

# SELECTION GUIDE

S200

High Performance Servo Drives



## S200 Series Drives

### Industry-Leading Performance In A Small Package

Danaher Motion's Kollmorgen S200 brushless servo drives push high performance servo technology into lower power applications than was previously possible without having to compromise on reliability or package size. Couple an S200 drive with a Kollmorgen AKM servo motor for a complete servo control solution designed to excel in applications such as semiconductor fabrication, electronic assembly, packaging, medical, and woodworking equipment.

Kollmorgen S200 servo drives are the first all digital industrial drives with a velocity loop bandwidth up to 800 Hz offering unmatched system throughput and simplified tuning. High resolution (24 bit) feedback and high performance 3-5 kHz current loop bandwidth provide smooth motion and rapid start and stop action to optimize machine performance. Smart feedback and industry leading high bandwidth deliver fast and accurate "plug and play" commissioning by eliminating the need for servo loop tuning in most applications.

Kollmorgen S200 servo drives come standard with torque or velocity control and with add-on options can support Indexing, CANopen or DeviceNet. They are available for AC (120/240 VAC) or DC (20-90V) operation with current ratings from 1 A rms continuous to 18 A rms peak. They have a compact footprint ranging from 1.1" (28.7mm) wide and 6.0" (152.4mm) tall to 2.2" (54.8mm) wide and 6.9" (175mm) tall with depths ranging from 3.9" (100.8mm) to 5.2" (131.6mm) allowing them to fit into tight spaces. They are UL 508C recognized, CE marked, and conform to EN50178 and EN61800-3 standards.



Separate "Keep Alive" power input allows rapid recovery from emergency stop conditions. Optically isolated inputs/outputs, positive locking connectors and full fault protection promise long machine life and immunity to accidental damage. A single motor power/feedback cable simplifies connectivity. All connectors and LED status indicators are easily accessible from the front of the drive.

If you are looking for a high performance servo drive in a small package, Danaher Motion's S200 servo drives extend the benefits of servo motion control technology to new levels of machine design.



## Increased Machine Throughput and Longer Life

Servo system performance is synonymous with machine throughput. The S200 family takes servo performance to new heights.

- Industry-leading current loop bandwidth up to 5KHz and velocity loop bandwidth up to 800Hz means machine throughput can be increased by as much as 2 to 3 times.
- Robust design including full fault protection, locking connectors and optical isolation promise greater machine "up-time".
- Smooth motion, a benefit of sinusoidal current control and high resolution (24 bit) feedback minimizes harsh torque disturbances that can cut short the life of mechanical components.
- Both the AC and the DC input drives are equipped with separate control power input to speed recovery from "E-Stop" conditions.

## Reduced Engineering and Support Time

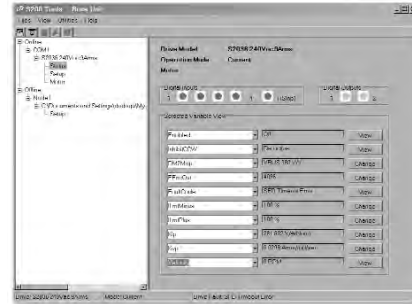
Simplified tuning, friendly Graphical User Interface and shared components with Stepper products.

- Working in conjunction with the new Smart Feedback Device the drive automatically sets the current and velocity loop parameters greatly reducing the need for drive tuning – out of the box "Plug & Play"
- Windows-based Graphical User Interface models the tree format found in Explorer so learning is quick and easy.
- Easy to debug with full fault diagnostics reduce engineering support time.
- Shares option cards, electrical I/O, and GUI components with the P7000 stepper drive family reducing the time required to learn new products.

## Reduced Overall Cost

The S200 design requires fewer components helping to lower the overall machine cost.

- S200 drive family and the AKM motor family linked with the new "value" line of cables – dependable Kollmorgen quality now at a lower price.
- Available in a "composite" version that combines the power and feedback into one cable to further reduce commissioning time.
- Single supplier of AC or DC input brushless servo drives and motors and stepper drives and motors reduce vendor list management.



