

FHA-mini Servo Actuator

24 Volt Motor Winding
Line Driver Encoder



harmonic drive gearing
Precision Gearing & Motion Control



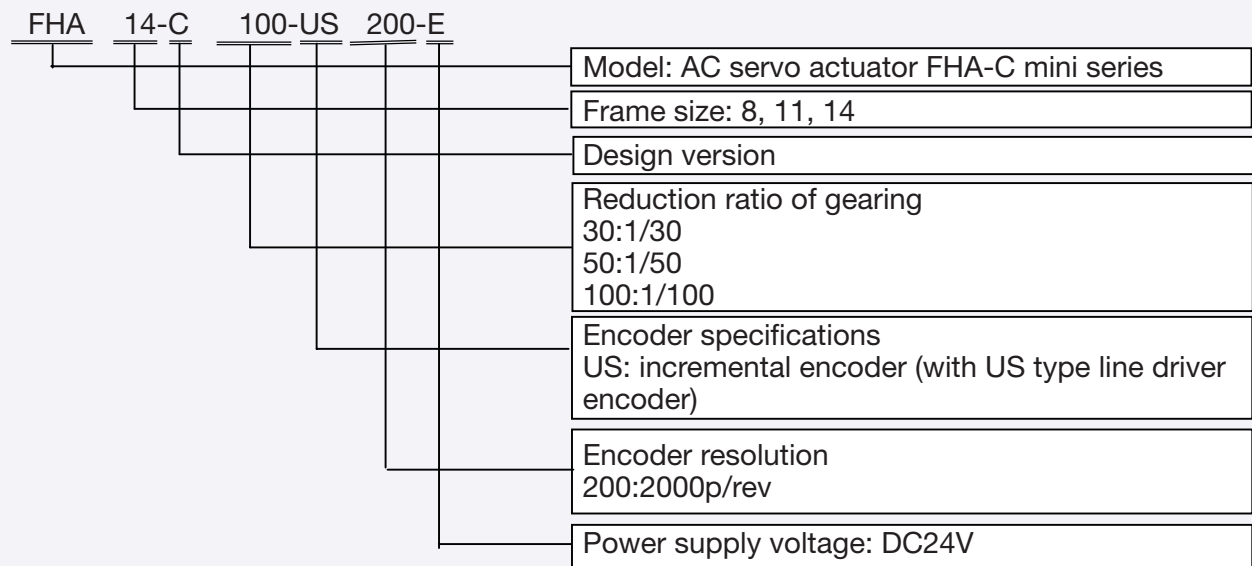
1. Application Model

Specifications in this document should be applied for the following FHA-C mini series with US type line driver encoder and supply voltage DC24V.

The object models are as follows:

- 1) FHA-8C-XXX-US200-E
- 2) FHA-11C-XXX-US200-E
- 3) FHA-14C-XXX-US200-E

2. Ordering information



3. Specifications (B2N1666 / Jun-2-05)

Refer the manual of FHA-C mini standard type except the following specifications.

3-1 Actuators

Table 1 General specifications of FHA-8C/11C/14C

Item	Environmental conditions
Service temperature	0~40°C
Storage temperature	-20~60°C
Service humidity	20~80% RH (no condensation)
Storage humidity	
Vibration	25m/s ² (frequency: 10~400Hz)
Impact resistance	300m/s ²



