

# TriStar



*Engineered Plastic Solutions™*



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**Ultrasert®**





Ultrasert®

Mounted Spherical Bearings

Ultrasert® bearings are the designer's choice for the most demanding applications in the food and beverage, timber, pulp and paper, and general conveyor industries.

Ultrasert® bearings excel in caustic wash-downs, water, dry abrasives and chemical immersion applications. Designed to be maintenance free, they can handle high impact and vibratory loading as well as temperatures up to 550° F all without lubrication.

Ultrasert® bearings are easily interchangeable with standard spherical inserts and are available off-the-shelf in several grades and shaft sizes.



Ultrasert® inserts will retrofit the following housings:



**Pillow Block**



**2-Bolt**



**4-Bolt**

Dodge	SC, SCTC, SXR	SC, SCTC	SC, SCTC
Fafnir	RAS, RASC	RCJT	RCJ
Browning	VPS	VF2S	VF4S
Sealmaster	NP	SFT	SF

Ultrasert® inserts are available in the following sizes:

Size	Insert Diameter (OD)	Shaft Diameter metric	Shaft Diameter inch
204	1.850	12,15,17,20	1/2, 9/16, 5/8, 11/16, 3/4
205	2.047	25	13/16, 7/8, 15/16, 1
206	2.440	30	1-1/16, 1-1/8, 1-3/16, 1-1/4
207	2.835	35	1-1/4, 1-5/16, 1-3/8, 1-7/16
208	3.150	40	1-1/2, 1-9/16
209	3.347	45	1-5/8, 1-11/16, 1-3/4



PILLOW BLOCK



2-BOLT



4-BOLT



INSERTS

**Applications**

- Food & Beverage Equipment
- Timber, Pulp & Paper Handling
- Waste Water & Water Treatment
- Conveyor Systems

**Benefits**

- Self-Lubricating
- Maintenance Free
- Impact and Vibration Resistant
- Longer Wear Life
- Interchanges with Industry Standards

Property	Units	Ultraflon RPG	Ultraflon 550W	Ultraflon 500AF	Ultraflon OFI
Specific Gravity	g/cc	1.46	2.23	1.50	0.93
Tensile Strength	psi	20,000	2,000	8,000	5,400
Elongation	%	4.5	175	15	260
Compressive Strength					
Yield	psi	15,000	—	16,000	—
Ultimate	psi	21,500	—	—	—
Impact Strength - Notched	ft-lbs/in.	1.4	1	0.7	no break
Operating Temperature					
Minimum	—	-120	-400	-40	Cryogenic
Maximum - Continuous	°F	430	550	180	160
Maximum - Short Term	°F	450	600	180	160
Coefficient of Friction - Dry	—	0.15	0.10	0.19	0.16
Water Absorption - 24 hour saturation	%	0.3	0.0	0.2 - 1.0	0.0
Maximum Bearing Load - Static (P)	psi	1,500	1,000	1,000	800
Maximum Bearing Speed - No Load (V)	sfm	400	400	100	75
Maximum Limiting PV Value (PxV)	psi x sfm	18,000	10,000	10,000	1,500



## Material Selection Process (MSP)

In all plastic component designs, material selection is critical. During the selection process, one should consider the following factors to ensure the best possible selection.

### 1 TEMPERATURE

All plastics are affected by ambient heat and have a maximum continuous service temperature. The maximum continuous service temperature is not a melting point, but is the highest temperature at which a material will retain physical integrity. Important: Note *that elevated temperatures affect material properties in a negative manner and should be carefully reviewed before use.*

### 2 TEMPERATURE VARIATION

All plastic materials have coefficients of thermal expansion. Measured in in/in/°F, plastic materials vary greatly not only from each other, but in some cases ten times that of metallic counter parts. As a result, we consider temperature variations. Components should be designed to meet required service temperature. Not doing so may result in premature failure.

