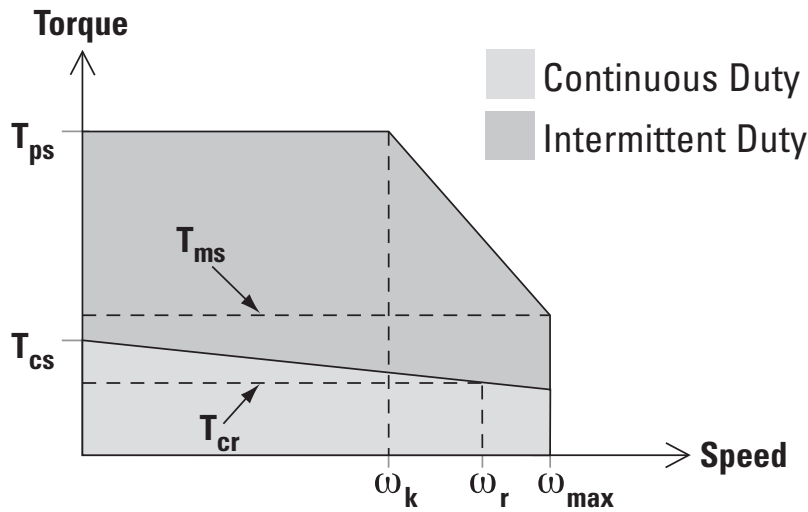


AKM Systems Overview



Definitions	
T_{ps}	- Peak stall torque for system
T_{ms}	- Peak torque at maximum speed
T_{cs}	- Continuous torque at stall
T_r	- Continuous rated torque (torque at rated power)
ω_{max}	- Maximum speed
ω_r	- Rated speed (speed at rated power)
ω_k	- Speed at knee in peak envelope (intersection of system peak torque with voltage limit line)

How to Build a Servo Drive and Motor System

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

Drive and Motor Performance Curves

The performance characteristics of a brushless servo system (motor/drives combination) are described by a torque/speed operating envelope. As shown above, the shaded areas of the curve indicate the continuous duty and intermittent duty zones of the system.

Continuous Duty Zone

The continuous duty zone is bordered by the maximum continuous torque line up to the intersection with the intermittent duty line. The continuous torque line is set by either the motor's maximum rated temperature, or the drives' rated continuous current output, whichever is less. The system voltage line is set by the voltage rating of the drives, the line voltage supplied, and the motor winding. The system can operate on a continuous basis anywhere within this area, assuming the ambient temperature is 40°C or less.

Intermittent Duty Zone

The intermittent duty zone is bordered by the peak torque line and the system voltage line. The peak torque line is set by either the drives' peak current rating, which the drive can produce for a limited time, or the maximum rated peak current for the motor, whichever is less. Refer to the Rating Data on the pages that follow. Note: Higher torque levels may be achievable at higher power levels.

Consult Kollmorgen Customer Support for more details. The system voltage line is set by the voltage rating of the controller, the line voltage applied and the motor winding. Operation in the intermittent zone must be limited to a duty cycle that will produce an RMS system torque falling within the continuous duty area. The RMS torque value is a function of the magnitude of the intermittent torque and the percentage of the time spent at that torque.

The AKM™ brushless servomotor stands alone in the marketplace in terms of flexibility and performance advantages. Kollmorgen's culture of continuous improvement has paid dividends again. The AKM servomotor's innovative design has been polished and optimized. With the new AKD amplifier, the venerable AKM servomotor sets a new standard of refined servo performance, designed to deliver precise motion and more power for your money. Nowhere else will you find a more versatile and complete servo family to meet your needs and exceed your expectations.

Features

- Eight frame sizes (40 to 260 mm)
- 28 frame-stack length combinations
- 117 standard windings for 120/240/400/480 Vac operation as well as low-voltage DC options
- Flexible flange mount and shaft options
- Industry-leading low-cogging contributing to extreme smoothness
- Wide feedback options for high-performance and precision or rugged environments
- Unmatched customization – special windings, special shafts, and much more



AKD with AKM Plug-and-Play Feedback

These feedback devices include electronic motor nameplates allowing plug-and-play commissioning, eliminating the need for drive parameter set-up and servo loop tuning in most applications.

Performance Data

AKM Motor		Single-turn Absolute			Multi-turn Absolute		
		Accuracy (arc-min)	Resolution (bits)	Feedback Type	Accuracy (arc-min)	Resolution (bits)	Feedback Type
Value Line	AKM1	16	24	C	—	—	—
	AKM2-3	9	24	C	8	20	LB
	AKM4-8	9	24	C	4.66	21	LB
Performance Line	AKM2-4	1.0	27	DA	1.0	27	DB
	AKM5-8	0.333	27	DA	0.333	27	DB

Note: Additional plug-and-play feedback options covered in the feedback devices section on page 60.

