Allied Motion
An Allient Company

Brushless DC Outer-Rotor Motors

# KINETIMAX HPD - 125

125 mm diameter, 2.29 to 6.30 Nm continuous torque, up to 1300 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 2.29 Nm to 6.30 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.

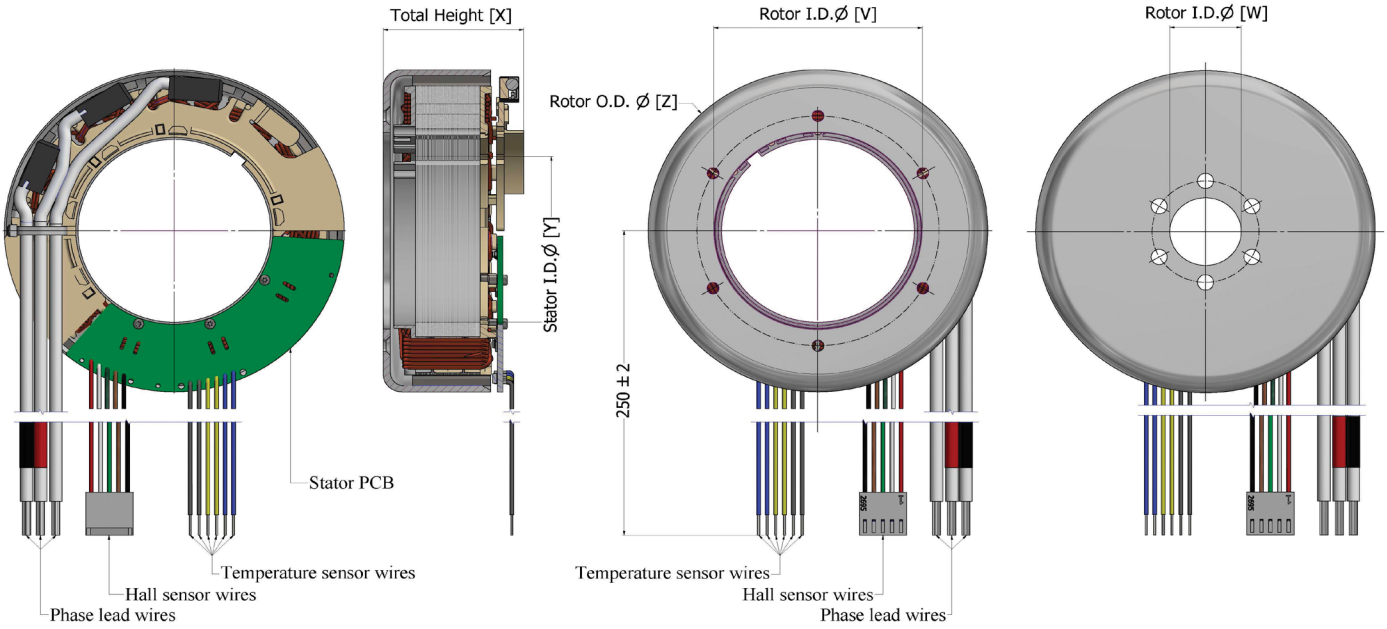
## APPLICATIONS

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

***Including***

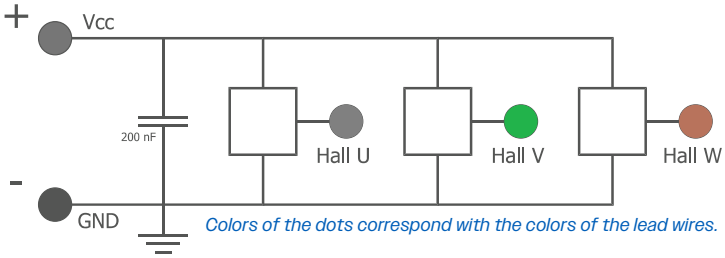
- Automated Guided Vehicles (AGVs)
- Robotics (arms, joints, end-effectors)
- Handheld hydraulic power tools
- Material handling systems
- Medical devices and equipment
- Rotary actuators and gimbals

