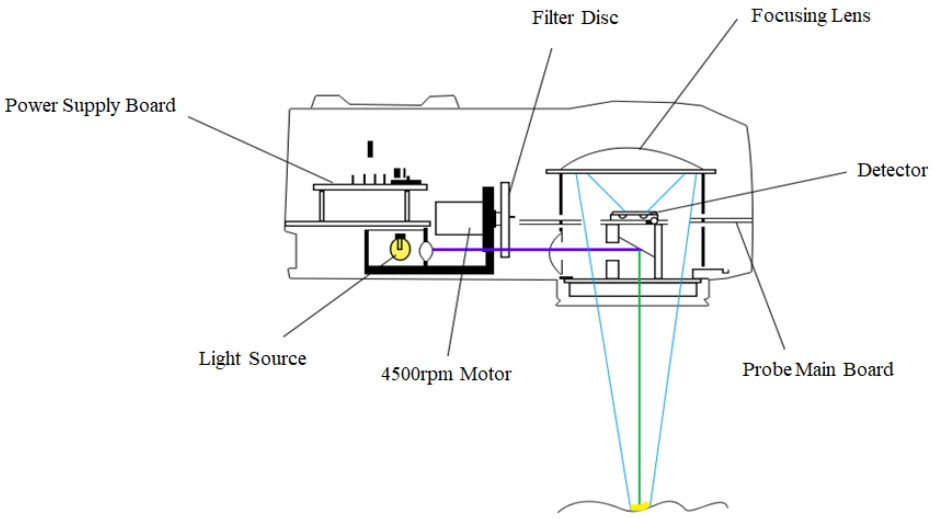
Near-infrared Measurement Principle

Molecular structures within substances, such as oxygen-hydrogen bonds in water and carbon-hydrogen bonds in organic matter, can absorb near-infrared light of specific wavelengths. At a specific wavelength, the amount of near-infrared energy reflected by a material is inversely proportional to the number of molecules it contains that can absorb near-infrared radiation. The online moisture meter analyzes the changes in near-infrared energy at specific wavelengths based on the principle that near-infrared wavelengths are absorbed by water molecules.

Water molecules are not static: they vibrate when they encounter specific energy bands. The bonds between the hydrogen atoms and oxygen atoms in water molecules stretch, contract, or become distorted in other ways. Water molecules are particularly strongly affected in the near infrared part of the spectrum. At the same time, the instrument is also easier to implement in terms of transmitting, filtering and receiving energy. The amount of near-infrared energy absorbed depends on the number of water molecules encountered by the energy beam and the intensity of the absorption. The number of water molecules encountered by the energy beam is proportional to the water content of the substance being measured. At the same time, because the moisture meter is in the form of reflectance, the measured beam is also affected by the reflection and absorption characteristics of the substance being measured. Near-infrared moisture measurement technology is a non-destructive, non-contact real-time moisture detection technology.

QL-300L Online Moisture Analyzer Testing Principle

Online moisture analyzer focuses near-infrared beams of multiple wavelengths onto the surface of the object to be measured, and the reflected near-infrared beams are received and processed by an advanced infrared optical detection system. This advanced infrared optical detection system has an embedded ultra-high-performance micro digital signal processing chip to process, store and display the required data, with outstanding accuracy and stability.



Online moisture analyzer installs a precision infrared filter on the wheel, so that the pulses of reference light and measurement light can alternately pass through the filter. First, the reference light is projected on the sample, and then the measurement light is also projected on the sample. These two sequential light energy pulses will be reflected back to the detector and converted into two

electrical signals in turn. The reference channel indicates how much reflected energy is expected. Part of the reflected energy in the measurement channel is absorbed by water molecules, so its energy will be attenuated. These two signals can form a ratio. The difference between this ratio and some other ratios obtained from samples with different moisture contents is proportional to the difference in moisture content between the two.