AKM Systems Overview

AKM Servomotor with AKD Servo Drive System Performance

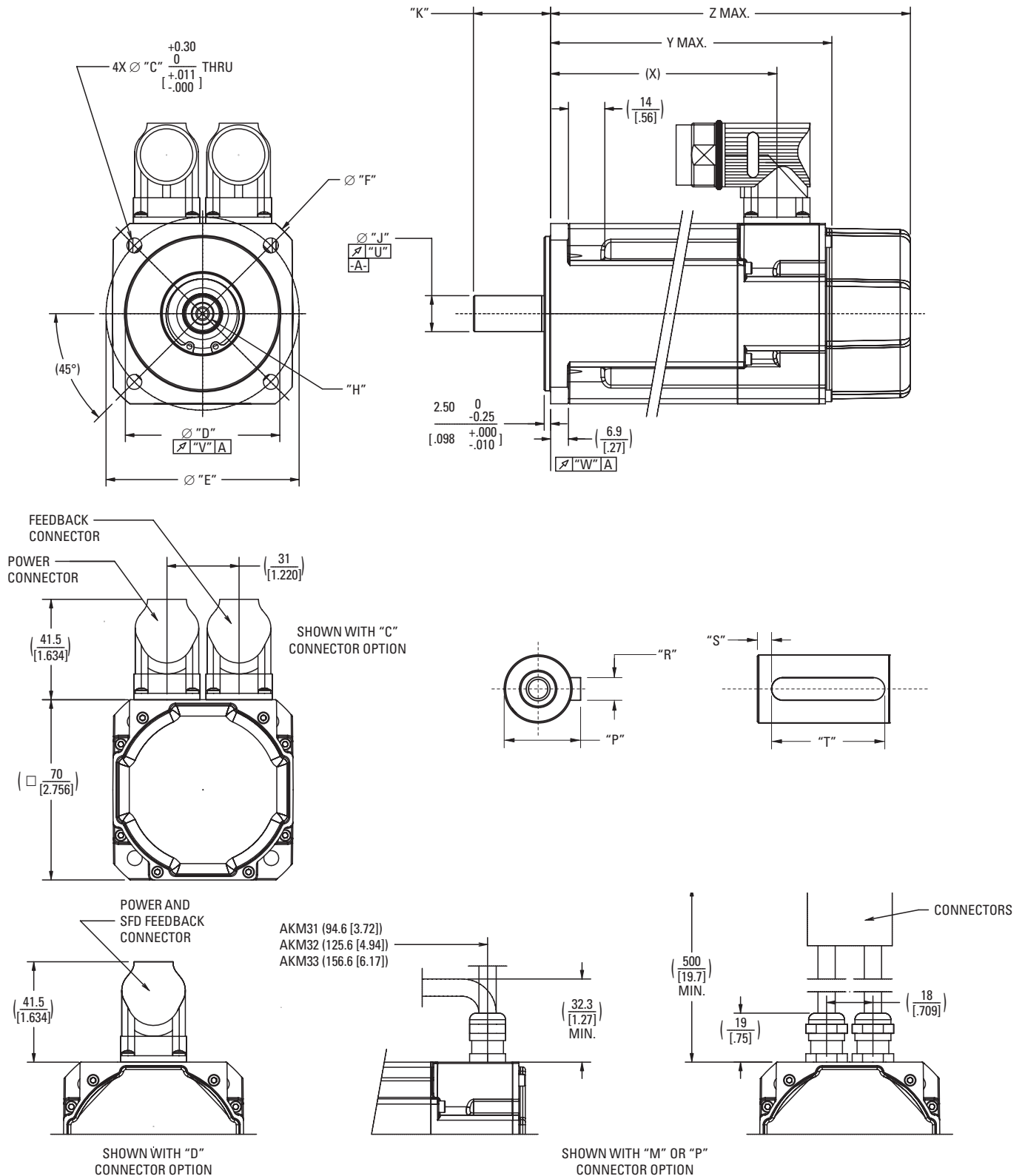
AKM Servomotor		AKD Servo Drive	Frame Size NEMA/mm	Cont.Torque at stall Tcs Nm (lb-in)	Peak Torque at stall Tps Nm (lb-in)	Rated Speed Nrtd RPM	Max System Speed ² RPM	Power Prtd watts	Inertia (Jm) Kg-cm ² (lb-in-s ² x10 ⁻²)
120 Vac	AKM11B	AKD-X00306	17/40	0.18 (1.59)	0.61 (5.4)	4000	8000	80	0.017 (0.0015)
	AKM11C	AKD-X00306	17/40	0.19 (1.68)	0.62 (5.5)	6000	8000	110	0.017 (0.0015)
	AKM12C	AKD-X00306	17/40	0.31 (2.74)	1.08 (9.56)	4000	8000	130	0.031 (0.00274)
	AKM12E	AKD-X00306	17/40	0.31 (2.74)	0.91 (8.05)	8000	8000	230	0.031 (0.00274)
	AKM13C	AKD-X00306	17/40	0.41 (3.63)	1.46 (12.9)	3000	6150	130	0.045 (0.0040)
	AKM13D	AKD-X00306	17/40	0.40 (3.54)	1.36 (12.0)	7000	8000	270	0.045 (0.0040)
	AKM21C	AKD-X00306	23/60	0.48 (4.25)	1.48 (13.1)	2500	5620	120	0.107 (0.0095)
	AKM21E	AKD-X00306	23/60	0.47 (4.16)	1.21 (10.7)	7000	8000	300	0.107 (0.0095)
	AKM22C	AKD-X00306	23/60	0.84 (7.43)	2.39 (21.2)	1000	2820	90	0.161 (0.0142)
	AKM22E	AKD-X00306	23/60	0.87 (7.70)	2.42 (21.4)	3500	5410	290	0.161 (0.0142)
	AKM23D	AKD-X00306	23/60	1.15 (10.2)	3.89 (34.4)	1500	3270	180	0.216 (0.0191)
	AKM23F	AKD-X00606	23/60	1.18 (10.4)	3.88 (34.3)	4500	6290	500	0.216 (0.0191)
	AKM24D	AKD-X00306	23/60	1.40 (12.4)	4.84 (42.8)	1500	2700	210	0.270 (0.0239)
	AKM24F	AKD-X00606	23/60	1.41 (12.5)	4.82 (42.7)	3000	4720	420	0.270 (0.0239)
	AKM31E	AKD-X00306	na/80	1.20 (10.6)	3.23 (28.6)	2500	4240	310	0.330 (0.0292)
	AKM32E	AKD-X00306	na/80	2.04 (18.1)	5.97 (52.8)	1000	2350	210	0.590 (0.0522)
	AKM32H	AKD-X00606	na/80	2.10 (18.6)	6.22 (55.1)	3000	4460	620	0.590 (0.0522)
	AKM33H	AKD-X00606	na/80	2.87 (25.4)	8.55 (75.7)	2500	3310	690	0.850 (0.0752)
	AKM41E	AKD-X00306	34/90	2.01 (17.8)	5.33 (47.2)	1200	2420	240	0.810 (0.0717)
	AKM41H	AKD-X00606	34/90	2.05 (18.1)	5.49 (48.6)	3000	4460	580	0.810 (0.0717)
	AKM43H	AKD-X00606	34/90	4.82 (42.7)	14.0 (124)	1200	1920	560	2.09 (0.185)
	AKM43L	AKD-X01206	34/90	4.73 (41.9)	11.7 (104)	3000	4020	1190	2.09 (0.185)
	AKM44H	AKD-X00606	34/90	5.89 (43.3)	17.0 (150)	1000	1620	570	2.73 (0.242)
	AKM51H	AKD-X00606	42/115	4.79 (42.4)	11.7 (104)	1200	2150	560	3.42 (0.303)
	AKM51L	AKD-X01206	42/115	4.89 (43.3)	10.6 (93.8)	3000	4150	1240	3.42 (0.303)
	AKM52L	AKD-X01206	42/115	8.67 (76.7)	19.6 (173)	1500	2290	1240	6.22 (0.551)
	AKM53L	AKD-X01206	42/115	11.6 (103)	26.5 (235)	1200	1740	1350	9.12 (0.807)
	AKM54L	AKD-X01206	42/115	13.5 (119)	31.3 (277)	1200	1510	1630	11.9 (1.06)
240 Vac	AKM11B	AKD-X00306	17/40	0.18 (1.59)	0.61 (5.4)	8000	8000	140	0.017 (0.0015)
	AKM12C	AKD-X00306	17/40	0.31 (2.74)	1.08 (9.56)	8000	8000	230	0.031 (0.00274)
	AKM13C	AKD-X00306	17/40	0.41 (3.63)	1.46 (12.9)	8000	8000	300	0.045 (0.0040)
	AKM21C	AKD-X00306	23/60	0.48 (4.25)	1.48 (13.1)	8000	8000	320	0.107 (0.0095)
	AKM22C	AKD-X00306	23/60	0.84 (7.43)	2.73 (24.2)	3500	5650	290	0.161 (0.0142)
	AKM22E	AKD-X00306	23/60	0.87 (7.70)	2.42 (21.4)	8000	8000	580	0.161 (0.0142)
	AKM23D	AKD-X00306	23/60	1.15 (10.2)	3.89 (34.4)	5000	6540	530	0.216 (0.0191)
	AKM23F	AKD-X00606	23/60	1.18 (10.4)	3.88 (34.3)	8000	8000	780	0.216 (0.0191)
	AKM24D	AKD-X00306	23/60	1.40 (12.4)	4.84 (42.8)	4000	5410	540	0.270 (0.0239)
	AKM24F	AKD-X00606	23/60	1.41 (12.5)	4.82 (42.7)	8000	8000	930	0.270 (0.0239)
	AKM31C	AKD-X00306	na/80	1.15 (10.2)	3.87 (34.3)	2500	4050	290	0.330 (0.0292)
	AKM31E	AKD-X00306	na/80	1.20 (10.6)	3.23 (28.6)	6000	8000	600	0.330 (0.0292)
	AKM32E	AKD-X00306	na/80	2.04 (18.1)	5.97 (52.8)	3000	4710	600	0.590 (0.0522)
	AKM32H	AKD-X00606	na/80	2.10 (18.6)	6.22 (55.1)	7000	8000	1060	0.590 (0.0522)
	AKM33E	AKD-X00306	na/80	2.80 (24.8)	8.95 (79.2)	2000	3130	550	0.850 (0.0752)
	AKM33H	AKD-X00606	na/80	2.87 (25.4)	8.55 (75.7)	5500	6640	1300	0.850 (0.0752)
	AKM41E	AKD-X00306	34/90	2.01 (17.8)	5.33 (47.2)	3000	4850	570	0.810 (0.0717)
	AKM41H	AKD-X00606	34/90	2.05 (18.1)	5.49 (48.6)	6000	6000	1010	0.810 (0.0717)
	AKM42E	AKD-X00306	34/90	3.42 (30.3)	9.74 (86.2)	1800	2740	590	1.45 (0.128)
	AKM42G	AKD-X00606	34/90	3.51 (31.1)	11.0 (97.4)	3500	4660	1060	1.45 (0.128)
	AKM43H	AKD-X00606	34/90	4.82 (42.7)	14.0 (124)	3000	3850	1210	2.09 (0.185)
	AKM43L	AKD-X01206	34/90	4.73 (41.9)	11.7 (104)	6000	6000	1590	2.09 (0.185)
	AKM44E	AKD-X00306	34/90	5.79 (51.2)	16.5 (146)	1200	1680	660	2.73 (0.242)
	AKM44H	AKD-X00606	34/90	5.89 (43.3)	17.0 (150)	2500	3250	1220	2.73 (0.242)

