ASDA-A2/B2 Series AC Servo Motors & Drives
DMCNET Motion Control System

Project Manager
Winex Yang
Agenda

• Development of Delta servo products
• Roadmap for new products
• Features of ASDA-A2/B2
• Market position
• Competitors
• Delta DMCNET
Development of Servo Products – 220VAC

Year

2010

550 Hz/17-bit (160,000 P/rev)

ASDA-B2

ASDA-B2

550 Hz/17-bit (160,000 P/rev)

ASDA-A2

Intelligent motion inside!

1,000 Hz/20-bit (1,280,000 P/rev)

ASDA-A2

Easy motion inside!

2009

550 Hz/10,000 P/rev

ASDA-AB

Easy motion inside!

2008

250 Hz/10,000 P/rev

ASDA-B

250 Hz/10,000 P/rev

2007

450 Hz/10,000 P/rev

ASDA-A

Easy motion inside!

2006

2005

2004

550 Hz/17-bit (160,000 P/rev)

ASDA-B2

550 Hz/17-bit

ASDA-A+

550 Hz/17-bit

ASDA-A2

1,000 Hz/20-bit (1,280,000 P/rev)

Capacity (kW)

0.1

0.2

0.4

0.75

1

1.5

2

3.4.5

5.5

7.5

The first generation

The second generation

Development of Servo Products
Roadmap for ASDA-A2 - 220V & 440V

- **ASDA-A2 (440VAC)**
  - 2010 Q3
  - Capacity: 11 ~ 15 kW

- **ASDA-A2 (220VAC)**
  - 2011 Q3
  - Capacity: 11 ~ 15 kW

- **ASDA-A2 (440VAC)**
  - 2010 Q3
  - Capacity: 750 W ~ 7.5 kW
Features of ASDA-A2 (1)

Drive with Motion Control inside!

Field controller + Pure servo → Drive + motion controller

- Electronic cam
- Flying rotary cut
- Flying saw
- Internal PR mode (64 sets of procedures)
- Gantry
- 35 sets of homing search models
- Data Capture & Data Compare
Features of ASDA-A2 (2)

High-speed Network Structure (full closed-loop)

- CANopen: 1M bps, 3 axes/1ms
- DMCNET: 20M bps, 12 axes/1ms

Internal I/O + Modbus RTU / Pulse IF

PLC → CANopen

PC-based DMCNET

Optical ruler

Drive Shaft → Servo Motor

Gearbox

Internal I/O Control

WL → POS 0, POS 1, POS 7
Features of ASDA-A2 (3)

High Resolution & Large Capacity Servo Motors!

**ASDA-A2 series**
- Resolution: 20-bit (1,280,000 p/rev)
- 0.1 ~ 15 kW
- INC/ABS encoder

**ASDA-A/AB/B series**
- Resolution: 10,000 p/rev
- 0.1 ~ 3.0 kW
- INC encoder

**ASDA-B2 series**
- Resolution: 17-bit (160,000 p/rev)
- 0.1 ~ 3 kW
- INC/ABS encoder
ASDA-A2 (12 axes) in DMCNET

DMCNET = Delta Motion Control Network

PCI Motion Card

- Communication baudrate: 20M bps
- Command update rate: 12 axes/ms
Applications for Electronic Cam

Flying saw

Synchronous control

Rotary cut
High Frequency Resonance Suppression

Built-in auto high frequency resonance suppression:

2 auto and 1 manual notch filters are provided to suppress mechanical resonances.
Friction Compensation

When the direction changes and the friction compensation function is used, the friction force can be overcome to reduce position feedback errors.

When the host controller receives feedback signals from the servo drive, it will start to perform internal calculations and command the servo drive to adjust the values for backlash and time constant.

The host controller does not provide the friction compensation function, but the servo drive does.
Gantry Structure

- Host sends DI/O signal to Axis 1.
- Host sends DI/O signal to Axis 2.
- Host sends pulse commands to Axis 1 & 2.
- Axis 1 encoder signals are sent to Axis 2 as the position reference command.
- Axis 2 encoder signals are sent to Axis 1 as the position reference command.
ASDA-B2: Product Position

Second Generation 17-bit General Purpose Servo!

- ASDA-B2 is expected to replace ASDA-B and general purpose Japanese brand servos (13/17-bit).
- Pure servos and high-level stepping motors.
- ASDA-B2 series has 17-bit high resolution and 500Hz frequency response.
- Satisfies 90% of mid- and entry-level applications, e.g. food processing, packing, plastic/textile machinery.
## Comparison of Delta Servos (1)

<table>
<thead>
<tr>
<th>Feature</th>
<th>ASDA-B</th>
<th>ASDA-A/AB</th>
<th>ASDA-B2</th>
<th>ASDA-A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input phase</td>
<td>220V</td>
<td>220V</td>
<td>220V</td>
<td>220V/440V</td>
</tr>
<tr>
<td>Encoder resolution</td>
<td>10,000 P/rev</td>
<td>10,000 P/rev</td>
<td>17-bit (160,000 P/rev)</td>
<td>20-bit (1,280,000 P/rev)</td>
</tr>
<tr>
<td>Output capacity</td>
<td>0.1 ~ 2 kW</td>
<td>0.1 ~ 3 kW</td>
<td>0.1 ~ 3 kW</td>
<td>0.1 ~ 15 kW (220V)</td>
</tr>
<tr>
<td>Max input pulse frequency</td>
<td>200Kpps (Open Collector)</td>
<td>200Kpps (Open Collector)</td>
<td>200Kpps (Open Collector)</td>
<td>200Kpps (Open Collector)</td>
</tr>
<tr>
<td></td>
<td>500Kpps (Line Receiver)</td>
<td>500Kpps (Line Receiver)</td>
<td>500K/4Mpps (Line Receiver)</td>
<td>500K/4Mpps (Line Receiver)</td>
</tr>
<tr>
<td>ABS encoder</td>
<td>None</td>
<td>None</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>A/D input</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>D/A output</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
## Comparison of Delta Servos (2)

