



# BEARING TECHNOLOGY



## ABOUT COMPANY

AWWA technologies established in the year 1992 is an ISO 9001:2015 approved company that specializes in the production of self-lubricated Bearings used for rotary or translatory movement between mechanical parts.

AWWA self-Lubricated bearings are Industry quality leaders catering to the Valve industry, construction machinery, Hydraulic machinery and general industrial machinery. Based in Bangalore and operating out of 4 units with state-of-the-art infrastructure, modern testing facility and an Innovation centre of excellence AWWA is constantly researching with new materials for best sliding properties in Bearings.

Customer satisfaction is at the centre of our focus, we endorse Just in time delivery system with an integrated supply chain management to work closely with our customers and provide the best service. Partner with us early in your design stage and avail the AWWA advantage.

## QUALITY POLICY

AWWA TU self-lubricated Bearings are produced in strict adherence to a well-defined quality system to offer the customers totally reliable products and we value total customer satisfaction. In order to achieve this, we are continually improving processes, products, supply chain and services, meeting and exceeding customer satisfaction at all times by inculcating a strict quality culture at all levels of the company.

## PRODUCT

Turbo self-lubricating bearings are provided in a wide variety of product materials with Base materials in carbon steel, hardened steel, iron, stainless steel, bronze, brass, copper, bronze-steel alloy and Lubricant materials in PTFE, Teflon, POM, fabric, nylon, plastic, and composites.

# PRODUCT RANGE OVERVIEW

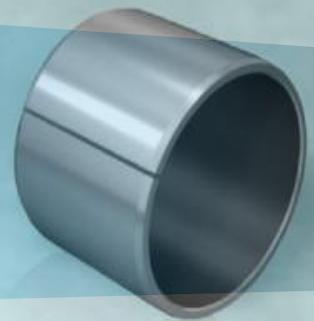
## TU-316

Stainless steel + Porous bronze sinter + PTFE + fillers  
Self lubricating, low maintenance and corrosion resistant



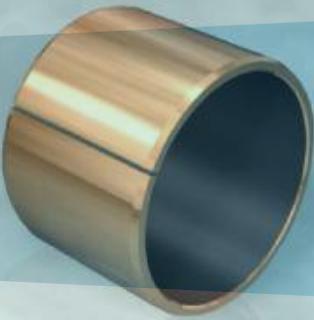
## TU-CS

Tin/zinc plating + mild steel + Porous bronze sinter + PTFE  
Self lubricating and low maintenance



## TU-B

Bronze + Porous bronze sinter + PTFE fillers  
Self lubricating and corrosion resistant



## TU-X

Inconel 625 + Porous bronze sinter + PTFE fillers  
Self lubricating, low maintenance and corrosion resistant



# PRODUCT RANGE OVERVIEW



## TU-POM

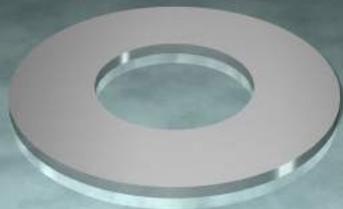
Stainless steel/ low carbon steel + POM + Solid lubricants + Fillers

Self lubricating and low maintenance

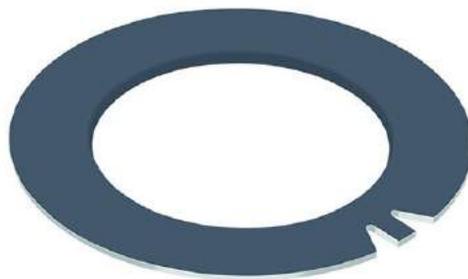
## TU-FIBREX

Stainless steel + Adhesive + PTFE fabric

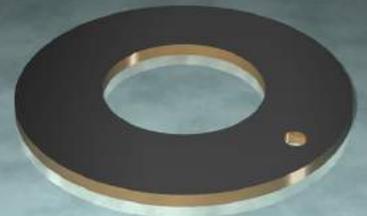
Self lubricating, corrosion resistant and very low coefficient of friction



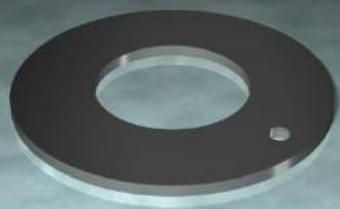
TU-HT



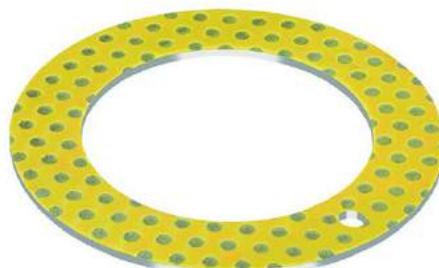
TU-316



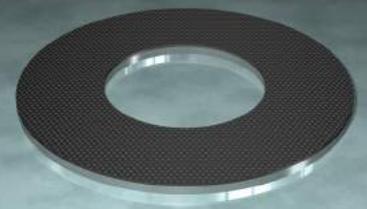
TU-B



TU-CS

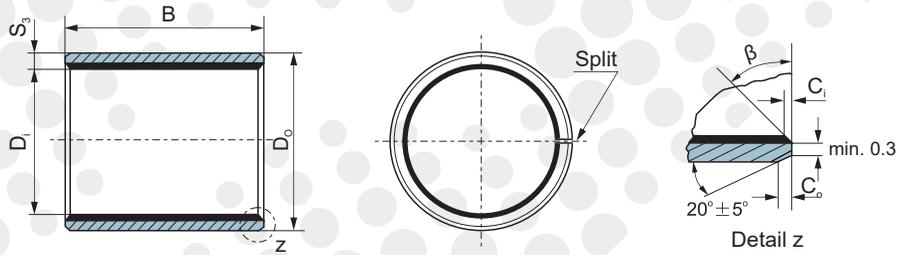


TU-POM



TU-Fibrex

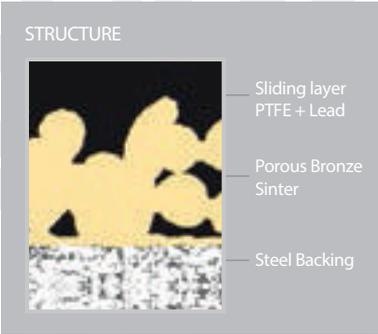
# TU-316



ID and OD chamfers

S <sub>3</sub>	C <sub>0</sub>	C <sub>1</sub>	β	S <sub>3</sub>	C <sub>0</sub>	C <sub>1</sub>	β
0.75	0.5±0.3	0.25±0.2	30° ±5°	2.00	1.2±0.4	0.50±0.3	30° ±5°
1.00	0.6±0.3	0.30±0.2	30° ±5°	2.50	1.8±0.6	0.60±0.3	45° ±5°
1.50	0.7±0.3	0.50±0.3	30° ±5°				

