

NICKEL CADMIUM BATTERY

Low Maintenance Industrial Rechargeable Battery



EUROPEAN TECHNOLOGY

- Excellent high rate discharge performance
- Over 1500 charge & discharge cycles
- Wide operating temperature range from -40 to 60 °C
- Comply to IEC60623/2000, DIN, EN standards
- Design life over 20 years
- Manufactured under ISO 9001 quality system
- Low maintenance with topping-up interval more than 2 years at 20 °C under normal operating conditions

Quality Product from TECHFILL

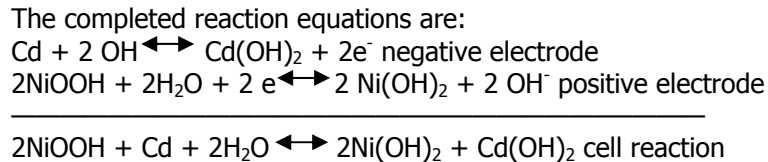


GENERAL AND OPERATION

The fundamental inventions in the field of nickel-cadmium batteries were made around 1900 by Edison in USA and by Jungner in Sweden. The electrochemical reactions during discharge are:

- the oxidation of cadmium $\text{Cd} \rightarrow \text{Cd}^{2+} + 2\text{e}^-$ at the negative electrode,
 - the reduction of trivalent nickel to the bivalent ion $\text{Ni}^{3+} + \text{e}^- \rightarrow \text{Ni}^{2+}$ at the positive electrode.
- During charging both reactions are reversed.

Diluted potassium hydroxide ($\text{KOH} + \text{H}_2\text{O}$) mixed with lithium hydroxide (LiOH) with nominal density 1.20 kg/l at 20°C is used as electrolyte in nickel-cadmium batteries, so, hydrogen and oxygen evolution are also secondary reactions in nickel-cadmium batteries.



When the nickel-cadmium battery was developed, the lead-acid battery was already existing, and the inventors clearly realized the advantages of nickel cadmium battery system.

Advantages are:

1. Potassium hydroxide (KOH) does (practically) not take part in the electrochemical reaction. Only water that represents the gross of the electrolyte is consumed (or released). So, only small concentration changes occur. Consequences for battery practice are:
 - Spacing between electrodes can be minimized. This means low electrolyte resistance and suitability for extremely high current of loads.
 - The freezing point of the electrolyte does hardly change, so there are no problems even at very low temperatures (-40°C).
 - Electrolyte stratification does not occur, boost charging is always possible.
2. Corrosion of metallic parts is hardly observed. Plate supports and conducting elements are made of nickel. Consequence is:
 - Nickel-cadmium batteries can be stored for practically unlimited periods without refreshing charges.
3. Hydrogen evolution does not occur at the equilibrium potential of the cadmium electrode. Consequence is:
 - Nickel-cadmium batteries can be made sealed.





BATTERY CELL CONSTRUCTION (Pocket Plate)

Cell container
Material: Translucent Polypropylene or MBS. Flame retardant is available on request.

Flame arresting vents
Material: Polypropylene.

Plate group bus
Connects the plate tabs with the terminal post. Plate tabs and terminal posts are projection welded to the plate group bus.

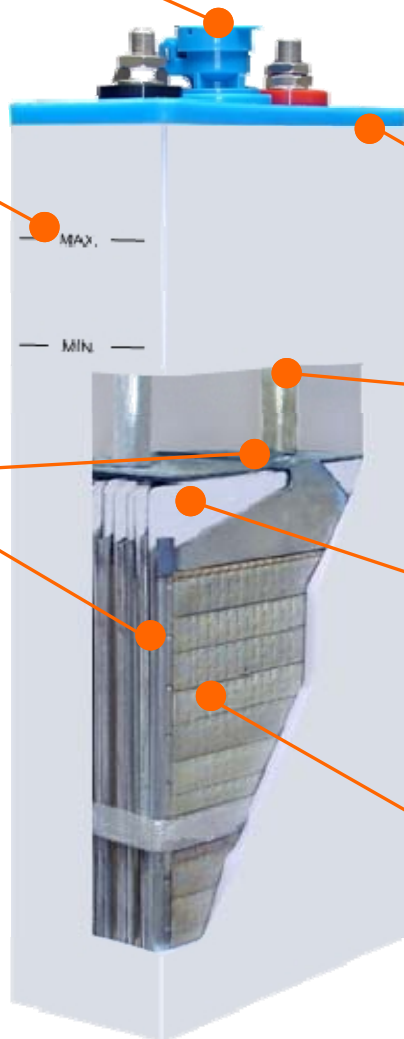
Cell cover
Material: Polypropylene or MBS.

Plate frame
Seals the place pocket and serves as a current collector.

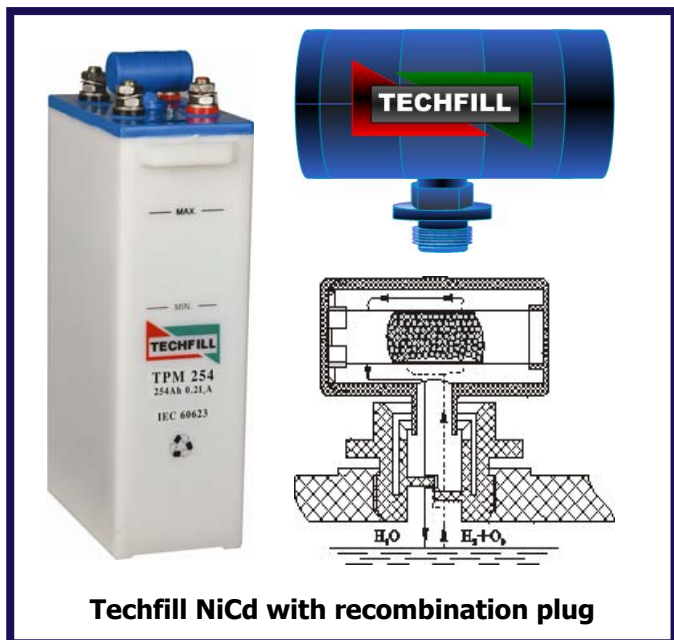
Terminal Material
Nickel plated steel.

Separating grids
Separate the plates and insulate the plate frames from each other. The grids allow free circulation of electrolyte between the plates.

Plates
Horizontal pockets of double-perforated steel strips for L, M, H Type and Sinter Plate for X Type.



TECHFILL NICD RECOMBINATION PLUG (Optional)



With Techfill Maintenance-Free plug (MF-plug) installed on the battery, it will effectively recombine the hydrogen and oxygen generated during charging and forms water vapor which goes back to the battery cells. Therefore topping-up with distilled water is no longer necessary under normal operation.

When the gasses enter the Techfill MF-Plug, the catalyst inside the plug controls the conversion of hydrogen and oxygen to water vapor. The catalyst material is made of precious metal. The efficiency of the conversion is above 95%.

Techfill MF-Plug type	Battery Capacity
MF-Plug - A	Up to 300AH
MF-Plug - B	301AH and above

Techfill NiCd with recombination plug



BATTERY RANGES AND APPLICATIONS

Battery Performance Type	X	H	M	L
Positive & negative electrode design	Sintered Plate	Pocket Plate	Pocket Plate	Pocket Plate
Optimize discharge current	Seconds to 15 minutes	15 minutes to 45 minutes	45 minutes to 1 hour	1 hour and above
Applications	Automatic Guided Vehicle (AGV), Engine starting, UPS application etc.	Engine starting, UPS, operation and control of DC motor, water treatment plants, etc.	UPS, railway DC power sources, auxiliary power source for power stations, chemical plants, oil refineries, steel mill, etc.	Emergency lighting, telecommunications, operation of communication equipment on a ship lighting and air conditioner control on a train, etc.



NOMINAL VOLTAGE

Nominal voltage 1.20 Volt/cell



CHARGING

The following charging voltages are recommended :

Cell type	Floating charge	Boost charge
TSX	1.38V ~ 1.40V	1.46V ~ 1.48V
TPH	1.40V ~ 1.45V	1.55V ~ 1.60V
TPM	1.40V ~ 1.45V	1.55V ~ 1.60V
TPL	1.40V ~ 1.45V	1.55V ~ 1.60V

Initial charging

The whole charge should preferably be carried out at constant current. The charging time is inversely proportional to the current which is set by the current limit of the charging equipment.

Recommended rates for the first charging:

0.2C₅ A for 12 hours

0.1C₅ A for 24 hours



CERTIFIED QUALITY SYSTEM

Techfill quality system is certified according to ISO 9001:2000.



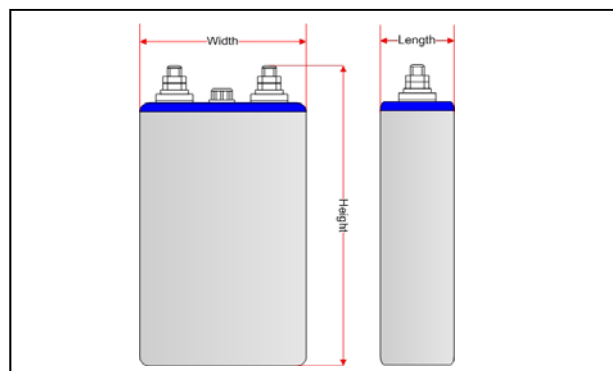
CAPACITIES, DIMENSIONS AND WEIGHTS

Type	Max. Dimensions (mm)			Max. Weight (Unfilled) (kg)	Max. Weight (filled) (kg)
	Length (L)	Width (W)	Height (H)		
TSX 10	29	81	218	1.05	1.24
TSX 20	36.5	81.5	244	1.25	1.43
TSX 30	42.5	81.5	255	1.65	1.92
TSX 40	42.5	81.5	245	1.75	2.00
TSX 50	49	81.5	244	2.00	2.24
TSX 60	62	138.5	267	4.50	5.60
TSX 80	62	138.5	267	5.10	6.18
TSX 90	74.5	80.5	243	3.40	3.88
TSX 100	70	134	285	5.50	6.52
TSX 120	79	139	365	7.50	8.80
TSX 140	79	139	365	7.60	8.82
TSX 170	79	139	365	7.90	9.17
TSX 190	79	139	365	8.50	9.70
TSX 200	107	166.5	348	11.00	13.04
TSX 220	107	166.5	348	13.00	14.92
TSX 230	107	166.5	348	13.05	14.98
TSX 240	107	166.5	348	13.10	15.02
TSX 250	107	166.5	348	13.20	15.12

Type	Max. Dimensions (mm)			Max. Weight (Unfilled) (kg)	Max. Weight (filled) (kg)
	Length (L)	Width (W)	Height (H)		
TPM 10	48	81	245	1.2	1.5
TPM 15	48	81	245	1.5	1.8
TPM 20	68	134	245	1.6	2.5
TPM 30	70	134	245	2.0	3.0
TPM 40	70	134	285	2.8	4.0
TPM 50	70	134	285	3.2	4.2
TPM 61	80	141	370	4.2	6.0
TPM 71	80	141	370	4.5	6.4
TPM 76	80	141	370	4.6	6.5
TPM 81	80	141	345	5.0	6.6
TPM 86	80	141	345	5.6	8.5
TPM 101	106	164	345	6.5	9.0
TPM 122	106	164	345	7.2	9.5
TPM 142	164	167	345	8.5	13.0
TPM 152	164	167	345	9.0	13.2
TPM 163	164	167	345	9.5	13.5
TPM 203	138	276	420	13.5	20.0
TPM 254	138	276	450	15.5	22.0
TPM 275	138	276	450	16.0	22.2
TPM 304	162	200	450	17.5	23.0
TPM 351	162	200	450	18.5	24.0
TPM 355	162	200	450	20.0	25.0
TPM 386	138	276	490	21.0	26.0
TPM 406	138	276	490	22.0	27.0
TPM 508	176	291	510	28.0	40.0
TPM 612	176	291	510	30.0	42.0
TPM 719	186	398	570	42.0	58.0
TPM 826	186	398	570	45.0	60.0
TPM 913	186	398	570	47.0	62.0
TPM 1020	186	398	570	50.0	65.0

