The background is a dark blue gradient. It features several faint, light blue mechanical diagrams, including circular gauges with numerical scales (e.g., 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260) and arrows indicating rotation. On the right side, there is a stylized white line-art robot head with large circular eyes and a simple body.

HARDWARE: LOCOMOTION & MECHANICAL DESIGN (ACTUATORS)

BY: MUHAMAD ZULFADHLI BIN MOHD ZULKIFLEE

BASIC MOTION PRINCIPLE

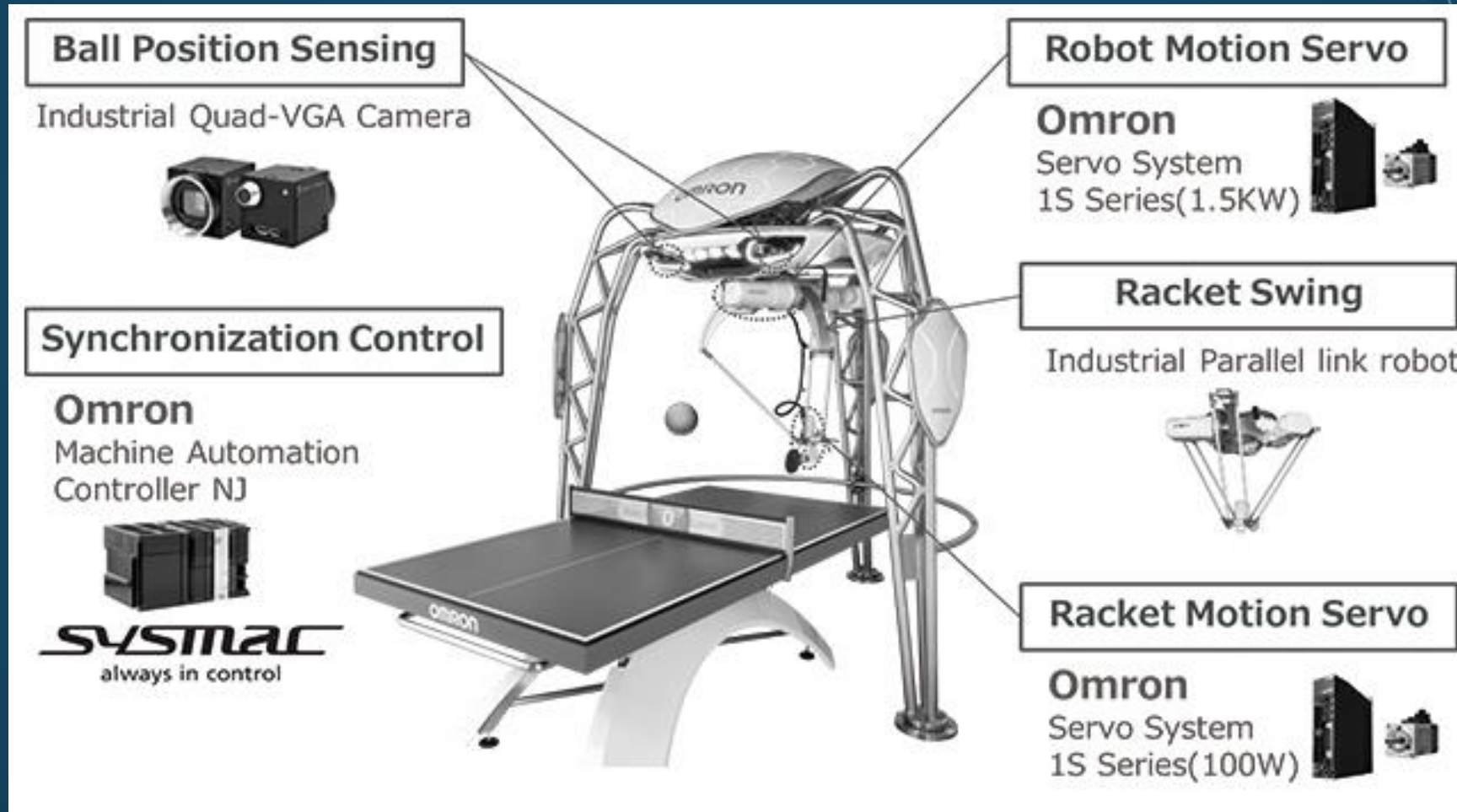
Robot locomotion is the collective name for the various methods that robots use to transport themselves from place to place. **Wheeled robots** are typically quite energy efficient and simple to control. However, other forms of locomotion may be more appropriate for a number of reasons, for example traversing rough terrain, as well as moving and interacting in human environments.

OTHER TYPES OF LOCOMOTION

Stationary	Wheeled	Legged	Swimming	Other
1. Omron Forpheus robot	1. Single wheel BB-8 2. 4WD Omni Directional Mobile Robot 3. Wall Climbing Robot (Metal vs Wall vs Glass)	1. Humanoid Robot (BIOLOID)	1. Fish robot 2. Underwater glider robot	1. Kilobot

STATIONARY ROBOTS

1. OMRON FORPHEUS ROBOT





Robot Motion

- Brand: OMRON Parallel link robot
- Four-axis parallel robot achieves high speed and high precision

