

## **LWB-12 Rapid detector for oil quality**

**(Integrated iron chip sensor and six-parameter sensor)**



## **I Summary**

**The fast lubricating oil quality detector is based on the combination of iron chip sensor and six-three-number oil characteristic sensor module.**

Main components:

Iron chip sensor

Six-parameter oil characteristic sensor

Equipped with micro self-priming pump, independent oil absorption detection.

Optional micro printer to print test report in real time.

Built-in mobile power supply can be used for 8 hours without 220V AC.

## **Function introduction**

1. Built-in oil inlet heating device can be set to display the detection values of iron filings, non-iron filings, moisture PPM, moisture saturation, viscosity, density, temperature and dielectric constant at 40°C.
2. 1-8 kinds of oil product detection curves can be calibrated in advance, and various oil products can be detected;
3. The detection report can be printed in real time
4. Software part: alarm can be set, alarm value can be input, and alarm scheme can be given by comparing with detection value, and it is judged that it is qualified and unqualified;

## **Optional features:**

1. Optional external pressure reducing valve for pressure reduction from 420 bar to 50 bar for online connection to high pressure systems for testing
2. Optional built-in 4G cloud communication module for wireless remote monitoring, real-time monitoring and viewing of historical data and historical data curves on PC web and mobile APP
3. Optional detection function of oil dielectric constant technical index can be added.

## II. Scope of application and scenarios:

Typical applications are suitable for hydraulic oil and lubrication of engine oil, gear oil and pressure changer oil, synthetic oil and other oil liquids.

### **aerospace**

- Matching hydraulic oil filtering and filling system
- The supporting cleaning system continuously monitors various oil systems of the aerospace ground support department to ensure the cleanliness of oil products and the safe operation of aerospace equipment.

### **construction machinery**

- Earthmoving machinery
- Agricultural machinery
- Forestry machinery
- Before leaving the factory or in daily use, the harvesting machinery and construction machinery can detect the cleanliness of the hydraulic system of the construction machinery, which can effectively ensure all components in the system. (such as piston pump, servo valve, controller, gear pump, etc.) can work best under load conditions.



### **electricity industry**

- Wind turbines
- Gear box
- The lubrication system regularly checks the oil system, so as to ensure that the best working industrial equipment can be achieved in the least time.
- Production plant
- Oil production and transportation
- Refinery
- Precision product production line affects the hydraulic system (cleaning system) of all equipment on the whole production line. Cleanliness testing, from hydraulic control system of machine bed, cleaning system of precision parts to oil. Pollution monitoring in the process of transmission can realize that the integrity of oil products can be effectively maintained at a high level in the process of oil refining.



### **testbed**

- Hydraulic valve test bench
- Flushing test bench
- Various oil product test benches can continuously detect the cleanliness of the oil in the hydraulic system (lubrication system), which can greatly improve the working efficiency of the equipment.