### 3 ENVIRONMENTAL CONDITIONS

Always consider the following environmental conditions under which the material must operate:

- Contact with debris such as sand, grit or dust
- Contact with chemicals such as strong acids, bases and caustics
- Contact with water, constant spray or wash downs
- FDA or USDA compliance
- Thermal Conductivity
- Radiation Exposure
- Microwave Exposure

### 4 OTHER CONSIDERATIONS

- Size and Shape Availability
- Material Cost/Economy
- Machinability
- Standard or Custom Runs
- Custom Compounds

[tstar.com](http://tstar.com)



Visit our interactive on-line Material Selection Process (MSP) at [tstar.com/msp](http://tstar.com/msp)

This four step process gathers all the information regarding your material and sends it directly to our engineering team so that we may assist you with your selection.

Plastic Material	Shape Availability		Machinability Rating 1-10 1=Easy	Serv Temp Long/Short Degrees F	Characteristics / Attributes
	Rod Dia	Sheet Thickness			
ULTRACOMP UC200	Tubing	1/8 to 3	3	266/360	High Load / Impact-Vibration Resistant / Composite
ULTRACOMP UC300	Tubing	1/8 to 3	3	266/360	Lowest Friction / Chemical Resistant / High load
ULTRACOMP UC400	Tubing	1/8 to 3	3	335/360	Moly Lubricant / Slow rotary / Salt water applications
ULTRACOMP UC500	Tubing	1/8 to 3	3	335/360	Bearing Grade Blended Fiber / Graphite Composite
ABS	3/16 to 8	1/4 to 4	1	140/210	General Purpose / Economical / Machinable / Moldable
ACETAL / DELRIN	1/8 to 12	1/4 to 3	1	180	Machinable / Good Wear / FDA / USDA
ACETRON	1/16 to 9	1/32 to 4-1/2	1	180	Co-polymer Acetal / Machinable / Economical
ACRYLIC	1/16 to 6	1/32 to 3	5	140/200	Optically Clear / Colors / Machinable / Formable
CELAZOLE / PBI	3/8 to 4	1/2 to 1-1/2	8	600/1000	Highest Temp / Chemically Resistant / High PV
CPVC	1/4 to 13-3/4	3/32 to 4	1	200	Weldable / Economical / Chemical Resistant / High Temp
DELRIN 500CL	1/2 to 3	1/4 to 4	1	122/300	Chemically Lubricated Acetal / Low Friction
DELRIN AF	1/4 to 6	1/4 to 2	1	185/300	PTFE Filled Acetal / Low Friction / Brown
ERTALYTE	3/8 to 8	1/4 to 4	1	210	PET / Economical / Good Wear / FDA / White
FEP	1/16 to 6	.005 to 3	3	400	Fluoropolymer / Excellent Chemical Resistance
FLUOROSINT 207 / 500	1/2 to 8-3/4	1/4 to 3	3	500	Mica Filled PTFE / High Thermal Stability / FDA
HYDEX 4101 & 4101L	1/2 to 6	3/8 to 4	1	245/350	PBT / PTFE Filled / FDA-USDA / Low Friction / White
HYDEX FGA	1/2 to 4	3/8 to 2	1	185/300	PTFE Filled Acetal / FDA / USDA / Low Friction
HYDLAR ZF	1/4 to 5	1/4 to 2	5	210/355	Aramid Fiber Filled Nylon / Wear Resistant
KYNAR / PVDF	1/4 to 10	1/4 to 4	2	285/340	Fluoropolymer / Excellent Chemical Resistance
MELDIN	1 to 4-3/4	3/8 to 2	7	600	High Temp / Wear Resistance / High PV / Low Outgas
MICARTA C & L	1/32 to 10	1/32 to 8	8	250	Phenolic Resin / Cloth Fabric Matrix / Laminate
