

FHA-MINI SERVO ACTUATOR

-24 Volt Motor Winding
-14 Wire Encoder



harmonic drive gearing
Precision Gearing & Motion Control



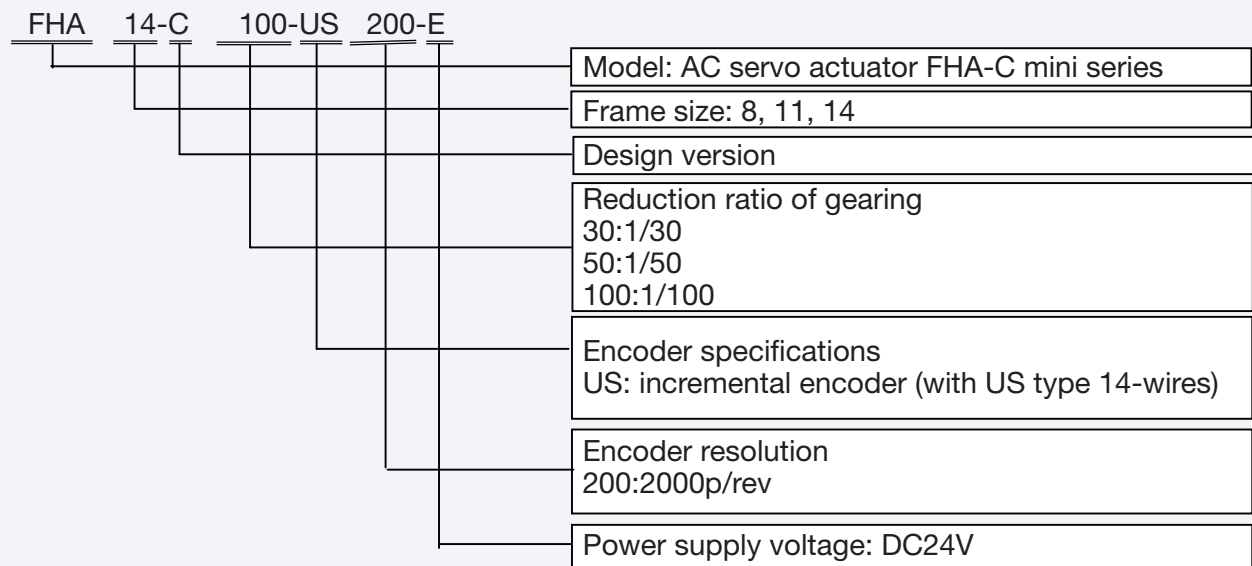
1. Application Model

Specifications in this document should be applied for the following FHA-C mini series with US type 14-wires 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, 14-wires |
| 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

