LAMPIRAN

LAMPIRAN 1

Tabel L.1 Elevasi tanah dan gradien hidrolik

Altitude (m)	Distance (km)	MAOH	Gradien Hidrolik
4.9	0	1844	916.59
3.5	1.0357	1842.6	907.02
0.3	2.2525	1839.4	897.45
1.2	3.2881	1840.3	887.88
3	4.5765	1842.1	878.31
1	5.0059	1840.1	868.74
0	5.614	1839.1	859.17
1.1	6.5953	1840.2	849.6
2.8	7.8828	1841.9	840.03
1.3	9.0982	1840.4	830.46
1.8	9.891	1840.9	820.89
2.5	10.8716	1841.6	811.32
1.1	11.6642	1840.2	801.75
1.6	12.879	1840.7	792.18
-0.2	13.9127	1838.9	782.61
1.3	15.2724	1840.4	773.04
1.1	16.4861	1840.2	763.47
0.2	17.6546	1839.3	753.9
2.4	18.8228	1841.5	744.33
5.5	19.7837	1844.6	734.76
4.8	20.575	1843.9	725.19
3.5	21.5356	1842.6	715.62
1	22.304	1840.1	706.05
3.8	23.2826	1842.9	696.48
2.8	24.0736	1841.9	686.91
2	24.8417	1841.1	677.34

Tabel L.1 Elevasi tanah dan gradien hidrolik (*lanjutan)*

Altitude (m)	Distance (km)	MAOH	Gradien Hidrolik
6.7	26.0084	1845.8	667.77
6.7	27.5888	1845.8	658.2
2.8	28.3789	1841.9	648.63
4.7	28.5707	1843.8	639.06
1.7	30.307	1840.8	629.49
1.4	31.4575	1840.5	619.92
1.9	32.7997	1841	610.35
1.2	32.9915	1840.3	600.78
0.6	34.5251	1839.7	591.21
0.9	35.3153	1840	581.64
1.9	36.4646	1841	572.07
2.1	37.6298	1841.2	562.5
2	38.8407	1841.1	552.93
2.7	39.7982	1841.8	543.36
0.9	40.7746	1840	533.79
0.1	41.3799	1839.2	524.22
1.5	42.4103	1840.6	514.65
3	43.4406	1842.1	505.08
7.2	44.2958	1846.3	495.51
4.1	45.4102	1843.2	485.94
5.3	46.1991	1844.4	476.37
4	46.9879	1843.1	466.8
5.2	48.0175	1844.3	457.23
5.3	49.1314	1844.4	447.66
3.5	50.5082	1842.6	438.09
8.2	51.3624	1847.3	428.52
2.1	52.5713	1841.2	418.95
0.3	53.4254	1839.4	409.38

Tabel L.1 Elevasi tanah dan gradien hidrolik (*lanjutan)*

Altitude (m)	Distance (km)	MAOH	Gradien Hidrolik
-0.3	54.2795	1838.8	399.81
1.1	55.0676	1840.2	390.24
-0.8	56.1804	1838.3	380.67
3.5	56.7844	1842.6	371.1
3.2	57.4722	1842.3	361.53
0	57.8991	1839.1	351.96
-0.2	58.9765	1838.9	342.39
1.5	60.0538	1840.6	332.82
0.5	61.274	1839.6	323.25
0.2	61.9615	1839.3	313.68
0.4	62.9125	1839.5	304.11
-1	64.1924	1838.1	294.54
1.1	64.8779	1840.2	284.97
0.4	66.2526	1839.5	275.4
4.7	67.4724	1843.8	265.83
3.4	68.1597	1842.5	256.26
8.3	69.2714	1847.4	246.69
4.4	70.5507	1843.5	237.12
0.8	71.5781	1839.9	227.55
-2.2	72.4309	1836.9	217.98
0.1	73.5423	1839.2	208.41
0.1	74.9317	1839.2	198.84
0.6	76.043	1839.7	189.27
2	77.1542	1841.1	179.7
3	78.1274	1842.1	170.13
4.3	78.8143	1843.4	160.56
2.9	79.8412	1842	150.99
3.1	80.8681	1842.2	141.42

