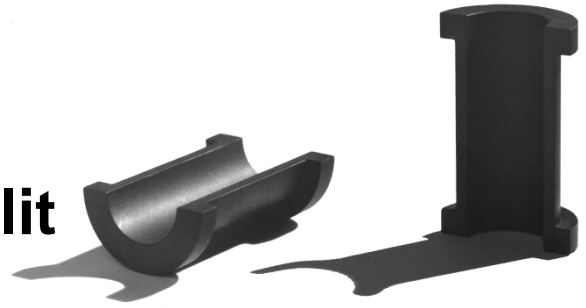




Kufalit



Bearing material from thermosetting plastic.

Properties of Kufalit:

- Good chemical resistance against acid, caustic, salts and other chemical attacks.
- By using graphite as filler, Kufalit is self lubricating, resulting in low maintenance
- Very good dimensional stability, no water absorption.

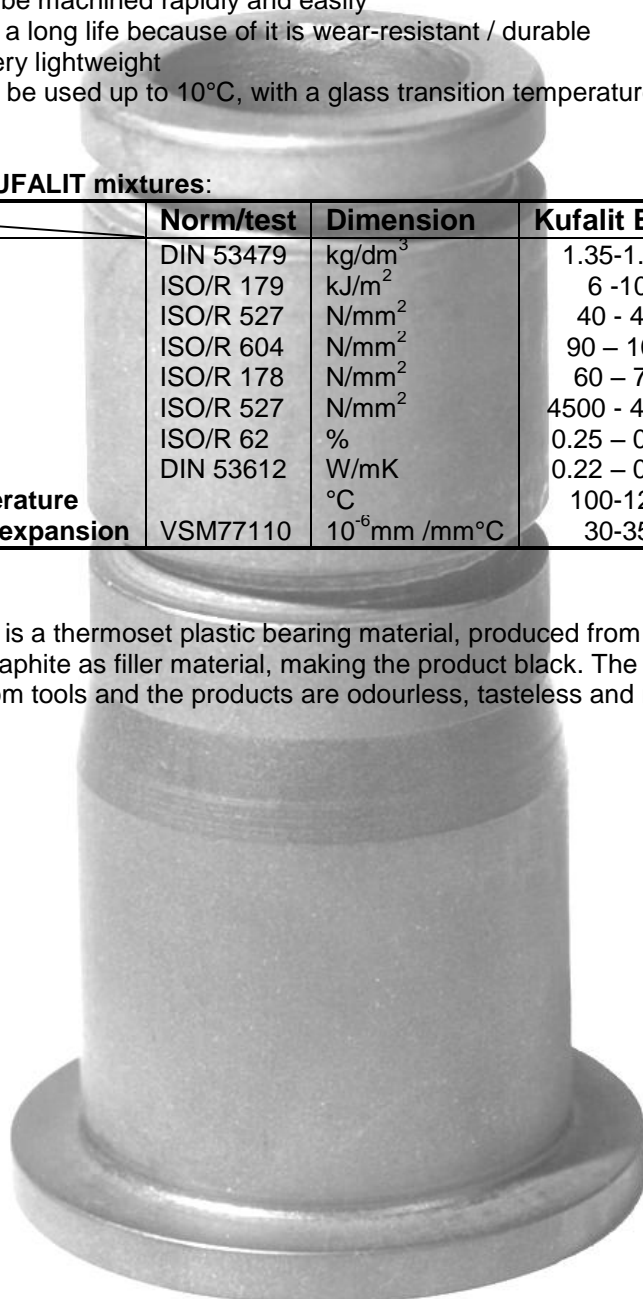
KUFALIT is a thermoset plastic bearing material with graphite as filler.
 KUFALIT is supplied as bearing material in rod, tube and castings from tools according to drawing specifications.
 KUFALIT can be machined rapidly and easily
 KUFALIT Has a long life because of it is wear-resistant / durable
 KUFALIT is very lightweight
 KUFALIT BWH Can be used up to 10°C, with a glass transition temperature of 115°C

Properties of several KUFALIT mixtures:

