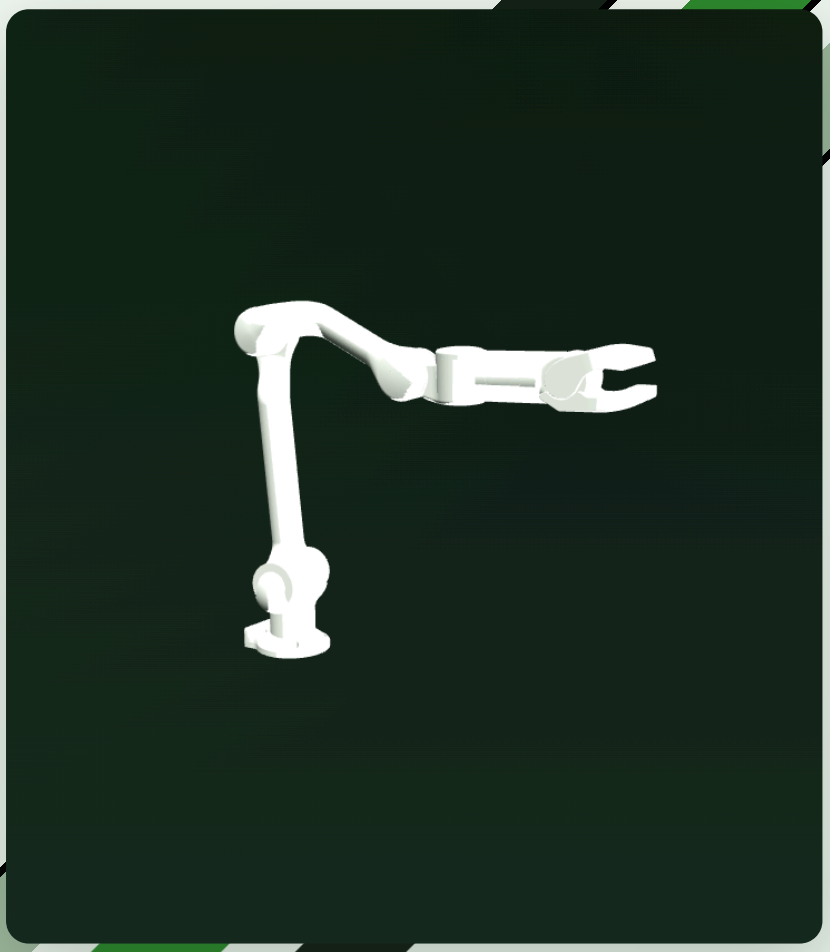
MYBOTSHOP

QUADRUPED ROBOTICS

Unitree Z1

User Manual



CONTACT

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Contents

1 Attention

Attention: Read this document carefully before operating the robot. In case of doubt, consult specialists, experts, or the manufacturer (Unitree Robotics) or distributor (MYBOTSHOP / QUADRUPED Robotics) of the assemblies used. The arm must not be put into operation before clarification. Contact information is available in Chapter 8, Getting Help & RMA.

Do not allow persons who are not familiar with robotics or these instructions to operate the arm. Robots are dangerous in the hands of untrained users.

Do not operate the robot if you are intoxicated, under the influence of drugs, or unable to concentrate. The Z1 is a powered manipulator arm with a working envelope that can reach people or objects near it — keep the workspace clear during operation and familiarize yourself with the emergency stop behaviour of your ROS driver setup before switching the robot on.

Caution: The Z1 has two Ethernet ports on its base — a main port and an auxiliary port. Connecting to the wrong one makes the connection to the robot unstable. Always double-check which port is which before connecting.

2 Disclaimer

The Z1 manipulator arm documented here is sold and supported by *MYBOTSHOP / QUADRUPED Robotics* as the German distributor for Unitree Robotics. Basic ROS 1 (Noetic) and MoveIt understanding is required to operate the software stack covered in this manual — if you are not familiar with ROS, we recommend checking the ROS documentation first.

The client acknowledges and agrees that any information or materials provided by MYBOTSHOP / QUADRUPED Robotics are for R&D and development purposes only. Any services are provided "AS IS" and without any representation or warranty of any kind, express or implied, including but not limited to any warranty of merchantability, fitness for a particular purpose, non-infringement, or any other warranty.

This product is intended for civilian use only. Users should avoid making dangerous modifications or using the robot in hazardous ways. The low-level Unitree `z1_controller` / `z1_sdk` binaries underneath the ROS driver are closed-source; some features described here may still be under active development. For terms, policies and compliance with local laws and regulations, refer to the Unitree Robotics website and the RMA/support process in Chapter 8.

