iglidur® UW

For fast rotation under water. The best iglidur® bearings for underwater applications. Extremely wear resistant under water, tested and free from maintenance. The first choice for pumping applications.

For underwater applications

For fast and constant motion

Long service life

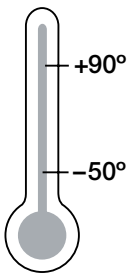
When to use it?

- For underwater applications and in liquid media
- For low loads
- For high speeds
- For extreme wear resistance in media-lubricated continuous operation

When not to use it?

- When temperatures are continuously higher than +90 °C
  ▶ **iglidur® UW500, page 313**
- When high loads are required
  ▶ **iglidur® H370, page 347**
  ▶ **iglidur® UW500, page 313**
  ▶ **iglidur® X, page 153**
- When only dry operation is feasible
  ▶ **iglidur® J, page 89**

Temperature



Product range

2 types
Ø 3–20 mm
more dimensions
on request

iglidur® UW | Application Examples

Typical sectors of industry and application areas

- Fluid technology etc.

Improve technology and reduce costs – 310 exciting examples for iglidur® plain bearings online

▶ **www.igus.eu/eu/iglidur-applications**

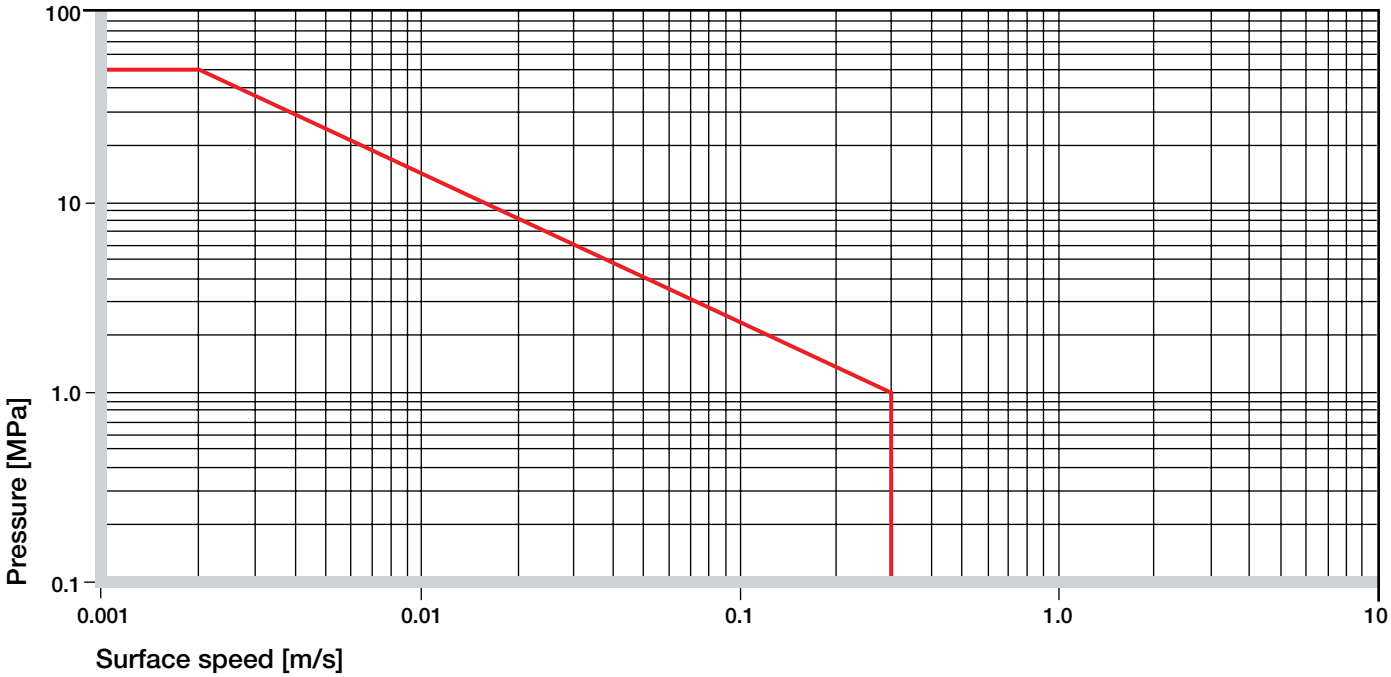
▶ **www.igus.eu/underwater-powerpump**

iglidur® UW | Technical Data

Material data			
General properties	**Unit**	**iglidur® UW**	**Testing method**
Density	**g/cm³**	1,52	
Colour		black	
Max. moisture absorption at +23 °C/50 % r. h.	**% weight**	0.2	DIN 53495
Max. moisture absorption	**% weight**	0.8	
Coefficient of sliding friction, dynamic against steel	**µ**	0,15–0,35	
pv value, max. (dry)	**MPa · m/s**	0,11	
Mechanical properties			
Modulus of elasticity	**MPa**	9.600	DIN 53457
