Power Steering Pumps

SAGINAW VANE TYPE

Chrysler Corp.
Ford ("E" Models Only)
General Motors
International Harvester
Jeep

DESCRIPTION

The Saginaw vane type power steering pump can be identified by the "ham can" shape of the fluid reservoir. Internally, rectangular pumping vanes carried by a shaft driven rotor move fluid from intake to pressure cavities of cam ring. As rotor begins to rotate, centrifugal force throws vanes against inside surface of cam ring to pick up residual oil, which is then forced into high pressure area. As more oil is picked up by the vanes, oil is forced into the cavities of the thrust plate and through two cross-over holes in the cam ring and pressure plate (which empty into high pressure area between pressure plate and housing end plate). Filling high pressure area causes oil to flow under vanes in slots of rotor, forcing vanes to follow inside oval surface of cam ring. As vanes rotate to small area of cam ring, oil is forced out from between vanes.

LUBRICATION, TROUBLE SHOOTING & TESTING

See Power Steering General Servicing in this section.

REMOVAL & INSTALLATION

POWER STEERING PUMP

Loosen pump adjusting bolt (or nut) and pump mounting bolts, then withdraw pump drive belt. Disconnect pressure and return hoses from pump and cap ends to prevent loss of fluid and entry of dirt. Remove bolts attaching pump mounting bracket to engine, and withdraw pump, pulley, and mounting bracket as an assembly. To install, reverse removal procedure and bleed hydraulic system.

OVERHAUL

CAUTION – *When clamping pump in vise, be careful not to exert excessive force on front hub of pump as bushing may become distorted.*

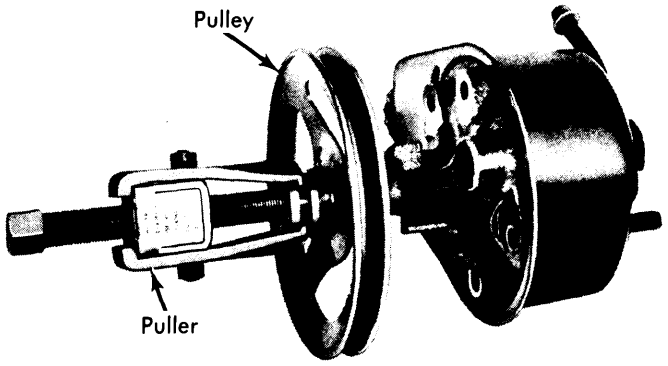

Fig. 1 Using Puller to Remove Pump Pulley

Disassembly – **1)** Using a suitable puller, withdraw pulley from shaft. Do not use a hammer to remove pulley. Drain pump reservoir, clean exterior of unit and remove mounting bracket(s). Clamp pump (with shaft pointing downward) in a soft jawed vise, making sure vise grips pump at square boss and shaft housing. Remove pressure line union and "O" ring seal. Remove reservoir retaining studs, then tap against filler tube to loosen reservoir on pump body. Remove reservoir from body, then withdraw and discard "O" ring seals.

2) Using a 1/8" diameter punch, tap end plate retaining ring around until one end of ring is near hole in pump body. Insert punch in hole far enough to disengage ring from groove in pump bore, then use a screwdriver and pry ring out of body. Tap end plate with a soft faced hammer to break it loose; the spring located under the end plate should push plate up. Remove pump body from vise.

Fig. 2 Disengaging and Removing Retaining Ring for End Plate of Pump

3) Place pump in inverted position on flat surface, and tap end of drive shaft with soft-faced hammer to loosen pressure plate, rotor, and thrust plate assembly from body. Lift pump body off rotor assembly (flow control valve and spring should also slide out of bore). Remove and discard end plate and pressure plate "O" rings. Pry drive shaft oil seal from body using a screwdriver.

