IQDS Smart Radar Water Level Gauge

Product Manual

Product description

The IQDS intelligent radar water level meter is a frequency modulated continuous wave (FMCW) radar product that works at 77-81GHz. The maximum range of the product can reach 40m, and the blind area is 15cm. Because it has a higher working frequency and a larger bandwidth, the measurement accuracy is higher. The product provides a bracket fixing method, and no on-site wiring is required, making installation convenient and easy.

● Features

◇ Millimeter-wave RF chips achieve a more compact RF architecture, higher signal-to-noise ratio, and smaller blind zones.

◇ 4GHz working bandwidth enables the product to have higher measurement resolution and measurement accuracy.

◇ The narrowest antenna beam angle is 6°, the interference in the installation environment has less impact on the instrument, and the installation is more convenient.

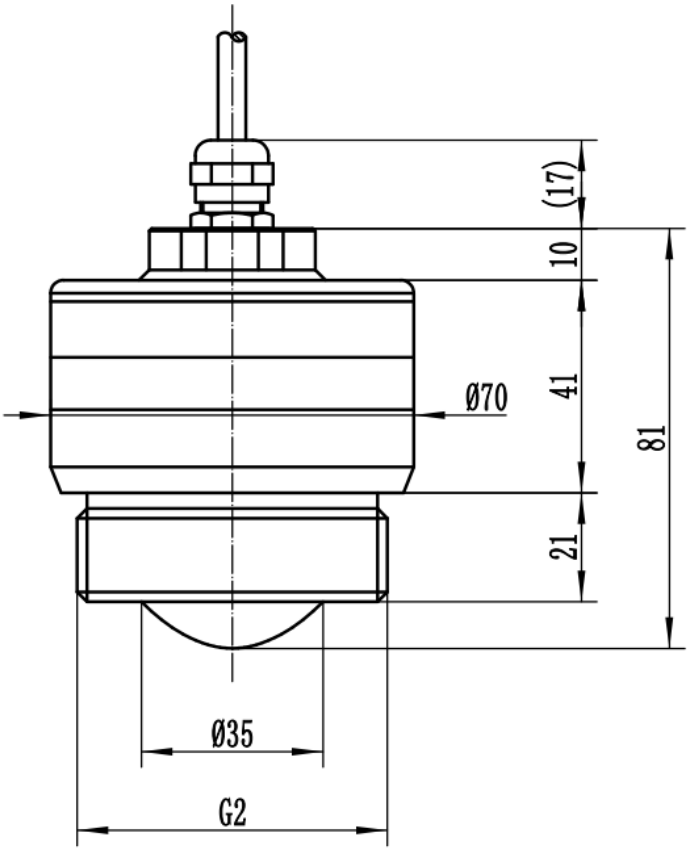
◇ Integrated lens design, compact size.

