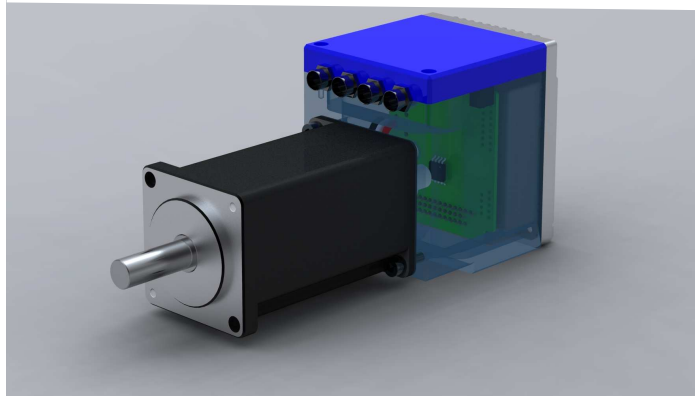


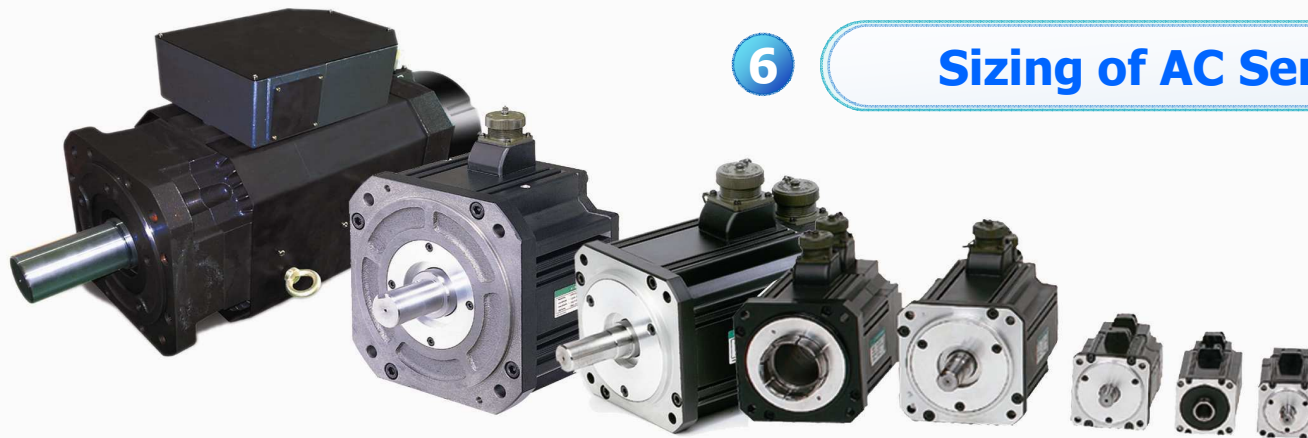
# AC SERVO MOTOR





## CONTENTS

- 1 Principle of AC Servo Motor
- 2 Characteristics of AC servo Motor
- 3 Type of AC servo Motor
- 4 Application of AC Servo Motor
- 5 Success Story of AC Servo Motor
- 6 Sizing of AC Servo Motor



# 1. Principle of AC Servo Motor



## 1) Type of Driving Device

Type of Driving Device		Strong points	Weak points
Mechanical Device	Hydraulic/ Pneumatic	<ul style="list-style-type: none"> <li>• Simple structure</li> <li>• Competitive price</li> </ul>	<ul style="list-style-type: none"> <li>• Low accuracy</li> <li>• The incidental equipment may be needed and noise, environmental pollution can be accompanied</li> </ul>
Electro-Mechanical Device	Stepping Motor	<ul style="list-style-type: none"> <li>• Competitive price</li> <li>• Simple controller</li> </ul>	<ul style="list-style-type: none"> <li>• Severe noise, vibration</li> <li>• High driving force, Large size are not available</li> </ul>
	Induction Motor	<ul style="list-style-type: none"> <li>• Competitive price</li> </ul>	<ul style="list-style-type: none"> <li>• High precision can't be allowed</li> </ul>
	Servo Motor	<ul style="list-style-type: none"> <li>• High-precision control</li> <li>• High driving force, Large size</li> <li>• Slight noise &amp; vibration</li> <li>• Excellent maintenance, environment-proof</li> </ul>	<ul style="list-style-type: none"> <li>• Comparatively high Price</li> </ul>
	Linear Motor	<ul style="list-style-type: none"> <li>• High- Speed &amp; Precision control</li> <li>• No mechanical converter</li> </ul>	<ul style="list-style-type: none"> <li>• High price</li> </ul>

