BLM Brushless Low Voltage Motors

Installation Manual

English Instruction Manual

Edition: B, March 2025
Part Number: FP00933
Original Language: English

For safe and proper use, follow these instructions.
Keep for future use.

Record of Document Revisions

Revision	Published	Remarks
A	March 2020	First version.
B	March 2025	Updated Dimension Drawings, Technical Data, added Performance Data and Curves, updated images and content.

Table of Contents

1 Benefits of BLM Frameless Motors

Industry-Leading Frameless Motor Performance

- Advanced electromagnetic designs deliver maximum torque density which minimizes required motor space envelope.
- Extremely smooth rotation with minimal cogging and low total harmonic distortion (THD).
- Broad operating speed range and rapid acceleration.

Quality Construction Ensures Reliability and Safe Operation

- Redundant magnet attachment to rotor on high-speed models – adhesive bonding.
- 155 °C motor winding temperature rating with optional thermistor allows continuous safe operation for demanding applications.
- RoHS compliant material selection.
- Compliant with Harmonized Standards EN 60034-1: 2004 - Rotating Electrical Machines and where appropriate in accordance to the Low Voltage Directive 2014/35/EU.

Highly Configurable Design Minimizes Time to Solution

- Five frame sizes with multiple stack lengths available upon request.
- Standard voltage insulation.
- Multiple standard windings with custom windings available upon request.
- Mechanical interface changes easily accommodated.

2 About this Manual

This manual describes the BLM series of frameless motors (standard version).

More background information is available from the Kollmorgen Support Network at kdn.kollmorgen.com.

The BLM motors are operated in drive systems together with Kollmorgen servo drives.

Read all this system documentation:

- Instruction manual for the servo drive.
- Bus Communication manual (e.g., CANopen or EtherCAT).
- Online help of the servo drive's setup software.
- Regional accessories manual.
- Technical description of the BLM series of motors.

NOTE Contact Kollmorgen customer support for a free printed copy of the installation manual.

2.1 Symbols Used

Symbol	Indication
DANGER	Indicates a hazardous situation which, if not avoided, **will result in death or serious injury**.
WARNING	Indicates a hazardous situation which, if not avoided, **could result in death or serious injury**.
CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates situations which, if not avoided, could result in property damage.
NOTE	Indicates useful information.
IMPORTANT	Indicates specific information that could impact results.
	Warning of a danger (general). The type of danger is specified by the text next to the symbol.
	Warning of danger from electricity and its effects.
	Warning of danger from hot surface.
	Warning of danger from suspended loads.

2.2 Abbreviations Used

See "Technical Data Terminology" (→ p. 59).

NOTE In this document, the symbol (→ p. 53) means: see page 53.

3 Part Number Scheme

IMPORTANT

- The part number scheme is for product identification only.
- Do not use for the order process because not all combinations of features are possible.

BLM 1 A A - A A 1 0 N - 00

Frame Size

1	35.6 mm
2	52.1 mm
3	64.1 mm
4	77.2 mm
5	100.2 mm

Stator Lamination Length

A	BLM1: 19.0 mm BLM2: 15.5 mm BLM3: 20.0 mm BLM4: 25.0 mm BLM5: 27.0 mm
S	Special/customized non-standard rotor length

Winding Type

A to R	Standard winding options
S	Special/customized

Rotor Inner Diameter

A	BLM1: 9.7 mm BLM2: 19.0 mm BLM3: 20.0 mm BLM4: 28.0 mm BLM5: 43.0 mm
S	Special/customized non-standard rotor inner diameter

Rotor Length

A	BLM1: 19.0 mm BLM2: 19.4 mm BLM3: 29.2 mm BLM4: 28.2 mm BLM5: 28.3 mm
S	Special/customized non-standard rotor length

Motor Connection Options

1	Flying leads (200 mm)
2	Flying leads (500 mm)
3	Reserved
4	Ferrules or terminal ring (200 mm)
S	Special/customized

Thermal Sensor

0	None
1	PTC (155 °C)
2	PTC 111-KD3 (140 °C)
3	PT1000

Feedback

N	None

Sleeve

–	Without sleeve

Customization

00	Standard

4 Safety

4.1 Specialist Staff Required!

Only properly qualified personnel are permitted to perform such tasks as transport, assembly, setup and maintenance.

Qualified specialist staff are people familiar with the transport, installation, assembly, commissioning, and operation of motors and who use their relevant minimum qualifications in their duties.

- Transport: Only by personnel with knowledge of handling electrostatically sensitive components.
- Mechanical Installation: Only by mechanically qualified personnel.
- Electrical Installation: Only by electrical engineering qualified personnel.
- Setup: Only by qualified personnel with extensive knowledge of electrical engineering and drive technology.

The qualified personnel must know and observe IEC 60364 / IEC 60664 and national accident prevention regulations.

4.2 Check Hardware Revision!

Check the Hardware Revision Number of the product (see the product label).

- This number is the link between your product and the manual.
- The product Hardware Revision Number must match the Hardware Revision Number on the cover page of the manual.

4.3 Read the Documentation!

Read the available documentation before installation and commissioning.

- Improper handling of the stator/rotor can cause harm to people or damage to property.
- Strictly adhere to the technical information on the installation requirements.
- The operator must ensure that all persons entrusted to work on the motor have read and understood the manual and that the safety notices in this manual are observed.

4.4 Pay Attention to the Technical Data!

Adhere to the technical data and the specifications on connection conditions (rating plate and documentation).

If permissible voltage values or current values are exceeded, the motors can be damaged (e.g., by overheating).

4.5 Perform a Risk Assessment!

The manufacturer of the machine must:

- Generate a risk assessment for the machine.
- Take appropriate measures to ensure that unforeseen movements cannot cause injury or damage to any person or property.
- Specialist staff may have additional requirements as a result of the risk assessment.

4.6 Safety Warnings

Symbol	Description
	**Hot surface!** The surfaces of the motors can be very hot in operation, according to their protection category. • Risk of minor burns! • The surface temperature can exceed 100 °C. • Measure the temperature and wait until the BLM motor has cooled down below 40 °C before touching it.

DANGER
 
	Earthing! High voltages!
	It is vital that you ensure the BLM motor is safely earthed to the PE (protective earth) busbar in the switch cabinet.
	• Risk of electric shock!
	  • Without low-resistance earthing, no personal protection can be guaranteed and there is a risk of death from electric shock.
	• Not having optical displays does not guarantee an absence of voltage.
	  • Power connections may carry voltage even if the rotor is not rotating.
	• Do not unplug any connectors during operation.
	  • There is a risk of death or severe injury from touching exposed contacts.
	  • Power connections may be live even when the rotor is not rotating.
	  • This can cause flashovers with resulting injuries to persons and damage to the contacts.
	• After disconnecting the servo drive from the supply voltage, wait several minutes before touching any components which are normally live (e.g., contacts, screw connections) or opening any connections.
	• The capacitors in the servo drive can still carry a dangerous voltage several minutes after switching off the supply voltages.
	  • To be safe, measure the DC-link voltage and wait until the voltage has fallen below $60V_{DC}$.

DANGER
 
	Earthing! High voltages!
	• It is mandatory to ensure that the metallic parts of the motor stator are properly grounded to the PE (protective earth) busbar in the switchgear cabinet.
	• Safety for personnel cannot be assured without a low-resistance protective earth.
	  • See "Grounding" (→ p. 17).
	• Power connections may still be live, even though the motor is not moving.
	  • Never undo the electrical connections to the motor while a voltage is present.
	  • In unfavorable cases this can cause arcing, with injury and damage to persons and equipment.
	• The optional thermal sensor in the stator windings (PT100 / PT1000) must be wired to the control circuit of the application to make sure that the motor temperature is supervised and the motor is protected from overheating.
	• Verify the winding temperature never exceeds 155 °C.

4.7 Magnetic Field

Keep watches and magnetic data media (credit cards, diskettes, etc.) and digital displays (mobile phones, laptops, etc.) out of the immediate vicinity (<500 mm) of the BLM motor.

NOTE

Only properly qualified persons are permitted to perform activities such as transport, installation, commissioning and maintenance.

- Properly qualified persons are those who are familiar with the transport, assembly, installation, commissioning and operation of motors, and who have the appropriate qualifications for their job.
- Qualified personnel must know and observe these standards and directives:
  - IEC 60364
  - IEC 60662
  - National accident prevention regulations.

⚠ CAUTION

- See "Pacemaker" (➔ p. 11) for personnel cautions.
- Because of the high forces of attraction, special care must be taken within a range of about 50mm from the magnetic rotor.
- Inside this area, heavy (>1kg) or large-area (>1dm²) objects of steel or iron **must not** be held in the hand.

NOTE

Recommendations in this document are intended to serve as general installation guidelines and are for reference purpose.

IMPORTANT

Kollmorgen assumes no responsibility for incorrect implementation of these techniques, which remain the sole responsibility of the user.

4.7.1 Metallic Objects

- Strong magnetic fields attract metallic objects and create potential safety hazards for hands and fingers.
- During work on or in the vicinity of BLM motors, verify these materials are available:
  - At least two finely pointed wedges of tough non- magnetic material (e.g., V2A - (with a wedge angle of approximately 10°-15°)).
  - A non-metallic hammer (approx. 3 kg).
  - In an emergency, use these tools to detach objects that are magnetically bound to the magnetic rotor (e.g., to free trapped parts of the body).

4.7.2 Rotor Storage

See "Warning Signs" (➔ p. 11).

- The rotor must never be stored in an unpacked condition.
- Use non-magnetic packaging material that is at least 20mm thick.
- The storage location must be dry and protected from heat.
- Do not expose the motor rotor to heat in excess of 120 °C, unless installed inside the stator.
- Heat over 120 °C can de-magnetize the rotor magnets.

4.7.3 Warning Signs

- Put up warning signs where the motors are stored: **Caution: STRONG MAGNETS!**
- Use permanent, self-adhesive labels to attach easily visible warning signs to the machine.

Caution: The rotors on this machine are fitted with strong magnets.
STRONG MAGNETIC FIELDS + HIGH ATTRACTION FORCES!

4.8 Pacemaker

⚠WARNING

Pacemaker!

- The strong magnetic fields which are produced as long as the magnetic rotor is not installed, constitute a hazard for persons with implants (e.g., cardiac pacemakers) that can be influenced by magnetic fields.
- As a general rule, all persons who may suffer impairment to health through the influence of strong magnetic fields must keep at a safe distance of at least 1 meter from the rotor.

4.9 Wear Gloves

⚠ CAUTION

Wear gloves!

- Always wear gloves when working on the motor.
- Read the available documentation before installation and commissioning.
- Incorrect handling of the motor components can cause injury and damage to persons and equipment.
- Special care must be taken when installing the rotor inside the stator of the motor.
- Tooling or fixtures may be required.

4.10 Use as Directed

- The BLM series of permanent, magnet, and frameless motors are designed especially for motion applications for industrial robots, machine tools, textile, packing machinery, and similar machines with high requirements for dynamic positioning and servo movement.
- The BLM motor uses a Class F UL insulation system and meets creepage and clearance requirements of UL 1004-1.
- The thermistor integrated in the motor windings must be observed and evaluated.
- The end user assumes responsibility for machine conformity.
- The user is only permitted to operate the motors under the ambient conditions defined in this documentation.
- The BLM series of motors is **exclusively** intended to be driven by servo drives under speed and / or torque control.
- The motors are installed as components in electrical apparatus or machines and can only be commissioned and put into operation as integral components of such apparatus or machines.
- The conformity of the BLM motor to the standards mentioned in the CE Declaration of Conformity is only guaranteed when installed in accordance with the "Mounting and Installation Guidelines" (→ p. 15).
    - See "Approvals" (→ p. 61).

4.11 Prohibited Use

- The use of the BLM motors is prohibited directly on mains supply networks.
- The use of the motors is prohibited in:
  - areas where there is a risk of explosions.
  - environments with caustic and/or electrically conducting acids, bases, oils, vapors, dusts.
  - vacuums.
- Commissioning the motor is prohibited if the machine in which it was installed:
  - Does not meet the requirements of the EC Machinery Directive.
  - Does not comply with the EMC Directive.
  - Does not comply with the Low Voltage Directive.

5 User Interface Responsibilities

To assure proper performance and reliability of the motor when installed in the system, the user is responsible for designing the mounting interface using the information in this document as guidelines.

The user is responsible for designing the rotor shaft, stator enclosure, bearing system, housing design details, material selection, fit calculations, and tolerance analysis based on the needs of the intended application.

NOTE

- The recommendations included in this Kollmorgen document are intended as general installation guidelines and are for reference purposes only.
- **Kollmorgen assumes no responsibility for incorrect implementation of these techniques, which remain the sole responsibility of the user.**

IMPORTANT

BLM motors, as well as any other Kollmorgen frameless brushless motors that are supplied as 2-piece rotor/stator components, should be installed by the user according to the general installation guidelines.

See:

- "Product Life Cycle Handling" (➔ p. 14)
- "Mounting and Installation Guidelines" (➔ p. 15)

6 Product Life Cycle Handling

6.1 Repair and Disposal

Repair of the motor must be done by the manufacturer.

Send the motor to:

KOLLMORGEN s.r.o
Attn.: Repair Department
Evropská 864
664 42 Modřice, Brno
Czech Republic

6.2 Storage

- Store only in the manufacturer's original recyclable packaging.
- Climate category 1K4 according to EN 61800-2.
- Humidity: Relative humidity 5% to 95% , no condensation.
- Maximum stacking height: See Packaging-Packaging.
- Storage temperature: -25 °C to +55 °C, maximum variation 20K/hr.
- Storage time: Unlimited.

6.3 Transport

- Transport is only allowed by qualified personnel in the manufacturer's original recyclable packaging.
  - Avoid shocks.
- Climate category 2K3 according to EN 61800-2.
- Humidity: Relative humidity 5% to 95% , no condensation.
- Maximum Weight: The weight of the package you receive depends on the number of parts inside.
  - The maximum possible weight for the package is 17kg.
- Temperature: -25 °C to +70 °C, maximum rate of change 20K/hr.
- If the packaging is damaged, check the motor for visible damage.
  - Inform the carrier and, if appropriate, the manufacturer.

7 Mounting and Installation Guidelines

7.1 Bearings

The user-supplied bearing system in the motor application must exhibit sufficient stiffness to maintain a rigid, uniform clearance gap between the rotor and the stator under all operating conditions.

7.2 Electrical Wiring Interface

7.2.1 Wiring

BLM motors are supplied with UL-compliant un-terminated flying leadwires.

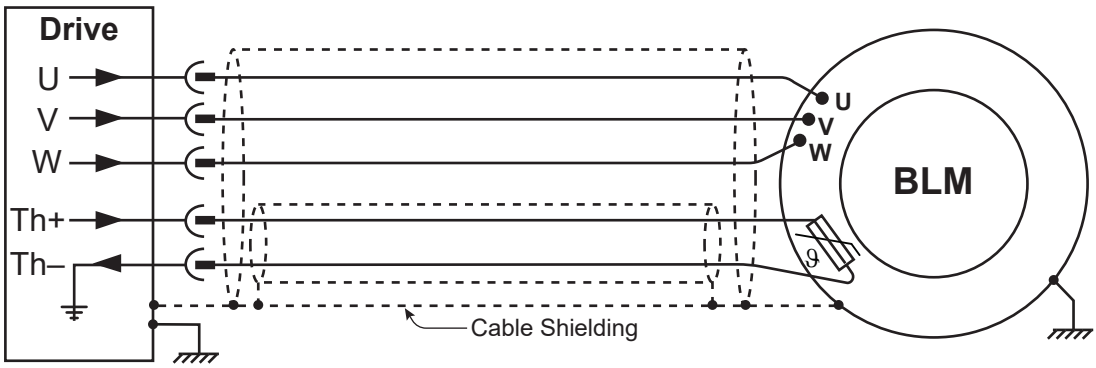
- The user is responsible for proper leadwire routing and connection per the diagrams shown on Kollmorgen drawings.
- Avoid routing wires across sharp corners, pinch points, or edges that may pierce the insulation.
  - Clamp or otherwise secure wire bundle in high vibration applications.
  - Avoid wire contact with moving/ vibrating surfaces that may abrade the insulation.
  - Provide strain relief for all wire bundles.
  - Allow room for a generous bend radius.
- The user assumes responsibility for connector installation, crimping, soldering, shielding, sleeving, or any other wire bundling or electrical interface enhancement beyond the configuration shown on the Kollmorgen outline drawing.