## DIMENSIONS



## HALL SENSORS

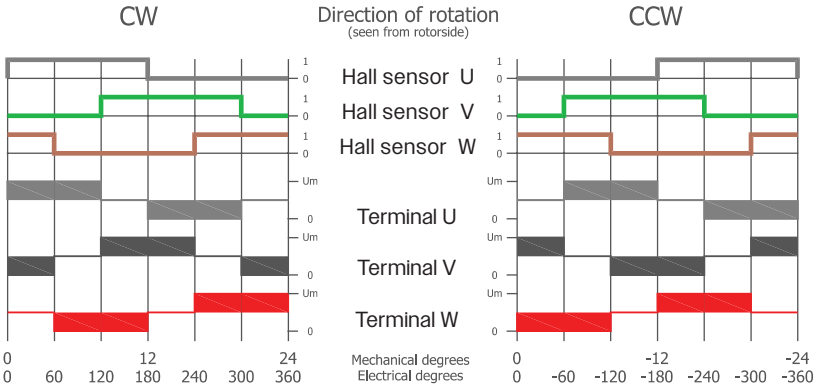
### Connections/Specifications:




*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 |

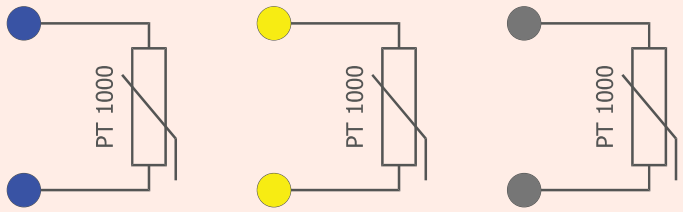
### Switching Sequence:




*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 125 01 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Winding Identification[3]** | | **C** | **D** | **E** | **F** | **G** | **H** | **J** | **K** |
| **Nominal Supply Voltage DC Link** | Volt | 30 | 36 | 54 | 72 | 72 | 72 | 72 | 72 |
| **Rated Output Power[1]** | Watt | 689 | 662 | 718 | 767 | 548 | 408 | 310 | 229 |
| **Rated Speed** | RPM | 2875 | 2760 | 2994 | 3200 | 2286 | 1701 | 1291 | 954 |
| **Rated Torque[1]** | Nm | 2.29 | | | | | | | |
| **Rated Line Current[1][4]** | Arms | 19.3 | 15.4 | 11.1 | 8.9 | 6.4 | 4.8 | 3.7 | 2.8 |
| **Max Efficiency** | % | 90 | | | | | | | |
| **No Load Speed (@ nominal voltage)** | RPM | 2953 | 2835 | 3069 | 3273 | 2362 | 1772 | 1364 | 1023 |
| **BEMF Constant Ke** | V/kRPM | 10.2 | 12.7 | 17.6 | 22.0 | 30.5 | 40.6 | 52.8 | 70.4 |
| **Motor Speed Constant Kv (=1/Ke)** | RPM/V | 98.4 | 78.7 | 56.8 | 45.5 | 32.8 | 24.6 | 18.9 | 14.2 |
| **Continuous Stall Torque[1]** | Nm | 3.10 | | | | | | | |
| **Continuous Stall Line Current (rms)[1]** | Arms | 26.1 | 20.9 | 15.1 | 12.0 | 8.7 | 6.5 | 5.0 | 3.8 |
| **Peak Torque** | Nm | 6.83 | | | | | | | |
| **Max. Demagnetization Line Current** | A | 136 | 108 | 78 | 63 | 45 | 34 | 26 | 20 |
| **Torque/Rms Line Current Kt[4]** | Nm/Arms | 0.119 | 0.149 | 0.206 | 0.257 | 0.356 | 0.475 | 0.617 | 0.823 |
| **Resistance (terminal-to-terminal)** | mOhm | 33 | 50 | 96 | 148 | 293 | 483 | 845 | 1414 |
| **Inductance (terminal-to-terminal)** | µH | 46 | 71 | 137 | 214 | 411 | 731 | 1233 | 2192 |
| **Back EMF (@1000 RPM terminal-to-terminal)** | Vrms | 7.2 | 9.0 | 12.4 | 15.6 | 21.6 | 28.7 | 37.3 | 49.8 |
| **Thermal Resistance (stator/rotor to ambient)[1]** | °C/W | 1.06 | | | | | | | |
| **Thermal Resistance Winding-Housing** | °C/W | 0.92 | | | | | | | |
| **Max. Winding Temperature** | °C | 160 | | | | | | | |
| **Number of Pole Pairs** | | 15 | | | | | | | |
| **Weight** | kg | 0.94 | | | | | | | |
| **Rotor Inertia - Large I.D.** | kgm²*E-6 | 1338 | | | | | | | |
| **Rotor Inertia - Small I.D.** | kgm²*E-6 | 1410 | | | | | | | |
| **Mechanical Time Constant** | ms | 3.2 | | | | | | | |
| **Electrical Time Constant** | ms | 1.4 | | | | | | | |
| **Motor Constant Km** | Nm/ sqrt(W) | 0.546 | | | | | | | |

