

# iglidur® UW500

**For use in hot liquids.** iglidur® UW500 was developed for underwater applications at temperatures up to +250 °C. In addition, the bearings will run in chemicals which would act as a lubricant.



For underwater use  
at high temperatures

For fast and  
constant movements



### When to use it?

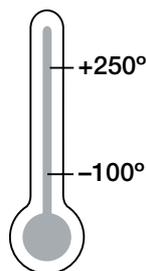
- When bearings need to be used in liquids
- For high speeds
- For high temperatures
- When a high chemical resistance is required



### When not to use it?

- When a cost-effective underwater bearing is required  
▶ **iglidur® UW, page 475**
- When a cost-efficient underwater bearing is sought for rare operations  
▶ **iglidur® H, page 325**
- When a cost-effective universal bearing is required  
▶ **iglidur® G, page 61**

### Temperature



### Product range

on request



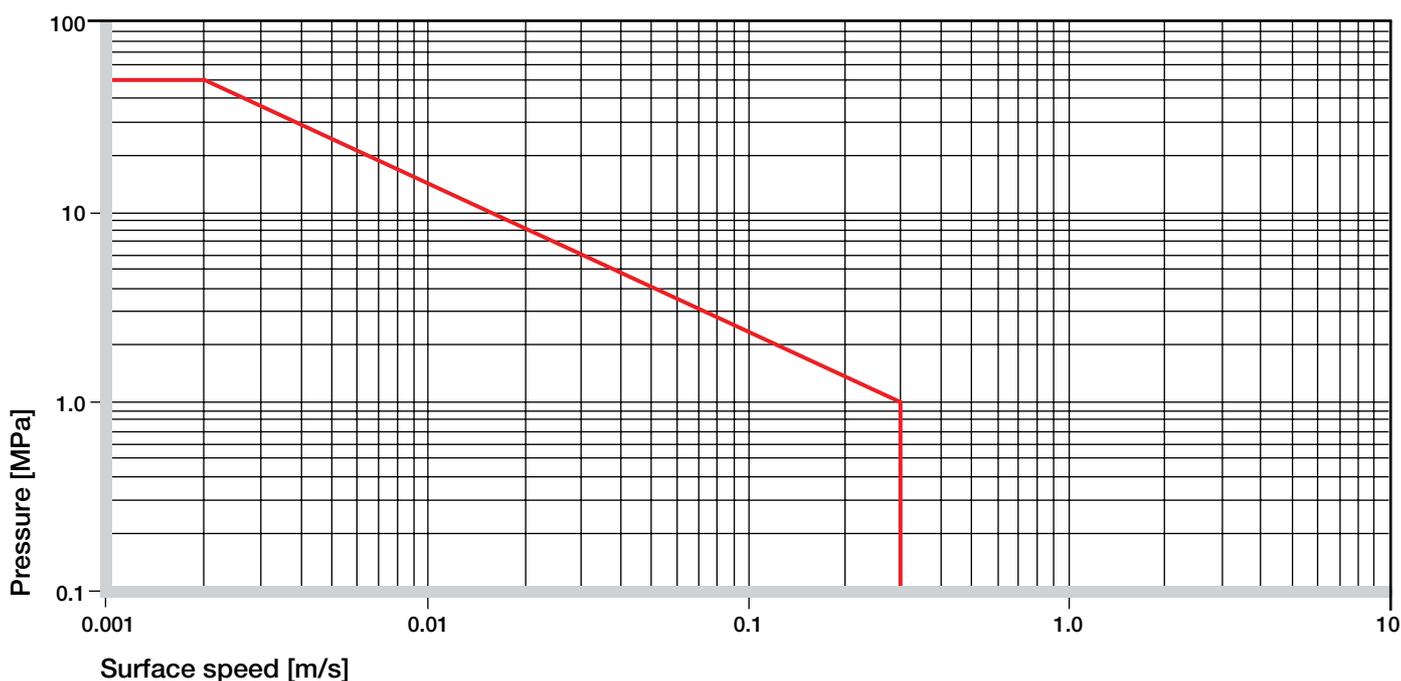
Material data			
General properties	Unit	iglidur® UW 500	Testing method
Density	g/cm <sup>3</sup>	1.49	
Colour		black	
Max. moisture absorption at +23 °C/50 % r.h.	% weight	0.1	DIN 53495
Max. water absorption <sup>3)</sup>	% weight	0.5	
Coefficient of sliding friction, dynamic against steel	μ	0.20–0.36	
pv value, max. (dry)	MPa · m/s	0.35	
Mechanical properties			
Modulus of elasticity	MPa	16,000	DIN 53457
Tensile strength at +20 °C	MPa	260	DIN 53452
Compressive strength	MPa	140	
Max. recommended surface pressure (+20 °C)	MPa	140	
Shore D hardness		86	DIN 53505
Physical and thermal properties			
Max. long term application temperature	°C	+250	
Max. short term application temperature	°C	+300	
Min. application temperature <sup>1)</sup>	°C	+315	
untere Anwendungstemperatur	°C	-100	
Thermal conductivity	W/m · K	0.60	ASTM C 177
Coefficient of thermal expansion (at +23 °C)	K <sup>-1</sup> · 10 <sup>-5</sup>	4	DIN 53752
Electrical properties <sup>2)</sup>			
Specific volume resistance	Ωcm	< 10 <sup>9</sup>	DIN IEC 93
Surface resistance	Ω	< 10 <sup>9</sup>	DIN 53482

