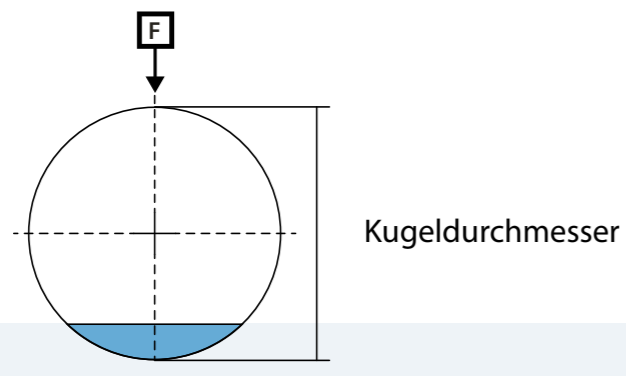
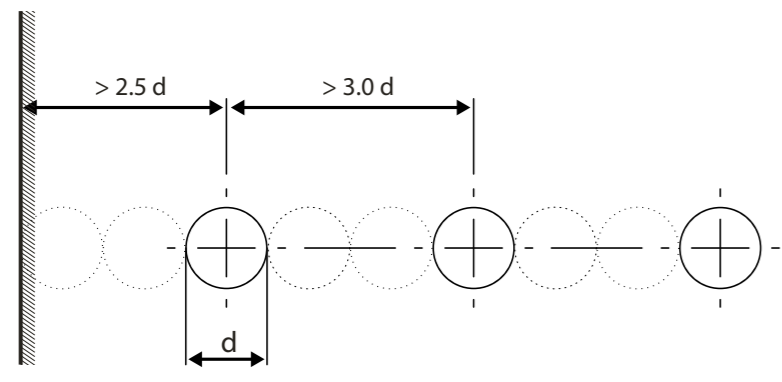


