ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 410

TABLES OF BRINELL HARDNESS VALUES (HB) FOR USE IN TESTS MADE ON FLAT SURFACES

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BRIEF HISTORY

The ISO Recommendation R 410, *Tables of Brinell Hardness Values (HB) for Use in Tests Made on Flat Surfaces,* was drawn up by the Co-ordinating Committee on the Mechanical Testing of Metals (METESCO), the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question began in 1960 and led, in 1962, to the adoption of a document which the METESCO Secretariat turned over to the General Secretariat, with the request that it be subjected to the procedures that Draft ISO Recommendations customarily follow.

In August 1962, this document was circulated, as Draft ISO Recommendation (No. 531) to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications, by the following Member Bodies:

Australia	Germany	Portugal
Austria	India	Republic of South Africa
Belgium	Ireland	Romania
Burma	Italy	Sweden
Canada	Japan	Turkey
Chile	Netherlands	U.A.R.
Czechoslovakia	New Zealand	United Kingdom
Denmark	Norway	U.S.S.R.
Finland	Poland	Yugoslavia

One Member Body opposed the approval of the Draft: France.

The Draft was submitted simultaneously to the Secretariats of all the ISO Technical Committees. It was approved by the Secretariats of the following Technical Committees concerned with the question of mechanical tests:

ISO/TC 2, *Bolts, nuts and accessories.*
ISO/TC 17, *Steel.*
ISO/TC 25, *Cast iron.*
ISO/TC 26, *Copper and copper alloys.* ·

and was not disapproved by any Secretariat.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in December 1964, to accept it as an ISO RECOMMENDATION.

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TABLES OF BRINELL HARDNESS VALUES (HB)
FOR USE IN TESTS MADE ON FLAT SURFACES

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1. TABLES OF BRINELL HARDNESS VALUES (HB)

Without regard to the limitations imposed by practical conditions, the following tables have been calculated from the formula

$$HB = \frac{2F}{\pi D (D - \sqrt{D^2 - d^2})}$$

where

F = Test load, in kilogrammes-force,
D = Diameter of the ball, in millimetres,
d = Diameter of identation, in millimetres.

The tables cover a range of identation diameters d between 0.25 D and 0.6 D.

In industrial tests carried out in accordance with ISO Recommendation R 79, *Brinell hardness test for steel*, and with corresponding ISO Recommendations for other metals*, and using testing machines in good order, the main cause of error is the measurement of the diameter of the indentation, and it is unlikely that the accuracy of determination of the mean diameter will be better than ± 1 per cent. This will lead to an error of approximately ± 2 per cent in the hardness value obtained.

NOTE. — The values above 450 HB appear in italic type so as to emphasize that the use of the Brinell test with a steel ball on products having a hardness greater than this value should be avoided. This limitation is not valid for the Modified Brinell test with a tungsten carbide ball, but the hardness obtained refers to a different scale.

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* To date, two ISO Recommendations:
ISO Recommendation R 191, *Brinell hardness test for light metals and their alloys*, and
ISO Recommendation R 403, *Brinell hardness test for copper and copper alloys*.

TABLE 1

Diameter of ball 10 mm   **Load = 3000 kgf**   **F/D² = 30**

Diameter of indentation mm	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.50	601	597	592	587	582	578	573	569	564	560
2.60	555	551	547	543	538	534	530	526	522	518
2.70	514	510	507	503	499	495	492	488	485	481
2.80	477	474	471	467	464	461	457	454	451	448
2.90	444	441	438	435	432	429	426	423	420	417
3.00	415	412	409	406	404	401	398	395	393	390
3.10	388	385	383	380	378	375	373	370	368	366
3.20	363	361	359	356	354	352	350	347	345	343
3.30	341	339	337	335	333	331	329	326	325	323
3.40	321	319	317	315	313	311	309	307	306	304
3.50	302	300	298	297	295	293	292	290	288	286
3.60	285	283	282	280	278	277	275	274	272	271
3.70	269	268	266	265	263	262	260	259	257	256
3.80	255	253	252	250	249	248	246	245	244	242
3.90	241	240	239	237	236	235	234	232	231	230
4.00	229	228	226	225	224	223	222	221	219	218
4.10	217	216	215	214	213	212	211	210	209	208
4.20	207	205	204	203	202	201	200	199	198	198
4.30	197	196	195	194	193	192	191	190	189	188
4.40	187	186	185	185	184	183	182	181	180	179
4.50	179	178	177	176	175	174	174	173	172	171
4.60	170	170	169	168	167	167	166	165	164	164
4.70	163	162	161	161	160	159	158	158	157	156
4.80	156	155	154	154	153	152	152	151	150	150
4.90	149	148	148	147	146	146	145	144	144	143
5.00	143	142	141	141	140	140	139	138	138	137
5.10	137	136	135	135	134	134	133	133	132	132
5.20	131	130	130	129	129	128	128	127	127	126
5.30	126	125	125	124	124	123	123	122	122	121
5.40	121	120	120	119	119	118	118	117	117	116
5.50	116	115	115	114	114	114	113	113	112	112
5.60	111	111	110	110	110	109	109	108	108	107
5.70	107	107	106	106	105	105	105	104	104	103
5.80	103	103	102	102	101	101	101	100	99.9	99.5
5.90	99.2	98.8	98.4	98.0	97.7	97.3	96.9	96.6	96.2	95.9
6.00	95.5	—	—	—	—	—	—	—	—	—

TABLE 2

Diameter of ball = 10 mm   **Load   1000 kgf**   **F/D² = 10**

Diameter of indentation mm	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.50	200	199	197	196	194	193	191	190	188	187
2.60	185	184	182	181	179	178	177	175	174	173
2.70	171	170	169	168	166	165	164	163	162	160
2.80	159	158	157	156	155	154	152	151	150	149
2.90	148	147	146	145	144	143	142	141	140	139
3.00	138	137	136	135	135	134	133	132	131	130
3.10	129	128	128	127	126	125	124	123	123	122
3.20	121	120	120	119	118	117	117	116	115	114
3.30	114	113	112	112	111	110	110	109	108	108
3.40	107	106	106	105	104	104	103	102	102	101
3.50	101	100	99.5	98.9	98.3	97.7	97.2	96.6	96.1	95.5
3.60	95.0	94.4	93.9	93.3	92.8	92.3	91.8	91.2	90.7	90.2
3.70	89.7	89.2	88.7	88.2	87.7	87.2	86.8	86.3	85.8	85.3
3.80	84.9	84.4	83.9	83.5	83.0	82.6	82.1	81.7	81.3	80.8
3.90	80.4	80.0	79.5	79.1	78.7	78.3	77.9	77.5	77.1	76.7
4.00	76.3	75.9	75.5	75.1	74.7	74.3	73.9	73.5	73.2	72.8
4.10	72.4	72.0	71.7	71.3	71.0	70.6	70.2	69.9	69.5	69.2
4.20	68.8	68.5	68.2	67.8	67.5	67.1	66.8	66.5	66.2	65.8
4.30	65.5	65.2	64.9	64.6	64.2	63.9	63.6	63.3	63.0	62.7
4.40	62.4	62.1	61.8	61.5	61.2	60.9	60.6	60.4	60.1	59.8
4.50	59.5	59.2	59.0	58.7	58.4	58.1	57.9	57.6	57.3	57.1
4.60	56.8	56.5	56.3	56.0	55.8	55.5	55.3	55.0	54.8	54.5
4.70	54.3	54.0	53.8	53.5	53.3	53.0	52.8	52.6	52.3	52.1
4.80	51.9	51.6	51.4	51.2	51.0	50.7	50.5	50.3	50.1	49.8
4.90	49.6	49.4	49.2	49.0	48.8	48.6	48.3	48.1	47.9	47.7
5.00	47.5	47.3	47.1	46.9	46.7	46.5	46.3	46.1	45.9	45.7
5.10	45.5	45.3	45.1	45.0	44.8	44.6	44.4	44.2	44.0	43.8
5.20	43.7	43.5	43.3	43.1	42.9	42.8	42.6	42.4	42.2	42.1
5.30	41.9	41.7	41.5	41.4	41.2	41.0	40.9	40.7	40.5	40.4
5.40	40.2	40.0	39.9	39.7	39.6	39.4	39.2	39.1	38.9	38.8
5.50	38.6	38.5	38.3	38.2	38.0	37.9	37.7	37.6	37.4	37.3
5.60	37.1	37.0	36.8	36.7	36.5	36.4	36.3	36.1	36.0	35.8
5.70	35.7	35.6	35.4	35.3	35.1	35.0	34.9	34.7	34.6	34.5
5.80	34.3	34.2	34.1	33.9	33.8	33.7	33.6	33.4	33.3	33.2
5.90	33.1	32.9	32.8	32.7	32.6	32.4	32.3	32.2	32.1	32.0
6.00	31.8	—	—	—	—	—	—	—	—	—

