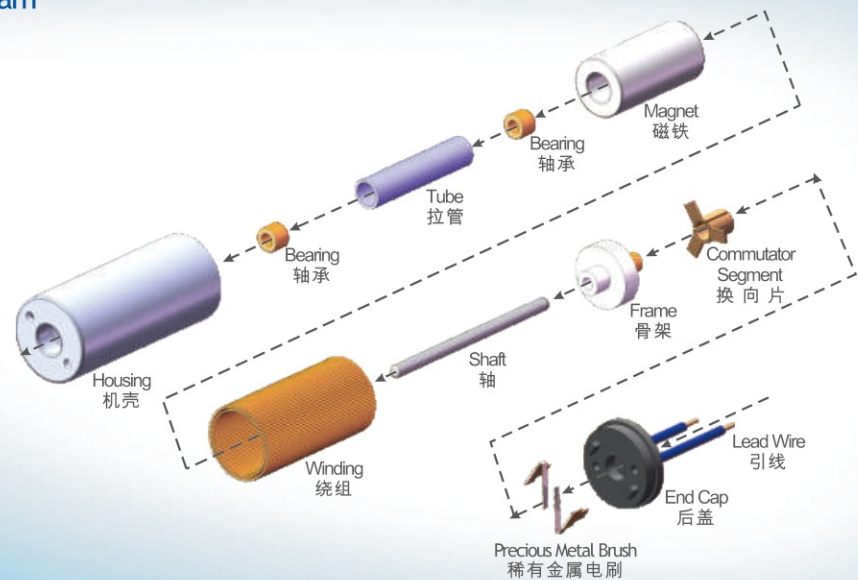


永磁直流空心杯电机产品介绍

Introduction of Permanent Magnet DC Coreless Motor

Structural Diagram
结构示意图



电机特点 Motor Characteristics

- | | | | |
|-----------|----------------|----------------------------------|--|
| ◆ 杯形绕组 | ◆ 良好的伺服特性 | ◆ Cylindrical winding | ◆ Good servo feature |
| ◆ 无齿槽效应 | ◆ 低电感 | ◆ No magnet cogging | ◆ Low inductance |
| ◆ 转动惯量小 | ◆ 低电磁干扰 | ◆ Low mass inertia | ◆ Low electromagnetic interference |
| ◆ 响应速度快 | ◆ 无铁损、高效率、高寿命 | ◆ Rapid reaction | ◆ No iron losses, high efficiency, long motor life |
| ◆ 低启动电压 | ◆ 可短时过载 | ◆ Low starting voltage | ◆ Able to bear high overload in short period of time |
| ◆ 平滑的调速性能 | ◆ 体积小、结构紧凑、重量轻 | ◆ Speed can be adjusted smoothly | ◆ Small dimension, compact and Light in weight |

电枢结构 Structure of the Armature

永磁直流空心杯电机突破了传统的转子结构，采用无铁芯电枢，也叫空心杯电枢。

空心杯电枢结构彻底消除了因铁芯产生涡流而造成的铁耗，同时其重量和转动惯量大幅降低，从而减少了自身的机械损耗，使电机的运转特性得到了极大改善，不但具有突出的节能特点，更为重要的是具备了普通电动机所无法达到的伺服特性。

Permanent magnet DC coreless motor is a break-through of traditional structure of rotor. It adopts ironless armature, also known as coreless armature.

Structure of the coreless armature completely eliminates the iron losses caused by the vortex of iron core. Significantly reduced weight and mass inertia help in lowering the mechanical wear and greatly improve the characteristics of motor operation. Not only having an outstanding energy-saving feature, it is also equipped with servo characteristics which can not be attained by ordinary electric motor.

伺服特性 Servo Characteristics

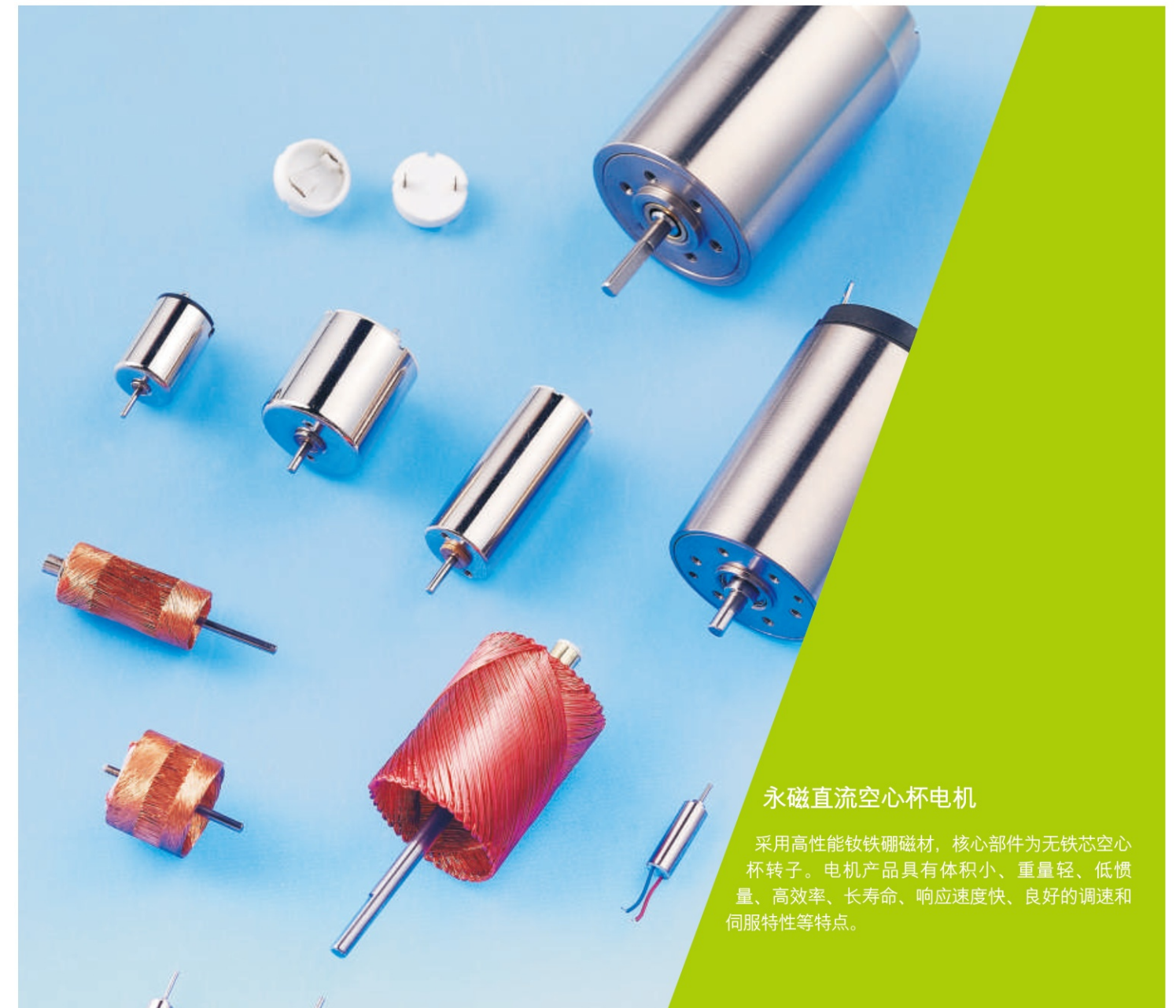
电机起、制动迅速，响应极快。在高速运转状态下，可以方便地对转速进行灵敏的调节。

Fast start and brake, rapid reaction. In high speed operation, motor speed can be regulated precisely and rapidly.

叠绕组 Lap Winding



斜绕组 Skew Winding



永磁直流空心杯电机

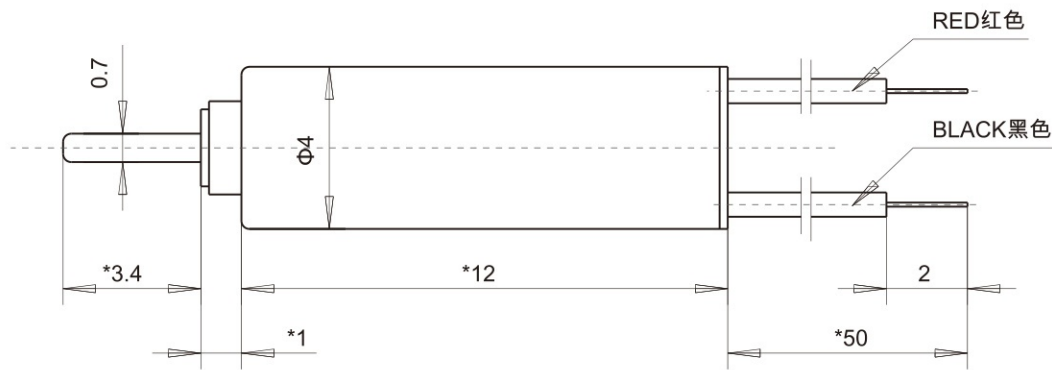
采用高性能钕铁硼磁材，核心部件为无铁芯空心杯转子。电机产品具有体积小、重量轻、低惯量、高效率、长寿命、响应速度快、良好的调速和伺服特性等特点。

Permanent Magnet DC Coreless Motor

Adopt high strength NdFeB magnet and cylindrical winding with ironless rotor to form a core part of the motor. It has the characteristics of small dimension, compact, light weight, low mass inertia, high efficiency, long life, rapid reaction, wide range of operating speed and good servo feature.

TSL-CL0412 Series $\Phi 4 \times L12$

稀有贵金属电刷 Precious Metal Brushes 0.1W



电机参数 Motor Parameter			电机型号 Motor Model								
额定电压下的数值 Values at nominal voltage			TSL-CL4A1-060101	TSL-CL4A1-065091	TSL-CL4A1-080071	TSL-CL4A1-107031	TSL-CL4A3-065131	TSL-CL4A3-065131			
空载点 Free Load	1	额定电压 Rated voltage	V	2.5	3	3	3	1.3	3		
	2	空载转速 No load speed	rpm	56300	59100	46800	34700	22800	52500		
最大效率点 At Max. Efficiency	3	空载电流 No load current	mA	55	45	37	18	20	41		
	4	转速 Speed	rpm	40100	43400	33000	23500	16700	39000		
	5	电流 Current	mA	136	124	88	37	55	120		
最大输出功率点 At Max. Output	6	转矩 Torque	g.cm	0.27	0.32	0.24	0.12	0.14	0.36		
	7	最大功率 Max. output	W	0.13	0.18	0.1	0.03	0.03	0.19		
	8	转速 Speed	rpm	28200	29500	23400	17300	11400	26200		
堵转点 At Stall	9	电流 Current	mA	196	195	124	48	85	194		
	10	转矩 Torque	g.cm	0.46	0.6	0.41	0.18	0.26	0.69		
堵转点 At Stall	11	堵转电流 Stall current	A	0.34	0.35	0.21	0.08	0.15	0.35		
	12	堵转转矩 Stall torque	g.cm	0.93	1.2	0.83	0.37	0.52	1.39		
电机常数 Motor Constants			13	端电阻 Terminal resistance	Ω	7.4	8.7	14.2	38.2	8.7	8.7
			14	转矩常数 Torque constant	g.cm/A	3.3	4	4.7	6	4.5	4.5
			15	转速常数 Speed constant	rpm/V	26900	22600	18900	14900	19900	19900
			16	速度/转矩常数 Speed/Torque constant	rpm/g.cm	60760	49370	56590	94920	37840	37840

电机特性 Motor characteristic

热参数 Thermal parameters

17	环境温度范围 Ambient temperature	-20~+65	°C
18	绕组最高允许温度 Max. permissible winding temperature	85	°C