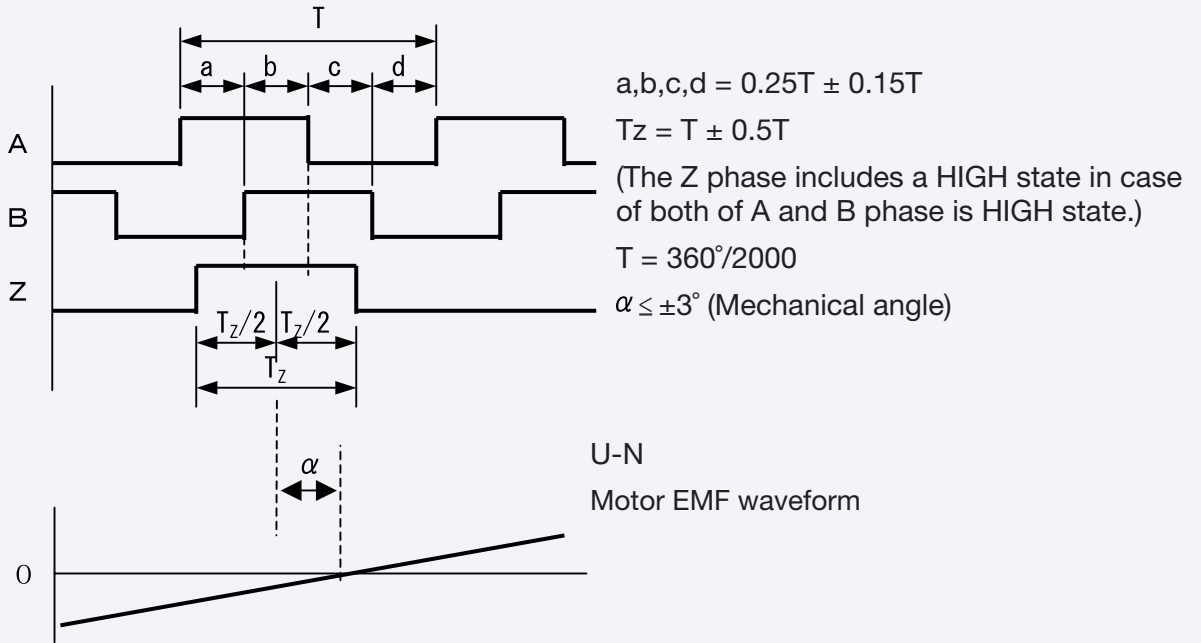
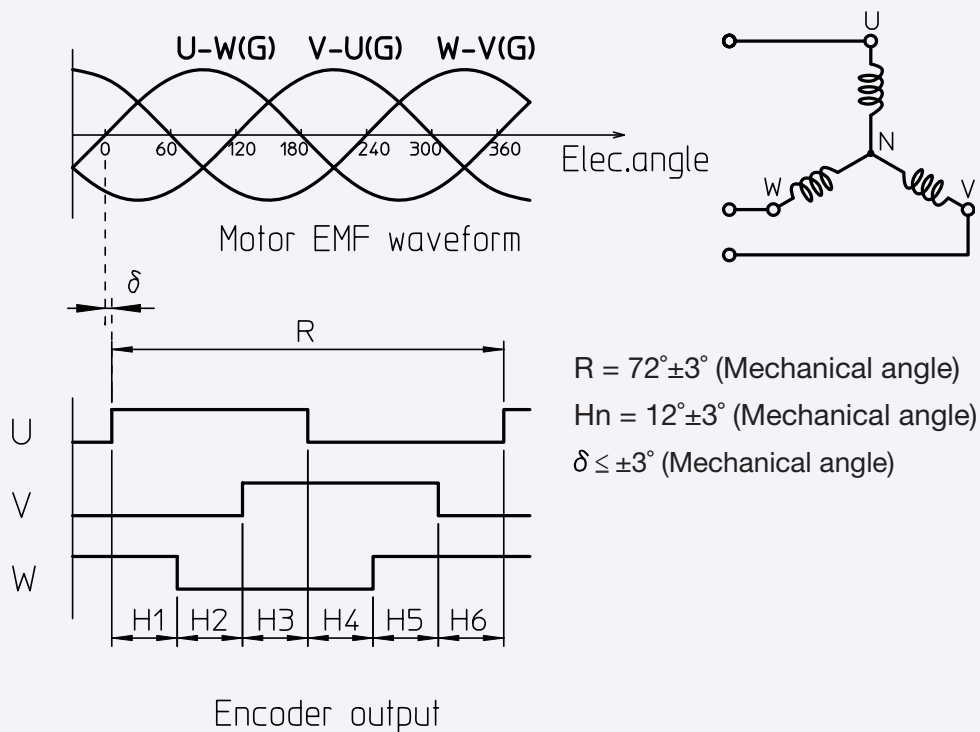


Fig.2 U,V and W signal and relationship with motor's EMF with CW rotation facing the output flange end





Encoder leads

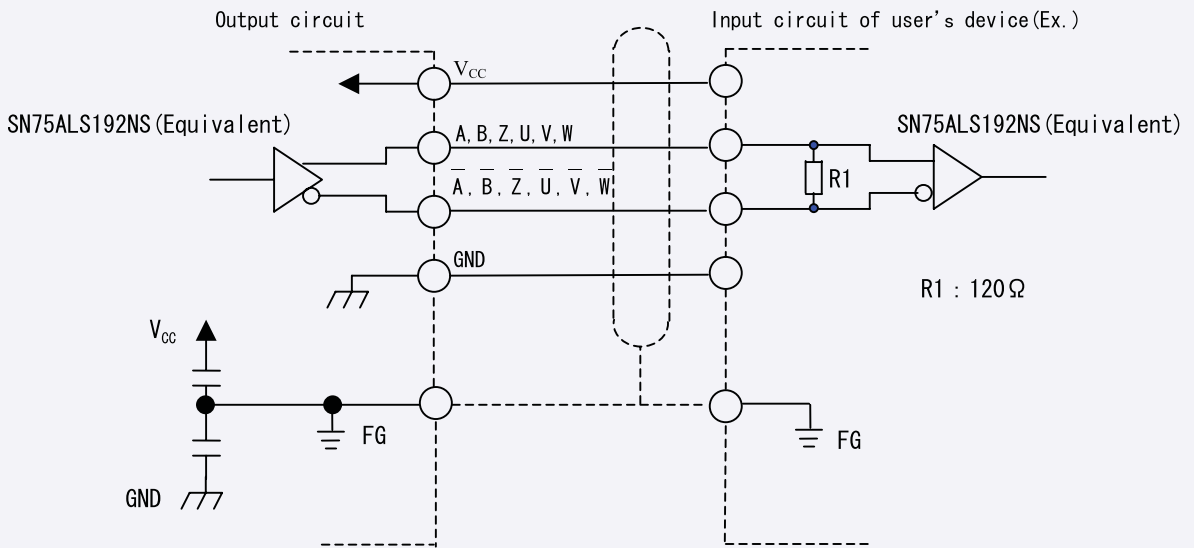
Color code of encoder leads shown in Table 4.

