Hardware: Locomotions & Mechanical Design (2-ACTUATORS)

Muhammad Hafiz Bin Rushdi 1818713

Hardware Components that move the Robots
i) Basic Motion Principle
ii)Hardware Components (Specification,Brands and Price)

1) Stationary Robots
   a) Omron forpheus robot
2) Wheeled Robots & Tracked Robots
   a) Single wheel BB-8
   b) 4WD Omni-Directional Mobile Robot
   c) Wall Climbing Robot (Metal vs Wall vs Glass)
3) Legged
   a) Humanoid Robot (BIOLOID)
4) Swimming
   a) Fish robot
   b) Underwater glider robot
5) Others
   a) Kilobot

1) Stationary Robots
a) Omron forpheus robot

1S Drives

Sysmac general purpose servo

Ratings: 230 VAC from 50 W to 1.5 kW, 400 VAC from 400 W to 15 kW

- 23-bit resolution encoder
- Fast and secure screw-less push-in in all connectors
- Pluggable connectors for easy pre-wiring and system maintenance
- Direct wiring of I/O signals
- Embedded relay for direct motor brake control
- Improved loop control for overshoot and quick setting time
- Safety function built-in:
  - Network Safe Torque Off: PLd (EN ISO 13849-1), SIL2 (IEC 61508)
  - Hardwired Safe Torque Off: PLe (EN ISO 13849-1), SIL3 (IEC 61508)

Compare all models | CAD Library

R88D-1SN_-ECT 1S-series Servo Drive Datasheet
PDF 3.46 MB

sysmac
always in control

R88M-1□

1S servo motor

Simplified machine design and maintenance

- 23-bit resolution encoder
- Compact and small motor size
- Multi-turn encoder design without mechanics: 16-bit, 65536 turns
- Battery-free absolute multi-turn encoder or incremental encoder
- Pre-assembled motor cables
- Designed for easy EMC compliance

Ratings

- 230 VAC from 50 W to 1.5 kW (rated torque from 0.159 to 8.59 Nm)
- 400 VAC from 400 W to 15 kW (rated torque from 1.91 to 95.5 Nm)

Omron 1S Servo Motor, 100 W, 1 Phase, 230 V

OMRON

RS Stock No.: **215-8264** | Mfr. Part No.: **R88M-1M10030H-S2** | Manufacturer: Omron

Temporarily out of stock - back order for despatch 05/09/2022, delivery within 4 working days from despatch date

1 units **Back Order**

Price Each

MYR4,008.82

units	Per Unit
1 +	MYR4,008.82

Omron 1S Servo Motor, 1.5 kW, 1 Phase, 230 V

OMRON

RS Stock No.: **215-8271** | Mfr. Part No.: **R88M-1M1K520T-BS2** | Manufacturer: Omron

Temporarily out of stock - back order for despatch 05/09/2022, delivery within 4 working days from despatch date

1 units **Back Order**

Price Each

MYR10,644.73

units	Per Unit
1 +	MYR10,644.73

1S servo motor						1S servo drive
Appearance	Speed	Voltage	Rated torque	Capacity	Model	
	3000 min^{-1}	230 V	0.159 Nm	50 W	R88M-1M05030T-□	R88D-1SN01H-ECT
			0.318 Nm	100 W	R88M-1M10030(H/T)-□	R88D-1SN01H-ECT
			0.637 Nm	200 W	R88M-1M20030(H/T)-□	R88D-1SN02H-ECT
			1.27 Nm	400 W	R88M-1M40030(H/T)-□	R88D-1SN04H-ECT
			2.39 Nm	750 W	R88M-1M75030(H/T)-□	R88D-1SN08H-ECT
			3.18 Nm	1 kW	R88M-1L1K030(H/T)-□	R88D-1SN15H-ECT
			4.77 Nm	1.5 kW	R88M-1L1K530(H/T)-□	R88D-1SN15H-ECT
		400 V	2.39 Nm	750 W	R88M-1L75030C-□	R88D-1SN10F-ECT
			3.18 Nm	1 kW	R88M-1L1K030C-□	R88D-1SN10F-ECT
			4.77 Nm	1.5 kW	R88M-1L1K530C-□	R88D-1SN15F-ECT
			6.37 Nm	2 kW	R88M-1L2K030C-□	R88D-1SN20F-ECT
			9.55 Nm	3 kW	R88M-1L3K030C-□	R88D-1SN30F-ECT
			12.7 Nm	4 kW	R88M-1L4K030C-□	R88D-1SN55F-ECT
			15.9 Nm	5 kW	R88M-1L5K030C-□	R88D-1SN55F-ECT
	2000 min^{-1}	230 V	4.77 Nm	1 kW	R88M-1M1K020(H/T)-□	R88D-1SN15H-ECT
			7.16 Nm	1.5 kW	R88M-1M1K520(H/T)-□	R88D-1SN15H-ECT
		400 V	1.91 Nm	400 W	R88M-1M40020C-□	R88D-1SN06F-ECT
			2.86 Nm	600 W	R88M-1M60020C-□	R88D-1SN06F-ECT
			4.77 Nm	1 kW	R88M-1M1K020C-□	R88D-1SN10F-ECT
			7.16 Nm	1.5 kW	R88M-1M1K520C-□	R88D-1SN15F-ECT
			9.55 Nm	2 kW	R88M-1M2K020C-□	R88D-1SN20F-ECT
			14.3 Nm	3 kW	R88M-1M3K020C-□	R88D-1SN30F-ECT
	1500 min^{-1}	400 V	25.5 Nm	4 kW	R88M-1M4K015C-□	R88D-1SN55F-ECT
			35 Nm	5.5 kW	R88M-1M5K515C-□	R88D-1SN55F-ECT
			47.8 Nm	7.5 kW	R88M-1M7K515C-□	R88D-1SN75F-ECT
			70 Nm	11 kW	R88M-1M11K015C-□	R88D-1SN150F-ECT
			95.5 Nm	15 kW	R88M-1M15K015C-□	R88D-1SN150F-ECT
	1000 min^{-1}	230 V	8.59 Nm	900 W	R88M-1M90010T-□	R88D-1SN15H-ECT
		400 V	8.59 Nm	900 W	R88M-1M90010C-□	R88D-1SN10F-ECT
			19.1 Nm	2 kW	R88M-1M2K010C-□	R88D-1SN20F-ECT
			28.7 Nm	3 kW	R88M-1M3K010C-□	R88D-1SN30F-ECT

