

# TOYO



TOYO AUTOMATION CO., LTD  
2019.Oct update



# Toyo Headquarters – Tainan, Taiwan



New production facility opening ceremony June, 2019

213,000 ft<sup>2</sup> = 4X the size of old factory





# Company Background

- Established: 2008
- Started from a High Tech Distributor (ECON) that sold Japanese actuators, est 2000
- Headquarters: Tainan City, Taiwan
- Manufactured ~100,000 actuators in 2018
- Largest aluminum extrusion actuator manufacture in China & Taiwan
- Less than 1% of sales outside of Asia – we are going to change that



2<sup>nd</sup> building for long base machining = 71,000 ft<sup>2</sup>



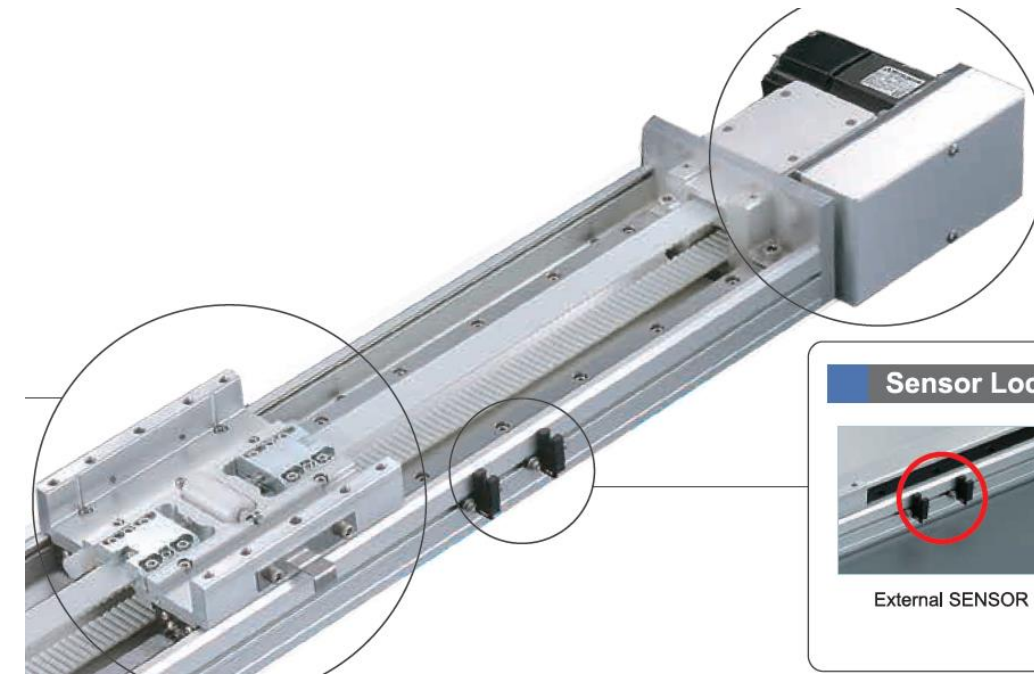
東佑達新吉新廠

# Six Product Segments





# Electric Actuator (No Motor)



Multiple motor installation positions provides the flexibility for machine design.

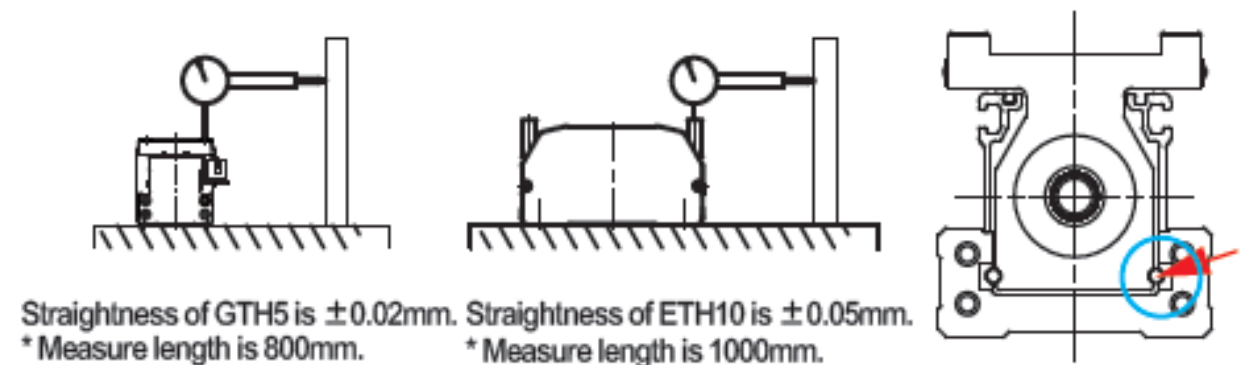
- BC Motor Exposed
- BL Motor Left Side
- BR Motor Right Side
- BM Motor Bottom Side
- M Motor Hidden In

# G-Series – Integrated linear bearings

- Aluminum body with steel bearing raceways bonded into the extrusion
- Single pass grinding of bearing block and bearing raceways
- Straightness and flatness +/- 20um/meter
  - Better than most precision grade steel body actuators (THK KR, NSK Monocarrier...)
- Fully enclosed with magnetically sealed coverband
  - Class 10 Cleanroom rated
- Single grease port for ballscrew and bearings
- Single piece steel bearing block/slider



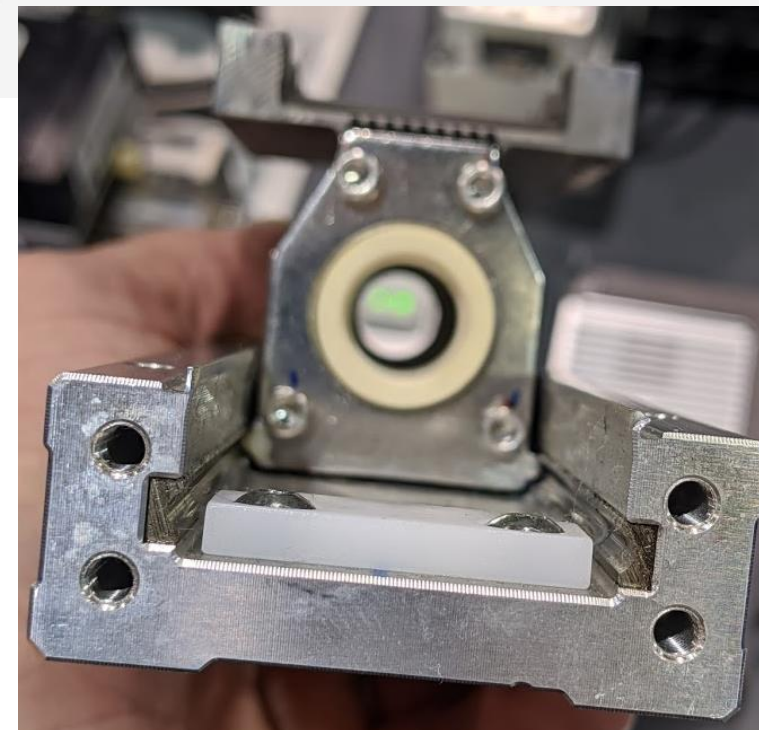
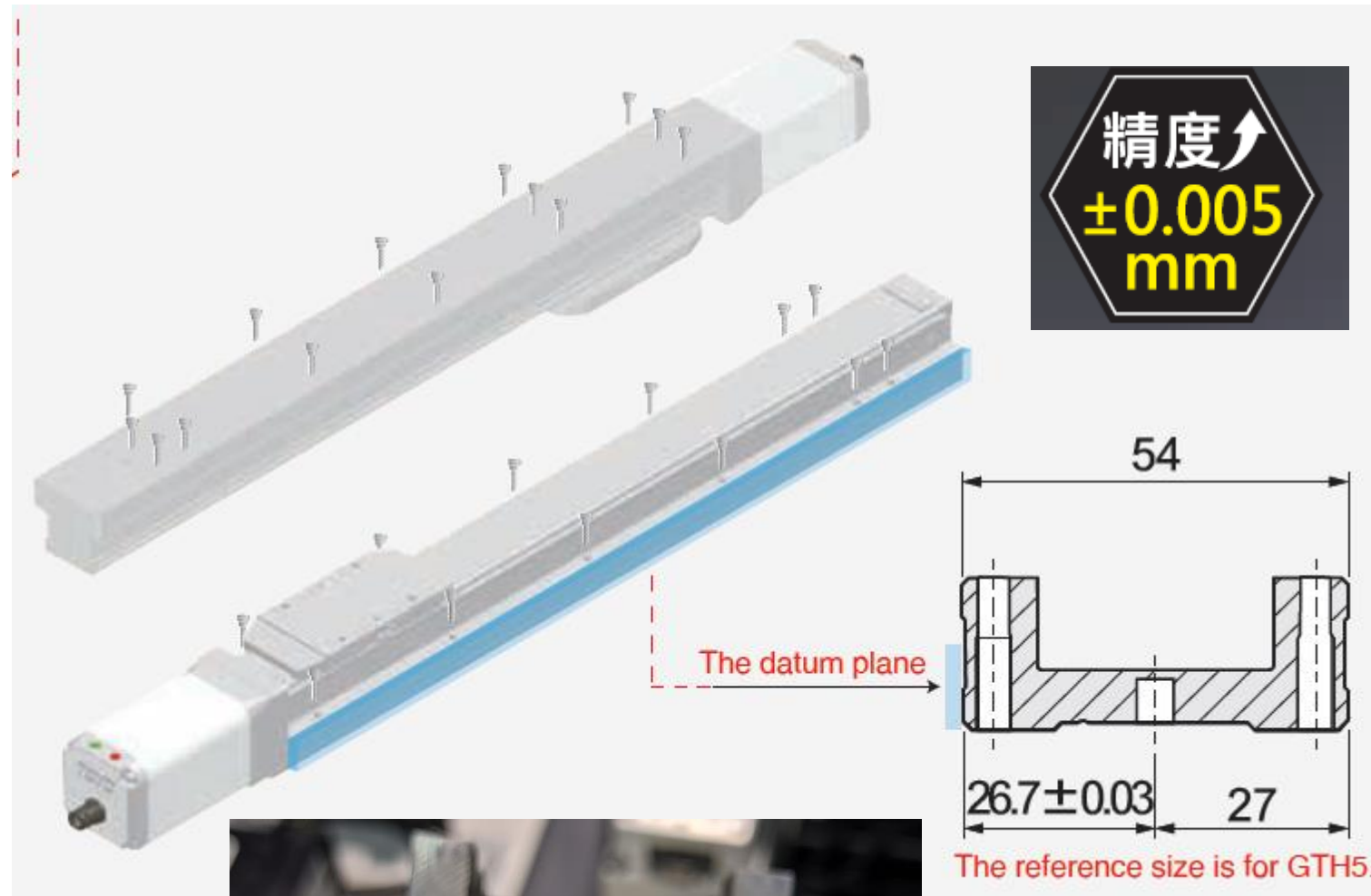
Built in linear rail design, Straightness and Flatness are highly improved to  $\pm 0.02\text{mm}$ .





