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# VLM Brushless Motor Selection Guide

with AKD<sup>®</sup> Servo Drive Systems



**KOLLMORGEN**<sup>®</sup>

*Because Motion Matters™*

# Kollmorgen: Your partner. In Motion.

Every solution comes from a real understanding of the challenges facing machine designers and users.

## **Innovators consistently rate Kollmorgen as one of their best motion systems**

**manufacturing partners.** Whether you are looking for classic servo motors, direct-drive servo motors, stepper motors, drives & amplifiers, gearing, actuation, or CNC & multi-axis motion controllers, Kollmorgen is one of the few companies in the world who actually designs and manufactures all of these products.

**Our customers are leaders** in many industries such as Aerospace & Defense, Printing, Packaging & Converting, Food & Beverage Processing, Medical Imaging, In Vitro Diagnostics & Laboratory Automation, Pharmaceutical Manufacturing, Material Forming and Cutting, Oil & Gas, and Robotics. Kollmorgen is also a leader in Warehouse Automation, including complete AGV systems, software, awareness and autonomy.

**Our Automation Solutions** can be found on Mars and in space, ships and submarines, O&G drilling and metrology, surgical robots and laser eye surgery, even inside artificial hearts. These are just a few applications that demand high-performance and high-quality while satisfying their specific needs.

**Because motion matters, it's our focus:** Motion can distinctly differentiate a machine and deliver a marketplace advantage by increasing its performance and dramatically improving overall equipment effectiveness (OEE).

High-performance motion can make your customer's machine more reliable and energy-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 and in our Vision, Mission & Values, relentlessly developing products that offer precise control of torque, velocity and position accuracy in machines that rely on complex motion.

**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 clear obstacles 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 offers complete solutions as well as motion subsystems that combine programming software, engineering services and best-in-class motion components.

**Global Footprint**

With direct sales, engineering support, manufacturing facilities, and distributors spanning the Americas, 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 Fortive. A key driver in the growth of all Fortive divisions is the Fortive 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.

Kollmorgen: Your partner. In Motion.

# Table of Contents

- ▶ **VLM Series Brushless Servo Motor Benefits** 4
- ▶ **VLM2x Series Brushless Servo Motor** 6
  - VLM2x General Specification 6
  - VLM2x Performance Data 7
  - VLM2x Performance Curves 8
  - VLM2x Outline Drawings & Dimensional Data 9
- ▶ **VLM3x Series Brushless Servo Motor** 10
  - VLM3x General Specification 10
  - VLM3x Performance Data 11
  - VLM3x Performance Curves 12
  - VLM3x Outline Drawings & Dimensional Data 13
- ▶ **VLM Model Nomenclature** 14
- ▶ **Bearing Fatigue and Shaft Loading** 15
- ▶ **Connector Options** 16
- ▶ **AKD® Servo Drive** 20
- ▶ **AKD Model Nomenclature** 24
- ▶ **MOTIONEERING® Online** 25



# VLM Series Brushless Servo Motor

The new VLM family of servo motors 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 servo motor features and offering torque ranges from 0.5Nm to almost 16Nm, VLM are able to deliver all the torque and performance of a servo while helping customers control their application costs.

VLM series brushless servo motors are 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 Value Line Brushless Servo Motors

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- Exceptional Quality and Value

- High torque per dollar
- Quality components
- No need for intermediate cables
- Low cost feedback options standard
- Low cost design

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- Standard Configurations To Fit Most Applications

- 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
- Smart Feedback Device, Resolver, or Encoder feedback options.

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- Ease of Use

- Standard connector options and matching cables
- Smart Feedback Device that offers automatic motor recognition and setup when used with Kollmorgen drives

# VLM2x Series Brushless Servo Motor

## General Specifications

- NEMA 23 or 60 mm metric
- Designed for 120/240 Vac servo drives
- Windings optimized for 75, 160 and 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
- RoHS compliant
- IP40 protection
- 1m and 3m lead lengths available
- High performance magnets for maximum torque
- Standard cabling option for direct connection to S200 (Hall or SFD feedback)
- Standard cabling option for direct connection to AKD (SFD, Resolver or Encoder feedback)



## VLM2x 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 <sub>bus</sub>	Vdc	320	160	320	160	320	160
Continuous Torque (Stall) for ΔT winding = 100°C ①②	Nom	T <sub>cs</sub>	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 <sub>cs</sub>	A <sub>rms</sub>	1.49	2.99	1.69	3.34	2.45	4.91
Max Mechanical Speed ③	Nom	N <sub>max</sub>	rpm	6000	6000	6000	6000	6000	6000
Peak Torque ①②	Nom	T <sub>p</sub>	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 <sub>p</sub>	A <sub>rms</sub>	6	12	6.8	13.3	9.8	19.6
Rated Torque (speed) ①②		T <sub>rtd</sub>	N-m	-	0.44	-	0.73	-	1.0
			lb-in	-	3.9	-	6.5	-	8.9
Rated Speed		N <sub>rtd</sub>	rpm	-	3000	-	2000	-	2500
Rated Power (speed) ①②		P <sub>rtd</sub>	kW	-	0.14	-	0.15	-	0.26
			Hp	-	0.19	-	0.21	-	0.35
Rated Torque (speed) ①②		T <sub>rtd</sub>	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 <sub>rtd</sub>	rpm	3500	6000	2500	6000	3000	6000
Rated Power (speed) ①②		P <sub>rtd</sub>	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 <sub>rtd</sub>	N-m	0.41	-	0.51	-	0.6	-
			lb-in	3.6	-	4.5	-	5.3	-
Rated Speed		N <sub>rtd</sub>	rpm	6000	-	6000	-	6000	-
Rated Power (speed) ①②		P <sub>rtd</sub>	kW	0.26	-	0.32	-	0.38	-
			Hp	0.35	-	0.43	-	0.51	-
Torque Constant ①	±10%	K <sub>t</sub>	N-m/A <sub>rms</sub>	0.32	0.16	0.48	0.25	0.48	0.24
			lb-in/A <sub>rms</sub>	2.8	1.4	4.2	2.2	4.2	2.1
Back EMF Constant ①	±10%	K <sub>e</sub>	V/k <sub>r</sub> rpm	20.8	10.4	31.2	16.1	31.2	15.6
Resistance (line-line) ①	±10%	R <sub>m</sub>	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 <sub>m</sub>	kg-cm <sup>2</sup>	0.429		0.633		0.819	
			lb-in-s <sup>2</sup>	3.80E-04		5.60E-04		7.25E-04	
Weight		W	kg	1.4		1.9		2.3	
			lb	3.1		4.2		5.1	
Static Friction ①		T <sub>f</sub>	N-m	0.008		0.01		0.025	
			lb-in	0.07		0.09		0.22	
Viscous Damping ①		K <sub>dv</sub>	N-m/k <sub>r</sub> rpm	0.003		0.006		0.009	
			lb-in/k <sub>r</sub> rpm	0.03		0.05		0.08	
Thermal Time Constant		TCT	minutes	7.5		12.5		17.5	
Thermal Resistance		R <sub>thw-a</sub>	°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<sub>bus</sub>.