	Norm/test	Dimension	Kufalit BWH	Kufalit BZH
Density	DIN 53479	kg/dm ³	1.35-1.45	1.40 – 1.50
Impact strength	ISO/R 179	kJ/m ²	6 -10	10 - 15
Tensile strength	ISO/R 527	N/mm ²	40 - 45	30 – 50
Compressive strength	ISO/R 604	N/mm ²	90 – 100	100 – 120
Flexural strength	ISO/R 178	N/mm ²	60 – 70	60 - 80
Elasticity modulus	ISO/R 527	N/mm ²	4500 - 4750	9000 – 11000
Water absorption	ISO/R 62	%	0.25 – 0.30	0.10 – 0.15
Thermal conductivity	DIN 53612	W/mK	0.22 – 0.23	0.2-0.3
Glass Transition Temperature		°C	100-125	115 – 135
Coeff. of linear thermal expansion	VSM77110	10 ⁻⁶ mm /mm°C	30-35	35 - 45

Properties

KUFALIT FWT and BWH is a thermoset plastic bearing material, produced from a two component epoxy resin system filled with graphite as filler material, making the product black. The tubes, rods, plates and castings are produced from tools and the products are odourless, tasteless and not poisonous.





Lubrication

As a consequence of the high content of graphite in Kufalit the need of additional lubricants (oil, fats, water and other chemical components) is very low or in some special cases not required at all. The use of Molybdenum disulfide (MoS₂) for example Molykote with the assembly of Kufalit plain bearings can provide sufficient lubrication over an extensive period of time. At applications where the surface pressure is minimal, Kufalit plain bearings can run without totally without lubrication.

Water absorption

In contrast to plastics based on polyamides, like for instance Nylon, the water absorption of Kufalit is very low. When designing applications, there is no need to take into account swelling of the bearings.

Recommendations for construction

KUFALIT has a low conductivity of heat, like any other plastic or thermoset. Because of this property, one has to keep the wall thickness in bearings as low as possible, to prevent build-up of heat. The wall thickness of a small bearing bush will be 2 to 2.5 mm, with an average size bearing bush 3 to 3.75 mm and with a large size bearing bush, if possible, do not exceed a thickness of 5 mm.

When using KUFALIT bearings in existing metal applications, where a large wall thickness is used, it is recommended to use a metal intermediate bush, over the KUFALIT bearing.

A thorough contact from the KUFALIT pressed bush or sleeve bearing in the housing is the decisive factor in a good heat transfer. A good heat transfer increases the usability of KUFALIT.

KUFALIT bearings can be glued in to position which results in a good heat transfer and secure fixation of the bearing.

The use of sharp corners should be avoided, to prevent a notch in the components.

De machining of KUFALIT is easy and rapid, high cutting speeds can be achieved, using hardened steel cutting equipment H1.





Increasing bearing clearance caused by heat for pressed and glued bearing bush.

Principle: As a result of the larger linear heat expansion of KUFALIT compared with metal, the bearing clearance (acc. to DIN or ISA) needs to be increased with a certain value, which is illustrated below.

- A. Bearing bush under normal temperature conditions, which will only reach minimum elevated temperatures caused by friction only:
DIN- or ISA-bearing clearance + 0.8% of the wall thickness.
Tolerances remain unchanged.
- B. Bearing bush under elevated temperature conditions above 80°C, which is not only caused by friction but also by higher temperature influences of another nature, for example hot fluids or gasses:
t = temperature of use. w = wall thickness.

Formula: $t \cdot w \cdot \frac{1}{10.000}$ = increase bearing clearance, tolerances unchanged.

