

Kollmorgen VLM Brushless Motor Selection Guide



KOLLMORGEN

Because Motion Matters™  **ELECTROMATE**

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Kollmorgen. Every solution comes from a real understanding of OEM challenges.

The ever-escalating demands of the marketplace mean increased pressure on OEMs at every turn. Time constraints. Demands for better performance. Having to think about the next-generation machine even before the current one is built. While expectations are enormous, budgets are not. Kollmorgen's innovative motion solutions and broad range of quality products help engineers not only overcome these challenges but also build truly differentiated machines.

Because motion matters, it's our focus. Motion can distinctly differentiate a machine and deliver a marketplace advantage by improving its performance. This translates to overall increased efficiency for your application. Perfectly deployed machine motion can make your customer's machine more reliable and efficient, enhance accuracy and improve operator safety. Motion also represents endless possibilities for innovation. We've always understood this potential, and thus have kept motion at our core, relentlessly developing products that offer precision control of speed, accuracy and position in machines that rely on complex motion.

K O L L M O R G E N

Removing the Barriers of Design, Sourcing, and Time

At Kollmorgen, we know that OEM engineers can achieve a lot more when obstacles aren't in the way. So, we knock them down in three important ways:

Integrating Standard and Custom Products

The optimal solution is often not clear-cut. Our application expertise allows us to modify standard products or develop totally custom solutions across our whole product portfolio so that designs can take flight.

Providing Motion Solutions, Not Just Components

As companies reduce their supplier base and have less engineering manpower, they need a total system supplier with a wide range of integrated solutions. Kollmorgen is in full response mode with complete solutions that combine programming software, engineering services and best-in-class motion components.

Global Footprint

With direct sales, engineering support, manufacturing facilities, and distributors across North America, Europe, Middle East, and Asia, we're close to OEMs worldwide. Our proximity helps speed delivery and lend support where and when they're needed.

Financial and Operational Stability

Kollmorgen is part of Danaher Corporation, our \$13B parent company. A key driver in the growth of all Danaher divisions is the Danaher Business System, which relies on the principle of "kaizen" – or continuous improvement. Using world-class tools, cross-disciplinary teams of exceptional people evaluate processes and develop plans that result in superior performance.

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AKD™ Servo Drive

Our AKD series is a complete range of Ethernet-based servo drives that are fast, feature-rich, flexible and integrate quickly and easily into any application.* AKD ensures plug-and-play commissioning for instant, seamless access to everything in your machine. And, no matter what your application demands, AKD offers industry-leading servo performance, communication options, and power levels, all in a smaller footprint.

This robust, technologically advanced family of drives delivers optimized performance when paired with our best-in-class components, producing higher quality results at greater speeds and more uptime.

* Patents pending.

K O L L M O R G E N

The Benefits of AKD Servo Drive

- Optimized Performance in Seconds
 - Auto-tuning is one of the best and fastest in the industry
 - Automatically adjusts all gains, including observers
 - Immediate and adaptive response to dynamic loads
 - Precise control of all motor types
 - Compensation for stiff and compliant transmission and couplings
- Greater Throughput and Accuracy
 - Up to 27-bit-resolution feedback yields unmatched precision and excellent repeatability
 - Very fast settling times result from a powerful dual processor system that executes industry-leading and patent pending servo algorithms with high resolution
 - Advanced servo techniques such as high-order observer and bi-quad filters yield industry-leading machine performance
 - Highest bandwidth torque-and-velocity loops. Fastest digital current loop in the market
- Easy-to-Use Graphical User Interface (GUI) for Faster Commissioning and Troubleshooting
 - Six-channel real-time software oscilloscope commissions and diagnoses quickly
 - Multi-function Bode Plot allows users to quickly evaluate performance
 - Auto-complete of programmable commands saves looking up parameter names
 - One-click capture and sharing of program plots and parameter settings allow you to send machine performance data instantly
 - Widest range of programming options in the industry
- Flexible and Scalable to Meet Any Application
 - 3 to 96 Arms continuous current; 9 to 192 Arms peak
 - Very high power density enables an extremely small package
 - True plug-and-play with all standard Kollmorgen servomotors and positioners
 - Supports a variety of single and multi-turn feedback devices—Smart Feedback Device (SFD), EnDat2.2, 01, BiSS, analog Sine/Cos encoder, incremental encoder, HIPERFACE®, and resolver
 - Tightly integrated Ethernet motion buses without the need to add large hardware: EtherCAT®, SynqNet®, Modbus/TCP, and CANopen®
 - Scalable programmability from base torque-and-velocity through multi-axis master

AKD Servo Drive

The AKD servo drive delivers cutting-edge technology and performance with one of the most compact footprints in the industry. These feature-rich drives provide a solution for nearly any application, from basic torque-and-velocity applications, to indexing, to multi-axis programmable motion with embedded Kollmorgen Automation Suite. The versatile AKD sets the standard for power density and performance.



Micron™ Gearheads



AKM™ Servomotors



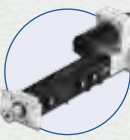
Cartridge Direct Drive Rotary™ Motors



Housed Direct Drive Rotary Motors



Direct Drive Linear Motors*



Linear Positioners



Multi-Axis Precision Tables

Best-in-Class Components

AKD works seamlessly with Kollmorgen motors and positioners - well-known for quality, reliability, and performance.



AKD™ Servo Drive



Industry-leading power density

General Specifications

| 120 / 240 Vac 1 & 3Ø (85 -265 V) | Continuous Current (Arms) | Peak Current (Arms) | Drive Continuous Output Power Capacity (Watts) | Internal Regen (Watts) (Ohms) | | Height mm (in) | Width mm (in) | Depth mm (in) | Depth with Cable Bend Radius mm (in) |
|-------------------------------------|---------------------------------|---------------------------|---------------------------------------------------------|----------------------------------|----|----------------------|---------------------|---------------------|-----------------------------------------------|
| AKD-■00306 | 3 | 9 | 1100 | 0 | 0 | 168 (6.61) | 57 (2.24) | 153 (6.02) | 184 (7.24) |
| AKD-■00606 | 6 | 18 | 2000 | 0 | 0 | 168 (6.61) | 57 (2.24) | 153 (6.02) | 184 (7.24) |
| AKD-■01206 | 12 | 30 | 4000 | 100 | 15 | 195 (7.68) | 76 (2.99) | 186 (7.32) | 215 (8.46) |
| AKD-■02406 | 24 | 48 | 8000 | 200 | 8 | 250 (9.84) | 100 (3.94) | 230 (9.06) | 265 (10.43) |
| 480 Vac 3Ø (342 -528 V) | Continuous Current (Arms) | Peak Current (Arms) | Drive Continuous Output Power Capacity (Watts) | Internal Regen (Watts) (Ohms) | | Height mm (in) | Width mm (in) | Depth mm (in) | Depth with Cable Bend Radius mm (in) |
| AKD-■00307 | 3 | 9 | 2000 | 100 | 33 | 256 (10.08) | 70 (2.76) | 186 (7.32) | 221 (8.70) |
| AKD-■00607 | 6 | 18 | 4000 | 100 | 33 | 256 (10.08) | 70 (2.76) | 186 (7.32) | 221 (8.70) |
| AKD-■01207 | 12 | 30 | 8000 | 100 | 33 | 256 (10.08) | 70 (2.76) | 186 (7.32) | 221 (8.70) |
| AKD-■02407 | 24 | 48 | 16,000 | 200 | 23 | 310 (12.20) | 105 (4.13) | 229 (9.02) | 264 (10.39) |
| AKD-■04807 | 48 | 96 | 32,000 | 400 | | <i>Coming Soon</i> | | | |
| AKD-■09607 | 96 | 192 | 64,000 | 800 | | <i>Coming Soon</i> | | | |

VLM Series Brushless Servomotor

The new VLM family of servomotors is designed for superior Torque-per-dollar for those customers looking for a low cost motor with optimal performance.