Tensile strength at +20 °C	**MPa**	90	DIN 53452
Compressive strength	**MPa**	70	
Max. recommended surface pressure (+20 °C)	**MPa**	40	
Shore D hardness		78	DIN 53505
Physical and thermal properties			
Max. long term application temperature	**°C**	+90	
Max. short term application temperature	**°C**	+110	
Max. short term ambient temperature[1)]	**°C**	+140	
Min. application temperature	**°C**	–50	
Thermal conductivity	**W/m · K**	0,60	ASTM C 177
Coefficient of thermal expansion (at +23 °C)	**$K^{-1} \cdot 10^{-5}$**	6	DIN 53752
Electrical properties			
Specific volume resistance	**Ωcm**	$< 10^5$	DIN IEC 93
Surface resistance	**Ω**	$< 10^5$	DIN 53482

[1)] Without additional load, no sliding movement; relaxation possible
[2)] The good conductivity of this plastic material under certain circumstances can favour the generation of corrosion on the metallic contact component.
[3)] 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 (demineralised water). We therefore recommend custom-designed tests under real application conditions.

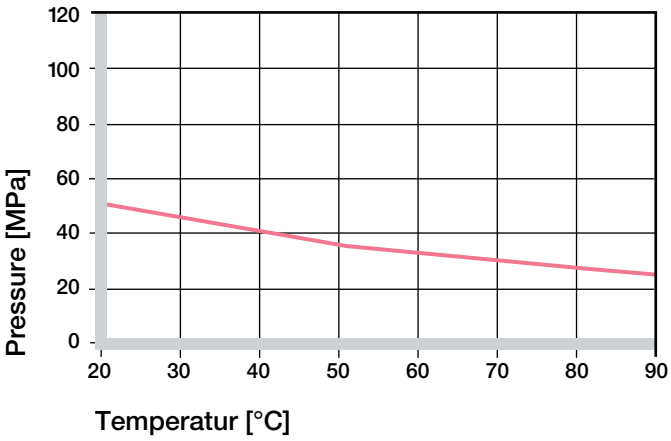
Table 01: Material data



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

Mechanical Properties

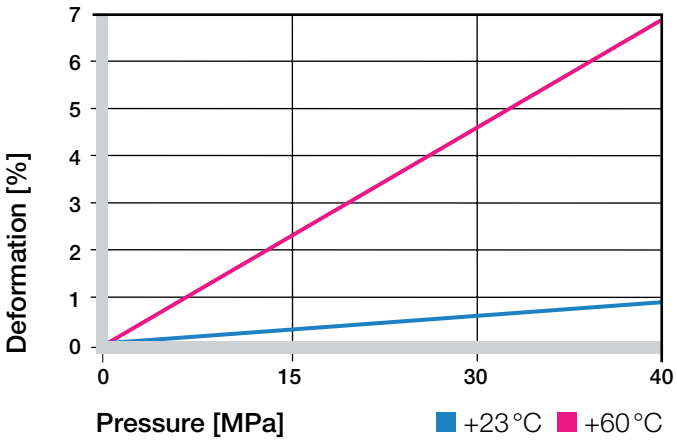
The recommended maximum surface pressure is a mechanical material parameter. No conclusions regarding the tribological properties can be drawn from this. With increasing temperatures, the compressive strength of iglidur® UW plain bearings decreases. The Graph 02 shows this inverse relationship. However, at the longterm maximum temperature of +90 °C the permissible surface pressure is almost 25 MPa.