Omron 1.5 kW Servo Drive, 16 A, 230 V

OMRON

RS Stock No.: **214-7366** | Mfr. Part No.: **R88D-1SN15H-ECT** | Manufacturer: Omron

Temporarily out of stock - back order for despatch 05/09/2022, delivery within 4 working days from despatch date

1 units **Back Order**

Price Each

MYR9,443.64

units	Per Unit
1 +	MYR9,443.64

Omron 0.1 kW Servo Drive, 230 V

OMRON

RS Stock No.: **215-3411** | Mfr. Part No.: **R88D-1SN01H-ECT** | Manufacturer: Omron

Temporarily out of stock - back order for despatch 05/09/2022, delivery within 4 working days from despatch date

1 units **Back Order**

Price Each

MYR4,870.97

units	Per Unit
1 +	MYR4,870.97

Single-phase, 230 V

Servo drive model				R88D-1SN01H-ECT	R88D-1SN02H-ECT	R88D-1SN04H-ECT	R88D-1SN08H-ECT	R88D-1SN15H-ECT
Applicable servo motor			3000 r/min	R88M-1M05030T R88M-1M10030(H/T)	R88M-1M20030(H/T)	R88M-1M40030(H/T)	R88M-1M75030(H/T)	R88M-1L1K030(H/T) R88M-1L1K530(H/T)
			2000 r/min	-	-	-	-	R88M-1M1K020(H/T) R88M-1M1K520(H/T)
			1000 r/min	-	-	-	-	R88M-1M90010T
Max. applicable motor capacity			W	100	200	400	750	1500
Input	Control circuit	Power supply voltage	V	24 VDC (21.6 to 26.4 V)				
	Main circuit	Power supply voltage	V	Single-phase 200 to 240 VAC (170 to 252 V)				
		Frequency	Hz	50/60 Hz (47.5 to 63 Hz)				
	Rated input current	Single-phase	Arms	1.8	2.7	4.6	7.3	15.7
Output	Rated output current		Arms	0.8	1.5	2.5	4.6	9.7
	Max. current		Arms	3.1	5.6	9.1	16.9	28.4
Basic	Ambient operating/storage temperature			0 to 55°C/-20 to 65°C				
	Ambient operating/storage humidity			90% RH or less (without condensation)				
	Atmosphere			Must be free from corrosive gases				
	Altitude			1000 m or less				
	Vibration resistance (max.)			5.88 m/s^2, 10 to 60 Hz (continuous operation at resonance point is not allowed)				
	Degree of protection			IP20 (Built into IP54 panel)				
Weight			kg	1.2	1.2	1.5	2.0	3.4

2) Wheeled Robots & Tracked Robots
a) Single wheel BB-8

https://hackaday.com/2016/06/24/driving-bb-8-more-than-one-way-to-move-this-bot/

AXLE DRIVE AKA PENDULUM DRIVE

Axle type showing shifted center of mass

Axle type turning

THE HAMSTER DRIVE

Borsch Cordless Drill Motor

13 Teeth Motor 10.8V Replace for BOSCH cordless screw driver drill GSR10.8-2-LI GSB10.8-2-LI GSB1080-2-LI GSR GSB 10.8-2-LI

★★★★★ 4.7 · 38 Reviews 78 orders

MYR 55.12 ~~MYR 64.84~~ -15%

MYR 8.65 Coupons For You Get coupons

Quantity:

− 1 + 119 Pieces available

Free Shipping

to Malaysia via Cainiao Standard For Special Goods

Estimated Delivery: 58-58 days

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Specifications:

Voltage (V)/Capacity (Ah)	10.8/1.3
Batteries/Charger	2/30 min
No load speed 1st/2nd (rpm)	0-380/1300
Impact rate (bpm)	0-19,500
Max drilling diameter wood/steel (mm)	19/10
Torque setting range	20+1
Max torque hard/soft (Nm)	30/13
Weight (kg)	1.0

Features and Benefits:

•Professional performance: newly developed 2-speed gearbox for powerful screw driving and drilling applications in wood with metal and impact drilling in masonry

•Bright Power-LED for optimum illumination in dark areas

•Most compact: shortest design (187mm) in its class for optimum handling, especially when performing drilling and screw driving applications overhead and in tight spaces

•Lowest weight: only 1.0 kg for perfect handling and low fatigue working

HUBLESS WHEEL DRIVE

2) Wheeled Robots & Tracked Robots
b) 4WD Omni-Directional Mobile Robot

Mecanum Wheel Sets for TT Motor

9 Ratings

Brand: China

Login to view ProMaker's Insider Price!

RM25.00 - RM29.00

Cashback: 3%

CytronCash Balance: Login

Available Options

* Diameter

60mm 48mm

Availability: 69

100mm Double Plastic Plate Omni Wheel

1 Ratings

Brand: NEXUS Robot

Login to view ProMaker's Insider Price!

