

Automation for a Changing World

# Delta Industrial Automation

2018 Full Range Catalogue

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# About Delta

Delta, founded in 1971, is a global leader in power and thermal management solutions and a major player in several product segments such as industrial automation, displays, and networking. Its mission statement, "To provide innovative, clean and energy-efficient solutions for a better tomorrow," focuses on addressing key environmental issues such as global climate change. As an energy-saving solutions provider with core competencies in power electronics and innovative research and development, Delta's business categories include Power Electronics, Automation, and Infrastructure. Delta has 163 sales offices, 64 R&D centers and 39 manufacturing facilities worldwide.



Throughout its history, Delta has received many global awards and recognition for its business achievements, innovative technologies and dedication to corporate social responsibility. Since 2011, Delta has been selected as a member of the Dow Jones Sustainability™ World Index (DJSI World) for 7 consecutive years. In 2016, Delta was selected out of 5,800 large companies by CDP (formerly the Carbon Disclosure Project) for its Climate Change Leadership Level.

## Delta IABG Milestones

1995		1999		2003	
<b>AC Motor Drive</b> (A Series) 	<b>Small PLC</b> (DVP-ES Series) 	<b>AC Servo Motor and Drive</b> (ASDA-A Series) 	<b>Temperature Controller</b> (DTA Series) 	<b>Optical Incremental Encoder</b> (ES / EH Series) 	
2009		2010		2011	
<b>Pressure Sensor</b> (DPA Series) 	<b>Active Front End Unit</b> (AFE2000 Series) 	<b>Motion Control Card</b> (PCI Series) 	<b>CNC Controller</b> (NC300 Series) 	<b>Hybrid Energy Saving System</b> (HES) 	
2012		2014			
<b>Machine Vision System</b> (DMV Series) 	<b>Programmable Automation Controller</b> (MH1 Series) 	<b>Power Meter</b> (DPM Series) 	<b>Linear Shaft Motor</b> (ECML-S Series) <b>Linear Stage</b> (LU/LA-S Series) 	<b>Photoelectric Sensor</b> (PS-F/PS-R Series) <b>Inductive Proximity Sensor</b> (M12/M18 Series) 	
2016					
<b>Compact Modular Mid-range PLC</b> (AS Series) 	<b>IIoT Cloud-based Platform</b> (DIACloud) 	<b>IIoT Industrial Cloud Routers</b> (DX-2100/2300 Series) 	<b>Industrial PCs</b> (DIAV Series) 	<b>Planetary Gearboxes</b> (PS Series) 	

# Delta IABG Profile

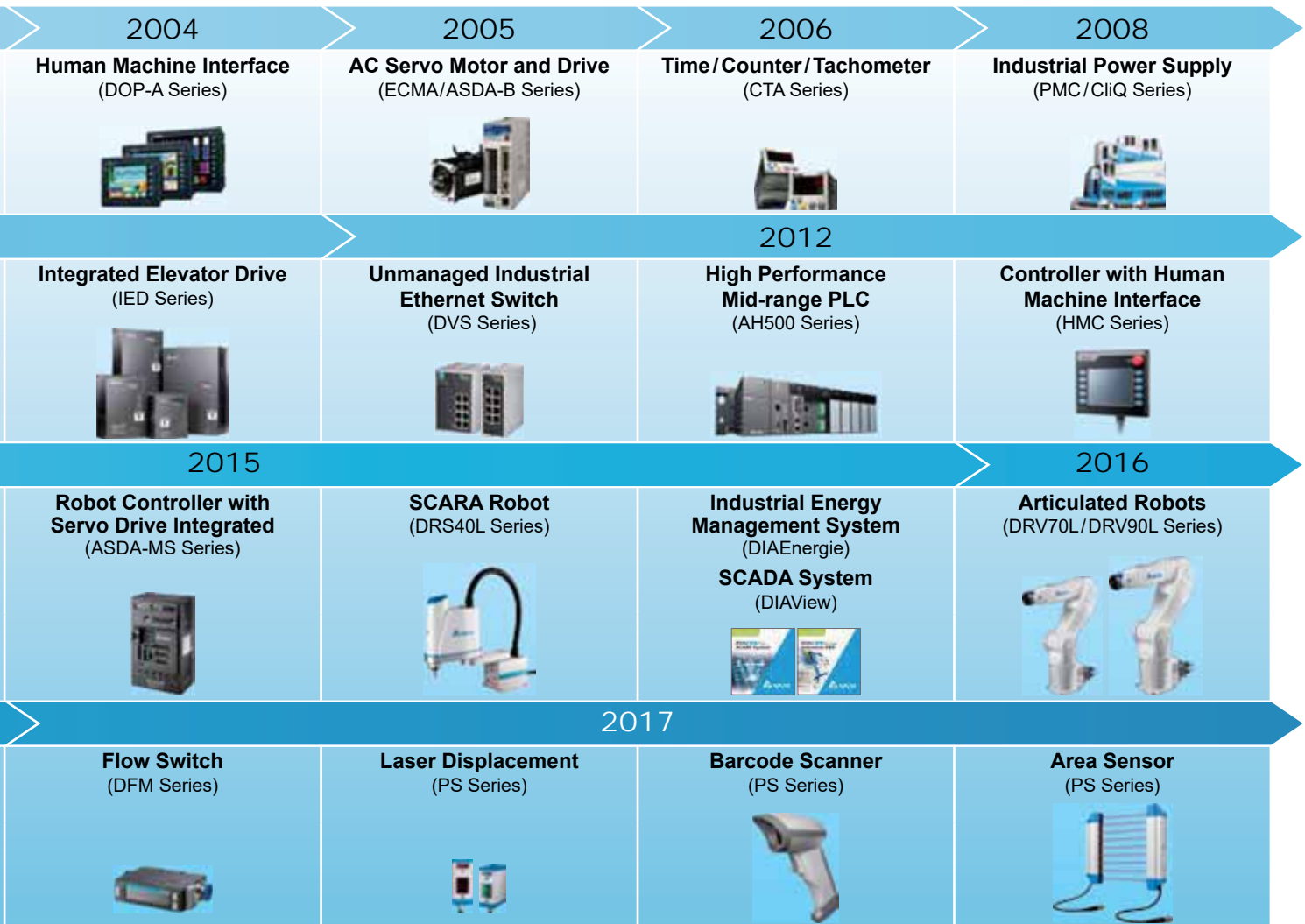
- **Mission:** To elevate the living environment through advanced automation technology with value added innovation.
- **Headquarters** in Taoyuan, Taiwan
- **Launched AC motor drives** in 1995
- **Manufacturing and R&D technology centers** in Taoyuan (Taiwan), Taichung (Taiwan), Tainan (Taiwan), Wujiang (China), Shanghai (China), and Hosur (India)
- **Number of employees:** 7,451 (R&D 1,047)



## About Delta Industrial Automation

As a world-class industrial automation brand, we are dedicated to the development of AC motor drives, servo and motion control systems, programmable logic controllers, human machine interfaces, machine vision systems, meters and sensors, industrial control and monitoring software, and industrial robots.

Our industrial automation solutions extend to a broad range of industry applications, including electronics, textiles, food, pharmacy, rubber and plastics, packaging, printing, woodworking, and machine tools. We integrate our automation products, equipment networking, system software, IoT technology, and big data analysis to build innovative and reliable smart, green factory automation solutions for global customers, and to realize our promise of “Automation for a Changing World”.



# High Performance / Standard Compact Drive New

## MH300/MS300

### Compact-designed Powerful Multifunction Drives

#### Optimized Space Utilization

- Compact design with up to 40% size reduction compared to existing models

#### Outstanding Drive Performance

- Support both induction and permanent magnet motors
- MS300 series: supports open-loop control
- MH300 series: supports open-loop/closed-loop control

#### Strong System Support

- High speed models: support up to 1500 Hz (MS300)/ 2000 Hz (MH300) output frequency under open-loop control
- Built-in PLC with 2k steps (MS300); 5k steps (MH300) program capacity
- Built-in braking choppers for the entire series
- Various communications: EtherCAT, PROFIBUS DP, DeviceNet, MODBUS TCP, EtherNet/IP, CANopen



#### High Safety, Stability and Reliability

- Built-in STO (SIL2/PLd) safety function and safety measures for sudden power outages
- Enhanced 100% PCBs conformal coating; compliant with IEC 60721-3-3 class 3C2
- Extended key components lifetime

#### Easy to Install, Easy to Use

- A user friendly and removable 5-digital LED keypad for the MS300 series; LCD keypad equipped with quick setting wheel dial for the MH300 series
- Macro function, quick parameter setting and duplication
- Built-in USB port for monitoring



Power Range	0.2 kW 0.25 HP	0.4 kW 0.5 HP	0.75 kW 1 HP	1.5 kW 2 HP	2.2 kW 3 HP	3.7 kW 5 HP	5.5 kW 7.5 HP	7.5 kW 10 HP	11 kW 15 HP	15 kW 20 HP	18.5 kW 25 HP	22 kW 30 HP
Standard Model MH300 & MS300 0~599 Hz	150V/1-phase											
	230V/1-phase											
	230V/3-phase											
	460V/3-phase											
High Speed Model MH300: 0~2000 Hz MS300: 0~1500 Hz				230V/1-phase								
					230V/3-phase							
							460V/3-phase					

#### Applications

**MS300:** Machine tools, textile machines, woodworking machines, packaging machines, electronics, fans, pumps and air compressors

**MH300:** Machine tools, textile machines, woodworking machines, rubber & plastic machines and cranes

# Sensorless Vector Control Compact Drive

## VFD-E/EL

### Small Size with Multifunctions



- Optional extension modules for more flexible applications (High speed fieldbus, braking modules, I/O cards and PG cards for VFD-E Series)
- Modular fan design for easy maintenance and replacement
- Built-in EMC filter for 230V single-phase and 460V three-phase models to effectively minimize the electromagnetic interference
- Built-in RFI Switch for noise suppression (all models)
- Built-in PLC with 500 steps program capacity (VFD-E Series)
- Support common DC BUS. The regenerative braking power is shared by parallel connected AC motor drives to enhance the stability of the DC BUS voltage
- Support side-by-side installation and DIN-rail mounting
- Built-in PID feedback control, special functions for constant pressure pump
- Built-in RS-485, compatible with MODBUS communication (baud rate up to 38,400 bps)
- Two models for selection: CANopen drive with CANopen communication protocol, and the plate drive with no fan and colling fins installed



Power Range	0.2 kW 0.25 HP	0.4 kW 0.5 HP	0.75 kW 1 HP	1.5 kW 2 HP	2.2 kW 3 HP	3.7 kW 5 HP	5.5 kW 7.5 HP	7.5 kW 10 HP	11 kW 15 HP	15 kW 20 HP	18.5 kW 25 HP	22 kW 30 HP
VFD-E	115V/1-phase											
	230V/1-phase											
	230V/3-phase											
	460V/3-phase											
VFD-EL	115V/1-phase											
	230V/1-phase											
	230V/3-phase											
	460V/3-phase											

### Applications

Food packaging machines, conveyor equipment, textile machines, woodworking machines, fans and water pumps

# Economy Vector Control Drive

## C200

### High Speed Frequency Output

- Support both induction and permanent magnet motors
- Built-in PLC with 5k steps program capacity
- Special PCB coating and ventilation design for enhanced environment tolerance
- Flange mount design for Frame A and removable panel to facilitate installation process
- Built-in pulse input terminal with encoder for closed-loop control
- Built-in CANopen and RS-485 (MODBUS) communication



Power Range	0.4 kW 0.5 HP	0.75 kW 1 HP	1.5 kW 2 HP	2.2 kW 3 HP	3.7 kW 5 HP	4 kW 5 HP	5.5 kW 7.5 HP	7.5 kW 10 HP
C200	230V/1-phase							
	230V/3-phase							
	460V/3-phase							

## Applications

Food packaging machines, conveyor equipment, textile machines, woodworking machines, fans and water pumps



# Vector Control Drive

## C2000

### For Universal Drive Controls

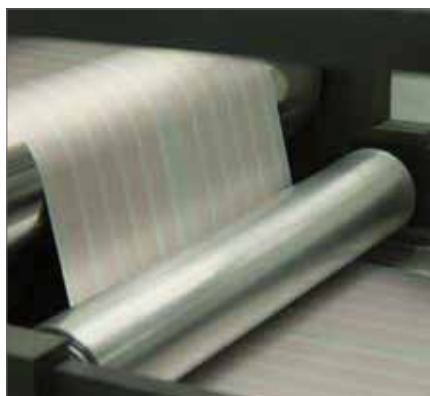
- Support both induction and permanent magnet motors
- Field oriented vector control
- Wide power range for different industry needs
- Built-in PLC with 10k steps program capacity
- Long service life design
- Enhanced protections and adaptation to industrial environments
- Modular design for easy maintenance and extensions
- Built-in MODBUS communication and provides for optional communication cards: PROFIBUS DP, DeviceNet, MODBUS TCP, EtherNet/IP, EtherCAT and CANopen



Power Range	0.75~3.7 kW 1~5 HP	5.5~18.5 kW 7.5~25 HP	22~37 kW 30~50 HP	45~90 kW 60~125 HP	110~185 kW 150~250 HP	220~450 kW 300~600 HP	560~630 kW 715~850 HP
C2000	230V/3-phase						
	460V/3-phase						
	575V/3-phase						
					690V/3-phase		

## Applications

Printing machines, extruders, calender machines, paper machines, compressors and wire drawing machines



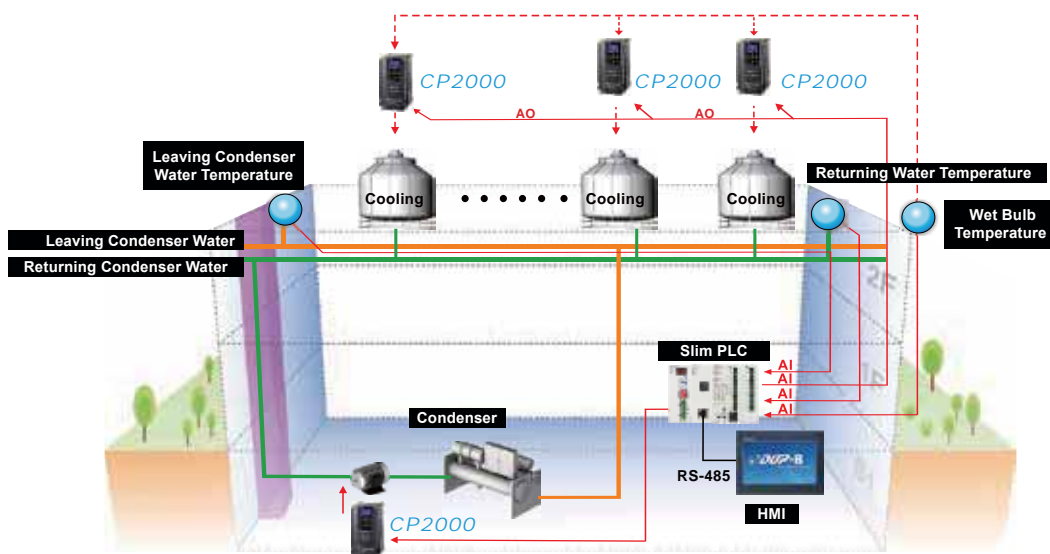
# Fan/Pump Vector Control Drive

## CP2000

### Excellent for Large Power Fans and Pumps Applications



- Built-in BACnet and RS-485 (MODBUS) communication protocols
- Enhanced conformal coating on PCBs for superior durability in critical environments
- Fire mode and Bypass mode: continuous pressure output to extract smoke when a fire accident or other emergencies occur
- Quick setting functions to support self-defined parameter groups and parameter duplication for fast and easy installation
- Various modes for fans/pumps applications including PID control, sleep/wake up functions, flying start and frequency-hopping functions
- Built-in LCD keypad is easy-to-use, and the TPEditor software allows users to customize the main page screen
- Multi-pumps synchronous control of up to 8 motors at one time, fixed amount and fixed time circulation control. Relay expansion card is optional
- Built-in PLC with 10k steps program capacity and Real Time Clock
- Optional communication cards: PROFIBUS DP, DeviceNet, MODBUS TCP, EtherNet/IP and CANopen



Power Range	0.75 ~ 3.7 kW 1 ~ 5 HP	5.5 ~ 18.5 kW 7.5 ~ 25 HP	22 ~ 37 kW 30 ~ 50 HP	45 ~ 90 kW 60 ~ 125 HP	110 ~ 185 kW 150 ~ 250 HP	220 ~ 450 kW 300 ~ 600 HP	560 ~ 630 kW 715 ~ 850 HP
CP2000	230 V/3-phase						
	460 V/3-phase						
	575 V/3-phase						
	690 V/3-phase						

### Applications

Factory automation, HVAC, fans and pumps



# IP55 Fan & Pump Drive New

## CFP2000

### For HVAC, Fans and Pumps Applications

- IP55 and IP41 enclosure protections
- Built-in mains switch option for the IP55 models
- Built-in Safe Torque Off (STO) SIL2 function
- Built-in EMC filter; IEC61800-3 C2, C1 standard
- Built-in DC reactor effectively reduces the harmonic distortion; IEC61000-3-12 standard
- Enhanced PCB (Printed Circuit Board) conformal coating improves drive durability; Class 3C3 standard
- 2 sets of PID controller functions
- Built-in PLC with 10k steps program capacity and Real Time Clock (RTC)
- Built-in MODBUS and BACnet MS/TP communication
- Optional communication cards: PROFIBUS DP, DeviceNet, MODBUS TCP, EtherNet/IP, CANopen
- Built-in Quick Start function and application groups to simplify the installation and setup



Power Range	0.75 ~ 5.5 kW 1 ~ 7.5 HP	11 ~ 22 kW 15 ~ 30 HP	30 ~ 37 kW 40 ~ 50 HP	45 ~ 55 kW 60 ~ 75 HP	75 ~ 90 kW 100 ~ 125 HP
<b>CFP2000</b>	<b>380 to 480V/3-phase</b>				

## Applications



Fans



Chiller



Water treatment

# Heavy Duty Vector Control Drive

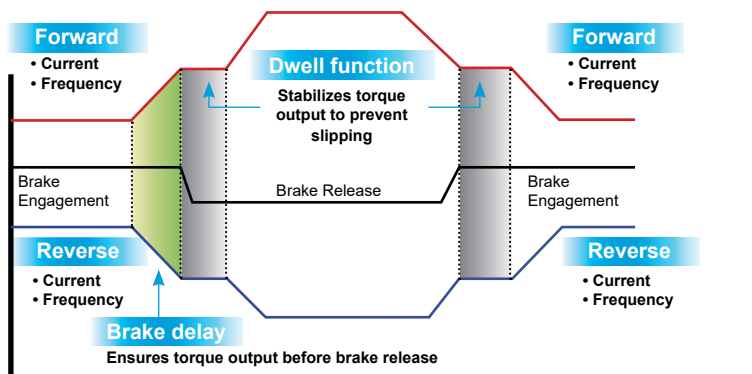
## CH2000

### Large Overload Capability Excellent for Impact Loading Applications

- Fast response to impact loads
- Super Heavy Duty (SHD) setting for high overload capability: 150% of rated current for 60sec and 200% of rated current for 3sec
- Large starting torque: above 200% at 0.5Hz, and 200% at 0Hz in FOC+PG mode
- Support both induction and permanent magnet motors
- Various crane functions for high operation performance
- Modular design: easy installation and maintenance
- Built-in PLC with 10k steps program capacity
- Built-in MODBUS communication
- Optional communication cards: PROFIBUS DP, DeviceNet, MODBUS TCP, EtherNet/IP, EtherCAT and CANopen



### Advanced Crane Functions

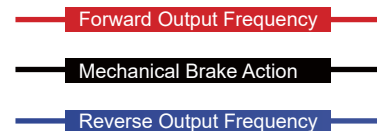


#### ▲ Mechanical Brake Control

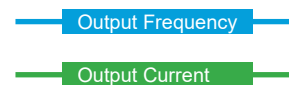
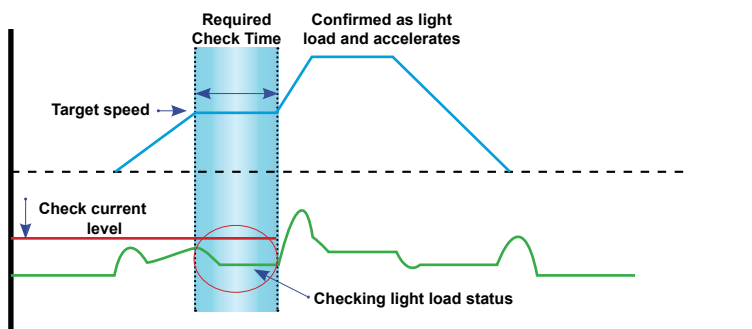
8 independent brake control settings for different criteria. High flexibility to meet complex application needs and to ensure operation safety

#### ▲ Advanced Crane Time Sequence

Brake delay and dwell function for smooth operation



### Light Load Acceleration



### Applications

Machine tools, punching machines, cranes and hoists



Power Range	0.75 ~ 3.7 kW 1 ~ 5 HP	5.5 ~ 18.5 kW 7.5 ~ 25 HP	22 ~ 37 kW 30 ~ 50 HP	45 ~ 75 kW 60 ~ 100 HP	90 ~ 185 kW 125 ~ 250 HP	220 ~ 280 kW 300 ~ 375 HP
CH2000	230V/3-phase					
	460V/3-phase					

# Textile Vector Control Drive

## CT2000

### Highly Flexible Flange Mount and Wall Mount Methods

- Fanless design with highly effective heat sink to prevent fiber and dust from clogging or entering the drive, solving overheating problems<sup>(\*)</sup>
- Flange mount installation to enhance system safety and stability, providing excellent heat dissipation performance<sup>(\*)</sup>
- Support external fan connection (optional)<sup>(\*)</sup>
- Wall mount installation model with an enlarged fan<sup>(\*\*)</sup>
- Deceleration Energy Backup (DEB) function for smooth motor deceleration control
- Support both induction and permanent magnet motors
- Common DC BUS design
- Built-in PLC with 10k steps program capacity and RS-485 with MODBUS communication
- Optional communication cards are available upon request

\*1: For model names ending with code A or B

\*2: For model names ending with code C



Flange Mount



Wall Mount



Power Range	11 kW	15 kW	18.5 kW	22 kW	30 kW	37 kW	45 kW	55 kW	75 kW	90 kW
CT2000	460 V/3-phase									

### Applications

Textile machines and all textile applications that require flange mount or wall mount method.