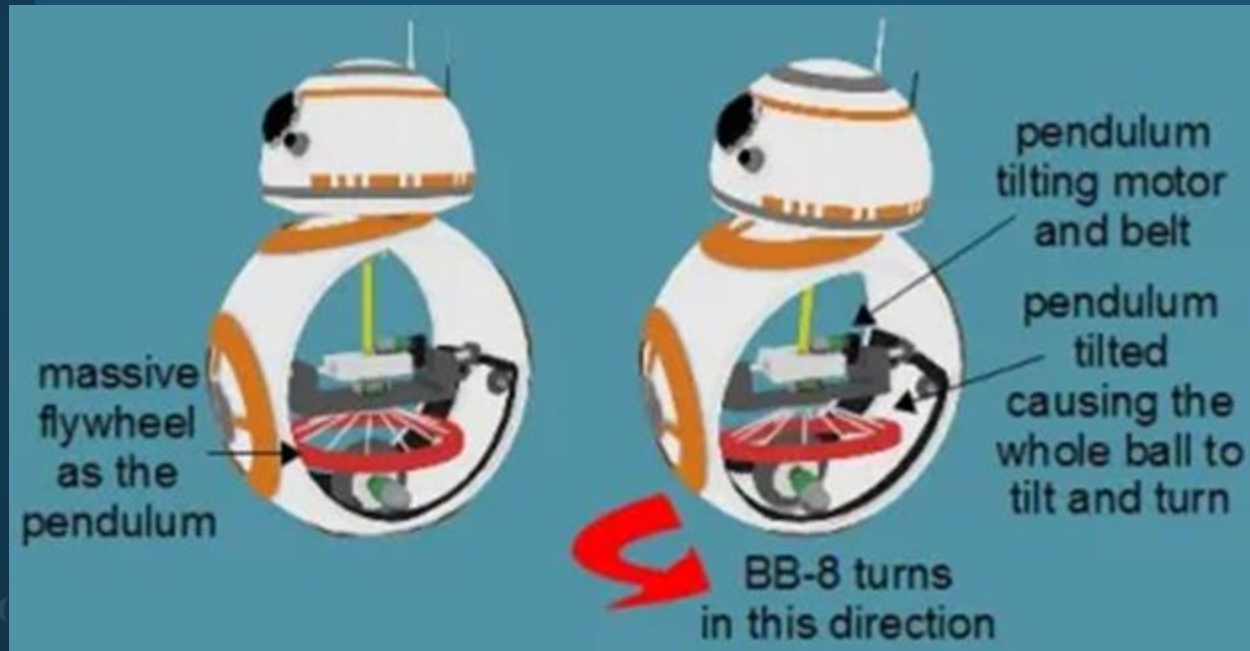


Robot Actuator

- Brand: OMRON Servo Motor 1S Series
 - Power range from 50 W to 15 kW
 - 23 bit high resolution encoder
- Battery-free absolute multi-turn encoder
 - Price: RM2919.00

WHEELED ROBOTS & TRACKED ROBOT

1. SINGLE WHEEL BB-8



Robot Motion

- Hubless Wheel Drive
- Typically a single wheeled vehicle that sits inside the ball, not physically attached to the ball in any way.
- Turning is accomplished by having a section that hangs down like a pendulum, and can be swung to either side. The mass of the pendulum illustrated here is a heavy flywheel (colored red). A motor can then swing that mass to either side to tilt the ball. Tilting the ball causes the entire robot to move in the direction of the tilt.
- For back and forth stability, the vehicle in the track moves back and forth, countering wobble. For side-to-side stability, the suspended mass is moved from side-to-side to counter that wobble.

Best Seller



22mm

40mm

STEPPER MOTOR
17HS4401
NO.201711120400

NEMA 17HS4401 Bipolar Stepper Motor

★★★★★ 85 Ratings

Brand: [China](#)


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RM39.00


10 or more RM35.88
30 or more RM31.20
Cashback: RM1.17
CytronCash Balance: [Login](#)



Availability: 🟡 29

1

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Product Code: MO-STEP-17HS4401
Warranty Period: 12 months

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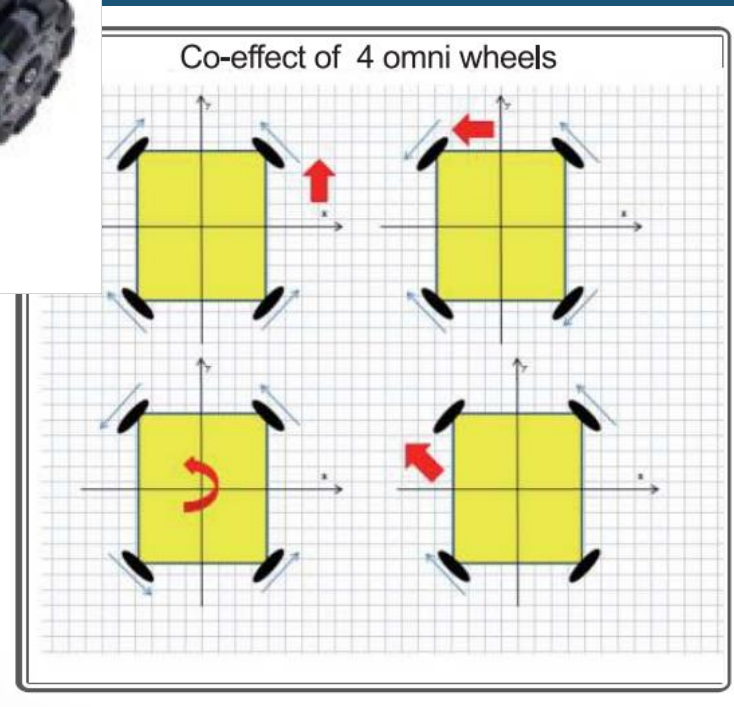
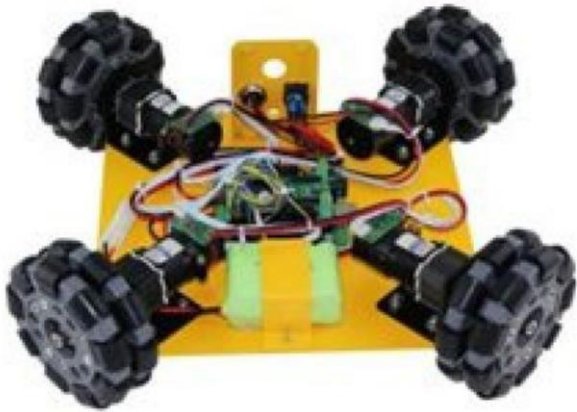
Robot Actuator

