

max			max			max		max	
10	8	6	9	7	5	5	4	4	3
10	8	6	9	7	5	5	4	4	3
10	8	6	9	7	5	5	4	4	3
13	10	8	10	8	6	6	5	5	4
15	12	9	13	10	8	8	6	6	5
19	19	11	15	15	9	9	7	7	5
25	25	15	19	19	11	10	8	8	6
31	31	19	23	23	14	13	10	10	8
31	31	19	23	23	14	13	10	10	8
38	38	23	28	28	17	15	12	12	9

Table 3 german: Tabelle

V _{dmo} ⁽²⁾				$\Delta Bs(\text{or } \Delta Cs)^{(3)}$							
P0/ ABEC1	P6/ ABEC3	P5/ ABEC5	P4/ ABEC7	Single Bearing German: Einzellager				Combined Bearing German: Kombinierte Lager			
				P0/ABEC1 P6/ABEC3		P5/ABEC5 P4/ABEC7		P0/ABEC1 P6/ABEC3		P5/ABEC5 P4/ABEC7	
max	max	max	max	High hoch	Low niedrig	high	low	high	low	high	low
6	5	3	2	0	-40	0	-40	-	-	0	-250
6	5	3	2	0	-120	0	-40	0	-250	0	-250
6	5	3	2	0	-120	0	-80	0	-250	0	-250
8	6	3	2.5	0	-120	0	-120	0	-250	0	-250
9	8	4	3	0	-120	0	-120	0	-250	0	-250
11	9	5	3.5	0	-150	0	-150	0	-380	0	-250
15	11	5	4	0	-200	0	-200	0	-380	0	-380
19	14	7	5	0	-250	0	-250	0	-500	0	-380
19	14	7	5	0	-250	0	-250	0	-500	0	-380
23	17	8	6	0	-300	0	-300	0	-500	0	-500

Table 4

$\Delta Bs(\text{or } \Delta Cs)$				Kla				Sd		Sla ⁽⁵⁾	
Inner Ring (or Outer Ring) ⁽³⁾ Innenring(oder Aussenring)		Inner Ring Innenring		P0/ ABEC1	P6/ ABEC3	P5/ ABEC5	P4/ ABEC7	P5/ ABEC5	P4/ ABEC7	P5/ ABEC5	P4/ ABEC7
P0/ ABEC1	P6/ ABEC3	P5/ ABEC5	P4/ ABEC7								
max	max	max	max	High hoch	Low niedrig	high	low	high	low	high	low
6	5	3	2	0	-40	0	-40	-	-	0	-250
6	5	3	2	0	-120	0	-40	0	-250	0	-250

6	5	3	2	0	-120	0	-80	0	-250	0	-250
8	6	3	2.5	0	-120	0	-120	0	-250	0	-250
9	8	4	3	0	-120	0	-120	0	-250	0	-250
11	9	5	3.5	0	-150	0	-150	0	-380	0	-250
15	11	5	4	0	-200	0	-200	0	-380	0	-380
19	14	7	5	0	-250	0	-250	0	-500	0	-380
19	14	7	5	0	-250	0	-250	0	-500	0	-380
23	17	8	6	0	-300	0	-300	0	-500	0	-500

深沟球轴承径向游隙 Radial deep groove ball bearing internal clearance

Radiale Lagerluft der Rillenkugellager

d(mm)		2 group german:Gruppe		0 group		3 group		4group		5 group	
Over ueber	incl	min	max	min	max	min	max	min	max	min	max
2.5	6	0	7	2	13	8	23	14	29	20	37
6	10	0	7	2	13	8	23	18	33	25	45
10	18	0	9	3	18	11	25				
18	24	0	10	5	20	13	28	20	36	28	48
24	30	1	11	5	20	13	28	23	41	30	53
30	40	1	11	6	20	15	33	28	46	40	64
40	50	1	11	6	23	18	36	30	51	45	73
50	65	1	15	8	28	23	43	38	61	55	90
65	80	1	15	10	30	25	51	46	71	65	105
80	100	1	18	12	36	30	58	53	84	75	120
100	120	2	20	15	41	36	66	61	97	90	140
120	140	2	23	18	48	41	81	71	114	105	160