TABLE 3

Diameter of ball = 10 mm   **Load = 500 kgf**   **F/D² = 5**

Diameter of indentation mm	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.50	100	99.4	98.6	97.8	97.1	96.3	95.5	94.8	94.0	93.3
2.60	92.6	91.8	91.1	90.4	89.7	89.0	88.4	87.7	87.0	86.4
2.70	85.7	85.1	84.4	83.8	83.2	82.6	81.9	81.3	80.8	80.2
2.80	79.6	79.0	78.4	77.9	77.3	76.8	76.2	75.7	75.1	74.6
2.90	74.1	73.6	73.0	72.5	72.0	71.5	71.0	70.5	70.1	69.6
3.00	69.1	68.6	68.2	67.7	67.3	66.8	66.4	65.9	65.5	65.0
3.10	64.6	64.2	63.8	63.3	62.9	62.5	62.1	61.7	61.3	60.9
3.20	60.5	60.1	59.8	59.4	59.0	58.6	58.3	57.9	57.5	57.2
3.30	56.8	56.5	56.1	55.8	55.4	55.1	54.8	54.4	54.1	53.8
3.40	53.4	53.1	52.8	52.5	52.2	51.8	51.5	51.2	50.9	50.6
3.50	50.3	50.0	49.7	49.4	49.2	48.9	48.6	48.3	48.0	47.7
3.60	47.5	47.2	46.9	46.7	46.4	46.1	45.9	45.6	45.4	45.1
3.70	44.9	44.6	44.4	44.1	43.9	43.6	43.4	43.1	42.9	42.7
3.80	42.4	42.2	42.0	41.7	41.5	41.3	41.1	40.9	40.6	40.4
3.90	40.2	40.0	39.8	39.6	39.4	39.1	38.9	38.7	38.5	38.3
4.00	38.1	37.9	37.7	37.5	37.3	37.1	37.0	36.8	36.6	36.4
4.10	36.2	36.0	35.8	35.7	35.5	35.3	35.1	34.9	34.8	34.6
4.20	34.4	34.2	34.1	33.9	33.7	33.6	33.4	33.2	33.1	32.9
4.30	32.8	32.6	32.4	32.3	32.1	32.0	31.8	31.7	31.5	31.4
4.40	31.2	31.1	30.9	30.8	30.6	30.5	30.3	30.2	30.0	29.9
4.50	29.8	29.6	29.5	29.3	29.2	29.1	28.9	28.8	28.7	28.5
4.60	28.4	28.3	28.1	28.0	27.9	27.8	27.6	27.5	27.4	27.3
4.70	27.1	27.0	26.9	26.8	26.6	26.5	26.4	26.3	26.2	26.1
4.80	25.9	25.8	25.7	25.6	25.5	25.4	25.3	25.1	25.0	24.9
4.90	24.8	24.7	24.6	24.5	24.4	24.3	24.2	24.1	24.0	23.9
5.00	23.8	23.7	23.6	23.5	23.4	23.3	23.2	23.1	23.0	22.9
5.10	22.8	22.7	22.6	22.5	22.4	22.3	22.2	22.1	22.0	21.9
5.20	21.8	21.7	21.6	21.6	21.5	21.4	21.3	21.2	21.1	21.0
5.30	20.9	20.9	20.8	20.7	20.6	20.5	20.4	20.3	20.3	20.2
5.40	20.1	20.0	19.9	19.9	19.8	19.7	19.6	19.5	19.5	19.4
5.50	19.3	19.2	19.2	19.1	19.0	18.9	18.9	18.8	18.7	18.6
5.60	18.6	18.5	18.4	18.3	18.3	18.2	18.1	18.1	18.0	17.9
5.70	17.8	17.8	17.7	17.6	17.6	17.5	17.4	17.4	17.3	17.2
5.80	17.2	17.1	17.0	17.0	16.9	16.8	16.8	16.7	16.7	16.6
5.90	16.5	16.5	16.4	16.3	16.3	16.2	16.2	16.1	16.0	16.0
6.00	15.9	—	—	—	—	—	—	—	—	—

TABLE 4

Diameter of ball = 10 mm   **Load = 100 kgf** $F/D^2 = 1$

Diameter of indentation mm	0.00		0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.50	20.0	19.9	19.7	19.6	19.4	19.3	19.1	19.0	18.8	18.7
2.60	18.5	18.4	18.2	18.1	17.9	17.8	17.7	17.5	17.4	17.3
2.70	17.1	17.0	16.9	16.8	16.6	16.5	16.4	16.3	16.2	16.0
2.80	15.9	15.8	15.7	15.6	15.5	15.4	15.2	15.1	15.0	14.9
2.90	14.8	14.7	14.6	14.5	14.4	14.3	14.2	14.1	14.0	13.9
3.00	13.8	13.7	13.6	13.5	13.5	13.4	13.3	13.2	13.1	13.0
3.10	12.9	12.8	12.8	12.7	12.6	12.5	12.4	12.3	12.3	12.2
3.20	12.1	12.0	11.9	11.8	11.7	11.7	11.6	11.5	11.5	11.4
3.30	11.4	11.3	11.2	11.2	11.1	11.0	11.0	10.9	10.8	10.8
3.40	10.7	10.6	10.6	10.5	10.4	10.4	10.3	10.2	10.2	10.1
3.50	10.1	10.0	9.95	9.89	9.83	9.77	9.72	9.66	9.61	9.55
3.60	9.50	9.44	9.39	9.33	9.28	9.23	9.18	9.12	9.07	9.02
3.70	8.97	8.92	8.87	8.82	8.77	8.72	8.68	8.63	8.58	8.53
3.80	8.49	8.44	8.39	8.35	8.30	8.26	8.21	8.17	8.13	8.08
3.90	8.04	8.00	7.95	7.91	7.87	7.83	7.79	7.75	7.71	7.67
4.00	7.63	7.59	7.55	7.51	7.47	7.43	7.39	7.35	7.32	7.28
4.10	7.24	7.20	7.17	7.13	7.10	7.06	7.02	6.99	6.95	6.92
4.20	6.88	6.85	6.82	6.78	6.75	6.71	6.68	6.65	6.62	6.58
4.30	6.55	6.52	6.49	6.46	6.42	6.39	6.36	6.33	6.30	6.27
4.40	6.24	6.21	6.18	6.15	6.12	6.09	6.06	6.04	6.01	5.98
4.50	5.95	5.92	5.90	5.87	5.84	5.81	5.79	5.76	5.73	5.71
4.60	5.68	5.65	5.63	5.60	5.58	5.55	5.53	5.50	5.48	5.45
4.70	5.43	5.40	5.38	5.35	5.33	5.30	5.28	5.26	5.23	5.21
4.80	5.19	5.16	5.14	5.12	5.10	5.07	5.05	5.03	5.01	4.98
4.90	4.96	4.94	4.92	4.90	4.88	4.86	4.83	4.81	4.79	4.77
5.00	4.75	4.73	4.71	4.69	4.67	4.65	4.63	4.61	4.59	4.57
5.10	4.55	4.53	4.51	4.50	4.48	4.46	4.44	4.42	4.40	4.38
5.20	4.37	4.35	4.33	4.31	4.29	4.28	4.26	4.24	4.22	4.21
5.30	4.19	4.17	4.15	4.14	4.12	4.10	4.09	4.07	4.05	4.04
5.40	4.02	4.00	3.99	3.97	3.96	3.94	3.92	3.91	3.89	3.88
5.50	3.86	3.85	3.83	3.82	3.80	3.79	3.77	3.76	3.74	3.73
5.60	3.71	3.70	3.68	3.67	3.65	3.64	3.63	3.61	3.60	3.58
5.70	3.57	3.56	3.54	3.53	3.51	3.50	3.49	3.47	3.46	3.45
5.80	3.43	3.42	3.41	3.39	3.38	3.37	3.36	3.34	3.33	3.32
5.90	3.31	3.29	3.28	3.27	3.26	3.24	3.23	3.22	3.21	3.20
6.00	3.18	—	—	—	—	—	—	—	—	—

TABLE 5

Diameter of ball = 5 mm   **Load = 750 kgf**   **F/D² = 30**

Diameter of indentation mm	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.20	—	—	—	—	—	601	592	582	573	564
1.30	555	547	538	530	522	514	507	499	492	485
1.40	477	471	464	457	451	444	438	432	426	420
1.50	415	409	404	398	393	388	383	378	373	368
1.60	363	359	354	350	345	341	337	333	329	325
1.70	321	317	313	309	306	302	298	295	292	288
1.80	285	282	278	275	272	269	266	263	260	257
1.90	255	252	249	246	244	241	239	236	234	231
2.00	229	226	224	222	219	217	215	213	211	209
2.10	207	204	202	200	198	197	195	193	191	189
2.20	187	185	184	182	180	179	177	175	174	172
2.30	170	169	167	166	164	163	161	160	158	157
2.40	156	154	153	152	150	149	148	146	145	144
2.50	143	141	140	139	138	137	135	134	133	132
2.60	131	130	129	128	127	126	125	124	123	122
2.70	121	120	119	118	117	116	115	114	113	112
2.80	111	110	110	109	108	107	106	105	105	104
2.90	103	102	101	101	99.9	99.2	98.4	97.7	96.9	96.2
3.00	95.5	—	—	—	—	—	—	—	—	—

TABLE 6

Diameter of ball = 5 mm   **Load = 250 kgf**   **F/D² = 10**

Diameter of indentation mm	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.20	—	—	—	—	200	197	194	191	188	
1.30	185	182	179	177	174	171	169	166	164	162
1.40	159	157	155	152	150	148	146	144	142	140
1.50	138	136	135	133	131	129	128	126	124	123
1.60	121	120	118	117	115	114	112	111	110	108
1.70	107	106	104	103	102	101	99.5	98.3	97.2	96.1
1.80	95.0	93.9	92.8	91.8	90.7	89.7	88.7	87.7	86.8	85.8
1.90	84.9	83.9	83.0	82.1	81.3	80.4	79.5	78.7	77.9	77.1
2.00	76.3	75.5	74.7	73.9	73.2	72.4	71.7	71.0	70.2	69.5
2.10	68.8	68.2	67.5	66.8	66.2	65.5	64.9	64.2	63.6	63.0
2.20	62.4	61.8	61.2	60.6	60.1	59.5	59.0	58.4	57.9	57.3
2.30	56.8	56.3	55.8	55.3	54.8	54.3	53.8	53.3	52.8	52.3
2.40	51.9	51.4	51.0	50.5	50.1	49.6	49.2	48.8	48.3	47.9
2.50	47.5	47.1	46.7	46.3	45.9	45.5	45.1	44.8	44.4	44.0
2.60	43.7	43.3	42.9	42.6	42.2	41.9	41.5	41.2	40.9	40.5
2.70	40.2	39.9	39.6	39.2	38.9	38.6	38.3	38.0	37.7	37.4
2.80	37.1	36.8	36.5	36.3	36.0	35.7	35.4	35.1	34.9	34.6
2.90	34.3	34.1	33.8	33.6	33.3	33.1	32.8	32.6	32.3	32.1
3.00	31.8	—	—	—	—	—	—	—	—	—

TABLE 7

Diameter of ball = 5 mm **Load = 125 kgf** **F/D² = 5**

Diameter of indentation mm	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.20	—	—	—	—	—	100	98.6	97.1	95.5	94.0
1.30	92.6	91.1	89.7	88.4	87.0	85.7	84.4	83.2	81.9	80.8
1.40	79.6	78.4	77.3	76.2	75.1	74.1	73.0	72.0	71.0	70.1
1.50	69.1	68.2	67.3	66.4	65.5	64.6	63.8	62.9	62.1	61.3
1.60	60.5	59.8	59.0	58.3	57.5	56.8	56.1	55.4	54.8	54.1
1.70	53.4	52.8	52.2	51.5	50.9	50.3	49.7	49.2	48.6	48.0
1.80	47.5	46.9	46.4	45.9	45.4	44.9	44.4	43.9	43.4	42.9
1.90	42.4	42.0	41.5	41.1	40.6	40.2	39.8	39.4	38.9	38.5
2.00	38.1	37.7	37.3	37.0	36.6	36.2	35.8	35.5	35.1	34.8
2.10	34.4	34.1	33.7	33.4	33.1	32.8	32.4	32.1	31.8	31.5
2.20	31.2	30.9	30.6	30.3	30.0	29.8	29.5	29.2	28.9	28.7
2.30	28.4	28.1	27.9	27.6	27.4	27.1	26.9	26.6	26.4	26.2
2.40	25.9	25.7	25.5	25.3	25.0	24.8	24.6	24.4	24.2	24.0
2.50	23.8	23.6	23.4	23.2	23.0	22.8	22.6	22.4	22.2	22.0
2.60	21.8	21.6	21.5	21.3	21.1	20.9	20.8	20.6	20.4	20.3
2.70	20.1	19.9	19.8	19.6	19.5	19.3	19.2	19.0	18.9	18.7
2.80	18.6	18.4	18.3	18.1	18.0	17.8	17.7	17.6	17.4	17.3
2.90	17.2	17.0	16.9	16.8	16.7	16.5	16.4	16.3	16.2	16.0
3.00	15.9	—	—	—	—	—	—	—	—	—

