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苏州绿的谐波传动科技股份有限公司

Leader Harmonious Drive Systems Co.,Ltd

KAH Hollow-Shaft Rotary Actuator  
Product Introduction Manual



## KAH series hollow shaft rotary actuators



KAH series hollow shaft rotary actuators

### Main features

- KAH series hollow shaft rotary actuator provides large-torque and high-precision rotary actuation. With integrated design, processing and assembly technique, it is provided with high precision speed reducer, framework torque motor, hollow shaft high resolution absolute encoder, brake and intelligent sensor.
- It provides high torque output and torque density, for example, the torque of KAH-40 rotary actuator can reach 800N·m.
- The positioning precision of rotary actuator is within 30 Arc sec.
- An internal through hole is set to facilitate threading wires, gas pipe and laser beams and simplify system structure.
- Dozens of product models are provided to meet diversified needs, and the products with 220 VAC, 110 VAC and 48 VAC voltages are available.
- The high protection grade (IP67) makes the product applicable to severe working environment.
- It can be used by matching with KDE series EtherCAT bus servo drives to realize ultra-low vibration control and reliable and stable operation. It provides an integrated drive control solution.

### Application areas

The products have been widely used in such fields as electronic and semiconductor equipment, precision machine tool, factory automation systems, precision laser processing device, LED equipment, detection device, medical apparatus and instruments, robot and special mechanical arm, printing machinery, spray painting equipment, glass processing equipment, precision measuring instrument and other fields.

### Model

KAH	—	25	C	M	1	N	E
①		②	③	④	⑤	⑥	⑦

- ① Series  
KAH: hollow shaft rotary actuators
- ② Model of speed reducer  
Model: 14, 17, 20, 25, 32, 40
- ③ Reduction ratio of speed reducer  
A: Reduction ratio 51:1  
B: Reduction ratio 81:1  
C: Reduction ratio 101:1  
D: Reduction ratio 121:1 (not suitable for model 14)  
E: Reduction ratio 161:1 (not suitable for model 14 or 17)
- ④ Voltage  
M: 220VAC  
N: 110VAC  
L: DC bus voltage 48VDC
- ⑤ Motor encoder  
1: Multi-turn hollow shaft absolute encoder, single-turn 19 bit / multi-turn 16 bit  
2: Multi-turn hollow shaft absolute encoder, single-turn 22 bit / multi-turn 16 bit  
3: Multi-turn hollow shaft absolute encoder, single-turn 24 bit / multi-turn 16 bit  
4: Hollow shaft incremental encoder, 10000P/R  
5: Hollow shaft incremental encoder, 2500P/R
- ⑥ Motor shaft brake  
N: without brake  
B: with brake
- ⑦ Other options  
E: cables are taken out from rear

