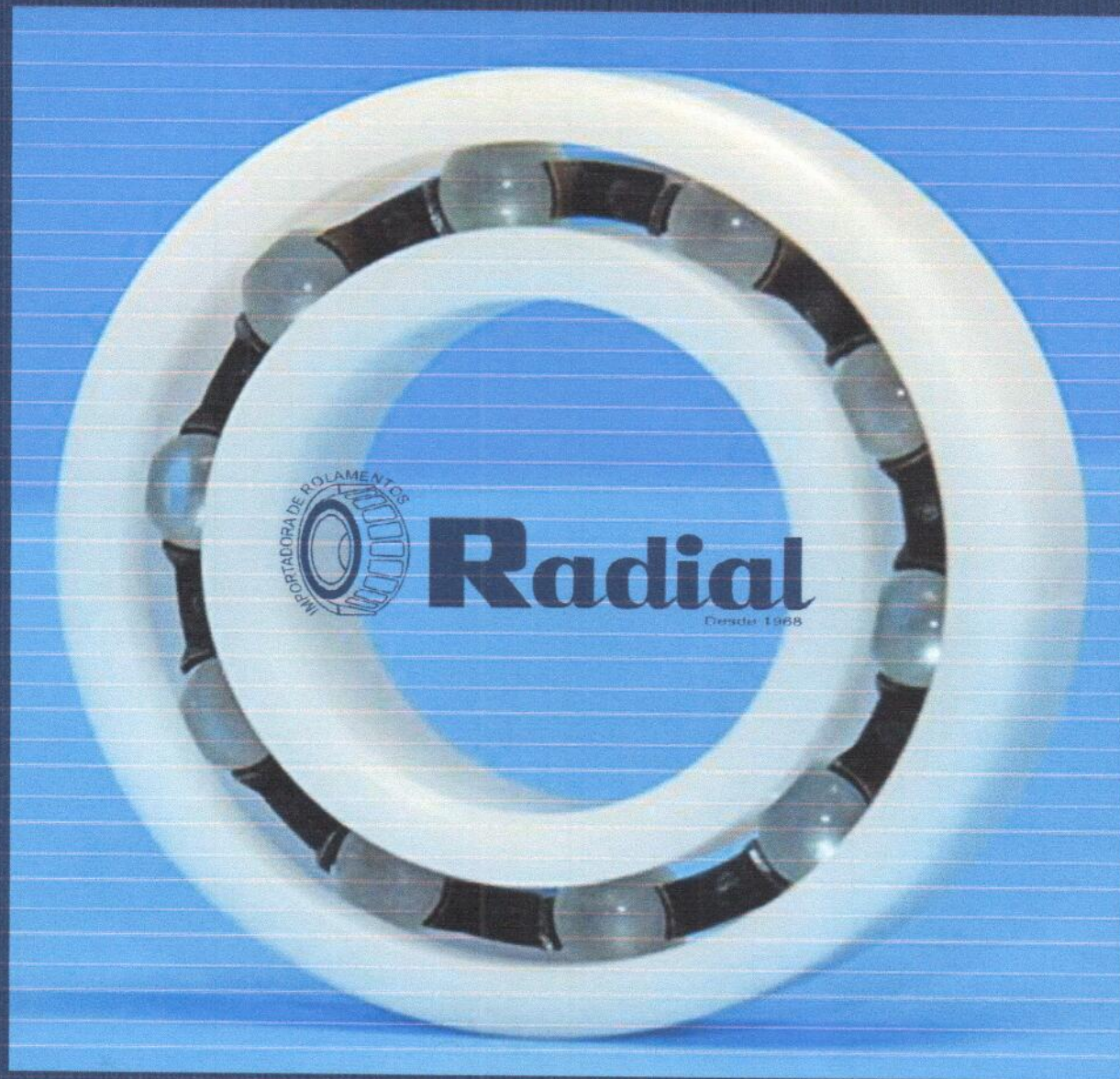


# **CATÁLOGO**



**ROLAMENTOS EM POLIACETAL  
(POM), COM ESFERAS DE VIDRO**



- CATALOGO DIRECIONADO
- AREA CORROSIVA
- TABELA DESCRITIVA
- COMPOSIÇÃO DO MATERIAL
- DIMENSIONAL
- INFORMES GERAIS

Dep. Técnico

*H. Fernandes*

# Poliacetal

Origem: Wikipédia, a enciclopédia livre.

Poliacetal (**POM**), também conhecido como **delrin**, é um polímero proveniente do formaldeído, um plástico resistente, descoberto em 1956.

## Características

- Peso molecular - 15.000-30.000
- Densidade - 1,42;
- Tm, 175°C; Tg, -13°C;
- Cristalinidade - 75%;
- Termoplástico, branco, opaco.

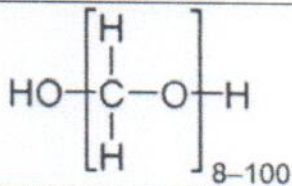
É um material utilizado em aplicações eletro-eletrônica, não absorve umidade após a injeção e alta estabilidade dimensional. Pode ser aditivado com fibra de vidro, elastômeros, carga mineral, etc. Também disponível com aditivação antichama (V0).

O poliacetal surgiu há cinco décadas no mercado e vem tendo destaque graças à sua resistência e outras propriedades excelentes que possui.

Sua absorção de umidade é extremamente baixa, e isso proporciona melhor estabilidade dimensional, uma excelente usinabilidade e um bom polimento. “Durante essas décadas após seu surgimento, o aperfeiçoamento do poliacetal permitiu sua utilização em peças técnicas simples e complexas, que exijam grande esforço, estabilidade dimensional, resistência mecânica e química e excelente deslize”. “As principais aplicações do poliacetal são engrenagens, buchas, mancais, roldanas, componentes diversos, eixos e demais aplicações.” Pode-se afirmar que o poliacetal possui características bem aproximadas às do aço.

## Utilização

O material tem sido bastante aplicado na indústria de eletroeletrônicos, alimentícia, automobilística, construção de máquinas, eletrotécnica, tecnologia de precisão, aparelhos domésticos, tecnologia médica e têxtil. Atualmente, encontramos poliacetal em automóveis (peças em contato com combustível), aviões (sensores) e em pólos industriais (peças e equipamentos). Sua alta resistência e alta estabilidade dimensional permitiram a confecção de engrenagens altamente complexas.