TABLE 8

Diameter of ball = 5 mm **Load = 25 kgf** **F/D² = 1**

Diameter of indentation mm	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.20	—	—	—	—	—	20.0	19.7	19.4	19.1	18.8
1.30	18.5	18.2	17.9	17.7	17.4	17.1	16.9	16.6	16.4	16.2
1.40	15.9	15.7	15.5	15.2	15.0	14.8	14.6	14.4	14.2	14.0
1.50	13.8	13.6	13.5	13.3	13.1	12.9	12.8	12.6	12.4	12.3
1.60	12.1	12.0	11.8	11.7	11.5	11.4	11.2	11.1	11.0	10.8
1.70	10.7	10.6	10.4	10.3	10.2	10.1	9.95	9.83	9.72	9.61
1.80	9.50	9.39	9.28	9.18	9.07	8.97	8.87	8.77	8.68	8.58
1.90	8.49	8.39	8.30	8.21	8.13	8.04	7.95	7.87	7.79	7.71
2.00	7.63	7.55	7.47	7.39	7.32	7.24	7.17	7.10	7.02	6.95
2.10	6.88	6.82	6.75	6.68	6.62	6.55	6.49	6.42	6.36	6.30
2.20	6.24	6.18	6.12	6.06	6.01	5.95	5.90	5.84	5.79	5.73
2.30	5.68	5.63	5.58	5.53	5.48	5.43	5.38	5.33	5.28	5.23
2.40	5.19	5.14	5.10	5.05	5.01	4.96	4.92	4.88	4.83	4.79
2.50	4.75	4.71	4.67	4.63	4.59	4.55	4.51	4.48	4.44	4.40
2.60	4.37	4.33	4.29	4.26	4.22	4.19	4.15	4.12	4.09	4.05
2.70	4.02	3.99	3.96	3.92	3.89	3.86	3.83	3.80	3.77	3.74
2.80	3.71	3.68	3.65	3.63	3.60	3.57	3.54	3.51	3.49	3.46
2.90	3.43	3.41	3.38	3.36	3.33	3.31	3.28	3.26	3.23	3.21
3.00	3.18	—	—	—	—	—	—	—	—	—

TABLE 9

Diameter of ball — 2.5 mm				Load	187.5 kgf			$F/D^2 = 30$	

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.620						601	599	597	596	594
0.630	592	590	588	586	584	582	581	579	577	575
0.640	573	571	569	568	566	564	562	561	559	557
0.650	555	554	552	550	548	547	545	543	542	540
0.660	538	537	535	533	532	530	528	527	525	524
0.670	522	521	519	517	516	514	513	511	510	508
0.680	506	505	504	502	500	499	497	496	495	493
0.690	492	490	489	487	486	484	483	482	480	479
0.700	477	476	475	473	472	471	469	468	467	465
0.710	464	462	461	460	459	457	456	455	453	452
0.720	451	449	448	447	446	444	443	442	441	439
0.730	438	437	436	435	433	432	431	430	429	427
0.740	426	425	424	423	422	420	419	418	417	416
0.750	415	413	412	411	410	409	408	407	406	405
0.760	404	402	401	400	399	398	397	396	395	394
0.770	393	392	391	390	389	388	387	386	385	384
0.780	383	382	381	380	379	378	377	376	375	374
0.790	373	372	371	370	369	368	367	366	365	364
0.800	363	362	361	360	359	359	358	357	356	355
0.810	354	353	352	351	350	350	349	348	347	346
0.820	345	344	344	343	342	341	340	339	338	338
0.830	337	336	335	334	333	333	332	331	330	329
0.840	328	328	327	326	325	324	324	323	322	321
0.850	321	320	319	318	317	317	316	315	314	314
0.860	313	312	311	311	310	309	308	308	307	306
0.870	306	305	304	303	303	302	301	301	300	299
0.880	298	298	297	296	296	295	294	294	293	292
0.890	291	291	290	289	289	288	287	287	286	285
0.900	285	284	284	283	282	282	281	280	280	279
0.910	278	278	277	276	276	275	275	274	273	273
0.920	272	272	271	270	270	269	269	268	267	267
0.930	266	266	265	264	264	263	263	262	261	261
0.940	260	260	259	259	258	257	257	256	256	255
0.950	255	254	253	253	252	252	251	251	250	250
0.960	249	249	248	247	247	246	246	245	245	244
0.970	244	243	243	242	242	241	241	240	240	239
0.980	239	238	238	237	237	236	236	235	235	234
0.990	234	233	233	232	232	231	231	230	230	229
1.000	229	228	228	227	227	226	226	225	225	225
1.010	224	224	223	223	222	222	221	221	220	220
1.020	219	219	219	218	218	217	217	216	216	215
1.030	215	215	214	214	213	213	212	212	212	211
1.040	211	210	210	209	209	209	208	208	207	207
1.050	207	206	206	205	205	204	204	204	203	203
1.060	202	202	202	201	201	200	200	200	199	199
1.070	198	198	198	197	197	197	196	196	195	195
1.080	195	194	194	193	193	193	192	192	192	191
1.090	191	191	190	190	189	189	189	188	188	188
1.100	187	187	187	186	186	185	185	185	184	184
1.110	184	183	183	183	182	182	182	181	181	181
1.120	180	180	180	179	179	179	178	178	178	177
1.130	177	177	176	176	176	175	175	175	174	174
1.140	174	173	173	173	172	172	172	171	171	171
1.150	170	170	170	169	169	169	169	168	168	168

TABLE 9 *(concluded)*

Diameter of ball = 2.5 mm **Load = 187.5 kgf** **F/D² = 30**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
1.160	167	167	167	166	166	166	165	165	165	165
1.170	164	164	164	163	163	163	163	162	162	162
1.180	161	161	161	160	160	160	160	159	159	159
1.190	158	158	158	158	157	157	157	156	156	156
1.200	156	155	155	155	155	154	154	154	153	153
1.210	153	153	152	152	152	152	151	151	151	150
1.220	150	150	150	149	149	149	149	148	148	148
1.230	148	147	147	147	147	146	146	146	146	145
1.240	145	145	145	144	144	144	144	143	143	143
1.250	143	142	142	142	142	141	141	141	141	140
1.260	140	140	140	139	139	139	139	138	138	138
1.270	138	138	137	137	137	137	136	136	136	136
1.280	135	135	135	135	135	134	134	134	134	133
1.290	133	133	133	133	132	132	132	132	131	131
1.300	131	131	131	130	130	130	130	129	129	129
1.310	129	129	128	128	128	128	128	127	127	127
1.320	127	126	126	126	126	126	125	125	125	125
1.330	125	124	124	124	124	124	123	123	123	123
1.340	123	122	122	122	122	122	121	121	121	121
1.350	121	120	120	120	120	120	119	119	119	119
1.360	119	118	118	118	118	118	118	117	117	117
1.370	117	117	116	116	116	116	116	115	115	115
1.380	115	115	115	114	114	114	114	114	113	113
1.390	113	113	113	113	112	112	112	112	112	112
1.400	111	111	111	111	111	110	110	110	110	110
1.410	110	109	109	109	109	109	109	108	108	108
1.420	108	108	108	107	107	107	107	107	107	106
1.430	106	106	106	106	106	105	105	105	105	105
1.440	105	104	104	104	104	104	104	103	103	103
1.450	103	103	103	103	102	102	102	102	102	102
1.460	101	101	101	101	101	101	101	100	100	100
1.470	99.9	99.8	99.6	99.5	99.3	99.2	99.0	98.9	98.7	98.6
1.480	98.4	98.3	98.1	98.0	97.8	97.7	97.5	97.4	97.2	97.1
1.490	96.9	96.8	96.6	96.5	96.4	96.2	96.1	95.9	95.8	95.6
1.500	95.5	—	—	—	—	—	—	—	—	—