The specifications of KAH-14 and KAH-17 series rotary actuators

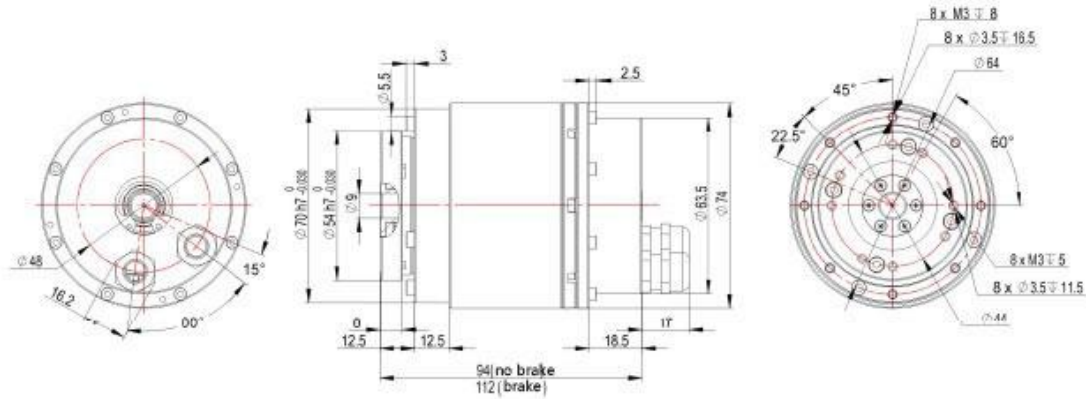
Series		KAH-14			KAH-17				
Mode: KAH-		14A	14B	14C	17A	17B	17C	17D	
Reduction ratio		1:51	1:81	1:101	1:51	1:81	1:101	1:121	
Maximum torque at start and stop	N·m	23	29	34	42	53	66	66	
Maximum average torque	N·m	8.6	13.5	13.5	32	33	49	49	
220VAC	Maximum speed	RPM	127.5	80.2	64.4	119.6	75.3	60.4	50.4
	Rated speed	RPM	70.6	44.4	35.6	60.8	38.3	30.7	25.6
	Maximum current	Arms	1.96	1.56	1.41	3.35	2.10	2.51	2.09
	Rated current	Arms	0.56	0.56	0.44	1.65	1.04	1.24	1.04
	Torque constant	N m/Arms	15.36	24.10	30.68	19.39	31.73	39.51	47.11
	Phase resistance	Ohms	4.311			2.135			
	Phase inductance	mH	5.256			3.869			
	Back EMF	Vrms/kRPM	23.85			30.66			
110VAC	Maximum speed	RPM	40.8	64.8	80.8	100.0	63.0	50.5	42.1
	Rated speed	RPM	70.6	44.4	35.6	60.8	38.3	30.7	25.6
	Maximum current	Arms	4.06	3.23	3.03	6.78	8.26	7.08	6.26
	Rated current	Arms	1.17	1.16	0.93	3.35	4.18	3.53	2.95
	Torque constant	N m/Arms	7.36	11.68	14.57	9.56	7.85	13.87	16.58
	Phase resistance	Ohms	2.089			1.036			
	Phase inductance	mH	2.593			1.684			
	Back EMF	Vrms/kRPM	11.07			14.79			
DC bus voltage 48VDC	Maximum speed	RPM	88.2	55.6	44.6	78.4	49.4	39.6	33.1
	Rated speed	RPM	70.6	44.4	35.6	60.8	38.3	30.7	25.6
	Maximum current	Arms	7.59	7.67	5.66	16.50	11.23	13.20	10.98
	Rated current	Arms	2.84	3.57	2.25	8.47	5.34	6.53	5.46
	Torque constant	N m/Arms	3.03	3.78	6.01	3.74	6.12	7.50	8.98
	Phase resistance	Ohms	0.275			0.262			
	Phase inductance	mH	0.352			0.313			
	Back EMF	Vrms/kRPM	6.32			7.98			
Absolute Encoder	Encoder type	Multi-turn hollow shaft absolute encoder							
	Resolution (single motor revolution )	$2^{19}$ (524,288) , $2^{22}$ (4,194,304) or $2^{24}$ (16,777,216)							
	Motor Multi-turn counter	$2^{16}$ (65,536)							
Incremental encoder	Resolution	Hollow shaft incremental encoder, 40000 pulse/rev (multiplied by 4)							
	Output shaft resolution	pulse/rev	2040000	3240000	4040000	2040000	3240000	4040000	4840000
Uni-directional positional accuracy	Arc sec	40	30	30	40	30	30	30	
Repeatability of positioning accuracy	Arc sec	8	7	7	8	7	7	7	
Overturning stiffness	$\times 10^4 \text{N} \cdot \text{m/rad}$	7.05	9.8		22.08		25.8		
Torsional stiffness	$\times 10^4 \text{N} \cdot \text{m/rad}$	0.46	0.6		1.07		1.3		
Inertia moment	Without brake	$\text{kg m}^2$	0.09	0.19	0.28	0.15	0.41	0.51	1.16
	With brake	$\text{kg m}^2$	0.11	0.22	0.31	0.17	0.45	0.56	1.28
Mass	Without brake	kg	1.3			1.8			
	With brake	kg	1.5			2.0			
Number of motor poles		16							
Motor insulation		Heat-resistant class: F (155 °C)							
		Insulation resistance: more than 200MΩ (DC500V)							
		Dielectric strength: AC1500V (1 minute)							
Protection structure (Degrees of Protection)		Totally enclosed self-cooled type (default: IP65, special customized: IP67)							