机械参数 Mechanical parameters

19	最高空载允许转速 Max. permissible No-load speed	60000	rpm
20	最大轴向载荷(动态) Max. axial load(dynamic)	0.1	N

其他参数 Other parameters

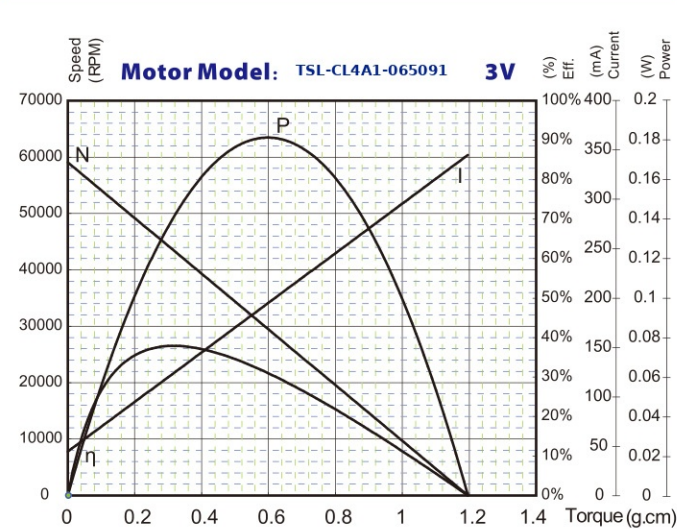
21	电机磁极对数 Number of pole pairs	1	
22	换向器片数 Number of commutator segments	3	
23	电机重量 Weight	0.8	g

备注 Remarks

- 外形图中带“*”尺寸可根据客户需求调整。
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1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

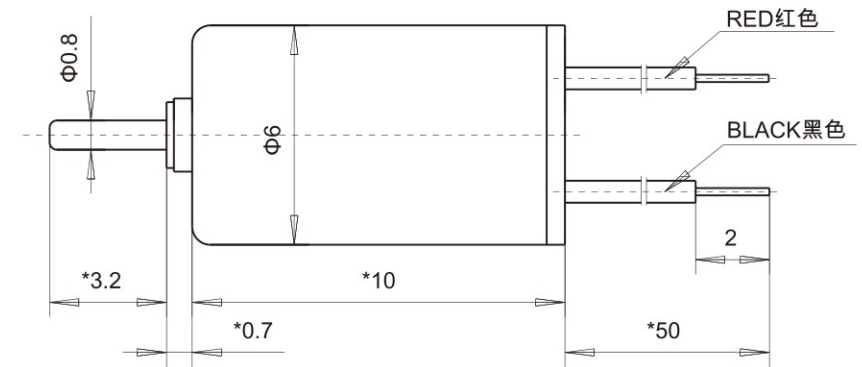
典型性能 Typical performance



备注: 电机测试环境温度: 常温 25-30 °C.
NOTE: Ambient temperature 25-30 °C

TSL-CL0610 Series $\Phi 6 \times L10$

稀有贵金属电刷 Precious Metal Brushes 0.2W



电机参数 Motor Parameter			电机型号 Motor Model											
额定电压下的数值 Values at nominal voltage			TSL-CL6D2-045112	TSL-CL6D2-045122	TSL-CL6D2-070141	TSL-CL6D2-084121	TSL-CL6D2-112111	TSL-CL6D2-145081	TSL-CL6D2-165081	TSL-CL6D101-165081	TSL-CL6D101-165081			
空载点 Free Load	1	额定电压 Rated voltage	V	1.3	1.3	3	3	3	3	3	4.5			
	2	空载转速 No load speed	rpm	35500	34400	52200	41300	37100	25300	23300	36600			
最大效率点 At Max. Efficiency	3	空载电流 No load current	mA	91	67	75	42	33	19	10	20			
	4	最大效率 Max. efficiency	%	29%	38%	41%	44%	39%	38%	48%	44%			
	5	转速 Speed	rpm	25200	25900	39100	31400	27500	18500	18100	27600			
最大输出功率点 At Max. Output	6	电流 Current	mA	222	205	223	134	92	53	36	62			
	7	转矩 Torque	g.cm	0.32	0.37	0.68	0.55	0.38	0.31	0.28	0.42			
	8	最大功率 Max. output	W	0.1	0.13	0.37	0.24	0.14	0.08	0.07	0.16			
堵转点 At Stall	9	转速 Speed	rpm	17700	17200	26100	20600	18600	12700	11600	18300			
	10	电流 Current	mA	318	345	371	236	147	82	68	105			
	11	转矩 Torque	g.cm	0.55	0.76	1.36	1.15	0.73	0.58	0.62	0.87			
堵转点 At Stall	12	堵转电流 Stall current	A	0.54	0.62	0.67	0.43	0.26	0.14	0.13	0.19			
	13	堵转转矩 Stall torque	g.cm	1.1	1.51	2.72	2.3	1.47	1.16	1.25	1.73			
电机常数 Motor Constants			14	端电阻 Terminal resistance	Ω	2.4	2.1	4.5	7	11.4	20.8	23.7	23.4	23.7
			15	转矩常数 Torque constant	g.cm/A	2.4	2.7	4.6	5.9	6.4	9.2	10.7	10	10.2
			16	转速常数 Speed constant	rpm/V	32800	29700	19600	15200	14100	9800	8400	9000	9100
			17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	32190	22760	19180	17940	25300	21930	18680	21140	21150

电机特性 Motor characteristic

热参数 Thermal parameters

18	环境温度范围 Ambient temperature	-20~+65	°C
19	绕组最高允许温度 Max. permissible winding temperature	85	°C

机械参数 Mechanical parameters

20	最高空载允许转速 Max. permissible No-load speed	55000	rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.15	N

其他参数 Other parameters

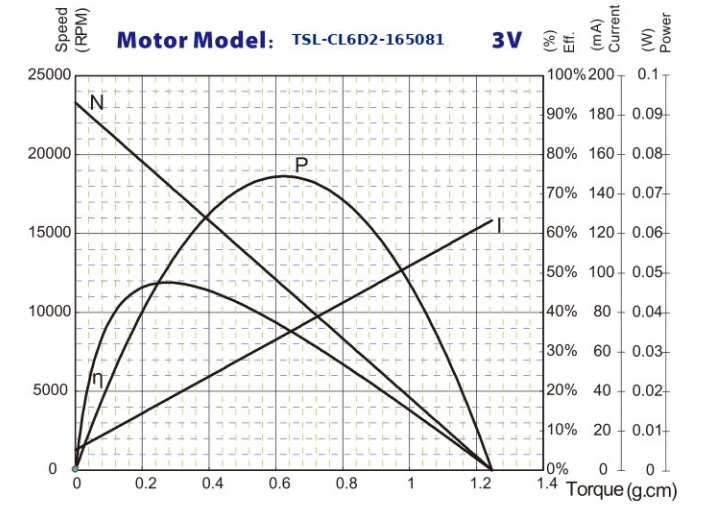
22	电机磁极对数 Number of pole pairs	1	
23	换向器片数 Number of commutator segments	3	
24	电机重量 Weight	1.2	g

备注 Remarks

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1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

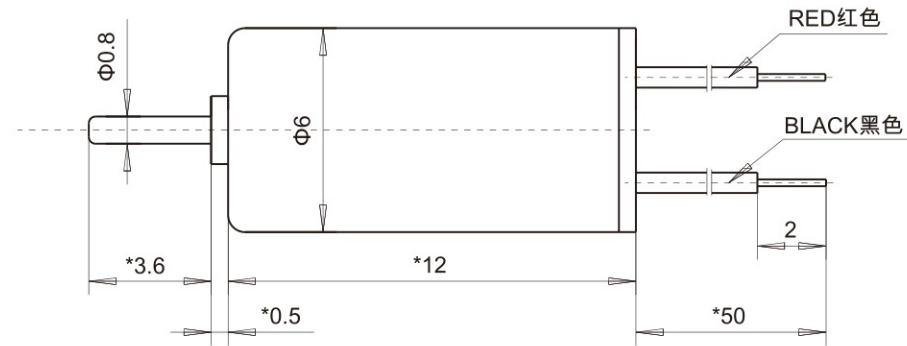
典型性能 Typical performance



备注: 电机测试环境温度: 常温 25-30 °C.
NOTE: Ambient temperature 25-30 °C

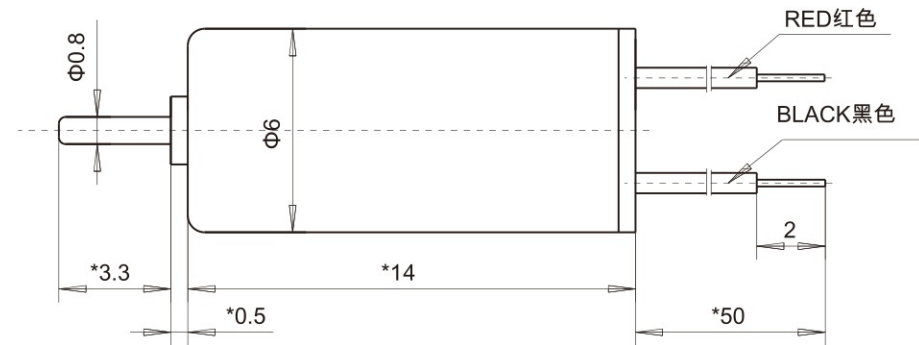
TSL-CL0612 Series Φ6×L12

稀有贵金属电刷Precious Metal Brushes 0.2W



TSL-CL0614 Series Φ6×L14

稀有贵金属电刷Precious Metal Brushes 0.2W



电机参数 Motor Parameter			电机型号 Motor Model										
额定电压下的数值 Values at nominal voltage			TSL-CL6C1-050112	TSL-CL6C1-050122	TSL-CL6C1-065141	TSL-CL6C1-080121	TSL-CL6C1-100091	TSL-CL6C1-165081	TSL-CL6C1-210051	TSL-CL6C1-210051			
空载点 Free Load	1	额定电压 Rated voltage	V	1.2	1.5	3.7	3.7	3.7	3.7	4.5			
	2	空载转速 No load speed	rpm	22300	28900	48100	41000	33000	20000	19500			
	3	空载电流 No load current	mA	35	47	45	39	16	12	12			
最大效率点 At Max. Efficiency	4	最大效率 Max. efficiency	%	38%	45%	55%	49%	55%	42%	43%			
	5	转速 Speed	rpm	16900	22600	38700	32000	26600	15000	12100			
	6	电流 Current	mA	109	170	187	140	66	35	21			
	7	转矩 Torque	g.cm	0.29	0.49	0.94	0.77	0.49	0.36	0.26			
最大输出功率点 At Max. Output	8	最大功率 Max. output	W	0.07	0.17	0.6	0.37	0.21	0.07	0.06			
	9	转速 Speed	rpm	11100	14500	24000	20500	16500	10000	9800			
	10	电流 Current	mA	189	328	408	270	145	59	35			
堵转点 At Stall	11	堵转转矩 Stall torque	g.cm	0.6	1.12	2.42	1.76	1.25	0.72	0.54			
	12	堵转电流 Stall current	A	0.34	0.61	0.77	0.5	0.27	0.11	0.06			
堵转转矩 At Stall	13	堵转转矩 Stall torque	g.cm	1.19	2.25	4.83	3.53	2.5	1.43	1.18			
	13	堵转转矩 Stall torque	g.cm	1.19	2.25	4.83	3.53	2.5	1.43	1.18			
电机常数 Motor Constants			14	端电阻 Terminal resistance	Ω	3.5	2.5	4.8	7.4	13.5	34.7	58.2	58.2
	15	转矩常数 Torque constant	g.cm/A	3.8	4	6.7	7.6	9.7	15.1	18.9	18		
	16	转速常数 Speed constant	rpm/V	20600	20900	13800	12000	9500	6100	4800	5100		
	17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	18720	12870	9940	11630	13190	13940	14890	16590		