Note 1: For complete AKM and AKD model nomenclature, refer to pages 71 and 72 respectively.

Note 2: Max mechanical speeds: 8000 RPM for AKM1, 2, 3 and 6000 RPM for AKM4, 5, 6, 7.

AKM3x Outline Drawings

AKM3x Frame



AKM3x Dimension Data

AKM3x Dimension Data

Mounting Code	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"P"
AC	5.80 [.228]	$\begin{matrix} 60 & +0.012 \\ & -0.007 \\ & +0.004 \\ & -0.002 \end{matrix}$ j6 [2.3622]	75 [2.953]	90 [3.543]	D M5 DIN 332	$\begin{matrix} 14 & +0.012 \\ & +0.001 \\ & +0.005 \\ & +0.000 \end{matrix}$ k6 [.5512]	30.0 [1.181]	$\begin{matrix} 16 & 0 \\ & -0.13 \\ & +0.000 \\ & -0.005 \end{matrix}$ [.630]
AN	5.80 [.228]	$\begin{matrix} 60 & +0.012 \\ & -0.007 \\ & +0.004 \\ & -0.002 \end{matrix}$ j6 [2.3622]	75 [2.953]	90 [3.543]	D M5 DIN 332	$\begin{matrix} 14 & +0.012 \\ & +0.001 \\ & +0.005 \\ & +0.000 \end{matrix}$ k6 [.5512]	30.0 [1.181]	—
CC	5.80 [.228]	$\begin{matrix} 60 & +0.012 \\ & -0.007 \\ & +0.004 \\ & -0.002 \end{matrix}$ j6 [2.3622]	85 [3.346]	—	D M5 DIN 332	$\begin{matrix} 14 & +0.012 \\ & +0.001 \\ & +0.005 \\ & +0.000 \end{matrix}$ k6 [.5512]	30.0 [1.181]	$\begin{matrix} 16 & 0 \\ & -0.13 \\ & +0.000 \\ & -0.005 \end{matrix}$ [.630]
CN	5.80 [.228]	$\begin{matrix} 60 & +0.012 \\ & -0.007 \\ & +0.004 \\ & -0.002 \end{matrix}$ j6 [2.3622]	85 [3.346]	—	D M5 DIN 332	$\begin{matrix} 14 & +0.012 \\ & +0.001 \\ & +0.005 \\ & +0.000 \end{matrix}$ k6 [.5512]	30.0 [1.181]	—
GC	5.80 [.228]	$\begin{matrix} 60 & +0.012 \\ & -0.007 \\ & +0.004 \\ & -0.002 \end{matrix}$ j6 [2.3622]	75 [2.953]	90 [3.543]	D M5 DIN 332	$\begin{matrix} 11 & +0.012 \\ & +0.001 \\ & +0.005 \\ & +0.000 \end{matrix}$ k6 [.4331]	23 [.906]	$\begin{matrix} 12.5 & 0 \\ & -0.13 \\ & +0.000 \\ & -0.005 \end{matrix}$ [.492]
GN	5.80 [.228]	$\begin{matrix} 60 & +0.012 \\ & -0.007 \\ & +0.004 \\ & -0.002 \end{matrix}$ j6 [2.3622]	75 [2.953]	90 [3.543]	D M5 DIN 332	$\begin{matrix} 11 & +0.012 \\ & +0.001 \\ & +0.005 \\ & +0.000 \end{matrix}$ k6 [.4331]	23 [.906]	—

