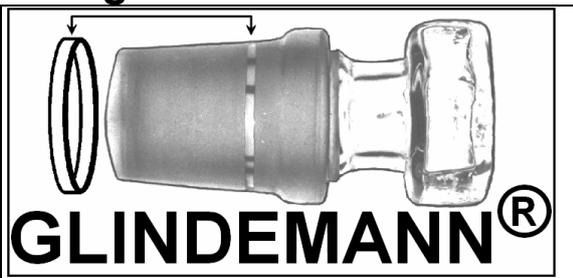


PTFE Sealing Ring for conical joints (NS, $\text{\textcircled{S}}$) – glassware, bottles and reagent tubes hermetically sealed - greasefree

Application: Sealing ring made of PTFE (often named Teflon) for conical glass stoppers makes “ampoules” out of bottles and reagent tubes. Tight like grease and inert. For jointed glass apparatus (high vacuum and overpressure leakage rate $< 10^{-6}$ mBar L s⁻¹). Very thin - useable with all joint clamps (including KECK-clips). Working at dynamic temperature fluctuation (-196 bis +300 °C, dip in-and-out of liquid N₂). No irreversible jamming of the joint. Reusable.



For sale: 1 Package = 50 PTFE-sealing rings. On plastic storage tube, matching diameter of glass conical joint. Available for all joint sizes.



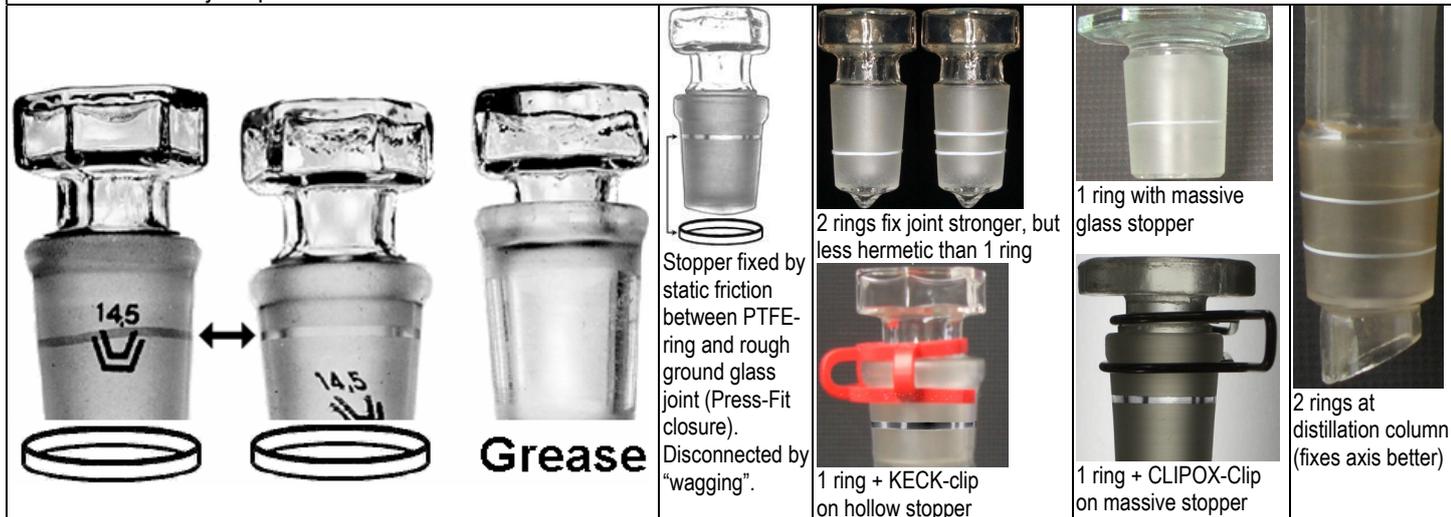
Recommended price: 25 €/pack of 50 for NS $\text{\textcircled{S}}$ sizes 14 - 29

Procedure:

Slip a sealing ring onto the male part of the joint. The ring sticks elastically. One ring is normally enough. Two rings with some distance to fix a rigid joint axis. Make sure that the ring is not twisted.

Carefully press the glass parts together. Do not break the joint by overstressing. The tightness is a maximum if the sealing ring looks partly transparent all around (like joint grease). With extra rough ground joints, soften sealing ring by warming or lubrication (microscale amount of grease, solvent, water). Rub and smooth PTFE ring gently with joint.