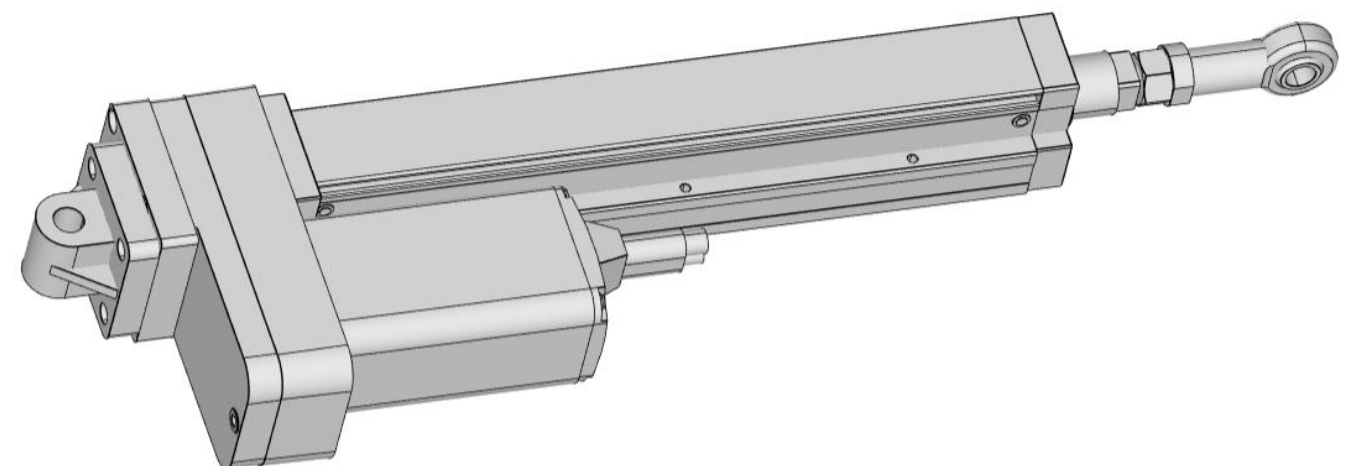
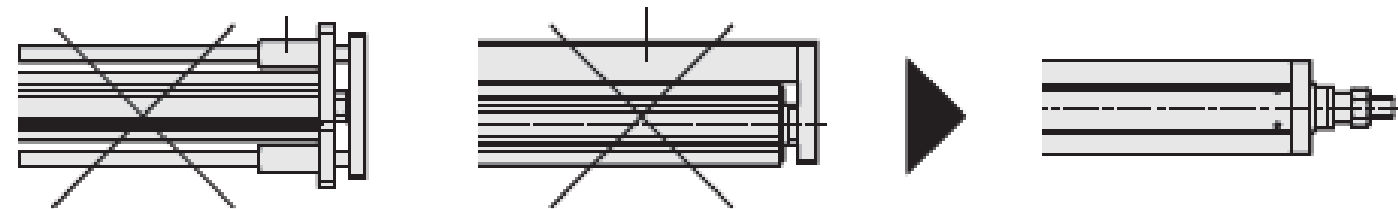
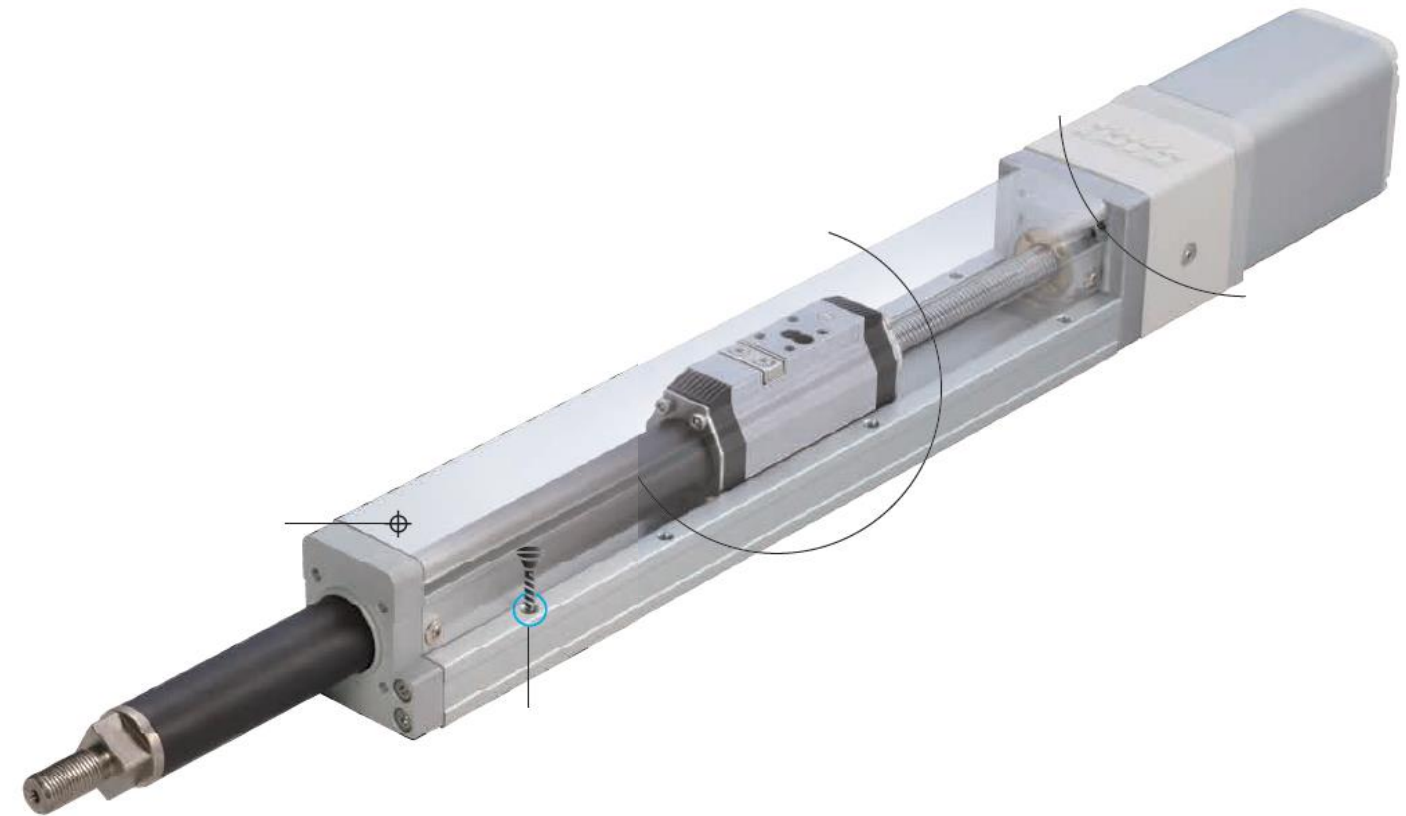
# G-Series - Integrated linear bearings

- 4 frame sizes from 10mm to 16mm ballscrew
- 2 more in development for 6mm and 20mm ballscrew
- Mount from top or bottom
- Pin locators and reference edge
- C7 ballscrew with +/-5um repeatability – this can be improved with added inspection
- Can improve to C5 and ground
- Can add 2<sup>nd</sup> carriage for increased load capacity for pitch and yaw moments
- GTH5S & 8S have available LH/RH ballscrew design



# G-Series – Rod Style

- All the same properties as slider type G-Series
- Utilizing the same integrated linear bearings this rod style actuator CAN take a side load.
  - The rod will deflect but the screw will not bend and fail or bind up
- There is no radial slop in the shaft
- Offered up to a 16mm ballscrew for high thrust ~4000N
- Up to 32mm lead for high speeds, 1.6m/s+
- Standard clevis and rod ends available





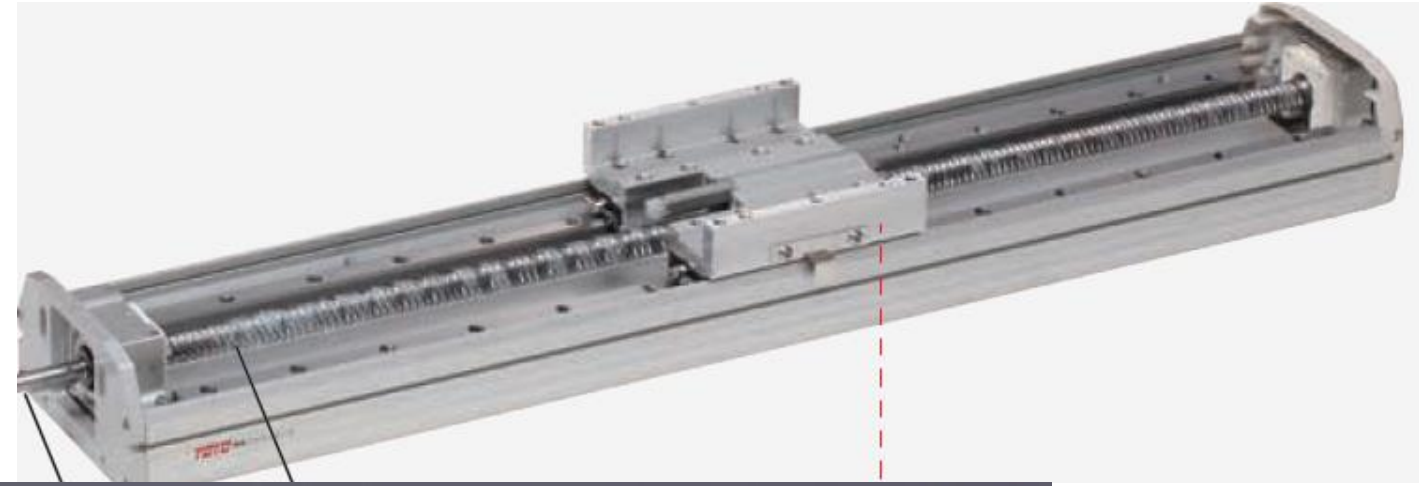
# GT3

- Production June 2020
- 30 x 30mm profile
- 300mm max stroke
- 6mm diameter ballscrew
  - 2, 6mm leads



# ETH Ballscrew and Dual Rail

- 3 frame sizes from 16mm to 25mm ballscrew
- Dual rail, x4 bearings frame sizes; 14(15), 17(20), 22(25)
- SS Coverband for cleanroom
- Aluminum extrusion cover
- C7 ballscrew with +/-5um repeatability
- Can improve to C5 and ground
- ETH17M & 22M with traveling ballscrew support for extra long travel, up to 2400mm





# ETB Belt and Linear Bearings

- 3 Single linear rail sizes; 5(12W mini), 6(15W mini), 10(15 x 2 bearings)
- 3 dual rail, x4 bearings frame sizes; 14(15), 17(20), 22(25)
- SS Coverband for cleanroom
  - Class 10 rated
- Aluminum extrusion cover
- +/-40um repeatability
- Up to 3500mm stroke
  - Longer strokes with multiple extrusions



# MH & MK Euro Belt and Linear Bearings

- Single rail dual bearing and thick belt
- Light duty, lower cost; MH65(12mini) & MH80(15mini)
  - Smaller bearings, belt, not designed for vertical and gearbox
- Heavy Duty frame size; MK65(15) 85(20) 110(25)
  - Vertically rated
  - Can be supplied with gearbox
- +/-100um repeatability
- Speeds up to 5m/s
- Up to 5000mm stroke
  - Longer strokes with multiple extrusions





# Class 10 Cleanroom Rated



Clean Room Type GCH / ECH / ECB / CGCH / CCB / LCF Series

- Almost all actuators are available with a Class 10 cleanroom spec
- Assembled in our cleanroom
- Add a pneumatic port and pull a little vacuum
- Conversely the “cleanroom” actuator design can be an advantage in “dirty” environments
- Add a little pressure to the port and keep debris out of the actuator

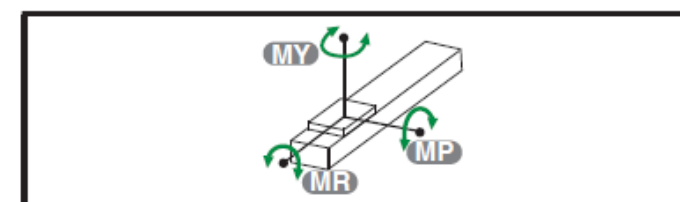


# GTH5 Load Specs



- Old catalog – only 10,000km spec

位置重複精度 Repeatability (mm)		±0.005			
螺桿導程 Ball Screw Lead (mm)		2	5	10	20
最高速度 Maximum Speed (mm/s) ※1		100	250	500	1000
最大可搬重量 Maximum Payload	水平使用 Horizontal (kg)	30	30	15	10
	垂直使用 Vertical (kg)	10	10	5	2.5
定格推力 Rated Thrust (N)		854	341	170	85
標準行程 Stroke Pitch (mm) ※2		50-800mm / 50 間隔 50 mm Pitch			
AC 伺服馬達容量 AC Servo Motor Output (W)		100			
滾珠螺桿外徑 Ball Screw Ø (mm)		C7Ø12			
連軸器 Coupling (mm)		7X8			



(單位 Unit : N.m)

MY	103
MP	103
MR	114

\* 力距表所表示的數據，代表重心。

The torque value in the chart indicate the center of gravity.

\* 符合型錄規範的正常情況下，保證壽命為 10000 公里。

Operation life is 10,000km when the product is using under the specified conditions.

\* 倒吊使用無法套用標準規範，如有需求請洽詢我司業務。

Data information is not for ceiling-mount inverse use.

Contact us for the details if you want to apply ceiling-mount inverse usage.

- New catalog – 50, 2540 & 10,000km spec
- Most actuator manufactures use a 100km spec
- Full ballscrew spec, 12mm dia

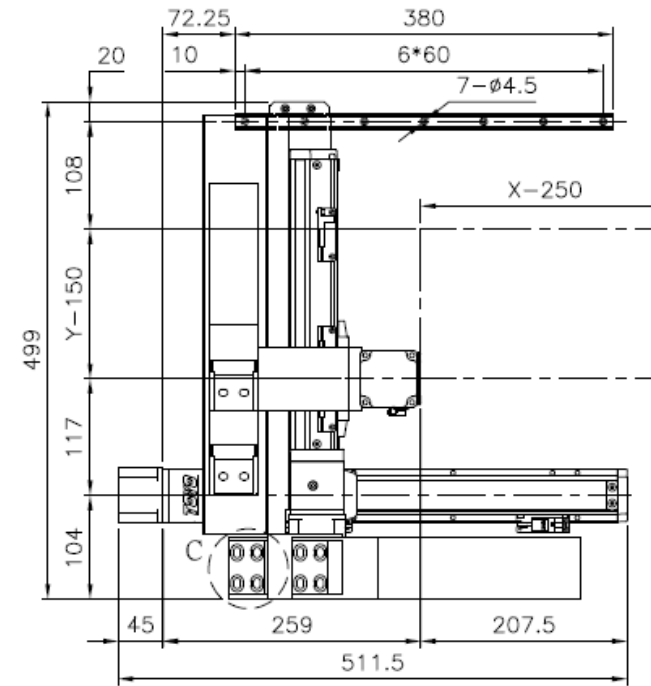
Ball Screw Lead (mm)		2	5	10	20	
Maximum Speed (mm/s)		100	250	500	1000	
Maximum Payload	Horizontal (kg)	30	30	15	10	
	Vertical (kg)	10	10	5	2.5	
Rated Thrust (N)		854	341	170	85	
Load Capacities	Dynamic Horizontal (kg)	50 km of travel	636	700	622	560
		2540 km of travel	172	189	168	151
	Static Horizontal (kg)	1734				
Repeatability (mm)		±0.01				
Allowable Input Torque (rpm)		3000				

Parts Specs	Ball Screw Lead (mm)		2	5	10	20
	Ball Screw	Basic dynamic load rating Ca (N)	3277	5258	6298	7622
		Basic static load rating Coa (N)	8888	7789	12625	16854
	Linear Guide	Basic dynamic load rating C (N)	840			
		Basic static load rating Co (N)	1700			
	Fixed Bearing	Basic dynamic load rating Cor (N)	1730			
		Basic static load rating Cr (N)	3800			
	AC Servo Motor Output (W)		100			
	Ball Screw Ø (mm)		C7 Ø12			
	Coupling (mm)		7X8			

