iNexBot

Robot Operation Manual

4-Axis Parallel

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Catalogue

4-Axis Parallel Robot Operation Manual

Parallel Robot Introduction

A parallel robot, named Parallel Mechanism, or PM for short, can be defined as a closed-loop mechanism in which the moving and fixed platforms are connected by at least two independent kinematic chains, and it has two or more degrees of freedom and is driven in parallel.

Definition:

A closed-loop mechanism in which the moving and fixed platforms are connected by at least two independent kinematic chains, has two or more degrees of freedom and is driven in parallel.

Features:

1. No cumulative error, high accuracy;

2. The driving device can be placed on or close to the fixed platform, so that the moving part is light in weight, high in speed and good in dynamic response;

3. Compact structure, high stiffness and high load capacity;

4. A completely symmetrical parallel mechanism has better isotropy;

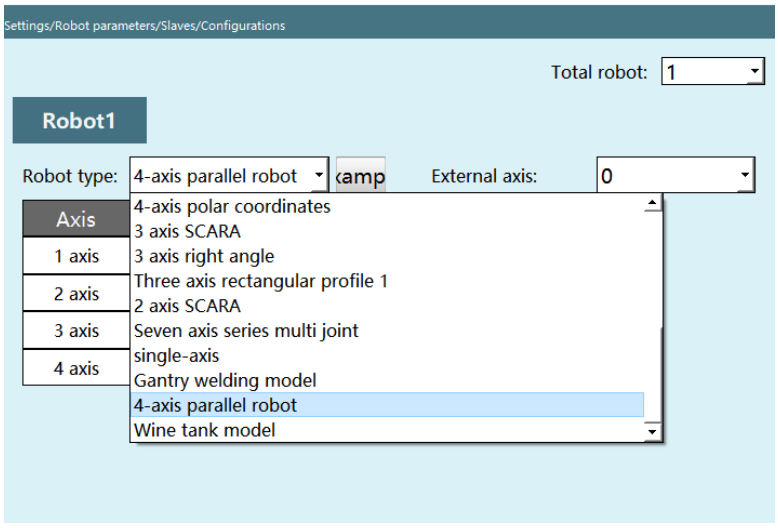
5. Small working space;

Based on these features, parallel robots are widely used in fields that require high stiffness, high accuracy or large loads without a large working space.

Parallel Robot Basic Operation

Slave configuration

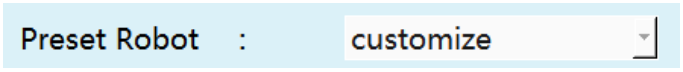
If you need to select 4-axis parallel robot, click [Settings-Robot parameters-Slave configuration-Robot] and select "4-axis parallel robot" in the "Robot type" drop-down menu, then click "Save".



Parameters presetting

When you click "Save" after selecting "4-axis parallel robot", you need to import the robot parameter profile, but in the "DH parameters" interface, we provide the function of presetting robot parameters. If this drop-down list contains the robot model you are using, you can set up all the robot parameters quickly and easily with this function. There is no need to import the controller configuration parameters separately.

1. Click [Preset robot] in the upper left corner of the "DH parameters" interface, you can select the robot model that has already been adapted, and the DH parameters and joint parameters of the robot will be filled in automatically after the selection.

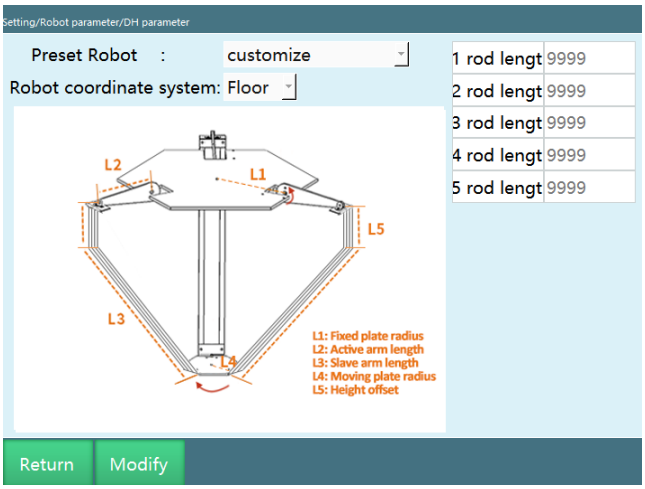


2.You need to calibrate the zero point manually after selecting the preset robot.