Graph 02: Recommended maximum surface pressure as a function of temperature (50 MPa at +20 °C)

iglidur® UW was developed for underwater applications in which the maximum temperatures clearly lie below +100 °C. For application temperatures above this limit, the bearings made of iglidur® UW500 **(▶ page 313)** are available. Though iglidur® UW was developed for application in liquids, it is also suitable for dry operation. This one is particularly important in applications that call for both dry and wet operations. These applications can be seen often in practice. The features of the bearings made of iglidur® UW described in this section apply to the dry operation. Unless it is expressly mentioned otherwise. Graph 02 shows the permissible bearing loads at the respective temperatures. It can be said that iglidur® UW plain bearings are not very suitable for high loads. Normally in underwater applications there is no question of high loads being present. It is also important to note that the wear rate increases significantly from loads of 5 MPa (Graph 03).

▶ Surface Pressure, **page 43**



Graph 03: Deformation under pressure and temperature

Permissible Surface Speeds

iglidur® UW 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® UW 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	0,5	0,4	2
Short term	1,5	1,1	3

Table 02: Maximum running speed

Temperatures

As stated earlier, iglidur® UW plain bearings are recommended for the low temperature range. The bearing temperature can be up to 90 °C, although the frictional heat must also be considered here, especially when running dry. In underwater applications, the fluid aids heat dissipation, so in this case the temperature of the fluid is of greater importance.

▶ Application Temperatures, **page 46**

iglidur® UW	Application temperature
Minimum	–50 °C
Max. long term	+90 °C
Max. short term	+110 °C
Add. securing is required from	+80 °C

Table 03: Temperature limits

Friction and Wear

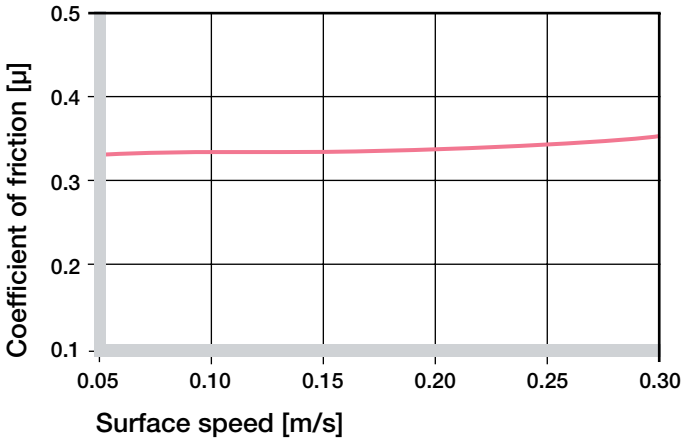
In dry operation the coefficient of friction rises up to 0.4 with low loads. With higher loads, it lowers to 0.1. The surface finishes of the shafts should not be extremely smooth in order to prevent a high adhesion effect and the entailing increases in the coefficient of friction.
Please contact us for the specifications of shaft surface finishes in underwater applications.

▶ Coefficients of Friction and Surfaces, **page 48**
▶ Wear Resistance, **page 49**

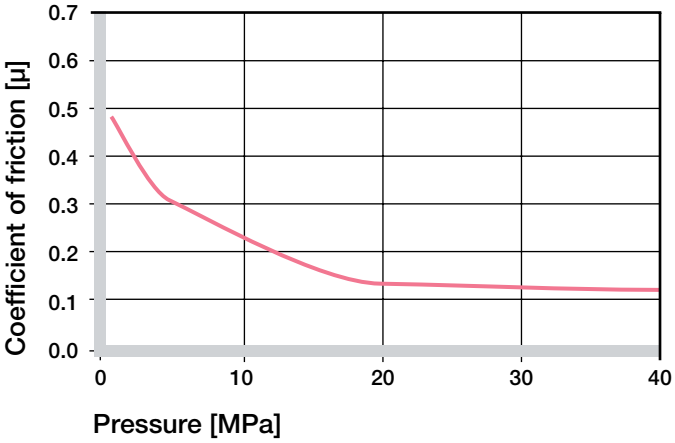
Shaft Materials

For low loads with rotation, the combinations achieve the best wear values with the stainless steels X90 and V2A. The conditions shift with increasing loads.
Graph 08 shows that this is more varied with increasing loads.

