



ergo.[®] anaerobic adhesives and sealants
Safe and secure metal bondings

Kisling

Bond, lock and seal

Be it a gearbox, a pump, piping, the intricate moving parts of a Swiss watch, a threaded connection, component, surface, flange, hydraulic connector or pipe thread, Kisling ergo.[®] anaerobic adhesives and sealants ensure that what belongs together stays together, safe and secure, even under hard real-life conditions.

Solvent-free product line for metal-to-metal applications:

Kisling ergo.[®] anaerobic adhesives, sealants and auxiliary products have successfully proven their performance in engine construction, mechanical engineering and metal construction. They are used throughout the production process to lock, fasten and seal, as well as for repairs and maintenance. This, because our anaerobic adhesives and sealants have a wide service temperature range (depending on the adhesive from $-55\text{ }^{\circ}\text{C}$ up to $+200\text{ }^{\circ}\text{C}$) and are resistant to water, humid conditions and many organic solvents, as well as diluted alkaline solutions and acids.

Instructions for using ergo.[®] anaerobic adhesives and sealants

Cleaning

- Clean the mating surfaces thoroughly using a metal cleaner, such as ergo.[®] 9190 metal cleaner.
- We recommend mechanical cleaning (sanding, grinding, sandblasting, etc.).

Dispensing

- Using our patented twist-open dispensing cap, the adhesive or sealant can be applied directly from the container or alternatively users can employ their preferred dispensing equipment (drops, continuous bead or screen-print system).
Tip: Apply a generous amount of the product to both sides of the areas to be bonded and use a foam roller or brush to ensure even distribution.
- ergo.[®] anaerobic adhesives and sealants are one-component products. They cure in the absence of oxygen.
- Requirement: Surface must be sufficiently large and the adhesive gap sufficiently small. If necessary, ergo.[®] 4900 activator may be used.
- Any excess adhesive that has been squeezed out of the gap onto the outside of the join will not cure.
- Simply wipe away excess adhesive with a dry cloth or a cloth moistened with acetone.

Storage

- Storing in a cool, dry place in the original container ensures storage stability for at least one year after delivery.

Threadlockers: Everything fastened securely

Every metalworker is familiar with mechanical screw locks such as spring washers or lock washers and with their associated drawbacks. As an alternative solution, our liquid, chemically cross-linking ergo.[®] threadlockers offer many advantages.

Advantages

- + Completely fills gaps and ensures absolute material contact
- + Tightness of the connection
- + Corrosion resistance
- + Undamaged component surfaces
- + Constant friction coefficients
- + Universal application (no warehousing for different screw diameters)
- + Resistant to extreme vibration

Product range Threadlockers

ergo.[®] 4003 low strength

Universal product with medium viscosity.

Ideally suited for easy to remove screwed joints.

For locking screws with fine threads in eyeglasses, watches and jewelry.

Suitable for screwed joints with a thread engagement length of more than 2D.

Low friction coefficient.

ergo.[®] 4052 medium strength

Universal product with excellent media and heat resistance.

Fast cure, also on stainless steel and galvanized surfaces.

Low friction coefficient.

ergo.[®] 4100 high strength

Fastens stud bolts reliably.

Difficult to remove using standard tools.

Low friction coefficient.

ergo.[®] 4101 high strength

Fastens stud bolts that typically do not need to be removed.

Particularly suitable for screwed fastenings subject to considerable stress.