4) Inspect seal bore in housing for burrs, nicks, or score marks that would allow oil to by-pass outer seal surface. Lift pressure plate and cam ring from rotor, then remove rotor vanes. Clamp drive shaft in soft-jawed vise, with rotor and thrust plate facing up, and remove rotor lock ring from shaft, using care not to nick shaft or rotor. Slide rotor and thrust plate off shaft, and remove shaft from vise.

SAGINAW VANE TYPE (Cont.)

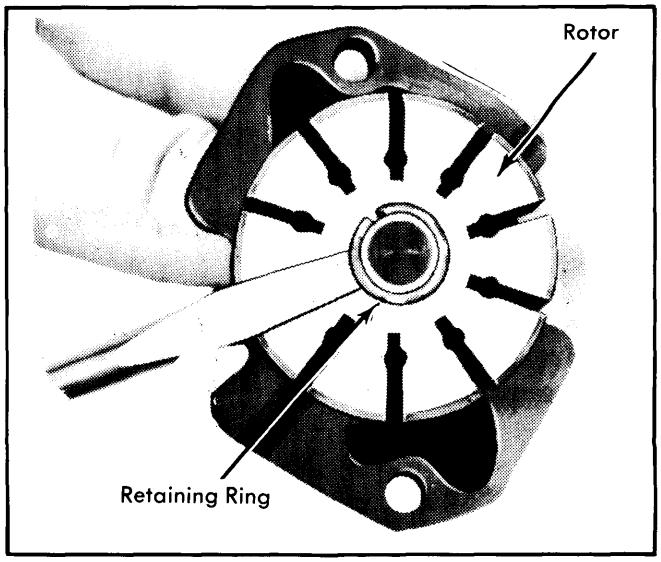

Fig. 3 Removing Pump Rotor Retaining Ring

Cleaning & Inspection – 1) Clean all pump components (except drive shaft seal) in a suitable solvent and blow dry. Inspect flow control valve assembly for wear, scoring, burrs or other damage. Check all machined surfaces of body for scratches or burrs which might allow leaks. Mating surfaces on "O" rings require special attention.

NOTE – *Cam ring is treated with "Lubrite" which leaves a dull gray-black finish on wear surface. Wavy grain appearance inside cam ring is normal.*

2) Inspect pump body drive shaft bushing for excessive wear. If replacement is required, replace pump body and bushing as an assembly. Inspect end cover for nicks and burrs on surface for "O" ring, then polish with a small oil stone if necessary.

3) Inspect rotor ring for roughness or irregularities. Use a small oil stone to correct minor irregularities and replace ring if outside cam surface is badly worn or scored. Check thrust plate and pressure plate for scoring and wear. To remove light scoring, carefully lap using crocus cloth until surface is smooth and flat, then clean thoroughly.

4) Check fit of vanes in rotor to ensure that they slide freely but fit snugly into slots. Use an oil stone to remove burrs or irregularities from vanes. If vanes are excessively loose in slots, the rotor requires replacement. Scoring on rotor may be removed by careful laping using crocus cloth, and then cleaning thoroughly.

Reassembly – 1) Lubricate all "O" rings and seal areas with power steering fluid. Place pump body on a flat surface. Drive a new shaft seal into bore using a 7/8" or 15/16" socket. Drive seal in until it bottoms on shoulder in bore. Lubricate seal with power steering fluid, then clamp body in vise with shaft pointing downward. Install end plate and pressure plate "O" rings in grooves of body.

2) With drive shaft clamped, splined end up, in a soft-jawed vise, install thrust plate on shaft with smooth, ported side up. Slide rotor over splines with counter bore of rotor facing down. Install rotor lock ring making sure it is seated in groove. Install two dowel pins in holes in pump cavity. Carefully insert drive shaft, rotor, and thrust plate assembly in pump cavity, indexing location holes with dowel pins.