With a design targeted for the most common servomotor features and offering torque ranges from 0.5Nm to almost 16Nm, VLM is able to deliver all the torque and performance of a servo while helping customers control their application costs.

VLM is available in both NEMA (23, 34) and Metric (60, 90mm) mounting standards with multiple shaft configurations for seamless integration into any system. Similarly, multiple feedback and cable options give customers flexibility in their system configuration without adding significant cost.

The Benefits of VLM Brushless Servomotors

- Exceptional Quality and Value
 - High torque per dollar
 - Quality components
 - No need for intermediate cables
 - Low cost feedback options standard
 - Low cost design
- Standard Configurations To Fit Most Applications
 - VLM offers 6 of the most popular size motors with 12 standard windings
 - NEMA and Metric standard mounts
 - S200, AKD, Flying Leads and Molex Connector options standard
 - Good match for dynamic loads
- Ease of Use
 - Standard connector options and matching cables

VLM2x Product Overview

- NEMA 23 or 60 mm metric
- 120/240 Vac, 160-320 Vdc
- Rated speeds to 6,000 RPM
- Up to 4.2 N-m peak
- Up to 1.2 N-m continuous
- CE, UL, cUL pending
- RoHs compliant
- IP40 protection
- 1m and 3m lead lengths available
- Neodymium iron-boron magnets for maximum torque
- Standard cabling option for direct connection to S200 (Hall feedback)
- Standard cabling option for direct connection to AKD (Resolver or Encoder feedback)

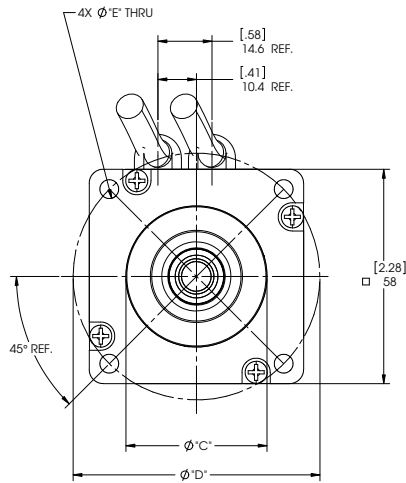


VLM2x Dimensional Data

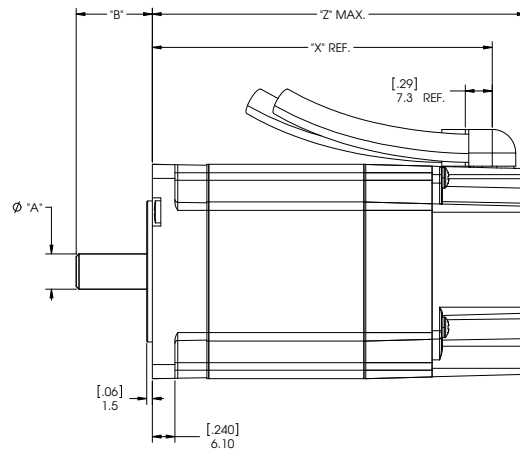
VLM2x Family Dimensional Data – Up to 320 Vdc

| Shaft Mount Option | Units | "A" Shaft Diameter | "B" Shaft Length | "C" Pilot Diameter | "D" Mtg Hole | "E" Mtg Hole Diameter | "R" Key Width | "S" Key Length | "T" Shaft Diameter Over Key | Shaft Feature |
|--------------------|-------|---------------------------------------------|------------------|-------------------------------------------|--------------|-----------------------|---------------------------------|----------------------------------|-----------------------------------|-------------------|
| A (Metric) | mm | 11 ⁰ _{-0.011} | 28.5 | 36 ⁰ _{-0.025} | 70.7 | 4.5 | 4 ⁰ _{-0.03} | 18 ⁰ _{-0.20} | 12.5 ⁰ _{0.13} | Key 4 x 4 x 18 |
| B (NEMA) | inch | .3750 ^{+0.0000} _{-0.0005} | 0.81 | 1.500 ^{+0.000} _{-0.002} | 2.625 | .200 | - | - | - | Smooth |
| C (Metric) | mm | 14 ⁰ _{-0.011} | 30 | 50 ⁰ _{-0.025} | 70 | 5.5 | 5 ⁰ _{-0.03} | 20 ⁰ _{-0.20} | 16 ⁰ _{-0.13} | Key 5 x 5 x 20 |
| D (NEMA) | inch | .2500 ^{+0.0000} _{-0.0005} | 0.81 | 1.500 ^{+0.000} _{-0.002} | 2.625 | .200 | - | - | - | Smooth |
| E (Metric) | mm | 11 ⁰ _{-0.011} | 28.5 | 36 ⁰ _{-0.025} | 70.7 | 4.5 | - | - | - | Smooth |
| F (NEMA) | inch | .3750 ^{+0.0000} _{-0.0005} | 0.81 | 1.500 ^{+0.000} _{-0.002} | 2.625 | .200 | - | - | - | Flat |
| G (Metric) | mm | 14 ⁰ _{-0.011} | 30 | 50 ⁰ _{-0.025} | 70 | 5.5 | - | - | - | Smooth |

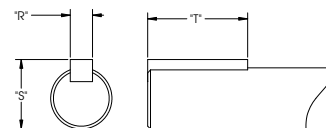
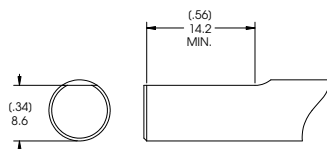
| MODEL | Units | "X" | Z MAX |
|-------|-------|-------|--------|
| VLM21 | mm | 78.2 | 102.40 |
| | inch | 3.1 | 4.03 |
| VLM22 | mm | 103.6 | 127.80 |
| | inch | 4.1 | 5.03 |
| VLM23 | mm | 129.0 | 153.20 |
| | inch | 5.1 | 6.03 |