# 1. Principle of AC Servo Motor



## 2) Comparison Table

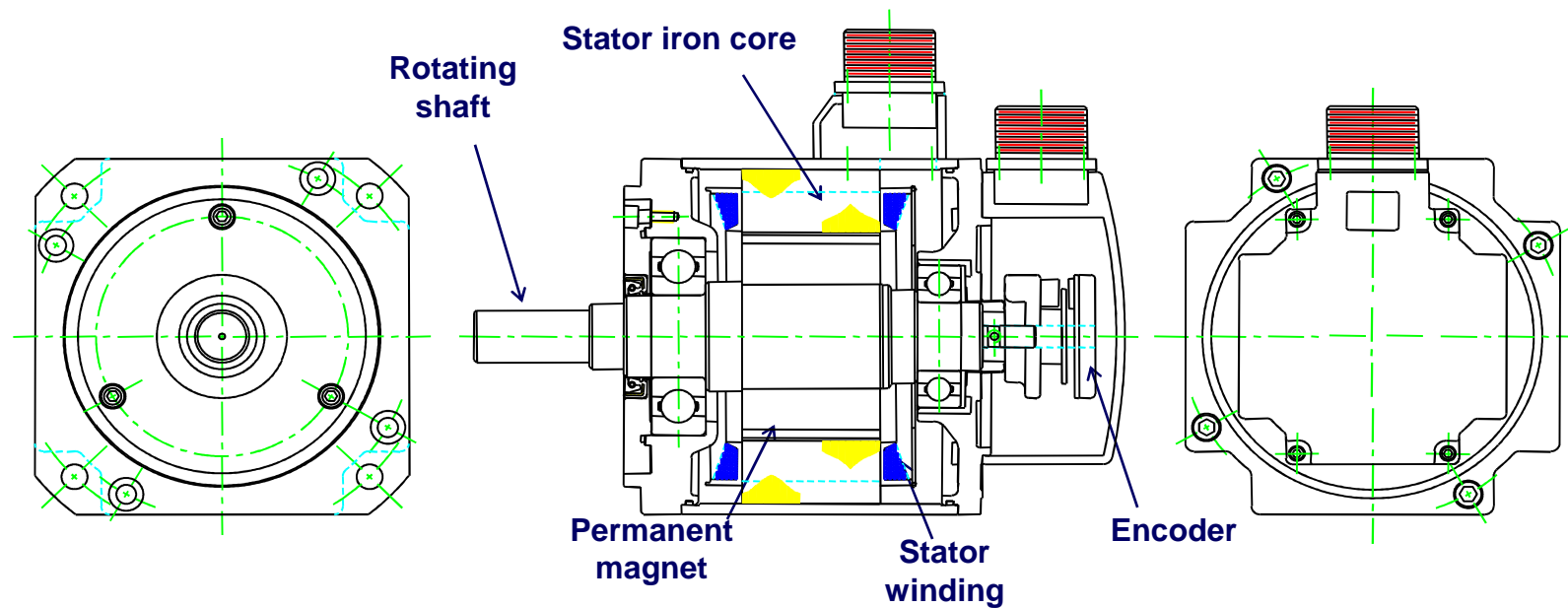
Item	Description	Induction Motor	DC Servo Motor	Synchronized AC Servo Motor	Inductive AC Servo Motor
<b>Motor</b>	Design	Simple	Complicated	Intermediate	Simple
	Stator	Coil	Permanent Magnet	Coil	Coil
	Rotor	Coil	Coil	Permanent Magnet	Coil
	Feedback	Option	Encoder (A,B,C)	Encoder (A,B,C,U,V,W)	Encoder (A,B,C)
	Speed	1800/3600 [r/min]	3000 [r/min]	1000~5000 [r/min]	20000 [r/min]
	Range	~ 400 [Kw]	~ 5 [Kw]	~ 22 [Kw]	2.2~55 [Kw]
	Life Time	Bearing life time	Brush life time	Bearing life time	Bearing life time
<b>Drive</b>	Control Type	V/F control	Vector control	Vector control	Vector control
	Control Mode	Speed	Speed/Position	Speed/Position/Torque	Position/Speed
	Speed Control Range	1:200	1:1,000	1:10,000	1:1,000
	Response Frequency	30 [Hz]	100 [Hz]	250~600 [Hz]	100 [Hz]
	Max. Torque	150 [%]	300 [%]	300 [%]	150 [%]
	Brake Resistor	N/A	N/A	Have	N/A
	Position Accuracy	±10 [mm]	±10 [ μm]	± 5 [ μm]	±20[ μm]

# 1. Principle of AC Servo Motor

## 3) Design of Motor(1)

The magnetic force is be made by permanent magnet and the current is used to generate torque. Then high torque and efficiency are available at low current and small size.

It has no brush so there is little noise/vibration and no dirt. And high precision control is available with high resolution encoder.

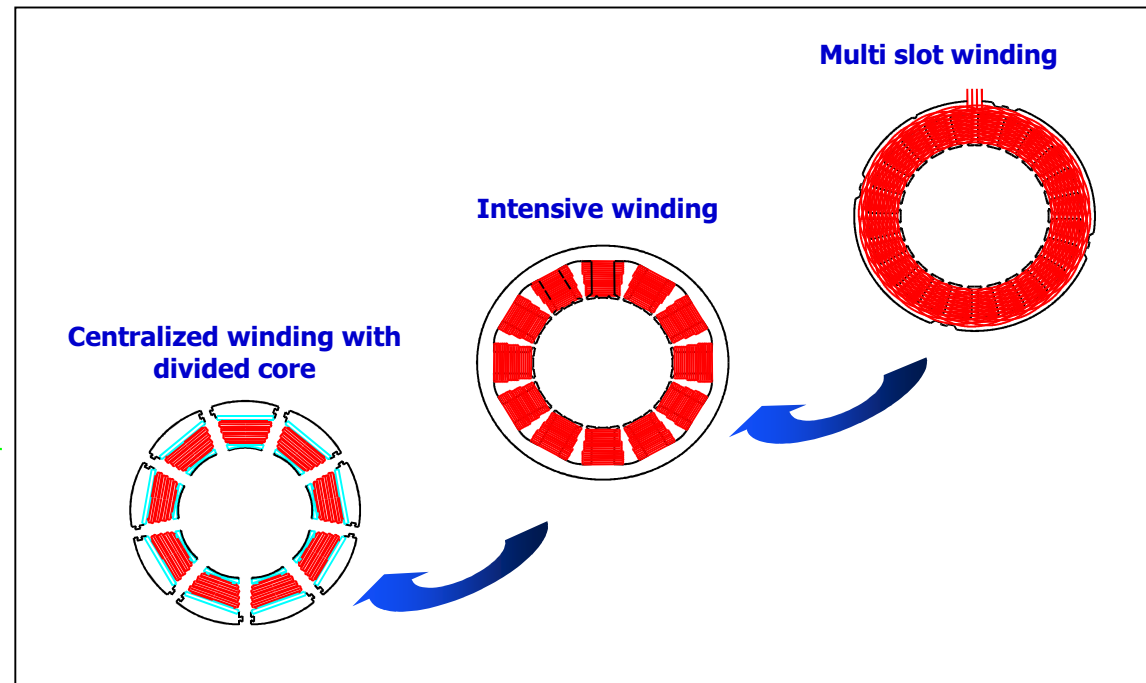
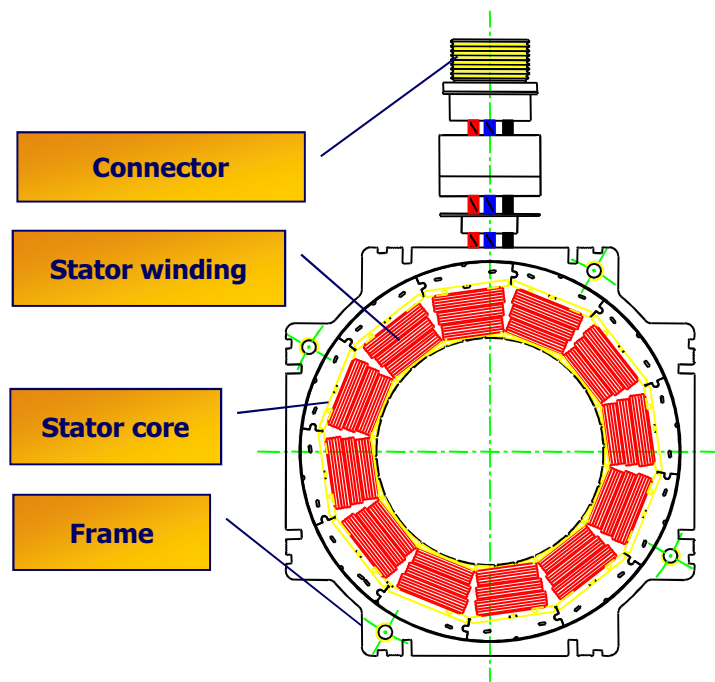


# 1. Principle of AC Servo Motor

## 3) Design of Motor(2) - Stator

Stator is composed of the core and winding which generates torque. The essential technologies are to apply the iron core and insert much coil to the equal area.

