Instructions For Use

VTi 50 / VTi 50.1
Vertical-Tube Rotor

For Use in Beckman Coulter Class R and S
Preparative Ultracentrifuges

VTi 50

VTi 50.1

L5-TB-050BA
August 2022

Beckman Coulter, Inc.
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BECKMAN COULTER

VTi 50 / VTi 50.1 Vertical-Tube Rotor
L5-TB-050BA (August 2022)

Contact Us
If you have any questions, contact our Customer Support Center.

- Worldwide, find us via our website at *www.beckman.com/support/technical*
- In the USA and Canada, call us at 1-800-369-0333.
- In Austria, call us at 0810 300484
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Glossary of Symbols is available at beckman.com/techdocs (PN C24689).

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Original Instructions

Revision History

This document applies to the latest and higher versions. When a subsequent version changes the information in this document, a new issue will be released to the Beckman Coulter website. For updates, go to www.beckman.com/techdocs and download the latest version of the manual or system help for your instrument.

Issue AV, 10/2018
Changes or additions were made to:
- Table 1, Available Tubes for the VTi 50 Rotor
- Certified Free Tubes
- Sterile Tubes
- Sterilization and Disinfection

Issue AW, 02/2022
Changes or additions were made to:
- Safety Notice
- Added references / information for VTi 50.1 throughout the document.
- Removed references to Class H Instruments (discontinued).

Issue AY, 03/2022
Changes or additions were made to:
- Safety Notice
- Description
- Preparation and Use
- Rotor Preparation
- Figure 1: Arranging Tubes in the VTi 50 Rotor
- Figure 2: Arranging Tubes in the VTi 50.1 Rotor
- Table 1: Available Tubes for the VTi 50 and VTi 50.1 Rotors
- Sterile Tubes
- Quick-Seal Tubes
- Selecting CsCl Gradients
- Figure 3: Precipitation Curves for the VTi 50 Rotor
- Figure 4: CsCl Gradients at Equilibrium for the VTi 50 Rotor
- Figure 5: CsCl Gradients for Lower Densities for the VTi 50 Rotor
- Figure 6: Precipitation Curves for the VTi 50.1 Rotor
- Figure 7: CsCl Gradients at Equilibrium for the VTi 50.1 Rotor AT EQUILIBRIUM During or After Centrifugation Volume (mL)
- Maintenance
- Other

Issue BA, 08/2022

- Specifications — VTi 50.1 Vertical-Tube Rotors

Note: *Changes that are part of the most recent revision are indicated in text by a bar in the margin of the amended page.*

Safety Notice

Read all product manuals and consult with Beckman Coulter-trained personnel before attempting to use this equipment. 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 Us.

Beckman Coulter, Inc. urges its customers and employees to comply with all national health and safety standards such as the use of barrier protection. This may include, but is not limited to, protective eyewear, gloves, and suitable laboratory attire when operating or maintaining this or any other laboratory centrifuge.

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This safety notice summarizes information basic to the safe use of the rotor described in this manual. The international symbol displayed to the left 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 of this publication, pay special attention to the safety information presented. Observance of safety precautions will also help to avoid actions that could damage or adversely affect the performance of the rotor. This rotor was developed, manufactured, and tested for safety and reliability as part of a Beckman Coulter ultracentrifuge/rotor system. Its safety or reliability cannot be assured if used in a centrifuge not of Beckman Coulter's manufacture or in a Beckman Coulter ultracentrifuge that has been modified without Beckman Coulter's approval.

⚠ WARNING

If the equipment is used in a manner not specified by Beckman Coulter, Inc., the protection provided by the equipment may be impaired.

⚠ CAUTION

If you purchased this product from anyone other than Beckman Coulter or an authorized Beckman Coulter distributor, and, if it is not presently under a Beckman Coulter Service Maintenance Agreement, Beckman Coulter cannot guarantee that the product is fitted with the most current mandatory engineering revisions or that you will receive the most current information bulletins concerning the product. If you purchased this product from a third party and would like further information concerning this topic, Contact Us.

Alerts for Danger, Warning, Caution, and Note

All Warnings and Cautions in this document include an exclamation point, framed within a triangle.

The exclamation point symbol is an international symbol which serves as a reminder that all safety instructions should be read and understood before installation, use, maintenance, and servicing are attempted.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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 Information for the VTi 50 and VTi 50.1 Rotors

IMPORTANT These rotors were developed, manufactured, and tested for safety and reliability as part of a Beckman Coulter centrifuge/rotor system. Their 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 rotor 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 rotor 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 ultracentrifuge.

Although rotor components and accessories made by other manufacturers may fit in the VTi 50 or VTi 50.1 rotors, their safety in these rotors cannot be ascertained by Beckman Coulter. Use of other manufacturers' components or accessories in these 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 these rotors.

Do not run an empty rotor. Place filled tubes in at least two opposing cavities. 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 before installing the rotor plugs.

If disassembly reveals evidence of leakage, you should assume that some fluid escaped the rotor. Apply appropriate decontamination procedures to the centrifuge and accessories if pathogenic or radioactive materials are involved.

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. Corrosion begins in scratches and may open fissures in the rotor with continued use.

Safety During Installation and/or Maintenance

⚠ WARNING

Risk of injury or equipment damage. Vapors from flammable reagents or combustible fluids could enter the centrifuge air system and be ignited by the motor. Do not use the centrifuge in the vicinity of flammable liquids or vapors, and do not run such materials in the instrument.

⚠ CAUTION

Risk of equipment damage. Corrosion begins in scratches and may open fissures in the rotor, carriers, and carriages with continued use. Do not use sharp tools on the rotor that could cause scratches in the rotor surface carrier and carriage surfaces.

Perform only the maintenance described in the appropriate User's Manual for the VTi 50 and VTi 50.1 Centrifuge. Maintenance other than that specified in the User's Manual should be performed only by a Beckman Coulter Representative.

IMPORTANT It is your responsibility to decontaminate components of the instrument before requesting service by a Beckman Coulter Representative or returning parts to Beckman Coulter for repair. Beckman Coulter will NOT accept any items which have not been decontaminated where it is appropriate to do so. If any parts are returned, they must be enclosed in a sealed plastic bag stating that the contents are safe to handle and are not contaminated.

Any servicing of this equipment that requires removal of any covers can expose parts that 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.

⚠ WARNING

Risk of personal injury. Use appropriate lifting techniques when installing this rotor into or removing it from the instrument.

Radiation Safety

Use universal precautions when working with radioactive materials. Means must be available to decontaminate the instrument and dispose of radioactive waste.

Chemical and Biological Safety

Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.

NOTE Observe all warnings and cautions listed for any external devices attached or used during operation of the instrument. Refer to applicable external device user's manals for operating procedures of that device.

NOTE For Safety Data Sheets (SDS) information, go to the Beckman Coulter website at https://www.beckman.com/techdocs.

⚠ WARNING

Risk of chemical injury from bleach. To avoid contact with the bleach, use barrie protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

⚠ WARNING

Risk of personal injury or equipment damage. Ethanol is a flammability hazard. Do not use it in or near operating or powered centrifuges.

⚠ WARNING

Risk of personal injury or property damage. 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.

⚠ WARNING

Risk of personal injury or contamination. Before running the centrifuge with chemical or biological samples, test new labware types to determine if normal operation of the rotor may involve the use of materials that are toxic or otherwise biologically harmful. When using such materials, observe the following precautions:

- **Handle infectious samples according to good laboratory procedures and methods to prevent the spread of disease.**
- **Observe all cautionary information printed on the original solutions' containers prior to their use.**
- **Dispose of all waste solutions according to your facility's waste disposal procedures.**
- **Operate the instrument in accordance with the instructions outlined in this manual and take all the necessary precautions when using pathological, toxic, or radioactive materials.**
- **Splashing of liquids may occur; therefore, take appropriate safety precautions, such as using safety glasses and wearing protective clothing, when working with potentially hazardous liquids.**
- **Use an appropriately-contained environment when using hazardous materials.**
- **Observe the appropriate cautionary procedures as defined by your safety officer when using flammable solvents in or near a powered-up instrument.**
- **Always observe appropriate cautionary procedures as defined by your safety officer when using flammable solvents or toxic, pathological, or radioactive materials.**

Mechanical Safety

⚠ WARNING

Risk of personal injury. To avoid injury due to moving parts, observe the following:

- **Before starting the centrifuge, make sure that the rotor tie-down screw is securely fastened.**
- **Never attempt to exchange labware or reagents while the instrument is operating.**
- **Never attempt to physically restrict any of the moving components of the instrument.**
- **NEVER attempt to slow or stop a rotor by hand.**
- **Keep the instrument work area clear to prevent obstruction of the movement.**

Rotors are designed for use at the speeds indicated; however, speed reductions may be required because of weight considerations of tubes, adapters, and/or the density of the solution being centrifuged. Be sure to observe the instructions in the applicable rotor manual.

The strength of containers can vary between lots, and will depend on handling and usage. We highly recommend that you pretest them in the rotor (using buffer or gradient of equivalent density to the intended sample solution) to determine optimal operating conditions.

To help prevent premature failures or hazards by detecting stress corrosion, metal fatigue, wear or damage to anodized coatings, and to instruct laboratory personnel in the proper care of rotors, Beckman Coulter offers the Field Rotor Inspection Program (FRIP). This program involves a visit to your laboratory by a specially trained Beckman Coulter representative, who will inspect all of your rotors for corrosion or damage. The representative will recommend repair or replacement of at risk rotors to prevent potential rotor failures. Contact Us to request this service.

Cleaning

Observe the cleaning procedures outlined in this user's manual for the rotor. Prior to cleaning equipment that has been exposed to hazardous material:

- Contact the appropriate Chemical and Biological Safety personnel.
- Review the Chemical and Biological Safety information in the user's manual.

Maintenance

Perform only the maintenance described in this manual. Maintenance other than that specified in this manual should be performed only by your Beckman Coulter Representative.

IMPORTANT It is your responsibility to decontaminate components of the instrument before requesting service by a Beckman Coulter Representative or returning parts to Beckman Coulter. Beckman Coulter will NOT accept any items which have not been decontaminated where it is appropriate to do so. If any parts are returned, they must be enclosed in a sealed plastic bag stating that the contents are safe to handle and are not contaminated.