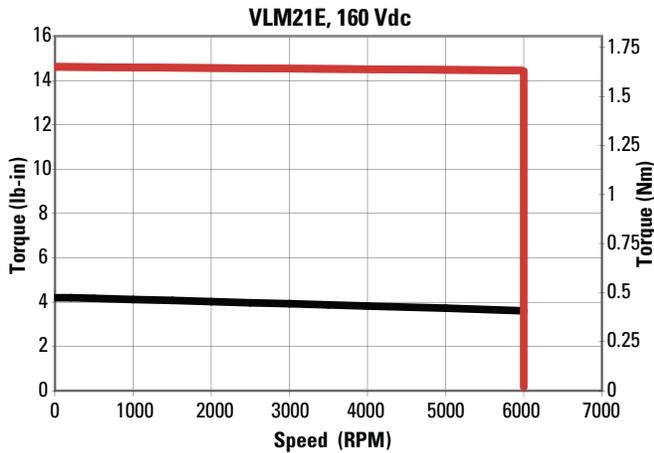
② All data referenced to sinusoidal commutation.

④ Measured at 25°C.

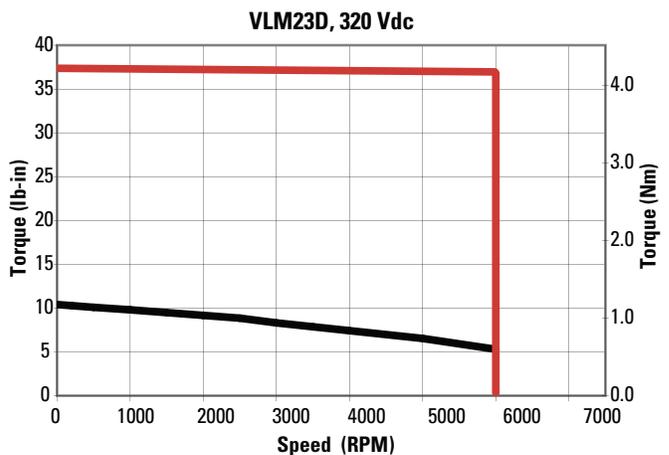
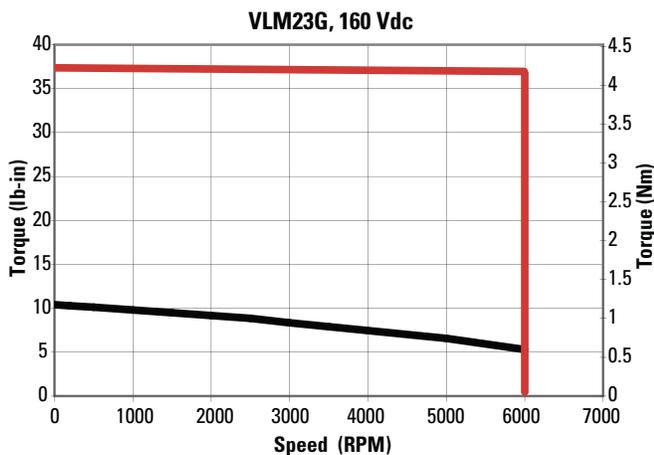
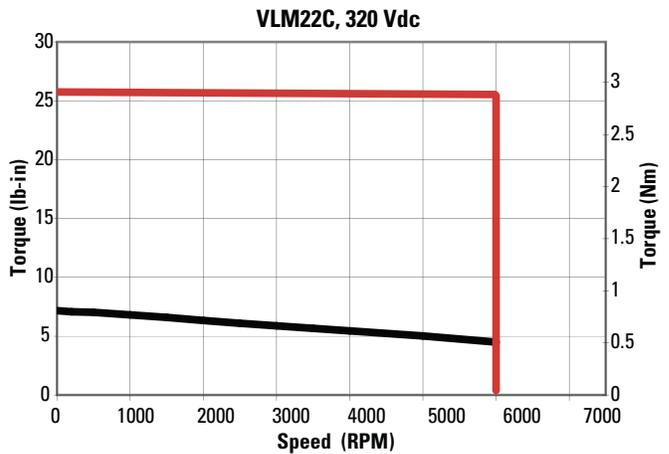
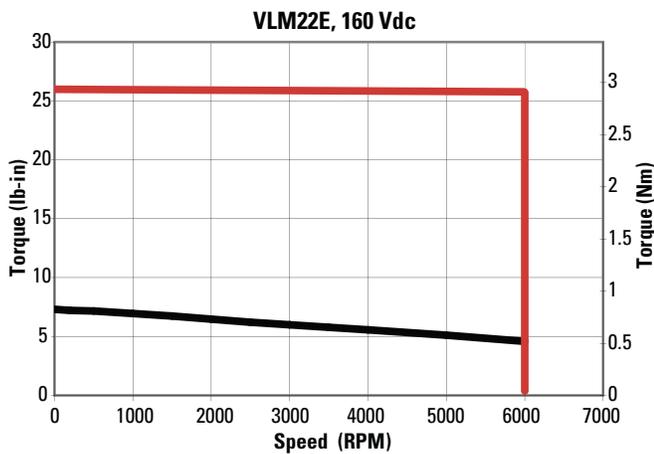
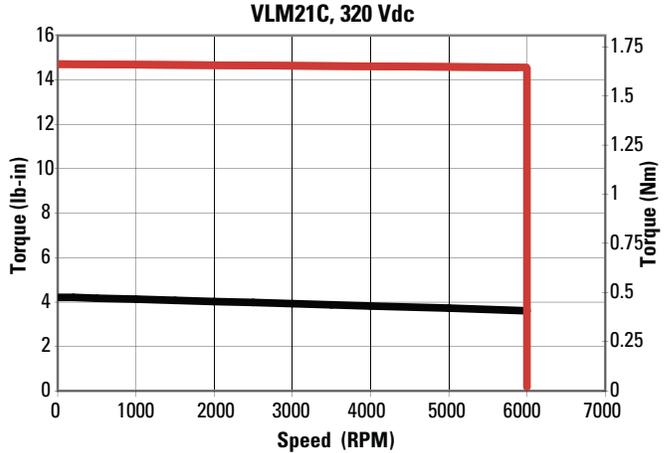
# VLM2x Series Brushless Servo Motor