<table>
<thead>
<tr>
<th>Feature</th>
<th>ASDA-B</th>
<th>ASDA-A/AB</th>
<th>ASDA-B2</th>
<th>ASDA-A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency response</td>
<td>250 Hz</td>
<td>450 Hz</td>
<td>550 Hz</td>
<td>1,000 Hz</td>
</tr>
<tr>
<td>Digital input</td>
<td>6</td>
<td>8</td>
<td>9</td>
<td>8 (+6)</td>
</tr>
<tr>
<td>Digital output</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Full closed-loop</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Internal position mode</td>
<td>None</td>
<td>Yes</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Electronic gear ratio</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Electronic cam</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## Competitors

<table>
<thead>
<tr>
<th>Company</th>
<th>Delta</th>
<th>M company</th>
<th>P company</th>
<th>Y company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>ASDA-A2</td>
<td>3- □ A</td>
<td>4 / 5</td>
<td>III / V</td>
</tr>
<tr>
<td>Frequency response</td>
<td>1,000 Hz</td>
<td>2.1 kHz</td>
<td>1 kHz / 2 kHz</td>
<td>600 Hz / 1.6 kHz</td>
</tr>
<tr>
<td>Output capacity</td>
<td>0.1 ~ 15 kW</td>
<td>0.1 ~ 7 kW</td>
<td>0.1 ~ 4.5 kW</td>
<td>0.05 ~ 5kW</td>
</tr>
<tr>
<td>Encoder resolution</td>
<td>20-bit (128,000,000)</td>
<td>18-bit</td>
<td>10,000 P / rev 17-bit</td>
<td>17-bit / 20-bit</td>
</tr>
<tr>
<td>Communication interface</td>
<td>CANopen (1Mbps) Modbus (RS-485/RS-232) DMCNET</td>
<td>(J3- SSCNET III)</td>
<td>RS-485 / RS-232</td>
<td>None (SGDS- □ □ □ □ 12 has MECHATROLINK II / III)</td>
</tr>
<tr>
<td>Built-in DC24V</td>
<td>Yes</td>
<td>Yes</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
• System structure
• System strengths
• Pulse motion card vs. Delta communication motion card
• Delta DMCNET vs. Japanese brands
• Delta servo motors (ASDA-A2-F)
• Comparison between different servo motors
DMCNET System Structure (1)

- Stepper motor
- Linear motor
- Remote modules (I/O & pulse output)
- GA main modules + GE extension modules
- PC-based
- AI/AO
- DI/DO
- PCI
The Pure Motion NET Structure

DMCNET System Structure (2)

Max. 12 axes
DMCNET System Structure (3)

- The Pure I/O NET Structure

PCI

PC-based
## Comparison of Motion Cards

<table>
<thead>
<tr>
<th>Feature</th>
<th>General motion card</th>
<th>Delta PCI-DMC-A01</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU</strong></td>
<td>No (Need CPU resources from PC)</td>
<td>Yes (Motion card includes TI DSP)</td>
</tr>
<tr>
<td><strong>Cabling problem &amp; maintenance working time</strong></td>
<td>Very long cabling &amp; maintenance time, high cost. Noise often makes the system unstable</td>
<td>Saves cabling &amp; maintenance cost to almost zero; no noise problems to digitalize signals</td>
</tr>
<tr>
<td><strong>Command cycle time</strong></td>
<td>No (no fixed cycle time)</td>
<td>Yes (1ms/fixed cycle time)</td>
</tr>
<tr>
<td><strong>Motion mode</strong></td>
<td>Velocity/position mode cannot be changed at any time</td>
<td>Velocity/position/torque mode can be changed at any time, can do complex trace algorithms</td>
</tr>
<tr>
<td><strong>2 axes or 3 axes of synchronized interpolation</strong></td>
<td>No</td>
<td>Yes (4 groups x 3 axes of interpolation)</td>
</tr>
<tr>
<td><strong>Special motion functions</strong></td>
<td>No</td>
<td>Yes (3 axes of helix interpolation)</td>
</tr>
<tr>
<td><strong>Data transfer rate</strong></td>
<td>1 ~ 6.5 M/s</td>
<td>10 M/s</td>
</tr>
</tbody>
</table>
DMCNET System Strengths

- High speed: 10 Mbps communication speed
- Cable distance: 30m
- Highly reliable network structure (redundancy)
- The highest communication efficiency (time slot function)
- Fixed command cycle time: 1ms (12 axes synchronization)
- Max. connection nodes: 12
- Versatile connectable devices: Motion Net (A2-F), I/O Net, stepper motors, linear motors.
- Changing modes at the same time: Velocity, Position, Torque
## Delta DMCNET vs. Japanese Brands

<table>
<thead>
<tr>
<th></th>
<th>Delta DMCNET</th>
<th>Mitsubishi SSCNET II</th>
<th>Yaskawa MechatroLink II</th>
<th>Fuji SX Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission speed</td>
<td>10</td>
<td>5.6</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>(Mbps)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication cycle</td>
<td>1</td>
<td>0.888</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(ms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication distance</td>
<td>30</td>
<td>30</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>(m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. linked axes</td>
<td>12</td>
<td>6</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>Extension I/O modules</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Redundancy</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Price level</td>
<td>Inexpensive</td>
<td>General</td>
<td>Expensive</td>
<td>General</td>
</tr>
</tbody>
</table>
Q & A