TABLE 10

| Diameter of ball = 2.5 mm | | | Load = 62.5 kgf | | | | F/D² = 10 | | |

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.620	—	—	—	—	—	200	200	199	199	198
0.630	197	197	196	195	195	194	194	193	192	192
0.640	191	190	190	189	189	188	187	187	186	186
0.650	185	185	184	183	183	182	182	181	181	180
0.660	179	179	178	178	177	177	176	176	175	175
0.670	174	174	173	172	172	171	171	170	170	169
0.680	169	168	168	167	167	166	166	165	165	164
0.690	164	163	163	162	162	161	161	161	160	160
0.700	159	159	158	158	157	157	156	156	156	155
0.710	155	154	154	153	153	152	152	152	151	151
0.720	150	150	149	149	149	148	148	147	147	146
0.730	146	146	145	145	144	144	144	143	143	142
0.740	142	142	141	141	141	140	140	139	139	139
0.750	138	138	137	137	137	136	136	136	135	135
0.760	135	134	134	133	133	133	132	132	132	131
0.770	131	131	130	130	130	129	129	129	128	128
0.780	128	127	127	127	126	126	126	125	125	125
0.790	124	124	124	123	123	123	122	122	122	121
0.800	121	121	120	120	120	120	119	119	119	118
0.810	118	118	117	117	117	117	116	116	116	115
0.820	115	115	115	114	114	114	113	113	113	113
0.830	112	112	112	111	111	111	111	110	110	110
0.840	109	109	109	109	108	108	108	108	107	107
0.850	107	107	106	106	106	106	105	105	105	105
0.860	104	104	104	104	103	103	103	103	102	102
0.870	102	102	101	101	101	101	100	100	99.9	99.7
0.880	99.5	99.2	99.0	98.8	98.5	98.3	98.1	97.9	97.6	97.4
0.890	97.2	96.9	96.7	96.5	96.3	96.1	95.8	95.6	95.4	95.2
0.900	94.9	94.7	94.5	94.3	94.1	93.9	93.6	93.4	93.2	93.0
0.910	92.8	92.6	92.4	92.2	92.0	91.7	91.5	91.3	91.1	90.9
0.920	90.7	90.5	90.3	90.1	89.9	89.7	89.5	89.3	89.1	88.9
0.930	88.7	88.5	88.3	88.1	87.9	87.7	87.5	87.3	87.1	86.9
0.940	86.8	86.6	86.4	86.2	86.0	85.8	85.6	85.4	85.2	85.1
0.950	84.9	84.7	84.5	84.3	84.1	83.9	83.8	83.6	83.4	83.2
0.960	83.0	82.9	82.7	82.5	82.3	82.1	82.0	81.8	81.6	81.4
0.970	81.3	81.1	80.9	80.7	80.6	80.4	80.2	80.0	79.9	79.7
0.980	79.5	79.4	79.2	79.0	78.9	78.7	78.5	78.4	78.2	78.0
0.990	77.9	77.7	77.5	77.4	77.2	77.1	76.9	76.7	76.6	76.4
1.000	76.3	76.1	75.9	75.8	75.6	75.5	75.3	75.2	75.0	74.8
1.010	74.7	74.5	74.4	74.2	74.1	73.9	73.8	73.6	73.5	73.3
1.020	73.2	73.0	72.9	72.7	72.6	72.4	72.3	72.1	72.0	71.8
1.030	71.7	71.5	71.4	71.2	71.1	71.0	70.8	70.7	70.5	70.4
1.040	70.2	70.1	70.0	69.8	69.7	69.5	69.4	69.3	69.1	69.0
1.050	68.8	68.7	68.6	68.4	68.3	68.2	68.0	67.9	67.8	67.6
1.060	67.5	67.3	67.2	67.1	66.9	66.8	66.7	66.6	66.4	66.3
1.070	66.2	66.0	65.9	65.8	65.6	65.5	65.4	65.3	65.1	65.0
1.080	64.9	64.7	64.6	64.5	64.4	64.2	64.1	64.0	63.9	63.8
1.090	63.6	63.5	63.4	63.3	63.1	63.0	62.9	62.8	62.7	62.5
1.100	62.4	62.3	62.2	62.1	61.9	61.8	61.7	61.6	61.5	61.3
1.110	61.2	61.1	61.0	60.9	60.8	60.6	60.5	60.4	60.3	60.2
1.120	60.1	60.0	59.8	59.7	59.6	59.5	59.4	59.3	59.2	59.1
1.130	59.0	58.8	58.7	58.6	58.5	58.4	58.3	58.2	58.1	58.0
1.140	57.9	57.8	57.6	57.5	57.4	57.3	57.2	57.1	57.0	56.9
1.150	56.8	56.7	56.6	56.5	56.4	56.3	56.2	56.1	56.0	55.9

TABLE 10 *(concluded)*

Diameter of ball = 2.5 mm **Load = 62.5 kgf** **F/D² = 10**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
1.160	55.8	55.7	55.6	55.5	55.4	55.3	55.2	55.1	55.0	54.9
1.170	54.8	54.7	54.6	54.5	54.4	54.3	54.2	54.1	54.0	53.9
1.180	53.8	53.7	53.6	53.5	53.4	53.3	53.2	53.1	53.0	52.9
1.190	52.8	52.7	52.6	52.5	52.4	52.3	52.2	52.1	52.1	52.0
1.200	51.9	51.8	51.7	51.6	51.5	51.4	51.3	51.2	51.1	51.0
1.210	51.0	50.9	50.8	50.7	50.6	50.5	50.4	50.3	50.2	50.2
1.220	50.1	50.0	49.9	49.8	49.7	49.6	49.5	49.5	49.4	49.3
1.230	49.2	49.1	49.0	48.9	48.9	48.8	48.7	48.6	48.5	48.4
1.240	48.3	48.3	48.2	48.1	48.0	47.9	47.8	47.8	47.7	47.6
1.250	47.5	47.4	47.4	47.3	47.2	47.1	47.0	46.9	46.9	46.8
1.260	46.7	46.6	46.5	46.5	46.4	46.3	46.2	46.2	46.1	46.0
1.270	45.9	45.8	45.8	45.7	45.6	45.5	45.5	45.4	45.3	45.2
1.280	45.1	45.1	45.0	44.9	44.8	44.8	44.7	44.6	44.5	44.5
1.290	44.4	44.3	44.2	44.2	44.1	44.0	43.9	43.9	43.8	43.7
1.300	43.7	43.6	43.5	43.4	43.4	43.3	43.2	43.1	43.1	43.0
1.310	42.9	42.9	42.8	42.7	42.6	42.6	42.5	42.4	42.4	42.3
1.320	42.2	42.2	42.1	42.0	42.0	41.9	41.8	41.7	41.7	41.6
1.330	41.5	41.5	41.4	41.3	41.3	41.2	41.1	41.1	41.0	40.9
1.340	40.9	40.8	40.7	40.7	40.6	40.5	40.5	40.4	40.3	40.3
1.350	40.2	40.1	40.1	40.0	39.9	39.9	39.8	39.8	39.7	39.6
1.360	39.6	39.5	39.4	39.4	39.3	39.2	39.2	39.1	39.1	39.0
1.370	38.9	38.9	38.8	38.7	38.7	38.6	38.6	38.5	38.4	38.4
1.380	38.3	38.3	38.2	38.1	38.1	38.0	38.0	37.9	37.8	37.8
1.390	37.7	37.6	37.6	37.5	37.5	37.4	37.4	37.3	37.2	37.2
1.400	37.1	37.1	37.0	36.9	36.9	36.8	36.8	36.7	36.7	36.6
1.410	36.5	36.5	36.4	36.4	36.3	36.3	36.2	36.1	36.1	36.0
1.420	36.0	35.9	35.9	35.8	35.7	35.7	35.6	35.6	35.5	35.5
1.430	35.4	35.4	35.3	35.3	35.2	35.1	35.1	35.0	35.0	34.9
1.440	34.9	34.8	34.8	34.7	34.7	34.6	34.6	34.5	34.4	34.4
1.450	34.3	34.3	34.2	34.2	34.1	34.1	34.0	34.0	33.9	33.9
1.460	33.8	33.8	33.7	33.7	33.6	33.6	33.5	33.5	33.4	33.4
1.470	33.3	33.3	33.2	33.2	33.1	33.1	33.0	33.0	32.9	32.9
1.480	32.8	32.8	32.7	32.7	32.6	32.6	32.5	32.5	32.4	32.4
1.490	32.3	32.3	32.2	32.2	32.1	32.1	32.0	32.0	31.9	31.9
1.500	31.8	—	—	—	—	—	—	—	—	—

TABLE 11

Diameter of ball = 2.5 mm   **Load = 31.25 kgf**   **F/D² = 5**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.620	—	—	—	—	—	100	99.9	99.6	99.3	98.9
0.630	98.6	98.3	98.0	97.7	97.4	97.0	96.8	96.4	96.1	95.8
0.640	95.5	95.2	94.9	94.6	94.3	94.0	93.7	93.4	93.1	92.8
0.650	92.5	92.3	92.0	91.7	91.4	91.1	90.8	90.6	90.3	90.0
0.660	89.7	89.4	89.2	88.9	88.6	88.3	88.1	87.8	87.5	87.3
0.670	87.0	86.8	86.5	86.2	86.0	85.7	85.5	85.2	84.9	84.7
0.680	84.4	84.2	83.9	83.7	83.4	83.2	82.9	82.7	82.4	82.2
0.690	82.0	81.7	81.5	81.2	81.0	80.7	80.5	80.3	80.0	79.8
0.700	79.6	79.3	79.1	78.9	78.7	78.4	78.2	78.0	77.8	77.5
0.710	77.3	77.1	76.8	76.6	76.4	76.2	76.0	75.8	75.6	75.3
0.720	75.1	74.9	74.7	74.5	74.3	74.1	73.9	73.6	73.4	73.2
0.730	73.0	72.8	72.6	72.4	72.2	72.0	71.8	71.6	71.4	71.2
0.740	71.0	70.8	70.6	70.4	70.3	70.1	69.9	69.7	69.5	69.3
0.750	69.1	68.9	68.7	68.5	68.4	68.2	68.0	67.8	67.5	67.4
0.760	67.3	67.1	66.9	66.7	66.5	66.4	66.2	66.0	65.8	65.6
0.770	65.5	65.3	65.1	64.9	64.8	64.6	64.4	64.3	64.1	63.9
0.780	63.8	63.6	63.4	63.3	63.1	62.9	62.8	62.6	62.4	62.3
0.790	62.1	62.0	61.8	61.1	61.5	61.3	61.2	61.0	60.9	60.7
0.800	60.5	60.4	60.2	60.1	59.9	59.8	59.6	59.5	59.3	59.2
0.810	59.0	58.9	58.7	58.6	58.4	58.3	58.1	58.0	57.8	57.7
0.820	57.5	57.4	57.3	57.1	57.0	56.8	56.7	56.5	56.4	56.3
0.830	56.1	56.0	55.8	55.7	55.6	55.4	55.3	55.1	55.0	54.9
0.840	54.7	54.6	54.5	54.3	54.2	54.1	54.0	53.8	53.7	53.6
0.850	53.4	53.3	53.2	53.0	52.9	52.8	52.7	52.5	52.4	52.3
0.860	52.2	52.0	51.9	51.8	51.7	51.5	51.4	51.3	51.2	51.0
0.870	50.9	50.8	50.7	50.6	50.4	50.3	50.2	50.1	50.0	49.9
0.880	49.7	49.6	49.5	49.4	49.3	49.2	49.0	48.9	48.8	48.7
0.890	48.6	48.5	48.4	48.2	48.1	48.0	47.9	47.8	47.7	47.6
0.900	47.5	47.4	47.3	47.2	47.0	46.9	46.8	46.7	46.6	46.5
0.910	46.4	46.3	46.2	46.1	46.0	45.9	45.8	45.7	45.6	45.5
0.920	45.4	45.3	45.2	45.1	45.0	44.9	44.8	44.7	44.6	44.5
0.930	44.4	44.3	44.3	44.1	44.0	43.9	43.8	43.7	43.6	43.5
0.940	43.4	43.3	43.2	43.1	43.0	42.9	42.8	42.7	42.6	42.5
0.950	42.4	42.3	42.2	42.2	42.1	42.0	41.9	41.8	41.7	41.6
0.960	41.5	41.4	41.3	41.2	41.2	41.1	41.0	40.9	40.8	40.7
0.970	40.6	40.5	40.5	40.4	40.3	40.2	40.1	40.0	39.9	39.9
0.980	39.8	39.7	39.6	39.5	39.4	39.4	39.3	39.2	39.1	39.0
0.990	38.9	38.9	38.8	38.7	38.6	38.5	38.4	38.4	38.3	38.2
1.000	38.1	38.0	38.0	37.9	37.8	37.7	37.7	37.6	37.5	37.4
1.010	37.3	37.3	37.2	37.1	37.0	37.0	36.9	36.8	36.7	36.7
1.020	36.6	36.5	36.4	36.4	36.3	36.2	36.1	36.1	36.0	35.9
1.030	35.8	35.8	35.7	35.6	35.5	35.5	35.4	35.4	35.3	35.2
1.040	35.1	35.0	35.0	34.9	34.8	34.8	34.7	34.6	34.6	34.5
1.050	34.4	34.4	34.3	34.2	34.1	34.1	34.0	33.9	33.9	33.8
1.060	33.7	33.7	33.6	33.5	33.5	33.4	33.3	33.3	33.2	33.1
1.070	33.1	33.0	33.0	32.9	32.8	32.8	32.7	32.6	32.6	32.5
1.080	32.4	32.4	32.3	32.2	32.2	32.1	32.1	32.0	31.9	31.9
1.090	31.8	31.8	31.7	31.6	31.6	31.5	31.4	31.4	31.3	31.3
1.100	31.2	31.1	31.1	31.0	31.0	30.9	30.8	30.8	30.7	30.7
1.110	30.6	30.6	30.5	30.4	30.4	30.3	30.3	30.2	30.2	30.1
1.120	30.0	30.0	29.9	29.9	29.8	29.8	29.7	29.6	29.6	29.5
1.130	29.5	29.4	29.4	29.3	29.3	29.2	29.1	29.1	29.0	29.0
1.140	28.9	28.9	28.8	28.8	28.7	28.7	28.6	28.6	28.5	28.5
1.150	28.4	28.3	28.3	28.2	28.2	28.1	28.1	28.0	28.0	27.9