### BRINELL ISO 6506



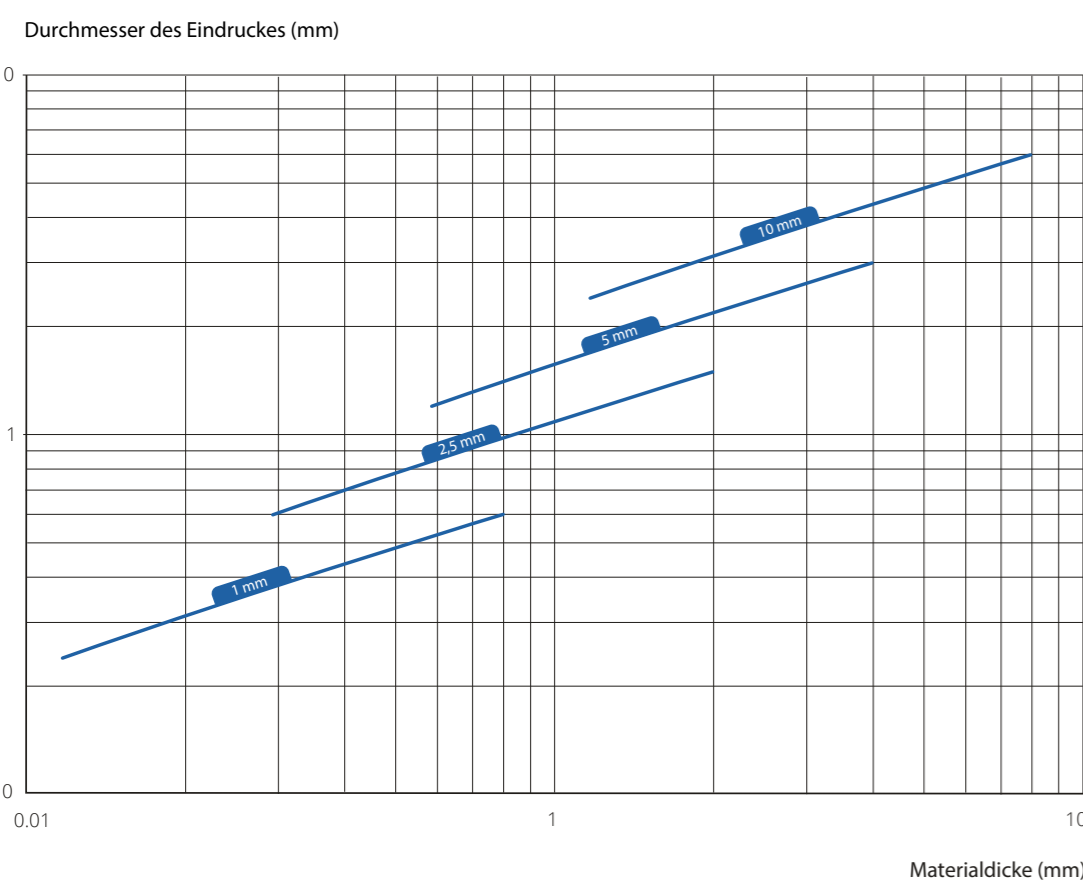
Kugeldurchmesser



### BRINELL PRÜFVERFAHREN

Material	Härteskala	Eindringkörper (mm)	Prüfkraft F (N)	Beanspruchungsgrad 0,102 x F/D <sup>2</sup>	Härtewerte
Blei / Zinn	HBW 10/100	10	980.7	1	3.18 - 21.8
	HBW 5/25	5	245.2		
	HBW 2.5/6.25	2.5	61.29		
Leichtmetall Zinnlegierungen	HBW 10/250	10	2452	2.5	7.96 - 54.5
	HBW 5/62.5	5	612.9		
	HBW 2.5/15.625	2.5	153.2		
Leichtmetall Kupfer / Aluminium Kupferlegierungen Ohne Wärmebehandlung	HBW 10/500	10	4903	5	15.9 - 109
	HBW 5/125	5	1226		
	HBW 2.5/31.25	2.5	306.5		
Leichtmetall Kupfer / Aluminium Kupferlegierungen Aluminiumlegierungen	HBW 10/1000	10	9807	10	31.8 - 218
	HBW 5/250	5	2452		
	HBW 2.5/62.5	2.5	612.9		
Stahl / Nickel / Titan-Legierungen	HBW 10/3000	10	29420	30	95.5 - 653
	HBW 5/750	5	7355		
	HBW 2.5/187.5	2.5	1839		
	HBW 1/30	1	294.2		

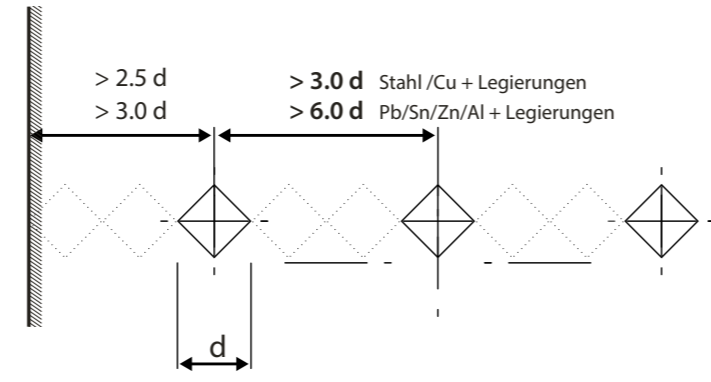
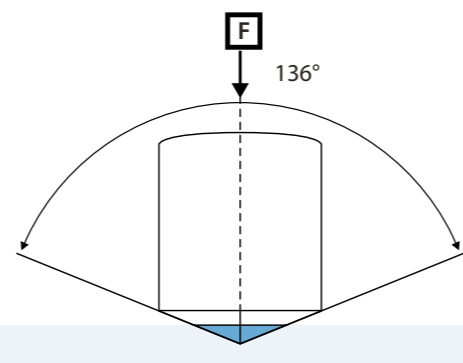
### BRINELL MINDESTDICKE



### BRINELL ISO 6506-2

Härtewerte	Zulässige Abweichung (%)	Zulässige Wiederholpräzision (%)
Beanspruchungsgrad 30		
< 250 HBW	3.0	3.0
250 < HBW < 450	2.5	2.5
> 450 HBW	2.0	2.0
Beanspruchungsgrad 10		
< 100 HBW	3.0	3.0
100 < HBW < 200	3.0	3.0
> 200 HBW	3.0	3.0
Beanspruchungsgrad 5		
< 70 HBW	3.0	3.0
70 < HBW < 100	3.0	3.0
> 100 HBW	3.0	3.0
Beanspruchungsgrad 2.5		
< 70 HBW	3.0	3.0
-	3.0	3.0
-	3.0	3.0