### III the technical analysis of each system

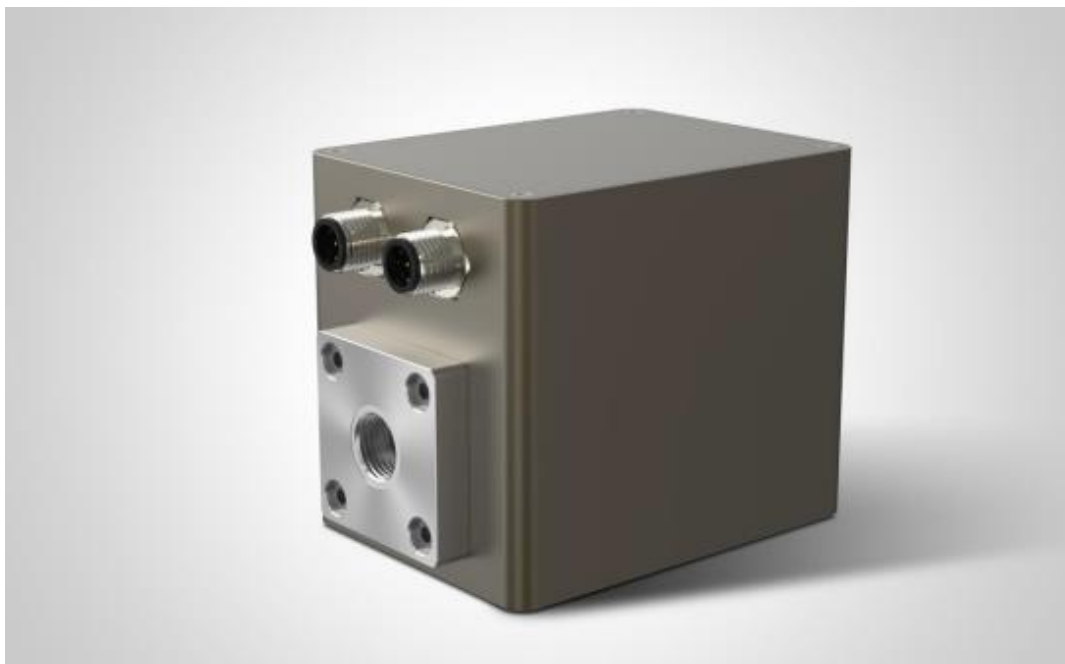
#### 1. LWTX-4501 Iron Chip Series Metal Abrasive Sensor

##### Product introduction

LWTX-4501 metal abrasive particle sensor is a real-time ferromagnetic and non-ferromagnetic abrasive particle monitoring sensor. It adopts advanced three based on the principle of electromagnetic induction of coil, a high-sensitivity data sampling and processing unit is integrated inside, which can monitor the wear of large industrial equipment in real time.

LWTX-4501 can capture ferromagnetic metal particles with a diameter of more than 40um and non-ferromagnetic metal particles with a diameter of more than 150um, and complete wear particle detection and data output through 10 size distributions. MPS2008 also provides the functions of measuring the temperature inside the sensor and estimating the velocity of wear particles.

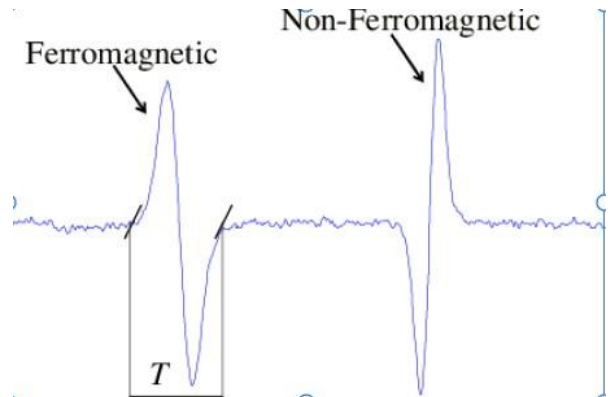
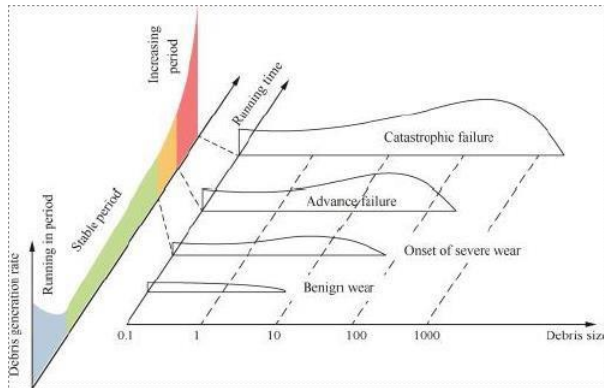
By continuously monitoring the generation of wear debris, MPS2008 can remind users of the earliest failure of equipment, and can take lower-cost maintenance measures compared with the traditional schedule.



