



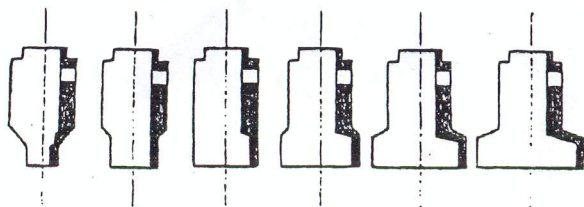
Edmund Optics Japan Co., Ltd.
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Handling Instruction of EASY SPHEROMETER

1. Selection of Measuring Head

Six types of measuring head are carried in this set. Which are shown below. Inside edges are to be used for measurement of convex radius and outside for concave. Combinations of ID and OD are as listed below. Select appropriate head not to fall in the area of dotted line in a graph shown in page 3.

Head No.	1	2	3	4	5	6
ID (for convex)	4mm	8mm	12mm	16mm	20mm	24mm
OD (for concave)	8mm	12mm	16mm	20mm	24mm	28mm



2. Setting of Measuring Heads and Zero Adjustment

Measuring heads are to be attached on the stem of dial gauge being fixed with screw. Ideal position of measuring head to measure convex surfaces is that tip of contact point is just a little outside of plane made by edge of the measuring head. Enough length to move is necessary when concave surface is measured. Push plane surface and set zero point by rotating bezel. Head-1 with smallest ID of 4mm requires needle tip.



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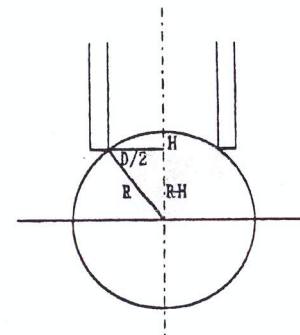
3. Brief Measurement

Push sample surface onto the measuring head and read distance moved (H). If the head has ideal shape, relation among movement(H), diameter of head(D) and radius(R) is shown by formula-(1). Then, radius is given by formula-(2). Table-1 through Table-7 are prepared to show relation between each head diameter and radius.

$$(R-H)^2 + (D/2)^2 = R^2 \quad \dots (1)$$

Then,

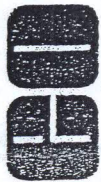
$$R = \frac{H^2 + (D/2)^2}{2H} \quad \dots (2)$$



4. Adjustment and Final Data

Because actual measuring head has round shape of edge, difference of size or distortion etc., reading of movement includes some error. This error can be adjusted by using samples with standard radius. Select appropriate standard referring graph in next page. Push the standard and turn bezel so that the dial shows the right reading of the radius. Measure sample in this setting. Seven standards are prepared in this set.

Standards	1	2	3	4	5	6	7
Radius of convex	3.0mm	5.0mm	10.0mm	20.0mm	50.0mm	100.0mm	Plano
Radius of concave	No	No	-10.0mm	-20.0mm	-50.0mm	-100.0mm	-200.0mm
Shape	Ball	Ball	Disk	Disk	Disk	Disk	Disk
OD	6mm	10mm	12mm	20mm	28mm	32mm	36mm