Type	Max. Dimensions (mm)			Max. Weight (Unfilled) (kg)	Max. Weight (filled) (kg)
	Length (L)	Width (W)	Height (H)		
TPH 10	48	81	245	1.5	1.8
TPH 20	68	134	245	2.4	3.0
TPH 31	70	134	285	3.0	4.0
TPH 41	80	141	370	4.0	6.0
TPH 51	80	141	370	4.6	6.2
TPH 61	80	141	370	5.0	6.5
TPH 71	106	164	345	6.5	9.0
TPH 81	106	164	345	7.5	9.5
TPH 91	164	167	345	8.6	12.9
TPH 101	164	167	345	9.0	13.0
TPH 121	164	167	345	10.5	14.0
TPH 151	138	276	420	14.5	19.5
TPH 181	138	276	420	15.0	20.0
TPH 201	176	291	510	22.0	35.0
TPH 226	176	291	510	23.0	35.5
TPH 251	176	291	510	25.0	36.0
TPH 277	176	291	510	27.0	36.5
TPH 302	176	291	510	27.5	37.0
TPH 352	186	398	570	32.0	54.0
TPH 402	186	398	570	36.0	56.0
TPH 508	186	398	570	40.0	59.0

Type	Max. Dimensions (mm)			Max. Weight (Unfilled) (kg)	Max. Weight (filled) (kg)
	Length (L)	Width (W)	Height (H)		
TPL 10	38	84	128	0.6	0.7
TPL 17	32	113	223	0.9	1.2
TPL 20	32	113	223	1.0	1.21
TPL 22	32	113	223	1.1	1.25
TPL 26	32	113	223	1.15	1.3
TPL 31	68	134	245	1.7	2.55
TPL 41	68	134	245	2.1	2.85
TPL 46	68	134	245	2.4	3.0
TPL 51	68	134	245	2.5	3.2
TPL 61	68	134	245	3.2	3.6
TPL 71	80	141	370	3.8	5.7
TPL 82	80	141	370	4.0	5.8
TPL 92	80	141	370	4.2	6.0
TPL 102	80	141	370	4.5	6.2
TPL 112	80	141	370	4.9	6.3
TPL 122	80	141	370	5.0	6.5
TPL 128	53	190	402	5.2	6.6
TPL 133	80	141	370	5.3	6.7
TPL 138	92	141	365	6.0	7.8
TPL 143	92	141	365	6.3	8.0
TPL 153	106	164	345	6.8	9.0
TPL 179	106	164	345	7.2	9.5
TPL 184	106	164	345	7.5	10.0
TPL 204	106	164	345	8.0	11.0
TPL 235	164	167	345	9.5	13.0
TPL 255	138	276	420	13.0	18.5
TPL 306	138	276	450	14.5	20.5
TPL 326	138	276	490	15.0	20.7
TPL 346	162	200	450	15.5	20.9
TPL 355	138	276	450	16.0	21.0
TPL 371	138	276	450	16.5	22.0
TPL 408	138	276	450	17.0	23.0
TPL 428	138	276	450	18.5	24.0
TPL 459	138	276	450	19.5	24.5
TPL 510	138	276	490	20.0	27.0
TPL 612	176	291	510	27.0	37.5
TPL 714	176	291	510	29.0	39.0
TPL 816	186	398	570	39.0	59.0
TPL 918	186	398	570	41.0	60.0
TPL 1020	186	398	570	44.0	61.0





MAIN ELECTRIC PERFORMANCE PARAMETERS

TSX Type for Ultra High rated loading

Final discharge voltage 1.14V per cell								
Cell Type	C ₅	Minutes				Seconds		
		20	10	5	1	30	5	1
TSX 10	10	24.08	29.96	40.13	52.97	59.17	75.44	79.50
TSX 20	20	46.22	57.46	77.04	101.65	113.42	144.45	151.94
TSX 30	30	72.23	89.88	119.84	158.36	176.55	225.77	237.54
TSX 40	40	92.45	114.49	154.08	203.30	226.84	288.90	304.95
TSX 50	50	119.84	149.80	200.09	264.29	295.32	376.64	396.97
TSX 60	60	144.45	179.76	240.75	317.79	354.17	462.24	476.15
TSX 80	80	192.60	239.68	321.00	423.72	472.94	603.48	635.58
TSX 90	90	224.70	269.64	363.80	471.87	532.86	682.66	724.39
TSX 100	100	240.75	299.60	401.25	529.65	590.64	754.35	793.94
TSX 120	120	288.90	359.52	481.50	635.58	709.41	905.22	953.37
TSX 140	140	337.05	419.44	561.75	741.51	827.11	1056.09	1111.73
TSX 170	170	408.74	509.32	681.59	899.87	1004.73	1281.86	1350.34
TSX 190	190	456.89	569.24	761.84	1005.80	1122.43	1432.73	1508.70
TSX 200	200	492.20	609.90	823.90	1080.70	1191.98	1540.80	1619.98
TSX 220	220	527.51	656.98	879.54	1160.95	1294.70	1653.15	1739.82
TSX 230	230	556.40	695.50	930.90	1230.50	1391.00	1754.80	1840.40
TSX 240	240	588.50	746.86	995.10	1294.70	1476.60	1851.10	1947.40
TSX 250	250	618.46	791.80	1070.00	1356.76	1551.50	1936.70	2054.40

Final discharge voltage 1.05V per cell								
Cell Type	C ₅	Minutes				Seconds		
		20	10	5	1	30	5	1
TSX 10	10	28.57	47.94	57.78	75.65	85.07	90.63	115.56
TSX 20	20	54.89	91.91	110.21	144.45	162.64	173.34	222.56
TSX 30	30	85.81	143.38	173.34	226.84	254.66	271.78	348.82
TSX 40	40	109.14	182.97	221.49	289.97	326.35	347.75	446.19
TSX 50	50	142.31	238.61	288.90	377.71	424.79	452.61	581.01
TSX 60	60	171.20	286.76	346.68	453.68	510.39	543.56	697.64
TSX 80	80	228.98	383.06	462.24	605.62	680.52	725.46	930.90
TSX 90	90	262.15	428.00	518.95	674.10	759.70	803.57	1031.48
TSX 100	100	285.69	478.29	577.80	756.49	850.65	906.29	1163.09
TSX 120	120	343.47	574.59	693.36	908.43	1020.78	1088.19	1396.35
TSX 140	140	400.18	669.82	808.92	1059.30	1190.91	1269.02	1628.54
TSX 170	170	485.78	813.20	982.26	1286.14	1445.57	1540.80	1977.36
TSX 190	190	543.56	909.50	1097.82	1438.08	1615.70	1722.70	2210.62
TSX 200	200	583.15	977.98	1177.00	1545.08	1733.40	1855.38	2433.18
TSX 220	220	625.95	1048.60	1265.81	1657.43	1863.94	1985.92	2548.74
TSX 230	230	663.40	1123.50	1348.20	1754.80	1990.20	2000.90	2664.30
TSX 240	240	704.06	1198.40	1417.75	1851.10	2107.90	2118.60	2771.30
TSX 250	250	725.46	743.65	1267.95	1487.30	1947.40	2225.60	2867.60

Final discharge voltage 0.85V per cell								
Cell Type	C ₅	Minutes				Seconds		
		20	10	5	1	30	5	1
TSX 10	10	34.24	59.92	104.86	203.30	214.00	264.29	276.06
TSX 20	20	67.41	113.42	194.74	385.20	406.60	449.40	535.00
TSX 30	30	101.65	178.69	289.97	567.10	609.90	713.69	737.23
TSX 40	40	136.96	223.63	346.68	749.00	813.20	937.32	959.79
TSX 50	50	171.20	273.92	449.40	909.50	1016.50	1213.38	1273.30
TSX 60	60	205.44	353.10	513.60	1091.40	1326.80	1551.50	1603.93
TSX 80	80	272.85	481.50	655.91	1369.60	1487.30	1776.20	1851.10
TSX 90	90	306.02	524.30	749.00	1540.80	1647.80	1936.70	2033.00
TSX 100	100	370.22	567.10	861.35	1712.00	1851.10	2134.65	2252.35
TSX 120	120	410.88	706.20	1032.55	2054.40	2418.20	2685.70	2782.00
TSX 140	140	470.80	834.60	1241.20	2396.80	2760.60	3017.40	3222.84
TSX 170	170	573.52	984.40	1519.40	2889.00	3327.70	3734.30	3853.07
TSX 190	190	632.37	1070.00	1690.60	3103.00	3531.00	3923.69	3980.40
TSX 200	200	666.61	1139.55	1733.40	3317.00	3680.80	4087.40	4258.60
TSX 220	220	734.02	1284.00	1819.00	3531.00	4001.80	4387.00	4499.35
TSX 230	230	761.84	1358.90	1863.94	3691.50	4151.60	4568.90	4782.90
TSX 240	240	791.80	1433.80	1915.30	3852.00	4312.10	4815.00	5039.70
TSX 250	250	818.55	1508.70	1979.50	4012.50	4472.60	5029.00	5296.50

Final discharge voltage 1.10V per cell								
Cell Type	C ₅	Minutes				Seconds		
		20	10	5	1	30	5	1
TSX 10	10	25.36	41.73	47.40	65.59	75.44	78.43	98.12
TSX 20	20	48.79	80.04	90.84	125.19	144.45	149.80	188.32
TSX 30	30	76.18	125.19	141.24	195.81	225.77	234.33	294.25
TSX 40	40	97.58	159.43	180.83	251.45	288.90	300.67	376.64
TSX 50	50	126.26	208.65	236.47	327.42	376.64	391.62	490.06
TSX 60	60	151.94	250.38	283.55	392.69	452.61	469.73	588.50
TSX 80	80	203.30	333.84	378.78	524.30	603.48	627.02	785.38
TSX 90	90	227.91	375.57	423.72	595.99	678.38	706.20	990.82
TSX 100	100	253.59	417.30	472.94	654.84	754.35	783.24	981.19
TSX 120	120	304.95	500.76	568.17	786.45	905.22	940.53	1178.07
TSX 140	140	355.24	584.22	662.33	916.99	1056.09	1096.75	1373.88
TSX 170	170	431.21	709.41	804.64	1113.87	1281.86	1332.15	1668.13
TSX 190	190	482.57	792.87	898.80	1244.41	1432.73	1504.42	1865.01
TSX 200	200	517.88	851.72	963.00	1341.78	1540.80	1598.58	2005.18
TSX 220	220	556.40	914.85	1036.83	1434.87	1653.15	1716.28	2150.70
TSX 230	230	599.20	973.70	1091.40	1530.10	1754.80	1829.70	2289.80
TSX 240	240	636.65	1027.20	1155.60	1615.70	1851.10	1931.35	2418.20
TSX 250	250	674.10	1080.70	1241.20	1712.00	1947.40	2043.70	2546.60

Final discharge voltage 1.00V per cell								
Cell Type	C ₅	Minutes				Seconds		
		20	10	5	1	30	5	1
TSX 10	10	32.10	53.50	72.76	97.58	107.00	113.42	132.68
TSX 20	20	61.63	102.72	139.10	187.25	205.44	218.28	254.66
TSX 30	30	96.30	160.50	218.28	292.11	322.07	342.40	398.04
TSX 40	40	123.05	205.44	279.27	374.50	411.95	437.63	510.39
TSX 50	50	160.50	267.50	363.80	487.92	537.14	570.31	664.47
TSX 60	60	192.60	321.00	436.56	585.29	645.21	684.80	797.15
TSX 80	80	256.80	428.00	582.08	781.10	860.28	913.78	1063.58
TSX 90	90	288.90	481.50	654.84	870.98	976.91	1028.27	1162.02
TSX 100	100	321.00	535.00	727.60	975.84	1075.35	1141.69	1328.94
TSX 120	120	385.20	642.00	873.12	1171.65	1290.42	1370.67	1595.37
TSX 140	140	449.40	749.00	1018.64	1366.39	1505.49	1598.58	1860.73
TSX 170	170	545.70	909.50	1236.92	1659.57	1827.56	1940.98	2259.84
TSX 190	190	609.90	1016.50	1382.44	1854.31	2042.63	2169.96	2525.20
TSX 200	200	652.70	1091.40	1487.30	1983.78	2193.50	2315.48	2722.08
TSX 220	220	704.06	1172.72	1594.30	2138.93	2356.14	2501.66	2912.54
TSX 230	230	736.16	1230.50	1679.90	2343.30	2514.50	2642.90	3103.00
TSX 240	240	770.40	1273.30	1754.80	2428.90	2632.20	2782.00	3370.50
TSX 250	250	802.50	1305.40	1819.00	2514.50	2728.50	2910.40	3509.60

Final discharge voltage 0.65V per cell								
Cell Type	C ₅	Minutes				Seconds		
		20	10	5	1	30	5	1
TSX 10	10	35.31	69.55	113.42	230.05	256.80	395.90	438.70
TSX 20	20	70.62	129.47	217.21	449.40	500.76	770.40	856.00
TSX 30	30	105.93	197.95	337.05	660.19	781.10	1111.73	1230.50
TSX 40	40	141.24	261.08	422.65	878.47	995.10	1506.56	1675.62
TSX 50	50	176.55	318.86	524.30	1106.38	1230.50	1868.22	2043.70
TSX 60	60	211.86	396.97	630.23	1401.70	1562.20	2136.79	2363.63
TSX 80	80	282.48	516.81	807.85	1815.79	1947.40	2530.55	2783.07
TSX 90	90	317.79	545.70	898.80	1909.95	2129.30	2618.29	3002.42
TSX 100	100	385.20	643.07	1013.29	2257.70	2461.00	3639.07	3964.35
TSX 120	120	423.72	770.40	1200.54	2652.53	2856.90	4156.95	4503.63
TSX 140	140	492.20	904.15	1392.07	3103.00	3434.70	4259.67	4705.86
TSX 170	170	599.20	1182.35	1607.14	3531.00	3959.00	4923.07	5294.36
TSX 190	190	663.40	1285.07	1808.30	3698.99	4173.00	5164.89	5551.16
TSX 200	200	700.85	1348.20	1861.80	3894.80	4312.10	5264.40	5660.30
TSX 220	220	770.40	1444.50	1926.00	4283.21	4601.00	5360.70	5883.93
TSX 230	230	791.80	1540.80	1979.50	4472.60	4740.10	5489.10	6077.60
TSX 240	240	816.41	1626.40	2043.70	4665.20	4868.50	5617.50	6259.50
TSX 250	250	842.09	1712.00	2107.90	4815.00	5050.		



