	Product name	MCS (Liquid Cooling) DC Charging Cable	File No	
	Part Number		Version	A 0


MCS (liquid-cooled) DC Charging Connector Technical Specification

Prepared/Date Zhou Hongbo 2024.06.03

Review/Date _____

Approval/Date _____

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Changes and Revisions

<input type="checkbox"/> Change <input type="checkbox"/> Revision	date	Change or revision of major	Modified/revised	Approver
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1 Connector model and description

1.1 Connector Model:

Basic product model	Rated voltage Rated current	Cable specifications	Cable length	Temperature detection device	Actual current range
YGC1000	1000V DC 1000A	4×2.5mm ² +1×6mm ² +2×(2×0.75mm ²) (P2)+(6×0.75mm ²)	0~5.5m	PT1000*6	0~1000A
YGC1500	1000V DC 1500A	4×35mm ² +1×6mm ² +2×(2×0.75mm ²) (P2)+(6×0.75mm ²)	0~5.5m	PT1000*6	0~1500A

1.2 Product Description:

1. This product complies with the requirements of IEC 61851-1 , IEC TS61851-23-3 and IEC TS63379 for connection devices for conductive charging of electric vehicles ;
2. Overall protection level of connector: IP 54 ;
3. The product has a novel appearance design, the shell is one-piece, the product conforms to ergonomics, feels comfortable to hold, and is easy to operate;
4. Adopting integrated design and implanting the concept of Galaxy array to enhance product grade and design sense ;
5. The internal structure of the product is simple in design, which simplifies the molding requirements to the maximum extent and meets the actual production needs;
6. The shell is made of Sabic's new advanced engineering plastic, which can maintain the stability and functionality of the product even in harsh operating environments.

2. Technical parameters


2.1 Electrical performance

- Rated voltage: 1000V DC;
- Rated current: 1000A , 1500A;
- Insulation resistance: ≥500MΩ 1000V DC 1min;
- Withstand voltage: 4000V AC for 1 minute without breakdown or flickering;
- Leakage current: ≤10mA ;

2.2 Mechanical properties

- Mechanical life: ≥10000 times;
- Insertion and separation force: ≤ 100N;
- Socket crimping retention force: 35mm² ≥2200N , 25mm² ≥ 1900N , 6mm² ≥ 450N , 0.75 mm² ≥

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85N ;

2.3 Protection level

- Waterproof level: IPX 4 (after plugging in) ;
- Dustproof level: IP 5 X

2.4 Usage Environment

- Pollution level: Level 2
- Ambient temperature: -30°C~+50°C

2.5 Materials and surface treatment


- Plug material: PA66+GF ;
- Flame retardant grade: UL94-V0 ;
 - Socket material and surface treatment: copper silver-plated + passivation, brass silver-plated + passivation;