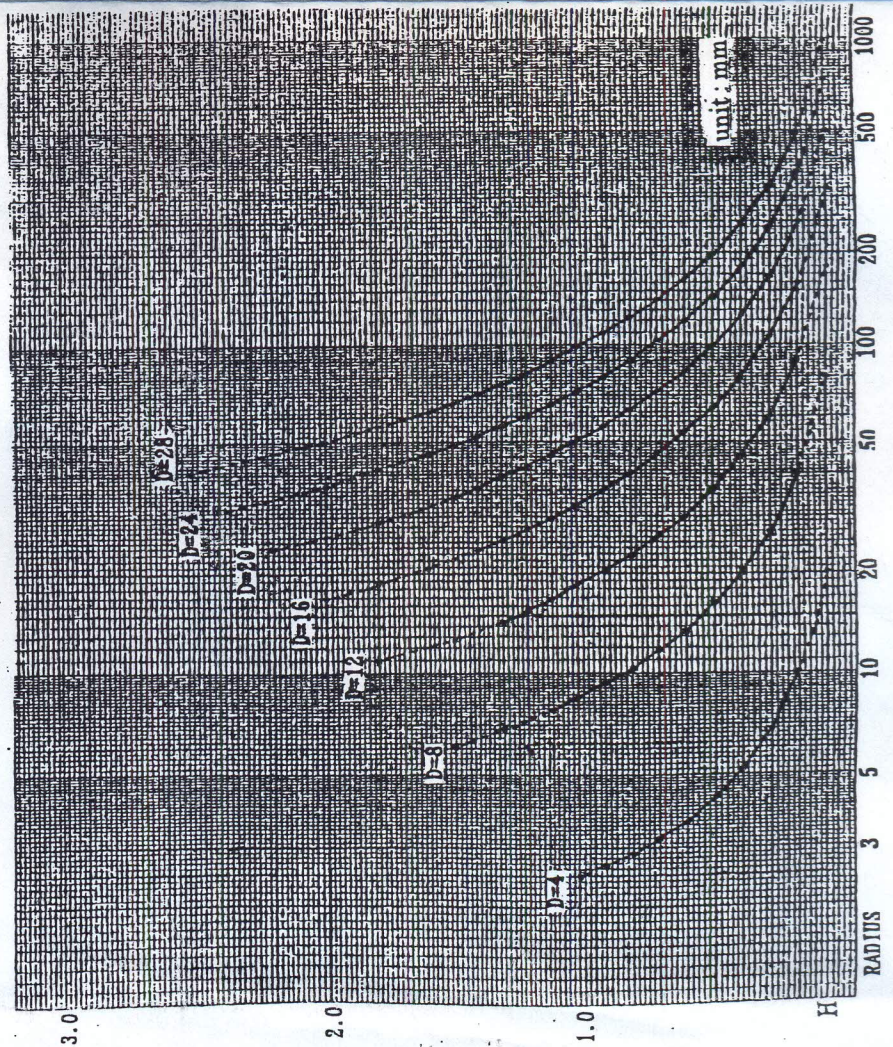


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4. Direct Read Sticker

For more easier and brief measurement, six direct read stickers are provided, which correspond to each measuring head. The sticker can be easily peeled off and can be used repeatedly. Apply it so that center dot of sticker matches with center of dial gauge, vertical line with "0-50" and horizontal line with "25-75" respectively. Outside scale is for convex surface and inside scale for concave surface. The scale is effective only one turn of dial.

HEIGHT(DEPTH) vs RADIUS



How to use this table

In case of diameter of measuring head is 4.0mm and movement is 0.73mm, then radius is 3.1mm as shown in the sample table.

D	H	0.00	0.01	0.02	0.03	0.04	0.05
4.00	---	200.0	100.0	66.7	50.0	40.0	33.4
4.00	0.10	20.1	18.2	16.7	15.4	14.4	12.6
4.00	0.20	10.1	9.6	9.2	8.8	8.5	7.8
4.00	0.30	6.8	6.6	6.4	6.2	6.1	5.9
4.00	0.40	5.2	5.1	5.0	4.9	4.8	4.7
4.00	0.50	4.3	4.2	4.1	4.0	3.9	3.9
4.00	0.60	3.6	3.6	3.5	3.5	3.4	3.4
4.00	0.70	3.2	3.2	3.1	3.1	3.0	3.0
4.00	0.80	2.9	2.9	2.8	2.8	2.8	2.8
4.00	0.90	2.7	2.7	2.6	2.6	2.6	2.6
4.00	1.00	2.5	2.5	2.5	2.5	2.4	2.4
4.00	1.10	2.4	2.4	2.3	2.3	2.3	2.3