The new Graphical User Interface is designed to expedite the set up process. Although most applications will work with the default parameter that are set automatically during power up, it may be necessary to adjust some of the user parameters to fully utilize all of the drive functionality and to optimize servo loop tuning. If you are familiar with Windows Explorer and tree structures this GUI is designed to make your life simple – now that is "Easy to Use".

### Ordering Information:

#### Servo Drive Family

S2 = S200 series brushless

#### Current Rating

02 = 1.5 A<sub>rms</sub> continuous, 4.5 A<sub>rms</sub> peak<sup>1</sup>  
 03 = 3 A<sub>rms</sub> continuous, 9 A<sub>rms</sub> peak  
 06 = 6 A<sub>rms</sub> continuous, 18 A<sub>rms</sub> peak<sup>2</sup>

#### Voltage Range

3 = 20 - 90 VDC  
 6 = 120/240 VAC

#### Electrical Options

0 = None

#### Notes:

- 1 N/A with units having DC input voltage.
- 2 N/A with units having AC input voltage.
- 3 Consult customer support for availability of CANopen functionality.

**S2 03 3 0 - VT S - xxx**

#### Customization

Omit field for standard configurations

#### Feedback Device Support

S = Smart Feedback Device / Halls  
 For units w/ CN Functionality option  
 S = Smart Feedback Device / Comcoder

#### Functionality

CN = CANopen with indexing<sup>3</sup>  
 VT = Velocity/Torque modes

## Specifications

Drive/Amplifier	S20330	S20630	S20260	S20360
<b>Input Voltage</b>				
Control logic	10-90 VDC		85-265 VAC, 47 TO 420 Hz, 1 phase	
Motor Bus voltage	20-90 VDC		0-264 VAC, 47 to 420 Hz, 1 or 3 phase	
<b>Output Current</b>				
Peak (A rms)	9	18	4.5	9
Peak time (Sec)	1	1	3	3
convection, (40 deg C)	3	6	1.5	3
<b>Performance</b>				
Current Loop BW (max kHz)	5		3	
Velocity Loop BW (max kHz)	800		800	
Update rate (MHz)			1.25	
Output Current Ripple Frequency (kHz)	31.2		20.8	
Motor Electrical Frequency (max Hz)	900		600	

Smart Feedback Device	
<b>Resolution</b>	
Resolution/Rev	24 bits = .0013 arc min
<b>Absolute Accuracy</b>	
AKM1	+/- 16 arc min = 10.4 bits/rev
AKM2, 3 or 4	+/- 9 arc min = 11.2 bits/rev
<b>Bandwidth</b>	
-3 dB bandwidth	> 2000 Hz
<b>Communications</b>	
Update period	51.2 μSec
<b>Emulated Encoder Output</b>	
Binary (pre quadrature line count)	128, 512, 1024, 2048, 4096, 8192, 16384, 32768, 65536 PPR
Decimal (pre quadrature line count)	125, 500, 1000, 2000, 5000, 10000, 20000 PPR
Max output line frequency	2.5 MHz

## Options

Connector Kits:	
<b>CK-S200-MF</b>	Motor power and Feedback mating connectors for AC or DC units, for customers building cables
<b>CK-S200-IP-DC</b>	I/O and input Power mating connectors for base DC drive
<b>CK-S200-IP-DC-TB</b>	I/O and input Power mating connectors for base DC drive, Terminal Block adaptor supplied for I/O connector.
<b>CK-S200-IP-AC</b>	I/O and input Power mating connectors for base AC drive
<b>CK-S200-IP-AC-TB</b>	I/O and input Power mating connectors for base AC drive, Terminal Block adaptor supplied for I/O connector.
<b>CK-S200-CNDN</b>	Option card CAN/DN and I/O mating connectors
<b>CK-S200-CNDN-TB</b>	Option card CAN/DN and I/O mating connectors, Terminal Block adaptors supplied for the I/O and feedback connector