TABLE 11 *(concluded)*

Diameter of ball — 2.5 mm   **Load = 31.25 kgf**   **F/D² = 5**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
1.160	27.9	27.8	27.8	27.7	27.7	27.6	27.6	27.5	27.5	27.4
1.170	27.4	27.3	27.3	27.2	27.2	27.1	27.1	27.0	27.0	26.9
1.180	26.9	26.8	26.8	26.7	26.7	26.6	26.6	26.5	26.5	26.5
1.190	26.4	26.4	26.3	26.3	26.2	26.2	26.1	26.1	26.0	26.0
1.200	25.9	25.9	25.8	25.8	25.8	25.7	25.7	25.6	25.6	25.5
1.210	25.5	25.4	25.4	25.3	25.3	25.3	25.2	25.2	25.1	25.1
1.220	25.0	25.0	24.9	24.9	24.9	24.8	24.8	24.7	24.7	24.6
1.230	24.6	24.6	24.5	24.5	24.4	24.4	24.3	24.3	24.3	24.2
1.240	24.2	24.1	24.1	24.0	24.0	24.0	23.9	23.9	23.8	23.8
1.250	23.8	23.7	23.7	23.6	23.6	23.6	23.5	23.5	23.4	23.4
1.260	23.4	23.3	23.3	23.2	23.2	23.2	23.1	23.1	23.0	23.0
1.270	23.0	22.9	22.9	22.8	22.8	22.8	22.7	22.7	22.6	22.6
1.280	22.6	22.5	22.5	22.5	22.4	22.4	22.3	22.3	22.3	22.2
1.290	22.2	22.2	22.1	22.1	22.0	22.0	22.0	21.9	21.9	21.9
1.300	21.8	21.8	21.8	21.7	21.7	21.6	21.6	21.6	21.5	21.5
1.310	21.5	21.4	21.4	21.4	21.3	21.3	21.3	21.2	21.2	21.1
1.320	21.1	21.1	21.0	21.0	21.0	20.9	20.9	20.9	20.8	20.8
1.330	20.8	20.7	20.7	20.7	20.6	20.6	20.6	20.5	20.5	20.5
1.340	20.4	20.4	20.4	20.3	20.3	20.3	20.2	20.2	20.2	20.1
1.350	20.1	20.1	20.0	20.0	20.0	19.9	19.9	19.9	19.8	19.8
1.360	19.8	19.7	19.7	19.7	19.7	19.6	19.6	19.6	19.5	19.5
1.370	19.5	19.4	19.4	19.4	19.3	19.3	19.3	19.2	19.2	19.2
1.380	19.2	19.1	19.1	19.1	19.0	19.0	19.0	18.9	18.9	18.9
1.390	18.9	18.8	18.8	18.8	18.7	18.7	18.7	18.6	18.6	18.6
1.400	18.6	18.5	18.5	18.5	18.4	18.4	18.4	18.4	18.3	18.3
1.410	18.3	18.2	18.2	18.2	18.2	18.1	18.1	18.1	18.0	18.0
1.420	18.0	18.0	17.9	17.9	17.9	17.8	17.8	17.8	17.8	17.7
1.430	17.7	17.7	17.7	17.6	17.6	17.6	17.5	17.5	17.5	17.5
1.440	17.4	17.4	17.4	17.4	17.3	17.3	17.3	17.2	17.2	17.2
1.450	17.2	17.1	17.1	17.1	17.1	17.0	17.0	17.0	17.0	16.9
1.460	16.9	16.9	16.9	16.8	16.8	16.8	16.8	16.7	16.7	16.7
1.470	16.7	16.6	16.6	16.6	16.6	16.5	16.5	16.5	16.5	16.4
1.480	16.4	16.4	16.4	16.3	16.3	16.3	16.3	16.2	16.2	16.2
1.490	16.2	16.1	16.1	16.1	16.1	16.0	16.0	16.0	16.0	15.9
1.500	15.9	—	—	—	—	—	—	—	—	—

TABLE 12

Diameter of ball = 2.5 mm　　　　**Load = 6.25 kgf**　　　　**F/D² = 1**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.620	—	—	—	—	—	20.0	20.0	19.9	19.9	19.8
0.630	19.7	19.7	19.6	19.5	19.5	19.4	19.4	19.3	19.2	19.2
0.640	19.1	19.0	19.0	18.9	18.9	18.8	18.7	18.7	18.6	18.6
0.650	18.5	18.5	18.4	18.3	18.3	18.2	18.2	18.1	18.1	18.0
0.660	17.9	17.9	17.8	17.8	17.7	17.7	17.6	17.6	17.5	17.5
0.670	17.4	17.4	17.3	17.2	17.2	17.1	17.1	17.0	17.0	16.9
0.680	16.9	16.8	16.8	16.7	16.7	16.6	16.6	16.5	16.5	16.4
0.690	16.4	16.3	16.3	16.2	16.2	16.1	16.1	16.1	16.0	16.0
0.700	15.9	15.9	15.8	15.8	15.7	15.6	15.6	15.6	15.6	15.5
0.710	15.5	15.4	15.4	15.3	15.3	15.2	15.2	15.2	15.1	15.1
0.720	15.0	15.0	14.9	14.9	14.9	14.8	14.8	14.7	14.7	14.6
0.730	14.6	14.6	14.5	14.5	14.4	14.4	14.4	14.3	14.3	14.2
0.740	14.2	14.2	14.1	14.1	14.1	14.0	14.0	13.9	13.9	13.9
0.750	13.8	13.8	13.7	13.7	13.6	13.6	13.6	13.6	13.5	13.5
0.760	13.5	13.4	13.4	13.3	13.3	13.3	13.2	13.2	13.2	13.1
0.770	13.1	13.1	13.0	13.0	13.0	12.9	12.9	12.9	12.8	12.8
0.780	12.8	12.7	12.7	12.7	12.6	12.6	12.6	12.5	12.5	12.5
0.790	12.4	12.4	12.4	12.3	12.3	12.3	12.2	12.2	12.2	12.1
0.800	12.1	12.1	12.0	12.0	12.0	12.0	11.9	11.9	11.9	11.8
0.810	11.8	11.8	11.7	11.7	11.7	11.7	11.6	11.6	11.6	11.5
0.820	11.5	11.5	11.5	11.4	11.4	11.4	11.3	11.3	11.3	11.3
0.830	11.2	11.2	11.2	11.1	11.1	11.1	11.1	11.0	11.0	11.0
0.840	10.9	10.9	10.9	10.9	10.8	10.8	10.8	10.8	10.7	10.7
0.850	10.7	10.7	10.6	10.6	10.6	10.6	10.5	10.5	10.5	10.5
0.860	10.4	10.4	10.4	10.4	10.3	10.3	10.3	10.3	10.2	10.2
0.870	10.2	10.2	10.1	10.1	10.0	10.1	10.0	10.0	9.99	9.97
0.880	9.95	9.92	9.90	9.88	9.85	9.83	9.81	9.79	9.76	9.74
0.890	9.72	9.69	9.67	9.65	9.63	9.61	9.58	9.56	9.54	9.52
0.900	9.49	9.47	9.45	9.43	9.41	9.39	9.36	9.34	9.32	9.30
0.910	9.28	9.26	9.24	9.22	9.20	9.17	9.15	9.13	9.11	9.09
0.920	9.07	9.05	9.03	9.01	8.99	8.97	8.95	8.93	8.91	8.89
0.930	8.87	8.85	8.83	8.81	8.79	8.77	8.75	8.73	8.71	8.69
0.940	8.68	8.66	8.64	8.62	8.60	8.58	8.56	8.54	8.52	8.51
0.950	8.49	8.47	8.45	8.43	8.41	8.39	8.38	8.36	8.34	8.32
0.960	8.30	8.29	8.27	8.25	8.23	8.21	8.20	8.18	8.16	8.14
0.970	8.13	8.11	8.09	8.07	8.06	8.04	8.02	8.00	7.99	7.97
0.980	7.95	7.94	7.92	7.90	7.89	7.87	7.85	7.84	7.82	7.80
0.990	7.79	7.77	7.75	7.74	7.72	7.71	7.69	7.67	7.66	7.64
1.000	7.63	7.61	7.59	7.58	7.56	7.55	7.53	7.52	7.50	7.48
1.010	7.47	7.45	7.44	7.42	7.41	7.39	7.38	7.36	7.35	7.33
1.020	7.32	7.30	7.29	7.27	7.26	7.24	7.23	7.21	7.20	7.18
1.030	7.17	7.15	7.14	7.12	7.11	7.10	7.08	7.07	7.05	7.04
1.040	7.02	7.01	7.00	6.98	6.97	6.95	6.94	6.93	6.91	6.90
1.050	6.88	6.87	6.86	6.84	6.83	6.82	6.80	6.79	6.78	6.76
1.060	6.75	6.73	6.72	6.71	6.69	6.68	6.67	6.66	6.64	6.63
1.070	6.62	6.60	6.59	6.58	6.56	6.55	6.54	6.53	6.51	65.0
1.080	6.49	6.47	6.46	6.45	6.44	6.42	6.41	6.40	6.39	6.38
1.090	6.36	6.35	6.34	6.33	6.31	6.30	6.29	6.28	6.27	6.25
1.100	6.24	6.23	6.22	6.21	6.19	6.18	6.17	6.16	6.15	6.13
1.110	6.12	6.11	6.10	6.09	6.08	6.06	6.05	6.04	6.03	6.02
1.120	6.01	6.90	5.98	5.97	5.96	5.95	5.94	5.93	5.92	5.91
1.130	5.90	5.88	5.87	5.86	5.85	5.84	5.83	5.82	5.81	5.80
1.140	5.79	5.78	5.76	5.75	5.74	5.73	5.72	5.71	5.70	5.69
1.150	5.68	5.67	5.66	5.65	5.64	5.63	5.62	5.61	5.60	5.59