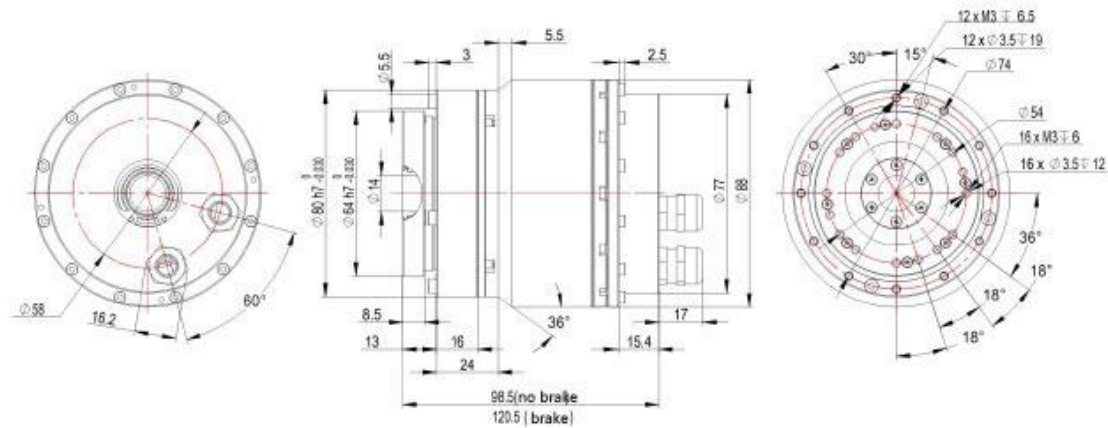
# KAH-14 and KAH-17 Product Outline Drawing

KAH-14

unit : mm



KAH-17



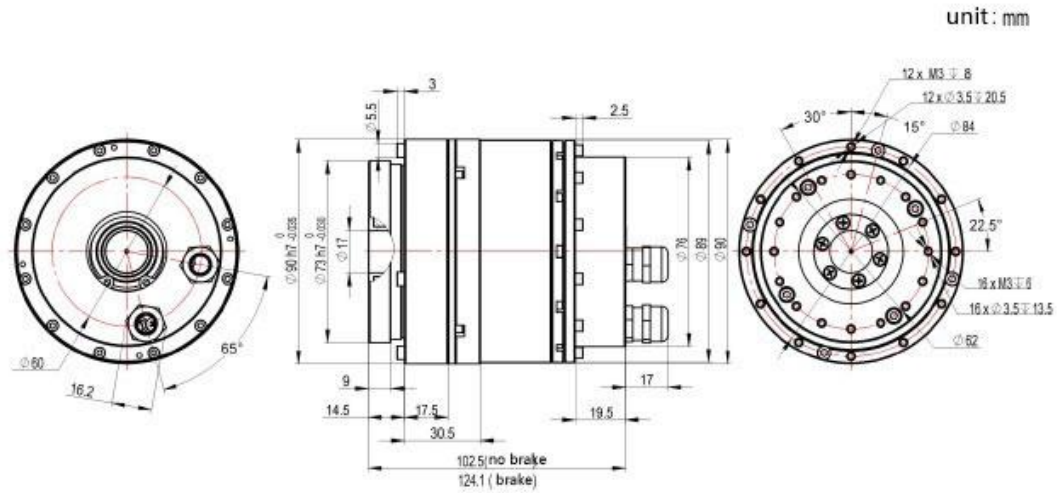
Remarks: The above is the outline drawing of the structure without flange and the rear end of the cable. Please contact the manufacturer for the specific model drawing.

