WLKATA®

USER'S MANUAL

Cultivate future intelligent makers & Popularize AI robot education

PSE · RoHS · FCC · CE · KC · CNAS · ilac-MRA · CMA

Mirobot Robotic Arm

BEFORE USE

The products described in this manual (including equipment, software, firmware etc.) are provided "as is" and may have defects, errors and faults.
The company does not provide any form of express or implied warranty In order to facilitate your use, please carefully read the user manual and relevant online documents before using this product, and strictly follow the instructions.

Users shall abide by the laws and regulations of relevant countries and regions, and it is strictly prohibited to use our products to participate in activities prohibited by the laws of corresponding countries and regions.

SAFETY PRECAUTIONS

The equipment contains small parts. Children should be accompanied by professionals.
During the movement of the robotic arm , do not put your hand into the movement range of the robotic arm to avoid injury.
The product shall be used in a satisfactory environment. Do not disassemble or modify the product without authorization, otherwise the product may be damaged.

MATERIAL

Relevant data can be obtained in the following ways:
Download Center：https://www.wlkata.com/support/download-center

The WLKATA robot team is always ready to provide you with professional and high-quality services. During the use, if you have any questions or suggestions, please contact us according to the phone number or email address provided at the end of the manual.

CONTENT

01 PRODUCT INTRODUCTION

◎ **Open-source scalable controller**
Multiple open interfaces with strong extensibility
Support artificial intelligence technologies such as visual recognition and deep learning
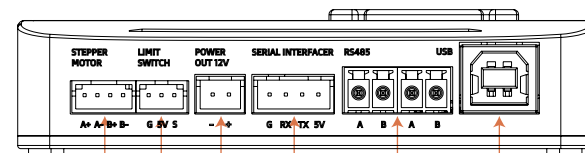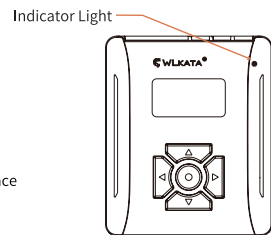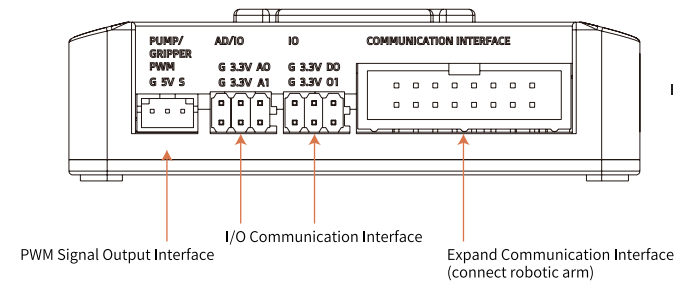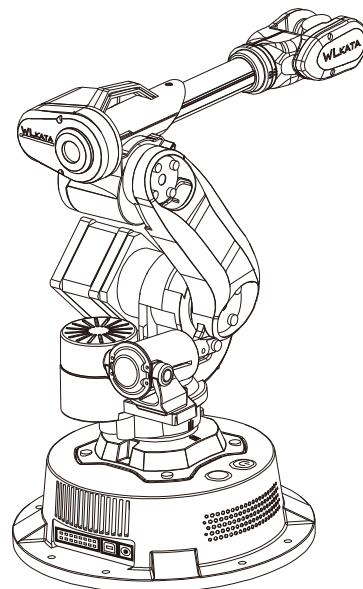
◎ **Six-axis industrial robot prototype**
More realistic application scenarios

◎ **Good-looking with integrated design**
ABS Engineering materials
Weight 1.5kg
(similar to the weight of an ultra-thin notebook)

02 PRODUCT DESCRIPTION

PWM Signal Output Interface

I/O Communication Interface

Expand Communication Interface (connect robotic arm)

Indicator Light

Sliding Rail/Conveyor Belt Motor Interface

USB Interface

RS485 Communication Interface

Serial Communication Interface

Power Output Interface

Sliding Rail Limit Switch Interface

Power Interface

USB Interface

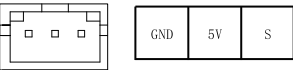Extended Communication Interfacee

Multi Function Controller Indicator Light	
🟢 Green	robotic arm in idle state
🔵 Blue	robotic arm in executing state
🔴 Red	robotic arm in locked state

