

Operating Instructions

Bio-Rad Laboratories Model 16K Microcentrifuge 166-0602 and 166-0612

**Bio-Rad Laboratories
2000 Alfred Nobel Drive
Hercules, CA 94547
1-800-4BIORAD**

BIO-RAD

Safety Precautions

- NEVER** use the centrifuge in any manner not specified in these instructions.
- NEVER** operate the centrifuge without a rotor properly attached to the shaft.
- NEVER** fill tubes while they are in the rotor. Liquid spillage may harm unit.
- NEVER** put hands in the rotor area unless the rotor is completely stopped.
- NEVER** move the centrifuge while the rotor is spinning.
- NEVER** use solvents or flammables near this or other electrical equipment.
- NEVER** centrifuge flammable, explosive or corrosive materials
- NEVER** centrifuge hazardous materials outside of a hood or proper containment facility
- ALWAYS** load the rotor symmetrically. Each tube should be counterbalanced by another tube of the same type and weight
- ALWAYS** locate the centrifuge within easy access to an electrical outlet.
- ALWAYS** use only microcentrifuge tubes made from plastic and designed to withstand centrifugal forces of at least 16,000 xg.

Copyright September 2002.

All rights reserved.

Reproduction without prior written permission is prohibited.

Information contained herein is subject to change without notice.

Table of Contents

1. General Information	1
Description	
Safety precautions	
Technical data	
Accessories supplied with unit	
Warranty	
2. Installation	2
Unpacking the centrifuge	
Required space	
Installing the centrifuge	
3. Installing the Rotor	3
Rotors and accessories	
Rotor maintenance	
Mounting and securing the angle rotors	
Removing the rotor	
Overloading rotors	
4. Operation	6
Closing the lid	
Lid release	
Lid lock	
Speed selection	
Selection of operating time and momentary operation	
5. Service and Maintenance	8
Service	
Cleaning	
Disinfection	
Replacing fuses	
6. Troubleshooting	9
7. Determination of g-values	10

1. General Information

This manual provides important safety information for the Model 16K laboratory microcentrifuge. It should be kept near the centrifuge for quick and easy reference.

1.1 Description

The Model 16K is a small benchtop centrifuge designed for separation of various research samples. The motor is brushless and requires no routine maintenance. The Model 16K is supplied with an 18 x 1.5ml rotor for micro samples. Adapters are available for tubes smaller than 1.5ml. The Model 16K reaches speeds of up to 14,000rpm/16,000 x g.

1.2 Safety precautions

Note: All users of the centrifuge must read the Safety Precautions section of this manual before attempting to operate the unit!



If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not operate the centrifuge if any of the following conditions exist:

- The centrifuge has not been installed properly
- The centrifuge is partially dismantled
- Service has been attempted by unauthorized or unqualified personnel
- The rotor has not been installed securely on the motor shaft
- Rotors and accessories not belonging to the standard range are being used without permission being obtained from the manufacturer to use such rotors and/or accessories in the centrifuge
Exception: Microcentrifuge tubes made of plastic, normally available in the laboratory.
- The centrifuge is located in an explosive atmosphere
- Materials to be centrifuged are combustible and/or explosive
- Materials to be centrifuged are chemically reactive
- The rotor load is not properly balanced

1.3 Technical data

Dimensions	
Width	8.25 inches (21 cm)
Depth	8.9 inches (22.6 cm)
Height	7.6 inches (19.3 cm)
Maximum speed	14,000rpm
Maximum RCF	16,000 x g
Maximum volume	18 x 1.5/2.0ml
Admiss. density	1.2kg/dm ³
Electrical/fuse rating	120V~, 50-60Hz, 1.0A/2.5AT 230V~, 50-60Hz, 0.6A/1.25AT

1.4 Accessories supplied with centrifuge

Each unit is supplied with 1 instruction manual, 1 warranty card, 1 power cord and a rotor screw wrench.

1.5 Warranty

This centrifuge has been subject to thorough testing and quality control. In the unlikely event of a manufacturing fault, our one year warranty (from the date of delivery) covers the centrifuge and the rotor. This warranty becomes invalid in the case of incorrect operation, use of nonstandard spare parts or accessories and unauthorized modification of the rotor or centrifuge.