Example: A bearing bush 80/70 F8 Ø (wall thickness = 5 mm) with a temperature of use of 90°C.

$$\text{Bearing clearing acc. DIN for 70 F8} = 70 \cdot \frac{+0.076}{+0.030} > \text{tolerance } 0.046$$

Calculation: $90 \cdot 5 \cdot \frac{1}{10.000} = 0,045$ (= increased bearing clearance)

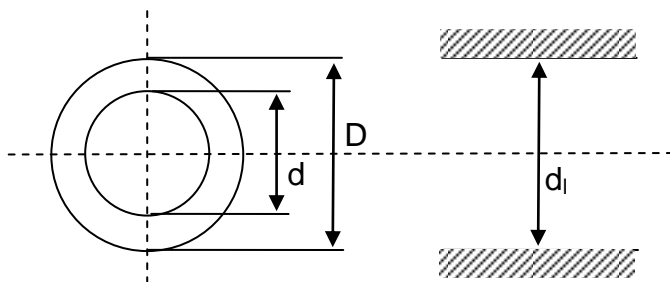
Bearing clearance acc. DIN = + 0.076
Increase bearing clearance = + 0.045

$$\text{Tolerance unchanged} + 0.046 < \frac{+0.121}{+0.075} = \text{new bearing clearance.}$$

Deviations of this calculation example can in special circumstances lead to better results. In the context of this information, it is only possible to indicate general rules.

Dimensional change of the bore due to press in.

On the basis of dozens of samples with pressed in bearings, one can estimate the final dimension, without the need of costly machining afterwards:



$$d_e = d + [(D - d_1) + 0.01]$$

Explanation

- de=Final dimension of bore after press in.
- D = Outside diameter of KUFALIT bearing
- d = Inside diameter of KUFALIT bearing
- d1 = Diameter where the KUFALIT is pressed in.

When bearings are pressed in position, one must take into account the dimensional change, when assessing the increased bearing clearance caused by

heat.

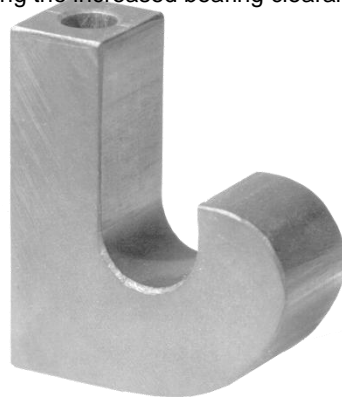




Table of Chemical resistance

Agent	Concentration [%]	Temperature [°C]	KUFALIT BWH
Acetaldehyde (solution)	40	70	not resistant
Acetaldehyde (solution)	40	20	resistant
Acetic acid	100	20	resistant
Acetic acid	100	60	not resistant
Acetone	100	20	not resistant
Acetone (solution)	50	20	limited resistant
Acetone (solution)	10	20	resistant
Air pollution in industrial area			resistant
Ammonia (solution)	30	20	resistant
Ammonia (solution)	20	20	resistant
Aniline (amino benzene)	100	20	resistant
Battery acid	32	20-40	resistant
Benzene	100	20	resistant
Benzene	100	60	not resistant
Butanol	100	20	resistant
Butyl acetate	100	20	not resistant
Butyric acid	100	20	resistant
Carbon disulfide	100	20	limited resistant
Carbon tetrachloride [CCl ₄]	100	20	resistant
Chlorosulfuric acid	100	20	not resistant
Chrome bath liquid	-	40	resistant
Cresol		20	resistant
Crotonaldehyde	100	20	not resistant
Cyclohexanol	100	20	not resistant
Cyclohexanon	100	20	limited resistant
Diethyl ether	100	20	resistant
Diethyl ether	100	35	limited resistant
Dioxane	100	20	not resistant
Distilled water	100	20-70	resistant
Distilled water	100	100	limited resistant
Ethanol	100	20-40	resistant
Ethanol	100	60	not resistant
Fixative	-	20	resistant
Formic acid (methanoic acid)	conc.	20	resistant
Formic acid (methanoic acid)	conc.	60	limited resistant
Formic acid (methanoic acid)	conc.	100	not resistant
Gasoline	100	60	resistant
Glycerine	100	20-100	resistant
Hydrochloric acid (solution)	10	20	resistant
Hydrochloric acid(solution)	50	20-60	resistant
Hydrochloric acid(solution)	50	100	limited resistant
Hydrofluoric acid (solution)	conc.	20	limited resistant
Hydrogen peroxide (solution)	30	20	resistant
Methyl chloride	100	20	not resistant
Mineral oil	100	20-100	resistant
Moisture	100	20-70	resistant
Nitric acid	50	20	resistant
Nitric acid	10	20	resistant
Nitric acid (solution)	conc.	20	not resistant
Nitrobenzene	100	20	not resistant
Potassium cyanide (bath liquid)		80	resistant
Potassium hydroxide soap (solution)	50	20	resistant
Potassium permanganate	6 gr / 100	20	resistant
Sodium bisulfite (solution)	20g/100	20	resistant
Sodium chloride [NaCl]	10g/100	20-70	resistant
Sodium chloride [NaCl]	20g/100	20-70	resistant
Sodium chloride [NaCl]	26g/100	20-70	resistant