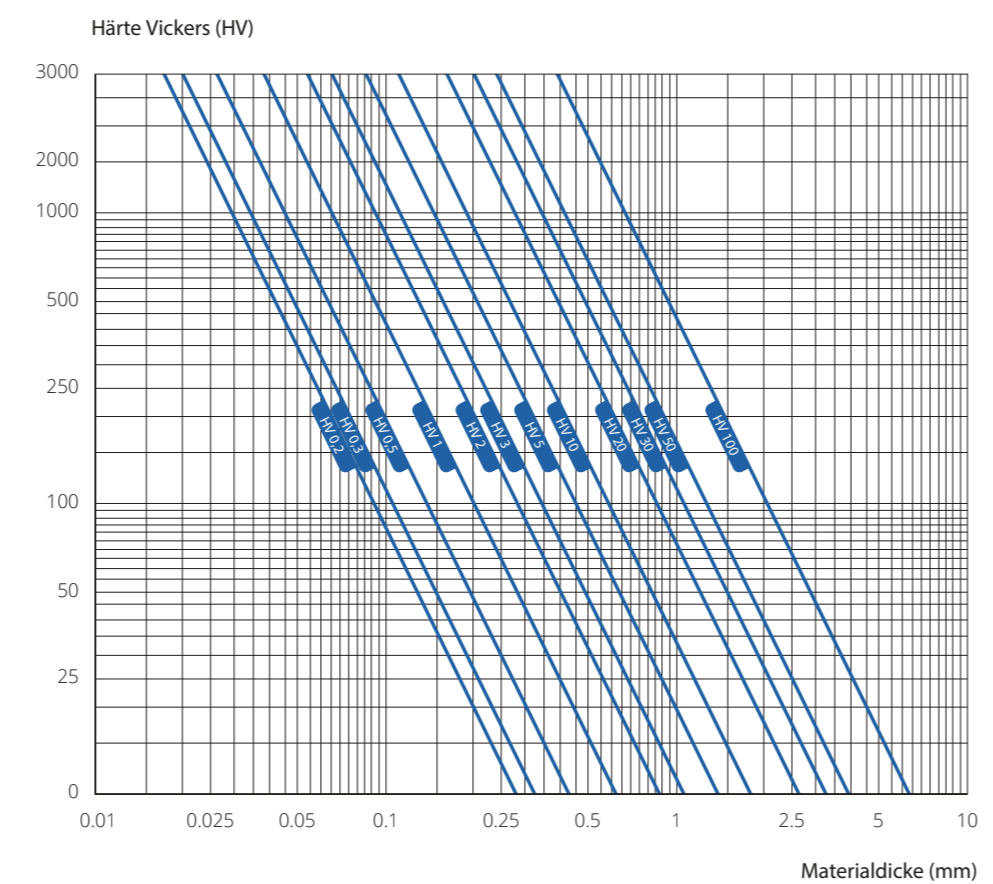
### VICKERS ISO 6507



### VICKERS PRÜFVERFAHREN

Vickers-Mikrohärteprüfung		Vicker Kleinfachhärteprüfung		Vickers Härteprüfung	
Skala	Prüfkraft (N)	Skala	Prüfkraft (N)	Skala	Prüfkraft (N)
HV 0.01	0.09807	HV 0.2	1.961	HV 5	49.03
HV 0.015	0.1471	HV 0.3	2.942	HV 10	98.07
HV 0.02	0.1961	HV 0.5	4.903	HV 20	196.1
HV 0.025	0.2452	HV 1	9.807	HV 30	294.2
HV 0.05	0.4903	HV 2	19.61	HV 50	490.3
HV 0.1	0.9807	HV 3	29.42	HV 100	980.7

### VICKERS MINDESTDICKE



### VICKERS ISO 6507-2

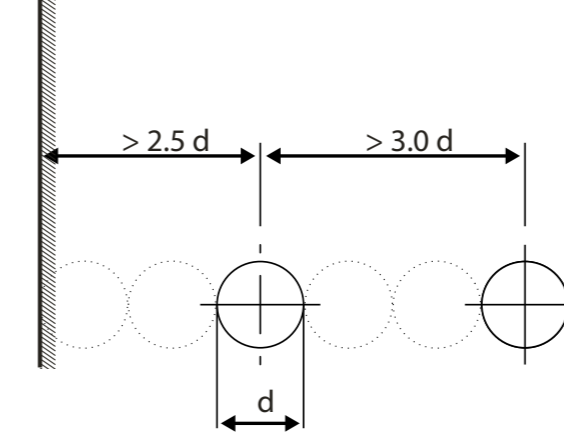
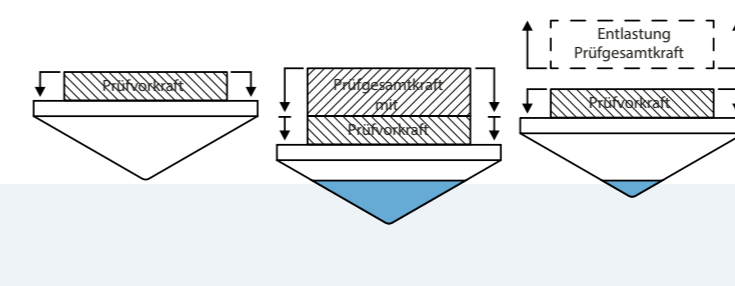
Härtewerte (HV)	Zulässige Wiederholpräzision (%)		
	HV 5 < HV ≤ 100	HV 0.2 ≤ HV < 5	HV < 0.2
≤ 250 HV	6	12	18
> 250 HV	4	8	12

Materialien mit geringerer Härte weisen oft höhere Wiederholgenauigkeiten auf als solche mit höherer Härte

Härteskala	Zulässiger Fehler (%)																			
HV 0.001	10	25	50	100	200	300	400	500	600	700	800	900	1000	1500	2000	-	-	-	-	-
HV 0.002	16	25	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HV 0.003	12	18	25	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HV 0.005	10	15	21	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HV 0.0075	8	12	16	23	32	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HV 0.01	6	9	12	16	23	28	32	35	39	-	-	-	-	-	-	-	-	-	-	-
HV 0.015	5	7	10	14	19	23	26	29	32	34	37	39	-	-	-	-	-	-	-	-
HV 0.02	4	6	9	12	16	20	23	25	28	30	32	34	35	-	-	-	-	-	-	-
HV 0.025	4	6	8	11	15	18	21	23	25	27	29	30	32	39	-	-	-	-	-	-
HV 0.05	3	4	6	8	11	13	15	16	18	19	21	22	23	28	32	-	-	-	-	-
HV 0.1	3	3	4	6	8	9	11	12	13	14	15	16	16	20	23	-	-	-	-	-
HV 0.2	3	3	3	4	6	7	8	9	9	10	11	11	12	14	16	-	-	-	-	-
HV 0.3	3	3	3	4	5	6	7	7	8	8	9	9	10	12	14	-	-	-	-	-
HV 0.5	3	3	3	3	4	5	5	6	6	7	7	8	8	9	11	-	-	-	-	-
HV 1	3	3	3	3	3	4	4	4	5	5	5	6	6	7	8	-	-	-	-	-
HV 2	3	3	3	3	3	3	3	4	4	4	4	4	4	5	6	-	-	-	-	-
HV 2.5	3	3	3	3	3	3	3	3	3	4	4	4	4	5	5	-	-	-	-	-
HV 3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	5	-	-	-	-	-
HV 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	-	-	-	-	-
HV 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	-	-	-	-	-
HV 10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-	-	-

