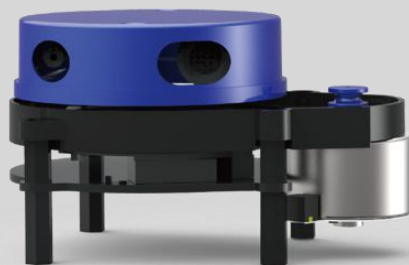




YDLIDAR X4 DATASHEET



DOC#: 01.13.000000

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OVERVIEW

YDLIDAR X4 is a 360-degree two-dimensional rangefinder (hereinafter referred to as X4) developed by YDLIDAR team. Based on the principle of triangulation, it is equipped with related optics, electricity, and algorithm design to achieve high-frequency and high-precision distance measurement. The mechanical structure rotates 360 degrees to continuously output the angle information as well as the point cloud data of the scanning environment while ranging.

Product Features

- 360 degree omnidirectional scanning ranging distance measurement
- Small distance error, stable performance and high accuracy
- Ranging distance is no less than 10m
- Strong resistance to ambient light interference
- Low power consumption, small size and long life
- Laser power meets Class I laser safety standards
- Adjustable motor speed frequency differ from 6Hz~12Hz (support customization)
- Ranging frequency up to 5kHz (support customization)

Applications

- Robot navigation and obstacle avoidance
- Robot ROS teaching and research
- Regional security
- Environmental scanning and 3D reconstruction
- Commercial robot /Robot vacuum cleaner

