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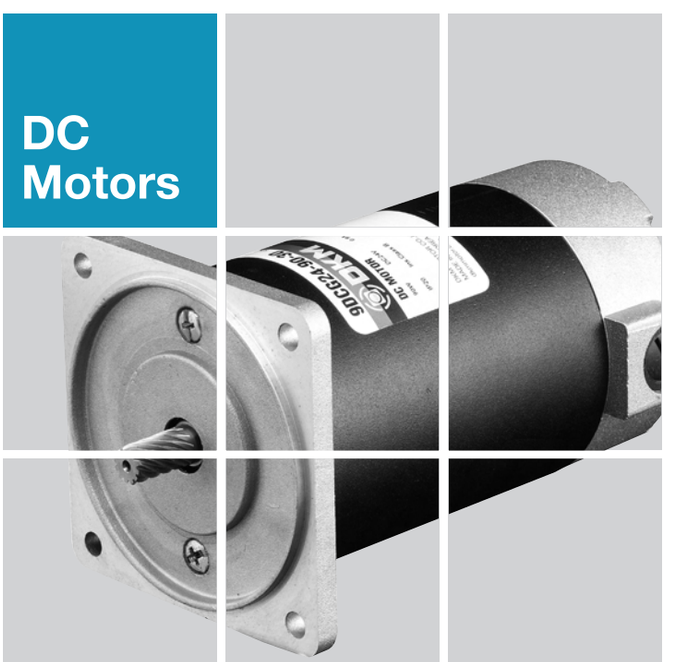
DC Motors



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Contents

C DC Motors

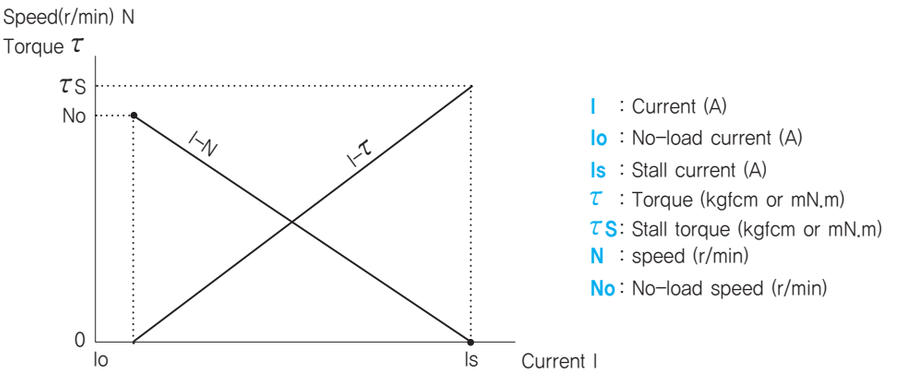
Technical Data of DC Motor

Features

- DC motor has a big starting torque and excellent mobility and when comparing with the same sized AC motor, the output is big and the efficiency is high.
- It is easy to control the speed and change the normal/reverse rotation.
- Comparing to AC motor, it is available to manufacture low voltage motor which can be applied to portable machine which uses various spec., especially battery power (12V, 24V).
- Due to the wear of brush, there is a limit in the service life.
- Due to brush and commutator, noise generates when starting.

Current, Torque and Speed (r/min)

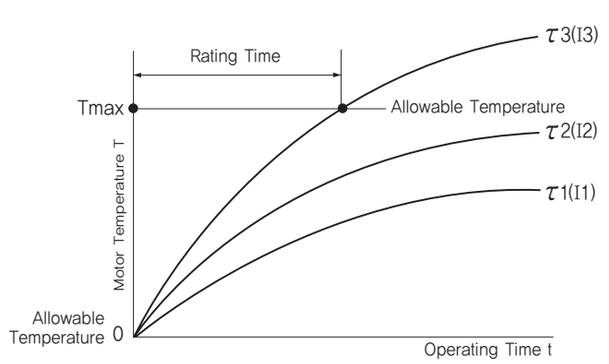
When the voltage of power supply is fixed, D.C. magnet motor shows the characteristic in the relationship between torque, speed and current as below. The relationship is almost linear show as the above, and the speed decreases, and current increases conversely when increasing the torque to the output shaft motor. It is same until the output shaft of motor is done a stall, when ignored heat generation in the motor. (It is possible to control the torque by controlling the current.)