Mounting Code	"R"	"S"	"T"	"U"	"V"	"W"
AC	$\begin{matrix} 5 & 0 \\ & -0.03 \\ & +0.000 \\ & -0.001 \end{matrix}$ N9 [.197]	5.00 [1.97]	$\begin{matrix} 20 & 0 \\ & -0.20 \\ & +0.000 \\ & -0.008 \end{matrix}$ [.787]	0.035 [.0013]	0.080 [.0031]	0.080 [.0031]
AN	—	—	—	0.035 [.0013]	0.080 [.0031]	0.080 [.0031]
CC	$\begin{matrix} 5 & 0 \\ & -0.03 \\ & +0.000 \\ & -0.001 \end{matrix}$ N9 [.197]	5.00 [1.97]	$\begin{matrix} 20 & 0 \\ & -0.20 \\ & +0.000 \\ & -0.008 \end{matrix}$ [.787]	0.035 [.0013]	0.080 [.0031]	0.080 [.0031]
CN	—	—	—	0.035 [.0013]	0.080 [.0031]	0.080 [.0031]
GC	$\begin{matrix} 4 & 0 \\ & -0.03 \\ & +0.000 \\ & -0.001 \end{matrix}$ N9 [.157]	3.5 [.138]	$\begin{matrix} 16 & 0 \\ & -0.20 \\ & +0.000 \\ & -0.008 \end{matrix}$ [.630]	0.035 [.0013]	0.080 [.0031]	0.080 [.0031]
GN	—	—	—	0.035 [.0013]	0.080 [.0031]	0.080 [.0031]
CN	—	—	—	0.035 [.0013]	0.080 [.0031]	0.080 [.0031]

MODEL	(X)	Y MAX	Z MAX (W/ BRAKE)
AKM31	87.9 [3.46]	109.8 [4.32]	141.3 [5.56]
AKM32	118.9 [4.68]	140.8 [5.54]	172.3 [6.78]
AKM33	149.9 [5.90]	171.8 [6.76]	203.3 [8.00]

Note 1: Dimensions are in mm [inches].

Note 2: Product designed in metric. English conversions provided for reference only.

AKM3x Performance Data

AKM3x Performance Data – Up to 640 Vdc

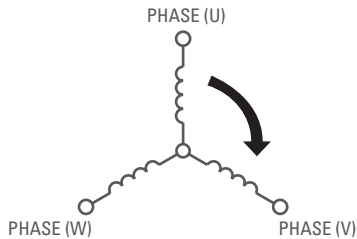
				AKM31			AKM32			AKM33			
	Parameters	Tol	Symbol	Units	C	E	H	C	E	H	C	E	H
	Max Rated DC Bus Voltage	Max	V _{bus}	V _{dc}	640	320	160	640	640	320	640	640	320
	Continuous Torque (Stall) for ΔT winding = 100°C ①②⑦⑧⑨	Nom	T _{cs}	Nm	1.15	1.20	1.23	2.00	2.04	2.10	2.71	2.79	2.88
				lb-in	10.2	10.6	10.8	17.7	18.1	18.6	24.0	24.7	25.5
	Continuous Current (Stall) for ΔT winding = 100°C ①②⑦⑧⑨	Nom	I _{cs}	A _{rms}	1.37	2.99	5.85	1.44	2.82	5.50	1.47	2.58	5.62
	Continuous Torque (Stall) for ΔT winding = 60°C ②	Nom	T _{cs}	Nm	0.92	0.96	0.98	1.60	1.63	1.68	2.17	2.23	2.30
				lb-in	8.1	8.5	8.7	14.2	14.4	14.9	19.2	19.7	20.4
	Max Mechanical Speed ⑤	Nom	N _{max}	rpm	8000	8000	8000	8000	8000	8000	8000	8000	8000
	Peak Torque ①②	Nom	T _p	Nm	3.88	4.00	4.06	6.92	7.11	7.26	9.76	9.96	10.22
				lb-in	34.3	35.4	35.9	61.2	62.9	64.3	86.4	88.1	90.5
	Peak Current	Nom	I _p	A _{rms}	5.5	12.0	23.4	5.7	11.3	22.0	5.9	10.3	22.5
75 Vdc	Rated Torque (speed) ①②⑦⑧⑨⑩		T _{rtd}	Nm	-	1.19	1.20	-	-	2.06	-	-	2.82
				lb-in	-	10.5	10.6	-	-	18.2	-	-	24.6
	Rated Speed		N _{rtd}	rpm	-	750	2000	-	-	1200	-	-	800
	Rated Power (speed) ①②⑦⑧⑨		P _{rtd}	kW	-	0.09	0.25	-	-	0.26	-	-	0.24
Hp				-	0.13	0.34	-	-	0.35	-	-	0.32	
160 Vdc	Rated Torque (speed) ①②⑦⑧⑨⑩		T _{rtd}	Nm	-	1.17	0.97	-	2.01	1.96	-	-	2.66
				lb-in	-	10.3	8.6	-	17.7	17.4	-	-	23.5
	Rated Speed		N _{rtd}	rpm	-	2500	6000	-	1000	3000	-	-	2500
	Rated Power (speed) ①②⑦⑧⑨		P _{rtd}	kW	-	0.31	0.61	-	0.21	0.62	-	-	0.70
Hp				-	0.41	0.82	-	0.28	0.83	-	-	0.93	
320 Vdc	Rated Torque (speed) ①②⑦⑧⑨⑩		T _{rtd}	Nm	1.12	0.95	-	1.95	1.91	1.45	2.64	2.62	2.27
				lb-in	9.9	8.4	-	17.3	16.9	12.8	23.4	23.2	20.1
	Rated Speed		N _{rtd}	rpm	2500	6000	-	1500	3000	7000	1000	2000	5500
	Rated Power (speed) ①②⑦⑧⑨		P _{rtd}	kW	0.29	0.60	-	0.31	0.6	1.06	0.28	0.55	1.31
Hp				0.39	0.80	-	0.41	0.80	1.42	0.37	0.74	1.75	
560 Vdc	Rated Torque (speed) ①②⑦⑧⑨⑩		T _{rtd}	Nm	1.00	-	-	1.86	1.50	-	2.54	2.34	-
				lb-in	8.9	-	-	16.5	13.3	-	22.5	20.7	-
	Rated Speed		N _{rtd}	rpm	5000	-	-	3000	6500	-	2000	4500	-
	Rated Power (speed) ①②⑦⑧⑨		P _{rtd}	kW	0.52	-	-	0.58	1.02	-	0.53	1.10	-
Hp				0.70	-	-	0.78	1.37	-	0.71	1.48	-	
640 Vdc	Rated Torque (speed) ①②⑦⑧⑨⑩		T _{rtd}	Nm	0.91	-	-	1.83	1.22	-	2.50	2.27	-
				lb-in	8.1	-	-	16.2	10.8	-	22.1	20.1	-
	Rated Speed		N _{rtd}	rpm	6000	-	-	3500	8000	-	2500	5000	-
	Rated Power (speed) ①②⑦⑧⑨		P _{rtd}	kW	0.57	-	-	0.67	1.02	-	0.65	1.19	-
Hp				0.77	-	-	0.90	1.37	-	0.88	1.59	-	