FLAT DETAIL



KEYWAY DETAIL



VLM2x Performance Data

VLM2x Family Performance Data – Up to 320 Vdc

| VLM2x Family Performance Data – Up to 320 Vdc | | | | VLM21 | | VLM22 | | VLM23 | |
|------------------------------------------------------|------|--------------------|------------------------|-----------------------------|------|-----------------------------|------|-----------------------------|------|
| Parameters | Tol | Symbol | Units | C | E | C | E | D | G |
| Max Rated DC Bus Voltage | Max | V _{bus} | Vdc | 320 | 160 | 320 | 160 | 320 | 160 |
| Continuous Torque (Stall) for ΔT winding = 100°C ①② | Nom | T _{cs} | N-m | 0.48 | 0.47 | 0.81 | 0.83 | 1.18 | 1.18 |
| | | | lb-in | 4.2 | 4.2 | 7.2 | 7.3 | 10.4 | 10.4 |
| Continuous Current (Stall) for ΔT winding = 100°C ①② | Nom | I _{cs} | A _{rms} | 1.49 | 2.99 | 1.69 | 3.34 | 2.45 | 4.91 |
| Max Mechanical Speed ③ | Nom | N _{max} | rpm | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 |
| Peak Torque ①② | Nom | T _p | N-m | 1.66 | 1.65 | 2.91 | 2.94 | 4.2 | 4.2 |
| | | | lb-in | 14.7 | 14.6 | 25.8 | 26.0 | 37.2 | 37.2 |
| Peak Current | Nom | I _p | A _{rms} | 6 | 12 | 6.8 | 13.3 | 9.8 | 19.6 |
| Rated Torque (speed) ①② | | T _{rtd} | N-m | - | 0.44 | - | 0.73 | - | 1.0 |
| | | | lb-in | - | 3.9 | - | 6.5 | - | 8.9 |
| Rated Speed | | N _{rtd} | rpm | - | 3000 | - | 2000 | - | 2500 |
| | | | | | | | | | |
| Rated Power (speed) ①② | | P _{rtd} | kW | - | 0.14 | - | 0.15 | - | 0.26 |
| | | | Hp | - | 0.19 | - | 0.21 | - | 0.35 |
| Rated Torque (speed) ①② | | T _{rtd} | N-m | 0.44 | 0.41 | 0.69 | 0.52 | 0.94 | 0.6 |
| | | | lb-in | 3.9 | 3.6 | 6.1 | 4.6 | 8.3 | 5.3 |
| Rated Speed | | N _{rtd} | rpm | 3500 | 6000 | 2500 | 6000 | 3000 | 6000 |
| | | | | | | | | | |
| Rated Power (speed) ①② | | P _{rtd} | kW | 0.16 | 0.26 | 0.18 | 0.33 | 0.30 | 0.38 |
| | | | Hp | 0.22 | 0.35 | 0.24 | 0.44 | 0.40 | 0.51 |
| Rated Torque (speed) ①② | | T _{rtd} | N-m | 0.41 | - | 0.51 | - | 0.6 | - |
| | | | lb-in | 3.6 | - | 4.5 | - | 5.3 | - |
| Rated Speed | | N _{rtd} | rpm | 6000 | - | 6000 | - | 6000 | - |
| | | | | | | | | | |
| Rated Power (speed) ①② | | P _{rtd} | kW | 0.26 | - | 0.32 | - | 0.38 | - |
| | | | Hp | 0.35 | - | 0.43 | - | 0.51 | - |
| Torque Constant ① | ±10% | K _t | N-m/A _{rms} | 0.32 | 0.16 | 0.48 | 0.25 | 0.48 | 0.24 |
| | | | lb-in/A _{rms} | 2.8 | 1.4 | 4.2 | 2.2 | 4.2 | 2.1 |
| Back EMF Constant ① | ±10% | K _e | V/krpm | 20.8 | 10.4 | 31.2 | 16.1 | 31.2 | 15.6 |
| Resistance (line-line) ① | ±10% | R _m | ohm | 10.4 | 2.6 | 8.8 | 2.3 | 4.7 | 1.2 |
| Inductance (line-line) | | L | mH | 12.1 | 3.0 | 12.1 | 3.2 | 7.7 | 1.9 |
| Inertia (includes Resolver feedback) | | J _m | kg-cm ² | 0.429 | | 0.633 | | 0.819 | |
| | | | lb-in-s ² | 3.80E-04 | | 5.60E-04 | | 7.25E-04 | |
| Weight | | W | kg | | | 1.9 | | 2.3 | |
| | | | lb | | | 4.2 | | 5.1 | |
| Static Friction ① | | T _f | N-m | 0.008 | | 0.01 | | 0.025 | |
| | | | lb-in | 0.07 | | 0.09 | | 0.22 | |
| Viscous Damping ① | | K _{dv} | N-m/krpm | 0.003 | | 0.006 | | 0.009 | |
| | | | lb-in/krpm | 0.03 | | 0.05 | | 0.08 | |
| Thermal Time Constant | | TCT | minutes | 7.5 | | 12.5 | | 17.5 | |
| Thermal Resistance | | R _{thw-a} | °C/W | 2.4 | | 2 | | 1.8 | |
| Pole Pairs | | | | 3 | | 3 | | 3 | |
| Heat Sink Size | | | | 10"x10"x1/4" Aluminum Plate | | 10"x10"x1/4" Aluminum Plate | | 10"x10"x1/4" Aluminum Plate | |

Notes: ① Motor winding temperature rise, ΔT = 100°C, at 40°C ambient.

③ May be limited at some values of V_{bus}.

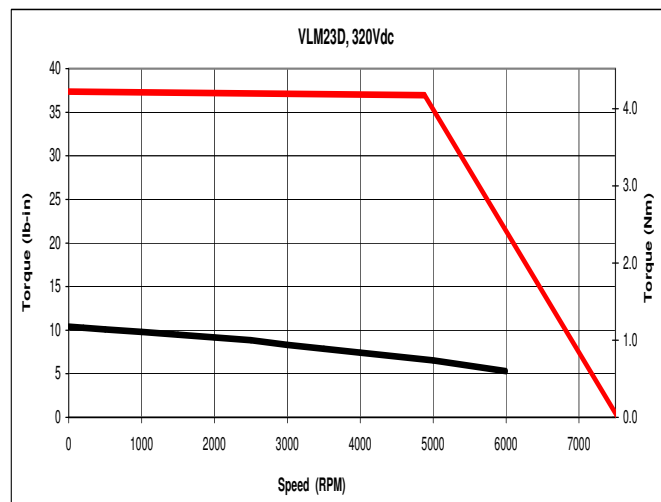
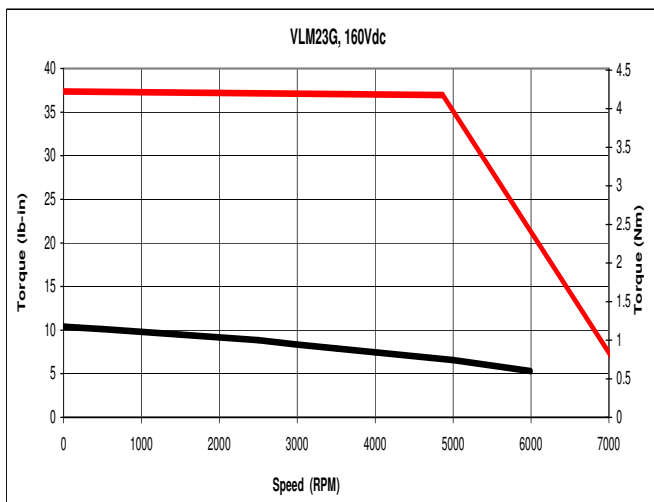
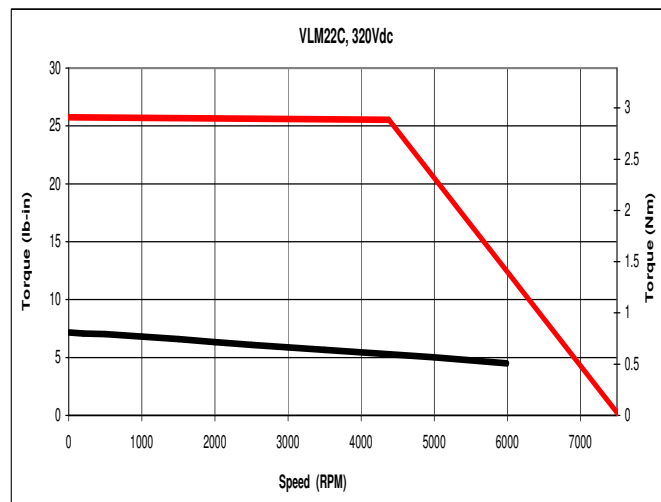
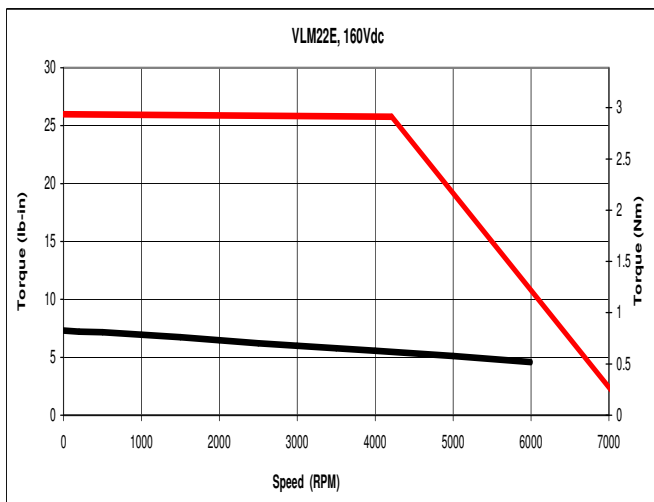
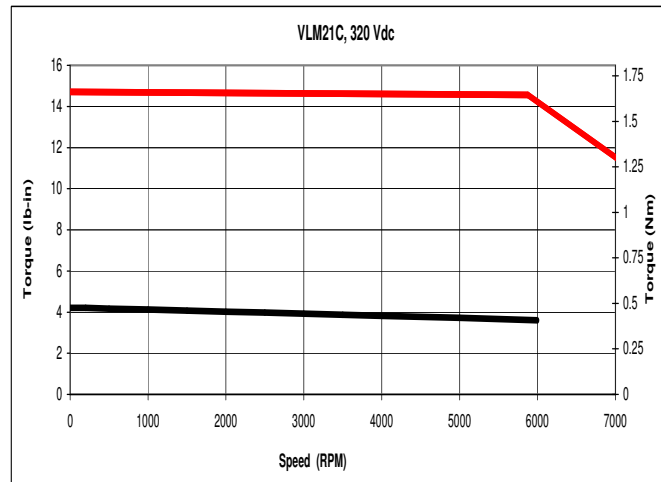
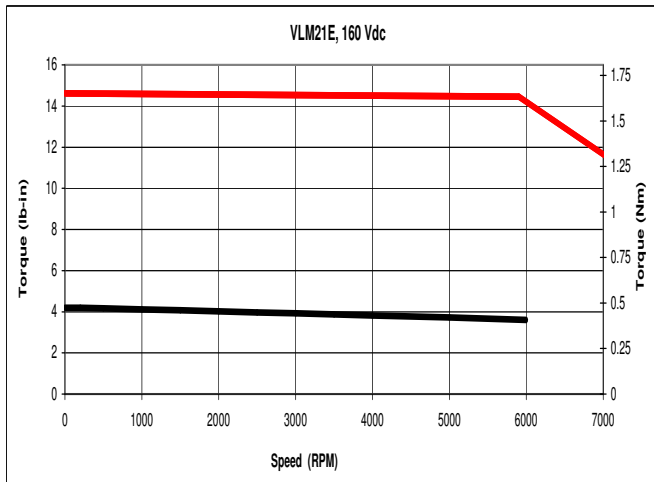
② All data referenced to sinusoidal commutation.

