

NMR CONSUMABLES AND ACCESSORIES



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Features

- Control temperature from -90°C to +100°C
- Flow rate of up to 2 scfm for solid state NMR samples
- $\pm 0.1^\circ\text{C}$ temperature stability
- Digital Temperature Control
- Choice of multiple non-magnetic delivery line lengths
- CE compliant

FTS Systems AirJet™ XR sample coolers provide sample temperature control for X-ray diffraction, NMR, EPR, and other applications. These mechanically-refrigerated systems control the temperature of a supplied gas stream to between -90°C and +100°C. An optional air dryer allows for the use of a house-compressed air supply. The unique temperature controller provides precise regulation of heat input to produce a temperature stability of $\pm 0.1^\circ\text{C}$. The non-magnetic variable length flexible delivery lines allow you to position the air stream for proper sample temperature control.



AirJet™ XR

Sample Cooler

for Liquid- and Solid-State NMR

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NMR Tube Technical Information

Outer Diameter & Inner Diameter

Outer Diameter (O.D.) - A measure of the distance across the center of the tube from the outermost surfaces.

Inner Diameter (I.D.) - A measure of the distance across the center of the tube from the innermost surfaces.

Concentricity

A measurement of variation in the radial centers, measured at the inner and outer walls.

Concentricity can be thought of as the degree to which the cylinders defined by the inner and outer surfaces of the tube are parallel. If the inner surface deviates and becomes closer to the outer surface that will cause one portion of the tube to have a smaller wall thickness than the other.

Camber

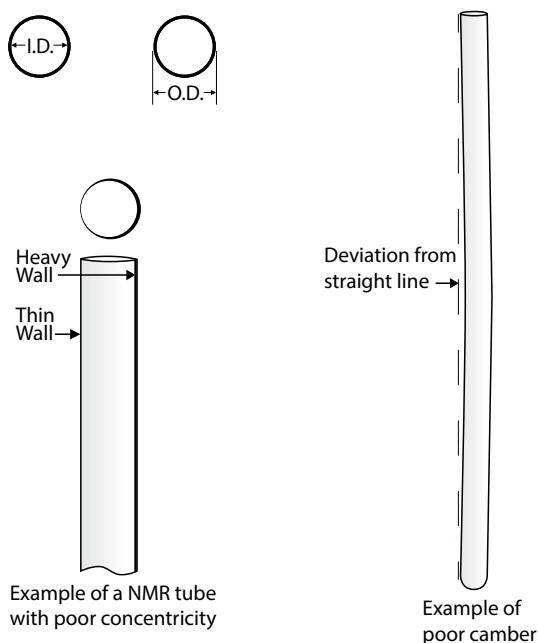
The lack of straightness of an NMR tube.

The camber of an NMR tube is measured by holding the tube on both ends and rotating it. During rotation, gauges measure the deflection in the middle of the tube giving a (+/-) deviation reading. All Wilmad-LabGlass Precision & Economy Thin-Walled tubes are guaranteed to have deviations less than 53.34 μm and can be expected to spin reliably.

Why it's Important

An NMR tube with poor O.D. & I.D. tolerances, concentricity, or camber can produce undesirable experimental outcomes such as...

- Tube rupture when the I.D. is too small and inserts are used
- Modulation sidebands and decreased spectral quality when the concentricity or camber is large
- Tube slipping or wobbling when the O.D. is too small which can cause major probe damage
- NMR tube breakage due to probe contact when the O.D. or Camber is too large causing instrument downtime & contamination



Liquid Phase NMR

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Precision Glass for Every Industry

Full Selection of Glassware and Equipment for all markets and industries.

Wilmad-LabGlass offers glass repair, design services, OEM glass manufacturing, and custom glassware in borosilicate & Quartz.



Product Lines

Lab Equipment



- Circulators
- Distillation
- Evaporation
- Liquid Transfer
- Pilot Plant Reactor
- Stirring/Mixing
- Vortexers



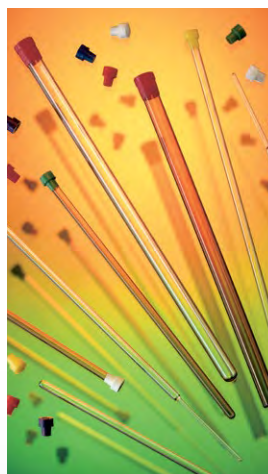
Precision Glass

- Glass Tubing
- Flow Meters
- Syringe Barrels
- Electronics Envelopes
- Glass to Metal Seals
- Ceramic Valves
- Diode Laser Substrates
- Sapphire Windows
- Surgical Implants
- Micro Array Slides
- Microwave Guides

Lab Glassware



- Air-Tite
- ASTM
- Dissolution
- Extraction
- Filtration
- Lab Kits
- Reaction Apparatus
- Standard Lab Glassware
- Custom Lab Glassware



NMR/EPR Consumables & Accessories

- Spinner & Washers
- L, S, X, Q, & W-Band
- EPR Tubes
- VT Dewar
- Gas Transfer Lines
- EPR References
- EPR Aqueous Cells
- Standard NMR Tubes
- Small Volume Inserts
- Gas-tight Tubes
- NMR References
- Solid-State Rotors

Glass Repair

- 3 Repair Centers
- Fast Turnaround
- Less costly than replacement

Served Markets

- Chemical
- Laboratory Instrumentation
- Education
- Healthcare
- Pharmaceutical
- Life Science
- Material Science
- Government
- Petrochemical
- Academic Research
- Food Science
- Quality Assurance

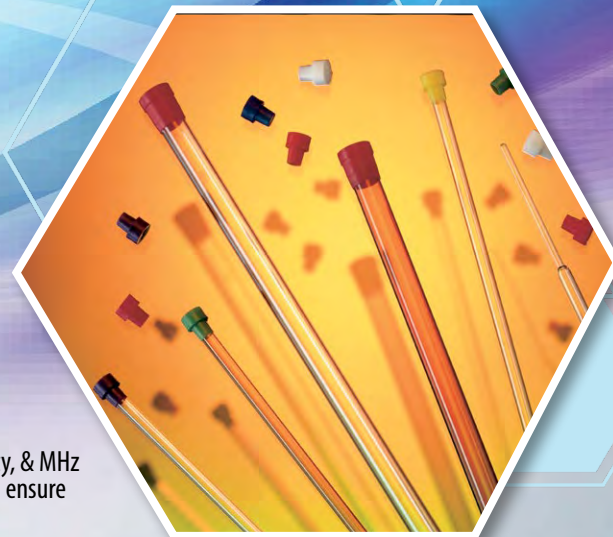


Standard Liquid Phase NMR Consumables



Technical Tubes

Always confirm the camber, concentricity, & MHz rating are correct for your experiment to ensure the highest spectral quality.



5mm Thin-Wall NMR Tube Comparison Table

| | High-Throughput | Economy | Precision (Glass) | Precision (Quartz) | Precision (Suprasil) |
|--|---|---|---|--|--|
| Material | Type 1 Class B Borosilicate Glass | Type 1 Class B Borosilicate Glass | Type 1 Class A Borosilicate Glass | Clear Fused Quartz | Synthetic Quartz |
| Impact On Shimming Quality By Paramagnetic Impurities | Medium (1200ppm Fe ₂ O ₃) | Medium (1200ppm Fe ₂ O ₃) | Small (400ppm Fe ₂ O ₃) | None (0.5ppm Fe ₂ O ₃) | None (<0.005ppm Fe ₂ O ₃) |
| Rapid Cooling/ Heating | No | No | Yes, within 120° C | Yes, within 300° C | Yes, within 300° C |
| Maximum Working Temperature | Ambient | Ambient | 230° C | 1300° C | 1300° C |
| Sample Volume Reproducibility | 10% | 10% | 0.5% | 0.5% | 0.5% |
| Cut-Off Wavelength | 320 nm | 320 nm | 320 nm | 265 nm | 190 nm |
| Averaged Sample Volume Within Rf Coil | 125 µl/cm | 125 µl/cm | 140 µl/cm | 140 µl/cm | 140 µl/cm |
| Outer Diameter | 4.95±0.02mm | 4.95±0.02mm | 4.9635±0.0065mm | 4.9635±0.0065mm | 4.9635±0.0065mm |
| Compatible With Small-Volume Inserts | No | No | Yes | Yes | Yes |
| Recommended Applications | Small molecule experiments up to 600 MHz (MW<250) | 1D NMR experiments with small organic molecules (MW<1500) | Experiments requiring critical shimming quality (high-field, multi-dimension, multi-nuclei) | ¹¹ B NMR, rapid cooling/heating experiments, photochemistry studies | Photochemistry studies with deep UV light source |

Standard Liquid Phase NMR Consumables

Precision NMR Tubes

To maximize SNR, Precision NMR Tubes have minimal paramagnetic impurities that would impact shimming. Tight I.D. and O.D. tolerances as small as 0.0065mm accommodate Wilmad inserts.

- Manufactured in a state-of-the-art ISO 9001:2015 USA facility using a unique precision shrinking and grinding process to shape the inner surface with maximized filling factor
- Inner surface is resistant to strong acid and base at ambient temperature
- Can be operated safely at temperatures up to 230° C, and within a temperature step of 120° C
- Rated as hydrolytic class 1
- Ideal for experiments requiring critical shimming quality (high/ultrahigh field, multi-dimensional, multi-nuclei, DNP experiments and studies involving biological samples)
- Made from borosilicate glass that meets the requirement of Type 1 Class A glass from ASTM E438
- 100% inspection with multiple NIST traceable gauges and optical surface defect checks
- Includes disposable cap



Note: Caps are not recommended for use with samples dissolved in chloroform-d or acetone-d₆.

Wilmad 3mm O.D. Thin Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|--------------------------|------------|--------|-----------------|---------------|--------|-----------------|----------------|
| 341-PP-7 | 800 | 7" | 2.9935±0.0065mm | 3.8 µm | 3.8 µm | 2.4195±0.0065mm | 0.29mm |
| 341-PP-8 | 800 | 8" | 2.9935±0.0065mm | 3.8 µm | 3.8 µm | 2.4195±0.0065mm | 0.29mm |
| 335-PP-7 | 600 | 7" | 2.9935±0.0065mm | 13 µm | 6 µm | 2.4195±0.0065mm | 0.29mm |
| 335-PP-8 | 600 | 8" | 2.9935±0.0065mm | 13 µm | 6 µm | 2.4195±0.0065mm | 0.29mm |
| 335-PP-9 | 600 | 9" | 2.9935±0.0065mm | 13 µm | 6 µm | 2.4195±0.0065mm | 0.29mm |
| 328-PP-7 | 500 | 7" | 2.9935±0.0065mm | 25 µm | 13 µm | 2.4195±0.0065mm | 0.29mm |
| 328-PP-8 | 500 | 8" | 2.9935±0.0065mm | 25 µm | 13 µm | 2.4195±0.0065mm | 0.29mm |
| 328-PP-9 | 500 | 9" | 2.9935±0.0065mm | 25 µm | 13 µm | 2.4195±0.0065mm | 0.29mm |
| 327-PP-7 | 400 | 7" | 2.9935±0.0065mm | 25 µm | 25 µm | 2.4195±0.0065mm | 0.29mm |
| 327-PP-8 | 400 | 8" | 2.9935±0.0065mm | 25 µm | 25 µm | 2.4195±0.0065mm | 0.29mm |
| 327-PP-9 | 400 | 9" | 2.9935±0.0065mm | 25 µm | 25 µm | 2.4195±0.0065mm | 0.29mm |
| 307-PP-7 | 300 | 7" | 2.9935±0.0065mm | 51 µm | 25 µm | 2.4195±0.0065mm | 0.29mm |
| 307-PP-8 | 300 | 8" | 2.9935±0.0065mm | 51 µm | 25 µm | 2.4195±0.0065mm | 0.29mm |
| 307-PP-9 | 300 | 9" | 2.9935±0.0065mm | 51 µm | 25 µm | 2.4195±0.0065mm | 0.29mm |
| 305-PS-7 | 200 | 7" | 2.9935±0.0065mm | 76 µm | 51 µm | 2.413±0.13mm | 0.29mm |
| 305-PS-8 | 200 | 8" | 2.9935±0.0065mm | 76 µm | 51 µm | 2.413±0.13mm | 0.29mm |
| 305-PS-9 | 200 | 9" | 2.9935±0.0065mm | 76 µm | 51 µm | 2.413±0.13mm | 0.29mm |

Wilmad 4mm O.D. Thin Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|--------------------------|------------|--------|-----------------|---------------|--------|---------------|----------------|
| 435-PP-7 | 600 | 7" | 3.9835±0.0065mm | 13 µm | 6 µm | 3.240±0.013mm | 0.38mm |
| 427-PP-7 | 400 | 7" | 3.9835±0.0065mm | 25 µm | 25 µm | 3.240±0.013mm | 0.38mm |
| 427-PP-8 | 400 | 8" | 3.9835±0.0065mm | 25 µm | 25 µm | 3.240±0.013mm | 0.38mm |
| 427-PP-9 | 400 | 9" | 3.9835±0.0065mm | 25 µm | 25 µm | 3.240±0.013mm | 0.38mm |
| 406-PP-7 | 300 | 7" | 3.9835±0.0065mm | 76 µm | 51 µm | 3.240±0.013mm | 0.38mm |
| 406-PP-8 | 300 | 8" | 3.9835±0.0065mm | 76 µm | 51 µm | 3.240±0.013mm | 0.38mm |
| 406-PP-9 | 300 | 9" | 3.9835±0.0065mm | 76 µm | 51 µm | 3.240±0.013mm | 0.38mm |
| 405-PS-7 | 100 | 7" | 3.9835±0.0065mm | 152 µm | 51 µm | 3.2mm | 0.4mm |
| 405-PS-8 | 100 | 8" | 3.9835±0.0065mm | 152 µm | 51 µm | 3.2mm | 0.4mm |
| 405-PS-9 | 100 | 9" | 3.9835±0.0065mm | 152 µm | 51 µm | 3.2mm | 0.4mm |

Wilmad 5mm O.D. Thin Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|--------------------------|------------|--------|-----------------|---------------|--------|-----------------|----------------|
| 542-PP-7 | 1000 | 7" | 4.9635±0.0065mm | 2.5 µm | 3.8 µm | 4.2065±0.0065mm | 0.38mm |
| 542-PP-8 | 1000 | 8" | 4.9635±0.0065mm | 2.5 µm | 3.8 µm | 4.2065±0.0065mm | 0.38mm |
| 541-PP-7 | 800 | 7" | 4.9635±0.0065mm | 3.8 µm | 3.8 µm | 4.2065±0.0065mm | 0.38mm |
| 541-PP-8 | 800 | 8" | 4.9635±0.0065mm | 3.8 µm | 3.8 µm | 4.2065±0.0065mm | 0.38mm |
| 535-PP-7 | 600 | 7" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.2065±0.0065mm | 0.38mm |
| 535-PP-8 | 600 | 8" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.2065±0.0065mm | 0.38mm |
| 535-PP-9 | 600 | 9" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.2065±0.0065mm | 0.38mm |
| 528-PP-7 | 500 | 7" | 4.9635±0.0065mm | 25 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 528-PP-8 | 500 | 8" | 4.9635±0.0065mm | 25 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 528-PP-9 | 500 | 9" | 4.9635±0.0065mm | 25 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 527-PP-7 | 400 | 7" | 4.9635±0.0065mm | 25 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |
| 527-PP-8 | 400 | 8" | 4.9635±0.0065mm | 25 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |
| 527-PP-9 | 400 | 9" | 4.9635±0.0065mm | 25 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |
| 526-PP-7 | 350 | 7" | 4.9635±0.0065mm | 51 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 526-PP-8 | 350 | 8" | 4.9635±0.0065mm | 51 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 526-PP-9 | 350 | 9" | 4.9635±0.0065mm | 51 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 507-PP-7 | 300 | 7" | 4.9635±0.0065mm | 51 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |
| 507-PP-8 | 300 | 8" | 4.9635±0.0065mm | 51 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |
| 507-PP-9 | 300 | 9" | 4.9635±0.0065mm | 51 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |
| 506-PP-7 | 200 | 7" | 4.9635±0.0065mm | 51 µm | 51 µm | 4.2065±0.0065mm | 0.38mm |
| 506-PP-8 | 200 | 8" | 4.9635±0.0065mm | 51 µm | 51 µm | 4.2065±0.0065mm | 0.38mm |
| 506-PP-9 | 200 | 9" | 4.9635±0.0065mm | 51 µm | 51 µm | 4.2065±0.0065mm | 0.38mm |
| 505-PS-7 | 100 | 7" | 4.9635±0.0065mm | 76 µm | 51 µm | 4.21±0.13mm | 0.38mm |
| 505-PS-8 | 100 | 8" | 4.9635±0.0065mm | 76 µm | 51 µm | 4.21±0.13mm | 0.38mm |
| 505-PS-9 | 100 | 9" | 4.9635±0.0065mm | 76 µm | 51 µm | 4.21±0.13mm | 0.38mm |

Standard Liquid Phase NMR Consumables

Wilmad 5mm O.D. Ultra-Thin Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|---------------------------|------------|--------|-----------------|---------------|--------|-----------------|----------------|
| 545-PPT-7 | 600 | 7" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.4965±0.0065mm | 0.24mm |
| 545-PPT-8 | 600 | 8" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.4965±0.0065mm | 0.24mm |
| 545-PPT-9 | 600 | 9" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.4965±0.0065mm | 0.24mm |
| 540-PPT-7 | 400 | 7" | 4.9635±0.0065mm | 25 µm | 13 µm | 4.4965±0.0065mm | 0.24mm |
| 540-PPT-8 | 400 | 8" | 4.9635±0.0065mm | 25 µm | 13 µm | 4.4965±0.0065mm | 0.24mm |
| 540-PPT-9 | 400 | 9" | 4.9635±0.0065mm | 25 µm | 13 µm | 4.4965±0.0065mm | 0.24mm |
| 537-PPT-7 | 300 | 7" | 4.9635±0.0065mm | 51 µm | 25 µm | 4.4965±0.0065mm | 0.24mm |
| 537-PPT-8 | 300 | 8" | 4.9635±0.0065mm | 51 µm | 25 µm | 4.4965±0.0065mm | 0.24mm |
| 537-PPT-9 | 300 | 9" | 4.9635±0.0065mm | 51 µm | 25 µm | 4.4965±0.0065mm | 0.24mm |

Wilmad 5mm O.D. Medium Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|--------------------------|------------|--------|-----------------|---------------|--------|-------------|----------------|
| 524-PP-7 | 400 | 7" | 4.9635±0.0065mm | 76 µm | 51 µm | 3.43±0.13mm | 0.77mm |
| 524-PP-8 | 400 | 8" | 4.9635±0.0065mm | 76 µm | 51 µm | 3.43±0.13mm | 0.77mm |
| 524-PP-9 | 400 | 9" | 4.9635±0.0065mm | 76 µm | 51 µm | 3.43±0.13mm | 0.77mm |
| 504-PP-7 | 300 | 7" | 4.9635±0.0065mm | 152 µm | 51 µm | 3.43±0.13mm | 0.77mm |
| 504-PP-8 | 300 | 8" | 4.9635±0.0065mm | 152 µm | 51 µm | 3.43±0.13mm | 0.77mm |
| 504-PP-9 | 300 | 9" | 4.9635±0.0065mm | 152 µm | 51 µm | 3.43±0.13mm | 0.77mm |
| 503-PS-7 | 100 | 7" | 4.9635±0.0065mm | 76 µm | 51 µm | 3.43±0.13mm | 0.77mm |
| 503-PS-8 | 100 | 8" | 4.9635±0.0065mm | 76 µm | 51 µm | 3.43±0.13mm | 0.77mm |
| 503-PS-9 | 100 | 9" | 4.9635±0.0065mm | 76 µm | 51 µm | 3.43±0.13mm | 0.77mm |

Wilmad 5mm O.D. Heavy Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|--------------------------|------------|--------|-----------------|---------------|--------|---------------|----------------|
| 522-PP-7 | 500 | 7" | 4.9635±0.0065mm | 51 µm | 51 µm | 2.160±0.013mm | 1.4mm |
| 522-PP-8 | 500 | 8" | 4.9635±0.0065mm | 51 µm | 51 µm | 2.160±0.013mm | 1.4mm |
| 522-PP-9 | 500 | 9" | 4.9635±0.0065mm | 51 µm | 51 µm | 2.160±0.013mm | 1.4mm |
| 502-PP-7 | 300 | 7" | 4.9635±0.0065mm | 152 µm | 51 µm | 2.160±0.013mm | 1.4mm |
| 502-PP-8 | 300 | 8" | 4.9635±0.0065mm | 152 µm | 51 µm | 2.160±0.013mm | 1.4mm |
| 502-PP-9 | 300 | 9" | 4.9635±0.0065mm | 152 µm | 51 µm | 2.160±0.013mm | 1.4mm |
| 501-PS-7 | 100 | 7" | 4.9635±0.0065mm | 152 µm | 51 µm | 2.16±0.13mm | 1.4mm |
| 501-PS-8 | 100 | 8" | 4.9635±0.0065mm | 152 µm | 51 µm | 2.16±0.13mm | 1.4mm |
| 501-PS-9 | 100 | 9" | 4.9635±0.0065mm | 152 µm | 51 µm | 2.16±0.13mm | 1.4mm |

