OPERATION MANUAL

BMS BULUT® MAKİNA
SANAYİ VE TİCARET LTD. ŞTİ.

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BMS 200-RBOV

ROCKWELL, BRINELL&VICKERS HARDNESS TESTER

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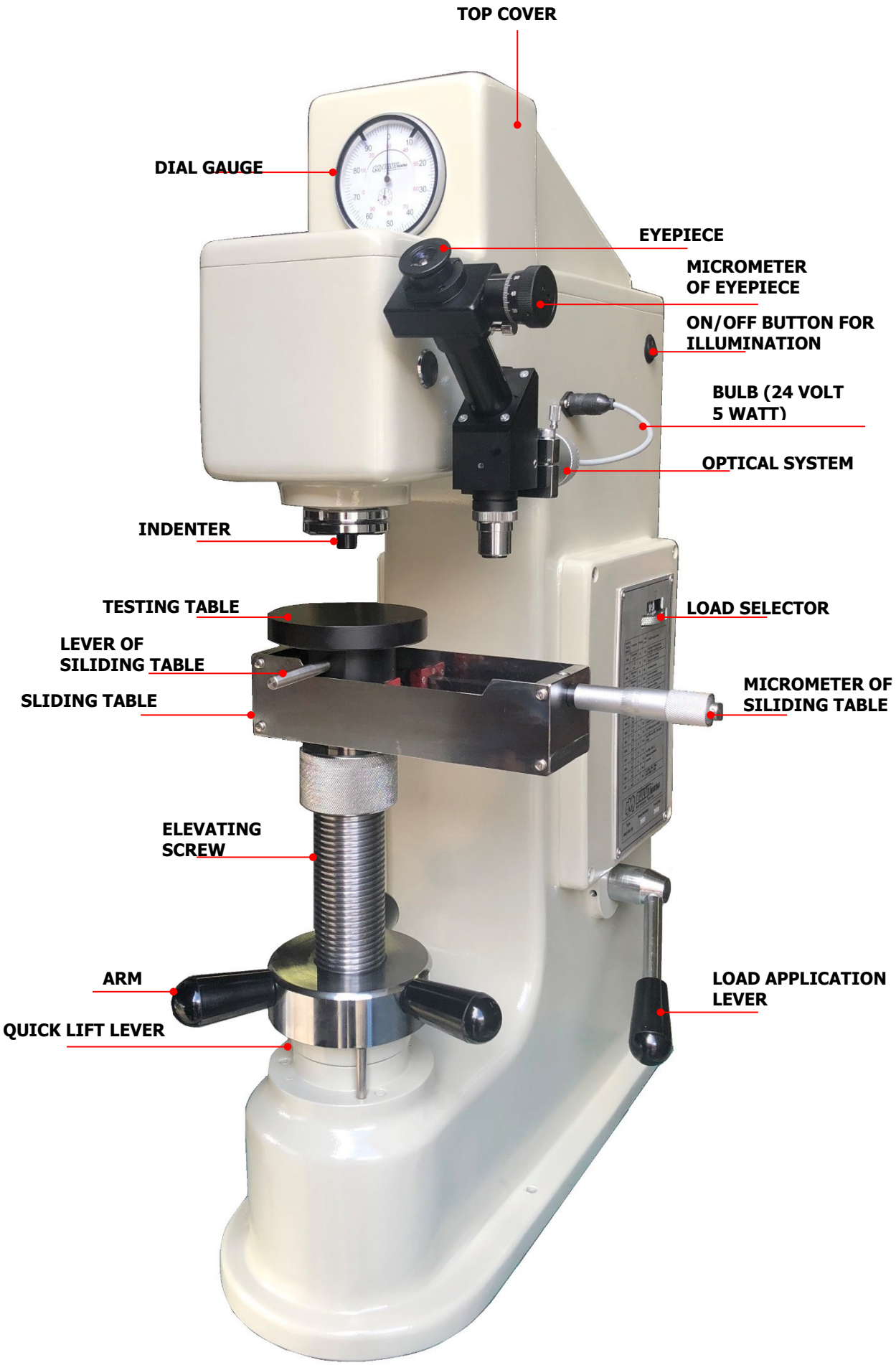

TOP COVER
DIAL GAUGE
EYEPIECE
MICROMETER OF EYEPIECE
ON/OFF BUTTON FOR ILLUMINATION
BULB (24 VOLT 5 WATT)
OPTICAL SYSTEM
INDENTER
TESTING TABLE
LOAD SELECTOR
LEVER OF SILIDING TABLE
SLIDING TABLE
MICROMETER OF SILIDING TABLE
ELEVATING SCREW
ARM
LOAD APPLICATION LEVER
QUICK LIFT LEVER

