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MECHANICAL SEAL RINGS

KLT Carbide Co., Ltd.



KLT Carbide Co. Ltd., established in 1988, is an international company which specializes in making cemented carbides and hard facing materials. Our products are widely used as highly wear resistant parts, molds for metal products and mining tools, especially mechanical seal rings, bushings, valve parts and nozzles for Oil, Gas industries and other flow control projects.

We are one of the biggest Chinese manufacturers for seal rings and bushings and also provide wear resistant solutions and technical support to customers.



Main products and corresponding industries

1. Wear resistant parts
 - 1.1 Wear parts for Oil, Gas industries and other flow control projects
 - 1.1.1 Mechanical seal rings
 - 1.1.2 Sleeves
 - 1.1.3 Nozzles
 - 1.1.4 Valve parts
 - 1.2 Blank dies
 - 1.2.1 Wire drawing dies
 - 1.2.2 Stamping dies for standard fasteners
 - 1.2.3 Forming dies for powder metallurgy
 - 1.2.4 Plates
2. Cemented carbide inserts for engineering, oil-field drilling and mining
 - 2.1 Carbide inserts for engineering and oil-field drilling
 - 2.2 Carbide inserts for coal mining
 - 2.3 Carbide inserts for geological prospecting and exploration
 - 2.4 Mining bits
3. Blank bars and grinding bars
4. Metal cutting inserts

Brazed tips, indexable inserts and heavy cutting inserts
5. Hard facing materials and surface treatments

Coating with cemented carbide powder, welding with composite rods, spray welding and thermal spraying



Grades for mechanical seal rings

Grade				
Grade	Co (wt %)	Density (g/cm ³)	Hardness (HRA)	TRS (≥N/mm ²)
KC100	5.8~6.2	14.6~15.0	91.5~92.5	2000
KC101	5.8~6.2	14.6~15.0	91.5~92.5	2500
KC200	7.8~8.2	14.5~14.9	91.0~92.0	2100
KC201	7.8~8.2	13.5~14.9	91.0~92.0	2800
KC300	9.8~10.3	14.2~14.6	90.5~91.5	2600
KC301	9.8~10.3	14.2~14.6	90.5~91.5	3200
KC401	12.7~13.2	14.0~14.3	87.5~88.5	3000
Grade	Ni (wt %)	Density (g/cm ³)	Hardness (HRA)	TRS (≥N/mm ²)
KN100	6.5~7.5	14.5~14.8	88.5~91.0	1800
KN101	6.5~7.5	14.5~14.8	88.5~91.0	2200
KN300	10.0~11.0	14.2~14.6	86.5~89.5	2100
KN301	10.0~11.0	14.2~14.6	86.5~89.5	2400
KTN10	19.5~20.5	6.5~7.5	90.5~92.0	1600
Grade	Co+Ni (wt %)	Density (g/cm ³)	Hardness (HRA)	TRS (≥N/mm ²)
KCN30	9.5~10.5	14.0~14.5	88.0~90.0	2400
KCN31	9.5~10.5	14.0~14.5	88.0~90.0	3200
KTP10	7.0~9.0	11.5~13.0	89.5~91.0	1800



Material for seal rings

1 Grade characteristics

Common grades and applicable mediums for cemented carbide mechanical seal rings



Grade	Applicable mediums
KC100	Oil, sewage, weak acid and alkaline, light hydrocarbon, solid granules
KC101	
KC200	
KC201	
KC401	Dry gas seals
KN100	Oil, sewage, weak acid and alkaline, light hydrocarbon, solid granules; sea water, solid granules
KN101	
KN300	
KN301	
KCN30	
KCN31	
KTP10	Oil, sewage, weak acid and alkaline, light hydrocarbon, solid granules
KTN10	Oil, sewage, weak acid and alkaline, light hydrocarbon

2 Additional characteristics of Grades for Cemented carbide mechanical seal rings

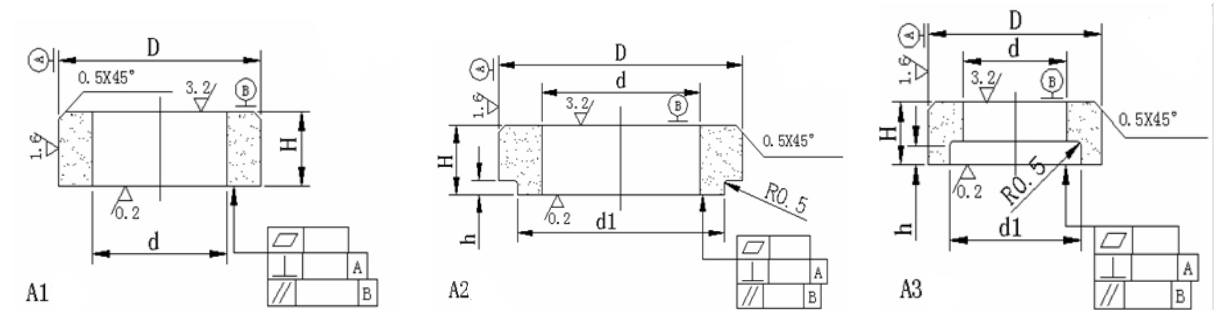
Additional characteristics of Grades for Cemented carbide mechanical seal rings are listed as below:

Grade	Elastic modulus kN/mm ²	Coefficient of thermal conductivity W/m·K	Thermal expansion coefficient ×10 ⁻⁶ /K
KC100	630	100	5.5
KC101			
KC200	590	90	5.8
KC201			
KC401	530	75	6.0
KN100	600	90	5.3
KN101			
KN300	550	75	5.2
KN301			
KCN30	570	80	5.4
KCN31			
KTP10	530	70	6.0
KTN10	400	25	7.8



Structures and dimensions of finished rings

- Structures and dimensions of type A1, A2 and A3 - mechanical seal rings inlaying with cemented carbide in attached drawing A.1.
- Structures and dimensions of type B - mating rings made by cemented carbide (with anti-rotating slot) in attached drawing A.2.
- Structures and dimensions of type C - mating rings made by cemented carbide (without anti-rotating slot) in attached drawing A.3.
- Structures and dimensions of type D- mating rings made by cemented carbide (with O-ring groove and anti-rotating slot) in attached drawing A.4.
- Structures and dimensions of type E- mating rings made by cemented carbide (without O-ring groove but with anti-rotating slot) in attached drawing A.5.
- Structures and dimensions of type F- mating rings made by cemented carbide (with rubber L-shaped seal) in attached drawing A.6.
- Structures and dimensions of type G- mating rings made by cemented carbide (balanced) in attached drawing A.7.
- Structures and dimensions of type H- mating rings made by cemented carbide (balanced on both sides) in attached drawing A.8.
- Structures and dimensions of type I- primary rings made by cemented carbide (unbalanced) in attached drawing A.9.
- Structures and dimensions of type J1 and J2- primary rings made by cemented carbide (unbalanced) in attached drawing A.10.
- Structures and dimensions of type K- primary rings made by cemented carbide (working with sleeve) in attached drawing A.11.