TABLE 12 *(concluded)*

Diameter of ball = 2.5 mm **Load = 6.25 kgf** **F/D² = 1**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
1.160	5.58	5.57	5.56	5.55	5.54	5.53	5.52	5.51	5.50	5.49
1.170	5.48	5.47	5.46	5.45	5.44	5.43	5.42	5.41	5.40	5.39
1.180	5.38	5.37	5.36	5.35	5.34	5.33	5.32	5.31	5.30	5.29
1.190	5.28	5.27	5.26	5.25	5.24	5.23	5.22	5.21	5.21	5.20
1.200	5.19	5.18	5.17	5.16	5.15	5.14	5.13	5.12	5.11	5.10
1.210	5.10	5.09	5.08	5.07	5.06	5.05	5.04	5.03	5.02	5.02
1.220	5.01	5.00	4.99	4.98	4.97	4.96	4.95	4.95	4.94	4.93
1.230	4.92	4.91	4.90	4.89	4.89	4.88	4.87	4.86	4.85	4.84
1.240	4.83	4.83	4.82	4.81	4.80	4.79	4.78	4.78	4.77	4.76
1.250	4.75	4.74	4.74	4.73	4.72	4.71	4.70	4.69	4.69	4.68
1.260	4.67	4.66	4.65	4.65	4.64	4.63	4.62	4.62	4.61	4.60
1.270	4.59	4.58	4.58	4.57	4.56	4.55	4.55	4.54	4.53	4.52
1.280	4.51	4.51	4.50	4.49	4.48	4.48	4.47	4.46	4.45	4.45
1.290	4.44	4.43	4.42	4.42	4.41	4.40	4.39	4.39	4.38	4.37
1.300	4.37	4.36	4.35	4.34	4.34	4.33	4.32	4.31	4.31	4.30
1.310	4.29	4.29	4.28	4.27	4.26	4.26	4.25	4.24	4.24	4.23
1.320	4.22	4.22	4.21	4.20	4.20	4.19	4.18	4.17	4.17	4.16
1.330	4.15	4.15	4.14	4.13	4.13	4.12	4.11	4.11	4.10	4.09
1.340	4.09	4.08	4.07	4.07	4.06	4.05	4.05	4.04	40.3	4.03
1.350	4.02	4.01	4.01	4.00	3.99	3.99	3.98	3.98	3.97	3.96
1.360	3.96	3.95	3.94	3.94	3.93	3.92	3.92	3.91	3.91	3.90
1.370	3.89	3.89	3.88	3.87	3.87	3.86	3.86	3.85	3.84	3.84
1.380	3.83	3.83	3.82	3.81	3.81	3.80	3.80	3.79	3.78	3.78
1.390	3.77	3.76	3.76	3.75	3.75	3.74	3.74	3.73	3.72	3.72
1.400	3.71	3.71	3.70	3.69	3.68	3.68	3.68	3.67	3.67	3.66
1.410	3.65	3.65	3.64	3.64	3.63	3.63	3.62	3.61	3.61	3.60
1.420	3.60	3.59	3.59	3.58	3.57	3.57	3.56	3.56	3.55	3.55
1.430	3.54	3.54	3.53	3.53	3.52	3.51	3.51	3.50	3.50	3.49
1.440	3.49	3.48	3.48	3.47	3.47	3.46	3.46	3.45	3.44	3.44
1.450	3.43	3.43	3.42	3.42	3.41	3.41	3.40	3.40	3.39	3.39
1.460	3.38	3.38	3.37	3.37	3.36	3.36	3.35	3.35	3.34	3.34
1.470	3.33	3.33	3.32	3.32	3.31	3.31	3.30	3.30	3.29	3.29
1.480	3.28	3.28	3.27	3.27	3.26	3.26	3.25	3.25	3.24	3.24
1.490	3.23	3.23	3.22	3.22	3.21	3.21	3.20	3.20	3.19	3.19
1.500	3.18	—	—	—	—	—	—	—	—	—

TABLE 13

Diameter of ball   2 mm   **Load = 120 kgf**   **F/D² = 30**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.500	601	599	597	594	592	589	587	585	582	580
0.510	578	575	573	571	569	566	564	562	560	558
0.520	555	553	551	549	547	545	543	540	538	536
0.530	534	532	530	528	526	524	522	520	518	516
0.540	514	512	510	508	507	505	503	501	499	497
0.550	495	494	492	490	488	486	485	483	481	479
0.560	477	476	474	472	471	469	467	466	464	462
0.570	461	459	457	456	454	452	451	449	448	446
0.580	444	443	441	440	438	437	435	434	432	431
0.590	429	428	426	425	423	422	420	419	417	416
0.600	415	413	412	410	409	408	406	405	404	402
0.610	401	399	398	397	395	394	393	392	390	389
0.620	388	386	385	384	383	381	380	379	378	376
0.630	375	374	373	372	370	369	368	367	366	364
0.640	363	362	361	360	359	357	356	355	354	353
0.650	352	351	350	348	347	346	345	344	343	342
0.660	341	340	339	338	337	336	335	334	333	332
0.670	331	330	329	327	326	326	325	324	323	322
0.680	321	320	319	318	317	316	315	314	313	312
0.690	311	310	309	308	307	306	306	305	304	303
0.700	302	301	300	299	298	298	297	296	295	294
0.710	293	292	292	291	290	289	288	287	286	286
0.720	285	284	283	282	282	281	280	279	278	278
0.730	277	276	275	274	274	273	272	271	271	270
0.740	269	268	268	267	266	265	265	264	263	262
0.750	262	261	260	260	259	258	257	257	256	255
0.760	255	254	253	253	252	251	250	250	249	248
0.770	248	247	246	246	245	244	244	243	242	242
0.780	241	241	240	239	239	238	237	237	236	235
0.790	235	234	234	233	232	232	231	231	230	229
0.800	229	228	228	227	226	226	225	225	224	223
0.810	223	222	222	221	221	220	219	219	218	218
0.820	217	217	216	216	215	214	214	213	213	212
0.830	212	211	211	210	210	209	209	208	208	207
0.840	207	206	205	205	204	204	203	203	202	202
0.850	201	201	200	200	199	199	198	198	198	197
0.860	197	196	196	195	195	194	194	193	193	192
0.870	192	191	191	190	190	190	189	189	188	188
0.880	187	187	186	186	185	185	185	184	184	183
0.890	183	182	182	182	181	181	180	180	179	179
0.900	179	178	178	177	177	176	176	176	175	175
0.910	174	174	174	173	173	172	172	172	171	171
0.920	170	170	170	169	169	168	168	168	167	167
0.930	167	166	166	165	165	165	164	164	164	163
0.940	163	162	162	162	161	161	161	160	160	159
0.950	159	159	158	158	158	157	157	157	156	156
0.960	156	155	155	155	154	154	154	153	153	153
0.970	152	152	152	151	151	151	150	150	150	149
0.980	149	149	148	148	148	147	147	147	146	146
0.990	146	145	145	145	144	144	144	143	143	143
1.000	143	142	142	142	141	141	141	140	140	140
1.010	140	139	139	139	138	138	138	137	137	137
1.020	137	136	136	136	135	135	135	135	134	134
1.030	134	133	133	133	133	132	132	132	132	131

TABLE 13 *(concluded)*

Diameter of ball = 2 mm **Load 120 kgf** **F/D² = 30**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
1.040	131	131	130	130	130	130	129	129	129	129
1.050	128	128	128	127	127	127	127	126	126	126
1.060	126	125	125	125	125	124	124	124	124	123
1.070	123	123	123	122	122	122	122	121	121	121
1.080	121	120	120	120	120	119	119	119	119	118
1.090	118	118	118	118	117	117	117	117	116	116
1.100	116	116	115	115	115	115	114	114	114	114
1.110	114	113	113	113	113	112	112	112	112	112
1.120	111	111	111	111	110	110	110	110	110	109
1.130	109	109	109	109	108	108	108	108	107	107
1.140	107	107	107	106	106	106	106	106	105	105
1.150	105	105	105	104	104	104	104	104	103	103
1.160	103	103	103	102	102	102	102	102	101	101
1.170	101	101	101	100	100	100	99.9	99.7	99.5	99.4
1.180	99.2	99.0	98.8	98.6	98.4	98.2	98.0	97.9	97.7	97.5
1.190	97.3	97.1	96.9	96.8	96.6	96.4	96.2	96.0	95.9	95.7
1.200	95.5	—	—	—	—	—	—	—	—	—

TABLE 14

Diameter of ball = 2 mm **Load = 40 kgf** **F/D² = 10**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.500	200	200	199	198	197	196	196	195	194	193
0.510	193	192	191	190	190	189	188	187	187	186
0.520	185	184	184	183	182	182	181	180	179	179
0.530	178	177	177	176	175	175	174	173	173	172
0.540	171	171	170	169	169	168	168	167	166	166
0.550	165	165	164	163	163	162	162	161	160	160
0.560	159	159	158	157	157	156	156	155	155	154
0.570	154	153	152	152	151	151	150	150	149	149
0.580	148	148	147	147	146	146	145	145	144	144
0.590	143	143	142	142	141	141	140	140	139	139
0.600	138	138	137	137	136	136	135	135	135	134
0.610	134	133	133	132	132	131	131	131	130	130
0.620	129	129	128	128	128	127	127	126	126	125
0.630	125	125	124	124	123	123	123	122	122	121
0.640	121	121	120	120	120	119	119	118	118	118
0.650	117	117	117	116	116	115	115	115	114	114
0.660	114	113	113	113	112	112	112	111	111	111
0.670	110	110	110	109	109	109	108	108	108	107
0.680	107	107	106	106	106	105	105	105	104	104
0.690	104	103	103	103	102	102	102	102	101	101
0.700	101	100	100	99.8	99.5	99.2	98.9	98.6	98.3	98.0
0.710	97.7	97.5	97.2	96.9	96.6	96.3	96.1	95.8	95.5	95.2
0.720	95.0	94.7	94.4	94.1	93.9	93.6	93.3	93.1	92.8	92.5
0.730	92.3	92.0	91.8	91.5	91.2	91.0	90.7	90.5	90.2	90.0
0.740	89.7	89.5	89.2	89.0	88.7	88.5	88.2	88.0	87.7	87.5
0.750	87.2	87.0	86.8	86.5	86.3	86.0	85.8	85.6	85.3	85.1
0.760	84.9	84.6	84.4	84.2	83.9	83.7	83.5	83.3	83.0	82.8