1 Technical Features

Pre-load (kgf)	***10***
Test Loads (kgf)	***60, 100, 150 (Rockwell), 62.5, 187.5 (Brinell), 30 (Vickers).***
Load Selection	***By load selector disc***
Test Method	***Rockwell, Brinell, Vickers***
Load Application	***Hydraulic***
Magn.of measuring microscope	***75xBrinell 150xVickers***
Max Test Height	***With sliding table 140 mm Without sliding table 240 mm***
Depth of Throat	***145 mm***
Machine Dimensions	***780x490x170 mm***
Case Dimensions	***950x700x350 mm***
Weight (net/gross)	***95 / 125 kg***
Power Supply	***220V, 50HZ***

2 Standart Accessories

Rockwell Diamond Indenter : 1
Vickers Pyramid Indenter : 1
1/16" Ball Indentor : 1
2,5mm Ball Indentor : 1
HRC Test Block : 1
HRB Test Block : 1
HB 2,5/187,5 Test Block : 1
Flat Testing Table : 1
V Testing Table : 1
Hardness Conversion Table : 1
Case for Accessories : 1
Allen Spanner : 1
Instruction Manual : 1
Calibration Certificate : 1

2.1 Optional Accessories

1/8”, 1/4”, 1/2" ball indenters
250,200,130, 100 mm test tables
Spot testing anvil
Spring loaded clamping device

3 Unpacking Of Equipment

Unscrew fixing steel sheet plates of upper side to wooden base of case and hold up upper side of wooden case by means of carrying handles. Take out two M8 bolts fastening equipment to lower wooden case. Locate equipment on a special table(see drawing of table enclosed) and fasten two M8 bolts by means of eye bull putting on flat testing table.
Open left cover. Take out wooden safety parts. Take out also 3 off M6 bolts of top cover by means of 5 mm special alyen key which is in accessory box. Hold top cover up with care. Pay attention not to touch Rockwell Dial gauge. Take out plastic safety parts. Equipment is now ready for testing.

4 Setting into Operation for Rockwell Hardness Testing

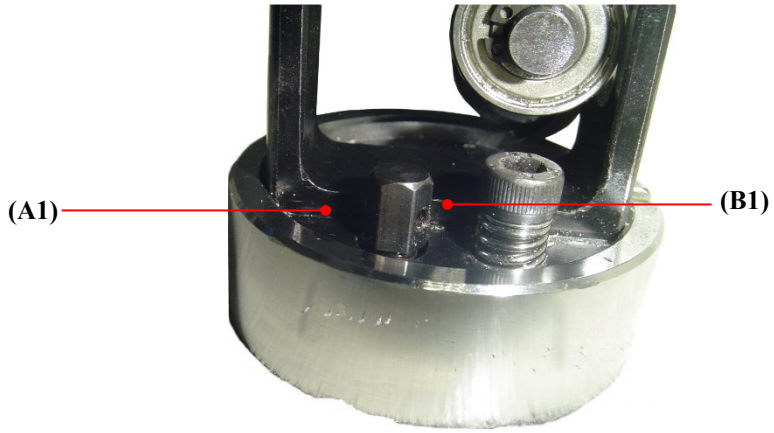
Before starting to test load application lever (KL2) (8) has to be in starting position (see drawing and picture). Locate part to be tested on testing table, Insert indenter to holder (ML3) (5) and choose load by means of load selector disc (VL1) (14) (according to testing method in attached table)

5 Testing

As soon as indenter touches on part, actuating main spindle (ML1)) (12) by means of arms (SM1) (13) Rockwell dial gauge pointers start movement. Keep going until big pointers at “0” and small pointer at 3 in red dot. Now Pre –load is applied. (If big pointer is exceeded by ± 3 points start to test again) Then apply total load application lever
(KL2) (8) to forward (see drawing) and follow movement of big pointer until it stops. Wait 3-5 sec. more. Then take back lever (KL2) (8) to starting position. And read value on display. Black numbers on dial gauge for HRA, HRC and HRD with diamond indenter. Red values for HRB, HRE, HRF etc. with ball indenters.