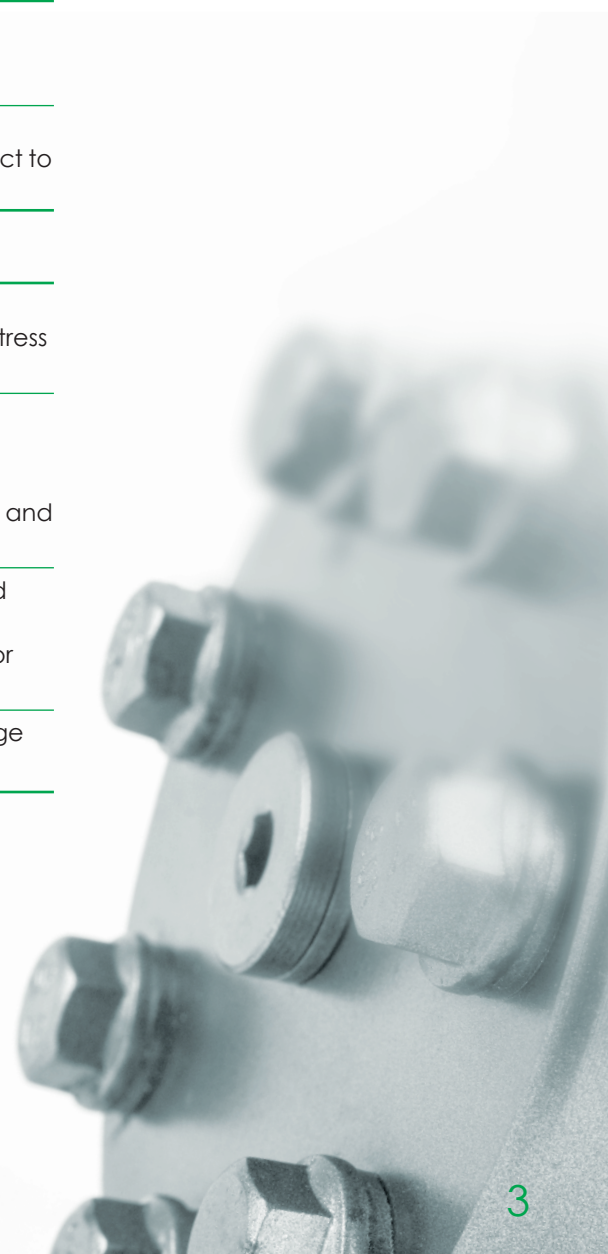
ergo.[®] 4115 heat-resistant and high strength

For screwed fastenings subject to considerable stress and high temperatures.

Locks and seals screws, stud bolts, nuts, threaded inserts and screw plugs against impact, vibration and corrosion.

Depending on the thread diameter, the screwed fastening will be difficult or impossible to remove.

Service temperature range -55 °C to +200 °C.



Advantages

- + Practical container
- + For fine and coarse threads
- + Seals against common gases and liquids
- + Ensures strength and tightness (torsion resistance)
- + Slight lubricating effect. Prevents seizure of stainless steel connections during fastening process
- + Vibration-resistant connection
- + No corrosion

Tip: Undertake a preliminary test for copper and copper alloy threads that must provide a water-tight seal against water temperatures above 40 °C.

Possible use in contact with pure oxygen under pressure is feasible to a limited extent and documented by test certificates.

Thread sealants: Permanently sealed

Threaded pipe joints often fail under high pressures, extreme temperatures or aggressive media. Vibrations also result in leakages. This must not happen: ergo.[®] anaerobic thread sealants ensure effortless and permanent sealed connections.

Product range Thread sealants

ergo.[®] 4202 hydraulic sealant, medium strength

Medium-strength product used to seal pneumatic and hydraulic fittings with a diameter of up to R ¾ inch. Pressure resistance up to burst pressure (depending on construction). Excellent chemical resistance.

ergo.[®] 4205 hydraulic sealant with Teflon[®], low strength

Specifically formulated for sealing conical-cylindrical pipe joints with a diameter of up to 3 inches. Flexible adhesive film. The sealant contains Teflon[®] and is easy to remove. May be used in the presence of pure oxygen up to +60 °C / 10 bar.

ergo.[®] 4207 pipe thread sealant, universal medium strength

Universal product with excellent media and heat resistance. Fast cure, also on stainless steel and galvanized surfaces. May be used in the presence of pure oxygen up to +60 °C / 10 bar.

ergo.[®] 4209 thread sealant, high strength

For high-strength threaded pipe joints that do not need to be removed. Excellent media resistance. Also suitable for fastening stud bolts.

ergo.[®] 4211 pipe thread sealant, heat and media resistance

For threaded pipes with a diameter of up to 2 inches. Particularly suitable for brass fittings. Excellent thermal and hot water resistance.

ergo.[®] 4212 pipe thread sealant with Teflon[®], low strength

Pasty sealant used to seal threaded pipe joints against liquids, gases and solvents. Tightly screwed-in connections are instantly able to withstand pressures up to 5 bar.

