

# URETHANE SPRINGS

## URETHANE SPRINGS



Product name Catalog No.	URETHANES FOR HEAVY LOADS EX	SQUARE URETHANES FOR HEAVY LOADS QX	URETHANE STOCK BLOCKS EST·ESBT·ESU·ESUB·S·SU	URETHANES FOR HEAVY LOADS A
Page	1029	1030	1030	1031



URETHANE STOCK BLOCKS E · EL	URETHANES FOR HEAVY LOADS LA-C · AX-CX	URETHANES WITH COUNTERBORE AZ · AZX	URETHANE SHEETS UT · UTH	URETHANE DIE PADS UD · UDH
1032	1033	1034	1035	1036



ECONOMY URETHANES AE·LAE·CE·AEX·CEX	URETHANE FOAM (POROUS) FOR HIGH-DEFLECTION USE PA · PLA	LOW REPULSION URETHANES AN·LAN·CNN	LOW REPULSION URETHANES WITH COUNTERBORE ANX·CNX
1037·1038	1039	1040	1041



LOW REPULSION URETHANE SHEETS UTN	LOW REPULSION URETHANE DIE PADS UDN
1042	1042

# [PRODUCTS DATA] URETHANE SPRINGS GUIDE

## Physical properties and features of urethane

Item	Urethanes for heavy loads					High-deflection type urethane foams (porous)	Low repulsion urethanes
	H type	M type	S type	L type	Economy type		
Hardness (Shore A)	95	90	80	70	90	N/A (foam)	70
Catalog No.	TUS-US-USN	EX-QX-EST ESBT-ESU ESUB-A-E-EL LA-C-AX-CX AZ-AZK-UT UTH-UD-UDH	—	—	AE-LAE-CE AEX-CEX	PA-PLA	AN-LAN-CNN ANX-CNX-AZN AZNX-UTN UDN
Page	P.641 ~ P.644	P.1029 ~ P.1036	—	—	P.1037 ~ P.1038	P.1039	P.1040 ~ P.1042
Tensile strength (N/cm²) / (kgf/cm²)	4511(460)	4462(455)	2941(300)	3138(320)	2452(250)	490(50)	1176(120)
Elongation (%)	450	550	500	650	540	250	250
300% modulus (N/cm²) / (kgf/cm²)	1755(179)	1304(133)	931(95)	372(38)	1225(125)	—	—
Repulsion elasticity (%)	23	28	56	51	42	50	6
Tearing strength (N/cm) / (kgf/cm)	1206(123)	1147(117)	539(55)	451(46)	686(70)	294(30)	343(35)
Specific gravity	1.28	1.27	1.26	1.26	1.16	1.02	1.02
Permanent strain (%) *	26	24	27	25	27	25	1
Operating environment temperature (°C)	−20 ~ +70				−5 ~ +80	−20 ~ +70	
Melting point (°C)	220	200	180	230 ~ 250	200		
Embrittlement point (°C)	−70	−60	−45	−70	−50		
Ignition point (°C)	500			450	400		
Characteristics	Weather resistance	Each type has better weather resistance than ordinary rubber materials.					
	Water resistance	Can be used even if exposed to a small amount of water. (Cannot be used under conditions of constant water immersion.)					
	Oil resistance	Can be used even if exposed to a small amount of cutting oil. (Cannot be used under conditions of constant oil immersion.)					
	Discoloration	Becomes discolored when exposed to ultraviolet rays (including sunlight), however there is no adverse effect on performance. Relatively more discoloration occurs with high-deflection type urethane foams than with other types.					
Features	<ul style="list-style-type: none"> <li>Provides the largest load resistance, for better contour forming.</li> <li>Because of the small deflection amount, this type can be used only for simple forming.</li> </ul>	<p>This type has physical properties intermediate between the H and S types, and can be used for general purposes.</p>	<p>Although the load resistance is lower, the larger deflection amount allows deeper forming.</p>	<p>Although the hardness is equivalent to general rubber materials, this type has superior abrasion resistance and mechanical strength.</p>	<p>Although the load resistance and durability (permanent strain) are somewhat inferior to the M type, the prices are lower.</p>	<ul style="list-style-type: none"> <li>Can be used for high deflection (40%max.) and high load applications.</li> <li>The lateral expansion is about half that of the M type at an equivalent deflection.</li> <li>Because this type is foamed urethane, it provides excellent heat radiation performance.</li> </ul>	<p>With low permanent strain and excellent shock absorbing performance, this type can deliver anti-vibration performance.</p>
Applications (reference)	Machining of thin stainless steel plates or steel plates approximately 2mm thick	Machining of thin plates of materials such as aluminum or brass	<ul style="list-style-type: none"> <li>Bulging</li> <li>Shallow drawing</li> </ul>	<ul style="list-style-type: none"> <li>Drawing</li> <li>Guerin method</li> <li>Wheelon method</li> </ul>	More suitable for small-volume production than the M type.	<p>Often used as pad cushions and cam return cushions.</p>	<ul style="list-style-type: none"> <li>Vibration proofing</li> <li>Machining of soft materials such as films.</li> </ul>

① The above figures are actual measurements at room temperature 23°C, and do not constitute guaranteed specifications.

\* method of measuring permanent strain (JIS K7312)

- 1) 24 hours at 70°C with 25% compression
- 2) Cooled for 30 min. in laboratory at 23°C
- 3) Strain is measured.

## Comparison of urethane springs, coil springs, and gas cushions

◎: Excellent ○: Satisfactory △: Slightly poor ×: Unacceptable

Item	Cost to load ratio	Machinability	High speed endurance	Load stability	Permanent strain	Initial pressure	Operating environment temperatures
Urethane springs	○	○	△	△	△	○	○
Coil springs	○	×	○	○	○	△	○
Gas cushions	△	×	△	○	○	○	△

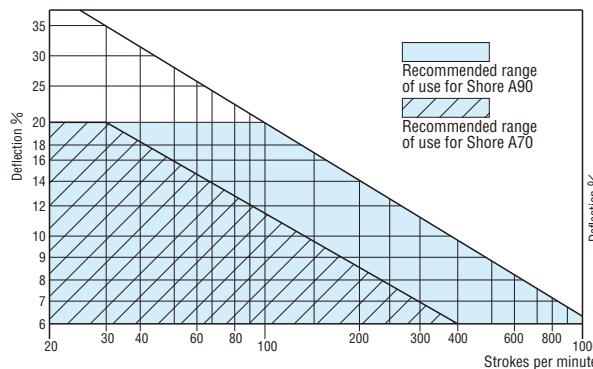
# [PRODUCTS DATA] CORRECT USES AND MACHINING METHODS FOR URETHANES

## [DATA] Relationship between compression ratio and strokes per minute

In order to control heat generation and accumulation and also to improve the endurance lifetime of the urethane spring, pay attention to the compression ratio and the strokes per minute. The following figures show the relationship between various compression ratios and allowable strokes per minute for maintaining good conditions for heat dissipation.

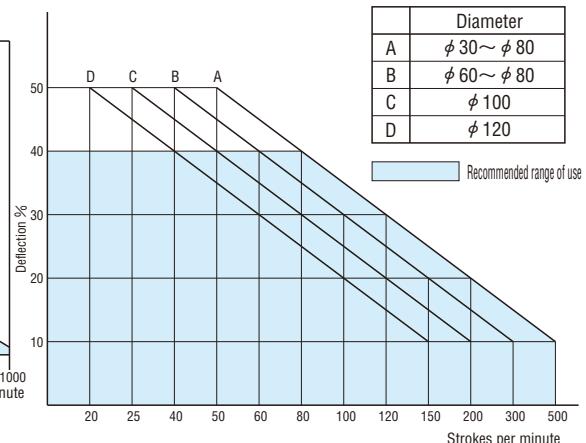
### ●Urethanes for heavy loads and low repulsion urethanes Shore A70・90

When shore A70 and 90 urethanes deform, they generate heat through internal friction (hysteresis effect). This phenomenon occurs when the urethane is pressurized rapidly. When used for high-speed machining, heat will accumulate inside the urethane. Therefore it is necessary to adjust the deflection according to the strokes per minutes as shown in the table below.



### ●High-deflection type urethane foams (porous)

High-deflection type urethane foams (porous) produce less heat when compressed than urethanes for heavy loads. This is because the air bubbles inside the urethane deform first, reducing the deformation of the urethane itself. As a result, the lateral expansion due to compression is half that of urethanes for heavy loads, the heat accumulation is small, and the heat radiation performance is high. However in the same way as urethanes for heavy loads, special attention must be paid to the compression amount and stroke counts, as these can result in deterioration.



## Urethane machining methods and precautions

- ①Move the material (urethane) as rapidly as possible so that heat will not build up internally.
- ②Slow machining causes heating of the material (urethane), which results in elasticity loss, causing the saw teeth or cutter blade to become stuck in the material.
- ③It is important to use a blade that is as sharp and narrow as possible.

### A. Cutting

1. Urethane can be easily cut with sawing machines, band saws, or other machines in the same way as steel.
2. When cutting with a lathe, operate the lathe at high speed with a sharp and narrow blade. (This is the best cutting method in terms of achieving good workpiece parallelism.)



### B. Flattening

1. Urethane can be flattened by a milling cutter, shaper, or planer.
2. Cutting speed

When using a milling machine, the cutter circumferential speed should be set to 40 ~ 60m/min. When using a shaper or planer, the speed should be set to the machine's highest speed.

### C. Grinding

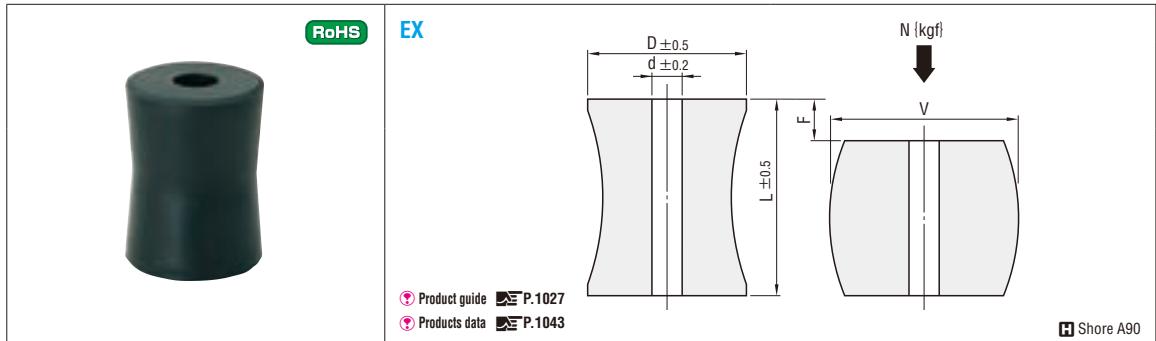
1. Use a cooling device while grinding, in the same way as when grinding steel. An appropriate grindstone circumferential speed is 80 ~ 100m/min.
2. The best grindstone material is GC with bonding strength K. The most suitable grain size is approximately 30 ~ 60.