2.6 Product Specifications

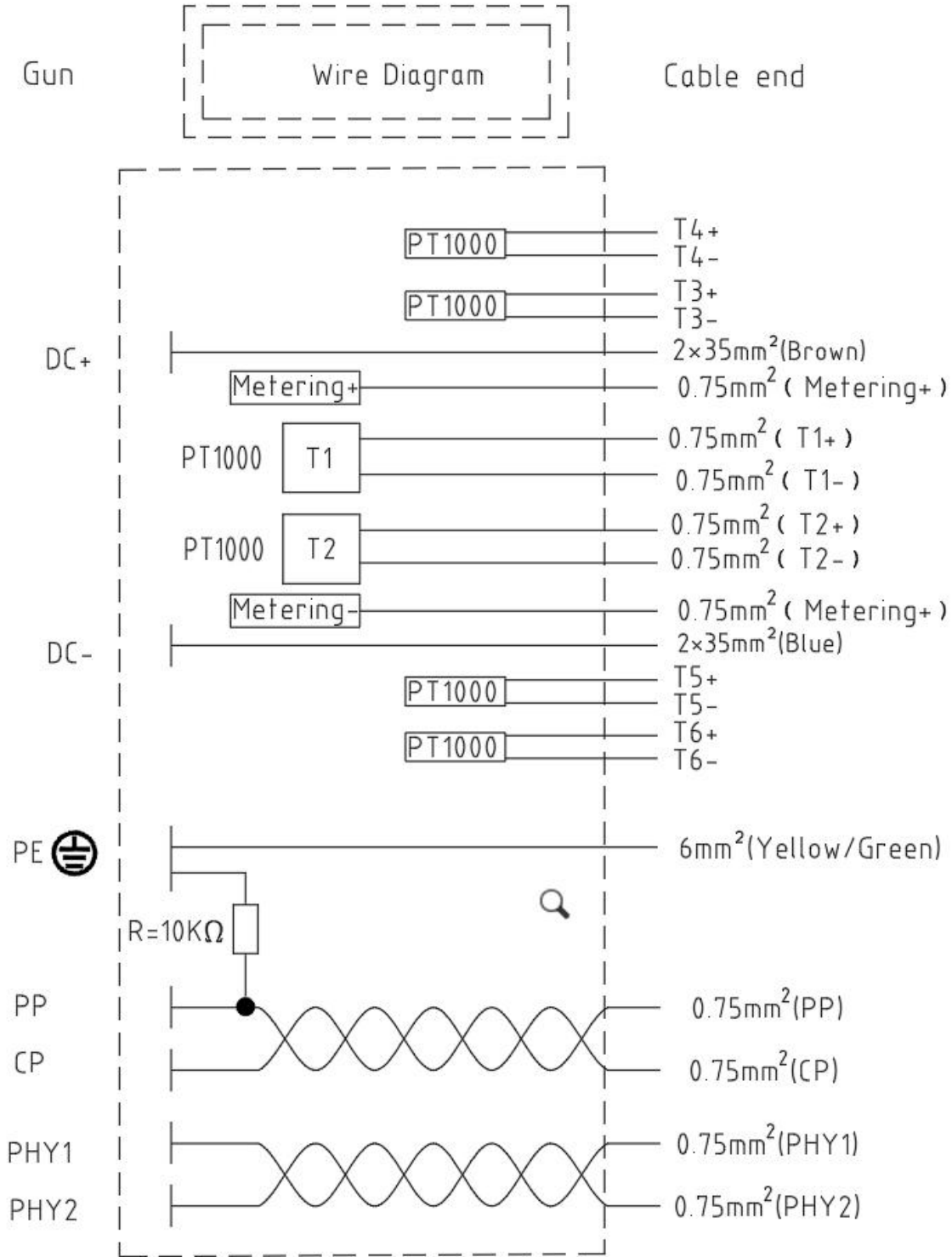
Product name	MCS Super (Liquid Cooling) DC Charging Cable
Model	YG C- *** -EV-S7P- XXXX
	*** indicates the product model, XXXX indicates the current
Rated voltage	1000V DC
Current	DC: 1 000 A, 1500A (rated current)
	Signal: 10 A (max)
Contact	Power: 2 Ground: 1 Signal: 4
Working Environment	-35 ~ +50°C (Do not use in condensation or freezing conditions)
	Use at altitudes below 2000m
Protection level	IP 5 4
Size	Charging connector: 395 (L)* 133 (D)* 121 (W)
	Cable: Length can be customized (customized length cannot exceed 5.5m)

Note: The product complies with RoHS2.0 and REACH requirements


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2.7 Wiring principle:



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2.8 Cable identification definitions and specifications:

Serial number	Function Definition	Core wire color	Terminals	Conductor cross-sectional area	
				1 000 A	1 500 A
1	DC power supply positive pole	/	DC+	2*25 mm ²	2*35 mm ²
2	DC power supply negative pole	/	DC-	2 *25 mm ²	2 *35 mm ²
3	Equipment ground wire	yellow-green	PE	6 mm ²	6 mm ²
4	Charging connection confirmation	White - (PP)	PP (resistor lead)	1mm ²	1mm ²
5	Charging Control Guide	White - (CP)	CP	1mm ²	1mm ²
6	Temperature sensor (DC+)	White + T 1 + / White - T 1 -	T 1+ / T 1-	0.75 mm ²	0.75 mm ²
7	Temperature sensor (DC-)	White + T 2 + / White - T 2 -	T 2+ / T 2-	0.75 mm ²	0.75 mm ²
8	Flow calculation (DC+)	brown	Metering +	0.75 mm ²	0.75 mm ²
9	Flow calculation (DC-)	blue	Metering-	0.75 mm ²	0.75 mm ²
10	Signal interface 1	white- PHY 1	PHY 1	0.75 mm ²	0.75 mm ²
11	Signal interface 2	white- PHY 2	PHY 2	0.75 mm ²	0.75 mm ²