## 2 measurement principle

LWTX-4501 has built-in two sets of high-performance reverse wound excitation coils and a set of high-performance induction coils. Both excitation and induction coils work in a resonant state. When metal abrasive particles pass through the pipeline, the magnetic flux change of the excitation coil is received by the induction coil, and the real-time capture and reporting of metal abrasive particle signals are completed through a high-sensitivity sampling unit, a band-pass filter unit, a phase and amplitude comparison unit, a signal amplification unit, a low-pass filter unit and a signal extraction unit.

LWTX-4501 has realized the detection ability of 40 $\mu$  m iron particles (Fe) and 150 $\mu$  m non-iron particles (NFe).

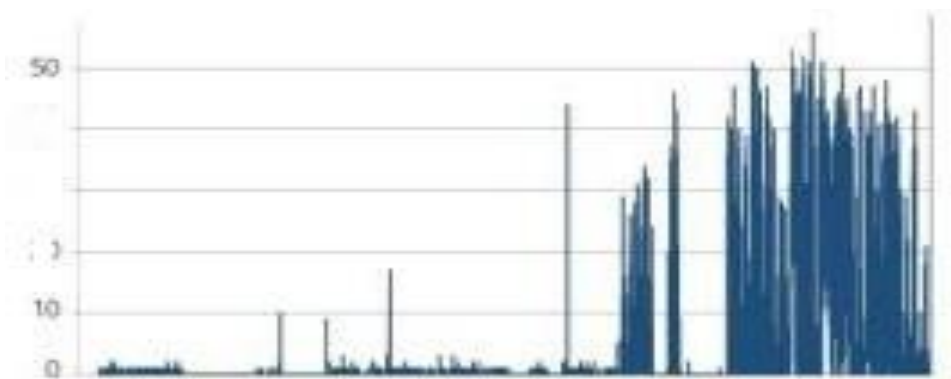


m non-iron particles (NFe).

### Important features

- Detection ability of 40 $\mu$ m ferromagnetic-150 $\mu$ m non-ferromagnetic abrasive particles
- Estimation of output/abrasive quality of ten-size belt
- System velocity estimation data output
- Abnormal wear detection to protect valuable assets
- The measurement is not interfered by external metal and magnetic field.
- The measurement is not affected by bubbles and moisture in oil.
- Fast response, adjustable data accumulation period
- Excellent chemical corrosion resistance and pressure resistance
- No moving parts and consumable parts, ten-year design life.
- 2.5kV Isolated RS485 Communication

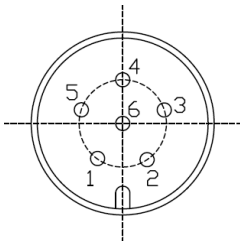
|                   |                            |
|-------------------|----------------------------|
| Fe ruler with     | NFe ruler with             |
| 40 ~ 99 $\mu$ m   | 150 ~ 199 $\mu$ m $\mu$ m. |
| 100 ~ 199 $\mu$ m | 200 ~ 299 $\mu$ m          |
| 200 ~ 299 $\mu$ m | 300 ~ 399 $\mu$ m          |
| 300 ~ 399 $\mu$ m | 400 ~ 499 $\mu$ m          |
| $\geq 400 \mu$ m  | $\geq 500 \mu$ m           |