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

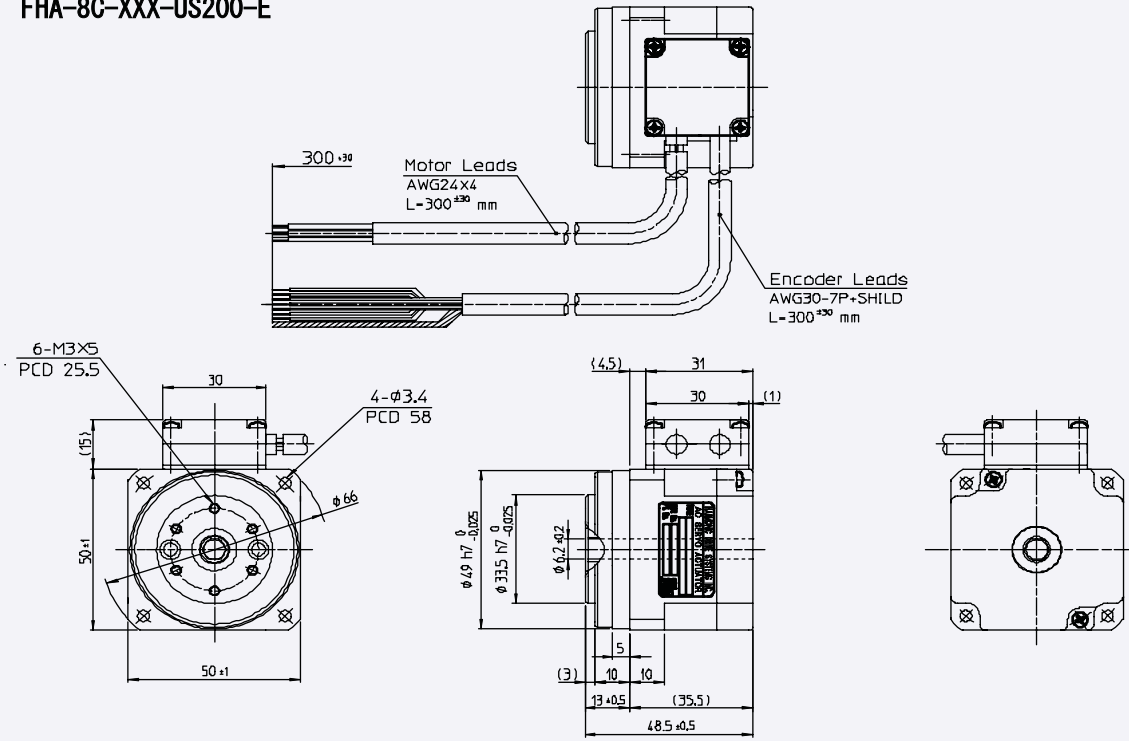


Voltage strength of capacitor C1, C2: 50V