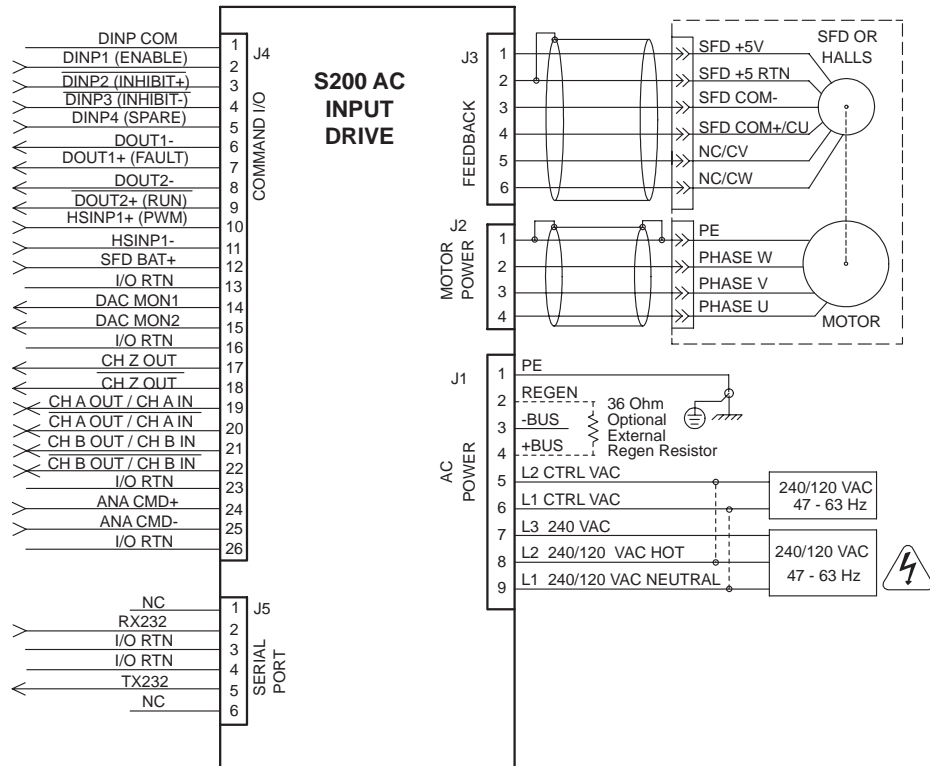
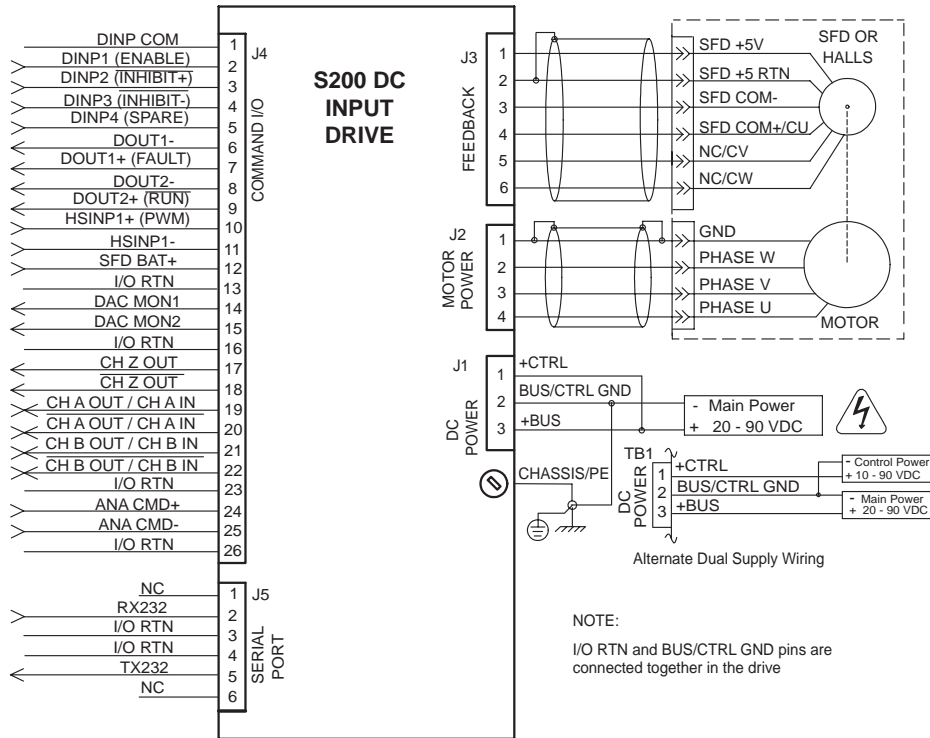
## Option Card:

