



# Instructions For Use

## Microfuge 16 Centrifuge

FX241.5P and FX121.5P Rotors



PN A49436AH  
December 2015



Beckman Coulter, Inc.  
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Brea, CA 92821 U.S.A.



**Microfuge 16 Centrifuge**  
**FX241.5P and FX121.5P Rotors**  
PN A49436AH (December 2015)

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- In the USA and Canada, call us at 1-800-369-0333.
- Outside of the USA and Canada, contact your local Beckman Coulter Representative.

Printed in USA

# Revision History

*This document applies to the latest software listed and higher versions. When a subsequent software version changes the information in this document, a new issue will be released to the Beckman Coulter website. For labeling updates, go to [www.beckmancoulter.com](http://www.beckmancoulter.com) and download the most recent manual or system help for your instrument.*

## **Issue Version AH, 12/2015**

Updates were made to the following section:

[CE Mark](#)



Read all product manuals and consult with Beckman Coulter-trained personnel before attempting to operate instrument. Do not attempt to perform any procedure before carefully reading all instructions. Always follow product labeling and manufacturer's recommendations. If in doubt as to how to proceed in any situation, contact your Beckman Coulter Representative.

## Centrifuge Safety Notice

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### Alerts for Danger, Warning, Caution, Important, and Note



**DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



**WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



**CAUTION** indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

**IMPORTANT** IMPORTANT is used for comments that add value to the step or procedure being performed. Following the advice in the Important adds benefit to the performance of a piece of equipment or to a process.

**NOTE** NOTE is used to call attention to notable information that should be followed during installation, use, or servicing of this equipment.

### Safety During Installation and/or Maintenance

Any servicing of this equipment that requires removal of any covers can expose parts which involve the risk of electric shock or personal injury. Make sure that the power switch is off and the centrifuge is disconnected from the main power source by removing the Mains (power) plug from the outlet receptacle, and refer such servicing to qualified personnel.

Do not replace any centrifuge components with parts not specified for use on this instrument.

## Electrical Safety

To reduce the risk of electrical shock, this equipment uses a three-wire electrical cord and plug to connect the centrifuge to earth-ground. To preserve this safety feature:

- Make sure that the matching wall outlet receptacle is properly wired and earth-grounded. Check that the line voltage agrees with the voltage listed on the name-rating plate affixed to the centrifuge.
- Never use a three-to-two wire plug adapter.
- Never use a two-wire extension cord or a two-wire non-grounding type of multiple-outlet receptacle strip.

Do not place containers holding liquid on or near the chamber door. If they spill, liquid may get into the centrifuge and damage electrical or mechanical components.

## Safety Against Risk of Fire

This centrifuge is not designed for use with materials capable of developing flammable or explosive vapors. Do not centrifuge such materials (such as chloroform or ethyl alcohol) in this centrifuge nor handle or store them within the 30-cm (1-ft) area surrounding the centrifuge.

## Mechanical Safety

For safe operation of the equipment, observe the following:

- Use only the rotors and accessories designed for use in this centrifuge.
- Before starting the centrifuge, make sure that the rotor tie-down screw is securely fastened.
- Do not exceed the maximum rated speed of the rotor in use.
- NEVER attempt to slow or stop the rotor by hand.
- Do not lift or move the centrifuge while the rotor is spinning.
- NEVER attempt to override the door interlock system while the rotor is spinning.
- Maintain a 7.6-cm (3-in.) clearance envelope around the centrifuge while it is running. During operation come within the envelope only to adjust instrument controls, if necessary. Never lean on the centrifuge or place items on the centrifuge while it is operating.

## Chemical and Biological Safety

Normal operation may involve the use of solutions and test samples that are pathogenic, toxic, or radioactive. Such materials should not be used in this centrifuge, however, unless all necessary safety precautions are taken.

- Observe all cautionary information printed on the original solution containers prior to their use.
- Handle body fluids with care because they can transmit disease. No known test offers complete assurance that they are free of micro-organisms. Some of the most virulent—Hepatitis (B and C) and HIV (I–V) viruses, atypical mycobacteria, and certain systemic fungi—further emphasize

the need for aerosol protection. Handle other infectious samples according to good laboratory procedures and methods to prevent spread of disease. Because spills may generate aerosols, observe proper safety precautions for aerosol containment. Do not run toxic, pathogenic, or radioactive materials in this centrifuge without taking appropriate safety precautions. Biosafe containment should be used when Risk Group II materials (as identified in the World Health Organization *Laboratory Biosafety Manual*) are handled; materials of a higher group require more than one level of protection.

- Dispose of all waste solutions according to appropriate environmental health and safety guidelines.

**It is your responsibility to decontaminate the centrifuge and accessories before requesting service by Beckman Coulter.**

## Rotor Safety Notice

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This safety notice summarizes information basic to the safe use of the rotors described in this manual. The international symbol displayed above is a reminder to the user that all safety instructions should be read and understood before operation or maintenance of this equipment is attempted. When you see the symbol on other pages throughout this publication, pay special attention to the specific safety information presented. Observance of safety precautions will also help to avoid actions that could damage or adversely affect the performance of the rotor. These rotors were developed, manufactured, and tested for safety and reliability as part of a Beckman Coulter centrifuge/rotor system. Rotor safety or reliability cannot be assured if used in a centrifuge not of Beckman Coulter's manufacture or in a Beckman Coulter centrifuge that has been modified without Beckman Coulter's approval.

- Handle body fluids with care because they can transmit disease. No known test offers complete assurance that such fluids are free of micro-organisms. Some of the most virulent—Hepatitis (B and C) viruses, HIV (I–V), atypical mycobacteria, and certain systemic fungi—further emphasize the need for aerosol protection. Handle other infectious samples according to good laboratory procedures and methods to prevent spread of disease. Because spills may generate aerosols, observe proper safety precautions for aerosol containment. Do not run toxic, pathogenic, or radioactive materials in this centrifuge without taking appropriate safety precautions. Biosafe containment should be used when Risk Group II materials (as identified in the World Health Organization *Laboratory Biosafety Manual*) are handled; materials of a higher group require more than one level of protection.
- The rotors and accessories are not designed for use with materials capable of developing flammable or explosive vapors. Do not centrifuge such materials in nor handle or store them near the centrifuge.
- Although rotor components and accessories made by other manufacturers may fit in the FX241.5P and FX121.5P rotors, their safety in these rotors cannot be ascertained by Beckman Coulter. Use of other manufacturers' components or accessories in the FX241.5P and FX121.5P rotors may void the rotor warranty and should be prohibited by your laboratory safety officer. Only the components and accessories listed in this publication should be used in this rotor.
- Make sure that filled containers are loaded symmetrically into the rotor and that opposing tubes are filled to the same level with liquid of the same density. Make sure that cavities in use have the proper spacers inserted (if applicable) before installing the rotor lid.

- If disassembly reveals evidence of leakage, you should assume that some fluid escaped the rotor. Apply appropriate decontamination procedures to the centrifuge and accessories.
- Never exceed the maximum rated speed of the rotor and labware in use. Refer to the section on RUN SPEEDS, and derate the run speed as appropriate.
- Do not use sharp tools on the rotor that could cause scratches in the rotor surface.

## RoHS Notice

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English These labels and materials declaration table (the Table of Hazardous Substance's Name and Concentration) are to meet People's Republic of China Electronic Industry Standard SJ/T11364-2006 "Marking for Control of Pollution Caused by Electronic Information Products" requirements.

### China RoHS Caution Label

This label indicates that the electronic information product contains certain toxic or hazardous substances. The center number is the Environmentally Friendly Use Period (EFUP) date, and indicates the number of calendar years the product can be in operation. Upon the expiration of the EFUP, the product must be immediately recycled. The circling arrows indicate the product is recyclable. The date code on the label or product indicates the date of manufacture.



### China RoHS Environmental Label

This label indicates that the electronic information product does not contain any toxic or hazardous substances. The center "e" indicates the product is environmentally safe and does not have an Environmentally Friendly Use Period (EFUP) date. Therefore, it can safely be used indefinitely. The circling arrows indicate the product is recyclable. The date code on the label or product indicates the date of manufacture.





## CE Mark

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A “CE” mark indicates that a product has been assessed before being placed on the market, and has been found to meet European Union safety, health, and/or environmental protection requirements.



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Beckman Coulter, Inc.,  
Microfuge 16 Centrifuge Warranty

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## Certification

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To ensure full system quality, Beckman Coulter Microfuge 16 centrifuges have been manufactured in an ISO 9001 or 13485 facility. They have been designed and tested to be compliant (when used with Beckman Coulter rotors) with the laboratory equipment requirements of applicable regulatory agencies. Declarations of conformity and certificates of compliance are available at [www.beckmancoulter.com](http://www.beckmancoulter.com).