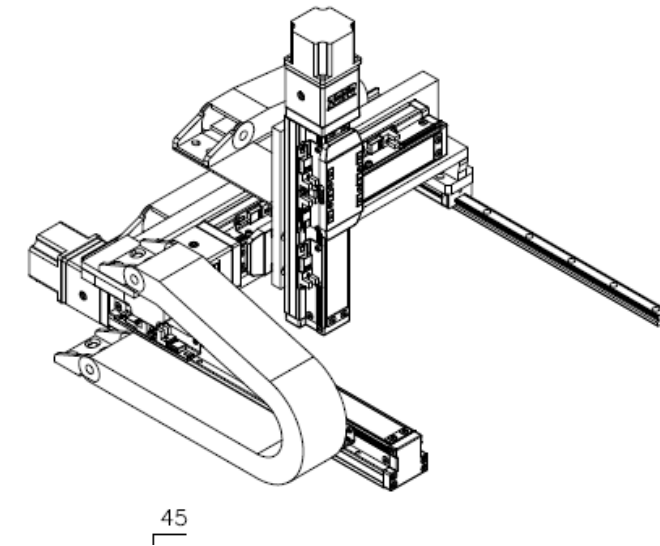


# Multi-Axis Systems

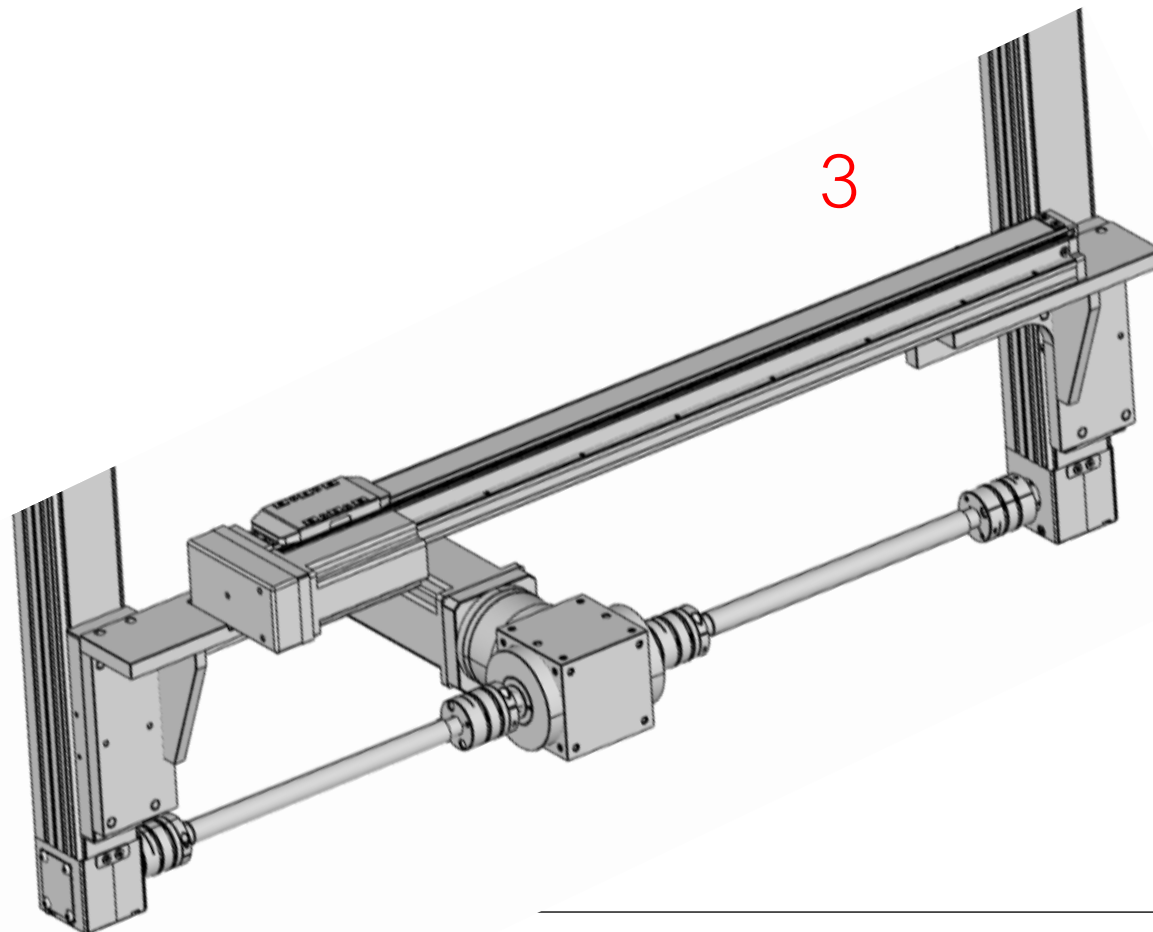
- Standard designs in 2-3 days
  - You receive a quote, 3D model and DXF file
- 1. XYGT222 - 250x150x100mm
- 1A. XYGT221 - 600x600x100
- 2. XYGT321 – 600x250x50
- 3. Vertical stocker 2000x700



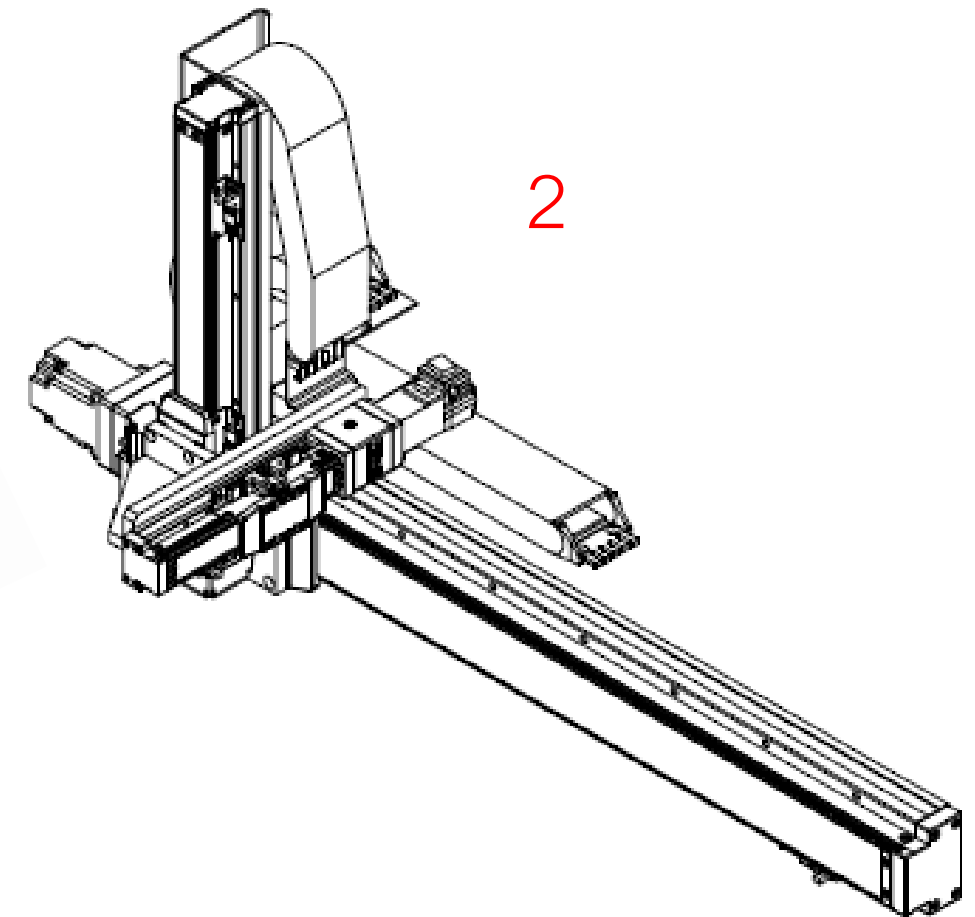
1 & 1A



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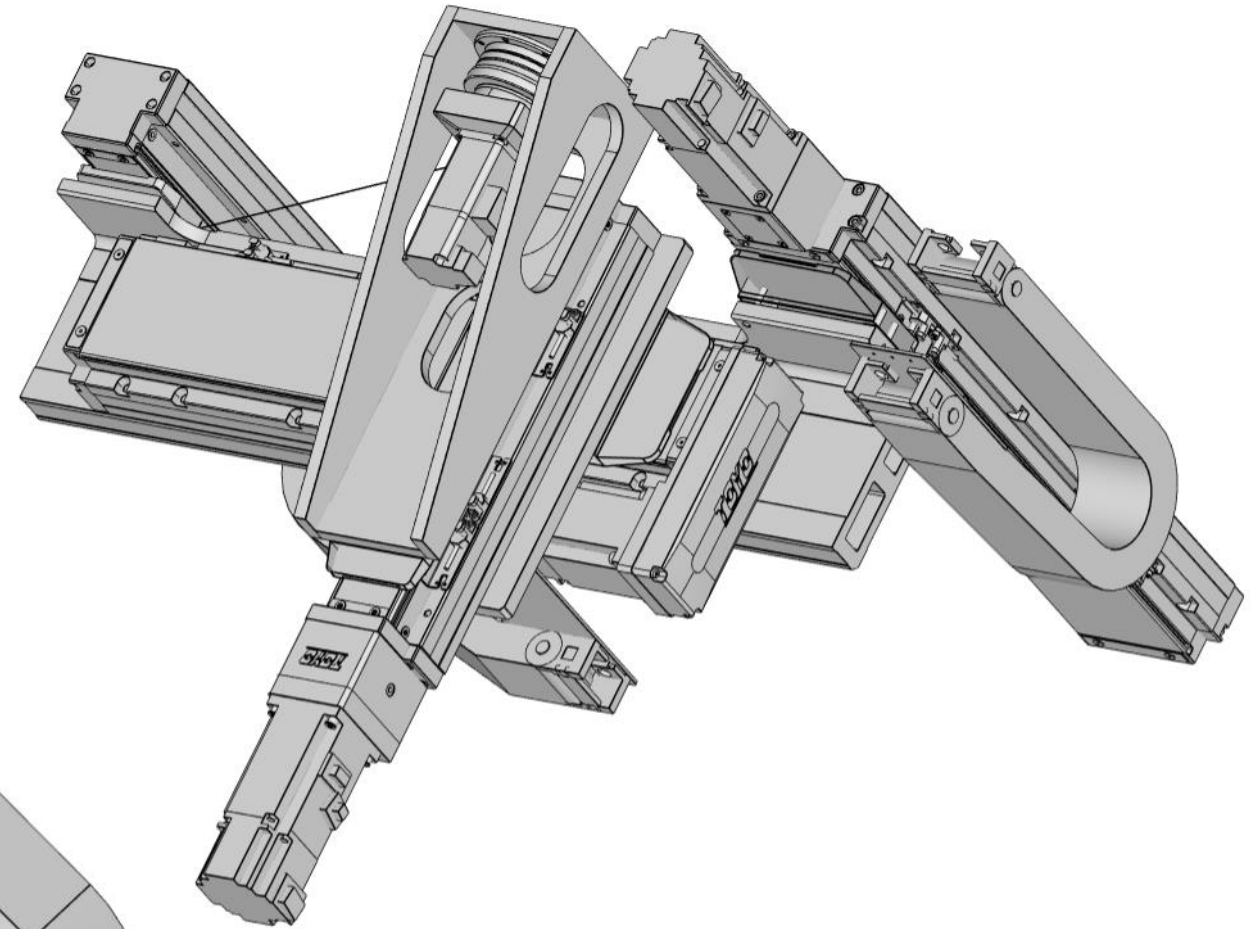
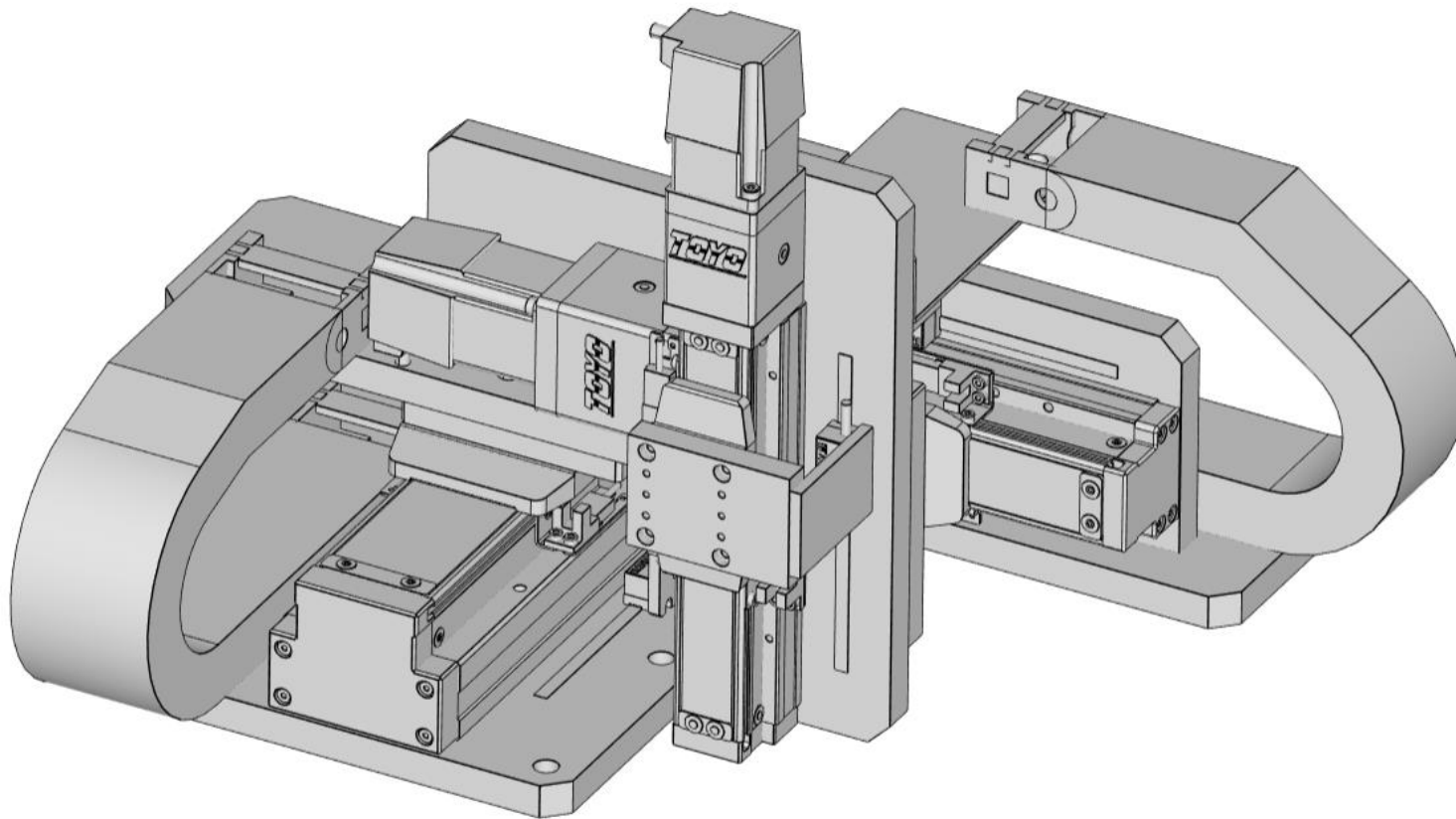


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# Multi-Axis Systems

- 1. XYZ - 50x50x50mm w/ linear encoders and ground ballscrews
- 2. XYZ Rotary, Undermount – 300x300x150





# Servo Cylinder

## Single Axis Actuator With Motor and Drive/Controller



# TC100 Closed Loop Stepper

The same controller is used for various actuator product lines  
Can connect EtherCAT with the help of Gateways





# XC100 DC Servo Controller



The same controller is used for various actuator product lines  
Can connect EtherCAT with the help of Gateways



## Reduce Noise



Line Driver / Open Collector  
The separate pin design of LD & OC helps to reduce the external noise.

