Instructions For Use

JS-24.15 and JS-24.38 Swinging-Bucket Rotors

For Use in Beckman Coulter Avanti J Series Centrifuges

PN J-TB-058AK
September 2016

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BECKMAN COULTER

JS-24.15 and JS-24.38 Swinging-Bucket Rotors
PN J-TB-058AK (September 2016)

Find us on the World Wide Web at:
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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 your Beckman Coulter Representative.

Alerts for Warning, Caution, Important, and Note

⚠ 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 JS-24.15 and JS-24.38 Rotors

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 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 JS-24.15 and JS-24.38 rotors, their safety in these rotors cannot be ascertained by Beckman Coulter. Use of other manufacturers' components or accessories in the JS-24.15 or JS-24.38 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.

Hook all six buckets, loaded or empty, to the rotor for every run. 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 buckets containing Quick-Seal tubes have the proper floating spacers inserted (if applicable) before installing the bucket cap.

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

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.

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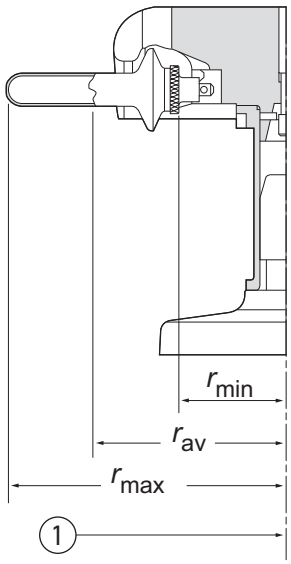


1. Axis of Rotation

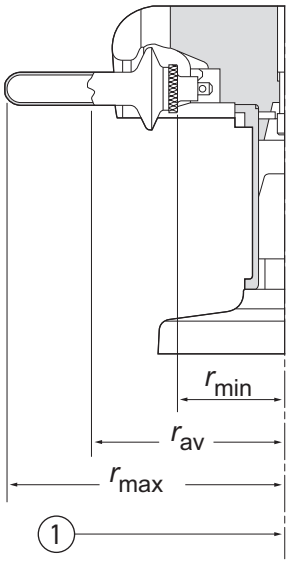
Maximum speed, Avanti JXN-30 and J-30I	24,000 RPM
Maximum speed,[a] Avanti JXN-26, J-26S XP series and J-26 XP series	10,000 RPM
Density rating at maximum speed	1.2 g/mL
Relative Centrifugal Field[b] at maximum speed	
At r_{max} (171.3 mm)	110,500 × *g*
At r_{av} (125.2 mm)	80,700 × *g*
At r_{min} (79.0 mm)	50,900 × *g*
k factor at maximum speed	376
k′ factors at maximum speed (5 to 20% sucrose gradient: 5°C)	
When particle density = 1.3 g/mL	757
When particle density = 1.5 g/mL	694
When particle density = 1.7 g/mL	668
Conditions requiring speed reductions	see *Run Speeds*
Number of buckets	6
Available tubes	see Table 1
Nominal tube dimensions (largest tube)	16 × 96 mm
Nominal tube capacity (largest tube)	15 mL
Nominal rotor capacity	90 mL
Approximate acceleration time to maximum speed (rotor fully loaded)	5 1/4 min[c]
Approximate deceleration time from maximum speed (rotor fully loaded)	5 min[c]
Weight of fully loaded rotor	5.5 kg (12.1 lb)
Rotor material	aluminum body; titanium buckets

a. Also applies to discontinued Avanti J-25 and J-20 XP series centrifuges.

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

c. To/from 24,000 RPM in the Avanti J-30I centrifuge, using slow acceleration and slow deceleraton settings.

Specifications for the JS-24.38 Rotor



1. Axis of Rotation

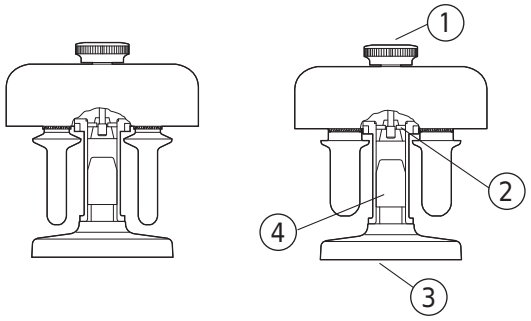
Maximum speed, Avanti JXN-30 and J-30I	24,000 RPM
Maximum speed,[a] Avanti JXN-26, J-26S XP series and J-26 XP series	10,000 RPM
Density rating at maximum speed	1.2 g/mL
Relative Centrifugal Field[b] at maximum speed	
At r_{max} (161.0 mm)	103,900 × g
At r_{av} (118.2 mm)	76,250 × g
At r_{min} (75.3 mm)	48,600 × g
k factor at maximum speed	334
k' factors at maximum speed (5 to 20% sucrose gradient: 5°C)	
When particle density = 1.3 g/mL	680
When particle density = 1.5 g/mL	622
When particle density = 1.7 g/mL	600
Conditions requiring speed reductions	see *Run Speeds*
Number of buckets	6
Available tubes	see Table 1
Nominal tube dimensions (largest tube)	25 × 89 mm
Nominal tube capacity (largest tube)	38.5 mL
Nominal rotor capacity	231 mL
Approximate acceleration time to maximum speed (rotor fully loaded)	5 1/4 min[c]
Approximate deceleration time from maximum speed (rotor fully loaded)	5 1/4 min[c]
Weight of fully loaded rotor	5.6 kg (12.3 lb)
Rotor material	aluminum body; titanium buckets

a. Also applies to discontinued Avanti J-25 and J-20 XP series centrifuges.

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

c. To/from 24,000 RPM in the Avanti J-30I centrifuge, using slow acceleration and slow deceleraton settings.

Description



1. Tie-down Knob
2. Drive Pins
3. Rotor Stand (362785)
4. Adapter

Beckman Coulter JS-24.15 and JS-24.38 rotors are manufactured in a facility that maintains certifications to both ISO 9001:2008 and ISO 13485:2003. They are for use with the specified Beckman Coulter centrifuges.

The JS-24.15 and JS-24.38 are swinging-bucket rotors designed to centrifuge up to six tubes each. Used in Beckman Coulter Avanti J series centrifuges, these rotors develop centrifugal forces for the separation of subcellular particles and viruses in density gradients. The rotors have a common rotor body with buckets that can be used interchangeably (see *Rotor Preparation*). Bucket and rotor body positions are numbered for operator convenience.

The rotor body and bucket caps are made of aluminum, anodized for corrosion resistance. The buckets are made of titanium, finished with clear polyurethane paint. Each bucket and cap assembly hooks into grooves on the rotor body. Bucket and rotor body positions are numbered for operator convenience. O-rings, made of Buna N rubber, between each bucket and bucket cap maintain atmospheric pressure inside the buckets during centrifugation. Drive pins in the rotor drive hole prevent the rotor from slipping on the centrifuge drive hub during acceleration and deceleration.