RM200.00

10 or more RM184.00

30 or more RM160.00

Cashback: RM6.00

CytronCash Balance: Login

Availability: 10

1

ADD TO CART

Product Code: WL-OW-D100

Warranty Period: 12 months

★★★★☆ 3 Review(s). Add my review

4WD Omni-Directional Arduino Compatible Mobile Robot Kit

by Nexus Robot

New stock soon See due date

Notify me when this product is in stock

Product Highlights

- 4 Wheels drive
- Easy to assemble
- Aluminum alloy frame
- Speed: 0.6m/s
- Moves in any direction without turning the orientation
- Comes assembled with only wheels not attached

Product Code : RB-Nex-06

USD $654.00

Pay as low as $109/mo. Klarna.
See if you're prequalified

Saw Better Price? Start Price Match

Qty

1

5 to 25 USD $614.76 each
25 and more USD $577.87 each

ADD TO CART

Add to Wishlist

Ask our experts

Ask a question on the RobotShop community

Specifications:

Chassis	Appearance	Square
	Max Width	402mm
	Height	100mm
	Chassis Height	21mm
	Wheel Base	260mm
	Coupled Mode	Compaction
	Material	Aluminium Alloy
	Color	Yellow, Black
	Speed	0.6m/s
	Drive Mode	4 wheel drive
	Climbing Capacity	20 degree
	Load Capacity	10kg
	PC104 Compatible	Yes
Wheel	Type	90 degree Omni Wheel
	Diameter	100mm or 123mm
	Thickness	38mm
	Material	Nylon or Aluminium Alloy
	Load Capacity	20kg
	Material	Rubber or Nylon
	Diameter of Roller	19mm
	Length of Roller	19mm
	Coupled Mode	Brass Tube or bearings

Motor	Type	Faulhaber 12V DC Coreless 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
Encoder	Type	Optical
	Encoder Phase	AB
	Encoder Resolution	12CPR
Battery and Charger	Battery	12V Ni-Mh
	Slow Charger	100~240V In, 2.4~12V Out
	Duration of Charge	2 hours
	Running Time	0.5 hour

Microcontroller Specification	Atmega 328
	14 Channels Digital I/O
	6 PWM Channels (Pin11,Pin10,Pin9,Pin6,Pin5,Pin3)
	8 Channels 10-bit Analog I/O
	USB interface
	Auto sensing/switching power input
	ICSP header for direct program download
	Serial Interface TTL Level
	Support AREF
	Support Male and Female Pin Header
	Integrated sockets for APC220 RF Module
	Five IIC Interface Pin Sets
	Two way Motor Drive with 2A maximum current
	7 key inputs
	DC Supply:USB Powered or External 7V~12V DC
	DC Output:5V /3.3V DC and External Power Output
	Dimension:90x80mm
IO expansion board	To support RS485 interface or dirve 4 motors

Faulhaber 12V DC Coreless Motor 16002

Product Code: 16002

Incl. Tax: £86.16 / Excl. Tax: £71.80

1 ADD TO CART ADD TO WISH LIST ADD TO COMPARE

This reliable Faulhaber 12V DC Coreless Motor makes a good choice for many different uses.

- Power: 17W
- No Load Speed: 8100 RPM
- Reduced Speed: 120 RPM
- Shaft Diameter: 6mm

+ 1

- Type: Faulhaber 12V DC Coreless Motor
- Power: 17W
- No Load Speed: 8100 RPM
- Reduced Speed: 120 RPM
- Diameter: 30mm
- Length: 42mm
- Total Length: 85mm
- Diameter of Shaft: 6mm
- Length of Shaft: 35mm
- No Load Current: 75mA
- Load Current: 1400mA
- Gearbox Ratio: 64:1

Encoder

- Type: Optical
- Encoder Phase: A B
- Encoder Resolution: 500CPR

2) Wheeled Robots & Tracked Robots
c) Wall Climbing Robot (Metal vs Wall vs Glass)

Electromagnetic Adsorption

Fig. 1. The plane assembly drawing of wall-climbing robot

1-Conductive plate, 2-Timing belt pulley,3-Timing belt, 4-Electromagnet, 5-Stepper motor

and etc. The conductive plate provides electric power for the electromagnet. 16 electromagnets are fixed in a synchronous belt equidistantly. The U-shaped conductive trough is arranged inside the synchronous belt. When the synchronous belt wheels are driven to rotate, the electromagnets will be brought into and out of contact with the conductive trough one by one. That is, only these electromagnets which contact with the conductive trough can generate magnetic force. In this way, when the wall-climbing robot moves forward, the electromagnets will get into or out of work in turn. As to our prototype, six electromagnets

Round Electromagnets, Flat-Faced

From $26.75 – $219.35

Know your SKU?	Select SKU
DIAMETER	Choose an option
HEIGHT	Choose an option
THREAD	Choose an option
THREAD DEPTH	Choose an option
WATTS	Choose an option
HOLDING FORCE (LBS)	Choose an option
WT.	Choose an option

Preferred High Torque Nema 23 CNC STEPPER MOTOR 114 mm 425Oz.In/3Nm Router

No Ratings Yet | 0 Sold

~~RM319.46~~ **RM158.01** 51% OFF

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Shipping Fee RM0.00

NEMA 23 two poles 5.7 x 5.7 x 11.3 cm 4-wire
This is the strongest el for NEMA 23 1.8 deg.
Stepper motor, angle cm (200 steps / industry).
Each stage absorbs 4.2 A and one carries 3.0 nm of torque (425 oz. in.).
Manufacturer Part Number: 23hs45 - 4204s
Motor Type: bipolar Stepper
Step Angle: 1.8 degrees.
Hold torque: 3.0 nm (425 oz. inch)
Current rating / Stage: 4.2 A
Stage: 0.9 ohms
inductance : 3.8 MH + / - 20 % (1 kHz)
X Shaft diameter: 10 MM
Shaft length: 24 MM
d-cut Length: 20 MM
Number of leads: 4
Wire length: 400 MM
Size:5.7 x 5.7 x 11.3 cm
Material:metal
Colour:black

2) Wheeled Robots & Tracked Robots
c) Wall Climbing Robot (Metal vs Wall vs Glass)

(a)
Tap water
Power source
Micro-vacuum pump
Motor
Regulator
Sealing ring
Orifices
Water layer
Annular reservoir
(b)
Micro-vacuum pump

Power source
Motor
Micro-vacuum pump
Tap water
P_c
P_b
P_a
Atmos-phere
Vacuum chamber
0
-20
-40
-60
-80
-100
P [kPa]
-60
-40
-20
0
20
40
60
r [mm]

4X Racerstar Racing Edition 1103 BR1103B 10000KV 1-3S Brushless Motor Black For 50 80 100 RC Drone FPV Racing COD