电机参数 Motor Parameter			电机型号 Motor Model						
额定电压下的数值 Values at nominal voltage			TSL-CL6B1-050122	TSL-CL6B1-090111	TSL-CL6B1-140081	TSL-CL6B1-120091			
空载点 Free Load	1	额定电压 Rated voltage	V	1.5	3.7	4.5			
	2	空载转速 No load speed	rpm	23700	35300	21100			
	3	空载电流 No load current	mA	45	33	17			
最大效率点 At Max. Efficiency	4	最大效率 Max. efficiency	%	44%	45%	41%			
	5	转速 Speed	rpm	18500	26800	15700			
	6	电流 Current	mA	158	106	50			
	7	转矩 Torque	g.cm	0.55	0.63	0.47			
最大输出功率点 At Max. Output	8	最大功率 Max. output	W	0.15	0.24	0.1			
	9	转速 Speed	rpm	11800	17600	10500			
	10	电流 Current	mA	301	186	82			
堵转点 At Stall	11	堵转转矩 Stall torque	g.cm	1.25	1.32	0.93			
	12	堵转电流 Stall current	A	0.56	0.34	0.15			
堵转转矩 At Stall	13	堵转转矩 Stall torque	g.cm	2.49	2.65	1.85			
	13	堵转转矩 Stall torque	g.cm	2.49	2.65	1.85			
电机常数 Motor Constants			14	端电阻 Terminal resistance	Ω	2.7	10.9	25.1	17.8
	15	转矩常数 Torque constant	g.cm/A	4.9	8.7	14.2	12.3		
	16	转速常数 Speed constant	rpm/V	17200	10600	6400	7500		
	17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	9500	13310	11360	10830		

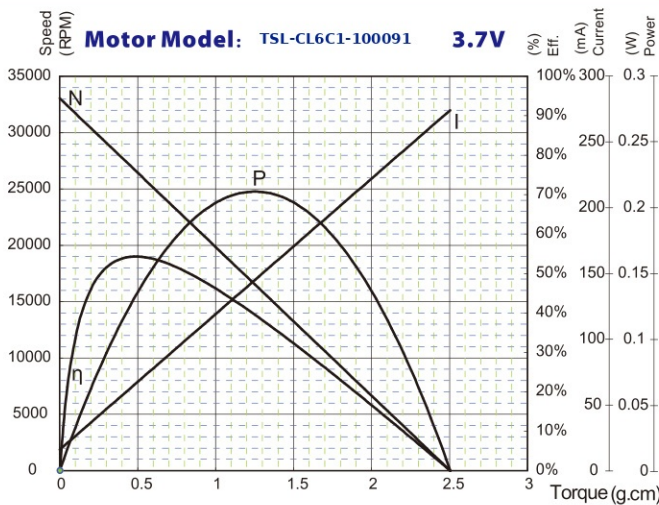
电机特性 Motor characteristic

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 °C
19	绕组最高允许温度 Max. permissible winding temperature	85 °C
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	50000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.15 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	3-5
24	电机重量 Weight	1.4 g

- 备注 Remarks**
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 1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

典型性能 Typical performance



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 NOTE: Ambient temperature 25-30℃

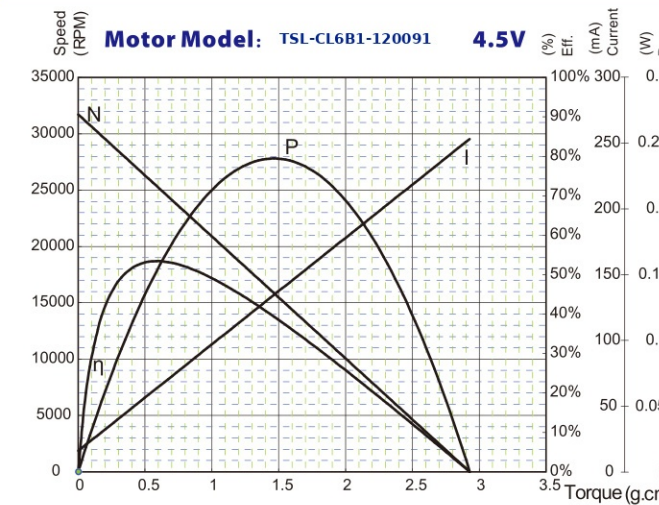
电机特性 Motor characteristic

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 °C
19	绕组最高允许温度 Max. permissible winding temperature	85 °C
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	40000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.15 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	3
24	电机重量 Weight	1.5 g

- 备注 Remarks**
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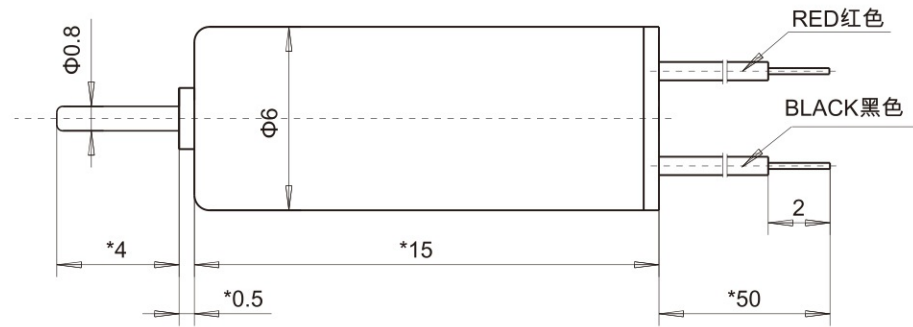
典型性能 Typical performance



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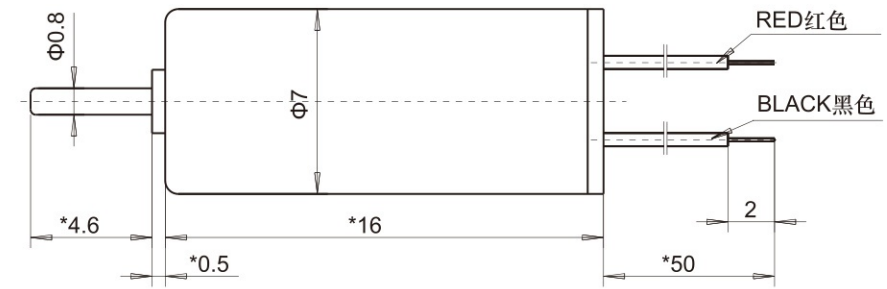
TSL-CL0615 Series $\Phi 6 \times L15$

稀有贵金属电刷 Precious Metal Brushes 0.3W



TSL-CL0716 Series $\Phi 7 \times L16$

稀有贵金属电刷 Precious Metal Brushes 0.5W



电机参数 Motor Parameter				电机型号 Motor Model				
额定电压下的数值 Values at nominal voltage				TSL-CL6A1-035142	TSL-CL6A1-036121	TSL-CL6A1-050141	TSL-CL6A1-075121	TSL-CL6A1-075121
空载点 Free Load	1	额定电压 Rated voltage	V	1.5	3.7	3.7	3.7	4.5
	2	空载转速 No load speed	rpm	28100	37200	45700	32300	39300
最大效率点 At Max. Efficiency	3	空载电流 No load current	mA	51	25	37	21	30
	4	最大效率 Max. efficiency	%	48%	56%	57%	56%	53.70%
最大输出功率点 At Max. Output	5	转速 Speed	rpm	22400	30200	37400	26300	31500
	6	电流 Current	mA	198	107	167	92	120
	7	转矩 Torque	g.cm	0.62	0.71	0.92	0.71	0.9
堵转点 At Stall	8	最大功率 Max. output	W	0.22	0.36	0.59	0.31	0.46
	9	转速 Speed	rpm	14000	18600	22900	16200	19700
电机常数 Motor Constants	10	电流 Current	mA	414	244	392	210	257
	11	转矩 Torque	g.cm	1.52	1.9	2.5	1.88	2.26
	12	堵转电流 Stall current	A	0.78	0.46	0.75	0.4	0.48
	13	堵转转矩 Stall torque	g.cm	3.04	3.79	5.01	3.76	4.53
	14	端电阻 Terminal resistance	Ω	1.9	8	5	9.3	9.3
	15	转矩常数 Torque constant	g.cm/A	4.2	8.6	7.1	10	10
	16	转速常数 Speed constant	rpm/V	20000	10600	13000	9200	9200
	17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	9240	9820	9130	8590	8590

电机参数 Motor Parameter				电机型号 Motor Model								
额定电压下的数值 Values at nominal voltage				TSL-CL7A3-018152	TSL-CL7A3-018162	TSL-CL7A3-020152	TSL-CL7A3-022142	TSL-CL7A3-022152	TSL-CL7A3-022162	TSL-CL7A3-022142	TSL-CL7A3-022142	TSL-CL7A5-017211
空载点 Free Load	1	额定电压 Rated voltage	V	3.7	3.7	3.7	3.7	3.7	3.7	4.5	3.7	
	2	空载转速 No load speed	rpm	48000	47100	43300	39600	40100	50800	48200	50000	
最大效率点 At Max. Efficiency	3	空载电流 No load current	mA	110	93	95	58	88	88	75	77	
	4	最大效率 Max. efficiency	%	57%	61%	58%	62%	59%	63%	61%	67%	
最大输出功率点 At Max. Output	5	转速 Speed	rpm	39200	39300	35500	33200	33100	42700	40200	43200	
	6	电流 Current	mA	491	469	434	303	415	467	375	479	
	7	转矩 Torque	g.cm	2.56	2.61	2.54	2.02	2.65	2.45	2.5	2.67	
堵转点 At Stall	8	最大功率 Max. output	W	1.72	1.91	1.57	1.28	1.56	2.01	1.85	2.49	
	9	转速 Speed	rpm	24000	23600	21600	19800	20100	25400	24100	25000	
电机常数 Motor Constants	10	电流 Current	mA	1147	1230	1040	817	1023	1280	975	1538	
	11	转矩 Torque	g.cm	6.98	7.89	7.07	6.27	7.58	7.7	7.5	9.7	
	12	堵转电流 Stall current	A	2.18	2.37	1.99	1.57	1.96	2.47	1.88	3	
	13	堵转转矩 Stall torque	g.cm	13.96	15.77	14.14	12.55	15.16	15.39	14.99	19.4	
	14	端电阻 Terminal resistance	Ω	1.7	1.6	1.9	2.4	1.9	1.5	2.4	1.2	
	15	转矩常数 Torque constant	g.cm/A	6.7	6.9	7.5	8.3	8.1	6.5	8.3	6.6	
	16	转速常数 Speed constant	rpm/V	13700	13300	12300	11100	11400	14200	11100	13900	
	17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	3440	2990	3060	3160	2650	3300	3160	2580	

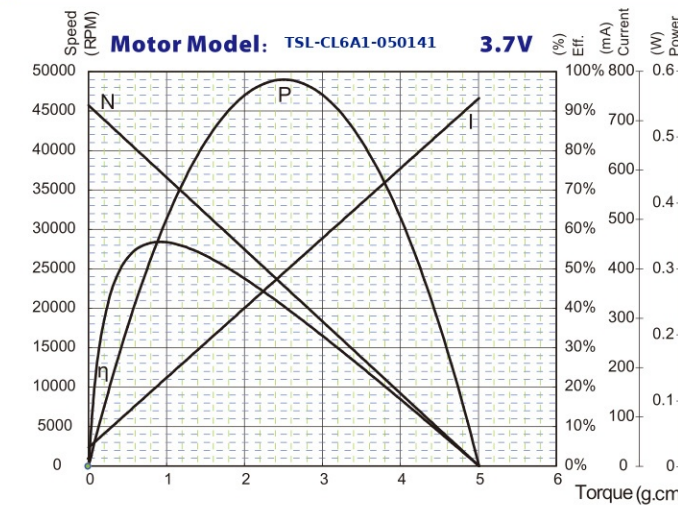
电机特性 Motor characteristic

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 °C
19	绕组最高允许温度 Max. permissible winding temperature	85 °C
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	50000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.15 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	3-5
24	电机重量 Weight	1.6 g

- 备注 Remarks**
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 - 电机可配置铁、铜、钨等材质及各种形状尺寸的偏心锤，组成振动电机。
- 1) Dimension with "*" in the drawing can be adjusted according to customer's requirement.
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 3) Motor can be mounted with various shape and sizes of eccentric weight which is made of iron, brass or ferro-alloy to become vibration motor.