6 Adjusting Loading Speed

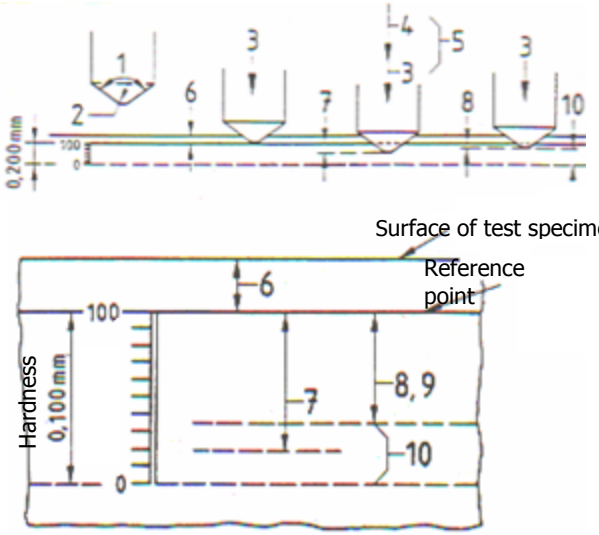
Load application is adjusted by hydraulic system. Hydraulic oil is filled at our works and hydraulic application speed is adjusted at our works. (But, working at extremely high temperatures or during transportation due to wrong handling if oil is reduced you may add some oil again. To do this, open left cover. There are two bolts on hydraulic piston (PS1) Take out bolt on the left (A1). Add some oil (Tellus 37 or similar) While adding oil, you can use load application lever (KL2) (8) forward and backward. This helps oil to settle down easily. You can adjust hydraulic speed, by allen bolt on the right (B1). If you turn this bolt clockwise load application speed is decreased, if you turn anti clockwise it is increased.



7 Rockwell Hardness Testing *(EN 6508-1,ASTM E18)*

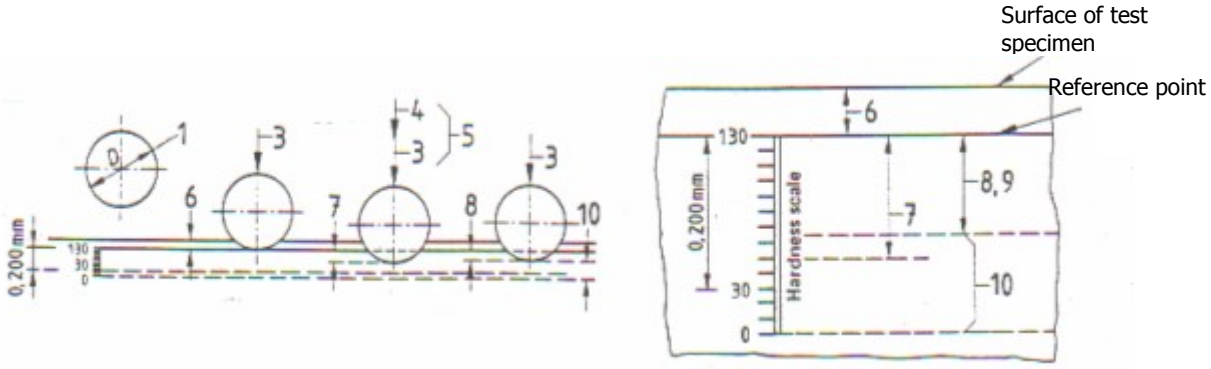
Rockwell Hardness testing method is evaluated from penetration depth of 120° diamond cone or ball indenter with different dias (please refer to table enclosed).

Below application shows working procedures using Rockwell diamond cone (HRC-HRA etc)



Nr	Symbol	Description
1	0	120° Diamond cone
2	0	Radius of diamond tip= 0,2 mm
3	F_0	Pre-Load
4	F_1	Additional Load
5	F	Total load F_0+ F_1
6	t_0	Depth of penetration under pre-load, mm
7	t_1	Depth of penetration under additional load, mm
8	t_b	Increase in depth of penetration from F_1 to F_0, mm
9	e	Equality as of 0,002 mm increase of depth of penetration e= tb / 0,002
10	0	Rockwell hardness = 100-e

Below application shows working procedures using 1/16” ball indenter (HRB etc)



Nr	Symbol	Description
1	D	Ball dia=1/16“ =1,5875 mm
3	F_0	Pre-load
4	F_1	Additional load
5	F	Total load =F_0+F_1
6	t_0	Depth of penetration under pre-load, mm
7	t_1	Depth of penetration under additional load, mm
8	t_b	Increase in depth of penetration from F_1 to F_0, mm
9	e	Equality as of 0,002 mm increase of depth of penetration e= tb / 0,002
10	HRB/HRF	Rockwell hardness= 130-e

8 Brinell Hardness Testing *(EN 6506-1, ASTM E10)*

Brinell hardness testing method is made by different balls depending (for BMS 200-RBOV only 2, 5 mm ball) on material type, thickness and loads applied. Diameters of ball indentations can be evaluated by optical system built-in hardness tester.
Relations with thickness of specimen, ball dia and material shown in related the table