Disconnect (unlock) the joint by moving one part of the joint back and forth (do not pull). With 2 rings extra motion or rotate a joint part.



PTFE ring seals like grease

Left: Sealing ring before being pressed, opaque
Middle: Sealing Ring pressed, partly transparent like grease
Right: For comparison greased joint, transparent
Conclusion: PTFE ring is tight as grease, but is chemically more resistant than grease.

Typical applications: Sealing of standard glass stoppers makes “ampoules” out of bottles, reagent tubes and volumetric bulbs for long-term storage of volatile and air-sensitive chemicals, buffers, standards, samples and reaction batches.
Sealing of glass joints of apparatus (high-vacuum, pressure, syntheses, distillation, evaporation).

Recommended by the glassblower societies ASGS (USA), BSSG (UK), VDG (D), BNVG (Benelux)

Literature: Glindemann D., Glindemann U. Greaseless Taper Jointed Glassware and Containers hermetic tight with new PTFE Sealing Ring. Fusion 2001, 48(2) 29-33 (FUSION is the journal of the American Scientific Glassblowers Society ASGS)

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Production according to ISO 9001. Patent granted.

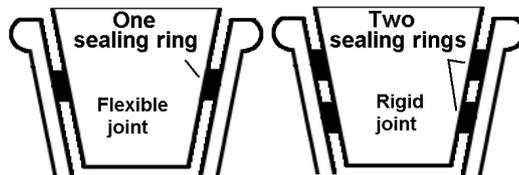
Distributors (catalogue-No. for $\text{\textcircled{S}}$ NS14, 50 rings): Europe: AMSI (A,D,CH, No. 6300014), Fisher Scientific (3391348), LLG (9.011664), Omnilab (5011336), Roth (E699), VWR (A,D,CH, 2016256) (complete list of distributors see www.glindemann.net). **Worldwide sale: Sigma-Aldrich (No. Z502081).**

How the PTFE-sealing rings are working

The narrow PTFE sealing ring is „tight as grease“ (significantly more tight than PTFE sleeves that cover the whole joint). The sealing rings works by a “press-fit” mechanism: The narrow sealing ring is under high sealing pressure. Under pressure, the tough polymer PTFE (known as Teflon) flows like joint grease and seals the rough glass joint. The ring looks under pressure optically almost transparent, similar to a greased joint. The pressed sealing ring causes static friction that “locks” the joint parts reversibly together (press-fit). Disconnection of the locked joint parts with 1 sealing ring is possible by moving one part of the joint 1-3 times back and forth (do not pull). Disconnecting a joint with 2 two sealing rings requires up to 10 back-and-forth moves (or rotate), because the joint is less flexible. A container with a glass stopper that is locked by the PTFE-ring allows tight storage of chemicals (like volatile pentane) under some overpressure without blowing out the stopper. Joint clamps (even KECK-clips) are a working option, because the sealing ring is very thin (0.05...0.07 mm) and does not cause much distance of the joint parts (1.3...2mm).

One or two sealing rings per joint?

One sealing ring is tight enough. Two sealing rings with some distance allow fixing a rigid joint axis and making sure the fixed joint will not disconnect unintentionally. **For containers with glass stopper** one ring is sufficient. A second ring fixes the stopper stronger; for example, a stopper can take a hit without loosening during transport of bottles. **For glass apparatus**, one sealing ring makes the joint somewhat flexible. Two rings make the joint axis rigid. Use two or more rings for joints under high weight load (for example distillation columns) to distribute the weight more evenly.

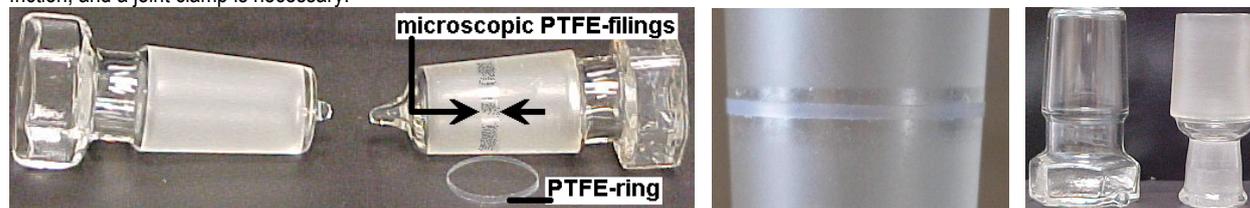


Problem: Sealing ring does not look transparently “tight as grease”. Joint locked with sealing ring is difficult to separate.