Tested for conical-cylindrical threaded connections with a diameter of up to R 3 inches.

Flange sealants: Excellent any time

Solid gaskets come in all shapes, sizes and materials – but with this also comes a costly warehousing and settling effects. ergo.[®] anaerobic liquid sealants make fastening much easier and joins more secure than the alternative of retightening every screw.

Advantages

- + No settling effects
- + Universal and can be used irrespective of component geometry
- + Lower warehousing costs
- + Effective barrier against many industrywide media
- + Adhesion improves component stiffness
- + Protects against corrosion
- + Easy to apply even on complex geometries (from the container or using a brush, roller, screen-printing system or robotics)
- + Easy to remove sealant available for maintenance work, if needed

Product range Flange sealants

ergo.[®] 4252 low strength

For sealing flanges and surfaces.

Parts can be easily removed.

Quick and easy manual application with a brush, foam roller or screen-printing system.

Slightly flexible.

ergo.[®] 4253 universal medium strength

For sealing flanges and surfaces.

Fast cure. Recommended for use with inactive metals.

Parts can be dismantled.

Quick and easy manual application with a brush, foam roller or screen-printing system.

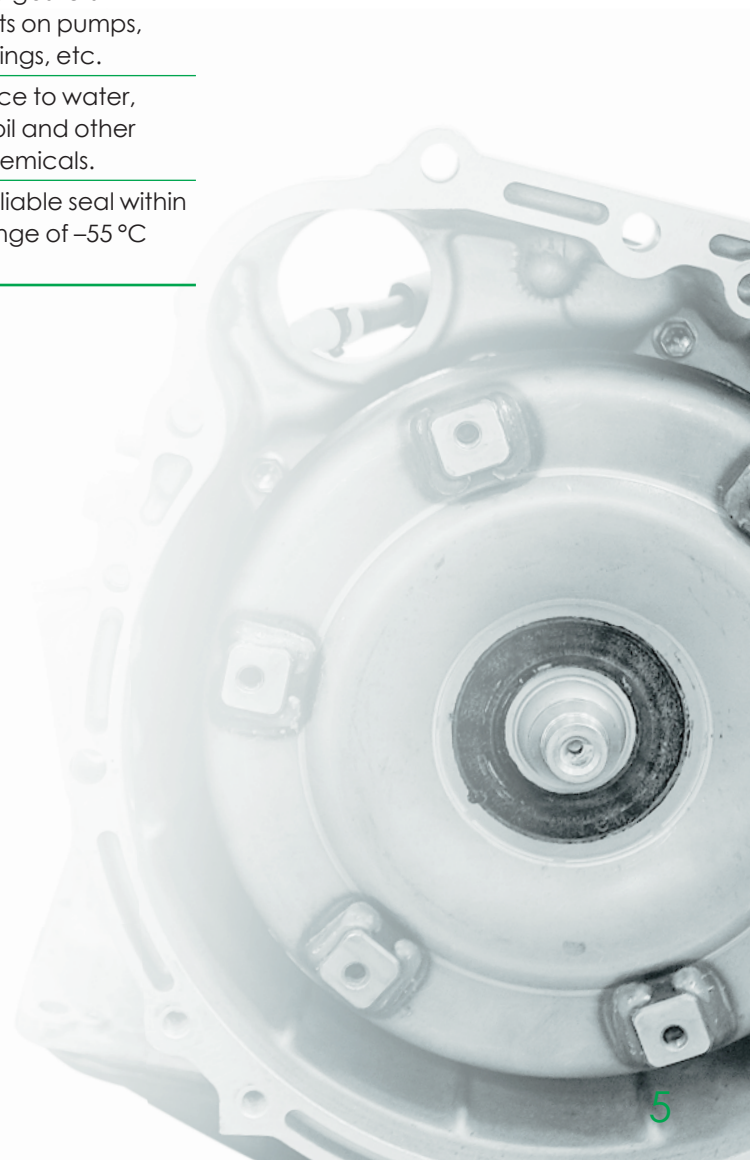
Slightly flexible sealing film.

ergo.[®] 4280 heat resistant and high strength

Suitable for use as a replacement for solid gaskets in flange joints on pumps, gearbox casings, etc.