The equation is as follows:

$$R * M1/M * R1 = Ratio$$

in the formula:

R represents the reference channel of the product beam;
M represents the measurement channel of the product beam;
M1 represents the measurement channel of the compensation beam;
R1 represents the reference channel of the compensation beam;

In the event of a drift, such as a change in the intensity of the light at the measuring wavelength, the values of M and M1 will also be affected proportionally, and in the case of ratios the effects will be canceled out. However, if the moisture content of the sample is changed, only the M value is affected and the measured moisture will vary significantly.

Product Picture

Instrument Features

- ✧ Non-contact measurement. Measure the moisture content changes of the product in real time on the production line without pre-processing the product. Even products in enclosed spaces can be measured by penetrating colorless glass (light transmittance greater than 95%).

- ✧ Easy to use. Install at the location where measurement is required. Take a sample near the test point and measure the moisture content using a laboratory standard method. Then compare the test data with the instrument data, adjust the translation amount and sensitivity parameters to complete the calibration. Online moisture analyzer starts to operate normally.

- ✧ Strong anti-interference ability.

The probe has the function of automatically compensating for temperature effects, and changes in ambient temperature will basically not affect the measurement accuracy.
The performance of the instrument is not affected by changes in ambient light, and there is no need to install a hood on the probe during use.
Equipped with a sintered filter element dust cover, which can eliminate interference from trace amounts of dust and water vapor after the air source is connected.

✧ The probe has a built-in MCU. It adopts fully digital computing and has strong light signal processing capabilities, making it more capable of judging light-absorbing materials such as black. At the same time, it also adds visible light signal measurement, which effectively reduces the impact of color changes and improves the instrument's adaptability to complex test sites.

✧ Diversified output and input interfaces: free protocol/MODBUS-RTU (read and write, supports remote modification of parameters and calibration); Rs485 (three channels); DC4-20MA (one channel); IO input and output; 2 channels of input; input stop signal to stop Measurement; 2-way 24v output; alarm light can be installed.

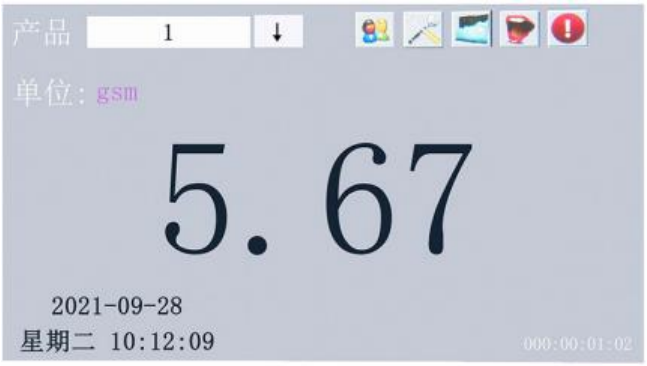
✧ The quality is stable and reliable.
It adopts waterproof power supply module, aluminum alloy shell, IP67 grade, AC 90-220V 50/60hz global voltage self-adaptation.
The power supply of the probe is DC24V. The low-voltage power supply is safer and more stable, and can effectively reduce the failure rate.
The power supply of the light source is DC5V. When the power is turned on, the voltage slowly increases, and the light source is protected when turning on and off.

Technical Parameters

Model	QL-300M
Applicable Products	Light-colored and bright-colored materials (no water seepage on the surface)
Probe Glass	Use high-bay quartz glass to avoid stains and moisture adhesion.
Measuring Range	0-50% (The maximum measurement range is when the material is saturated with water. There is no water seepage on the surface.)
Measurement Accuracy	±0.1%-0.5% (depending on material properties)
Resolution	0.01%
Display Content	5-digit digital tube, 4 buttons, 8 status lights (directly determine various status of the probe)
Spot Diameter	50mm (varies with distance)
Measuring Speed	0.125 seconds (after stabilization)
Detector	Add filter package to avoid external light interference