Bei Zwischenwerten kann der Fehler durch Interpolation ermittelt werden. Die Werte werden auf eine ganze Zahl abgerundet.

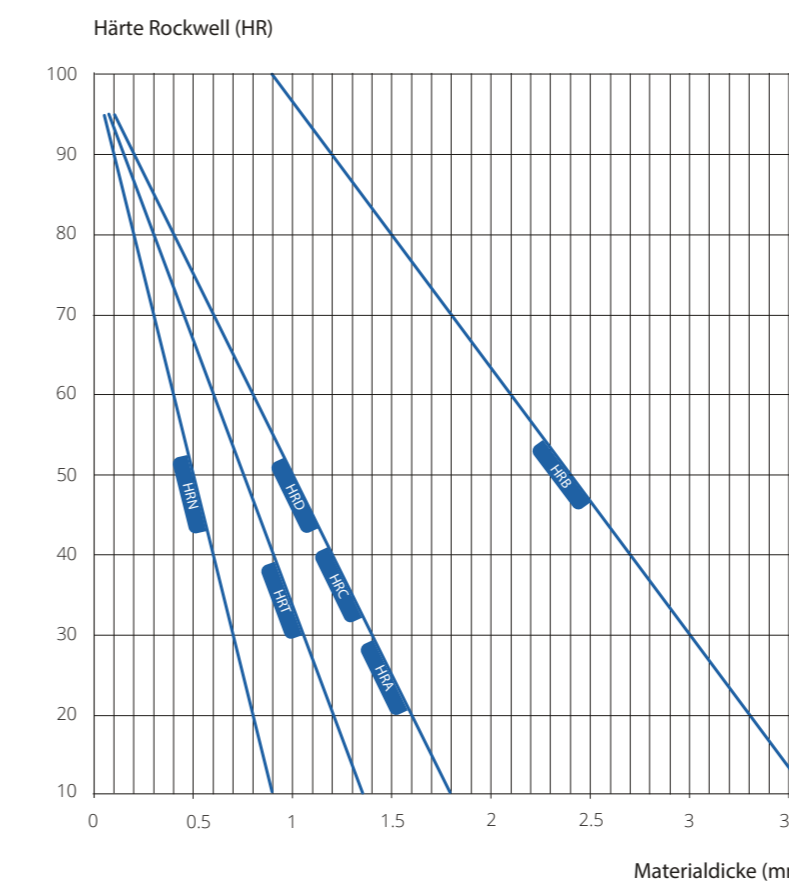
### ROCKWELL ISO 6508



### ROCKWELL PRÜFVERFAHREN

Härteskala	Eindringkörper Typ	Prüfvorkraft (N)	Prüfgesamtkraft (N)	Range
HRA	Diamant-Konus	98.07	588.4	20 - 95 HRA
HRB	1/16" Kugel	98.07	980.7	10 - 100 HRB
HRC	Diamant-Konus	98.07	1471	20 - 70 HRC
HRD	Diamant-Konus	98.07	980.7	40 - 77 HRD
HRE	1/8" Kugel	98.07	980.7	70 - 200 HRE
HRF	1/16" Kugel	98.07	588.4	60 - 100 HRF
HRG	1/16" Kugel	98.07	1471	30 - 94 HRG
HRH	1/8" Kugel	98.07	588.4	80 - 100 HRH
HRK	1/8" Kugel	98.07	1471	40 - 100 HRK
HR15N	Diamant-Konus	29.42	147.1	70 - 94 HR15N
HR30N	Diamant-Konus	29.42	294.2	42 - 86 HR30N
HR45N	Diamant-Konus	29.42	441.3	20 - 77 HR45N
HR15T	1/16" Kugel	29.42	147.1	67 - 93 HR15T
HR30T	1/16" Kugel	29.42	294.2	29 - 82 HR30T
HR45T	1/16" Kugel	29.42	441.3	10 - 72 HR45T

