



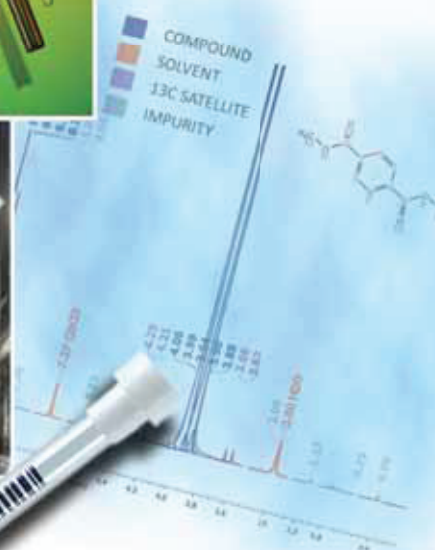
NMR Consumables and Accessories

СОВ ЛАБ

КОМПЛЕКСНОЕ ОСНАЩЕНИЕ

+7(916)414-93-61 www.sov-lab.ru

+7(495)045-58-29 sov_lab@mail.ru



1172 NW Boulevard, Vineland, NJ 08360, USA

Tel: 800-220-5171 Fax: 856-691-6206

www.wilmad-labglass.com

ISO 9001:2008
Registered

THE NEW www.wilmad-labglass.com

Web Key Features

- Quick Order Widget
- Favorites/Wish Lists
- Graphic Navigation
- Online Order Status
- Real-time Discount
- E-mail Shopping Cart
- Accepts Purchase Order, PayPal and all major credit cards
- Request quotations for standard or customized products

Over **8,000** products

Open **24/7**



Why Wilmad NMR Tubes?

- ISO 9001 Certified Manufacturer
- Inventor of the first NMR tube and standard-setter for NMR tube MHz frequency rating
- 60 years of experience in serving NMR community
- Optical QC check to eliminate scratches
- Precision tube features unparalleled quality through a unique precision shrinking, grinding and polishing process
- Economy tube has 20% tighter outer diameter tolerance, and 30% thicker wall than any competitor's product
- Most comprehensive offering with over 1000 NMR products



Toll Free: **1-800-220-5171**
Intl.: **856-691-3200**



Toll Free: **1-800-220-1081**
Intl.: **856-691-6206**



www.wilmad-labglass.com
cs@wilmad-labglass.com

Standard Consumables for Liquid-Phase NMR

High Throughput NMR Tubes	4
NEW! Bar Code NMR Tubes	4
NEW! SampleJet® NMR Tubes	5
5 mm Economy NMR Tubes	5-6
Precision Brand NMR Tubes	6-12
Quartz/Suprasil® Tubes for Photochemistry and ¹¹ B	12-13
NMR Tube Caps	14-15
PTFE Tube Liner for Corrosive Sample and ²⁹ Si NMR	16
Double Layered Tubes for Toxic Sample	17
Amberized Tubes for Light-Sensitive Sample	17
Constricted Tubes for Flame Seal	17
NEW! Time Domain NMR Tubes	18
Select-A-Product Guide for NMR Caps	18

Consumables for Liquid-Phase Small Volume NMR and External Reference NMR

Pyrex® NMR Capillary Tubes	20
Stem Coaxial Small Volume NMR Insert	20
Coaxial Small Volume NMR Insert	21
Microcell Small Volume NMR Insert	21-22
Large Volume Microcell NMR Insert	22
Bruker® MicroProbe/MicroCryoProbe Sample Tubes	23
Varian® ColdProbe 2.5 mm O.D. Sample Tubes	23
Doty® Susceptibility Plugs	23-25
NEW! Shigemi® Susceptibility Matched NMR Tubes	25
Select-A-Product Guide for Small Volume NMR	26

Gas-Tight Consumables for Liquid-Phase and Gas-Phase NMR

Constricted Vacuum Tube and Tip-Off Manifolds	28
Low Pressure/Vacuum Tube	29
NEW! Low Pressure/Vacuum (LPV) Shigemi Tube	30
Screw-Cap Tube	31
Quick Pressure Valve Tube	32
Pressure/Vacuum Tube	33-34
Omni-Fit Tube	35
Select-A-Product Guide for Gas-Tight Tubes	36

NMR Reference Standards

3 mm and 5 mm O.D. NMR Reference Standards	38
--	----

Accessories for Liquid-Phase NMR

Spinner Turbines for Bruker® Spectrometers	40
Spinner Turbines for Varian® Spectrometers	41
Spinner for Small Volume NMR (Bruker® Match®)	42
NEW! Tube Washers	42-45
Tube Racks	45
Spinner Bearing NMR Sample Tube Tester	45
Liquid Nitrogen Dewar Flask	46
Combination pH Electrodes	46
NMR Pipettes	47
NMR Filter and Funnel	47
Hamilton® Gas-Tight Syringe	48
Syringe Needles	48
Pressure Sensitive NMR Tube Labels	48
NMR Tube Carrier	49
Vortex Plugs and Positioning Rods	49
NEW! 2D Bar Code NMR Tube Labels	49
Tips to Avoid Tube Shattering	50

Consumables and Accessories for Solid-State NMR

NEW! Rotor and Cap for Bruker®, Varian®, Doty® MAS-NMR	52-54
Pyrex® MAS Rotor Inserts	55
Pyrex® Tube for Varian® NanoProbe®	55-56
Micro Spatula	57
Select-A-Product Guide for MAS Caps	57

Cross References

Most Popular Economy NMR Tubes

WG-1000-7 > 5 mm High Throughput NMR Tube, 7", 100 Pack **P4**WG-5MM-ECONOMY-7 > 5 mm 100 MHz Economy NMR Tube, 7" **P6**WG-5MM-ECONOMY-8 > 5 mm 100 MHz Economy NMR Tube, 8" **P6**WG-1226-7 > 5 mm 300 MHz Economy NMR Tube, 7" **P5**WG-1228-7 > 5 mm 400 MHz Economy NMR Tube, 7" **P5**

Most Popular Precision NMR Tubes

528-PP-7 > 5 mm 500 MHz Precision Thin Wall NMR Tube, 7" **P8**528-PP-8 > 5 mm 500 MHz Precision Thin Wall NMR Tube, 8" **P8**507-PP-7 > 5 mm 300 MHz Precision Thin Wall NMR Tube, 7" **P8**507-PP-8 > 5 mm 300 MHz Precision Thin Wall NMR Tube, 8" **P8**WGS-5BL > Coaxial Insert for 5 mm Thin Wall NMR Tube **P20**

Most Popular NMR Accessories

521-ASST-100 > 5 mm Assorted Color NMR Tube Cap **P14**STB-5 > 5 mm Spinner for Bruker® Spectrometers RT **P40**

NMR Tube Technical Information

Concentricity is defined as a measure of the lack of uniformity of the wall thickness of the tube. This tolerance can be thought of as the degree to which the "cylinders" as defined by the inner and outer surfaces of the tube parallel and overlap. Failure to meet concentricity tolerances will result in sample volumes which cross magnetic field flux lines, experience magnetic field gradients and contribute to reduced resolution along with modulation sidebands.

Camber is a measure of the lack of straightness of a tube, this tolerance is determined by gauging the deflection at the middle of a tube held at the ends and rotated through 360 degrees. Failure to meet camber requirements leads to a marked increase in the intensity of modulation sidebands, particularly harmful at higher fields, and damage to the probe.

Paramagnetic Impurities are mainly composed of Fe_2O_3 in the glass material. The less paramagnetic impurities, the better shimming and signal locking quality. Failure to meet the material requirements (>1800 ppm) leads to a difficulty in shimming and decreased spectrum resolution.

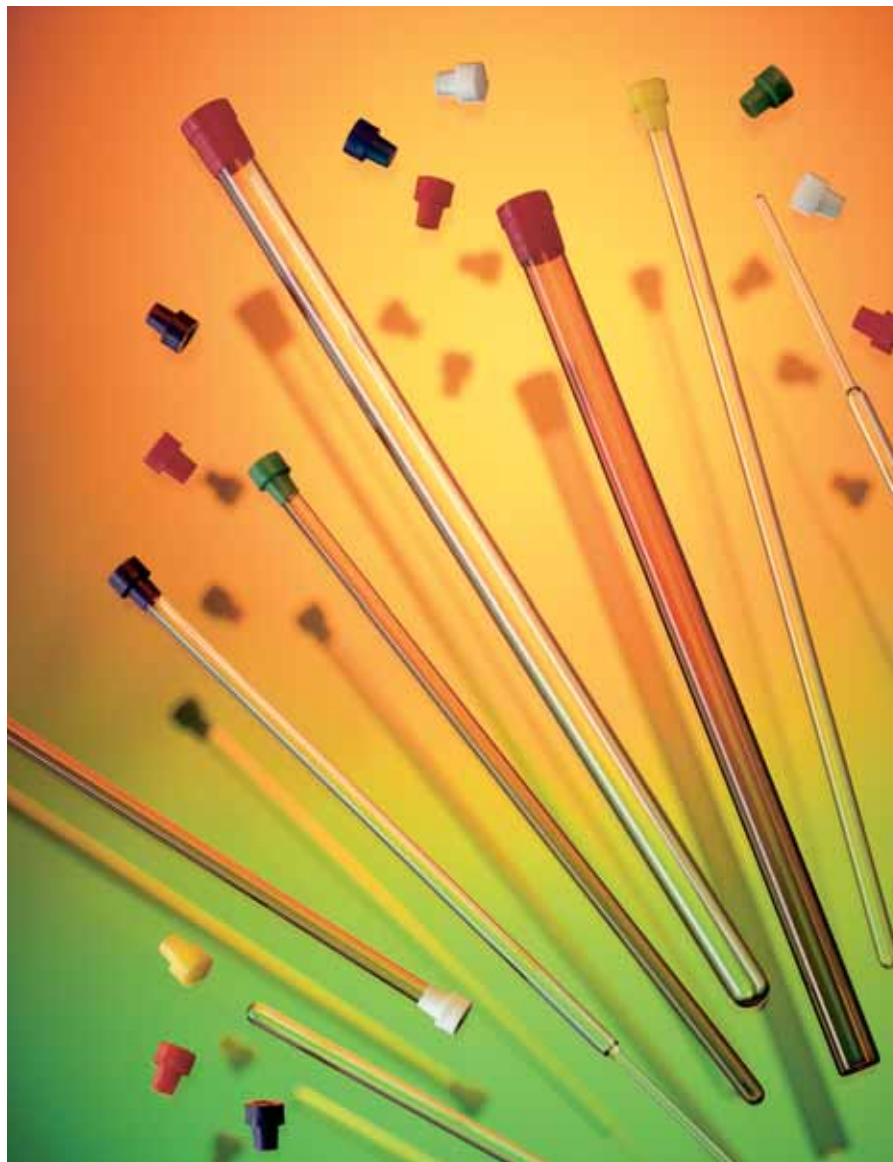
MHz Rating Concentricity, Camber and Paramagnetic Impurity Concentration in NMR tubing are the three key factors to impact the homogeneity of the magnetic field inside the sample, which could broaden the linewidth and bring unwanted spinning sidebands. Wilmad sets the MHz rating based on the shimming and signal locking quality in 1D ^1H NMR experiment with the following experiment setup:

	Economy Tube MHz Standard	Precision Tube MHz Standard
Spin Rate [Hz]	20	20
Number of Scans	16	16
Sample Molecular Weight [kD]	0.5	2.5
Sample Concentration [mM]	20	1

For non-spinning experiments, samples with a higher concentration, or a longer scan time than the list parameters, a lower rated MHz NMR tube can be applied in a higher MHz experiment.



Standard Consumables for Liquid-Phase NMR



STANDARD CONSUMABLES FOR
LIQUID-PHASE NMR

3, 5 and 10 mm Economy Brand NMR Tubes | ASTM Type 1, Class B Borosilicate Glass

Wilmad's NMR Economy Tubes are manufactured from borosilicate glass that meets the American Society for Testing and Materials (ASTM) Type 1 Class B standard, which is also known as N51A®. Due to the nature of this material, N51A® has much less thermal-shock resistance than ASTM Type 1 Class A glass, which is known as Pyrex® and the material for Precision Brand Tubes. N51A® may contain Fe₂O₃, which is paramagnetic and has certain impact on shimming quality.

Economy Brand NMR Tubes are only recommended for 1D NMR experiments with organic molecule (Molecular Weight <1500) at ambient temperature. Cooling/heating of Economy Brand NMR Tubes may lead to tube breakage¹.



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

Wilmad's high throughput NMR tubes have an averaged camber of 60 µm to guarantee the spectrum resolution for small molecule (MW<250) NMR experiment up to 600 MHz. Item is sold in plastic twist pack of 50 or paper pack of 100. Caps are not included and are purchased separately. The twist pack is made of polypropylene and resistant to common organic solvents.

	Product No.	MHz Rating	Length (inch)	O.D. (mm)	Wall Thickness (mm)	Averaged Camber (µm)	Package Style
3 mm	WG-3000-7-50	HT	7	2.95 ± 0.03	0.27	60	50 Tube Twist Pack
	WG-3000-8-50	HT	8	2.95 ± 0.03	0.27	60	50 Tube Twist Pack
5 mm	WG-1000-7-50	HT	7	4.947±0.019	0.43	60	50 Tube Twist Pack
	WG-1000-7	HT	8	4.947±0.019	0.43	60	100 Tube Paper Pack
	WG-1000-8-50	HT	7	4.947±0.019	0.43	60	50 Tube Twist Pack
	WG-1000-8	HT	8	4.947±0.019	0.43	60	100 Tube Paper Pack
10 mm	WG-4000-7	HT	7	9.944±0.025	0.60	60	100 Tube Paper Pack
	WG-4000-8	HT	8	9.944±0.025	0.60	60	100 Tube Paper Pack



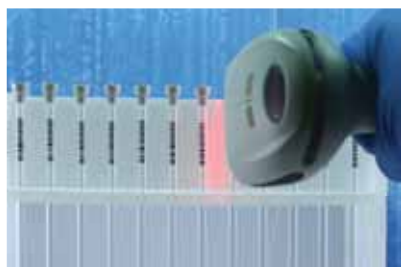
Bar Code NMR Tubes | Thin Walled | ASTM Type 1, Class B Borosilicate Glass

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 ID numbers for each box are marked on the package.

	Product No.	MHz Rating	Length (inch)	O.D. (mm)	Wall Thickness (mm)	Averaged Camber (µm)	Package Style
3 mm	WG-3001-7	HT	7	2.95 ± 0.03	0.27	60	50 Tube Twist Pack
5 mm	WG-1001-7	HT	7	4.947±0.019	0.60	60	100 Tube Paper Pack

NOTE 1: For NMR experiments that involve with cooling, heating, biological sample, multi-dimension, multi-nuclei, DNP techniques, please refer to our Precision Brand NMR Tubes.

NOTE 2: For small-volume NMR experiments that require tubes with O.D. less than 3 mm, please see Page 20 (Consumables for Liquid-Phase Small Volume NMR and External Reference NMR).



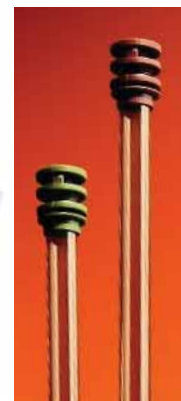
Accessories for Bar Code Tube

Product No.	Description
LG-10010	Honeywell Xenon Scanner Optimized for Glass Surface
820-D	Tube Rack for Bar Code Tube

SampleJet® NMR Tubes | Thin Walled

Wilmad's SampleJet® NMR tubes are manufactured to fit Bruker® SampleJet® caps (purchase separately).

Product No.	MHz Rating	Length (mm)	O.D. (mm)	Wall Thickness (mm)	Averaged Camber (µm)	Package Qty.
620-2A	500	103.5	1.00±0.019	0.1	30	10
620-2B	500	103.5	1.70±0.019	0.2	30	10
620-2F	500	103.5	2.50±0.019	0.2	30	10
WG-3000-4	HT	103.5	2.95 ± 0.03	0.27	60	100
WG-1000-4	HT	103.5	4.947±0.019	0.43	60	100



5 mm Economy Tubes | Thin Walled | ASTM Type 1, Class B Borosilicate Glass

Wilmad's Economy NMR tubes follow the MHz rating listed on page 2. The camber and concentricity in the table are the upper limit value. Unlike any of our competitors, Wilmad does NOT require a minimum purchase quantity of 5 tubes as a box. Each tube comes with a disposable cap.

Product No.	MHz Rating	Length (inch)	O.D. (mm)	Wall Thickness (mm)	Concentricity (µm)	Camber (µm)
WG-1242-7	700	7	4.947±0.019	0.43	2.5	3.8
WG-1242-8	700	8	4.947±0.019	0.43	2.5	3.8
WG-1241-7	600	7	4.947±0.019	0.43	3.8	3.8
WG-1241-8	600	8	4.947±0.019	0.43	3.8	3.8
WG-1235-7	500	7	4.947±0.019	0.43	13	6
WG-1235-8	500	8	4.947±0.019	0.43	13	6
WG-1228-7	400	7	4.947±0.019	0.43	25	13
WG-1228-8	400	8	4.947±0.019	0.43	25	13
WG-1226-7	300	7	4.947±0.019	0.43	51	13
WG-1226-8	300	8	4.947±0.019	0.43	51	13

Continued...