Unit:mm



## Structure of the material:

Layer	Average analyses of the material	Thickness of layer
Sliding layer (Minimum)	PTFE Coating	10µm
Intermediate layer (Average Peak)	CuSn11 Sintered	200÷350µm
Supporting shell	SS 316 Stainless Steel	0,70 ÷ 2,20 mm <small>(Depending on Dim. of the Bearing)</small>

## Operating Performance

Dry	Very Good
Oil lubricated	Good
Grease lubricated	Fair
Water lubricated	Fair
Process fluid lubricated	Fair

## TECHNICAL DATA

Max. load	Static	250N/mm <sup>2</sup>	Friction coefficient	0.03~0.20		
	Very low speed	140N/mm <sup>2</sup>		Max. speed	Dry running	2m/s
	Rotating oscillating	60N/mm <sup>2</sup>			Hydrodynamic operation	>2m/s
Max. PV dry running	Short-term operation	3.6N/mm <sup>2</sup> *m/s	Thermal conductivity		42 W(m*K) <sup>-1</sup>	
	Continuous operation	1.8N/mm <sup>2</sup> *m/s	Coefficient of thermal expansion		11*10 <sup>-6</sup> *K <sup>-1</sup>	
Temp. limit	-195°C~+280°C					

## CHARACTERISTICS

- Very good wear and low friction performance over a wide range of loads, speeds and temperatures in dry running conditions
- Suitable for lubricated applications
- Suitable for linear, oscillating and rotating movements

## APPLICATIONS

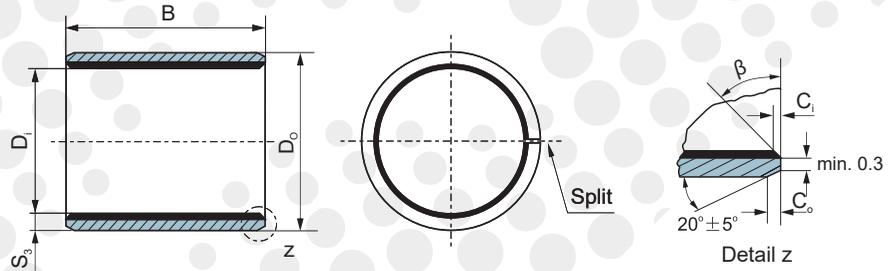
Industrial: Aerospace, agricultural equipment, construction equipment, food and beverage, material handling equipment, forming machines: metal, plastic and rubber; office equipment, medical and scientific equipment, packaging equipment, pneumatic and hydraulic cylinders, pumps and motors, railroad and tramways, textile machinery, valves, etc.

## AVAILABILITY

- Bearing forms available in standard dimensions
- Cylindrical bushes • Flanged bushes • Sliding plates
- Thrust washers • Flanged Washers

Bearing forms made to order:

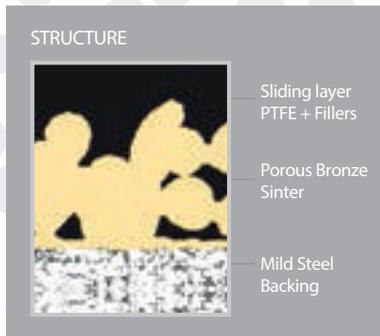
Standard forms in special dimensions, half bearings half-bearings and customized bearing designs



ID and OD chamfers

S <sub>3</sub>	C <sub>0</sub>	C <sub>1</sub>	β	S <sub>3</sub>	C <sub>0</sub>	C <sub>1</sub>	β
0.75	0.5±0.3	0.25±0.2	35° ±5°	2.00	1.2±0.4	0.50±0.3	35° ±5°
1.00	0.6±0.3	0.30±0.2	35° ±5°	2.50	1.8±0.6	0.60±0.3	45° ±5°
1.50	0.7±0.3	0.50±0.3	35° ±5°				

Unit:mm



**Structure of the material:**

Layer	Average analyses of the material	Thickness of layer
Sliding layer (Minimum)	PTFE Coating	10µm
Intermediate layer (Average Peak)	CuSn11 Sintered	200÷350µm
Supporting shell	Mild steel (Also Tin/zinc coated)	0,70 ÷ 2,20 mm (Depending on Dim. of the Bearing)

**Operating Performance**

Dry	Good
Oil lubricated	Very Good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Good

**TECHNICAL DATA**

Max. load	Static	250N/mm <sup>2</sup>	Temp. limit	-195°C~-+280°C	
	Very low speed	140N/mm <sup>2</sup>		Max. speed	Dry running
	Rotating oscillating	60N/mm <sup>2</sup>	Hydrodynamic operation		>2m/s
Max. PV dry running	Short-term operation	3.6N/mm <sup>2</sup> *m/s	Thermal conductivity	42 W(m*K) <sup>-1</sup>	
	Continuous operation	1.8N/mm <sup>2</sup> *m/s	Coefficient of thermal expansion	11*10 <sup>-6</sup> *K <sup>-1</sup>	
PV max. hydrodynamic		30N/mm <sup>2</sup> *m/s	Friction coefficient	Dry	0.08~0.20
				Hydrodynamic	0.03~0.08