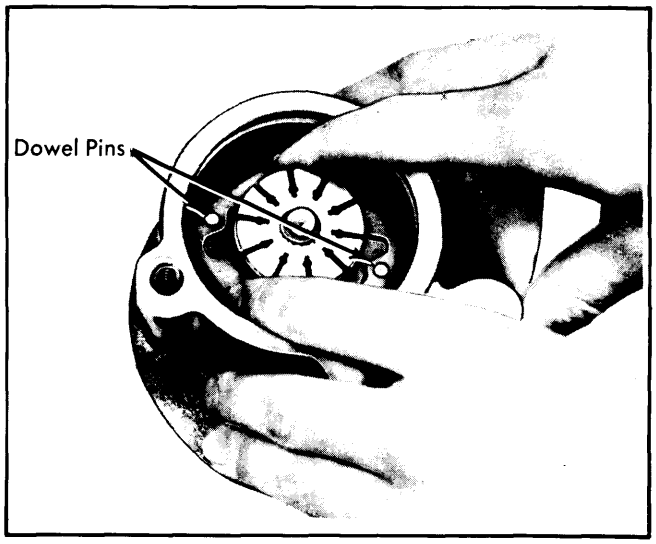

Fig. 4 Installing Drive Shaft Assembly and Aligning Location Holes with Dowel Pins

3) Slide cam ring over rotor and onto dowel pins, with arrow on ring facing up. Install vanes in rotor slots with radius edge facing out towards cam ring inner surface. Position pressure plate on dowel pins. Place a 1 1/4" socket in groove of pressure plate, and seat entire assembly on "O" ring in pump cavity by pressing down on socket with both thumbs.

4) Place spring in groove in pressure plate and position end cover lip edge up over spring. Press end cover down below retaining ring groove with thumb, and install retaining ring, making sure ring is seated in groove. Care should be taken to prevent cocking end cover in bore or distorting assembly.

5) Using a punch, tap retaining ring ends around in groove until opening is opposite flow control valve bore. This is necessary for maximum retention of retaining ring. Install new reservoir "O" ring, mounting stud "O" rings, and flow control valve "O" ring on pump body, then carefully position reservoir on pump body. Align mounting stud holes until studs can be started in threads.

6) Using a soft-faced hammer, tap reservoir down on pump and install flow control valve spring and valve assembly. Install new "O" ring seal on pressure hose fitting, making sure it is installed on the upper groove. Install pressure hose fitting and tighten mounting studs. Tighten hose fitting and rear mounting studs. Remove pump assembly from vise, and install mounting bracket and drive pulley.

CAUTION – *Do not hammer pulley on shaft.*

SAGINAW VANE TYPE (Cont.)

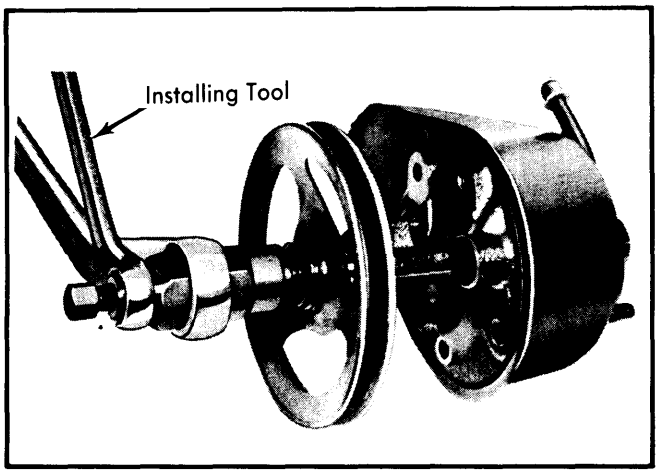

Fig. 5 Pressing Pump Pulley into Position

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.
Hose Fittings	
Gear End	
Chrysler Corp.	25
Ford Motor Co.	20-30
Jeep	25-35
Pump End	
Chrysler Corp.	35
Ford Motor Co.	20-35
Jeep	25-35
Bracket Bolts	
All Models	35
Flow Control Valve Plug	
Chrysler Corp.	4

