

Kollmorgen Essentials Motor

3-Phase AC Permanent Magnet Servo Motor

English



Installation Manual



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

KOLLMORGEN

A REGAL REXNORD BRAND

Record of Document Revisions

Revision	Date	Remarks
BETA	02/2025	Initial content for beta program.
A	10/2025	Initial production release.

Table of Contents



"English" (→ p. 3)

1 English

1.1 Welcome to Kollmorgen Essentials	5
1.1.1 Kollmorgen Essentials Servo System Features	5
1.2 About this Manual	7
1.2.1 Symbols Used	7
1.2.2 Abbreviations Used	8
1.3 Part Number Scheme	9
1.4 Safety	10
1.4.1 Specialist Staff Required!	10
1.4.2 Check Hardware Revision!	10
1.4.3 Read the Documentation!	10
1.4.4 Pay Attention to the Technical Data!	10
1.4.5 Perform a Risk Assessment!	10
1.4.6 Secure the Key!	11
1.4.7 Safety Warnings	11
1.4.8 Use as Directed	12
1.4.9 Prohibited Use	12
1.5 Product Life Cycle Handling	13
1.5.1 Maintenance and Cleaning	14
1.5.2 Packaging	14
1.5.3 Repair and Disposal	14
1.5.4 Storage	15
1.5.5 Transport	15
1.6 Package	16
1.6.1 Package Supplied	16
1.6.2 Nameplate	16
1.7 General Technical Data	18
1.8 Standard Features	19
1.8.1 Feedback - SFD-M Multiturn Absolute Encoder	20
1.8.2 Flange	20
1.8.3 Holding Brake	20
1.8.4 Ingress Protection Class	21
1.8.5 Insulation Material Class	21
1.8.6 Surface	21

1.8.7 Shaft End, A-side	21
1.8.8 Shaft Seal	22
1.8.9 Style	22
1.8.10 Thermal Protective Device	23
1.8.11 Vibration Class	23
1.9 Wiring Technology	24
1.9.1 Connectors	24
1.9.2 Wire Cross Sections	24
1.10 Mechanical Installation	25
1.10.1 Flange Mounting	25
1.11 Electrical Installation	27
1.11.1 Electrical Installation Guide	28
1.11.2 Connect the Servo Motor	28
1.11.3 Connect the Kollmorgen Essentials Motor to the Kollmorgen Essentials Drive using the Kollmorgen Essentials Cable	29
1.12 Setup	30
1.12.1 Setup Procedure	30
1.13 Troubleshooting	31
1.13.1 Brake Does Not Engage	32
1.13.2 Error Message: Feedback	32
1.13.3 Error Message: Servo Motor Brake	32
1.13.4 Error Message: Servo Motor Temperature	32
1.13.5 Error Message: Output Stage Fault	32
1.13.6 Servo Motor does not Rotate	32
1.13.7 Servo Motor Oscillates	33
1.13.8 Servo Motor Runs Away	33
1.14 Accessories	34
1.14.1 Shaft Key Kit	34
1.14.2 Shaft Seal Kit	34
1.15 Technical Data Terminology	35

1.1 Welcome to Kollmorgen Essentials



1.1.1 Kollmorgen Essentials Servo System Features

- Industry-leading torque density, efficiency and reliability.
- Minimal cogging for smooth operation, even at low speeds.
- SFD-M high-resolution absolute multi-turn feedback as standard.
- Dual STO safety and motion synchronization capable.
- Multi-Ethernet feature enables compatibility with various controls solutions within the same SKU.
- Access full parameters and tuning options in WorkBench for complex axes.
- Pre-configured to work seamlessly within Kollmorgen Automation Suite™.
- The new Express Setup layout with WorkBench provides a pre-configured plug + play solution to enable simplified commissioning.
- The system is designed and manufactured by Kollmorgen, with each configuration validated to deliver optimum performance.
- High signal integrity cable prevents degraded performance and instability.
- UL, CE, RoHS, TUV, REACH, TSCA and ISO compliant when the drive is used along with the Kollmorgen Essentials servo motor and cable.

1.1.1.1 Kollmorgen Essentials Drive

- Supports EtherCAT®, PROFINET®, and EtherNet/IP™ all in one drive.
- Synchronization capability with CIP Sync or PROFINET IRT.
- Seamlessly integrates with Kollmorgen Automation Suite and most Industrial Ethernet based motion controllers.
- High speed digital inputs for registration capability.
- USB-C service port for fast configuration and diagnostics.
- Optimized for single-cable feedback via SFD-M Multi-Turn absolute encoder (24-bit single-turn + batteryless 16-bit multi-turn resolution).
- Capable of DC Bus Sharing for energy efficiency, reduced wiring, and reduction of components like braking resistors.
- Commissioning in less than 20 minutes with WorkBench Express Setup.

1.1.1.2 Kollmorgen Essentials Motor

- Integrated multi-turn absolute encoder feedback for high-resolution for precision control, long linear travels, or high gear ratios.
- Industry-common IEC motor mount and innovative key kit supports adaptable motor mounting to standard mechanical interfaces such as gearboxes and coupling types requiring either smooth or keyed shafts.
- 2 shaft configurations - smooth or keyed.
- Optional 24V_{DC} brake and field-installable IP65 shaft seal kits available.
- On-board memory in our smart feedback device (SFD-M) enables “plug-and-play” parametrization with Kollmorgen drives.
- Power ranges from 200W to 4000W with windings optimized for 120, 240, 400, or 480V_{AC} inputs.
- Rated speeds of 3000 RPM with maximum speed capability up to 6000 RPM.

1.1.1.3 Kollmorgen Essentials Cable

- Single cable design with SpeedTec connectors.
- Batteryless, multi-turn functionality simplifies installation and long-term maintenance while ensuring high reliability.
- Works with Kollmorgen AKM and AKM2G servo motors configured with a “9” connector option for AKM or “A” connector option for AKM2G and SFD-M or SFD-3 feedback.
- Shielded cable with additional internal shielding around both data and brake wires to maximize signal integrity.

1.1.1.4 WorkBench with Express Setup

- Commissioning in less than 20 minutes - our Express Setup layout within industry-best WorkBench commissioning software enables our customers to deliver machines faster to market.
- Quick Tune functionality offers one-button tuning, while full WorkBench functionality remains available for advanced tuning and diagnostics.
- Express Setup allows quick and easy setup for less experienced engineers.
- Auto-complete of programmable commands saves looking up parameter names.
- Full setup included with multi-function bode plot allowing users to quickly evaluate performance.
- Six-channel real time software oscilloscope commissions and diagnoses quickly.
- One-click capture and sharing of program plots and parameter settings allow you to send machine performance data instantly.

1.2 About this Manual

This manual describes the Kollmorgen Essentials Motor series of synchronous servomotors (standard version / low voltage versions).

The servo 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 Kollmorgen Essentials Motor series of servo motors.
- More background information is available from the [Kollmorgen Support Network](#).

NOTE

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

1.2.1 Symbols Used

Symbol	Indication
	Indicates a hazardous situation which, if not avoided, will result in death or serious injury .
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury .
	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	Indicates situations which, if not avoided, could result in property damage.
	Indicates useful information.
	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 automatic start.
	Warning of danger from electricity and its effects.
	Warning of danger from hot surface.
	Warning of danger from suspended loads.

1.2.2 Abbreviations Used

See "Technical Data Terminology" (→ p. 35).

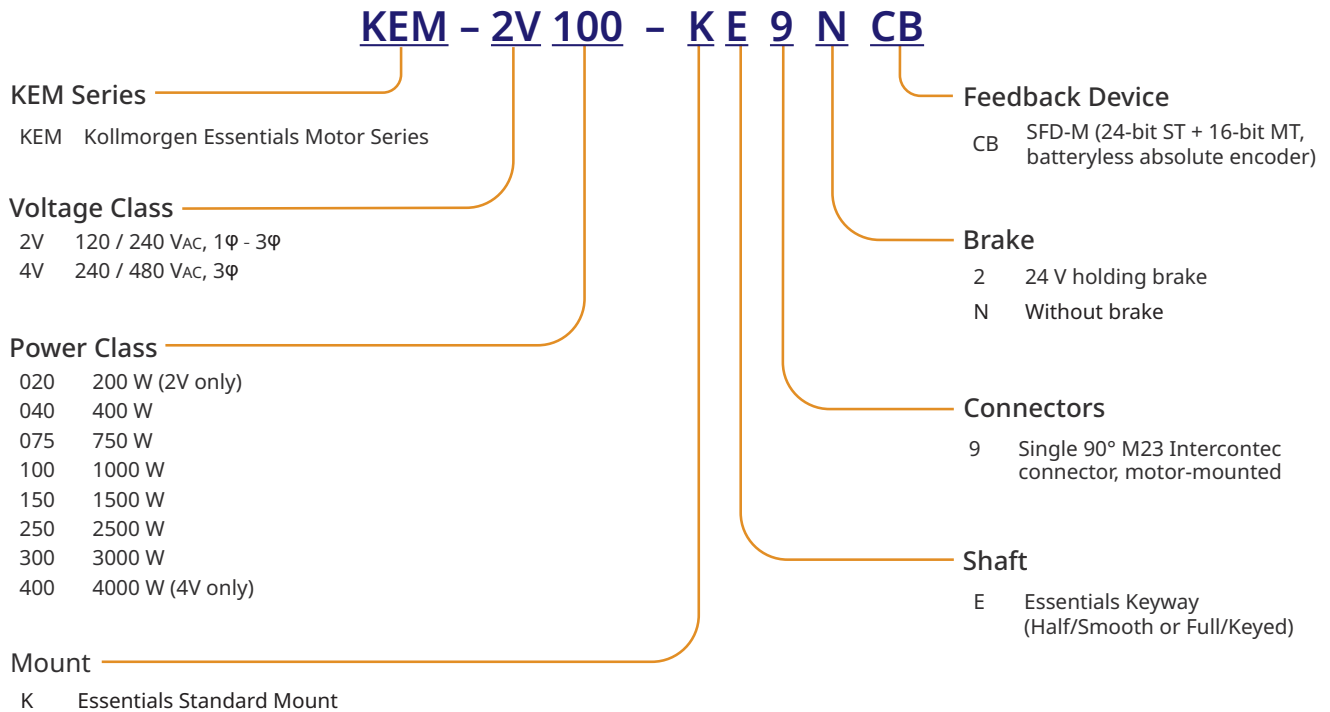
NOTE

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

1.3 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.



Kollmorgen Essentials Motor Options 120/240 VAC Rated

- KEM-2V020-KE9NCB
- KEM-2V020-KE92CB
- KEM-2V040-KE9NCB
- KEM-2V040-KE92CB
- KEM-2V075-KE9NCB
- KEM-2V075-KE92CB
- KEM-2V100-KE9NCB
- KEM-2V100-KE92CB
- KEM-2V150-KE9NCB
- KEM-2V150-KE92CB
- KEM-2V250-KE9NCB
- KEM-2V250-KE92CB
- KEM-2V300-KE9NCB
- KEM-2V300-KE92CB

Kollmorgen Essentials Motor Options 240/480 VAC Rated

- KEM-4V040-KE9NCB
- KEM-4V040-KE92CB
- KEM-4V075-KE9NCB
- KEM-4V075-KE92CB
- KEM-4V100-KE9NCB
- KEM-4V100-KE92CB
- KEM-4V150-KE9NCB
- KEM-4V150-KE92CB
- KEM-4V250-KE9NCB
- KEM-4V250-KE92CB
- KEM-4V300-KE9NCB
- KEM-4V300-KE92CB
- KEM-4V400-KE9NCB
- KEM-4V400-KE92CB

1.4 Safety

1.4.1 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 servo motors and who use their relevant minimum qualifications in their duties.

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

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

1.4.2 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.

1.4.3 Read the Documentation!



Read the available documentation before installation and commissioning.

- Improper handling of the 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 servo motor have read and understood the manual and that the safety notices in this manual are observed.

1.4.4 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 servo motors can be damaged (e.g., by overheating).

1.4.5 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.

1.4.6 Secure the Key!



- Remove any fitted key (if present) from the shaft before letting the servo motor run without coupled load to avoid the dangerous results of the key being thrown out by centrifugal forces.
- When delivered, the shaft keys are provided in a separate plastic bag.

1.4.7 Safety Warnings

Symbol	Description
	Automatic Restart! • Risk of death or serious injury for humans working in the machine. • The servo motor might restart automatically after power on, voltage dip, or interruption of the supply voltage, depending on the parameter setting. • For an Kollmorgen Essentials Drive, if the parameter AXIS#.ENDEFAULT is set to 1, place a warning sign, with this text, on the machine: Warning: Automatic Restart at Power On • If the power is on, disabled it while humans are in the dangerous zone of the machine. • If using an undervoltage protection device, you must observe EN 60204-1:2006 chapter 7.5.
	Hot surface! The surfaces of the servo 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 servo motor has cooled down below 40 °C before touching it.
 DANGER 	Earthing! High voltages! It is vital that you ensure the servo motor housing 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. • 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 servo motor shaft is not rotating. • This can cause flashovers with resulting injuries to persons and damage to the contacts. • The motor can generate dangerous voltages when the motor shaft is rotated, even if the drive is not connected. • Verify the servo motor is de-energized prior to any work. • Before performing any work on the servo motor, always ensure that it is de-energized. • 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}.

1.4.8 Use as Directed

- The Kollmorgen Essentials Motor series of synchronous servo motors is designed especially for drives for industrial robots, machine tools, textile and packing machinery and similar with high requirements for dynamics.
- The user is only permitted to operate the servo motors under the ambient conditions defined in this documentation.
- The Kollmorgen Essentials Motor series of servo motors is **exclusively** intended to be driven by servo drives under speed and / or torque control.
- The servo 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 thermal sensor integrated in the servo motor windings must be observed and evaluated.
- The holding brakes are designed as standstill brakes and are not suited for repeated operational braking.
- The conformity of the servo system to the standards mentioned in the EC Declaration of Conformity is only guaranteed when the components (servo drives, servo motors, cables, etc.) that are used have been supplied by Kollmorgen.
 - See "Approvals" (→ p. 86).

1.4.9 Prohibited Use

- The use of the Kollmorgen Essentials Motors is prohibited directly on supply networks, mains.
- The use of the Kollmorgen Essentials Motor is prohibited in:
 - areas where there is a risk of explosions.
 - contact with food and beverage.
 - environments with caustic and/or electrically conducting acids, bases, oils, vapors, dusts.
- Commissioning the servo 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.
- Built-in holding brakes without further equipment must not be used to ensure functional safety.

1.5 Product Life Cycle Handling

1.5.1 Maintenance and Cleaning	14
1.5.2 Packaging	14
1.5.3 Repair and Disposal	14
1.5.4 Storage	15
1.5.5 Transport	15

1.5.1 Maintenance and Cleaning

NOTICE

- Maintenance and cleaning must be done by qualified personnel only.
- Opening the servo motor voids the warranty.
- Once per year or after 2,500 hours of operation:
 - Check the servo motor for bearing noise.
 - If any unusual noises are heard, stop the operation of the servo motor.
 - The bearings must be replaced by the manufacturer.
- After 20,000 hours of operation under rated conditions, ball bearings should be replaced by the manufacturer.

1.5.2 Packaging

- Cardboard packing with Instapak™ foam cushion.
 - Recycling of foam is possible at special waste collection points.
- You can return the plastic portion to the supplier.
 - See "Repair and Disposal" (→ p. 14).

Servo Motor Type	Packaging	Maximum Stacking Height
KEM-xV020/xV040	Cardboard	10
KEM-xV075/xV100	Cardboard	6
KEM-xV150/xV250	Cardboard	5
KEM-xV300/xV400	Cardboard	1

1.5.3 Repair and Disposal

1.5.3.1 Repair

Repair of the servo motor must be done by the manufacturer.

- Opening the servo motor voids the warranty.
- The manufacturer accepts returns of old servo motors and accessories for professional disposal.
- The sender is responsible for the transport costs to return the servo motor.

1.5.3.2 Disposal

For disposal, send the device, in the original packaging, to the appropriate manufacturer's address.

Region	Disposal Address
North America	Kollmorgen Corporation 201 West Rock Road Radford, VA 24141, USA
Europe	Kollmorgen s.r.o. Attn.: Repair Department Evropská 864 664 42 Modřice, Brno Czech Republic

1.5.4 Storage

NOTICE

- Store only in the manufacturer's original recyclable packaging.
- Climate category 1K4 according to EN 61800-2, IEC 60721-3-2.
- Humidity: 5 to 95% relative humidity, no condensation.
- Maximum stacking height: See "Packaging" (→ p. 14).
- Storage temperature: -25 °C to +55 °C, maximum variation 20K/hr.
- Storage time: Unlimited.

1.5.5 Transport

NOTICE

- Transport is only allowed by qualified personnel in the manufacturer's original recyclable packaging.
 - Avoid shocks, especially to the shaft end.
- Climate Category: 2K3 according to EN 61800-2, IEC 60721-3-2.
- Humidity: 5 to 95% relative humidity, no condensation.
- Temperature: -25 °C to +70 °C, maximum rate of change 20K/hr.
- If the packaging is damaged, check the servo motor for visible damage.
 - Inform the carrier and, if appropriate, the manufacturer.

1.6 Package

1.6.1 Package Supplied

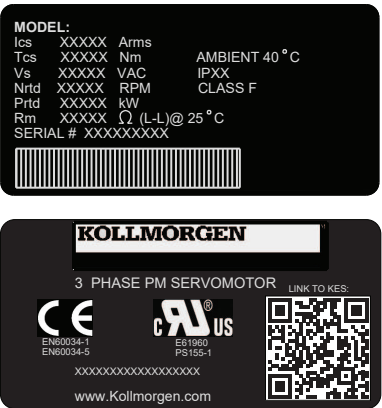
The package contains:

- Servo motor from the Kollmorgen Essentials Motor series.
- QR code, printed on the motor label, leading to the installation manual.
- Shaft key kit with full-height key and modified (smooth shaft) key.

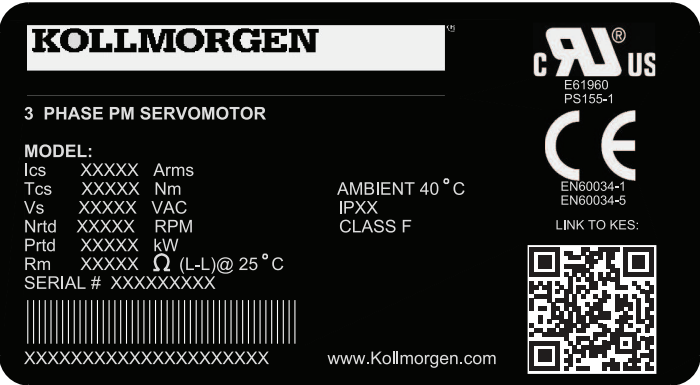
1.6.2 Nameplate

With standard servo motors, the nameplate uses adhesive on the housing side.

1.6.2.1 Kollmorgen Essentials Motor - 2V020-xV040



1.6.2.2 Kollmorgen Essentials Motor - xV075-xV400



Legend	Description
MODEL	Servo Motor Type
Ics	Standstill Current
Tcs	Standstill Torque
Vs	U _N Supply Voltage
Nrtd	nn Rated Speed @ U _n
Prtd	Rated Power
Rm	Winding Resistance @ 25 °C
SERIAL	Serial Number

Legend	Description
AMBIENT	Maximum Ambient Temperature 40 °C
IPXX	Ingress Protection Rating
CLASS F	Insulation Rating

The year and week of manufacturing is coded in the serial number.
The first two digits of the serial number are the year of manufacturing (e.g., 25 is 2025).
The third and fourth digits of the serial number are the week of manufacturing (e.g., 32 is the 32nd week).

1.7 General Technical Data

Technical Data	Description
Ambient Temperature	-20 °C to 40 °C for site altitude up to 1000m AMSL (at rated values). - It is vital to consult Kollmorgen's applications department for ambient temperatures above 40 °C and encapsulated mounting of the servo motors.
Ball Bearing Life	≥ 20,000 operating hours.
Permissible Humidity	5 to 95% relative humidity, no condensation (at rated values).
Power derating (currents and torques)	1%/°K in range 40 °C to 50 °C up to 1000m AMSL. For site altitude above 1000m AMSL and 40 °C: 1.5%/100m between 1000m to 2000m

NOTE

See the individual servo motor series sections for their respective technical data, dimensional drawings, and key and keyway dimension details.