④ Measured at 25°C.

VLM2x Performance Curves

160 Vdc Windings

320 Vdc Windings



- Continuous Performance
- Peak Performance

VLM3x Product Overview

- NEMA 34 or 90 mm metric
- 120/240 Vac, 160-320 Vdc
- Rated speeds to 6,000 RPM
- Up to 15.9 N-m peak
- Up to 4.5 N-m continuous
- CE, UL, cUL pending
- RoHs compliant
- IP40 protection
- 1m and 3m lead lengths available
- Neodymium iron-boron magnets for maximum torque
- Standard cabling option for direct connection to S200 (Hall feedback)
- Standard cabling option for direct connection to AKD (Resolver or Encoder feedback)

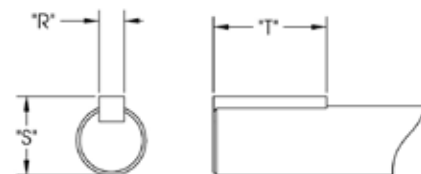
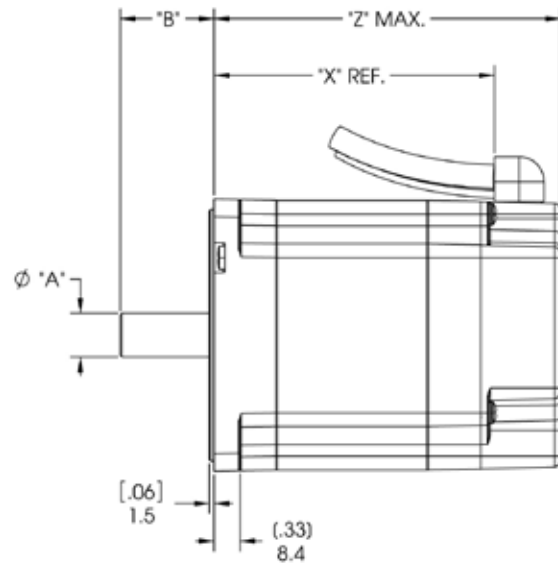
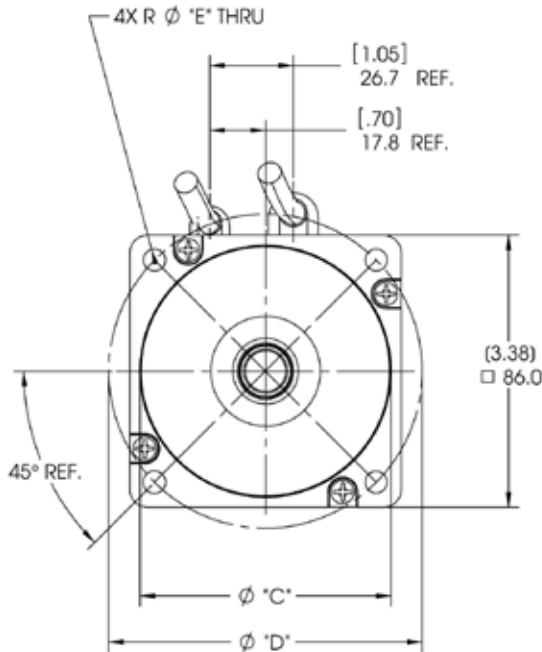


VLM3x Dimensional Data

VLM3x Family Dimensional Data – Up to 320 Vdc

| Shaft Mount | Units | "A" Shaft Diameter | "B" Shaft Length | "C" Pilot Diameter | "D" Mtg Hole | "E" Mtg Hole Diameter | "R" Key Width | "S" Key Length | "T" Shaft Diameter Over Key | Shaft Feature |
|-------------|-------|---------------------------------------------|------------------|--------------------|------------------|-----------------------|------------------------------------------|----------------------------------|------------------------------------------|------------------------|
| A (Metric) | mm | 14 ⁰ _{-0.011} | 30 | 80 | +0.012 -0.007 | 100 | 7 ⁰ _{-0.03} | 20 ⁰ _{-0.20} | 16 ⁰ _{-0.13} | Key 5 x 5 x 20 |
| B (NEMA) | inch | .5000 ^{+0.0000} _{-0.0005} | 1.25 | 2.875 | +0.000 -0.002 | 3.875 | .125 ^{+0.000} _{-0.002} | .750 +/- .010 | .555 ^{+0.000} _{-0.017} | Key 1/8 x 1/8 x 3/4 |
| C (Metric) | mm | 14 ⁰ _{-0.011} | 30 | 80 | +0.012 -0.007 | 100 | - | - | - | Smooth |
| D (NEMA) | inch | .5000 ^{+0.0000} _{-0.0005} | 1.25 | 2.875 | +0.000 -0.002 | 3.875 | - | - | - | Smooth |

| MODEL | Units | "X" | Z MAX |
|-------|-------|-------|--------|
| VLM31 | mm | 89.4 | 110.50 |
| | inch | 3.5 | 4.35 |
| VLM32 | mm | 127.5 | 148.60 |
| | inch | 5.0 | 5.85 |
| VLM33 | mm | 165.6 | 186.70 |
| | inch | 6.5 | 7.35 |