Disposal

Clean and decontaminate the rotor per the Care and Maintenance section of this manual before disposal. Users are encouraged to check with local waste disposal authorities for specific disposal requirements.

VTi 50 and VTi 50.1Rotors Safety Messages

⚠ WARNING

Risk of personal injury or contamination. Tubes and well plates can break during centrifugation. When working with potentially hazardous materials, open cannisters in an appropriate hood or biological safety cabinet. Consult your laboratory safety officer regarding the proper methods to use.

⚠ CAUTION

Risk of contamination. Buckets are designed to be used only with bottle sleeves and bottle adapters. Do not pour samples directly into buckets, bottle sleeves or bottle adapters. Do not load bottles or tubes directly into the buckets. Do not use labware that is not specified for use with the rotor.

⚠ CAUTION

Risk of contamination or equipment damage. Tubes and well plates can break during centrifugation. To reduce the potential for corrosion, clean rotors, adapters, buckets or carriers thoroughly immediately following a tube or well plate breakage, according to your laboratory safety procedures.

⚠ CAUTION

Risk of equipment damage. Salts and other corrosive materials can damage the rotor and rotor components. Wash the rotor and rotor components immediately if salts or other corrosive materials are used or if spillage has occurred, according to your laboratory safety procedures. Do not allow corrosive materials to dry on rotors or buckets.

⚠ CAUTION

Risk of contamination or equipment damage. Rotors operated with improperly balanced loads can cause breakage or contamination. Make sure that filled containers are loaded symmetrically into the rotor and that opposing bottles or tubes are filled to the same level with liquid of the same density.

⚠ CAUTION

Risk of equipment damage. The drive shaft can be damaged if a rotor is forced sideways or dropped onto it. Never force or drop the rotor onto the centrifuge drive shaft.

⚠ CAUTION

Operating the centrifuge at speeds above those recommended for the rotor, buckets or carriers (when applicable) and labware can cause breakage. Never exceed the maximum rated speed of the rotor, bucket, and labware in use.

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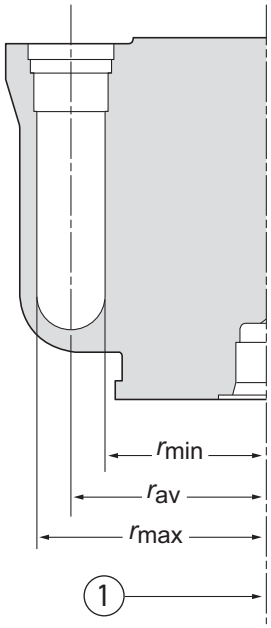
Specifications — VTi 50 Vertical-Tube Rotors



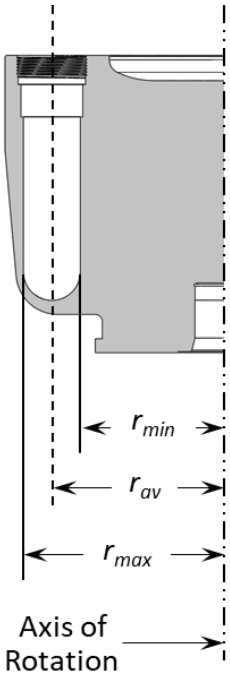
1. Axis of Rotation

Maximum speed	50,000 RPM
Density rating at maximum speed	1.7 g/mL
Relative Centrifugal Field[a] at maximum speed	
At r_{max} (86.6 mm)	242,000 × *g*
At r_{av} (73.7 mm)	206,000 × *g*
At r_{min} (60.8 mm)	170,000 × *g*
k factor at maximum speed	36
Conditions requiring speed reductions	see *Run Speeds*
Number of tube cavities	8
Available tubes	see Table 1
Nominal tube dimensions (largest tube)	25 × 89 mm
Nominal tube capacity	39 mL
Nominal rotor capacity	312 mL
Approximate acceleration time to maximum speed (fully loaded)	13 min
Approximate deceleration time from maximum speed (fully loaded)	15 min
Weight of fully loaded rotor[b]	13.2 kg (29.1 lb)
Rotor material	titanium

a. 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, ω is the angular velocity in radians per second (2 π RPM /60), and *g* is the standard acceleration of gravity (9807 mm/s^2).
After substitution: RCF = 1.12r (RPM/1000)^2

b. Rotor loaded with (8) 39 mL UC tubes and spacers with 1.7 g/mL density solution.

Specifications — VTi 50.1 Vertical-Tube Rotors



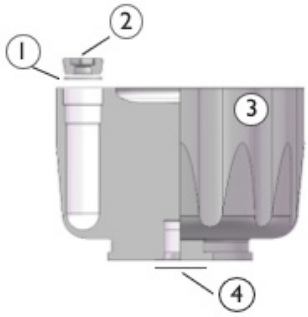
Maximum speed	50,000 RPM
Density rating at maximum speed	1.7 g/mL
Relative Centrifugal Field[a] at maximum speed	
At r_{max} (89.7 mm)	251,000 × *g*
At r_{av} (76.8 mm)	215,000 × *g*
At r_{min} (63.9 mm)	179,000 × *g*
k factor at maximum speed	34
Conditions requiring speed reductions	see *Run Speeds*
Number of tube cavities	12
Available tubes	see Table 1
Nominal tube dimensions (largest tube)	25 × 89 mm
Nominal tube capacity	39 mL
Nominal rotor capacity	468 mL
Approximate acceleration time to maximum speed (fully loaded)	13 min
Approximate deceleration time from maximum speed (fully loaded)	14 min
Weight of fully loaded rotor[b]	12.6 kg (27.8 lb)
Rotor material	titanium
Maximum rotor life	12 years[c]

a. 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, ω is the angular velocity in radians per second (2 π RPM /60), and g is the standard acceleration of gravity (9807 mm/s^2).
After substitution: RCF = 1.12r (RPM/1000)^2

b. Rotor loaded with (12) 39 mL UC tubes and spacers with 1.7 g/mL density solution.

c. The 12 year rotor life is based on standard laboratory usage of 500 runs per year.

Description



1. Plug Gasket (340825)
2. Plug (355587)
3. Rotor Body
4. Overspeed Disk (330336)

This Beckman Coulter rotor has been manufactured in an ISO 9001 or 13485 facility for use with the specified Beckman Coulter ultracentrifuges.

The VTi 50 is designed to centrifuge up to eight tubes in an upright position. The VTi 50.1 is designed to centrifuge up to twelve tubes in an upright position. Used in Beckman Coulter class R and S preparative ultracentrifuges, the rotor develops centrifugal forces that can efficiently band DNA or isolate and viral particles on density gradients. Up to 312 mL of gradient and sample can be centrifuged per run. Up to 468 ml of gradient and sample can be centrifuged per run in the VTi 50.1.

The rotor is made of titanium and is finished with black polyurethane paint. A tube spacer and hex-cavity rotor plug hold each tube in the rotor, and a plug gasket forms a closure around each plug. Rotor plugs are red-anodized aluminum, and tube spacers are clear-anodized aluminum for Quick-Seal tubes and gold-anodized aluminum for OptiSeal tubes. Because of the weight of the rotor, drive pins are not required in the rotor drive hub cavity.

For overspeed protection, a photoelectric detector in the ultracentrifuge monitors the overspeed disk on the rotor bottom and shuts down the run if speeds exceeding 50,000 RPM are detected.

See the Warranty at the back of this manual for warranty information.

Preparation and Use

Specific information about the VTi 50 and VTi 50.1 rotors is given here. Information common to this and other rotors is contained in Rotors and Tubes for Preparative Ultracentrifuges (publication LR-IM-24), *which should be used together with this manual for complete rotor and accessory operation.*

NOTE Although rotor components and accessories made by other manufacturers may fit in the VTi 50 or VTi 50.1 rotors, their safety in these rotors cannot be ascertained by Beckman Coulter. Use of other manufacturers' components or accessories in these 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 these rotors.

Prerun Safety Checks

Read the Safety Notice section at the front of this manual before using the rotor.

1 Inspect the rotor plugs and gaskets for damage—the high forces generated in this rotor can cause damaged components to fail.

2 Make sure that the rotor is equipped with the correct overspeed disk (330336).

a. If the disk is missing or damaged, replace it according to the instructions in *Rotors and Tubes for Preparative Ultracentrifuges* (publication LR-IM-24).

3 Verify that only the tubes and accessories listed in Table 1 are being used.

4 Check the chemical compatibilities of all materials used.

- Refer to *Chemical Resistances* (publication IN-175).

Rotor Preparation

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

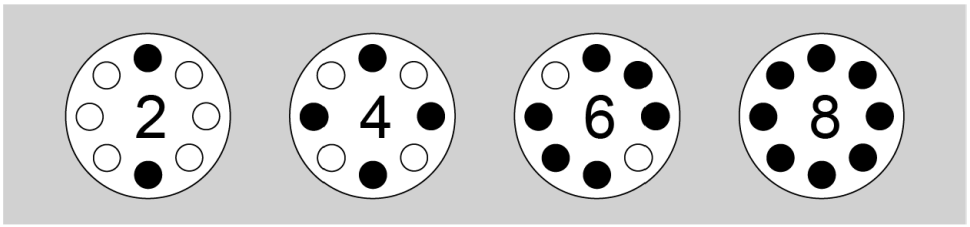
1 Be sure that the plug threads are clean and lightly but evenly lubricated with Spinkote lubricant (306812) to ensure a proper seal by minimizing thread friction.

2 Set the rotor in the rotor vise (332688), which should be bolted or clamped to a rigid surface.

3 Load the filled and plugged or sealed tubes symmetrically into the rotor (see *Tubes and Accessories* for tube information).