1.8 Standard Features

1.8.1 Feedback - SFD-M Multiturn Absolute Encoder	20
1.8.2 Flange	20
1.8.3 Holding Brake	20
1.8.4 Ingress Protection Class	21
1.8.5 Insulation Material Class	21
1.8.6 Surface	21
1.8.7 Shaft End, A-side	21
1.8.8 Shaft Seal	22
1.8.9 Style	22
1.8.10 Thermal Protective Device	23
1.8.11 Vibration Class	23

1.8.1 Feedback - SFD-M Multiturn Absolute Encoder

Feedback	Description
Code	CB
Type	SFD-M
Motor ID Support ¹	Yes
Accuracy ² (arc-min)	+/- 1' (typical)
RMS Noise ³ (Rev rms)	2-22
Resolution	24-bits
Absolute Revs	65,536
Compatible Drives	All Kollmorgen drives
Functional Safety Support	No

1. Motor ID Support means electronic motor nameplate data is included, allowing for plug-and-play commissioning.
2. Accuracy refers to overall system accuracy once installed in the motor.
3. Noise refers to the RMS position noise when at stand-still.

1.8.2 Flange

IEC flange accuracy according to DIN 42955.

Tolerances of shaft extension run-out and of mounting flanges for rotating electrical machines.

Code	Flange
K	• IEC with accuracy N. • Fit KEM-KEM: H6/H7

1.8.3 Holding Brake

All servo motors are available with a holding brake option.

- A spring applied brake (24V_{DC}) is integrated into the servo motors.
 - When this brake is de-energized, it blocks the rotor.



Secure hanging loads!

Risk of injury exists for personnel operating the machine.



- If there is a suspended load (vertical axes) and the servo motor's holding brake is released without the servo drive producing output at the same time, the load may fall down!
- The user should consider:
 - Required local safety standards in the case of hanging loads (vertical axes).
 - The need to ensure personnel safety by using additional safety measures for hazard avoidance.

NOTICE

- The holding brakes are designed as standstill brakes.
 - They are **not** suited for repeated operational braking.
- In the case of frequent, operational braking, premature wear and failure of the holding brake is to be expected.

- The length of the servo motor increases when a holding brake is mounted.
- The holding brake can be controlled directly by the servo drive.
 - **There is no personal safety!**
 - See "Holding Brake Functionality" (→ p. 83).
- The winding is suppressed in the servo drive.
 - Additional circuitry is not required (see the servo drive instruction manual).
- If the holding brake is not controlled directly by the servo drive, additional wiring (e.g., varistor) is required.
 - Contact "Support and Services" (→ p. 89) for assistance.
- See "Brakes - Technical Data" (→ p. 77).

1.8.4 Ingress Protection Class

Per EN 60529.

This connector option is for all Kollmorgen Essentials Motors.

Connector Option	Shaft Seal	Protection Class
9	Without	IP541

- Optional field-installable shaft seal kits are available as an accessory. The servo motors meet IP65 Protection Class if properly installed. See "Kollmorgen Essentials Motor Shaft Seal Kit" (→ p. 41).

NOTE

See [Ingress Protection of Servo Motors](#).

1.8.5 Insulation Material Class

The servo motors meet the standard for insulation material Class F according to IEC 60085 (UL1446).

1.8.6 Surface

- The servo motors are coated with epoxy powder coating in matte black.
- This finish is **not** resistant against solvents (e.g., trichlorethylene, nitro-thinners, or similar).

1.8.7 Shaft End, A-side

Power transmission is made through the cylindrical shaft end A, fit h6 to ISO 286 standard.

- Per DIN 6885, every Kollmorgen Essentials Motor is provided with a:
 - Half-key insert for smooth shaft requirements.
 - Full-key for keyed shaft requirements.
- Shaft Key Kits (KEM ...SKK) are available as an accessory in case of damaged or misplaced keys.
 - Verify any shaft seals are installed prior to installation of the keys.
 - See "Kollmorgen Essentials Motor Shaft Seal Kit" (→ p. 41).
- Bearing life is calculated with 20,000 operating hours.

Order Code	Shaft End	Available For
E	Keyway shaft with: • Half-key insert for smooth shaft requirements. • Full-key for keyed shaft requirements.	All Kollmorgen Essentials Motors.

1.8.7.1 Coupling

Double-cone collets have proved to be ideal zero-backlash coupling devices, combined, if required, with metal bellows couplings.

1.8.7.2 Maximum Axial Force

When assembling pinions or wheels to the axis and use of angular gearheads, axial forces arise.

1.8.7.3 Maximum Radial Force

If the servo motor drives pinions or toothed belts, high radial forces will occur.

The maximum radial load ratings reflect these assumptions:

- Servo motors are operated with peak torque of the longest member of the frame size.
- Fully reversed load applied to the end of the smallest diameter standard mounting shaft extension.
- Safety factor = 2.

NOTE

- Power take-off from the middle of the free end of the shaft allows a 10% increase in F_R .
- See the individual servo motor series sections for their respective technical data, dimensional drawings, and key and keyway dimension details.

1.8.8 Shaft Seal

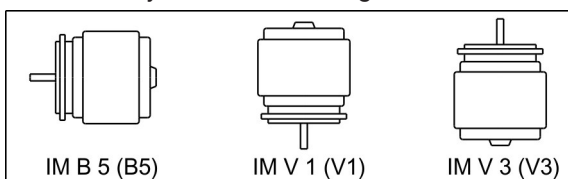
If the Kollmorgen Essentials Motor is connected to a machine flange with an unsealed shaft region, the optional Shaft Seal Kit should be used to ensure shaft sealing.

See "Accessories" (→ p. 34).

- The shaft seal is made of mineral filled PTFE (Teflon®).
 - This is self-lubricating and is recommended for applications where regular lubrication of the shaft seal is not possible.
- The Teflon shaft seal ensures the IP65 protection for the shaft area.
- The rated performance is achieved after some hours of shaft seal run-in.
 - No special procedure for run-in is needed.
- Some shedding of the Teflon shaft seal material is normal and does not affect the function.
- The shaft seal is pre-lubricated by grease.
 - Additional MOLYKOTE® grease is needed for installation.
 - See "Kollmorgen Essentials Motor Shaft Seal Kit" (→ p. 41).

1.8.9 Style

The basic style for the Kollmorgen Essentials servo motors is style IM B 5 according to EN 60034-7.



1.8.10 Thermal Protective Device

The Standard AC voltage version of each servo motor is fitted with an electrically isolated PTC Avalanche-style thermistor.

- The thermal sensors **do not** provide any protection against short, heavy overloading.
- With SFD-M digital feedback systems the temperature sensor status is transmitted digitally and evaluated in the servo drives.
- When Kollmorgen-configured feedback cables are used, the sensor is integrated into the monitoring system of the digital servo drives

1.8.10.1 Thermal Device: Resistance vs. Temperature Curves

Thermal Device curves show the equivalent resistance in ohms that corresponds to a given temperature of the servo motor windings.

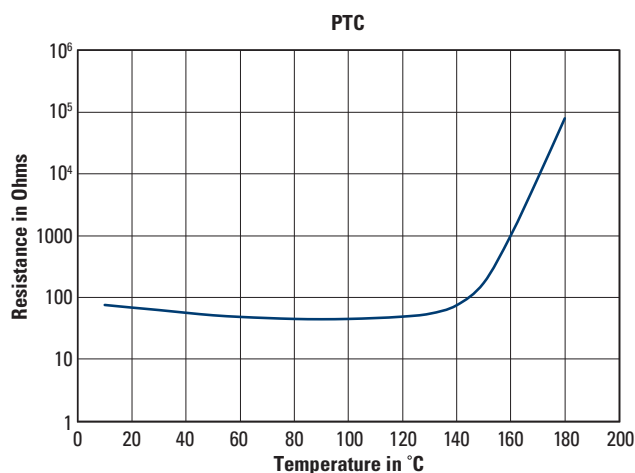
The drive used with the servo motor must support the selected thermal device for proper operation.

1.8.10.2 Thermal Device: Resistance vs. Temperature Graph

Thermal Device curves show the equivalent resistance in ohms that corresponds to a given temperature of the servo motor windings.

The drive used with the servo motor must support the selected thermal device for proper operation.

1.8.10.2.1 Kollmorgen Essentials Motor Standard Thermal Device Option



Note:

PTC thermistor (155°C ± 5°C switching temperature) installed.

Resistance at 25°C: ≤550 ohms.

Switching Resistance: ≥1330 ohms within ±5°C of switch temperature.

1.8.11 Vibration Class

The servo motors are made to vibration class A according to EN 60034-14.

For a speed range of 600RPM to 3600RPM, and a shaft center between 56mm and 132mm, the actual value of the permitted vibration severity is 1.6mm/s.

1.9 Wiring Technology

1.9.1 Connectors

- See "Part Number Scheme" (→ p. 9) for connector information.
- See "Kollmorgen Essentials Motor - Connector Pinouts" (→ p. 71) for pinout information.

1.9.2 Wire Cross Sections

Wire cross sections for 40 °C ambient.

1.9.2.1 Hybrid Cable

SFD-M: 4 power lines, 2 brake lines, and 2 signal lines.

Type	Cross Section
SFD-M	$(4 \times 1.5 + (2 \times 0.34) + (2 \times 0.75))$
SFD-M	$(4 \times 2.5 + (2 \times 0.34) + (2 \times 1.0))$

1.10 Mechanical Installation

NOTE

See the individual servo motor series sections for their respective technical data, dimensional drawings, and key and keyway dimension details.

1.10.1 Flange Mounting

! IMPORTANT

Only qualified staff with mechanical engineering knowledge are permitted to assemble the servo motor.

1.10.1.1 Flange Mounting Guidelines

NOTICE

- Protect the servo motor from unacceptable stresses.
 - During transport and handling, no components must be damaged.
- The site must be free of conductive and aggressive material.
 - For V3-mounting (shaft end upwards), make sure that no liquids can enter the bearings.
- Verify there is unhindered ventilation of the servo motors.
- Observe the permissible ambient and flange temperatures.
 - For ambient temperatures above 40 °C, contact the Kollmorgen applications department beforehand.
 - Verify there is adequate heat transfer in the surroundings and the servo motor flange.
- The servo motor flange and shaft are especially vulnerable during storage and assembly - avoid brute force.
 - It is important to use the provided locking thread to tighten couplings, gear wheels, pulley wheels, and warm up the drive components, where possible.
 - Blows, or the use of force, leads to damage to the bearings and the shaft.

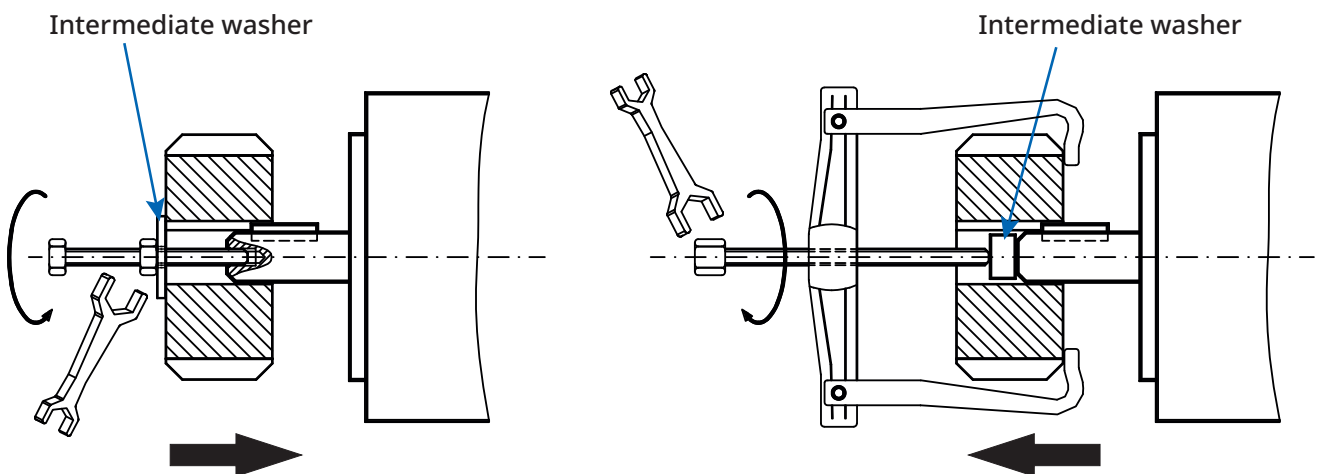


Figure 1-1: Example: Intermediate Washer

NOTICE

- Wherever possible, use only backlash-free, frictionally-locking collets or couplings.
 - Verify correct alignment of the couplings.
 - A displacement causes unacceptable vibration and the destruction of the bearings and the coupling.
- In all cases, **do not** create a mechanically constrained servo motor shaft mounting by using a rigid coupling with additional external bearings (e.g., in a gearbox).
- Identify the number of servo motor poles and resolver poles (if applicable).
 - Verify the correct setting is made in the used servo drive.
 - An incorrect setting can lead to the destruction of the servo motor, especially with small servo motors.
- If possible, avoid axial loads on the servo motor shaft.
 - Axial loading significantly shortens the life of the servo motor.
- Check the compliance to the permitted radial and axial forces F_R and F_A .
 - When a toothed belt drive is used, the minimal permitted diameter of the pinion follows from this equation: $d_{\min} \geq (M_0/F_R)^{*2}$.

1.11 Electrical Installation

! IMPORTANT

Only qualified staff with electrical engineering knowledge are permitted to assemble the servo motor.

DANGER



Dangerous Voltage!

- Always verify the servo motors are de-energized during assembly and wiring.
 - No voltage can be switched on for any piece of equipment which is to be connected.
- There is a risk of death or severe injury from touching exposed contacts.
 - Verify the switch cabinet remains turned off (e.g., barrier, warning signs etc.).
 - The individual voltages are only turned on again during setup.
- Risk of electric shock!
 - Never undo the electrical connections to the servo motor while it is energized.
 - In unfavorable circumstances, electric arcs can arise causing harm to people and damaging contacts.
- The residual charge in the capacitors of the drive can produce dangerous voltages up to 10 minutes after the mains supply has been switched off.
 - Even when the servo motor is not rotating, control and power leads may be energized.
- Measure the DC-link voltage and wait until it has fallen below 60V_{DC}.

NOTE

- The ground symbol () indicates that you must provide an electrical connection.
 - This connection must have as large a surface area as possible between the unit indicated and the mounting plate in the switch cabinet.
 - The symbol is found in the wiring diagrams.
- This connection is to suppress HF interference and must not be confused with the PE (protective earth) symbol () (protective measure to EN 60204).

NOTE

To connect the servo motor, use the wiring diagrams in the Installation and Setup Instructions of the used servo drive.

NOTE

- Pinouts for the cable connectors are here: "Kollmorgen Essentials Motor - Connector Pinouts" (→ p. 71).
- Pinouts of the servo drive's end are in the instructions manual of the servo drive.

1.11.1 Electrical Installation Guide

1. Verify the servo drive and servo motor match each other.
 - a. Compare the rated voltage and rated current of the unit.
 - b. Install the wiring according to the wiring diagram in the instructions manual of the servo drive.
The connections to the servo motor are in "Kollmorgen Essentials Motor - Connector Pinouts" (→ p. 71).
2. Install all cables carrying a heavy current with an adequate cross-section per EN 60204.
See the individual servo motor series sections for their respective technical data, dimensional drawings, and key and keyway dimension details.

NOTE

- For long servo motor cables (>25m), and depending on the type of servo drive used, a servo motor choke must be switched into the servo motor cable.
- See the servo drive instruction manual and accessory manual.

3. Verify there is proper earthing of the servo drive and the servo motor.
 - a. Use correct earthing and EMC-shielding according to the used servo drive installation manual.
 - b. Earth ground the mounting plate and servo motor casing.
4. If a hybrid cable is used and it includes integral brake control leads, the brake control leads must be shielded.
 - a. The shielding must be connected at both ends.
 - b. See the servo drive instruction manual.

1.11.1.1 Cable Connection

1. Route servo motor cables as separately as possible from control cables.
2. Connect the feedback device.
3. Connect the servo motor cables.
4. Install servo motor chokes (if applicable) close to the servo drive.
5. Connect the holding brake, if used.

1.11.1.2 Cable Material Requirements - Capacity

- Servo motor cable: less than 150 pF/m.
- Hybrid cable: less than 120 pF/m.

1.11.1.3 Shields

1. Connect shields to shielding terminals or EMC connectors at both ends.
2. Connect the shielding at both ends.
3. Connect all shielding via a wide surface-area contact (low impedance) and metalized connector housings or EMC-cable glands.

1.11.2 Connect the Servo Motor

!IMPORTANT

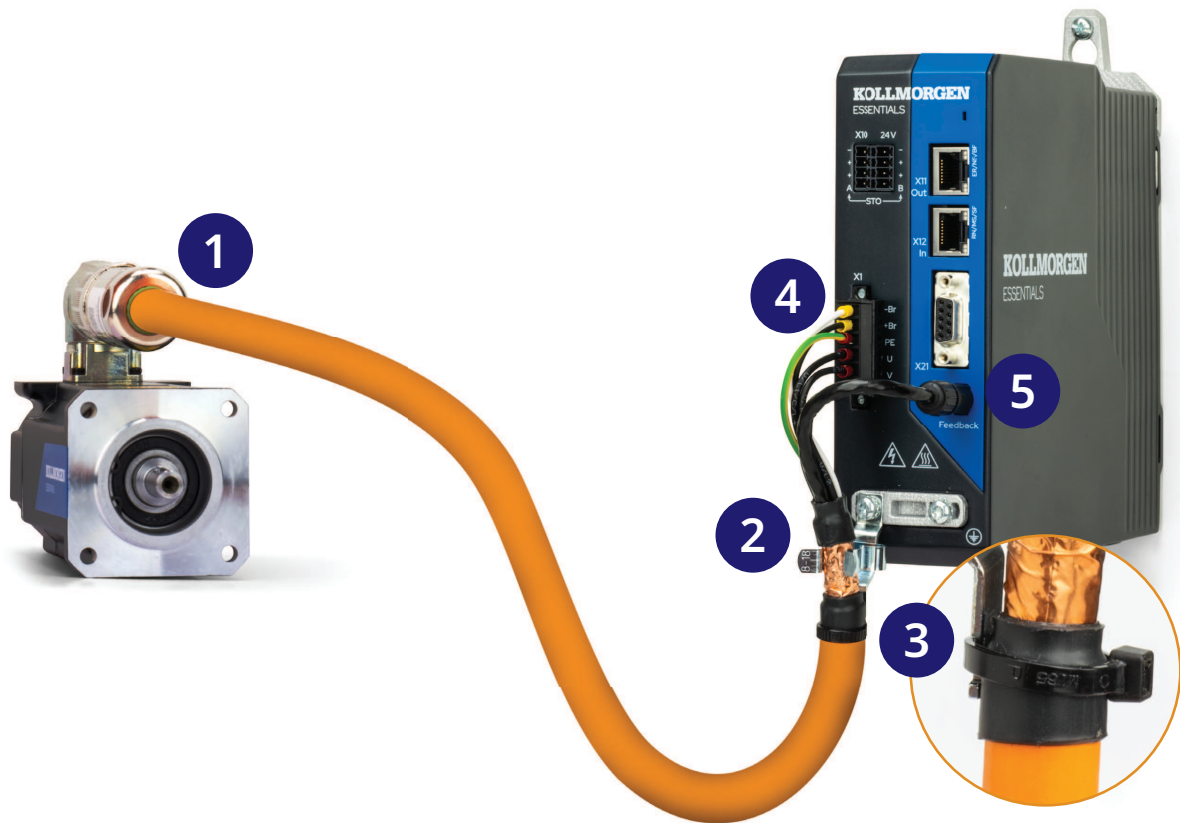
Kollmorgen® Drive and Motor system compatibility and performance cannot be guaranteed if user-customized or third-party cables are used.

- Install the wiring in accordance with the valid standards and regulations.
- Use only Kollmorgen pre-assembled, shielded cables for the feedback and power connections.
- Incorrectly installed shielding leads to EMC interference and has an adverse effect on system function.
- The maximum cable length is defined in the instruction manual of the used servo drive.

NOTE

For a detailed description of configured cables, see the regional accessories manual.

1.11.3 Connect the Kollmorgen Essentials Motor to the Kollmorgen Essentials Drive using the Kollmorgen Essentials Cable



Procedure

1. Connect the cable to the motor.
2. Screw the shield clamp to the ground plate.
Insert the cable into the clamp.
3. Fasten a zip-tie firmly around the cable and shield clamp base.
4. Plug the cable power connector into the X1 drive port.
5. Plug the cable feedback connector into the X23 drive port.