2. Installation

2.1 Unpacking the centrifuge

Before unpacking the centrifuge, inspect the outside of the carton for any shipping damage.

The centrifuge is delivered in a carton with protective cushions. Remove the centrifuge from the carton. Retain the carton and cushions until it has been established that the centrifuge is working properly.

Inspect the centrifuge for any visible signs of shipping damage. Shipping damage is the responsibility of the transportation carrier. Any claims for damage must be filed within 48 hours.

The accessories supplied with the centrifuge should be kept with the instruction manual near the centrifuge's place of installation.

2.2 Required space

The centrifuge should be installed on a rigid, even surface such as a stable laboratory bench, cabinet, etc. To guarantee sufficient ventilation, ensure that the centrifuge has at least 15cm (6 inches) of free space on all sides, including the rear.

The centrifuge should not be located in areas subject to excessive heat such as in direct sunlight or near radiators or the exhaust of a compressor, as a buildup of heat may occur within the chamber.

2.3 Installation

Make certain that the timer is set to the off position. Before operating the centrifuge, check that the power source corresponds to that on the manufacturer's rating label, then connect the power cord to the centrifuge and the power source.

ATTENTION: The timer must be in the OFF position before connecting the power cord. Failing to place the timer in the off position may result in damage to the centrifuge and injury to personnel.

3. Installation of rotor and rotor maintenance

3.1 Rotors and accessories

The following accessories are available for the Model 16K:

Angle rotor for 18 x 1.5ml tubes (Included with unit)

Tube measurement	1.5ml (10 x 40mm)
Max. speed/rcf	14,000rpm/16,000 x g
Centrifuging radius	7.3cm

Adapter for 0.5ml tubes

Order no.	C-1205
Tube measurement	8 x 30mm
Max. speed/RCF	14,000rpm/14,462 x g
Centrifuging radius	6.6cm

Adapter for 0.4ml tubes

Order no.	C-1206
Tube measurement	6 x 47mm
Max. speed/RCF	14,000rpm/16,000 x g
Centrifuging radius	7.3cm

Adapter for 0.2ml tubes

Order no.	C-1222
Tube measurement	6 x 21mm
Max. speed	14,000rpm
Centrifuging radius	6.1cm
RCF (g-value)	13,366 x g

3.2 Rotor maintenance

The rotor should be cleaned thoroughly after each use. **Thorough cleaning must be performed when spinning samples containing phenol or phenol chloroform.** Periodically inspect the rotor for dents, dings, scratches, discoloration and cracks. If any damage to the rotor is found, discontinue use of the rotor immediately and replace.

3.3 Mounting and securing the angle rotor

Remove the rotor screw from the motor shaft by turning the screw counterclockwise. Clean the motor shaft and the rotor mounting hole (see figures 1&2). Place the rotor on the motor shaft ensuring that the cross-pin (figure 1) aligns correctly with the rotor slot (see figure 2). Figures 1 and 2 next page.

Reinstall the rotor screw on the motor shaft by turning it clockwise. Hold the rotor with one hand and hand-tighten the rotor screw. Then use the supplied 1/4 inch wrench to tighten the screw an additional quarter turn.

When loading the rotor, refer to figure 3 (located on page 5). Loading in the pattern indicated will ensure a balanced load. Tubes to be loaded should be filled equally by eye. The difference in the weight between the tubes should not exceed 0.1 gram. A partially loaded rotor may be centrifuged if the loading scheme for balancing a rotor given in figure 3 is followed.

Caution: Be sure to tighten the rotor screw with a wrench before operation.

3.4 Removing the rotor

Using an adjustable wrench or the 1/4 inch wrench supplied to loosen the screw and remove the rotor retaining screw/washer assembly by turning it counterclockwise. Lift the rotor directly upward in a straight vertical motion.

