



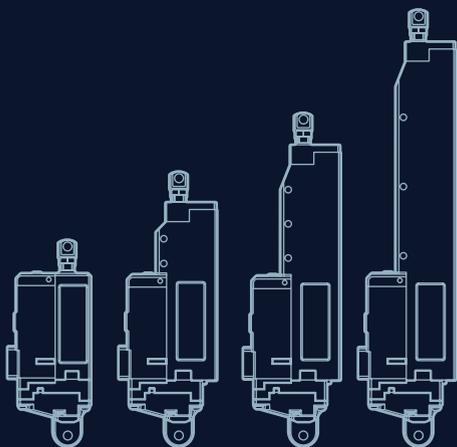
ZAP
MIGHTY
 MINI LINEAR SERVO ACTUATOR

MINI, BUT **MIGHTY**

BENEFITS FOR CORPORATE CUSTOMERS

- ◆ Quantity discount program
- ◆ Customization
- ◆ Instant technical support

Please feel free to contact us for customization.



ZAP
MIGHTY
 MINI LINEAR SERVO ACTUATOR

12Lf Force Control Servo Series

- Built-in Drive, Mini Size
- Current & Speed Control
- Positional Repeatability (30~50 μ m)
- Data Communication & Feedback
- Stroke Option (27 ~ 90mm)
- Rate Load Option (10N ~ 100N)
- Speed Option (7.7 ~ 110mm/sec)

* For 12Lb Feedback Model specifications, refer to the separate specification sheet



SIZE COMPARISON



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ISO 9001:2015
 ISO 14001:2015
 CERTIFIED

OVERVIEW

Introduction

Communication Type | 12Lf Series

- ▶ Position, Current, Speed Control
 - ▶ Built-in drive circuit, position sensor, DC motor and gear box
 - ▶ 12mm diameter heavy-duty 12V DC coreless motor applied (Input voltage range 7~13V)
 - ▶ 27*/40/53/90mm stroke option
 - ▶ Rated Load of 10N ~ 100N according to gear ratio for each stroke
 - ▶ Support RS-485 or TTL / PWM communication
 - ▶ MODBUS RTU or IR Open Protocol
 - ▶ Metal alloy rod applied
 - ▶ Engineering Plastic Case (27mm Stroke)
 - ▶ Aluminum Stroke Case, Engineering Plastic Motor Case (40/53/90mm stroke)
- * Extendable upto 30mm via Manager software



Feedback Type | 12Lb Series

- ▶ Consists of DC motor, gearbox, potentiometer sensor, and other mechanical parts without a drive circuit
- ▶ For advanced users with high degree of freedom to directly control DC motor & potentiometer feedback

STRUCTURE

12Lf/12Lb Series Structure

* Communication Type only

5 strand wires for 12Lb Feedback series

2 Daisy Chain Connectors (Power, communication)*

Motor, gear box and drive circuit (Engineering plastic case)

LED Indicator*

Hinge (Detachable & Rotatable)

Aluminum stroke case (Built-in Potentiometer & Lead screw)

Metal Rod (SUS)

Detachable Rod-End Tip (hole caliber M3.5 / Screw caliber M3)

12Lf Series Stroke Lineup



*The stroke of the 12Lb feedback version is different. To be determined within the potentiometer range by user.

12Lf SERVO SERIES MAIN FEATURES

FORCE CONTROL



- Stall Force and current control based on current feedback
- Current feedback allowing detection of objects and obstacles
- Possible to maintain constant force for a certain time (Applicable to Gripper, etc.)