MICARTA G-10 & G-11	1/32 to 5	.005 to 5	10	300	Epoxy / Woven Fiberglass Matrix / Laminate
MICARTA XXX	1/32 to 2	1/32 to 5	8	250	Phenolic Resin / Paper Matrix / Laminate
NORYL EN265	3/8 to 8	1/4 to 4	2	220/230	PPO & Styrene Alloy / Good Creep Resistance
NYLATRON	1/32 to 2	.010 to 4	1	200	Filled Nylon Type 66 / Impact & Wear / Cast Type 6
NYLON 66	1/32 to 6	.010 to 3	1	210	Economical / Good Wear / High Impact Strength
PCTFE / KEL-F	1/16 to 6	.005 to 2	3	500	Chemical Resistant / Heat Resistant / High Temp
PEEK	1/4 to 4	1/4 to 2-1/2	5	480	Autoclavable / Chemical & Steam Resistant
PFA	1/16 to 3	.002 to 3	3	500	Chemical Resistant / Heat Resistant / High Temp
POLYCARBONATE	1/32 to 15	1/32 to 4	3	250	Good Machinability / Transparent / High Rigidity
POLYETHYLENE	1/32 to 18	.002 to 10	1	140/175	General Purpose / Economical / Chemical Resistant
POLYPROPYLENE	1/4 to 16	.010 to 10	1	160/230	Chemically Resistant / Weldable / Economical
POLYSULFONE / UDEL	3/16 to 8	1/4 to 4	1	325/340	Autoclavable / Chemically Resistant / Heat Resistant
PTFE - EXT & MOLDED	1 to 38	.001 to 12	3	550	Unfilled Teflon / Inert / High Temp / Insulator / White
PTFE - GLASS FILLED	1/4 to 12	1/4 to 4	5	550	Filled PTFE / High V / High Temp / Chemical Resistant
PTFE - TUBING	.034 to 12	N/A	N/A	550	Roll Covers / Spaghetti / Shrinkable / AWG Sizes
PVC	1/4 to 13-3/4	3/32 to 4	1	165	Weldable / Economical / Chemical Resistant
RADEL R	1/4 to 6	1/4 to 3	3	300	Autoclavable / Chemically Resistant / Impact Resistant
REXOLITE	1/16 to 9	1/32 to 6	3	212	Crosslinked Polystyrene / High Frequency Dielectric
RULON 123	3/16 to 13	.010 to 2	3	550	Filled PTFE / FDA / USDA / High V / Inert / Black
RULON 142	N/A	.015 to 1/4	1	550	Filled PTFE / Machine Ways / Expansion Slides
RULON 488	3/16 to 12	.015 to 1	3	550	Filled PTFE / High V / Inert / Dryer Bearings / Green
RULON 641	3/16 to 12	.015 to 1	3	550	Filled PTFE / FDA / USDA / High V / Inert / White
RULON J	3/16 to 13	.010 to 4	3	550	Filled PTFE / Low Friction / Non Abrasive / Gold
RULON LR / AR	3/16 to 13	.010 to 4	5	550	Filled PTFE / Good Strength / High V / Inert / Maroon
TECHTRON / PPS	1/4 to 4	1/4 to 2	4	425	Chemical Resistant / High Temp / High Strength
TEFZEL / ETFE	1/16 to 3-3/4	.030 to 3	3	300/350	Fluoropolymer / Excellent Chemical Resistance
TFM	1 to 12	.010 to 4	3	500	Fluoropolymer / Low Porosity / High Temperature
TORLON 4203 / 4301	1/4 to 2	3/16 to 1	5	500	High Temp / High Strength / Electrical & Bearing Grade
UHMW	1/4 to 10	.005 to 7	5	180	High Abrasion Resistance / Low Friction / FDA
UHMW / OIL FILLED	1/4 to 8	1/8 to 2	3	180	Lowest Friction / High Abrasion Resistance
ULTEM 1000	1/8 to 6	.002 to 2-1/2	5	340	High Strength / Autoclavable / Chemical Resistance
ULTEM 2300	1/2 to 6	3/8 to 2	8	340	High Strength / Rigid / Autoclavable / Thermally Stable
VHMW	N/A	1/8 to 3/4	5	160	Good Abrasion Resistance / Low Friction / Economical