Poliacetal	
	
Nome IUPAC	Polyoxymethylene
Identificadores	
Número CAS	30525-89-4
PubChem	24898648
Propriedades	
Fórmula molecular	(CH <sub>2</sub> O) <sub>n</sub> (n = 8 - 100)
Aparência	white crystalline solid
Densidade	0.88 g·cm <sup>-3</sup> (20 °C)
Ponto de fusão	120-170 °C
Solubilidade em água	low
Riscos associados	
MSDS	Oxford MSDS ( <a href="http://msds.chem.ox.ac.uk/PA/paraformaldehyde.html">http://msds.chem.ox.ac.uk/PA/paraformaldehyde.html</a> )
Classificação UE	Toxic (T); Corrosive (C)
<small>Excepto onde denotado, os dados referem-se a materiais sob condições PTN Referências e avisos gerais sobre esta caixa</small>	





Palheta de guitarra de poliacetal

Outras vantagens do poliacetal são a capacidade de deslize e a atoxidade, o que permite contato com alimentos e tornam o material uma melhor opção para solução de problemas apresentados na utilização de alumínio, aço ou ferro em equipamentos para a indústria alimentícia, médica e farmacêutica.

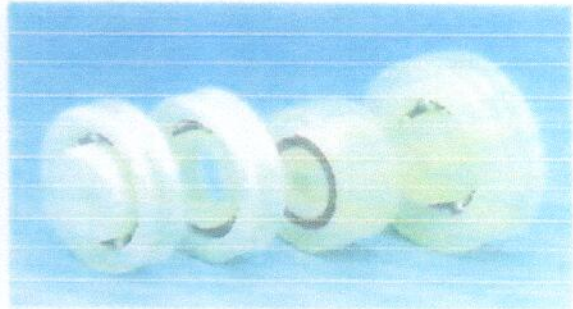
Desde a assinatura de um tratado internacional de proteção à tartaruga-de-pente, o material também passou a ser popular na fabricação de palhetas utilizadas em instrumentos musicais de corda, como guitarra e baixo, que utilizavam o casco da tartaruga como matéria-prima.

## Special products

To learn more about the capabilities of engineering custom sized bearings please take a look at page 10 and 11.

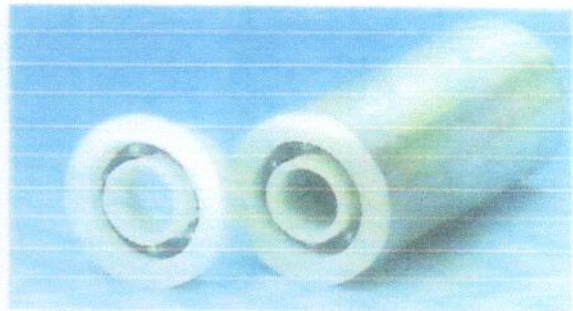
Single row and double row plastic ball bearings specially designed to be used as pulleys for flat and round belts in the production of computer motherboards.

**Advantages:** These chemically resistant bearings have been specially designed to facilitate simplicity in construction, keeping costs down.



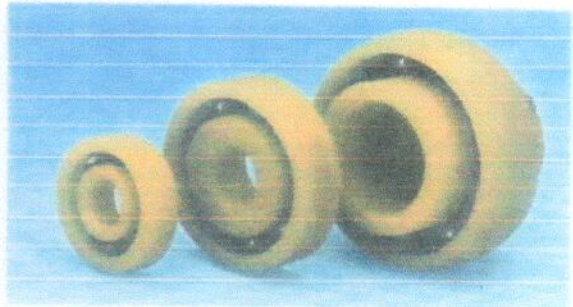
Flanged plastic ball bearings are extremely smooth running when used in conveyor roller operations.

**Advantages:** Because of the use of plastic in the construction of the inner and outer bearing races, tight tolerance is not required. The flanged plastic bearing will easily be fitted into the pipe with a light press fit vs. the normal tolerance associated with metal bearing used in the same application.

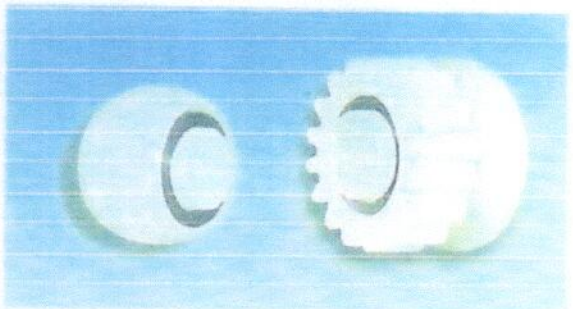


Plastic ball bearings made of PPS, PEEK or PI with glass balls can be used in high temperature applications such as drying plants, pass through type furnaces or sterilizers.

**Advantages:** The PI material is capable for temperatures to 250° C without lubrication. Even in difficult conditions such as extreme humidity or steam, these bearings are suitable for continuous high temperature use.



Custom-engineered rolling bearings for special applications. Integrated in the product as toothed bearing, ball or needle bearing. There is no limit with regard to design.





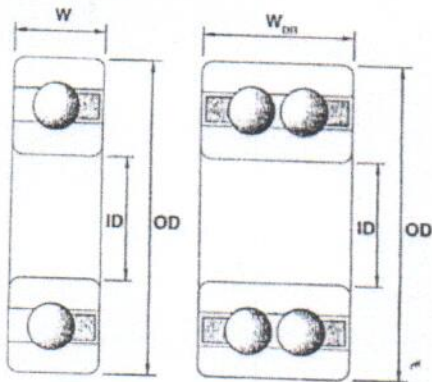


### Anti-acid & alkali plastic bearings

Anti-acid & alkali plastic bearings are made from PE material which was swelled many times, also can resist strong acid and alkali eroding, especially one can endure high temperature about 180° C

