

BRITISH STANDARD 427 : Part 1 : 1961

UDC 620.178.152.3 : 669

CONFIRMED DECEMBER 1981

METHOD FOR VICKERS HARDNESS TEST

Part 1. Testing of metals

BRITISH STANDARDS INSTITUTION

METHOD FOR VICKERS HARDNESS TEST

Part 1. Testing of metals

B.S. 427 : Part 1 : 1961

Incorporating amendment issued October 1982 (AMD 4071)

CONFIRMED DECEMBER 1981

BRITISH STANDARDS INSTITUTION

Incorporated by Royal Charter

2 PARK STREET, LONDON, W1A 2BS

Telex: 266934

Telephone: 01-629 9000

B.S. 427 : Part 1 : 1961

THIS BRITISH STANDARD, having been approved by the Mechanical Engineering Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 18th October, 1961.

First published November, 1931.

First revision October, 1961.

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 9,000, fully indexed and with a note of the contents of each, will be found in the BSI Catalogue which may be purchased from BSI Sales Department. The Catalogue may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

- B.S. 350. Conversion factors and tables. Part 1. Basis of tables.
Conversion factors.
- B.S. 427. Vickers hardness test. Part 2. Verification of the testing machine.
- B.S. 485. Tests on thin metal sheet and strip (not exceeding 0.128 in. (10 S.W.G.) in thickness).
- B.S. 860. Table of approximate comparison of hardness scales.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following B.S.I. references relate to the work on this standard:
Committee reference MEE/37, MEE/37/9.
Draft for comment AA(MEE) 2962.

CONTENTS

	Page
Co-operating organizations	4
Foreword	5

METHOD OF TEST

1. Definition of Vickers hardness	5
2. Symbols	6
3. Tables of hardness values	7
4. Load	7
5. Application of load	7
6. Indenter	7
7. Measurement of indentation	8
8. Test piece	8
9. Recommendations	9

APPENDICES

A. Tables of Vickers hardness (HV) values for use in tests made on flat surfaces	10
B. Tables of correction factors for use in tests made on spherical or cylindrical surfaces	46
C. Minimum thickness of test specimens	50

FIGURES

1. Form of indentation	6
2. Tip of indenter	8
3. Graph showing change of hardness for 0.001 mm change in mean diagonal for different loads at different levels of hardness	45
4. Graph showing recommended minimum thickness of test piece	50

B.S. 427 : Part 1 : 1961

CO-OPERATING ORGANIZATIONS

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Admiralty
 Air Ministry
 Associated Offices' Technical Committee
 Association of Consulting Engineers (Incorporated)
 British Chemical Plant Manufacturers' Association
 British Compressed Air Society
 British Electrical and Allied Manufacturers' Association
 British Engineers' Association
 British Gear Manufacturers' Association
 British Internal Combustion Engine Manufacturers' Association
 *British Iron and Steel Federation
 British Railways, The British Transport Commission
 Crown Agents for Oversea Governments and Administrations
 *D.S.I.R. National Engineering Laboratory
 Electricity Council, The Generating Board and the Area Boards in England and Wales
 Engineering Equipment Users' Association
 Gas Council
 High Commission of India
 Institute of Marine Engineers
 Institute of Petroleum
 Institution of Civil Engineers
 Institution of Gas Engineers
 Institution of Heating and Ventilating Engineers
 Institution of Mechanical Engineers
 Institution of Mechanical Engineers (Automobile Division)
 *Institution of Production Engineers
 Locomotive and Allied Manufacturers' Association of Great Britain
 Machine Tool Trades Association
 Ministry of Labour (Factory Inspectorate)
 Ministry of Power
 Ministry of Transport
 Ministry of Works
 National Coal Board
 *National Physical Laboratory (D.S.I.R.)
 Radio Industry Council
 *War Office

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this standard:

Alloy Steels Association
 Aluminium Development Association
 Aluminium Industry Council
 British Cast Iron Research Association
 British Non-ferrous Metals Federation
 British Non-ferrous Metals Research Association
 Copper Development Association
 D.S.I.R.—Building Research Station
 D.S.I.R.—Forest Products Laboratory
 Gauge and Tool Makers Association
 Institute of Metals
 Institute of Sheet Metal Engineering
 Institute of Welding
 Institution of Engineering Inspection
 Iron and Steel Institute
 Ministry of Aviation
 Post Office
 Society of Motor Manufacturers and Traders
 Individual Manufacturers of Testing Machines

BRITISH STANDARD METHOD FOR VICKERS HARDNESS TEST

Part 1. Testing of metals

FOREWORD

The purpose of this British Standard is to define the test requirements and procedure for carrying out the Vickers hardness test at ordinary temperature. During the revision of the standard full consideration has been given to the corresponding documents prepared by Technical Committees of the International Organization for Standardization (ISO). The title of the standard, which was originally Diamond Pyramid Hardness Numbers, has been changed so as to restrict the use of the standard to the 136° pyramid. The new title is in agreement with the nomenclature adopted by the ISO, and the requirements laid down in the standard are not less exacting than the corresponding recommendations of the ISO.

Part 1 of this standard is intended to meet the general needs of industrial hardness measurement of both ferrous and non-ferrous metals by the Vickers principle for loads in the range 1 to 100 kilogrammes-force, including tests of thin metal sheet and strip which were formerly dealt with in B.S. 485 : 1934.

To facilitate the use of the standard, tables of hardness values applicable to tests made on flat surfaces with loads of 1, 2.5, 5, 10, 20, 30, 50 and 100 kilogrammes-force have been provided together with tables giving the correction factors necessary when tests are carried out on spherical or cylindrical surfaces and guidance concerning the minimum thickness of test pieces.

The accurate measurement of hardness calls for skill and precision and it is hoped that the recommendations included in the standard will be helpful.

Part 2 of this standard deals with the verification of testing machines used for measuring Vickers hardness and with the calibration of standard Vickers hardness blocks.

METHOD OF TEST

DEFINITION OF VICKERS HARDNESS

1. A diamond indenter, in the form of a right pyramid with a square base and an angle of 136° between opposite faces, is forced into the material under a load F (Fig. 1). The two diagonals, d_1 and d_2 , of the indentation left in the surface of the material after removal of the load are measured and their arithmetic mean d calculated. The area of the sloping surface of the indentation

is calculated, the indentation being considered as a right pyramid with a square base of diagonal d and a vertex angle of 136° .

The Vickers hardness is the quotient obtained by dividing the load F , expressed in kilogrammes-force, by the sloping area of the indentation expressed in square millimetres.

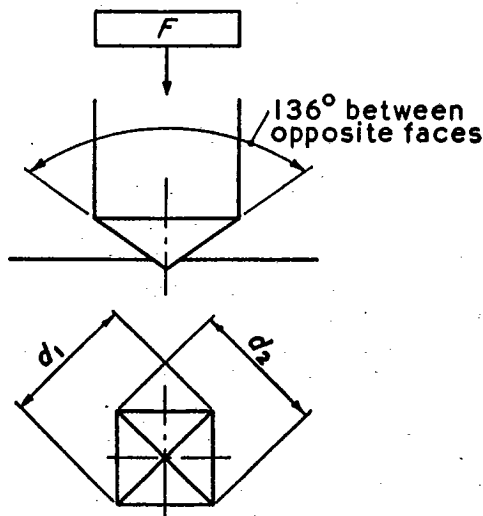


Fig. 1 Form of Indentation

SYMBOLS

2. The symbols used are as follows:

F = Load in kilogrammes-force (kgf).

d = Arithmetic mean of the two diagonals, d_1 and d_2 , in millimetres (mm).