## Wiring Saving network



# TOYO Single UI Interface functions



**自動運轉:**  
Automatic operation  
執行已選定的點位置作動。  
Proceed with the selected position points automatically.

**手動運轉:**  
Manual operation  
執行已選定的點位置中的座標及速度, 適合點教時確認用。  
Proceed with the selected position points automatically.(suggest to use when confirming the teaching)

**執行點位:**  
Operating point  
顯示目前執行的點位置。  
Display current position point

**手動操作:**  
Manual Operation  
執行定量距離移動或定速速度移動。  
Proceed with JOGGING and INCHING

**功能頁面選擇:**  
Function page selection  
本區為選擇主要設定區;"點位置"、"監測"、"參數"等。  
To select the setting of position points, monitoring and parameters.

**輸出監控區:**  
Output monitoring  
主要顯示控制器目前的OUT及錯誤狀態。  
Display current output from controller and alarm status.

The screenshot displays the TOYO Single UI interface with several key components highlighted by red boxes and arrows:

- Navigation Panel (Left):** Includes buttons for Position, Monitor, and Parameter. A red box highlights the Position button, which is linked to the 'Automatic operation' and 'Manual operation' text blocks.
- Operation Mode (Top Center):** Shows 'Servo / Home operation' and 'Servo status'. A red box highlights the 'Servo ON' power button, which is linked to the 'Automatic operation' and 'Manual operation' text blocks.
- Simulation Display (Top Right):** Shows 'Current position(mm)' as 0.00. A red box highlights this area, which is linked to the '執行點位' text block.
- Manual Operation Controls (Bottom Right):** Includes 'Automatic operation' (START) and 'Manual operation' (TEACH) buttons. A red box highlights these buttons, which are linked to the '手動操作' text block.
- Manual Operation Parameters (Bottom Right):** Includes 'Quantitative distance' (0.01 mm) and 'Fixed Speed (Start speed 0%)' (50%). A red box highlights these parameters, which are linked to the '手動操作' text block.
- Output Monitoring (Left Side):** A red box highlights the 'Output monitoring' section, which is linked to the '輸出監控區' text block.
- Information Data Sheet (Bottom):** A table showing operation data for various points.

Point List	Operation Mode	Moving coordinate(mm)	Moving speed(%) [0~100]	Torque limit(X 0.1%) [1~1000]	The bottom limit of interval range(mm)	The upper limit of interval range(mm)	Next operating number[-1, 1~127]
001	04:CLOSE-R	0.00	100	1000	4.00	6.00	2
002	05:OPEN	0.00	20	500	0.00	0.00	1
003	02:ABS-T	12.00	5	300	0.00	0.00	-1
004	02:ABS-T	0.00	5	300	0.00	0.00	-1
005	03:CLOSE	0.00	5	1000	0.00	0.00	-1
006	03:CLOSE	0.00	5	500	0.00	0.00	-1
007	01:INC-T	0.00	5	1000	0.00	0.00	-1
008	01:INC-T	0.00	5	1000	0.00	0.00	-1
009	01:INC-T	0.00	5	1000	0.00	0.00	-1
010	01:INC-T	0.00	5	1000	0.00	0.00	-1
011	02:ABS-T	12.00	100	1000	0.00	0.00	12
012	02:ABS-T	0.00	100	1000	0.00	0.00	11



伺服/原點操作:  
SERVO/ORG control

控制伺服(ON/OFF)、原點復歸、減速停止及警報重置。

Control servo ON or OFF, returning to the ORG, deceleration, stop and alarm reset.

模擬顯示:

Simulation display

模擬目前連接硬體的動作。

Simulate the movement of current hardware

目前位置:

Current position

顯示目前硬體的所在位置。

Display the current position

點位設定表單:

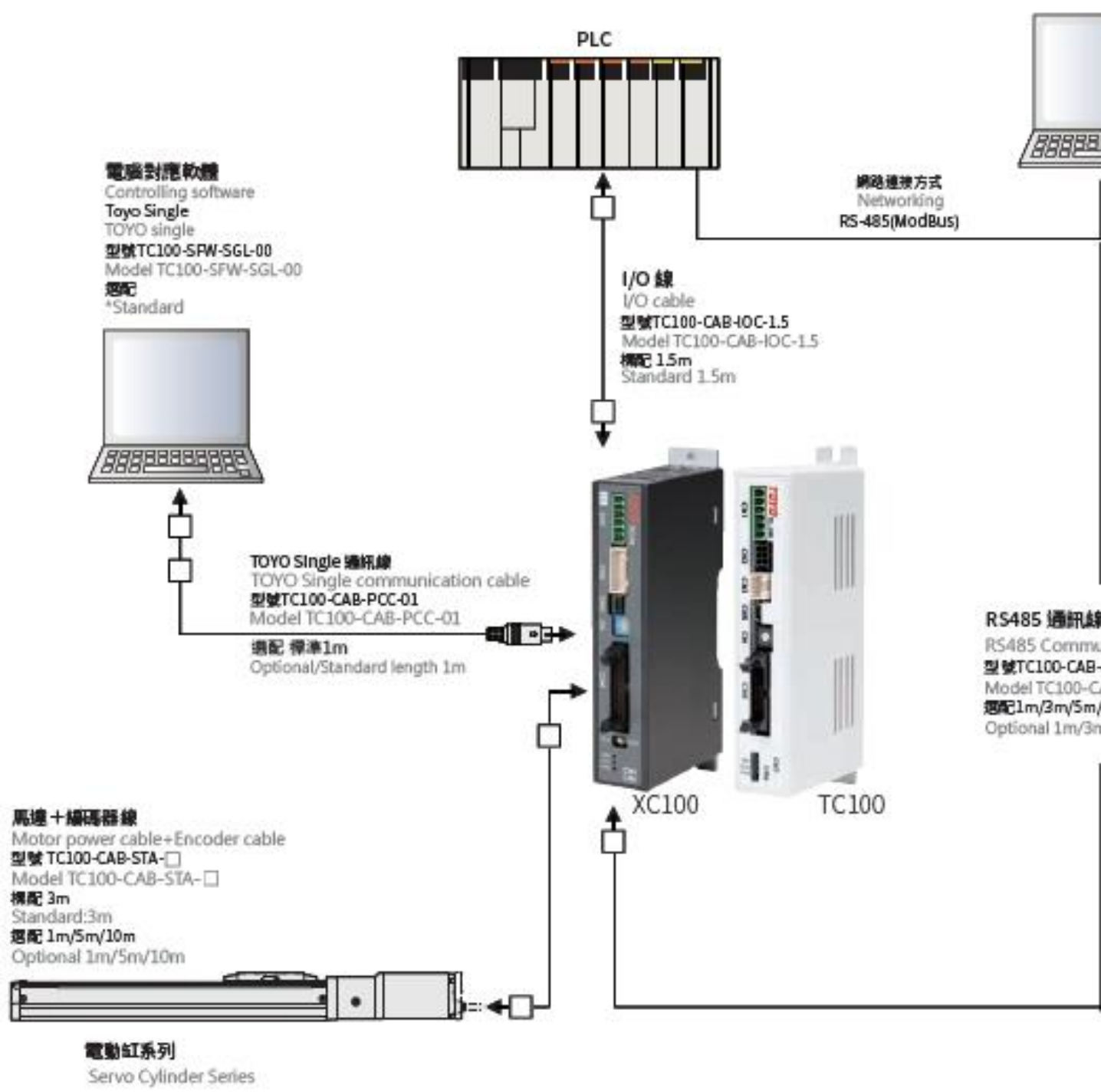
Position point list

設定點位的移動模式、速度、扭力、等待時間、下一步序。

Set position point moving mode, speed, torque, dwell time and next step.

Point List	Operation Mode	Moving coordinate(mm)	Moving speed(%)	Torque limit(X 0.1N/51-1000)	The bottom limit of interval range(mm)	The upper limit of interval range(mm)	Next operating number(1-127)
001	04:CLOSE-R	0.00	100	1000	4.00	6.00	2
002	05:OPEN	0.00	20	500	0.00	0.00	1
003	02:ABS-T	12.00	5	300	0.00	0.00	-1
004	02:ABS-T	0.00	5	300	0.00	0.00	-1
005	03:CLOSE	0.00	5	1000	0.00	0.00	-1
006	03:CLOSE	0.00	5	500	0.00	0.00	-1
007	01:INC-T	0.00	5	1000	0.00	0.00	-1
008	01:INC-T	0.00	5	1000	0.00	0.00	-1
009	01:INC-T	0.00	5	1000	0.00	0.00	-1
010	01:INC-T	0.00	5	1000	0.00	0.00	-1
011	02:ABS-T	12.00	100	1000	0.00	0.00	12
012	02:ABS-T	0.00	100	1000	0.00	0.00	11

# One single unit can support 3 different control interfaces.



Control Mode	Function	Note
Pulse control	✓ Line Drive(200K Hz)	✳
	✓ Open collector(60K Hz)	
	✓ Encoder expanded output module	Enable closed-loop control
I/O control	✓ 127 positioning points	
Communication control	✓ Modbus-RS485	Max.16 axis
	✓ mini USB	for TOYO-Single



# RS485 serial connection instructions



## Possible to connect 16 actuators via RS-485

### Optional

RS - 485通訊用RJ- 45 網路線(平行線)  
RJ-45 cable for RS-485 connections



型式 Model	TC100-CAB-485-□
□	線長 Cable Length
01	1m
03	3m
05	5m
10	10m



最多可控制16台  
The maximum number of connecting unit is 16.

# CGTH/Y G-Series With Stepper Motor

- Same performance characteristics as the GTH/Y but add the C for Closed Loop Stepper
- Frame size 4 & 5





# DGTH/Y

## G-Series with Direct Drive DC Servo Motor

### DGTH Built-in guideway Robot

High rigidity, easy assembly and maintenance

- Servo Motor
- Max.Stroke  
800mm
- Max.Speed  
1000mm/s
- Max.Payload  
20Kg
- Position  
127 points
- Controller  
XC100
- Input Power  
DC24V



Status indicates light make monitoring easily and quickly.

**Servo motor applied. None coupling design.**



- Total length shortened.
- High position accuracy.
- Outstanding speed response performance.



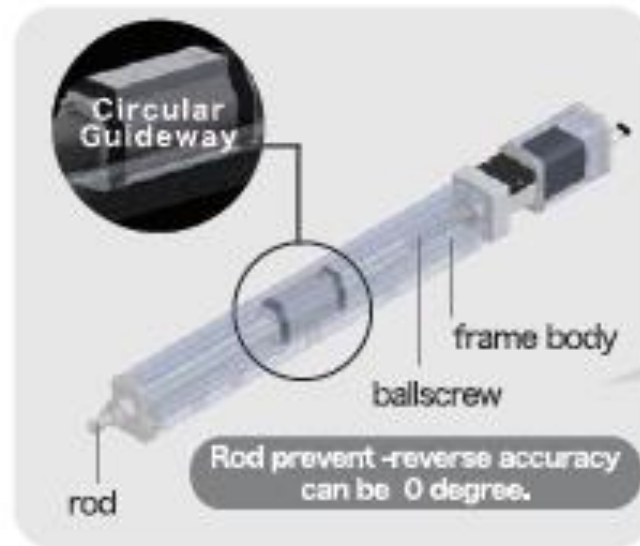
### DGTY Rod Type Built-in guideway Robot

Innovative structure, speed greatly improved

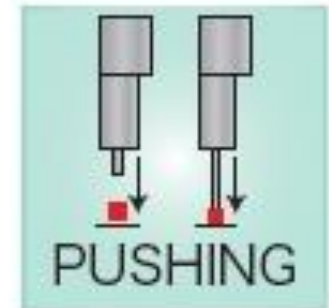
- Servo Motor
- Max.Stroke  
600mm
- Max.Speed  
1000mm/s
- Max.Payload  
342N
- Position  
127 points
- Controller  
XC100
- Input Power  
DC24V



Status indicates light make monitoring easily and quickly.