PRECISION POSITION & DYNAMIC SPEED CONTROL



- 30-50 μ m Unidirectional repeatability & Position feedback (Varied by each stroke version. See spec chart.)
- Absolute position sensing via Potentiometer (No Homing needed)
- 32Bit Micro controller, 4096 high resolution A/D converter
- 1024 steps dynamic speed control

DURABILITY & SAFETY



- Heavy Duty Reliable 12V coreless motor with 7 ~ 13V input voltage range
- Metal alloy rod
- Engineering plastic case (27mm stroke version)
- Aluminum stroke case & engineering plastic motor case (40 / 53 / 90mm)
- Current control allowing longer life cycle & safer control
- Life-cycle Reference Data is available (Under 50% duty cycle recommended)
- Vertical (Z axis) use is applicable due to mechanical Self-lock (Certain models are not applicable, see the model chart)
- Overload protection by calculation of cumulative current
- LED indicator showing voltage/overload error status

VARIETY AND LINE-UP



- Various Stroke options (27mm*, 40mm, 53mm, 90mm)
- Various Rated Load options (10 to 100N)
- Various Speed options (7.7 to 110mm/s at No load condition)
- Two types of data communication options (TTL or RS-485)
- IR Robot open protocol and Modbus RTU Protocol selectable
- TTL(Data comm.) or PWM(Pulse signal) is automatically recognized in TTL/PWM version
- Custom design available
- 27mm stroke can be extended to 30mm using IR-USB02

EASINESS



- Compact size for space constraints
- Hassle-free, Built-in drive circuitry
- Daisy chain serial connection between actuators
- Various mounting solutions
- Detachable and 90° rotatable hinge design (Patented)
- Various APIs / Libraries / Examples of programming languages (C# / C++ / Python / Java / Raspberry Pi / Arduino / LabView etc.)
- Dedicated PC Software (Parameter setting & simple motion testing) and PC USB Interface (IR-USB02) available (Optional)
- LED indicator for error status & circuit diagnosis
- Compatible with various controller types (PC / PLC / Arduino / Raspberry-Pi / RC Controller / Dedicated embedded board etc.)

MODEL NAME SYSTEM

Model Name System : DMF-LLLCC-SS

FEATURE	OPTIONS
D Diameter	12 12mm diameter motor
M Motor Type	L Coreless
F Function	f force Control Lineup b feedback Lineup
L Load (Rated)	XXX N (Newton)
C Communication	PT PWM & TTL F RS-485
S Stroke*	27 27mm 40 40mm 53 53mm 90 90mm

* For 12Lb Feedback series, stroke to be determined by user within the potentiometer range.

PC SOFTWARE | mightyZAP Total Manager



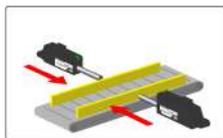
- ▶ Windows compatible mightyZAP manager software
- ▶ Optional PC USB Interface (IR-USB02) required
- ▶ Setting various operation parameters & memory parameters
- ▶ Motion Test and Motion Simulation
- ▶ System reset and Firmware update
- ▶ Real time monitoring (Position, Current, Motor Operating Rate, Voltage)
- ▶ PC software is supposed to be updated from time to time and it is recommended to update user's software properly.

APPLICATION



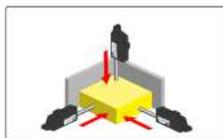
FACTORY AUTOMATION (PRODUCTION & TEST)

- Better Replacement of Pneumatic Cylinder or Solenoid
- Automatic Width Adjustment Conveyer
- Automatic Alignment (Up/Down or Left/Right)
- Automatic Dispensing (Grease, Glue, etc.)
- Stage Control
- Hole Punching / Hole Inspection
- Button/Switch/Lever/Touch Panel Control
- Depth / Thickness Inspection (by Positional Feedback)



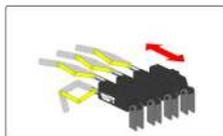
GENERAL USAGE

- Valve Control
- Locking / Clamping
- In & out / Extension & retraction
- Pull & Pushing, Compression
- Open & Closing (On-Off)
- Direction / Angle(Tilt) Control
- Distance / Gap Adjustment
- Hexapod / Tripod movement
- Linear Control in Vending / Game Machine



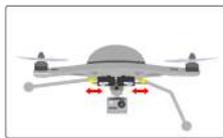
ROBOTICS

- Robot Joints
- Robot Hands
- Robot Grippers
- Rope wire Climbing Robot



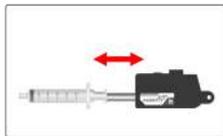
UAV/DRONE/MILITARY

- Fixed wing (Aileron/Elevator/Throttle/Flap/Air Brake/ Rudder)
- Helicopter (Swash Plate Control/Rudder)
- Multicopter (Landing Gear, Dropping Device)
- Linear Control Parts for Military Products