Tabel L.1 Elevasi tanah dan gradien hidrolik (*lanjutan)*

Altitude (m)	Distance (km)	MAOH	Gradien Hidrolik
1.2	81.2498	1840.3	131.85
1.7	82.4105	1840.8	122.28
3.1	83.0136	1842.2	112.71
1	83.8002	1840.1	103.14
2	84.9452	1841.1	93.57
0.8	86.1058	1839.9	84
0.1	86.8691	1839.2	74.43
1.9	87.6324	1841	64.86
1	88.9681	1840.1	55.29
0.6	90.3038	1839.7	45.72
0	91.4643	1839.1	36.15
0	92.2276	1839.1	26.58
0	93.3725	1839.1	17.01
0	93.9449	1839.1	7.44
3.5	95.1054	1842.6	916.59
1.9	96.3113	1841	907.02
3	97.1635	1842.1	897.45
2.7	98.0157	1841.8	887.88
2.1	99.1264	1841.2	878.31
4.9	100.332	1844	868.74
2.7	101.019	1841.8	859.17
0.3	102.471	1839.4	849.6
1.6	102.662	1840.7	840.03
0.6	103.634	1839.7	830.46
2.8	104.607	1841.9	820.89
0	106.146	1839.1	811.32
0	107.874	1839.1	801.75
3.7	109.4	1842.8	792.18

Tabel L.1 Elevasi tanah dan gradien hidrolik (*lanjutan)*

Altitude (m)	Distance (km)	MAOH	Gradien Hidrolik
2.5	110.75	1841.6	782.61
3.5	112.277	1842.6	773.04
0	112.964	1839.1	763.47
0	113.567	1839.1	753.9
3.3	114.419	1842.4	744.33
0	115.698	1839.1	734.76
0	116.977	1839.1	725.19
0	117.664	1839.1	715.62
0	118.451	1839.1	706.05
0	119.987	1839.1	696.48
1.5	121.524	1840.6	686.91
3.3	122.377	1842.4	677.34
0.9	124.007	1840	667.77
3	124.96	1842.1	658.2
2.8	125.151	1841.9	648.63
3.3	126.857	1842.4	639.06
0.4	128.065	1839.5	629.49
1.1	129.177	1840.2	619.92
3.2	129.984	1842.3	610.35
0	130.557	1839.1	600.78
0	131.51	1839.1	591.21
0	132.964	1839.1	581.64
0	133.752	1839.1	572.07
0	134.865	1839.1	562.5
0	135.653	1839.1	552.93
0	136.441	1839.1	543.36
0	137.045	1839.1	533.79
0	137.649	1839.1	524.22

Tabel L.1 Elevasi tanah dan gradien hidrolik (*lanjutan)*

Altitude (m)	Distance (km)	MAOH	Gradien Hidrolik
2.9	138.762	1842	514.65
0.2	139.97	1839.3	505.08
1.6	141.179	1840.7	495.51
0	142.46	1839.1	485.94
1.2	143.065	1840.3	476.37
1.1	144.095	1840.2	466.8
0.8	145.377	1839.9	457.23
0.7	146.142	1839.8	447.66
0.7	147.118	1839.8	438.09
0.3	148.094	1839.4	428.52
0.6	149.07	1839.7	418.95
2.5	149.925	1841.6	409.38
-1.3	151.136	1837.8	399.81
0.5	152.112	1839.6	390.24
0.4	152.879	1839.5	380.67
0.8	153.91	1839.9	371.1
1.7	154.485	1840.8	361.53
1.2	155.251	1840.3	351.96
1.4	156.041	1840.5	342.39
1.5	156.83	1840.6	332.82
2.9	157.807	1842	323.25
1.5	158.972	1840.6	313.68
4.3	159.739	1843.4	304.11
5.1	161.273	1844.2	294.54
4.1	162.251	1843.2	284.97
2.4	163.229	1841.5	275.4
4.2	164.443	1843.3	265.83
8.7	165.903	1847.8	256.26

Tabel L.1 Elevasi tanah dan gradien hidrolik (*lanjutan)*

Altitude (m)	Distance (km)	MAOH	Gradien Hidrolik
0.6	167.364	1839.7	246.69
1.2	167.971	1840.3	237.12
2.9	168.763	1842	227.55
2.8	170.224	1841.9	217.98
3.8	170.652	1842.9	208.41
1.5	171.82	1840.6	198.84
0.5	172.989	1839.6	189.27
1.8	173.847	1840.9	179.7