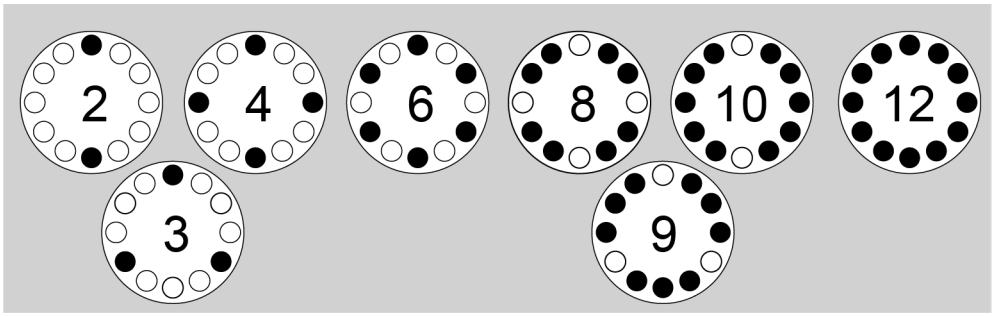
- If less than the maximum number of tubes are being run, they must be arranged symmetrically in the rotor (see Figure 1 and Figure 2).
- *Opposing tubes must be filled to the same level with liquid of the same density.*

Figure 1 Arranging Tubes in the VTi 50 Rotor



NOTE Two, four, six, or eight tubes can be centrifuged per run if they are arranged in the rotor as shown.

Figure 2 Arranging Tubes in the VTi 50.1 Rotor



NOTE Two, three, four, six, eight, nine, ten, or twelve tubes can be centrifuged per run if they are arranged in the rotor as shown.

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4 Complete loading by placing the correct spacers (and floating spacers, if applicable) over the tubes.

- It is important that each cavity being used is completely filled

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5 Insert a rotor plug (355587), gasket-end down, over each spacer and screw it in.

NOTE *Do not* use rotor plugs in empty cavities.

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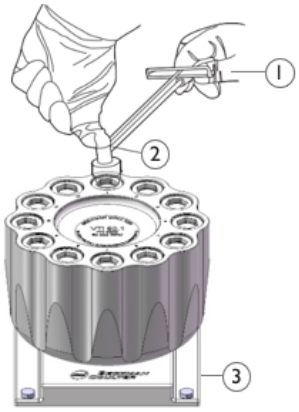
6 Using the hex plug adapter (355588) and torque wrench (369791), tighten each rotor plug to 17.5 N•m (155 in.-lb).

a. *To avoid stripping the plugs, apply downward pressure to the hex plug adapter while tightening the plugs.*

- Do not overtighten plugs.
- For the VTi 50 Rotor, the top surface of each rotor plug should be flush with the surrounding rotor surface when properly torqued.
- For the VTi 50.1, the top surface of each rotor plug should be recessed 2mm below the surrounding rotor surface when properly torqued.



1. Torque to 17.5 N-m (155 in-lb)
2. Press Down
3. Rotor Vise

Operation

1 Carefully place the rotor on the drive hub.

2 Refer to the instrument instruction manual for ultracentrifuge operation.

3 For additional operating information, see the following:

- *Run Times*, page 11, for using *k* factors to adjust run durations.
- *Run Speeds*, page 12, for information about speed limitations.
- *Slow Acceleration/Deceleration*, page 12, for information about using slow acceleration and deceleration for gradient stability.
- *Selecting CsCl Gradients*, page 13, for methods to avoid CsCl precipitation during centrifugation.

Removal and Sample Recovery

⚠ CAUTION

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

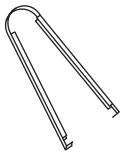
1 Remove the rotor from the centrifuge by lifting it straight up and off the drive hub.

2 Return the rotor to the rotor vise.

a. Remove the plugs with the torque wrench.

- To avoid stripping the plugs, apply downward pressure to the hex plug adapter while loosening the plugs.

3 Use the appropriate removal tool (see the *Supply List*) to remove the spacers and tubes.



Quick-Seal Tube Removal Tool (361668)

Tubes and Accessories

The VTi 50 and VTi 50.1 rotors use only OptiSeal and Quick-Seal tubes; use only the tubes and accessories listed in Table 1. Refer to *Rotors and Tubes for Preparative Ultracentrifuges* (publication LR-IM-24) for information on the chemical resistances of tube and accessory materials. OptiSeal and Quick-Seal tubes are disposable and should be discarded after a single use.

Table 1 Available Tubes for the VTi 50 and VTi 50.1 Rotors[a]

Tube			Required Accessory			VTi 50	VTi 50.1
Dimensions/ Nominal Volume	**Description**	**Part Number**	**Description**	**Part Number**	**Tube Rack**	**Max Speed/ RCF/ *k* factor**	**Max Speed/ RCF/ *k* factor**
25 × 89 mm 39 mL	Certified Free & Sterile Ultra-Clear Quick-Seal	C14299 Carton of 48 (6 packs of 8)	clear-anodized aluminum spacer	342417	348124	50,000 RPM 242,000 × *g* 36	50,000 RPM 251,000 × *g* 34
	Certified Free Ultra-Clear Quick-Seal	C14283 (pkg/50)					
	Standard Ultra-Clear Quick-Seal	344326 (pkg/50)					

Table 1 Available Tubes for the VTi 50 and VTi 50.1 Rotors[a] *(Continued)*

Tube			Required Accessory			VTi 50	VTi 50.1
Dimensions/ Nominal Volume	**Description**	**Part Number**	**Description**	**Part Number**	**Tube Rack**	**Max Speed/ RCF/ *k* factor**	**Max Speed/ RCF/ *k* factor**
25 × 89 mm 39 mL	Certified Free & Sterile Polypropylene Quick-Seal	C14304 Carton of 48 (8 packs of 6)	clear-anodized aluminum spacer	342417	348124	50,000 RPM 242,000 × *g* 36	50,000 RPM 251,000 × *g* 34
	Certified Free Polypropylene Quick-Seal	C14288 (pkg/50)					
	Standard Polypropylene Quick-Seal	342414 (pkg/50)					
25 × 89 mm 36.2 mL	OptiSeal polypropylene	362183[b] (pkg/56)	gold-anodized aluminum spacer	362204	360542	50,000 RPM 242,000 × *g* 36	50,000 RPM 251,000 × *g* 34
25 × 64 mm 27 mL	Quick-Seal Ultra-Clear	344323 (pkg/50)	clear-anodized aluminum spacer	342417	348124	50,000 RPM 242,000 × *g* 36	50,000 RPM 251,000 × *g* 34
			floating spacer[c]	343448			
25 × 64 mm 27 mL	Quick-Seal polypropylene	343665 (pkg/50)	clear-anodized aluminum spacer	342417	348124	50,000 RPM 242,000 × *g* 36	50,000 RPM 251,000 × *g* 34
			floating spacer	343448			
25 × 35 mm 15 mL	Quick-Seal Ultra-Clear	344324 (pkg/50)	clear-anodized aluminum spacer	342417	348124	50,000 RPM 242,000 × *g* 36	50,000 RPM 251,000 × *g* 34
			floating spacer	343448[d]			

Table 1 Available Tubes for the VTi 50 and VTi 50.1 Rotors[a] *(Continued)*

Tube			Required Accessory			VTi 50	VTi 50.1
Dimensions/ Nominal Volume	**Description**	**Part Number**	**Description**	**Part Number**	**Tube Rack**	**Max Speed/ RCF/ *k* factor**	**Max Speed/ RCF/ *k* factor**
25 × 38 mm 15 mL	Quick-Seal polypropylene	343664 (pkg/50)	clear-anodized aluminum spacer	342417	348124	50,000 RPM 242,000 × *g* 36	50,000 RPM 251,000 × *g* 34
			floating spacer	343448[d]			

a. Use only the items listed here.
b. Includes disposable plastic plugs.
c. Floating spacers, part of the g-Max system of tube support, are made of Noryl, a registered trademark of SHPP GLOBAL TECHNOLOGIES B.V.
d. Use two floating spacers with this tube.

Temperature Limits

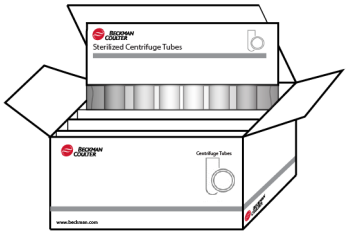
- Plastic tubes have been centrifuge tested for use at temperatures between 2 and 25°C. For centrifugation at other temperatures, pretest tubes under anticipated run conditions.
- If plastic containers are frozen before use, make sure that they are thawed to at least 2°C prior to centrifugation.

Certified Free Tubes

Based on Sample Results Below Detectable Limit

Certified free tubes are lot traceable to testing that confirms the absence of endotoxin, DNase, RNase, and human & mouse DNA below a detectable limit.

Sterile Tubes

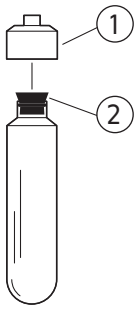


Sterile tubes are sterilized via ethylene oxide in compliance with ISO 11135. Cartons include several peel packages, each containing a quantity of tubes per the tube details in Table 1. Packaging meets requirements of ISO 11607.

OptiSeal Tubes

OptiSeal tubes come with plastic plugs and can be quickly and easily prepared for use without tools or heat. With the tube spacer and rotor plug in place, the combination of g force and hydrostatic pressure during centrifugation ensures a tight, reliable seal that protects your samples. Fill each tube to the base of the stem, leaving no fluid in the stem. Overfilling the tube can cause spillage when the plug is inserted or compromise seal integrity; however, too much air can cause the tube to deform, disrupting gradients and sample bands. Refer to *Using OptiSeal Tubes* (publication IN-189), included in each package of OptiSeal tubes, for detailed information on the use and care of OptiSeal tubes.

- OptiSeal tubes are disposable and should be discarded after a single use.



1. Gold Aluminum Spacer
2. Plug

Quick-Seal Tubes

Quick-Seal tubes must be sealed prior to centrifugation. These tubes are heat sealed and do not need caps; however, spacers are required on top of the tubes when they are loaded into the rotor.

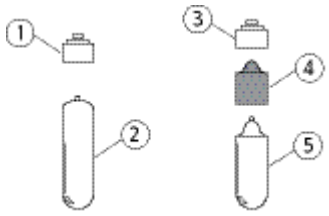
---

1 Fill Quick-Seal tubes leaving a *small* bubble of air at the base of the neck.

   a. Do not leave a large air space—too much air can cause excessive tube deformation and make the tube difficult to remove.