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

Preparation and Use

Specific information about the JS-24.15 and JS-24.38 rotors is given here. Use the J Series Rotors and Tubes manual *(publication JR-IM) together with this manual for complete rotor and accessory operation.*

NOTE Although rotor components and accessories made by other manufacturers may fit in the JS-24.15 and JS-24.38 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 Make sure that the rotor, buckets, and caps are clean and show no sign of corrosion or cracking.

2 Verify that the tubes and bottles being used are listed in Table 1 or Table 2.

3 Check the chemical compatibilities of all materials used.

Refer to *Chemical Resistances* (publication IN-175), included in the *Rotors and Tubes* CD.

Rotor Preparation

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

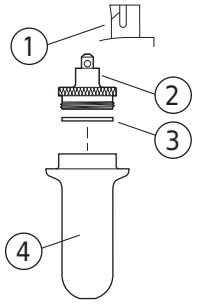
Place the rotor on the rotor stand (362785) when it is not in the centrifuge.

1 Load the filled containers into the buckets (see page 7 and for page 7 tube and bottle information).

Complete loading by placing the correct floating spacers (if required) over the tubes.

2 Ensure that bucket O-rings are lightly but evenly coated with silicone vacuum grease (335148).

Do not run a bucket without an O-ring, as the bucket will leak.



1. Hanger
2. Cap
3. O-ring
   JS-24.15 (815472)
   JS-24.38 (812715)
4. Bucket

3 Be sure that metal threads in the bucket caps are clean and lightly but evenly lubricated with Spinkote lubricant (306812).

Put bucket caps on the buckets and screw them down manually until tight.

4 Hook the buckets to the rotor by inserting the bucket pins into the grooves on the rotor body.

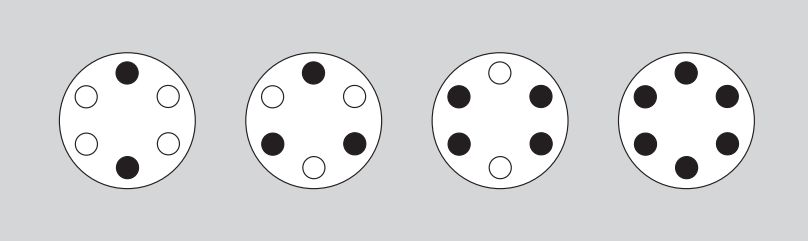
Swing each bucket back and forth slightly to ensure proper installation; the buckets should move freely.

Six buckets must be installed, whether loaded or empty.

Do not intermix the 15-mL and the 38-mL buckets during a run.

If fewer than six tubes are being run, they must be arranged symmetrically in the rotor (see Figure 1). Opposing tubes must be filled to the same level with liquid of the same density.

Figure 1 Arranging Tubes Symmetrically in the Rotor Buckets



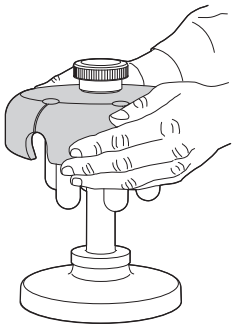
NOTE Two, three, four, or six tubes can be centrifuged per run if they are arranged in the rotor as shown. All buckets must be attached to the rotor, whether loaded or empty.

Operation

For low-temperature runs, precool the rotor in the centrifuge or in a refrigerator before use—especially before short runs—to ensure that the rotor reaches the set temperature. A suggested precooling cycle is a minimum of 30 minutes at 2000 RPM at the required temperature.

1 To install the rotor, carefully lift it up off the rotor stand with both hands—do not lift the rotor by the adapter—and place it on the drive hub.

Slowly turn the rotor to the right (clockwise) to make sure that the rotor is seated properly on the hub



2 Press the tie-down knob down and turn it to the right (clockwise) until secure.

Do not overtighten.

3 Before each run, select the JS-24.15 or JS-24.38 rotor on the centrifuge control panel. Refer ti your centrifuge instruction manual for additional information.

⚠ CAUTION

***Always enter the rotor name before beginning a run*. The forces generated during maximum acceleration can, in some cases, cause the rotor buckets to come unhooked, causing a rotor mishap. To avoid this situation, the slow acceleration setting must be used. When the rotor name is entered as described above, the centrifuge will default to slow acceleration and disable the maximum setting. If no rotor name is entered, and the acceleration setting (maximum) is not adjusted to slow, the centrifuge will use maximum acceleration and there is a possibility that buckets may become unhooked.**

Refer to the centrifuge instruction manual for additional operating instructions.

NOTE Some gradients may degrade when run time exceeds 8 hours.

4 For additional operating information, see the following:

- *Run Times*, page 11, for using *k* factors to adjust run durations.
- *Run Speeds*, page 11, for information about speed limitations.
- *Selecting CsCl Gradients*, page 13, for methods to avoid CsCl precipitation during centrifugation.

Removal and Sample Recovery

⚠ CAUTION

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

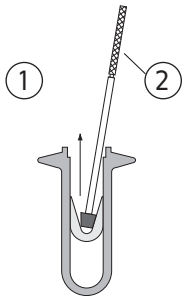
1 Remove the rotor from the centrifuge by turning the tie-down knob to the left (counterclockwise), and lifting the rotor straight up and off the drive hub.

2 Set the rotor on the rotor stand and carefully remove the buckets.

3 Remove the bucket caps and use the appropriate removal tool (listed in the *Supply List*) to remove the spacers and tubes.

If floating spacers were used, remove them with the threaded end of the floating spacer removal tool (338765).

NOTE If the conical-shaped adapters that support *k*onical tubes are difficult to remove after centrifugation, an extractor tool (354468) is available to facilitate removal.



1. While pressing the rubber tip aginst the adapter wall, pull the tool and adapter up and out of the cavity.
2. Extractor Tool (354468)

Tubes and Bottles

The JS-24.15 rotor uses tubes and accessories listed in Table 1; the JS-24.38 rotor uses tubes and accessories listed in Table 2. Be sure to use only those items listed, and to observe the maximum speed limits shown. Refer to *Chemical Resistances* (publication IN-175) for information on the chemical compatibilities of tube and accessory materials.