Cause: New sealing ring is rough. Ground glass joint is rough. The roughness of ground joints is high with new joints, after glassblowing, or after aggressive cleaning operations such as “baking” or rinsing with caustic KOH or acids.

To make a sealing ring looking transparent (“tight as grease”) at normal sealing pressure:

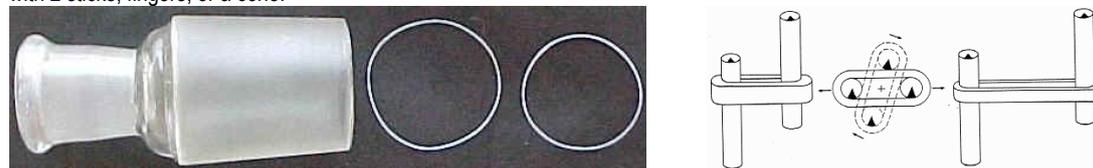
Do not break the joint by overstressing by trying to make a sealing ring optically transparent. Even if the sealing rings looks “dull” (partly transparent) it is sufficiently tight for most common applications. **Allow the pressured sealing ring to flow/adapt over time** the sealing effect will improve over time. **Increase temperature of the joint:** During hot operation the ring will become softer and adaptive, and the seal improves. **Lubricate and smooth out a new sealing ring:** Add a drop of liquid (or a micro-quantity of grease) as lubricant to the ring that is compatible with your work. For example, use hexane as lubricant if you work with hexane as solvent, or use water as lubricant if you work with water as solvent. **Smooth out the ground glass joint:** Smooth out a rough glass joint by careful rotation to rub the PTFE ring. The friction causes a transfer of microscopic PTFE filings from the ring to form a glossy shining smooth zone on the glass joint. The abrasion is produced on the initially smoother joint part (often the male joint). Do not rub too strongly because that will wear out or even tear apart the ring. The PTFE-abrasion-layer can be scratched off of the joint, for example with a nylon sponge. A joint smoothed out by rubbing with a sealing ring can be separated more easily. However, it is not recommended to smooth a ground joint zone completely to the point of polishing. A polished glass stopper can, because of the lack of static friction with the sealing ring, not be fixed (locked) to a bottle and is almost loose if not fixed by a joint clamp. Therefore, **clear precision joints (KPV, cast without grinding)** with sealing rings are tight, however, can not be locked due to missing static friction, and a joint clamp is necessary.



Pictures left and middle: Smoothed glossy shining zone of joint (microscopic PTFE abrasion layer after rubbing a PTFE sealing ring between joint parts). **Picture right:** Clear precision joint (KPV) compared to common ground joint.

Problem: Sealing ring is too large (falls off the joint) or is too small:

Make sure the ring is not stripped off (lost) by separating the joint or by water rinsing in the glass washer (direct joint or stopper with sealing ring upward or remove ring). The elastic tension of the ring can be increased by tightening and loosening the joint 3-5 times. A ring will be smaller by removing the ring from the smaller diameter end of the plastic storage tube. The diameter of the ring can also be reduced in a short time by heating evenly (60-150 °C, use oven, hot air pistol, flame, hot water). A ring “sticks” better to the joint by a micro-amount of sticky grease or liquid. If the ring diameter decreases too much, the ring can be stretched again with 2 sticks, fingers, or a cone.



Picture left: Sealing ring diameter, decrease after warming. **Picture right:** Increasing the ring diameter by stretching.

Problem: PTFE-sealing ring with or without joint clip?

Due to the “press-fit”-effect, a joint clamp is not necessary for example for bottles and reagent tubes in upright position in the laboratory. A joint clip is recommended on shipping of bottled water samples, to protect the stopper from loosening due to taking a hit or by vibration. The thin PTFE-ring can be used with all types of joint clamps. For massive glass stoppers where the grip is only 3 mm apart from the ground taper we recommend the CLIPOX-clamp (2 mm wire, 4mm elasticity).