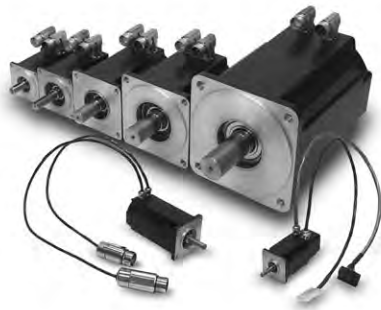
The S200 is designed to support a factory installed option card. Several versions of this card are under development and will support Position Loop Closure with Step/Direction or Incremental Encoder command, Simple Indexing Move Profiles, CANopen field bus support, or DeviceNet field bus support. Please consult the factory for details and availability.

Serial Cable:	
<b>PTS2-232-9D</b>	RS232 serial communication cable (DB9 to Mod Jack) — 6 feet

## Cables

<b>CF-DC011N-XX-X</b>	Feedback cable "value series" - Molex connector at the motor end to IEEE1394 connector at drive end for Smart Feedback Device support.
<b>CF-DA0111N-XX-X</b>	Feedback Cable "value series" - Euro connector at the motor end to IEEE1394 connector at the drive end for Smart Feedback Device support.
<b>CP-102AACN-XX-X</b>	Power Cable "value series" - Molex connector at the motor end to S200 crimp pin pluggable connector at the drive end.
<b>CP-102AAAN-XX-X</b>	Power Cable "value series" - Euro connector at the motor end to S200 crimp pin pluggable connector at the drive end.
<b>CC-D01CO2N-XX-X</b>	Composite Cable "value series" - single Molex connector at the motor end to IEEE1394 connector and S200 crimp pin pluggable connector at the drive end for Smart Feedback Device and power support in a single cable.
<b>CC-D01AO2N-XX-X</b>	Composite Cable "value series" - Euro style connector for power and feedback at the motor end to IEEE1394 connector and S200 crimp pin pluggable connector at the drive end for Smart Feedback Device and power support in a single cable. Only available on AKM3 and AKM4 series motors.





The advanced Kollmorgen AKM high performance motor series offers a wide range of mounting, connectivity, feedback and other options. These motors offer superb flexibility to meet application needs with:

- 7 frame sizes
- 25 frame/stack combinations
- 77 'standard' windings
- Fail-safe brakes
- Shaft seals
- Shaft & mounting variations
- Custom windings
- Connectivity

## AKM motors offer extremely high torque, density and acceleration

### Torque

0.16 to 53Nm continuous stall torque (1.4 to 470lb-in) in 25 frame/stack combinations. Specific torques are often available from multiple frame sizes to optimize mounting and inertia matching capabilities.

### Speed

Speeds to 8000 rpm meet high speed application requirements. Windings specifically tailored to lower speeds are also available.

### Voltage

AKM motors can be applied to all standard global voltages. Windings are specifically tailored to 75 VDC, 120, 240, 400 and 480 VAC.

### Mounting

Multiple mounting standards are available to meet common European, North American, and Japanese standards.

### Feedback

AKM motors include resolver, encoder (commutating) or SFD (Smart Feedback Device) feedback options to meet specific application requirements.

### Smoothness

Smooth performance results from low-cog, low-harmonic distortion magnetic designs.

### Connectivity

Rugged, rotatable IP65 connectors and low cost Molex plugs are both available to provide flexibility. Single connectors/Plugs (combined power and feedback) are also available to minimize motor and cable cost (SFD only).