**Rigidity improved!**



# DM & CS Short Stroke Stages

- Ballscrew driven stages with 30 to 100mm of stroke
- Up to 466N of thrust
  - Good horizontal and moment load capacity with linear bearing guides
  - 20kg load capacity
- Up to 600mm/s
- DM uses DC servo motor
- CS uses closed loop stepper
- Similar pneumatic form factors
- Good for compact Z axis applications

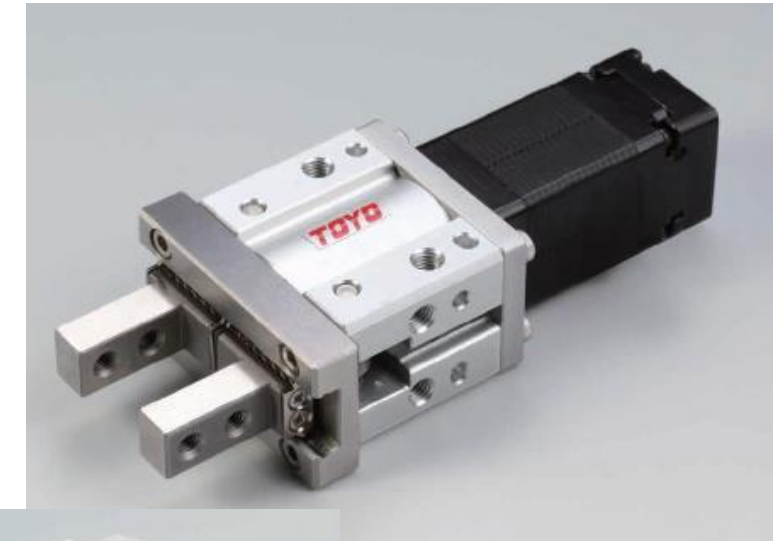




# Grippers



- Speed and acceleration control
- Multi position control
- Gripping force control
- Measuring workpiece check function
  - Go No-Go function
- Communication format is open Flexible control
- Gripper software can alert you if it fails to pick up the work or if it drops the workpiece



# CHZ Grippers Lead Screw & Linkage Type



- Lowest Cost – easily replace pneumatic grippers
- 2 frame sizes
- 14mm max stroke
- Maximum gripping force 98N
- Vmax 50mm/sec
- Repeatability +/- 0.02mm

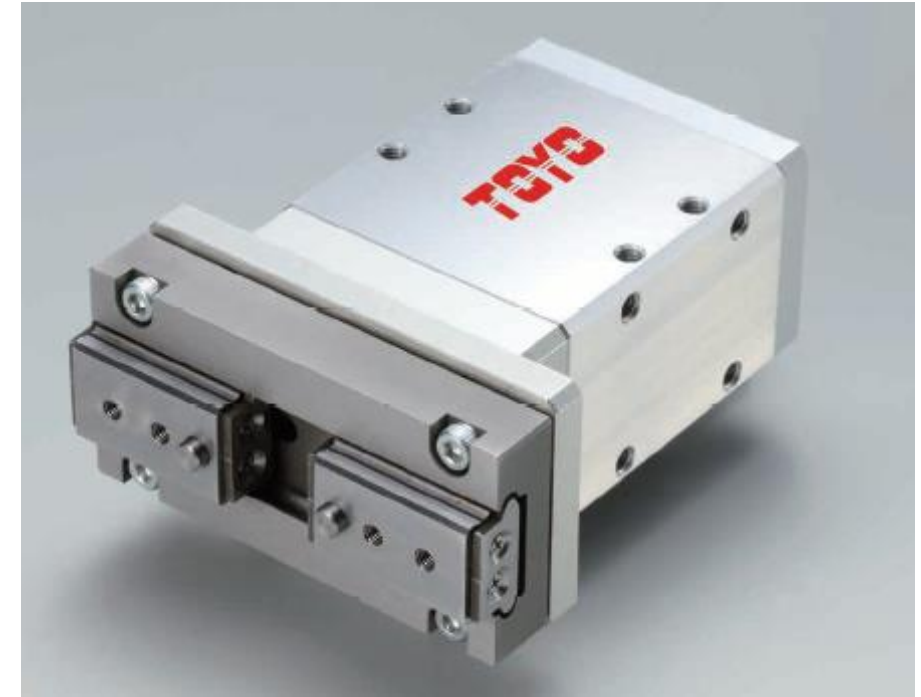




# CHB Grippers Cam Type



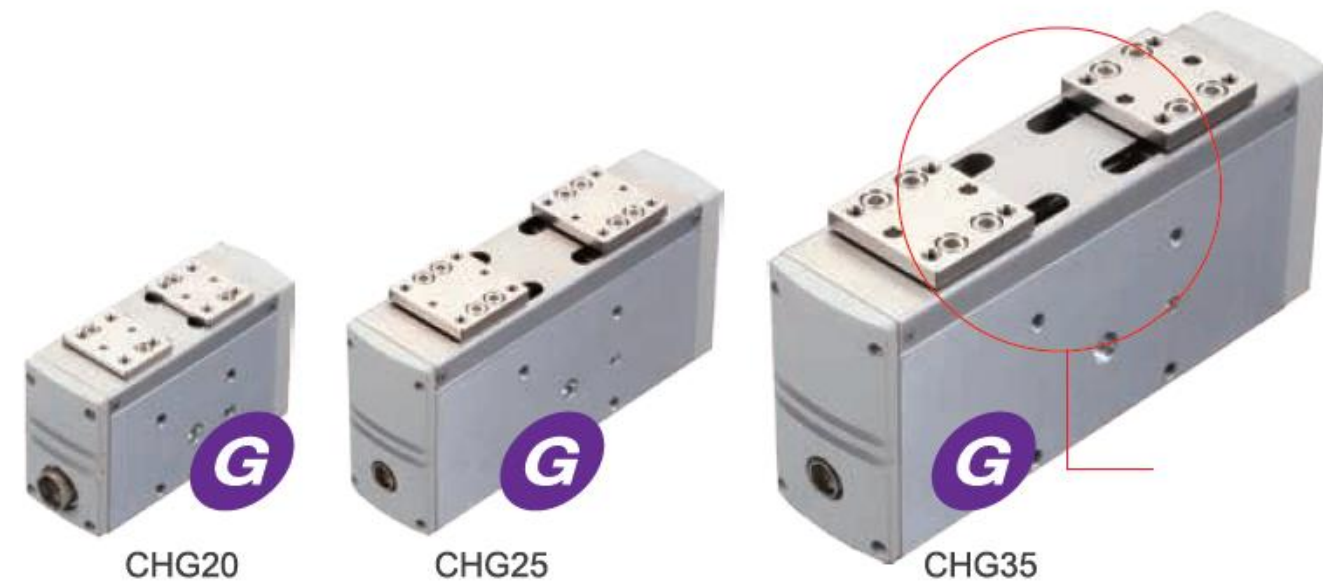
- Small form factor
- Sensitive force control
- 2 frame sizes
- 14mm max stroke
- Maximum gripping force 7N
- Vmax 100mm/sec
- Repeatability +/- 0.02mm



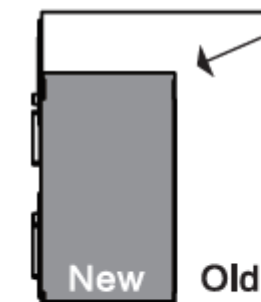
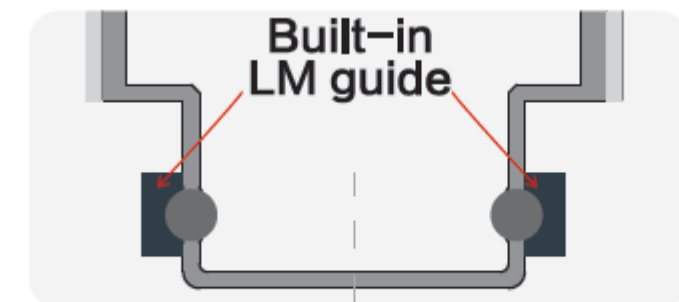
# CHG Grippers Ball screw Type



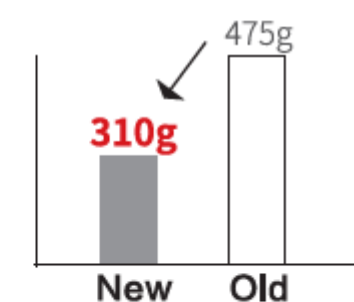
- LH/RH ground ballscrew
- Integrated linear bearings
- Highest load and force performance
- 3 frame sizes
- Vmax 100mm/sec



		CHG20	CHG25	CHG35
gripping force	Max gripping force (N)	100	190	360
	Min gripping force (%N)	20% 20	20% 38	20% 72
	Resolution %	1%		
Stroke range (mm)		0~20	0~40	0~70
Speed (mm/sec)		33	41	91
Repeatability (mm)		±0.01	±0.01	±0.01
Guiding structure		Built-in LM guide		
Max Gripping weight (kg)		1	1.9	3.6
Operating temperature (°c)		0~40°		
Weight of gripper (g)		310	625	1730



● Size 30% smaller  
Compared to CHG20



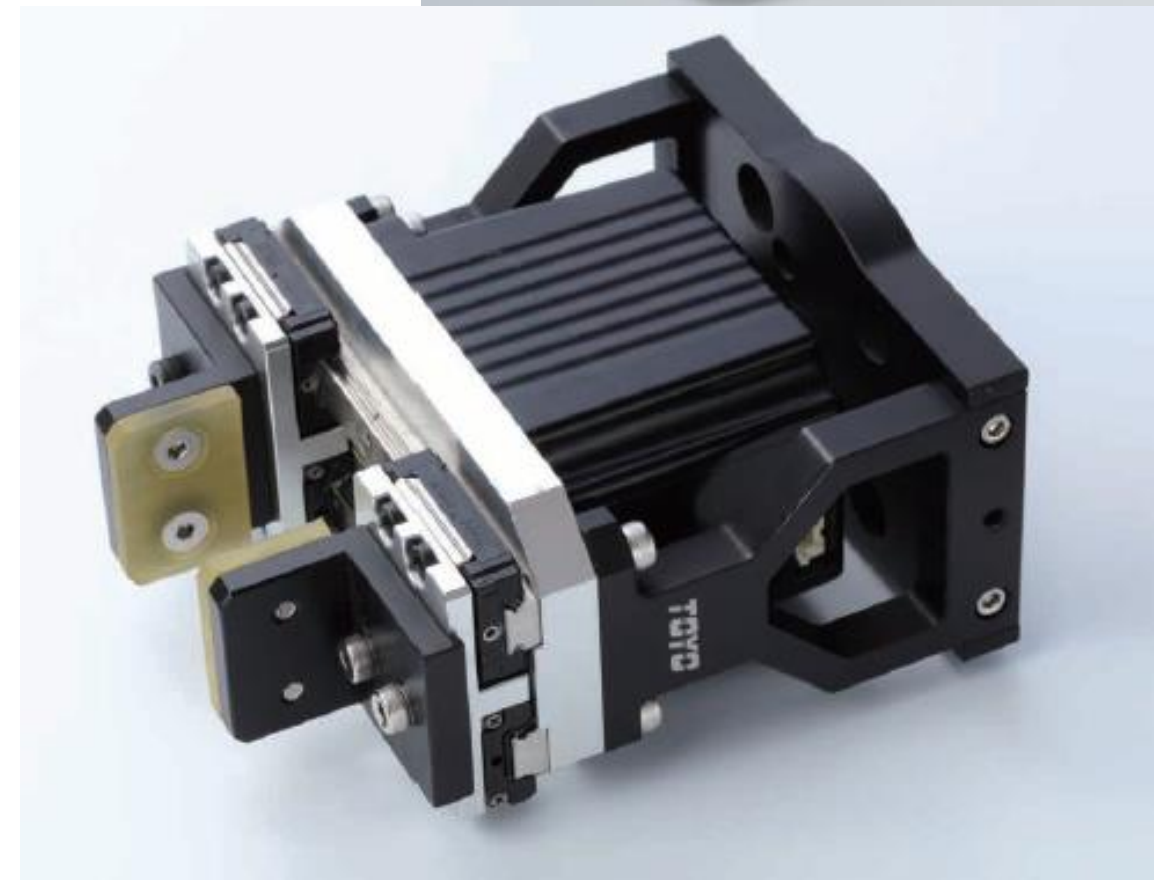
● Weight 20% lighter  
Compared to CHG20



# CHY/CHG2 Grippers

## Built in Controller

- Built in drive/controller
- Designed for Cobots
  - plug and play with Techman
  - Working towards UR+
- Maximum stroke 150 mm with 200mm/s max speed



# Linear Motor Actuator



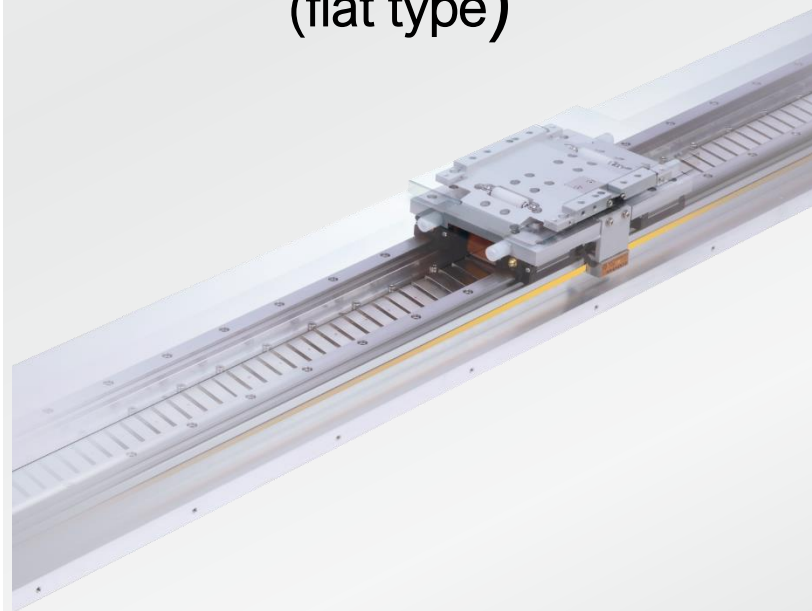


# Types of Linear Motor Actuators



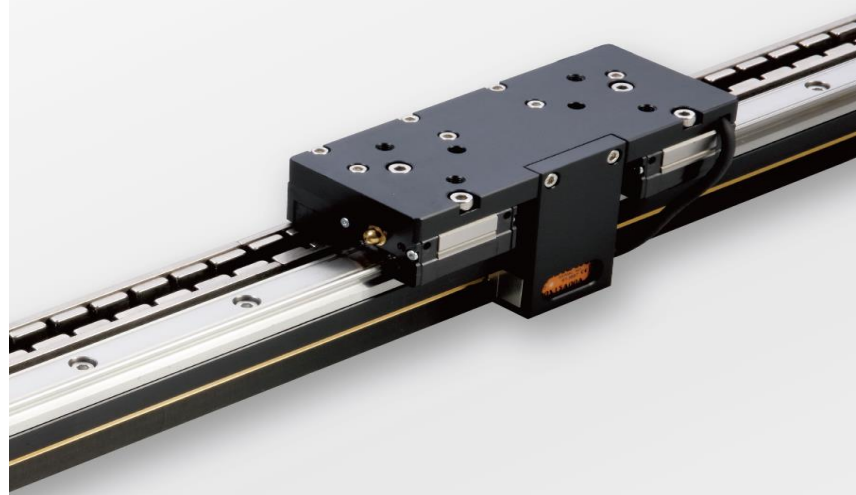
- Toyo manufactures 3 types of linear motor actuators
  - Iron Core – highest thrust and most cost effective
  - Core Less – very smooth, used for scanning and vision applications
  - Shaft Bar – Specific performance advantages due to packaging and heat dissipation