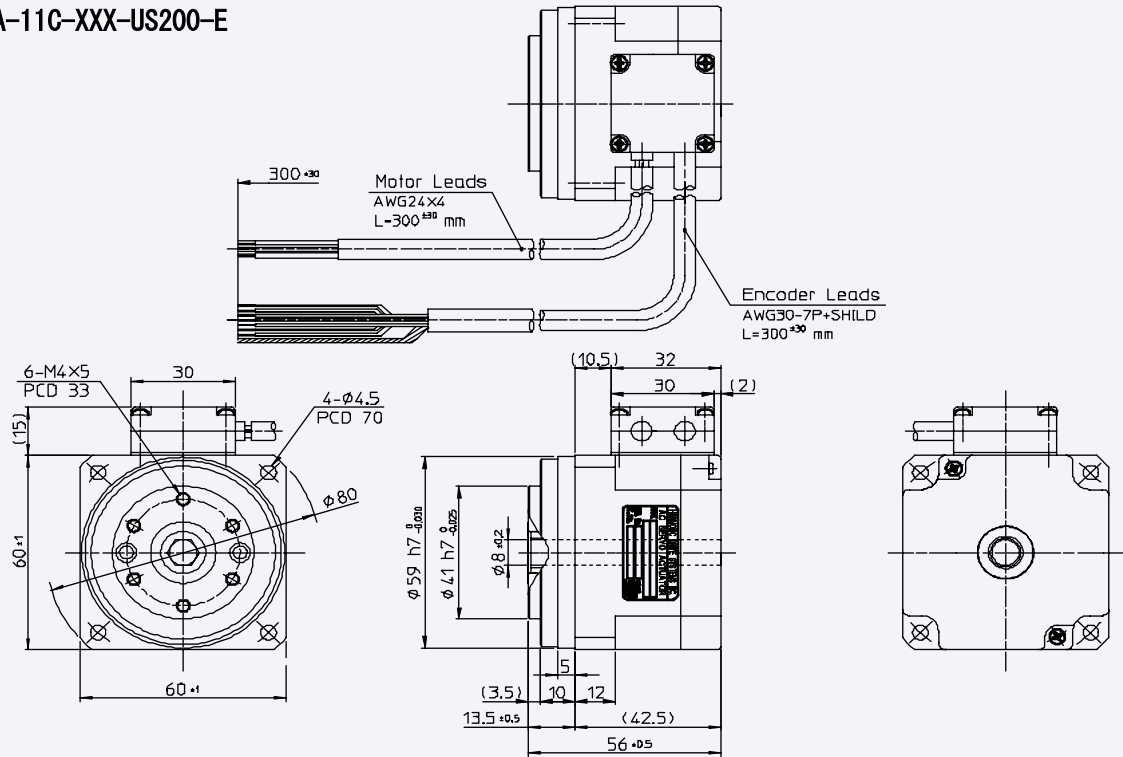


4 External dimensions of FHA-C mini actuators with US type

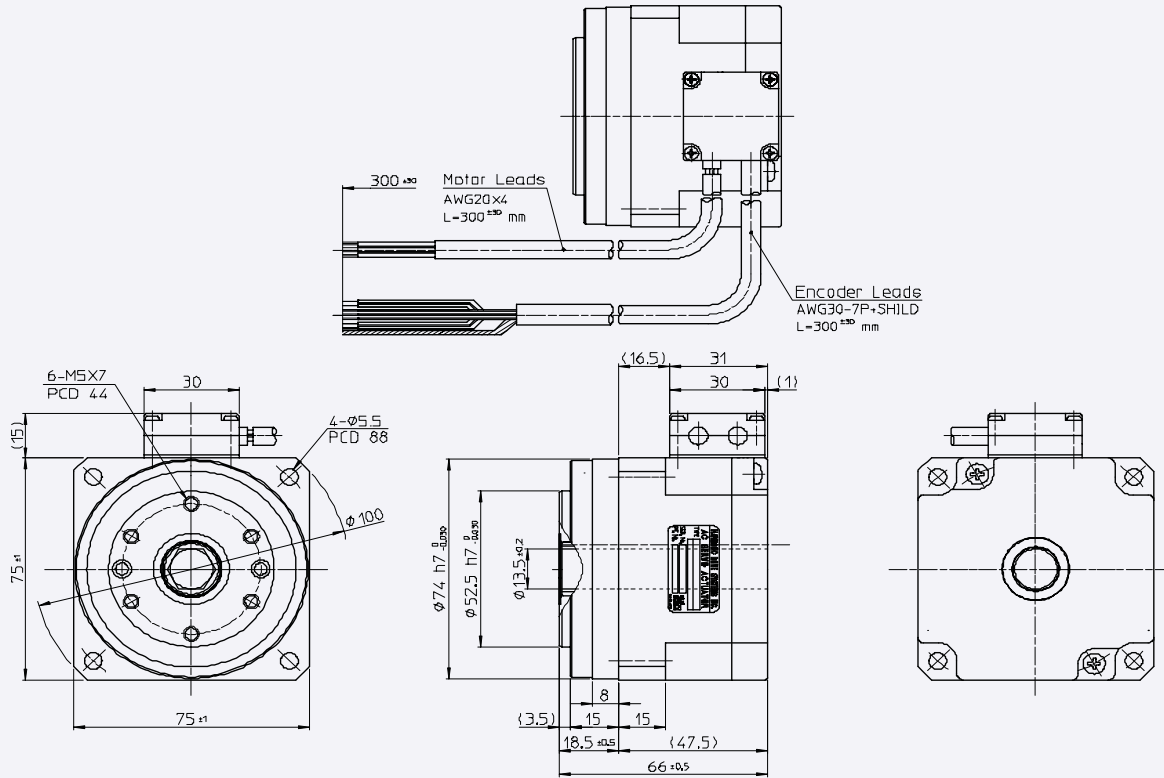