Part Number	d (mm) +0.05 -0	D (mm) +0 -0.05	W (mm) +0 -0.12	Static load(N)	Dynamic (N)	Max Speed rpm	Gross Weight (KG)
PE6000	10	26	8	9.0	13.0	1900	0.002
PE6001	12	28	8	11.0	16.0	1750	0.003
PE6002	15	32	9	13.0	19.0	1550	0.005
PE6003	17	35	10	17.0	24.0	1400	0.008
PE6004	20	42	12	20.0	30.0	1200	0.012
PE6005	25	47	12	24.0	36.0	1050	0.037
PE6006	30	55	13	28.0	42.0	900	0.024
PE6007	35	62	14	32.0	48.0	800	0.031
PE6008	40	68	15	35.0	52.0	750	0.035
PE6009	45	75	16	38.0	56.0	650	0.053
PE6010	50	80	16	39.0	58.0	600	0.062
PE6011	55	90	18	40.0	60.0	550	0.084
PE6012	60	95	18	42.0	64.0	500	0.091
PE6200	10	30	9	13.0	17.0	1650	0.006
PE6201	12	32	10	15.0	22.0	1550	0.007
PE6202	15	35	11	17.0	25.0	1400	0.009
PE6203	17	40	12	22.0	32.0	1250	0.013
PE6204	20	47	14	27.0	42.0	1050	0.022
PE6205	25	52	15	32.0	48.0	950	0.026
PE6206	30	62	16	36.0	55.0	800	0.044
PE6207	35	72	17	41.0	62.0	700	0.060
PE6208	40	80	18	44.0	66.0	625	0.075
PE6209	45	85	19	47.0	72.0	580	0.093
PE6210	50	90	20	54.0	77.0	550	0.11
PE6211	55	100	21	60.0	80.0	500	0.13
PE6212	60	110	22	63.0	88.0	450	0.17
PE6300	10	35	11	19.0	28.0	1400	0.010
PE6301	12	37	12	21.0	31.0	1300	0.012
PE6302	15	42	13	26.0	37.0	1200	0.017
PE6303	17	47	14	30.0	45.0	1050	0.024





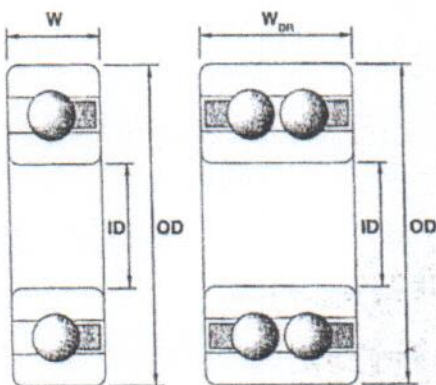
## Bearings – metric size single and double row

Code	Single row			DR W mm	Single row			Double row		
	ID mm	OD mm	W mm		capacity stat. N	capacity dyn. N	max. speed rpm	capacity stat. N	capacity dyn. N	max. speed rpm
623	3	10	4	6	30	45	4500			
624	4	13	5	8	40	60	3600	54	81	4050
625	5	16	5	9	45	65	3050	72	108	3250
626	6	19	6	10	50	70	2600	81	117	2750
607	7	19	7	10	50	70	2600	90	126	2340
627	7	22	7	10	55	80	2200	90	126	2340
608	8	22	7	10	55	80	2200	99	144	1980
609	9	24	7	10	60	90	2050	99	144	1980
629	9	26	8	13	70	100	1900	108	162	1850
6000	10	26	8	13	90	130	1900	126	180	1710
6200	10	30	9	13	110	160	1650	162	234	1710
6300	10	35	11	18	190	280	1400	198	288	1480
6001	12	28	8	13	110	160	1750	342	504	1260
6201	12	32	10	16	150	220	1550	198	288	1580
6301	12	37	12	20	210	310	1300	270	396	1390
16002	15	32	8	13	130	190	1500	378	558	1170
6002	15	32	9	13	140	200	1500	234	342	1350
6202	15	35	11	16	170	250	1400	252	360	1350
6302	15	42	13	20	260	370	1200	306	450	1260
16003	17	35	8	13	160	240	1400	468	666	1080
6003	17	35	10	13	170	260	1400	288	432	1260
6203	17	40	12	18	220	320	1250	306	468	1260
6303	17	47	14	20	260	370	1050	396	576	1120
16004	20	42	8	16	190	290	1150	468	666	945
6004	20	42	12	16	200	300	1150	342	522	1035
6204	20	47	14	20	270	420	1050	360	540	1035
6304	20	52	15	25	350	500	950	486	756	945
16005	25	47	8	16	210	310	1050	630	900	855
6005	25	47	12	17	240	360	1050	378	558	950
6205	25	52	15	20	320	480	950	432	648	950
6305	25	62	17	30	400	600	725	576	864	855
16006	30	55	9	17	240	370	900	720	1080	650
6006	30	55	13	18	280	420	900	432	666	810
6206	30	62	16	24	360	550	800	504	756	810
6306	30	72	19	32	460	700	675	648	990	720
16007	35	62	9	17	240	370	800	828	1260	600
6007	35	62	14	20	320	480	800	432	666	720
6207	35	72	17	28	410	620	700	576	864	720
6307	35	80	21	35	490	750	600	738	1116	630
16008	40	68	9	17	300	450	750	882	1350	540
6008	40	68	15	22	350	520	750	540	810	675
6208	40	80	18	32	440	660	625	630	936	675
6308	40	90	23	36	520	800	575	792	1188	560
16009	45	75	10	18	330	500	650	936	1440	510
6009	45	75	16	23	380	560	650	594	900	575
6209	45	85	19	32	470	720	650	684	1008	575
6309	45	100	25	40	540	900	580	846	1296	520
6010	50	80	16	26	390	580	600	972	1620	500
6210	50	90	20	32	540	770	550	702	1044	540
6011	55	90	18	28	400	600	550	972	1386	500
6211	55	100	21	38	600	800	550	720	1080	480
6012	60	95	18	28	420	640	500	1080	1440	450

Ball bearings with ZZ or RS shields on inquiry.

Load and speed ratings are for comparison purposes only. Graphs on page 3 should be used to determine actual application values.



