Allied Motion
An Allient Company

Brushless DC Outer-Rotor Motors

KINETIMAX HPD - 109

109 mm diameter, 1.43 to 3.90 Nm continuous torque, up to 780 Watts

The KinetiMax HPD (High Power Density) Series motors are frameless, outer-rotor brushless DC motors designed as stator-rotor part sets. With an exceptional torque-to-weight ratio, these motors are ideal for weight-sensitive applications.

The large stator inner diameter (ID) accommodates larger ball bearings, while the clear aperture allows cabling to pass through the motor. Additionally, low cogging torque and high peak torque characteristics enhance performance in demanding servo applications. The HPD series provides flexible configuration options to deliver optimal performance tailored to your application's needs.

KEY FEATURES & BENEFITS

Efficiency:
Exceptional efficiency ranging from 81% to 91% across a broad speed-torque range, ensuring optimal performance near the nominal working point.

High Torque-to-Weight Ratio:
Delivers powerful torque while keeping weight to a minimum, critical in battery-operated and portable systems.

Torque Range:
Rated torque from 1.43 Nm to 3.90 Nm for diverse.

Multiple Voltage Options:
Winding selections available to match specific voltage requirements.

Battery Optimization:
High efficiency is ideal for battery-powered applications, maximizing operational timeper charge.

OPTIONS & ACCESSORIES

Frame Sizes & Stack Heights:
Available in six frame sizes with three different stack heights to suit various space and performance constraints.

Commutation Sensors:
Integrated Hall effect sensor board for precise commutation.

Thermal Monitoring:
Stator-mounted temperature sensor for thermal management and protection.

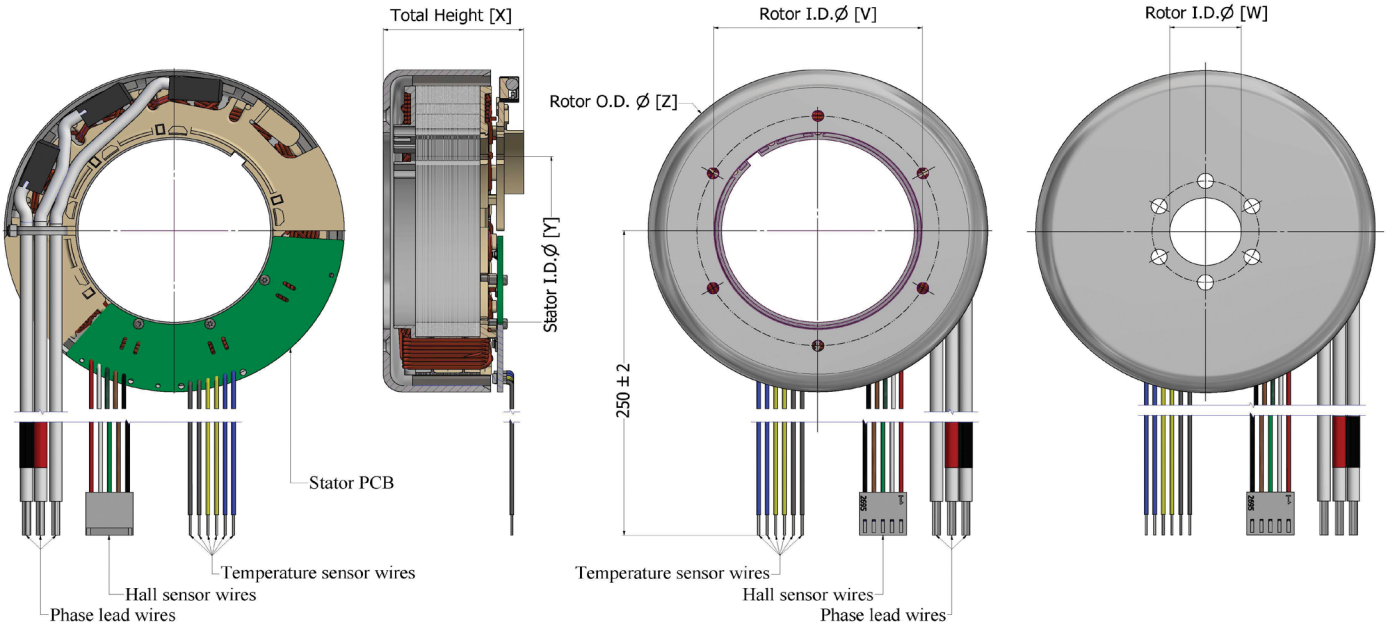
APPLICATIONS

The KinetiMax HPD Series motors are well-suited for a variety of high-performance applications:

Including

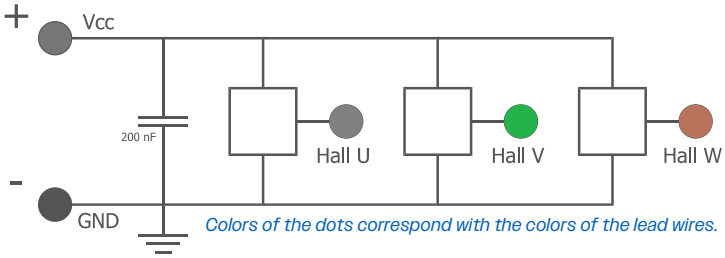
- Automated Guided Vehicles (AGVs)
- Robotics (arms, joints, end-effectors)
- Handheld hydraulic power tools
- Material handling systems
- Medical devices and equipment
- Rotary actuators and gimbals

DIMENSIONS



HALL SENSORS

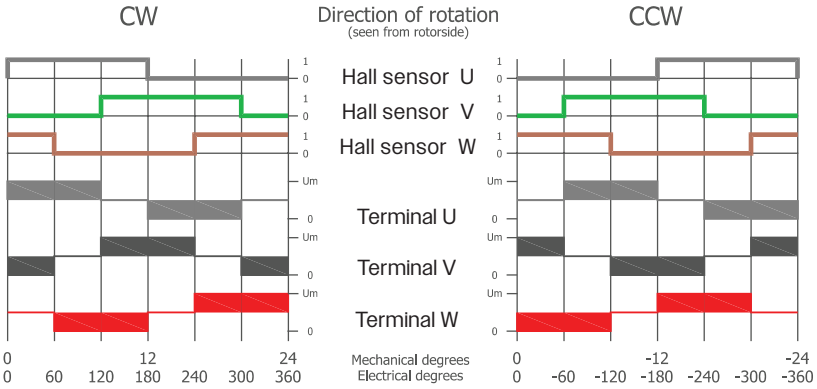
Connections/Specifications:



Colors of the dots correspond with the colors of the lead wires.

Specification Item	Value [typ.]
Supply Voltage [VCC]	3.0-32V
Supply Current	4.8 mA
Temperature Range	-40 °C+170 °C
Output Type	Open drain
Max Output Voltage	32 V
Max Output Current	25 mA

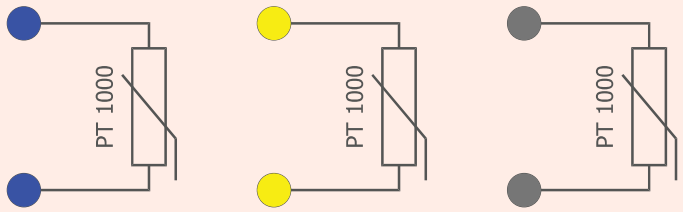
Switching Sequence:



The colors of the 3 Hall sensor signals correspond with the 3 colors of the Hall lead wires.
The colors of the 3 signals of the terminals U, V, W, correspond with the 3 colors of the motor lead wires.

TEMPERATURE SENSORS

Connections/Specifications:



Specification Item	Value [typ.]
Resistance at 0°C	1000 Ohm
Temperature Coefficient	+ 3850 ppm/K
Temperature Range	-40 °C/+175 °C
ΔT (1)	T.B.D.

Colors of the dots correspond with the colors of the lead wires, each wire color is used for a different motor phase.

(1) Due to the thermal coupling between the winding and sensor, the temperature measured by the sensor will be lower than the actual temperature of the winding.
Optional sensor types are possible after consulting the factory (PTC, NTC).