MEDICAL AND LAB EQUIPMENT

- Dispensing Control
- Medical 3D Printer
- Prosthetic Hands / Rehabilitation Equipment
- Medical Devices (HiFU, Fractional RF etc)
- Syringe / Pipette Control (Meso Gun/Filler Injection etc)
- Camera or Laser Focusing / Area Control

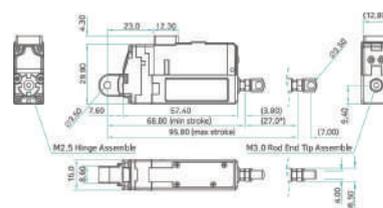


OTHER USAGE

- Educational Maker's DIY Project (Arduino or Raspberry Pi Control)
- Linear Control for Animatronics / Kinetic Art
- Linear Control for Simulation Device / Diorama
- Linear Control for Smart-farm and Fire Protection System

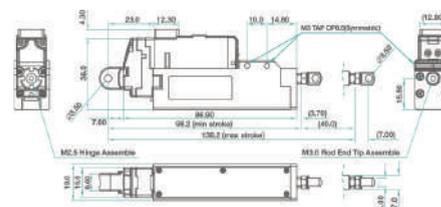
PRODUCT DIMENSION

12LF FORCE CONTROL SERVO ACTUATORS

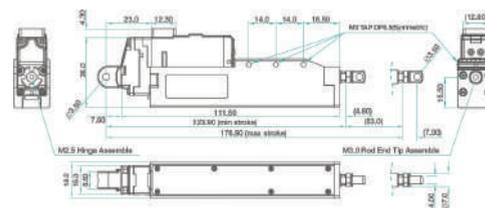


* 27mm stroke can be extended to 30mm using IR-USB02

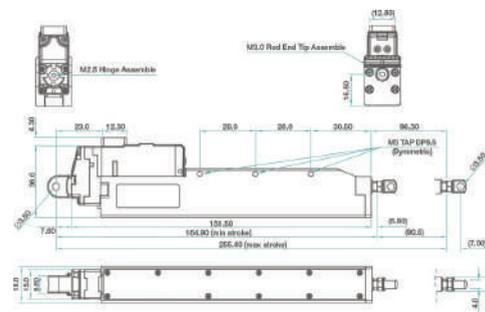
27MM STROKE



40MM STROKE



53MM STROKE



90MM STROKE

*For 12Lb Feedback series, stroke can be varied by users.
Only refer to the size of bodies.