5 mm Economy NMR Tubes (Continued)

Product No.	MHz Rating	Length (inch)	O.D. (mm)	Wall Thickness (mm)	Concentricity (μm)	Camber (μm)
WG-1208-7	200	7	4.947±0.019	0.43	51	25
WG-1208-8	200	8	4.947±0.019	0.43	51	25
WG-1206-7	100	7	4.947±0.019	0.43	51	50
WG-1206-8	100	8	4.947±0.019	0.43	51	50
WG-5MM-ECONOMY-7	100	7	4.947±0.019	0.43	76	76
WG-5MM-ECONOMY-8	100	8	4.947±0.019	0.43	76	76
WG-5MM-ECONOMY-9	100	8	4.947±0.019	0.43	76	76

Precision Brand NMR Tubes | ASTM Type 1, Class A Borosilicate Glass



Wilmad adopts a unique precision shrinking and grinding process to shape the inner surface with maximized filling factor (10% more than Economy tube), and a tight ID and OD tolerance as small as 0.0065 mm. None of our competitors can come to close to this capability. Each of our individual NMR tubes released into the market has been manufactured in our state-of-art facility in the United States and passed multiple NIST traceable gauge control and optical surface defect checks.

Wilmad's NMR Precision Tubes are manufactured from borosilicate glass that meets the requirement of Type 1 Class A glass from ASTM E438. Precision Tube has 3 fold less paramagnetic contamination compared to the Economy and can be operated safely at temperature up to 230 °C and within a temperature step of 120 °C. It is rated as hydrolytic class 1, which states that the inner surface is resistant to strong acid and base at ambient temperature.

Economy Tube vs. Precision Tube Comparison Table

	5 mm Economy	5 mm Thin Wall Precision (Glass)	5 mm Thin Wall Precision (Quartz)	5 mm thin Wall Precision (Suprasil)
Material	ASTM Type 1 Class B Borosilicate Glass	ASTM Type 1 Class A Borosilicate Glass	Clear Fused Quartz	Synthetic Quartz
Impact on shimming quality by paramagnetic impurities ¹	Medium (1200 ppm Fe ₂ O ₃)	Small (400 ppm Fe ₂ O ₃)	None (0.5 ppm Fe ₂ O ₃)	None (<0.005 ppm Fe ₂ O ₃)
Rapid cooling/heating	No	Yes, within 120 °C	Yes, within 300 °C	Yes, within 300 °C
Max. working temperature	Ambient	230 °C	1300 °C	1300 °C
Sample volume reproducibility ²	10%	0.5%	0.5%	0.5%
Cut-off wavelength	320 nm	320 nm	265 nm	190 nm
Averaged Sample Volume within Rf coil	125 μl/cm	140 μl/cm	140 μl/cm	140 μl/cm
Outer Diameter	4.947±0.019 mm	4.9635±0.0065 mm	4.9635±0.0065 mm	4.9635±0.0065 mm
Compatible with Small Volume Insert	No	Yes	Yes	Yes
Recommended Application	1D NMR experiments with small organic molecule (Molecular Weight <1500) below 600 MHz	Experiments requiring critical shimming quality (high/ultra high field, non-spinning, multi-dimension, multi-nuclei, DNP experiments and studies involving with biological samples)	Photochemistry studies and experiments involving rapid freezing procedure in liquid nitrogen	Photochemistry with Deep UV light source

NOTE 1: Impact on shimming quality varies upon magnetic field strength. Economy tube is recommended for 1D low field experiments.

NOTE 2: Sample volume reproducibility refers to the maximum volume fluctuation when filling different NMR tubes to the same sample height. This number correlates to the reproducibility of time domain signal amplitude between different runs.

3 mm O.D. Precision NMR Tubes | Thin Walled | ASTM Type 1, Class A Borosilicate Glass

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

4 mm O.D. Precision NMR Tubes | Thin Walled | ASTM Type 1, Class A Borosilicate Glass

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

NOTE: For small-volume NMR experiments that require tubes with O.D. less than 3 mm, please see Page 20 (Consumables for Liquid-Phase Small Volume NMR and External Reference NMR). Please visit wilmad-labglass.com for a complete listing of Precision Brand NMR tubes from 3 mm to 30 mm.

5 mm O.D. NMR Precision Tubes | Thin Walled | ASTM Type 1, Class A Borosilicate Glass

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

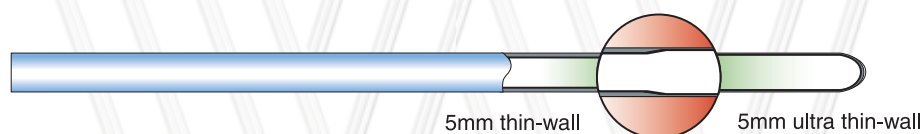
NOTE: For small-volume NMR experiments that require tubes with O.D. less than 3 mm, please see Page 20 (Consumables for Liquid-Phase Small Volume NMR and External Reference NMR). Please visit wilmad-labglass.com for a complete listing of Precision Brand NMR tubes from 3 mm to 30 mm.

5 mm O.D. NMR Precision Tubes | Ultra-Thin Walled | ASTM Type 1, Class A Borosilicate Glass

15% More Sample Volume than Thin Walled Precision Tubes

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

5 mm O.D. Precision Step-Down Tube | Ultra-Thin Wall within the R_f Coil Limit | ASTM Type 1, Class A Borosilicate Glass



15% More Sample Volume than Thin Walled Precision Tubes
Plus Less Fragile Than Ultra-Thin Walled Precision Tubes

Product No.	MHz Rating	Length (inch)	O.D. (mm)	Bottom I.D. (mm)	Bottom Wall Thickness (mm)	Concentricity (μm)	Camber (μm)
555-PPT-7	600	7	4.9635±0.0065	4.4965±0.0065	0.24	13	6
555-PPT-8	600	8	4.9635±0.0065	4.4965±0.0065	0.24	13	6
555-PPT-9	600	9	4.9635±0.0065	4.4965±0.0065	0.24	13	6
550-PPT-7	400	7	4.9635±0.0065	4.4965±0.0065	0.24	38	13
550-PPT-8	400	8	4.9635±0.0065	4.4965±0.0065	0.24	38	13
550-PPT-9	400	9	4.9635±0.0065	4.4965±0.0065	0.24	38	13
547-PPT-7	350	7	4.9635±0.0065	4.4965±0.0065	0.24	51	13
547-PPT-8	350	8	4.9635±0.0065	4.4965±0.0065	0.24	51	13
547-PPT-9	350	9	4.9635±0.0065	4.4965±0.0065	0.24	51	13

NOTE: For small-volume NMR experiments that require tubes with O.D. less than 3 mm, please see Page 20 (Consumables for Liquid-Phase Small Volume NMR and External Reference NMR). Please visit wilmad-labglass.com for a complete listing of Precision Brand NMR tubes from 3 mm to 30 mm.

5 mm O.D. Precision NMR Tubes | Medium Walled | ASTM Type 1, Class A Borosilicate Glass**2X More Robust than Thin-Walled Precision 5 mm O.D. Tube**

Product No.	MHz Rating	Length (inch)	O.D. (mm)	I.D. (mm)	Wall Thickness (mm)	Concentricity (μm)	Camber (μm)
524-PP-7	400	7	4.9635±0.0065	3.430±0.013	0.77	76	51
524-PP-8	400	8	4.9635±0.0065	3.430±0.013	0.77	76	51
524-PP-9	400	9	4.9635±0.0065	3.430±0.013	0.77	76	51
504-PP-7	300	7	4.9635±0.0065	3.430±0.013	0.77	152	51
504-PP-8	300	8	4.9635±0.0065	3.430±0.013	0.77	152	51
504-PP-9	300	9	4.9635±0.0065	3.430±0.013	0.77	152	51
503-PS-7	100	7	4.9635±0.0065	3.43±0.13	0.77	76	51
503-PS-8	100	8	4.9635±0.0065	3.43±0.13	0.77	76	51
503-PS-9	100	9	4.9635±0.0065	3.43±0.13	0.77	76	51

5 mm O.D. Precision NMR Tubes | Heavy Walled | ASTM Type 1, Class A Borosilicate Glass**4X More Robust than Thin-Walled Precision 5 mm O.D. Tube**

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

8 mm O.D. Precision NMR Tubes | Thin Walled | ASTM Type 1, Class A Borosilicate Glass

Product No.	MHz Rating	Length (inch)	O.D. (mm)	I.D. (mm)	Wall Thickness (mm)	Concentricity (μm)	Camber (μm)
513A-9PP-7	500	7	7.9935±0.0065	6.990±0.013	0.51	13	13
513A-9PP-8	500	8	7.9935±0.0065	6.990±0.013	0.51	13	13
513A-9PP-9	500	9	7.9935±0.0065	6.990±0.013	0.51	13	13

NOTE: For small-volume NMR experiments that require tubes with O.D. less than 3 mm, please see Page 20 (Consumables for Liquid-Phase Small Volume NMR and External Reference NMR). Please visit wilmad-labglass.com for a complete listing of Precision Brand NMR tubes from 3 mm to 30 mm.

8 mm O.D. Precision NMR Tubes | Thin Walled | ASTM Type 1, Class A Borosilicate Glass

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

10 mm O.D. Precision NMR Tubes | Thin Walled | ASTM Type 1, Class A Borosilicate Glass

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

NOTE: For small-volume NMR experiments that require tubes with O.D. less than 3 mm, please see Page 20 (Consumables for Liquid-Phase Small Volume NMR and External Reference NMR). Please visit wilmad-labglass.com for a complete listing of Precision Brand NMR tubes from 3 mm to 30 mm.

10 mm O.D. Precision NMR Tubes | Medium Walled | ASTM Type 1, Class A Borosilicate Glass

Product No.	MHz Rating	Length (inch)	O.D. (mm)	I.D. (mm)	Wall Thickness (mm)	Concentricity (μm)	Camber (μm)
513-7PPM-7	500	7	9.9935±0.0065	8.160±0.013	0.92	38	13
513-7PPM-8	500	8	9.9935±0.0065	8.160±0.013	0.92	38	13
513-7PPM-9	500	9	9.9935±0.0065	8.160±0.013	0.92	38	13

10 mm O.D. Precision NMR Tubes | Heavy Walled | ASTM Type 1, Class A Borosilicate Glass

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

5 mm and 10 mm O.D. Precision Brand NMR Tubes | Quartz (Natural Quartz)

- Quartz tube is 14 times more robust during cooling/heating process than corresponding Precision glass tubes.
- Naturally occurring quartz maintains over 85% transmission rate (10 mm thickness, with consideration of reflection loss) above 265 nm, which makes quartz tubes preferable in photochemistry studies.
- Quartz sample tubes possess a low Boron density as below 0.1 ppm, which guarantees a clean background in Boron-11 NMR studies.
- Quartz has 2 times less dielectric constant than Pyrex®, which helps to improve the quality factor.

5 mm O.D. Precision NMR Tubes | Thin Walled | Quartz (Natural Quartz)

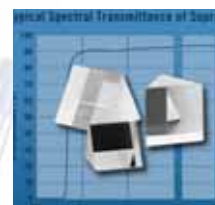
Product No.	MHz Rating	Length (inch)	O.D. (mm)	I.D. (mm)	Wall Thickness (mm)	Concentricity (μm)	Camber (μm)
535-PP-7QTZ	600	7	4.9635±0.0065	4.2065±0.0065	0.38	13	6
535-PP-8QTZ	600	8	4.9635±0.0065	4.2065±0.0065	0.38	13	6
535-PP-9QTZ	600	9	4.9635±0.0065	4.2065±0.0065	0.38	13	6
528-PP-7QTZ	500	7	4.9635±0.0065	4.2065±0.0065	0.38	25	13
528-PP-8QTZ	500	8	4.9635±0.0065	4.2065±0.0065	0.38	25	13
528-PP-9QTZ	500	9	4.9635±0.0065	4.2065±0.0065	0.38	25	13
507-PP-7QTZ	300	7	4.9635±0.0065	4.2065±0.0065	0.38	51	25
507-PP-8QTZ	300	8	4.9635±0.0065	4.2065±0.0065	0.38	51	25
507-PP-9QTZ	300	9	4.9635±0.0065	4.2065±0.0065	0.38	51	25

10 mm O.D. Precision NMR Tubes | Thin Walled | Quartz (Natural Quartz)

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

5 mm and 10 mm O.D. Precision Brand NMR Tubes | Suprasil® (Synthetic Quartz)

- Suprasil® is high purity synthetic fused silica materials with outstanding optical characteristics in the deep UV to the near IR. The transmission rate from 190 nm to 2600 nm is well over 95% (10 mm thickness) excluding reflection. The Suprasil® tubes are ideal for photolysis experiments that employ 266 nm light from Q-Switched laser or 254 nm light emitted by Hg low pressure lamp with a Schott® UG 5 filter.
- Suprasil® possesses similar thermal expansion rate and tensile strength compared to natural quartz.



5 mm O.D. Precision NMR Tubes | Thin Walled | Suprasil®

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

10 mm O.D. Precision NMR Tubes | Thin Walled | Suprasil®

Product No.	MHz Rating	Length (inch)	O.D. (mm)	I.D. (mm)	Wall Thickness (mm)	Concentricity (μm)	Camber (μm)
513-7PP-7SUP	400	7	9.9935±0.0065	9.070±0.013	0.46	38	13
513-7PP-8SUP	400	8	9.9935±0.0065	9.070±0.013	0.46	38	13
513-7PP-9SUP	400	9	9.9935±0.0065	9.070±0.013	0.46	38	13

T Technical Tip

- To maximize light transmission, please consider using a larger diameter tube during photolysis and coupling a cylindrical focusing lens in front of the sample tube.
- For deep UV light under or near 265 nm, please choose Suprasil® tubes.

NMR Tube Caps



Disposable NMR Tube Caps

Wilmad's Disposable NMR Tube Caps are made from high quality Polyethylene or Ethylene Vinyl Acetate depending on the O.D. of the tube. Different colors help to track samples based on various reference solvents. Packaged in bags of 25, 100 or 1000.

Please avoid using disposable NMR 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.

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

Continued...

Disposable NMR Tube Caps (Continued)

Product No.	Fits Tube with O.D. (mm)	Material	Color	Package Qty.
521-B-100	8.0	Polyethylene	Neutral	100
521-B-1000	8.0	Polyethylene	Neutral	1000
521-C-100	10.0	Polyethylene	Red	100
521-C-1000	10.0	Polyethylene	Red	1000
521-C-YLW-100	10.0	Polyethylene	Yellow	100
521-C-YLW-1000	10.0	Polyethylene	Yellow	1000
521-WGS-100	5.0 (with hole for coaxial insert)	Ethylene Vinyl Acetate	Red	100

PTFE NMR Tube Caps

Wilma's PTFE NMR Tube Caps are machined to exact specifications with smaller gyroradius and more homogeneous mass distribution than disposable caps for better spinning stability. These caps are recommended in experiments at high-ultra high field and experiments using Chloroform as reference solution. Will fit Precision Brand NMR Tubes only due to the tight tolerance.

Product No.	Fits Tube with O.D. (mm)	Material	Color	Package Qty.
WG-1264-3	3.0	PTFE	White	25
WG-1264-4	4.0	PTFE	White	25
WG-1264-5	5.0	PTFE	White	25
WG-1264-8	8.0	PTFE	White	25
WG-1264-10	10.0	PTFE	White	25
WG-1264-12	12.0	PTFE	White	25

Gas-Tight NMR Tube Caps

The 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 Wilma Medium-Walled and Heavy Walled NMR tubes for better seal and robustness in variable temperature experiments.

WG-3891 Caps allow easy access via syringe needle.



Product No.	Cap Type	Fits Tube with O.D. (mm)	Material	Package Qty.
521-PC-100	Superior Pressure	5.0	Polyethylene	100
521-PC-1000	Superior Pressure	5.0	Polyethylene	1000
WG-3891-10	Degassing	5.0	White Rubber	10
WG-3891-100	Degassing	5.0	White Rubber	100

T Technical Tip

To choose proper NMR tube caps, please refer to page 18 for Select-A-Product Guide for NMR Caps. For more detailed information, request your copy of Resonance Report NMR-009 at www.wilma-labglass.com under Support.

PTFE-FEP NMR Tube Liners for Corrosive Sample and ^{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.

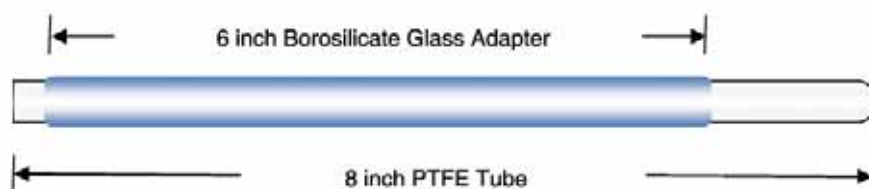
PTFE-FEP Tube liners are round-bottom and made from Polytetrafluoroethylene/Fluorinated Ethylene Polypropylene Copolymer. Thin-wall construction minimizes filling-factor losses. Although the liners are not rigid, they straighten upon insertion into the sample tube. Not recommended for elevated temperature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

PTFE-FEP material does not contain silicon, which makes it ideal in ^{29}Si NMR experiments. Wilmad manufactures high field 500 MHz rating open-ended tube as an adapter to the 5 mm spinner turbine. Please use the depth gauge to fine adjust the position of the liner so no glass part will protrude into the R_f coil limit.