### D. Drilling

1. Drilling can be done in the same manner as with steel.
2. When the tip of the drill is shaped as shown below, better drilling can be accomplished without deforming the material (urethane).
3. The internal diameter of the drilled hole will shrink.



# URETHANES FOR HEAVY LOADS



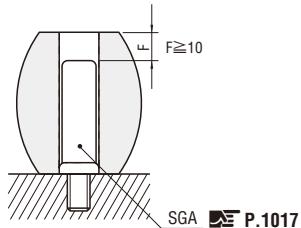
F=L×20%		F=L×25%		F=L×30%		V	D	d	L	Catalog No.	Base unit price 1~19 pieces
F mm	Load N (kgf)	F mm	Load N (kgf)	F mm	Load N (kgf)						
12	6865	15	8924	18	12749	58	50	14	62	EX 5146	
16	{700}	20	{910}	24	{1300}				82	EX 5148	
12	9807	15	13239	18	18633	70	60	20	62	EX 6206	
16	{1000}	20	{1350}	24	{1900}				82	EX 6208	
16	19123	20	26478	24	39227	92	80	20	82	EX 8208	
20	{1950}	25	{2700}	30	{4000}				103	EX 82010	
16	27949	20	38736	24	54427	114	100	20	82	EX 10208	
20	{2850}	25	{3950}	30	{5550}				103	EX 102010	
24		30		36					123	EX 102012	

EX

Product guide P.1027  
Products data P.1043

● Load (kgf) = Load (N) × 0.101972

**ex** Example



Catalog No.

EX 8208



Quotation



Quotation



Catalog No. — (C1)

EX8208 — C1

Quotation



Alterations

Catalog No.

EX8208 — C1

Quotation



Code

Spec.

1Code

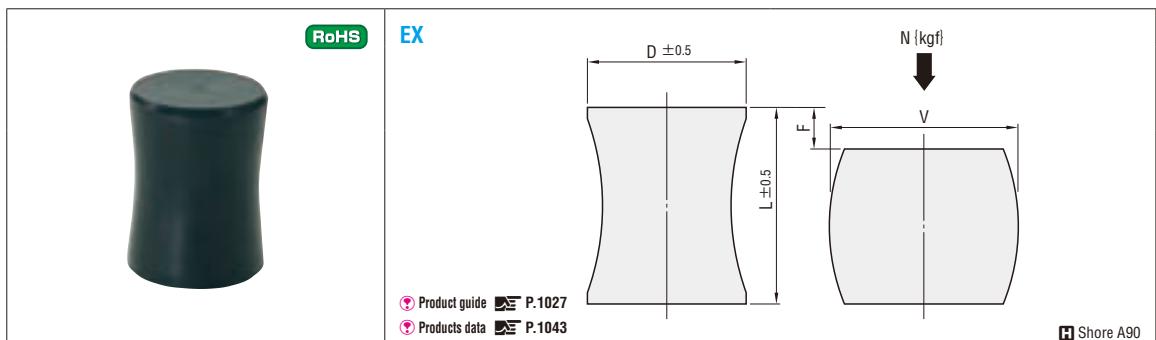
Quotation



C1

C1 chamfering on inner diameter

Quotation



F=L×20%		F=L×25%		F=L×30%		V	D	L	Catalog No.	Base unit price 1~19 pieces
F mm	Load N (kgf)	F mm	Load N (kgf)	F mm	Load N (kgf)					
12	7551	15	9807	18	14710	58	50	62	EX 5060	
16	{770}	20	{1000}	24	{1500}			82	EX 5080	
12	11082	15	15004	18	21575	70	60	62	EX 6060	
16	{1130}	20	{1530}	24	{2200}			82	EX 6080	
16	20104	20	27753	24	41188	92	80	82	EX 8080	
20	{2050}	25	{2830}	30	{4200}			103	EX 80100	
16	29420	20	41188	24	61292	114	100	82	EX 10080	
20	{3000}	25	{4200}	30	{6250}			103	EX 100100	
24		30		36				123	EX 100120	

Quotation

● Load (kgf) = Load (N) × 0.101972



Catalog No.

EX100100

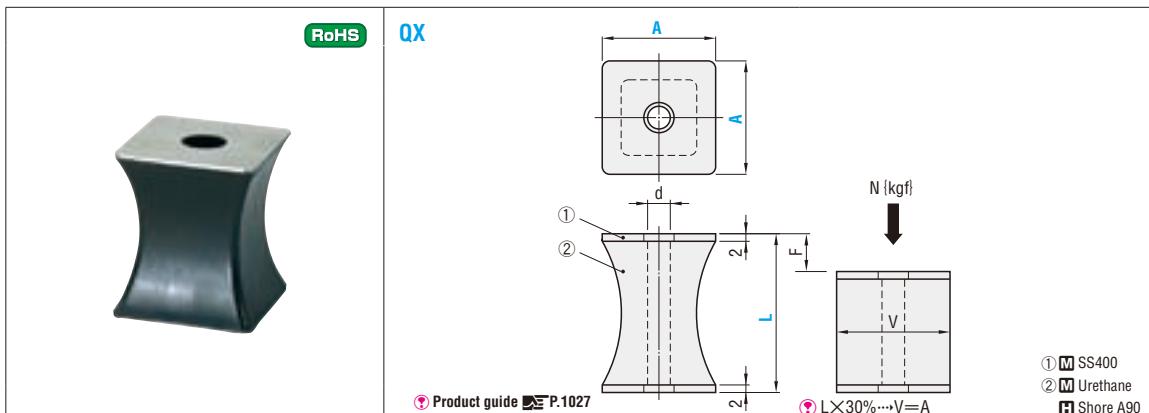


Quotation



Quotation

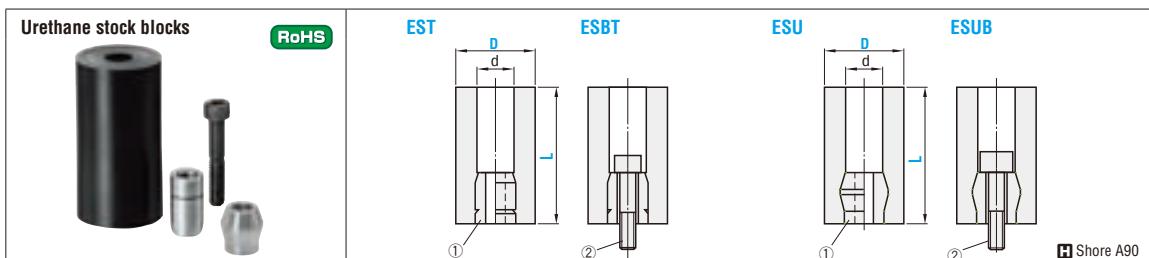
# SQUARE URETHANES FOR HEAVY LOADS / URETHANE STOCK BLOCKS



F=L×20%		F=L×25%		F=L×30%		d	Catalog No.		Base unit price 1 ~ 19 pieces
F mm	Load N [kgf]	F mm	Load N [kgf]	F mm	Load N [kgf]		Type	A-L	
12	9807 (1000)	15	13239 (1350)	18	18633 (1900)	14	60	62 82	● Load [kgf] = Load [N] × 0.101972
16	13729 (1400)	20	18633 (1900)	24	25497 (2600)		70	62 82 92	
12		15		18			95	82 103 123	
16		20		24			120	103 123 143	
18		23		27					
16		20		24					
20	25497 (2600)	25	35304 (3600)	30	49033 (5000)				
24		30		36					
20		25		30					
24	39227 (4000)	30	53937 (5500)	36	73550 (7500)				
28		35		42					

**Quotation**

Order Catalog No. **OX 70-92** Days to Ship **Quotation** Price **Quotation**



d	Urethane	(1)		(2)	Catalog No.	Base unit price 1 ~ 9 pieces	Order Catalog No. <b>EST 40-80</b>
		Type	D-L				
14	E40-80	S14	SU14	CB8-45 (1 piece)	* 40-80	Days to Ship <b>Quotation</b>	Price <b>Quotation</b>
	E50-110				50-110		
	E70-140				70-140		
	E7022110				* 7022110		
22	E7022140	S22	SU22	CB12-55 (1 piece)	* 7022140		
	E90-120				90-120		
	E90-140				90-140		
	E100-140				100-140		

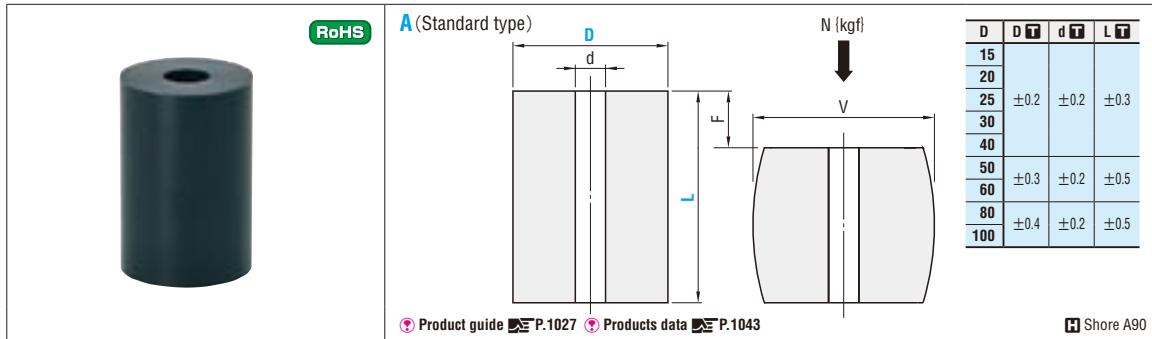
For ESU and ESUB, only the sizes marked with \* are available. Applicable urethanes P.1032