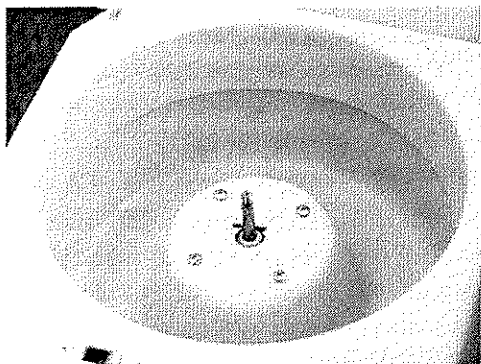


Figure 1. Chamber and motor shaft

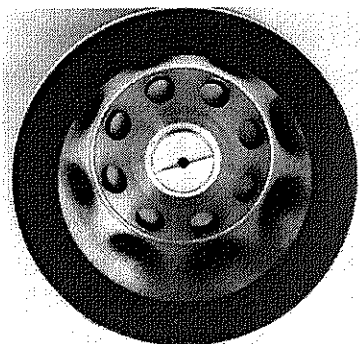


Figure 2. Bottom of angle rotor

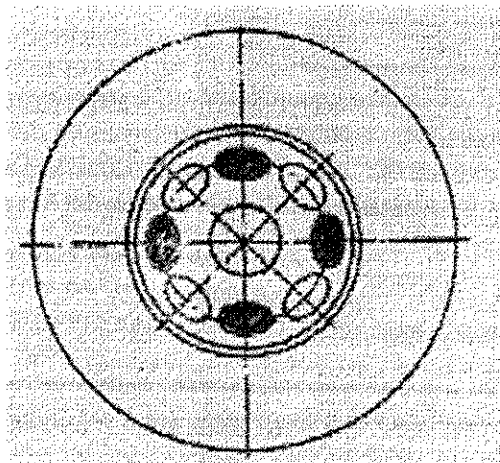


Figure 3. Loading the rotor

3.5 Overloading rotors

The maximum load of the rotor and the maximum speed have been established by the manufacturer. Do not attempt to exceed these values. The maximum speed of the rotor has been measured for liquids having a homogeneous density of 1.2g/ml or less. In order to centrifuge liquids with a higher density it is necessary to reduce the speed. **Failure to reduce the speed may result in damage to the rotor and centrifuge.** The revised maximum speed can be calculated with the following formula:

$$\text{Reduced speed } (n_{\text{red}}) = \sqrt{\frac{1.2}{\text{higher density value}}} \times \text{max speed } (n_{\text{max}})$$

Example:

Where the density of the liquid is 1.7, the new maximum speed would be calculated as follows:

$$n_{\text{red}} = \sqrt{\frac{1.2}{1.7}} \times 14,000 = 9,882 \text{ rpm}$$

If in doubt concerning maximum speeds, please contact the manufacturer for assistance.

4. Operation

ATTENTION: Never attempt to operate the centrifuge with rotors or adapters that show signs of corrosion or mechanical damage. Never centrifuge strongly corrosive materials that may damage the rotors or accessories.

4.1 Closing the lid

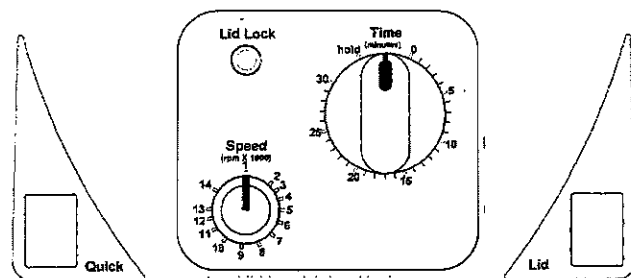
After the rotor has been properly secured and loaded, close the centrifuge lid, making sure that the interlock has been engaged.

4.2 Lid release

Once the run has been completed and the rotor come to a stop, the lid will open automatically. If the lid does not open automatically, press the lid button. Note that the lid button will not operate while the rotor is spinning.

WARNING: Do not attempt to open the lid of any centrifuge until the rotor has come to a complete stop.

Figure 4.
Control panel
layout



In the event of a power failure or malfunction, it may be necessary to open the lid manually.

1. Disconnect the power cord from the wall socket.
2. Remove the plastic plug, located on the left side of the unit, below the quick button.
3. Pull the cord (attached to the plug) to open the lid lock manually.