Brand: Racerstar ★★★★★ 4.8 114 Reviews | 12 answered questions ID: 1133949

RM172.20 ~~RM206.65~~ -17% Price alert

RM8.61 New User Allowance

Ship From: CN

CN

QTY: 1

Shipping: Free shipping

to Malaysia via SEA Direct Mail

Shipping time 7-16 business days

Arrival Notice 2099

Secure Payment

Multiple payment options

Customer Service Guarantee

DOA Guarantee Missing/Wrong Items Guarantee Quality Guarantee

MOTOR PERFORMANCE DATA

MODEL	KV (rpm/V)	Voltage (V)	Prop	Load Current (A)	Pull (g)	Power (W)	Efficiency (g/W)	Lipo Cell	Weight (g) Approx
BR1103B	6500	7.4	3020	2.8	45	20.7	2.2	1-3S	3.7
		11.1		3.6	72	40.0	1.8		
	8000	3.7	3020	2.3	28	8.5	3.3		
		7.4		5.0	60	37.0	1.6		
		11.1	2030	4.7	78	52.2	1.5		
	10000	3.7	3020	2.9	30	10.7	2.8		
		7.4		6.2	66	45.9	1.4		
		11.1	2030	5.8	90	64.4	1.4		

Description:

Brand: Racerstar

Item No: BR1103B 10000KV Brushless Motor

Height: 15mm

Width: 13.6mm

Weight: about 3.7g

Shaft: φ1.5mm

KV (rpm/V): 10000KV

Voltage: 3.7-11.1V

Battery: 1-3S lipo battery

DC 12V 6W Mini Vacuum Pump 5L/min Negative Pressure Suction Air Pump Diaphragm Micro-Vacuum Pump with Holder

MYR 69.16 ~~MYR 115.29~~ -40%

Instant discount: MYR 4.32 off per MYR 151.30

MYR 10.81 Coupons For You | MYR 4.32 off on MYR 138.33 | Get coupons

Quantity:

1 9999 Pieces available

Ships to Malaysia

Free Shipping

From China to Malaysia via China Post Registered Air Mail

Estimated delivery: 30-30 days

More options

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Specification:

- Brand new
- Type: DC12V Mini Vacuum Pump
- Operating voltage: DC9V ~ 14V
- Rated voltage: DC 12V
- Rated Current: 500mA
- Rated Power: 6W
- Suction capacity: 5L / min
- Vacuum degree: 65kpa
- Maximum pressure: 120kpa
- Noise:<60db
- Size: as picture shows
- Color: as picture shows

2) Wheeled Robots & Tracked Robots
c) Wall Climbing Robot (Metal vs Wall vs Glass)

Bill of Materials

Product: Window Cleaning Device | **Date:** 15/09/10

Item #	Part #	Qty	Name	Material	Source	Price (RM)
1	HD-AC-A4-5	1	Acrylic Sheet 5mm	Acrylic	UTP Lab	0
2	PFG-60-NBR	4	Flat PFG Suction Cup 60mm dia.	Nitrile Rubber	RS Malaysia	212.00
3	ZH13BS-08-10	2	Vacuum Generator		RS Malaysia	250.00
4	N/A	2	Bearing ways	Polyethylene	Hardware Shop	20.00
5	N/A	1	Carriage	Acrylic	UTP Lab	0
6	MO-SPG-30-200K	1	DC gear motor		Cytron Sdn Bhd.	80.00
7	MO-SPG-50-180K	1	DC gear motor		Cytron Sdn Bhd.	80.00
8	CO-SPG	2	Motor Coupler	Aluminium	Cytron Sdn Bhd.	30.00
9	WL-TW-200	2	Trans-wheel 2-inch dia.	Plastic	Cytron Sdn Bhd.	140.00
10	N/A	1	Water container	Plastic	Hardware Shop	2.00
11	N/A	1	Sponges	Artificial Fibre	Hardware Shop	1.00
12	N/A	2	Squeegee	Rubber	Hardware Shop	5.00
13	SRB20/30	1	Bevel Gear	Steel	RS Malaysia	10.00
14	521-6610	2	Gear	Steel	RS Malaysia	10.00
15	N/A	1	Shaft	Stainless steel	Hardware Shop	15.00
16	N/A	4	Castor	Steel	Hardware Shop	10.00
17	N/A	1	Leadscrew 40cm	Steel	Hardware Shop	25.00
19	SK40C	1	PIC Development Board SK40C		Cytron Sdn Bhd.	63.00
20	IC-PIC-18F4550	1	PIC 18F4550		Cytron Sdn Bhd.	35.00
21	N/A	1	H-Bridge IC L293D		Cytron Sdn Bhd.	
22	UP00B	1	USB Programmer UIC00A		Cytron Sdn Bhd.	
23	LIP-11.1-2200	2	LiPo Rechargeable Battery 12V 2200mAH		Cytron Sdn Bhd.	200.00
					TOTAL	938.00

Prepared by: Dzulfikry Aris

Checked by: Prof. Dr. T. Nagarajan

SOLD OUT

12V 22RPM 7kgfcm Brushed DC Geared Motor (SPG30-200K)

Price	RM45.00
Product SKU	EEP2707
Brand	Cytron Technologies
Points Needed	2250
Availability	Out Of Stock

Specifications and Features:

- Rated voltage: 12VDC
- No load current: < 100mA
- No load speed: 22.5 ± 2.2 RPM
- Rated load torque: 687mN.m (7kgf.cm)
- Rated current: < 600mA
- Rated load speed: 17 ± 1.7RPM
- Weight: 168g
- Gear ratio: 200:1
- Shaft: 6mm diameter x 15.5mm length
- Motor dimension (*w x l x h*): 37 x 37 x 80.5mm, detailed drawing

12V 24RPM 15kgfcm Brushed DC Geared Motor

17 Ratings

Brand: Cytron OEM

Login to view ProMaker's Insider Price!