调心球轴承径向游隙

Self aligning ball bearing radial clearance

Radiale Lagerluft der Pendelkugellager

(μ m)

d(mm)		2 group german:Gruppe		0 group		3 group		4group		5 group	
Over ueber	incl	min	max	min	max	min	max	min	max	min	max
2.5	6	1	8	5	15	10	20	15	25	21	33
6	10	2	9	6	17	12	25	19	33	27	42
10	14	2	10	6	19	13	26	21	35	30	48

14	18	3	12	8	21	15	28	23	37	32	50
18	24	4	14	10	23	17	30	25	39	34	52
24	30	5	16	11	24	19	35	29	46	40	58
30	40	6	18	13	29	23	40	34	53	46	66
40	50	6	19	14	31	25	44	37	57	50	71
50	65	7	21	16	36	30	50	45	69	62	88
65	80	8	24	18	40	35	60	54	83	76	108
80	100	9	27	22	48	42	70	64	96	89	124
100	120	10	31	25	56	50	83	75	114	105	145
120	140	10	38	30	68	60	100	90	135	125	175
140	160	15	44	35	80	70	120	110	161	150	210

滚动轴承

深沟球轴承

Bearing material Lagermaterial			Typical Serious	Anti- Corrosion	Speed- Limited	Max working temp Max. Betriebstemp eratur	Load capacity Belastba rkeit
Rin g Rin ge	Balls Kug eln	Cage types Gehaeuset ypen	Typische ???	Korrosionsbestae ndigkeit	Geschwindigkeitsbe grenzung		
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCI NG PTFE German: Graphit verstaerkt PTFE	6000 、 6200 、 6300	○●●●●	●●●●●	260°C	○●●●●
ZrO 2	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCI NG PTFE German: Graphit verstaerkt PTFE	6000 、 6200 、 6300	○●●●●	○●●●●	260°C	○●●●●
ZrO 2	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCI NG PTFE	6000 、 6200 、 6300	○●●●●	○●●●●	260°C	●●●●●

		German: Graphit verstaerkt PTFE					
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCI NG PTFE German: Graphit verstaerkt PTFE	6000 、 6200 、 6300	○●●●●	○●●●●	260°C	○○●●●
SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCI NG PTFE German: Graphit verstaerkt PTFE	6000 、 6200 、 6300	●●●●●	○○●●●	260°C	○○●●●

薄壁轴承

Bearing material Lagermaterial			Typical series	Anti- corrosion	Speed- limited	Max working temp	Load capacity
Ring Ringe	Balls Kugeln	Cage types Gehauesetypen					
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	61800、61900、 71800、71900	○●●●●	●●●●●	260°C	○●●●●
ZrO ₂	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	61800、61900、 71800、71900	○●●●●	○●●●●	260°C	○●●●●
ZrO ₂	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	61800、61900、 71800、71900	○●●●●	○●●●●	260°C	●●●●●
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	61800、61900、 71800、71900	○●●●●	○●●●●	260°C	○○●●●

SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	61800、61900、 71800、71900	●●●●●	○○●●●	260℃	○○●●●
------	------	--	-----------------------------	-------	-------	------	-------

微型轴承

Bearing material			Typical serious	Anti-corrosion	Speed-limited	Max working temp	Load capacity
Ring	Balls	Cage types					
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	683、693、603、 623、633	○●●●●	●●●●●	260℃	○●●●●
ZrO ₂	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	683、693、603、 623、633	○●●●●	○●●●●	260℃	○●●●●
ZrO ₂	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	683、693、603、 623、633	○●●●●	○●●●●	260℃	●●●●●
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	683、693、603、 623、633	○●●●●	○●●●●	260℃	○○●●●
SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	683、693、603、 623、633	●●●●●	○○●●●	260℃	○○●●●