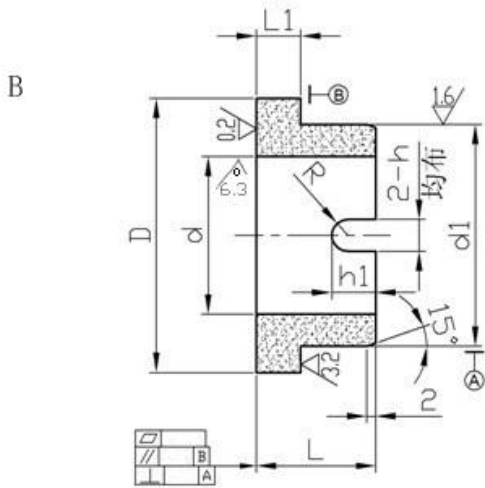
A. 1

Spec	Dimension & Tolerance												
	A1			A2.					A3				
	d (H13)	D (u6)	H	d (H13)	d1	D (u6)	H	h	d (H13)	d1	D (u6)	H	h
18	19(20)	28(26)	5	19(20)	25(26)	28	5		19	22	28	5	
20	21(22)	30(28)		21(22)	27(28)	30			21	24	30		
22	23(24)	32(30)		23(24)	29(30)	32			23	26	32		
24	25(26)	35(32)		25(26)	31(32)	35			25	29	35		
25	26(28)	36(34)		26(28)	32(34)	36			26	30	36		
28	29(31)	39(37)	6	29(31)	35(37)	39	6	1.5	29	33	39	6	1.5
30	31(33)	41(39)		31(33)	37(39)	41			31	35	41		
32	33(36)	43(42)		33(36)	39(42)	43			33	37	43		
33	34(36)	44(42)		34(36)	40(42)	44			34	38	44		
35	36(38)	46(44)		36(38)	42(44)	46			36	40	46		
38	39(41)	50(47)		39(41)	45(47)	50			39	44	50		
40	41(43)	52(49)		41(43)	47(49)	52			41	46	52		
43	44(46)	55(52)		44(46)	50(52)	55			44	49	55		
45	46(48)	57(54)		46(48)	52(54)	57			46	51	57		
48	49(51)	60(57)		49(51)	55(57)	60			49	54	60		
50	51(53)	62(59)	7	51(53)	57(59)	62	7	2	51	56	62	7	2
53	54(56)	65(62)		54(56)	60(62)	65			54	59	65		
55	56(58)	67(64)		56(58)	62(64)	67			56	61	67		
58	59(61)	71(68)		59(61)	66(68)	71			59	64	71		
60	61(63)	73(70)		61(63)	68(70)	73			61	66	73		
63	64(66)	77(73)		64(66)	71(73)	77			64	70	77		
65	66(68)	79(75)		66(68)	73(75)	79			66	72	79		
68	69(73)	82(81)		69(73)	77(81)	82			69	75	82		
70	71(73)	84(81)		71(73)	79(81)	84			71	76	84		
75	76(78)	90(86)		76(78)	84(86)	90			76	82	90		
80	81(83)	97(91)	8	81(83)	89(91)	97	8		81	89	97	8	
85	86(88)	101(96)		86(88)	94(96)	101			86	93	101		



Continued Table A.1

Spec	Dimension & Tolerance													
	A1			A2.					A3					
	d (H13)	D (u6)	H	d (H13)	d1	D (u6)	H	h	d (H13)	d1	D (u6)	H	h	
90	91(93)	106(101)	7	91(93)	99(101)	106	7	2	91	98	106	7	2	
95	96(98)	111(106)		96(98)	104(106)	111			96	103	111			
100	101(103)	116(111)		101(103)	109(111)	116			101	108	116			
105	106(108)	126(117)	8	106(108)	115(117)	126	8		106	117	126	8		2
110	111(113)	131(122)		111(113)	120(122)	131			111	122	131			
115	116(118)	136(127)		116(118)	125(127)	136			116	127	136			
120	121(123)	141(132)		121(123)	130(132)	141			121	132	141			
125	126(132)	146(142)		126(132)	136(142)	146			126	136	146			
130	131(137)	151(147)		131(137)	141(147)	151			131	141	151			
135	136(142)	156(152)		136(142)	146(152)	156			136	146	156			
140	141(147)	161(157)		141(147)	151(157)	161			141	151	161			
145	146(152)	168(163)	9	146(152)	157(163)	168	9	2.5	146	157	168	9	2.5	
150	151(157)	173(168)		151(157)	162(168)	173			151	162	173			
155	156(162)	178(173)		156(162)	167(173)	178			156	167	178			
160	161(167)	183(178)		161(167)	172(178)	183			161	172	183			
165	166(172)	188(183)		166(172)	177(183)	188			166	177	188			
170	171(177)	193(188)		171(177)	182(188)	193			171	182	193			
175	176(182)	198(193)		176(182)	187(193)	198			176	187	198			
180	181(187)	203(198)		181(187)	192(198)	203			181	192	203			
185	186(192)	210(204)	10	186(192)	198(204)	210	10	3	186	198	210	10	3	
190	191(197)	215(209)		191(197)	203(209)	215			191	203	215			
195	196(202)	220(214)		196(202)	208(214)	220			196	208	220			
200	201(207)	225(219)		201(207)	213(219)	225			201	213	225			