PTFE-FEP NMR Tube Liners for Corrosive Sample

Product No.	Fits Tube with Wall Thickness	Fits Tube with O.D. (mm)	Fits Tube with Length (inch)	Length (inch)	Volume per 10 mm Height (μL)
6003	Thin	3.0	7	8	30
6005	Thin	5.0	7	8	80
6005-8	Thin	5.0	7 & 8	9	80
6010	Thin	10.0	7	8	440
6012	Thin or Medium	12.0	7	8	550
6015	Thin	15.0	7	8	1000

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

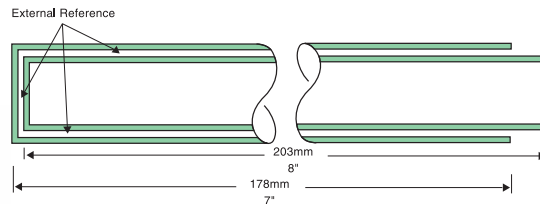


Wilmad's PTFE NMR Tube Kit features a precision bore glass adapter, which eliminates the O-ring and wobbling in spinning experiment.

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

Double Layered NMR Tube for Toxic Sample

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. Outer tube and inner tube has about 50 μm gap and the system is ideal for variable temperature studies as the components are made of same Pyrex® glass. Each insert fits snugly into the outer tube like a syringe plunger fits its barrel.



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

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 requirement of your experiments.

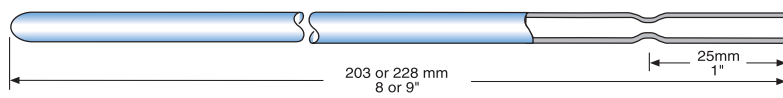
The minimum order for amberization service is 5 tubes per order.

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

Constricted NMR Tube 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.



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

Time Domain NMR Tubes

With the rapid growth of Benchtop NMR spectrometers serving many industries for cost efficient measurement of proton-bearing subjects (e.g. rock, water, oil and fat), Wilmad announces corresponding consumables to meet this rising demand.

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



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

10 mm tube caps (521-C series) are sold separately on page 15.

Product No.	O.D. (mm)	Length (inch)	Bottom	Package/Qty.
WG-4001-7	10	7	Flat	100
WG-4002-7	10	7	Round	100

TD NMR Tubes | Thin Walled | PTFE-FEP

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

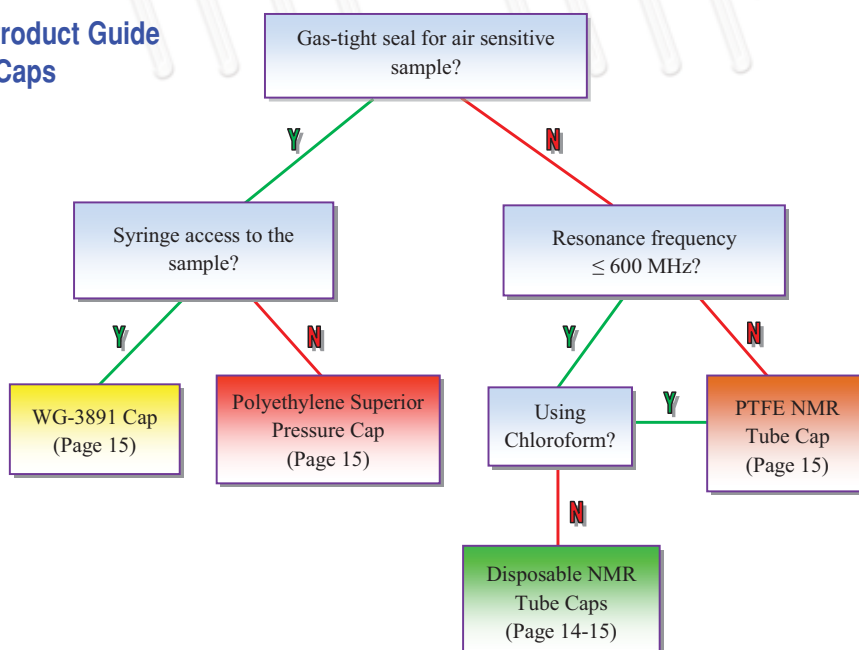
- Literally unbreakable
- Better resistance to corrosive chemicals, including HF acid
- Cheaper price
- 100% contamination-free for ^1H background

Each tube is supplied with a PTFE cap.

Product No.	O.D.(mm)	Length(inch)	Bottom
6012-BTNMR	12	8	Round
6018-BTNMR	18	8	Round
6026-BTNMR	26	8	Round



Wilmad Select-A-Product Guide for NMR Caps



Consumables for Liquid-Phase Small Volume and External Reference NMR



CONSUMABLES FOR LIQUID-PHASE SMALL VOLUME
AND EXTERNAL REFERENCE NMR

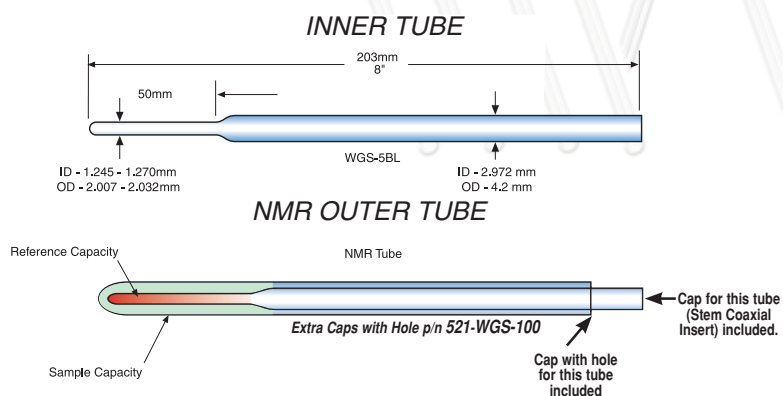
Pyrex® NMR Capillary Tubes



Wilmad's WG-1364/1365 capillary tubes provide a low cost solution for small volume NMR measurement. They are made of ASTM Type 1 Class A glass and tested at 400 MHz field. For higher magnetic field, please refer to Small Volume Inserts on page 20-21, and MicroProbe Tubes on page 23.

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

Stem Coaxial Small Volume NMR Insert



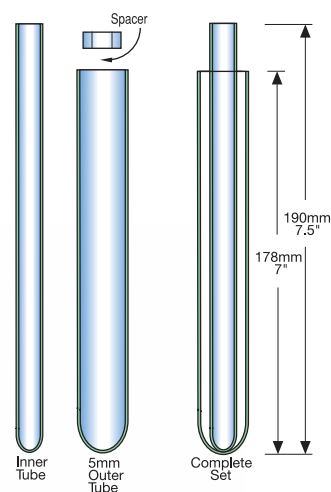
- Wilmad Stem Coaxial Insert is the most versatile and reliable coaxial system available for various NMR experiments.
- General applications include small volume NMR, external referencing, external locking and magnetic susceptibility determination.
- System is manufactured from ASTM Type 1 Class A glass, making it ideal for variable temperature studies.
- Outer tube must be ordered separately depending on magnetic field strength.

Product No.	Fits Outer Tube with O.D. (mm)	Stem Height (mm)	Stem O.D. (mm)	Inner Capacity (μL)	Outer Capacity (μL)	Use with
WGS-4BL	4	25	2	30	124	406-PP, 427-PP
WGS-5BL	5	50	2	60	530	506-PP to 535-PP
WGS-5BL-SP	5	50	3.3	220	260	506-PP to 535-PP
WGS-8BL	8	50	3	190	1560	513A-XPP ¹
WGS-10BL	10	50	4	410	2600	513-XPP ¹

Note 1: X = 1, 3, 5 or 7. For example, 513-7PP

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, inner tube and spacer.
- In a complete set system, the insert and outer tube are fused together at the bottom. It is recommended for high field experiment under 600 MHz.
- For ultra high field experiment over 600 MHz, order an inner tube, two spacers and Wilmad Precision Thin-Walled Tube over 600 MHz separately.



Complete Sets

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

Inner Tube Only

Product No.	I.D. (mm)	O.D. (mm)
517-Inner	2.34	3.30
518-Inner	1.96	2.97
519-Inner	1.50	2.52

Outer Tube Only

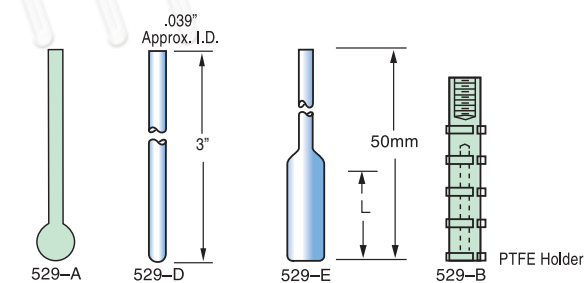
Product No.	I.D. (mm)	O.D. (mm)
517-Outer	4.20	4.97
518-Outer	4.20	4.97
519-Outer	4.20	4.97

Spacers

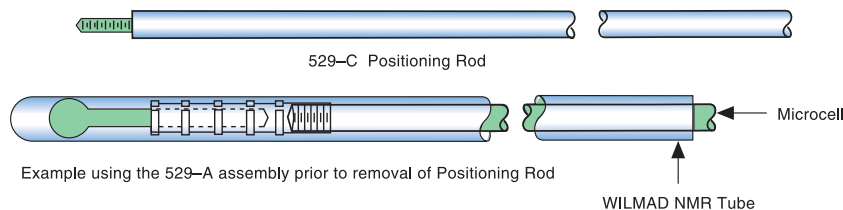
Product No.	I.D. (mm)	O.D. (mm)
517-Spacer	3.30	4.20
518-Spacer	2.97	4.20
519-Spacer	2.52	4.20

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 experiment.
- Use Wilmad PTFE Needles (P/N: 90630 on page 48) with syringe to fill and clean sample.



Cylindrical microcells can be customized in lengths to match the probe.



The positioning rod should be removed prior to recording the spectrum.

Positioning Components

Product No.	Fits Tube with O.D. (mm)	Description	Length (mm)
529-B	5.0	PTFE Holder	50
529-C	5.0	Positioning Rod	228

Spherical Bulb and Capillary Tube Microcell

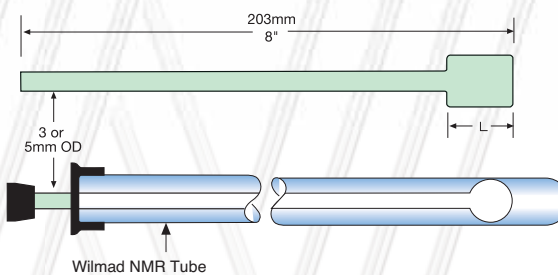
Product No.	Fits Tube with O.D. (mm)	Description	Volume (μL)
529-A	5.0	Spherical Bulb	18
529-D	5.0	Capillary Tube	61

Cylindrical Bulb Microcell

Product No.	Fits Tube with O.D. (mm)	Description	Volume (μL)	Cylinder Length (mm)
529-E	5.0	Cylindrical Bulb	110	12
529-E-5-L-15	5.0	Cylindrical Bulb	140	15
529-E-5-L-20	5.0	Cylindrical Bulb	190	20

Large Volume Microcell Insert

- Use with Probe size between 8 mm to 20 mm.
- Custom sizes available.
- Add sample through NMR pipets (P/N: 803A or 22 gauge needle (P/N: 90022).
- Outer tube cap is provided to hold insert.



Spherical Bulb Insert

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

Note 1: These products are designed to fit in Wilmad Medium-Walled Tubes.

Note 2: When ordering, please specify the desired cylinder height (Max height = 30 mm).

Cylindrical Bulb Insert

Product No.	Fits Tube with O.D. (mm)	Stem O.D. (mm)	Capacity (μL)	Cylinder Length (mm)
529-E-8	8.0	3.0	270	10
529-E-8-L-15	8.0	3.0	410	15
529-E-8-L-20	8.0	3.0	540	20
529-E-10	10.0	3.0	490	10
529-E-10-L-15	10.0	3.0	730	15
529-E-10-L-20	10.0	3.0	970	20
529-E-12	12.0	3.0	940	12
529-E-12-L-15	12.0	3.0	1180	15
529-E-12-L-20	12.0	3.0	1570	20
529-E-15	15.0	3.0	1260	15
529-E-15-L-20	15.0	3.0	1680	20
529-E-16	16.0	5.0	1320	N/A ²
529-E-18 ¹	18.0	5.0	1970	N/A ²
529-E-20 ¹	20.0	5.0	2600	N/A ²

T Technical Tip

To improve the shimming quality and signal lock, surround the microcell with reference solvent to reduce the susceptibility differences between the inner and outer compartments of the assembly.

T Resonance Report

For a detailed explanation of the application of Coaxial Inserts and Microsampling, see Resonance Report NMR-007 and NMR-008 at www.wilmad-labglass.com under Support.

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 5.0 mm.



Product No.	MHz Rating	Probe Type	Stem Length (mm)	Stem O.D. (mm)	Stem I.D. (mm)	Stem Volume (μL)	Overall Length (inch)
620-1A	500	Bruker® 1.0 mm MicroProbe	50	1.00	0.80	25	8
620-1H	500	Bruker® 1.7 mm MicroProbe	43.5	1.7	0.8	22	4
620-1B	500	Bruker® 1.7 mm MicroCryoProbe	50	1.70	1.30	66	8
620-1G	500	Bruker® 3.0/2.5 mm CryoProbe	43.5	2.00	1.60	87	4
620-1C	500	Bruker® 3.0/2.5 mm CryoProbe	50	2.00	1.60	100	8
520-1A	800	Bruker® 3.0/2.5 mm MicroProbe	50	2.50	2.16	1.83	8
620-1F	500	Bruker® 3.0 mm CryoProbe	43.5	2.95	2.41	198	4
620-1D	500	Bruker® 3.0 mm CryoProbe	50	2.95	2.41	228	4
620-1E	500	Bruker® 3.0 mm CryoProbe	50	2.95	2.41	228	8

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

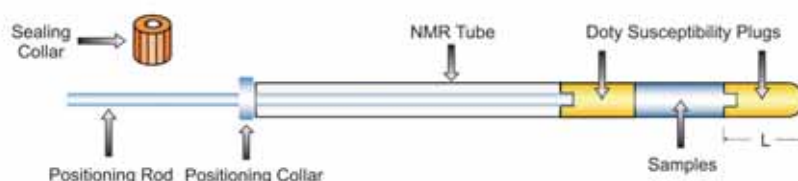
Product No.	MHz Rating	Probe Type	Length (inch)	O.D. (mm)	I.D. (mm)	Tube Qty.
WG-1364-2.5A-203M	400	Agilent® ColdProbe	8	2.50	2.20	5

Doty® Susceptibility Plugs



- Match a wider range of solvents
- Less fragile in variable temperature experiments involving freeze-pump-thaw
- Use with Wilmad's 3, 5 or 8 mm thin wall Precision Tubes
- Easy sample loading and cleaning
- Fully compatible with Bruker®, Varian® and JEOL® NMR spectrometer/probe

Material	Solid State Wideline	H ₂ O Absorption (%)	Density (g/cc)	Max. T (°C)	Acid/Base Resistance
Kel-F®	F, Cl, C	0.02	2.1	150	Excellent
Aurum®	H, C, N	0.8	1.42	240	Good
PPS	H, C, S	0.03	1.35	120	Good
Ultem®	H, C, N	0.7	1.27	205	Good
Zirconia	Zr	0.01	5.7	700	Excellent
GFP	H, C, Al, Si, F	0.2	1.45	250	Poor
G-10	H, C, Al, Si, F	0.15	1.88	160	Fair



Tips for Using Susceptibility Plugs

- Determine the sample solvent. For easier bubble removal and use with viscous samples/solvents, use plugs with vent grooves along the outer surface (product numbers with a "V").
- Select plug material-closest match of magnetic susceptibility constants.
- Check chemical resistance compatibility with sample/solvent.
- Store Doty Plugs in deuterated solvent to suppress water absorption.
- Determine plug length using the depth gauge. Ideally, the plugs should not protrude into the Rf Coil limit.
- Susceptibility constants of rod/collar are inconsequential. Rod/collar material selection is based on chemical resistance. G-10 rods are more rigid and easier to use; Kel-F® rods are recommended for use with organic solvents.

Positioning Rod and Collar

Product No. ¹	Material ³	Description
SP-PR-K-X	Kel-F®	Positioning Rod
SP-PR-G-X	G-10	Positioning Rod
SP-PR-SC-X		Sealing Collar

Short Plugs for 5 mm Wilmad Thin Walled Precision Tubes (L=9 mm)⁴

Product No. ⁵	Material	Solvents
SP-KS-5 SP-KSV-5	Kel-F®	Glycerol
SP-AS-5 SP-ASV-5	Aurum®	D ₂ O, H ₂ O
SP-PSS-5 SP-PSSV-5	PPS	Chloroform, H ₂ O
SP-US-5 SP-USV-5	Ultem®	D ₂ O, H ₂ O
SP-ZS-5 ² SP-ZSV-5 ²	Zirconia	D ₂ O, CCl ₄ , DMSO, Toluene, Benzene, Chloroform
SP-GPS-5 SP-GPSV-5	GFP	Methanol, Ethanol, Diethyl Ether
SP-GS-5 SP-GSV-5	G-10	Acetone, Methanol

Note 1: X = 3, 5 or 8, which indicates the O.D. (unit in mm) of the Wilmad NMR thin wall Precision tube compatible with this product. For example, SP-PR-K-5 is the number for a positioning rod and collar set made of Kel-F® for the Wilmad 5 mm O.D. NMR thin wall Precision tubes.