VLM3x Performance Data

VLM3x Family Performance Data – Up to 320 Vdc

| Parameters | Tol | Symbol | Units | VLM31 | | VLM32 | | VLM33 |
|------------------------------------------------------|------------------------|--------------------|----------------------|--------------------------------|------|--------------------------------|-------|--------------------------------|
| | | | | E | H | H | J | J |
| Max Rated DC Bus Voltage | Max | V _{bus} | Vdc | 320 | 160 | 320 | 160 | 320 |
| Continuous Torque (Stall) for ΔT winding = 100°C ①② | Nom | T _{cs} | N-m | 1.96 | 1.95 | 3.55 | 3.51 | 4.53 |
| | | | lb-in | 17.3 | 17.3 | 31.4 | 31.1 | 40.1 |
| Continuous Current (Stall) for ΔT winding = 100°C ①② | Nom | I _{cs} | A _{rms} | 2.84 | 5.72 | 5.26 | 8.43 | 7.23 |
| Max Mechanical Speed ③ | Nom | N _{max} | rpm | 6000 | 6000 | 6000 | 6000 | 6000 |
| Peak Torque ①② | Nom | T _p | N-m | 6.4 | 6.4 | 12.0 | 11.9 | 15.9 |
| | | | lb-in | 56.6 | 56.6 | 106.2 | 105.3 | 140.7 |
| Peak Current | Nom | I _p | A _{rms} | 11.3 | 22.9 | 21.1 | 33.7 | 28.9 |
| 75 Vdc | | T _{rtd} | N-m | - | 1.82 | - | 3.32 | - |
| | | | lb-in | - | 16.1 | - | 29.4 | - |
| | | | rpm | - | 1750 | - | 1500 | - |
| Rated Power (speed) ①② | | P _{rtd} | kW | - | 0.33 | - | 0.52 | - |
| | | | Hp | - | 0.45 | - | 0.70 | - |
| 160 Vdc | | T _{rtd} | N-m | 1.8 | 1.62 | 3.26 | 3.0 | 3.93 |
| | | | lb-in | 15.9 | 14.3 | 28.9 | 26.6 | 34.8 |
| | | N _{rtd} | rpm | 2000 | 4000 | 2000 | 3500 | 2250 |
| | | | P _{rtd} | kW | 0.38 | 0.68 | 0.68 | 1.10 |
| Hp | 0.51 | 0.91 | | 0.92 | 1.47 | 1.24 | | |
| 320 Vdc | | T _{rtd} | N-m | 1.63 | - | 2.86 | - | 2.37 |
| | | | lb-in | 14.4 | - | 25.3 | - | 21.0 |
| | | N _{rtd} | rpm | 4000 | - | 4500 | - | 5000 |
| | | | P _{rtd} | kW | 0.68 | - | 1.35 | - |
| | | Hp | | 0.92 | - | 1.81 | - | 1.66 |
| Torque Constant ① | ±10% | K _t | N-m/A _{rms} | 0.71 | 0.35 | 0.70 | 0.43 | 0.65 |
| | lb-in/A _{rms} | | 6.3 | 3.1 | 6.2 | 3.8 | 5.8 | |
| Back EMF Constant ① | ±10% | K _e | V/krpm | 45.9 | 22.6 | 45.2 | 27.9 | 41.9 |
| Resistance (line-line) ① | ±10% | R _m | ohm | 4.3 | 1.1 | 1.6 | 0.7 | 0.85 |
| Inductance (line-line) | | L | mH | 11.7 | 2.8 | 5.0 | 1.9 | 2.7 |
| Inertia (includes Resolver feedback) | | J _m | kg-cm ² | 1.79 | | 3.37 | | 4.84 |
| | | | lb-in-s ² | 1.58E-03 | | 2.98E-03 | | 4.28E-05 |
| Weight | | W | kg | 3 | | 4.7 | | 6.3 |
| | | | lb | 6.6 | | 10.4 | | 13.9 |
| Static Friction ① | | T _f | N-m | 0.06 | | 0.15 | | 0.17 |
| | | | lb-in | 0.53 | | 1.33 | | 1.50 |
| Viscous Damping ① | | K _{dv} | N-m/krpm | 0.016 | | 0.039 | | 0.047 |
| | | | lb-in/krpm | 0.14 | | 0.35 | | 0.42 |
| Thermal Time Constant | | TCT | minutes | 10.5 | | 20.5 | | 26 |
| Thermal Resistance | | R _{thw-a} | °C/W | 1.6 | | 1.2 | | 0.96 |
| Pole Pairs | | | | 3 | | 3 | | 3 |
| Heat Sink Size | | | | 10"x10"x1/4" Aluminum Plate | | 10"x10"x1/4" Aluminum Plate | | 10"x10"x1/4" Aluminum Plate |

Notes: ① Motor winding temperature rise, ΔT = 100°C, at 40°C ambient.

③ May be limited at some values of V_{bus}.

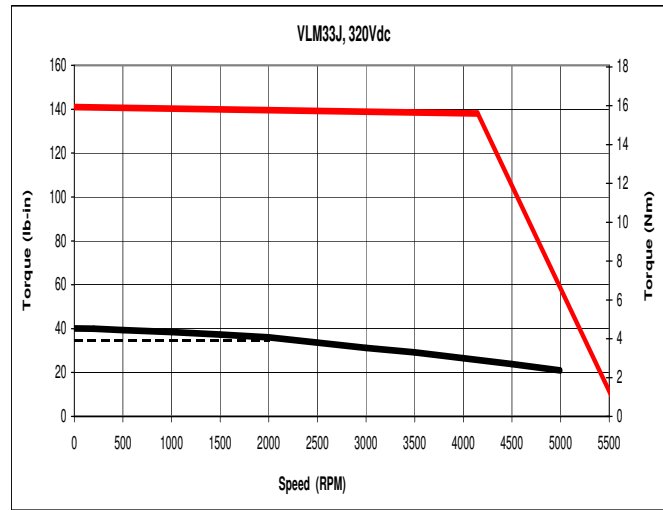
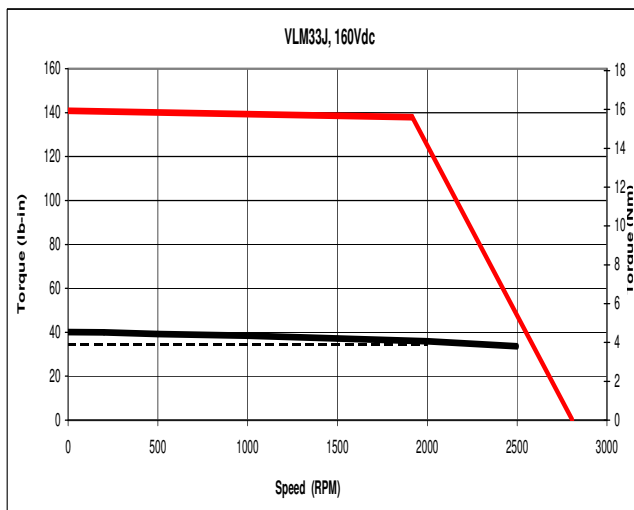
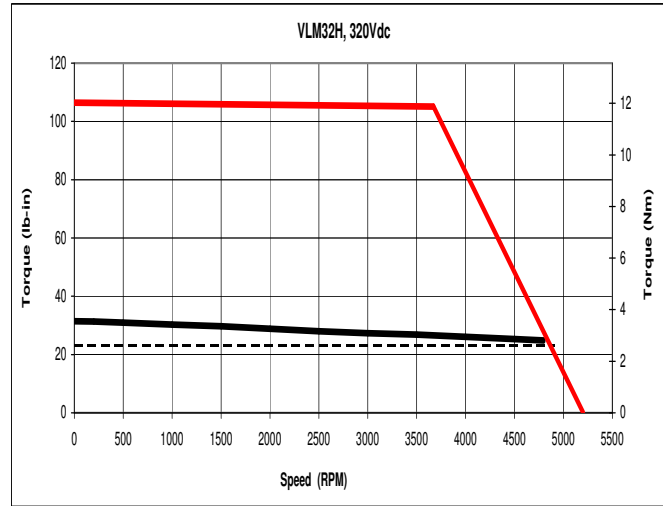
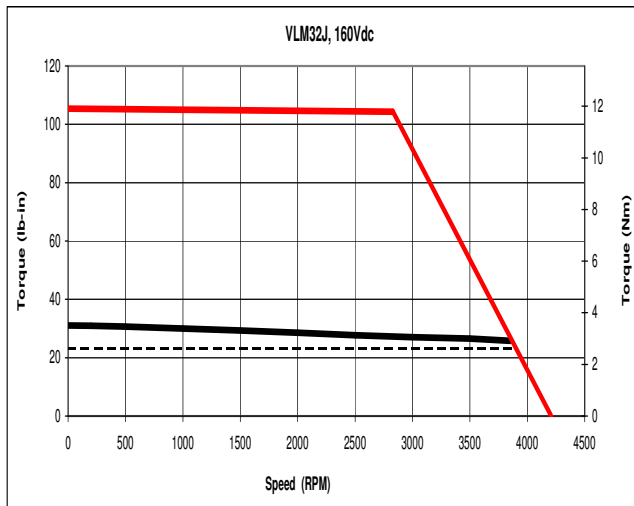
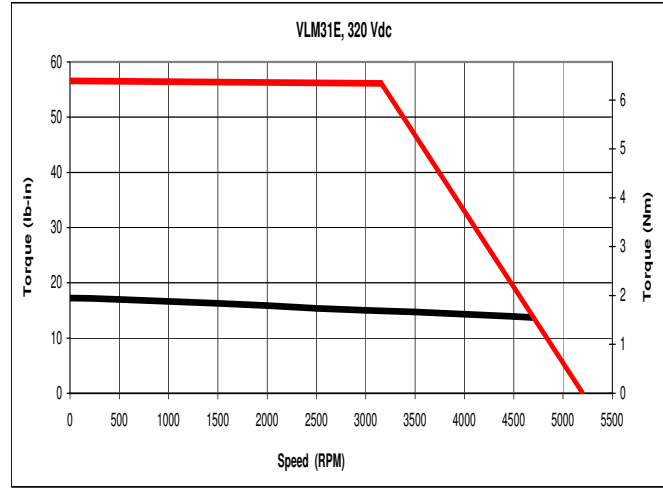
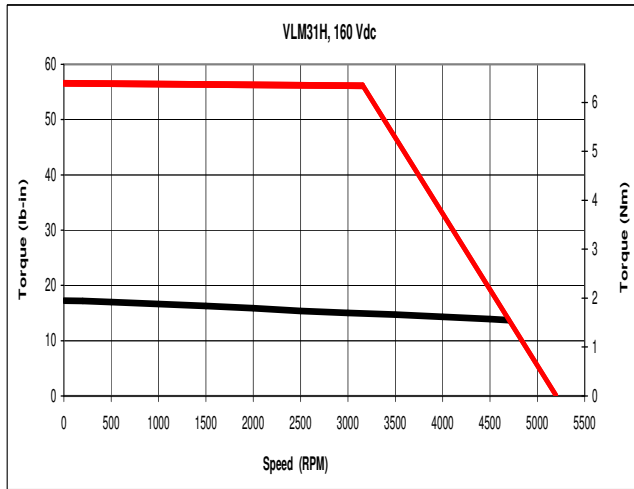
② All data referenced to sinusoidal commutation.

