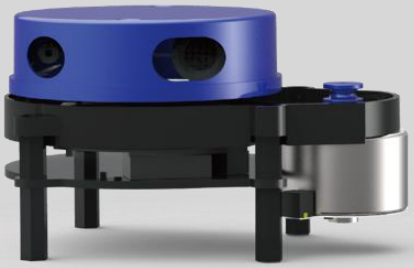
YDLIDAR

YDLIDAR X4
DATASHEET



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Contents

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
- 10m Ranging distance
- 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 5K Hz (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

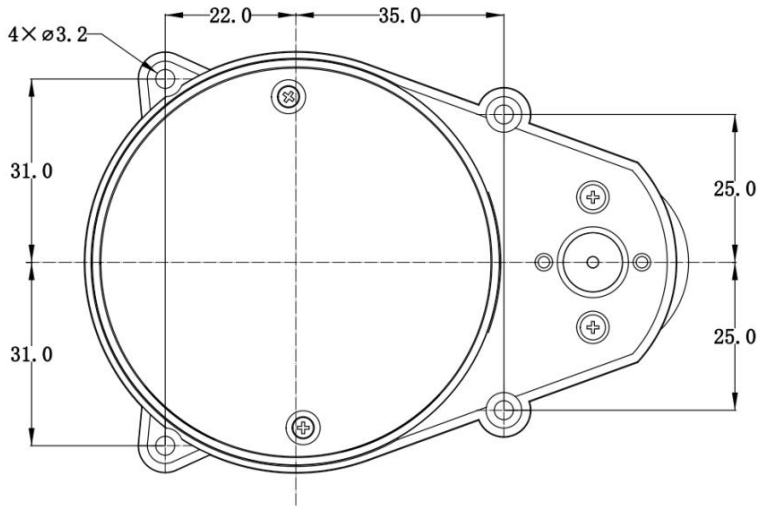

FIG 1 YDLIDAR X4 INSTALLATION SIZE

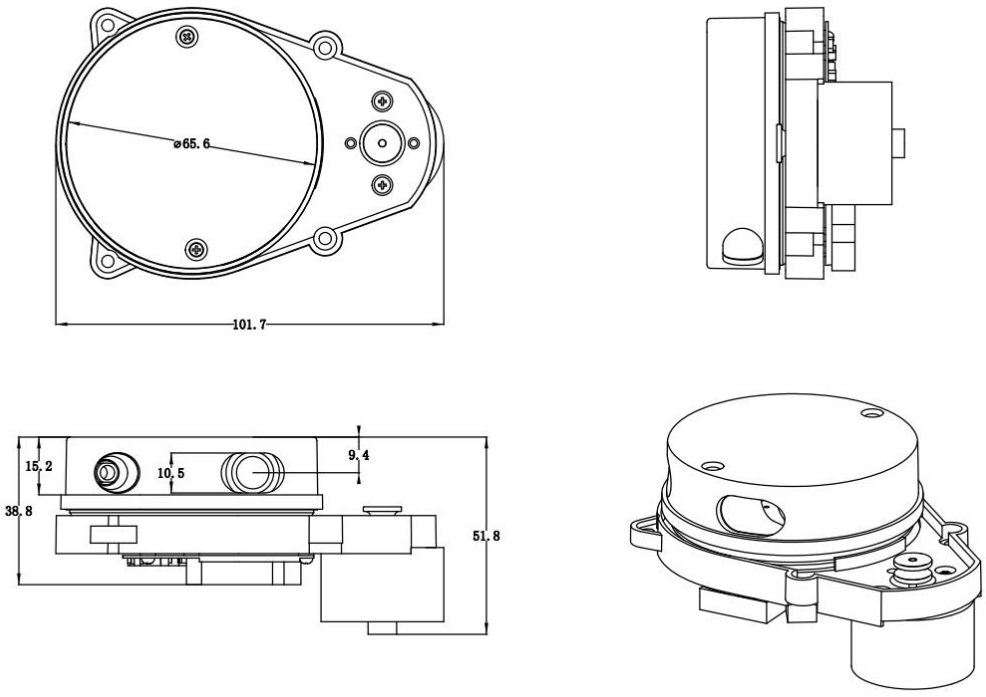

FIG2 YDLIDAR X4 MECHANICAL DIMENSIONS

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 measurement 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 situation, which might cause a 3% relative error.