HV = Vickers hardness

$$\begin{aligned} &= \frac{2F \sin \frac{136^\circ}{2}}{d^2} \\ &= 1.854 \frac{F}{d^2} \text{ approximately.} \end{aligned}$$

NOTE 1. The kilogramme-force is that force which, acting alone on a mass of one kilogramme, will impart to it the international standard acceleration 980.665 cm/s^2 (see B.S. 350, Part 1, Section One (2) a.)

NOTE 2. The symbol HV is supplemented by a number indicating the load used in the test. Thus, HV 30 indicates that the Vickers hardness was measured with a load of 30 kgf.

TABLES OF HARDNESS VALUES

3. When the mean diagonal of the indentation has been determined the Vickers hardness may be computed by means of the formula given in Clause 2. It is convenient, however, to use tables and such tables, calculated from the formula

$$HV = \frac{2F \sin \frac{136^\circ}{2}}{d^2}$$

without regard to the limitations imposed by practical conditions, are given in Appendix A.

The tables have been prepared for certain selected loads, i.e. 1, 2.5, 5, 10, 20, 30, 50 and 100 kgf, and when these loads are used the required hardness values may be obtained by direct reference to the tables.

The tables in Appendix A apply to hardness tests in which the indentations are made in flat surfaces. When the surface is of spherical or cylindrical form a correction should be applied, the magnitude of which depends on the diagonal of the indentation in relation to the curvature of the surface. Tables giving the correction factors applicable when tests are made on convex and concave surfaces, for both spherical and cylindrical forms, are reproduced as Appendix B.

LOAD

4. *a.* The selected load shall lie within the range 1 to 100 kgf.
- b.* The tolerance on the load shall be ± 0.5 per cent.

APPLICATION OF LOAD

5. *a.* The load shall be applied along the axis of the indenter and normal to the surface of the test piece.
- b.* The mechanism controlling the application of the load shall ensure that the indenter is forced into the test piece without shock or vibration.
- c.* The full load shall be maintained for 10 to 15 seconds and then removed without distorting the indentation.

INDENTER

6. *a.* The indenter shall be a diamond in the form of a right pyramid with a square base rigidly mounted in a suitable holder.
- b.* The angle between opposite faces of the diamond pyramid shall be $136 \pm 0.3^\circ$.
- c.* Each of the four angles in a section normal to the axis of the diamond pyramid shall be $90 \pm 0.5^\circ$.

*As amended
Oct., 1982*

B.S. 427 : Part 1 : 1961

d. All four faces of the diamond pyramid shall meet in a point. This requirement is satisfied if the line of junction between opposite faces (Fig. 2) is less than 0.002 mm.

*As amended
Oct., 1982*

e. The inclination of the axis of the diamond pyramid to the axis of the indenter (normal to the seating surface) shall be less than 0.3° .

f. The diamond pyramid shall be well polished and free from cracks or other surface defects (see Clause 9 c).

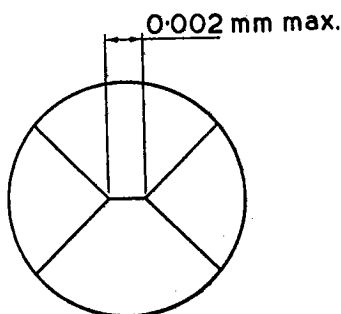


Fig. 2. Tip of Indenter

MEASUREMENT OF INDENTATION

7. *a.* The measuring microscope or other measuring device used for measuring the diagonals of the indentation shall be graduated to read directly to 0.001 mm or less.

b. The microscope shall permit the intervals of a calibrated stage micrometer to be measured to the following accuracy:

Intervals up to and including 0.2 mm: ± 0.001 mm.

Intervals exceeding 0.2 mm: ± 0.5 per cent.

TEST PIECE

8. *a.* The surface finish of the test piece shall be such as to permit accurate measurement of the diagonals of the indentation.