See Also

- "Kollmorgen Essentials Motor - Cable Connector Pinouts" (→ p. 71)
- "Kollmorgen Essentials Motor - Connector Pinout" (→ p. 72)

1.12 Setup

IMPORTANT

Only specialist personnel with extensive knowledge in electrical engineering / drive technology are allowed to commission the drive unit of the servo drive and servo motor.

DANGER



High Voltages!

- Deadly voltages can occur, up to 900V_{DC}.
- Risk of electric shock!
 - Verify that all live connection points are safe against accidental contact.
 - Never undo the electrical connections to the servo motor while it is energized.
- The residual charge in the capacitors of the drive can produce dangerous voltages up to 10 minutes after the mains supply has been switched off.
 - Even when the servo motor is not rotating, control and power leads may be energized.
- Measure the DC-link voltage and wait until it has fallen below 60V_{DC}.

CAUTION



Hot Surface!

- Danger of light burns!
 - The surface temperature of the servo motor can exceed 100 °C in operation.
- Measure the temperature of the servo motor.
 - Wait until the servo motor has cooled below 40 °C before touching it.

CAUTION

Beware of Unplanned Movements!

- Operate the motor only when it is firmly mounted.
- Use a suitable cover over the rotating parts of the engine during operation and when operated without load!
- The safety measures that must be taken for a task are based on the risk assessment of the application.

1.12.1 Setup Procedure

NOTE

- This procedure is an example of the setup.
- A different method may be appropriate or necessary, depending on the application of the equipment.

1. Check the assembly and orientation of the servo motor.
2. Check the drive components (e.g., clutch, gear unit, belt pulley) for the correct seating and setting.
3. Observe the permissible radial and axial forces.
4. Check the wiring and connections to the servo motor and the servo drive.
5. Check that the earth grounding is correct.
6. Servo motor with brake: test the brake by applying 24V_{DC} and confirming the brake disengages and the rotor revolves freely.
7. Servo motor without brake: Check whether the rotor of the servo motor revolves freely.
8. Listen for grinding noises.
9. Check that all the required measures against accidental contact with live and moving parts have been implemented.
10. Based on the risk assessment, conduct any further tests specifically required for the system.
11. Commission the drive according to the servo drive setup instructions.
12. In multi-axis systems, individually commission each drive unit (servo drive and servo motor).

1.13 Troubleshooting

There can be many different reasons for a fault, depending on the system setup.

- The fault causes in the tables are those which directly influence the servo motor.
- Peculiarities which appear in the control loop behavior can usually be traced back to an error in the parameterization of the servo drive.
- The documentation for the servo drive and the setup software provides information.
- For multi-axis systems there may be further hidden reasons for faults.

1.13.1 Brake Does Not Engage	32
1.13.2 Error Message: Feedback	32
1.13.3 Error Message: Servo Motor Brake	32
1.13.4 Error Message: Servo Motor Temperature	32
1.13.5 Error Message: Output Stage Fault	32
1.13.6 Servo Motor does not Rotate	32
1.13.7 Servo Motor Oscillates	33
1.13.8 Servo Motor Runs Away	33

1.13.1 Brake Does Not Engage

Possible Cause	Correction Measures
Faulty brake.	Replace the servo motor.
Servo motor shaft is axially overloaded.	• Check the axial load, reduce it. • Replace the servo motor, since the bearings have been damaged.
Required holding torque is too high.	Check the dimensioning.

1.13.2 Error Message: Feedback

Possible Cause	Correction Measures
Break in hybrid cable, cable crushed, or similar.	Check the cable.
Drive-side feedback connector is not properly plugged in.	Check the connector.

1.13.3 Error Message: Servo Motor Brake

Possible Cause	Correction Measures
Faulty servo motor holding brake.	Replace the servo motor.
Short-circuit in the supply voltage lead to the servo motor holding brake.	Remove the short-circuit.

1.13.4 Error Message: Servo Motor Temperature

Possible Cause	Correction Measures
Loose drive-side feedback connector or break in the hybrid cable.	• Check the connector. • Replace the hybrid cable, if necessary.
Servo motor thermosensor has switched.	• Wait until the servo motor has cooled down. • Investigate why the servo motor becomes too hot.

1.13.5 Error Message: Output Stage Fault

Possible Cause	Correction Measures
Hybrid cable has short-circuit or earth short.	Replace the cable.
Servo motor has short-circuit or earth short.	Replace the servo motor.

1.13.6 Servo Motor does not Rotate

Possible Cause	Correction Measures
Brake is not released.	Check the brake controls.
Break in the setpoint lead.	Check the setpoint lead.
Drive is mechanically blocked.	Check the mechanism.
Servo motor phases in wrong sequence.	Correct the phase sequence.
Servo drive is not enabled.	Supply ENABLE signal.

1.13.7 Servo Motor Oscillates

Possible Cause	Correction Measures
Break in the hybrid cable shielding.	Replace the hybrid cable.
Servo -Servo drive gain too high.	Use the servo motor default values.

1.13.8 Servo Motor Runs Away

Possible Cause	Correction Measures
Servo motor phases are in the wrong sequence.	Correct the phase sequence.

1.14 Accessories

NOTE

See the individual servo motor series sections for their respective technical data, dimensional drawings, and key and keyway dimension details.

1.14.1 Shaft Key Kit

Each kit includes both the standard and modified keys.

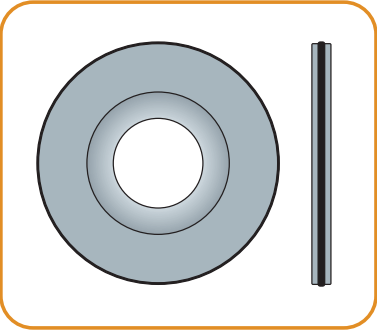
Motor Series	Shaft Key Kit Part Number
KEM-2V020 or KEM-xV040	KEM-020-040-SKK
KEM-xV075 or KEM-xV100	KEM-075-100-SKK
KEM-xV150 to KEM-4V400	KEM-150-400-SKK



1.14.2 Shaft Seal Kit

The shaft seals are IP65 rated.

Motor Series	Shaft Seal Kit Part Number
KEM-2V020 or KEM-xV040	KEM-020-040-SSK
KEM-xV075 or KEM-xV100	KEM-075-100-SSK
KEM-xV150 or KEM-xV250	KEM-150-250-SSK
KEM-xV300 or KEM-4V400	KEM-300-400-SSK



1.15 Technical Data Terminology

NOTE

- See the individual servo motor series sections for their respective technical data, dimensional drawings, and key and keyway dimension details.
- All data is valid for 40 °C environmental temperature and 100K overtemperature of the winding.
- Determination of nominal data with constant temperature of adapter flange of 65 °C.
- The data can have a tolerance of +/- 10%.

Term	Definition
Peak Current, (pulse current) I_{0max} [A]	• The Peak Current (effective sinusoidal value) is several times the rated current, depending on the servo motor winding. • The actual value is determined by the peak current of the drive which is used.
Rated Torque, M_n [Nm]	• The Rated Torque is produced when the servo motor is drawing the rated current at the rated speed. • The Rated Torque can be produced indefinitely at the rated speed in continuous operation (S1).
Release Delay Time t_{BRH} [ms] / Engage Delay Time t_{BRL} [ms] of the brake	These constants define the response times of the holding brake when operated with the rated voltage from the servo drive.
Rotor Moment of Inertia, J [kg·cm ²]	The constant J is a measure of the acceleration capability of the servo motor. Example: At I_0, the acceleration time t_b from 0 to 3000RPM is given as: $t_b \left[s \right] = \frac{3000 \cdot 2\pi}{M_0 \cdot 60s} \cdot \frac{m^2}{10^4 \cdot cm^2} \cdot J$ with M_0 in Nm and J in kg·cm².
Standstill Current, I_{0rms} [A]	The standstill current is the effective sinusoidal current which the servo motor draws at $0 < n < 100$ RPM to produce the standstill torque.
Standstill Torque, M_0 [Nm]	The standstill torque can be maintained indefinitely at a speed $0 < n < 100$ RPM and rated ambient conditions.
Thermal Time Constant, t_{th} [min]	• The constant t_{th} defines the time for the cold servo motor, under a load of I_{0rms}, to heat up to a temperature rise of 0.63×10^5 Kelvin. • This temperature rise happens in a much shorter time when the servo motor is loaded with the peak current.
Torque Constant,	• The Torque Constant defines how much torque in Nm is produced by the servo motor with 1A r.m.s. current. • The relationship is $M = I \times K_T$.
U_N	Rated mains voltage.
U_n	• DC-Bus link voltage. • $U_n = \sqrt{2} \cdot U_N$
Voltage Constant, $K_{E_{rms}}$ [mV/min-1]	• The Voltage Constant defines the induced servo motor EMF, as an effective sinusoidal value between two terminals, per 1000RPM. • Measured at 25 °C.

2 Kollmorgen Essentials Motor Shaft Key Kit

This section is the installation instructions of the Kollmorgen Essentials Motor shaft key kit.

2.1 Kollmorgen Essentials Motor Shaft Key Kit - Contents and Required Tools	37
2.1.1 Kit Contents	37
2.1.2 Required Tools	37
2.2 Kollmorgen Essentials Motor Shaft Key Kit - Installation	38

2.1 Kollmorgen Essentials Motor Shaft Key Kit - Contents and Required Tools

Every Kollmorgen Essentials Motor is provided with a Shaft Key Kit.

2.1.1 Kit Contents

The shaft keyways are in a separate plastic bag from the servo motor.

The kit contents are:

- 1 - Half/modified key for smooth shaft applications.
- 1 - Full key for keyed shaft applications.
- QR code leading to this installation manual.

IMPORTANT

- The shaft should be in balance when either key is properly installed in the keyway.
- The keys are intended for permanent installation.
- Verify the correct type of key is installed based on the application requirement for either a smooth or keyed shaft.

NOTE

- If the original shaft key kit shipped with the motor is lost or misplaced, additional shaft key kits may be ordered using the part numbers in the "Shaft Key Kit" (→ p. 34).
- Contact Kollmorgen "Support and Services" (→ p. 89) to order.

NOTICE

- Third-party shaft keys or seals are not approved for use with these servo motors.
- The use of third-party shaft keys or seals voids any implied or expressed warranties.

2.1.2 Required Tools

These tools are required for installation:

- Plastic or rubber coated pliers.
- Abrasive cloth to remove nicks or burrs on shaft.
- Calibrated measurement tool to confirm installation (e.g., calipers, etc.)
- Protective pad.

2.2 Kollmorgen Essentials Motor Shaft Key Kit - Installation

! IMPORTANT

- Determine the keyway your application requires before installation.
- If installing the Kollmorgen Essentials Motor Shaft Seal Kit, install that kit prior to installation of any keyways.
 - See "Kollmorgen Essentials Motor Shaft Seal Kit - Installation" (→ p. 45).

! WARNING

- Once a key is installed, do not allow the servo motor to run without an attached load.
- This is to avoid dangerous results if the key is thrown out by centrifugal forces.

Procedure

1. Verify all kit contents and required tools are available for kit installation.
See "Kollmorgen Essentials Motor Shaft Key Kit - Contents and Required Tools" (→ p. 37).
2. Remove the power to the servo motor prior to installation of the shaft key or seal.
3. Inspect all surfaces for any damage, including nicks or burrs.
If nicks or burrs are present, use an abrasive cloth to remove.

NOTICE

Kollmorgen is not liable for user alterations or damages to the shaft or servo motor body.

4. Place the protective pad on a firm, flat, horizontal surface.
5. Place the servo motor on the protective pad to avoid damaging the powder coating.

NOTE

Kollmorgen does not recommend gluing the keyways into the shaft.

6. Using either the half/modified key or full key, insert the keyway into the keyway slot in the shaft.
7. Using the plastic- or rubber-lined pliers, press the keyway into the shaft as far as it can go. (Figure 2-1)
Press along length of key to ensure it is fully seated along the entire length of the keyway.

NOTICE

- Support the shaft during the installation process.
- Excessive radial loads may damage the motor bearings or rotor assembly.
- Kollmorgen is not liable for injury or damages occurred during any installation process.



Figure 2-1: Press the keyway

8. When the shaft key is installed, verify proper installation using a calibrated measurement device (e.g., calipers).
The keyway should be flush with the flat surface of the keyway slot. (Figure 2-2)



Figure 2-2: Example: Calipers measurement

NOTE

Shaft Height over key with Full Key Installed

The height along the entire keyway length should fall within these tolerance ranges when installing the full key. (Figure 2-3)

Motor Series	Shaft Height "X" (mm)
KEM-2V020 or KEM-xV040 (200W or 400W)	15.87 - 16.00
KEM-xV075 or KEM-xV100 (750W or 1000W)	21.37 - 21.50
KEM-xV150 to KEM-4V400 (1500W to 4000W)	26.71 - 27.00

KEY SHAFT

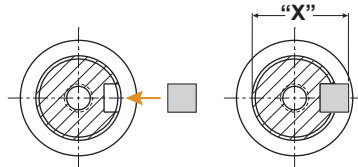


Figure 2-3: Key Shaft

Shaft Diameter with Half/Modified Key Installed

The modified key should align with the rounded surface of the shaft. (Figure 2-4)

Motor Series	Shaft Diameter (mm)
KEM-2V020 or KEM-xV040 (200W or 400W)	14.000 (+0.000/-0.011)
KEM-xV075 or KEM-xV100 (750W or 1000W)	19.000 (+0.000/-0.013)
KEM-xV150 to KEM-4V400 (1500W to 4000W)	24.000 (+0.000/-0.013)

SMOOTH SHAFT

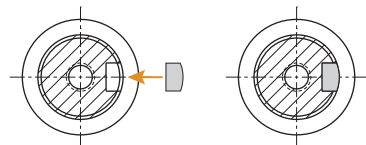


Figure 2-4: Smooth Shaft

See the individual servo motor series sections for their respective technical data, dimensional drawings, and key and keyway dimension details.

! IMPORTANT

- If the resulting height exceeds the tolerance range, the key is not properly installed.
 - Repeat Step 7.
- If the height still remains out of tolerance, contact Kollmorgen "Support and Services" (→ p. 89).

9. Visually inspect the keyway and shaft for any damage.
10. Spin the servo motor shaft by hand.
11. Look and listen for any squeaks, rubs, or other rough movements.
If the keyway installation is suspect, damage may have occurred during installation.
Contact Kollmorgen "Support and Services" (→ p. 89).

3 Kollmorgen Essentials Motor Shaft Seal Kit

This section is the installation instructions of the Kollmorgen Essentials Motor Shaft Seal Kit.

3.1 Kollmorgen Essentials Motor Shaft Seal Kit - Contents, Required Tools and Supplies, Optional Tools	42
3.1.1 Kit Contents	42
3.1.2 Required Tools	42
3.1.3 Required Supplies	42
3.2 Kollmorgen Essentials Motor Shaft Seal Kit - Material and Usage	44
3.2.1 Shaft Seal Kit Material	44
3.2.2 Shaft Seal Kit Usage	44
3.3 Kollmorgen Essentials Motor Shaft Seal Kit - Installation	45
3.4 Kollmorgen Essentials Motor Shaft Seal Kit - Seal Removal	50

3.1 Kollmorgen Essentials Motor Shaft Seal Kit - Contents, Required Tools and Supplies, Optional Tools

3.1.1 Kit Contents

The kit contents are:

- Individual shaft seal.
- QR code leading to this installation manual.

NOTICE

- Third-party shaft keys or seals are not approved for use with these servo motors.
- The use of third-party shaft keys or seals voids any implied or expressed warranties.

3.1.2 Required Tools

- Gloves.
- Clean brush to apply MOLYKOTE® grease.
- Abrasive cloth to remove nicks or burrs on shaft.
- Protective pad.

3.1.2.1 Optional Tools

- Additional pressing tool (e.g., rubber/wooden mallet) if hand force is insufficient.
- See:
 - "KEM-2V020 / KEM-xV040 - Installation Tool - Dimensional Drawing" (→ p. 55)
 - "KEM-xV075 / KEM-xV100 - Installation Tool - Dimensional Drawing" (→ p. 60)
 - "KEM-xV150 / KEM-xV250 - Installation Tool - Dimensional Drawing" (→ p. 65)
 - "KEM-xV300 / KEM-4V400 - Installation Tool - Dimensional Drawing" (→ p. 70)

3.1.3 Required Supplies

- MOLYKOTE G-4500 FM Multi-Purpose Synthetic Grease or equivalent. (Figure 3-1)
 - Used in applications up to 8000 RPM with a temperature range between -40 °C to +150 °C.

MOLYKOTE® G-4500 FM Multi-Purpose Synthetic Grease

Standard ⁽¹⁾	Test	Unit	Result
Consistency, viscosity, specific gravity			
DIN 51 818	NLGI consistency class		2
ASTM D217	Penetration at 25°C (77°F) (W/60)	mm/10	265-295
ASTM D445	Base oil viscosity at 40°C (104°F)	cSt	100
ASTM D445	Base oil viscosity at 100°C (212°F)	cSt	14.4
ISO 2811	Specific gravity at 25°C (77°F)	g/ml	0.84
Temperature			
	Temperature range (approximate)	°C	-40 to 150
		°F	-40 to 302
ASTM D2265	Dropping point	°C	>270
		°F	>518
FD 791-32/2	Oil bleed, 24 hours, 100°C (212°F)	wt%	3.1
FD 791-32/2	Oil evaporation, 24 hours, 100°C (212°F)	wt%	0.4
ASTM D4693	Low-temperature torque at -40°C (-40°F)	Nm	0.9
Load-carrying capacity, wear protection, speed			
ASTM D2266	Four-ball wear, 40 kg, 1,200 rpm	mm	0.5
ASTM D2596	Four-ball EP, weld load, minimum	N	>3,100
ASTM D2509	TIMKEN test, OK load	kg	>18
	Dn, bearing ID (mm)x(rpm), estimated		325,000

⁽¹⁾ASTM: American Society for Testing and Materials. ISO: International Standardization Organization. DIN: Deutsche Industrie Norm. FD: Federal Standard: Testing Method of Lubricants Liquid Fuels and Related Products.

Figure 3-1: MOLYKOTE Product Label

3.2 Kollmorgen Essentials Motor Shaft Seal Kit - Material and Usage

To order a Shaft Seal Kit, see "Shaft Seal Kit" (→ p. 34).

3.2.1 Shaft Seal Kit Material

The shaft seal is made of mineral filled PTFE (Teflon®).

- This is self-lubricating and is recommended for applications where regular lubrication of the shaft seal is not possible.
- There is a normal break-in period for Kollmorgen Teflon shaft seals.
 - The best conditions during the break-in period are running the motor for a few hours at the operational temperature and speed typical for the application.
- Some shedding of the Teflon shaft seal material is normal and does not affect the function.
 - The material shed should be reduced with usage.
- See "Shaft Seal" (→ p. 22).

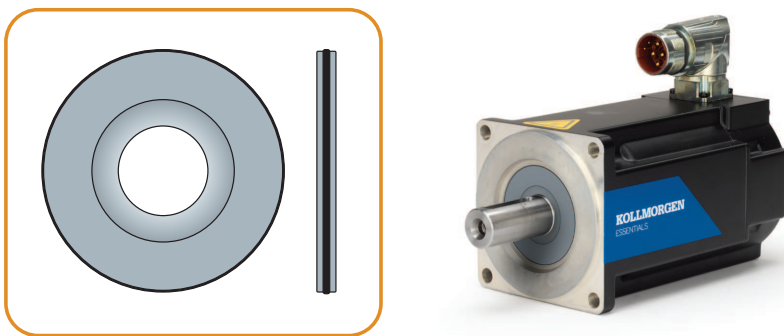


Figure 3-2: Shaft Seal

3.2.2 Shaft Seal Kit Usage

The Shaft Seal Kit is intended for environments where the servo motor is connected to a machine flange with an unsealed shaft region.

- The base IP rating for the servo motor is IP54.
- Shaft seals are for environments where small dust particles, water, oils, or other fluids may be present around the shaft side of the servo motor.
 - Shaft seals should NOT be used in environments where these contaminants are NOT present.
- Shaft seals help to prevent the ingress of these contaminants and prolong the life of the servo motor.
- If properly installed, the combination of the shaft seal and standard right-angle, rotatable connector meets the requirements for an IP65 rating.
- Shaft seals are subject to wear and require periodic inspection and replacement.

NOTE

The shaft seal is not required in applications where:

- The motor shaft and endbell are NOT exposed to oil, fluids, or fine dust.
- An IP rating of IP54 or less is sufficient.

3.3 Kollmorgen Essentials Motor Shaft Seal Kit - Installation

! IMPORTANT

Install the Shaft Seal Kit prior to installation of either keyway that is included with every Kollmorgen Essentials Motor.

! WARNING

Remove power (de-energize) to the servo motor prior to any installation work.

