

# JOHNSON MOTOR

Standard DC Series Motors  
Stock Products





## JOHNSON ELECTRIC COMPANY PROFILE

# Johnson Electric is the global leader in Micro motors, Motion Sub-systems, Human Machine Interfaces, and Infrastructure Control Systems.

We serve a broad range of industries including Automotive, Business Equipment, Building Automation, Home Technologies, Medical Devices, Power Tools, Optical Devices and Industrial Automation.

Established in 1959, Johnson Electric ships its products to more than 30 countries for use in hundreds of different product applications. Innovation and product design centers are located in Hong Kong, China, Switzerland, Germany, Italy, Israel, Japan, the UK and the USA. We employ more than 40,000 employees in over 23 countries.

The Group's business strategy is based on the twin pillars of providing "technology leadership" and being the "safe choice" for our customers. We support our long term customers through their complete product life from new product introduction to mature high volume production. Our customers' new products and new growth segments are addressed by providing technically differentiated new products and superior service.

Our unique "Productizing Process" and the "Johnson Electric Production System" combine to deliver product differentiation and supply chain performance to our customers. Johnson Electric is the safe choice for global brand companies that demand performance leadership, high reliability, and assurance of supply.

The Company has been listed on the Stock Exchange of Hong Kong since 1984, and has a sponsored American Depository Receipt (ADR) program in the USA.



## INDUSTRY PRODUCTS GROUP

### Industries Served

The Industry Products Group (IPG) provides motion products and customized solutions for various commercial and industrial applications, including home appliances, power tools, business equipment, personal care products, building automation, security, audio-visual and other industrial products. The IPG product line comprises the following brands: Johnson Motor for DC motors (Standard DC, Compact DC, and brushless DC product lines), and AC motors; Saia Motor for stepper motors and synchronous motors; Ledex and Dormeyer for solenoids; and Saia, Bär, Burgess, th-contact for switches.

**JOHNSON  
MOTOR**

**saia**

**BÄR**

**burgess**

**LEDEX**

**DORMEYER**

**nm** NANOMOTION

**JOHNSON  
MEDTECH**



**Building Automation  
and Security**



**Business Machines**



**Camera and Optical**



**Entertainment and  
Gaming**



**Food and Beverage**



**Home Technologies**



**HVAC**



**Industrial Automation**



**Medical Devices**



**Personal Care**



**Power Equipment**



**Snow Blowers**

## Standard DC Series - Low Voltage DC Motors

Page	Dia. (mm)	DC Motor Platform		Input Voltage (V)	No Load Speed (rpm)	Maximum Efficiency (%)	Stall Torque (mNm)	Maximum Output Power (W)	Application Examples
		Part Number	Series						
8-9	15.5	NF003SG-011	000	5.0	12623	50	2.09	0.69	Door Locks, Locks
10-11	20.4	NF113LG-011	100	13.0	25000	65	20.00	15.00	Hair Dryers
12-13	20.4	NF183LG-011	100	2.4	6200	65	8.00	1.30	Shavers
14-15	24.2	NF213G-011	200	2.4	7000	70	26.00	5.00	Hair Clipper, Trimmer
16-17	24.2	NF223G-011	200	1.2	7800	60	12.00	2.50	Hair Cutting
18-19	24.2	HF283LG-011	200	24.0	26000	70	85.00	60.00	Hair Dryers
20-21	24.0	HC213LG-011	200	21.0	30000	60	40.00	32.00	Hair Dryers, Hair Curlers, Hair Care
22-23	24.4	PC280LG-011	200	12.0	8200	62	25.50	5.50	Paper Feeds, Printers
24-25	27.5	HC313G-011	300	24.0	7200	55	20.00	4.00	Facial Massager, Massagers
26-27	27.5	HC315G-011	300	41.0	18000	65	38.00	18.00	Massagers
28-29	27.5	HC385G-011	300	18.0	9987	57	39.24	10.20	Paper Feeder, Paper Feeds, Printers
30-31	27.5	HC315MG-011	300	39.0	21000	70	70.00	40.00	Hair Dryers
32-33	27.5	HC315MG-012	300	24.0	22000	70	60.00	35.00	Hair Dryers
34-35	27.5	HC383XLG-011	300	7.2	17230	64	114.86	51.24	Power Equipment, Screw Drivers
36-36	27.5	HC385XLG-011	300	36.0	11000	70	90.00	25.00	Foot Massagers
38-39	27.5	HC385XLG-013	300	28.0	19000	75	140.00	70.00	Hair Dryers
40-41	29.0	HC485G-011	400	42.0	6400	64	92.00	15.50	Paper Feeds, Printers
42-43	42.3	HC785LP-012	700	18.0	20950	78	1175.03	644.74	Power Equipment, Drills
44-45	48.0	HC875SG-011	800	14.4	20120	66	787.72	415.00	Power Equipment, Drills
46-47	48.0	HC875SG-012	800	18.0	20281	69	656.65	348.79	Power Equipment, Drills
48-49	48.0	QC875SG-011	800	18.0	19600	66	1055.00	542.00	Power Equipment, Drills
50-51	48.0	HC877P-011	800	18.0	22500	76	1400.00	830.00	Power Equipment, Drills

## Standard DC Series - High Voltage DC Motors

Page	Dia. (mm)	DC Motor Platform		Input Voltage (V)	No Load Speed (rpm)	Maximum Efficiency (%)	Torque @	Speed @	Application Examples
		Part Number	Series				Maximum Efficiency (mNm)	Maximum Efficiency (rpm)	
52-53	35.8	HC615SG-011	600	60.0	8600	70	25.00	7400	Hair Dryer
54-55	45.0	DC751(2)XLLG-011	700	230.0	15600	65	92.00	11500	Stick Blenders, Hand Mixers
56-57	52.4	DC971(2)LG-011	900	120.0	11000	64	155.00	8200	Brush Roll, Power Brushes, Floor Polishers

The data used in this Product Overview may be used as a guideline only. Specific operational characteristics of our products may vary according to individual applications. It is strongly recommended that specific operating conditions are clarified with Johnson Electric before application. Johnson Electric Terms and Conditions of Sale apply. All data may be subject to change without notice.

**Characteristics:**

Compact Size Motor

**Specifications:**

Dimensions	: Ø 15.5 X 12.0 X 18.6 mm
Shaft Diameter	: Ø 1.505 mm
Input Voltage	: 5.0 V DC
No Load Speed	: 12623 rpm
No Load Current	: 0.06 A
Stall Torque	: 2.09 mNm
Stall Current	: 0.64 A
Maximum Output Power	: 0.69 W
Maximum Efficiency	: 50 %
Speed at Maximum Efficiency	: 9602 rpm
Life (typical)	: 17 hr
Weight	: 10 g
Operation Temperature	: -20 to 70 °C
Storage Temperature	: -40 to 85 °C
Electrical Connection	: Terminal



Ø < 20.0 mm

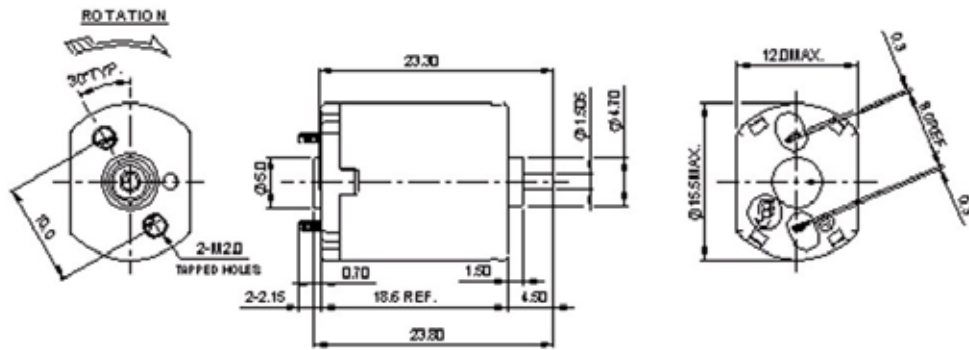
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.06	0.64	0.20	0.35
Efficiency (%)	-	-	50	-
Output Power (W)	-	-	0.50	0.69
Speed (rpm)	12623	-	9602	6312
Torque (mNm)	-	2.09	0.50	1.05

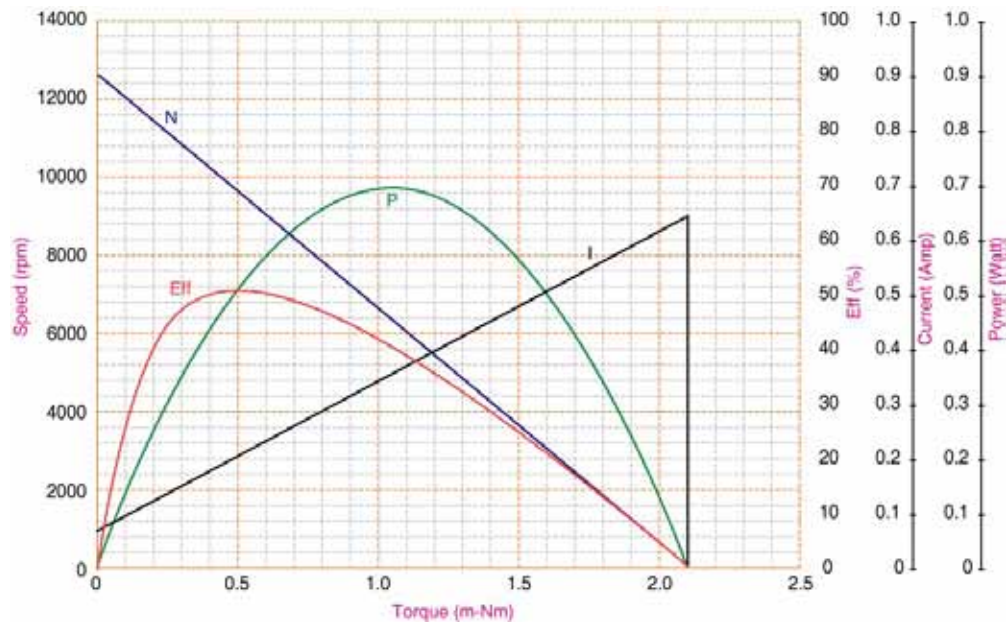
**Application Examples:**

Locks, Door Locks

Drawing:



Performance Curves:



Units in Metric

Ø < 20.0 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 20.4 X 15.4 X 32.1 mm
Shaft Diameter	: Ø 2.000 mm
Input Voltage	: 13.0 V DC
No Load Speed	: 25000 rpm
No Load Current	: 0.20 A
Nominal Speed	: 22000 rpm
Nominal Torque	: 3.00 mNm
Nominal Current	: 0.80 A
Stall Torque	: 20.00 mNm
Stall Current	: 4.50 A
Maximum Output Power	: 15.00 W
Maximum Efficiency	: 65 %
Torque at Maximum Efficiency	: 4.00 mNm
Speed at Maximum Efficiency	: 21000 rpm
Life (typical)	: 100 hr
Weight	: 35 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: terminals



Ø 20.0 – 24.9 mm

**Performance Data:**

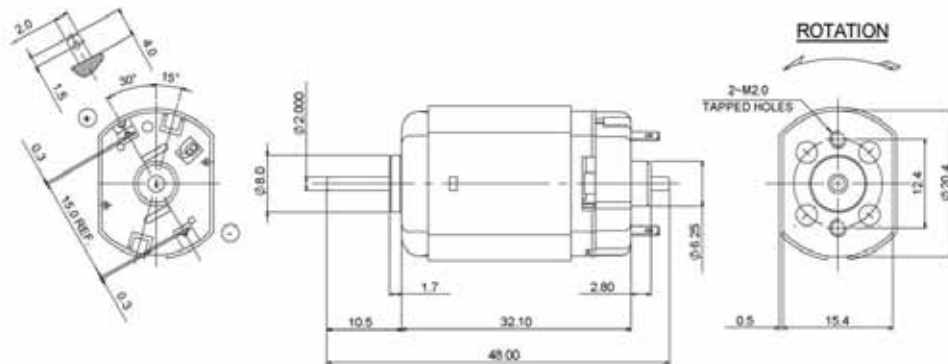
	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.20	4.50	1.00	2.50
Efficiency (%)	-	-	65	45
Output Power (W)	-	-	8.00	15.00
Speed (rpm)	25000	-	21000	12500
Torque (mNm)	-	20.00	4.00	10.00

**Application Examples:**

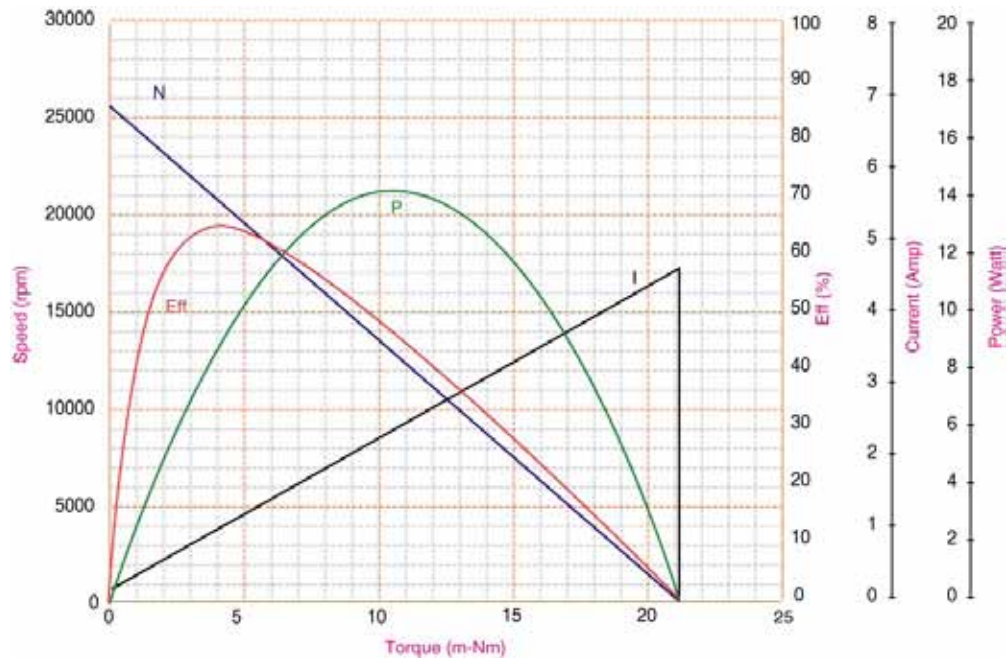
Hair Dryers



Drawing:



Performance Curves:



Units in Metric

Ø 20.0 – 24.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 20.4 X 15.4 X 32.1 mm
Shaft Diameter	: Ø 2.000 mm
Input Voltage	: 2.4 V DC
No Load Speed	: 6200 rpm
No Load Current	: 0.08 A
Nominal Speed	: 5300 rpm
Nominal Torque	: 1.20 mNm
Nominal Current	: 0.40 A
Stall Torque	: 8.00 mNm
Stall Current	: 2.50 A
Maximum Output Power	: 1.30 W
Maximum Efficiency	: 65 %
Torque at Maximum Efficiency	: 1.20 mNm
Speed at Maximum Efficiency	: 5300 rpm
Noise Level	: 50 dB(A)
Life (typical)	: 60 hr
Weight	: 30 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminals



Ø 20.0 – 24.9 mm

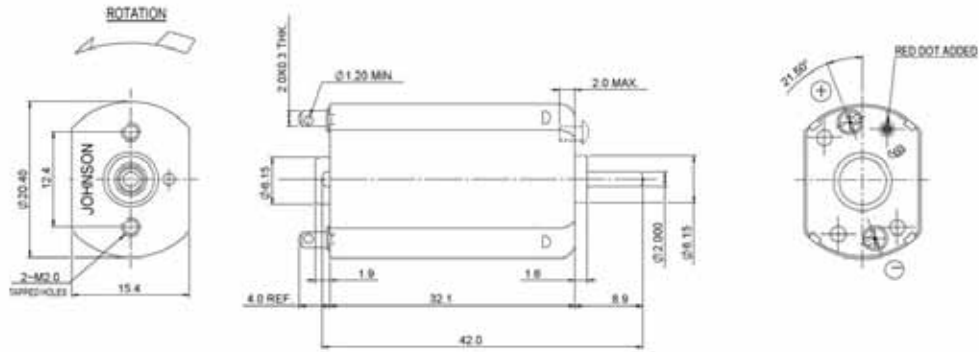
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.08	2.50	0.40	1.20
Efficiency (%)	-	-	65	45
Output Power (W)	-	-	0.70	1.30
Speed (rpm)	6200	-	5300	3000
Torque (mNm)	-	8.00	1.20	4.00