NOTE. Precautions should be taken to ensure that the surface tested is representative and that its hardness is not affected by any unsuitable machining, grinding or polishing process applied to it.

b. The thickness of the test piece or of the layer under test shall be at least 1.5 times the diagonal of the indentation (see Clause 9 e and Appendix C).

c. The test piece shall be rigidly supported so that the surface to be indented is at right angles to the axis of the indenter.

d. The distance between the centre of any indentation and any edge of the test piece or edge of any other indentation shall be not less than 2.5 times the diagonal of the indentation.

RECOMMENDATIONS

9. a. The testing machine should not be sited in gritty or dusty conditions nor in a position subject to vibration or excessive temperature changes.

b. The testing machine should be frequently checked by means of standardized blocks (see B.S. 427 : Part 2*).

c. Periodic examination of the indenter for surface defects is strongly recommended. These are clearly reproduced in the indentations and can be detected by carefully scrutinizing an indentation whilst viewing it through the measuring microscope.

d. Where the Vickers hardness test is carried out to ascertain the surface hardness of surface-hardened metals, it is recommended that several indentations should be made with decreasing loads until substantially the same hardness value is given by two successive loads.

e. When testing metal in thin sheet or strip form, special care is required if erroneous hardness values are to be avoided. If the requirement as to thickness laid down in Clause 8 *b* is satisfied, it is unlikely that hardness measurements on either ferrous or non-ferrous metals will be faulty provided the under surface of the test piece is smooth and in intimate contact with the supporting anvil. If, in particular circumstances, it becomes necessary to accept a ratio of thickness to diagonal of less than 1.5, the hardness value may depend on the load and on the size and hardness of the anvil, and a special investigation may be needed to establish what influence these factors exert on the true hardness as obtained from thicker test pieces.

f. To achieve maximum accuracy, the load should be reasonably large having regard to the composition, treatment and dimensions of the test piece.

Although a maximum load of 30 kgf is generally recommended, heavier loads, e.g. 100 kgf, may be desirable to yield average hardness values when testing metals having a coarse structure, but it should be borne in mind that the use of high loads on hard metals tends to reduce the life of the diamond indenter.

g. As there is no general procedure for accurately converting Vickers hardness into other scales of hardness, it is recommended that such conversions should be avoided except for special cases where a reliable basis for the conversion has been established beforehand by direct test on the material concerned.

NOTE. Approximate comparisons of hardness scales are given in B.S. 860, 'Table of approximate comparison of hardness scales'.

* B.S. 427, 'Vickers hardness test', Part 2, 'Verification of the testing machine'.

B.S. 427 : Part 1 : 1961

APPENDIX A

TABLES OF VICKERS HARDNESS VALUES (HV) FOR USE IN
TESTS MADE ON FLAT SURFACES

The following tables, for loads of 1, 2.5, 5, 10, 20, 30, 50 and 100 kgf have been calculated from the formula

$$HV = \frac{2F \sin \frac{136^\circ}{2}}{d^2}$$

without regard to the limitations imposed by practical conditions.

In industrial tests carried out in accordance with this standard, using testing machines in good order, the principal limitation will arise in the measurement of the diagonals of the indentation, and it is unlikely that the accuracy of determination of the mean diagonal will be better than ± 0.001 mm. The corresponding accuracy in the resulting hardness value may be obtained from the graphs reproduced at the end of the tables (Fig. 3) which show the change of hardness value equivalent to a change of 0.001 mm in the length of the mean diagonal for various loads at different levels of hardness.