3 Product images:

3.1. Outline view:

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3	Equipment ground wire	yellow-green	PE	SC 6 -8
4	Charging connection confirmation	White - (PP)	PP (resistor lead)	1012
5	Charging Control Guide	White - (CP)	CP	1012
6	Temperature sensor (DC+)	White + T 3 + / White - T 3 - White + T 4 + / White - T 4 -	T 3+ / T 3- T 4+ / T 4-	1012
7	Temperature sensor (DC-)	White + T 5 + / White - T 5 - White + T 6 + / White - T 6 -	T 5+ / T 5- T 6+ / T 6-	1012
8	Flow calculation (DC+)	brown	M+	1012
9	Flow calculation (DC-)	blue	M-	1012
10	Physical interface 1	white- PHY 1	P HY1	1012
11	Physical interface 2	white- PHY 2	P HY2	1012
12	Cooling pipe DC+ / DC-	Beige (DC + / DC-)	Liquid return pipe	φ 6 / φ 8 x4
13	Cooling pipe	Natural color (no printing)	Liquid inlet	φ 8 / φ 10 x 2

Remark:

- ① The inner diameter of the cooling pipe φ 8 / φ 10 is Φ 8 mm, the outer diameter is Φ 10 mm, and the length of the lead-out pipe can be customized, but it is recommended not to exceed 1.5m;
- ② The tail cooling pipe can rotate 360° based on the terminal plane;
- ③ Coolant flow rate ≥ 8 L/min (the flow rate can be controlled by the liquid cooling system);
- ④ The working pressure cannot exceed 7 bar;
- ⑤ The cable length can be customized (cable length 5.5m max).

Note: (1) Coolant matches Shell E4 CCF , Volkswagen TF 8016 , TF 8025 , PetroChina SCC 350EN .


(2) The cooling system uses an 8kW cooling system.

The coolant and cooling system have been matched and tested above. If replacement is required, re-calibration and testing are required to confirm the adaptation effect and related performance (such as compatibility, cooling capacity)

4 Implementation standards:

■ ISO 5474 , IEC 61851-23 , IEC 61851-23-3 , IEC 61851-1 , IEC 62196-1 , IEC 62196-3 , IEC TS62196-3-1 , IEC TS 63379 , ISO 15118-20 , ISO 15118-6 , SAE J3271 , UL 2251 , UL 2231 , UL 2202 .

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appendix

Appendix 1: Reference standards and tests

Table B: Test items and standards

project		judgement standard
1	Exterior	The easily accessible surface of the charging connector should be free of burrs, flash and similar sharp edges; the outer shell of the charging connector should be marked with information such as the manufacturer's name or trademark, product model, rated voltage and rated current
2	Size	The dimensions of the charging connector are based on the MCS standard.
3	Temperature rise	The maximum allowable temperature rise should not exceed 50K
4	Insulation resistance	> 100MΩ (Applied voltage: DC + / DC - : 1500V DC, others : 500 V DC, 1 minute)
5	Pressure resistance	4000V AC leakage current ≤10mA, no breakdown or flashover for 1 minute
6	Charging connector insertion	< 100N
7	Cable retention	The cable must not fall out of the charging connector housing .
8	Drop test	The specimen must not be damaged , and no parts inside the connector housing must be separated or fall off.
9	Service life test	10,000 plug-in and unplug without power supply , After the test, the following should not occur: 1. No deterioration of casing or partitions; 2. No electrical or mechanical connections are loose ; 3. Maintain the continuity of signal transmission between contacts ; 4. There should be no flashover or breakdown during the dielectric strength test (voltage reduction 500V) ;
10	Protection level	IP67 (House), whole connector IP 5 4
11	High temperature resistance test	The sample is not damaged and can be used normally (Check the sample after returning to room temperature.)
12	Low temperature resistance test	The sample is not damaged and can be used normally (Check the sample after returning to room temperature.)