7.2.2 Thermistors (Optional)

To provide for continuous safe operation of BLM motors in demanding applications, integral thermistors can be mounted in the stator.

For details on the available BLM thermistor options see "Thermal Sensor Protective Devices" (→ p. 58).

7.2.3 Cabling - Wiring Diagram



IMPORTANT If the distance between motor and servo drive exceeds 500mm, it is highly recommended to use shielded cables to ensure proper function and EMC behavior of the system.

7.3 Grounding

When mounted in the application, the laminated stack (or bare metal outer sleeve) of the stator should be at the same electrical ground potential as the system chassis and the servo drive chassis.

- If this common ground path is not ensured, the application may exhibit electrical noise and also create an electrical shock hazard.
  - The risk of shock is particularly prevalent when using high pole-count motors with large capacitance characteristics.
- Typically, if the stator is mounted using electrically conductive metallic components, then a robust ground path between stator stack and machine chassis is inherently achieved.
  - Kollmorgen suggests performing a continuity check to confirm proper ground path before enabling the motor system.
- In some applications, depending on mounting configuration and materials chosen by the user, a separate conductive ground strap may be required.
  - In such cases, the user is responsible for installation of the ground path and electrical verification.

7.4 Insulation Tape

Insulation tape is part of the stator. (Figure 7-1)

- Insulation of the stator is designed to meet standard IEC 60664-1 for insulation coordination.
- It is **forbidden** to remove any part of the stator.

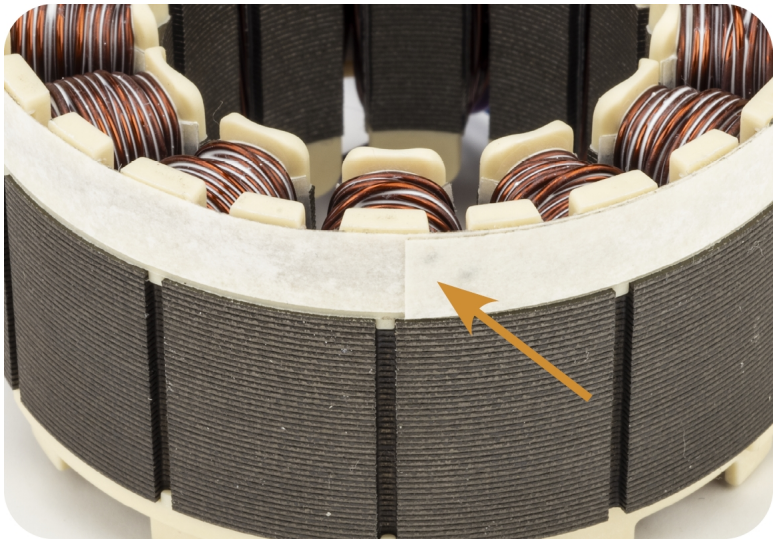


Figure 7-1: Insulation Tape

7.5 Operation

- Ambient Temperature (at rated values): +5 to +25 °C for site altitude up to 1000m AMSL.
- Permissible Humidity (at rated values): Relative humidity 5% to 95% , no condensation.
- Power Derating (currents and torques): No derating for site altitudes above 1000m AMSL with temperature reduction of 10K / 1000 m

IMPORTANT **Verify the winding temperature does not exceed 155 °C.**

7.6 Rotor Mounting

Kollmorgen's BLM series and other frameless brushless motors utilize high-performance rare earth magnets.

- Use extreme caution when handling or transporting to avoid injury and product damage.
- The attractive forces between magnetized rotors and nearby metallic objects can be extremely powerful. Improper handling can result in sudden unexpected impacts.
- The strong magnetic field can damage nearby computers, display screens and memory storage devices.
- Keep the rotor in its shipping container or wrapped protectively until ready to install.
- This practice helps avoid accidents and prevent contamination such as metallic chips or debris that tend to cling to the magnets.

7.6.1 Axial Alignment Control

Kollmorgen's model-specific outline drawings note axial alignment that must be maintained between rotor and stator when mounted to ensure proper motor performance.

- The user is responsible for designing the rotor shaft, stator enclosure, and bearing system to achieve the specified mounting alignment.
- Machined shoulders on the shaft or grooves for removable retaining rings are common ways of controlling rotor installation position.
- The maximum diameter of retaining rings or shaft shoulders should be kept below the rotor diameter where magnets are bonded to the steel hub.

See:

- "BLM1 - Dimensional Drawing" (→ p. 26)
- "BLM2 - Dimensional Drawing" (→ p. 32)
- "BLM3 - Dimensional Drawing" (→ p. 39)
- "BLM4 - Dimensional Drawing" (→ p. 46)
- "BLM5 - Dimensional Drawing" (→ p. 53)

7.6.2 Bonding

Generally, for applications where peak torque does not exceed 50Nm, rotors can be bonded to carbon steel or stainless steel shafts.

- Retaining compounds (e.g., LOCTITE® 640™ or other similar adhesives) usually require smooth, continuous interface diameters and tight fit tolerances.
- Structural epoxies generally require slightly larger fit clearance to allow a thicker bond line.
  - Epoxies often benefit from grooves in the shaft/rotor interface that function as adhesive reservoirs and may be enhanced by textured machined surfaces via knurling or grit blasting.
  - Consult the adhesive manufacturer for proper bond line thickness, fit tolerances, process details, and curing guidelines.
- Always clean the bond joint surfaces thoroughly to ensure good adhesion.
- To avoid partial demagnetization of the rotor, do not cure rotor/shaft bond joints at temperatures greater than 120 °C unless rotor is nested inside the matching stator or rotor is completely surrounded by a ferrous metal keeper fixture.
  - Contact a Kollmorgen engineer for more information.
- Before bonding rotors to aluminum shafts, consult the adhesive manufacturer for assistance.
  - A highly flexible adhesive with broad thermal properties may be required.

7.6.3 Rotor Mounting Materials

The magnetized rotor may be mounted to any metallic shaft of the user's choice.

- Carbon steel and stainless steel are the most commonly used shaft materials.
  - Aluminum alloys are occasionally used if properly designed for the intended torque and thermal operating range.
- The user's intended method of attaching the rotor to the shaft may influence the optimum material and tolerance choices for the shaft.
- The user's shaft does not need to carry flux or function as a portion of the magnetic circuit to achieve rated performance when using a Kollmorgen brushless motor.

7.7 Stator Mounting

Kollmorgen suggests these options for installation of the motor stator depending on torque, vibration, thermal characteristics of the application, cost, ease of assembly, and serviceability desired by the user.

Installation is according Harmonized Standard IEC 60664-1.

7.7.1 Bonding with Structural Adhesives

In most cases, motors in the general peak torque range up to 50Nm may have the stator bonded in place using a structural epoxy (e.g., Hysol® EA934NA, 3M™ Scotch-Weld™ 2214) or other similar adhesives.

- Bonding is a preferred installation technique for BLM1 through BLM5 size stators.
  - Shrink fitting is also an acceptable option.
  - See "Shrink Fit" (➔ p. 23).
- Bonding can be used to secure stators larger than the aforementioned size range if desired, but requires additional design and process considerations.
  - To successfully utilize adhesive bonding, the user's stator enclosure should be designed as a cylindrical cup (Figure 7-2) with a small shoulder for axial positioning at one end and open at the opposite end.

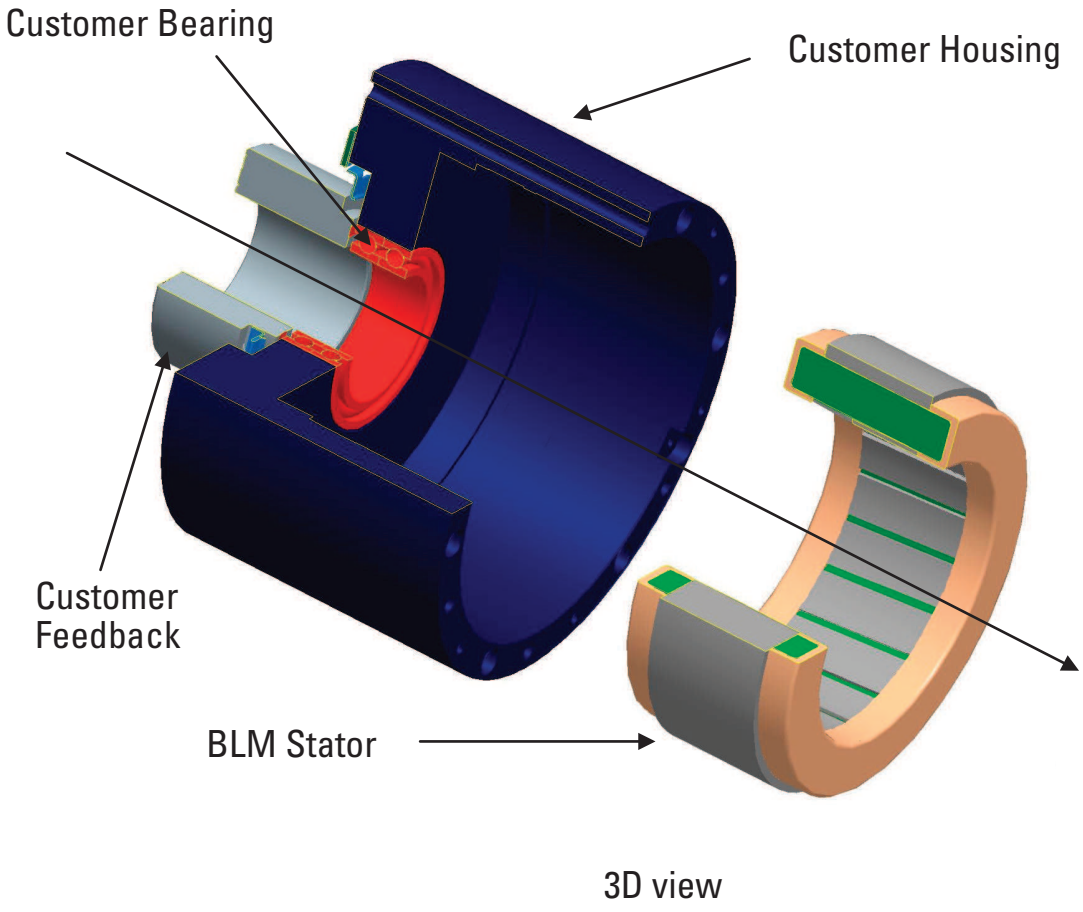


Figure 7-2: Stator Mounting

The shoulder serves as a stop point for the stator to bank against when inserted from the open end.

It should generally clear the maximum outer diameter of the winding end-turn by no less than 0.5mm at all circumferential points.

A small internal chamfer at the open end of the housing cup simplifies stator insertion.

- If using a thick structural epoxy, the inner diameter of the housing cup should be approximately 0.1mm - 0.2mm larger than the maximum outer diameter of the stator.
  - The user should consult the adhesive manufacturer for proper bond line thickness, application process and curing instructions.
- The grooves in the inner diameter of the housing are intended as adhesive reservoirs for the thick structural epoxy.

  - They provide significant torsional strength across a broad temperature range.
  - See "Front Mounting" (→ p. 22) or "Rear Mounting" (→ p. 23).
- Temperature extremes create the potential issue of dissimilar expansion coefficients (steel laminations vs. aluminum housing).
  - These bonding agents provide excellent life and strength characteristics over time when used in the manufacturers recommended manner.
  - If the assembly procedure is performed with the stator housing laying flat (rotation axis vertical), the hydrostatic pressure of the structural adhesive will cause the stator to self-center within the stator housing.

7.7.2 Retaining Compound

If a retaining compound (e.g., LOCTITE® 640™ or other similar adhesive) is preferred instead of a structural epoxy, a tighter clearance between housing inner diameter and stator outer diameter **must be** controlled to maintain appropriate bond line thickness.

- See the adhesive manufacturer's guidelines for recommendations.
- The user assumes responsibility for selecting proper adhesive and for designing housing dimensions per expected thermal growth rate at intended temperature extremes of application.
- Adhesive cure temperatures **must not** exceed 155 °C to avoid damaging the motor stator.
- Stator and housing surfaces should be cleaned thoroughly prior to bonding to ensure good adhesion.