2 Some of the Quick-Seal tubes listed in Table 1 are part of the *g*-Max system, which uses a combination of small bell-top Quick-Seal tubes and floating spacers (also called g-Max spacers).

- This means that you can run the shorter tubes in this rotor without reduction in *g* force.
- For detailed information on the *g*-Max system see *g-Max Optima Application Note* at www.beckman.com/resources/reading-material/application-notes/g-max-system-for-ultracentrifugation.



1. Aluminum Spacer
2. Dome-shaped Tube
3. Metal Spacer
4. Floating Spacer
5. Bell-top Tube

3 Refer to *Rotors and Tubes for Preparative Ultracentrifuges* (publication LR-IM-24) for detailed information on the use and care of Quick-Seal tubes.

- Quick-Seal tubes are disposable and should be discarded after a single use.

Run Times

The *k* factor of the rotor is a measure of the rotor's pelleting efficiency. (Beckman Coulter has calculated the *k* factors for all of its preparative rotors at maximum rated speed and using full tubes.) The *k* factor is calculated from the formula

$$k = \frac{\ln(r_{max}/r_{min})}{\omega^2} \times \frac{10^{13}}{3600} \qquad \text{EQ 1}$$

where ω is the angular velocity of the rotor in radians per second (ω = 0.105 × RPM), r_{max} is the maximum radius, and r_{min} is the minimum radius.

After substitution:

$$k = \frac{(2.533 \times 10^{11})\ln(r_{max}/r_{min})}{RPM^2} \qquad \text{EQ 2}$$

Use the *k* factor in the following equation to estimate the run time *t* (in hours) required to pellet particles of known sedimentation coefficient *s* (in Svedberg units, *S*).

$$t = \frac{k}{s} \qquad \text{EQ 3}$$

Run times can be estimated for centrifugation at less than maximum speed by adjusting the *k* factor as follows:

$$k_{adj} = k \left(\frac{50,000}{\text{actual run speed}} \right)^2 \quad \textbf{EQ 4}$$

Run times can also be estimated from data established in prior experiments if the *k* factor of the previous rotor is known. For any two rotors, a and b:

$$\frac{t_a}{t_b} = \frac{k_a}{k_b} \quad \textbf{EQ 5}$$

Slow Acceleration/Deceleration

Vertical banding of sample and gradient formation occurs with centrifugation. With deceleration, tube contents reorient back to horizontal position. For gradient stability when *preformed gradients are used,* select a slow acceleration profile. For the stability of all gradients during deceleration, select a slow deceleration profile. Refer to the appropriate centrifuge user manual for instructions on selecting acceleration and deceleration rates.

Run Speeds

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 a number of rotor speeds is provided in Table 2 for the VTi 50 and Table 3 for the VTi 50.1.

Speeds must be reduced under the following circumstances:

1. If nonprecipitating solutions more dense than 1.7 g/mL are centrifuged, the maximum allowable run speed must be reduced according to the following equation:

$$\text{reduced maximum speed} = (50,000 \text{ RPM}) \sqrt{\frac{1.7 \text{ g/mL}}{\rho}} \quad \textbf{EQ 6}$$

   where ρ 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.

2. *Further speed limits must be imposed* when CsCl or other self-forming-gradient salts are centrifuged, as equation (6) does not predict concentration limits/speeds that are required to avoid precipitation of salt crystals. Precipitation during centrifugation would alter the density distribution of CsCl and this would change the position of the sample bands. Figure 3, Figure 4, and Figure 5 together with the description and examples below, show how to reduce run speeds when using CsCl gradients for the VTi 50 rotor. Refer to Figure 6 and Figure 7 for the VTi 50.1 rotor.

Selecting CsCl Gradients

NOTE The curves in Figure 3 through Figure 7 are for solutions of CsCl salt dissolved in distilled water only. If other salts are present in significant concentrations, the overall CsCl concentration may need to be reduced.

Solid CsCl has a density of 4 g/mL, and if precipitation occurs during centrifugation, it may cause rotor failure. Precipitation will also alter density distribution, and therefore sample separation. In general, lower speeds provide better resolution, but longer run times will be required to achieve particle separation and gradient equilibrium. Curves are provided up to the maximum rated speed of the rotor.

Rotor speed is used to control the slope of a CsCl density gradient, and must be limited so that CsCl precipitation is avoided. Figure 3 and Figure 6 give the CsCl concentration-limiting curves. The reference curves in Figure 4 and Figure 7 show equilibrium gradients that result from centrifugation using the maximum densities allowed by Figure 3 and Figure 6. Each curve in Figure 4 and Figure 7 is within the density limits allowed for the rotors: each curve was generated for a single run speed using the maximum allowable homogeneous CsCl densities that avoid precipitation at that speed. Figure 5 gives the gradients that result from centrifugation using lower-than-maximum-allowable CsCl concentrations for the VTi 50 rotor. These reduced-density curves can be used to make particles band more towards the middle of a tube, where volume between bands will be greatest. (The gradients in Figure 4, Figure 5, and Figure 7 can be generated from step or linear gradients, or from homogeneous solutions. But the total amount of CsCl in solution must be equivalent to a homogeneous solution corresponding to the concentrations specified.)

Table 2 Relative Centrifugal Fields for the VTi 50 Rotor[a]

Rotor Speed (RPM)	Relative Centrifugal Field (×*g*)			*k* Factor[b]
	At r_{max} (86.6 mm)	At r_{av} (73.7 mm)	At r_{min} (60.8 mm)	
50,000	242,000	206,000	170,000	36
45,000	196,000	167,000	138,000	44
40,000	155,000	132,000	109,000	56
35,000	119,000	101,000	83,400	73
30,000	87,300	74,300	61,300	100
25,000	60,600	51,600	42,600	143
20,000	38,800	33,000	27,200	224
15,000	21,800	18,600	15,300	398
10,000	9,700	8,250	6,800	896
5,000	2,430	2,060	1,700	3,584

a. Entries in this table are calculated from the formula RCF = 1.12r (RPM/1000)2 and then rounded to three significant digits.

b. Calculated for all Beckman Coulter preparative rotors as a measure of the rotor's relative efficiency in pelleting sample in water at 20°C.

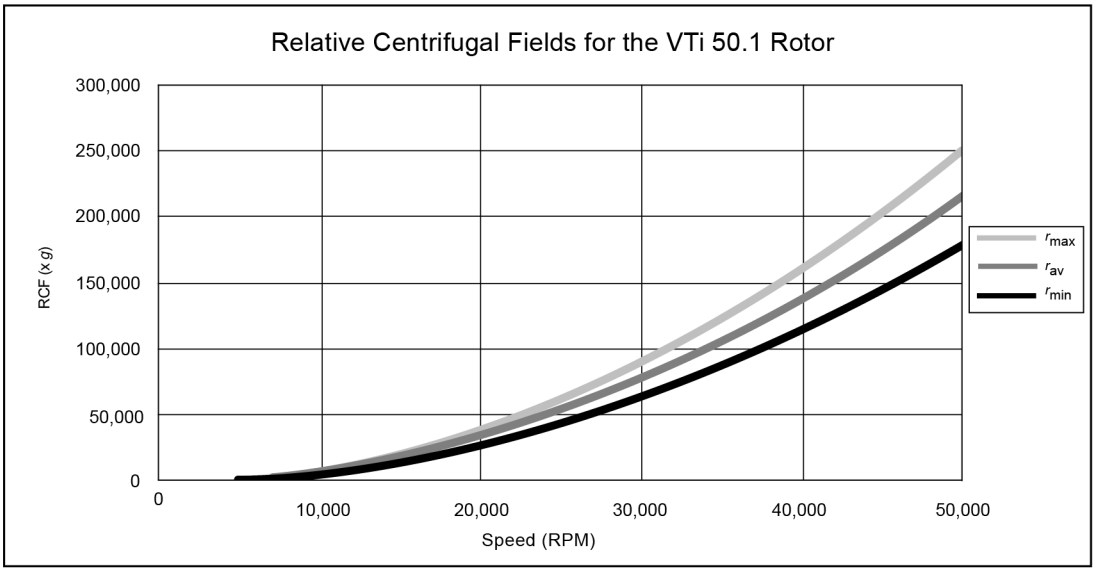


Table 3 Relative Centrifugal Fields for the VTi 50.1 Rotor[a]

Rotor Speed (RPM)	Relative Centrifugal Field (×*g*)			*k* Factor[b]
	At r_{max} (89.7 mm)	At r_{av} (76.8 mm)	At r_{min} (63.9 mm)	
50,000	251,000	215,000	179,000	34
49,100[c]	242,000	207,000	173,000	36
45,000	203,000	174,000	145,000	42
40,000	161,000	138,000	115,000	54
35,000	123,000	105,000	87,700	70
30,000	90,400	77,400	64,400	95
25,000	62,800	53,800	44,700	137
20,000	40,200	34,400	28,600	215
15,000	22,600	19,400	16,100	382
10,000	10,000	8,600	7,160	859
5,000	2,510	2,150	1,790	3,437

a. Entries in this table are calculated from the formula RCF = 1.12r (RPM/1000)2 and then rounded to three significant digits.

b. Calculated for all Beckman Coulter preparative rotors as a measure of the rotor's relative efficiency in pelleting sample in water at 20°C.

c. 49,100 RPM will provide similar RCF as the VTi 50 rotor at 50,000 RPM due to rmin/rmax difference