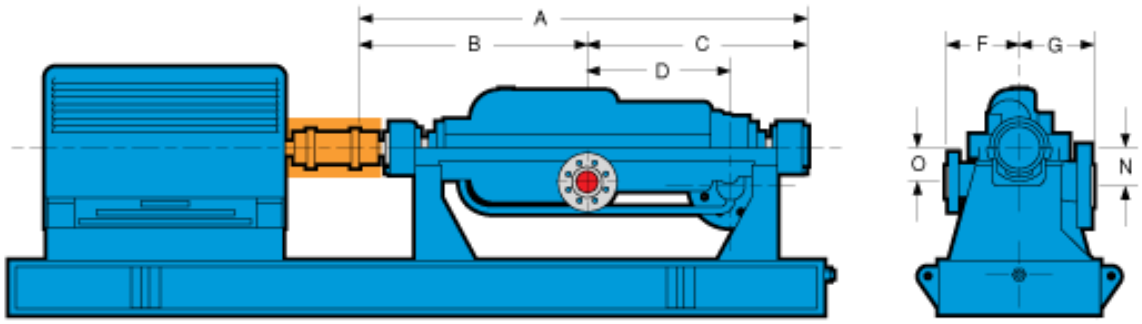
LAMPIRAN 2

Spesifikasi pompa *Goulds* 3600[12]

Dimensi pompa

Dimensions Model 3600

All dimensions in inches and (mm). Not to be used for construction.