7.7.2.1 Front Mounting

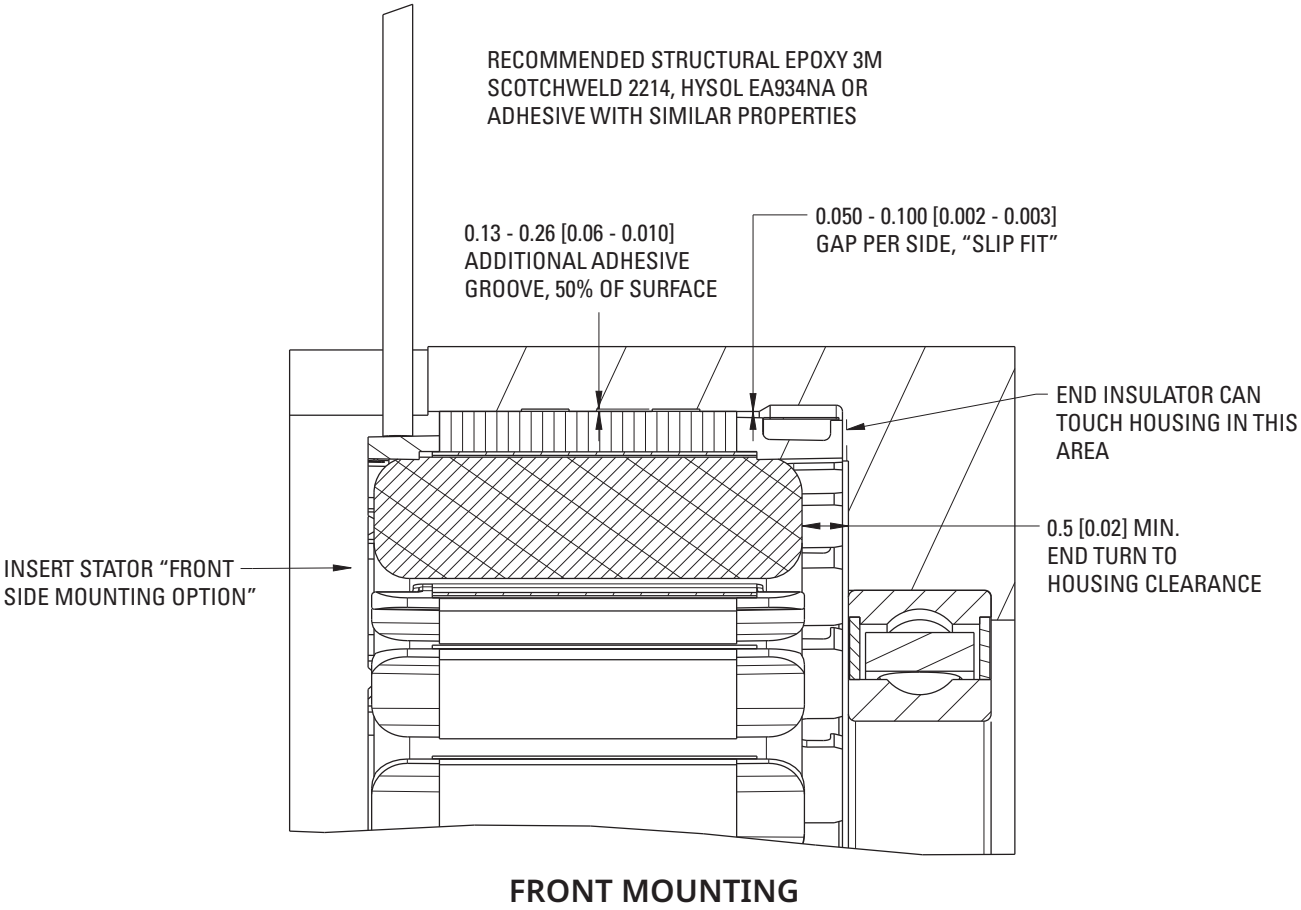


Figure 7-3: Housing Front Mounting

7.7.2.2 Rear Mounting

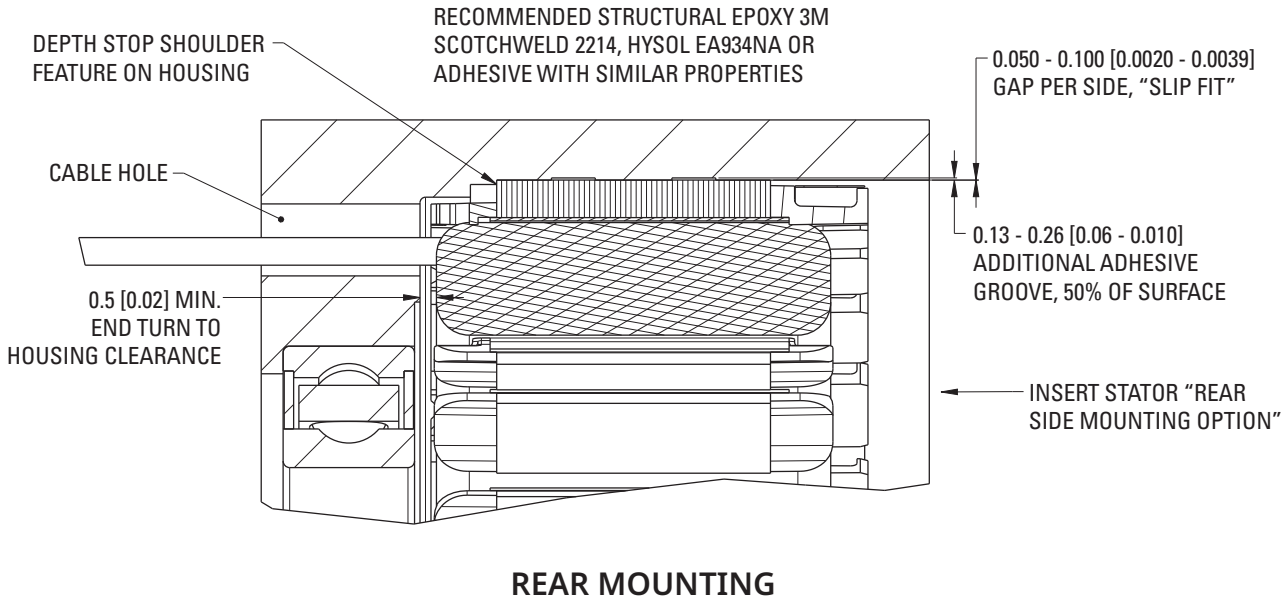


Figure 7-4: Housing Rear Mounting

7.7.3 Shrink Fit

It is allowed to mount the stator into a preheated housing to supply precise concentricity between the stator and the housing.

- The temperature of the stator **must not** exceed 155 °C after assembly to the housing.
- Contact Kollmorgen engineering for more details and technical support.
  - Information about housing material properties, dimensions of housing, heat dissipation from housing and environmental temperature will be needed.
  - See "Support and Services" (➔ p. 63).

7.7.4 Stator Mounting Materials

A metallic housing/clamp structure is suggested to rigidly mount the stator to assure best conductive heat-sinking path and proper structural integrity.

- Aluminum alloys are preferred due to their superior thermal conductivity and strength-to-weight ratio.
  - Stainless steel alloys (300 series or equivalent) are an acceptable alternative for applications that are less thermally critical.
- Carbon steel, cast iron, 400 series stainless alloys and other magnetic flux-conducting ferrous metals are the least desirable choices for stator mounting, but can be used in some cases if proper design choices are considered.
  - Consult a Kollmorgen engineer for assistance if such metals must be used.
- Plastics or other similar thermally isolating materials are **not** recommended.
  - They adversely affect the heat-sinking capacity of the system, making it necessary to significantly de-rate the motor's performance.

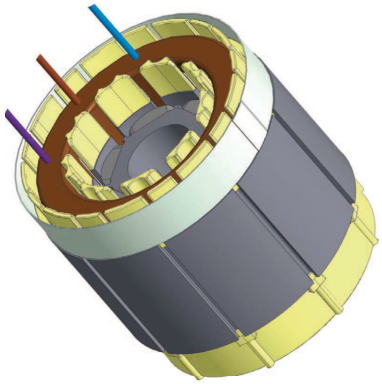
8 BLM1 - Technical Data

8.1 BLM1 - Frameless Motor

The BLM1 series is designed to operate over a broad speed range with high acceleration. Designed for maximum torque density with minimal cogging, the BLM1 is an ideal choice to meet or exceed your compact frameless motor application needs.

General Specifications

	BLM1
Peak torque range	0.53 - 0.58 Nm
Continuous torque range	0.153 - 0.163 Nm
Insulation voltage rating	48 VDC
Thermal Devices	PTC, PTC 111-KD3, PT1000
Certification	UL, CE, RoHS, REACH



Motor Leads:
#26 AWG, Teflon® Coated, Per UL Style 10086
3 Leads, U - Blue, V - Brown, W - Violet

Optional Thermistor Leads:
#26 AWG, ETFE Coated, Per UL Style 10086
2 Leads, Minimum 0.2 m Length

Connection Options

PN Lead Designation	Lead Length (Min)
1	0.2 m
2	0.5 m

Thermal Device Options

PN Lead Designation	Lead Length (Min)
1	PTC
2	PTC 111-KD3
3	PT1000

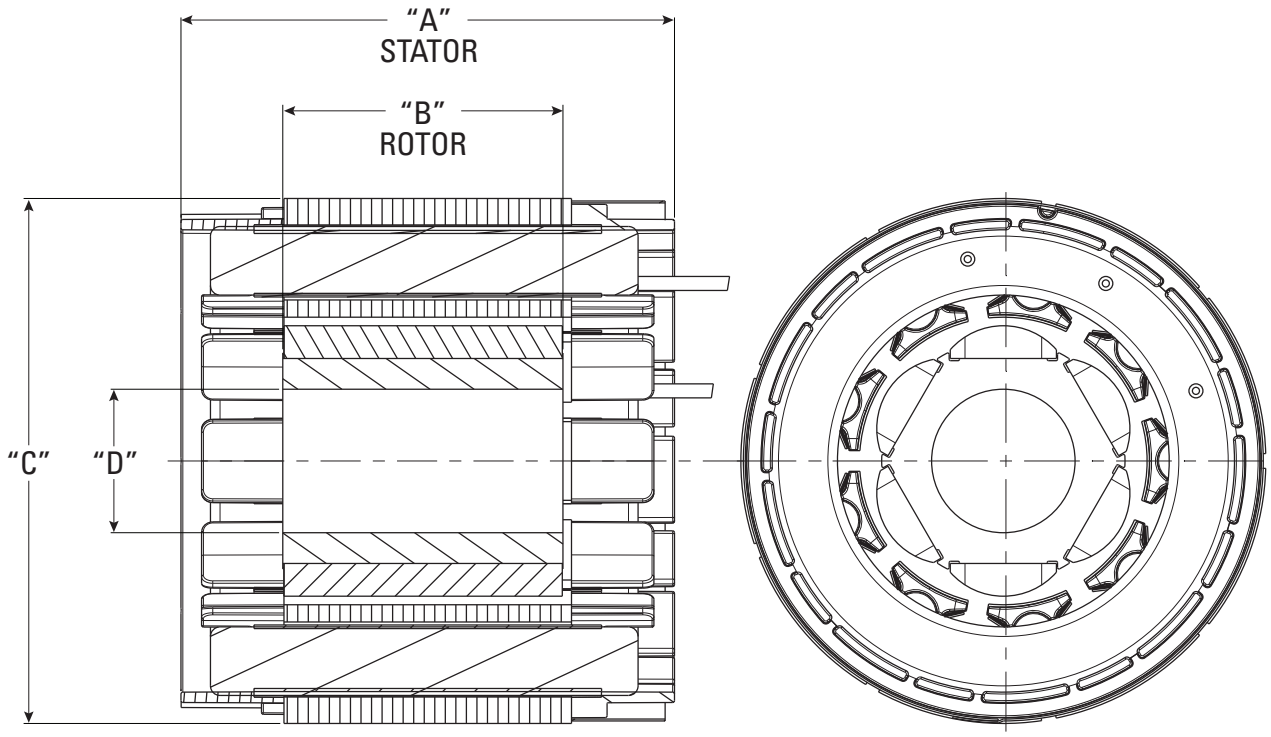
Excitation Sequence Table

	Power Connection		
STEP	Phase 'U' Blue	Phase 'V' Brown	Phase 'W' Violet
1	⊕	⊖	○
2	⊕	○	⊖
3	○	⊕	⊖
4	⊖	⊕	○
5	⊖	○	⊕
6	○	⊖	⊕

CCW viewed from lead end

8.2 BLM1 - Dimensional Drawing

BLM1A



Dimensional Data

MODEL	Stator Length "A"	Rotor Length "B"	Stator O.D. "C"	Rotor I.D. "D"	Stack Length	Endturn (Front)	Endturn (Rear)
BLM1A	34.5	19.0	35.6	9.73	19.0	7.25	7.25

Note: All dimensions are in mm.

8.3 BLM1 - Performance Data

				BLM1Ax	
	Parameter	Symbol	Units	A	F
	Max Rated DC Bus Voltage	Vbus	VDC	48	48
	Max Cont. Torque for ΔT wdg. = 130°C ①②④	T_{mc}	Nm	0.163	0.153
			lb-in	1.44	1.35
	Max Cont. Current for ΔT wdg. = 130°C ①②④	I_{mc}	Arms	2.55	3.38
	Max mechanical speed ⑤	N_{max}	rpm	8000	8000
	Peak Torque ①②	T_p	Nm	0.53	0.58
			lb-in	4.69	5.1
	Peak Current ①②	I_p	Arms	8.7	13.5
12 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	–	–
			lb-in	–	–
	Rated Speed	N_{rtd}	rpm	–	–
	Rated Power (speed) ①②④	P_{rtd}	kW	–	–
			Hp	–	–
24 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	0.161	0.151
			lb-in	1.42	1.34
	Rated Speed	N_{rtd}	rpm	1500	2800
	Rated Power (speed) ①②④	P_{rtd}	kW	0.03	0.04
			Hp	0.04	0.05
48 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	0.156	0.143
			lb-in	1.38	1.27
	Rated Speed	N_{rtd}	rpm	5100	8000
	Rated Power (speed) ①②④	P_{rtd}	kW	0.08	0.12
			Hp	0.11	0.16

① Motor winding at temp. rise, δT = 130°C , at 25°C ambient
② All data referenced to sinusoidal commutation
③ Measured at 25°C
④ Motor with standard heat sink
⑤ May be limited at some values of Vbus
⑥ Line-Line Resistance; Standard 200 mm lead wire resistance included.

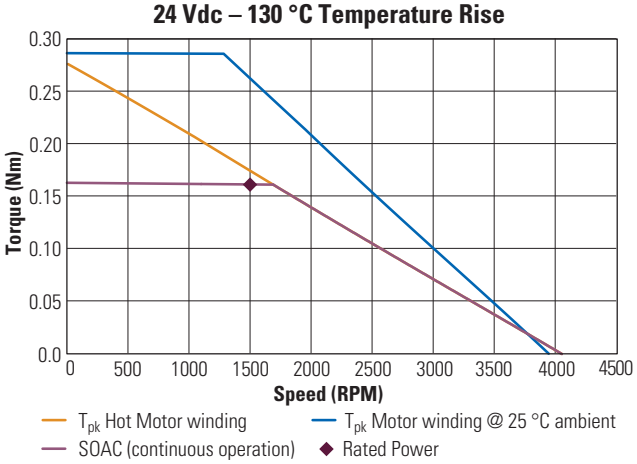
8.4 BLM1 - Motor Parameters

				BLM1Ax	
Parameter	**Tol**	**Symbol**	**Units**	**A**	**F**
Torque Constant ①	+/- 10%	K_t	Nm/Arms	0.066	0.047
			lb-in/Arms	0.58	0.42
Back EMF Constant ③	+/- 10%	K_e	Vrms/krpm	4.11	2.94
Resistance (line-line) ③⑥	+/- 10%	R_m	Ω	2.91	1.68
Inductance (line-line)	+/- 20%	L_m	mH	1.86	0.95
Thermal Resistance ④		R_{thw-a}	K/W	3.10	3.10
Rotor Moment of Inertia		J_m	kg-cm^2	0.015	
			lb-in-s^2	1.3E-05	
Total Weight		W	kg	0.10	
			lb	0.2	
Stator Weight		W_s	kg	0.08	
			lb	0.2	
Rotor Weight		W_r	kg	0.02	
			lb	0.0	
Static Friction ①		T_f	Nm	0.005	
			lb-in	0.04	
Viscous Damping ①		K_{dv}	Nm/krpm	0.0005	
			lb-in/krpm	0.004	
Thermal Time Constant		TCT	mins	2	
Pole Pairs		pp		3	
Heatsink Size			in	10" x 10" x 0.25" Aluminum Plate	

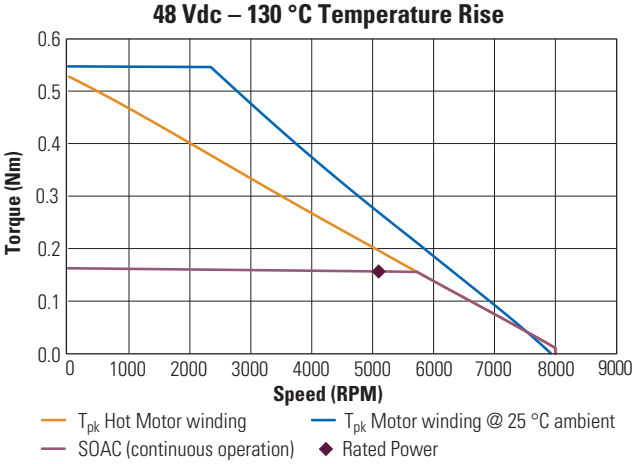
① Motor winding at temp. rise, δT = 130°C , at 25°C ambient
② All data referenced to sinusoidal commutation
③ Measured at 25°C
④ Motor with standard heat sink
⑤ May be limited at some values of Vbus
⑥ Line-Line Resistance; Standard 200 mm lead wire resistance included.

8.5 BLM1 - Performance Curve

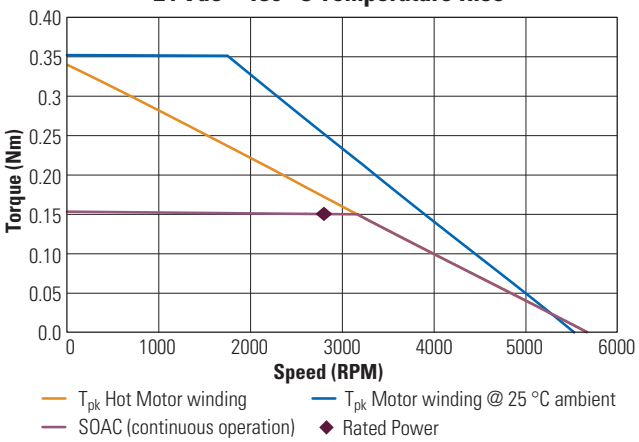
BLM1AA
24 Vdc – 130 °C Temperature Rise



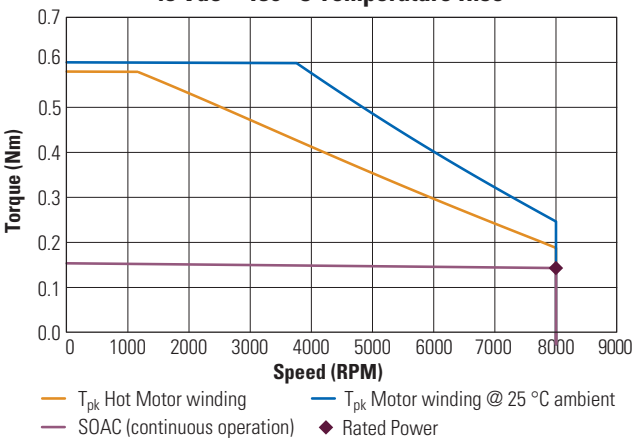
BLM1AA
48 Vdc – 130 °C Temperature Rise



BLM1AF
24 Vdc – 130 °C Temperature Rise



BLM1AF
48 Vdc – 130 °C Temperature Rise



9 BLM2 - Technical Data

9.1 BLM2 - Frameless Motor

The BLM2 series is designed to operate over a broad speed range with high acceleration. Designed for maximum torque density with minimal cogging, the BLM2 is an ideal choice to meet or exceed your compact frameless motor application needs.