Wilmad 6.5mm O.D. Thin Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|--------------------------|------------|--------|-----------------|---------------|--------|-------------|----------------|
| 6.5-PP-7 | 400 | 7" | 6.5135±0.0065mm | 51 µm | 13 µm | 5.7±0.013mm | 0.41mm |
| 6.5-PP-8 | 400 | 8" | 6.5135±0.0065mm | 51 µm | 13 µm | 5.7±0.013mm | 0.41mm |
| 6.5-PP-9 | 400 | 9" | 6.5135±0.0065mm | 51 µm | 13 µm | 5.7±0.013mm | 0.41mm |

Wilmad 7.5mm O.D. Thin Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|----------------------------|------------|--------|-----------------|---------------|--------|---------------|----------------|
| 513B-7PP-7 | 400 | 7" | 7.4835±0.0065mm | 38 µm | 13 µm | 6.480±0.013mm | 0.51mm |
| 513B-7PP-8 | 400 | 8" | 7.4835±0.0065mm | 38 µm | 13 µm | 6.480±0.013mm | 0.51mm |
| 513B-7PP-9 | 400 | 9" | 7.4835±0.0065mm | 38 µm | 13 µm | 6.480±0.013mm | 0.51mm |
| 513B-1PP-7 | 100 | 7" | 7.4835±0.0065mm | 254 µm | 51 µm | 6.480±0.013mm | 0.51mm |
| 513B-1PP-8 | 100 | 8" | 7.4835±0.0065mm | 254 µm | 51 µm | 6.480±0.013mm | 0.51mm |
| 513B-1PP-9 | 100 | 9" | 7.4835±0.0065mm | 254 µm | 51 µm | 6.480±0.013mm | 0.51mm |

Wilmad 8mm O.D. Thin Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|----------------------------|------------|--------|-----------------|---------------|--------|---------------|----------------|
| 513A-9PP-7 | 500 | 7" | 7.9935±0.0065mm | 13 µm | 13 µm | 6.990±0.013mm | 0.51mm |
| 513A-9PP-8 | 500 | 8" | 7.9935±0.0065mm | 13 µm | 13 µm | 6.990±0.013mm | 0.51mm |
| 513A-9PP-9 | 500 | 9" | 7.9935±0.0065mm | 13 µm | 13 µm | 6.990±0.013mm | 0.51mm |
| 513A-7PP-7 | 400 | 7" | 7.9935±0.0065mm | 38 µm | 13 µm | 6.990±0.013mm | 0.51mm |
| 513A-7PP-8 | 400 | 8" | 7.9935±0.0065mm | 38 µm | 13 µm | 6.990±0.013mm | 0.51mm |
| 513A-5PP-7 | 350 | 7" | 7.9935±0.0065mm | 51 µm | 25 µm | 6.990±0.013mm | 0.51mm |
| 513A-5PP-8 | 350 | 8" | 7.9935±0.0065mm | 51 µm | 25 µm | 6.990±0.013mm | 0.51mm |
| 513A-3PP-7 | 300 | 7" | 7.9935±0.0065mm | 76 µm | 38 µm | 6.990±0.013mm | 0.51mm |
| 513A-3PP-8 | 300 | 8" | 7.9935±0.0065mm | 76 µm | 38 µm | 6.990±0.013mm | 0.51mm |
| 513A-1PP-7 | 60 | 7" | 7.9935±0.0065mm | 254 µm | 51 µm | 6.990±0.013mm | 0.51mm |
| 513A-1PP-8 | 60 | 8" | 7.9935±0.0065mm | 254 µm | 51 µm | 6.990±0.013mm | 0.51mm |
| 513A-1PP-9 | 60 | 9" | 7.9935±0.0065mm | 254 µm | 51 µm | 6.990±0.013mm | 0.51mm |

Standard Liquid Phase NMR Consumables

Wilmad 10mm O.D. Thin Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|---------------------------|------------|--------|-----------------|---------------|--------|---------------|----------------|
| 513-7PP-7 | 500 | 7" | 9.9935±0.0065mm | 38 µm | 13 µm | 9.070±0.013mm | 0.46mm |
| 513-7PP-8 | 500 | 8" | 9.9935±0.0065mm | 38 µm | 13 µm | 9.070±0.013mm | 0.46mm |
| 513-7PP-9 | 500 | 9" | 9.9935±0.0065mm | 38 µm | 13 µm | 9.070±0.013mm | 0.46mm |
| 513-5PP-7 | 400 | 7" | 9.9935±0.0065mm | 51 µm | 25 µm | 9.070±0.013mm | 0.46mm |
| 513-5PP-8 | 400 | 8" | 9.9935±0.0065mm | 51 µm | 25 µm | 9.070±0.013mm | 0.46mm |
| 513-5PP-9 | 400 | 9" | 9.9935±0.0065mm | 51 µm | 25 µm | 9.070±0.013mm | 0.46mm |
| 513-3PP-7 | 300 | 7" | 9.9935±0.0065mm | 76 µm | 38 µm | 9.070±0.013mm | 0.46mm |
| 513-3PP-8 | 300 | 8" | 9.9935±0.0065mm | 76 µm | 38 µm | 9.070±0.013mm | 0.46mm |
| 513-3PP-9 | 300 | 9" | 9.9935±0.0065mm | 76 µm | 38 µm | 9.070±0.013mm | 0.46mm |
| 513-1PP-7 | 200 | 7" | 9.9935±0.0065mm | 254 µm | 51 µm | 9.070±0.013mm | 0.46mm |
| 513-1PP-8 | 200 | 8" | 9.9935±0.0065mm | 254 µm | 51 µm | 9.070±0.013mm | 0.46mm |
| 513-1PP-9 | 200 | 9" | 9.9935±0.0065mm | 254 µm | 51 µm | 9.070±0.013mm | 0.46mm |
| 513-1PS-7 | 100 | 7" | 9.9935±0.0065mm | 254 µm | 51 µm | 8.90±0.13mm | 0.55mm |
| 513-1PS-8 | 100 | 8" | 9.9935±0.0065mm | 254 µm | 51 µm | 8.90±0.13mm | 0.55mm |
| 513-1PS-9 | 100 | 9" | 9.9935±0.0065mm | 254 µm | 51 µm | 8.90±0.13mm | 0.55mm |

Wilmad 10mm O.D. Medium Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|----------------------------|------------|--------|-----------------|---------------|--------|---------------|----------------|
| 513-7PPM-7 | 200 | 7" | 9.9935±0.0065mm | 38 µm | 13 µm | 8.160±0.013mm | 0.92mm |
| 513-7PPM-8 | 200 | 8" | 9.9935±0.0065mm | 38 µm | 13 µm | 8.160±0.013mm | 0.92mm |
| 513-7PPM-9 | 200 | 9" | 9.9935±0.0065mm | 38 µm | 13 µm | 8.160±0.013mm | 0.92mm |

Wilmad 10mm O.D. Heavy Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|----------------------------|------------|--------|-----------------|---------------|--------|---------------|----------------|
| 513-7PPH-7 | 450 | 7" | 9.9935±0.0065mm | 51 µm | 13 µm | 7.100±0.013mm | 1.45mm |
| 513-7PPH-8 | 450 | 8" | 9.9935±0.0065mm | 51 µm | 13 µm | 7.100±0.013mm | 1.45mm |
| 513-7PPH-9 | 450 | 9" | 9.9935±0.0065mm | 51 µm | 13 µm | 7.100±0.013mm | 1.45mm |

Wilmad 12mm O.D. Thin Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|----------------------------|------------|--------|----------------|---------------|--------|----------------|----------------|
| 514A-7PP-7 | 400 | 7" | 12.065±0.008mm | 38 µm | 13 µm | 11.050±0.013mm | 0.51mm |
| 514A-7PP-8 | 400 | 8" | 12.065±0.008mm | 38 µm | 13 µm | 11.050±0.013mm | 0.51mm |
| 514A-7PP-9 | 400 | 9" | 12.065±0.008mm | 38 µm | 13 µm | 11.050±0.013mm | 0.51mm |

Wilmad 18mm O.D. Medium Walled Precision NMR Tubes

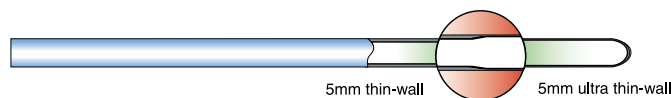
| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|-------------------------|------------|--------|----------------|---------------|--------|---------------|----------------|
| 18-PP-7 | 350 | 7" | 18.000±0.013mm | 51 µm | 25 µm | 17.00±0.013mm | 0.50mm |
| 18-PP-8 | 350 | 8" | 18.000±0.013mm | 51 µm | 25 µm | 17.00±0.013mm | 0.50mm |
| 18-PP-9 | 350 | 9" | 18.000±0.013mm | 51 µm | 25 µm | 17.00±0.013mm | 0.50mm |

Wilmad 20mm O.D. Medium Walled Precision NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|------------------------|------------|--------|----------------|---------------|--------|----------------|----------------|
| 20-9-7 | 350 | 7" | 20.000±0.013mm | 51 µm | 25 µm | 18.050±0.013mm | 0.97mm |
| 20-9-8 | 350 | 8" | 20.000±0.013mm | 51 µm | 25 µm | 18.050±0.013mm | 0.97mm |
| 20-9-9 | 350 | 9" | 20.000±0.013mm | 51 µm | 25 µm | 18.050±0.013mm | 0.97mm |

Wilmad Precision Step-Down Tubes

Precision Step-Down Tubes change wall thickness from Thin-Wall to Ultra Thin-Wall within the Rf coil limit. This change in wall thickness allows for 15% more sample volume and a less fragile tube than standard Ultra Thin-Walled tubes.



Wilmad 5mm O.D. Step-Down Ultra-Thin Walled Precision NMR Tubes

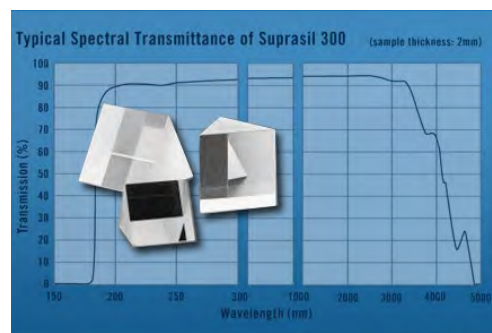
| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | Bottom I.D. | Bottom Wall Thickness |
|---------------------------|------------|--------|-----------------|---------------|--------|-----------------|-----------------------|
| 555-PPT-7 | 600 | 7" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.4965±0.0065mm | 0.24mm |
| 555-PPT-8 | 600 | 8" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.4965±0.0065mm | 0.24mm |
| 555-PPT-9 | 600 | 9" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.4965±0.0065mm | 0.24mm |

Standard Liquid Phase NMR Consumables

Wilmad Precision NMR Suprasil® (Synthetic Quartz) Tubes

Wilmad Precision NMR Suprasil® (Synthetic Quartz) Tubes are manufactured from high purity synthetic fused silica materials with <0.005ppm Fe₂O₃ and outstanding optical characteristics in the deep UV to the near IR.

- Transmission rate from 190nm to 2600nm is well over 95% (10mm thickness) excluding reflection
- Possesses a similar thermal expansion rate and tensile strength as natural quartz which is 14 times more robust during the cooling/heating process than Type 1 Class A glass
- Tight I.D. and O.D. tolerance as small as 0.0065mm accommodates Wilmad inserts
- To maximize SNR, Wilmad Precision NMR Suprasil® Tubes have minimal paramagnetic impurities that would impact shimming
- Manufactured in a state-of-the-art ISO 9001:2015 USA facility using a unique precision shrinking and grinding process to shape the inner surface with maximized filling factor
- Inner surface is resistant to strong acid and base at ambient temperature
- Ideal for photolysis experiments that employ 266nm light from a Q-Switched laser or 254nm light emitted by a mercury low pressure lamp with a Schott UG 5 filter, as well as variable temperature experiments that have a temperature step over 120°C
- Safe for experiments at temperatures up to 1300°C
- 100% inspection with multiple NIST traceable gauges and optical surface defect checks
- Includes disposable cap



Note: Caps are not recommended for use with samples dissolved in chloroform-d or acetone-d₆.

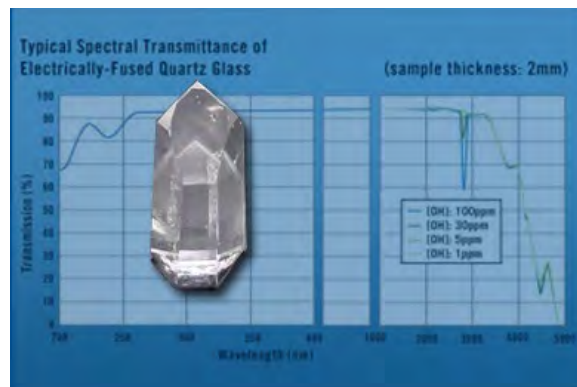
Wilmad 5mm O.D. Thin Walled Suprasil® NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|-----------------------------|------------|--------|-----------------|---------------|--------|-----------------|----------------|
| 535-PP-7SUP | 600 | 7" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.2065±0.0065mm | 0.38mm |
| 535-PP-8SUP | 600 | 8" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.2065±0.0065mm | 0.38mm |
| 535-PP-9SUP | 600 | 9" | 4.9635±0.0065mm | 13 µm | 6 µm | 4.2065±0.0065mm | 0.38mm |
| 528-PP-7SUP | 500 | 7" | 4.9635±0.0065mm | 25 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 528-PP-8SUP | 500 | 8" | 4.9635±0.0065mm | 25 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 528-PP-9SUP | 500 | 9" | 4.9635±0.0065mm | 25 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 507-PP-7SUP | 300 | 7" | 4.9635±0.0065mm | 51 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |
| 507-PP-8SUP | 300 | 8" | 4.9635±0.0065mm | 51 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |
| 507-PP-9SUP | 300 | 9" | 4.9635±0.0065mm | 51 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |

Wilmad Precision NMR Quartz Tubes

Wilmad Precision NMR Quartz Tubes have an extremely low thermal expansion rate and high tensile strength which is 14 times more robust during the cooling/heating process than Type 1 Class A glass tubes.

- Naturally occurring quartz maintains an over 85% transmission rate (10 mm thickness, with consideration of reflection loss) above 265nm that makes quartz tubes preferable in photochemistry studies
- Half the dielectric constant of Pyrex® glass helps improve the quality factor
- Low Boron density at or below 0.1 ppm guarantees a clean background in Boron-11 NMR studies
- Tight I.D. and O.D. tolerance as small as 0.0065mm accommodates Wilmad inserts
- To maximize SNR, Precision NMR Quartz Tubes have minimal paramagnetic impurities that would impact shimming
- Manufactured in a state-of-the-art ISO 9001:2015 USA facility using a unique precision shrinking and grinding process to shape the inner surface with maximized filling factor
- Ideal for variable temperature experiments that have a temperature step over 120°C as well as experiments at temperatures up to 1300°C
- Inner surface is resistant to strong acid and base at ambient temperature
- 100% inspection with multiple NIST traceable gauges and optical surface defect checks
- Includes disposable cap



Note: Caps are not recommended for use with samples dissolved in chloroform-d or acetone-d₆.

Wilmad 5mm O.D. Thin Walled Quartz NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|-----------------------------|------------|--------|----------------|---------------|--------|-----------------|----------------|
| 535-PP-7QTZ | 600 | 7" | 4.936±0.0065mm | 13 µm | 6 µm | 4.2065±0.0065mm | 0.38mm |
| 535-PP-8QTZ | 600 | 8" | 4.936±0.0065mm | 13 µm | 6 µm | 4.2065±0.0065mm | 0.38mm |
| 535-PP-9QTZ | 600 | 9" | 4.936±0.0065mm | 13 µm | 6 µm | 4.2065±0.0065mm | 0.38mm |
| 528-PP-7QTZ | 500 | 7" | 4.936±0.0065mm | 25 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 528-PP-8QTZ | 500 | 8" | 4.936±0.0065mm | 25 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 528-PP-9QTZ | 500 | 9" | 4.936±0.0065mm | 25 µm | 13 µm | 4.2065±0.0065mm | 0.38mm |
| 507-PP-7QTZ | 300 | 7" | 4.936±0.0065mm | 51 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |
| 507-PP-8QTZ | 300 | 8" | 4.936±0.0065mm | 51 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |
| 507-PP-9QTZ | 300 | 9" | 4.936±0.0065mm | 51 µm | 25 µm | 4.2065±0.0065mm | 0.38mm |

Wilmad 10mm O.D. Thin Walled Quartz NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|------------------------------|------------|--------|-----------------|---------------|--------|---------------|----------------|
| 513-7PP-7QTZ | 400 | 7" | 9.9935±0.0065mm | 38 µm | 13 µm | 9.070±0.013mm | 0.46mm |
| 513-7PP-8QTZ | 400 | 8" | 9.9935±0.0065mm | 38 µm | 13 µm | 9.070±0.013mm | 0.46mm |
| 513-7PP-9QTZ | 400 | 9" | 9.9935±0.0065mm | 38 µm | 13 µm | 9.070±0.013mm | 0.46mm |

Standard Liquid Phase NMR Consumables

Wilmad Economy NMR Tubes

Designed for routine use in all NMR spectrometers, Wilmad Economy NMR Tubes are guaranteed to fit tightly in any spinner turbine and have zero NMR background.

- Best O.D. tolerance in the industry and a 30% thicker wall than any competitors' product
- Manufactured in an ISO 9001:2015 USA facility
- Camber and concentricity values listed are the Total Indicator Reading (TIR)
- 100% visual and physical inspection ensures quality, including physical dimensions and surface defects
- Made from borosilicate glass; meets ASTM E438 Type 1 Class B standard, recognized as N51A
- Includes disposable cap
- Recommended only for experiments with small organic molecules (Molecular Weight ~500) at ambient temperatures only
- Cooling/heating of these tubes may lead to breakage; for NMR experiments that involve cooling, heating, biological sample, multi-dimension, multi-nuclei or DNP techniques, refer to Wilmad Precision NMR Tubes



Note: Caps are not recommended for use with samples dissolved in chloroform-d or acetone-d₆.

Wilmad 5mm O.D. Thin Walled Economy NMR Tubes

| Catalog No. | MHz Rating | Length | O.D. | Concentricity | Camber | I.D. | Wall Thickness |
|----------------------------------|------------|--------|-------------------|---------------|--------|-------|----------------|
| WG-1242-7 | 700 | 7" | 4.947±0.019mm | 2.5 µm | 3.8 µm | 4.1mm | 0.43mm |
| WG-1242-8 | 700 | 8" | 4.947±0.019mm | 2.5 µm | 3.8 µm | 4.1mm | 0.43mm |
| WG-1241-7 | 600 | 7" | 4.947±0.019mm | 3.8 µm | 3.8 µm | 4.1mm | 0.43mm |
| WG-1241-8 | 600 | 8" | 4.947±0.019mm | 3.8 µm | 3.8 µm | 4.1mm | 0.43mm |
| WG-1235-7 | 500 | 7" | 4.947±0.019mm | 13 µm | 6 µm | 4.1mm | 0.43mm |
| WG-1235-8 | 500 | 8" | 4.947±0.019mm | 13 µm | 6 µm | 4.1mm | 0.43mm |
| WG-1228-7 | 400 | 7" | 4.947±0.019mm | 13 µm | 13 µm | 4.1mm | 0.43mm |
| WG-1228-8 | 400 | 8" | 4.947±0.019mm | 13 µm | 13 µm | 4.1mm | 0.43mm |
| WG-1226-7 | 300 | 7" | 4.947±0.019mm | 51 µm | 13 µm | 4.1mm | 0.43mm |
| WG-1226-8 | 300 | 8" | 4.947±0.019mm | 51 µm | 13 µm | 4.1mm | 0.43mm |
| WG-1208-7 | 200 | 7" | 4.947±0.019mm | 51 µm | 25 µm | 4.1mm | 0.43mm |
| WG-1208-8 | 200 | 8" | 4.947±0.019mm | 51 µm | 25 µm | 4.1mm | 0.43mm |
| WG-1206-7 | 100 | 7" | 4.947±0.019mm | 51 µm | 50 µm | 4.1mm | 0.43mm |
| WG-1206-8 | 100 | 8" | 4.947±0.019mm | 51 µm | 50 µm | 4.1mm | 0.43mm |
| WG-5MM-ECONOMY-7 | 100 | 7" | 4.94665±0.01905mm | 76 µm | 76 µm | 4.1mm | 0.43mm |
| WG-5MM-ECONOMY-8 | 100 | 8" | 4.94665±0.01905mm | 76 µm | 76 µm | 4.1mm | 0.43mm |
| WG-5MM-ECONOMY-9 | 100 | 9" | 4.94665±0.01905mm | 76 µm | 76 µm | 4.1mm | 0.43mm |

Wilmad Thin Walled High Throughput NMR Tubes

Wilmad Thin Walled High Throughput NMR Tubes have an average camber of 60 microns to guarantee spectral quality for small molecule (MW<250) samples up to 600 MHz.