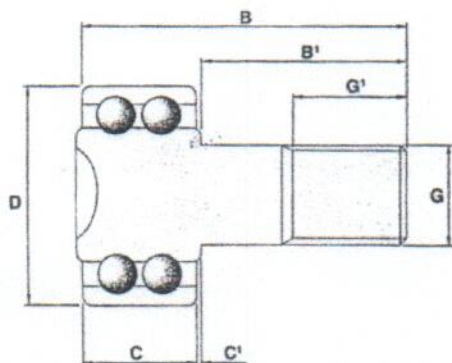


## Bearings - inch size single and double row

Code	ID		Single row OD		W		DR W		Single row capacity			Double row capacity		
	mm	inch	mm	inch	mm	inch	mm	inch	stat. N	dyn. N	max. speed rpm	stat. N	dyn. N	max. speed rpm
R4	6,35	1/4	15,88	5/8	5,0	0,196	9,53	3/8	40	60	3600	72	108	2900
R4 A	6,35	1/4	19,05	3/4	5,56	7/32	9,53	3/8	50	70	2600	90	130	2100
R4 AW	6,35	1/4	19,05	3/4	7,14	9/32	12,7	1/2	50	70	2600	90	130	2100
R6	9,53	3/8	22,22	7/8	5,56	7/32	11,11	7/16	60	80	2200	110	150	1750
R6 A	9,53	3/8	22,22	7/8	7,14	9/32	11,11	7/16	60	80	2200	110	150	1750
R8	12,7	1/2	28,58	1-1/8	6,35	1/4	11,11	7/16	110	160	1750	200	290	1400
R8 A	12,7	1/2	28,58	1-1/8	9,53	3/8	12,7	1/2	110	160	1750	200	290	1400
R10	15,88	5/8	34,93	1-3/8	7,14	9/32	11,11	7/16	170	250	1400	300	450	1150
R10 A	15,88	5/8	34,93	1-3/8	9,53	3/8	11,11	7/16	170	250	1400	300	450	1150
R10 B	15,88	5/8	34,93	1-3/8	11,11	7/16	11,11	7/16	170	250	1400	300	450	1150
R12	19,05	3/4	41,28	1-5/8	7,94	5/16	15,88	5/8	200	300	1200	360	540	960
R16	25,4	1,0	50,8	2,0	12,7	1/2	19,05	3/4	240	360	1050	430	650	840

Ball bearings with ZZ or RS shields on inquiry.

Load and speed ratings are for comparison purposes only. Graphs on page 3 should be used to determine actual application values.



## Guide rollers

Code	D mm	C mm	B mm	B' mm	C' mm	G mm	G' mm	load capacity		speed n max rpm
								stat. N	dyn. N	
KR 16	16	11	28	16	0,6	M 6	8	45	65	3050
KR 19	19	11	32	20	0,6	M 8	10	50	70	2600
KR 22	22	12	36	23	0,6	M 10x1	12	55	80	2200
KR 26	26	12	36	23	0,6	M 10x1	12	70	100	1900
KR 30	30	14	40	25	0,6	M 12x1,5	13	110	160	1650
KR 32	32	14	40	25	0,6	M 12x1,5	13	150	220	1550
KR 35	35	18	52	32,5	0,8	M 16x1,5	17	170	250	1400
KR 40	40	20	58	36,5	0,8	M 18x1,5	19	220	320	1250
KR 47	47	24	66	40,5	0,8	M 20x1,5	21	260	370	1050

Ball bearings with ZZ or RS shields on inquiry.

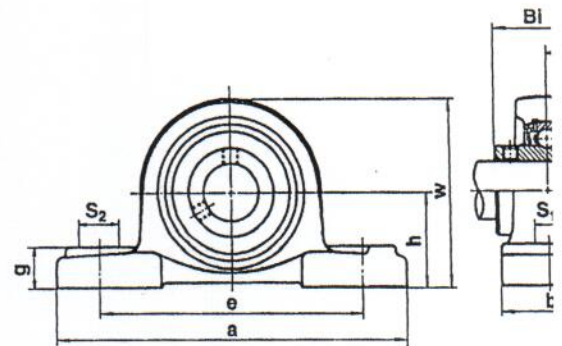


# Pillow blocks and 4/2 bolt flange housings reinforced thermoplastic

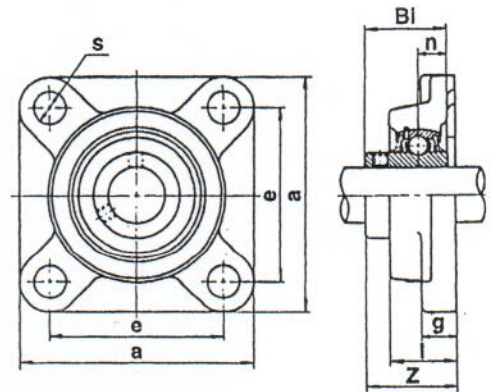
housings are manufactured from extra strong glass fiber reinforced PA. In addition, the PA is formed around a small steel frame to provide strength near that of metal housings. These housings have exceptional chemical resistance and can not rust. And they are lightweight.

housings are industry standard sizes and dimensions and will accept the polymer insert bearings listed on page 9 or most steel insert bearings. The bolt holes have zinc-plated sleeves or optional stainless steel sleeves.

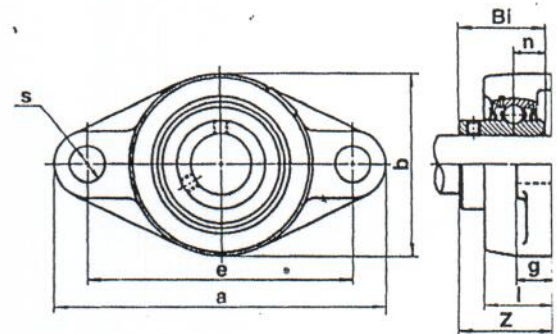
Thermoplastic Pillow Blocks								
Type	h mm	a mm	e mm	b mm	S <sub>1</sub> mm	S <sub>2</sub> mm	g mm	w mm
PL 200-P	33,3	127	95	38	11	14	14	65
PL 201-P	33,3	127	95	38	11	14	14	65
PL 202-P	33,3	127	95	38	11	14	14	65
PL 203-P	33,3	127	95	38	11	14	14	65
PL 204-P	33,3	127	95	38	11	14	14	65
PL 205-P	36,5	140	105	38	11	14	14,5	71
PL 206-P	42,9	162	119	46	14	18	17,5	83
PL 207-P	47,6	167	127	48	14	18	18	93
PL 208-P	49,2	184	137	54	14	18	18	98