SPECIFICATIONS

		KMF 109 01							
Winding Identification[3]		**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**
Nominal Supply Voltage DC Link	Volt	24	30	42	54	72	72	72	72
Rated Output Power[1]	Watt	439	440	444	458	441	327	249	184
Rated Speed	RPM	2931	2935	2966	3056	2942	2183	1666	1225
Rated Torque[1]	Nm	1.43							
Rated Line Current[1][4]	Arms	15.4	12.3	8.9	7.1	5.1	3.9	3.0	2.2
Max Efficiency	%	89							
No Load Speed (@ nominal voltage)	RPM	3028	3028	3059	3146	3028	2271	1748	1311
BEMF Constant Ke	V/kRPM	7.9	9.9	13.7	17.2	23.8	31.7	41.2	54.9
Motor Speed Constant Kv (=1/Ke)	RPM/V	126.1	100.9	72.8	58.3	42.0	31.5	24.3	18.2
Continuous Stall Torque[1]	Nm	1.80							
Continuous Stall Line Current (rms)[1]	Arms	19.4	15.5	11.2	9.0	6.5	4.9	3.7	2.8
Peak Torque	Nm	4.53							
Max. Demagnetization Line Current	A	115	92	67	53	38	29	22	17
Torque/Rms Line Current Kt[4]	Nm/Arms	0.093	0.116	0.161	0.201	0.278	0.371	0.482	0.642
Resistance (terminal-to-terminal)	mOhm	40	61	117	178	323	586	933	1723
Inductance (terminal-to-terminal)	µH	41	64	124	193	371	659	1112	1978
Back EMF (@1000 RPM terminal-to-terminal)	Vrms	5.6	7.0	9.7	12.1	16.8	22.4	29.1	38.8
Thermal Resistance (stator/rotor to ambient)[1]	°C/W	1.39							
Thermal Resistance Winding-Housing	°C/W	1.22							
Max. Winding Temperature	°C	160							
Number of Pole Pairs		15							
Weight	kg	0.69							
Rotor Inertia - Large I.D.	kgm²*E-6	783							
Rotor Inertia - Small I.D.	kgm²*E-6	822							
Mechanical Time Constant	ms	3.7							
Electrical Time Constant	ms	1.0							
Motor Constant Km	Nm/ sqrt(W)	0.392							

(1) Assuming the stator-rotor set is mounted on a bracket with an aluminium flange diameter 1.5 times rotor diameter.
(2) See the dimensions in the drawing (page 6).
(3) Windings C, D, G and H are delta connected, windings E, F, J and K are wye connected.
(4) Line currents are the AC currents running into the three terminals of the stator.

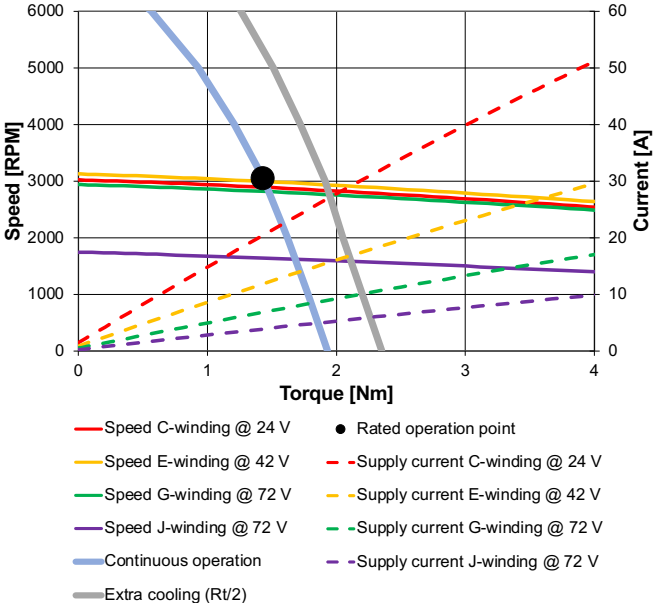
SPECIFICATIONS

		KMF 109 01							
Winding Identification[3]		**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**
Cogging Torque (typical, peak to peak)	Nm	0.036							
Drag Torque	Nm	0.034							
Viscous Damping	Nm/RPM	2.5E-05							
Thermal Time Constant of Winding Only	s	32							
Adiabatic Heating of Winding at Peak Torque	K/s	3							
Rotor Inner Diameter [V] [2]	mm	67							
Rotor Inner Diameter [W] [2]	mm	20							
Rotor Outer Diameter [Z] [2]	mm	109.7							
Stator Inner Diameter [Y] [2]	mm	62.5							
Total Height [X] [2]	mm	32.0							
Motor Lead Wire AWG Size		12	12	14	14	20	20	20	20