- Camber and concentricity values listed are the Total Indicator Reading (TIR)
- Designed for routine use in most low to mid field NMR spectrometers
- One of the best O.D. tolerances in the industry
- Made from ASTM E4



- 100% inspected for surface defects and physical dimension to ensure the success of your experiments

Note: Experiments involving cooling, heating, biological sample, multi-dimension, multi-nuclei, or DNP use Precision NMR Tubes.

Wilmad Benchtop Spectrometer NMR Tubes

| Catalog No. | O.D. | Length | MHz Rating | Wall Thickness | Pack Size |
|------------------------------|-------------------|--------|-----------------|----------------|-----------|
| WG-3000-3-50 | 3.0±0.03mm | 3" | High Throughput | 0.27mm | 50 |
| WG-3000-4-50 | 3.0±0.03mm | 4" | High Throughput | 0.27mm | 50 |
| WG-3000-4 | 3.0±0.03mm | 4" | High Throughput | 0.27mm | 100 |
| WG-3000-7-50 | 3.0±0.03mm | 7" | High Throughput | 0.27mm | 50 |
| WG-3000-8-50 | 3.0±0.03mm | 8" | High Throughput | 0.27mm | 50 |
| WG-1000-4 | 4.94665±0.01905mm | 4" | High Throughput | 0.43mm | 100 |
| WG-1000-7-25 | 4.94665±0.01905mm | 7" | High Throughput | 0.43mm | 25 |
| WG-1000-7-50 | 4.94665±0.01905mm | 7" | High Throughput | 0.43mm | 50 |
| WG-1000-7 | 4.94665±0.01905mm | 7" | High Throughput | 0.43mm | 100 |
| WG-1000-8-50 | 4.94665±0.01905mm | 8" | High Throughput | 0.43mm | 50 |
| WG-1000-8 | 4.94665±0.01905mm | 8" | High Throughput | 0.43mm | 100 |
| WG-4000-7 | 9.944±0.025mm | 7" | High Throughput | 0.60mm | 100 |

Large Writing Area High-Throughput NMR Tubes

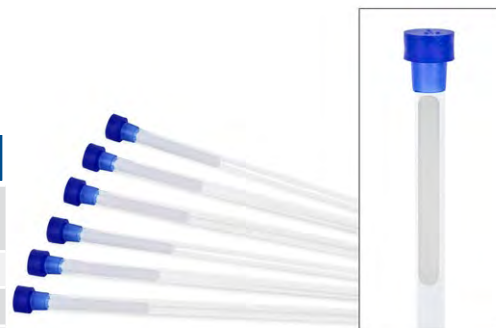
Double the writing area allows for easy sample marking and identification. These High-Throughput tubes have an average camber of 60 microns to ensure spectrum clarity for small molecule (MW<250) samples up to 600 MHz.

- 2x larger marking area eliminates cramped and unreadable sample names
- Packaging allows for easy tube access and storage
- Attractively priced for a high-throughput laboratory environment
- Type 1, Class B Borosilicate glass construction with disposable caps

Note: Not for use with high-field instruments or spinning experiments

Wilmad Large Writing Area NMR Tubes

| Catalog No. | Length | O.D. | Wall Thickness | Package Qty. |
|------------------------------|--------|-------------------|----------------|--------------|
| WG-1003-7 | 7" | 4.94665±0.01905mm | 0.43mm | 100 |
| WG-1003-7-50 | 7" | 4.94665±0.01905mm | 0.43mm | 50 |
| WG-1003-7-25 | 7" | 4.94665±0.01905mm | 0.43mm | 25 |



Wilmad SampleJet NMR Tubes

Wilmad Sample Jet NMR Tubes are manufactured to fit Bruker® SampleJet® caps

Wilmad Bruker® SampleJet® NMR Tubes

| Catalog No. | MHz Rating | O.D. | Length | Wall Thickness | Camber | Pack Qty |
|------------------------------|------------|---------------|---------|----------------|--------|----------|
| WG-1000-4-SJ | 600 | 4.947±0.019mm | 103.5mm | 0.43mm | 60 µm | 100 |
| WG-1000-7-SJ | 600 | 4.947±0.019mm | 178mm | 0.43mm | 60 µm | 100 |
| WG-3000-4-SJ | 600 | 3.0mm | 103.5mm | 0.43mm | 60 µm | 100 |
| WG-3000-7-SJ | 600 | 3.0mm | 178mm | 0.43mm | 60 µm | 100 |



Wilmad SampleJet MicroProbe & MicrCryoProbe NMR Tubes

| Catalog No. | MHz Rating | O.D. | Length | Wall Thickness | Camber | Pack Qty |
|------------------------|------------|--------------|---------|----------------|--------|----------|
| 620-2A | 500 | 1.00±0.019mm | 103.5mm | 0.1mm | 30 µm | 10 |
| 620-2B | 500 | 1.70±0.019mm | 103.5mm | 0.2mm | 30 µm | 10 |
| 620-2F | 500 | 2.50±0.019mm | 103.5mm | 0.2mm | 30 µm | 10 |

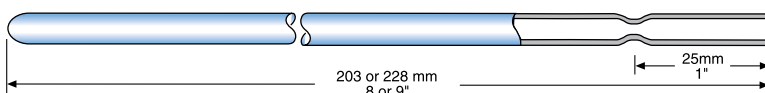
Wilmad Agilent® Automatic Sample Changer NMR Tubes

| Catalog No. | Description | MHz Rating | O.D. | I.D. | Length | Wall Thickness | Pack Qty |
|------------------------------|---|------------|-----------------|-----------------|------------|------------------------|----------|
| 528-PP-4VAR | — | 500 | 4.9635±0.0065mm | 4.2065±0.0065mm | 4.00"±0.01 | 0.38mm (Thin Walled) | 1 |
| 524-PP-4VAR | — | 400 | 4.9635±0.0065mm | 3.43±0.013mm | 4.00"±0.01 | 0.77mm (Medium Walled) | 1 |
| 522-PP-4VAR | — | 400 | 4.9635±0.0065mm | 2.160±0.013mm | 4.00"±0.01 | 1.4mm (Heavy Walled) | 1 |
| 5MM-CAP-POLY | Polypropylene Cap For Automatic Sampler | — | — | — | — | — | 1 |

Constricted NMR Tubes for Flame Seal

Constricted NMR tubes offer the most convenient way to flame-seal an air-sensitive sample. Simply apply vacuum to the tube using our Tip-Off Manifold, then heat the constricted portion and twist off to seal the sample. Order a constricted NMR tube by adding "CONS" to the product number of any Wilmad sample tube. Example: 507-PP-7CONS.

Unless otherwise specified, constrictions are placed 1 inch from top of tube. Order tubes that are 1 inch longer than your required finished length.



Constricted NMR Tubes for Flame Seal

| Tube I.D. | Constricted I.D. |
|-----------|------------------|
| 3-5mm | 1.0mm |
| 6.5-16mm | 2.0mm |
| 18-30mm | 2.0mm |

Wilmad Benchtop Spectrometer NMR Tubes

Ideal for use with 43, 60, & 80MHz manual sample loading benchtop NMR spectrometers, Wilmad-LabGlass Benchtop NMR Tubes have been tested in the most popular benchtop spectrometers to assure performance and give you confidence in purchasing consumables for your instrument.

- 5mm O.D. tubes available in 7" or 8" lengths in quantities of 25 or 150 pieces
- Packaging allows for easy tube access and storage
- Attractively priced for a high-throughput laboratory environment
- Type 1, Class B Borosilicate glass construction with disposable caps

Note: Not for use with high-field instruments or spinning experiments

Wilmad Benchtop Spectrometer NMR Tubes

| Catalog No. | Length | O.D. | Wall Thickness | Package Qty. |
|-------------------------------|--------|------|----------------|--------------|
| WG-BTNMR-7-25 | 7" | 5mm | 0.43mm | 25 |
| WG-BTNMR-7 | 7" | 5mm | 0.43mm | 150 |
| WG-BTNMR-8-25 | 8" | 5mm | 0.43mm | 25 |
| WG-BTNMR-8 | 8" | 5mm | 0.43mm | 150 |



Bar Code NMR Tubes | Thin Walled | ASTM Type 1, Class B Borosilicate Glass

Each tube features a unique 8 digit 1D bar code for easy sample tracking. The bar code paint is resistant to most organic chemicals, including acetone and chloroform. Caps are not included and are purchased separately. The starting and ending tube I.D. numbers for each box are marked on the package.

Bar Code NMR Tubes | Thin Walled | ASTM Type 1, Class B Borosilicate Glass

| Catalog No. | MHz Rating | Length | O.D. | Wall Thickness | Averaged Camber | Package Qty. |
|---------------------------|------------|--------|---------------|----------------|-----------------|--------------------|
| WG-3001-7 | HT | 7" | 3.00 ± 0.03mm | 0.27mm | 60 µm | 50 Tube Twist Pack |

2D Bar Code NMR Tube Labels



Wilmad's 2D Bar Code NMR Tube Labels provide an easy way to integrate NMR sample tracking into lab management software. Each label starts with a letter W and is followed by a unique 7 digit code. The label is chemical resistant.

2D Bar Code NMR Tube Labels

| Catalog No. | Package Qty. |
|-------------|--------------|
| WGL-5D | 50 |

Standard Liquid Phase NMR Consumables

Wilmad Reaction Monitoring System NMR Tubes

Designed to monitor reactions from start to finish, the Wilmad-LabGlass Reaction Monitoring System is a two-chamber borosilicate glass NMR tube that allows for in-tube mixing. The system features an inner chamber with a Teflon® tip that when secured creates a positive seal separating solutions until the user is ready to mix.

- Allows for acquisition of both pre-mix and post-mix spectra
- In situ mixing of solutions provides a clear 'before and after' reaction picture
- Enables specific reaction endpoint determination
- Eliminates variables and reduces risk of contamination during experiments
- May allow for capture of initial kinetic data points in benchtop spectrometers where the upper portion of the sample tube is accessible
- Permits researchers to run reaction experiments without specialized instruments or equipment
- Includes an extra black phenolic cap with a white rubber liner for the outer tube allowing for easy sample storage

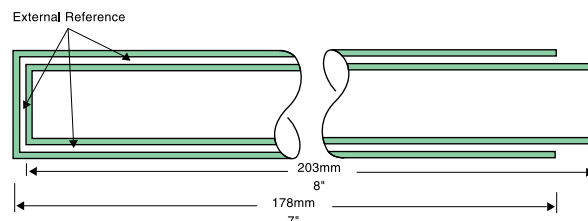


Wilmad 5mm O.D. Reaction Monitoring System NMR Tubes

| Catalog No. | MHz Rating | Outer Tube O.D. | Inner Tube O.D. | Tube Length | Overall Length | Thread Size |
|--------------------------|------------|-----------------|-----------------|-------------|------------------------------------|-------------|
| WG-RMS-7 | 600 | 5mm | 3mm | 7" | 8.75" collapsed 15.75" extended | 15mm O.D. |
| WG-RMS-8 | 600 | 5mm | 3mm | 8" | 9.75" collapsed 17.75" extended | 15mm O.D. |

Double Layered NMR Tube for Toxic Samples

Wilmad's Double Layered Tube provides extra protection for your toxic sample. It can also be used with a reference standard which is insoluble in the sample or may cause a reaction. The Outer tube and inner tube have about a 50 µm gap and the system is ideal for variable temperature studies as the components are made of the same Type 1, Class A borosilicate glass. Each insert fits snugly into the outer tube like a syringe plunger fits its barrel.



Wilmad Double Layered NMR Tubes

| Product No. | MHz Rating | Components | O.D. | I.D. |
|---------------------------|------------|----------------------------|---------|--------|
| 516-CC-3 | 600 | Complete Set | 3.00mm | 1.07mm |
| 516-CC-5 | 600 | Complete Set | 5.00mm | 2.97mm |
| 516-CC-10 | 600 | Complete Set | 10.00mm | 7.87mm |
| 516-O-3 | 600 | Outer Tube | 3.00mm | 1.93mm |
| 516-O-5 | 600 | Outer Tube | 5.00mm | 4.07mm |
| 516-O-10 | 600 | Outer Tube | 10.00mm | 8.99mm |
| 516-I-3 | N/A | Inner Insert for 516-CC-3 | 1.83mm | 1.07mm |
| 516-I-5 | N/A | Inner Insert for 516-CC-5 | 3.97mm | 2.97mm |
| 516-I-10 | N/A | Inner Insert for 516-CC-10 | 8.89mm | 7.87mm |

Time Domain NMR Tubes

With the rapid growth of Benchtop NMR spectrometers serving many industries for cost efficient measurement Wilmad announces corresponding consumables to meet this rising demand.

Since ^1H is the target of interest, Wilmad adopts both borosilicate glass (Class B) and PTFE to manufacture such consumables.

521-C Series 10mm NMR tube caps sold separately ([see page 44](#))

TD NMR Tubes | Thin Walled | ASTM Type 1, Class B Borosilicate Glass

| Catalog No. | O.D. | Length | Bottom | Package Qty. |
|---------------------------|------|--------|--------|--------------|
| WG-4001-Z | 10mm | 7" | Flat | 100 |



Wilmad PTFE-FEP Time Domain NMR Tubes

Compared to borosilicate glass, PTFE tubing possesses the following advantages:

- Shatterproof
- Better resistance to corrosive chemicals, including HF acid
- 100% contamination-free for ^1H background
- Each tube is supplied with a PTFE cap

Wilmad PTFE-FEP Time Domain NMR Tubes

| Catalog No. | O.D. | Length | Bottom |
|----------------------------|------|--------|--------|
| 6012-BTNMR | 10mm | 8" | Round |
| 6018-BTNMR | 17mm | 8" | Round |
| 6026-BTNMR | 25mm | 8" | Round |



Amberized NMR Tubes for Light-Sensitive Sample

Wilmad can offer extra protection for your valuable light-sensitive samples via amberization on the borosilicate NMR tubes. The transmission rate between 300 to 700 nm is lowered by several orders of magnitude after amberization. Just add 'AMB' to the Product Number of the tubes that meet the requirements of your experiments. Example: 507-PP-7AMB

The minimum order for amberization service is 5 tubes per order.



Amberized NMR Tubes for Light-Sensitive Sample

| Tube I.D. |
|-----------|
| 3-8mm |
| 10-18mm |
| 20-30mm |

Standard Liquid Phase NMR Consumables

PTFE-FEP NMR Tube Liners for Corrosive Samples & ^{29}Si NMR

For NMR investigations where chemical compounds such as hydrofluoric acid, ammonium bifluoride and concentrated hydroxide solutions are present, Wilmad's PTFE-FEP NMR Tube Liner provides a contamination-free environment.

PTFE-FEP Tube liners are round-bottom and made from Polytetrafluoroethylene/Fluorinated Ethylene Polypropylene Copolymer. Thin-wall construction minimizes filling-factor losses. Although the liners are not rigid, they straighten upon insertion into the sample tube. Not recommended for elevated temperature studies. A PTFE plug is included with each liner.

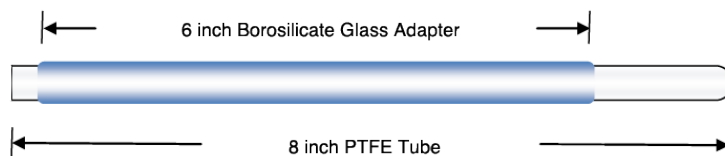


PTFE-FEP NMR Tube Liners for Corrosive Samples & ^{29}Si NMR

| Catalog No. | Fits Tube with Wall Thickness | Fits Tube with O.D. | Fits Tube with Length | Length | Volume per 10mm Height |
|------------------------|-------------------------------|---------------------|-----------------------|--------|------------------------|
| 6003 | Thin | 3mm | 7" | 8" | 30 μL |
| 6005 | Thin | 5mm | 7" | 8" | 80 μL |
| 6005-8 | Thin | 5mm | 7 & 8" | 9" | 80 μL |
| 6010 | Thin | 10mm | 7" | 8" | 440 μL |
| 6012 | Thin or Medium | 12mm | 7" | 8" | 550 μL |
| 6015 | Thin | 15mm | 7" | 8" | 1000 μL |

PTFE-FEP NMR Tube Kit for ^{29}Si NMR

Wilmad's PTFE NMR Tube Kit features a high field 500MHz precision bore open-ended glass adapter for a 5mm spinner turbine. Please use a depth gauge to fine adjust the position of the liner so no glass part will protrude into the Rf coil limit.



PTFE-FEP NMR Tube Kit for ^{29}Si NMR

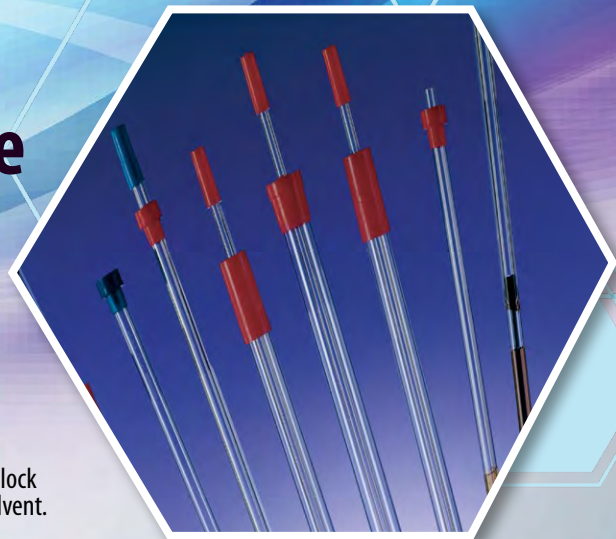
| Catalog No. | MHz Rating | Description | Length | Camber | Concentricity |
|-------------------------------|------------|--|--------|------------------|------------------|
| PTFE-5MM-KIT | 500 | PTFE Tube + 5mm O.D. Both End Open Glass Adapter | 8" | 13 μm | 25 μm |
| PTFE-10MM-KIT | 500 | PTFE Tube + 10mm O.D. Both End Open Glass Adapter | 8" | 36 μm | 75 μm |

Consumables for Liquid-Phase Small Volume & External Reference NMR

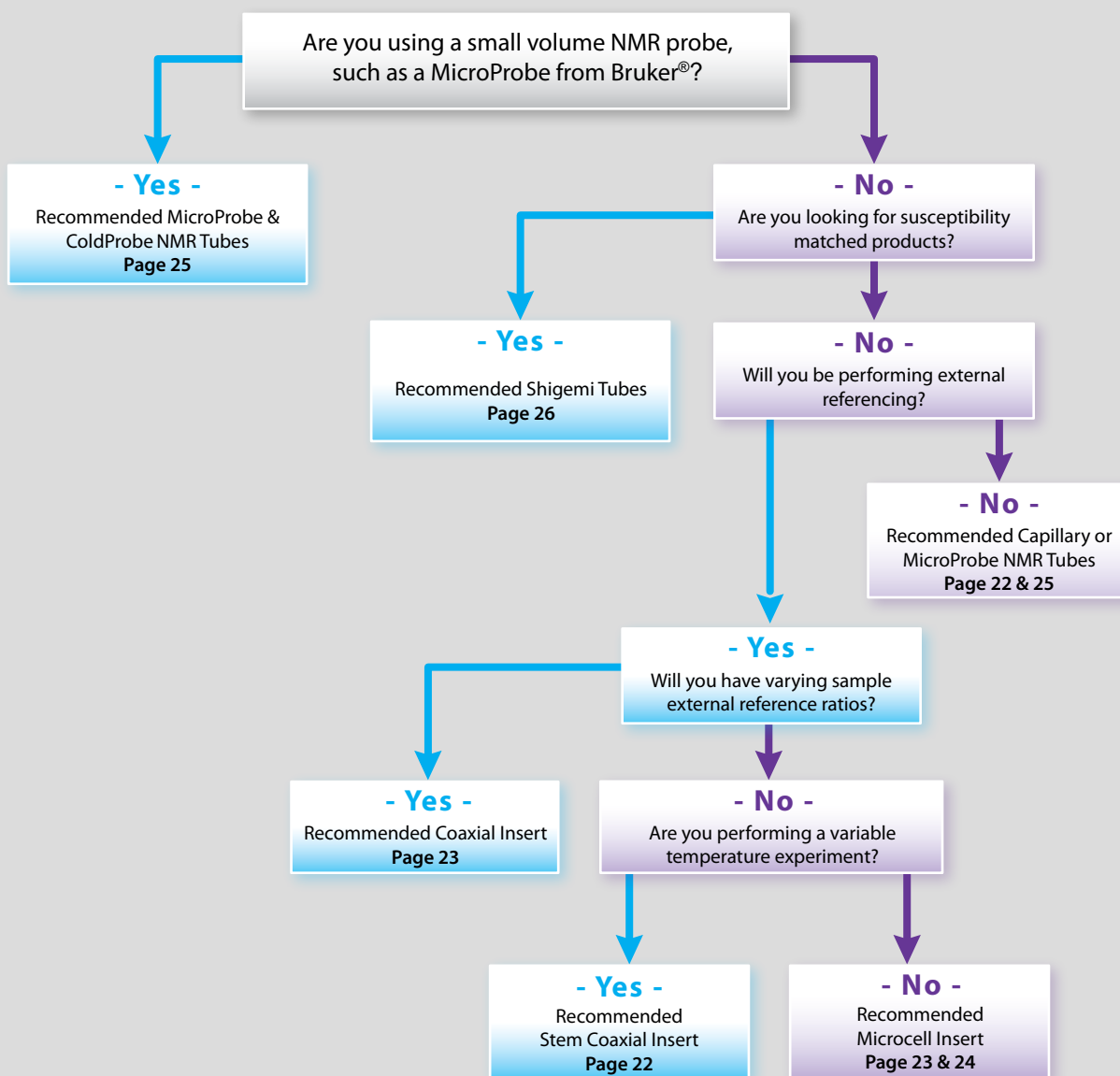


Microcell Technical Tip

To improve shimming quality and signal lock surround the microcell with reference solvent.