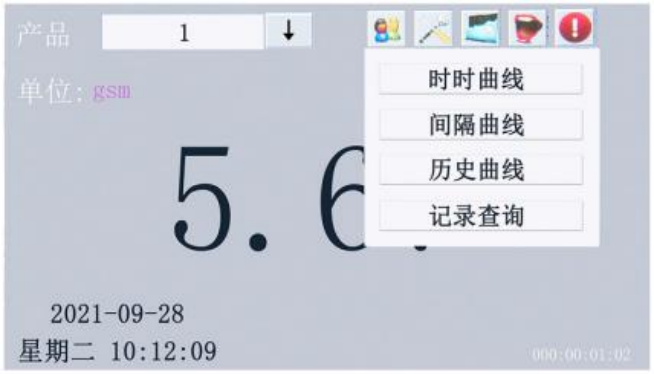
Calibration and Adjustment	Quick calibration; pre-calibration; no need for daily re-calibration
Signal Output	RS485, 4-20mA analog signal
Protocol	Free protocol/MODBUS-RTU (read and write, supports remote modification of parameters and calibration); three Rs485 channels in total
Number of Channels	50
Operating Temperature	-10℃ ~ 50℃
Working Distance	250mm ~ 450mm
Working Power Supply	Waterproof power supply module: AC 90-220V 50/60hz global voltage adaptive; output DC 24V;
Dust and Vapor Proof (trace amount)	Standard sintered filter element dust cover (users prepare air source by themselves)
IP Rating	IP67
Weight	Probe: 6kg; Host: 4kg;
Mounting Brackets	Customers need to customize it according to the conditions of the work site. The diameter of the installation round pipe is 25-32mm.

Products Advantage



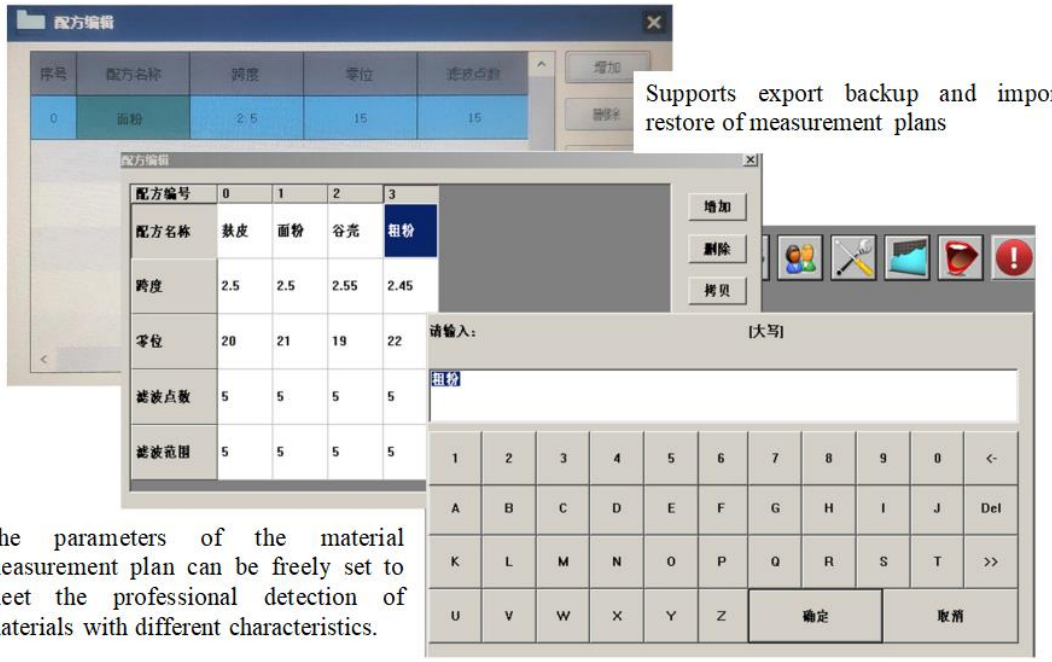
7-inch color touch screen.
Provides Chinese and English operating systems, and you can switch the system language freely.

Moisture value upper and lower limit warning function. Once the limit is exceeded, the instrument will automatically change the value into a red letter warning display.



Three types of recording curves can be selected: real-time curve, interval curve, and historical curve.
You can set the coordinate parameters independently.