(1) Assuming the stator-rotor set is mounted on a bracket with an aluminium flange diameter 1.5 times rotor diameter.
(2) See the dimensions in the drawing (page 6).
(3) Windings C, D, G and H are delta connected, windings E, F, J and K are wye connected.
(4) Line currents are the AC currents running into the three terminals of the stator.

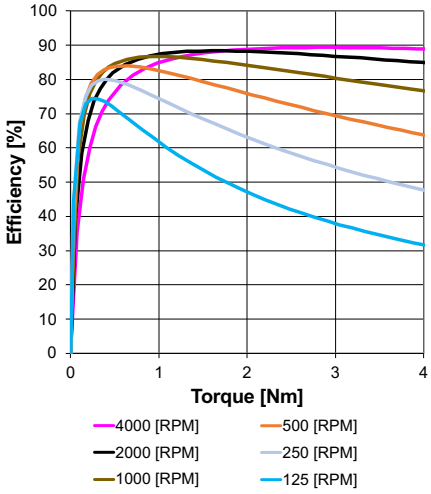
PERFORMANCE

KMF10901-W T-n and T-I curves



Supply current is the DC current taken from the DC power supply by the drive. The torque-speed curves and torque-current curves are made assuming a FOC drive is used.

KMF10901 Efficiency curves



SPECIFICATIONS

		KMF 109 02							
Winding Identification[3]		**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**
Nominal Supply Voltage DC Link	Volt	30	42	54	72	72	72	72	72
Rated Output Power[1]	Watt	563	634	587	628	449	331	251	183
Rated Speed	RPM	1901	2141	1980	2119	1514	1117	848	617
Rated Torque[1]	Nm	2.83							
Rated Line Current[1][4]	Arms	15.9	12.8	9.2	7.4	5.3	4.0	3.1	2.3
Max Efficiency	%	89							
No Load Speed (@ nominal voltage)	RPM	1976	2213	2053	2190	1581	1186	913	684
BEMF Constant Ke	V/kRPM	15.2	19.0	26.3	32.9	45.5	60.7	78.9	105.2
Motor Speed Constant Kv (=1/Ke)	RPM/V	65.9	52.7	38.0	30.4	22.0	16.5	12.7	9.5
Continuous Stall Torque[1]	Nm	3.50							
Continuous Stall Line Current (rms)[1]	Arms	19.7	15.8	11.4	9.1	6.6	4.9	3.8	2.8
Peak Torque	Nm	9.06							
Max. Demagnetization Line Current	A	120	96	69	56	40	30	23	17
Torque/Rms Line Current Kt[4]	Nm/Arms	0.178	0.222	0.308	0.384	0.533	0.710	0.923	1.230
Resistance (terminal-to-terminal)	mOhm	58	88	171	260	467	855	1367	2531
Inductance (terminal-to-terminal)	µH	72	113	217	339	652	1159	1955	3476
Back EMF (@1000 RPM terminal-to-terminal)	Vrms	10.7	13.4	18.6	23.2	32.2	42.9	55.8	74.4
Thermal Resistance (stator/rotor to ambient)[1]	°C/W	1.23							
Thermal Resistance Winding-Housing	°C/W	0.61							
Max. Winding Temperature	°C	160							
Number of Pole Pairs		15							
Weight	kg	1.07							
Rotor Inertia - Large I.D.	kgm²*E-6	1108							
Rotor Inertia - Small I.D.	kgm²*E-6	1147							
Mechanical Time Constant	ms	2.0							
Electrical Time Constant	ms	1.2							
Motor Constant Km	Nm/ sqrt(W)	0.622							

(1) Assuming the stator-rotor set is mounted on a bracket with an aluminium flange diameter 1.5 times rotor diameter.
(2) See the dimensions in the drawing (page 6).
(3) Windings C, D, G and H are delta connected, windings E, F, J and K are wye connected.
(4) Line currents are the AC currents running into the three terminals of the stator.