DH parameters setting

1. Fill in the rod length parameter of the robot; this parameter affects the linear motion and accuracy of the robot.

Note: Please do not power on and operate the robot until the DH parameters, joint parameters and zero point are set.



4-axis parallel robot

Parameter description

Preset robot

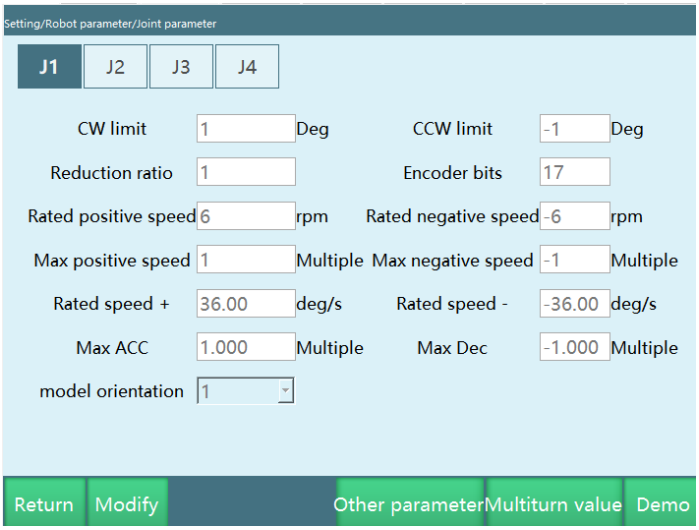
By importing the robot joint parameters and DH parameters into the controller in advance, you can eliminate the need to fill in the parameters repeatedly

Rod length

The rod length parameter should be filled in as shown in the model diagram on the "DH parameters" interface, if no value is given, we can only measure the length of each axis of the robot by using a ruler, and inaccurate filling will affect the robot motion accuracy

Joint parameters

Note: Please do not power on and jog the robot before DH parameters and joint parameters are set to prevent the robot from getting out of control and causing danger to the operator. If you need the robot to return to the zero position, click [Robot parameters - Zero position] to see if it is at the zero position, if not, please calibrate the zero point first.



Meaning of each parameter

CW limit

The maximum range of the robot joints in the positive direction. After importing the controller configuration, the values of each parameter in the joint parameter interface will be entered automatically and the values of the limits can be modified

CCW limit

The maximum position of the robot in the reverse direction during single-axis rotation (This value must be negative)

Reduction ratio

The ratio of instantaneous input speed to output speed in the reduction mechanism

Encoder bits

The number of bits of the encoder. Usually 17 or 23 bits

Rated positive RPM

The rated rotation speed of the motor in the positive direction

Rated reverse RPM

The rated rotation speed of the motor in the reverse direction (This value must be negative)

Maximum positive RPM

The maximum rotation speed of the motor in the positive direction; its value is a multiple of the rated positive RPM. If the rated positive RPM is 3000 rpm and the maximum positive RPM needs to be 6000 rpm, then fill in 2 times here.

Maximum reverse RPM

The maximum rotation speed of the motor in the reverse direction; its value is a multiple of the rated reverse RPM. If the rated reverse RPM is -4000 rpm and the maximum reverse RPM needs to be -6000 rpm, then fill in -1.5 times here. (This value must be negative)

Rated positive speed

The rated positive speed of the robot joint; it is automatically calculated from the rated positive RPM, encoder bits and the reduction ratio (the axis 3 of the 4-axis SCARA and axis 1 of the 4-axis SCARA special-shaped robot also need to add the pitch), no need to fill in.