<sup>1)</sup> Without additional load; no sliding movement; relaxation possible

<sup>2)</sup> The good conductivity of this plastic material under certain circumstances can favour the formation of corrosion on the metallic contact component

<sup>3)</sup> With respect to the use of the material in direct contact with water, it has to be pointed out that all results have been attained under laboratory conditions DW (fully demineralised water). We therefore recommend custom-designed tests under real application conditions.

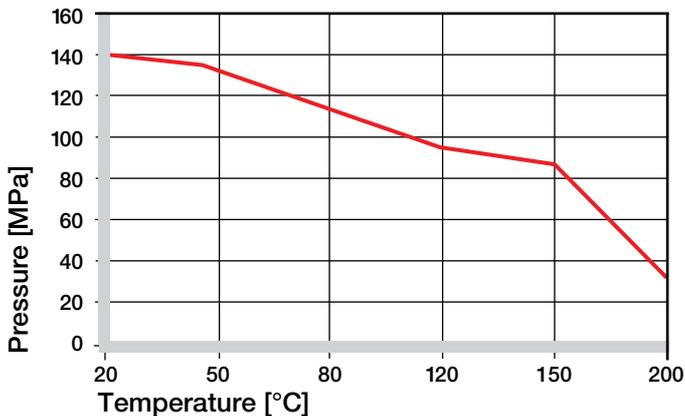
Table 01: Material data



Graph 01: Permissible pv values for iglidur® UW500 with a wall thickness of 1 mm dry running against a steel shaft at +20 °C, mounted in a steel housing

## Mechanical Properties

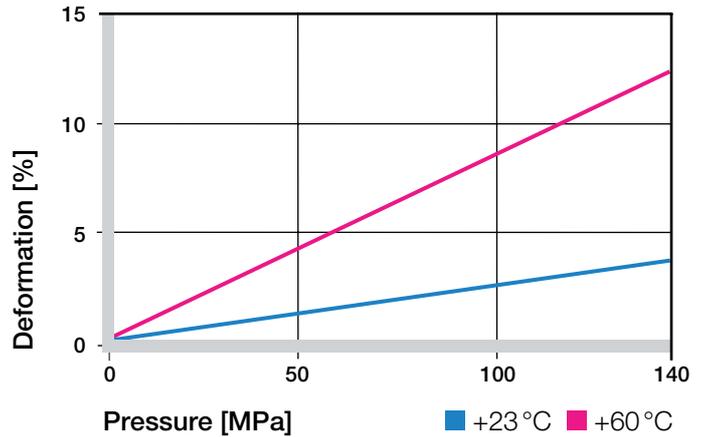
The recommended maximum surface pressure is a mechanical material parameter. No conclusions regarding the tribological properties can be drawn from this. With increasing temperatures, the compressive strength of iglidur® UW500 plain bearings decreases. The Graph 02 shows this inverse relationship. Of +200 °C the permissible surface pressure is almost 35 MPa.



**Graph 02: Recommended maximum surface pressure as a function of temperature (130 MPa at +20 °C)**

The plain bearings of iglidur® UW500 were developed for underwater applications with high temperatures. Examples for this are water pumps in automotive engineering, but also the field of medical engineering and related fields. iglidur® UW500 can be used in applications with continuous temperatures of +150 °C. If the bearings are additionally secured, these temperatures can even exceed +200 °C. Unless the underwater operation is explicitly stated, the information in this chapter describes iglidur® UW500 in when running dry. Graph 03 illustrates how iglidur® UW500 plain bearings elastically deform under load. Graph 01 on the preceding page shows the maximum pv values at room temperature. The high pv values are attained by the high temperature resistance.

