

15. Tolerances and Surface Imperfections

Shape and Surface Deviations in O-ring Seals According to ISO 3601-3

Type of Deviation	Schematic Representation	Measurement	Type Characteristics N d2 according to ISO 3601-1				
			1,78	2,62	3,53	5,33	6,99
			Largest measure				
Shoulder and Shape Deformation		e	0,08	0,10	0,13	0,15	0,15
Bead, Ridge, and Shoulder combined		f	0,10	0,12	0,14	0,16	0,18
Grooving		g	0,18	0,27	0,36	0,53	0,70
		h	0,08	0,08	0,10	0,10	0,13
Ridge Removal Area		-	Departures from round cross-sections are permitted if the flat area transitions evenly into the curve, and d2 is maintained				
Flow lines (radial spread is not permissible)		j	0,05 x d1* or**				
		k	1,5	1,5	6,5	6,5	6,5
Flow lines (radial spread is not permissible)		l	0,60	0,80	1,00	1,30	1,70
		depth m	0,08	0,08	0,10	0,10	0,13
Foreign Bodies	-	-	Not permitted				

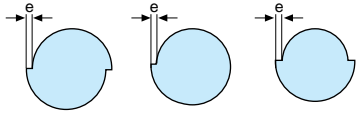
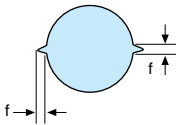
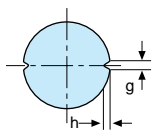
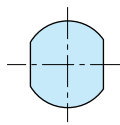
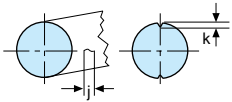
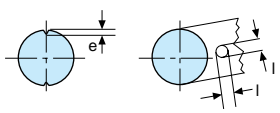
* d1 = inside diameter.

** According to which amount is the larger.

All dimensions in mm.

15. Tolerances and Surface Imperfections

Shape and Surface Deviations in O-ring Seals According to ISO 3601-3

Type of Deviation	Schematic Representation	Measurement	Type Characteristics S d2 according to ISO 3601-1				
			1,78	2,62	3,53	5,33	6,99
			Largest measure				
Shoulder and Shape Deformation		e	0,08	0,08	0,10	0,12	0,13
Bead, Ridge, and Shoulder combined		f	0,10	0,10	0,13	0,15	0,15
Grooving		g	0,10	0,15	0,20	0,20	0,30
		h	0,05	0,08	0,10	0,10	0,13
Ridge Removal Area		-	Departures from round cross-sections are permitted if the flat area transitions evenly into the curve, and d2 is maintained				
Flow lines (radial spread is not permissible)		j	0,03 x d1* or**				
		k	1,5	1,5	5,0	5,0	5,0
Flow lines (radial spread is not permissible)		l	0,15	0,25	0,40	0,63	1,0
		depth m	0,08	0,08	0,10	0,10	0,13
Foreign Bodies	-	-	Not permitted				

* d1 = inside diameter.

** According to which amount is the larger.

All dimensions in mm.

15. Tolerances on cross section

Tolerances on cross section (W) for O-rings acc. AS568A - inches

.070	+/- .003	.139	+/- .004	.275	+/- .006
.103	+/- .003	.210	+/- .005		

Tolerances on cross section (W) for O-rings acc. ISO 3601-1 class B - millimeters

Cross Section (W)	Tolerance
0,80 < W ≤ 2,25	+/-0,08
2,25 < W ≤ 3,15	+/-0,09
3,15 < W ≤ 4,50	+/-0,10
4,50 < W ≤ 6,30	+/-0,13
6,30 < W ≤ 8,40	+/-0,15