## Plane Bearing Design (PBD)

In all plane bearing designs, material selection is critical. During the selection process, one should consider the following factors to ensure the best possible selection.

### 1 BEARING LOAD – P $P = \text{LBS} / (\text{ID} \times \text{LENGTH})$

Measured in pounds per square inch (PSI), bearing pressure is calculated by disbursing the total load over the projected area (IDxLENGTH) of the bearing. This provides the average pressure (PSI) that the bearing must support. Note that all materials have a maximum P.

### 2 RELATIVE VELOCITY – V $V = C \times \text{RPM}$

Measured in feet per minute (FPM), bearing velocity is calculated by first calculating the shaft circumference (C) in inches (C= Shaft Dia x 3.14 ÷ 12). Then by multiplying by the RPM of the shaft, this calculation gives the surface velocity in feet per minute (FPM) or V. Note that all materials have a maximum V.

### 3 SYSTEM – PV $PV = P \times V$

System PV is measured in PSI x FPM, and is the product of P x V. System PV is a means of measuring the performance capabilities of a plastic material and is the result of multiplying the operating pressure by the surface velocity. *Important: Note that the maximum PV rating is not the maximum P x maximum V.*

### 4 TEMPERATURE

Materials used as self-lubricating plane bearings are always affected by ambient heat. All plastic materials have a maximum continuous service temperature. The maximum continuous service temperature is not a melting point, but is the highest temperature at which a material will retain enough physical integrity to allow it to continue to operate as a bearing. *Important: Note that elevated temperatures affect material properties in a negative manner and should be carefully reviewed before use.*

### 5 TEMPERATURE VARIATIONS

All plane-bearing materials have coefficients of thermal expansion. Measured in in/in/degree F, plastic materials vary greatly not only from each other, but in some cases ten times that of their metallic counter parts. As a result, we must consider temperature variations. Bearings should be designed such that at service temperature, the bearing does not close down on the shaft. Failure to do so will result in additional frictional heat and/or total system freeze up.

### 6 ENVIRONMENTAL CONDITIONS

Always consider the following environmental conditions under which the bearing must operate:

- Contact with debris such as sand, grit or dust
- Contact with chemicals such as strong acids, bases and caustics
- Contact with water, constant spray or wash downs
- FDA or USDA compliance
- Shaft material, surface finish, and thermal conductivity

### 7 HARDWARE CONDITIONS

Hardware Conditions are critical elements in optimizing wear life and frictional properties in bearing design.

- Shaft Material
- Shaft Surface Finish – 12 to 16 RMS recommended
- Shaft Treatments
- Housing Design – Finish and Materials

[tstar.com](http://tstar.com)  Visit our interactive on-line

Plane Bearing Design Worksheet (PBD) at [tstar.com/pbd](http://tstar.com/pbd)

This seven step process gathers all the information regarding your bearing application and sends it directly to our engineering team so that we may assist you with your bearing design.