RM55.00

5 or more RM52.25
20 or more RM49.50
50 or more RM44.00
Cashback: RM1.65
CytronCash Balance: Login

Availability: 44

1

- Rated voltage: 12VDC
- No load current: < 300mA
- No load speed: 24 RPM
- Rated load torque: 1.47N.m (15kgf.cm)
- Rated current: < 1A
- Rated load speed: 19 RPM
- Weight: 300g
- Gear ratio: 180:1
- Metal gears
- Shaft: 6mm diameter x 15.5mm length
- Motor dimension (w x l x h): 37 x 37 x 106.8mm (inc shaft)

SMC ZH13BS-08-10 vacuum ejector, ZH VACUUM EJECTOR***

Part Number: ZH13BS-08-10

PRICE

Your Price: $31.02

This is a legacy product, and replaced by
ZH13BSA-08-10

CAD Drawings | SMC Part Builder | Series Catalog

Close match in stock items **Inventory**

0

0

Model

ZH□□B

Model	Nozzle diameter (mm)	Body type	Max. vacuum pressure * (kPa)		Maximum suction flow rate (ℓ/min (ANR))		Air consumption (ℓ/min (ANR))	Connection (One-touch/Screw-in)			Weight (g)
			Type S	Type L	Type S	Type L	Type S/Type L	SUP	VAC	EXH	
ZH05B□	0.5	Box type (Built-in silencer)	–88	–48	5	8	13	ø6/Rc 1/8	ø6/Rc 1/8	—	28
ZH07B□	0.7				12	20	23				28
ZH10B□	1.0				24	34	46				33
ZH13B□	1.3				40	70	78	ø8/Rc 1/8	ø10/Rc 1/4		66
ZH05D□	0.5	Body ported type (Without silencer)	–88	–48	5	8	13	ø6/Rc 1/8	ø6/Rc 1/8	ø6/Rc 1/8	11
ZH07D□	0.7				12	20	23				12
ZH10D□	1.0				24	34	46	ø6/Rc 1/8	ø6/Rc 1/8	ø8/Rc 1/8	16
ZH13D□	1.3				40	70	78	ø8/Rc 1/8	ø10/Rc 1/4	ø10/Rc 1/4	27
ZH15D□	1.5	Body ported type (Without silencer)	–88	–53	55	75	95	ø10/Rc 1/4	ø12/Rc 3/8	ø12/Rc 3/8	43
ZH18D□	1.8				65	110	150	ø12/Rc 3/8			55
ZH20D□	2.0				85	135	185	ø12/Rc 3/8	ø16/Rc 1/2	ø16/Rc 1/2	95

* Supply pressure: 0.45 MPa.

Main Data for Flat PFG Cups

Model Number	Cup Diameter [mm]	Area [cm²]	Volume [V] Liters	Lifting Force @60% [N]		Cup Deflection [S] [mm]	Radius [R] [mm]
PFG-1-*	1	0,008	0,00000015	0,05	0,025	0,1	1,6
PFG-1.5-*	1,5	0,01	0,00000053	0,10	0,05	0,1	3,5
PFG-2A-*	2	0,03	0,0000007	0,19	0,09	0,1	1,75
PFG-3.5A-*	3	0,10	0,000002	0,59	0,29	0,2	2,0
PFG-5A-*	5	0,20	0,000005	1,20	0,6	0,5	3,5
PFG-6A-*	6	0,28	0,000008	1,70	0,85	1,0	4,0
PFG-8A-*	8	0,50	0,00003	3,10	1,5	1,4	5,0
PFG-10A-*	10	0,79	0,00007	4,80	2,4	1,5	6,0
PFG-15A-*	15	1,77	0,0004	10,8	5,4	1,9	6,0
PFG-20B-*	20	3,14	0,0008	19,2	9,6	2,3	13,0
PFG-25-*	25	4,91	0,0013	30,0	15,0	3,0	17,5
PFG-30-*	30	7,07	0,0018	43,2	21,6	2,0	26
PFG-35-*	35	9,62	0,0026	58,9	29,5	3,0	31
PFG-40-*	40	12,60	0,004	76,9	38,5	3,5	37
PFG-50-*	50	19,60	0,007	120	60	4,0	41
PFG-60-*	60	28,30	0,0090	173	87	5,0	70
PFG-80-*	80	50,30	0,025	308	154	6,0	100
PFG-95-*	95	70,90	0,035	434	267	6,0	150
PFG-120-*	120	113,00	0,078	692	346	6,0	365
PFG-150-*	150	176,70	0,177	1081	541	9,0	380
PFG-200-*	200	314,20	0,425	1922	961	13,0	430

* Cup Material

PFG-60-NBR

PFG Series Vacuum Cups

Vacuum Cups - PFG Flat Vacuum Cups

$38.24

Sales Pricing Unit: EA

Part #: PFG-60-NBR

Manufacturer: Parker

Availability: (0) Out of Stock

3) Legged

a) Humanoid Robot (BIOLOID)

https://emanual.robotis.com/docs/en/edu/bioloid/premium/

DYNAMIXEL AX-12A

DYNAMIXEL

$48.90

SKU: 902-0003-001
UPC: 8809052930196
Condition: New
Weight: 0.10 LBS
Shipping: Calculated at Checkout

Quantity: 1

ADD TO CART SAVE

Model Name		**AX-12A**
MCU		-
Input Voltage	**Min. [V]**	9.0
	Recommended [V]	11.1
	Max. [V]	12.0
Performance Characteristics	**Voltage [V]**	12.0
	Stall Torque [N·m]	1.50
	Stall Current [A]	1.5
	No Load Speed [rpm]	59.0
	No Load Current [A]	0.14
Continuous Operation	**Voltage [V]**	-
	Torque [N·m]	-
	Speed [rpm]	-
	Current [A]	-
Resolution	**Resolution [deg/pulse]**	0.2930
	Step [pulse/rev]	1
	Angle [degree]	300
Position Sensor		Potentiometer
Operating Temperature	**Min. [°C]**	-5
	Max. [°C]	70
Motor		Cored
Baud Rate	**Min. [bps]**	7,843
	Max. [bps]	1,000,000
Control Algorithm		Compliance

