Turcite® Slydway®

PROTECTING THE ESSENTIAL

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Trelleborg Sealing Solutions is one of the world's leading developers, manufacturers and suppliers of precision seals, bearings and custom-molded polymer components.
We collaborate closely with customers to develop unique, innovative solutions to tomorrow's challenges. Utilizing our dedicated product design, material development and testing capabilities, we are a one-stop-shop providing the best in elastomer, silicone, thermoplastic, PTFE and composite technologies for applications in aerospace, automotive, general industrial and healthcare & medical industries.

With over 70 years of experience, we serve as long-term business partners to help our customers bring products to market faster. Through strategically positioned material and product laboratories, specializing in design and applications, Trelleborg Sealing Solutions engineers support customers with design, prototyping, production, testing, installation and quality assurance using state-of-the-art tools. Our ServicePLUS portfolio of value-added services is designed to help customers optimize their business across the entire value chain.

Trelleborg Sealing Solutions brings leading edge technology and an in-depth, experience-based understanding of applications to customers through a global, but local approach. An international network of over 100 facilities worldwide includes over 40 manufacturing sites, more than 60 Customer Solution Centers and 10 R&D centers. Developing and formulating materials in-house, our material database includes over 2,000 proprietary compounds. We fulfill challenging service requirements, supplying standard parts in volume or a single custom-manufactured component, through our integrated logistical support, which effectively delivers over 40,000 sealing products to customers worldwide.

Trelleborg Sealing Solutions facilities are certified according to current market-related quality standards. In addition to the established ISO 9001 standard, our facilities are certified to environmental, health and safety standards, as well as specific customer specifications. These certifications are in many cases prerequisites, allowing us to comply to all market segment requirements.

ISO 9001

Contents

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General Description

Turcite® Slydway® is a high-performance, low-friction thermoplastic bearing system designed for linear movements. For decades, it has proven its reliability in machine tools and other heavy-duty engineering applications.

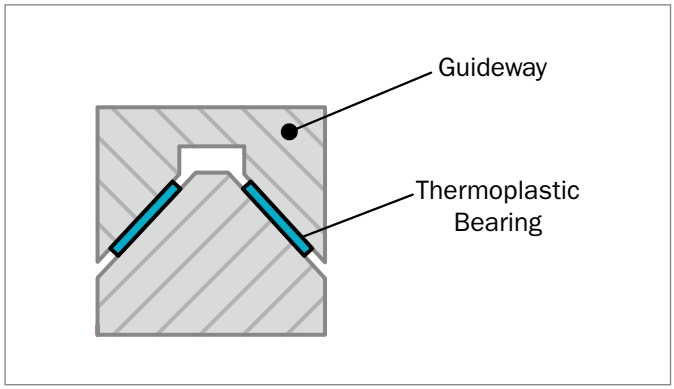


Figure 1: Turcite® Slydway®

The PTFE-based materials used are customized with fillers, such as bronze, to meet specific application requirements and solve engineering challenges.

Typically, Turcite® Slydway® is bonded to the moving surface of a linear application, then finished by milling, grinding and/or scraping to create a suitable surface for a static countersurface of steel, cast iron or another material.

FEATURES AND BENEFITS

- Ensures precise, repeatable movements with low friction and no jamming, backlash or stick-slip, even at low sliding speeds.
- Delivers reliable, high-performance over a long service life.
- Maintains dimensional stability with excellent mechanical properties to avoid deformation while bearing weight and absorbing machine forces.
- Resists wear and can operate effectively with poor or no lubrication without seizing.
- Damps and absorbs vibrations, minimizing chatter even with interrupted operations.
- Withstands aggressive chemicals, like coolants and lubricants and resists moisture and contamination.
- Offers stock availability for standard dimensions with simple and cost-effective handling.

APPLICATION EXAMPLES

Turcite® Slydway® are perfectly suited to the requirements of linear guideways, but can also be used as heavy-duty bearings in other sectors and applications. Key uses include:

Machine tools
- Guideways
- Milling Machines
- Machining centers
- Drilling machines
- Grinding machines
- Lathes
- Saws
- Accessories

Construction and civil engineering
- Bridge supports
- Skids
- Pipe or cable expansion supports
- Telescopic arms
- Product guides
- Maintenance and refurbishment

USE IN GUIDEWAYS

Guideways ensure precise movements of components that can include slides, sleeves, quills and plungers. They must also bear the weight of guided components and workpieces while absorbing machining forces without deforming.

This places critical demands on the guideways:

- High positional accuracy and repeatability of movements
- High performance over many years
- Low production costs
- Low friction without stick-slip as a precondition for positional accuracy at differing velocities
- Low wear, even in the event of poor or failed lubrication
- Backlash-free or minimum backlash for high repeatability even under load
- Good damping behavior even with interrupted cutting operations to minimize chatter.

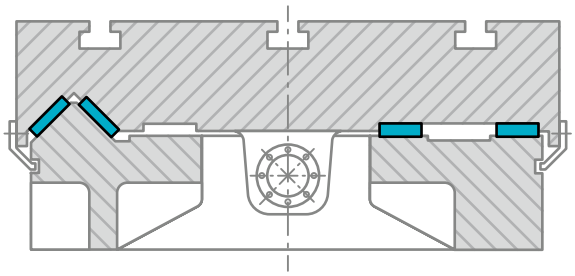
Turcite® Slydway® offers the optimal solution to meet these requirements.

DESIGNS

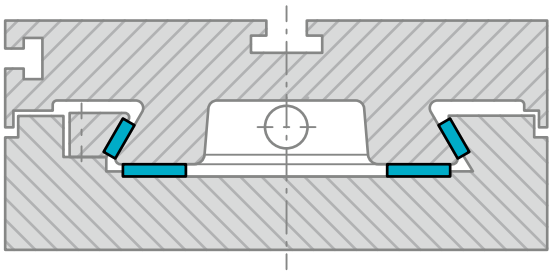
Turcite® Slydway® is available in various dimensions and to meet the demands made by different guide systems. It can be supplied cut to a specified length as a ready-to-use product or as off-the-roll material. Standard sizes are shown in Table 3, page 16.

Turcite® Slydway® is ideal for refurbishing machine tools. Applying Turcite® Slydway® of an appropriate thickness can restore worn linear bearings to the original working tool heights and center lines.

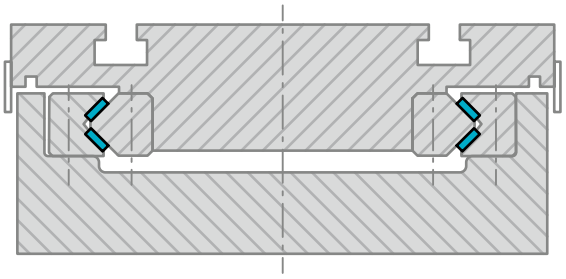
Designs



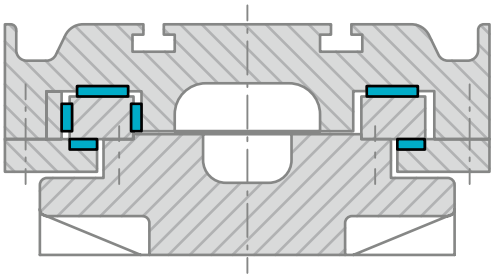
Flat Tapered Guideway



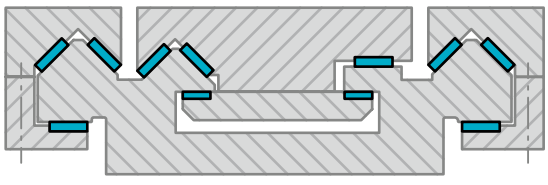
Dovetail Guideway



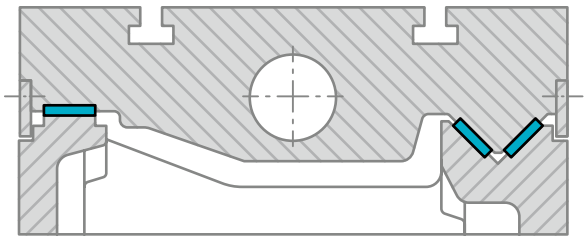
V-Guideway



Flat Guideway



Double V-Guideway



Flat V-Guideway

Figure 2: Slydway® installation examples

Recommended Materials

Turcite® Slydway® is manufactured from specially developed, PTFE-based thermoplastics, modified to the specific requirements of linear bearing applications. To achieve good adhesion when bonding with machine components, the surface is chemically treated.

