makeblock

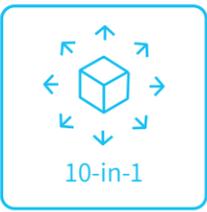**f** @Makeblock    **Twitter** @Makeblock    **G+** @Makeblock

# makeblock

# Ultimate 2.0
## 10-in-1 Robot Kit

Infinite Extensibility

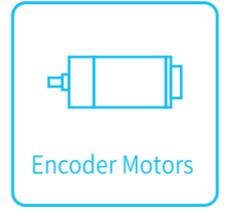10-in-1

Arduino & Raspberry Pi Compatible

Heavy-duty Aluminum Alloy

Encoder Motors

App-Enabled

Support Various Programming Languages

Beverage Robot

Robotic Arm Tank

Camera Dolly

MegaPi inside

## Make & Control Your Own Robot

Ultimate 2.0 is a flagship robot kit of Makeblock platform. It contains various mechanical parts and electronic modules, allowing you to build more complicated robots and develop your creativity. Get started and build your own Ultimate 2.0 for exploring more interesting cases!

Note: This user manual includes building instruction for the three main building forms.

For other building instructions, please refer to learn.makeblock.com/ultimate2/

### Robotic Arm Tank

This Robot Arm Tank consists of a highly-adaptable track chassis and a flexible robotic arm. This robot is designed to help you grip, lift, and deliver objects in various terrains.

### Beverage Robot

Beverage Robot is made up of a mobile chassis, a variable angle support structure and a self-adaptive bracket.
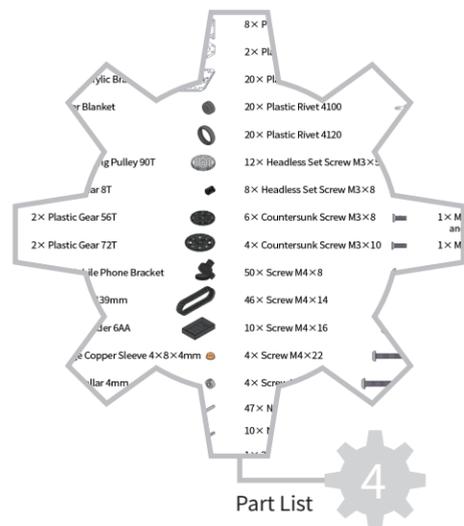
### Camera Dolly

Camera Dolly consists of a mobile chassis and a 360-degree swivel base. Add a smart phone or a camera onto this robot and start filming from a low angle. You can also preset a path for the robot to follow  in order to capture the moments of your life. (Motion noise may affect the sound recording.)
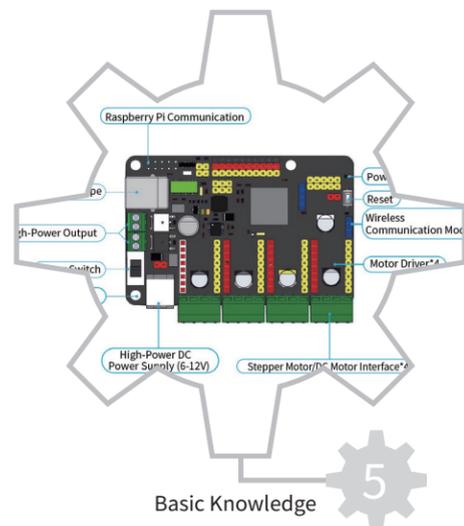
# Quick Guide

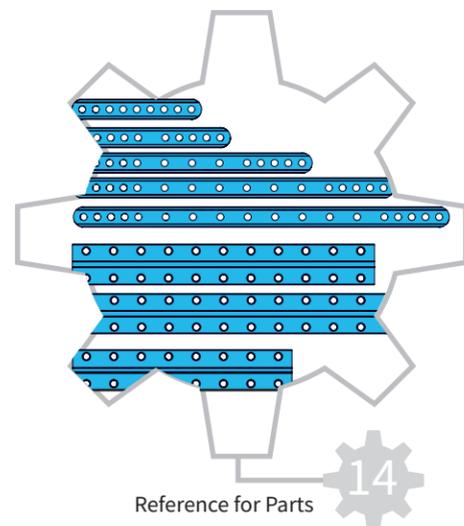※ Here is a quick guide for you to get started easily.

Part List **4**


Basic Knowledge **5**


Reference for Parts **14**


Robotic Arm Tank **16**


Beverage Robot **30**


Camera Dolly **42**


App **54**


Programming **55**

Check the parts of Ultimate 2.0 according to the Part List .

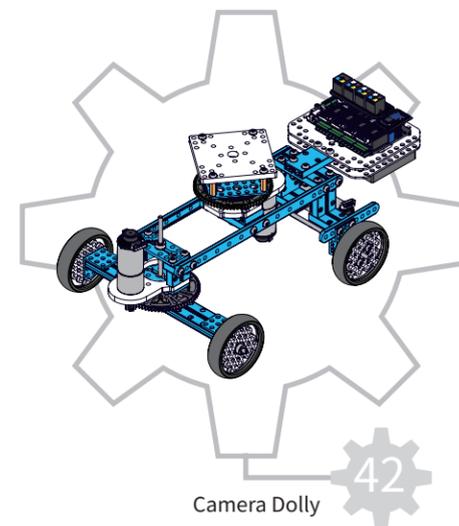Explain in detail how to use the instructions for you.

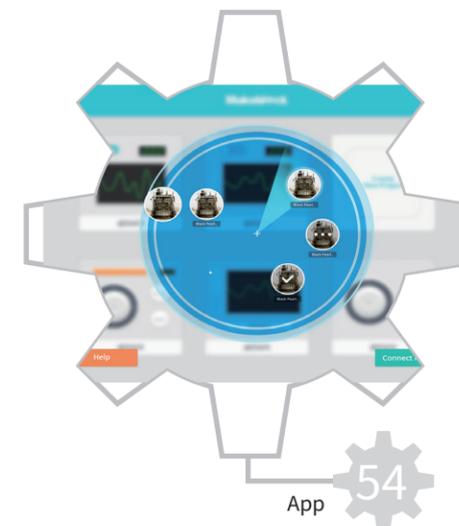A reference with a ratio of 1:1 provides an easier way for you to distinguish parts of Ultimate 2.0.

Robotic Arm Tank uses its  gripper to grip and deliver objects.
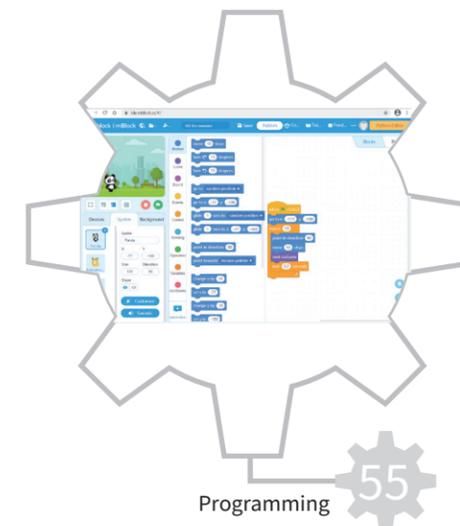
Control Beverage Robot to pour water or wine via the companion app.

By adding a smartphone or a digital camera, Camera Dolly can film your life from a low angle.

Control your robot with smartphone, tablet, and computer.
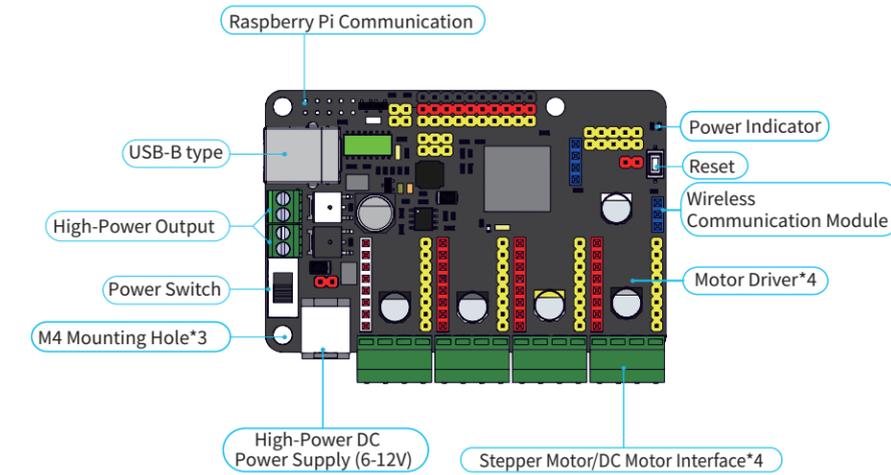
Ultimate 2.0 supports graphical programming to realize more interesting interactions. Or combine Ultimate2.0 with Raspberry Pi to realize Python programming.

# Part List

| Qty | Part | Qty | Part | Qty | Part | Qty | Part |
|---|---|---|---|---|---|---|---|
| 4× | Beam0824-016 | 4× | Stiffener1616-08-M4 | 4× | Brass Stud M4×16 | 1× | Makeblock Robot Gripper |
| 5× | Beam0824-032 | 1× | Plane Bearing TurntableD34x24mm | 4× | Plastic Ring 4×7×2 | 3× | 25mm DC Encoder Motor Cable |
| 3× | Beam0824-064 | 1× | Quick Release Plate | 8× | Plastic Ring 4×7×3 | 1× | MegaPi |
| 2× | Beam0824-128 | 2× | 25mm Motor Bracket-72T | 2× | Plastic Ring 4×7×10 | 4× | Megapi Encoder/DC Motor Driver |
| 1× | Slide Beam0824-176 | 2× | MegaPi Acrylic Bracket | 20× | Plastic Rivet 4060 | 1× | Megapi Shield for RJ25 |
| 2× | Slide Beam0824-192 | 4× | Rubber Blanket | 20× | Plastic Rivet 4100 | 1× | Bluetooth Module |
| 2× | Beam0808-024 | 4× | Tire 90T B | 20× | Plastic Rivet 4120 | 1× | Me Ultrasonic Sensor |
| 2× | Plate0324-056 | 6× | Plastic Timing Pulley 90T | 12× | Headless Set Screw M3×5 | 1× | Me Line Follower |
| 3× | Plate0324-088 | 3× | Plastic Gear 8T | 8× | Headless Set Screw M3×8 | 1× | Me Shutter |
| 4× | Beam0412-076 | 2× | Plastic Gear 56T | 6× | Countersunk Screw M3×8 | 1× | Me 3-Axis Accelerometer and Gyro Sensor |
| 4× | Beam0412-092 | 2× | Plastic Gear 72T | 4× | Countersunk Screw M3×10 | 1× | Me Adapter |
| 4× | Beam0412-140 | 1× | 360° Mobile Phone Bracket | 50× | Screw M4×8 | 1× | USB Cable B-1.3m |
| 6× | Beam0412-188 | 2× | Track 80×139mm | 46× | Screw M4×14 | 2× | 6P6C RJ25 Cable-20cm |
| 2× | Beam0412-220 | 1× | Battery Holder 6AA | 10× | Screw M4×16 | 1× | 6P6C RJ25 Cable-35cm |
| 2× | Bracket P3 | 12× | Flange Copper Sleeve 4×8×4mm | 4× | Screw M4×22 | 10× | Rubber Band |
| 3× | 25mm DC Motor Bracket | 12× | Shaft Collar 4mm | 4× | Screw M4×30 | 10× | Nylon Cable Tie 1.9×100 |
| 4× | Bracket 3×3 | 6× | Threaded Shaft 4×39mm | 47× | Nut M4 | 1× | Cross&2.5mm HEX Screwdriver |
| 2× | Plate 3×6 | 2× | D shaft D4×50mm | 10× | Nylon Lock Nut M4 | 1× | Small Fourway Socket Wrench |
| 1× | Plate 7×9-B | 2× | Shaft D4×88mm | 1× | 25mm DC Encoder Motor 9V/86RPM | 1× | Wrench 5mm&7mm |
| 6× | Shaft Connector 4mm | 1× | D shaft D4×160mm | 2× | 25mm DC Encoder Motor 9V/185RPM | 1× | HEX Key 1.5mm |

# Basic Knowledge -- MegaPi



- Raspberry Pi Communication
- USB-B type
- High-Power Output
- Power Switch
- M4 Mounting Hole*3
- Power Indicator
- Reset
- Wireless Communication Module
- Motor Driver*4
- High-Power DC Power Supply (6-12V)
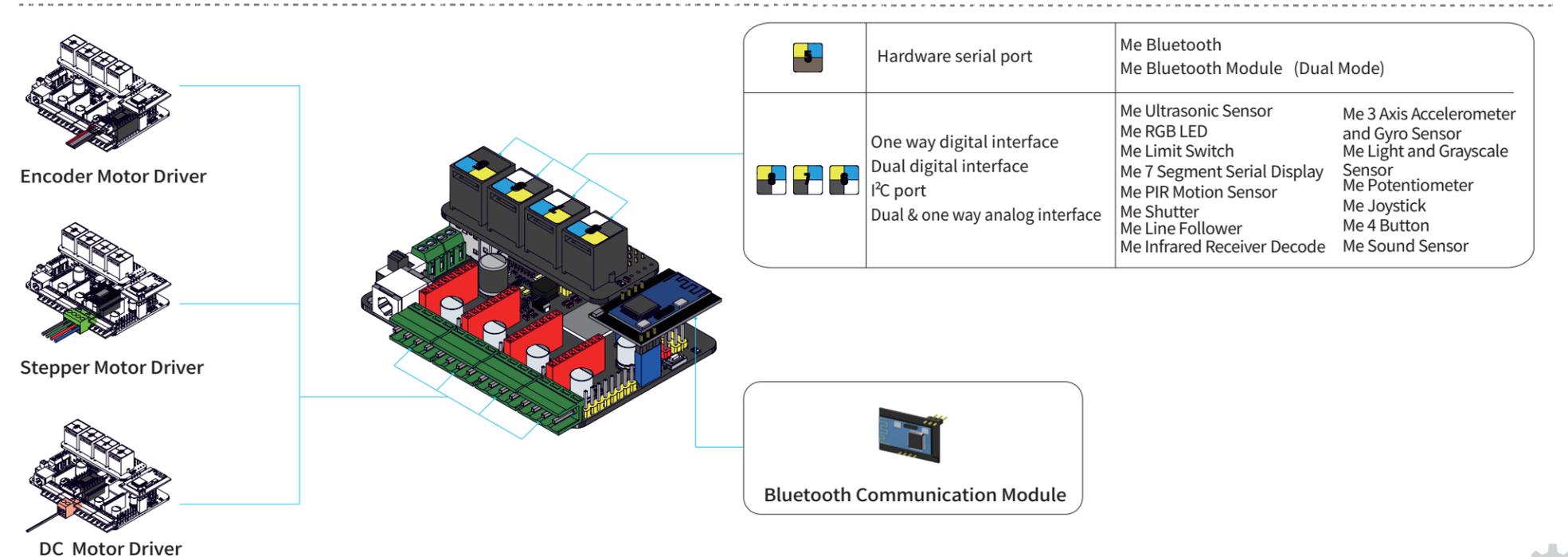- Stepper Motor/DC Motor Interface*4

MegaPi is a main control board specially designed for makers and also an ideal option for being applied to education field and all kinds of matches. It is based on Arduino MEGA 2560 and supports programming with Arduino IDE perfectly. MegaPi can be divided into 6 function area, allowing you to connect with various plug-in modules to drive motors and sensor and to realize wireless communication. MegaPi has strong motor-driving ability which is capable of driving 10 servos or 8 DC motors simultaneously. It is the ideal option for various robotic projects, such as smart robot car and 3D printer.

**Technical Specifications**
- Microcontroller: ATMEGA2560-16AU
- Input Voltage: DC 6V-12V
- Operating Voltage: DC 5V
- I/O Pins: 43
- Serial Ports: 3
- I²C Interface: 1
- SPI Interface: 1
- Analog Input Pins: 15

The various colors on MegaPi represents specialized functions:
1. Red Pin--power output/motor output
2. Yellow Pin--I/O pin
3. Blue Pin--wireless communication interface
4. Black Pin--power GND
5. Green Interface--power output/motor output

Encoder Motor Driver

Stepper Motor Driver

DC Motor Driver

| | | |
|---|---|---|
| | Hardware serial port | Me Bluetooth / Me Bluetooth Module (Dual Mode) |
| | One way digital interface / Dual digital interface / I²C port / Dual & one way analog interface | Me Ultrasonic Sensor, Me RGB LED, Me Limit Switch, Me 7 Segment Serial Display, Me PIR Motion Sensor, Me Shutter, Me Line Follower, Me Infrared Receiver Decode / Me 3 Axis Accelerometer and Gyro Sensor, Me Light and Grayscale Sensor, Me Potentiometer, Me Joystick, Me 4 Button, Me Sound Sensor |

Bluetooth Communication Module

# Basic Knowledge -- Electronic Modules

## Gyroscope Sensor

Gyro Sensor is a motion-processsing module. It can be used to measure the angular rate and the acceleration information of your robot or other devices. This gyro sensor is developed based on MPU-6050, which is capable of processing complex 9-axis Motion Fusion algorithms by combining a 3-axis gyroscope, 3-axis accelerometer, and a Digital Motion Processor™(DMP). You can build a self-balance robot using the Gyro Sensor with encoder motor.
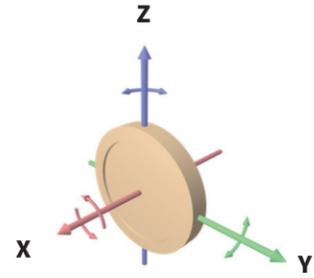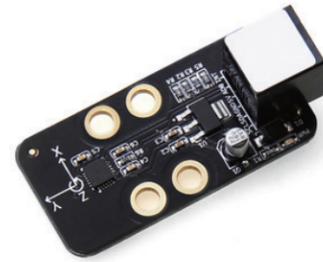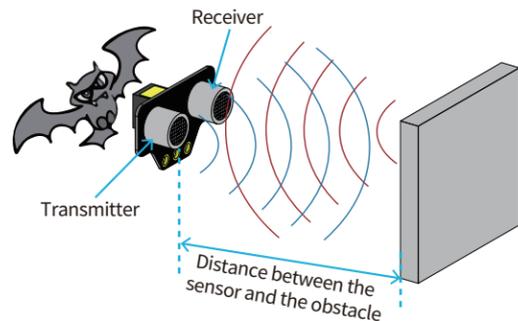
Specifications:

- Operating Voltage: 5V DC
- Angular rate sensor (gyro) sensitivity: 131 LSBs/dps

## Me Ultrasonic Sensor

Ultrasonic module is a kind of electronic module to measure distance, and the measurement range is 3 cm to 400 cm. It is used for obstacle avoidance car as well as other projects. This module can be connected to the port with yellow tag on mainboard.

Specifications:

- Operating Voltage: 5V DC
- Detecting Range: 3cm-400cm
- Detecting Angle: Prefer at 30 degree angle

# Basic Knowledge -- Electronic Modules

## Me Line Follower Sensor

Me Line Follower is designed for the line-following robots. It has two sensors on the module and each sensor contains two parts - an IR emitting LED and an IR sensitive phototransistor. You can program the robot to reliably follow a black line on a white background, or vice versa.
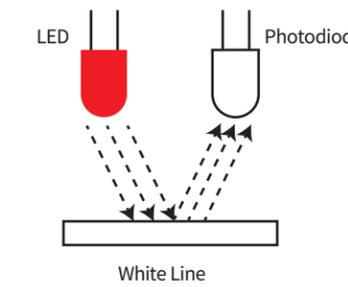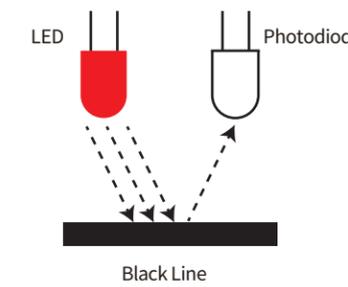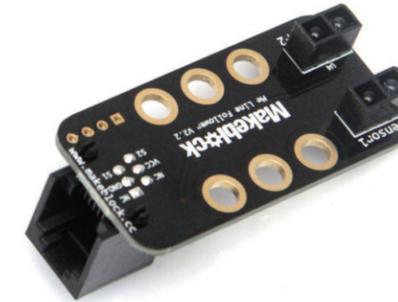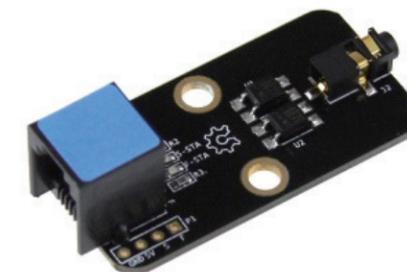
Specifications:

- Operating Voltage: 5V DC
- Detecting Range: 1~2cm

## Me Shutter

Me Shutter is a special module designed to implement auto-photographing for digital SLR camera. Users can use it to take high-speed photos, or take time-lapse video and photo through controlling time exposure. This module can be connected to the port with blue tag on the mainboard. Specific cable is required when connecting camera with this module.
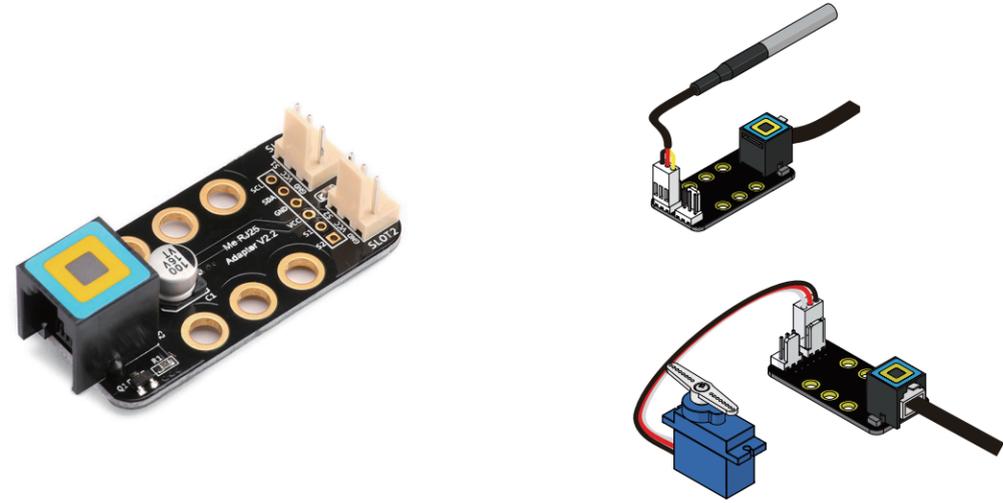
Specifications:

- Rated Voltage: 5V DC

# Basic Knowledge -- Electronic Modules

## Me RJ25 Adapter

The Me RJ25 Adapter module converts the standard RJ25 port into six pins (VCC, GND, S1, S2, SDA, and SCL) so that they can be easily drawn out from Makeblock port in compatible with electronic modules from other manufacturers, such as temperature sensor and servo module.

Features:
- Enable connections with electronic modules from other manufacturer

## Battery Information

Ultimate 2.0 requires six 1.5V AA alkaline batteries (Not included).

**IMPORTANT BATTERY INFORMATION:**

· Use only fresh batteries of the required size and recommended type.
· Do not mix old and new batteries, or use different types of batteries.
· Please respect the correct polarity, (+) and (-).
· Do not try to recharge non-rechargeable batteries.
· Do not throw batteries into fire.
· Replace all batteries of the same type/brand at the same time.
· The supply terminals are not to be short-circuited.
· Batteries should be replaced by adults.
· Remove batteries if the robot is not going to be played with for some time.

LOW BATTERY INDICATORS:

When the batteries grow weak, Ultimate 2.0 robot kit will move much slower than usual, or even restart its mainboard. At this time, power off the robot and replace all batteries.

# Basic Knowledge -- Assembly Tip



※ With many parts contained in this product, please assemble the Ultimate2.0 exactly as the steps in this instruction to avoid confusion. Pay especially attention to the mark of "O" and "X". Make sure you are doing exactly as required by the diagram marked with "O", otherwise the parts may be broken and the robot may fail to work normally.
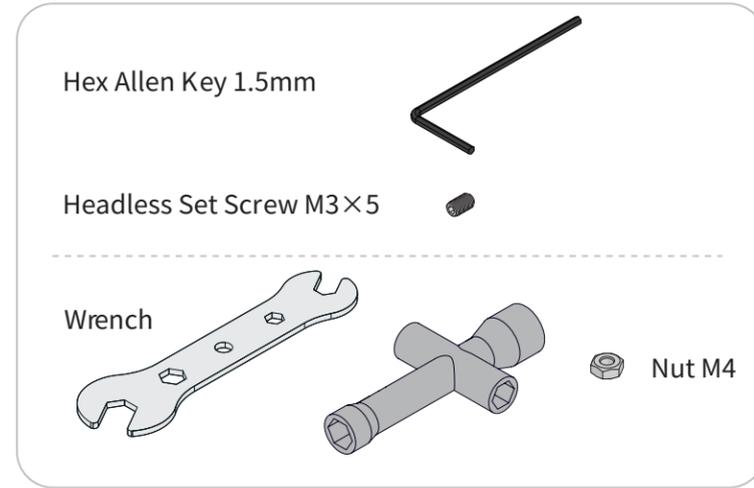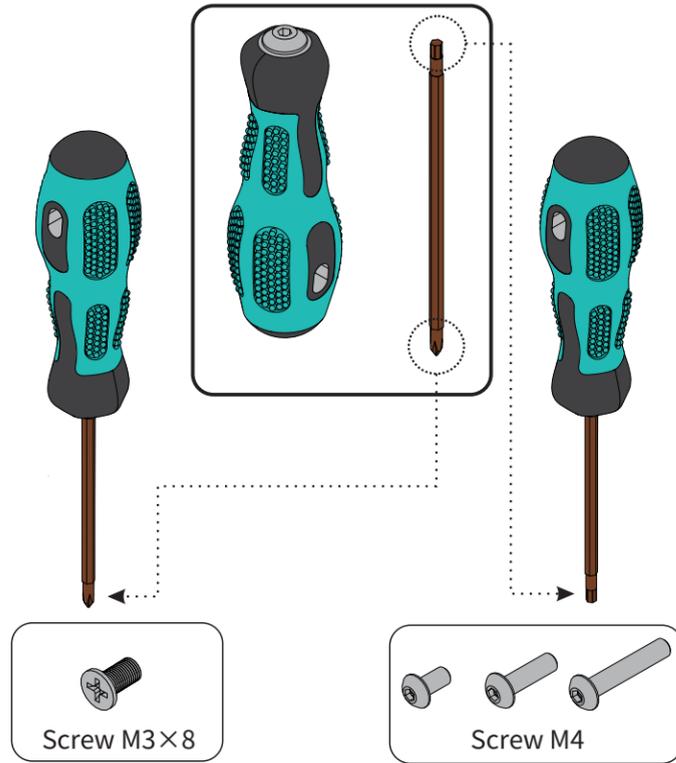
## Diagram

Part Number    Quantity

Assembly Step

3

Encoder Motor 185RPM (1)

25mm DC Motor Bracket (1)

M3×8 (2)

Parts that are required in this step

Notes

Pay attention to direction of the motor interface.