Table 2 Ability specifications of FHA-8C/11C/14C

Item	Model ratio	FHA-8C			FHA-11C			FHA-14C		
		30	50	100	30	50	100	30	50	100
Max.torque	N•m	1.8	3.3	4.8	4.5	8.3	11	9	18	28
Max. speed	r/min	200	120	60	200	120	60	200	120	60
Torque constant Note 3	N•m/A	0.8	1.3	2.7	0.8	1.3	2.6	0.8	1.4	2.9
	kgf•m/A	0.08	0.13	0.28	0.08	0.13	0.27	0.08	0.14	0.3
Max. current Note 5	A	3	3.3	2.4	7.8	8.2	5.6	14.8	16.4	12.3
Continuous torque	N•m	0.75	1.5	2	1.8	2.9	4.2	3.5	4.7	6.8
Continuous speed	r/min	117	70	35	117	70	35	100	60	30
Continuous current Note 5	A	1.6	1.7	1.3	3.7	3.5	2.8	6.5	5.4	4.4
Power supply voltage	V	DC24			DC24			DC24		
EMF constant	V/(r/min)	0.10	0.16	0.32	0.09	0.15	0.31	0.1	0.17	0.34
Phase resistance	Ω (20)	0.54			0.19			0.07		
Phase inductance	mH	0.22			0.11			0.06		
Moment of inertia	kg•m ²	0.003	0.007	0.029	0.006	0.017	0.067	0.018	0.05	0.2
	kgf•cm•s ²	0.027	0.075	0.3	0.061	0.17	0.68	0.18	0.51	2
Allowable torsional moment	N•m	15			40			75		
	kgf•m	1.5			4.1			7.7		
Moment stiffness	N•m/rad	2x10 ⁴			4x10 ⁴			8x10 ⁴		
	kgf•m/rad	0.2x10 ⁴			0.4x10 ⁴			0.8x10 ⁴		
One-way positioning accuracy	Arc sec	150	120	120	120	90	90	120	90	90
Quad encoder-resolution Note 4	p/rev	240000	400000	800000	240000	400000	800000	240000	400000	800000
Mass	kg	0.40			0.62			1.2		
Number of paired poles		5								
Insulation class		B								
Insulation resistance		100MΩ or more (by DC500V insulation tester)								
Withstanding voltage		AC500V/1minute								
Phase sequence		UVW (with CW rotation facing the output flange end)								

Note 1: The table shows typical output values of actuators.

Note 2: All values are typical.

Note 3: Torque constant is specified considering an efficiency of gear.

Note 4: Quad encoder resolutions are obtained by [motor encoder resolution]x4x[reduction ratio]



3-2 Specifications of encoder

Table 3 Main specifications of encoder

Item		Unit	Specification
Type			Incremental, Rectangular wave, line driver
Output signal			A,A,B,B,Z,Z,U,U,V,V,W,W
Number of pulse	A,B	p/rev	2000
	U,V,W	p/rev	5
	Z	p/rev	1
Power supply voltage		V	DC +5 ±5%
Current consumptionNote1		mA	250 max
Output circuit form			Line driver (equivalent to SN75ALS192NS)
Maximum response frequency		kHz	200

Note 1: When R1 resistor shown in Fig.3 below

Signal waveform

Fig.1 A,B and Z signal and relationship with U-N motor EMF waveform with CW rotation facing the output flange end