角接触轴承

Bearing material			Typical serious	Anti-corrosion	Speed-limited	Max working temp	Load capacity
Ring	Balls	Cage types					
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	7000、7200、 7300	○●●●●	●●●●●	260℃	○●●●●
ZrO ₂	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	7000、7200、 7300	○●●●●	○●●●●	260℃	○●●●●
ZrO ₂	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	7000、7200、 7300	○●●●●	○●●●●	260℃	●●●●●
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	7000、7200、 7300	○●●●●	○●●●●	260℃	○○●●●
SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFOR	7000、7200、 7300	●●●●●	○○●●●	260℃	○○●●●

		CING PTFE					
--	--	-----------	--	--	--	--	--

直线轴承

Bearing material	Anti-corrosion	Speed-limited	Max working temp	Load capacity
ZrO ₂	○●●●●	○●●●●	600°C	●●●●●

Characteristic: widely used in electronic equipment, tensile testing machine and the digital three-dimensional coordinate measuring equipment, and multi-axis machine tools, presses, tool grinders, automatic gas cutting machine, printer, card sorting machine, food packaging machines as sliding parts.

Usage: a linear motion systems, in conjunction with the cylinder axis. As the balls point contact with the shaft, so the use load is small. Ceramic balls rotate with minimal friction, which can get a smooth precision movement.

Eigenschaft: weit gebrauchlich im elektronischen Equipment, Zugpruefmaschine und ein digitales dreidimensionales Messsystem, Multi-Achsenbearbeitungsmaschine, Pressen, Schleifwerkzeug, automatische Gasschneidemaschine, Drucker, Kartensortiermaschine, Lebensmittelverpackungsmaschinen wie z.B. Gleitteile

Gebrauch: ein lineares Bewegungssystem, in Verbindung mit der Zylinderachse, wenn jede einzelne Kugel mit dem Stab in Beruehrung kommt, ist die Verwendungslast gering. **Keramikkugeln** rotieren mit minimaler Reibung, bei der sie eine glattere und praezisere Bewegung erhalten.

双列角接触

Bearing material			Typical serious	Anti-corrosion	Speed-limited	Max working temp	Load capacity
Ring	Balls	Cage types					
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	5200、5300	○●●●●	●●●●●	260°C	○●●●●
ZrO ₂	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	5200、5300	○●●●●	○●●●●	260°C	○●●●●
ZrO ₂	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	5200、5300	○●●●●	○●●●●	260°C	●●●●●
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	5200、5300	○●●●●	○●●●●	260°C	○●●●●

SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	5200、5300	●●●●●	○○●●●	260℃	○○●●●
------	------	--	-----------	-------	-------	------	-------

调心球轴承

Bearing material			Typical series	Anti-corrosion	Speed-limited	Max working temp	Load capacity
Ring	Balls	Cage types					
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	1200、2200、 1300、2300	○●●●●	●●●●●	260℃	○●●●●
ZrO ₂	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	1200、2200、 1300、2300	○●●●●	○●●●●	260℃	○●●●●
ZrO ₂	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	1200、2200、 1300、2300	○●●●●	○●●●●	260℃	●●●●●
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	1200、2200、 1300、2300	○●●●●	○●●●●	260℃	○○●●●
SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	1200、2200、 1300、2300	●●●●●	○○●●●	260℃	○○●●●

外球面球轴承

Bearing material			Typical series	Anti-corrosion	Speed-limited	Max working temp	Load capacity
Ring	Balls	Cage types					
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	UC 200	○●●●●	●●●●●	260℃	○●●●●
ZrO ₂	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	UC 200	○●●●●	○●●●●	260℃	○●●●●
ZrO ₂	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	UC 200	○●●●●	○●●●●	260℃	●●●●●
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	UC 200	○●●●●	○●●●●	260℃	○○●●●
SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	UC 200	●●●●●	○○●●●	260℃	○○●●●