Assembled Diagram
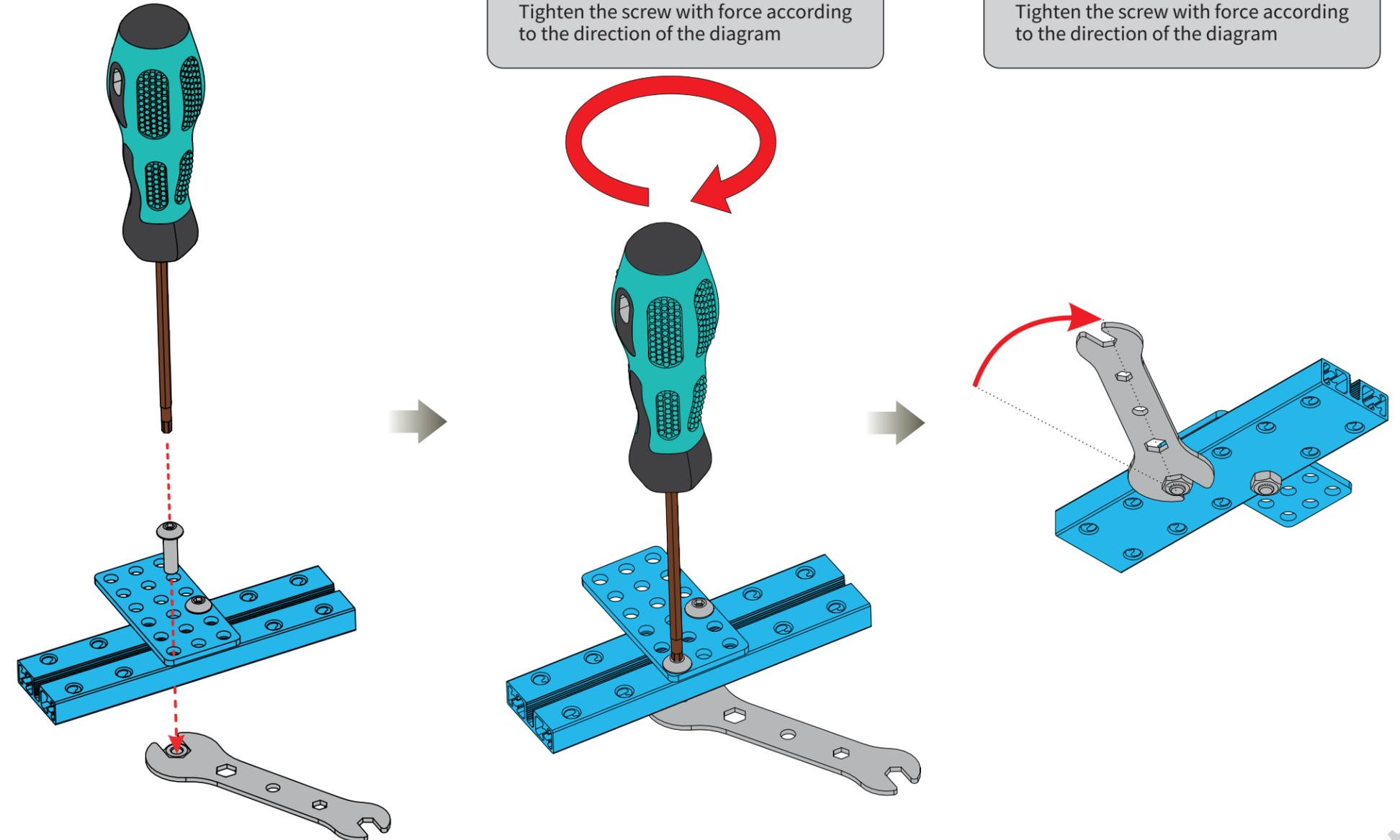
Encoder Motor 185RPM

Assembly Path    Part Name
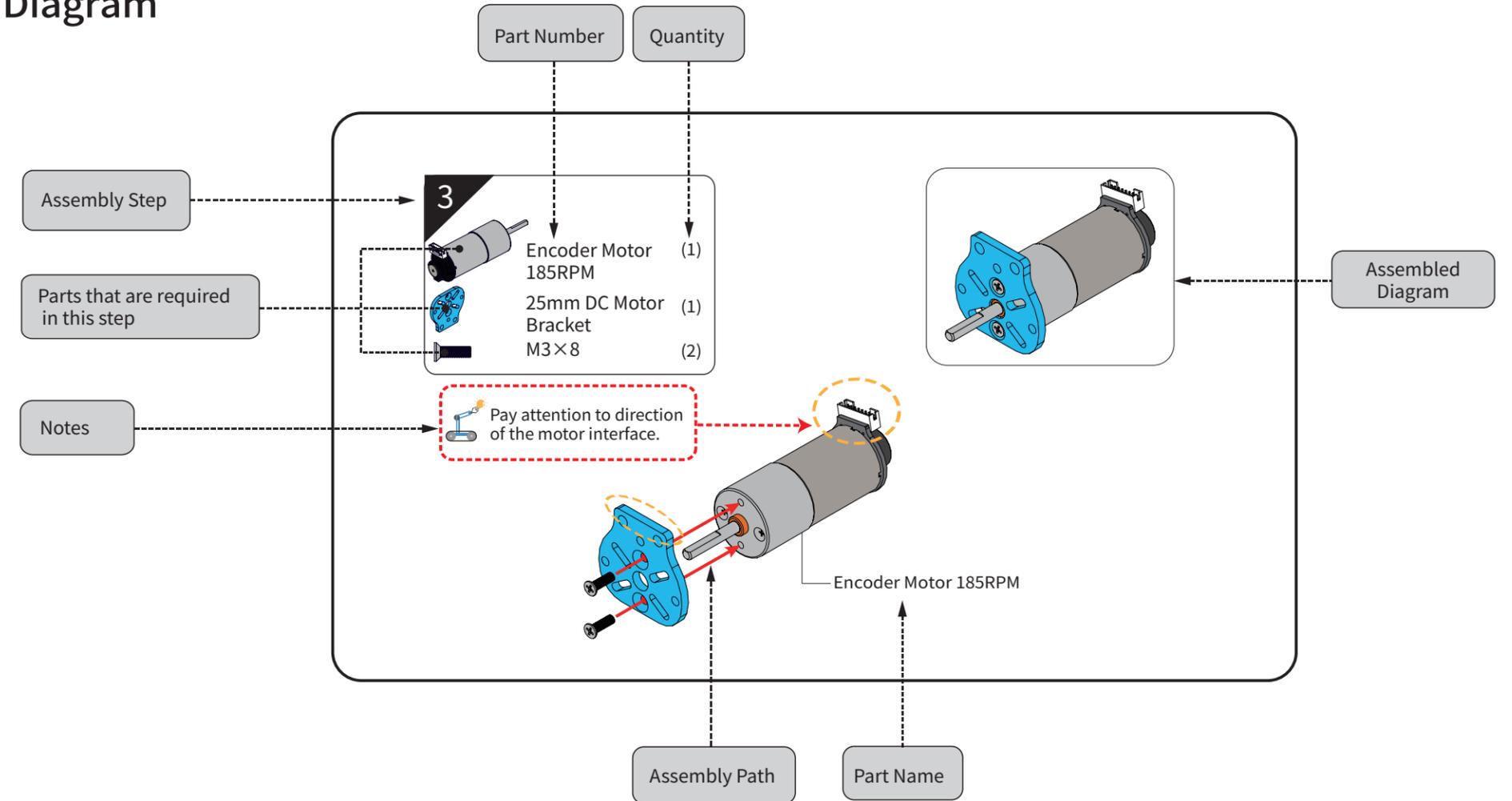
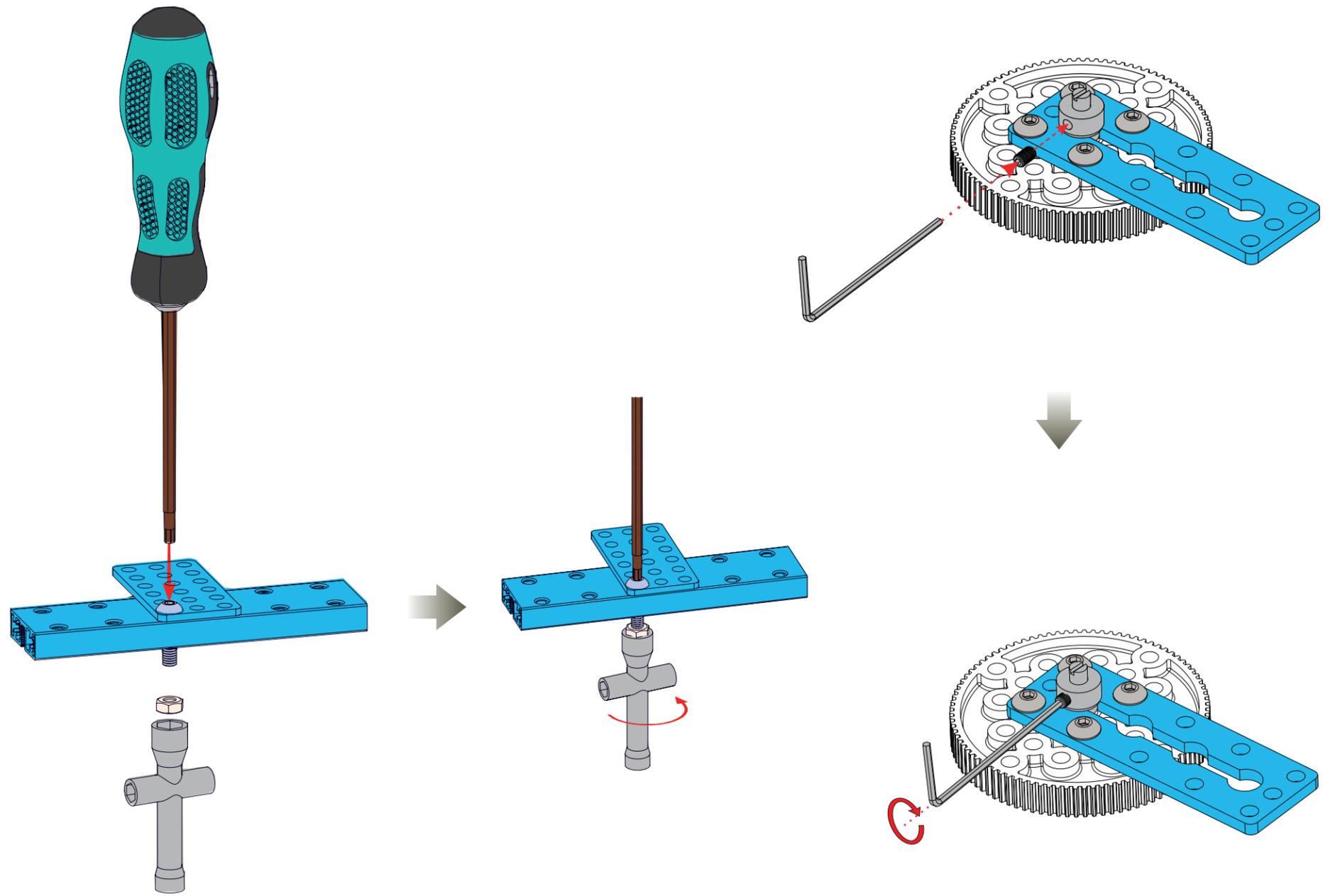# Basic Knowledge -- Assembly Requirement

Please assemble the robot in strict accordance with the following three requirements, otherwise it will result in inaccuracy or unsatisfying performance.
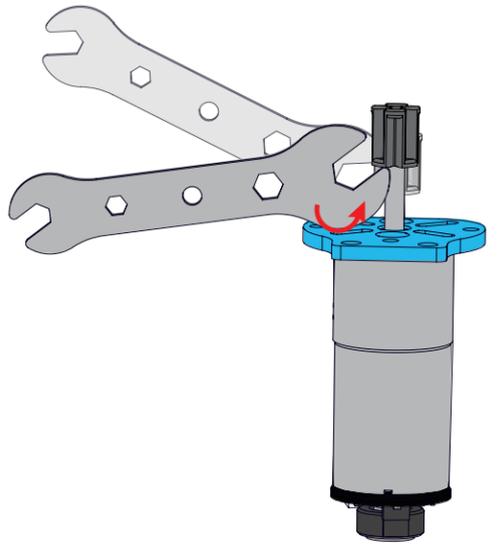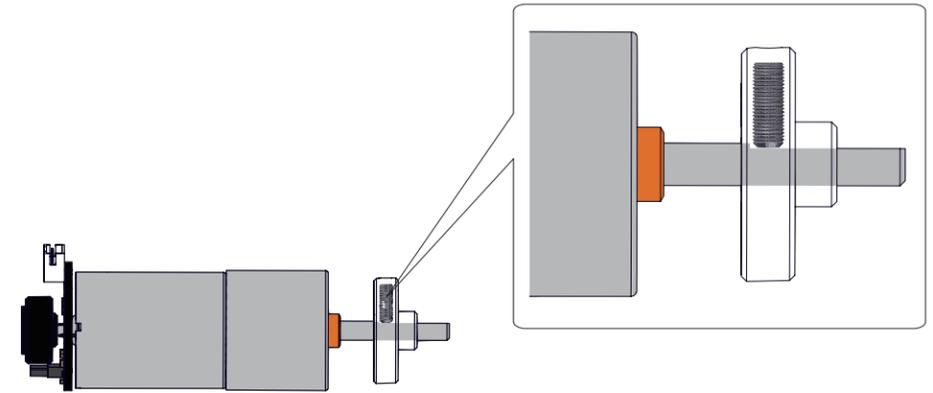
1. Tools

Screw M3×8

Screw M4

Hex Allen Key 1.5mm

Headless Set Screw M3×5

Wrench

Nut M4

2. Make sure to tighten the screw and the nut.

Tighten the screw with force according to the direction of the diagram

Tighten the screw with force according to the direction of the diagram

## 3. Assembly Requirements

① Disassemble Gear 8T



② Tighten the Headless Set Screw and make sure the screw is pushing against the D-shape plane



③ Headless Set Screw require alignment with the D-shaped plane



O    X
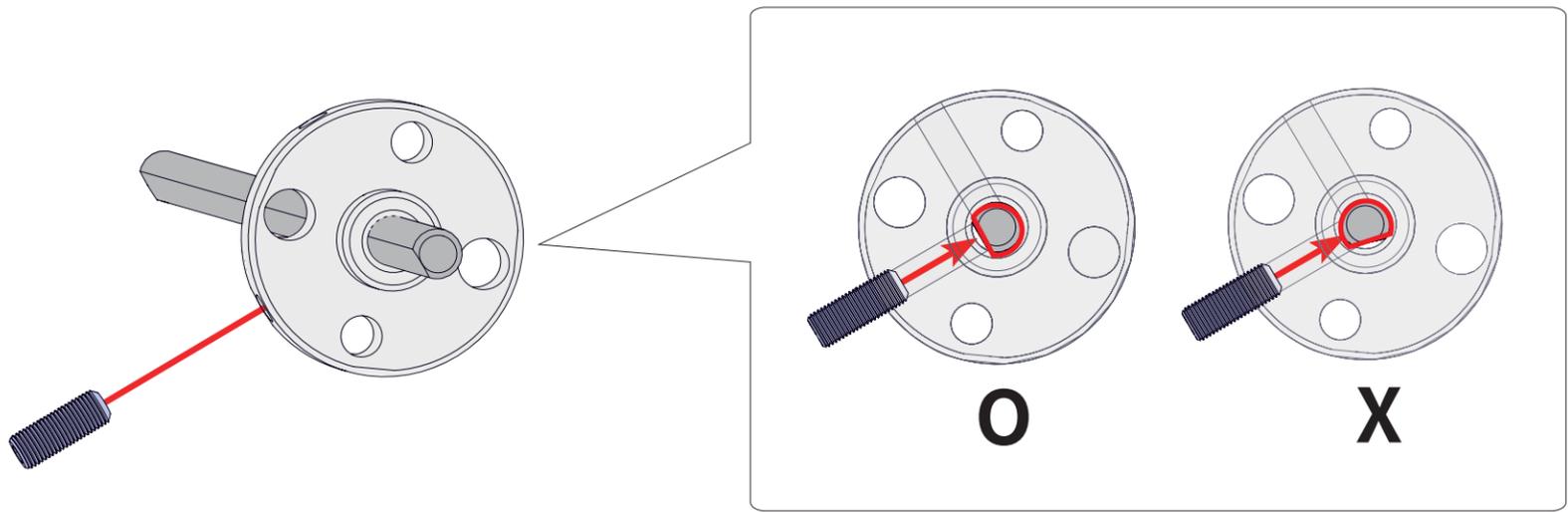
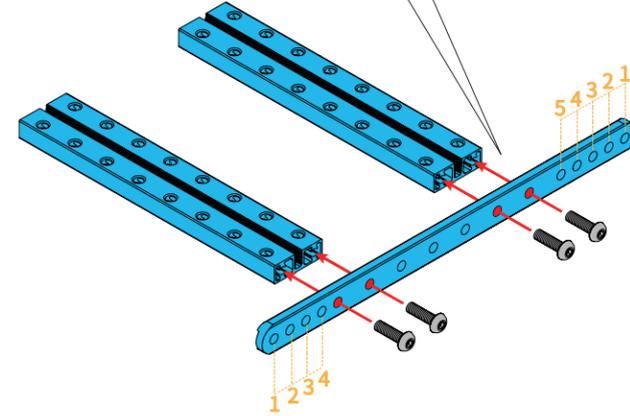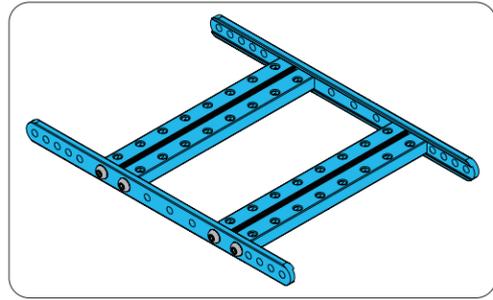# Reference I for Parts (Ratio 1:1)

Beam0412-076

Beam0412-092

Beam0412-140

Beam0412-188

Beam0412-220

D shaft D4×50mm

Shaft D4×88mm

D shaft D4×160mm

Screw M4×8

Screw M4×14

Screw M4×16

Screw M4×22

Screw M4×30

Countersunk Screw M3×8

Countersunk Screw M3×10

Headless Set Screw M3×5

Headless Set Screw M3×8

Nut M4

Nylon Lock Nut M4

Plastic Ring 4×7×2

Plastic Ring 4×7×3

Plastic Ring 4×7×10

Plastic Rivet 4060

Plastic Rivet 4100

Plastic Rivet 4120

# Reference II for Parts (Ratio 1:1)

Slider0824-192

Slider0824-176

Beam0824-128

Beam0824-064

Plastic Gear 56T

Plastic Gear 72T

Timing Pully 90T
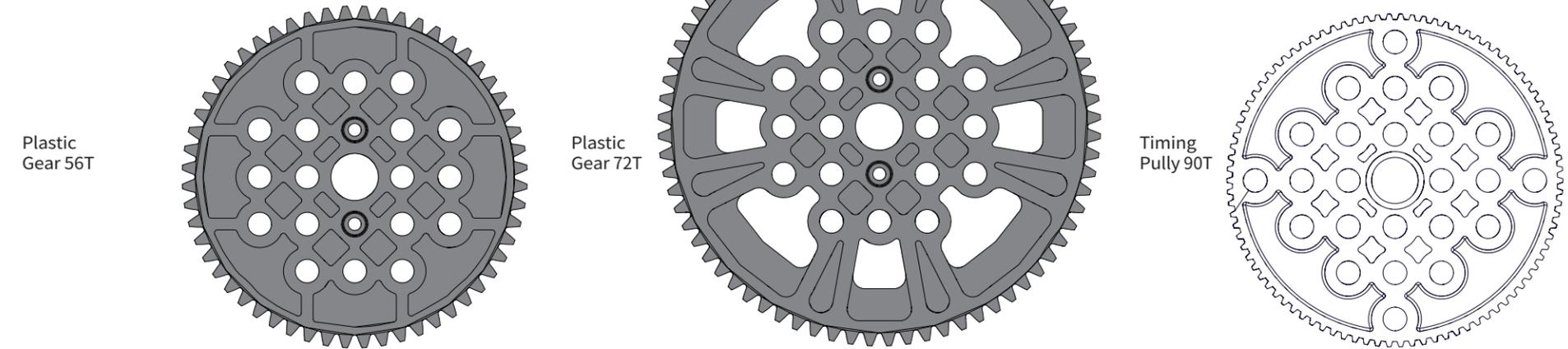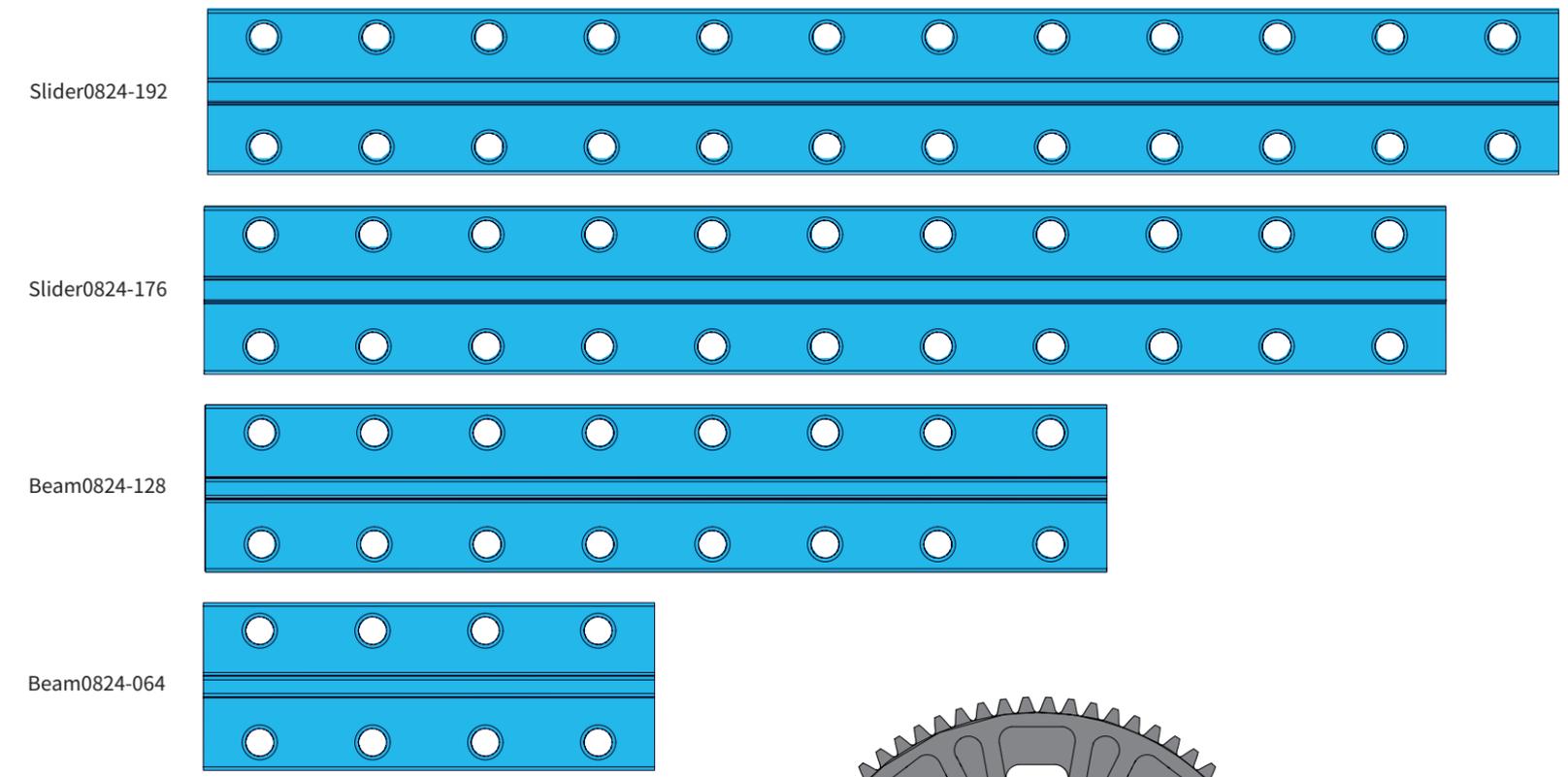
# Robotic Arm Tank

**1**

| | | |
|---|---|---|
| 0412-188 | (2) | |
| 0824-128 | (2) | |
| M4×8 | (8) | |
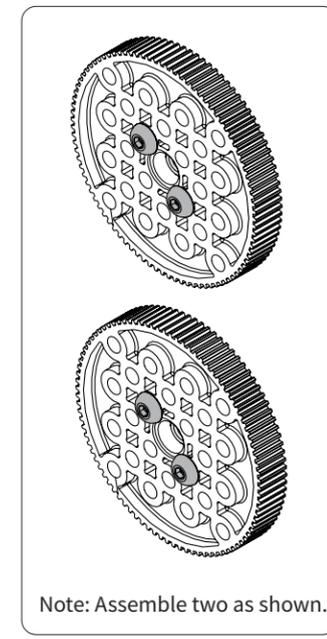
O  X

O  X

5 4 3 2 1

1 2 3 4 5

1 2 3 4

4 3 2 1

**2**

| | | |
|---|---|---|
| 90T | (2) | |
| Shaft Connector 4mm | (2) | |
| M4×14 | (4) | |

Threaded Hole

Note: Assemble two as shown.

**3**

| | | |
|---|---|---|
| Encoder Motor 185RPM | (1) | |
| 25mm DC Motor Bracket | (1) | |
| Countersunk Screw M3×8 | (2) | |

Pay attention to direction of the motor interface.

Encoder Motor A 185RPM

## 4

M4×14　(2)
Nut M4　(2)
Headless Set Screw M3×8　(1)

O　X

tool
1.5mm

## 5

Encoder Motor 185RPM　(1)
25mm DC Motor Bracket　(1)
Countersunk Screw M3×8　(2)

Pay attention to direction of the motor interface.

Encoder Motor B 185RPM

## 6

M4×14　(2)
Nut M4　(2)
Headless Set Screw M3×8　(1)

Encoder Motor A 185RPM

Encoder Motor B 185RPM

O　X

## 7

P3　(2)
4×39mm　(2)
Flange Copper Sleeve　(4)
Nut M4　(2)

Note: Assemble two as shown.

## 8

M4×14　(4)
Nut M4　(4)

Encoder Motor A 185RPM

Encoder Motor B 185RPM

Back

Front

## 9

| | | |
|---|---|---|
| 90T | (1) |
| Shaft Collar | (1) |
| Flange Copper Sleeve | (2) |
| Plastic Ring 4×7×3 | (2) |
| Headless Set Screw M3×5 | (1) |

Shaft Collar 4mm
Plastic Ring 4×7×3



## 10

| | | |
|---|---|---|
| 90T | (1) |
| Shaft Collar | (1) |
| Flange Copper Sleeve | (2) |
| Plastic Ring 4×7×3 | (2) |
| Headless Set Screw M3×5 | (1) |

Plastic Ring 4×7×3
Shaft Collar 4mm



## 11

| | | |
|---|---|---|
| Bracket 3×3 | (2) |
| M4×14 | (4) |
| Nut M4 | (4) |

Back
Encoder Motor A 185RPM
Encoder Motor B 185RPM
Front

**You have finished building the first structure.**
30%

Back
Front

## 12

| | | |
|---|---|---|
| 0412-140 | (2) |
| 0824-064 | (1) |
| M4×8 | (4) |



## 13

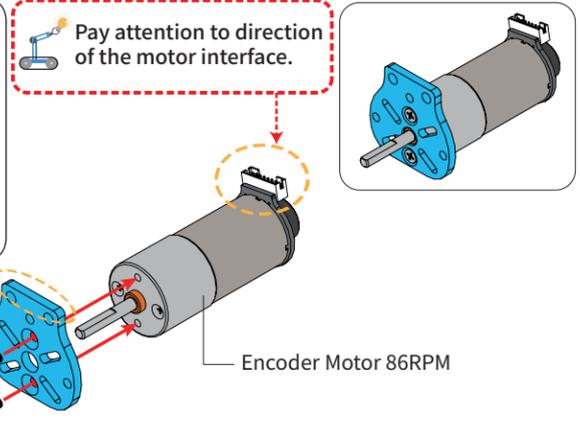| | | |
|---|---|---|
| M4×14 | (2) |
| Nut M4 | (2) |