Table 1 Beckman Coulter Tubes and Bottles for the JS-24.15 Rotorr[a]

Tube			Required Accessory		Max Speed/ RCF/ *k* factor
Dimensions and Volume	**Description**	**Part Number**	**Description**	**Part Number**	
16 × 96 mm 15 mL	Ultra-Clear, open-top	361706	none	—	24 000 RPM 110 500 × *g* 376
16 × 96 mm 15 mL	polypropylene, open-top	361707	none	—	24 000 RPM 110 500 × *g* 376
16 × 93 mm 12.5 mL	konical polypropylene, open-top	361708	adapter	358155	24 000 RPM 108 500 × *g* 368
16 × 67 mm 10 mL	polypropylene Quick-Seal, bell-top	344622	modified polyphenylene oxide floating spacer	355579	24 000 RPM 110 500 × *g* 293

Table 1 Beckman Coulter Tubes and Bottles for the JS-24.15 Rotor[a] *(Continued)*

Tube			Required Accessory		Max Speed/ RCF/ *k* factor
Dimensions and Volume	**Description**	**Part Number**	**Description**	**Part Number**	
16 × 57 mm 8 mL	polypropylene Quick-Seal, bell-top	344621	modified polyphenylene oxide floating spacer	355579	24 000 RPM 110 500 × *g* 261
16 × 44 mm 6.3 mL	polypropylene Quick-Seal, bell-top	345830	modified polyphenylene oxide floating spacer	355579	24 000 RPM 110 500 × *g* 215
16 × 38 mm 4.2 mL	polypropylene Quick-Seal, bell-top	356562	modified polyphenylene oxide floating spacer	355579	24 000 RPM 110 500 × *g* 193

a. Use only the items listed here.

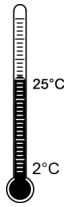
Table 2 Beckman Coulter Tubes and Bottles for the JS-24.38 Rotor[a]

Tube			Required Accessory		Max Speed/ RCF/ *k* factor
Dimensions and Volume	**Description**	**Part Number**	**Description**	**Part Number**	
25 × 89 mm 38.5 mL	Ultra-Clear open-top	344058	none	—	24 000 RPM 103 900 × *g* 334
25 ´ 89 mm 38.5 mL	polypropylene open-top	326823	none	—	24 000 RPM 103 900 × *g* 334
25 × 76 mm 25 mL	konical polypropylene open-top	358125	adapter	358156	24 000 RPM 95 500 × *g* 297
25 × 89 mm 30 mL	konical polypropylene open-top	358126	adapter	358156	24 000 RPM 103 900 × *g* 334
25 × 89 mm 32 mL	thickwall polypropylene open-top	355642	none	—	24 000 RPM 103 900 × *g* 334
25 × 89 mm 32 mL	thickwall polycarbonate open-top	355631	none	—	24 000 RPM 103 900 × *g* 334
25 × 83 mm 33 mL	polypropylene Quick-Seal, bell-top	344623	modified polyphenylene oxide floating spacer	355536	24 000 RPM 103 900 × *g* 317

Table 2 Beckman Coulter Tubes and Bottles for the JS-24.38 Rotor[a] *(Continued)*

Tube			Required Accessory		Max Speed/ RCF/ *k* factor
Dimensions and Volume	**Description**	**Part Number**	**Description**	**Part Number**	
25 × 64 mm 27 mL	polypropylene Quick-Seal, bell-top	343665	modified polyphenylene oxide floating spacer	355536	24 000 RPM 103 900 × *g* 260
25 × 38 mm 15 mL	polypropylene Quick-Seal, bell-top	343664	modified polyphenylene oxide floating spacer	355536	24 000 RPM 103 900 × *g* 167
25 × 38 mm 8.5 mL	*k*onical polypropylene Quick-Seal, bell-top	358652	adapter	358156	24 000 RPM 103 900 × *g* 167
			modified polyphenylene oxide floating spacer	355536	
25 × 76 mm 23 mL	*k*onical polypropylene Quick-Seal, bell-top	358654	adapter	358156	24 000 RPM 103 900 × *g* 297
			modified polyphenylene oxide floating spacer	355536	

a. Use only the items listed here.



Temperature Limits

- Plastic tubes and bottles 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.

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 buckets.

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

Do not leave a large air space—too much air can cause excessive tube deformation.

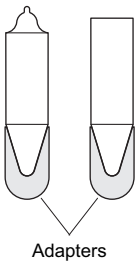
2 Refer to *Rotors and Tubes* for detailed information on the use and care of Quick-Seal tubes.

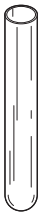
Quick-Seal tubes are disposable and should be discarded after a single use.

Some of the tubes listed in Table 1 and Table 2 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 listed in the Tables in the JS-24.15 and JS 24.38 rotors without reduction in *g* force. Additional information about the *g*-Max system is available in publication DS-709.

*k*onical Tubes

Polypropylene *k*onical tubes, used to optimize pelleting separations, have a conical tip that concentrates the pellet in the narrow end of the tube. The narrow bottom also reduces the tube's nominal volume and minimizes gradient material requirement. The *k*onical tubes come in both open-top and Quick-Seal tube designs. Conical cavity adapters hold the tubes in the rotor buckets.





Polypropylene and Ultra-Clear Open-Top Tubes

Polypropylene and Ultra-Clear open-top tubes should be filled to 2 or 3 mm from the tube top for tube support. If necessary, float mineral oil (or some other low-density, immiscible liquid) on top of the tube contents to fill the tube to its maximum volume. (Do not use an oil overlay in Ultra-Clear tubes.) All opposing tubes for a run must be filled to the same level with liquid of the same density.)

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 rotors at maximum rated speed and using full tubes.) The *k* factor is calculated from the formula

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

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:

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

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*).

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

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

$$k_{adj} = k\left(\frac{24{,}000}{\text{actual run speed}}\right)^2 \quad \text{EQ 4}$$

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:

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

where the *k* factors have been adjusted for the actual run speed used.

Run Speeds

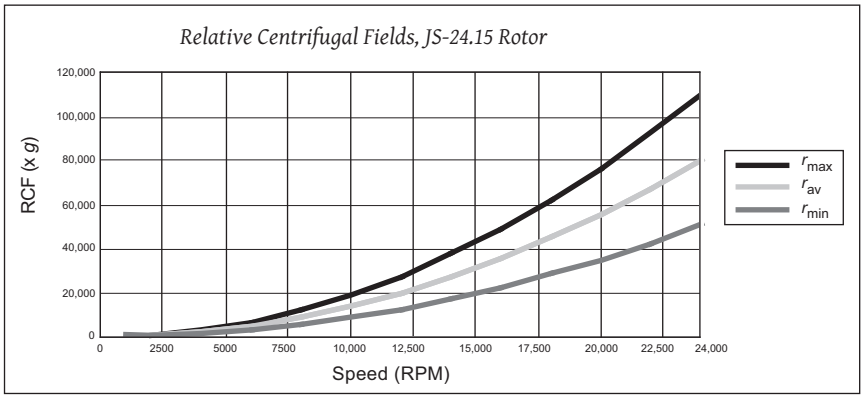
The centrifugal force at a given radius in a rotor is a function of speed. Comparisons of forces between different rotors are made by comparing the rotors' relative centrifugal fields (RCF). When rotational speed is selected so that identical samples are subjected to the same RCF in two different rotors, the samples are subjected to the same force. The RCF at a number of rotor speeds is provided in Table 3.