Sleeve unit <b>S</b>	<b>SU</b>	Dimensions								Urethane d	Catalog No.	Base unit price 1 ~ 19 pieces
		d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	ℓ	ℓ <sub>1</sub>	ℓ <sub>2</sub>	ℓ <sub>3</sub>			
		16	9	—	—	30	—	—	—	14	S14	
		24	13	—	—	35	—	—	—	22	S22	
		24	13	—	—	100	—	—	—	22	S22-100	
		14	9	13	19	30	7	10	3	14	SU14	
		22	13	20	27					22	SU22	

**Quotation**

Order Catalog No. **S 14** Days to Ship **Quotation** Price **Quotation**

# URETHANES FOR HEAVY LOADS



D	d	F	V
15			
20			
25	±0.2	±0.2	±0.3
30			
40			
50	±0.3	±0.2	±0.5
60			
80	±0.4	±0.2	±0.5
100			

F=L×15%		F=L×20%		F=L×25%		d	Catalog No.	Base unit price 1 ~ 19 pieces
F mm	Load N (kgf)	F mm	Load N (kgf)	F mm	Load N (kgf)	V	Type D — L	
3.8		5		6.3				
4.5	588 { 60}	6	785 { 80}	7.5	981 { 100}	18		
5.3		7		8.8				
6		8		10				
3.8		5		6.3				
4.5	1128 { 115}	6	1422 { 145}	7.5	1765 { 180}	24		
5.3		7		8.8				
6		8		10				
3.8		5		6.3				
4.5		6		7.5				
5.3	1667 { 170}	7	2157 { 220}	8.8	2648 { 270}	30		
6		8		10				
6.8		9		11.3				
7.5		10		12.5				
3.8		5		6.3				
4.5		6		7.5				
5.3		7		8.8				
6	2599 { 265}	8	3040 { 310}	10	3531 { 360}	37		
6.8		9		11.3				
7.5		10		12.5				
8.3		11		13.8				
9		12		15				
6	4560 { 465}	8	5394 { 550}	10	6276 { 640}	48		
7.5		10		12.5				
9		12		15				
7.5	7747 { 790}	10	9218 { 940}	12.5	10787 { 1100}	60		
9		12		15				
12		16		20				
7.5	13042 { 1330}	10	15102 { 1540}	12.5	17652 { 1800}	72		
9		12		15				
12		16		20				
9	21378 { 2180}	12	25399 { 2590}	15	29420 { 3000}	95		
12		16		20				
15		20		25				
12	35990 { 3670}	16	42659 { 4350}	20	49720 { 5070}	119		
15		20		25				
18		24		30				

● Load [kgf] = Load [N] × 0.101972



Order

Catalog No.

A 25~40



Days to Ship

Quotation



Price

Quotation



Alterations



Catalog No. — (C1)

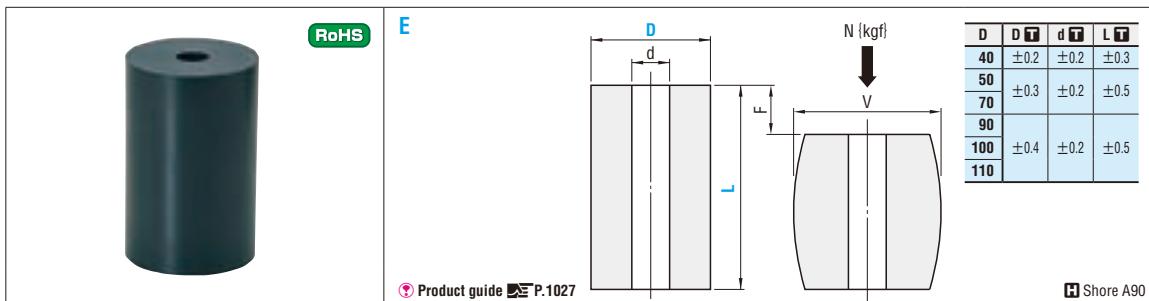
A 60~80 — C1



Quotation

Alteration	Code	Spec.	1 Code
	C1	C1 chamfering on inner diameter	Quotation

# URETHANE STOCK BLOCKS



F=L×15%		F=L×20%		F=L×25%			D	d	L	Catalog No.		Base unit price 1 ~ 19 pieces
F mm	Load N (kgf)	F mm	Load N (kgf)	F mm	Load N (kgf)	V				Type	D—L	
12	4560 {465}	16	5394 {550}	20	6276 { 640}	47	40	80	14	40—80		
16.5	7747 {790}	22	9218 {940}	27.5	10787 {1100}	59		110		50—110		
16.5		22		27.5				110		70—110		
21		28		35				110		70—140		
25.5	18633 {1900}	34	22555 {2300}	42.5	24517 {2500}			140		70—170		
16.5		22		27.5				170		7022110		
21		28		35				110		7022140		
25.5		34		42.5				140		7022170		
21		28		35				170		90—140		
25.5	27459 {2800}	34	33342 {3400}	42.5	40207 {4100}	105		140		90—170		
30		40		50				170		90—200		
21	35990 {3670}	28	42659 {4350}	35	49720 {5070}	117		90		100—140		
21		28		35				110		110—140		
25.5	39226 {4000}	34	47072 {4800}	42.5	56878 {5800}	129		110		110—170		
30		40		50				110		110—200		
37.5		50		62.5				200		110—250		
								250				

● Load (kgf) = Load (N) × 0.101972

Quotation



Catalog No.  
E 7022110

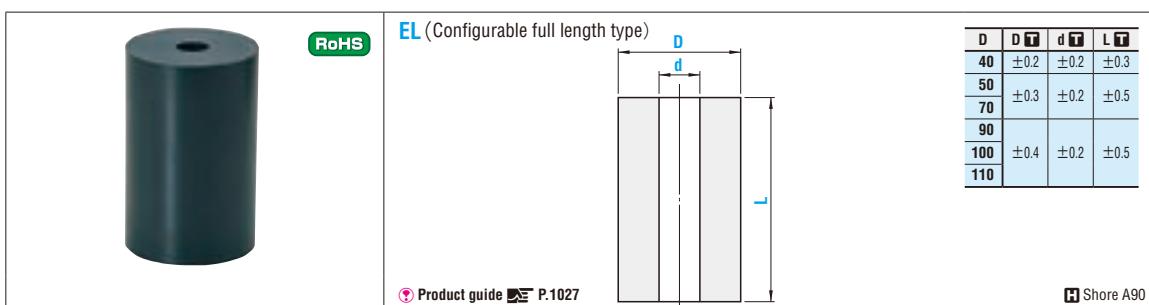
P Price

Quotation



Days to Ship

Quotation



Type	Catalog No.		L 1mm increments	Base unit price 1 ~ 9 pieces							
	D	d		L15 ~ 20	L21 ~ 40	L41 ~ 60	L61 ~ 80	L81 ~ 100	L101 ~ 150	L151 ~ 200	L201 ~ 250
EL	40	14	15 ~ 200								
	50										
	70	14~22									
	90										
	100	22		50 ~ 250							
	110										

Quotation



Order

Catalog No.—L  
EL 70—22 — 155

P Price

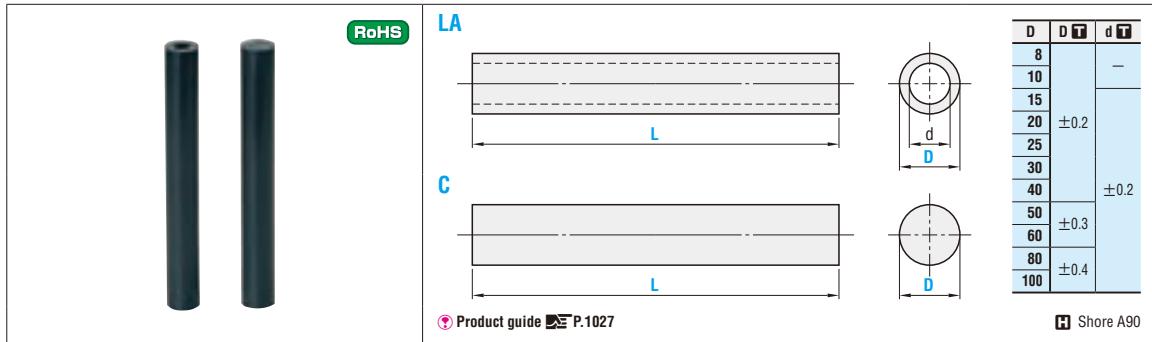
Quotation



Days to Ship

Quotation

# URETHANES FOR HEAVY LOADS



d	Catalog No.		Catalog No.		Base unit price 1 ~ 19 pieces
	Type	D—L	Type	D—L	
—	—	—	C	8—200	
—	—	—	C	10—200	
7	LA	15—200	C	15—200	
8.5	LA	20—200	C	20—200	
11	LA	25—200	C	25—200	
14	LA	30—500	C	30—500	
	LA	40—500	C	40—500	
	LA	50—500	C	50—500	
	LA	60—500	C	60—500	
22	LA	80—500	C	80—500	
	LA	100—500	C	100—500	