Sodium chlorite [NaClO ₂]	10g/1000	20	resistant
Sodium chlorite [NaClO ₂]	10g/1000	100	not resistant
Sodium dichromate (solution)	60g/100	20	resistant
Sodium hydroxide [NAOH]	10g/100	20	resistant
Sodium hydroxide [NAOH]	10g/100	60	limited resistant
Sodium hydroxide [NAOH]	25-50/100	20	resistant
Sodium hypochlorite (Eau de Javel)	5	20	resistant
Stearic acid	100	60	resistant
Sulphuric acid (solution)	10	20-60	resistant
Sulphuric acid (solution)	75	20	limited resistant
Sulphuric acid (solution)	conc.	20	not resistant
Thionyl chloride	100	20	not resistant
Toluene	100	20	resistant
Trichloroethylene	100	20	not resistant
Triethanolamine (TEA)	100	20	resistant

Product portfolio

All sizes in [mm]

Rod material

rough, not machined
tolerances:
up to 50 Ø = ± 0.5 mm
larger than 50 Ø = ± 1.0 mm

400 mm length, from Ø 10 until Ø 125.

The sizes from Ø 10 until Ø 80, from 2.5:2.5 mm upwards.

The sizes Ø 80 till Ø 125 van 5:5 mm upwards.

Deviations / larger lengths and diameters can be supplied upon request.

Bush / tube

rough, not machined
tolerances:
Ø d_o en Ø d_i up to Ø 50 = ± 0.5 mm
Ø d_o en Ø d_i larger than Ø 50
= ± 1.0 mm

250 mm length, from Ø 25/15 d_o/d_i up to Ø 80/72.5 d_o/d_i.

In all sizes up to a minimal wall thickness of 3.75 mm, d_o and d_i increasing 2.5:2.5 mm upwards.

From Ø 85/25 d_o/d_i up to Ø 125/115 d_o/d_i.

In all sizes up to a minimal wall thickness of 5 mm, d_o and d_i increasing 5:5 mm upwards.

Deviations / larger lengths and diameters can be supplied upon request.

Plate- and stripping material

rough, not machined.
tolerances:
for gauge size = ± 0.5 mm
for length and width = ± 1.0 mm

From 2,5 mm thickness with 2.5 mm upwards, a maximum length of 500 mm and a maximum width of 450 mm.

Deviations in dimensions can be supplied upon request.

More:

Castings from various designs, when technically possible to cast, can be produced from custom build tools like Blocks, Ball Bearing, Rings, Flanged Bush, Bearing Bush etc.

Supply of machined parts acc. drawing in all sorts and numbers.

Price of rods and bush / tube available on request.



Applications

- Equipment manufacturers and special equipment for the chemical industry
- (car) Body manufacturing, for example steering swivel pin, steering gear, brakes, shock absorber etc.
- Agriculture Machinery, for example transport belts, vans, etc.
- Food industry, for example processing machines for milk, potato flour, yeast, salt, dextrin, preserved foods, etc.
- Paper-, cardboard and fibre industry, for example in bearings of agitators.
- Presses, for example lining bush for steering shaft and column.
- Pneumatics and Hydraulics, for example guide bush for piston rods etc.
- Pumps, for example plain bearing, consumable ring and –plate, sealing bush, pistons, stuffing box, thrust bearing, etc.
- Shipbuilding, for example shaft bearing, pulley bearing, bush for clamp of watertight bulkheads etc.
- Textile industry, for example die bearings of spinning machine, bleach machine bearings etc.
- Transport machinery, for example guide rail in chemical industry, shipping bolts, vans etc.