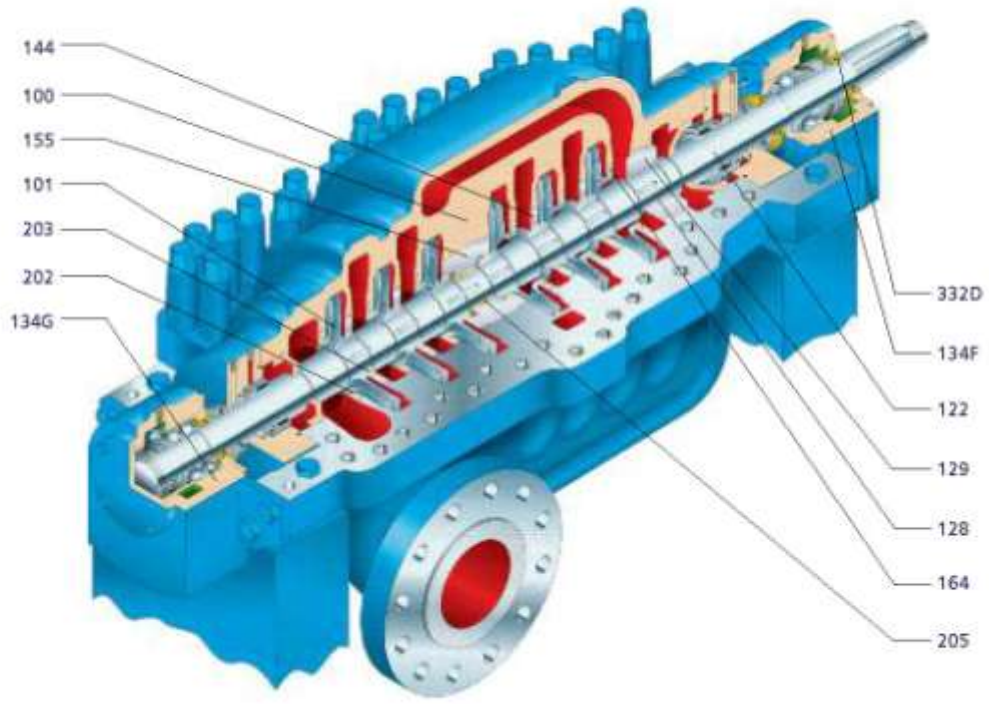


DIMENSIONS											
Pump Size	Suction	Discharge	Number of Stages	A	B	D	F	G	N	O	Approx. Weight Lbs. (kg)
3x4-8	4	3	3	53.8 (1367)	30.9 (785)	22.3 (566)	15.6 (396)	14.5 (368)	7.5 (191)	5 (127)	1312 (595)
			14	93.7 (2380)	49 (1245)	44.7 (1135)					2350 (1066)
3x6-9	6	3	3	53.8 (1367)	31 (786)	8.2 (209)	14 (356)	14.6 (370)	7.5 (190)	6.5 (165)	1750 (794)
			14	98 (2490)	51 (1297)	32 (821)					3125 (1418)
3x6-10	6	3	3	53.8 (1367)	31 (786)	8.2 (209)	14 (356)	14.6 (370)	7.5 (190)	6.5 (165)	1750 (794)
			14	98 (2490)	51.1 (1297)	32.3 (821)					3125 (1418)
4x6-10	6	4	4	66.5 (1689)	35.9 (913)	13.5 (342)	15.4 (392)	16 (407)	8.2 (209)	7.2 (182)	2400 (1089)
			12	101.9 (2587)	53.6 (1362)	31.1 (791)					3680 (1669)
4x6-11	6	4	4	67.9 (1724)	36.4 (925)	14.7 (373)	16.8 (427)	17.5 (445)	9.0 (229)	7.8 (198)	3011 (1366)
			10	96.80 (2459)	50.9 (1292)	29.2 (740)					4216 (1912)
4x6-10D	6	4	4	65.5 (1663)	31.5 (800)	13.4 (340)	15.4 (392)	16 (407)	8.2 (209)	7.2 (182)	2655 (1204)
			12	100.8 (2561)	49.2 (1249)	31.1 (789)					4000 (1814)
4x6-11D	6	4	4	71.6 (1818)	36.4 (925)	14.6 (371)	16.8 (427)	17.5 (445)	9 (229)	7.8 (198)	3220 (1461)
			10	100.6 (2555)	50.9 (1292)	29.1 (739)					4387 (1990)

Note: 4x6-10D and 4x6-11D with double suction first stage impeller.

Material dan konstruksipompa*Goulds* 3600

Sectional View



Parts List and Materials of Construction

Item Number	Part Name	MATERIAL	
		S-6	C-6
100	Casing	Carbon Steel	12% Chrome
101	Impeller	12% Chrome	
107	Gland (Packing)	Carbon Steel	12% Chrome
122	Shaft	17-4 PH	
126A	Shaft Sleeves (Packing)	12% Chrome	
126B	Shaft Sleeves (Mechanical Seals)	316SS or 12% Chrome	
128	Throttle Sleeve	Nitronic 60	
129	Throttle Bushing	12% Chrome Hardened	
134F	Bearing Housing (Inboard)	Carbon Steel	
134G	Bearing Housing (Outboard)	Carbon Steel	
144	Stage Pieces (Back)	12% Chrome	
155	Center Bushing	12% Chrome Hardened	
164	Casing Wear Rings (Front)	12% Chrome Hardened	
202	Impeller Wear Rings (Front)	17-4 PH	
203	Impeller Wear Rings (Back)	17-4 PH	
205	Center Sleeve	Nitronic 60	
250	Gland (Mechanical Seal)	316 Stainless Steel	
332D	Bearing Seals	Bronze	

Other materials available such as Duplex, Super Duplex etc.

Pompa desain

Proven Leadership

ITT Goulds Pumps is a proven leader in Multistage and API Pumps with several thousand engineered multistage pumps sold and 40+ years of multistage pump expertise.

ITT Goulds Pumps offers proven engineering packaging expertise with highly complex specifications. We offer complex lube oil skids, seal flush piping plans, etc. to meet the toughest customer applications.

Goulds 3600

Heavy-Duty Multistage Pumps Designed for High-Head/ High Capacity Services

- Capacities to 8500 GPM (1930 m3/h)
- Heads to 9000 feet (2740 m)
- Temperatures to 400° F (205° C)
- Pressures to 4000 PSIG (275 Bar)
- API-610 API/ISO 13709 Latest Edition (API-BB3) Compliance is Available

Design features

Engineered Hydraulics — Dense hydraulic coverage to better match your process for efficiency and reliability. Custom hydraulics are available.

Engineered Packaging with a wide range of drivers, seals, piping, nozzle configurations, flanges, baseplates, and QC testing.

Axially Split Casing — For ease of maintenance.

Dual Volute Design — Balances hydraulic radial thrust at each stage for extended seal/bearing life.

Heavy Duty Single Row Bolting — Prevents distortion and chance of interstage leakage.

Precision Cast Impellers — Smooth, dimensionally consistent hydraulic passages for maximum efficiency.

Compact Crossover — For streamlined fluid flow, minimum friction loss, and maximum efficiency.

Dynamically Balanced — Impellers and rotors insure smooth operation and increased reliability.