Data can be stored and queried;
Supports exporting reports from USB flash drive.

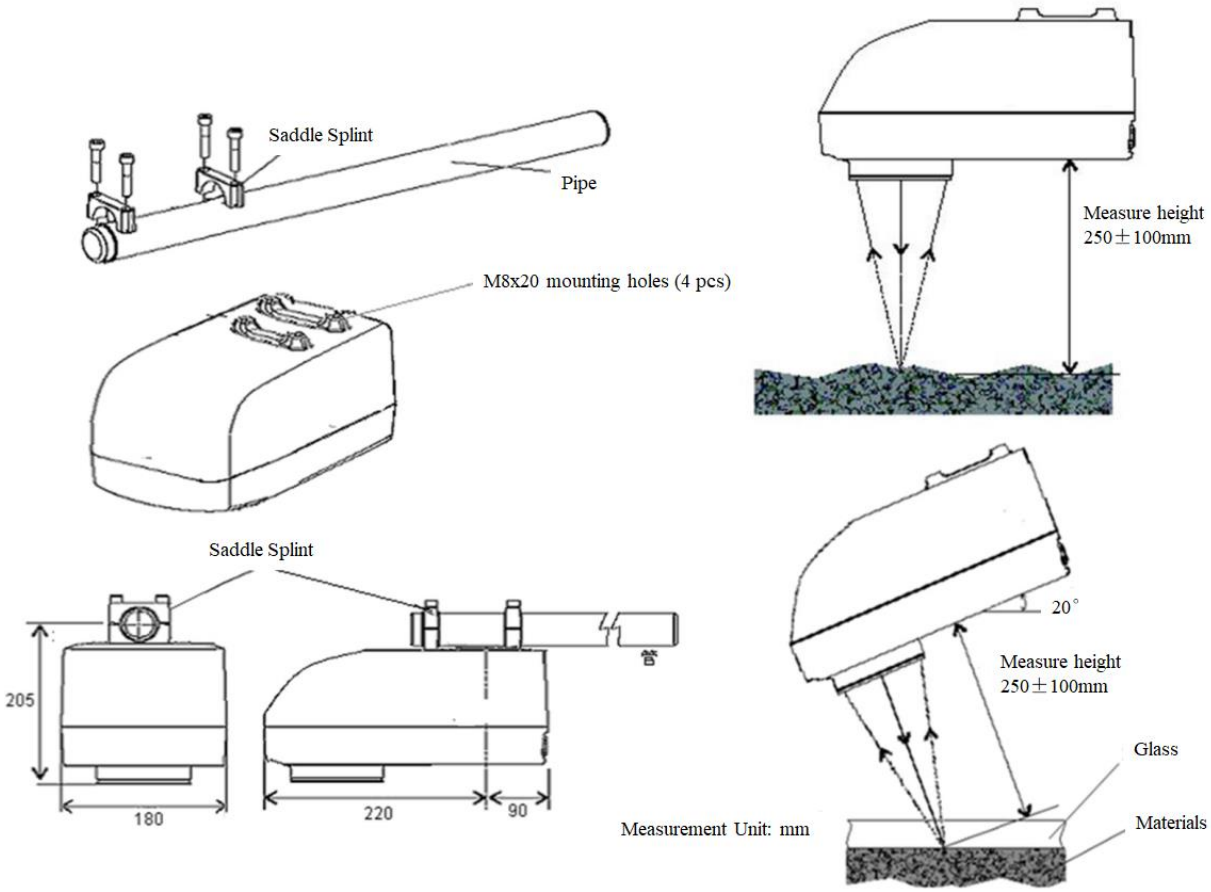


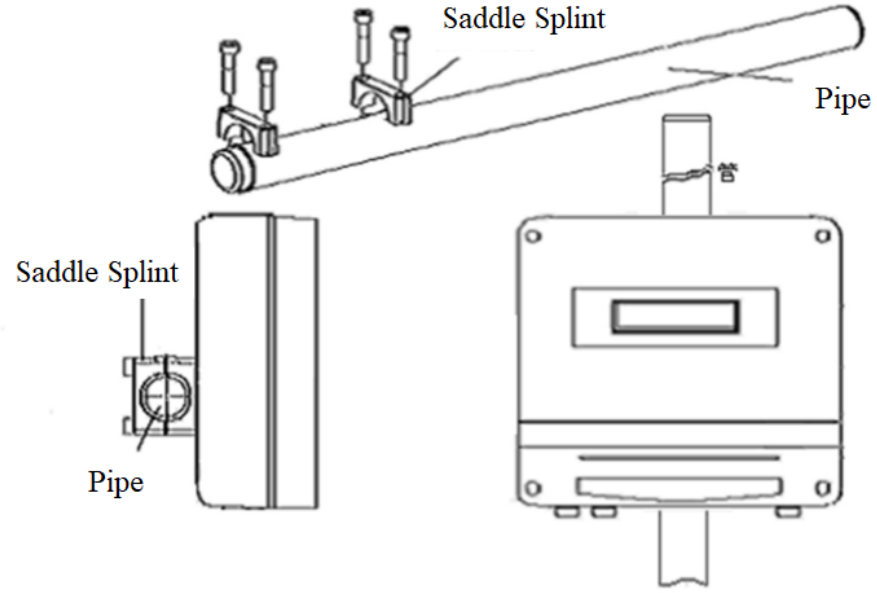
Packing List

No	Name	QTN	UNIT
1	Online moisture meter host	1	set
2	Online moisture analyzer probe	1	set
3	Connecting cable (including 5P)	1	pcs

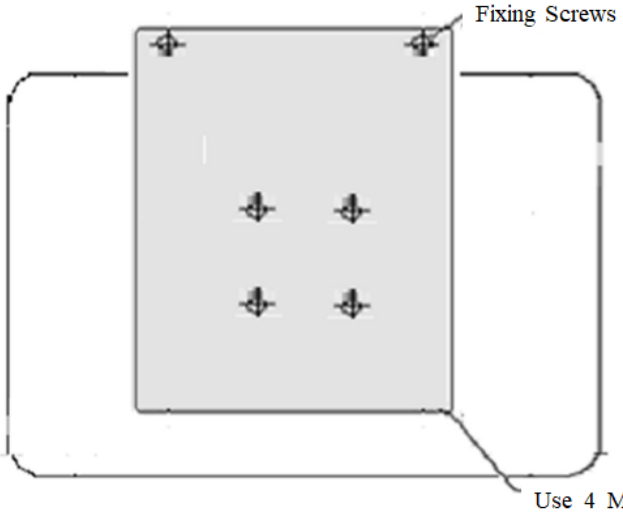
4	Power module with connecting cable	1	pcs
5	8P output plug with cable	1	pcs
6	9P output plug with cable	1	pcs
7	Manual	1	copy
8	saddle clamp	4	pcs
9	dust cover	1	pcs
10	Gas nozzle	1	pcs
11	M8 inner hexagon screw	8	pcs
12	Backup IR light source	1	pcs

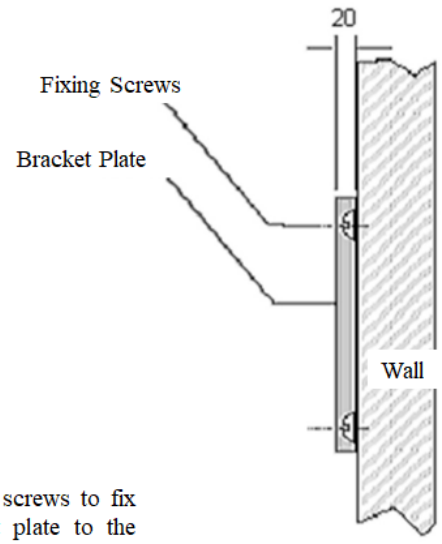
Installation diagram





Length Unit: mm





Use 4 M8 screws to fix the bracket plate to the back of the host