MAIN ELECTRIC PERFORMANCE PARAMETERS

TPH Type for High rated loading

Final discharge voltage 1.14V per cell																	
Cell Type	C ₅	Hours							Minutes						Seconds		
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30	5	1
TPH 10	10	0.99	1.18	1.80	3.20	4.70	6.10	8.00	10.70	12.50	13.80	15.30	18.80	29.20	34.10	41.50	45.60
TPH 20	20	1.98	2.36	3.60	6.40	9.40	12.20	16.10	21.50	24.90	27.60	30.70	37.60	58.40	68.30	83.00	91.10
TPH 31	31	2.97	3.54	5.40	9.70	14.20	18.30	24.20	32.20	37.50	41.40	46.00	56.40	87.60	102.40	124.10	135.90
TPH 41	41	3.96	4.75	7.70	12.90	18.90	24.50	32.50	44.10	51.30	56.50	62.60	76.50	118.80	138.00	171.20	179.80
TPH 51	51	4.95	5.96	9.50	16.20	23.80	30.70	40.80	55.10	64.10	70.60	78.10	95.20	148.70	172.30	215.10	224.70
TPH 61	61	5.94	7.17	11.30	19.40	28.50	36.80	48.90	66.00	76.90	84.50	94.20	114.50	177.60	206.50	257.90	269.60
TPH 71	71	6.93	8.38	13.10	22.60	33.20	42.90	57.00	77.00	89.90	98.40	109.10	133.80	207.60	240.80	300.70	314.60
TPH 81	81	7.92	9.49	15.20	25.90	37.90	49.20	65.30	87.70	102.70	113.40	125.20	153.00	237.50	275.00	343.50	359.50
TPH 91	91	8.91	10.71	17.05	29.10	42.50	55.10	73.30	98.95	115.55	127.30	140.70	172.25	266.95	309.25	386.30	404.45
TPH 101	101	9.90	11.92	18.90	32.30	47.10	61.00	81.30	110.20	128.40	141.20	156.20	191.50	296.40	343.50	429.10	449.40
TPH 121	121	11.92	14.34	22.50	38.70	56.90	73.80	97.40	131.60	154.10	169.10	187.30	229.00	356.30	413.00	514.70	539.30
TPH 151	151	14.85	17.88	28.20	48.50	71.20	92.00	122.00	165.90	192.60	211.90	234.30	287.80	444.10	514.70	643.10	674.10
TPH 181	181	17.88	21.33	32.40	58.16	85.12	110.00	145.10	195.42	226.62	250.42	277.98	340.48	528.82	615.50	755.42	816.00
TPH 201	201	19.90	23.63	35.20	64.60	94.40	122.00	160.50	215.10	249.30	276.10	307.10	375.60	585.30	682.70	830.30	910.60
TPH 226	226	22.30	26.68	41.04	72.87	106.48	137.35	181.69	244.75	284.79	314.22	348.43	426.44	662.07	769.52	949.99	1015.99
TPH 251	251	24.75	29.80	47.00	81.30	118.80	153.00	203.30	275.00	321.00	353.10	390.60	478.30	740.40	858.10	1072.10	1123.50
TPH 277	281	27.22	32.77	52.70	88.80	130.00	168.00	222.00	298.50	346.10	380.40	418.90	509.90	774.10	891.80	1082.80	1151.30
TPH 302	302	29.69	35.75	56.40	96.30	141.20	183.00	240.80	322.10	371.30	407.70	447.30	541.40	807.90	925.60	1093.50	1179.10
TPH 327	327	32.18	38.75	61.13	104.90	153.62	199.15	262.83	353.84	410.58	451.26	497.35	605.99	923.04	1064.43	1298.57	1377.18
TPH 352	352	34.64	41.71	65.80	113.40	165.90	215.10	284.60	385.20	449.40	494.30	546.80	669.80	1036.80	1201.60	1501.20	1572.90
TPH 402	402	39.59	47.67	75.20	129.50	189.40	245.00	325.30	440.80	512.50	565.00	626.00	765.10	1187.70	1380.30	1712.00	1797.60
TPH 508	508	49.69	59.59	94.50	161.60	237.50	307.10	407.70	551.10	640.90	705.10	782.20	955.50	1487.30	1722.70	2150.70	2247.00

Final discharge voltage 1.10V per cell																	
Cell Type	C ₅	Hours							Minutes						Seconds		
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30	5	1
TPH 10	10	1.01	1.24	2.00	3.40	5.00	6.50	9.20	14.20	16.50	18.40	20.40	24.40	36.90	42.60	52.30	55.70
TPH 20	20	2.02	2.48	4.00	6.70	9.90	12.90	18.40	28.50	33.00	36.80	40.90	48.80	73.90	85.20	104.60	111.30
TPH 31	31	3.03	3.73	5.90	10.10	14.90	19.50	27.60	42.70	49.40	55.20	61.30	73.20	111.30	127.30	157.30	166.90
TPH 41	41	4.04	4.95	7.90	13.50	19.80	25.90	36.90	57.00	65.90	73.50	81.70	97.80	147.70	171.20	209.70	222.60
TPH 51	51	5.11	6.19	9.80	16.90	24.80	32.40	46.10	71.40	82.50	91.90	102.70	122.00	185.10	214.00	262.20	278.20
TPH 61	61	6.13	7.42	11.80	20.20	29.70	38.80	55.30	85.60	98.90	110.20	123.10	146.60	221.50	256.80	314.60	333.80
TPH 71	71	7.15	8.67	13.70	23.60	34.70	45.40	64.50	99.90	115.60	128.40	143.40	171.20	258.90	299.60	367.00	389.50
TPH 81	81	8.17	9.90	15.70	27.00	39.60	51.80	73.70	114.50	131.60	146.60	163.70	195.80	295.30	342.40	419.40	445.10
TPH 91	91	9.19	11.16	17.65	30.35	44.55	58.25	82.90	128.40	148.20	165.30	184.05	219.90	332.25	385.20	471.85	501.30
TPH 101	101	10.20	12.42	19.60	33.70	49.50	64.70	92.10	142.30	164.80	184.00	204.40	244.00	369.20	428.00	524.30	557.50
TPH 121	121	12.22	14.85	23.40	40.40	59.50	77.70	110.20	171.20	198.00	220.40	245.00	293.20	444.10	513.60	629.20	668.80
TPH 151	151	15.35	18.69	29.20	50.60	74.40	97.20	138.00	214.00	248.20	276.10	307.10	365.90	554.30	643.10	787.50	841.00
TPH 181	181	18.44	22.45	35.14	60.74	89.34	117.18	166.26	257.68	298.30	332.56	369.38	440.42	665.96	769.58	944.16	1007.32
TPH 201	201	20.50	24.95	39.10	67.50	99.30	130.50	185.10	286.80	331.70	370.20	410.90	490.10	740.40	853.90	1048.60	1118.20
TPH 226	226	23.05	28.00	43.85	75.87	111.58	146.39	207.87	321.75	373.03	414.70	461.74	550.44	833.66	966.17	1184.18	1264.37
TPH 251	251	25.65	31.11	48.70	84.40	124.10	162.60	231.10	357.40	415.20	460.10	513.60	612.00	928.80	1080.70	1322.50	1413.50
TPH 277	281	30.70	37.47	54.50	92.90	137.50	180.30	255.70	394.30	458.00	508.30	566.00	675.20	1025.10	1181.30	1452.50	1546.20
TPH 302	302	33.23	40.55	58.90	101.40	150.90	198.00	280.30	431.20	500.80	556.40	618.50	738.30	1121.40	1281.90	1582.50	1678.80
TPH 327	327	34.50	42.10	63.73	111.76	165.44	215.76	306.15	467.82	541.14	604.84	670.16	799.67	1213.95	1403.53	1714.94	1827.89
TPH 352	352	35.75	43.63	68.50	122.00	179.80	233.30	331.70	504.00	581.00	652.70	721.20	860.30	1305.40	1523.70	1845.80	1975.20
TPH 402	402	40.91	49.69	78.30	137.00	201.20	263.20	372.40	576.70	664.50	740.40	823.90	985.50	1485.20	1722.70	2110.00	2240.60
TPH 508	508	51.11	62.01	97.90	173.30	254.70	330.60	468.70	718.00	832.50	923.40	1033.60	1228.40	1860.70	2150.70	2634.30	2806.60

Final discharge voltage 1.05V per cell																	
Cell Type	C ₅	Hours							Minutes						Seconds		
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30	5	1
TPH 10	10	1.01	1.24	2.00	3.40	5.00	6.50	9.20	14.20	16.50	18.40	20.40	24.40	36.90	42.60	52.30	55.70
TPH 20	20	2.02	2.48	4.00	6.70	9.90	12.90	18.40	28.50	33.00	36.80	40.90	48.80	73.90	85.20	104.60	111.30
TPH 31	31	3.03	3.73	5.90	10.10	14.90	19.50	27.60	42.70	49.40	55.20	61.30	73.20	111.30	127.30	157.30	166.90
TPH 41	41	4.04	4.95	7.90	13.50	19.80	25.90	36.90	57.00	65.90	73.50	81.70	97.80	147.70	171.20	209.70	222.60
TPH 51	51	5.11	6.19	9.80	16.90	24.80	32.40	46.10	71.40	82.50	91.90	102.70	122.00	185.10	214.00	262.20	278.20
TPH 61	61	6.13	7.42	11.80	20.20	29.70	38.80	55.30	85.60	98.90	110.20	123.10	146.60	221.50	256.80	314.60	333.80
TPH 71	71	7.15	8.67	13.70	23.60	34.70	45.40	64.50	99.90	115.60	128.40	143.40	171.20	258.90	299.60	367.00	389.50
TPH 81	81	8.17	9.90	15.70	27.00	39.60	51.80	73.70	114.50	131.60	146.60	163.70	195.80	295.30	342.40	419.40	445.10
TPH 91	91	9.19	11.16	17.65	30.35	44.55	58.25	82.90	128.40	148.20	165.30	184.05	219.90	332.25	385.20	471.85	501.30
TPH 101	101	10.20	12.42	19.60	33.70	49.50	64.70	92.10	142.30	164.80	184.00	204.40	244.00	369.20	428.00	524.30	557.50
TPH 121	121	12.22	14.85	23.40	40.40	59.50	77.70	110.20	171.20	198.00	220.40	245.00	293.20	444.10	513.60	629.20	668.80
TPH 151	151	15.35	18.69	29.20	50.60	74.40	97.20	138.00	214.00	248.20	276.10	307.10	365.90	554.30	643.10	787.50	841.00
TPH 181	181	18.44	22.45	35.14	60.74	89.34	117.18	166.26	257.68	298.30	332.56	369.38	440.42	665.96	769.58	944.16	1007.32
TPH 201	201	20.50	24.95	39.10	67.50	99.30	130.50	185.10	286.80	331.70	370.20	410.90	490.10	740.40	853.90	1048.60	1118.20
TPH 226	226	23.05	28.00	43.85	75.87	111.58	146.39	207.87	321.75	373.03	414.70	461.74	550.44	833.66	966.17	1184.18	1264.37
TPH 251	251	25.65	31.11	48.70	84.40	124.10	162.60	231.10	357.40	415.20	460.1						