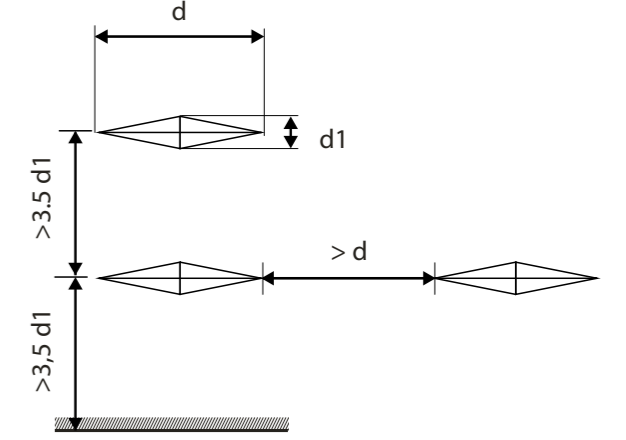
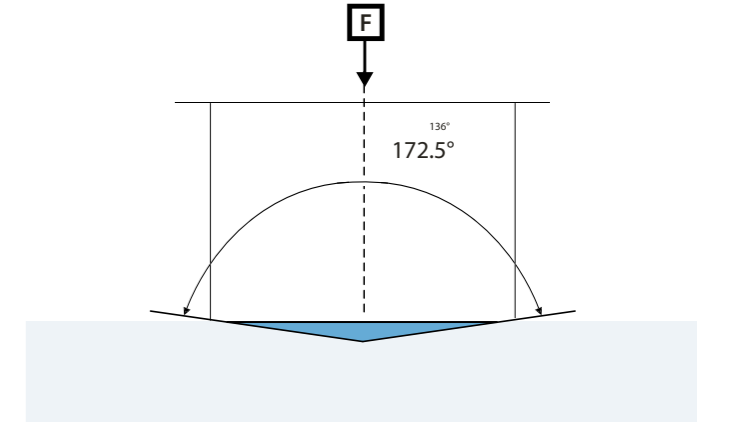
### ROCKWELL MINDESTDICKE



### ROCKWELL ISO 6508-2

Härteskala	Härtebereich	Zulässige Messabweichung (HR)	Zulässige Wiederholpräzision (HR)
HRA	20 ≤ HR ≤ 75 75 < HR ≤ 95	2 1.5	≤ 0.02 (100 - $\bar{R}$ ) oder 0.8
HRB	10 ≤ HR ≤ 45 45 < HR ≤ 80 HR > 80	4 3 2	≤ 0.04 (130 - $\bar{R}$ )
HRC	10 ≤ HR ≤ 70	1.5	≤ 0.02 (100 - $\bar{R}$ ) oder 0.8
HRD	40 ≤ HR ≤ 70 70 < HR ≤ 77	2 1.5	≤ 0.02 (100 - $\bar{R}$ ) oder 0.8
HRE	70 ≤ HR ≤ 90 90 < HR ≤ 100	2.5 2	≤ 0.04 (130 - $\bar{R}$ )
HRF	60 ≤ HR ≤ 90 90 < HR ≤ 100	3 2	≤ 0.0 (130 - $\bar{R}$ )
HRG	30 ≤ HR ≤ 50 50 < HR ≤ 75 75 < HR ≤ 94	6 4.5 3	≤ 0.04 (130 - $\bar{R}$ )
HRH	80 ≤ HR ≤ 100	2	≤ 0.04 (130 - $\bar{R}$ )
HRK	40 ≤ HR ≤ 60 60 < HR ≤ 80 80 < HR ≤ 100	4 3 2	≤ 0.04 (130 - $\bar{R}$ )
HRN	All	2	≤ 0.04 (100 - $\bar{R}$ ) oder 1.2
HRT	All	3	≤ 0.06 (100 - $\bar{R}$ ) oder 2.4