Procedure

1. Remove the power to the servo motor prior to installation of the shaft key or seal.
2. Verify all kit contents and required tools are available for kit installation.
See "Kollmorgen Essentials Motor Shaft Seal Kit - Contents, Required Tools and Supplies, Optional Tools" (→ p. 42).
3. Remove any installed shaft key (if applicable) from the shaft.
4. Inspect all surfaces for any damage, including nicks or burrs.
If nicks or burrs are present, use an abrasive cloth to remove.

NOTICE

- Be aware of the sharp edges of the keyway slot in the shaft.
- Use tape to protect the shaft seal lip from damage.

NOTICE

Kollmorgen is not liable for user alterations or damages to the shaft or servo motor body.

5. Place the protective pad on a firm, flat, horizontal surface.
6. Place the servo motor on the protective pad to avoid damaging the powder coating. (Figure 3-3)



Figure 3-3: Servo motor on protective pad

7. Inspect and clean the motor shaft and pilot ring surfaces where the shaft seal makes contact.
8. Using a clean brush with MOLYKOTE grease, coat the inner shaft seal lip (Figure 3-4) and apply a film of grease to the outer diameter O-ring of the seal (Figure 3-5).

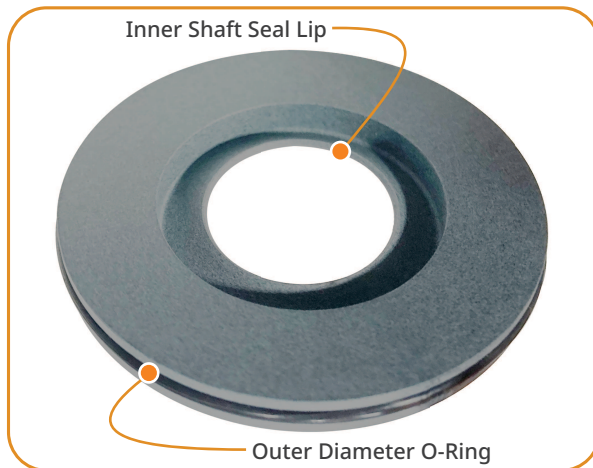


Figure 3-4: MOLYKOTE® grease to coat the inner shaft seal lip and outer diameter o-ring of the seal



Figure 3-5: MOLYKOTE grease to coat the outer diameter O-ring

NOTICE

- Shaft seals require a lubricant to reduce wear.
- Lubricate **only** the inner shaft seal lip and outer diameter o-ring of the seal.
- **Do not lubricate the motor pilot bore.**

9. Place the lubricated shaft seal over the servo motor shaft.
10. Carefully maneuver the seal inner diameter over the shaft diameter.

NOTICE

- The shaft seal **must not** be cut or nicked during this operation or the IP rating is compromised.
- If any shaft seal damage is noticed, dispose of the seal and replace with a new one starting with Step 7.

11. Insert the shaft seal over the shaft so that the ID lip curves up. (Figure 3-6)

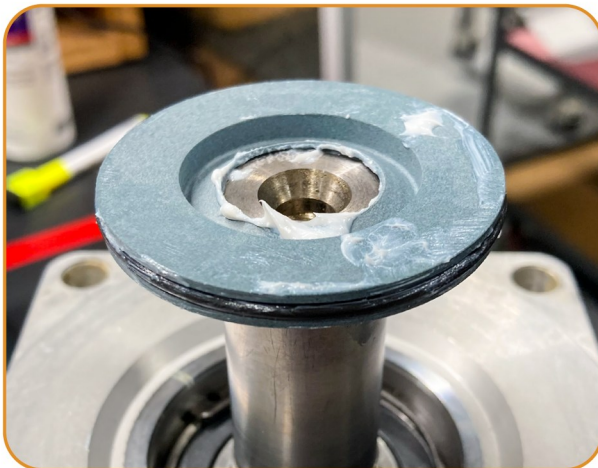


Figure 3-6: Shaft seal over the shaft

12. Use your hands, or the optional installation tool, to gently press the seal into position. (Figure 3-7)
See "Optional Tools" (→ p. 42).



Figure 3-7: Seal in position

13. Use your hands or the optional installation tool to press the shaft seal until it is seated flush with the servo motor pilot height with the back of the seal resting against the beveled retaining ring. (Figure 3-8)

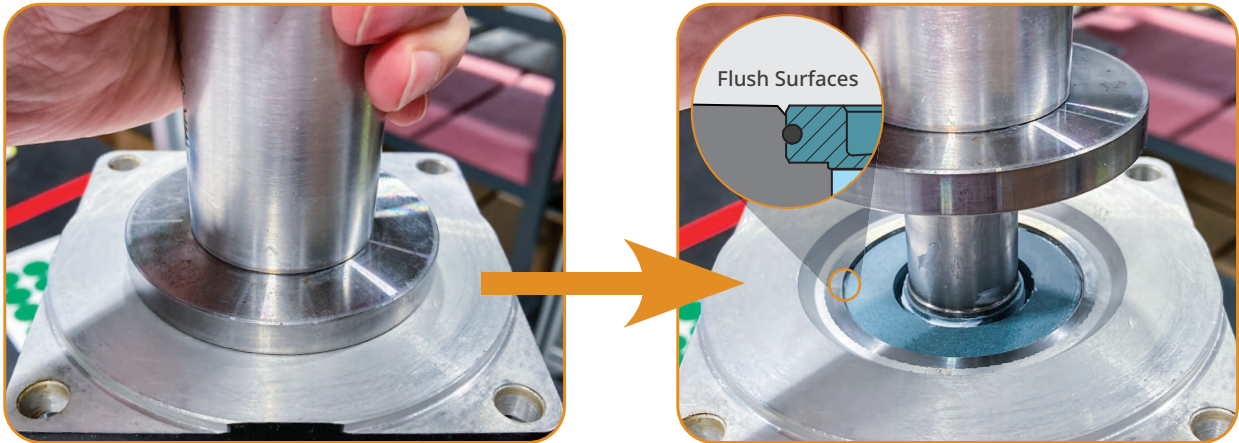


Figure 3-8: Installation tool used to press the shaft seal

NOTICE

- The beveled retaining ring in front of the bearing should:
 - Act as a natural axial limit for the shaft seal.
 - Protect against any movement of the rotor assembly that could cause unintentional damage.
- Proper installation is when the seal is flush, or sub-flush, with the front surface of the pilot. (Figure 3-9)
- Significant force should not be necessary, but do not exceed the limits of the axial force identified in this table:

Motor Series	Maximum Axial Force (N)
KEM-2V020 or KEM-xV040	600
KEM-xV075 or KEM-xV100	1400
KEM-xV150 or KEM-xV250	1740
KEM-xV300 or KEM-4V400	2200

NOTICE

- Do not press on the shaft during shaft seal installation.
- Pay careful attention to not damage the motor flange during installation.

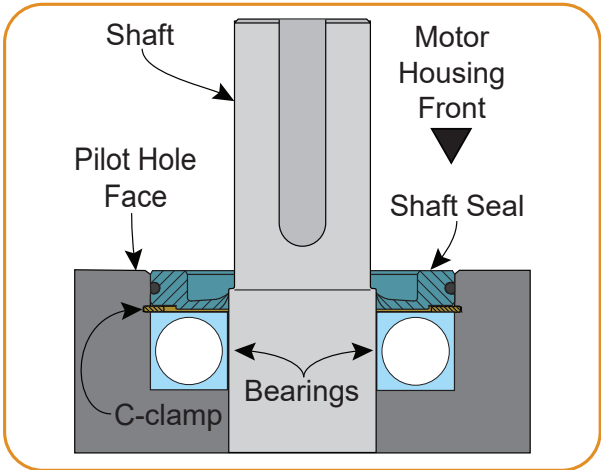


Figure 3-9: Flush seal

14. Remove the installation tool from the seal and visually inspect the installation. (Figure 3-10)

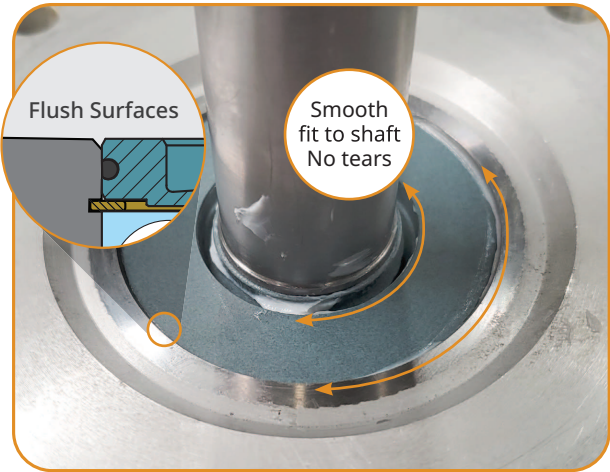


Figure 3-10: Inspect the installation

! IMPORTANT

The outside diameter of the shaft seal should be flush or sub-flush with the motor pilot height. (Figure 3-10)

15. Wipe the excess MOLYKOTE® grease off the shaft. (Figure 3-11)



Figure 3-11: Wipe off the MOLYKOTE grease

16. Spin the servo motor shaft by hand.
17. Look and listen for any squeaks, rubs, or tears in the seal.
If the seal installation is suspect, remove and replace the seal starting at Step 7.
18. Install applicable shaft key into the servo motor shaft.
See "Kollmorgen Essentials Motor Shaft Key Kit - Installation" (→ p. 38).

See Also

"Kollmorgen Essentials Motor Shaft Seal Kit - Seal Removal" (→ p. 50).

3.4 Kollmorgen Essentials Motor Shaft Seal Kit - Seal Removal

1. Use an insulated, flat-head screw driver on the inside diameter of the shaft seal outer lip.
2. Carefully work around the seal, prying slowly until the seal can be grasped by hand and removed. (Figure 3-12)
This may require gentle twisting of the seal out of the motor bore.

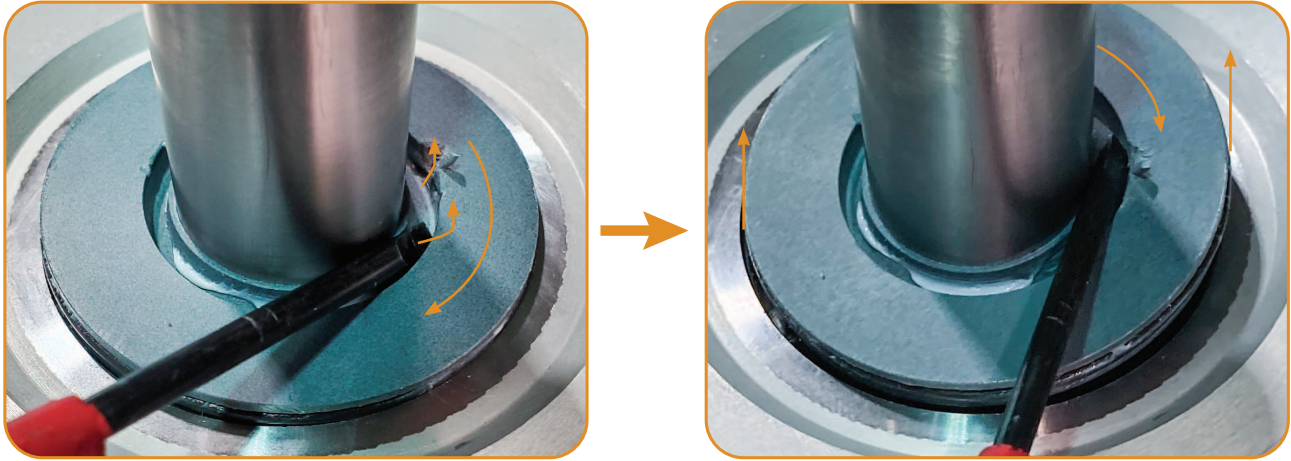


Figure 3-12: Shaft seal removal

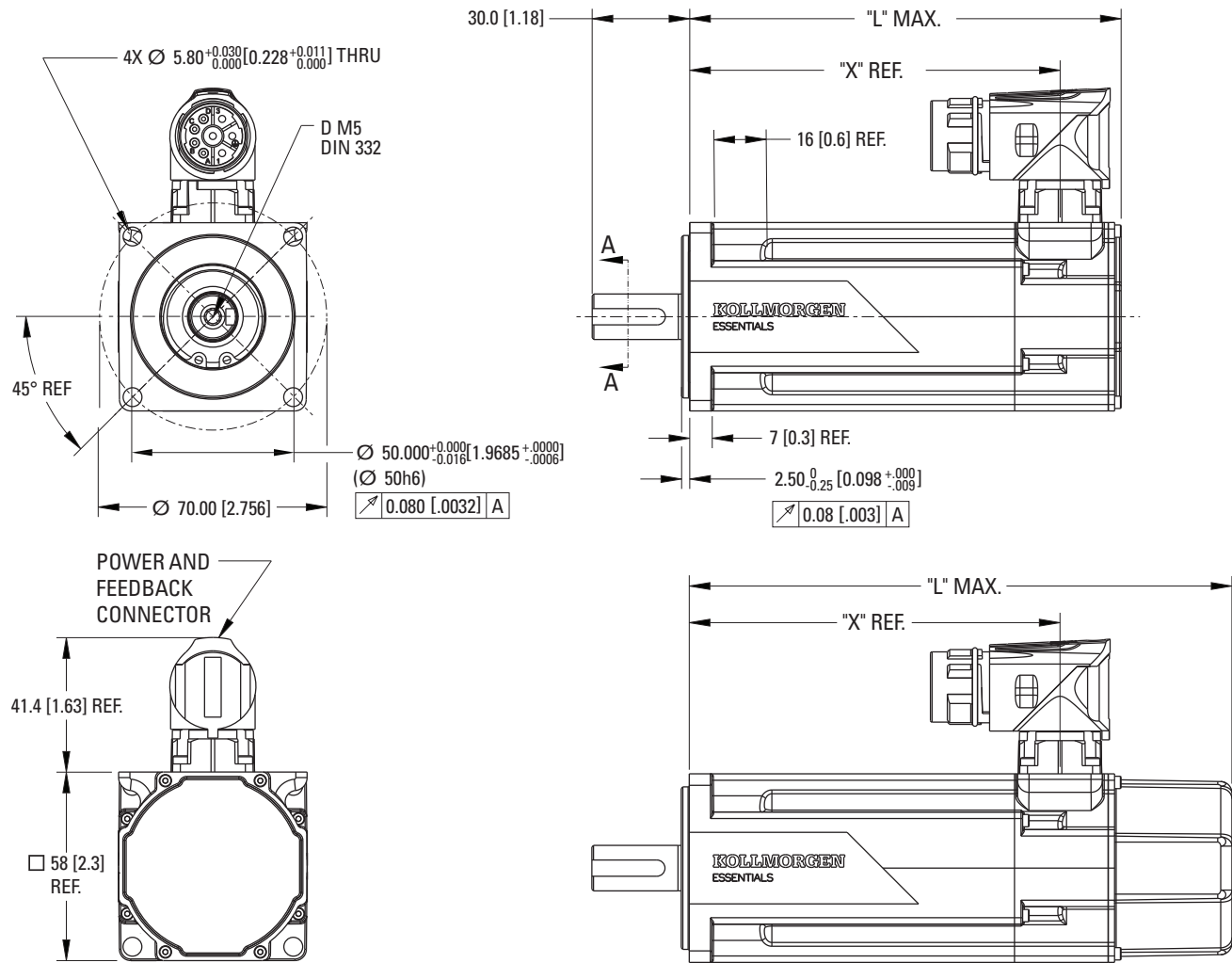
NOTICE

- **Do not** pry against the front endbell or shaft.
- This could cause potential damage to these components.

4 KEM-2V020 and KEM-xV040 - Technical Data

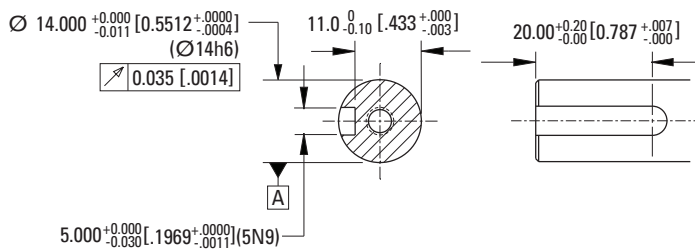
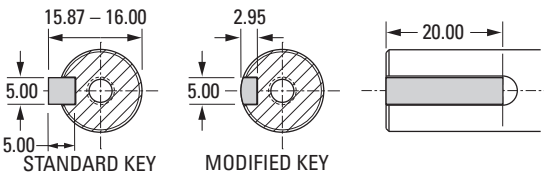
4.1 KEM-2V020 / KEM-xV040 - Dimensional Drawing and Data	52
4.2 KEM-2V020 / KEM-xV040 - Servo Motor Parameters	53
4.3 KEM-2V020 / KEM-xV040 - Performance Data	54
4.4 KEM-2V020 / KEM-xV040 - Installation Tool - Dimensional Drawing	55

4.1 KEM-2V020 / KEM-xV040 - Dimensional Drawing and Data



Shaft Key Dimensions

NOTE:
EACH MOTOR PACKAGE CONTAINS
1X MODIFIED KEY - RECTANGULAR METRIC (5.00 X 2.95 X 20.00)
1X STANDARD KEY - RECTANGULAR METRIC (5.00 X 5.00 X 20.00)



"L" and "X" Dimensional Data

Model	"X" REF.	No Brake	Brake
		"L" MAX.	"L" MAX.
KEM-2V020	85.60 [3.370]	104.90 [4.130]	139.00 [5.472]
KEM-xV040	114.10 [4.492]	133.40 [5.252]	167.50 [6.594]

Dimensions in mm [inches]

4.2 KEM-2V020 / KEM-xV040 - Servo Motor Parameters

KEM-2V020/KEM-xV040 - 58 mm Flange Series				KEM-2V-	KEM-2V-	KEM-4V-
Parameters	Tol	Symbol	Units	020	040	
Torque Constant ①	±10%	K _t	Nm/A _{rms}	0.48	0.57	0.96
			lb-in/A _{rms}	4.25	5.0	8.5
Back EMF Constant ⑥	±10%	K _e	V _{rms} /krpm	30.9	36.6	62.0
Motor Constant	Nom	K _m	N-m/√W	0.110	0.175	0.170
			lb-in/√W	0.97	1.55	1.52
Resistance (line-line) ⑥	±10%	R _m	ohm	12.9	7.0	20.8
Inductance (line-line)		L	mH	21.2	14.1	40.4
Inertia (includes SFD-M feedback) ③	±10%	J _m	kg-cm ²	0.118	0.209	
			lb-in-s ²	1.0E-04	1.8E-04	
Optional Brake Inertia (additional)	±10%	J _m	kg-cm ²	0.018		
			lb-in-s ²	1.6E-05		
Weight (w/o brake) ⑧		W	kg	1.08	1.48	
			lb	2.4	3.3	
Static Friction ①⑦		T _f	Nm	0.012	0.018	
			lb-in	0.11	0.16	
Viscous Damping ①		K _{dv}	Nm/krpm	0.004	0.008	
			lb-in/krpm	0.035	0.071	
Thermal Time Constant		TCT	minutes	7	9	
Thermal Resistance		R _{thw-a}	°C/W	1.47	1.06	
Pole Pairs				6		
Heat Sink Size ④				10"x10"x0.25" Aluminum Plate		

Notes:

① Motor winding temperature rise, $\Delta T = 100^\circ\text{C}$, at 40°C ambient.

② All data referenced to sinusoidal commutation.

③ Add brake inertia if applicable for total inertia.

④ Motor with standard heat sink.

⑤ May be limited at some values of V_{bus} .

⑥ Measured at 25°C .

⑦ For motors with optional shaft seal, reduce torque shown by 0.047 Nm, and increase T_f by the same amount.

⑧ Brake option increases weight by 0.27 kg (0.60 lb).