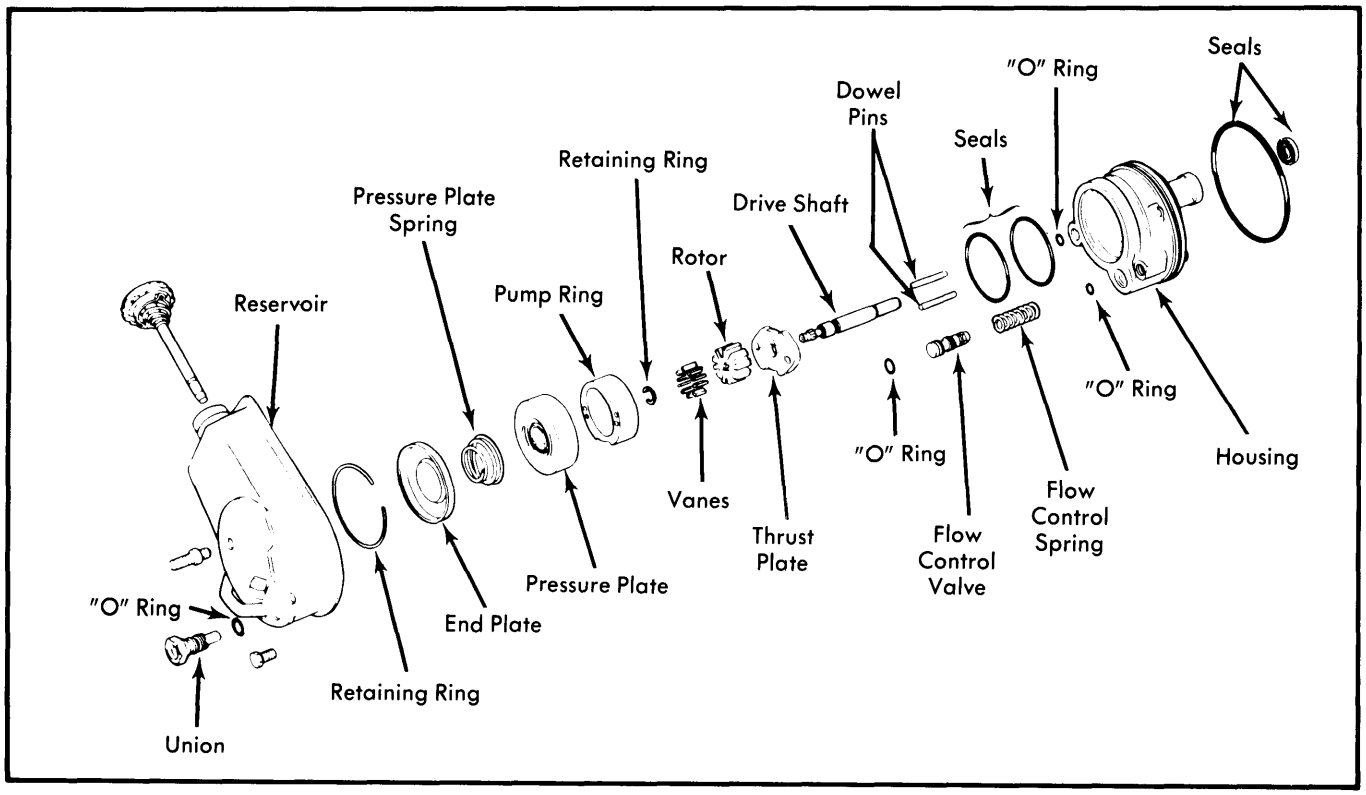

Fig. 6 Exploded View of Power Steering Pump

Torque & Drill Conversion Chart

TORQUE CONVERSIONS
FOOT POUNDS TO METER KILOGRAMS

Ft. Lbs.	Mkg	Ft. Lbs.	Mkg	Ft. Lbs.	Mkg	Ft. Lbs.	Mkg
1	.14	26	3.60	51	7.05	76	10.51
2	.28	27	3.73	52	7.19	77	10.65
3	.41	28	3.87	53	7.33	78	10.78
4	.55	29	4.01	54	7.47	79	10.92
5	.69	30	4.15	55	7.60	80	11.06
6	.83	31	4.29	56	7.74	81	11.20
7	.97	32	4.42	57	7.88	82	11.34
8	1.11	33	4.56	58	8.02	83	11.48
9	1.24	34	4.70	59	8.16	84	11.61
10	1.38	35	4.84	60	8.30	85	11.75
11	1.52	36	4.98	61	8.43	86	11.89
12	1.66	37	5.12	62	8.57	87	12.03
13	1.80	38	5.25	63	8.71	88	12.17
14	1.94	39	5.39	64	8.85	89	12.31
15	2.07	40	5.53	65	8.99	90	12.44
16	2.21	41	5.67	66	9.13	91	12.58
17	2.35	42	5.81	67	9.26	92	12.72
18	2.49	43	5.95	68	9.40	93	12.86
19	2.63	44	6.08	69	9.54	94	13.00
20	2.77	45	6.22	70	9.68	95	13.13
21	2.90	46	6.36	71	9.82	96	13.27
22	3.04	47	6.50	72	9.95	97	13.41
23	3.18	48	6.64	73	10.09	98	13.55
24	3.32	49	6.77	74	10.23	99	13.69
25	3.46	50	6.91	75	10.37	100	13.83

DRILL SIZE & IDENTIFICATION