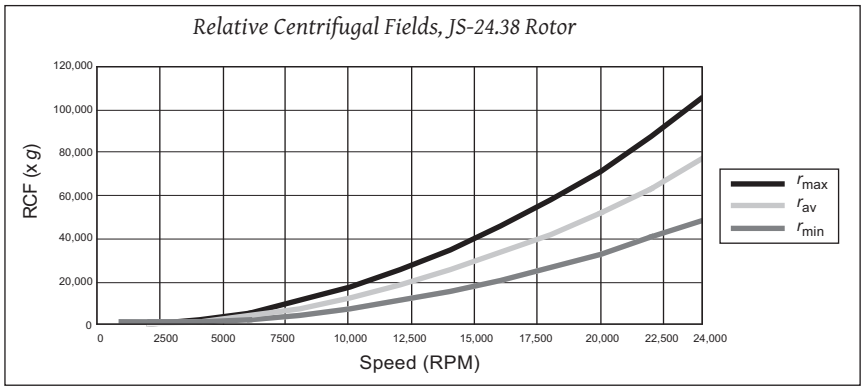
Table 3 Relative Centrifugal Fields for the Type 90 Ti Rotor[a]

JS-24.15 Rotor			
Rotor Speed (RPM)	Relative Centrifugal Field (× *g*)		
	At r_{max} (171.3 mm)	At r_{av} (125.2 mm)	At r_{min} (79.0 mm)
24,000	110,500	80,000	51,000
22,000	92,900	67,900	42,800
20,000	76,700	56,000	35,400
18,000	62,200	45,400	28,700
16,000	49,100	35,900	22,700
14,000	37,600	27,500	17,300
12,000	27,600	20,200	12,700
10,000	19,200	14,000	8850
8000	12,380	8980	5660
6000	6900	5050	3190
4000	3070	2240	1420
2000	770	561	354

JS-24.38 Rotor			
Rotor Speed (RPM)	Relative Centrifugal Field (× *g*)		
	At r_{max} (161 mm)	At r_{av} (118.2 mm)	At r_{min} (75.3 mm)
24,000	103,900	76,300	48,600
22,000	87,300	64,100	40,800
20,000	72,100	53,000	33,700
18,000	58,400	42,900	27,300
16,000	46,200	33,900	21,600
14,000	35,300	26,000	16,500
12,000	26,000	19,100	12,100
10,000	18,000	13,200	8430
8000	11,500	8470	5400
6000	6490	4770	3040
4000	2880	2120	1350
2000	721	530	337

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





Do not select run speeds in excess of 24,000 RPM in an Avanti JXN-30 or J-30I; or 10,000 RPM* in an Avanti JXN-26, J-26S XP series or Avanti J-26 XP series centrifuge. In addition, speeds must be reduced under the following circumstances:

1. If nonprecipitating solutions more dense than 1.2 g/mL are centrifuged, reduce the maximum allowable run speed according to the following equation:

$$\text{reduced maximum speed} = (24{,}000\ \text{RPM}) \sqrt{\frac{1.2\ \text{g/mL}}{\rho}} \qquad \textbf{EQ 6}$$

   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.

2. *Further speed limits must be imposed* when CsCl or other self-forming-gradient salts are centrifuged, as EQ 6 does not predict concentration limits/speeds that are required to prevent precipitation of salt crystals. Solid CsCl has a density of 4 g/mL, and if precipitated during centrifugation may cause rotor failure. Figure 2 through Figure 5, together with the description and examples below, show how to reduce run speeds when using CsCl gradients.

Selecting CsCl Gradients

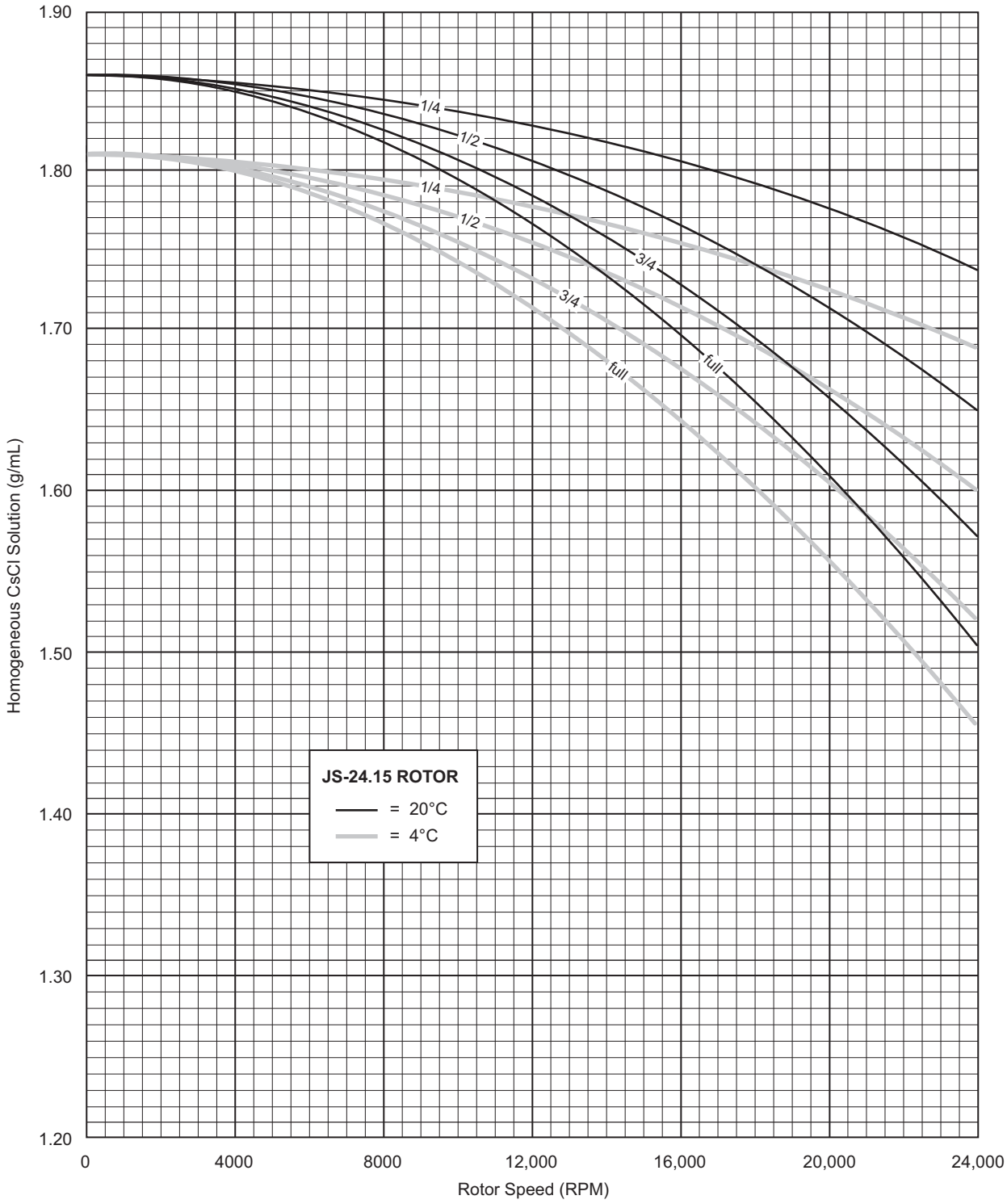
Rotor speed is used to control the slope of a CsCl density gradient, and must be limited to prevent CsCl precipitation during centrifugation. Speed and density combinations that intersect on or below the curves in Figure 3 (for the JS-24.15 rotor) and in Figure 5 (for the JS-24.38 rotor) ensure that CsCl will not precipitate during centrifugation in these rotors. Curves are provided at two temperatures: 20°C (black curves) and 4°C (gray curves). Curves in Figure 2, Figure 3, Figure 4, and Figure 5 are provided up to the maximum speed of the rotor.