● Technical indicators

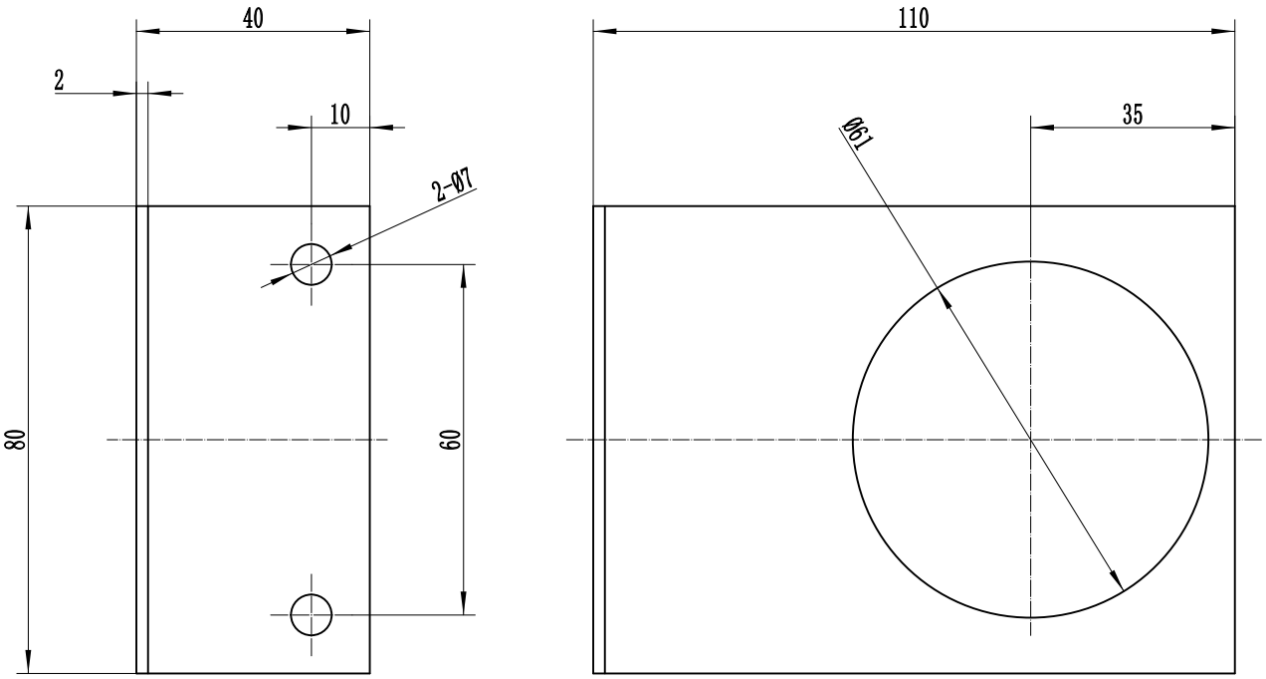
Measuring range	0.15m~40m
measurement accuracy	±2mm
Beam angle	6°
Power supply range	9~28 VDC (RS485), 12~28 VDC (4~20mA)
communication method	RS485, 4~20mA
Operating temperature	-30~75℃
Shell material	Stainless steel
Antenna type	Lens antenna
Protection level	IP68
Installation method	Bracket/thread
Cable entry	PG9
Mounting Thread	Stainless steel material: G2

Note: Product performance and wiring definition are subject to actual order.

● Product structure and dimension diagram and connection method



IQDS (RS485 output), stainless steel water level gauge dimensions



Bracket Dimensions

RS485 wiring definition

The cable is a 4-core twisted pair shielded cable, and the line sequence definition is:

◇ Red line - power line (12~24VDC)　　◇ Black wire - ground wire (GND)

◇Green wire—RS485 A　　◇ White wire—RS485 B

● Install

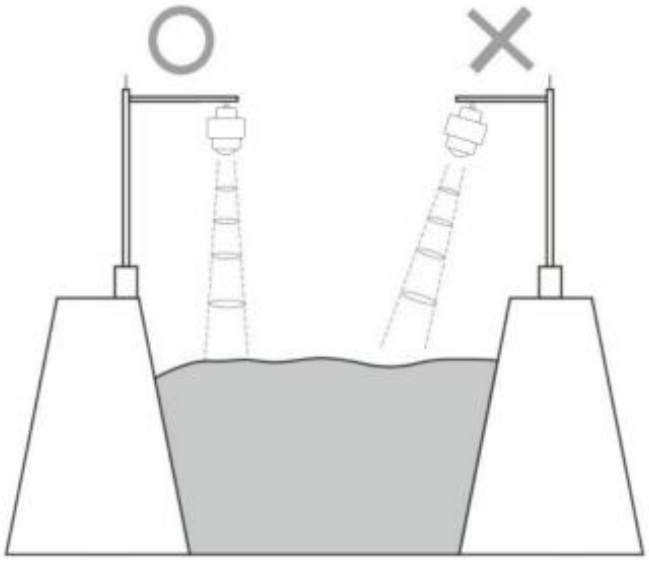
Two points to note during installation:

1. Ensure that the instrument is perpendicular to the water surface

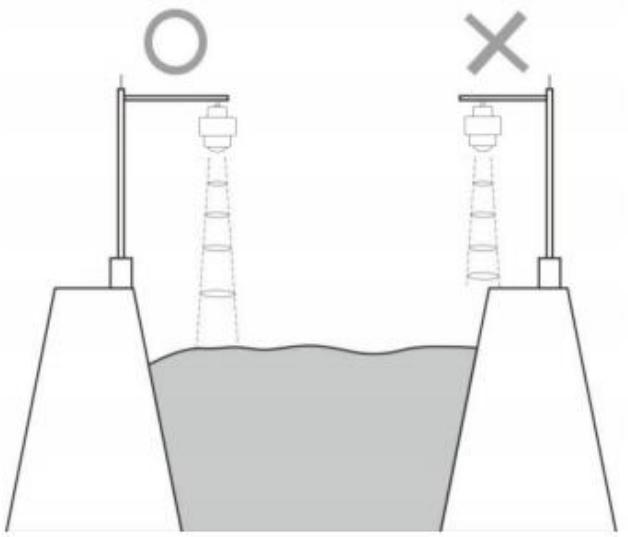
2. Avoid the transmitting beam from hitting interference objects and producing false echoes.

Please refer to the following points for typical working conditions:

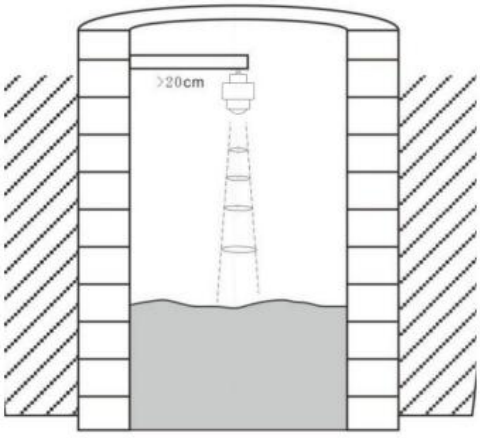
Ensure that the water level meter is installed perpendicular to the water surface. Inclination will weaken the received signal amplitude and affect normal ranging.



Make sure there are no interference objects within the beam range, such as river banks.



The instrument should be installed at least 20cm away from the side wall, and the underground pipe network should be installed as close to the center of the sewer well as possible, otherwise the well wall will easily produce interference signals, affecting measurement judgment.



Function introduction

[Installation height setting]

The distance from the front end of the water level meter to the bottom of the water level. The installation height setting must be less than the range.

Value range: 1-4000, unit: cm; default value: 2000

[Range setting]

The maximum distance that the radar can detect. If the detection distance exceeds the range, a value of 0 will be output. Users do not need to set it manually unless necessary. After setting the installation height, the range will automatically follow, which is 0.5m to 1m greater than the installation height.

Value range: 1-41, unit: m; default value: 21

[Baud rate setting]

The rate of serial communication, which indicates the number of bits of binary data transmitted per second.

Value range: 24, 48, 96, 144, 192, 384, 576, 1152, corresponding to baud rates 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200; default value: 96

[Parity bit setting]

Check whether the received data bit is wrong.

Value range: 0X0000 (no parity), 0X0001 (odd parity), 0X0002 (even parity); default value: 0X0000 (no parity)

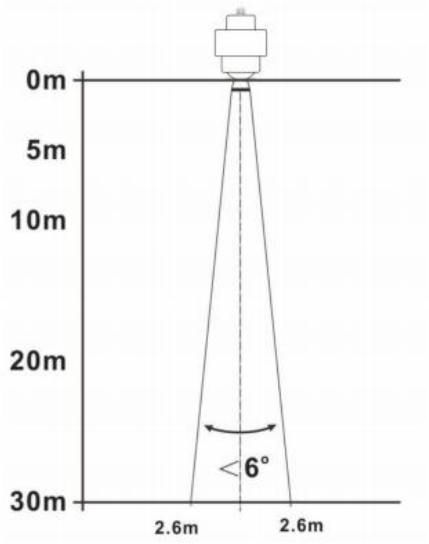
[Slave address setting]

The slave address refers to the unique identifier of each slave device in the Modbus network, which is used to distinguish different slave devices.

Value range: 1-255; default value: 1

● Glossary

Beam angle: The beam width with a limit of 3dB lower than the maximum value. Series beam angle 6°, as shown in the figure.