General Specifications

	BLM2
Peak torque range	1.20 - 1.25 Nm
Continuous torque range	0.41 - 0.43 Nm
Insulation voltage rating	48 VDC
Thermal Devices	PTC, PTC 111-KD3, PT1000
Certification	UL, CE, RoHS, REACH

Motor Leads:
#22 AWG, Teflon® Coated, Per UL Style 10086
3 Leads, U - Blue, V - Brown, W - Violet

#18 AWG, Teflon® Coated, Per UL Style 10086
3 Leads, U - Blue, V - Brown, W - Violet (winding H only)

Optional Thermistor Leads:
#26 AWG, ETFE Coated, Per UL Style 10086
2 Leads, Minimum 0.2 m Length

Connection Options

PN Lead Designation	Lead Length (Min)
1	0.2 m
2	0.5 m

Thermal Device Options

PN Lead Designation	Lead Length (Min)
1	PTC
2	PTC 111-KD3
3	PT1000

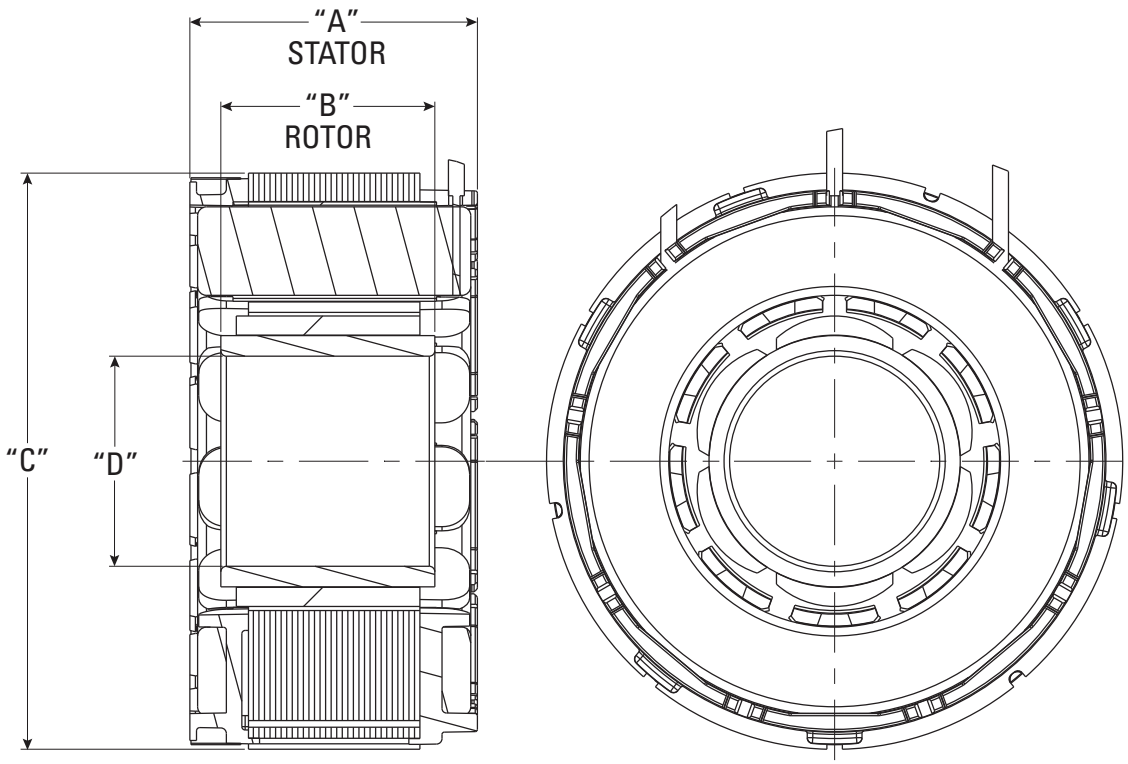
Excitation Sequence Table

	Power Connection		
STEP	Phase 'U' Blue	Phase 'V' Brown	Phase 'W' Violet
1	⊕	⊖	○
2	⊕	○	⊖
3	○	⊕	⊖
4	⊖	⊕	○
5	⊖	○	⊕
6	○	⊖	⊕

CCW viewed from lead end

9.2 BLM2 - Dimensional Drawing

BLM2A



Dimensional Data

MODEL	Stator Length "A"	Rotor Length "B"	Stator O.D. "C"	Rotor I.D. "D"	Stack Length	Endturn (Front)	Endturn (Rear)
BLM2A	34.5	19.35	52.1	19.0	15.5	5.43	5.77

Note: All dimensions are in mm.

9.3 BLM2 - Performance Data

				BLM2Ax			
	Parameter	Symbol	Units	A	F	G	H
	Max Rated DC Bus Voltage	Vbus	VDC	48	48	48	24
	Max Cont. Torque for ΔT wdg. = 130°C ①②④	T_{mc}	Nm	0.43	0.41	0.43	0.41
			lb-in	3.81	3.63	3.81	3.63
	Max Cont. Current for ΔT wdg. = 130°C ①②④	I_{mc}	Arms	4.00	9.0	6.9	15.5
	Max mechanical speed ⑤	N_{max}	rpm	8000	8000	8000	8000
	Peak Torque ①②	T_p	Nm	1.20	1.22	1.25	1.22
			lb-in	10.6	10.8	11.1	10.8
	Peak Current ①②	I_p	Arms	14.5	35.7	27.6	62
12 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	–	0.41	0.43	0.395
			lb-in	–	3.63	3.81	3.5
	Rated Speed	N_{rtd}	rpm	–	1000	600	2900
	Rated Power (speed) ①②④	P_{rtd}	kW	–	0.04	0.03	0.12
			Hp	–	0.05	0.04	0.16
24 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	0.43	0.392	0.42	0.368
			lb-in	3.81	3.47	3.72	3.26
	Rated Speed	N_{rtd}	rpm	900	3500	2400	7100
	Rated Power (speed) ①②④	P_{rtd}	kW	0.04	0.14	0.11	0.27
			Hp	0.05	0.19	0.15	0.36
48 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	0.42	0.361	0.40	–
			lb-in	3.72	3.19	3.54	–
	Rated Speed	N_{rtd}	rpm	3000	8000	5900	–
	Rated Power (speed) ①②④	P_{rtd}	kW	0.13	0.3	0.25	–
			Hp	0.17	0.4	0.34	–

① Motor winding at temp. rise, δT = 130°C , at 25°C ambient
② All data referenced to sinusoidal commutation
③ Measured at 25°C
④ Motor with standard heat sink
⑤ May be limited at some values of Vbus
⑥ Line-Line Resistance; Standard 200 mm lead wire resistance included.

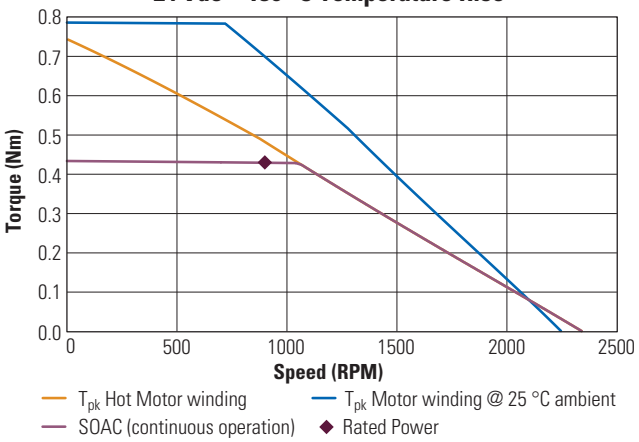
9.4 BLM2 - Motor Parameters

				BLM2Ax			
Parameter	**Tol**	**Symbol**	**Units**	**A**	**F**	**G**	**H**
Torque Constant ①	+/- 10%	K_t	Nm/Arms	0.113	0.048	0.065	0.027
			lb-in/Arms	1	0.42	0.58	0.239
Back EMF Constant ③	+/- 10%	K_e	Vrms/krpm	7.2	3.04	4.15	1.75
Resistance (line-line) ③⑥	+/- 10%	R_m	Ω	1.74	0.40	0.59	0.134
Inductance (line-line)	+/- 20%	L_m	mH	2.68	0.48	0.89	0.160
Thermal Resistance ④		R_{thw-a}	K/W	2.10	1.90	2.10	1.90
Rotor Moment of Inertia		J_m	kg-cm^2	0.038			
			lb-in-s^2	3.4E-05			
Total Weight		W	kg	0.20			
			lb	0.4			
Stator Weight		W_s	kg	0.17			
			lb	0.4			
Rotor Weight		W_r	kg	0.03			
			lb	0.1			
Static Friction ①		T_f	Nm	0.017			
			lb-in	0.15			
Viscous Damping ①		K_{dv}	Nm/krpm	0.0035			
			lb-in/krpm	0.031			
Thermal Time Constant		TCT	mins	3			
Pole Pairs		pp		3			
Heatsink Size			in	10" x 10" x 0.25" Aluminum Plate			

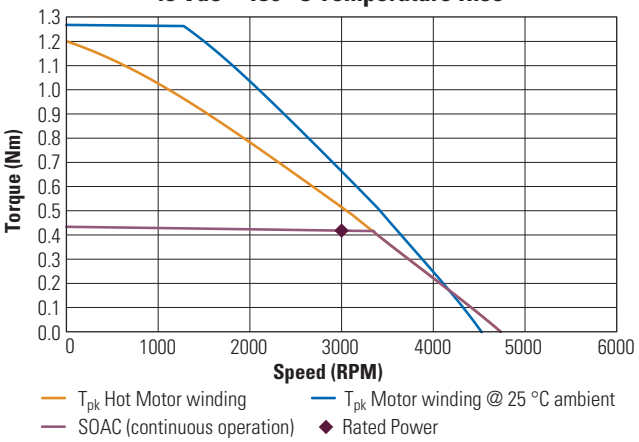
① Motor winding at temp. rise, δT = 130°C , at 25°C ambient
② All data referenced to sinusoidal commutation
③ Measured at 25°C
④ Motor with standard heat sink
⑤ May be limited at some values of Vbus
⑥ Line-Line Resistance; Standard 200 mm lead wire resistance included.