Appendix 2: Test methods

Test conditions

-Ambient temperature **20±5°C**, relative humidity 65±20%


Table C test methods

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project		experiment method
1	Exterior	Visual and manual inspection of surface condition.
2	Size	Interoperability test
3	Temperature rise	Supply current according to product specifications and measure the temperature at the following points. Test point: - DC terminal contact surface - Shell surface - Cable surface
4	Insulation resistance	Use an insulation resistance tester to add 500V DC voltage to measure the insulation resistance between adjacent terminals and between each terminal and the shell.
5	Pressure resistance	Apply 4000V AC voltage between adjacent power terminals and between the power terminals and the housing for 1 minute.
6	Charging connector insertion and extraction force	With the vehicle charging station fixed , measure the insertion /extraction force of the charging connector tip at a specified speed (excluding the insertion / extraction force on the rubber seal of the vehicle charging station).
7	Cable retention	With the charging connector fixed , apply a pulling force of 750N from the charging connector to the cable output direction for 1 minute ; then apply a torque of 11Nm for 1 minute , and the cable displacement does not exceed 5mm.
8	Drop test	Lift the test sample to a predetermined height, then let it fall freely in a predetermined state and collide with the impact table.
9	Service life test	10,000 plugging and unplugging without power on .
10	Protection level	The top is 0.15-1 meter away from the water surface for 30 minutes without any impact on performance or water leakage .
1 1	High temperature resistance test	Place the charging connector in a constant temperature box (105°C×1000 hours).
1 2	Low temperature resistance test	Place the charging connector in a constant temperature box (-35°C×120 hours).

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Appendix 3 : Temperature Monitoring

1. DC+ and DC- are monitored by PT1000 temperature resistance sensors and connected to the power supply equipment through cable wires: T 1+ , T 1- , T 2+ , T 2- , T 3 + , T 3 - , T 4 + , T 4 - , T 5 + , T 5 - , T 6 + , T 6 - .

2. DC+ and DC- are monitored by PT1000 temperature resistance sensors. It is recommended that the threshold values of pile end temperature T 1 , T 2 , T 3 , T 4 , T 5 , and T 6 be set to $\leq 110^{\circ}\text{C}$;

3. The relationship between temperature and impedance is shown in the figure below;


Tolerance class: 2B

PT 1000 TC 3850ppm

Permissible deviation : $Dt = \pm 2(0.3^{\circ}\text{C} + 0.005 \cdot | t |)$


Temperature	Resistance Rt	Sensibility	Permissible deviation	
$^{\circ}\text{C}$	Q	Q°C	$^{\circ}\text{C}$	Q
-40	846.580	3.863	1.000	3.863
-39	850.440	3.861	0.990	3.823
-38	854.300	3.860	0.980	3.783
-37	858.160	3.858	0.970	3.743
-36	862.010	3.857	0.960	3.703
-35	865.870	3.856	0.950	3.663
-34	869.730	3.854	0.940	3.623
-33	873.580	3.853	0.930	3.583
-32	877.430	3.851	0.920	3.543
-31	881.280	3.850	0.910	3.503
-30	885.130	3.849	0.900	3.464
-29	888.980	3.847	0.890	3.424
-28	892.830	3.846	0.880	3.384
-27	896.670	3.844	0.870	3.345
-26	900.510	3.843	0.860	3.305
-25	904.360	3.842	0.850	3.266
-24	908.200	3.840	0.840	3.226
-23	912.040	3.839	0.830	3.186
-22	915.880	3.838	0.820	3.147
-21	919.710	3.836	0.810	3.108
-20	923.550	3.835	0.800	3.068