Installation and dimensions

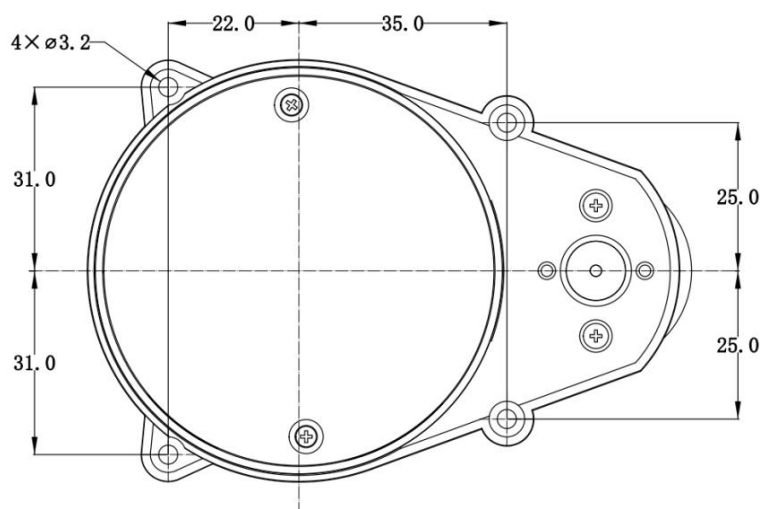


FIG 1 YDLIDAR X4 INSTALLATION SIZE

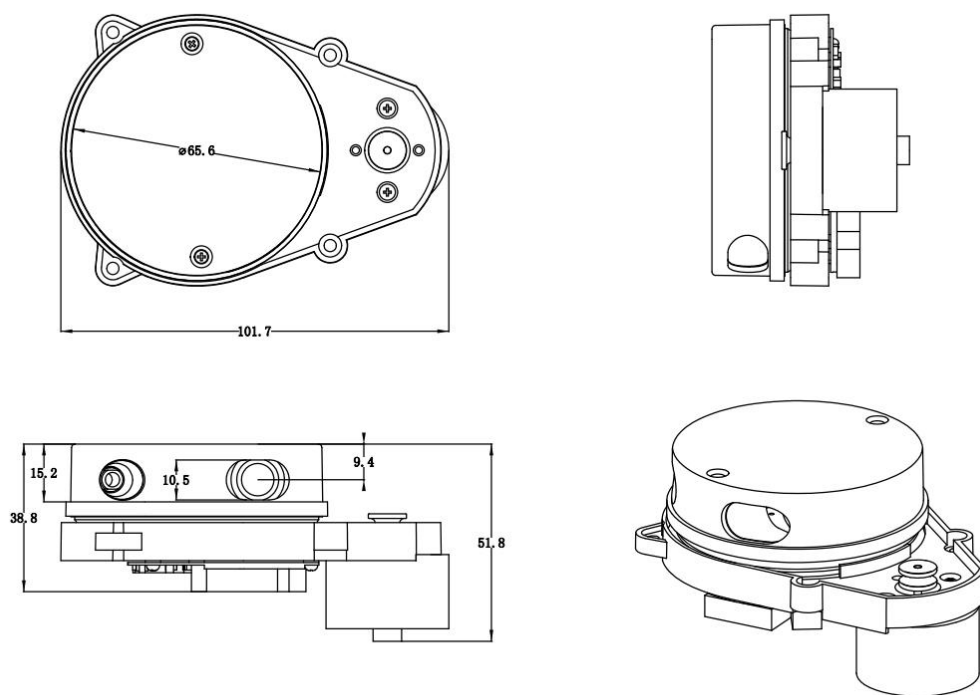


FIG2 YDLIDAR X4 MECHANICAL DIMENSIONS

SPECIFICATIONS

Product Parameter

CHART1 YDLIDAR X4 PRODUCT PARAMETER

| Item | Min | Typical | Max | Unit | Remarks |
|-------------------|------|---------|-----|------|---------------------------|
| Ranging frequency | - | 5000 | - | Hz | 5000 times per second |
| Motor frequency | 6 | - | 12 | Hz | PWM or Voltage Regulation |
| Ranging distance | 0.12 | - | >10 | m | 80% reflectivity |
| Scanning angle | - | 0~360 | - | Deg | - |
| Absolute error | - | 2 | - | cm | Distance≤0.5m |
| Relative error | - | 1.5% | - | - | 0.5m<Distance≤6m |
| | - | 2.0% | - | - | 6m<Distance≤8m |

| | | | | | |
|------------------|------|------|------|-----|--------------------------|
| Angle resolution | 0.48 | 0.50 | 0.52 | Deg | Distance≤0.5m |
| Working life | - | 1500 | - | h | Continuous working hours |

Note 1: The ranging range and relative accuracy above are the factory inspection standard value;

Note 2: The relative error value indicates the accuracy of the Lidar measurement.

*Relative error = (Measuring distance - Actual distance) / Actual distance * 100%.*

Please avoid using Lidar under high-temperature, high-low temperature or strong vibration use scenarios, which might cause a 3% relative error parameter index.

Electrical Parameter

CHART2 YDLIDAR X4 ELECTRICAL PARAMETER

| Item | Min | Typical | Max | Unit | Remarks |
|------------------|-----|---------|-----|------|--|
| Supply voltage | 4.8 | 5 | 5.2 | V | Excessive voltage might damage the Lidar while low affect normal performance |
| Voltage ripple | 0 | 50 | 100 | mV | Excessive ripple affect normal performance |
| Starting current | 400 | 450 | 480 | mA | Higher current required at start-up |
| Sleeping current | 280 | 300 | 340 | mA | System sleep, motor rotation |
| Working current | 330 | 350 | 380 | mA | System work, motor rotation |

Interface Definition

X4 provides a PH1.25-4P female connector with functional interfaces for system power, data communication and motor control.