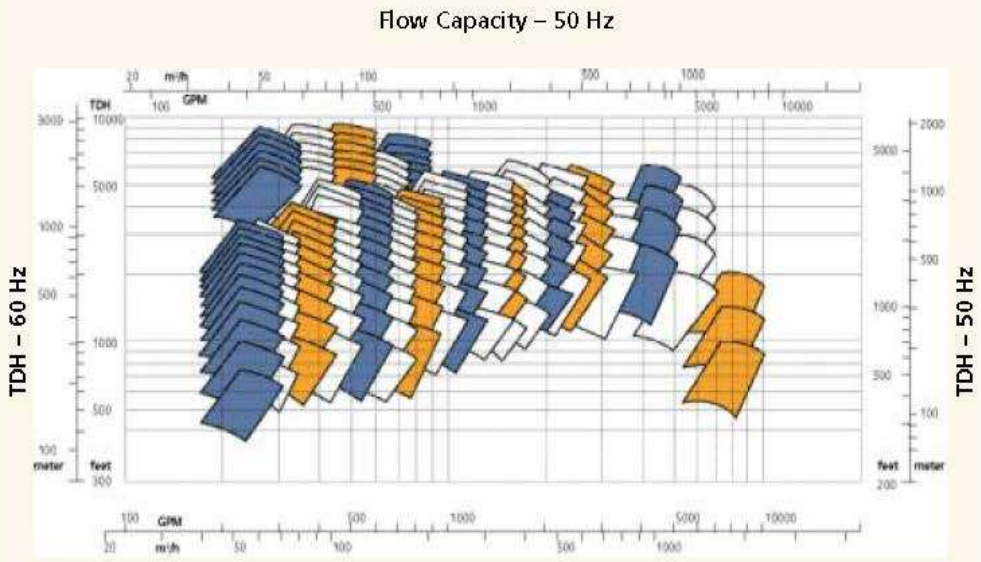
Services

The model 3600 is a robust solution for a variety of applications. This is an API pump for refineries, injection offshore platforms, remote pipeline, boiler feed in mid-range cogeneration, descaling, mine dewatering, process transfer, desalination, and CO^2 injection.

Performansi pompa

Goulds 3600

Hydraulic Coverage 60 Hz and 50 Hz



Note: Hydraulics above represent 80% to 110% of best efficiency point (BEP).