Small Volume NMR Tube Selection Guide



Pyrex® NMR Capillary Tubes

Wilmad's Pyrex® capillary tubes are a low cost solution for small volume NMR measurement.

- Available with both ends open or sealed at one end
- Tested at 400 MHz field
- Made of ASTM Type 1 Class A glass



Pyrex NMR Capillary Tubes

| Catalog No. | Description | O.D. | I.D. | Length | Package Qty. |
|-----------------------------------|-------------------|-------|-------|--------|--------------|
| WG-1364-1 | Sealed at one end | 1.0mm | 0.8mm | 75mm | 10 |
| WG-1364-1-203M | Sealed at one end | 1.0mm | 0.8mm | 203mm | 5 |
| WG-1365-1 | Both ends open | 1.0mm | 0.8mm | 300mm | 1 |
| WG-1364-1.7 | Sealed at one end | 1.7mm | 1.3mm | 100mm | 10 |
| WG-1364-1.7-5 | Sealed at one end | 1.7mm | 1.3mm | 127mm | 10 |
| WG-1364-1.7-203M | Sealed at one end | 1.7mm | 1.3mm | 203mm | 5 |
| WG-1365-1.7 | Both ends open | 1.7mm | 1.3mm | 300mm | 1 |
| WG-1364-1.9 | Sealed at one end | 1.9mm | 1.5mm | 110mm | 10 |
| WG-1365-1.9 | Both ends open | 1.9mm | 1.5mm | 300mm | 1 |
| WG-1364-2 | Sealed at one end | 2.0mm | 1.6mm | 100mm | 10 |
| WG-1364-2-203M | Sealed at one end | 2.0mm | 1.6mm | 203mm | 5 |
| WG-1365-2 | Both ends open | 2.0mm | 1.6mm | 300mm | 1 |
| WG-1364-2.5A | Sealed at one end | 2.5mm | 2.2mm | 100mm | 10 |
| WG-1364-2.5A-203M | Sealed at one end | 2.5mm | 2.2mm | 203mm | 5 |
| WG-1365-2.5A | Both ends open | 2.5mm | 2.2mm | 300mm | 1 |

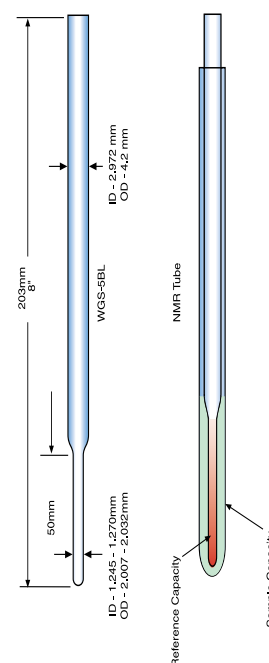
Stem Coaxial Small Volume NMR Insert

The most versatile and reliable coaxial system available for NMR experiments is the Wilmad Stem Coaxial Small Volume NMR Inserts.

- General applications include small volume NMR, external referencing, external locking and magnetic susceptibility determination
- Manufactured from ASTM Type 1 class A glass, ideal for variable temperature studies
- Outer tube must be ordered separately depending on magnetic field strength

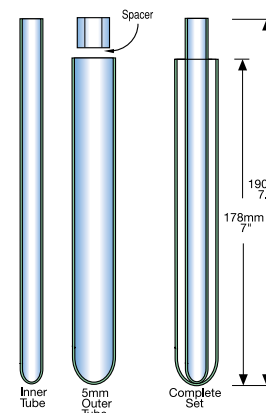
Stem Coaxial Small Volume NMR Insert

| Catalog No. | Fits Outer Tube with O.D. | Stem Height | Stem O.D. | Inner Capacity | Outer Capacity | Use with |
|----------------------------|---------------------------|-------------|-----------|----------------|----------------|------------------|
| WGS-4BL | 4mm | 25mm | 2mm | 30 µL | 124 µL | 406-PP, 427-PP |
| WGS-5BL | 5mm | 50mm | 2mm | 60 µL | 530 µL | 506-PP to 535-PP |
| WGS-5BL-SP | 5mm | 50mm | 3.3mm | 220 µL | 260 µL | 506-PP to 535-PP |
| WGS-8BL | 8mm | 50mm | 3mm | 190 µL | 1560 µL | 513A-XPP |
| WGS-10BL | 10mm | 50mm | 4mm | 410 µL | 2600 µL | 513-XPP |



Coaxial Small Volume NMR Insert

- Switch between three unique sample/reference solution ratios during external referencing experiments
- Ideal for variable temperature experiments since material remains the same between the outer tube, inner tube and spacer
- Insert and outer tube in complete set systems are fused together at the bottom; recommended for high field experiments under 600 MHz
- For ultra high field experiment over 600 MHz, order an inner tube, two spacers and a Wilmad Precision Thin-Walled Tube over 600 MHz separately



Complete Sets

| Catalog No. | Components |
|------------------------------|--|
| 517-Complete | 517-Inner, 517-Outer, 517-Spacer, 5mm Cap with hole (C/N: 521-WGS-100) |
| 518-Complete | 518-Inner, 518-Outer, 518-Spacer, 5mm Cap with hole (C/N: 521-WGS-100) |
| 519-Complete | 519-Inner, 519-Outer, 519-Spacer, 5mm Cap with hole (C/N: 521-WGS-100) |

Outer Tube Only

| Catalog No. | I.D. | O.D. |
|---------------------------|--------|--------|
| 517-Outer | 4.20mm | 4.97mm |
| 518-Outer | 4.20mm | 4.97mm |
| 519-Outer | 4.20mm | 4.97mm |

Inner Tube Only

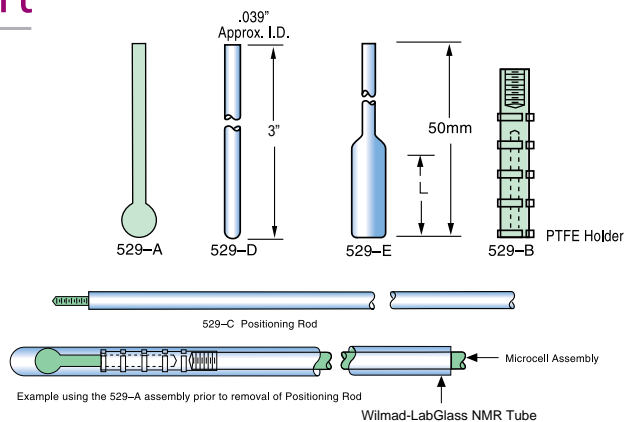
| Catalog No. | I.D. | O.D. |
|---------------------------|--------|--------|
| 517-Inner | 2.34mm | 3.30mm |
| 518-Inner | 1.96mm | 2.97mm |
| 519-Inner | 1.50mm | 2.52mm |

Spacers

| Catalog No. | I.D. | O.D. |
|----------------------------|--------|--------|
| 517-Spacer | 3.30mm | 4.20mm |
| 518-Spacer | 2.97mm | 4.20mm |
| 519-Spacer | 2.52mm | 4.20mm |

Microcell Small Volume NMR Insert

- Sample volume can be as little as 18 μ L
- Three different inserts with various shapes (Spherical Bulb, Capillary Tube, Cylindrical Bulb)
- Outer tube (Wilmad Precision Thin-Walled Tube) must be ordered separately depending on magnetic field strength
- Not recommended for variable temperature experiments.
- Use Wilmad PTFE Needles (C/N: 90630) with syringe to fill and clean sample



Positioning Components

| Catalog No. | Fits Tube with O.D. | Description | Length |
|-----------------------|---------------------|-----------------|--------|
| 529-B | 5.0mm | PTFE Holder | 25mm |
| 529-C | 5.0mm | Positioning Rod | 228mm |

Spherical Bulb and Capillary Tube Microcell

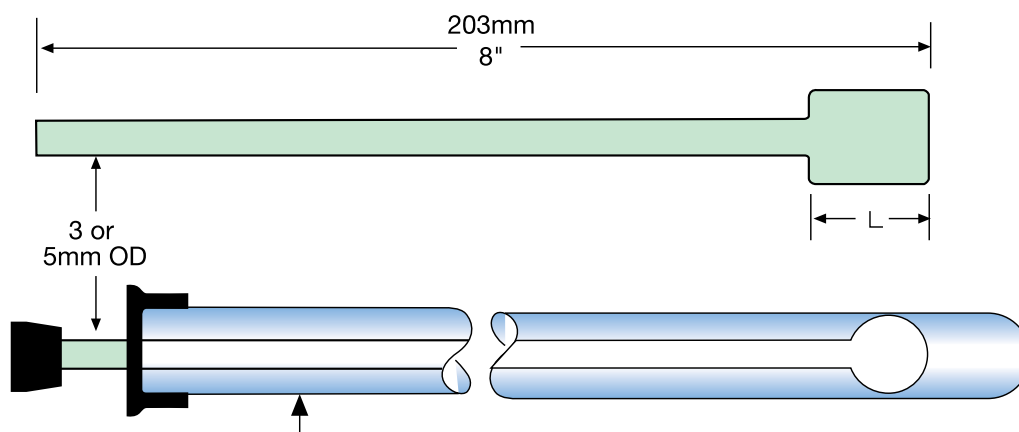
| Catalog No. | Fits Tube with O.D. | Description | Volume |
|-----------------------|---------------------|----------------|------------|
| 529-A | 5.0mm | Spherical Bulb | 18 μ L |
| 529-D | 5.0mm | Capillary Tube | 6 μ L |

Cylindrical Bulb Microcell

| Catalog No. | Fits Tube with O.D. | Description | Volume | Cylinder Length |
|------------------------------|---------------------|------------------|-------------|-----------------|
| 529-E | 5.0mm | Cylindrical Bulb | 110 μ L | 12mm |
| 529-E-5-L-15 | 5.0mm | Cylindrical Bulb | 140 μ L | 15mm |
| 529-E-5-L-20 | 5.0mm | Cylindrical Bulb | 190 μ L | 20mm |

Large Volume Microcell Insert

- Use with probe size between 8 to 20mm
- Add sample through NMR pipets
- Outer tube cap is provided to hold insert
- Custom sizes available



Spherical Bulb Insert

| Catalog No. | Fits Tube with O.D. | Stem O.D. | Capacity |
|--------------------------|---------------------|-----------|--------------|
| 529-A-8 | 8.0mm | 3.0mm | 110 μ L |
| 529-A-10 | 10.0mm | 3.0mm | 280 μ L |
| 529-A-12 | 12.0mm | 3.0mm | 530 μ L |
| 529-A-15 | 15.0mm | 5.0mm | 1020 μ L |
| 529-A-16 | 16.0mm | 5.0mm | 1320 μ L |
| 529-A-18 | 18.0mm | 5.0mm | 1970 μ L |
| 529-A-20 | 20.0mm | 5.0mm | 2600 μ L |

Cylindrical Bulb Insert

| Catalog No. | Fits Tube with O.D. | Stem O.D. | Capacity | Cylinder Length |
|-------------------------|---------------------|-----------|-------------|-----------------|
| 529-E-8 | 8.0mm | 3.0mm | 270 μ L | 10mm |

Bruker® MicroProbe/MicroCryoProbe NMR Tubes

Wilmad has been manufacturing small volume NMR Tubes with the highest quality in the industry to meet the demand in small volume NMR. Our Ultra-High Field MicroProbe Tube (>600 MHz) is 10 times more precise in terms of camber and concentricity than instrument manufacturers' stock tubes. This technological advancement helps increase the shimming quality and SNR. The overall length for these tubes is 4" or 8", and the O.D. of the upper section is 5.0mm.



Bruker® MicroProbe/MicroCryoProbe NMR Tubes

| Catalog No. | MHz Rating | Probe Type | Stem Length | Stem O.D. | Stem I.D. | Stem Volume | Overall Length |
|------------------------|------------|-------------------------------|-------------|-----------|-----------|-------------|----------------|
| 620-1A | 500 | Bruker® 1.0 mm MicroProbe | 50mm | 1.00mm | 0.80mm | 25 µL | 8" |
| 620-1H | 500 | Bruker® 1.7 mm MicroProbe | 43.5mm | 1.70mm | 1.30mm | 22 µL | 4" |
| 620-1B | 500 | Bruker® 1.7 mm MicroCryoProbe | 50mm | 1.70mm | 1.30mm | 66 µL | 8" |
| 620-1G | 500 | Bruker® 3.0/2.5 mm CryoProbe | 43.5mm | 2.00mm | 1.60mm | 87 µL | 4" |
| 620-1C | 500 | Bruker® 3.0/2.5 mm CryoProbe | 50mm | 2.00mm | 1.60mm | 100 µL | 8" |
| 520-1A | 800 | Bruker® 3.0/2.5 mm MicroProbe | 50mm | 2.50mm | 2.16mm | 1.83 µL | 8" |
| 620-1F | 500 | Bruker® 3.0 mm CryoProbe | 43.5mm | 2.95mm | 2.41mm | 198 µL | 4" |
| 620-1D | 500 | Bruker® 3.0 mm CryoProbe | 50mm | 2.95mm | 2.41mm | 228 µL | 4" |
| 620-1E | 500 | Bruker® 3.0 mm CryoProbe | 50mm | 2.95mm | 2.41mm | 228 µL | 8" |

Agilent®(Varian®) ColdProbe 2.5 mm O.D. NMR Tubes

Agilent®(Varian®) ColdProbe 2.5 mm O.D. NMR Tubes

| Catalog No. | MHz Rating | Probe Type | Length | O.D. | I.D. | Pack Qty. |
|-----------------------------------|------------|--------------------|--------|--------|--------|-----------|
| WG-1364-2.5A-203M | 400 | Agilent® ColdProbe | 8" | 2.50mm | 2.20mm | 5 |

Shigemi Susceptibility Matched NMR Tubes

Shigemi's unique susceptibility matched tubes can reduce the sample volume down to 1/3 by minimizing the susceptibility gradients occurring at the solvent-air interface.



Shigemi® Susceptibility Matched NMR Tubes

| Catalog No. | Outer Tube O.D. | Insert O.D. | Insert Length | Outer Tube Length | Bottom Length | Matched Solvent | Compatibility |
|--------------------------|-----------------|-------------|---------------|-------------------|---------------|-------------------------|-------------------|
| CMS-005B | 5.0mm | 4.1mm | 190mm | 180mm | 8mm | Chloroform-d | Bruker® |
| CMS-005J | 5.0mm | 4.1mm | 190mm | 180mm | 12mm | | JEOL® |
| CMS-005V | 5.0mm | 4.1mm | 190mm | 180mm | 15mm | | Agilent®(Varian®) |
| CMS-010B | 10.0mm | 8.9mm | 200mm | 190mm | 8mm | | Bruker® |
| CMS-010V | 10.0mm | 8.9mm | 200mm | 190mm | 15mm | | Agilent®(Varian®) |
| MMS-005B | 5.0mm | 4.1mm | 190mm | 180mm | 8mm | Methanol-d ₄ | Bruker® |
| MMS-005J | 5.0mm | 4.1mm | 190mm | 180mm | 12mm | | JEOL® |
| MMS-005V | 5.0mm | 4.1mm | 190mm | 180mm | 15mm | | Agilent®(Varian®) |
| MMS-010B | 10.0mm | 8.9mm | 200mm | 190mm | 8mm | | Bruker® |
| MMS-010V | 10.0mm | 8.9mm | 200mm | 190mm | 15mm | | Agilent®(Varian®) |
| DMS-005B | 5.0mm | 4.1mm | 190mm | 180mm | 8mm | DMSO-d ₆ | Bruker® |
| DMS-005J | 5.0mm | 4.1mm | 190mm | 180mm | 12mm | | JEOL® |
| DMS-005V | 5.0mm | 4.1mm | 190mm | 180mm | 15mm | | Agilent®(Varian®) |
| DMS-010B | 10.0mm | 8.9mm | 200mm | 190mm | 8mm | | Bruker® |
| DMS-010V | 10.0mm | 8.9mm | 200mm | 190mm | 15mm | | Agilent®(Varian®) |
| BMS-005B | 5.0mm | 4.1mm | 190mm | 180mm | 8mm | Deuterium Oxide | Bruker® |
| BMS-005J | 5.0mm | 4.1mm | 190mm | 180mm | 12mm | | JEOL® |
| BMS-005V | 5.0mm | 4.1mm | 190mm | 180mm | 15mm | | Agilent®(Varian®) |
| BMS-010B | 10.0mm | 8.9mm | 200mm | 190mm | 8mm | | Bruker® |
| BMS-010V | 10.0mm | 8.9mm | 200mm | 190mm | 15mm | | Agilent®(Varian®) |

Gas-Tight Consumables for Liquid & Gas-Phase NMR

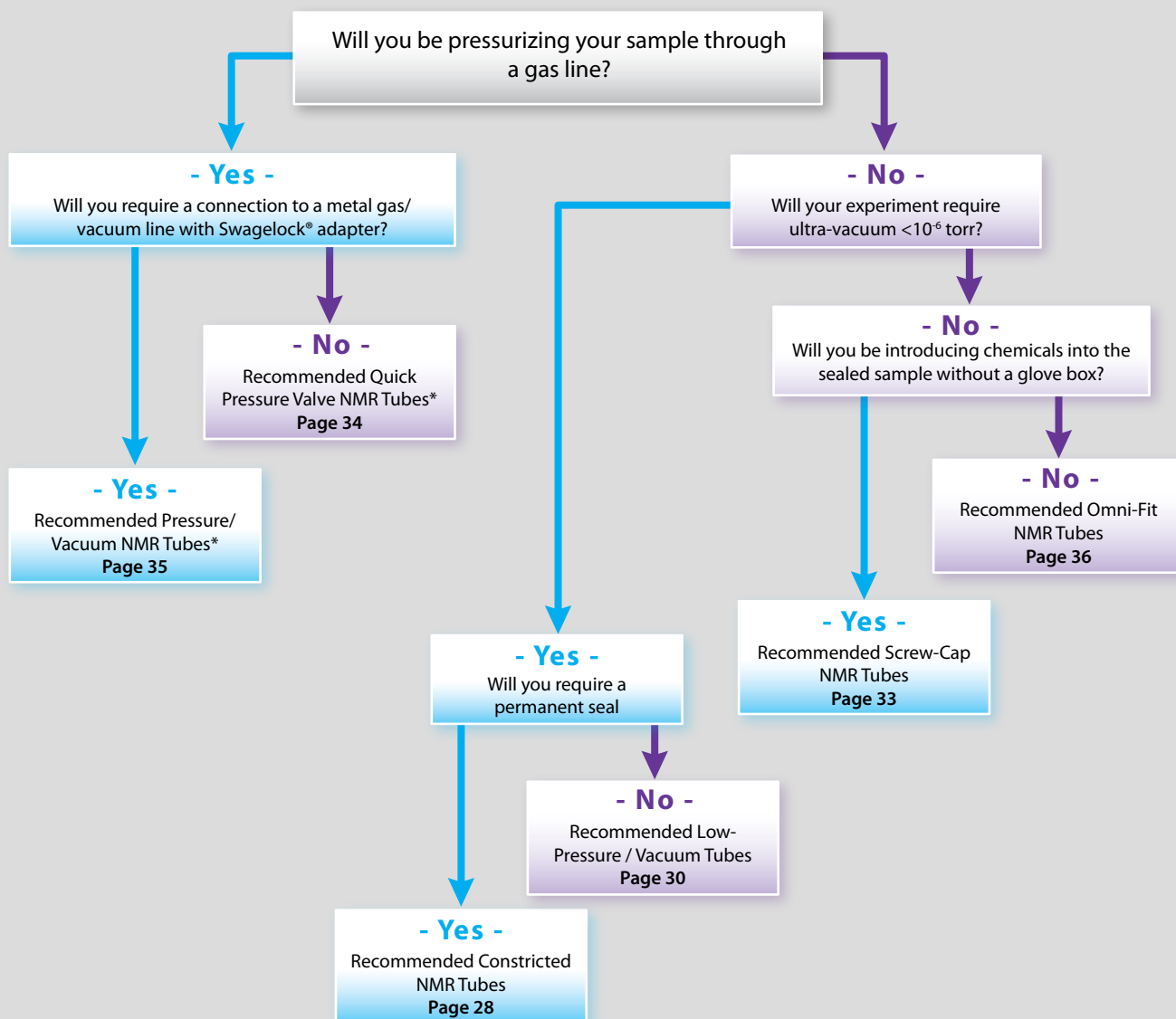


Under Pressure

Caution should always be taken when pressurizing an NMR tube as even a tiny scratch could cause the tube to break.