**(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.

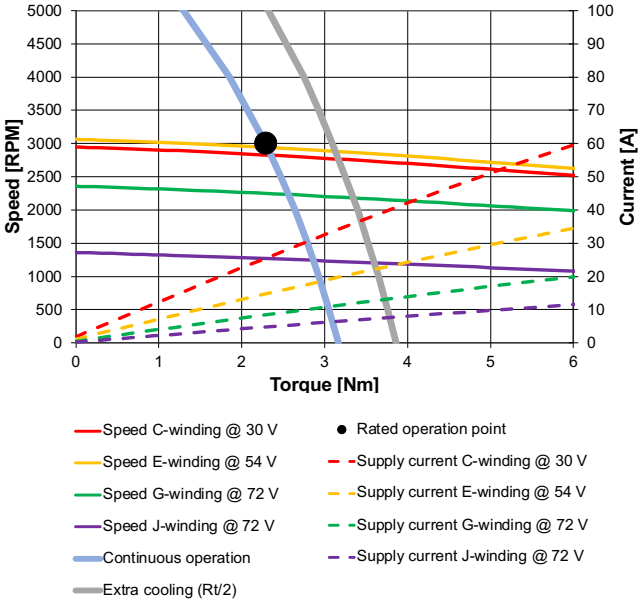
## SPECIFICATIONS

| | | KMF 125 01 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Winding Identification[3]** | | **C** | **D** | **E** | **F** | **G** | **H** | **J** | **K** |
| **Cogging Torque (typical, peak to peak)** | Nm | 0.057 | | | | | | | |
| **Drag Torque** | Nm | 0.056 | | | | | | | |
| **Viscous Damping** | Nm/RPM | 4.2E-05 | | | | | | | |
| **Thermal Time Constant of Winding Only** | s | 36 | | | | | | | |
| **Adiabatic Heating of Winding at Peak Torque** | K/s | 2 | | | | | | | |
| **Rotor Inner Diameter [V] [2]** | mm | 77 | | | | | | | |
| **Rotor Inner Diameter [W] [2]** | mm | 26 | | | | | | | |
| **Rotor Outer Diameter [Z] [2]** | mm | 125.2 | | | | | | | |
| **Stator Inner Diameter [Y] [2]** | mm | 73.0 | | | | | | | |
| **Total Height [X] [2]** | mm | 33.5 | | | | | | | |
| **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.

