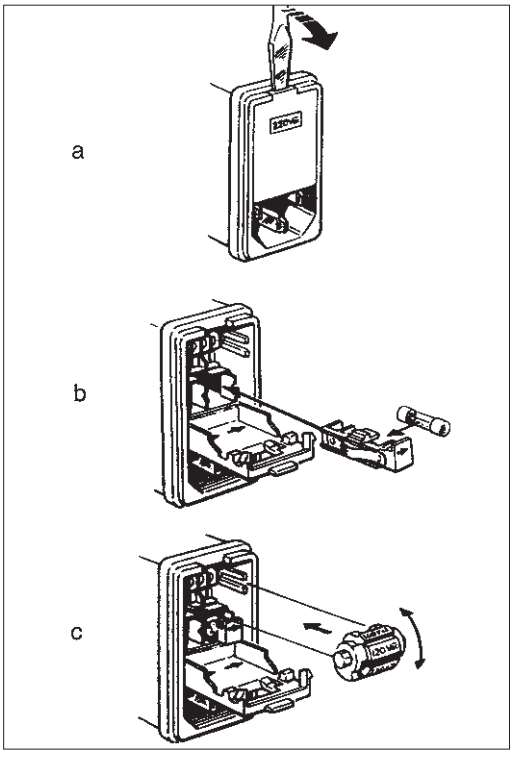


Fig. 15. Setting the correct mains voltage.

4. Operation

4.1 Programming instructions

The RediFrac is a versatile fraction collector capable of collecting fractions by time or drop count, both with automatic drop synchronisation. Drop synchronisation will only allow a tube change 50 ms after the drop has passed the drop sensor thus ensuring safe collection prior to tube change and minimizing spillage. Maximum drop rate is approximately 15/s.

To program collection mode

Program collection mode by observing the red lights above the display;

"min" collection mode, for time (minutes per fraction)

"drop" collection mode, for drop (drops per fraction)

When the instrument is switched on the "min" light is displayed and time mode is chosen. Press collection mode control once for drop mode and the "drop" light is displayed. Press once more to move back to time mode. When you change collection mode, the previously programmed instruction is clared automatically.

Note: Drop synchronisation is always activated. This means that RediFrac will stop changing tubes if there is no liquid flow through the drop sensor in the arm.

4.2 Programming fractionation parameters

Fraction size: defines the basic size of the collected fractions in minutes or number of drops.

Program fraction size by pressing: "fraction size", the desired fraction size (min or drop number), then "store".

Fraction size must be programmed for all runs.

End at: "end at" defines the time or drop count at which fraction collection will end automatically. The pump connected to the back panel of the RediFrac will also stop. If no "end at" is programmed, collection will continue until all the tubes have been filled. The delivery arm will then swing into the middle of the rack, the pump will be stopped and any further liquid will drain into the center funnel.

To program the end of the fractionation, press "end at", the desired end of fractionation time or drop count, then "store".

4.3 Changing a program

It is not necessary to repeat the whole programming sequence before every run. Simply recall the fractionation parameters and check them one-by-one. Delete any unwanted values by pressing "CE" (clear entry) or change them by entering a new value and pressing "store".

The collection mode can only by changed when collection is not in progress. Other parameters can be changed during fraction collection; the new value will apply to the next occasion the parameter is used e.g. a changed fraction size will apply to the next fraction, the present fraction will be completed at the previous setting.

4.4 Check codes

The RediFrac is equipped with a powerful status checking facility which continually checks the status of the fraction collector and equipment connected to it. In the event of deviation from proper operation, the display will flash a check code. If a check code is displayed, look to see what it means from the list below and take the appropriate action.

Start-up: when the RediFrac is switched on the display flashes for 2 s, as a self-diagnostic test circuit checks that the fraction collector is operating properly. When the check is completed satisfactorily, "End" is displayed.

Most check codes are of the form "Ch.01". The significance of each is shown below.

All check codes are cleared by pressing "store/return".

Code No.	Explanation	Action
01	(1) No more tubes left or tubes missing or (2) delivery arm in stand-by position or (3) rack movement jammed. Fraction collection has stopped	(1) Add more tubes if required and reposition delivery arm (2) Position arm correctly (3) Check for loose cables or other obstructions to free movement of the rack and remove them.
02	Same as Ch 01, but evaluation continues until programmed "end at" is reached	Fractionation may be stopped by pressing "run/end".
03	Collection stopped at programmed "end at"	Remove fractions of further interest.
09	Data cannot by changed during fraction collection	If data must be changed before continuing the experiment, end collection by pressing "run/end" and make the desired changes.
11	No decimal point can be entered for this parameter	Round to nearest whole number and enter this new value.
14	Decimal used in drop counting mode	Use only integers for programming number of drops.
23	Non-existent collection mode	See Sections 4.1 and 4.2 for a description of correct collection modes.
24	Define fraction size	Program a fraction size for every collection sequence.
28	The drop counter is dirty or not connected	Check drop counter installation and/or clean if necessary.
60	Power failure	Time or drop number from start to power failure available.
61	Severe power disturbance has destroyed stored data; memory cleared	Re-program the RediFrac and repeat the run.
70	Memory has been cleared, no memory protection while power off	Memory protection will work again 20 s after power up.
71	Memory protection does not work	Wait 20 seconds then try again.