Divided core / centralized winding type which can insert much coil to the equal area has been on the rise with the progress of forming and winding technologies. Especially, the design using FEM technology becomes usual to minimize the torque ripple and cogging torque. Then, servo motor becomes small-sized and high-precision.

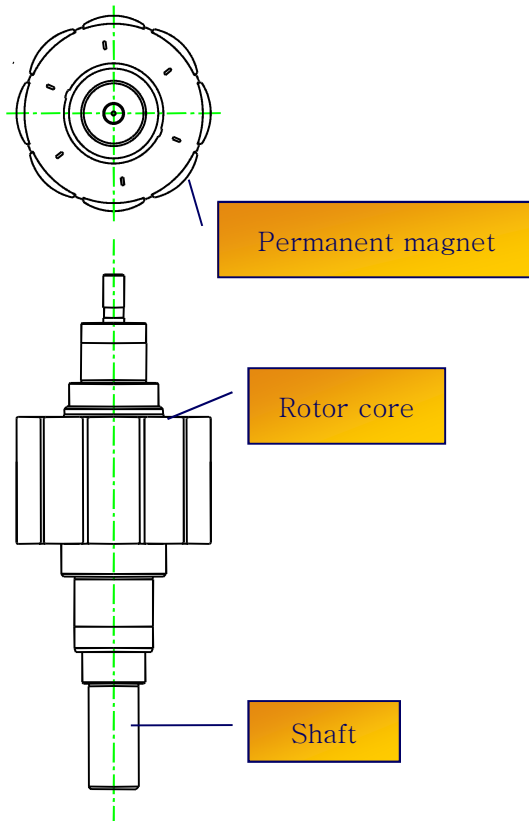


# 1. Principle of AC Servo Motor

## 3) Design of Motor(3) - Rotor

The rotor part is composed of shaft and rotor core and permanent magnet. It can generate high power at the same size depending on the performance of permanent magnet.

So selecting and applying permanent magnet is the essential technology. Especially, it is designed to minimize cogging torque through FEM technology with stator.

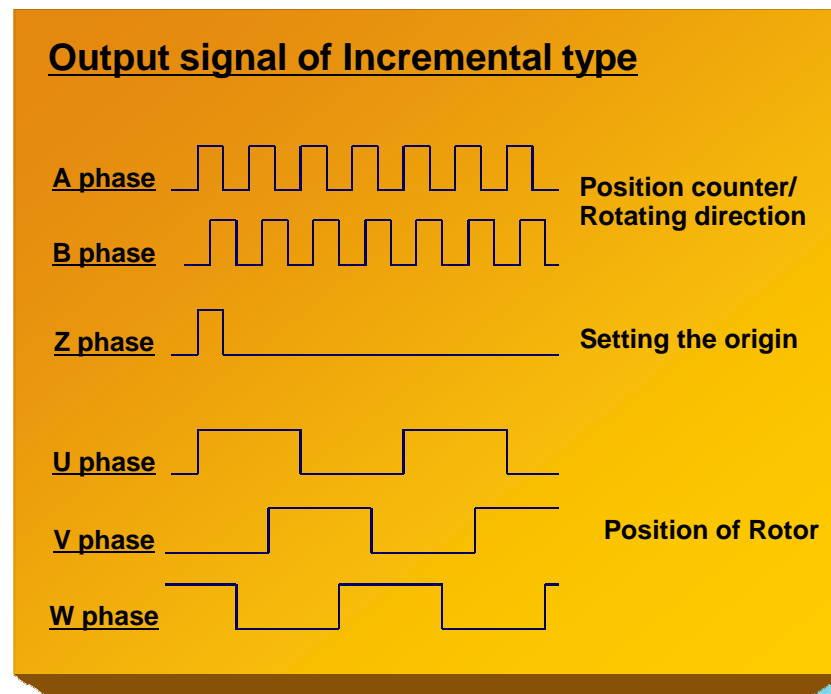
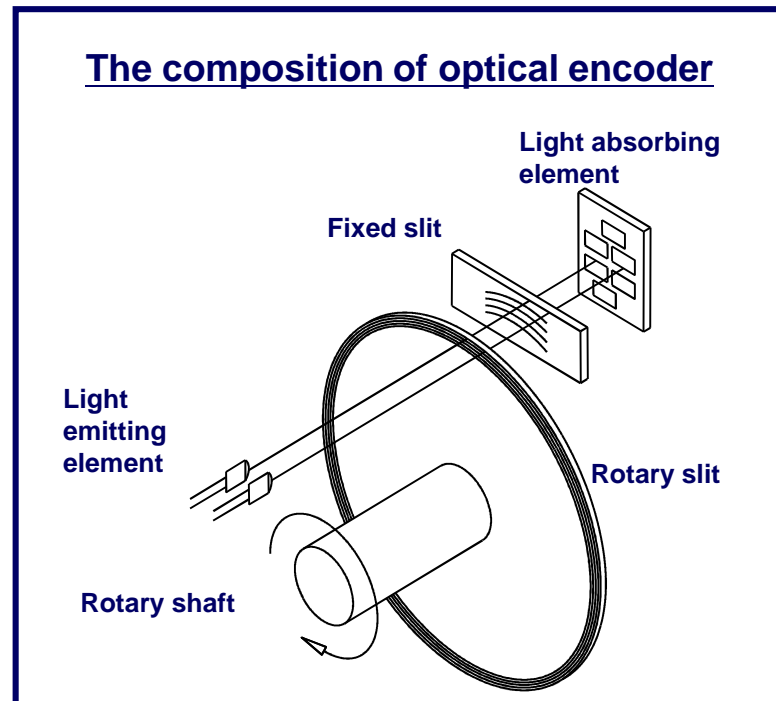


Type	Characteristics	The appearance of rotor
Laying Type (IPM)	<ul style="list-style-type: none"><li>• High Speed Rotation</li><li>• Low Power Rate</li><li>• Hard to Work</li></ul>	
Attached Type (SPM)	<ul style="list-style-type: none"><li>• High Power Rate</li><li>• Easy to Work</li><li>• Permanent Magnet is easily damaged</li></ul>	

# 1. Principle of AC Servo Motor

## 3) Design of Motor(4) - Encoder

Digital encoder can be divided into optical and magnetic type, which codes electric signal to digital signal. Optical type which has high resolution is usually used.