LAMPIRAN 3

Tabel L.3 Pipa Komersil Diameter Nominal (DN) 200 mm

d_n		D	t	d	A_i	A_m	S_o	S_i	w_p	w_w	I	z_e	R_g	z_p
Nom dia	Schedule	Outside dia	Wall thick	Inside dia	Inside area	Metal area	Outside surf	Inside surf	Pipe wt.	Water wt.	Mom of inert	Elast sec mod	Rad of gyr	Plast sec mod
mm		mm	mm	mm	cm^2	cm^2	m^2/m	m^2/m	kg/m	kg/m	cm^4	cm^3	cm	cm^3
	Std 40	114.3	6.02	102.26	82.130	20.478	0.3591	0.3213	16.033	8.213	301.05	52.677	3.834	70.656
	XS 80	114.3	8.56	97.18	74.173	28.436	0.3591	0.3053	22.262	7.417	400.02	69.995	3.751	95.920
	120	114.3	11.1	92.1	66.621	35.988	0.3591	0.2893	28.175	6.662	484.63	84.800	3.670	118.676
	—	114.3	12.7	88.9	62.072	40.537	0.3591	0.2793	31.736	6.207	531.22	92.952	3.620	131.782
	160	114.3	13.487	87.326	59.893	42.715	0.3591	0.2743	33.442	5.989	552.36	96.652	3.596	137.892
	XXS	114.3	17.12	80.06	50.341	52.267	0.3591	0.2515	40.920	5.034	636.16	111.314	3.489	163.356
	—	114.3	20.32	73.66	42.614	59.994	0.3591	0.2314	46.970	4.261	693.31	121.315	3.399	182.271
	—	114.3	23.495	67.31	35.584	67.025	0.3591	0.2115	52.474	3.558	737.06	128.970	3.316	198.056
125	5S	141.3	2.769	135.762	144.760	12.051	0.4439	0.4265	9.435	14.476	289.20	40.934	4.899	53.148
	10S	141.3	3.404	134.492	142.064	14.747	0.4439	0.4225	11.545	14.206	350.72	49.642	4.877	64.743
	Std 40	141.3	6.553	128.194	129.070	27.740	0.4439	0.4027	21.718	12.907	631.07	89.324	4.770	119.077
	XS 80	141.3	9.525	122.25	117.379	39.432	0.4439	0.3841	30.871	11.738	860.37	121.779	4.671	165.690
	120	141.3	12.7	115.9	105.501	51.309	0.4439	0.3641	40.170	10.550	1071.0	151.595	4.569	210.719
	160	141.3	15.875	109.55	94.257	62.553	0.4439	0.3442	48.973	9.426	1249.8	176.894	4.470	251.075
	XXS	141.3	19.05	103.2	83.647	73.164	0.4439	0.3242	57.280	8.365	1400.0	198.155	4.374	287.014
	—	141.3	22.225	96.85	73.670	83.141	0.4439	0.3043	65.091	7.367	1524.9	215.834	4.283	318.791
	—	141.3	25.4	90.5	64.326	92.484	0.4439	0.2843	72.406	6.433	1627.5	230.357	4.195	346.663
150	5S	168.275	2.769	162.737	208.000	14.398	0.5287	0.5113	11.272	20.800	493.1	58.607	5.852	75.858
	10S	168.275	3.404	161.467	204.766	17.631	0.5287	0.5073	13.804	20.477	599.3	71.232	5.830	92.544
	—	168.275	5.563	157.149	193.961	28.437	0.5287	0.4937	22.263	19.396	942.2	111.980	5.756	147.342
	Std 40	168.275	7.112	154.051	186.389	36.009	0.5287	0.4840	28.191	18.639	1171.4	139.219	5.704	184.847
	XS 80	168.275	10.973	146.329	168.171	54.226	0.5287	0.4597	42.454	16.817	1685.4	200.310	5.575	271.961
	120	168.275	14.275	139.725	153.334	69.063	0.5287	0.4390	54.070	15.333	2065.0	245.426	5.468	339.522
	160	168.275	18.237	131.801	136.436	85.962	0.5287	0.4141	67.300	13.644	2454.6	291.738	5.344	412.570
	XXS	168.275	21.946	124.383	121.510	100.887	0.5287	0.3908	78.985	12.151	2761.0	328.151	5.231	473.444
	—	168.275	25.4	117.475	108.388	114.009	0.5287	0.3691	89.258	10.839	3001.0	356.683	5.131	523.970
	—	168.275	28.575	111.125	96.987	125.410	0.5287	0.3491	98.184	9.699	3187.4	378.829	5.041	565.461
200	5S	219.075	2.769	213.537	358.127	18.817	0.6882	0.6708	14.732	35.813	1100.7	100.483	7.648	129.566
	10S	219.075	3.759	211.557	351.516	25.427	0.6882	0.6646	19.907	35.152	1474.0	134.563	7.614	174.292
	—	219.075	5.563	207.949	339.629	37.315	0.6882	0.6533	29.214	33.963	2127.8	194.251	7.551	253.665
	20	219.075	6.35	206.375	334.507	42.437	0.6882	0.6483	33.224	33.451	2402.6	219.336	7.524	287.441
	30	219.075	7.036	205.003	330.074	46.870	0.6882	0.6440	36.694	33.007	2637.0	240.738	7.501	316.465
	Std 40	219.075	8.179	202.717	322.754	54.190	0.6882	0.6369	42.425	32.275	3017.3	275.456	7.462	363.968
	60	219.075	10.312	198.451	309.313	67.631	0.6882	0.6235	52.949	30.931	3693.3	337.175	7.390	449.792
	XS 80	219.075	12.7	193.675	294.604	82.340	0.6882	0.6084	64.464	29.460	4400.2	401.708	7.310	541.595
	100	219.075	15.062	188.951	280.407	96.536	0.6882	0.5936	75.578	28.041	5049.8	461.010	7.233	628.052
	120	219.075	18.237	182.601	261.877	115.067	0.6882	0.5737	90.086	26.188	5849.4	534.012	7.130	737.642
	140	219.075	20.625	177.825	248.357	128.587	0.6882	0.5587	100.671	24.836	6398.4	584.126	7.054	815.203
	160	219.075	23.012	173.051	235.201	141.743	0.6882	0.5437	110.970	23.520	6904.6	630.343	6.979	888.677
	—	219.075	25.4	168.275	222.398	154.546	0.6882	0.5287	120.994	22.240	7370.8	672.906	6.906	958.236
	—	219.075	28.575	161.925	205.930	171.014	0.6882	0.5087	133.887	20.593	7932.2	724.149	6.811	1044.792