### Thermal

Windings are rated conservatively at 100°C rise over a 40°C ambient while using 155°C (class F) insulation materials. Motors meet all UR, cUR and CE requirements and include thermistors. Thermal ratings at 60°C rise are also provided to meet the needs of specific applications.

## Danaher Motion Cables Offer The Complete Solution

Factory cables are provided for your convenience and offer high reliability to keep your application running day and night. The new "Value" line provides a cost saving option for applications that don't require long distances or encounter extreme environmental conditions. Included in our new "Value" line is a

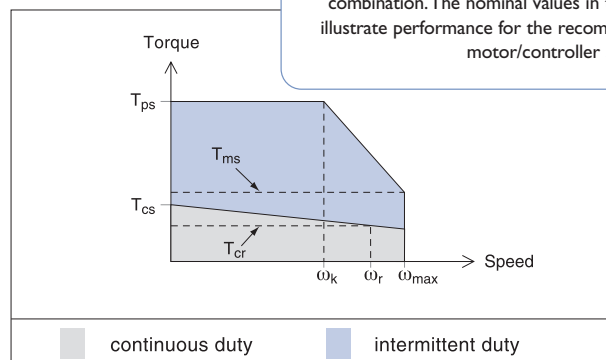
composite cable that combines power and feedback in one cable to aid in faster machine commissioning. Please consult your local sales person or contact the Danaher Motion Customer Support Center to decide which cable option is best suited for your application.

## How To Build A Servo Drive & Motor System

### Definitions

- $T_{ps}$  - Peak stall torque for system
- $T_{rms}$  - Peak torque at maximum speed
- $T_{cs}$  - Continuous torque at stall
- $T_{cr}$  - Continuous rated torque (torque at rated power)
- $\omega_{max}$  - Maximum speed
- $\omega_r$  - Rated speed (speed at rated power)
- $\omega_k$  - Speed at knee in peak envelope (intersection of system peak torque with voltage limit line)

System torque/speed information on the following pages is designed to help you select the optimum brushless servo motor/controller combination. The nominal values in this data illustrate performance for the recommended motor/controller systems.



## Recommended Motor/Drive Systems, 75 VDC bus ①

Servo Motor Model	Servo Drive Model	Peak Stall Torque $T_{ps}$ N-m (lb-in)	Peak Torque at Max. Speed $T_{ms}$ N-m (lb-in)	Cont. Stall Torque $T_{cs}$ N-m (lb-in)	Cont. Rated Torque $T_{cr}$ N-m (lb-in)	Speed at Knee $\omega_k$ rpm	Rated Speed $\omega_r$ rpm	$\omega_{max}$ Speed $\omega_{max}$ rpm	Cont. Stall Current $I_{cs}$ A <sub>rms</sub>	Current@Peak Torque $I_{ps}$ A <sub>rms</sub>	Inertia <sup>③</sup> J kg-cm <sup>2</sup> (lb-in-s <sup>2</sup> x 10 <sup>-3</sup> )
AKM11E	S20330	0.50 (4.45)	0.264 (2.34)	0.19 (1.64)	0.18 (1.56)	3,530	6,000	8,000	2.91	9.0	0.017 (0.015)
AKM12E	S20330	0.90 (8.0)	0.0 (0.0)	0.30 (2.69)	0.30 (2.68)	1,380	3,000	7,180	2.72	9.0	0.031 (0.0274)
AKM13D	S20330	1.29 (11.4)	0.0 (0.0)	0.40 (3.55)	0.40 (3.55)	0	2,000	4,750	2.4	9.0	0.045 (0.0398)
AKM21E	S20330	1.21 (10.7)	0.0 (0.0)	0.48 (4.23)	0.48 (4.21)	1,320	2,000	5,050	3.0	9.0	0.107 (0.0947)
AKM21G	S20630	1.44 (12.7)	0.0 (0.0)	0.50 (4.43)	0.46 (4.05)	2,350	4,000	7,800	4.87	18.0	0.107 (0.0947)
AKM22E	S20330	2.34 (20.7)	0.0 (0.0)	0.87 (7.71)	0.85 (7.55)	0	1,000	2,540	2.73	9.0	0.161 (0.143)
AKM22G	S20630	2.66 (23.6)	0.0 (0.0)	0.88 (7.79)	0.84 (7.39)	1,150	2,500	4,420	4.82	18.0	0.161 (0.143)
AKM23F	S20630	3.88 (34.4)	0.0 (0.0)	1.18 (10.4)	1.15 (10.1)	352	1,500	2,940	4.31	17.2	0.216 (0.191)
AKM24F	S20630	4.82 (42.6)	0.0 (0.0)	1.42 (12.6)	1.39 (12.3)	28	1,000	2,210	3.89	15.6	0.27 (0.239)
AKM31E	S20330	3.24 (28.6)	0.0 (0.0)	1.20 (10.6)	1.19 (10.5)	118	750	1,990	2.99	9.0	0.33 (0.292)
AKM31H	S20630	3.36 (29.7)	0.0 (0.0)	1.23 (10.9)	1.20 (10.6)	1,520	2,000	3,780	5.85	18.0	0.33 (0.292)
AKM32H	S20630	6.22 (55.1)	0.0 (0.0)	2.10 (18.6)	2.06 (18.2)	634	1,200	2,090	5.5	18.0	0.59 (0.522)
AKM33H	S20630	8.56 (75.8)	0.0 (0.0)	2.88 (25.5)	2.82 (25.0)	383	800	1,550	5.62	18.0	0.85 (0.752)
AKM41H	S20630	5.48 (48.5)	0.0 (0.0)	2.06 (18.2)	1.99 (17.6)	604	1,000	2,190	5.6	18.0	0.81 (0.717)