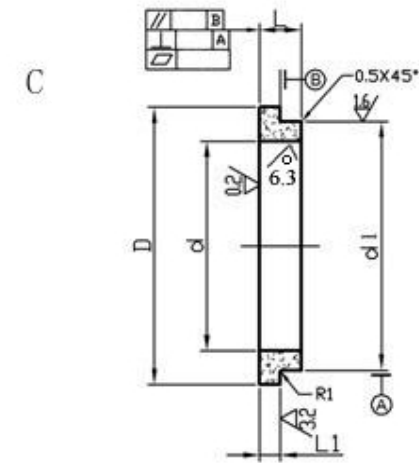
A. 2

Spec	Dimension & Tolerance									
	D 0 -0.2	D (H13)	d1 (h8)	L	L1	h1	h	Rubber ring cross-sectional diameter		
18	32.7	19	26.7	20	8.5	6.5	4	3.55		
20	34.7	21	28.7							
22	36.7	23	30.7							
24	38.7	25	32.7							
25	39.7	26	33.7							
28	42.7	29	36.7							
30	44.7	31	38.7							
32	47.7	33	41.7							
33	47.7	34	41.7							
35	49.7	36	43.7							
38	55.7	39	48.7	21	8.9	6.5	5	4.1		
40	57.7	41	50.7							
43	60.7	44	53.7							
45	62.7	46	55.7							
48	65.7	49	58.7							
50	69.7	51	61.7	21.5	8.8			4.7		
53	72.7	54	64.7							
55	74.7	56	66.7							
58	77.7	59	69.7							
60	79.7	61	71.7							
63	82.7	64	74.7							
65	84.7	66	76.7							
68	89.7	69	80.6							
70	91.7	71	82.6	22.5	9.2					5.3



Continued Table A.2

Spec	Dimension & Tolerance									
	D ₀ −0.2	D (H13)	d1 (h8)	L	L1	h1	h	Rubber ring cross-sectional diameter		
75	96.7	76	87.6	22.5	9.2	6.5	5	5.3		
80	104.7	81	94.7	23	9.3			5.7		
85	109.7	86	99.7							
90	114.7	91	104.7							
95	119.7	96	109.7							
100	124.7	101	114.7							
105	129.7	106	119.7							
110	135.7	111	124.6	26	10.6	7.5	6	6.4		
115	140.7	116	129.6							
120	145.7	121	134.6							
125	151.7	126	140.6	29	13			7		
130	157.7	131	145.5							
135	162.7	136	150.5							
140	172.7	141	160.5							
145	177.7	146	165.5							
150	182.7	151	170.5							
155	187.7	156	175.5	31	15				7	
160	192.7	161	180.5							
165	197.7	166	185.5							
170	202.7	171	190.5							
175	212.7	176	200.5							
180	217.7	181	205.5	33	17					7
185	222.7	186	210.5							
190	227.7	191	215.5							
195	232.7	196	220.5							
200	237.7	201	225.5							



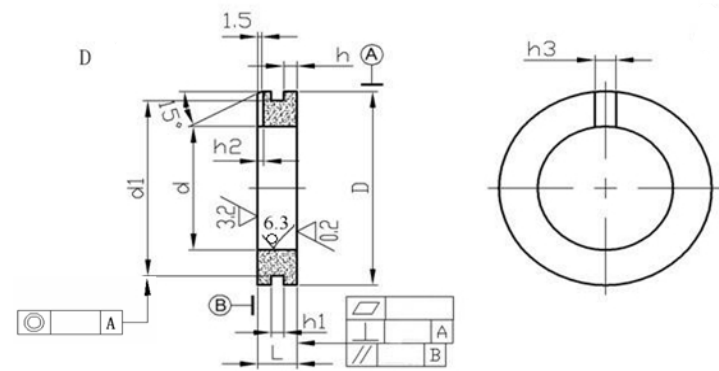
A. 3

Spec	Dimension & Tolerance					
	$\begin{matrix} D \\ 0 \\ -0.2 \end{matrix}$	$\begin{matrix} d \\ (H13) \end{matrix}$	$\begin{matrix} d1 \\ (h8) \end{matrix}$	L	$L1 \pm 0.1$	Rubber ring cross-sectional diameter
14	24.7	15	20.8	12.8	9.6	2.4
16	26.7	17	22.8			
18	32.7	19	26.8	14.5	10	3.55
20	34.7	21	28.8			
22	36.7	23	30.8			
24	38.7	25	32.8			
25	39.7	26	33.8			
28	42.7	29	36.8			
30	44.7	31	38.8			
32	47.7	33	41.8			
33	47.7	34	41.8			
35	49.7	36	43.8			
38	55.7	39	48.8	15	9.9	4.1
40	57.7	41	50.8			
43	60.7	44	53.8			
45	62.7	46	55.8			
48	65.7	49	58.8			
50	69.7	51	61.8			
53	72.7	54	64.8	15.5	9.8	4.7
55	74.7	56	66.8			
58	77.7	59	69.8			
60	79.7	61	71.8			
63	82.7	64	74.8			
65	84.7	66	76.8			
68	89.7	69	80.8	16	9.7	5.3



Continued Table A.3

Spec	Dimension & Tolerance					
	D 0 -0.2	d (H13)	d1 (h8)	L	L1±0.1	Rubber ring cross-sectional diameter
70	91.7	71	82.8	16	9.7	5.3
75	96.7	76	87.8			
80	104.7	81	94.8	16.5	9.8	5.7
85	109.7	86	99.8			
90	114.7	91	104.8			
95	119.7	96	109.8			
100	124.7	101	114.8			