The specifications of KAH-20 and KAH-25 series rotary actuators

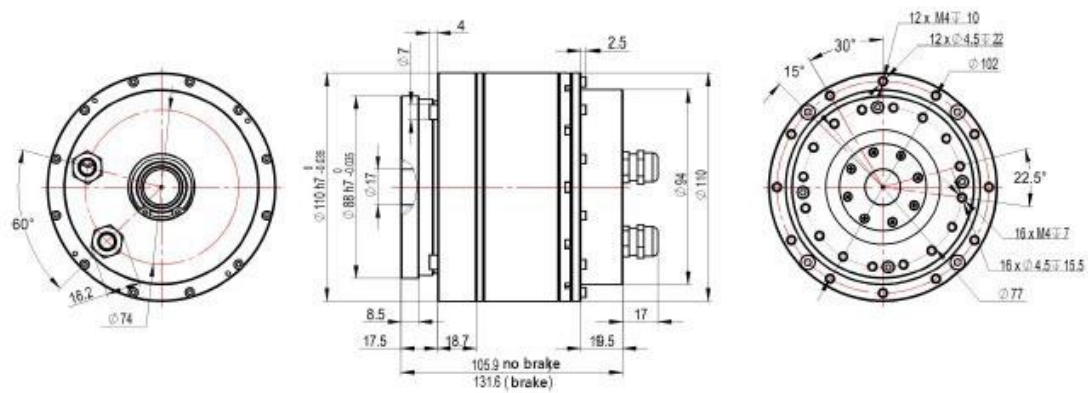
Series			KAH-20					KAH-25				
Mode: KAH-			20A	20B	20C	20D	20E	25A	25B	25C	25D	25E
Reduction ratio			1:51	1:81	1:101	1:121	1:161	1:51	1:81	1:101	1:121	1:161
220VAC	Maximum torque at start and stop	N·m	69	91	102	108	113	121	169	194	207	217
	Maximum average torque	N·m	42	58	61	61	61	68.5	107	133	133	133
	Maximum speed	RPM	119.6	75.3	60.4	50.4	37.9	102.0	64.2	51.5	43.0	32.3
	Rated speed	RPM	60.8	38.3	30.7	25.6	19.3	58.8	37.0	29.7	24.8	18.6
	Maximum current	Arms	4.53	3.89	3.41	2.78	2.21	8.05	7.08	6.52	5.81	4.58
	Rated current	Arms	2.12	1.85	1.56	1.30	0.98	3.38	3.32	3.31	2.76	2.08
	Torque constant	N m/Arms	19.81	31.35	39.10	46.92	62.24	20.28	32.21	40.16	48.11	64.02
	Phase resistance	Ohms	2.135					1.779				
	Phase inductance	mH	3.869					3.375				
	Back EMF	Vrms/kRPM	30.66					40.84				
110VAC	Maximum speed	RPM	100.0	63.0	50.5	42.1	31.7	80.4	50.6	40.6	33.9	25.5
	Rated speed	RPM	60.8	38.3	30.7	25.6	19.3	54.9	34.6	27.7	23.1	17.4
	Maximum current	Arms	9.49	7.87	7.08	6.25	4.91	13.57	11.93	10.99	9.78	7.71
	Rated current	Arms	4.28	3.72	3.14	2.62	1.97	5.69	5.60	5.58	4.66	3.52
	Torque constant	N m/Arms	9.82	15.61	19.45	23.32	31.04	12.04	19.12	23.84	28.56	38.00
	Phase resistance	Ohms	1.036					0.809				
	Phase inductance	mH	1.684					1.534				
	Back EMF	Vrms/kRPM	14.79					18.56				
	Maximum speed	RPM	78.4	49.4	39.6	33.1	24.8	60.8	38.3	30.7	25.6	19.3
	Rated speed	RPM	60.8	38.3	30.7	25.6	19.3	51.0	32.1	25.7	21.5	16.2
DC bus voltage 48VDC	Maximum current	Arms	17.89	18.86	13.33	11.79	9.27	28.61	32.01	23.15	20.62	16.24