## Scope of Manual

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This manual is designed to familiarize you with the Beckman Coulter Microfuge 16 centrifuge, its functions, specifications, operation, and routine operator care and maintenance. We recommend that you read this entire manual, especially , *Safety* and all safety-related information, before operating the centrifuge or performing instrument maintenance.

- [CHAPTER 2, \*Description\*](#) contains system specifications and a brief physical and functional description of the centrifuge, including the operating controls and indicators.
- [CHAPTER 3, \*Operation\*](#) contains centrifuge operating procedures.
- [CHAPTER 4, \*Troubleshooting\*](#) lists possible malfunctions, together with probable causes and suggested corrective actions.
- [CHAPTER 5, \*Care and Maintenance\*](#) contains procedures for routine operator care and maintenance, as well as a brief list of supplies and replacement parts.
- [APPENDIX A, \*Installation\*](#) provides instructions for installing and connecting the centrifuge.

**NOTE** If the centrifuge is used in a manner other than specified in this manual, the safety and performance of this equipment could be impaired. Further, the use of any equipment other than that recommended by Beckman Coulter has not been evaluated for safety. Use of any equipment not specifically recommended in this manual and/or the appropriate rotor manual is the sole responsibility of the user.

## Conventions

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Certain symbols are used in the product labeling to call out safety-related and other important information. These international symbols may also be displayed on the centrifuge and are reproduced on the inside of the back cover.

## CFC-Free Centrifugation

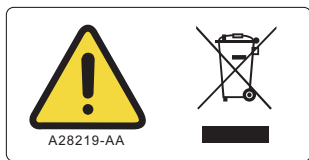
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To ensure minimal environmental impact, no CFCs are used in the manufacture or operation of Microfuge 16 centrifuges

## Recycling Label

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This symbol is required in accordance with the Waste Electrical and Electronic Equipment (WEEE) Directive of the European Union. The presence of this marking on the product indicates:



1. the device was put on the European market after August 13, 2005 and
2. the device is not to be disposed via the municipal waste collection system of any member state of the European Union.

It is very important that customers understand and follow all laws regarding the proper decontamination and safe disposal of electrical equipment. For Beckman Coulter products bearing this label please contact your dealer or local Beckman Coulter office for details on the take back program that will facilitate the proper collection, treatment, recovery, recycling and safe disposal of the device.

## Centrifuge Function, Specifications, and Safety Features

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### Centrifuge Function

The Beckman Coulter Microfuge 16 (Figure 2.1) is a microprocessor-controlled compact benchtop centrifuge that generates centrifugal forces required for a wide variety of applications. Together with the Beckman Coulter FX241.5P and FX121.5P rotors, designed specifically for use in this centrifuge, applications include:

- Nucleic acid plasmids and bacteriophages isolation.
- Routine processing such as sample preparations, pelleting, extractions, purifications, concentrations, phase separations, and receptor binding.
- Virus isolation.
- Rapid sedimentation of protein precipitates, large particles, and cell debris.
- Preparation of subcellular organelles such as mitochondria, granules, and crude microsomes.
- Cell isolation.

**Figure 2.1** The Microfuge 16 Centrifuge



### Specifications

*Only values with tolerances or limits are guaranteed data. Values without tolerances are informative data, without guarantee.*

## Description

Centrifuge Function, Specifications, and Safety Features

Specification	Description
Set speed	200 to 14,800 rpm/16 163 × <i>g</i> , in increments of 100 rpm or 10 × <i>g</i>
Set time	10 sec to 99 min, 59 sec in 1-second increments, continuous run, or short run (pulse)
Ambient temperature <sup>a</sup>	4°C (39°F) to 40°C (104°F)
Humidity restrictions	<80% (noncondensing)
Dimensions	<ul style="list-style-type: none"><li>• Width<ul style="list-style-type: none"><li>— 22.6 cm (8.9 in.)</li></ul></li><li>• Depth<ul style="list-style-type: none"><li>— 26.6 cm (10.5 in.)</li></ul></li><li>• Height, door closed<ul style="list-style-type: none"><li>— 17.6 cm (6.9 in.)</li></ul></li><li>• Height, door open<ul style="list-style-type: none"><li>— 39.5 cm (15.6 in.)</li></ul></li><li>• Weight<ul style="list-style-type: none"><li>— 6.4 kg (14.0 lb)</li></ul></li><li>• Ventilation clearances (sides and rear)<ul style="list-style-type: none"><li>— 7.6 cm (3.0 in.)</li></ul></li></ul>
Electrical requirements	<ul style="list-style-type: none"><li>• 220–240 VAC, 2 A, 50/60 Hz</li><li>• 100–120 VAC, 4 A, 50/60 Hz</li></ul>
Electrical supply	Class I
Maximum heat dissipation into room under steady-state conditions	324 Btu/hr (0.09 kW)
Noise level 0.91 m (3 ft) in front of centrifuge	<60 dBa
Installation (overvoltage) category	II
Pollution degree	2 <sup>b</sup>

a. The Microfuge 16 centrifuge can be used in a humidity controlled cold room.

b. Normally only nonconductive pollution occurs; occasionally, however, a temporary conductivity caused by condensation must be expected.

## Safety Features

The Microfuge 16 centrifuge has been designed and tested to operate safely indoors at altitudes up to 2000 m (6562 ft). An electromechanical door-locking mechanism prevents operator contact with spinning rotors. When the door is closed it locks automatically. The door can be unlocked and opened only when the power is on and the rotor is at rest.

## Ground Wire Check

A ground wire check can be performed on any metal part of the centrifuge using an appropriate measuring instrument.

## Name Rating Plate

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The name rating plate is affixed to the rear of the centrifuge. Check that the line voltage agrees with the voltage listed on this name rating plate before connecting the centrifuge. Always mention the serial number and the model number shown when corresponding with Beckman Coulter regarding your centrifuge.

## Chassis

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### Housing

The housing is made of metal diecast parts. The control panel is covered by a protective overlay made of coated polycarbonate.

### Door

The diecast door has a strobe port for speed verification. The door is secured by a solid hinge at the back of the centrifuge and by a motorized auto-lock closure system at the front. This system keeps the door locked when a run is in progress and allows the door to be opened only when the rotor is stopped. In the event of a power failure, the door lock can be opened via the emergency door release for sample recovery (see [CHAPTER 4, Troubleshooting](#)).

### Rotor Chamber

The air-cooled rotor chamber is made of high-impact thermoplastic for safety and easy cleaning.

### Drive

The asynchronous direct-drive motor is brushless for low maintenance. A tie-down screw secures the rotor to the drive shaft. The resilient suspension ensures that loads will not be disturbed by vibration, and prevents damage to the drive shaft if an imbalance occurs during centrifugation.

## Controls and Indicators

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### Power Switch

A two-position rocker switch (**I**, on; **O**, off), located on the back of the centrifuge next to the power cord outlet, controls electrical power to the centrifuge.

## Control Panel

The control panel (Figure 2.2), including touch keys and hermetically sealed LCD display, is mounted at an angle on the centrifuge front for easy visibility and access.

Figure 2.2 The Control Panel



### MENU Key



Pressing the **MENU** key puts the system into edit mode, in which parameters can be entered or changed. Pressing **MENU** repeatedly activates the following parameters in succession.

- Speed in rpm; speed in  $rcf \times g$
- Time in minutes and seconds (see page 3-7 for more information on time settings)
- Soft (slow) acceleration and/or deceleration. Slow acceleration and deceleration settings are available to preserve the sample-to-gradient interfaces. The following options are available:
  - **soft:** soft acceleration and soft deceleration
  - **soft stop:** soft deceleration only
  - **stop:** standard acceleration and deceleration

Slow acceleration and deceleration are selected by pressing the **MENU** key four times and then pressing the up arrow key to select and display **soft**, **stop**, and **soft stop**.

Continuing to press the up or down arrow keys will cycle repeatedly through the slow acceleration and deceleration settings.

Parameter settings will flash for 20 seconds, then be stored.

**Up and Down Arrow  
Keys**

Pressing the up or down arrow key adjusts parameter settings as follows:

- Speed and time settings can be adjusted upwards or downwards.
- After the **MENU** key is pressed four times, pressing the up arrow key displays slow acceleration and deceleration settings.
- During a run, pressing the up arrow key toggles the speed display between rpm and rcf.