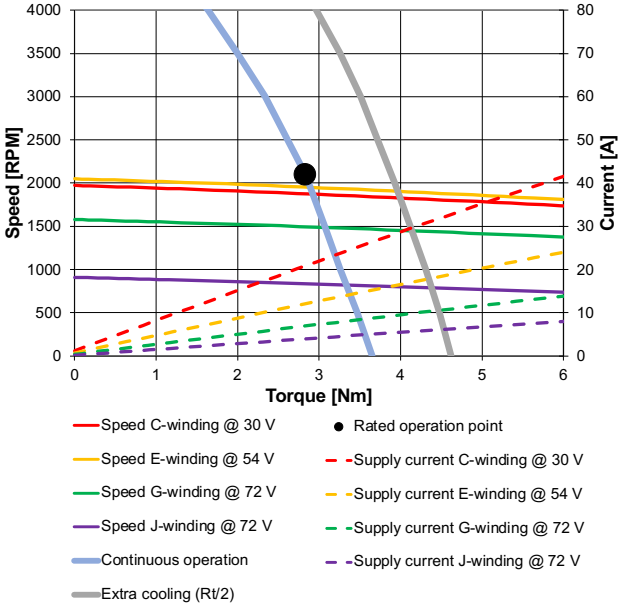
SPECIFICATIONS

		KMF 109 02							
Winding Identification[3]		**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**
Cogging Torque (typical, peak to peak)	Nm	0.071							
Drag Torque	Nm	0.065							
Viscous Damping	Nm/RPM	5.2E-05							
Thermal Time Constant of Winding Only	s	23							
Adiabatic Heating of Winding at Peak Torque	K/s	4							
Rotor Inner Diameter [V] [2]	mm	67							
Rotor Inner Diameter [W] [2]	mm	20							
Rotor Outer Diameter [Z] [2]	mm	109.7							
Stator Inner Diameter [Y] [2]	mm	62.5							
Total Height [X] [2]	mm	43.0							
Motor Lead Wire AWG Size		12	12	14	14	20	20	20	20

(1) Assuming the stator-rotor set is mounted on a bracket with an aluminium flange diameter 1.5 times rotor diameter.
(2) See the dimensions in the drawing (page 6).
(3) Windings C, D, G and H are delta connected, windings E, F, J and K are wye connected.
(4) Line currents are the AC currents running into the three terminals of the stator.

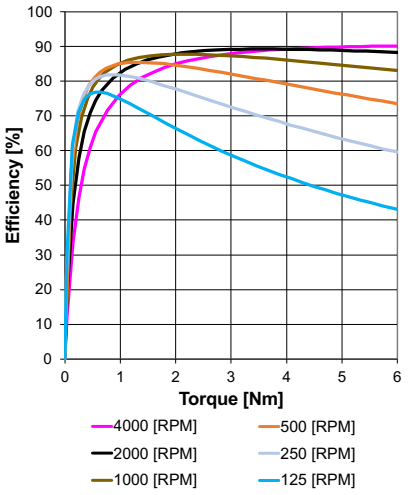
PERFORMANCE

KMF10902-W T-n and T-I curves



Supply current is the DC current taken from the DC power supply by the drive. The torque-speed curves and torque-current curves are made assuming a FOC drive is used.