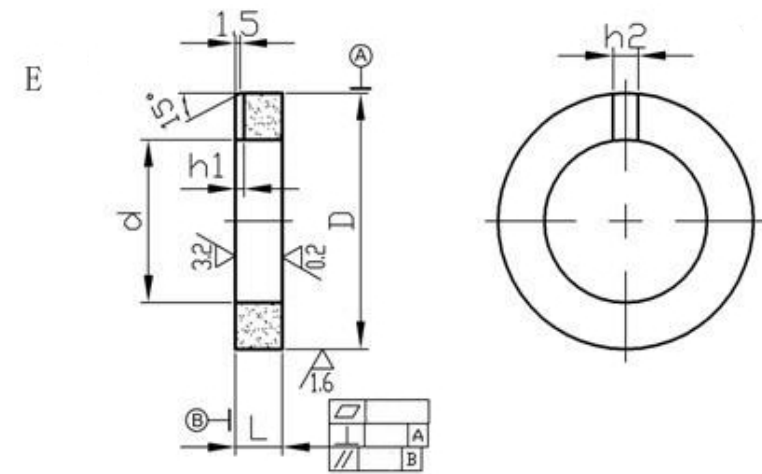
A. 4

Spec	Dimension & Tolerance												
	D 0 -0.1	d (H13)	d1 (h8)	L	h	h1	h2	h3	Rubber ring cross-sectional diameter				
14	24.8	15	20.3	10	2.5	3	2		2.65				
16	26.8	17	22.3										
18	32.8	19	27.7	11		4.2	2.5		4.5	3.55			
20	34.8	21	28.7										
22	36.8	23	30.7										
24	38.8	25	32.7	12	3.5			4.2			2.5	4.5	3.55
25	39.8	26	33.7										
28	42.8	29	37.7										
30	44.8	31	38.7										
32	47.8	33	41.7										
33	47.8	34	41.7										
35	49.8	36	43.7										
38	55.8	39	49.7										
40	57.8	41	51.7	13	4								
43	60.8	44	54.7										



Continued Table A.4

Spec	Dimension & Tolerance								
	D 0 -0.1	d (H13)	d1 (h8)	L	h	h1	h2	h3	Rubber ring cross-sectional diameter
45	62.8	46	57.7	13	4	4.2	2.5	4.5	3.55
48	65.8	49	59.7						
50	69.8	51	73.7						
53	72.8	54	77.7	14.5	5				
55	74.8	56	78.7						
58	77.8	59	71.7						
60	79.8	61	73.7						
63	82.8	64	77.7						
65	84.8	66	78.7	16	6				
68	89.8	69	83.7						
70	91.8	71	85.7						
75	96.8	76	90.7						
80	104.8	81	98.7	20	8				
85	109.8	86	103.7						
90	114.8	91	108.7						
95	119.8	96	113.7						
100	124.8	101	118.7						



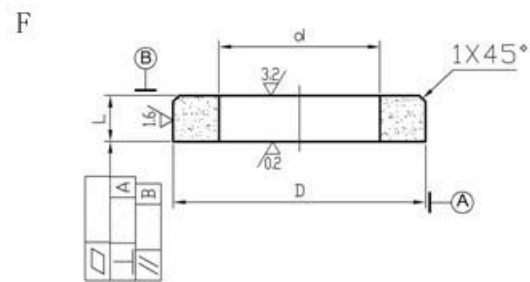
A. 5

Spec	Dimension & Tolerance					
	D (h7)	d (H13)	L	h1	h2	Rubber ring cross-sectional diameter
14	24.8	15	10	2	4.5	2.65
16	26.8	17				
18	32.8	19	11	2.5		3.55
20	34.8	21				
22	36.8	23				
24	38.8	25	12			
25 39.8		26				
28	42.8	29				
30	44.8	31				
32	47.8	33				
33	47.8	34				
35	49.8	36				
38	55.8	39				
40	57.8	41	13			
43	60.8	44				
45	62.8	46				
48	65.8	49				
50	69.8	51				
53	72.8	54	14.5			
55	74.8	56				
58	77.8	59				
60	79.8	61				
63	82.8	64	16			
65	84.8	66				
68	89.8	69				



Continued Table A.5

Spec	Dimension & Tolerance					
	D (h7)	d (H13)	L	h1	h2	Rubber ring cross-sectional diameter
70	91.8	71	16	2.5	4.5	3.55
75	96.8	76				
80	104.8	81	20			
85	109.8	86				
90	114.8	91				
95	119.8	96				
100	124.8	101				

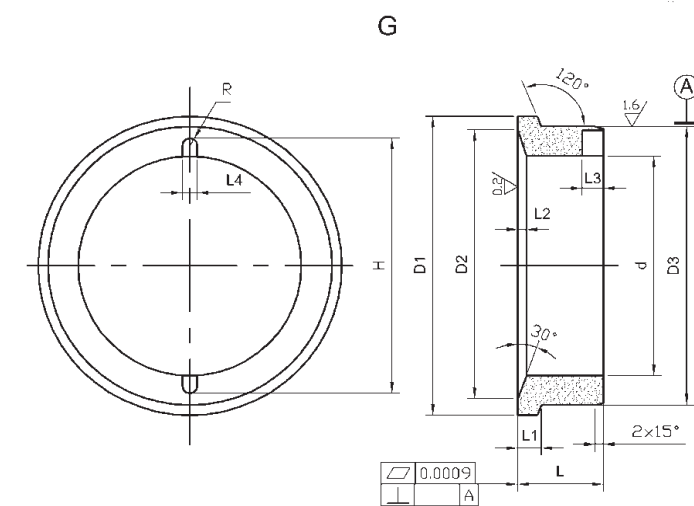


A. 6

Spec	Dimension & Tolerance		
	d (H13)	D (h7)	L
14	15	23	4
16	17	25	
18	19	29	
20	21	31	4.5
22	23	33	
24	25	35	6
25	26	36	
28	29	39	7
30	31	41	
32	33	44	
33	34	44	
35	36	46	
38	39	51	7.5
40	41	53	
43	44	56	
45	46	58	
48	49	61	
50	51	65	9
53	54	68	
55	56	70	
58	59	73	
60	61	75	
63	64	78	
65	66	80	
68	69	83	
70	71	87	

Continued Table A.6

Spec	Dimension & Tolerance		
	d (H13)	D (h7)	L
75	76	92	9
80	81	99	10
85	86	103	
90	91	109	
95	96	114	
100	101	119	