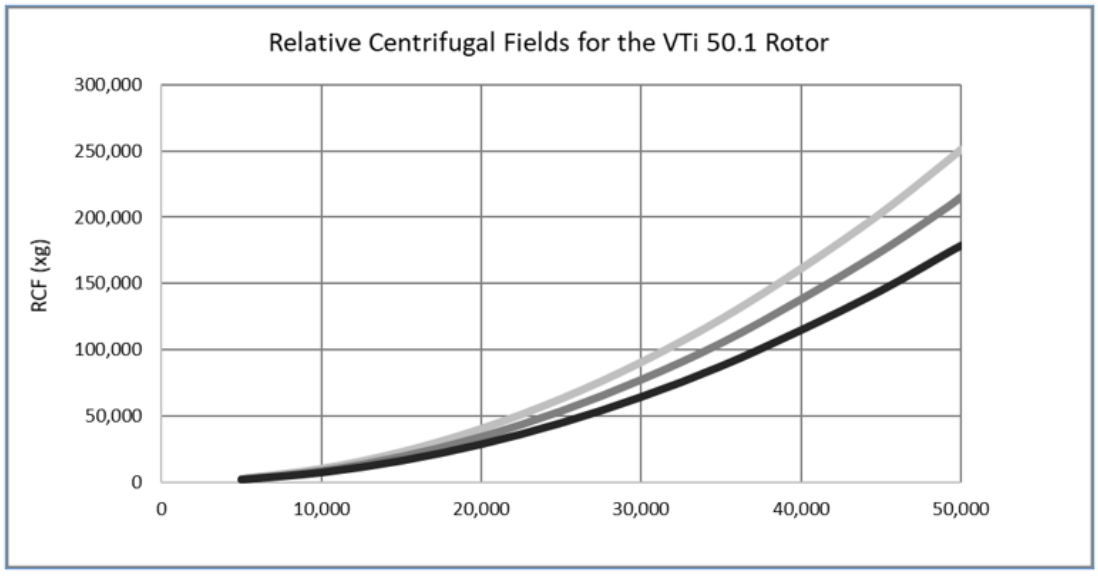
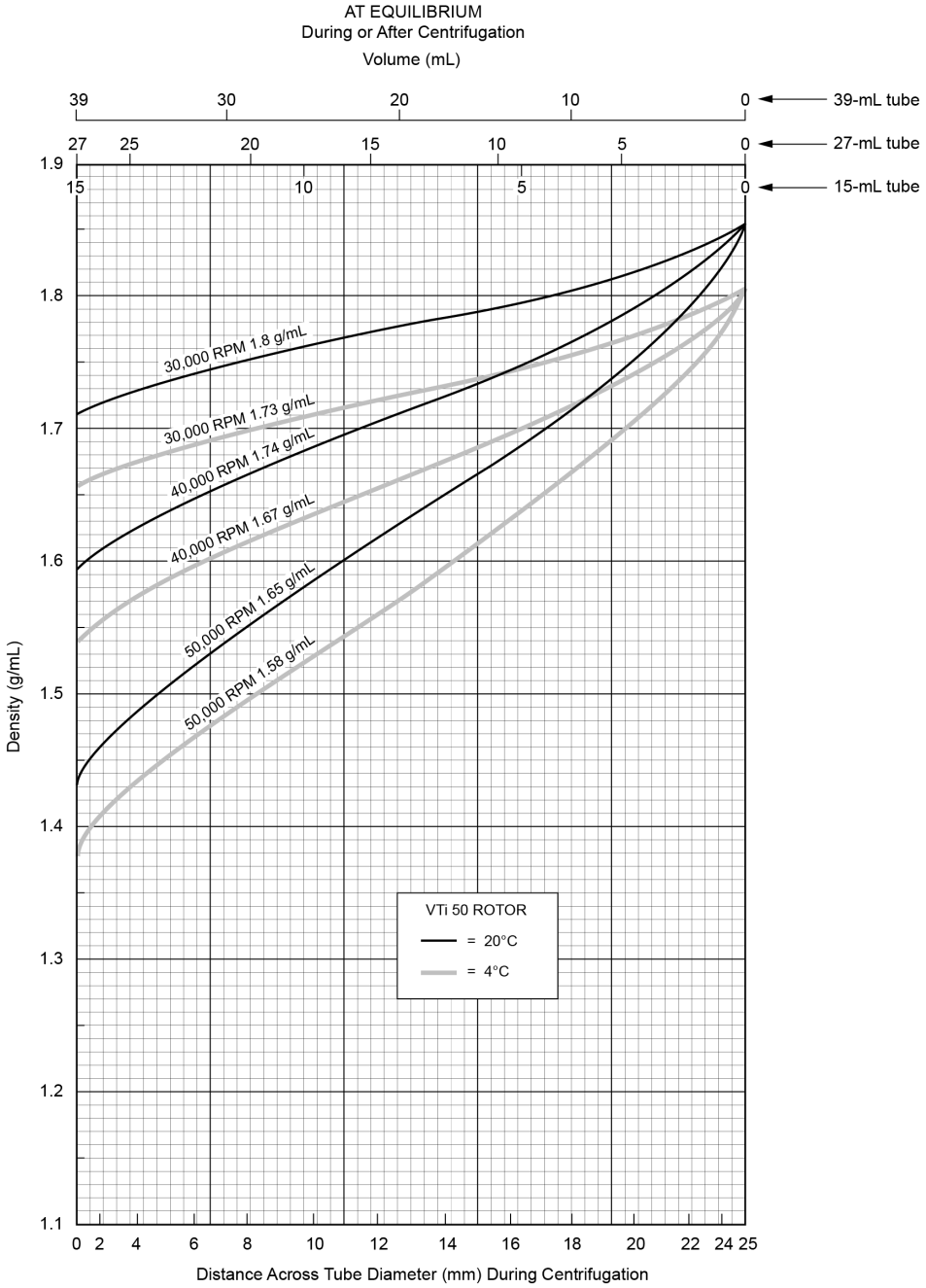
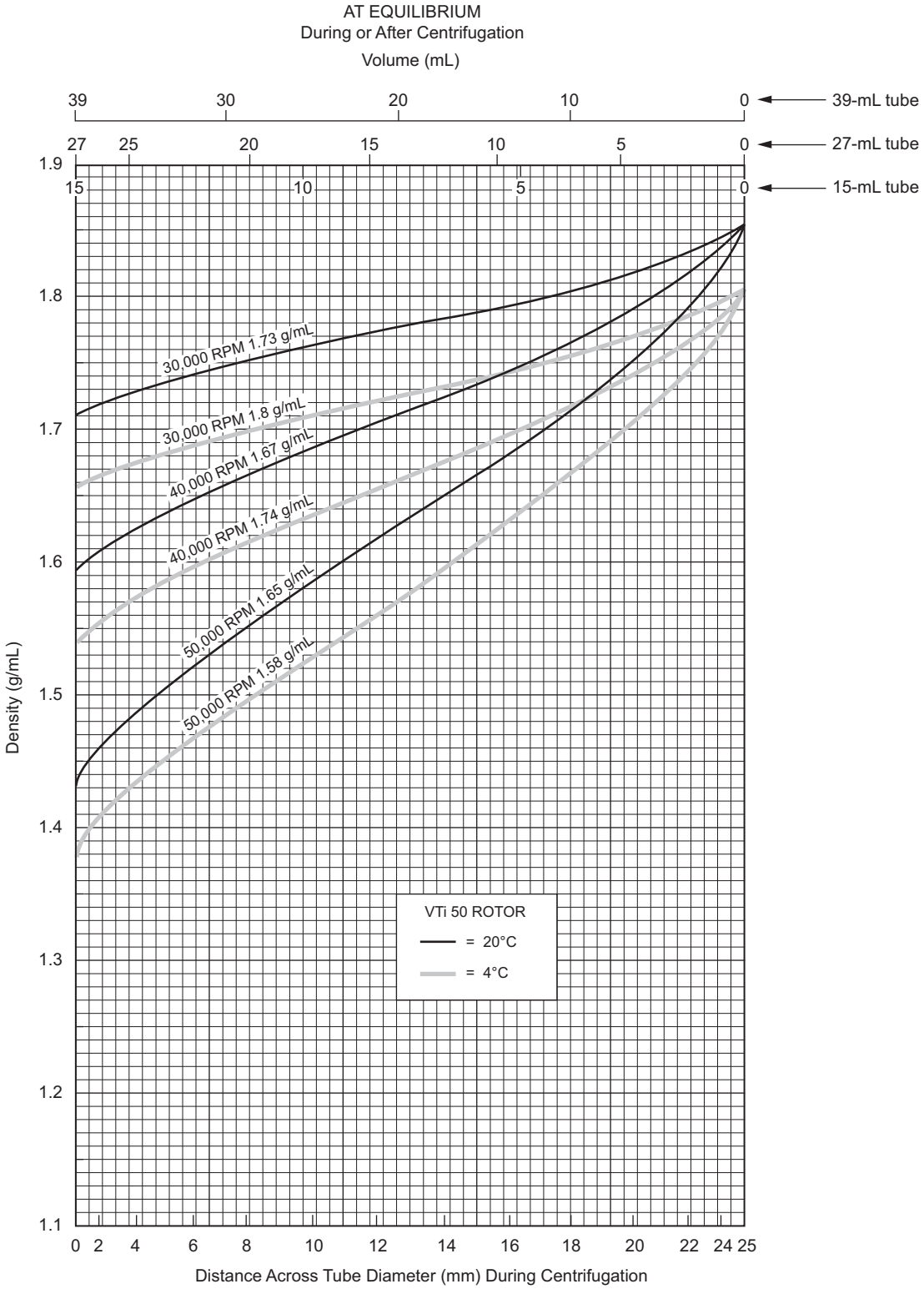