PRODUCT SPECIFICATION

PRODUCT DETAILS SPECIFICATIONS

Rated Load	Stroke*	Communication Type		Feedback Type	Rated Load / Max. Speed (No Load)	Stall Force at Current* (1.6A / 800mA / 100mA)	Mechanical Self Lock (Z axis Availability)	Leadscrew / Gear Ratio / Gear Type	
		RS-485	TTL / PW						
10N	40mm	12Lf-10F-40	12Lf-10PT-40	12Lb-10-45	10N / 110.0mm/s	60N / 40N / 10N	No (Caution : Z axis application)	Lead Angle 20° / 10:1 / Engineering Plastic Gears	
	53mm	12Lf-10F-53	12Lf-10PT-53	12Lb-10-60					
	90mm	12Lf-10F-90	12Lf-10PT-90	12Lb-10-100					
12N	27mm	12Lf-12F-27	12Lf-12PT-27	12Lb-12-30	12N / 110.0mm/s	100N / 60N / 12N		Lead Angle 15° / 10:1 / Engineering Plastic Gears	
17N	40mm	12Lf-17F-40	12Lf-17PT-40	12Lb-17-45	17N / 80.0mm/s	100N / 60N / 17N			
	53mm	12Lf-17F-53	12Lf-17PT-53	12Lb-17-60					
	90mm	12Lf-17F-90	12Lf-17PT-90	12Lb-17-100					
20N	27mm	12Lf-20F-27	12Lf-20PT-27	12Lb-20-30	20N / 80.0mm/s	120N / 72N / 20N		Yes (Z axis Available)	Lead Angle 5° / 10:1 / Engineering Plastic Gears
27N	40mm	12Lf-27F-40	12Lf-27PT-40	12Lb-27-45	27N / 28.0mm/s	160N / 96N / 27N			
	53mm	12Lf-27F-53	12Lf-27PT-53	12Lb-27-60					
	90mm	12Lf-27F-90	12Lf-27PT-90	12Lb-27-100					
35N	27mm	12Lf-35F-27	12Lf-35PT-27	12Lb-35-30	35N / 28.0mm/s	210N / 126N / 35N	Lead Angle 5° / 20:1 / Metal Gears		
42N	40mm	12Lf-42F-40	12Lf-42PT-40	12Lb-42-45	42N / 15.0mm/s	240N / 144N / 42N			
	53mm	12Lf-42F-53	12Lf-42PT-53	12Lb-42-60					
55N	27mm	12Lf-55F-27	12Lf-55PT-27	12Lb-55-30	55N / 15.0mm/s	300N / 180N / 55N	Lead Angle 5° / 50:1 / Metal Gears		
78N	40mm	12Lf-78F-40	12Lf-78PT-40	12Lb-78-45	78N / 7.7mm/s	420N / 252N / 78N			
	53mm	12Lf-78F-53	12Lf-78PT-53	12Lb-78-60					
100N	27mm	12Lf-100F-27	12Lf-100PT-27	12Lb-100-30	100N / 7.7mm/s	600N / 360N / 100N			

* 12Lf communication type actuator's reference data. Please refer to the data sheet for the 12Lb feedback type.

12LF COMMUNICATION TYPE COMMON SPECIFICATION

Positional Accuracy	Stroke		Unidirectional	LED Indication	2 Error Indications (Input voltage, Overload) PWM/TTL(PT version) Molex to Molex Type (Molex 50-37-5033, 3pins) / 200mm length, 0.08x60(22AWG) or RS-485(F version) Molex to Molex Type (Molex 051065-0400, 4pins) / 200mm length, 0.08x60(22AWG)
	27mm / 40mm		0.03mm (30μm)	Wire Harness	
	53mm		0.04mm (40μm)		
Mechanical Backlash	0.03mm (30μm)		0.05mm (50μm)	Data Communication / Protocol	RS-485 (F version) or TTL (PT version) / IR Robot open Protocol / MODBUS RTU Protocol
Motor Type / Voltage / Watt	Coreless Motor / 12V / 26W			Pulse Signal / Pulse Range	PWM (PT version, Used in RC hobby) / 900μs(Retracted) ~ 2100μs(Extended)
Current Accuracy	±15% at Over 50mA			Operating Temperature	-10°C ~ 60°C
Position Sensor	10KΩ linear Potentiometer			Ingress Protection	IP-54 (Dust & Water Tight)
Input Voltage Range	7 ~ 13V			Audible Noise	Approx. 50db at 1m
Applicable Max Load	Up to twice the rated load / Set the duty rate to 20% or less			Size / Weight (Excluding rod-end & hinge)	27mm 57.4(L)x29.9(W)x15(H)mm / 49-52g 40mm 86.9(L)x36(W)x18(H)mm / 96-99g 53mm 111.5(L)x36(W)x18(H)mm / 124-127g 96mm 151.5(L)x36(W)x18(H)mm / Approx. 177g
Recommend Duty Cycle	At Rated Load		At Applicable Max Load		
	Max 50%		Max 20%		
Current Consumption	Idle	Rated	Max (Stall)		
	20mA	380mA	Default	Max	
			800mA	1.6A	

CONTROL SOLUTION

* The mightyZAP actuators are compatible with various controllers such as PC, PLC, and Embedded system.

PC USB INTERFACE IR-USB02

The IR-USB02 is the interface board which connects mightyZAP servo with mightyZAP manager software on user's PC for various tasks shown below.