推力球轴承

Bearing material			Typical serious	Anti-corrosion	Speed-limited	Max working temp	Load capacity
Ring	Balls	Cage types					
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	51100、51200	○●●●●	●●●●●	260℃	○●●●●
ZrO ₂	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	51100、51200	○●●●●	○●●●●	260℃	○●●●●
ZrO ₂	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	51100、51200	○●●●●	○●●●●	260℃	●●●●●
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	51100、51200	○●●●●	○●●●●	260℃	○●●●●
SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	51100、51200	●●●●●	○●●●●	260℃	○●●●●

双列圆锥轴承

Bearing material			Typical serious	Anti-corrosion	Speed-limited	Max working temp	Load capacity
Ring	Balls	Cage types					
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	30200、30300	○●●●●	●●●●●	260℃	○●●●●
ZrO ₂	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	30200、30300	○●●●●	○●●●●	260℃	○●●●●
ZrO ₂	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	30100、30200、 30300	○●●●●	○●●●●	260℃	●●●●●
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	30200、30300	○●●●●	○●●●●	260℃	○●●●●
SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	30200、30300	●●●●●	○●●●●	260℃	○●●●●

单列圆柱滚子轴承

Bearing material			Typical serious	Anti-corrosion	Speed-limited	Max working temp	Load capacity
Ring	Balls	Cage types					
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GR	NU200、NU300	○●●●●	●●●●●	260℃	○●●●●

		APHITE REINFORCING PTFE					
ZrO ₂	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	NU200, NU300	○●●●●	○●●●●	260°C	○●●●●
ZrO ₂	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	NU200, NU300	○●●●●	○●●●●	260°C	●●●●●
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	NU200, NU300	○●●●●	○●●●●	260°C	○○●●●
SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	NU200, NU300	●●●●●	○●●●●	260°C	○○●●●

双列圆柱滚子轴承

Bearing material			Typical serious	Anti-corrosion	Speed-limited	Max working temp	Load capacity
Ring	Balls	Cage types					
Si ₃ N ₄	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	NN3000	○●●●●	●●●●●	260°C	○●●●●
ZrO ₂	Si ₃ N ₄	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	NN3000	○●●●●	○●●●●	260°C	○●●●●
ZrO ₂	ZrO ₂	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	NN3000	○●●●●	○●●●●	260°C	●●●●●
ZrO ₂	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	NN3000	○●●●●	○●●●●	260°C	○○●●●
SSiC	SSiC	PEEK/ PTFE/ PFA/ GRAPHITE REINFORCING PTFE	NN3000	●●●●●	○●●●●	260°C	○○●●●
Ceramic material		Anti-corrosion	Speed-limited	Max working temp	Load capacity		
Si ₃ N ₄		○○●●●	●●●●●	200°C	●●●●●		

Rolling element material Waelzkoerpermaterial	Anti-corrosion	Speed-limited	Max working temp	Load capacity
304 stainless steel rostfreies Stahl/Edelstahl	○○●●●	●●●●●	200°C	●●●●●

Engineering Material Mechanisches Material	Anti-corrosion	Speed-limited	Max working temp	Load capacity
PEEK	○○●●●	●●●●●	260℃	○○●●●

Engineering material	Anti-corrosion	Speed-limited	Max working temp	Load capacity
YG8/YG6	○○●●●	●●●●●	800—1000℃	●●●●●

关节轴承

Bearing material	Anti-corrosion	Speed-limited	Max working temp	Load capacity
SSiC	●●●●●	○○●●●	1400℃	○○●●●
Si ₃ N ₄	○●●●●	○●●●●	1100℃	○●●●●
ZrO ₂	○●●●●	○●●●●	600℃	●●●●●