1g=0.035oz 1inch=25.4mm 1g.cm=0.098mN.m
 1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

典型性能 Typical performance



备注: 电机测试环境温度: 常温25-30°C。
 NOTE: Ambient temperature 25-30°C

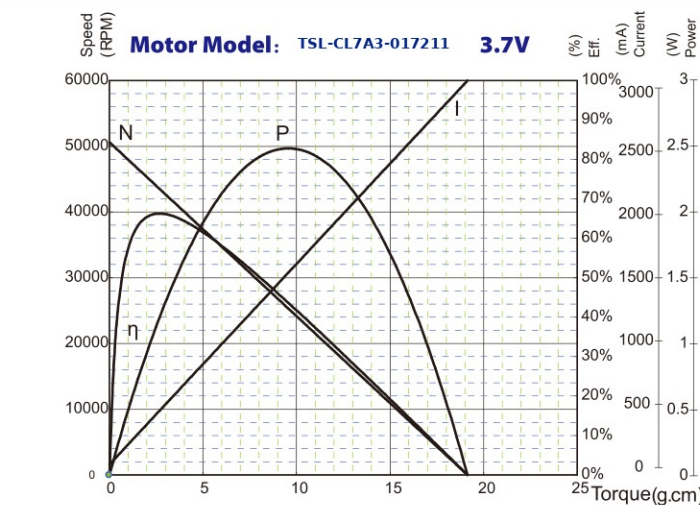
电机特性 Motor characteristic

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 °C
19	绕组最高允许温度 Max. permissible winding temperature	85 °C
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	51000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.13 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	3-5
24	电机重量 Weight	2.5 g

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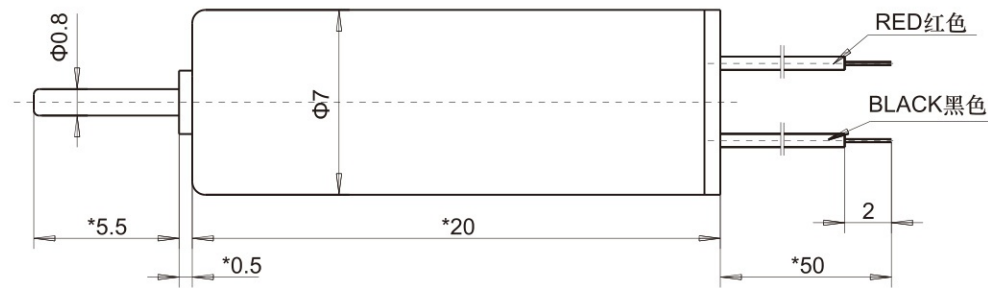
典型性能 Typical performance



备注: 电机测试环境温度: 常温25-30°C。
 NOTE: Ambient temperature 25-30°C

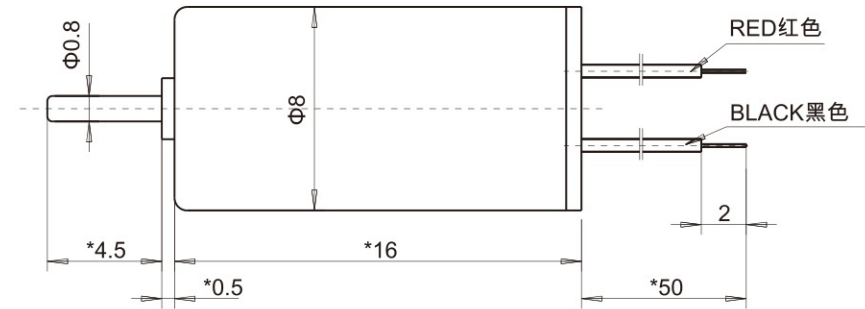
TSL-CL0720 Series $\Phi 7 \times L20$

稀有贵金属电刷 Precious Metal Brushes 0.5W



TSL-CL0816 Series $\Phi 8 \times L16$

稀有贵金属电刷 Precious Metal Brushes 0.5W



电机参数 Motor Parameter			电机型号 Motor Model						
额定电压下的数值 Values at nominal voltage			TSL-CL7E1-018182	TSL-CL7E1-018182	TSL-CL7E1-018182				
空载点 Free Load	1	额定电压 Rated voltage	V	1.5	3.4	4.5			
	2	空载转速 No load speed	rpm	15800	39000	51600			
	3	空载电流 No load current	mA	30	67	80			
最大效率点 At Max. Efficiency	4	最大效率 Max. efficiency	%	57%	63%	65%			
	5	转速 Speed	rpm	13300	32900	43900			
	6	电流 Current	mA	160	361	454			
	7	转矩 Torque	g.cm	1	2.26	2.93			
最大输出功率点 At Max. Output	8	最大功率 Max. output	W	0.26	1.45	2.59			
	9	转速 Speed	rpm	7900	19500	25800			
	10	电流 Current	mA	444	1005	1326			
堵转点 At Stall	11	转矩 Torque	g.cm	3.18	7.22	9.79			
	12	堵转电流 Stall current	A	0.86	1.94	2.57			
堵转点 At Stall	13	堵转转矩 Stall torque	g.cm	6.36	14.45	19.57			
	电机常数 Motor Constants								
	14	端电阻 Terminal resistance	Ω	1.8	1.8	1.8			
	15	转矩常数 Torque constant	g.cm/A	7.7	7.7	7.7			
	16	转速常数 Speed constant	rpm/V	11900	11900	11900			
	17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	2699.3	2699.3	2699.3			

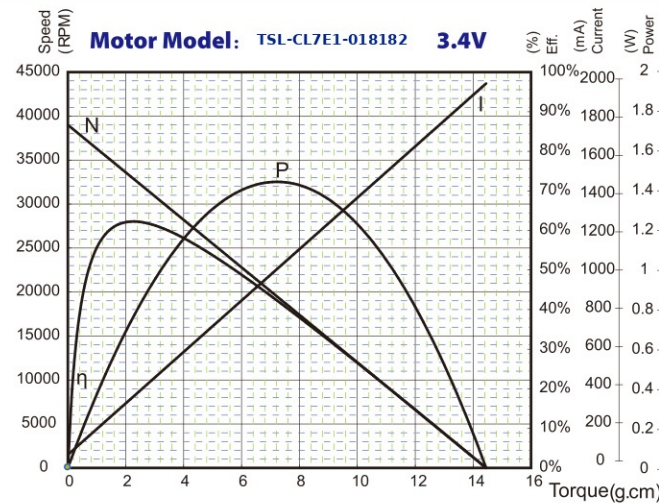
电机特性 Motor characteristic

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 $^{\circ}\text{C}$
19	绕组最高允许温度 Max. permissible winding temperature	85 $^{\circ}\text{C}$
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	52000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.15 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	3-5
24	电机重量 Weight	3 g

- 备注 Remarks**
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1g=0.035oz 1inch=25.4mm 1g.cm=0.098mN.m
 1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

典型性能 Typical performance



备注: 电机测试环境温度: 常温25-30 $^{\circ}\text{C}$ 。
 NOTE: Ambient temperature 25-30 $^{\circ}\text{C}$

电机参数 Motor Parameter			电机型号 Motor Model						
额定电压下的数值 Values at nominal voltage			TSL-CL8A2-014153	TSL-CL8A2-014154	TSL-CL8A2-014155	TSL-CL8A2-014156	TSL-CL8A2-014157	TSL-CL8A2-014158	
空载点 Free Load	1	额定电压 Rated voltage	V	2.4	4.2	6	7.2	9	12
	2	空载转速 No load speed	rpm	14000	14300	13400	14400	14500	15700
	3	空载电流 No load current	mA	16	9	6	5	4	4
最大效率点 At Max. Efficiency	4	最大效率 Max. efficiency	%	70%	70%	69%	68%	70%	69%
	5	转速 Speed	rpm	12000	12300	11500	12300	12500	13500
	6	电流 Current	mA	95	56	35	32	27	22
	7	转矩 Torque	g.cm	1.29	1.3	1.23	1.25	1.32	1.3
最大输出功率点 At Max. Output	8	最大功率 Max. output	W	0.33	0.34	0.29	0.32	0.35	0.37
	9	转速 Speed	rpm	7000	7200	6700	7200	7300	7900
	10	电流 Current	mA	298	175	106	96	85	67
堵转点 At Stall	11	转矩 Torque	g.cm	4.6	4.63	4.26	4.3	4.75	4.58
	12	堵转电流 Stall current	A	0.58	0.34	0.21	0.19	0.17	0.13
堵转点 At Stall	13	堵转转矩 Stall torque	g.cm	9.19	9.26	8.52	8.59	9.51	9.17
	电机常数 Motor Constants								
	14	端电阻 Terminal resistance	Ω	4.1	12.3	29	38.5	54.3	92.2
	15	转矩常数 Torque constant	g.cm/A	16.3	27.9	42.4	47.3	58.9	72.4
	16	转速常数 Speed constant	rpm/V	6000	3500	2300	2100	1700	1300
	17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	1520	1540	1570	1680	1530	1710

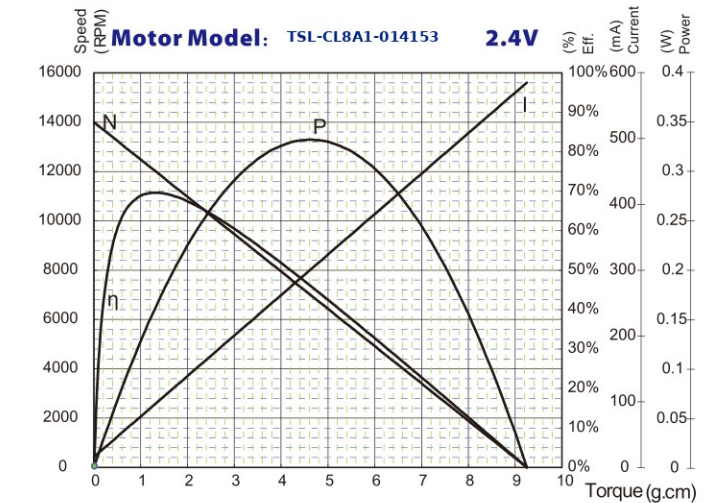
电机特性 Motor characteristic

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 $^{\circ}\text{C}$
19	绕组最高允许温度 Max. permissible winding temperature	85 $^{\circ}\text{C}$
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	40000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.15 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	3
24	电机重量 Weight	4.1 g

- 备注 Remarks**
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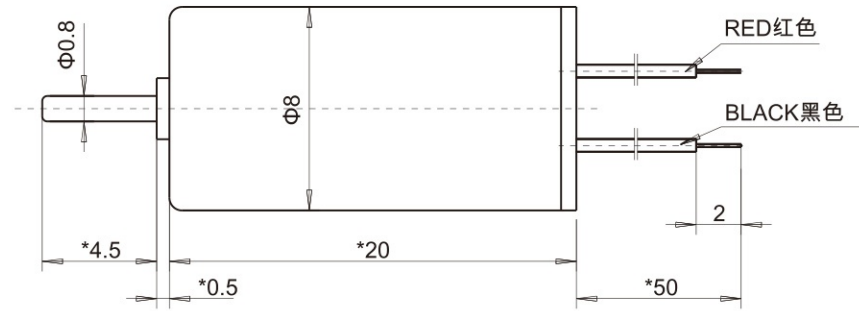
典型性能 Typical performance