Tolerances on cross section (W) for O-rings - inches

.040	+/- .003	.118	+/- .003	.275	+/- .006
.059	+/- .003	.138	+/- .004	.315	+/- .007
.063	+/- .003	.139	+/- .004	.330	+/- .007
.070	+/- .003	.142	+/- .004	.354	+/- .008
.075	+/- .003	.157	+/- .004	.394	+/- .008
.079	+/- .003	.177	+/- .004	> .394	+/-1,8% to +/- .008
.095	+/- .003	.197	+/- .005		
.100	+/- .003	.210	+/- .005		
.103	+/- .003	.224	+/- .006		
.106	+/- .003	.236	+/- .006		

15. Tolerances on inside diameter for O-rings

Tolerances on inside diameter for o-rings with non standard metric sizes according to ISO 3601 Class B will be calculated using the following formula (values in millimetres):

$$\Delta ID = \pm[(ID^{0,95} \times 0,009) + 0,011]$$

The next table shows the tolerances resulting from the formula.

Tolerances on Inside Diameter for O-rings acc. ISO 3601-1 Class B - millimetres

O-ring ID	Tolerance	O-ring ID	Tolerance	O-ring ID	Tolerance	O-ring ID	Tolerance
1,50 - 1,71	±0,12	56,42 - 57,84	±0,53	116,28 - 117,75	±0,94	177,80 - 179,31	±1,35
1,72 - 2,93	±0,13	57,85 - 59,27	±0,54	117,76 - 119,24	±0,95	179,32 - 180,82	±1,36
2,94 - 4,17	±0,14	59,28 - 60,71	±0,55	119,25 - 120,72	±0,96	180,83 - 182,34	±1,37
4,18 - 5,44	±0,15	60,72 - 62,14	±0,56	120,73 - 122,21	±0,97	182,35 - 183,86	±1,38
5,45 - 6,72	±0,16	62,15 - 63,58	±0,57	122,22 - 123,70	±0,98	183,87 - 185,38	±1,39
6,73 - 8,01	±0,17	63,59 - 65,02	±0,58	123,71 - 125,19	±0,99	185,39 - 186,89	±1,40
8,02 - 9,31	±0,18	65,03 - 66,47	±0,59	125,20 - 126,68	±1,00	186,90 - 188,41	±1,41
9,32 - 10,62	±0,19	66,48 - 67,91	±0,60	126,69 - 128,17	±1,01	188,42 - 189,93	±1,42
10,63 - 11,94	±0,20	67,92 - 69,35	±0,61	128,18 - 129,66	±1,02	189,94 - 191,45	±1,43
11,95 - 13,27	±0,21	69,36 - 70,80	±0,62	129,67 - 131,15	±1,03	191,46 - 192,98	±1,44
13,28 - 14,61	±0,22	70,81 - 72,25	±0,63	131,16 - 132,64	±1,04	192,99 - 194,50	±1,45
14,62 - 15,95	±0,23	72,26 - 73,70	±0,64	132,65 - 134,14	±1,05	194,51 - 196,02	±1,46
15,96 - 17,29	±0,24	73,71 - 75,15	±0,65	134,15 - 135,63	±1,06	196,03 - 197,54	±1,47
17,30 - 18,64	±0,25	75,16 - 76,60	±0,66	135,64 - 137,13	±1,07	197,55 - 199,07	±1,48
18,65 - 20,00	±0,26	76,61 - 78,05	±0,67	137,14 - 138,62	±1,08	199,08 - 200,59	±1,49