TURCITE® B

Turcite® B is a polytetrafluoroethylene (PTFE) based bearing material with low friction for use in machine tool linear bearings with excellent damping properties.

MECHANICAL PROPERTIES
Specific Gravity (ASTM D792): 3.0 – 3.1
Tensile Strength (ASTM D4745): 12.4 MPa (1,800 psi)
Tensile Elongation at Break (ASTM D4745): 110%
Hardness (ASTM D2240): 55– 66 Type D
Peel Strength (Bonded to metal substrate using Waylock® II): 178 N/mm (40 lbf/in)

Compressive Strength (ASTM D695)
0.2% Offset: 7.6 MPa (1,102 psi)
1% Strain: 6.1 MPa (885 psi)
5% Strain: 13.2 MPa (1,915 psi)
Young's Modulus: 722 MPa (105 ksi)

Deformation Under Load
2 kg/cm² @ 0.203 mm/min: 0.016 mm
4 kg/cm² @ 0.203 mm/min: 0.030 mm
6 kg/cm² @ 0.203 mm/min: 0.043 mm
28 lb/in² @ 0.008 in/min: 0.0006 in
57 lb/in² @ 0.008 in/min: 0.0012 in
85 lb/in² @ 0.008 in/min: 0.0017 in

THERMAL PROPERTIES
Coefficient of Linear Thermal Expansion (ASTM E831)
25 °C to 100 °C: 103.5 µm/m °C
100 °C to 150 °C: 135.7 µm/m °C
77 °F to 212 °F: 57.5 µin/in °F
212 °F to 302 °F: 75.4 µin/in °F

Thermal Conductivity (TCi Thermal Analyzer)
23 °C / 73.4 °F: 0.36 W/m-K

TRIBOLOGICAL PROPERTIES
Wear Factor, K (Lubricated, Tonna V68 Way Oil):
3.57 E-08 mm³/Nm (2.47 E-13 in³/lb-in)
Friction Coefficient (Lubricated, Tonna V68 Way Oil):
0.034

COLOR DESCRIPTION: Turquoise Bronze

TURCITE® LF

Turcite® LF (Low Friction) is a polytetrafluoroethylene (PTFE) based bearing material with outstanding low friction for use in machine tool linear bearings.

MECHANICAL PROPERTIES
Specific Gravity (ASTM D792): 2.0 – 2.4
Tensile Strength (ASTM D4745): 15 MPa (2,176 psi)
Tensile Elongation at Break (ASTM D4745): 200%
Hardness (ASTM D2240): 55 – 66 Type D
Peel Strength (Bonded to metal substrate using Waylock® II): 180 N/mm (40.5 lbf/in)

Compressive Strength (ASTM D695)
0.2% Offset: 8.2 MPa (1,189 psi)
1% Strain: 5.8 MPa (841 psi)
5% Strain: 13.9 MPa (2,016 psi)
Young's Modulus: 653 MPa (95 ksi)

Deformation Under Load
2 kg/cm² @ 0.203 mm/min: 0.015 mm
4 kg/cm² @ 0.203 mm/min: 0.029 mm
6 kg/cm² @ 0.203 mm/min: 0.042 mm
28 lb/in² @ 0.008 in/min: 0.0006 in
57 lb/in² @ 0.008 in/min: 0.0011 in
85 lb/in² @ 0.008 in/min: 0.0017 in

THERMAL PROPERTIES
Coefficient of Linear Thermal Expansion (ASTM E831)
25 °C to 100 °C: 138.4 µm/m °C
100 °C to 150 °C: 173.3 µm/m °C
77 °F to 212 °F: 76.9 µin/in °F
212 °F to 302 °F: 96.3 µin/in °F

Thermal Conductivity (TCi Thermal Analyzer)
23 °C / 73.4 °F: 0.28 W/m-K

TRIBOLOGICAL PROPERTIES
Wear Factor, K (Lubricated, Tonna V68 Way Oil):
3.22 E-08 mm³/Nm (2.23 E-13 in³/lb-in)
Friction Coefficient (Lubricated, Tonna V68 Way Oil):
0.020

COLOR DESCRIPTION: Dark Gray

Working Conditions

LOAD AND CONTACT DEFORMATION

In conjunction with the contact deformation, the load is of great significance for the operating precision of a linear bearing. The surface load pressures for Turcite® Slydway® in machine tool construction are generally selected between 2 and 20 kgf/cm2 20 and 200 N/cm2. For machine guideways, it is commonly between 1 and 3 kgf/cm2.

The load-carrying capacity is dependent on the thickness of the Turcite® bearing material and the surface roughness.

Figure 3 shows the contact deformation as a function of different material thicknesses "w" for Turcite® B with a surface roughness of Ra = 0.6 µm. As can be seen from the diagram, Turcite® B can be subjected to even more than the optimum range.

Within the working range depicted, the coefficient of friction for the Turcite® B material remains practically unchanged.

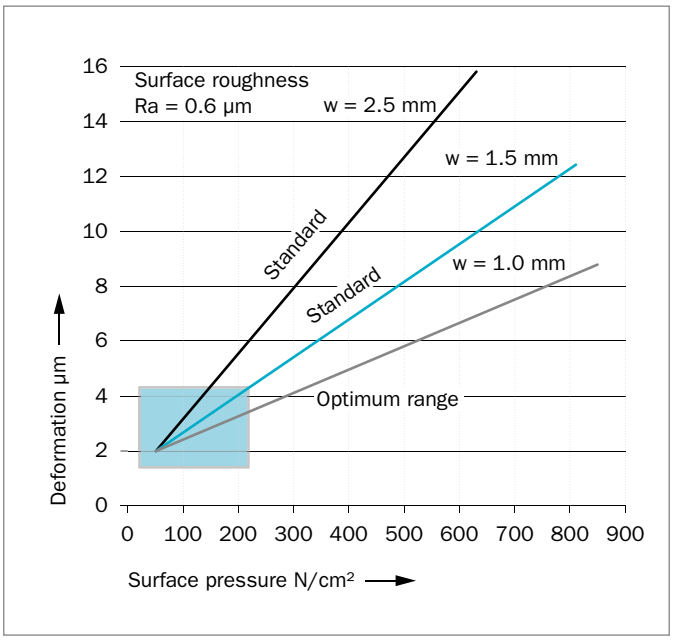


Figure 3: Deformation as a function of surface pressure and thickness "w" of the Turcite® B material

COEFFICIENTS OF FRICTION

In use, Turcite® Slydway® displays only a slight difference between static friction and dynamic friction, thus eliminating any stick-slip. When used in numerically controlled machines, this produces higher positioning and reproduction precision.

DYNAMIC FRICTION

Figure 4 shows a close to linear pattern for dynamic friction when using Turcite® Slydway® over a range of speeds. The influence of pairing Turcite® B and hardened steel guides can be clearly seen in the mixed friction zone. With a combination of a surface load of 35 N/cm2 and a scraped Turcite® B surface, the coefficient of friction reaches f = 0.022 - 0.055.

The least variation in friction is seen at the transition to the hydrodynamic range. With higher surface pressures up to 200 N/cm2, the change in sliding behavior is insignificant.

Good lubrication is of paramount importance to achieve a controlled level of dynamic friction.