MAIN ELECTRIC PERFORMANCE PARAMETERS

TPH Type for High rated loading

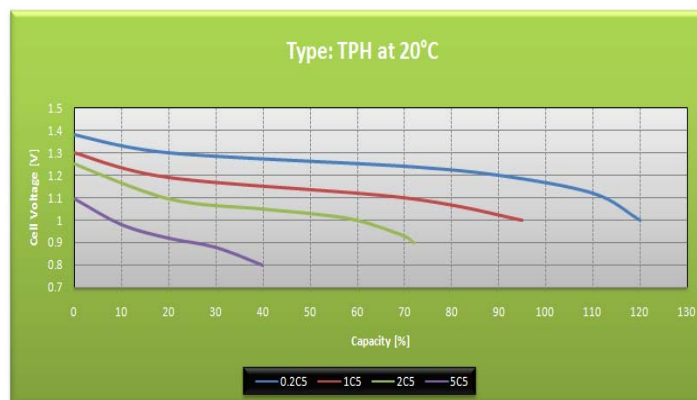
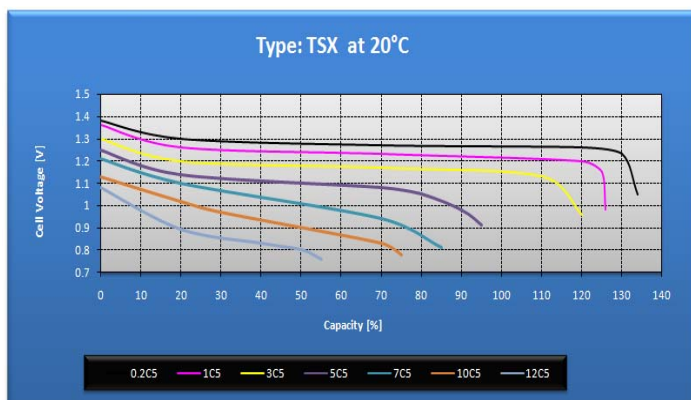
Cell Type	C _s	Final discharge voltage 1.00V per cell															
		Hours							Minutes					Seconds			
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30	5	1
TPH 10	10	1.04	1.27	2.00	3.50	5.20	6.80	10.00	17.50	23.90	27.40	31.50	37.70	53.90	62.20	78.20	85.90
TPH 20	20	2.08	2.55	4.10	7.00	10.40	13.50	19.90	35.10	47.70	54.80	62.90	75.30	107.00	124.10	156.20	172.30
TPH 31	31	3.12	3.82	6.20	10.60	15.60	20.70	30.20	54.90	74.50	84.20	96.30	116.60	165.90	190.50	238.60	262.20
TPH 41	41	4.16	5.10	8.20	14.10	20.90	27.50	40.20	73.20	99.30	112.40	128.40	155.20	220.40	253.60	317.80	348.80
TPH 51	51	5.20	6.37	10.20	17.50	26.10	34.30	50.30	91.50	124.10	141.20	160.50	193.70	276.10	316.70	398.00	436.60
TPH 61	61	6.24	7.66	12.20	21.10	31.40	41.20	60.30	110.20	148.70	169.10	192.60	232.20	330.60	379.90	477.20	523.20
TPH 71	71	7.28	8.93	14.20	24.60	36.60	48.00	70.40	128.40	173.30	198.00	224.70	270.70	386.30	443.00	556.40	611.00
TPH 81	81	8.32	10.20	16.20	28.10	41.70	54.90	80.50	146.60	199.00	225.80	256.80	310.30	440.80	506.10	636.70	697.60
TPH 91	91	9.36	11.47	18.20	31.65	46.95	61.80	90.55	164.80	223.60	254.15	288.90	348.80	495.95	569.75	715.85	785.35
TPH 101	101	10.40	12.73	20.20	35.20	52.20	68.70	100.60	183.00	248.20	282.50	321.00	387.30	551.10	633.40	795.00	873.10
TPH 121	121	12.52	15.35	24.20	42.30	62.70	82.40	120.90	219.40	297.50	338.10	385.20	465.50	661.30	759.70	954.40	1047.50
TPH 151	151	15.66	19.09	30.20	52.90	78.30	103.00	150.90	275.00	372.40	423.70	481.50	581.00	827.10	950.20	1193.10	1309.70
TPH 181	181	18.75	22.91	36.20	63.40	93.96	123.40	181.08	329.54	446.86	508.48	577.80	697.22	992.10	1140.22	1431.24	1571.60
TPH 201	201	20.81	25.45	40.20	70.40	104.40	137.00	201.20	365.90	496.50	565.00	642.00	774.70	1102.10	1266.90	1590.00	1746.20
TPH 226	226	23.41	28.60	45.20	79.16	117.32	154.47	226.10	411.49	557.93	634.89	721.45	870.58	1238.77	1423.67	1787.06	1962.32
TPH 251	251	26.06	31.82	50.30	88.10	130.50	172.30	251.50	458.00	620.60	706.20	802.50	968.40	1378.20	1583.60	1988.10	2182.80
TPH 277	277	30.01	36.67	55.40	96.99	143.56	189.67	277.00	504.18	683.64	777.93	884.03	1066.75	1517.90	1744.48	2189.73	2404.59
TPH 302	302	33.84	41.36	60.34	105.60	156.20	206.50	301.70	548.90	744.70	847.40	963.00	1162.00	1653.20	1900.30	2385.00	2619.40
TPH 327	327	35.16	42.96	65.40	114.40	169.68	223.75	327.00	595.18	807.12	918.47	1043.73	1259.43	1792.03	2059.60	2584.69	2838.96
TPH 352	352	36.46	44.54	70.40	123.10	183.00	240.80	352.00	640.90	868.80	988.70	1123.50	1355.70	1929.20	2217.00	2782.00	3055.90
TPH 402	402	41.71	51.01	80.40	141.20	208.70	275.00	402.30	731.90	993.00	1129.90	1284.00	1549.40	2204.20	2533.80	3180.00	3492.50
TPH 508	508	52.22	63.83	101.50	177.60	263.20	346.70	507.20	919.10	1247.60	1418.80	1615.70	1947.40	2773.40	3182.20	3995.40	4382.70

Cell Type	C _s	Final discharge voltage 0.85V per cell						
		Minutes		Seconds				
		5	3	60	30	10	5	1
TPH 10	10	60.99	77.04	103.79	116.63	126.26	133.75	145.52
TPH 20	20	132.68	170.13	221.49	240.75	263.22	274.99	29.96
TPH 31	31	207.58	252.52	331.70	357.38	394.83	414.09	450.47
TPH 41	41	263.22	330.63	404.46	441.91	477.22	499.69	558.54
TPH 51	51	289.97	367.01	444.05	486.85	524.30	547.84	613.11
TPH 61	61	369.15	429.07	532.86	588.50	636.65	667.68	727.60
TPH 71	71	506.11	560.68	714.76	761.84	820.69	843.16	926.62
TPH 81	81	577.80	640.93	816.41	870.98	938.39	963.00	1059.30
TPH 91	91	607.23	682.13	852.79	927.69	992.96	1029.88	1123.50
TPH 101	101	636.65	723.32	889.17	984.40	1047.53	1096.75	1187.70
TPH 121	121	691.22	805.71	949.09	1105.31	1158.81	1242.27	1335.36
TPH 151	151	970.49	1078.56	1323.59	1464.83	1541.87	1588.95	1780.48
TPH 181	181	1113.01	1240.34	1493.08	1640.74	1750.52	1818.14	2021.87
TPH 201	201	1208.03	1348.20	1606.07	1758.01	1889.62	1970.94	2182.80
TPH 226	226	1342.56	1498.62	1788.27	1951.86	2099.36	2184.39	2414.79
TPH 251	251	1479.81	1652.08	1974.15	2149.63	2313.34	2402.15	2651.46
TPH 277	277	1628.01	1817.40	2171.57	2364.70	2544.46	2642.37	2916.82
TPH 302	302	1776.20	1982.71	2368.98	2579.77	2775.58	2882.58	3182.18
TPH 327	327	1865.54	2082.28	2487.92	2709.48	2914.98	3027.36	3342.03
TPH 352	352	1953.82	2180.66	2605.45	2837.64	3052.71	3170.41	3499.97
TPH 402	402	2148.56	2398.94	2866.53	3121.19	3358.73	3488.20	3850.93
TPH 508	508	2363.63	2638.62	3153.29	3433.63	3694.71	3837.02	4235.06

Cell Type	C _s	Final discharge voltage 0.65V per cell						
		Minutes		Seconds				
		5	3	60	30	10	5	1
TPH 10	10	68.48	99.51	142.31	157.29	170.13	176.55	191.53
TPH 20	20	128.40	214.00	292.11	315.65	343.47	358.45	386.27
TPH 31	31	255.73	339.19	444.05	477.22	523.23	546.77	592.78
TPH 41	41	303.88	435.49	554.26	600.27	642.00	676.24	736.16
TPH 51	51	332.77	485.78	609.90	660.19	700.85	742.58	807.85
TPH 61	61	433.35	556.40	716.90	785.38	848.51	877.40	937.32
TPH 71	71	562.82	763.98	971.56	1015.43	1103.17	1129.92	1220.87
TPH 81	81	644.14	870.98	1114.94	1162.02	1261.53	1294.70	1399.56
TPH 91	91	677.85	910.04	1160.42	1254.04	1339.11	1385.65	1499.61
TPH 101	101	711.55	949.09	1205.89	1346.06	1416.68	1476.60	1599.65
TPH 121	121	781.10	1020.78	1285.07	1579.32	1602.86	1656.36	1806.16
TPH 151	151	1102.10	1464.83	1811.51	1997.69	2091.85	2151.77	2343.30
TPH 181	181	1340.92	1688.89	2046.48	2248.07	2376.26	2461.21	2671.36
TPH 201	201	1500.14	1838.26	2203.13	2414.99	2565.86	2667.51	2890.07
TPH 226	226	1643.68	2048.00	2450.48	2675.58	2851.87	2952.99	3202.03
TPH 251	251	1790.11	2261.98	2702.82	2941.43	3143.66	3244.24	3520.30
TPH 277	277	1969.34	2488.29	2973.00	3235.68	3458.24	3568.45	3872.33
TPH 302	302	2148.56	2714.59	3243.17	3529.93	3772.82	3892.66	4224.36
TPH 327	327	2256.74	2850.76	3406.25	3707.54	3962.81	4088.57	4436.95
TPH 352	352	2363.63	2985.30	3567.38	3883.03	4150.53	4282.14	4647.01
TPH 402	402	2600.10	3283.83	3923.69	4271.44	4565.69	4710.14	5111.39
TPH 508	508	2860.11	3612.32	4316.38	4698.37	5022.58	5180.94	5622.85



DISCHARGE CURVES (TSX AND TPH)



- Fully charged condition, with ambient temperature of 20°C and with allowance for connector loss
- Nominal Capacity C_s is 5 hours rated to end voltage of 1.00 Volt/cell