- Brand: NEMA 17HS4401 Bipolar Stepper Motor
- Price: RM39.00

Specs:

- Step Angle: 1.8 deg.
- Holding Torque: 40N.cm (56oz.in)
- Rated Current/phase: 1.7A
- Phase Resistance: 1.5Ohm \pm 10%
- Insulation Resistance: 100M Ω , Min, 500VDC
- Insulation Strength: 500VAC for one minute

2. 4WD OMNI-DIRECTIONAL MOBILE ROBOT



Robot Motion

- 90 degree Omni Wheel
- Omni-directional wheels are able to roll freely in two directions. It can either roll like a normal wheel or roll laterally using the wheels along its circumference.
- It is holonomic omni-directional wheels that are highly maneuverable. It can move in an arbitrary direction continuously without changing the direction of the wheels. It can move back and forth, sideways and rotate at the same position.

Robot Actuator

- Brand: Faulhaber 12V DC Coreless Motor
- Price: RM 400

Specs:

Motor	Power	17W
	RPM	120rpm
	Diameter	30mm
	Length	42mm
	Total Length	85mm
	Diameter of Shaft	6mm
	Length of Shaft	35mm
	No Load Current	75m
	Load Current	1400mA
	Gearbox Ratio	64:1



Faulhaber 12V DC Coreless Motor with encoder(Aluminum alloy Shell)16002
1 order

US \$96.80

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Quantity:

— 1 + 123 Pieces available

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Free Shipping

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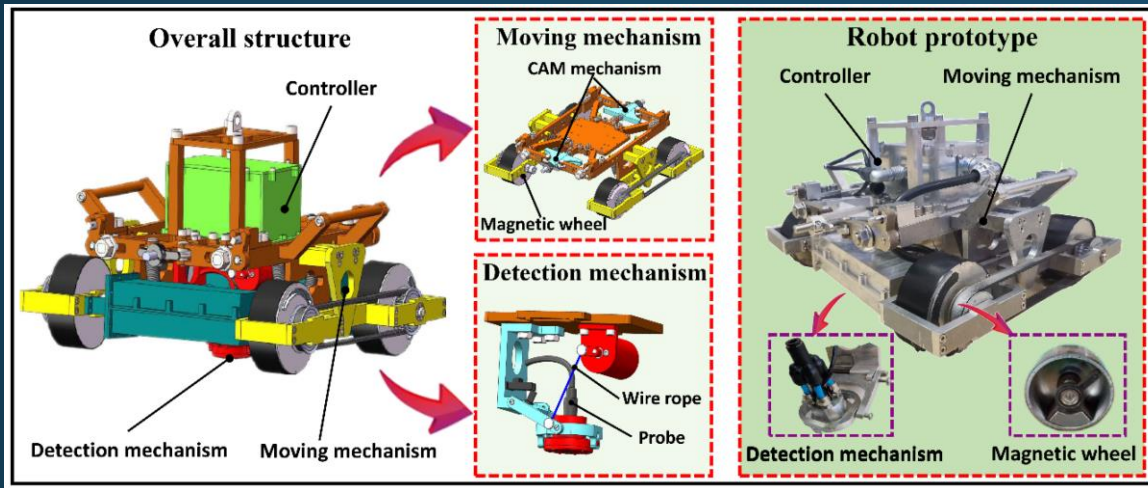
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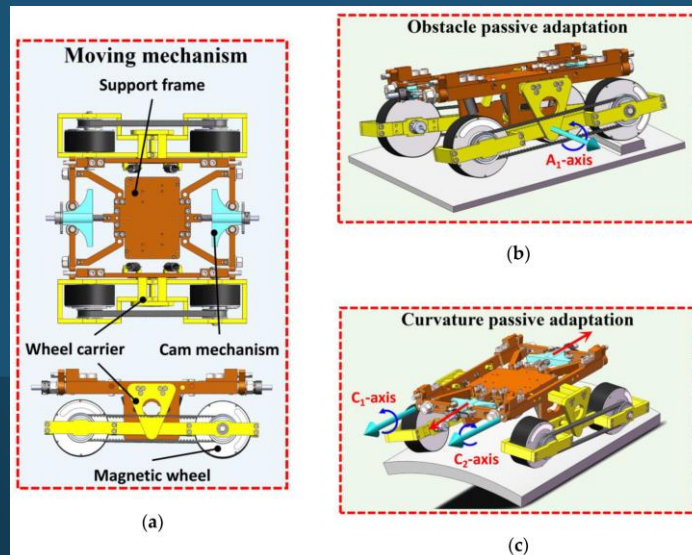
3. WALL CLIMBING ROBOT (METAL VS WALL VS GLASS)