Figure 3 Precipitation Curves for the VTi 50 Rotor*



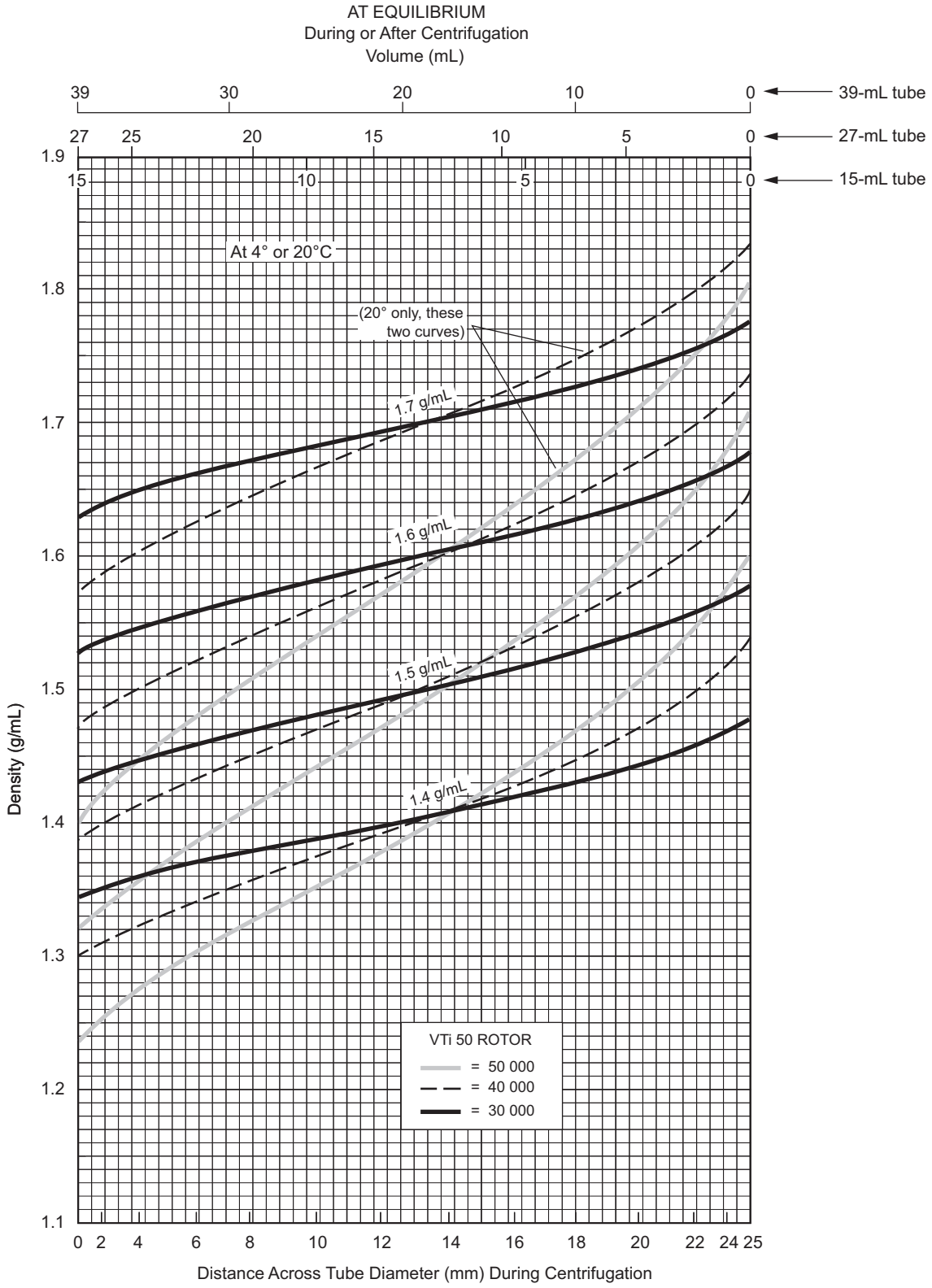
* Using combinations of rotor speeds and homogeneous CsCl solution densities that intersect on or below these curves ensures that CsCl will not precipitate during centrifugation. If gradient and sample solutions do not completely fill the tube, add mineral oil to fill. (Do not use an oil overlay in Ultra-Clear tubes.) The dashed line is a representation of equation (6), and is shown here to illustrate the inability of that equation to predict CsCl precipitation.

Figure 4 CsCl Gradients at Equilibrium for the VTi 50 Rotor*



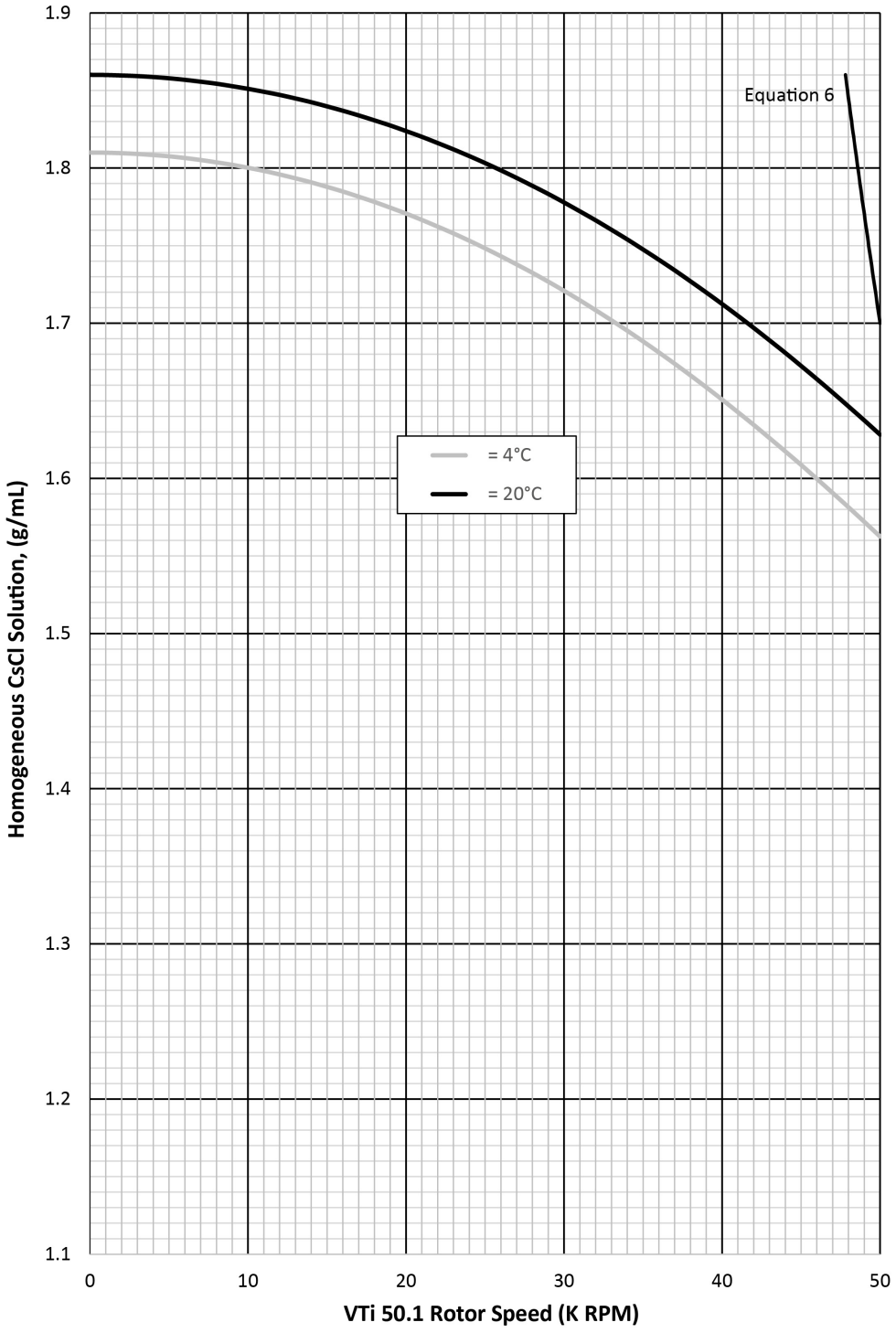
* Centrifugation of homogeneous CsCl solutions at the maximum allowable speeds (from Figure 3) results in gradients presented here.

Figure 5 CsCl Gradients for Lower Densities for the VTi 50 Rotor*



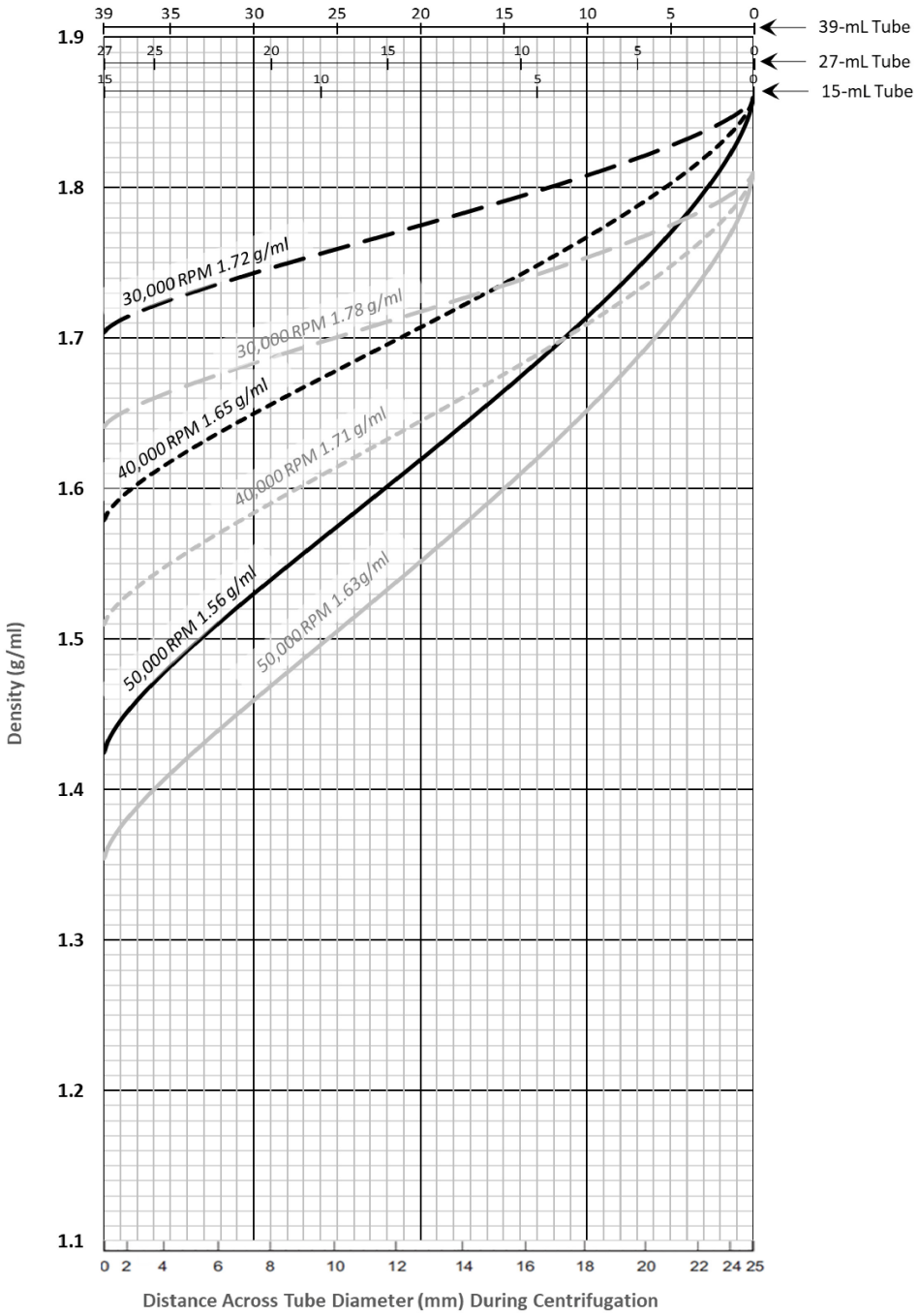
* Densities used to generate curves are printed along the curves.