## VLM2x Performance Curves

### 160 Vdc Windings



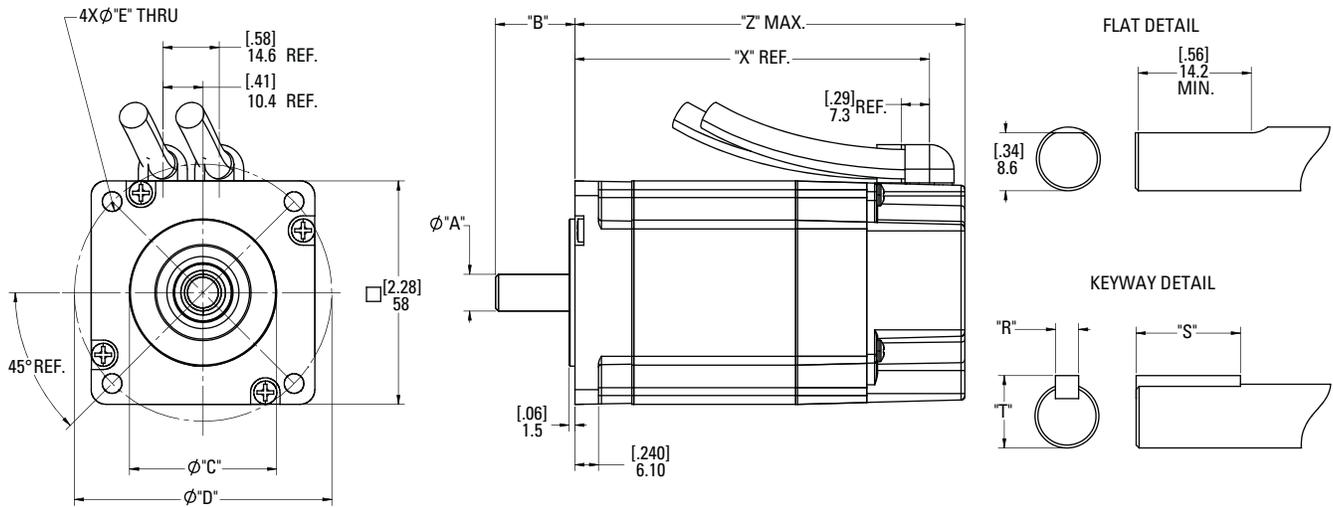
### 320 Vdc Windings



— - Continuous Performance  
 — - Peak Performance

VLM2X SERIES BRUSHLESS SERVO MOTOR

### VLM2x Outline Drawings



### VLM2x 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 <sup>0</sup> <sub>-0.011</sub>	28.5	36 <sup>0</sup> <sub>-0.025</sub>	70.7	4.5	4 <sup>0</sup> <sub>-0.03</sub>	18 <sup>0</sup> <sub>-0.20</sub>	12.5 <sup>0</sup> <sub>-0.13</sub>	Key 4 x 4 x 18
B (NEMA)	inch	.3750 <sup>+0.0000</sup> <sub>-0.0005</sub>	0.81	1.500 <sup>+0.000</sup> <sub>-0.002</sub>	2.625	.200	-	-	-	Smooth
C (Metric)	mm	14 <sup>0</sup> <sub>-0.011</sub>	30	50 <sup>0</sup> <sub>-0.025</sub>	70	5.5	5 <sup>0</sup> <sub>-0.03</sub>	20 <sup>0</sup> <sub>-0.20</sub>	16 <sup>0</sup> <sub>-0.13</sub>	Key 5 x 5 x 20
D (NEMA)	inch	.2500 <sup>+0.0000</sup> <sub>-0.0005</sub>	0.81	1.500 <sup>+0.000</sup> <sub>-0.002</sub>	2.625	.200	-	-	-	Smooth
E (Metric)	mm	11 <sup>0</sup> <sub>-0.011</sub>	28.5	36 <sup>0</sup> <sub>-0.025</sub>	70.7	4.5	-	-	-	Smooth
F (NEMA)	inch	.3750 <sup>+0.0000</sup> <sub>-0.0005</sub>	0.81	1.500 <sup>+0.000</sup> <sub>-0.002</sub>	2.625	.200	-	-	-	Flat
G (Metric)	mm	14 <sup>0</sup> <sub>-0.011</sub>	30	50 <sup>0</sup> <sub>-0.025</sub>	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

Note: For SFD versions add 0.5 inch (12.7mm)

# VLM3x Series Brushless Servo Motor

## General Specifications

- NEMA 34 or 90 mm metric
- Designed for 120/240 Vac servo drives
- Windings optimized for 75, 160 and 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
- RoHS compliant
- IP40 protection
- 1m and 3m lead lengths available
- High performance magnets for maximum torque
- Standard cabling option for direct connection to S200 (SFD or Hall feedback)
- Standard cabling option for direct connection to AKD (SFD, Resolver or Encoder feedback)



## VLM3x 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 <sub>bus</sub>	Vdc	320	160	320	160	320
Continuous Torque (Stall) for ΔT winding = 100°C ①②	Nom	T <sub>cs</sub>	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 <sub>cs</sub>	A <sub>rms</sub>	2.84	5.72	5.26	8.43	7.23
Max Mechanical Speed ③	Nom	N <sub>max</sub>	rpm	6000	6000	6000	6000	6000
Peak Torque ①②	Nom	T <sub>p</sub>	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 <sub>p</sub>	A <sub>rms</sub>	11.3	22.9	21.1	33.7	28.9
75 Vdc		T <sub>rtd</sub>	N-m	-	1.82	-	3.32	-
			lb-in	-	16.1	-	29.4	-
		N <sub>rtd</sub>	rpm	-	1750	-	1500	-
Rated Power (speed) ①②		P <sub>rtd</sub>	kW	-	0.33	-	0.52	-
			Hp	-	0.45	-	0.70	-
160 Vdc		T <sub>rtd</sub>	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 <sub>rtd</sub>	rpm	2000	4000	2000	3500	2250
Rated Power (speed) ①②		P <sub>rtd</sub>	kW	0.38	0.68	0.68	1.10	0.93
			Hp	0.51	0.91	0.92	1.47	1.24
320 Vdc		T <sub>rtd</sub>	N-m	1.63	-	2.86	-	2.37
			lb-in	14.4	-	25.3	-	21.0
		N <sub>rtd</sub>	rpm	4000	-	4500	-	5000
Rated Power (speed) ①②		P <sub>rtd</sub>	kW	0.68	-	1.35	-	1.24
			Hp	0.92	-	1.81	-	1.66
Torque Constant ①	±10%	K <sub>t</sub>	N-m/A <sub>rms</sub>	0.71	0.35	0.70	0.43	0.65
			lb-in/A <sub>rms</sub>	6.3	3.1	6.2	3.8	5.8
Back EMF Constant ①	±10%	K <sub>e</sub>	V/k <sub>r</sub> rpm	45.9	22.6	45.2	27.9	41.9
Resistance (line-line) ①	±10%	R <sub>m</sub>	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 <sub>m</sub>	kg-cm <sup>2</sup>	1.79		3.37		4.84
			lb-in-s <sup>2</sup>	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 <sub>f</sub>	N-m	0.06		0.15		0.17
			lb-in	0.53		1.33		1.50
Viscous Damping ①		K <sub>dv</sub>	N-m/k <sub>r</sub> rpm	0.016		0.039		0.047
			lb-in/k <sub>r</sub> rpm	0.14		0.35		0.42
Thermal Time Constant		TCT	minutes	10.5		20.5		26
Thermal Resistance		R <sub>thw-a</sub>	°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<sub>bus</sub>.

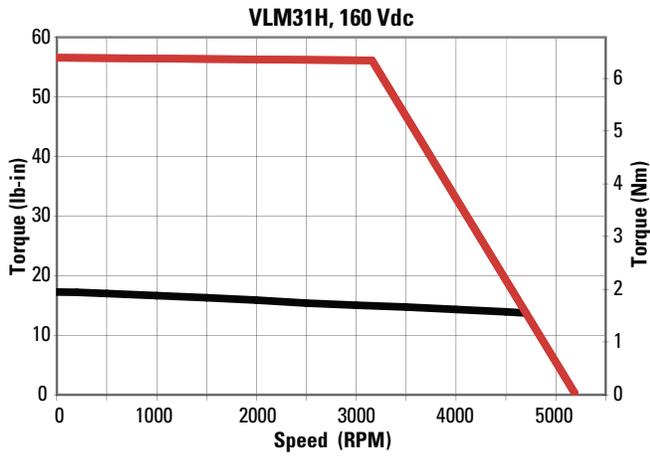
② All data referenced to sinusoidal commutation.