KMF10902 Efficiency curves



SPECIFICATIONS

		KMF 109 03							
Winding Identification[3]		**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**
Nominal Supply Voltage DC Link	Volt	42	54	72	72	72	72	72	72
Rated Output Power[1]	Watt	761	785	754	598	426	313	237	171
Rated Speed	RPM	1864	1921	1845	1465	1044	766	579	417
Rated Torque[1]	Nm	3.90							
Rated Line Current[1][4]	Arms	15.3	12.3	8.8	7.1	5.1	3.8	2.9	2.2
Max Efficiency	%	90							
No Load Speed (@ nominal voltage)	RPM	1930	1985	1910	1528	1103	827	637	477
BEMF Constant Ke	V/kRPM	21.8	27.2	37.7	47.1	65.3	87.1	113.1	150.8
Motor Speed Constant Kv (=1/Ke)	RPM/V	45.9	36.8	26.5	21.2	15.3	11.5	8.8	6.6
Continuous Stall Torque[1]	Nm	4.80							
Continuous Stall Line Current (rms)[1]	Arms	18.9	15.1	10.9	8.7	6.3	4.7	3.6	2.7
Peak Torque	Nm	13.59							
Max. Demagnetization Line Current	A	126	101	73	58	42	31	24	18
Torque/Rms Line Current Kt[4]	Nm/Arms	0.255	0.318	0.441	0.551	0.764	1.018	1.323	1.764
Resistance (terminal-to-terminal)	mOhm	76	115	224	343	612	1125	1801	3339
Inductance (terminal-to-terminal)	µH	107	167	320	500	961	1708	2882	5124
Back EMF (@1000 RPM terminal-to-terminal)	Vrms	15.4	19.2	26.7	33.3	46.2	61.6	80.0	106.6
Thermal Resistance (stator/rotor to ambient)[1]	°C/W	1.11							
Thermal Resistance Winding-Housing	°C/W	0.41							
Max. Winding Temperature	°C	160							
Number of Pole Pairs		15							
Weight	kg	1.45							
Rotor Inertia - Large I.D.	kgm²*E-6	1432							
Rotor Inertia - Small I.D.	kgm²*E-6	1471							
Mechanical Time Constant	ms	1.7							
Electrical Time Constant	ms	1.4							
Motor Constant Km	Nm/ sqrt(W)	0.778							

(1) Assuming the stator-rotor set is mounted on a bracket with an aluminium flange diameter 1.5 times rotor diameter.
(2) See the dimensions in the drawing (page 6).
(3) Windings C, D, G and H are delta connected, windings E, F, J and K are wye connected.
(4) Line currents are the AC currents running into the three terminals of the stator.

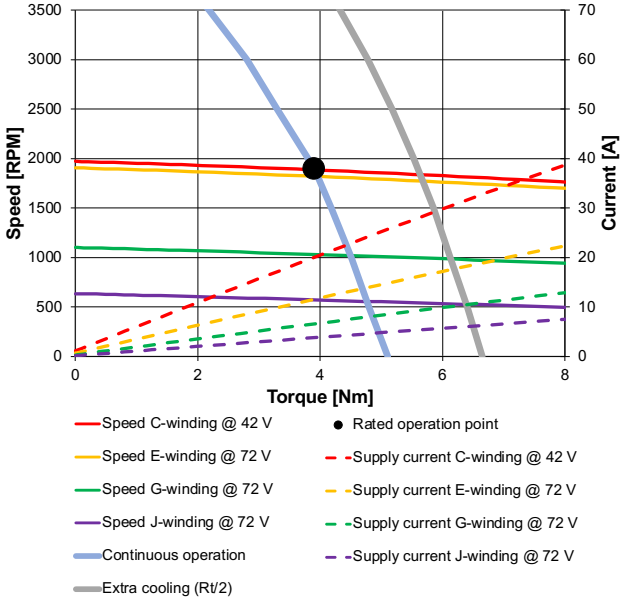
SPECIFICATIONS

		KMF 109 03							
Winding Identification[3]		**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**
Cogging Torque (typical, peak to peak)	Nm	0.098							
Drag Torque	Nm	0.081							
Viscous Damping	Nm/RPM	7.5E-05							
Thermal Time Constant of Winding Only	s	21							
Adiabatic Heating of Winding at Peak Torque	K/s	4							
Rotor Inner Diameter [V] [2]	mm	67							
Rotor Inner Diameter [W] [2]	mm	20							
Rotor Outer Diameter [Z] [2]	mm	109.7							
Stator Inner Diameter [Y] [2]	mm	62.5							
Total Height [X] [2]	mm	54.0							
Motor Lead Wire AWG Size		12	12	14	14	20	20	20	20

(1) Assuming the stator-rotor set is mounted on a bracket with an aluminium flange diameter 1.5 times rotor diameter.
(2) See the dimensions in the drawing (page 6).
(3) Windings C, D, G and H are delta connected, windings E, F, J and K are wye connected.
(4) Line currents are the AC currents running into the three terminals of the stator.