**START STOP Key**

The **START STOP** key is used to:

- Start a timed run, by pressing and releasing **START STOP**. The rotor accelerates to the set speed and continues until the time runs down or **START STOP** is pressed.
- End a timed run before the set time has elapsed, by pressing and releasing **START STOP**.
- End deceleration in process, by pressing and releasing **START STOP**; this will restart the centrifuge.
- Perform a short run, by pressing and holding **START STOP**. The rotor accelerates to maximum speed and spins as long as the key is pressed; deceleration begins when the key is released. **Short run** is displayed under the rotor speed.

**OPEN Key**

When pressed, this key releases the latch mechanism and allows the door to be opened (the rotor must be stopped and centrifuge power must be on).

## Display

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The LCD display shows parameter settings and operating conditions.

**During run setup:**

- The speed setting (in rpm or rcf) is displayed in the top line
- The time setting is displayed in the bottom line

- The middle line displays the optional settings **soft** (slow acceleration and deceleration), **soft stop** (slow deceleration), or **stop** (standard acceleration and deceleration) if selected. If the **stop** setting is selected, **stop** will flash for 20 seconds and then no longer be displayed.

#### During operation:

- The actual run speed in rpm or rcf is displayed in the top line
- The run time is shown in time elapsed (continuous and short run settings) or time remaining (timed run setting)
- The optional slow acceleration and deceleration settings **soft** or **soft stop** are displayed, if selected. **Short run** is displayed during a short (pulse) run.

## Speed

Speed settings are accessed by pressing the **MENU** key. Pressing **MENU** once activates rpm (revolutions per minute) edit mode; **rpm** flashes in the display. Adjust the rpm setting, in increments of 100, using the up and down arrow keys.



Pressing **MENU** twice activates the rcf (relative centrifugal force) edit mode; **xg** flashes in the display. Adjust the rcf setting, in increments of  $10 \times g$ , using the up and down arrow keys.

During a run, the actual speed (in rpm or rcf) is displayed.

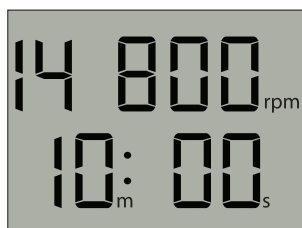




## Time

Timed and continuous runs can be selected by pressing the **MENU** key until **m** and **s** flash in the display, and then pressing the up and down arrow keys to adjust the setting.

- A timed run can be set from 10 seconds up to 99 minutes 59 seconds in 1-second increments. The up and down arrows are used to adjust the setting. A timed run can be stopped at any time by pressing the **START STOP** key.



- In continuous run mode, the run time is not limited and the run must be ended manually.
- Continuous run mode is indicated by --:-- in the Time display, which is accessed either by selecting a time setting of 10 seconds (0:10) and pressing the down arrow once, or by selecting 99:59 and pressing the up arrow once. When the **START STOP** key is pressed, the rotor accelerates to the set speed and run time counts up. After 99 minutes 59 seconds, run time is no longer displayed but the run continues.



A short run is started by pressing and holding the **START STOP** key. The rotor accelerates to maximum speed, **short run** is displayed, and the run time begins counting up in seconds.

- A short (pulse) run has no set time. The rotor accelerates to maximum speed, even if a lower speed setting is selected.
- A short run ends when the **START STOP** key is released. During deceleration, the elapsed time is displayed until the rotor reaches 0 rpm. The door opens automatically.



## Rotor Function and Specifications

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Two rotors are available for use in the Microfuge 16 centrifuge. The FX241.5P rotor, rated for 14,800 rpm, is a fixed angle rotor with two concentric rows of twelve tube cavities. The tube angle for the outer row is 32 degrees, and the tube angle for the inner row is 53 degrees. This unique design delivers the same maximum  $g$  force to samples placed in both rows. The FX241.5P rotor can centrifuge up to twenty-four 1.5 to 2.2-mL reaction-vials, as well as 200 to 750- $\mu$ L vials using adapters.\*



The FX121.5P rotor, rated for 14 800 rpm, is a fixed angle rotor with a tube angle 45 degrees from the axis of rotation. The FX121.5P rotor can centrifuge up to twelve 1.5 to 2.2-mL reaction-vials, as well as 200 to 750- $\mu$ L vials using adapters.\*

The FX241.5P and FX121.5P rotors develop centrifugal forces that can efficiently pellet subcellular organelles, viruses, bacteria, mitochondria, chloroplasts, or algae.

The rotors are made of high-impact thermoplastic. A polysulfone snap-on lid will contain most liquids and broken tube particles, reducing the need to clean the centrifuge chamber, and allowing you to take appropriate precautions before opening the lid in the event of spillage. A tie-down screw is used to secure the rotor to the drive shaft during centrifugation.

The rotors are warranted for one year (see the [Beckman Coulter, Inc., Benchtop Rotor Warranty](#)).

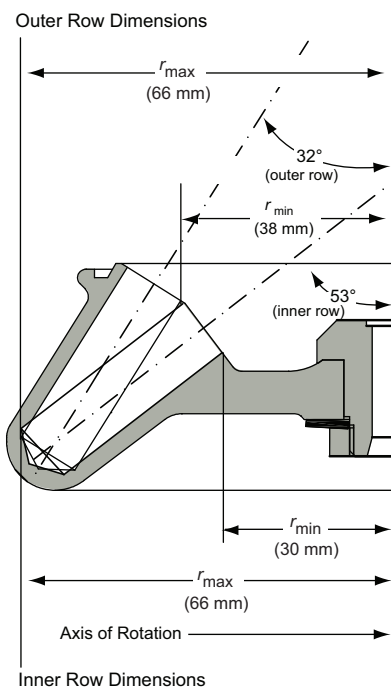


**Use only the FX241.5P and FX121.5P rotors in the Microfuge 16.**

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\* Adapters are purchased separately. See [Table 2.1](#) for part numbers.

## FX241.5P Rotor Specifications



Specification	Description
Maximum speed	14,800 rpm
Density rating at maximum speed	1.2 g/mL
Critical speed range <sup>a</sup>	600 to 900 rpm
Relative Centrifugal Field <sup>b</sup> at maximum speed at $r_{max}$	<ul style="list-style-type: none"> <li>Outer row (66 mm) (32-degree angle) — 16 163 × g</li> <li>Inner row (66 mm) (53-degree angle) — 16 163 × g</li> </ul>
Conditions requiring speed reductions	see <a href="#">Run Speeds</a> (page 3-12)
Maximum imbalance of opposing loads	2 grams
Number of tube cavities	24
Nominal tube capacity (largest tube)	2.2 mL
Nominal rotor capacity	24 × 1.5/2.2 mL (36/52.8 mL)
Approximate acceleration time to maximum speed (fully loaded)	15 seconds
Approximate deceleration time from maximum speed (fully loaded)	13 seconds
Weight of fully loaded rotor	344 g (0.76 lb)
Rotor material	polypropylene
Lid material	polysulfone

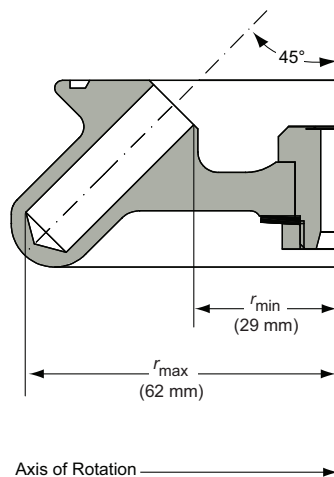
a. The critical speed range is the range of speeds over which the rotor shifts so as to rotate about its center of mass. Passing through the critical speed range is characterized by some vibration.

## Description

### Rotor Function and Specifications

- b. Relative Centrifugal Field (RCF) is the ratio of the centrifugal acceleration at a specified radius and speed ( $r\omega^2$ ) to the standard acceleration of gravity ( $g$ ) according to the following formula:  $RCF = r\omega^2/g$ — where  $r$  is the radius in millimeters,  $\omega$  is the angular velocity in radians per second ( $2\pi \text{ RPM}/60$ ), and  $g$  is the standard acceleration of gravity ( $9807 \text{ mm/s}^2$ ).  
After substitution:  $RCF = 1.12r (\text{RPM}/1000)^2$

## FX121.5P Rotor Specifications



Specification	Description
Maximum speed	14,800 rpm
Density rating at maximum speed	1.2 g/mL
Critical speed range <sup>a</sup>	600 to 900 rpm
Relative Centrifugal Field <sup>b</sup> at maximum speed at $r_{\max}$ (62 mm)	$15\,183 \times g$
Conditions requiring speed reductions	see <a href="#">Run Speeds</a> (page 3-12)
Maximum imbalance of opposing loads	2 grams
Number of tube cavities	12
Nominal tube capacity (largest tube)	2.2 mL
Nominal rotor capacity	$12 \times 1.5/2.2 \text{ mL}$ (18/26.4 mL)
Approximate acceleration time to maximum speed (fully loaded)	13 seconds
Approximate deceleration time from maximum speed (fully loaded)	11 seconds
Weight of fully loaded rotor	307 g (0.68 lb)
Rotor material	polypropylene
Lid material	polysulfone

- a. The critical speed range is the range of speeds over which the rotor shifts so as to rotate about its center of mass. Passing through the critical speed range is characterized by some vibration.
- b. Relative Centrifugal Field (RCF) is the ratio of the centrifugal acceleration at a specified radius and speed ( $r\omega^2$ ) to the standard acceleration of gravity ( $g$ ) according to the following formula:  $RCF = r\omega^2/g$ — where  $r$  is the radius in millimeters,  $\omega$  is the angular velocity in radians per second ( $2\pi \text{ RPM}/60$ ), and  $g$  is the standard acceleration of gravity ( $9807 \text{ mm/s}^2$ ). After substitution:  $RCF = 1.12r (\text{RPM}/1000)^2$

## Tubes and Adapters

Available tubes and adapters for the FX241.5P and FX121.5P rotors are listed in [Table 2.1](#). Be sure to observe the maximum speeds shown. If using commercially available tubes, follow the manufacturer's recommended speed and fill guidelines.