Thermoplastic 4 Bolt Flange housings					
Type	a mm	e mm	g mm	l mm	S mm
F 200-P	86	63,5	13	26	11
F 201-P	86	63,5	13	26	11
F 202-P	86	63,5	13	26	11
F 203-P	86	63,5	13	26	11
F 204-P	86	63,5	13	26	11
F 205-P	94,5	70	13,5	27	11
F 206-P	107	83	14	31	11
F 207-P	117	92	15,5	34	13
F 208-P	130	102	17	37	14



Thermoplastic 2 Bolt Flange housings						
Type	a mm	e mm	b mm	g mm	l mm	S mm
FL 200-P	113	90	60	11	25,5	11
FL 201-P	113	90	60	11	25,5	11
FL 202-P	113	90	60	11	25,5	11
FL 203-P	113	90	60	11	25,5	11
FL 204-P	113	90	60	11	25,5	11
FL 205-P	130	99	68	13	27	11
FL 206-P	148	117	80	15	31	11
FL 207-P	161	130	90	15	34	13





# Bearing tolerances

Inner diameter	Tolerance	Outer diameter	Tolerance	Width	Tolerance
3 - 17 mm 1/8" - 11/16"	+/- 0.03 mm +/- 0.0012"	10 - 30 mm 3/8" - 1-1/8"	+/- 0.04 mm +/- 0.0016"	4 - 8 mm 5/32" - 5/16"	- 0.1 mm - 0.04"
20 - 50 mm 3/4" - 2"	+/- 0.04 mm +/- 0.0016"	35 - 47 mm 1-3/8" - 1-7/8"	+/- 0.05 mm +/- 0.002"	10 - 14 mm 7/16" - 9/16"	- 0.1 mm - 0.04"
55 - 70 mm 2-1/8" - 2-3/4"	+/- 0.05 mm +/- 0.002"	52 - 80 mm 2-1/8" - 3-1/8"	+/- 0.06 mm +/- 0.024"	14 - 20 mm 5/8" - 7/8"	- 0.1 mm - 0.04"
		90 - 125 mm 3-1/2 - 5"	+/- 0.08 mm +/- 0.0032"		

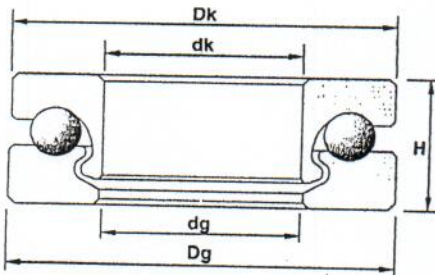
These tolerances are for bearings with races of POM only. Other materials may have different tolerances.

## Assembly instructions – Radial Ball Bearings:

We recommend a press fit on the ID and a loose fit on the OD (or the reverse is also okay). This will compensate for any growth of the shaft or housing. However, a press fit on the ID AND OD, or a too tight press fit on the ID OR OD will reduce or eliminate the radial clearance and may cause the bearing to fail.

For a press fit on the ID, the shaft should be 0.02 mm larger than the bearing inner diameter. For a press fit on the OD, the housing bore should be 0.02 mm smaller than the bearing OD.

If you should like help to calculate these values, please contact SMG for technical support.



## Thrust ball bearing units

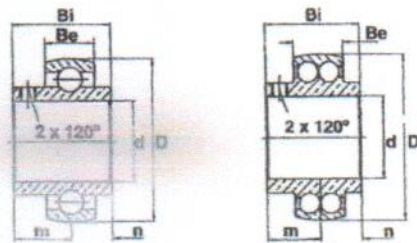
\_\_\_\_\_ can manufacture thrust bearings in most standard inch or metric sizes as well as custom sizes. Most thrust bearings are manufactured with POM races and glass or SS316 balls. All other materials listed on page 2 are available for thrust bearings upon special request. Contact \_\_\_\_\_ for assistance.

Code	dk mm	Dg mm	dg mm	Dk mm	H mm	Capacity		max. speed rpm
						stat. N	dyn. N	
51100	10	24	11	23	9	200	250	600
51200	10	26	11	25	11	210	260	600
51101	12	26	13	25	9	320	400	540
51201	12	28	13	27	11	330	410	540
51102	15	28	16	27	9	500	625	500
51202	15	32	16	31	12	520	650	500
51103	17	30	18	29	9	570	710	480
51203	17	35	18	34	12	600	750	480
51104	20	35	21	34	10	650	810	460
51204	20	40	21	39	14	690	860	460
51105	25	42	26	41	11	710	880	410
51205	25	47	26	46	15	750	930	400
51106	30	47	31	46	11	760	950	400
51206	30	52	31	51	16	820	1025	375
51107	35	52	36	51	12	810	1010	390
51207	35	62	36	61	18	870	1090	365

Load and speed ratings are for comparison purposes only. Graphs on page 3 should be used to determine actual application values.



# Insert bearings Single and double row



Code	d		D	Bi	Be	m	n	Load capacity single row (N)			Load capacity double row (N)		
	mm	inch						stat.	dyn	rpm	stat.	dyn	rpm
UC 200-P	10	3/8	47	31,0	17	18,3	12,7	270	420	1050	490	750	945
UC 201-P	12	7/16; 1/2	47	31,0	17	18,3	12,7	270	420	1050	490	750	945
UC 202-P	15	5/8	47	31,0	17	18,3	12,7	270	420	1050	490	750	945
UC 203-P	17	3/4	47	31,0	17	18,3	12,7	270	420	1050	490	750	945
UC 204-P	20	7/8	47	31,0	17	18,3	12,7	270	420	1050	490	750	945
UC 205-P	25	1	52	34,1	17	19,6	14,5	320	480	950	580	860	855
UC 206-P	30	1-1/16; 1-1/8 1-1/4; 1-3/16	62	38,1	19	22,2	15,9	360	550	800	650	990	720
UC 207-P	35	1-1/4; 1-3/8	72	42,9	20	25,4	17,5	410	620	700	740	1110	630
UC 208-P	40	1-1/2; 1-5/8	80	49,2	21	30,2	19,0	440	660	625	790	1200	560
UC 209-P	45	1-3/4; 1-7/8	85	49,2	22	30,2	19,0	470	720	580	840	1300	520

Ball bearings with ZZ or RS shields on inquiry.

Load and speed ratings are for comparison purposes only. Graphs on page 3 should be used to determine actual application values.