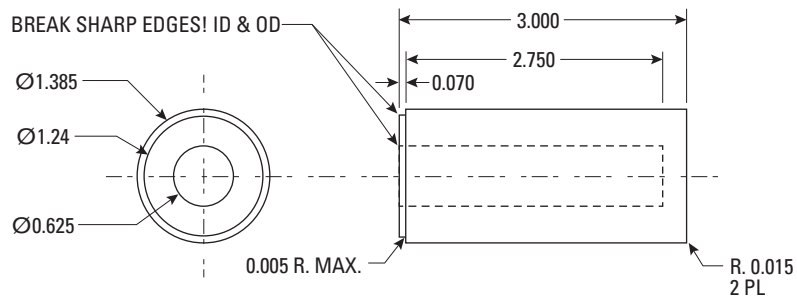
4.3 KEM-2V020 / KEM-xV040 - Performance Data

KEM-2V020/KEM-xV040 - 58 mm Flange Series				KEM-2V-				KEM-4V-	
				020		040		040	
Parameters	Tol	Symbol	Units	No Brake	w/ Brake	No Brake	w/ Brake	No Brake	w/ Brake
Max Rated Voltage	Max	–	Vac	240		240		480	
Continuous Torque for ΔT winding = 100°C ①②⑦	Nom	T _{CS}	Nm	0.74	0.73	1.40	1.32	1.37	1.29
			lb-in	6.5	6.5	12.4	11.7	12.1	11.4
Continuous Current for ΔT winding = 100°C ①②⑦	Nom	I _{CS}	A _{RMS}	1.56	1.54	2.50	2.36	1.45	1.37
Continuous Torque for ΔT winding = 60°C ②⑦	Nom	T _{CS}	Nm	0.59	0.58	1.12	1.06	1.10	1.03
			lb-in	5.2	5.1	9.9	9.4	9.7	9.1
Max Mechanical Speed ⑤	Nom	N _{max}	rpm	6000		6000		6000	
Peak Torque ①②	Nom	T _p	Nm	2.09		3.96		3.89	
			lb-in	18.5		35		34.4	
Peak Current	Nom	I _p	A _{RMS}	4.7		7.50		4.35	
120 Vac		T _{rtd}	Nm	0.74	0.72	1.37	1.30	1.36	1.28
			lb-in	6.5	6.4	12.1	11.5	12.0	11.3
Rated Speed		N _{rtd}	rpm	1000		1000		500	
Rated Power (speed) ①②⑦		P _{rtd}	W	0.08	0.08	0.14	0.14	0.07	
			Hp	0.11	0.11	0.19	.019	0.09	
240 Vac		T _{rtd}	Nm	0.70	0.67	1.30	1.25	1.33	1.27
			lb-in	6.2	5.9	11.5	11.1	11.8	11.2
Rated Speed		N _{rtd}	rpm	3000		3000		1500	
Rated Power (speed) ①②⑦		P _{rtd}	kW	0.22	0.21	0.41	0.39	0.21	0.20
			Hp	0.30	0.28	0.55	0.52	0.28	0.27
400 Vac		T _{rtd}	Nm	–		–		1.28	1.23
			lb-in	–		–		11.3	10.9
Rated Speed		N _{rtd}	rpm	–		–		3000	
Rated Power (speed) ①②⑦		P _{rtd}	kW	–		–		0.40	0.39
			Hp	–		–		0.54	0.52
480 Vac		T _{rtd}	Nm	–		–		1.27	1.22
			lb-in	–		–		11.2	10.8
Rated Speed		N _{rtd}	rpm	–		–		3000	
Rated Power (speed) ①②⑦		P _{rtd}	kW	–		–		0.40	0.38
			Hp	–		–		0.54	0.51

Notes:
① Motor winding temperature rise, ΔT = 100°C, at 40°C ambient.
② All data referenced to sinusoidal commutation.
③ Add brake inertia if applicable for total inertia.
④ Motor with standard heat sink.
⑤ May be limited at some values of Vbus.
⑥ Measured at 25°C.
⑦ For motors with optional shaft seal, reduce torque shown by 0.047 Nm, and increase T_f by the same amount.
⑧ Brake option increases weight by 0.27 kg (0.60 lb).

4.4 KEM-2V020 / KEM-xV040 - Installation Tool - Dimensional Drawing

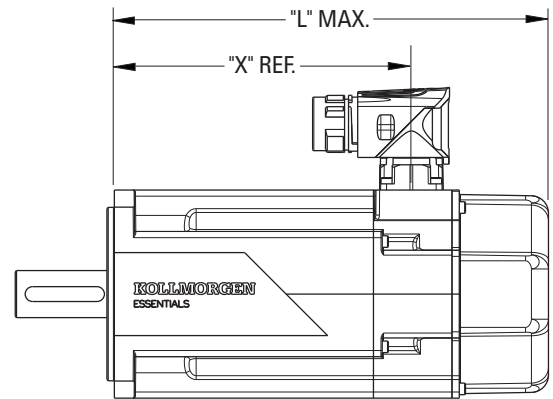
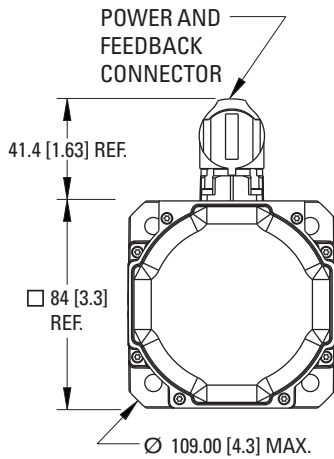
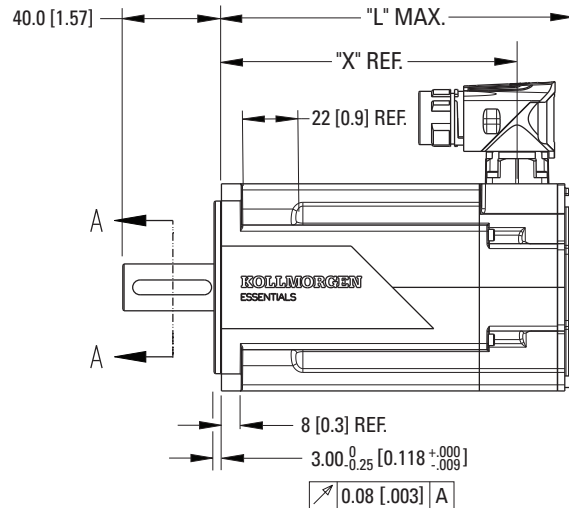
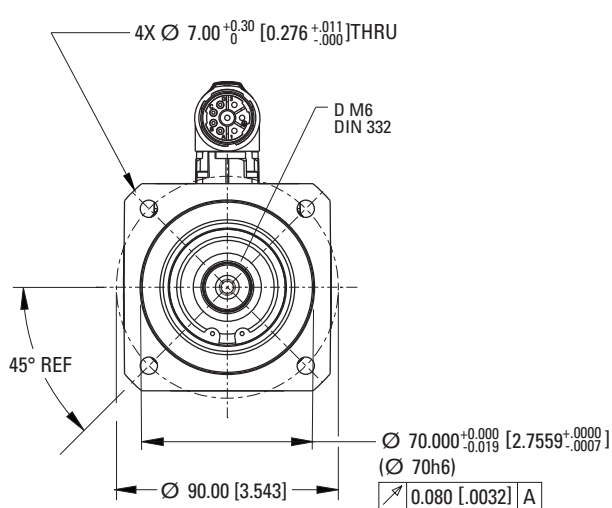
- The shaft seal installation tools should be made of aluminum.
- The side indicating **Break sharp edges** is in contact with the shaft seal.
- Sharp edges should be broken to ensure the shaft seal is not damaged by the installation tool.



5 KEM-xV075 and KEM-xV100 - Technical Data

5.1 KEM-xV075 / KEM-xV100 - Dimensional Drawing and Data	57
5.2 KEM-xV075 / KEM-xV100 - Servo Motor Parameters	58
5.3 KEM-xV075 / KEM-xV100 - Performance Data	59
5.4 KEM-xV075 / KEM-xV100 - Installation Tool - Dimensional Drawing	60

5.1 KEM-xV075 / KEM-xV100 - Dimensional Drawing and Data



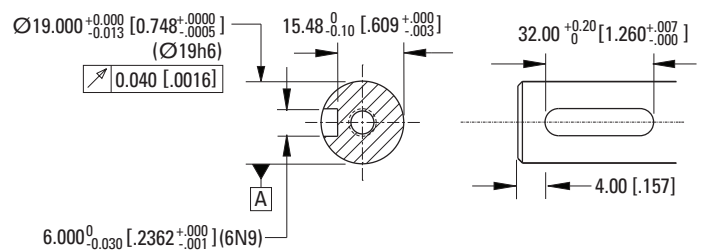
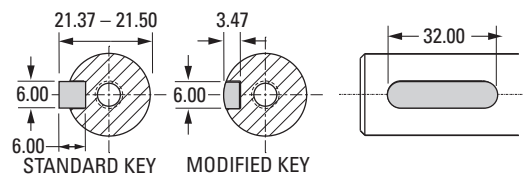
Shaft Key Dimensions

NOTE:

EACH MOTOR PACKAGE CONTAINS

1X MODIFIED KEY - ROUND METRIC (6.00 X 3.47 X 32.00)

1X STANDARD KEY - ROUND METRIC (6.00 X 6.00 X 32.00)



"L" and "X" Dimensional Data

Model	"X" REF.	No Brake	Brake
		"L" MAX.	"L" MAX.
KEM-xV075	102.40 [4.031]	124.80 [4.913]	158.30 [6.232]
KEM-xV100	119.90 [4.720]	142.30 [5.602]	175.80 [6.921]

Dimensions in mm [inches]

5.2 KEM-xV075 / KEM-xV100 - Servo Motor Parameters

KEM-xV075/KEM-xV100 – 84 mm Flange Series				KEM-2V-	KEM-4V-	KEM-2V-	KEM-4V-
Parameters	Tol	Symbol	Units	075		100	
Torque Constant ①	±10%	K _T	Nm/A _{rms}	0.72	1.1	0.77	1.2
			lb-in/A _{rms}	6.4	9.7	6.8	10.6
Back EMF Constant ⑥	±10%	K _e	V _{rms} /krpm	46.4	71	50	78
Motor Constant	Nom	K _m	N-m/√W	0.325	0.32	0.41	0.41
			lb-in-in/√W	2.88	2.82	3.63	3.63
Resistance (line-line) ⑥	±10%	R _m	ohm	3.28	8.0	2.35	5.7
Inductance (line-line)		L	mH	9.9	22.9	7.5	18.2
Inertia (includes SFD-M feedback) ③	±10%	J _m	kg-cm ²	0.950		1.350	
			lb-in-s ²	8.4E-04		1.2E-03	
Optional Brake Inertia (additional)	±10%	J _m	kg-cm ²	0.070			
			lb-in-s ²	6.2E-05			
Weight (w/o brake) ⑧		W	kg	2.61		3.11	
			lb	5.8		6.9	
Static Friction ①⑦		T _f	Nm	0.037		0.042	
			lb-in	0.33		0.37	
Viscous Damping ①		K _{dv}	Nm/krpm	0.014		0.017	
			lb-in/krpm	0.124		0.150	
Thermal Time Constant		TCT	minutes	12		15	
Thermal Resistance		R _{thw-a}	°C/W	0.95		0.87	
Pole Pairs				5			
Heat Sink Size ④				10"x10"x0.25" Aluminum Plate			

Notes:
① Motor winding temperature rise, ΔT = 100°C, at 40°C ambient.
② All data referenced to sinusoidal commutation.
③ Add brake inertia if applicable for total inertia.
④ Motor with standard heat sink.
⑤ May be limited at some values of Vbus.
⑥ Measured at 25°C.
⑦ For motors with optional shaft seal, reduce torque shown by 0.071 Nm, and increase T_f by the same amount.
⑧ Brake option increases weight by 0.69 kg (1.52 lb).

5.3 KEM-xV075 / KEM-xV100 - Performance Data

KEM-xV075/KEM-xV100 – 84 mm Flange Series

				KEM-2V-				KEM-4V-			
				075		100		075		100	
Parameters	Tol	Symbol	Units	No Brake	w/ Brake	No Brake	w/ Brake	No Brake	w/ Brake	No Brake	w/ Brake
Max Rated Voltage	Max	–	Vac	240		240		480		480	
Continuous Torque for ΔT winding = 100°C ①②⑦	Nom	T_{CS}	Nm	2.74	2.67	3.63	3.57	2.68	2.61	3.64	3.57
			lb-in	24.2	23.6	32.1	31.6	23.7	23.1	32.2	31.6
Continuous Current for ΔT winding = 100°C ①②⑦	Nom	I_{CS}	A_{rms}	3.85	3.76	4.76	4.67	2.47	2.41	3.06	3.00
Continuous Torque for ΔT winding = 60°C ②⑦	Nom	T_{CS}	Nm	2.19	2.14	2.90	2.86	2.14	2.09	2.91	2.86
			lb-in	19.4	18.9	25.7	25.3	18.9	18.5	25.8	25.3
Max Mechanical Speed ⑤	Nom	N_{max}	rpm	6000		6000		6000		6000	
Peak Torque ①②	Nom	T_p	Nm	7.2		9.7		7.0		9.7	
			lb-in	64		86		62		86	
Peak Current	Nom	I_p	A_{rms}	11.6		14.3		7.4		9.2	
120 Vac Rated Torque (speed) ①②⑦		T_{rtd}	Nm	2.69	2.62	3.56	3.48	2.65	2.58	3.61	3.53
			lb-in	23.8	23.2	31.5	30.8	23.5	22.8	31.9	31.2
120 Vac Rated Speed		N_{rtd}	rpm	1000		1000		500		500	
120 Vac Rated Power (speed) ①②⑦		P_{rtd}	W	0.28	0.27	0.37	0.36	0.14	0.14	0.19	0.18
			Hp	0.38	0.36	0.50	0.48	0.19	0.19	0.25	0.24
240 Vac Rated Torque (speed) ①②⑦		T_{rtd}	Nm	2.52	2.44	3.30	3.19	2.55	2.48	3.46	3.37
			lb-in	22.3	21.6	29.2	28.2	22.6	21.9	30.6	29.8
240 Vac Rated Speed		N_{rtd}	rpm	3000		3000		2000		2000	
240 Vac Rated Power (speed) ①②⑦		P_{rtd}	kW	0.79	0.77	1.04	1.00	0.53	0.52	0.72	0.71
			Hp	1.06	1.03	1.39	1.34	0.71	0.70	0.97	0.95
400 Vac Rated Torque (speed) ①②⑦		T_{rtd}	Nm	–		–		2.44	2.37	3.29	3.19
			lb-in	–		–		21.6	21.0	29.1	28.2
400 Vac Rated Speed		N_{rtd}	rpm	–		–		3000		3000	
400 Vac Rated Power (speed) ①②⑦		P_{rtd}	kW	–		–		0.77	0.74	1.03	1.00
			Hp	–		–		1.03	0.99	1.38	1.34
480 Vac Rated Torque (speed) ①②⑦		T_{rtd}	Nm	–		–		2.43	2.36	3.25	3.15
			lb-in	–		–		21.5	20.9	28.8	27.9
480 Vac Rated Speed		N_{rtd}	rpm	–		–		3000		3000	
480 Vac Rated Power (speed) ①②⑦		P_{rtd}	kW	–		–		0.76	0.74	1.02	0.99
			Hp	–		–		1.02	0.99	1.37	1.33

Notes:

① Motor winding temperature rise, $\Delta T = 100^\circ\text{C}$, at 40°C ambient.

② All data referenced to sinusoidal commutation.

③ Add brake inertia if applicable for total inertia.

④ Motor with standard heat sink.

⑤ May be limited at some values of V_{bus} .

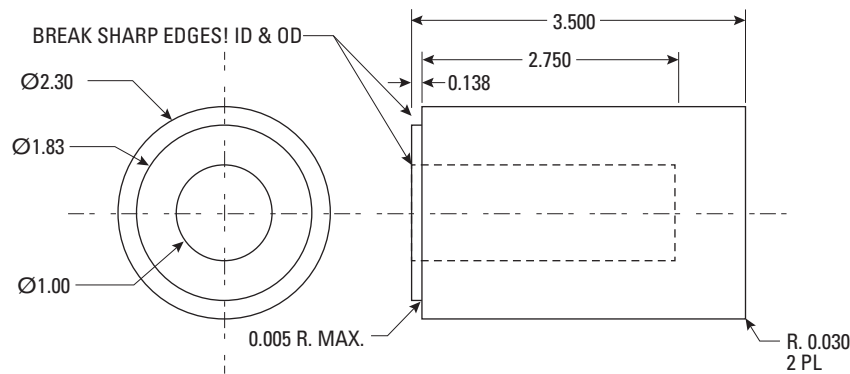
⑥ Measured at 25°C .

⑦ For motors with optional shaft seal, reduce torque shown by 0.071 Nm, and increase T_f by the same amount.

⑧ Brake option increases weight by 0.69 kg (1.52 lb).

5.4 KEM-xV075 / KEM-xV100 - Installation Tool - Dimensional Drawing

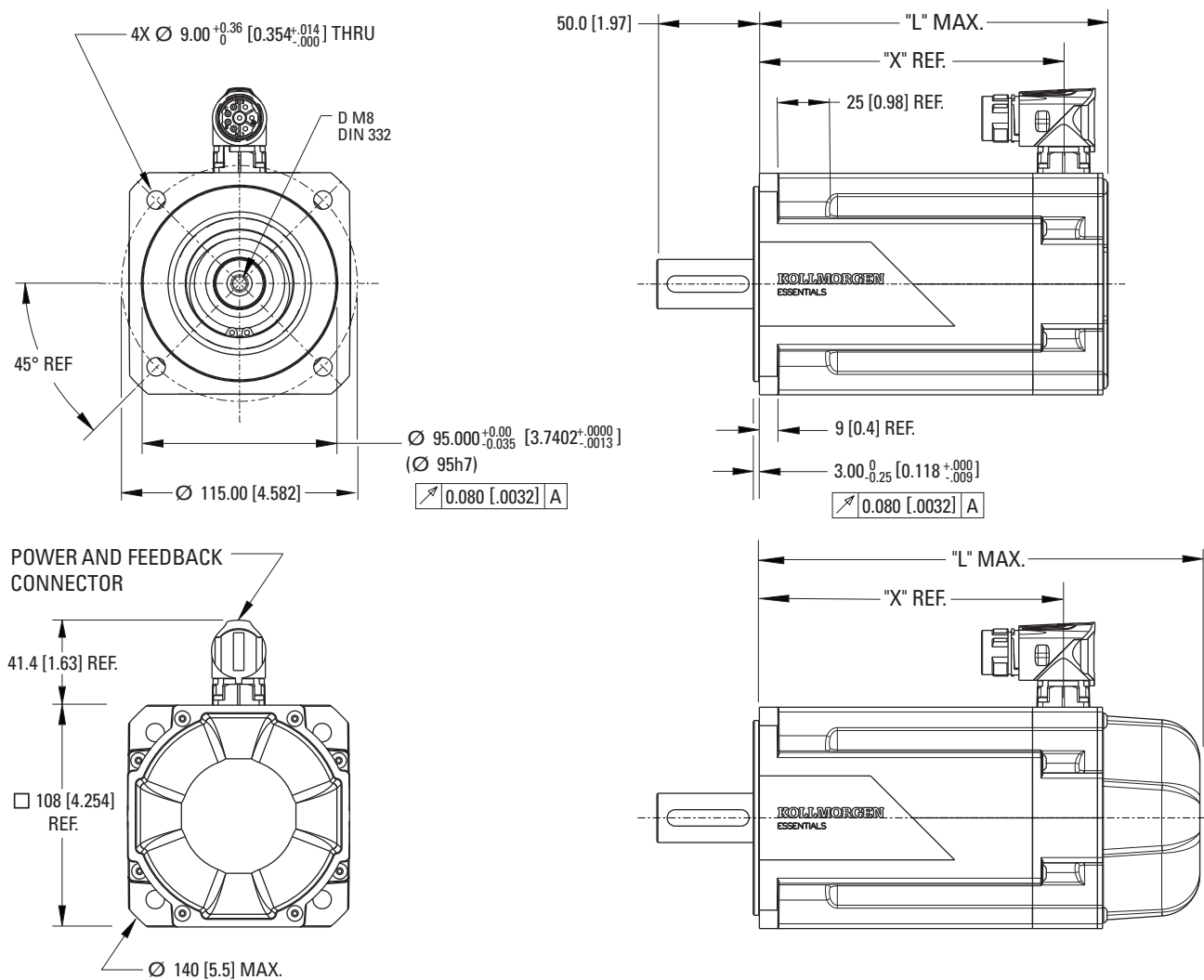
- The shaft seal installation tools should be made of aluminum.
- The side indicating **Break sharp edges** is in contact with the shaft seal.
- Sharp edges should be broken to ensure the shaft seal is not damaged by the installation tool.