Load = 1 kgf

TABLE 1

Diagonal of impression mm	0-000	0-001	0-002	0-003	0-004	0-005	0-006	0-007	0-008	0-009
0-03	2060	1930	1811	1703	1604	1514	1431	1355	1284	1219
0-04	1159	1103	1051	1003	958	916	876	839	805	772
0-05	742	713	686	660	636	613	591	571	551	533
0-06	515	498	482	467	453	439	426	413	401	389
0-07	378	368	358	348	339	330	321	313	305	297
0-08	290	283	276	269	263	257	251	245	239	234
0-09	229	224	219	214	210	205	201	197	193	189
0-10	185	182	178	175	171	168	165	162	159	156
0-11	153	151	148	145	143	140	138	135	133	131
0-12	129	127	125	123	121	119	117	115	113	111
0-13	110	108	106	105	103	102	100	98.8	97.4	96.0
0-14	94.6	93.3	92.0	90.7	89.4	88.2	87.0	85.8	84.7	83.5
0-15	82.4	81.3	80.3	79.2	78.2	77.2	76.2	75.2	74.3	73.4
0-16	72.4	71.5	70.7	69.8	68.9	68.1	67.3	66.5	65.7	64.9
0-17	64.2	63.4	62.7	62.0	61.2	60.6	59.9	59.2	58.5	57.9
0-18	57.2	56.6	56.0	55.4	54.8	54.2	53.6	53.0	52.5	51.9
0-19	51.4	50.8	50.3	49.8	49.3	48.8	48.3	47.8	47.3	46.8
0-20	46.4	45.9	45.4	45.0	44.6	44.1	43.7	43.3	42.9	42.5
0-21	42.0	41.7	41.3	40.9	40.5	40.1	39.7	39.4	39.0	38.7
0-22	38.3	38.0	37.6	37.3	37.0	36.6	36.3	36.0	35.7	35.4
0-23	35.1	34.8	34.5	34.2	33.9	33.6	33.3	33.0	32.7	32.5
0-24	32.2	31.9	31.7	31.4	31.1	30.9	30.6	30.4	30.2	29.9
0-25	29.7	29.4	29.2	29.0	28.7	28.5	28.3	28.1	27.9	27.6
0-26	27.4	27.2	27.0	26.8	26.6	26.4	26.2	26.0	25.8	25.6
0-27	25.4	25.2	25.1	24.9	24.7	24.5	24.3	24.2	24.0	23.8
0-28	23.7	23.5	23.3	23.2	23.0	22.8	22.7	22.5	22.4	22.2
0-29	22.0	21.9	21.7	21.6	21.5	21.3	21.2	21.0	20.9	20.7
0-30	20.6	20.5	20.3	20.2	20.1	19.9	19.8	19.7	19.5	19.4
0-31	19.3	19.2	19.0	18.9	18.8	18.7	18.6	18.5	18.3	18.2
0-32	18.1	18.0	17.9	17.8	17.7	17.6	17.4	17.3	17.2	17.1
0-33	17.0	16.9	16.8	16.7	16.6	16.5	16.4	16.3	16.2	16.1
0-34	16.04	15.95	15.85	15.76	15.67	15.58	15.49	15.40	15.31	15.22
0-35	15.14	15.05	14.97	14.88	14.80	14.71	14.63	14.55	14.47	14.39
0-36	14.31	14.23	14.15	14.07	14.00	13.92	13.84	13.77	13.69	13.62
0-37	13.55	13.47	13.40	13.33	13.26	13.19	13.12	13.05	12.98	12.91
0-38	12.84	12.77	12.71	12.64	12.58	12.51	12.45	12.38	12.32	12.25
0-39	12.19	12.13	12.07	12.01	11.95	11.89	11.83	11.77	11.71	11.66
0-40	11.59	11.53	11.47	11.42	11.36	11.31	11.25	11.19	11.14	11.09
0-41	11.03	10.98	10.92	10.87	10.82	10.77	10.72	10.66	10.61	10.56

B.S. 427 : Part 1 : 1961

Load = 1 kgf

TABLE 1 (continued)