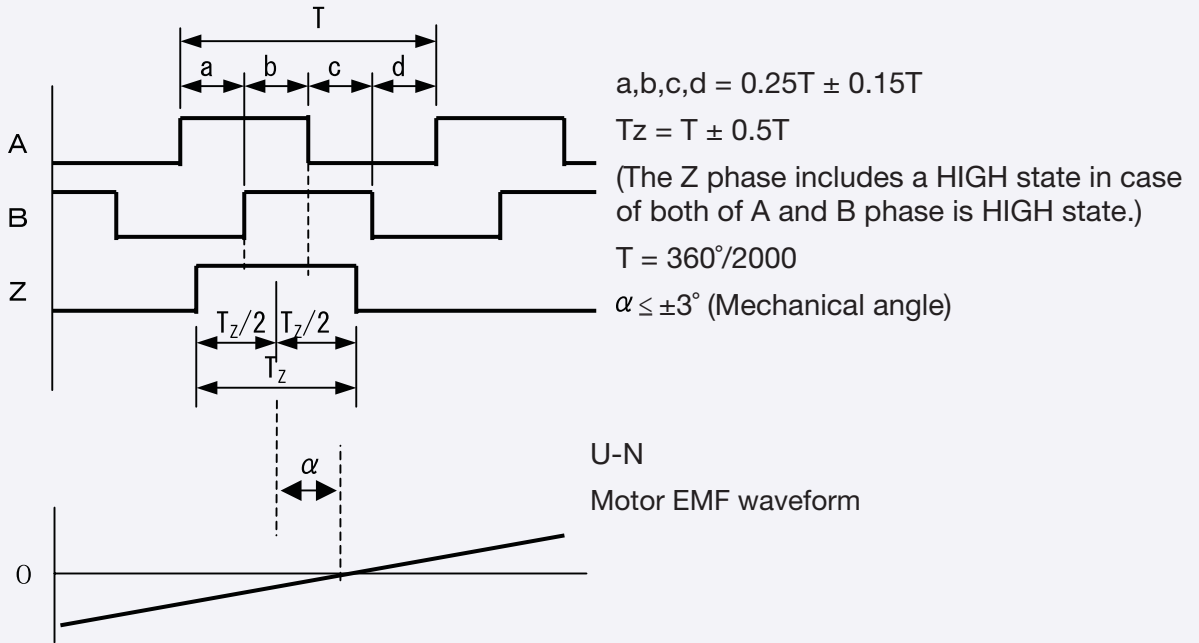
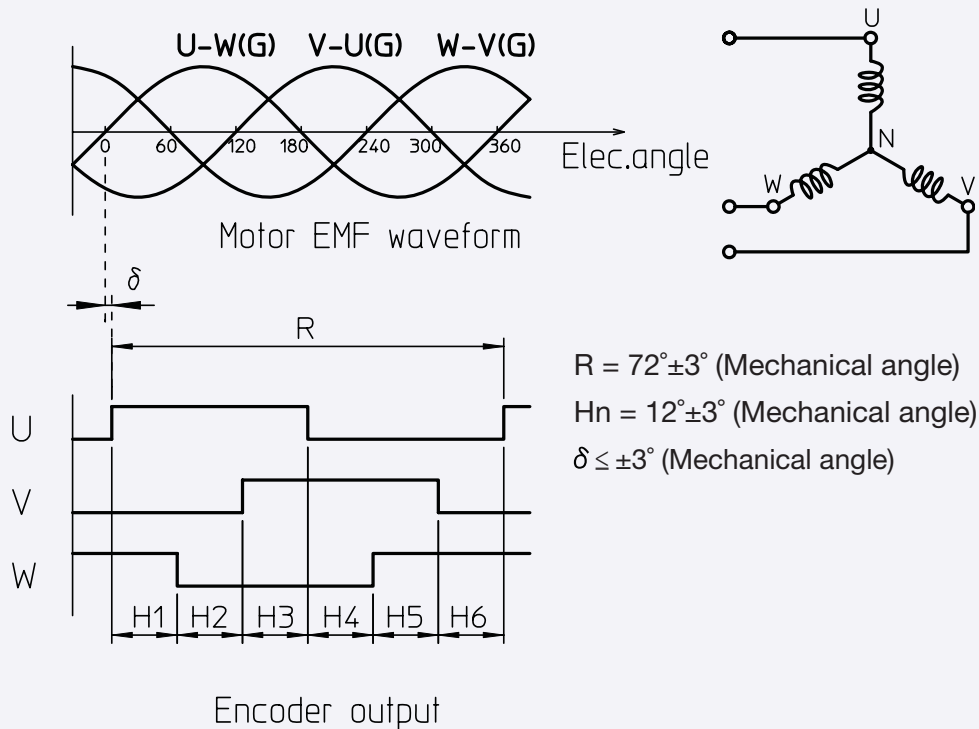


Fig.2 U,V and W signal and relationship with motor's EMF with CW rotation facing the output flange end