Some check codes show other flashing symbols; their explanation is given below.

Code No.	Explanation	Action
-----	(1) Serious electrical disturbance has stopped the collector or (2) PROM failure	Turn power OFF and then ON. If check code persists, there is a PROM failure. Contact a service technician.
]]]]	RAM failure	Turn power OFF and then ON. If check code persists, there is a RAM failure. Contact a service technician.

5. Maintenance

The fraction collector should be kept clean and spilled liquid should be wiped up before it dries. The arm should be over the center when the RediFrac is not in operation.

The instrument may be wiped with mild aqueous cleaning fluid or with ethanol.

6. Trouble-shooting

Problem	Solution
No tube change	a) The fractionation has reached the programmed “end at”. b) Press “run/end”; if motor does not start and Ch 01 or Ch 02 appears, contact a service technician. c) Push the delivery arm out to one of the safety stops. Press “run/end”, if motor starts press the tube sensor together and the motor should stop without a check code. If a check code does appear, then check the connection in the arm. If this looks OK then the sensor connection or sensor itself is faulty; contact a service technician.

7. Technical Specifications

Tube racks	Diameter range	Height range	Max. number per rack
Standard	10-18 mm	50-180 mm*	95
Accessory	12 mm	50-180 mm	175
(optional)	30 mm	30-180 mm	40

*If >100 mm, diameter must be 10 % of height

Tubing	1.7-2 mm outer diameter			
Tube change time	Maximum tube change times for each track (outer to inner tracks)			
Standard				
Tube rack 18 mm	Track 1	0.3 sec	Track 2	0.4 sec
	Track 3	0.5 sec	Track 4	0.6 sec
Accessory				
Tube rack 12 mm	Track 1	0.2 sec	Track 3	0.3 sec
	Track 5	0.4 sec		
Tube rack 30 mm	Track 1	0.4 sec	Track 2	0.55 sec
	Track 3	0.7 sec		
Fraction sizes				
Time	0.01-99.99 min (0.01 min increments)			
	100-999.9 min (0.1 min increments)			
	1 000-9 999 min (1 min increments)			
	within an accuracy of ± 0.02%			
Drops	1-9 999 drops (1 drop increments)			
Memory protection	Programmed parameters and stored data are guaranteed for at least 1 hour after the instrument is switched off or in the event of a power failure. Under normal conditions at least 4 days storage can be expected			
Event mark	0.2 s for both contact closure and TTL outport in remote socket			
	(see Section 3.6).			
Max flow rate	Approximately 15 drops/sec			

Chemical resistance

The bowl and the racks are made of PBT (Valox) which is generally resistanct to:

- weak bases, e.g. diluted solutions of ammonium, amines etc.
- alcohols, e.g. methyl-, ethyl-, propylalcohol etc, and som glycols.

PBT is also resitant to cleaning detergents and chemicals, hot water, UV-radiation.

Avoid contact with the following groups of chemicals; should spillage occur, clean immediately:

- Oxidizing components, e.g. nitric acid, peroxides.
- Strong bases, e.g. sodium or other metal hydroxides, some amines.
- Chlorinated solvents, e.g. methylene chloride, ethylene chloride, trichloroethane.
- Esters, e.g. acetates.
- Aromatic hydrocarbons, e.g. ketones and aldehydes.

Remote control	15-pin female D-type connector, TTL compatible signals (see Section 3.6)	
	Outport:	event mark
		stop pump
		Error
		operable
Voltage	100/120/220-230/240 V ~	
Frequency	50-60 Hz	
Power consumption	15 VA	
Environment	+4 to +40 °C, 20-95% relative humidity, 84-106 kPa (840-1060 mbar) atmospheric pressure	
Dimensions	290 × 300 × 390 mm (W × D × H)	
Weight	5.5 kg (12 lb)	

8. Accessories and Spare Parts

Please order spare parts and accessories according to the designation and code numbers given below.

Refer to figure 16 for position number.

Position No.	Designation	Code No.	No./Pack
1	Tube holder/guide, 12 mm	19-7242-02	2
2	Tube holder/guide, 18 mm	19-8689-02	2
3	Tube holder/guide, 30 mm	18-1124-68	2
4	Tube support	18-3054-02	1
5	Bowl	18-3051-03	1
6	Tube rack complete, 12 mm	19-8684-03	1
7	Tube rack complete, 18 mm	18-3050-03	1
8	Tube rack complete, 30 mm	18-1124-67	1
9	Tube spring (metal)*	19-6057-01	1
10	Tubing holder	18-6464-01	1
11	Tube sensor kit	19-7815-02	1
12	Funnel	19-6044-01	1
13	Funnel tubing 12/8, 250 mm	18-3020-01	2
14	Drive sleeve	19-6067-02	5
15	Foot	19-3015-01	4
16	Spiral cable	19-8638-01	1
17	Sensor positioning kit	18-6470-01	1

* Only for Tube holder/guide, 18 mm.