**CHARACTERISTICS**

- Good wear and low friction performance over a wide range of loads, speeds and temperatures in dry running conditions
- Very good performance in lubricated applications
- Good performance in greased applications
- Suitable for linear, oscillating and rotating movements
- Lead-free material

**AVAILABILITY**

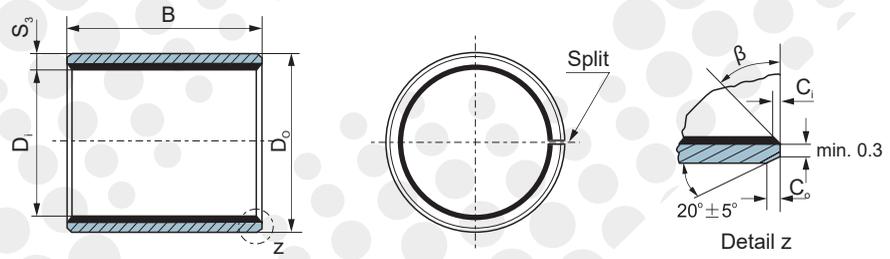
- Bearing forms available in standard dimensions
- Cylindrical bushes • Flanged bushes • Flanged Washers
  - Sliding plates • Thrust washers

Bearing forms made to order Standard forms in special dimensions, half-bearings, special shapes obtained by stamping or deep drawing, bearings with locating notches, lubricant holes and machined/stamped grooves, customized bearing designs

**APPLICATIONS**

Automotive Aerospace, agricultural equipment, construction equipment, pumps and motors, railroad and tramways, textile machinery, valves food and beverage, material handling equipment, forming machines: metal, plastic and rubber; office equipment, medical and scientific equipment, packaging equipment, pneumatic and hydraulic cylinders,

# TU-B



ID and OD chamfers

S <sub>3</sub>	C <sub>0</sub>	C <sub>1</sub>	β	S <sub>3</sub>	C <sub>0</sub>	C <sub>1</sub>	β
0.75	0.5±0.3	0.25±0.2	30° ±5°	2.00	1.2±0.4	0.50±0.3	30° ±5°
1.00	0.6±0.3	0.30±0.2	30° ±5°	2.50	1.8±0.6	0.60±0.3	45° ±5°
1.50	0.7±0.3	0.50±0.3	30° ±5°				

Unit:mm

## STRUCTURE



Sliding layer  
PTFE + Fillers

Porous Bronze  
Sinter

Bronze Backing

## Structure of the material:

Layer	Average analyses of the material	Thickness of layer
Sliding layer (Minimum)	PTFE Coating	10µm
Intermediate layer (Average Peak)	CuSn11 Sintered	200÷350µm
Supporting shell	Bronze (CuSn8P)	0,50 ÷ 2,70 mm (Depending on Dim. of the Bearing)

## Operating Performance

Dry	Good
Oil lubricated	Very Good
Grease lubricated	Good
Water lubricated	Good
Process fluid lubricated	Good

## TECHNICAL DATA

Max. load	Static	250N/mm <sup>2</sup>	Friction coefficient	0.03~0.20		
	Very low speed	140N/mm <sup>2</sup>		Max. speed	Dry running	2m/s
	Rotating oscillating	60N/mm <sup>2</sup>			Hydrodynamic operation	>2m/s
Max. PV dry running	Short-term operation	3.6N/mm <sup>2</sup> *m/s	Thermal conductivity	60W(m*K) <sup>-1</sup>		
	Continuous operation	1.8N/mm <sup>2</sup> *m/s	Coefficient of thermal expansion	18*10 <sup>-6</sup> *K <sup>-1</sup>		
Temp. limit	-195°C~+280°C					

## CHARACTERISTICS

- Good wear and low friction performance over a wide range of loads, speeds and temperatures in dry running conditions
- Very good performance in lubricated applications
- Good performance in greased applications
- Suitable for linear, oscillating and rotating movements
- Bronze back offers improved corrosion resistance in humid/saline environments
- Lead-free material compliant to EVL, WEEE, and RoHS specifications

## APPLICATIONS

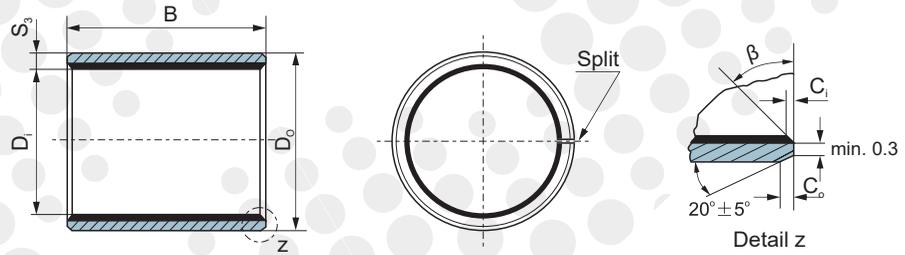
Civil engineering, marine and offshore equipment, other applications in water or in outdoor environments, etc.

## AVAILABILITY

Bearing forms available in standard dimensions

- Cylindrical bushes
- Flanged bushes
- Sliding plates

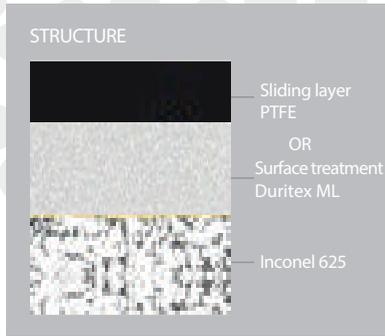
Bearing forms made to orderStandard forms in special dimensions, thrust washers, flanged thrust washers, half-bearings, special shape obtained by stamping or deep drawing, bearings with locating notches, lubricant holes and machined/stamped grooves



ID and OD chamfers

S <sub>3</sub>	C <sub>0</sub>	C <sub>1</sub>	β	S <sub>3</sub>	C <sub>0</sub>	C <sub>1</sub>	β
0.75	0.5±0.3	0.25±0.2	30° ±5°	2.00	1.2±0.4	0.50±0.3	30° ±5°
1.00	0.6±0.3	0.30±0.2	30° ±5°	2.50	1.8±0.6	0.60±0.3	45° ±5°
1.50	0.7±0.3	0.50±0.3	30° ±5°				

