K1 Instruction Manual-V1.0

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> 中文版本： K1说明书-V1.0

Product Overview

Booster K1 is a humanoid robot development platform for scenarios such as competitions, education, and entertainment, featuring affordable, portable, and durable.

Product Composition

The K1 robot consists of head, torso, arms, and legs, with a total of 22 DoFs, allowing for flexible movement and posture control.

- The head has 2 DoFs, including Yaw Joint and Pitch Joint. It contains a depth camera and microphone array.
- Each arm has 4 DoFs, including Shoulder Pitch Joint, Shoulder Roll Joint, Shoulder Yaw Joint, and Elbow Joint.
- Each leg has 6 DoFs, including Hip Pitch Joint, Hip Roll Joint, Hip Yaw Joint, Knee Joint, and Ankle Up and Down Joint.
- Controller board, speaker and battery are installed in torso.

Product Functions

1. Omnidirectional Walking
   - Supports forward, backward, and lateral walking.
   - Supports rotation and complex walking.
2. Disturbance Resistance while Walking
   - Can walk on uneven surfaces.
   - Can withstand certain impact disturbances while walking.
3. Predefined Actions
   - Waving.
   - Shaking hand.
   - Fall recovery.
4. Safety Protection
   - Automatically enters damping mode in uncontrolled states to prevent damage.
   - Soft emergency stop.

Product Specifications

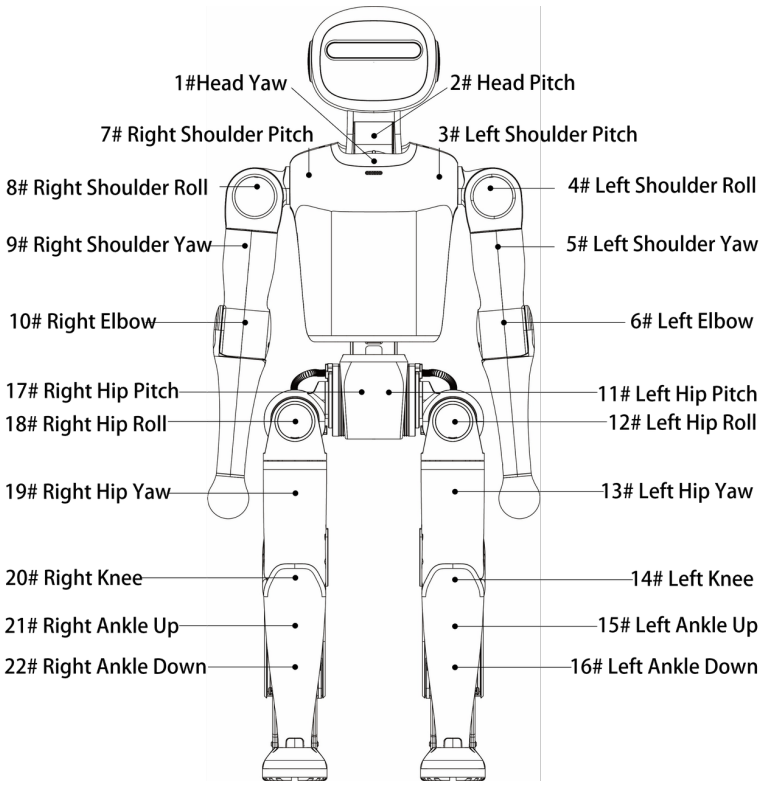
Type	Specification Parameters	Description
Basic Parameters	Height (when standing upright)	0.95m
	Weight	About 19.5kg
DoFs	Total DoFs	22
	Single Leg DoFs	6
	Single Arm DoFs	4
	Head DoFs	2
Operational Parameters	Walking Speed	
	Turning Speed	
Battery Parameters	Battery capacity	48V 2Ah
	Battery Life	50min
	Charging Time	≤1h
	Cycle Life	≥500 times
Computing Platform	Processor	Jetson Orin NX 16GB，AI Performance 157TOPS
Sensors	Camera	Depth Camera
	Microphone	Microphone Array
	Speaker	1
Interaction interface	Buttons	interaction button*3
	Indicator Light	RGB LED*1
Safety Fuction	Auditory Alerts	Low Battery Alert, Joint Overheat Alert
Communication Methods	Wired connection	Gigabit Ethernet
	Wireless Connection	WIFI 6
	Bluetooth	Bluetooth 5.2
	Certification Standards	CE/FCC
Noise	Walking Noise	≤70dB
Environmental Adaptability	Environmental Adaptability	-10°C~45°C
	Operating Humidity	5%~90%，without condensation

Main parts

Joint motors.