INTERFACE DETAILS

Robotic Arm Interface

Extended communication interface:
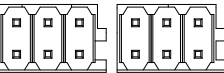serial communication (connecting multifunctional extender box)
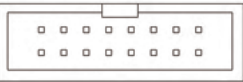
2A	2B	EX0	5V	GND	12V	STA0	RX_2
1A	1B	EX1	5V	GND	12V	STA1	TX_2

Multifunctional Extender Box Interface

AIR PUMP/GRIPPER PWM :
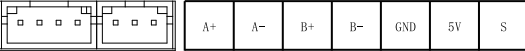Interface of air pump, Servo Gripper and other end effectors

GND	5V	S

I/O : For receiving external input digital signals

GND	5V	S1	GND	5V	S3
GND	5V	S2	GND	5V	S4

STEPPER MOTOR LIMIT SWITCH:
Interface of conveyor belt/slide rail and limit switch

A+	A−	B+	B−	GND	5V	S

RS485:
RS485 is a communication interface (generally used for communication in production lines)

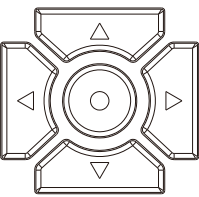| A1	B1	A2	B2

POWER 12V:
12V power interface

G	12V

SERIAL INTERFACE:
Serial communication interface

GND	RX	TX	5V
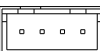
NAVIGATION KEY:
multifunctional extender box button function

Direction key " ↑ "	Select cursor to move up
Direction key " ↓ "	Select cursor to move down
Direction key "←"	Cancel (return to the upper menu)/Long press to return to the main interface
Direction key "→"	Confirm (enter the lower menu)
Round button "OK"	Long press for 2s to reset the robotic arm/short press on the main interface to execute the last running program

03 ROBOTIC ARM EXTENSION

Pen Holder

Servo Gripper

Single Head Pneumatic Suction Cup

Double Head Pneumatic Suction Cup

Three-Finger Soft Gripper
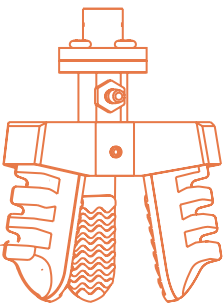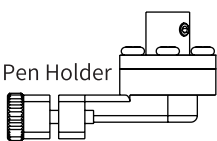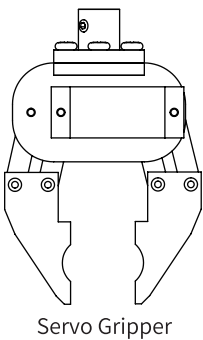
Installation of End Effectors

Connect the air pump line to the air nozzle of the pneumatic tool

Use the Allen wrench in the tool kit to loosen the jacking screw counterclockwise.
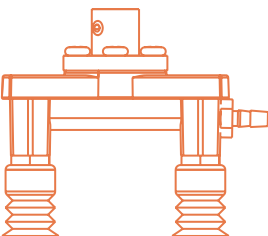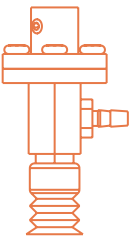After installing the end tool into the end shaft, align it with the end shaft plane and screw it clockwise
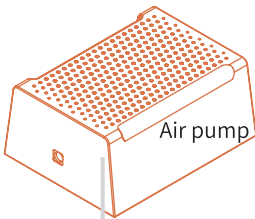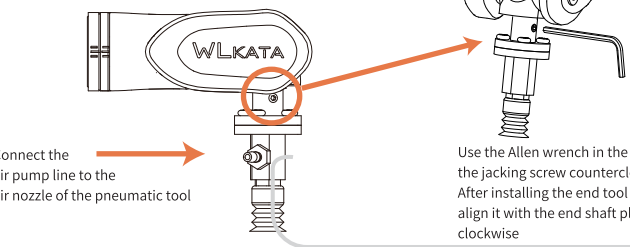
Air pump

Air pump, single/double head pneumatic suction cup and three finger flexible soft gripper are part of the pneumatic set in the education kit

04 COORDINATE SYSTEM

The direction of arrows at each joint is the positive direction when the corresponding joint rotates.