Note 2: Zirconia plugs are supplied with positioning rod and collar.

Note 3: G-10 rods are more rigid to operate. Kel-F® rods are recommended for organic solvents.

Plugs for 3 mm Wilmad Thin Walled Precision Tubes (L=8 mm)⁴

Product No. ⁵	Material	Solvents
SP-K-3 SP-KV-3	Kel-F®	Glycerol
SP-A-3 SP-AV-3	Aurum®	D ₂ O, H ₂ O
SP-PS-3 SP-PSV-3	PPS	Chloroform, H ₂ O
SP-U-3 SP-UV-3	Ultem®	D ₂ O, H ₂ O
SP-Z-3 ² SP-ZV-3 ²	Zirconia	D ₂ O, CCl ₄ , DMSO, Toluene, Benzene, Chloroform
SP-GP-3 SP-GPV-3	GFP	Methanol, Ethanol, Diethyl Ether
SP-G-3 SP-GV-3	G-10	Acetone, Methanol

Long Plugs for 5 mm Wilmad Thin Walled Precision Tubes (L=14 mm)⁴

Product No. ⁵	Material	Solvents
SP-K-5 SP-KV-5	Kel-F®	Glycerol
SP-A-5 SP-AV-5	Aurum®	D ₂ O, H ₂ O
SP-PS-5 SP-PSV-5	PPS	Chloroform, H ₂ O
SP-U-5 SP-UV-5	Ultem®	D ₂ O, H ₂ O
SP-Z-5 ² SP-ZV-5 ²	Zirconia	D ₂ O, CCl ₄ , DMSO, Toluene, Benzene, Chloroform
SP-GP-5 SP-GPV-5	GFP	Methanol, Ethanol, Diethyl Ether
SP-G-5 SP-GV-5	G-10	Acetone, Methanol

Short Plugs for 8 mm Wilmad Thin Walled Precision Tubes (L=9 mm)⁴

Product No. ⁵	Material	Solvents
SP-KS-8 SP-KSV-8	Kel-F®	Glycerol
SP-AS-8 SP-ASV-8	Aurum®	D ₂ O, H ₂ O
SP-PSS-8 SP-PSSV-8	PPS	Chloroform, H ₂ O
SP-US-8 SP-USV-8	Ultem®	D ₂ O, H ₂ O
SP-ZS-8 ² SP-ZSV-8 ²	Zirconia	D ₂ O, CCl ₄ , DMSO, Toluene, Benzene, Chloroform
SP-GPS-8 SP-GPSV-8	GFP	Methanol, Ethanol, Diethyl Ether
SP-GS-8 SP-GSV-8	G-10	Acetone, Methanol

Long Plugs for 8 mm Wilmad Thin Walled Precision Tubes (L=14 mm)⁴

Product No. ⁵	Material	Solvents
SP-K-8 SP-KV-8	Kel-F®	Glycerol
SP-A-8 SP-AV-8	Aurum®	D ₂ O, H ₂ O
SP-PS-8 SP-PSV-8	PPS	Chloroform, H ₂ O
SP-U-8 SP-UV-8	Ultem®	D ₂ O, H ₂ O
SP-Z-8 SP-ZV-8	Zirconia	D ₂ O, CCl ₄ , DMSO, Toluene, Benzene, Chloroform
SP-GP-8 SP-GPV-8	GFP	Methanol, Ethanol, Diethyl Ether
SP-G-8 SP-GV-8	G-10	Acetone, Methanol

Note 4: L is the length of the bottom plug. Please refer to the picture in previous page. It should be chosen to most closely match your probe coil.

Note 5: Product with a "V" is designed to use with viscous sample by providing vent grooves along the outer surface.

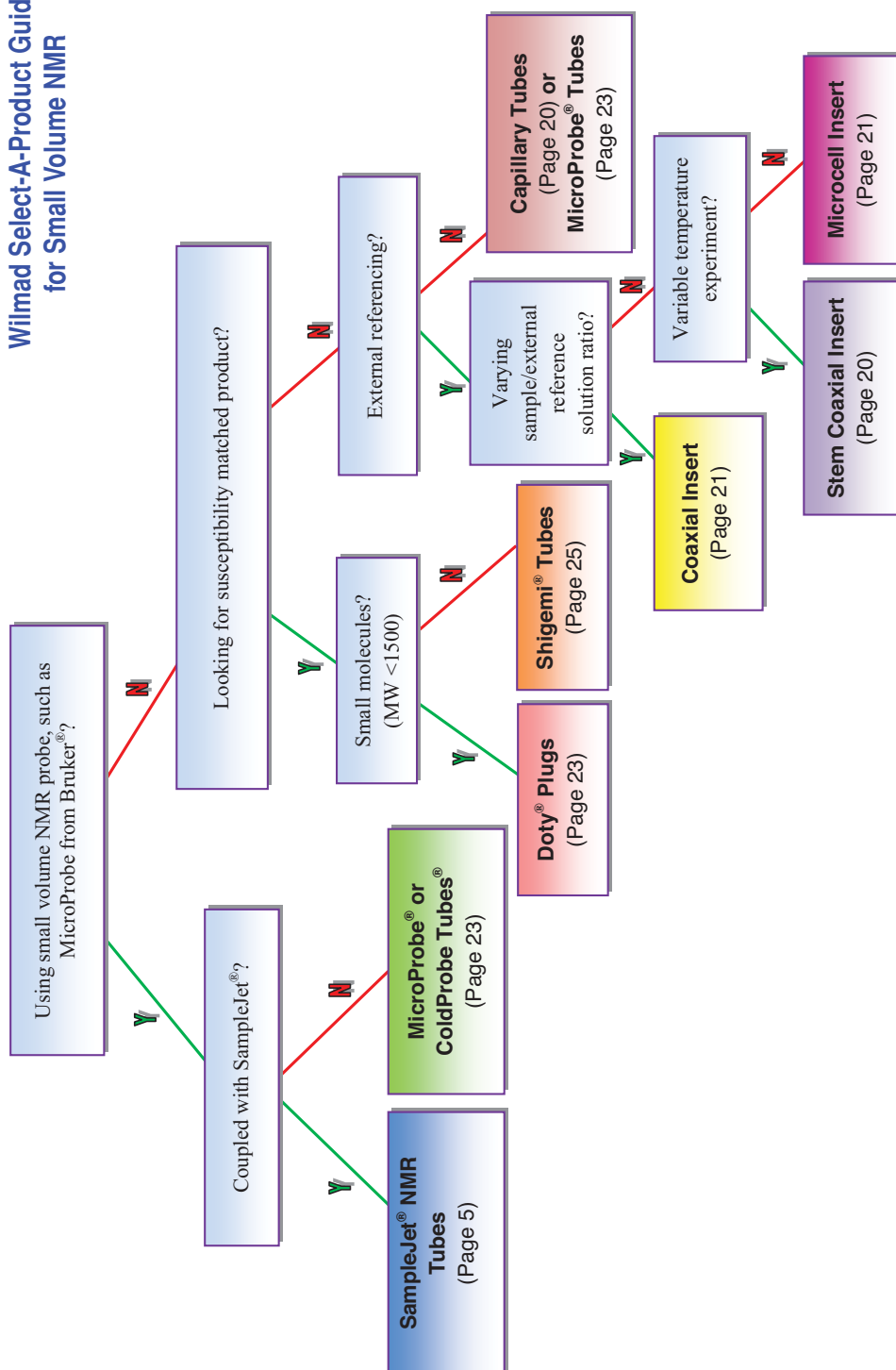


Shigemi® Susceptibility Matched NMR Tubes

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.

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

Wilmad Select-A-Product Guide for Small Volume NMR



Gas-Tight Consumables for Liquid-Phase and Gas-Phase NMR

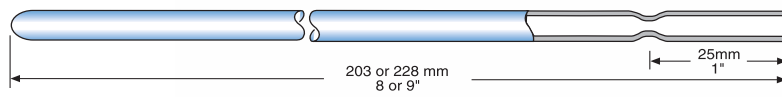


GAS-TIGHT CONSUMABLES FOR
LIQUID-PHASE AND GAS-PHASE NMR

Constricted Vacuum Tube and Tip-Off Manifolds

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.



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

Tip-Off Manifolds

Chemical resistance of the manifold ports is excellent. The NMR tube will connect to 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.

General Components

Product No.	Description
552-P	Piston Valve
552-S	Piston O-Ring
552-G	Glass Section

Tip-Off Manifolds for 3 mm O.D. Tubes

Product No.	Description	Fits Tube wth O.D. (mm)
552-3	Complete Tip-off Manifold	3.0
552-3-B	Aluminum Port Bushing	3.0
552-3-O	O-Ring, Viton®	3.0



1: Glass Section; 2: Piston O-ring; 3: Piston Valve; 4: Aluminum Port Bushing

Tip-Off Manifolds for 5 mm O.D. Tubes

Product No.	Description	Fits Tube wth O.D. (mm)
552-5	Complete Tip-off Manifold	5.0
552-5-B	Aluminum Port Bushing	5.0
552-5-O	O-Ring, Viton®	5.0

Tip-Off Manifolds for 10 mm O.D. Tubes

Product No.	Description	Fits Tube wth O.D. (mm)
552-10	Complete Tip-off Manifold	10.0
552-10-B	Aluminum Port Bushing	10.0
552-10-O	O-Ring, Viton®	10.0

Resonance Report

Due to the nature of glass, Extreme Caution should be exercised 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. Request a copy of technical report NMR-003: Pressure Performance of NMR and EPR Sample Tubes at www.wilmad-labglass.com under Support.

Low Pressure/Vacuum Tube

Wilmad's low pressure/vacuum (LPV) tube is ideal for anaerobic and gas-tight NMR and EPR experiments. A redesigned sealing surface eliminates leaks and greatly increases its lifetime when compared to traditional gas-tight tubes. Our low pressure/vacuum tube continues to offer a convenient flame-free sealing solution for air sensitive or volatile liquid samples. The robust sealing system allows pressure build-up inside sample.

- 4X larger sealing surface increases lifetime and reliability.
- PTFE piston provides a 100% contamination-free seal.
- Axial symmetric design guarantees its application in spinning experiments.
- Spare glass tube can be purchased separately.
- Cheaper price reduces experimental costs.
- Standard sizes can be shipped within 1-2 business days after receipt of order.
- Choose quartz version for experiments requiring degas through freeze pump thaw cycle.



5 mm O.D. Low Pressure/Vacuum NMR Tube

Product No.	MHz Rating	Concentricity/ Camber (μm)	Length (inch)
535-LPV-7	600	13 / 6	7
535-LPV-8	600	13 / 6	8
535-LPV-9	600	13 / 6	9
528-LPV-7	500	25 / 13	7
528-LPV-8	500	25 / 13	8
528-LPV-9	500	25 / 13	9
507-LPV-7	300	51 / 25	7
507-LPV-8	300	51 / 25	8
507-LPV-9	300	51 / 25	9

5 mm O.D. Quartz Low Pressure/Vacuum NMR Tube

Product No.	MHz Rating	Concentricity/ Camber (μm)	Length (inch)
528-LPV-7QTZ	500	25 / 13	7

3 mm O.D. Low Pressure/Vacuum NMR Tube

Product No.	MHz Rating	Concentricity/ Camber (μm)	Length (inch)
335-LPV-8	600	13 / 6	8
335-LPV-9	600	13 / 6	9
328-LPV-7	500	25 / 13	7
328-LPV-8	500	25 / 13	8
328-LPV-9	500	25 / 13	9
307-LPV-7	300	51 / 25	7
307-LPV-8	300	51 / 25	8
307-LPV-9	300	51 / 25	9

5mm Low Pressure/Vacuum Tube for Auto Samplers

These LPV tubes are optimized for automatic samplers that require clearance on sample tube height. The length of this system after tightening the piston and removing the top glass vacuum adapter is ≤200 mm; the bottom NMR tube is ≤138 mm.

Product No.	MHz Rating	Concentricity/ Camber (μm)	Bottom NMR Tube Length (mm)	Length after Removing Vacuum Adapter (mm)
535-LPV-200M	600	13 / 6	137±1	199±1
528-LPV-200M	600	25 / 13	137±1	199±1
507-LPV-200M	300	51 / 25	137±1	199±1

Resonance Report

Due to the nature of glass, Extreme Caution should be exercised 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. Request a copy of technical report NMR-003: Pressure Performance of NMR and EPR Sample Tubes at www.wilmad-labglass.com under Support.

10 mm O.D. Low Pressure/Vacuum NMR Tube

10 mm LPV tubes features a larger valve than 5 mm LPV tubes with an inside inside clearance of 7 mm.

Product No.	MHz Rating	Concentricity/Camber (μm)	Length (inch)
513-7LPV-7	500	38 / 13	7
513-7LPV-8	500	38 / 13	8

Low Pressure/Vacuum (LPV) Shigemi Tube



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

Product No.	Description
GVA-5	Pyrex® Adapter
WNMR-5-PISTON	PTFE Piston for LPV Tube (3, 5 mm)
WNMR-10-PISTON	PTFE Piston for LPV Tube (10 mm)
X-LPV-X-T-P ¹	Spare Pyrex Glass Tube Only
X-LPV-X-T-SQ ¹	Spare Quartz Tube Only

Spare Parts for LPV Tube

Note 1: "X" corresponds to the original product number of the complete LPV tube. For example, 528-LPV-7-T-P is the spare Pyrex tube for 528-LPV-7 (X=528 and 7 individually).

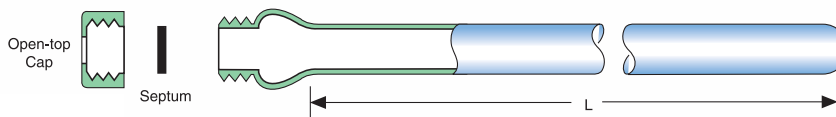
Resonance Report

Due to the nature of glass, Extreme Caution should be exercised 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. Request a copy of technical report NMR-003:Pressure Performance of NMR and EPR Sample Tubes at www.wilmad-labglass.com under Support.

Screw-Cap Tube

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 (Page 33) and Quick Pressure Valve Tube (Page 32).

Each Screw-Cap Tube comes with one PTFE/Silicone Septum.



Screw-Cap Sample Tubes

Product No.	MHz Rating	O.D. (mm)	Length (inch)
335-TR-7	600	3.0	7
335-TR-8	600	3.0	8
335-TR-9	600	3.0	9
328-TR-7	500	3.0	7
328-TR-8	500	3.0	8
328-TR-9	500	3.0	9
307-TR-7	300	3.0	7
307-TR-8	300	3.0	8
307-TR-9	300	3.0	9
535-TR-7	600	5.0	7
535-TR-8	600	5.0	8
535-TR-9	600	5.0	9
528-TR-7	500	5.0	7
528-TR-8	500	5.0	8
528-TR-9	500	5.0	9
507-TR-7	300	5.0	7
507-TR-8	300	5.0	8
507-TR-9	300	5.0	9
513-7TRA-7	400	10.0	7
513-7TRA-8	400	10.0	8
513-7TRA-9	400	10.0	9

Screw-Cap Accessories

Product No.	Description	Fits Tube with O.D. (mm)	Qty. per Package
TR-LR-01	PTFE/rubber septum ¹	4 and 5	36
TR-LR-05	PTFE/rubber septum ¹	10	36
TR-LR-07	PTFE/rubber septum ¹	12, 13, 15, 16, and 18	36
TR-LS-01	PTFE/silicone septum ²	4 and 5	36
TR-LS-03	PTFE/silicone septum ²	7.5 and 8	36
TR-LS-05	PTFE/silicone septum ²	10	36
TR-LS-07	PTFE/silicone septum ²	12, 13, 15, 16, and 18	36
TR-SC-01	Solid Cap	4 and 5	12
TR-SC-05	Solid Cap	10	12
TR-SC-07	Solid Cap	12, 13, 15, 16, and 18	12
TR-SC-09	Solid Cap	20	12
TR-OC-01	Open Cap	4 and 5	12
TR-OC-03	Open Cap	7.5 and 8	12
TR-OC-05	Open Cap	10	12
TR-OC-07	Open Cap	12, 13, 15, 16, and 18	12

Note 1: PTFE/Rubber Septum is a laminated disc consisting of a sheath of PTFE bonded chemically to pharmaceutical rubber. This septum is inert to most solvents and many corrosive materials but not recommended for multiple punctures.

Note 2: PTFE/Silicone Septum is a laminated disc consisting of a sheath of PTFE bonded chemically to silicone rubber. This type of septum is inert to most organic solvents and compounds but poor to strongly corrosive materials. Remains reliable after multiple punctures.

T Resonance Report

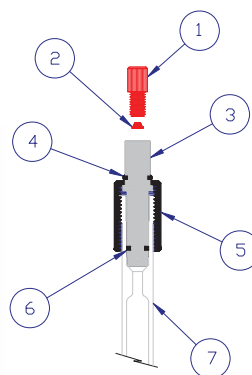
Due to the nature of glass, Extreme Caution should be exercised at elevated or reduced pressures since a tiny scratch on the glass surface would significantly lower the tensile strength. Adequate safety shielding should always be used when working in these conditions. Request a copy of technical report NMR-003:Pressure Performance of NMR and EPR Sample Tubes at www.wilmad-labglass.com under Support.

Quick Pressure Valve 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.