Unit:mm



Structure of the material:

Layer	Average analyses of the material	Thickness of layer
Sliding layer (Minimum) OR Surface treatment	PTFE Coating OR Duritex ML	10µm OR 0.15 mm (min)
Supporting shell	Inconel 625	0,50 ÷ 2,70 mm <small>(Depending on Dim. of the Bearing)</small>

**Operating Performance**

Dry	Very Good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Good

**TECHNICAL DATA**

Max. load	Static	200 N/mm <sup>2</sup>	Friction coefficient	0.07~0.13		
	Very low speed	100N/mm <sup>2</sup>		Max. speed	Dry running	0.5 m/s
	Rotating oscillating	60N/mm <sup>2</sup>			Hydrodynamic operation	>0.5 m/s
Max. PV dry running	Short-term operation	3.6N/mm <sup>2</sup> *m/s	Thermal conductivity		42 W(m*K) <sup>-1</sup>	
	Continuous operation	1.8N/mm <sup>2</sup> *m/s	Coefficient of thermal expansion		11*10 <sup>-6</sup> *K <sup>-1</sup>	
Temp. limit	-200°C to +430°C					

**CHARACTERISTICS**

- Very good wear and low friction performance over a wide range of loads, speeds and temperatures in dry running conditions
- Suitable for lubricated applications
- Suitable for very high temperature applications

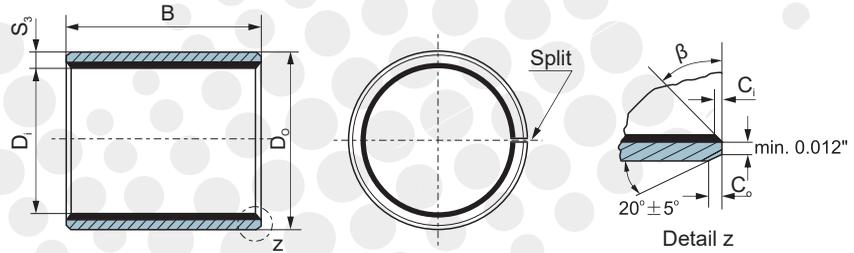
**APPLICATIONS**

Industrial: Valves and Isolators Aerospace, agricultural equipment, food and beverage, material handling equipment, forming machines: metal, plastic and rubber; office equipment, medical and scientific equipment, packaging equipment, pneumatic and hydraulic cylinders, pumps and motors, railroad and tramways, textile machinery, construction equipment etc.,

**AVAILABILITY**

- Bearing forms available in standard dimensions
- Cylindrical bushes
  - Flanged bushes
  - Sliding plates
  - Thrust washers
  - Flanged Washers
- Bearing forms made to order:  
Standard forms in special dimensions, half bearings half-bearings and customized bearing designs

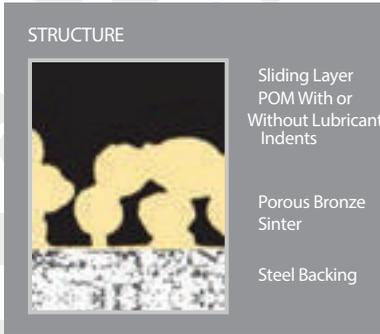
# TU-POM



ID and OD chamfers

S <sub>3</sub>	C <sub>0</sub>	C <sub>i</sub>	β	S <sub>3</sub>	C <sub>0</sub>	C <sub>i</sub>	β
0.0315	0.008-0.030	0.002-0.018	30° ± 5°	0.0787	0.030-0.060	0.008-0.032	30° ± 5°
0.0472	0.012-0.035	0.006-0.022	30° ± 5°	0.0945	0.050-0.095	0.020-0.043	45° ± 5°
0.0630	0.015-0.040	0.008-0.032	30° ± 5°				

Unit:mm



## Structure of the material:

Layer	Average analyses of the material	Thickness of layer
Sliding layer (Minimum)	POM-C	250 - 450 μm
Intermediate layer (Average Peak)	CuSn11 Sintered	200 - 350 μm
Supporting shell	Low Carbon Steel	0,50 ÷ 2,70 mm
Protective layer	Sn or Zn	(Depending on Dim. of the Bearing) 2 - 8 μm

Operating Performance	
Dry	Poor
Oil lubricated	Good
Grease lubricated	Very Good
Water lubricated	Poor
Process fluid lubricated	Poor

TECHNICAL DATA						
Max. load	Static	140N/mm <sup>2</sup>	Temp. limit	-30°c to +130°c		
	Very low speed	70 N/mm <sup>2</sup>		Max. speed	Dry running	2.5 m/s
	Rotating oscillating	60N/mm <sup>2</sup>			Hydrodynamic operation	>2.5 m/s
Max. PV dry running	Short-term operation	3.6N/mm <sup>2</sup> *m/s	Thermal conductivity		42 W(m*K) <sup>-1</sup>	
	Continuous operation	2.8N/mm <sup>2</sup> *m/s	Coefficient of thermal expansion		11*10 <sup>-6</sup> *K <sup>-1</sup>	
PV max. hydrodynamic		30N/mm <sup>2</sup> *m/s	Friction coefficient	Dry	0.06~0.12	
				Hydrodynamic	0.03~0.08	

## CHARACTERISTICS

- Marginally lubricated bearing material for grease or oil lubricated applications
- Standard parts contain grease indents in the sliding layer; plain sliding layer available by request
- Optimum performance under relatively high loads and low speeds
- Suitable for linear, oscillating and rotating movements
- Wide range of parts available from stock

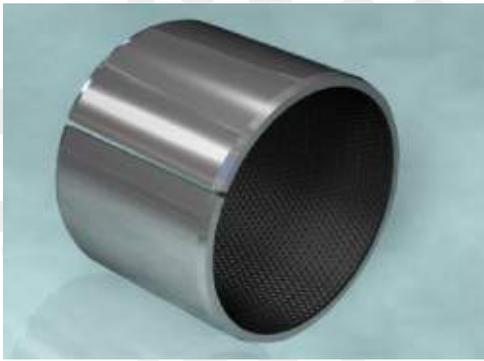
## AVAILABILITY

- Bearing forms available in standard dimensions
- Cylindrical bushes
  - Thrust washers
  - Sliding plates
- Bearing forms made to order Standard forms in special dimensions, half-bearings, special shapes obtained by stamping, bearings with locating notches, lubricant holes and machined grooves, customized bearing designs

## APPLICATIONS

Automotive Mechanical handling and lifting equipment, machine slides, hydraulic cylinders, hydraulic motors, ski-lifts, pneumatic equipment, medical equipment, textile machinery, agricultural equipment, scientific equipment, etc.