XYZ is the base coordinate system (located in the center of the robotic arm base)

X' Y' Z' is the end coordinate system

Joint4

Joint3

Joint2

Joint5

Joint6

Joint1

Note: In the WlkataStudio coordinate control mode,

RX RY RZ is the attitude of the X' Y' Z' coordinate system with respect to the X Y and Z coordinate systems. .

RX rotates about X', RY rotates about Y', RZ rotates about Z' prime all in the end-effector coordinate system.

05 SPECIFICATIONS

Specifications(Robotic Arm)

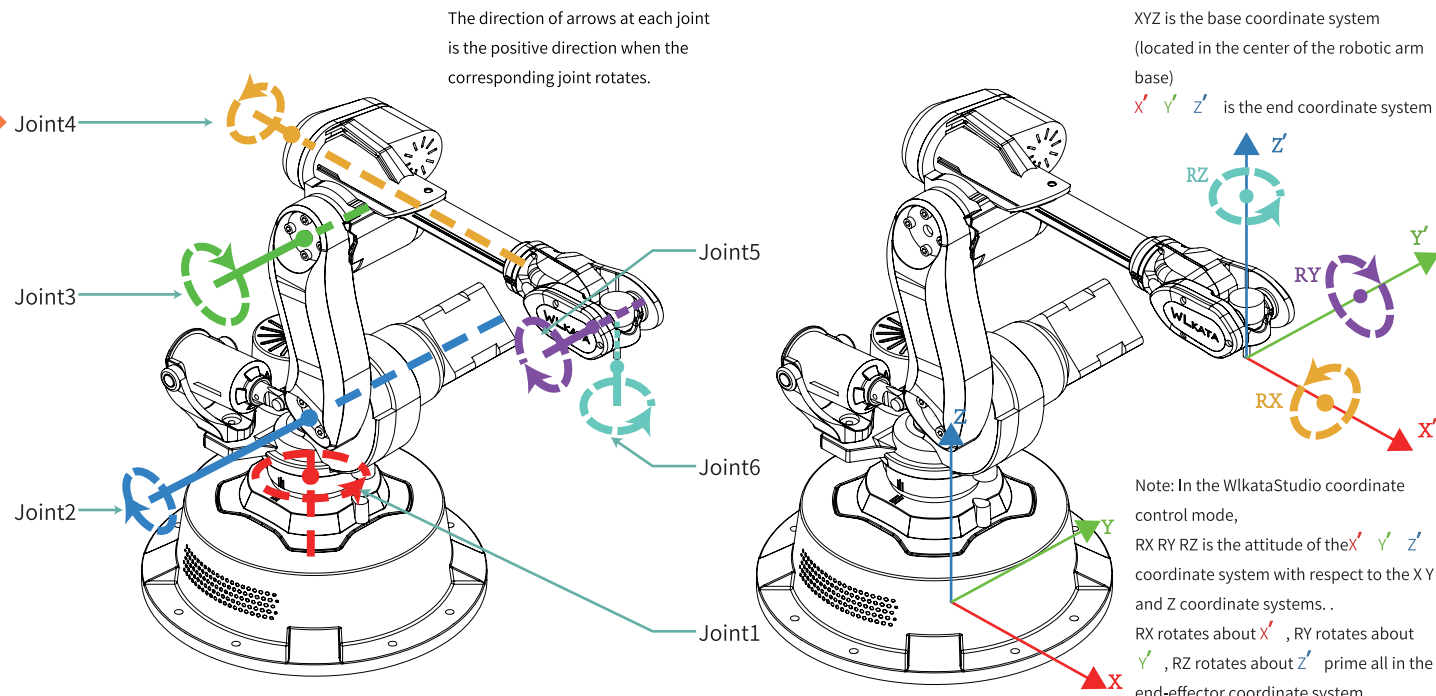|	
Number of axes	6+1
Payload	Vertical load 600g Omnidirectional load 150g
Maximum extension distance	315mm
Repetitive positioning accuracy	0.2mm
Communication mode	USB/Wi-Fi/Bluetooth/RS485
Power supply/voltage	100V～240V, 50/60Hz
Power input	12V/5A DC
Power	60W Max
Work environment	-20℃～70℃
Communication interface	USB to serial port/UART
Control chip	ATmega 2560
Control software	Wlkata Studio
Net weight	1.37kg
Base size	Diameter 160mm
Material	ABS
Packing size	385*345*295mm