Encoder leads

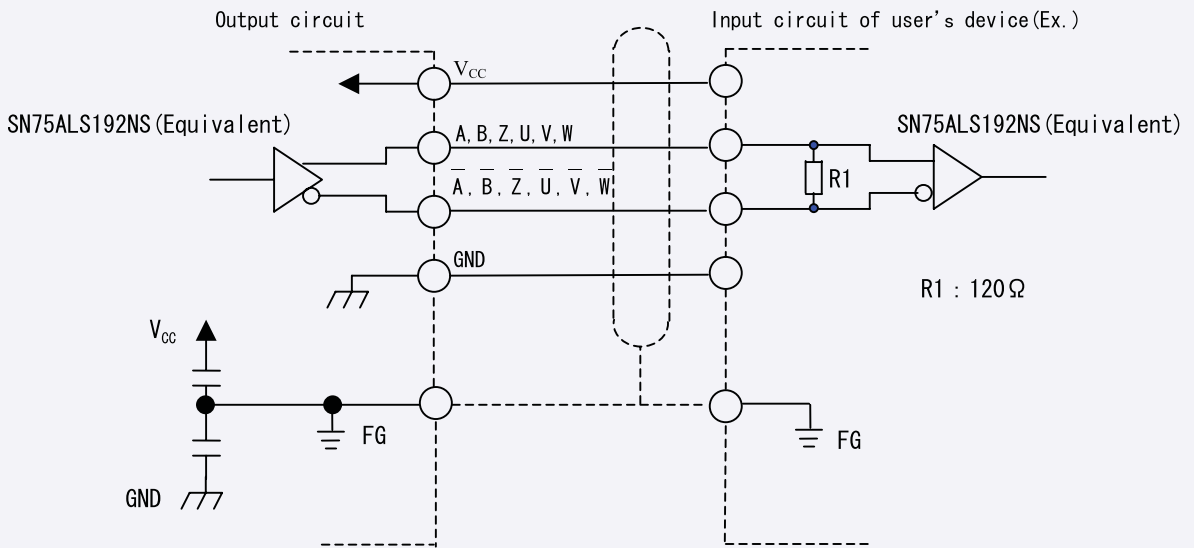
Color code of encoder leads shown in Table 4.

Table 4 Color code of encoder leads

Color	Signal	Color	Signal
Red	+5V (Vcc)	Black	OV (GND)
Green	A	Dark green	\bar{A}
Gray	B	White	\bar{B}
Yellow	Z	Clear	\bar{Z}
Brown	U	Purple	\bar{U}
Blue	V	Light blue	\bar{V}
Orange	W	Pink	\bar{W}
Shield	FG		