MAIN ELECTRIC PERFORMANCE PARAMETERS TPM Type for Medium rated loading

Final discharge voltage 1.14V per cell																	
Cell Type	C ₅	Hours							Minutes						Seconds		
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30	5	1
TPM 10	10	0.95	1.17	1.76	3	3.42	3.96	4.6	5.89	6.85	7.49	8.56	10.59	15.73	17.87	21.19	23.54
TPM 15	15	1.42	1.8	2.77	4.44	5.14	5.99	6.9	8.93	10.27	11.18	12.79	15.57	22.36	25.2	30.07	35.31
TPM 20	20	1.9	2.42	3.77	5.89	6.85	8.03	9.2	11.98	13.7	14.87	17.01	20.54	29	32.53	38.95	47.08
TPM 30	30	2.85	3.54	5.71	8.77	10.27	12.09	13.8	17.98	20.54	22.36	25.57	30.92	43.44	48.79	56.71	71.69
TPM 40	40	3.8	4.75	7.65	11.66	13.59	16.05	18.51	23.97	27.39	29.75	34.03	41.3	57.99	64.95	75.97	96.3
TPM 50	50	4.75	5.96	9.59	14.55	17.01	20.12	23.11	29.85	34.35	37.24	42.48	51.25	72.55	81.21	94.16	119.84
TPM 61	61	5.7	7.14	11.42	16.37	20.87	24.72	29.21	37.66	43.23	47.83	53.61	65.38	93.52	104.54	123.05	127.33
TPM 71	71	6.65	8.33	13.36	19.15	24.29	28.89	34.03	43.98	50.4	55.75	63.24	76.29	109.14	121.98	143.38	148.73
TPM 76	76	7.12	8.93	14.28	20.54	26	30.98	36.43	47.08	53.98	59.71	67.73	81.75	117.17	130.54	153.55	159.43
TPM 81	81	7.6	9.52	15.2	21.94	27.71	33.06	38.84	50.18	57.57	63.67	72.23	87.21	125.19	139.1	163.71	170.13
TPM 86	86	8.07	10.12	16.17	23.3	29.45	35.12	41.28	53.34	61.18	67.65	76.75	92.69	132.95	147.93	173.88	180.56
TPM 101	101	9.49	11.92	19.07	27.39	34.67	41.3	48.58	62.81	72.01	79.61	90.31	109.14	156.22	174.41	204.37	211.86
TPM 122	122	11.41	14.24	22.85	32.85	41.62	49.54	58.32	74.9	86.67	95.23	108.07	130.54	186.18	209.72	246.1	254.66
TPM 142	142	13.3	16.67	26.72	38.34	48.54	57.82	68.02	87.74	100.94	115.2	126.62	152.65	217.57	243.96	286.76	297.46
TPM 152	152	14.24	17.88	28.66	41.09	52	61.95	72.87	94.16	108.07	125.19	135.89	163.71	233.26	261.08	307.09	318.86
TPM 163	163	15.19	19.07	30.56	43.81	55.49	66.04	77.77	100.37	115.35	132.04	144.88	174.62	248.88	278.63	327.63	340.05
TPM 203	203	18.99	23.84	38.15	54.68	69.44	82.39	97.37	125.19	144.45	159.43	180.83	218.28	311.37	348.82	409.81	424.79
TPM 254	254	23.84	29.8	47.74	68.37	86.67	102.72	121.98	157.29	179.76	199.02	225.77	271.78	389.48	435.49	511.46	531.79
TPM 275	275	26.26	32.78	52.48	75.22	95.39	113.42	133.75	172.81	197.95	219.35	248.24	299.6	428.54	479.36	562.82	584.76
TPM 304	304	28.68	35.75	57.22	82.07	104.11	124.12	145.52	188.32	216.14	239.68	270.71	327.42	467.59	523.23	614.18	637.72
TPM 351	351	32.87	41.24	66.04	94.67	120.55	142.82	168.16	216.87	249.61	276.1	312.05	376.64	539.45	602.97	708.68	735.18
TPM 355	355	33.23	41.71	66.81	95.77	121.98	144.45	170.13	219.35	252.52	279.27	315.65	380.92	545.7	609.9	716.9	743.65
TPM 386	386	36.2	45.29	72.5	103.79	132.25	156.65	184.9	238.61	273.71	303.02	343.26	413.66	592.57	662.54	778.53	807.21
TPM 406	406	38.18	47.67	76.3	109.14	139.1	164.78	194.74	251.45	287.83	318.86	361.66	435.49	623.81	697.64	819.62	849.58
TPM 508	508	47.57	59.69	95.47	136.96	173.34	206.51	242.89	314.58	359.52	398.04	451.54	544.63	778.96	872.05	1023.99	1062.51
TPM 612	612	56.96	71.41	114.24	164.78	208.65	248.24	292.11	376.64	432.28	478.29	541.42	653.77	935.18	1045.39	1228.36	1275.44
TPM 719	719	66.46	83.33	133.62	191.53	242.89	288.9	340.26	439.77	503.97	557.47	632.37	762.91	1090.33	1219.8	1433.8	1487.3
TPM 826	826	76.15	95.24	153	218.28	277.13	330.63	388.41	502.9	575.66	637.72	723.32	870.98	1246.55	1394.21	1638.17	1700.23
TPM 913	913	85.65	107.06	171.36	246.1	312.44	371.29	437.63	564.96	648.42	716.9	813.2	980.12	1402.77	1568.62	1843.61	1912.09
TPM 1020	1020	95.14	119.18	190.74	273.92	346.68	413.02	485.78	628.09	720.11	797.15	904.15	1089.26	1558.99	1744.1	2049.05	2125.02

Final discharge voltage 1.10V per cell																	
Cell Type	C ₅	Hours							Minutes						Seconds		
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30	5	1
TPM 10	10	0.99	1.24	1.98	3.11	4.02	4.83	6	7.84	9.14	9.93	11.13	13.48	19.15	21.72	25.68	28.14
TPM 15	15	1.48	1.86	2.97	4.68	6.03	7.24	9.05	11.79	13.72	14.92	16.75	20.28	28.68	32.58	38.52	42.21
TPM 20	20	1.98	2.47	3.97	6.24	8.04	9.66	12.09	15.73	18.3	19.9	22.36	27.07	38.2	43.44	51.36	56.28
TPM 30	30	2.97	3.73	5.94	9.34	12.09	14.45	17.98	23.43	27.39	29.75	33.38	40.45	57.46	65.16	77.04	84.42
TPM 40	40	3.96	4.97	7.92	12.41	16.16	19.37	23.97	31.35	36.59	39.7	44.51	53.93	76.61	86.88	102.72	112.35
TPM 50	50	4.95	6.21	9.89	15.62	20.12	24.18	30.07	39.27	45.69	49.65	55.64	67.41	95.77	109.14	128.4	141.24
TPM 61	61	5.94	7.42	11.93	18.73	24.08	29	36.06	46.97	54.89	59.6	67.09	81.11	114.49	130.54	154.08	169.06
TPM 71	71	6.93	8.67	13.87	21.83	28.14	33.81	42.05	54.89	63.99	69.55	78.22	94.59	133.75	151.94	179.76	196.88
TPM 76	76	7.42	9.29	14.84	23.38	30.17	36.22	45.05	58.8	68.53	74.53	83.78	101.33	143.38	162.64	192.6	210.79
TPM 81	81	7.92	9.91	15.81	24.93	32.21	38.63	48.04	62.7	73.08	79.5	89.35	108.07	153.01	173.34	205.44	224.7
TPM 86	86	8.41	10.54	16.8	26.48	34.21	41.06	51.07	66.66	77.71	84.56	95.36	115.29	163.71	185.65	219.89	240.48
TPM 101	101	9.9	12.42	19.79	31.14	40.23	48.36	60.13	78.54	91.59	99.72	113.42	136.96	195.81	222.56	263.22	287.83
TPM 122	122	11.92	14.95	23.77	37.34	48.26	57.99	72.12	94.27	110.21	119.84	135.89	164.78	235.4	267.5	315.65	345.61
TPM 142	142	13.87	17.44	27.71	43.62	56.32	67.7	84.17	109.89	128.04	139.81	158.72	191.89	274.63	311.73	368.44	403.39
TPM 152	152	14.85	18.69	29.68	46.76	60.35	72.55	90.2	117.7	136.96	149.8	170.13	205.44	294.25	333.84	394.83	432.28
TPM 163	163	15.84	19.9	31.68	49.9	64.37	77.38	96.56	125.83	146.59	160.29	181.47	219.14	312.44	355.24	419.87	459.67
TPM 203	203	19.8	24.75	39.68	62.49	80.46	96.73	121.98	158.36	185.11	202.23	226.84	273.92	385.2	440.84	520.02	569.24
TPM 254	254	24.75	31.11	49.47	77.9	100.58	120.91	150.87	196.88	228.98	251.45	286.76	346.68	493.27	560.68	663.4	728.67
TPM 275	275	27.28	34.24	54.52	85.77	110.75	132.68	165.32	215.61	251.99	275.53	312.44	378.78	536.61	609.37	720.11	791.27
TPM 304	304	29.8	37.37	59.57	93.63	120.91	144.45	179.76	234.33	274.99	299.6	338.12	410.88	579.94	658.05	776.82	853.86
TPM 351	351	34.26	43.04	68.48	107.9	139.61	167.09	208.31	271.74	317.32	346.85	397.18	477.82	682.32	775.19	917.59	1005.46
TPM 355	355	34.64	43.53	69.26	109.14	141.24	169.06	210.79	274.99	321	350.96	402.32	483.64	691.22	785.38	929.83	1018.64
TPM 386	386	37.67	47.35	75.32	118.13	153.44	184.47	229.41	300.67	350.53	381.13	430.57	520.88	739.37	841.88	993.39	1085.41
TPM 406	406	39.69	49.89	79.36	124.12	161.57	194.74	241.82	317.79	370.22	401.25	449.4	545.7	771.47	879.54	1035.76	1129.92
TPM 508	508	49.59	62.22	99.14	156.22	201.16	242.89	301.74	393.76	457.96	499.69	560.68	680.52	960.86	1097.82	1294.7	1425.24
TPM 612	612	59.49	74.44	121.38	190.46	243.96	293.18	363.8	472.94	553.19	600.27	676.24	817.48	1151.32	1313.96	1551.5	1703.44
TPM 719	719	69.39	86.76	139.74	222.56	287.83	342.4	426.93	555.33	646.28	701.92	790.73	954.44	1346.06	1527.96	1808.3	1979.5
TPM 826	826	79.39	99.38	159.12	250.38	325.28	389.48	483.64	633.44	735.09	800.36	899.87	1088.19	1538.66	1746.24	2069.38	2266.26
TPM 913	913	89.28	114.13	181.56	285.69	368.08	442.98	549.98	714.76	831.39	910.57	1026.13	1239.06	1770.85	2014.81	2382.89	2616.15
TPM 1020	1020	99.18	127.26	201.96	316.72	408.74	492.2	610.97	793.94	923.41	1012.22	1140.62	1377.09	1967.73	2238.44	2647.18	2906.12

- Fully charged condition, with ambient temperature of 20°C and with allowance for connector loss
- Nominal Capacity C₅ is 5 hours rated to end voltage of 1.00 Volt/cell