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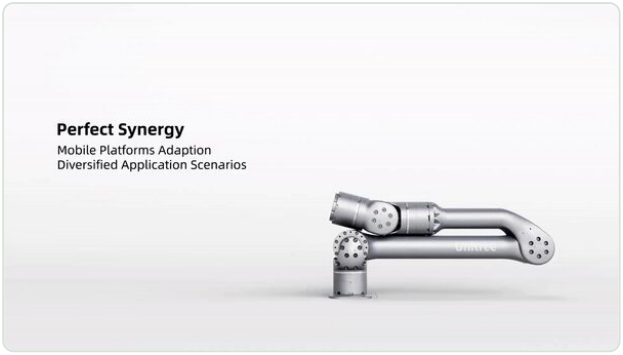
3 About the Z1



Unitree Z1 manipulator arm

This package supplies Sphinx-based tutorial content to assist you with setting up and operating your Z1 manipulator robot. The tutorial topics are listed in the left column, and presented in the suggested reading order.

Key Features

> **Note:** The source documentation's "Key Features" list describes a four-legged quadruped (weight, LiDAR, stair-climbing) rather than the Z1 arm itself — an apparent copy-paste artifact from a quadruped product template. It is replaced below with verified facts about the actual hardware.

- **6-DOF Manipulator:** Six revolute joints (joint1–joint6) form the arm kinematic chain, fixed to its mounting base at the `world` frame.
- **Optional Parallel Gripper:** A 7th revolute joint (`jointGripper`, −90° to 0°) adds a parallel gripper end-effector for pick-and-place tasks.
- **Wide Joint Travel:** Joint ranges vary per axis — e.g. joint1 (base yaw) ±150°, joint2 (shoulder) 0–180°, joint6 (wrist roll) ±160° — see the table below for the full per-joint limit set.
- **Meaningful Joint Torque:** Joint effort limits of 30 N·m (joints 1, 3–6 and the gripper) and 60 N·m (joint 2, the shoulder), each with a 10 rad/s velocity limit.
- **ROS 1 Noetic + MoveIt:** Motion planning and control run on Ubuntu 20.04 / ROS Noetic, with MoveIt handling planning for both the arm-only and arm+gripper configurations.
- **Unitree SDK Underneath:** The MYBOTSHOP `z1_base` ROS wrapper drives Unitree's own closed-source `z1_controller` / `z1_sdk` binaries (x86_64 / aarch64) at the low level.
- **Gazebo Simulation:** An optional Gazebo11 (Noetic) simulation layer is available alongside the real-hardware ROS drivers.

Joint Limits (from z1_description / z1_gripper.urdf)

Joint	Lower	Upper	Effort	Velocity
joint1 (base yaw)	−150.0°	150.0°	30 N·m	10 rad/s

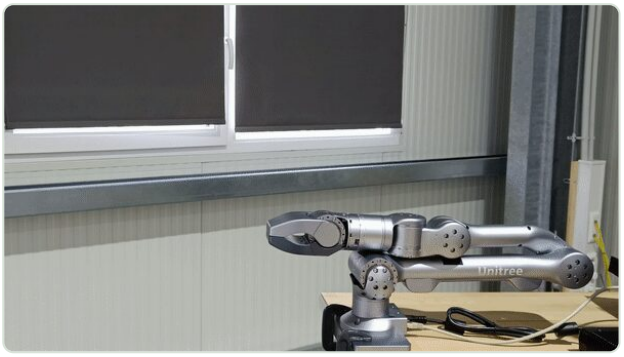
joint2 (shoulder)	0.0°	180.0°	60 N·m	10 rad/s
joint3 (elbow)	−274.0°	0.0°	30 N·m	10 rad/s
joint4 (wrist pitch 1)	−100.0°	90.0°	30 N·m	10 rad/s
joint5 (wrist pitch 2)	−99.0°	99.0°	30 N·m	10 rad/s
joint6 (wrist roll)	−160.0°	160.0°	30 N·m	10 rad/s
jointGripper (optional)	−90.0°	0.0°	30 N·m	10 rad/s

Source: qre_z1 repository, z1_description package, compiled z1_gripper.urdf (private repository, MYBOTSHOP/qre_z1).

Important: These tutorials assume that you are comfortable working with ROS. We recommend starting with our ROS tutorial if you are not familiar with ROS already.

4 Quick-Start – Network & Operation

Quick-Start



_images/z1.gif

Quadruped Robotics Europe is a young, but fast growing startup in the field of legged robotics. In this documentation, the software overview of Z1 robot is shown. The software is currently under development. At the moment simples ros drivers are available for the robot along with simulation are available in Gazebo.

Operation

To quickly test the real Z1 capabilities, one may interact with it using the keyboard. However, first the network must be set up as in Z1 Networking and secondly the software drivers must be installed.