Output circuit and example for receiving signal

Fig.3 Output circuit of encoder and example for input to user's device

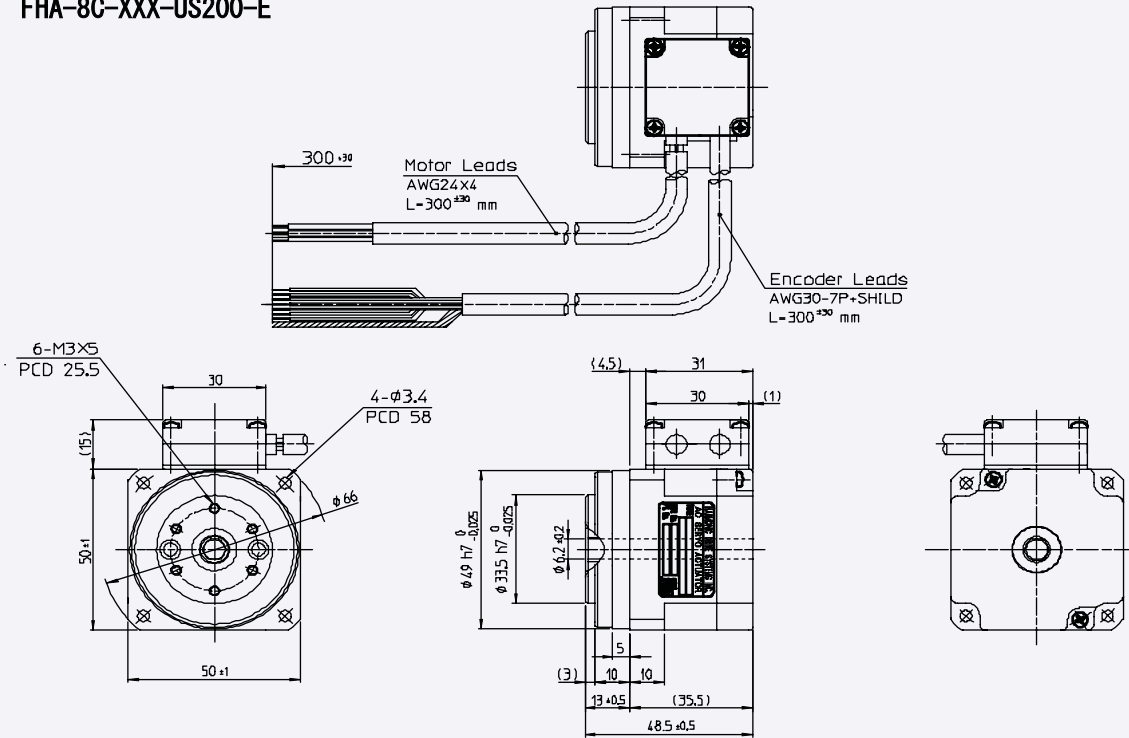