④ Measured at 25°C.

VLM3x Performance Curves

160 Vdc Windings

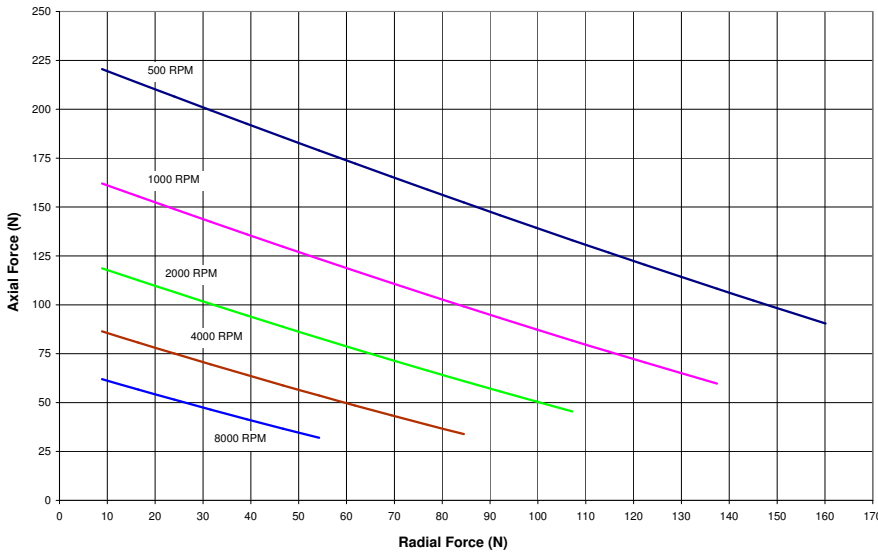
320 Vdc Windings



- - Continuous Performance w/Molex Connectors
- - Continuous Performance
- - Peak Performance

Bearing Fatigue and Shaft Loading

VLM2 Motors
20000 HOURS BEARING LIFE



Shaft Loading

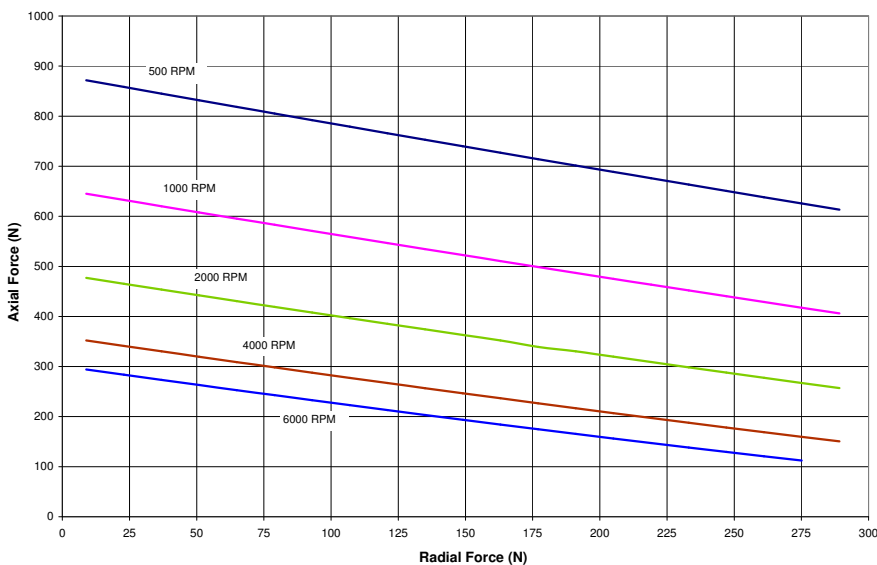
| Motor | Max. Radial Force (N) | Max. Axial Force (N) |
|-------|-----------------------|----------------------|
| VLM2 | 150* | 260 |
| VLM3 | 280 | 1330 |

*VLM2 with "D" Shaft/Mount option is limited to 50N due to .25 inch diameter shaft.

The maximum radial load ratings reflect the following assumptions:

1. Motors are operated with peak torque of the longest member of the frame size.
2. Fully reversed load applied to the end of the smallest diameter standard mounting shaft extension.
3. Infinite life with 99% reliability.
4. Safety factor = 2.