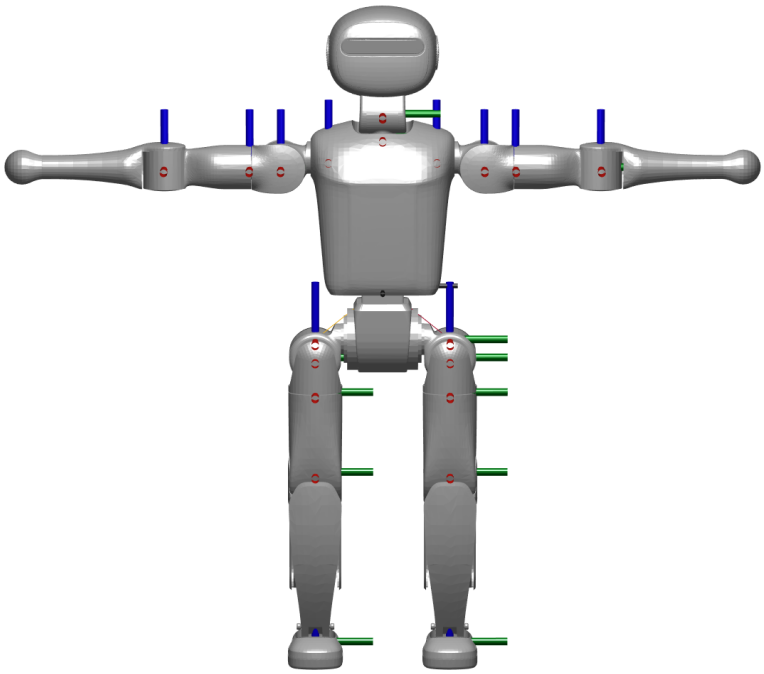
Joint ID and limits.

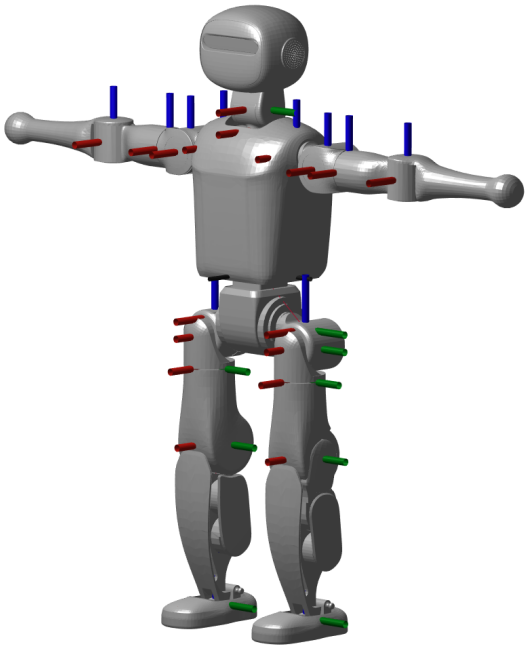
Joint ID	Joint Name	Limit (Degrees)	
		Max	Min
1	Head Yaw Joint	59	-59
2	Head Pitch Joint	43	-17
3	Left Shoulder Pitch Joint	69	-169
4	Left Shoulder Roll Joint	89	-99
5	Left Shoulder Yaw Joint	109	-109
6	Left Elbow Joint	39	-129
7	Right Shoulder Pitch Joint	69	-169
8	Right Shoulder Roll Joint	89	-99
9	Right Shoulder Yaw Joint	109	-109
10	Right Elbow Joint	129	-39
11	Left Hip Pitch Joint	126	-171
12	Left Hip Roll Joint	89	-22
13	Left Hip Yaw Joint	59	-59
14	Left Knee Joint	127	0
15	Left Ankle Up Joint	38	-17
16	Left Ankle Down Joint	41	-16
17	Right Hip Pitch Joint	126	-171
18	Right Hip Roll Joint	22	-89
19	Right Hip Yaw Joint	59	-59
20	Right Knee Joint	127	0
21	Right Ankle Up Joint	38	-17
22	Right Ankle Down Joint	41	-16



Coordinate System

The joint coordinate system with all joints at zero position is shown in the diagram below.





Controller

	Motion control board
Processor	Jetson Orin NX 16GB
Computing performance	8-core Cortex-A78AE CPU@2GHz Tensor Cores GPU@1173MHz AI performance: 157 TOPS
Memory	16GB
Storage	512GB
Wired Network	1000M*1
Wireless Network	WIFI6*1
Audio	Microphone, speaker

Operation Manual

K1 is packed with an out-of-the box motion control program. Follow the instructions below to control K1 remotely.

WARNINGS

1. K1 must first enter PREP mode, and then **put to a stable standing position on the ground**, before switching to WALK mode.
2. **DO NOT lift K1 while under WALK mode.**
3. **Make sure to clear any obstacles on the ground and avoid human injuries while operating K1.**
4. **DO NOT touch any parts of K1 while under WALK mode, except for the handle.**
5. **Make sure to remove ALL zero parts before restarting K1.**