## Recommended Motor/Drive Systems, 120 VAC, 160 VDC bus ①

AKM11B	S20260	0.59 (5.27)	0.179 (1.58)	0.18 (1.62)	0.18 (1.60)	290	4,000	8,000	1.16	4.5	0.017 (0.015)
AKM11C	S20260	0.51 (4.49)	0.30 (2.66)	0.19 (1.64)	0.18 (1.56)	4,160	6,000	8,000	1.45	4.5	0.017 (0.015)
AKM12C	S20260	0.85 (7.49)	0.071 (0.628)	0.31 (2.73)	0.30 (2.69)	3,120	4,000	8,000	1.50	4.5	0.031 (0.0274)
AKM12E	S20360	0.90 (8.0)	0.090 (8.0)	0.30 (2.69)	0.27 (2.42)	8,000	8,000	8,000	2.72	9.0	0.031 (0.0274)
AKM13C	S20260	1.16 (10.3)	0.0 (0.0)	0.41 (3.62)	0.41 (3.60)	2,110	3,000	6,160	1.48	4.5	0.045 (0.0398)
AKM13D	S20360	1.37 (12.1)	0.624 (5.52)	0.40 (3.55)	0.36 (3.23)	4,560	7,000	8,000	2.4	9.0	0.045 (0.0398)
AKM21C	S20260	1.17 (10.4)	0.0 (0.0)	0.45 (3.98)	0.45 (3.98)	1,810	2,500	5,630	1.50	4.5	0.107 (0.0947)
AKM21E	S20360	1.21 (10.7)	0.695 (6.15)	0.48 (4.23)	0.41 (3.65)	5,330	7,000	8,000	3.0	9.0	0.107 (0.0947)
AKM22C	S20260	2.34 (20.7)	0.0 (0.0)	0.84 (7.48)	0.83 (7.32)	187	1,000	2,830	1.39	4.5	0.161 (0.143)
AKM22E	S20360	2.42 (21.4)	0.0 (0.0)	0.87 (7.71)	0.81 (7.13)	2,240	3,500	5,410	2.73	9.0	0.161 (0.143)
AKM23C	S20260	3.20 (28.4)	0.0 (0.0)	1.13 (10.0)	1.11 (9.81)	53	1,000	2,130	1.41	4.5	0.216 (0.191)
AKM23D	S20360	3.84 (33.9)	0.0 (0.0)	1.16 (10.2)	1.12 (9.93)	638	1,500	3,270	2.19	8.8	0.216 (0.191)
AKM24D	S20360	4.76 (42.1)	0.0 (0.0)	1.41 (12.4)	1.36 (12.1)	529	1,500	2,710	2.21	8.8	0.27 (0.239)
AKM31E	S20360	3.24 (28.6)	0.0 (0.0)	1.2 (10.7)	1.17 (10.4)	1,940	2,500	4,240	2.99	9.0	0.33 (0.292)
AKM32D	S20360	7.05 (62.4)	0.0 (0.0)	2.04 (18.0)	2.00 (17.7)	1,650	1,000	1,870	2.23	8.9	0.59 (0.522)
AKM41E	S20360	5.33 (47.2)	0.0 (0.0)	2.02 (17.8)	1.94 (17.2)	778	1,200	2,430	2.85	9.0	0.81 (0.717)