Refer to *Chemical Resistances*, publication IN-175, for information on the chemical compatibilities of labware materials.

**Table 2.1** Available Tubes and Adapters for the FX241.5P and FX121.5P Rotors

Description	Dimensions	Volume	Part Number	Adapter	Max Speed (rpm) <sup>a</sup>
polyethylene tube with attached cap	11 × 45 mm	1.8 mL	340196 (pkg/500)	none	10,000
polypropylene tube with attached cap (natural)	11 × 40 mm	1.5 mL	357448 (pkg/500)	none	14,800
polypropylene tube with attached cap	11 × 40 mm	1.5 mL	343169 (pkg/500)	none	14,800
polyethylene tube, plain	7 × 40 mm	400 µL	314326 (pkg/1000)	361247 (pkg/24)	11,500
polyethylene tube, Heparin-Lithium Fluoride coated	7 × 40 mm	400 µL	652824 (pkg/1000)	361247 (pkg/24)	11,500
polyethylene tube, Heparin-Lithium coated	7 × 40 mm	400 µL	652825 (pkg/1000)	361247 (pkg/24)	11,500
polyethylene tube, Heparin-Lithium Fluoride coated	5 × 45 mm	250 µL	652821 (pkg/1000)	361247 (pkg/24)	11,500
polyethylene tube, Heparin-Lithium coated	5 × 45 mm	250 µL	652822 (pkg/1000)	361247 (pkg/24)	11,500
polyethylene tube, plain	5 × 45 mm	250 µL	652823 (pkg/1000)	361247 (pkg/24)	11,500
PCR tubes	—	0.5/0.6/ 0.75 mL	commercially available	364690 (pkg/12)	14,800
PCR tubes	—	0.2 mL	commercially available	392294 (pkg/12)	14,800

a. See Temperature Limits below.

## Temperature Limits

- Plastic containers have been centrifuge tested for use at temperatures between 2 and 25°C. For centrifugation at other temperatures, pretest containers under anticipated run conditions.
- If plastic containers are frozen before use, make sure that they are thawed to at least 2°C before centrifugation.

## Run Speeds

---



14 800<sub>rpm</sub>

The centrifugal force at a given radius in a rotor is a function of speed. Comparisons of forces between different rotors are made by comparing the rotors' relative centrifugal fields (RCF). When rotational speed is adjusted so that identical samples are subjected to the same RCF in two different rotors, the samples are subjected to the same force. The RCF at each speed is automatically calculated by the centrifuge software; if the RCF is entered, the centrifuge calculates the equivalent revolutions per minute (rpm).

The maximum run speed listed in the rotor specifications is for operation when all conditions are within the standard specifications.

The maximum run speed listed in the rotor specifications is for operation when all conditions are within the standard specifications.

- If nonprecipitating solutions more dense than 1.2 g/mL are centrifuged, the maximum allowable run speed must be reduced according to the following equation:

$$\text{reduced maximum speed} = (14,800 \text{ rpm}) \sqrt{\frac{1.2 \text{ g/mL}}{\rho}}$$

where  $\rho$  is the density of the tube contents. This speed reduction will protect the rotor from excessive stresses due to the added tube load. *Note, however, that the use of this formula may still produce maximum speed figures that are higher than the limitations imposed by the use of certain tubes or adapters.* In such cases, use the lower of the two figures.

- *Further speed limits must be imposed* when self-forming-gradient salts are centrifuged, as the equation does not predict concentration limits/speeds that are required to avoid precipitation of salt crystals.

## Introduction

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 **WARNING**

Handle infectious samples according to good laboratory procedures and methods to prevent spread of disease. Because spills, operator error, or tube failure may generate aerosols, observe proper safety precautions for aerosol containment.

Do not run toxic, pathogenic, or radioactive materials in this centrifuge without taking appropriate safety precautions. Biosafe containment should be used when Risk Group II materials (as identified in the World Health Organization *Laboratory Biosafety Manual*) are handled; materials of a higher group require more than one level of protection.

 **WARNING**

The centrifuge must not be used in the vicinity of flammable liquids or vapors, and such materials should not be run in the centrifuge. Never bring any flammable substances within the 30-cm (1-ft) boundary surrounding the centrifuge. Do not lean on the centrifuge or place items on the centrifuge while it is operating. During operation you should not come within the 7.6-cm (3-in.) clearance envelope except to adjust centrifuge controls, if necessary.

## Run Procedure

---



The Microfuge 16 centrifuge and FX241.5P and FX121.5P rotors were developed, manufactured, and tested for safety and reliability as part of a Beckman Coulter centrifuge/rotor system. Safety or reliability of the centrifuge cannot be assured if used with any other rotor.

## Preparation and Loading

---



Although rotor components and accessories made by other manufacturers may fit in the FX241.5P and FX121.5P rotors, their safety in these rotors cannot be ascertained by Beckman Coulter. Use of other manufacturers' components or accessories in the FX241.5P and FX121.5P rotors may void the rotor warranty and should be prohibited by your laboratory safety officer.

## Prerun Safety Checks

Read the [Safety](#) chapter at the front of this manual before using the rotor.

- 1 Make sure that the rotor, lid, and all tubes and accessories are clean and show no signs of corrosion or cracking.
- 2 If fluid containment is required, use *capped tubes*.
  - All containers carrying physiological fluids should be capped, and not overfilled, to prevent leakage.
  - a. Verify that the tubes being used are listed in [Table 2.1](#) in [CHAPTER 2](#).
- 3 Check the chemical compatibilities of all materials used (refer to *Chemical Resistances*, publication IN-175).

**NOTE** The rotors can be run without lids, but this will result in slightly increased run noise and temperature.

## Rotor Preparation

For runs at other than room temperature, refrigerate or warm the rotor before the run for fast equilibration.



Load the filled containers symmetrically into the rotor (see [Table 2.1](#) for tube information). If fewer than 24 tubes (FX241.5P rotor) or 12 tubes (FX121.5P rotor) are being run, they must be arranged symmetrically in the rotor. *Opposing tubes must be filled to the same level with liquid of the same density.*

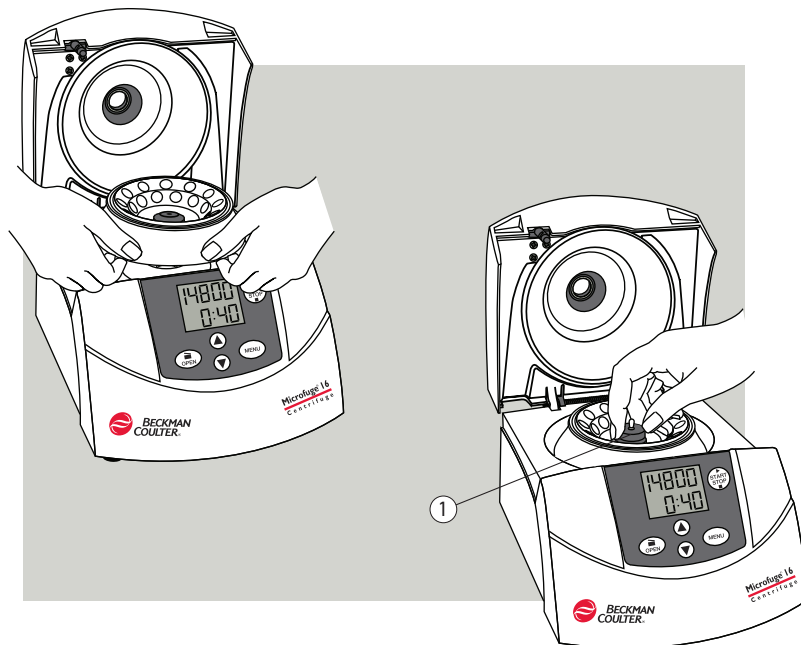
- 1 Press the power switch to on (I).
  - Power is applied to the centrifuge.
    - The centrifuge display is illuminated.
    - The door latch releases.