# TU- fibrex



Structure of the material:

Layer	Average analyses of the material	Thickness of layer
Sliding layer	PTFE fabric	0.40 mm
Intermediate layer	Adhesive	200÷350µm
Supporting shell	Stainless steel / Mild steel	0,50 ÷ 2,70 mm (Depending on Dim. of the Bearing)

TECHNICAL DATA				
Max. load	Static	200 N/mm <sup>2</sup>	Temp.	-50°c to +160°c
	Dynamic	150 N/mm <sup>2</sup>		
Max. speed		1.5 m/s	Thermal conductivity	42W(m*k) <sup>-1</sup>
Max. PV (Dry)	Short-term	3.6N/mm <sup>2</sup> *m/s	Coefficient of thermal expansion	11*10 <sup>-6</sup> *K <sup>-1</sup>
	Continuous	1.8N/mm <sup>2</sup> *m/s		

## CHARACTERISTICS

Suitable for rotating and oscillating movement, Fibrex structure combines in the best possible way the mechanical strength and the chemical resistance of sintered bronze and low friction characteristics of coated PTFE with less maintenance requirements due to long re-lubrication intervals, lower wear, lower susceptibility to edge loading, no absorption of water and therefore no swelling, good damping behaviours, good resistance to impact loads. It has longer service life under low speed and high load.

## APPLICATIONS

This material is used in equipments like suspension and auxiliary of agriculture, construction machines, cranes, hydraulic and mechanical jibs, ball, butterfly and sluice valves, water pumps and chemical industries etc.-

# TU FRB Composite bearings



## STRUCTURE

Sliding layer Contains PTFE filled liner and high-strength fibers encapsulated in as internally lubricating layer. Backing is made up of Continuous wound glass fiber encapsulated in a high temperature epoxy resin.

BEARING PROPERTIES	METRIC	IMPERIAL
Ultimate compressive strength $\sigma_c$	621 N/mm <sup>2</sup>	90 000 psi
Maximum static load $P_{sta,max}$	250 N/mm <sup>2</sup>	36 000 psi
Maximum dynamic load $P_{dyn,max}$	140 N/mm <sup>2</sup>	20 000 psi
Maximum sliding speed U	0.13 m/s	25 fpm
Maximum pU factor	1.05 N/mm x m/s	30 000 psi x fpm
Maximum temperature $T_{max}$	160 °C	320 °F
Minimum temperature $T_{min}$	- 195 °C	- 320 °F

## CHARACTERISTICS

- Excellent shock and misalignment resistance
- Excellent contamination resistance
- Very good friction and wear properties
- Good chemical resistance
- Medium to high load capacity

## AVAILABILITY

### STANDARD

- Plain cylindrical bushes Inner diameter range:  
Metric: 10 - 150 mm

### NON-STANDARD

- Customized bushing designs
- Cylindrical bushes with nonstandard lengths and wall thickness, flanged bearings.

# POLYGLIDE plastic bearings

## ENGINEERED PLASTIC BEARINGS

As modern equipment and systems get advanced they require bearings that can reliably operate under extreme conditions with minimal maintenance and lower operating costs.

Our series of Engineered Plastics bearings provide excellent wear resistance and low friction in both dry and lubricated operating conditions. In addition to their high shock-load resistance and noise-dampening properties, our Engineered Plastics provide environmentally friendly, grease-free operation—helping minimize the need for maintenance.



## STRUCTURE

The high performance polyglide plain bearing materials are composed of:

- Base polymer
- Solid lubricants
- Fibers and/or filaments

These components are not applied in layers, but instead is a homogeneous blend.

## Base polymers and technical fibers

The radial pressure, with which the bearings are loaded, is received by the plastic base material. In the contact area, this material provides shaft support.

The polymer base material ensures the lubricants do not receive a surface pressure that is too high. The base material is also reinforced by technical fibers or filaments. These additional materials stabilize the bearing, especially in cases of continuous stress.



# TU -P Polyglide plastic bearings



## STRUCTURE

Polyglide TU-P is a 30% glass reinforced, heat stabilized resin containing Teflon/ PTFE Micropowder. It is designed for highly reduced friction in applications requiring low wear and/ or low friction against itself, steel, or other plastics.

## PROPERTIES

### CHARACTERISTIC

- Self-lubricating
- Corrosion resistance
- Best material to use with soft shaft materials
- Low moisture absorption
- Vibration dampening
- Low coefficients of friction
- Maintenance free
- Low weight
- High wear resistance
- Very good price performance ratio

### APPLICATION

- General machinery
- Aviation
- Agriculture
- Automotive
- Construction machinery
- Machine tools
- Fitness and sports

Property	Test Method	Units	Value DAM
<b>Mechanical</b>			
Stress at Break	ISO 527	MPa (kpsi)	185 (26.8)
Strain at Break	ISO 527	%	2.8
Tensile Modulus	ISO 527	MPa (kpsi)	10300 (1500)
Flexural Modulus	ISO 178	MPa (kpsi)	9200 (1330)
Flexural Strength	ISO 178	MPa (kpsi)	270 (39.2)
Notched Charpy Impact Strength	ISO 179/1eA	kJ/m <sup>2</sup>	13
Unnotched Charpy Impact Strength	ISO 179/1eU	kJ/m <sup>2</sup>	80
<b>Thermal</b>			
Deflection Temperature	ISO 75-1/-2	°C (°F)	
1.80MPa			250 (482)
Melting Temperature	ISO 11357-1/-3	°C (°F)	
10°C/min			263 (505)
<b>Other</b>			
Density	ISO 1183	kg/m <sup>3</sup> (g/cm <sup>3</sup> )	1500 (1.50)

# TU-G Polyglide plastic bearings



## STRUCTURE

Polyglide TU-G is a 33% glass fiber reinforced, heat stabilized, lubricated polyamide based bearing. It is well suited for low wear, low friction application.