## 2. Characteristics of AC servo Motor

### 1) Characteristics

#### SHAFT

There are 2 kinds of Shaft type (Hollow Shaft & Solid Shaft)  
As followed the customer's request Shaft Dia. Length and Key way type can be changed.

#### WINDING

With long experience and high technology For motor design, Mecapion realized The most optimized winging system for High speed and Various Input Power range

#### MAGNET

High torque output is possible at smaller Size by adapting Neodymium permanent magnet of Highest-performance in its class

#### FRAME

There 7 Kind of Frame ( 40 / 60 / 80 130 / 180 / 220 / 280mm) and with those Kind of various frame, the optimized motor Design for customer is available

#### LENGTH

With the change of motor Length, Different inertia of Motor can be designed



Middle inertia type



Low inertia slim type  
(High speed, Low torque)

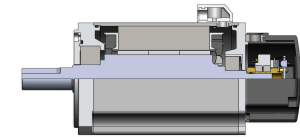


High-inertia flat type  
(Low speed, high torque)

#### ENCODER

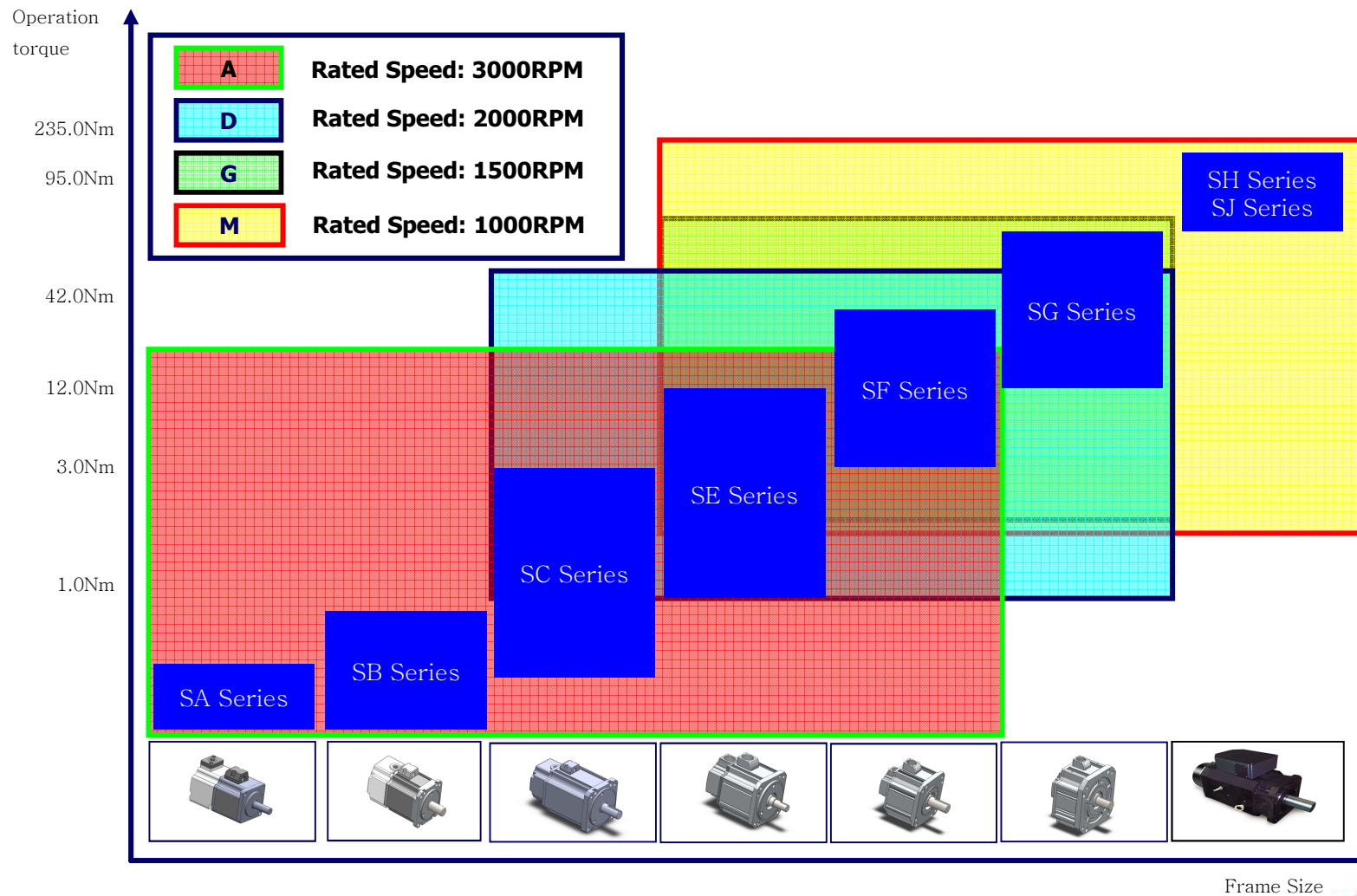
High torque output is possible at smaller Size by adapting Neodymium permanent magnet of Highest-performance in its class

- Optical Incremental Encoder (6000ppr)
- Magnetic Encoder (13bit cpr)
- Serial Encoder with Biss (19bit)
- Serial Encoder with Analog signal (1024ppr)