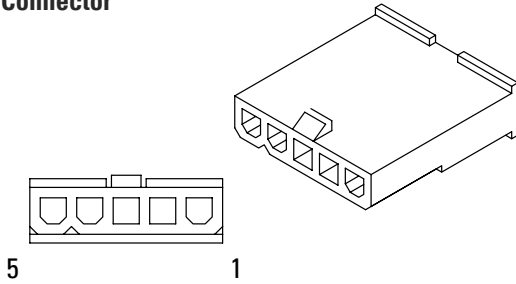
VLM3 Motors
20000 HOURS BEARING LIFE



Connector Options

“M” Connector Option

Power Connector



Connector Part Number: Molex 39-01-4056 (Eng No. 5559-05P3)

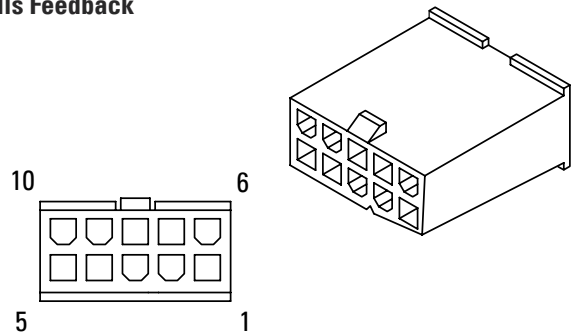
| Pin | Function | Color |
|-----|----------|--------------|
| 1 | Phase U | Blue |
| 2 | Phase V | Brown |
| 3 | Phase W | Violet |
| 4 | Ground | Green/Yellow |
| 5 | Shield | |

Shield Connected to Motor
Ground Internal to Motor

Suggested Mating Connector

Molex 39-01-4050

Halls Feedback



Connector Part Number: Molex 43020-1001

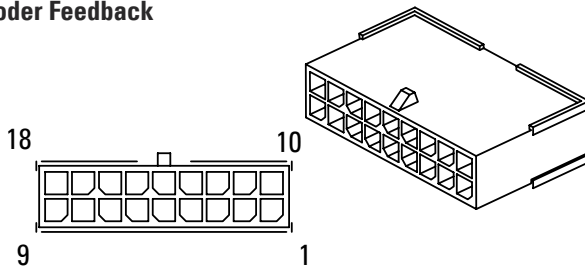
| Pin | Function | Color |
|-----|----------|--------|
| 1 | +5 Vdc | Red |
| 2 | Ground | Black |
| 3 | | |
| 4 | | |
| 5 | Shield | |
| 6 | Thermal+ | Grey |
| 7 | Thermal- | Violet |
| 8 | Hall U | Green |
| 9 | Hall V | Brown |
| 10 | Hall W | White |

Shield Connected to Motor
Ground Internal to Motor

Suggested Mating Connector

Molex 43025-1000

Encoder Feedback



Connector Part Number: Molex 43020-1801

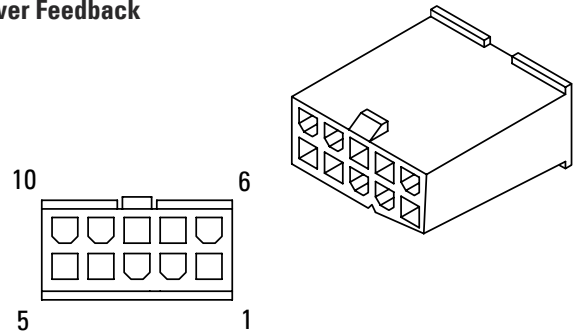
| Pin | Function | Color |
|-----|-------------|--------------|
| 1 | B+ | Blue |
| 2 | B- | Blue/White |
| 3 | A+ | Yellow |
| 4 | A- | Yellow/White |
| 5 | Z+ | Orange |
| 6 | Z- | Orange/White |
| 7 | Ground | Black |
| 8 | Thermal+ | Grey |
| 9 | Thermal- | Violet |
| 10 | +5 Vdc | Red |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | Hall Ground | Green/White |
| 15 | Hall U | Green |
| 16 | Hall V | Brown |
| 17 | Hall W | White |
| 18 | Shield | |

Shield is Not Connected at Motor End

Suggested Mating Connector

Molex 43025-1800

Resolver Feedback



Connector Part Number: Molex 43020-1001

| Pin | Function | Color |
|-----|------------|-------------|
| 1 | | |
| 2 | Thermal+ | Grey |
| 3 | S4 COS- | Blue |
| 4 | S3 SIN- | Black |
| 5 | Reference | Black/White |
| 6 | Thermal- | Violet |
| 7 | S2 COS+ | Yellow |
| 8 | S1 SIN+ | Red |
| 9 | Reference+ | Red/White |
| 10 | Shield | |

Shield is Not Connected at Motor End

Suggested Mating Connector

Molex 43025-1000

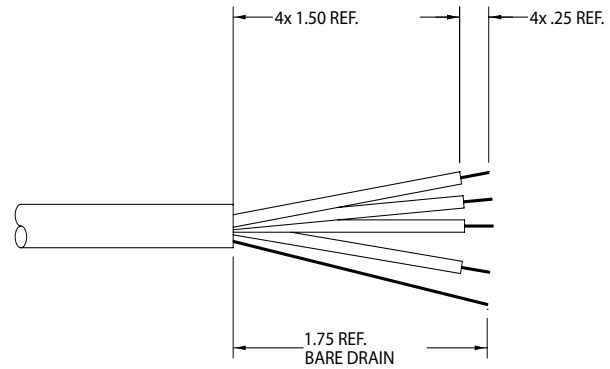
Connector Options

"L" Flying Lead Option (No connectors)

Power Leads

Unterminated Shielded Cable

| Function | Color |
|----------|--------------|
| Phase U | Blue |
| Phase V | Brown |
| Phase W | Violet |
| Ground | Green/Yellow |
| Shield | |



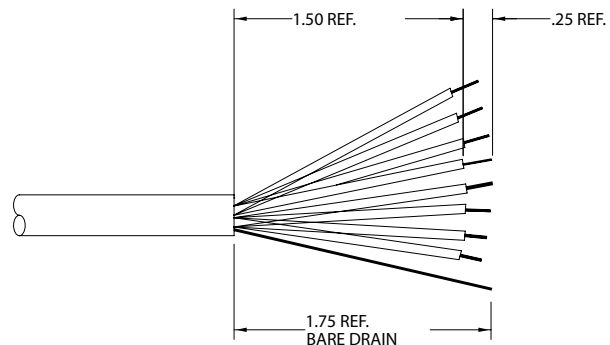
POWER CABLE

VLM2 22 AWG
VLM3 18 AWG

Encoder Feedback

Unterminated Shielded Cable

| Function | Color |
|-------------|--------------|
| A+ | Yellow |
| A- | Yellow/White |
| B+ | Blue |
| B- | Blue/White |
| Z+ | Orange |
| Z- | Orange/White |
| Thermal+ | Grey |
| Thermal- | Violet |
| +5 Vdc | Red |
| Ground | Black |
| Hall Ground | Green/White |
| Hall U | Green |
| Hall V | Brown |
| Hall W | White |
| Shield | |



FEEDBACK CABLES

28 AWG
NUMBER OF CONDUCTORS
WILL VARY DEPENDING
ON FEEDBACK TYPE.

Hall Feedback

Unterminated Shielded Cable

| Function | Color |
|----------|--------|
| +5 Vdc | Red |
| Ground | Black |
| Hall U | Green |
| Hall V | Brown |
| Hall W | White |
| Thermal+ | Grey |
| Thermal- | Violet |
| Shield | |

Resolver Feedback

Unterminated Shielded Cable

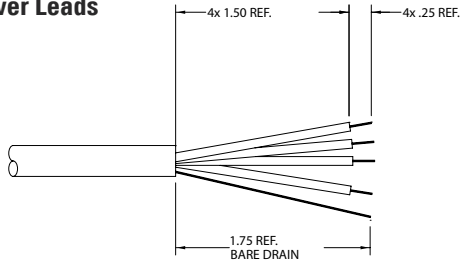
| Function | Color |
|------------|-------------|
| S1 SIN+ | Red |
| S2 COS+ | Yellow |
| S4 COS- | Blue |
| S3 SIN- | Black |
| Reference- | Black/White |
| Reference+ | Red/White |
| Thermal+ | Grey |
| Thermal- | Violet |
| Shield | |