## CHARACTERISTIC

- Self-lubricating
- Corrosion resistance
- Good media resistance
- High compressive strength
- Vibration dampening
- Low coefficients of friction
- Maintenance free
- Low weight
- High wear resistance
- Cost effective

## APPLICATION

- Agriculture
- Automotive
- Construction machinery
- Machine tools
- Fitness and sports

## PROPERTIES

Property	Test Methods	Units	Value	
			DAM	50%RH
<b>Mechanical</b>				
Stress at Break	ISO 527	MPa (kpsi)	190 (27.5)	135 (19.6)
Strain at Break	ISO 527	%	2.5	4
Tensile Modulus	ISO 527	MPa (kpsi)	12500 (1810)	8500 (1230)
Notched Charpy Impact Strength	ISO 179/1eA	kJ/m <sup>2</sup>	12	16
Unnotched Charpy Impact Strength ISO 179/1eU	ISO 179/1e	kJ/m <sup>2</sup>	80	90
<b>Thermal</b>				
Deflection Temperature	ISO 75-1/-2	°C (°F)		
0.45M Pa			256 (493)	
1.80M Pa			248 (478)	
Melting Temperature	ISO 11357-1/-3	°C (°F)		
10°C/min			256 (493)	
<b>Other</b>				
Density	ISO 1183	kg/m <sup>3</sup>	1450 (1.45)	

# TU-BM Steel with Lead-free Bronze Powder

RoHS

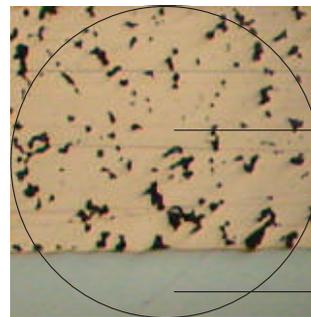


## Features

Steel backing lead-free bronze layer provides high specific loads, excellent fatigue strength under dynamic and shock load application, superior performance under oscillating movement, indents and grooves in the bearing lining provide a reservoir for grease and thus allow extended re-greasing intervals. Lead free bearing lining can meet EC directive of 2000/53/EC.

## Structure

1. **Sinter lead-free bronze powder**, provides bearing performance, have good wear resistance and excellent load carrying capacity.
2. **Steel backing**, provides exceptionally high load carrying capacity and excellent heat dissipation.



① CuSn8Ni

② Steel Back

## Tech. Data

Max. load	Static	250N/mm <sub>2</sub>	Alloy hardness	≥HB70
	Dynamic	140N/mm <sub>2</sub>		Temp.
Max. speed (Lubricated)		2.5m/s	Friction coefficient	0.05~0.20
Max. PV		2.8N/mm <sup>2</sup> *m/s	Thermal conductivity	60W(m*k) <sup>-1</sup>
Breaking Load		350N/mm <sub>2</sub>	Coef. of thermal expansion	14*10 <sup>-6</sup> *K <sup>-1</sup>

## Typical Applications

This material is recommended to be used under the medium speed and medium load condition with oil or grease lubricating. It is widely used for motor rod ends, Kingpin bushing, undercarriage rollers, hydraulic cylinder rod eyes of construction machines and spherical joint bearings of agricultural machines.



## Structure

TU-GB material is made of strong cast bronze based metal with special solid lubricants embedded. The base metal withstands high load and the solid lubricants provide self-lubrication. The bearing shows excellent performance without pre-lubrication under conditions of extreme high/low temperature with low speed. This material provides a maintenance-free bearing solution, particularly for high load, intermittent or oscillating motion.

## Features

1. May work without any oil for long period
2. Extremely high load capacity, good anti-wear and lower friction
3. Particularly appropriate for low speed and high load
4. Suitable for reciprocating, oscillation or intermittent motion where oil film is hard to be formed
5. Good chemical resistant and anti-corrosion characteristics
6. Can be used in wide range of temperature from  $-40^{\circ}\text{C}$   $\sim +300^{\circ}\text{C}$

## Typical Applications

This kind of bearing can be applied under dry, high temperature, high pressure, corrosive, water or other chemical environments when no oil can be introduced. It is widely used in automotive products line, water engineering, dam gate, plastic industries, successive casting machines, steel rollers in metallurgy industry, mineral machines, ships, turbo generators, hydraulic turbines and injection molding machines...

Main Metal Type							
Grade	650	650S5	650W1	650W3	650S1	650S2	650S3
Material	CuZn25Al5Mn4				CuSn5Pb5Zn5	CuAl10Ni5Fe5	CuSn12
Density	7.8				8.9	7.8	8.9
HB hardness	≥210	≥240	≥210	≥235	≥70	≥100	≥75
Tensile strength Mpa	≥750	≥800	≥755	≥755	≥250	≥500	≥270
Yeild strength Mpa	≥450	≥450	≥400	≥400	≥90	≥260	≥150
Elongation %	≥12	≥8	≥12	≥12	≥13	≥10	≥5
Coefficient of linear expansion	1.9x10 <sup>-5</sup> /°C				1.8x10 <sup>-5</sup> /°C	1.6x10 <sup>-5</sup> /°C	1.8x10 <sup>-5</sup> /°C
Max. temp.	-40~+250°C				-40~+400°C		
Max. load Mpa	50	75	75	100	50		
Max. speed m/s	Dry	0.5	0.1	0.5	0.1	0.5	
	Lubrication	1	0.25	1	0.25	2.5	
Max. PV (N/mm <sup>2</sup> *m/s)	Dry	1.65				1	
	Lubrication	3.25				1.65	

The above technical data is recommend from AWWA, better to test under detail condition.