\* Flange mount: Please refer to the CT2000 user manual for airway design requirements before installing the drive



# Elevator Drive

## VFD-ED

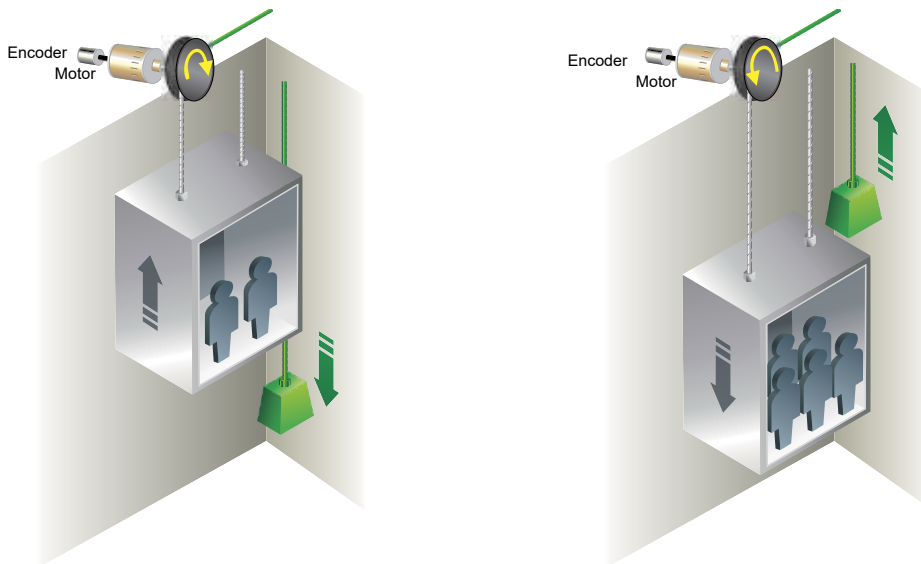
### Excellent Time Sequence Control for Smooth Rides

- Support both induction and permanent magnet motors
- Precise control of S curve performs smooth start and stop for a comfortable ride
- Optional PG feedback cards (for ABZ & Heidenhain encoder)
- Advanced field oriented vector control
- Automatic torque compensation function to prevent elevator from slipping or vibrating
- Emergency operation is enabled using UPS or battery set when power outage occurs
- Support both wall-mount and embedded installation methods
- Built-in LED digital keypad
- 4 relay output and 2 multi-function digital signal output terminals (MO)
- 2 analog signal input (AI) and 2 analog signal output (AO)
- 1 CANopen and 2 RS-485 with MODBUS communication



### Emergency Operation

- Support single phase 230VAC Uninterrupted Power System (UPS)
- Automatically determine the light load operation direction when a power outage occurs



CE EAC cUL<sup>US</sup> (UL: does not include VFD22ED21S and VFD037ED21S models)

Power Range	2.2 kW 3 HP	3.7 kW 5 HP	4 kW * 5 HP	5.5 kW 7.5 HP	7.5 kW 10 HP	11 kW 15 HP	15 kW 20 HP	18.5 kW 25 HP	22 kW 30 HP	30 kW 40 HP	37 kW 50 HP	45 kW 60 HP	55 kW 75 HP	75 kW 100 HP
ED	230V/1-phase													
	230V/3-phase													
	460V/3-phase													

\*Minimum Power Range of the 460V model is 4kW

# Door Control Drive

VFD-DD

Door Control Solution

■ **Compact and Thin Design**

55mm

■ **Safety Switch**

■ **Removable Terminal Blocks**



■ **Built-in Digital Keypad**

■ **Distance Control Mode**

■ **Speed Control Mode**

■ **Multi-step Speed Control Mode**

- Simplified elevator door control system
- Support both induction and permanent magnet motors
- Easy to install with I/O input/output design
- Various protection functions ensure passenger safety
- Auto-tuning of door width

- Auto-positioning when power is applied
- Smooth door re-open / re-close curve
- Demo mode
- Support elevator door obstruction detection

## Optional Motors

ECMD-B91207MS

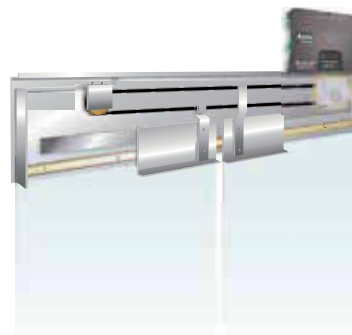
ECMD-B91608MS

ECMD-B81610MS



## Applications

Elevator doors



Power Range	0.2 kW 0.25 HP	0.4 kW 0.5 HP
VFD-DD	230 V/1-phase	



# Integrated Elevator Drive

## IED

### Integrated Drive and Control to Save Installation Space

#### Control

- High-efficiency group control function capable of controlling multiple elevators without the need of additional control cards
- Various operation modes including demo mode; attendant service mode and time-based modes
- Single and double door elevator applications
- Max. 48 floors

#### Design

- Compact design, suitable for limited installation spaces
- Modular design of fans and capacitors for easy replacement and maintenance
- A small-size LED keypad allows users to check and set the drive control

#### Drive

- Support induction and permanent magnet motors
- Emergency Power Supply (EPS) function
- Dual safety protection functions. All time output phase loss check and confirms torque output before releasing mechanical brake

#### Tune

- Auto-learning hoistway and auto floor height detection
- Auto-tuning motor parameters without load disconnection
- PC software monitors motor operation status

#### Energy Saving

- Power regeneration function available when installed with Delta's Active Front End (AFE2000 Series) or Power Regenerative Unit (REG2000 Series)
- Scheduled lighting and air circulation time function for the elevator car
- Standby mode to save energy

#### Efficiency

- Direct stop: multi-speed control to provide a comfortable ride with higher efficiency
- Peak hour operation: improves peak hour operation efficiency
- Full-load bypass operation: arrives at designated floor without stopping



**One drive for all control needs**

#### Optional

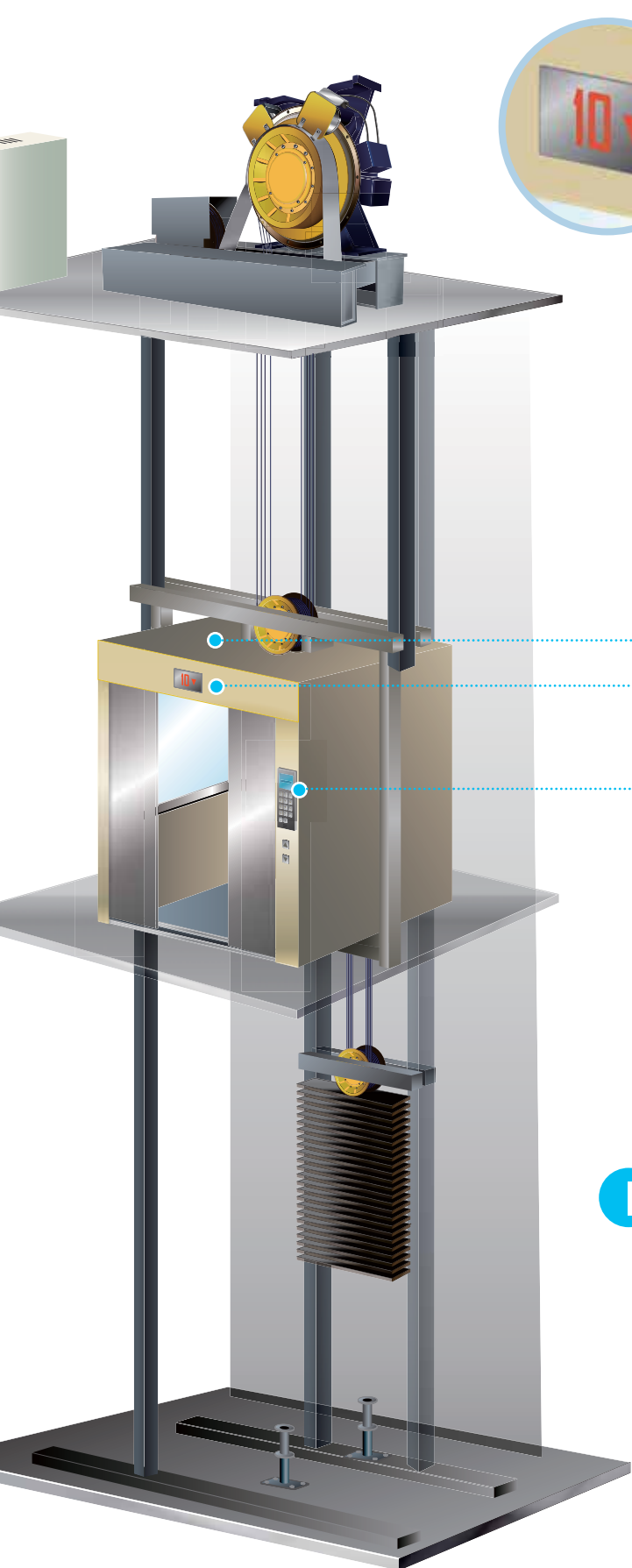
#### External Digital Keypad

- Controller setting
- Drive setting
- Parameter copy



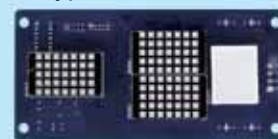
**CE EAC**

Power Range	2.2 kW 3 HP	3.7 kW 5 HP	4 kW 5 HP	5.5 kW 7.5 HP	7.5 kW 10 HP	11 kW 15 HP	15 kW 20 HP	18.5 kW 25 HP	22 kW 30 HP	30 kW 40 HP	37 kW 50 HP	45 kW 60 HP	55 kW 75 HP	75 kW 100 HP
IED	230V/1-phase													
	230V/3-phase													
	460V/3-phase													



### Floor Display Board

- Vertical matrix display board - Standard Type



- Vertical/Horizontal matrix display board - Standard Type



### Integrated Cartop and Button Board

- Integrated cartop and button board

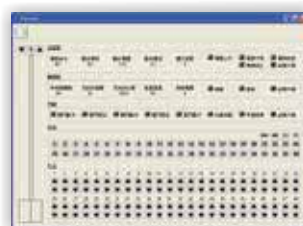


- Button extension board



### PC Software

USB port facilitates program upload/download and tuning process



# Hybrid Energy Saving System

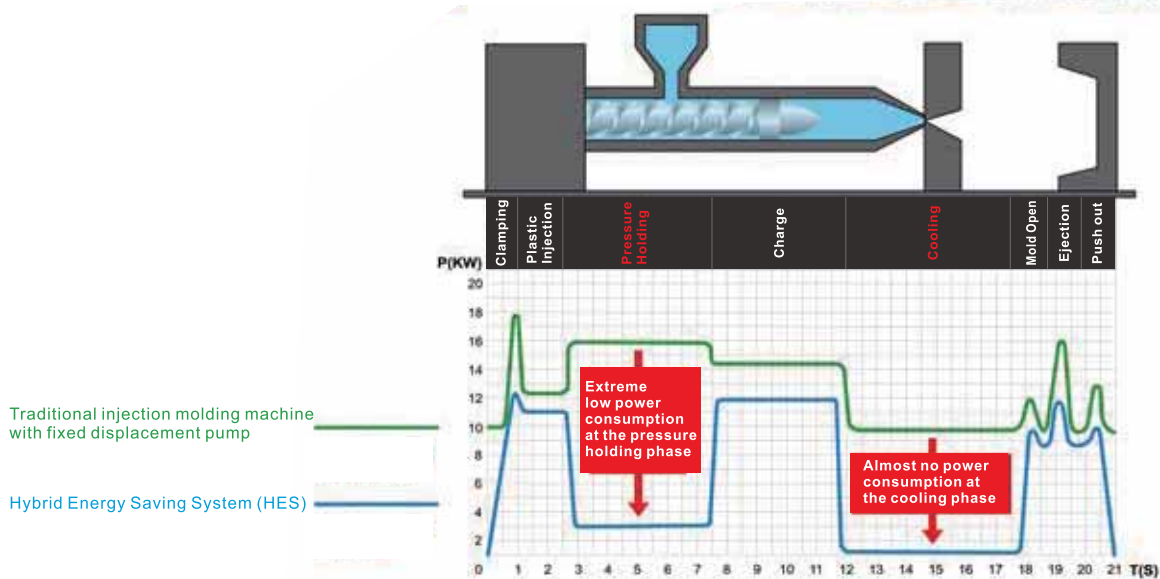
## HES

### Energy Saving for Injection Molding Machine



- **Superior Energy-Saving Outcomes:** 40% less energy consumption compared to variable pump hydraulic systems; 60% less energy consumption compared to traditional quantitative pump hydraulic systems
- **Low Oil Temperature:** oil temperature decreased by 5°C to 10°C, saving costs on oil cooler
- **Reduce Oil Usage:** 50% to 60% oil usage savings and a 50% smaller oil tank
- **High Duplication Accuracy:** Precise flow and pressure control featuring duplication of products with less than 0.09% difference
- **Long Holding Pressure:** Keep mold halves securely closed for a longer period for thick plastic products formation
- **Fast Frequency Response:** Delta HES with permanent magnet servo motor (PMSM) speeds up frequency response to 50 ms
- **Suitable for Harsh Environments:** Resolver is resistant to earthquakes, oil and dust
- **Easy to Refurbish Old Machines:** Analog command 0~10V and linear correction (3 points), no need to replace the computer
- **Flow Convergence:** Saves cost on tubes, large flow capacity, and outstanding energy-saving performance

### Power Consumption Curve of the Injection Molding Process



Power Range	50 L/min	63 L/min	80 L/min	100 L/min	125 L/min	160 L/min	200 L/min	250 L/min	320 L/min	
HES	230V/3-phase									
	460V/3-phase									

### Applications

Injection molding machines, bottle blowing machines, pipe bending machines, bending machines and other hydraulic equipment



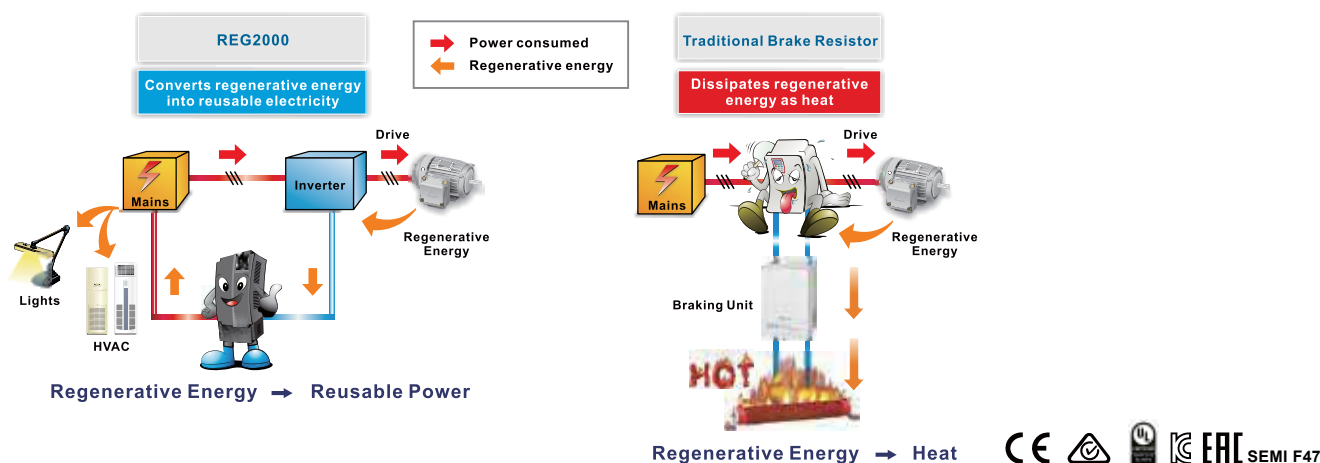
# Power Regenerative Unit

## REG2000

### Replaces Traditional Brake Resistor and Features Power Regeneration

- Compact design with reactor included and easy to install
- Outstanding energy-saving performance with more than 95% power regeneration efficiency
- Replace traditional brake resistors to reduce the generation of heat
- Improve motor braking capability from 125% to 150%
- Built-in RS-485 (MODBUS) communication and real-time monitoring of energy-saving performance and cost
- Compatible with the drives and servo drives that have a DC terminal
- Support parallel connections for large power applications
- Optional communication cards: (\*) MODBUS TCP, EtherNet/IP, CANopen, PROFIBUS DP and DeviceNet

\* Please contact Delta Industrial Automation



Power Range	7.5 kW	11 kW	15 kW	18.5 kW	22 kW	30 kW	37 kW	45 kW	55 kW
REG2000	230V/3-phase								
	460V/3-phase								

## Applications

**Large-inertia load applications:** centrifuge equipment, industrial laundries, roving machines and more

**4-quadrant load applications:** elevators, cranes, pumpjacks and more

**Long-term energy feedback applications:** printing machines, escalators and more

**Quick braking applications:** machine tools, bag making machines, auto storage and retrieval systems, press machines and more