▶ Shaft Materials, **page 51**



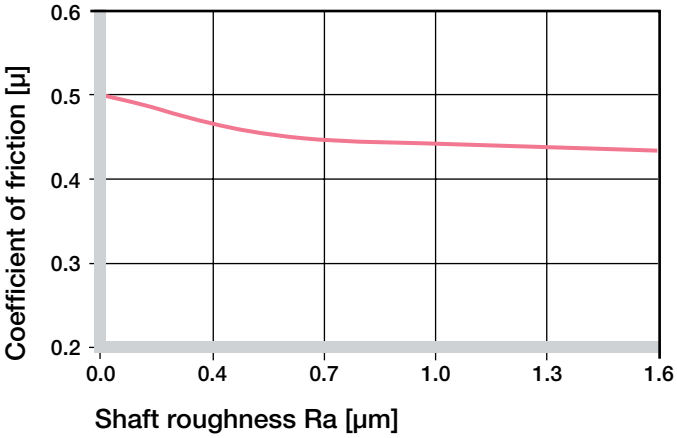
Graph 04: Coefficient of friction as a function of the running speed, p = 0,75 MPa



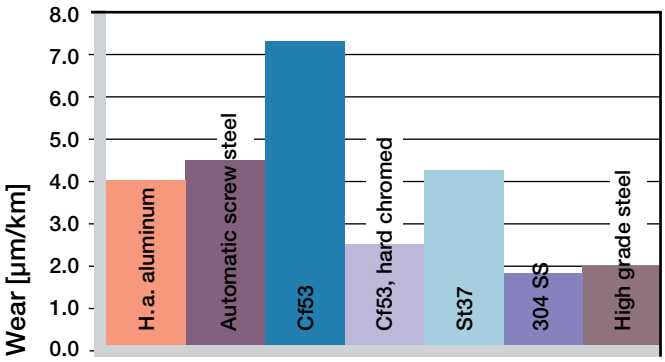
Graph 05: Coefficient of friction as a function of the pressure, v = 0,01 m/s

iglidur® UW	Dry	Greases	Oil	Water
C. o. f. µ	0,15–0,35	0,09	0,04	0,04

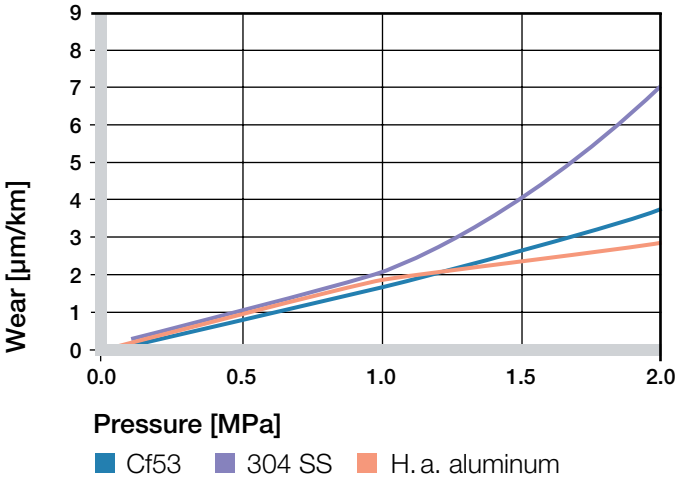
Table 04: Coefficient of friction against steel (Ra = 1 µm, 50 HRC)