Quotation



Order

Catalog No.  
LA 60—500



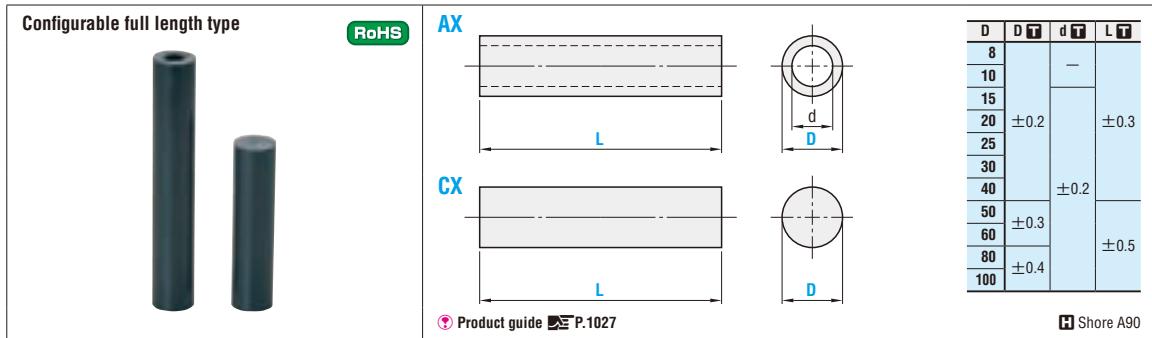
Days to Ship

Quotation



Price

Quotation



d	Catalog No.	D	L 1mm increments	Base unit price 1 ~ 19 pieces							
				L10 ~ 20	L21 ~ 40	L41 ~ 60	L61 ~ 80	L81 ~ 100	L101 ~ 150	L151 ~ 200	
—	CX	8	10 ~ 200								
—											
7		10									
8.5											
11		15									
14											
14		20									
22											
11		25									
14											
14		30									
22											
14		40									
22											
14		50									
22											
14		60									
22											
14		80									
22											
14		100									
22											

Quotation



Order

Catalog No.  
AX 20 — 45



Days to Ship

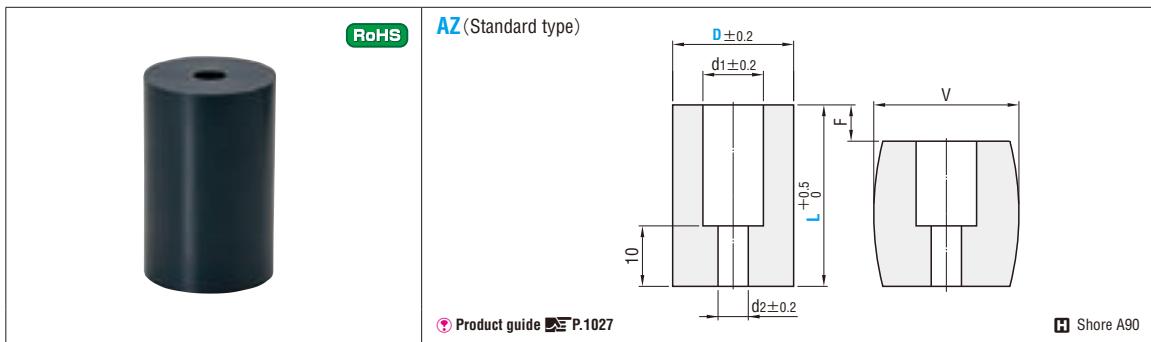
Quotation



Price

Quotation

# URETHANES WITH COUNTERBORE



F=L×10%	F=L×15%	F=L×20%	V	D	d1	d2	M	L	Catalog No.	Base unit price 1~19 pieces
F mm	Load N (kgf)	F mm	Load N (kgf)	F mm	Load N (kgf)	V	D	d1	Type D-L	
2.5	3.7	5.0		24	20	11	7	M6	AZ 20-25	
3.0	883	4.5	1079	6.0	1275				30	
3.5	{90}	5.2	{110}	7.0	{130}				35	
4.0		6.0		8.0					40	
2.5	3.7	5.0							AZ 25-25	
3.0	1177	4.5	1569	6.0	1765	29	25	11	30	
3.5	{120}	5.2	{160}	7.0	{180}				35	
4.0		6.0		8.0					40	
3.0	2550	4.5	3040	6.0	3530	35	30	14	M8	AZ 30-30
3.5	{260}	5.2	{310}	7.0	{360}				35	
4.0		6.0		8.0					40	
3.0	4119	4.5	5099	6.0	5884	46	40	18	M10	AZ 40-30
3.5	{420}	5.2	{520}	7.0	{600}				35	
4.0		6.0		8.0					40	

● Load (kgf) = Load (N) × 0.101972



Order

Catalog No.  
AZ 20-30



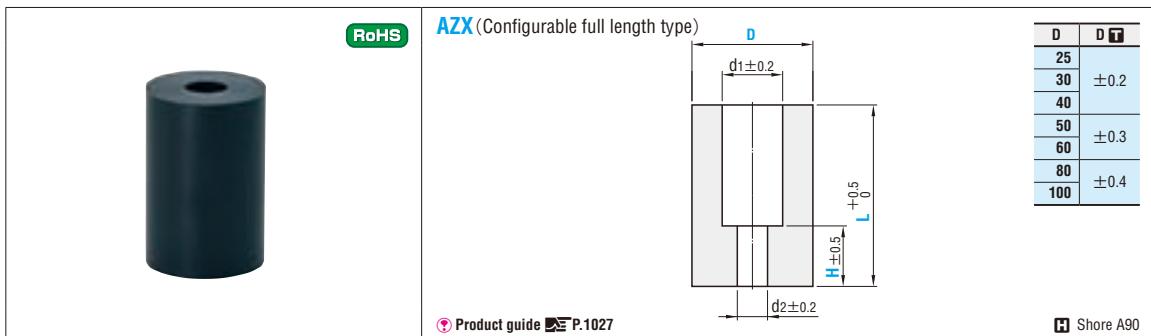
Days to Ship

Quotation



Price

Quotation



D	D
25	
30	±0.2
40	
50	±0.3
60	
80	±0.4
100	

Catalog No.	L	M	H	M	d1	d2	
Type	D	1mm increments		1mm increments			
AZX	25	20 ~ 80	M 6	5 ≤ H < L	M 6	11	7
	30		M 8		M 8	14	9
	40	25 ~ 150	M 10		M 10	18	11
	50		M 12		M 12	20	14
	60				M 16	26	18
	80	25 ~ 200	M 12				
	100		M 16				



Order

Catalog No. — L — M — H  
AZX 25 — 42 — M6 — 15



Days to Ship

Quotation



Price

Quotation

# URETHANE SHEETS

**RoHS**

**UT**

Product guide P.1027

T	Tolerance
1 ~ 4	±0.3
5 ~ 10	±0.4
15 ~ 25	±0.5
30 ~ 50	±1

Shore A90

A	B	T	Catalog No.	Base unit price	
			Type	T — A	1 ~ 9 pieces
300	300	5	UT	5 — 300	
		6		6 — 300	
		8		8 — 300	
		10		10 — 300	
		15		15 — 300	
		20		20 — 300	
		25		25 — 300	
		30		30 — 300	
		1	UT	1 — 500	
		2		2 — 500	
500	500	3		3 — 500	
		4		4 — 500	
		5		5 — 500	
		6		6 — 500	
		8		8 — 500	
		10		10 — 500	
		15		15 — 500	
		20		20 — 500	
		25		25 — 500	
		30		30 — 500	
		50		50 — 500	



Order

**Catalog No.**

**UT 8-500**



Days to Ship

**Quotation**



Price

**Quotation**

**RoHS**

**UTH** (Configurable size type)

Product guide P.1027

T	Tolerance
1 ~ 4	±0.3
5 ~ 10	±0.4
15 ~ 25	±0.5
30 ~ 50	±1

Shore A90

Catalog No.		1mm increments		Catalog No.		1mm increments	
Type	T	A	B	Type	T	A	B
UTH	1			UTH	10		
	2				15		
	3				20		
	4	20 ~ 500	20 ~ 500		25	20 ~ 500	20 ~ 500
	5				30		
	6				40		
	8				50		



Order

**Catalog No.** — A — B

**UTH 8 — 351 — 200**



Days to Ship

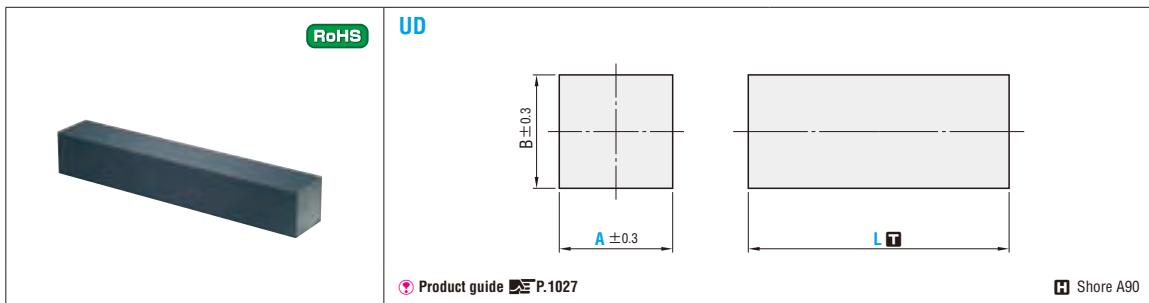
**Quotation**



Price

**Quotation**

# URETHANE DIE PADS



A	B	L	T	Catalog No.		Base unit price 1 ~ 9 pieces
				Type	A — L	
25	25	50	±1	UD 25 —	50	
		100			100	
		300			300	
		500			500	
		800			800	
		1000			1000	
50	50	50	±1	UD 50 —	50	
		100			100	
		300			300	
		500			500	
		800			800	
		1000			1000	
75	50	50	±1	UD 75 —	50	
		100			100	
		300			300	
		500			500	
		800			800	
		1000			1000	



Catalog No.