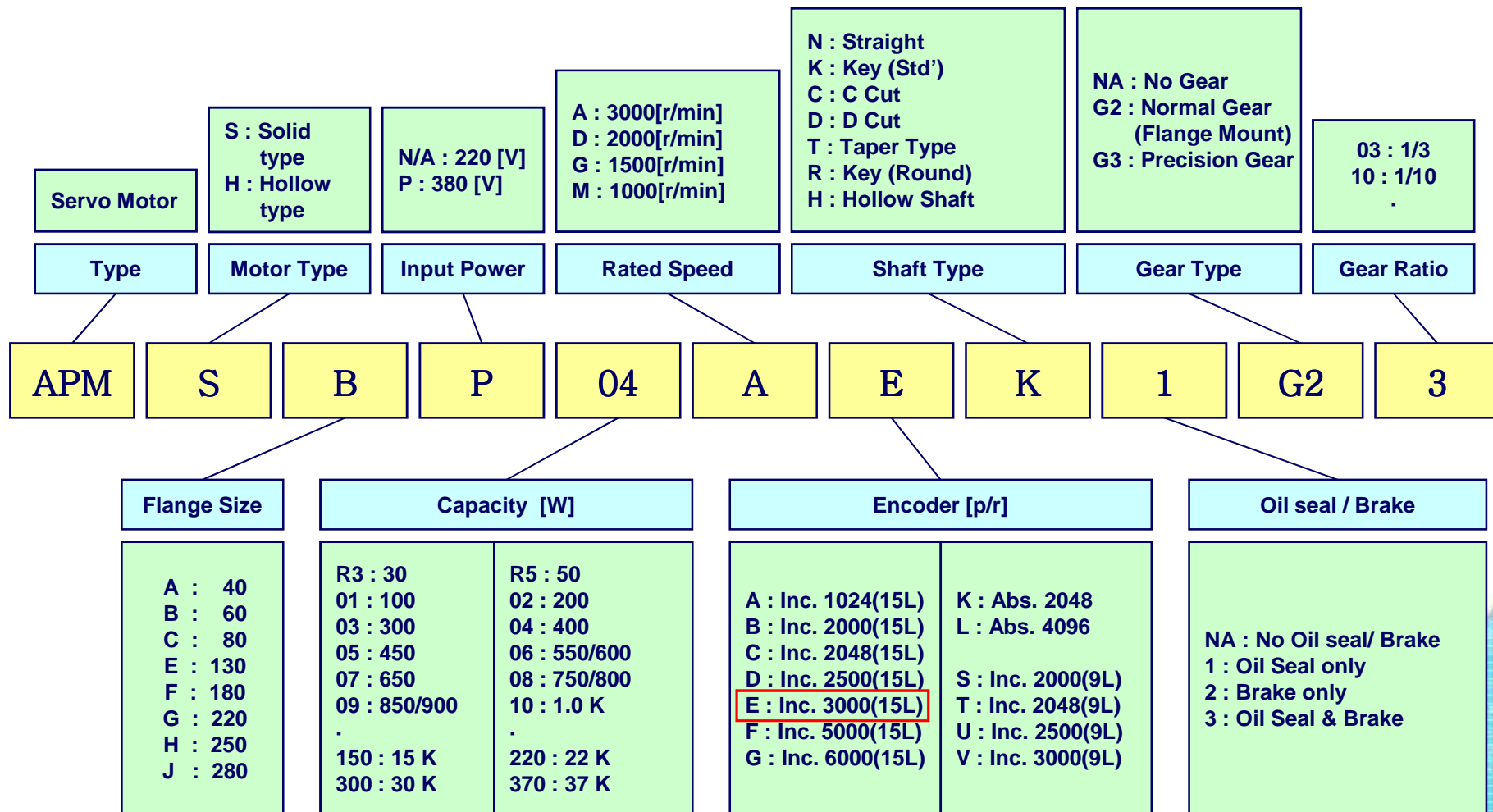
## 2. Characteristics of AC servo Motor

### 2) Speed And Torque range




## 2. Characteristics of AC servo Motor

### 3) Order Information












### 3. Type of AC servo Motor

#### 1) Standard AC servo motor

	<b>Model Name</b>	<ul style="list-style-type: none"> <li>- APM - S series</li> <li>- APM – S_P series</li> </ul>
	<b>Range</b>	<ul style="list-style-type: none"> <li>- 40mm Flange ~ 280mm Flange</li> <li>- 30W ~ 37KW</li> <li>- 0.1Nm ~ 235.5Nm</li> <li>- 3000RPM ~ 5000RPM</li> </ul>
	<b>Feedback</b>	<ul style="list-style-type: none"> <li>- Incremental Encoder (1024PPR – 6000ppr)</li> <li>- Serial Encoder with Biss (19 bite)</li> <li>- Magnetic Encoder (13 bite)</li> <li>- Customer’s Encoder</li> </ul>
	<b>Specification</b>	<ul style="list-style-type: none"> <li>- Power Supply of motor</li> <li>- 3phase AC 220V (Standard)</li> <li>- 3phase AC 400V (0.4KW ~ 37.0KW)</li> <li>- DC48V, DC85V, DC185V(0.1KW~3.0KW)</li> </ul>
	<b>Application</b>	<ul style="list-style-type: none"> <li>- Semiconductor Equipment</li> <li>- Machine Tools, Special Purpose Machine</li> <li>- Packing and Food process Machine</li> <li>- Medical Equipment, Defense Industry.</li> <li>- Others</li> </ul>

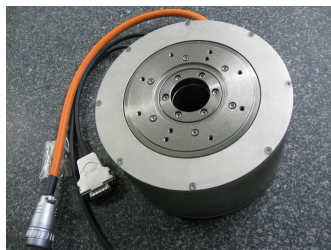
### 3. Type of AC servo Motor

#### 2) Special Type AC Servo Motor

 	<b>Model Name</b>	<ul style="list-style-type: none"> <li>- APM - S series</li> <li>- APM - H series</li> </ul>
 	<b>Range</b>	<ul style="list-style-type: none"> <li>- 40mm Flange ~ 220mm Flange</li> <li>- 30W ~ 15KW</li> <li>- 0.1Nm ~ 95.5Nm</li> <li>- 3000RPM ~ 8000RPM</li> </ul>
 	<b>Feedback</b>	<ul style="list-style-type: none"> <li>- Incremental Encoder (1024PPR – 3000ppr)</li> <li>- Serial Encoder with Biss (19 bite)</li> <li>- Magnetic Encoder (13 bite)</li> <li>- Customer's Encoder</li> </ul>
 	<b>Specification</b>	<ul style="list-style-type: none"> <li>- Hollow Shaft Motor(1.0KW ~2.2KW)</li> <li>- Spinner Motor (0.2KW ~ 12.0KW)</li> <li>- Customized Designed Motor</li> </ul>
 	<b>Application</b>	<ul style="list-style-type: none"> <li>- Semiconductor Equipment</li> <li>- FA application</li> <li>- Simulator</li> <li>- Medical Device</li> <li>- Welding Robot</li> </ul>