Accessories available but not illustrated

Designation	Code No.	No./Pack
Communication cable	19-6005-02	1
Communication cable to MicroPerpex S pump	80-1266-29	1
Signal/event mark cable	19-6006-01	1
Tube holder kit 8/11 mm	18-8522-01	100
Fuse 200 mA SB (120 V)	19-6125-01	2
Connector 2-pole female	19-8629-01	2
Fuse holder 5 × 20	19-8654-01	1
Fuse holder 6.3 × 32	18-0847-01	1

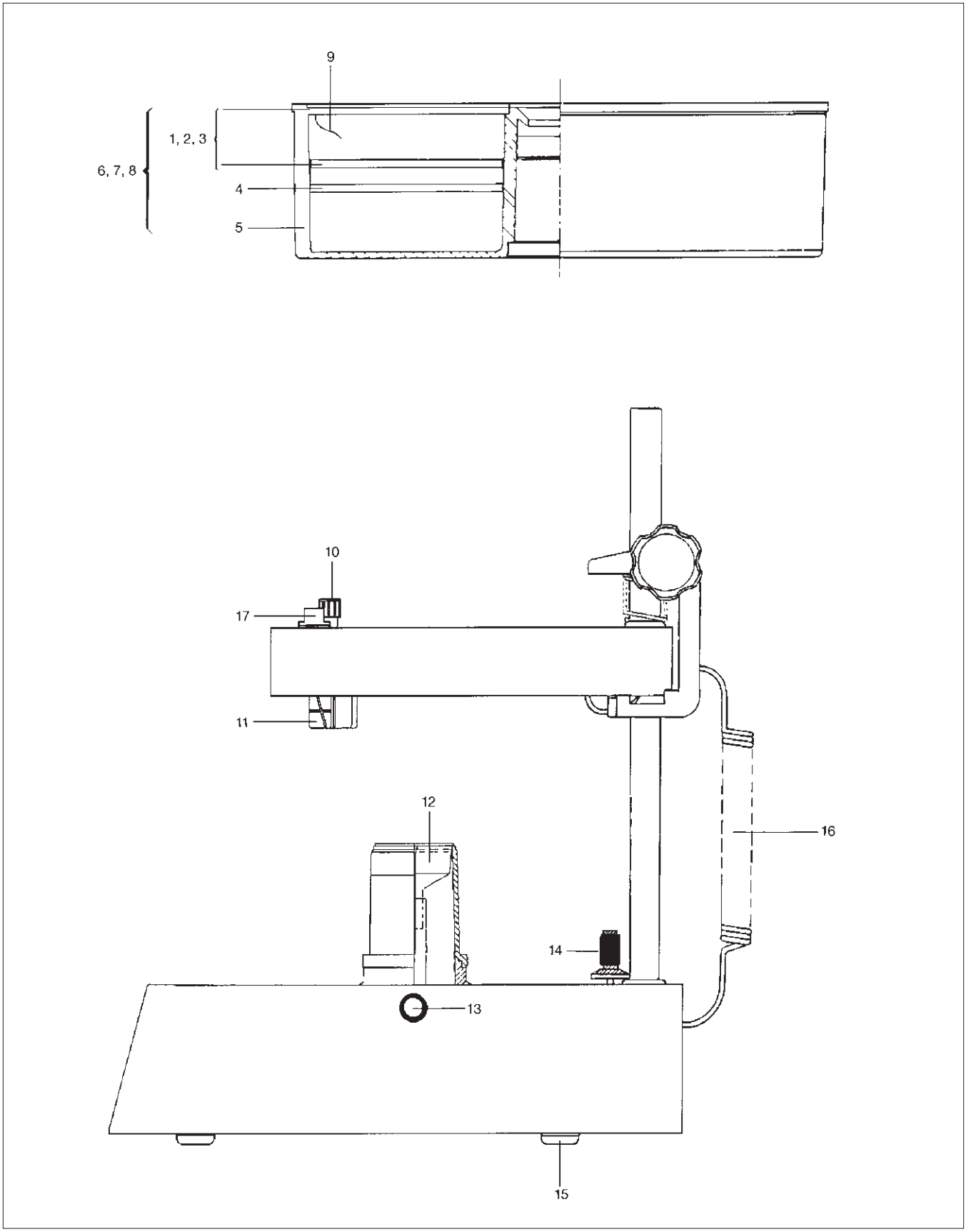


Fig. 16. Diagram showing spare parts.

Position No.	Designation
1	Tube holder/guide, 12 mm
2	Tube holder/guide, 18 mm
3	Tube holder/guide, 30 mm
4	Tube support
5	Bowl
6	Tube rack complete, 12 mm
7	Tube rack complete, 18 mm
8	Tube rack complete, 30 mm
9	Tube spring /metal)*
10	Tubing holder
11	Tube sensor kit
12	Funnel
13	Funnel tubing 12/8, 250 mm
14	Drive sleeve
15	Foot
16	Spiral cable
17	Sensor positioning kit

* Only for Tube holder/guide, 18 mm



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