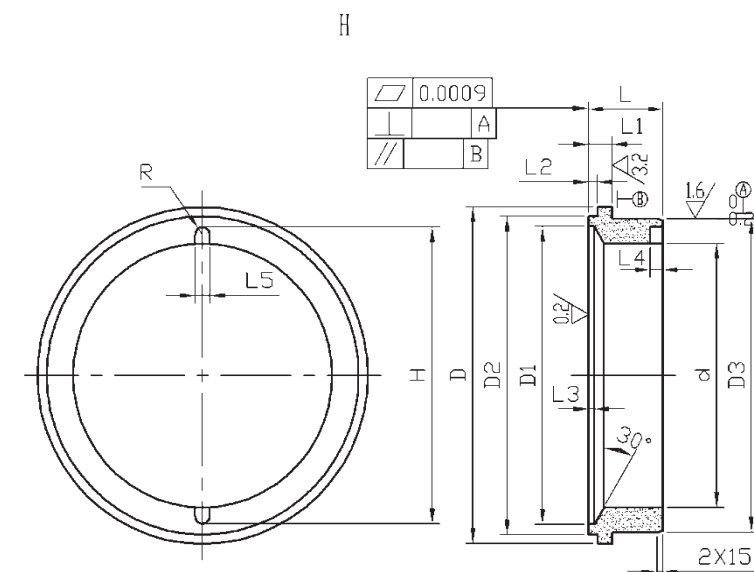


A. 7

Spec	Dimension & Tolerance											Size of rubber ring
	d	D1	D2	D3	L	L1	L2	L3	L4	H +0.2 0	R	
50	52	70.8	63.8	66	20	5.5	2	5	5	64	2.5	φ 66×3.55
53	55	74.8	67.8	70						67		φ 70×3.55
55	57	76.8	69.8	72						69		φ 71.4×3.55
58	60	79.8	72.8	75						72		φ 75×3.55
60	62	81.8	74.8	77						74		φ 76.6×3.55
63	65	84.8	77.8	80	25	6.5	2	5	5	77	2.5	φ 80×3.55
65	67	90.5	82.5	85						79		φ 85×3.55
68	70	93.5	85.5	88						82		φ 88×3.55
70	72	95.5	87.5	90						84		φ 90×3.55
75	77	100.5	92.5	95						89		φ 95×3.55
80	82	105.5	97.5	100						94		φ 100×3.55
85	87	110.5	102.5	105						99		φ 104.3×3.55
90	92	115.5	107.5	110						103		φ 110×3.55



Spec	Dimension & Tolerance										Size of rubber ring							
	d	D1	D2	D3	L	L1	L2	L3	L4	H <small>+0.2 0</small>		R						
95	97	120.5	112.5	115	25	6.5	2	5	5	109	2.5	φ 115×3.55						
100	102	125.5	117.5	120						114		φ 120×3.55						
105	107	131.3	122.3	125	30	7.5			6	121	3	φ 125×5.3						
110	112	136.3	127.3	130						126		φ 130×5.3						
115	117	141.3	132.3	135						131		φ 135×5.3						
120	122	146.3	137.3	140						136		φ 140×5.3						
125	127	151.3	142.3	145						141		φ 145×5.3						
130	132	156.3	147.3	150						146		φ 150×5.3						
135	137	161.3	152.3	155						151		φ 155×5.3						
140	142	166.3	157.3	160						156		φ 160×5.3						
145	147	171.3	162.3	165						161		φ 165×5.3						
150	152	176.3	167.3	170						166		φ 170×5.3						
155	158	187	177	180						35		8	3	6	7	174	3.5	φ 180×5.3
160	163	192	182	185												179		φ 185×5.3
165	168	197	187	190	184	φ 190×5.3												
170	173	202	192	195	189	φ 196×5.3												
175	178	207	197	200	194	φ 200×5.3												
180	183	212	202	205	199	φ 205×5.3												
185	188	217	207	210	204	φ 210×5.3												
190	193	222	212	215	209	φ 215×5.3												
195	198	227	217	220	214	φ 220×5.3												
200	203	232	222	225	219	φ 225×5.3												
205	208	237	227	230	224	φ 230×5.3												
210	213	242	232	235	229	φ 235×5.3												
215	218	247	237	240	234	φ 240×5.3												
220	223	252	242	245	239	φ 246.2×5.3												
225	228	257	247	250	244	φ 250×5.3												
230	233	262	252	255	249	φ 255×5.3												
235	238	267	257	260	254	φ 260×5.3												
240	243	272	262	265	259	φ 265×5.3												