## Recommended Motor/Drive Systems, 240 VAC, 320 VDC bus ①

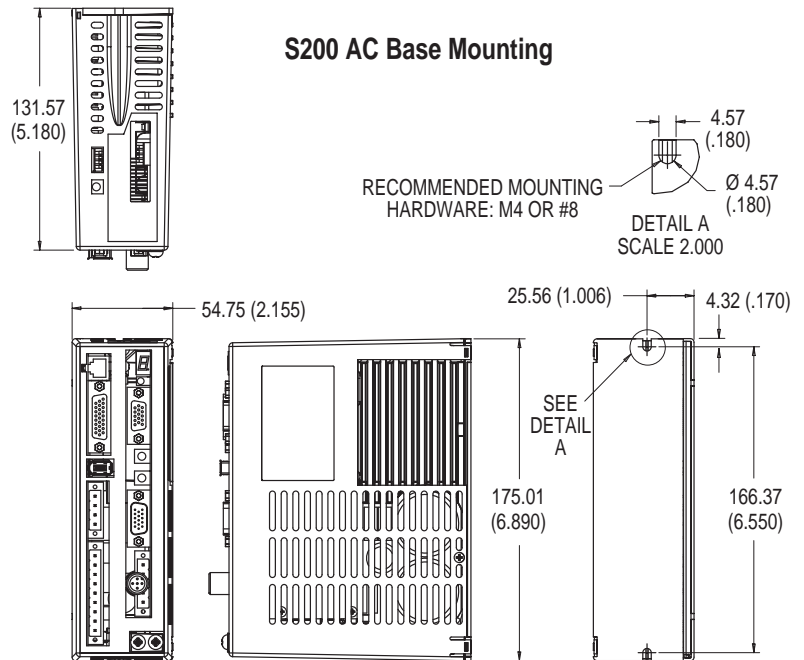
AKM11B	S20260	0.59 (5.27)	0.59 (5.27)	0.18 (1.62)	0.17 (1.47)	8,000	8,000	8,000	1.16	4.5	0.017 (0.015)
AKM12C	S20260	0.85 (7.49)	0.85 (7.43)	0.31 (2.73)	0.28 (2.47)	8,000	8,000	8,000	1.50	4.5	0.031 (0.0274)
AKM13C	S20260	1.16 (10.3)	1.06 (9.38)	0.41 (3.62)	0.36 (3.22)	7,600	8,000	8,000	1.48	4.5	0.045 (0.0398)
AKM21C	S20260	1.17 (10.4)	0.75 (6.64)	0.45 (3.98)	0.39 (3.42)	5,810	8,000	8,000	1.50	4.5	0.107 (0.0947)
AKM22C	S20260	2.34 (20.7)	0.0 (0.0)	0.84 (7.48)	0.78 (6.92)	2,470	3,500	5,660	1.39	4.5	0.161 (0.143)
AKM22E	S20360	2.42 (21.4)	1.61 (14.2)	0.87 (7.71)	0.70 (6.18)	6,010	8,000	8,000	2.73	9.0	0.161 (0.143)
AKM23C	S20260	3.2 (28.4)	0.0 (0.0)	1.13 (10.0)	1.08 (9.52)	1,900	2,500	4,270	1.41	4.5	0.216 (0.191)
AKM23D	S20360	3.84 (34.0)	0.0 (0.0)	1.16 (10.2)	1.03 (9.08)	3,020	5,000	6,540	2.19	8.8	0.216 (0.191)
AKM24C	S20260	3.94 (34.9)	0.0 (0.0)	1.38 (12.2)	1.32 (11.7)	1,620	2,000	3,540	1.42	4.5	0.27 (0.239)
AKM24D	S20360	4.76 (42.1)	0.0 (0.0)	1.41 (12.4)	1.29 (11.4)	2,620	4,000	5,420	2.21	8.8	0.27 (0.239)
AKM31C	S20260	3.34 (29.6)	0.0 (0.0)	1.15 (10.2)	1.12 (9.94)	1,630	2,500	4,060	1.37	4.5	0.33 (0.292)
AKM31E	S20360	3.24 (28.6)	0.77 (6.82)	1.2 (10.6)	0.95 (8.41)	5,000	6,000	8,000	2.99	9.0	0.33 (0.292)
AKM32C	S20260	5.74 (50.8)	0.0 (0.0)	2.0 (17.7)	1.95 (17.2)	1,010	1,500	2,470	1.44	4.5	0.59 (0.522)
AKM32D	S20360	7.05 (62.4)	0.0 (0.0)	2.04 (18.0)	1.93 (17.1)	1,670	2,500	3,750	2.23	8.9	0.59 (0.522)