20,01 - 21,36	±0,27	78,06 - 79,51	±0,68	138,63 - 140,12	±1,09	200,60 - 202,12	±1,50
21,37 - 22,73	±0,28	79,52 - 80,97	±0,69	140,13 - 141,62	±1,10	202,13 - 203,64	±1,51
22,74 - 24,10	±0,29	80,98 - 82,42	±0,70	141,63 - 143,12	±1,11	203,65 - 205,17	±1,52
24,11 - 25,47	±0,30	82,43 - 83,88	±0,71	143,13 - 144,62	±1,12	205,18 - 206,69	±1,53
25,48 - 26,85	±0,31	83,89 - 85,34	±0,72	144,63 - 146,12	±1,13	206,70 - 208,22	±1,54
26,86 - 28,23	±0,32	85,35 - 86,80	±0,73	146,13 - 147,62	±1,14	208,23 - 209,75	±1,55
28,24 - 29,61	±0,33	86,81 - 88,27	±0,74	147,63 - 149,12	±1,15	209,76 - 211,28	±1,56
29,62 - 31,00	±0,34	88,28 - 89,73	±0,75	149,13 - 150,62	±1,16	211,29 - 212,81	±1,57
31,01 - 32,39	±0,35	89,74 - 91,20	±0,76	150,63 - 152,13	±1,17	212,82 - 214,34	±1,58
32,40 - 33,78	±0,36	91,21 - 92,66	±0,77	152,14 - 153,63	±1,18	214,35 - 215,87	±1,59
33,79 - 35,18	±0,37	92,67 - 94,13	±0,78	153,64 - 155,13	±1,19	215,88 - 217,40	±1,60
35,19 - 36,58	±0,38	94,14 - 95,60	±0,79	155,14 - 156,64	±1,20	217,41 - 218,93	±1,61
36,59 - 37,98	±0,39	95,61 - 97,07	±0,80	156,65 - 158,15	±1,21	218,94 - 220,46	±1,62
37,99 - 39,38	±0,40	97,08 - 98,54	±0,81	158,16 - 159,65	±1,22	220,47 - 221,99	±1,63
39,39 - 40,79	±0,41	98,55 - 100,01	±0,82	159,66 - 161,16	±1,23	222,00 - 223,52	±1,64
40,80 - 42,20	±0,42	100,02 - 101,48	±0,83	161,17 - 162,67	±1,24	223,53 - 225,06	±1,65
42,21 - 43,61	±0,43	101,49 - 102,96	±0,84	162,68 - 164,18	±1,25	225,07 - 226,59	±1,66
43,62 - 45,02	±0,44	102,97 - 104,43	±0,85	164,19 - 165,69	±1,26	226,60 - 228,12	±1,67
45,03 - 46,44	±0,45	104,44 - 105,91	±0,86	165,70 - 167,20	±1,27	228,13 - 229,66	±1,68
46,45 - 47,86	±0,46	105,92 - 107,39	±0,87	167,21 - 168,71	±1,28	229,67 - 231,19	±1,69
47,87 - 49,28	±0,47	107,40 - 108,86	±0,88	168,72 - 170,22	±1,29	231,20 - 232,73	±1,70
49,29 - 50,70	±0,48	108,87 - 110,34	±0,89	170,23 - 171,73	±1,30	232,74 - 234,27	±1,71
50,71 - 52,12	±0,49	110,35 - 111,82	±0,90	171,74 - 173,25	±1,31	234,28 - 235,80	±1,72
52,13 - 53,55	±0,50	111,83 - 113,30	±0,91	173,26 - 174,76	±1,32	235,81 - 237,34	±1,73
53,56 - 54,98	±0,51	113,31 - 114,79	±0,92	174,77 - 176,28	±1,33	237,35 - 238,88	±1,74
54,99 - 56,41	±0,52	114,80 - 116,27	±0,93	176,29 - 177,79	±1,34	238,89 - 240,42	±1,75