NOTE The curves in Figure 2, Figure 3, Figure 4, and Figure 5 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.

The reference curves shown in Figure 3 and Figure 5 show gradient distribution at equilibrium. Each curve in Figure 3 is within the density limits allowed for the JS-24.15 rotor; each curve in Figure 5 is within the density limits allowed for the JS-24.38 rotor. Each curve was generated for a single run speed using the maximum allowable homogeneous CsCl densities (one for each fill level) that avoid precipitation at that speed. (The gradients in Figure 3 and Figure 5 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 in Figure 3 and Figure 5.) Figure 3 and Figure 5 can also be used to approximate the banding positions of sample particles. Curves not shown in the Figures may be interpolated.

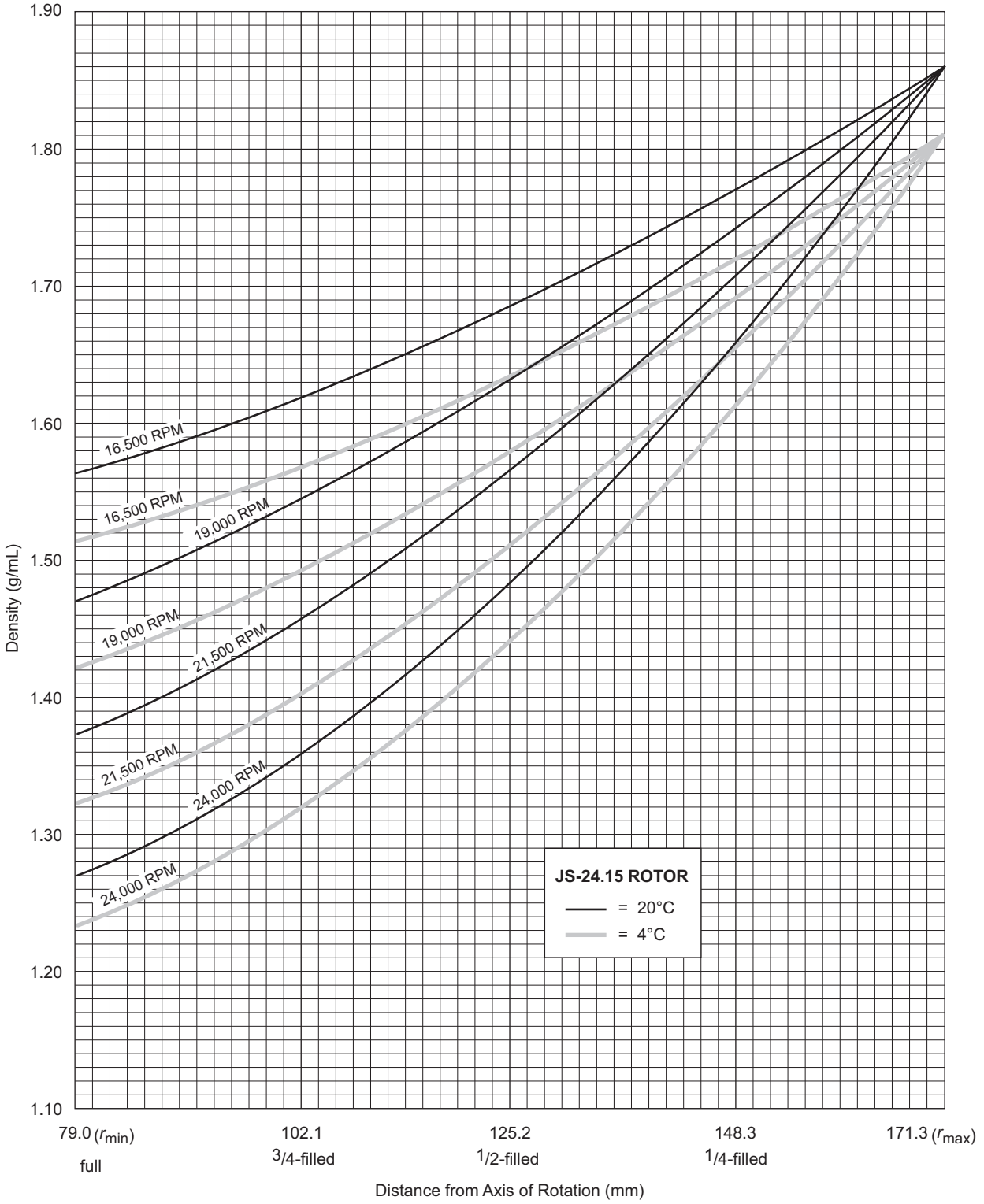
* This speed also applies to discontinued Avanti J-25 or Avanti J-20XP series centrifuges.