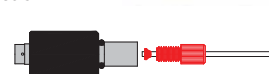
Features:

- 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 to both 1/16" and 1/8" tubing.



- | | |
|------------------|------------------------------|
| 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 |

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 its finger tight.

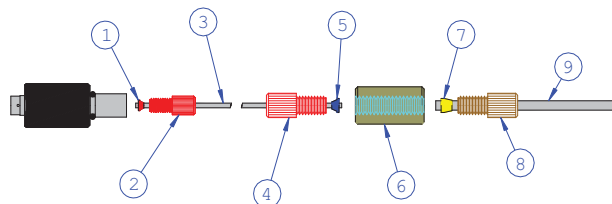
Quick Pressure Valve (QPV) Tubes (Parts for Basic Tubing Connection Included)

Product No.	MHz Rating	O.D. (mm)	Length (inch)	Wall Thickness (mm)	Concentricity/Camber (µm)	Recommended Max Pressure (psi)
528-QPV-7	500	5.0	7	0.38	25 / 13	100
528-QPV-8	500	5.0	8	0.38	25 / 13	100
524-QPV-7	300	5.0	7	0.77	76 / 51	150
524-QPV-8	300	5.0	8	0.77	76 / 51	150
522-QPV-7	300	5.0	7	1.40	51 / 51	200
522-QPV-8	300	5.0	8	1.40	51 / 51	200
507-QPV-7	300	5.0	7	0.38	51 / 25	100
507-QPV-8	300	5.0	8	0.38	51 / 25	100

Spare Parts and Special O-Rings

Product No.	Description
QPV-V	Valve plug assembly with nut and ferrule
QPV-VOS	Set of 20 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

Optional Tubing Connections



- | | |
|----------------|---|
| 1. QPV-F | Ferrule for 10-32 nut / 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-T116 | Tubing, 1/16" O.D. PTFE |
| 4. QPV-T116 | Nut, 1/4-28 for 1/16" Tubing |
| 5. QPV-F116 | Ferrule for 1/4-28 nut / 1/16" Tubing |
| 6. QPV-U116 | 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-1823-018 | Tubing, 1/8" O.D. PTFE |

Resonance Report

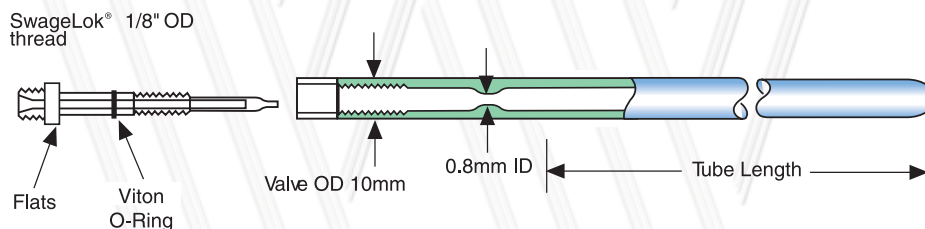
Due to the nature of glass, Extreme Caution should be exercised at elevated or reduced pressures since a tiny scratch on the glass surface would significantly lower the tensile strength. Adequate safety shielding should always be used when working in these conditions. Request a copy of technical report NMR-003:Pressure Performance of NMR and EPR Sample Tubes at www.wilmad-labglass.com under Support.

Ferrules, Nuts, Tubing and Unions for QPV Sample Tube

Product No.	Description	Qty. per Package
QVP-F14	Ferrule, 1/16", ETFE, Blue - to attach vacuum/pressure source	10
QVP-N14	Nut, 1/16", 1/4-28, Delrin, Red - to attach vacuum/pressure source	1
QVP-T16	Tubing, PTFE, 1/16" O.D. X 3 FT.	1
QVP-U14	Union, Delrin, 1/4-28 for 1/8" tubing	1
QPV-F	Ferrule, 1/16" x 10-32	10
QPV-N	Nut, 1/16" 10-32 x 1/16"	1
OF-60	Vacuum Connector	1
BP-1821-018	Nut 1/4-28 for 1/8" tubing	1
BP-1822-018	Ferrule 1/4-28 for 1/8" tubing	1
BP-1823-018	Tubing 1/8" x 10 feet	1

Pressure/Vacuum Sample Tube

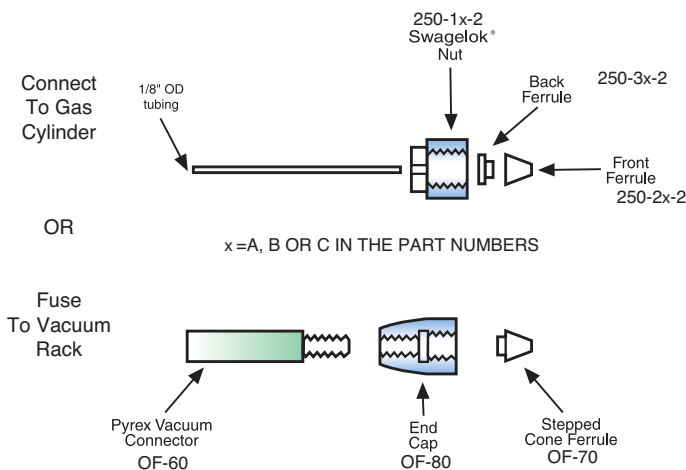
Wilmad's Pressure/Vacuum Tube is the most reliable NMR tube for medium range pressure (<300 psi) experiments in the market. It is designed to connect to a 1/8" metal (stainless steel or brass) vacuum line using SwageLok® fittings or a rubber vacuum hose and a glass connector (OF-60). The PV-ANV valve 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 spare parts/ adapter table).

Connections

The upper portion of the Needle Valve is threaded and I.D. beveled 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 right picture. The needle valve can be tightly closed using a small wrench (flat surfaces are provided on the valve). Components of the Pressure Valve NMR Tube and compatible fittings are available separately. See spare parts/adapters. Tube available in 7, 8, or 9" lengths. Order shortest length to minimize overall weight.



T Resonance Report

Due to the nature of glass, Extreme Caution should be exercised 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. Request a copy of technical report NMR-003:Pressure Performance of NMR and EPR Sample Tubes at www.wilmad-labglass.com under Support.

Pressure/Vacuum Sample Tube (Including one Glass Tube and one PV-ANV Valve)

Product No.	MHz Rating	O.D (mm)	Length (inch)	Wall Thickness (mm)	Concentricity (μm)	Camber (μm)	Recommended Max Pressure (psi)
528-PV-7	500	5.0	7	0.38	25	13	100
528-PV-8	500	5.0	8	0.38	25	13	100
528-PV-9	500	5.0	9	0.38	25	13	100
524-PV-7	400	5.0	7	0.77	76	51	150
524-PV-8	400	5.0	8	0.77	76	51	150
524-PV-9	400	5.0	9	0.77	76	51	150
522-PV-7	500	5.0	7	1.40	51	51	200
522-PV-8	500	5.0	8	1.40	51	51	200
522-PV-9	500	5.0	9	1.40	51	51	200
507-PV-7	300	5.0	7	0.38	51	25	100
507-PV-8	300	5.0	8	0.38	51	25	100
507-PV-9	300	5.0	9	0.38	51	25	100
513-7PV-7	500	10.0	7	0.46	38	13	90
513-7PV-8	500	10.0	8	0.46	38	13	90
513-7PV-9	500	10.0	9	0.46	38	13	90
513-7PVM-7	500	10.0	7	0.92	38	13	150
513-7PVM-8	500	10.0	8	0.92	38	13	150
513-7PVM-9	500	10.0	9	0.92	38	13	150
513-7PVH-7	450	10.0	7	1.45	51	13	200
513-7PVH-8	450	10.0	8	1.45	51	13	200
513-7PVH-9	450	10.0	9	1.45	51	13	200

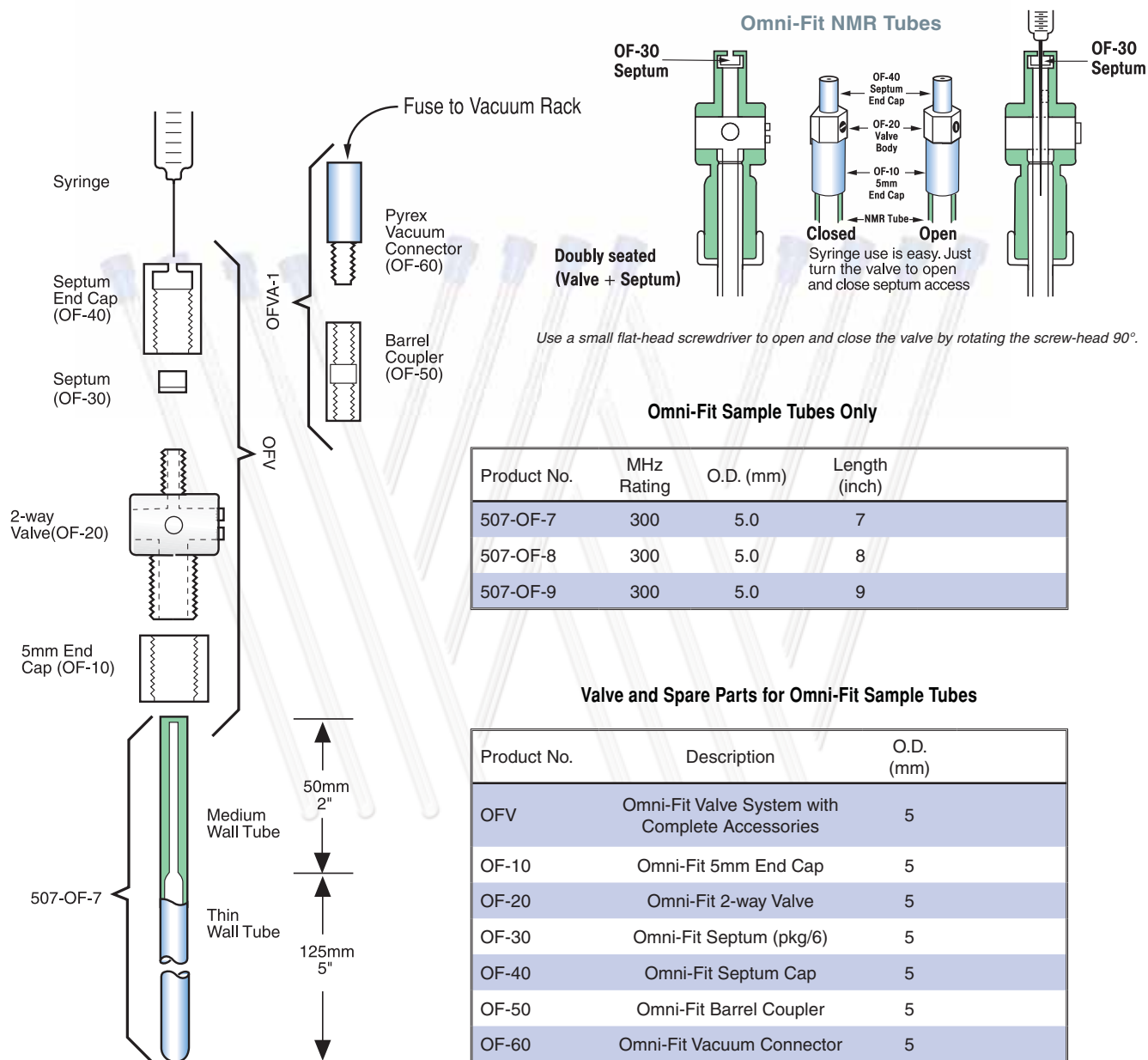
Connectors for Pressure/Vacuum Sample Tube

Product No.	Description	Material	Qty. per Package
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	Brass 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

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.

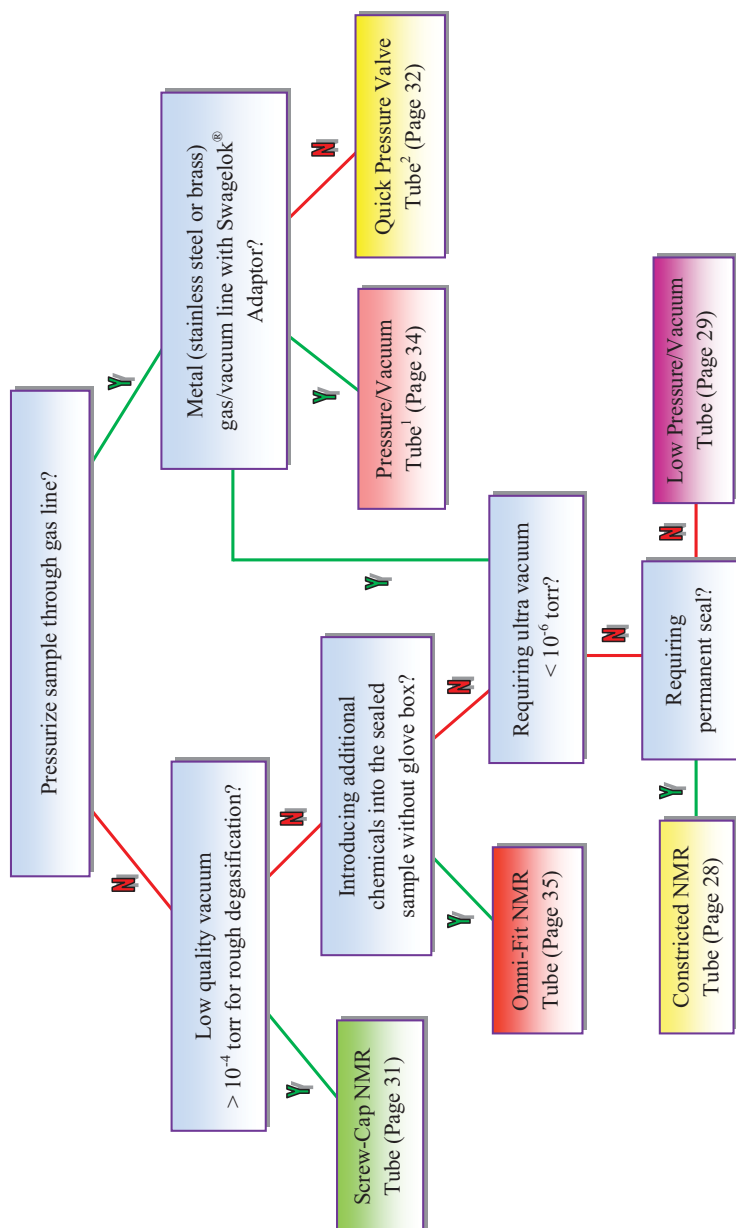


Resonance Report

Due to the nature of glass, Extreme Caution should be exercised 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. Request a copy of technical report NMR-003: Pressure Performance of NMR and EPR Sample Tubes at www.wilmad-labglass.com under Support.

Wilmad Select-A-Product Guide for Gas-Tight Tubes

Use Universal Solvent Jet NMR Tube Washer WG-7200-2(J2) on Page 42 to wash Low Pressure/Vacuum Tube and Screw-Cap NMR Tube.
 Use Universal Solvent Jet NMR Tube Washer WG-7200-1(J1) on Page 42 to wash Quick Pressure Valve Tube and Omni-Fit NMR Tube.
 Use Hamilton Syringe 81420 plus PTFE Needle 90630 on Page 48 to wash Pressure/Vacuum Tube.



Note 1: Please check the maximum pressure for Quick Pressure Valve Tube and Pressure/Vacuum NMR Tube.

Note 2: For any experiment with NH₃ gas or other corrosive gas, we recommend Quick Pressure Valve Tube with Kalrez® O-ring

NMR Reference Standards



NMR Reference Standards

Wilmad's NMR Reference Standards are packaged in ultra-high field precision tubes to guarantee their performance in experiments over 600 MHz. Each standard comes with a Certificate of Analysis (CoFA).

Wilmad's NMR Reference Standards meet or exceed requirements set by NMR spectrometer manufacturers; many of whom include Wilmad Standards with their instruments.

3 mm O.D. NMR Reference Standards

Product No.	MHz Rating	Length (inch)	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-04-3	600+	8	0.3% 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-07-3	600+	8	2 mM sucrose, 0.5 mM DSS, 2 mM NaN ₃ in 90% H ₂ O/D ₂ O	Water Suppression
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-09-3	600+	8	99.8% methanol-d ₄	Temperature 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

5 mm O.D. NMR Reference Standards

Product No.	MHz Rating	Length (inch)	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-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-07-5	600+	8	2 mM sucrose, 0.5 mM DSS, 2 mM NaN ₃ in 90% H ₂ O/D ₂ O	Water Suppression
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-13-5	600+	8	0.05% Trifluorotoluene in CDCl ₃	¹⁹ F Sensitivity

If you need reference standards in other sizes, please contact us.

Accessories for Liquid-Phase NMR



ACCESSORIES FOR
LIQUID-PHASE NMR

Spinner Turbines

Wilmad supplies a full range of Spinner Turbines for Varian®/Nalorac® and Bruker® NMR spectrometers from 1.7 mm to 10 mm. These Spinner Turbines are manufactured to precision standards that exceeds spectrometer manufacturer's products in terms of dimension tolerance, reliability and life span.

Spinner Turbines for Bruker® Spectrometers

STB-5 ROOM TEMPERATURE 5 MM SPINNER TURBINE



Highlights:

- Less probe insert damage by better insert sample control.
- Tachometer strip with foil protection for improved life span.
- Longer upper barrel stabilizer with 3 mm Yellow band.
- Limited VT operation around ambient.
- Can be mixed with originals during sample changer operation.
- Susceptibility and weight matched to the originals.