# 3. Type of AC servo Motor

## 3) Direct Drive Motor



<b>Model Name</b>	- MDM series
<b>Range</b>	- Dia. 135mm ~ Dia. 360mm - 50W ~ 3960W - 2.37Nm ~ 252Nm - 100RPM ~ 600RPM
<b>Feedback</b>	- Incremental Encoder (Upto 2,400,000 Count) - Sin/Cos Encoder with (24,000 Grating)
<b>Specification</b>	- Power Supply of motor <b>3phase AC 220V (Standard)</b>
<b>Application</b>	- Semiconductor Equipment - Packing and Printing Machine - Medical Equipment

# 4. Application of AC servo Motor



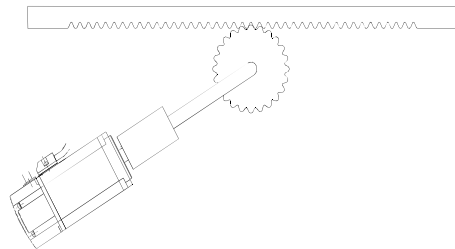
## 1) Application Summary

Control		Motion	Industry	Machine	Application
Control	Position	Continuous Curve Operation	Machine Tools	- Machining Center - Lathe	- Transportation
			Industrial Robot	- Welding Robot - Palletizing Robot	- Position control for each Axis
			Others	- Winding M/C	- Traverse, Winding & Un-Winding
		High Accuracy Position Control	Machine Tools	- Wire EDM	- Position control
			Semicon Equipment	- Vision Device	- Table Position control
			Semicon Equipment	- Wire Bonder	- Table Position control
		High Frequency Position Control	Chip mounter	- Chip mounter	- Table Position control
			Textile M/C	- Weaving M/C	- Position control
			Machine Tools	- Polishing M/C	- Transportation
	Speed	High Stable Rotation	Semicon Equipment	- Molding M/C	- Rotation
			OA	- Fax / Printer	- Rotation
			Cutting M/C	- Rotary Cutter	- Feeding & Cutting System
		Synchronous Operation	Packing M/C	- Packing M/C	- Feeding system
			Printing M/C	- Color Printer	- Tuning Operation
		Torque	Torque	Machine Tools	- Special Purpose M/C
Molding M/C	Injection Molding M/C			- Clamping	
Semicon Equipment	- Wire Sawing M/C			- Feeding	
Power	High Power	Molding M/C	- Injection Molding M/C	- Injection / Extrusion / Charging	