9.5 BLM2 - Performance Curve

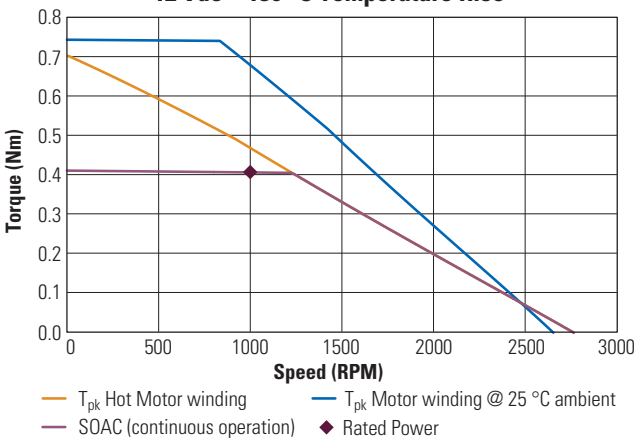
BLM2AA
24 Vdc – 130 °C Temperature Rise



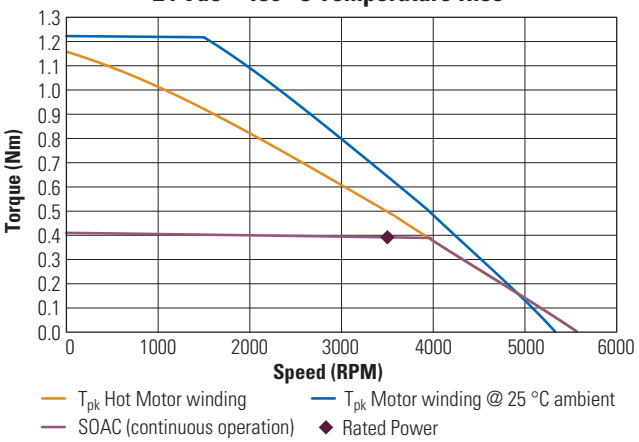
BLM2AA
48 Vdc – 130 °C Temperature Rise



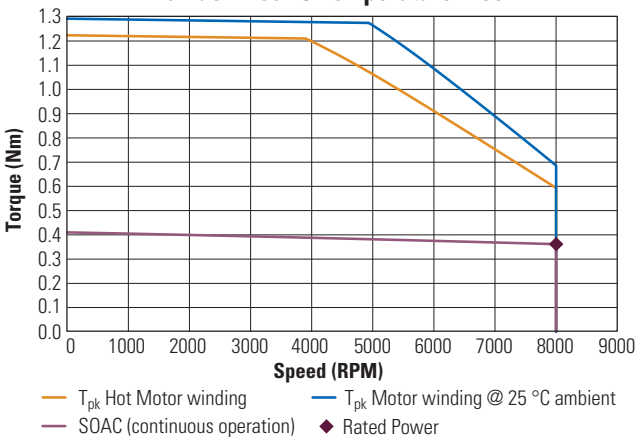
BLM2AF
12 Vdc – 130 °C Temperature Rise



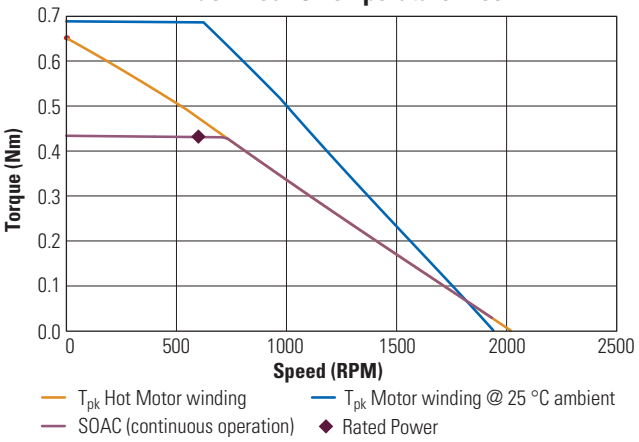
BLM2AF
24 Vdc – 130 °C Temperature Rise



BLM2AF
48 Vdc – 130 °C Temperature Rise

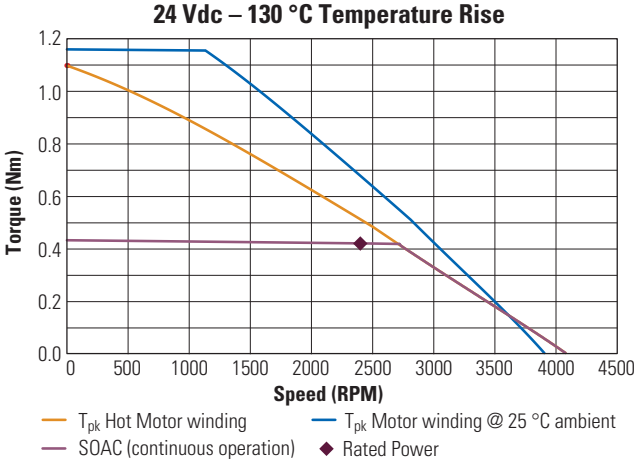


BLM2AG
12 Vdc – 130 °C Temperature Rise

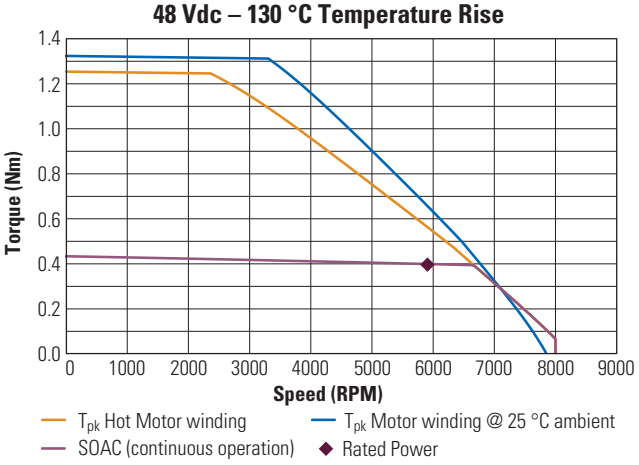


9.5.1 BLM2 - Performance Curve (con't)

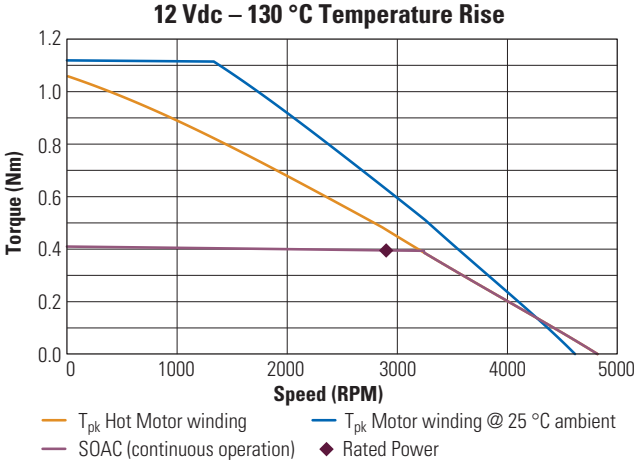
BLM2AG
24 Vdc – 130 °C Temperature Rise



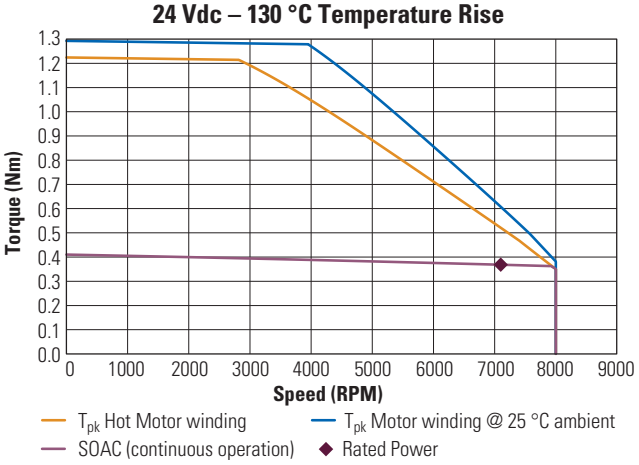
BLM2AG
48 Vdc – 130 °C Temperature Rise



BLM2AH
12 Vdc – 130 °C Temperature Rise



BLM2AH
24 Vdc – 130 °C Temperature Rise



10 BLM3 - Technical Data

10.1 BLM3 - Frameless Motor

The BLM3 series is designed to operate over a broad speed range with high acceleration. Designed for maximum torque density with minimal cogging, the BLM3 is an ideal choice to meet or exceed your compact frameless motor application needs.

General Specifications

	BLM3
Peak torque range	2.44 - 2.92 Nm
Continuous torque range	0.71 - 0.93 Nm
Insulation voltage rating	48 VDC
Thermal Devices	PTC, PTC 111-KD3, PT1000
Certification	UL, CE, RoHS, REACH

Motor Leads:
#18 AWG, Teflon® Coated, Per UL Style 10086
3 Leads, U - Blue, V - Brown, W - Violet

Optional Thermistor Leads:
#26 AWG, ETFE Coated, Per UL Style 10086
2 Leads, Minimum 0.2 m Length

Connection Options

PN Lead Designation	Lead Length (Min)
1	0.2 m
2	0.5 m

Thermal Device Options

PN Lead Designation	Lead Length (Min)
1	PTC
2	PTC 111-KD3
3	PT1000

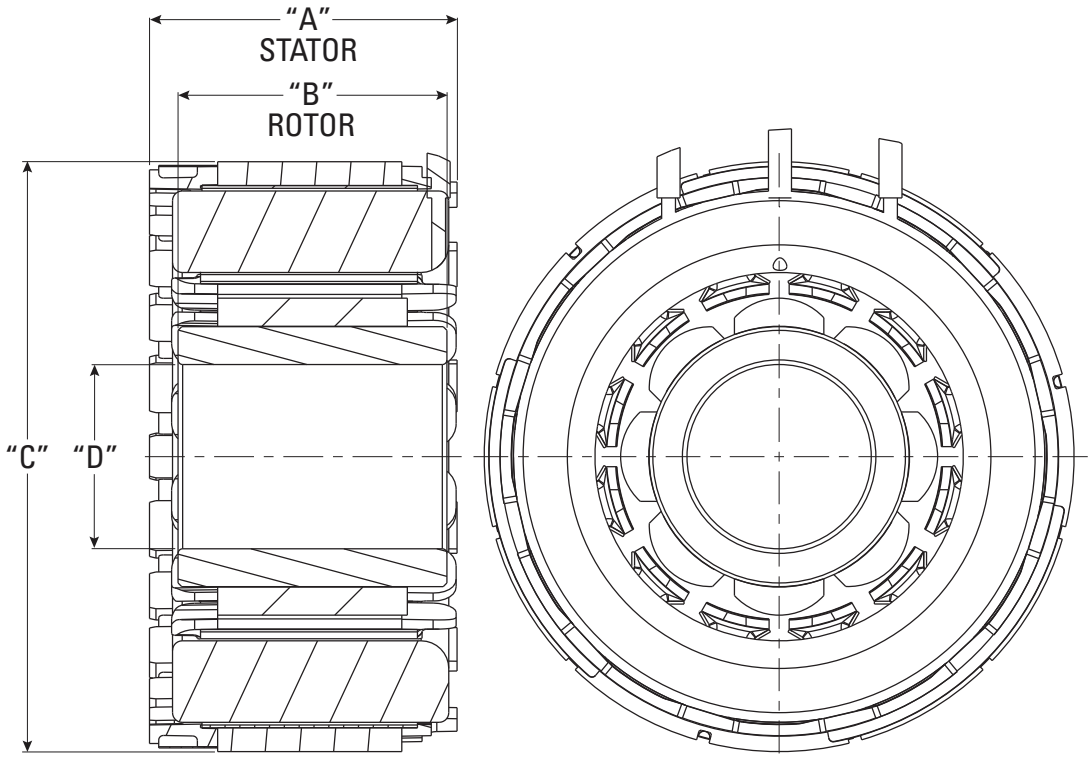
Excitation Sequence Table

	Power Connection		
STEP	Phase 'U' Blue	Phase 'V' Brown	Phase 'W' Violet
1	⊕	⊖	○
2	⊕	○	⊖
3	○	⊕	⊖
4	⊖	⊕	○
5	⊖	○	⊕
6	○	⊖	⊕

CCW viewed from lead end

10.2 BLM3 - Dimensional Drawing

BLM3A



Dimensional Data

MODEL	Stator Length "A"	Rotor Length "B"	Stator O.D. "C"	Rotor I.D. "D"	Stack Length	Endturn (Front)	Endturn (Rear)
BLM3A	34.9	29.2	64.0	20.0	20.0	6.3	7.4

Note: All dimensions are in mm.

10.3 BLM3 - Performance Data

	Parameter	Symbol	Units	BLM3Ax A	BLM3Ax G	BLM3Ax H
	Max Rated DC Bus Voltage	Vbus	VDC	48	48	48
	Max Cont. Torque for ΔT wdg. = 130°C ①②④	T_{mc}	Nm	0.93	0.93	0.71
			lb-in	8.2	8.2	6.3
	Max Cont. Current for ΔT wdg. = 130°C ①②④	I_{mc}	Arms	6.3	10.9	13.5
	Max mechanical speed ⑤	N_{max}	rpm	8000	8000	8000
	Peak Torque ①②	T_p	Nm	2.92	2.92	2.44
			lb-in	25.8	25.8	21.6
	Peak Current ①②	I_p	Arms	25.1	43.5	54
12 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	–	0.93	0.70
			lb-in	–	8.2	6.2
	Rated Speed	N_{rtd}	rpm	–	600	1300
	Rated Power (speed) ①②④	P_{rtd}	kW	–	0.06	0.1
			Hp	–	0.08	0.13
24 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	0.93	0.91	0.67
			lb-in	8.2	8.1	5.9
	Rated Speed	N_{rtd}	rpm	900	2000	3500
	Rated Power (speed) ①②④	P_{rtd}	kW	0.09	0.19	0.25
			Hp	0.12	0.25	0.34
48 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	0.91	0.87	0.60
			lb-in	8.1	7.7	5.3
	Rated Speed	N_{rtd}	rpm	2400	4700	8000
	Rated Power (speed) ①②④	P_{rtd}	kW	0.23	0.43	0.5
			Hp	0.31	0.58	0.67

① Motor winding at temp. rise, δT = 130°C , at 25°C ambient
② All data referenced to sinusoidal commutation
③ Measured at 25°C
④ Motor with standard heat sink
⑤ May be limited at some values of Vbus
⑥ Line-Line Resistance; Standard 200 mm lead wire resistance included.

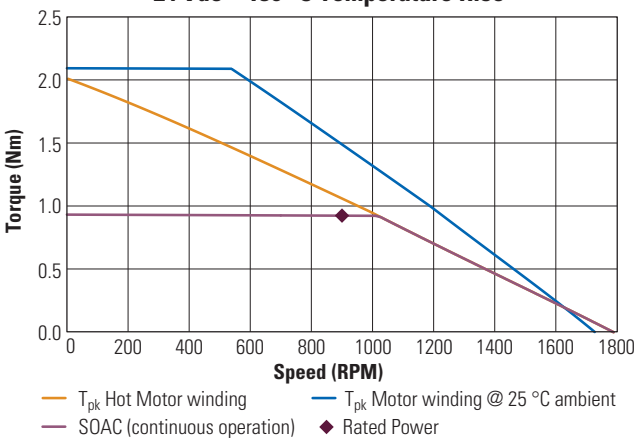
10.4 BLM3 - Motor Parameters

				BLM3Ax		
Parameter	**Tol**	**Symbol**	**Units**	**A**	**G**	**H**
Torque Constant ①	+/- 10%	K_t	Nm/Arms	0.151	0.087	0.054
			lb-in/Arms	1.34	0.77	0.48
Back EMF Constant ③	+/- 10%	K_e	Vrms/krpm	9.5	5.5	3.39
Resistance (line-line) ③⑥	+/- 10%	R_m	Ω	0.84	0.285	0.180
Inductance (line-line)	+/- 20%	L_m	mH	1.44	0.48	0.180
Thermal Resistance ④		R_{thw-a}	K/W	1.75	1.75	1.85
Rotor Moment of Inertia		J_m	kg-cm^2	0.184		
			lb-in-s^2	1.6E-04		
Total Weight		W	kg	0.4		
			lb	0.9		
Stator Weight		W_s	kg	0.3		
			lb	0.7		
Rotor Weight		W_r	kg	0.1		
			lb	0.2		
Static Friction ①		T_f	Nm	0.015		
			lb-in	0.13		
Viscous Damping ①		K_{dv}	Nm/krpm	0.008		
			lb-in/krpm	0.071		
Thermal Time Constant		TCT	mins	4		
Pole Pairs		pp		4		
Heatsink Size			in	10" x 10" x 0.25" Aluminum Plate		

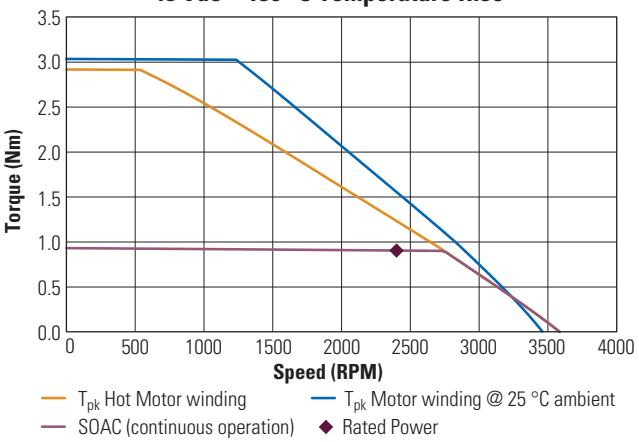
① Motor winding at temp. rise, δT = 130°C , at 25°C ambient
② All data referenced to sinusoidal commutation
③ Measured at 25°C
④ Motor with standard heat sink
⑤ May be limited at some values of Vbus
⑥ Line-Line Resistance; Standard 200 mm lead wire resistance included.