1. Table-1 : Radius measured by 4 mm Head

D	H	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
4.00	---	200.0	100.0	66.7	50.0	40.0	33.4	29.6	25.0	22.3	20.6
4.00	0.10	20.1	18.2	16.7	15.4	14.4	13.4	12.6	11.8	11.2	10.6
4.00	0.20	10.1	9.6	9.2	8.8	8.5	8.1	7.8	7.5	7.3	7.0
4.00	0.30	6.8	6.6	6.4	6.2	6.1	5.9	5.7	5.6	5.5	5.3
4.00	0.40	5.2	5.1	5.0	4.9	4.8	4.7	4.6	4.5	4.4	4.3
4.00	0.50	4.3	4.2	4.1	4.0	4.0	3.9	3.9	3.8	3.7	3.7
4.00	0.60	3.6	3.6	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.2
4.00	0.70	3.2	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	2.9
4.00	0.80	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.7	2.7	2.7
4.00	0.90	2.7	2.7	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.5
4.00	1.00	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4
4.00	1.10	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3

2. Table-2 : Radius measured by 8 mm Head

D	H	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
8.00	---	800.0	400.0	266.7	200.0	160.0	133.4	114.3	100.0	88.9	80.0
8.00	0.10	80.1	72.8	66.7	61.6	57.2	53.4	50.1	47.1	44.5	42.2
8.00	0.20	40.1	38.2	36.5	34.9	33.5	32.1	30.9	29.8	28.7	27.7
8.00	0.30	26.8	26.0	25.2	24.4	23.7	23.0	22.4	21.8	21.2	20.7
8.00	0.40	20.2	19.7	19.3	18.8	18.4	18.0	17.6	17.3	16.9	16.6
8.00	0.50	16.3	15.9	15.6	15.4	15.1	14.8	14.6	14.3	14.1	13.9
8.00	0.60	13.6	13.4	13.2	13.0	12.8	12.6	12.5	12.3	12.1	11.9
8.00	0.70	11.8	11.6	11.5	11.3	11.2	11.0	10.9	10.8	10.6	10.5
8.00	0.80	10.4	10.3	10.2	10.1	9.9	9.8	9.7	9.6	9.5	9.4
8.00	0.90	9.3	9.2	9.2	9.1	9.0	8.9	8.8	8.7	8.7	8.6
8.00	1.00	8.5	8.4	8.4	8.3	8.2	8.1	8.1	8.0	7.9	7.9
8.00	1.10	7.8	7.8	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3
8.00	1.20	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8
8.00	1.30	6.8	6.8	6.7	6.7	6.6	6.6	6.6	6.5	6.5	6.5
8.00	1.40	6.4	6.4	6.3	6.3	6.3	6.2	6.2	6.2	6.1	6.1
8.00	1.50	6.1	6.1	6.0	6.0	6.0	5.9	5.9	5.9	5.9	5.8
8.00	1.60	5.8	5.8	5.7	5.7	5.7	5.7	5.6	5.6	5.6	5.6