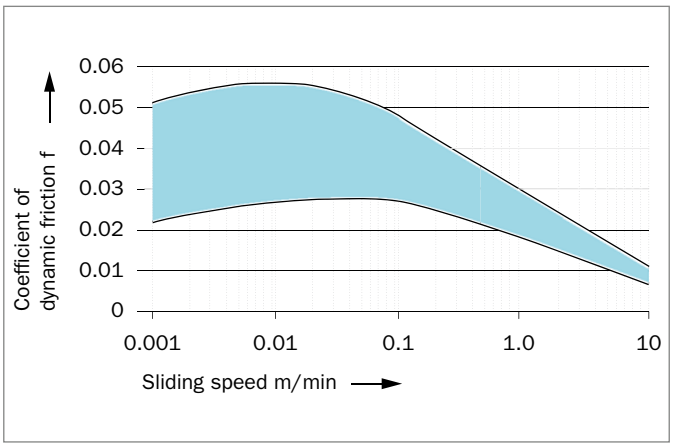


Figure 4: Range of the coefficient of dynamic friction (f) as a function of the sliding speed when using different lubricants

WEAR

The service life and the continuous precision of Turcite® Slydway® is determined primarily by its wear behavior. The bearings are generally supplied with adequate lubrication. Should the lubricant supply suddenly be interrupted, Turcite® Slydway® will remain functional with low wear even for prolonged periods due to the self-lubricating properties of the material. Very low wear rates are achieved using the combination of Turcite® Slydway® and hardened mating surface. The wear behavior is mainly determined by ambient influences. It is important to protect the guides from external soiling by using covers and seals. Turcite® Slydway® has the great advantage of being able to absorb and embed small dirt particles, thus preventing immediate seizing, damage and extreme wear of the guides.

START-UP PHASE

A linear bearing application using Turcite® Slydway® should always be well lubricated during the start-up phase. During this phase, very fine particles of the Turcite® material are deposited on the mating surface. This leads to a slight shading of the metallic running surfaces. The start-up phase concludes with the smoothing phase. A very low level of friction and wear is then reached which remains essentially constant (Figure 5). The guides can then be used for continuous operation.

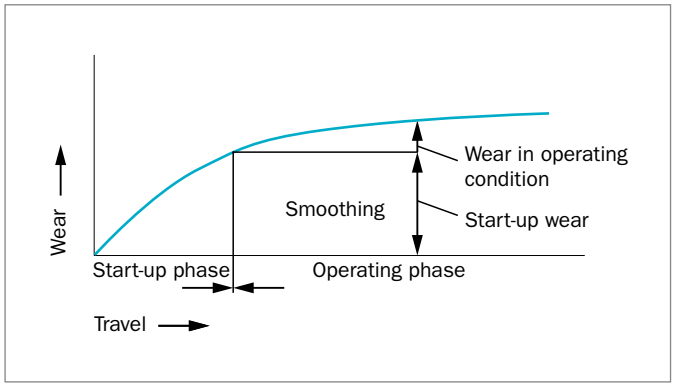


Figure 5: Wear as a function of the operating condition

SLIDING WEAR

Turcite® Slydway® are set backlash-free or even slightly preloaded, thus ensuring a very high continuous precision even over many years. The sliding behavior is then determined primarily by the lubricant and the surface finish.

Figure 6 shows the wear behavior of a scraped Turcite® B Slydway® with a mean load of 50 N/cm^2 with adequate lubrication.

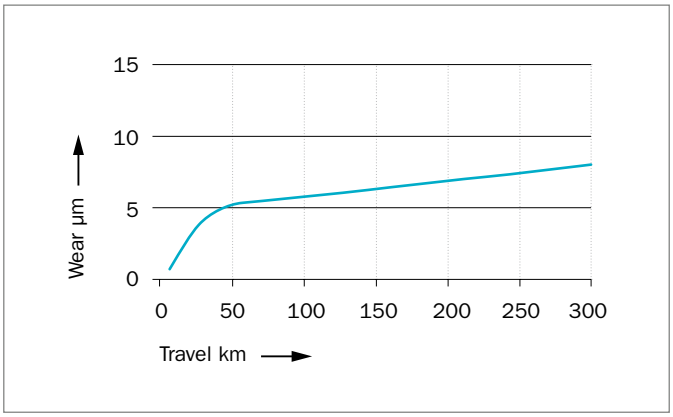


Figure 6: Wear behavior of Turcite® B Slydway®

TEMPERATURE

The temperature of the sliding surfaces should be kept as constant as possible. In the event of elevated temperatures, adequate heat dissipation must be assured by means of lubrication.

Installation Instructions

When properly installed, Turcite® Slydway® provides rigid linear bearing support that reduces friction, absorbs vibration and delivers years of reliable service.

Three main components are required for installation: Turcite® Slydway® PTFE-based material, Wayprep® degreaser/ cleaner for preparing the surfaces and Waylock® II epoxy adhesive to effectively secure the material to the metal substrate.

Turcite® Slydway® material will normally come with one side chemically etched to accept the bonding adhesive. The appearance of the etched surface will depend on the Turcite® Slydway® material being used for the following materials:

- Turcite® B – brown to dark brown color
- Turcite® LF – dark gray to black color. Dull surface appearance.
- Other PTFE materials – gray to black color or distinctively darker than the unetched surface.

IMPORTANT NOTES

Improper installation or handling will result in inadequate bonding.

To ensure maximum bond strength for Turcite® Slydway® , surfaces must be free of oil, grease, rust and other contaminants.

Alternate mating surface materials not recommended without prior testing by the customer.

MATERIALS CHECKLIST

1. Turcite® Slydway® material
2. Waylock® II Adhesive Kit, including:
    1. Resin (Part A)
    2. Hardener (Part B)
    3. Serrated spatula
    4. Installation instructions
3. Wayprep® Industrial degreaser and cleaner
4. Isopropyl alcohol
5. Clean gloves
6. Clean white, lint-free cloths
7. Stir sticks / jiffy mixing blade
8. Wax paper or plastic film
9. Weights or clamps
10. Utility knife

SURFACE FINISH PREPARATION

Turcite® Slydway® Preparation
Do not sand or roughen the etched surface to be bonded — this exposes unetched material and weakens bond strength. Keep the bond surface clean, dry, and free from dirt and chemicals, including oils from hands.

Preparation of Metal Surface for Bonding
Typical surface roughness should be 6.3 µm (250 µin) Ra. Surface finish must be between 3.2 µm (125 µin) and 12.5 µm (500 µin). Finishes outside this range will result in reduced bond strength and failure.

Preparation of Metal Running Surface
The running surface against Turcite® Slydway® should be finished to 0.35 to 0.50 µm (14 to 20 µin) Ra for optimum performance. Never lap or polish the surface — this creates stick-slip effects, increases friction, and leads to premature wear. Surface finish should not be less than 0.20 µm (8 µin) Ra.

For precision guides under high loads, hardened running surfaces are preferred. Optimal hardness values are approximately 60 HRc for steel and 240 HB for cast iron.

Cleaning the Bonding Surface
Before applying Waylock® II adhesive, thoroughly clean both bonding surfaces. Use Wayprep® degreaser/cleaner to wipe down both the etched Turcite® Slydway® surface and metal surface. Perform at least three cleaning cycles for proper surface preparation. Used casting surfaces, common in rebuilt or reworked machine tools, may need multiple cleaning cycles to remove all embedded oils.

IMPORTANT NOTE

Only use Wayprep® degreaser/cleaner for this application. It is specifically formulated to remove contaminants from Turcite® and metal surfaces before bonding. Other degreasers, petrol, or thinners may leave invisible residue that causes bond failure.

Final Surface Preparation
After cleaning and drying the etched Turcite® Slydway® and metal surfaces, perform one final cleaning just before bonding. Use a clean, lint-free white cloth saturated with isopropyl alcohol to remove any remaining contamination. Allow surfaces to dry completely and avoid touching them until bonding.

IMPORTANT NOTE

Acetone may replace isopropyl alcohol. Do not use compressed air for drying as it may contain water or oil that causes bond failure. In humid conditions, be aware that acetone has an evaporative cooling effect that may cause surface condensation.

PREPARING WAYLOCK® II ADHESIVE

Use a container to prepare the adhesive with the following procedure:

- **Before blending, separately stir both Part A (Resin) and Part B (Hardener)** using clean stir sticks to disperse the self-leveling component.