Bearing Material	Max P Static psi	Max V No Load SFM dry	Max PV P x V Dry	Serv. Temp Continuous °F	Characteristics / Attributes
ULTRACOMP UC200	54,400	15	25,000	266	High Load / Impact-Vibration Resistant / Bearing Grade Composite
ULTRACOMP UC300	45,000	30	15,000	266	Lowest Friction / High Load / Bearing Grade Composite
ULTRACOMP UC400	52,000	15	25,000	266	Moly lubricant / Slow rotary / Salt water applications
ULTRACOMP UC500	50,000	30	25,000	266	Bearing Grade Blended Fiber / Bearing Grade Composite
MELDIN 7021	6,000	1,000	300,000	600	Highest PV / Very High Temp / Lowest Friction
MELDIN 7030	3,000	750	100,000	550	High PV / High Temp / Lowest Friction / Polyimide
MELDIN 7211	4,500	750	100,000	600	High PV / High Temp / Low Friction / Chemical Resistant
CARBON FIBER / PTFE FILLED PEEK	6,000	600	75,000	480	High PV / High Temp / Chemical Resistant / Thermally Stable
CELAZOLE / PBI	1,000	150	50,000	650	Highest Temp / Chemical Resistant / Polybenzamidizole
TORLON 4301	1,000	900	50,000	500	High Temp / High Strength / Low Friction / Graphite Filled
CARBON FIBER FILLED PEEK	6,000	600	30,000	480	High PV / High Temp / Thermally Stable / Conductive
FCJ BEARING	5,000	400	20,000	320	Rulon Lined Glass / Epoxy Shell / High P
HYDEX 4101L	1,000	200	15,000	245	PTFE Filled PBT / FDA / USDA / Low Friction
HYDLAR FGA	1,000	100	12,400	180	PTFE Filled Acetal / Low Friction / FDA / USDA
BEARING GRADE PPS	1,500	400	10,000	425	High Strength / Rigidity / Excellent Chemical Resistance
CJ BEARING	15,000	150	10,000	320	PTFE Nomex-Lined Glass / Epoxy Shell / High Load
DELIN AF	1,000	100	10,000	180	PTFE Filled Acetal / Low Friction / Brown
FLUOROGOLD	1,000	400	10,000	500	Filled PTFE / Lowest Friction / High V / Chemical Resistant
NYLATRON NSM	400	100	10,000	200	Solid Lubricant Filled Nylon Type 6
PTFE - 15% GRAPHITE FILLED	1,000	400	10,000	500	Filled PTFE / Low Friction / Economical
PTFE - 25% CARBON FILLED	1,000	400	10,000	500	Filled PTFE / Low Friction / Conductive
PTFE - 25% GLASS FILLED	1,000	400	10,000	500	Filled PTFE / High V / High Temp / Chemical Resistant
RULON 123	1,000	400	10,000	500	Filled PTFE / FDA / USDA / Very Low Friction / Economical
RULON 1337	1,000	400	10,000	500	Filled PTFE / Excellent Seal and Bearing Material
RULON 142	1,000	400	10,000	500	Filled PTFE / Bondable / Machine Tool Ways / High Load
RULON 488	1,000	400	10,000	500	Filled PTFE / Economical / High V / Chemical Resistant
RULON 641	1,000	400	10,000	500	Filled PTFE / FDA / USDA / High V / Chemical Resistant
RULON DC7035	1,000	400	10,000	500	Filled PTFE / Conductive / High V / Chemical Resistant
RULON F	1,000	400	10,000	500	Filled PTFE / Excellent High Temperature Wear
RULON K / FLUOROLOY K	1,000	400	10,000	500	Filled PTFE / Stability / Seals / High V / Chemical Resistant
RULON LR	1,000	400	10,000	500	Filled PTFE / Good Strength / High V / Chemical Resistant
RULON W2	1,000	400	10,000	500	Filled PTFE / Water Applications / High V / Chemical Resistant
HYDLAR ZF	1,500	100	8,000	230	Aramid Fiber Filled Nylon / Good Wear / FDA
FLUROSINT 207	750	400	7,500	500	Thermal Stability / Filled PTFE / Low Friction / FDA
RULON 945	1,000	400	7,500	500	Filled PTFE / High Impact / Very Low Deformation Under Load
RULON 988 / FLUOROLOY A	1,000	400	7,500	500	Filled PTFE / Stability / Strength / High V / Low Friction
RULON J	750	400	7,500	500	Filled PTFE / Low Friction / Non Abrasive / Chemical Resistant
ERTALYTE TX	1,000	100	6,000	210	PET / Economical / Good Wear / FDA / USDA
HYDEX 4101	1,000	100	6,000	245	PBT / Chemical Resistant / Economical / Good Wear
NYLATRON GSM BLUE	350	100	5,500	200	Oil & MOs Filled Nylon Type 6 / Monocast / Good Wear
NYLATRON MC901	350	100	5,500	200	Heat Stabilized Nylon Type 6 / Monocast / Good Wear
FLUROSINT 500	750	400	5,000	500	Filled PTFE / Most Thermally Stable in PTFE Family
DELIN	1,000	50	3,500	180	Acetal / Economical / Good Wear / FDA / USDA
ACETRON GP	1,000	50	3,000	180	Porosity Free Acetal / Good Wear / FDA / USDA
DELIN CL500	1,000	50	3,000	180	Chemically Lubricated Acetal / Low Friction
GLASS FILLED NYLON	350	40	3,000	210	Economical / Good Wear / High Impact
NYLATRON GSM	300	60	3,000	200	Moly Filled Nylon Type 6 / Economical / Monocast
NYLON ST801	300	40	3,000	200	High Strength / Good Impact Strength
NYLON 66	300	60	2,700	210	Economical / Good Wear / High Impact
UHMW - GLASS FILLED	1,000	50	1,500	180	Low Friction / Highest Abrasion Resistance
UHMW - OIL FILLED	800	75	1,500	180	Low Friction / High Abrasion Resistance / FDA
PTFE	50	400	1,000	500	Unfilled Teflon / High Temp / Low Heat Transfer
UHMW	800	50	1,000	180	High Abrasion Resistance / Low Friction / FDA
XYLETHON	1000	50	1,000	335	High Temperature / Dimensionally Stable / Abrasion Resistance UHMW



The "**TriStar Advantage**" is more than just our material expertise and machining capabilities at work for you. We offer an educational series of Training Seminars on a variety of subjects relative to materials and applications. These seminars are often custom designed to meet the specific interests of the customer and their market.