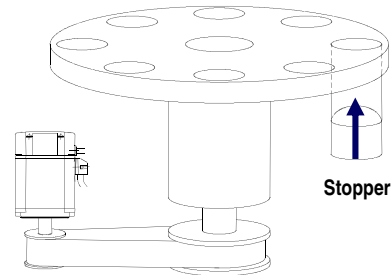
# 4. Application of AC servo Motor

## 2) Application Example-1

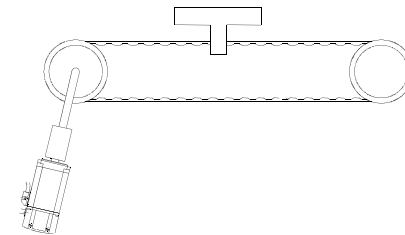
**Rack&Pinion Potential Operating**



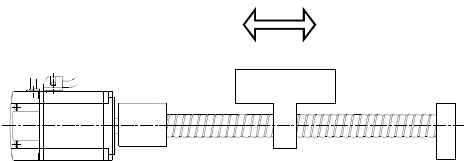
**Index potential operating**



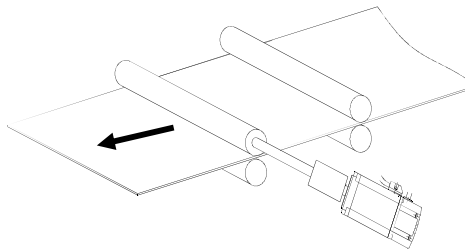
**Timing belt Potential Operating**



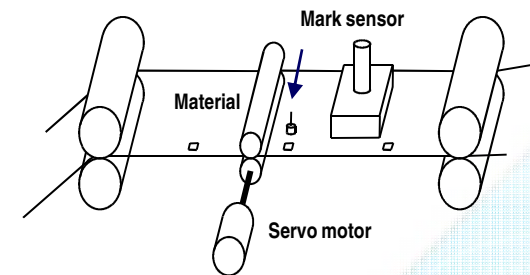
**Ball Screw Potential Operating**



**Feeder operation**



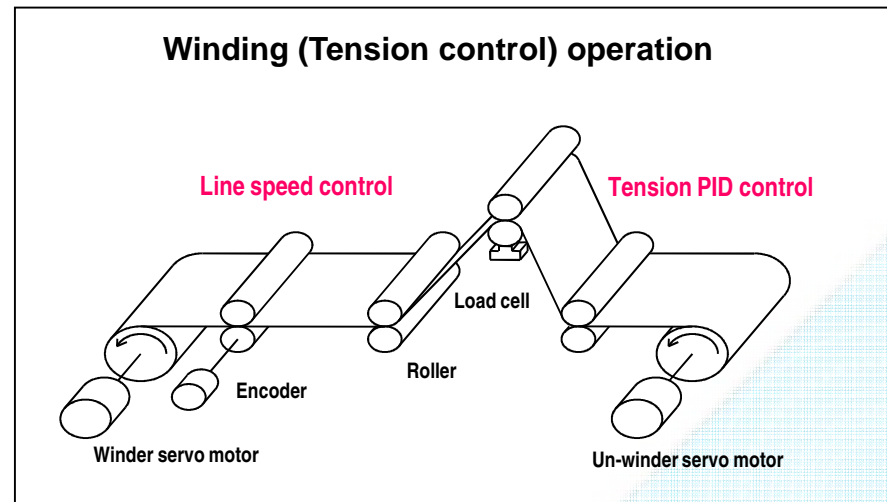
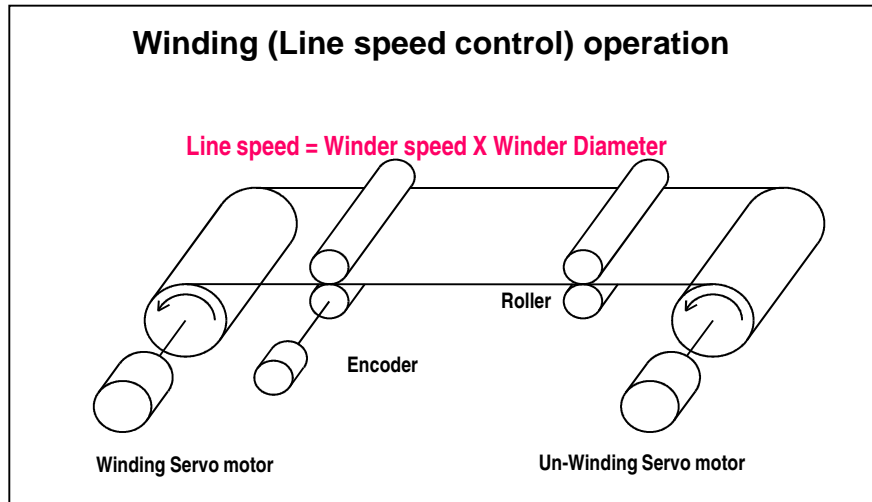
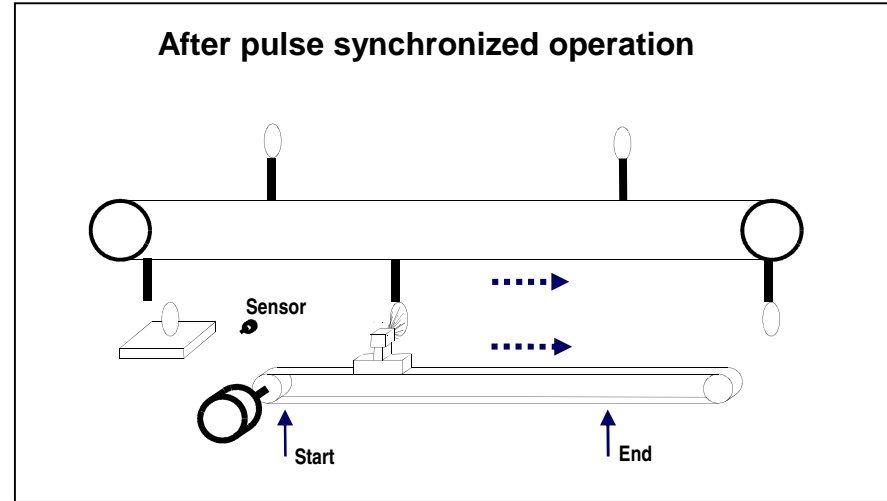
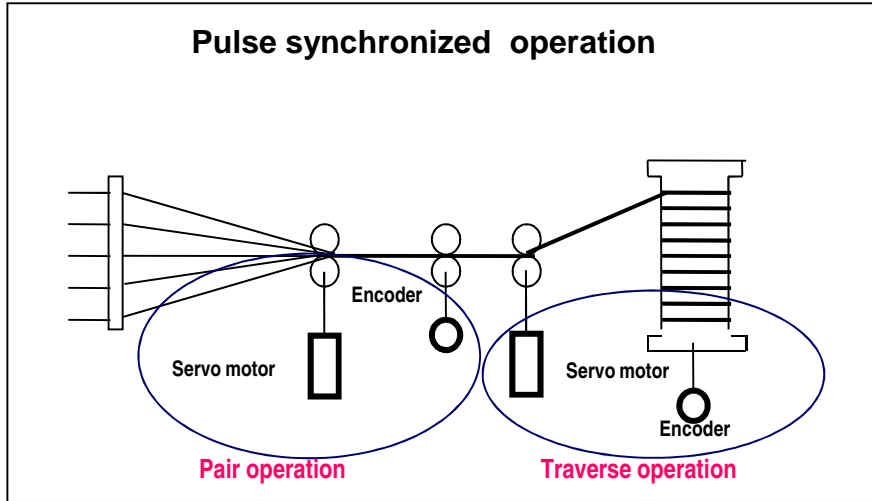
**Potential operation after sensor**





# 4. Application of AC servo Motor

## 2) Application Example-2



# 5. Success story of AC servo Motor

## 1) Semiconductor and Display (LCD/PDP) Industry

	Description
Type	<ul style="list-style-type: none"><li>• Standard AC Servo Motor</li><li>• Spinner Motor</li></ul>
Application	<ul style="list-style-type: none"><li>• Auto Molding M/C</li><li>• Cleaning M/C</li><li>• Transfer M/C</li></ul>
Description	<ul style="list-style-type: none"><li>• High Speed</li><li>• Hollow shaft</li><li>• Low Vibration</li></ul>



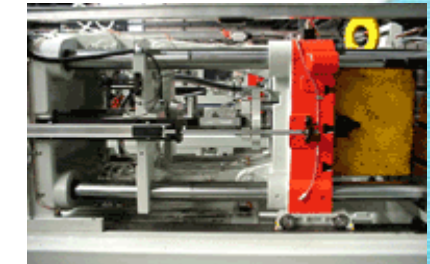
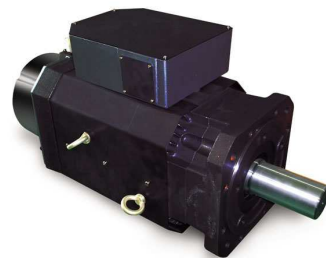
Moving towards tomorrow

**MECAPION**

# 5. Success story of AC servo Motor

## 2) Replacing Hydraulic Cylinder to Servo Motor

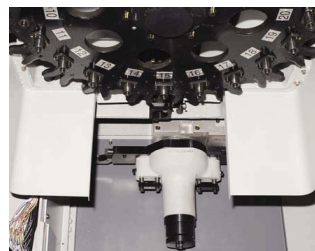
	Description
Type	<ul style="list-style-type: none"><li>• 22KW ~ 37KW AC servo motor</li><li>• High Voltage Servo Motor</li></ul>
Application	<ul style="list-style-type: none"><li>• Servo Press M/C</li><li>• Injection Molding M/C</li><li>• Packing M/C</li><li>• Steel Processing M/C</li></ul>
Description	<ul style="list-style-type: none"><li>• High Power</li><li>• High Voltage Power</li></ul>