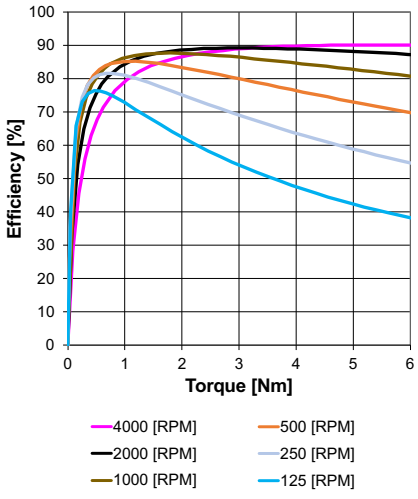
## PERFORMANCE

**KMF12501-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.

**KMF12501 Efficiency curves**



## SPECIFICATIONS

| | | KMF 125 02 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **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 | 969 | 998 | 959 | 763 | 542 | 402 | 303 | 222 |
| **Rated Speed** | RPM | 2102 | 2166 | 2082 | 1655 | 1177 | 872 | 657 | 482 |
| **Rated Torque[1]** | Nm | 4.40 | | | | | | | |
| **Rated Line Current[1][4]** | Arms | 19.4 | 15.5 | 11.2 | 8.9 | 6.5 | 4.8 | 3.7 | 2.8 |
| **Max Efficiency** | % | 90 | | | | | | | |
| **No Load Speed (@ nominal voltage)** | RPM | 2161 | 2223 | 2139 | 1711 | 1235 | 926 | 713 | 535 |
| **BEMF Constant Ke** | V/kRPM | 19.4 | 24.3 | 33.7 | 42.1 | 58.3 | 77.7 | 101.0 | 134.7 |
| **Motor Speed Constant Kv (=1/Ke)** | RPM/V | 51.4 | 41.2 | 29.7 | 23.8 | 17.1 | 12.9 | 9.9 | 7.4 |
| **Continuous Stall Torque[1]** | Nm | 5.80 | | | | | | | |
| **Continuous Stall Line Current (rms)[1]** | Arms | 25.5 | 20.4 | 14.7 | 11.8 | 8.5 | 6.4 | 4.9 | 3.7 |
| **Peak Torque** | Nm | 13.67 | | | | | | | |
| **Max. Demagnetization Line Current** | A | 142 | 113 | 82 | 65 | 47 | 35 | 27 | 20 |
| **Torque/Rms Line Current Kt[4]** | Nm/Arms | 0.227 | 0.284 | 0.394 | 0.492 | 0.682 | 0.909 | 1.181 | 1.575 |
| **Resistance (terminal-to-terminal)** | mOhm | 48 | 73 | 140 | 215 | 424 | 704 | 1237 | 2076 |
| **Inductance (terminal-to-terminal)** | µH | 83 | 130 | 249 | 389 | 747 | 1329 | 2242 | 3986 |
| **Back EMF (@1000 RPM terminal-to-terminal)** | Vrms | 13.7 | 17.2 | 23.8 | 29.8 | 41.2 | 55.0 | 71.4 | 95.2 |
| **Thermal Resistance (stator/rotor to ambient)[1]** | °C/W | 0.94 | | | | | | | |
| **Thermal Resistance Winding-Housing** | °C/W | 0.46 | | | | | | | |
| **Max. Winding Temperature** | °C | 160 | | | | | | | |
| **Number of Pole Pairs** | | 15 | | | | | | | |
| **Weight** | kg | 1.47 | | | | | | | |
| **Rotor Inertia - Large I.D.** | kgm²*E-6 | 1906 | | | | | | | |
| **Rotor Inertia - Small I.D.** | kgm²*E-6 | 1978 | | | | | | | |
| **Mechanical Time Constant** | ms | 1.8 | | | | | | | |
| **Electrical Time Constant** | ms | 1.7 | | | | | | | |
| **Motor Constant Km** | Nm/ sqrt(W) | 0.867 | | | | | | | |