## 14
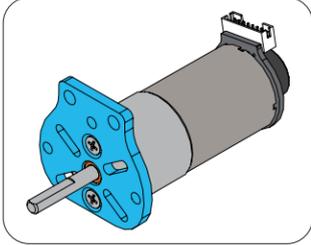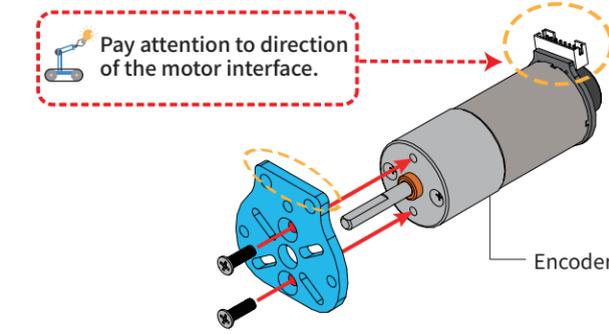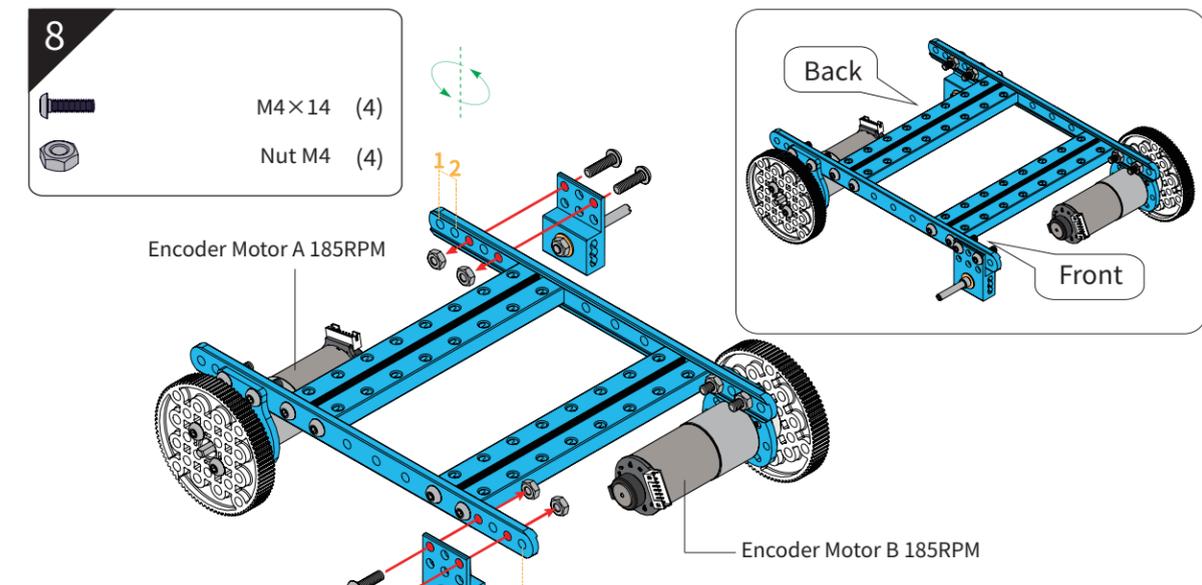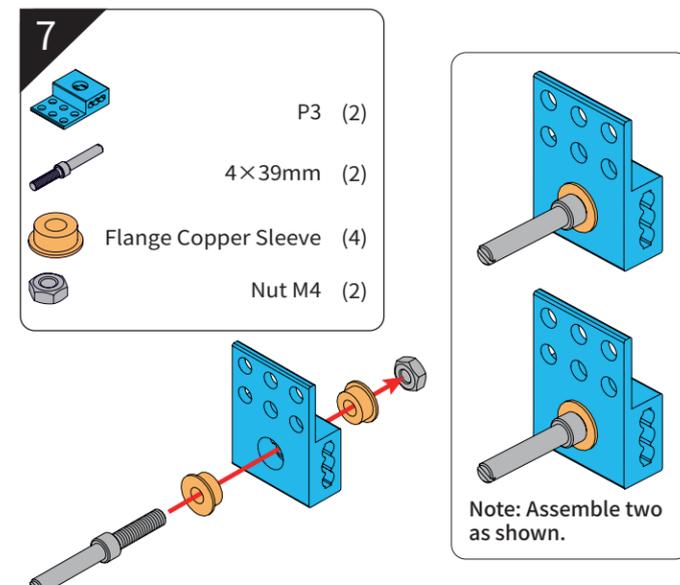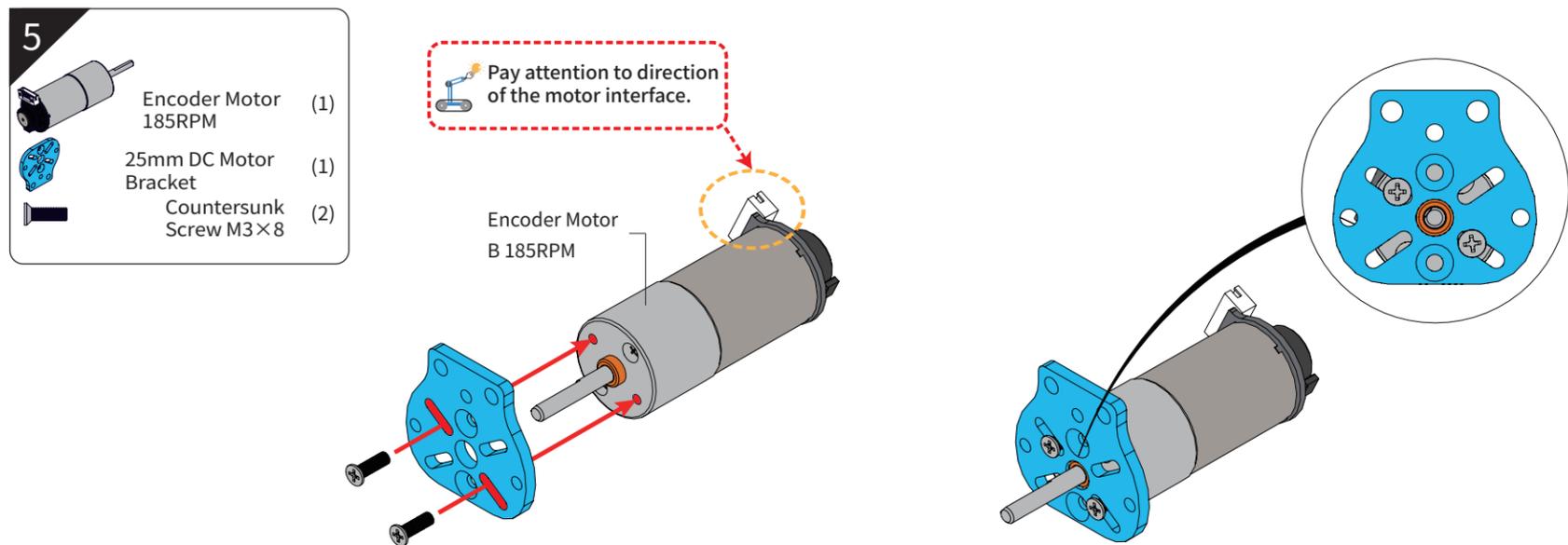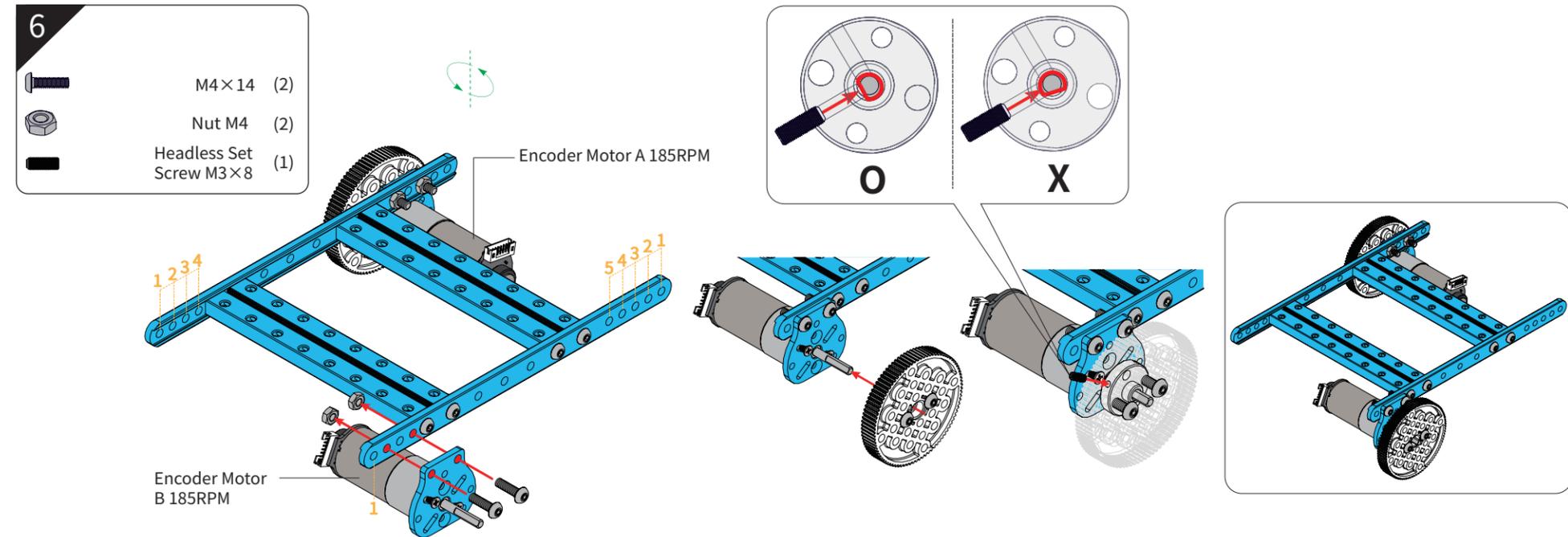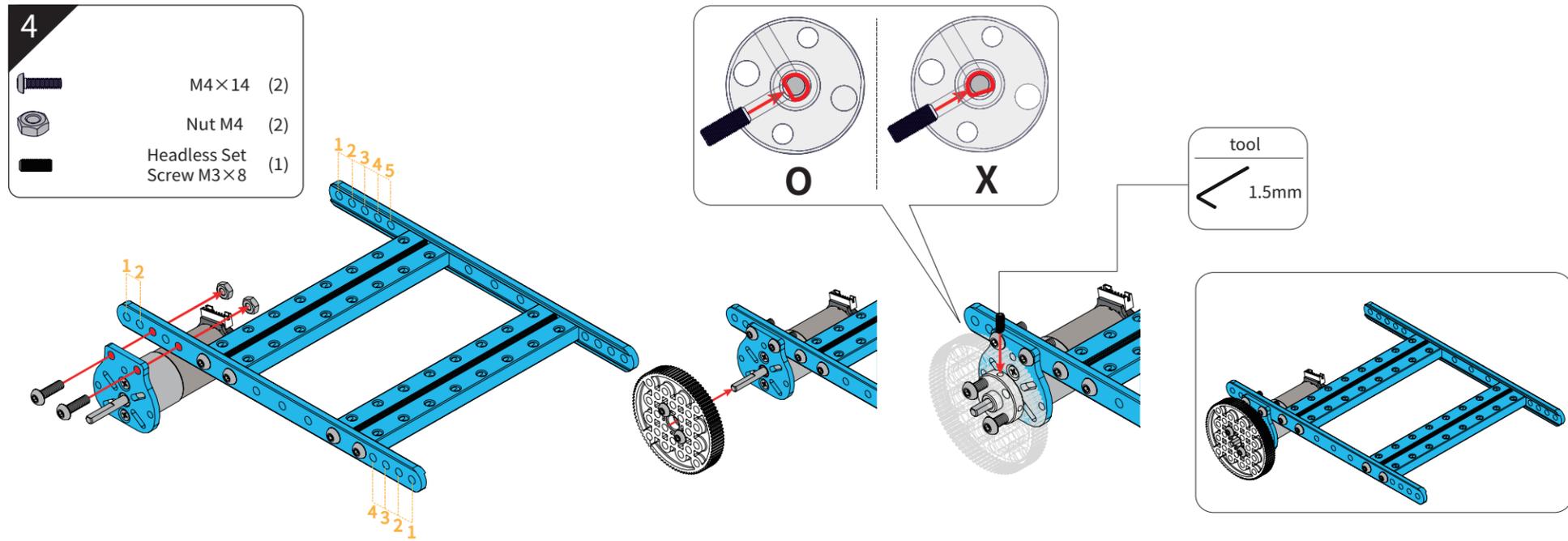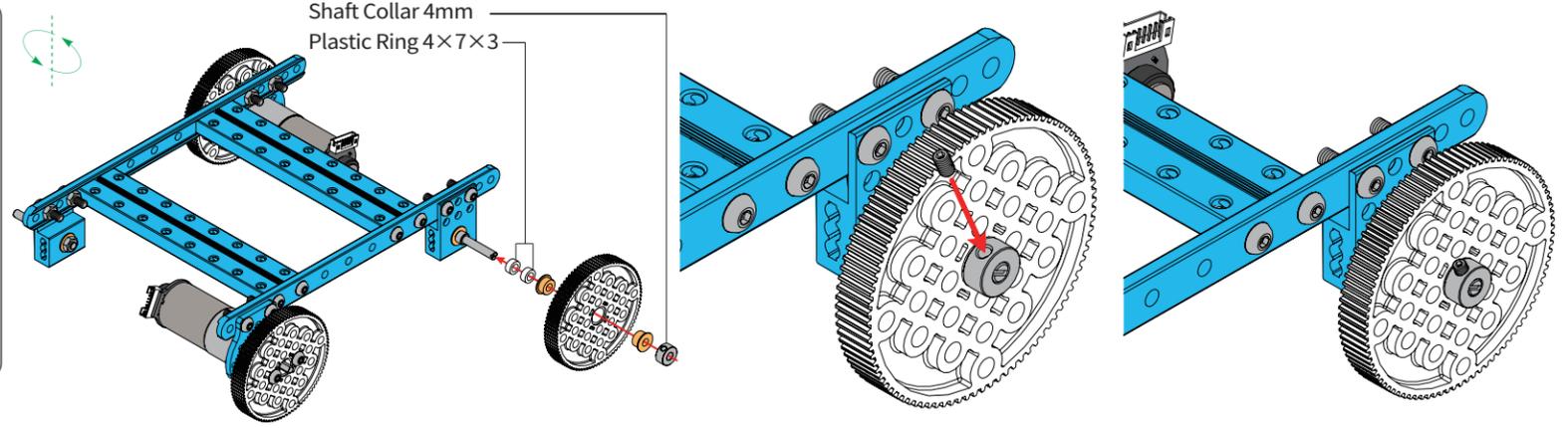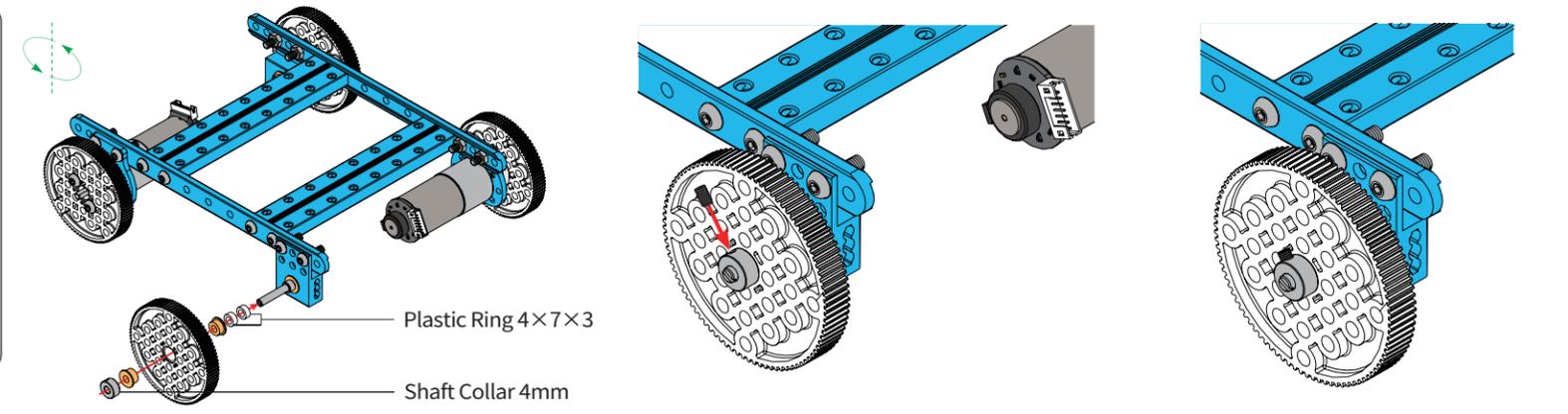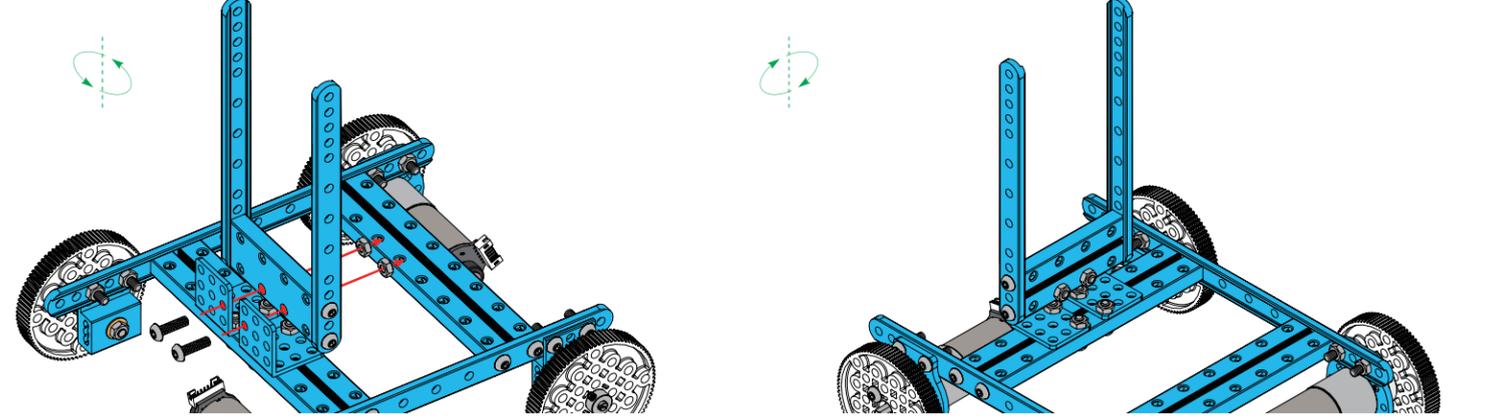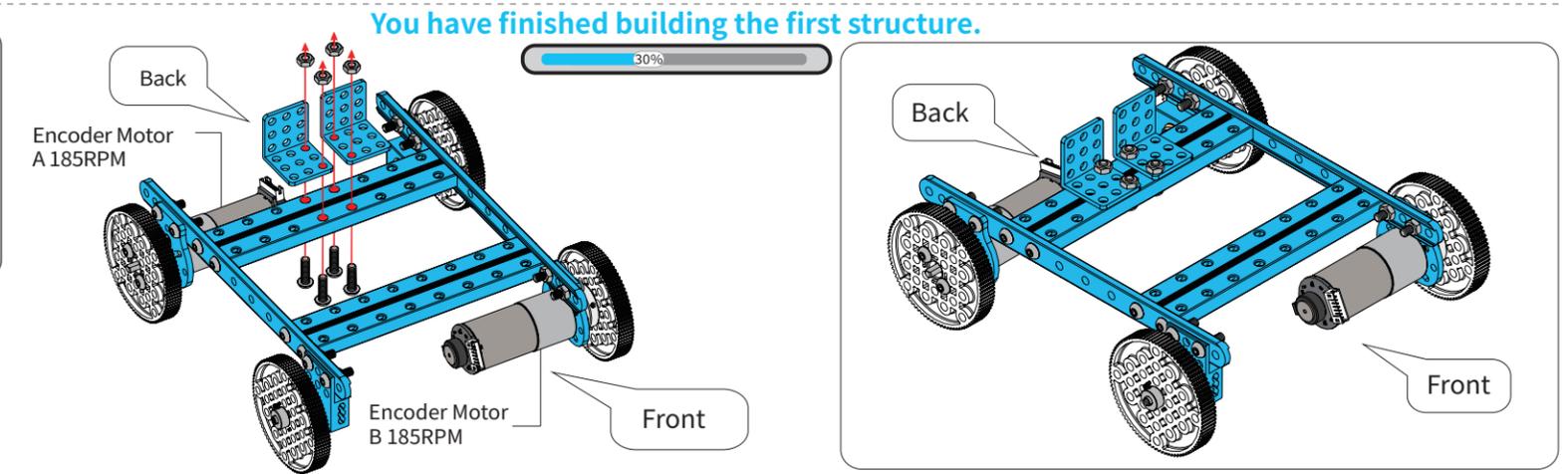
| | | |
|---|---|---|
| 1616-08-M4 | (2) |
| M4×14 | (4) |

**15**

0824-064 (1)
M4×14 (2)

M4x14
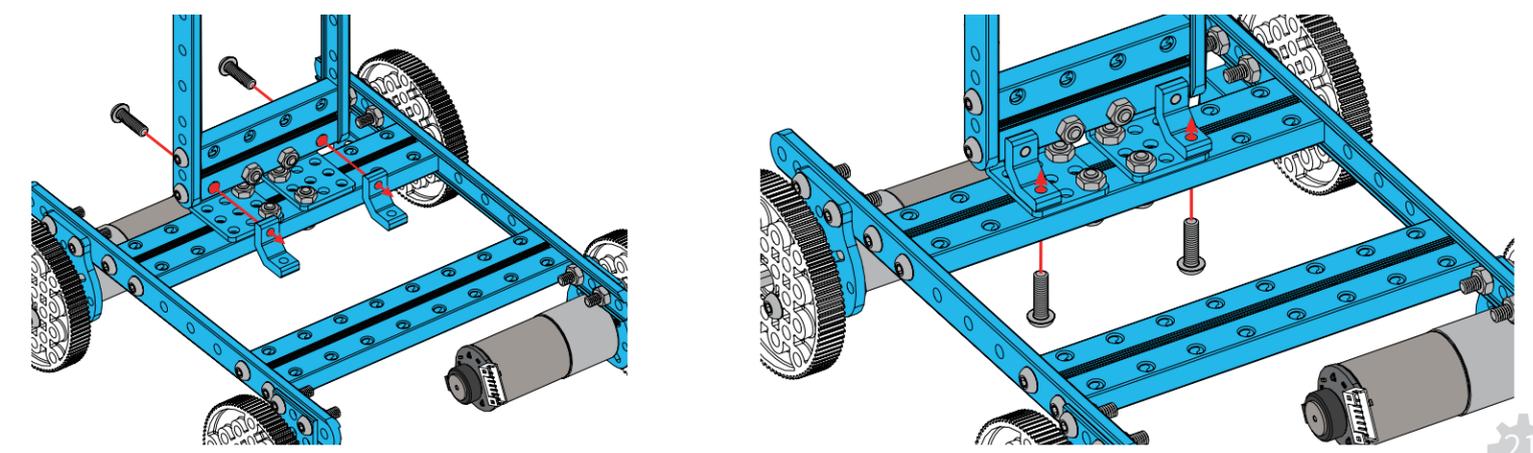
**16**

Encoder Motor 86RPM (1)
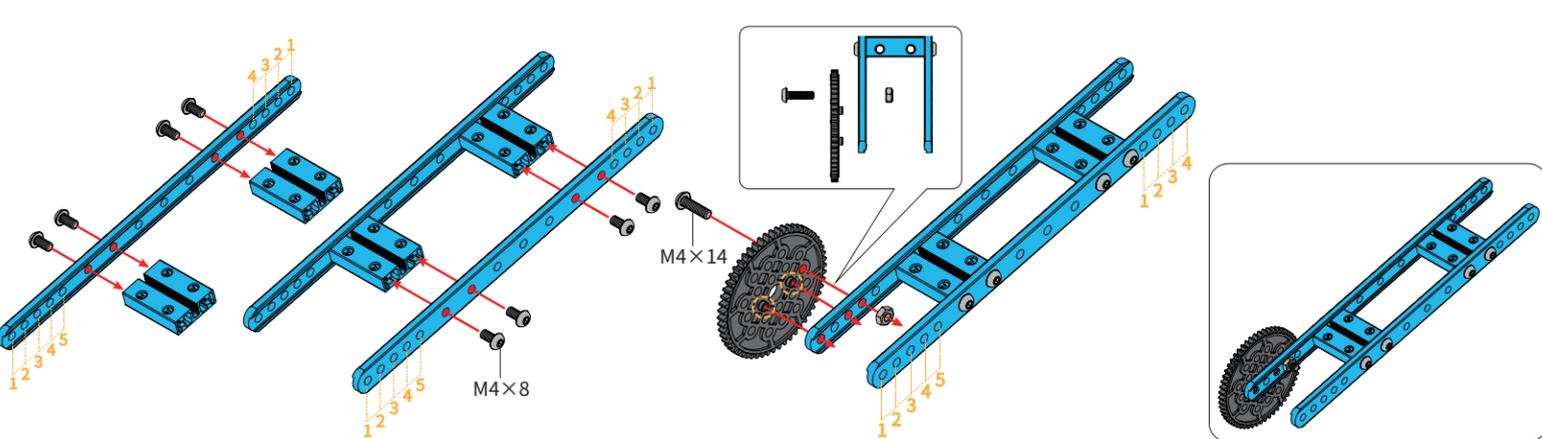25mm DC Motor Bracket (1)
Countersunk Screw M3×8 (2)

Pay attention to direction of the motor interface.

Encoder Motor 86RPM

**You have finished 50% of the assembling process.** 50%

**17**

M4×8 (2)
8T (1)

Front

Back

**18**

0412-188 (2)
0824-032 (2)
56T (1)
M4×14 (1)
M4×8 (8)
Nut M4 (1)

M4×14

M4×8

**19**

D4×88 (2)
Shaft Collar (2)
Flange Copper Sleeve (1)
Plastic Ring 4×7×3 (3)
Headless Set Screw M3×5 (2)

≈4mm

Shaft D4×88mm

Note: Assemble two as shown.

Plastic Ring 4×7×3

**20**

Shaft Collar (1)

Back ≈105° Front
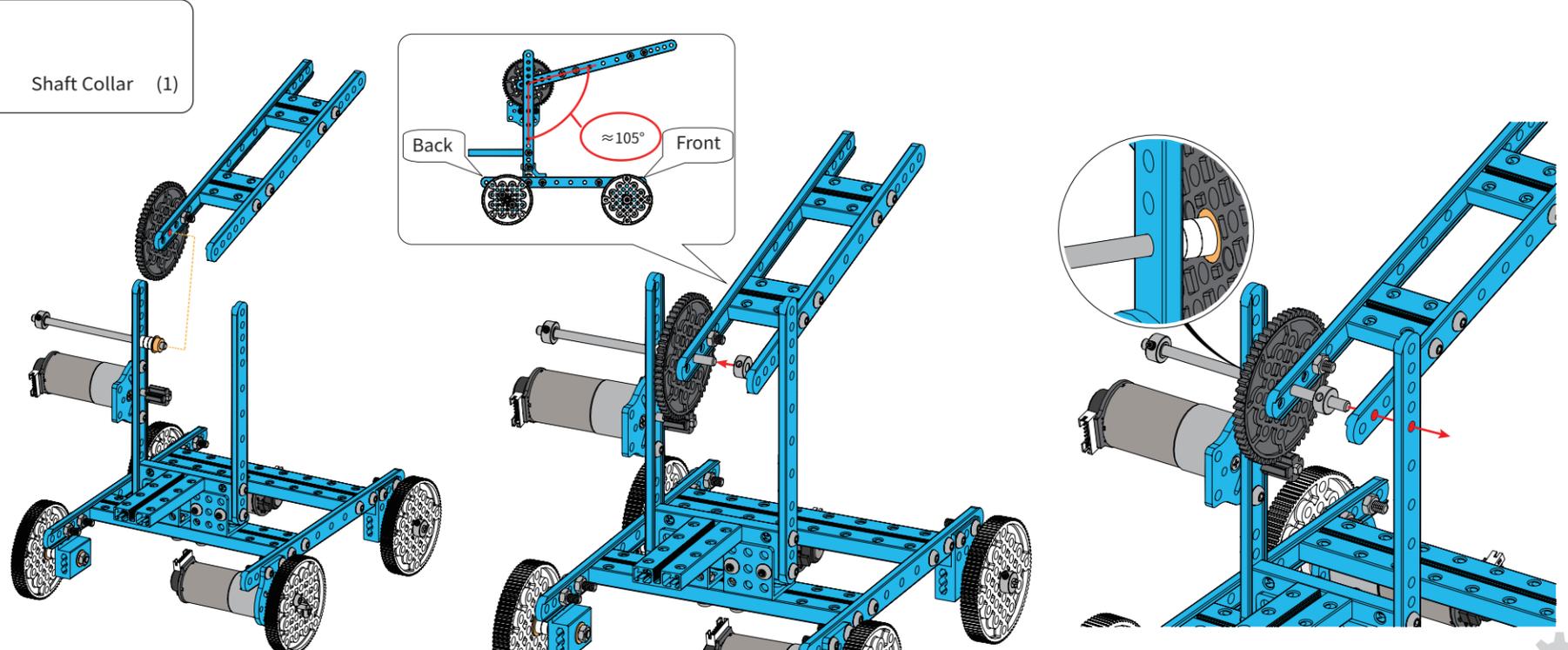
**21**

Shaft Collar (1)

Headless Set Screw M3×5 (2)

Headless screw M3×5

Headless screw M3×5

**22**

0412-188 (2)

0824-032 (2)

M4×8 (8)

4 3 2 1

4 3 2 1

1 2 3 4 5

1 2 3 4 5

**23**

Shaft Collar (2)

Plastic Ring 4×7×3 (1)

Plastic Ring 4×7×2 (2)

Plastic Ring 4×7×2

Plastic Ring 4×7×3
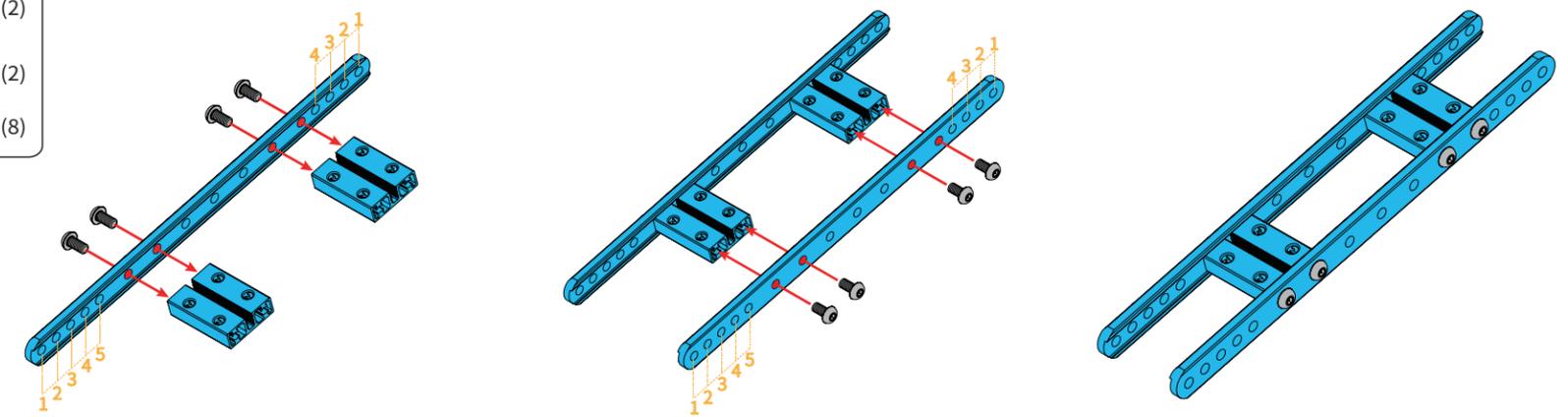
**24**

Headless Set Screw M3×5 (1)

80%
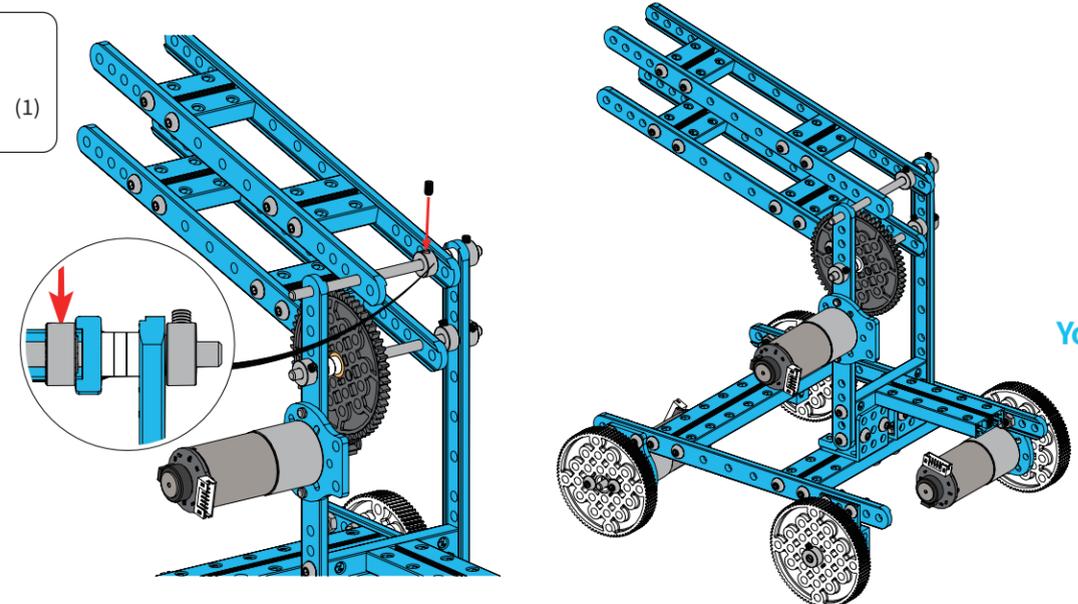
You have finished 80% of the assembly.