TABLE 14 (concluded)

Diameter of ball 2 mm **Load = 40 kgf** **F/D² = 10**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.770	82.6	82.4	82.1	81.9	81.7	81.5	81.3	81.0	80.8	80.6
0.780	80.4	80.2	80.0	79.8	79.5	79.3	79.1	78.9	78.7	78.5
0.790	78.3	78.1	77.9	77.7	77.5	77.3	77.1	76.9	76.7	76.5
0.800	76.3	76.1	75.9	75.7	75.5	75.3	75.1	74.9	74.7	74.5
0.810	74.3	74.1	73.9	73.7	73.5	73.3	73.2	73.0	72.8	72.6
0.820	72.4	72.2	72.0	71.9	71.7	71.5	71.3	71.1	71.0	70.8
0.830	70.6	70.4	70.2	70.1	69.9	69.7	69.5	69.4	69.2	69.0
0.840	68.8	68.7	68.5	68.3	68.2	68.0	67.8	67.7	67.5	67.3
0.850	67.1	67.0	66.8	66.7	66.5	66.3	66.2	66.0	65.8	65.7
0.860	65.5	65.4	65.2	65.0	64.9	64.7	64.6	64.4	64.2	64.1
0.870	63.9	63.8	63.6	63.5	63.3	63.2	63.0	62.9	62.7	62.6
0.880	62.4	62.3	62.1	62.0	61.8	61.7	61.5	61.4	61.2	61.1
0.890	60.9	60.8	60.6	60.5	60.4	60.2	60.1	59.9	59.8	59.7
0.900	59.5	59.4	59.2	59.1	59.0	58.8	58.7	58.5	58.4	58.3
0.910	58.1	58.0	57.9	57.7	57.6	57.5	57.3	57.2	57.1	56.9
0.920	56.8	56.7	56.5	56.4	56.3	56.1	56.0	55.9	55.8	55.6
0.930	55.5	55.4	55.3	55.1	55.0	54.9	54.8	54.6	54.5	54.4
0.940	54.3	54.1	54.0	53.9	53.8	53.6	53.5	53.4	53.3	53.2
0.950	53.0	52.9	52.8	52.7	52.6	52.5	52.3	52.2	52.1	52.0
0.960	51.9	51.8	51.6	51.5	51.4	51.3	51.2	51.1	51.0	50.8
0.970	50.7	50.6	50.5	50.4	50.3	50.2	50.1	50.0	49.8	49.7
0.980	49.6	49.5	49.4	49.3	49.2	49.1	49.0	48.9	48.8	48.7
0.990	48.6	48.5	48.3	48.2	48.1	48.0	47.9	47.8	47.7	47.6
1.000	47.5	47.4	47.3	47.2	47.1	47.0	46.9	46.8	46.7	46.6
1.010	46.5	46.4	46.3	46.2	46.1	46.0	45.9	45.8	45.7	45.6
1.020	45.5	45.4	45.3	45.2	45.1	45.1	45.0	44.9	44.8	44.7
1.030	44.6	44.5	44.4	44.3	44.2	44.1	44.0	43.9	43.8	43.7
1.040	43.7	43.6	43.5	43.4	43.3	43.2	43.1	43.0	42.9	42.8
1.050	42.8	42.7	42.6	42.5	42.4	42.3	42.2	42.1	42.1	42.0
1.060	41.9	41.8	41.7	41.6	41.5	41.5	41.4	41.3	41.2	41.1
1.070	41.0	40.9	40.9	40.8	40.7	40.6	40.5	40.5	40.4	40.3
1.080	40.2	40.1	40.0	40.0	39.9	39.8	39.7	39.6	39.6	39.5
1.090	39.4	39.3	39.2	39.2	39.2	39.1	39.0	38.9	38.8	38.7
1.100	38.6	38.5	38.5	38.4	38.3	38.2	38.2	38.1	38.0	37.9
1.110	37.9	37.8	37.6	37.6	37.5	37.4	37.3	37.3	37.3	37.2
1.120	37.1	37.0	37.0	36.9	36.8	36.8	36.7	36.6	36.5	36.5
1.130	36.4	36.3	36.3	36.2	36.1	36.0	36.0	35.9	35.8	35.8
1.140	35.7	35.6	35.6	35.5	35.4	35.3	35.3	35.2	35.1	35.1
1.150	35.0	34.9	34.9	34.8	34.7	34.7	34.6	34.5	34.5	34.4
1.160	34.3	34.3	34.2	34.1	34.1	34.0	33.9	33.9	33.8	33.8
1.170	33.7	33.6	33.6	33.5	33.4	33.4	33.3	33.2	33.2	33.1
1.180	33.1	33.0	32.9	32.9	32.8	32.7	32.7	32.6	32.6	32.5
1.190	32.4	32.4	32.3	32.3	32.2	32.1	32.1	32.0	32.0	31.9
1.200	31.8	—		—	—	—	—	—	—	

TABLE 15

Diameter of ball = 2 mm				Load = 20 kgf				F/D² = 5	

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.500	100	99.8	99.4	99.0	98.6	98.2	97.8	97.4	97.1	96.7
0.510	96.3	95.9	95.5	95.1	94.8	94.4	94.0	93.7	93.3	92.9
0.520	92.6	92.2	91.8	91.5	91.1	90.8	90.4	90.1	89.7	89.4
0.530	89.0	88.7	88.4	88.0	87.7	87.3	87.0	86.7	86.4	86.0
0.540	85.7	85.4	85.1	84.7	84.4	84.1	83.8	83.5	83.2	82.9
0.550	82.6	82.3	81.9	81.6	81.3	81.0	80.8	80.5	80.2	79.9
0.560	79.6	79.3	79.0	78.7	78.4	78.1	77.9	77.6	77.3	77.0
0.570	76.8	76.5	76.2	75.9	75.7	75.4	75.1	74.9	74.6	74.3
0.580	74.1	73.8	73.6	73.3	73.0	72.8	72.5	72.3	72.0	71.8
0.590	71.5	71.3	71.0	70.8	70.5	70.3	70.1	69.8	69.6	69.3
0.600	69.1	68.9	68.6	68.4	68.2	67.9	67.7	67.5	67.3	67.0
0.610	66.8	66.6	66.4	66.1	65.9	65.7	65.5	65.3	65.0	64.8
0.620	64.6	64.4	64.2	64.0	63.8	63.6	63.3	63.1	62.9	62.7
0.630	62.5	62.3	62.1	61.9	61.7	61.5	61.3	61.1	60.9	60.7
0.640	60.5	60.3	60.1	60.0	59.8	59.6	59.4	59.2	59.0	58.8
0.650	58.6	58.5	58.3	58.1	57.9	57.7	57.5	57.4	57.2	57.0
0.660	56.8	56.6	56.5	56.3	56.1	55.9	55.8	55.6	55.4	55.3
0.670	55.1	54.9	54.8	54.6	54.4	54.3	54.1	53.9	53.8	53.6
0.680	53.4	53.3	53.1	52.9	52.8	52.6	52.5	52.3	52.2	52.0
0.690	51.8	51.7	51.5	51.4	51.2	51.1	50.9	50.8	50.6	50.5
0.700	50.3	50.2	50.0	49.9	49.7	49.6	49.4	49.3	49.2	49.0
0.710	48.9	48.7	48.6	48.4	48.3	48.2	48.0	47.9	47.7	47.6
0.720	47.5	47.3	47.2	47.1	46.9	46.8	46.7	46.5	46.4	46.3
0.730	46.1	46.0	45.9	45.7	45.6	45.5	45.4	45.2	45.1	45.0
0.740	44.9	44.7	44.6	44.5	44.4	44.2	44.1	44.0	43.9	43.7
0.750	43.6	43.5	43.4	43.3	43.1	43.0	42.9	42.8	42.7	42.6
0.760	42.4	42.3	42.2	42.1	42.0	41.9	41.7	41.6	41.5	41.4
0.770	41.3	41.2	41.1	41.0	40.9	40.7	40.6	40.5	40.4	40.3
0.780	40.2	40.1	40.0	39.9	39.8	39.7	39.6	39.5	39.4	39.2
0.790	39.1	39.0	38.9	38.8	38.7	38.6	38.5	38.4	38.3	38.2
0.800	38.1	38.0	37.9	37.8	37.7	37.6	37.5	37.4	37.3	37.2
0.810	37.1	37.1	37.0	36.9	36.8	36.7	36.6	36.5	36.4	36.3
0.820	36.2	36.1	36.0	35.9	35.8	35.7	35.7	35.6	35.5	35.4
0.830	35.3	35.2	35.1	35.0	34.9	34.9	34.8	34.7	34.6	34.5
0.840	34.4	34.3	34.2	34.2	34.1	34.0	33.9	33.8	33.7	33.7
0.850	33.6	33.5	33.4	33.3	33.2	33.2	33.1	33.0	32.9	32.8
0.860	32.8	32.7	32.6	32.5	32.4	32.4	32.3	32.2	32.1	32.0
0.870	32.0	31.9	31.8	31.7	31.7	31.6	31.5	31.4	31.4	31.3
0.880	31.2	31.1	31.1	31.0	30.9	30.8	30.8	30.7	30.6	30.5
0.890	30.5	30.4	30.3	30.3	30.2	30.1	30.0	30.0	29.9	29.8
0.900	29.8	29.7	29.6	29.5	29.5	29.4	29.3	29.3	29.2	29.1
0.910	29.1	29.0	28.9	28.9	28.8	28.7	28.7	28.6	28.5	28.5
0.920	28.4	28.3	28.3	28.2	28.1	28.1	28.0	27.9	27.9	27.8
0.930	27.8	27.7	27.6	27.6	27.5	27.4	27.4	27.3	27.3	27.2
0.940	27.1	27.1	27.0	26.9	26.9	26.8	26.8	26.7	26.6	26.6
0.950	26.5	26.5	26.4	26.3	26.3	26.2	26.2	26.1	26.1	26.0
0.960	25.9	25.9	25.8	25.8	25.7	25.6	25.6	25.5	25.5	25.4
0.970	25.4	25.3	25.3	25.2	25.1	25.1	25.0	25.0	24.9	24.9
0.980	24.8	24.8	24.7	24.7	24.6	24.5	24.5	24.4	24.4	24.3
0.990	24.3	24.2	24.2	24.1	24.1	24.0	24.0	23.9	23.9	23.8
1.000	23.8	23.7	23.7	23.6	23.6	23.5	23.5	23.4	23.4	23.3
1.010	23.3	23.2	23.2	23.1	23.1	23.0	23.0	22.9	22.9	22.8
1.020	22.8	22.7	22.7	22.6	22.6	22.5	22.5	22.4	22.4	22.3
1.030	22.3	22.2	22.2	22.1	22.1	22.1	22.0	22.0	21.9	21.9