Table of weight for KUFALIT BWH, rod material

calculated on the basis of a density of 1.38 kg/dm³.

To calculate the weight of KUFALIT or BZH, multiply below weights with and BZH with 1.065.

Values present a rod of 1 meter in length.

Ø	BWH	BZH	Ø	BWH	BZH	Ø	BWH	BZH	Ø	BWH	BZH	Ø	BWH	BZH
			61	4,0	4,3	121	15,9	16,9	181	35,5	37,8	241	63,0	67,1
			62	4,2	4,4	122	16,1	17,2	182	35,9	38,2	242	63,5	67,6
			63	4,3	4,6	123	16,4	17,5	183	36,3	38,7	243	64,0	68,2
			64	4,4	4,7	124	16,7	17,8	184	36,7	39,1	244	64,5	68,7
5	0,03	0,03	65	4,6	4,9	125	16,9	18,0	185	37,1	39,5	245	65,1	69,3
6	0,04	0,04	66	4,7	5,0	126	17,2	18,3	186	37,5	39,9	246	65,6	69,9
7	0,05	0,06	67	4,9	5,2	127	17,5	18,6	187	37,9	40,4	247	66,1	70,4
8	0,07	0,07	68	5,0	5,3	128	17,8	18,9	188	38,3	40,8	248	66,7	71,0
9	0,09	0,09	69	5,2	5,5	129	18,0	19,2	189	38,7	41,2	249	67,2	71,6
10	0,11	0,12	70	5,3	5,7	130	18,3	19,5	190	39,1	41,7	250	67,7	72,2
11	0,13	0,14	71	5,5	5,8	131	18,6	19,8	191	39,5	42,1	251	68,3	72,7
12	0,16	0,17	72	5,6	6,0	132	18,9	20,1	192	40,0	42,6	252	68,8	73,3
13	0,18	0,20	73	5,8	6,2	133	19,2	20,4	193	40,4	43,0	253	69,4	73,9
14	0,21	0,23	74	5,9	6,3	134	19,5	20,7	194	40,8	43,5	254	69,9	74,5
15	0,24	0,26	75	6,1	6,5	135	19,8	21,0	195	41,2	43,9	255	70,5	75,1
16	0,28	0,30	76	6,3	6,7	136	20,0	21,4	196	41,6	44,4	256	71,0	75,7
17	0,31	0,33	77	6,4	6,8	137	20,3	21,7	197	42,1	44,8	257	71,6	76,3
18	0,35	0,37	78	6,6	7,0	138	20,6	22,0	198	42,5	45,3	258	72,1	76,9
19	0,39	0,42	79	6,8	7,2	139	20,9	22,3	199	42,9	45,7	259	72,7	77,4
20	0,43	0,46	80	6,9	7,4	140	21,2	22,6	200	43,4	46,2	260	73,3	78,0
21	0,48	0,51	81	7,1	7,6	141	21,5	23,0	201	43,8	46,6	261	73,8	78,6
22	0,52	0,56	82	7,3	7,8	142	21,9	23,3	202	44,2	47,1	262	74,4	79,3
23	0,57	0,61	83	7,5	8,0	143	22,2	23,6	203	44,7	47,6	263	75,0	79,9
24	0,62	0,67	84	7,6	8,1	144	22,5	23,9	204	45,1	48,0	264	75,5	80,5
25	0,68	0,72	85	7,8	8,3	145	22,8	24,3	205	45,5	48,5	265	76,1	81,1
26	0,73	0,78	86	8,0	8,5	146	23,1	24,6	206	46,0	49,0	266	76,7	81,7
27	0,79	0,84	87	8,2	8,7	147	23,4	24,9	207	46,4	49,5	267	77,3	82,3
28	0,85	0,91	88	8,4	8,9	148	23,7	25,3	208	46,9	49,9	268	77,8	82,9
29	0,91	0,97	89	8,6	9,1	149	24,1	25,6	209	47,3	50,4	269	78,4	83,5