- Operation parameters and memory parameter setting
- Simple motion test
- System reset and Firmware update
- Voltage, Load, Temperature, Present position monitoring



RASPBERRY PI HAT (HARDWARE ATTACHED ON TOP) IR-STS02

- Raspberry Pi HAT (add-On board) which is compatible with Raspberry Pi B3 or Raspberry Pi Zero
- TTL/RS-485/PWM communication interface, power connector and GPIO pins provided
- Python API and library available



EZ CONTROLLER IR-CT01

- Arduino based mightyZAP controller/tester for customers who do not have their own controller
- Built-in basic control program, User programmable (Arduino API and library available)
- Built-in position setting dials, position command button switches and position command slide
- Also controllable through external switch or voltage level signal 6 x I/O pins for analog/digital sensor connection
- External communication terminal for Bluetooth or Zigbee communication



SERVO TESTER SHIELD IR-STS01

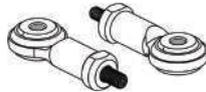
- Arduino servo tester shield for mightyZAP
- Control mightyZAP servo motions without PC software
- Delivered with Arduino Leonardo Board
- Arduino API & libraries available



MOUNTING SOLUTION & ROD-END TIPS

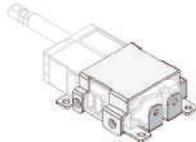
END BEARING IR-EB01

- Rod end-bearings for most optimal installation
- Two end bearings (M3 and M2.5) to be packed in a set. (on the Rod-end(M3) and on the end of mightyZAP case (M2.5))



METAL BRACKET IR-MB02

- Lateral mounting bracket for 26/27mm stroke mightyZAPs.
- Drawing available from the website.



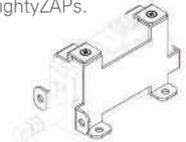
METAL BRACKET IR-MB03

- Mounting bracket for 40 to 96mm stroke mightyZAPs.
- Both lateral & vertical mounting available
- Drawing available from the website
- 40 to 96mm stroke line-up can be installed through the tapped holes of the body without bracket, but IR-MB03 offers better installation freedom.



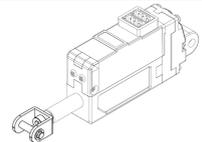
METAL BRACKET IR-MB04

- Vertical mounting bracket 26/27mm stroke mightyZAPs.
- Drawing available from the website.



U TYPE ROD-END BRACKET IR-MC05

- U Type bracket for all strokes versions (used with the standard hinge)
- Easy to adjust installation angle
- Drawing available from the website.



ROD-END GRIP TIP IR-GT01

- The Rod-End Grip tip to prevent physical damage to the application object or improve grip force.
- 3 types different shape rubber / silicone pads with 1 metal flat end tip (M3).

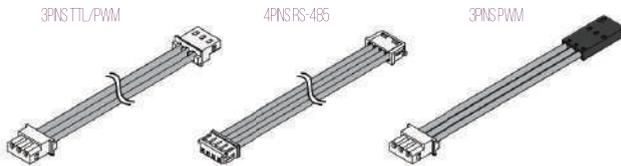


Wire Harness & ETC

EXTENSION WIRE IR-EW01~10

We offer extension wires as below for your application (0.08x60(22AWG))

- IR-EW01 1,000mm length / 3pins TTL/PWM / Molex connectors (50-37-5033)
- IR-EW02 2,000mm length / 3pins TTL/PWM / Molex connectors (50-37-5033)
- IR-EW03 2,000mm length / 4pins RS-485 / Molex connectors (51065-0400)
- IR-EW04 4,000mm length / 4pins RS-485 / Molex connectors (51065-0400)
- IR-EW05 200mm length / 3pins TTL/PWM (5pcs in a set) / Molex connectors (50-37-5033)
- IR-EW06 200mm length / 3pins PWM (5pcs in a set) / Molex to S02 connectors (for R/C Hobby, Arduino)
- IR-EW07 200mm length / 4pins RS-485 (5pcs in a set) / Molex connectors (51065-0400)
- IR-EW08 500mm length / 3pins TTL/PWM / Molex connectors (50-37-5033)
- IR-EW09 500mm length / 4pins RS-485 / Molex connectors (51065-0400)
- IR-EW10 1,000mm length / 4pins RS-485 / Molex connectors (51065-0400)