Solid Lubricants		
Lubricant	Features	Typical application
SL1 Graphite+add	Excellent resistance against chemical attacks and low friction. Temp limit 400°C	Suite for general machines and under atmosphere
SL4 PTFE+MOS <sub>2</sub> +add	Lower in friction and good for water lubrication, Temp. limit 300°C	Suite for water/sea lubrication, like ship, hydraulic turbine, gas turbine etc.

Tech. Data				
Max. load	Static	250N/mm <sub>2</sub>	Temp.	-100°C~+300°C
	Dynamic	100N/mm <sub>2</sub>		Friction coefficient
Max. speed	Dry	0.5m/s	Thermal conductivity	60W(m*k) <sub>-1</sub>
	Lubrication	1.0m/s	Coef. of thermal expansion	19*10 <sup>-6</sup> *K <sub>-1</sub>
Max. PV Bronze alloy hardness	3.25N/mm <sub>2</sub> *m/s HB>210		Interlay bonding strength	150N/mm <sub>2</sub>



# Dimensions

UNIT: mm

AXLE	HOUSING H7	OD Tolerance	ID After fixing	Wall thickness	$L_{-0.40}^0 \begin{matrix} (d \leq 30 L - 0.3) \\ (d > 30 L - 0.4) \end{matrix}$																
					6	8	10	12	15	20	25	30	40	50							
6 <sup>-0.013</sup> <sub>-0.028</sub>	8 <sup>+0.015</sup>	8 <sup>+0.055</sup> <sub>+0.025</sub>	6.055 5.990	1.005 0.980	0606	0608	0610														
8 <sup>-0.013</sup> <sub>-0.028</sub>	10 <sup>+0.015</sup>	10 <sup>+0.055</sup> <sub>+0.025</sub>	8.055 7.990		0806	0808	0810	0812	0815												
10 <sup>-0.013</sup> <sub>-0.028</sub>	12 <sup>+0.018</sup>	12 <sup>+0.065</sup> <sub>+0.030</sub>	10.058 9.990		1006	1008	1010	1012	1015	1020											
12 <sup>-0.016</sup> <sub>-0.034</sub>	14 <sup>+0.018</sup>	14 <sup>+0.065</sup> <sub>+0.030</sub>	12.058 11.990		1206	1208	1210	1212	1215	1220	1225										
13 <sup>-0.016</sup> <sub>-0.034</sub>	15 <sup>+0.018</sup>	15 <sup>+0.065</sup> <sub>+0.030</sub>	13.058 12.990				1310			1320											
14 <sup>-0.016</sup> <sub>-0.034</sub>	16 <sup>+0.018</sup>	16 <sup>+0.065</sup> <sub>+0.030</sub>	14.058 13.990				1410	1412	1415	1420	1425										
15 <sup>-0.016</sup> <sub>-0.034</sub>	17 <sup>+0.018</sup>	17 <sup>+0.065</sup> <sub>+0.030</sub>	15.058 14.990				1510	1512	1515	1520	1525										
16 <sup>-0.016</sup> <sub>-0.034</sub>	18 <sup>+0.018</sup>	18 <sup>+0.065</sup> <sub>+0.030</sub>	16.058 15.990				1610	1612	1615	1620	1625										
17 <sup>-0.016</sup> <sub>-0.034</sub>	19 <sup>+0.021</sup>	19 <sup>+0.075</sup> <sub>+0.035</sub>	17.061 16.990				1710	1712		1720											
18 <sup>-0.016</sup> <sub>-0.034</sub>	20 <sup>+0.021</sup>	20 <sup>+0.075</sup> <sub>+0.035</sub>	18.061 17.990				1810	1812	1815	1820	1825										
20 <sup>-0.020</sup> <sub>-0.041</sub>	23 <sup>+0.021</sup>	23 <sup>+0.075</sup> <sub>+0.035</sub>	20.071 19.990	1.505 1.475			2010	2012	2015	2020	2025	2030									
22 <sup>-0.020</sup> <sub>-0.041</sub>	25 <sup>+0.021</sup>	25 <sup>+0.075</sup> <sub>+0.035</sub>	22.071 21.990				2210	2212	2215	2220	2225	2230									
24 <sup>-0.020</sup> <sub>-0.041</sub>	27 <sup>+0.021</sup>	27 <sup>+0.075</sup> <sub>+0.035</sub>	24.071 23.990						2415	2420	2425	2430									
25 <sup>-0.020</sup> <sub>-0.041</sub>	28 <sup>+0.021</sup>	28 <sup>+0.075</sup> <sub>+0.035</sub>	25.071 24.990				2510	2512	2515	2520	2525	2530	2540	2550							
28 <sup>-0.020</sup> <sub>-0.041</sub>	32 <sup>+0.021</sup>	32 <sup>+0.085</sup> <sub>+0.045</sub>	28.085 27.990						2815	2820	2825	2830	2840								
30 <sup>-0.020</sup> <sub>-0.041</sub>	34 <sup>+0.025</sup>	34 <sup>+0.085</sup> <sub>+0.045</sub>	30.085 29.990	2.005 1.970			3012	3015	3020	3025	3030	3040									
32 <sup>-0.025</sup> <sub>-0.050</sub>	36 <sup>+0.025</sup>	36 <sup>+0.085</sup> <sub>+0.045</sub>	32.085 31.990						3220		3230	3240									
35 <sup>-0.025</sup> <sub>-0.050</sub>	39 <sup>+0.025</sup>	39 <sup>+0.085</sup> <sub>+0.045</sub>	35.085 34.990				3512	3515	3520	3525	3530	3540	3550								
38 <sup>-0.025</sup> <sub>-0.050</sub>	42 <sup>+0.025</sup>	42 <sup>+0.085</sup> <sub>+0.045</sub>	38.085 37.990					3815			3830	3840									
40 <sup>-0.025</sup> <sub>-0.050</sub>	44 <sup>+0.025</sup>	44 <sup>+0.085</sup> <sub>+0.045</sub>	40.085 39.990					4012		4020	4025	4030	4040	4050							
					20	25	30	40	50	60	70	80	100	115							
45 <sup>-0.025</sup> <sub>-0.050</sub>	50 <sup>+0.025</sup>	50 <sup>+0.085</sup> <sub>+0.045</sub>	45.105 44.990	2.505 2.460	4520	4525	4530	4540	4550												
50 <sup>-0.025</sup> <sub>-0.050</sub>	55 <sup>+0.030</sup>	55 <sup>+0.100</sup> <sub>+0.055</sub>	50.110 49.990		5020		5030	5040	5050	5060											
55 <sup>-0.030</sup> <sub>-0.060</sub>	60 <sup>+0.030</sup>	60 <sup>+0.100</sup> <sub>+0.055</sub>	55.110 54.990				5530	5540	5550	5560											
60 <sup>-0.030</sup> <sub>-0.060</sub>	65 <sup>+0.030</sup>	65 <sup>+0.100</sup> <sub>+0.055</sub>	60.110 59.990				6030	6040	6050	6060	6070										
65 <sup>-0.030</sup> <sub>-0.060</sub>	70 <sup>+0.030</sup>	70 <sup>+0.100</sup> <sub>+0.055</sub>	65.110 64.990				6530	6540	6550	6560	6570										
70 <sup>-0.030</sup> <sub>-0.060</sub>	75 <sup>+0.030</sup>	75 <sup>+0.100</sup> <sub>+0.055</sub>	70.110 69.990					7040	7050	7060	7070	7080									
75 <sup>-0.030</sup> <sub>-0.060</sub>	80 <sup>+0.030</sup>	80 <sup>+0.100</sup> <sub>+0.055</sub>	75.110 74.990				7530	7540	7550	7560	7570	7580									
80 <sup>-0.030</sup>	85 <sup>+0.035</sup>	85 <sup>+0.120</sup> <sub>+0.070</sub>	80.155 80.020				8040	8050	8060	8070	8080	80100									
85 <sup>-0.035</sup>	90 <sup>+0.035</sup>	90 <sup>+0.120</sup> <sub>+0.070</sub>	85.155 85.020				8540		8560		8580	85100									