5. Table-5 : Radius measured by 20 mm Head

D	H	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
20.00	0.00	---	5000	2500	1667	1250	1000	833	714	625	556
20.00	0.10	500	455	417	385	357	333	313	294	278	263
20.00	0.20	250	238	227	218	208	200	192	185	179	173
20.00	0.30	167	161	156	152	147	143	139	135	132	128
20.00	0.40	125	122	119	116	114	111	109	107	104	102
20.00	0.50	100	98.3	96.4	94.6	92.9	91.2	89.6	88.0	86.5	85.0
20.00	0.60	83.6	82.3	81.0	79.7	78.4	77.2	76.1	75.0	73.9	72.8
20.00	0.70	71.8	70.8	69.8	68.9	67.9	67.0	66.2	65.3	64.5	63.7
20.00	0.80	62.9	62.1	61.4	60.7	59.9	59.2	58.6	57.9	57.3	56.6
20.00	0.90	56.0	55.4	54.8	54.2	53.7	53.1	52.6	52.0	51.5	51.0
20.00	1.00	50.5	50.0	49.5	49.1	48.6	48.1	47.7	47.3	46.8	46.4
20.00	1.10	46.0	45.6	45.2	44.8	44.4	44.1	43.7	43.3	43.0	42.6
20.00	1.20	42.3	41.9	41.6	41.3	40.9	40.6	40.3	40.0	39.7	39.4
20.00	1.30	39.1	38.8	38.5	38.3	38.0	37.7	37.4	37.2	36.9	36.7
20.00	1.40	36.4	36.2	35.9	35.7	35.4	35.2	35.0	34.7	34.5	34.3
20.00	1.50	34.1	33.9	33.7	33.4	33.2	33.0	32.8	32.6	32.4	32.2
20.00	1.60	32.1	31.9	31.7	31.5	31.3	31.1	31.0	30.8	30.6	30.4
20.00	1.70	30.3	30.1	29.9	29.8	29.6	29.4	29.3	29.1	29.0	28.8
20.00	1.80	28.7	28.5	28.4	28.2	28.1	28.0	27.8	27.7	27.5	27.4
20.00	1.90	27.3	27.1	27.0	26.9	26.7	26.6	26.5	26.4	26.2	26.1
20.00	2.00	26.0	25.9	25.8	25.6	25.5	25.4	25.3	25.2	25.1	25.0
20.00	2.10	24.9	24.8	24.6	24.5	24.4	24.3	24.2	24.1	24.0	23.9
20.00	2.20	23.8	23.7	23.6	23.5	23.4	23.3	23.3	23.2	23.1	23.0
20.00	2.30	22.9	22.8	22.7	22.6	22.5	22.5	22.4	22.3	22.2	22.1
20.00	2.40	22.0	22.0	21.9	21.8	21.7	21.6	21.6	21.5	21.4	21.3