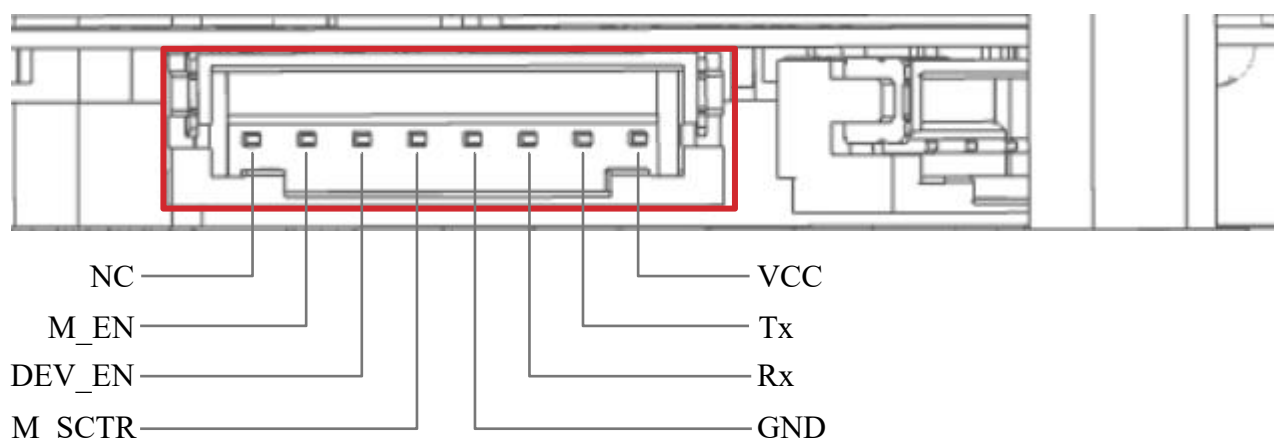


FIG3 YDLIDAR X4 INTERFACES

CHART3 YDLIDAR X4 INTERFACE DEFINITION

| Pin | Type | Description | Defaults | Range | Remarks |
|--------|--------------|------------------------------|----------|-----------|-----------------------------------|
| VCC | Power Supply | Positive | 5V | 4.8V~5.2V | - |
| Tx | Output | System serial output | - | - | Data stream: Lidar→Peripherals |
| Rx | Input | System serial port Input | - | - | Data stream: Peripherals→Lidar |
| GND | Power Supply | Negative | 0V | 0V | - |
| M_EN | Input | Motor enable control | 3.3V | 0V~3.3V | High level enable |
| DEV_EN | Input | Ranging enable control | 3.3V | 0V~3.3V | High level enable |
| M_SCTR | Input | Motor speed control terminal | 1.8V | 0V~3.3V | Voltage or PWM speed regulation |
| NC | - | Reserved pin | - | - | High level enable |

Data communication

With a 3.3V level serial port (UART), users can connect the external system and the product through the physical interface. After that, you can obtain the real-time scanned point cloud data, device information as well as device status. The communication protocol of parameters are as follows: :

CHART4 YDLIDAR X4 SERIAL SPECIFICATION

| Item | Min | Typical | Max | Unit | Remarks |
|-------------------|-----|---------|-----|------|---------------------------------------|
| Baud rate | - | 128000 | - | bps | 8-bit data bit, 1 stop bit, no parity |
| High Signal Level | 1.8 | 3.3 | 3.5 | V | Signal voltage > 1.8V |
| Low signal Level | 0 | 0 | 0.5 | V | Signal voltage < 0.5V |

Motor control

X4's motor driver supports speed control function and can be adjusted by the M_SCTR pin and M_EN pin.

The lower the voltage / the smaller the PWM duty cycle, the higher the motor speed.

For example:

M_EN is high level, M_SCTR Input voltage is 0V, then the motor rotates at the highest speed.

Following is the PWM signal requirements of M_SCTR :


CHART5 YDLIDAR X4 MOTOR PWM SIGNAL SPECIFICATION

| Item | Min | Typical | Max | Unit | Remarks |
|------------------|-----|---------|------|------|---|
| PWM Frequency | - | 10 | - | KHz | PWM is the wave signal |
| Duty cycle range | 50% | 85% | 100% | | The smaller the duty cycle,the faster the speed |

Optical Characteristic

X4 uses an infrared point pulsed laser that meets FDA Class I laser safety standards. The laser and optical lens finish the transmission and reception of the laser signal to achieve high-frequency ranging while working. To ensure system ranging performance, please keep the laser and optical lens clean. The detailed optical parameters are as follows:

CHART6 YDLIDAR X4 LASER OPTICAL PARAMETERS

| Item | Min | Typical | Max | Unit | Remarks |
|------------------|---|---------|-----|------|---------------|
| Laser wavelength | 775 | 785 | 795 | nm | Infrared band |
| Laser power | - | 3 | 5 | mW | Peak power |
| FDA |  Class I | | | | |

Polar coordinate system definition

In order to facilitate secondary development, X4 internally defines a polar coordinate system.