Figure 2 Precipitation Curves for the JS-24.15 Rotor*



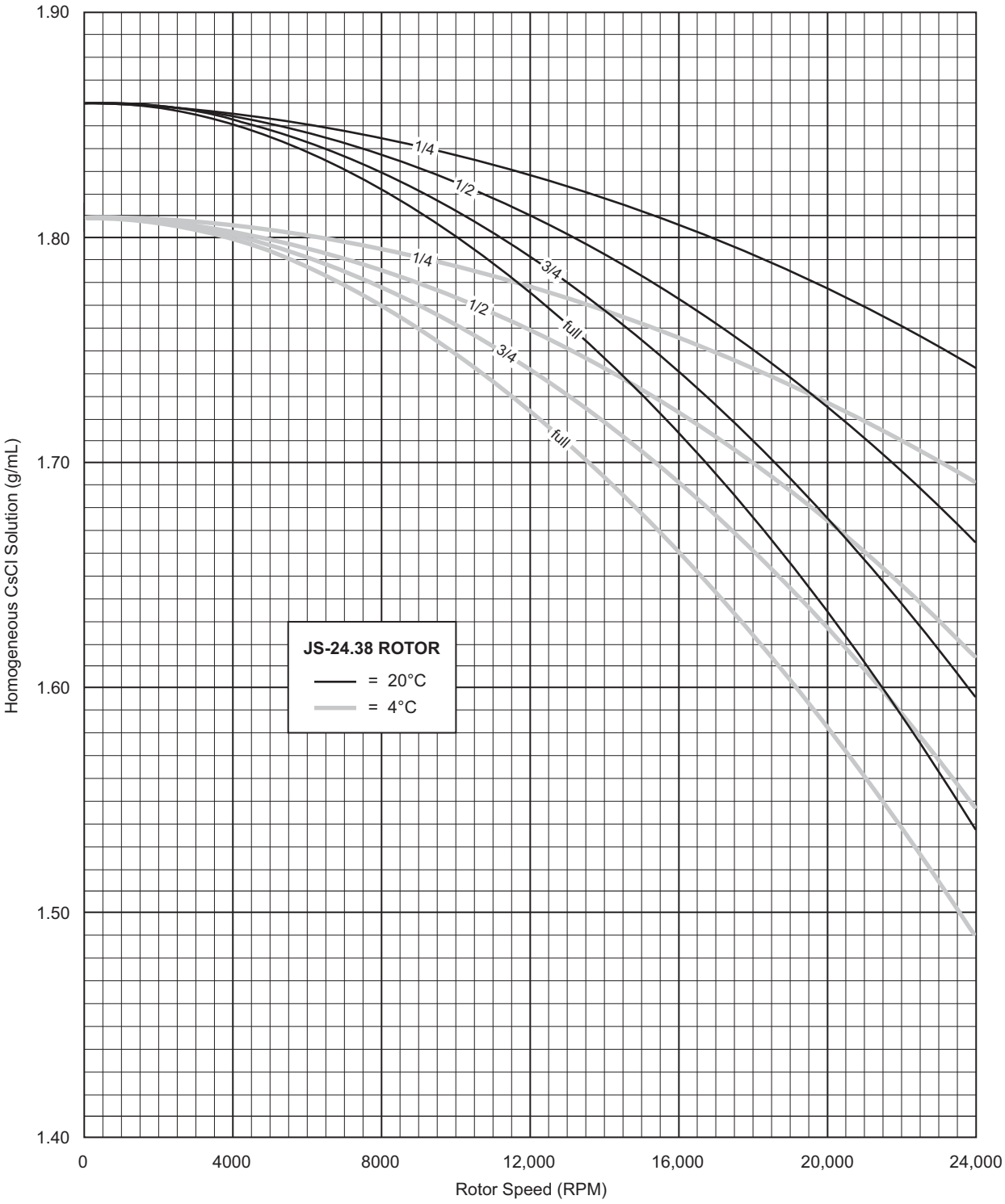
* Using combinations of rotor speeds and homogeneous CsCl solution densities that intersect on or below these curves ensures that CsCl will not precipitate during centrifugation.

Figure 3 CsCl Gradients at Equilibrium for the JS-24.15 Rotor*



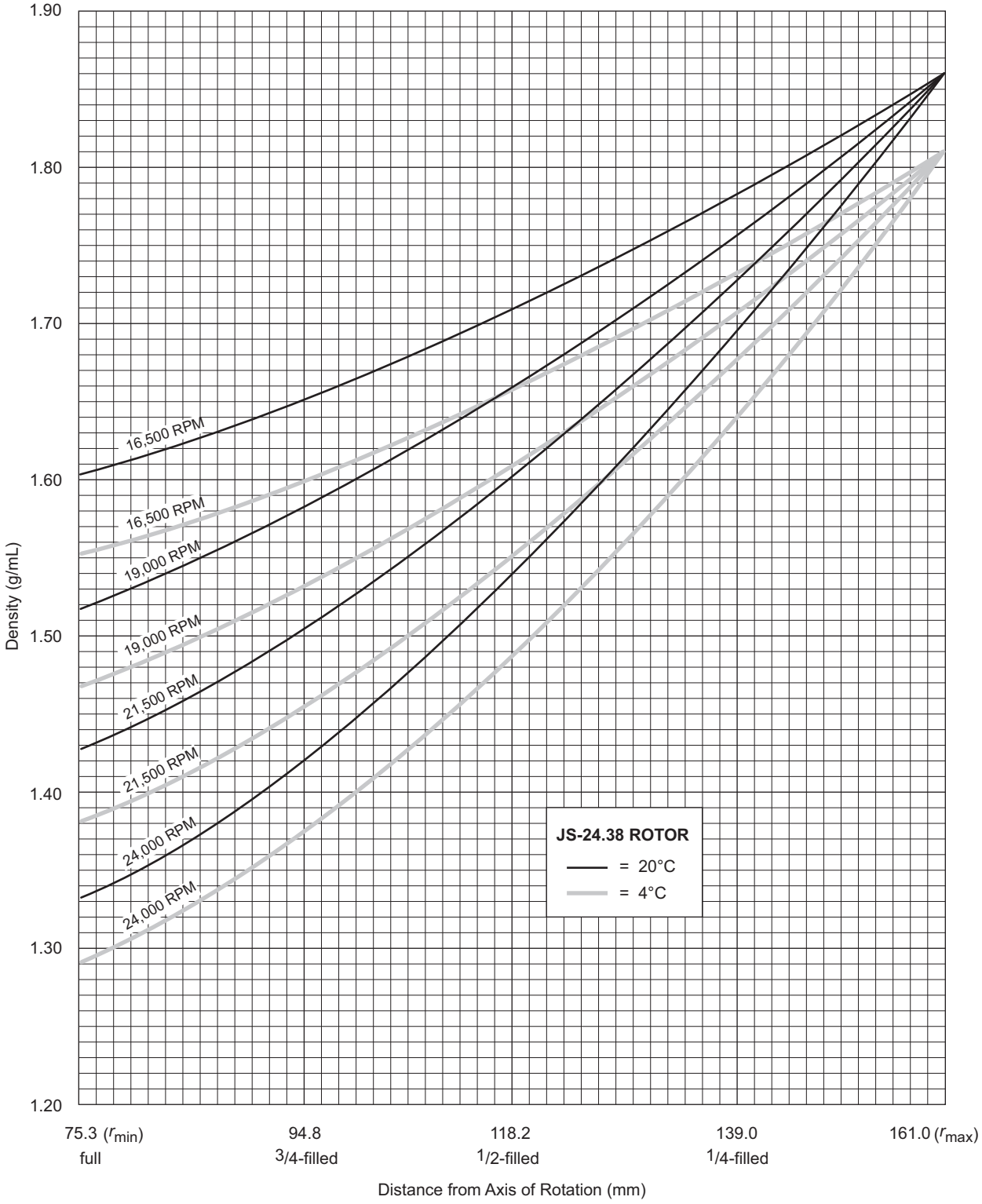
* Centrifugation of homogeneous CsCl solutions at maximum allowable speeds (from Figure 2) results in gradients presented here.

Figure 4 Precipitation Curves for the JS-24.38 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.