Gas-Tight NMR Tube Selection Guide



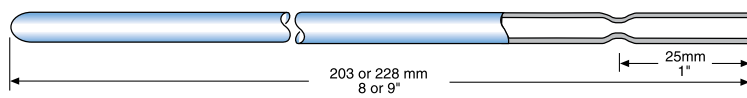
* Check the maximum pressure for Quick Pressure Valve NMR Tubes and Pressure/Vacuum NMR Tubes on the individual product pages.

Gas-Tight Consumables for Liquid & Gas-Phase NMR

Constricted Vacuum Tubes

Constricted NMR tubes offer the most convenient way to flame-seal an air-sensitive sample. Simply apply vacuum to the tube using our Tip-Off Manifold, then heat the constricted portion and twist off to seal the sample. Order a constricted NMR tube by adding "CONS" to the product number of any Wilmad sample tube. Example: 507-PP-7CONS.

Unless otherwise specified, constrictions are placed 1 inch from top of tube. Order tubes that are 1 inch longer than your required finished length.



Constricted Vacuum Tubes

| Tube I.D. | Constricted I.D. |
|-----------|------------------|
| 3-5mm | 1mm |
| 6.5-16mm | 2mm |
| 18-30mm | 2mm |

Tip-off Manifolds

The Tip-Off Manifold connects to an NMR tube by a threaded aluminum bushing which is isolated from the vacuum by a PTFE high-vacuum rotary valve with Viton O-rings. Rotating the valve will open and close the tube to the vacuum line.

- Highly resistant to chemicals
- Easy operation

Tip-Off Manifolds and Replacement Parts

| Catalog No. | Fits tube with O.D. | Description |
|--------------------------|---------------------|---------------------------------|
| 552-3 | 3mm | Complete Tip-Off Manifold |
| 552-3-B | 3mm | Aluminum Port Bushing |
| 552-3-O | 3mm | Viton O-Ring |
| 552-4 | 4mm | Complete Tip-Off Manifold |
| 552-4-B | 4mm | Aluminum Port Bushing |
| 552-4-O | 4mm | Viton O-Ring |
| 552-5 | 5mm | Complete Tip-Off Manifold |
| 552-5-B | 5mm | Aluminum Port Bushing |
| 552-5-O | 5mm | Viton O-Ring |
| 552-10 | 10mm | Complete Tip-Off Manifold |
| 552-10-B | 10mm | Aluminum Port Bushing |
| 552-10-O | 10mm | Viton O-Ring |
| 552-P | — | Replacement Piston Valve |
| 552-S | — | Replacement Piston O-Ring |
| 552-G | — | Replacement Glass Valve Section |



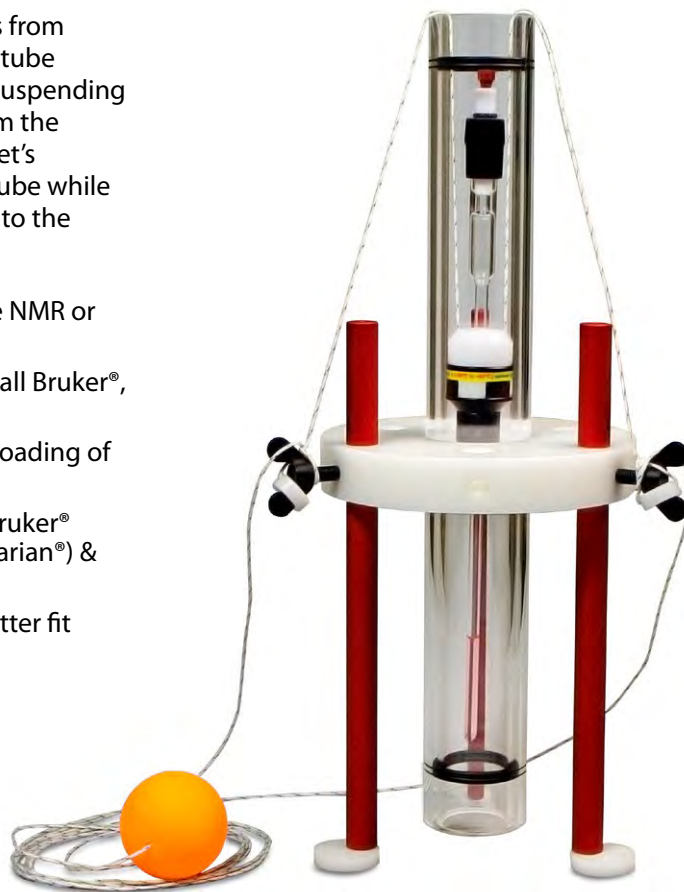
Explosion Protection Chamber for High-Pressure NMR

NEW

Acrylic tube system shields users by preventing debris from projecting sideways should a pressurized NMR or EPR tube fracture or explode. The chamber is used by securely suspending the sample during pressurization and in transport from the bench to the spectrometer. Placement over the magnet's upper barrel allows for simple loading of the sample tube while the stopper ensures the lowering strings cannot fall into the spectrometer.

- Helps prevent injury when performing high-pressure NMR or EPR experiments
- One-size-fits-all design allows for simple set-up with all Bruker®, JEOL®, Agilent®(Varian®) spectrometers
- Chamber also shields the user during transport and loading of the sample, unlike blast shields
- Can withstand up to 1000 bar when configured for Bruker® systems and 500 bar when configured for Agilent®(Varian®) & JEOL® systems
- Leg array can be set to a wide or narrow stance to better fit your spectrometer

Note: Not for use with spinning experiments



Explosion Protection Chamber for High-Pressure NMR

| Catalog No. | Used With | Inner Tube I.D. | Outer Tube I.D. |
|---------------------------------|---------------------|-----------------|-----------------|
| RS-EXPL-PROTECT | 5mm NMR & EPR Tubes | 1.01" (25.65mm) | 1.34" (34.04mm) |

Gas-Tight Consumables for Liquid & Gas-Phase NMR

Low Pressure/Vacuum Tubes

Wilmad's Low Pressure/Vacuum (LPV) tube is ideal for anaerobic and gas-tight NMR experiments, and offers a convenient flame-free sealing solution for air sensitive or volatile liquid samples.

- Robust sealing system allows pressure build-up inside the sample
- Greaseless PTFE piston provides a 100% contamination-free seal
- Redesigned with a 4X larger sealing surface; eliminates leaks and greatly increases lifetime when compared to traditional J. Young tubes
- Axial symmetric design guarantees application in spinning experiments
- Due to the nature of glass, Extreme Caution should be exercised when using at elevated or reduced pressures since a tiny scratch on the glass surface would significantly lower the tensile strength. Adequate safety shielding should always be used when working in these conditions.



Low Pressure/Vacuum Tube

| Catalog No. | MHz Rating | Length | O.D. | Wall Thickness | Concentricity | Camber | Glass Type |
|-------------------------------|------------|--------|------|----------------|---------------|------------|--------------|
| 335-LPV-7 | 600 | 7" | 3mm | 0.29mm | 13 μ m | 6 μ m | Borosilicate |
| 335-LPV-8 | 600 | 8" | 3mm | 0.29mm | 13 μ m | 6 μ m | Borosilicate |
| 328-LPV-7 | 500 | 7" | 3mm | 0.29mm | 25 μ m | 13 μ m | Borosilicate |
| 328-LPV-8 | 500 | 8" | 3mm | 0.29mm | 25 μ m | 13 μ m | Borosilicate |
| 328-LPV-9 | 500 | 9" | 3mm | 0.29mm | 25 μ m | 13 μ m | Borosilicate |
| 307-LPV-7 | 300 | 7" | 3mm | 0.29mm | 51 μ m | 25 μ m | Borosilicate |
| 307-LPV-8 | 300 | 8" | 3mm | 0.29mm | 51 μ m | 25 μ m | Borosilicate |
| 435-LPV-7 | 600 | 7" | 4mm | 0.38mm | 13 μ m | 6 μ m | Borosilicate |
| 535-LPV-7 | 600 | 7" | 5mm | 0.38mm | 13 μ m | 6 μ m | Borosilicate |
| 535-LPV-8 | 600 | 8" | 5mm | 0.38mm | 13 μ m | 6 μ m | Borosilicate |
| 535-LPV-9 | 600 | 9" | 5mm | 0.38mm | 13 μ m | 6 μ m | Borosilicate |
| 528-LPV-7 | 500 | 7" | 5mm | 0.38mm | 25 μ m | 13 μ m | Borosilicate |
| 528-LPV-7Q TZ | 500 | 7" | 5mm | 0.38mm | 25 μ m | 13 μ m | Quartz |
| 528-LPV-8 | 500 | 8" | 5mm | 0.38mm | 25 μ m | 13 μ m | Borosilicate |
| 528-LPV-9 | 500 | 9" | 5mm | 0.38mm | 25 μ m | 13 μ m | Borosilicate |
| 522-LPV-7 | 400 | 7" | 5mm | 1.40mm | 51 μ m | 51 μ m | Borosilicate |
| 524-LPV-7 | 400 | 7" | 5mm | 0.77mm | 76 μ m | 51 μ m | Borosilicate |

Low Pressure/Vacuum Tube (Continued)

| Catalog No. | MHz Rating | Length | O.D. | Wall Thickness | Concentricity | Camber | Glass Type |
|----------------------------|------------|--------|------|----------------|---------------|--------|--------------|
| 507-LPV-7 | 300 | 7" | 5mm | 0.38mm | 51µm | 25µm | Borosilicate |
| 507-LPV-8 | 300 | 8" | 5mm | 0.38mm | 51µm | 25µm | Borosilicate |
| 507-LPV-9 | 300 | 9" | 5mm | 0.38mm | 51µm | 25µm | Borosilicate |
| 513-7LPV-7 | 500 | 7" | 10mm | 0.46mm | 38µm | 13µm | Borosilicate |
| 513-7LPV-8 | 500 | 8" | 10mm | 0.46mm | 38µm | 13µm | Borosilicate |

Low Pressure/Vacuum Tube Parts & Accessories

| Catalog No. | Fits Tubes with O.D. | O.D. | Description | Wall Thickness | Concentricity | Camber | Glass Type |
|--------------------------------|----------------------|------|--------------------------------------|----------------|---------------|--------|--------------|
| GVA-5 | 3 & 5mm | 5mm | Pyrex Adapter | — | — | — | Borosilicate |
| GVA-5-14/20 | 3,4, & 5mm | 5mm | Pyrex Adapter with 14/20 outer joint | — | — | — | Borosilicate |
| LPV-O-5 | — | — | Replacement O-Rings (5/pack) | — | — | — | — |
| WNMR-5-PISTON | 3 & 5mm | — | PTFE Piston for LPV Tube | — | — | — | — |
| WNMR-10-PISTON | 10mm | — | PTFE Piston for LPV Tube | — | — | — | — |
| 507-LPV-7-T-P | — | 5mm | Replacement Glass tube for 507-LPV-7 | 0.38mm | 51 µm | 25 µm | Borosilicate |
| 507-LPV-8-T-P | — | 5mm | Replacement Glass tube for 507-LPV-8 | 0.38mm | 51 µm | 25 µm | Borosilicate |
| 524-LPV-7-T-P | — | 5mm | Replacement Glass tube for 524-LPV-7 | 0.77mm | 76 µm | 51 µm | Borosilicate |
| 528-LPV-7-T-P | — | 5mm | Replacement Glass tube for 528-LPV-7 | 0.38mm | 25 µm | 13 µm | Borosilicate |
| 528-LPV-8-T-P | — | 5mm | Replacement Glass tube for 528-LPV-8 | 0.38mm | 25 µm | 13 µm | Borosilicate |
| 535-LPV-7-T-P | — | 5mm | Replacement Glass tube for 535-LPV-7 | 0.38mm | 13 µm | 6 µm | Borosilicate |
| 535-LPV-8-T-P | — | 5mm | Replacement Glass tube for 535-LPV-8 | 0.38mm | 13 µm | 6 µm | Borosilicate |

Low Pressure/Vacuum Tube for Autosamplers

| Catalog No. | MHz Rating | Bottom NMR Tube Length | Length after removing the Vacuum Adapter | Concentricity | Camber | Glass Type |
|------------------------------|------------|------------------------|--|---------------|--------|--------------|
| 535-LPV-200M | 600 | 137 ± 1mm | 199 ± 1mm | 13 µm | 6 µm | Borosilicate |
| 528-LPV-200M | 500 | 137 ± 1mm | 199 ± 1mm | 25 µm | 13 µm | Borosilicate |
| 507-LPV-200M | 300 | 137 ± 1mm | 199 ± 1mm | 51 µm | 25 µm | Borosilicate |

Gas-Tight Consumables for Liquid & Gas-Phase NMR

Low Pressure/Vacuum Shigemi Tubes

Low Pressure/Vacuum Shigemi® tubes feature a susceptibility matched bottom and plunger to reduce the boundary gradients at the edges of the Rf coil and a valve that offers a flame-free seal for air sensitive or volatile liquid samples.

- Select tube based on solvent used: Chloroform-d, Methanol-d₄, Deuterium Oxide, or DMSO-d₆
- Tubes available for Bruker®, JEOL®, Agilent®(Varian®) spectrometers



Assembly



PTFE holder with Inner Insert



Positioning Rod

Low Pressure/Vacuum Shigemi Tubes

| Catalog No. | Description | O.D. | Bottom Length | Matched Solvent | Compatibility |
|------------------------------|--------------------------------------|---------|---------------|-------------------------|-------------------|
| CMS-005B-LPV | Gas-tight Shigemi® Tube Complete Set | 4.965mm | 8mm | Chloroform-d | Bruker® |
| CMS-005J-LPV | | 4.965mm | 12mm | | JEOL® |
| CMS-005V-LPV | | 4.965mm | 15mm | | Agilent®(Varian®) |
| MMS-005B-LPV | Gas-tight Shigemi® Tube Complete Set | 4.965mm | 8mm | Methanol-d ₄ | Bruker® |
| MMS-005J-LPV | | 4.965mm | 12mm | | JEOL® |
| MMS-005V-LPV | | 4.965mm | 15mm | | Agilent®(Varian®) |
| DMS-005B-LPV | Gas-tight Shigemi® Tube Complete Set | 4.965mm | 8mm | DMSO-d ₆ | Bruker® |
| DMS-005J-LPV | | 4.965mm | 12mm | | JEOL® |
| DMS-005V-LPV | | 4.965mm | 15mm | | Agilent®(Varian®) |
| BMS-005B-LPV | Gas-tight Shigemi® Tube Complete Set | 4.965mm | 8mm | Deuterium Oxide | Bruker® |
| BMS-005J-LPV | | 4.965mm | 12mm | | JEOL® |
| BMS-005V-LPV | | 4.965mm | 15mm | | Agilent®(Varian®) |
| 529-C | Positioning Rod | — | — | Universal | All |
| 529-B | PTFE Holder | — | — | | All |

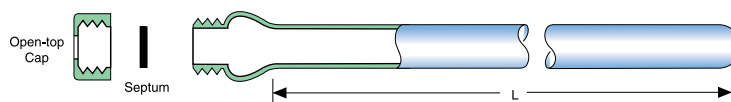
Screw-Cap Tubes

The Screw-Cap Tube is commonly used in sample degasification. The vacuum quality that it can maintain is $>10^{-4}$ torr. For better vacuum, please check our Pressure/Vacuum Tube and Quick Pressure Valve Tube. Each Screw-Cap Tube comes with one PTFE/Silicone Septum.

Note:

PTFE/ Rubber septums are inert to most solvents and many corrosive materials but not recommended for multiple punctures.

PTFE/Silicone septums are inert to most organic solvents and compounds but not recommended for strongly corrosive materials. The septum remains reliable after multiple punctures.



Screw-Cap Sample Tube

| Catalog No. | MHz Rating | O.D. | Length |
|----------------------------|------------|------|--------|
| 335-TR-7 | 600 | 3mm | 7" |
| 335-TR-8 | 600 | 3mm | 8" |
| 328-TR-7 | 500 | 3mm | 7" |
| 328-TR-8 | 500 | 3mm | 8" |
| 328-TR-9 | 500 | 3mm | 9" |
| 307-TR-7 | 300 | 3mm | 7" |
| 535-TR-7 | 600 | 5mm | 7" |
| 535-TR-8 | 600 | 5mm | 8" |
| 535-TR-9 | 600 | 5mm | 9" |
| 528-TR-7 | 500 | 5mm | 7" |
| 528-TR-8 | 500 | 5mm | 8" |
| 528-TR-9 | 500 | 5mm | 9" |
| 507-TR-7 | 300 | 5mm | 7" |
| 507-TR-8 | 300 | 5mm | 8" |
| 507-TR-9 | 300 | 5mm | 9" |
| 513-7TRA-7 | 500 | 10mm | 7" |
| 513-7TRA-8 | 500 | 10mm | 8" |
| 513-7TRA-9 | 500 | 10mm | 9" |

Screw-Cap Sample Tube Replacement Parts

| Catalog No. | Description | Fits Tube with O.D. | Package Qty. |
|--------------------------|-----------------------------------|--------------------------|--------------|
| TR-LR-01 | PTFE/rubber septum | 4 and 5mm | 36 |
| TR-LR-05 | PTFE/rubber septum | 10mm | 36 |
| TR-LR-07 | PTFE/rubber septum | 12, 13, 15, 16, and 18mm | 36 |
| TR-LS-01 | PTFE/silicone septum | 4 and 5mm | 36 |
| TR-LS-03 | PTFE/silicone septum | 7.5 and 8mm | 36 |
| TR-LS-05 | PTFE/silicone septum | 10mm | 36 |
| TR-LS-07 | PTFE/silicone septum ² | 12, 13, 15, 16, and 18mm | 36 |
| TR-SC-01 | Solid Cap | 4 and 5mm | 12 |
| TR-SC-05 | Solid Cap | 10mm | 12 |
| TR-SC-07 | Solid Cap | 12, 13, 15, 16, and 18mm | 12 |
| TR-SC-09 | Solid Cap | 20mm | 12 |
| TR-OC-01 | Open Cap | 4 and 5mm | 12 |
| TR-OC-03 | Open Cap | 7.5 and 8mm | 12 |
| TR-OC-05 | Open Cap | 10mm | 12 |
| TR-OC-07 | Open Cap | 12, 13, 15, 16, and 18mm | 12 |

Gas-Tight Consumables for Liquid & Gas-Phase NMR

Quick Pressure Vacuum Tube

Wilmad's Quick Pressure Valve Sample Tubes are specially designed to simplify the work of NMR studies for catalysis, gas-liquid phase reactions, air sensitive samples and elevated temperature studies using low boiling point solvents.

- Easy to operate - one turn to open, one to close
- Larger opening for convenient sample addition
- Lightweight, concentric design for better performance
- Offered with Wilmad Precision Tubes - thin, medium and heavy wall
- Choice of Viton® or Kalrez® O-ring for different applications
- Adapters available for both 1/16" and 1/8" tubing

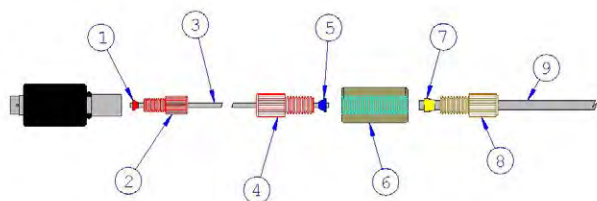
Basic Tubing Connection



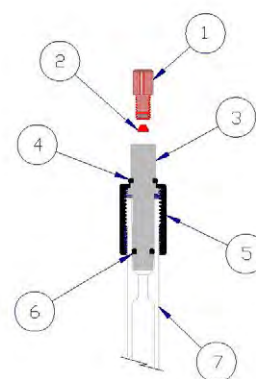
Slide the Nut (1) and Ferrule (2) onto the 1/16" diameter tubing. Make sure the end of the tubing extends past the end of the ferrule as shown. Screw the assembly into the threaded port in the end of the valve stem until finger tight.