备注: 电机测试环境温度: 常温25-30 $^{\circ}\text{C}$ 。
 NOTE: Ambient temperature 25-30 $^{\circ}\text{C}$

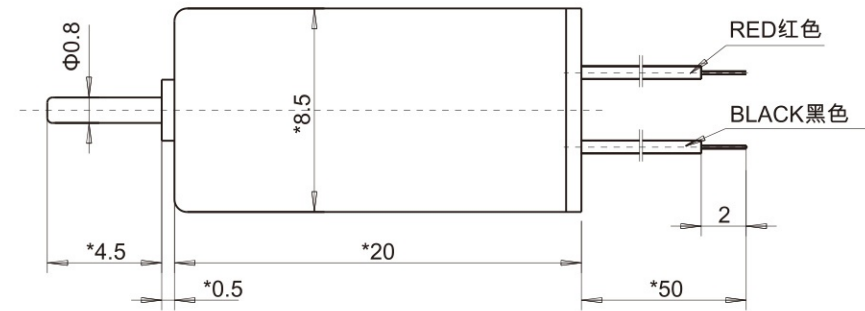
TSL-CL0820 Series $\Phi 8 \times L20$

稀有贵金属电刷 Precious Metal Brushes 0.5W



TSL-CL8520 Series $\Phi 8.5 \times L20$

稀有贵金属电刷 Precious Metal Brushes 0.6W



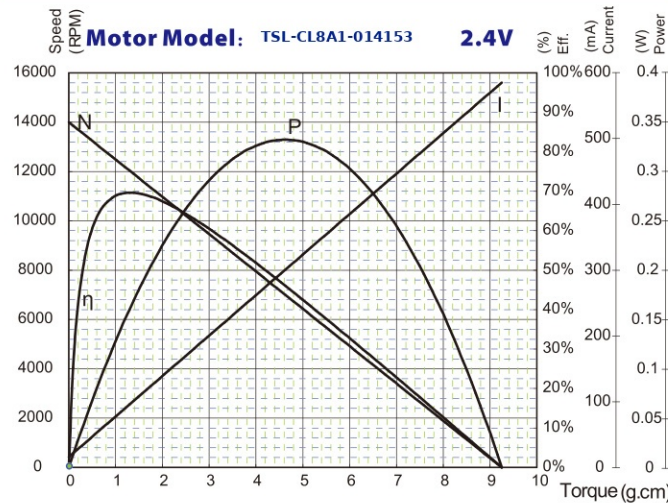
电机参数 Motor Parameter			电机型号 Motor Model						
额定电压下的数值 Values at nominal voltage			TSL-CL8A2-014153	TSL-CL8A2-014154	TSL-CL8A2-014155	TSL-CL8A2-014156	TSL-CL8A2-014157	TSL-CL8A2-014158	
空载点 Free Load	1 额定电压 Rated voltage	V	2.4	4.2	6	7.2	9	12	
	2 空载转速 No load speed	rpm	14000	14300	13400	14400	14500	15700	
	3 空载电流 No load current	mA	16	9	6	5	4	4	
最大效率点 At Max. Efficiency	4 最大效率 Max. efficiency	%	70%	70%	69%	68%	70%	69%	
	5 转速 Speed	rpm	12000	12300	11500	12300	12500	13500	
	6 电流 Current	mA	95	56	35	32	27	22	
	7 转矩 Torque	g.cm	1.29	1.3	1.23	1.25	1.32	1.3	
最大输出功率点 At Max. Output	8 最大功率 Max. output	W	0.33	0.34	0.29	0.32	0.35	0.37	
	9 转速 Speed	rpm	7000	7200	6700	7200	7300	7900	
	10 电流 Current	mA	298	175	106	96	85	67	
堵转点 At Stall	11 转矩 Torque	g.cm	4.6	4.63	4.26	4.3	4.75	4.58	
	12 堵转电流 Stall current	A	0.58	0.34	0.21	0.19	0.17	0.13	
电机常数 Motor Constants	13 堵转转矩 Stall torque	g.cm	9.19	9.26	8.52	8.59	9.51	9.17	
	14 端电阻 Terminal resistance	Ω	4.1	12.3	29	38.5	54.3	92.2	
	15 转矩常数 Torque constant	g.cm/A	16.3	27.9	42.4	47.3	58.9	72.4	
	16 转速常数 Speed constant	rpm/V	6000	3500	2300	2100	1700	1300	
	17 速度/转矩常数 Speed/Torque constant	rpm/g.cm	1520	1540	1570	1680	1530	1710	

电机特性 Motor characteristic | 典型性能 Typical performance

热参数 Thermal parameters		
18 环境温度范围 Ambient temperature	-20~+65	°C
19 绕组最高允许温度 Max. permissible winding temperature	85	°C
机械参数 Mechanical parameters		
20 最高空载允许转速 Max. permissible No-load speed	40000	rpm
21 最大轴向载荷(动态) Max. axial load(dynamic)	0.15	N
其他参数 Other parameters		
22 电机磁极对数 Number of pole pairs	1	
23 换向器片数 Number of commutator segments	3	
24 电机重量 Weight	4.1	g

- 备注 Remarks**
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1g=0.035oz 1inch=25.4mm 1g.cm=0.098mN.m
 1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm



备注：电机测试环境温度：常温25-30℃。
 NOTE: Ambient temperature 25-30℃

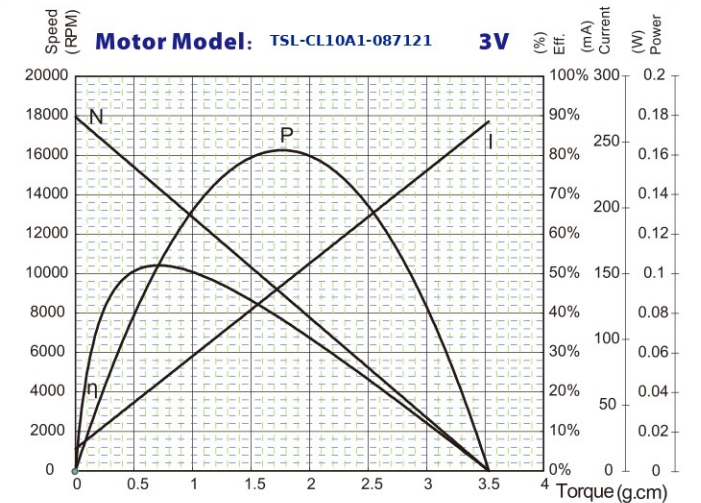
电机参数 Motor Parameter			电机型号 Motor Model						
额定电压下的数值 Values at nominal voltage			TSL-CL10A1-087121	TSL-CL10A1-087121	TSL-CL10A1-093141	TSL-CL10A1-110031	TSL-CL10A1-110031	TSL-CL10A1-110031	
空载点 Free Load	1 额定电压 Rated voltage	V	1.5	3	3	3	4.5	6	
	2 空载转速 No load speed	rpm	9000	17900	14900	13300	20000	26600	
	3 空载电流 No load current	mA	12	17	32	16	25	32	
最大效率点 At Max. Efficiency	4 最大效率 Max. efficiency	%	42%	53%	45%	42%	42%	44%	
	5 转速 Speed	rpm	6900	14300	11400	10000	15000	20000	
	6 电流 Current	mA	40	67	105	49	74	97	
	7 转矩 Torque	g.cm	0.35	0.71	1.19	0.6	0.91	1.23	
最大输出功率点 At Max. Output	8 最大功率 Max. output	W	0.04	0.16	0.19	0.08	0.19	0.34	
	9 转速 Speed	rpm	4500	9000	7500	6600	10000	13300	
	10 电流 Current	mA	72	141	187	82	123	164	
堵转点 At Stall	11 转矩 Torque	g.cm	0.76	1.77	2.54	1.19	1.82	2.49	
	12 堵转电流 Stall current	A	0.13	0.27	0.34	0.15	0.22	0.3	
电机常数 Motor Constants	13 堵转转矩 Stall torque	g.cm	1.52	3.53	5.08	2.38	3.63	4.97	
	14 端电阻 Terminal resistance	Ω	11.3	11.3	8.8	20.3	20.3	20.3	
	15 转矩常数 Torque constant	g.cm/A	14.2	14.2	16.4	18.1	18.1	18.1	
	16 转速常数 Speed constant	rpm/V	6400	6400	5500	5000	5000	5000	
	17 速度/转矩常数 Speed/Torque constant	rpm/g.cm	5080	5080	2940	5580	5580	5580	

电机特性 Motor characteristic | 典型性能 Typical performance

热参数 Thermal parameters		
18 环境温度范围 Ambient temperature	-20~+65	°C
19 绕组最高允许温度 Max. permissible winding temperature	85	°C
机械参数 Mechanical parameters		
20 最高空载允许转速 Max. permissible No-load speed	35000	rpm
21 最大轴向载荷(动态) Max. axial load(dynamic)	0.2	N
其他参数 Other parameters		
22 电机磁极对数 Number of pole pairs	1	
23 换向器片数 Number of commutator segments	3-5	
24 电机重量 Weight	4.4	g

- 备注 Remarks**
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 - 电机可配置铁、铜、钨等材质及各种形状尺寸的偏心锤，组成振动电机。
- 1) Dimension with "*" in the drawing can be adjusted according to customer's requirement.
 2) Motor can be designed upon customer's requirements on performance, installation, power connection method and motor dimension.
 3) Motor can be mounted with various shape and sizes of eccentric weight which is made of iron, brass or ferro-alloy to become vibration motor.

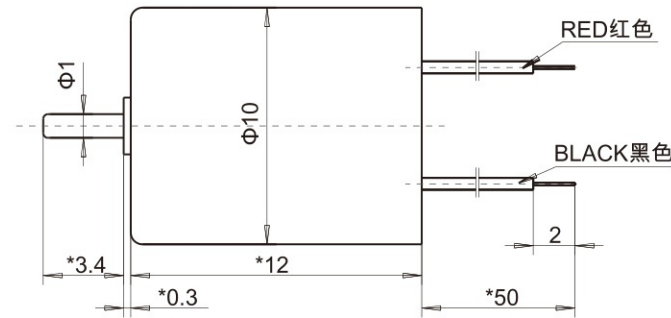
1g=0.035oz 1inch=25.4mm 1g.cm=0.098mN.m
 1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm



备注：电机测试环境温度：常温25-30℃。
 NOTE: Ambient temperature 25-30℃

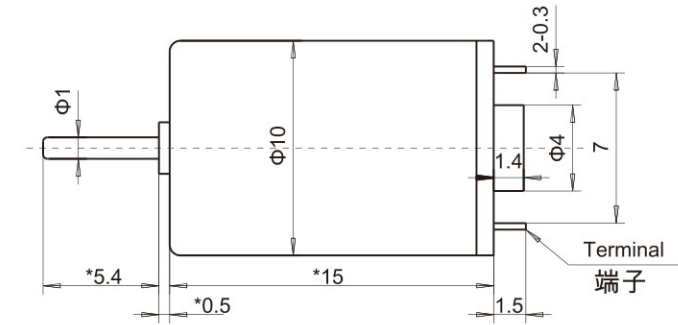
TSL-CL1020 Series $\Phi 10 \times L12$

稀有贵金属电刷 Precious Metal Brushes 0.6W



TSL-CL1015 Series $\Phi 10 \times L15$

稀有贵金属电刷 Precious Metal Brushes 0.8W



电机参数 Motor Parameter			电机型号 Motor Model						
额定电压下的数值 Values at nominal voltage			TSL-CL10A1-087121	TSL-CL10A1-087121	TSL-CL10A1-093141	TSL-CL10A1-110031	TSL-CL10A1-110031	TSL-CL10A1-110031	
空载点 Free Load	1	额定电压 Rated voltage	V	1.5	3	3	3	4.5	6
	2	空载转速 No load speed	rpm	9000	17900	14900	13300	20000	26600
	3	空载电流 No load current	mA	12	17	32	16	25	32
最大效率点 At Max. Efficiency	4	最大效率 Max. efficiency	%	42%	53%	45%	42%	42%	44%
	5	转速 Speed	rpm	6900	14300	11400	10000	15000	20000
	6	电流 Current	mA	40	67	105	49	74	97
最大输出功率点 At Max. Output	7	转矩 Torque	g.cm	0.35	0.71	1.19	0.6	0.91	1.23
	8	最大功率 Max. output	W	0.04	0.16	0.19	0.08	0.19	0.34
	9	转速 Speed	rpm	4500	9000	7500	6600	10000	13300
堵转点 At Stall	10	电流 Current	mA	72	141	187	82	123	164
	11	转矩 Torque	g.cm	0.76	1.77	2.54	1.19	1.82	2.49
堵转点 At Stall	12	堵转电流 Stall current	A	0.13	0.27	0.34	0.15	0.22	0.3
	13	堵转转矩 Stall torque	g.cm	1.52	3.53	5.08	2.38	3.63	4.97
电机常数 Motor Constants									
14	端电阻 Terminal resistance	Ω	11.3	11.3	8.8	20.3	20.3	20.3	
15	转矩常数 Torque constant	g.cm/A	14.2	14.2	16.4	18.1	18.1	18.1	
16	转速常数 Speed constant	rpm/V	6400	6400	5500	5000	5000	5000	
17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	5080	5080	2940	5580	5580	5580	

电机参数 Motor Parameter			电机型号 Motor Model					
额定电压下的数值 Values at nominal voltage			TSL-CL10B1-040142	TSL-CL10B1-040142	TSL-CL10B1-060122	TSL-CL10B1-060122	TSL-CL10B1-060122	TSL-CL10B1-060122
空载点 Free Load	1	额定电压 Rated voltage	V	1.5	3	3	4.5	6
	2	空载转速 No load speed	rpm	12900	25700	16900	25400	33800
	3	空载电流 No load current	mA	25	41	22	35	44
最大效率点 At Max. Efficiency	4	最大效率 Max. efficiency	%	57%	64%	64%	64%	66%
	5	转速 Speed	rpm	10800	21900	14400	21500	28800
	6	电流 Current	mA	131	239	125	194	251
最大输出功率点 At Max. Output	7	转矩 Torque	g.cm	0.99	2.05	1.6	2.53	3.35
	8	最大功率 Max. output	W	0.2	0.91	0.47	1.08	1.94
	9	转速 Speed	rpm	6500	12800	8500	12700	16900
堵转点 At Stall	10	电流 Current	mA	353	712	367	553	736
	11	转矩 Torque	g.cm	3.09	6.93	5.36	8.26	11.21
堵转点 At Stall	12	堵转电流 Stall current	A	0.68	1.38	0.71	1.07	1.43
	13	堵转转矩 Stall torque	g.cm	6.18	13.87	10.73	16.51	22.41
电机常数 Motor Constants								
14	端电阻 Terminal resistance	Ω	2.2	2.2	4.2	4.2	4.2	
15	转矩常数 Torque constant	g.cm/A	10.3	10.3	15.5	15.5	15.5	
16	转速常数 Speed constant	rpm/V	8800	8800	5800	5800	5800	
17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	1850	1850	1580	1580	1580	

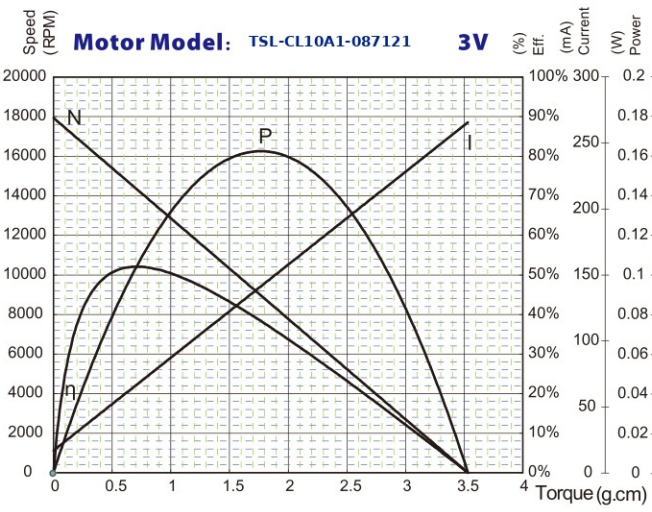
电机特性 Motor characteristic

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 °C
19	绕组最高允许温度 Max. permissible winding temperature	85 °C
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	35000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.2 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	3-5
24	电机重量 Weight	4.4 g

- 备注 Remarks**
- 外形图中带“*”尺寸可根据客户需求调整。
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1g=0.035oz 1inch=25.4mm 1g.cm=0.098mN.m
1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

典型性能 Typical performance



备注: 电机测试环境温度: 常温 25-30 °C。
NOTE: Ambient temperature 25-30 °C

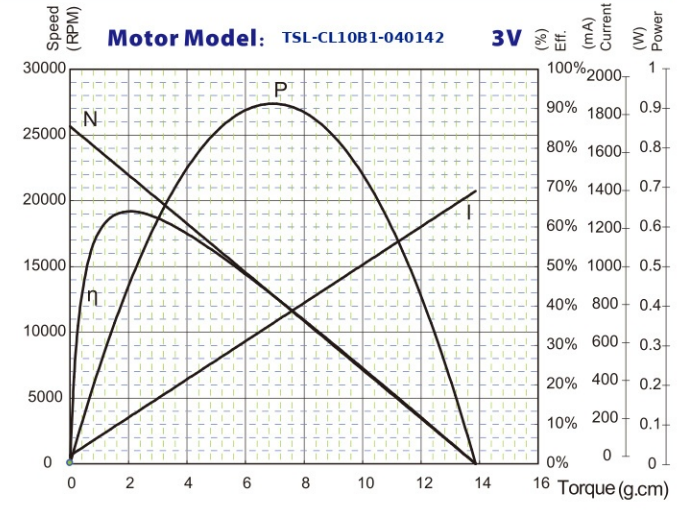
电机特性 Motor characteristic

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 °C
19	绕组最高允许温度 Max. permissible winding temperature	85 °C
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	30000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.2 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	3-5
24	电机重量 Weight	4.9 g

- 备注 Remarks**
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1g=0.035oz 1inch=25.4mm 1g.cm=0.098mN.m
1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

典型性能 Typical performance

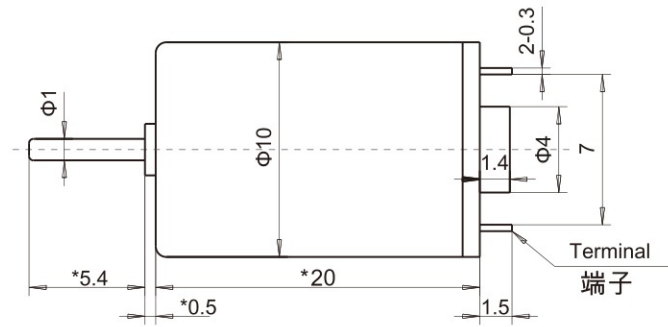


备注: 电机测试环境温度: 常温 25-30 °C。
NOTE: Ambient temperature 25-30 °C

Vibration Motor 振动电机
Permanent Magnet DC Coreless Motor 永磁直流空心杯电机
Permanent Magnet DC Cored Motor 永磁直流铁芯电机
Permanent Magnet DC Brushless Motor 永磁直流无刷电机

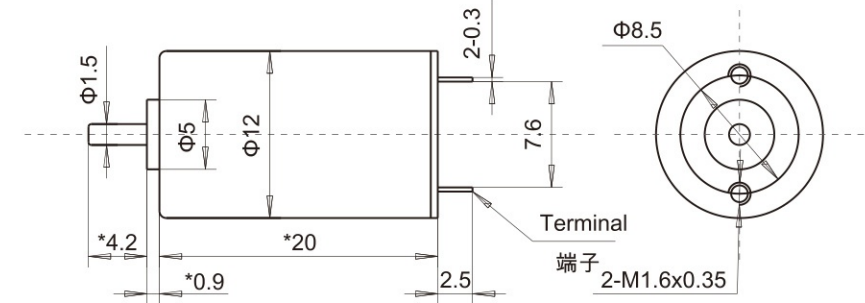
TSL-CL1020 Series $\Phi 10 \times L20$

稀有贵金属电刷 Precious Metal Brushes 0.8W



TSL-CL1220 Series $\Phi 12 \times L20$

稀有贵金属电刷 Precious Metal Brush 1.5W



电机参数 Motor Parameter			电机型号 Motor Model				
额定电压下的数值 Values at nominal voltage			TSL-CL10B1-040142	TSL-CL10B1-040142	TSL-CL10B1-060122	TSL-CL10B1-060122	TSL-CL10B1-060122
空载点 Free Load	1 额定电压 Rated voltage	V	1.5	3	3	4.5	6
	2 空载转速 No load speed	rpm	12900	25700	16900	25400	33800
	3 空载电流 No load current	mA	25	41	22	35	44
最大效率点 At Max. Efficiency	4 最大效率 Max. efficiency	%	57%	64%	64%	64%	66%
	5 转速 Speed	rpm	10800	21900	14400	21500	28800
	6 电流 Current	mA	131	239	125	194	251
	7 转矩 Torque	g.cm	0.99	2.05	1.6	2.53	3.35
最大输出功率点 At Max. Output	8 最大功率 Max. output	W	0.2	0.91	0.47	1.08	1.94
	9 转速 Speed	rpm	6500	12800	8500	12700	16900
	10 电流 Current	mA	353	712	367	553	736
堵转点 At Stall	11 转矩 Torque	g.cm	3.09	6.93	5.36	8.26	11.21
	12 堵转电流 Stall current	A	0.68	1.38	0.71	1.07	1.43
堵转点 At Stall	13 堵转转矩 Stall torque	g.cm	6.18	13.87	10.73	16.51	22.41
	电机常数 Motor Constants						
	14 端电阻 Terminal resistance	Ω	2.2	2.2	4.2	4.2	4.2
	15 转矩常数 Torque constant	g.cm/A	10.3	10.3	15.5	15.5	15.5
	16 转速常数 Speed constant	rpm/V	8800	8800	5800	5800	5800
	17 速度/转矩常数 Speed/Torque constant	rpm/g.cm	1850	1850	1580	1580	1580

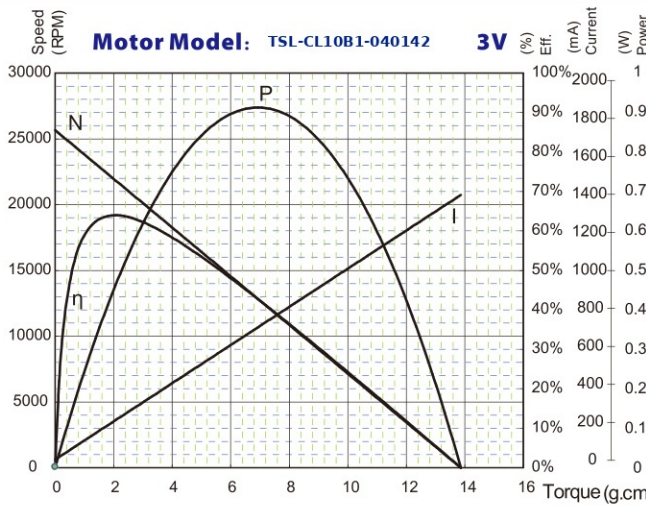
电机特性 Motor characteristic

热参数 Thermal parameters		
18 环境温度范围 Ambient temperature	-20~+65	°C
19 绕组最高允许温度 Max. permissible winding temperature	85	°C
机械参数 Mechanical parameters		
20 最高空载允许转速 Max. permissible No-load speed	30000	rpm
21 最大轴向载荷(动态) Max. axial load(dynamic)	0.2	N
其他参数 Other parameters		
22 电机磁极对数 Number of pole pairs	1	
23 换向器片数 Number of commutator segments	3-5	
24 电机重量 Weight	4.9	g