UD 75—1000



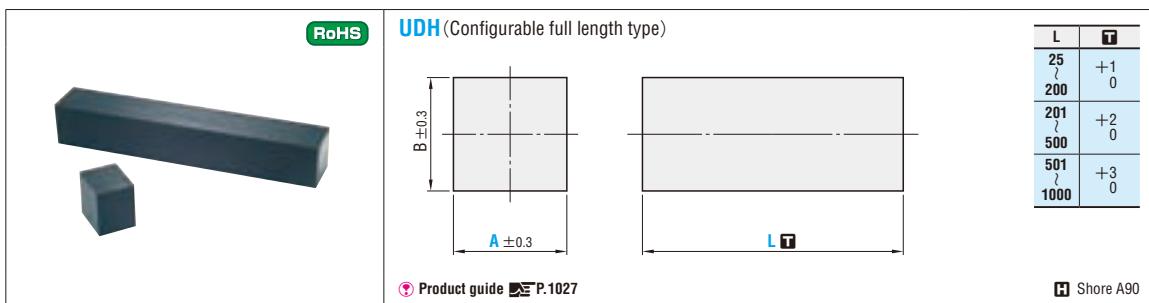
Days to Ship

Quotation



Price

Quotation



L	T
25	+1 0
200	
201	+2 0
500	
501	+3 0
1000	

A	B	Catalog No. Type A	L		Base unit price 1 ~ 9 pieces
			1mm increments		
25	25	UDH 25	25 ~ 50		
			51 ~ 100		
			101 ~ 300		
			301 ~ 500		
			501 ~ 800		
			801 ~ 1000		
50	50	UDH 50	25 ~ 50		
			51 ~ 100		
			101 ~ 300		
			301 ~ 500		
			501 ~ 800		
			801 ~ 1000		
75	50	UDH 75	25 ~ 50		
			51 ~ 100		
			101 ~ 300		
			301 ~ 500		
			501 ~ 800		
			801 ~ 1000		



Catalog No. — L

UDH 50 — 355



Days to Ship

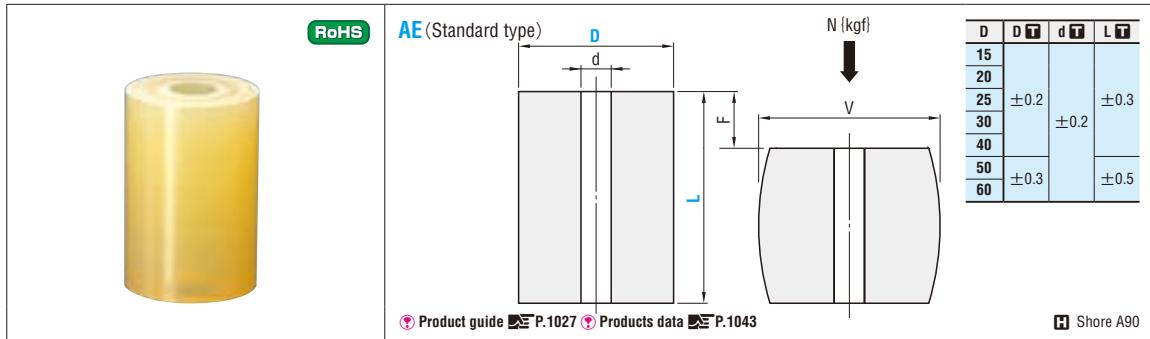
Quotation



Price

Quotation

# ECONOMY URETHANES



F=L×15%		F=L×20%		F=L×25%			d	Catalog No.		Base unit price 1 ~ 19 pieces
F mm	Load N (kgf)	F mm	Load N (kgf)	F mm	Load N (kgf)	V		Type D — L	AE 15 — 25	
3.8	539 { 55}	5	735 { 75}	6.3	932 { 95}	18	7	AE 15 — 25	30	
4.5		6		7.5					30	
5.3		7		8.8					35	
6		8		10					40	
3.8	1079 { 110}	5	1373 { 140}	6.3	1667 { 170}	24	8.5	AE 20 — 25	30	
4.5		6		7.5					30	
5.3		7		8.8					35	
6		8		10					40	
3.8	1569 { 160}	5	2059 { 210}	6.3	2550 { 260}	30	11	AE 25 — 25	30	
4.5		6		7.5					30	
5.3		7		8.8					35	
6		8		10					40	
6.8		9		11.3					45	
7.5		10		12.5					50	
4.5	2452 { 250}	6	2844 { 290}	7.5	3334 { 340}	37	14	AE 30 — 30	30	
5.3		7		8.8					35	
6		8		10					40	
6.8		9		11.3					45	
7.5		10		12.5					50	
8.3		11		13.8					55	
9		12		15					60	
6	4315 { 440}	8	5099 { 520}	10	5982 { 610}	48	14	AE 40 — 40	40	
7.5		10		12.5					50	
9		12		15					60	
7.5	7355 { 750}	10	8728 { 890}	12.5	10297 { 1050}	60	14	AE 50 — 50	50	
9		12		15					60	
12		16		20					80	
7.5	12356 { 1260}	10	14318 { 1460}	12.5	16769 { 1710}	72	14	AE 60 — 50	50	
9		12		15					60	
12		16		20					80	

● Load (kgf) = Load (N) × 0.101972



Order

Catalog No.

AE 15—25



Days to Ship

Quotation

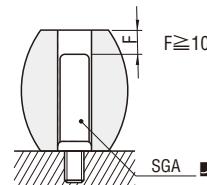


Price

Quotation



Example



P.1005

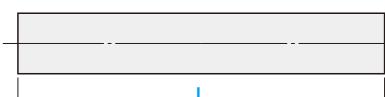


**RoHS**

**LAE**



**CE**



Product guide P.1027

D	D <sub>T</sub>	d <sub>T</sub>
8		—
10		
15		
20	±0.2	
25		
30		
40		
50	±0.3	
60		

H Shore A90

d	Catalog No.		Base unit price 1 ~ 19 pieces
	Type	D—L	
—	—	CE 8—200	
—	—	CE 10—200	
7	LAE 15—200	CE 15—200	
8.5	LAE 20—200	CE 20—200	
11	LAE 25—200	CE 25—200	
14	LAE 30—500	CE 30—500	
	LAE 40—500	CE 40—500	
	LAE 50—500	CE 50—500	
	LAE 60—500	CE 60—500	



Catalog No.  
**LAE 30—500**



Days to Ship

**Quotation**



Price

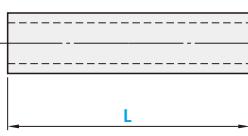
**Quotation**

**Configurable full length type**

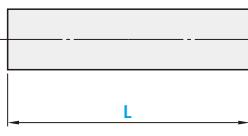


**RoHS**

**AEX**



**CEX**



Product guide P.1027

D	D <sub>T</sub>	d <sub>T</sub>	L <sub>T</sub>
8		—	
10			
15			
20	±0.2		±0.3
25			
30		±0.2	
40			
50	±0.3		±0.5
60			

H Shore A90

d	Catalog No.	D	L 1mm increments	Base unit price 1 ~ 19 pieces							
				L10 ~ 20	L21 ~ 40	L41 ~ 60	L61 ~ 80	L81 ~ 100	L101 ~ 150	L151 ~ 200	
—	CEX	8	10 ~ 200								
		10									
		15									
		20									
		25									
8.5	AEX	25									
11	CEX	30									
14	CEX	40									



Catalog No.  
**AEX 20 — 52**



Days to Ship

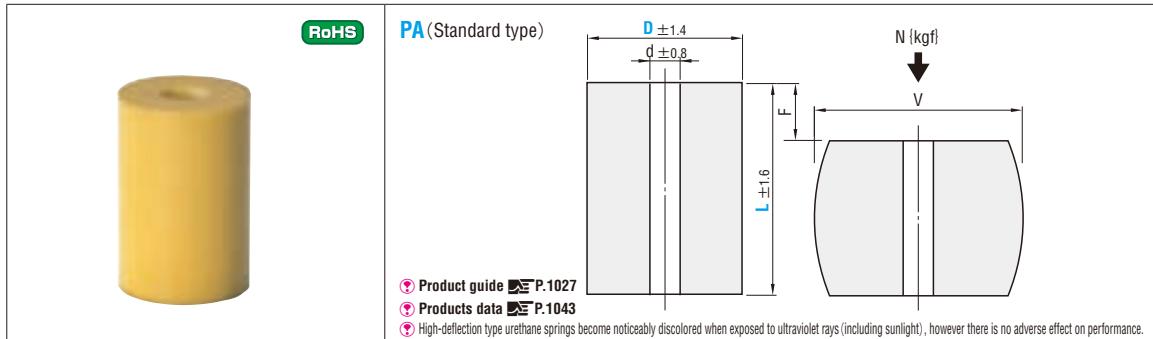
**Quotation**



Price

**Quotation**

# URETHANE FOAM (POROUS) FOR HIGH-DEFLECTION USE



F=L×20%		F=L×30%		F=L×40%		d	Catalog No.		Base unit price Type D — L 1 ~ 19 pieces
F mm	Load N (kgf)	F mm	Load N (kgf)	F mm	Load N (kgf)		Type	D — L	
6	981	9	1177	12	1471	36	PA	30 — 30	
8	{ 100 }	12	{ 120 }	16	{ 150 }			40	
8	1961	12	2452	16	3040	48	PA	40 — 40	
10	{ 200 }	15	{ 250 }	20	{ 310 }			50	
12		18		24				60	
8		12		16		60	PA	50 — 40	
10	3481	15	4413	20	5541			50	
12	{ 355 }	18	{ 450 }	24	{ 565 }			60	
16		24		32				80	
10		15		20		72	PA	60 — 50	
12	4609	18	5737	24	7257			60	
16	{ 470 }	24	{ 585 }	32	{ 740 }			80	
20		30		40				100	
12		18		24		96	PA	80 — 60	
16	8532	24	10787	32	13729			80	
20	{ 870 }	30	{ 1100 }	40	{ 1400 }			100	
26		39		52				130	
16		24		32		120	PA	100 — 80	
20	13925	30	17652	40	21771			100	
24	{ 1420 }	36	{ 1800 }	48	{ 2220 }			120	
32		48		64				160	
16		24		32		144	PA	120 — 80	
20	19907	30	24909	40	30793			100	
24	{ 2030 }	36	{ 2540 }	48	{ 3140 }			120	
32		48		64				160	

● Load (kgf) = Load (N) × 0.101972

Quotation

Catalog No.