**(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.

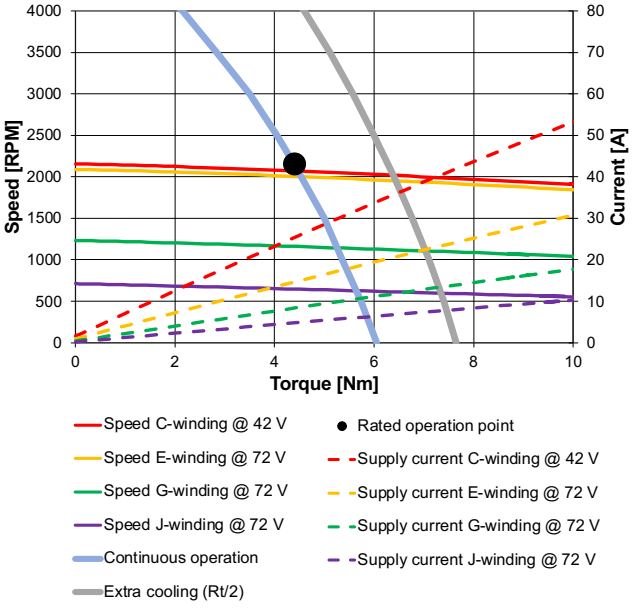
## SPECIFICATIONS

| | | KMF 125 02 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Winding Identification[3]** | | **C** | **D** | **E** | **F** | **G** | **H** | **J** | **K** |
| **Cogging Torque (typical, peak to peak)** | Nm | 0.110 | | | | | | | |
| **Drag Torque** | Nm | 0.106 | | | | | | | |
| **Viscous Damping** | Nm/RPM | 8.4E-05 | | | | | | | |
| **Thermal Time Constant of Winding Only** | s | 27 | | | | | | | |
| **Adiabatic Heating of Winding at Peak Torque** | K/s | 3 | | | | | | | |
| **Rotor Inner Diameter [V] [2]** | mm | 77 | | | | | | | |
| **Rotor Inner Diameter [W] [2]** | mm | 26 | | | | | | | |
| **Rotor Outer Diameter [Z] [2]** | mm | 125.2 | | | | | | | |
| **Stator Inner Diameter [Y] [2]** | mm | 73.0 | | | | | | | |
| **Total Height [X] [2]** | mm | 46.0 | | | | | | | |
| **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.