See following page for notes.

Feedback Options

Phasing Diagram - All Motors

Motor Winding Configuration



General notes:

- 1 When motor is rotated CW (viewed from drive shaft end), these waveforms result:
Voltage U, leads V, leads W.
Voltage U-W leads Voltage V-W by 60° electrical.
- 2A 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.
- 2B Optional KTY84-130 Nominal Resistance at 25°C, 603 ohms.
- 2C Optional KTY83-110 Nominal Resistance at 25°C, 1000 ohms.
- 3 When optional shaft seal is included on front shaft extension, note that static friction stated in catalog or on winding data sheet is measured without shaft seal installed.
- 4 Standard outline drawings showing mounting dimensions and standard winding information are available on our website or by calling the Kollmorgen Customer Support at 1-540-633-3545, or through email at support@kollmorgen.com.

Feedback Summary for AKM Servomotor with AKD Servo Drive

Feedback Device/ (Motor designation)	Plug & Play, Motor ID ³	AKM Models	Device Resolution Cycles or Lines/rev	Resolution after AKD Interpolation ⁴ : counts (arc-min)	Accuracy: Arc-min (±)
Comcoder (1-)	N	AKM1-8	1024	4096 (5.27)	5.27
Comcoder (2-)	N	AKM1-8	2048	8192 (2.64)	2.64
Resolver (R-)	N	AKM1	1	65536 (0.330)	15
		AKM2-8			8
SFD (C-)	Y	AKM1	16,777,216 (0.00129 arc-min)	N/A	16
		AKM2-8			9
Endat 2.1 ¹ (DA)	Y	AKM2-4	512	134,217,728 (0.000161)	1.0
		AKM5-8	2048		0.333
Endat 2.1 Multi-turn ^{1,2} (DB)	Y	AKM2-4	512	134,217,728 (0.000161)	1.0
		AKM5-8	2048		0.333
BiSS ¹ (AA)	Y	AKM2-8	2048	134,217,728 (0.000161)	0.60
BiSS Multi-turn ^{1,2} (AB)	Y	AKM2-8	2048	134,217,728 (0.000161)	0.60
Inductive enc. ¹ (LA)	Y	AKM2,3	16	1,048,576 (0.0206)	8
		AKM4-7	32	2,097,152 (0.0103)	4.66
Inductive enc. Multi-turn ^{1,2} (LB)	Y	AKM2,3	16	1,048,576 (0.0206)	8
		AKM4-7	32	2,097,152 (0.0103)	4.66

Note 1: Not available for AKM1.

Note 2: Provides 4096 turns of absolute positioning.

Note 3: These feedback devices include electronic motor nameplate data allowing plug-and-play commissioning, eliminating the need for drive parameter set-up and servo loop tuning in most applications.

Note 4: AKD interpolation for sinusoidal feedback devices is 2¹⁶, however the resulting usable resolution for positioning may be much less for very high resolution systems.

Servomotor Feedback Combinations

AKM Family of Servomotors with Smart Feedback Device (SFD)

The SFD Feedback communicates with the drive over a four-wire interface. Two wires supply +5V power at <150 mA and the second pair is an RS-485 digital communications link. The device includes EEPROM memory to save motor parameters.

Angle Measurement:

Resolution: $2^{24} = 16,777,216$ counts per rev
 $= 0.0013$ arc-min
 Accuracy: $< \pm 0.75$ arc-min electrical + sensor error
 Size 10 sensor ± 16 arc-min net (AKM 1)
 Size 15 sensor ± 9 arc-min net (AKM 2,3,4)
 Size 21 sensor ± 9 arc-min net (AKM 5,6,7)
 Electrical Noise: $< 2^{-17}$ Rev rms at full bandwidth
 Bandwidth: > 2000 Hz at -3 dB
 > 1000 Hz at -45° phase lag
 Max Tracking Rate: $> 50,000$ RPM
 Velocity Ripple: $< 0.2\%$ p-p electronics only
 Size 10 sensor $< 2.5\%$ p-p net (AKM 1)
 Size 15 sensor $< 1.5\%$ p-p net (AKM 2,3,4)
 Size 21 sensor $< 1.5\%$ p-p net (AKM 5,6,7)
 Velocity Noise: < 4 RPM rms at full bandwidth

Digital Communications:

Baud Rate: 2.5 MBaud
 Signaling: RS-485 differential, 8 bit data with odd parity compatible with standard UARTs
 Update Period: Once every 51.2 uSec new position sample
 Error Detection: 5 bit CRC in addition to parity check
 EEPROM Memory: Does a data dump when the unit powers up.