④ Measured at 25°C.

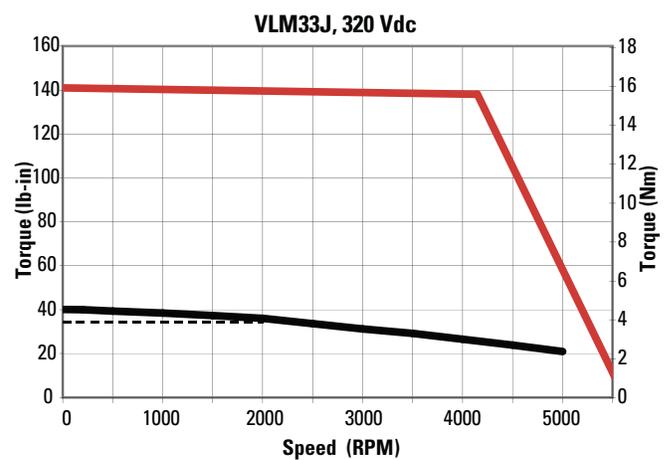
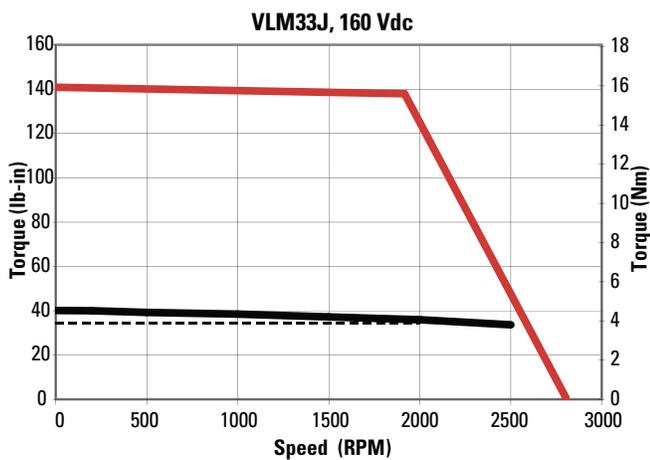
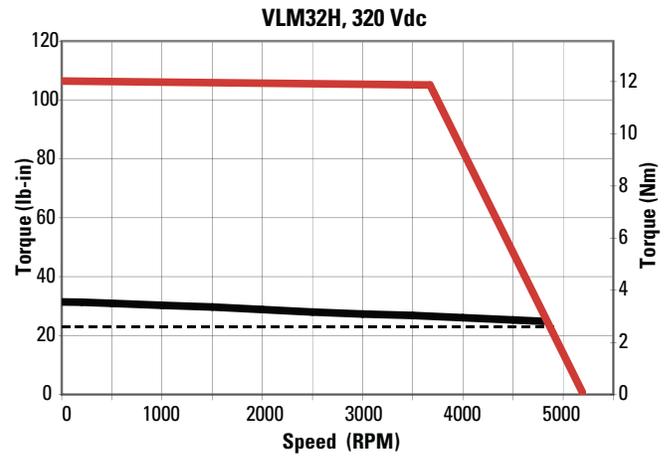
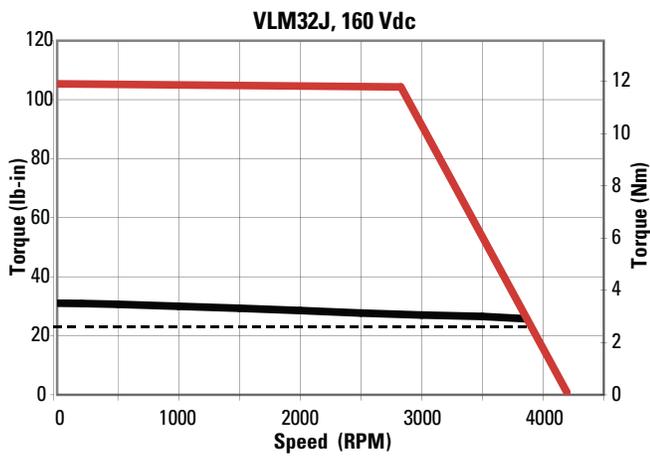
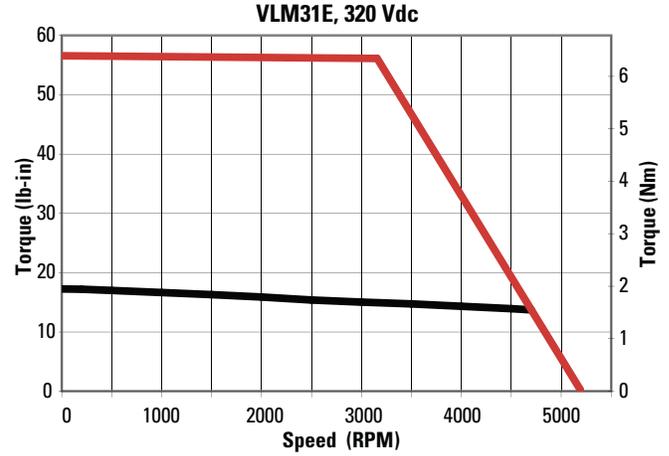
# VLM3x Series Brushless Servo Motor