High resistance to water, gases, LPG, oil and other technical chemicals.

Provides a reliable seal within a thermal range of -55 °C to +200 °C.



Advantages

- + Completely fills gaps and ensures absolute material contact
- + Simple and easy to use on almost all components that require bonding
- + Apply product directly from its container or using semi-automatic or fully automatic dispensing system.
- + No change to the material structure (unlike welding)
- + Even distribution of force
- + No stress peaks
- + No feather keys, wedges, pins or similar tools required
- + Effectively prevents relative movements
- + No frictional corrosion
- + Cost-savings because it supports larger tolerances

Tipp: For larger component surfaces or gaps, apply generously to both substrates. For bonding materials with very different expansion coefficients, please take expansion behavior into account during temperature changes.

In such cases, additional calculations or pretesting the substrate prior to application are recommended.

Retaining compounds: Flawless bondings

Do you need to join cylindrical components securely with each other? No need to shrink, press, pin or use wedges and feather keys: ergo.[®] retaining compounds completely fill gaps between components and ensure tight material contact at room temperature. What is more, they also increase the strength by a factor of 1.2 compared to a mere press fit.

Product range Retaining compounds

ergo.[®] 4401 medium strength

Universal, medium-strength adhesive for fastening bearings and bushings in sockets as well as wheels on shafts, etc.

Replaces mechanical retaining elements such as feather keys, wedges and pins, among other things.

Ideally used in situations where components will need to be dismantled or replaced.

ergo.[®] 4430 high strength

To retain bearings, bushings and sleeves in as-delivered condition such as ball bearings or oil impregnated sintered bronze bushings.

Excellent curing properties, even at low temperatures (> 5 °C) and on passive metal surfaces.

ergo.[®] 4451 high strength

For maximum static shear stress conditions or dynamic loads.

For fastening gear wheels, belt pulleys and redor shafts to electric motors, etc.

Fast cure

ergo.[®] 4453 heat resistant and high strength

Fast-curing, heat-resistant product.

For fastening cylindrical parts with strong resistance to acids, alkaline solutions, etc.

For fastening cylinder liners to engine blocks.

Also for mounting bearings in furnaces.

May be used in the presence of pure oxygen up to +60 °C / 25 bar.

ergo.[®] 4460 heat resistant and high strength

For fastening cylindrical parts in a close sliding fit for maximum strength.

Very wide service temperature range of -55 °C to +200 °C.

Auxiliary products: The all-time plus in performance

ergo.[®] anaerobic adhesives and sealants bond nearly every type of metal securely and permanently. For typical cases such as contaminated substrates, inactive surfaces (precious metals, high-alloy steel and aluminum) and passivated surfaces (phosphated, galvanized or oxidized), Kisling has a premium, high-quality auxiliary product at hand:

Product range Auxiliary products

ergo.[®] 9190 metal cleaner

Universal solvent.

Removes mold release agents, grease, oil, fingerprints and dust residues from mating surfaces.

It evaporates quickly leaving a residue-free clean surface (minimum delays in processing).

Components that require cleaning may be sprayed, dipped or wiped with a lint-free cloth moistened with the cleaner.

Compatible with all ergo.[®] products.

ergo.[®] 9153 adhesive remover

Removes cured adhesive as a slow-evaporating solvent with a long reaction time.

After the surfaces have been treated, adhesive residue is easily removed mechanically.

Also absorbs liquid adhesive residues. Please check whether mated components are resistant to the adhesive remover.

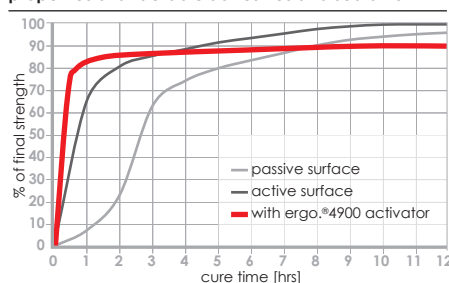
Tip: Any adhesive that is still liquid can be easily removed with diluted acetone or ethyl acetate and a paper towel.

ergo.[®] 4900 activator

Promotes, accelerates or facilitates curing under unfavorable conditions. This includes inactive surfaces, very large gaps, extreme surface roughness and low temperatures.