30	0,98	1,04	90	8,8	9,4	150	24,4	26,0	210	47,8	50,9	270	79,0	84,2
31	1,04	1,11	91	9,0	9,6	151	24,7	26,3	211	48,3	51,4	271	79,6	84,8
32	1,11	1,18	92	9,2	9,8	152	25,0	26,7	212	48,7	51,9	272	80,2	85,4
33	1,18	1,26	93	9,4	10,0	153	25,4	27,0	213	49,2	52,4	273	80,8	86,0
34	1,25	1,33	94	9,6	10,2	154	25,7	27,4	214	49,6	52,9	274	81,4	86,7
35	1,33	1,41	95	9,8	10,4	155	26,0	27,7	215	50,1	53,4	275	82,0	87,3
36	1,40	1,50	96	10,0	10,6	156	26,4	28,1	216	50,6	53,9	276	82,6	87,9
37	1,48	1,58	97	10,2	10,9	157	26,7	28,5	217	51,0	54,4	277	83,2	88,6
38	1,57	1,67	98	10,4	11,1	158	27,1	28,8	218	51,5	54,9	278	83,8	89,2
39	1,65	1,76	99	10,6	11,3	159	27,4	29,2	219	52,0	55,4	279	84,4	89,9
40	1,73	1,85	100	10,8	11,5	160	27,7	29,6	220	52,5	55,9	280	85,0	90,5
41	1,82	1,94	101	11,1	11,8	161	28,1	29,9	221	52,9	56,4	281	85,6	91,2
42	1,91	2,04	102	11,3	12,0	162	28,4	30,3	222	53,4	56,9	282	86,2	91,8
43	2,00	2,13	103	11,5	12,2	163	28,8	30,7	223	53,9	57,4	283	86,8	92,5
44	2,10	2,24	104	11,7	12,5	164	29,2	31,1	224	54,4	57,9	284	87,4	93,1
45	2,19	2,34	105	11,9	12,7	165	29,5	31,4	225	54,9	58,4	285	88,0	93,8
46	2,29	2,44	106	12,2	13,0	166	29,9	31,8	226	55,4	59,0	286	88,7	94,4
47	2,39	2,55	107	12,4	13,2	167	30,2	32,2	227	55,8	59,5	287	89,3	95,1
48	2,50	2,66	108	12,6	13,5	168	30,6	32,6	228	56,3	60,0	288	89,9	95,8
49	2,60	2,77	109	12,9	13,7	169	31,0	33,0	229	56,8	60,5	289	90,5	96,4
50	2,71	2,89	110	13,1	14,0	170	31,3	33,4	230	57,3	61,1	290	91,2	97,1
51	2,82	3,00	111	13,4	14,2	171	31,7	33,8	231	57,8	61,6	291	91,8	97,8
52	2,93	3,12	112	13,6	14,5	172	32,1	34,2	232	58,3	62,1	292	92,4	98,4
53	3,04	3,24	113	13,8	14,7	173	32,4	34,6	233	58,8	62,7	293	93,0	99,1
54	3,16	3,37	114	14,1	15,0	174	32,8	35,0	234	59,3	63,2	294	93,7	99,8
55	3,28	3,49	115	14,3	15,3	175	33,2	35,4	235	59,9	63,8	295	94,3	100,5
56	3,40	3,62	116	14,6	15,5	176	33,6	35,8	236	60,4	64,3	296	95,0	101,2
57	3,52	3,75	117	14,8	15,8	177	34,0	36,2	237	60,9	64,8	297	95,6	101,8
58	3,65	3,88	118	15,1	16,1	178	34,3	36,6	238	61,4	65,4	298	96,3	102,5
59	3,77	4,02	119	15,3	16,3	179	34,7	37,0	239	61,9	65,9	299	96,9	103,2
60	3,90	4,16	120	15,6	16,6	180	35,1	37,4	240	62,4	66,5	300	97,5	103,9