Power Supply:

Supply at Drive: $5.0 \text{ V} \pm 0.25 \text{ V} (\pm 5\%)$
 Supply at SFD in motor: 4.25 V to 5.25 V
 Nominal Supply Current: 120 mA
 Worst Case Supply: 150 mA
 Cable Resistance: +5V, Rtn: < 3.3 Ohm net

Environmental:

Operating Ambient: -20 to 120° C
 Humidity: 10% to 90% non-condensing
 Storage Temperature: -40 to 135° C

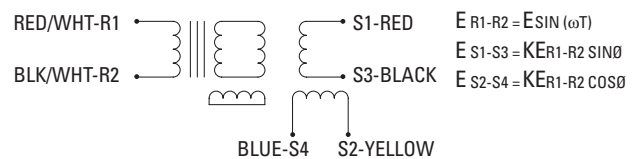
Resolver (Feedback)

Resolver Data	Units	AKM 1	AKM 2, 3, 4	AKM 5, 6, 7, 8
Type		1 Speed	1 Speed	1 Speed
Input Voltage	V_{RMS}	7.0	7.0	7.0
	k Hz	10	10	10
Input Current Max.	mA	30	50	50
Transformation Ratio	10%	0.5	0.5	0.5
Null Voltage	mV_{RMS}	50	30	30
Max. Error (pk-pk)	MINS.	30	18	18
Phase Shift	Degrees	-9	0	0
Operating Temperature	°C	-55° to 155°	-55° to 155°	-55° to 155°
Rotor Inertia Max.	kg-cm ²	0.002	0.046	0.497

Resolver Alignment

With positive DC current into phase W and out of phase V (U floats) the resolver is aligned to electrical ± 5 counts. ie. Voltage S1-S3 set to null voltage S2-S4 max in phase with reference (R1-R2).

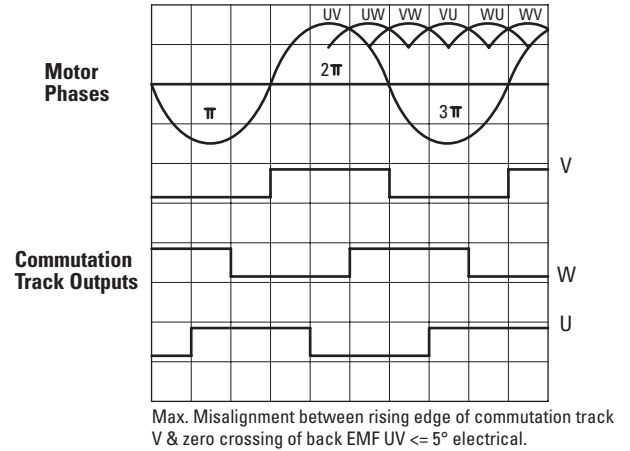
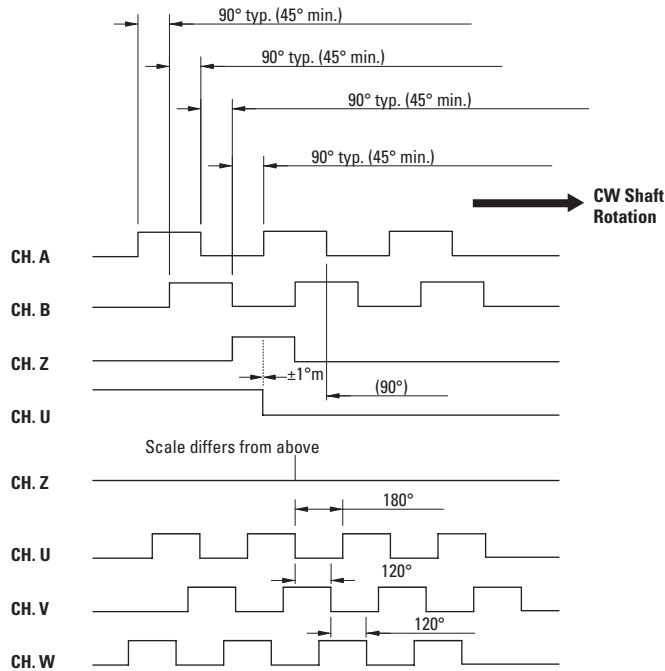
Resolver Winding Configuration



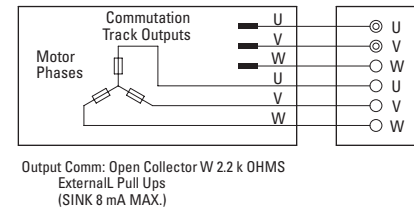
Servomotor Feedback Combinations

Commutating Encoder Option

Commutating Encoder



Motor Connections



Parameter	Units	1- (AKM1-8)	2- (AKM1-8)	ED (AKM2-8)	EE (AKM2-8)	EF (AKM2-4)	EF (AKM5-8)	EG (AKM2-8)	EM (AKM2-8)	EH (AKM2-8)	EN (AKM5-8)	EJ (AKM5-8)
Input Voltage	Vdc $\pm 10\%$	5										
Output Data		26LS31 Diff. Line Driver. Sink/Source 40mA Max										
Line Count		1,024	2,048	500	1,000	2,000	2,000	2,500	4,096	5,000	8,192	10,000
Frequency Response	KHz	200	200	200	200	200	200	200	500	500	1000	1000
Max. Speed	RPM	12,000	12,000	12,000	12,000	12,000	7,500	12,000	7,324	8,000	3,662	3,000
Min. Edge Separation of Incremental Channel	$^\circ$ e MIN.	45										
Index to U Comm Channel		$\pm 1^\circ$ m Index Center To U Falling Edge										
Index Pulse Width		Gated With B Low										
Incremental Channel Accuracy		± 1 Arc Min. (AKM2-8), ± 2.5 Arc Min. (AKM1) Max. Edge to Edge										
Max. Acceleration	Rad/s ²	100,000										
Operating Temperature	$^\circ$ C	0-120										
Storage Temperature	$^\circ$ C	-40 - 120										

	Type	AKM1	AKM2	AKM3	AKM4	AKM 5, 6, 7, 8
Commutating Channel	All Models	6 Pole 60°m ± 6 Min.	6 Pole 60°m ± 6 Min.	8 Pole 45°m ± 6 Min.	10 Pole 36°m ± 6 Min.	10 Pole 36°m ± 6 Min.
Moment of Inertia (kg-cm ²)	1-2-	0.0016	0.0048	0.0048	0.0048	0.0275
	All Ex Models	NA	0.0048	0.0048	0.0048	0.0275

Absolute Sine Encoder Options

Encoder Alignment

With positive DC current into phase W and out of phase V (U floats) the encoder is aligned to ± 1 electrical degree¹.