Quick Pressure Valve (QPV) Tubes (Parts for Basic Tubing Connection Included)

| Catalog No. | MHz Rating | O.D. | Length | Wall Thickness | Concentricity/Camber | Recommended Max Pressure |
|---------------------------|------------|------|--------|----------------|----------------------|--------------------------|
| 528-QPV-7 | 500 | 5mm | 7" | 0.38mm | 25 / 13 µm | 100 psi |
| 528-QPV-8 | 500 | 5mm | 8" | 0.38mm | 25 / 13 µm | 100 psi |
| 524-QPV-7 | 300 | 5mm | 7" | 0.77mm | 76 / 51 µm | 150 psi |
| 524-QPV-8 | 300 | 5mm | 8" | 0.77mm | 76 / 51 µm | 150 psi |
| 522-QPV-7 | 300 | 5mm | 7" | 1.40mm | 51 / 51 µm | 200 psi |
| 522-QPV-8 | 300 | 5mm | 8" | 1.40mm | 51 / 51 µm | 200 psi |
| 507-QPV-7 | 300 | 5mm | 7" | 0.38mm | 51 / 25 µm | 100 psi |
| 507-QPV-8 | 300 | 5mm | 8" | 0.38mm | 51 / 25 µm | 100 psi |



1. QPV-F Ferrule for 10-32 nut / 1/16" O.D. Tubing (Supplied with QPV-V Nut, 10-32 for 1/16" O.D. Tubing (Supplied with QPV-V Valve)
2. QPV-N Nut, 10-32 for 1/16" O.D. Tubing (Supplied with QPV-V Valve)
3. QPV-T16 Tubing, 1/16" O.D. PTFE
4. QPV-N14 Nut, 1/4-28 for 1/16" Tubing
5. QPV-F14 Ferrule for 1/4-28 nut / 1/16" Tubing
6. QPV-U14 Union, 1/4-28
7. BP-1822-018 Ferrule for 1/4-28 Nut / 1/8" Tubing
8. BP-1821-018 Nut, 1/4-28 for 1/8" O.D. Tubing
9. BP-1823-014 Tubing, 1/8" O.D. PTFE



1. QPV-N 10-32 X 1/16" PEEK Nut
2. QPV-F 1/16" X 10-32 Tefzel Ferrule
3. QPV-V-S Valve Stem, PTFE
4. LX7980-3009* Retaining Ring, Viton
5. QPV-V-C Cap
6. LG-10220-500* Sealing Ring, Viton*
7. QPV-B Precision Glass Barrel

Ferrules, Nuts, Tubing and Unions for QPV Sample Tube

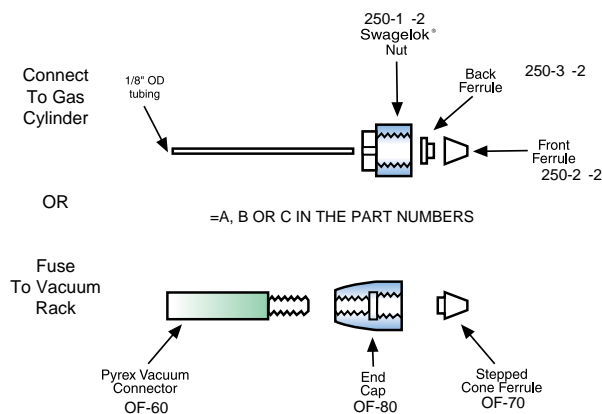
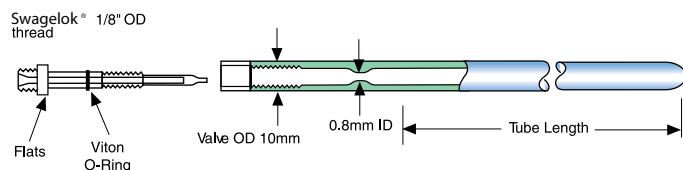
| Catalog No. | Description |
|-----------------------------|---------------------------------------|
| QVP-F14 | Ferrule, 1/16", ETFE, Blue |
| QVP-N14 | Nut, 1/16", 1/4-28, Delrin, Red |
| QVP-T16 | Tubing, PTFE, 1/16" O.D. X 3' |
| QVP-U14 | Union, Delrin, 1/4-28 for 1/8" tubing |
| QPV-F | Ferrule, 1/16" x 10-32 |
| QPV-N | Nut, 1/16" 10-32 x 1/16" |
| OF-60 | Vacuum Connector |
| BP-1821-018 | Nut 1/4-28 for 1/8" tubing |
| BP-1822-018 | Ferrule 1/4-28 for 1/8" tubing |
| BP-1823-018 | Tubing 1/8" x 10' |

Spare Parts and Special O-Rings

| Catalog No. | Description |
|-------------------------|---|
| QPV-V | Valve plug assembly with nut and ferrule |
| QPV-VOS | Set of 10 each Viton® O-Rings - Viton® Sealing O-Ring and Viton® cap retaining ring, pack |
| QPV-KOS | Kalrez® sealing O-Ring and Viton® cap retaining ring, chemically resistant and highly inert |

Pressure/Vacuum Sample Tube

Wilmad's Pressure/Vacuum Tube is the most reliable NMR tube for medium range pressure (<300 psi) experiments in the market. It is designed to connect to a 1/8" metal (stainless steel or brass) vacuum line using Swagelok® fittings or a rubber vacuum hose and a glass connector (OF-60). The PV-ANV valve is made of PTFE and all other parts are Pyrex® or equivalent glass. Valve is opened simply by turning counterclockwise.



Each Pressure/Vacuum tube is supplied with a PV-ANV valve, but not with a Swagelok® nut or ferrules. Order these separately (see connectors table).

Pressure/Vacuum Sample Tubes

| Catalog No. | MHz Rating | O.D | Length | Wall Thickness | Concentricity | Camber | Recommended Max Pressure |
|----------------------------|------------|------|--------|----------------|---------------|--------|--------------------------|
| 528-PV-7 | 500 | 5mm | 7" | 0.38mm | 25 µm | 13 µm | 100 psi |
| 528-PV-8 | 500 | 5mm | 8" | 0.38mm | 25 µm | 13 µm | 100 psi |
| 528-PV-9 | 500 | 5mm | 9" | 0.38mm | 25 µm | 13 µm | 100 psi |
| 524-PV-7 | 400 | 5mm | 7" | 0.77mm | 76 µm | 51 µm | 150 psi |
| 524-PV-8 | 400 | 5mm | 8" | 0.77mm | 76 µm | 51 µm | 150 psi |
| 524-PV-9 | 400 | 5mm | 9" | 0.77mm | 76 µm | 51 µm | 150 psi |
| 522-PV-7 | 500 | 5mm | 7" | 1.40mm | 51 µm | 51 µm | 200 psi |
| 522-PV-8 | 500 | 5mm | 8" | 1.40mm | 51 µm | 51 µm | 200 psi |
| 522-PV-9 | 500 | 5mm | 9" | 1.40mm | 51 µm | 51 µm | 200 psi |
| 507-PV-7 | 300 | 5mm | 7" | 0.38mm | 51 µm | 25 µm | 100 psi |
| 507-PV-8 | 300 | 5mm | 8" | 0.38mm | 51 µm | 25 µm | 100 psi |
| 507-PV-9 | 300 | 5mm | 9" | 0.38mm | 51 µm | 25 µm | 100 psi |
| 513-7PV-7 | 500 | 10mm | 7" | 0.46mm | 38 µm | 13 µm | 90 psi |
| 513-7PVM-7 | 500 | 10mm | 7" | 0.92mm | 38 µm | 13 µm | 150 psi |
| 513-7PVM-8 | 500 | 10mm | 8" | 0.92mm | 38 µm | 13 µm | 150 psi |
| 513-7PVM-9 | 500 | 10mm | 9" | 0.92mm | 38 µm | 13 µm | 150 psi |
| 513-7PVH-7 | 450 | 10mm | 7" | 1.45mm | 51 µm | 13 µm | 200 psi |
| 513-7PVH-8 | 450 | 10mm | 8" | 1.45mm | 51 µm | 13 µm | 200 psi |
| 513-7PVH-9 | 450 | 10mm | 9" | 1.45mm | 51 µm | 13 µm | 200 psi |

Connectors for Pressure/Vacuum Sample Tube

| Catalog No. | Description | Material | Package Qty. |
|--|--|----------------------------------|--------------|
| 250-1A-2 250-1B-2 250-1C-2 | Swagelok® Nut for 1/8" OD Tubing | Brass Stainless Steel PTFE | 6 |
| 250-2A-2 250-2B-2 250-2C-2 | Front Ferrule for 1/8" OD Tubing | Brass Stainless Steel PTFE | 10 |
| 250-3A-2 250-3B-2 250-3C-2 | Back Ferrule for 1/8" OD Tubing | Brass Stainless Steel PTFE | 10 |
| 250-4A-2 250-4B-2 | Swagelok® Male Connector for 1/8" tubing | Brass Stainless Steel | 1 |
| OF-60 | Pyrex® Vacuum Connector | Borosilicate Glass | 1 |
| OF-80 | End Cap | Polypropylene | 1 |
| OF-70 | Stepped Cone Ferrule | PTFE | 4 |
| PV-ANV | Replacement Valve | PTFE | 1 |
| PV-ANV-O | Replacement O-Ring for PV-ANV Valve | Viton™ | 1 |

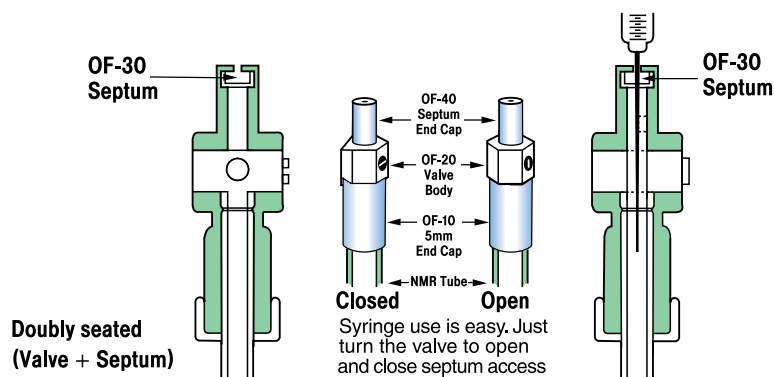
Connections: The upper portion of the needle valve is threaded and I.D. bevelled to accept Swagelok® 1/8" tubing nut and ferrule, which makes it simple to connect the "PV" tubes to a compressed gas cylinder or directly to a vacuum rack as shown on the above picture. The needle valve can be tightly closed using a small wrench (flat surfaces are provided on the valve). Components of the Pressure/Vacuum Valve NMR Tube and compatible fittings are available separately (see connectors). Tube available in 7, 8, or 9" lengths. Order shortest length possible to minimize overall weight.

Gas-Tight Consumables for Liquid & Gas-Phase NMR

Omni-Fit NMR Tubes

Wilmad's Omni-Fit NMR Tubes are designed for easy injection of chemicals through a gas-tight syringe without using a glove box for air-sensitive samples.

The Omni-Fit Tube consists of a 507-PP tube topped by a sturdy 2" section of medium-walled tubing which supports the valve system.

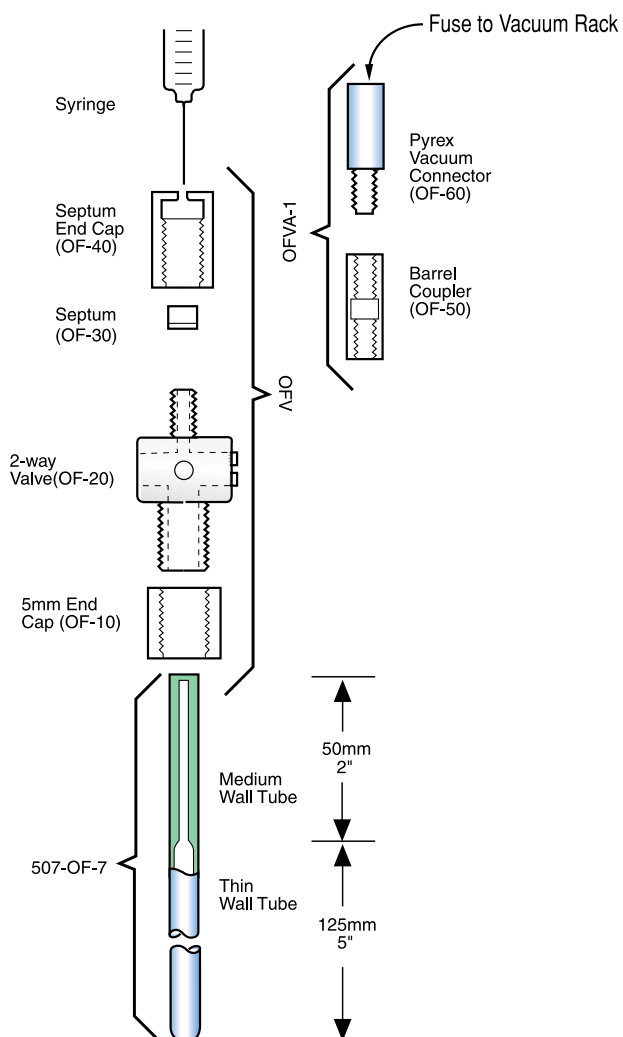


Omni-Fit Sample Tubes Only

| Catalog No. | MHz Rating | O.D. | Length |
|--------------------------|------------|-------|--------|
| 507-OF-7 | 300 | 5.0mm | 7" |
| 507-OF-8 | 300 | 5.0mm | 8" |
| 507-OF-9 | 300 | 5.0mm | 9" |

Valve and Spare Parts for Omni-Fit Sample Tubes

| Catalog No. | Description | O.D. |
|------------------------|---|------|
| OFV | Omni-Fit Valve System with Complete Accessories | 5mm |
| OF-10 | Omni-Fit 5mm End Cap | 5mm |
| OF-20 | Omni-Fit 2-way Valve | 5mm |
| OF-30 | Omni-Fit Septa (pkg/6) | 5mm |
| OF-40 | Omni-Fit Septa Cap | 5mm |
| OF-50 | Omni-Fit Barrel Coupler | 5mm |
| OF-60 | Omni-Fit Vacuum Connector | 5mm |
| OFVA-1 | Omni-Fit Adapter Set | 5mm |



NMR Reference Standards



Reference Standard Quality

Paramagnetic oxygen has been completely removed from most reference standards to ensure it does not affect your resolution or line shape.



NMR Reference Standards Selection Guide

| Application | Catalog No. | WG-R-01 | WG-R-02 | WG-R-03 | WG-R-04 | WG-R-05 | WG-R-06 | WG-R-07 | WG-R-08 | WG-R-09 | WG-R-10 | WG-R-11 | WG-R-12 | WG-R-13 | WG-R-14 |
|--|-------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| ¹ H Sensitivity | ● | | | | | | | | | | | | | | |
| ¹³ C Sensitivity | | | | | ● | ● | | | | | | | | | |
| ¹⁹ F Sensitivity | | | | | | | | | | | | | ● | | |
| ³¹ P Sensitivity | | | | | | | | | | | | ● | | ● | |
| ¹ H Lineshape | | ● | ● | ● | | | | | | | | | | | |
| ¹ H & ¹³ C Calibration | | | | | | | | ● | | | | | | | |
| Temperature Calibration | | | | | | | | | ● | | | | | | |
| Low Temperature Calibration | | | | | | | | | | ● | | | | | |
| High Temperature Calibration | | | | | | | | | | | ● | | | | |

NMR Reference Standards

Wilmad NMR Reference Standards are packaged in ultra-high field precision tubes to guarantee their performance in experiments over 600 MHz.


- Certificate of Analysis (CofA) supplied with each standard
- Meet or exceed requirements set by NMR spectrometer manufacturers
- All standards are backward compatible with NMR experiments below 600 MHz

3mm O.D. NMR Reference Standards

| Catalog No. | MHz Rating | Length | Description | Application |
|-----------------------------|------------|--------|---|--|
| WG-R-01-3 * | 600+ | 8" | 0.1% ethylbenzene in chloroform-d | ¹ H Sensitivity |
| WG-R-02-3 * | 600+ | 8" | 3% CHCl ₃ / 0.2% TMS in acetone-d ₆ | ¹ H Lineshape |
| WG-R-03-3 * | 600+ | 8" | 1% CHCl ₃ in acetone-d ₆ | ¹ H Lineshape |
| WG-R-05-3 * | 600+ | 8" | 10% ethylbenzene in chloroform-d | ¹³ C Sensitivity |
| WG-R-06-3 * | 600+ | 8" | 40% dioxane in benzene-d ₆ | ¹³ C Sensitivity |
| WG-R-08-3 * | 600+ | 8" | 0.1 mg/mL GdCl ₃ in D ₂ O with 1% H ₂ O + 0.1% CH ₃ OH enriched ¹³ C | ¹ H and ¹³ C Calibration |
| WG-R-10-3 * | 600+ | 8" | 4% methanol in methanol-d ₄ | Low Temperature Calibration |
| WG-R-11-3 * | 600+ | 8" | 80% glycol in DMSO-d ₆ | High Temperature Calibration |
| WG-R-14-3 * | 600+ | 8" | 0.0485M triphenylphosphate in CDCl ₃ | ³¹ P Sensitivity |

5mm O.D. NMR Reference Standards

| Catalog No. | MHz Rating | Length | Description | Application |
|-------------------------------|------------|--------|---|--|
| WG-R-01-5 * | 600+ | 8" | 0.1% ethylbenzene in chloroform-d | ¹ H Sensitivity |
| WG-R-02-5 * | 600+ | 8" | 3% CHCl ₃ / 0.2% TMS in acetone-d ₆ | ¹ H Lineshape |
| WG-R-03-5 * | 600+ | 8" | 1% CHCl ₃ in acetone-d ₆ | ¹ H Lineshape |
| WG-R-03-5-7 * | 600+ | 7" | 1% CHCl ₃ in acetone-d ₆ | ¹ H Lineshape |
| WG-R-04-5 * | 600+ | 8" | 0.3% CHCl ₃ in acetone-d ₆ | ¹ H Lineshape |
| WG-R-05-5 * | 600+ | 8" | 10% ethylbenzene in chloroform-d | ¹³ C Sensitivity |
| WG-R-06-5 * | 600+ | 8" | 40% dioxane in benzene-d ₆ | ¹³ C Sensitivity |
| WG-R-08-5 * | 600+ | 8" | 0.1 mg/mL GdCl ₃ in D ₂ O with 1% H ₂ O + 0.1% CH ₃ OH enriched ¹³ C | ¹ H and ¹³ C Calibration |
| WG-R-09-5 * | 600+ | 8" | 99.8% methanol-d ₄ | Temperature Calibration |
| WG-R-10-5 * | 600+ | 8" | 4% methanol in methanol-d ₄ | Low Temperature Calibration |
| WG-R-11-5 * | 600+ | 8" | 80% glycol in DMSO-d ₆ | High Temperature Calibration |
| WG-R-12-5 * | 600+ | 8" | 3mM triphenylphosphate in CDCl ₃ | ³¹ P Sensitivity |
| WG-R-13-5 * | 600+ | 8" | 0.05% trifluorotoluene in CDCl ₃ | ¹⁹ F Sensitivity |
| WG-R-14-5 * | 600+ | 8" | 0.0485M triphenylphosphate in CDCl ₃ | ³¹ P Sensitivity |

*  See page 57

Accessories for Liquid-Phase NMR

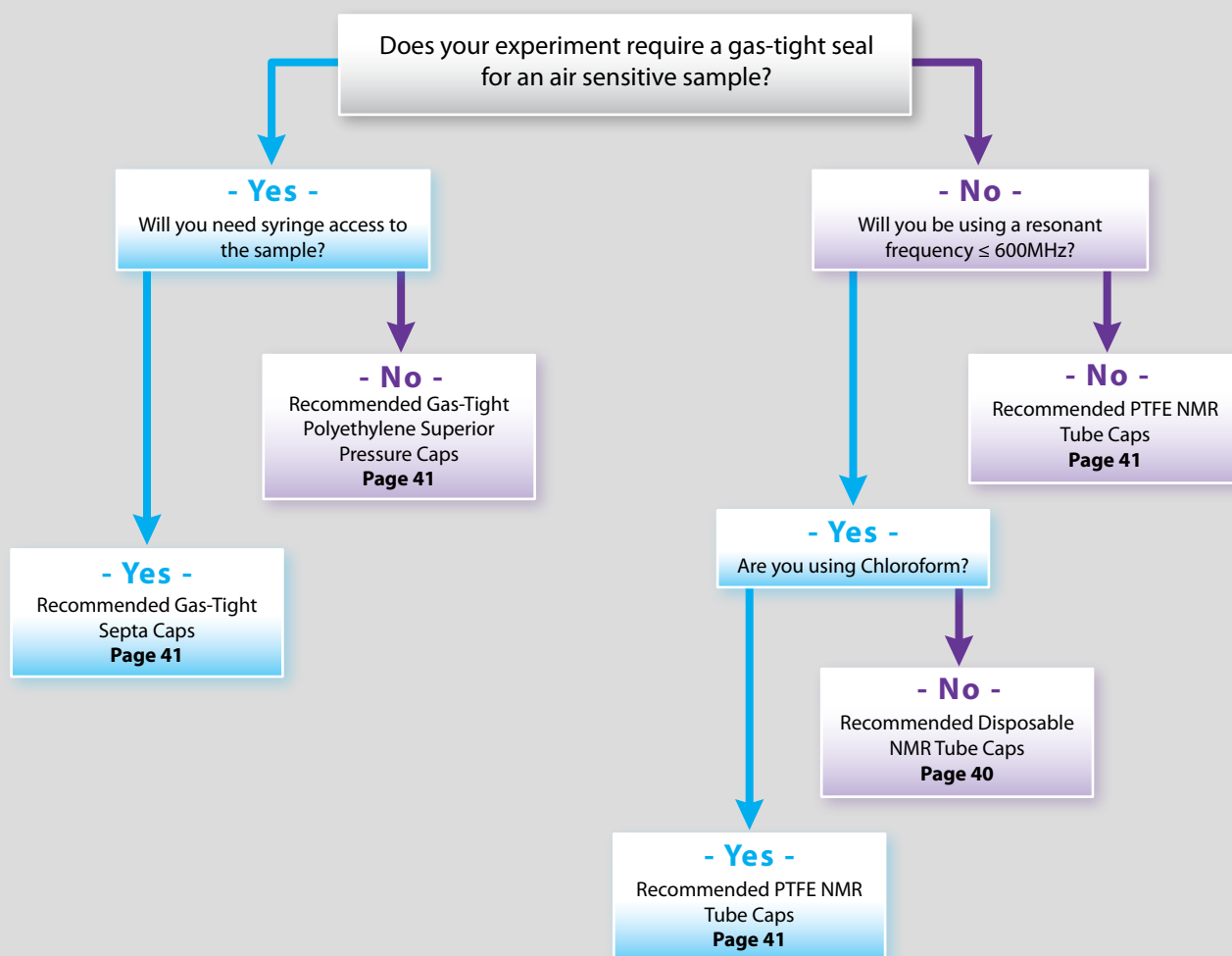


Sample Success

From tube testers, to caps, to washers, Wilmad's selection of accessories will give your experiments the best results possible.