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-19	927.380	3.834	0.790	3.029
-18	931.220	3.833	0.780	2.989
-17	935.050	3.831	0.770	2.950
-16	938.880	3.830	0.760	2.911
-15	942.710	3.829	0.750	2.872
-14	946.540	3.827	0.740	2.832
-13	950.360	3.826	0.730	2.793
-12	954.190	3.825	0.720	2.754
-11	958.010	3.824	0.710	2.715
-10	961.840	3.822	0.700	2.676
-9	965.660	3.821	0.690	2.637
-8	969.480	3.820	0.680	2.598
-7	973.300	3.819	0.670	2.559
-6	977.120	3.817	0.660	2.520
-5	980.930	3.816	0.650	2.481
-4	984.750	3.815	0.640	2.442
-3	988.560	3.814	0.630	2.403
-2	992.380	3.813	0.620	2.364
-1	996.190	3.811	0.610	2.325
0	1000.000	3.810	0.600	2.286
1	1003.810	3.809	0.610	2.323
2	1007.620	3.808	0.620	2.361
3	1011.430	3.807	0.630	2.398
4	1015.230	3.805	0.640	2.435
5	1019.040	3.804	0.650	2.473
6	1022.840	3.803	0.660	2.510
7	1026.640	3.802	0.670	2.547
8	1030.440	3.801	0.680	2.584
9	1034.240	3.799	0.690	2.622
10	1038.040	3.798	0.700	2.659
11	1041.840	3.797	0.710	2.696
12	1045.640	3.796	0.720	2.733
13	1049.430	3.795	0.730	2.770
14	1053.220	3.793	0.740	2.807
15	1057.020	3.792	0.750	2.844

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16	1060.810	3.791	0.760	2.881
17	1064.600	3.790	0.770	2.918
18	1068.390	3.789	0.780	2.955
19	1072.180	3.787	0.790	2.992
20	1075.960	3.786	0.800	3.029
21	1079.750	3.785	0.810	3.066
22	1083.530	3.784	0.820	3.103
23	1087.320	3.783	0.830	3.139
24	1091.100	3.781	0.840	3.176
25	1094.880	3.780	0.850	3.213
26	1098.660	3.779	0.860	3.250
27	1102.440	3.778	0.870	3.287
28	1106.210	3.776	0.880	3.323
29	1109.990	3.775	0.890	3.360
30	1113.760	3.774	0.900	3.397
31	1117.540	3.773	0.910	3.433
32	1121.310	3.772	0.920	3.470
33	1125.080	3.770	0.930	3.507
34	1128.850	3.769	0.940	3.543
35	1132.620	3.768	0.950	3.580
36	1136.390	3.767	0.960	3.616
37	1140.150	3.766	0.970	3.653
38	1143.920	3.764	0.980	3.689
39	1147.680	3.763	0.990	3.726
40	1151.440	3.762	1.000	3.762
41	1155.210	3.761	1.010	3.798
42	1158.970	3.760	1.020	3.835
43	1162.730	3.758	1.030	3.871
44	1166.480	3.757	1.040	3.908
45	1170.240	3.756	1.050	3.944
46	1174.000	3.755	1.060	3.980
47	1177.750	3.754	1.070	4.016
48	1181.500	3.752	1.080	4.053
49	1185.250	3.751	1.090	4.089

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50	1189.010	3.750	1.100	4.125
51	1192.750	3.749	1.110	4.161
52	1196.500	3.748	1.120	4.197
53	1200.250	3.746	1.130	4.233
54	1204.000	3.745	1.140	4.270
55	1207.740	3.744	1.150	4.306
56	1211.480	3.743	1.160	4.342
57	1215.230	3.742	1.170	4.378
58	1218.970	3.740	1.180	4.414
59	1222.710	3.739	1.190	4.450
60	1226.450	3.738	1.200	4.486
61	1230.180	3.737	1.210	4.521
62	1233.920	3.736	1.220	4.557
63	1237.650	3.734	1.230	4.593
64	1241.390	3.733	1.240	4.629
65	1245.120	3.732	1.250	4.665
66	1248.850	3.731	1.260	4.701
67	1252.580	3.730	1.270	4.737
68	1256.310	3.728	1.280	4.772
69	1260.040	3.727	1.290	4.808
70	1263.760	3.726	1.300	4.844
71	1267.490	3.725	1.310	4.879
72	1271.210	3.724	1.320	4.915
73	1274.940	3.722	1.330	4.951
74	1278.660	3.721	1.340	4.986
75	1282.380	3.720	1.350	5.022
76	1286.100	3.719	1.360	5.057
77	1289.820	3.718	1.370	5.093
78	1293.530	3.716	1.380	5.129
79	1297.250	3.715	1.390	5.164
80	1300.960	3.714	1.400	5.199
81	1304.680	3.713	1.410	5.235
82	1308.390	3.711	1.420	5.270