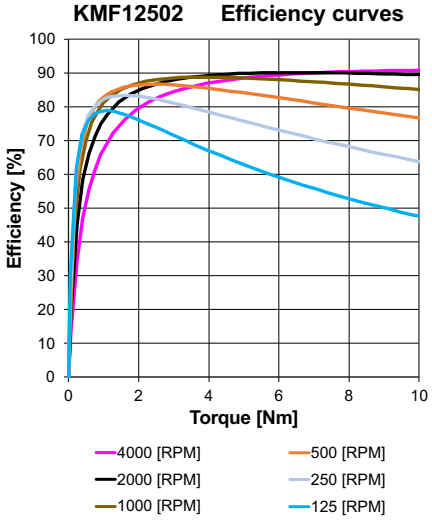
## PERFORMANCE

**KMF12502-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.

**KMF12502 Efficiency curves**



## SPECIFICATIONS

| | | KMF 125 03 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Winding Identification[3]** | | **C** | **D** | **E** | **F** | **G** | **H** | **J** | **K** |
| **Nominal Supply Voltage DC Link** | Volt | 54 | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| **Rated Output Power[1]** | Watt | 1245 | 1331 | 951 | 754 | 534 | 394 | 295 | 214 |
| **Rated Speed** | RPM | 1887 | 2018 | 1442 | 1143 | 810 | 598 | 447 | 325 |
| **Rated Torque[1]** | Nm | 6.30 | | | | | | | |
| **Rated Line Current[1][4]** | Arms | 19.4 | 15.5 | 11.2 | 8.9 | 6.5 | 4.8 | 3.7 | 2.8 |
| **Max Efficiency** | % | 91 | | | | | | | |
| **No Load Speed (@ nominal voltage)** | RPM | 1940 | 2070 | 1494 | 1195 | 862 | 647 | 498 | 373 |
| **BEMF Constant Ke** | V/kRPM | 27.8 | 34.8 | 48.2 | 60.3 | 83.5 | 111.3 | 144.6 | 192.8 |
| **Motor Speed Constant Kv (=1/Ke)** | RPM/V | 35.9 | 28.7 | 20.7 | 16.6 | 12.0 | 9.0 | 6.9 | 5.2 |
| **Continuous Stall Torque[1]** | Nm | 8.20 | | | | | | | |
| **Continuous Stall Line Current (rms)[1]** | Arms | 25.2 | 20.2 | 14.5 | 11.6 | 8.4 | 6.3 | 4.8 | 3.6 |
| **Peak Torque** | Nm | 20.50 | | | | | | | |
| **Max. Demagnetization Line Current** | A | 148 | 119 | 86 | 69 | 49 | 37 | 29 | 21 |
| **Torque/Rms Line Current Kt[4]** | Nm/Arms | 0.325 | 0.407 | 0.564 | 0.705 | 0.976 | 1.302 | 1.691 | 2.255 |
| **Resistance (terminal-to-terminal)** | mOhm | 62 | 96 | 183 | 283 | 554 | 924 | 1628 | 2738 |
| **Inductance (terminal-to-terminal)** | µH | 122 | 191 | 367 | 574 | 1102 | 1959 | 3305 | 5876 |
| **Back EMF (@1000 RPM terminal-to-terminal)** | Vrms | 19.7 | 24.6 | 34.1 | 42.6 | 59.0 | 78.7 | 102.3 | 136.3 |
| **Thermal Resistance (stator/rotor to ambient)[1]** | °C/W | 0.84 | | | | | | | |
| **Thermal Resistance Winding-Housing** | °C/W | 0.31 | | | | | | | |
| **Max. Winding Temperature** | °C | 160 | | | | | | | |
| **Number of Pole Pairs** | | 15 | | | | | | | |
| **Weight** | kg | 1.99 | | | | | | | |
| **Rotor Inertia - Large I.D.** | kgm²*E-6 | 2437 | | | | | | | |
| **Rotor Inertia - Small I.D.** | kgm²*E-6 | 2546 | | | | | | | |
| **Mechanical Time Constant** | ms | 1.4 | | | | | | | |
| **Electrical Time Constant** | ms | 2.0 | | | | | | | |
| **Motor Constant Km** | Nm/ sqrt(W) | 1.083 | | | | | | | |

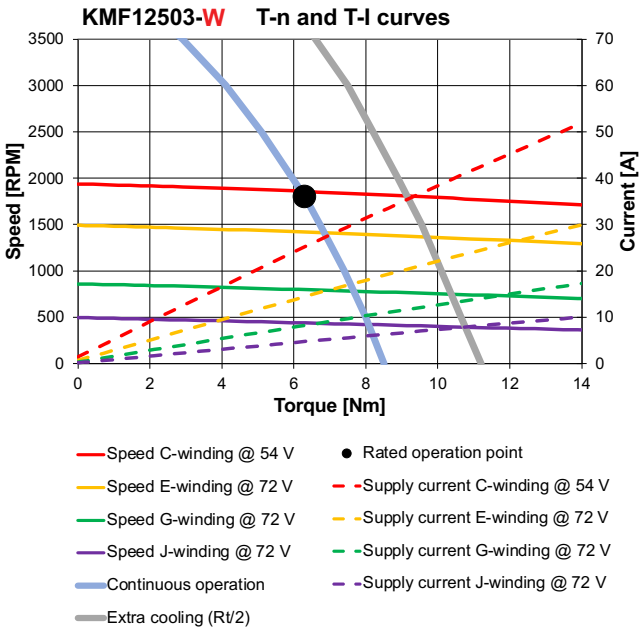
**(1)** Assuming the stator-rotor set is mounted on a bracket with an aluminium flange diameter 1.5 times rotor diameter.
**(2)** See the dimensions in the drawing (page 6).
**(3)** Windings C, D, G and H are delta connected, windings E, F, J and K are wye connected.
**(4)** Line currents are the AC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