NMR Tube Cap Selection Guide



Accessories for Liquid-Phase NMR

Disposable NMR Tube Caps

Wilmad's Disposable NMR Tube Caps are made from high quality Polyethylene or Ethylene Vinyl Acetate. Different colors help to track samples.



Note: Please avoid using Wilmad's Disposable NMR Tube Caps when CDCl_3 serves as the reference solution as the material(s) could be dissolved. For CDCl_3 , we recommend PTFE tube caps shown on the next page.

Disposable NMR Tube Caps

| Catalog No. | Fits Tube O.D. | Material | Color | Package Qty. |
|--------------------------------|--------------------------------------|------------------------|----------|--------------|
| 521-R | 1.7mm | Polyethylene | Red | 25 |
| 521-T | 2.0mm | Polyethylene | Red | 25 |
| 521-U | 2.5mm | Polyethylene | Red | 25 |
| 521-P-100 | 3.0mm | Polyethylene | Red | 100 |
| 521-P-1000 | 3.0mm | Polyethylene | Red | 1000 |
| 521-G-100 | 4.0mm | Polyethylene | Blue | 100 |
| 521-G-1000 | 4.0mm | Polyethylene | Blue | 1000 |
| 521-BLK-100 | 5.0mm | Ethylene Vinyl Acetate | Black | 100 |
| 521-BLK-1000 | 5.0mm | Ethylene Vinyl Acetate | Black | 1000 |
| 521-BLU-100 | 5.0mm | Ethylene Vinyl Acetate | Blue | 100 |
| 521-BLU-1000 | 5.0mm | Ethylene Vinyl Acetate | Blue | 1000 |
| 521-GRN-100 | 5.0mm | Ethylene Vinyl Acetate | Green | 100 |
| 521-GRN-1000 | 5.0mm | Ethylene Vinyl Acetate | Green | 1000 |
| 521-ORG-100 | 5.0mm | Ethylene Vinyl Acetate | Orange | 100 |
| 521-ORG-1000 | 5.0mm | Ethylene Vinyl Acetate | Orange | 1000 |
| 521-PUR-100 | 5.0mm | Ethylene Vinyl Acetate | Purple | 100 |
| 521-PUR-1000 | 5.0mm | Ethylene Vinyl Acetate | Purple | 1000 |
| 521-RED-100 | 5.0mm | Ethylene Vinyl Acetate | Red | 100 |
| 521-RED-1000 | 5.0mm | Ethylene Vinyl Acetate | Red | 1000 |
| 521-WHT-100 | 5.0mm | Ethylene Vinyl Acetate | White | 100 |
| 521-WHT-1000 | 5.0mm | Ethylene Vinyl Acetate | White | 1000 |
| 521-YLW-100 | 5.0mm | Ethylene Vinyl Acetate | Yellow | 100 |
| 521-YLW-1000 | 5.0mm | Ethylene Vinyl Acetate | Yellow | 1000 |
| 521-PNK-100 | 5.0mm | Ethylene Vinyl Acetate | Pink | 100 |
| 521-PNK-1000 | 5.0mm | Ethylene Vinyl Acetate | Pink | 1000 |
| 521-AQA-100 | 5.0mm | Ethylene Vinyl Acetate | Aqua | 100 |
| 521-AQA-1000 | 5.0mm | Ethylene Vinyl Acetate | Aqua | 1000 |
| 521-SKY-100 | 5.0mm | Ethylene Vinyl Acetate | Sky Blue | 100 |
| 521-SKY-1000 | 5.0mm | Ethylene Vinyl Acetate | Sky Blue | 1000 |
| 521-FUH-100 | 5.0mm | Ethylene Vinyl Acetate | Fuchsia | 100 |
| 521-FUH-1000 | 5.0mm | Ethylene Vinyl Acetate | Fuchsia | 1000 |
| 521-ASST-100 | 5.0mm | Ethylene Vinyl Acetate | Assorted | 100 |
| 521-ASST-1000 | 5.0mm | Ethylene Vinyl Acetate | Assorted | 1000 |
| 521-B-100 | 8.0mm | Polyethylene | Neutral | 100 |
| 521-B-1000 | 8.0mm | Polyethylene | Neutral | 1000 |
| 521-C-100 | 10.0mm | Polyethylene | Red | 100 |
| 521-C-1000 | 10.0mm | Polyethylene | Red | 1000 |
| 521-C-YLW-100 | 10.0mm | Polyethylene | Yellow | 100 |
| 521-C-YLW-1000 | 10.0mm | Polyethylene | Yellow | 1000 |
| 521-WGS-100 | 5.0mm (with hole for coaxial insert) | Ethylene Vinyl Acetate | Red | 100 |

Wilmad PTFE NMR Tube Caps

Wilmad PTFE NMR Tube Caps

| Catalog No. | Fits Tubes With O.D. | Fits Tube Style | Material | Color | Package Qty. |
|-----------------------------|----------------------|-----------------|----------|-------|--------------|
| WG-1264-3 | 3mm | Precision | PTFE | White | 25 |
| WG-1264-4 | 4mm | Precision | PTFE | White | 25 |
| WG-1264-5 | 5mm | Precision | PTFE | White | 25 |
| WG-1265-10 | 5mm | Precision | PTFE | White | 10 |
| WG-1265-100 | 5mm | Precision | PTFE | White | 100 |
| WG-1264-8 | 8mm | Precision | PTFE | White | 25 |
| WG-1264-10 | 10mm | Precision | PTFE | White | 25 |

Wilmad's PTFE NMR Tube Caps are machined to exact specifications with a smaller gyroradius and more homogeneous mass distribution than disposable caps for better spinning stability. These caps are recommended in experiments at high to ultra high field and experiments using chloroform as reference solution.



Gas-Tight NMR Tube Caps

Gas-Tight NMR Tube Caps

| Catalog No. | Cap Type | Fits Tubes With O.D. | Color | Material | Package Qty. |
|-----------------------------|-------------------|----------------------|--------|----------------|--------------|
| 521-PC-100 | Superior Pressure | 5mm | Opaque | Polyethylene | 100 |
| 521-PC-1000 | Superior Pressure | 5mm | Opaque | Polyethylene | 1000 |
| WG-3889-10 | Septum | 3 & 4mm | White | Natural Rubber | 10 |
| WG-3889-100 | Septum | 3 & 4mm | White | Natural Rubber | 100 |
| WG-3890-10 | Septum | 3 & 4mm | Red | Natural Rubber | 10 |
| WG-3890-100 | Septum | 3 & 4mm | Red | Natural Rubber | 100 |
| WG-3891-10 | Septum | 5mm | White | Natural Rubber | 10 |
| WG-3891-100 | Septum | 5mm | White | Natural Rubber | 100 |
| WG-3892-10 | Septum | 5mm | Red | Natural Rubber | 10 |
| WG-3892-100 | Septum | 5mm | Red | Natural Rubber | 100 |
| WG-3895-10 | Septum | 10mm | White | Natural Rubber | 10 |
| WG-3895-100 | Septum | 10mm | White | Natural Rubber | 100 |
| WG-3896-10 | Septum | 10mm | Red | Natural Rubber | 10 |
| WG-3896-100 | Septum | 10mm | Red | Natural Rubber | 100 |

Gas-Tight NMR Tube Caps are ideal for experiments that require an air-tight environment under vacuum or low pressure less than 1 bar. Use these caps with Wilmad medium walled and heavy walled NMR tubes for better seal and robustness in variable temperature experiments. Septa allow easy access via syringe needle.



Accessories for Liquid-Phase NMR

Spinner Turbines for Bruker® Spectrometers

Bruker® Room Temperature 5 & 10mm Spinner Turbine



Highlights

- Less probe insert damage due to better insert sample control
- Longer upper barrel stabilizer with 3mm yellow band
- Can be mixed with originals during sample changer operation

Bruker® Room Temperature 5 & 10mm Spinner Turbines

| Catalog No. | Application Temperature | Description |
|-------------------------------------|-------------------------|-------------------------------|
| STB-5 | Ambient | 5mm Spinner for Bruker® |
| STB-5-TACHO | — | Replacement Tacho-Strip |
| TURBINE-ORING-BLACK | — | Replacement 5mm Viton® O-Ring |
| STB-10 | Ambient | 10mm Spinner for Bruker® |

Bruker® Variable Temperature 5 & 10mm Spinner Turbines



Highlights in addition to previous

- Far less likely to break than ceramic spinners if dropped on a hard surface
- Weight is comparable to room temperature spinners
- Long life high-temperature top and bottom O-rings

Bruker® Variable Temperature 5 & 10mm Spinner Turbines

| Catalog No. | Application Temperature | Description |
|---------------------------------|-------------------------|-------------------------------|
| B-PEEK-5 | -150 to 200° C | 5mm PEEK Spinner for Bruker® |
| B-PEEK-10 | -150 to 200° C | 10mm PEEK Spinner for Bruker® |
| B-PEEK-5-O-RING | — | Replacement 5mm Viton® O-Ring |
| B-PEEK-10-O | — | Replacement 10mm O-Ring |

Bruker® 3 to 5mm Spinner Turbine with Exchangeable Fingers



Highlights in addition to previous

- Allows a portion of the VT air to pass straight through the sample inside the spinner turbine therefore reducing VT gradients and micro sonic flutter due to any high VT flow
- Includes high temperature external O-rings at the top and bottom for long life and a firm grip on the sample
- Optimized for non-spinning experiments but compatible with spinning experiments
- No need to adjust eject air to eject sample
- The mass multiplier ring is not included but can be purchased separately

Bruker® Variable Temperature 3 to 5mm Spinner Turbines with Exchangeable Fingers

| Catalog No. | Application Temperature | Description | Material |
|-----------------------------------|-------------------------|--|----------|
| B-PEEK-3-NS | -150 to 200° C | Bruker® Spinner Turbine with 3mm PEEK exchangeable fingers | PEEK |
| B-PEEK-4-NS | -150 to 200° C | Bruker® Spinner Turbine with 4mm PEEK exchangeable fingers | PEEK |
| B-PEEK-5-NS | -150 to 200° C | Bruker® Spinner Turbine, with 5mm PEEK exchangeable fingers | PEEK |
| UNI-FINGER-PEEK-3 | -150 to 200° C | 3mm Finger for B-PEEK-X-NS Turbines (Two Required), Double VT O-Ring | PEEK |
| UNI-FINGER-PEEK-4 | -150 to 200° C | 4mm Finger for B-PEEK-X-NS Turbines (Two Required), PEEK, Double VT O-Ring | PEEK |
| UNI-FINGER-PEEK-5 | -150 to 200° C | 5mm Finger for B-PEEK-X-NS Turbines (Two Required), PEEK, Double VT O-Ring | PEEK |
| UNI-MASS-MULTI | — | Mass Multiplier Ring for Bruker® Style Spinner Turbines with 1 or 2 O-Rings at the top | — |

Spinner Turbines for Agilent® (Varian®) Spectrometers

Agilent® Room Temperature 5mm & 10mm Spinner Turbine



Highlights

- Can be mixed with originals in sample changer operation
- Does not jam at top of upper barrel during insert operation

Agilent® Room Temperature 5 & 10mm Spinner Turbines

| Catalog No. | Application Temperature | Description |
|-----------------------------------|-------------------------|--------------------------|
| STV-5 | Ambient | 5mm Spinner for Agilent® |
| STV-5-TACHO | — | Replacement Tacho-Strip |
| TURBINE-ORING-RED | — | Replacement 5mm O-Ring |

Agilent® Variable Temperature 5mm & 10mm Spinner Turbine



Highlights in addition to previous

- Weight compatible with room temperature spinners
- Cost effective as compared to the originals
- Long life high-temperature top and bottom O-rings

Agilent® Variable Temperature 5 & 10mm Spinner Turbines

| Catalog No. | Application Temperature | Description |
|-----------------------------------|-------------------------|-------------------------------|
| V-PEEK-5 | -150 to 200° C | 5mm PEEK Spinner for Agilent® |
| TURBINE-ORING-RED | — | Replacement 5mm Viton® O-Ring |

Agilent® 3 to 5mm Spinner Turbine with Exchangeable Fingers



Highlights in addition to previous

- Allows a portion of the VT air to pass straight through the sample inside the spinner turbine therefore reducing VT gradients and micro sonic flutter due to any high VT flow
- Includes high temperature external O-rings at the top and bottom for long life and a firm grip on the sample
- Optimized for non-spinning experiments but compatible with spinning experiments
- No need to adjust eject air to eject sample
- The mass multiplier ring is not included but can be purchased separately

Agilent® 3 to 5mm Variable Temperature Spinner Turbines with Exchangeable Fingers

| Catalog No. | Application Temperature | Description | Material |
|------------------------------------|-------------------------|---|----------|
| V-PEEK-3-NS | -150 to 200° C | Agilent® Spinner Turbine with 3mm PEEK exchangeable fingers | PEEK |
| V-PEEK-4-NS | -150 to 200° C | Agilent® Spinner Turbine with 4mm PEEK exchangeable fingers | PEEK |
| V-PEEK-5-NS | -150 to 200° C | Agilent® Spinner Turbine with 5mm PEEK exchangeable fingers | PEEK |
| UNI-FINGER -PEEK-3 | -150 to 200° C | 3mm Finger for V-PEEK-X-NS style turbines (Two Required), Double VT O-Ring | PEEK |
| UNI-FINGER -PEEK-4 | -150 to 200° C | 4mm Finger for V-PEEK-X-NS style turbines (Two Each Required), PEEK, Double VT O-Ring | PEEK |
| UNI-FINGER -PEEK-5 | -150 to 200° C | 5mm Finger for V-PEEK-X-NS style turbines (Two Each Required), PEEK, Double VT O-Ring | PEEK |
| UNI-MASS-MULTI | — | Mass Multiplier Ring for V-NS Style Spinner Turbines with 1 or 2 O-Rings at the top | |



Accessories for Liquid-Phase NMR

Tube Washers

Multi-Tube Jet Solvent NMR/EPR Tube Washer/Dryer

Wilmad's 2nd generation Multi-Tube Jet Solvent Washer/Dryer is recommended for research labs that routinely clean NMR and EPR tubes; a single unit can accommodate up to 5 tubes at once. When an inverted tube is inserted onto the solvent transfer tubing and the open end is immersed under wash solvent in the solvent cup, a reliable vacuum-tight seal will be formed and generate solvent flow under vacuum. After solvent is fully consumed, air flow will follow to turn the unit into a dryer.

A filter flask with vacuum sidearm is required and can be purchased separately, [see page 50](#).

Features:

- 5 PTFE coated stainless steel solvent transfer tubes fit 3, 4, and 5mm NMR/EPR tubes
- PTFE solvent cup and tubing make this unit resistant to common organic solvents
- Flanged reservoir connection eliminates joint freeze
- Grease-less joint between the solvent cup and glass reservoir eliminates possibility of contamination
- Complete disassembly without tools for easy cleaning
- Hands free during washing/drying cycle
- Calibrated length mark for 4, 7, 8 and 9" tube

Multi-Tube Jet Solvent NMR/EPR Tube Washer/Dryer

| Catalog No. | Compatible with | Description |
|----------------------------|---------------------------|----------------------------------|
| WG-1209-1 | #9 Silicone Stopper Joint | Complete Multi-Tube Washer/Dryer |
| WG-1209-J1 | 24/40 Taper Joint | Complete Multi-Tube Washer/Dryer |
| WG-1209-J2 | 29/32 Taper Joint | Complete Multi-Tube Washer/Dryer |
| WG-1209-5 | — | Replacement Solvent Cup |



Economy Single Tube Solvent Jet Washer/Cleaner

After fitting the washer to a filter flask, an inverted sample tube is inserted into the washer and solvent is introduced into the reservoir using a series of wash bottles. You can perform numerous wash steps and finish by pulling vacuum to dry the tube.

A filter flask with vacuum sidearm is required and can be purchased separately, [see page 50](#).

Economy Single Tube Solvent Jet Washer/Cleaner

| Catalog No. | Fits Tubes with O.D. | For Tubes with Length | Washer Connection |
|------------------------------|----------------------|-----------------------|-------------------|
| WG-1207-5 | 5mm | 7" | Plain |
| WG-1207-5-8 | 5mm | 8" | Plain |
| WG-1207-10 | 10mm | 7" | Plain |
| WG-1207-J5 | 5mm | 7" | 24/40 Joint |
| WG-1207-J5-8 | 5mm | 8" | 24/40 Joint |
| WG-1207-J10 | 10mm | 7" | 24/40 Joint |



Note: The 5mm Single Tube Washer is compatible with 5mm Thin-Walled Tubes only.

Universal Solvent Jet NMR Tube Washer

Wilmad-LabGlass's Universal Solvent Jet Washer can be used for any length sample tube by a simple adjustment of the flexible PTFE tubing. It is especially recommended for cleaning gas-tight sample tubes.

By loosening and re-tightening the tubing fitting on the assembled washer head, the PTFE tubing that extends into the sample tube is adjusted to the proper length. The washer head is then affixed to a filter flask (with sidearm) and the side tubing is inserted into a washing solvent reservoir. After an inverted sample tube is placed over the PTFE tubing, a vacuum is applied to the flask and the sample tube is pressed against the rubber gasket to form an air-tight seal that starts the solvent flow. By lifting the PTFE tubing out of the solvent reservoir, the sample tube can be air-dried.

A filter flask with vacuum sidearm is required and can be purchased separately, see below.



Universal Solvent Jet NMR Tube Washer

| Catalog No. | Fits Tubes with O.D. | Washer Connection |
|----------------------------|----------------------|-------------------|
| WG-7200-1 | 2.5-5mm | Plain |
| WG-7200-J1 | 2.5-5mm | 3/24/40 Joint |
| WG-7200-J2 | 6.5-25mm | 3/24/40 Joint |

Parts for Universal Solvent Jet Washer

| Catalog No. | Description | For Tube Washers |
|-----------------------------|-------------------|-------------------|
| WG-7200-B | Washer Glass Body | WG-7200-1, -2 |
| WG-7200-J-B | Washer Glass Body | WG-7200-J-1, -J-2 |
| WG-7200-S-G | Rubber Gasket | WG-7200-1, -J1 |
| WG-7200-S-O | Small O-Ring | WG-7200-1, -J1 |
| WG-7200-L-O | Small O-Ring | WG-7200-2, -J2 |
| WG-7200-S-P | PTFE Tubing | WG-7200-1, -J1 |
| WG-7200-L-P | PTFE Tubing | WG-7200-2, -J2 |

Filter Flasks with Vacuum Sidearms

Filter flasks have a standard taper 3/24/40 outer joint and are used with all Wilmad-LabGlass NMR Tube Washers

Filter Flasks with Vacuum Sidearms

| Catalog No. | Description | Volume |
|-----------------------------|----------------------------------|---------|
| LG-7800-102 | Filter Flask with Vacuum Sidearm | 250 mL |
| LG-7800-104 | Filter Flask with Vacuum Sidearm | 500 mL |
| LG-7800-106 | Filter Flask with Vacuum Sidearm | 1000 mL |



Accessories for Liquid-Phase NMR

Ultrasonic Cleaning Systems

The Ultrasonic Cleaning Systems can wash up to 20 tubes at a time and are recommended for NMR research facilities. Operating at 21,000 sonic vibrations per second, these versatile, compact units can be used with aqueous detergent solutions or organic solvents (tank manufactured from stainless steel).

Note: Covers, Baskets, Trays & Racks are sold separately

Capacity: 1 gallon (approximately 3.8 liters)
Tank Dimensions: 9" x 5" x 6" deep
Outer Dimensions: 10 1/2" x 6 1/2" x 11" high



Ultrasonic Cleaning System Units

| Catalog No. | Voltage | Description |
|--------------------------|---------|--|
| SC-101T | 110/120 | Ultrasonic Cleaner with 0-30 Minute Timer |
| SC-101TH | 110/120 | Ultrasonic Cleaner with 0-30 Minute Timer & Heater |
| SC-121TH | 230 | Ultrasonic Cleaner with 0-30 Minute Timer & Heater |

Detergent

| Catalog No. | Description |
|-------------------------|--|
| 101-GAL | 1 Gallon Alkaline Cleaning Concentrate |

Accessories

| Catalog No. | Description |
|--------------------------|-----------------------------------|
| C-100 | Cover, Stainless Steel |
| B-101 | Basket, Stainless Steel |
| IT-101 | Liquid Tight Stainless Steel Tray |
| WG-11100 | Poly Coated NMR Tube Rack |

Liquid Nitrogen Dewar Flask



The liquid nitrogen flask is extremely useful for a wide range of applications in basic science research, such as cell cryo-preservation, sample degasification by freeze-pump-thaw cycle and cold trap for experiments involving vacuum lines.