20.00	2.50	21.3	21.2	21.1	21.0	21.0	20.9	20.8	20.7	20.7	20.6
20.00	2.60	20.5	20.5	20.4	20.3	20.3	20.2	20.1	20.1	20.0	19.9
20.00	2.70	19.9	19.8	19.7	19.7	19.6	19.6	19.5	19.4	19.4	19.3
20.00	2.80	19.3	19.2	19.1	19.1	19.0	19.0	18.9	18.9	18.8	18.7
20.00	2.90	18.7	18.6	18.6	18.5	18.5	18.4	18.4	18.3	18.3	18.2
20.00	3.00	18.2	18.1	18.1	18.0	18.0	17.9	17.9	17.8	17.8	17.7
20.00	3.10	17.7	17.6	17.6	17.5	17.5	17.4	17.4	17.4	17.3	17.3
20.00	3.20	17.2	17.2	17.1	17.1	17.0	17.0	16.9	16.9	16.8	16.8
20.00	3.30	16.8	16.8	16.7	16.7	16.6	16.6	16.6	16.5	16.5	16.4
20.00	3.40	16.4	16.4	16.3	16.3	16.3	16.2	16.2	16.1	16.1	16.1
20.00	3.50	16.0	16.0	16.0	15.9	15.9	15.9	15.8	15.8	15.8	15.7
20.00	3.60	15.7	15.7	15.6	15.6	15.6	15.5	15.5	15.5	15.4	15.4
20.00	3.70	15.4	15.3	15.3	15.3	15.2	15.2	15.2	15.1	15.1	15.1
20.00	3.80	15.1	15.0	15.0	15.0	14.9	14.9	14.9	14.9	14.8	14.8
20.00	3.90	14.8	14.7	14.7	14.7	14.6	14.6	14.6	14.6	14.6	14.5
20.00	4.00	14.5	14.5	14.4	14.4	14.4	14.3	14.3	14.3	14.3	14.3
20.00	4.10	14.2	14.2	14.2	14.2	14.1	14.1	14.1	14.1	14.1	14.0
20.00	4.20	14.0	14.0	14.0	13.9	13.9	13.9	13.9	13.8	13.8	13.8
20.00	4.30	13.8	13.8	13.7	13.7	13.7	13.7	13.6	13.6	13.6	13.6
20.00	4.40	13.6	13.5	13.5	13.5	13.5	13.5	13.4	13.4	13.4	13.4
20.00	4.50	13.4	13.3	13.3	13.3	13.3	13.3	13.2	13.2	13.2	13.2
20.00	4.60	13.2	13.2	13.1	13.1	13.1	13.1	13.1	13.0	13.0	13.0
20.00	4.70	13.0	13.0	13.0	12.9	12.9	12.9	12.9	12.9	12.9	12.8
20.00	4.80	12.8	12.8	12.8	12.8	12.8	12.7	12.7	12.7	12.7	12.7
20.00	4.90	12.7	12.6	12.6	12.6	12.6	12.6	12.6	12.5	12.5	12.5
20.00	5.00	12.5	12.5	12.5	12.5	12.4	12.4	12.4	12.4	12.4	12.4