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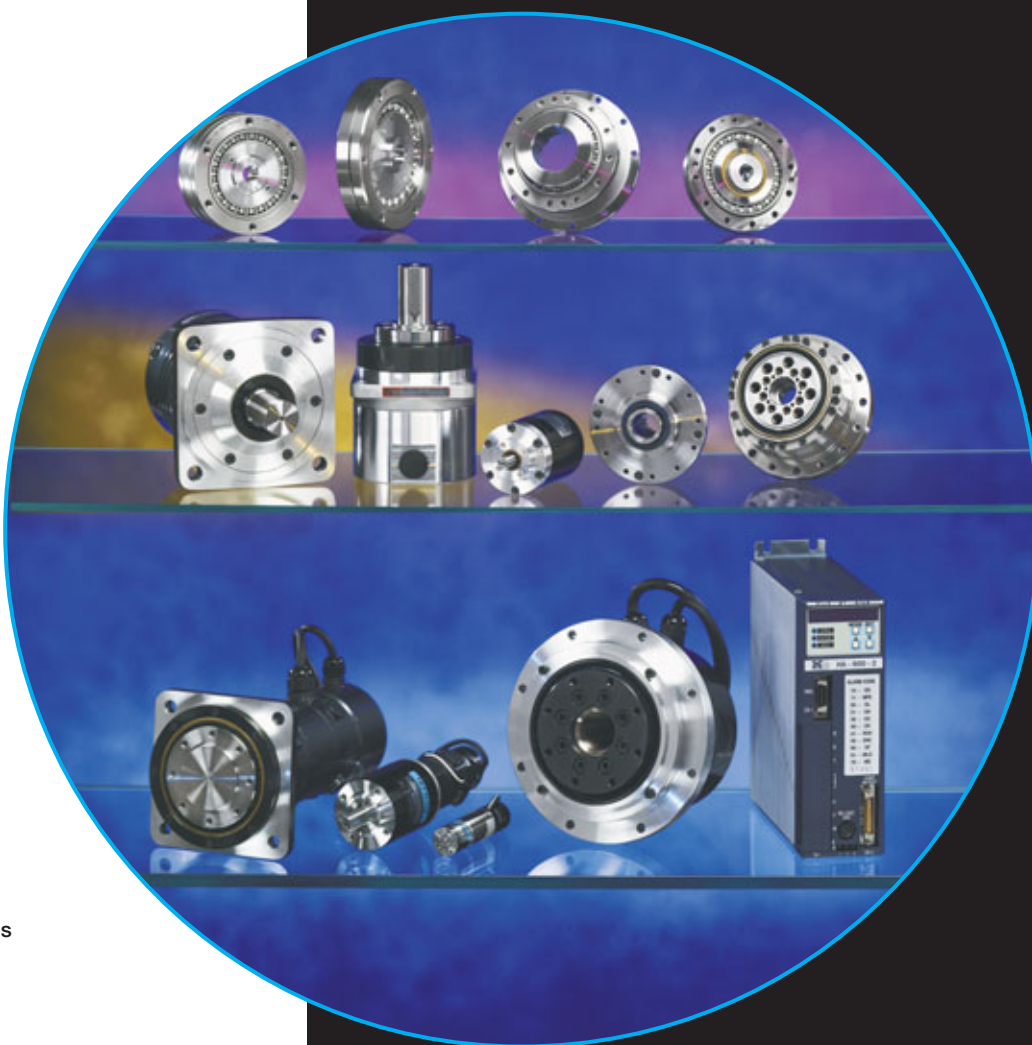
Brushless DC Servo Controller

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