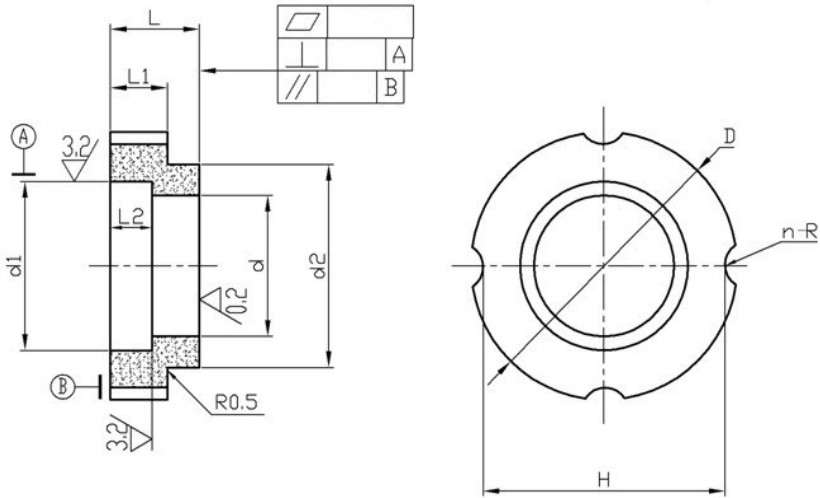


Spec	Dimension & Tolerance													Size of rubber ring
	d	D _{0 -0.1}	D1 ±0.05	D2 ±0.05	D3 h7	L	L1	L2	L3	L4	L5	H _{+0.2 0}	R	
50	52	72	63.8	70.8	66	20						64	2.5	φ 66X3.55
53	55	76	67.8	74.8	70							67		φ 70X3.55
55	57	78	69.8	76.8	72							69		φ 71.4X3.55
58	60	81	72.8	79.8	75							72		φ 75X3.55
60	62	83	74.8	81.8	77							74		φ 76.6X3.55
63	65	86	77.8	84.8	80							77		φ 80X3.55
65	67	91	82.5	90.5	85	25	8	3	2	5	5	79	2.5	φ 85X3.55
68	70	94	85.5	93.5	88							82		φ 88X3.55
70	72	96	87.5	95.5	90							84		φ 90X3.55
75	77	101	92.5	100.5	95							89		φ 95X3.55
80	82	106	97.5	105.5	100							94		φ 100X3.55
85	87	111	102.5	110.5	105							99		φ 104.3X3.55
90	92	116	107.5	115.5	110	30	10	4	3	6	6	103	3	φ 110X3.55
95	97	121	112.5	120.5	115							109		φ 115X3.55
100	102	126	117.5	125.5	120							114		φ 120X3.55
105	107	134.2	122.3	131.3	125							121		φ 125X5.3
110	112	139.2	127.3	136.3	130							126		φ 130X5.3
115	117	144.2	132.3	141.3	135							131		φ 135X5.3
120	122	149.2	137.3	146.3	140	30	10	4	3	6	6	136	3	φ 140X5.3
125	127	154.2	142.3	151.3	145							141		φ 145X5.3
130	132	159.2	147.3	156.3	150							146		φ 150X5.3



Continued Table A.8

Spec	Dimension & Tolerance													Size of rubber ring
	d	D _{0 -0.1}	D1 ±0.05	D2 ±0.05	D3 h7	L	L1	L2	L3	L4	L5	H _{+0.2 0}	R	
135	137	164.2	152.3	161.3	155	30					6	151	3	φ 155X5.3
140	142	169.2	157.3	166.3	160							156		φ 160X5.3
145	147	174.2	162.3	171.3	165							161		φ 165X5.3
150	152	179.2	167.3	176.3	170							166		φ 170X5.3
155	158	189.2	177	187	180							174		φ 180X5.3
160	163	194.2	182	192	185	35	10	4	3	6	7	179	3.5	φ 185X5.3
165	168	199.2	187	197	190							184		φ 190X5.3
170	173	204.2	192	202	195							189		φ 196X5.3
175	178	209.2	197	207	200							194		φ 200X5.3
180	183	214.2	202	212	205							199		φ 205X5.3
185	188	219.2	207	217	210							204		φ 210X5.3
190	193	224.2	212	222	215							209		φ 215X5.3
195	198	229.2	217	227	220							214		φ 220X5.3
200	203	234.2	222	232	225							219		φ 225X5.3
205	208	239.2	227	237	230							224		φ 230X5.3
210	213	244.2	232	242	235							229		φ 235X5.3
215	218	249.2	237	247	240							234		φ 240X5.3
220	223	254.2	242	252	245							239		φ 246.2X5.3
225	228	259.2	247	257	250							244		φ 250X5.3
230	233	264.2	252	262	255							249		φ 255X5.3
235	238	269.2	257	267	260							254		φ 260X5.3
240	243	274.2	262	272	265							259		φ 265X5.3



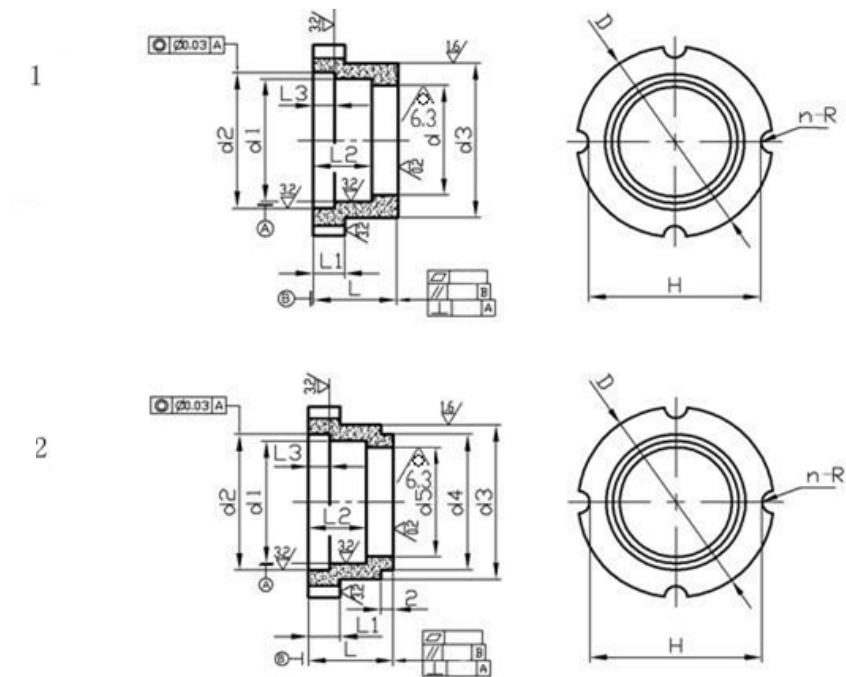
A. 9

Spec	Dimension & Tolerance										Rubber ring cross-sectional diameter
	d (A11)	d1 (H8)	d2±0.1	D (a11)	L	L1	L2	H 0 -0.2	n	R	
18	18	24.5	26(24)	30	12	6		27	4		3.55
20	20	26.5	28(26)	32				29			
22	22	28.5	30(28)	34				31			
24	24	30.5	32(30)	36				33			
25	25	31.5	33(31)	37				34			
28	28	34.5	36(34)	40				37			
30	30	36.5	38(36)	42				39			
32	32	38.5	40(38)	44				41			
33	33	39.5	41(39)	45				42			
35	35	41.5	43(41)	47				44			
38	38	44.5	46(44)	51	15	7	4.5	47	5		5.3
40	40	46.5	48(46)	53				49			
43	43	49.5	51(49)	56				52			
45	45	51.5	53(51)	58				54			
48	48	54.5	56(54)	61				57			
50	50	56.5	58(56)	63				59			
53	53	59.5	61(59)	66				62			
55	55	61.5	63(61)	68				64			
58	58	67.7	70(65)	75				71			
60	60	69.7	72(67)	77				73			
63	63	72.7	75(70)	80	18	8	7	76			
65	65	74.7	77(72)	82				78			
68	68	77.7	80(76)	85				81			