I : Current (A)
Io : No-load current (A)
Is : Stall current (A)
τ : Torque (kgfcm or mN.m)
τS : Stall torque (kgfcm or mN.m)
N : speed (r/min)
No : No-load speed (r/min)

Rating Time

According to increase of current (torque), heat generation in the motor increases. Generally, when the temperature of component parts in the motor is below than allowable temperature after it was saturated, it is possible to keep continuous operation.
When it was not saturated in the allowable temperature, the time to exceed the temperature is rating time of motor and it is short-time rating specification.
According to size and the specification, each motor model has different current (torque) value to be possible continuous operation.



τ1(I1),τ2(I2)
The torque (current) to be possible continuous operation

τ3(I3)
The torque (current) to be short-time rating

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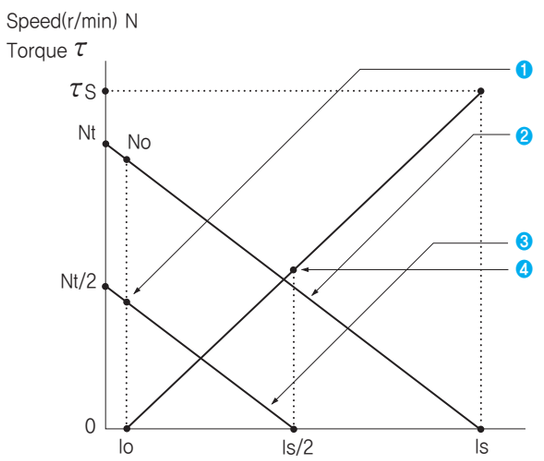
Performance of DC Motor in Case of Voltage Change at Power Supply

DC magnet motor can change speed by changing power supply voltage. The relationship between torque(τ), speed(N) and current(I) of motor when the voltage is half (1/2) is shown as below.

As the below figure, in the relationship between current and speed when power supply voltage was changed to half (1/2), ideal no-load speed "Nt" becomes "Nt/2" and it falls parallel to the performance of rated voltage.

The relationship between current and torque is same as the rated voltage, but the stall current "τs" falls accordingly as the stall current "Is" becomes "Is/2".



1. No-load speed when voltage is half (1/2)
2. I-N characteristic at rated voltage
3. I-N characteristic when the voltage is half (1/2)
4. Stall torque when the voltage is half (1/2)

▶ Nt : Ideal no-load speed when current is zero.
(The point extended the diagram of speed to zero current.)

Input, Output and Efficiency of DC motor

The input, output and efficiency can be calculated with the next formula.

Input(W) = Power Supply Voltage (V) X Current (A)

Output(W) = Torque τ (kgfcm) X Speed N (r/min) X 1.027 X 10^{-2}

Efficiency η (%) = $\frac{\text{Output(W)}}{\text{Input(W)}}$ X100

General Specifications

Item	Specification
Insulation Resistance	100MΩ or more when DC500V MEGA is applied between the windings and the frame after rated motor operation under normal ambient temperature and humidity.
Dielectric Strength	Sufficient to withstand 1.5KV at 50Hz and 60Hz applied between the windings and the frame for 1 minute after rated motor operation under normal ambient temperature and humidity.
Temperature Rise	Temperature rise of windings are 80℃ or less measured by the resistance change method after rated motor operation with connecting a Gearbox or equivalent heat radiation plate.
Insulation Class	Class B [130℃]
Ambient Temperature	-10℃~+40℃
Ambient Humidity	85% maximum

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DC Motor

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C DC Motors

DC Motor 60W(□90mm)

60W DC Motor 60W(□90mm)

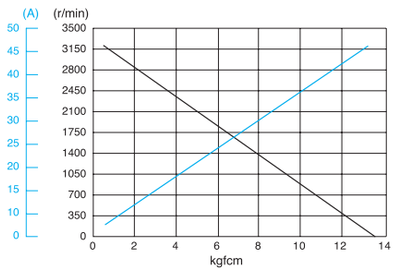
Motor Specification

Model 9DCP(W)□-60-30: Gear Type Shaft 9DCD□-60-30: D-Cut Type Shaft 9DCK□-60-30: Key Type Shaft	Output	Voltage	Starting Current	Starting Torque		No Load		Rated Load			
						Current	Speed	Current	Speed	Torque	
	W	V	A	kgfcm	N.m	A	r/min	A	r/min	kgfcm	N.m
9DCP(W)12-60-30	60	12	50.00	13.00	1.300	2.00	3400	8.50	2900	1.95	0.195
9DCP(W)24-60-30	60	24	36.00	19.00	1.900	1.15	3300	4.30	3000	1.95	0.195
9DCP(W)90-60-30	60	90	11.50	25.00	2.500	0.02	3250	0.80	3000	1.95	0.195