**25**

| | | |
|---|---|---|
| 3×6 | (2) | |
| 0824-032 | (1) | |
| Makeblock Gripper | (1) | |
| M4×8 | (4) | |
| M4×14 | (4) | |
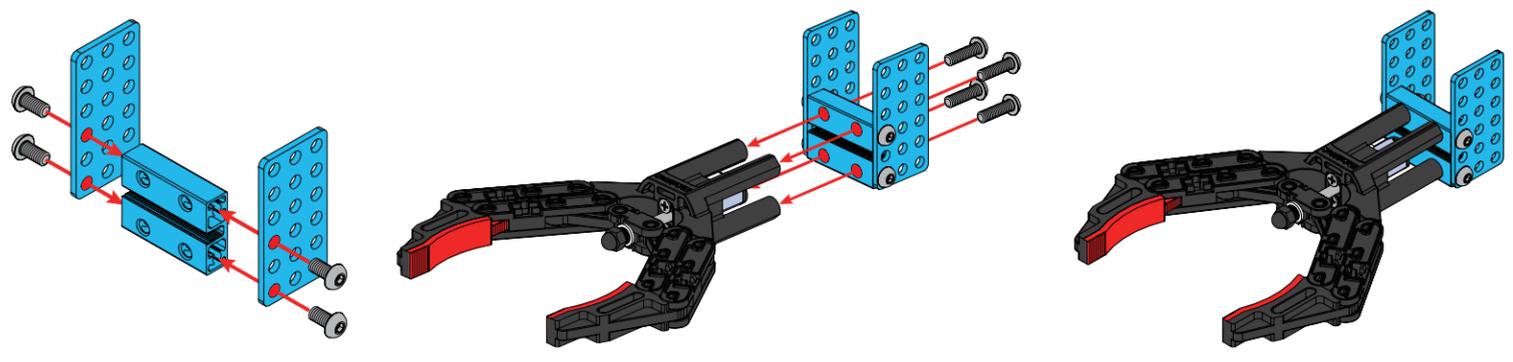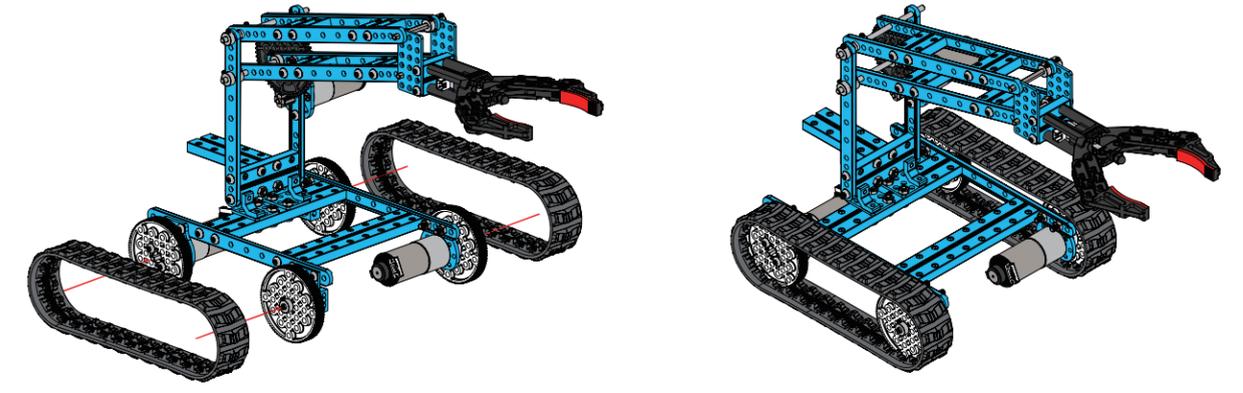


**26**

| | |
|---|---|
| D4×50 | (2) |
| Shaft Collar | (2) |
| Headless Set Screw M3×5 | (2) |
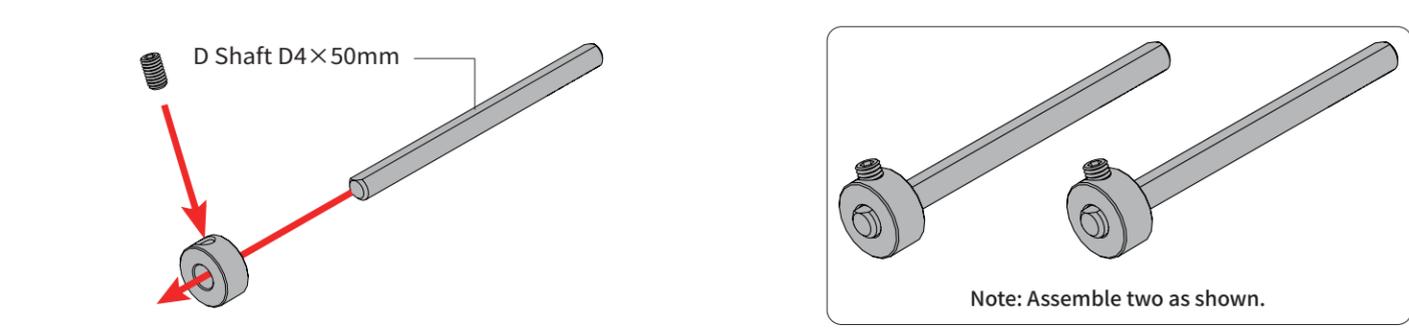
D Shaft D4×50mm

Note: Assemble two as shown.

**27**

| | |
|---|---|
| Shaft Collar | (2) |
| Headless Set Screw M3×5 | (2) |

**28**

| | |
|---|---|
| Track 80×139mm | (2) |

**29**
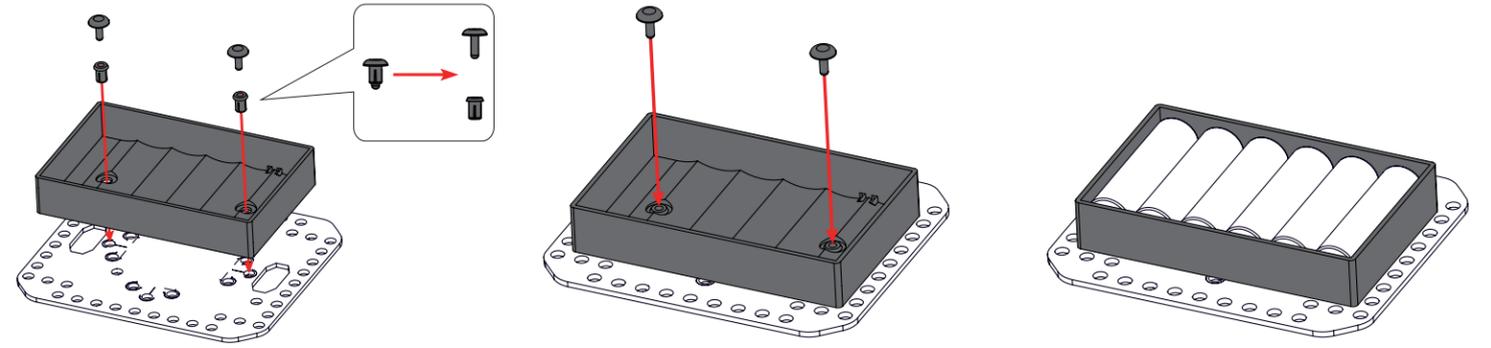
| | |
|---|---|
| MegaPi Acrylic Bracket | (1) |
| Battery Holder | (1) |
| Plastic Rivet 4060 | (2) |
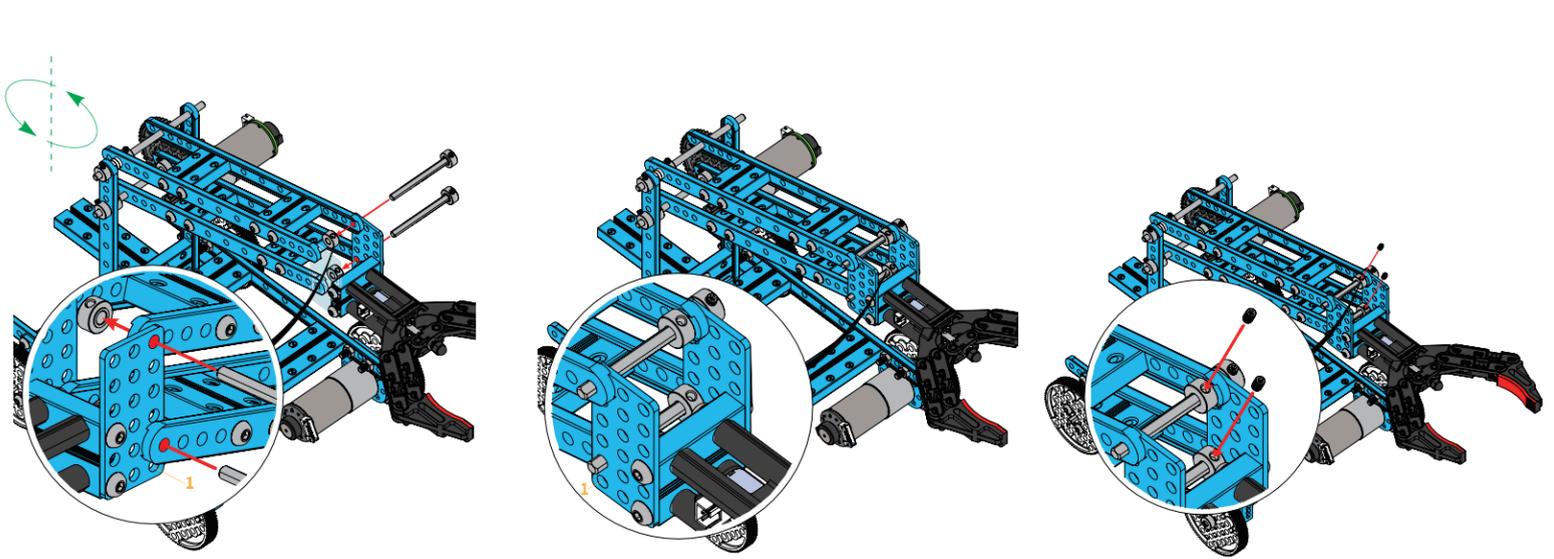
**30**

| | |
|---|---|
| 0324-088 | (1) |
| M4×8 | (2) |
| Nut M4 | (2) |

**31**

M4×16 (2)
Nut M4 (2)

**32**

MegaPi (1)
Shield for RJ25 (1)
Encoder/DC Motor Driver (4)
Bluetooth Module (1)
MegaPi Acrylic Bracket (1)
Plastic Rivet 4100 (3)

To correctly assemble the main board onto the acrylic bracket, please pay attention to the direction of the arrow on the bracket.
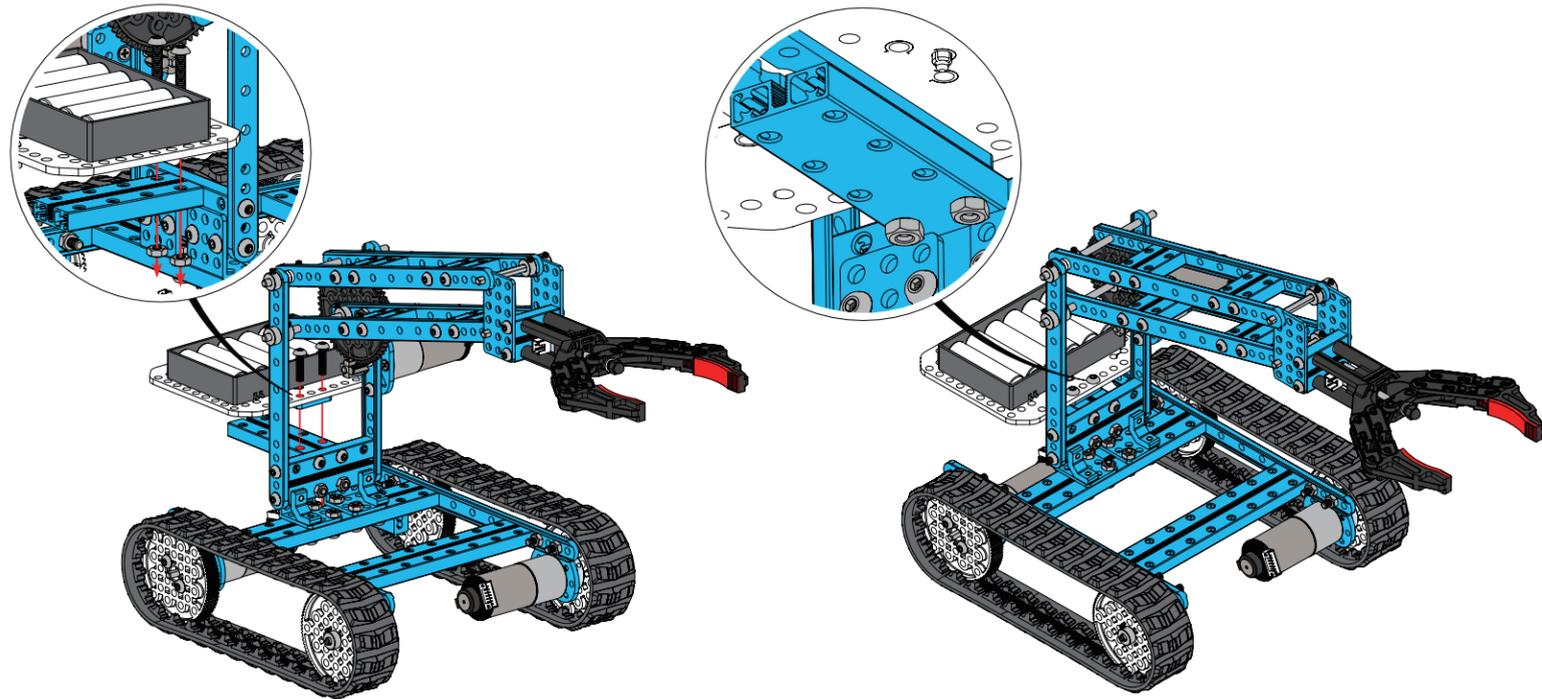
**33**

Plastic Rivet 4120 (4)

## Assembled Diagram

NOTE: Please check whether the screw is tightened according to the instruction.

Motor C (86RPM)

Motor A (185RPM)

Motor B (185RPM)

100%

You can also use the Screw M4x14 to replace the rivet.

**You have now finished building the Robotic Arm Tank.**

## Wiring

Port 3
Port 2
Port 1
Port 4

Motor A (185RPM)

Motor B (185RPM)

Motor C (86RPM)

Makeblock Gripper
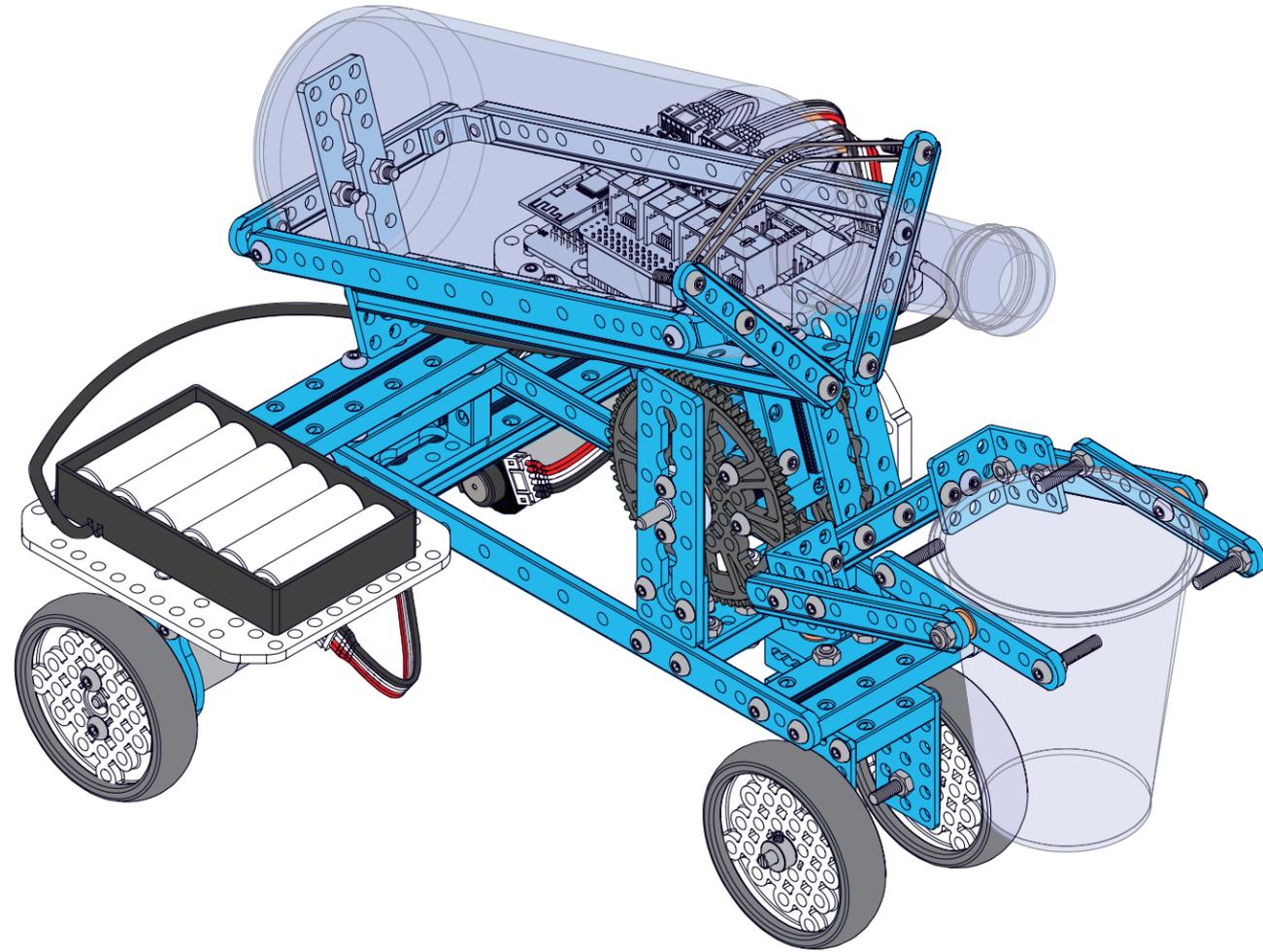
After assembly, please skip to page 54 for software instruction.

Please connect the white and black wires with the sequence shown in the image, then insert the plug to the 4B- and 4B+ port on mainboard.
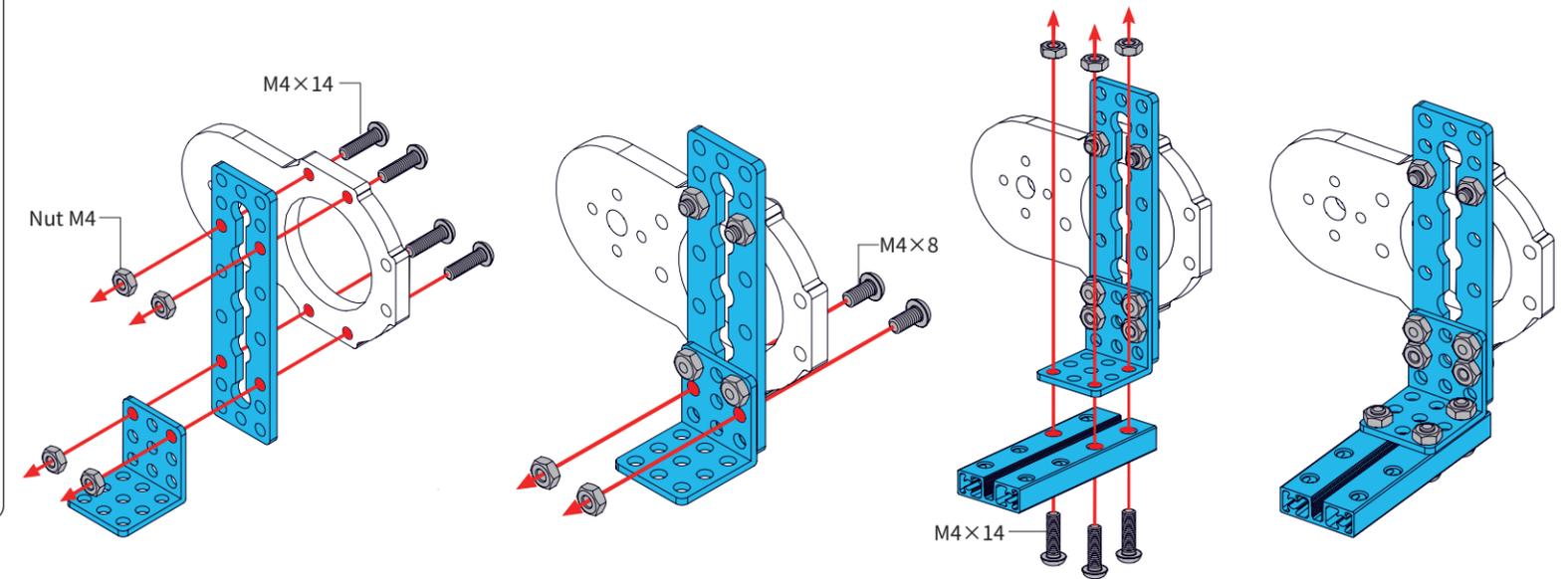
# Beverage Robot

## 1

| | | |
|---|---|---|
| | 0824-064 | (1) |
| | Bracket 3×3 | (1) |
| | 0324-088 | (1) |
| | 25mm Motor Bracket-72T | (1) |
| | Nut M4 | (9) |
| | M4×8 | (2) |
| | M4×14 | (7) |

M4×14

Nut M4

M4×8

M4×14

## 2

| | | |
|---|---|---|
| | 0824-032 | (4) |
| | 72T | (2) |
| | Nut M4 | (4) |
| | M4×8 | (8) |
| | M4×22 | (4) |

Nut M4

M4×22

Pay attention to the direction of the Gear 72T.

M4×8

Note: Assemble two as shown.

## 3
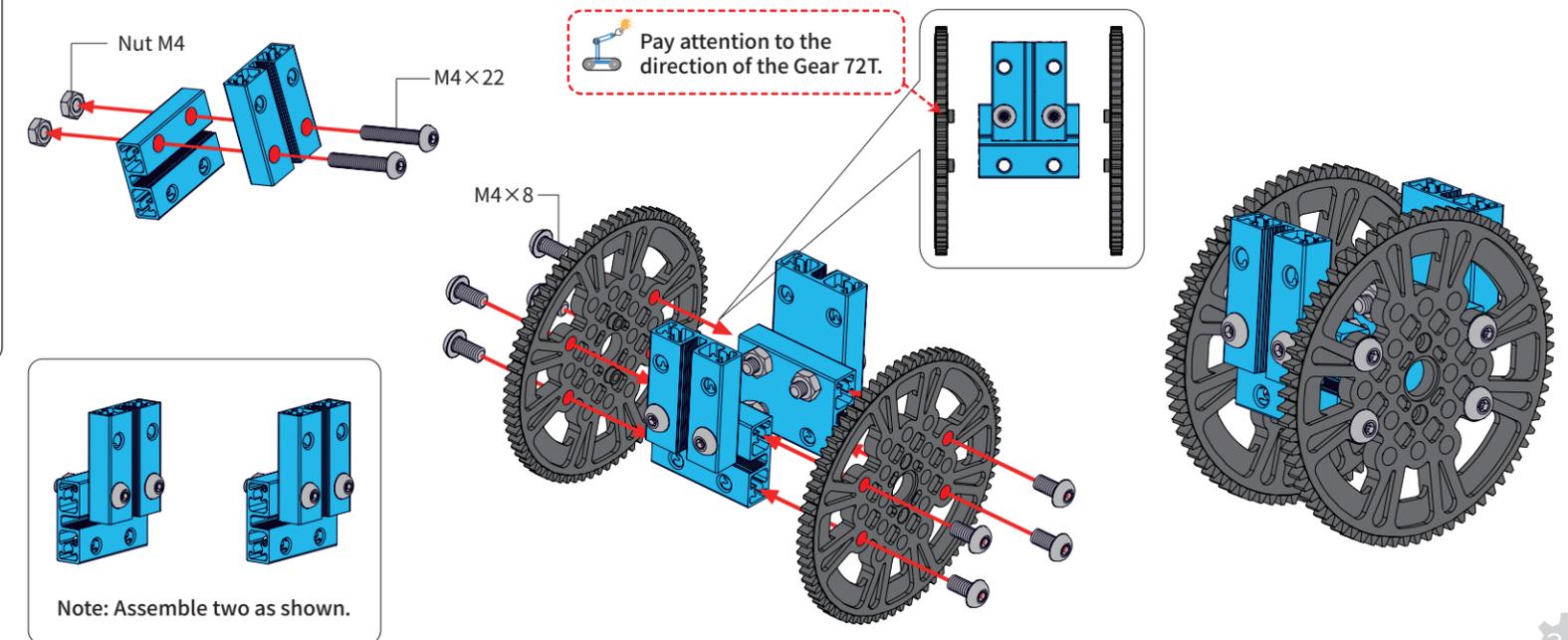
| | | |
|---|---|---|
| Shaft Connector 4mm | | (1) |
| M4×8 | | (2) |
| Plastic Ring 4×7×3 | | (1) |
| Plastic Ring 4×7×2 | | (1) |
| Flange Copper Sleeve | | (1) |
| Headless Set Screw M3×8 | | (1) |
| D4×88 | | (1) |