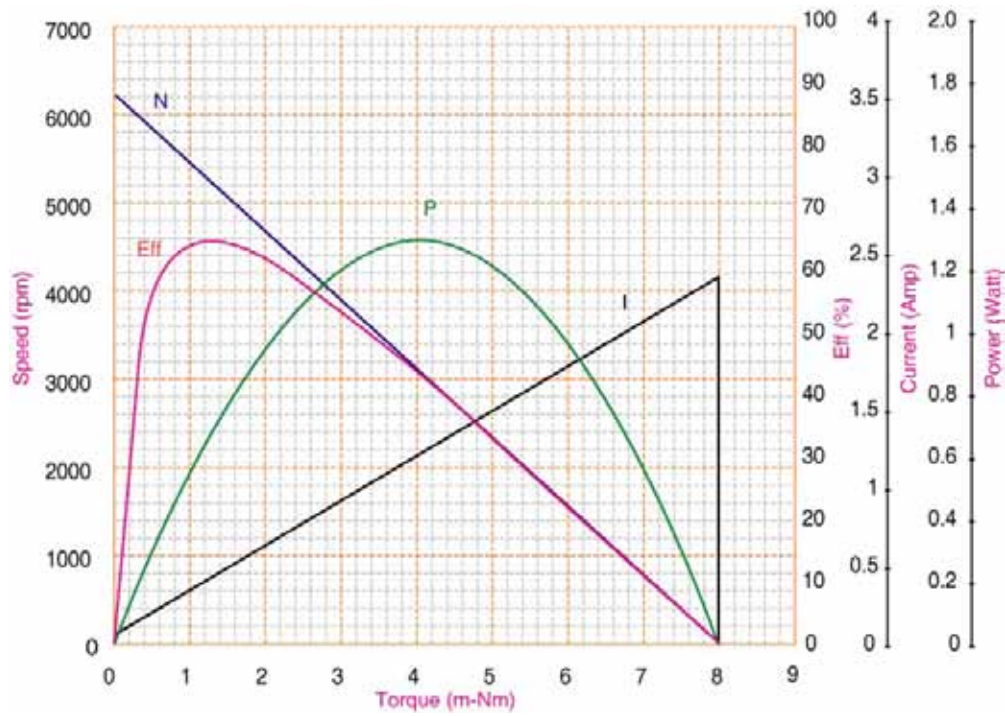
**Application Examples:**

Shavers

Drawing:



Performance Curves:



Units in Metric

Ø 20.0 – 24.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 24.2 X 18.3 X 30.5 mm
Shaft Diameter	: Ø 2.000 mm
Input Voltage	: 2.4 V DC
No Load Speed	: 7000 rpm
No Load Current	: 0.18 A
Nominal Speed	: 6500 rpm
Nominal Torque	: 2.00 mNm
Nominal Current	: 0.80 A
Stall Torque	: 26.00 mNm
Stall Current	: 9.00 A
Maximum Output Power	: 5.00 W
Maximum Efficiency	: 70 %
Torque at Maximum Efficiency	: 3.00 mNm
Speed at Maximum Efficiency	: 6000 rpm
Life (typical)	: 100 hr
Weight	: 45 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: terminals



Ø 20.0 – 24.9 mm

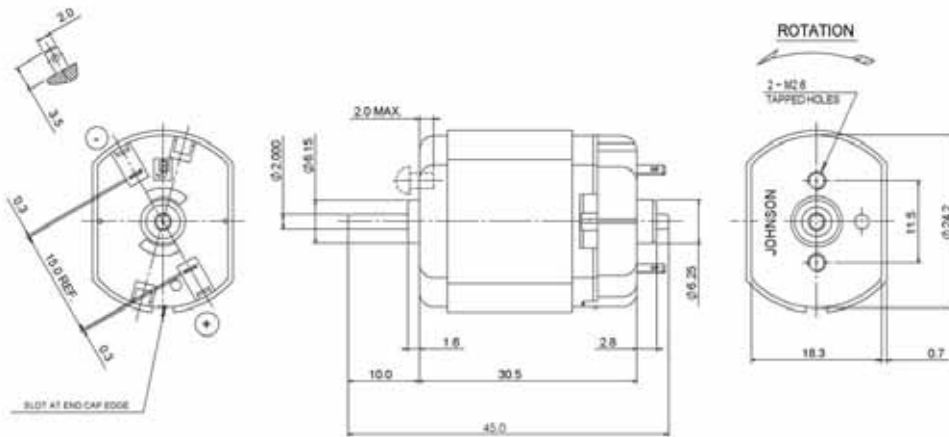
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.18	9.00	1.30	4.50
Efficiency (%)	-	-	70	40
Output Power (W)	-	-	2.00	5.00
Speed (rpm)	7000	-	6000	3500
Torque (mNm)	-	26.00	3.00	13.00

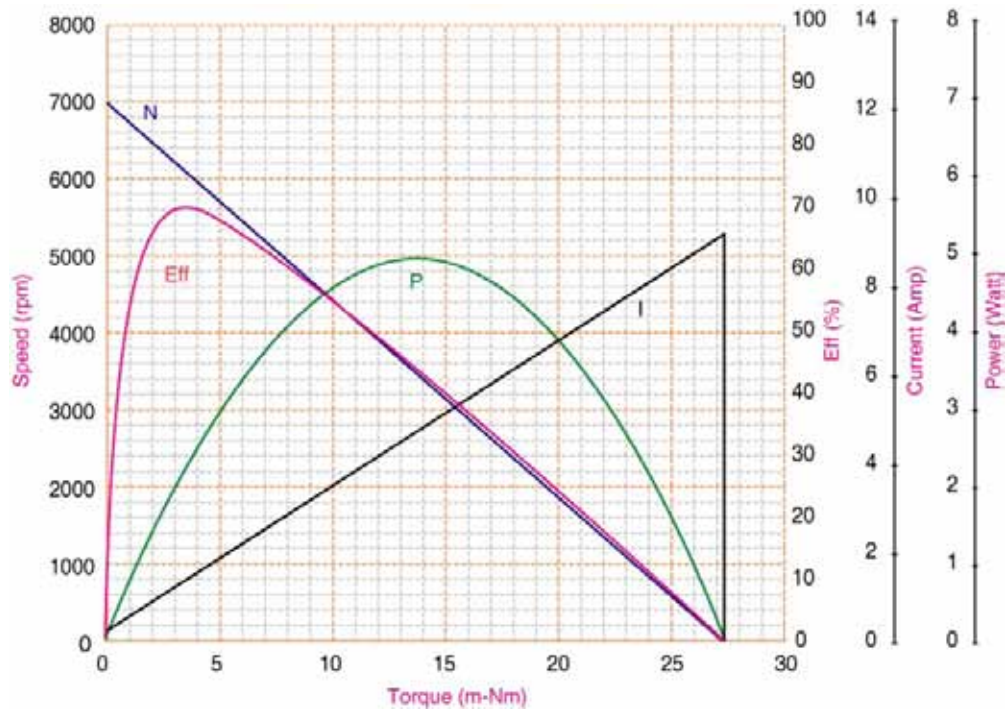
**Application Examples:**

Hair Clipper, Trimmer

Drawing:



Performance Curves:



Units in Metric

Ø 20.0 – 24.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 24.2 X 18.3 X 30.5 mm
Shaft Diameter	: Ø 2.000 mm
Input Voltage	: 1.2 V DC
No Load Speed	: 7800 rpm
No Load Current	: 0.40 A
Nominal Speed	: 7000 rpm
Nominal Torque	: 1.50 mNm
Nominal Current	: 1.50 A
Stall Torque	: 12.00 mNm
Stall Current	: 10.00 A
Maximum Output Power	: 2.50 W
Maximum Efficiency	: 60 %
Torque at Maximum Efficiency	: 2.00 mNm
Speed at Maximum Efficiency	: 6500 rpm
Life (typical)	: 100 hr
Weight	: 35 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: terminals



Ø 20.0 – 24.9 mm

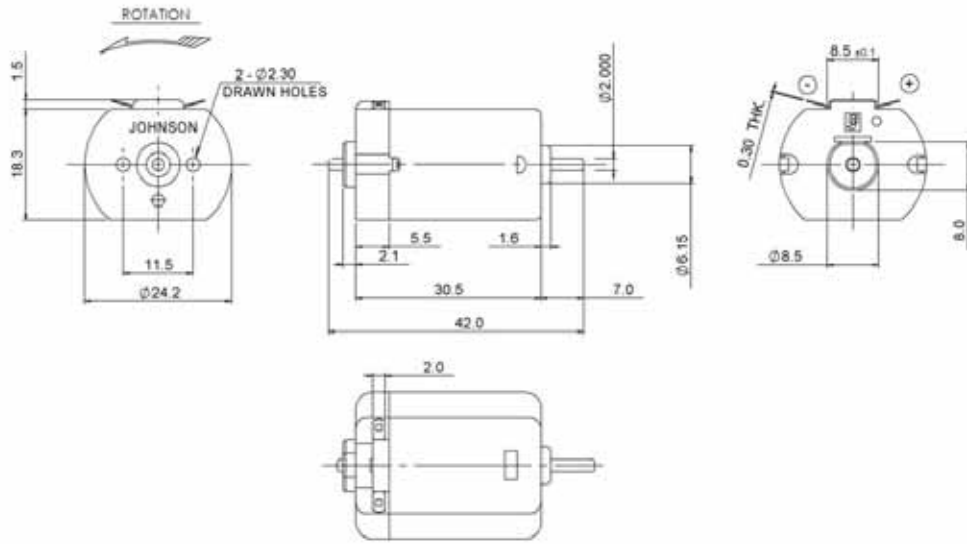
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.40	10.00	2.00	5.00
Efficiency (%)	-	-	60	40
Output Power (W)	-	-	1.50	2.50
Speed (rpm)	7800	-	6500	4000
Torque (mNm)	-	12.00	2.00	6.00

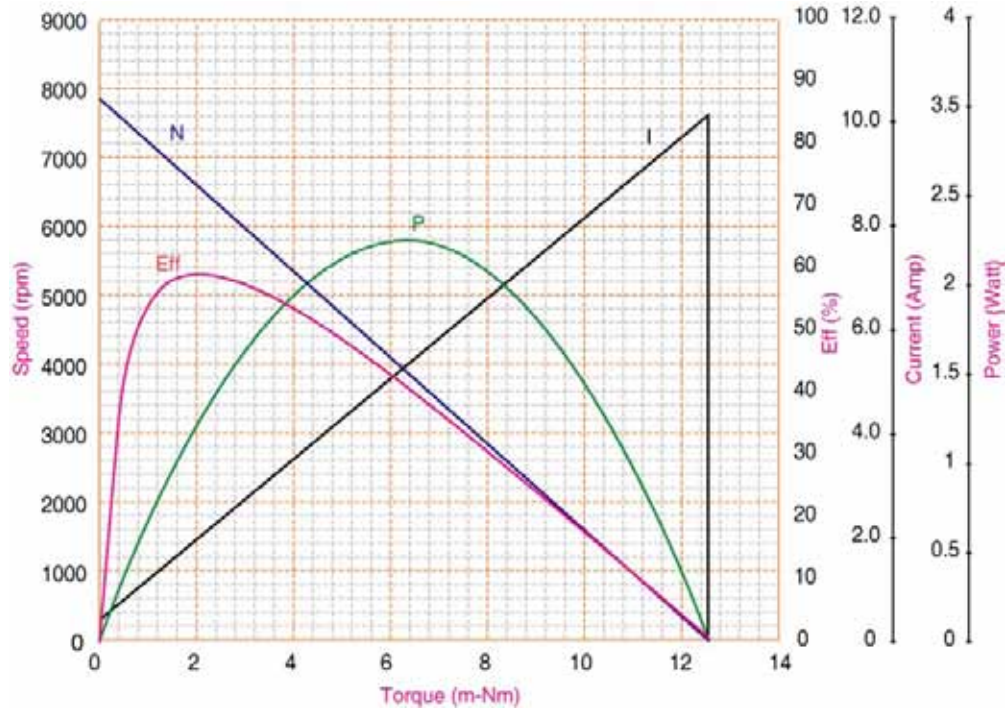
**Application Examples:**

Hair Clipper, Trimmer

Drawing:



Performance Curves:



Units in Metric

$\phi$  20.0 – 24.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 24.2 X 18.3 X 36.0 mm
Shaft Diameter	: Ø 2.000 mm
Input Voltage	: 24.0 V DC
No Load Speed	: 26000 rpm
No Load Current	: 0.20 A
Nominal Speed	: 23000 rpm
Nominal Torque	: 10.00 mNm
Nominal Current	: 1.50 A
Stall Torque	: 85.00 mNm
Stall Current	: 10.00 A
Maximum Output Power	: 60.00 W
Maximum Efficiency	: 70 %
Torque at Maximum Efficiency	: 10.00 mNm
Speed at Maximum Efficiency	: 23000 rpm
Life (typical)	: 100 hr
Weight	: 55 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: terminals



Ø 20.0 – 24.9 mm

**Performance Data:**

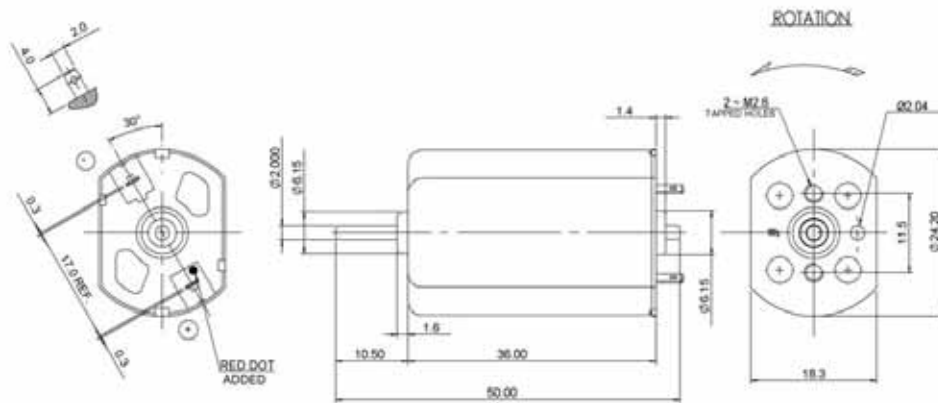
	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.20	10.00	1.50	5.50
Efficiency (%)	-	-	70	45
Output Power (W)	-	-	25.00	60.00
Speed (rpm)	26000	-	23000	13000
Torque (mNm)	-	85.00	10.00	40.00

**Application Examples:**

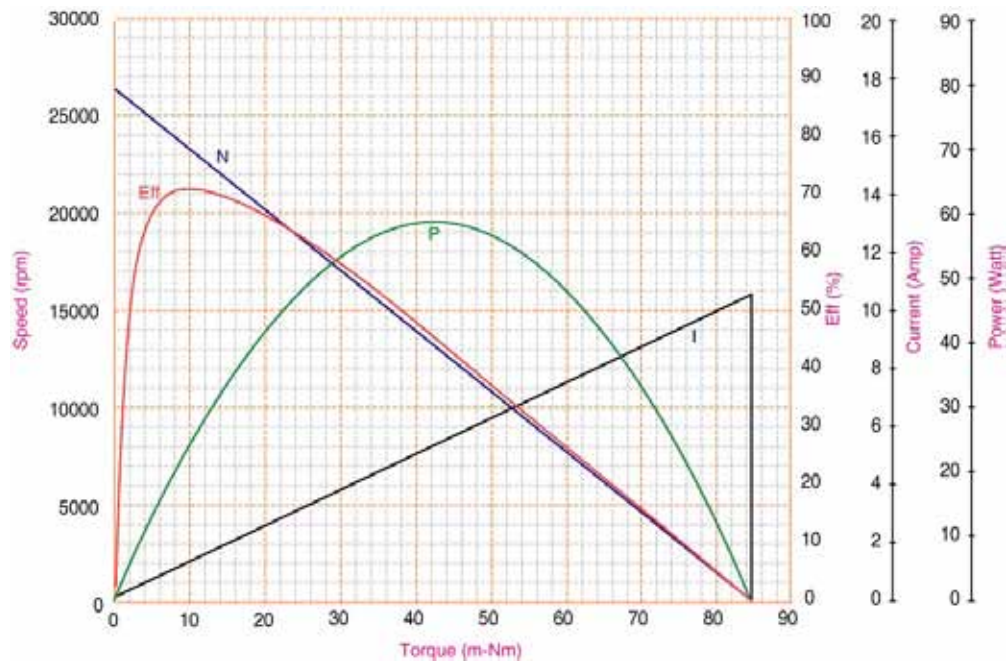
Hair Dryers



Drawing:



Performance Curves:



Units in Metric

Ø 20.0 – 24.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 24.0 X 30.5 mm
Shaft Diameter	: Ø 2.000 mm
Input Voltage	: 21.0 V DC
No Load Speed	: 30000 rpm
No Load Current	: 0.30 A
Nominal Speed	: 26500 rpm
Nominal Torque	: 4.00 mNm
Nominal Current	: 1.50 A
Stall Torque	: 40.00 mNm
Stall Current	: 7.00 A
Maximum Output Power	: 32.00 W
Maximum Efficiency	: 60 %
Torque at Maximum Efficiency	: 7.00 mNm
Speed at Maximum Efficiency	: 25000 rpm
Life (typical)	: 80 hr
Weight	: 45 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminals



Ø 20.0 – 24.9 mm

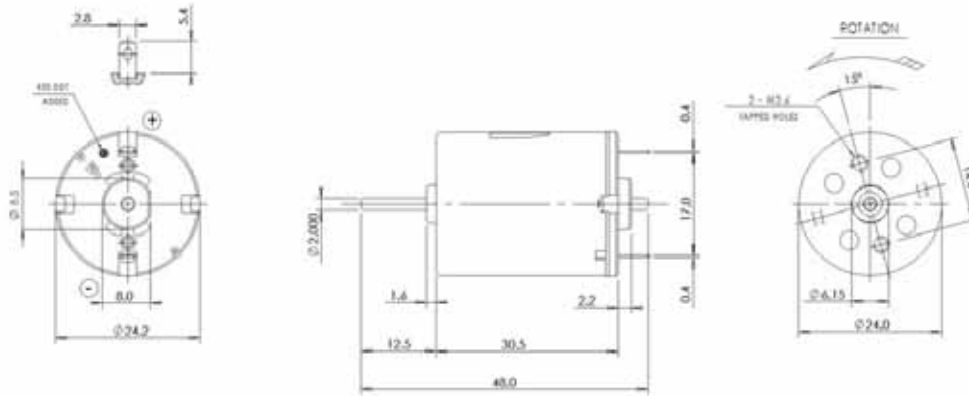
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.30	7.00	1.50	4.00
Efficiency (%)	-	-	60	45
Output Power (W)	-	-	20.00	32.00
Speed (rpm)	30000	-	25000	14800
Torque (mNm)	-	40.00	7.00	20.00

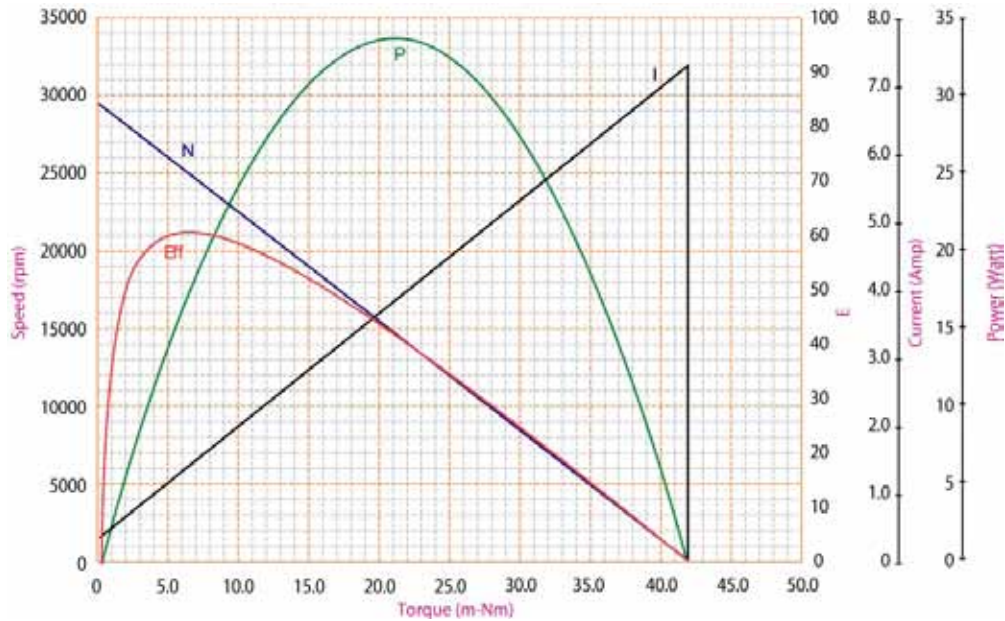
**Application Examples:**

Hair Care, Hair Dryers, Hair Curlers

Drawing:



Performance Curves:



Units in Metric

Ø 20.0 – 24.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 24.4 X 30.8 mm
Shaft Diameter	: Ø 2.000 mm
Input Voltage	: 12.0 V DC
No Load Speed	: 8200 rpm
No Load Current	: 0.65 A
Stall Torque	: 25.50 mNm
Stall Current	: 2.10 A
Maximum Output Power	: 5.50 W
Maximum Efficiency	: 62 %
Speed at Maximum Efficiency	: 7000 rpm
Life (typical)	: 50 hr
Weight	: 52 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminal



Ø 20.0 – 24.9 mm

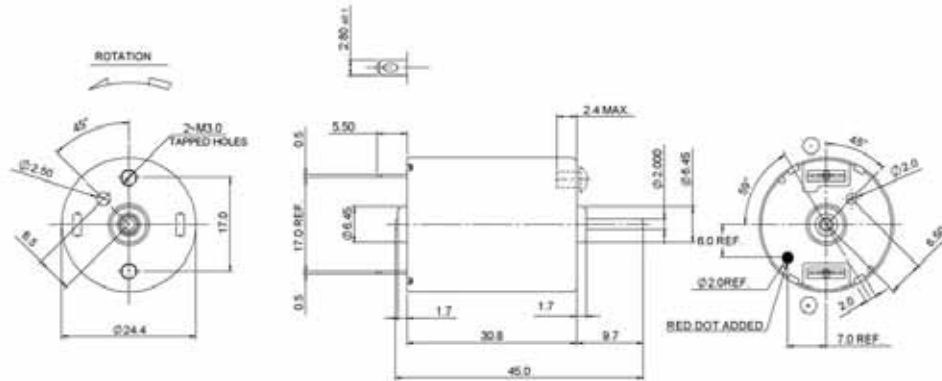
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.65	2.10	0.37	1.10
Efficiency (%)	-	-	62	-
Output Power (W)	-	-	2.80	5.50
Speed (rpm)	8200	-	7000	4100
Torque (mNm)	-	25.50	3.80	12.80

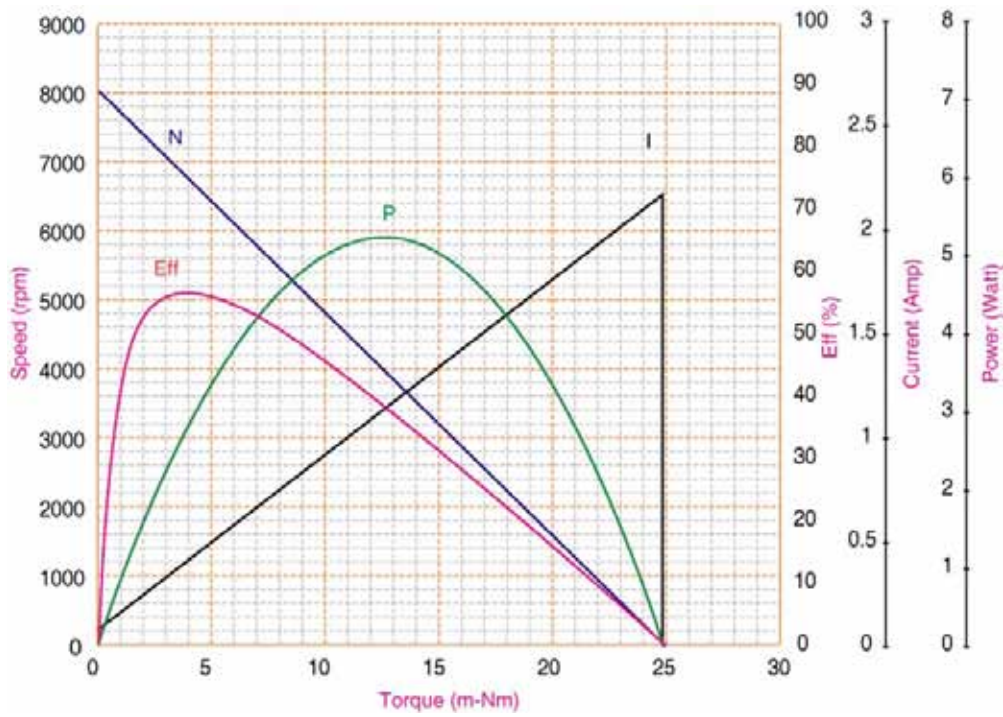
**Application Examples:**

Printers, Paper Feeds

Drawing:



Performance Curves:



Units in Metric

Ø 20.0 – 24.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 27.5 X 32.5 mm
Shaft Diameter	: Ø 2.305 mm
Input Voltage	: 24.0 V DC
No Load Speed	: 7200 rpm
No Load Current	: 0.05 A
Nominal Speed	: 5800 rpm
Nominal Torque	: 4.00 mNm
Nominal Current	: 0.18 A
Stall Torque	: 20.00 mNm
Stall Current	: 0.70 A
Maximum Output Power	: 4.00 W
Maximum Efficiency	: 55 %
Torque at Maximum Efficiency	: 4.80 mNm
Speed at Maximum Efficiency	: 5600 rpm
Life (typical)	: 150 hr
Weight	: 50 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminals



Ø 25.0 – 29.9 mm

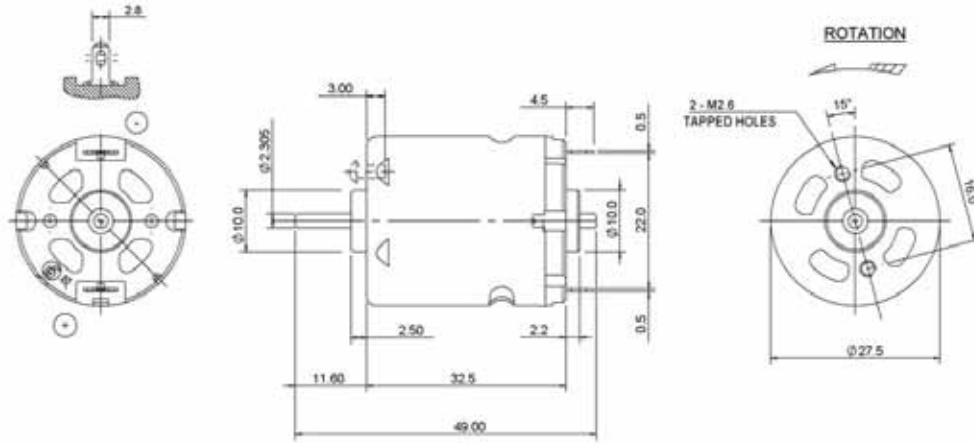
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.05	0.70	0.20	0.40
Efficiency (%)	-	-	55	45
Output Power (W)	-	-	3.00	4.00
Speed (rpm)	7200	-	5600	3500
Torque (mNm)	-	20.00	4.80	10.00

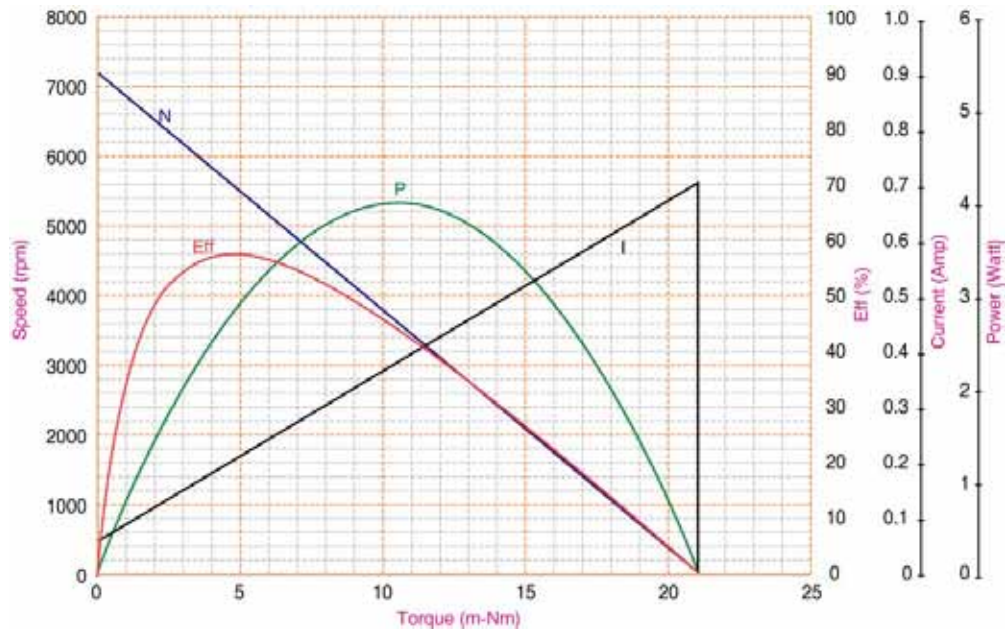
**Application Examples:**

Massagers, Facial Massager

Drawing:



Performance Curves:



Units in Metric

Ø 25.0 – 29.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 27.5 X 32.5 mm
Shaft Diameter	: Ø 2.305 mm
Input Voltage	: 41.0 V DC
No Load Speed	: 18000 rpm
No Load Current	: 0.05 A
Nominal Speed	: 16500 rpm
Nominal Torque	: 2.50 mNm
Nominal Current	: 0.18 A
Stall Torque	: 38.00 mNm
Stall Current	: 2.00 A
Maximum Output Power	: 18.00 W
Maximum Efficiency	: 65 %
Torque at Maximum Efficiency	: 6.00 mNm
Speed at Maximum Efficiency	: 15000 rpm
Life (typical)	: 150 hr
Weight	: 50 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: terminals



Ø 25.0 – 29.9 mm

**Performance Data:**

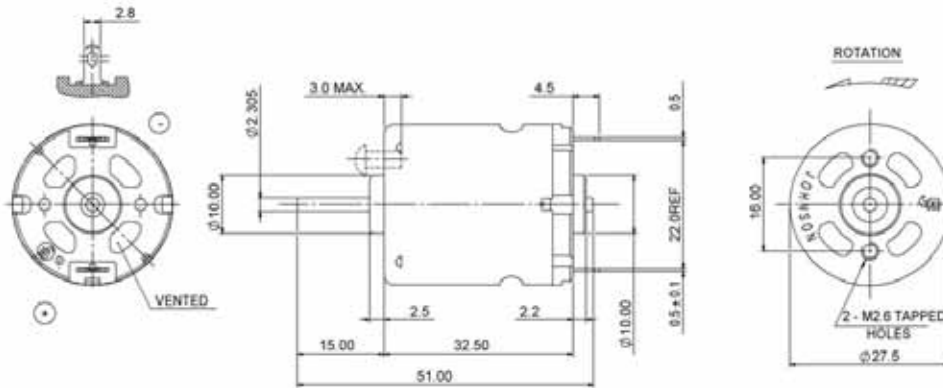
	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.05	2.00	0.35	1.00
Efficiency (%)	-	-	65	45
Output Power (W)	-	-	10.00	18.00
Speed (rpm)	18000	-	15000	9000
Torque (mNm)	-	38.00	6.00	20.00