15. Tolerances on inside diameter for O-rings

Tolerances on Inside Diameter for O-rings acc. ISO 3601-1 Class B - millimetres

O-ring ID	Tolerance	O-ring ID	Tolerance	O-ring ID	Tolerance	O-ring ID	Tolerance
240,43 - 241,95	±1,76	313,23 - 314,78	±2,23	386,90 - 388,47	±2,70	461,29 - 462,87	±3,17
241,96 - 243,49	±1,77	314,79 - 316,34	±2,24	388,48 - 390,05	±2,71	462,88 - 464,46	±3,18
243,50 - 245,03	±1,78	316,35 - 317,90	±2,25	390,06 - 391,62	±2,72	464,47 - 466,05	±3,19
245,04 - 246,57	±1,79	317,91 - 319,46	±2,26	391,63 - 393,20	±2,73	466,06 - 467,64	±3,20
246,58 - 248,11	±1,80	319,47 - 321,02	±2,27	393,21 - 394,78	±2,74	467,65 - 469,23	±3,21
248,12 - 249,66	±1,81	321,03 - 322,58	±2,28	394,79 - 396,35	±2,75	469,24 - 470,82	±3,22
249,67 - 251,20	±1,82	322,59 - 324,15	±2,29	396,36 - 397,93	±2,76	470,83 - 472,41	±3,23
251,21 - 252,74	±1,83	324,16 - 325,71	±2,30	397,94 - 399,51	±2,77	472,42 - 474,00	±3,24
252,75 - 254,28	±1,84	325,72 - 327,27	±2,31	399,52 - 401,09	±2,78	474,01 - 475,59	±3,25
254,29 - 255,82	±1,85	327,28 - 328,83	±2,32	401,10 - 402,66	±2,79	475,60 - 477,19	±3,26
255,83 - 257,37	±1,86	328,84 - 330,39	±2,33	402,67 - 404,24	±2,80	477,20 - 478,78	±3,27
257,38 - 258,91	±1,87	330,40 - 331,96	±2,34	404,25 - 405,82	±2,81	478,79 - 480,37	±3,28
258,92 - 260,46	±1,88	331,97 - 333,52	±2,35	405,83 - 407,40	±2,82	480,38 - 481,96	±3,29
260,47 - 262,00	±1,89	333,53 - 335,09	±2,36	407,41 - 408,98	±2,83	481,97 - 483,56	±3,30
262,01 - 263,55	±1,90	335,10 - 336,65	±2,37	408,99 - 410,56	±2,84	483,57 - 485,15	±3,31
263,56 - 265,09	±1,91	336,66 - 338,21	±2,38	410,57 - 412,14	±2,85	485,16 - 486,74	±3,32
265,10 - 266,64	±1,92	338,22 - 339,78	±2,39	412,15 - 413,72	±2,86	486,75 - 488,34	±3,33
266,65 - 268,18	±1,93	339,79 - 341,35	±2,40	413,73 - 415,30	±2,87	488,35 - 489,93	±3,34
268,19 - 269,73	±1,94	341,36 - 342,91	±2,41	415,31 - 416,89	±2,88	489,94 - 491,52	±3,35
269,74 - 271,28	±1,95	342,92 - 344,48	±2,42	416,90 - 418,47	±2,89	491,53 - 493,12	±3,36
271,29 - 272,83	±1,96	344,49 - 346,04	±2,43	418,48 - 420,05	±2,90	493,13 - 494,71	±3,37
272,84 - 274,38	±1,97	346,05 - 347,61	±2,44	420,06 - 421,63	±2,91	494,72 - 496,31	±3,38