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 MPa, v = 0,5 m/s



Graph 08: Wear with different shaft materials in rotational applications

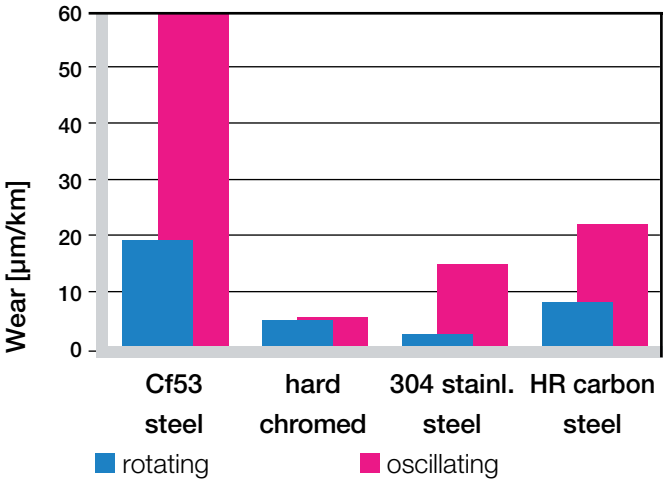


Abb. 09: Wear for rotating and oscillating applications with different shaft materials, p = 2 MPa

Additional Properties

Chemical Resistance

iglidur® UW bearings are resistant to diluted alkalis and very weak acids as well as to solvents and all kinds of lubricants.

▶ Chemical Table, **page 974**

Medium	Resistance
Alcohol	+
Hydrocarbons	+
Greases, oils without additives	+
Fuels	+
Diluted acids	0 to –
Strong acids	–
Diluted alkalines	+
Strong alkalines	+ to 0

+ resistant 0 conditionally resistant – not resistant
All data given at room temperature [+20 °C]
Table 05: Chemical resistance

Radiation Resistance

Plain bearings of iglidur® UW are radiation resistant to a radiation intensity of $3 \cdot 10^2$ Gy.

UV Resistance

iglidur® UW plain bearings are resistant to the impact of UV radiation.

Vacuum

Applications in a vacuum are only possible to a limited extent. Only dehumidified bearings of iglidur® UW should be tested in a vacuum.

Electrical Properties

iglidur® UW plain bearings are electrically conductive.

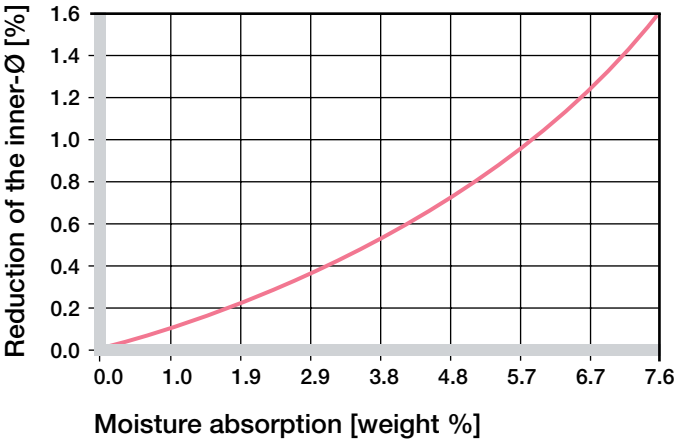
Volume resistance	$< 10^5$ Ωcm
Surface resistance	$< 10^5$ Ω 10

Moisture Absorption

The humidity absorption of iglidur® UW bearings amounts to about 0,2 % in standard climatic conditions. The saturation limit in water is 0,8 %. These values are so low that a moisture expansion need to be considered only in extreme cases.

Maximum moisture absorption	
At +23 °C/50 % r. h.	0,2 % weight
Max. moisture absorption	0,8 % weight

Table 06: Moisture absorption



Graph 10: Effect of moisture absorption on plain bearings

Installation Tolerances

iglidur® UW bearings are standard bearings for shafts with h-tolerance (recommended minimum h9).
After the installation in a housing bore with H7 tolerance, the inner diameter of the bearing automatically adjusts to the E10 tolerance.