► Surface Pressure, page 43



**Graph 03: Deformation under pressure and temperature**

## Permissible Surface Speeds

iglidur® UW500 bearings can be used both dry running and in media like water in a wide range of conditions. Permitted surface speeds iglidur® UW500 is excellent in both dry and wet operations. Through a hydrodynamic lubrication, attained under water with high speeds, surface speeds far above 2 m/s can be achieved. In dry operation the iglidur® UW500 bearings can be used anyhow up to 1.5 m/s on the short term.

► Surface Speed, page 45

m/s	Rotating	Oscillating	Linear
Continuous	0.8	0.6	2
Short term	1.5	1.1	3

**Table 02: Maximum running speed**

## Temperatures

iglidur® UW500 can be used in applications with permanent temperatures of +150 °C. If the bearings are fixed specially, the temperatures can even be higher than +200 °C. iglidur® UW500 are among the most temperature-resistant iglidur materials, tolerating temperatures of up to +250 °C permanently. Short-term it can even be heated up to +315 °C! Nonetheless, the pressfit can be loosened over a temperature of +150 °C due to relaxation. We therefore recommend to secure the bearing axially if these temperatures are reached in the application.

► Application Temperatures, page 46

iglidur® UW500	Application temperature
Minimum	-100 °C
Max. long term	+250 °C
Max. short term	+300 °C
Add. securing is required	+150 °C

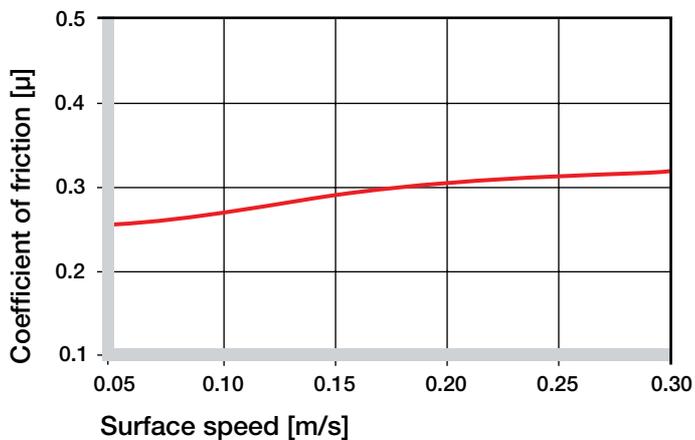
**Table 03: Temperature limits**

## Friction and Wear

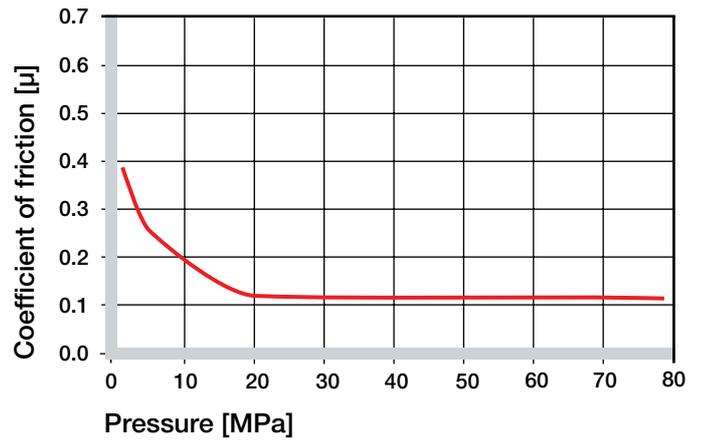
With increasing load the friction of the bearing system with iglidur® UW500 bearings declines. Instead of that the coefficient of friction rises with increasing speed. This illustrates the excellent suitability of iglidur® UW500 bearings with high loads. Friction and wear also depend to a high degree on the reverse partner. Extremely smooth and extremely coarse shafts enhance the coefficient of friction of the bearing. Ideal are smoothed surfaces with an average surface finish of Ra of 0.1 to 0.4.