The power switch is on the centrifuge rear panel.

- 2 Ensure that the rotor tie-down screw (A46544) is in good condition and the threads are free of foreign matter.

- 3 Center the rotor over the drive shaft and carefully lower it straight down (see [Figure 3.1](#)).

**Figure 3.1** Installing the Rotor and Tightening the Tie-Down Screw



1. Tie-down Screw

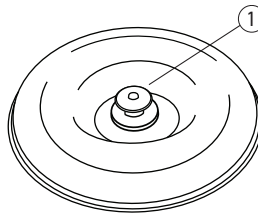
**CAUTION**

Do not drop the rotor onto the drive shaft. The shaft can be bent if the rotor is forced sideways or dropped onto it. Install the rotor by centering it over the shaft and carefully lowering it straight down.

- 
- 4** Secure the rotor to the drive shaft with the rotor tie-down screw (see [Figure 3.1](#)).
- Tighten the screw by turning it to the right (clockwise) by hand.
  - Once the screw contacts the rotor body, continue turning until a stop is felt.
    - Do not continue tightening past this point.

- 
- 5** Load filled tubes into the rotor.
- Always run the rotor with a balanced load.*

- 
- 6** Pull up on the snap-on lock and set the lid in place on the rotor.
- Release the lock, then make sure that the lid is firmly in place.
  - Press down on the lock to ensure engagement.



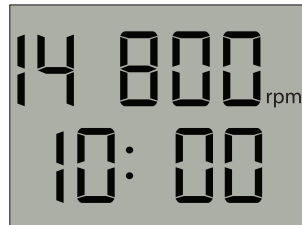
1. Snap-on Lock

**NOTE** If the rotor is left in the centrifuge between runs, make sure it is seated on the drive shaft and the rotor tie-down screw is tight before each run. Approximately every 20 runs, or once a day, loosen the tie-down screw and retighten it to ensure proper connection between the rotor and the shaft.

- 
- 7** Close the centrifuge door by pressing down on it until the latch engages.
- The system is ready for operation.
-

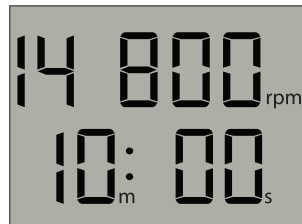
## Starting a Timed or Continuous Run

- 1 Press the **MENU** key until **rpm** or **xg** flashes in the display.
  - The speed setting can be adjusted



- 2 Press the up and/or down arrow keys to select a run speed, in rpm or rcf.
  - The speed setting is saved after 20 seconds.

- 3 Press the **MENU** key until **m** and **s** flash in the display.
  - The time setting can be adjusted.



- 4 *Timed run*—press the up and/or down arrow keys to select a run time.
  - The time setting is saved after 20 seconds.

- 5 *Continuous run*—set the time to 10 seconds (0:10) and press the down arrow key once, or press the up and/or down arrow keys until 99:59 is displayed, then press the up arrow once.
  - The time display shows --:--.



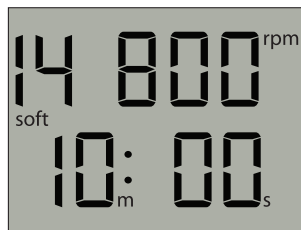
- a. To select slow acceleration and deceleration settings, follow steps 6 and 7 below.

6 Press the **MENU** key four times.

- If previously selected, **soft** or **soft stop** will flash.
  - Slow (soft) acceleration and deceleration settings can be selected.

7 Press the up arrow key repeatedly to display **soft** (slow acceleration and deceleration), **soft stop** (slow deceleration only), or **stop** (standard acceleration and deceleration settings).

- The settings are displayed in succession, and the displayed setting is stored after 20 seconds.
  - **Soft** and **soft stop** settings continue to be displayed after 20 seconds.



8 Check that the door is shut and securely latched.

9 Press **START STOP**.

- *Timed run*—The time remaining is displayed and begins to count down, in 1-second increments.
  - The run will stop when the time counts down to zero.
  - The run can be terminated early by pressing **START STOP**.
- *Continuous run*—The time begins counting up, in 1-second increments.
  - The run continues until **START STOP** is pressed.
  - (After 99 minutes 59 seconds, run time is no longer displayed but the run continues.)

 **CAUTION**

**Do not lift or move the centrifuge while the rotor is spinning.**

 **WARNING**

**Do not attempt to override the door interlock system while the rotor is spinning.**

**10** When the rotor reaches 0 rpm, the door latch releases automatically.

- Lift the door to full open position and unload the rotor.

**NOTE** Depending upon the duration of the event, transient power-line interruptions may cause this equipment to decelerate or reset with the possible loss of in-process operation. If you suspect this has occurred, repeat the run.

## RCF Display

The relative centrifugal field (RCF) values shown on the centrifuge display apply to the FX241.5P rotor. For the FX121.5P rotor, maximum RCF values at various speeds are shown in [Table 3.1](#).

**Table 3.1** RCF Values at Various Speeds for the FX121.5P Rotor

RPM	RCF	RPM	RCF
14,800	15,183	7,000	3,403
14,000	13,610	6,000	2,500
13,000	11,735	5,000	1,736
12,000	9,999	4,000	1,111
11,000	8,402	3,000	625
10,000	6,944	2,000	278
9,000	5,625	1,000	69
8,000	4,444		

## Starting a Short (Pulse) Run

**1** Check that the door is shut and securely latched.

**2** Press and hold the **START STOP** key.

- The rotor accelerates to its maximum speed.
  - **Short run** is displayed, and the run time begins counting up in seconds.
  - The run continues until the **START STOP** key is released.



- 
- 3 Release the **START STOP** key to begin deceleration.



**Do not lift or move the centrifuge while the rotor is spinning.**

- 
- 4 When the rotor reaches 0 rpm, the door latch releases automatically.
- Elapsed time is displayed for several seconds after the rotor reaches 0 rpm.
- a. Lift the door to full open position and unload the rotor.



**Do not attempt to override the door interlock system while the rotor is spinning.**

---

## Removal and Sample Recovery

---



**If disassembly reveals evidence of leakage, you should assume that some fluid escaped the rotor. Apply appropriate decontamination procedures to the centrifuge and accessories.**

- 
- 1 Pull up on the snap-on lock to remove the rotor lid.  
Tubes can be removed from the rotor.  
The rotor can be left in the centrifuge for subsequent runs.
- 
- 2 If desired, turn the rotor tie-down screw to the left (counterclockwise) to release the rotor.
- 
- 3 Remove the rotor by lifting it straight up and off the drive shaft.
-

## Troubleshooting

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**NOTE** It is your responsibility to decontaminate the centrifuge, rotors, and accessories before requesting service by Beckman Coulter representatives.

Centrifuge malfunctions that may occur are described in [Table 4.1](#), along with probable causes and corrective actions required. Possible causes for each problem are listed in the probable order of occurrence. Perform the recommended corrective action in sequence, as listed. If you are unable to correct the problem, call your Beckman Coulter representative.

To help diagnose and correct the problem, try to gather as much information about the situation as you can:

- Note the operating situation when the error occurred (such as speed or load type).
- Note any unusual environmental and/or operating conditions (such as ambient temperature or voltage fluctuations).
- Add any other information that may be helpful.

**Table 4.1** Troubleshooting Chart

Problem	Probable Cause	Recommended Action
No indication on displays	Power not on	Plug in power cord; turn power on ( <b>I</b> ).
	Fuse blown	Call Beckman Coulter Field Service. There are no user-replaceable fuses.
	Mechanical failure	Call Beckman Coulter Field Service.
Centrifuge cannot be started	Power not on	Plug in power cord; turn power on ( <b>I</b> ).
	Fuse blown	Call Beckman Coulter Field Service. There are no user-replaceable fuses.
	Mechanical failure	Call Beckman Coulter Field Service.
Rotor cannot achieve set speed	Line voltage below rating	Measure line voltage while centrifuge is operating.
	Electrical failure	Check connections; call Beckman Coulter Field Service.
	Mechanical failure	Call Beckman Coulter Field Service.