Gear Type	Spur
Gear Material	Engineering Plastic
Case Material	Engineering Plastic
Dimensions (W x H x D) [mm]	32 X 50 X 40
Dimensions (W x H x D) [inch]	1.26 X 1.97 X 1.57
Weight [g]	55.00
Weight [oz]	1.93
Gear Ratio	254 : 1
Command Signal	Digital Packet
Protocol Type	Half duplex Asynchronous Serial Communication (8bit, 1stop, No Parity)
Link (Physical)	TTL Level Multi Drop Bus
ID	0 ~ 253
Feedback	Position, Temperature, Load, Input Voltage, etc
Protocol Type	Protocol 1.0
Operating Mode / Angle	Wheel Mode : Endless turn Joint Mode : 300 [deg]
Output [W]	-
Standby Current [mA]	50

USB2Dynamixel

$49.90

USB extension cable included

Purchase

Technical Documentation

- Connecting the AX-12 to the USB2Dynamixel (by John Raffensperger)
- USB2Dynamixel manual (ver1 pdf)
- USB2Dynamixel manual (ver2 pdf)

Go the to **Robotis Support Site** to get the latest drivers, software and manuals for the USB2dynamixel

Features

- USB2Dyanmixel provides USB to RS-232, RS-485, and AX-12 (TTL) interfaces in one unit.
- The status LED displays power status, TxD (data write), and RxD (data read).
- Connects to the AX series Dynamixel via TTL
- Connects to the DX, RX series Dynamixel via RX-485
- Converts a USB port to a serial port via RX-232
- USB extension cable included

Name	Description
Status Display LED	Display power supply, TXD(data writing), and RXD(data reading) status.
Function Selection Switch	Select the communication method of TTL, RS-485, and RS-232.
3P Connector	Connect DYNAMIXEL's of AX Series through TTL communication.
4P Connector	Connect DYNAMIXEL's of DX, RX Series through RS-485 communication.
Serial Connector	Change from USB port to Serial port through RS-232 communication.

CM-530

$108.90

SKU: 902-0062-000
UPC: 8809052930653
Condition: New
Weight: 0.40 LBS
Shipping: Calculated at Checkout

Current Stock: 5

Quantity: 1

ADD TO CART SAVE TO W

BT-410

$21.70

SKU: 902-0110-000
UPC: 8809052930813
Weight: 0.20 LBS
Shipping: Calculated at Checkout

Current Stock: 15

Quantity: 1

ADD TO CART SAVE

LIPO Battery 11.1V 1000mA LB-010

$26.10

SKU: 903-0143-000
UPC: 8809052930011
Condition: New
Weight: 0.30 LBS
Shipping: Calculated at Checkout

Current Stock: 7

Quantity: 1

ADD TO CART SAVE TO WISHLIST

IR Sensor IRSS-10

$7.50

SKU: 902-0039-000
UPC: 8809052937270
Condition: New
Weight: 0.20 LBS
Shipping: Calculated at Checkout

Current Stock: 13

Quantity: 1

ADD TO CART SAVE TO WISHLIST

Distance Measuring Sensor DMS-80

$16.20

SKU: 902-0043-000
UPC: 8809052937416
Condition: New
Weight: 0.20 LBS
Shipping: Calculated at Checkout

Current Stock: 8

Quantity: 1

ADD TO CART SAVE TO WISHLIST

Gyro Sensor GS-12

$38.00

SKU: 902-0042-000
UPC: 8809052937324
Condition: New
Weight: 0.20 LBS
Shipping: Calculated at Checkout

Current Stock: 9

Quantity: 1

ADD TO CART SAVE TO WISHLIST

4) Swimming
a) Fish robot SoFi

A Raspberry Pi receives input from the controller and amplifies the ultrasound signals for SoFi via a HiFiBerry. The controller, Raspberry Pi, and HiFiBerry are sealed within a waterproof, cast-moulded silicone membrane filled with non-conductive mineral oil, allowing for underwater equalisation.

Click to enlarge

Be the first to review this product

HS-646WP Waterproof, High Torque Servo

by Hitec

New stock soon See due date

Notify me when this product is in stock

Product Highlights

- Motor type: 3 Pole
- Bearing type: dual ball bearing
- Speed (6.0V/7.4V): 0.20 / 0.17
- Torque oz./in. (6.0V/7.4V): 133 / 161
- Torque kg./cm. (6.0V/7.4V): 9.6 / 11.6
- Programmable Circuitry

Product Code : **RB-Hit-116**

USD $**51.28**

Saw Better Price? Start Price Match

Qty

1

ADD TO CART

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Ask our experts

Compare RC Servo Motors

Ask a question on the RobotShop community

The HS-5646WP Waterproof, High Torque Servo have what it takes to keep your radio control vehicle, airplane or robot watertight! With high torque, dual ball bearings and metal gears, our analog waterproof servos have the industry's first IP67* rating ranking them among the most durable and reliable servos for wet conditions. Whether you are manning your power boat, bashing in the mud, directing your underwater robot, or water landing your 25% plane, It will dependably keep your mind at ease.

A detailed study of the various actuation systems is provided in (*90*). We chose an external gear pump (Fig. 7) for the fully integrated robotic fish because of its better swimming performance, lower part count, and easier controllability.

The motor controller operates the motor attached to the pump through a trapezoidal voltage profile, alternating from positive to negative voltages after each half-cycle. This profile rotates the motor shaft back and forth, causing the pump to create a cyclic hydraulic flow. Asymmetrically varying the flow intensity for each half-phase can enable yaw control by creating a pressure bias in the tail.

Ready to Ship ⊘In Stock ⊘Fast Dispatch

Cast Iron Materials Low Pressure Gear Pump CB-B2.5 CB-B4 CB-B6 CB-B10 Oil Pumps

1 - 4 Units	5 - 9 Units	10 - 19 Units	>=20 Units
$15.00	$14.00	$13.00	$12.00

Source now

CB-B Gear Pump

1. CB-B gear pump is a displacement gear oil pump. It uses two gyres gear to translate engine power which produced by motor into hydraulic pressure power.