Joint Motion Parameters

Joint	Operating range	Maximum speed (160g load)
Joint1	-110°to+160°	6000°/min
Joint2	-40°to+70°	6500°/min
Joint3	-120°to+60°	4300°/min
Joint4	-350°to+350°	20000°/min
Joint5	-200°to+30°	40000°/min
Joint6	-350°to+350°	40000°/min

Specifications (End Effectors)

Pen Holder	Diameter	7mm-10mm
	Weight	18.1g
	Drive mode	Electric
Servo Gripper	Grab range	0-30mm
	Weight	36.4g
	Size	24.4mm*12.5mm*22.8mm
	Torsion	0.8kg/cm（5.0V）
	Speed	0.3sec/60°（5.0V）
	Clamping jaw material	Plastic

Specifications(Multifunctional Extender Box)

Control chip	Xtensa 32-bit LX6
Dominant frequency	240MHz Computational ability 600DMIPS
Power supply/voltage	12V
Work environment	-10℃～60℃
Communication mode	USB/UART/RS485/Wi-Fi/Bluetooth BT/Bluetooth BLE
Control software	Wlkata Studio
Weight	83.9g
Size	90*75*22mm
Material	ABS engineering plastict
Screen	Monochrome OLED

Specifications（Pneumatic Set）

Air pump	Size	84*108*48mm
	Weight	184.8g
	Positive pressure	120kPa
	Negative pressure	60kPa
	Inner diameter of Air tube	2mm
	Trachea length	60cm
	Air tube material	Silica gel
Single head pneumatic suction cup	Weight	12.6g
	Suction cup diameter	12mm
Double head pneumatic suction cup	Weight	17.1g
	Suction cup diameter	12mm
Three-finger soft gripper	Drive mode	Pneumatic
	Weight	38.1g
	Grab range	5mm-40mm
Spare suction cup	20mm suction cup	2
	8mm suction cup	2

Expansion Interface (Multifunctional Extender Box)

Extended communication interface×1	16PIN, Special communication serial port for robotic arm
AD/IO communication interface×2	Black terminal,3PIN,(G,3.3V,A0) Digital input, digital output, analog input, analog output
I/O communication interface×2	Black terminal,3PIN,(G,3.3V,A0) Digital input, digital output, analog input
PWM Signal output interface×1	Yellow terminal,3PIN,(G,5V,S)
Extended stepper motor interface×1	White terminal, 4PIN(A+,A-,B+,B-) Driving current of two-phase 4-wire stepper motor, 0.8A
Extended stepper motor reset switch×1	White terminal,3PIN(G,5V,S) In the pull-up level state by default
12V Power interface×1	Red terminal,2PIN(-,+) Maximum current 1A
Serial communication interface×1	White terminal, 4PIN(G,RX,TX,5V)
RS485 communication interface×2	Green terminal,2PIN(A,B) Support linkage control of up to 99 robotic arms at most
USB communication interface×1	White terminal , USB-typeB Communication with computer

06 WORKSPACE

160 Degree

429.4 mm

255 mm

30.5 mm

229.64 mm   325.62 mm

110 Degree

245.62 mm

325.62 mm   80 mm

The shaded part is the motion space of the robotic arm. If it exceeds the motion space, it may cause damage to the robot. Please pay attention when using it.

07 DAILY USE HELP

▶ 1.How can I get help using the robotic arm?

Please visit our website WWW.WLKATA.COM and click [Support Center] → [Use Document] to view the robotic arm use tutorial online. Click [Support Center] → [Download Center] to download the robotic arm control software. You can also learn about the use scenarios of robotic arms and extension equipment in the following ways.

　　　1) Official teaching video
　　　2) Official documents

▶ 2.Glossary

1) Homing: The robotic arm will lose the memory of the coordinate positions of each axis after power off. Therefore, each time of power-ing on, each axis must first retu to a fixed point to reestablish the coordinate system. This process is called "homing". The homing time is about 3 seconds. There are two ways to start the homing process:

　　　A. Turn on host computer software Wlkata Studio, click the HOME button, and the robotic arm will start homing.

　　　B. Press and hold the middle button of the multifunctional extender box for 3 seconds, and the robotic arm will start homing.

