

# Characteristics of Urethane, Rubbers and Sponges

## Features of High Performance Urethane and Rubber

### Urethane Properties

Tests of tensile strength and elongation for Vulkollan are conducted based on the JIS Standards K6251.  
Tests of tensile strength and elongation for other products are conducted based on the JIS Standards K7312.

Item	Unit	Urethane															
		Standard					Vulkollan®		Abrasion Resistant		Ceramic Urethane				Heat Resistant	Low Rebound	Extra Low Hardness
Hardness	Shore A	95	90	70	50	30	92	68	90	70	95	90	70	50	90	70	15
Specific Gravity	-	1.13	1.13	1.20	1.20	1.20	1.26	1.20	1.13	1.13	1.20	1.15	1.13	1.03	1.02		
Tensile Strength	MPa	44	27	56	47	27	46.5	60	44.6	31.3	42	26	53	45	44.6	11.8	1.5
Elongation	%	380	470	720	520	600	690	650	530	650	360	440	680	490	530	250	385
Heat resistance	°C	70					80 (120 deg. for Short Time)		70		70				120	70	80
Low Temp. Resistance	°C	-40		-20			-20		-20		-20				-20	-20	-40

### Urethane (Ether Type, Ester Type) Property Comparison

Properties	Ether Type (Shore A95, 90)	Ester Type (Shore A70, 50, 30)
Tensile Strength		○
Elongation		○
Tear Strength		○
Impact Resilience	○	
Abrasion Resistance		○
Slip Wear		○
Shock Wear	○	
Hydrolysis Resistance	○	
Oil Resistance		○
Strength		○
Durability		○
Acid Resistance, Alkali Resistance	○	

### Discoloration of Urethane

Urethane may experience discoloration and yellowing with age. Urethane turns yellow by aging, but physical property or characteristics remain unchanged. Discoloration is distinct especially with antistatic urethane and Vulkollan®. See the explanation below.

#### • Aging Discoloration of Antistatic Urethane

**Before** → **After**  
\* Time to turn yellow and level of yellowing vary depending on operating environment, etc.

#### • Discoloration of Vulkollan®

Vulkollan® has poorer color stability against ultraviolet rays than general urethanes due to its unique composition. Pictures below show the process of change in colors of a sample exposed to outdoor sunlight.

**Before Test** → **1 day** → **6 days** → **20 days**  
\* No change in physical property or characteristics due to discoloration.

### Features of Various Urethanes

Material	Features
<b>Standard Urethane Ether / Ester Polyurethane</b>	Excels in strength in repeat use and shock-absorbing properties. Can be used for applications such as Mechanical Stoppers. Ester Type is Hydrolytic. Do not use in humid and wet areas.
<b>Antistatic Urethane</b>	Excels in antistatic effect. Can be used where mechanical strength and anti-static measures are required.
<b>Heat Resistant Urethane</b>	CThis urethane has up to 120°C heat resistance. (70 deg. for the standard urethane) Suitable for use in applications where high material strength in high-temperature range is required.
<b>Super Abrasion Resistant Urethane (Vulkollan®)</b>	Vulkollan® is a super abrasion resistant urethane which is far superior to conventional urethanes in abrasion resistance and load bearing. Excels in tearing strength, 6 times higher in abrasion resistance and 1.5 times in material strength than the standard urethane.
<b>Abrasion Resistant Urethane</b>	Unique composition realized abrasion resistance 2.5 times higher than standard urethane at low cost. Helps to reduce the exchange frequency. Color is dark brown.
<b>Ceramic Urethane</b>	These MISUMI original urethane sheets are <b>unique mixture of ceramic particles</b> . Vulkollan® and Wear Resistant Urethane have resistant property against "surface", and the Ceramic Urethane has resistance against "line". Compared to the Standard Urethane and various rubbers, the Ceramic Urethane is <b>relatively smooth in its machined surfaces though it is lower in hardness</b> . Note that cutting due to contact may cause dust.