Drill Diam.	Drill Size	Drill Diam.	Drill Size	Drill Diam.	Drill Size	Drill Diam.	Drill Size
.413″	Z	.2280″	1	.1440″	27	.0550″	54
.404″	Y	.2210″	2	.1405″	28	.0520″	55
.397″	X	.2130″	3	.1360″	29	.0465″	56
.386″	W	.2090″	4	.1285″	30	.0430″	57
.377″	V	.2055″	5	.1200″	31	.0420″	58
.368″	U	.2040″	6	.1160″	32	.0410″	59
.358″	T	.2010″	7	.1130″	33	.0400″	60
.348″	S	.1990″	8	.1110″	34	.0390″	61
.339″	R	.1960″	9	.1100″	35	.0380″	62
.332″	Q	.1935″	10	.1065″	36	.0370″	63
.323″	P	.1910″	11	.1040″	37	.0360″	64
.316″	O	.1890″	12	.1015″	38	.0350″	65
.302″	N	.1850″	13	.0995″	39	.0330″	66
.295″	M	.1820″	14	.0980″	40	.0320″	67
.290″	L	.1800″	15	.0960″	41	.0310″	68
.281″	K	.1770″	16	.0935″	42	.0292″	69
.277″	J	.1730″	17	.0890″	43	.0280″	70
.272″	I	.1695″	18	.0860″	44	.0260″	71
.266″	H	.1660″	19	.0820″	45	.0250″	72
.261″	G	.1610″	20	.0810″	46	.0240″	73
.257″	F	.1590″	21	.0785″	47	.0225″	74
.250″	E	.1570″	22	.0760″	48	.0210″	75
.246″	D	.1540″	23	.0730″	49	.0200″	76
.242″	C	.1520″	24	.0700″	50	.0180″	77
.238″	B	.1495″	25	.0670″	51	.0160″	78
.234″	A	.1470″	26	.0635″	52	.0145″	79
				.0595″	53	.0135″	80