	Rated current	Arms	10.88	12.03	7.97	6.66	5.03	16.19	20.27	15.87	13.25	9.96
	Torque constant	N m/Arms	3.86	4.82	7.65	9.16	12.19	4.23	5.28	8.38	10.04	13.36
	Phase resistance	Ohms	0.262					0.239				
	Phase inductance	mH	0.313					0.282				
	Back EMF	Vrms/kRPM	7.98					10.57				
Absolute Encoder	Encoder type		Multi-turn hollow shaft absolute encoder									
	Resolution (single motor revolution)		2 <sup>18</sup> (524,288), 2 <sup>22</sup> (4,194,304) or 2 <sup>26</sup> (16,777,216)									
Incremental encoder	Motor Multi-turn counter		2 <sup>16</sup> (65,536)									
	Resolution		Hollow shaft incremental encoder, 40000 pulse/rev (multiplied by 4)									
Uni-directional	Output shaft resolution	pulse/rev	2040000	3240000	4040000	4840000	6440000	2040000	3240000	4040000	4840000	6440000
	positional accuracy	Arc sec	40	30	30	30	30	40	30	30	30	30
	Repeatability of positioning accuracy	Arc sec	8	7	7	7	7	8	7	7	7	7
Overturning stiffness	×10 <sup>4</sup> N·m/rad		23.5	27.3				34.7	42.8			
	Torsional stiffness		1.8	2.3				3.4	4.6			
Inertia moment	Without brake	kg m <sup>2</sup>	0.19	0.57	0.86	1.23	2.18	0.49	1.24	1.93	2.85	5.01
	With brake	kg m <sup>2</sup>	0.22	0.63	0.95	1.35	2.35	0.58	1.51	2.31	3.31	5.97
Mass	Without brake	kg	2.2					3.2				
	With brake	kg	2.5					3.6				
Number of motor poles			16									
Motor insulation			Heat-resistant class: F (155 °C)									
Protection structure (Degrees of Protection)			Insulation resistance: more than 200M Ω (DC500V)									
			Dielectric strength: AC1500V (1 minute)									
			Totally enclosed self-cooled type (default: IP65, special customized: IP67)									