Thickness of material (mm)	Ball dia (mm)	P=30D2 Steel, iron, cast iron	P=10D2 Brass, Bronze, Cupper, Aluminum	P=D2 Soft cupper	P=5D2 Lead
6 mm and up	**10**	**3.000 kgf**	**1.000 kgf**	**500 kgf**	**250 kgf**
3 mm and up	**5**	**750 kgf**	**250 kgf**	**125 kgf**	**62,5 kgf**
1,2 mm and up	**2,5**	**187,5 kgf**	**62,5 kgf**	**31,25 kgf**	**15,625 kgf**
0,5 mm and up	**1**	**30 kgf**	**10 kgf**	**5 kgf**	**-**

9 Setting into Operation for Brinell Hardness Testing

Locate 5X objective (16) on optical system
Before starting to test, load application lever (KL2) (8) has to be in starting position (see drawing and picture) Locate part to be tested on testing table (10), **Moving lever of sliding table (11) to the left , assure testing table (10) to touch stopping bolt.**
Insert 2, 5 mm ball indenter to holder (ML3) (5) and choose load by means of load selector disc (VL1) (14) (according to table shown above)

IMPORTANT: For Brinell and Vickers tests quick lift lever (7) always must be in forward position touching the stop pin.

Apply pre-load and total load as described in Rockwell testing.
Follow movement of big pointer until it stops. Wait 3-5 sec.more.Then take back lever (KL2) (8) to starting position. Move quick lift lever (7) from right to left until it touches stop pin.
Move quick lift lever (7) from right to left until it touches stopping pin.(in this case indenter to be separated from the surface of the part to be tested)
In this case, move the lever of sliding table to the right carefully (11) until testing table touches micrometer.
Observe, ball indentation as per shown in eyepiece of microscope (OP-1)

9.1 Sample of reading indentation

Drawing: OP-2
Adjust, measuring moving line by means of micrometer of eyepiece (2) until it touches leftist side of indentation. Then move, measuring line from left to right until it touches rightest side of indentation. Than calculate value.

For example, value shown in OP-2 can be calculated as follows.
Every single line is 100 unit. (In Brinell testing total magnification is 75X when 5X objective is used)
One line of eyepiece micrometer is 0,002 mm.
100X6 = 600, Plus 24 unit shown on micrometer.
Total = 600 + 24 = 624 .Total value = 624 X 0,002 = 1.248
From the related table 145 HB 2, 5 / 187, 5 obtained.

10 Vickers Hardness Testing *(EN-6507-1, ASTM E-92)*

Vickers Hardness testing method is made by 136° Vickers pyramid indenter. Vickers indentation can be evaluated by optical system built-in hardness tester.
(For this method, only 30kgf available with BMS 200-RBOV)

11 Setting into Operation for Vickers Hardness Testing

Locate 10X objective (16) on optical system

Assure all points same as Brinell test before start to operation.
Insert Vickers diamond indenter to holder (ML3) (5) and choose 30 kgf load by means of load selector disc (VL1) (14)
Actuate Vickers test using same steps as per mentioned for Brinell test.
Observe, pyramid indentation as per shown in eyepiece of microscope (OP-1)

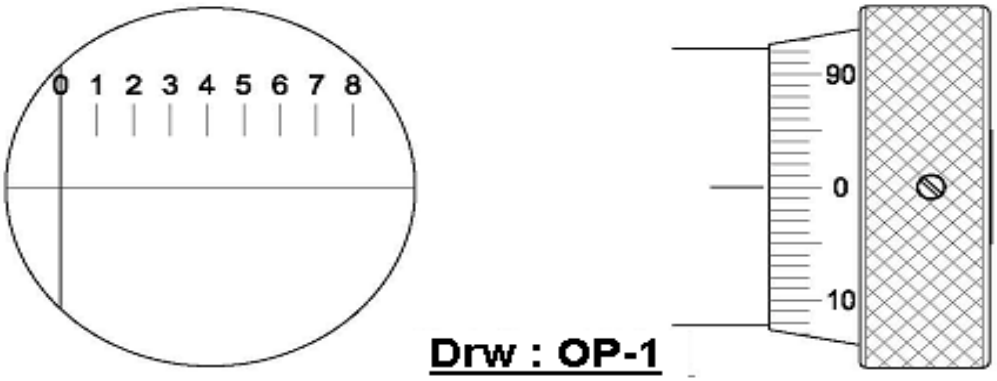
Sample of reading indentation

Drawing: OP-3
Adjust, measuring moving line by means of micrometer of eyepiece (2) until it touches leftist side of indentation. Then, move, measuring line from left to right until it touches rightest side of indentation. Than calculate value.