- 备注 Remarks**
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1g=0.035oz 1inch=25.4mm 1g.cm=0.098mN.m
 1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

典型性能 Typical performance



备注：电机测试环境温度：常温25-30℃。
 NOTE: Ambient temperature 25-30℃

电机参数 Motor Parameter			电机型号 Motor Model			
额定电压下的数值 Values at nominal voltage			TSL-CL12B1-050242	TSL-CL12B1-050242	TSL-CL12B1-050242	TSL-CL12B1-050242
空载点 Free Load	1 额定电压 Rated voltage	V	1.5	3.7	4.5	6
	2 空载转速 No load speed	rpm	7200	17600	21400	28600
	3 空载电流 No load current	mA	25	54	70	90
最大效率点 At Max. Efficiency	4 最大效率 Max. efficiency	%	49%	56%	56%	57%
	5 转速 Speed	rpm	5800	14300	17300	23200
	6 电流 Current	mA	102	236	296	387
	7 转矩 Torque	g.cm	1.26	3.32	4.16	5.55
最大输出功率点 At Max. Output	8 最大功率 Max. output	W	0.12	0.8	1.19	2.16
	9 转速 Speed	rpm	3600	8800	10700	14300
	10 电流 Current	mA	221	541	660	878
堵转点 At Stall	11 转矩 Torque	g.cm	3.21	8.91	10.87	14.71
	12 堵转电流 Stall current	A	0.42	1.03	1.25	1.67
堵转点 At Stall	13 堵转转矩 Stall torque	g.cm	6.41	17.82	21.75	29.42
	电机常数 Motor Constants					
	14 端电阻 Terminal resistance	Ω	3.6	3.6	3.6	3.6
	15 转矩常数 Torque constant	g.cm/A	18.3	18.3	18.3	18.3
	16 转速常数 Speed constant	rpm/V	5020	5020	5020	5020
	17 速度/转矩常数 Speed/Torque constant	rpm/g.cm	988	988	988	988

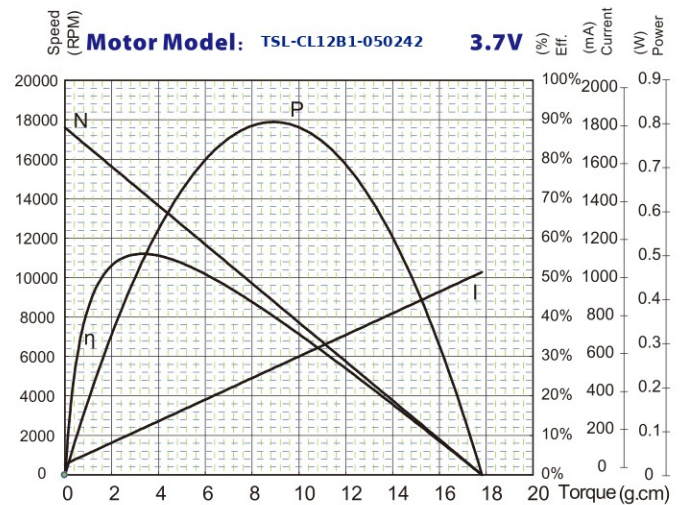
电机特性 Motor characteristic

热参数 Thermal parameters		
18 环境温度范围 Ambient temperature	-20~+65	°C
19 绕组最高允许温度 Max. permissible winding temperature	85	°C
机械参数 Mechanical parameters		
20 最高空载允许转速 Max. permissible No-load speed	30000	rpm
21 最大轴向载荷(动态) Max. axial load(dynamic)	0.2	N
其他参数 Other parameters		
22 电机磁极对数 Number of pole pairs	1	
23 换向器片数 Number of commutator segments	3-5	
24 电机重量 Weight	11.5	g

- 备注 Remarks**
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1g=0.035oz 1inch=25.4mm 1g.cm=0.098mN.m
 1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

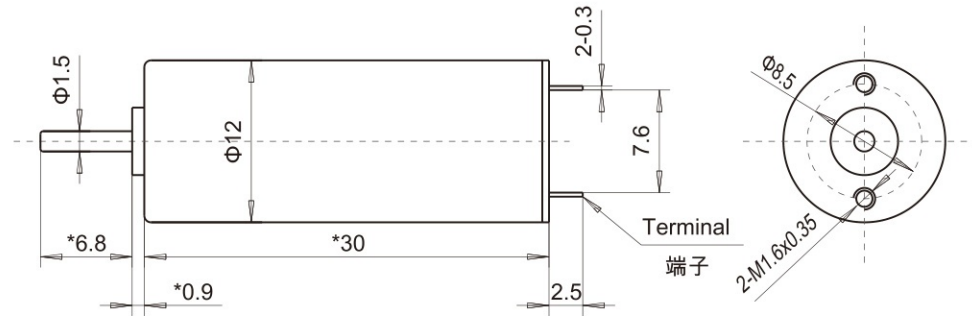
典型性能 Typical performance



备注：电机测试环境温度：常温25-30℃。
 NOTE: Ambient temperature 25-30℃

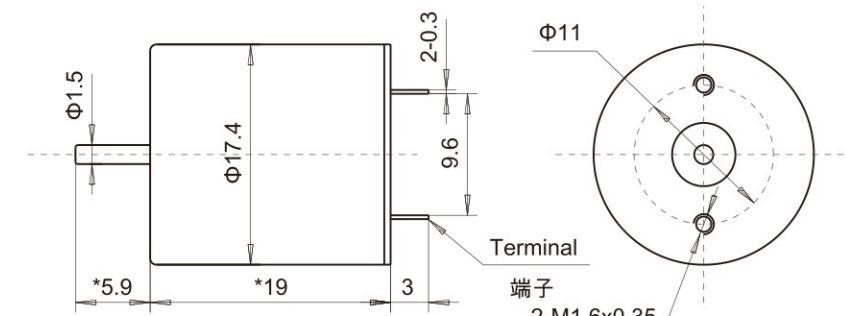
TSL-CL1230 Series $\Phi 12 \times L30$

稀有贵金属电刷 Precious Metal Brushes 2W



TSL-CL1719 Series $\Phi 17 \times L19$

稀有贵金属电刷 Precious Metal Brushes 2.5W



电机参数 Motor Parameter			电机型号 Motor Model				
额定电压下的数值 Values at nominal voltage			TSL-CL12A1-048242	TSL-CL12A1-048242	TSL-CL12A1-048242	TSL-CL12A1-048242	
空载点 Free Load	1	额定电压 Rated voltage	V	3	4.5	6	9
	2	空载转速 No load speed	rpm	7500	11300	15000	22500
最大效率点 At Max. Efficiency	3	空载电流 No load current	mA	20	24	32	50
	4	最大效率 Max. efficiency	%	67%	71%	72%	72%
最大输出功率点 At Max. Output	5	转速 Speed	rpm	6500	9900	13200	19700
	6	电流 Current	mA	127	171	228	349
	7	转矩 Torque	g.cm	3.8	5.33	7.23	11.15
堵转点 At Stall	8	最大功率 Max. output	W	0.54	1.26	2.26	5.13
	9	转速 Speed	rpm	3800	5700	7500	11300
电机常数 Motor Constants	10	电流 Current	mA	415	620	827	1241
	11	转矩 Torque	g.cm	14	21.65	29.34	44.44
	12	堵转电流 Stall current	A	0.81	1.22	1.62	2.43
	13	堵转转矩 Stall torque	g.cm	28.01	43.29	58.67	88.89
	14	端电阻 Terminal resistance	Ω	3.7	3.7	3.7	3.7
	15	转矩常数 Torque constant	g.cm/A	36.9	36.9	36.9	36.9
	16	转速常数 Speed constant	rpm/V	2550	2550	2550	2550
	17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	256	256	256	256

电机参数 Motor Parameter			电机型号 Motor Model				
额定电压下的数值 Values at nominal voltage			TSL-CL17B1-057242	TSL-CL17B1-057242	TSL-CL17B1-057242	TSL-CL17B1-057242	
空载点 Free Load	1	额定电压 Rated voltage	V	3	6	9	12
	2	空载转速 No load speed	rpm	4600	9200	13800	18400
最大效率点 At Max. Efficiency	3	空载电流 No load current	mA	10	15	19	30
	4	最大效率 Max. efficiency	%	68%	74%	76%	75%
最大输出功率点 At Max. Output	5	转速 Speed	rpm	4000	8200	12300	16300
	6	电流 Current	mA	67	117	161	234
	7	转矩 Torque	g.cm	3.33	6.15	8.7	12.51
堵转点 At Stall	8	最大功率 Max. output	W	0.3	1.27	2.92	5.19
	9	转速 Speed	rpm	2300	4600	6900	9200
电机常数 Motor Constants	10	电流 Current	mA	232	462	691	924
	11	转矩 Torque	g.cm	12.87	26.99	41.18	54.93
	12	堵转电流 Stall current	A	0.45	0.91	1.36	1.82
	13	堵转转矩 Stall torque	g.cm	25.75	53.99	82.36	109.87
	14	端电阻 Terminal resistance	Ω	6.6	6.6	6.6	6.6
	15	转矩常数 Torque constant	g.cm/A	61.3	61.3	61.3	61.3
	16	转速常数 Speed constant	rpm/V	1550	1550	1550	1550
	17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	168	168	168	168

电机特性 Motor characteristic

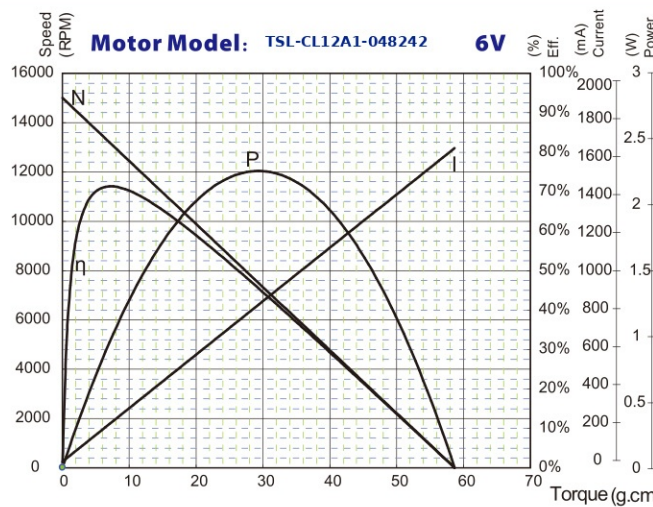
热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 $^{\circ}\text{C}$
19	绕组最高允许温度 Max. permissible winding temperature	85 $^{\circ}\text{C}$
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	30000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.2 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	3-5
24	电机重量 Weight	16.5 g

备注 Remarks

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- 可按客户要求性能、安装、电源连接方式、外形尺寸的设计。

1) Dimension with "*" in the drawing can be adjusted according to customer's requirement.
2) Motor can be designed upon customer's requirements on performance, installation, power connection method and motor dimension.