# KAH-20 and KAH-25 Product Outline Drawing

## KAH-20



## KAH-25



Remarks: The above is the outline drawing of the structure without flange and the rear end of the cable. Please contact the manufacturer for the specific model drawing.

The specifications of KAH-32 and KAH-40 series rotary actuators

Series		KAH-32					KAH-40					
Mode: KAH-		32A	32B	32C	32D	32E	40A	40B	40C	40D	40E	
Reduction ratio		1:51	1:81	1:101	1:121	1:161	1:51	1:81	1:101	1:121	1:161	
Maximum torque at start and stop	N·m	267	376	411	436	459	497	641	702	762	800	
Maximum average torque	N·m	133	206	267	267	267	242	351	460	557	557	
220VAC	Maximum speed	RPM	88.2	55.6	44.6	37.2	28.0	76.5	48.1	38.6	32.2	24.2
	Rated speed	RPM	51.0	32.1	25.7	21.5	16.1	43.1	27.2	21.8	18.2	13.7
	Maximum current	Arms	14.37	12.74	11.17	9.89	7.82	22.79	18.51	16.26	14.73	11.62
	Rated current	Arms	5.96	5.82	6.04	5.05	3.79	8.67	7.92	8.32	8.41	6.32
	Torque constant	N m/Arms	22.30	35.42	44.17	52.92	70.41	27.91	44.32	55.26	66.23	88.09
	Phase resistance	Ohms			1.438					1.024		
	Phase inductance	mH			3.165				3.026			
	Back EMF	Vrms/kRPM			44.29				50.87			
	Maximum speed	RPM	68.6	43.2	34.7	28.9	21.7	52.9	33.3	26.7	22.3	16.8
	Rated speed	RPM	45.1	28.4	22.8	19.0	14.3	35.3	22.2	17.8	14.9	11.2
110VAC	Maximum current	Arms	25.29	22.42	19.66	17.41	13.77	35.85	29.12	25.58	23.17	18.29
	Rated current	Arms	10.50	10.24	10.64	8.88	6.68	14.55	13.29	13.97	14.11	10.61
	Torque constant	N m/Arms	12.67	20.12	25.09	30.06	39.99	16.63	26.41	32.93	39.47	52.50
	Phase resistance	Ohms			0.730				0.530			
	Phase inductance	mH			1.408				1.207			
	Back EMF	Vrms/kRPM			22.51				44.96			
	Maximum speed	RPM	51.00	32.10	25.70	21.50	16.10	35.30	22.20	17.80	14.90	11.20
	Rated speed	RPM	41.20	25.90	20.80	17.40	13.00	29.40	18.50	14.90	12.40	9.30
	Maximum current	Arms	51.25	57.94	39.83	35.33	27.95	72.66	75.06	51.81	46.98	37.05
	Rated current	Arms	25.53	31.74	25.87	21.64	16.26	35.38	41.10	33.95	34.34	25.80
DC bus voltage 48VDC	Torque constant	N m/Arms	5.21	6.49	10.32	12.34	16.42	6.84	8.54	13.55	16.22	21.59
	Phase resistance	Ohms			0.188				0.139			
	Phase inductance	mH			0.265				0.207			
	Back EMF	Vrms/kRPM			12.05				17.48			
Absolute Encoder	Encoder type	Multi-turn hollow shaft absolute encoder										
Encoder	Resolution (single motor revolution)	$2^{19}$ (524,288), $2^{22}$ (4,194,304) or $2^{24}$ (16,777,216)										
	Motor Multi-turn counter	$2^{19}$ (65,536)										
Incremental encoder	Resolution	Hollow shaft incremental encoder, 40000 pulse/rev (multiplied by 4)										
encoder	Output shaft resolution	pulse/rev	2040000	3240000	4040000	4840000	6440000	2040000	3240000	4040000	4840000	6440000
	Uni-directional positional accuracy	Arc sec	40	30	30	30	30	40	30	30	30	30
	Repeatability of positioning accuracy	Arc sec	8	7	7	7	7	8	7	7	7	7
Inertia moment	Overturning stiffness	$\times 10^4 \text{N} \cdot \text{m}/\text{rad}$	87.5		113.6			149.5		187.4		
	Torsional stiffness	$\times 10^4 \text{N} \cdot \text{m}/\text{rad}$	7.6		9.9			14		18.6		
Mass	Without brake	kg $\text{m}^2$	1.72	4.34	6.76	9.98	17.54	3.91	9.86	15.36	22.68	39.86
	With brake	kg $\text{m}^2$	2.03	5.29	8.09	11.59	20.90	4.62	12.03	18.39	26.35	47.50
Mass	Without brake	kg			6.2				9.1			
	With brake	kg			6.7				9.7			
Number of motor poles		16										
Motor insulation		Heat-resistant class: F (155 °C)										
Protection structure (Degrees of Protection)		Insulation resistance: more than 200M $\Omega$ (DC500V)										
		Dielectric strength: AC1500V (1 minute)										
		Totally enclosed self-cooled type (default: IP65, special customized: IP67)										







KAH Rotary Actuators Product Bending Moment, Radial Force And Axial Force Parameter Values						
Model KAH-	14	17	20	25	32	40
Allowable Value Of Bending Moment Mb	41	72	140	243	460	600
Bending Moment Momentary Allowable Value Mb	80	140	280	480	900	1200
Allowable Value Of Radial Force Ft	270	400	650	900	1350	2000
Radial Force Momentary Allowable Value Ft	490	700	1150	1600	2300	3500
Allowable Value Of Axial Force Fa	270	400	650	900	1350	2000
Momentary Allowable Value Of Axial Force Fa	490	700	1150	1600	2300	3500

KAH Rotary Actuators Product Accuracy Retention Life						
Model KAH-	14	17	20	25	32	40
Accuracy Retention Life (Reduction Ratio 1/51)	15000 hours					
Accuracy Retention Life (Other Reduction Ratio)	20000 hours					

Note: The parameter value in the table refers to the life under the condition that the positioning accuracy and other parameters are kept unchanged. If the user allows other parameters to be slightly reduced, the use can be extended.