English-Metric Conversion Chart

FRACTIONS TO INCHES & METRIC EQUIVALENTS

Fractions	Inches	MM	Fractions	Inches	MM
1/64	.016	.397	33/64	.516	13.097
1/32	.031	.794	17/32	.531	13.494
3/64	.047	1.191	35/64	.547	13.891
1/16	.063	1.588	9/16	.563	14.288
5/64	.078	1.984	37/64	.578	14.684
3/32	.094	2.381	19/32	.594	15.081
7/64	.109	2.778	39/64	.609	15.478
1/8	.125	3.175	5/8	.625	15.875
9/64	.141	3.572	41/64	.641	16.272
5/32	.156	3.969	21/32	.656	16.669
11/64	.172	4.366	43/64	.672	17.066
3/16	.188	4.763	11/16	.687	17.463
13/64	.203	5.159	45/64	.703	17.859
7/32	.219	5.556	23/32	.719	18.256
15/64	.234	5.953	47/64	.734	18.653
1/4	.250	6.350	3/4	.750	19.050
17/64	.266	6.747	49/64	.766	19.447
9/32	.281	7.144	25/32	.781	19.844
19/64	.297	7.541	51/64	.797	20.241
5/16	.313	7.938	13/16	.813	20.638
21/64	.328	8.334	53/64	.828	21.034
11/32	.344	8.731	27/32	.844	21.431
23/64	.359	9.128	55/64	.859	21.828
3/8	.375	9.525	7/8	.875	22.225
25/64	.391	9.922	57/64	.891	22.622
13/32	.406	10.319	29/32	.906	23.019
27/64	.422	10.716	59/64	.922	23.416
7/16	.438	11.113	15/16	.938	23.813
29/64	.453	11.509	61/64	.953	24.209
15/32	.469	11.906	31/32	.969	24.606
31/64	.484	12.303	63/64	.984	25.003
1/2	.500	12.700			

CONVERSION FACTORS

Unit	To Unit	Multiply By
LENGTH		
Millimeters	Inches	.03937
Inches	Millimeters	25.4
Meters	Feet	3.28084
Feet	Meters	.3048
Kilometers	Miles	.62137
Miles	Kilometers	1.60935
AREA		
Square Centimeters	Square Inches	.155
Square Inches	Square Centimeters	6.45159
VOLUME		
Cubic Centimeters	Cubic Inches	.06103
Cubic Inches	Cubic Centimeters	16.38703
Liters	Cubic Inches	61.025
Cubic Inches	Liters	.01639
Liters	Quarts	1.05672
Quarts	Liters	.94633
Liters	Pints	2.11344
Pints	Liters	.47317
Liters	Ounces	33.81497
Ounces	Liters	.02957

Unit	To Unit	Multiply By
WEIGHT		
Grams	Ounces	.03527
Ounces	Grams	28.34953
Kilograms	Pounds	2.20462
Pounds	Kilograms	.45359
WORK		
Centimeter Kilograms	Inch Pounds	.8676
Inch Pounds	Centimeter Kilograms	1.15262
Meter Kilograms	Foot Pounds	7.23301
Foot Pounds	Meter Kilograms	.13826
PRESSURE		
Kilograms/ Sq. Centimeter	Pounds/Sq.Inch	14.22334
Pounds/Sq.Inch	Kilograms/Sq.Centimeter	.07031
Bar	Pounds/Sq.Inch	14.504
Pounds/Sq.Inch	Bar	.06895
Atmosphere	Pounds/Sq.Inch	14.696
Pounds/Sq.Inch	Atmosphere	.06805
TEMPERATURE		
Centigrade Degrees	Fahrenheit Degrees	$(C° \times 9/5) + 32$
Fahrenheit Degrees	Centigrade Degrees	$(F° - 32) \times 5/9$