## VLM3x Performance Curves

### 160 Vdc Windings

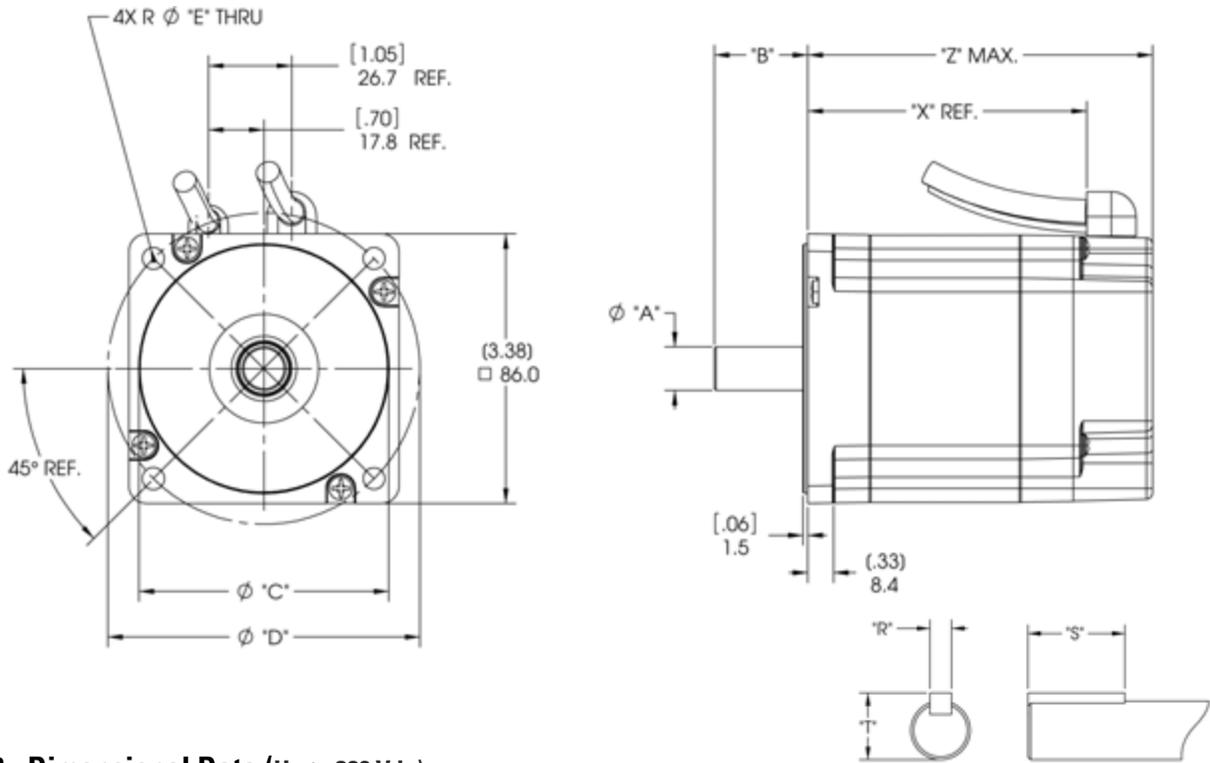


### 320 Vdc Windings



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

### VLM3x Outline Drawings



### VLM3x Dimensional Data (Up to 320 Vdc)

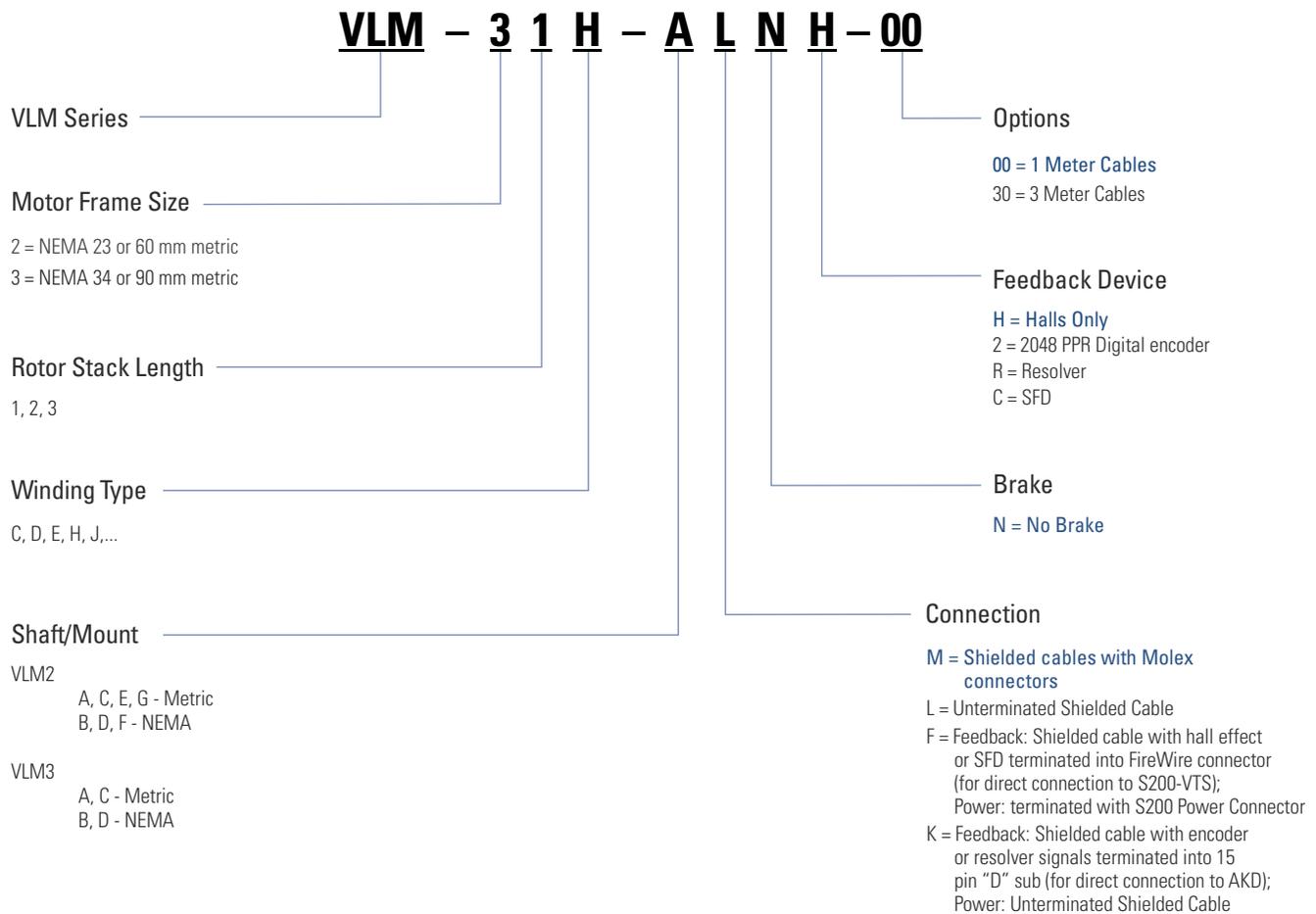
Shaft Mount Option	Units	"A" Shaft Diameter	"B" Shaft Length	"C" Pilot Diameter	"D" Mtg Hole	"E" Mtg Hole Diameter	"R" Key Width	"S" Key Length	"T" Shaft Diameter Over Key	Shaft Feature
A (Metric)	mm	14 <sup>0</sup> <sub>-0.011</sub>	30	80 <sup>+0.012</sup> <sub>-0.007</sub>	100	7	5 <sup>0</sup> <sub>-0.03</sub>	20 <sup>0</sup> <sub>-0.20</sub>	16 <sup>0</sup> <sub>-0.13</sub>	Key 5 x 5 x 20
B (NEMA)	inch	.5000 <sup>+0.0000</sup> <sub>-0.0005</sub>	1.25	2.875 <sup>+0.000</sup> <sub>-0.002</sub>	3.875	.218	.125 <sup>0</sup> <sub>-0.03</sub>	.750 ± .010	.555 <sup>+0.000</sup> <sub>-0.017</sub>	Key 1/8 x 1/8 x 3/4
C (Metric)	mm	14 <sup>0</sup> <sub>-0.011</sub>	30	80 <sup>+0.012</sup> <sub>-0.007</sub>	100	7	-	-	-	
D (NEMA)	inch	.5000 <sup>+0.0000</sup> <sub>-0.0005</sub>	1.25	2.875 <sup>+0.000</sup> <sub>-0.002</sub>	3.875	.218	-	-	-	Smooth

MODEL	Units	"X"	Z MAX
VLM31	mm	89.4	112.1
	inch	3.5	4.42
VLM32	mm	127.5	150.2
	inch	5.0	5.92
VLM33	mm	165.6	188.3
	inch	6.5	7.42

Note: For SFD versions add 0.5 inch (12.7mm)