May be sprayed over the entire area of the mated surfaces prior to bonding or also after dispensing the adhesive.

Effect of ergo.[®] 4900 activator on the hardening properties of anaerobic adhesives and sealants

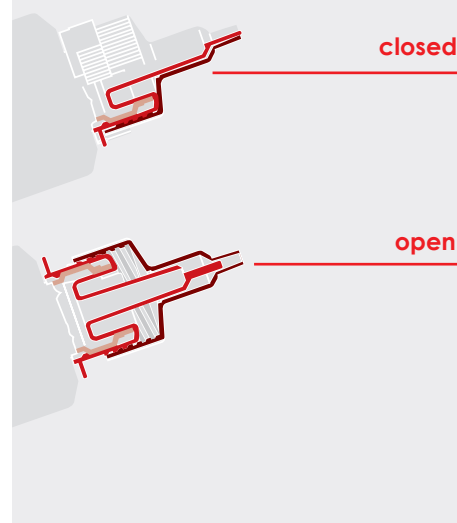


Twist-open dispensing cap

ensures very precise and neat bonding right up to the very last drop.

No-spill bonding: ergo.[®] twist-open dispensing cap

Exclusive to Kisling: the patented ergo.[®] twist-open dispensing cap ensures very precise and neat bonding right up to the very last drop. In other words, no spills, no clogged nozzles, no waste of time or money, and no hassles.



For information on the full range of Kisling products, please visit:

www.kisling.com/ch-en/flyers-brochures



Detailed information: From professionals for professionals

Curing process

Liquid anaerobic reactive adhesives harden in the absence of oxygen and in contact with metal (metal ions) to form a high molecular polymer.

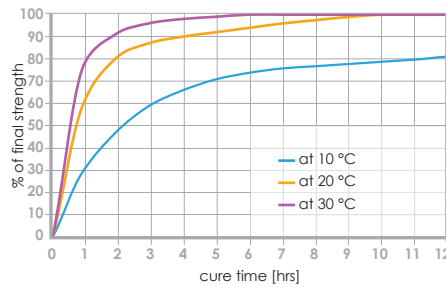
The hardener component contained in the adhesive will not be activated while oxygen is present. The curing process starts as soon as the adhesive in the gap between two metal substrates is isolated from oxygen.

The type of metal has a measurable influence on the curing speed. Passive metals have no or a low catalytic (accelerating) effect, whereas active metals have a strong catalytic effect.

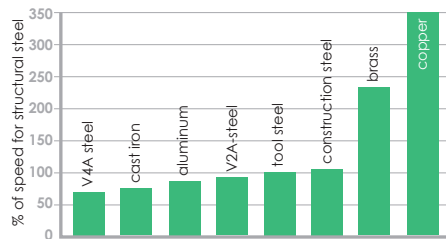
| Active materials | Passive materials activators may be useful |
|---------------------|---|
| structural steel | nickel |
| tool steel | zinc |
| bronze | precious metals |
| brass | aluminum |
| copper | high-alloy steel |
| aluminum | metal oxides |
| with CU-content >1% | plastics |
| | glass and ceramics |

The ambient temperature also affects the cure time. Rule of thumb: The cure time is cut in half when the temperature increases by 10 °C. The cure time will double when the temperature drops by 10 °C.