EnDat Optical

Type		Single-Turn "DA"		Multi-Turn "DB"	
Frame Size		AKM 2, 3, 4	AKM 5, 6, 7, 8	AKM 2, 3, 4	AKM 5, 6, 7, 8
Cycles Per Revolution		512	2048	512	2048
Input Voltage	Vdc $\pm 5\%$	5	5	5	5
Current Consumption	mA MAX.	160	150	200	250
Operating Temperature	°C MIN/MAX	-20/115	-20/115	-20/115	-20/115
Inertia	kg-cm ²	0.040	0.260	0.040	0.260
Output Interface		HEIDENHAIN EnDat			
Type		ECN1113	ECN1313	EQN1125	EQN1325

EnDat Inductive

Type		Single-Turn "LA"		Multi-Turn "LB"	
Frame Size		AKM 2, 3	AKM 4, 5, 6, 7	AKM 2, 3	AKM 4, 5, 6, 7
Cycles Per Revolution		16	32	16	32
Input Voltage	Vdc $\pm 5\%$	5	5	5	5
Current Consumption	mA MAX.	160	170	190	170
Operating Temperature	°C MIN/MAX	-20/115	-20/115	-20/115	-20/115
Inertia	kg-cm ²	0.0076	0.022	0.0076	0.022
Output Interface		HEIDENHAIN EnDat			
Type		ECI 1118	ECI1319	EQI 1130	EQI1331

BiSS Optical

Type		Single-Turn "AA"		Multi-Turn "AB"	
Frame Size		AKM 2, 3, 4	AKM 5, 6, 7, 8	AKM 2, 3, 4	AKM 5, 6, 7, 8
Cycles Per Revolution		2048	2048	2048	2048
Input Voltage	Vdc $\pm 5\%$	5	5	5	5
Current Consumption	mA MAX.	45	70	85	100
Operating Temperature	°C MIN/MAX	-20/115	-20/115	-20/115	-20/115
Inertia	kg-cm ²	0.025	0.038	0.025	0.038
Output Interface		BiSS			
Type		AD36	AD58	AD36	AD58

Note 1: EnDat Inductive is aligned to ± 3 electrical degrees

Brake Option

Failsafe, Holding Brake

The holding brake is designed to provide static holding torque to the motor shaft with the brake coil de-energized. The brake must first be released (coil energized) prior to commanding motor rotation as determined by its drop-out time. The brake is intended for holding or “parking” of a stationary 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.

AKM Motor Brake Specifications

Motor Family	Minimum Static Torque @120°C		Weight		Power Consumption @24V, 20°C	Current @24V, 20°C	Inertia		Closing Time (engage)	Opening Time (release)	Backlash	
											Maximum	Typical
	Nm	lb-in	Kg	lb	Watts ±7%	ADC	kg-cm ²	lb-in-sec ²	msec	msec	deg.	deg.
AKM2	1.42	12.6	0.27	0.59	8.4	0.35	0.011	0.97E-05	36	35	1.01	0.46
AKM3	2.5	22.1	0.35	0.77	10.1	0.42	0.011	0.97E-05	20	50	1.01	0.46
AKM4	5.3	46.9	0.63	1.39	12.8	0.53	0.068	6.02E-05	30	75	0.81	0.37
AKM5	14.5	128	1.1	2.42	19.5	0.82	0.173	1.53E-04	30	115	0.71	0.31
AKM6	25	221	2	4.4	25.7	1.07	0.605	5.35E-04	40	155	0.51	0.24
AKM7	53	469	2.9	6.38	35.6	1.48	1.64	1.46E-03	70	170	0.44	0.20
AKM8	150	1330	8	17.5	49	2.04	5.53	4.90E-03	100	300	0.44	0.20

Note 1: Contamination of the motor internal compartment by oil or other foreign materials will result in failure of the brake. Check the suitability of motor sealing for the working environment.

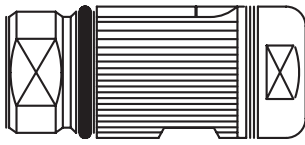
Note 2: Operating Voltage: 24 Vdc ± 10%.

Note 3: Maximum backlash is calculated using worst-case tolerancing, and typical backlash is calculated using statistical tolerancing.

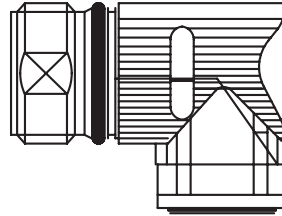
Servomotor Connector Options

B, C, G, H, & T Power Connectors

B, C- Connector

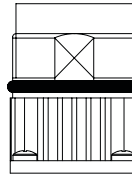


Cable Option (AKM 1 & 2 Only)
Connector Part Number:
BKUA-199-NN-00-11-0035-000
(For AKM 1 & 2)



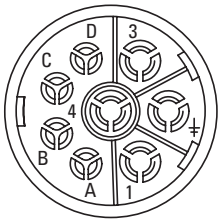
Motor Mounted Option
Connector Part Number:
BEDC-089-NN-00-00-0005-000

G- Connector



Motor Mounted Option
Connector Part Number:
BEDC-089-NN-00-00-0011-000
(AKM 2, 3, 4, 5, 6 & 7)

Power Connector (View Facing Front)



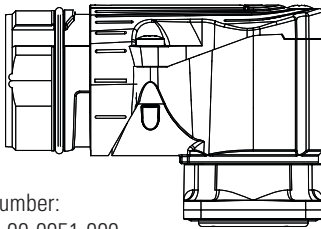
Pin	Function	Color
1	U	Blue
±	PE	Grn/Yel
3	W	Violet
4	V	Brown
A	Brake +	Black
B	Brake -	Black
C	N/C	
D	N/C	

Shield Connected to Motor
Ground Internal to Motor
(For AKM 1 & 2)

Suggested Mating Connector

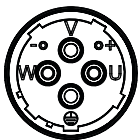
Intercontec
BSTA-108-NN-00-08-0036-000

H- Connector



Connector Part Number:
CEDE-270-NN-00-00-0051-000

Power Connector (View Facing Front)



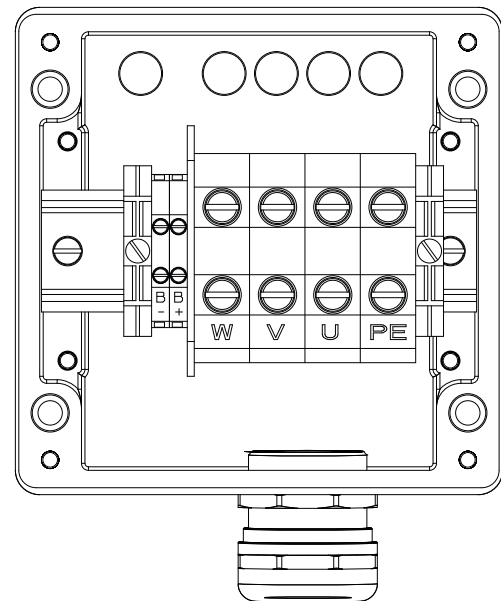
Pin	Function	Color
U	U	Blue
±	PE	Grn/Yel
W	W	Violet
V	V	Brown
+	Brake +	Black
-	Brake -	Black