6 KEM-xV150 and KEM-xV250 - Technical Data

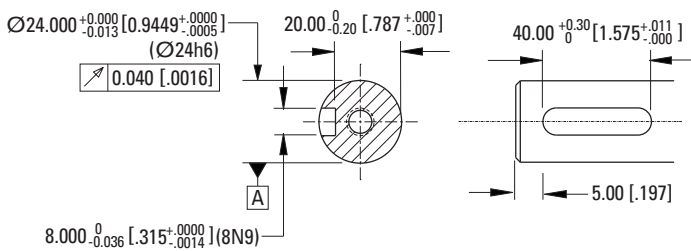
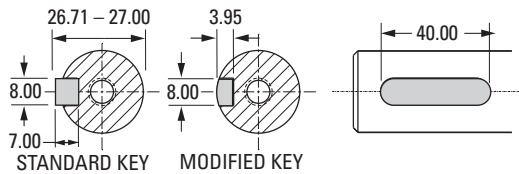
6.1 KEM-xV150 / KEM-xV250 - Dimensional Drawing and Data	62
6.2 KEM-xV150 / KEM-xV250 - Servo Motor Parameters	63
6.3 KEM-xV150 / KEM-xV250 - Performance Data	64
6.4 KEM-xV150 / KEM-xV250 - Installation Tool - Dimensional Drawing	65

6.1 KEM-xV150 / KEM-xV250 - Dimensional Drawing and Data



Shaft Key Dimensions

NOTE:
EACH MOTOR PACKAGE CONTAINS
1X MODIFIED KEY - ROUND METRIC (8.00 X 3.95 X 40.00)
1X STANDARD KEY - ROUND METRIC (8.00 X 7.00 X 40.00)



"L" and "X" Dimensional Data

Model	"X" REF.	No Brake	Brake
		"L" MAX.	"L" MAX.
KEM-xV150	111.30 [4.382]	133.50 [5.256]	178.50 [7.027]
KEM-xV250	148.30 [5.838]	170.50 [6.713]	215.50 [8.484]

Dimensions in mm [inches]

6.2 KEM-xV150 / KEM-xV250 - Servo Motor Parameters

KEM-xV150/KEM-xV250 – 108 mm Flange Series				KEM-2V-	KEM-4V-	KEM-2V-	KEM-4V-
Parameters	Tol	Symbol	Units	150		250	
Torque Constant ①	±10%	K _t	Nm/A _{rms}	0.75	1.27	0.94	1.49
			lb-in/A _{rms}	6.6	11.2	8.3	13.2
Back EMF Constant ⑥	±10%	K _e	V _{rms} /krpm	48.5	82	61	97
Motor Constant	Nom	K _m	N-m/√W	0.59	0.92	0.58	0.93
			lb-in/√W	5.3	8.2	5.1	8.2
Resistance (line-line) ⑥	±10%	R _m	ohm	1.06	3.19	0.69	1.72
Inductance (line-line)		L	mH	5.4	15.5	4.0	10.0
Inertia (includes SFD-M feedback) ③	±10%	J _m	kg-cm ²	4.10		7.8	
			lb-in-s ²	3.6E-05		6.9E-03	
Optional Brake Inertia (additional)	±10%	J _m	kg-cm ²	0.200			
			lb-in-s ²	1.8E-04			
Weight (w/o brake) ⑧		W	kg	4.40		6.4	
			lb	9.7		14.1	
Static Friction ①⑦		T _f	Nm	0.065		0.078	
			lb-in	0.58		0.69	
Viscous Damping ①		K _{dv}	Nm/krpm	0.023		0.033	
			lb-in/krpm	0.204		0.292	
Thermal Time Constant		TCT	minutes	14		19	
Thermal Resistance		R _{thw-a}	°C/W	0.69		0.57	
Pole Pairs				5			
Heat Sink Size ④				12"x12"x0.5" Aluminum Plate			

Notes:

① Motor winding temperature rise, $\Delta T = 100^\circ\text{C}$, at 40°C ambient.

② All data referenced to sinusoidal commutation.

③ Add brake inertia if applicable for total inertia.

④ Motor with standard heat sink.

⑤ May be limited at some values of V_{bus} .

⑥ Measured at 25°C .

⑦ For motors with optional shaft seal, reduce torque shown by 0.13 Nm, and increase T_f by the same amount.

⑧ Brake option increases weight by 1.2 kg (2.64 lb).

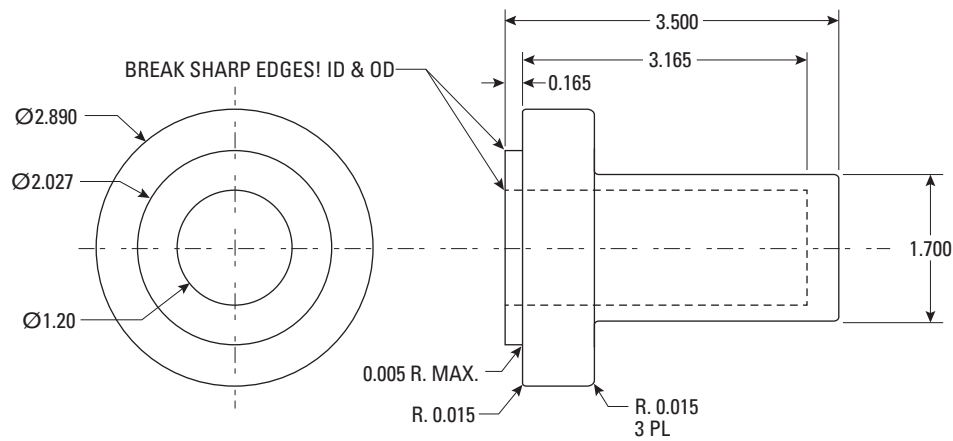
6.3 KEM-xV150 / KEM-xV250 - Performance Data

KEM-xV150/KEM-xV250 – 108 mm Flange Series				KEM-2V-				KEM-4V-			
				150		250		150		250	
Parameters	Tol	Symbol	Units	No Brake	w/ Brake	No Brake	w/ Brake	No Brake	w/ Brake	No Brake	w/ Brake
Max Rated Voltage	Max	–	Vac	240		240		480		480	
Continuous Torque for ΔT winding = 100°C ①②⑦	Nom	T _{CS}	Nm	5.9		10.1		5.8	5.7	10.1	10.1
			lb-in	52		89		51	50	89	89
Continuous Current for ΔT winding = 100°C ①②⑦	Nom	I _{CS}	A _{RMS}	8.0	7.9	10.9	10.9	4.58	4.56	6.9	6.9
Continuous Torque for ΔT winding = 60°C ②⑦	Nom	T _{CS}	Nm	4.72		8.1		4.64	4.56	8.1	8.1
			lb-in	41.8		72		41.1	40.4	72	72
Max Mechanical Speed ⑤	Nom	N _{max}	rpm	5000		5000		5000		5000	
Peak Torque ①②	Nom	T _p	Nm	13.3		23.4		13.1		23.4	
			lb-in	118		207		116		207	
Peak Current	Nom	I _p	A _{RMS}	20.0		27.2		11.5		17.2	
120 Vac		T _{rtd}	Nm	5.6		9.8	9.7	5.7		10.0	
			lb-in	49.6		87	86	50		89	
Rated Speed		N _{rtd}	rpm	1500		1000		500		500	
Rated Power (speed) ①②⑦		P _{rtd}	W	0.88		1.03	1.02	0.3		0.52	
			Hp	1.18		1.38	1.37	0.4		0.7	
240 Vac		T _{rtd}	Nm	5.1		8.6	8.5	5.4		9.6	9.5
			lb-in	45.1		76	75	47.8		85	84
Rated Speed		N _{rtd}	rpm	3000		3000		2000		1500	
Rated Power (speed) ①②⑦		P _{rtd}	kW	1.6		2.7	2.67	1.13		1.51	1.49
			Hp	2.15		3.62	3.58	1.52		2.02	2.00
400 Vac		T _{rtd}	Nm	–		–		5.0	4.98	8.5	8.4
			lb-in	–		–		44.3	44.1	75	74
Rated Speed		N _{rtd}	rpm	–		–		3000		3000	
Rated Power (speed) ①②⑦		P _{rtd}	kW	–		–		1.57	1.56	2.67	2.64
			Hp	–		–		2.11	2.09	3.58	3.54
480 Vac		T _{rtd}	Nm	–		–		4.94	4.90	8.3	8.2
			lb-in	–		–		43.7	43.4	73	73
Rated Speed		N _{rtd}	rpm	–		–		3000		3000	
Rated Power (speed) ①②⑦		P _{rtd}	kW	–		–		1.55	1.54	2.61	2.58
			Hp	–		–		2.08	2.07	3.50	3.46

- Notes:
- ① Motor winding temperature rise, ΔT = 100°C, at 40°C ambient.
 - ② All data referenced to sinusoidal commutation.
 - ③ Add brake inertia if applicable for total inertia.
 - ④ Motor with standard heat sink.
 - ⑤ May be limited at some values of V_{bus}.
 - ⑥ Measured at 25°C.
 - ⑦ For motors with optional shaft seal, reduce torque shown by 0.13 Nm, and increase T_r by the same amount.
 - ⑧ Brake option increases weight by 1.2 kg (2.64 lb).

6.4 KEM-xV150 / KEM-xV250 - Installation Tool - Dimensional Drawing

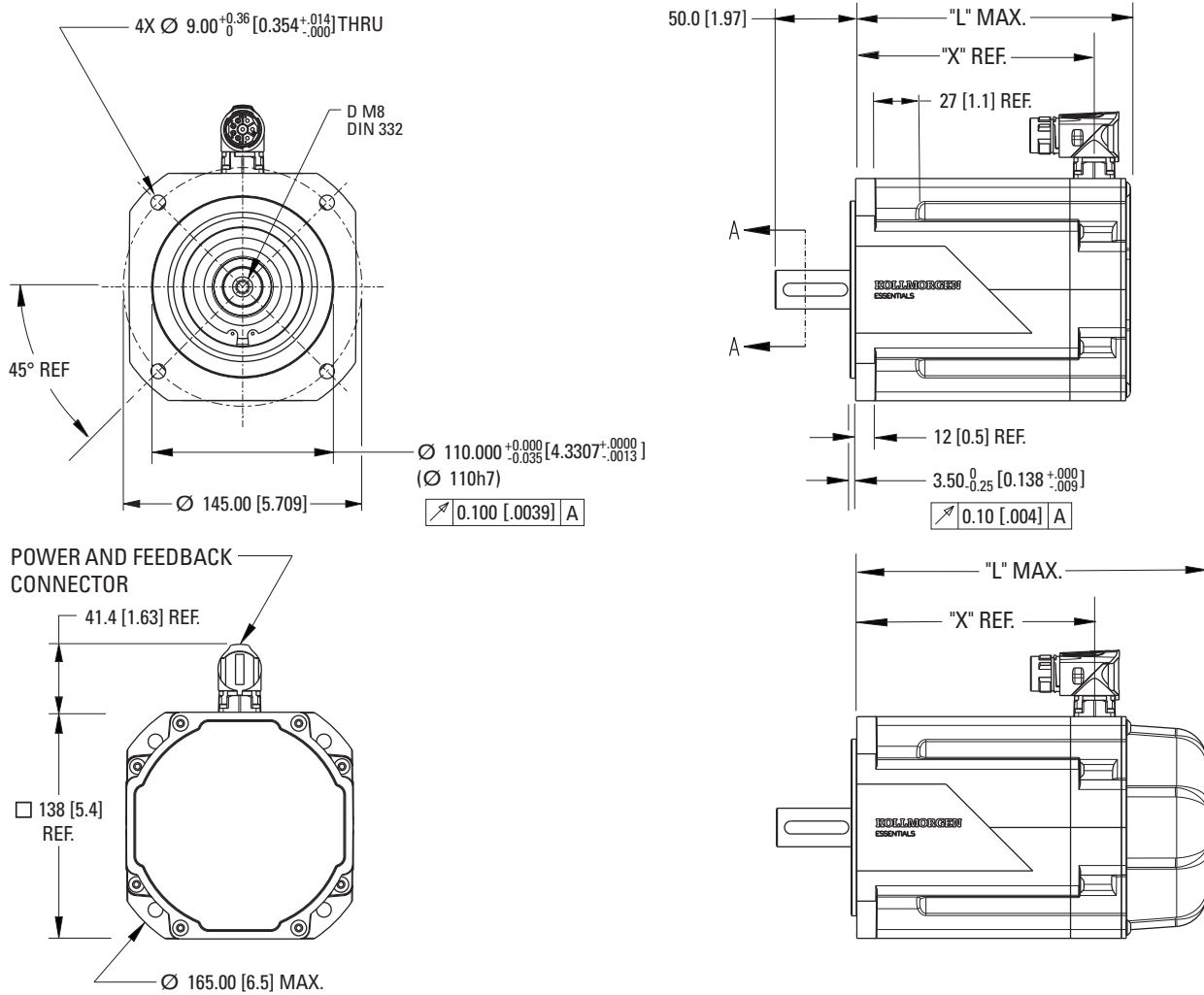
- The shaft seal installation tools should be made of aluminum.
- The side indicating **Break sharp edges** is in contact with the shaft seal.
- Sharp edges should be broken to ensure the shaft seal is not damaged by the installation tool.



7 KEM-xV300 and KEM-4V400 - Technical Data

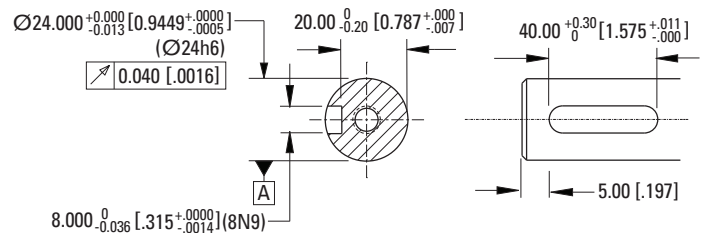
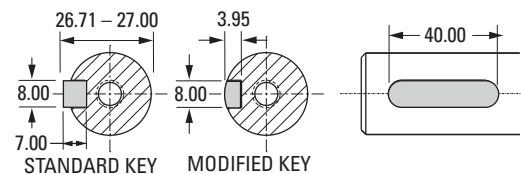
7.1 KEM-xV300 / KEM-4V400 - Dimensional Drawing and Data	67
7.2 KEM-xV300 / KEM-4V400 - Servo Motor Parameters	68
7.3 KEM-xV300 / KEM-4V400 - Performance Data	69
7.4 KEM-xV300 / KEM-4V400 - Installation Tool - Dimensional Drawing	70

7.1 KEM-xV300 / KEM-4V400 - Dimensional Drawing and Data



Shaft Key Dimensions

NOTE:
EACH MOTOR PACKAGE CONTAINS
1X MODIFIED KEY - ROUND METRIC (8.00 X 3.95 X 40.00)
1X STANDARD KEY - ROUND METRIC (8.00 X 7.00 X 40.00)



"L" and "X" Dimensional Data

Model	"X" REF.	No Brake	Brake
		"L" MAX.	"L" MAX.
KEM-xV300	125.50 [4.941]	148.70 [5.854]	195.70 [7.705]
KEM-4V400	148.00 [5.827]	171.20 [7.740]	218.20 [8.591]

Dimensions in mm [inches]

7.2 KEM-xV300 / KEM-4V400 - Servo Motor Parameters

KEM-xV300/KEM-4V400 – 138 mm Flange Series				KEM-2V-	KEM-4V-	KEM-4V-
Parameters	Tol	Symbol	Units	300		400
Torque Constant ①	±10%	K _t	Nm/A _{rms}	0.97	1.61	1.52
			lb-in/A _{rms}	8.6	14.2	13.5
Back EMF Constant ⑥	±10%	K _e	V _{rms} /krpm	63	104	99
Motor Constant	Nom	K _m	N-m/√W	1.02	1.04	1.35
			lb-in/√W	9.0	9.2	11.9
Resistance (line-line) ⑥	±10%	R _m	ohm	0.61	1.59	0.85
Inductance (line-line)		L	mH	3.39	9.40	5.40
Inertia (includes SFD-M feedback) ③	±10%	J _m	kg-cm ²	15.8		22.9
			lb-in-s ²	1.4E-02		2.0E-02
Optional Brake Inertia (additional)	±10%	J _m	kg-cm ²	1.0		
			lb-in-s ²	8.9E-04		
Weight (w/o brake) ⑧		W	kg	6.5		10.1
			lb	14.3		22.3
Static Friction ①⑦		T _f	Nm	0.120		0.180
			lb-in	1.06		1.59
Viscous Damping ①		K _{dv}	Nm/krpm	0.050		0.075
			lb-in/krpm	0.443		0.664
Thermal Time Constant		TCT	minutes	16		18
Thermal Resistance		R _{thw-a}	°C/W	0.53		0.41
Pole Pairs				5		
Heat Sink Size ④				18"x18"x0.5" Aluminum Plate		

Notes:
① Motor winding temperature rise, ΔT = 100°C, at 40°C ambient.
② All data referenced to sinusoidal commutation.
③ Add brake inertia if applicable for total inertia.
④ Motor with standard heat sink.
⑤ May be limited at some values of Vbus.
⑥ Measured at 25°C.
⑦ For motors with optional shaft seal, reduce torque shown by 0.25 Nm, and increase T_f by the same amount.
⑧ Brake option increases weight by 2.2 kg (4.84 lb).

7.3 KEM-xV300 / KEM-4V400 - Performance Data

KEM-xV300/KEM-4V400 – 138 mm Flange Series

				KEM-2V-		KEM-4V-			
				300		300		400	
Parameters	Tol	Symbol	Units	No Brake	w/ Brake	No Brake	w/ Brake	No Brake	w/ Brake
Max Rated Voltage	Max	–	Vac	240		480		480	
Continuous Torque for ΔT winding = 100°C ①②⑦	Nom	T_{CS}	Nm	11.5	11.4	11.8	11.7	17.4	17.2
			lb-in	102	101	104	104	154	152
Continuous Current for ΔT winding = 100°C ①②⑦	Nom	I_{CS}	A_{rms}	12.0	11.9	7.4	7.3	11.5	11.4
Continuous Torque for ΔT winding = 60°C ②⑦	Nom	T_{CS}	Nm	9.2	9.1	9.4	9.4	13.9	13.8
			lb-in	81	81	83	83	123	122
Max Mechanical Speed ⑤	Nom	N_{max}	rpm	4000		4000		4000	
Peak Torque ①②	Nom	T_p	Nm	26.8		27.3		40.5	
			lb-in	237		242		358	
Peak Current	Nom	I_p	A_{rms}	30.0		18.5		28.9	
120 Vac Rated Torque (speed) ①②⑦		T_{rtd}	Nm	11.1	11.0	11.6	11.5	16.9	16.6
			lb-in	98	97	103	102	150	147
120 Vac Rated Speed		N_{rtd}	rpm	1000		500		800	
120 Vac Rated Power (speed) ①②⑦		P_{rtd}	W	1.16	1.15	0.61	0.60	1.42	1.39
			Hp	1.56	1.54	0.82	0.80	1.90	1.86
240 Vac Rated Torque (speed) ①②⑦		T_{rtd}	Nm	9.6	9.5	11.1	11.0	15.7	15.4
			lb-in	85	84	98	97	139	136
240 Vac Rated Speed		N_{rtd}	rpm	3000		1500		1800	
240 Vac Rated Power (speed) ①②⑦		P_{rtd}	kW	3.02	2.98	1.74	1.73	2.96	2.9
			Hp	4.05	4.00	2.33	2.32	3.97	3.89
400 Vac Rated Torque (speed) ①②⑦		T_{rtd}	Nm	–		9.8	9.7	13.5	13.2
			lb-in	–		87	86	119	117
400 Vac Rated Speed		N_{rtd}	rpm	–		3000		3000	
400 Vac Rated Power (speed) ①②⑦		P_{rtd}	kW	–		3.08	3.05	4.24	4.15
			Hp	–		4.13	4.09	5.69	5.57
480 Vac Rated Torque (speed) ①②⑦		T_{rtd}	Nm	–		9.7	9.5	13.1	12.8
			lb-in	–		86	84	116	113
480 Vac Rated Speed		N_{rtd}	rpm	–		3000		3000	
480 Vac Rated Power (speed) ①②⑦		P_{rtd}	kW	–		3.05	2.98	4.12	4.02
			Hp	–		4.09	4.00	5.53	5.39

Notes:

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

② All data referenced to sinusoidal commutation.

③ Add brake inertia if applicable for total inertia.

④ Motor with standard heat sink.

⑤ May be limited at some values of V_{bus} .