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83	1312.100	3.710	1.430	5.306
84	1315.810	3.709	1.440	5.341
85	1319.520	3.708	1.450	5.376
86	1323.230	3.707	1.460	5.412
87	1326.930	3.705	1.470	5.447
88	1330.640	3.704	1.480	5.482
89	1334.340	3.703	1.490	5.518
90	1338.040	3.702	1.500	5.553
91	1341.740	3.701	1.510	5.588
92	1345.440	3.699	1.520	5.623
93	1349.140	3.698	1.530	5.658
94	1352.840	3.697	1.540	5.693
95	1356.540	3.696	1.550	5.729
96	1360.230	3.695	1.560	5.764
97	1363.930	3.693	1.570	5.799
98	1367.620	3.692	1.580	5.834
99	1371.310	3.691	1.590	5.869
100	1375.000	3.690	1.600	5.904
101	1378.690	3.689	1.610	5.939
102	1382.380	3.687	1.620	5.974
103	1386.070	3.686	1.630	6.009
104	1389.750	3.685	1.640	6.043
105	1393.440	3.684	1.650	6.078
106	1397.120	3.683	1.660	6.113
107	1400.800	3.681	1.670	6.148
108	1404.480	3.680	1.680	6.183
109	1408.160	3.679	1.690	6.217
110	1411.840	3.678	1.700	6.252
111	1415.520	3.677	1.710	6.287
112	1419.190	3.675	1.720	6.322
113	1422.870	3.674	1.730	6.356
114	1426.540	3.673	1.740	6.391
115	1430.210	3.672	1.750	6.426

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116	1433.880	3.671	1.760	6.460
117	1437.550	3.669	1.770	6.495
118	1441.220	3.668	1.780	6.529
119	1444.890	3.667	1.790	6.564
120	1448.560	3.666	1.800	6.598
121	1452.220	3.665	1.810	6.633
122	1455.890	3.663	1.820	6.667
123	1459.550	3.662	1.830	6.702
124	1463.210	3.661	1.840	6.736
125	1466.870	3.660	1.850	6.770
126	1470.530	3.659	1.860	6.805
127	1474.190	3.657	1.870	6.839
128	1477.840	3.656	1.880	6.873
129	1481.500	3.655	1.890	6.908
130	1485.150	3.654	1.900	6.942
131	1488.810	3.653	1.910	6.976
132	1492.460	3.651	1.920	7.010
133	1496.110	3.650	1.930	7.045
134	1499.760	3.649	1.940	7.079
135	1503.410	3.648	1.950	7.113
136	1507.050	3.646	1.960	7.147
137	1510.700	3.645	1.970	7.181
138	1514.350	3.644	1.980	7.215
139	1517.990	3.643	1.990	7.249
140	1521.630	3.642	2.000	7.283
141	1525.270	3.640	2.010	7.317
142	1528.910	3.639	2.020	7.351
143	1532.550	3.638	2.030	7.385
144	1536.190	3.637	2.040	7.419
145	1539.820	3.636	2.050	7.453
146	1543.460	3.634	2.060	7.487
147	1547.090	3.633	2.070	7.521
148	1550.730	3.632	2.080	7.555

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	Product name	MCS (Liquid Cooling) DC Charging Cable	File No	
	Part Number		Version	A 0

149	1554.360	3.631	2.090	7.588
150	1557.990	3.630	2.100	7.622

Form Number	Department	Page number
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