Iron core  
(flat type)



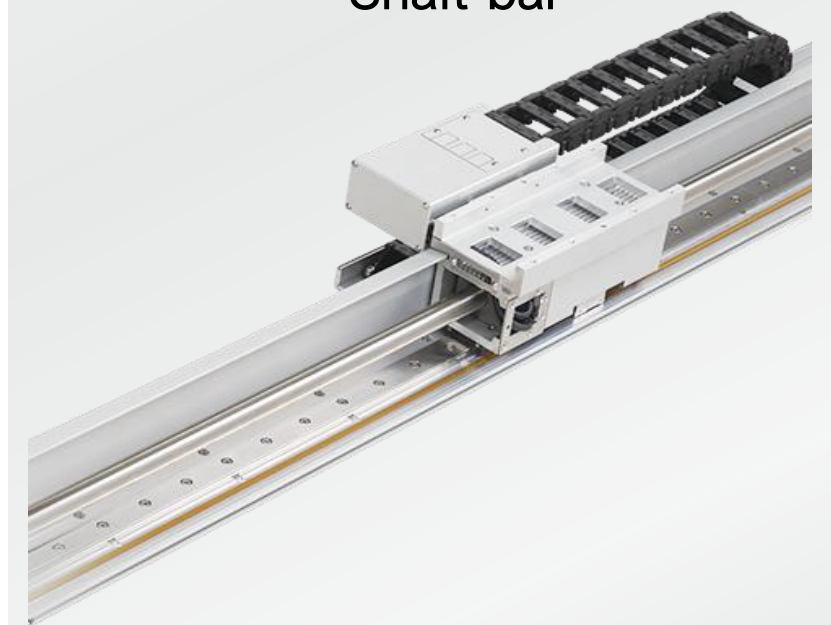
Magnets are a flat track,  
Mover (coil) wound  
inside steel sheet with  
silicon

Core less  
U Type



Magnet is U-shaped,  
Mover (coil) is fixed with  
resin/epoxy glue

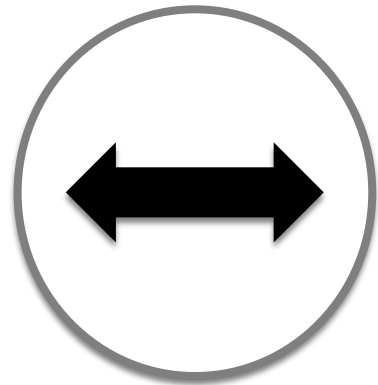
Shaft bar



Magnet stack is a round  
bar type, also a type of  
ironless linear motor



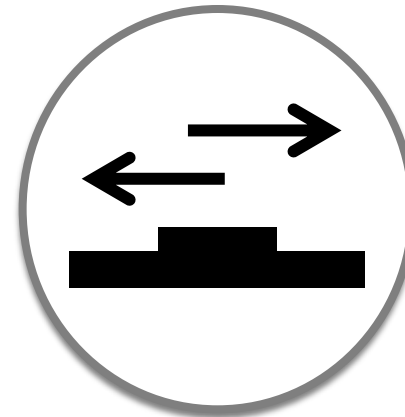
# Linear Motor Performance Specs



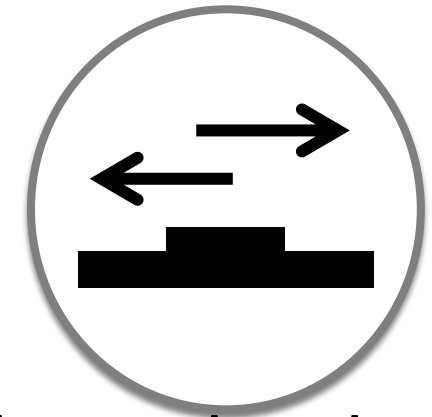
Long Stroke  
8M+



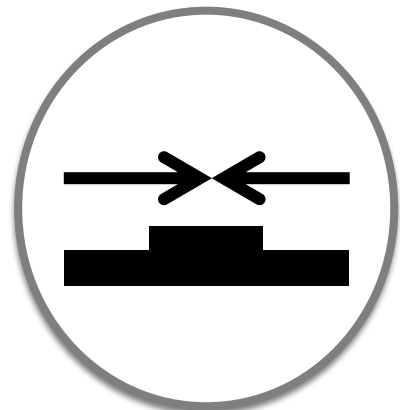
High payload  
120Kg



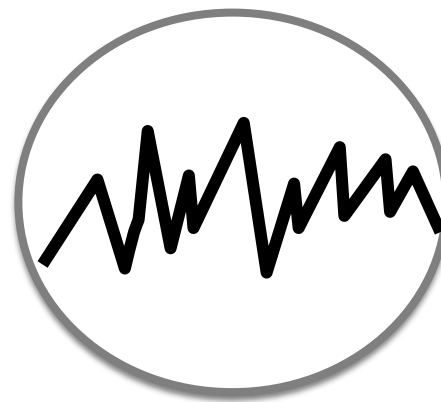
High speed  
3m/sec



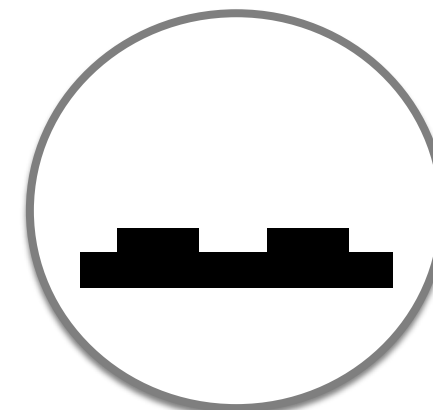
High acceleration and  
deceleration (4G)



High Repeatability  
 $\pm 1\mu\text{m}$



THK Guideway-  
Quite 63dB

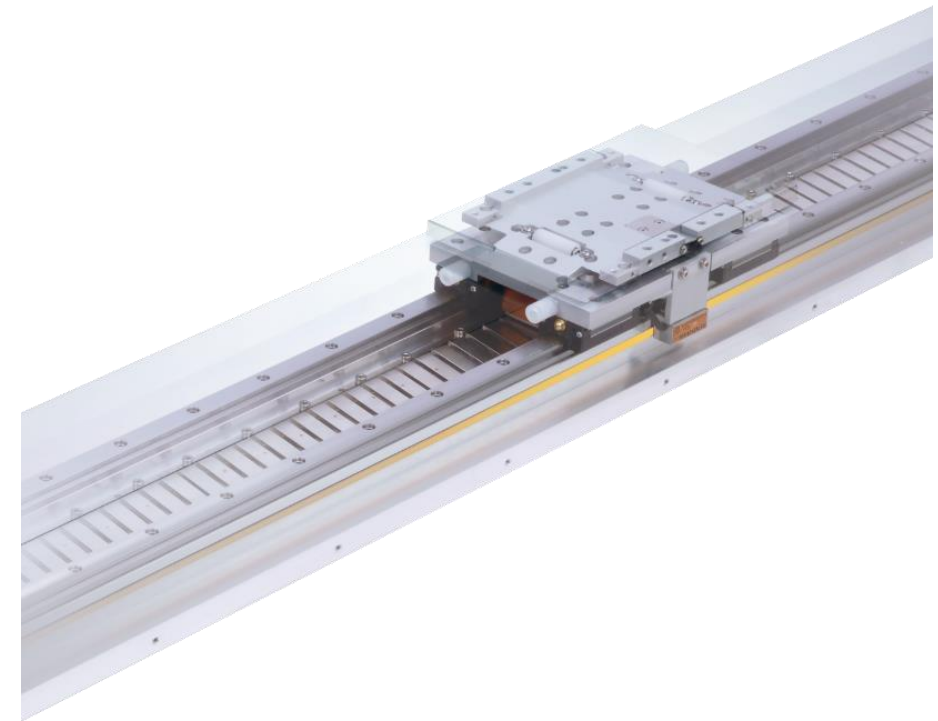


Support  
Multi-slider

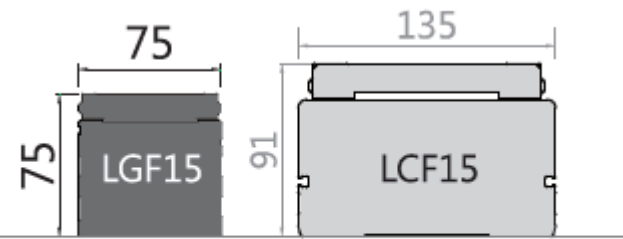
# Iron Core Linear Motor Actuator



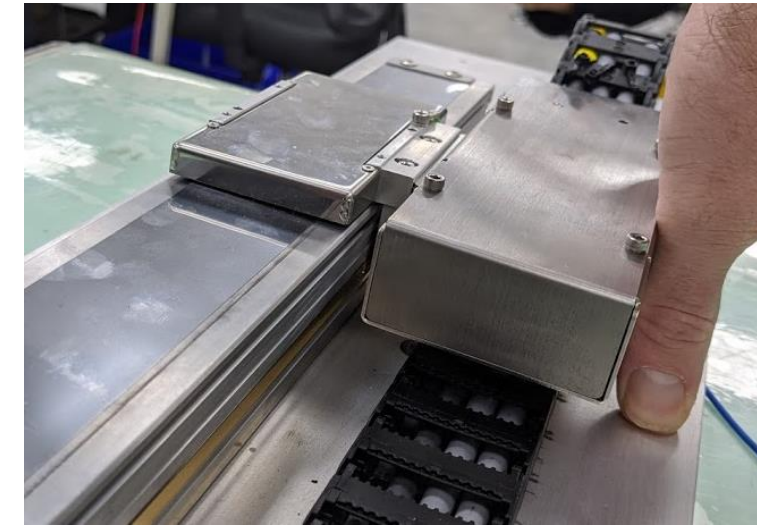
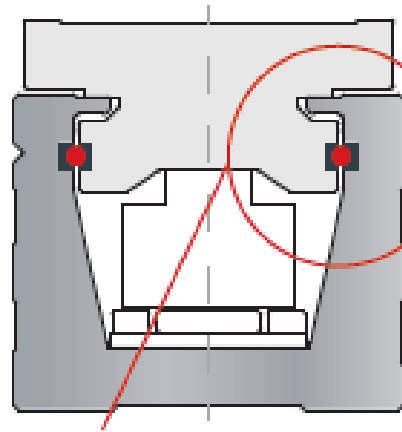
- Highest thrust capacity
- Lowest cost
- Straightness/flatness  $\pm 0.02\text{mm/m}$
- Repeatability  $\pm 1\mu$
- Optical scale or magnetic scale option
- Magnetic scale provides resolution of  $0.001\text{mm}$
- Optical scale provides resolution of  $0.1$  and  $0.5\mu\text{m}$  available
- This is Toyo's primary focus for linear motor actuators



# Iron Core Linear Motor Actuator



**Size 40% smaller in same thrust.**



Standard

## LGW Series

Max. Speed : ~~2500mm/s~~  
 Max. Payload : ~~20Kg~~  
 Max. Stroke : ~~1370mm~~

Standard

## LGF Series

Max. Speed : ~~2500mm/s~~  
 Max. Payload : 20Kg  
 Max. Stroke : ~~1370mm~~

Standard

## LTF Series

Max. Speed : 2500mm/s  
 Max. Payload : 120Kg  
 Max. Stroke : 3080mm

Clean-room

## LCF Series

Max. Speed : 2500mm/s  
 Max. Payload : 120Kg  
 Max. Stroke : 3080mm

Standard

## LAF/LSF Series

Max. Speed : 2500mm/s  
 Max. Payload : 50Kg  
 Max. Stroke : 1600mm

**NEW**



LGF5 = 50x50



LGF15



LTF15 LTF20 LTF30 LTF45 LTF75

Class 10



LCF15 LCF20 LCF30 LCF45 LCF75



LAF7 LAF15 LAF20 LAF30



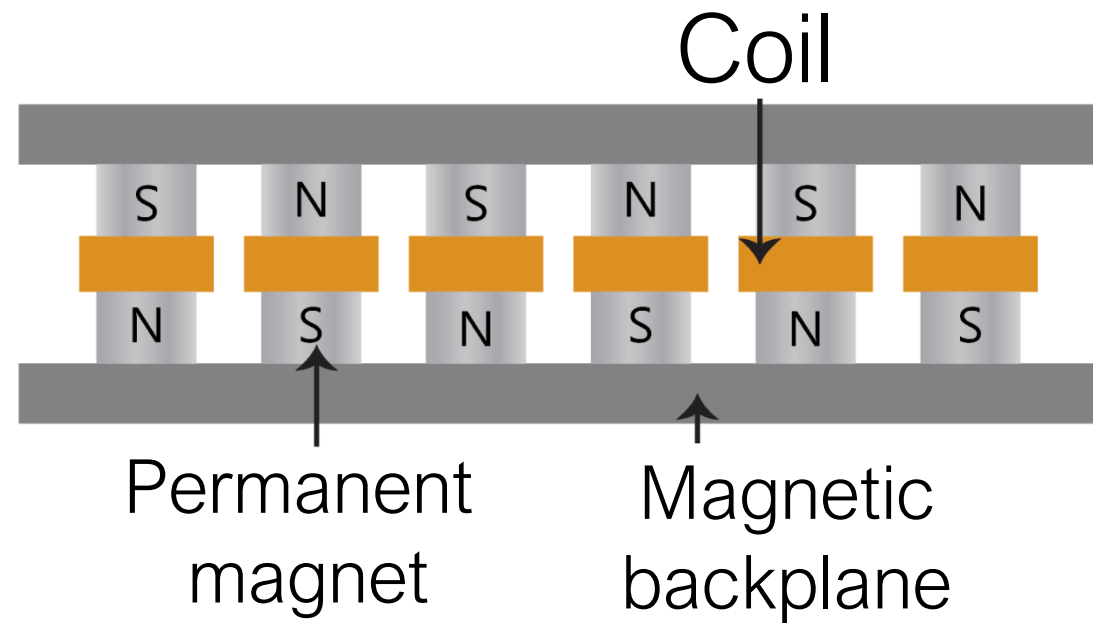
LSF7 LSF15 LSF20 LSF30



# Core less, U Type, LAU



- High accuracy
- Width of body greatly reduced
- High stable speed
- Very smooth motion (no cogging)