**Table 4.1** Troubleshooting Chart (*Continued*)

Problem	Probable Cause	Recommended Action
Door will not open	Rotor spinning	Wait until rotor stops.
	Power not on	Plug in power cord; turn power on (I). If power cannot be restored, see <a href="#">Accessing the Rotor in Case of Power Failure</a> , below, to retrieve your sample.

## Error Messages



If a problem occurs during operation, “**ERR**” is displayed along with an error number from 1 to 19. Refer to [Table 4.2](#) to determine the nature of the problem and recommended actions. If you are unable to correct the problem, call your Beckman Coulter Field Service representative.

**Table 4.2** Error Message Chart.<sup>a</sup>

Error Number	Description	Recommended Action
1	Bad tachometer reading	Turn the power off (O) and wait for the rotor to come to a complete stop, then turn the power back on (I) to reset.
2, 3, 5–18	Internal fault	
4	Door does not open when the <b>OPEN</b> key is pressed	Turn the power off (O). Verify that the rotor is completely stopped, then open the door using the procedures under <a href="#">Accessing the Rotor in Case of Power Failure</a> . Close the door firmly, and turn the power back on (I).
19	Power supply failure during run	Wait for the rotor to come to a complete stop. Open the door. Confirm the error message by pressing the <b>OPEN</b> key.

a. If the recommended action does not correct the problem, call Beckman Coulter Field Service.

## Accessing the Rotor in Case of Power Failure

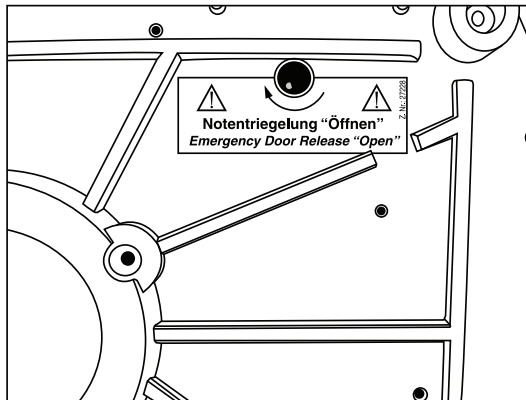
If the facility power fails you will have to restart the run when the power is restored. In the event of an extended power failure, it may be necessary to trip the door-locking mechanism manually to remove the rotor and retrieve your sample.



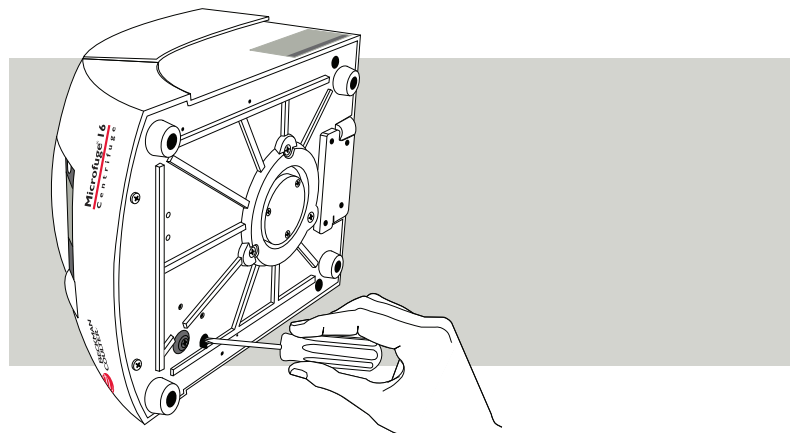
**WARNING**

The following procedure may expose the operator to the possibility of contact with a spinning rotor. Turn the power off (O) and disconnect the centrifuge from the main power source before proceeding. Never attempt to override the door interlock system while the rotor is spinning.

- 1 Turn the power switch to off (O) and unplug the power cord from the power source.
  - The display is inactive.
- 2 Make sure that the rotor is not spinning.
  - No sound or vibration comes from the centrifuge.
- 3 Tilt the centrifuge to its side and locate the label **Emergency Door Release "Open"**.



- 4 Insert the tool (B08091) into the hole and turn it clockwise to release the latch mechanism until the door can be opened.



- 
- 5** Remove the tool, return the instrument to its normal position and remove the rotor.



**Never try to slow or stop the rotor by hand.**

- 
- 6** Open the door and remove the rotor.
-

## Introduction

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*For maintenance not covered in this manual, contact Beckman Coulter Field Service (1-800-742-2345 in the U.S.A.; customers outside the United States should contact their local Beckman Coulter representative).*

**NOTE** It is your responsibility to decontaminate the centrifuge, rotors, and accessories before requesting service by Beckman Coulter representatives.

 **WARNING**

**Any maintenance procedure or servicing of this equipment that requires removal of any covers can expose parts which involve the risk of electric shock or personal injury. Make sure that the power switch is off (O) and the centrifuge is disconnected from the main power source by removing the Mains (power) plug from the outlet receptacle, and refer such servicing to qualified service personnel.**

**Do not use alcohol or other flammable substances in or near operating centrifuges.**

## Maintenance

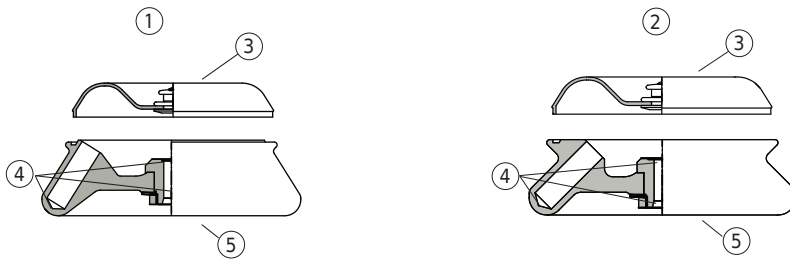
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### Centrifuge Preventive Maintenance

Perform the following procedures regularly to ensure satisfactory performance and long service life of the centrifuge.

- 1** Regularly inspect the interior of the rotor chamber for accumulations of sample or dust.
  - a.** Clean as required (see [Cleaning](#), below), as these accumulations can result in rotor vibrations.
- 2** Regularly check the air intake and exhaust vents for obstructions. Keep vents clear and clean.

## Rotor Preventive Maintenance



- |                   |                        |
|-------------------|------------------------|
| 1. FX241.5P Rotor | 4. Check for Corrosion |
| 2. FX121.5P Rotor | 5. Rotor Body          |
| 3. Lid            |                        |
- 

Do not use sharp tools on the rotor, as they can scratch the rotor surface.

---

- 1 Periodically (at least monthly) inspect the rotor, especially inside cavities, for damage.
    - a. If damage is evident, do not run the rotor.
  - 2 Contact your Beckman Coulter representative for information about the Field Rotor Inspection Program and the rotor repair center.
  - 3 Before using the rotor tie-down screw, check it for damage such as stripped threads.
    - a. Replace it if it is damaged.
  - 4 Refer to *Chemical Resistances* for the chemical compatibilities of rotor and accessory materials.
    - Your Beckman Coulter representative provides contact with the Field Rotor Inspection Program and the rotor repair center.
- 

## Cleaning

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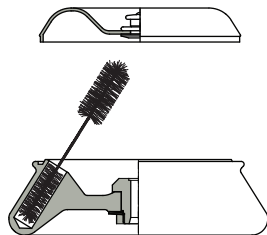
Frequent cleaning will ensure proper operation and prolong the life of the centrifuge and rotors. *Always clean up spills when they occur to prevent corrosives or contaminants from drying on component surfaces. Wash the rotor and rotor components immediately if salts or other corrosive materials are used or if spillage has occurred.*

**NOTE** Before using any cleaning methods except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment.

## Centrifuge Cleaning

- 1 To prevent accumulations of sample and/or dust, keep the interior of the rotor chamber clean and dry by frequent wiping with a cloth or paper towel.
- 2 Clean the drive shaft, shaft cavity, threads, and the tie-down screw at least once a week using a mild detergent such as Beckman Solution 555 (339555) and a soft brush.
  - a. Dilute the detergent 10 to 1 with water.
  - b. Rinse thoroughly and dry completely.
  - c. Lubricate the drive shaft with Spinkote\* (306812) after cleaning.
- 3 Wash the bowl using a mild detergent such as Solution 555.
  - a. Rinse thoroughly and dry completely.
- 4 Clean the centrifuge case and door by wiping with a cloth dampened with Solution 555.
  - a. Do not use acetone or other solvents.

## Rotor Cleaning



Under normal use, wash the rotor frequently (at least weekly) to prevent buildup of residues. If the rotor is left in the centrifuge for long periods of time, remove it at least once a month for cleaning and lubrication.

