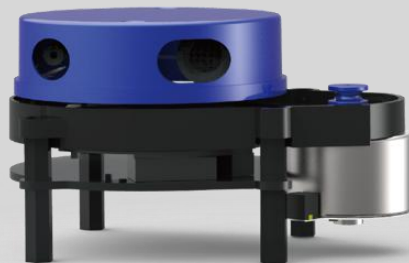




# **YDLIDAR X4 DATASHEET**



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

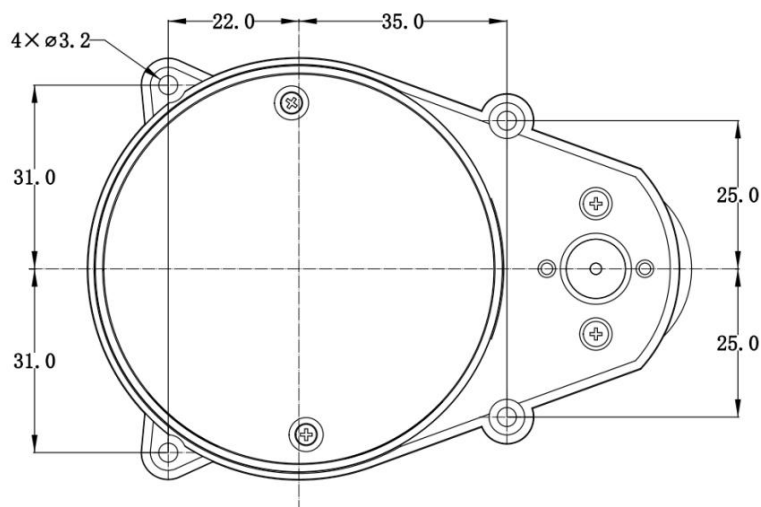


FIG 1 YDLIDAR X4 INSTALLATION SIZE

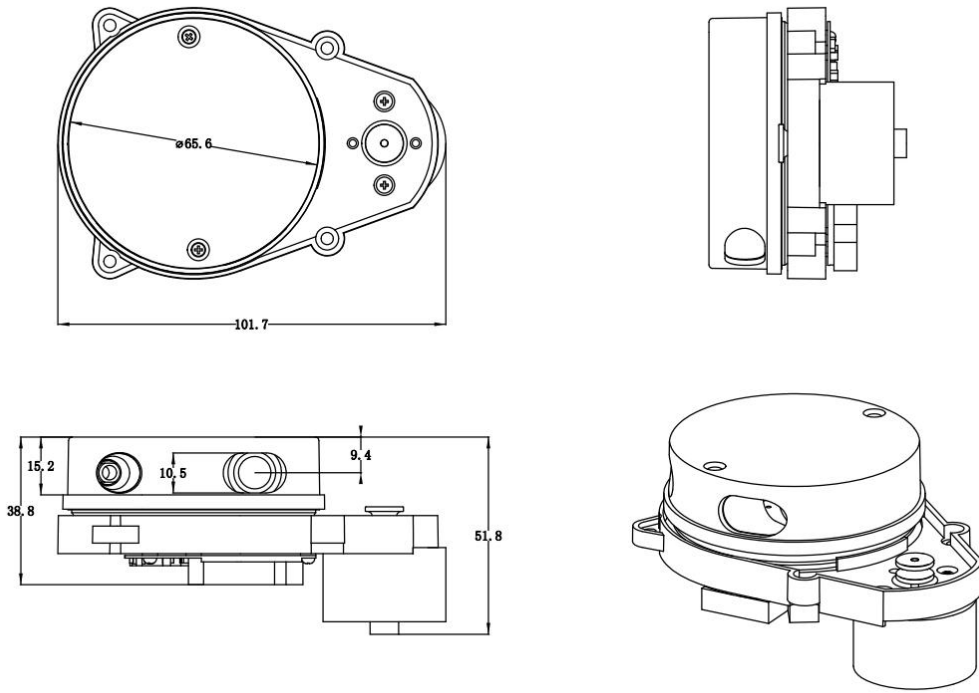


FIG2 YDLIDAR X4 MECHANICAL DIMENSIONS

## 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.

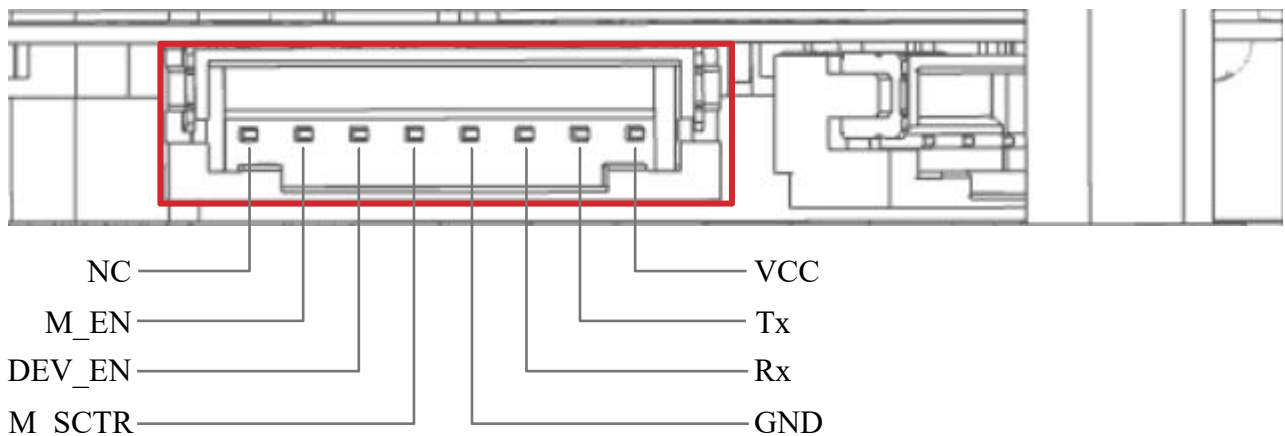


FIG3 YDLIDAR X4 INTERFACES

**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;

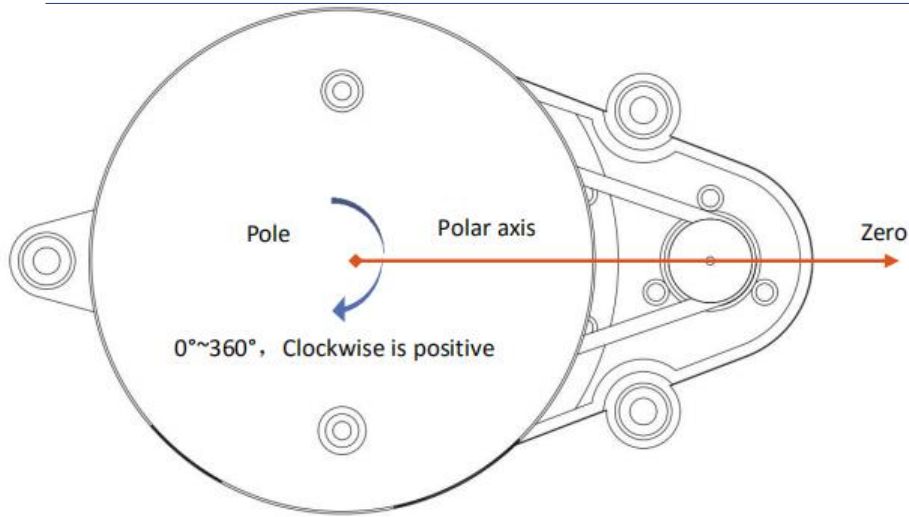


FIG4 YDLIDAR X4 POLAR COORDINATE SYSTEM DEFINITION

**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](http://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"> <li>❖ Update the relative error description,</li> <li>❖ update the document code: 01.13.000000,</li> <li>❖ change the footer to 2015-2019 YDLIDAR</li> </ul>
2019-05-06	1.4	<ul style="list-style-type: none"> <li>❖ Update page number is 8 pages,</li> <li>❖ modify the accuracy description,</li> <li>❖ increase the absolute error to 2cm when measuring distance less than 0.5m,</li> <li>❖ modify M_SCTR error text</li> </ul>