滚动体

Rolling element material Waelzkoerpermaterial	Anti-corrosion	Speed-limited	Max working temp	Load capacity
SSiC	●●●●●	○○●●●	1400℃	○○●●●
Si ₃ N ₄	○●●●●	●●●●●	1100℃	○●●●●
ZrO ₂	○●●●●	○●●●●	600℃	●●●●●
Al ₂ O ₃	○●●●●	○●●●●	1400℃	○○●●●

混合轴承

Bearing material			Typical serious	Anti-corrosion	Speed-limited	Max working temp	Load capacity
Ring	Balls	Cage types					
GCr15	Si ₃ N ₄	PEEK/ PTFE/ PFA/Phenolic resin tube no cage Phenolharz Rohr ohne Gehaeuse	7000、7200、 61800、61900、 6000、6200	○○○○○	●●●●●	260℃	●●●●●
M50	Si ₃ N ₄	PEEK/ PTFE/ PFA/Phenolic resin tube no cage	7000、7200、 61800、61900、 6000、6200	○○○○○	○●●●●	260℃— 520℃	○●●●●

W18Cr4V	Si ₃ N ₄	PEEK/ PTFE/ PFA/Phenolic resin tube no cage	7000、7200、 61800、61900、 6000、6200	○○○○●	○●●●●	260℃— 520℃	●●●●●
M50	SSiC	PEEK/ PTFE/ PFA/Phenolic resin tube no cage	7000、7200、 61800、61900、 6000、6200	○○○○○	○●●●●	260℃— 520℃	○●●●●
W18Cr4V	SSiC	PEEK/ PTFE/ PFA/Phenolic resin tube no cage	7000、7200、 61800、61900、 6000、6200	○○○○●	○●●●●	260℃— 520℃	○●●●●

陶瓷成品球与钢球精度等级对照表

The ceramic balls and steel balls standards comparison with ISO&GB

A table of standard Q/ZXSQ 21-2004 for finished ceramic balls compared to ISO 3290 and GB308-2002 for finished steel balls.

Standard im Vergleich ISO&GB der Keramikkugeln und Stahlkugeln. Eine Tabelle des Standards Q/ZXSQ 21-2004 fuer gefertigte Keramikkugeln verglichen mit ISO 3290 und GB308-2002 der gefertigten Stahlkugeln.

Table 1

Tabelle 1

Grade Klasse			Tolerance Toleranz			Lot Diameter Variation Mengendurchmesservariation			Ball Diameter Variation Kugeldurchmesser Variation			Deviation from Spherical form Abweichung der Kugelform			Surface Roughness Oberflächenrauheit		
NOT EXCEED (μ m)																	
ISO	GB	ZXSQ	ISO	GB	ZXSQ	ISO	GB	ZXSQ	ISO	GB	ZXSQ	ISO	GB	ZXSQ	ISO	GB	ZXSQ
3	3	3	5	5	5	0.13	0.13	0.13	0.08	0.0	0.08	0.0	0.0	0.08	0.01	0.01	0.01
5	5	5	5	8	7	0.25	0.25	0.25	0.13	0.1	0.13	0.1	0.1	0.13	0.02	0.02	0.02
10	10	10	9	10	10	0.5	0.5	0.5	0.25	0.2	0.25	0.2	0.2	0.25	0.02	0.02	0.02
16	16	16	10	16	12	0.8	0.8	0.7	0.4	0.4	0.4	0.4	0.4	0.4	0.03	0.03	0.03
20	20	20	12	16	14	1	1	0.8	0.5	0.5	0.5	0.5	0.5	0.5	0.04	0.04	0.04