**Application Examples:**

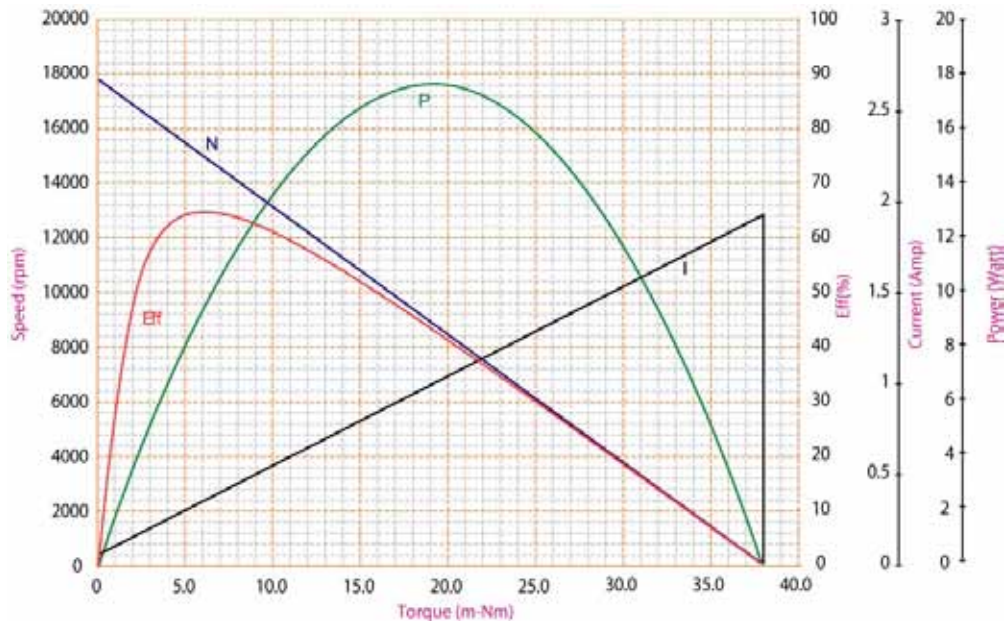
Massagers



Drawing:



Performance Curves:



Units in Metric

Ø 25.0 – 29.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 27.5 X 32.5 mm
Shaft Diameter	: Ø 2.305 mm
Input Voltage	: 18.0 V DC
No Load Speed	: 9987 rpm
No Load Current	: 0.13 A
Stall Torque	: 39.24 mNm
Stall Current	: 2.70 A
Maximum Output Power	: 10.20 W
Maximum Efficiency	: 57 %
Speed at Maximum Efficiency	: 8200 rpm
Life (typical)	: 500 hr
Weight	: 57 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminal



Ø 25.0 – 29.9 mm

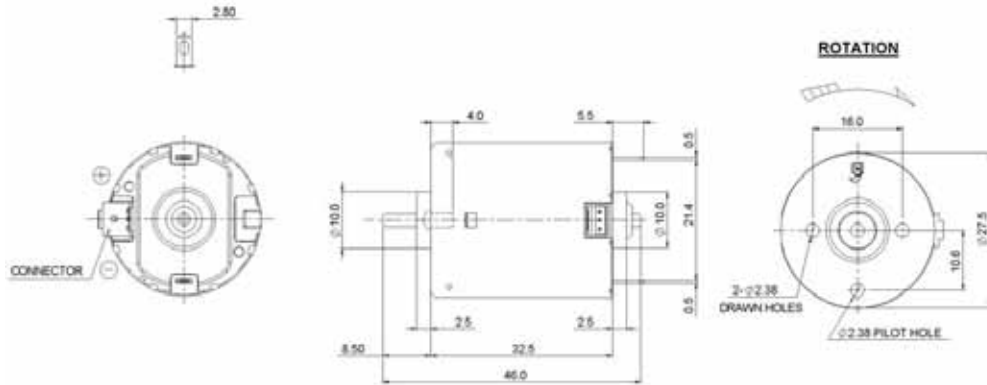
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.13	2.70	0.60	1.41
Efficiency (%)	-	-	57	-
Output Power (W)	-	-	6.09	10.20
Speed (rpm)	9987	-	8200	4994
Torque (mNm)	-	39.24	7.10	19.62

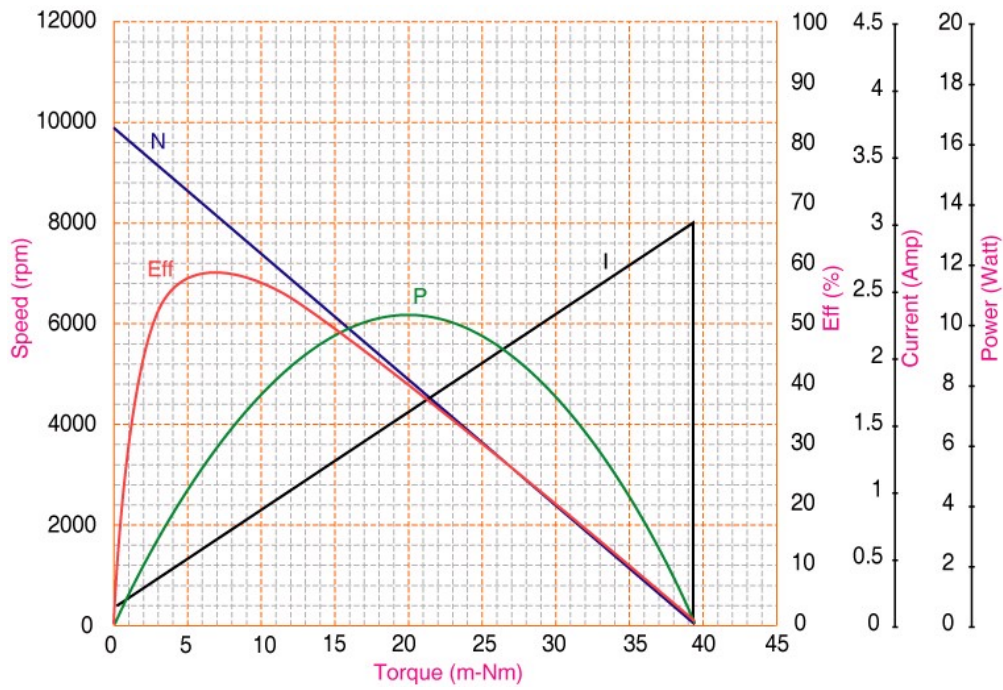
**Application Examples:**

Printers, Paper Feeds, Paper Feeder

Drawing:



Performance Curves:



Units in Metric

Ø 25.0 – 29.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 27.5 X 38.0 mm
Shaft Diameter	: Ø 2.305 mm
Input Voltage	: 39.0 V DC
No Load Speed	: 21000 rpm
No Load Current	: 0.15 A
Nominal Speed	: 16800 rpm
Nominal Torque	: 14.00 mNm
Nominal Current	: 0.80 A
Stall Torque	: 70.00 mNm
Stall Current	: 4.00 A
Maximum Output Power	: 40.00 W
Maximum Efficiency	: 70 %
Torque at Maximum Efficiency	: 10.00 mNm
Speed at Maximum Efficiency	: 17500 rpm
Life (typical)	: 150 hr
Weight	: 66 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminals



Ø 25.0 – 29.9 mm

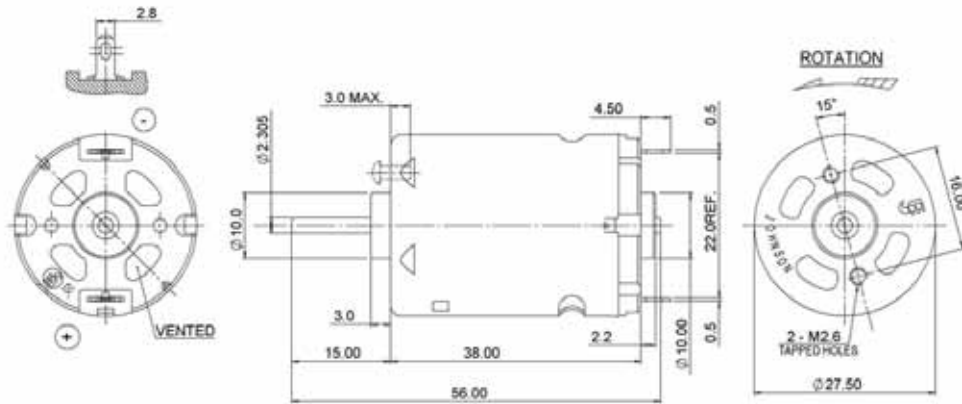
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.15	4.00	0.70	2.00
Efficiency (%)	-	-	70	48
Output Power (W)	-	-	20.00	40.00
Speed (rpm)	21000	-	17500	10000
Torque (mNm)	-	70.00	10.00	35.00

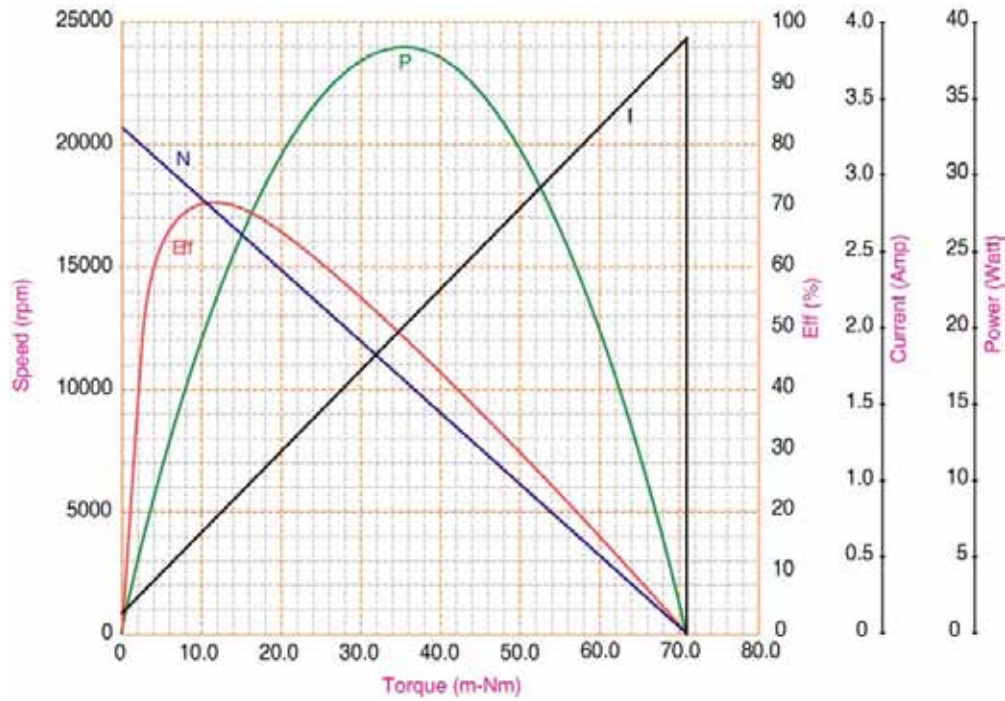
**Application Examples:**

Hair Dryers

Drawing:



Performance Curves:



Units in Metric

Ø 25.0 – 29.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 27.5 X 38.0 mm
Shaft Diameter	: Ø 2.305 mm
Input Voltage	: 24.0 V DC
No Load Speed	: 22000 rpm
No Load Current	: 0.20 A
Nominal Speed	: 18500 rpm
Nominal Torque	: 10.00 mNm
Nominal Current	: 1.20 A
Stall Torque	: 60.00 mNm
Stall Current	: 6.00 A
Maximum Output Power	: 35.00 W
Maximum Efficiency	: 70 %
Torque at Maximum Efficiency	: 10.00 mNm
Speed at Maximum Efficiency	: 18500 rpm
Life (typical)	: 150 hr
Weight	: 65 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: terminals



Ø 25.0 – 29.9 mm

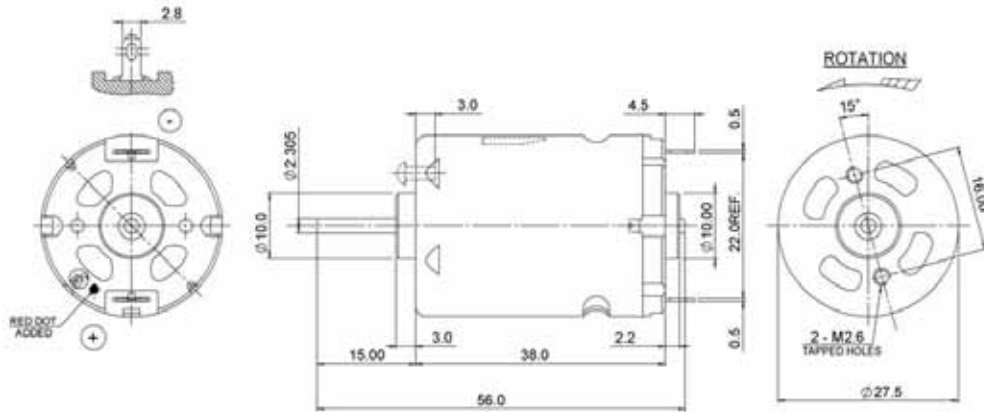
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.20	6.00	1.20	3.00
Efficiency (%)	-	-	70	45
Output Power (W)	-	-	20.00	35.00
Speed (rpm)	22000	-	18500	11000
Torque (mNm)	-	60.00	10.00	30.00

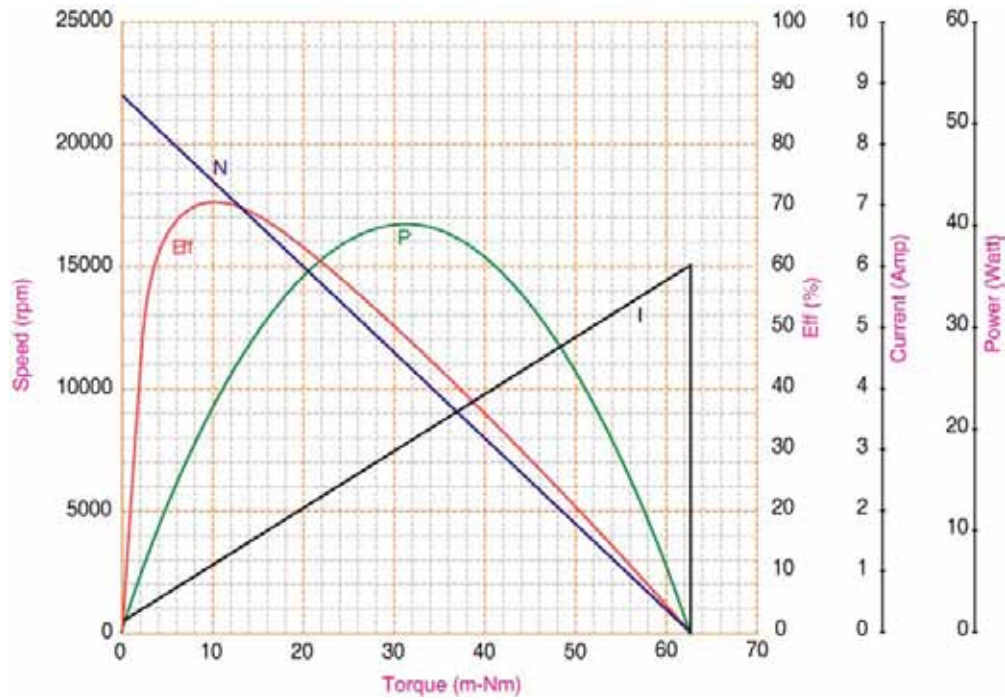
**Application Examples:**

Hair Dryers

Drawing:



Performance Curves:



Units in Metric

Ø 25.0 – 29.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 27.5 X 46.5 mm
Shaft Diameter	: Ø 2.305 mm
Input Voltage	: 7.2 V DC
No Load Speed	: 17230 rpm
No Load Current	: 0.90 A
Stall Torque	: 114.86 mNm
Stall Current	: 32.37 A
Maximum Output Power	: 51.24 W
Maximum Efficiency	: 64 %
Speed at Maximum Efficiency	: 14600 rpm
Weight	: 100 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminal



Ø 25.0 – 29.9 mm

**Performance Data:**

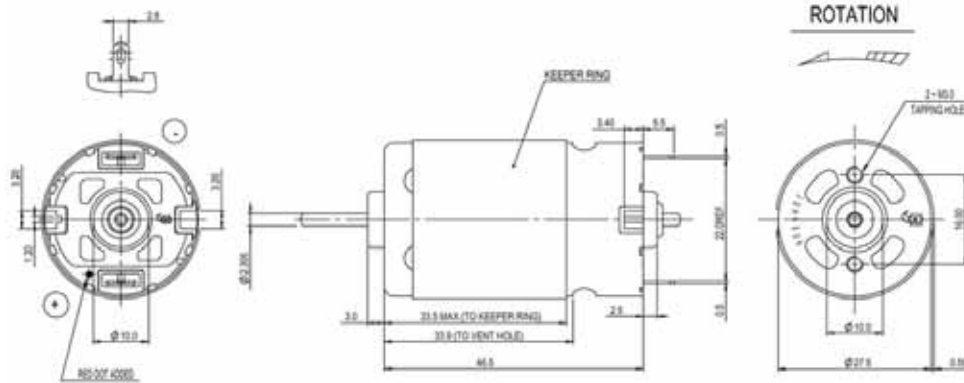
	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.90	32.37	5.37	15.41
Efficiency (%)	-	-	64	43
Output Power (W)	-	-	25.01	47.80
Speed (rpm)	17230	-	14612	8564
Torque (mNm)	-	114.86	16.34	53.34