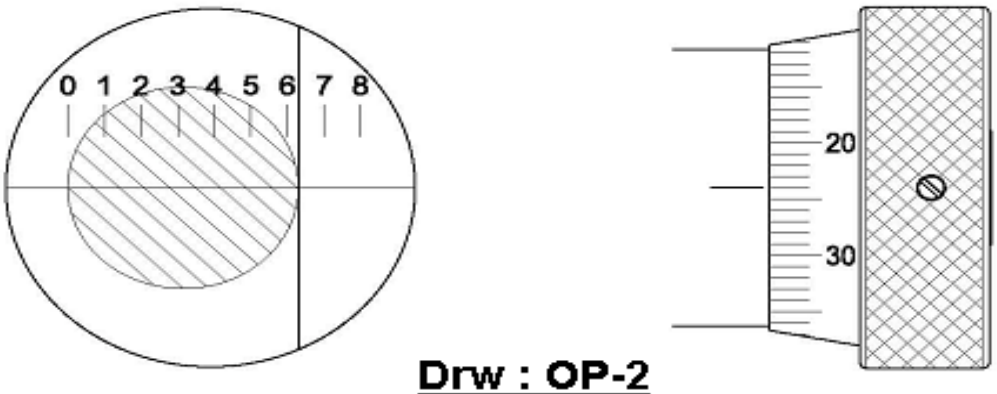
For example, value shown in OP-3 can be calculated as follows.
Every single line is 100 unit. (In Vickers testing total magnification is 150X when 10 X objective is used) One line of eyepiece micrometer is 0,001 mm.
100X3 = 300, Plus 45 unit shown on micrometer.
Total = 300 + 45 =345.Total value = 345 X 0,001 = 0,345
From the related table 467 HV30 obtained.

12 **Samples of Readings**

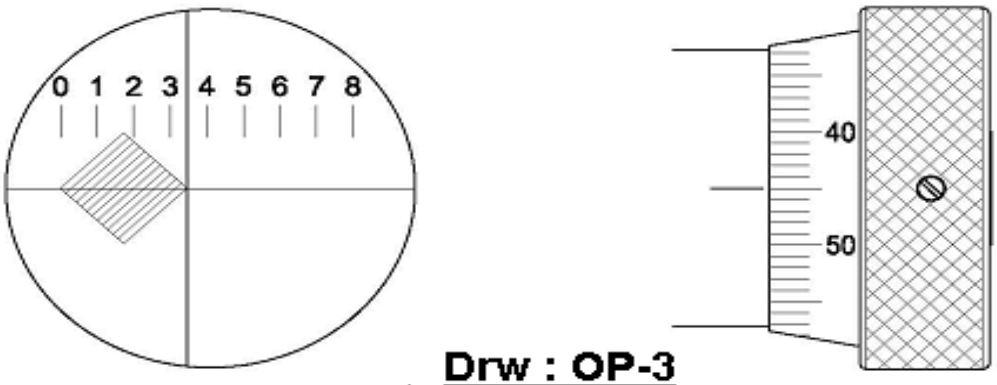
SAMPLES OF READINGS



Drw : OP-1



Drw : OP-2



Drw : OP-3

13 **Test Method**

Test Method	Indenter	Pre-load (kgf	Total load (kgf)	Field of application
HRA	Diamond cone	10	60	Surface hardened parts with thin cases (≥0,4 mm)
HRB	1/16" ball	10	100	Non ferrous metals,unhardened steels
HRC	Diamond cone	10	150	Hardnened steels
HRD	Diamond cone	10	100	Surface hardnened parts with medium cases
HRE	1/8" ball	10	100	Aluminium amd magnesium alloys,antifriction metals,synetic metals
HRF	1/16" ball	10	60	Annealed cupper alloys,thin sheet metals (≥ 0,6 mm)
HRG	1/16" ball	10	150	Phospor-bronze,melleable iron of medium hardness
HRH	1/8" ball	10	60	Aluminium,zinc,lead,grinding stones
HRK	1/8" ball	10	150	Antifriction and other metals of very low hardness
HRL	1/4" ball	10	60	As HRK and hard rubber
HRM	1/4" ball	10	100	As HRK and HRL,laminated wood
HRP	1/4" ball	10	150	HRK,HRL or HRM and syntetic materials
HRR	1/2" ball	10	60	
HRS	1/2" ball	10	100	
HRV	1/2" ball	10	150	As HRK,HRL,HRM,HRP,HRR or HRS
HR 15 N HR 30 N HR 45 N	Diamond cone	3	15 30 45	As HRA,HRC or HRD ,but especially thin case depth (≥ 0,18 mm)
HR15T HR30T HR45T	1/16" ball	3	15 30 45	As HRB,HRF or HRG but especially for thin sheet metals (≥ 0,25 mm)
HR15W HR30W HR45W	1/8" ball	3	15 30 45	For metals with very low hardness and for very thin cases,for example thin linings of antifriction metals,HRX and HRY especially for sintered metals
HR15X HR30X HR45X	1/4" ball	3	15 30 45	
HR15Y HR30Y HR45Y	1/2" ball	3	15 30 45	