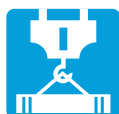
Escalators



Elevators



Tension Controls



Cranes



Centrifuge Equipment



Press Machines



Industrial Laundries



Machine Tools

# Active Front End

## AFE2000

### The Best Energy Saving Device with AC Motor Drives

- More than 95% power regeneration efficiency
- Improve power factor to more than 99% with input current THD  $\leq 5\%$
- Realize 4-quadrant operation with variable frequencies and speed control when applied with AC motor drives
- Maintain constant DC BUS voltage and current when the voltage provided by the mains is unstable
- Supports all kinds of fieldbus for real time power status monitoring and control\*



CANopen

DeviceNet

MODBUS TCP

EtherNet/IP

\*Available from Delta upon request



EAC

Power Range	7.5 kW 10 HP	15 kW 20 HP	22 kW 30 HP	37 kW 50 HP	45 kW 60 HP	75 kW 100 HP
AFE2000	230 V 3-phase					
	460 V 3-phase					

### Applications

**Large-inertia loads applications:** centrifuge equipment, dewatering machines and roving machines

**4-quadrant loads applications:** elevators, cranes and pumpjacks (oil extraction machines)

**Quick braking applications:** machine tools, bag making machines, auto storage and retrieval systems, and lathes

**Power quality improvement:** semiconductor and panel industries

**Long energy feedback time applications:** wind power, water power, steel printing and paper making machinery (winding equipment)

# Static Var Generator

## SVG2000

### Comprehensive Reactive Power Compensation to Improve Power Efficiency

- Compensates both leading and lagging reactive current; improves power factor to 0.99
- Adopts special Delta power supply modules to provide a wide range application from 220 V~480 V and 525 V~690 V
- Modular design of fan, power, drive, control and reactor modules
- 7" touch screen TFT LCE expression in 65,536 colors

Capacity	300 k VAR	500 k VAR
SVG2000	220 V~480 V/3-phase	
	525 V~690 V/3-phase	

### Applications

A new solution to replace traditional phase-leading capacitors, applicable to the power distribution systems of industry, infrastructure, commercial buildings and homes

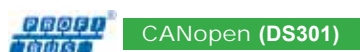


# Active Power Filter

## APF2000

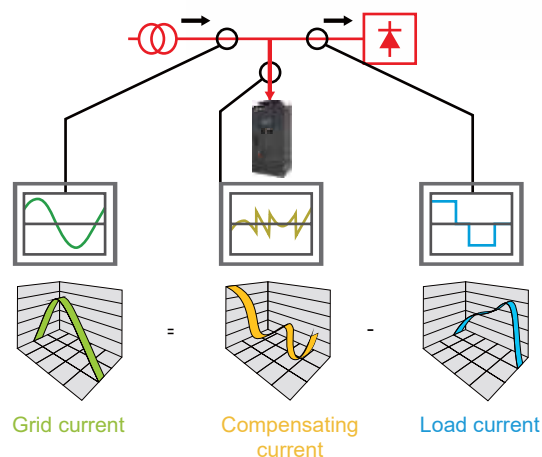
### For Power Quality Improvement

- Filter the 2<sup>nd</sup> to 50<sup>th</sup> order harmonics with efficiency of more than 90%. IEEE519 standard
- Full response speed faster than 20ms
- Selection to compensate either harmonic wave or reactive power, or compensate both at the same time
- Modular design of fan, power, drive control and reactor modules
- 7" touch screen TFT LCD expression in 65,536 colors
- Compact design: the 300A model only measured 600W x 800D x 2200H (mm)
- Parallel connection of multiple units to expand total capacity
- Built-in RS-485 communication and provides various communication and fieldbus card options



### Concept

An active power filter is a large power electrical device that monitors the three-phase current in real time and provides an equally opposite phase to relevant devices to filter out the harmonics. It is parallel connected to the grid and uses a current transformer to inspect the 3-phase current waveform and obtain the required compensation data of harmonic current and reactive power. The active power filter will then inject an equally opposite current input to the power system for harmonic filtering results. In addition, the active power filter can also create phase that complements the leading and lagging reactive current. It effectively improves the power factor of the grid and provides compensation to the reactive power.



Capacity	50 A	100 A	200 A	300 A
APF2000	200 V ~ 480 V/3-phase			

### Applications

#### Metallurgy and petrochemicals industries:

rectifier, converter, rolling mill, electric arc furnace, medium frequency furnace and inverter

#### Chemical and electrolysis industries:

rectifier, calcium carbide furnace, electric soldering and inverter

#### Mechanical industries:

rectifier, rolling mill, inverter, electric arc equipment

#### Metal, paper, plastic processing and textile industries:

rectifier, rolling mill, inverter, electric arc furnace and electric furnace

#### Transportation industries:

the rectifier and the inverter of electric vehicles, electric motorcycles and metro systems

#### Automobile manufacturing industries:

soldering equipment, car painting equipment, battery charger and inverter

#### Telecommunication, medical and construction industries:

Server station, EPS, UPE, converter, charger and inverter



# AC Servo Drive & Motor New

## ASDA-A3

### 24-bit Absolute Type Encoder

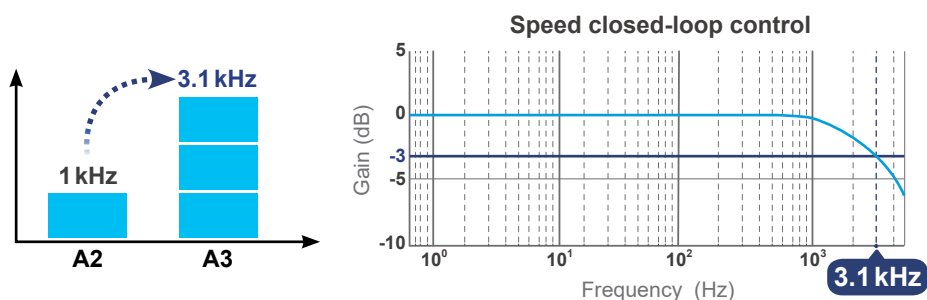
### 3.1 kHz Bandwidth

### Advanced Motion Control Functions Inside



## 3.1 kHz Bandwidth

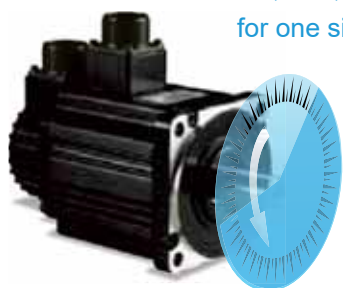
- Higher responsiveness and shorter settling time increases productivity



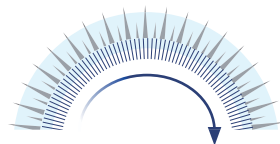
## 24-bit Absolute Type Encoder

- Positioning precision is enhanced by the 16,777,216 pulses/turn encoder
- The speed variance in low speed is reduced.
- Absolute type encoder helps to keep the motor's position when the power is off

16,777,216 pulses  
for one single turn



46,603 pulses for one degree



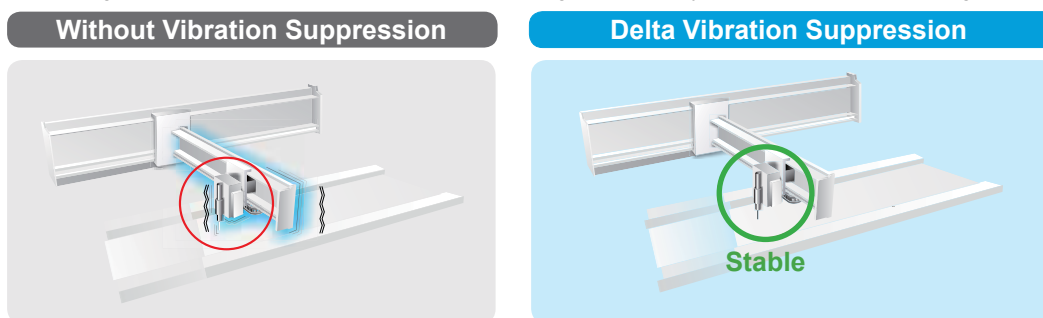
## Advanced Motion Control Functions

- 99 sophisticated motion commands and segments allowed
- Graphical user interface offers simple setup and programming
- Arithmetic operation and condition jump commands are added
- General motion functions like homing, position, speed, superimposition, blending, on-the-fly change motion commands and E-CAM functions are available



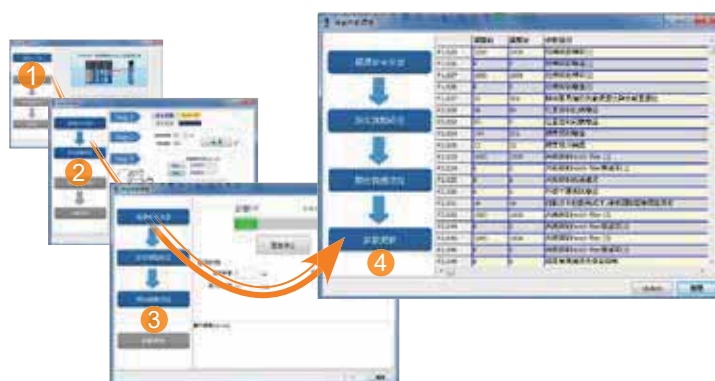
## Low Frequency Vibration Suppression Function

- Keeps the machining process stable when mechanisms with higher elasticity such as a belt or a swing arm are applied



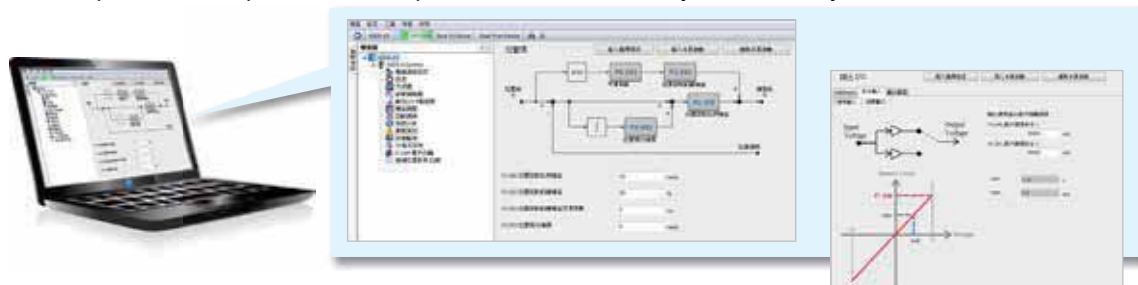
## Auto-Tuning Function

- This function will optimize machine performance with less tuning effort and with simple setup procedures via panel keypad or software



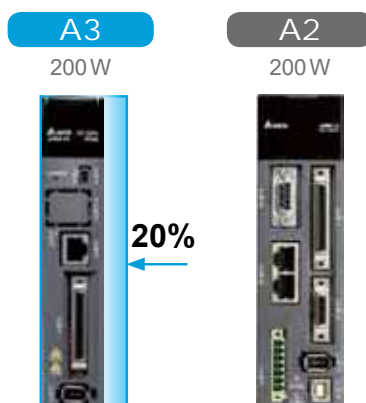
## Smart and Intuitive Software Interface

- Tree-view index window with organized list and collapsible menu helps to access functions easily
- Intuitive user interface provides set up functions and parameters with efficiency and accuracy

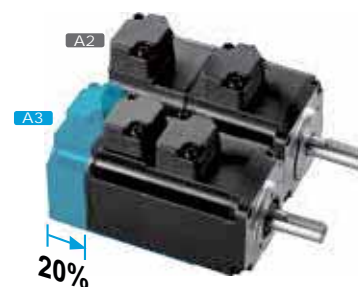


## Compact Size Design

- ASDA-A3 is 20% smaller than A2 in dimensions, which requires less installation space



Servo motor shorter in length



## Applications

Machine tools, electronic assembly or detection equipment, industrial robots, packaging, labeling, semiconductor and textile equipment

# AC Servo Drive & Motor

## ASDA-A2

Implements 20-bit (1,280,000 p/rev) superior resolution encoder as a standard



### Built-in Motion Control Functions

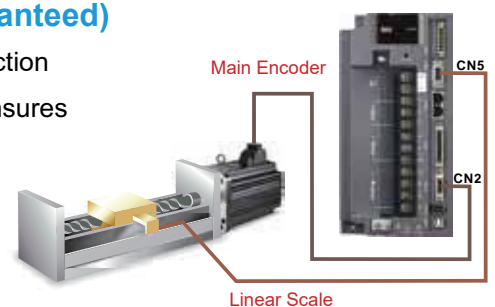
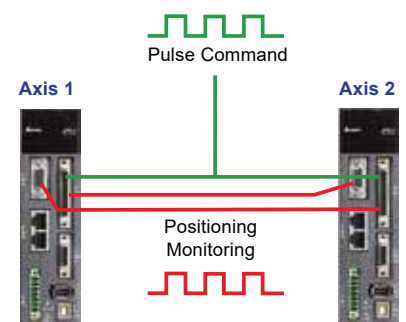
- Electronic Cam (E-CAM) function for mark tracing, positioning, synchronous control applications. 720 points max. for E-CAM outline
- High-speed Capture and Compare function for position latch and detection. Max. 800 records can be stored in the memory
- Built-in gantry control algorithm

### High Precision, High Performance Servo Motors

- Supports incremental type and absolute type encoders
- Incremental type encoder provides up to 1,280,000 p/rev resolution for high-precision positioning

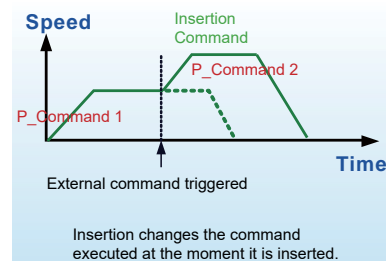
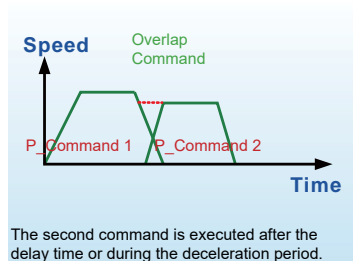
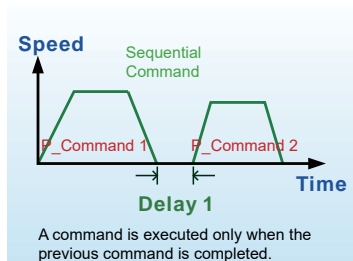
### Full-Closed Loop Control (Accuracy of positioning guaranteed)

- Direct signal transmission through CN5 port to perform full-closed function
- Reduces the effect of backlash and flexibility from the machine and ensures the accuracy of positioning



## Versatile PR mode

- 64 procedures can be applied for various and multiple points continuous motion movements
- 35 Homing modes/ Jump mode/Write parameter mode/Speed mode/Position mode



## Basic Features

- Input voltage: 200 V<sub>AC</sub> ~ 230 V<sub>AC</sub>, 0.1 kW ~ 15 kW, 1-phase / 3-phase, or 3-phase
- Input voltage: 400 V<sub>AC</sub>, 0.4 kW ~ 15 kW, 3-phase
- Up to 1 kHz bandwidth for high speed and high precision applications
- Supports CANopen, DMCNET, EtherCAT communication protocols
- A2-E model is equipped with Safe Torque Off function (STO) complying with the international standard IEC61800-5-2

	Type	RS-485 (CN3)	Full-Closed Control (CN5) <sup>*1</sup>	Extension Port for Digital Input (CN7)	PR Parameters <sup>*2</sup>	E-CAM <sup>*3</sup>	EtherCAT <sup>*4</sup>	CANpen	DMCNET	Analog Voltage Control	Pulse Input Port
Standard Model	L	O	O	X	O	X	X	X	X	O	O
	U	O	O	O	O	O	X	X	X	O	O
Network Model	E	X	O	O	O	O	O	X	X	X	X
	F	O	O	X	O	X	X	X	O	X	X
	M	O	O	X	O	O	X	O	X	O	O

\*1. In PR mode, only A2-F supports full-closed control function.

\*2. PR parameters can be read and written through communication by DMCNET only.

\*3. E-CAM function can only be used in PR mode.

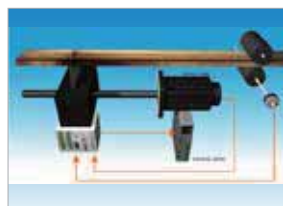
\*4. For information about ASDA A2-E EtherCAT interface servo drive, please refer to the ASDA A2-E brochure.

## Applications

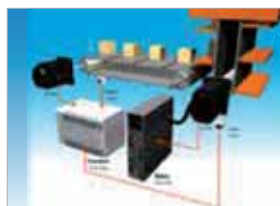
Precise motion control applications, food packaging machines, filling and bottling equipment, labeling machines, feeding machines, TFT LCD cutting machines, IC packaging machines, injection processing equipment, lathes, electric discharge machines (EDM), woodworking machines, wire cutting machines, printing machines, textile equipment



Food Packaging Machines



Wire Cutting Machines



Feeding Machines



High-speed Labeling Machines

# AC Servo Drive EtherCAT<sup>®</sup>

## ASDA A2-E

### Supports EtherCAT High-speed Communication

Delta's ASDA A2-E, an advanced AC Servo Drive with an EtherCAT communication interface, complies with IEC61158 and IEC61800-7 to enable faster, real time, and accurate performance in high-end applications.

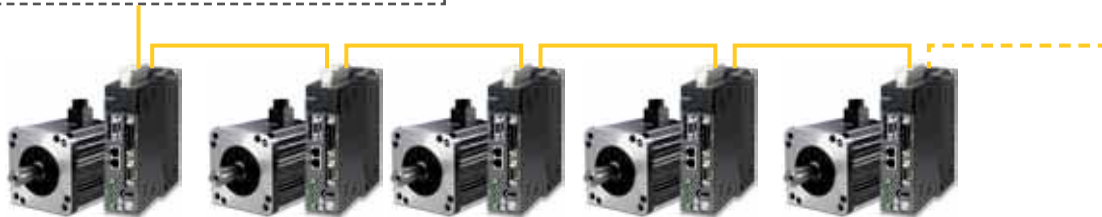
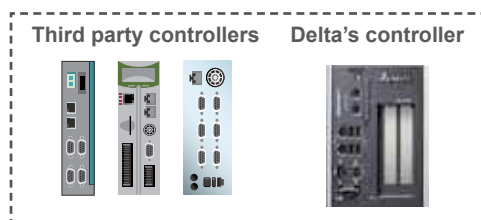
The new A2-E the supports a CoE device profile based on CiA402, and all command types of EtherCAT.

In addition to the EtherCAT communication function, the A2-E features the integrated Safe Torque Off (STO), short cycle time, and extension digital input port, which makes the A2-E ideal for multi-axis synchronization applications in a wide range of machinery automation applications. This series offers a wide range of rated power to drive motors, from 400W to 7.5kW for 400V and 100W to 3kW for 220V.