- **Combine Part A (Resin) and Part B (Hardener) in a clean cylindrical container** according to the specified mix ratio.

- **Mix thoroughly for complete blending.** Using a Jiffy blade with a drill is recommended. If mixing by hand, frequently scrape the container walls and bottom to prevent unmixed material. Properly mixed Waylock® II should be uniformly dark gray without swirls.

IMPORTANT NOTES

Do not attempt to bond Turcite® Slydway® if the metallic surface temperature is below +10 °C (+50 °F).

Mix only as much material as you can apply in one step.

Do not mix large quantities (more than 300 grams) at one time. If a large quantity of this material is mixed and allowed to react in a concentrated mass, considerable heat and possible toxic fumes could result.

Do not heat resin or hardener in a hot water bath – moisture adversely affects these materials.

In room temperature cure systems, mixing resin and hardener triggers an exothermic reaction that generates heat and accelerates curing. Viscosity first decreases, then increases until gelation at the end of the gel time. Temperature continues to rise and may cause overheating, fumes and smoke in large batches.

APPLICATION AND BONDING

- **Apply a thin, even layer of Waylock® II** to the metal surface using the included serrated spatula. This tool helps create the ideal bond line thickness of 0.08 mm to 0.15 mm (.003" to .006"). The self-leveling Waylock® II will spread evenly. You may also apply it to the Turcite® Slydway® etched surface if desired.

- **Position the Turcite® Slydway® material on the prepared surface.** Working from center to edges, smooth out any bubbles and wrinkles.

- **Apply weights or clamps to ensure even pressure across the entire Turcite® Slydway® surface.** Use 20 kPa to 69 kPa (3 psi to 10 psi) clamping pressure for proper bonding. Place wax paper or plastic sheet between the Turcite® Slydway® and weights to prevent accidental adhesion.

- **Allow time to cure** (see Table 1 for curing time requirements).

- **Remove excess cured Waylock® II along the bond line with a utility knife.** Never use solvents on the bond line, though they may be used to clean tools or excess spillage.

Table 1: Curing time requirements

Temperature	Curing Time
Room temperature	6 hours (ready to be machined)
	24 hours (fully cured)
Accelerated curing time with pre-curing for 4 hours at room temperature	2 hours at +66 °C (+150 °F)
	30 minutes at +82 °C (+180 °F)

Note: Extend cure time when using adhesive that is below +15 °C (+60 °F)

Table 2: Typical Properties of Waylock® II

Lap Sheer ASTM D1002	
AL/AL	>2000 psi (>13.8 MPa)
Cold Rolled Steel	>1200 psi (>8.2 MPa)
Mixing Ratio by Volume	1:1 (Part A; Part B)
Pot Life (Working Time)	20 minutes / 200 g mass
Appearance	Viscous Liquid
Color (Part A Resin / Part B Hardener combined)	Dark Gray
Cure Time:	
At Room Temperature	6 Hours (Ready to be Machined)
Accelerated Cure (pre-cure for 4 hours @ room temp.)	2 Hours @ 150 °F (66 °C) 30 minutes @ 180 °F (82 °C)
Fully Cured	24 Hours @ room temperature
Service Temperature	-65° to 180 °F (-54° to 82 °C)
Density ASTM D1475	11.0 lb/gal (0.45 kg/3.79 L)
Viscosity (Blended Part A/B) ASTM D2196	83,600 cP
Gel Time @ 77 °F (25 °C) ASTM D2471	26 minutes

Finishing

After the recommended 24-hour cure time, finish the Turcite® Slydway® surface using conventional methods like hand scraping, milling or grinding. Maintain a minimum contact area of 80% between sliding members.

GRINDING

Grinding wheels with normal abrasives (e.g. special fused alumina, silicon carbide) can be used for grinding. The grinding wheels should have a medium grain (36) and a low hardness (I). The method of bonding can be ceramic (Ke) or may contain synthetic resin (Bo).. When grinding, flood the surface with coolant for a better surface finish and to prevent overheating Waste must be removed.

SCRAPING

Milled and ground surfaces can be re-machined by scraping to improve the surface quality and dimensional accuracy. Only sharply-ground scraping tools should be used and can be performed manually or with a scraping machine. A grade of 2 is required for a precision surface, corresponding to 2 to 3 points per cm^2. A perfectly scraped or patterned surface enhances the tribological properties of the guides.

OIL GROOVES

For optimal performance, Turcite® Slydway® can be machined to incorporate oil or lubrication groove patterns. These grooves deliver and maintain a consistent oil film between mating surfaces.

Grooves should be milled to a depth less than the material thickness. Best results are obtained by machining to a depth of 50 – 70% of the Turcite® Slydway® thickness. Never cut grooves through to the metal substrate or closer than 6 mm (0.240 inch) from the bearing edge of the material.

For any pattern chosen, it is extremely important that the milled grooves maintain a generous, smooth radius which blends the top of the groove back to the surface of the material without creating any sharp edges. Figure 7 shows recommended oil groove patterns, which can be chosen according to preference.

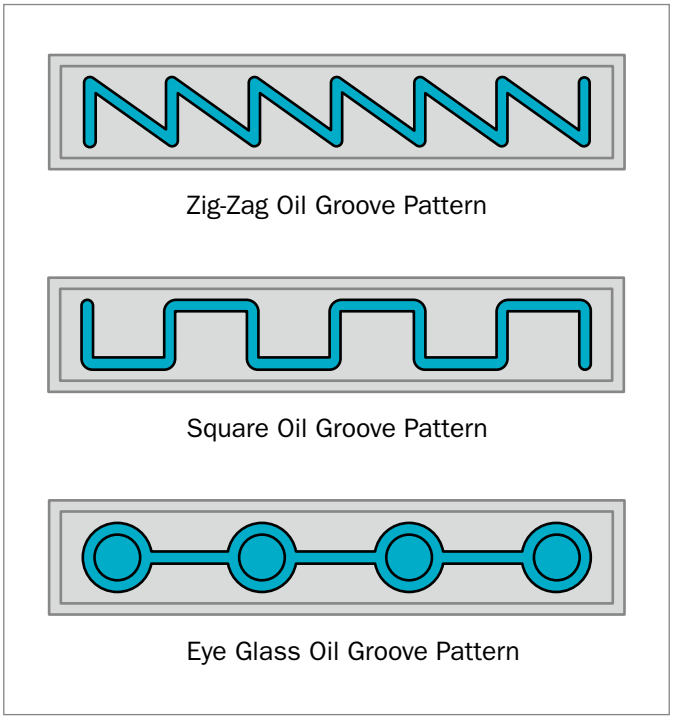


Figure 7: Oil Grooves

Dimensions and Ordering

WIDTH AND THICKNESS

Turcite® Slydway® is available cut to length or off-the-roll. Thicknesses up to 5 mm (0.197 inch) are available on request.

Standard widths are shown in Table 3. Other widths up to 300 mm (11.811 inch) can also be supplied. For standard dimensions, use the order numbers from Table 3. The desired length in meters or feet must be stated with the order number.

Table 3: Standard Dimensions / TSS Article No.

Width		TSS Part No. Turcite® Slydway®, one side etched, 1.5 mm thickness
mm	inch	
10	0.394	GLB500010
15	0.591	GLB500015
20	0.787	GLB500020
25	0.984	GLB500025
30	1.181	GLB500030
35	1.378	GLB500035
40	1.575	GLB500040
45	1.772	GLB500045
50	1.969	GLB500050
60	2.362	GLB500060
70	2.756	GLB500070
80	3.150	GLB500080
90	3.543	GLB500090
100	3.937	GLB500100
125	4.921	GLB500125
150	5.906	GLB500150

Limitations:

- Up to and inclusive 3 mm (0.118 inch) thickness, Turcite® B can be delivered one-side treated, up to 300 mm (11.811 inch) width.
- Up to and inclusive 3.5 mm (0.138 inch) thickness all standard materials, except Turcite® B, can be delivered two-side treated, up to 200 mm (7.874 inch) width.
- Up to and inclusive 4 mm (0.157 inch) thickness all standard materials, except Turcite® B, can be delivered two-side treated, up to 140 mm (5.512 inch) width.
- Up to and inclusive 5 mm (0.197 inch) thickness all standard materials, except Turcite® B, can be delivered two-side treated, up to 60 mm (2.362 inch) width.