PA 50—50



Order



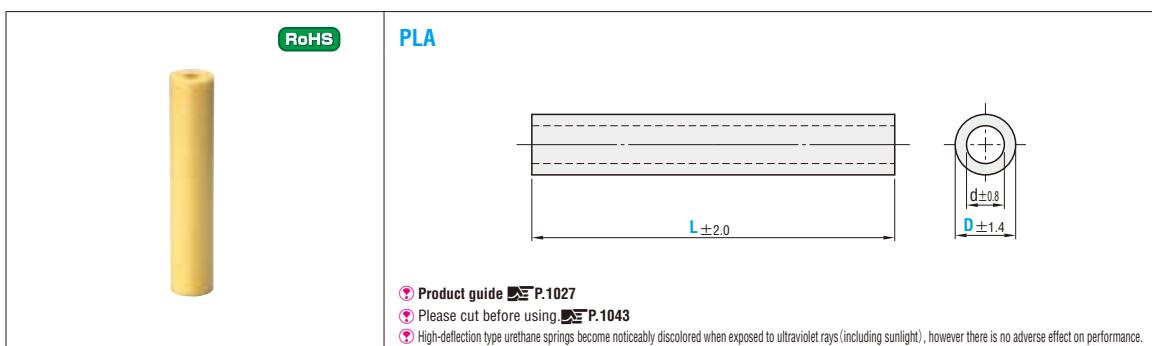
Days to Ship

Quotation



Price

Quotation



d	Catalog No.		Base unit price Type D — L 1 ~ 19 pieces
	Type	D — L	
14	PLA	30 — 200	
	PLA	40 — 200	
	PLA	50 — 200	
	PLA	60 — 200	
22	PLA	80 — 200	
	PLA	100 — 200	
	PLA	120 — 200	

Quotation

Catalog No.

PLA 80—200



Days to Ship

Quotation

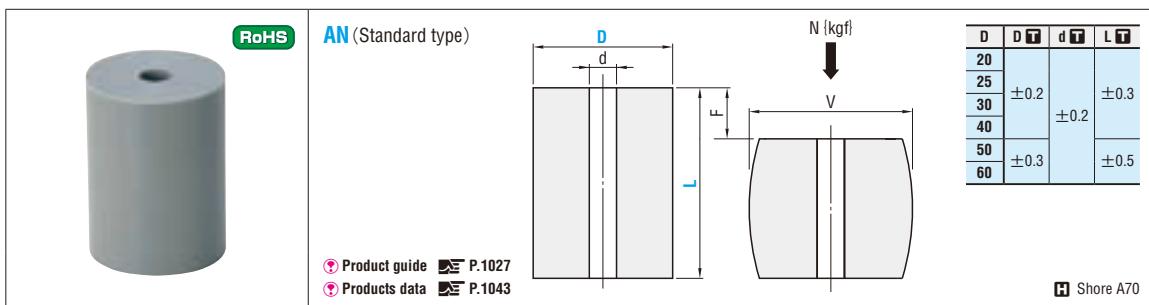


Price

Quotation

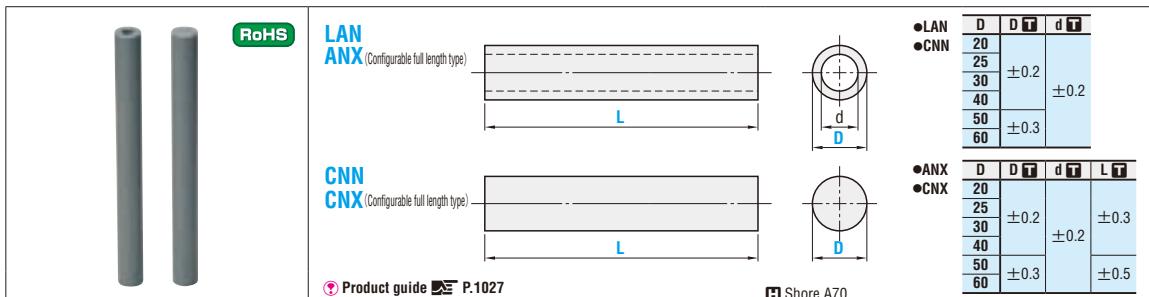
● Please cut before using.

# LOW REPULSION URETHANES

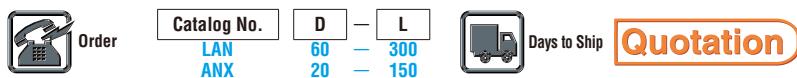


F=L×15%		F=L×20%		F=L×25%		V	d	Catalog No.	Base unit price
F mm	Load N [kgf]	F mm	Load N [kgf]	F mm	Load N [kgf]				
3.75		5		6.25				AN 20–25	
4.5	343	6	451	7.5	617	24	8.5	30	
5.25 { 35}		7 { 46}		8.75 { 63}				35	
6		8	10					40	
3.75		5		6.25				AN 25–25	
4.5		6		7.5				30	
5.25 470		7 { 48}	686 { 70}	8.75 { 93}	912	30	11	35	
6 { 48}		8		10 { 93}				40	
6.75		9		11.3				45	
7.5		10		12.5				50	
4.5		6		7.5				AN 30–30	
5.25		7		8.75				35	
6	666	8 { 68}	941 { 96}	10 { 127}	1245 { 127}	37	14	40	
6.75		9		11.3				45	
7.5		10		12.5				50	
8.3		11		13.8				55	
9		12		15				60	
6	1343	8 { 137}	1914 { 195}	10 { 260}	2549 { 260}	48	14	AN 40–40	
7.5		10		12.5				50	
9		12		15				60	
7.5	2081	10 { 212}	2983 { 304}	12.5 { 410}	4028 { 410}	59	14	AN 50–50	
9		12		15				60	
12		16		20				80	
7.5	3089	10 { 315}	4481 { 457}	12.5 { 408}	5962 { 608}	71	14	AN 60–50	
9		12		15				60	
12		16		20				80	

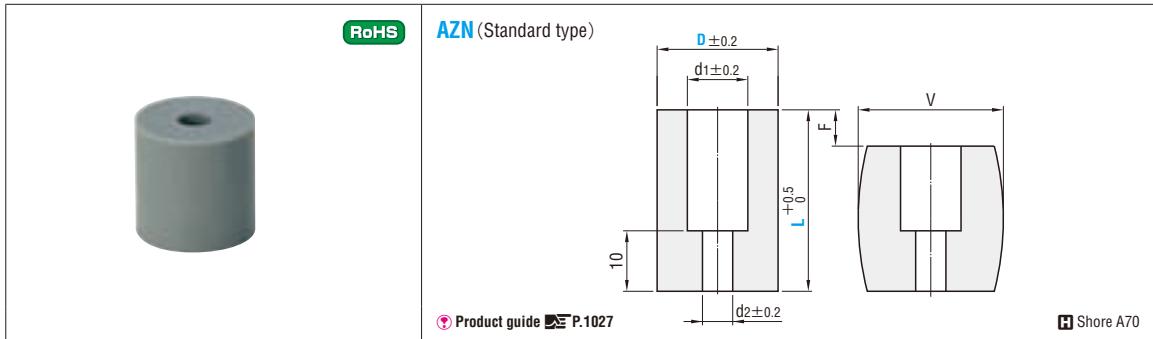
● Load [kgf] = Load [N] × 0.101972



d	Catalog No.		Base unit price 1 ~ 19 pieces	d	Catalog No.	D	L 1mm increments	Base unit price 1 ~ 19 pieces					
	Type	D – L						L10 ~ 20 L21 ~ 40 L41 ~ 60 L61 ~ 80 L81 ~ 100 L101 ~ 150 L151 ~ 200					
8.5	LAN	20–200	Quotation	8.5	ANX	20	10 ~ 200						
11		25–200		11		25							
		30–200				30							
14		40–300		14		40							
		50–300				50							
		60–300				60							

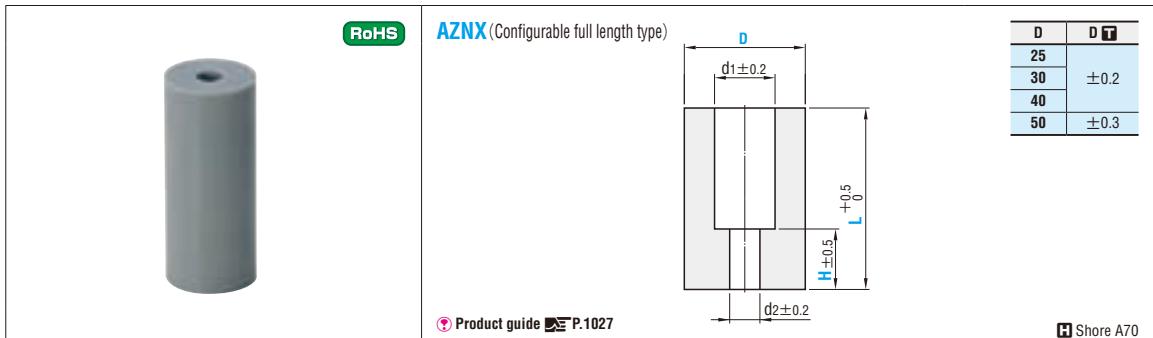


# LOW REPULSION URETHANES WITH COUNTERBORE

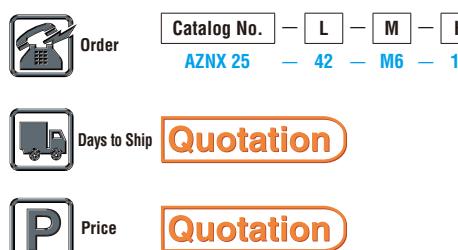


F=L×10%		F=L×15%		F=L×20%		V	D	d1	d2	M	L	Catalog No.	Base unit price
F mm	Load N [kgf]	F mm	Load N [kgf]	F mm	Load N [kgf]							Type D — L	1 ~ 19 pieces
2.5		3.7		5.0		647 (66)	29	25	11	7	M6	25	AZN25 — 25
3.0	304	4.5	442	6.0	647							30	
3.5	{31}	5.2	{45}	7.0	{66}							35	
4.0		6.0		8.0								40	
3.0	362	4.5	627	6.0	892							30	AZN30 — 30
3.5	{37}	5.2	{64}	7.0	{91}	35	30	30	14	9	M8	35	
4.0		6.0		8.0								40	
3.0	735	4.5	1274	6.0	1814							30	AZN40 — 30
3.5	{75}	5.2	{130}	7.0	{185}							35	
4.0		6.0		8.0		40	30	35	11	M10	M10	40	
3.0	1117	4.5	1971	6.0	2824							30	AZN50 — 30
3.5	{114}	5.2	{201}	7.0	{288}							35	
4.0		6.0		8.0								40	
5.0		7.5		10.0		57	50	20	14	M12	M12	50	
												50	

● Load [kgf] = Load [N] × 0.101972



Catalog No.		L		M	H	
Type	D	1mm increments				
AZNX	25	20 ~ 60		M 6	5≤H<L	
	30			M 8		
	40	25 ~ 100		M 10		
	50			M 12		
Tap M		M	M6	M8	M10	M12
d1		11	14	18	20	
d2		7	9	11	14	