# Model Nomenclature

## VLM Servo Motor

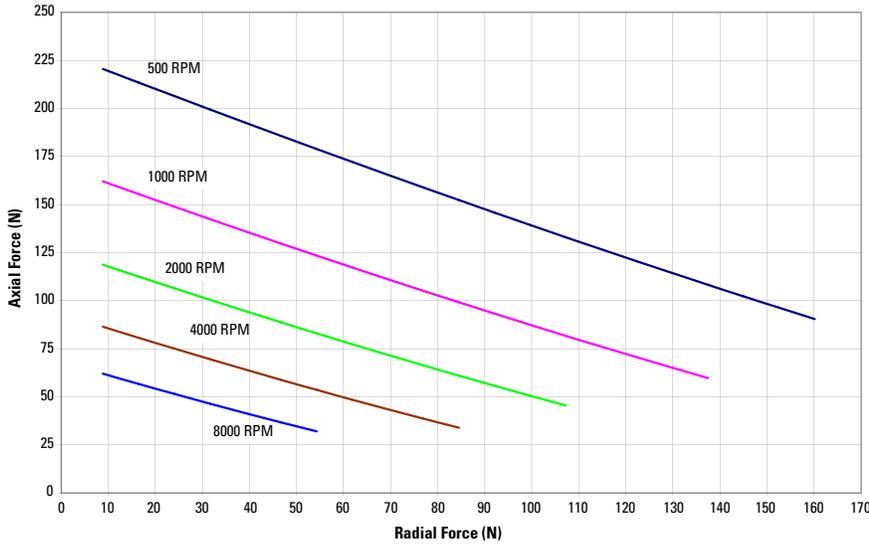


The VLM is one family of many servo motors offered by Kollmorgen. If you seek higher-performance, greater torque in a smaller package, or options not listed above, contact Kollmorgen to discuss the AKM and GoldLine servo motor families.

Note: Options shown in blue text are considered standard.

# Bearing Fatigue and Shaft Loading

**VLM2 Motors**  
 20000 HOURS BEARING LIFE



## Shaft Loading

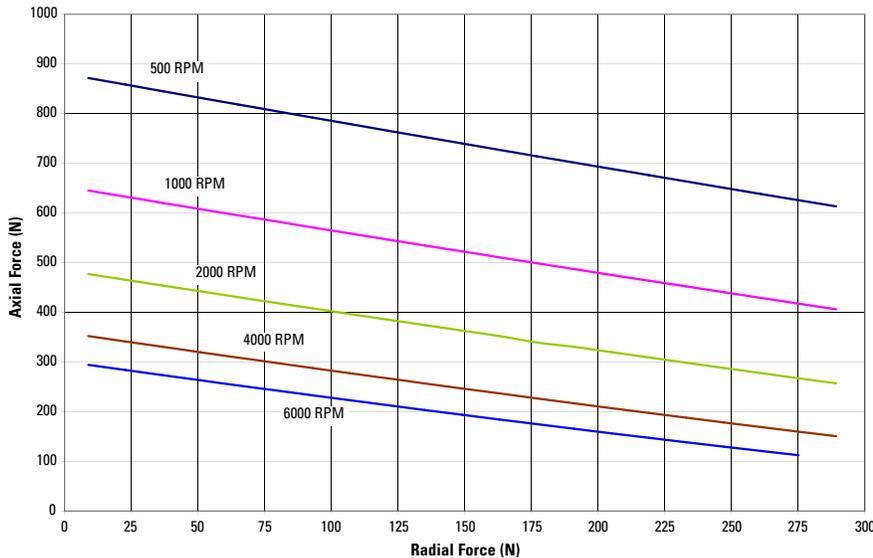
Motor	Max. Radial Force (N)	Max. Axial Force (N)
VLM2	150*	260
VLM3	280	1330

\*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.

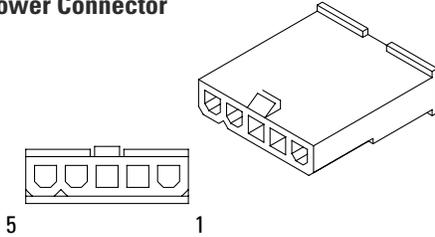
**VLM3 Motors**  
 20000 HOURS BEARING LIFE



# 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	

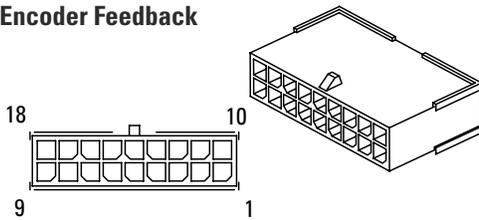
Shield Connected to Motor

Ground Internal to Motor

#### Suggested Mating Connector

Molex 39-01-4050

### 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/Hall Ground	Black
8	Thermal+	Grey
9	Thermal-	Violet
10	+5 Vdc	Red
11		
12		
13		
14		
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

### Halls Feedback

Connector Part Number: Molex 43020-1001

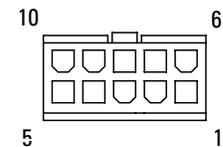
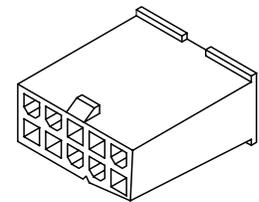
Pin	Function	Color
1	+5 Vdc	Red
2	Ground	Black
3		
4		
5	Shield	
6	Thermal+	Grey
7	Thermal-	Violet
8	Hall U	Green
9	Hall V	Brown
10	Hall W	White

Shield Connected to Motor

Ground Internal to Motor

#### Suggested Mating Connector

Molex 43025-1000



### SFD Feedback

Connector Part Number: Molex 43020-1001

Pin	Function	Color
1	SFD +5 V	Red
2	SFD +5V RTN	Black
3	SFD COM-	Green
4	SFD COM+	Brown
5	SFD COM Shield	

### Resolver Feedback

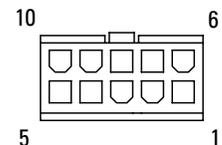
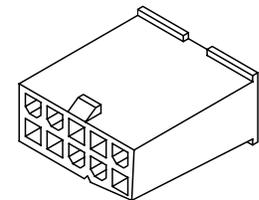
Connector Part Number: Molex 43020-1001

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	

### 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/Hall Ground	Black
Hall U	Green
Hall V	Brown
Hall W	White
Shield	