WAYPREP® CLEANER/DEGREASER

Approved degreaser and cleaner for metal surfaces before bonding Turcite® Slydway® .

Table 4: TSS Article Numbers for Wayprep®

TSS Article No.	Description / Volume
S26263QT	Wayprep® Quart (946 ml)
S26263GAL	Wayprep® II Gallon (3.78 l)

WAYLOCK® II BONDING EPOXY

The only two-part bonding epoxy approved by Trelleborg Sealing Solutions for Turcite® Slydway® .

Waylock® II is available either as a standard kit which must be mixed according to the instructions in the Installation Instructions on page 11, or as a EZ Tube kit for simpler, quicker application.

Table 5: TSS Article Numbers for Waylock® II

TSS Article No.	Description / Volume	Contents
S26311QT	Waylock® II Quart Kit (946 ml)	Resin Hardener Serrated Spatula
S26311PT	Waylock® II Pint Kit (473 ml)	Resin Hardener Serrated Spatula
S26262-50EZ	Waylock® II EZ Tube Kit* – 50 ml	Dual Syringe Nozzle Serrated Spatula
S26262-200EZ	Waylock® II EZ Tube Kit* – 200 ml	Dual Syringe Nozzle Serrated Spatula

* If ordering the EZ Tube Kit, dispensing gun must be ordered separately.

Ordering Information – metric

Thicknesses and minimum lengths of roll for Turcite® materials are given in Table 6. Widths are available between 1 and 610 mm. When creating Article Numbers for ordering, the desired width should be standardized to four digits, for example, a 10 mm width becomes ‘0010’ and a 250 mm width becomes ‘0250’. When ordering using the metric part number system, Turcite® Slydway® comes etched on one side as standard, indicated by the ‘0’ as the fifth digit.

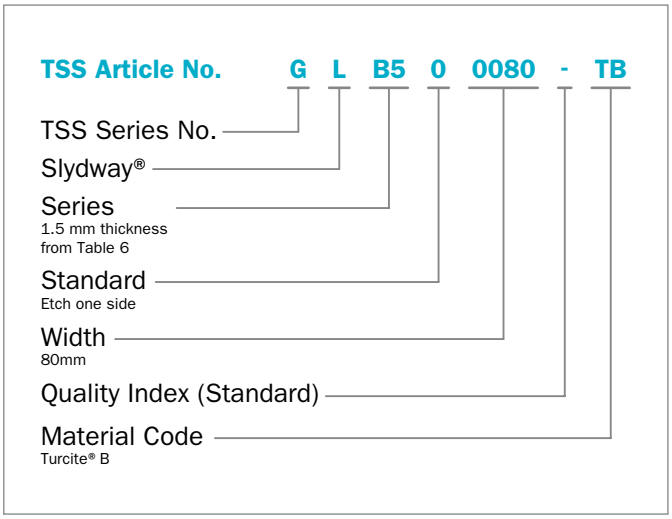
Table 6: Series number in relation to thickness and roll length for metric

Series	Thickness (mm)	Minimum Length of Roll (m)
A5	0.5	50
A6	0.6	40
A8	0.8	33
B0	1	24.4
B2	1.2	20
B5	1.5	18
B6	1.6	15.5
B7	1.7	15
C0	2	13
C5	2.5	9.5
D0	3	8
D5	3.5	6.5
E0	4	5.5
E5	4.5	5
F0	5	4.5

ORDERING EXAMPLE – METRIC

Turcite® Slydway® in Turcite® B for linear bearings with thickness 1.5 mm and width 80 mm.

Thickness:	1.5 mm
Width:	80 mm
Material:	Turcite® B
TSS Part No.:	GLB500080 - TB



■ Ordering Information – Inch

When creating Article Numbers for ordering, the desired width in decimal inches should be standardized to five digits and multiplied by 1000. For example, a 1.059 inch width becomes ’01059’ and a 10 inch width becomes ‘10000’. Widths are available between one and 24 inches. In the inch part number system, the third digit indicates etching: ‘0’ for unetched, ‘1’ for single-sided etching and ‘2’ for double-sided etching.

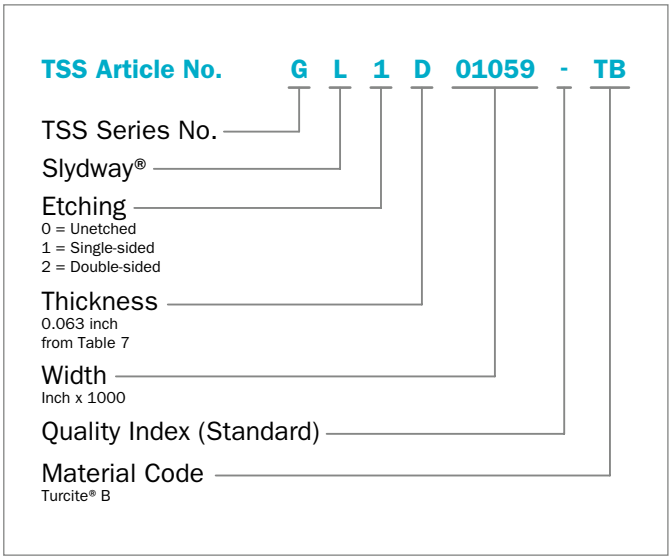
Table 7: Series number in relation to thickness and roll length for inch

Series	Thickness (inch)	Minimum Length of Roll (feet)
A	0.016	210
B	0.031	120
C	0.047	70
D	0.063	52
E	0.094	35
F	0.125	24
G	0.156	20
H	0.188	15.5
J	0.250	5
K	0.078	44

ORDERING EXAMPLE – INCH

Turcite® Slydway® ® in Turcite® B for linear bearings with thickness 0.063 inch and width 1.059 inch., etched on one side.

Thickness:	0.063 inch
Width:	1.059 inch
Material:	Turcite® B
TSS Part No.:	GL1D01059



■ Etched Turcite® Slydway® Storage Guidelines

Turcite® Slydway® should be stored and sealed at room temperature in a moisture-free environment away from UV light. Under these optimal conditions, etched Turcite® Slydway® material can last up to one year before use. The etched surface will degrade in less than 6 months if these guidelines are not followed which can adversely affect bonding adhesion. Unetched Turcite® Slydway® will have an unlimited shelf life.

Indicators of etchant degradation:

- **Color Change:**
  A change in color from the original dark brown to a light brown/tan, if the material has a marbled (multi-shaded) look, it may no longer be viable to use
- **Hydrophobicity (droplet test):**
  Add a drop of water to the etchant surface. If the water droplet forms a ball and rolls around the surface, it has become hydrophobic and the etch effectiveness has been lost. If the water spreads out when applied, the etched surface is still good.
- **Reduced Adhesion:**
  If the etched surface no longer bonds well to the substrate material, it may be a sign of degradation.

General Quality Criteria

The cost-effective use of seals and bearings is highly influenced by the quality criteria applied in production. Seals and bearings from Trelleborg Sealing Solutions are continuously monitored according to strict quality standards from material acquisition through to delivery.

Production facilities are certified according to relevant quality management system standards. Depending on the requirements of the customer or market and in addition to the current ISO 9001, these locations may have further certifications: IATF 16949 for Automotive customers, EN/AS 9100 for Aerospace customers, ISO 13485 for Healthcare & Medical customers and ISO 29001 for Oil & Gas customers. This enables us to provide all market segments with the required quality standards.

Our quality policy is consistently controlled by strict procedures and guidelines which are implemented within all areas of the company.

All testing of materials and products is performed in accordance with accepted test standards and specifications, e.g. random sample testing in accordance with ISO 2859-1 AQL 1.0 general inspection level II, normal inspection.