10.5 BLM3 - Performance Curve

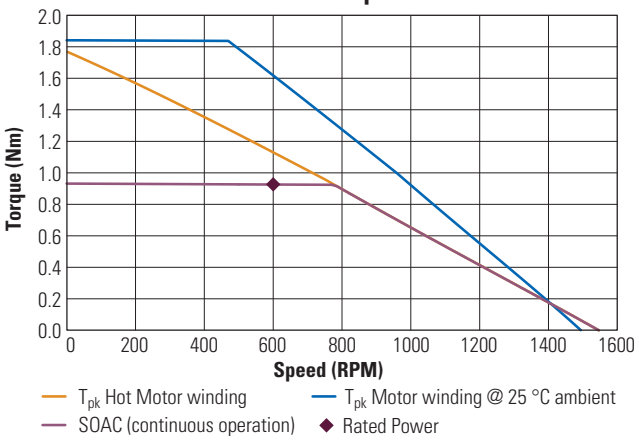
BLM3AA
24 Vdc – 130 °C Temperature Rise



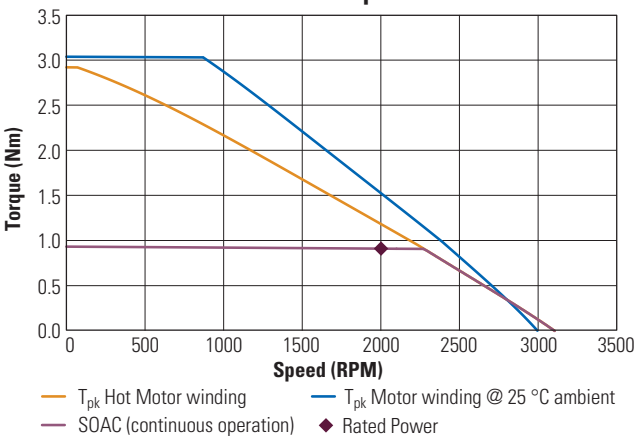
BLM3AA
48 Vdc – 130 °C Temperature Rise



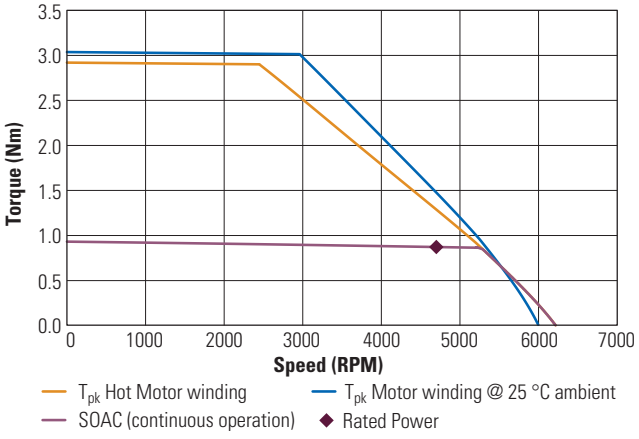
BLM3AG
12 Vdc – 130 °C Temperature Rise



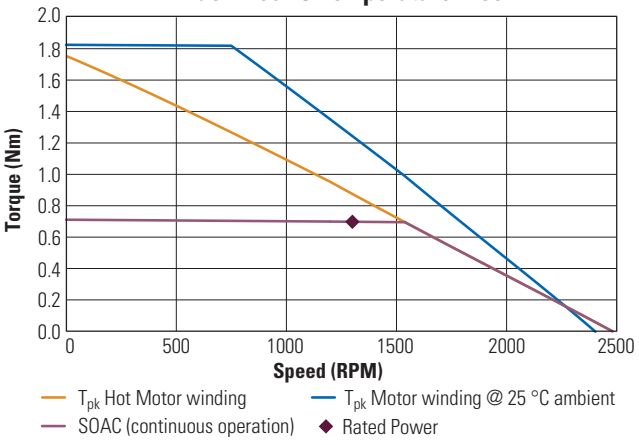
BLM3AG
24 Vdc – 130 °C Temperature Rise



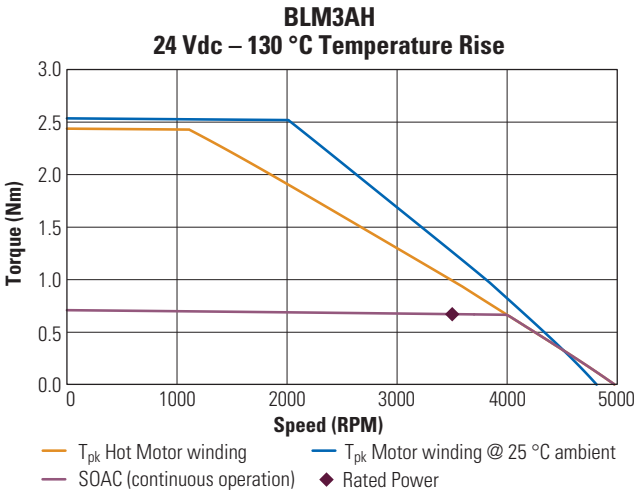
BLM3AG
48 Vdc – 130 °C Temperature Rise

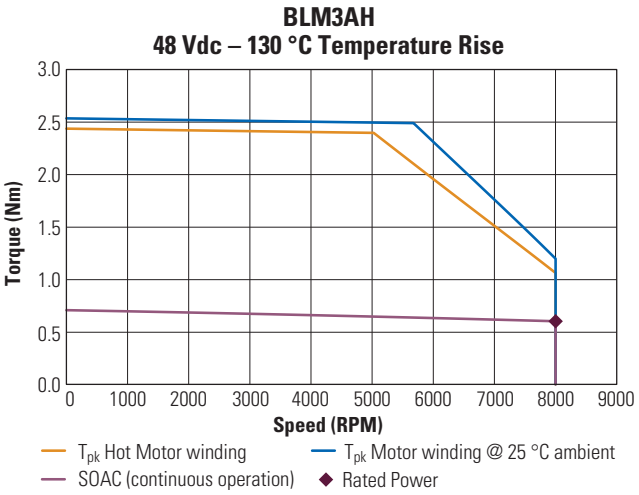


BLM3AH
12 Vdc – 130 °C Temperature Rise



10.5.1 BLM3 - Performance Curves (con't)





11 BLM4 - Technical Data

11.1 BLM4 - Frameless Motor

The BLM4 series is designed to operate over a broad speed range with high acceleration. Designed for maximum torque density with minimal cogging, the BLM4 is an ideal choice to meet or exceed your compact frameless motor application needs.

General Specifications

	BLM4
Peak torque range	4.61 - 6.00 Nm
Continuous torque range	1.45 - 2.06 Nm
Insulation voltage rating	48 VDC
Thermal Device Options	PTC, PTC 111-KD3, PT1000
Certification	UL, CE, RoHS, REACH

Motor Leads:

#18 AWG, Teflon® Coated, Per UL Style 10086
3 Leads, U - Blue, V - Brown, W - Violet

#14 AWG, Teflon® Coated, Per UL Style 1199
3 Leads, U - Blue, V - Brown, W - Violet (windings G & H only)

Optional Thermistor Leads:

#26 AWG, ETFE Coated, Per UL Style 10086
2 Leads, Minimum 0.2 m Length

Connection Options

PN Lead Designation	Lead Length (Min)
1	0.2 m
2	0.5 m

Thermal Device Options

PN Lead Designation	Lead Length (Min)
1	PTC
2	PTC 111-KD3
3	PT1000

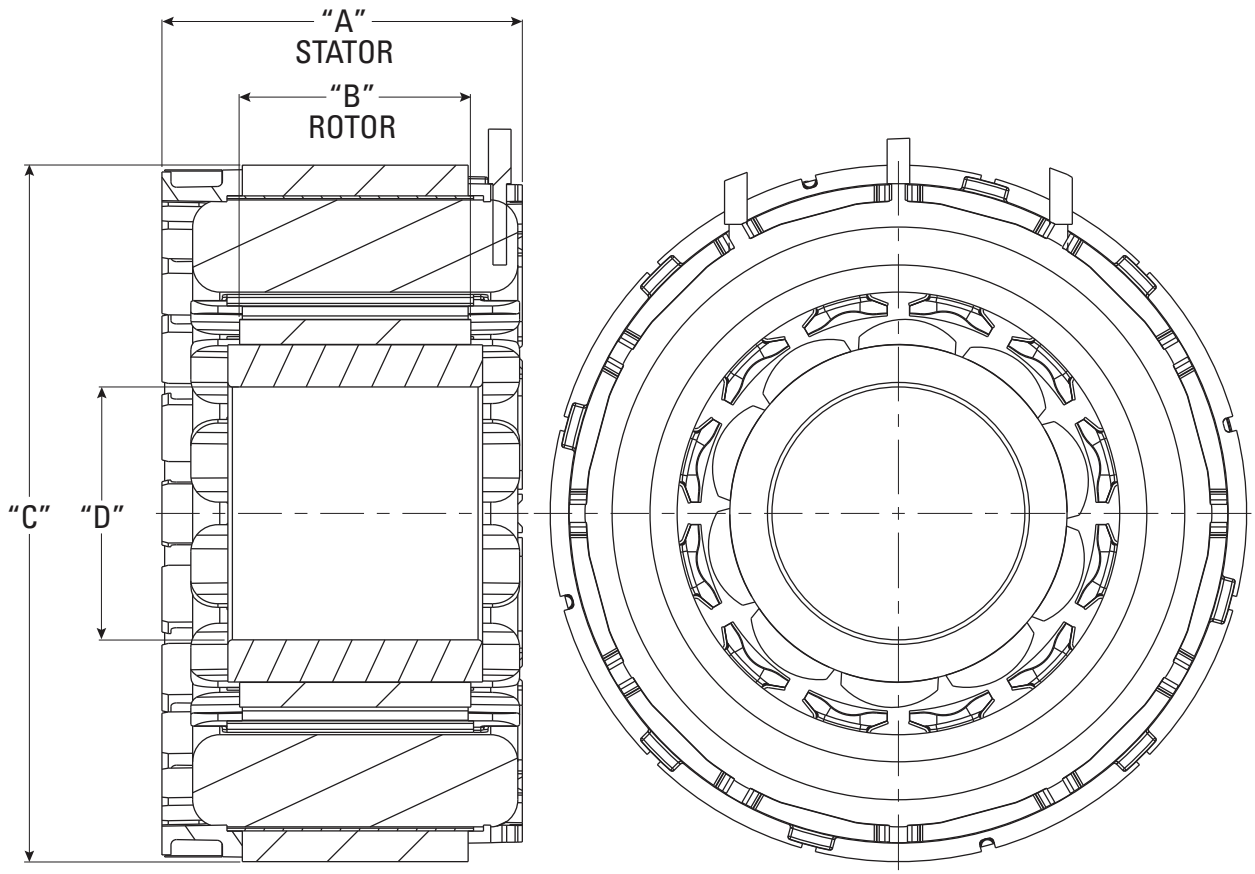
Excitation Sequence Table

	Power Connection		
STEP	Phase 'U' Blue	Phase 'V' Brown	Phase 'W' Violet
1	⊕	⊖	○
2	⊕	○	⊖
3	○	⊕	⊖
4	⊖	⊕	○
5	⊖	○	⊕
6	○	⊖	⊕

CCW viewed from lead end

11.2 BLM4 - Dimensional Drawing

BLM4A



Dimensional Data

MODEL	Stator Length "A"	Rotor Length "B"	Stator O.D. "C"	Rotor I.D. "D"	Stack Length	Endturn (Front)	Endturn (Rear)
BLM4A	41.3	28.2	77.1	28.0	25.0	9.2	6.1

Note: All dimensions are in mm.

11.3 BLM4 - Performance Data

				BLM4Ax		
	Parameter	Symbol	Units	A	G	H
	Max Rated DC Bus Voltage	Vbus	VDC	48	48	48
	Max Cont. Torque for ΔT wdg. = 130°C ①②④	T_{mc}	Nm	2.06	1.87	1.45
			lb-in	18.2	16.5	12.8
	Max Cont. Current for ΔT wdg. = 130°C ①②④	I_{mc}	Arms	13.7	17.4	20.4
	Max mechanical speed ⑤	N_{max}	rpm	6000	6000	6000
	Peak Torque ①②	T_p	Nm	6.0	5.6	4.61
			lb-in	53	49.6	40.8
	Peak Current ①②	I_p	Arms	47.6	61	71
12 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	2.05	1.85	1.42
			lb-in	18.1	16.4	12.6
	Rated Speed	N_{rtd}	rpm	300	600	1100
	Rated Power (speed) ①②④	P_{rtd}	kW	0.06	0.12	0.16
			Hp	0.08	0.16	0.21
24 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	2.03	1.82	1.37
			lb-in	18	16.1	12.1
	Rated Speed	N_{rtd}	rpm	1000	1700	2700
	Rated Power (speed) ①②④	P_{rtd}	kW	0.21	0.32	0.39
			Hp	0.28	0.43	0.52
48 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	1.97	1.72	1.2
			lb-in	17.4	15.2	10.6
	Rated Speed	N_{rtd}	rpm	2500	3800	6000
	Rated Power (speed) ①②④	P_{rtd}	kW	0.52	0.68	0.75
			Hp	0.7	0.91	1.01

① Motor winding at temp. rise, δT = 130°C , at 25°C ambient
② All data referenced to sinusoidal commutation
③ Measured at 25°C
④ Motor with standard heat sink
⑤ May be limited at some values of Vbus
⑥ Line-Line Resistance; Standard 200 mm lead wire resistance included.

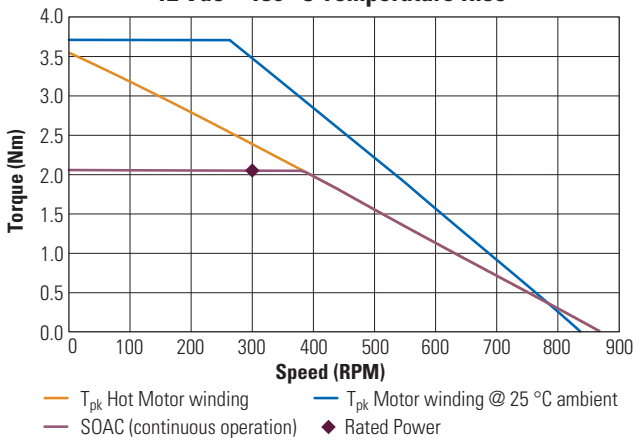
11.4 BLM4 - Motor Parameters

				BLM4Ax		
Parameter	**Tol**	**Symbol**	**Units**	**A**	**G**	**H**
Torque Constant ①	+/- 10%	K_t	Nm/Arms	0.154	0.11	0.074
			lb-in/Arms	1.36	0.97	0.65
Back EMF Constant ③	+/- 10%	K_e	Vrms/krpm	9.7	6.9	4.63
Resistance (line-line) ③⑥	+/- 10%	R_m	Ω	0.255	0.145	0.100
Inductance (line-line)	+/- 20%	L_m	mH	0.63	0.321	0.143
Thermal Resistance ④		R_{thw-a}	K/W	1.25	1.35	1.45
Rotor Moment of Inertia		J_m	kg-cm^2	0.50		
			lb-in-s^2	4.4E-04		
Total Weight		W	kg	0.82		
			lb	1.8		
Stator Weight		W_s	kg	0.66		
			lb	1.5		
Rotor Weight		W_r	kg	0.16		
			lb	0.4		
Static Friction ①		T_f	Nm	0.045		
			lb-in	0.40		
Viscous Damping ①		K_{dv}	Nm/krpm	0.012		
			lb-in/krpm	0.106		
Thermal Time Constant		TCT	mins	5		
Pole Pairs		pp		5		
Heatsink Size			in	10" x 10" x 0.25" Aluminum Plate		

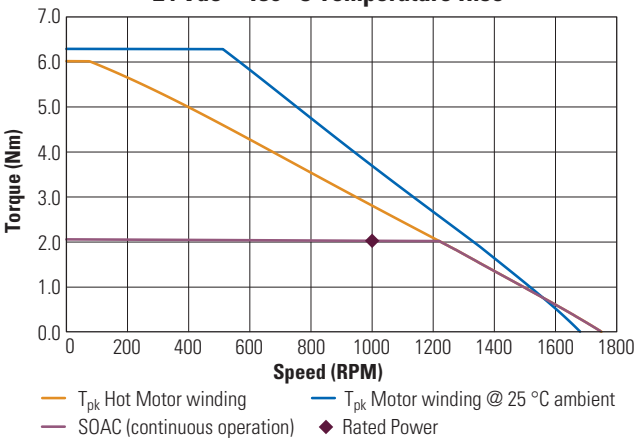
① Motor winding at temp. rise, δT = 130°C , at 25°C ambient
② All data referenced to sinusoidal commutation
③ Measured at 25°C
④ Motor with standard heat sink
⑤ May be limited at some values of Vbus
⑥ Line-Line Resistance; Standard 200 mm lead wire resistance included.