Pole: the center of the rotating core of the X4;

Positive direction: clockwise;

Zero angle: directly in front of the X4 motor;

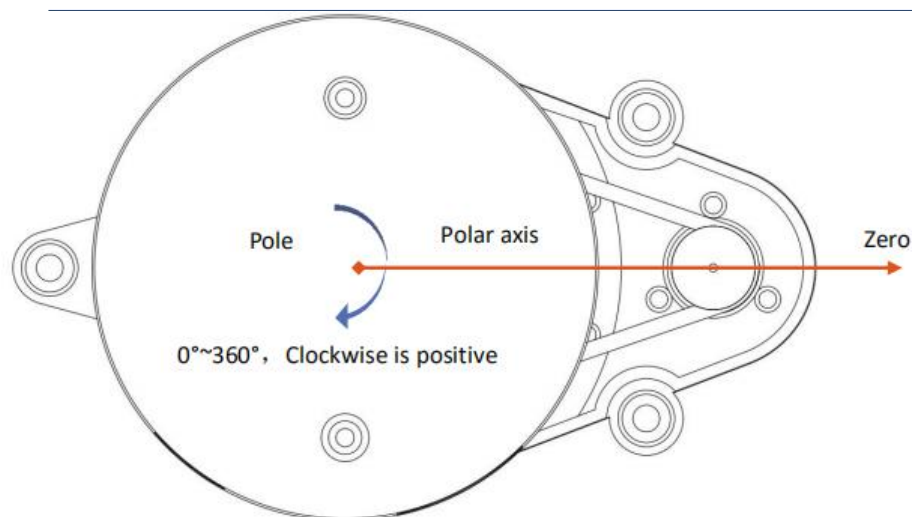


FIG4 YDLIDAR X4 POLAR COORDINATE SYSTEM DEFINITION

Others

CHART7 YDLIDAR X4 OTHERS

| Item | Min | Typical | Max | Unit | Remarks |
|-----------------------|-----|---------|------|------|--|
| Operating temperature | 0 | 20 | 40 | °C | High temperature environment will reduce life expectancy |
| Lighting environment | 0 | 550 | 2000 | Lux | For reference only |
| weight | - | 180 | - | g | N.W. |

Development and support

With a wealth of hardware and software interfaces,X4 can support motor enable control, speed control, and enable control&output control of the ranging core. Thus,users can also implement the power control and scan control purpose.

Also, the 3D model is open.YDLIDAR provides the graphical debugging client-PointCloud Viewers,together with the corresponding SDK development kit and Ros development kit.

For the X4 development manual, SDK development manual and Ros manual,please download from our official website: www.ydlidar.com

Revision

| Date | Version | Contents |
|------------|---------|--|
| 2017-11-29 | 1.0 | First writing |
| 2018-01-15 | 1.1 | Modify the interface definition,Tx,Rx |
| 2018-08-06 | 1.2 | Ranging resolution parameter correction |
| 2019-03-21 | 1.3 | <ul style="list-style-type: none"> ❖ Update the relative error description, ❖ update the document code: 01.13.000000, ❖ change the footer to 2015-2019 YDLIDAR |
| 2019-05-06 | 1.4 | <ul style="list-style-type: none"> ❖ Update page number is 8 pages, ❖ modify the accuracy description, ❖ increase the absolute error to 2cm when measuring distance less than 0.5m, ❖ modify M_SCTR error text |
| | | |