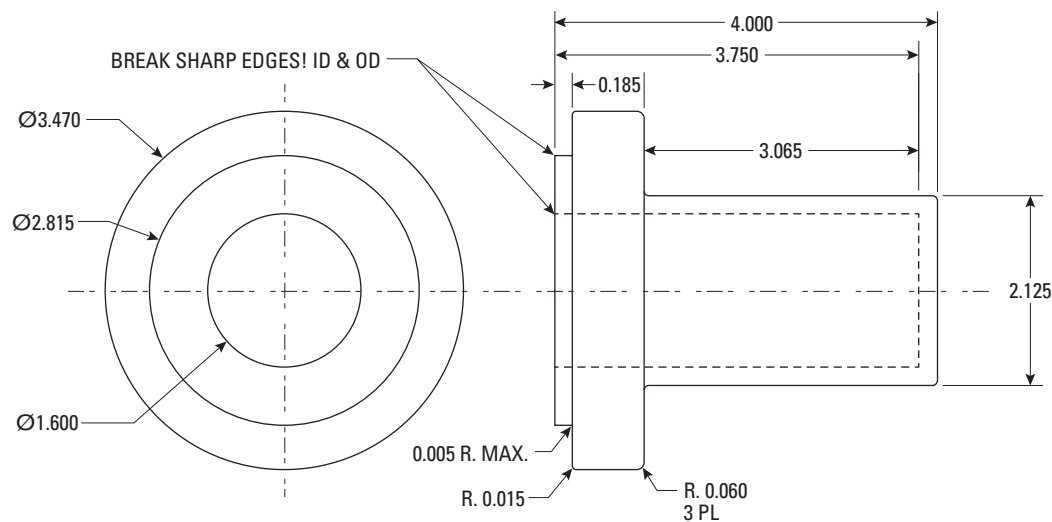
⑥ Measured at 25°C.

⑦ For motors with optional shaft seal, reduce torque shown by 0.25 Nm, and increase T_r by the same amount.

⑧ Brake option increases weight by 2.2 kg (4.84 lb).

7.4 KEM-xV300 / KEM-4V400 - Installation Tool - Dimensional Drawing

- The shaft seal installation tools should be made of aluminum.
- The side indicating **Break sharp edges** is in contact with the shaft seal.
- Sharp edges should be broken to ensure the shaft seal is not damaged by the installation tool.



8 Kollmorgen Essentials Motor - Connector Pinouts

All connector views are facing front.

This table lists the abbreviations:

Abbreviation	Description
BR	Motor holding brake
n.c.	not connected
PE	Protection Earth
SFD	SFD-M Signal (incl. thermal device signal)
U	Motor phase U
V	Motor phase V
W	Motor phase W

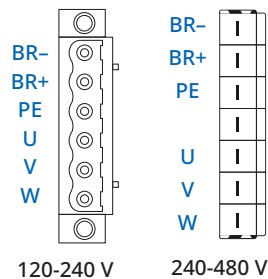
8.1 Kollmorgen Essentials Motor - Cable Connector Pinouts

❗ IMPORTANT

Kollmorgen® Drive and Motor system compatibility and performance cannot be guaranteed if user-customized or third-party cables are used.

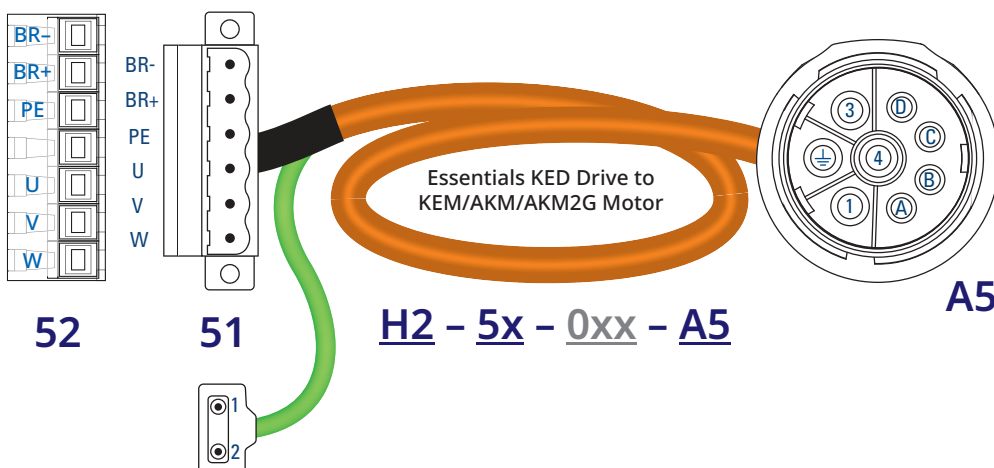
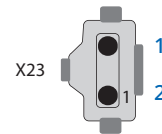
Drive Connector X1: Motor, Power + Brake

Signal	Description
BR-	Motor holding brake
BR+	Motor holding brake
PE	Protective Earth (motor housing)
U	Motor Phase U
V	Motor Phase V
W	Motor Phase W



Drive Connector X23: Feedback Pinouts

Pin	SFD-M
1	COM+
2	COM-

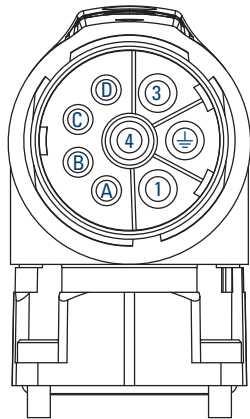


Motor Connector Pinout

Pin	Function
1	U
2	PE
3	W
4	V
A	Brake +
B	Brake -
C	SFD+
D	SFD -

8.2 Kollmorgen Essentials Motor - Connector Pinout

9- Connector Pinout – Hybrid combined power and SFD-M feedback

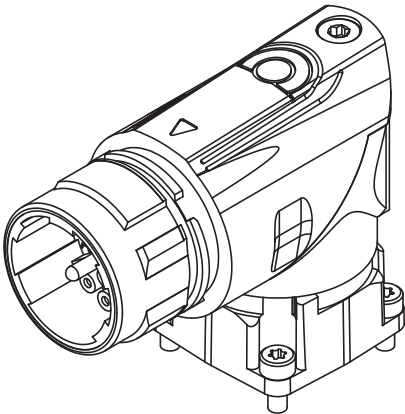


Power + SFD-M / SFD3

Power + SFD-M	
Pin	Function
1	U
2	PE
3	W
4	V
A	Brake +
B	Brake -
C	SFD-M -
D	SFD-M +

Connector Part Number:
BEDC-110-NN-00-00-1116-000

Mating Connector Part Number:
BSTA-078-NN-00-42-0100-000



9- Connector

Connector - M23 SpeedTec (right angle connectors - Size 1)	
Usage	Hybrid (SFD-M)
Contacts - Pins	4 / 4
Maximum Current [A]	20 / 10
Maximum Cross Section [mm ²]	2.5 / 1.0
Protection Class	IP65
Cable Power Conductor Size [mm ²]	1.5 or 2.5
Suggested Mating Connector	BSTA-108-NN-00-08-0036

9 Kollmorgen Essentials Motor - Performance Curves

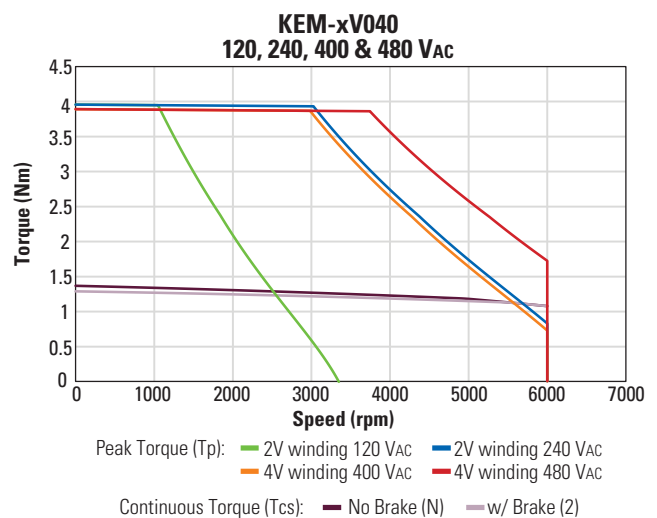
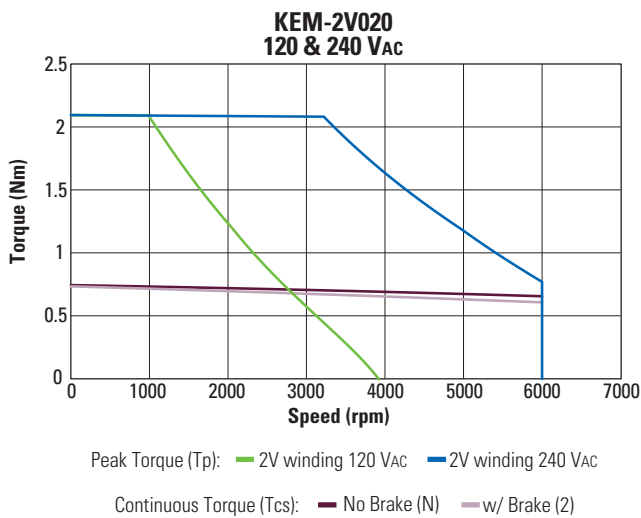
- "KEM-2V020, KEM-xV040, KEM-xV075, and KEM-xV100 - Performance Curves" (→ p. 73)
- "KEM-xV150, KEM-xV250, KEM-xV300, and KEM-4V400 - Performance Curves" (→ p. 74)

9.1 KEM-2V020, KEM-xV040, KEM-xV075, and KEM-xV100 - Performance Curves

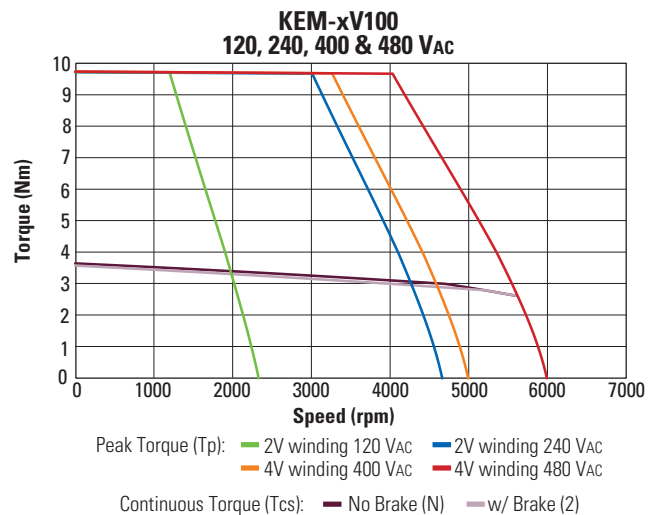
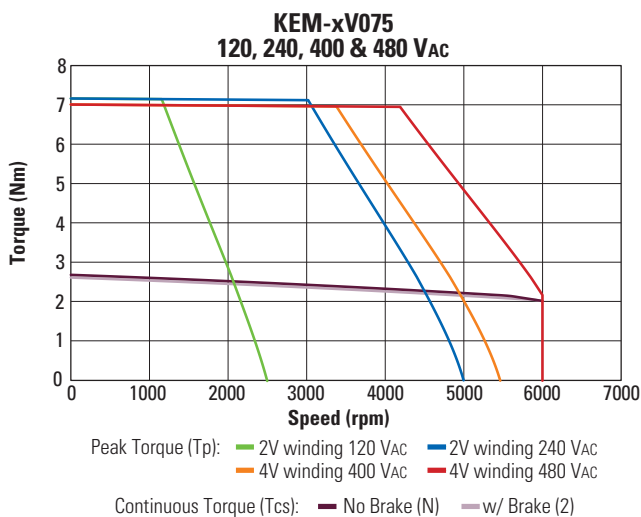
NOTE

The on-line [Performance Curve Generator](#) provides the most accurate information for specific models.

KEM-2V020/KEM-xV040 Performance Curves



KEM-xV075/KEM-xV100 Performance Curves

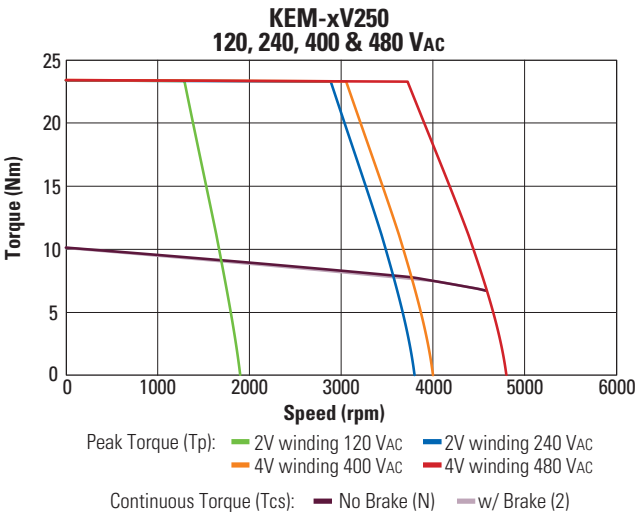
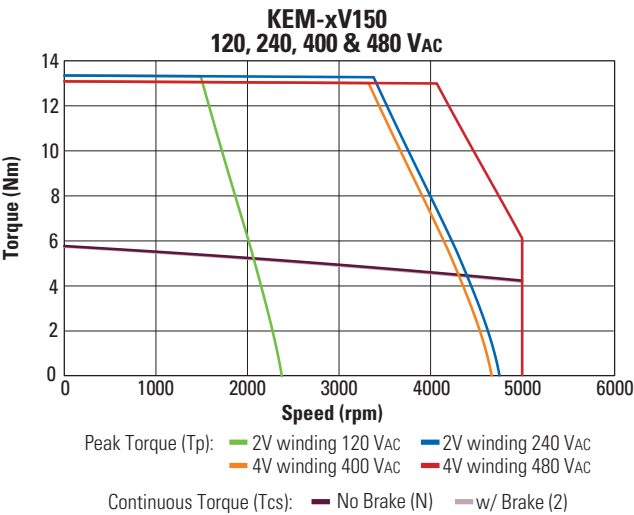


9.2 KEM-xV150, KEM-xV250, KEM-xV300, and KEM-4V400 - Performance Curves

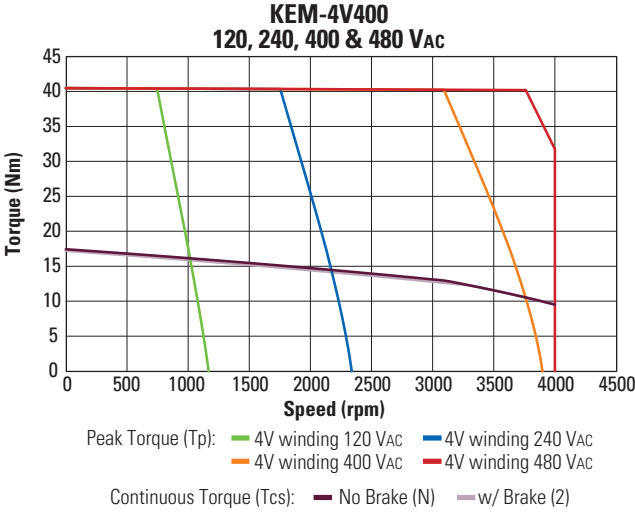
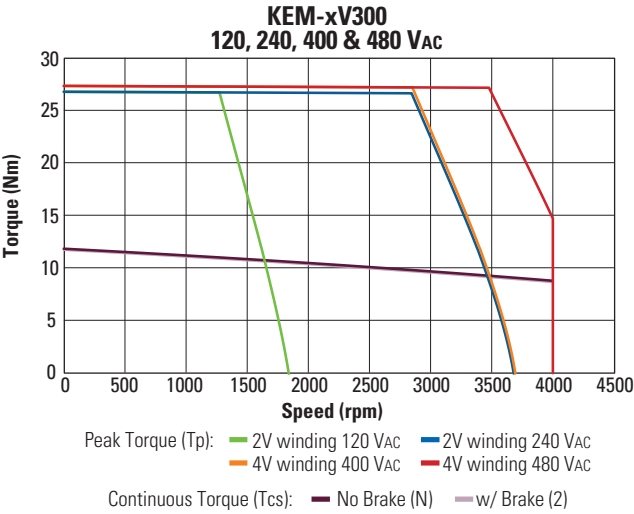
NOTE

The on-line [Performance Curve Generator](#) provides the most accurate information for specific models.

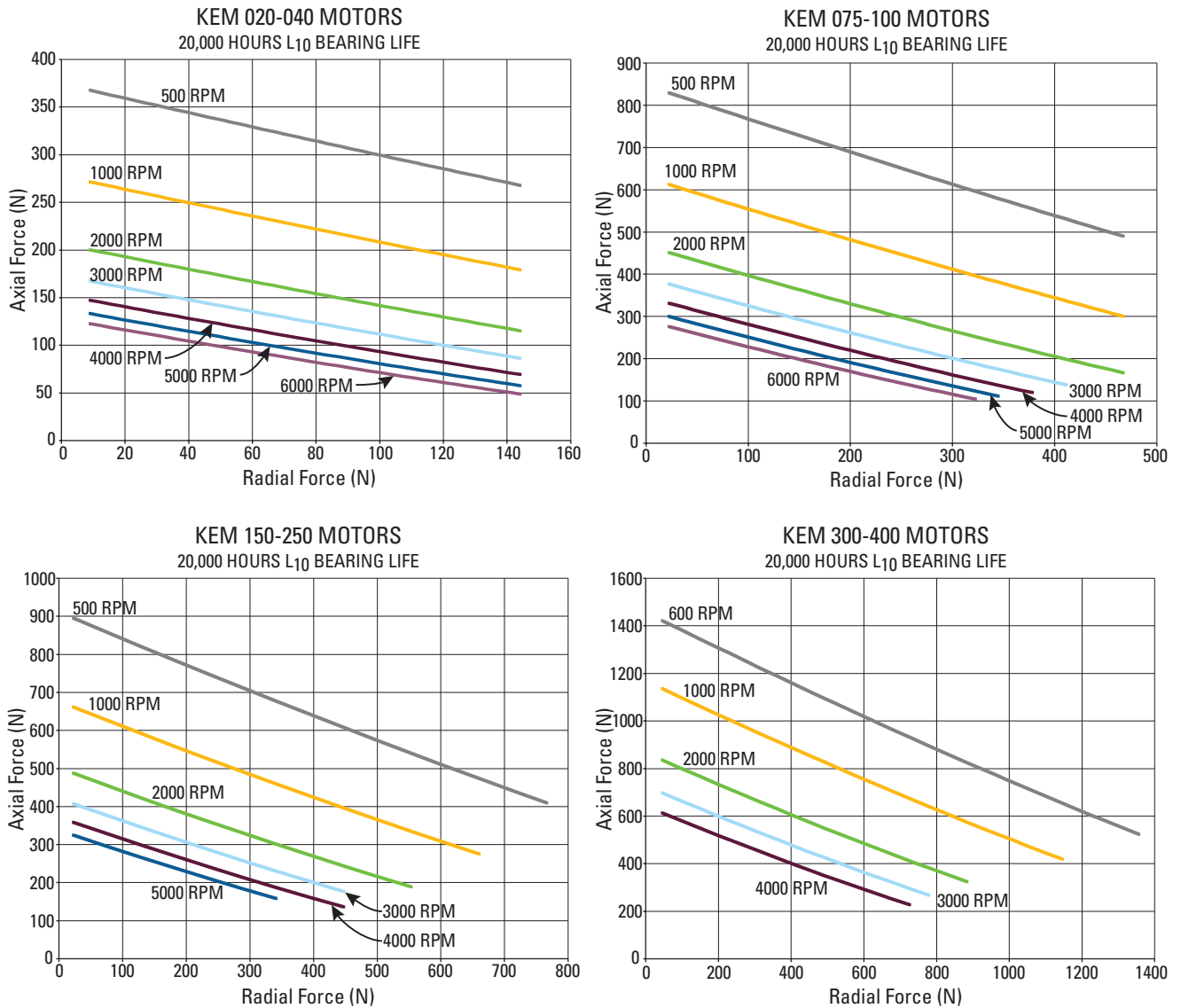
KEM-xV150/KEM-xV250 Performance Curves



KEM-xV300/KEM-4V400 Performance Curves



10 Kollmorgen Essentials Motor - L₁₀ Servo Motor Bearing Fatigue

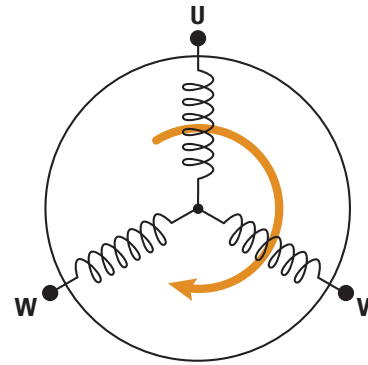
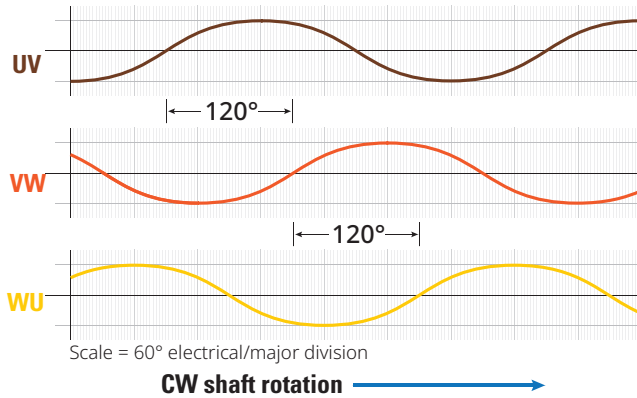


11 Kollmorgen Essentials Motor - Phasing Diagram

When the motor is rotated clockwise (CW) as viewed from front shaft end, the following BEMF voltage waveforms result:

- » Voltage phase-UV leads Voltage phase-VW by 120-degrees
- » Voltage phase-VW leads Voltage phase-WU by 120-degrees
- » Voltage phase-WU leads Voltage phase-UV by 120-degrees

BEMF Waveforms



12 Brakes - Technical Data

12.1 Failsafe, Holding Brake	78
12.2 Emergency Stops	78
12.3 Servo Motor Contamination	78
12.4 Kollmorgen Essentials Motor Brake Data	79
12.5 Brake Notes	80
12.6 Time Needed to Achieve 90% of Static Torque	82
12.6.1 Brake Switching Cycle for Kollmorgen Essentials Drives	82
12.7 Holding Brake Functionality	83
12.8 Brake and Servo Motor Terminology	84
12.8.1 Brake Terms	84
12.8.2 Servo Motor Terms	84

12.1 Failsafe, Holding Brake

The holding brake is designed to provide static holding torque to the servo motor shaft with the brake coil de-energized.