4.3 Lid lock

The centrifuge can be started only with the lid securely closed. When the rotor begins to accelerate, the lid lock indicator light turns on and the lid button becomes inoperable. Do not attempt to open the lid until the lid lock indicator turns off. At the end of the run, the lid will automatically open.

4.4 Speed selection

The speed (rpm) can be selected to 14,000rpm with the knob labeled "speed". The scale is directly proportional to the speed - a setting of 9 corresponds to 9,000rpm, a setting of 13 corresponds to a speed of 13,000rpm, etc.

4.5 Selection of operating time and momentary operation

Operation of the centrifuge begins when the timer knob is turned clockwise to set a run time. For run times less than 5 minutes, turn the knob clockwise past the halfway point and then counterclockwise to the desired time. For run times longer than 5 minutes, turn the knob clockwise to the desired time.

When the preselected time expires, the centrifuge will stop automatically. To stop the centrifuge prior to the expiration of set

time, turn the timer knob to the zero position.

The centrifuge may be operated manually by pressing and holding the quick button. The centrifuge will continue to run as long as the button is depressed.

Some models are equipped with a timer that includes a hold position. Continuous operation of these models may be achieved by turning the timer knob firmly to the left. The centrifuge will continue to operate until the knob is turned to the zero position.

Note: The timer knob may be turned in either direction during operation of the centrifuge without damage to the timer mechanism.

5. Service and Maintenance

5.1 Centrifuge service

The brushless motor in the Model 16K requires no routine maintenance. Any required service should be performed by authorized, qualified personnel only. Repairs performed by unauthorized personnel may void the warranty.

5.2 Cleaning the centrifuge

Always keep the centrifuge housing, rotor chamber, rotor and rotor accessories clean. All parts should be wiped down periodically with a soft cloth. For more thorough cleaning, use a neutral cleaning agent (pH between 6 and 8) applied with a soft cloth. Excessive amounts of liquid should be avoided. Liquid should not come into contact with the motor. After cleaning, ensure that all parts are dried thoroughly by hand or in a warm air cabinet (maximum temperature 50°C)

5.3 Cleaning the rotor

The rotor should be cleaned after each use. When spinning samples containing phenol or phenol chloroform, the rotor should be cleaned immediately after use.

5.4 Disinfection

Should a spill of infectious materials occur within the rotor or chamber, the unit should be disinfected. This should be performed by qualified personnel with proper protective equipment.

5.5 Replacing fuses

Check the fuse when it is recommended in the Troubleshooting Guide located in this manual. The fuse holder is located in the power inlet on the rear of the unit. Disconnect the power cord from the power inlet. Open the fuse holder drawer by inserting a small screwdriver under the tab and prying it open. Remove the innermost (operative) fuse from its retaining tabs and replace the fuse if necessary. A spare fuse is located in the outermost chamber of the fuse drawer. Replace only with a fuse of exactly the same value as the original. (Fuse type may be found in the Technical data section of this manual.)

6. Troubleshooting Guide

Please refer to this guide before calling for service.

Centrifuge will not start

Possible reason:	No power supply
Solution:	Check that power is being supplied to the outlet Check that the power cord is plugged into both the wall outlet and the back of the centrifuge Check that power cord is not damaged

Possible reason:	Blown fuse
Solution:	Check fuse and replace if necessary

Lid lock will not release

Possible reason:	Defective lid lock
Solution:	Open manually and have unit serviced

Possible reason:	No power from PC board
Solution:	Call for service

Possible reason:	Lid lock is jammed
Solution:	Call for service

Possible reason:	Centrifuge is not receiving power
Solution:	See "Centrifuge will not start"