#### • Characteristic Values of Antistatic Urethane

Specific Volume Resistivity	2.1x10 <sup>10</sup> Ω · cm
Surface Resistivity	4.0x10 <sup>9</sup> Ω

(Test Conditions: Temperature 30°C Humidity 60%)  
\* All other properties are equal to those of urethane of the same hardness.

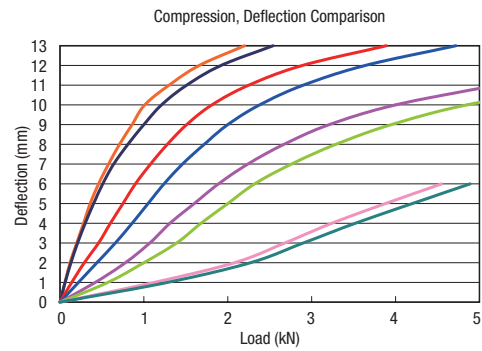
#### • Taber Abrasion Test Results

Material	Standard Urethane	Super Abrasion Resistant Urethane	Abrasion Resistant Urethane	Ceramic Urethane
Abrasion Test (Taber Method)	197.3	33.9	73.8	101
Abrasion Volume (mm <sup>3</sup> )				

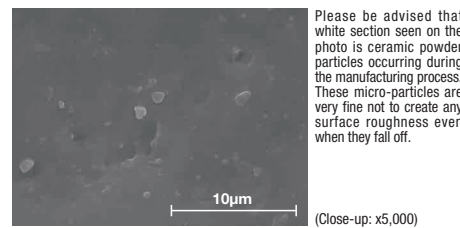
Testing Method: JIS K 7204: 1999 "Plastics - Determination of Resistance to Wear by Abrasive Wheels"  
Abrasive Wheel: H, 22 Load: 9.8N  
Number of Strokes: 1,000 Test Parameter: 1  
\* The values are not guaranteed but measured ones.

### Features of Ceramic Urethane

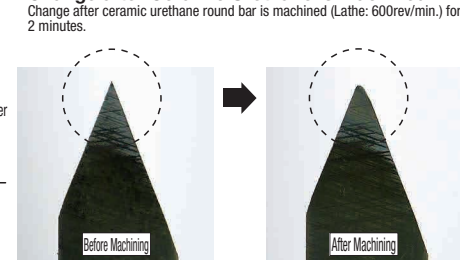
**• Deflection Comparison of Standard Urethane and Ceramic Urethane**  
Deflection between the ceramic urethane and the standard urethane differs when the same load is applied. Careful consideration should be given for replacement.



#### • Enlarged View of Ceramic Urethane



#### • Change after Ceramic Urethane is Machined



### Rubber Properties

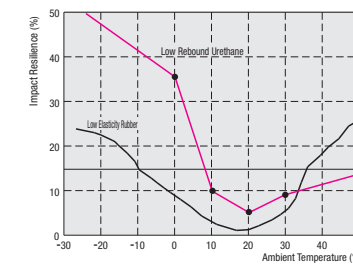
The characteristic values of tensile strength and elongation are tested based on the JIS standard K6251.

Item	Unit	Nitrile Rubber (NBR)		Chloroprene Rubber (CR)	Ethylene Rubber (EPDM)	Butyl Rubber (IIR)	Fluororubber (FPM)		Silicon Rubber (SI)		Low Elasticity Rubber (Hanenaito®)	Natural Rubber (NR)
		70	50	65	65	65	80	60	Standard	High Strength	49	33
Hardness	Shore A	70	50	65	65	65	80	60	70	50	49	33
Specific Gravity	-	1.6	1.3	1.6	1.2	1.5	1.8	1.9	1.2	1.2	1.27	1.26
Tensile Strength	MPa	12.7	4.4	13.3	12.8	7.5	12.5	10.8	7.4	8.8	7.8	8.5
Elongation	%	370	400	460	490	380	330	270	300	330	400	630
Maximum Operating Temperature	°C	90	99	100	120	120	230	230	200	200	60	70
Temperature of Continuous Use	°C	80	80	80	80	80	210	210	150	150	30	70
Low Temp. Resistance	°C	-10	-10	-35	-40	-30	-10	-10	-70	-50	19	18