Product No.	Application Temperature	Description
STB-5	Ambient	5 mm Spinner for Bruker®
STB-5-TACHO		Replacement Tacho-Strip
TURBINE-OR-ING-BLACK		Spare 5 mm Viton® O-Ring

B-PEEK-5 VARIABLE TEMPERATURE 5 MM AND 10 MM SPINNER TURBINE



Highlights in addition to STB-5:

- VT operation of -150°C to +200°C.
- Far less likely to break as compared with ceramic spinners if dropped on a hard surface, and more economical.
- Weight compatible with room temperature spinners.
- Long life high temperature O-rings top and bottom.

Product No.	Application Temperature	Description
B-PEEK-5	-150 °C to +200° C	5 mm Spinner for Bruker®
B-PEEK-10	-150 °C to +200° C	10 mm Spinner for Bruker®
B-PEEK-5-O-RING		Spare Viton® 5 mm O-Ring
B-PEEK-10-O		Spare 10 mm O-Ring

3 TO 5 MM SPINNER TURBINE VARIABLE TEMPERATURE WITH EXCHANGEABLE FINGERS



Highlights in addition to STB-5 and B-PEEK-5:

- Cost effective compared to the full VT version for sample changers.
- 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 experiment but compatible for spinning experiments.
- No need to adjust eject air to eject sample, interchangeable to STB-5, B-PEEK-5 and originals.

Product No.	Application Temperature	Description	Material
B-PEEK-3-NS	-150 °C to +200 °C	Bruker® Spinner Turbine with 3 mm PEEK exchangeable fingers (Note: The Mass Multiplier Ring is not included and can be purchased separately)	PEEK
B-PEEK-4-NS	-150 to +200°C	Bruker® Spinner Turbine with 4 mm PEEK exchangeable fingers (Note: The Mass Multiplier Ring is not included and can be purchased separately)	PEEK
B-PEEK-5-NS	-150 °C to +200 °C	Bruker® Spinner Turbine, with 5 mm PEEK exchangeable fingers (Note: The Mass Multiplier Ring is not included and can be purchased separately.)	PEEK
UNI-FINGER-PEEK-3	-150 °C to +200 °C	3 mm Finger for B-PEEK-X-NS style turbines (Two Each Required), Double VT O-Ring, for both spin and non-spin NMR	PEEK
UNI-FINGER-PEEK-4	-150 °C to +200 °C	4 mm Finger for B-PEEK-X-NS style turbines (Two Each Required), PEEK, Double VT O-Ring, for both spin and non-spin NMR	PEEK
UNI-FINGER-PEEK-5	-150 °C to +200 °C	5 mm Finger for B-PEEK-X-NS style turbines (Two Each Required), PEEK, Double VT O-Ring, for spin and non-spin NMR	PEEK
UNI-FINGER-3	-150 °C to +200 °C	3 mm Finger for B-PEEK-X-NS (Two Each Required)), PTFE, Double VT O-Ring, optimized for non-spin NMR	PTFE
UNI-FINGER-5	-150 °C to +200 °C	5 mm Finger for B-PEEK-X-NS (Two Each Required), PTFE, Double VT O-Ring, optimized for non-spin NMR	PTFE
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

STV-5 ROOM TEMPERATURE 5 MM SPINNER TURBINE



Highlights are:

- Low cost alternative to the full VT version for sample changers.
- Weight and susceptibility matched to originals.
- Can be mixed with originals in sample changer operation.
- Limited VT operation around ambient.
- Does not jam at top of upper barrel during insert operation.
- Tachometer strip now with foil protection for improved life span.

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

V-PEEK-5 VARIABLE TEMPERATURE 5 MM AND 10 MM SPINNER TURBINE



Highlights in addition to STV-5:

- VT operation of -150°C to +200°.
- Weight compatible with room temperature spinners.
- Cost effective as compared to the originals.

Product No.	Application Temperature	Description
V-PEEK-5	-150 °C to +200° C	5 mm Spinner for Agilent®
V-GFK-10	-150 °C to +200° C	10 mm Spinner for Agilent®
TURBINE-ORING-RED		Spare Viton® 5 mm O-Ring
V-GFK-10-O		Spare 10 mm O-Ring

3 TO 5 MM SPINNER TURBINE VARIABLE TEMPERATURE WITH EXCHANGEABLE FINGERS



Highlights in addition to STV-5 and V-PEEK-5:

- Cost effective compared to the full VT version for sample changers.
- 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 experiment but compatible for spinning experiments.
- No need to adjust eject air to eject sample, interchangeable to STV-5, V-PEEK-5 and originals.

Product No.	Application Temperature	Description	Material
V-PEEK-3-NS	-150 °C to +200 °C	Agilent® Spinner Turbine with 3 mm PEEK exchangeable fingers (Note: The Mass Multiplier Ring is not included and can be purchased separately)	PEEK
V-PEEK-4-NS	-150 to +200°C	Agilent® Spinner Turbine with 4 mm PEEK exchangeable fingers (Note: The Mass Multiplier Ring is not included and can be purchased separately)	PEEK
V-PEEK-5-NS	-150 °C to +200 °C	Agilent® Spinner Turbine with 5 mm PEEK exchangeable fingers (Note: The Mass Multiplier Ring is not included and can be purchased separately.)	PEEK
UNI-FINGER-PEEK-3	-150 °C to +200 °C	3 mm Finger for V-PEEK-X-NS style turbines (Two Each Required), Double VT O-Ring, for both spin and non-spin NMR	PEEK
UNI-FINGER-PEEK-4	-150 °C to +200 °C	4 mm Finger for V-PEEK-X-NS style turbines (Two Each Required), PEEK, Double VT O-Ring, for both spin and non-spin NMR	PEEK
UNI-FINGER-PEEK-5	-150 °C to +200 °C	5 mm Finger for V-PEEK-X-NS style turbines (Two Each Required), PEEK, Double VT O-Ring, for spin and non-spin NMR	PEEK
UNI-FINGER-3	-150 °C to +200 °C	3 mm Finger for V-PEEK-X-NS (Two Each Required)), PTFE, Double VT O-Ring, optimized for non-spin NMR	PTFE
UNI-FINGER-5	-150 °C to +200 °C	5 mm Finger for V-PEEK-X-NS (Two Each Required), PTFE, Double VT O-Ring, optimized for non-spin NMR	PTFE
UNI-MASS-MULTI		Mass Multiplier Ring for V-NS Style Spinner Turbines with 1 or 2 O-Rings at the top	

Spinner for Small Volume NMR (Alternative to Bruker® MATCH® System)

Similar to Bruker® MATCH® system, Wilmad's Spinner for Small Volume NMR holds a variety of microsample capillaries and is compatible with Bruker®, Varian®, and JEOL®'s spectrometers/probes and automatic sample changers. A substantial savings is realized considering the "one size" variety available from NMR probe manufacturers.

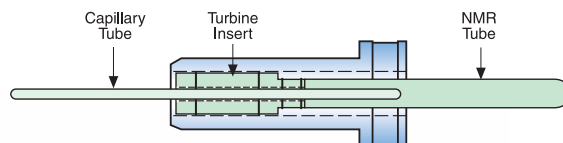
The lower portion of each insert fits precisely into the Spinner Turbine; the upper portion holds a short 10 mm NMR tube (almost 4 inches long with open ends) that extends beyond the top. This set-up can be used with autosample changers that grasp the tube above the turbine.

Turbine Insert Only

Product No.	Fits Capillary Tube with O.D. (mm)
WP-INS-1.7	1.7
WP-INS-2.0	2.0
WP-INS-2.5	2.5
WP-INS-3	3

The minimum length of the capillary tubes used in this system is 125 mm. Please refer to Page 20.

For Tube Caps, please see Page 14-15.



Complete Sets

Product No.	For Probe	Fits Capillary Tube with O.D. (mm)
V-GFK-10/1.7	Varian®/Nalorac® 3 mm	1.7
V-GFK-10/2.0	Varian®/Nalorac® 3 mm	2.0
V-GFK-10/2.5	Varian®/Nalorac® 3 mm	2.5
V-GFK-10/3	Varian®/Nalorac® 3 mm	3.0
B-GFK-10/1.7	Bruker® 2.5 mm/5 mm	1.7
B-GFK-10/2.0	Bruker® 2.5 mm/5 mm	2.0
B-GFK-10/2.5	Bruker® 2.5 mm/5 mm	2.5
B-GFK-10/3	Bruker® 3 mm/5mm	3.0

Tube Washers

Universal Solvent Jet NMR Tube Washer

Wilma'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 our gas-tight sample tubes.

By loosening and retightening 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.

Product No.	Fits Tubes with O.D. (mm)	Washer Connection
WG-7200-1	2.5-5 mm	Plain
WG-7200-2	6.5-25 mm	Plain
WG-7200-J1	2.5-5 mm	§24/40 Joint
WG-7200-J2	6.5-25 mm	§24/40 Joint



Parts for Universal Solvent Jet Washer

Product 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 "G"	WG-7200-1, J1
WG-7200-L-G	Rubber Gasket "G"	WG-7200-2, J2
WG-7200-S-O	Small O-Ring "O"	WG-7200-1, J1
WG-7200-L-O	Small O-Ring "O"	WG-7200-2, J2
WG-7200-S-P	PTFE Tubing "T"	WG-7200-1, J1
WG-7200-L-P	PTFE Tubing "T"	WG-7200-2, J2

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 (3, 4 and 5 mm OD) 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.

Features:

- 5 PTFE coated stainless steel solvent transfer tubes fit 3, 4 and 5 mm NMR/EPR tubes.
- PTFE solvent cup and tubing make this unit fully resistant to common organic solvents.
- Flanged reservoir connection eliminates joint freeze
- Greaseless 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.

Product No.	Description
WG-1209-1	Multi-tube Washer/Dryer Complete, #9 Silicone Stopper Joint
WG-1209-J1	Multi-tube Washer/Dryer Complete, 24/40 Taper Joint
WG-1209-J2	Multi-tube Washer/Dryer Complete, 29/32 Taper Joint



Parts for Multi-Tube Jet Solvent Washer

Product No.	Description
WG-1209-5	Multi-tube Washer/Dryer Solvent Cup

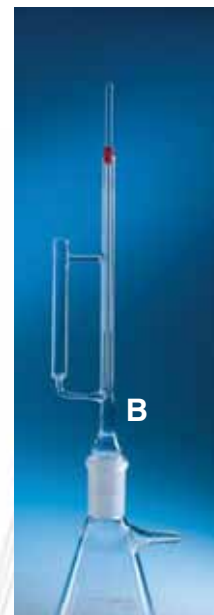
Economy Single Tube Solvent Jet Washer/Cleaner

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 air through the tube to complete the procedure.

Filter flasks are ordered separately. The single tube washers (WG-1207-series) require flasks with vacuum sidearms (see below).

Product No.	Fits Tubes with O.D. (mm)	For Tubes with Length (inch)	Washer Connection	"B" Diameter (mm)
WG-1207-5	5 ¹	7	Plain	10mm
WG-1207-5-8	5 ¹	8	Plain	10mm
WG-1207-10	10	7	Plain	14mm
WG-1207-J5	5 ¹	7	324/40 Joint	10mm
WG-1207-J5-8	5 ¹	8	324/40 Joint	10mm
WG-1207-J10	10	7	324/40 Joint	14mm

Note 1: Compatible with 5 mm O.D. Thin-Walled Tubes only.



Filter Flasks with Vacuum Sidearms

Filter flasks have a standard taper 324/40 outer joint and are used with WG-1207 Economy Single Tube Washer and WG-7200 Universal Tube Washer.

Product No.	Description	Volume (mL)
LG-7800-102	Filter Flask with Vacuum Sidearm	250
LG-7800-104	Filter Flask with Vacuum Sidearm	500
LG-7800-106	Filter Flask with Vacuum Sidearm	1000

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).

Capacity is 1 gallon and the Tube Cleaning Rack is plastic-coated to protect tubes. Available in a number of configurations, e.g. with 0-30 min timer and/or heater (thermostated for 60 °C) these units provide up to 100 watts output while drawing a maximum of just 1 A input power.

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 Unit¹

Product No.	Description	Voltage (V)
SC-101	Ultrasonic Cleaner	110/120
SC-101T	Ultrasonic Cleaner with 0-30 Minute Timer	110/120
SC-101H	Ultrasonic Cleaner with Heater	110/120
SC-101TH	Ultrasonic Cleaner with 0-30 Minute Timer and Heater	110/120

Note 1: Stainless steel trays, baskets, lid and rack are **ordered separately**.

Accessories

Product 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

Detergent

Product No.	Description
101-GAL	1 Gallon Alkaline Cleaning Concentrate

NMR Tube Racks

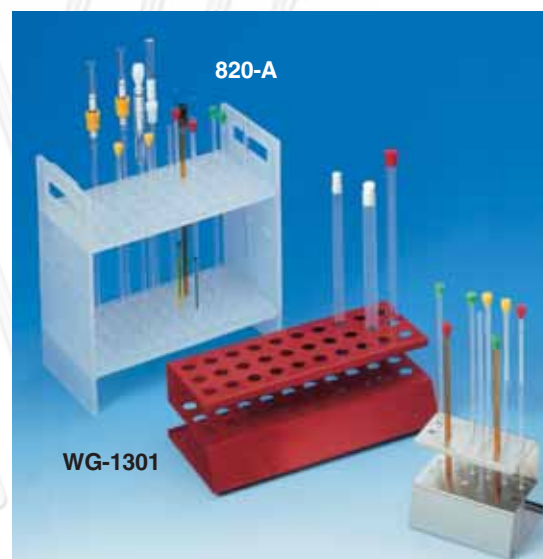
Wilmad offers three different NMR tube racks.

820-A For large numbers of tubes, Wilmad's lightweight Polypropylene NMR Tube Racks maximize your benchtop storage capacity and are virtually inert.

WG-1301 Coated Steel rack is completely encased in inert PVC to prevent any scratches to the tube, ideal for 10 mm tubes.

WG-2442 is Stainless Steel Rack without any coating.

Product No.	Material	Fits Tube with Maximum O.D. (mm)	Capacity (Max number of tubes)
820-A	Polypropylene	5	72
WG-1301	PVC-coated Steel	12	30
WG-2442	Stainless Steel	5	12



Spinner Bearing NMR Sample Tube Tester

How do you keep NMR tubes bent from misuse from affecting your spectrometers? Have every tube pass the spinner bearing test before each use.

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

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

Product No.	Description	Fits Tubes with O.D. (mm)
SB-5-7	Spinner Bearing Tube Tester	5
SB-8-7	Spinner Bearing Tube Tester	8
SB-10-7	Spinner Bearing Tube Tester	10

Liquid Nitrogen Dewar Flask



Liquid nitrogen is an easily transported and economic source of coolant, whose boiling point is far below the freezing point of water without pressurization. This unique feature makes liquid nitrogen 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:

- 30% cheaper than other manufacturers' similar products.
- Unique metal base increases stability.
- High vacuum minimizes liquid nitrogen loss during storage.

Product No.	Base	I.D. (mm)	Total Height (mm)	Inside Depth (mm)	Max Volume (mL)	Cross Reference
LN2DF-600-1	3 inch Aluminum	80	180	150	600	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 3 mm O.D. x 180 mm length.

pH Range: 0-14

Resolution: 0.02 pH Units

Resistance at 20°C: 100-1000 MΩ

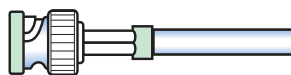
Temperature Range: 0-70°C

Sodium Error: 0.1 at pH 12

Reproducibility: 99% within



Connectors



6030-02-BNC



6030-02-6

pH Electrode¹

Product No.	Description
6030-02-BNC	pH Electrode with BNC Connector
6030-02-6	pH Electrode with 6 mm Radiometer Connector

Electrode Solutions

Product No.	mL	Description
18513	250	Reference Solution - 3M KCl saturated with AgCl
18823	125	Electrode Storage Solution - 3M KCl
18528	250	Diaphragm Cleaner - Thiol based
18508	125	Electrode Cleaner - for removing protein coating

Note 1: These electrodes are extremely fragile due to size. Please pay extra attention during operation.

NMR Pipettes



Long-tip Pipettes

Product No.	Overall Length (inch)	Compatible with	Qty. per Package
803A	13-3/4	Min. 3 mm O.D. Max. 9 inch long tubes	100

Short Pipette and Latex Bulb

Product No.	Description	Qty. per Package
802	Short Pasteur Pipette	100
804	Latex Bulb (for all pipettes)	50

NMR Filter and Funnel

Sample sedimentation may bring trouble to both shimming and spectrum quality. Use Wilmad's special Bulb Filter to remove large particles. Two designs available: one with luer tip for stainless steel needle attachment, the other with glass tip. Both fit into all sizes of Wilmad NMR tubes. The sintered glass tip removes particles larger than 60 μ m.



Wilmad's Powder Funnel is designed to load large amounts of liquid reagents into NMR tubes. Tip fits into 5 mm thin-walled NMR or larger tubes.

Product No.	Description
815	NMR Funnel
807	Regular Tip Filter
808	Luer Tip Filter
809	Rubber Bulb
810-A	Needle, Stainless Steel, 3" long
810-B	Needle, Stainless Steel, 5" long
810-C	Needle, Stainless Steel, 8" Long

Hamilton® Gas-Tight Syringe (PTFE Luer Lock)



Wilmad offers PTFE Luer Lock syringes that best meet your NMR sampling needs. These syringes handle 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.