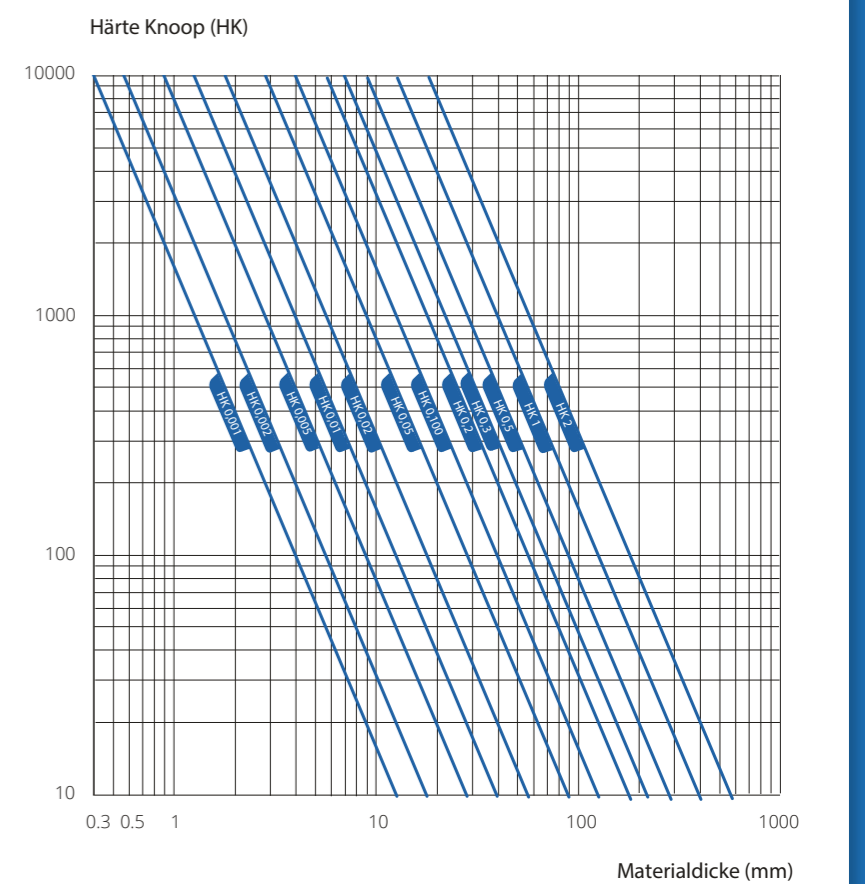
### KNOOP ISO 4545



### KNOOP PRÜFVERFAHREN

Härteskala	Prüfkraft (N)	Ungefähres kgf Äquivalent
HK 0.01	0.09807	0.010
HK 0.02	0.1961	0.020
HK 0.025	0.2452	0.025
HK 0.05	0.4903	0.050
HK 0.1	0.9807	0.100
HK 0.2	1.961	0.200
HK 0.3	2.942	0.300
HK 0.5	4.903	0.500
HK 1	9.807	1.000
HK 2	19.61	2.000

### KNOOP MINDESTDICKE



### KNOOP ISO 4545-2

Härte Knoop (HK)	Prüfkraft in Newton	Zulässige Messabweichung (%)	Zulässige Wiederholpräzision (%)
100 ≤ HK ≤ 250	F ≤ 4.903N	18	2
100 < HK ≤ 650		10	
HK > 650		8	
100 ≤ HK ≤ 250	F > 4.903N	16	2
250 < HK ≤ 650		10	
HK > 650		8	

Härteskala	Zulässiger Fehler (%)																			
HK 0.001	10	25	50	100	200	300	400	500	600	700	800	900	1000	-	-	-	-	-	-	-
HK 0.002	6	10	14	20	28	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HK 0.005	4	6	8	12	15	17	20	22	23	25	26	28	-	-	-	-	-	-	-	-
HK 0.01	4	4	4	6	8	11	12	14	15	16	17	19	20	-	-	-	-	-	-	-
HK 0.02	4	4	4	4	6	7	8	10	11	11	12	13	14	-	-	-	-	-	-	-
HK 0.025	4	4	4	4	5	6	8	9	10	11	12	12	-	-	-	-	-	-	-	-
HK 0.05	4	4	4	4	4	5	6	6	7	8	8	8	-	-	-	-	-	-	-	-
HK 0.1	4	4	4	4	4	4	4	4	4	5	5	6	6	-	-	-	-	-	-	-
HK 0.2	4	4	4	4	4	4	4	4	4	4	4	4	4	-	-	-	-	-	-	-
HK 0.3	4	4	4	4	4	4	4	4	4	4	4	4	4	-	-	-	-	-	-	-
HK 0.5	4	4	4	4	4	4	4	4	4	4	4	4	4	-	-	-	-	-	-	-
HK 1	4	4	4	4	4	4	4	4	4	4	4	4	4	-	-	-	-	-	-	-
HK 2																				