All bearings are manufactured with spherical OD to fit standard metal housings or the Schmeing reinforced PA housings listed on page 8. The standard bearing material is POM races with SS316 balls. Other materials listed on page 2 are also available on special request. Bearings can be specially manufactured to meet your specific application needs.

## Photographic and film materials

For more than 20 years has been a leading OEM and aftermarket supplier to the photographic processing industry worldwide. Companies whose reputation keep them at the forefront of their industries depend on Schmeing quality products.

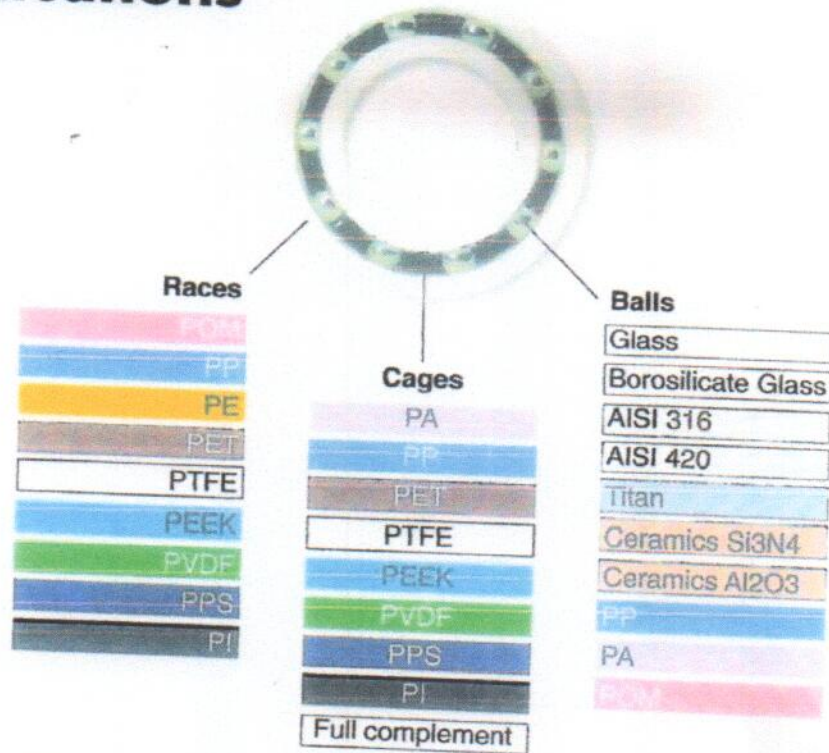
Most standard bearings and spice pads are in stock for machines manufactured by Kodak, Agfa, GPE, Houston, Noritsu, San Marco, and many more. Contact for details.

Please ask for our product line summary.





# Materials and applications

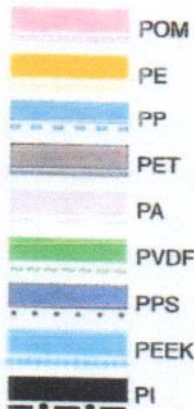
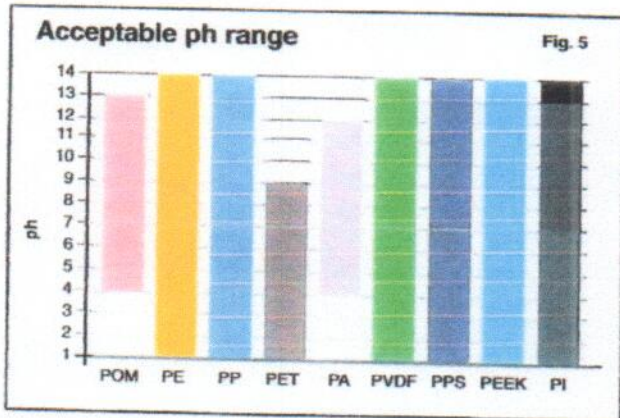
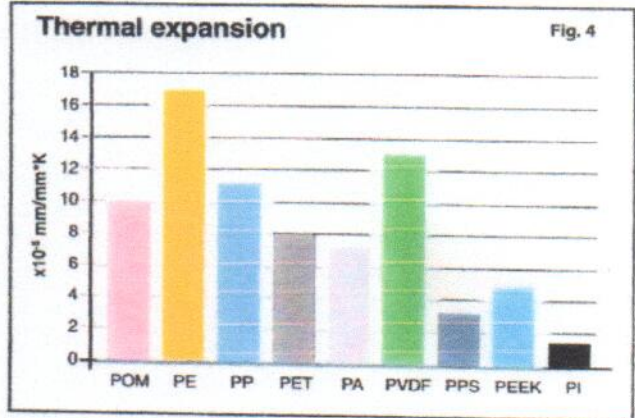
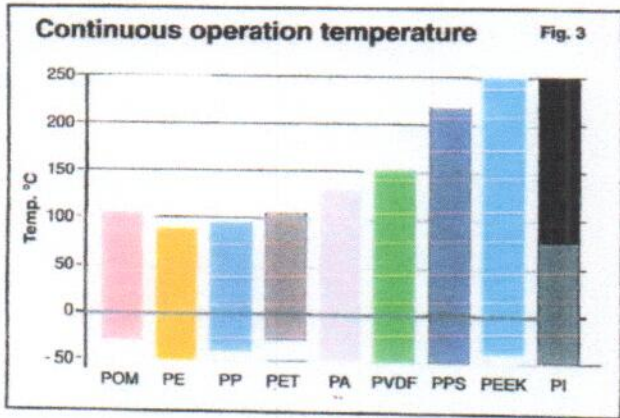
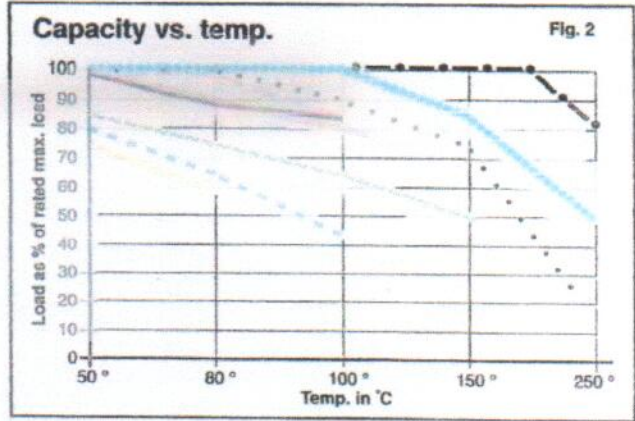
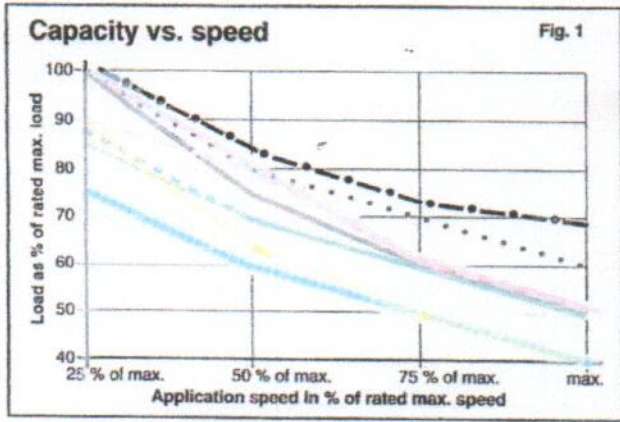