- 1 Wash the rotor and lid in a mild detergent, such as Beckman Solution 555 (339555), that won't damage the rotor.
  - The Rotor Cleaning Kit (339558) contains two plastic-coated brushes and two quarts of Solution 555 for use with rotors and accessories.

\* Spinkote lubricant (306812) is shipped with rotors.

- a. Dilute the detergent 10 to 1 with water.

**NOTE** Do not wash the rotor components or accessories in a dishwasher. Do not soak components in detergent solution for long periods of time, such as overnight.

- 
- 2 Rinse the cleaned rotor and components with distilled water.

- 
- 3 Air-dry the rotor and lid upside down.

- a. Do not use acetone to dry the rotor.
- 

## Decontamination

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If the centrifuge, rotor, and/or accessories are contaminated with radioactive or pathogenic solutions, follow appropriate decontamination procedures as outlined by your laboratory safety officer. Refer to *Chemical Resistances* to be sure the decontamination method will not damage any part of the centrifuge, rotor, or accessories.

## Sterilization and Disinfection

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### Centrifuge

Ethanol (70%)\* may be used on the centrifuge surface. See *Chemical Resistances* for more information regarding chemical resistance of centrifuge and accessory materials.

While Beckman Coulter has tested these methods and found that they do not damage the centrifuge, no guarantee of sterility or disinfection is expressed or implied. When sterilization or disinfection is a concern, consult your laboratory safety officer regarding proper methods to use.

### Rotor

- The rotors can be autoclaved at 118°C for 40 minutes. Remove the lid from the rotor and place the rotor and lid in the autoclave upside down.
- The polysulfone rotor lid can be autoclaved at 138°C for up to 5 minutes.
- Ethanol (70%)\* or hydrogen peroxide (6%) may be used on all rotor components, including those made of plastic. Use the minimum immersion time for each solution, per laboratory standards.

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\* Flammability hazard. Do not use in or near operating centrifuges.

While Beckman Coulter has tested these methods and found that they do not damage the rotor or components, no guarantee of sterility or disinfection is expressed or implied. When sterilization or disinfection is a concern, consult your laboratory safety officer regarding proper methods to use.

Refer to publication IN-192, included in each box of tubes or bottles, for tube sterilization and disinfection procedures.

 **CAUTION**

**Frequent, repeated autoclaving will reduce the useful life of plastic components. Replace components if any signs of damage are evident, including change in color or shape.**

## Storage and Transportation

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### Storage

Before storing a centrifuge for an extended period, return it to the original shipping container to protect it from dust and dirt. Temperature and humidity conditions for storage should meet the environmental requirements described under *Specifications*, in [CHAPTER 2](#).

When a rotor is not in use, store it in a dry environment (not in the centrifuge) with the rotor lid removed to allow air circulation so moisture will not collect in the tube cavities.

### Returning a Centrifuge or Rotor

Before returning a centrifuge, rotor, or accessory for any reason, prior permission (a Returned Materials Authorization form) must be obtained from Beckman Coulter, Inc. Contact your local Beckman Coulter office to obtain the RMA form and for packaging and shipping instructions. When returning a rotor, make sure that the RMA form contains the following information:

- rotor serial number,
- history of use (approximate frequency of use),
- reason for the return,
- original purchase order number, billing number, and shipping number, if possible,
- name and phone number of the person to be notified upon receipt of the rotor or accessory at the factory, and
- name and phone number of the person to be notified about repair costs, etc.

To protect our personnel, it is the customer's responsibility to ensure that all parts are free from pathogens and/or radioactivity. Sterilization and decontamination must be done before returning the parts.

*All parts must be accompanied by a signed note, plainly visible on the outside of the box, stating that they are safe to handle and that they are not contaminated with pathogens or radioactivity. **Failure to attach this notification will result in return or disposal of the items without review of the reported problem.***

Use the address label printed on the RGA form when mailing the rotor and/or accessories.

Customers located outside the United States should contact their local Beckman Coulter office.

## Supply List

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**NOTE** Publications referenced in this manual can be obtained by calling 1-800-742-2345 in the United States, or by contacting your local Beckman Coulter office, or visit [www.beckmancoulter.com](http://www.beckmancoulter.com).

Contact Beckman Coulter Sales (1-800-742-2345 in the United States) for information about ordering parts and supplies. See the Beckman Coulter *Benchtop Rotors, Tubes & Accessories* catalog (BR-9742, available at [www.beckmancoulter.com](http://www.beckmancoulter.com)) for detailed information on ordering rotors, tubes, and accessories. For your convenience, a partial list is given below.

### Replacement Parts

Description	Part Number
FX241.5P rotor	A46475
FX121-5P rotor	A46476
Snap-on lid (for FX241.5P and FX121.5P)	A46477
Rotor tie-down screw (for FX241.5P and FX121.5P)	A46544

### Supplies

**NOTE** For MSDS information, go to the Beckman Coulter website at [www.beckmancoulter.com](http://www.beckmancoulter.com).

Description	Part Number
Tubes and accessories	see <a href="#">Table 2.1</a>
Beckman Solution 555 (1 qt)	339555
Rotor Cleaning Kit	339558



## Installing the Centrifuge

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 **WARNING**

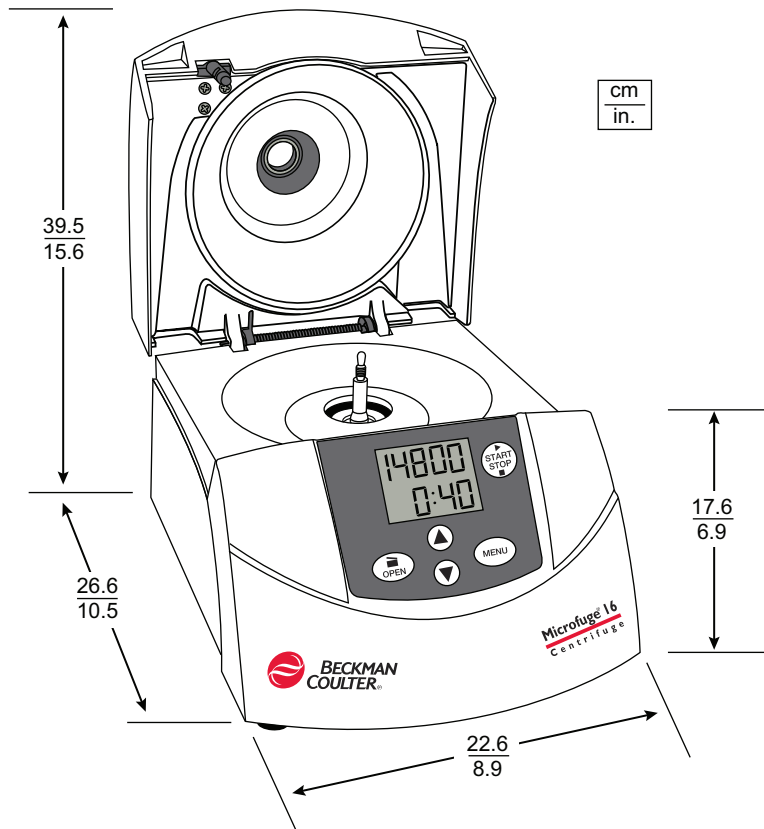
Do not place the centrifuge near areas containing flammable reagents or combustible fluids. Vapors from these materials could enter the centrifuge's air system and be ignited by the motor. No hazardous materials should be handled or stored within the 30-cm (1-ft) boundary surrounding the centrifuge. Maintain a 7.6-cm (3-in.) clearance envelope around the centrifuge while it is running. No persons should be within this clearance envelope while the centrifuge is operating, except to adjust centrifuge controls, if necessary.

- 1 Carefully remove the centrifuge and accessories from the shipping container.
  - a. Save the container and packing materials for possible future relocation or storage.
- 2 Select a location away from heat-producing laboratory equipment and direct sunlight, with sufficient ventilation to allow for heat dissipation.
- 3 Position the centrifuge on a level surface, such as a sturdy table or laboratory bench that can support the weight of the centrifuge (5.4 kg/11.9 lb) and resist vibration.
- 4 In addition to space for the centrifuge itself (see [Figure A.1](#) for dimensions), allow 7.6-cm (3-in.) clearances at the sides and back of the centrifuge to ensure sufficient air circulation.
  - The centrifuge must have adequate air ventilation to ensure compliance to local requirements for vapors produced during operation.

Ambient temperatures during operation should not be lower than 4°C (39°F) or higher than 40°C (104°F). Relative humidity should not exceed 80% (noncondensing).

**NOTE** During transport between areas with varying temperatures, condensation may occur inside the centrifuge. Allow sufficient drying time before running the centrifuge.