AKM33C	S20260	7.83 (69.3)	0.0 (0.0)	2.71 (24.0)	2.64 (23.4)	689	1,000	1,840	1.47	4.5	0.85 (0.752)
AKM33E	S20360	8.95 (79.3)	0.0 (0.0)	2.79 (24.7)	2.62 (23.2)	1,640	2,000	3,140	2.58	9.0	0.85 (0.752)
AKM41C	S20260	5.12 (45.3)	0.0 (0.0)	1.95 (17.3)	1.88 (16.6)	880	1,200	2,560	1.46	4.5	0.81 (0.717)
AKM41E	S20360	5.33 (47.2)	0.0 (0.0)	2.02 (17.8)	1.82 (16.1)	2,140	3,000	4,850	2.85	9.0	0.81 (0.717)
AKM42E	S20360	9.72 (86.0)	0.0 (0.0)	3.42 (30.3)	3.12 (27.6)	1,260	1,800	2,740	2.74	9.0	1.45 (1.28)
AKM43E	S20360	13.6 (120)	0.0 (0.0)	4.7 (41.6)	4.24 (37.6)	937	1,500	2,000	2.76	9.0	2.09 (1.85)
AKM44E	S20360	16.5 (146)	0.0 (0.0)	5.76 (51.0)	5.2 (46.0)	834	1,200	1,680	2.85	9.0	2.73 (2.42)
AKM51E	S20360	11.6 (103)	0.0 (0.0)	4.7 (41.6)	4.41 (39.0)	942	1,200	2,010	2.75	8.2	3.42 (3.03)

① See detailed motor specifications in the AKM brochure beginning on page 15.

② Peak torque ratings are for 5 seconds.

③ Includes resolver feedback inertia.

**S200 AC Base Mounting**



**Danaher Motion Customer Support Center**

4301 Kishwaukee Street  
Rockford, IL 61109

Tel: 815-226-2222  
Fax: 815-226-3080  
Support e-mail: customer.support@DanaherMotion.com  
Internet: www.DanaherMotion.com

**In Europe**

Wacholderstr. 40-42  
D-40489 Düsseldorf  
Germany

Tel: +49 (0) 203/9979-0  
Fax: +49 (0) 203/9979-155  
Support e-mail: info@danahermotion.de  
Internet: www.DanaherMotion.de

Danaher Motion enjoys a reputation of excellence based on constant endeavors to update products. Information in this brochure is subject to change.

**S200 DC Base Mounting**