**Application Examples:**

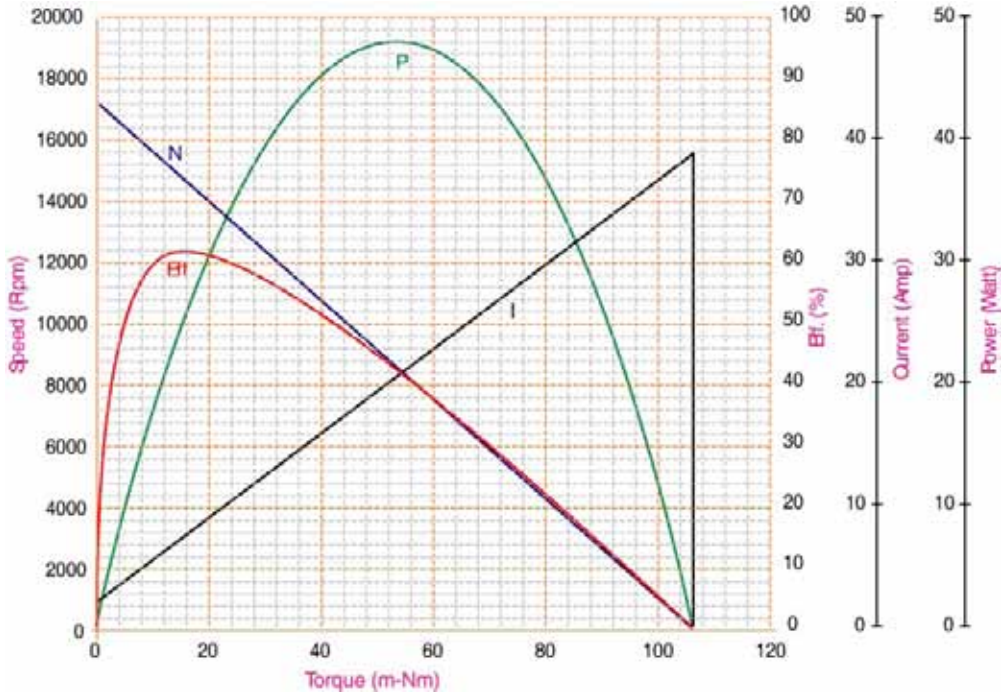
Screw Drivers, Power Equipment



Drawing:



Performance Curves:



Units in Metric

Ø 25.0 – 29.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 27.5 X 46.5 mm
Shaft Diameter	: Ø 2.305 mm
Input Voltage	: 36.0 V DC
No Load Speed	: 11000 rpm
No Load Current	: 0.10 A
Nominal Speed	: 9700 rpm
Nominal Torque	: 13.00 mNm
Nominal Current	: 0.50 A
Stall Torque	: 90.00 mNm
Stall Current	: 3.00 A
Maximum Output Power	: 25.00 W
Maximum Efficiency	: 70 %
Torque at Maximum Efficiency	: 12.00 mNm
Speed at Maximum Efficiency	: 9500 rpm
Life (typical)	: 150 hr
Weight	: 90 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: terminals



Ø 25.0 – 29.9 mm

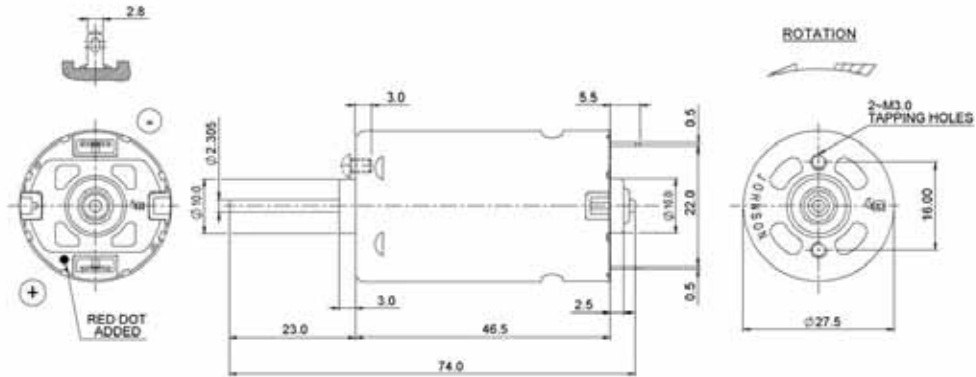
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.10	3.00	0.45	1.50
Efficiency (%)	-	-	70	45
Output Power (W)	-	-	12.00	25.00
Speed (rpm)	11000	-	9500	5500
Torque (mNm)	-	90.00	12.00	45.00

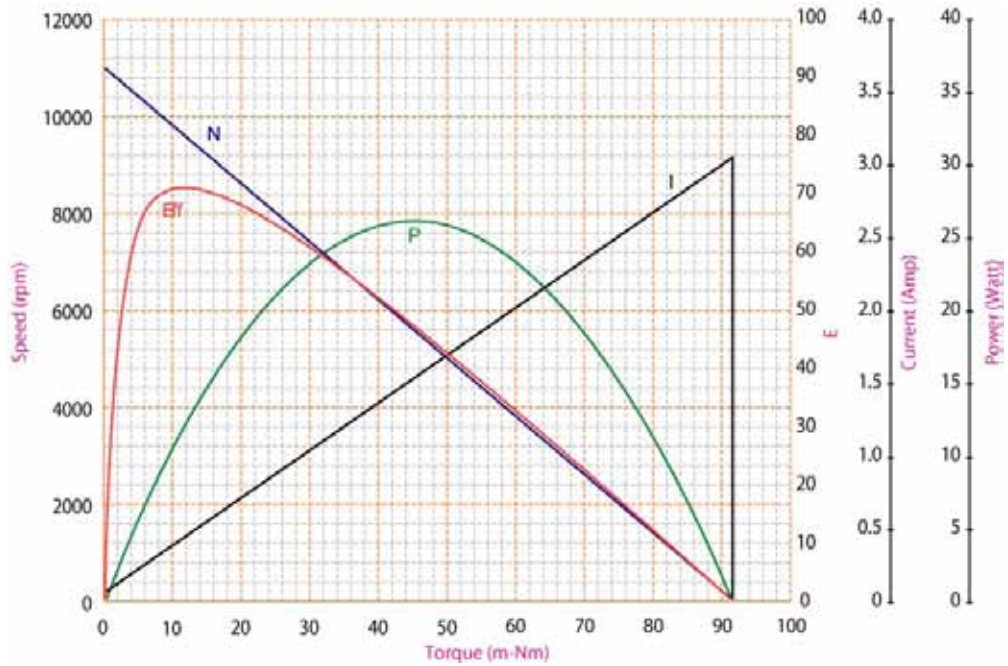
**Application Examples:**

Foot Massagers

Drawing:



Performance Curves:



Units in Metric

Ø 25.0 – 29.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 27.5 X 46.5 mm
Shaft Diameter	: Ø 2.305 mm
Input Voltage	: 28.0 V DC
No Load Speed	: 19000 rpm
No Load Current	: 0.20 A
Nominal Speed	: 16000 rpm
Nominal Torque	: 22.00 mNm
Nominal Current	: 1.80 A
Stall Torque	: 140.00 mNm
Stall Current	: 10.00 A
Maximum Output Power	: 70.00 W
Maximum Efficiency	: 75 %
Torque at Maximum Efficiency	: 15.00 mNm
Speed at Maximum Efficiency	: 17000 rpm
Life (typical)	: 175 hr
Weight	: 100 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: terminals



Ø 25.0 – 29.9 mm

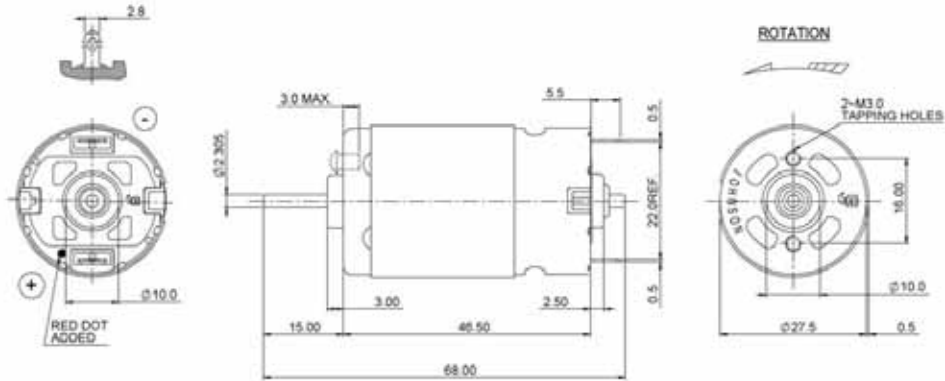
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.20	10.00	1.30	5.50
Efficiency (%)	-	-	75	45
Output Power (W)	-	-	30.00	70.00
Speed (rpm)	19000	-	17000	9400
Torque (mNm)	-	140.00	15.00	70.00

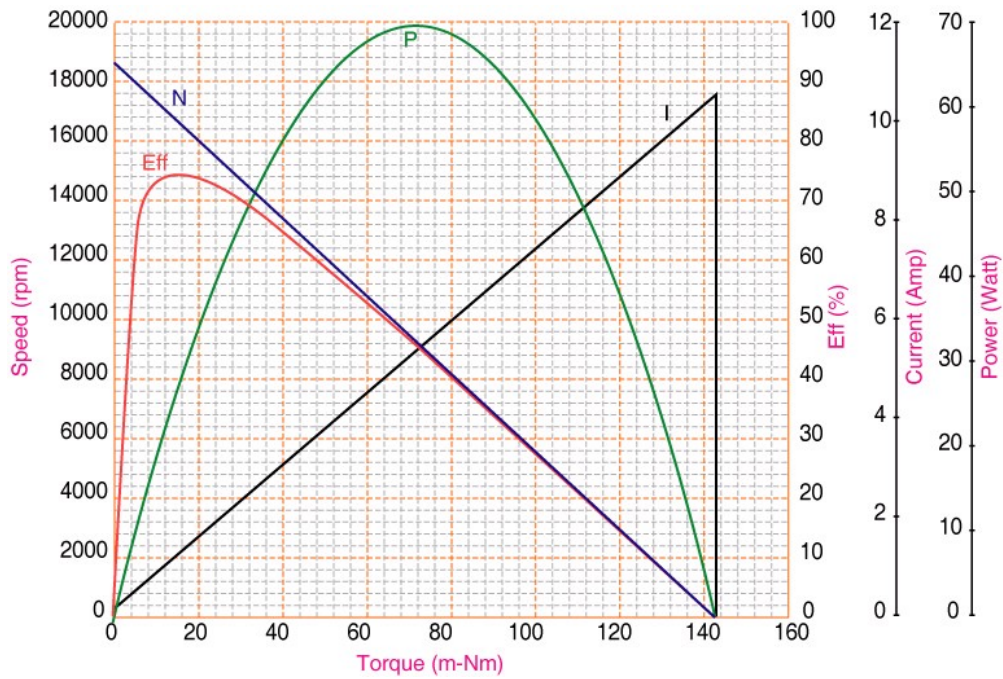
**Application Examples:**

Hair Dryers

Drawing:



Performance Curves:



Units in Metric

Ø 25.0 – 29.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 29.0 X 47.0 mm
Shaft Diameter	: Ø 3.175 mm
Input Voltage	: 42.0 V DC
No Load Speed	: 6400 rpm
No Load Current	: 0.06 A
Stall Torque	: 92.00 mNm
Stall Current	: 1.60 A
Maximum Output Power	: 15.50 W
Maximum Efficiency	: 64 %
Speed at Maximum Efficiency	: 5380 rpm
Life (typical)	: 240 hr
Weight	: 122 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminal



Ø 25.0 – 29.9 mm

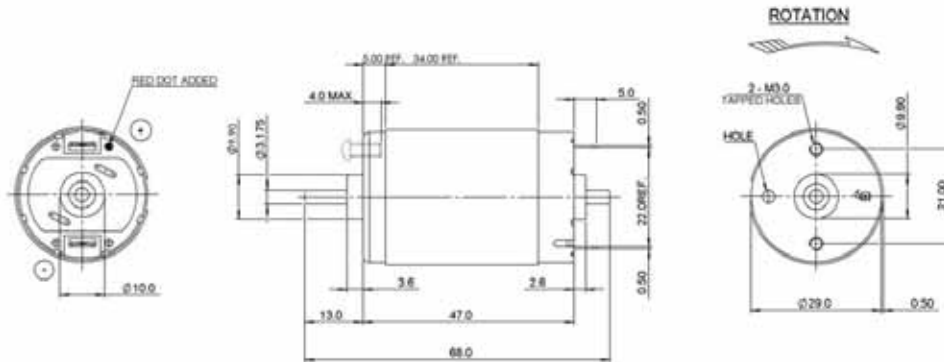
**Performance Data:**

	No Load	Stall	Max Efficiency	Max Power
Current (A)	0.06	1.60	0.30	0.83
Efficiency (%)	-	-	64	-
Output Power (W)	-	-	8.00	15.50
Speed (rpm)	6400	-	5380	3200
Torque (mNm)	-	92.00	14.80	46.30

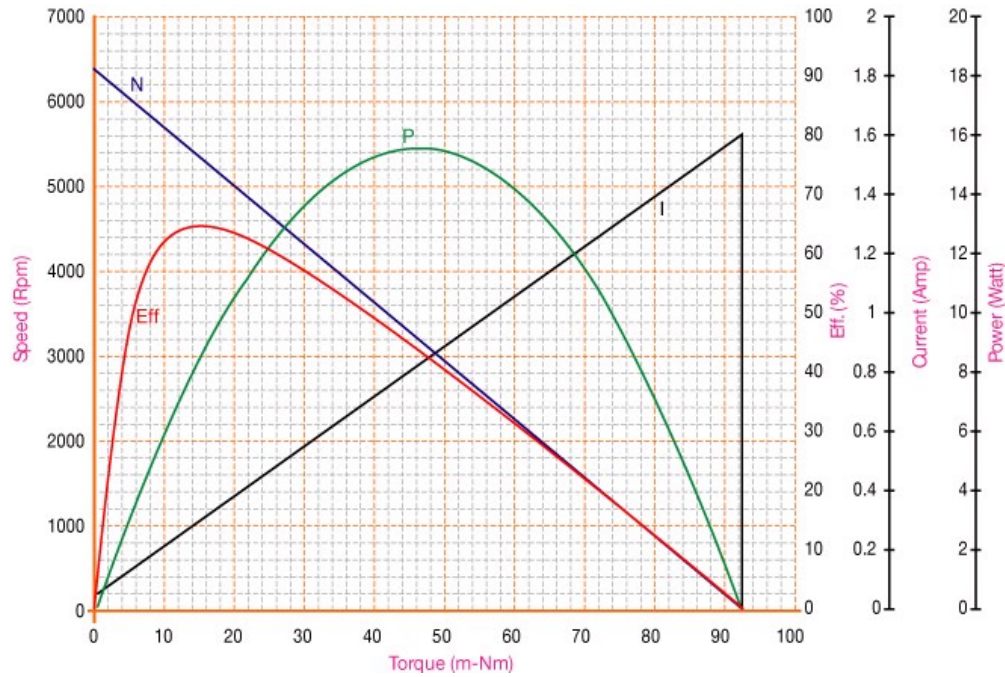
**Application Examples:**

Printers, Paper Feeds

Drawing:



Performance Curves:



Units in Metric

Ø 25.0 – 29.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 42.3 X 67.0 mm
Shaft Diameter	: Ø 5.005 mm
Input Voltage	: 18.0 V DC
No Load Speed	: 20950 rpm
No Load Current	: 2.90 A
Stall Torque	: 1175.03 mNm
Stall Current	: 138.64 A
Maximum Output Power	: 644.74 W
Maximum Efficiency	: 78 %
Speed at Maximum Efficiency	: 18300 rpm
Life (typical)	: 18 hr
Weight	: 380 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminal



Ø 40.0 – 44.9 mm

**Performance Data:**

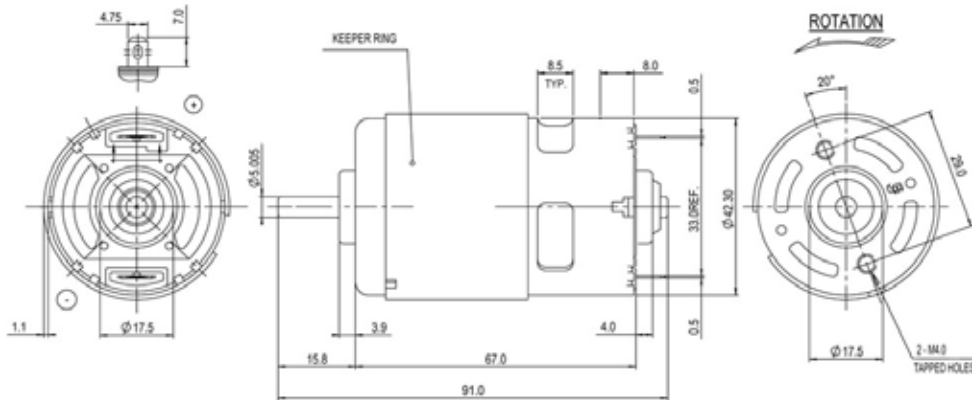
	No Load	Stall	Max Efficiency	Max Power
Current (A)	2.90	138.64	19.99	70.76
Efficiency (%)	-	-	78	50
Output Power (W)	-	-	-	644.74
Speed (rpm)	20950	-	18310	10475
Torque (mNm)	-	1175.03	148.10	587.51

**Application Examples:**

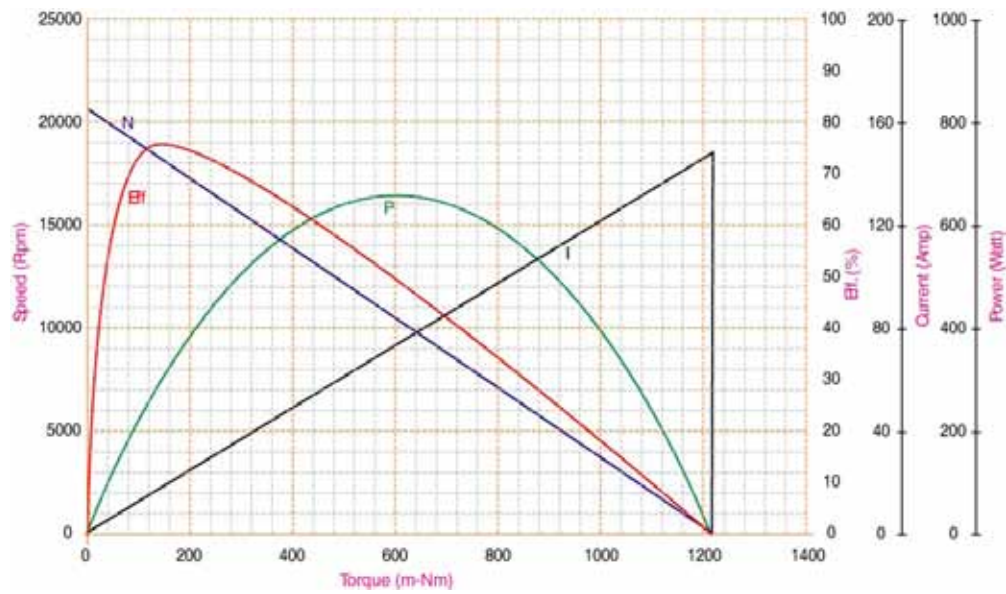
Drills, Power Equipment



Drawing:



Performance Curves:



Units in Metric

$\phi 40.0 - 44.9$  mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 48.0 X 50.5 mm
Shaft Diameter	: Ø 4.005 mm
Input Voltage	: 14.4 V DC
No Load Speed	: 20120 rpm
No Load Current	: 3.80 A
Stall Torque	: 787.72 mNm
Stall Current	: 124.99 A
Maximum Output Power	: 415.00 W
Maximum Efficiency	: 66 %
Speed at Maximum Efficiency	: 17000 rpm
Weight	: 320 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Lead wire



**Performance Data:**

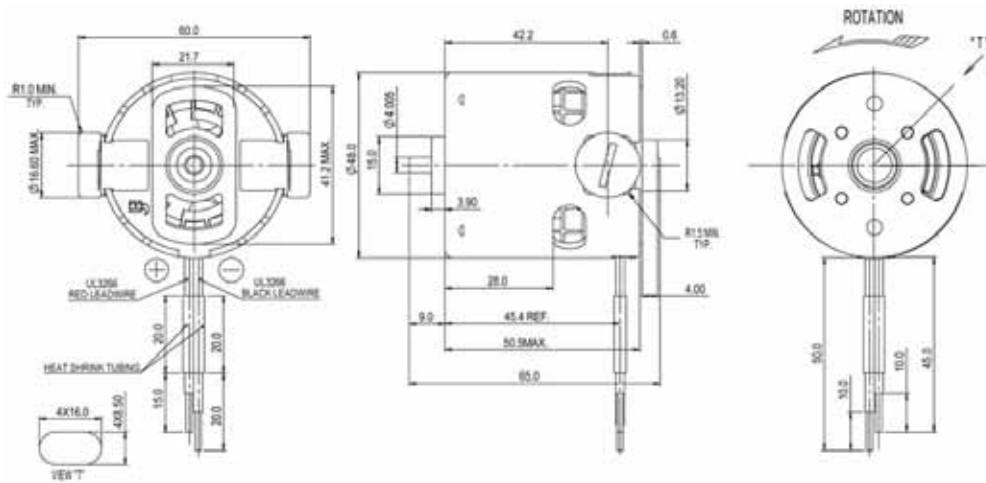
	No Load	Stall	Max Efficiency	Max Power
Current (A)	3.80	124.99	21.78	64.39
Efficiency (%)	-	-	66	-
Output Power (W)	-	-	209.86	415.00
Speed (rpm)	20120	-	17134	10060
Torque (mNm)	-	787.72	116.91	393.86

Ø 45.0 – 49.9 mm

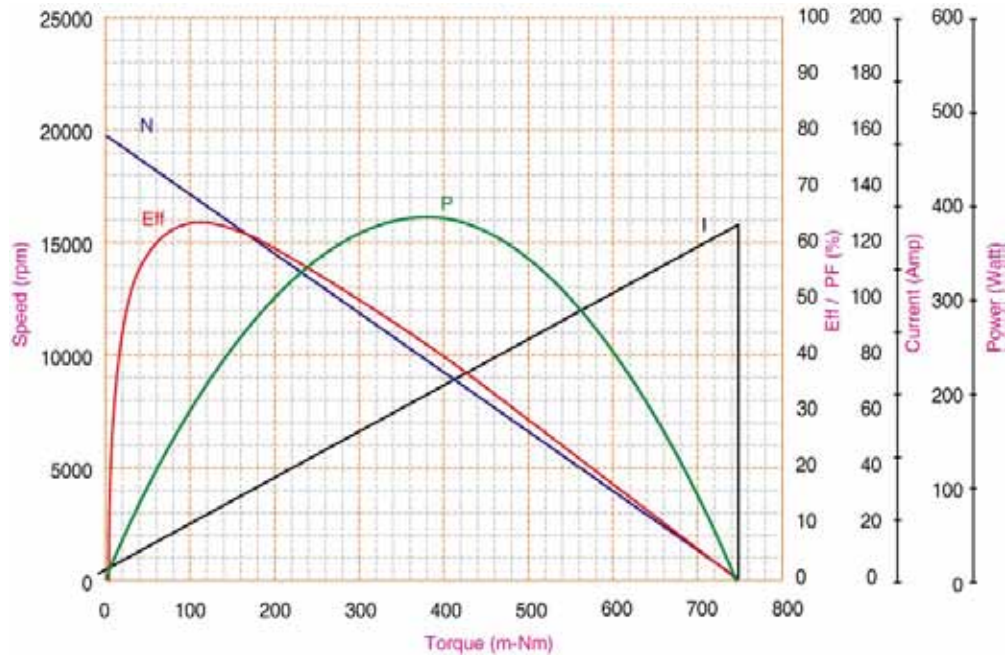
**Application Examples:**

Drills, Power Equipment

Drawing:



Performance Curves:



Units in Metric

Ø 45.0 – 49.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 48.0 X 50.5 mm
Shaft Diameter	: Ø 4.005 mm
Input Voltage	: 18.0 V DC
No Load Speed	: 20281 rpm
No Load Current	: 2.29 A
Stall Torque	: 656.64 mNm
Stall Current	: 82.49 A
Maximum Output Power	: 348.79 W
Maximum Efficiency	: 69 %
Speed at Maximum Efficiency	: 17385 rpm
Weight	: 313 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Lead wire



**Performance Data:**

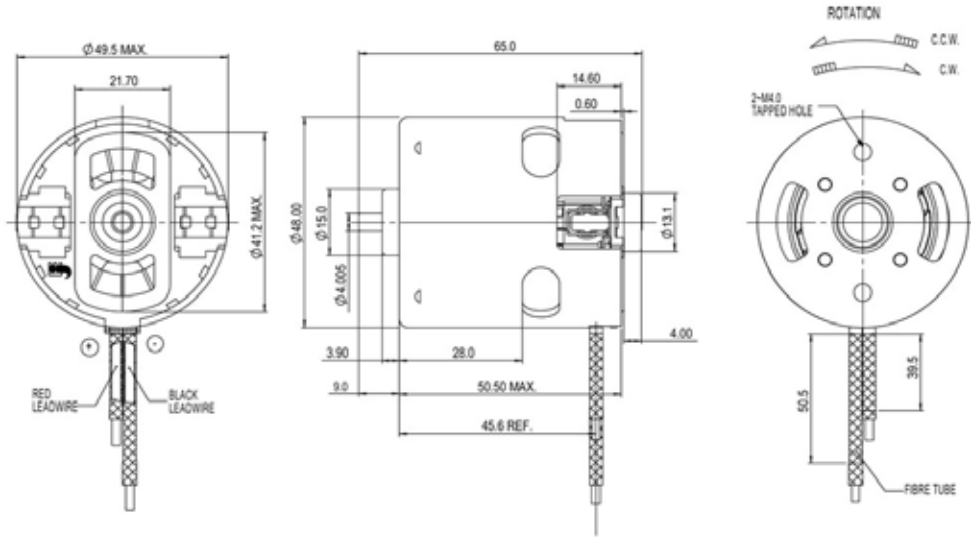
	No Load	Stall	Max Efficiency	Max Power
Current (A)	2.29	82.49	13.74	42.39
Efficiency (%)	-	-	69	45
Output Power (W)	-	-	170.80	348.79
Speed (rpm)	20281	-	17385	10141
Torque (mNm)	-	656.64	93.78	328.32

Ø 45.0 – 49.9 mm

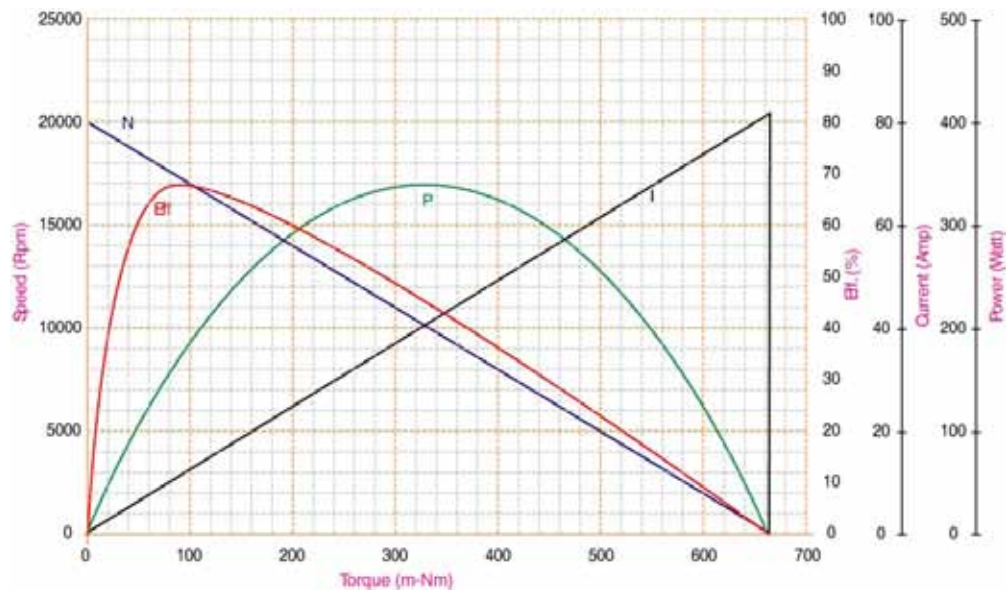
**Application Examples:**

Drills, Power Equipment

Drawing:



Performance Curves:



Units in Metric

$\phi$  45.0 – 49.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 48.0 X 50.5 mm
Shaft Diameter	: Ø 5.005 mm
Input Voltage	: 18.0 V DC
No Load Speed	: 19600 rpm
No Load Current	: 2.80 A
Stall Torque	: 1055.00 mNm
Stall Current	: 101.00 A
Maximum Output Power	: 542.00 W
Maximum Efficiency	: 66 %
Speed at Maximum Efficiency	: 16800 rpm
Life (typical)	: 32 hr
Weight	: 325 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Lead wire



**Performance Data:**

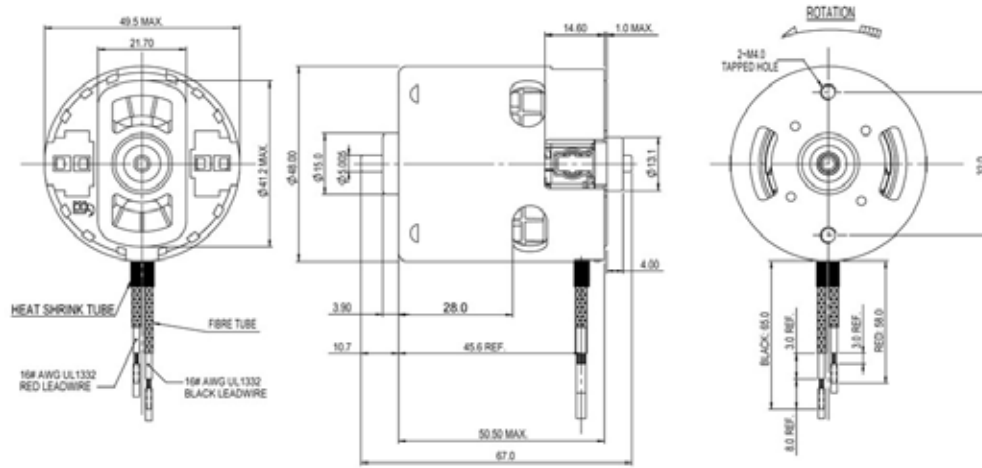
	No Load	Stall	Max Efficiency	Max Power
Current (A)	2.80	101.00	24.37	66.60
Efficiency (%)	-	-	66	42
Output Power (W)	-	-	280.69	542.00
Speed (rpm)	19600	-	16557	9934
Torque (mNm)	-	1055.00	161.96	485.89

**Application Examples:**

Drills, Power Equipment

Ø 45.0 – 49.9 mm

Drawing:



Performance Curves:



Units in Metric

Ø 45.0 – 49.9 mm

**Characteristics:**

High Power DC motor

**Specifications:**

Dimensions	: Ø 48.0 X 68.0 mm
Shaft Diameter	: Ø 5.005 mm
Input Voltage	: 18.0 V DC
No Load Speed	: 22500 rpm
No Load Current	: 3.90 A
Stall Torque	: 1400.00 mNm
Stall Current	: 185.00 A
Maximum Output Power	: 830.00 W
Maximum Efficiency	: 76 %
Speed at Maximum Efficiency	: 19500 rpm
Life (typical)	: 150 hr
Weight	: 464 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminals
Certification	: Nil