- Touch probe function can be enabled with two dedicated Digital Inputs (DI) on CN7 or the external encoder
- Integrated Safe Torque Off (STO) safety function complies with the standards of IEC61508, SIL2; IEC62061, SILCL2; ISO13849-1, Cat. 3 PL=d
- Wide power range coverage for both 220V and 400V versions
- Supports full-closed loop control
- Supports absolute type and incremental type ECMA Series motors



#### EtherCAT controllers



## Applications



Metal Working Machines



Woodworking Machines



Food Processing



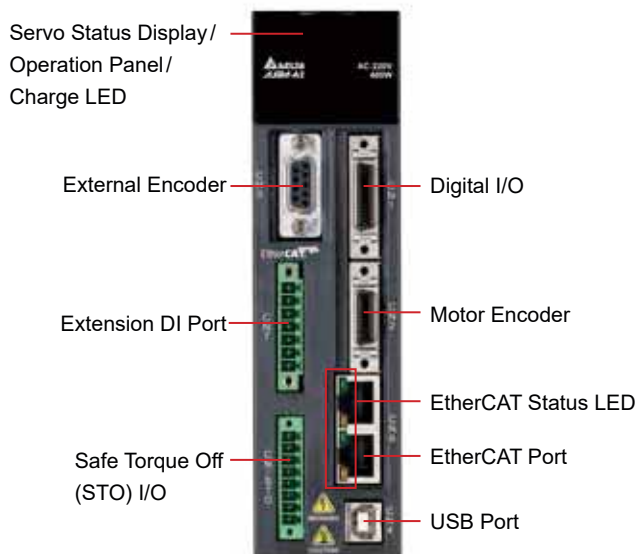
Printing Machines



## Communication Specifications

<b>Physical Layer</b>	IEEE802.3u (100 BASE-TX)
<b>EtherCAT Commands (Data Link Layer)</b>	APRD, FPRD, BRD, LRD, APWR, FPWR, BWR, LWR, ARMW, FRMW, APRW, FPRW, BRW, LRW
<b>Device Profile (CiA402)</b>	Homing Mode, Profile Position Mode, Profile Velocity Mode, Profile Torque Mode, Interpolated Position Mode, Cyclic Syn. Position Mode, Cyclic Syn. Velocity Mode, Cyclic Syn. Torque Mode, Touch Probe Function, Torque Limit Function
<b>Process Data Size</b>	Tx: 8 Object (32 byte, Max.) Rx: 8 Object (32 byte, Max.) Dynamic Mapping Support.
<b>Bus Clock</b>	DC cycle with min. 250 $\mu$ s
<b>LED Indicator</b>	EtherCAT Link/Activity Indicator (L/A)x2 EtherCAT RUN Indicator (RUN)x1 EtherCAT ERROR Indicator (ERR)x1

## Part Names and Functions



## Accessories for ASDA A2-E

<b>Part Number</b>	ASD-CN5C0026
<b>Description</b>	CN1 connector
<b>Part Number</b>	ASD-CNFS0808
<b>Description</b>	Pack of connectors used for STO wiring, 8 pcs of connectors in one pack



# AC Servo Drive & Motor

## ASDA-B2

Implements 17-bit (160,000 p/rev) high resolution encoder as a standard



### Power Range: 0.1 kW ~ 3 kW

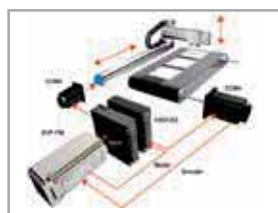
- Input Voltage: 200 V<sub>AC</sub> ~ 230 V<sub>AC</sub>, 1-phase/3-phase, or 3-phase
- Meets high precision positioning control requirements of general-purpose machine tools
  - Built-in Position, Speed and Torque modes (Speed and Torque modes can be controlled via internal parameters or external voltage)
  - Provides pulse input (up to 4 Mpps) and analog voltage commands
  - Three notch filters are provided to optimize the operation of the mechanical system automatically
  - Friction compensation and motor protection functions are available to reinforce the system
  - Power of main circuit and control circuit is separated
  - Maintenance is easy and very safe
  - Built-in regenerative resistor is featured as standard (400W and above models). No need to purchase or wire up a separate regenerative resistor



### Applications



Bar Feeders



Transporting and Conveying Equipment



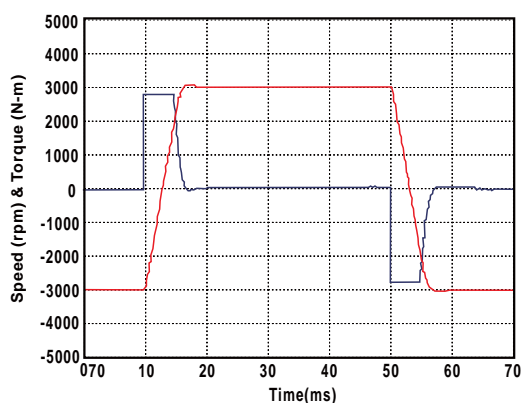
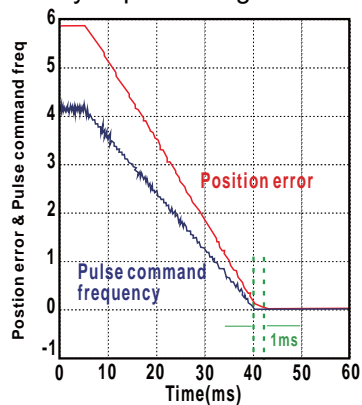
Electric Discharge Machines (EDM)



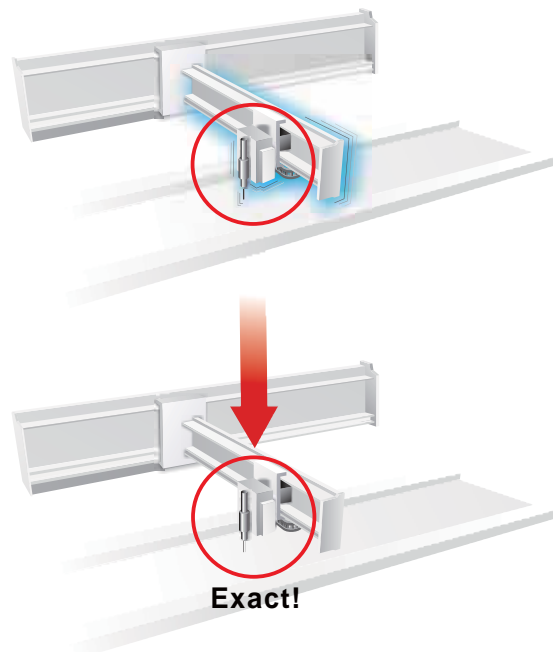
Cutting Machines

## High Accuracy for Positioning

- ASDA-B2 Series features an incremental encoder with 17-bit resolution (160,000 p/rev) which can eliminate unstable commands at low speed, smooth the motor operation and enhance the accuracy of positioning

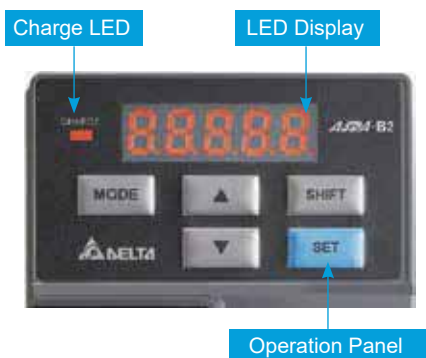


- Three auto notch filters are provided to suppress mechanical resonance efficiently

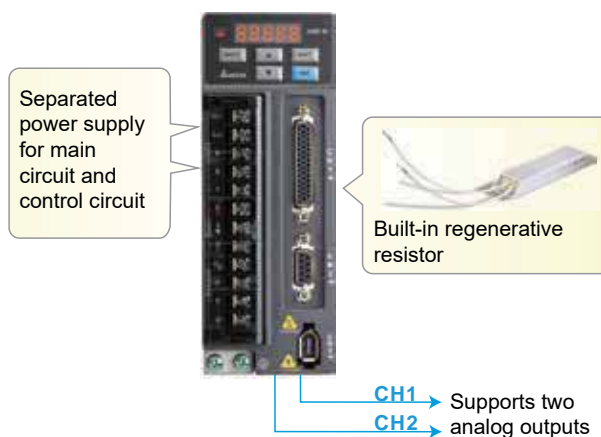


## Easy-to-Use and Cost-Saving

- The same power and encoder cables as the ASDA-B Series. Easy to set up and no extra accessories are required
- Easy-to-use digital keypad is ideal for setting parameters and monitoring the system directly



- Built-in regenerative resistor (400W and above models) is provided. Simplifies wiring and minimizes space



# AC Servo Drive & Motor

## ASDA-M

### Three-in-one Intelligent Servo System Harmonizing Motion Controller and Servo Drive

#### Impeccable motion control inside

- 3-axis synchronous servo module with performance better than comparable three servo drives
- Built-in motion control and PLC functions
- Multi-axis synchronous interpolation and built-in motion control commands are ideal for applications requiring high synchronous control accuracy
- Versatile PR mode for various continuous motion movements
- Built-in G-code interpreter

#### New PC Software Functions

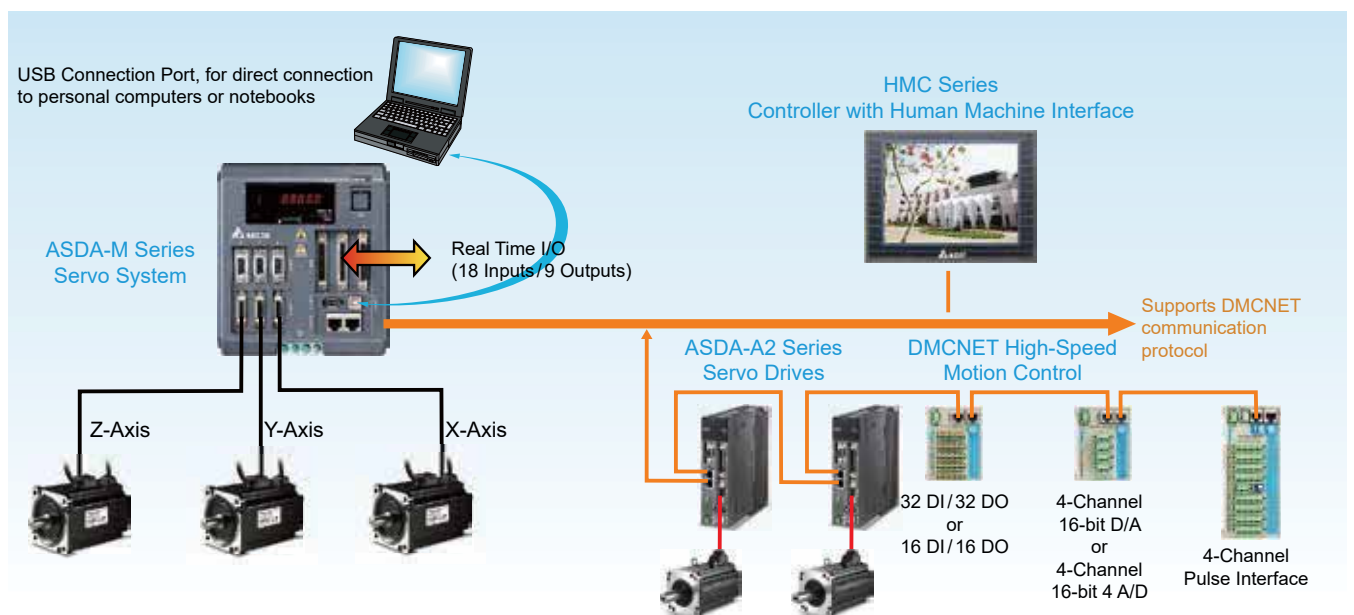
- ASDA-Soft provides built-in contour analysis function
- EzASD provides PLC programming and motion commands editing environment

#### High Precision, High Performance Servo Motors

- Supports incremental type and absolute type encoders
- Incremental type encoder provides up to 1,280,000 p/rev resolution for high-precision positioning



#### Product Line-up

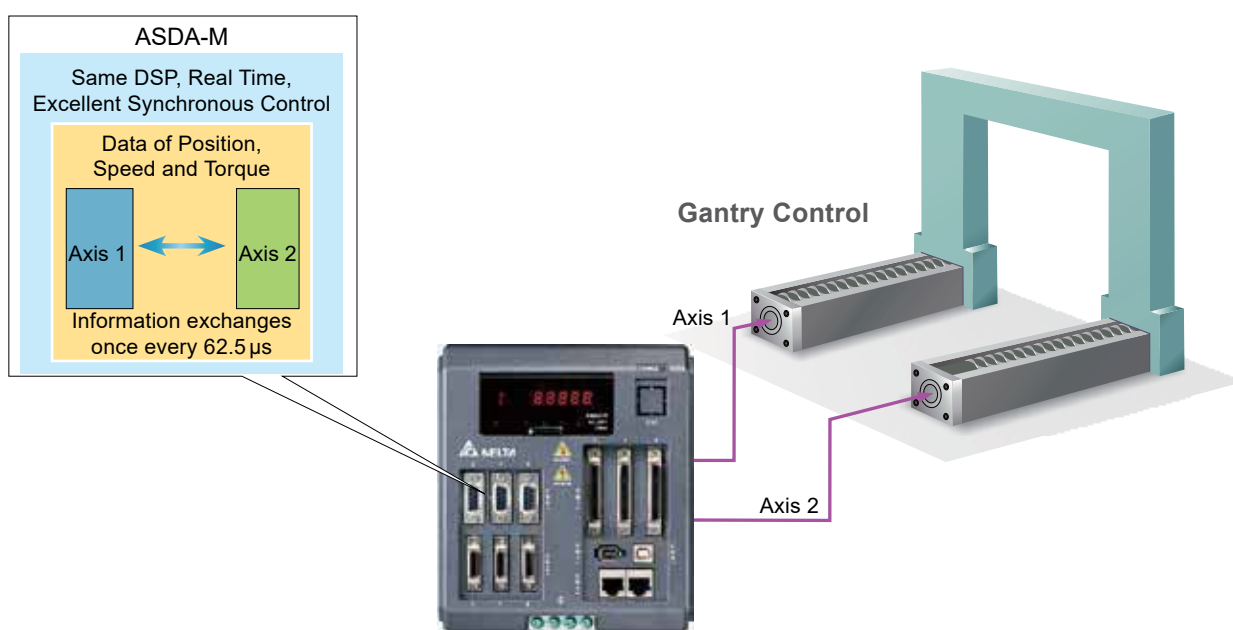


## Real Time, Reliable and High-Speed Motion Control Network

- Supports DMCNET and CANopen communication protocols
- With the aid of Delta's Controller with Human Machine Interface (HMC), it can establish an integrated system configuration by DMCNET
- Supports DMCNET extension digital input and output modules

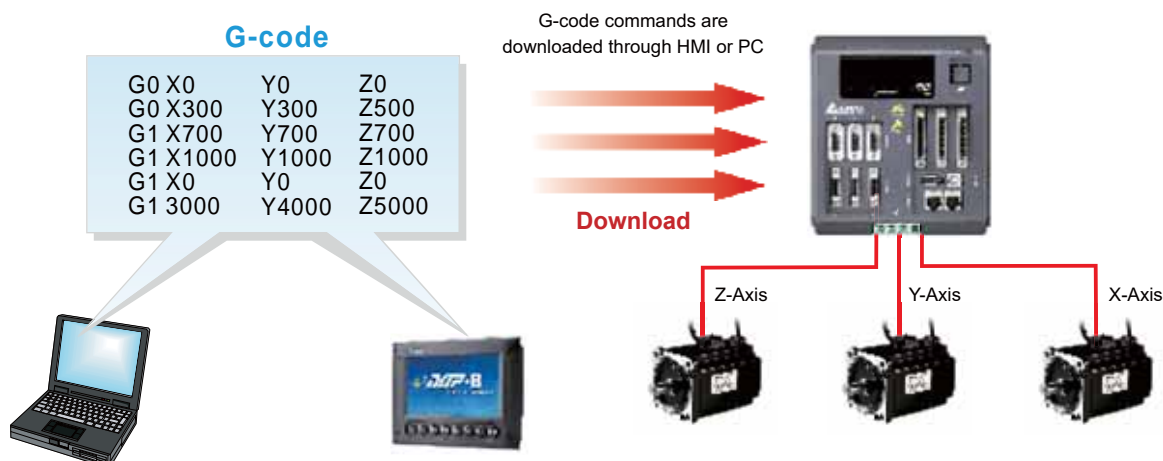
## Advanced Gantry Control

- A large amount of data can be exchanged in real time among 3 axes without any time delay. This greatly increases the efficiency and performance of gantry control
- In rigid or general mechanical systems, no matter if the loading on multiple axes is equal or not, the ASDA-M Series can perform precise motion control and drive for each axis simultaneously



## Built-in G-code Interpreter

- G-code commands are downloaded and executed to the servo drive through HMI or PC
- ASDA-M Series provides built-in G-code interpreter to decode the G-code commands and complete the motion movement



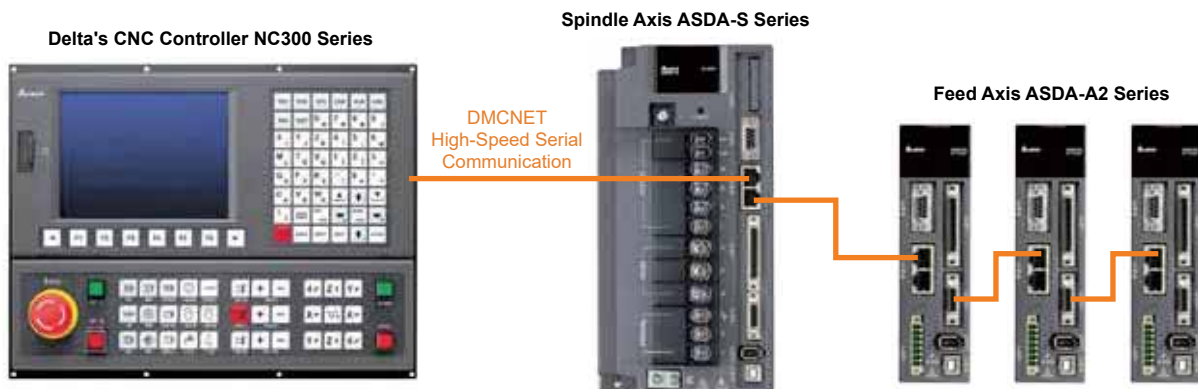
# Spindle Motor Drive

## ASDA-S

Ensuring Premium Surface Finish Quality for the CNC Industry

**Power range: 3 kW~15 kW**

- Supports Delta permanent magnet spindle motors and other induction motors
- Provides high performance servo vector control as in the ASDA-A2 Series
- Supports pulse encoder signals (ABZ phase) via CN5 port. External converter card is no longer necessary
- Built-in induction motor parameter measuring and estimating function
- Offers V/F control for induction motors without encoders
- Equipped with analog speed and resolution switching function
- Accepts analog voltage, position pulse and DMCNET communication commands
- 200V models and 400V models are available for selection
- Capable of connecting to CNC controllers via DMCNET high-speed serial communication



# IPM Spindle Motor

## ECMS

**Power range: 3.7 kW/6.7 kW**

- Encoder Type: Incremental 20-bit
- Max. torque: 14.72 N-m/26.65 N-m
- Speed range: 6000 r/min ~ 12000 r/min
- Options: Coolant through spindle
- IP degree: IP54



# Linear Motion Drive

## ASDA-A2R

### Delivering a Superior Linear Motor

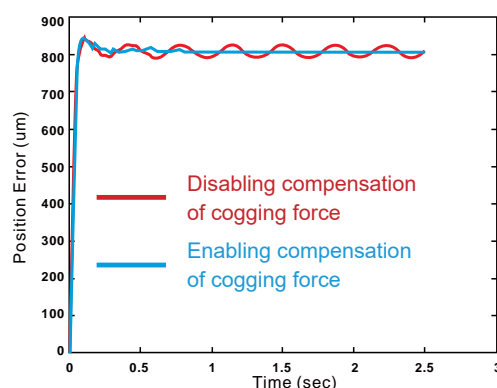
The new ASDA-A2R Series linear drive system provides high accuracy, high rigidity and high response. It not only expands the applications of the servo system, but also increases the work efficiency of the motion control system and satisfies high-precision requirements.