Rated reverse speed

The rated reverse speed of the robot joint; it is automatically calculated from the rated reverse RPM, encoder bits and the reduction ratio, no need to fill in. (This value must be negative)

Maximum acceleration

The maximum acceleration of the robot joint movement; its value is a multiple of the rated positive (reverse) speed. If the rated positive speed is 300 degrees/s, the maximum acceleration needs to be 1500 degrees/s^2 , then fill in 5 times here.

Maximum deceleration

The maximum deceleration of the robot joint movement; its value is a multiple of the rated positive (reverse) speed. If the rated positive speed is 300 degrees/s, the maximum acceleration is 1200 degrees/s^2 , fill in -4 times here. It is recommended that the maximum acceleration and maximum deceleration values be the same. (This value must be negative)

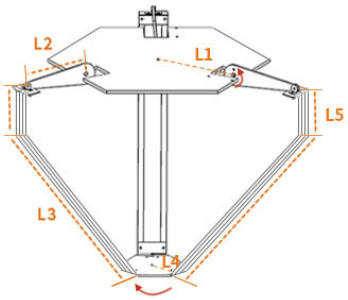
Model direction

The model direction should be set by referring to the joint positive direction diagram below, and the direction of the jogging "+" key of each axis should be the same as the joint positive direction diagram (choosing 1 for the same and -1 for the opposite)

Gear backlash

The angle to compensate for the filled value whenever the joint moves in the opposite direction; not filled by default.

Joint positive direction diagram

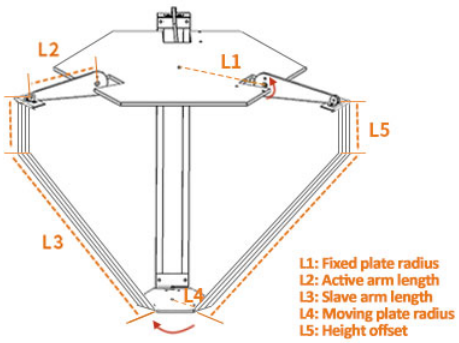


The direction shown in the figure is the positive direction of the robot joints

Note: Please do not power on and operate the robot until the positive direction of the joint has been set.

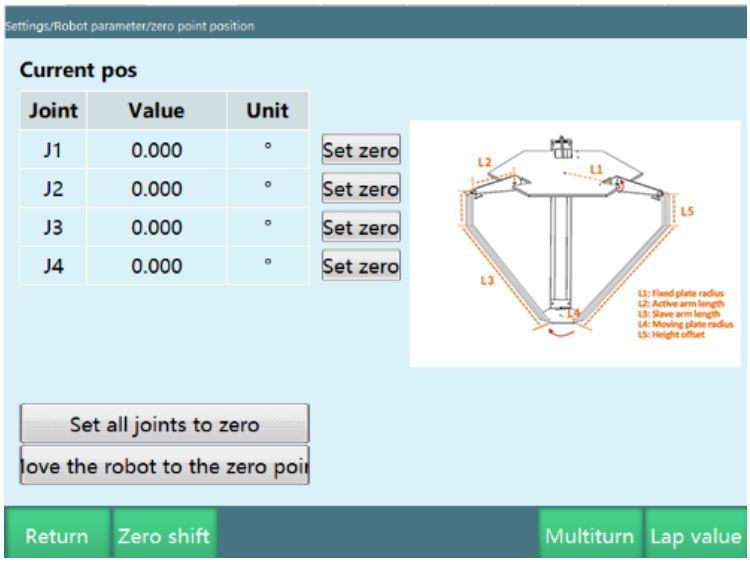
Zero calibration

If the robot zero position is a non-standard zero position, users can align the robot according to the robot's alignment hole, and then set the current robot position coordinates to the zero position on the robot zero position interface. The diagram of the zero position of the 4-axis parallel robot is as follows.