Diagonal of impression mm	0-000	0-001	0-002	0-003	0-004	0-005	0-006	0-007	0-008	0-009
0-42	10-51	10-46	10-41	10-36	10-31	10-27	10-22	10-17	10-12	10-08
0-43	10-03	9-98	9-94	9-89	9-85	9-80	9-75	9-71	9-67	9-62
0-44	9-58	9-53	9-49	9-45	9-41	9-36	9-32	9-28	9-24	9-20
0-45	9-16	9-12	9-08	9-04	9-00	8-96	8-92	8-88	8-84	8-80
0-46	8-76	8-73	8-69	8-65	8-61	8-58	8-54	8-50	8-47	8-43
0-47	8-39	8-36	8-32	8-29	8-25	8-22	8-18	8-15	8-12	8-08
0-48	8-05	8-02	7-98	7-95	7-92	7-88	7-85	7-82	7-79	7-75
0-49	7-72	7-69	7-66	7-63	7-60	7-57	7-54	7-51	7-48	7-45
0-50	7-42	7-39	7-36	7-33	7-30	7-27	7-24	7-21	7-19	7-16
0-51	7-13	7-10	7-07	7-05	7-02	6-99	6-96	6-94	6-91	6-88
0-52	6-86	6-83	6-81	6-78	6-75	6-73	6-70	6-68	6-65	6-63
0-53	6-60	6-58	6-55	6-53	6-50	6-48	6-45	6-43	6-41	6-38
0-54	6-36	6-34	6-31	6-29	6-27	6-24	6-22	6-20	6-17	6-15
0-55	6-13	6-11	6-09	6-06	6-04	6-02	6-00	5-98	5-96	5-93
0-56	5-91	5-89	5-87	5-85	5-83	5-81	5-79	5-77	5-75	5-73
0-57	5-71	5-69	5-67	5-65	5-63	5-61	5-59	5-57	5-55	5-53
0-58	5-51	5-49	5-47	5-46	5-44	5-42	5-40	5-38	5-36	5-35
0-59	5-33	5-31	5-29	5-27	5-26	5-24	5-22	5-20	5-19	5-17
0-60	5-15	5-13	5-12	5-10	5-08	5-07	5-05	5-03	5-02	5-00

Load = 2.5 kgf

TABLE 2

Diagonal of impression mm	0-000	0-001	0-002	0-003	0-004	0-005	0-006	0-007	0-008	0-009
0-04	2897	2758	2628	2507	2395	2289	2191	2099	2012	1931
0-05	1854	1782	1714	1650	1590	1533	1478	1427	1378	1332
0-06	1288	1246	1206	1168	1132	1097	1064	1033	1003	974
0-07	946	920	894	870	847	824	803	782	762	743
0-08	724	707	689	673	657	642	627	612	599	585
0-09	572	560	548	536	525	514	503	493	483	473
0-10	464	454	446	437	429	420	413	405	397	390
0-11	383	376	370	363	357	351	345	339	333	327
0-12	322	317	311	306	302	297	292	287	283	279
0-13	274	270	266	262	258	254	251	247	243	240
0-14	237	233	230	227	224	220	217	215	212	209
0-15	206	203	201	198	195	193	190	188	186	183
0-16	181	179	177	174	172	170	168	166	164	162
0-17	160	159	157	155	153	151	150	148	146	145
0-18	143	142	140	138	137	135	134	133	131	130
0-19	128	127	126	124	123	122	121	119	118	117
0-20	116	115	114	112	111	110	109	108	107	106
0-21	105	104	103	102	101	100	99.4	98.5	97.5	96.7
0-22	95.8	94.9	94.1	93.2	92.4	91.6	90.8	90.0	89.2	88.4
0-23	87.6	86.9	86.1	85.4	84.7	83.9	83.2	82.5	81.8	81.2
0-24	80.5	79.8	79.2	78.5	77.9	77.2	76.6	76.0	75.4	74.8
0-25	74.2	73.6	73.0	72.4	71.9	71.3	70.7	70.2	69.6	69.1
0-26	68.6	68.1	67.5	67.0	66.5	66.0	65.5	65.0	64.5	64.1
0-27	63.6	63.1	62.7	62.2	61.7	61.3	60.9	60.4	60.0	59.6
0-28	59.1	58.7	58.3	57.9	57.5	57.1	56.7	56.3	55.9	55.5
0-29	55.1	54.7	54.4	54.0	53.6	53.3	52.9	52.6	52.2	51.9
0-30	51.5	51.2	50.8	50.5	50.2	49.8	49.5	49.2	48.9	48.6
0-31	48.2	47.9	47.6	47.3	47.0	46.7	46.4	46.1	45.8	45.6
0-32	45.3	45.0	44.7	44.4	44.2	43.9	43.6	43.4	43.1	42.8
0-33	42.6	42.3	42.1	41.8	41.6	41.3	41.1	40.8	40.6	40.3
0-34	40.1	39.9	39.6	39.4	39.2	38.9	38.7	38.5	38.3	38.1
0-35	37.8	37.6	37.4	37.2	37.0	36.8	36.6	36.4	36.2	36.0
0-36	35.8	35.6	35.4	35.2	35.0	34.8	34.6	34.4	34.2	34.0
0-37	33.9	33.7	33.5	33.3	33.1	33.0	32.8	32.6	32.4	32.3
0-38	32.1	31.9	31.8	31.6	31.4	31.3	31.1	31.0	30.8	30.6
0-39	30.5	30.3	30.2	30.0	29.9	29.7	29.6	29.4	29.3	29.1
0-40	29.0	28.8	28.7	28.5	28.4	28.3	28.1	28.0	27.8	27.7
0-41	27.6	27.4	27.3	27.2	27.0	26.9	26.8	26.7	26.5	26.4
0-42	26.3	26.2	26.0	25.9	25.8	25.7	25.5	25.4	25.3	25.2