### Hall Feedback

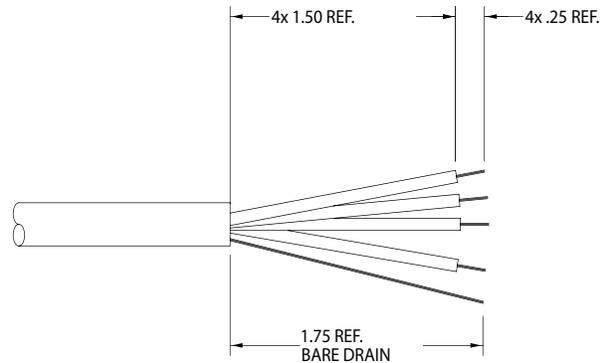
Unterminated Shielded Cable

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

### Resolver Feedback

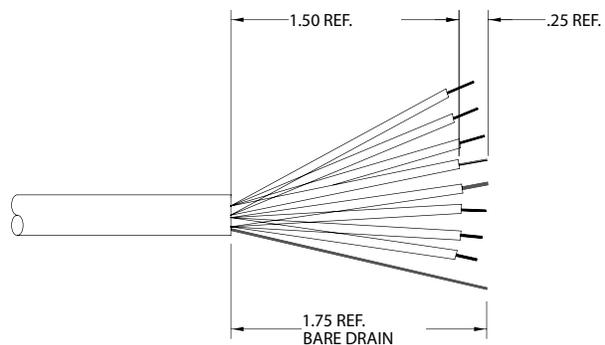
Unterminated Shielded Cable

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	



POWER CABLE

VLM2 22 AWG  
 VLM3 18 AWG



FEEDBACK CABLES

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

### SFD Feedback

Unterminated Shielded Cable

Function	Color
SFD +5v	Red
SFD +5v RTN	Black
SFD COM-	Green
SFD COM+	Brown
SFD COM SHIELD	

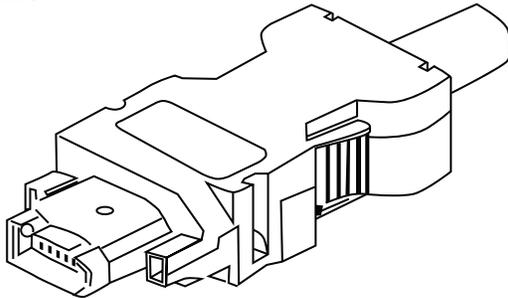
# Connector Options

## "F" Connector Option (For Direct Connection To S200-VTS)

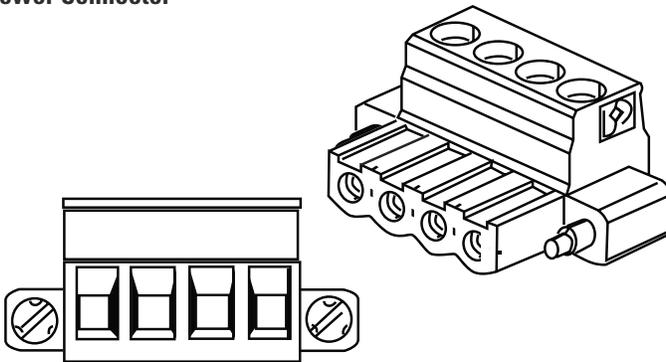
### Power Cable

VLM2 22 AWG

VLM3 18 AWG



### Power Connector



Connector Part Number: Phoenix MSTB2,5/4-STF-5,08-BK

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

### SFD Feedback

Connector Part Number: Molex 55100-0670

Pin	Function	Color
1	SFD +5V	Red
2	SFD +5V RTN	Black
3	SFD COM-	Green
4	SFD COM+	Brown
5		
6		

### Halls Feedback

Connector Part Number: Molex 55100-0670

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

# Connector Options

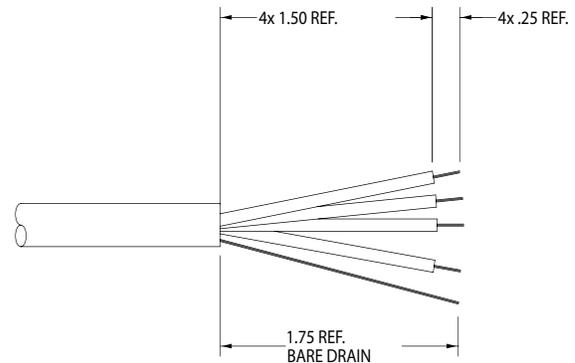
## "K" Connector Option

### Power Leads

(For Direct Connection To AKD)

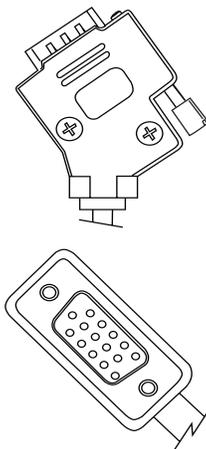
Unterminated Shielded Cable

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

### SFD Feedback

Connector Part Number: 15 PIN HD D-SUB

Pin	Function	Color
1		
2		
3		
4		
5		
6	SFD COM+	Brown
7	SFD COM-	Green
8		
9		
10	SFD +5V	Red
11	SFD +5V RTN	Black
12		
13		
14		
15		

### 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

## ▶ AKD<sup>®</sup> 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. With Kollmorgen servo components, we can help you increase your machine's overall equipment effectiveness (OEE) by 50%.

## 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 48 Arms continuous current; 9 to 96 Arms peak
    - Very high power density enables an extremely small package
    - True plug-and-play with all standard Kollmorgen servo motors and actuators
    - 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, EtherNet/IP™, PROFINET® RT, SERCOS® III, and CANopen®
    - Scalable programmability from base torque-and-velocity through multi-axis master

# AKD<sup>®</sup> 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.

AKD<sup>®</sup> SERVO DRIVE



AKMH<sup>™</sup> Hygienic Stainless Steel Motors



AKM<sup>®</sup> 2G Servo Motors



Frameless Brushless Direct Drive Motors



AKD<sup>®</sup>-N Decentralized Servo Drive



Cartridge DDR<sup>®</sup> Motors



Housed DDR<sup>®</sup> Motors



Direct Drive Linear Motors



Linear Actuators



Multi-Axis Precision Tables



AKD<sup>®</sup> Servo Drive



Control of motors with AKD<sup>®</sup> PDMM programmable multi-axis master

### Best-in-Class Components

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



Industry-leading power density

48A @ 480V

AKD® SERVO DRIVE

## General Specifications

120 / 240 Vac 1 & 3 Phase (85 -265 V)	Continuous Current (Arms)	Peak Current (Arms)	Drive Continuous Output Power Capacity (Watts)	Internal Regen		Height mm (in)	Width mm (in)	Depth mm (in)	Depth with Cable Bend Radius mm (in)
				(Watts)	(Ohms)				
AKD-x00306	3	9	1100	0	0	168 (6.61)	59 (2.32)	156 (6.14)	184 (7.24)
AKD-x00606	6	18	2000	0	0	168 (6.61)	59 (2.32)	156 (6.14)	184 (7.24)
AKD-x01206	12	30	4000	100	15	196 (7.72)	78 (3.07)	187 (7.36)	215 (8.46)
AKD-x02406	24	48	8000	200	8	247 (9.72)	100 (3.94)	228 (8.98)	265 (10.43)
240/480 Vac 3 Phase (187-528 V)	Continuous Current (Arms)	Peak Current (Arms)	Drive Continuous Output Power Capacity (Watts)	Internal Regen		Height mm (in)	Width mm (in)	Depth mm (in)	Depth with Cable Bend Radius mm (in)
(Watts)				(Ohms)					
AKD-x00307	3	9	2000	100	33	256 (10.08)	70 (2.76)	185 (7.28)	221 (8.70)
AKD-x00607	6	18	4000	100	33	256 (10.08)	70 (2.76)	185 (7.28)	221 (8.70)
AKD-x01207	12	30	8000	100	33	256 (10.08)	70 (2.76)	185 (7.28)	221 (8.70)
AKD-x02407	24	48	16,000	200	23	306 (12.01)	105 (4.13)	228 (8.98)	264 (10.39)
AKD-x04807	48	96	35,000	-	-	385 (15.16)	185 (7.28)	225 (8.86)	260 (10.23)

Note: For complete AKD AKD drive data refer to page 23.