Inspection specifications correspond to standards applicable to individual product groups (e.g. for O-Rings: ISO 3601).

Guidelines for the Storage of Polymer Products Based on ISO 2230

Many polymer products and components are stored for long periods of time before being put into service, so it is important they are stored in conditions that minimize unwanted changes in properties. Such changes may result from degradation, in which case they may include excessive hardening, softening, cracking, crazing and other surface effects. Other changes may be caused by deformation, contamination or mechanical damage.

Packaging
Unless otherwise specified in the appropriate product specification, rubber products should be enclosed in individual sealed envelopes. The packaging should be carried out in an atmosphere in which the relative humidity is less than 70%, or if polyurethanes are being packed, less than 65%. Where there is serious risk of ingress of moisture (e.g. rubber-metal-bonded parts), aluminum foil/paper/polyethylene laminate or other similar means of protection should be used to ensure protection from ingress of moisture.

Temperature
The preferred storage temperature for elastomer parts is +15 °C (+59 °F) and should not exceed +25 °C (+77 °F). The products should be stored away from direct sources of heat such as boilers, radiators and direct sunlight. If the storage temperature is below +15 °C (+59 °F), care should be exercised during handling of stored products, as they may have stiffened and have become susceptible to distortion if not handled carefully.

Humidity
The relative humidity should be such that, given in the variations of temperature in storage, condensation does not occur. In all cases, the relative humidity of the atmosphere in storage should be less than 70%, or if polyurethanes are being stored, less than 65%.

Light
Rubber should be protected from light sources, in particular direct sunlight or intense light having a high ultra-violet content. It is advisable that any windows of storage rooms be covered with a red or orange coating or screen.

Radiation
Precautions should be taken to protect stored products from all sources of ionizing radiation likely to cause damage to the products.

Ozone
Ozone has a particularly harmful effect on rubber. Storage rooms should not contain any equipment that is capable of generating ozone, such as mercury vapor lamps or highvoltage electrical equipment giving rise to electric sparks or electrical discharges. Combustion gases and organic vapors should also be excluded, as they may give rise to ozone via photo-chemical processes. When equipment such as a fork-lift truck is used to handle large rubber products, care needs to be taken to ensure this equipment is not a source of pollution that may affect the rubber. Combustion gases should be considered separately. While they are responsible for generating ground-level ozone, they may also contain unburned fuel which, by condensing on rubber products, can cause additional deterioration.

Deformation
Rubber should be stored free from tension, compressive stresses or other causes of deformation. Where products are packaged in a strain-free condition, they should be stored in their original packaging. In case of doubt, the manufacturer's advice should be sought. It is advisable that rings of large internal diameter are formed into three equal loops so as to avoid creasing or twisting. It is not possible to achieve this condition by forming just two loops.

Contact with liquids and semi-liquid materials
Rubber should not be allowed to come into contact with liquid or semi-liquid materials (for example, petrol, greases, acids, disinfectants, cleaning fluids) or their vapors at any time during storage, unless these materials are by design an integral part of the product or the manufacturer's packaging. When rubber products are received coated with their operational media, they should be stored in this condition.

Contact with metals
Certain metals and their alloys (in particular, copper and manganese) are known to have harmful effects on some rubbers. Rubber should not be stored in contact with such metals except when bonded to them. They should be protected by wrapping in, or by separation with, a suitable material, e.g. paper or polyethylene.

Contact with dusting powder
Dusting powders should only be used for the packaging of rubber items in order to prevent adhesion. In such cases, the minimum quantity of powder to prevent adhesion should be used. Any powder used should be free from any constituent that would have a harmful effect on the rubber or the subsequent application of the rubber.

Contact between different products
Contact between products made from rubbers of different compositions should be avoided. This includes products of the same type but differing in color.

Rubber-to-metal bonded products
The metal part of rubber-to-metal bonded products should not come into contact with the rubber of other products. Preservative used on the metal should be of a type that it will not adversely affect the rubber or the bond to such an extent that it does not comply with the product specification.

Storage life
This is the maximum period of time that a rubber product, appropriately packaged, may be stored. After this time the product is regarded as unserviceable for the purposes for which it was originally manufactured. The storage life of a rubber product is influenced by its shape and size as well as its composition. Thick products usually undergo slower changes through degradation than thinner ones.

Initial storage period
This is the maximum period, starting from the time of manufacture, for which a rubber product, appropriately packaged, may be stored under specified conditions before a sample needs to be inspected or re-tested.

Extension storage period
This is the period for which a rubber product, appropriately packaged, may be stored after the initial storage period, before further inspection and re-testing is necessary.

Assembly
These are products or components containing more than one element, one or more of which is made of rubber. Generally it is not recommended to store elastomeric products in an assembled condition. If it is necessary to do so, the units should be checked more often. The inspection interval depends on the design and geometry of the components.

Inspection before extension storage
Before any items are to be stored for an extension period, representative samples of each type should be selected for inspection at the end of the appropriate initial storage period. Inspection should be in accordance with the relevant product specification.

Visual inspection
Inspect each of the items for the following:
1. Permanent distortions, such as creases or flats.
2. Mechanical damage, such as cuts, tears, abraded areas or delaminated plies.
3. Surface cracking when viewed under a microscope at x10 magnification.
4. Changes in surface condition, such as hardening, softening or tackiness.

Assessment at the end of the initial period
If, following the visual inspection procedure the items are not satisfactory, they should not be stored for an extended period. If the items are satisfactory and are stored for an extended period a record should be kept of the date initial storage began as well as the date the extended storage period began. Items stored for an extended period should be inspected and tested at, or before, the expiry of the extension storage period before they are put into service or stored for a further extended period.

Table 8: Material Group Initial Storage Period Extended Storage Period

Material Group	Initial Storage Period	Extended Storage Period
AU, EU, NR, SBR	5 years	2 years
ACM, AEM, CR, ECO, HNBR, IIR, NBR	7 years	3 years
CSM, EPDM, FKM, VMQ, FVMQ	10 years	5 years
FFKM Isolast®	20 years	5 years
Zurcon®	10 years	5 years
PTFE	unlimited	

Note 1: Reference the PTFE Initial Storage Period for Turcite® materials.
Note 2: If the storage temperature is over or under +25 °C (+77 °F) this will influence the storage time. Storage at +10 °C (+50 °F) higher will reduce the storage time by about 50%. Storage at +10 °C (+50 °F) lower will increase the storage time by around 100%.
Note 3: In application areas such as aerospace, the storage periods can differ from this specification. These specific storage conditions have to be agreed between the supplier and the buyer.
Note 4: Etched PTFE should be stored in the same way as non-etched PTFE.

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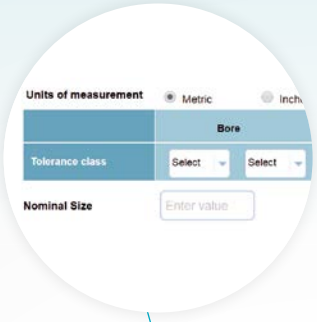
Design Support & Engineering Tools



ONLINE TOOLS MAKE LIFE EASIER

Trelleborg Sealing Solutions has developed a number of online tools that make the working life of an engineer specifying seals easier. All these industry-leading tools are available free-of-charge from the Trelleborg Sealing Solutions website at www.trelleborg.com/seals. To use these advanced services all you have to do is register on the Members Area.

There is also a continually increasing range of innovative engineering apps available for smartphones, both for iOS and Android devices. Just search for "Trelleborg" in the App Store or GooglePlay to find the tools to optimize your daily productivity.

Materials Search and Chemical Compatibility Check

These two programs allow you to find out the compatibility of sealing materials with hundreds of different media and help identify the most suitable material for your application.

Sealing Solutions Configurator

The Sealing Solutions Configurator is the first tool of its kind offered by any seal supplier. It allows engineers to identify a proven sealing solution for their specific application in just four easy steps.

Technical Proposals Online

Enhance your communication with Trelleborg Sealing Solutions with the Technical Proposals Online tool. Instantly access all your proposed solutions anywhere at any time and benefit from quicker dialog with our sealing specialists.