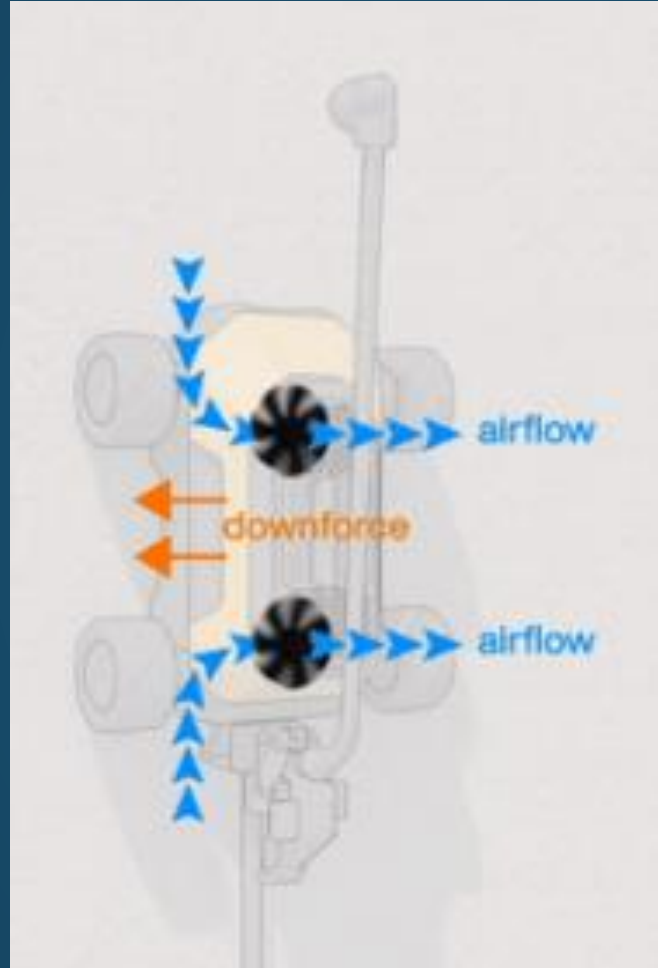


METAL SURFACE

Robot Motion

- The adsorption mechanism. There are 5 adsorption modes: permanent magnet, electromagnetic, negative pressure, molecular force, and mixed adsorption.
- Use a version of magnetic tracks or wheels to create adhesion force upon magnetic surfaces.

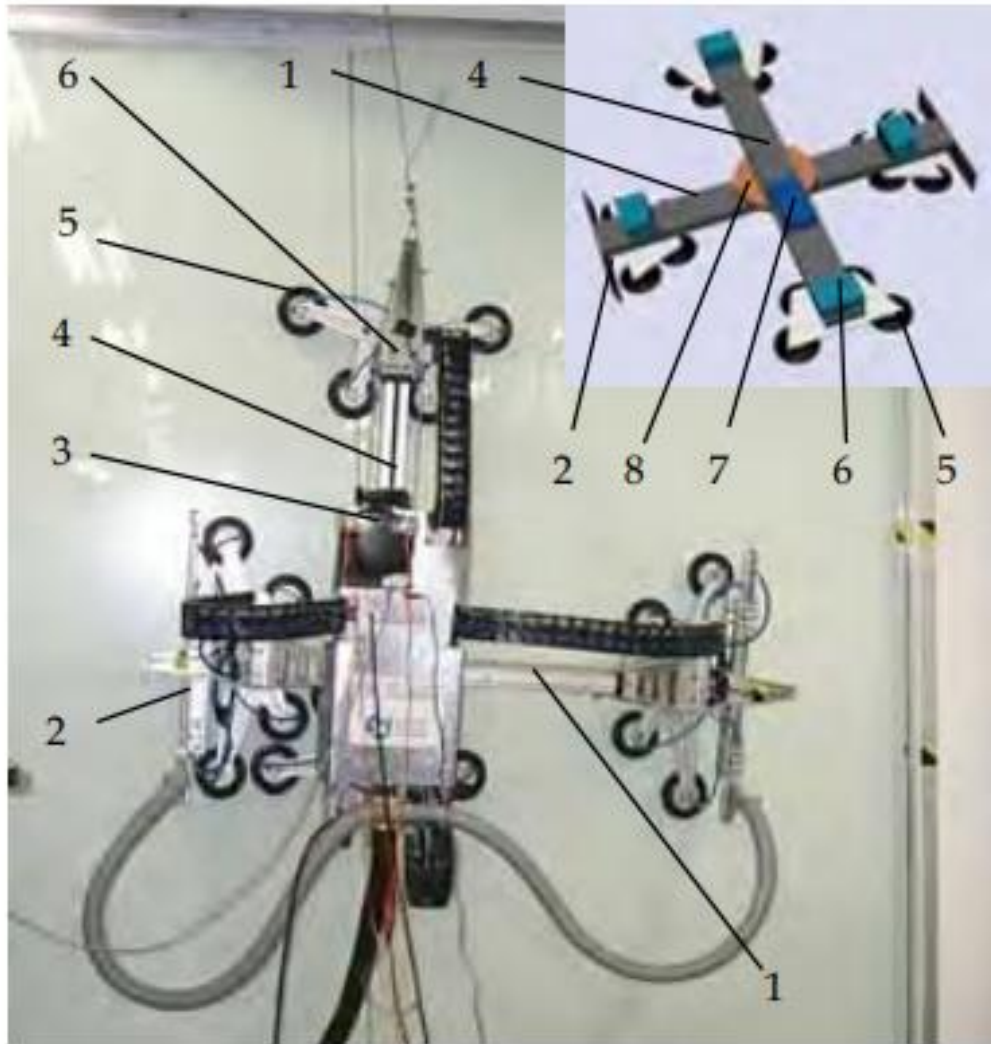




BRICK SURFACE

Robot Motion

- Suction system.
- Creates 42KG of force into the surface.
- Chassis is carefully design to creates high speed airflow from a turbine and low pressure to generate downforce.



- | | |
|-----------------------------|---------------------------|
| 1. Horizontal (X-) Cylinder | 2. Brush |
| 3. Visual Sensor | 4. Vertical (Y-) Cylinder |
| 5. Suction Cup | 6. Z-Cylinder |
| 7. Slave CPU | 8. Rotation Cylinder |

GLASS SURFACE

Robot Motion

- The robot employs suction pads for adhesion.
- Provide suction force to withstand the payload.
- The robot uses a translational mechanism for the movement.
- With the operating mode of sticking-moving-sticking, the robot can complete a series of motions including moving, rotation, and crossing obstacles.
- The rotation of the robot is controlled by adjusting rotation angles of the rotational cylinder.