Ø 45.0 – 49.9 mm

**Performance Data:**

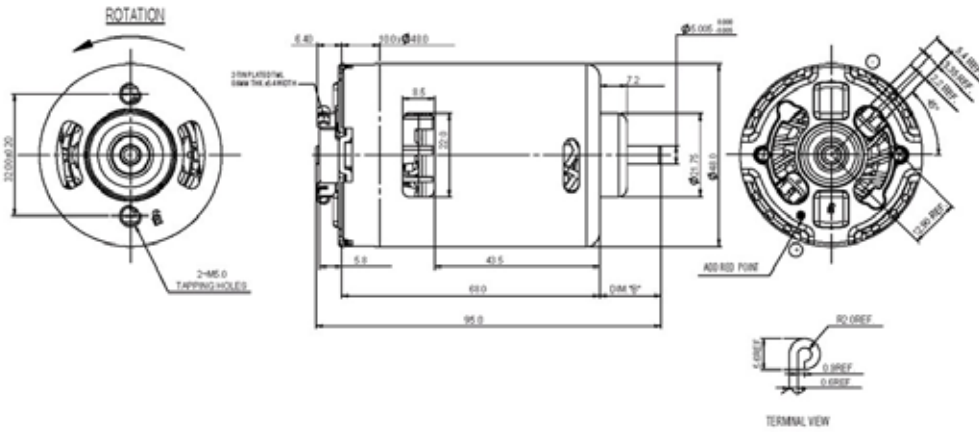
	No Load	Stall	Max Efficiency	Max Power
Current (A)	3.90	185.00	26.81	93.98
Efficiency (%)	-	-	76	49
Output Power (W)	-	-	369.20	830.00
Speed (rpm)	22500	-	19500	11150
Torque (mNm)	-	1400.00	180.97	711.60

**Application Examples:**

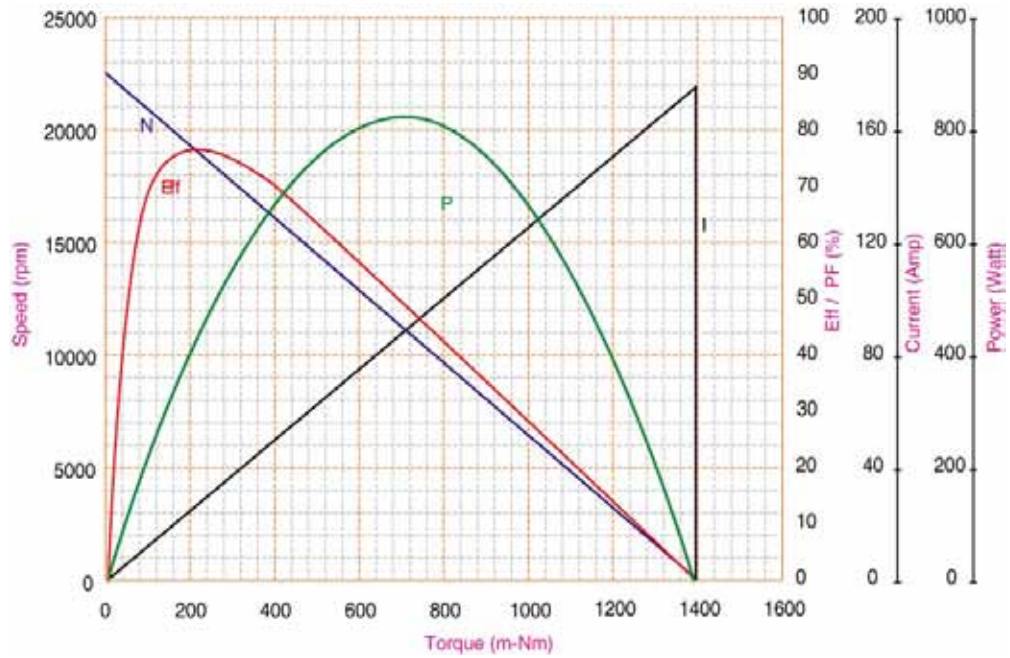
Drills, Power Equipment



Drawing:



Performance Curves:



Units in Metric

Ø 45.0 – 49.9 mm

## HC615SG-011

## High Voltage DC Motors

### Characteristics:

High Power DC motor

### Specifications:

Dimensions	: Ø 35.8 X 43.5 mm
Shaft Diameter	: Ø 3.175 mm
Input Voltage	: 60.0 V DC
No Load Speed	: 8600 rpm
No Load Current	: 0.10 A
Nominal Speed	: 7200 rpm
Nominal Torque	: 30.00 mNm
Nominal Current	: 0.50 A
Maximum Efficiency	: 70 %
Torque at Maximum Efficiency	: 25.00 mNm
Speed at Maximum Efficiency	: 7400 rpm
Life (typical)	: 1000 hr
Weight	: 150 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: terminals



### Performance Data:

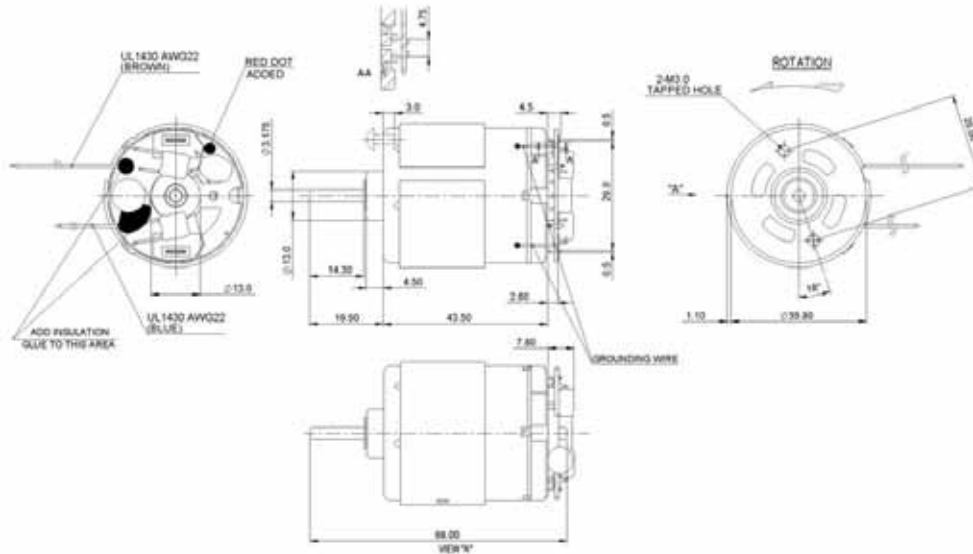
	No Load	Max Efficiency	Max Power
Current (A)	0.10	0.50	1.30
Efficiency (%)	-	70	45
Output Power (W)	-	20.00	40.00
Speed (rpm)	8600	7400	4300
Torque (mNm)	-	25.00	80.00

### Application Examples:

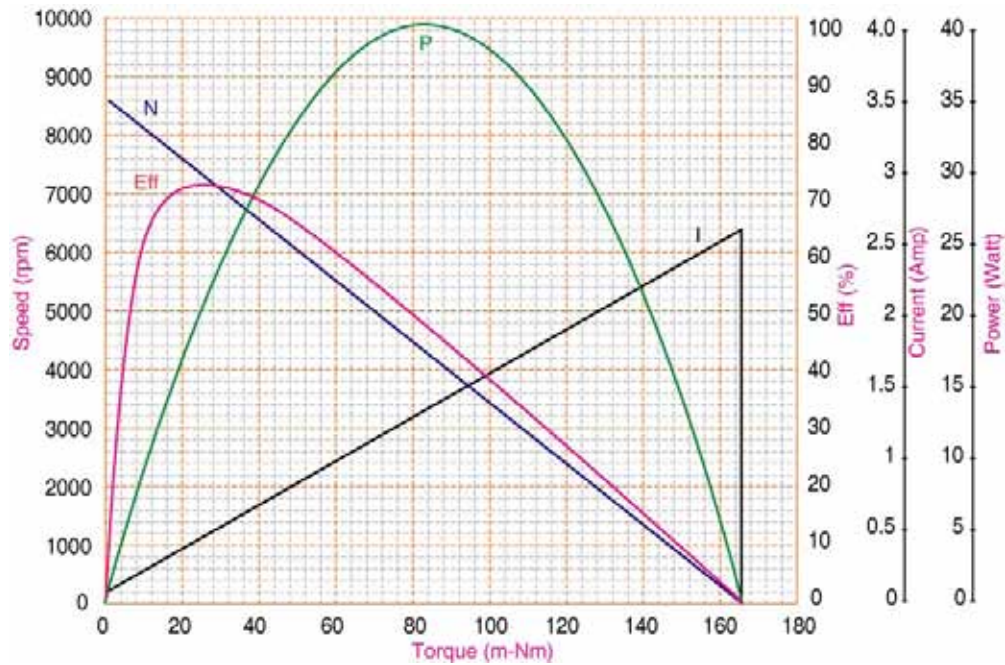
Hair Dryers

Ø 35.0 – 39.9 mm

Drawing:



Performance Curves:



Units in Metric

**Characteristics:**

High Power HVDC Motor



Ø 45.0 – 49.9 mm

**Specifications:**

Dimensions	: Ø 45.0 X 67.5 mm
Shaft Diameter	: Ø 5.005 mm
Input Voltage	: 230.0 V DC , Rectified , 50 Hz
No Load Speed	: 15600 rpm
No Load Current	: 0.11 A
Maximum Efficiency	: 65 %
Torque at Maximum Efficiency	: 92.00 mNm
Speed at Maximum Efficiency	: 11500 rpm
Life (typical)	: 60 hr
Weight	: 413 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: terminals
Certification	: VDE, CCC

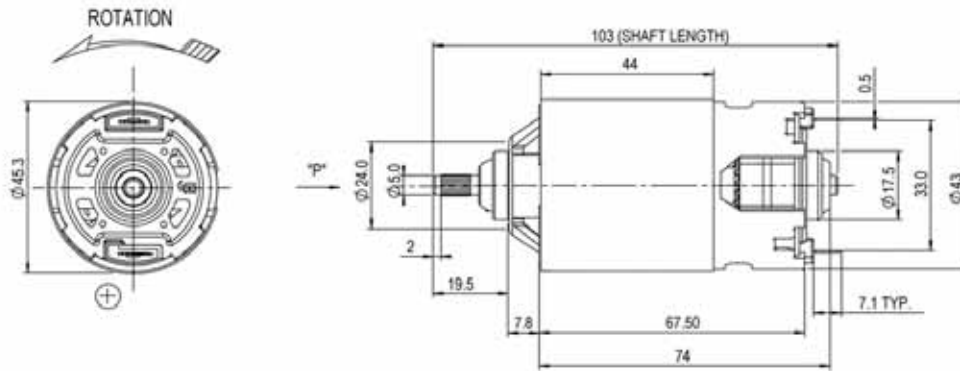
**Performance Data:**

	No Load	Max Efficiency	Max Power
Current (A)	0.11	0.86	1.94
Efficiency (%)	-	65	47
Output Power (W)	-	113.00	200.00
Speed (rpm)	15600	11500	7200
Torque (mNm)	-	92.31	270.00

**Application Examples:**

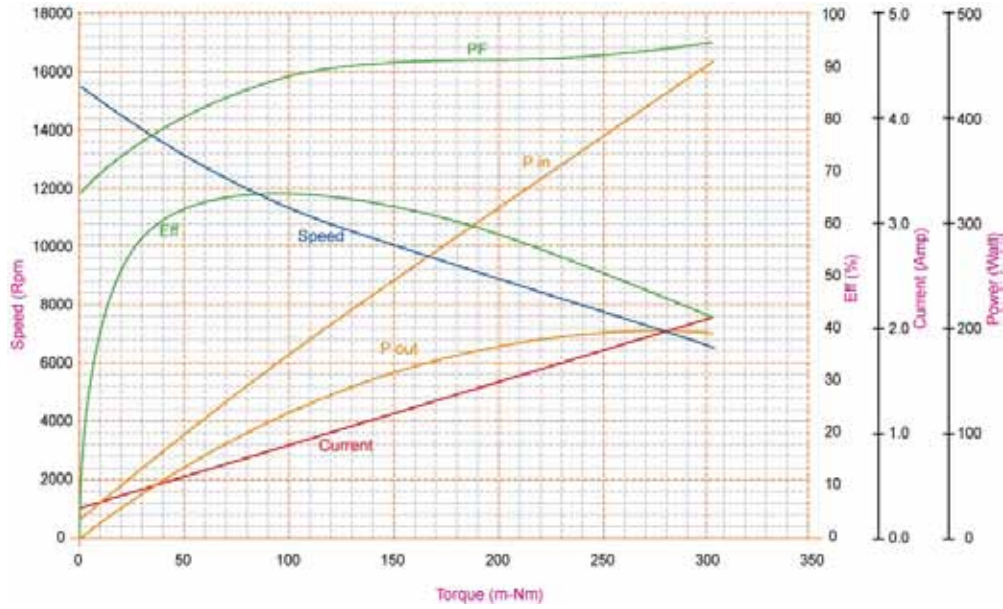
Hand Mixers, Stick Blenders

Drawing:



Ø 45.0 – 49.9 mm

Performance Curves:



Units in Metric

**Characteristics:**

High Power HVDC Motor

**Specifications:**

Dimensions	: Ø 52.4 X 116.0 mm
Shaft Diameter	: Ø 6.350 mm
Input Voltage	: 120.0 V DC , Rectified , 60 Hz
No Load Speed	: 11000 rpm
No Load Current	: 0.50 A
Maximum Efficiency	: 64 %
Torque at Maximum Efficiency	: 155.00 mNm
Speed at Maximum Efficiency	: 8200 rpm
Life (typical)	: 500 hr
Weight	: 795 g
Operation Temperature	: -10 to 55 °C
Storage Temperature	: -20 to 80 °C
Electrical Connection	: Terminals
Certification	: UL, cUL



Ø 50.0 – 54.9 mm

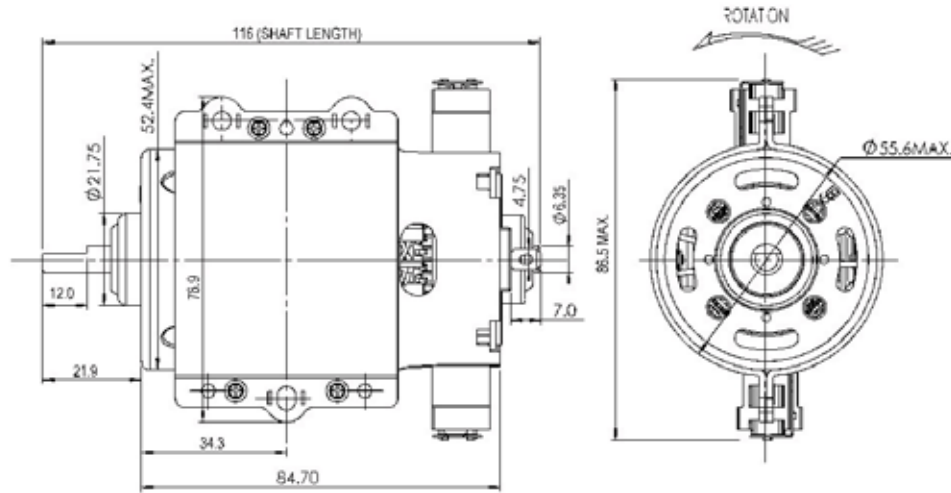
**Performance Data:**

	No Load	Max Efficiency
Current (A)	0.50	2.16
Efficiency (%)	-	64
Output Power (W)	-	133.00
Speed (rpm)	11000	8350
Torque (mNm)	-	160.00

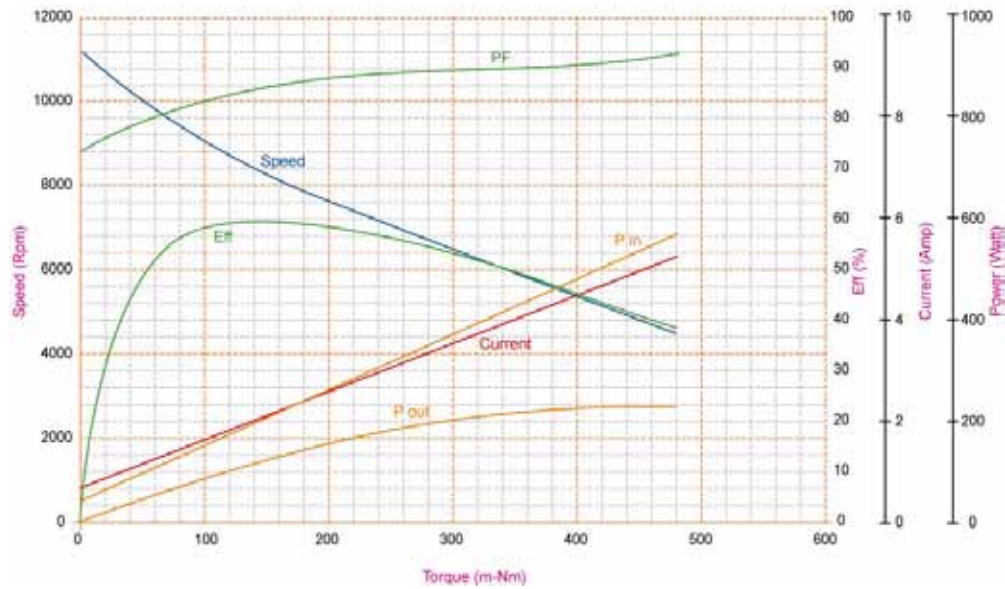
**Application Examples:**

Floor Care, Power Brushes, Floor Polishers, Brush Roll

Drawing:



Performance Curves:

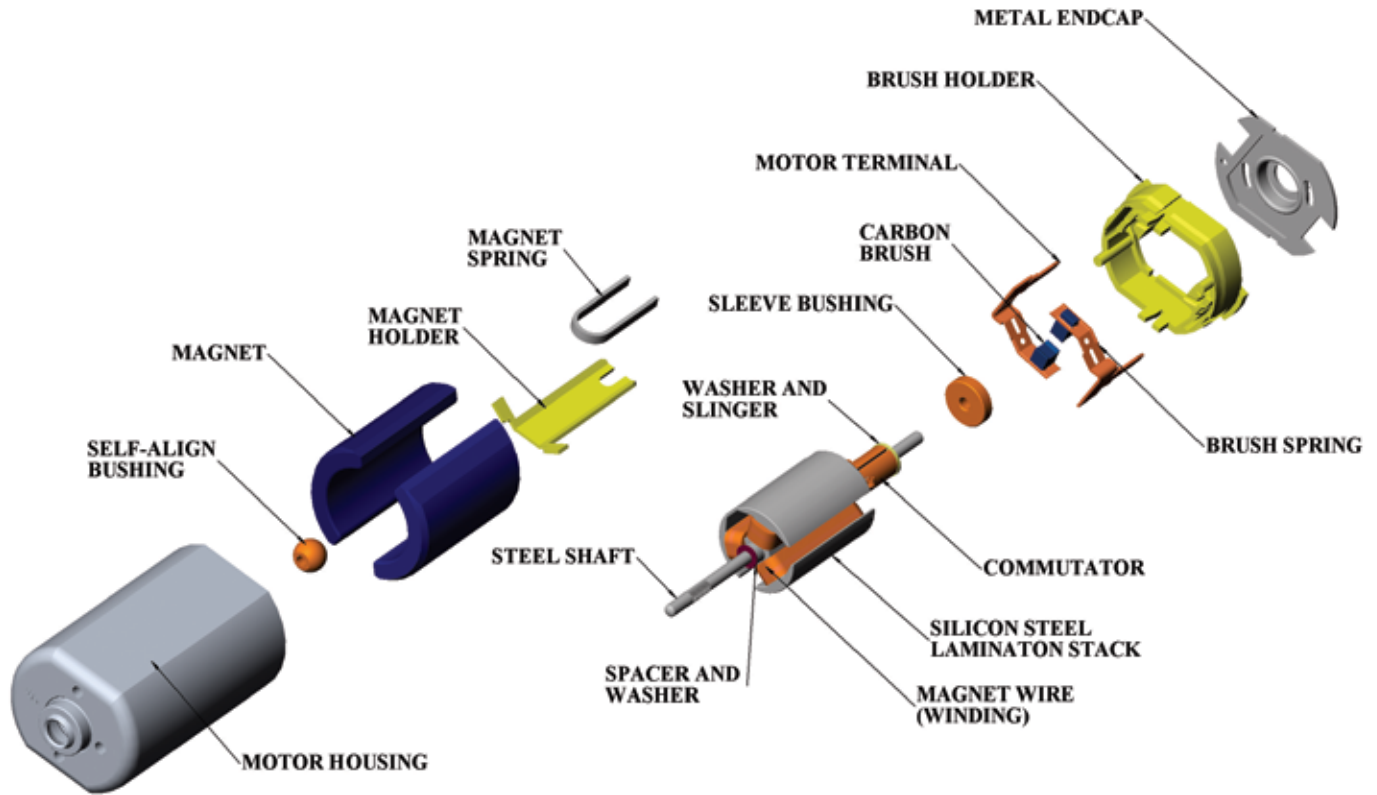


Units in Metric

$\phi 50.0 - 54.9$  mm

# Basics of DC Motor Construction and Operation

The function of the motor is to convert electrical energy to mechanical energy. Thus, the motor is also classified as an electromechanical device/machine



## Operation

Typically, electric motors run by electromagnetism. However, there are also other types of motors that utilize electrostatic forces or piezoelectric effect. In the case of a PMDC motor, motion is produced by an electromagnet (armature) interacting with a fixed field magnet (housing assembly).

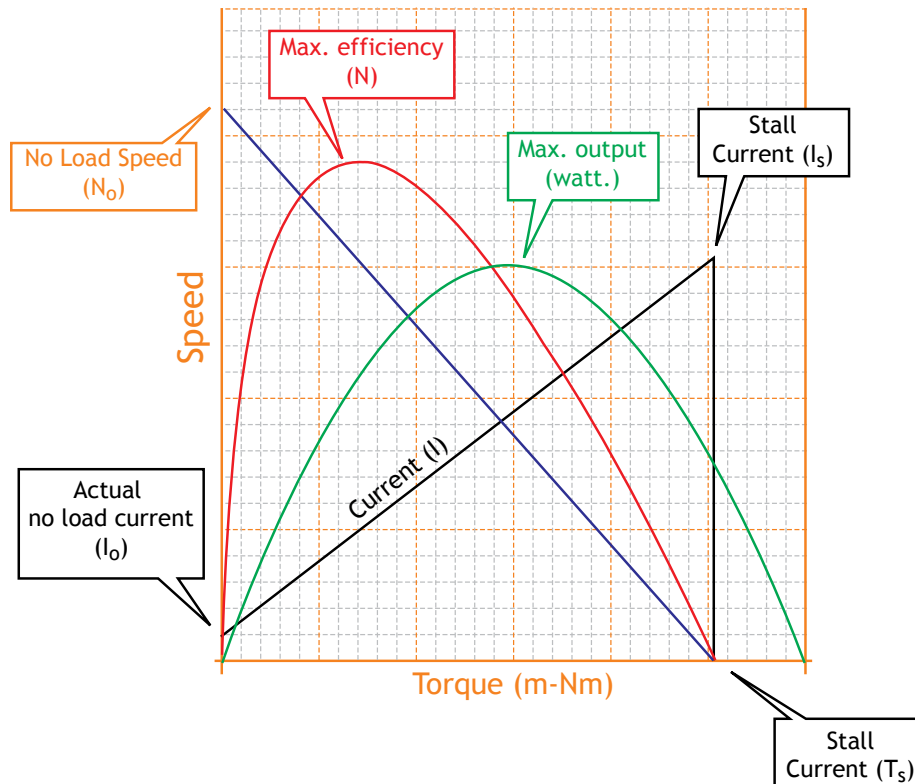
Electrical current flows through the motor terminals in the endcap assembly that comes in contact with the commutator in the armature assembly through the carbon brushes or brush leaves. The electrical current powers the coils generating a magnetic field causing the armature to rotate as it interacts with the magnets encased in the housing assembly.

Flemming's Left Hand Rule helps to determine the direction of the force, the current and the magnetic flux.

## 3 Key Elements Interacting to Produce Motion

- **Magnetic Flux** – The motor housing which contains the permanent magnets generate a magnetic field with the core or lamination stack forming a path.
- **Current** – When electricity is applied across the motor terminals, current flows through from one end of the terminal to the brush, commutator then to the windings, back to the commutator and brush and out through the other terminal.
- **Force** – The current that flows through the magnetic field then produces an electromagnetic force that causes the shaft to rotate. As conductor rotates to opposite pole, the commutator switches the direction of the current and continuously causes the shaft to rotate. This continuous switching of current produces the rotating force. This generated rotating force is called torque and this is usually measured at the shaft.





There are 4 critical points in the performance chart.

- **No Load Speed (N<sub>0</sub>)** – This pertains to the speed of the shaft measured in number of revolutions per minute (rpm) when voltage is applied without any mechanical resistance or load on the motor.
- **No Load Current (I<sub>0</sub>)** – This pertains to the current measured during no load condition of the motor.
- **Stall Torque (T<sub>S</sub>)** – This pertains to the torque measured when the motor stops rotating due to the increase in load.
- **Stall Current (I<sub>S</sub>)** – This pertains to the current measured during stall condition of the motor due to the increase in load.

### Plotting the Performance Chart

- **Speed Line** – This is the line that connects the points N<sub>0</sub> and T<sub>S</sub>, this line identifies the motor's speed at various conditions
- **Current Line** – This is the line that connects the points I<sub>0</sub> and I<sub>S</sub>, this line identifies the motor's current discharge at various conditions.
- **Output Curve** – This curve displays the output power of the motor and can be graphed using the formula:  

$$P = (\text{Speed} \times \text{Torque}) / 9550$$
<where speed is in rpm and torque in mNm>
- **Efficiency Curve** – This curve displays the efficiency of the motor and can be graphed using the formula:  

$$\text{Eff} (\%) = ((\text{Output Power} / (\text{Voltage} \times \text{Current})) \times 100$$

### Main Factors Affecting Motor Performance

- **Input Voltage** – Increase in input voltage increases N<sub>0</sub>, I<sub>S</sub> and T<sub>S</sub> while I<sub>0</sub> remains unchanged.
- **Series Resistance** – Increase in series resistance will cause T<sub>S</sub>, I<sub>S</sub> to decrease, while I<sub>0</sub> and N<sub>0</sub> remain unchanged.
- **Number of Winding Turns** – Increase in number of winding turns will decrease N<sub>0</sub>, I<sub>0</sub> and I<sub>S</sub>, while T<sub>S</sub> is unchanged.
- **Winding Wire Diameter** – Increasing the diameter of the winding wire will increase T<sub>S</sub> and I<sub>S</sub>, while I<sub>0</sub> and N<sub>0</sub> remains unchanged.
- **Magnetic Flux** – Increasing the magnetic flux will decrease N<sub>0</sub> and I<sub>0</sub> and increase T<sub>S</sub> while I<sub>S</sub> will remain unchanged.
- **Temperature** – Increase in environmental temperature increases N<sub>0</sub> and I<sub>0</sub> while decreases I<sub>S</sub> and T<sub>S</sub>.

# Leading products... from the industry leading brands

## Motor Products

### JOHNSON MOTOR

- #1 provider of PMDC, brushless, AC and universal motors for power tools, home appliance, business equipment, personal care and audio-visual markets
- 3 million motors per day capacity
- Motor and component technology combined with application expertise, scale and production efficiency
- Extensive range of DC motors including permanent magnet, micromotors, brushless, and high voltage
- AC synchronous and universal motors
- Value-added subsystems
- New products include high voltage DC for dishwasher drain pump, stand mixer and vacuum cleaner power brush



### saia

- #1 in stepper motors
- Large variety of stepper and synchronous motors and motor-gearbox combinations to suite a wide range of industrial applications
- Customer-specific solutions-oriented with a high degree of flexibility



### NANOMOTION

- #1 in piezoelectric motors and stages
- Piezoceramic servo motors among the smallest in the world
- Motors provide unlimited travel in a compact package, with the ability to achieve unmatched precision for linear or rotary motion
- Typical applications include semiconductor and flat panel equipment, fiber optics manufacturing, storage media manufacturing and test equipment, biomedical and pharmaceutical manufacturing, metrology and general automation
- Modular linear stages for single and multi-axis applications
- Custom motion solutions



## Switch Products

### saia

- High volume production lines for micro switches with less than 3 mm contact gap
- High operating speed / frequency
- High electrical ratings and longer life cycles
- Snap action function with leaf-spring and coil-spring mechanisms available
- Wide range of switching characteristics and terminal options
- Strong in home appliance applications
- Sure switch contacts with contact wiping



### burgess

- World's first snap action switch manufacturer
- Largest variety in switching technologies
- Widest range of micro switches
- A market leader in industrial automation applications
- Solid products fulfill high requirements in robustness
- Expert innovative switch solutions
- Low-volume capabilities



### th contact

- Illuminated push-button, keylock switches, joysticks and emergency stop switches for control panels
- Modular design for easy assembly of countless permutations



### BAR

- Innovative switch solutions for home appliances
- Rocker, push-button and door switches with customized styling
- Setting industry standards for safety and comfort solutions in switch functions
- Intelligent switch combined with electronic controller
- Experts in optical styling and tactile feel



## Solenoid Products

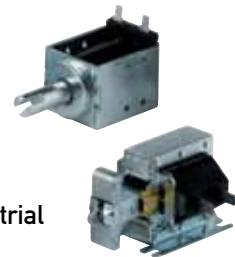
### LEDEX

- America's leading industrial solenoid brand for more than 60 years
- Precision electromechanical and electromagnetic solutions for DC actuation
- Rotary, linear, tubular, open frame solenoids in on/off, magnetic latching, battery operated and miniature configurations
- Excellent customer service and delivery performance
- Experienced teams of design and production engineers provide a technical design advantage



### DORMEYER

- Leading AC solenoid brand
- Electromechanical and electromagnetic solutions for consumer appliance and industrial actuation applications
- Excellent customer service and delivery performance to support high-volume AC solenoid requirements



## Flexible Circuit Products

### PARLEX

- Flexible printed circuits
- Flat flexible cables
- Polymer thick film circuits



## Headquarters

### Johnson Electric Group

12 Science Park East Avenue, 6/F, Hong Kong Science Park  
Shatin, New Territories, **Hong Kong**

Tel: (852) 2663 6688

Fax: (852) 2663 2054

e-mail: [salesupport@johnsonelectric.com](mailto:salesupport@johnsonelectric.com)

## Sales Offices (IPG)

### Asia

#### China

No.1, Lane 10800, Songze  
Avenue, Qingpu Industrial Zone  
201700 **Shanghai**

T +86 21 6922 8200

F +86 21 5882 2800

5/F, Block 5A, Sin Er Industrial  
Zone, Shajing Town, Baoan

District 518125 **Shenzhen**

T +86 755 2990 0437

F +86 755 2990 0203

#### Japan

Keihin Higashi-Ohi Bldg.  
10/F, 2-13-8 Higashi-Ohi  
Shinagawa-ku 140-0011

**Tokyo**

T +81 357 62 1031

F +81 357 62 1032

Ishizuki 4144-4, Negishi  
385-0062 Saku-shi,

**Nagano**

T +81 267 63 2221

F +81 267 63 2220

#### India

6, Vanagaram Road  
**Chennai** - 600 095  
Tamil nadu  
T +91 44 4355 1549

#### Singapore

1 Maritime Square #09-01  
Harbour Front Centre  
099253 **Singapore**  
T +65 6224 7570  
F +65 6224 4538

#### South Korea

6<sup>th</sup> Fl, Fine Bldg. 701-6  
Banpo-Dong, Seocho-Ku  
137-808 **Seoul**  
T +82 2 518 8341  
F +82 2 518 8342

### Europe

#### Austria

Linzer Bundesstrasse 101  
A-5023 **Salzburg**  
T +43 662 88 4910  
F +43 662 88 4910 11

#### France

10 Bld. Louise Michel  
F-92230 **Gennevilliers**  
T +33 1 46 88 07 70  
F +33 1 46 88 07 99

#### Germany

Weissenpferd 9  
D-58553 **Halver**  
T +49 2353 911 0  
F +49 2353 911 230

#### Italy

Via Cadamosto 3  
I-20094 **Corsico**, Milano  
T +39 02 4869 21  
F +39 02 4860 0692

#### Netherlands

Hanzeweg 12c  
NL-2803 MC **Gouda**  
T +31 1825 43 154  
F +31 1825 43 151

#### Switzerland

Bahnhofstrasse 18  
CH-3280 **Murten**  
T +41 26 672 71 11  
F +41 26 672 76 06

#### United Kingdom

Unit 5, Woodstock Way  
Baldon Business Park  
**Baldon**, Tyne & Wear  
NE35 9PF  
T +44 844 811 2130  
F +44 844 811 2135

### Americas

#### USA

10 Progress Drive  
06484 **Shelton**, CT  
T +1 203 447 5362  
F +1 203 447 5383

801 Scholz Drive  
P.O. Box 427  
45377 **Vandalia**, OH  
T +1 937 454 2345  
F +1 937 898 8624

#### Brazil

Av. Papa Joao Paulo I - 1174  
**Guarulhos**, Sao Paulo  
CEP 07170-350  
T +55 11 2431 5600  
F +55 11 2432 4711