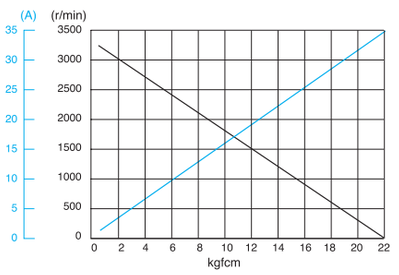
1) Enter the phase & voltage code in the in the box (□) within the motor model name.
2) Gear Type Shaft are for attaching Gearbox and D-Cut & Key Type Shafts are for using motor only.

Performance Curve

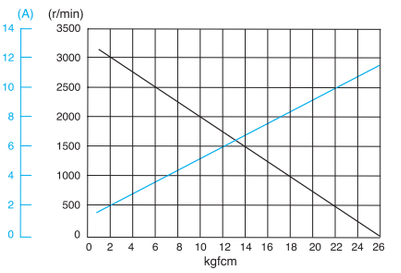
9DCG12-60-30



9DCG24-60-30



9DCG90-60-30



Max. Permissible Torque at Output Shaft of Gearbox

Motor Model	Gearbox Model	Gear Ratio		2	3	3.6	5	6	7.5	9	12.5	15	18	20	25	30	36	40	50	60	75	90	100	120	150	180	200
		r/min		1500	1000	833	600	500	400	333	240	200	167	150	120	100	83	75	60	50	40	33	30	25	20	17	17
9DCP□-60-30	9PBK□BH	Rated	kgfcm	3.2	4.9	5.8	8.1	9.7	12.1	14.6	18.3	21.9	26.3	26.5	33.2	39.8	47.7	53.0	66.3	79.6	89.2	107.1	119.0	142.7	178.4	200.0	200.0
			N.m	0.32	0.48	0.57	0.79	0.95	1.19	1.43	1.79	2.15	2.58	2.60	3.25	3.90	4.68	5.20	6.50	7.80	8.74	10.49	11.66	13.99	17.49	19.60	19.60
		12V	kgfcm	21.6	32.4	38.8	54.0	64.7	80.9	97.1	121.9	146.3	175.5	176.8	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
		Starting	N.m	2.11	3.17	3.81	5.29	6.34	7.93	9.52	11.94	14.33	17.20	17.33	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60
	9PFK□BH	24V	kgfcm	31.5	47.3	56.8	78.9	94.6	118.3	141.9	178.1	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
		Starting	N.m	3.09	4.64	5.56	7.73	9.27	11.59	13.91	17.46	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60
		90V	kgfcm	41.5	62.3	74.7	103.8	124.5	155.6	186.8	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
		Starting	N.m	4.07	6.10	7.32	10.17	12.20	15.25	18.30	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60

Motor Model	Gearbox Model	Gear Ratio		10	12	15	18	25	30	36	50	60
		r/min		300	250	200	167	120	100	83	60	50
9DCW□-60-30	9WD□BL/□BR/□BRL	Rated	kgfcm	16.0	18.7	22.5	26.0	34.1	38.6	44.9	58.5	64.4
			N.m	1.57	1.83	2.21	2.55	3.34	3.78	4.40	5.73	6.31
		12V	kgfcm	106.6	124.8	150.2	153.1	142.9	163.3	153.1	142.9	122.4
		Starting	N.m	10.45	12.23	14.71	15.00	14.00	16.00	15.00	14.00	12.00
		24V	kgfcm	155.8	153.1	163.3	153.1	142.9	163.3	153.1	142.9	122.4
		Starting	N.m	15.27	15.00	16.00	15.00	14.00	16.00	15.00	14.00	12.00
		90V	kgfcm	163.3	153.1	163.3	153.1	142.9	163.3	153.1	142.9	122.4
		Starting	N.m	16.00	15.00	16.00	15.00	14.00	16.00	15.00	14.00	12.00

1) Enter the phase & voltage code in the box (□) within the motor model name.
2) Enter the gear ratio in the box (□) within the Gearbox model name.
3) A colored background indicates gear shaft rotation in the same direction as the motor shaft; a white background indicates rotation in the opposite direction.
4) The rotating speed is calculated by dividing the motor's synchronous speed (50Hz: 1,500r/min, 60Hz: 1,800r/min) by the gear ratio.
The actual speed is 2~20% less than the displayed value, depending on the size of the load.