Continued Table A.9

Spec	Dimension & Tolerance										Rubber ring cross-sectional diameter
	d (A11)	d1 (H8)	d2±0.1	D (a11)	L	L1	L2	H 0 -0.2	n	R	
70	70	79.7	82(78)	87	18	8	7	83	5	5	5.3
75	75	84.7	91(83)	96				92			
80	80	89.7	96(88)	101				97			
85	85	94.7	101(93)	106				102			
90	90	99.7	106(98)	111				107			
95	95	104.7	111(103)	116				112			
100	100	109.7	116(108)	121	21	9	7.5	117	4	5.5	5.7
105	105	115.4	125(114)	130				126			
110	110	120.4	130(119)	135				131			
115	115	125.4	135(124)	140				136			
120	120	130.4	140(129)	145				141			
125	125	135.4	146(135)	153				148			
130	130	140.4	153(140)	160				155			
135	135	145.4	158(145)	165				160			
140	140	150.4	163(150)	170				165			
145	145	155.4	168(156)	175				170			
150	150	160.4	173(161)	180				175			
155	155	165.4	181(166)	188				183			
160	160	170.4	186(171)	193	24	10	8.5	188	6	6	6.4
165	165	176.7	190(176)	198				192			
170	170	181.7	195(181)	203				197			
175	175	186.7	200(186)	208				202			
180	180	191.7	205(191)	213				207			
185	185	196.7	210(197)	218				212			
190	190	201.7	215(202)	223				217			
195	195	206.7	220(207)	228				222			
200	200	211.7	225(212)	233				227			



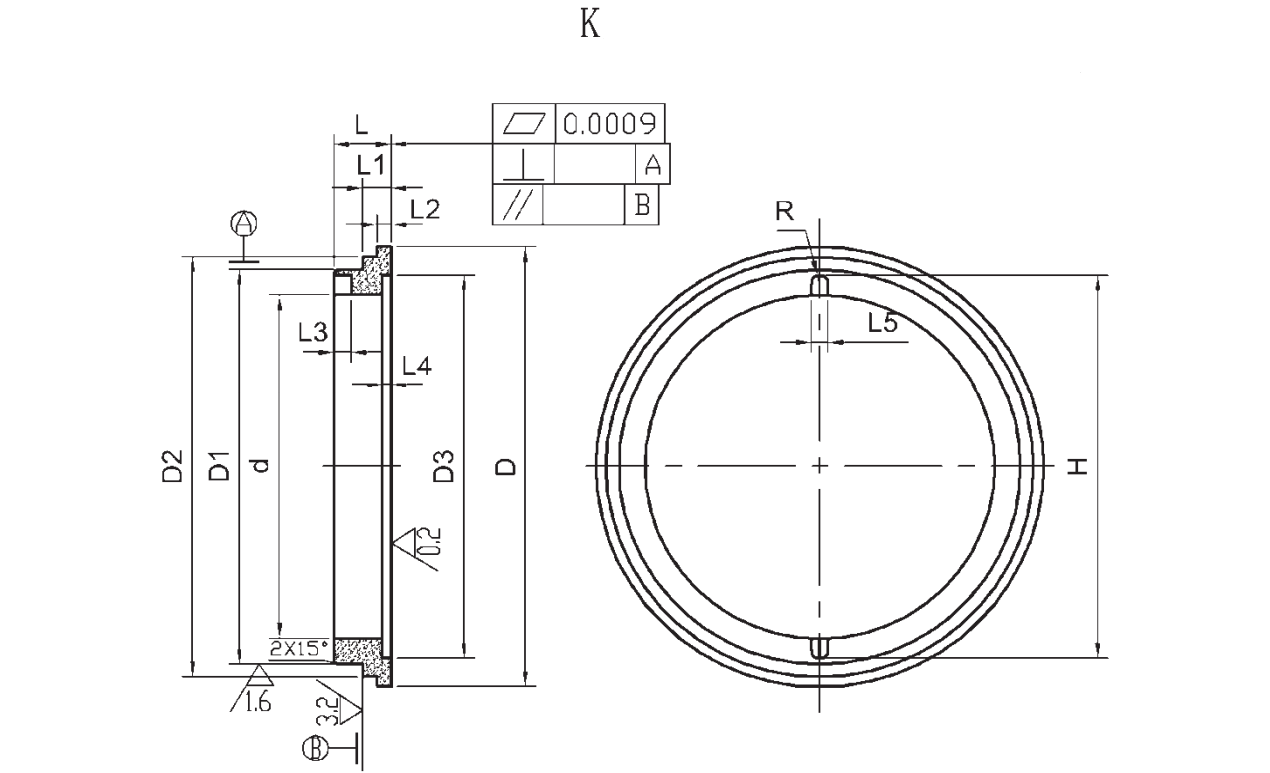
A10

Spec	Dimension & Tolerance														
	d (H13)	d1 (A11)	d2 (H8)	d3	d4	d5	D (a11)	L	L1	L2	L3	H _{0 -0.2}	n	R	Rubber ring cross-sectional diameter
18	19	22	28.5	30	26	20	34	17	6	12		31	4	4	3.55
20	21	24	30.5	32	28	22	36					33			
22	23	26	32.5	34	30	24	38					35			
24	25	28	34.5	36	32	26	40					37			
25	26	30	36.5	38	34	28	42					39			
28	29	33	39.5	41	37	31	45	20		14.5	4.5	42		5	
30	31	35	41.5	43	39	33	47					44			
32	33	38	44.5	46	42	36	51					47			
33	34	38	44.5	46	42	36	51					47			
35	36	40	46.5	48	44	38	53					49			
38	39	43	49.5	51	47	41	56	21	7	15.5		52			
40	41	45	51.5	53	49	43	58					54			
43	44	48	54.5	56	52	46	61					57			
45	46	50	56.5	58	54	48	63					59			
48	49	53	59.5	61	57	51	66					62			
50	51	55	61.5	63	59	53	68	23	8	17	7	64			
53	54	58	67.7	70	62	56	75					71			
55	56	60	69.7	72	64	58	77					73			
58	59	63	72.7	75	68	61	80					76			
60	61	65	74.7	77	70	63	82					78			