14 **Brinell HB Ø 2, 5**

Brinell HB ⌀ 2,5

d mm	F/D²=30	F/D²=10	F/D²=5	F/D²=2,5	F/D²=1,25	d mm	F/D²=30	F/D²=10	F/D²=5	F/D²=2,5	F/D²=1,25
	HB 2,5/ . . .						HB 2,5/ . . .				
	187,5	62,5	31,25	15,625	7,8125		187,5	62,5	31,25	15,625	7,8125
0,50		315	158	78,8	39,4	1,15	170	56,8	28,4	14,2	7,1
0,51		303	151	75,7	37,8	1,16	167	55,8	27,9	13,9	7,0
0,52		291	146	72,8	36,4	1,17	164	54,8	27,4	13,7	6,8
0,53		280	140	70,0	35,0	1,18	161	53,8	26,9	13,4	6,7
0,54		270	135	67,4	33,7	1,19	158	52,8	26,4	13,2	6,6
0,55		260	130	65,0	32,5	1,20	156	51,9	25,9	13,0	6,5
0,56		251	125	62,6	31,3	1,21	153	51,0	25,5	12,7	6,4
0,57		242	121	60,4	30,2	1,22	150	50,1	25,0	12,5	6,3
0,58		233	117	58,3	29,2	1,23	148	49,2	24,6	12,3	6,1
0,59		225	113	56,3	28,2	1,24	145	48,3	24,2	12,1	6,0
0,60		218	109	54,5	27,2	1,25	143	47,5	23,8	11,9	5,9
0,61		211	105	52,7	26,3	1,26	140	46,7	23,4	11,7	5,8
0,62		204	102	50,9	25,5	1,27	138	45,9	23,0	11,5	5,7
0,63	592	197	98,6	49,3	24,7	1,28	135	45,1	22,6	11,3	5,6
0,64	573	191	95,5	47,8	23,9	1,29	133	44,4	22,2	11,1	5,5
0,65	555	185	92,6	46,3	23,1	1,30	131	43,7	21,8	10,9	5,5
0,66	538	179	89,7	44,9	22,4	1,31	129	42,9	21,5	10,7	5,4
0,67	522	174	87,0	43,5	21,8	1,32	127	42,2	21,1	10,6	5,3
0,68	507	169	84,4	42,2	21,1	1,33	125	41,5	20,8	10,4	5,2
0,69	492	164	81,9	41,0	20,5	1,34	123	40,9	20,4	10,2	5,1
0,70	477	159	79,6	39,8	19,9	1,35	121	40,2	20,1	10,1	5,0
0,71	464	155	77,3	38,7	19,3	1,36	119	39,6	19,8	9,9	4,9
0,72	451	150	75,1	37,6	18,8	1,37	117	38,9	19,5	9,7	4,9
0,73	438	146	73,0	36,5	18,3	1,38	115	38,3	19,2	9,6	4,8
0,74	426	142	71,0	35,5	17,8	1,39	113	37,7	18,9	9,4	4,7
0,75	415	138	69,1	34,6	17,3	1,40	111	37,1	18,6	9,3	4,6
0,76	404	135	67,3	33,6	16,8	1,41	110	36,5	18,3	9,1	4,6
0,77	393	131	65,5	32,7	16,4	1,42	108	36,0	18,0	9,0	4,5
0,78	383	128	63,8	31,9	15,9	1,43	106	35,4	17,7	8,9	4,4
0,79	373	124	62,1	31,1	15,5	1,44	105	34,9	17,4	8,7	4,4