TTL/PWM MOLEX CONNECTOR 10 HOUSINGS & 30 TERMINALS (BULK) (IR-MC02)

- TTL/PWM Molex Connector 10 Housings & 30 Terminals (Bulk) Molex connector/housing set for our actuators for the customers who need to make their own wire harness with the experience in assembling cables. Molex 3P TTL Male Housing 05037-5033 : 10pcs
- Molex 3P TTL Male Terminal 00870-1039 : 30pcs
- Cable Crimper is required. Pay close attention not to make mis-wiring or contact failure.



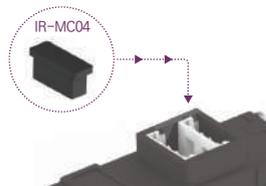
RS-485 MOLEX CONNECTOR 10 HOUSINGS & 40 TERMINALS (BULK) (IR-MC03)

- RS-485 Molex Connector 10 Housings & 40 Terminals (Bulk) Molex connector/housing set for our actuators for the customers who need to make their own wire harness with the experience in assembling cables. Molex 4P RS-485 Male Housing 51065-0400 : 10pcs
- Molex 4P RS-485 Male Terminal 50212-8000 : 40pcs
- Cable Crimper is required. Pay close attention not to make mis-wiring or contact failure



CONNECTOR RUBBER CAP (IR-MC04)

- Connector Rubber Caps, 10pcs in a set
- Available for 3pin, 4pin connectors



POWER GENDER JACK

The IR-AG01 is a power gender jack between AC/DC adapter power jack and power terminal on our various control boards



Please check if the jack of the adapter you have meets the size specification below.

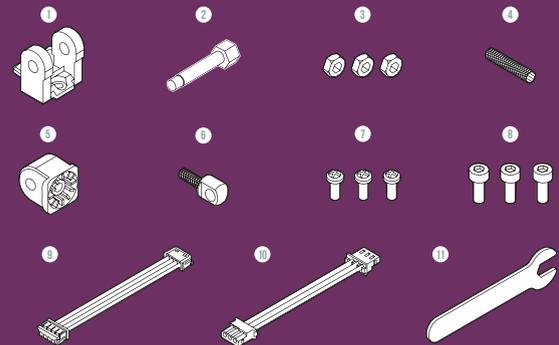
This product is supposed to be assembled by the customer referring to the assembly manual.

- Outer diameter 5.5mm
- Inner diameter 2.1mm
- Maximum allowable current : 7.5A
- Input voltage : 12V
- EC381V terminal block applied