28	28	28	12	16	14	1.4	1.4	1.2	0.7	0.7	0.7	0.7	0.7	0.7	0.05	0.05
Standard for the finished steel balls									Standard for the finished ceramic balls							
● Hardness on Spherical: 60~66HRC									● Hardness on Spherical:							
● Hardness Variation of a Ball: ≤0.5HRC									● SSiC: 2920~3150HV							
● Hardness Variation of One Lot: ≤1.0HRC									● Si ₃ N ₄ /Sialon: 1380~1590HV							
● Decarburized layer: ≤0.02mm									● ZrO ₂ : 1180~1320HV							
● Micro-structure: 1~3 class, no troostite on the surface									● Hardness Variation of a Ball: ≤ 2 HRC							
									● Hardness Variation of One Lot: ≤ 3 HRC							
									● Density: Si ₃ N ₄ /Sialon: 3.23~3.40g/cm ³							
									● ZrO ₂ : 5.95~6.03g/cm ³							
									● SSiC: 3.10~3.18g/cm ³							
									● Micro-structure: micro-fine structure having well Distraction : 20μm ~ 5μm							
									● Gas hole ratio: < 1%							

German left table: Standard fuer die gefertigten Stahlkugeln,

Haerte der Kugelform, Haerte der Vartiation der Kugeln, Haerte der Variation, Mikrostruktur: 1-3

German right table: Standard fuer die gefertigte Keramikugeln,

Haerte der Kugelform: Si₃N₄ Sialon; Haerte der Kugelvariationen, Haerte der Einzel -Kugelvariationen, Dichte, Mikro-Struktur: die mikrofeine Struktur hat eine gute Distraction, der Prozentsatz der Gasbohrung ist weniger als 1 %

成品球精度等级企业标准

ZXSQ The ceramic balls enterprise standards for munufacture Q/ZXSQ21-2004

ZXSQ Die Keramikugeln Unternehmensstandard fuer die Fertigung Q/ZXSQ21-2004

Grade	Tolerance	Lot Diameter Variation	Ball Diameter Variation	Deviation from Spherical form	Surface Roughness
3	5	0.13	0.08	0.08	0.012
5	7	0.25	0.13	0.13	0.02
10	10	0.5	0.25	0.25	0.025
16	12	0.7	0.4	0.4	0.032
20	14	0.8	0.5	0.5	0.04
28	14	1.2	0.7	0.7	0.05
Standard for the finished ceramic balls					
Standard der gefertigten Keramikugeln					
● Hardness on Spherical: SSiC: 2920~3150HV					
● Si ₃ N ₄ /Sialon: 1380~1590HV					
● ZrO ₂ : 1200~1500HV					

● Hardness Variation of a Ball: ≤ 2 HRC
● Hardness Variation of One Lot: ≤ 3 HRC
● Density: SSiC : 3.10~3.18g/cm ³
● Si ₃ N ₄ / Sialon: 3.23~3.40g/cm ³
● ZrO ₂ : 5.95~6.03g/cm ³
● Micro-structure: micro-fine structure having well distraction: 20 μ m ~ 5 μ m
● Gas hole ratio: <1%

陶瓷材料耐腐蚀性能表

Si₃N₄, SSiC and ZrO₂ corrosion resistance list

Si₃N₄, SSiC und ZrO₂ Korrosionsbestaendigungs-Liste

Medium Medium	Content(%) Gehalt	Temperature Temperatur	Corrosion resistance Korrosionsbestaendigkeit
Al	100	700°C	Excellent
HCL	10	25°C	Good
HCL	35	25°C	Good
HNO3	10	25°C	Good
HNO3	63	25°C	Good
NaOH+H2SO4	30	100°C	Excellent
NaOH	50	25°C	Excellent
H2SO4	20	25°C	Excellent
H2SO4	98	50°C	Good