Figure 5 CsCl Gradients at Equilibrium for the JS-24.38 Rotor*



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

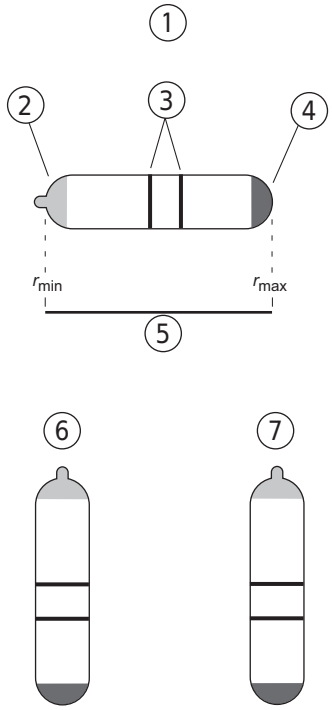
Adjusting Fill Volumes

Figure 2, Figure 3, Figure 4, and Figure 5 show that several fill volumes are possible in a tube. If a thinwall tube is partially filled with gradient solution, float mineral oil (or some other low-density, immiscible liquid) on top of the tube contents to fill the tube to its maximum volume. (Do not use an oil overlay in Ultra-Clear tubes.) Note that for a given CsCl density, as the fill level decreases the maximum allowable speed increases. Partial filling may be desirable when there is little sample or when you wish to shorten the run time.

For example, in the JS-24.38 rotor, a *quarter-filled* tube of 1.69-g/mL homogeneous CsCl solution at 20°C may be centrifuged at 24,000 RPM (see Figure 4). The segment of the 24,000 RPM curve (Figure 5) from the one-quarter-filled line to r_{max} (the tube bottom) represents this gradient. The same solution in a *half-filled* tube may be centrifuged no faster than 22,500 RPM, and 19,000 RPM in a *three-quarter-filled* tube. A tube *full* of the 1.69-g/mL CsCl solution may be centrifuged no faster than 17,500 RPM. Curves not shown in the Figure may be interpolated.

Typical Examples for Determining CsCl Run Parameters

Example A:
Starting with a homogeneous CsCl solution density of 1.70 g/mL and approximate particle buoyant densities of 1.67 and 1.72 g/mL, at 20°C, where will particles band at equilibrium in the JS-24.38 rotor.



1. At Speed
2. Floating Components
3. Bands
4. Pelleted Material
5. Pathlength
6. At Rest iln Rotor
7. At Rest Outside Rotor

1. In Figure 4, find the curve that corresponds to the required run temperature (20°C) and fill volume (three-quarters full).

   The maximum allowable rotor speed is determined from the point where this curve intersects the homogeneous CsCl density (18,500 RPM).

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

3. Mark the point in Figure 5 where each particle density intersects the curve corresponding to the selected run speed and temperature.

4. Particles will band at these locations across the tube diameter at equilibrium during centrifugation.

In this example, particles will band about 118 and 128 mm from the axis of rotation, about 10 mm of centerband-to-centerband separation.

To determine interband volume in milliliters, use the following equation:

$$V = \pi r^2 h \qquad \text{EQ 7}$$

where r is the tube radius in centimeters and h is the interband separation in centimeters.

Example B:
Knowing particle buoyant densities (for example, 1.55 and 1.50 g/mL), how do you achieve good separation in the JS-24.15 rotor.

1. In Figure 3, sketch in a horizontal line corresponding to each particle's buoyant density.

2. Select the curve at the required temperature (4°C) and tube volume (full) that gives the best particle separation.

3. Note the run speed along the selected curve (19,000 RPM).

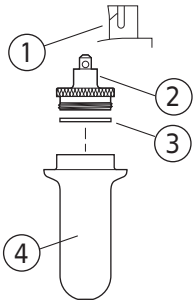
4. From Figure 2, select the maximum homogeneous CsCl density (in this case, 1.58 g/mL) that corresponds to the temperature and run speed established above.

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

In this example, particles will band about 99 and 114 mm from the axis of rotation (about 15 mm apart).

Care and Maintenance

Maintenance



1. Hanger
2. Cap
3. O-ring
4. Bucket

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 Frequently check the bucket O-rings (JS-24.15, p/n 815472; JS-24.38, p/n 812715) for signs of wear.

Replace O-rings every 6 months, or whenever worn or damaged.

Keep the O-rings lightly coated with silicone vacuum grease.

2 Before every run, lubricate the bucket cap threads with a thin, even coat of Spinkote lubricant (306812).

3 Before using the rotor, inspect the rotor drive pins to ensure that they are not damaged.

Damaged drive pins can prevent the rotor from seating properly on the centrifuge drive hub (Avanti J series centrifuges only).

To inspect the drive pins, turn the rotor upside down and look into the drive hole in the center of the rotor.

If the drive pins appear damaged, contact Beckman Coulter Field Service.

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

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, or after each run if runs are more infrequent) to prevent buildup of residues.

1 Wash the rotor buckets, O-rings, and caps in a mild detergent, such as Solution 555, that won't damage the rotor.

Dilute the detergent with water (10 parts water to 1 part detergent).

The Rotor Cleaning Kit (339558) contains two plastic-coated brushes and two quarts of Solution 555 for use with rotors and accessories.

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

2 Wash the rotor body with a sponge or cloth dampened with a mild detergent, such as Solution 555, diluted with water (10 parts water to 1 part detergent).

3 Rinse the cleaned rotor and components with distilled water.

4 Air-dry the rotor and buckets upside down.

Do not use acetone to dry the rotor.

5 Clean metal threads frequently to prevent buildup of residues and ensure adequate closure.

Use a brush and concentrated Solution 555.

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

Decontamination

If the rotor (and/or accessories) becomes contaminated with radioactive material, it should be decontaminated using a solution that will not damage the anodized surfaces. Beckman Coulter has

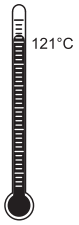
tested a number of solutions and found two that do not harm anodized aluminum: RadCon Surface Spray or IsoClean Solution (for soaking),* and Radiacwash.†

NOTE IsoClean can cause fading of colored anodized surfaces. Use it only when necessary and remove it promptly from surfaces.

While Beckman Coulter has tested these methods and found that they do not damage components, no guarantee of decontamination is expressed or implied. Consult your laboratory safety officer regarding the proper decontamination methods to use.

If the rotor or other components are contaminated with toxic or pathogenic materials, follow appropriate decontamination procedures as outlined by your laboratory safety officer.

Sterilization and Disinfection



- The rotor and all rotor components, except those made of modified polyphenylene oxide can be autoclaved at 121°C for up to one hour. Remove the caps from the rotor buckets and place the rotor, caps, and spacers in the autoclave upside down.
- Ethanol (70%) may be used on all rotor components, including those made of plastic. Bleach (sodium hypochlorite) may be used, but may cause discoloration of anodized surfaces. Use the minimum immersion time for each solution, per laboratory standards.

⚠ CAUTION

Ethanol is a flammability hazard. Do not use it in or near operating centrifuges.