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
Standby current	280	300	340	mA	System idle, 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.

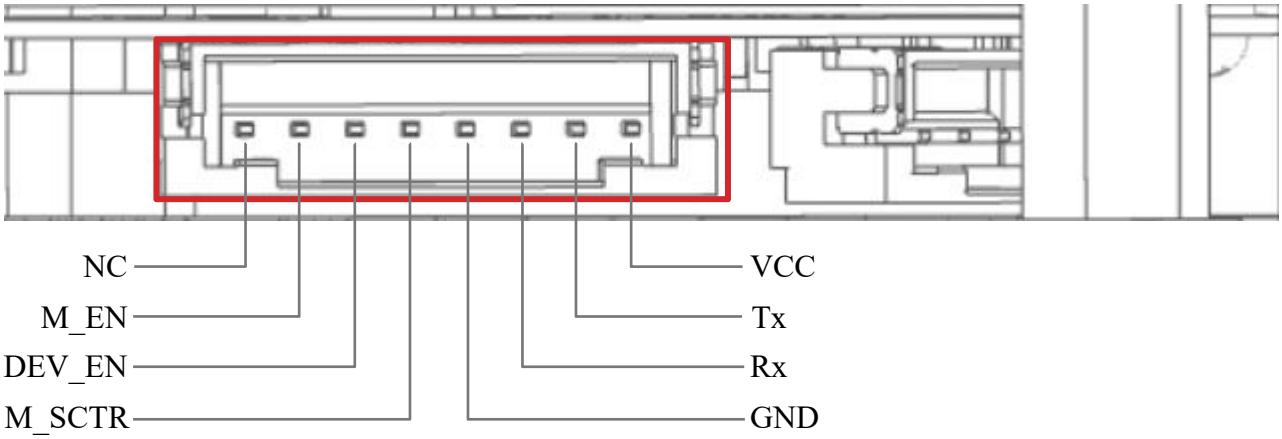

FIG3 YDLIDAR X4 INTERFACES

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➔Computer
Rx	Input	System serial port Input	-	-	Data stream: Computer➔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, and 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 are used for 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

For 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;

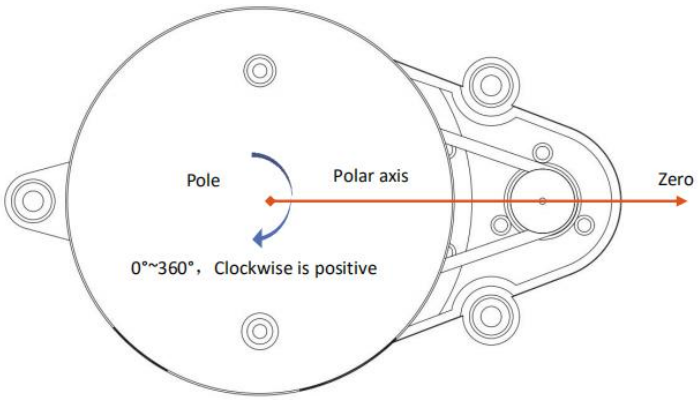

FIG4 YDLIDAR X4 POLAR COORDINATE SYSTEM DEFINITION

Others

CHART7 YDLIDAR X4 OTHERS

Item	Min	Typical	Max	Unit	Remarks
Operating temperature	0	20	40	℃	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 scanning.

Also, the 3D model is available. YDLIDAR provides the graphical debugging client-Point Cloud 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	❖ Update the relative error description, ❖ update the document code: 01.13.000000, ❖ change the footer to 2015-2019 YDLIDAR
2019-05-06	1.4	❖ 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