The ASDA-A2R follows in the footsteps of Delta's successful servo system and provides the same functions such as high-speed and high response performance, excellent vibration and resonance suppression, versatile PR mode, DMCNET and CANopen communication interfaces, built-in E-Cam and gantry control functions.



#### Power range: 100W~3kW

- Intelligent motor parameter measuring, easy and fast auto tuning
- Accurate positioning and initiation without a Hall sensor unit
- High flexibility in connecting various kinds of linear motors and servo motors
- Signal Converter Box (Delta option) available for high speed and high precision requirements
- - Supports AB phase square waves of digital signals
- - and sine waves of analog signals
- - Signals can be divided up into a multiple of 2048 to
- - increases positioning resolution for precise position control
- Detection and compensation of cogging force



# Ironless Linear Motor

## ECML

#### Power range: 100 W~750 W

- Rated thrust: 21~177 N
- Direct driving mechanism, high speed and high precision control
- No cogging forces and low thrust ripple



# Linear Shaft Motor

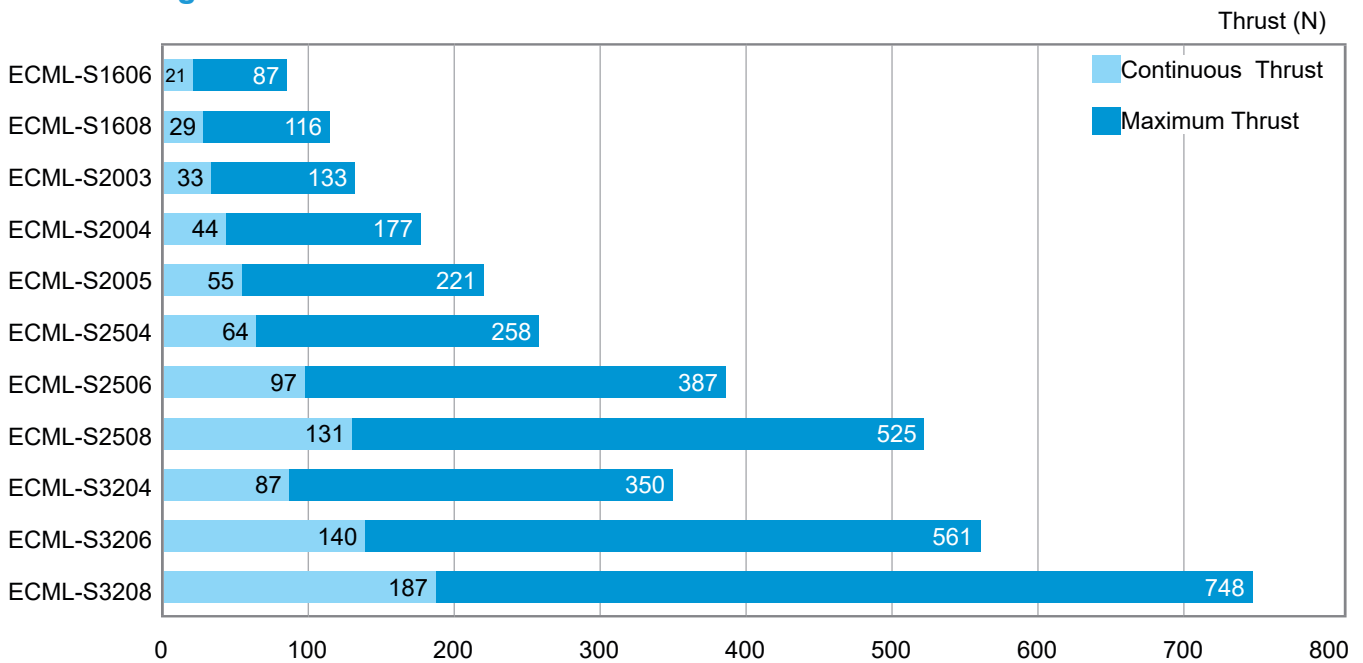
## ECML-S

### High-speed, High-precision Linear Motor Position Repeatability within $\pm 1 \mu\text{m}$

- Simple mechanism structure for quick installation
- Direct driving mechanism, easy to replace ballscrew mechanism
- No cogging forces, low thrust ripple
- Excellent dynamic response
- No backlash
- Built-in temperature sensor and hall sensor units
- Large air gap for easy installation
- Installation holes on both sides in the coil assembly for easy mounting



### Thrust Range



### Length of Magnetic Way (Dimensions are in mm)

Shaft Diameter	Minimum Length	Maximum Length	Increments
ECML - SM16	250	1240	30
ECML - SM20	250	1270	60
ECML - SM25	330	1650	60
ECML - SM32	450	2310	60



# Linear Stage

## LU

### High Precision Steel Ballscrew Driven Stage Position Repeatability of $\pm 3 \mu\text{m}$

- Non-coupling mechanism design
- Compact size for space saving
- High rigidity and high accuracy
- Fast response
- Low inertia ratio



### Characteristic Analysis

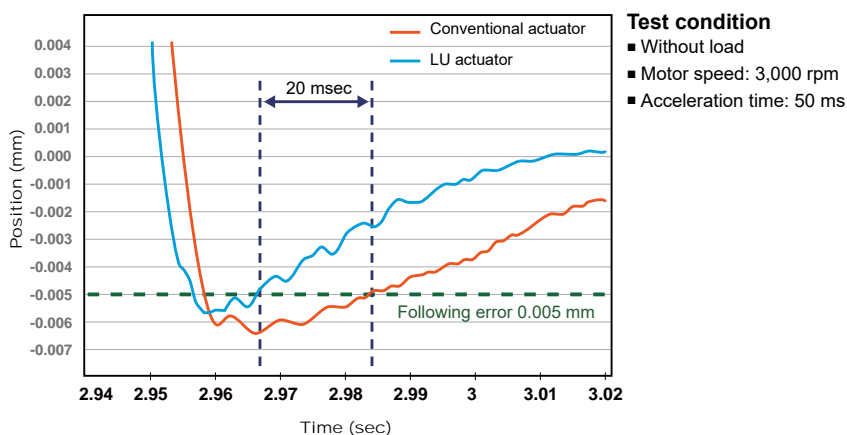


Delta LU Series  
(without coupling)

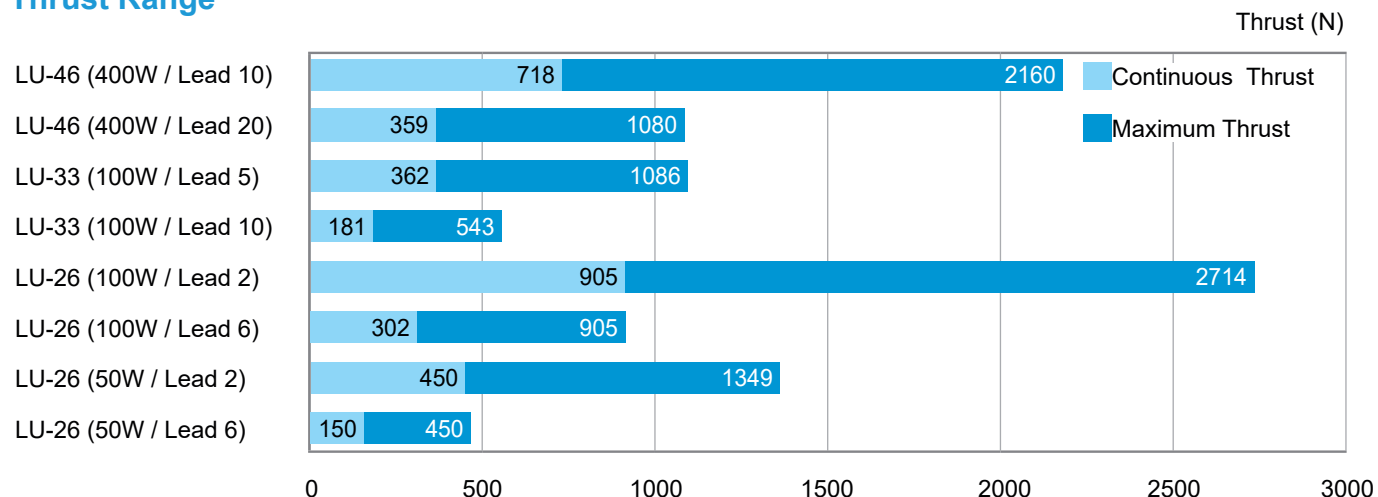


Conventional Linear Stage  
(with coupling)

### Measured Data by Laser Interferometer



### Thrust Range



# Linear Stage

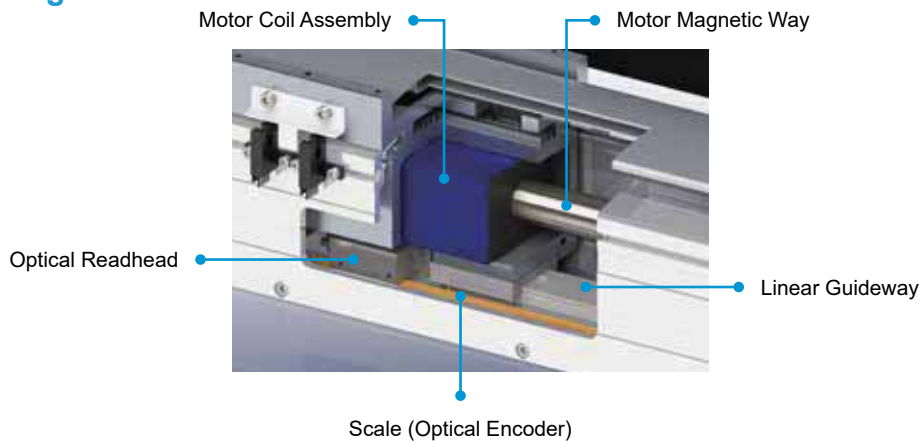
## LA-S

### High Speed, High Precision Linear Motor Driven Stage Position Repeatability of $\pm 1 \mu\text{m}$

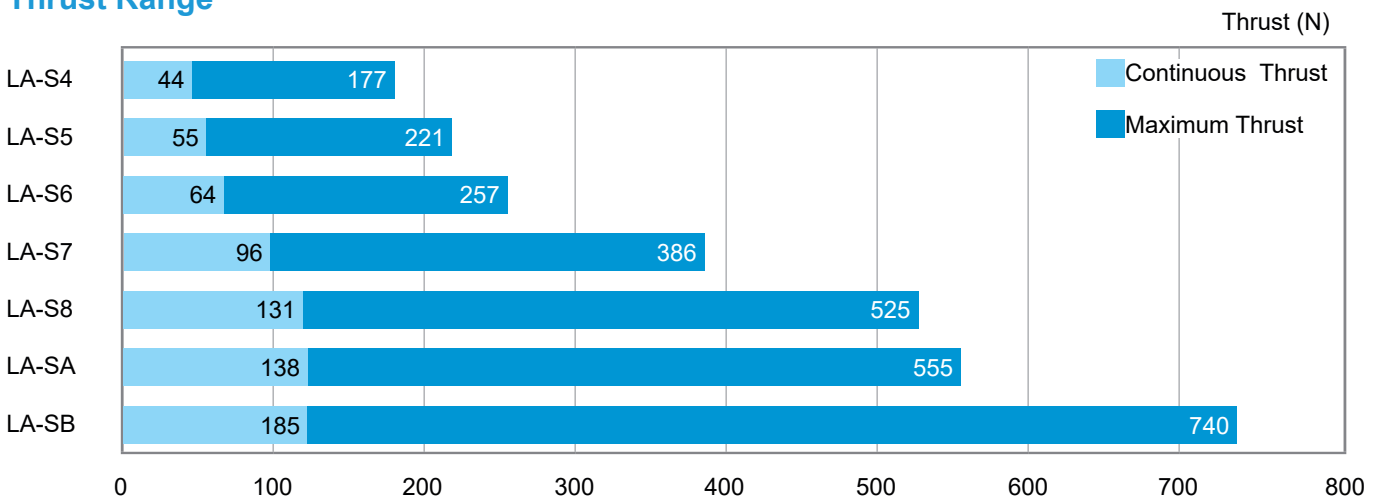
- **Direct driving with zero backlash**  
Directly driven by Delta's linear motor, without backlash and alignment issues
- **High speed and high precision**
  - Provides high-precision and high-stability motion operation: high speed capability of up to 4m/s
  - Integrates with linear motor and optical linear encoder for direct driving and preventing backlash and accumulated offsets caused by changing machines
- **Cog-free design with low thrust ripple**  
Uses an ironless forcer for zero cogging and low thrust ripple to perform smooth motion, even at low speed
- **Long travel distance with multiple sliders**
  - Good performance on long travel distances (up to 1.5m) for various positioning applications
  - Single-axis platform supports more than 2 linear motors, creating multiple sliders within one stage unit for efficient space savings and independent operation



### Mechanism Design



### Thrust Range



# High Precision Planetary Gearbox

PS



- **Supports all series of Delta servo motors**
- **Provides concentric and right-angle models**
- **High precision**
  - Backlash for concentric 1-stage gearbox is under 3 arcmin
  - Backlash for right angle 1-stage gearbox is under 4 arcmin
- **High input speed**  
Input speed allows for 5,000 RPM
- **High torque**  
Helical gear design offers higher output torque in comparison with spur gearbox
- **High efficiency**
  - Efficiency for 1-stage model exceeds 97%
  - Efficiency for 2-stage model exceeds 94%
- **Low noise**  
Under 65dB
- **Lifetime lubrication**  
Protective class IP65 sealed design avoids leakage problems and requires no maintenance during the product's lifetime

# Precision Planetary Gearbox

PA



- **Supports all series of Delta servo motors**
- **Provides concentric models**
- **High rigidity and high torque**
  - Employs uncaged needle roller bearings with a set design
  - including ring teeth, gearbox and helical gears for high rigidity and output torque
- **High precision**
  - Backlash for 1-stage gearbox is under 8 arcmin
  - Backlash for 2-stage gearbox is under 12 arcmin
- **High efficiency**
  - Efficiency for 1-stage model exceeds 95%
  - Efficiency for 2-stage model exceeds 92%
- **Low noise**
  - Uses helical gears capable of meshing to ensure smooth
  - and quiet operation
- **Lifetime lubrication**
  - Protective class IP65 sealed design avoids leakage problems and requires no maintenance during the product's lifetime

# PC-Based Motion Controller (PAC)

## MH1 / MP1

### A Perfect Balance of EtherCAT Fieldbus and High-Performance Motion Control

- **Energy Efficient and Robust Hardware**

- The MH1 Series: provides a cable-less, fan-less and low-power consumption design, increasing reliability and providing CFast card and SSD slots inside for fast and stable data transmission
- The MP1 Series: equipped with a 10.1-inch touchscreen for more flexible operation

- **Multiple Peripheral Interfaces for Communication**

Equipped with USB ports, serial COM ports, Gbps Ethernet ports and PCI/PCIe extension slots

- **Supports EtherCAT and DMCNET Master and Slave Modules**

Up to 12 units of DMCNET modules and 12 servo axes of motion control, and up to 100 units of EtherCAT modules and 64 axes of motion control are able to be connected and controlled. For implementing multiple I/O extensions and achieving more axes of motion control: the PCI-DMC-B01 and PCI-L221-B1

- **High Security**

Customizable IC device for programming security and confidential protection

- **Software Support**

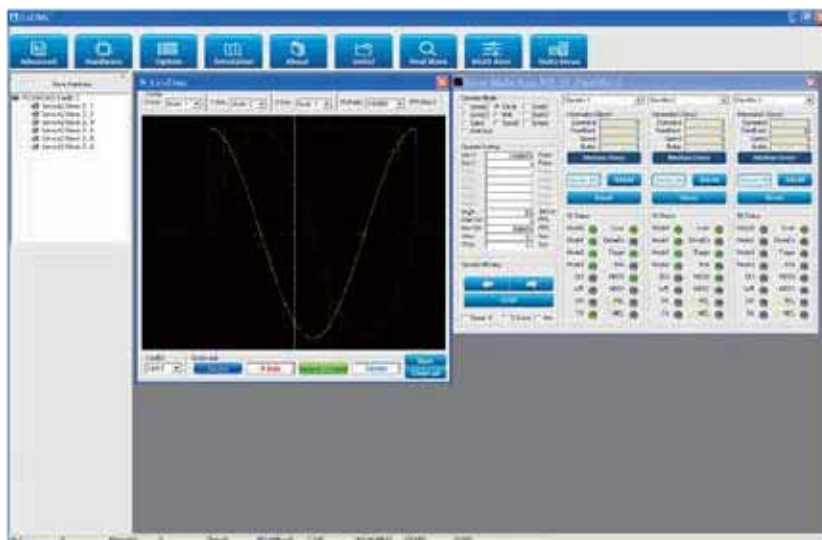
The MH1 Series: equipped with Real Time OS (Windows CE, RTX)\*, Windows 7/10 Embedded and a library of other software

\* When changing to this environment, please contact customer service



Host PAC  
MH1

Panel PAC  
MP1



#### Motion Control

- Point-to-point position control
- Linear interpolation (multi-axis)
- Two-speed motion (single-axis)
- Circular interpolation
- Helical interpolation
- Backlash compensation
- Compensation for helix deviation
- Compare
- Table motion
- JOG
- PT/PVT
- Gantry control (EtherCAT Communication)
- E-CAM (EtherCAT Communication Structure)

- **Speed Curve Tracing**

Integrates speed curves tracing function for tracing current motion commands to achieve better synchronization effects between multiple axes efficiently

- **Simulation Scope**

Verifies and controls timer, sequential and motion tracks for fast response and high-end motion via 2-dimension scope function

- **DMCNET/EtherCAT Automation Software**

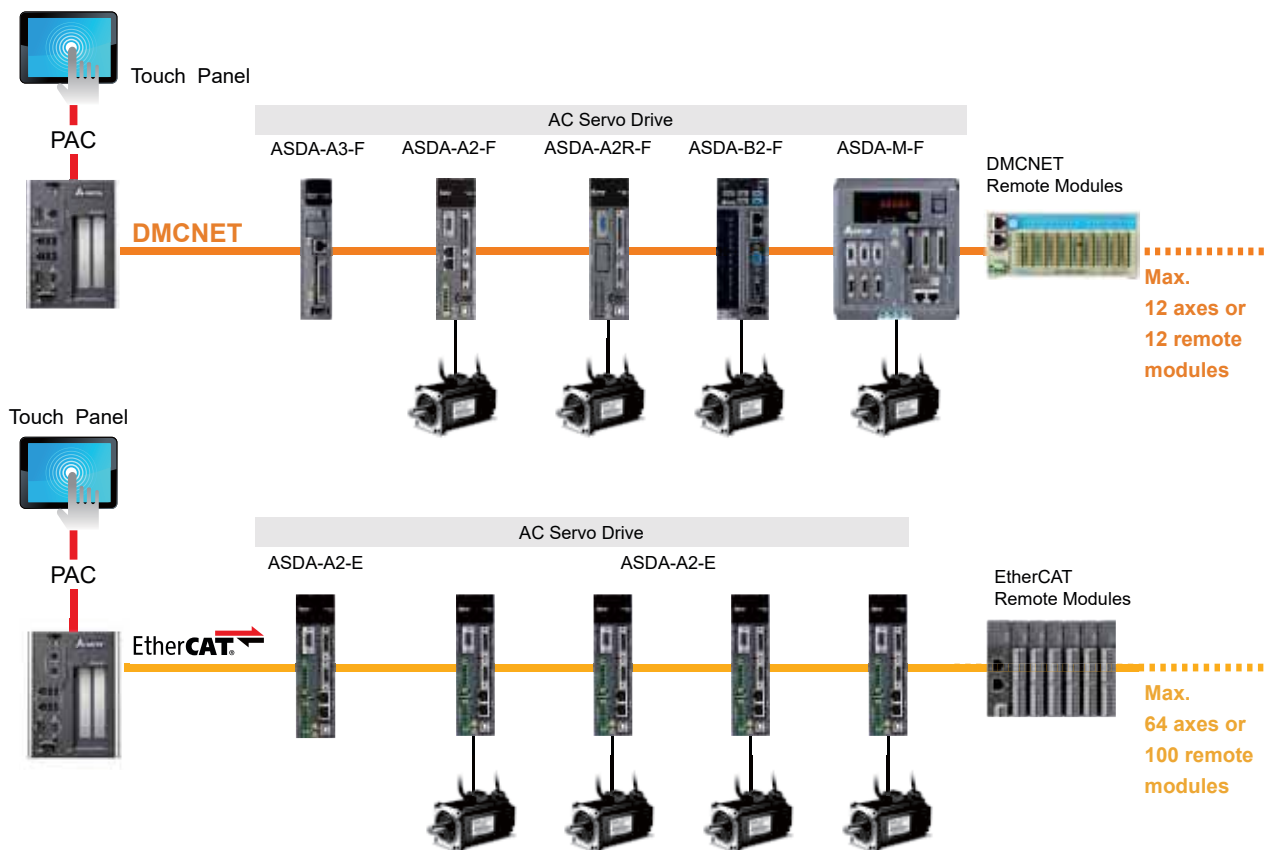
EzDMC/ EcNavi development software: includes a DMCNET / EtherCAT master controller and slave devices for data communication, functional identification, programming and debugging, providing a fast and easy way for first-timers to understand the solution