M4×8
Plastic Ring 4×7×3
Plastic Ring 4×7×2
Threaded Hole
M3×8
≈10mm
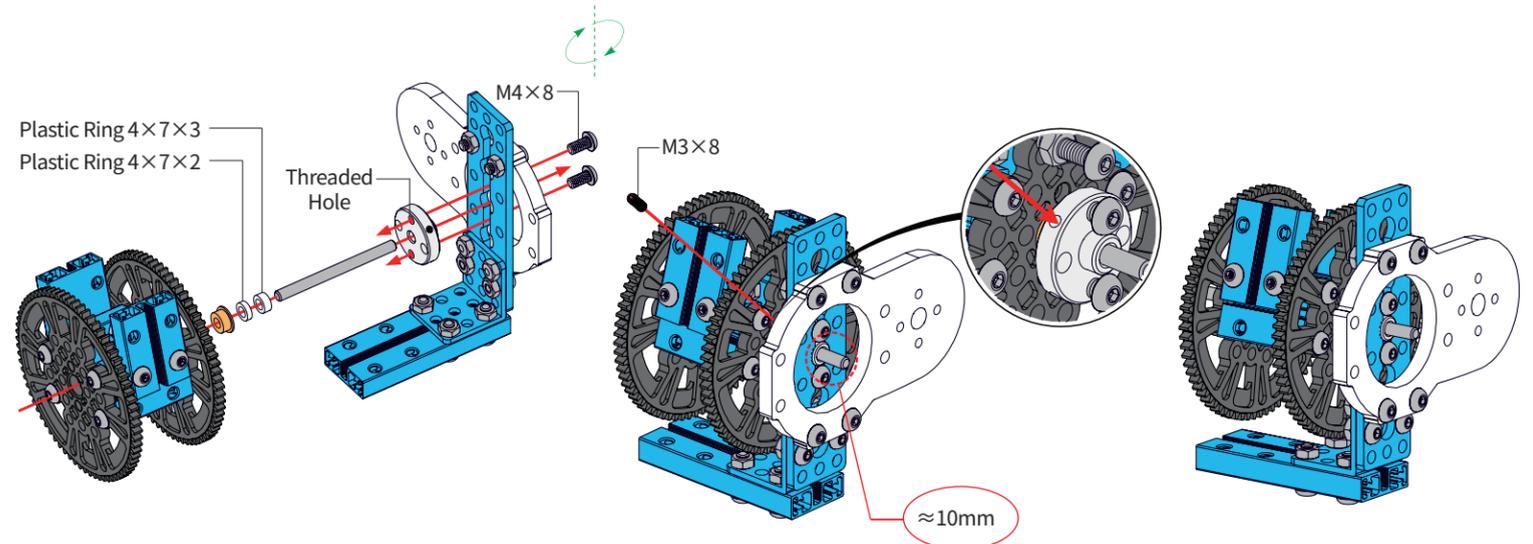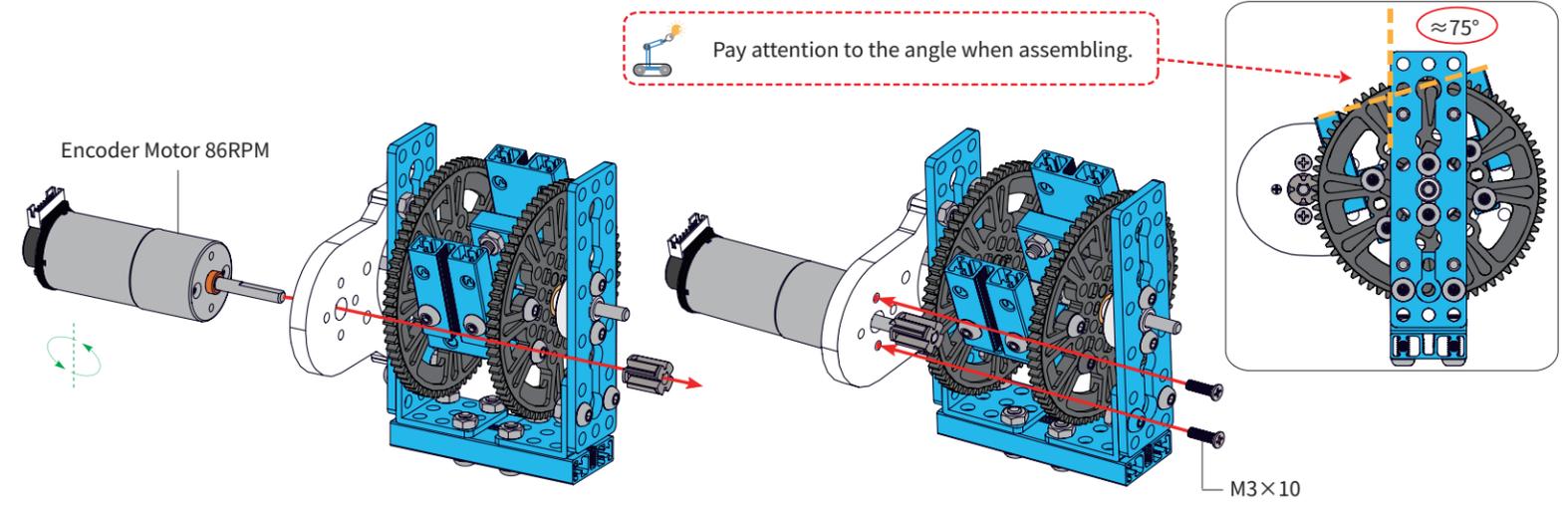
## 4

| | | |
|---|---|---|
| Bracket 3×3 | | (1) |
| 0324-088 | | (1) |
| Shaft Connector 4mm | | (1) |
| Nut M4 | | (5) |
| M4×8 | | (4) |
| M4×14 | | (3) |
| Plastic Ring 4×7×3 | | (1) |
| Plastic Ring 4×7×2 | | (1) |
| Flange Copper Sleeve | | (1) |
| Headless Set Screw M3×8 | | (1) |

Plastic Ring 4×7×2
Plastic Ring 4×7×3
M3×8
M4×8
M4×14

## 5

| | | |
|---|---|---|
| Encoder Motor 86RPM | | (1) |
| 8T | | (1) |
| Countersunk Screw M3×10 | | (2) |

Pay attention to the angle when assembling.
≈75°
Encoder Motor 86RPM
M3×10

## 6

| | | |
|---|---|---|
| 0412-220 | | (2) |
| M4×8 | | (4) |

O  X
O  X
Back
Front
1 2 3 4 5
1 2 3 4 5

25%
You have finished the rotational structure.
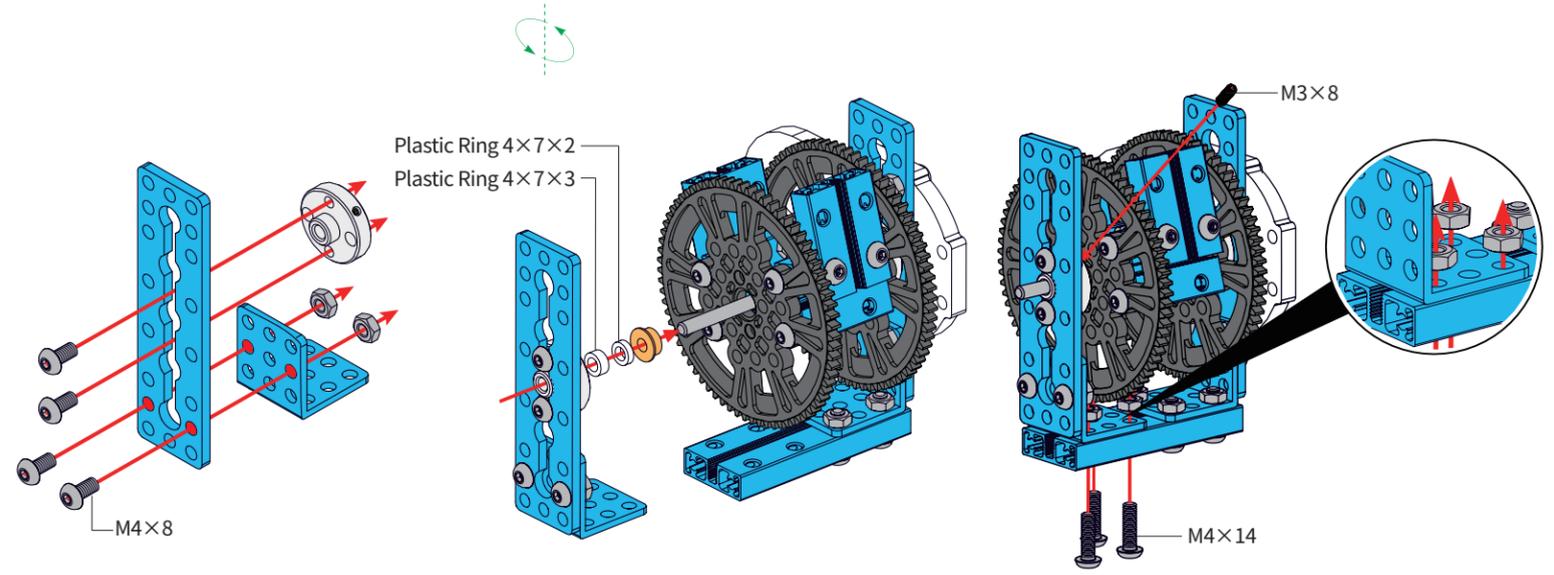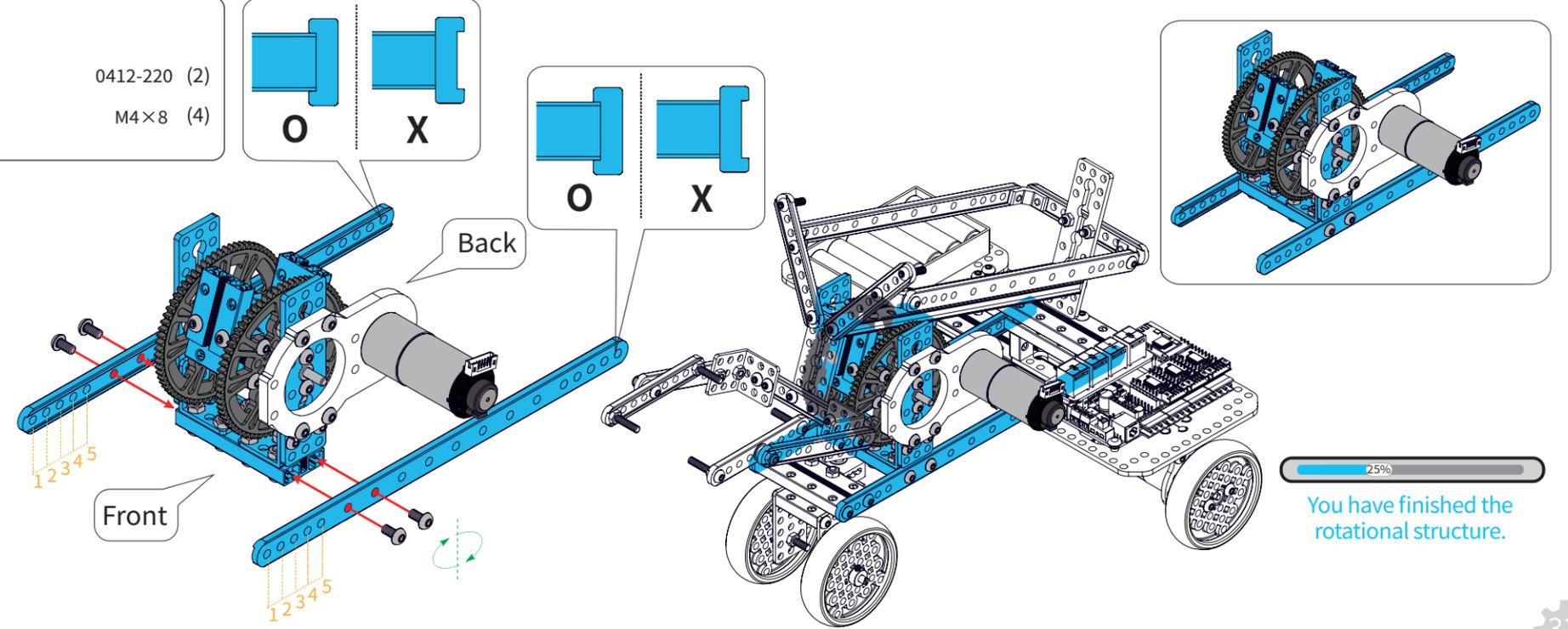
**7**

| Encoder Motor 185RPM | (2) |
| Countersunk Screw M3×8 | (4) |
| 25mm DC Motor Bracket | (2) |

Pay attention to direction of the motor interface.

Pay attention to direction of the motor interface.

Encoder Motor 185RPM A

Encoder Motor 185RPM B

**A**

**B**

**8**

| 0824-192 | (1) |
| 90T | (2) |
| Shaft Connector 4mm | (2) |
| M4×8 | (4) |
| M4×14 | (4) |

**B**

M4×14

Encoder Motor 185RPM B

Note: Assemble two as shown.

M4×8

**A**

Encoder Motor 185RPM A

**9**

| Headless Set Screw M3×8 | (2) |

M3×8

O     X

**10**

| Tire 90T B | (2) |
| M4×14 | (4) |
| M4×16 | (4) |
| 0324-056 | (1) |
| 0824-064 | (1) |
| 0824-016 | (2) |

M4×14

1  2  3  4

M4×16

**11**

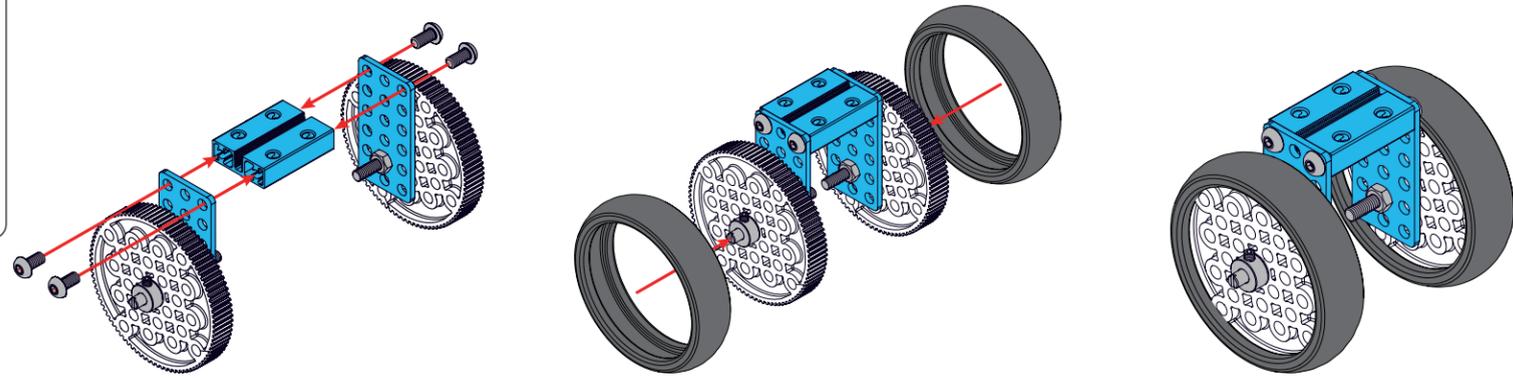| 3×6 | (2) |
| 90T | (2) |
| Shaft Collar | (2) |
| Flange Copper Sleeve | (4) |
| Plastic Ring 4×7×3 | (2) |
| 4×39mm | (2) |
| Nut M4 | (2) |
| Headless Set Screw M3×5 | (2) |

Plastic Ring 4×7×3

M3×5

Shaft Collar

Note: Assemble two as shown.

0824-032 (1)
Tire 90T B (2)
M4×8 (4)
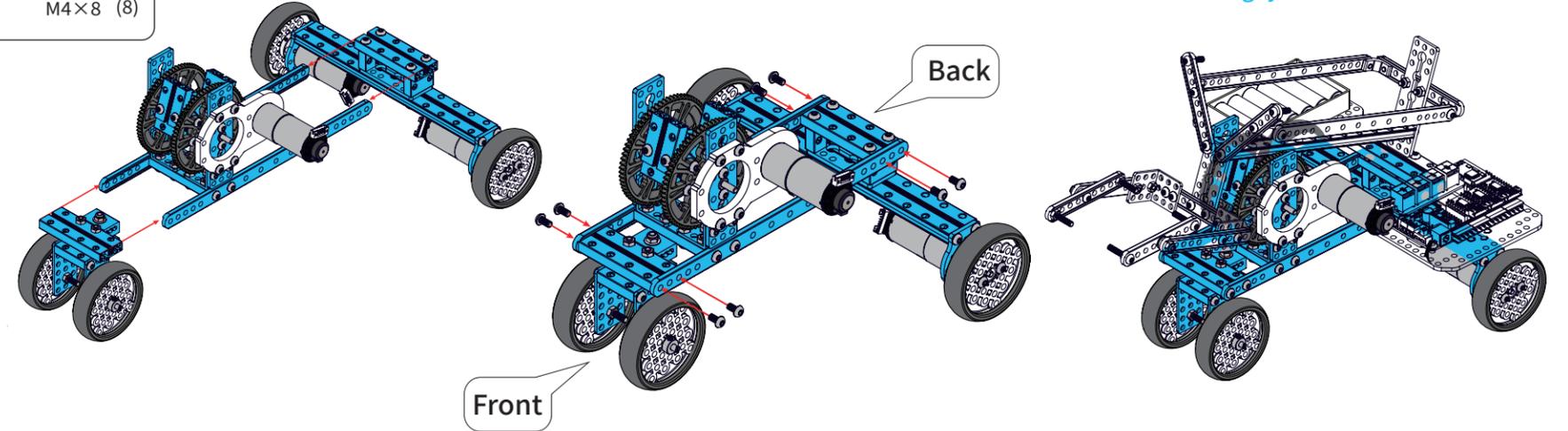
P3 (1)
4×39mm (1)
Flange Copper Sleeve (2)
M4×14 (2)
Nut M4 (2)
Shaft Collar (1)
Headless Set Screw M3×5 (1)

Shaft Collar

M3×5
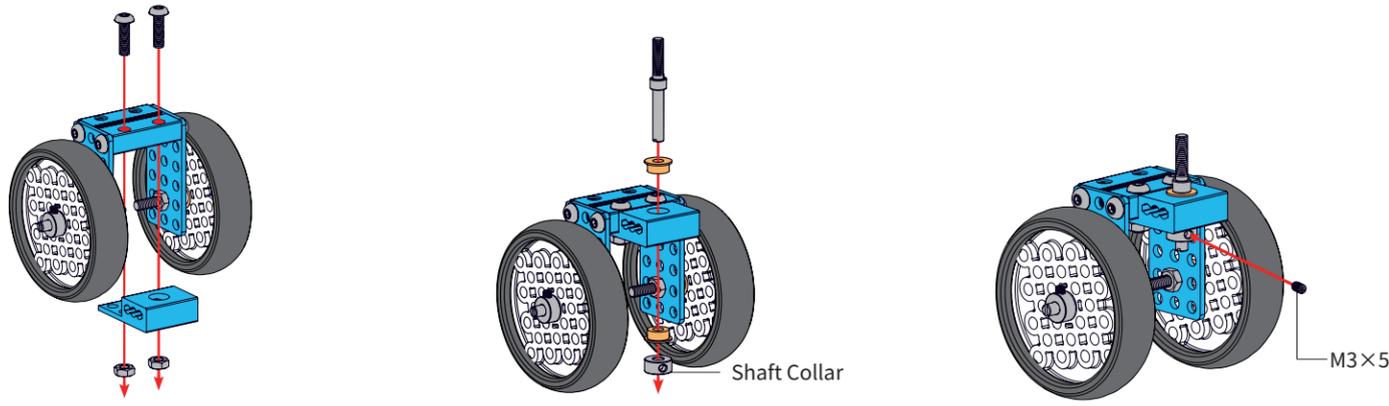
P3 (1)
0824-64 (1)
Flange Copper Sleeve (2)
M4×14 (2)
Nut M4 (2)
Nylon Lock Nut M4 (1)

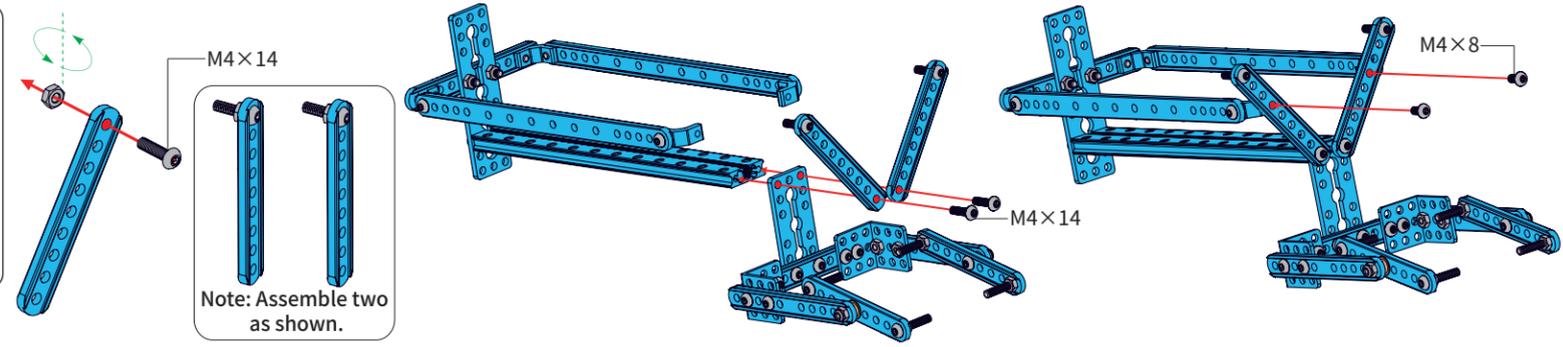Nylon Lock Nut M4

65%

Now take a look at the cool things you have built.

M4×8 (8)

Back

Front
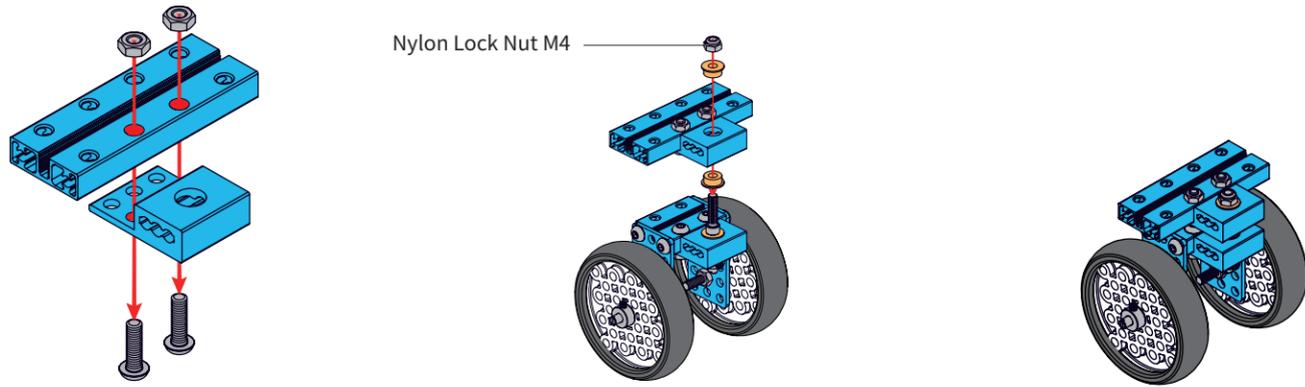
0824-192 (1)
0412-188 (2)
0412-092 (1)
1616-08-M4 (4)
0324-088 (1)
M4×8 (8)
M4×14 (2)
Nut M4 (2)

M4×8

M4×8

M4×14

M4×8

Note: Assemble two as shown.
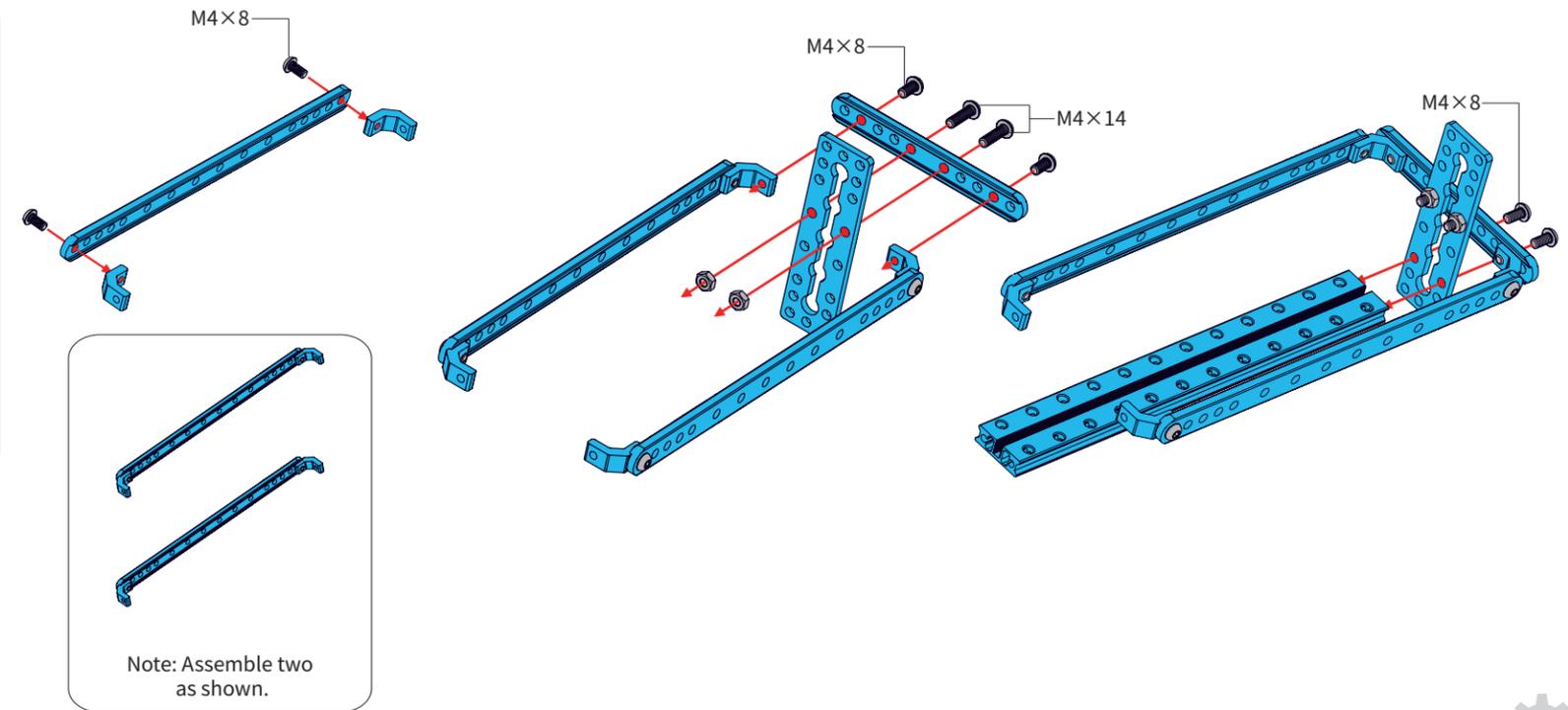
**17**

| | | |
|---|---|---|
| 0412-076 | (2) |
| 0412-092 | (2) |
| Bracket 3×3 | (2) |
| Flange Copper Sleeve | (2) |
| M4×8 | (4) |
| M4×14 | (2) |
| M4×22 | (4) |
| Nylon Lock Nut M4 | (2) |
| Nut M4 | (8) |

M4×22

Nut M4

M4×8

Nylon Lock Nut M4

M4×14

Nylon Lock Nut M4

Note: Assemble two as shown.

Note: Make sure this structure can rotate smoothly.

**18**

| | | |
|---|---|---|
| 0412-092 | (1) |
| 0324-056 | (1) |
| M4×14 | (6) |
| Nut M4 | (6) |
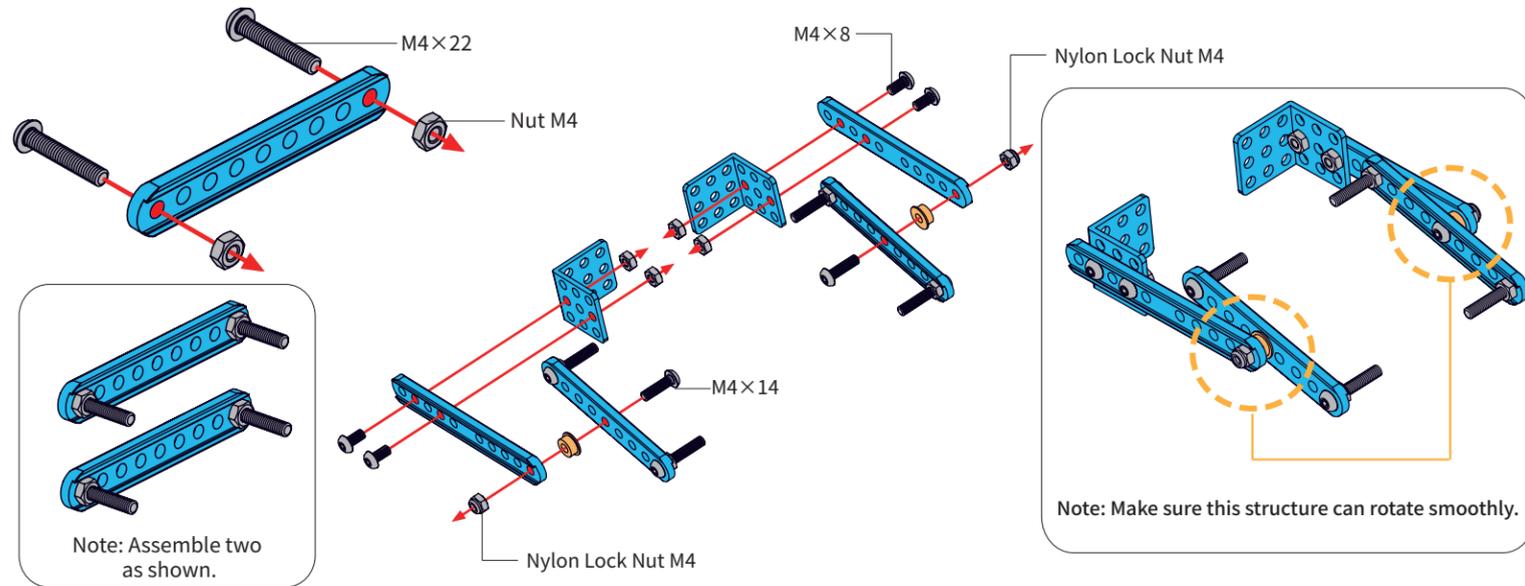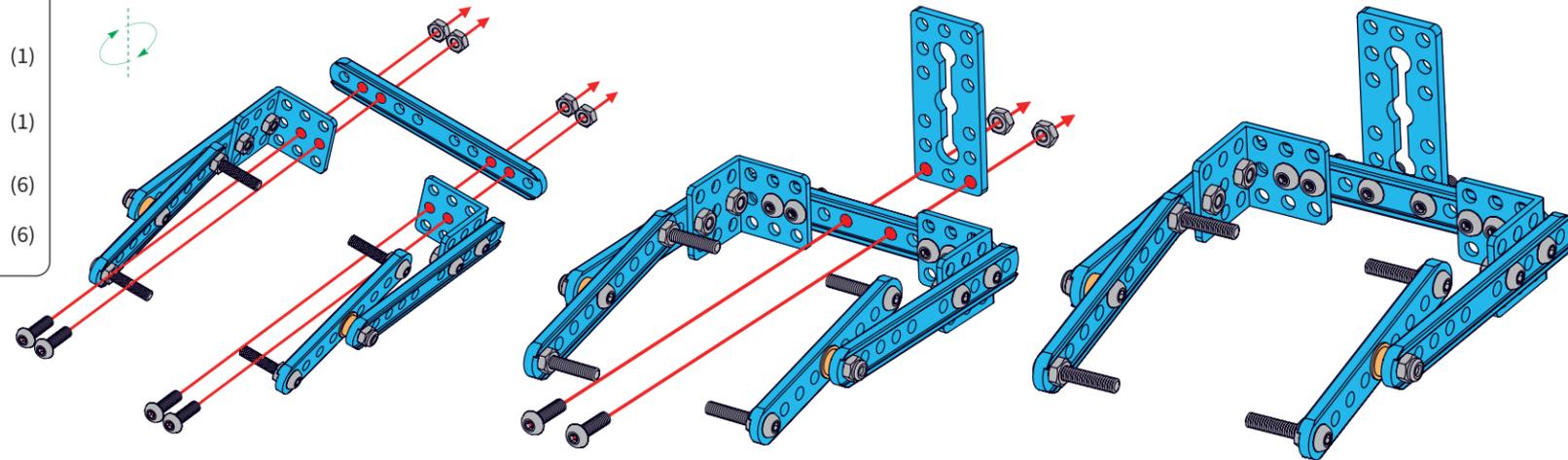
**19**

| | | |
|---|---|---|
| 0412-076 | (2) |
| M4×8 | (2) |
| M4×14 | (4) |
| Nut M4 | (2) |

M4×14

Note: Assemble two as shown.