典型性能 Typical performance



备注: 电机测试环境温度: 常温 25 -30 $^{\circ}\text{C}$ 。
NOTE: Ambient temperature 25 -30 $^{\circ}\text{C}$

1g=0.035oz 1inch=25.4mm 1g.cm=0.098mN.m
1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

电机特性 Motor characteristic

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 $^{\circ}\text{C}$
19	绕组最高允许温度 Max. permissible winding temperature	85 $^{\circ}\text{C}$
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	25000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	0.8 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	3-5
24	电机重量 Weight	19 g

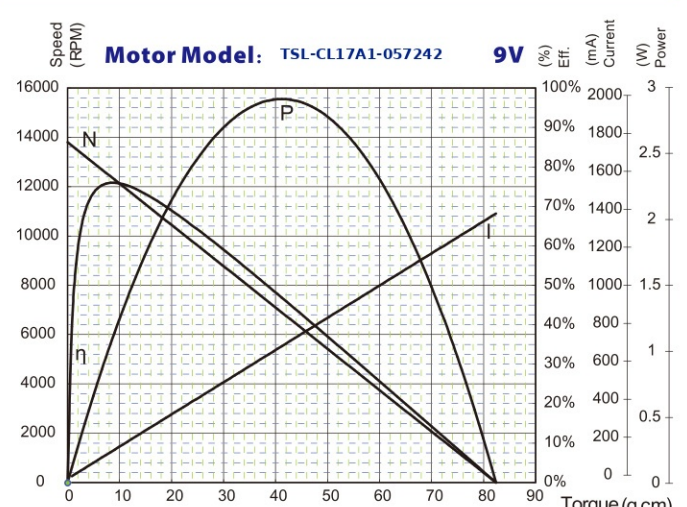
备注 Remarks

- 外形图中带“*”尺寸可根据客户需求调整。
- 可按客户要求性能、安装、电源连接方式、外形尺寸的设计。

1) Dimension with "*" in the drawing can be adjusted according to customer's requirement.
2) Motor can be designed upon customer's requirements on performance, installation, power connection method and motor dimension.

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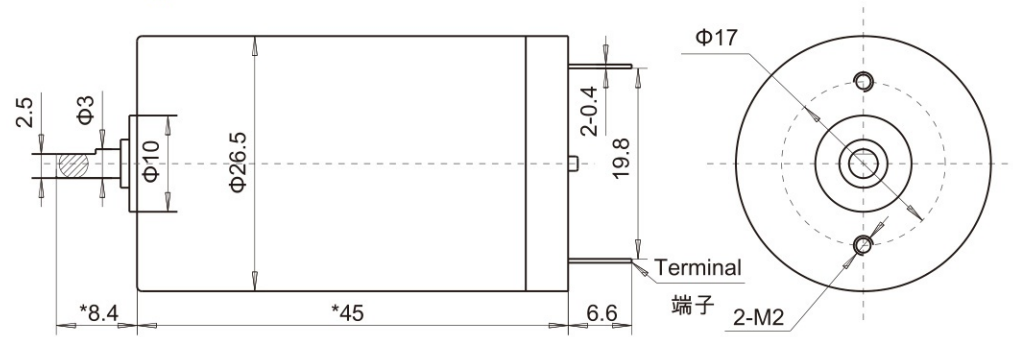
典型性能 Typical performance



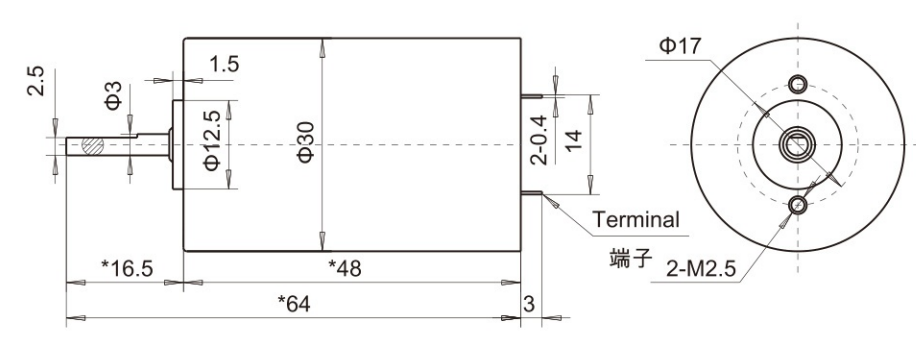
备注: 电机测试环境温度: 常温 25 -30 $^{\circ}\text{C}$ 。
NOTE: Ambient temperature 25 -30 $^{\circ}\text{C}$

1g=0.035oz 1inch=25.4mm 1g.cm=0.098mN.m
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TSL-CL2645 Series $\Phi 26.5 \times L45$ 石墨电刷 Graphite Brushes 10W



TSL-CL3048 Series $\Phi 30 \times L48$ 稀有贵金属电刷 Precious Metal Brushes 14W



电机参数 Motor Parameter			电机型号 Motor Model					
额定电压下的数值 Values at nominal voltage			TSL-CL26A1-040203	TSL-CL26A1-040203	TSL-CL26A1-043182	TSL-CL26A1-040203	TSL-CL26A1-043182	
空载点 Free Load	1	额定电压 Rated voltage	V	12	18	24	24	36
	2	空载转速 No load speed	rpm	4400	6500	8000	8700	12000
	3	空载电流 No load current	mA	30	45	30	55	50
最大效率点 At Max. Efficiency	4	最大效率 Max. efficiency	%	78%	79%	79%	80%	78%
	5	转速 Speed	rpm	3900	5900	7200	7900	10700
	6	电流 Current	mA	271	407	268	519	424
	7	转矩 Torque	g.cm	62.92	95.29	68.47	122.29	107.28
最大输出功率点 At Max. Output	8	最大功率 Max. output	W	7.05	15.95	13.92	28.49	31.33
	9	转速 Speed	rpm	2200	3300	4000	4400	6000
	10	电流 Current	mA	1239	1859	1215	2476	1825
堵转点 At Stall	11	转矩 Torque	g.cm	315.72	478.11	340.47	638.17	508.79
	12	堵转电流 Stall current	A	2.45	3.67	2.4	4.9	3.6
电机常数 Motor Constants	13	堵转转矩 Stall torque	g.cm	631.43	956.23	680.93	1276.34	1017.58
	14	端电阻 Terminal resistance	Ω	4.9	4.9	10	4.9	10
	15	转矩常数 Torque constant	g.cm/A	263.5	263.5	287.3	263.5	287.3
	16	转速常数 Speed constant	rpm/V	400	400	336	400	336
	17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	10	10	11.7	10	11.7

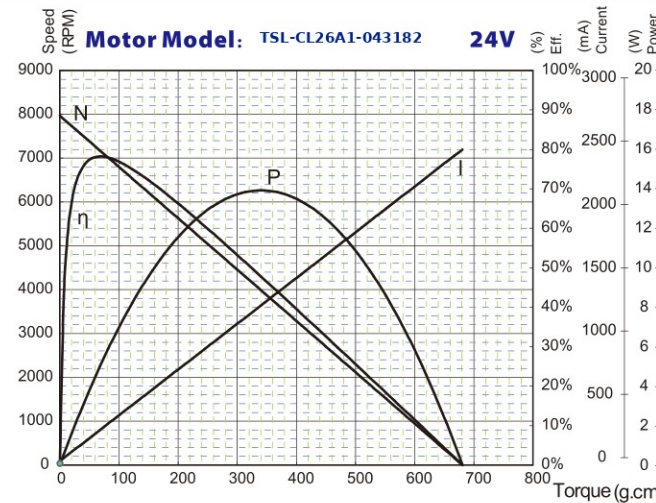
电机特性 Motor characteristic | 典型性能 Typical performance

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 $^{\circ}\text{C}$
19	绕组最高允许温度 Max. permissible winding temperature	85 $^{\circ}\text{C}$
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	20000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	3 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	7
24	电机重量 Weight	115 g

备注 Remarks

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备注: 电机测试环境温度: 常温 25-30 $^{\circ}\text{C}$ 。
NOTE: Ambient temperature 25-30 $^{\circ}\text{C}$

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1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

电机参数 Motor Parameter			电机型号 Motor Model					
额定电压下的数值 Values at nominal voltage			TSL-CL30A1-036212	TSL-CL30A1-036212	TSL-CL30A1-036212	TSL-CL30A1-018211	TSL-CL30A1-018211	
空载点 Free Load	1	额定电压 Rated voltage	V	6	12	18	24	36
	2	空载转速 No load speed	rpm	2700	5400	8100	3600	5400
	3	空载电流 No load current	mA	12	20	30	12	20
最大效率点 At Max. Efficiency	4	最大效率 Max. efficiency	%	84%	86%	87%	78%	77%
	5	转速 Speed	rpm	2500	5100	7600	3200	4800
	6	电流 Current	mA	170	310	465	103	163
	7	转矩 Torque	g.cm	32.84	61.45	92.7	58.82	91.18
最大输出功率点 At Max. Output	8	最大功率 Max. output	W	3.44	14.04	31.77	5.15	11.58
	9	转速 Speed	rpm	1400	2700	4100	1800	2700
	10	电流 Current	mA	1206	2410	3615	450	677
堵转点 At Stall	11	转矩 Torque	g.cm	248.63	506.74	764.43	282.52	417.81
	12	堵转电流 Stall current	A	2.4	4.8	7.2	0.89	1.33
电机常数 Motor Constants	13	堵转转矩 Stall torque	g.cm	497.27	1013.48	1528.85	565.05	835.62
	14	端电阻 Terminal resistance	Ω	2.5	2.5	2.5	27	27
	15	转矩常数 Torque constant	g.cm/A	212	212	212	644.4	644.4
	16	转速常数 Speed constant	rpm/V	452	452	452	150	150
	17	速度/转矩常数 Speed/Torque constant	rpm/g.cm	5.3	5.3	5.3	6.3	6.3

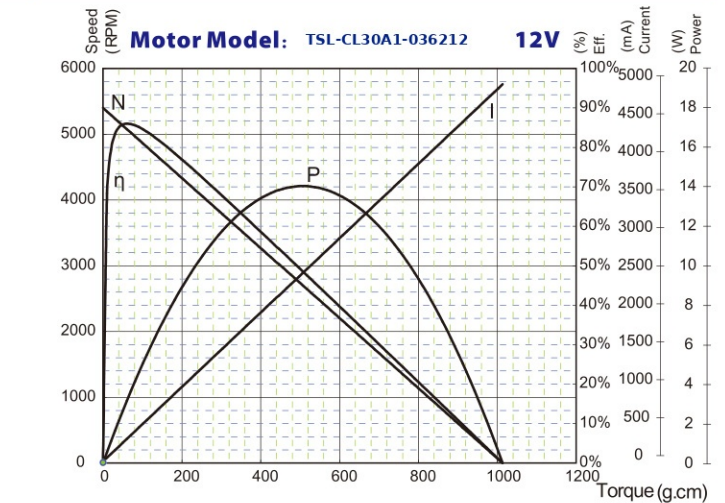
电机特性 Motor characteristic | 典型性能 Typical performance

热参数 Thermal parameters		
18	环境温度范围 Ambient temperature	-20~+65 $^{\circ}\text{C}$
19	绕组最高允许温度 Max. permissible winding temperature	85 $^{\circ}\text{C}$
机械参数 Mechanical parameters		
20	最高空载允许转速 Max. permissible No-load speed	15000 rpm
21	最大轴向载荷(动态) Max. axial load(dynamic)	5 N
其他参数 Other parameters		
22	电机磁极对数 Number of pole pairs	1
23	换向器片数 Number of commutator segments	7
24	电机重量 Weight	175 g

备注 Remarks

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NOTE: Ambient temperature 25-30 $^{\circ}\text{C}$

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1oz=28.35g 1mm=0.0394inch 1mN.m=10.2g.cm