- The brake must first be released (coil energized) prior to commanding servo motor rotation as determined by its drop-out time.
- The brake is intended for holding or parking of a stationary servo motor.
 - It is not intended for dynamic braking.
- There should be absolutely no motion of the rotor when power is removed from the brake coil.

12.2 Emergency Stops

The brake can be used for a limited number of emergency stop conditions.

- Such use will eventually cause wear, leading to eventual malfunction of the brake.
- The number of emergency stops strongly depends on applied load.
- Contact Kollmorgen for proper calculation of energy that needs to be absorbed during emergency stops in application.

12.3 Servo Motor Contamination

Contamination of the servo motor internal compartment by oil or other foreign materials results in failure of the brake.

Check the suitability of servo motor sealing for the working environment.

NOTE

Contact "Support and Services" (→ p. 89) for detailed specification and all other inquiries.

12.4 Kollmorgen Essentials Motor Brake Data

**Note Numbers are here: "Brake Notes" (→ p. 80).

Motor Family	Units	KEM- 2V020-xV040	KEM- xV075-xV100	KEM- xV150-xV250	KEM xV300-4V400	**Note Number
B _{10d}	–	20,000,000		15,000,000		13, 15
Coil Resistance @ 20 ° C	Ω ±7%	67.2	46.0	29.0	22.4	–
Current @ 24VDC, 20 °C	ADC	0.35	0.53	0.82	1.07	10
Friction Disc Inertia	kg.cm ²	0.013	0.058	0.166	0.668	–
Maximum Acceleration	rad/s2	84500	37000	15400	6800	11, 12
Maximum Backlash	deg.	1.01	0.81	0.71	0.51	4, 5, 12
Maximum Release Current (New Brake), 20 °C	ADC	0.26	0.40	0.62	0.80	14
Maximum Release Voltage (New Brake)	VDC	18				2, 14
Maximum Speed	RPM	6000	6000	5000	4000	–
Minimum Dry Static Torque, 120 °C	Nm	1.42	5.3	14.5	25.0	1
Minimum Number of Springs	–	6	6	8	12	–
Minimum Re-Engage Voltage (New Brake)	VDC	≥1.5		≥1.5		3, 14
Nominal Operating Voltage	VDC ±10%	24				–
Power Consumption @ 24VDC, 20 °C	Watt ±7%	8.41	12.74	19.73	25.70	–
Release (Opening) Time	ms	45	75	115	155	6, 7
Response Time (Engage/Closing)	ms	36	30	30	40	6, 8, 9
Response Time with Essentials Drive	ms	36	40	45	55	17
Temperature Range	°C	-20° C to 120° C				–
Total Torque Rise Time with Essentials Drive	ms	65	115	165	240	17, 18
Typical Backlash	deg.	0.46	0.37	0.31	0.24	4, 5, 12
Weight	kg	0.27	0.69	1.2	2.2	–

12.5 Brake Notes

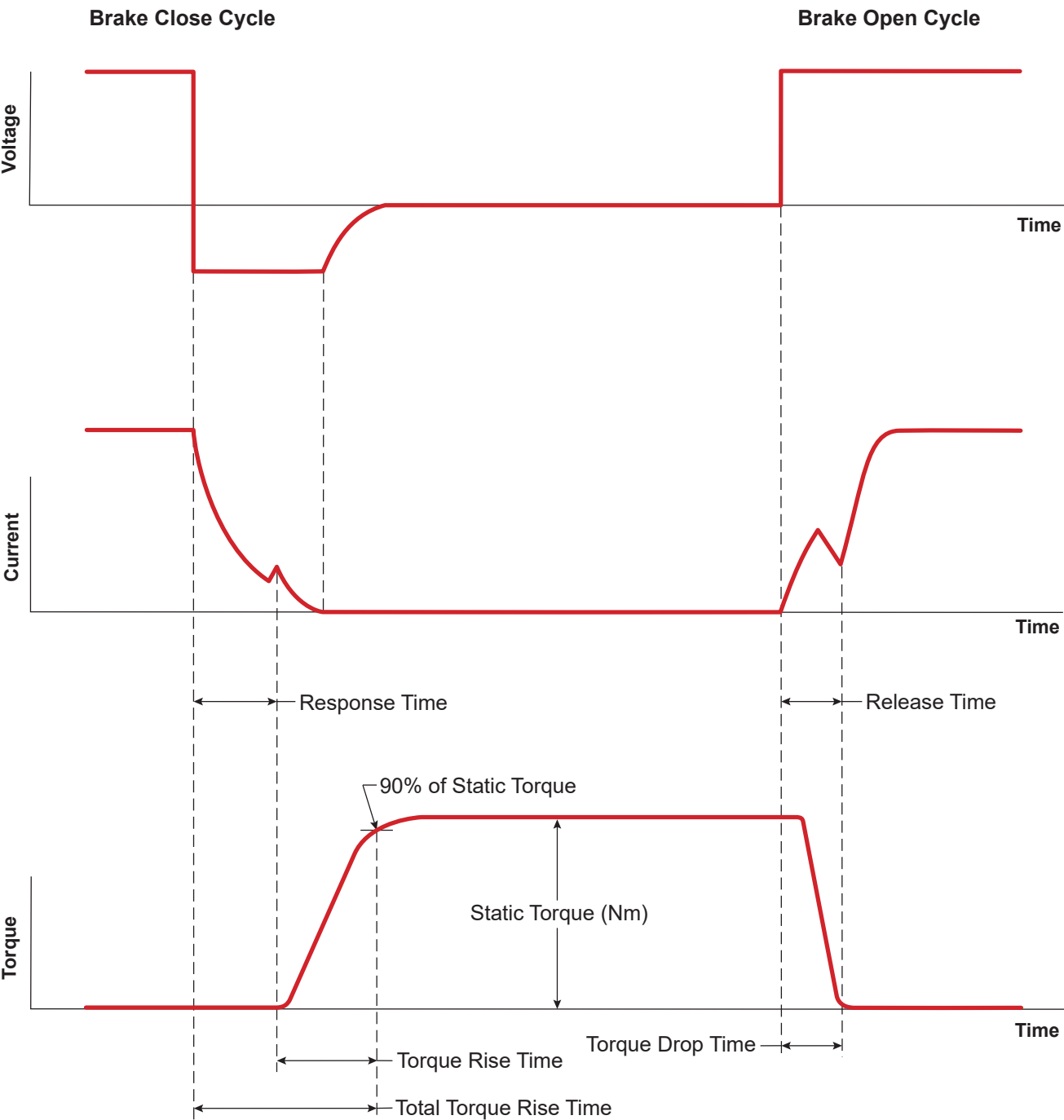
Note	Description
1	Minimum Dry Static Torque The maximum torque that can be applied to a brake without the risk of slipping.
2	Maximum Release Voltage • The value of voltage where the brake is 100% OPEN. • The brake is mounted inside of the servo motor.
3	Minimum Re-Engage Voltage • The value of voltage where the brake is 100% CLOSED. • The brake is mounted inside of the servo motor.
4	Backlash • The amount of clearance, or free rotation, from a point based in one direction to a point in the opposite direction with torque applied, between the drive connection of the brake to the servo motor shaft. • 25% of the rated torque of the brake can be applied during the backlash measurement.
5	• Maximum Backlash is calculated using worst-case tolerancing. • Typical Backlash is calculated using statistical tolerancing.
6	• Release and response times measured on standalone brakes connected to hard switching power supply.
7	• Brake release time is fairly consistent regardless of how the brake is switched. • This is the time for the brake to release when the power is applied to the brake.
8	• Brake response time when the decay circuit within the brake, when the power is removed, is prolonged. • This is the time taken for the brake to re-engage when the power is removed if the circuit contains any form of arc suppression over the switching.
9	• Removing the brake supply on the DC side gives the fastest possible switching. • This is a clean cut in the brake supply at the brake connection.
10	Current of the brake is calculated from nominal voltage and nominal resistance at 20 °C.
11	Acceleration calculated from maximum acceleration of Kollmorgen® servo motor with the brake without external load.
12	Brake is able to perform 50.000.000 reverse cycles with maximum acceleration and backlash up to 0.8°.
13	B_{10d} is the number of operations where 10% of the sample would fail to danger.
14	• New brake - brake mounted in the servo motor without previous usage. • Parameters could be influenced by the number of emergency stops absorbed by brake during lifetime.
15	• Response times measured on brakes connected to a Kollmorgen Essentials Drive. See "Holding Brake Functionality" (→ p. 83). • B_{10d} and Number of Springs is specific to AKM servo motors with brakes labeled Made in Czech Republic. • Contact Kollmorgen for detailed specification and all other inquiries.
16	• See "Time Needed to Achieve 90% of Static Torque" (→ p. 82). • Contact Kollmorgen for detailed specification and all other inquiries.

Note	Description
17	• Response times measured on brakes connected to a Kollmorgen Essentials Drive. See "Holding Brake Functionality" (→ p. 83). • Response time of the brake measured with a diode and a transistor in power supply current.
18	• Vertical load application setup requires using the Kollmorgen Essentials Drive manufacturer's total torque rise time. • See "Time Needed to Achieve 90% of Static Torque" (→ p. 82).

12.6 Time Needed to Achieve 90% of Static Torque

This is the minimum time required for the brake to engage and hold vertical loads.

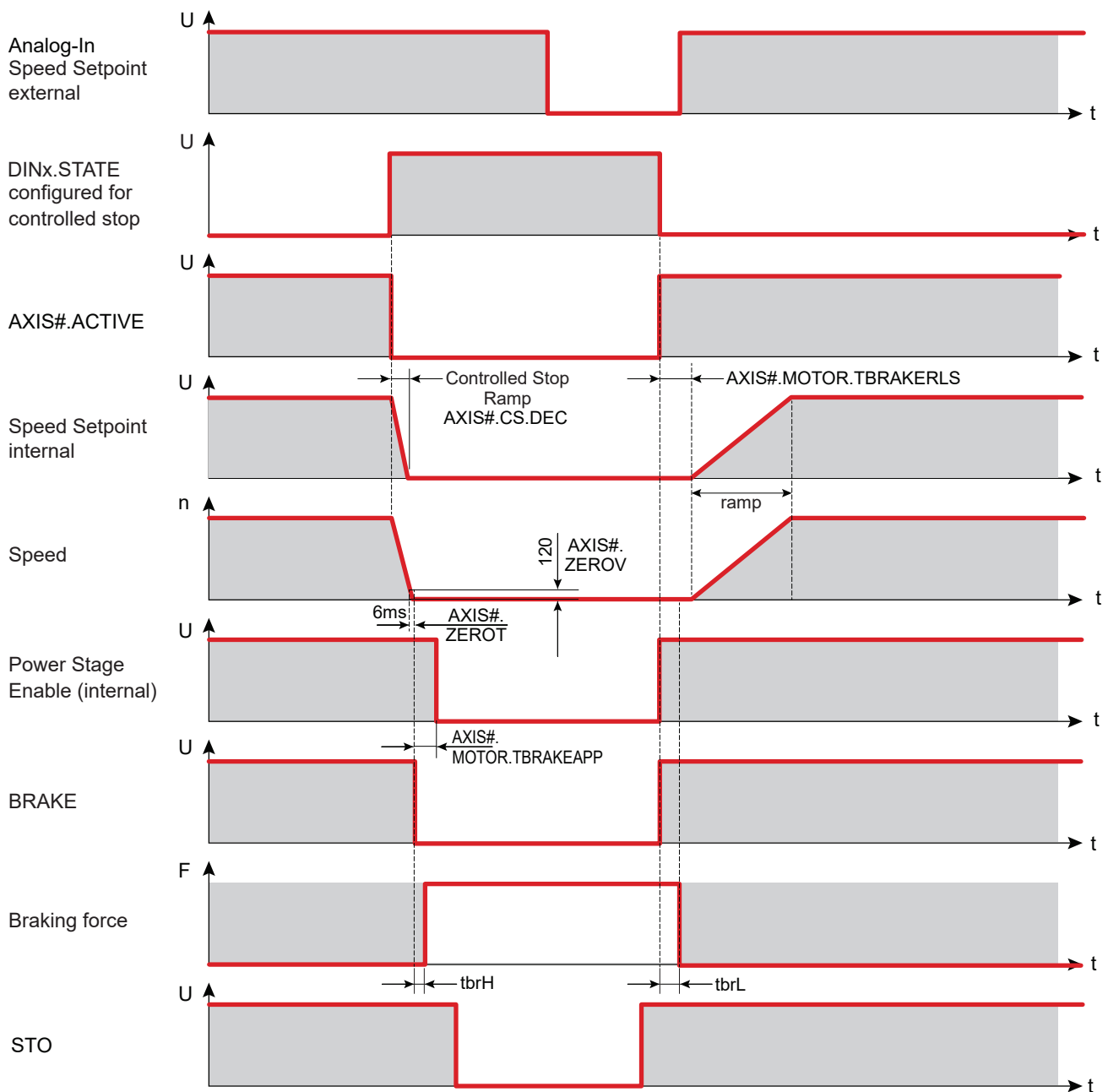
12.6.1 Brake Switching Cycle for Kollmorgen Essentials Drives



12.7 Holding Brake Functionality

The brake function must be enabled through a drive parameter.

- The following image shows the timing and functional relationships between the controlled stop signal, speed, and braking force.
 - All values can be adjusted with drive parameters; values in the diagram are default values.
- The parameters shown are specific to Kollmorgen AKD2G drives and Kollmorgen Essentials Drive.
 - See [WorkBench Help - AKD2G](#) for the drive parameter details.
- The drive speed setpoint is internally driven down an adjustable ramp (AXIS#.CS.DEC) to 0 V.
- With default values, the output for the brake is switched on when the speed has reached 5 rpm (AXIS#.ZEROV) for at least 6 ms (AXIS#.ZEROT).
- The rise (t_{BRH} [ms]) and fall (t_{BRL} [ms]) times of the holding brake built into the servo motor are different for the various types of servo motor.



12.8 Brake and Servo Motor Terminology

12.8.1 Brake Terms

Brake Terms				
English	Deutsch	Español	Français	Italiano
Brake data	Bremsendaten	Datos de frenos	Caractéristiques du frein	Dati freno
Electrical power	Elektrische Leistung	Potencia eléctrica	Puissance électrique	Potenza elettrica
Engage delay time	Einfallverzögerungszeit	Tiempo de reacción	Délai d'attente de serrage	Ritardo all'incidenza
Holding torque	Haltemoment	Momento de parada	Couple de maintien	Coppia di arresto
Moment of inertia	Trägheitsmoment	Momento de inercia	Moment d'inertie	Momento d'inerzia
Operating voltage	Anschlussspannung	Tensión de conexión	Tension de service	Tensione di allacciamento
Release delay time	Lüftverzögerungszeit	Tiempo de respuesta	Délai d'attente de desserrage	Ritardo al rilascio
Typical backlash	typisches Spiel	Contragolpe típico	Jeu typique	Gioco tipico
Weight of the brake	Gewicht der Bremse	Peso de freno	Poids du frein	Peso del freno

12.8.2 Servo Motor Terms

Servo Motor Terms				
English	Deutsch	Español	Français	Italiano
Axial load permitted	Zulässige Axialkraft	Fuerza axial admitido	Charge axiale admissible	Soll. assiale ammessa
Data	Daten	Datos	Caractéristiques	Dati
Electrical data	Elektrische Daten	Datos eléctricos	Caractéristiques électriques	Dati elettrici
Maximum mains voltage	Maximale Netzspannung	Tensión de red máxima	Tension maximale de l'alimentation	Tensione di rete massima
Mechanical data	Mechanische Daten	Datos mecánicos	Caractéristiques mécaniques	Dati meccanici
Minimum cross section	Minimaler Querschnitt	Sección máx.	Section minimale	Sezione max.
Peak Current	Spitzenstrom	Corriente máxima	Courant de crête	Corrente di picco
Peak Torque	Spitzendrehmoment	Par servomotor máximo	Couple de crête	Coppia di picco
Pole Number	Polzahl	Nº de polos	Nombre de pôles	Numero di poli
Radial load permitted at shaft end	Zulässige Radialkraft am Wellenende	Fuerza radial admitido en el extremo del eje	Charge radiale admissible en bout d'arbre	Soll. radiale ammessa sull'estr. dell'albero
Rated power	Nennleistung	Potencia nominal	Puissance nominale	Potenza nominale
Rated speed	Nenndrehzahl	Velocidad nominal	Vitesse nominale	Velocità nominale

Servo Motor Terms				
English	Deutsch	Español	Français	Italiano
Rated torque	Nenndrehmoment	Par servomotor nominal	Couple nominal	Coppia nominale
Reference flange	Bemessungsflansch	Brida de la referencia	Bride de référence	Flangia di calcolo
Rotor moment of inertia	Rotorträgheitsmoment	Momento de inercia del rotor	Moment d'inertie du rotor	Momento di inerzia del rotore
Standstill current	Stillstandsstrom	Corriente de parada	Courant d'arrêt	Corrente cont. allo stallo
Standstill torque	Stillstandsdrehmoment	Par servomotor de parada	Couple d'arrêt	Coppia cont. allo stallo
Static friction torque	Statisches Reibmoment	Par estático de fricción	Couple de friction statique	Momento di aderenza statica
Symbol [Unit]	Symbol [Einheit]	Símbolo [unidad]	Symbole [unité]	Simbolo [unità]
Thermal time constant	Thermische Zeitkonstante	Constante térmica de tiempo	Constante de temps thermique	Costante di tempo termica
Torque constant	Drehmomentkonstante	Constante de par servomotor	Constante de couple	Costante di coppia
Voltage constant	Spannungskonstante	Constante de tensión	Constante de tension	Costante di tensione
Weight standard	Gewicht standard	Peso de estándar	Poids standard	Peso standard
Winding inductance	Wicklungsinduktivität	Inductividad de la bobina	Inductance de l'enroulement	Induttività avvolgimento
Winding resistance	Wicklungswiderstand	Resistencia de la bobina	Résistance de l'enroulement	Resistenza avvolgimento

13 Approvals

Certificates are on the [Kollmorgen Essentials System Support Page](#) of the Kollmorgen website.

13.1 Conformance with EC	87
13.2 Conformance with REACH	87
13.3 Conformance with RoHS	87
13.4 Conformance with UL	87

13.1 Conformance with EC

The servo 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

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

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

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

13.2 Conformance with REACH

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 Regulations).

Information based on REACH Art. 33(1) regarding Substances of Very High Concern [SVHC] as referenced by Candidate List last amended on 17, January 2023.

The conformity is only valid on the delivery date.

The chemical composition of the product may change due to environmental influences.

13.3 Conformance with RoHS

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.

The conformity is only valid on the delivery date.

The chemical composition of the product may change due to environmental influences.

13.4 Conformance with UL

The servo motor is a UL USA and Canada recognized component, file E61960.

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Technical changes which improve the performance of the device may be made without prior notice!

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Kollmorgen Support Network



See the [Kollmorgen Support Network](#) for product support, product downloads, knowledge base answers, and information.



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