M4×8

M4×14

**20**

| | | |
|---|---|---|
| MegaPi | (1) |
| Shield for RJ25 | (1) |
| Encoder/DC Motor Driver | (3) |
| Bluetooth Module | (1) |
| MegaPi Acrylic Bracket | (1) |
| Plastic Rivet 4100 | (3) |

To correctly assemble the main board onto the acrylic bracket, please pay attention to the direction of the arrows on the bracket.
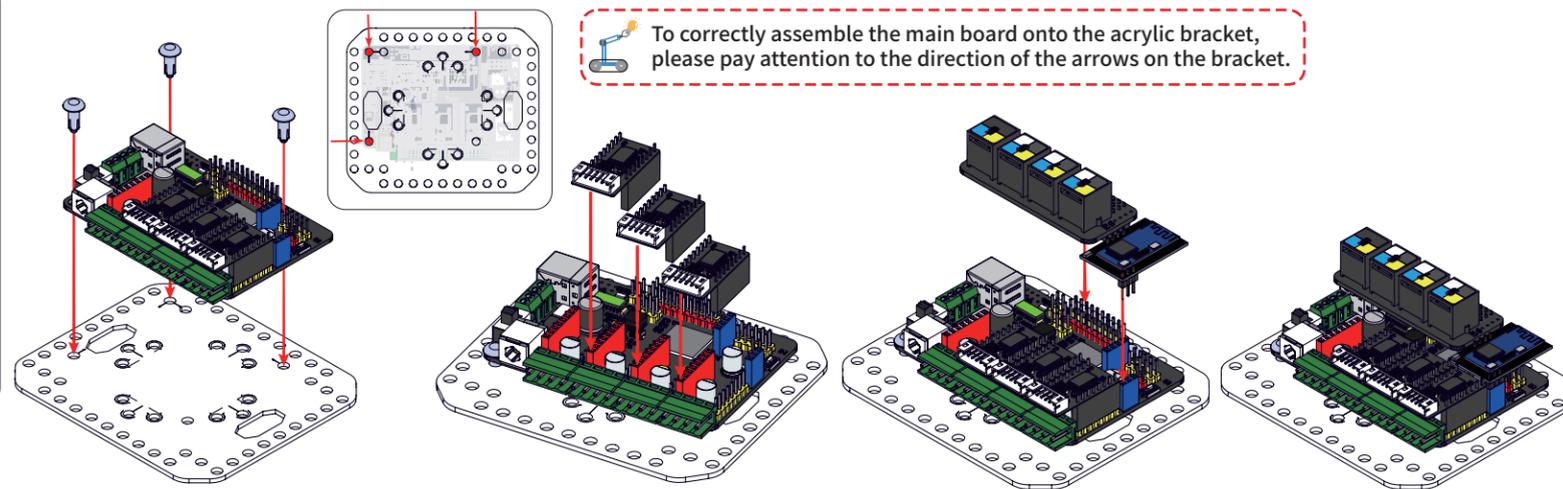
**21**

| | | |
|---|---|---|
| MegaPi Acrylic Bracket | (1) |
| Battery Holder | (1) |
| Plastic Rivet 4060 | (2) |

| | | |
|---|---|---|
| | 0824-128 | (1) |
| | M4×8 | (2) |
| | M4×14 | (2) |
| | M4×22 | (2) |
| | Nut M4 | (4) |

M4×8
M4×14

M4×22
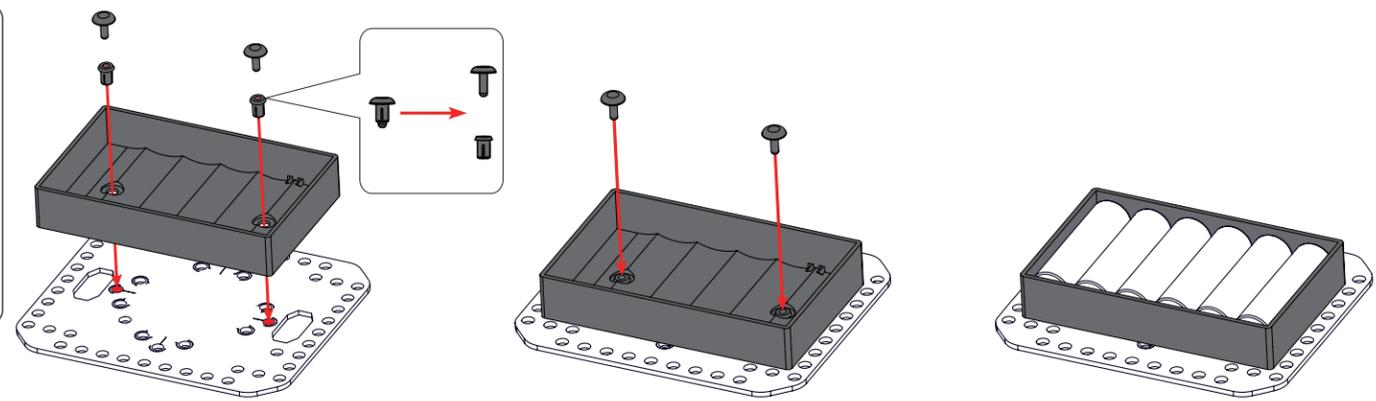
Nut M4

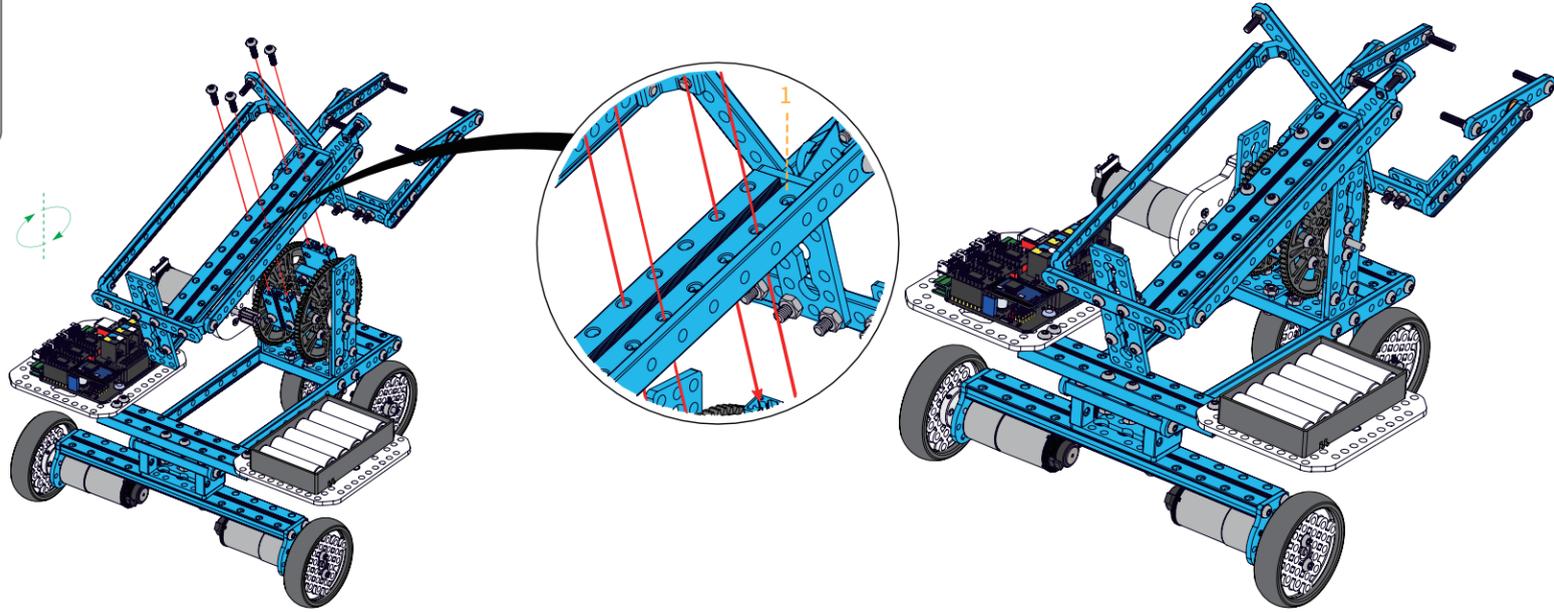| | | |
|---|---|---|
| | M4×14 | (4) |
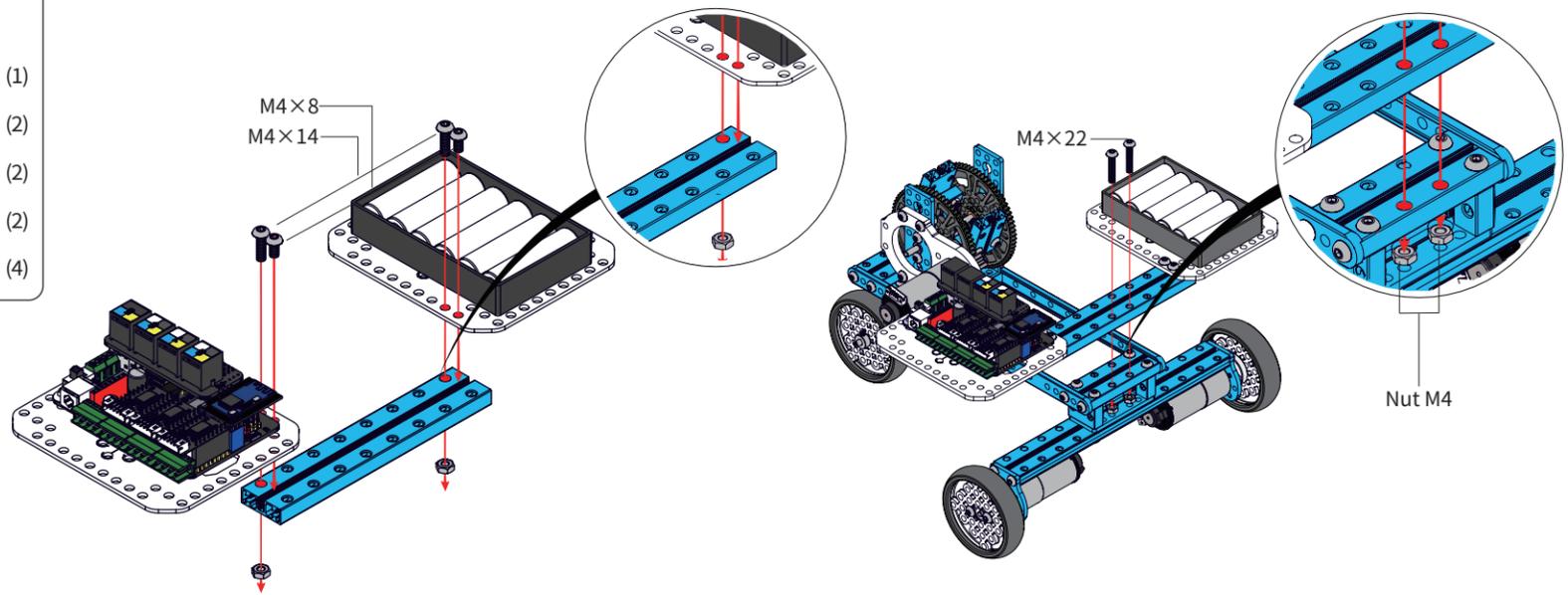
**Assembled Diagram**
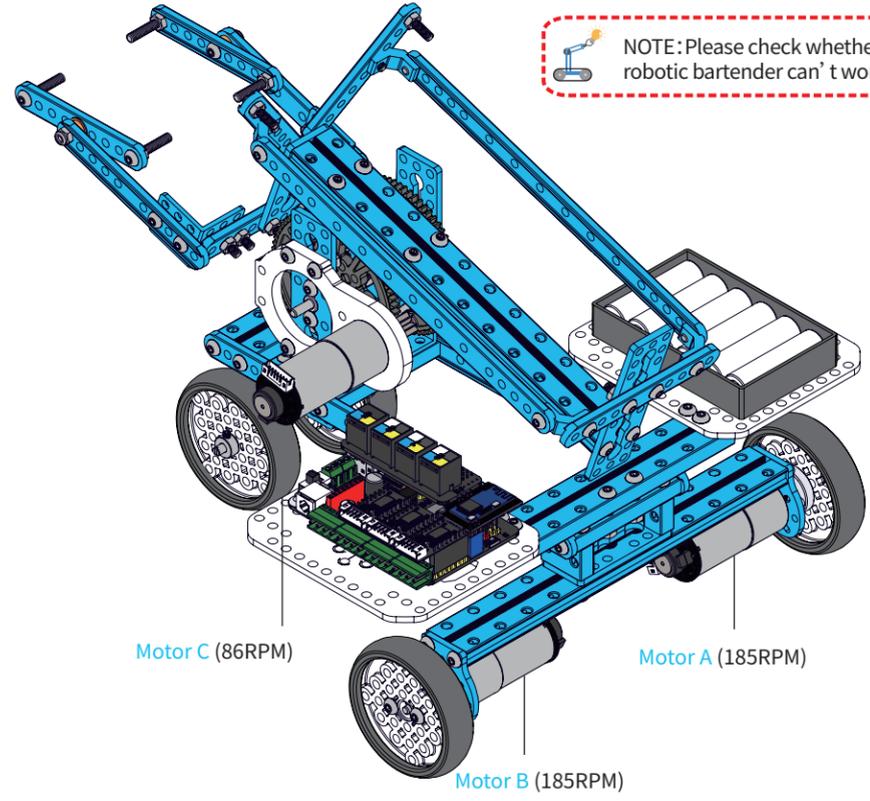
NOTE：Please check whether the screw is tightened according to the instruction. If the robotic bartender can't work normally, please refer to FAQs for answers.
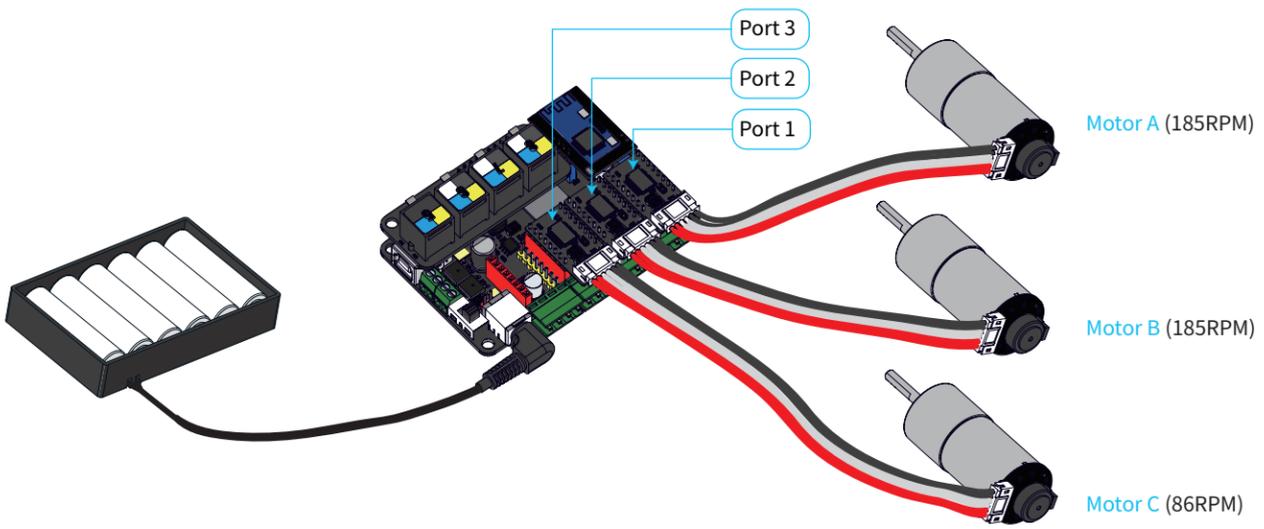
100%
100% Completed!

Motor C (86RPM)
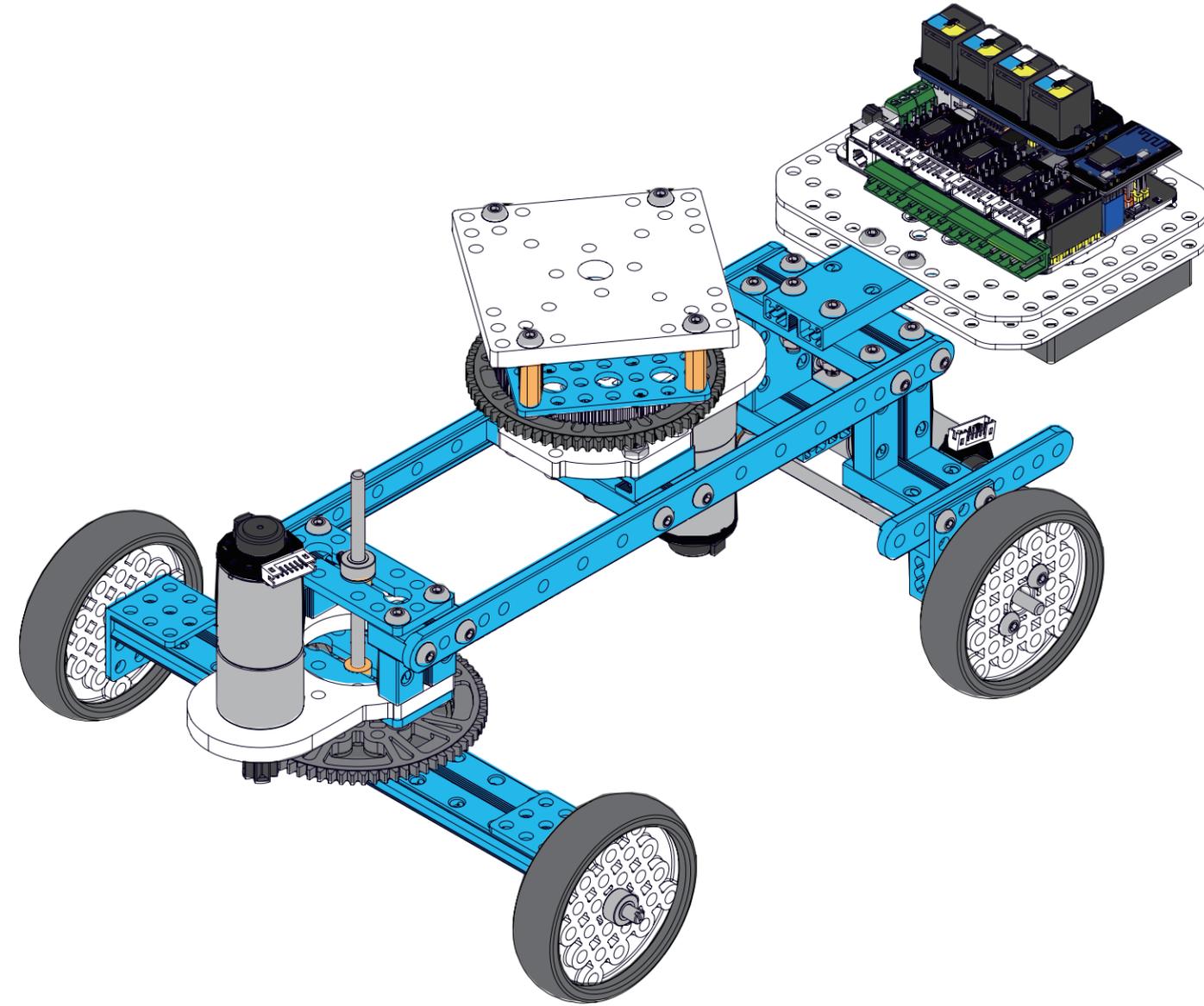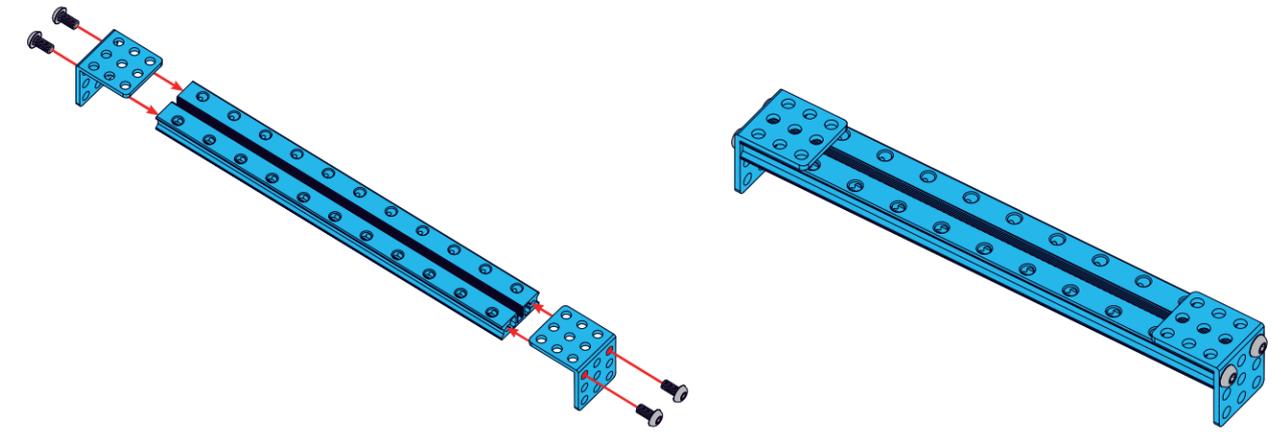Motor A (185RPM)
Motor B (185RPM)

**Wiring**

Port 3
Port 2
Port 1

Motor A (185RPM)
Motor B (185RPM)
Motor C (86RPM)

After assembly, please skip to page 54 for software instruction.

# Camera Dolly

## 1

| | | |
|---|---|---|
| | 0824-176 | (1) |
| | Bracket 3×3 | (2) |
| | M4×8 | (4) |

## 2

| | | |
|---|---|---|
| | 90T | (2) |
| | Shaft Collar | (2) |
| | 4×39mm | (2) |
| | Flange Copper Sleeve | (4) |
| | Plastic Ring 4×7×2 | (2) |
| | Headless Set Screw M3×5 | (2) |

Plastic Ring 4x7x2

Flange Copper Sleeve

tool
1.5mm

Note: Assemble two as shown.

## 3

| | | |
|---|---|---|
| | Nut M4 | (2) |

**4**

Tire 90T B (2)

**5**

Shaft Connector 4mm (1)

Flange Copper Sleeve (1)

M4×22 (2)

56T (1)

72T (1)

Threaded Hole

1 2 3 4 5

Note: Pay attention to the direction when assembling.

**6**
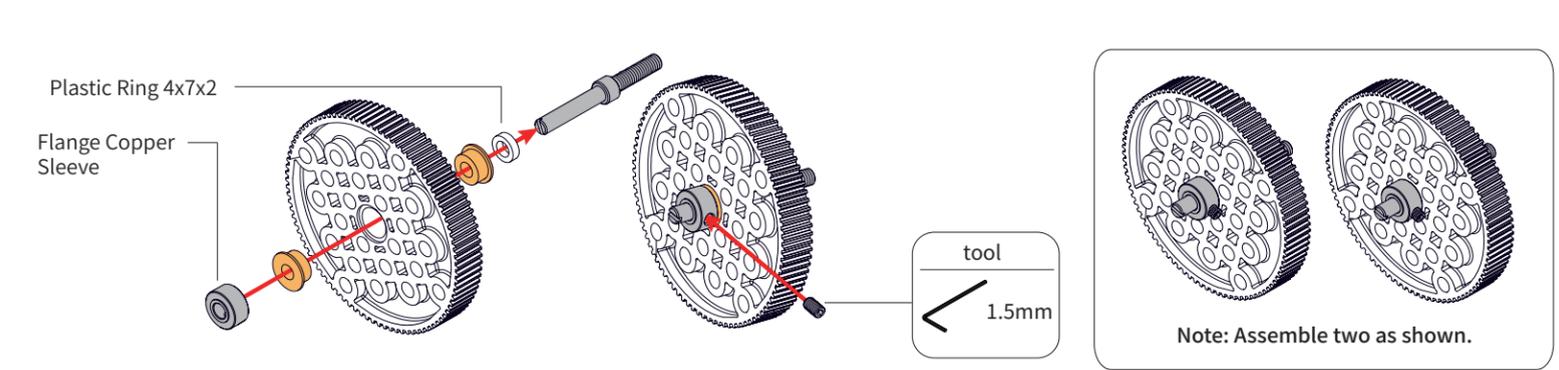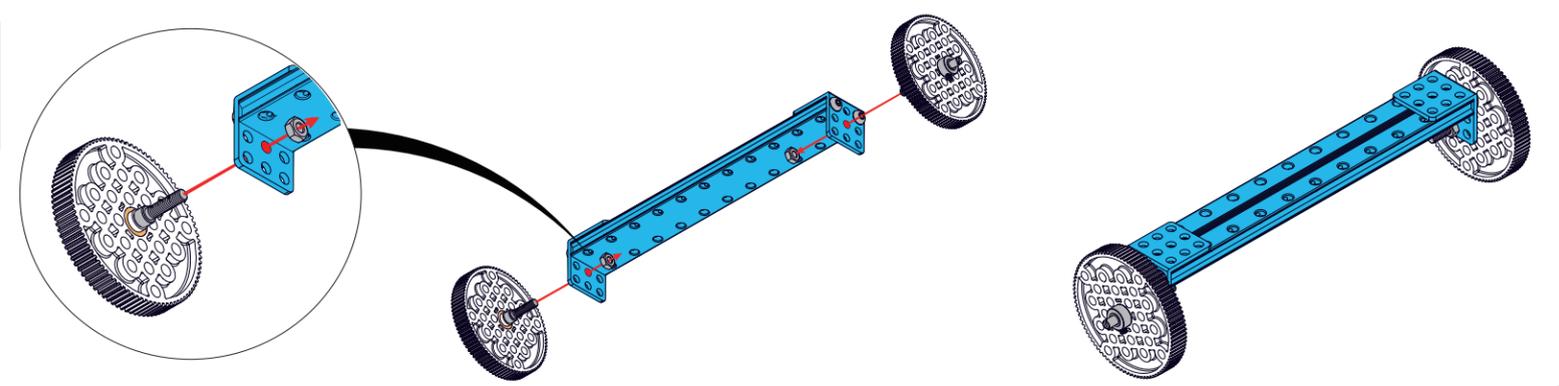
D4×88 (1)

Countersunk Screw M3×8 (2)
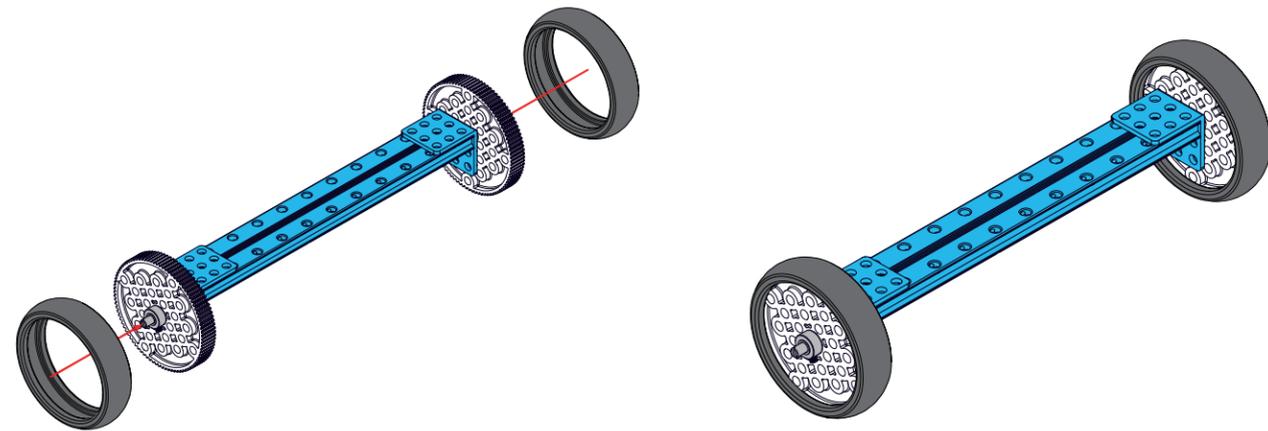
**7**

0824-016 (4)

