

Seal Hardness

The hardness testing of plastics is most commonly measured by the Shore (Durometer) test. This method measures the resistance of plastics toward indentation and provides an empirical hardness value. Shore Hardness, is the preferred method for rubbers/elastomers and is also commonly used for 'softer' plastics such as fluoropolymers. Most septa hardness values are stated in Shore A. The results obtained from this test are a useful measure of relative resistance to piercing of various grades of polymers. This gives guidance on the type of needle that will penetrate the seal and whether thinner gauge needles may be used.

Seals in 8mm, 9mm, 11mm, 12mm Caps

Seal Material	Hardness °shore	Thickness (mm)
TST1 Red PTFE/white silicone/red PTFE	57	1.0
CBT1 Gray Chlorobutyl/PTFE	52	1.0
ST14 Blue silicone/PTFE	50	1.2
6RT1/AC6 Synthetic rubber/PTFE	38	1.0
ST101 Blue silicone/PTFE	30	1.0
ST143 White silicone/PTFE	20	1.4
ST144 Blue silicone/red PTFE	20	1.4
V1 Viton	62	1.0
AC7 Natural rubber/PTFE	60	1.0
8RT1 Synthetic rubber/PTFE	58	1.0
ST2 White silicone/red PTFE	57	2.0
ST18 White silicone/red PTFE	57	1.8
ST15 White silicone/red PTFE	57	1.5
ST1 White silicone/red PTFE	57	1.0

Seals in 18 and 20mm Caps

Seal Material	Hardness °shore	Thickness (mm)	max. Temp °C
CBT3B Bromobutyl/PTFE (Moulded)	52	3	120
CBT3 Bromobutyl/PTFE	52	3	120
CB3 Chlorobutyl	52	3	120
ST3 Blue silicone/PTFE	45	3	200
ST3HT Red silicone/PTFE	45	3	300
ST201 Blue silicone/PTFE	45	2	200
AS3 White silicone/aluminium	45	3	170
ASH3 Red silicone/aluminium	45	3	250

Seal properties

Rubber	Used primarily for routine analysis in gas chromatography. Offers moderate resealability and good chemical inertness. Not recommended for multiple injections or holding samples for further analysis. PTFE is protective layer that once broken exposes rubber to chemical attack.
PTFE/red rubber – AC6, 6RT1	Low durometer of rubber allows ease of needle penetration. A popular and economical septa for general GC purposes.
PTFE/rubber – AC7, 8RT1	Harder grade of rubber for use with piercing needle. Most popular and economical septa for general GC purposes in Agilent systems.
Pre-slit PTFE/red rubber – 8RT1X	Pre-slit, high quality red rubber with a thin (0.003") layer PTFE. For applications using a very thin-gauge syringe needle or in instances when a vacuum may form in the vial.
Silicone rubber	High quality, silicone rubber laminated to PTFE. Use when excellent resealing qualities are a must. Septum resists coring and is recommended when multiple injections are required. Preferred septa for use in liquid chromatography applications.
PTFE/silicone – ST1, ST15, ST18, ST2	A white medium hardness silicone with red PTFE protective layer available in a range of thickness.
PTFE/silicone – ST101, ST14	<ul style="list-style-type: none"> • A very pure soft silicone laminated to PTFE. Septum resists coring and is recommended for instruments with fine gauge needles. • Also recommended for LC-MS and GC-MS due to high purity.
PTFE /silicone – ST143, ST144	A very soft silicone laminated to PTFE. Use with flexible needle.
PTFE /silicone/PTFE – TST1, TST11	<ul style="list-style-type: none"> • A layer of PTFE on each side of medium hardness silicone. Most resistant to coring with above average resealing characteristics. • Recommended for most demanding applications such as trace analysis, longer time between injections or for internal standards. • Use with Gilson instruments and with any autosampler using large diameter, blunt-tip syringe needles.
Pre-slit PTFE/silicone – ST1X, ST101X, ST14X	Pre-slit, high quality pure white silicone faced with PTFE. For applications using a very thin-gauge syringe needle or in instances when a vacuum may form in the vial. Highly recommended for Shimadzu and Hitachi autosampler units.
PTFE and fluoropolymers	Very good chemical resistance and used as a protective layer for less resistant elastomers.
PTFE – T, T02	For single injections and short sample cycles. This type of septa is not resealable.
Viton – V1	Viton provides the best chemical resistance with limited resealability. Recommended for chlorinated solvents. Due to Viton®'s intrinsic hardness, these septa are not suitable for finer-gauge syringe needles.
Integral plastic seal	Moulded as part of the cap.
Polyethylene – PE, Polypropylene – PP	Chemically resistant but for one time use only with no resealability. Free of Fluoropolymer coating so suitable for PFOA analysis.

20mm seal selection for Headspace and Sample Preparation applications

Butyl rubber/chlorobutyl rubber	An economical choice for low temperature (< 125°C) or low-pressure applications. Not suitable for alkanes, benzene, chlorinated solvents or cyclohexane without a protective PTFE layer.
Grey bromobutyl stopper – B3P	Does not provide PTFE barrier. Use for gas sampling due to low permeability.
Black chlorobutyl – CB3	Does not provide PTFE barrier. Use for gas sampling due to low permeability.
Grey bromobutyl/black PTFE – CBT3	Has PTFE barrier that makes it suitable for work with general organic solvents with low gas permeability.
Grey PTFE/black bromobutyl molded – CBT3B	Specially molded seal with PTFE insert. Sealing surface of Butyl and PTFE affects a more positive seal than non-PTFE-faced septa. Ideal choice for temperatures below 125°C. Good sealing characteristics, excellent resistance to most solvents with reduced coring and high puncture tolerance. PTFE provides increased chemical resistance.
Silicone rubber	Excellent septa choice for volatiles with very low background peaks and low permeability. Also ideal for alcohols and aqueous samples. Good resealing characteristics and resistant to coring.
Natural PTFE/blue silicone – ST3, ST201	Best septa choice when temperatures are over 125°C.
Natural PTFE/red silicone – ST3HT	High temperature formulated seal with low bleed. Best septa choice when temperatures are up to 300°C.
Blue silicone/red PTFE – ST144	Thin 1.4mm seal with PTFE face for use with Fisons/ Carlo Erba Instruments. Resealing capability limited due to thinner silicone layer.
Aluminum/white silicone – AS3	Reflective aluminium face protects the silicone seal. The white silicone is suitable for use up to 170°C
Aluminum/red silicone – ASH3	Reflective aluminium face protects the silicone seal. The red silicone is suitable for use at temperatures up to 250°C.
Blue silicone/natural PTFE – ST101	Soft silicone with clean formulation for minimal interference. Thinner seal suitable for solvent washing, solvent extraction and SPME applications with some resealing. Not for direct headspace applications.
Freezer bungs – 2FB3	Butyl bungs for sealing of lyophilized products. Compatible with low storage temperatures and low gas permeability.
PTFE/silicone ring – LLX	Thin PTFE layer with sealing ring to give secure closure for strong solvents. For use in liquid extraction or SPME stage during sample preparation. Does not reseal. Single use only.