► Coefficients of Friction and Surfaces, **page 48**

► Wear Resistance, **page 49**



**Graph 04: Coefficient of friction as a function of the running speed, p = 0.75 MPa**

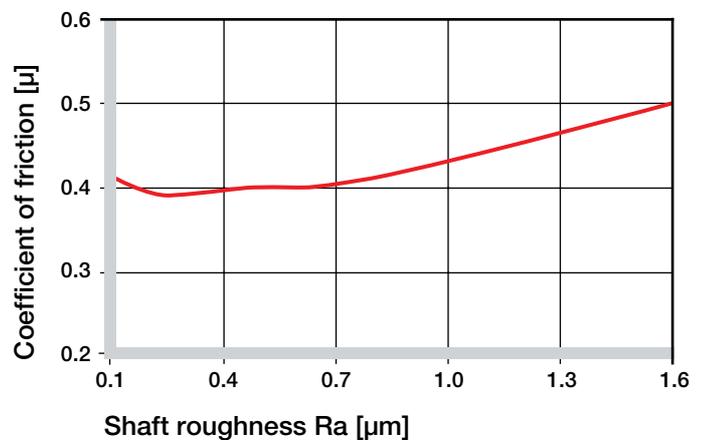


**Graph 05: Coefficient of friction as a function of the pressure, v = 0.01 m/s**

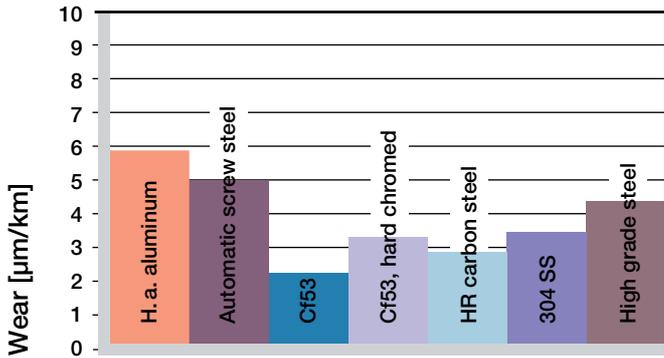
## Shaft Materials

The Graphs 06–09 display a summary of the results of tests with different shaft materials conducted with bearings made of iglidur® UW500. With low loads in the rotating application, the coefficients of wear are ideal with Cf53 shafts.

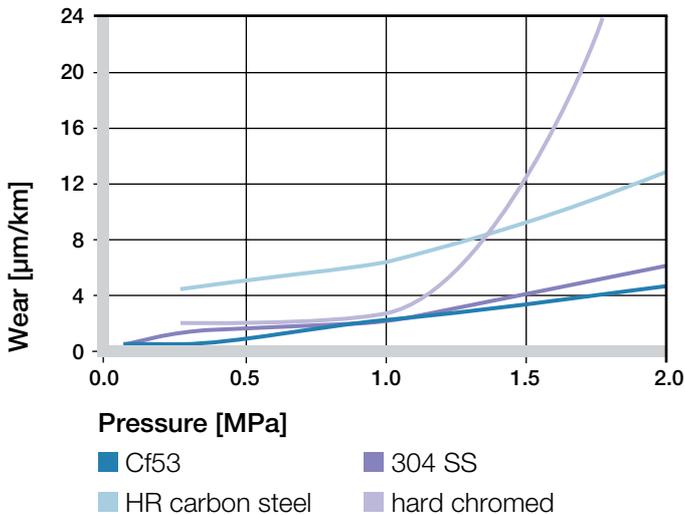
► Shaft Materials, **page 51**



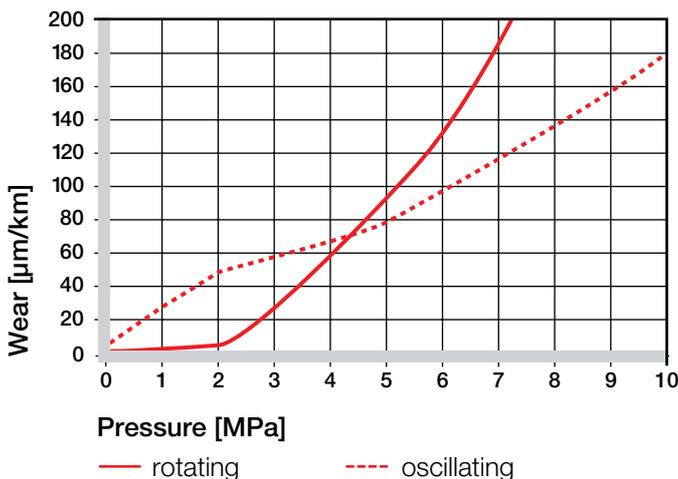
**Graph 06: Coefficient of friction as function of the shaft surface (Cf53 hardened and ground steel)**



Graph 07: Wear, rotating with different shaft materials, pressure  $p = 0.75 \text{ MPa}$ ,  $v = 0.5 \text{ m/s}$



Graph 08: Wear with different shaft materials in rotational operation, as a function of the pressure



Graph 09: Wear for oscillating and rotating applications with shaft material Cf53 hardened and ground steel, as a function of the pressure

iglidur® UW500	Dry	Greases	Oil	Water
C. o. f. $\mu$	0,2–0,36	0,09	0,04	0,04

Table 04: Coefficient of friction against steel ( $R_a = 1 \text{ }\mu\text{m}$ , 50 HRC)

## Additional Properties

### Chemical Resistance

iglidur® UW500 bearings have almost universal chemical resistance. They are affected only by concentrated nitric acid and sulfuric acid.