0,80	363	121	60,5	30,3	15,1	1,45	103	34,3	17,2	8,6	4,3
0,81	354	118	59,0	29,5	14,8	1,46	101	33,8	16,9	8,5	4,2
0,82	345	115	57,5	28,8	14,4	1,47	99,9	33,3	16,7	8,3	4,2
0,83	337	112	56,1	28,1	14,0	1,48	98,4	32,8	16,4	8,2	4,1
0,84	329	110	54,8	27,4	13,7	1,49	96,9	32,3	16,2	8,1	4,0
0,85	321	107	53,4	26,7	13,4	**1,50**	95,5	31,8	15,9	8,0	4,0
0,86	313	104	52,2	26,1	13,0	1,51	94,1	31,4	15,7	7,8	3,9
0,87	306	102	50,9	25,5	12,7	1,52	92,7	30,9	15,4	7,7	3,9
0,88	298	99,5	49,7	24,9	12,4	1,53	91,3	30,4	15,2	7,6	3,8
0,89	292	97,2	48,6	24,3	12,1	1,54	90,0	30,0	15,0	7,5	3,7
0,90	285	95,0	47,5	23,7	11,9	1,55	88,7	29,6	14,8	7,4	3,7
0,91	278	92,8	46,4	23,2	11,6	1,56	87,4	29,1	14,6	7,3	3,6
0,92	272	90,7	45,4	22,7	11,3	1,57	86,1	28,7	14,4	7,2	3,6
0,93	266	88,7	44,4	22,2	11,1	1,58	84,9	28,3	14,1	7,1	3,5
0,94	260	86,8	43,4	21,7	10,8	1,59	83,7	27,9	13,9	7,0	3,5
0,95	255	84,9	42,4	21,2	10,6	1,60	82,5	27,5	13,7	6,9	3,4
0,96	249	83,0	41,5	20,8	10,4	1,61	81,3	27,1	13,5	6,8	3,4
0,97	244	81,3	40,6	20,3	10,2	1,62	80,1	26,7	13,4	6,7	3,3
0,98	239	79,5	39,8	19,9	9,9	1,63	79,0	26,3	13,2	6,6	3,3
0,99	234	77,9	38,9	19,5	9,7	1,64	77,9	26,0	13,0	6,5	3,2
1,00	229	76,3	38,1	19,1	9,5	1,65	76,8	25,6	12,8	6,4	3,2
1,01	224	74,7	37,3	18,7	9,3	1,66	75,7	25,2	12,6	6,3	3,2
1,02	219	73,2	36,6	18,3	9,1	1,67	74,7	24,9	12,4	6,2	3,1
1,03	215	71,7	35,8	17,9	9,0	1,68	73,6	24,5	12,3	6,1	3,1
1,04	211	70,2	35,1	17,6	8,8	1,69	72,6	24,2	12,1	6,0	3,0
1,05	207	68,8	34,4	17,2	8,6	1,70	71,6	23,9	11,9	6,0	3,0
1,06	202	67,5	33,7	16,9	8,4	1,71	70,6	23,5	11,8	5,9	2,9
1,07	198	66,2	33,1	16,5	8,3	1,72	69,6	23,2	11,6	5,8	2,9
1,08	195	64,9	32,4	16,2	8,1	1,73	68,7	22,9	11,4	5,7	2,9
1,09	191	63,6	31,8	15,9	8,0	1,74	67,7	22,6	11,3	5,6	2,8
1,10	187	62,4	31,2	15,6	7,8	1,75	66,8	22,3	11,1	5,6	2,8
1,11	184	61,2	30,6	15,3	7,7						
1,12	180	60,1	30,0	15,0	7,5						
1,13	177	59,0	29,5	14,7	7,4						
1,14	174	57,9	28,9	14,5	7,2						