Standard

## LAU Series

Max. speed : 2500mm/s

Max. payload : 15Kg

Max. stroke : 1290mm



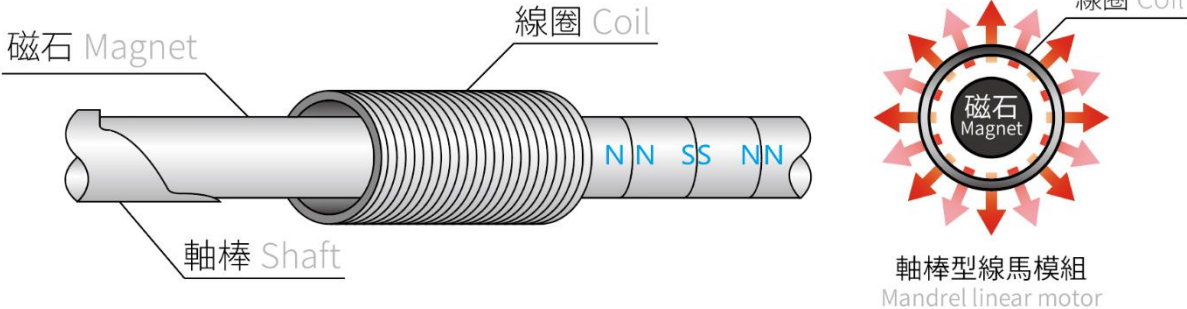
LAU3

LAU5

# Shaft bar, LMR



- High Efficiency Heat Dissipation of the motor
- Tight packaging



standard  
**LMR Series**

Max. speed : 2500mm/s  
Max. payload : 51Kg  
Max. stroke : 1940mm



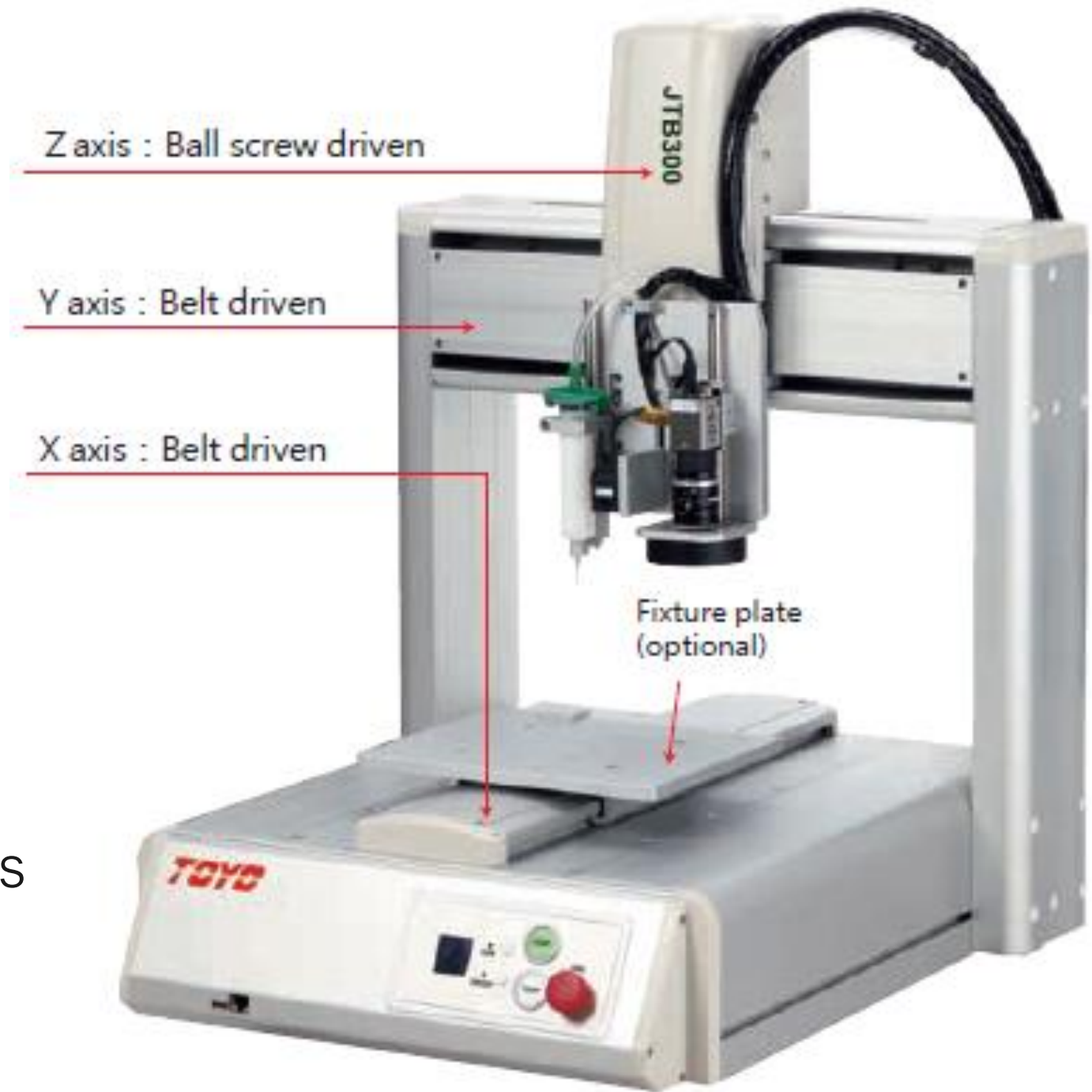
# Desktop Robots





# 3-Axis Series Automated Dispensing Robot !!

- Stepping Motor.
- Max. Stroke -  
X500mm, Y500mm, Z100mm
- Max. Payload-X:15kg, Z:7kg
- Points-30000
- Controller-TSC400
- Input Voltage-AC110V/220V
- Max. Speed is up to 850 mm/s.
- Repeatability  $\pm 0.01$ mm.
- New Type 500D for double X axes to increase production efficiency



Increased Structural Rigidity	Multi Software Functions	Communication Port
Ball Screw is applied in Z axis	Import image file into the software convert to a program is capable.	Input/Output: 16/16
Faster, more precise, with greater structural rigidity for long-term, dependable use; increased stability for	Import DXF file into the software convert to a program is capable.	USB port for programs backup and F/W upgrades
High speed tracking function.	CCD camera adjustment function	Multifunction display
	Editing path and pallet by using software wizard.	COM1/COM2 EMG, Start, Dispense Purge buttons

# Various Dispense Commands

➤ Click the icon of dispensing command to enter the associated command at a numbered address in a program.



➤ Convenient fill-in dispensing functions which allow you to dispense like drawing a picture using only 2 points for a rectangle and 3 points for a circle.