► Chemical Table, page 974

Medium	Resistance
Alcohol	+
Hydrocarbons	+
Greases, oils without additives	+
Fuels	+
Diluted acids	+
Strong acids	+
Diluted alkalines	+
Strong alkalines	+

**+** resistant **0** conditionally resistant **-** not resistant

All data given at room temperature [+20 °C]

Table 05: Chemical resistance

### Radiation Resistance

Plain bearings of iglidur® UW500 are radiation resistant up to a radiation intensity of  $1 \cdot 10^5 \text{ Gy}$ . With regard to radiation, iglidur® UW500 is one of the most resistant materials of the iglidur® range.

iglidur® UW500 is very resistant to hard gamma radiation and endures a radiation dose of 1,000 Mrad without noticeable losses of its characteristics. The material also endures an alpha or beta radiation 10,000 Mrad with practically no effect.

### UV Resistance

Under UV radiation and other atmospheric influences, the excellent material characteristics of iglidur® UW500 are not affected.

### Vacuum

Also in vacuum atmosphere, iglidur® UW500 plain bearings can be used almost without restrictions. Outgassing only takes place to a minor degree.

## Electrical Properties

iglidur® UW500 plain bearings are electrically conductive.

Volume resistance	< 10 <sup>9</sup> Ωcm
Surface resistance	< 10 <sup>9</sup> Ω 10

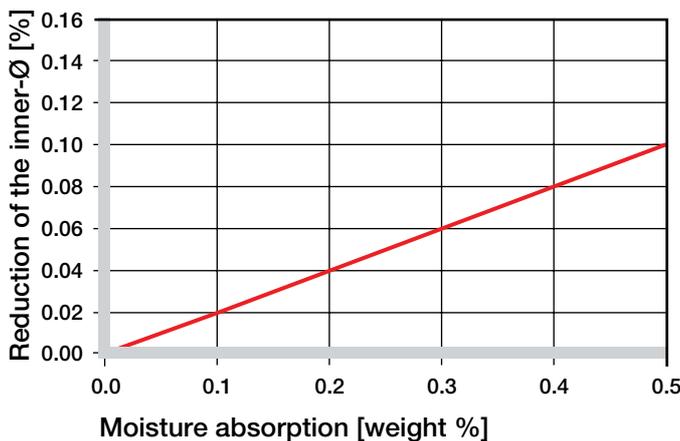
## Moisture Absorption

The moisture absorption of iglidur® UW500 plain bearings is extremely low. In standard atmosphere it is below 0.1 % by weight. Therefore, even with regard to applications under water, iglidur® UW500 plain bearings can be used without adjusting the fitting conditions. The maximum moisture absorption is 0.5 % by weight.

### Maximum moisture absorption

At +23 °C/50 % r.h.	0.1 % weight
Max. moisture absorption	0.5 % weight

**Table 06: Moisture absorption**



**Graph 10: Effect of moisture absorption on plain bearings**

## Installation Tolerances

iglidur® UW500 plain bearings are standard bearings for shafts with h-tolerance (recommended minimum h9). The bearings are designed for pressfit into a housing machined to a H7 tolerance. After being assembled into a nominal size housing, the inner diameter adjusts to meet the specified tolerances.

► Testing Methods, page 55

Diameter d1 [mm]	Shaft h9 [mm]	iglidur® UW500 F10 [mm]	Housing H7 [mm]
up to 3	0-0.025	+0.006 +0.046	0 +0.010
> 3 to 6	0-0.030	+0.010 +0.058	0 +0.012
> 6 to 10	0-0.036	+0.013 +0.071	0 +0.015
> 10 to 18	0-0.043	+0.016 +0.086	0 +0.018
> 18 to 30	0-0.052	+0.020 +0.104	0 +0.021
> 30 to 50	0-0.062	+0.025 +0.125	0 +0.025
> 50 to 80	0-0.074	+0.030 +0.150	0 +0.030

**Table 07: Important tolerances for plain bearings according to ISO 3547-1 after pressfit**

## Product Range

iglidur® UW500 plain bearings are manufactured to special order.