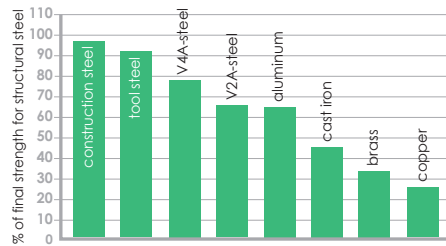
Effect of ambient temperature on the hardening properties of anaerobic adhesives and sealants



Relative curing speed is determined by material

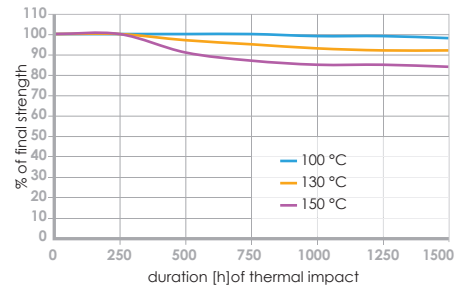


Shear strength (DIN 54452) is determined by the material used



Temperature resistance

Long-term resistance to elevated temperatures



The service temperature range for most ergo.[®] products is between -55 °C and +150 °C.

For heat-resistant products, thermal stress up to +200 °C is feasible without damaging the adhesive film.

Adhesives typically exhibit thermo-plastic behavior after cure.

The adhesive softens at higher temperatures, whereas it becomes almost glass-hard at very low temperatures. Please refer to the charts for more details.

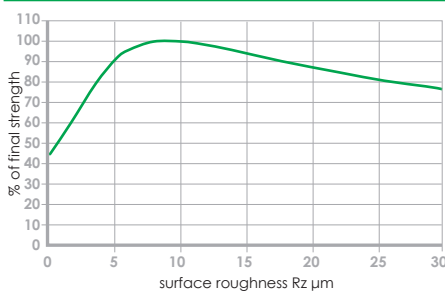
Strength

When choosing adhesives and sealants, it is important to take into account all the factors that affect strength as well as their relevance. The charts shown here, together with our technical data sheets, enable our customers to make an initial assessment of the strength behavior of adhesives for a specific application. When an adhesive cures very quickly, it generally results in a loss of strength because the adhesive cannot develop an optimum polymer structure, especially for materials that contain copper or when using an activator.

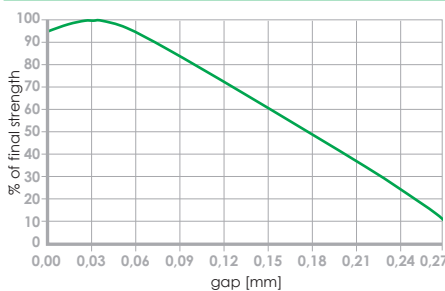
The higher the surface roughness, the larger the active surface area.

Please note that excessive surface roughness reduces strength because the gaps that need to be filled are bigger. With a bigger gap, the adhesive does not cure properly and, as a result, forms a soft polymer film that is less than optimal at its center. In this case, cohesion is the weak point of the adhesive bond.

Shear strength (DIN 54452) is determined by surface roughness

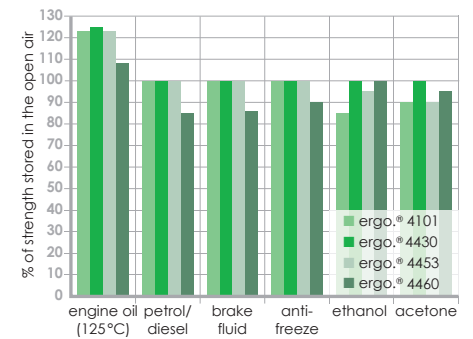


Shear strength (DIN 54452) is determined by joint gap



Media resistance



























Shear strength (DIN 54452) after storage for 500 hours in specified media



Regardless of whether it is fuel, engine coolant, cutting oil, anti-corrosion oil or a cleaning agent, ergo.® anaerobic adhesives and sealants demonstrate excellent chemical resistance when stored for long periods of time in common media.

Exposure to warm oil for all products leads to post-curing; hot-air post-cure is also observed.