# Dimensions

90 <sub>-0.035</sub>	95 <sup>+0.035</sup>	95 <sup>+0.120</sup> <sub>+0.070</sub>	90.155 90.020	2.490 2.440				9040	9050	9060		9080	90100		
95 <sub>-0.035</sub>	100 <sup>+0.035</sup>	100 <sup>+0.120</sup> <sub>+0.070</sub>	95.155 95.020						9550	9560			9580	95100	
100 <sub>-0.035</sub>	105 <sup>+0.035</sup>	105 <sup>+0.120</sup> <sub>+0.070</sub>	100.155 100.020						10050	10060			10080		100115
105 <sub>-0.035</sub>	110 <sup>+0.035</sup>	110 <sup>+0.120</sup> <sub>+0.070</sub>	105.155 105.020							10560			10580		105115
110 <sub>-0.035</sub>	115 <sup>+0.035</sup>	115 <sup>+0.120</sup> <sub>+0.070</sub>	110.155 110.020							11060			11080		110115
120 <sub>-0.035</sub>	125 <sup>+0.040</sup>	125 <sup>+0.170</sup> <sub>+0.100</sub>	120.210 120.070	2.465 2.415						12060		12080	120100		
125 <sub>-0.035</sub>	130 <sup>+0.040</sup>	130 <sup>+0.170</sup> <sub>+0.100</sub>	125.210 125.070							12560				125100	125115
130 <sub>-0.040</sub>	135 <sup>+0.040</sup>	135 <sup>+0.170</sup> <sub>+0.100</sub>	130.210 130.070							13060			13080	130100	
140 <sub>-0.040</sub>	145 <sup>+0.040</sup>	145 <sup>+0.170</sup> <sub>+0.100</sub>	140.210 140.070							14060			14080	140100	
150 <sub>-0.040</sub>	155 <sup>+0.040</sup>	155 <sup>+0.170</sup> <sub>+0.100</sub>	150.210 150.070							15060			15080	150100	
160 <sub>-0.040</sub>	165 <sup>+0.040</sup>	165 <sup>+0.170</sup> <sub>+0.100</sub>	160.210 160.070							16060		16080	160100	160115	
180 <sub>-0.040</sub>	185 <sup>+0.046</sup>	185 <sup>+0.210</sup> <sub>+0.130</sub>	180.216 180.070	2.465 2.415								18080	180100		
190 <sub>-0.046</sub>	195 <sup>+0.046</sup>	195 <sup>+0.210</sup> <sub>+0.130</sub>	190.216 190.070										19080	190100	
200 <sub>-0.046</sub>	205 <sup>+0.046</sup>	205 <sup>+0.210</sup> <sub>+0.130</sub>	200.216 200.070								20060		20080	200100	
220 <sub>-0.046</sub>	225 <sup>+0.046</sup>	225 <sup>+0.210</sup> <sub>+0.130</sub>	220.216 220.070										22080	220100	
250 <sub>-0.046</sub>	255 <sup>+0.052</sup>	255 <sup>+0.260</sup> <sub>+0.170</sub>	250.222 250.070										25080	250100	
260 <sub>-0.052</sub>	265 <sup>+0.052</sup>	265 <sup>+0.260</sup> <sub>+0.170</sub>	260.222 260.070	2.465 2.415								26080	260100		
280 <sub>-0.052</sub>	285 <sup>+0.052</sup>	285 <sup>+0.210</sup> <sub>+0.130</sub>	280.222 280.070									28080	280100		
300 <sub>-0.052</sub>	305 <sup>+0.052</sup>	305 <sup>+0.210</sup> <sub>+0.130</sub>	300.222 300.070									30080	300100		

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# PRECISION

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