## SPECIFICATIONS

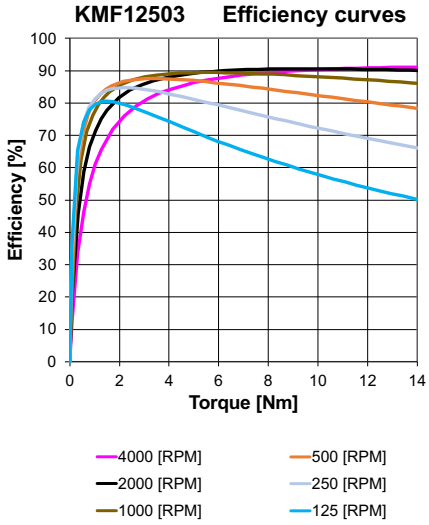
| | | KMF 125 03 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Winding Identification[3]** | | **C** | **D** | **E** | **F** | **G** | **H** | **J** | **K** |
| **Cogging Torque (typical, peak to peak)** | Nm | 0.158 | | | | | | | |
| **Drag Torque** | Nm | 0.131 | | | | | | | |
| **Viscous Damping** | Nm/RPM | 1.2E-04 | | | | | | | |
| **Thermal Time Constant of Winding Only** | s | 24 | | | | | | | |
| **Adiabatic Heating of Winding at Peak Torque** | K/s | 3 | | | | | | | |
| **Rotor Inner Diameter [V] [2]** | mm | 77 | | | | | | | |
| **Rotor Inner Diameter [W] [2]** | mm | 26 | | | | | | | |
| **Rotor Outer Diameter [Z] [2]** | mm | 125.2 | | | | | | | |
| **Stator Inner Diameter [Y] [2]** | mm | 73.0 | | | | | | | |
| **Total Height [X] [2]** | mm | 57.5 | | | | | | | |
| **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

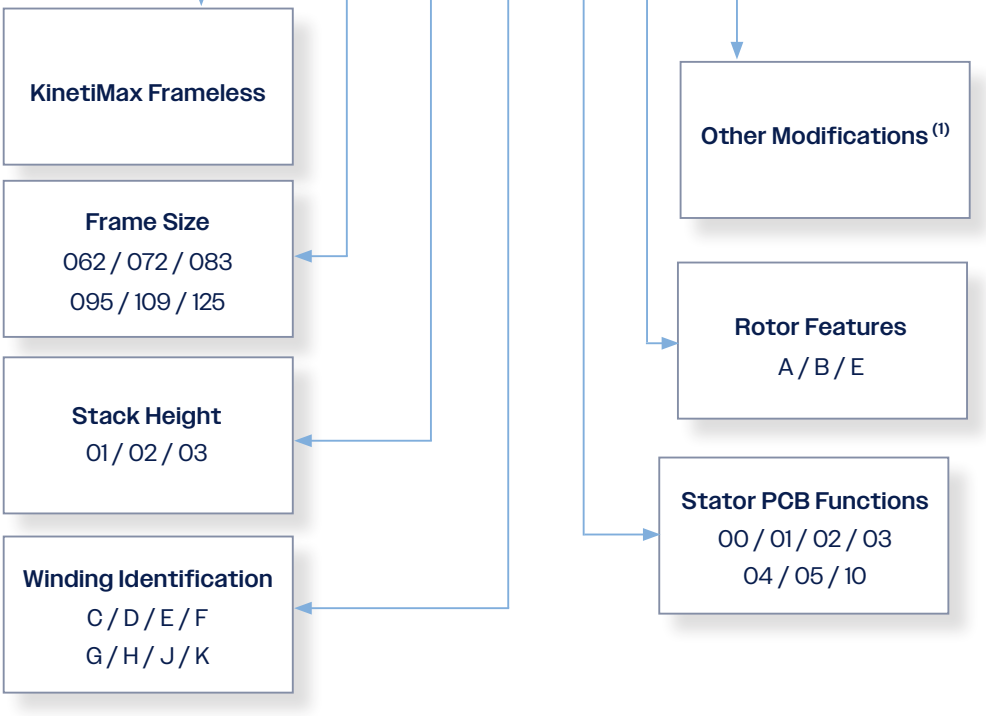



Supply current is the DC current taken from the DC power supply by the drive. The torque-speed curves and torque-current curves are made assuming a FOC drive is used.



## 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.