6. Table-6 : Radius measured by 24 mm Head

D	H	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
24.00	0.00	---	7200	3600	2400	1800	1440	1200	1029	900	800
24.00	0.10	720	655	600	554	514	480	450	424	400	379
24.00	0.20	360	343	327	313	300	288	277	267	257	248
24.00	0.30	240	232	225	218	212	206	200	195	190	185
24.00	0.40	180	176	172	168	164	160	157	153	150	147
24.00	0.50	144	141	139	136	134	131	129	127	124	122
24.00	0.60	120	118	116	115	113	111	109	108	106	105
24.00	0.70	103	102	100	99.0	97.7	96.4	95.1	93.9	92.7	91.5
24.00	0.80	90.4	89.3	88.2	87.2	86.1	85.1	84.2	83.2	82.3	81.3
24.00	0.90	80.5	79.6	78.7	77.9	77.1	76.3	75.5	74.7	74.0	73.2
24.00	1.00	72.5	71.8	71.1	70.4	69.8	69.1	68.5	67.8	67.2	66.6
24.00	1.10	66.0	65.4	64.8	64.3	63.7	63.2	62.6	62.1	61.6	61.1
24.00	1.20	60.6	60.1	59.6	59.2	58.7	58.2	57.8	57.3	56.9	56.5
24.00	1.30	56.0	55.6	55.2	54.8	54.4	54.0	53.6	53.2	52.9	52.5
24.00	1.40	52.1	51.8	51.4	51.1	50.7	50.4	50.0	49.7	49.4	49.1
24.00	1.50	48.8	48.4	48.1	47.8	47.5	47.2	46.9	46.6	46.4	46.1
24.00	1.60	45.8	45.5	45.3	45.0	44.7	44.5	44.2	43.9	43.7	43.4
24.00	1.70	43.2	43.0	42.7	42.5	42.2	42.0	41.8	41.6	41.3	41.1
24.00	1.80	40.9	40.7	40.5	40.3	40.1	39.8	39.6	39.4	39.2	39.0
24.00	1.90	38.8	38.7	38.5	38.3	38.1	37.9	37.7	37.5	37.4	37.2
24.00	2.00	37.0	36.8	36.7	36.5	36.3	36.1	36.0	35.8	35.7	35.5
24.00	2.10	35.3	35.2	35.0	34.9	34.7	34.6	34.4	34.3	34.1	34.0
24.00	2.20	33.8	33.7	33.5	33.4	33.3	33.1	33.0	32.9	32.7	32.6
24.00	2.30	32.5	32.3	32.2	32.1	31.9	31.8	31.7	31.6	31.4	31.3
24.00	2.40	31.2	31.1	31.0	30.8	30.7	30.6	30.5	30.4	30.3	30.2
24.00	2.50	30.1	29.9	29.8	29.7	29.6	29.5	29.4	29.3	29.2	29.1
24.00	2.60	29.0	28.9	28.8	28.7	28.6	28.5	28.4	28.3	28.2	28.1
24.00	2.70	28.0	27.9	27.8	27.7	27.6	27.6	27.5	27.4	27.3	27.2
24.00	2.80	27.1	27.0	26.9	26.9	26.8	26.7	26.6	26.5	26.4	26.4
24.00	2.90	26.3	26.2	26.1	26.0	26.0	25.9	25.8	25.7	25.6	25.6
24.00	3.00	25.5	25.4	25.4	25.3	25.2	25.1	25.1	25.0	24.9	24.8
24.00	3.10	24.8	24.7	24.6	24.6	24.5	24.4	24.4	24.3	24.2	24.2
24.00	3.20	24.1	24.0	24.0	23.9	23.8	23.8	23.7	23.7	23.6	23.5
24.00	3.30	23.5	23.4	23.3	23.3	23.2	23.2	23.1	23.0	23.0	22.9
24.00	3.40	22.9	22.8	22.8	22.7	22.7	22.6	22.5	22.5	22.4	22.4
24.00	3.50	22.3	22.3	22.2	22.2	22.1	22.1	22.0	22.0	21.9	21.9
24.00	3.60	21.8	21.7	21.7	21.6	21.6	21.6	21.5	21.5	21.4	21.4
24.00	3.70	21.3	21.3	21.2	21.2	21.1	21.1	21.0	21.0	20.9	20.9
24.00	3.80	20.8	20.8	20.8	20.7	20.7	20.6	20.6	20.5	20.5	20.5
24.00	3.90	20.4	20.4	20.3	20.3	20.2	20.2	20.2	20.1	20.1	20.0
24.00	4.00	20.0	20.0	19.9	19.9	19.8	19.8	19.8	19.7	19.7	19.6
24.00	4.10	19.6	19.6	19.5	19.5	19.5	19.4	19.4	19.4	19.3	19.3
24.00	4.20	19.2	19.2	19.2	19.1	19.1	19.1	19.0	19.0	19.0	18.9
24.00	4.30	18.9	18.9	18.8	18.8	18.8	18.7	18.7	18.7	18.6	18.6
24.00	4.40	18.6	18.5	18.5	18.5	18.4	18.4	18.4	18.3	18.3	18.3
24.00	4.50	18.3	18.2	18.2	18.2	18.1	18.1	18.1	18.0	18.0	18.0
24.00	4.60	18.0	17.9	17.9	17.9	17.8	17.8	17.8	17.8	17.7	17.7
24.00	4.70	17.7	17.6	17.6	17.6	17.6	17.5	17.5	17.5	17.5	17.4
24.00	4.80	17.4	17.4	17.3	17.3	17.3	17.3	17.2	17.2	17.2	17.2
24.00	4.90	17.1	17.1	17.1	17.1	17.0	17.0	17.0	17.0	16.9	16.9
24.00	5.00	16.9	16.9	16.9	16.8	16.8	16.8	16.8	16.7	16.7	16.7