Figure 6 Precipitation Curves for the VTi 50.1 Rotor*



* Using combinations of rotor speeds and homogeneous CsCl solution densities that intersect on or below these curves ensures that CsCl will not precipitate during centrifugation. If gradient and sample solutions do not completely fill the tube, add mineral oil to fill. (Do not use an oil overlay in Ultra-Clear tubes.) The dashed line is a representation of equation (6) and is shown here to illustrate the inability of that equation to predict CsCl precipitation.

Figure 7 CsCl Gradients at Equilibrium for the VTi 50.1 Rotor*
AT EQUILIBRIUM During or After Centrifugation Volume (mL)



* Centrifugation of homogeneous CsCl solutions at the maximum allowable speeds (from Figure 4) results in gradients presented here.

Typical Examples for Determining CsCl Run Parameters

Example A (VTi 50 Rotor):
Knowing homogeneous CsCl solution density (1.71 g/mL) and approximate particle buoyant densities (1.70 and 1.65 g/mL), at 20°C, where will particles band?

1 In Figure 3, find the curve that corresponds to the required run temperature (20°C).

- The maximum allowable rotor speed is determined from the point where this curve intersects the homogeneous CsCl density (40,000 RPM).

2 In Figure 4, sketch in a horizontal line corresponding to each particle's buoyant density.

3 Mark the point in the figure where each particle density intersects the curve corresponding to the selected run speed and temperature.

- Particles will band at these locations across the tube diameter (lower axis of Figure 4) at equilibrium during centrifugation.
- After centrifugation, the bands will reorient (top axis).

If the required gradient curve is not presented in Figure 4, interpolate between the nearest curves and draw it in. Using the horizontal axis, it can be estimated that these particles will be about 5 mm apart at equilibrium during centrifugation. In the 39-mL tube, they will be separated by 9.4 mL (top axis).

Example B:
Knowing particle buoyant densities (1.60 and 1.61 g/mL), how do you achieve the best separation?

1 In Figure 5 sketch in a horizontal line corresponding to each particle's buoyant density.

2 Select the curve at the temperature (20°C) that gives the best particle separation.

- Particles will band at points across the tube diameter where the sketched lines intersect this curve (lower axis) at equilibrium during centrifugation.
- After centrifugation the bands will reorient (top axis).

3 Note the run speed along the selected curve.

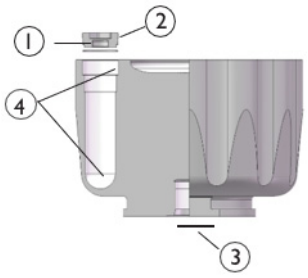
4 Select the maximum homogeneous CsCl density that corresponds to the temperature and run speed established above.

- These parameters will provide the particle-banding pattern selected in Step 2.

In this case the 1.6-g/mL 30,000 RPM curves in Figure 5 give the best separation. These curves intersect the particle buoyant densities in such a way that particles band about 2 mm apart at equilibrium during centrifugation (lower axis). Bands are located in the middle of the tube.

Care and Maintenance

Maintenance



1. Plug Gasket (340825)
2. Plug (355587)
3. Overspeed Disk (330336)
4. Check for Corrosion

NOTE Do not use sharp tools on the rotor that could cause scratches in the rotor surface. Corrosion begins in scratches and may open fissures in the rotor with continued use.

---

1 Regularly inspect the overspeed disk.

a. If it is scratched, damaged, or missing, replace it.

- Replacement instructions are in *Rotors and Tubes for Preparative Ultracentrifuges* (publication LR-IM-24).

---

2 Regularly inspect the rotor plugs (355587) for wear lu(worn threads will have a shiny appearance).

a. Replace worn or damaged plugs.

---

3 Regularly lubricate the metal threads in the rotor plugs with a thin, even coat of Spinkote lubricant (306812).

- Failure to keep these threads lubricated can result in damaged threads.

a. Replace rotor plugs (as a set) if they show signs of wear.

4 The rotor plug gaskets (340825) require no maintenance except cleaning.

a. Replace damaged gaskets.

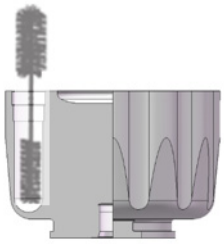
b. To replace the plug gasket, use the sharpened end of a cotton swab or similar nonmetallic tool to pry the gasket from the plug.

- *Do this carefully so that the plug is not damaged.*
- The new gasket snaps onto the grooved end of the plug.

5 Refer to Appendix A in *Rotors and Tubes for Preparative Ultracentrifuges* (publication LR-IM-24) for the chemical resistances of rotor and accessory materials.

- Your Beckman Coulter representative provides contact with the Field Rotor Inspection Program and the rotor repair center.

Cleaning



Wash the rotor and rotor components immediately if salts or other corrosive materials are used or if spillage has occurred. Do not allow corrosive materials to dry on the rotor.

Under normal use, wash the rotor frequently (at least weekly) to prevent buildup of residues.

1 Wash the rotor, plugs, and spacers in a mild detergent, such as Beckman Solution 555 (339555), that won't damage the rotor.

a. Dilute the detergent 10 to 1 with water.

NOTE Do not wash rotor components in a dishwasher. Do not soak in detergent solution for long periods, such as overnight.

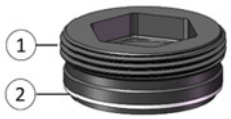
- The Rotor Cleaning Kit contains two plastic-coated brushes and two quarts of Solution 555 for use with rotors and accessories.

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.*

4 Clean plug threads as necessary.



1. Threads
2. Gasket

a. Use a brush and concentrated Solution 555.

b. Rinse and dry thoroughly, then lubricate lightly but evenly with Spinkote to coat all threads.

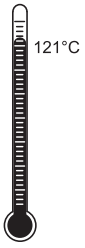
Decontamination

If the rotor or other components are contaminated with toxic or pathogenic materials, follow appropriate decontamination procedures as outlined by your laboratory safety officer. Check Appendix A in *Rotors and Tubes for Preparative Ultracentrifuges* (publication LR-IM-24) to be sure the decontamination method will not damage any part of the rotor.

Sterilization and Disinfection

⚠ CAUTION

Risk of personal injury or equipment damage. Ethanol is a flammability hazard. Do not use in or near operating ultracentrifuges.



- The rotor and all rotor components, except those made of Noryl, can be autoclaved at 121°C for up to an hour. Remove the plugs from the rotor and place the rotor, plugs, and spacers in the autoclave upside down.
- Ethanol (70%) or hydrogen peroxide (6%) (see NOTE below) may be used on all rotor components, including those made of plastic. A dilute (10:1) solution of water and bleach (high quality, fragrance-free, gel-free bleach, 5-6% sodium hypochlorite) may be used, but may cause discoloration of anodized surfaces. Use the minimum immersion time for each solution, per laboratory standards.

NOTE Only hydrogen peroxide solution is recommended. Use of Vaporous Hydrogen Peroxide will cause permanent damage to anodized surfaces.

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.

Where sterilization is critical in your application, consider using Beckman Coulter Certified Free & Sterilized Tubes. For tubes not available in the sterilized option, refer to *Use and Care of Centrifuge Tubes and Bottles* (publication IN-192) included in each box of tubes or bottles for sterilization and disinfection procedures. *Quick-Seal and Optiseal tubes are disposable and should be discarded after a single use.*

Storage

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

Returning a Rotor

Before returning a rotor or accessory for any reason, prior permission must be obtained from Beckman Coulter, Inc. This form may be obtained from your local Beckman Coulter sales office. The form, entitled *Returned Material Authorization* (RMA) for United States returns or *Returned Goods Authorization* (RGA) for international returns, should contain the following information:

- rotor type and 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 email address of the person to be notified upon receipt of the rotor or accessory at the factory,
- name and email address 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. Smaller items (such as tubes, bottles, etc.) should be enclosed in a sealed plastic bag.

All parts must be accompanied by a note, plainly visible on the outside of the box or bag, 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 RMA/RGA form when mailing the rotor and/or accessories.

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

Supply List

NOTE Publications referenced in this manual can be obtained at www.beckman.com, by calling Beckman Coulter at 1-800-742-2345 in the United States, or by contacting your local Beckman Coulter office.

See the Beckman Coulter *Ultracentrifuge Rotors, Tubes & Accessories* catalog (BR-8101, available at www.beckman.com) or contact Beckman Coulter Sales (1-800-742-2345 in the United States) for detailed information on ordering parts and supplies. For your convenience, a partial list is given below.

Replacement Rotor Parts

Description	Part Number
VTi 50 rotor assembly	362758
VTi 50.1 rotor assembly	C78759
Rotor plug	355587
Rotor plug gasket	340825
Overspeed disk (50,000 RPM)	330336

Other

NOTE For SDS information, go to the Beckman Coulter Life Sciences website at *www.beckman.com/techdocs*.