## Applications

**Electronics Production:** PCB machines, Automated Optical Inspection (AOI) machines, semi-conductor machines, LED machines, TFT inspection machines, glue-dispensing machines, SMT pick-and-place machines, winding machines, optical lens processing machines, glass grinding machines

**Woodworking:** CNC drilling machines, woodwork cutting machines, board slitting machines

**Other:** Bending machines



## Centralized Slave Module

- **Gateway Type E-BUS Remote Power Coupler**

[R1-EC5500D0](#) / [R1-EC5512D0](#)

Connect to digital I/O, analog I/O and pulse I/O extension modules



- **1-Channel Pulse Remote Module**

[R1-EC5621D0](#)

Use E-BUS power module and EtherCAT remote modules for single-axis pulse motion control



- **16 Digital Input Remote Module**

[R1-EC6002D0](#) / [R1-EC6022D0](#)

Use E-Bus power module and EtherCAT remote modules for digital control



- **16 Digital Output Remote Module**

[R1-EC7062D0](#) / [R1-EC70A2D0](#) / [R1-EC70E2D0](#) / [R1-EC70F2D0](#)

Use E-Bus power module and EtherCAT remote modules for digital I/O control



- **4-Channel Analog Input Remote Module**

[R1-EC8124D0](#)

Use E-Bus power module and EtherCAT remote modules for analog I/O control



- **4-Channel Analog Output Remote Module**

[R1-EC9144D0](#)

Use E-Bus power module and EtherCAT remote modules for analog I/O control



# Delta High-Speed Motion Control System

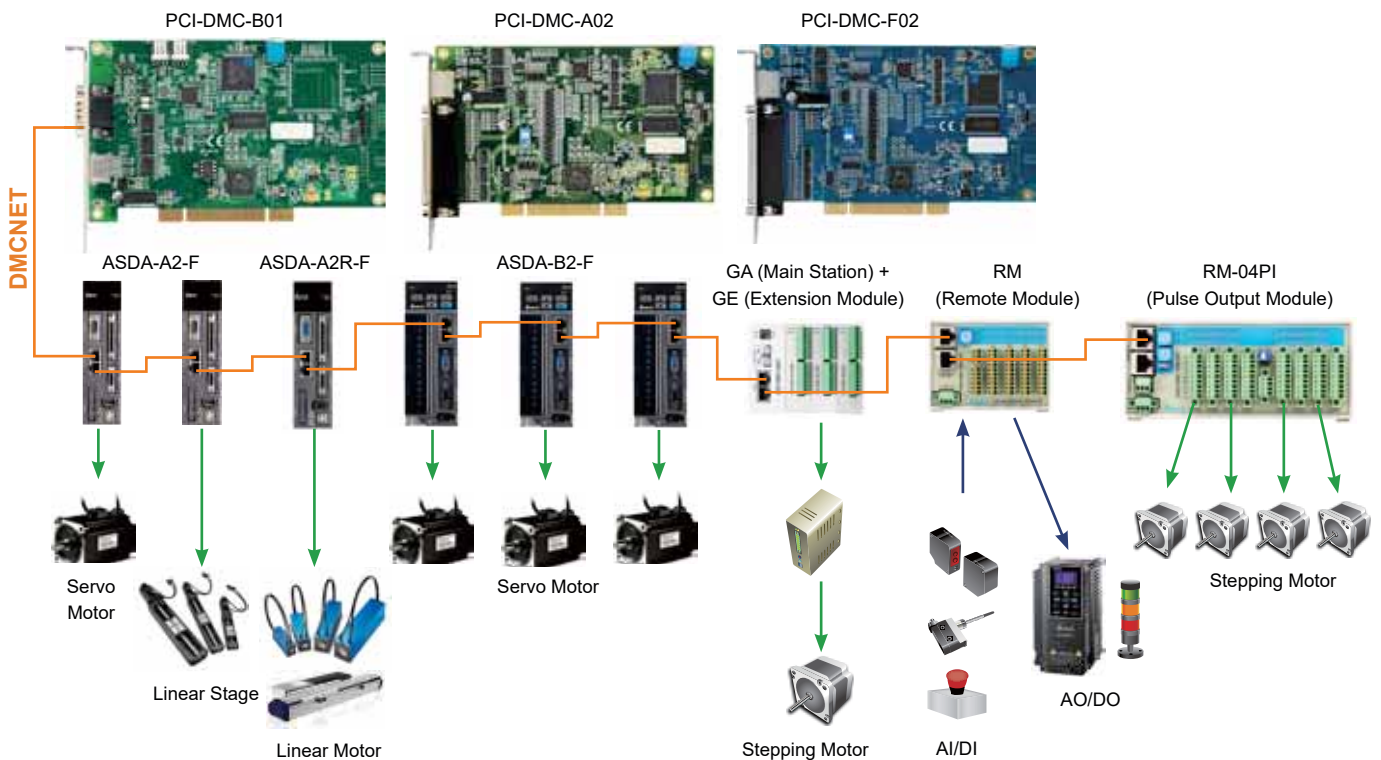
## DMCNET

Delta's Motion Control NETwork (DMCNET) is a high speed, real-time communication system, capable of controlling up to 12 axes of servo system units within 1ms simultaneously: with 3-axis helical and linear interpolation in 4 groups, or 2-axis linear and arc interpolation in 6 groups. It supports 64-bit dual-precision floating point, allowing high-precision system calculations and flexible operation, and also absolute commands, incremental commands and T-curve / S-curve velocity profiles for different uses. With built-in position, speed and torque control modes, and 35 homing modes, it is able to receive real-time servo information, parameters, or change control modes via communication command, offering fast communication and motion control for various applications



DMCNET is equipped with the high-speed and reliable one-wire DMCNET communication protocol for diverse motion control applications. Adapted for customer's needs, Delta's PCI motion control cards are available in three series: the 12-axis PCI-DMC-A02, 6-axis PCI-DMC-F02 with digital I/O interfaces and the PCI-DMC-B01 with pulse compare & capture functions. All series are able to connect to multiple servo systems, such as the high-performance ASDA-A2-F Series, standard ASDA-B2-F Series, or ASDA-A2R Series. Combining with Delta's linear motors, the series establishes a total motion control solution enabling lower system cost and superior performance to increase end-product value and competitiveness

### DMCNET System Configuration



### Applications

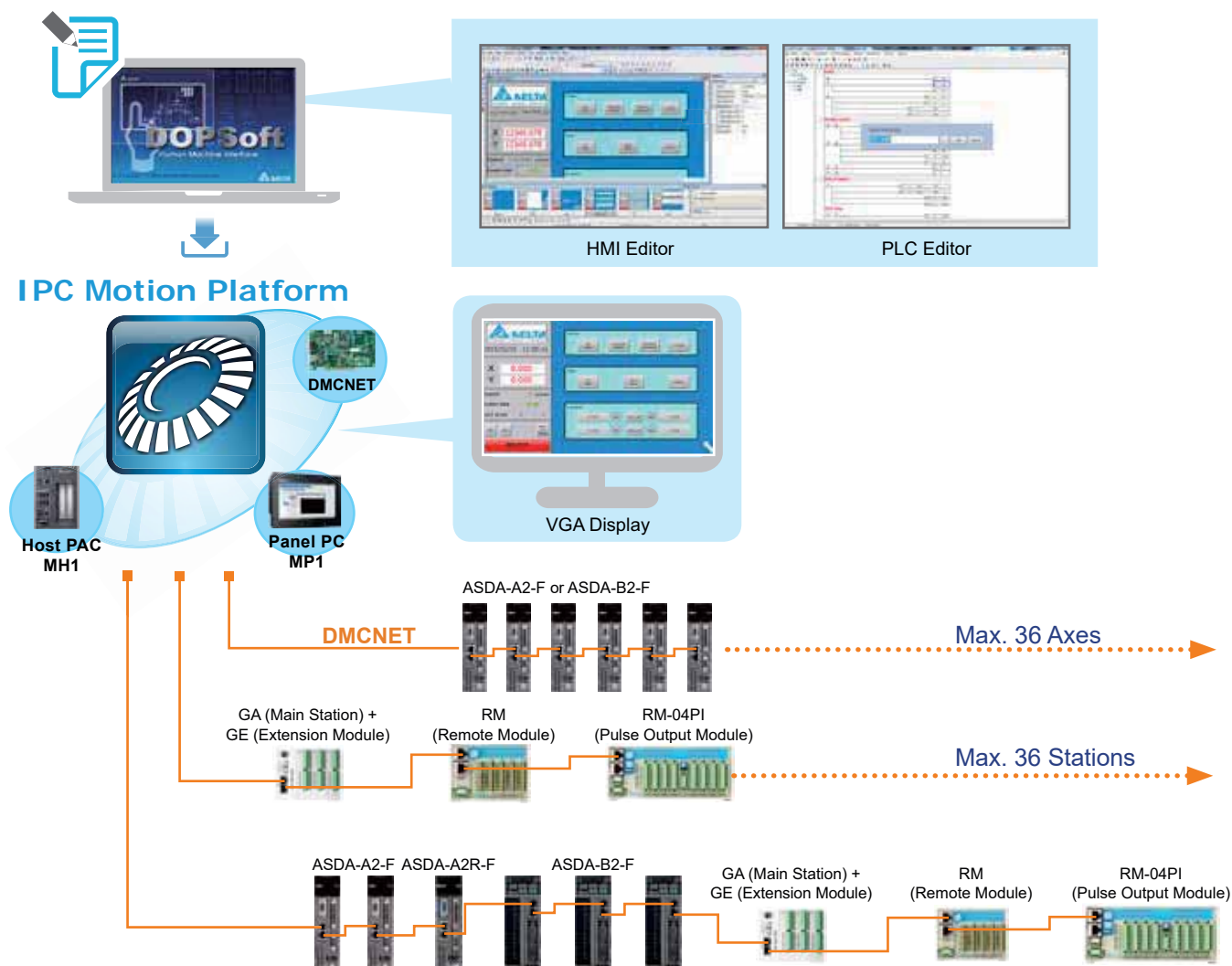
Electronic integrated applications, glue dispensing machines, woodworking machines, tube bending machines

## IPC Motion Platform (IMP1.5)

### A Simple and Fast Setup Development Platform for Realizing Unsurpassed Motion Control

The IMP is a high-speed, flexible and scalable development platform which combines powerful motion control functions and integrates Delta's HMI editing and PLC logic programming software tools to achieve complex and precise motion control based on customers' requirements

- **Power Motion Control Core:** Upgrades Delta's PAC and PC with a motion control card installed to become an advanced
- **Simple Secondary Development Platform:** Combines with Delta's standard HMI editor DOPSoft and PLC editor WPLSoft in one customer-driven platform to make complex programming and development easy and time-saving without depending on technical support from the manufacturer
- **Scalable Communication for Expandable Network:** Through PCI extension slots, three DMCNET communication networks with up to 36 stations can be established, which means 36 axes of servo motors can be controlled simultaneously without connecting to any remote modules
- **Industry-Oriented Controller:** Provides Soft Numeric Control (SNC) and Motion Program Macro (MPM) to adjust and modify self-defined motion paths and commands according to changing application requirements
- **Standard Communication Interfaces:** Supports built-in standard MODBUS and MODBUS TCP gateways to enable more convenient data transmission exchange between machines



# High-Speed Motion Control System <sup>New</sup>

## EtherCAT

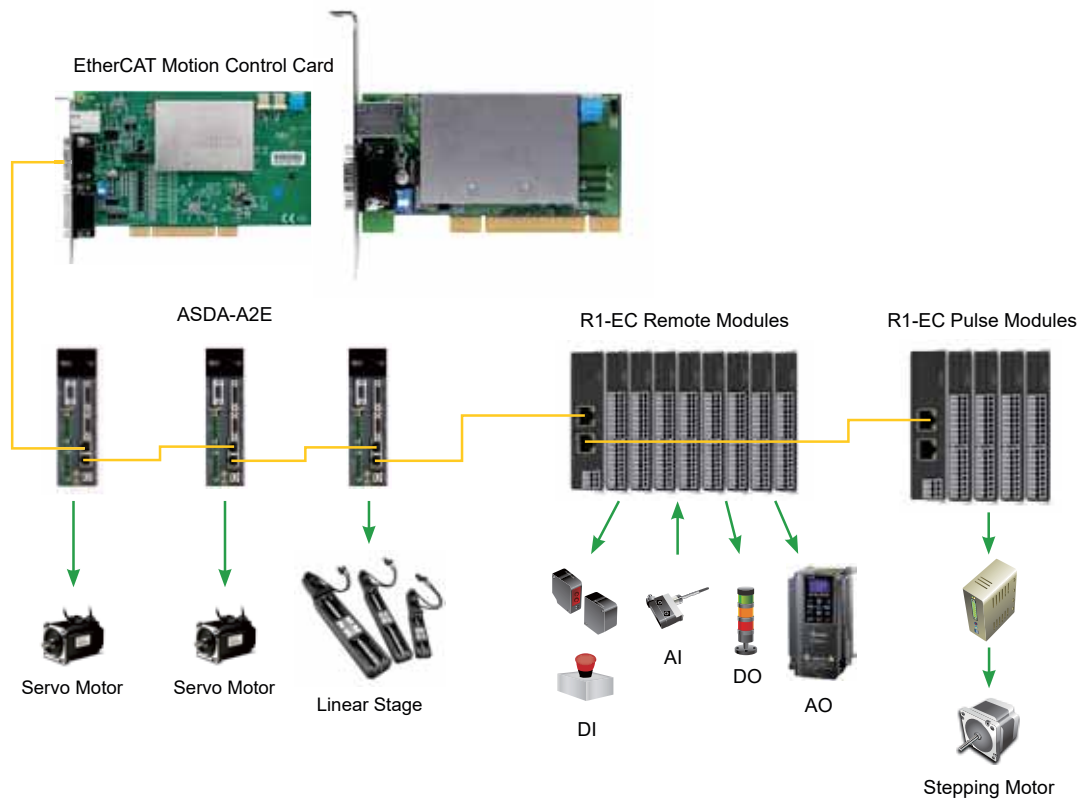
EtherCAT Motion Control Products (Ethernet Control Automation Technology) is an open Ethernet-based fieldbus system that provides high-efficiency and high-performance synchronization quality for automation control.

With EtherCAT, Delta's EtherCAT motion control card PCI-L221-P1 achieves rapid and real-time multiple axes of motion control, and is capable of controlling up to 100 slave stations that enable a 64-axis motion control within 1ms cycle time. It also provides 35 homing modes, point-to-point position control, 2-axis interpolation, 3-axis interpolation, multi-axis synchronization, continuous motion, gantry control, speed control, torque control and more



Delta provides a high-speed motion control card PCI-L221-XXD0 with complete functions for EtherCAT masters. Supporting device descriptions in XML format (EtherCAT Slave Information - ESI), the PCI-L221-XXD0 also allows the system to quickly identify ESI files and offers the capability of real-time connection via EtherCAT for high level integration. It can adjust the communication cycle time between stations within 1ms to 0.5ms according to customer needs

### EtherCAT System Configuration



### Applications

Electronic integrated applications, glue dispensing machines, woodworking machines, tube bending machines

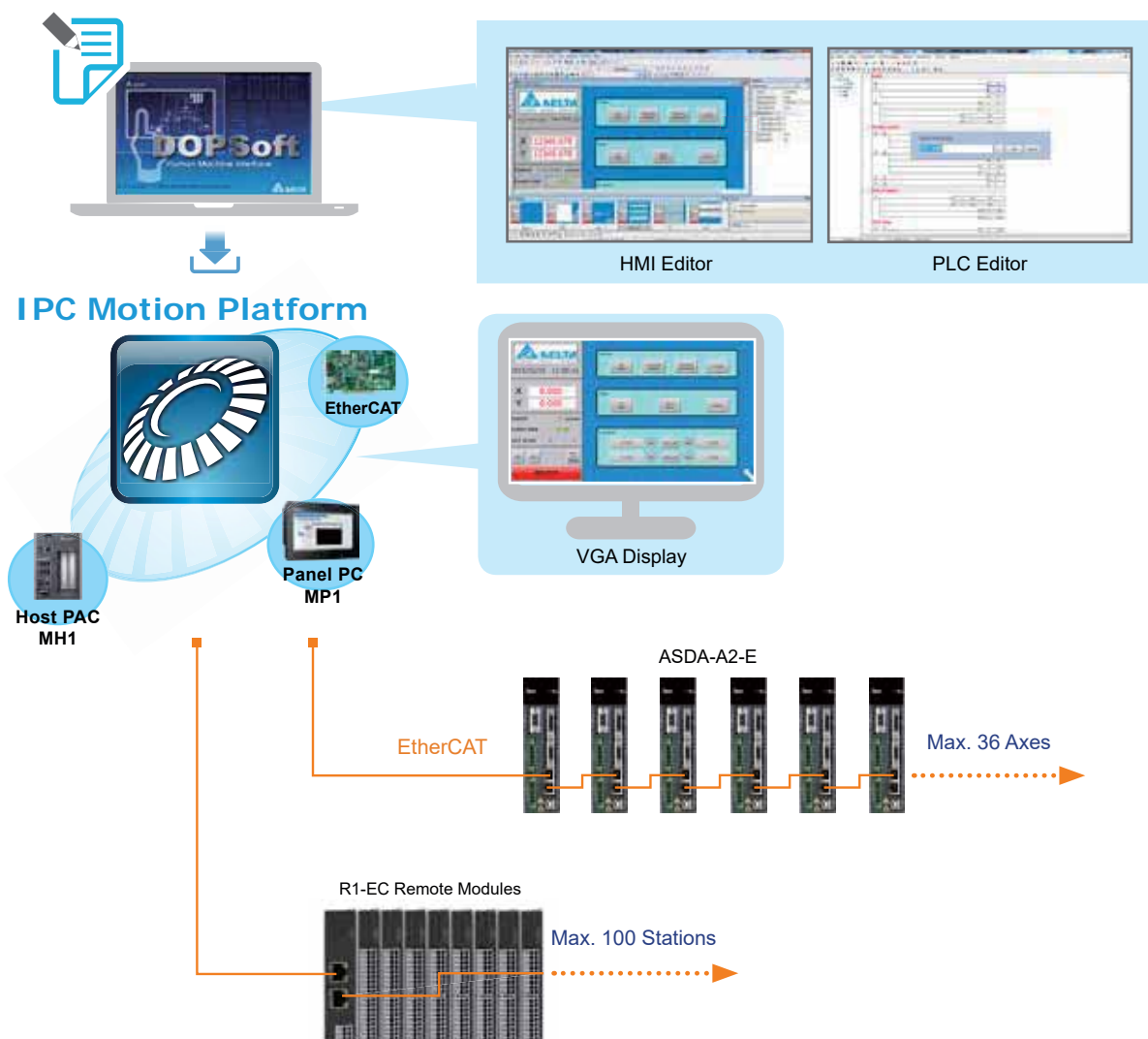


## IPC Motion Platform (IMP1.5)

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The IMP is a high-speed, flexible and scalable development platform which combines powerful motion control functions and integrates Delta's HMI editing and PLC logic programming software tools to achieve complex and precise motion control based on customers' requirements