Connector Options

"F" Connector Option

(For Direct Connection To S200-VTS)

Power Leads

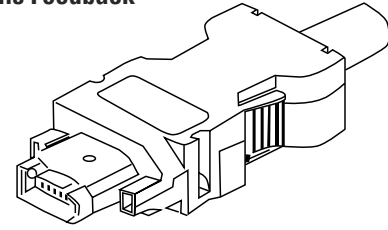


POWER CABLE
VLM2 22 AWG
VLM3 18 AWG

Unterminated Shielded Cable

| Function | Color |
|----------|--------------|
| Phase U | Blue |
| Phase V | Brown |
| Phase W | Violet |
| Ground | Green/Yellow |
| Shield | |

Halls Feedback



Connector Part Number: Molex 55100-0670

| Pin | Function | Color |
|-----|----------|--------|
| 1 | | Red |
| 2 | | Black |
| 3 | | |
| 4 | Hall U | Green |
| 5 | Hall V | Brown |
| 6 | Hall W | White |
| | Thermal+ | Grey |
| | Thermal- | Violet |

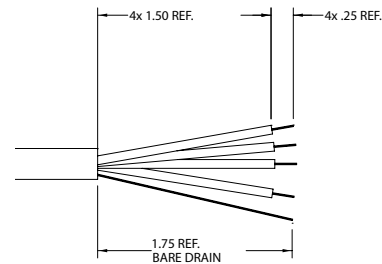
"K" Connector Option

Power Leads

(For Direct Connection To AKD)

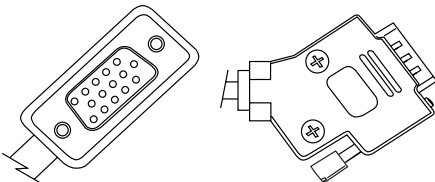
Unterminated Shielded Cable

| Function | Color |
|----------|--------------|
| Phase U | Blue |
| Phase V | Brown |
| Phase W | Violet |
| Ground | Green/Yellow |
| Shield | |



POWER CABLE
VLM2 22 AWG
VLM3 18 AWG

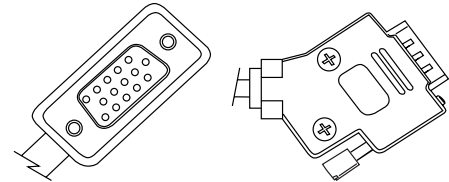
Resolver Feedback



Connector Part Number: 15 PIN HD D-SUB

| Pin | Function | Color |
|-----|------------|-------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | Reference+ | Red/White |
| 7 | Reference- | Black/White |
| 8 | Thermal+ | Grey |
| 9 | Thermal- | Violet |
| 10 | | |
| 11 | | |
| 12 | S1 SIN+ | Red |
| 13 | S3 SIN- | Black |
| 14 | S2 COS+ | Yellow |
| 15 | S4 COS- | Blue |

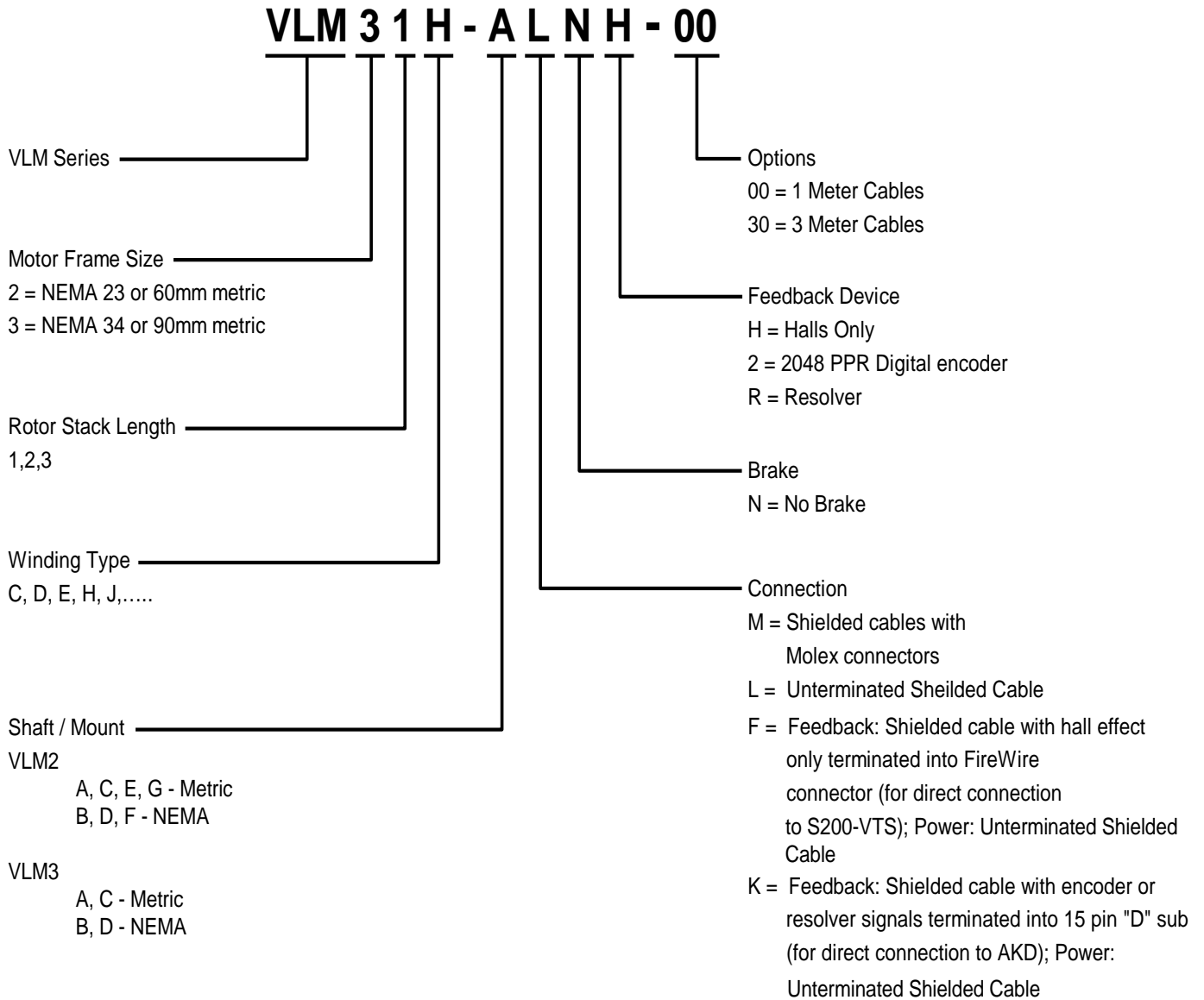
Encoder Feedback



Connector Part Number: 15 PIN HD D-SUB

| Pin | Function | Color |
|-----|----------|---------------------|
| 1 | Hall U | Green |
| 2 | Hall V | Brown |
| 3 | Hall W | White |
| 4 | | |
| 5 | | |
| 6 | Z+ | Orange |
| 7 | Z- | Orange/White |
| 8 | Thermal+ | Grey |
| 9 | Thermal- | Violet |
| 10 | +5 Vdc | Red |
| 11 | Ground | Black & Green/White |
| 12 | A+ | Yellow |
| 13 | A- | Yellow/White |
| 14 | B+ | Blue |
| 15 | B- | Blue/White |

Model Nomenclature



The VLM is one family of many servo motors offered by Kollmorgen. If you seek higher-performance, greater torque in a smaller package, or options not listed above, contact Kollmorgen to discuss the AKM and GoldLine servo motor families.