3 种钢球标准

A.F.B.M.A.标准

Grade Klasse e	Roundness Rundheit		Lot Diameter Variation Mehrfache Durchmesservariation		Diameter Tolerance Durchmessertoleranz		Max gauge interval Max. Spurweite- Intervall		Surface Roughness Oberflaechenrauheit	
	in Inches	μ m	in Inches	μ m	in Inches	μ m	in Inches	μ m	Microinches	μ m
3	.000003	0.08	.000005	0.13	\pm .00003	0.76	.000010	0.25	.5	0.012
5	.000005	0.13	.000010	0.25	\pm .00005	0.27	.000010	0.25	.8	0.020
10	.000010	0.25	.000020	0.51	\pm .0001	2.54	.000010	0.25	1.0	0.025
16	.000016	0.38	.000032	0.76	\pm .0001	2.54	.000010	0.25	1.0	0.025
24	.000024	0.63	.000048	1.27	\pm .0001	2.54	.000010	0.25	2.0	0.050
48	.000048	1.27	.000096	2.54	\pm .0002	5.08	.000050	0.12	3.0	0.076
100	.0001	2.50	.0002	5.08	\pm .0005	12.70	.0001	2.54	5.0	0.120
200	.0002	5.08	.0004	10.20	\pm .001	25.40	.0002	5.08	8.0	0.203
500	.0005	12.70	.001	25.40	\pm .002	50.80	.0005	12.70	-	-

1000	.001	25.40	.002	50.80	±.005	127.00	.001	25.40	-	-
------	------	-------	------	-------	-------	--------	------	-------	---	---

DIN5401 标准

Grade Klasse	Roundness Rundheit	Lot Diameter Variation Mehrfache Durchmesservariation	Diameter Tolerance Durchmessertoleranz	Gauge Interval Spurweite- Intervall
	μ m	μ m	μ m	μ m
I	0.25	0.50	± 10.25	0.50
II	0.50	1.00	± 10.50	1.00
III	1.00	2.00	± 11.00	2.00
IV	2.00	4.00	± 14.00	4.00
V	25.00	50.00	± 75.00	50.00
VI	-	400.00	± 200.00	-

ISO 3290 标准

Grade Klasse	Diameter Tolerance Durchmessertoleranz	Lot Diameter Variation Mehrfache Durchmesservariation	Gauge Interval Spurweite- Intervall	Ball Subgauge Kugel Spurweite	Ball Subgauge Interval Kugel Spurweite- Intervall	Ball Diameter Variation Kugel- Durchmesservariation	Roundness Rundheit	Surface Roughness Oberflächennrauheit
	μ m	μ m	μ m	μ m	μ m	μ m	μ m	μ m
3	±5	0.13	0.500	±0.2	0.1	0.08	0.080	0.010
5	±5	0.25	1.000	±0.4	0.2	0.13	0.130	0.014
10	±9	0.50	1.000	±0.4	0.2	0.25	0.250	0.020
16	±10	0.80	2.000	±0.8	0.4	0.40	0.400	0.025
20	±10	1.00	2.000	±0.8	0.4	0.50	0.500	0.032
24	±12	1.20	2.000	±0.8	0.4	0.60	6.60	0.040
28	±12	1.40	2.000	±0.8	0.4	0.70	0.700	0.050
40	±16	2.00	4.000	±1.6	0.8	1.00	1.000	0.060
60	±40	3.00	6.00	±2.4	1.2	1.50	1.50	0.080
100	±18	5.00	10.000	±4.0	2.0	2.50	2.500	0.100
200	±60	10.00	15.000	±6.0	3.0	5.00	5.000	0.150

Metric equivalent scale

Metrische Äquivalenzskala

Millimeter(mm)	Inches
0.397	1/64"
0.500	-
0.794	1/32"
1.000	-
1.191	3/64"
1.500	-
1.588	1/16"
2.000	-
2.381	3/32"
2.500	-
1.788	7/64"
3.000	-
3.175	1/8"
3.500	-
3.969	5/32"
4.000	-
4.500	-
4.763	3/16"
5.000	-
5.500	-
5.556	7/32"
6.000	-
6.350	1/4"
6.500	-
7.000	-
7.144	9/32"
7.500	-
7.938	5/16"
8.000	-
8.500	-
8.731	11/32"
9.000	-
9.525	3/8"
10.000	-
10.319	13/32"
11.000	-
11.113	7/16"
11.906	15/32"
12.000	-
12.700	1/2"
13.000	-
13.494	17/32"