- **Power Motion Control Core:** Upgrades Delta's PAC and PC with a motion control card installed to become an advanced motion controller that integrates the functions of motion control, HMI, PLC and high-speed communication fieldbus in one unit
- **Simple Secondary Development Platform:** Combines with Delta's standard HMI editor DOPSoft and PLC editor WPLSoft in one customer-driven platform to make complex programming and development easy and time-saving without depending on technical support from the manufacturer
- **Scalable Communication for Expandable Network:** Through PCI extension slots, three DMCNET communication networks with up to 36 stations can be established, which means 36 axes of servo motors can be controlled simultaneously without connecting to any remote modules
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# Open CNC Solution New

NC E

Open-structured CNC Control System for Customization and Flexibility



## Solution 1: Standard

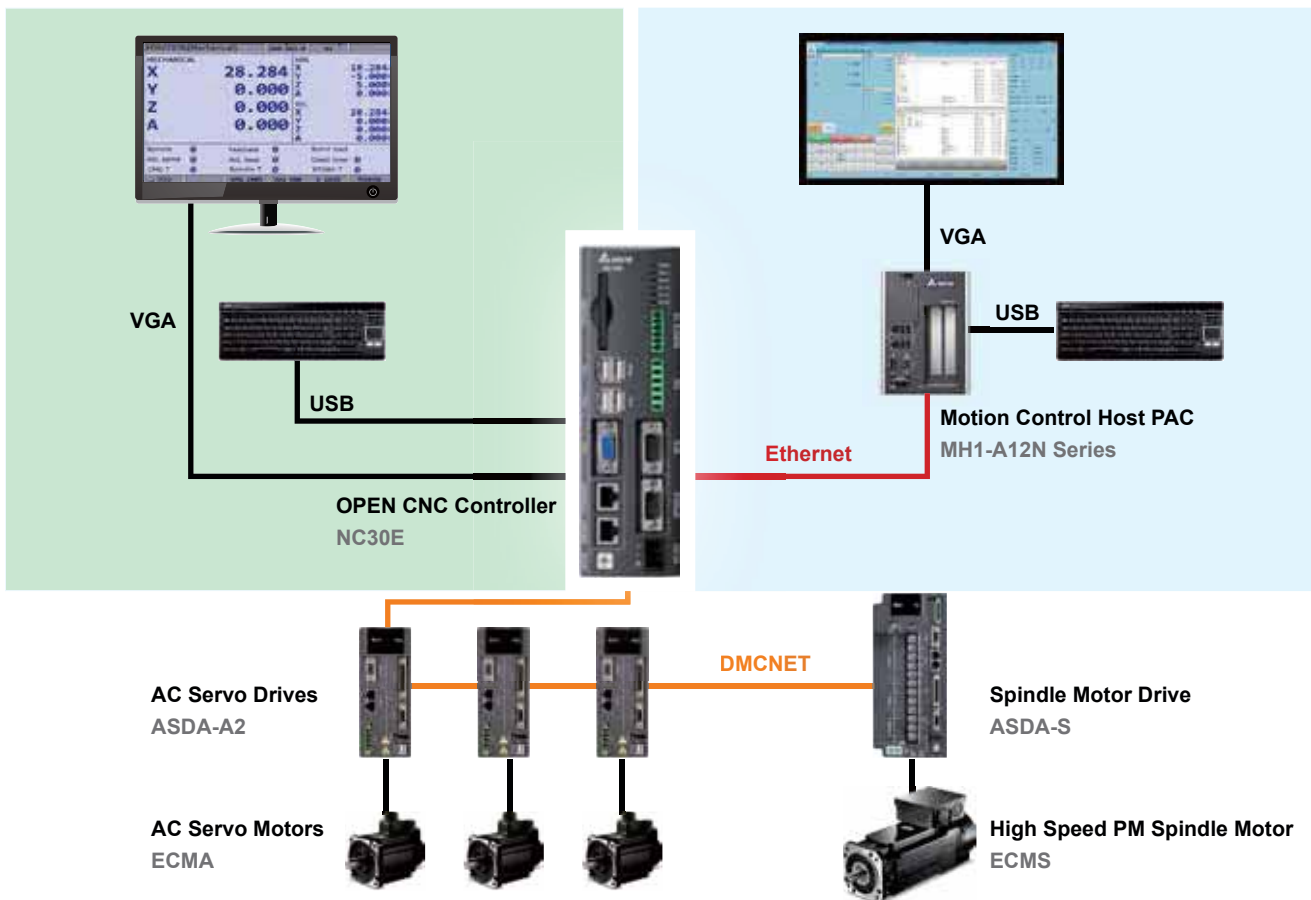
VGA output for external display with Delta's standard interface

- Two-language CNC operation interface (Chinese, English)
- Embedded control system provides high efficiency
- Allows easy customization with accessories including a monitor and a keyboard
- Supports DMCNET communication for easy wiring and excellent synchronous multi-axis control

## Solution 2: Function-Oriented

Matches with panels or other products based on applications

- API platform and template are provided for users to self-define the HMI functions
- Easy integration with third party software via IPC
- Reduces additional hardware cost for customers to focus more on software upgrades and better integrated operation performance



## Applications

Customized CNC system, woodworking machine, lathe, grinding, glass cutting, spot welding, rim engraving, robot arms, milling

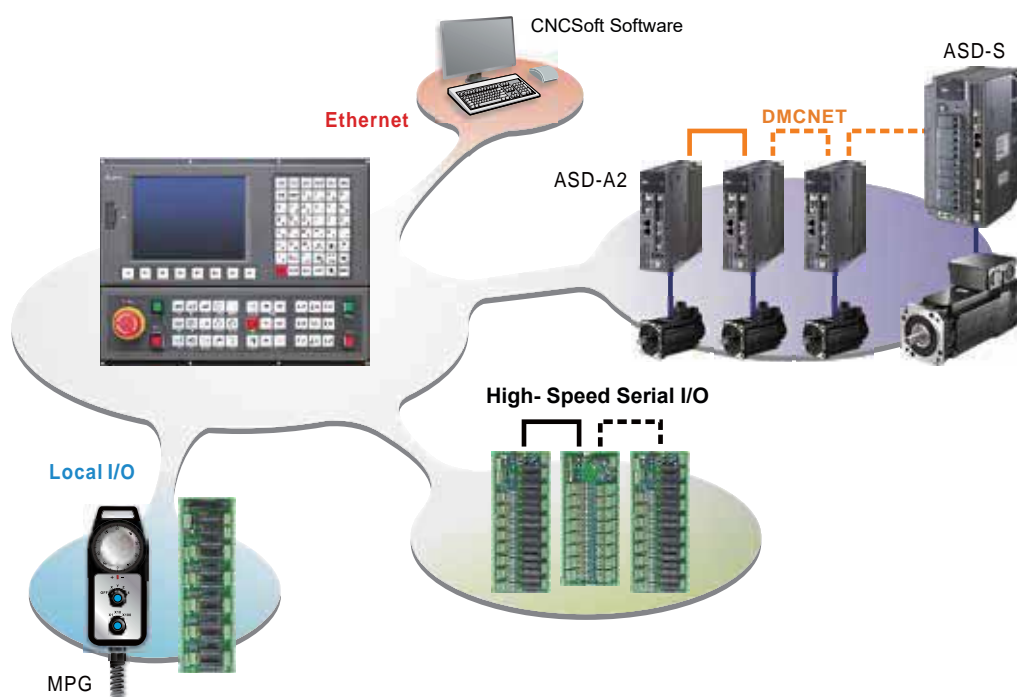
# CNC Solution

## Integrated Total Solution for the CNC Machine Tools Industry



- Built-in 32-bit high speed and high processing dual CPU to construct a real-time and multi-functional control center
- High-quality digital data transmission when matched with Delta's high-speed servo and spindle systems
- Auto-gain tuning allows automatic servo system parameter settings to achieve easy and real-time optimum control
- CNCSoft software offers user-friendly setup and user-defined operation to build customized screens
- Capable of connecting serial digital I/O modules to greatly improve the extension capacity

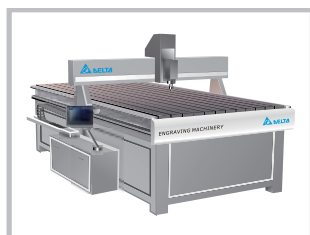
### System Configuration



### Applications



CNC Machining Centers,  
High-speed Tapping Machines



Engraving Machines



CNC Gantry Control Machines



CNC Woodworking Machines

# Robot Controller with Servo Drive Integrated ASDA-MS

## An Innovative and Comprehensive Development Platform for Robot Control

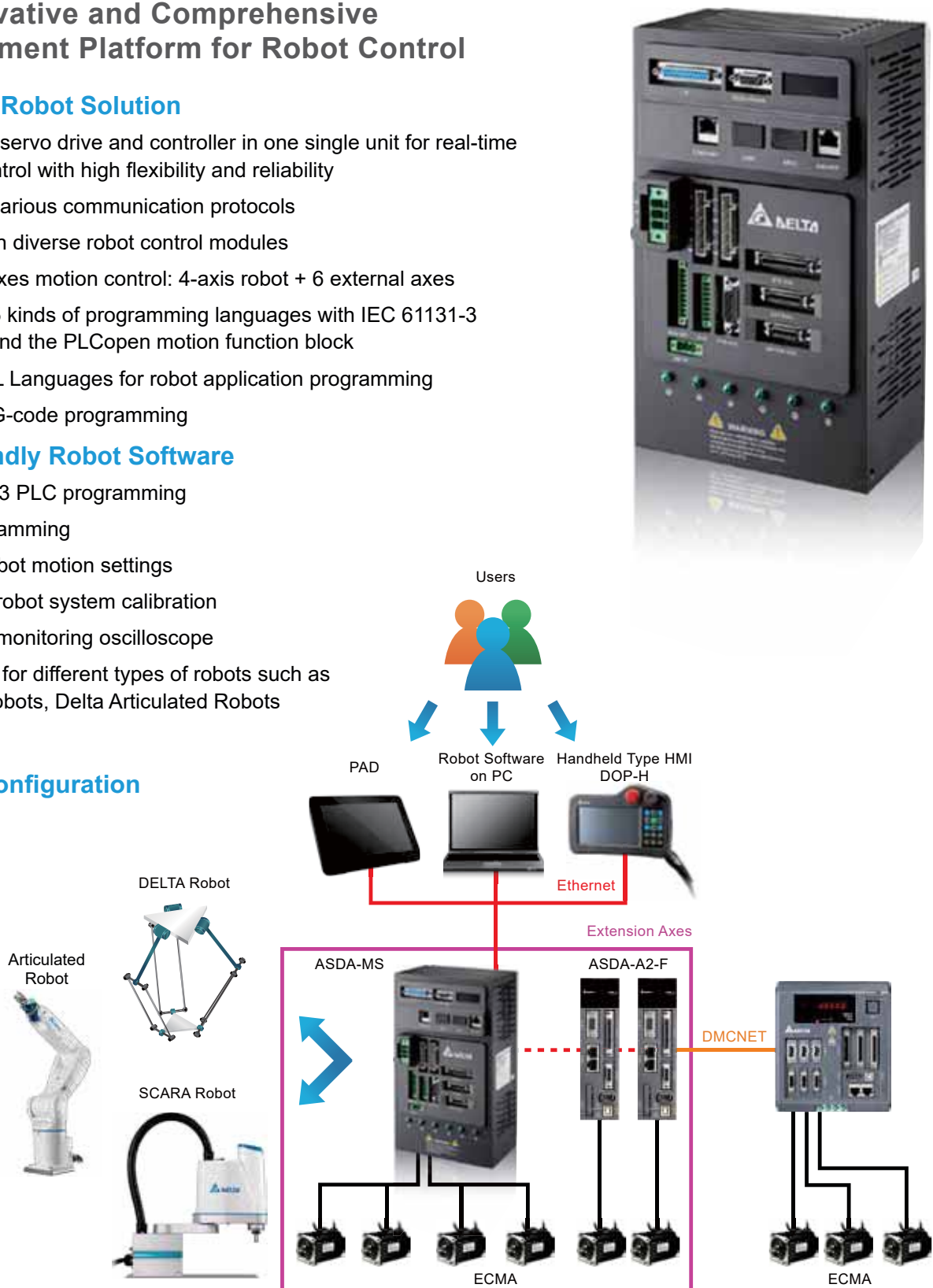
### Complete Robot Solution

- Integrated servo drive and controller in one single unit for real-time motion control with high flexibility and reliability
- Supports various communication protocols
- Built-in with diverse robot control modules
- Up to 10 axes motion control: 4-axis robot + 6 external axes
- Supports 5 kinds of programming languages with IEC 61131-3 standard and the PLCopen motion function block
- Offers DRL Languages for robot application programming
- Supports G-code programming

### User-Friendly Robot Software

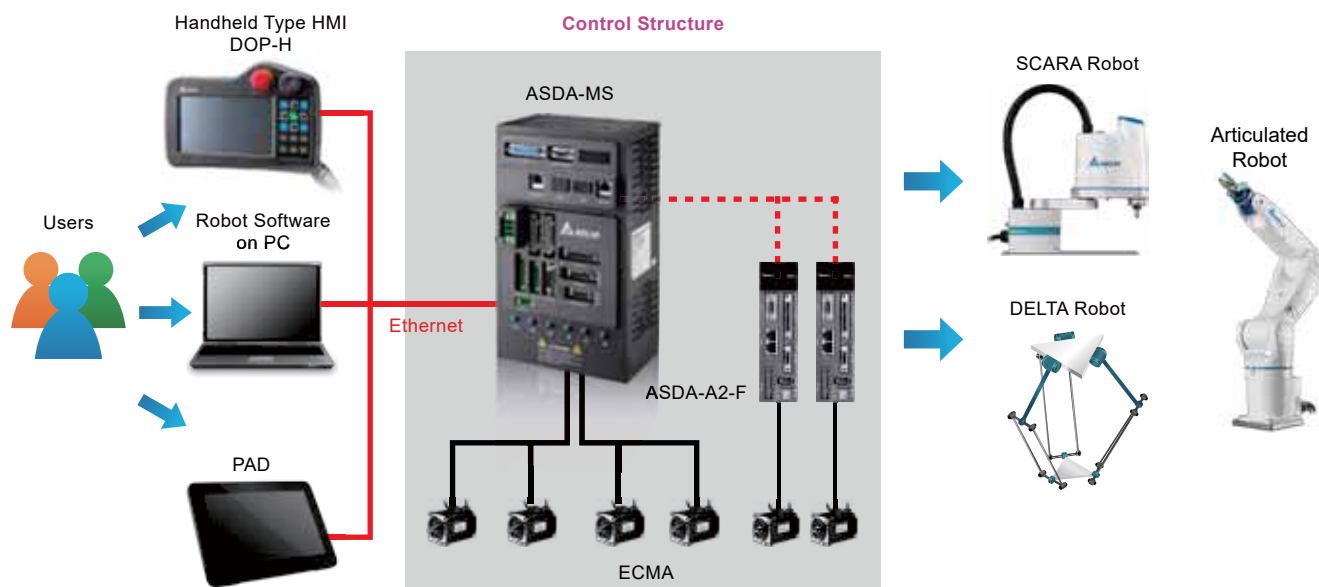
- IEC61131-3 PLC programming
- DRL programming
- Multiple robot motion settings
- Intelligent robot system calibration
- Real-time monitoring oscilloscope
- Applicable for different types of robots such as SCARA Robots, Delta Articulated Robots and more

### System Configuration



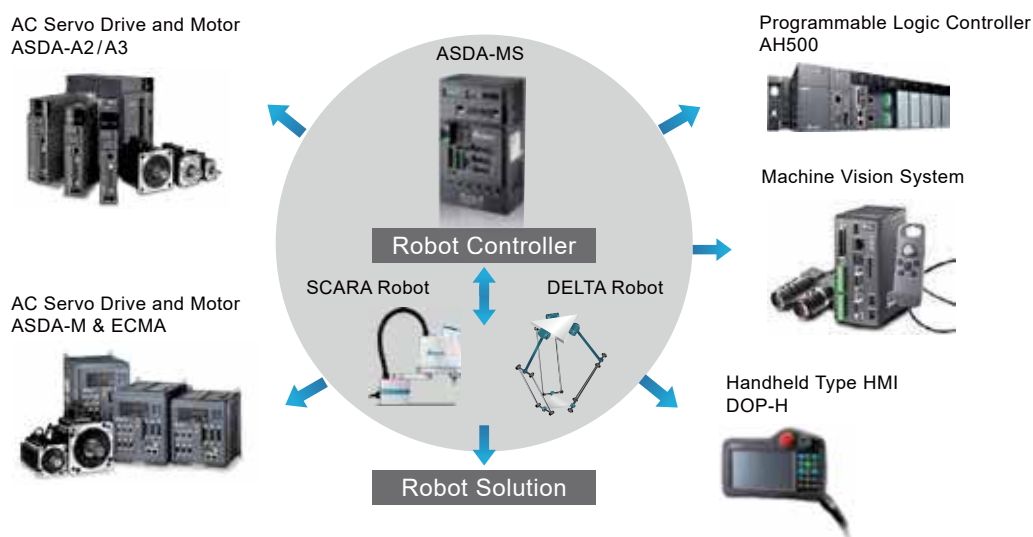
## All-in-One Robot Controller

- Integrates motion controller, robot controller and 4 servo drives into one single unit to speed up data transmission, enhance system control performance and dynamically compensate non-linear terms that affect robot motion during robot moving processes, which meets the high speed and high precision requirements of robot or motion control applications
- Provides a variety of tools for implementing required functions and supports different types of robots such as the 4-axis SCARA robot, the Linear DELTA, DELTA robot, and the 2 axes extension via DMCNET for 6-axis articulated robot to meet diverse requirements with flexibility and reliability



## Comprehensive Development Platform

- Provides a comprehensive development platform for customers to design their specific applications, which enhances value-added secondary development and efficiency of various manufacturing techniques
- Meets the requirements for both single robot or workstation applications integrated with Delta's industrial automation products and related robot peripheral devices to create a complete robotic automation solution



## Applications

**Industries:** Consumer electronics, electrical / electronics, rubber and plastics, packaging, metal fabrication

**Techniques:** Insertion, screw driving, assembly, glue dispensing, soldering, load and unload, stacking, inspection

## Optimum Combination of Display and Controller Controllers with Human Machine Interfaces

# HMC Series

## 7-inch Controller with Widescreen Handheld HMI HMC07-N411H5C5(A)

- 7" 16:9 widescreen 65536 colors TFT
- Display Resolution: 800x480 pixels
- Built-in PLC functions
- Built-in emergency stop switch
- Built-in enable switch (rear side)
- Optional MPG (Manual Pulse Generator)
- Supports SDHC card
- Supports DMCNET
- Compact and lightweight 750g design