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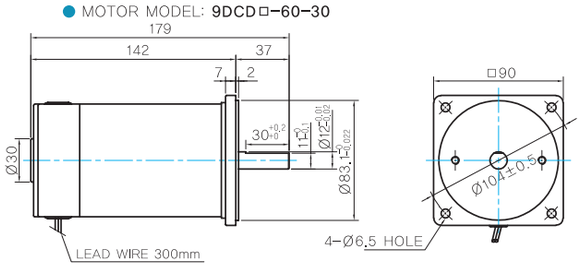
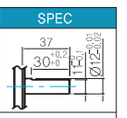
Dimensions

MOTOR ONLY

● MOTOR MODEL: 9DCD□-60-30

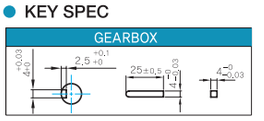


● MOTOR OUTPUT SHAFT

MODEL	SPEC
D-CUT TYPE	
9DCD□-60-30	
KEY TYPE	
9DCK□-60-30	

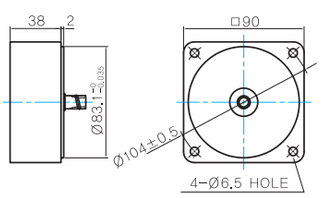
● KEY SPEC

GEARBOX



INTER-DECIMAL GEARBOX

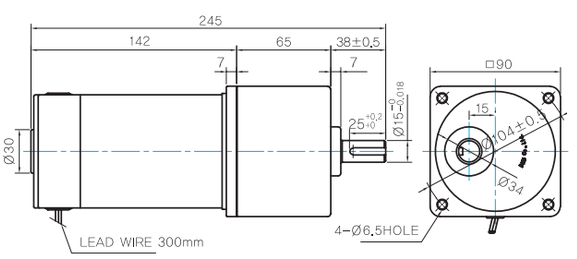
● MODEL: 9XD10□□



GEARED MOTOR

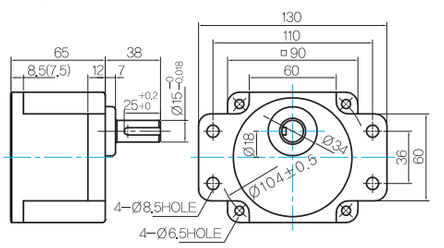
P TYPE GEARBOX

● MOTOR MODEL: 9DCP□-60-30

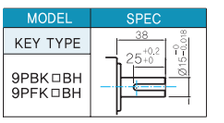


● GEARBOX MODEL: 9PBK□BH

● GEARBOX MODEL: 9PFK□BH

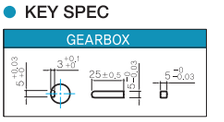


● GEARBOX OUTPUT SHAFT

MODEL	SPEC
KEY TYPE	
9PBK□BH 9PFK□BH	

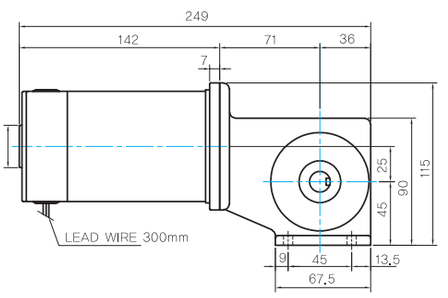
● KEY SPEC

GEARBOX

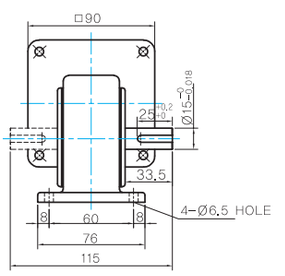


W TYPE GEARBOX

● MOTOR MODEL: 9DCW□-60-30

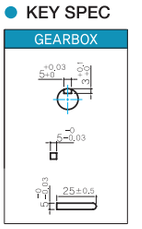


● GEARBOX MODEL: 9WD□BL/BR/BRL



● KEY SPEC

GEARBOX



WEIGHT

PART		WEIGHT(Kg)
MOTOR		1.9
GEAR BOX	9PB(F)K2BH ~ 9PB(F)K18BH	1.3
	9PB(F)K20BH ~ 9PB(F)K180BH	1.4
	9WD□BL/BR/BRL	1.0
	9XD10□□	0.5

Motor Images

9DCD□-60-30	9DCP□-60-30+9PBK□BH	9DCP□-60-30+9PFK□BH	9DCW□-60-30+9WD□BL
			

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