Distance resolution: Distance resolution refers to the distance between two objects close together at which the level radar can distinguish that they are two objects rather than one object and can measure their respective distances. If the distance between the two objects is less than the distance resolution of the level radar, the radar can only measure one distance value, which is not equal to the distance value of any one of the objects, but the combined distance value of the two objects. The frequency modulation bandwidth of the product B=80GHz, the minimum distance resolution = speed of light/working bandwidth/2≈1.875mm.

Measurement accuracy: If there is only one object and this object moves a very small distance, can the level radar identify the distance change? The indicator of distinguishing the moving distance of a single object is called accuracy. The intermediate frequency signal is analyzed by its own algorithm, and the measurement accuracy is ±2mm.

Blind zone: (1) refers to the measurement limit of the near end of the instrument. The instrument cannot measure in the blind zone.

Echo: The reflected signal received by the radar.

False echo: Any echo that is not generated by the desired target. Generally speaking, false echoes are generated by obstacles in the container.

Range: (1) refers to the maximum measurement limit of the instrument. (2) Special, refers to the maximum distance set manually. Distances beyond this limit are not considered when the instrument processes data.

● Precautions

1. After opening the product package, please check whether the product appearance is intact, verify whether the relevant content of the product manual is consistent with the product, and properly keep the product manual for more than one year;
2. Strictly connect the wires according to the product wiring diagram, and work under the allowable excitation voltage of the product. Do not use overvoltage;
3. Do not knock the product to avoid damaging the appearance and internal structure of the ring;

4. The product does not have self-repair parts for customers. Please contact our company in case of failure;

5. If the company's products fail under normal use, the warranty period is one year (13 months from the date of shipment from our company to the date of return). Whether it is a normal failure is based on the inspection of our quality inspectors. If the maintenance exceeds the period, the company will charge a processing fee, and all products of the company will be repaired for life;

6. For any unfinished matters, please refer to our company's website or call us for inquiries.

(RS485) MODBUS communication protocol

● Communication protocol hardware interface parameters

The level meter uses serial communication, and the default parameters are as follows:

Communication parameters	Serial port	Baud rate/bps	Parity check	Data length/bit	Stop bit/bit
Serial port	485	9600	None	8	1

Each frame interval timeout 50ms.

● Communication protocol format

The communication adopts ModbusRTU communication protocol. Each complete data frame contains: address field, function code, data and checksum. The checksum is the CRC16 checksum data of the data frame, with the low byte in front and the high byte in the back. The factory default address of the level meter radar is 1.

The request command format and radar response data format are as follows:

(1) Query parameter format: Function code 0x03 request:

Device address	Function code	Starting address	Number of registers	CRC
（1 byte）	（1 byte）	（2 byte）	（2 byte）	（2 byte）

Reply:

Device address	Function code	Data length	Register value	CRC
（1 byte）	（1 byte）	（1 byte）	（2xN byte）	（2 byte）

N：Number of registers

● Register description

Parameters	Register address	Number of registers	Access mode

Aerial height (distance between device and liquid surface, cm)	Address: 0x0000, unsigned integer	1 (2 bytes)	Read
Aerial height (distance between device and liquid surface, mm)	Address: 0x0001, unsigned integer	1 (2 bytes)	Read
Liquid level (cm, installation height minus aerial height)	Address: 0x0002, unsigned integer	1 (2 bytes)	Read
Liquid level (mm, installation height minus aerial height)	Address: 0x0003, unsigned integer	1 (2 bytes)	Read
Installation height (cm, distance between device and the bottom of liquid level), setting range 1-4000cm	Address: 0x0005, unsigned integer	1 (2 bytes)	Write/Read
Range (m, after setting the installation height, the range will automatically follow, 0.5m to 1m greater than the installation height, so users do not need to set it manually if it is not necessary), setting range 1-41m	Address: 0x0008, unsigned integer	1 (2 bytes)	Write/Read
Baud rate	Address: 0x00014, unsigned integer	1 (2 bytes)	Write/Read
Checksum	Address: 0x00015, unsigned integer	1 (2 bytes)	Write/Read
Device address	Address: 0x0017, unsigned integer	1 (2 bytes)	Write/Read