B.S. 427 : Part 1 : 1961

Load = 2.5 kgf

TABLE 2 (continued)

Diagonal of Impression mm	0-000	0-001	0-002	0-003	0-004	0-005	0-006	0-007	0-008	0-009
0.43	25.1	25.0	24.8	24.7	24.6	24.5	24.4	24.3	24.2	24.1
0.44	23.9	23.8	23.7	23.6	23.5	23.4	23.3	23.2	23.1	23.0
0.45	22.9	22.8	22.7	22.6	22.5	22.4	22.3	22.2	22.1	22.0
0.46	21.9	21.8	21.7	21.6	21.5	21.4	21.35	21.26	21.17	21.08
0.47	20.99	20.90	20.81	20.72	20.63	20.55	20.46	20.38	20.29	20.21
0.48	20.12	20.04	19.95	19.87	19.79	19.71	19.63	19.55	19.47	19.39
0.49	19.31	19.23	19.15	19.07	19.00	18.92	18.84	18.77	18.69	18.62
0.50	18.54	18.47	18.40	18.32	18.25	18.18	18.11	18.04	17.96	17.89
0.51	17.82	17.75	17.68	17.62	17.55	17.48	17.41	17.34	17.28	17.21
0.52	17.14	17.08	17.01	16.95	16.88	16.82	16.76	16.69	16.63	16.57
0.53	16.50	16.44	16.38	16.32	16.26	16.20	16.14	16.08	16.02	15.96
0.54	15.90	15.84	15.78	15.72	15.67	15.61	15.55	15.49	15.44	15.38
0.55	15.33	15.27	15.21	15.16	15.10	15.05	15.00	14.94	14.89	14.84
0.56	14.78	14.73	14.68	14.63	14.57	14.52	14.47	14.42	14.37	14.32
0.57	14.27	14.22	14.17	14.12	14.07	14.02	13.97	13.92	13.88	13.83
0.58	13.78	13.73	13.69	13.64	13.59	13.55	13.50	13.45	13.41	13.36
0.59	13.32	13.27	13.23	13.18	13.14	13.09	13.05	13.01	12.96	12.92
0.60	12.88	12.83	12.79	12.75	12.71	12.67	12.62	12.58	12.54	12.50
0.61	12.46	12.42	12.38	12.34	12.30	12.26	12.22	12.18	12.14	12.10
0.62	12.06	12.02	11.98	11.94	11.91	11.87	11.83	11.79	11.75	11.72
0.63	11.68	11.64	11.61	11.57	11.53	11.50	11.46	11.43	11.39	11.35
0.64	11.32	11.28	11.25	11.21	11.18	11.14	11.11	11.07	11.04	11.01
0.65	10.97	10.94	10.91	10.87	10.84	10.81	10.77	10.74	10.71	10.67
0.66	10.64	10.61	10.58	10.55	10.51	10.48	10.45	10.42	10.39	10.36
0.67	10.33	10.30	10.27	10.24	10.21	10.17	10.14	10.11	10.09	10.06
0.68	10.03	10.00	9.97	9.94	9.91	9.88	9.85	9.82	9.79	9.77
0.69	9.74	9.71	9.68	9.65	9.63	9.60	9.57	9.54	9.52	9.49
0.70	9.46	9.43	9.41	9.38	9.35	9.33	9.30	9.27	9.25	9.22
0.71	9.20	9.17	9.14	9.12	9.09	9.07	9.04	9.02	8.99	8.97
0.72	8.94	8.92	8.89	8.87	8.84	8.82	8.80	8.77	8.75	8.72
0.73	8.70	8.68	8.65	8.63	8.60	8.58	8.56	8.53	8.51	8.49
0.74	8.47	8.44	8.42	8.40	8.38	8.35	8.33	8.31	8.29	8.26
0.75	8.24	8.22	8.20	8.18	8.15	8.13	8.11	8.09	8.07	8.05
0.76	8.03	8.01	7.98	7.96	7.94	7.92	7.90	7.88	7.86	7.84
0.77	7.82	7.80	7.78	7.76	7.74	7.72	7.70	7.68	7.66	7.64
0.78	7.62	7.60	7.58	7.56	7.54	7.52	7.50	7.48	7.47	7.45
0.79	7.43	7.41	7.39	7.37	7.35	7.34	7.32	7.30	7.28	7.26
0.80	7.24	7.23	7.21	7.19	7.17	7.15	7.14	7.12	7.10	7.08
0.81	7.07	7.05	7.03	7.01	7.00	6.98	6.96	6.95	6.93	6.91