Voltage strength of capacitor C1, C2: 50V

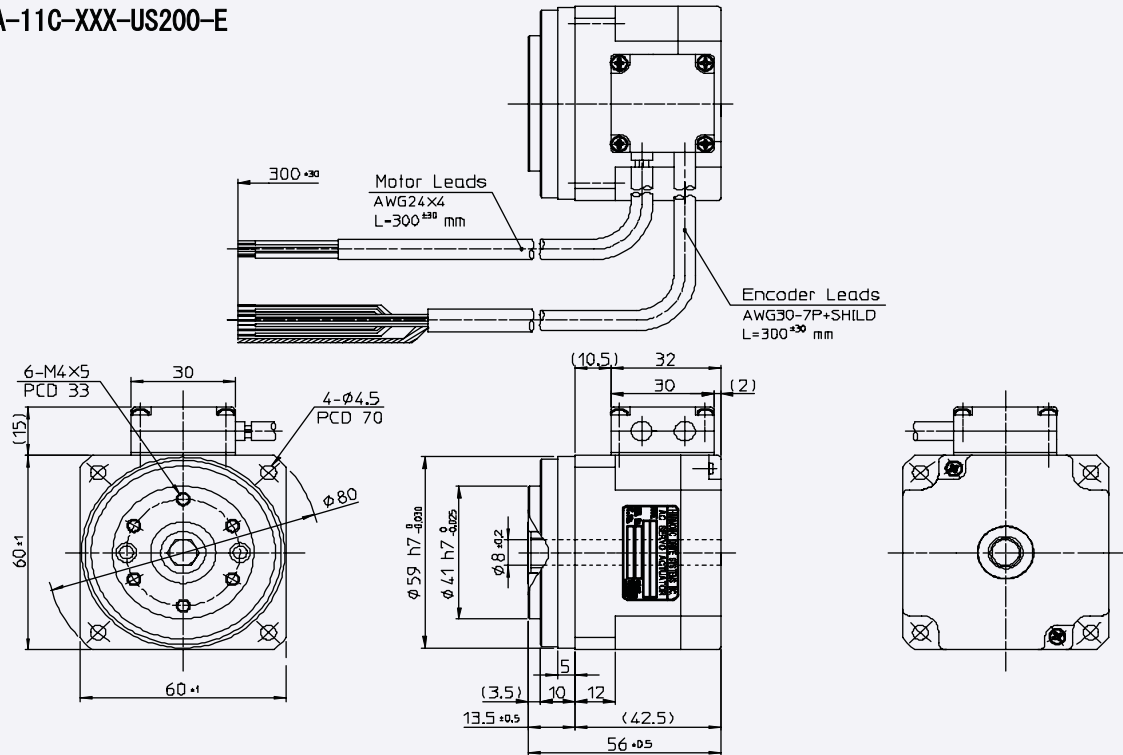


4 External dimensions of FHA-C mini actuators with US type

FHA-8C-XXX-US200-E