# Model Nomenclature

## AKD® Servo Drive

**AKD – B 003 06 – NB AN – 0000**

AKD Series

Version

B = Base drive

C = Central power supply for AKD-N (Requires CB Extension)

N = Decentralized drive (Requires DB, DF, or DS Extension)

P = Position indexer (motion tasking)

T = AKD BASIC Language Programmable drive (Requires IC or NB Extension)

M = Multi-axis Master Drive (Requires MC Extension option, and EC Connectivity option)

Current Rating

003 = 3 Amp

006 = 6 Amp

010 = 10kW (for AKD-C, this field refers to power.)

012 = 12 Amp

024 = 24 Amp

048 = 48 Amp

Voltage

06 = 120/240 Vac 1Ø/3Ø (24 Amp Drive: 240 Vac 3Ø only)

07 = 240/480 Vac 3Ø (Version C: 07 = 400/480 Vac 3Ø | Version N: 07 = 560/680 Vdc)

Variants

0000 = Standard

Connectivity\*

AN = Analog command

CN = CANopen®

EC = EtherCAT®

EI = EtherNet/IP™

PN - PROFINET®

SQ = SynqNet®

Drive Version Availability

B, P, T

P

C, M, N, P

P

P

B

\*Motion Tasking is included as a free upgrade with CN, EC, EI and PN

Extension

CB = without extension (AKD-C version only)

DB = hybrid motor cable (AKD-N version only)

DF = additional EtherCAT® port + feedback connector (AKD-N version only)

DS = local STO + feedback connector (AKD-N version only)

IC = Expanded I/O version and SD card slot (AKD-T version only)

NB = Without extensions

Note: Options shown in blue text are considered standard.

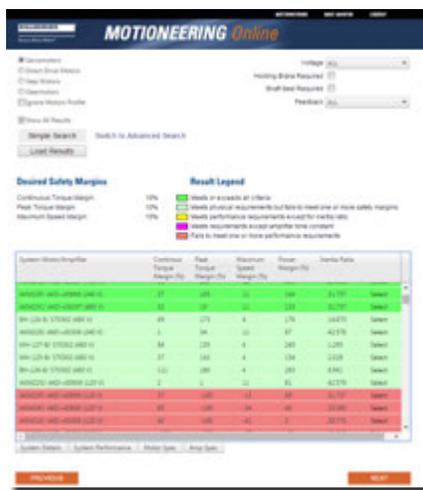
# MOTIONEERING® Online

MOTIONEERING® Online – Kollmorgen has revamped, modernized and put online one of the most respected applications sizing programs of the last 20 years. You now can access this application sizing and selection tool wherever you have access to the internet. MOTIONEERING Online is just a start of a series of releases that will empower you to optimize solutions for your toughest applications. Sizing frameless motors and drive systems has never been easier. Using a mechanism project concept for collecting and saving multiple axes of load information, MOTIONEERING® Online can automatically calculate application results and compare against a catalog of systems - recommending the most optimized set of Kollmorgen system solutions available.

Versatile units-of-measure selection options for mechanism and motion profile data-entry, with the ability to convert data into other available units, makes this a convenient international tool. A user-friendly Help file teaches program functions and algorithms used to provide results.

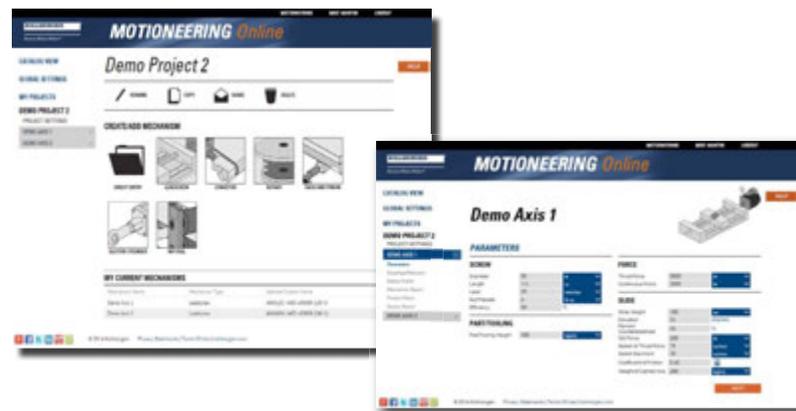
## Mechanism Projects

- Direct drive entry, lead screw, conveyor
- Rack and pinion, nip rolls
- Direct Drive Rotary
- Electric Cylinder
- Direct data entry



The screenshot shows a table of system recommendations with columns for System Number, Continuous Torque, Peak Torque, Maximum Speed, Power Margin, and Inertia Ratio. The rows are color-coded: green for systems meeting all criteria, yellow for systems meeting physical requirements but lacking safety margins, and red for systems failing to meet one or more performance requirements.

System Number	Continuous Torque Margin (%)	Peak Torque Margin (%)	Maximum Speed Margin (%)	Power Margin (%)	Inertia Ratio
MS-224-6-17000-000-00	100	100	100	100	24.777
MS-224-6-17000-000-00	100	100	100	100	24.777
MS-224-6-17000-000-00	100	100	100	100	24.777
MS-224-6-17000-000-00	100	100	100	100	24.777
MS-224-6-17000-000-00	100	100	100	100	24.777
MS-224-6-17000-000-00	100	100	100	100	24.777
MS-224-6-17000-000-00	100	100	100	100	24.777
MS-224-6-17000-000-00	100	100	100	100	24.777
MS-224-6-17000-000-00	100	100	100	100	24.777
MS-224-6-17000-000-00	100	100	100	100	24.777



## Solution Set Search Screen

- Color-coded indication of system's ability to meet application requirements
- Review system components specifications
- Save, print, or create a pdf application report
- Evaluate system performance curve with application points

## MOTIONEERING® Online Features:

- Inertia Calculator - lets you build up inertia based on odd shapes by additive or subtractive methods
- Custom Motion Profile - easy to add entire segments or copy segments to repeat
- Environmental Factor - takes into account your ambient temperature
- Project by Project Units - You can tailor your units on a project by project basis, or use the global units settings

## MOTIONEERING Online Supported Browsers

- IE, Chrome, Firefox, Safari

Sold & Serviced By:



Toll Free Phone: 877-378-0240

Toll Free Fax: 877-378-0249

[sales@servo2go.com](mailto:sales@servo2go.com)

[www.servo2go.com](http://www.servo2go.com)

## About Kollmorgen

Since its founding in 1916, Kollmorgen's innovative solutions have brought big ideas to life, kept the world safer, and improved peoples' lives. Today, its world-class knowledge of motion systems and components, industry-leading quality, and deep expertise in linking and integrating standard and custom products continually delivers breakthrough motion solutions that are unmatched in performance, reliability, and ease-of-use. This gives machine builders around the world an irrefutable marketplace advantage and provides their customers with ultimate peace-of-mind.



**KOLLMORGEN**®

*Because Motion Matters™*