ISO Fits & Tolerances

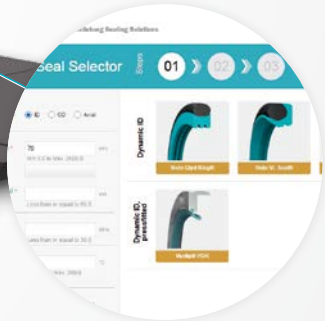
Our Fits & Tolerances Calculator allows you to easily determine type of fits using the tolerances according to DIN ISO 286. In addition, upon entering the nominal diameter the tool calculates lower and upper limit deviations plus the maximum and minimum interferences dependent on the selected tolerance classes for bore and shaft.

Versatile CAD Service

The CAD download functionality provides thousands of drawings of a wide range of seals. It gives the option of 2- or 3-dimensional files in a range of formats to suit most commonly used CAD systems.

Hydraulic System Calculator

Hydraulic System Calculator helps you design a solution around the cylinder which may involve motor, pump, orifice and pipe calculations. The application is in compliance with ISO 3320, ISO 3321 & ISO 4393.



Rotary Seal Selector

The Rotary Seal Selector allows you to search through the wide range of rotary seals and materials available based on application conditions and offers detailed information on installation and seal capabilities.

O-Ring Calculator

An industry-leading tool, the easy to use O-Ring calculator includes sizing capabilities, compression forces, design parameter recommendations and complete measurements. Results and comments may be printed, shared or filed as PDF.

Discover our design support and engineering tools at **www.trelleborg.com/seals**

Mobile Tools & Apps

We understand the needs of engineers on the go. Check out our latest mobile tools and apps, ranging from an O-Ring calculator to unit and hardness converters. Just search for "Trelleborg" in the App Store or Google Play to find the tools to optimize your daily productivity.

Android App on **Google Play**

MANY MORE APPS available

Available on the **APP STORE**

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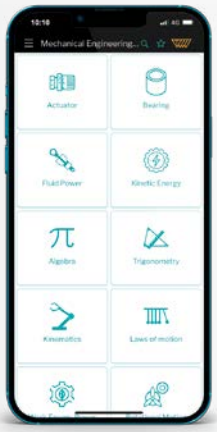
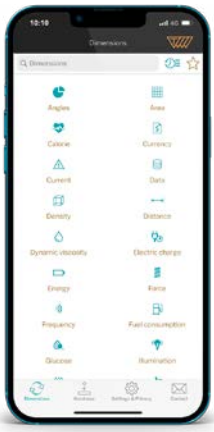




ISO Fits & Tolerances

Simply enter the nominal diameter and select the tolerance classes for bore and shaft to find the complete ISO fits definition. It contains all relevant values, including type of fit, with handy graphs to illustrate the classes by bore and shaft. The results of this application are based on DIN ISO 286.

Mechanical Engineering Calculator

A useful app containing over 250 formula calculators in 16 categories, with more being added with every update. Categories include the fields of mathematics, physics and mechanical engineering.

Aerospace Groove Selector

This app covers five of the most important SAE Aerospace groove standards for hydraulic systems, making it quick and easy to find the size of grooves and hardware needed. Includes dimensions for AS4716 Rev B, AS5857 Rev A, AS6235 Rev A, AS4088 Rev E and AS4832 Rev A.

Installation Instructions

Videos demonstrate the best practice methods for installing seals, providing all relevant documentation within the interface. It guides you to successful installation of Radial Oil Seals, Mechanical Face Seals and Turcon® and Zurcon® rod and piston seals.

Converter – Universal

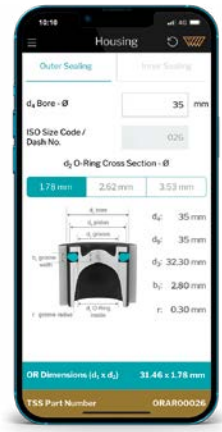
By simply selecting the dimension and entering a value for conversion, the app offers a wide range of engineering and scientific units for each dimension. It also has other useful features like currency conversion, timezone conversion, percentage calculations, a running pace calculator and more.

in the groove

Our *in the groove* magazine provides news, technical and product information on seals, as well as insights into the markets they are used in. The magazine is also available in print and as an interactive PDF.

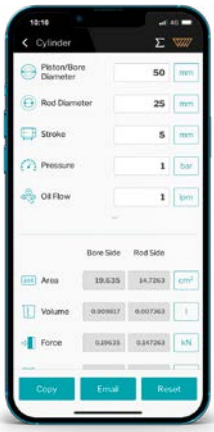
Rotary Seal Selector

This app is specifically for the selection of rotary seals based on application information, including size, operating parameters and the lubricant used. It also considers installation type and seal function.



O-Ring Selector

When a user enters installation specifications into the O-Ring Selector app, such as the bore or rod/shaft diameter, the app quickly calculates O-Ring and housing dimensions in both metric and inch. Standards covered are ISO 3601-1, NFT 47-502, JIS B 2401 and SMS 1586.



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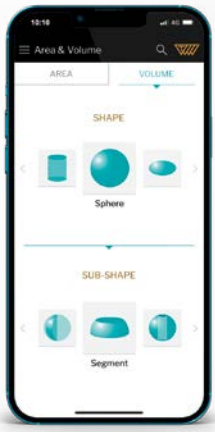
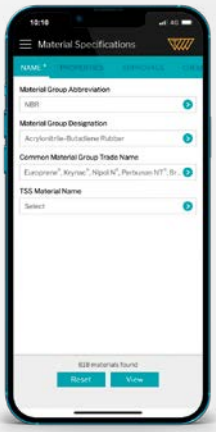


Area and Volume Calculator

Speeds up and simplifies calculating the area and volume of more than 170 geometric shapes. The app supports both metric and inch, and conveniently displays the formulas used. Fill your shape with solids or liquids, choosing from 1500 different materials to calculate the weight.

Healthcare Materials

A quick and easy overview of the compatibility of 34 materials with 35 chemical environments that are commonly encountered in the healthcare and medical industries. Select up to 20 materials and environments at once to produce a chart that rates each material from 'excellent' to 'not recommended'.