11.5 BLM4 - Performance Curve

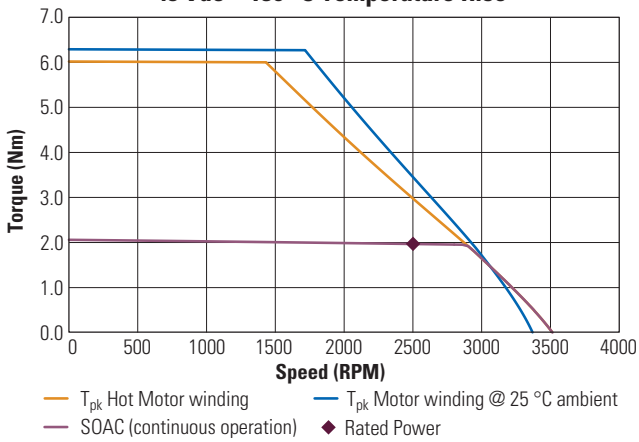
BLM4AA
12 Vdc – 130 °C Temperature Rise



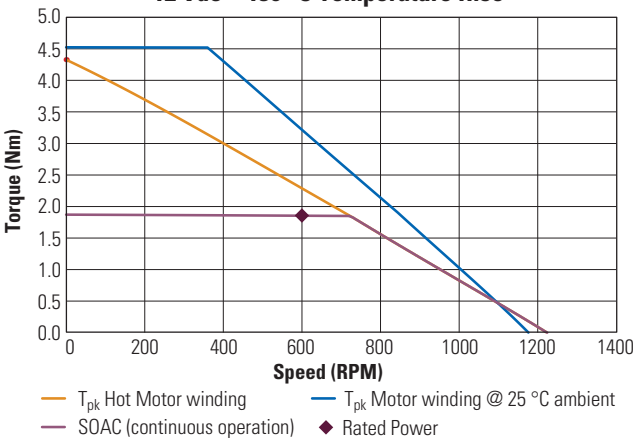
BLM4AA
24 Vdc – 130 °C Temperature Rise



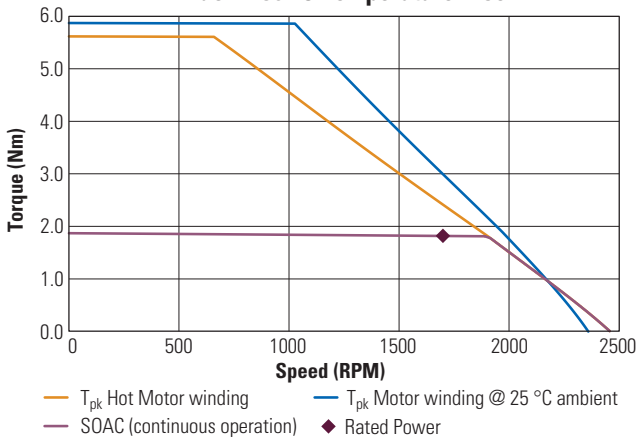
BLM4AA
48 Vdc – 130 °C Temperature Rise



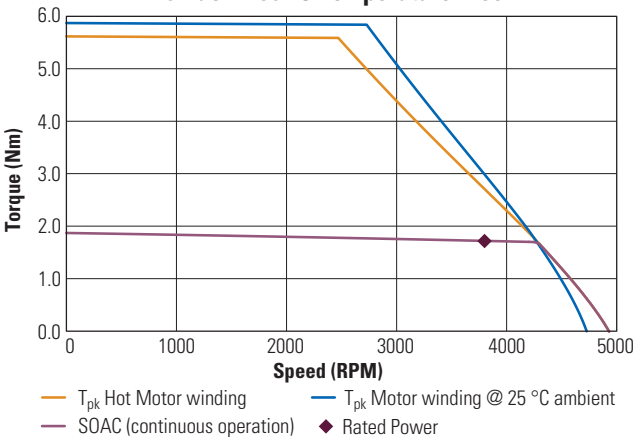
BLM4AG
12 Vdc – 130 °C Temperature Rise



BLM4AG
24 Vdc – 130 °C Temperature Rise

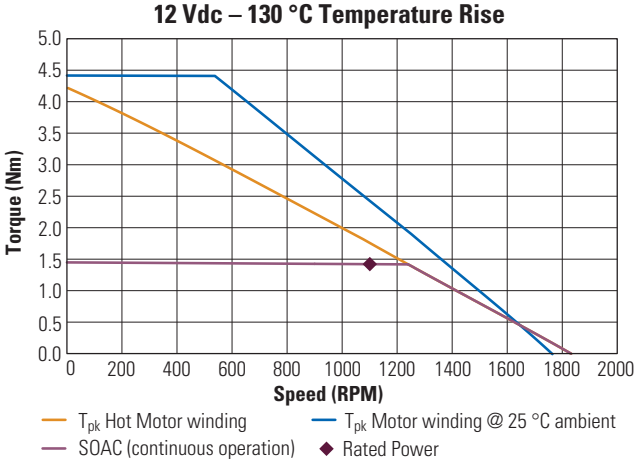


BLM4AG
48 Vdc – 130 °C Temperature Rise

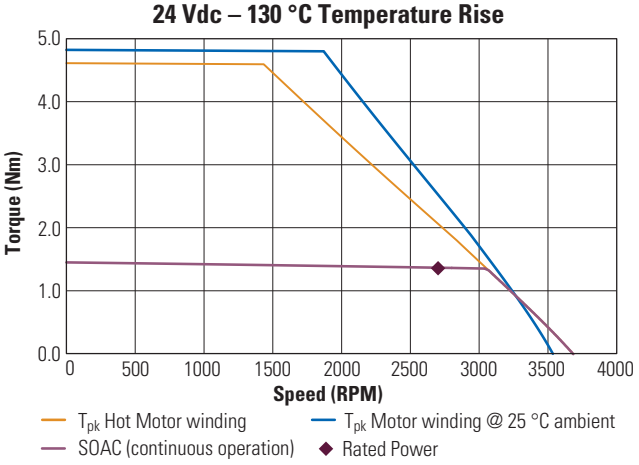


11.5.1 BLM4 - Performance Curves (con't)

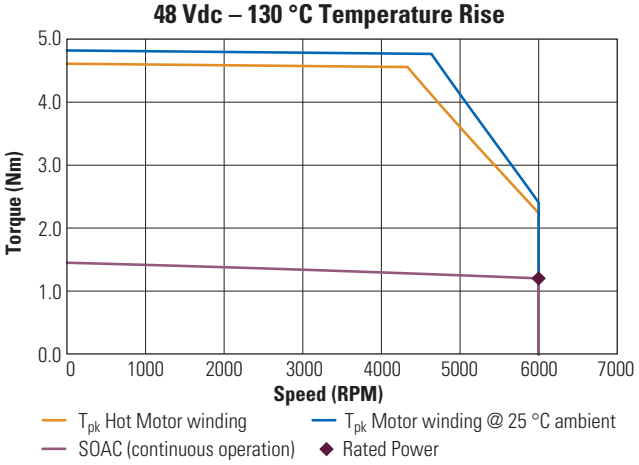
BLM4AH
12 Vdc – 130 °C Temperature Rise



BLM4AH
24 Vdc – 130 °C Temperature Rise



BLM4AH
48 Vdc – 130 °C Temperature Rise



12 BLM5 - Technical Data

12.1 BLM5 - Frameless Motor

The BLM5 series is designed to operate over a broad speed range with high acceleration. Designed for maximum torque density with minimal cogging, the BLM5 is an ideal choice to meet or exceed your compact frameless motor application needs.

General Specifications

	BLM5
Peak torque range	9.5 - 11.2 Nm
Continuous torque range	3.48 - 4.33 Nm
Insulation voltage rating	48 VDC
Thermal Device Options	PTC, PTC 111-KD3, PT1000
Certification	UL, CE, RoHS, REACH

Motor Leads:
#14 AWG, Teflon® Coated, Per UL Style 1199
3 Leads, U - Blue, V - Brown, W - Violet

#12 AWG, Teflon® Coated, Per UL Style 10086
3 Leads, U - White, V - Black, W - Red (windings G & H only)

Optional Thermistor Leads:
#26 AWG, ETFE Coated, Per UL Style 10086
2 Leads, Minimum 0.2 m Length

Connection Options

PN Lead Designation	Lead Length (Min)
1	0.2 m
2	0.5 m

Thermal Device Options

PN Lead Designation	Lead Length (Min)
1	PTC
2	PTC 111-KD3
3	PT1000

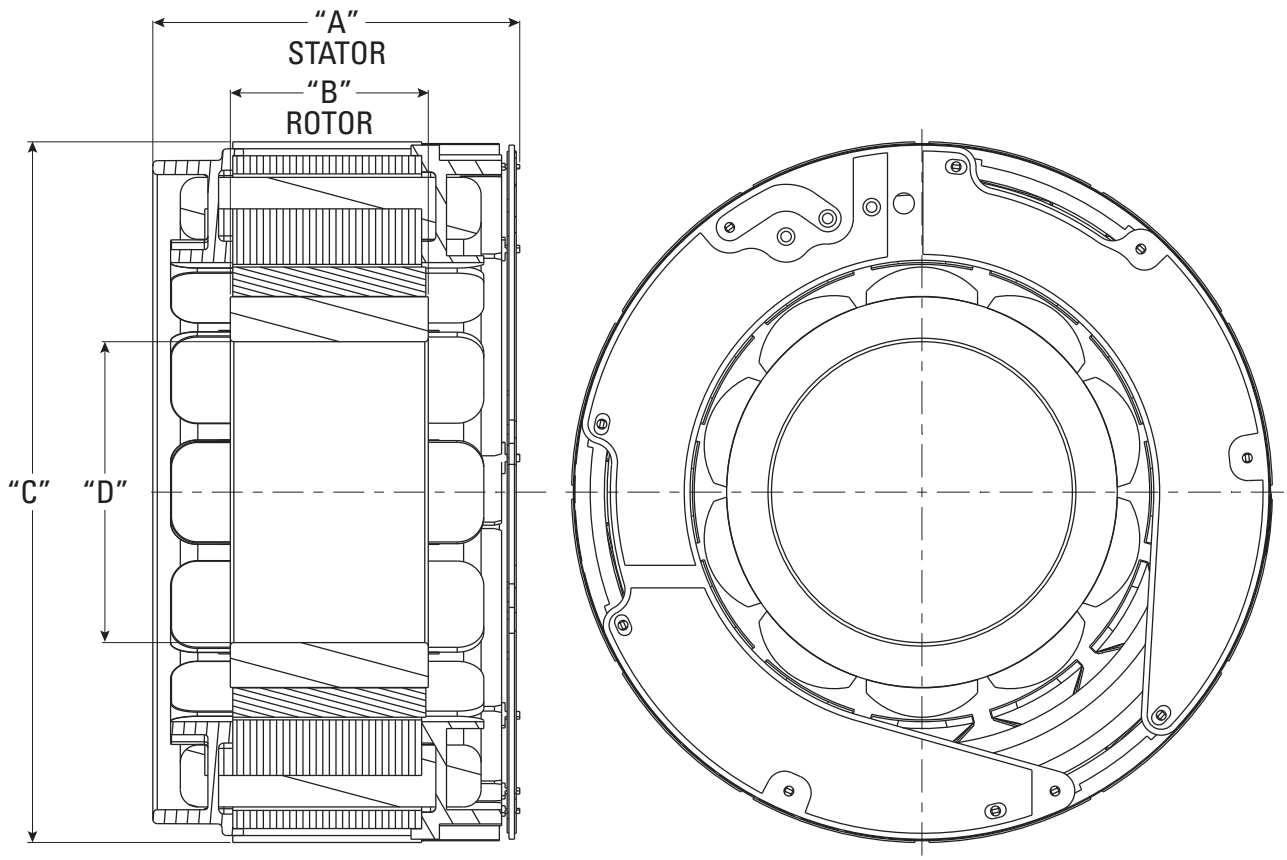
Excitation Sequence Table

	Power Connection		
STEP	Phase 'U' Blue	Phase 'V' Brown	Phase 'W' Violet
1	⊕	⊖	○
2	⊕	○	⊖
3	○	⊕	⊖
4	⊖	⊕	○
5	⊖	○	⊕
6	○	⊖	⊕

CCW viewed from lead end

12.2 BLM5 - Dimensional Drawing

BLM5A



Dimensional Data

MODEL	Stator Length "A"	Rotor Length "B"	Stator O.D. "C"	Rotor I.D. "D"	Stack Length	Endturn (Front)	Endturn (Rear)
BLM5A	55.0	28.3	100.2	43.0	27.0	11.7	11.7

Note: All dimensions are in mm.

12.3 BLM5 - Performance Data

				BLM5Ax		
	Parameter	Symbol	Units	A	G	H
	Max Rated DC Bus Voltage	Vbus	VDC	48	48	48
	Max Cont. Torque for ΔT wdg. = 130°C ①②④	T_{mc}	Nm	4.33	4.25	3.48
			lb-in	38.3	37.6	30.8
	Max Cont. Current for ΔT wdg. = 130°C ①②④	I_{mc}	Arms	22.8	38.8	46.0
	Max mechanical speed ⑤	N_{max}	rpm	6000	6000	6000
	Peak Torque ①②	T_p	Nm	11.2	11.1	9.5
			lb-in	99	98	84
	Peak Current ①②	I_p	Arms	68	116	138
12 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	–	4.21	3.43
			lb-in	–	37.3	30.4
	Rated Speed	N_{rtd}	rpm	–	800	1200
	Rated Power (speed) ①②④	P_{rtd}	kW	–	0.35	0.43
			Hp	–	0.47	0.58
24 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	4.29	4.14	3.32
			lb-in	38	36.6	29.4
	Rated Speed	N_{rtd}	rpm	900	1800	2700
	Rated Power (speed) ①②④	P_{rtd}	kW	0.4	0.78	0.94
			Hp	0.54	1.05	1.26
48 Vdc	Rated Torque (speed) ①②④	T_{rtd}	Nm	4.20	3.93	2.97
			lb-in	37.2	34.8	26.3
	Rated Speed	N_{rtd}	rpm	2100	3800	6000
	Rated Power (speed) ①②④	P_{rtd}	kW	0.92	1.56	1.87
			Hp	1.23	2.09	2.51

① Motor winding at temp. rise, δT = 130°C , at 25°C ambient
② All data referenced to sinusoidal commutation
③ Measured at 25°C
④ Motor with standard heat sink
⑤ May be limited at some values of Vbus
⑥ Line-Line Resistance; Standard 200 mm lead wire resistance included.

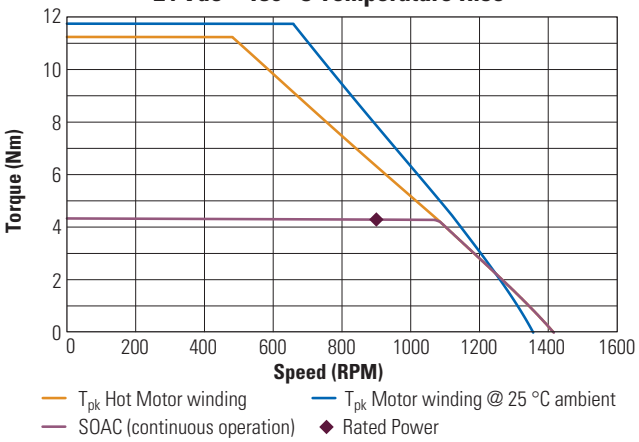
12.4 BLM5 - Motor Parameters

				BLM5Ax		
Parameter	**Tol**	**Symbol**	**Units**	**A**	**G**	**H**
Torque Constant ①	+/- 10%	K_t	Nm/Arms	0.192	0.111	0.077
			lb-in/Arms	1.7	0.98	0.68
Back EMF Constant ③	+/- 10%	K_e	Vrms/krpm	12.1	7.0	4.84
Resistance (line-line) ③⑥	+/- 10%	R_m	Ω	0.112	0.037	0.027
Inductance (line-line)	+/- 20%	L_m	mH	0.44	0.147	0.071
Thermal Resistance ④		R_{thw-a}	K/W	1.02	1.10	1.10
Rotor Moment of Inertia		J_m	kg-cm^2	2.40		
			lb-in-s^2	2.1E-03		
Total Weight		W	kg	1.21		
			lb	2.7		
Stator Weight		W_s	kg	0.87		
			lb	1.9		
Rotor Weight		W_r	kg	0.34		
			lb	0.7		
Static Friction ①		T_f	Nm	0.050		
			lb-in	0.44		
Viscous Damping ①		K_{dv}	Nm/krpm	0.014		
			lb-in/krpm	0.124		
Thermal Time Constant		TCT	mins	7		
Pole Pairs		pp		5		
Heatsink Size			in	12″ x 12″ x 0.5″ Aluminum Plate		

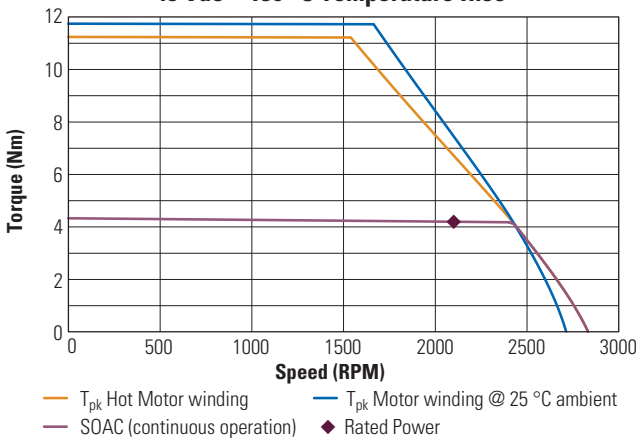
① Motor winding at temp. rise, δT = 130°C , at 25°C ambient
② All data referenced to sinusoidal commutation
③ Measured at 25°C
④ Motor with standard heat sink
⑤ May be limited at some values of Vbus
⑥ Line-Line Resistance; Standard 200 mm lead wire resistance included.