2. This power is used in hydraulic system of machine tool and other machines.

Application:

1. This pump can convery oil with viscosity 1-8 ° E, with temperature 10-50 ° C.

2. Stainless steel type can pump corrosive liquid. High temperature type can pump liquids reach 180 ° C.

Quick Details

Customized support:	OEM	Brand Name:	TIMEWAY
		Model Number:	CB-B2.5 CB-B4 CB-B6 CB-B10
Place of Origin:	Jiangsu, China	Application:	Automotive Industry, Irrigation and Agriculture, Metering
Horsepower:	0.37kw	Power Source:	Electric
Pressure:	25bar, Low Pressure	Structure:	Gear Pump
Power:	Electric	Fuel:	Hydraulic oil
Standard or Nonstandard:	Standanrd	Material:	Aluminum Alloy
		Delivery time:	Within 2 Days
Packing:	Carton	Type:	Hydraulic Power Units
Capacity:	2L 4L 6L 8L	Certification:	ISO

presented in Fig. 7. A single unit contains a micro linear actuator with potentiometer feedback (PQ12, Actuonix, Victoria, Canada) that sits within a watertight cylinder and moves a piston. A closed-loop proportional-integral-derivative (PID) controller with pressure feedback from an integrated pressure sensor is used to drive the volume-changing actuators. Ascent, descent, and hovering can be achieved over several meters by symmetrically controlling the pistons. The pitch can also be modified by asymmetrically controlling the two pistons (fig. S4).

PQ12-P Linear Actuator with Feedback

ACTUONIX

Price: $65.00

Product Code: PQ12-P

Choose your o

Ratio

Gear Ratio*:

PQ12 Specifications

Gearing Option	30:1	63:1	100:1
Peak Power Point	15N@15mm/s	30N @ 8mm/s	40N @ 6mm/s
Peak Efficiency Point	8N @ 20mm/s	12N@12mm/s	20N @ 8mm/s
Max Speed (no load)	28mm/s	15mm/s	10mm/s
Max Force (lifted)	18N	45N	50N
Max Side Load	5N	10N	10N
Back Drive Force	9N	25N	35N
Stroke	20 mm		
Input Voltage	6 or 12 VDC		
Stall Current	550mA @ 6V, 210mA @ 12V		
Mass	15g		
Operating Temperature	-10°C to +50°C		
Positional Repeatability	±0.1mm		
Mechanical Backlash	0.25 mm		
Audible Noise	55dB @ 45cm		
Ingress Protection	IP-54		
Feedback Potentiometer	5kΩ±50%		
Limit Switches	Max. Current Leakage: 8uA		
Maximum Duty Cycle	20%		

4) Swimming
b) Underwater glider robot

https://www.youtube.com/watch?v=WVg47-5Skjs

https://hackaday.io/project/20458-osug-open-source-underwater-glider

NEMA-17 Bipolar 32mm Stepper

ID: 3304_0

This high speed bipolar stepper has a 3.75° step angle and 590 g·cm of torque at low speeds.

Discontinued

The stepper motor spins to push and pull the syringe to control the buoyancy at the head of the glider.

Product Specifications

Motor Properties	
Motor Type	Bipolar Stepper
Manufacturer Part Number	39BYGS202
Step Angle	$3\,^{3}/_{4}$°
Step Accuracy	5 %
Holding Torque	750 g·cm
Rated Torque	590 g·cm
Maximum Speed (w/1063 Motor Controller)	1250 RPM
Maximum Motor Speed	4105 RPM
Acceleration at Max Speed (w/1067 Motor Controller)	1E+06 1/16 steps/sec²
Electrical Properties	
Recommended Voltage	12 V DC
Rated Current	1 A
Coil Resistance	4.5 Ω
Phase Inductance	5 mH
Physical Properties	
Shaft Diameter	5 mm
Mounting Plate Size	NEMA - 17
Weight	171 g
Number of Leads	4
Wire Length	300 mm
Customs Information	
Canadian HS Export Code	8501.10.00
American HTS Import Code	8501.10.40.40
Country of Origin	CN (China)

4) Swimming
b) Underwater glider robot

https://www.youtube.com/watch?v=WVg47-5Skjs

https://hackaday.io/project/20458-osug-open-source-underwater-glider

QUANTITY		COMPONENT NAME
1	×	Printed parts
1	×	Blue Robotics 4" tubing 1000mm The main tubing
1	×	MPU6050 Gyroscope/accelerometer
3	×	A4988 Stepper motor driver Stepper motor drivers
6	×	18650 Protected cells Litium-ion batteries
6	×	C/D Battery contact spring Battery contact springs for the lithium-ion batteries
6	×	LRB-2.5T-M4 Solderless crimp terminals to connect to the battery
3	×	Micro lever switch Endstops
2	×	2mm stainless steel plate (400x140mm) Used for the wings
2	×	300mm Acme screw Used for pitch/buoyancy motor
2	×	Acme nut Used for pitch/buoyancy motor
6	×	316 Stainless steel hosetail (barb fitting), 10mm diam Used to connect the syringes to the endplate
1	×	10mm aluminium tubing (1 meter lengths) Used in general assembly
1	×	9mm reinforced PVC tubing (1m) used to connect the syringes to the exterior
1	×	Blue Robotics Fathom-S Tether Interface Board Set Serial communication boards
1	×	Blue Robotics Fathom ROV Tether (25m recommended) Used to test the glider/communicate/charge
1	×	Blue Robotics Enclosure Vent and Plug Used to equalise pressure when putting the glider together
2	×	Blue Robotics Aluminum End Cap (4" Series) Endplate pieces
2	×	Blue Robotics O-Ring Flange (4" Series) Endcap pieces
1	×	Blue Robotics Bar30 High-Resolution 300m Depth/Pressure Sensor Used for depth sensing
1	×	Blue Robotics Switch On/Off switch for the glider
1	×	Silicone grease Used to coat the o-rings to ensure the glider is watertight
1	×	Marine epoxy Used to fix the barbs to the endplate
2	×	NEMA 17 32mm Stepper motor Stepper motors for the planetary gearbox and the buoyancy engine
1	×	27mm metal hole saw Not technically a part, but used to drill the hole for the underwater connector
1	×	Pogo connector male PCB Download from the "Files" section
1	×	Pogo connector female PCB Download from the "Files" section
1	×	Control board PCB Download from the "Files" section
20	×	16mm Pogo pins (P75-B1) (20 includes 10 spare) Used to electrically connect the front and back of the glider
1	×	PX0733 - Bulgin buccaneer standard series, dust cap 314390
2	×	PX0728/P - Bulgin buccaneer standard series, 9 pins, cable mount plug 469683
1	×	12237 – Bulgin buccaneer standard series, strain relief 469713
1	×	PX0727/S - Bulgin buccaneer standard series, 9 pins, panel mount receptacle 314419