Application	races recommended material	cages	balls
Conveying systems, Apparatus engineering, Air conditioning	POM	PA	AISI 420
Electro plating, Electro polishing	PP	PP	Glass
Food processing	POM	PA	AISI 316
Vacuum applications	PVDF	PVDF	Glass
Fiber processing	POM	PA	Glass
Conveyor ovens	PEEK	PEEK	Glass
Textile finishing	POM	PA	AISI 316
Medical radiation	PET	PET	AISI 316
Medical radiation (sterilization)	PPS	PPS	Glass
Photo processing	PP/PET	PP/PET	AISI 316
Computer assembly	POM	PA	Glass
Automotive application high temp.	PPS	PPS	AISI 316
Automotive application	POM	PA	AISI 316
Model and lightweight construction	POM	PA	Glass

Technology for the future



# Engineering data



Example of how to determine approximate load rating based on actual application parameters: If your bearing will be

- a. 6204 with POM races
- and b. actual application temp. is 80 °C
- and c. actual application speed is 525 rpm

then use dynamic load rating from page 5 times percent from fig. 1 and times percent from fig. 2, you get an actual application load rating of 302 N  
 $(420 \text{ N} \times 80 \% \times 90 \% = 302 \text{ N})$

This means that **in your application** the 6204 with POM races should handle a load of 302 N.

We recommend to test the bearings in your current application.

Technology for the future



## Chemical resistance of materials

- resistant
- adequately resistant
- limited resistance
- ▬ generally non-resistant
- ▬ completely non-resistant

(Data from material contractors not binding)



	Water	Inorganic saline solutions	Weak acids	Strong organic acids	Strong acids	Hydrofluoric acid	Oxidizing acids	Weak alkaline solutions	Strong alkaline solutions	Aliphatics	Aromatic hydrocarbons	Chlorinated hydrocarbons	Unchlorinated chlorinated hydrocarbons	Low in alcohol	Ester	Ketone	Ether	Benzene	Fuel mixture	Mineral oil	Greases, oils	Turpentine	
1.0616 hardened	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1.3505 hardened	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1.4034 (1.3541)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1.4125 hardened	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1.4301	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1.4401	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1.4571	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Titanium 35	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Aluminium	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Tungsten carbide	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Brass	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Bronze	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Stellite	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Glass	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
PA (Polyamide 66)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
POM (Polyacetal)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
PP (Polypropylene)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
PTFE (Teflon)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
PUR (Polyurethane)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Silicon nitride Si <sub>3</sub> N <sub>4</sub>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Zirkon oxide ZrO <sub>2</sub>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Aluminium oxide Al <sub>2</sub> O <sub>3</sub>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

## standard packaging

### Quantity of balls in a bag:

Diameter mm	inches	Quantity	Diameter mm	inches	Quantity	Diameter mm	inches	Quantity
3.175	1/8	40.000	5.5		7.500	7.938	5/16	2.500
3.5		30.000	5.556	7/32	7.500	8.0		2.500
3.969	5/32	20.000	6.0		6.000	8.5		2.000
4.0		20.000	6.35	1/4	5.000	8.731	11/32	2.000
4.5		15.000	6.5		5.000	9.0		1.700
4.762	3/16	12.000	7.0		3.500	9.525	3/8	1.500
5.0		10.000	7.144	9/32	3.500	10.0		1.250

### Amount on a standardized pallet (DIN) for bag packaging:

Diameter mm	inches	Quantity	Diameter mm	inches	Quantity	Diameter mm	inches	Quantity
3.175	1/8	7.200.000	5.556	7/32	1.350.000	8.731	11/32	360.000



## Materials

### Stainless steel balls, hardened

Materials	Density (kg/dm <sup>3</sup> )	Hardness	
		D <sub>w</sub> ≤ 12.7 mm (HV 10)	D <sub>w</sub> > 12.7 mm (HRC)
1.3541 (1.4034)	7.7	580 to 700	54 to 60
1.3543 (1.4125)		640 to 780	57 to 63
1.3549 (1.4112)		640 to 780	57 to 63
1.4037		640 to 780	57 to 63
1.4021		ca. 43 to 48 HRC	

Other materials upon request.

### Stainless steel balls, unhardened

Materials	Density (kg/dm <sup>3</sup> )	Hardness (HV 10)
1.4016	7.7	ca. 280 - 380
1.4104	7.7	
1.4301	7.9	
1.4401	8.0	
1.4571	8.0	

Other materials upon request.

### Brass, bronze, copper an titanium balls<sup>1)</sup>

Materials	Density (kg/dm <sup>3</sup> )	Hardness (HB) ca.
Brass 2.0321 (Cu Zn37)	8.6	180 - 200
Bronze 2.1030 (Cu Sn8)	8.8	200 - 220
Copper (E-Cu 99.9%)	8.93	110 - 180
Titanium 3.7035	4.5	130 - 180

Other materials upon request.

### Aluminium balls<sup>1)</sup>

Materials	Density (kg/dm <sup>3</sup> )	Hardness (HB) ca.
Al 99.98% (3.0380)	ca. 2.7	30 - 40
Al 99.9% (3.0305)		
AlZnMgCu1.5 (3.4365)	ca. 2.8	160 - 180

Other materials upon request.