Product No.	Syringe Max. Volume (μL)	Graduation Interval (μL)
81220	500	10
81320	1000	20
81420	2500	50

Syringe Needles

The stainless steel needle is designed for septum punctures for air-sensitive sample. The PTFE version in various sizes offers a convenient way to load and wash your sample in Small Volume NMR experiments.

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



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's symmetry in spinning experiment.

Product No.	For Tubes with O.D. (mm)	Qty. per Package
WGL-5	5	480
WGL-10	10	400

NMR Tube Carrier

Wilmad's pocket NMR tube carrier holds one NMR tube up to 7 inch long. Each pack has 3 carriers: one in red, one in white and one in blue. Carrier features a shirt clip that keeps it secured in the lab coat pocket. Made from polymer material with a snap-on cap. Protection is provided for the sample and lab personnel during transport.

Product No.	Description
WG-6192	NMR Tube Carrier with Shirt Clip. Holds 7" tubes. Pack of 3 each



Vortex Plugs and Positioning Rods

Recommended for sample positioning inside the NMR tube.



Vortex Plugs

Product No.	Fits Tubes with O.D. (mm)	Fits Tubes with Wall Thickness (mm)
WG-805	5	0.38
WG-805J	6.5	0.41
WG-805K	7.5	0.51
WG-805D	8	0.51
WG-805A	10	0.46
WG-805A-3	10	0.92
WG-805C	15	0.76
WG-805M	16	0.70
WG-805G	18	0.73
WG-805F	20	0.97

Positioning Rods

Product No.	Material	Fits Tubes with O.D. (mm)
WG-504	Stainless Steel	5 and 10+
529-C	Kel-F®	5-15
WG-1208	Kel-F®	16-25

2D Bar Code NMR Tube Labels

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

Product No.	Package Qty.
WGL-5D	50



Tips to Avoid Tube Shattering

Tube shattering during extreme temperature change is mainly caused by mechanical stress due to large temperature gradient over tube body and/or gas expansion inside frozen sample.

To minimize this possibility, we provide the following tips based on stress equations and physical properties of different tube materials.

- ✍ Pyrex[®] glass can only be operated safely at temperatures up to 500 K. Sudden temperature change should be controlled within 120 K to avoid structure failure.
- ✍ Always use Wilmad-LabGlass brand tubes, which have the highest quality in the industry.
- ✍ Increase wall thickness. For example, by changing from thin-walled tube to medium-walled tube, the chance of breakage is reduced by a factor of 4.
- ✍ Degas sample and take multiple steps in sample warm up.
- ✍ Freeze sample with pre-cooled isopentane¹ (2-methylbutane) at around 120 K. It will reduce the chance of breakage by a factor of 2.
- ✍ Use quartz tube instead of Pyrex[®] or N51A glass tube. This will reduce the chance of breakage by a factor of 14 at the same wall thickness.
- ✍ Due to the sample weight increase, please take extra caution in handling sample tubes with O.D. over 5 mm. Keep the motion of tubes in one direction. Do not suddenly flip or rotate the tube against gravity in order to prevent ~~shearing~~ **shearing** force.

Note 1: Isopentane is an organic solvent which evaporates at room atmosphere. Cooling of isopentane should be performed in chemical fume hoods.

Consumables and Accessories for Solid-State NMR



CONSUMABLES AND ACCESSORIES
FOR SOLID-STATE NMR

Rotor and Cap for Bruker®, Varian®, Doty® MAS-NMR

Zirconia MAS Rotors and Caps

Manufactured from the highest purity Zirconia, Wilmad's MAS Rotors provide the NMR spectroscopist with the ultimate alternative for analysis of solid samples. The need to solvate solid samples is eliminated. They are available for most current solid state NMR spectrometers.

Wilmad MAS Rotors are carefully examined for material irregularities by optical methods before and after the precision machining process. Without overspinning, each rotor is spin tested to only the highest specified spinning speed. High precision (which becomes a necessity for proper spinning performance) is maintained in the manufacture of the end caps. Most caps are fitted with O-rings for better sealing; some have axial holes for venting.

Advantages of Zirconia Rotors

- Most homogeneous ceramic material
- Wilmad's Zirconia Rotor Body has higher strength (1,000 MPa, greater than Si_3N_4)
- Highest spinning speed (up to 12 kHz for 7 mm O.D. rotors)
- High precision superior finish (0.05 μm mirror gloss)



Wilmad MAS Rotor Cap



Wilmad MAS Rotor Body

Properties of Rotor and Cap Materials

Material	Chemical Components	Recommended Temperature Range	Additional Remarks
Zirconia	ZrO_2 with MgO	-150 °C to 650 °C	Excellent chemical resistance.
Kel-F®	F, Cl, C	-20 °C to 70 °C	Excellent chemical resistance; commonly used for ^1H studies.
Macor®	Al, Si, O, B, K, F boro-silicate glass ceramic with Mica	-150 °C to 250 °C	Excellent chemical resistance; ideal for ^{13}C studies, variable temperature work, air-sensitive and wet samples.
Torlon®	C, N, O, H Poly (amide-imide)	-150 °C to 200 °C	Not recommended for bases or wet samples; otherwise, excellent chemical resistance. For multi-nuclei studies (except ^{13}C) and variable temperature work.
VespeI® SP1	N/A	-150 °C to 250 °C	For Bruker® 2.5 mm and 4 mm rotor.

To make a proper cap selection based on NMR applications, please refer to the Select-A-Product Guide on Page 57.

Rotor and Cap for Doty® MAS Probe

Product No.	For Doty® MAS Probe	Description	Material
WP-501-5135	Standard 5 mm	Rotor Body	Zirconia
WP-601-5135	Standard 5 mm	Rotor Cap	Kel-F®
WP-501-5150	High Speed 5 mm	Rotor Body	Zirconia
WP-601-5150	High Speed 5 mm	Rotor Cap	Kel-F®
WP-501-7185	Standard 7 mm	Rotor Body	Zirconia
WP-601-7185	Standard 7 mm	Rotor Cap	Kel-F®
WP-501-7222	High Speed 7 mm	Rotor Body	Zirconia
WP-601-7222	High Speed 7 mm	Rotor Cap	Kel-F®

Rotor and Cap for Bruker® MAS Probe

Product No.	For Bruker® MAS Probe	Application Temperature	Description	Material	Remarks
WP-501-2180	2.5 mm	-150 °C to 650 °C	Both Ends Open Rotor	Zirconia	V _{max} =35 kHz
WP-602-2181	2.5 mm	-30 °C to +70 °C	Cap	Vespel®	
WP-602-2182	2.5 mm	-30 °C to +70 °C	Bottom Plug	Vespel®	
WP-501-2180-SET1	2.5 mm	-30 °C to +70 °C	One 2.5mm Rotor, Two Vespel® Caps and Bottoms	Various	V _{max} =35 kHz
WP-501-3180	3.2 mm	-150 °C to 650 °C	Rotor Body, Both Ends Open	Zirconia	V _{max} =24 kHz
WP-501-3180-SET1	3.2 mm	-30 °C to +70 °C	One 3.2 mm Rotor, Two Vespel® Caps and Bottoms	Various	V _{max} =24 kHz
WP-602-3181	3.2 mm	-30 °C to +70 °C	Rotor Cap	Vespel®	
WP-602-3182	3.2 mm	-30 °C to +70 °C	Bottom Plug	Vespel®	
WP-603-3181	3.2 mm	-20 °C to 70 °C	Rotor Cap	Kel-F®	
WP-603-3182	3.2 mm	-20 °C to 70 °C	Bottom Plug	Kel-F®	
WP-501-4180	4 mm	-150 °C to 650 °C	Rotor Body	Zirconia	V _{max} =18 kHz
WP-501-4181	4 mm	-150 °C to 650 °C	Rotor Body w/ Laser Marked Serial Number and Tachometer Mark on the Base.	Zirconia	V _{max} =18 kHz
WP-601-4181	4 mm	Ambient	Cap	Kel-F®	
JK-601-4181	4 mm	-20 °C to 70 °C	Cap with One O-ring ³	Kel-F®	
JK-602-4181	4 mm	-100 °C to 200 °C	Cap with One O-ring ³	Macor®	
JK-603-4181	4 mm	-100 °C to 200 °C	Cap, with One O-ring ³	Torlon®	
JK-604-4181	4 mm	-100 °C to 200 °C	Cap with One O-ring ³	Vespel®	
WP-501-4180-02	4 mm		Viton® O-ring	Viton®	for JK-603-4181/ JK-601-4181
JK-602-4181-O	4 mm		Viton® O-ring	Viton®	for JK-602-4181
WP-501-4180-SET-1	4 mm	-100 °C to 200 °C	One Rotor, Two Kel-F® Caps, One Torlon® Cap	Various	V _{max} =18 kHz
WP-501-4180-SET-2	4 mm	-100 °C to 200 °C	Two Rotors, Four Kel-F® Caps, One Torlon® Cap	Various	V _{max} =18 kHz
WP-501-4180-SET-5	4 mm	-100 °C to 200 °C	Five Rotors, Ten Kel-F® Caps and Three Torlon® Caps	Various	V _{max} =18 kHz
WP-501-7180	7 mm	-150 °C to 650 °C	Rotor Body	Zirconia	V _{max} =8 kHz
WP-601-7180	DB ¹ 7 mm	-20 °C to 70 °C	Cap	Kel-F®	
WP-601-7181	BL ² 7 mm	-20 °C to 70 °C	Cap	Kel-F®	
JK-601-7180	DB ¹ 7 mm	-20 °C to 70 °C	Cap with One O-Ring ³	Kel-F®	
JK-601-7181	BL ² 7 mm	-20 °C to 70 °C	Cap with One O-Ring ³	Kel-F®	
JK-601-7181-L	BL ² 7 mm	-20 °C to 70 °C	Long Cap with Two O-Rings ³	Kel-F®	
JK-601-7181LWH	BL ² 7 mm	-20 °C to 70 °C	Long Cap with Two O-Rings ³ and Axial Hole	Kel-F®	
JK-601-7181-WH	BL ² 7 mm	-20 °C to 70 °C	Cap with One O-Ring ³ and Axial Hole	Kel-F®	
JK-602-7180	DB ¹ 7 mm	-100 °C to 200 °C	Cap with One O-Ring ³	Macor®	
JK-602-7180-L	DB ¹ 7 mm	-100 °C to 200 °C	Long Cap with Two O-Rings ³	Macor®	
JK-602-7181	BL ² 7 mm	-100 °C to 200 °C	Cap with One O-Ring ³	Macor®	
JK-602-7181-L	BL ² 7 mm	-100 °C to 200 °C	Long Cap with Two O-Rings ³	Macor®	

Continued...

Note 1: DB is the abbreviation for Bruker® "Double Bearing" style rotor.

Note 2: BL is the abbreviation for Bruker® "Boden Lager" (Bottom Bearing) style rotor.

Note 3: These O-rings are designed for air-sensitive samples and are detachable. After removing O-rings, caps still work perfectly with a tight fitting to rotor body.

Rotor and Cap for Bruker® MAS Probe (continued)

Product No.	For Bruker® MAS Probe	Application Temperature	Description	Material	Remarks
JK-603-7180	DB ¹ 7 mm	-100 °C to 200 °C	Cap with One O-Ring ³	Torlon®	
JK-603-7180-L	DB ¹ 7 mm	-100 °C to 200 °C	Long Cap with Two O-Rings ³	Torlon®	
JK-603-7181	BL ² 7 mm	-100 °C to 200 °C	Cap with One O-Ring ³	Torlon®	
JK-603-7181-L	BL ² 7 mm	-100 °C to 200 °C	Long Cap with Two O-Rings ³	Torlon®	
JK-603-7181LWH	BL ² 7 mm	-100 °C to 200 °C	Long Cap with Two O-Rings ³ and Axial Hole	Torlon®	
JK-603-7181-WH	BL ² 7 mm	-100 °C to 200 °C	Cap with One O-Ring ³ and Axial Hole	Torlon®	
JK-601-7180-O	7 mm		Viton® O-Ring for 7 mm Rotor Caps	Viton®	
WP-501-7180-SET-1	7 mm	-100 °C to 200 °C	One Rotor with Two Kel-F® Caps and One Torlon® Cap	Various	
WP-501-7180-SET-2	7 mm	-100 °C to 200 °C	Two Rotors with Four Kel-F® Caps and Two Torlon® Caps	Various	
WP-501-7180-SET-5	7 mm	-100 °C to 200 °C	Five Rotors with Ten Kel-F® Caps and Five Torlon® Caps	Various	

Rotor and Cap for Varian® Jakobsen MAS Probe

Product No.	For Varian® MAS Probe	Application Temperature	Description	Material	Remarks
WP-501-5225	5 mm	-150 °C to 650 °C	Rotor Body	Zirconia	$V_{max}=15$ kHz
JK-601-5225	5 mm	-20 °C to 70 °C	Cap with Two O-Rings ³	Kel-F®	
JK-603-5225	5 mm	-100 °C to 200 °C	Cap with Two O-Rings ³	Torlon®	
JK-603-5225-WH	5 mm	-100 °C to 200 °C	Cap with Two O-Rings ³ and Axial Hole	Torlon®	
JK-603-5225-O	5 mm		O-Ring for 5 mm Caps	Viton®	
WP-501-7225	7 mm	-150 °C to 650 °C	Rotor Body	Zirconia	$V_{max}=9$ kHz
JK-601-7225	7 mm	-20 °C to 70 °C	Cap with Two O-Rings ³	Kel-F®	
JK-603-7225	7 mm	-100 °C to 200 °C	Cap with Two O-Rings ³	Torlon®	
JK-603-7225-WH	7 mm	-100 °C to 200 °C	Cap with Two O-Rings ³ and Axial Hole	Torlon®	

Operating Caps: No special tools are needed to put in or take out of rotor. They should NOT be pressed in as this may damage the O-ring. Ensuring the cap shaft and the rotor are aligned, cap should be screwed in; when the cap is in completely it should be turned back slightly (approximately 1/4 turn). Remove in the same fashion.

Note 1: DB is the abbreviation for Bruker® “Double Bearing” style rotor.

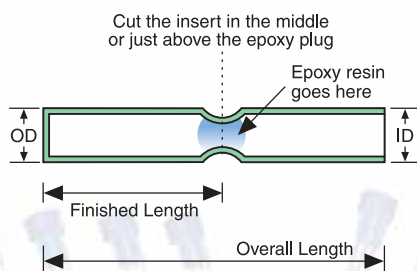
Note 2: BL is the abbreviation for Bruker® “Boden Lager” (Bottom Bearing) style rotor.

Note 3: These O-rings are designed for air-sensitive samples and are detachable. After removing O-rings, caps still work perfectly with a tight fitting to rotor body.

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® Jewelry and 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 (P/N: 815 on Page 47), 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.



Product No.	For MAS Rotor	O.D. (mm)	I.D. (mm)	Finished Length (mm)	Overall Length (mm)
DWGSK2583	WP-501-5225 Varian® 5 mm	3.48	2.69	11.5	23
DWGSK2584	WP-501-7225 Varian® 7 mm	4.97	4.20	11.5	23
DWGSK2576-1	WP-501-4180 Bruker® 4 mm	2.99	2.24	14.0	25
DWGSK2356	WP-501-7180 Bruker® 7 mm	5.59	4.57	13.2	68
DWGSK2594	WP-501-7180 Bruker® 7 mm	5.59	5.00	13.2	68
DWGSK2886-4	WP-501-5135 Doty® 5 mm	4.09	3.08	8.8	33
DWGSK2891-2	WP-501-5150 Doty® 5 mm High Speed	3.58	2.57	10.7	33
DWGSK2202	WP-501-7185 Doty® 7 mm	6.01	5.00	13.2	33
DWGSK2890-2	WP-501-7222 Doty® 7 mm High Speed	5.40	4.40	16.0	33

Pyrex® Tube for Varian® NanoProbe

Wilmad's Tubes for Varian® NanoProbe are constructed of Pyrex® glass for NMR analysis of solids and semi-solids. This product is specially machined at close tolerances which allows the tube to operate at around 2.5 kHz rotating speed.