B.S. 427 : Part 1 : 1961

Load = 2.5 kgf

TABLE 2 (continued)

Diagonal of impression mm	0-000	0-001	0-002	0-003	0-004	0-005	0-006	0-007	0-008	0-009
0-82	6-89	6-88	6-86	6-84	6-83	6-81	6-79	6-78	6-76	6-75
0-83	6-73	6-71	6-70	6-68	6-67	6-65	6-63	6-62	6-60	6-59
0-84	6-57	6-55	6-54	6-52	6-51	6-49	6-48	6-46	6-45	6-43
0-85	6-42	6-40	6-39	6-37	6-36	6-34	6-33	6-31	6-30	6-28
0-86	6-27	6-25	6-24	6-22	6-21	6-20	6-18	6-17	6-15	6-14
0-87	6-12	6-11	6-10	6-08	6-07	6-06	6-04	6-03	6-01	6-00
0-88	5-99	5-97	5-96	5-95	5-93	5-92	5-91	5-89	5-88	5-87
0-89	5-85	5-84	5-83	5-81	5-80	5-79	5-77	5-76	5-75	5-74
0-90	5-72	5-71	5-70	5-69	5-67	5-66	5-65	5-64	5-62	5-61
0-91	5-60	5-59	5-57	5-56	5-55	5-54	5-53	5-51	5-50	5-49
0-92	5-48	5-47	5-45	5-44	5-43	5-42	5-41	5-39	5-38	5-37
0-93	5-36	5-35	5-34	5-33	5-31	5-30	5-29	5-28	5-27	5-26
0-94	5-25	5-24	5-22	5-21	5-20	5-19	5-18	5-17	5-16	5-15
0-95	5-14	5-13	5-12	5-10	5-09	5-08	5-07	5-06	5-05	5-04
0-96	5-03	5-02	5-01	5-00	4-99	4-98	4-97	4-96	4-95	4-94