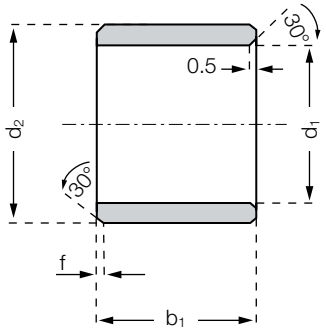
▶ Testing Methods, **page 55**

Diameter d1 [mm]			Shaft h9 [mm]	iglidur® UW E10 [mm]	Housing H7 [mm]
	up to	3	0–0,025	+0,014 +0,054	0 +0,010
> 3	to	6	0–0,030	+0,020 +0,068	0 +0,012
> 6	to	10	0–0,036	+0,025 +0,083	0 +0,015
> 10	to	18	0–0,043	+0,032 +0,102	0 +0,018
> 18	to	30	0–0,052	+0,040 +0,124	0 +0,021
> 30	to	50	0–0,062	+0,050 +0,150	0 +0,025
> 50	to	80	0–0,074	+0,060 +0,180	0 +0,030
> 80	to	120	0–0,087	+0,072 +0,212	0 +0,035
> 120	to	180	0–0,100	+0,085 +0,245	0 +0,040

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

iglidur® UW | Product Range

Sleeve bearing



Order key

UWSM-0304-05

- Length b1
- Outer diameter d2
- Inner diameter d1
- Metric
- Type (Form S)
- Material iglidur® UW

Dimensions according to ISO 3547-1 and special dimensions

Chamfer in relation to the d1

d1 [mm]:	Ø 1–6	Ø 6–12	Ø 12–30	Ø > 30
f [mm]:	0.3	0.5	0.8	1.2

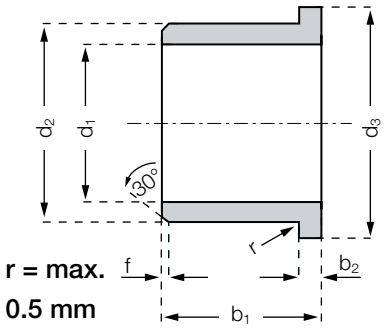
Dimensions [mm]

Part number	d1	d1-Tolerance*	d2	b1 h13
UWSM-0304-05	3,0	+0,014 +0,054	4,5	5,0
UWSM-0405-06	4,0	+0,020 +0,068	5,5	6,0
UWSM-0507-08	5,0	+0,020 +0,068	7,0	8,0
UWSM-0608-08	6,0	+0,020 +0,068	8,0	8,0
UWSM-0810-10	8,0	+0,025 +0,083	10,0	10,0
UWSM-1012-10	10,0	+0,025 +0,083	12,0	10,0
UWSM-1214-12	12,0	+0,032 +0,102	14,0	12,0

* after pressfit. Testing methods ▶ page 55

iglidur® UW | Product Range

Flange bearing



r = max. 0.5 mm

Order key

UWFM-0304-05

- Length b1
- Outer diameter d2
- Inner diameter d1
- Metric
- Type (Form F)
- Material iglidur® UW

Dimensions according to ISO 3547-1 and special dimensions

Chamfer in relation to the d1

d1 [mm]:	Ø 1–6	Ø 6–12	Ø 12–30	Ø > 30
f [mm]:	0.3	0.5	0.8	1.2

Dimensions [mm]

Part number	d1	d1-Tolerance*	d2	d3	b1	b2
				d13	h13	–0,14
UWFM-0304-05	3,0	+0,014 +0,054	4,5	7,5	5	0,75
UWFM-0405-06	4,0	+0,020 +0,068	5,5	9,5	6	0,75
UWFM-0507-05	5,0	+0,020 +0,068	7,0	11,0	5	1
UWFM-0608-06	6,0	+0,020 +0,068	8,0	12,0	6	1
UWFM-0810-10	8,0	+0,025 +0,083	10,0	15,0	10	1
UWFM-1012-10	10,0	+0,025 +0,083	12,0	18,0	10	1
UWFM-1214-12	12,0	+0,032 +0,102	14,0	20,0	12	1
UWFM-1618-17	16,0	+0,032 +0,102	18,0	24,0	17	1
UWFM-2023-21	20,0	+0,040 +0,124	23,0	30,0	21,5	1,5

* after pressfit. Testing methods ▶ page 55

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