# LOW REPULSION URETHANE SHEETS / LOW REPULSION URETHANE DIE PADS



**RoHS**

**UTN** (Urethane sheets)

Product guide **P.1027**

T	T
5	±0.4
10	
15	
20	±0.5
25	
30	±1

Shore A70

A	B	T	Catalog No.	Base unit price	<b>Quotation</b>	Catalog No.	
			Type T — A	1 ~ 9 pieces		Order	
250	250	5	<b>UTN 5 — 250</b>		<b>Quotation</b>	<b>UTN 25—250</b>	
		10	<b>10 — 250</b>				
		15	<b>15 — 250</b>				
		20	<b>20 — 250</b>				
		25	<b>25 — 250</b>				
		30	<b>30 — 250</b>				
			<b>Days to Ship</b>		<b>Quotation</b>		
			<b>Price</b>		<b>Quotation</b>		



**RoHS**

**UDN** (Urethane die pads)

Product guide **P.1027**

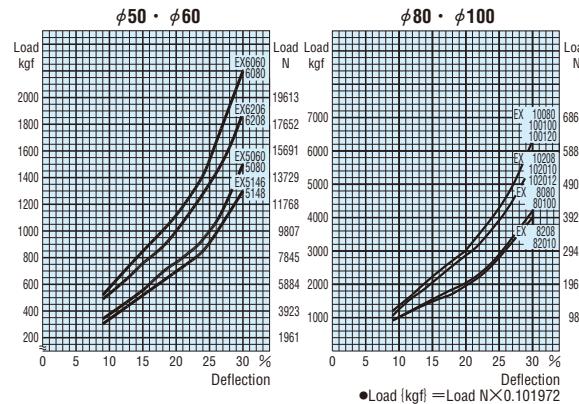
Shore A70

A	B	L	T	Catalog No.	Base unit price	<b>Quotation</b>	Catalog No.		
				Type A — L	1 ~ 9 pieces		Order		
25	25	50	±1	<b>UDN 25 — 50</b>		<b>Quotation</b>	<b>UDN 25—300</b>		
		100		<b>100</b>					
		300		<b>300</b>					
50	50	50	±1	<b>UDN 50 — 50</b>		<b>Quotation</b>	<b>UDN 25—300</b>		
		100		<b>100</b>					
		300		<b>300</b>					
			<b>Days to Ship</b>		<b>Quotation</b>				
			<b>Price</b>		<b>Quotation</b>				

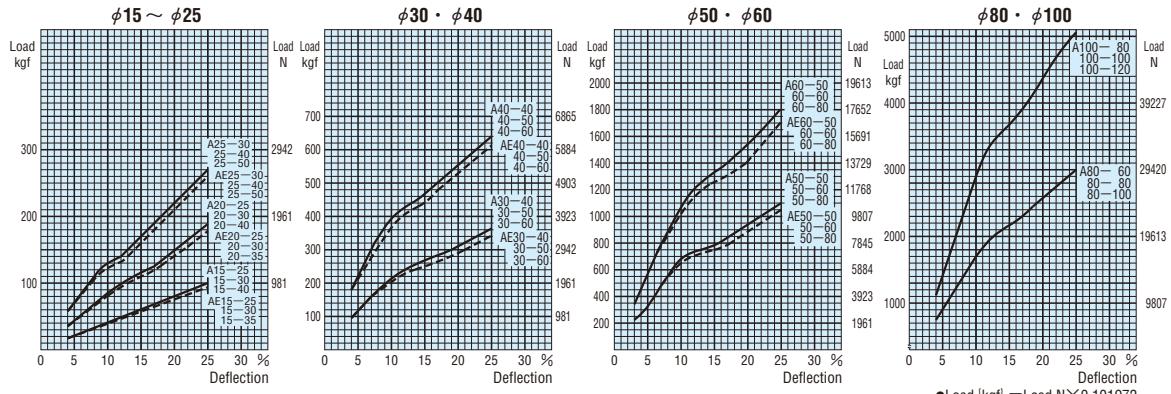
# [PRODUCTS DATA] URETHANE LOAD VS. DEFLECTION GRAPH

## ■Urethanes for heavy loads (Shore A90)

### •EX type

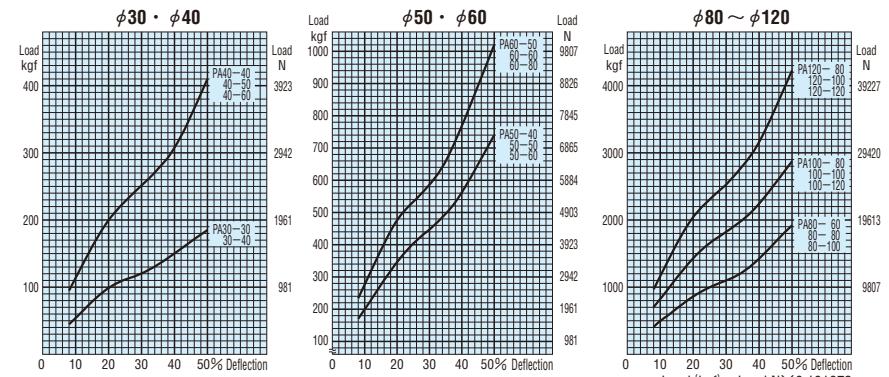


### •A・AE type



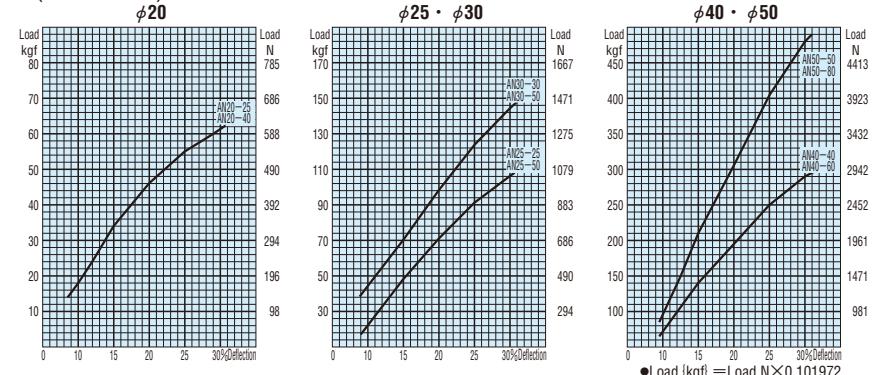
## ■High-deflection type urethane foams

### •PA type



## ■Low repulsion urethanes (Shore A70)

### •AN type



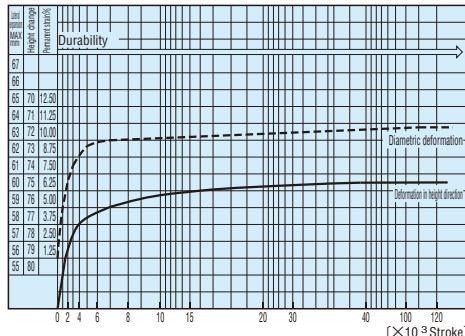
# [PRODUCTS DATA] URETHANE DURABILITY VS. PERMANENT STRAIN GRAPH

## ■ Urethanes for heavy loads (Shore A90)

### • EX type

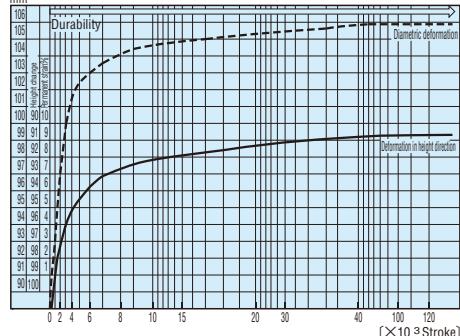
EX6080

( $\phi 60 \times 80L$ ) Compression 30% 80SPM No lubrication



EX100100

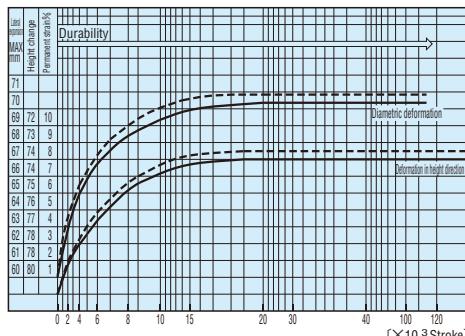
( $\phi 100 \times 100L$ ) Compression 30% 80SPM No lubrication



### • A·AE type

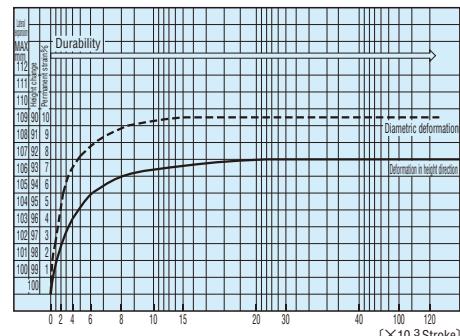
A60-80 · AE60-80 (— A type, - - - AE type)

( $\phi 60 \times 80L$ ) Compression 25% 98SPM No lubrication



A100-100

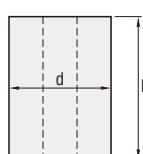
( $\phi 100 \times 100L$ ) Compression 25% 45SPM No lubrication



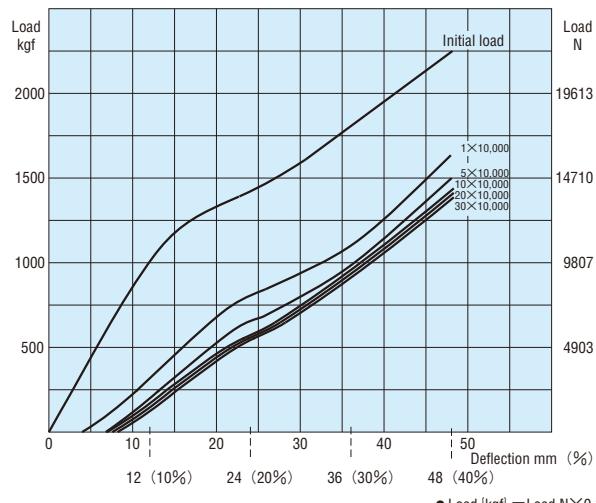
## ■ High-deflection type urethane foams

### • PA type

Load and full length changes according to the operation count



Operation count	Deflection=L×10%		Deflection=L×20%		Deflection=L×30%		Deflection=L×40%		$L_1$	$d$	Permanent strain mm
	Deflection mm	Load N (kgf)									
Initial	9611	{980}	13925	{1420}	17725	{1810}	22065	{2250}	120.0	101.1	—
10,000	3138	{320}	7845	{800}	10787	{1100}	16188	{1650}	115.8	104.9	4.2
50,000	1961	{200}	6423	{655}	9512	{970}	14612	{1490}	113.3	105.8	6.7
100,000	1569	{160}	5688	{580}	8973	{915}	14024	{1430}	112.5	106.7	7.5
200,000	1373	{140}	5492	{560}	8826	{900}	13925	{1420}	112.2	106.7	7.8
300,000	1177	{120}	5296	{540}	8777	{895}	13827	{1410}	112.0	106.7	8.0

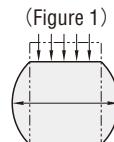


# [PRODUCTS DATA] CALCULATING URETHANE LOAD CHARACTERISTICS

If urethane is used as a pressure medium, it is extremely important to know how much deflection will be caused at a given load. Especially in a limited space, it is necessary to design a die with appropriate considerations for load and deformation.