Robot Actuator

Brand: CHR-GM37-3429 Carbon Brush
DC 12v Motor

Price: RM 37

Specs:

- ◆Surface galvanized cover
- ◆Beautiful appearance
- ◆Strong magnetic magnet
- ◆corrosion resistance
- ◆Increasing carbon brush
- ◆Life above 1000H
- ◆high-power



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chihai motor CHR-GM37-3429 Carbon Brush large torque dc 12v metal gear reduction motor for climbing robot ,ATM devices

\$8.60 / Piece 1 Piece (Min. Order)

Benefits: [Quick refunds on orders under US \\$1,000](#) [Claim now >](#)

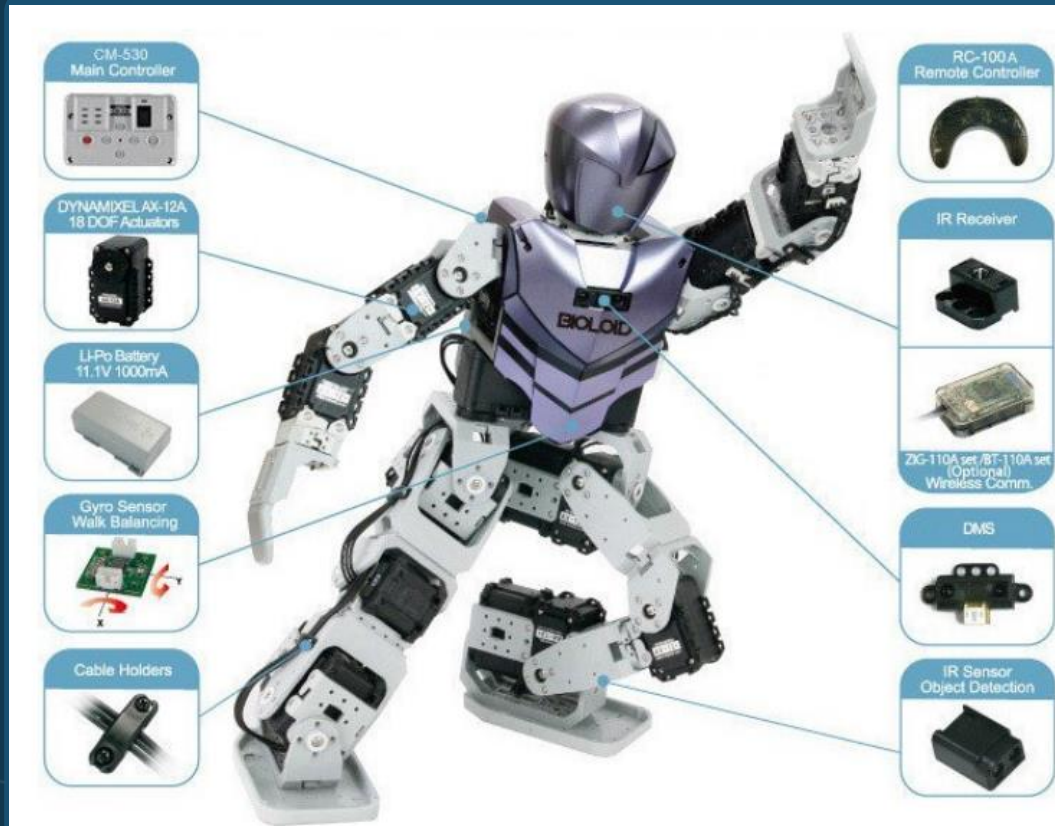
Voltage(V) : **DC 12V**

Output Power :	ratio 1:6.3	US\$8.60	-	0	+
	ratio 1:10	US\$8.60	-	0	+
	ratio 1:18.8	US\$8.60	-	0	+

LEGGED ROBOTS

1. HUMANOID ROBOT (BIOLOID)

Robot Motion



- Gait and support pattern.
- Legged robots require control of leg actuators to maintain balance, sensors to determine foot placement and planning algorithms to determine the direction and speed of movement. The periodic contact of the legs of the robot with the ground is called the gait.
- To maintain locomotion, the center of gravity of the walker must be supported either statically or dynamically. Static support is provided by ensuring the center of gravity is within the support pattern formed by legs in contact with the ground. Dynamic support is provided by keeping the trajectory of the center of gravity located so that it can be repositioned by forces from one or more of its legs.
- Two-legged robots exhibit bipedal motion.



DYNAMIXEL AX-12A

DYNAMIXEL

\$48.90



SKU: 902-0003-001

UPC: 8809052930196

Condition: New

Weight: 0.10 LBS

Shipping: Calculated at Checkout

Quantity:

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Robot Actuator

- Brand: DYNAMIXEL AX-12A actuator.
- Fully integrated DC Motor + Controller + Driver + Sensor + Reduction Gear + Network in one DC servo module.
- Price: RM 200.00

Specs:

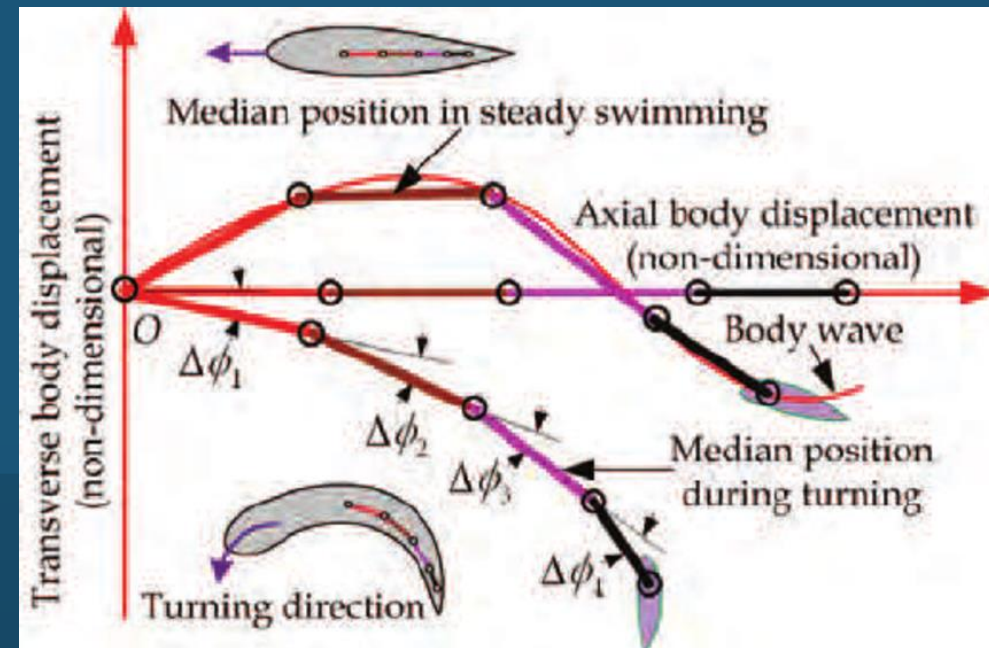
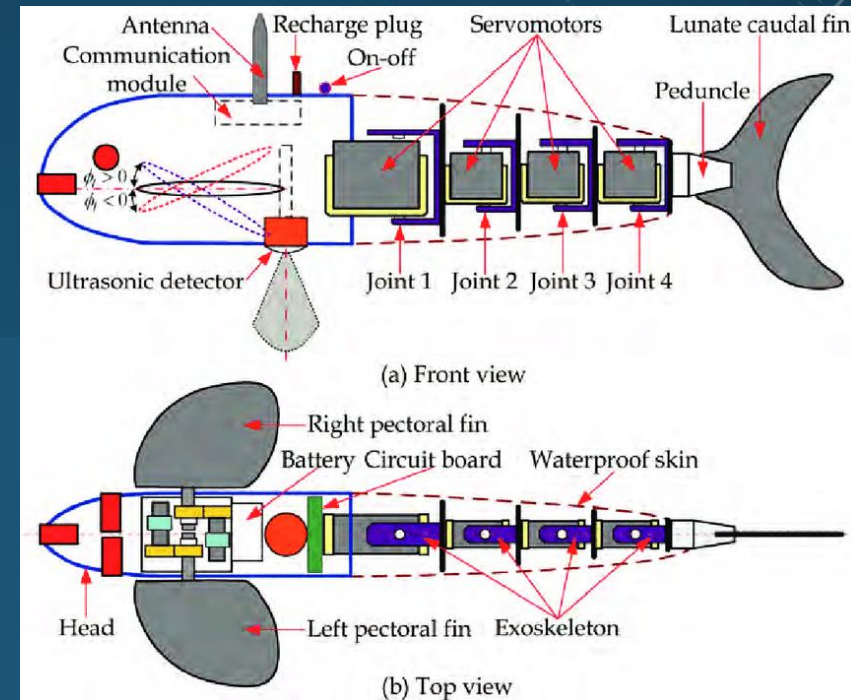
Item	Specifications
Baud Rate	7,843 [bps] ~ 1 [Mbps]
Weight	AX-12 (53.5 [g]), AX-12+ (53.5 [g]), AX-12A (54.6 [g])
Dimensions (W x H x D)	32 X 50 X 40 [mm] 1.26 X 1.97 X 1.57 [inch]
Resolution	0.29 [°]
Running Degree	0 ~ 300 [°] Endless Turn
Motor	Cored
Gear Ratio	254 : 1
Stall Torque	1.5 [N.m] (at 12 [V], 1.5 [A])
No Load Speed	59 [rev/min] (at 12V)
Operating Temperature	-5 ~ +70 [°C]
Input Voltage	9.0 ~ 12.0 [V] (Recommended : 11.1V)

SWIMMING ROBOTS

1. FISH ROBOT

Robot Motion

- Robot fish can achieve the same type of rapid and maneuverable propulsion as real fish, robot fish need multiple control surfaces.
- The propulsive performance is related to the position, mobility, and hydrodynamic characteristics of the control surfaces.
- A central neural system known as a "Central Pattern Generator" (CPGs) can govern multilink robotic fish locomotion. The CPG is located in every segment, and can connect and stimulate contracting or stretching muscles. The cerebrum, the most anterior part of the brain in vertebrates, can control signal inputs to startup, stop and turn. After the systems form a steady locomotion, the signal from the cerebrum stops and the CPGs can produce and modulate locomotion patterns.



Robot Actuator

Brand: Waterproof Coreless RC Servo.

Price: RM 150.00

Specs:

CNC metal On the cover In the shell
High-precision Taiwan-made aluminium gears with hard anodizing
High Voltage Coreless Digital Servo
SPECIFICATIONS:
Dead band: 1µs
Working frequency: 1520µs / 330hz
Motor: Coreless
Operating Speed 6.0v 0.11 sec/60°
Operating Speed 8.4v 0.09 sec/60°
Stall Torque 6.0v 24.7 kg.cm
Stall Torque 8.4v 30.3 kg.cm
Dimensions: 40.5X20.2X38mm
Weight: 58 g
Wire/Color: JR 265 mm/ -Brown +Red S Orange
Bearing: 2 ball bearings