Sealing Materials Selector

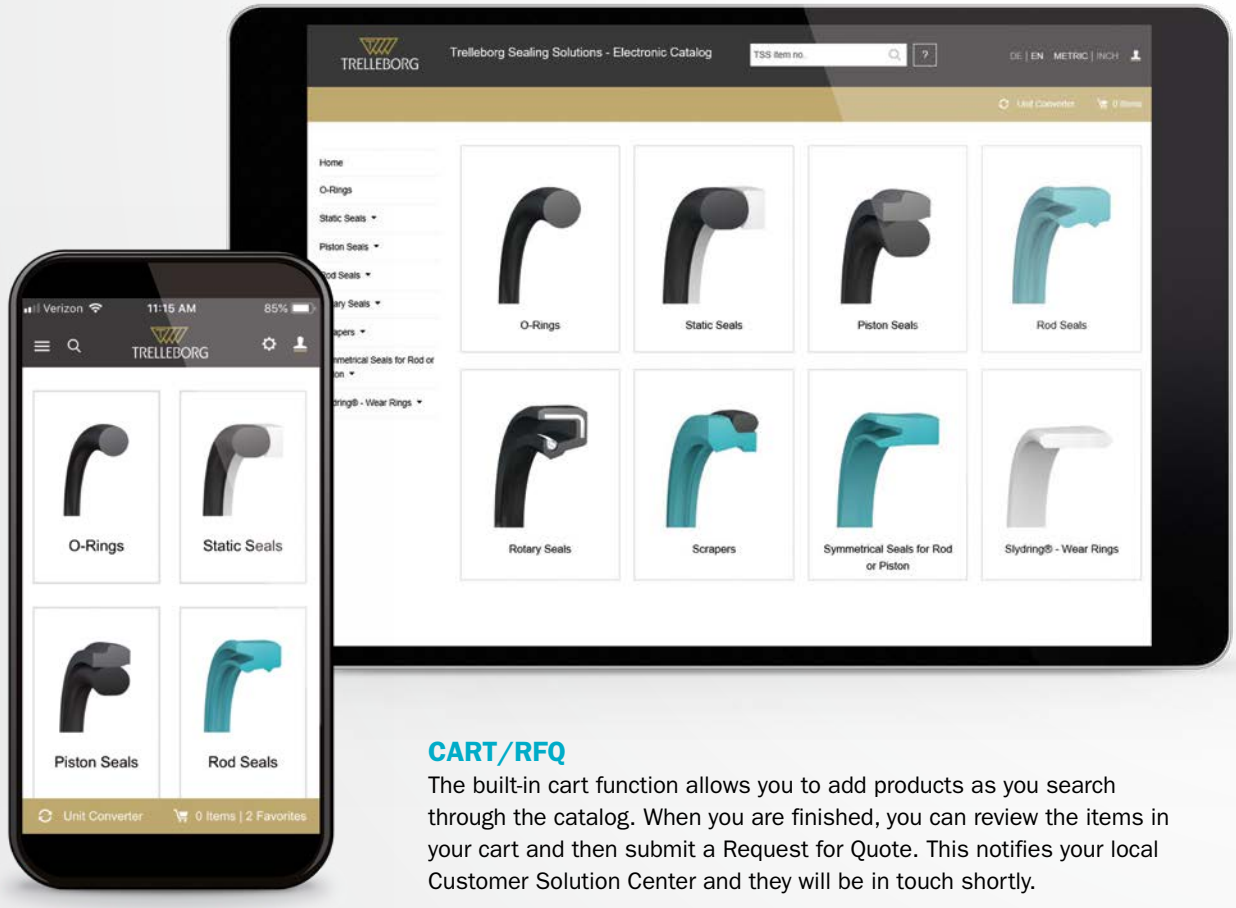
Enter material specifications and required parameters, such as application temperature or hardness, to receive instant material proposals. The app features filters to limit searches based on chemical compatibility, institute approvals and product type. Data sheets can be requested from within the interface.

Electronic Catalog

Discover the Electronic Catalog online as an app or on our website

The Electronic Catalog is a user-friendly service that connects you to the broad range of products Trelleborg Sealing Solutions offers. The products are arranged based on product type and product group, making it easy to find the exact one you need.

Many functions are also included within the Electronic Catalog that allow you to understand product capabilities, compare similar seals, request a quote and much more. The Electronic Catalog is available from the Trelleborg Sealing Solutions website and in the App Store and GooglePlay for mobile use.

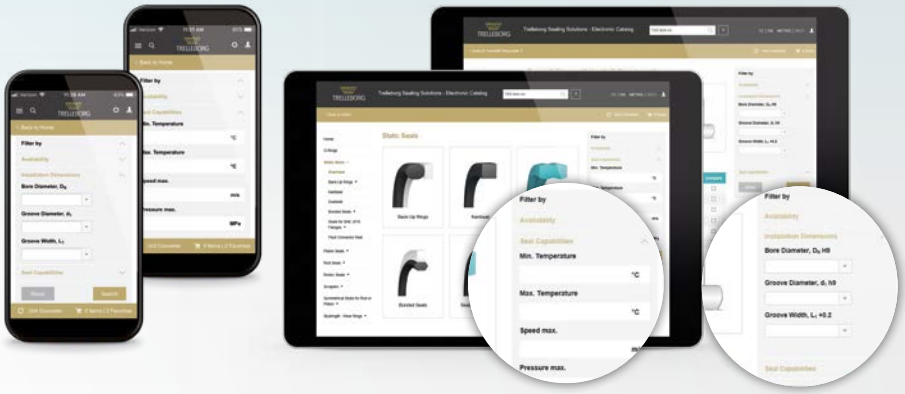


CART/RFQ

The built-in cart function allows you to add products as you search through the catalog. When you are finished, you can review the items in your cart and then submit a Request for Quote. This notifies your local Customer Solution Center and they will be in touch shortly.

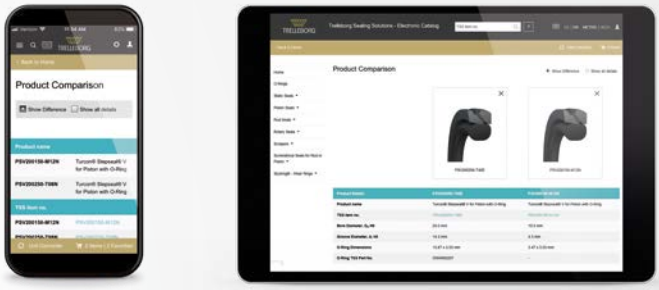
FILTERING

If you have specific operating conditions that the seal must meet and/or installation dimensions, the Electronic Catalog offers a filtering function within the product groups. Here you can input your temperatures, pressure, speed and various installation dimensions to filter products that can meet your needs.



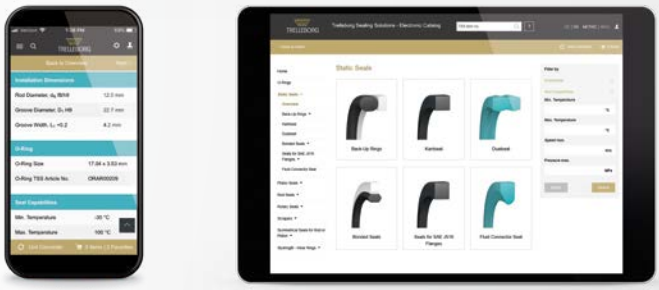
PRODUCT COMPARISON

When looking through the catalog, you can choose to compare multiple products. The product comparison function allows you to select which products you are interested in, and then puts all relevant information into a table for your review. You can even choose to display all product details side by side or to only show the fields where they differ.



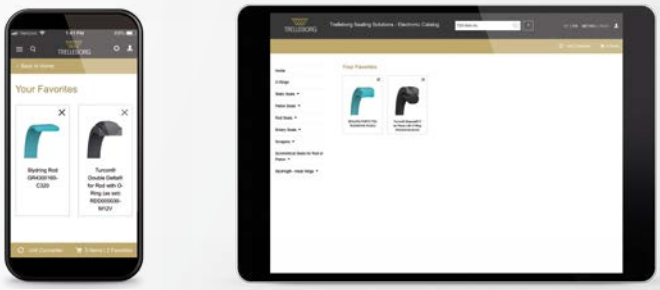
PRODUCT INFORMATION

Detailed product information is available for each part number. Once you select a specific part number, you will be able to see its installation dimensions, seal capabilities, related catalogs and other information. From this page, registered users can access the material data sheets that are applicable to the part number.



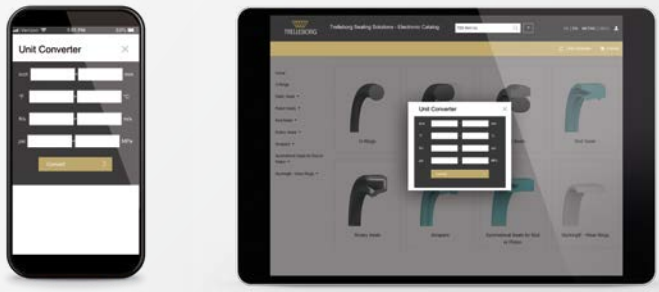
ADD TO FAVORITES

Do you have a part that you frequently look up or need information on? You can now save any of our part numbers as a favorite that is linked to your account. Anytime you log in to the Electronic Catalog, your favorites will be a click away!



UNIT CONVERTER

If you are looking at a product and need to know the conversion between metric and imperial, you can use the Unit Converter tool that is available at the top of the screen for web users and at the bottom for mobile.



Trelleborg is a world leader in engineered polymer solutions that protect essential applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

Trelleborg Sealing Solutions is a leading developer, manufacturer and supplier of precision seals, bearings and custom-molded polymer components. It focuses on meeting the most demanding needs of aerospace, automotive and general industrial customers with innovative solutions.

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