### BRINELL HÄRTEWERTE

Kugel Ø	10	5	2.5	(mm)	10	5	2.5	(mm)	10	5	2.5
Belastungsgrad	3000	750	187.5	Belastungsgrad	1000	250	62.5	Belastungsgrad	500	125	31.25
HBW30	Ø mm			HBW10	Ø mm			HB5	Ø mm		
95.5	6.00	3.00	1.50	31.8	6.00	3.00	1.50	15.9	6.00	3.00	1.50
96.9	5.96	2.98	1.49	32.3	5.96	2.98	1.49	16.2	5.96	2.98	1.49
98.4	5.92	2.96	1.48	32.8	5.92	2.96	1.48	16.4	5.92	2.96	1.48
99.9	5.88	2.94	1.47	33.3	5.88	2.94	1.47	16.7	5.88	2.94	1.47
101	5.84	2.92	1.46	33.8	5.84	2.92	1.46	16.9	5.84	2.92	1.46
103	5.80	2.90	1.45	34.3	5.80	2.90	1.45	17.2	5.80	2.90	1.45
105	5.76	2.88	1.44	34.9	5.76	2.88	1.44	17.4	5.76	2.88	1.44
106	5.72	2.86	1.43	35.4	5.72	2.86	1.43	17.7	5.72	2.86	1.43
108	5.68	2.84	1.42	36.0	5.68	2.84	1.42	18.0	5.68	2.84	1.42
110	5.64	2.82	1.41	36.5	5.64	2.82	1.41	18.3	5.64	2.82	1.41
111	5.60	2.80	1.40	37.1	5.60	2.80	1.40	18.6	5.60	2.80	1.40
113	5.56	2.78	1.39	37.7	5.56	2.78	1.39	18.9	5.56	2.78	1.39
115	5.52	2.76	1.38	38.3	5.52	2.76	1.38	19.2	5.52	2.76	1.38
117	5.48	2.74	1.37	38.9	5.48	2.74	1.37	19.5	5.48	2.74	1.37
119	5.44	2.72	1.36	39.6	5.44	2.72	1.36	19.8	5.44	2.72	1.36
121	5.40	2.70	1.35	40.2	5.40	2.70	1.35	20.1	5.40	2.70	1.35
123	5.36	2.68	1.34	40.9	5.36	2.68	1.34	20.4	5.36	2.68	1.34
125	5.32	2.66	1.33	41.5	5.32	2.66	1.33	20.8	5.32	2.66	1.33
127	5.28	2.64	1.32	42.2	5.28	2.64	1.32	21.1	5.28	2.64	1.32
129	5.24	2.62	1.31	42.9	5.24	2.62	1.31	21.5	5.24	2.62	1.31
131	5.20	2.60	1.30	43.7	5.20	2.60	1.30	21.8	5.20	2.60	1.30
133	5.16	2.58	1.29	44.4	5.16	2.58	1.29	22.2	5.16	2.58	1.29
135	5.12	2.56	1.28	45.1	5.12	2.56	1.28	22.6	5.12	2.56	1.28
138	5.08	2.54	1.27	45.9	5.08	2.54	1.27	23.0	5.08	2.54	1.27
140	5.04	2.52	1.26	46.7	5.04	2.52	1.26	23.4	5.04	2.52	1.26
143	5.00	2.50	1.25	47.5	5.00	2.50	1.25	23.8	5.00	2.50	1.25
145	4.96	2.48	1.24	48.3	4.96	2.48	1.24	24.2	4.96	2.48	1.24
148	4.92	2.46	1.23	49.2	4.92	2.46	1.23	24.6	4.92	2.46	1.23
150	4.88	2.44	1.22	50.1	4.88	2.44	1.22	25.0	4.88	2.44	1.22
153	4.84	2.42	1.21	51.0	4.84	2.42	1.21	25.5	4.84	2.42	1.21
156	4.80	2.40	1.20	51.9	4.80	2.40	1.20	25.9	4.80	2.40	1.20
158	4.76	2.38	1.19	52.8	4.76	2.38	1.19	26.4	4.76	2.38	1.19
161	4.72	2.36	1.18	53.8	4.72	2.36	1.18	26.9	4.72	2.36	1.18
164	4.68	2.34	1.17	54.8	4.68	2.34	1.17	27.4	4.68	2.34	1.17
167	4.64	2.32	1.16	55.8	4.64	2.32	1.16	27.9	4.64	2.32	1.16
170	4.60	2.30	1.15	56.8	4.60	2.30	1.15	28.4	4.60	2.30	1.15
174	4.56	2.28	1.14	57.9	4.56	2.28	1.14	28.9	4.56	2.28	1.14
177	4.52	2.26	1.13	59.0	4.52	2.26	1.13	29.5	4.52	2.26	1.13
180	4.48	2.24	1.12	60.1	4.48	2.24	1.12	30.0	4.48	2.24	1.12
184	4.44	2.22	1.11	61.2	4.44	2.22	1.11	30.6	4.44	2.22	1.11
187	4.40	2.20	1.10	62.4	4.40	2.20	1.10	31.2	4.40	2.20	1.10
191	4.36	2.18	1.09	63.6	4.36	2.18	1.09	31.8	4.36	2.18	1.09
195	4.32	2.16	1.08	64.9	4.32	2.16	1.08	32.4	4.32	2.16	1.08
198	4.28	2.14	1.07	66.2	4.28	2.14	1.07	33.1	4.28	2.14	1.07
202	4.24	2.12	1.06	67.5	4.24	2.12	1.06	33.7	4.24	2.12	1.06
207	4.20	2.10	1.05	68.8	4.20	2.10	1.05	34.4	4.20	2.10	1.05
211	4.16	2.08	1.04	70.2	4.16	2.08	1.04	35.1	4.16	2.08	1.04
215	4.12	2.06	1.03	71.7	4.12	2.06	1.03	35.8	4.12	2.06	1.03
219	4.08	2.04	1.02	73.2	4.08	2.04	1.02	36.6	4.08	2.04	1.02
224	4.04	2.02	1.01	74.7	4.04	2.02	1.01	37.3	4.04	2.02	1.01
229	4.00	2.00	1.00	76.3	4.00	2.00	1.00	38.1	4.00	2.00	1.00
234	3.96	1.98	0.99	77.9	3.96	1.98	0.99	38.9	3.96	1.98	0.99
239	3.92	1.96	0.98	79.5	3.92	1.96	0.98	39.8	3.92	1.96	0.98
244	3.88	1.94	0.97	81.3	3.88	1.94	0.97	40.6	3.88	1.94	0.97
249	3.84	1.92	0.96	83.0	3.84	1.92	0.96	41.5	3.84	1.92	0.96
255	3.80	1.90	0.95	84.9	3.80	1.90	0.95	42.4	3.80	1.90	0.95
260	3.76	1.88	0.94	86.8	3.76	1.88	0.94	43.4	3.76	1.88	0.94
266	3.72	1.86	0.93	88.7	3.72	1.86	0.93	44.4	3.72	1.86	0.93
272	3.68	1.84	0.92	90.7	3.68	1.84	0.92	45.4	3.68	1.84	0.92
278	3.64	1.82	0.91	92.8	3.64	1.82	0.91	46.4	3.64	1.82	0.91
285	3.60	1.80	0.90	95.0	3.60	1.80	0.90	47.5	3.60	1.80	0.90
292	3.56	1.78	0.89	97.2	3.56	1.78	0.89	48.6	3.56	1.78	0.89
298	3.52	1.76	0.88	99.5	3.52	1.76	0.88	49.7	3.52	1.76	0.88
306	3.48	1.74	0.87	102	3.48	1.74	0.87	50.9	3.48	1.74	0.87
313	3.44	1.72	0.86	104	3.44	1.72	0.86	52.2	3.44	1.72	0.86
321	3.40	1.70	0.85	107	3.40	1.70	0.85	53.4	3.40	1.70	0.85
329	3.36	1.68	0.84	110	3.36	1.68	0.84	54.8	3.36	1.68	0.84
337	3.32	1.66	0.83	112	3.32	1.66	0.83	56.1	3.32	1.66	0.83
345	3.28	1.64	0.82	115	3.28	1.64	0.82	57.5	3.28	1.64	0.82
354	3.24	1.62	0.81	118	3.24	1.62	0.81	59.0	3.24	1.62	0.81
363	3.20	1.60	0.80	121	3.20	1.60	0.80	60.5	3.20	1.60	0.80
373	3.16	1.58	0.79	124	3.16	1.58	0.79	62.1	3.16	1.58	0.79
383	3.12	1.56	0.78	128	3.12	1.56	0.78	63.8	3.12	1.56	0.78
393	3.08	1.54	0.77	131	3.08	1.54	0.77	65.5	3.08	1.54	0.77
404	3.04	1.52	0.76	135	3.04	1.52	0.76	67.3	3.04	1.52	0.76
415	3.00	1.50	0.75	138	3.00	1.50	0.75	69.1	3.00	1.50	0.75
426	2.96	1.48	0.74	142	2.96	1.48	0.74	71.0	2.96	1.48	0.74
438	2.92	1.46	0.73	146	2.92	1.46	0.73	73.0	2.92	1.46	0.73
451	2.88	1.44	0.72	150	2.88	1.44	0.72	75.1	2.88	1.44	0.72
464	2.84	1.42	0.71	155	2.84	1.42	0.71	77.3	2.84	1.42	0.71
477	2.80	1.40	0.70	159	2.80	1.40	0.70	79.6	2.80	1.40	0.70
492	2.76	1.38	0.69	164	2.76	1.38	0.69	81.9	2.76	1.38	0.69
507	2.72	1.36	0.68	169	2.72	1.36	0.68	84.4	2.72	1.36	0.68
522	2.68	1.34	0.67	174	2.68	1.34	0.67	87.0	2.68	1.34	0.67
538	2.64	1.32	0.66	179	2.64	1.32	0.66	89.7	2.64	1.32	0.66
555	2.60	1.30	0.65	185	2.60	1.30	0.65	92.6	2.60	1.30	0.65
573	2.56	1.28	0.64	191	2.56	1.28	0.64	95.5	2.56	1.28	0.64
592	2.52	1.26	0.63	197	2.52	1.26	0.63	98.6	2.52	1.26	0.63
611	2.48	1.24	0.62	204	2.48	1.24	0.62	102	2.48	1.24	0.62
632	2.44	1.22	0.61	211	2.44	1.22	0.61	105	2.44	1.22	0.61
653	2.40	1.20	0.60	218	2.40	1.20	0.60	109	2.40	1.20	0.60