30Kgs full waterproof HV coreless RC Servo

coreless servo rc servo waterproof rc servo



\$35.80

Specification

CLS5830HV

Size	Color	Weight
30Kgs		0.070Kgs

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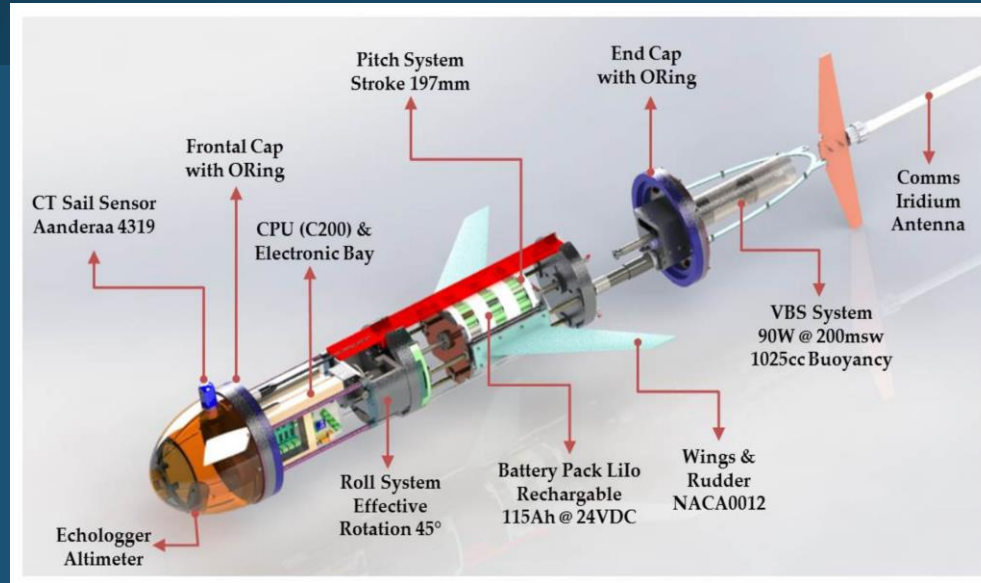
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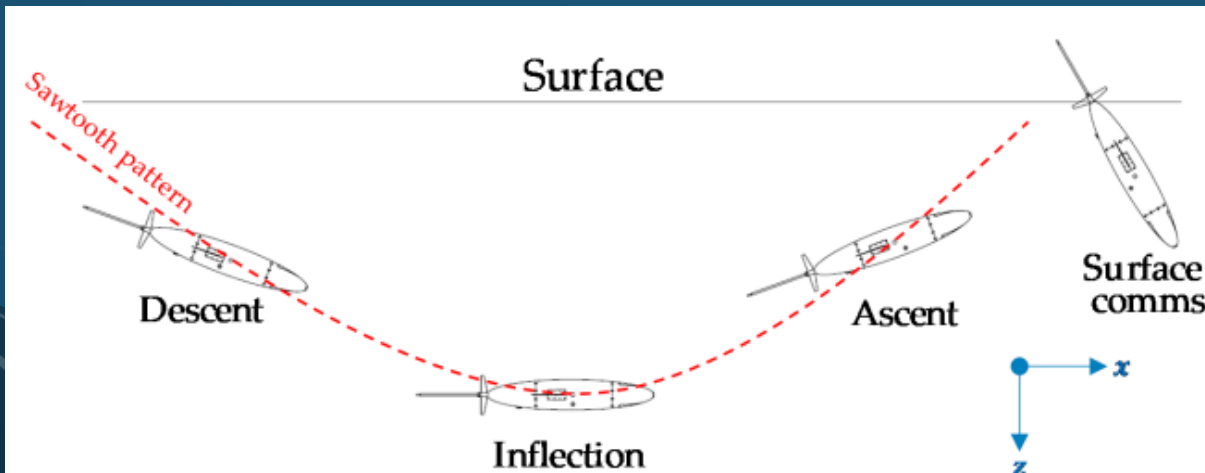
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2. UNDERWATER GLIDER ROBOT



Robot Motion

- The robot propelled by buoyancy changes, for which the mechanical force of locomotion, necessary to overcome the drag of the vehicle as it moves through a fluid medium, is supplied by gravitational force in the form of net buoyancy (positive or negative).
- The basic modes are based on their movement in the vertical plane (xz), generating the characteristic "sawtooth pattern" in each cycle of operation.




Robot Actuator

- Brand: Hitec HS-785HB Servo with 785 Gear Rack Kit
- Price: RM550.00

Specs:

Required pulse: 3–5V peak-to-peak square wave Operating voltage: 4.8–6V Operating temperature range: -20 to +60 °C Operating speed (4.8V): 1.68 s/360° at no load Operating speed (6V): 1.4 s/360° at no load Stall torque at 4.8V: 11 kg/cm Stall torque at 6V: 13.2 kg/cm Operating angle: 630° one side pulse travelling 400 µs Continuous rotation modifiable: yes Direction: clockwise/pulse travelling 1500–1900 µsec Current drain (4.8V): 8 mA idle and 230 mA no load operating Current drain (6V): 8.7 mA idle and 285 mA no load operating Dead bandwidth: 8 µs Motor type: 3 pole ferrite Potentiometer drive: indirect drive Bearing type: 1 bearing and 1 Oilite bushing Gear type: all karbonite gear Connector wire length: 300 mm Dimensions: 59 x 29 x 50 mm Weight: 110 g



785 Gear Rack Kit (Single Perpendicular)
SERVOCITY | A-000000-03247
End of life product

This 785 Gear Rack Kit includes a Hitec HS-785HB rotary servo motor allowing you to easily create a system for converting a rotary motion into a linear motion.