2	×	DF13-4P-1.25DSA – DF13 male header, 4 pins 1324879
1	×	NEMA 17 60mm Stepper motor Stepper motor for the mass assembly carriage
3	×	22-27-2041 or 22-29-2041 – 0.1” Male header, 4 contacts 9731164
1	×	NOTE: The electrical components are supplied with a UK farnell code in the component description, so you can identify them and f
3	×	22-27-2021 or 22-29-2021 – 0.1” Male header, 2 contacts 9731148
1	×	22-27-2081 or 22-29-2081 – 0.1” Male header, 8 contacts 9731180
3	×	22-01-2025 – 0.1” Female header, 2 contacts 143126
3	×	22-01-2045 – 0.1” Female header, 4 contacts 143128
2	×	22-01-2085 – 0.1” Female header, 8 contacts 143130
50	×	08-50-0113 – Crimp contact for motor/endstop headers (includes 16 spare) 2063734
3	×	0603 SMD resistor 10kohm 9238603
1	×	DF13-6P-1.25DSA – DF13 male header, 6 pins 2427590

8	×	LM8UU Linear bearings for mass assembly
4	×	3.5mm Screw terminal block, 2 pins, through hole 2478586
1	×	16MHz Crystal, through hole, 11.5mm x 5mm 1842217
2	×	0603 SMD ceramic capacitor 22pF 1759057
1	×	0.1” male header, through hole, 12 contacts, 2 rows 1593443
1	×	ATMEGA2560 16MHz TQFP 1288330
1	×	0.1” male header, through hole, 6 contacts, 2 rows 1248132
50	×	Crimp contact for communication headers (includes 18 spare) 1097978
4	×	2 contact female header for communication 1211646
2	×	4 contact female header for communication 1211644
1	×	8 core 24AWG ribbon wire 1301023
1	×	Small zip ties (many) Used to fasten linear bearings

100	×	M3 nuts (includes 4 spare)
60	×	10mm M3 bolts (includes 10 spare)
70	×	16mm M3 bolts (includes 11 spare)
10	×	20mm M3 bolt (includes 4 spare)
5	×	25mm M3 bolt (includes 2 spare)
15	×	M4 nuts (includes 15 spare)
20	×	16mm M4 bolts (includes 8 spare)
5	×	25mm M4 bolts (includes 2 spare)
10	×	30mm M4 bolts (includes 6 spare)
1	×	M8 nut
2	×	8mm chromed smooth rod 1000mm Stainless steel smooth rod used for movement
1	×	40mm M8 bolt
1	×	Arduino Used for burning the bootloader
1	×	6 pin ICSP cable Used for burning the bootloader
6	×	Terumo Catheter Tip Syringes 50ml Syringe Buoyancy engine syringes (Other brands may work, but dimensions will vary)
3	×	608ZZ Bearings To keep the mass assembly rotating smoothly

5) Others
a) Kilobot

Basic Motion Principle

Shaftless Vibration Motor 10x2.0mm

Pololu item #: 1638 **3118** in stock
Brand: Unspecified
✓RoHS 3

Price break	Unit price (US$)
1	3.49
10	3.14
50	2.79
100	2.62

Quantity: 1 Add to cart
backorders allowed Add to wish list

This tiny, button-type, vibrating motor shakes with a vibration amplitude of 0.75g and draws approximately 60 mA when 3 V is applied to its leads. The shaftless design keeps this motor small: 10 mm in diameter and 2.0 mm in height.

Vibration motors to move

2 legs with motor, 1 leg as support

Stick-Slip Locomotion

Dimensions

Size:	10.0 x 2.0 mm
Weight:	0.8 g

General specifications

No-load speed @ 3V:	14500 rpm[1]
No-load current @ 3V:	60 mA[2]
Voltage:	3 V[3]
Vibration amplitude:	0.75 g

Notes:

1. 12000 RPM minimum at 3 V.
2. 80 mA maximum at 3 V.
3. Recommended operating range is 2.5 to 3.5 V.

Other Component List

Description	Distributor	Distributor #	Designation	Unit Price $
TRANS NPN 30V 0.5A SOT-23 (**)	Digikey	MMBT6428CT-ND	T5, T6, T7	0.1555
MCU 32KB In-system Flash 20MHz (*)	Mouser	556-ATMEGA328P-MU	U1	2.41
Shaftless Vibration Motor 10x2.0mm (**)	Pololu	1638	M1, M2	2.62
Lithium ion Rechargeable Coin Cells (**)	Powerstream	Lir2477		2.02
SHUNT JUMPER .1" BLACK GOLD (*)	Digikey	3M9580-ND	Jumpers	0.06
CONN HEADER 50POS .100" SGL GOLD	Digikey	SAM1061-50-ND	J3, J4, J5	4.96
Coin Cell Battery Holder (*)	Mouser	534-1025-7	BATT	1.4
Infrared Emitters 5V 160mW 60Deg (*)	Mouser	782-VSMB1940X01	Tx1	0.735
Photodiodes 60V 215mW 60Deg (*)	Mouser	782-TEMD7100X01	Rx1	0.66
CONN HDR BRKWAY .100 80POS VERT	Digikey	A26536-40-ND	J1(POWER), J2(DEBUG),ISP1	3.54
Photo Transistor(Ambient Light Sensor) (*)	Mouser	782-TEPT5700	T4	0.478
PCB 1.7424 in^2 (Total Price = 157.50)	OSH Park			

* Price Break (50 Units)
** Price Break (100 Units)
*** Price Break (250 Units)
**** Price Break (500 Units)