English-Metric Conversion Chart

MILLIMETERS TO INCHES

Conversion Factor — Multiply known millimeter figure by .03937

MM	Inches	MM	Inches	MM	Inches	MM	Inches	MM	Inches
1	.039	21	.827	41	1.614	61	2.402	81	3.189
2	.079	22	.866	42	1.654	62	2.441	82	3.228
3	.118	23	.906	43	1.693	63	2.480	83	3.268
4	.157	24	.945	44	1.732	64	2.520	84	3.307
5	.197	25	.984	45	1.772	65	2.559	85	3.346
6	.236	26	1.024	46	1.811	66	2.598	86	3.386
7	.276	27	1.063	47	1.850	67	2.638	87	3.425
8	.315	28	1.102	48	1.890	68	2.677	88	3.465
9	.354	29	1.142	49	1.929	69	2.717	89	3.504
10	.394	30	1.181	50	1.969	70	2.756	90	3.543
11	.433	31	1.220	51	2.008	71	2.795	91	3.583
12	.472	32	1.260	52	2.047	72	2.835	92	3.622
13	.512	33	1.299	53	2.087	73	2.874	93	3.661
14	.551	34	1.339	54	2.126	74	2.913	94	3.701
15	.591	35	1.378	55	2.165	75	2.953	95	3.740
16	.630	36	1.417	56	2.205	76	2.992	96	3.780
17	.669	37	1.457	57	2.244	77	3.031	97	3.819
18	.709	38	1.496	58	2.283	78	3.071	98	3.858
19	.748	39	1.535	59	2.323	79	3.110	99	3.898
20	.787	40	1.575	60	2.362	80	3.150	100	3.937

INCHES TO MILLIMETERS

Conversion Factor — Multiply known inch figure by 25.40

Inches	MM	Inches	MM	Inches	MM	Inches	MM	Inches	MM
.001	.025	.040	1.016	.340	8.636	.640	16.256	.940	23.876
.002	.051	.050	1.270	.350	8.890	.650	16.510	.950	24.130
.003	.076	.060	1.524	.360	9.144	.660	16.764	.960	24.384
.004	.102	.070	1.778	.370	9.398	.670	17.018	.970	24.638
.005	.127	.080	2.032	.380	9.652	.680	17.272	.980	24.892
.006	.152	.090	2.286	.390	9.906	.690	17.526	.990	25.146
.007	.178	.100	2.540	.400	10.160	.700	17.780	1.000	25.400
.008	.203	.110	2.794	.410	10.414	.710	18.034	2.000	50.800
.009	.229	.120	3.048	.420	10.668	.720	18.288	3.000	76.200
.010	.254	.130	3.302	.430	10.922	.730	18.542	4.000	101.600
.011	.279	.140	3.556	.440	11.176	.740	18.796	5.000	127.000
.012	.305	.150	3.810	.450	11.430	.750	19.050		
.013	.330	.160	4.064	.460	11.684	.760	19.304		
.014	.356	.170	4.318	.470	11.938	.770	19.558		
.015	.381	.180	4.572	.480	12.192	.780	19.812		
.016	.406	.190	4.826	.490	12.446	.790	20.066		
.017	.432	.200	5.080	.500	12.700	.800	20.320		
.018	.457	.210	5.334	.510	12.954	.810	20.574		
.019	.483	.220	5.558	.520	13.208	.820	20.828		
.020	.508	.230	5.842	.530	13.462	.830	21.082		
.021	.533	.240	6.096	.540	13.716	.840	21.336		
.022	.559	.250	6.350	.550	13.970	.850	21.590		
.023	.584	.260	6.604	.560	14.224	.860	21.844		
.024	.610	.270	6.858	.570	14.478	.870	22.098		
.025	.635	.280	7.112	.580	14.732	.880	22.352		
.026	.652	.290	7.366	.590	14.986	.890	22.606		
.027	.686	.300	7.620	.600	15.240	.900	22.860		
.028	.711	.310	7.874	.610	15.494	.910	23.114		
.029	.737	.320	8.128	.620	15.748	.920	23.368		
.030	.762	.330	8.382	.630	16.002	.930	23.622		