

Microcentrifuges

QA

Question: How does an engineered polymer rotor impact the operation and maintenance of a microcentrifuge?

Answer:

Microcentrifuges are critical to both life science research and clinical diagnostic applications and the rotor selection can impact the safety and productivity of these high-use instruments. By selecting engineered polymer (polypropylene) rotors, these lightweight rotors create efficient run time with a faster acceleration/ deceleration and as a result, may consume less energy. Additionally, lowering inertia may increase safety by minimizing the risk of damage in the event of a rotor failure. Enhanced chemical resistance properties may also protect the rotor from corrosion, compared to traditional aluminum rotors, even when using a bleaching agent for cleaning purposes.



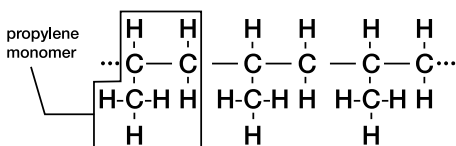
Thermo Scientific™ M Series
microcentrifuges with polypropylene rotor

Why is polypropylene a good material for microcentrifuge rotors?

What is polypropylene?

Polypropylene (PP) is a thermoplastic with linear structure based on the monomer C_nH_{2n} (Figure 1). It is manufactured from propylene gas in presence of a catalyst such as titanium chloride. Polypropylene is light in weight with a low density of about 0.90-0.92 g/cm³, compared with the density of aluminum which is 2.7 g/cm³, and has excellent resistance to stress, cracking and corrosion.¹

Figure 1. Linear structure of polypropylene.



Lighter weight

In addition to being easy to handle, experiments have shown² that accelerating and decelerating a polypropylene rotor in a microcentrifuge requires up to 40% less energy than a metal rotor of the same performance and geometry.

Table 1. Kinetic energy comparison of metal and polypropylene rotors.

	Polypropylene rotor	Aluminum rotor
Weight (g)	419	822
Inertia (kgm ²)	0.001395	0.003339
Kinetic energy (kJ)	1.67	4.01
To run at 10,000 rpm for 10 mins		
Accelerating energy (kWh)	0.000463	0.00111
Decelerating energy (kWh)	0.000463	0.00111
Total energy consumed (kWh)	0.000926	0.00222

Lightweight polypropylene rotors also have a lower inertia compared to metal rotors. In the case of rotor failure, there is less risk of damage to the centrifuge (Table 1).

Chemical resistance

Centrifuge rotors made of aluminum alloy are particularly susceptible to corrosion, typically caused by acids, alkalis and high concentrations of salt solutions.

Even when anodized to decrease corrosion and wear, this anodizing film can become damaged, exposing the aluminum surface to corrosion risks which eventually will cause rotor failures.

Compared with aluminum and anodic coating, polypropylene has a much better chemical resistance to these commonly used acids, alkalis and reagents, like the bleaching agent for cleaning purpose, and as a result, is easier to manage in routine rotor care.

¹<http://www.lenntech.com/polypropylene.htm>

²"Practical Techniques for Centrifugal Separations", Owen Mitch Griffith, Ph.D.

Conclusion: Lightweight and corrosion-resistant polypropylene rotors, available for Thermo Scientific M Series microcentrifuges, are designed to enhance productivity.

Specifications	M17 Series	M21 Series
Max RCF	17,000 xg	21,100 xg
Max Speed	13,300 rpm	14,800 rpm
Max Noise Level	MT 17: <54db(A)(Rotor 24x2ml; 13300 RPM) MTR 17: <48db(A)(Rotor 24x2ml; 13300 RPM)	MT 21: <56db(A)(Rotor 24x2ml; 14800 RPM) MTR 21: <56db(A)(Rotor 24x2ml; 14800 RPM)
Weight	MT 17/MT 21: 120V/230V 11 kg; 100V: 12kg MTR 17/MTR 21: 120V 24 kg; 230V 24kg/25kg 100V: 25kg	
Acceleration/Deceleration Rates	11/12 seconds (ventilated); 10/12 seconds (refrigerated)	
Time Set Range	1 min - 99 min; 1 min increments + HOLD mode	
Temperature Range⁴	Set from -9 °C to +40 °C per 1 °C increment	
Certifications	CSA certified, CE marked, IVD compliant, Certified biocontainment ¹	
Technical Standards	IEC 61010-1, IEC 61010-2, IEC 61010-020	
Warranty	2 years	
Dimensions (H x W x D)		
MT 17 and MT 21	225 x 243 x 352 mm (8.86 x 9.56 x 13.8 in)	
MTR 17 and MTR 21	330 x 290 x 440 mm (12.9 x 11.4 x 17.3 in)	

¹Biocontainment certification by Public Health England, Porton Down, UK. ⁴M17 series centrifuges only.

Ordering information	MT 17		MT 21		MTR 17		MTR 21	
	IVD-MD	General Use Only	IVD-MD	General Use Only	IVD-MD	General Use Only	IVD-MD	General Use Only
120 V, 50/60 Hz	75002576	N/A	75002579	N/A	75002588	N/A	75002591	N/A
230 V, 50/60 Hz	75002577	75002571	75002580	75002574	75002589	75002583	75002592	75002586
100 V, 50/60 Hz	N/A	N/A	75002581	75002575	N/A	N/A	75002593	75002587
230 V, 60 Hz for USA only	N/A	N/A	N/A	N/A	75002597	N/A	75002599	N/A

All part numbers include a 24 x 1.5/2 mL rotor

Application Package	Voltage	Accessories included	IVD-MD or General use	Cat. No.
Everylab Centrifuge Package MT 21	120V	incl. 24 x 1.5/2 mL rotor, Thermo Scientific™ Finnpiptette™ F2 GLP Kit 2: <ul style="list-style-type: none"> Single-channel 0.2-2 µL, 2-20 µL, 20-200 µL and 100-1,000 µL pipettes <ul style="list-style-type: none"> Flex tips: 10 micro: 1 x 96; 200: 2 x 96; 1000: 1 x 96 F-stand • Reagent reservoir demo pack and 1.5 Snap Cap Low Retention microcentrifuge tubes, full case (5,000 tubes) 	General use	75002532
Everylab Centrifuge Package MTR 21	120 V	incl. 24 x 1.5/2 mL rotor, Thermo Scientific™ Finnpiptette™ F2 GLP Kit 2: <ul style="list-style-type: none"> Single-channel 0.2-2 µL, 2-20 µL, 20-200 µL and 100-1,000 µL pipettes <ul style="list-style-type: none"> Flex tips: 10 micro: 1 x 96; 200: 2 x 96; 1000: 1 x 96 F-stand • Reagent reservoir demo pack and 1.5 Snap Cap Low Retention microcentrifuge tubes, full case (5,000 tubes) 	General use	75002533
MT 17	230 V, 50/60 Hz	includes hematocrit rotor	IVD	75002578
MT 17	120 V, 50/60 Hz	includes hematocrit rotor	IVD	75002598
MT 21	120 V, 50/60 Hz	includes 24 x 1.5/2.0 mL rotor and 18x2 0/0.5 mL rotor	IVD	75002584
MTR 21	230 V, 50/60 Hz	includes 24 x 1.5/2.0 mL rotor and 18x2 0/0.5 mL rotor	General use	75002596
MTR 21	120 V, 50/60 Hz	includes 24 x 1.5/2.0 mL rotor and 18x2 0/0.5 mL rotor	IVD	75002590
MTR 21	230 V, 50/60 Hz	includes 24 x 1.5/2.0 mL rotor and 18x2 0/0.5 mL rotor	IVD	75002594