## 7-inch Controller with Handheld HMI HMC08-N500S52

- 7" 65536 colors TFT
- Display Resolution: 800x600 pixels
- Built-in PLC functions
- RS-422 high-speed remote I/O connection
- Supports Ethernet
- Supports SDHC card
- Supports DMCNET
- Supports audio output: MP3, Wav files
- USB Host for direct connection to USB disk, printer, mouse and keypad

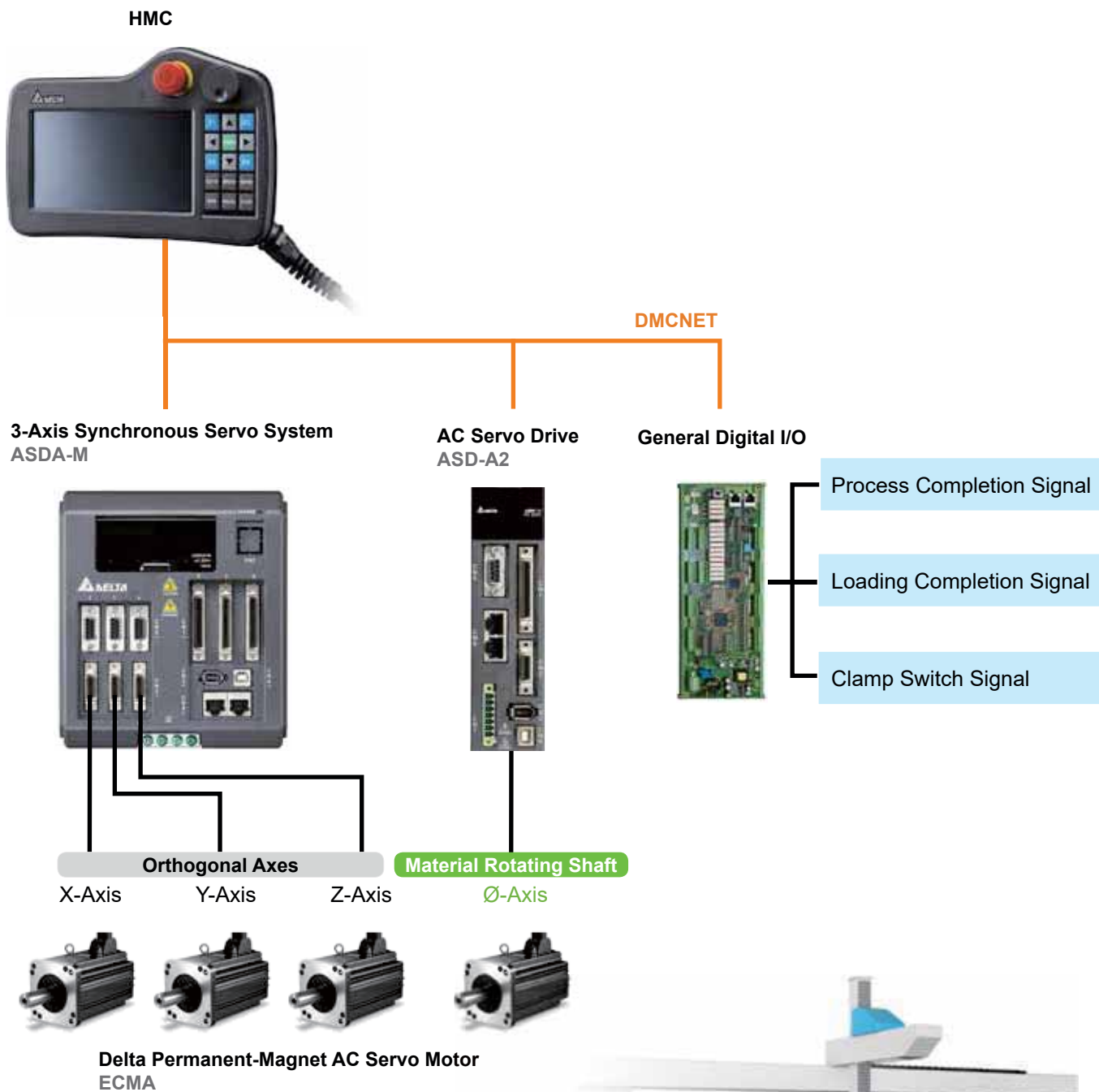


## 8-inch Controller with HMI HMC08-N500S52

- 8" 65536 colors TFT
- Display Resolution: 800x600 pixels
- Built-in PLC functions
- RS-422 high-speed remote I/O connection
- Supports MPG (Manual Pulse Generator) Input
- Supports Ethernet
- Supports SDHC card
- Supports DMCNET
- Supports audio output: MP3, Wav files



## Control of a Material Loading/Unloading Robot for Machine Tools



# Hot Swappable Mid-range PLC

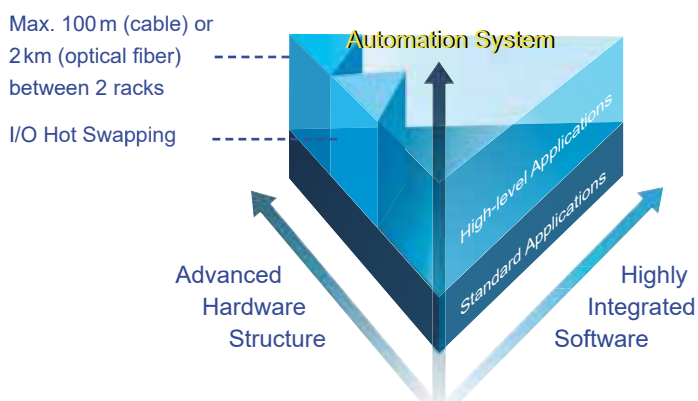
## AH500

### The Smart Solution for High-end Machinery and System Integration



- 32-bit dual-core multitasking processor
- Excellent program execution speed: LD: 20ns
- Max. I/O:
  - DIO: Max. 4,352 points
  - AIO: Max. 544 channels
  - RIO: Max. 125,440 digital points/3,920 analog channels
- Program capacity: Max. 1M steps (4 MB)
- Data register (D+L): 512k words
- CPU with built-in fully isolated RS-232 / 422 / 485 ports, Mini USB port, Ethernet port and SDHC card slot (compatible with the memory cards on the market)
- Abundant selection of AIO modules, DIO modules, temperature modules, network modules, pulse-train and DMCNET motion control modules

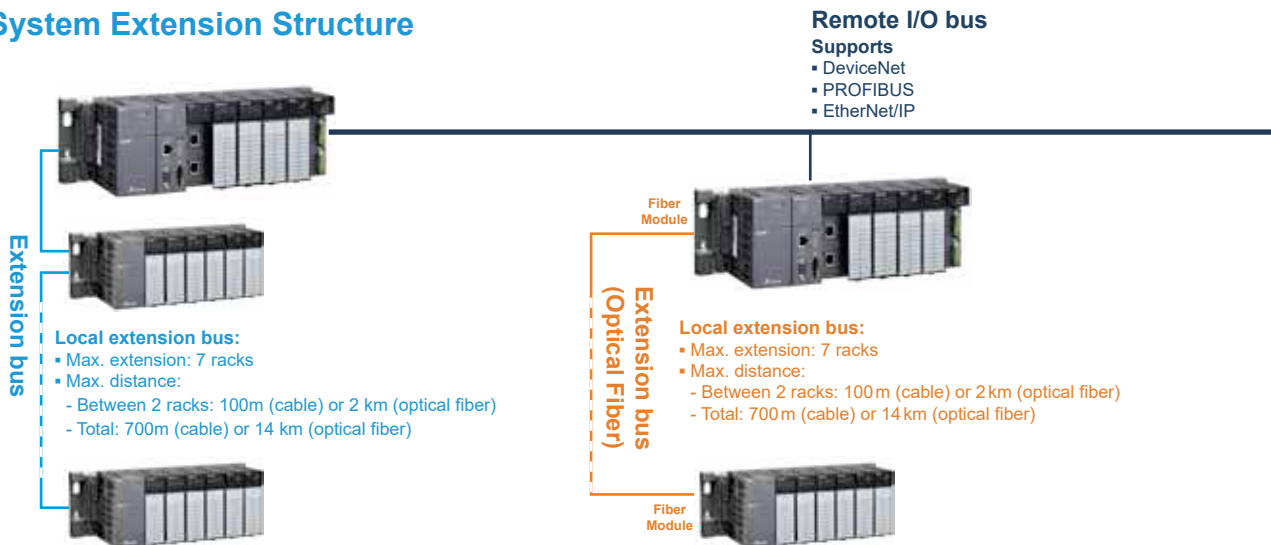
### Modularized Hardware Structure and Highly Integrated Software



- Highly integrated programming software ISPSOft: Graphical Interface with 5 programming languages
- Enhanced flexibility: Max. 100 m (cable) or 2 km (optical fiber) between 2 local extension racks
- Redundant system and hot-swapping function ensure non-stop system operation for improved maintainability

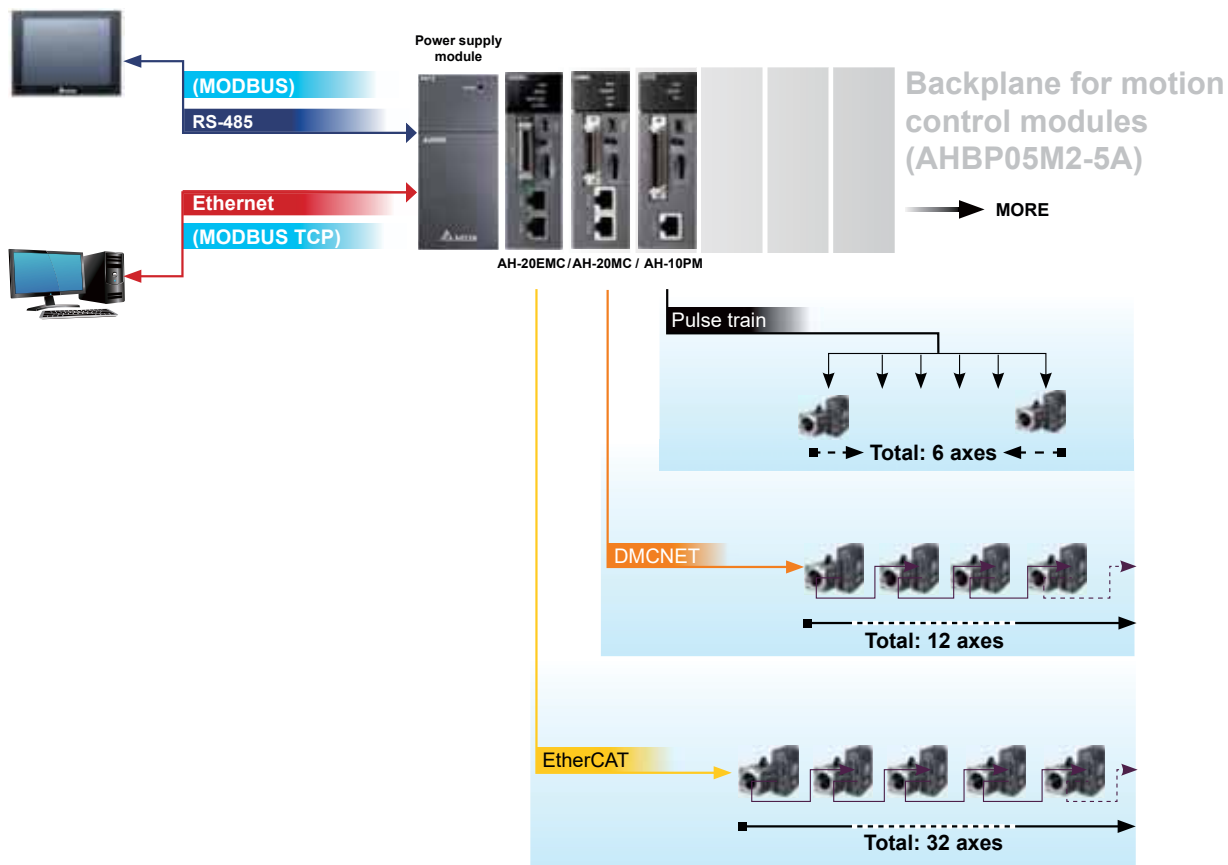


## System Extension Structure



## Motion Control Structure

Example: AH20EMC



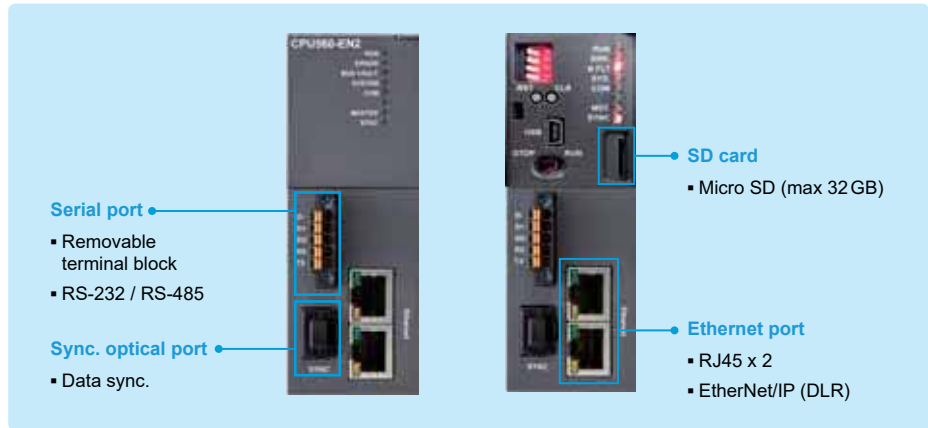
## Applications

High-end industrial equipment (textile machines, packaging machines, injection and molding machines, electronics equipment, printing machines, paper making machines, warehousing management systems, logistics management systems) and system integration applications (water treatment, HVAC system, traffic monitoring system)

## Redundant CPU

The redundant CPU of the AH Series adopts a reliable redundancy structure, and integrates synchronous modules, Ethernet ports and serial communication interfaces for a more competitive control solution.

AHCPU560-EN2



## Redundant Backplane

The redundant backplane of the AH Series provides redundant power supply and communication interfaces for a complete control solution.

### Redundant main backplane: AHBP04MR1-5A (4-slot)



### Redundant expansion backplane: AHBP06ER1-5A (6-slot), AHBP08ER1-5A (8-slot)



## Redundant System

### Full Redundancy Structure

Redundant CPU	Redundant main backplane	Redundant power	Redundant ext. ports	Ring topology
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### Modules

Main backplane	Expansion backplane	RTU rack
<ul style="list-style-type: none"> <li>Ethernet module - AH10EN-5A (V3)</li> <li>Serial module - AH10SCM-5A (V3)</li> </ul>	<ul style="list-style-type: none"> <li>DIO</li> <li>AIO (includes temperature modules)</li> <li>Serial modules - AH10SCM-5A, AH15SCM-5A</li> </ul>	<ul style="list-style-type: none"> <li>DIO</li> <li>AIO (include temperature modules)</li> </ul>

### Tasks

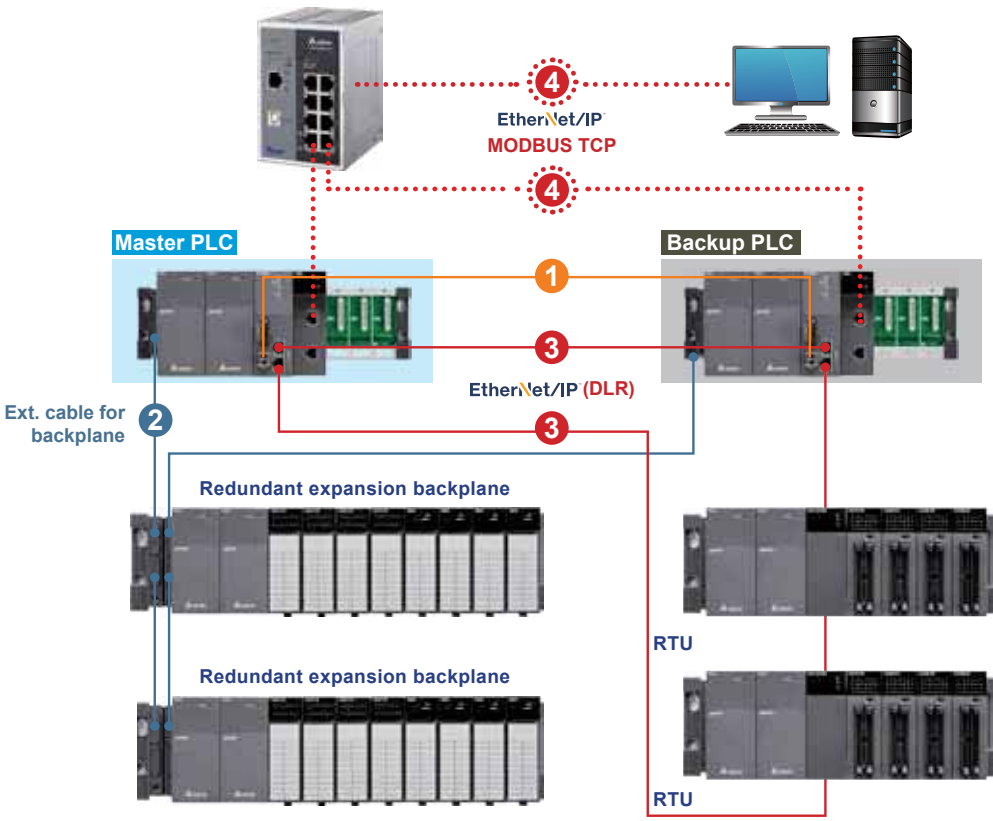
Cyclic	Timer interrupt
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CPU built-in sync. module

CPU switch-over time: 20 ms

RTU nodes to support expansion backplanes

Standard backplanes available (under some conditions)



- 1 Sync. optical fiber
- 2 Ext. cable for backplane
- 3 EtherNet/IP ring topology (DLR)
- 4 Star topology EtherNet/IP, MODBUS TCP

# Compact Modular Mid-range PLC

## AS

Flexible, Smart, Friendly - The Best Choice for Automated Equipment Control



- Max. I/O: 1,024 points
- Program capacity: 128k steps
- Data register: 60k words
- Max. extension ability: 32 modules
- 32-bit SoC (System on Chip) CPU for high-performance and high-speed computing
- CPU with built-in RS-485 port\*2, Mini USB port, Ethernet port, and Micro SD card slot
- Max. 8 axes control via CANopen motion network / max. 6 axes control via pulse control (200 kHz)
- Robust rackless design and patented DIN rail clips for direct plug-in/plug-out module installation and replacement
- Various modules for selection: digital I/O modules, analog I/O modules, load cell modules, temperature measurement modules, serial communication modules, industrial bus modules
- PLC programming software (ISPSoft) for program editing, hardware and network configuration, system diagnosis and axes positioning control

### Advanced CPU Performance

High speed execution: up to 40k steps/ms  
(Condition: 40% LD instruction / 60% MOV instruction)

LD instruction 25 ns

MOV instruction 0.15  $\mu$ s

Floating point operation instruction 1.6  $\mu$ s

Trigonometric function instruction 3.5  $\mu$ s

### Positioning Control - Delta's CANopen Control

- Up to 8-axis CANopen positioning control with AS-FCOPM communication card
- Fast positioning configuration in one initialization instruction without building CANopen data exchange table
- Batch download of programmable servo drive parameters to avoid data loss
- Axis control by instructions to enhance the legibility and maintainability of PLC programs