MAIN ELECTRIC PERFORMANCE PARAMETERS

TPM Type for Medium rated loading

Final discharge voltage 1.05V per cell																	
Cell Type	C ₅	Hours							Minutes					Seconds			
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30	5	1
TPM 10	10	1.02	1.25	2	3.45	4.47	5.35	6.85	8.92	10.24	11.34	13.05	15.94	23.65	27.07	33.38	36.17
TPM 15	15	1.53	1.88	3	5.17	6.71	8.08	10.27	13.34	15.34	17.01	19.58	23.91	35.47	40.61	50.08	54.25
TPM 20	20	2.04	2.5	4	6.89	8.95	10.81	13.7	17.76	20.44	22.68	26.11	31.89	47.29	54.14	66.77	72.33
TPM 30	30	3.06	3.76	6	10.34	13.38	16.16	20.54	26.75	30.71	34.03	39.16	47.83	70.94	81.21	100.15	108.07
TPM 40	40	4.08	5.01	8	13.8	17.87	21.4	27.39	35.74	40.98	45.37	52.22	63.77	94.59	108.07	133.75	144.45
TPM 50	50	5.1	6.26	10	17.23	22.36	26.86	34.35	44.62	51.15	56.82	65.27	79.72	117.7	135.89	166.92	180.83
TPM 61	61	6.12	7.58	12.14	20.76	27.07	32.74	43.12	58.1	65.81	72.76	84	101.11	142.31	161.57	194.74	208.65
TPM 71	71	7.14	8.84	14.18	24.18	31.57	38.2	50.29	67.73	76.83	84.85	98.01	117.7	165.85	188.32	226.84	242.89
TPM 76	76	7.65	9.47	15.2	25.89	33.81	40.93	53.87	72.55	82.34	90.9	105.18	126.26	177.62	201.7	242.89	260.01
TPM 81	81	8.16	10.1	16.22	27.61	36.06	43.66	57.46	77.36	87.85	96.94	112.35	134.82	189.39	215.07	258.94	277.13
TPM 86	86	8.67	10.73	17.24	29.34	38.31	46.38	61.04	82.2	93.44	102.93	119.31	143.11	201.16	228.45	275.26	294.52
TPM 101	101	10.2	12.63	20.3	34.56	45.05	54.57	71.8	96.73	110.21	120.91	140.17	167.99	236.47	268.57	324.21	346.68
TPM 122	122	12.22	15.15	24.38	41.52	54.04	65.48	86.14	115.56	132.68	145.52	167.99	201.16	283.55	322.07	389.48	416.23
TPM 142	142	14.31	17.71	28.46	48.44	63.09	76.4	100.76	135.53	154.79	169.77	196.52	235.4	331.34	376.28	454.39	485.42
TPM 152	152	15.35	18.99	30.5	51.9	67.62	81.86	108.07	145.52	165.85	181.9	210.79	252.52	355.24	403.39	486.85	520.02
TPM 163	163	16.36	20.24	32.52	55.34	72.12	87.31	115.13	155.15	176.76	193.88	224.7	269.21	378.78	430.14	519.16	554.69
TPM 203	203	20.4	25.25	40.6	69.12	90.09	109.14	143.38	193.67	220.42	241.82	280.34	335.98	472.94	537.14	648.42	693.36
TPM 254	254	25.55	31.61	50.8	86.46	112.35	136.96	179.76	241.82	276.06	302.81	350.96	420.51	591.71	671.96	811.06	866.7
TPM 275	275	28.08	34.75	55.85	95.07	124.12	150.34	197.42	265.9	303.35	332.77	385.74	462.24	650.56	738.84	891.85	953.37
TPM 304	304	30.6	37.88	60.89	103.68	135.89	163.71	215.07	289.97	330.63	362.73	420.51	503.97	709.41	805.71	972.63	1040.04
TPM 351	351	35.34	43.73	70.28	119.53	155.58	189.3	248.54	334.27	381.82	418.84	485.48	581.74	818.68	929.74	1122.26	1199.51
TPM 355	355	35.75	44.24	71.09	120.91	157.29	191.53	251.45	338.12	386.27	423.72	491.13	588.5	828.18	940.53	1135.27	1213.38
TPM 386	386	38.84	48	77.15	131.18	170.77	207.58	272.64	367.65	419.01	459.67	532.86	638.58	898.8	1020.78	1232.21	1317.38
TPM 406	406	40.91	50.5	81.19	138.03	179.76	218.28	286.76	387.34	440.84	483.64	560.68	671.96	945.88	1074.28	1296.84	1386.72
TPM 508	508	51.11	63.13	101.59	173.34	225.77	272.85	359.52	483.64	551.05	604.55	700.85	839.95	1182.35	1342.85	1621.05	1733.4
TPM 612	612	61.41	75.75	122.4	209.72	276.06	335.98	440.84	590.64	667.68	737.23	849.58	1018.64	1431.66	1628.54	1962.38	2101.48
TPM 719	719	71.61	88.38	143.82	248.24	322.07	389.48	509.32	684.8	775.75	858.14	988.68	1185.56	1669.2	1896.04	2279.1	2442.81
TPM 826	826	81.71	101	165.24	281.41	364.87	441.91	582.08	781.1	887.03	977.98	1132.06	1356.76	1903.53	2162.47	2602.24	2794.84
TPM 913	913	91.81	116.15	182.58	311.37	405.53	491.13	646.28	870.98	991.89	1088.19	1261.53	1511.91	2128.23	2417.13	2917.89	3120.12
TPM 1020	1020	103.02	129.28	204	348.82	456.89	554.26	726.53	1073.21	1111.73	1219.8	1412.4	1692.74	2378.61	2700.68	3259.22	3486.06

Final discharge voltage 1.00V per cell																	
Cell Type	C ₅	Hours							Minutes					Seconds			
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30	5	1
TPM 10	10	1.03	1.27	2.04	3.5	5.13	6.17	8.01	11.45	13.38	14.66	16.69	20.33	28.57	32.53	39.59	42.16
TPM 15	15	1.55	1.91	3.06	5.25	7.68	9.24	12.03	17.12	20.01	21.99	24.98	30.5	42.85	48.85	59.39	63.29
TPM 20	20	2.06	2.55	4.08	7	10.24	12.31	16.05	22.79	26.64	29.32	33.28	40.66	57.14	65.16	79.18	84.42
TPM 30	30	3.09	3.82	6.12	10.49	15.41	18.51	24.08	34.24	40.02	43.98	49.97	60.99	85.71	97.69	118.77	126.26
TPM 40	40	4.12	5.09	8.16	14.02	20.44	24.72	31.99	45.58	53.29	58.53	66.66	81.32	114.49	130.54	158.36	169.06
TPM 50	50	5.15	6.36	10.2	17.55	25.57	30.92	40.02	57.03	66.66	73.19	83.35	101.65	143.38	162.64	197.95	210.79
TPM 61	61	6.18	7.66	12.24	20.97	30.71	37.02	48.04	68.37	79.93	87.85	99.94	121.98	171.2	195.81	237.54	253.59
TPM 71	71	7.21	8.93	14.28	24.5	35.85	43.23	56.07	79.82	93.3	102.51	116.63	142.31	200.09	227.91	277.13	295.32
TPM 76	76	7.73	9.56	15.3	26.27	38.41	46.33	60.08	83.94	99.99	109.57	125.19	152.48	214.54	243.96	296.93	316.19
TPM 81	81	8.24	10.2	16.32	28.03	40.98	49.43	64.09	88.06	106.68	116.63	133.75	162.64	228.98	260.01	316.72	337.05
TPM 86	86	8.76	10.86	17.34	29.77	43.55	52.51	68.11	94.67	113.45	124.12	142.04	172.81	243.16	276.33	336.52	358.18
TPM 101	101	10.3	12.83	20.4	34.99	51.25	61.74	80.14	114.49	133.75	146.59	166.92	203.3	285.69	325.28	395.9	421.58
TPM 122	122	12.32	15.35	24.48	41.94	61.53	74.04	96.19	136.96	160.5	175.48	200.09	243.96	342.4	390.55	475.08	506.11
TPM 142	142	14.41	17.98	28.56	49.01	71.8	86.46	111.96	160.5	187.61	205.44	233.62	284.62	400.18	455.46	554.26	590.28
TPM 152	152	15.45	19.29	30.6	52.54	76.93	92.66	119.84	172.27	201.16	220.42	250.38	304.95	429.07	487.92	593.85	632.37
TPM 163	163	16.48	20.56	32.64	56.03	82.05	98.74	127.76	183.61	214.43	234.97	267.07	325.28	457.53	520.45	633.44	674.53
TPM 203	203	20.6	25.65	40.8	69.98	102.51	123.05	159.43	228.98	267.5	293.18	333.84	406.6	571.38	650.56	791.8	843.16
TPM 254	254	25.76	32.12	51	87.53	128.4	154.08	200.09	286.76	334.91	367.01	417.3	508.25	714.76	813.2	989.75	1053.95
TPM 275	275	28.34	35.95	56.1	96.25	141.24	169.6	220.42	315.12	368.08	403.39	459.03	559.08	785.92	894.52	1088.73	1159.35
TPM 304	304	30.91	37.78	61.2	104.97	154.08	185.11	240.75	343.47	401.25	439.77	500.76	609.9	857.07	975.84	1187.7	1264.74
TPM 351	351	35.64	44.09	70.58	120.62	177.71	213.66	277.17	396.63	463.27	507.69	577.54	703.42	988.98	1125.47	1369.81	1458.67
TPM 355	355	36.06	44.95	71.4	121.98	179.76	216.14	280.34	401.25	468.66	513.6	584.22	711.55	1000.45	1138.48	1385.65	1475.53
TPM 386	386	39.15	48.76	77.52	132.89	195.17	234.76	304.74	435.28	508.46	557.26	634.3	772.54	1085.84	1236.06	1504.42	1602
TPM 406	406	41.21	51.31	81.6	140.17	205.44	247.17	321	457.96	535	586.36	667.68	813.2	1142.76	1301.12	1583.6	1686.32
TPM 508	508	51.71	64.14	102	175.48	256.8	309.23	401.25	572.45	668.75	732.95	834.6	1016.5	1428.45	1626.4	1979.5	2107.9
TPM 612	612	62.01	76.56	123.42	210.79	308.16	371.29	481.5	686.94	802.5	881.68	1002.59	1226.22	1718.42	1966.66	2383.96	2545.53
TPM 719	719	71.31	89.39	143.82	246.1	359.52	434.42	562.82	800.36	936.25	1028.27	1170.58	1429.52	2007.32	2285.52	2779.86	2961.76
TPM 826	826	82.62	103.02	165.24	282.48	411.95	496.48	645.21	883.82	1071.07	1170.58	1341.78	1632.82	2296.22	2606.52	3175.76	3381.2
TPM 913	913	92.72	115.14	184.62	314.58	462.24	556.4	721.18	1030.41	1203.75	1319.31	1502.28	1829.7	2571.21	2921.1	3563.1	3794.22
TPM 1020	1020	104.03	129.28	206.04	352.03	514.67	619.53	804.64	1148.11	1341.78	1470.18	1673.48	2038.35	2863.32	3260.29	3966.49	4224.36

- Fully charged condition, with ambient temperature of 20°C and with allowance for connector loss
- Nominal Capacity C₅ is 5 hours rated to end voltage of 1.00 Volt/cell



MAIN ELECTRIC PERFORMANCE PARAMETERS

TPL Type for Long rated loading

Final discharge voltage 1.14V per cell															
Cell Type	C ₅	Hours							Minutes						Seconds
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30
TPL 10	10	0.91	1.13	1.54	2.42	2.64	3.06	3.48	4.04	4.33	4.47	4.64	5.20	6.35	6.94
TPL 17	17	1.55	1.92	2.62	4.11	4.49	5.20	5.91	6.88	7.37	7.60	7.89	8.84	10.82	11.75
TPL 20	20	1.82	2.26	3.08	4.84	5.29	6.12	6.96	8.09	8.67	8.95	9.29	10.40	12.73	13.80
TPL 22	22	2.00	2.49	3.39	5.32	5.81	6.73	7.65	8.91	9.52	9.83	10.21	11.44	14.00	15.22
TPL 26	26	2.27	2.83	3.86	6.05	6.60	7.65	8.70	10.14	10.81	11.16	11.60	13.01	15.89	17.33
TPL 31	31	2.73	3.39	4.63	7.25	7.92	9.17	10.44	12.20	12.95	13.38	13.91	15.62	19.05	20.87
TPL 41	41	3.64	4.52	6.16	9.67	10.57	12.20	13.91	16.16	17.33	17.87	18.62	20.76	25.36	27.71
TPL 46	46	4.09	5.09	6.93	10.88	11.92	13.75	15.68	18.19	19.53	20.12	20.92	23.38	28.57	31.24
TPL 51	51	4.55	5.66	7.70	12.09	13.27	15.30	17.44	20.22	21.72	22.36	23.22	26.00	31.78	34.78
TPL 61	61	5.46	6.79	9.27	14.45	18.30	20.65	23.33	27.93	31.35	33.60	36.38	41.73	54.57	58.85
TPL 71	71	6.37	7.92	10.81	16.91	21.29	24.08	27.18	32.64	36.59	39.16	42.48	48.69	63.67	68.59
TPL 82	82	7.28	9.05	12.34	19.37	24.29	27.50	31.03	37.34	41.84	44.73	48.58	55.64	72.76	78.11
TPL 92	92	8.19	10.20	13.87	21.72	27.39	30.92	34.99	41.94	46.97	50.40	54.57	63.13	82.39	88.81
TPL 102	102	9.10	11.31	15.50	24.18	30.39	34.35	38.84	46.65	52.32	55.96	60.67	69.55	90.95	98.44
TPL 112	112	10.00	12.42	17.03	26.59	33.44	37.77	42.75	51.31	57.57	61.58	66.77	76.51	100.05	108.07
TPL 122	122	10.91	13.53	18.56	29.00	36.49	41.20	46.65	55.96	62.81	67.20	72.87	83.46	109.14	117.70
TPL 128	128	11.36	14.11	19.35	30.21	38.00	42.92	48.60	58.30	65.43	70.00	75.90	86.94	113.78	122.52
TPL 133	133	11.82	14.68	20.13	31.42	39.52	44.65	50.54	60.63	68.05	72.80	78.93	90.42	118.41	127.33
TPL 138	138	12.27	15.25	20.91	32.64	41.03	46.38	52.48	62.97	70.67	75.60	81.96	93.89	123.05	132.15
TPL 143	143	12.73	15.82	21.69	33.85	42.55	48.11	54.43	65.31	73.30	78.40	84.99	97.37	127.69	136.96
TPL 153	153	13.64	16.97	23.26	36.27	45.58	51.57	58.32	69.98	78.54	84.00	91.06	104.33	136.96	146.59
TPL 179	179	15.96	19.80	27.03	42.32	49.22	56.39	63.93	75.44	82.60	86.72	91.97	104.16	132.15	142.31
TPL 184	184	16.42	20.36	27.78	43.53	49.95	57.35	65.06	76.53	83.42	87.27	92.15	104.13	131.18	141.45
TPL 204	204	18.28	22.62	30.80	48.36	52.86	61.20	69.55	80.89	86.67	89.45	92.88	104.00	127.33	138.03
TPL 235	235	20.95	26.02	35.58	55.62	66.73	75.84	86.11	102.33	112.99	119.88	128.31	146.25	187.68	202.23
TPL 255	255	22.73	28.28	38.76	60.46	75.97	85.60	97.16	116.63	130.54	140.17	151.94	174.41	227.91	245.03
TPL 306	306	27.37	33.94	46.51	72.55	91.16	103.04	116.63	140.17	157.29	167.99	181.90	208.65	272.85	294.25
TPL 326	326	29.15	36.20	49.61	77.38	97.24	109.76	124.33	149.59	167.56	179.12	193.88	222.77	291.25	313.94
TPL 346	346	30.93	38.46	52.71	82.22	103.32	116.48	132.04	159.00	177.83	190.25	205.87	236.90	309.66	333.63
TPL 355	355	31.82	39.59	54.26	84.64	106.36	119.84	135.89	163.71	182.97	195.81	211.86	243.96	318.86	343.47
TPL 371	371	33.21	41.29	56.47	88.26	111.04	124.98	141.67	170.45	191.00	204.16	221.17	254.23	332.34	357.92
TPL 408	408	36.46	45.25	61.61	96.73	121.98	136.96	155.15	186.18	209.72	223.63	242.89	278.20	363.80	391.62
TPL 428	428	38.28	47.51	64.69	101.56	124.12	140.17	159.00	189.39	211.22	234.97	255.09	292.11	381.99	411.31
TPL 459	459	41.01	50.90	69.31	108.82	127.33	144.99	164.78	194.21	213.47	251.99	273.39	312.98	409.28	440.84
TPL 510	510	45.55	56.56	77.01	120.91	132.68	153.01	174.41	202.23	217.21	280.34	303.88	347.75	454.75	490.06
TPL 612	612	54.64	67.87	92.62	145.52	180.83	204.37	232.19	274.99	310.30	326.35	356.31	408.74	530.72	576.73
TPL 714	714	63.73	79.18	108.12	169.06	212.93	240.75	271.78	326.35	365.94	391.62	424.79	486.85	636.65	685.87
TPL 816	816	72.82	90.50	123.42	193.67	242.89	274.99	310.30	373.43	418.37	447.26	485.78	556.40	727.60	784.31
TPL 918	918	81.91	102.01	138.72	217.21	273.92	309.23	349.89	419.44	469.73	503.97	545.70	625.95	818.55	881.68
TPL 1020	1020	91.00	113.12	155.04	241.82	303.88	343.47	388.41	466.52	523.23	559.61	606.69	695.50	909.50	980.12