Parallel robot zero point commissioning: Align the driving shaft horizontally with the upper plate of the robot to perform zero calibration.

Make sure the robot is in this position and click "Set all joints to zero"



Note: Please do not power on and jog the robot before DH parameters and joint parameters are set to prevent the robot from getting out of control and causing danger to the operator.

If you need the robot to return to the zero position, click [Robot parameters - Zero position] to see if it is at the zero position, if not, please calibrate the zero point first.

Cautions

If the robot is not zero position calibrated, you can not return it to the zero point and jog it.

For systems that use multiple robots, each robot must perform origin position calibration.

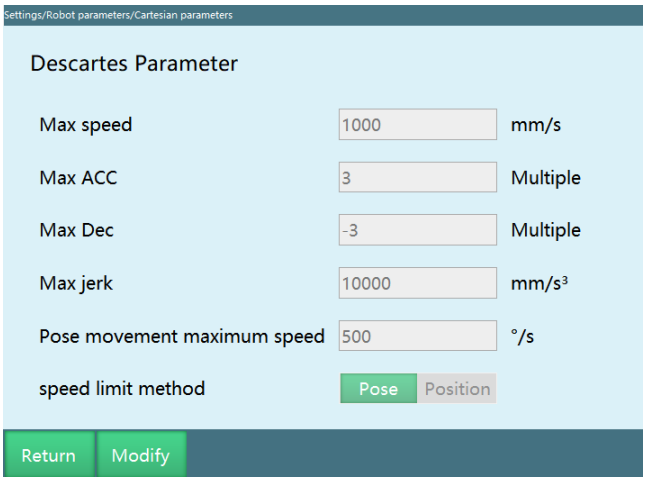
When there is a coupling relationship between joint axes, such as the common coupling relationship between the fifth axis and the sixth axis of a robot, the fifth axis must be at the zero position, then the zero data recorded for the sixth axis will be valid, otherwise, the zero data recorded for the sixth axis will be invalid. So the zero data of the sixth axis must be recorded with the fifth axis at the zero position. If there is no coupling relationship, each axis can calibrate the zero

position individually, and the respective zero position will not affect the zero position of other joints.

When all the used axes (body axes and auxiliary extension axes) have been zero-calibrated, the "All" indicator on the "Zero calibration" interface turns green, indicating that the robot has completed zero calibration, and the robot is ready to move in Cartesian space.

Cartesian parameters setting

Cartesian parameters can use default values directly.



Meaning of each parameter

Maximum speed

The maximum linear speed of the robot during operation.

Maximum acceleration

The maximum acceleration of the robot during operation; its value is a multiple of the maximum speed. If the maximum speed is 1000mm/s and the maximum acceleration needs to be 3000mm/s², then fill in 3 times here.

Maximum deceleration

The maximum deceleration of the robot during operation; its value is a multiple of the maximum speed. If the maximum speed is 1000 mm/s and the maximum deceleration needs to be -3000 mm/s², then fill in -3 times here. It is recommended that the maximum acceleration and maximum deceleration values be the same and the same as the maximum acceleration and maximum deceleration in the joint parameters. (This value must be negative)

Maximum jerk

This parameter is a reserved parameter and is currently invalid.

Pose movement maximum speed

The maximum speed of the robot during operation, if the instruction speed exceeds this value, it will be decelerated.

Speed limit method

Pose: The linear interpolation motion of the robot is limited by the maximum speed and the pose movement maximum speed.

Position: The linear interpolation motion of the robot is limited only by the maximum speed.

Application of Parallel Robot in Process

The parallel robot has great advantages in some processes as it can be seen from its advantages, such as: palletizing process, conveyor tracking process, vision process, searching and tracking, etc. (You can perform process-related tests of it through the manual)