12.5 BLM5 - Performance Curve

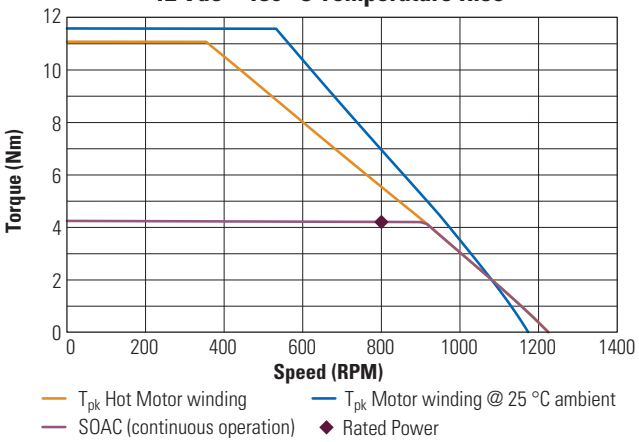
BLM5AA
24 Vdc – 130 °C Temperature Rise



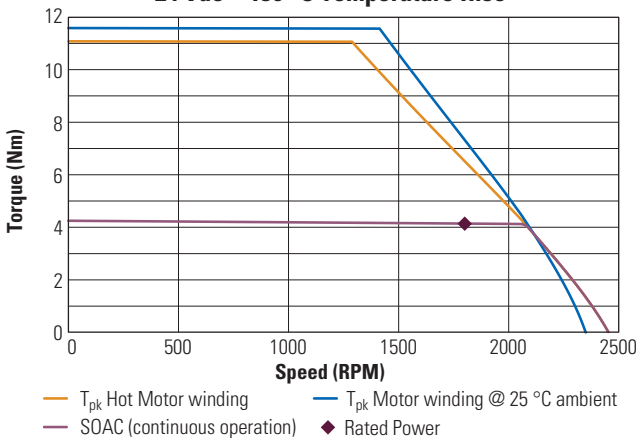
BLM5AA
48 Vdc – 130 °C Temperature Rise



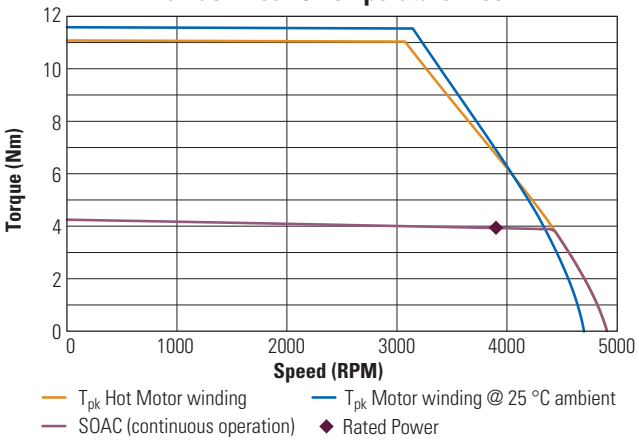
BLM5AG
12 Vdc – 130 °C Temperature Rise



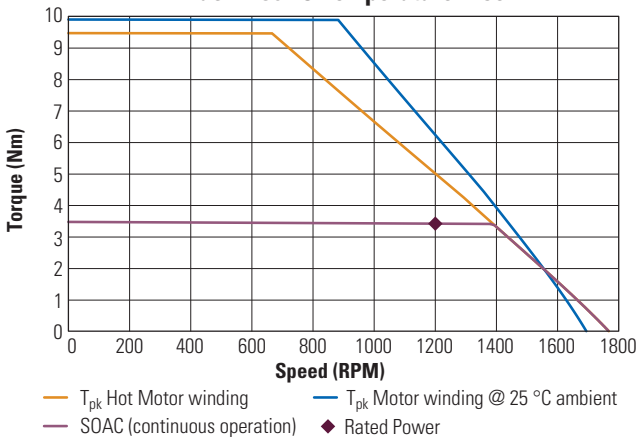
BLM5AG
24 Vdc – 130 °C Temperature Rise



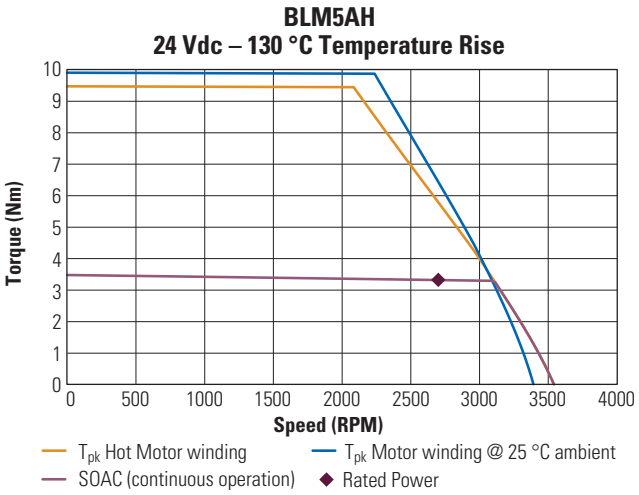
BLM5AG
48 Vdc – 130 °C Temperature Rise

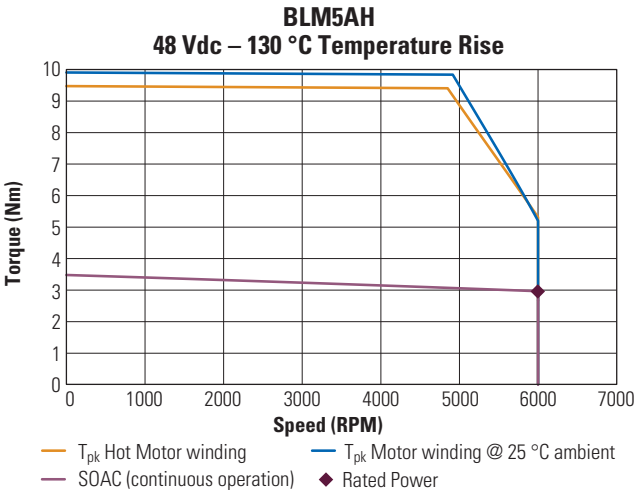


BLM5AH
12 Vdc – 130 °C Temperature Rise



12.5.1 BLM5 - Performance Curves (con't)





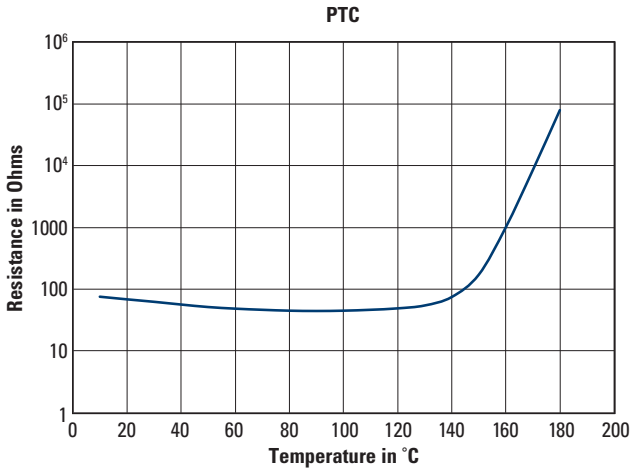
13 Thermal Sensor Protective Devices

To provide for continuous safe operation of series motors in demanding applications, integral thermistors may be attached to the PCBA. The typical option is a PT1000 RTD. As an alternative, three PTC devices wired in series with one placed in each phase winding provides protection of each phase.

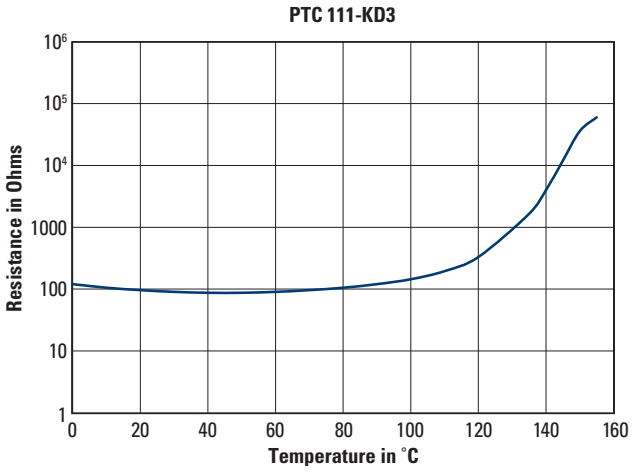
Thermal Device Options: Resistance vs. Temperature Graphs

Kollmorgen AKD drives can directly interpret information from the motor thermal sensors to properly reflect the motor winding temperature. For other drives please refer to the graph Delta Between Motor Winding and Thermal Device on the following page.

Option 1

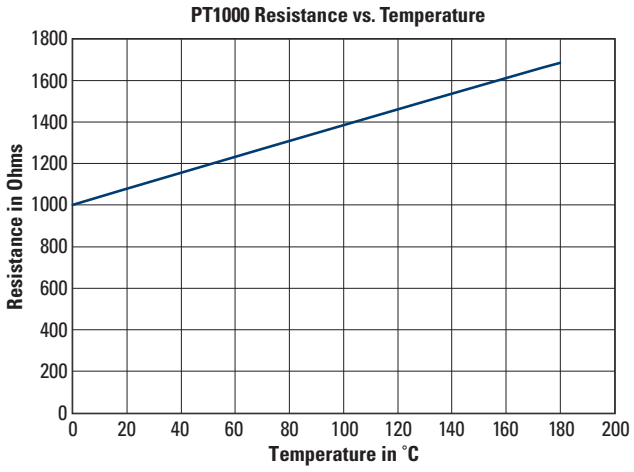


Option 2



Note: This option has three PTC in series in three different phases. If one of the phases approaches the temperature rating of the motor, the resistance will greatly increase.

Option 3



14 Technical Data Terminology

NOTE

- All data is valid for 25 °C environmental temperature and 130K overtemperature of the winding.
- The data can have a tolerance of +/- 10%.

Term	Definition
Back EMF Constant, K_e [Vrms/krpm]	• The BEMF Constant defines the induced motor back EMF as an effective sinusoidal value between two terminals, per 1000RPM. • Measured at 25 °C ambient.
Inductance, L_m [mH]	• The Inductance is measured line-to-line between two terminals. • The value is measured on a standalone stator at 25 °C.
Max Cont. Current, I_{mc} [Arms]	The Maximum Continuous Current is the effective current which the motor draws at low speed to produce the Maximum Continuous Torque.
Max Cont. Torque, T_{mc} [Nm]	• The Maximum Continuous Torque can be maintained indefinitely at low speed and rated ambient conditions. • There may be additional derating if the speed is not high enough to produce even heat distribution across phases. • This value assumes an ambient temperature of 25 °C.
Max Mechanical Speed, N_{max} [rpm]	• The Maximum Mechanical Speed is the highest speed achievable by the motor. • This is limited by mechanical factors (e.g., adhesion strength of magnet bond).
Peak Current, Ip [Arms]	• The Peak Current of the motor (effective sinusoidal value) is several times the rated current, depending on the motor size and winding. • The actual value is the lessor of the peak current of the motor or the peak current of the drive used.
Peak Torque, T_p [Nm]	• The Peak Torque can be maintained for brief durations of time, depending on ambient conditions and overall duty cycle. • This value may be limited based on drive specifications and supply voltage.
Rated Torque, T_{rtd} [Nm]	• The Rated Torque is produced when the motor is drawing the rated current at the rated speed in continuous operation (Nrtd). • This value assumes an ambient temperature of 25 °C.
Resistance, R_m [Ω]	• The Resistance is measured line-to-line between two terminals. • This value **does** include the resistance of motor leads. • The resistance value is at 25 °C and will increase with the winding temperature.
Rotor Moment of Inertia, J_m [kg.cm²]	• The Rotor Moment of Inertia factors into the angular acceleration capability of your motor. • This value pertains only to the standard Field Assembly components (Yoke Ring and Magnets). • Customer supplied components will alter the total Inertia.
Static Friction, T_f [Nm]	Static Friction is the torque that must be overcome to get the motor rotating.
Thermal Resistance, R_{thw-a} [K/W]	• The Thermal Resistance is a measurement of steady state temperature rise per unit of energy dissipated from losses. • This value assumes the BLM motor is housed and mounted to an Aluminum heat sink. See the BLM1-5 Motor Parameters table for the specification.

Term	Definition
Thermal Time Constant, TCT [min]	• The constant TCT defines the time for the cold motor, under a load of I_{mc}, to heat up to a temperature rise of 0.63 x 130 Kelvin. • This temperature rise happens in a much shorter time when the motor is loaded with the peak current.
Torque Constant, K_t [Nm/Arms]	• The Torque Constant defines how much torque is produced by the motor per unit of Current. • Measured at 155 °C winding temperature.

15 Approvals

15.1 Suitable Drives

The power supply in the drive connects to the mains up to $240V_{AC}$ and is realized according to SELV requirements to $48V_{DC}$ nominal (60VD) maximum. Internal circuitry of the drive converts up to 96V PWM nominal to the motor.

Alternate: Listed NMMS Power Conversion equipment inverter servo drive (AC Servo Drive) with $48V_{DC}$ (SELV) input rated adjustable frequency motor drive.

15.2 Conformance with CE

The motors have been tested by an authorized testing laboratory in a defined configuration.

- Any divergence from the configuration and installation described in this documentation means that the user is responsible for carrying out new measurements to ensure conformance with regulatory requirements.

NOTICE

Feedback systems and contacts must not be tested with high voltage.

- Feedback systems are not suitable for high voltage testing, it is allowed to exclude sensitive electronic components from these tests.
- Feedback systems might be destroyed during a high voltage test.

NOTE

CE Declaration of Conformity can be found on the Kollmorgen website.

Kollmorgen declares the conformity of the BLM product series with these directives:

- CE Directive 2014/30/EU, Electromagnetic compatibility
- CE Directive 2014/35/EU, Low voltage

15.3 Conformance with RoHS

BLM Motors without a thermal sensor or with a thermal sensor PTC (155 °C) or PTC 111-KD3 (140 °C), i.e., model numbers with “0”, “1” or “2” on the 10th position, are compliant without exemptions with the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, including commission delegated Directive (EU) 2015/863 for installation in a machine (RoHS).

BLM Motors with a thermal sensor PT-1000, i.e., model numbers with “3” on the 10th position (BLMXXX-XXX3X-XX, where “X” stands for any allowed character) are RoHS compliant with the exemption 7(c)-I: Electrical and electronic components containing lead (Pb) in a glass or ceramic other than dielectric ceramic capacitors or in a glass or ceramic matrix compound.

15.4 Conformance with REACH

BLM Motors are compliant with Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

Regarding REACH Article 33(1), to the best of our knowledge and based on the information available to us from our suppliers, we declare that:

BLM Motors without a thermal sensor or with a thermal sensor PTC (155 °C) or PTC 111-KD3 (140 °C), i.e., model numbers with “0”, “1” or “2” on the 10th position do not contain any Substances of Very High Concern (SVHC) listed in the Candidate List as amended on 23 January 2024, containing 240 Substances, as published by the European Chemical Agency.

BLM Motors with a thermal sensor PT-1000, i.e., model numbers with “3” on the 10th position (BLMXXX-XXX3X-XX, where “X” stands for any allowed character) do contain Lead (Pb, CAS No. 7439-92-1) in the amount > 0.1 % weight by weight used in solders.

15.5 Conformance with UL

The motor is a UL USA and Canada recognized component, file E136406.

Support and Services

About Kollmorgen

When you need motion and automation systems for your most demanding applications and environments, count on Kollmorgen - the innovation leader for more than 100 years. We deliver the industry's highest-performing, most reliable motors, drives, AGV control solutions and automation platforms, with over a million standard and easily modifiable products to meet virtually any motion challenge. We offer manufacturing facilities, distributors and engineering expertise in all major regions around the world, so you can bring a better machine to market faster and keep it profitable for many years to come.

Kollmorgen Developer Network

Join the Kollmorgen Support Network for product support.
Ask the community questions, search the knowledge base for answers, get downloads, and suggest improvements.

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