Comprehensive overview of ergo.[®] anaerobic products

| Designation | Color | Viscosity [mPas] | Break loose torque [Nm] (DIN 54454) | Prevailing torque [Nm] | Shear strength under pressure [N/mm ²] (DIN 54452) | Tensile strength [N/mm ²] | max. gap [mm] | max. thread size | Service temperature range [°C] | Final strength at 25°C [hrs] | Approvals, registrations | Packaging size |
|---|----------------|------------------|-------------------------------------|------------------------|--|---------------------------------------|---------------|------------------|--------------------------------|------------------------------|---|----------------|
| ergo. [®] 4003 ■ Threadlocker low strength | purple | 1000 | >10 | >2 | >10 | — | 0,2 | M 36 | -55 bis +150 | 10 | — | 10g/50g/250g |
| ergo. [®] 4050 ■ Threadlocker medium strength | blue | 150 | >15 | >7 | >8 | — | 0,15 | M 12 | -55 bis +150 | 10 | — | 5g/50g |
| ergo. [®] 4052 ■ Threadlocker medium strength | blue | 2200 fx | >21 | >10 | >20 | — | 0,25 | M 36 | -55 bis +150 | 3 |    | 10g/50g/250g |
| ergo. [®] 4100 ■ Threadlocker high strength | red | 1 500 fx | >20 | >35 | >20 | — | 0,25 | M 36 | -55 bis +150 | 6 |  | 10g/50g/250g |
| ergo. [®] 4101 ■ Threadlocker high strength | green | 700 | >25 | >40 | >20 | — | 0,15 | M 25 | -55 bis +150 | 10 |  | 10g/50g/250g |
| ergo. [®] 4115 Threadlocker heat-resistant and high strength | red | 10000 fx | >23 | >23 | >25 | — | 0,2 | M 36 | -55 bis +200 | 24 | — | 50g/250g |
| ergo. [®] 4202 ■ Hydraulic sealant medium strength | brown | 600 | >14 | >16 | >8 | — | 0,15 | 3/4" | -55 bis +150 | 6 | — | 10g/50g/250g |
| ergo. [®] 4203 ■ Hydraulic sealant low strength | violet | 17000 fx | >2 | >1 | >1 | — | 0,15 | 3/4" | -55 bis +150 | 24 | — | 50g/250g |
| ergo. [®] 4205 ■ Pipe thread sealant with Teflon [®] low strength | white | 17500 fx | >5 | >4 | >5 | — | 0,3 | 3" | -55 bis +200 | 12 |    | 50g/250g |
| ergo. [®] 4207 ■ Pipe thread sealant universal medium strength | yellow | 23000 fx | >10 | >10 | >6 | — | 0,5 | 3" | -55 bis +150 | 6 |    | 50g/100ml/250g |
| ergo. [®] 4208 Pipe thread sealant high strength | red | 2500 | >25 | >30 | >27 | — | 0,2 | 2" | -55 bis +175 | 24 | — | 50g/250g |
| ergo. [®] 4209 ■ Pipe thread sealant high strength | red | 6500 | >25 | >35 | >20 | — | 0,3 | 2" | -55 bis +150 | 24 |   | 50g/250g |
| ergo. [®] 4211 Pipe thread sealant heat-resistant and medium strength | violet | 11 000 fx | >15 | >19 | >7 | — | 0,2 | 2" | -55 bis +175 | 24 |  | 50g/250g |
| ergo. [®] 4212 ■ Pipe thread sealant with Teflon [®] low strength | white | 240000 fx | >4 | >1 | >2 | — | 0,5 | 3" | -55 bis +150 | 24 |   | 50g/250g |
| ergo. [®] 4252 ■ Flange sealant low strength | green | 20000 fx | >6 | >3 | >4 | >2 | 0,30 | — | -55 bis +150 | 24 |  | 50g/250g |
| ergo. [®] 4253 ■ Flange sealant universal medium strength | orange | 34000 fx | >8 | >5 | >5 | — | 0,50 | — | -55 bis +150 | 24 |  | 50g/250g |
| ergo. [®] 4254 Flange sealant flexible medium strength | red | 250000 fx | >18 | >10 | >18 | >14 | 0,50 | — | -55 bis +150 | 72 | — | 50g/250g |
| ergo. [®] 4280 Flange sealant heat-resistant high strength | red | 80000 fx | — | — | >12 | >10 | 0,50 | — | -55 bis +200 | 12 |  | 50g/250g |
| ergo. [®] 4301 ■ Impregnating agent universal medium strength | green | 50 | >18 | >30 | >12 | — | 0,07 | M 5 | -55 bis +150 | 6 | — | 50g/250g |
| ergo. [®] 4401 ■ Retaining compound medium strength | yellow | 500 | — | — | >8 | — | 0,15 | M 12 | -55 bis +150 | 3 | — | 50g/250g |
| ergo. [®] 4430 Retaining compound high strength | green | 150 | >25 | >40 | >25 | — | 0,15 | M 12 | -55 bis +150 | 6 |  | 10g/50g/250g |
| ergo. [®] 4451 Retaining compound high strength | green | 2500 | >25 | >40 | >27 | — | 0,20 | M 36 | -55 bis +150 | 4 |  | 10g/50g/250g |
| ergo. [®] 4452 Retaining compound high strength | green | 600 | >20 | >30 | >25 | — | 0,15 | M 20 | -55 bis +175 | 24 | — | 50g/250g |
| ergo. [®] 4453 Retaining compound heat-resistant high strength | green | 550 | >25 | >40 | >27 | — | 0,15 | M 20 | -55 bis +175 | 4 |     | 10g/50g/250g |
| ergo. [®] 4455 Retaining compound heat-resistant high strength | green | 1 500 | >25 | >40 | >27 | — | 0,15 | M 20 | -55 bis +175 | 4 |  | 50g/250g |
| ergo. [®] 4460 Retaining compound heat-resistant high strength | green | 13000 | >25 | >25 | >25 | — | 0,20 | M 36 | -55 bis +200 | 24 |  | 50g/250g |
| ergo. [®] 4900 Activator | tur- quoise | 10 | — | — | — | — | — | — | — | — | — | 100g/1 kg |