TABLE 15 (concluded)

Diameter of ball = 2 mm   **Load = 20 kgf**   **F/D² = 5**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
1.040	21.8	21.8	21.7	21.7	21.6	21.6	21.6	21.5	21.5	21.4
1.050	21.4	21.3	21.3	21.2	21.2	21.2	21.1	21.1	21.0	21.0
1.060	20.9	20.9	20.9	20.8	20.8	20.8	20.7	20.7	20.6	20.6
1.070	20.5	20.5	20.4	20.4	20.3	20.3	20.3	20.2	20.2	20.1
1.080	20.1	20.1	20.0	20.0	19.9	19.9	19.9	19.8	19.8	19.7
1.090	19.7	19.7	19.6	19.6	19.5	19.5	19.5	19.4	19.4	19.3
1.100	19.3	19.3	19.2	19.2	19.2	19.1	19.1	19.0	19.0	19.0
1.110	18.9	18.9	18.9	18.8	18.8	18.7	18.7	18.7	18.6	18.6
1.120	18.6	18.5	18.5	18.5	18.4	18.4	18.3	18.3	18.3	18.2
1.130	18.2	18.2	18.1	18.1	18.1	18.0	18.0	18.0	17.9	17.9
1.140	17.8	17.8	17.8	17.7	17.7	17.7	17.6	17.6	17.6	17.5
1.150	17.5	17.5	17.4	17.4	17.4	17.3	17.3	17.3	17.2	17.2
1.160	17.2	17.1	17.1	17.1	17.0	17.0	17.0	16.9	16.9	16.9
1.170	16.8	16.8	16.8	16.7	16.7	16.7	16.7	16.6	16.6	16.6
1.180	16.5	16.5	16.5	16.4	16.4	16.4	16.3	16.3	16.3	16.2
1.190	16.2	16.2	16.2	16.1	16.1	16.1	16.0	16.0	16.0	15.9
1.200	15.9	...	—	—	...	—	—	—	—	

TABLE 16

Diameter of ball = 2 mm   **Load = 4 kgf**   **F/D² = 1**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.500	20.0	20.0	19.9	19.8	19.7	19.6	19.6	19.5	19.4	19.3
0.510	19.3	19.2	19.1	19.0	19.0	18.9	18.8	18.7	18.7	18.6
0.520	18.5	18.4	18.4	18.3	18.2	18.2	18.1	18.0	17.9	17.9
0.530	17.8	17.7	17.7	17.6	17.5	17.5	17.4	17.3	17.3	17.2
0.540	17.1	17.1	17.0	16.9	16.9	16.8	16.8	16.7	16.6	16.6
0.550	16.5	16.5	16.4	16.3	16.3	16.2	16.2	16.1	16.0	16.0
0.560	15.9	15.9	15.8	15.7	15.7	15.6	15.6	15.5	15.5	15.4
0.570	15.4	15.3	15.2	15.2	15.1	15.1	15.0	15.0	14.9	14.9
0.580	14.8	14.8	14.7	14.7	14.6	14.6	14.5	14.5	14.4	14.4
0.590	14.3	14.3	14.2	14.2	14.1	14.1	14.0	14.0	13.9	13.9
0.600	13.8	13.8	13.7	13.7	13.6	13.6	13.5	13.5	13.5	13.4
0.610	13.4	13.3	13.3	13.2	13.2	13.1	13.1	13.1	13.0	13.0
0.620	12.9	12.9	12.8	12.8	12.8	12.7	12.7	12.6	12.6	12.5
0.630	12.5	12.5	12.4	12.4	12.3	12.3	12.3	12.2	12.2	12.1
0.640	12.1	12.1	12.0	12.0	12.0	11.9	11.9	11.8	11.8	11.8
0.650	11.7	11.7	11.7	11.6	11.6	11.5	11.5	11.5	11.4	11.4
0.660	11.4	11.3	11.3	11.3	11.2	11.2	11.2	11.1	11.1	11.1
0.670	11.0	11.0	11.0	10.9	10.9	10.9	10.8	10.8	10.8	10.7
0.680	10.7	10.7	10.6	10.6	10.6	10.5	10.5	10.5	10.4	10.4
0.690	10.4	10.3	10.3	10.3	10.2	10.2	10.2	10.2	10.1	10.1
0.700	10.1	10.0	10.0	9.98	9.95	9.92	9.89	9.86	9.83	9.80
0.710	9.77	9.75	9.72	9.69	9.66	9.63	9.61	9.58	9.55	9.52
0.720	9.50	9.47	9.44	9.41	9.39	9.36	9.33	9.31	9.28	9.25
0.730	9.23	9.20	9.18	9.15	9.12	9.10	9.07	9.05	9.02	9.00
0.740	8.97	8.95	8.92	8.90	8.87	8.85	8.82	8.80	8.77	8.75
0.750	8.72	8.70	8.68	8.65	8.63	8.60	8.58	8.56	8.53	8.51
0.760	8.49	8.46	8.44	8.42	8.39	8.37	8.35	8.33	8.30	8.28

TABLE 16 *(concluded)*

Diameter of ball = 2 mm　　　　　　　　**Load = 4 kgf**　　　　　　　　**F/D² = 1**

Diameter of indentation mm	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.770	8.26	8.24	8.21	8.19	8.17	8.15	8.13	8.10	8.08	8.06
0.780	8.04	8.02	8.00	7.98	7.95	7.93	7.91	7.89	7.87	7.85
0.790	7.83	7.81	7.79	7.77	7.75	7.73	7.71	7.69	7.67	7.65
0.800	7.63	7.61	7.59	7.57	7.55	7.53	7.51	7.49	7.47	7.45
0.810	7.43	7.41	7.39	7.37	7.35	7.33	7.32	7.30	7.28	7.26
0.820	7.24	7.22	7.20	7.19	7.17	7.15	7.13	7.11	7.10	7.08
0.830	7.06	7.04	7.02	7.01	6.99	6.97	6.95	6.94	6.92	6.90
0.840	6.88	6.87	6.85	6.83	6.82	6.80	6.78	6.77	6.75	6.73
0.850	6.71	6.70	6.68	6.67	6.65	6.63	6.62	6.60	6.58	6.57
0.860	6.55	6.54	6.52	6.50	6.49	6.47	6.46	6.44	6.42	6.41
0.870	6.39	6.38	6.36	6.35	6.33	6.32	6.30	6.29	6.27	6.26
0.880	6.24	6.23	6.21	6.20	6.18	6.17	6.15	6.14	6.12	6.11
0.890	6.09	6.08	6.06	6.05	6.04	6.02	6.01	5.99	5.98	5.97
0.900	5.95	5.94	5.92	5.91	5.90	5.88	5.87	5.85	5.84	5.83
0.910	5.81	5.80	5.79	5.77	5.76	5.75	5.73	5.72	5.71	5.69
0.920	5.68	5.67	5.65	5.64	5.63	5.61	5.60	5.59	5.58	5.56
0.930	5.55	5.54	5.53	5.51	5.50	5.49	5.48	5.46	5.45	5.44
0.940	5.43	5.41	5.40	5.39	5.38	5.36	5.35	5.34	5.33	5.32
0.950	5.30	5.29	5.28	5.27	5.26	5.25	5.23	5.22	5.21	5.20
0.960	5.19	5.18	5.16	5.15	5.14	5.13	5.12	5.11	5.10	5.08
0.970	5.07	5.06	5.05	5.04	5.03	5.02	5.01	5.00	4.98	4.97
0.980	4.96	4.95	4.94	4.93	4.92	4.91	4.90	4.89	4.88	4.87
0.990	4.86	4.85	4.83	4.82	4.81	4.80	4.79	4.78	4.77	4.76
1.000	4.75	4.74	4.73	4.72	4.71	4.70	4.69	4.68	4.67	4.66
1.010	4.65	4.64	4.63	4.62	4.61	4.60	4.59	4.58	4.57	4.56
1.020	4.55	4.54	4.53	4.52	4.51	4.51	4.50	4.49	4.48	4.47
1.030	4.46	4.45	4.44	4.43	4.42	4.41	4.40	4.39	4.38	4.37
1.040	4.37	4.36	4.35	4.34	4.33	4.32	4.31	4.30	4.29	4.28
1.050	4.28	4.27	4.26	4.25	4.24	4.23	4.22	4.21	4.21	4.20
1.060	4.19	4.18	4.17	4.16	4.15	4.15	4.14	4.13	4.12	4.11
1.070	4.10	4.09	4.09	4.08	4.07	4.06	4.05	4.05	4.04	4.03
1.080	4.02	4.01	4.00	4.00	3.99	3.98	3.97	3.96	3.96	3.95
1.090	3.94	3.93	3.92	3.92	3.91	3.90	3.89	3.89	3.88	3.87
1.100	3.86	3.85	3.85	3.84	3.83	3.82	3.82	3.81	3.80	3.79
1.110	3.79	3.78	3.77	3.76	3.76	3.75	3.74	3.73	3.73	3.72
1.120	3.71	3.70	3.70	3.69	3.68	3.68	3.67	3.66	3.65	3.65
1.130	3.64	3.63	3.63	3.62	3.61	3.60	3.60	3.59	3.58	3.58
1.140	3.57	3.56	3.56	3.55	3.54	3.53	3.53	3.52	3.51	3.51
1.150	3.50	3.49	3.49	3.48	3.47	3.47	3.46	3.45	3.45	3.44
1.160	3.43	3.43	3.42	3.41	3.41	3.40	3.39	3.39	3.38	3.38
1.170	3.37	3.36	3.36	3.35	3.34	3.34	3.33	3.32	3.32	3.31
1.180	3.31	3.30	3.29	3.29	3.28	3.27	3.27	3.26	3.26	3.25
1.190	3.24	3.24	3.23	3.23	3.22	3.21	3.21	3.20	3.20	3.19
1.200	3.18	—	—	—	—	—	—	—	—	—