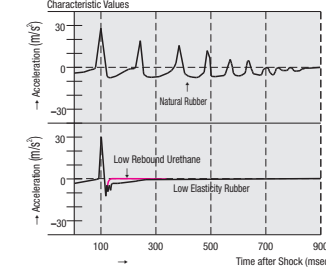
### Features of Low Rebound Urethane and Low Elasticity Rubber (Hanenaito®)

Low Rebound Urethane has the same properties as urethane, and excels in shock absorption. With more resistance to permanent compression than standard urethane, it is hard to deform. Not suitable for absorption of large impact energy because its tensile strength and elongation resistance are weaker than that of urethane of the same hardness.  
Low Elasticity Rubber (Hanenaito®) Hanenaito® is a registered trademark of Naigai Rubber Industry Co., Ltd. It is used as cushioning material for pallet damper, conveyor machine, precision instrument etc, because of its good elongation and shock absorption. Also it is used as vibration absorption materials of various precision instruments because of its excellent vibration absorption.

#### • Impact Resilience Variation by Temperature of Low Elasticity Rubber and Low Rebound Urethane

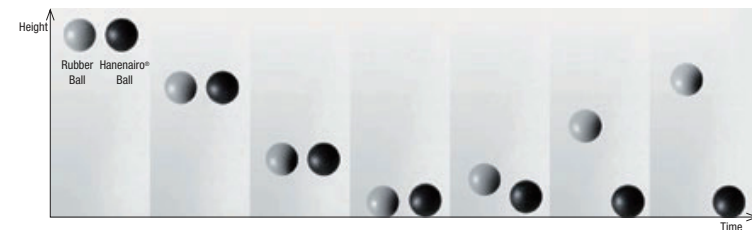


#### • Shock Absorption Comparison of Low Elasticity Rubber and Low Rebound Urethane



Listed values are for reference, not guaranteed.

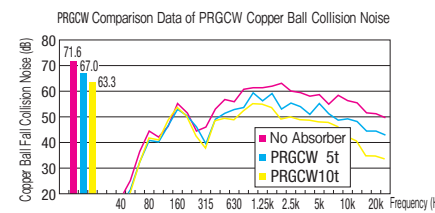
### Drop Comparison of Rubber Ball and Hanenaito® Ball



### Features of Shock Absorbing Foam P435

Excellent sound damping and vibration absorbing characteristics. Flexible material can be pasted on curved surfaces with ease. Lightweight material can be applied on large panel areas. Best suited for human body protection. Can be pasted in multi-layers where more protection is needed.

#### Steel Ball Collision Noise Level Test



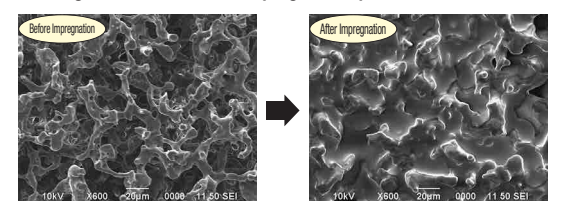
Item	No Absorber	PRGCW5	PRGCW10
Collision Noise (dB)	71.6	67	63.3
Sound Pressure	-	40% Reduced Sound Pressure	80% Reduced Sound Pressure

\*A steel ball (Ø20, 36g) is dropped on a wooden base from a 55cm height, and the sound pressure level is measured with a microphone at a distance of 50m, positioned 50cm above the ground.

### Features of Special Urethane Foam SOFRAS® P446

This special urethane foam excels in water retention and abrasion resistance allowing it to be used in industrial purposes such as application and moisture absorption. SOFRAS® excels in abrasion resistance and requires less concerns about dust shedding, whereas the use of sponges and felts may result in shedding of dust and felt fiber.

#### • Enlarged Photo of Grease-impregnated Special Urethane



### Reference: Compression Set of Low Rebound Urethane

Low Rebound Urethane	1%
Urethane (Shore A70)	25%

\* The above data is measured at room temperature 23°C.  
\* 70°Cx24H 25% Compression

### Comparison of Damping Effects of Hanenaito® and Natural Rubber