### VICKERS HÄRTEWERTE

HV	0.05	0.1	0.2	0.5	1	2	5	10	30	50	100
d (µm)											
80	34.0	48.1	68.1	108	152	215	340	482	834	1.077	-
85	33.0	46.7	66.1	104	148	209	330	467	809	1.044	-
90	32.1	45.4	64.2	102	144	203	321	454	786	1.015	-
95	31.2	44.2	62.5	98.8	140	198	312	442	765	988	1.397
100	30.4	43.1	60.9	96.3	136	193	305	431	746	963	1.362
105	29.7	42.0	59.4	94.0	133	188	297	420	728	940	1.329
110	29.0	41.1	58.1	91.8	130	184	290	411	711	918	1.298
115	28.4	40.2	56.8	89.8	127	180	284	402	696	898	1.270
120	27.8	39.3	55.6	87.9	124	176	278	393	681	879	1.243
125	27.2	38.5	54.5	86.1	122	172	272	385	667	861	1.218
130	26.7	37.8	53.4	84.5	119	169	267	378	654	845	1.194
135	26.2	37.1	52.4	82.9	117	166	262	371	642	829	1.172
140	25.7	36.4	51.5	81.4	115	163	257	364	630	814	1.151
145	25.3	35.8	50.6	80.0	113	160	253	358	619	800	1.131
150											