274,39 - 275,92	±1,98	347,62 - 349,18	±2,45	421,64 - 423,21	±2,92	496,32 - 497,90	±3,39
275,93 - 277,47	±1,99	349,19 - 350,75	±2,46	423,22 - 424,80	±2,93	497,91 - 499,50	±3,40
277,48 - 279,02	±2,00	350,76 - 352,31	±2,47	424,81 - 426,38	±2,94	499,51 - 501,10	±3,41
279,03 - 280,57	±2,01	352,32 - 353,88	±2,48	426,39 - 427,96	±2,95	501,11 - 502,69	±3,42
280,58 - 282,12	±2,02	353,89 - 355,45	±2,49	427,97 - 429,55	±2,96	502,70 - 504,29	±3,43
282,13 - 283,68	±2,03	355,46 - 357,02	±2,50	429,56 - 431,13	±2,97	504,30 - 505,89	±3,44
283,69 - 285,23	±2,04	357,03 - 358,59	±2,51	431,14 - 432,71	±2,98	505,90 - 507,48	±3,45
285,24 - 286,78	±2,05	358,60 - 360,16	±2,52	432,72 - 434,30	±2,99	507,49 - 509,08	±3,46
286,79 - 288,33	±2,06	360,17 - 361,73	±2,53	434,31 - 435,88	±3,00	509,09 - 510,68	±3,47
288,34 - 289,88	±2,07	361,74 - 363,30	±2,54	435,89 - 437,47	±3,01	510,69 - 512,27	±3,48
289,89 - 291,44	±2,08	363,31 - 364,87	±2,55	437,48 - 439,05	±3,02	512,28 - 513,87	±3,49
291,45 - 292,99	±2,09	364,88 - 366,44	±2,56	439,06 - 440,64	±3,03	513,88 - 515,47	±3,50
293,00 - 294,54	±2,10	366,45 - 368,01	±2,57	440,65 - 442,22	±3,04	515,48 - 517,07	±3,51
294,55 - 296,10	±2,11	368,02 - 369,58	±2,58	442,23 - 443,81	±3,05	517,08 - 518,67	±3,52
296,11 - 297,65	±2,12	369,59 - 371,16	±2,59	443,82 - 445,40	±3,06	518,68 - 520,27	±3,53
297,66 - 299,21	±2,13	371,17 - 372,73	±2,60	445,41 - 446,98	±3,07	520,28 - 521,87	±3,54
299,22 - 300,76	±2,14	372,74 - 374,30	±2,61	446,99 - 448,57	±3,08	521,88 - 523,46	±3,55
300,77 - 302,32	±2,15	374,31 - 375,87	±2,62	448,58 - 450,16	±3,09	523,47 - 525,06	±3,56
302,33 - 303,88	±2,16	375,88 - 377,45	±2,63	450,17 - 451,75	±3,10	525,07 - 526,66	±3,57
303,89 - 305,43	±2,17	377,46 - 379,02	±2,64	451,76 - 453,33	±3,11	526,67 - 528,26	±3,58
305,44 - 306,99	±2,18	379,03 - 380,59	±2,65	453,34 - 454,92	±3,12	528,27 - 529,86	±3,59
307,00 - 308,55	±2,19	380,60 - 382,17	±2,66	454,93 - 456,51	±3,13	529,87 - 531,46	±3,60
308,56 - 310,11	±2,20	382,18 - 383,74	±2,67	456,52 - 458,10	±3,14	531,47 - 533,07	±3,61
310,12 - 311,66	±2,21	383,75 - 385,32	±2,68	458,11 - 459,69	±3,15	533,08 - 534,67	±3,62
311,67 - 313,22	±2,22	385,33 - 386,89	±2,69	459,70 - 461,28	±3,16	534,68 - 536,27	±3,63