## Technical specifications

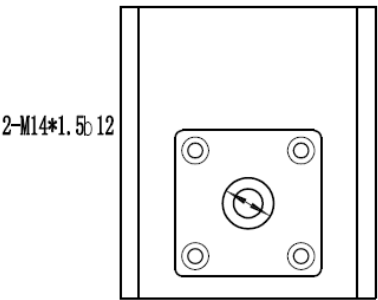
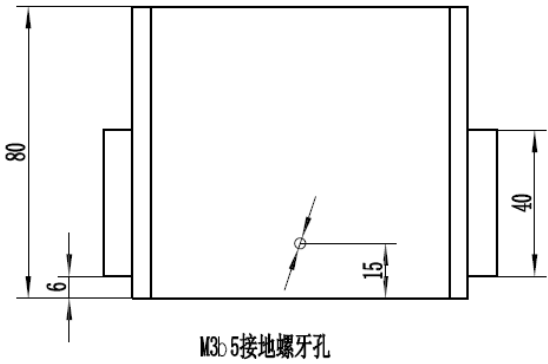
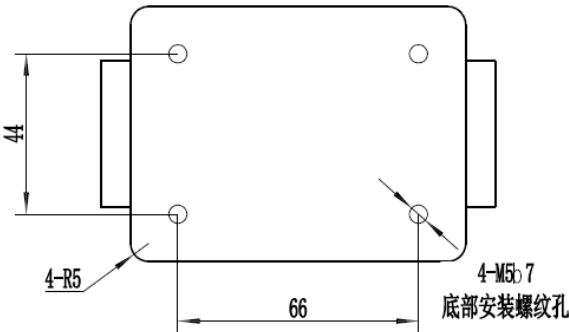
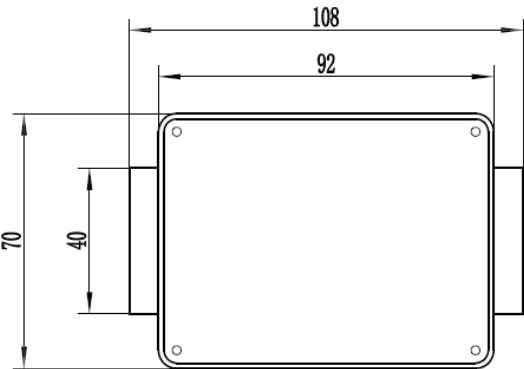
|                               |                                                                                          |
|-------------------------------|------------------------------------------------------------------------------------------|
| Testing capability            | Ferromagnetic abrasive grains Fe > 40µm (ESD) 5 steps                                    |
|                               | Non-ferromagnetic abrasive grains NFe > 150µm (ESD) Five grades                          |
| Statistical period            | Start-up self-test 30 seconds (first time), count interval 300 ~ 3600 seconds adjustable |
| Number of particles           | Max 100 pcs/sec                                                                          |
| Allowable flow                | 0.3 ... 9 L/m (0.1 ... 3m/s)                                                             |
| Piping specifications         | Φ8mm                                                                                     |
| Digital output                | RS485 MODBUS RTU, isolation voltage 2.5kv                                                |
| Working power                 | DC 24V±10%, < 200mA                                                                      |
| Probe pressure resistance     | 10bar Max                                                                                |
| Applicable fluids             | Lubricants and hydraulic fluids (synthetic and mineral bases), etc.                      |
| Fluid temperature             | -20 ... 80 °C                                                                            |
| Ambient temperature           | -20 ... 85 °C                                                                            |
| Housing material              | Stainless steel, anodised aluminium                                                      |
| Structural dimensions         | 108 x 70 x 80 mm (L x W x H)                                                             |
| Threaded connections          | M14*1.5                                                                                  |
| Weight                        | <1.0 kg                                                                                  |
| Protection class              | IP65                                                                                     |
| Connection cables             | 2 m M8 - 6-pole straight                                                                 |
| Electromagnetic compatibility | EN 61326-1 EN 61326-2-3 ICES-003 B 级                                                     |

Interface definition (M8 male)



|    |          |       |
|----|----------|-------|
| 1) | +24V DC  | Red   |
| 3) | GND      | Black |
| 2) | RS485+/A | White |
| 4) | RS485-/B | Green |

Structural dimensions (mm)



## IV Introduction of Six-in-One Oil Property Sensor Technology

### Brief introduction of six-in-one oil property sensor for viscosity, density, moisture, water activity, temperature and dielectric constant

#### Product Description

DR-600 6-in-1 oil product characteristic sensor is the original core technology product of our company, which integrates six physical and chemical parameters of oil viscosity, density, moisture, water activity, temperature and dielectric constant.

DR-600 is simple and easy to use, and there is no need for personnel to participate in the intelligent monitoring process, and all tests are automatically completed by sensors. Users can realize real-time measurement of oil viscosity, density, trace moisture, water activity, temperature and dielectric constant during the operation of mechanical equipment only by installing it on the pipeline, and users can also realize laboratory analysis of oil products through off-line suite.