Description	Part Number
Rotor vise assembly	332688
Centering tool (for replacing overspeed disk)	331325
Tubes and accessories	see Table 1
OptiSeal tube rack assembly	360542
Quick-Seal Cordless Tube Topper kit, (Japan, US, Canada)	358312
Quick-Seal Cordless Tube Topper kit, 50 Hz (Europe)	358313
Quick-Seal Cordless Tube Topper kit, 50 Hz (Great Britain)	358314
Quick-Seal Cordless Tube Topper kit, 50 Hz (Australia)	358315
Tube Topper rack (25-mm dia. tubes)	348124
Torque wrench assembly (3/8-in. drive)	369791
Hex plug adapter	355588
Tube removal tool	361668
Floating spacer removal tool	338765
Spinkote lubricant (2 oz)	306812
Silicone vacuum grease (1 oz)	335148
Rotor Cleaning Kit	339558
Beckman Solution 555 (1 qt)	339555
Rotor cleaning brush	339379

Beckman Coulter, Inc.
Ultracentrifuge Rotor Warranty

All Beckman Coulter ultracentrifuge Fixed Angle, Vertical Tube, Near Vertical Tube, Swinging Bucket, and Airfuge rotors are warranted against defects in materials or workmanship for the time periods indicated below, subject to the Warranty Conditions stated below.

Preparative Ultracentrifuge Rotors	5 years — No Proration
Analytical Ultracentrifuge Rotors	5 years — No Proration
ML and TL Series Ultracentrifuge Rotors	5 years — No Proration
Airfuge Ultracentrifuge Rotors	1 year — No Proration

For Zonal, Continuous Flow, Component Test, and Rock Core Ultracentrifuge Rotors, see separate warranty.

Warranty Conditions (as applicable)

1. This warranty is valid for the time periods indicated above from the date of shipment to the original Buyer by Beckman Coulter or an authorized Beckman Coulter representative.
2. This warranty extends only to the original Buyer and may not be assigned or extended to a third person without written consent of Beckman Coulter.
3. This warranty covers the Beckman Coulter Centrifuge Systems only (including but not limited to the centrifuge, rotor, and accessories) and Beckman Coulter shall not be liable for damage to or loss of the user's sample, non-Beckman Coulter tubes, adapters, or other rotor contents.
4. This warranty is void if the Beckman Coulter Centrifuge System is determined by Beckman Coulter to have been operated or maintained in a manner contrary to the instructions in the operator's manual(s) for the Beckman Coulter Centrifuge System components in use. This includes but is not limited to operator misuse, abuse, or negligence regarding indicated maintenance procedures, centrifuge and rotor classification requirements, proper speed reduction for the high density of certain fluids, tubes, and tube caps, speed reduction for precipitating gradient materials, and speed reduction for high-temperature operation.
5. Rotor bucket sets purchased concurrently with or subsequent to the purchase of a Swinging Bucket Rotor are warranted only for a term co-extensive with that of the rotor for which the bucket sets are purchased.
6. This warranty does not cover the failure of a Beckman Coulter rotor in a centrifuge not of Beckman Coulter manufacture, or if the rotor is used in a Beckman Coulter centrifuge that has been modified without the written permission of Beckman Coulter, or is used with carriers, buckets, belts, or other devices not of Beckman Coulter manufacture.
7. Rotor parts subject to wear, including but not limited to rotor O-rings, VTi, NVT, TLV, MLN, and TLN rotor tube cavity plugs and gaskets, tubing, tools, optical overspeed disks, bearings, seals, and lubrication are excluded from this warranty and should be frequently inspected and replaced if they become worn or damaged.
8. Keeping a rotor log is not mandatory, but may be desirable for maintenance of good laboratory practices.

Repair and Replacement Policies

1. If a Beckman Coulter rotor is determined by Beckman Coulter to be defective, Beckman Coulter will repair or replace it, subject to the Warranty Conditions. A replacement rotor will be warranted for the time remaining on the original rotor's warranty.
2. If a Beckman Coulter centrifuge is damaged due to a failure of a rotor covered by this warranty, Beckman Coulter will supply free of charge (i) all centrifuge parts required for repair (except the drive unit, which will be replaced at the then current price less a credit determined by the total number of revolutions or years completed, provided that such a unit was manufactured or rebuilt by Beckman Coulter), and (ii) if the centrifuge is currently covered by a Beckman Coulter warranty or Full Service Agreement, all labor necessary for repair of the centrifuge.
3. If a Beckman Coulter rotor covered by this warranty is damaged due to a malfunction of a Beckman Coulter ultracentrifuge covered by an Ultracentrifuge System Service Agreement, Beckman Coulter will repair or replace the rotor free of charge.
4. If a Beckman Coulter rotor covered by this warranty is damaged due to a failure of a Beckman Coulter tube, bottle, tube cap, spacer, or adapter, covered under the Conditions of this Warranty, Beckman Coulter will repair or replace the rotor and repair the instrument as per the conditions in policy point (2) above, and the replacement policy.
5. Damage to a Beckman Coulter rotor or instrument due to the failure or malfunction of a non-Beckman Coulter tube, bottle, tube cap, spacer, or adapter is not covered under this warranty, although Beckman Coulter will assist in seeking compensation under the manufacturer's warranty.

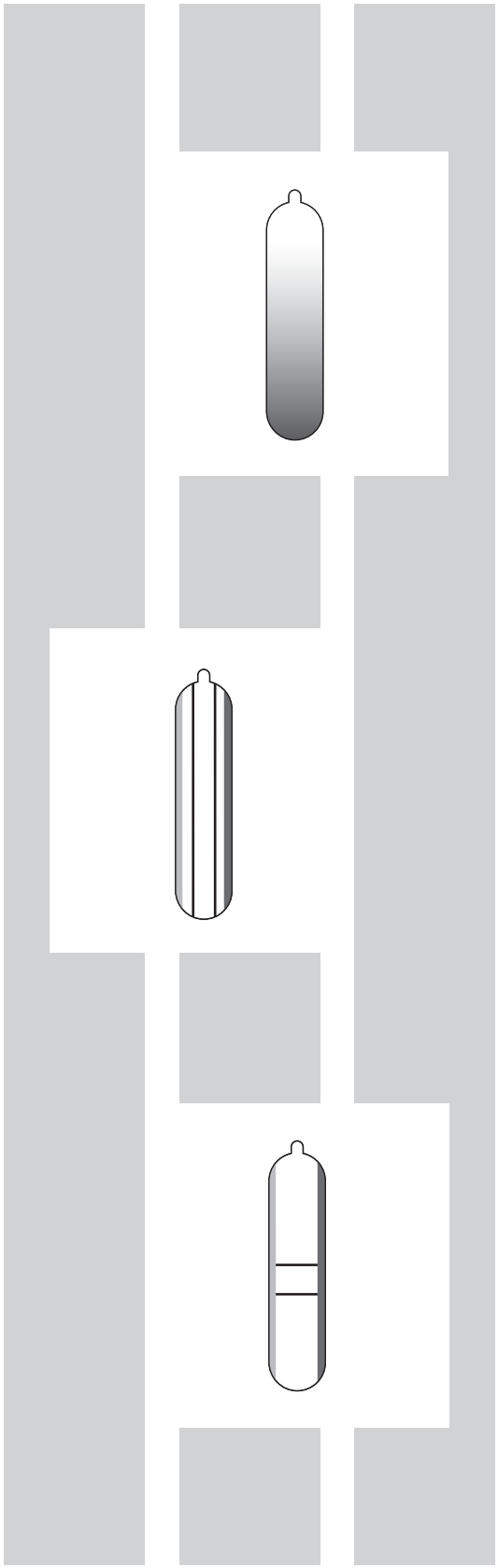
Disclaimer

IT IS EXPRESSLY AGREED THAT THE ABOVE WARRANTY SHALL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND OF THE WARRANTY OF MERCHANTABILITY AND BECKMAN COULTER, INC. SHALL HAVE NO 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.

Factory Rotor Inspection Service

Beckman Coulter, Inc., will provide free mechanical and metallurgical inspection in Indianapolis, Indiana, USA, of any Beckman Coulter rotor at the request of the user. (Shipping charges to Beckman Coulter are the responsibility of the user.) Rotors will be inspected in the user's laboratory if the centrifuge in which they are used is covered by an appropriate Beckman Coulter Service Agreement. Contact your local Beckman Coulter office for details of service coverage or cost.

Before shipping, contact the nearest Beckman Coulter Sales and Service office and request a Returned Goods Authorization (RGA) form and packaging instructions. Please include the complete rotor assembly, with buckets, lid, handle, tube cavity caps, etc. A SIGNED STATEMENT THAT THE ROTOR AND ACCESSORIES ARE NON-RADIOACTIVE, NON-PATHOGENIC, NON-TOXIC, AND OTHERWISE SAFE TO SHIP AND HANDLE IS REQUIRED.



Related Documents

Available in electronic pdf at www.beckman.com/techdocs or hard copy by request.

Beckman Coulter Ultracentrifuge Rotors, Tubes & Accessories Catalog (BR-8101)

Using OptiSeal Tubes (IN-189)

Using The Cordless Tube Topper for Quick Seal Tubes (IN-181)

Use and Care of Centrifuge Tubes and Bottles (IN-192)

Rotors and Tubes for Preparative Ultracentrifuges (LR-IM-24)

- Rotors
- Tubes, Bottles, and Accessories
- Using Tubes, Bottles, and Accessories
- Using Fixed-Angle Rotors
- Using Swinging-Bucket Rotors
- Using Vertical-Tube and Near-Vertical Tube Rotors
- Care and Maintenance
- Chemical Resistances for Beckman Coulter Centrifugation Products
- Use of the w2t Integrator
- The Use of Cesium Chloride Curves
- Gradient Materials
- References
- Glossary

Included with shipment of Rotor:

- Chemical Resistances for Beckman Coulter Centrifugation Products (IN-175)
- Rotor Safety Manual (IN-197)

Refer to www.beckman.com for additional information on Beckman Coulter Life Sciences products, resources, service, and support.

www.beckman.com

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