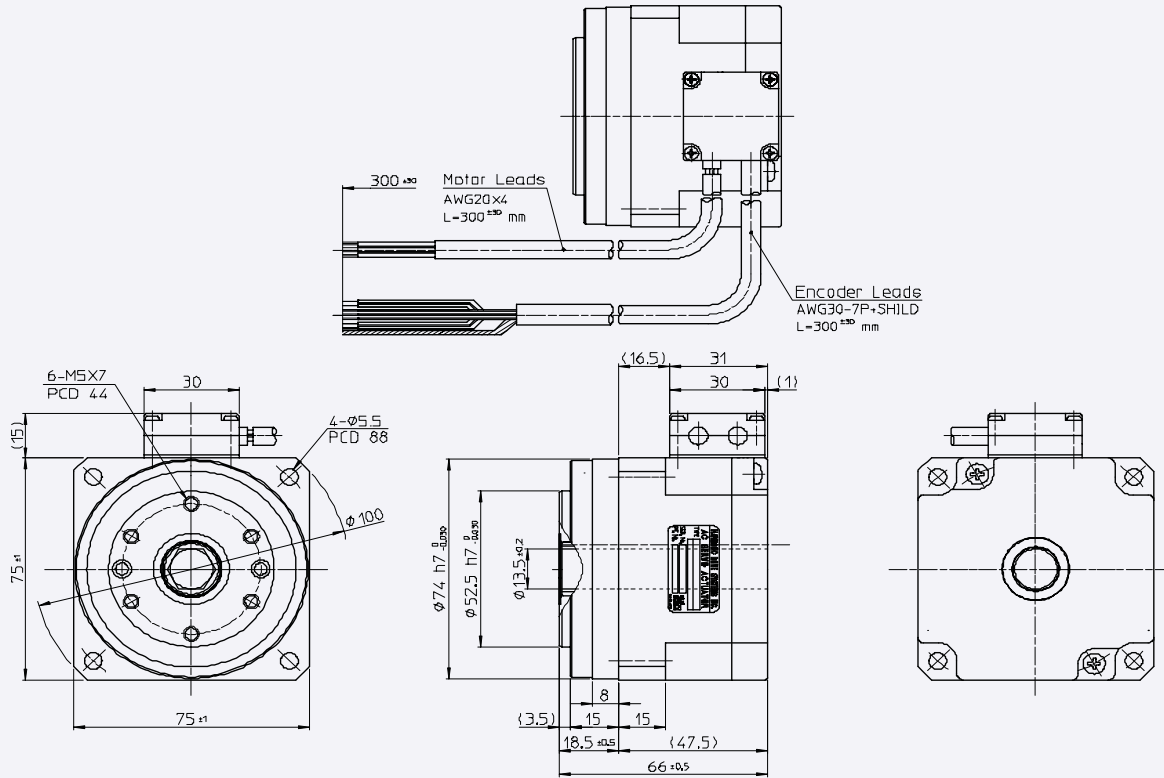


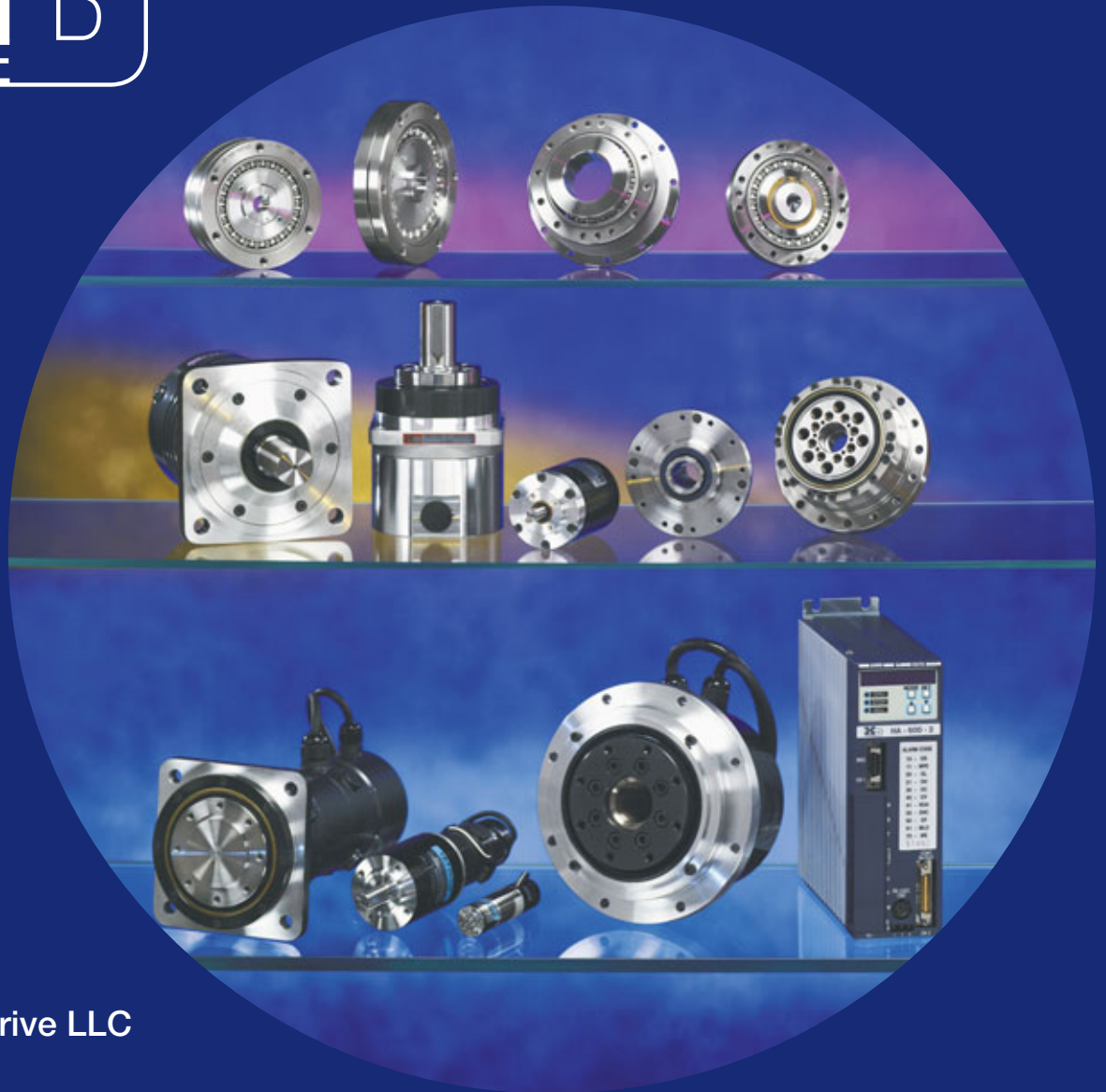
FHA-11C-XXX-US200-E





FHA-14C-XXX-US200-E





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