0324-056 (2)

25mm Motor Bracket-72T (1)

M4×16 (8)
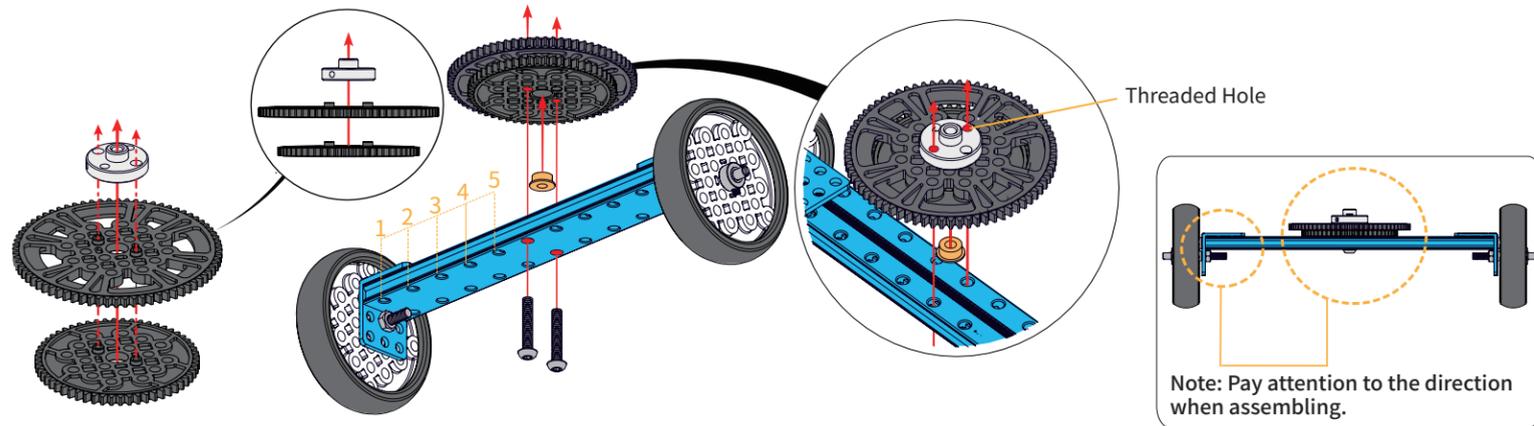
**8**

Shaft Collar (1)

Flange Copper Sleeve (2)

Headless Set Screw M3×5 (1)

Pressure

M3x5
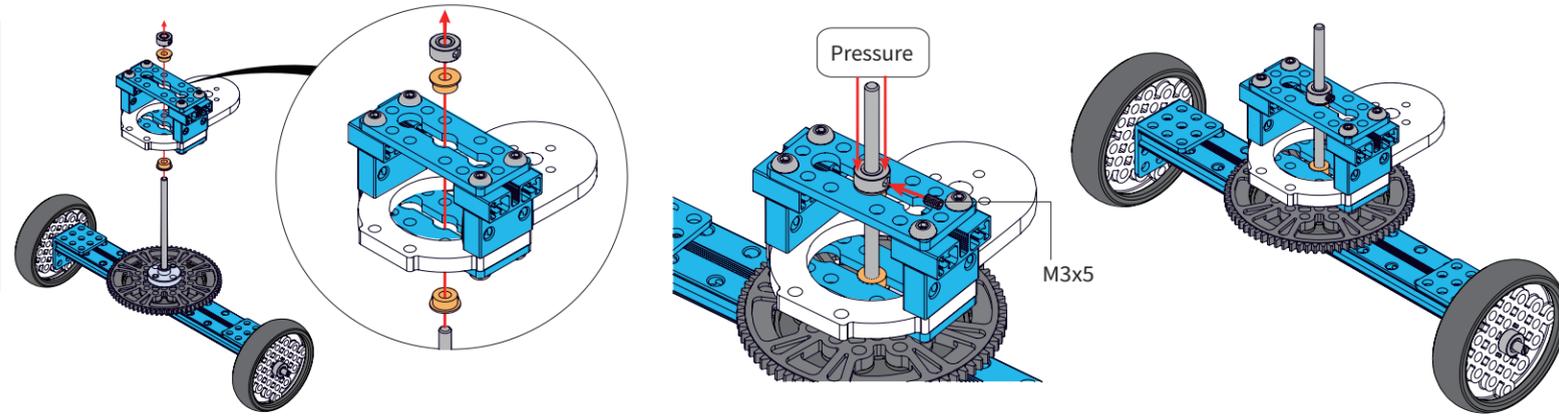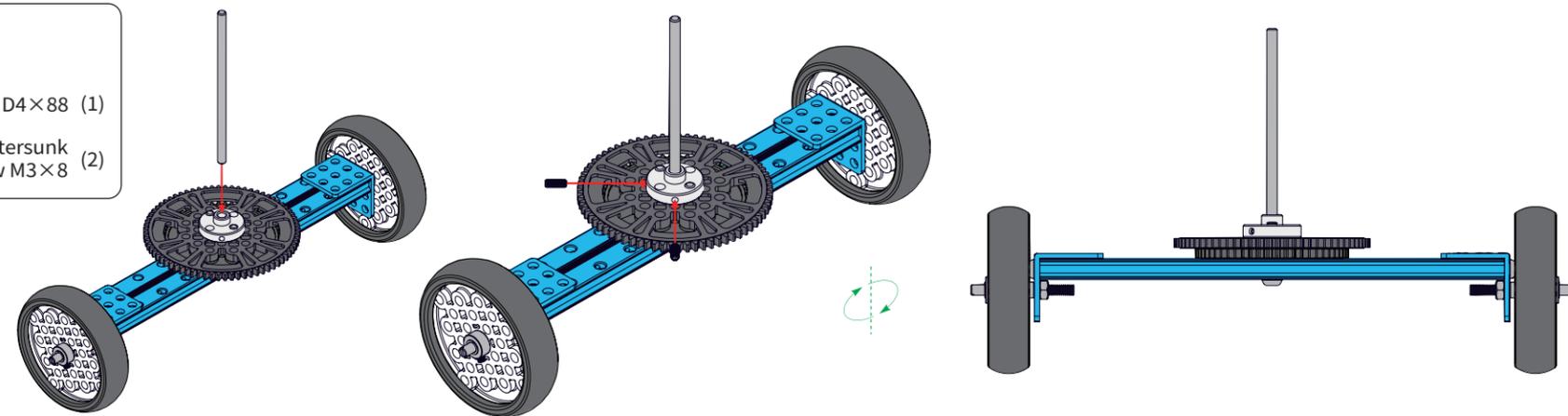
**9**

Encoder Motor 86RPM (1)

8T (1)

Countersunk Screw M3×10 (2)

Encoder Motor 86RPM

35%

You have finished the first part.
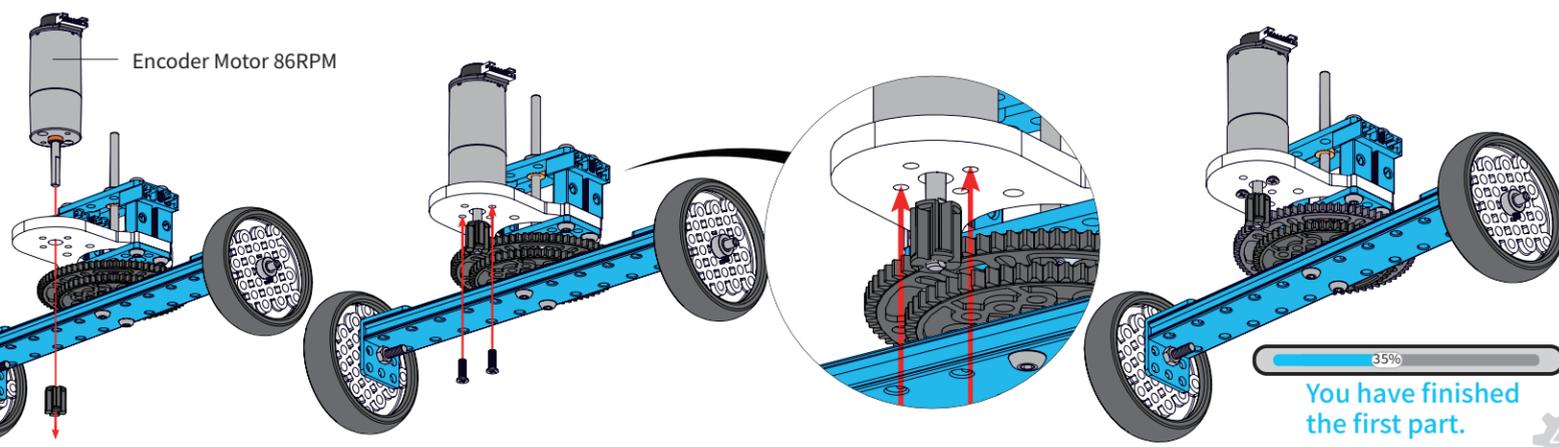
## 10

| 0824-64 | (1) |
| 0824-32 | (4) |
| M4×14 | (8) |

## 11

| 0412-76 | (2) |
| P3 | (2) |
| Plastic Ring 4×7×3 | (2) |
| M4×14 | (4) |

O    X

Plastic Ring 4x7x3

Note: Please check the direction of the P3 bracket.

## 12

| D4×160 | (1) |
| Shaft Collar | (2) |
| Flange Copper Sleeve | (4) |
| Headless Set Screw M3×5 | (2) |

≈20mm

## 13

| Shaft Connector 4mm | (1) |
| 56T | (1) |
| Headless Set Screw M3×8 | (1) |
| M4×8 | (2) |

Threaded Hole

O    X

## 14

| 90T | (2) |
| Shaft Connector 4mm | (2) |
| Plastic Ring 4x7x10 | (2) |
| M4×14 | (4) |
| Headless Set Screw M3×8 | (2) |

Plastic Ring 4x7x10

M3×8

## 15

| Tire 90T B | (2) |

Now take a look at the cool things you have built.

60%
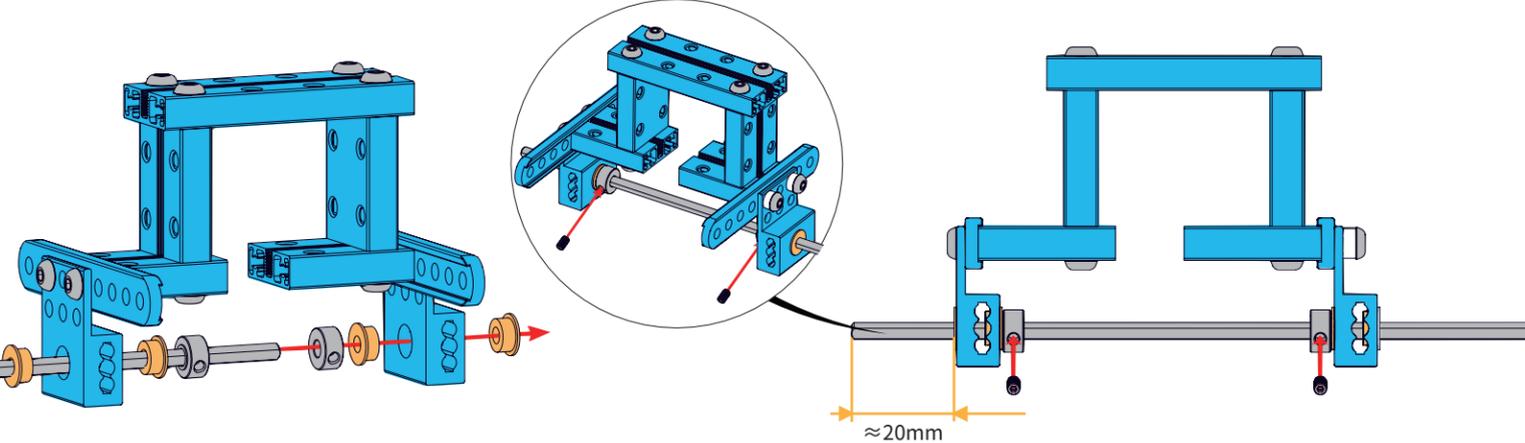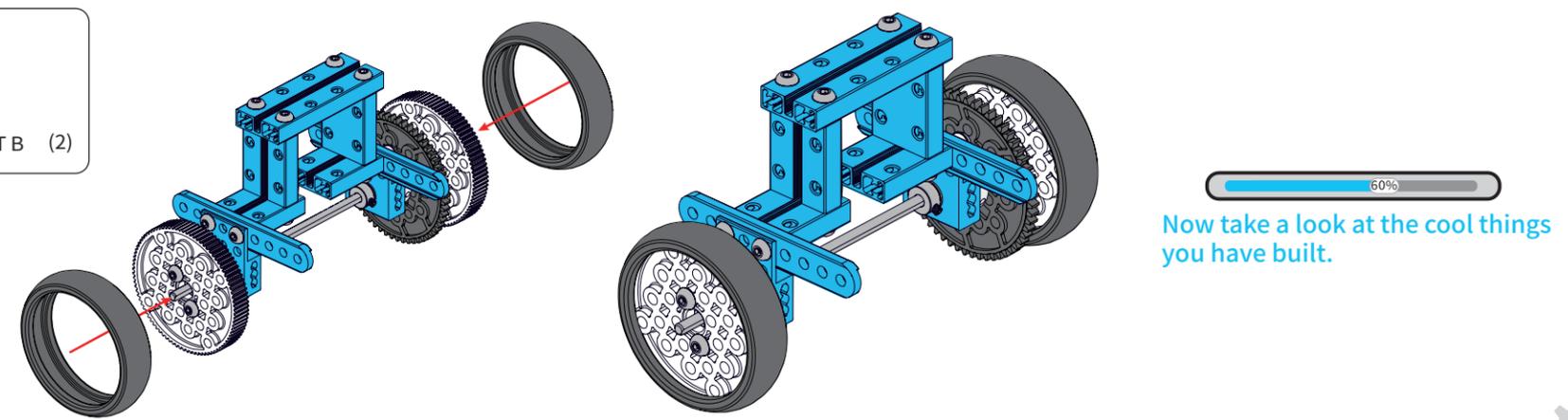
**16**

| | | |
|---|---|---|
| Encoder Motor 185RPM | (1) | |
| 25mm DC Motor Bracket | (1) | |
| 8T | (1) | |
| Countersunk Screw M3×8 | (2) | |
| M4×14 | (2) | |
| Nut M4 | (2) | |

Pay attention to direction of the motor interface.

Encoder Motor 185RPM

M3×8

**17**

| | |
|---|---|
| 0412-220 | (2) |
| 0824-64 | (1) |
| Plane Bearing Turntable | (1) |
| M4×8 | (4) |
| M4×14 | (4) |

1 2 3 4 5 6 7 8

1 2 3 4 5 6 7 8

M4×8

**18**

| | |
|---|---|
| 0808-24 | (2) |
| 25mm Motor Bracket-72T | (1) |
| 90T | (1) |
| 72T | (1) |
| M4×16 | (4) |
| M4×30 | (4) |
| Nut M4 | (4) |

M4×30

**19**

| | |
|---|---|
| Encoder Motor 185RPM | (1) |
| 8T | (1) |
| Countersunk Screw M3×10 | (2) |

Encoder Motor 185RPM

**20**

| | |
|---|---|
| 7×9-B | (1) |
| Quick Release Plate | (1) |
| Brass Stud M4x16 | (4) |
| M4×8 | (4) |
| M4×14 | (4) |
| M4×22 | (2) |

M4×22

M4×14

M4×8
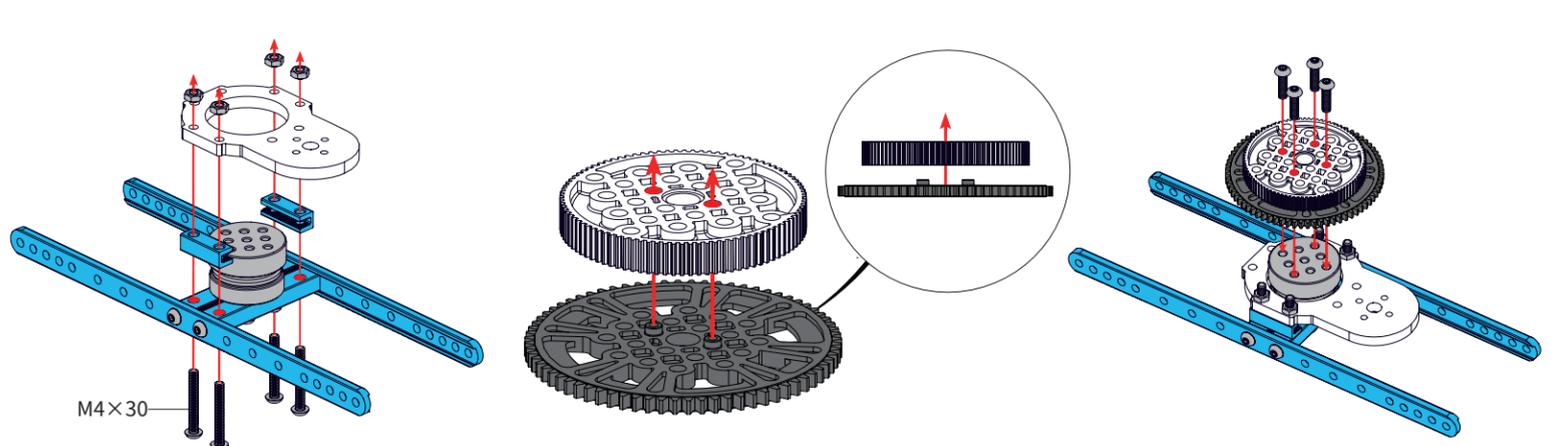
**21**

| | |
|---|---|
| M4×8 | (8) |
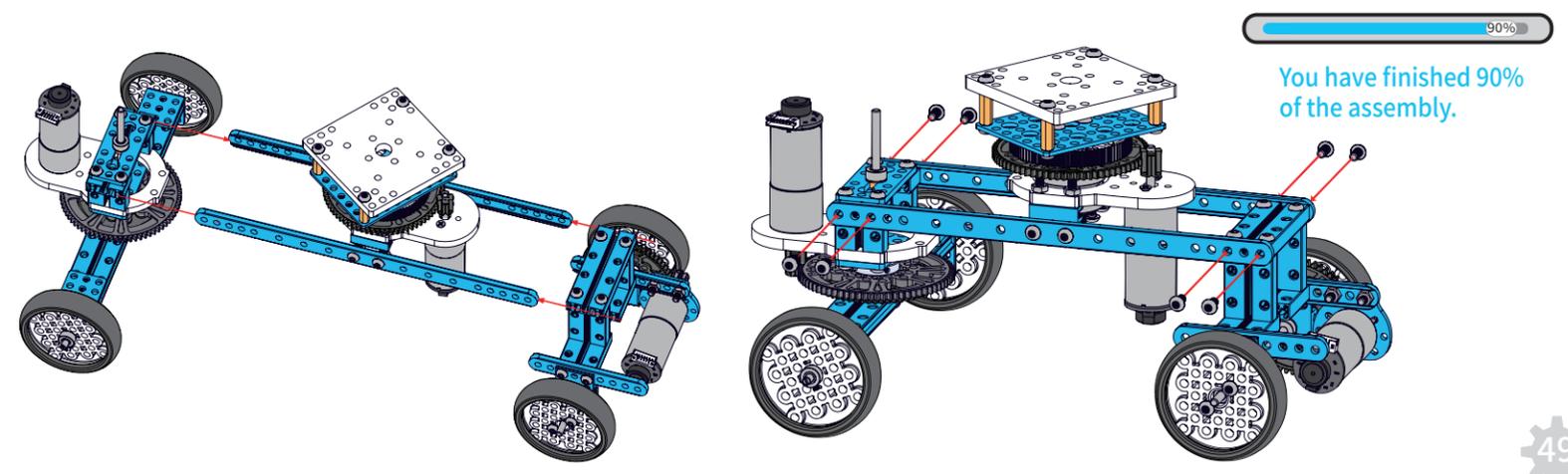
90%

You have finished 90% of the assembly.

## 22

| | | |
|---|---|---|
| MegaPi Acrylic Bracket | (1) |
| Battery Holder | (1) |
| Plastic Rivet 4060 | (2) |
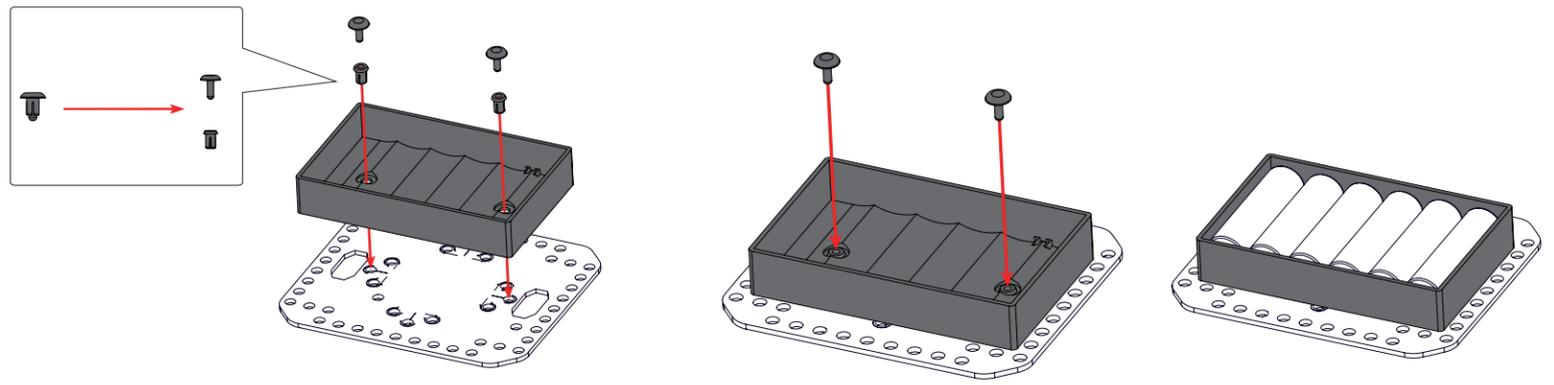
## 23

| | | |
|---|---|---|
| MegaPi | (1) |
| Shield for RJ25 | (1) |
| Encoder/DC Motor Driver | (3) |
| Bluetooth Module | (1) |
| MegaPi Acrylic Bracket | (1) |
| Plastic Rivet 4100 | (3) |

To correctly assemble the main board onto the acrylic bracket, please pay attention to the direction of the arrows on the bracket.
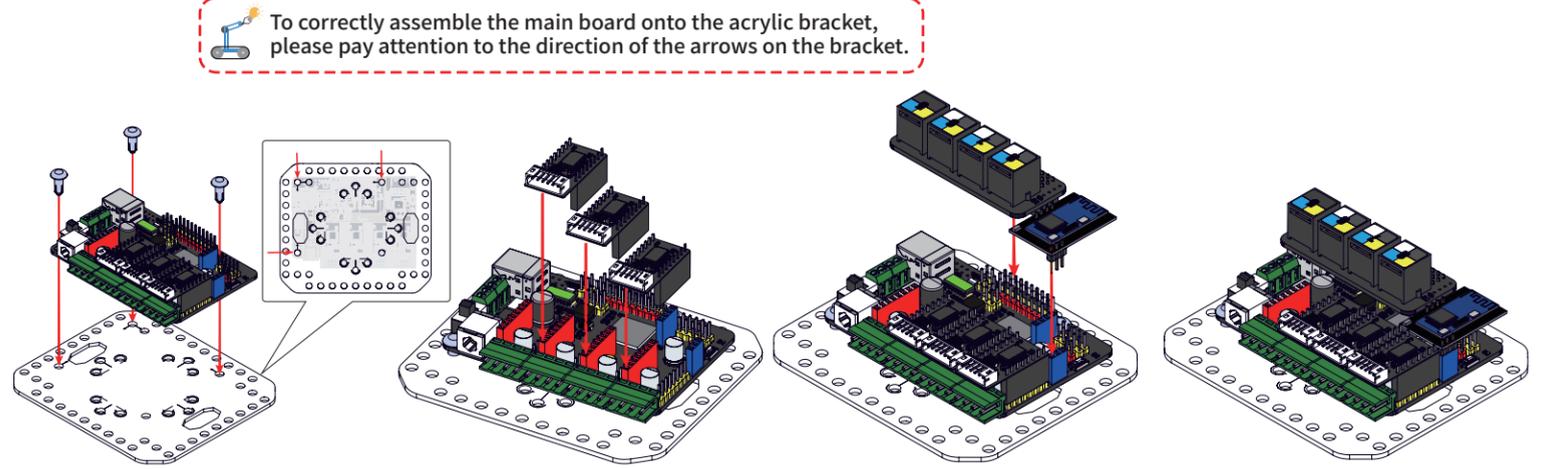
## 24

| | | |
|---|---|---|
| 0824-128 | (1) |
| M4×16 | (4) |
| M4×22 | (2) |
| Nut M4 | (6) |