CONTROL BOARDS THAT CAN BE USED WITH IR-AG01

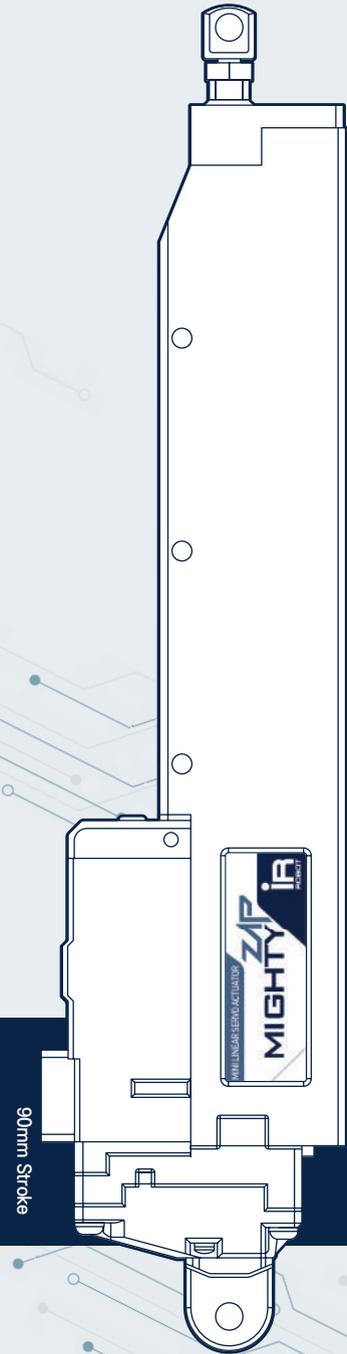
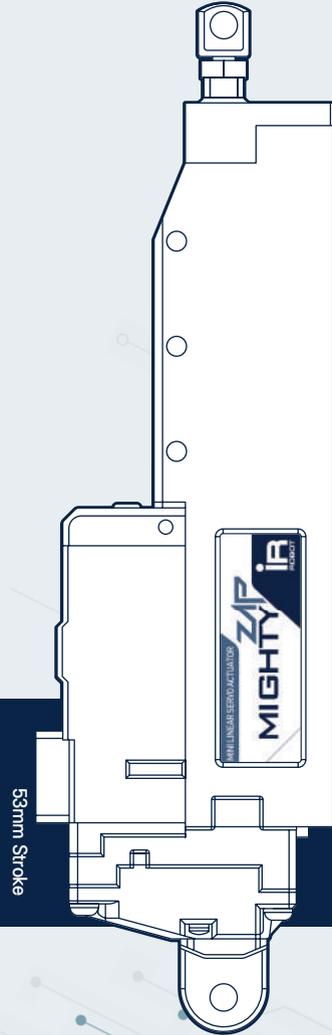
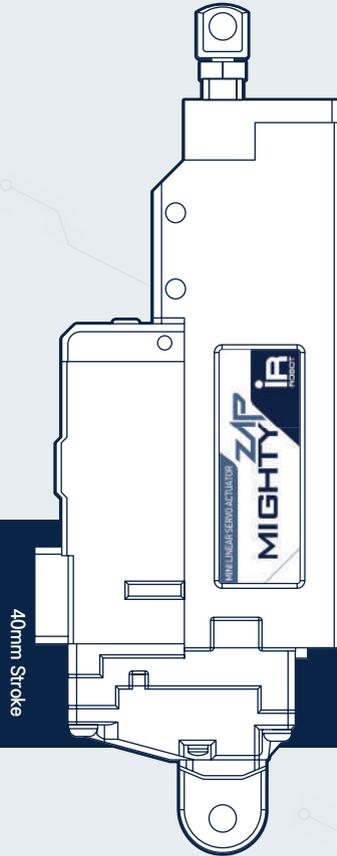
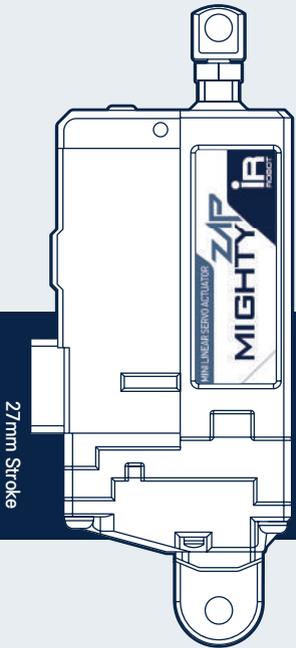
- IR-USB02 PC USB Interface
- IR-CT01 EZ Controller
- IR-STS01 Arduino Servo Tester Shield
- IR-STS02 Raspberry Pi HAT

Basic Accessories | Basic accessories packed in the actuator



- ① Hinge Base 1pc
- ② Hinge Shaft 1pc
- ③ M3 NUT 3pcs
- ④ Socket Set Screw 1pc
- ⑤ Hinge 1pc
- ⑥ Rod End Tip 1pc
- ⑦ M2.5x6 Screws 3pcs
- ⑧ Socket head M3.0x8 mounting bolt 3pcs (40mm~96mm Stroke lineup only)
- ⑨ Wire | 4Pin Molex to Molex (RS-485), 200mm
- ⑩ Wire | 3Pin Molex to Molex (TTL/PWM), 200mm
- ⑪ Wrench for M3 Nut 1pc

ACTUAL SIZE



* The picture above is the actual size.