15 Vickers HV 30

Vickers HV 30

F = 294,1 N ≙ 30 kp

Diagonale mm	0	1	2	3	4	5	6	7	8	9
0,16						2043	2018	1995	1971	1948
0,17	1925	1903	1880	1859	1838	1817	1796	1776	1756	1736
0,18	1717	1698	1680	1661	1643	1626	1608	1591	1574	1557
0,19	1541	1525	1509	1493	1478	1463	1448	1433	1419	1405
0,20	1391	1377	1363	1350	1337	1324	1311	1298	1286	1274
0,21	1261	1250	1238	1226	1215	1203	1192	1181	1171	1160
0,22	1149	1139	1129	1119	1109	1099	1089	1080	1070	1061
0,23	1052	1043	1034	1025	1016	1007	999	990	982	974
0,24	966	958	950	942	934	927	919	912	905	897
0,25	890	883	876	869	862	856	849	842	836	829
0,26	823	817	810	804	798	792	786	780	775	769
0,27	763	757	752	746	741	736	730	725	720	715
0,28	710	705	700	695	690	685	680	675	671	666
0,29	661	657	652	648	644	639	635	631	626	622
0,30	618	614	610	606	602	598	594	590	586	583
0,31	579	575	571	568	564	561	557	554	550	547
0,32	543	540	537	533	530	527	523	520	517	514
0,33	511	508	505	502	499	496	493	490	487	484
0,34	481	478	476	473	470	467	465	462	459	457
0,35	454	451	449	446	444	441	439	436	434	432
0,36	429	427	425	422	420	418	415	413	411	409
0,37	406	404	402	400	398	396	393	391	389	387
0,38	385	383	381	379	377	375	373	371	370	368
0,39	366	364	362	360	358	357	355	353	351	349
0,40	348	346	344	343	341	339	337	336	334	333
0,41	331	329	328	326	325	323	321	320	318	317
0,42	315	314	312	311	309	308	307	305	304	302
0,43	301	299	298	297	295	294	293	291	290	289
0,44	287	286	285	283	282	281	280	278	277	276
0,45	275	274	272	271	270	269	268	266	265	264
0,46	263	262	261	260	258	257	256	255	254	253
0,47	252	251	250	249	248	247	246	245	244	243
0,48	242	241	240	239	238	237	236	235	234	233
0,49	232	231	230	229	228	227	226	225	224	224
0,50	223	222	221	220	219	218	217	216	216	215
0,51	214	213	212	211	211	210	209	208	207	207
0,52	206	205	204	203	203	202	201	200	200	199
0,53	198	197	197	196	195	194	194	193	192	191
0,54	191	190	189	189	188	187	187	186	185	185
0,55	184	183	183	182	181	181	180	179	179	178
0,56	177	177	176	176	175	174	174	173	172	172
0,57	171	171	170	169	169	168	168	167	167	166
0,58	165	165	164	164	163	163	162	161	161	160
0,59	160	159	159	158	158	157	157	156	156	155
0,60	155	154	154	153	152	152	151	151	150	150
0,61	150	149	149	148	148	147	147	146	146	145
0,62	145	144	144	143	143	142	142	142	141	141
0,63	140	140	139	139	138	138	138	137	137	136
0,64	136	135	135	135	134	134	133	133	132	132
0,65	132	131	131	130	130	130	129	129	128	128
0,66	128	127	127	127	126	126	125	125	125	124
0,67	124	124	123	123	122	122	122	121	121	121
0,68	120	120	120	119	119	119	118	118	118	117
0,69	117	117	116	116	116	115	115	115	114	114
0,70	114	113	113	113	112	112	112	111	111	111
0,71	110	110	110	109	109	109	109	108	108	108
0,72	107	107	107	106	106	106	106	105	105	105
0,73	104	104	104	104	103	103	103	102	102	102
0,74	102	101	101	101	101	100	100	99,7	99,4	99,2
0,75	98,9	98,6	98,4	98,1	97,9	97,6	97,3	97,1	96,8	96,6
0,76	96,3	96,1	95,8	95,6	95,3	95,1	94,8	94,6	94,3	94,1
0,77	93,8	93,6	93,3	93,1	92,9	92,6	92,4	92,1	91,9	91,7
0,78	91,4	91,2	91,0	90,7	90,5	90,3	90,0	89,8	89,6	89,4
0,79	89,1	88,9	88,7	88,5	88,2	88,0	87,8	87,6	87,4	87,1
0,80	86,9	86,7	86,5	86,3	86,1	85,8	85,6	85,4	85,2	85,0
0,81	84,8	84,6	84,4	84,2	84,0	83,8	83,5	83,3	83,1	82,9
0,82	82,7	82,5	82,3	82,1	81,9	81,7	81,5	81,3	81,1	80,9
0,83	80,8	80,6	80,4	80,2	80,0	79,8	79,6	76,4	79,2	79,0

Vickers HV 30

F = 294,1 N ≙ 30 kp

Diagonale mm	0	1	2	3	4	5	6	7	8	9
0,1	5562	4597	3862	3291	2838	2472	2173	1925	1717	1541
0,2	1391	1261	1149	1051	966	890	823	763	709	661
0,3	618	579	543	511	481	454	429	406	385	366
0,4	348	331	315	301	287	275	263	252	241	232
0,5	222	214	206	198	191	184	177	171	165	160
0,6	155	149	145	140	136	132	128	124	120	117
0,7	114	110	107	104	102	98,9	96,3	93,8	91,4	89,1
0,8	86,9	84,8	82,7	80,7	78,8	77,0	75,2	73,5	71,8	70,2
0,9	68,7	67,2	65,7	64,3	62,9	61,6	60,4	59,1	57,9	56,7
1,0	55,6	54,5	53,5	52,4	51,4	50,4	49,5	48,6	47,7	46,8
1,1	46,0	45,1	44,3	43,6	42,8	42,1	41,3	40,6	39,9	39,3
1,2	38,6	38,0	37,4	36,8	36,2	35,6	35,0	34,5	33,9	33,4
1,3	32,9	32,4	31,9	31,4	31,0	30,5	30,1	29,6	29,2	28,8
1,4	28,4	28,0	27,6	27,2	26,8	26,5	26,1	25,7	25,4	25,1
1,5	24,7	24,4	24,1	23,8	23,5	23,2	22,9	22,6	22,3	22,0
1,6	21,7	21,5	21,2	20,9	20,7	20,4	20,2	19,9	19,7	19,5
1,7	19,2	19,0	18,8	18,6	18,4	18,2	18,0	17,8	17,6	17,4
1,8	17,2	17,0	16,8	16,6	16,4	16,3	16,1	15,9	15,7	15,6
1,9	15,4	15,2	15,1	14,9	14,8	14,6	14,5	14,3	14,2	14,0