Features:

- Each cap has an axial hole for venting air from the tube.
- A small screw plug is optional for closing the hole in experiments to prevent evaporation and /or spill.
- Air-tight O-ring seals are optional on caps and plugs.
- Three Volumes are available:

110 µl - each consisting of a Pyrex® tube and a cap (Ertalyte® or Kel-F®)

60 µl and 40 µl - each consisting of a Pyrex® tube, a cap and a plug (Ertalyte® or Kel-F®)

Overall Size - 4 mm O.D. x 22.5 mm Length



Properties of Cap and Plug Materials

Material	Chemical Components	Recommended Temperature Range	Additional Remarks
Ertalyte®	C, H, O, Polyethylene Tetraphthalate Polyester (PET-P) F, Cl, C	Ambient to 99 °C	Not for strong acids, strong bases or chlorinated solvents; otherwise, excellent chemical resistance
Kel-F®	F, Cl, C	-20° to 70° C	Excellent chemical resistance commonly used for ¹ H studies

Non-GHX type Varian® NanoProbe

Product No.	Application Temperature	Description	Material	Volume (µL)
WP-502-4225/C		Tube with bottom	Pyrex®	
WP-502-4225/O		Tube without bottom	Pyrex®	
WP-7021-4225-110	-20° to 70° C	Tube with bottom and Kel-F® cap	Various	110
WP-7021-4225-40	-20° to 70° C	Tube with Kel-F® cap and bottom plug	Various	40
WP-7021-4225-60	-20° to 70° C	Tube with Kel-F® cap and bottom plug	Various	60
WP-7024-4225-110	Ambient to 99 °C	Tube with bottom and Ertalyte cap	Various	110
WP-7024-4225-40	Ambient to 99 °C	Tube with Ertalyte cap and bottom plug	Various	40
WP-7024-4225-60	Ambient to 99 °C	Tube with Ertalyte cap and bottom plug	Various	60
JK-601-4225FT		Optional Cap Screw		
JK-601-4225/40	-20° to 70° C	Cap for 40 µL	Kel-F®	
JK-601-4225	-20° to 70° C	Cap for 60 µL and 110 µL	Kel-F®	
JK-601-4225P/40	-20° to 70° C	Bottom Plug for 40 µL	Kel-F®	
JK-601-4225P/60	-20° to 70° C	Bottom Plug for 60 µL	Kel-F®	
JK-604-4225/40	Ambient to 99 °C	Cap for 40 µL	Ertalyte®	
JK-604-4225	Ambient to 99 °C	Cap for 60 µL and 110 µL	Ertalyte®	
JK-604-4225P/40	Ambient to 99 °C	Bottom Plug for 40 µL	Ertalyte®	
JK-604-4225P/60	Ambient to 99 °C	Bottom Plug for 60 µL	Ertalyte®	

GHX type Varian® NanoProbe

Product No.	Application Temperature	Description	Material	Volume (µL)
WP-7021-4225F/110	-20° to 70° C	Tube with bottom and Kel-F® cap	Various	110
WP-7021-4225F/40	-20° to 70° C	Tube with Kel-F® cap and bottom plug	Various	40
WP-7021-4225F/60	-20° to 70° C	Tube with Kel-F® cap and bottom plug	Various	60
JK-601-4225F/40	-20° to 70° C	Cap for 40 µL	Kel-F®	
JK-601-4225F/60	-20° to 70° C	Cap for 60 µL and 110 µL	Kel-F®	
JK-601-4225FP/40	-20° to 70° C	Bottom Plug for 40 µL	Kel-F®	
JK-601-4225FP/60	-20° to 70° C	Bottom Plug for 60 µL	Kel-F®	
JK-601-4225FT		Optional Cap Screw		

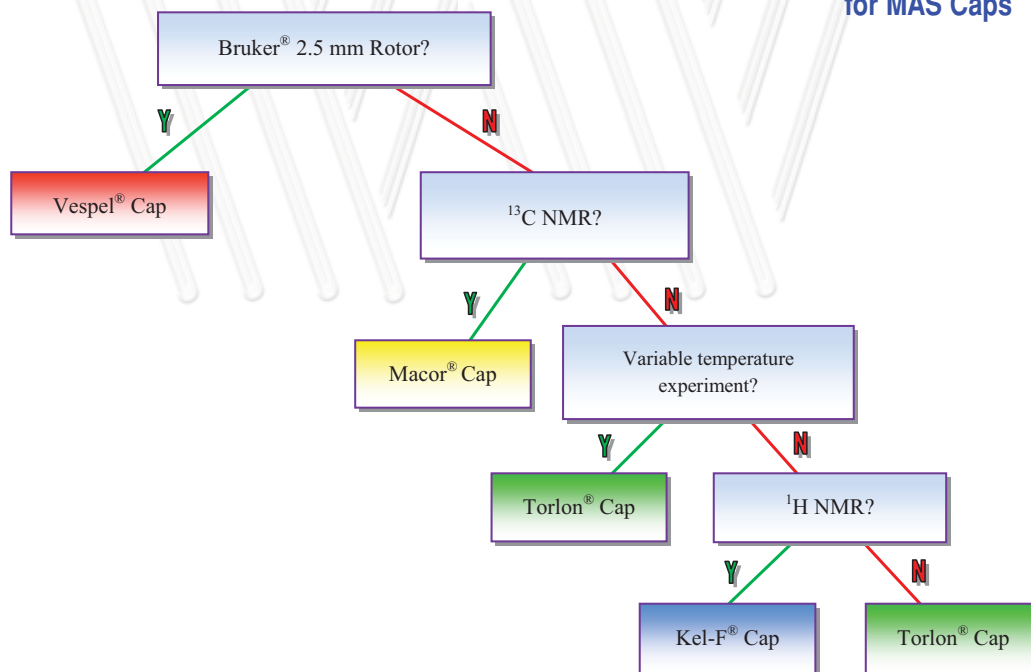
Stainless Steel Micro-Spatula

Getting a tiny powder sample into any tube larger than 4 mm O.D. tube should never be a struggle again. Unlike ordinary spatulas, Wilmad's Stainless Steel NMR Spatula fits into the most common NMR tubes. Add or remove samples easily, (including freeze-dried); scoop samples with the round end or pry stiff samples with the sharp edged flat end.



Product No.	Material	Length (mm)
806	Stainless Steel	250

Wilmad Select-A-Product Guide for MAS Caps



NMR Tube Cross Reference

Recently some of our competitors altered our MHz rating standard by advertising inferior product for higher frequency experiments. To avoid lowering the SNR, we offer this complete **NMR Tube Cross Reference Guide**. The products listed on the same row will have the same performance at the same magnetic field only if the specifications of our competitors' product are guaranteed as advertised in their publication. From this head-to-head comparison, Wilmad proves its 60-year philosophy again - we are committed to providing customers with cost-effective NMR consumables of the highest quality.

5 mm Economy Tubes | Thin Walled | ASTM Type 1, Class B Borosilicate Glass

MHz Rating	Camber/Concentricity ¹ (μm/μm)	Wilmad-LabGlass ²		Norell		New Era		Kimble	
		Model Number	Price ³	Model Number	Price ³	Model Number	Price ³	Model Number	Price ³
700	2.5/3.8	WG-1242-7	\$13.19						
700	2.5/3.8	WG-1242-8	\$15.00						
600	3.8/3.8	WG-1241-7	\$6.28			NE-SL5-7	\$9.40		
600	3.8/3.8	WG-1241-8	\$7.50			NE-SL5-8	\$10.75		
500	13/6	WG-1235-7	\$5.69	509-UP-7	\$15.64	NE-UL5-7	\$8.20	897150-0007	\$6.87
500	13/6	WG-1235-8	\$6.92	509-UP-8	\$17.76	NE-UL5-8	\$9.35	897150-0008	\$8.31
400	25/13	WG-1228-7	\$3.99	508-UP-7	\$7.49			897140-0007	\$4.87
400	25/13	WG-1228-8	\$5.11	508-UP-8	\$8.88			897140-0008	\$6.17
300	51/13	WG-1226-7	\$3.51	506-P-7	\$4.64	NE-HL5-7	\$4.70	897130-0007	\$4.26
300	51/13	WG-1226-8	\$4.47	506-P-8	\$5.70	NE-HL5-8	\$5.90	897130-0008	\$5.35
200	51/25	WG-1208-7	\$2.71	XR-55-7	\$3.91	NE-ML5-7	\$3.85	897120-0007	\$3.25
200	51/25	WG-1208-8	\$2.48	XR-55-8	\$4.64	NE-ML5-8	\$4.05	897120-0008	\$3.90
100	51/50	WG-1206-7	\$2.45	505-P-7	\$3.58	NE-LL5-7	\$3.55	897110-0007	\$2.97
100	51/50	WG-1206-8	\$2.87	505-P-8	\$4.24	NE-LL5-8	\$3.90	897110-0008	\$3.47
100	76/76	WG-5MM-Economy-7	\$1.60	502-7 552-7	\$1.61			897193-0000	\$3.11
100	76/76	WG-5MM-Economy-8	\$2.02	502-8 552-8	\$2.17			897193-0008	\$3.38
HT ⁴	102/102	WG-1000-7	\$100.65	ST500-7 ST550-7	\$131.00	NE-RG5-7	\$107.35	897193-0050 897193-7100	\$138.04
HT ⁴	102/102	WG-1000-8	\$125.18	ST500-8 ST550-8	\$154.82			897193-8050 897193-8100	\$145.25

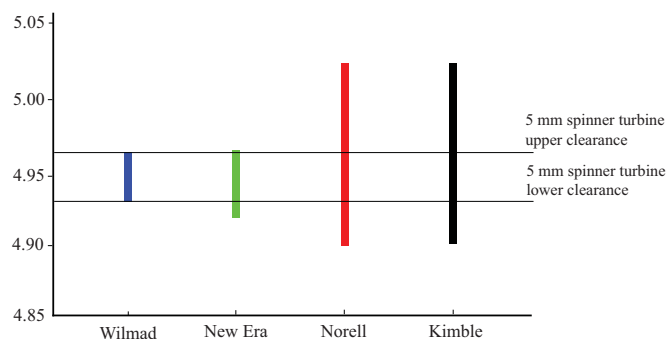
1: The specifications of camber and concentricity refer to upper limit value and are guaranteed for Wilmad's products.

2: Wilmad's Economy Tube is **30%** more robust than our competitors' products by increasing wall thickness from 0.38 mm to 0.43 mm. The outer diameter tolerance of Wilmad's Tube is at least 20% better than any competitor's product. Refer to the comparison chart below.

3: The price reflects 2012 US market suggested retail price. The lowest price is marked in **red**.

4: HT refers to High-Throughput and is bulk packed (100 tubes per package).

5 mm Economy Tube Outer Diameter Comparison



During sample loading, any NMR tube with outer diameter greater than spinner upper clearance may lead to scratching and breaking of the tube, any NMR tube with outer diameter less than spinner lower clearance may slip through.

3 mm Economy Tubes | Thin Walled | ASTM Type 1, Class A Borosilicate Glass

MHz Rating	Averaged Camber (µm)	Wilmad-LabGlass		Norell		New Era		Kimble	
		Model Number	Price	Model Number	Price	Model Number	Price	Model Number	Price
HT	60	WG-3000-7-50	\$1.93	S-3-HT-7	\$2.74				
HT	60	WG-3000-8-50	\$2.13	S-3-HT-8	\$3.06				

10 mm Economy Tubes | Thin Walled | ASTM Type 1, Class B Borosilicate Glass

MHz Rating	Averaged Camber (µm)	Wilmad-LabGlass		Norell		New Era		Kimble	
		Model Number	Price	Model Number	Price	Model Number	Price	Model Number	Price
HT	60	WG-4000-7	\$3.10	1001-7	\$3.25				
HT	60	WG-4000-8	\$3.90	1001-8	\$4.30				

Precision tubes refers to tubes made through precision bore glass technique with the tolerance on outer and inner diameter to be less than 6.5 µm. Only the products from manufacturers with such capability are listed in the cross reference. Norell's Select Series™ tubes represent products made from the same technique as Economy tubes, and therefore are not listed.

5 mm Precision Tubes | Thin Walled | ASTM Type 1, Class A Borosilicate Glass

MHz Rating	Concentricity TIR (µm)	Camber TIR (µm)	Wilmad-LabGlass		Norell		New Era		Kimble	
			Model Number	Price	Model Number	Price	Model Number	Price	Model Number	Price
1000	2.5	3.8	542-PP-7	\$34.25						
1000	2.5	3.8	542-PP-8	\$34.85						
800	3.8	3.8	541-PP-7	\$27.12			NE-SP5-7	\$21.65	897245-3000	\$26.79
800	3.8	3.8	541-PP-8	\$28.93			NE-SP5-8	\$23.70	897245-3008	\$28.05
600	13	6	535-PP-7	\$17.64			NE-UP5-7	\$14.00	897241-0000	\$21.09
600	13	6	535-PP-8	\$19.45			NE-UP5-8	\$15.15	897241-0008	\$22.97
500	25	13	528-PP-7	\$12.71			NE-HP5-7	\$10.60	897240-0000	\$14.96
500	25	13	528-PP-8	\$14.36			NE-HP5-8	\$11.65	897240-0008	\$16.53
400	25	25	527-PP-7	\$10.52					897235-0000	\$11.09
400	25	25	527-PP-8	\$11.73					897235-0008	\$12.19
350	51	13	526-PP-7	\$9.97					897230-0000	\$9.43
350	51	13	526-PP-8	\$11.07					897230-0008	\$10.46
300	51	25	507-PP-7	\$8.55			NE-MP5-7	\$6.40	897225-0000	\$9.43
300	51	25	507-PP-8	\$9.48			NE-MP5-8	\$7.00	897225-0008	\$10.46
200	51	51	506-PP-7	\$6.03			NE-LP5-7	\$5.10	897205-0000	\$5.75
200	51	51	506-PP-8	\$6.85			NE-LP5-8	\$5.30	897205-0008	\$32.95
100	76	51	505-PS-7	\$5.70					897200-0000	\$5.00
100	76	51	505-PS-8	\$5.80					897200-0008	\$5.25

3 mm Precision Tubes | Thin Walled | ASTM Type 1, Class A Borosilicate Glass

MHz Rating	Concentricity TIR (μm)	Camber TIR (μm)	Wilmad-LabGlass		Norell		New Era		Kontes	
			Model Number	Price	Model Number	Price	Model Number	Price	Model Number	Price
600	13	6	335-PP-7	\$14.79					897840-0000	\$18.60
600	13	6	335-PP-8	\$16.11					897840-0008	\$20.67
500	25	13	328-PP-7	\$12.71					897835-0000	\$16.07
500	25	13	328-PP-8	\$13.86					897835-0008	\$17.99
400	25	25	327-PP-7	\$10.79					897830-0000	\$14.46
400	25	25	327-PP-8	\$11.95						
300	51	25	307-PP-7	\$9.97					897825-0000	\$14.46
300	51	25	307-PP-8	\$10.52					897820-0008	\$12.19
200	76	51	305-PS-7	\$7.95					897805-0000	\$13.25
200	76	51	305-PS-8	\$8.38					897800-0008	\$13.39

10 mm Precision Tubes | Thin Walled | ASTM Type 1, Class A Borosilicate Glass

MHz Rating	Concentricity TIR (μm)	Camber TIR (μm)	Wilmad-LabGlass		Norell		New Era		Kimble	
			Model Number	Price	Model Number	Price	Model Number	Price	Model Number	Price
500	38	13	513-7PP-7	\$27.95					897335-0000	\$36.36
500	38	13	513-7PP-8	\$29.26					897335-0008	\$39.46
400	51	25	513-5PP-7	\$25.26					897330-0000	\$30.91
400	51	25	513-5PP-8	\$26.58					897330-0008	\$34.73
300	76	38	513-3PP-7	\$22.63			NE-U10-7	\$21.90	897325-0000	\$26.73
300	76	38	513-3PP-8	\$23.95			NE-U10-8	\$22.95		
200	254	51	513-1PP-7	\$15.18			NE-H10-7	\$17.90	897320-0000	\$18.52
200	254	51	513-1PP-8	\$16.33			NE-H10-8	\$19.10	897320-0008	\$23.68
100	254	51	513-1PS-7	\$11.95			NE-L10-7	\$10.10		
100	254	51	513-1PS-8	\$12.33			NE-L10-8	\$10.85		

Prices shown in catalog based on current 2012 info and subject to change without notice due to material and cost fluctuations

Wilmad-LabGlass

committed to Product Excellence and Continuous Support for 60 years



Product Lines



Lab Equipment

- Circulators
- Distillation
- Evaporation
- Liquid Transfer
- Pilot Plant Reactor
- Stirring/Mixing
- Vortexers
- Heating Controls
- Shakers
- Centrifuges

- Standard NMR Tubes
- Small Volume Inserts
- Gas-tight Tubes
- NMR References
- Solid-State Rotors



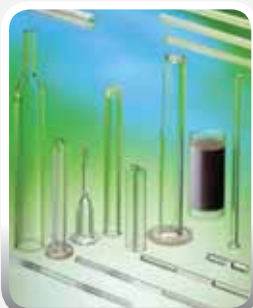
NMR/EPR Consumables & Accessories

- Spinners and Washers
- L, S, X, Q and W-Band EPR Tubes
- VT Dewar
- Gas Transfer Lines
- EPR References
- EPR Aqueous Cells

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



Lab Glassware



OEM Precision Glass

- OEM Manufacturing
- Design Assistance
- Precision Bore Tubing
- Precision Grinding and Polishing
- Precision Cutting and End Finishing
- Glass to Metal Seals
- Lathe Fabrication
- Redraw Tubing
- Quartz Envelopes
- Quartz ICP Torches
- Optical Windows
- Square & Oval Tubes
- Syringe Barrels



Glass Repair

- 3 Repair Centers
- Fast Turnover
- Cheaper than Replacement

Served Markets



Toll Free: **1-800-220-5171**
Intl.: **856-691-3200**



Toll Free: **1-800-220-1081**
Intl.: **856-691-6206**



www.wilmad-labglass.com
cs@wilmad-labglass.com



an SP Industries Company



Committed to Product Excellence and Continuous Support

SP Service

VirTis

Hull

Wilmad-LabGlass

Genevac

FTS

Hotpack

SP Industries Corporate Headquarters:

935 Mearns Road Warminster, PA 18974 USA Tel: 800.523.2327 215.672.7800 Fax: 215.672.7807 www.SPindustries.com

© SP Industries, Inc. 2012 All Rights Reserved GN-17 02/12 10K Printed in USA