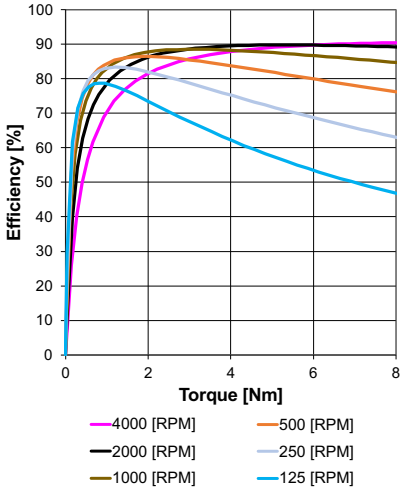
PERFORMANCE

KMF10903-W T-n and T-I curves



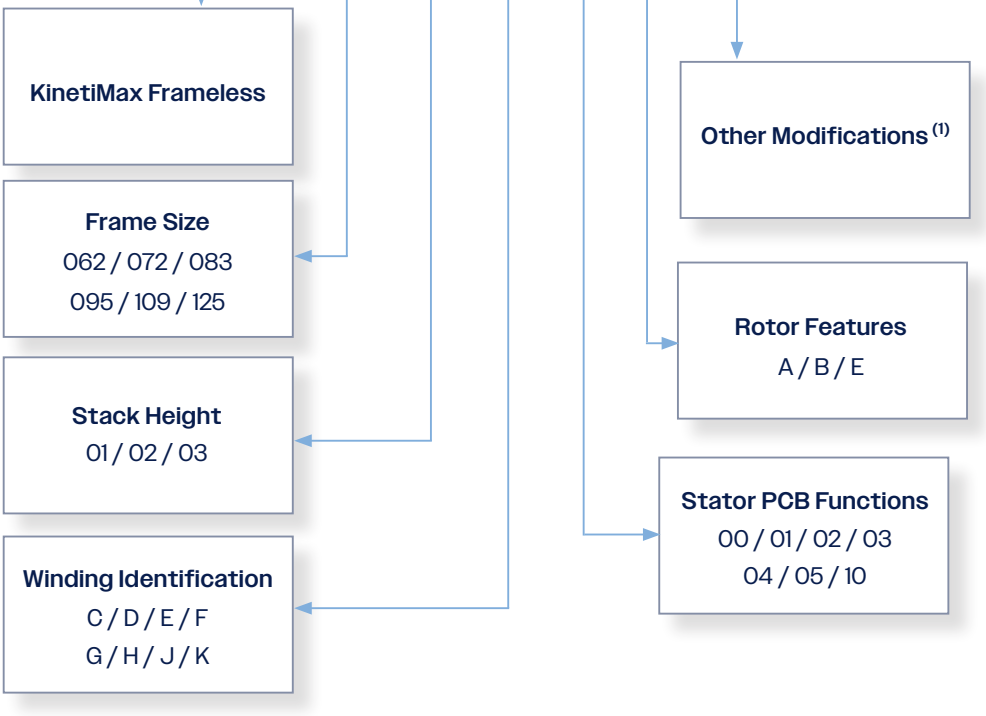
Supply current is the DC current taken from the DC power supply by the drive. The torque-speed curves and torque-current curves are made assuming a FOC drive is used.

KMF10903 Efficiency curves



COMMERCIAL PART NUMBERING KMF HPD STATOR-ROTOR SETS

KMF xxx yy-W zz R-vv



ZZ	Stator PCB functions
00	No PCB
01	PCB with 3 Hall sensors
02	PCB with 1 temperature sensor only
03	PCB with 3 Hall sensors and 1 temperature sensor
04	PCB with 3 temperature sensors only
05	PCB with 3 Hall sensors and 3 temperature senors
10	Starting with 1 are custom PCB's

R	Rotor features
A	Large bore hole, G40 balancing class
B	Small bore hole, G40 balancing class
E	Custom rotor or balancing

(1) ***Other modifications*** are meant custom added parts to stator or rotor like a stator bracket, other leadwires with connector or a rotor nave/shaft etc.