– 1 +

Victim of its own success!
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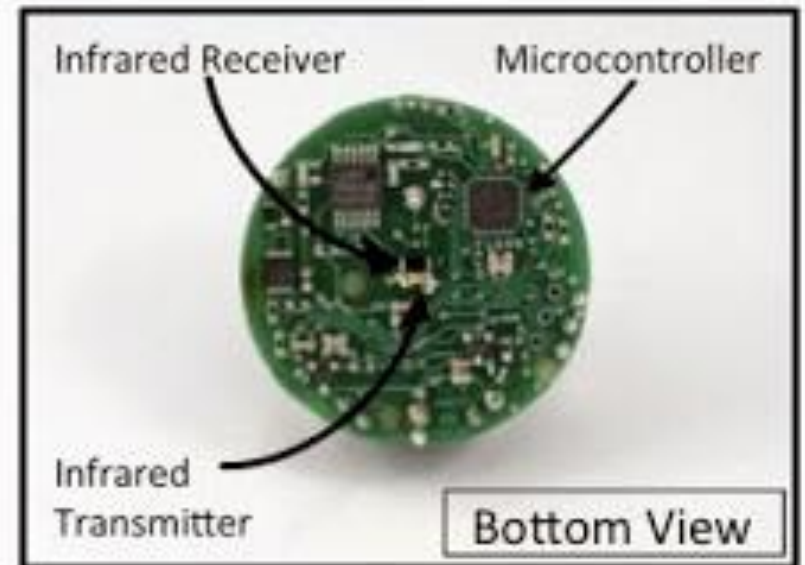
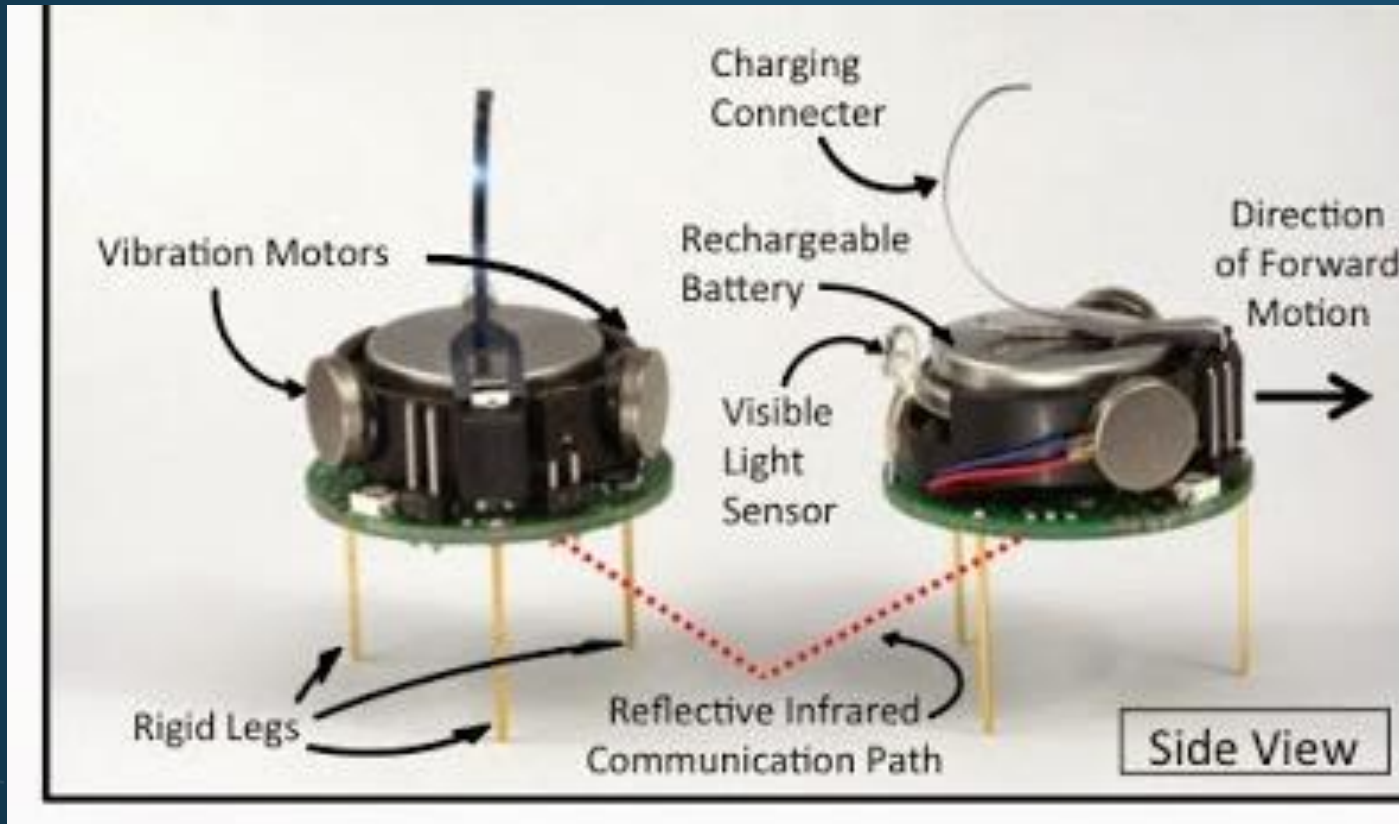
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Payment methods (see T&C) >

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OTHER TYPE OF ROBOT

1. KILOBOT



Robot Motion

- It uses vibrations of the system for the movement of the system's body.
- Moderately swarm robotic.
- Collective movement is a way of letting to coordinate a group of robots and making them move together as a group in a cohesive way. It's a basic way of making some collective tasks done and can be classified into two types formation and flocking.



Robot Actuator

- Brand: Seeed Studio 316040001 Mini Vibration Motor
- Price: RM 5.50

Specs:

No. 序号	Item 项目	Measuring Condition 测试条件	Specification 规格
3-1	Rated Speed 额定转速	At Rated Voltage and Rated Load 额定电压及负荷下测试	Min 10,000rpm
3-2	Rated Current 额定电流	At Rated Voltage and Rated Load 额定电压及负荷下测试	80mA or less 80mA 以下
3-3	Starting Voltage 起动电压	At Rated Load and Step Voltage 额定负载及逐渐升高电压法测试	DC2.3V or less DC2.3V 以下
3-4	Insulation Resistance 绝缘电阻	DC100V between Lead wire and Case 引线与电机机身之间的绝缘电阻	10MΩ Min
3-5	Insulation Voltage 绝缘电压	DC50V between Lead wire and Motor Case 引线与电机机身之间施加DC50V电压一分钟	No Destruction Occurs 不被击穿
3-6	Terminal Resistance 端子电阻	Measure between Terminals 端子间电阻	75Ω Max

Seeed Studio 316040001 Mini Vibration Motor for Multipurpose

RS Stock No.: 184-5122 | Mfr. Part No.: 316040001 | Manufacturer: Seeed Studio



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