7. Table-7 : Radius measured by 28 mm Head

D	H	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
28.00	0.00	—	9800	4900	3267	2450	1960	1633	1400	1225	1089
28.00	0.10	980	891	817	754	700	653	613	577	545	516
28.00	0.20	490	467	446	426	408	392	377	363	350	338
28.00	0.30	327	316	306	297	288	280	272	265	258	251
28.00	0.40	245	239	234	228	223	218	213	209	204	200
28.00	0.50	196	192	189	185	182	178	175	172	169	166
28.00	0.60	164	161	158	156	153	151	149	147	144	142
28.00	0.70	140	138	136	135	133	131	129	128	126	124
28.00	0.80	123	121	120	118	117	116	114	113	112	111
28.00	0.90	109	108	107	106	105	104	103	102	100	99.5
28.00	1.00	98.5	97.5	96.6	95.7	94.8	93.9	93.0	92.1	91.3	90.5
28.00	1.10	89.6	88.8	88.1	87.3	86.5	85.8	85.1	84.3	83.6	82.9
28.00	1.20	82.3	81.6	80.9	80.3	79.7	79.0	78.4	77.8	77.2	76.6
28.00	1.30	76.0	75.5	74.9	74.3	73.8	73.3	72.7	72.2	71.7	71.2
28.00	1.40	70.7	70.2	69.7	69.2	68.8	68.3	67.9	67.4	67.0	66.5
28.00	1.50	66.1	65.7	65.2	64.8	64.4	64.0	63.6	63.2	62.8	62.4
28.00	1.60	62.1	61.7	61.3	60.9	60.6	60.2	59.9	59.5	59.2	58.8
28.00	1.70	58.5	58.2	57.8	57.5	57.2	56.9	56.6	56.3	55.9	55.6
28.00	1.80	55.3	55.0	54.8	54.5	54.2	53.9	53.6	53.3	53.1	52.8
28.00	1.90	52.5	52.3	52.0	51.7	51.5	51.2	51.0	50.7	50.5	50.2
28.00	2.00	50.0	49.8	49.5	49.3	49.1	48.8	48.6	48.4	48.2	47.9
28.00	2.10	47.7	47.5	47.3	47.1	46.9	46.7	46.5	46.2	46.0	45.8
28.00	2.20	45.6	45.4	45.3	45.1	44.9	44.7	44.5	44.3	44.1	43.9
28.00	2.30	43.8	43.6	43.4	43.2	43.1	42.9	42.7	42.5	42.4	42.2
28.00	2.40	42.0	41.9	41.7	41.5	41.4	41.2	41.1	40.9	40.8	40.6
28.00	2.50	40.5	40.3	40.1	40.0	39.9	39.7	39.6	39.4	39.3	39.1
28.00	2.60	39.0	38.9	38.7	38.6	38.4	38.3	38.2	38.0	37.9	37.8
28.00	2.70	37.6	37.5	37.4	37.3	37.1	37.0	36.9	36.8	36.6	36.5
28.00	2.80	36.4	36.3	36.2	36.0	35.9	35.8	35.7	35.6	35.5	35.4
28.00	2.90	35.2	35.1	35.0	34.9	34.8	34.7	34.6	34.5	34.4	34.3
28.00	3.00	34.2	34.1	34.0	33.9	33.8	33.7	33.6	33.5	33.4	33.3
28.00	3.10	33.2	33.1	33.0	32.9	32.8	32.7	32.6	32.5	32.4	32.3
28.00	3.20	32.2	32.1	32.0	32.0	31.9	31.8	31.7	31.6	31.5	31.4
28.00	3.30	31.3	31.3	31.2	31.1	31.0	30.9	30.8	30.8	30.7	30.6
28.00	3.40	30.5	30.4	30.4	30.3	30.2	30.1	30.1	30.0	29.9	29.8
28.00	3.50	29.8	29.7	29.6	29.5	29.5	29.4	29.3	29.2	29.2	29.1
28.00	3.60	29.0	29.0	28.9	28.8	28.7	28.7	28.6	28.5	28.5	28.4
28.00	3.70	28.3	28.3	28.2	28.1	28.1	28.0	27.9	27.9	27.8	27.8
28.00	3.80	27.7	27.6	27.6	27.5	27.4	27.4	27.3	27.3	27.2	27.1
28.00	3.90	27.1	27.0	27.0	26.9	26.8	26.8	26.7	26.7	26.6	26.6
28.00	4.00	26.5	26.4	26.4	26.3	26.3	26.2	26.2	26.1	26.1	26.0
28.00	4.10	26.0	25.8	25.8	25.8	25.7	25.7	25.6	25.6	25.5	25.5
28.00	4.20	25.4	25.4	25.3	25.3	25.2	25.2	25.1	25.1	25.0	25.0
28.00	4.30	24.9	24.9	24.8	24.8	24.8	24.7	24.7	24.6	24.6	24.5
28.00	4.40	24.5	24.4	24.4	24.3	24.3	24.2	24.2	24.2	24.1	24.1
28.00	4.50	24.0	24.0	23.9	23.9	23.8	23.8	23.8	23.7	23.7	23.6
28.00	4.60	23.6	23.6	23.5	23.5	23.4	23.4	23.4	23.3	23.3	23.2
28.00	4.70	23.2	23.2	23.1	23.1	23.0	23.0	23.0	22.9	22.9	22.9
28.00	4.80	22.8	22.8	22.7	22.7	22.7	22.6	22.6	22.6	22.5	22.5
28.00	4.90	22.5	22.4	22.4	22.3	22.3	22.3	22.2	22.2	22.2	22.1
28.00	5.00	22.1	22.1	22.0	22.0	22.0	21.9	21.9	21.9	21.8	21.8