15. Tolerances on inside diameter for O-rings

Tolerances on Inside Diameter for O-rings acc. ISO 3601-1 Class B - millimetres

O-ring ID	Tolerance	O-ring ID	Tolerance	O-ring ID	Tolerance	O-ring ID	Tolerance
536,28 - 537,87	±3,64	584,43 - 586,02	±3,94	632,77 - 634,38	±4,24	501,11 - 502,69	±3,42
537,88 - 539,47	±3,65	586,03 - 587,63	±3,95	634,39 - 635,99	±4,25	502,70 - 504,29	±3,43
539,48 - 541,07	±3,66	587,64 - 589,24	±3,96	636,00 - 637,61	±4,26	504,30 - 505,89	±3,44
541,08 - 542,68	±3,67	589,25 - 590,85	±3,97	637,62 - 639,22	±4,27	505,90 - 507,48	±3,45
542,69 - 544,28	±3,68	590,86 - 592,46	±3,98	639,23 - 640,84	±4,28	507,49 - 509,08	±3,46
544,29 - 545,88	±3,69	592,47 - 594,07	±3,99	640,85 - 642,45	±4,29	509,09 - 510,68	±3,47
545,89 - 547,48	±3,70	594,08 - 595,68	±4,00	642,46 - 644,07	±4,30	510,69 - 512,27	±3,48
547,49 - 549,09	±3,71	595,69 - 597,29	±4,01	644,08 - 645,69	±4,31	512,28 - 513,87	±3,49
549,10 - 550,69	±3,72	597,30 - 598,90	±4,02	645,70 - 647,30	±4,32	513,88 - 515,47	±3,50
550,70 - 552,29	±3,73	598,91 - 600,51	±4,03	647,31 - 648,92	±4,33	515,48 - 517,07	±3,51
552,30 - 553,90	±3,74	600,52 - 602,12	±4,04	648,93 - 650,54	±4,34	517,08 - 518,67	±3,52
553,91 - 555,50	±3,75	602,13 - 603,73	±4,05	470,83 - 472,41	±3,23	518,68 - 520,27	±3,53
555,51 - 557,11	±3,76	603,74 - 605,34	±4,06	472,42 - 474,00	±3,24	520,28 - 521,87	±3,54
557,12 - 558,71	±3,77	605,35 - 606,95	±4,07	474,01 - 475,59	±3,25	521,88 - 523,46	±3,55
558,72 - 560,32	±3,78	606,96 - 608,56	±4,08	475,60 - 477,19	±3,26	523,47 - 525,06	±3,56
560,33 - 561,92	±3,79	608,57 - 610,18	±4,09	477,20 - 478,78	±3,27	525,07 - 526,66	±3,57
561,93 - 563,53	±3,80	610,19 - 611,79	±4,10	478,79 - 480,37	±3,28	526,67 - 528,26	±3,58
563,54 - 565,13	±3,81	611,80 - 613,40	±4,11	480,38 - 481,96	±3,29	528,27 - 529,86	±3,59
565,14 - 566,74	±3,82	613,41 - 615,01	±4,12	481,97 - 483,56	±3,30	529,87 - 531,46	±3,60
566,75 - 568,34	±3,83	615,02 - 616,62	±4,13	483,57 - 485,15	±3,31	531,47 - 533,07	±3,61
568,35 - 569,95	±3,84	616,63 - 618,24	±4,14	485,16 - 486,74	±3,32	533,08 - 534,67	±3,62
569,96 - 571,56	±3,85	618,25 - 619,85	±4,15	486,75 - 488,34	±3,33	534,68 - 536,27	±3,63
571,57 - 573,16	±3,86	619,86 - 621,46	±4,16	488,35 - 489,93	±3,34	536,28 - 537,87	±3,64
573,17 - 574,77	±3,87	621,47 - 623,08	±4,17	489,94 - 491,52	±3,35	537,88 - 539,47	±3,65
574,78 - 576,38	±3,88	623,09 - 624,69	±4,18	491,53 - 493,12	±3,36	539,48 - 541,07	±3,66
576,39 - 577,98	±3,89	624,70 - 626,30	±4,19	493,13 - 494,71	±3,37	541,08 - 542,68	±3,67
577,99 - 579,59	±3,90	626,31 - 627,92	±4,20	494,72 - 496,31	±3,38	542,69 - 544,28	±3,68
579,60 - 581,20	±3,91	627,93 - 629,53	±4,21	496,32 - 497,90	±3,39	544,29 - 545,88	±3,69
581,21 - 582,81	±3,92	629,54 - 631,15	±4,22	497,91 - 499,50	±3,40	545,89 - 547,48	±3,70
582,82 - 584,42	±3,93	631,16 - 632,76	±4,23	499,51 - 501,10	±3,41	547,49 - 549,09	±3,71