# Exterior and specifications



JTB200

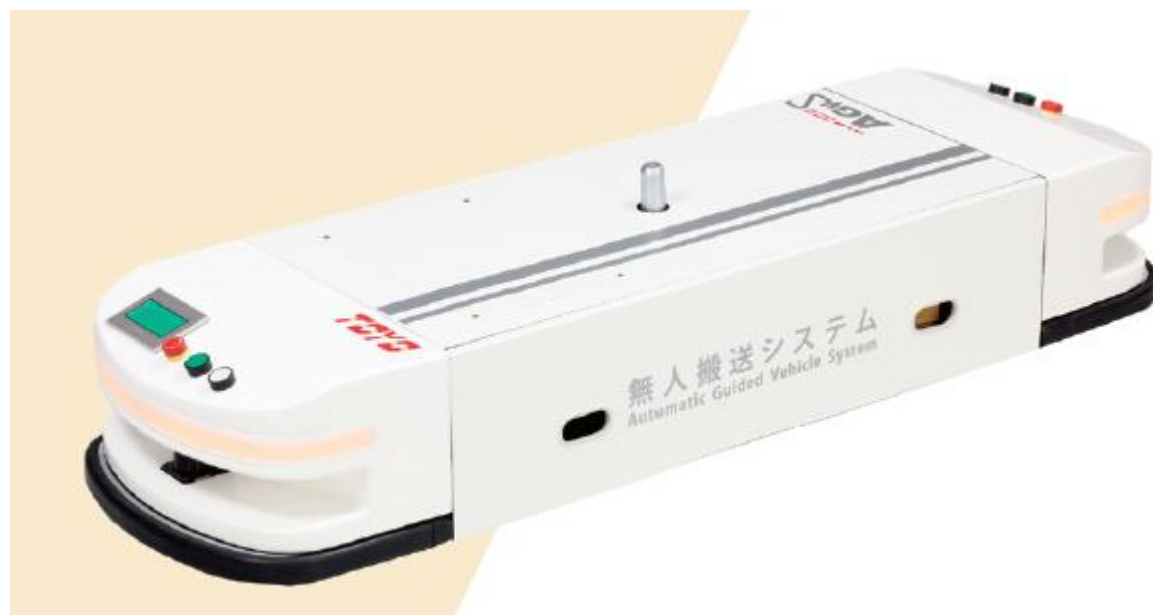
JTB300

JTB400

JTB500 D

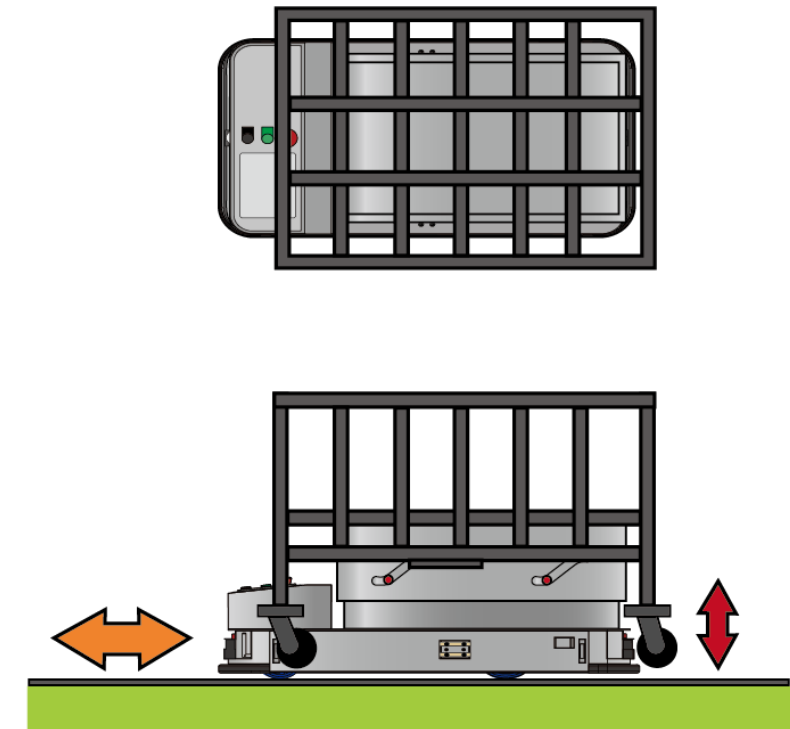
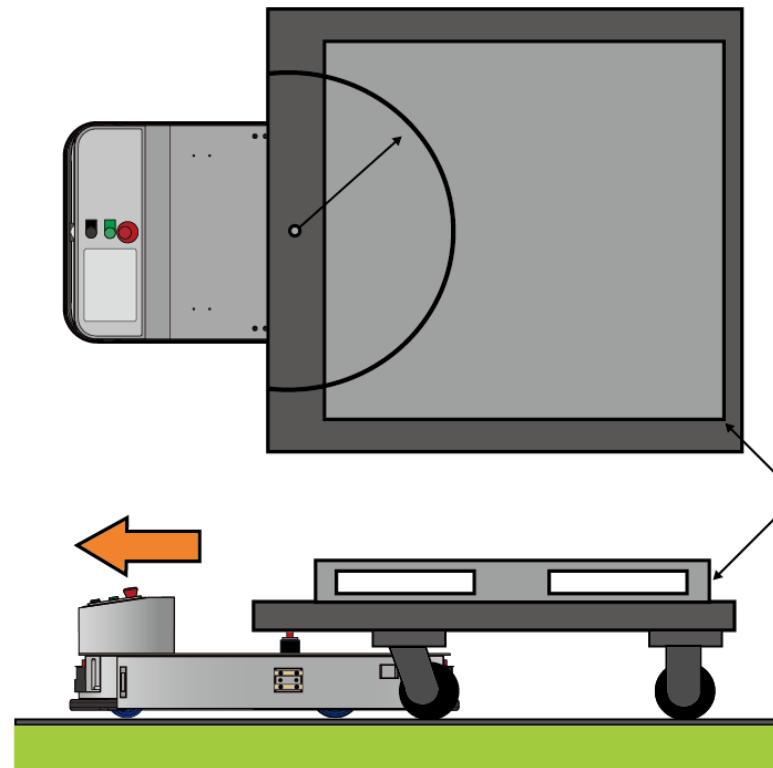
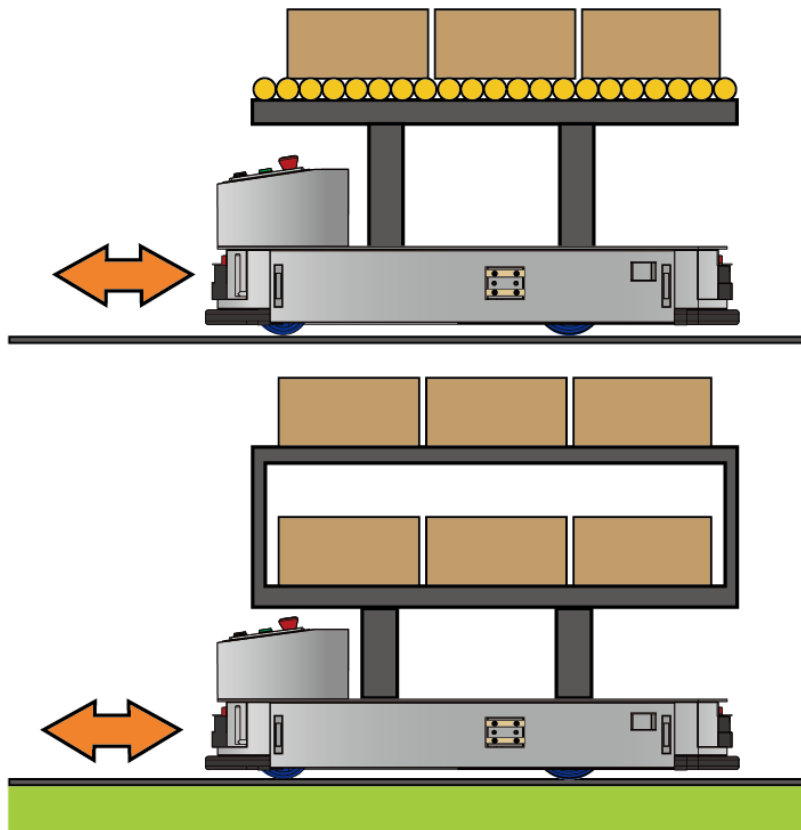
Model			JTB200	JTB300	JTB400	JTB500	JTB500 D
Operating Range	X/Y axis	(mm)	200/200	300/300	400/400	500/500	500/500 (Double X Axes)
	Z axis	(mm)	100	100	100	100	100
Maximum Portable Load	X axis	(kg)	8	15	15	15	X1:10 ; X2:10
	Z axis	(kg)	4	7	7	7	7
Maximum Speed <sup>*1</sup> PTP Movement setting range %	X and Y axes	(mm/s)	700(7~700)	900(9~900)	900(9~900)	900(9~900)	900(9~900)
	Z axis	(mm/s)	250(2.5~250)	400(4~400)	400(4~400)	400(4~400)	400(4~400)
Maximum Speed <sup>*1</sup> CP Movement setting range %	X, Y and Z Synthesized speed	(mm/s)	600(0.1~600)	850(0.1~850)	850(0.1~850)	850(0.1~850)	850(0.1~850)
Repeatability <sup>*2</sup>	X/Y axis	(mm)	±0.01	±0.01	±0.01	±0.01	±0.01
	Z axis	(mm)	±0.01	±0.01	±0.01	±0.01	±0.01
Dimensions/Weight	W×D×H	(mm)	497×454×672	597×554×672	697×654×672	797×754×672	797×754×672
	Weight	(kg)	33	41	51	61	61

# AVG



## 01 Drive kit

# Multi- purpose applications

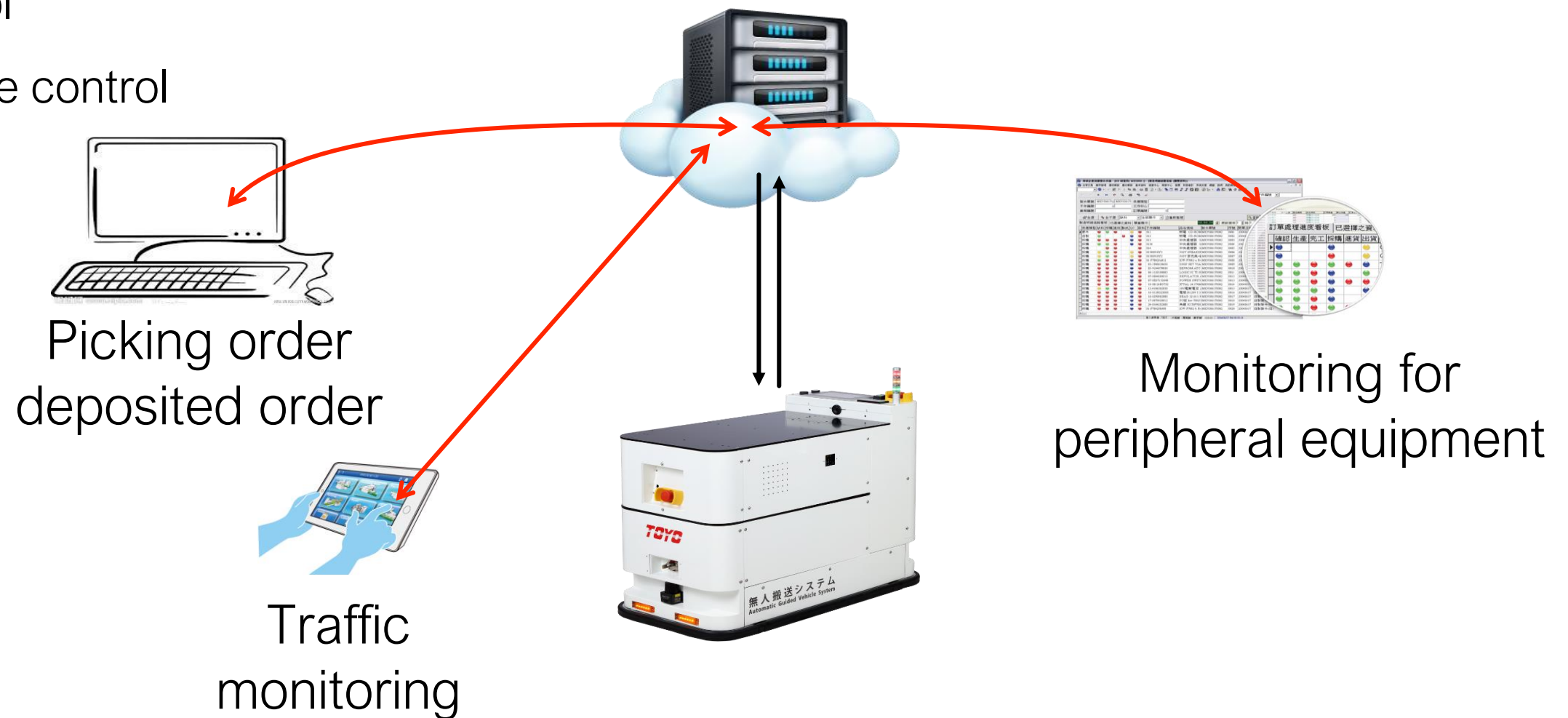




# Operation control and Monitoring

- Dispatch control
- Traffic control
- Crossing control
- Blocking control
- Push out control
- Call in control
- Blocking zone control

## AGV Order & Monitoring



# Route map mode



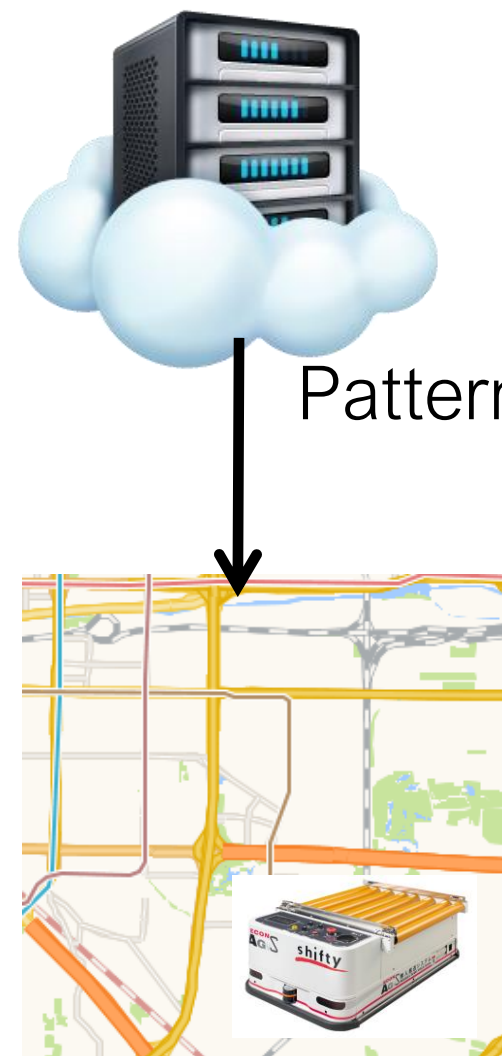
## 1) Local mode

Application field

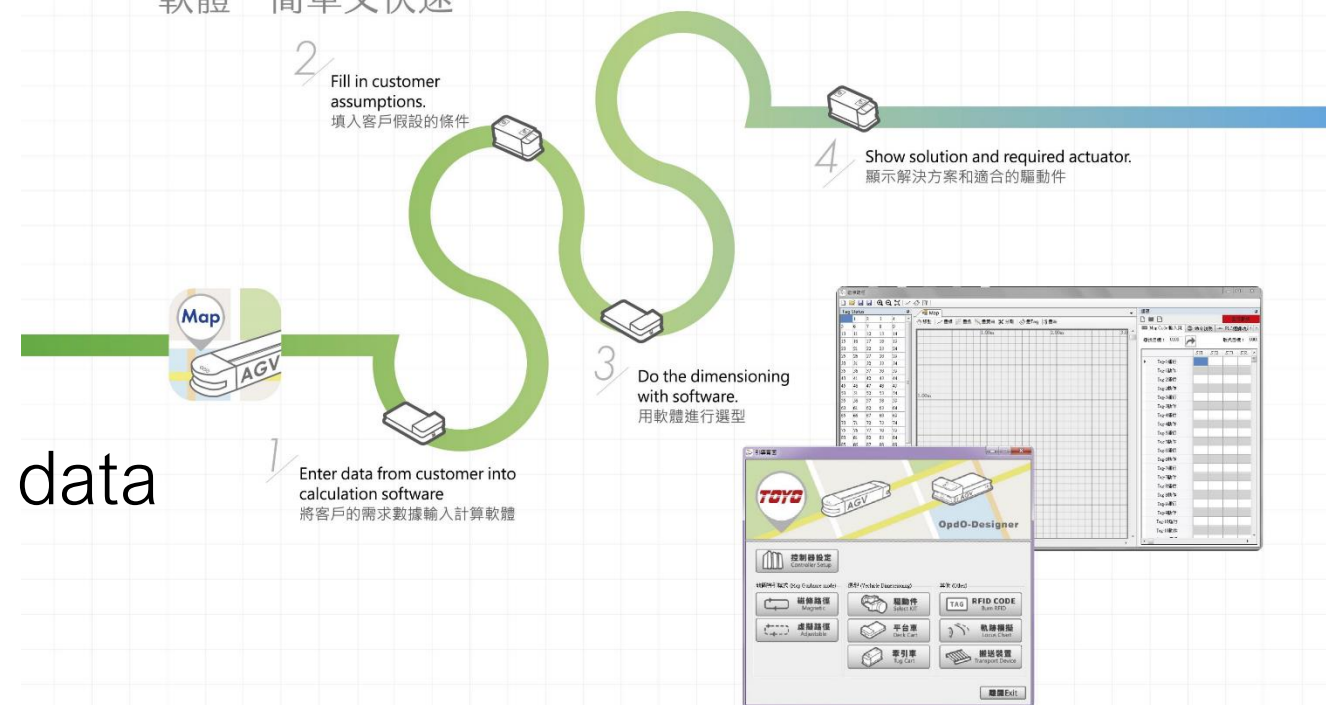


## 2) Cloud mode

Application field  
Flexible production system



Software - easy and fast  
軟體 - 簡單又快速



# Towing AGV



- Each type of design is an ideal
- AGV designed for special manufacturing applications.
- Towing vehicle This is the earliest type and still has many applications. The main function is towing the trailer.
- The main application for this type of AGV is the movement of products taken from or stored in a warehouse.





# Mobile robotics AGV

- This type of AGV is suitable for moving pallets or containers of small workpieces from a storage area to individual workstations; to provide operators with the ability to perform assembly.
- Verification of this type of AGV applications is assembling electronics and small products.
- The 6 Axis Robot is driven by DC electric power, which makes electric power more efficient.



# Carry Cart AGV

- A unit load vehicle has a deck that can be used to support material pallets; and usually has certain types of automated conveyors to transfer or pick up materials.
- It is mainly used in warehouses and regional systems.



# Charge device

## Charging station



## Battery exchange cart



# Charge device



Nominal capacity



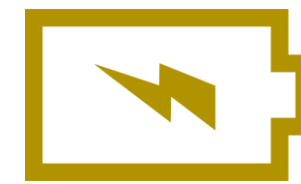
Cycle life



Charge correct



Discharge efficiency



Charging mode



Maintenance mode



Safety



# Drive Kit



## US Series

- One piece design to reduce the body
- Operating maintenance easily, customer can change driven wheel by themselves
- Payload 500 to 1000 Kg.
- speed 30-40m/min
- special spur gearbox.
- Double axis controller



- Upgrade the used room of gearbox in wheel.
- Convenience for installing chassis with special flange design.
- Payload- 500 to 1000Kg
- Speed 50-70m/min
- Planetary gearbox
- Double axis controller