The most popular seminars currently available for presentation are:

- **Plane Bearing Technology** – *The application of self-lubricating materials in bearings*
- **High Performance Materials** – *Pushing the design envelope of plastics*
- **Basic Plastics** – *A general overview of engineering plastics and their applications*
- **FDA Materials** – *Specific overview of materials for food and pharmaceutical use*
- **Composites** – *Materials for extreme bearing and structural applications*
- **Fluoropolymers** – *Specific overview of fluoropolymers and their applications*
- **Meldin® 7000** – *Now you have the "Freedom of Choice" in polyimides*

*These complimentary seminars are each approximately one hour in length and can be modified to meet your specific interests. Contact your TriStar engineer for more information.*



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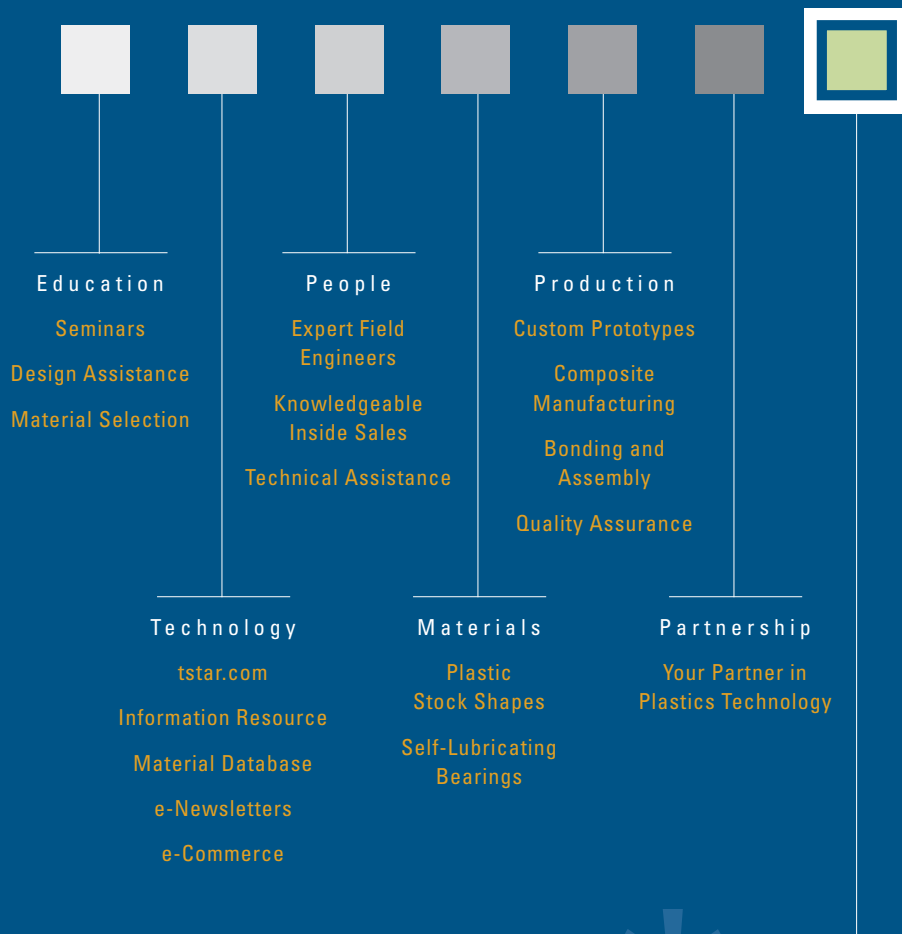
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# TriStar



*Engineered Plastic Solutions™*

*We've created the TriStar Advantage with you in mind.*



## The TriStar Advantage

Our studies show that customers that utilize us as their in-house engineering department increase their bottom line profits.

# TriStar




Engineered Plastic Solutions™



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