2) Zero position: the robotic arm will move to a fixed position after completing the homing process, which is called the zero position. It is also the calibrated position of the robotic arm..

3) Firmware: Firmware is the program stored in the device. Through firmware, the device can execute or react to the command obtained according to the standard Generally, when the device is modified or new features are added, the firmware needs to be updated.

▶ 3.Robotic arm calibration

The calibration of the robotic arm has been completed before leaving the factory. In the following cases, if it is deemed necessary to calibrate, operate according to the *Robotic Arm Calibration Document.*

　　　1) After the robotic arm is "zeroed", the "initial position" deviation is large, affecting the use.
　　　2) The robot arm works in a scene with high requirements for absolute accuracy.

4.FAQs

Q1. Robotic arm firmware or multi-function control firmware upgrade failed
A1: Check whether USB is connected to the device to be upgraded
    Check whether the equipment to be upgraded is powered on.
Q2. Unable to control the end tool
A2: Check the connection mode of the end tool, which should be connected to the PWM signal output interface (yellow terminal) on the multi-function controller. Check whether the tools selected in the end tool control of the upper computer are correct.
Q3. The robotic arm cannot return to the initial position after the zero return movement stops.
A3: Check the color of the indicator on the multi-function controller.
    If green is displayed continuously, recalibrate the robotic arm;
    If it continues to display blue, check whether the slide rail reset switch interface is wrongly connected, and disconnect it if any;
    When problems occur in the process of using the upper computer to control the robotic arm, fault codes will appear in the command control area and the screen of the multi-function controller.
    In case of any problem, please refer to *WLKATA Mirobot Fault Code Manual* and check the problem against the fault code.

5.Secondary Development Of Robotic Arm

Mirobot supports secondary development and provides professional developers with multiple SDKs, such as Python, Arduino, ROS, C++, and V-rep.

08 AFTER SALE SERVICE TERMS

1.Warranty Details

1) The warranty period shall be in accordance with the time limit agreed in the contract (if not agreed, it shall be within one year after receiving the product). If users need product warranty service, the purchase documents and product warranty cards of corresponding products shall be provided as vouchers;
2) This product is applicable to WLKATA Mirobot series robotic arms directly purchased from Wristline Inc.and within the valid warranty period. If there is any quality problem of the product itself during normal use, Wristline Inc. will provide warranty service according to the quality warranty policy.

2.Warranty Policy

See *Quality Assurance Policy for details*

3.Specification

1) The terms on this page are only applicable to customers from official channels, and other warranties and support are provided by purchase channels.
2) If there is any problem that cannot be solved, please contact the official after service, and we will help you solve the problem.

CONTROL AND SOFTWARE WLKATA MIROBOT

	WLKATA STUDIO	WIRELESS CONTROLLER	SERIAL OVER USB (ETHERCAT, RS485, PYTHON SDK, ARDUINO)	ROS, MATLAB, V-REP
OVERVIEW	WLKATA Studio is a software that provides essential control functions for robotics learners.	A simple way for beginners learning robotics control and functioning like an industrial robot pendant.	WLKATA Mirobot Firmware allows users operating the robotic arm using serial over USB.	Learning packages including 3D models and control demos for Ubuntu 16.04 ROS Kinetic, MATLAB and V-Rep.
OPERATING SYSTEM	Windows / MacOS	Windows / MacOS / Linux	Windows / MacOS / Linux	ROS: Linux MATLAB: Windows V-Rep: Windows
LANGUAGES	Python / Blockly / G-CODE	G-CODE	Any language which can communicate via serial over USB	C++, Python, and other compatible languages with ROS, MATLAB and V-Rep
CONTROLLER	WLKATA Mirobot Firmware	WLKATA Mirobot Firmware	WLKATA Mirobot Firmware	WLKATA Mirobot Firmware
DOCUMENTS	Manual and samples in various languages (Teach&Play, Blockly, Python, G-CODE, and more)	Manual of using Wireless Bluetooth Controller	Multifunctional Extender Box manual and Python SDK examples	ROS, MATLAB, and V-Rep examples