# 5. Success story of AC servo Motor

## 3) Machine Tools and Steel Processing M/C

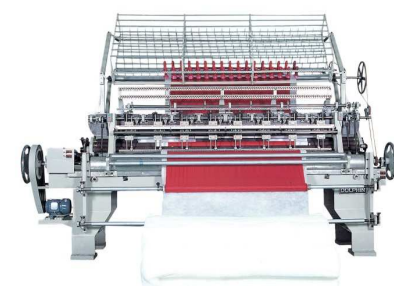
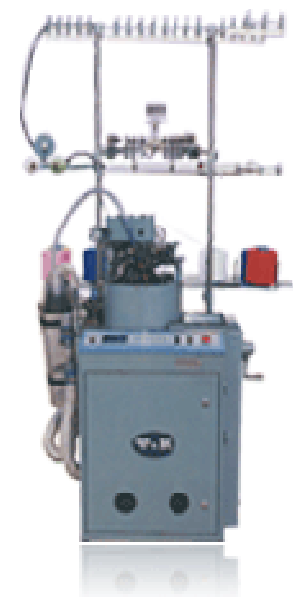
	Description
Type	<ul style="list-style-type: none"><li>• 1KW ~ 15KW AC servo motor</li><li>• High Resolution Feedback System</li></ul>
Application	<ul style="list-style-type: none"><li>• Press Brake M/C</li><li>• ATC (Auto Tool Changer)</li><li>• Coil Feeder</li><li>• Steel Processing M/C</li></ul>
Description	<ul style="list-style-type: none"><li>• High Inertia</li><li>• Accuracy control</li></ul>



# 5. Success story of AC servo Motor

## 4) Textile Machine

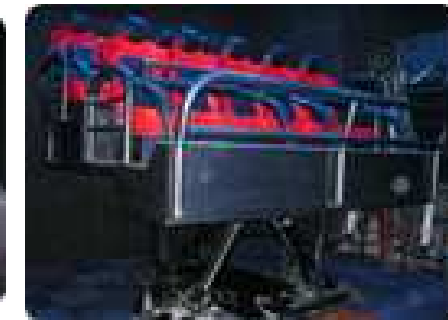
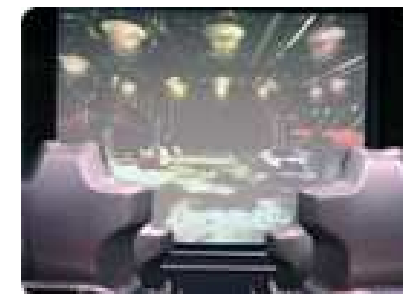
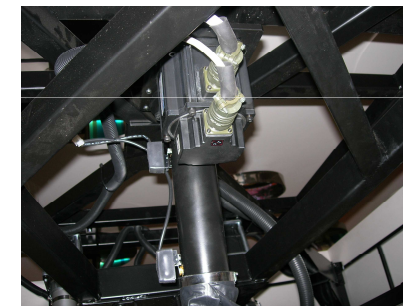
	Description
Type	<ul style="list-style-type: none"><li>• 0.1KW ~ 7.5KW AC servo motor</li><li>• High Resolution Feedback System</li></ul>
Application	<ul style="list-style-type: none"><li>• Socks Knitting M/C</li><li>• Embroidery M/C</li><li>• TFO Twister / Winder</li><li>• Quilting M/C</li></ul>
Description	<ul style="list-style-type: none"><li>• High Speed</li><li>• Accuracy control</li><li>• Low Cost</li></ul>



# 5. Success story of AC servo Motor

## 5) Simulator

	Description
Type	<ul style="list-style-type: none"><li>• 1.1KW ~ 1.5KW AC servo motor</li><li>• Customized Special Design System</li></ul>
Application	<ul style="list-style-type: none"><li>• Simulator</li><li>• Movie Theater</li><li>• Game Machine</li></ul>
Description	<ul style="list-style-type: none"><li>• High Speed</li><li>• Special Design</li><li>• High Inertia</li></ul>



# 5. Success story of AC servo Motor

## 6) Special Purposed Machine

	Description
Type	<ul style="list-style-type: none"> <li>• 30W ~ 37KW AC servo motor</li> <li>• High Speed</li> <li>• High Torque</li> </ul>
Application	<ul style="list-style-type: none"> <li>• Router</li> <li>• Spring Forming Machine</li> <li>• Bending Machine</li> <li>• EDM machine</li> <li>• Packing Machine</li> </ul>
Description	<ul style="list-style-type: none"> <li>• High Speed</li> <li>• High Torque</li> </ul>



Model YGB-665T



# 5. Success story of AC servo Motor

## 7) Medical & Defense Machine

	Description
Type	<ul style="list-style-type: none"> <li>• 30W ~750W AC servo motor</li> <li>• High Speed</li> <li>• High Feedback resolution</li> </ul>
Application	<ul style="list-style-type: none"> <li>• Medical Machine</li> <li>• Defense Industry</li> </ul> <p>=&gt; Normally our motor can operated with many of advanced Drive maker for this field.</p>
Description	<ul style="list-style-type: none"> <li>• High Speed</li> <li>• High Torque</li> <li>• High Accurcay</li> </ul>

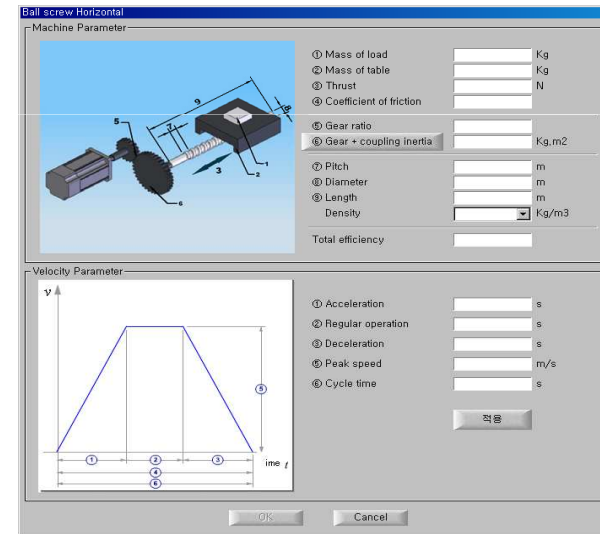




## 6. Sizing of AC servo Motor

### 1) Sizing Software - **smartSIZER**

To get optimized selection of our Servo motor. Mecapion also provide Motor Sizing Software( **smartSIZER** ).  
With this software Customer can select the most optimized designed motor for their application..  
And it is very convenience to use so, without any training, customer can use it.



**Download the software from our web site ([www.mecapion.com](http://www.mecapion.com))**



# Thank you