■ Products without hazard pictograms in accordance with Regulation (EC) No. 1272/2008, paragraph 2.2
fx thixotropic

Approvals, certifications and classifications:

Tested and approved



NSF Category FDA P1

For use as a sealant in food processing areas where there is no risk of unintended contact with food or just a risk of accidental contact. Note: This is a regional approval. If you require further clarification and information, please contact your local Technical Service Centre.

Certified by NSF in accordance with ANSI Standard 61

For use in residential potable water systems and in the commercial sector not exceeding 82 °C. Note: This is a regional approval. If you require further clarification and information, please contact your local Technical Service Centre.



DVGW certification

Approved for use with gas (DIN EN 751-1). Thread sealants not approved for residential gas installations in Germany (DVGW TRGI 2008).



KTW approval (plastics in contact with potable water)

The German Federal Environmental Agency (UBA) deems anaerobic products in the drinking water distribution system to be negligible. When used as directed (in accordance with the recommendation of the IVK e.V. registered association and our instructions for use), products that comply with UBA guidelines without a certificate of conformity can be used in potable water systems.

Source: «Hygienic assessment of anaerobic adhesives that come in contact with drinking water», UBA, 11 February 2016



BAM Approval of the German Federal Institute for Materials Research and Testing for contact with pure oxygen (in accordance with the respective test certificate).



Kisling AG and Kisling Deutschland GmbH have **SQS ISO 9001 Certification**.



You will find information on applications, technical information, all certificates and individual approvals at:
www.kisling.ch/en/download-center

If you require specific information, please contact our Customer Service Center:
+41 58 272 02 72 or customerservice@kisling.com

Our current business terms and conditions apply. Always refer to the latest (most recently issued) relevant local product data sheet and material safety data sheet prior to using the product and processing.

Kisling. Secure connections any time.

Kisling AG, Wetzikon, founded in 1862, is one of the world's leading manufacturers of adhesives and sealants. Covering the entire process from development and manufacture through to support, Kisling offers everything under one roof. As an experienced developer, producer and solutions provider of adhesives and sealants, we are happy to advise and assist you with your individual projects – from complex challenges to tasks that require a quick solution. This approach produces a steady stream of new and innovative products that provide exactly what you want.

Kisling

www.kisling.com

Kisling AG
Motorenstrasse 102 | CH-8620 Wetzikon
Tel. +41 58 272 01 01 | Fax +41 58 272 01 03

Kisling Deutschland GmbH
Bürgermeister-Seidl-Strasse 2 | D-82515 Wolfratshausen
Tel. ++49 8171 99 98 230 | Fax +49 791 407 27 50