While Beckman Coulter has tested these methods and found that they do not damage 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 with each box of tubes) for tube sterilization and disinfection procedures. *Quick-Seal, Ultra Clear, and thinwall open-top tubes are disposable and should be discarded after a single use.*

Storage

When the rotor is not in use, store it and the buckets in a dry environment (not in the instrument). Remove the bucket caps to allow air circulation so that moisture will not collect in the buckets.

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* In U.S., contact Nuclear Associates (New York); in Eastern Europe and Commonweath States, contact Victoreen GmbH (Munich); in South Pacific, contact Gammasonics Pty. Ltd. (Australia); in Japan, contact Toyo Medic Co. Ltd. (Tokyo).

† In U.S., contact Biodex Medical Systems (Shirley, New York); internationally, contact the U.S. office to find the dealer closest to you.

Returning a Rotor

Before returning a rotor or accessory for any reason, prior permission must be obtained from Beckman Coulter, Inc. A return form may be obtained from your local Beckman Coulter sales office. The form 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 return 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.beckmancoulter.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 *High Performance, High Speed, High Capacity Rotors Tubes & Accessories* catalog (BR-8102, available at www.beckmancoulter.com) for detailed information on ordering parts and supplies. For your convenience, a partial list is given below.

Replacement Rotor Parts

Description	Part Number
JS-24 rotor and adapter assembly	364802
JS-24.15 buckets (set of 6, with caps and O-rings)	362398
JS-24.15 bucket O-ring	815472
JS-24.38 buckets (set of 6, with caps and O-rings)	362397
JS-24.38 bucket O-ring	812715
Rotor stand	362785

Other

NOTE For MSDS information, go to the Beckman Coulter website at www.beckmancoulter.com.

Description	Part Number
Tubes and accessories	see Tables 1 and 2
Bucket holder rack	331186
Quick-Seal Cordless Tube Topper Kit, 60 Hz (U.S.A./Japan)	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
Quick-Seal Cordless Tube Topper Kit, 50 Hz (Canada)	367803
Tube racks for the Tube Topper for 16-mm diameter tubes for 38-mm diameter tubes	 348123 348124
Floating spacer removal tool	338765
Tube removal tool (Quick-Seal tubes)	361668
Extractor tool (konical tube adapters)	354468
Silicone vacuum grease (1 oz)	335148

Description	Part Number
Spinkote lubricant (2 oz)	306812
Rotor Cleaning Kit	339558
Solution 555 (1 qt)	339555
Rotor cleaning brush	339379

Beckman Coulter, Inc.
J Series Swinging-Bucket Rotor Warranty

Subject to the conditions specified below and the warranty clause of the Beckman Coulter, Inc., terms and conditions of sale in effect at the time of sale, Beckman Coulter, Inc. 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 J series rotor to the original buyer by Beckman Coulter, Inc. 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.

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.

A defective rotor will be replaced by Beckman Coulter at its then current list price less a credit based upon the age of the rotor (years since date of purchase). The Buyer shall not receive credit until the claimed defective rotor is returned to Beckman Coulter's Indianapolis, Indiana facility or delivered to a Beckman Coulter Field Service representative.

The replacement price (cost to Buyer) for the respective rotor shall be calculated as follows:

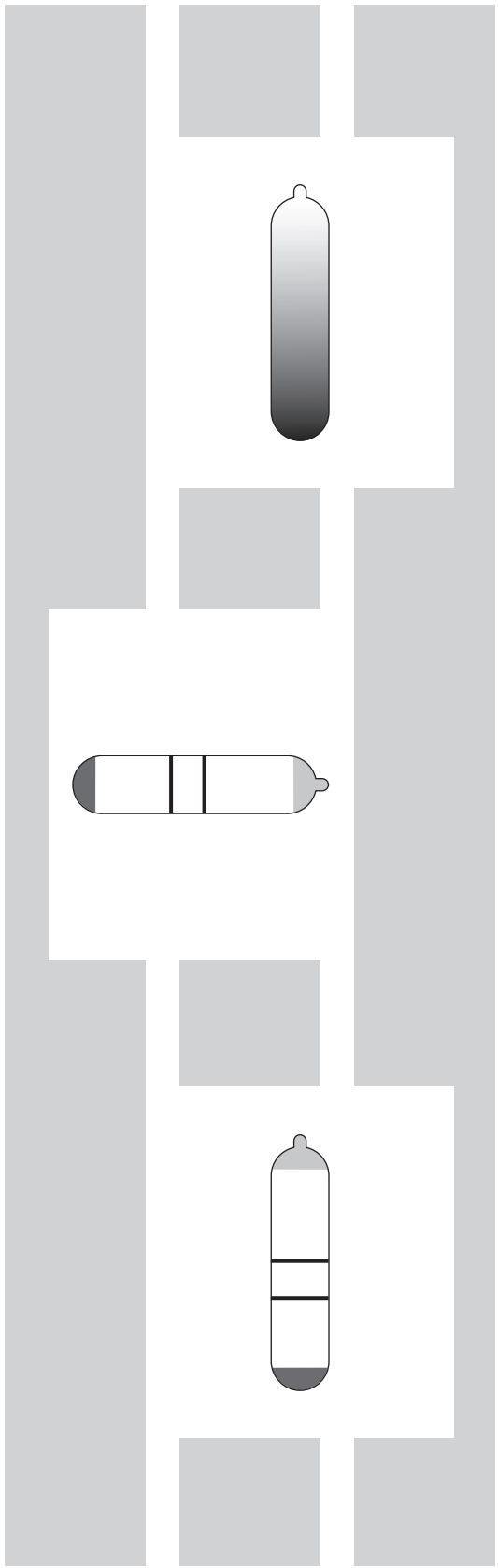
$$\text{Replacement price} = \text{Current rotor list price} \times \frac{\text{years}}{7}$$

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 is operated in a Beckman Coulter centrifuge that has been improperly disassembled, repaired, or modified.

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 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.



Related Documents

Rotors and Tubes for Beckman Coulter J2, J6,and Avanti J Series Centrifuges
PN JR-IM-10

- Rotors
- Tubes, Bottles, and Accessories
- Using Tubes and Accessories
- Using Fixed-Angle Rotors
- Using Swinging-Bucket Rotors
- Using Vertical-Tube and Rack Type Rotors
- Care and Maintenance
- Chemical Resistances
- Temperature Compensation Tables
- Gradient Materials
- Blood Component Separation

Available in electronic pdf or CD-ROM by request.

Avanti J-26S XP
PN B10087

Avanti J-26S XPI
PN B10093

Avanti J-26 XP
PN J326XP-IM-5

Avanti J-26 XPI
PN J326XPI-IM-4

Avanti J-30I
PN J330I-IM-9

Avanti JXN
PN B38322

PN B383223

Use and Care of Centrifuge Tubes and Bottles
PN IN-192

Chemical Resistances for Beckman Coulter Centrifugation Products
PN IN-175

High Performance, High Speed, High Capacaity Rotors, Tubes, & Accessories
PN BR-1802

Available in hard copy by request.

Available at www.beckmancoulter.com

www.beckmancoulter.com

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