- Fully charged condition, with ambient temperature of 20°C and with allowance for connector loss
- Nominal Capacity C₅ is 5 hours rated to end voltage of 1.00 Volt/cell



MAIN ELECTRIC PERFORMANCE PARAMETERS

TPL Type for Long rated loading

Final discharge voltage 1.10V per cell															
Cell Type	C ₅	Hours							Minutes						Seconds
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30
TPL 10	10	0.97	1.20	1.79	2.72	3.60	4.26	4.92	5.55	6.00	6.16	6.44	6.90	8.31	9.02
TPL 17	17	1.65	2.04	3.03	4.62	6.11	7.24	8.37	9.46	10.19	10.46	11.00	11.73	14.10	15.36
TPL 20	20	1.94	2.40	3.57	5.44	7.19	8.52	9.84	11.13	11.98	12.31	12.95	13.80	16.59	18.08
TPL 22	22	2.13	2.64	3.92	5.98	7.91	9.36	10.83	12.24	13.18	13.55	14.23	15.17	18.25	19.88
TPL 26	26	2.42	3.00	4.46	6.79	9.00	10.63	12.31	13.91	14.98	15.41	16.16	17.23	20.76	22.58
TPL 31	31	2.90	3.61	5.34	8.15	10.81	12.73	14.77	16.69	17.98	18.51	19.37	20.65	24.93	27.07
TPL 41	41	3.88	4.81	7.15	10.91	14.34	17.01	19.69	22.26	23.97	24.72	25.89	27.61	33.28	36.17
TPL 46	46	4.36	5.41	8.04	12.25	16.16	19.15	22.20	25.09	27.07	27.77	29.05	31.08	37.45	40.66
TPL 51	51	4.85	6.01	8.93	13.59	17.98	21.29	24.72	27.93	30.17	30.82	32.21	34.56	41.62	45.15
TPL 61	61	5.80	7.19	10.61	16.26	21.51	25.04	28.36	34.35	38.63	40.87	44.41	51.57	66.13	70.83
TPL 71	71	6.77	8.40	12.44	19.15	25.57	29.75	34.13	41.09	46.55	49.11	53.18	61.85	78.65	85.39
TPL 82	82	7.74	9.61	14.18	21.94	29.21	34.03	39.06	46.97	53.18	56.18	60.78	70.73	89.88	97.58
TPL 92	92	8.70	10.81	16.01	24.72	32.85	38.20	43.87	52.86	59.81	63.13	68.37	79.50	101.12	110.21
TPL 102	102	9.70	12.02	17.75	27.39	36.49	42.48	48.79	58.74	66.45	70.19	75.97	88.38	112.35	121.98
TPL 112	112	10.66	13.23	19.53	30.12	40.13	46.76	53.66	64.57	73.13	77.20	83.57	97.21	123.59	134.29
TPL 122	122	11.62	14.44	21.32	32.85	43.76	51.04	58.53	70.41	79.82	84.21	91.16	106.04	134.82	146.59
TPL 128	128	12.10	15.05	22.20	34.22	45.60	53.16	60.97	73.37	83.14	87.72	95.05	110.48	140.53	152.65
TPL 133	133	12.59	15.66	23.09	35.60	47.44	55.28	63.42	76.33	86.46	91.24	98.94	114.92	146.23	158.72
TPL 138	138	13.08	16.26	23.97	36.97	49.27	57.41	65.86	79.29	89.77	94.75	102.83	119.36	151.94	164.78
TPL 143	143	13.57	16.87	24.85	38.34	51.11	59.53	68.30	82.25	93.09	98.26	106.71	123.80	157.65	170.84
TPL 153	153	14.54	18.08	26.62	41.09	54.78	63.77	73.19	88.17	99.72	105.29	114.49	132.68	169.06	182.97
TPL 179	179	17.02	21.06	31.06	47.94	63.88	74.37	85.39	102.93	116.20	123.26	133.22	155.15	196.88	213.47
TPL 184	184	17.51	21.65	31.95	49.31	65.70	76.48	87.83	105.89	119.50	126.86	136.96	159.64	202.44	219.56
TPL 204	204	19.49	24.04	35.50	54.78	72.97	84.96	97.58	117.70	132.68	141.24	151.94	177.62	224.70	243.96
TPL 235	235	22.34	27.67	40.82	63.00	83.95	97.73	112.22	135.03	153.22	161.78	175.05	203.94	258.73	280.55
TPL 255	255	24.24	30.10	44.37	68.48	91.27	106.25	121.98	146.59	166.92	175.48	190.46	221.49	281.41	304.95
TPL 306	306	28.99	36.06	53.45	81.64	109.14	129.47	151.94	171.20	185.11	190.46	200.09	266.43	337.05	365.94
TPL 326	326	30.97	38.48	56.92	87.33	116.42	137.17	159.64	184.90	204.37	212.72	226.63	283.55	359.73	390.34
TPL 346	346	32.95	40.91	60.38	93.03	123.69	144.88	167.35	198.59	223.63	234.97	253.16	300.67	382.42	414.73
TPL 355	355	33.94	42.12	62.12	95.87	127.33	148.73	171.20	205.44	233.26	246.10	266.43	309.23	393.76	426.93
TPL 371	371	35.39	43.90	64.99	100.49	132.79	156.43	180.19	215.39	245.46	259.58	281.52	325.60	414.30	448.12
TPL 408	408	38.78	48.08	71.71	111.28	145.52	174.41	201.16	238.61	273.92	291.04	316.72	363.80	462.24	497.55
TPL 428	428	40.76	50.50	75.26	116.63	152.80	182.97	211.00	249.74	287.19	303.88	330.63	380.92	484.07	521.73
TPL 459	459	43.73	54.14	80.58	124.66	163.71	195.81	225.77	266.43	307.09	323.14	351.50	406.60	516.81	558.01
TPL 510	510	48.68	60.20	89.45	138.03	181.90	217.21	250.38	294.25	340.26	355.24	386.27	449.40	571.38	618.46
TPL 612	612	57.97	72.01	107.10	163.71	217.21	251.45	287.83	346.68	388.41	411.95	447.26	521.09	665.54	714.76
TPL 714	714	67.77	84.23	126.48	193.67	258.94	300.67	344.54	414.09	469.73	496.48	543.56	627.02	792.87	862.42
TPL 816	816	77.37	96.05	142.80	220.42	295.32	344.54	394.83	474.01	539.28	568.17	612.04	714.76	907.36	987.61
TPL 918	918	87.06	109.08	163.20	250.38	332.77	387.34	444.05	533.93	604.55	637.72	691.22	804.64	1017.57	1110.66
TPL 1020	1020	97.26	122.21	179.52	277.13	370.22	433.35	496.48	595.99	673.03	711.55	768.26	894.52	1136.34	1240.13

- Fully charged condition, with ambient temperature of 20°C and with allowance for connector loss
- Nominal Capacity C₅ is 5 hours rated to end voltage of 1.00 Volt/cell