Features:

- Unique metal base increases stability
- High vacuum minimizes liquid nitrogen loss during storage

Liquid Nitrogen Dewar Flask

| Catalog No. | Base | I.D. | Total Height | Inside Depth | Max Volume | Cross Reference |
|-----------------------------|-------------|------|--------------|--------------|------------|----------------------|
| LN2DF-600-1 | 3" Aluminum | 80mm | 180mm | 150mm | 600 mL | Pope Scientific 8640 |

Combination pH Electrode

For use in 5 mm thin-walled NMR sample tubes up to 8" in length. Glass probe dimensions are 3mm O.D. x 180mm length.

pH Range: 0-14

Resolution: 0.02 pH Units

Resistance at 20° C: 100-1000 MΩ

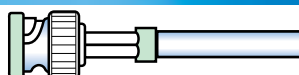
Temperature Range: 0-70° C

Sodium Error: 0.1 at pH 12

Reproducibility: 99% within



Connectors



6030-02-BNC



6030-02-6

pH Electrode

| Catalog No. | Description |
|-----------------------------|---------------------------------|
| 6030-02-BNC | pH Electrode with BNC Connector |

Electrode Solutions

| Catalog No. | Volume | Description |
|-----------------------|--------|---|
| 18513 | 250 mL | Reference Solution - 3M KCl saturated with AgCl |
| 18823 | 125 mL | Electrode Storage Solution - 3M KCl |

Accessories for Liquid-Phase NMR

NMR Tube Rack

Sturdy, stable polypropylene rack made specifically for organizing and protecting 5mm thin-walled NMR tubes.

NMR Tube Racks

| Catalog No. | Material | Fits Tube with Maximum O.D. | Capacity |
|-----------------------|---------------|-----------------------------|----------|
| 820-A | Polypropylene | 5mm | 72 tubes |



NMR Tube Carrier

The NMR tube carrier holds one 5mm O.D., 7" length NMR tube.

- Pocket clip keeps sample secure during pocket transportation
- Made from shatterproof polymer material
- In the case of an accident it provides protection to lab personnel from hazardous materials and broken glass

NMR Tube Carrier

| Catalog No. | Description | Package Qty. |
|-------------------------|---------------------------------|--------------|
| WG-6192 | NMR Tube Carrier w/ Pocket Clip | 3 |



Pressure Sensitive NMR Tube Labels

Wilmad's Pressure Sensitive NMR Tube Labels are a handy alternative to marking tubes. Each label fits the circumference of the NMR tube precisely with no overlapping to guarantee sample tube symmetry in spinning experiments.

Pressure Sensitive NMR Tube Labels

| Catalog No. | For Tubes with O.D. | Package Qty. |
|------------------------|---------------------|--------------|
| WGL-5 | 5mm | 480 |
| WGL-10 | 10mm | 400 |



Vortex Plugs and Positioning Rods

Vortex Plugs are recommended for spinning experiments where a vortex is created in your sample. PTFE flexible fins fit snugly into Precision Thin-Wall NMR tubes. A positioning rod is needed to place the plug at the correct height in the NMR tube. An air vent in the plug's center assures easy insertion. Not recommended for variable temperature experiments.



Vortex Plugs

| Catalog No. | Fits Tubes with O.D. | Fits Tubes with Wall Thickness | Material | Description |
|------------------------|----------------------|--------------------------------|-----------------|-----------------|
| 529-B | 5mm | 0.38mm | PTFE | Holder |
| 529-C | 5-15mm | — | Kel-F® | Positioning Rod |
| WG-504 | 5-15mm | — | Stainless Steel | Positioning Rod |

Spinner Bearing NMR Sample Tube Tester



How do you keep bent & misused NMR tubes from damaging your instruments? Have every tube pass the spinner bearing test before use.

Warped tubes bind in the spinner bearing, good tubes spin freely. Keep a tube tester beside every NMR spectrometer. It will be the best investment you ever make.

Available for 5, 8 and 10mm O.D. NMR tubes.

Spinner Bearing NMR Sample Tube Tester

| Catalog No. | Description | Fits Tubes with O.D. |
|-------------------------|-----------------------------|----------------------|
| SB-5-7 | Spinner Bearing Tube Tester | 5mm |
| SB-8-7 | Spinner Bearing Tube Tester | 8mm |
| SB-10-7 | Spinner Bearing Tube Tester | 10mm |

Accessories for Liquid-Phase NMR

NMR Pipettes

Wilmad Sample Transfer NMR Pipettes are designed for easy transfer of liquid samples contained in 5mm OD and larger NMR tubes, long neck volumetric flasks or chromatography columns.

- Manufactured from high quality ASTM Type 1 Class A borosilicate glass
- Resistant to most organic solvents
- Transparency provides easy control of sample loading
- Easily attach a latex bulb (804), sold separately
- Manufactured in a clean room
- Free from organic and inorganic contamination
- Special shaping process ensures a smooth surface to minimize sample loss



Wilmad Long-Tip Sample Transfer NMR Pipettes

| Catalog No. | Description | Length | Fits with Tube | Package Qty. |
|----------------------|-----------------------------|----------------|------------------------------|--------------|
| 803A | Long Tip Pipette | 13.75" Overall | 7", 8", 9", 5mm minimum O.D. | 100 |
| 802 | Short Pasteur Pipette | 5" tip | 5mm minimum O.D. | 100 |
| 804 | Latex Bulb for all Pipettes | — | — | 50 |

NMR Filter and Funnel

Wilmad's Bulb Filter removes large particles from samples that may impact shimming and spectrum quality.

Two designs available: one with luer lock tip for stainless steel needles, the other with a glass tip. Both fit most sizes of Wilmad NMR tubes. The sintered glass tip removes particles larger than 60 μ m.

NMR Filter and Funnel

| Catalog No. | Description |
|---------------------|--------------------|
| 815 | NMR Funnel |
| 807 | Regular Tip Filter |
| 808 | Luer Tip Filter |
| 809 | Rubber Bulb |

Wilmad's Powder Funnel is designed to load large amounts of liquid reagents into NMR tubes. The tip fits into 5mm or larger NMR tubes.



Hamilton® Gas-Tight Syringe (PTFE Luer Lock)

Wilmad offers PTFE Luer Lock syringes that are ideal for the handling of air-sensitive and/or volatile samples with precise control over sample volumes.

Features:

- Gas and liquid tight
- Reproducible (volumes to $\pm 1\%$)
- Made of inert borosilicate glass, PTFE, and stainless steel
- Pressure tight to 200 psi

Hamilton® Gas-Tight Syringe (PTFE Luer Lock)

| Catalog No. | Max. Volume | Graduation Interval |
|-----------------------|--------------------|---------------------|
| 81220 | 500 μL | 10 μL |
| 81320 | 1000 μL | 20 μL |
| 81420 | 2500 μL | 50 μL |



Syringe Needles

Stainless steel needles are designed for septum punctures. PTFE needles, offered in various diameters, provide a convenient method of sample loading and washing in small-volume NMR experiments.



Syringe Needles

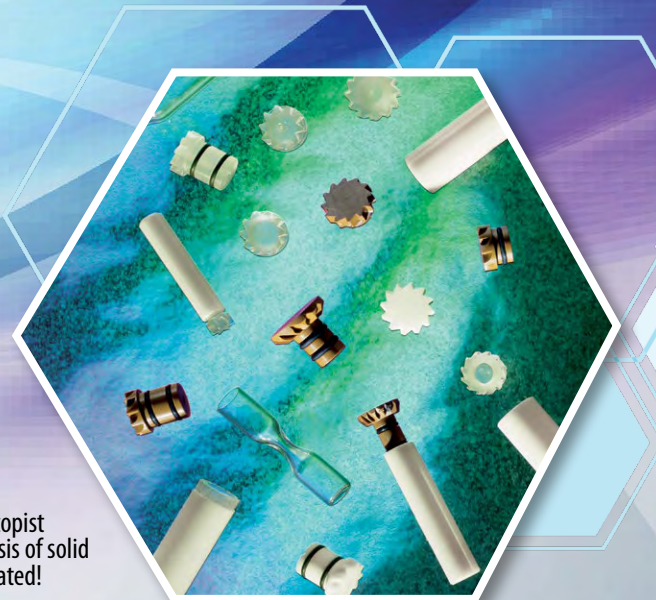
| Catalog No. | Material | O.D. | I.D. | Length | Package Qty. |
|-----------------------|-----------------|--------|--------|--------|--------------|
| 90022 | Stainless Steel | 0.71mm | 0.41mm | 2" | 6 |
| 90052 | Stainless Steel | 0.71mm | 0.41mm | 5" | 6 |
| 91026 | Stainless Steel | 0.46mm | 0.26mm | 6" | 6 |
| 90630 | PTFE | 0.79mm | 0.33mm | 12" | 1 |
| 90628 | PTFE | 0.84mm | 0.38mm | 12" | 1 |
| 90626 | PTFE | 0.91mm | 0.45mm | 12" | 1 |
| 90624 | PTFE | 1.02mm | 0.56mm | 12" | 1 |
| 90622 | PTFE | 1.14mm | 0.69mm | 12" | 1 |
| 90620 | PTFE | 1.35mm | 0.86mm | 12" | 1 |
| 90619 | PTFE | 1.57mm | 0.97mm | 12" | 1 |
| 90618 | PTFE | 1.68mm | 1.07mm | 12" | 1 |
| 90617 | PTFE | 1.80mm | 1.19mm | 12" | 1 |
| 90616 | PTFE | 2.01mm | 1.35mm | 12" | 1 |
| 90615 | PTFE | 2.11mm | 1.50mm | 12" | 1 |

Solid-State NMR Consumables & Accessories



Solid State Significance

MAS Rotors provide the NMR spectroscopist with the ultimate alternative for analysis of solid samples. The need to solvate is eliminated!



Properties of MAS-NMR Rotors & Caps

| | Rotors | Caps & Plugs | | | |
|---|----------------------------|----------------------------|-----------------|---------------------------------------|---------------|
| | Zirconia | Kel-F® | Macor® | Torlon® | Vespel® SP1 |
| Minimum Temperature | -150° C | -20° C | -100° C | -100° C | -100° C |
| Maximum Temperature | 650° C | 70° C | 200° C | 200° C | 200° C |
| Studies Commonly Used for | — | ¹ H | ¹³ C | Multi-nuclei (except ¹³ C) | — |
| Fits Probe Size (mm) | 2.5, 3.2, 4.0, 5.0, 7.0 | 2.5, 3.2, 4.0, 5.0, 7.0 | 4.0, 7.0 | 4.0, 5.0, 7.0 | 2.5, 3.2, 4.0 |
| Compatible with Probe Manufacturer | Bruker® Agilent/Varian® | Bruker® Agilent/Varian® | Bruker® | Bruker® Agilent/Varian® | Bruker® |
| Contains a Detachable O-ring for a Gas-tight Seal | — | Yes | Yes | Yes | Yes |
| Available with Venting Axial Hole | — | Yes | No | Yes | No |

Rotor & Cap for Bruker® & Agilent/Varian® MAS-NMR

MAS-NMR rotor bodies are manufactured from the highest quality Zirconia, Kel-F, Torlon®, & Vespel® providing the ultimate solution for analysis of solid samples.

- MAS rotors and caps are 100% compatible with most solid state NMR spectrometers
- Thoroughly inspected before and after the precision machining process to ensure there are no material irregularities
- Spin testing is performed to only the highest specified spinning speed, assuring performance without overspinning the rotor
- Spinning speeds of up to 12 kHz for 7mm O.D. rotors
- Some caps are fitted with O-rings for improved sealing
- Zirconia rotor body has a strength of 1,000 MPa, greater than Si_3N_4



Note: "DB" is the abbreviation for Bruker® "Double Bearing" style rotor.

"BL" is the abbreviation for Bruker® "Boden Lager" (Bottom Bearing) style rotor.

Rotor & Cap for Bruker® MAS Probe

| Catalog No. | For Bruker® MAS Probe | Temperature Range | Description | Material | Remarks |
|----------------------------------|-----------------------|-------------------|--|----------|-------------------------|
| WP-501-2180 | 2.5mm | -150 to 650° C | Both Ends Open Rotor | Zirconia | $V_{\text{max}}=35$ kHz |
| WP-602-2181 | 2.5mm | -30 to 70° C | Cap | Vespel® | |
| WP-602-2182 | 2.5mm | -30 to 70° C | Bottom Plug | Vespel® | |
| WP-501-2180-SET1 | 2.5mm | -30 to 70° C | One 2.5mm Rotor, Two Vespel® Caps and Bottoms | Various | $V_{\text{max}}=35$ kHz |
| WP-501-3180 | 3.2mm | -150 to 650° C | Rotor Body, Both Ends Open | Zirconia | $V_{\text{max}}=24$ kHz |
| WP-501-3180-SET1 | 3.2mm | -30 to 70° C | One 3.2mm Rotor, Two Vespel® Caps and Bottoms | Various | $V_{\text{max}}=24$ kHz |
| WP-602-3181 | 3.2mm | -30 to 70° C | Rotor Cap | Vespel® | |
| WP-602-3182 | 3.2mm | -30 to 70° C | Bottom Plug | Vespel® | |
| WP-603-3181 | 3.2mm | -20 to 70° C | Rotor Cap | Kel-F® | |
| WP-603-3182 | 3.2mm | -20 to 70° C | Bottom Plug | Kel-F® | |
| WP-501-4180 | 4mm | -150 to 650° C | Rotor Body | Zirconia | $V_{\text{max}}=18$ kHz |
| WP-501-4181 | 4mm | -150 to 650° C | Rotor Body w/ Laser Marked Serial Number and Tachometer Mark on the Base | Zirconia | $V_{\text{max}}=18$ kHz |
| WP-601-4181 | 4mm | Ambient | Cap | Kel-F® | |
| JK-601-4181 | 4mm | -20 to 70° C | Cap with One O-ring | Kel-F® | |
| JK-602-4181 | 4mm | -100 to 200° C | Cap with One O-ring | Macor® | |
| JK-603-4181 | 4mm | -100 to 200° C | Cap with One O-ring | Torlon® | |

Solid-State NMR Consumables & Accessories

Rotor & Cap for Bruker® MAS Probe (continued)

| Catalog No. | For Bruker® MAS Probe | Temperature Range | Description | Material | Remarks |
|-----------------------------------|-----------------------|-------------------|--|----------|--------------------------|
| JK-604-4181 | 4mm | -100 to 200° C | Cap with One O-ring | Vespel® | |
| WP-501-4180-SET-1 | 4mm | -100 to 200° C | One Rotor, Two Kel-F® Caps, One Torlon® Cap | Various | V _{max} =18 kHz |
| WP-501-4180-SET-2 | 4mm | -100 to 200° C | Two Rotors, Four Kel-F® Caps, One Torlon® Cap | Various | V _{max} =18 kHz |
| WP-501-4180-SET-5 | 4mm | -100 to 200° C | Five Rotors, Ten Kel-F® Caps and Three Torlon® Caps | Various | V _{max} =18 kHz |
| WP-501-7180 | 7mm | -150 to 650° C | Rotor Body | Zirconia | V _{max} =8 kHz |
| WP-601-7181 | 7mm, BL | -20 to 70° C | Cap | Kel-F® | |
| JK-601-7181 | 7mm, BL | -20 to 70° C | Cap with One O-ring | Kel-F® | |
| JK-601-7181-L | 7mm, BL | -20 to 70° C | Long Cap with Two O-rings | Kel-F® | |
| JK-601-7181LWH | 7mm, BL | -20 to 70° C | Long Cap with Two O-rings and Axial Hole | Kel-F® | |
| JK-601-7181-WH | 7mm, BL | -20 to 70° C | Cap with One O-ring and Axial Hole | Kel-F® | |
| JK-603-7181 | 7mm, BL | -100 to 200° C | Cap with One O-ring | Torlon® | |
| WP-501-7180-SET-1 | 7mm | -100 to 200° C | One Rotor with Two Kel-F® Caps and One Torlon® Cap | Various | |
| WP-501-7180-SET-2 | 7mm | -100 to 200° C | Two Rotors with Four Kel-F® Caps and Two Torlon® Caps | Various | |
| WP-501-7180-SET-5 | 7mm | -100 to 200° C | Five Rotors with Ten Kel-F® Caps and Five Torlon® Caps | Various | |

Solid State NMR Rotor Cap Remover

One of the most challenging parts of a solid state NMR experiment is to remove the end cap or base plug. This zero turn cap remover eliminates possible damage to the cap and rotor.

Solid State NMR Rotor Cap Remover

| Catalog No. | Compatibility | Material |
|-----------------------------|---------------|-----------------|
| RS-301-2180 | 2.5mm Rotors | Stainless Steel |
| RS-301-3180 | 3.2mm Rotors | Stainless Steel |
| RS-301-4180 | 4mm Rotors | Stainless Steel |



Pyrex® Tube for Varian® NanoProbe

Wilmad Varian Nanoprobe tubes are 100% compatible with the Varian NanoProbe system in analysis of solids and semi-solids.

- Manufactured to tight tolerances that enable a maximum rotating speed of 2.5kHz
- Tube body is manufactured from Type 1 Class A borosilicate glass for optimized variable temperature performance
- Cap and bottom plugs are made of Kel-F® or Ertalyte®, allowing for excellent chemical resistance



Properties of Cap and Plug Materials

| Material | Chemical Components | Temperature Range | Additional Remarks | Finished Length | Overall Length |
|-----------|--|-------------------|--|-----------------|----------------|
| Ertalyte® | C, H, O, Polyethylene Terephthalate Polyester (PET-P) F, Cl, C | Ambient to 99° C | Not for strong acids, strong bases or chlorinated solvents; otherwise, excellent chemical resistance | 11.5mm | 23mm |
| Kel-F® | F, Cl, C | -20 to 70° C | Excellent chemical resistance commonly used for ¹ H studies | 14.0mm | 25mm |

Non-GHX type Varian® NanoProbe

| Catalog No. | Temperature Range | Description | Material | Volume |
|-------------------------------|-------------------|---------------------|----------|--------|
| WP-502-4225/C | | Tube with bottom | Pyrex® | |
| WP-502-4225/O | | Tube without bottom | Pyrex® | |

GHX type Varian® NanoProbe

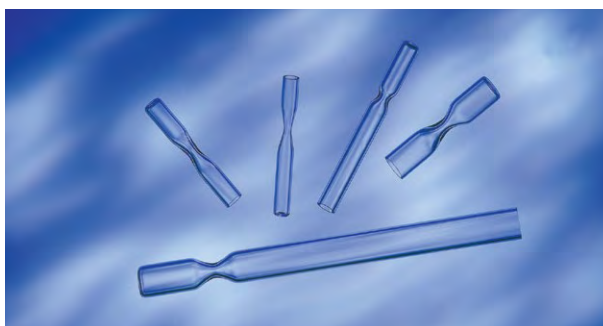
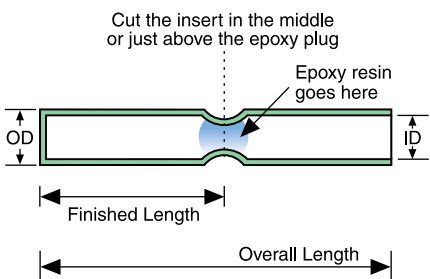
| Catalog No. | Temperature Range | Description | Material | Volume |
|-----------------------------------|-------------------|--------------------------------------|----------|--------|
| WP-7021-4225F/110 | -20 to 70° C | Tube with bottom and Kel-F® cap | Various | 110 µL |
| WP-7021-4225F/40 | -20 to 70° C | Tube with Kel-F® cap and bottom plug | Various | 40 µL |

Solid-State NMR Consumables & Accessories

Pyrex® MAS Rotor Inserts

Wilmad's Pyrex® MAS Rotor Inserts are designed for air-sensitive samples and semi-solid samples such as gels or highly viscous liquids. The sample can be sealed into the insert tube by heat-sealing with a torch or applying a small drop of epoxy (we recommend E-6000® Craft Adhesive) to the constricted part as shown in the picture below. After the epoxy is set and dry (24 hours), the sealed insert is then cut through the constriction with a glass saw.

Using a small funnel powder samples can be packed into the insert. Gelatinous samples can be warmed and transferred to the insert using a syringe. A glove box may be required for the sealing of air-sensitive samples.



Pyrex® MAS Rotor Inserts

| Catalog No. | For MAS Rotor | O.D. | I.D. | Finished Length | Overall Length |
|-----------------------------|-------------------------|--------|--------|-----------------|----------------|
| DWGSK2576-1 | WP-501-4180 Bruker® 4mm | 2.99mm | 2.24mm | 14.0mm | 25mm |
| DWGSK2356 | WP-501-7180 Bruker® 7mm | 5.59mm | 4.57mm | 13.2mm | 68mm |
| DWGSK2594 | WP-501-7180 Bruker® 7mm | 5.59mm | 5.00mm | 13.2mm | 68mm |

Stainless Steel Micro-Spatula

- Fits into most 4mm or larger OD NMR tubes
- Makes solid state and gel-phase sample transfers easier

Stainless Steel Micro Spatula

| Catalog No. | Length | Material |
|---------------------|--------|-----------------|
| 806 | 250mm | Stainless Steel |



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