The shape coefficient and elastic modulus are necessary for determining the load and the amount of deflection.

One characteristic of urethane springs is that, regardless of the shape, they expand on both sides when load is applied. This does not change its overall volume; however this bulging caused by load application must be taken into consideration when designing a die. (Figure 1)



## ● Shape change and load

### A. Shape coefficient

The shape coefficient is defined mathematically as the surface area of one load bearing surface divided by the surface area of all the sides not directly subjected to the load.

$$\text{Shape coefficient (SF)} = \frac{\text{Area of load bearing surface (S}_1\text{)}}{\text{Area of all other sides (S}_2\text{)}}$$

Different calculation methods must be used for block shapes and pillar (cylinder) shapes.

(See Figure 2.)

a) Block shapes

$$SF = \frac{L \times W}{2H(L+W)} \dots\dots (1)$$

b) Pillar shapes

$$SF = \frac{\pi D^2}{4\pi DH} = \frac{D}{4H} \dots\dots (2)$$

$\pi$  : Circular constant = 3.14

c) Cylinder shapes

$$SF = \frac{D-d}{4H} \dots\dots (3)$$

However the following conditions must be met in order to apply these formulas.

- ① The load must be applied straight (not at an angle) and in a direction parallel to the axis.
- ② The width, length, and diameter of the load bearing surface must exceed half of the length or thickness.

### B. Elastic modulus

The elastic modulus (E) is defined as the force (stress) per unit area divided by the percentage of height deformation (distortion). From Chart 1, it can be seen that under non-lubricated conditions, the elastic modulus changes greatly depending on the shape coefficient.

Under the two conditions listed above, the elastic modulus (E) can be determined as shown below.

$$\text{Elastic modulus (E)} = \frac{F/S}{\Delta H/H} \dots\dots (4)$$

(F: Load, S: Load bearing surface area,  $\Delta H$ : Height change, H: Initial height (free height))

### C. Load and change amount

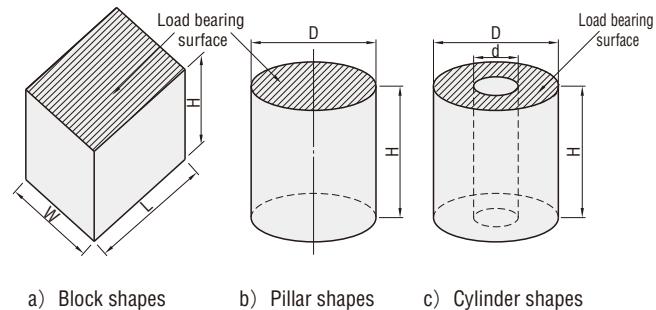
The load can be determined by using Formula (4).

$$\text{Load (F)} = \frac{\Delta H \times S \times E}{H} \dots\dots (5)$$

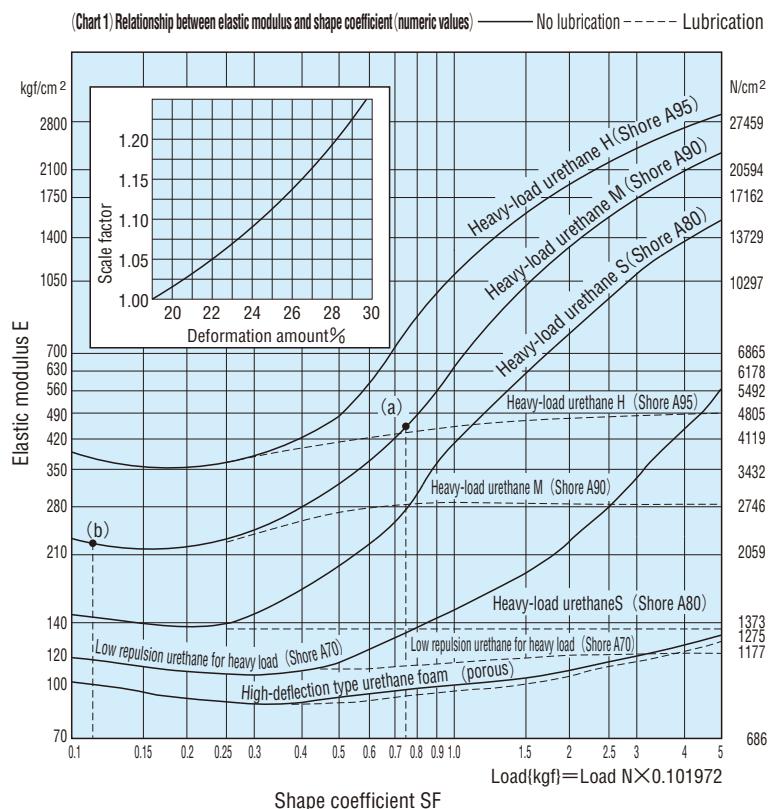
The amount of change in height can also be determined in the same way.

$$\text{Height change (\Delta H)} = \frac{F \times H}{S \times E} \dots\dots (6)$$

(Figure 2)



(Chart 1) Relationship between elastic modulus and shape coefficient (numeric values)



If the deformation rate is 20% or more, the scale factor must be considered.

**[Example 1]**

Suppose that the length L is 100mm, the width W 80mm and the height H 30mm. At that time, how much force is required to change the urethane thickness by 5mm? (Conditions: Heavy load urethane M, no lubrication) (1cm=10mm)

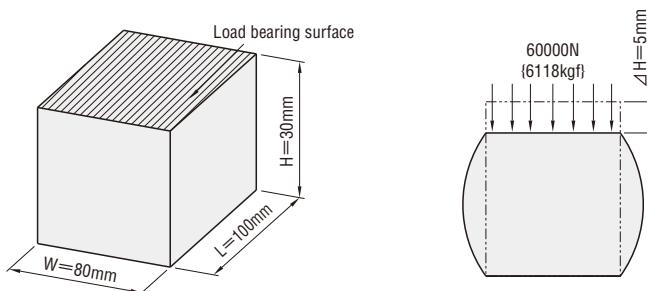
First, consider the shape coefficient (SF). From Formula (1):

$$\text{Shape coefficient (SF)} = \frac{L \times W}{2H(L+W)} = \frac{10 \times 8}{2 \times 3 \times (10+8)} = \frac{80}{108} = 0.74$$

Using Chart 1, find the intersecting point (a) between the curve for heavy load urethane M and SF=0.74. The obtained elastic modulus (E) is approximately 4,500N/cm<sup>2</sup> {459kgf}. From Formula (5), the load is calculated as follows.

$$\text{Load (F)} = \frac{\Delta H \times S \times E}{H} = \frac{\Delta H \times L \times W \times E}{3cm} = \frac{0.5[\text{cm}] \times 80[\text{cm}^2] \times 4,500[\text{N/cm}^2]}{3\text{cm}} = 60,000\text{N} \{6,118\text{kgf}\}$$

Therefore, to change the urethane height by 5mm, a force of 60,000N {6,118kgf} is necessary.



**[Example 2]**

When a force of 10,000N {1,020kgf} is applied to a urethane pillar with diameter D of 50mm and height H of 100mm, how much does the urethane height change? (Conditions: Heavy-load urethane M, no lubrication) (1cm=10mm)

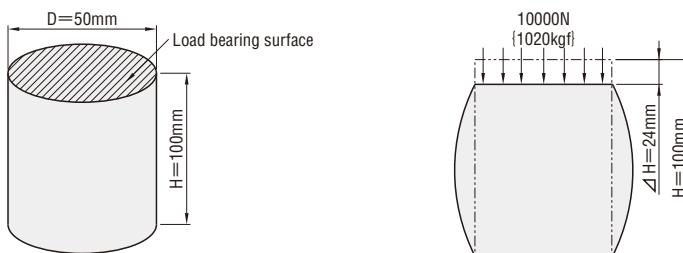
First, determine the shape coefficient (SF) by using Formula (2),

$$\text{Shape coefficient (SF)} = \frac{D}{4H} = \frac{5}{4 \times 10} = 0.125$$

Using Chart 1, find the intersecting point (b) between the curve for heavy load urethane M and SF=0.125. The obtained elastic modulus (E) is approximately 2,100N/cm<sup>2</sup> {214kgf}. From Formula (6), the height change ( $\Delta H$ ) is calculated as follows.

$$\text{Height change } (\Delta H) = \frac{F \times H}{S \times E} = \frac{F \times H}{\pi \times \left(\frac{D}{2}\right)^2 \times E} = \frac{4F \times H}{\pi E D^2} = \frac{4 \times 10,000[\text{N}] \times 10[\text{cm}]}{3.14 \times 2,100[\text{N/cm}^2] \times 5^2[\text{cm}^2]} = 2.4\text{cm}$$

Therefore, when a load of 10,000N {1020kgf} is applied, the urethane height change is 24mm.



Note: The calculated numerical values should be used only for reference.