### Tungsten carbide balls<sup>1)</sup>

Materials	Density (kg/dm <sup>3</sup> )	Hardness (HV 50)
94 WC+6Co	14.90	1550

### Glass balls<sup>1)</sup>

Materials	Density (kg/dm <sup>3</sup> )	Hardness (HRC)
Soft glass	2.5	ca. 45

## Dimensional and form accuracy in accordance with DIN 5401 part 2

D <sub>w</sub> (mm)		t <sub>Dw</sub> (μm) max.	V <sub>DwA</sub> (μm) max.	l <sub>G</sub> (μm)	Tolerance (μm)
over	to				
-	25	2	4	4	±22
25	50	3	6	6	±27
50	75	4	8	8	±36
75	100	5	10	10	±45
100	125	6	12	12	±54
125	150	7	14	14	±63

Other qualities grades (in accordance with ISO AFBMA) are possible.

D <sub>w</sub> (mm)		t <sub>Dw</sub> (μm) max.	V <sub>DwA</sub> (μm) max.	l <sub>G</sub> (μm)	Tolerance
over	to				
-	25	10	20	20	±70
25	50	15	30	30	±105
50	75	20	40	40	±140

Other quality grades (in accordance with ISO 329 AFBMA) are possible.

D <sub>w</sub> (mm)		t <sub>Dw</sub> (μm) max.	V <sub>DwA</sub> (μm) max.	l <sub>G</sub> (μm)	Tolerance
over	to				
-	25	10	20	20	±70
25	50	15	30	30	±105
50	75	20	40	40	±140

<sup>1)</sup> Titanium is not listed in DIN 5401, part 2.

D <sub>w</sub> (mm)		t <sub>Dw</sub> (μm) max.	V <sub>DwA</sub> (μm) max.	l <sub>G</sub> (μm)	Tolerance
over	to				
	10	15	30	30	±115
10		20	40	40	±125
	10	10	20	20	±115
10	20	15	30	40	±115

<sup>1)</sup> Aluminium and aluminium alloys are not listed in DIN 5401. Other qualities upon request.

D <sub>w</sub> (mm)		t <sub>Dw</sub> (μm) max.	V <sub>DwA</sub> (μm) max.	l <sub>G</sub> (μm)	Tolerance (μm)
over	to				
0.5	15	0.635	2.50	-	±1.25
15		2	4	-	±2

<sup>1)</sup> Tungsten carbide balls are not listed in DIN 5401.

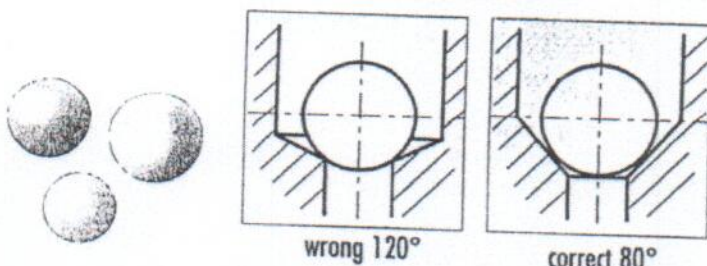
D <sub>w</sub> (mm)		t <sub>Dw</sub> (μm) max.	V <sub>DwA</sub> (μm) max.	l <sub>G</sub> (μm) max.	Tolerance (μm)
over	to				
	10	7	14	14	
10	20	14	28	28	



	polyamide 66	polyacetal	polypropylene	polytetrafluoroethylene	polyurethane
Density approx. g/cm <sup>3</sup>	1.13	1.41	0.91	2.15-2.19	1.23
Dimensional stability under heat according to DIN 534 61 (ISO 75)	acc.to A 100°C acc.to B 200°C dry	acc.to A 105°C acc.to B 160°C	acc.to A 52°C acc.to B 95°C	50-60°C  130-140°C	upon request
Method A, d = 1.8 N/mm <sup>2</sup> / B, d = 0.45 N/mm <sup>2</sup>					
Shore hardness					
DIN 53505	D 80	D 80	D 65	D 55-60	A 90
Indentation hardness test N/mm <sup>2</sup>					
DIN 534 56	dry 160 humid 100	145	49	40-45	
Water absorption					
DIN 534 95	8.5 %	0.8 %	-	0	1.5 %
Modulus of elasticity N/mm <sup>2</sup>					
DIN 534 57	dry 3.200 humid 1.600	2.900	900	750	

PA, POM, PTFE and PUR balls are supplied in their natural colours, PP is dyed green. Other colours upon request.

Valve seat for ball



1			0,076		
1.2			0.131		
1.5			0.256		
2			0.414	0.607	0.394
2.381	3/32		0.698	1.02	0.665
2.5			0.92	1.18	0.78
3			1.59	2.05	1.34
3.175	1/8		1.90	2.44	1.60
3.969	5/32		3.69	4.74	3.11
4			3.78	4.85	3.18
4.762	3/16		6.41	8.23	5.39
5			7.39	9.48	6.22
5.556	7/32		10.1	12.9	8.49
6			12.7	16.3	10.7
6.35	1/4		14.8	19.0	12.5
7			20.3	26.0	17.1
7.144	9/32		21.5	27.7	18.1
7.938	5/16		29.6	38.0	24.9
8			30.2	38.7	25.4
9			43.1	55.4	36.3
9.525	3/8		51.0	65.5	42.9
10			59.1	75.8	49.7
10.319	13/32		63.6	81.7	53.6
11			78.6	101.0	66.1
11.112	7/16		81	104	68.2
12			102	131	85.8
12.7	1/2		121	155	102
13			130	167	109
14			162	208	137
14.288	9/16		172	221	145
15			200	256	168
15.081	19/32		203	260	170
15.875	5/8		237	304	200
16			241	310	203
18			345	443	290
18.256	23/32		359	461	302
19			408	524	343
19.05	3/4		408	524	343
19.5			438	562	369
20			414	607	394
21			479	698	456
22			629	808	530
22.225	7/8		649	834	547
25			922	1183	776
Weight in g (approx.)					
30			1.6	2.0	1.3
40			3.8	4.8	3.2
45			5.4	6.9	4.5
50			7.4	9.5	6.2
60			12.7	16.3	10.7
70			20.3	26.0	17.1
80			30.2	38.7	25.4
90			43.1	55.4	36.3
100			59.1	75.8	49.7