M4×16

M4×22
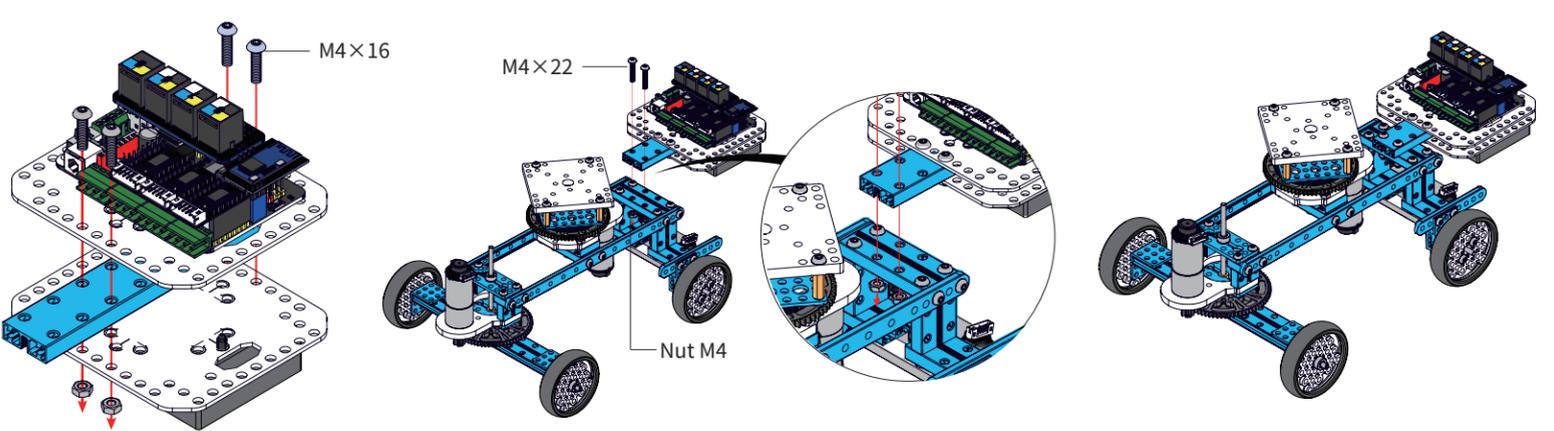
Nut M4

## Assemble mobile phone onto the robot
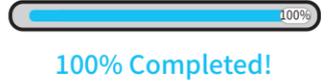
## 25

| | | |
|---|---|---|
| Mobile Phone Bracket | (1) |
| 0324-88 | (1) |
| M4×30 | (2) |
| Nut M4 | (2) |
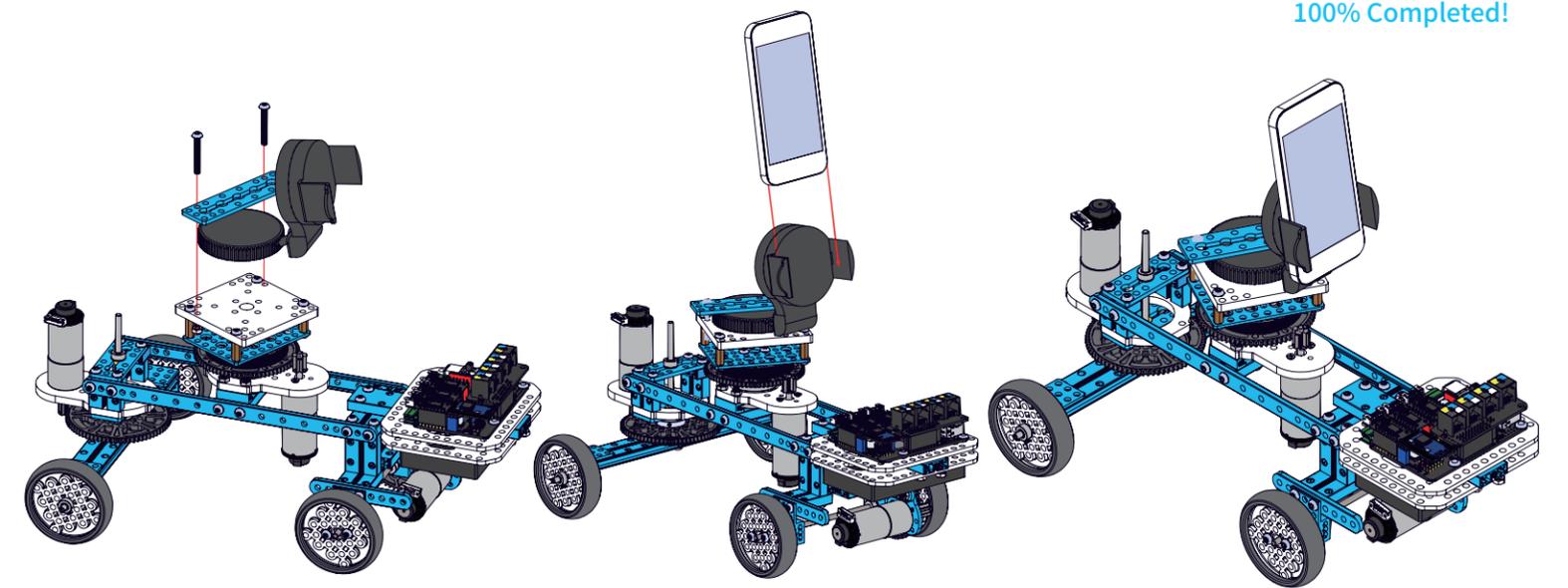
## Assemble camera onto the robot
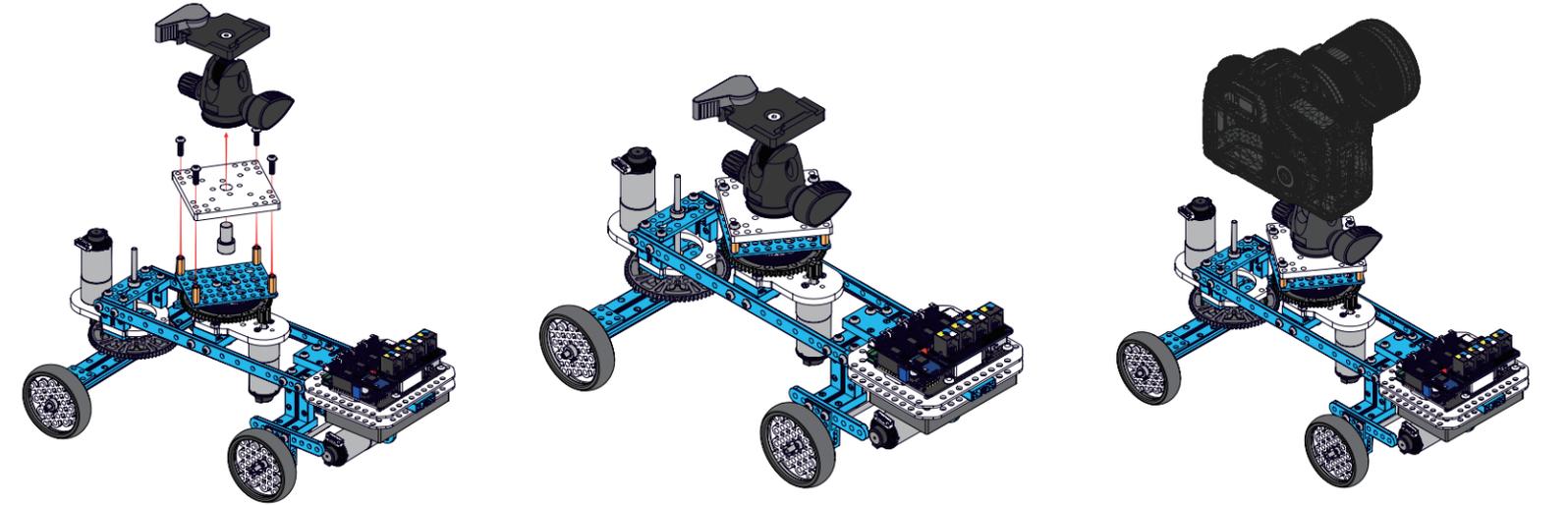
Note: The camera and the ball head are not included in this kit.

## Assembled Diagram



Motor A (86RPM)

NOTE: Please check whether the screw is tightened according to the instruction.

Motor C (185RPM)

Motor B (185RPM)

## Wiring



Port 3
Port 2
Port 1

Motor A (86RPM)

Motor B (185RPM)

Motor C (185RPM)
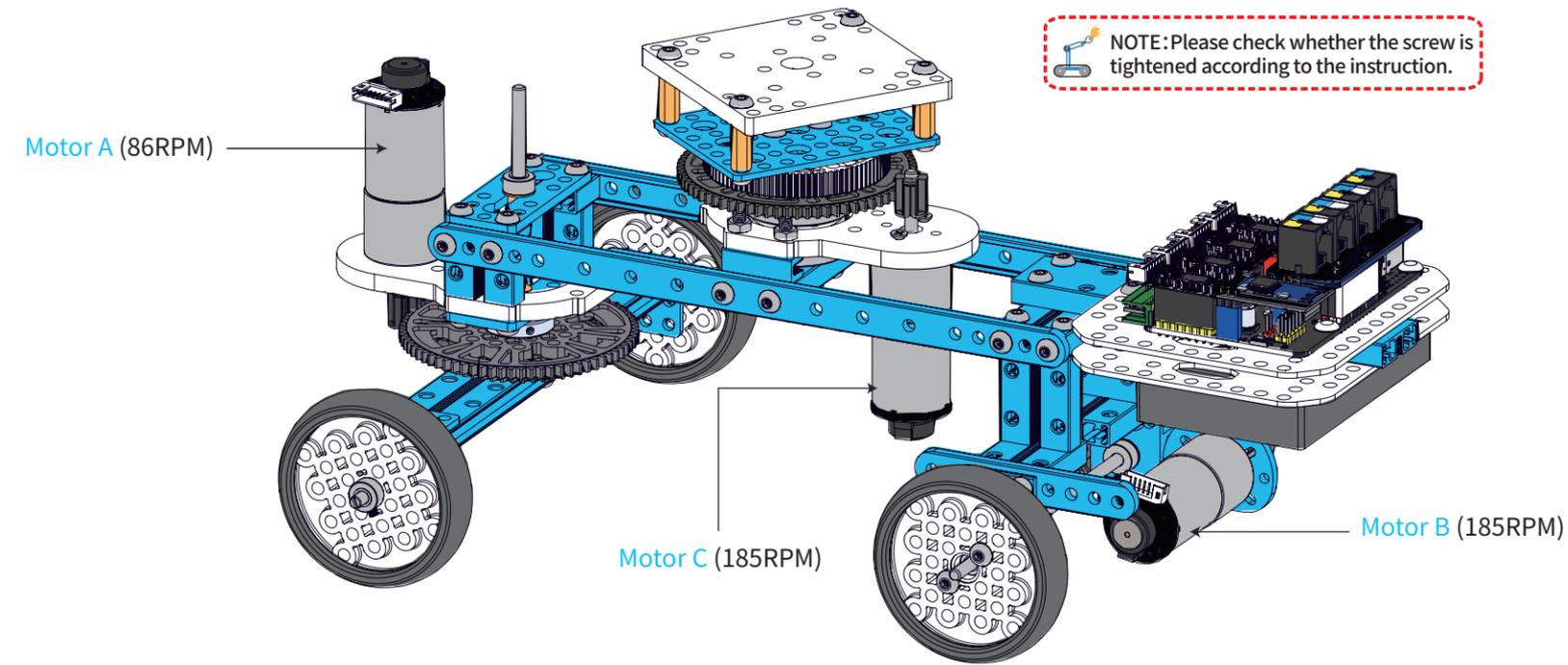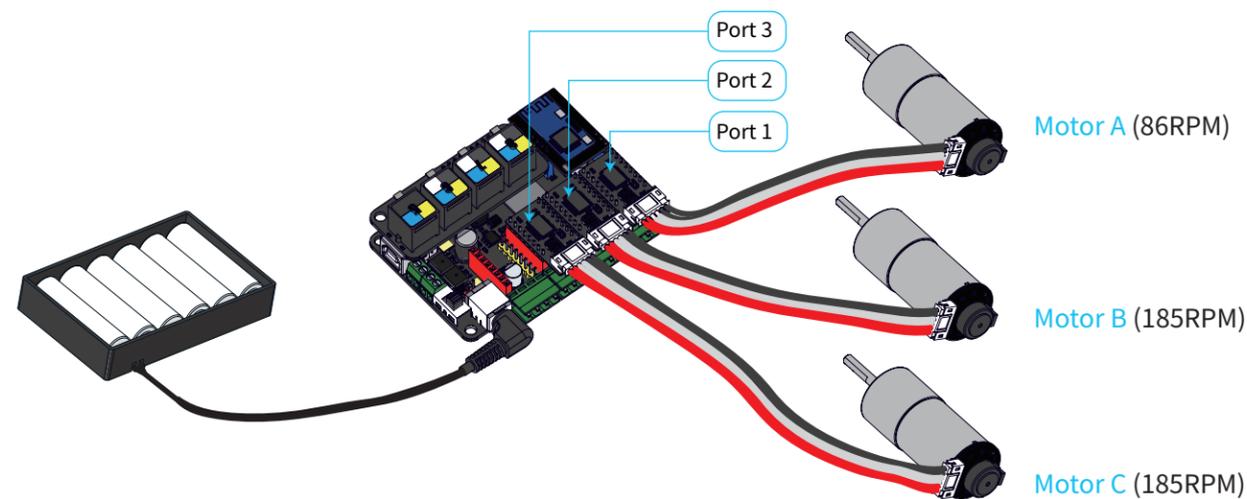
After assembly, please skip to page 54 for software instruction.

## Other Building Forms



Self-Balancing Robot
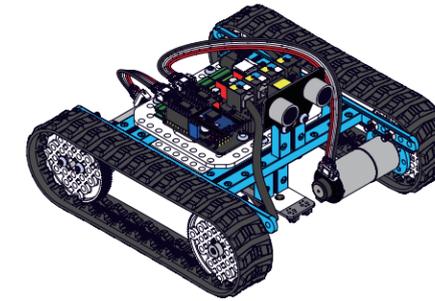
Detecting Robot
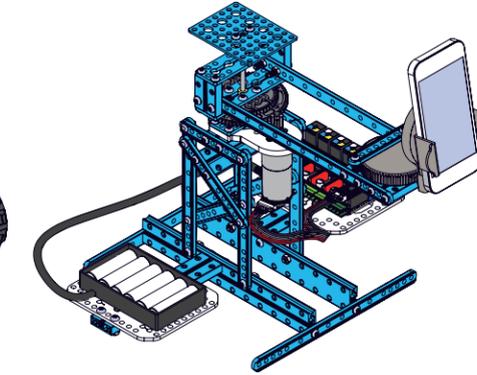
3D Capture A
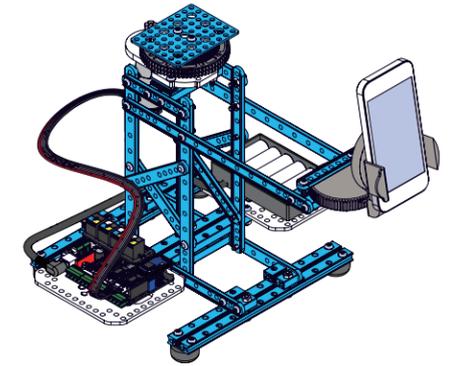
3D Capture B
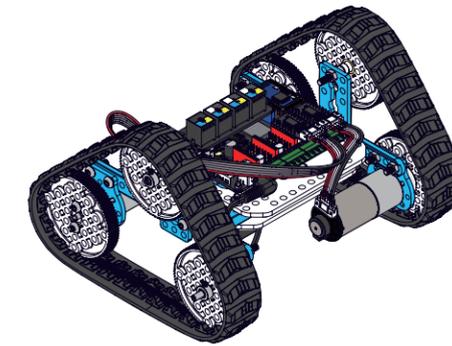


Rolling Tank
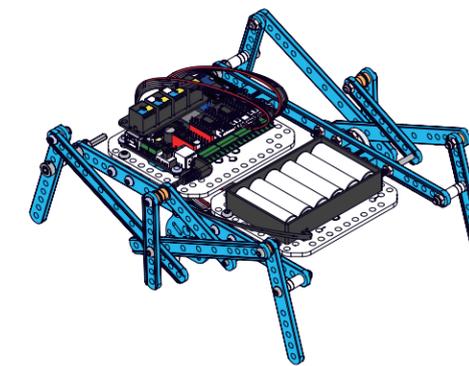
Robotic Ant
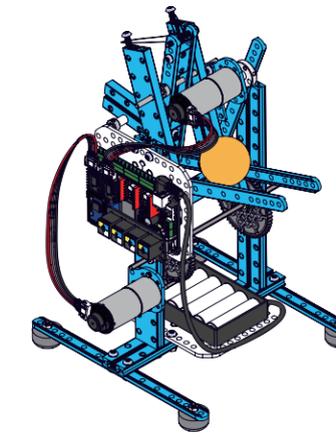
Catapult Ram

Visit learn.makeblock.com/ultimate2/ for detailed assembling instructions and 3D models of other forms.

# App

1. App Download. Not all devices are compatible now. Check d.makeblock.com/c/ on your smart device's browser for confirmation, then download on App store or Google play.



2. Bluetooth Connection. Turn on your robot and the Bluetooth of your smart device; tap on the Robot ID in the search list to pair your smart device with the robot. When the connection indicator LED is solid on, it means that they have been paired successfully.



Connection indicator LED
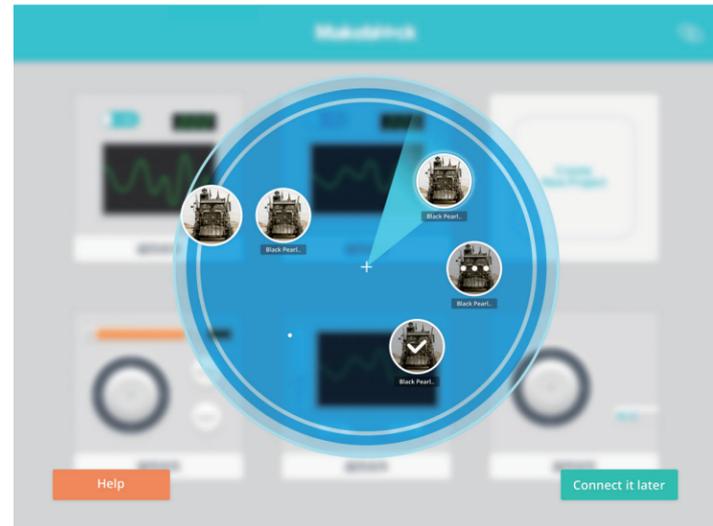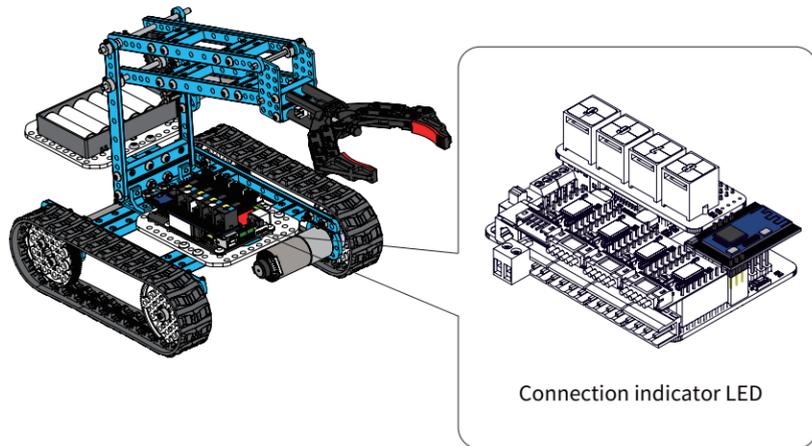
3. Get to know how to use the Makeblock App with Ultimate 2.0, please visit learn.makeblock.com/ultimate2-play-with-app/

# Programming

## Further Learning -- Graphical Programming
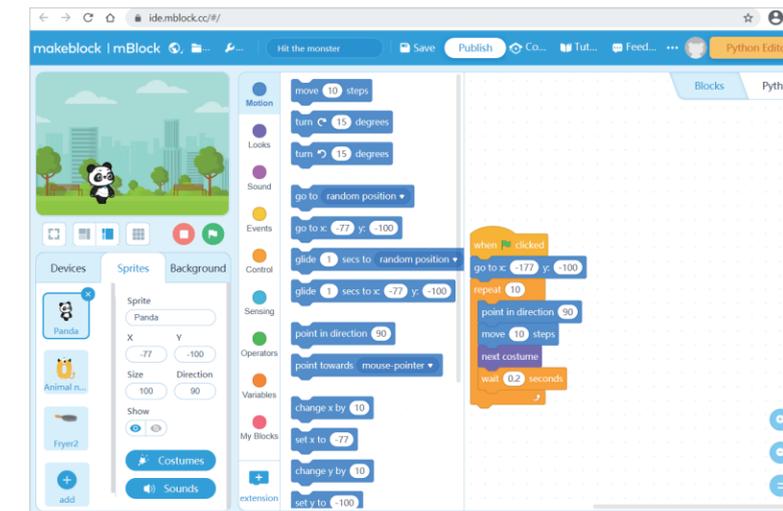


**Introduction to mBlock 5**

mBlock 5 is designed for the Science, Technology, Engineering, Arts and Mathematics (STEAM) education. It supports both block-based and textual programming.

The Ultimate 2.0 Robot Kit supports mBlock 5 perfectly, allowing you to program your robot by simply dragging and dropping blocks.

More information: https://mblock.makeblock.com
Required System: Windows/Mac
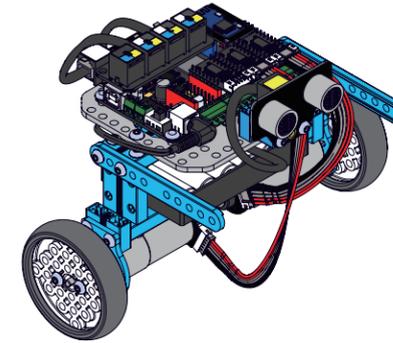
## Advanced Learning -- Arduino Programming (C Language)
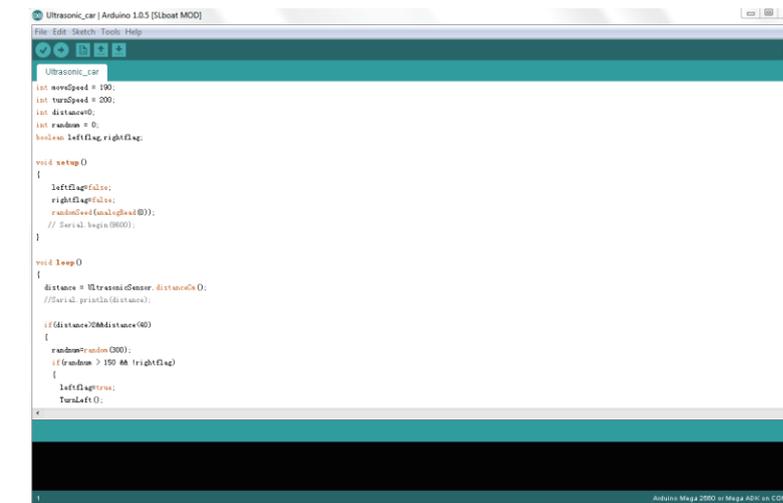


**Introduction to Arduino**

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. The Arduino software consists of a development environment (IDE) and the core libraries. The IDE is written in Java and based on the Processing Development Environment.

More Info: www.arduino.cc
Required System: Windows/Mac/Linux

**Online Arduino Tutorials**

This online tutorial is great for beginners who want to learn about the basics of writing code while having fun playing with Ultimate 2.0.
Online tutorials: learn.makeblock.com/ultimate2-arduino-programming/

# FAQ

Q1. Why doesn't the robot work after powered on? The main board suddenly restarts when I try to drive motors.
a. The robot might be running out of battery. Please charge the batteries or use new batteries. (Note: Please use batteries with low internal resistance which can supply enough power for the robot.)
b. Make sure you've downloaded related program or firmware for the robot. Otherwise, it won't be running.
c. Please check if the motors on the robot are wired correctly.

Q2. When I try to turn the robot to the left, it turns to the right. Why and how to fix this problem?
a. You may need to switch the order of two wires (Port 1, Port 2) to correct the rotation direction.

Q3. Why there is noise after I got the robot tank running?
a. Please check if the driven wheels are correctly installed.
b. Please adjust the bearings of the driven wheel to make sure they are not too tight or too loose.
c. Please make sure encoder disk and the interface of the photoelectric switch are separated from each other.



X          X          O

Q4. Why can't I connect the app with the robot via Bluetooth?
a. Please visit d.makeblock.com to check if your smartphone is compatible with the app.
b. Please try restarting the app or reset the main control board on the robot.

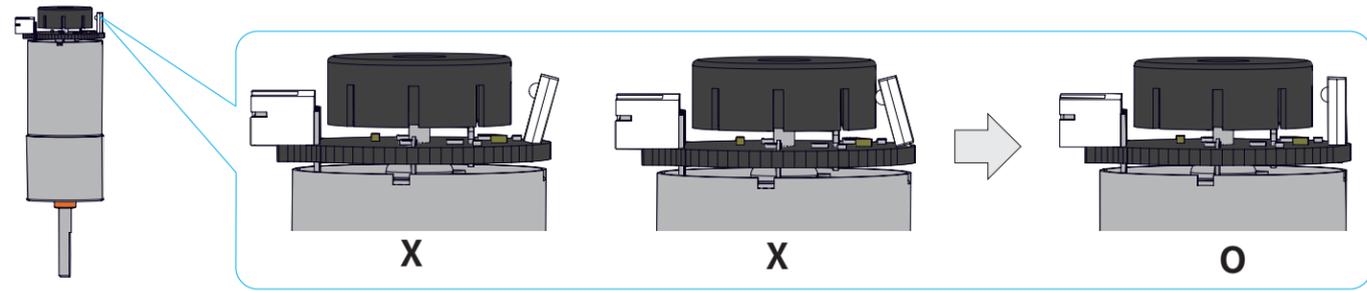Q5. How to upgrade MegaPi firmware?
a. Visit learn.makeblock.com/ultimate2-play-with-app/ to download the latest firmware and upgrade it for MegaPi via Micro USB.

Q6. Where can I find the instruction for other building forms?
a. Visit learn.makeblock.com/ultimate2/ for more building instructions of Ultimate 2.0 robot kit.vt

Visit learn.makeblock.com/ultimate2-faq/ for more FAQs.

## Further Exploration -- Electronic Modules

| | | |
|---|---|---|
|  | Ultrasonic Module is able to measure distance from 3cm to 400cm. |  |
|  | Me 7-Segment Display is a display module with four digit tubes that can show data like speed, time, score, and etc. |  |
|  | Me RGB LED Module contains four programmable RGB LEDs. The color of each LED can be set by editing components of red, green, and blue. |  |
|  | Me Joystick is normally used to control the moving direction. |  |

| | | |
|---|---|---|
|  | Me Sound Sensor is designed to measure volume. It is suitable for some sound interactive projects, such as an voice-operated switch. |  |
|  | MeTemperature Sensor is a stainless steel tube sensor which is used for measuring temperature. |  |
|  | Me PIR Motion Sensor is able to detect infrared ray from animals and humans within 6 meters. |  |
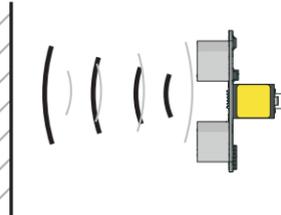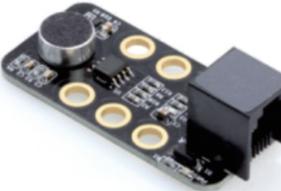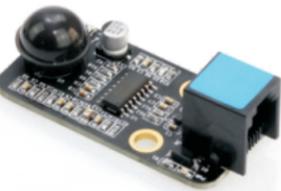
See more on Makeblock platform
www.makeblock.com

## Further exploration -- More Kits
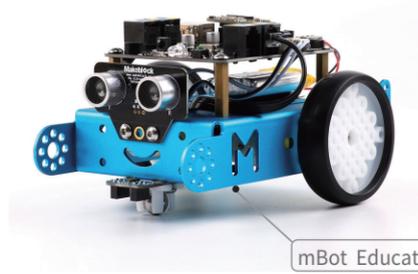

mBot Educational Robot Kit


mBot Ranger Robot Kit


Codey Rocky


Maker Space kit

# FCC Ultimate 2.0

## FCC Information

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

· Reorient or relocate the receiving antenna.
· Increase the separation between the equipment and receiver.
· Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
· Consult the dealer or an experienced radio/TV technician for help.
 "This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body."

FCC ID:2AH9Q-ULTIMATE2

| Product | Ultimate 2.0 |
|---------|--------------|
| Model | 90040 |

## Limited Warranty

This product is warranted against defects in materials and workmanship under normal use by the original purchaser for 90 days after the date of purchase from an authorized retailer. THERE ARE NO OTHER EXPRESS WARRANTIES.

This warranty does not cover: (a) damage or failure caused by or attributable to abuse, misuse, failure to follow instructions, improper installation or maintenance, alteration, accident, Acts of God (such as floods or lightning), or excess voltage or current; (b) improper or incorrectly performed repairs by non-authorized service facilities; (c) consumables such as fuses or batteries; (d) ordinary wear and tear or cosmetic damage; (e) transportation, shipping or insurance costs; (f) costs of product removal, installation, set-up service, adjustment or reinstallation; and (g) claims by persons other than the original purchaser.
Should a problem occur that is covered by this warranty, take the product and the original sales receipt as proof of purchase date to the place of purchase. The product, at the warrantor's option, unless otherwise provided by law: (a) be repaired without charge for parts and labor; (b) be replaced with the same or a comparable product; or (c) a refund of the purchase price will be provided. All replaced parts and products, and product son which are fund is made, become the property of the warrantor. New or reconditioned parts and products may be used in the performance of warranty service. Repaired or replaced parts and products are warranted for the remainder of the original warranty period. You will be charged for repair or replacement of the product made after the expiration of the warranty period.

ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTY OF MERCHANT ABILITY AND, IF APPLICABLE, THE IMPLIED WARRANTY OF FITNESS FOR APARTICULAR PURPOSE, SHALL EXPIRE ON THE EXPIRATION OF THE STATED WARRANTY PERIOD.

EXCEPT AS DESCRIBED ABOVE, THE WARRANTOR SHALL HAVE NO LIABI LITY OR RESPONSIBILITY TO THE PURCHASER OF THE PRODUCT OR ANY OTHER PERSON OR ENTITY WITH RESPECT TO ANY LIABILITY , LOSS OR DAMAGE CAUSED DIRECTLY OR INDIRECTLY BY USE OR PERFORMANCE OF THE PRODUCT OR ARISING OUT OF ANY BREACH OF THIS WARRANTY , INCLUDING, BUT NOT LIMITED TO, ANY DAMAGES RESULTING FROM INCONVENIENCE AND ANY LOSS OF TIME, DATA, PROPERTY , REVENUE, OR PROFIT AND ANY INDIRECT , SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, EVEN IF THE WARRANTOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

## Warnings

· Adult supervision and assistance are required.
· CHOKING HAZARD — This product contains small parts and functional sharp points on components. Keep away from children under age 3.
· Read and follow all instructions in the user guide before using.
· Retain this user guide for future reference.

## Battery Notes

· Use only fresh batteries of the required size and type. Do not mix old and new batteries, different types of batteries (standard, alkaline, or rechargeable), or rechargeable batteries of different capacities.
· Dispose of batteries promptly and properly. Do not burn or bury them.
· If you do not plan to play with the robot for an extended period of time, remove the batteries.

## Caution

· Do not insert the wires into telecommunication or network socket outlets.
· As an extra precaution, check this product regularly for signs of wear or damage.
· Ensure all wiring connections are correct before inserting batteries and switching on the  product .
  Failure to do so may result in damage to components and the product.
· Ensure all wires are correctly connected to the battery terminals and other connectors. If the circuit does not work, make sure the plastic insulation of the wire is not obstructing the connection to the connector.
· When you have finished playing, remove the batteries and switch off the unit before you disconnect the wires. Do not apply any components or parts to the unit other than those provided with this kit.
· To prevent overheating and damage, do not short - circuit the battery terminals and  connectors. Do not block or cover the motor or other moving parts.