Continued Table A.10

Spec	Dimension & Tolerance																
	d (H13)	d1 (A11)	d2 (H8)	d3	d4	d5	D (a11)	L	L1	L2	L3	H 0 -0.2	n	R	Rubber ring cross-sectional diameter		
63	64	68	77.7	80	73	66	85	23		17		81	4	5	5.3		
65	66	70	79.7	82	75	68	87					83					
70	71	75	84.7	91	81	73	96	25		8		19				7	92
75	76	80	89.7	96	86	78	101										97
80	81	85	94.7	101	91	83	106		102								
85	86	90	99.7	106	96	88	111		107								
90	91	95	104.7	111	101	93	116		112								
95	96	100	109.7	116	106	98	121		117								
100	101	105	115.4	125	111	103	130	28			7.5	126	4	5.5	5.7		
105	106	110	120.4	130	117	108	135					131					
110	111	115	125.4	135	122	113	140		136								
115	116	120	130.4	140	127	118	145		141								
120	121	125	135.4	146	132	123	153		148								
125	126	135	150.4	158	142	132	165		160								
130	131	140	155.4	163	147	137	170		165								
135	136	145	160.4	168	152	142	175		170								
140	141	150	160.4	173	157	147	180		175								
145	146	155	165.4	181	163	152	188		183								
150	151	160	170.4	186	168	157	193		188								
155	156	165	176.7	190	173	162	198		32		25	8.5	192	6	6	6.4	
160	161	170	181.7	195	178	167	203	197									
165	166	175	186.7	200	183	172	208	202									
170	171	180	191.7	205	188	177	213	207									
175	176	185	196.7	210	193	182	218	212									
180	181	190	201.7	215	198	187	223	217									
185	186	195	206.7	220	204	192	228	222									
190	191	200	211.7	225	209	197	233	227									
195	196	205	216.7	230	214	202	238	232									
200	201	210	221.7	235	219	207	243	237									



A. 11

Spec	Dimension & Tolerance													Size of rubber ring
	d	D	D1 h7	D2 _{0 -0.1}	D3	L	L1	L2	L3	L4	L5	H _{+0.2 0}	R	
50	52	78	66	72	62							64		φ 66x3.55
53	55	82	70	76	66							67		φ 70x3.55
55	57	84	72	78	68							69		φ 71.4x3.55
58	60	87	75	81	71							72		φ 75x3.55
60	62	89	77	83	73							74		φ 76.6x3.55
63	65	92	80	86	76							77		φ 80x3.55
65	67	97	85	91	81							79		φ 85x3.55
68	70	100	88	94	84	17	9	4	5	2	5	82	2.5	φ 88x3.55
70	72	102	90	96	86							84		φ 90x3.55
75	77	107	95	101	91							89		φ 95x3.55
80	82	112	100	106	96							94		φ 100x3.55
85	87	117	105	111	101							99		φ 104.3x3.55
90	92	122	110	116	106							103		φ 110x3.55
95	97	127	115	121	111							109		φ 115x3.55
100	102	132	120	126	116							114		φ 120x3.55
105	107	141	125	134	121							121		φ 125x5.3
110	112	146	130	139	126	20	10	5	6	3	6	126	3	φ 130x5.3
115	117	151	135	144	131							131		φ 135x5.3
120	122	156	140	149	136							136		φ 140x5.3



Continued Table A.11

Spec	Dimension & Tolerance													Size of rubber ring
	d	D	D1 h7	D2 0 -0.1	D3	L	L1	L2	L3	L4	L5	H +0.2 0	R 2.5	
125	127	161	145	154	141	20	10	5			6	141	3	φ 145x5.3
130	132	166	150	159	146							146		φ 150x5.3
135	137	171	155	164	151							151		φ 155x5.3
140	142	176	160	169	156							156		φ 160x5.3
145	147	181	165	174	161							161		φ 165x5.3
150	152	186	170	179	166							166		φ 170x5.3
155	158	196	180	189	175	22	12	6	6	3	7	174	3.5	φ 180x5.3
160	163	201	185	194	180							179		φ 185x5.3
165	168	206	190	199	185							184		φ 190x5.3
170	173	211	195	204	190							189		φ 196x5.3
175	178	216	200	209	195							194		φ 200x5.3
180	183	221	205	214	200							199		φ 205x5.3
185	188	226	210	219	205							204		φ 210x5.3
190	193	231	215	224	210							209		φ 215x5.3
195	198	236	220	229	215							214		φ 220x5.3
200	203	241	225	234	220							219		φ 225x5.3
205	208	246	230	239	225							224		φ 230x5.3
210	213	251	235	244	230							229		φ 235x5.3
215	218	256	240	249	235							234		φ 240x5.3
220	223	261	245	254	240							239		φ 246.2x5.3
225	228	266	250	259	245							244		φ 250x5.3
230	233	271	255	264	250							249		φ 255x5.3
235	238	276	260	269	255							254		φ 260x5.3
240	243	281	265	274	260							259		φ 265x5.3

Blank Seal Rings

Size and tolerance for blank seal rings

Dimension	ID	OD	Height
$\phi \leq 10$	-0.05	+0.30	+0.30
	-0.2	+0.10	+0.10
$10 < \phi \leq 20$	-0.1	+0.40	+0.40
	-0.3	+0.20	+0.20
$20 < \phi \leq 30$	-0.2	+0.50 +0.30	+0.60
	-0.4		
$30 < \phi \leq 35$	-0.3	+0.70 +0.40	+0.30
	-0.5		
$35 < \phi \leq 50$	-0.4	+0.80 +0.40	+0.80 +0.40
	-0.7		
$50 < \phi \leq 80$	-0.4	+1.10 +0.50	+1.00 +0.50
	-0.8		
$80 < \phi \leq 120$	-0.5	+1.50 +0.70	+1.20 +0.60
	-1.1		
$120 < \phi \leq 200$	-0.7	+2.10 +1.10	+1.50 +0.80
	-1.5		
$200 < \phi \leq 300$	-1.1	+2.70 +1.50	+2.00 +1.20
	-2.1		
$300 < \phi$	-1.5		
	-2.7		