For Z1 gripper and arm run the following command:

```
roslaunch z1_gripper_moveit_config real_z1_moveit.launch
```

For Z1 arm only:

```
roslaunch z1_moveit_config real_z1_moveit.launch
```

Network-Setup

For network setup please connect the ethernet cable that is provided with the Z1 from the Z1 to your computer. After that set-up a static connection as explained below.

Network-Connection

- To create a static connection in your own PC, in Ubuntu go to Settings → Network then click on + icon and create a new connection. The first task is to go to IPv4 and change the connection to Manual . The second task is to put the Address IP as 192.168.123.51 and the Netmask as 24 .
- Click save and restart your network. Next is to connect the LAN cable to the robot.

- After a successful connection, the host's local IP can be checked by:

```
ifconfig
```

This should show the host IP which was assigned in the above step. Now its time to check if we can ping the robot or not, to do so type in your host pc

```
ping 192.168.123.110
```

After a successful ping, you can access the robot.

Network-IPs

The Z1 has the following networks as of 20-Mar-2024 and may vary in future versions, the following table shows the networks

Device	Network Address	Password
Z1-MCU	192.168.123.110	N/A

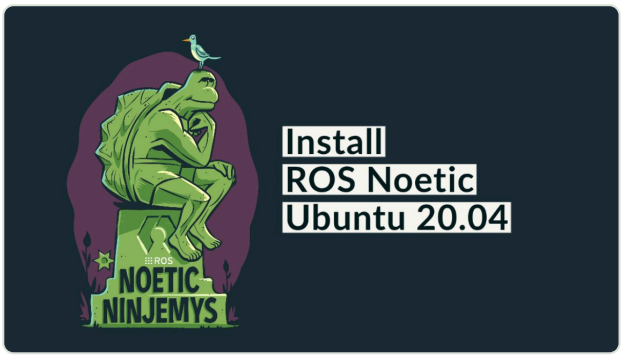
For connection please follow the instructions provided with the manual of the Z1.

Warning: There are two ethernet ports on the Z1. One is the main port and one is the auxiliary port. If you connect to incorrect ethernet port, connection of the Z1 would be unstable.

5 Pre-requisite System – Installing ROS Noetic

Z1 Pre-requisite System

[Ubuntu 20.04 - ROS NOETIC]



_images/ros_noetic.png

The ROS driver for the robots is initially supported for the ROS Noetic .

Warning: Care should be taken when installing theROS so that it matches with your CPU's architecture (i.e. armhf, amd64, arm6, etc.)

PC Setup

ROS Noetic installation requires Ubutnu 20.04.

1. Download Ubuntu 20.04
2. Follow the Ubuntu 20.04 Installation guide

ROS-noetic Installation

The ros driver provided must run on a PC. You may run the following commands to install ROS noetic or you can simply follow the instructions from the roswiki.

1. Enter the Ubuntu terminal and typie in the following command:

```
cd
```

1. The next step is setting up the source list:

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" >
/etc/apt/sources.list.d/ros-latest.list'
```

1. After which you will set up the keys:

```
sudo apt install curl
curl -s https://raw.githubusercontent.com/ros/rosdistro/master/ros.asc | sudo apt-key add -
```

1. Then, you will install ROS-noetic:

```
sudo apt update
sudo apt install ros-noetic-desktop-full
```

1. Finally, you will add ROS environment to your bash file, what this means is that each time you load up your terminal, it will automatically find the built-in ROS packages.

```
echo "source /opt/ros/noetic/setup.bash" >> ~/.bashrc
source ~/.bashrc
```

1. Install python dependencies and initialize repo:

```
sudo apt install python3-rosdep python3-rosinstall python3-rosinstall-generator python3-
wstool build-essential
sudo rosdep init
rosdep update
```

Once the ROS packages are set-up the next step would be to set up a workspace in which you can add pre-built packages to control your robot.

Catkin Workspace

1. The first step is to ensure that you have correctly setup you ROS noetic. It can be checked by:

```
cd ..
source /opt/ros/noetic/setup.bash
```

1. Next, install catkin_tools:

```
sudo apt install python3-catkin-tools
```

1. The next step is to create, your workspace. This is typically created in the home directory following the standard ROS convention, once built, you should see a build and devel folder next to your src folder:

```
mkdir -p ~/catkin_ws/src
cd ~/catkin_ws/
catkin build
```

1. To enable the workspace, you must type in:

```
source devel/setup.bash
```

1. To avoid typing this everytime you start a terminal, you'll add this into the last line of the bashrc file:

```
gedit ~/.bashrc
```

- Add the following line at the end of the bashrc file:

```
source /home/<your_computer_username>/catkin_ws/devel/setup.bash
```

- Everytime you do a catkin build , it is necessary to either restart all your terminals, or source them.
- To verify that everything is working correctly, type the following into the terminal:

```
echo $ROS_PACKAGE_PATH
```

Z1 Installation Package

Important: To acquire Z1 package with installation script please email support+z1@mybotshop.de with your subject as Z1 GitHub Access , your GitHub ID and your Invoice Name/ID .

6 Z1 Software Packages

Z1 Software Setup

Requirements

This driver requires a system setup with ROS. It is recommended to use 20.04 with ROS noetic.

Building

Please follow the pre-requisite section.

- ROS Noetic

Important: To acquire Z1 package with installation script please email support+z1@mybotshop.de with your subject as Z1 GitHub Access , your GitHub ID and your Invoice Name/ID .

Optional

- Gazebo11 (noetic)

Z1 Base

This ros package contains the ROS wrapper for controlling the Z1.

Z1 Bringup

This is a ros package that launches the Z1 Base driver.

```
roslaunch z1_bringup bringup.launch
```

Z1 Control

This is a ros package that contains the control parameters for the Z1 arm utilized by moveit.

Z1 Demo

This is contains a ROS demo script that works in conjunction with the Z1 moveit to execute a series of trajectories.

Z1 Description

This is a ros package that contains the 3D models of the Z1. Additionally, the seperate 3D models are stitched together into a single entity via the universal robot description format (URDF). Additions to the robot's 3D model can be made in the z1.urdf .

Z1 Gripper Moveit

This launches the Z1 bringup along with control enabling moveit control. It can be controlled via GUI or the Z1 demo. This is the main driver for the package.

```
roslaunch z1_gripper_moveit_config real_z1_moveit.launch
```

Z1 Moveit

This launches the Z1 bringup along with control enabling moveit control only for the arm. It can be controlled via GUI or the Z1 demo.

```
roslaunch z1_moveit_config real_z1_moveit.launch
```

7 Manuals & External Resources

Z1 Manuals

_images/z1_application.gif

Important: The following text are hyperlinks to demonstratory videos. Click on them to get redirected to the websites. Z1 Unitree Tutorial Z1 Unitree Controller Github Z1 Unitree SDK Github Z1 Unitree ROS Github Manufacturers Documentation - Requires Translation Plugin

Attention: It is highly recommended to view the quick start manual and user manual before using the robot to ensure safe and correct operation.

- Z1 Unitree Tutorial – https://dev-z1.unitree.com/
- Z1 Unitree Controller GitHub – https://github.com/unitreerobotics/z1_controller
- Z1 Unitree SDK GitHub – https://github.com/unitreerobotics/z1_sdk
- Z1 Unitree ROS GitHub – https://github.com/unitreerobotics/unitree_ros
- Manufacturer Documentation (requires a browser translation plugin) – https://www.yuque.com/ironfatty/nly1un/fscioc

8 Getting Help & RMA

RMA / Support

How to Raise a Return Merchandise Authorization (RMA) Case

At QUADRUPED Robotics, we are committed to providing excellent support to ensure your issues are resolved promptly. If you encounter any problems with our products, please follow the steps below to raise a Return Merchandise Authorization (RMA) case:

Step 1: Open a Topic in Our Forum

1. Visit MYBOTSHOP Forum .
2. Open a new topic describing your issue in detail. Our support team and community members will attempt to assist you in resolving the problem remotely.

Step 2: Contact Support for RMA Number

If the issue cannot be resolved remotely through our forum:

1. Email us at support @ quadruped . de .
2. Provide a detailed description of the issue and include any troubleshooting steps already taken.
3. Our support team will evaluate your case and, if necessary, issue a RMA number along with a return address or a shipping label.

Important Shipping Information

Note: Please note: All goods must be sent back to the following address: QUADRUPED Robotics GmbH c / o MYBOTSHOP GmbH Willy - Messerschmitt - Strasse 12 50126 Bergheim Germany Do not ship goods without obtaining a RMA number. Parcels sent without a RMA number will be declined and returned to the sender. Do not ship goods to QUADRUPED Robotics GmbH Office in Leverkusen!

Help Resources

In case of any issues, help can be taken from any of the following forums/resources:

1. MYBOTSHOP Forum : The forum is actively monitored by support teams at MYBOTSHOP GmbH .
2. Github Issues : Issues can be reported in the repository.
3. Online QA Sites: Questions can be asked on any of the QA sites like StackOverflow and Answers ROS .

9 Getting Involved

Getting Involved

Contact support @ mybotshop . de for more information.

10 FAQ

Frequently Asked Questions

None asked yet...