Centrifuge cannot be started, although power is on

Possible reason:	Lid not closed correctly
Solution:	Close lid correctly

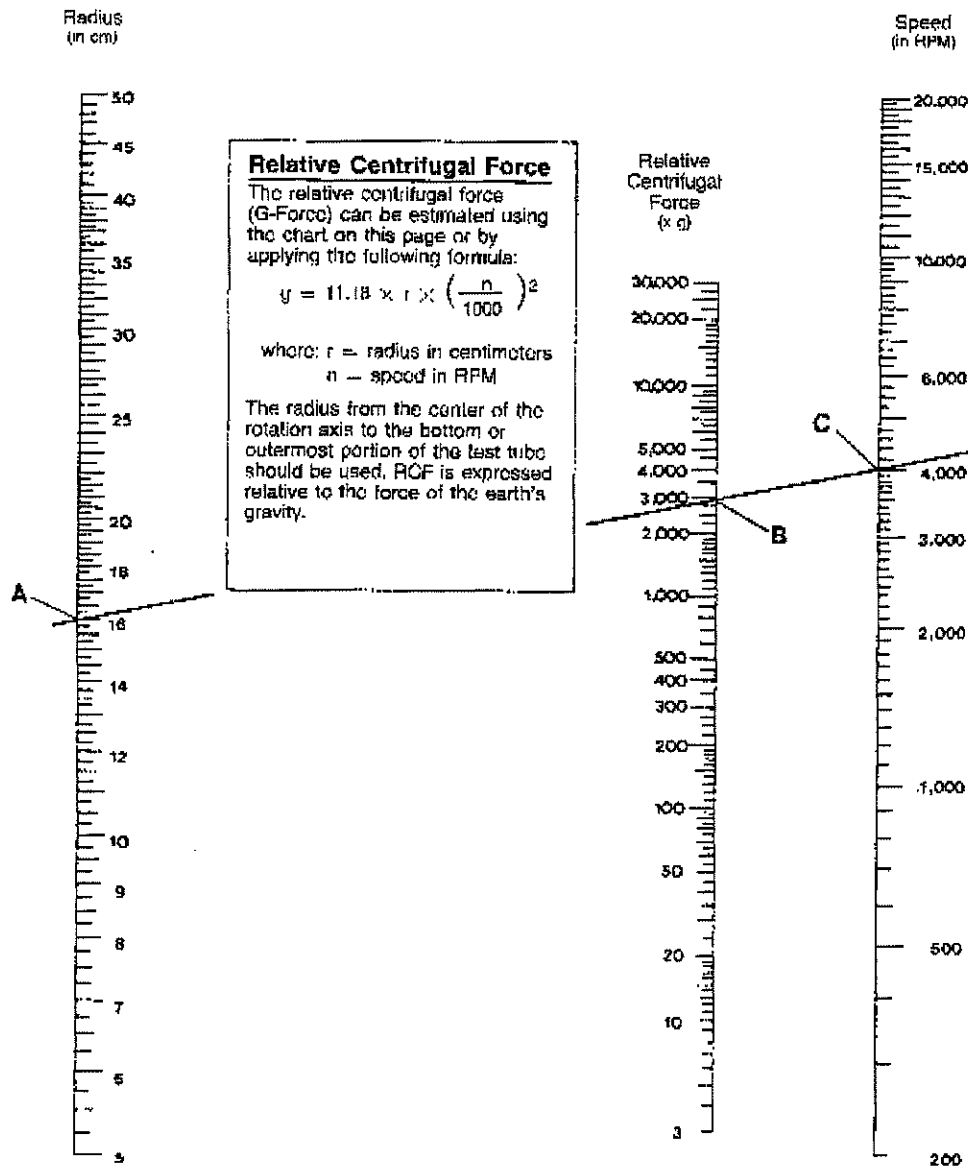
Possible reason:	No speed or time has been selected
Solution:	Set speed and/or time

7. Determination of g-values

The centrifuging radius of the 1.5ml rotor is 7.3cm. See Section 3.1 for the correct radius when using adapters and smaller tubes. The chart on the next page can be used to determine g-values.

RELATIVE CENTRIFUGAL FORCE

Notes



To use this chart, find the radius value on the radius scale. Place the edge of a ruler on the value. Place the right side edge of the ruler on the speed scale at the desired speed. The estimated RCF can then be read from the RCF scale where the ruler edge passes through it. This chart can also be used to determine the proper speed for the desired RCF value.