Figure A.1 Dimensions of the Microfuge 16 Centrifuge



## Electrical Requirements

100 to 120-V centrifuge: 100–120 VAC, 4 A, 50/60 Hz

220 to 240-V centrifuge: 220–240 VAC, 2 A, 50/60 Hz

Power cord: 2.5-m (8-ft) power cord with grounded plug is supplied with the centrifuge

To reduce the risk of electrical shock, this centrifuge uses a three-wire electrical cord and plug to connect the centrifuge to earth-ground. To preserve this safety feature:

- Make sure that the matching wall outlet receptacle is properly wired and earth-grounded. Check that the line voltage agrees with the voltage listed on the name rating plate affixed to the centrifuge. Then plug in both ends of the centrifuge power cord.
- Never use a three-to-two wire plug adapter.
- Never use a two-wire extension cord or a two-wire non-grounding type of multiple-outlet receptacle strip.
- If there is any question about voltage, have a qualified service person measure it under load while the drive is operating.

To ensure safety the centrifuge should be wired to a remote emergency switch (preferably outside the room where the centrifuge is housed, or adjacent to the exit from that room), in order to disconnect the centrifuge from the main power source in case of a malfunction.

## Test Run

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We recommend that you make a test run to ensure that the centrifuge is in proper operating condition following shipment. See [CHAPTER 3](#) for instructions on operating the centrifuge.

After completing the test run, return the preaddressed warranty card included with this literature. This will validate the centrifuge warranty and ensure your receipt of further information regarding new accessories and/or modifications as they become available.



# Beckman Coulter, Inc., Microfuge 16 Centrifuge Warranty

Subject to the exceptions and upon the conditions specified below and the warranty clause of the Beckman Coulter terms and conditions in effect at the time of sale, Beckman Coulter agrees to correct either by repair or, at its election, by replacement, any defects of material or workmanship which develop within two (2) years after delivery of a Microfuge16 centrifuge (the product), to the original buyer by Beckman Coulter or by an authorized representative, provided that investigation and factory inspection by Beckman Coulter discloses that such defect developed under normal and proper use.

Some components and accessories by their nature are not intended to and will not function for as long as one (1) year. A complete list of such components or accessories is maintained at the factory and at each Beckman Coulter District Sales Office. The lists applicable to the products sold hereunder shall be deemed to be part of this warranty. If any such component or accessory fails to give reasonable service for a reasonable period of time, Beckman Coulter will repair or, at its election, replace such component or accessory. What constitutes either reasonable service and a reasonable period of time shall be determined solely by Beckman Coulter.

## **Replacement**

Any product claimed to be defective must, if requested by Beckman Coulter, be returned to the factory, transportation charges prepaid, and will be returned to Buyer with the transportation charges collect unless the product is found to be defective, in which case Beckman Coulter will pay all transportation charges.

## **Conditions**

Beckman Coulter shall be released from all obligations under all warranties, either expressed or implied, if the product(s) covered hereby are repaired or modified by persons other than its own authorized service personnel, unless such repair in the sole opinion of Beckman Coulter is minor, or unless such modification is merely the installation of a new Beckman Coulter plug-in component for such product(s).

## **Disclaimer**

IT IS EXPRESSLY AGREED THAT THE ABOVE WARRANTY SHALL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND OF THE WARRANTY OF MERCHANTABILITY AND THAT NEITHER BECKMAN COULTER, INC. NOR ITS SUPPLIERS SHALL HAVE ANY LIABILITY FOR SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER ARISING OUT OF THE MANUFACTURE, USE, SALE, HANDLING, REPAIR, MAINTENANCE, OR REPLACEMENT OF THE PRODUCT.



# Beckman Coulter, Inc., Benchtop Rotor Warranty

Subject to the conditions specified below and the warranty clause of the Beckman Coulter, Inc., terms and conditions in effect at the time of sale, Beckman Coulter agrees to correct either by repair or, at its election, by replacement, any defects of material or workmanship which develop within seven (7) years after delivery of a benchtop centrifuge rotor to the original buyer by Beckman Coulter or by an authorized representative, provided that investigation and factory inspection by Beckman Coulter discloses that such defect developed under normal and proper use. Should a Beckman Coulter centrifuge be damaged due to a failure of a rotor covered by this warranty, Beckman Coulter will supply free of charge all centrifuge parts required for repair.

## **Conditions**

1. Except as otherwise specifically provided herein, this warranty covers the rotor only and Beckman Coulter shall not be liable for damage to accessories or ancillary supplies including but not limited to (i) tubes, (ii) tube caps, (iii) tube adapters, or (iv) tube contents.
2. This warranty is void if the rotor has been subjected to customer misuse such as operation or maintenance contrary to the instructions in the Beckman Coulter rotor or centrifuge manual.
3. This warranty is void if the rotor is operated with a rotor drive unit or in a centrifuge unmatched to the rotor characteristics or operated in a Beckman Coulter centrifuge that has been improperly disassembled, repaired, or modified.
4. Thermoplastic rotors or components used in some benchtop centrifuges are warranted for one (1) year from date of purchase.

## **Disclaimer**



IT IS EXPRESSLY AGREED THAT THE ABOVE WARRANTY SHALL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND OF THE WARRANTY OF MERCHANTABILITY AND THAT NEITHER BECKMAN COULTER, INC. NOR ITS SUPPLIERS SHALL HAVE ANY LIABILITY FOR SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER ARISING OUT OF THE MANUFACTURE, USE, SALE, HANDLING, REPAIR, MAINTENANCE, OR REPLACEMENT OF THE PRODUCT.





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Symbol Symbol Simbolo Symbole Simbolo	Simbole СИМВОЛ 符号 記号 상징	Title / Titel / Titolo / Titre / Titolo / Titolo / Название / 标题 / タイトル / 제목
		Dangerous voltage Gefährliche elektrische Spannung Voltaje peligroso Courant haute tension Pericolo: alta tensione
		Tensão perigosa Опасное напряжение тока 危険电压 危険な電圧 위험한 전압
		Caution, consult accompanying documents Vorsicht, konsultieren Begleitdokumente Atención, consulta documentos adjuntos Attention, consultez des documents d'accompagnement Attenzione, consulta i documenti di accompagnamento
		Cuidado, ulta documentos adjuntos Внимание, советует с сопроводительными документами 注意, 咨询附属单证 注意, 伴う文書に相談しなさい 주의, 동반 문서를 상담하십시오
		Biohazard Potentiell infektiösem Material Riesgo biológico Risque biologique Pericolo biologico
		Material infeccioso potencial биологической опасности 可能的传染性物 潜在的な感染性物質 전염하는 물자
		On (power) Ein (Netzverbindung) Encendido Marche (mise sous tension) Acceso (sotto tensione)
		Fora (o poder) На (мощности) 开 (电源) ㄴ (電源) 에 (힘)
		Off (power) Aus (Netzverbindung) Apagado Arrêt (mise sous tension) Spento (fuori tensione)
		Fora de (poder) С (сила) (电源) ㄴ (電源) 떨어져 (힘)
		Protective earth (ground) Schutzleiteranschluß Puesta a tierra de protección Liaison à la terre Collegamento di protezione a terra
		Terra de proteção (terra) Защитное заземление (земля) 保护接地 保護アース (接地) 방어적인 지구 (지상)
		Earth (ground) Erde (Masse) La tierra (suelo) Terre (sol) Scarica a terra
		Terra Земли 接地 アース (接地) 지구 (지상)

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<b>Symbol</b> <b>Symbol</b> <b>Simbolo</b> <b>Symbole</b> <b>Simbolo</b>	<b>Simbole</b> <b>СИМВОЛ</b> 符号 記号 상징	<b>Title / Titel / Titolo / Titre / Titolo / Título / Название / 标题 / タイトル / 제목</b>	
		Manufacturer Hersteller Fabricante Fabricant Fabbricante	Fabricante производитель 製造商 メーカー 제조자
		Consult Instructions for Use Konsultieren Sie Anwendungsvorschriften Consulte las instrucciones para el uso Consultez les instructions pour l'usage Consulti le istruzioni per uso	Consulte instruções para o uso Советуйте с инструкциями для пользы 咨询使用说明书 使用説明に相談しなさい 사용 설명을 상담하십시오



## Related Documents

### **Chemical Resistances for Beckman Coulter Centrifugation Products**

PN IN-175

Available in hard copy or electronic pdf by request.

Available at [www.beckmancoulter.com](http://www.beckmancoulter.com)

### **Use and Care of Centrifuge Tubes and Bottles**

PN IN-192

Available in hard copy or electronic pdf by request.

### **Benchtop Rotors, Tubes, and Accessories catalog**

PN BR-200634

Available at [www.beckmancoulter.com](http://www.beckmancoulter.com)

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