MAIN ELECTRIC PERFORMANCE PARAMETERS

TPL Type for Long rated loading

Final discharge voltage 1.05V per cell															
Cell Type	C ₅	Hours							Minutes						Seconds
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30
TPL 10	10	1.02	1.26	1.99	3.04	4.00	4.77	5.71	6.99	7.45	7.66	8.09	8.87	10.81	11.66
TPL 17	17	1.73	2.15	3.38	5.17	6.80	8.11	9.73	11.91	12.65	13.01	13.74	15.02	18.37	19.83
TPL 20	20	2.04	2.53	3.98	6.08	8.00	9.54	11.45	14.02	14.87	15.30	16.16	17.66	21.61	23.33
TPL 22	22	2.24	2.78	4.40	6.68	8.80	10.50	12.58	15.41	16.37	16.84	17.78	19.45	23.75	25.64
TPL 26	26	2.55	3.16	5.03	7.59	9.99	11.94	14.28	17.49	18.62	19.15	20.22	22.15	26.96	29.10
TPL 31	31	3.05	3.79	6.08	9.11	11.98	14.34	17.12	20.97	22.36	23.01	24.29	26.64	32.31	34.88
TPL 41	41	4.07	5.05	7.96	12.20	15.94	19.05	22.90	27.93	29.75	30.60	32.31	35.52	43.23	46.65
TPL 46	46	4.58	5.68	8.95	13.70	17.98	21.45	25.73	31.46	33.49	34.45	36.38	39.96	48.63	52.48
TPL 51	51	5.09	6.31	9.95	15.19	20.01	23.86	28.57	34.99	37.24	38.31	40.45	44.41	54.04	58.32
TPL 61	61	6.09	7.58	12.14	18.62	24.93	30.28	35.95	44.08	49.01	52.75	58.10	66.45	84.10	91.16
TPL 71	71	7.11	8.84	14.18	21.72	29.10	35.31	41.94	51.47	57.14	61.53	67.73	77.47	98.12	106.36
TPL 82	82	8.16	10.10	16.22	24.82	33.28	40.34	47.94	58.74	65.27	70.30	77.36	88.17	112.35	121.98
TPL 92	92	9.17	11.41	18.26	27.93	37.45	45.37	53.93	66.13	73.51	79.07	87.10	99.19	126.26	136.96
TPL 102	102	10.20	12.63	20.30	31.03	41.62	50.40	59.92	73.51	81.64	87.85	96.73	110.21	140.17	151.94
TPL 112	112	11.21	13.89	22.34	34.13	45.80	55.43	65.91	80.84	89.83	96.62	106.14	121.45	154.08	166.92
TPL 122	122	12.22	15.15	24.38	37.24	49.97	60.46	71.90	88.17	98.01	105.40	115.56	132.68	167.99	181.90
TPL 128	128	12.74	15.79	25.40	38.79	52.06	62.99	74.90	91.84	102.01	109.76	120.55	138.21	175.12	189.57
TPL 133	133	13.26	16.43	26.42	40.34	54.14	65.52	77.90	95.52	106.00	114.13	125.55	143.74	182.26	197.24
TPL 138	138	13.79	17.07	27.44	41.89	56.23	68.05	80.89	99.19	110.00	118.50	130.54	149.27	189.39	204.91
TPL 143	143	14.31	17.71	28.46	43.44	58.32	70.58	83.89	102.86	113.99	122.87	135.53	154.79	196.52	212.57
TPL 153	153	15.35	18.99	30.50	46.55	62.49	75.65	89.88	110.21	121.98	131.61	145.52	165.85	210.79	227.91
TPL 179	179	17.88	22.17	35.19	53.71	71.26	85.65	102.19	126.26	136.96	143.92	155.69	172.81	216.68	234.87
TPL 184	184	18.38	22.81	36.13	55.15	73.02	87.65	104.65	129.47	139.96	146.38	157.72	174.20	217.85	236.26
TPL 204	204	20.40	25.35	39.88	60.88	80.04	95.66	114.49	142.31	151.94	156.22	165.85	179.76	222.56	241.82
TPL 235	235	23.49	29.11	46.43	70.90	94.48	114.02	135.68	167.35	183.40	194.10	211.43	231.12	274.56	304.74
TPL 255	255	25.55	31.61	50.80	77.58	104.11	126.26	149.80	184.04	204.37	219.35	241.82	265.36	309.23	346.68
TPL 306	306	30.50	37.98	60.28	91.16	120.91	144.45	173.34	211.86	227.91	234.33	247.17	271.78	327.42	354.17
TPL 326	326	32.60	40.48	64.61	98.35	130.75	157.29	187.89	229.84	251.02	260.44	276.70	301.74	358.24	387.98
TPL 346	346	34.70	42.99	68.93	105.54	140.60	170.13	202.44	247.81	274.13	286.55	306.23	331.70	389.05	421.79
TPL 355	355	35.75	44.24	71.09	109.14	145.52	176.55	209.72	256.80	285.69	299.60	321.00	346.68	404.46	438.70
TPL 371	371	37.24	46.15	73.63	112.99	149.69	180.72	216.46	264.50	290.18	302.49	322.61	350.53	414.09	448.65
TPL 408	408	40.70	50.60	79.56	121.98	159.43	190.46	232.19	282.48	300.67	309.23	326.35	359.52	436.56	471.87
TPL 428	428	42.74	53.13	83.58	128.19	167.78	200.52	243.32	296.39	315.44	324.64	342.61	377.28	458.39	495.62
TPL 459	459	45.80	56.91	89.61	137.50	180.30	215.61	260.01	317.26	337.59	347.75	367.01	403.93	491.13	531.26
TPL 510	510	50.90	63.23	99.65	153.01	201.16	240.75	287.83	352.03	374.50	386.27	407.67	448.33	545.70	590.64
TPL 612	612	61.00	75.75	121.38	186.18	248.24	300.67	354.17	431.21	480.43	511.46	570.31	650.56	816.41	882.75
TPL 714	714	71.21	88.48	141.78	218.28	293.18	355.24	421.58	517.88	574.59	619.53	681.59	778.96	988.68	1070.00
TPL 816	816	81.61	102.01	164.22	250.38	334.91	405.53	482.57	589.57	655.91	706.20	778.96	887.03	1129.92	1228.36
TPL 918	918	91.81	115.14	184.62	281.41	376.64	456.89	542.49	664.47	740.44	795.01	876.33	997.24	1269.02	1378.16
TPL 1020	1020	102.01	127.26	204.00	312.44	418.37	507.18	602.41	738.30	819.62	881.68	972.63	1177.00	1409.19	1530.10

- Fully charged condition, with ambient temperature of 20°C and with allowance for connector loss
- Nominal Capacity C₅ is 5 hours rated to end voltage of 1.00 Volt/cell

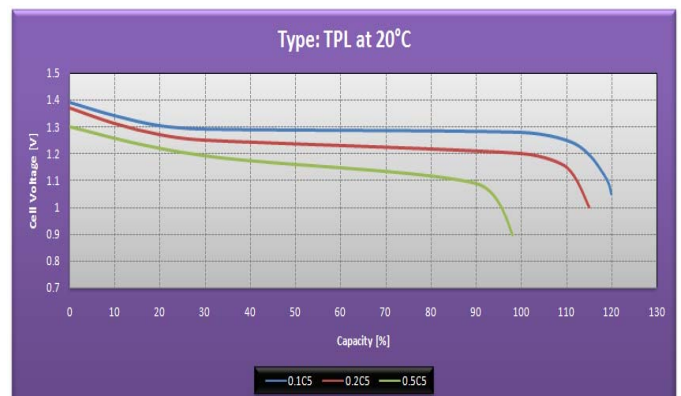
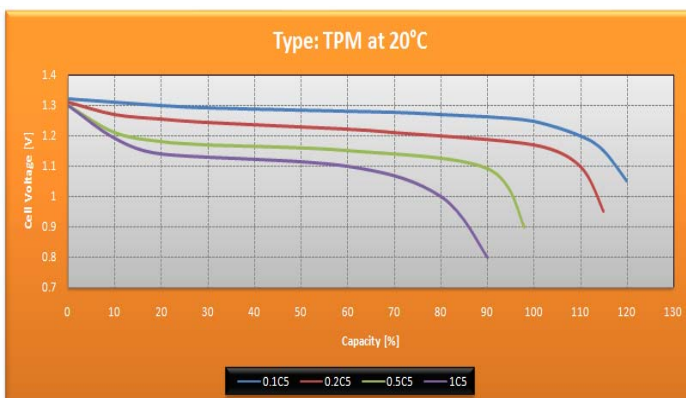


MAIN ELECTRIC PERFORMANCE PARAMETERS

TPL Type for Long rated loading

Cell Type	C ₅	Final discharge voltage 1.00V per cell														
		Hours							Minutes							Seconds
		10	8	5	3	2	1.5	1	30	20	15	10	5	1	30	
TPL 10	10	1.03	1.27	2.04	3.40	4.58	5.38	6.52	8.17	8.96	9.35	9.98	11.24	13.59	14.55	
TPL 17	17	1.75	2.16	3.47	5.78	7.79	9.10	11.09	13.91	15.20	15.91	17.00	19.10	23.10	24.74	
TPL 20	20	2.06	2.55	4.08	6.81	9.16	10.70	13.05	16.37	17.87	18.73	20.01	22.47	27.18	29.10	
TPL 22	22	2.27	2.79	4.49	7.49	10.07	11.79	14.36	18.00	19.67	20.59	22.00	24.72	29.90	32.01	
TPL 26	26	2.58	3.15	5.10	8.51	11.43	13.43	16.32	20.44	22.36	23.38	24.98	28.09	33.97	36.38	
TPL 31	31	3.09	3.76	6.12	10.21	13.70	16.16	19.58	24.50	26.86	28.03	29.96	33.71	40.77	43.66	
TPL 41	41	4.12	5.09	8.16	13.59	18.30	21.51	26.11	32.74	35.85	37.45	39.91	44.94	54.36	58.21	
TPL 46	46	4.64	5.73	9.18	15.30	20.60	24.24	29.37	36.81	40.34	42.10	44.94	50.56	61.15	65.48	
TPL 51	51	5.15	6.37	10.20	17.01	22.90	26.96	32.64	40.87	44.83	46.76	49.97	56.18	67.95	72.76	
TPL 61	61	6.15	7.66	12.24	20.87	27.39	33.92	43.01	52.75	59.49	63.34	69.98	80.57	102.72	111.28	
TPL 71	71	7.18	8.93	14.28	24.29	31.99	39.59	50.18	61.53	69.44	73.94	81.53	94.05	119.84	129.47	
TPL 82	82	8.21	10.20	16.32	27.71	36.59	43.66	57.35	70.30	79.39	84.53	93.20	107.00	136.96	147.66	
TPL 92	92	9.23	11.51	18.36	31.24	41.09	48.66	64.52	79.07	89.24	95.02	104.86	120.91	154.08	166.92	
TPL 102	102	10.30	12.73	20.40	34.56	47.29	56.50	69.87	86.14	97.37	104.00	113.42	130.54	166.92	179.76	
TPL 112	112	11.31	14.04	22.44	38.04	52.00	62.17	76.88	94.75	107.00	114.60	125.19	143.92	183.51	197.95	
TPL 122	122	12.32	15.35	24.48	41.52	56.71	67.84	83.89	103.36	116.63	125.19	136.96	157.29	200.09	216.14	
TPL 128	128	12.84	15.99	25.50	43.25	59.08	70.67	87.38	107.71	121.62	130.36	142.67	163.89	208.29	225.24	
TPL 133	133	13.37	16.63	26.52	44.98	61.45	73.51	90.88	112.06	126.62	135.53	148.37	170.49	216.50	234.33	
TPL 138	138	13.89	17.27	27.54	46.71	63.83	76.34	94.37	116.42	131.61	140.71	154.08	177.09	224.70	243.43	
TPL 143	143	14.41	17.91	28.56	48.44	66.20	79.18	97.87	120.77	136.60	145.88	159.79	183.68	232.90	252.52	
TPL 153	153	15.45	19.19	30.60	51.90	70.94	84.85	104.86	129.47	146.59	156.22	171.20	196.88	249.31	270.71	
TPL 179	179	18.03	22.32	35.70	59.97	81.27	95.93	118.77	150.87	170.67	181.90	199.02	228.98	296.93	315.12	
TPL 184	184	18.54	22.95	36.72	61.59	83.33	98.14	121.55	155.15	175.48	187.04	204.58	235.40	306.45	324.00	
TPL 204	204	20.60	25.45	40.80	68.05	91.59	107.00	132.68	172.27	194.74	207.58	226.84	261.08	344.54	359.52	
TPL 235	235	23.76	29.27	46.92	79.09	107.90	127.54	157.72	197.95	224.27	239.04	260.87	300.24	388.20	413.45	
TPL 255	255	25.86	31.82	51.00	86.46	118.77	141.24	174.41	215.07	243.96	260.01	283.55	326.35	417.30	449.40	
TPL 306	306	30.91	37.67	61.20	102.29	139.10	165.85	200.09	257.87	292.11	312.44	340.26	391.62	500.76	539.28	
TPL 326	326	32.85	40.30	65.16	105.03	141.67	170.13	203.94	257.44	289.54	307.30	332.56	373.64	462.24	499.05	
TPL 346	346	34.78	42.93	69.12	107.77	144.24	174.41	207.79	257.01	286.97	302.17	324.85	355.67	423.72	458.82	
TPL 355	355	35.75	44.24	71.09	109.14	145.52	176.55	209.72	256.80	285.69	299.60	321.00	346.68	404.46	438.70	
TPL 371	371	37.39	46.30	74.25	117.49	157.08	188.75	225.77	278.63	316.83	333.95	361.13	399.65	482.78	523.12	
TPL 408	408	41.21	51.11	81.60	136.96	184.04	217.21	263.22	329.56	389.48	414.09	454.75	523.23	665.54	720.11	
TPL 428	428	43.29	53.65	85.68	144.02	193.46	228.12	276.49	346.04	408.95	435.06	477.43	549.34	698.92	756.06	
TPL 459	459	46.41	57.47	91.80	154.62	207.58	244.50	296.39	370.76	438.17	466.52	511.46	588.50	749.00	809.99	
TPL 510	510	51.61	63.83	102.00	172.27	231.12	271.78	329.56	411.95	486.85	518.95	568.17	653.77	832.46	899.87	
TPL 612	612	61.61	76.56	122.40	207.58	283.55	339.19	419.44	516.81	584.22	623.81	682.66	785.38	998.31	1080.70	
TPL 714	714	71.91	89.28	142.80	243.96	321.00	396.97	503.97	617.39	697.64	742.58	818.55	944.81	1202.68	1301.12	
TPL 816	816	82.32	102.01	163.20	279.27	370.22	390.55	576.73	706.20	797.15	849.58	936.25	1074.28	1374.95	1483.02	
TPL 918	918	92.52	116.15	183.60	313.51	411.95	437.63	649.49	793.94	895.59	954.44	1050.74	1213.38	1546.15	1677.76	
TPL 1020	1020	104.03	128.27	204.00	346.68	475.08	567.10	700.85	863.49	976.91	1043.25	1137.41	1309.68	1673.48	1806.16	

DISCHARGE CURVES (TPM AND TPL)



- Fully charged condition, with ambient temperature of 20°C and with allowance for connector loss
- Nominal Capacity C₅ is 5 hours rated to end voltage of 1.00 Volt/cell