Suggested Mating Connector

Intercontec
CSTA-263-NN-00-45-0001-000

Shield Connected to Motor
Ground Internal to Motor

T- Connector

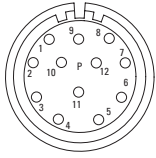


Terminal Box AKM8 Only

Servomotor Connector Options

B, C, G, H, & T Feedback Connectors

SFD Feedback (View Facing Front)



Connector Part Number:
AKUA-020-NN-00-09-0035-000 (For AKM 1 & 2)
AEDC-052-NN-00-00-0012-000 (For AKM 2, 3, 4, 5, 6, 7, & 8)

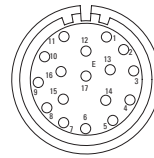
Pin	Function	Color
1	SFD +5V	Red
2	SFD +5V RTN	Black
3	SFD COM-	Yellow
4	SFD COM+	Blue
5	SFD COM Shield (AKM 1, 2)	
6	N/C	
7	N/C	
8	N/C	
9	N/C	
10	N/C	
11	N/C	
12	N/C	

Shield is Not Connected at Motor End

Suggested Mating Connector

Intercontec
ASTA-021-NN-00-10-0035-000

Commutating Encoder (View Facing Front)



Connector Part Number:
AKUA-034-NN-00-09-0035-000 (For AKM 1 & 2)
AEDC-113-NN-00-00-0012-000 (For AKM 2, 3, 4, 5, 6, & 7)

Pin	Function	Color
1	B	Green
2	\bar{B}	Gm/Blk
3	A	Blue
4	\bar{A}	Blue/Blk
5	Z	Violet
6	\bar{Z}	Violet/Blk
7	Gnd	Black
8	Thermal Sensor +	Orange
9	Thermal Sensor -	Orange/White
10	Vcc	Red
11	N/C	
12	N/C	
13	N/C	
14	N/C	
15	U	Brown
16	V	Grey
17	W	White

Shield is Not Connected at Motor End

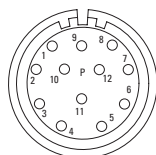
On motor mounted connectors, the thermal sensor lead colors are (+) Blue, (-) Black.

Suggested Mating Connector

Intercontec
ASTA-035-NN-00-10-0035-000

B, C, G, H, & T Feedback Connectors

Resolver (View Facing Front)



Connector Part Number:
AKUA-020-NN-00-09-0035-000 (For AKM 1 & 2)
AEDC-052-NN-00-00-0012-000 (For AKM 2, 3, 4, 5, 6, 7, & 8)

Pin	Function	Color
1	N/C	
2	Thermal Sensor +	Orange
3	S4, COS-	Blue
4	S3, SIN-	Black
5	R2, REF-	Blk/Wht
6	Thermal Sensor -	Orange/White
7	S2, COS+	Yellow
8	S1, SIN+	Red
9	R1, REF+	Red/Wht
10	N/C	
11	N/C	
12	N/C	

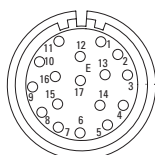
Shield is Not Connected at Motor End
On motor mounted connectors, the thermal sensor lead colors are (+) Blue, (-) Black.

Suggested Mating Connector

Intercontec
ASTA-021-NN-00-10-0035-000

"DA" & "DB" Absolute Encoder (View Facing Front)

"LA" & "LB" Absolute Encoder (Inductive)



Connector Part Number:
AKUA-034-NN-00-09-0035-000 (For AKM 2)
AEDC-113-NN-00-00-0012-000 (For AKM 3, 4, 5, 6, 7 & 8)

Pin	Function	Color	
		AKM2	AKM3, 4, 5, 6, 7, 8 (Motor-mounted connector)
1	B-	Red/Blk	Red/Blk
2	GND	Wht/Grn	Wht/Grn
3	A-	Yel/Blk	Yel/Blk
4	Vcc (5Vdc)	Brn/Grn	Brn/Grn
5	Data	Gray	Gray
6	N/C		
7	Thermal Sensor +	Green	Blue
8	Clock	Violet	Violet
9	B+	Blu/Blk	Blu/Blk
10	Un Sense (common)	White	White
11	A+	Grn/Blk	Grn/Blk
12	Up Sense (VCC)	Blue	Blue
13	Data	Pink	Pink
14	Thermal Sensor-	Brown	Black
15	Clock	Yellow	Yellow
16	N/C		
17	N/C		

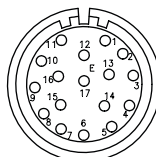
Shield is Not Connected at Motor End

Suggested Mating Connector

Intercontec
ASTA-035-NN-00-10-0035-000

Option "DA" = Single-Turn Absolute
Option "DB" = Multi-Turn Absolute

"AA" & "AB" Absolute Encoder (View Facing Front)



Connector Part Number:
AEDC-113-NN-00-00-0012-000 (For AKM 3, 4, 5, 6, & 7)

Pin	Function	Color
1	B-	Red/Blk
2	Gnd	Wht/Blk
3	A-	Yel/Blk
4	Vcc (5Vdc)	Brn/Grn
5	Data	Gray
6	N/C	
7	Thermal Sensor+	Green
8	Clock	Violet
9	B+	Blu/Blk
10	Un Sense (Common)	White
11	A+	Grn/Blk
12	Up Sense (VCC)	Blue
13	Data	Pink
14	Thermal Sensor-	Brown
15	Clock	Yellow
16	N/C	
17	N/C	

Shield is Not Connected at Motor End

Suggested Mating Connector

Intercontec
ASTA-035-NN-00-10-0035-000

Mating Connector Kits

(For Use On Motors With "C & G" Connectors Only)

Connector Part Number: BEDC-089-NN-00-00-0005-000

Resolver	CKT-T1A-SRE	CKT-T1B-SRE
Encoder	CKT-T1A-SCE	CKT-T1B-SCE

Mating Connector Kits Include Both
Power and Feedback Connectors.

Model Nomenclature

AKM Brushless Servomotor