The appearance of DR-600 has greatly increased the investment income of users. It makes users have a reliable basis for quality control in the production process, and also provides real-time monitoring data for the stable and reliable operation of users' major equipment. It is a compact, intelligent, reliable and multifunctional online monitoring sensor.

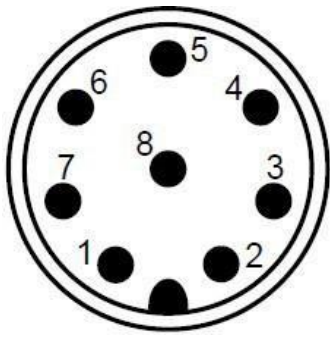


## Important features

- Imported probe, micro motion measurement
- Up to six oil parameters-moisture, density, viscosity, water activity, dielectric constant and temperature.
- The density accuracy is  $5 \text{ kg m}^{-3}$ .
- The viscosity ranges from 1 to 1~400cP, and the accuracy reaches 5%.
- Wide allowable fluid temperature, from 0°C to 100°C
- Fast response, data refresh every second.
- The measurement is not affected by external vibration.
- All stainless steel, suitable for on-line monitoring robustness
- Excellent chemical corrosion resistance and pressure resistance
- No moving parts, no consumable parts, ten years life.
- A variety of certification and testing reports
- Small structure, convenient system.
- Convenient field calibration integration

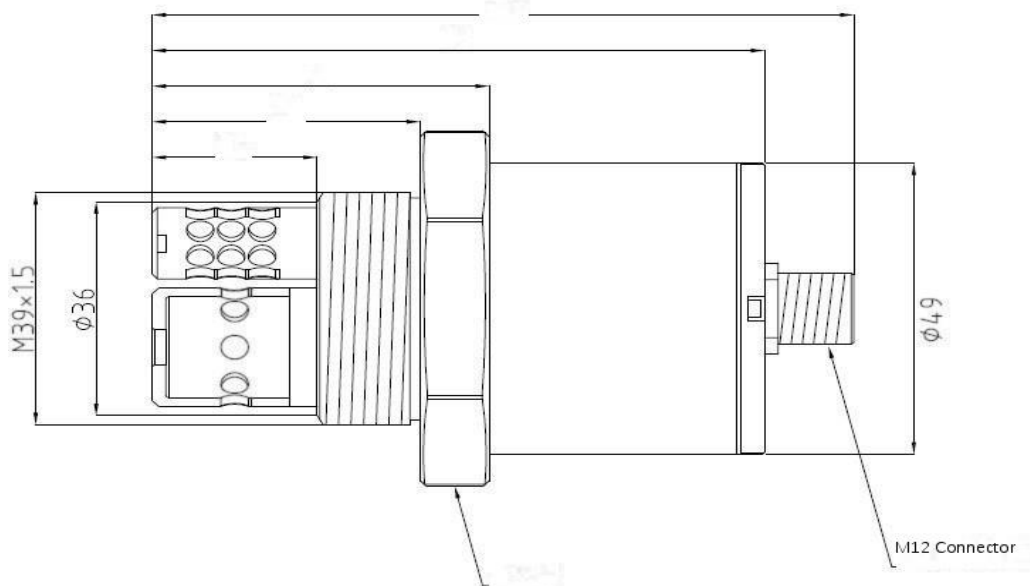


|                                     |                                                                                                                               |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Measurement index                   | Moisture (ppm), density (kg.m <sup>-3</sup> ), dynamic viscosity (cP), dielectric constant, water activity, temperature (°C). |
| measuring range                     | moisture 0-30000ppm (calibrated according to different oil products)                                                          |
|                                     | density 600 kg.m-3...1250 kg.m-3 *                                                                                            |
|                                     | viscosity 1cP...400cP(500cSt)                                                                                                 |
|                                     | Water activity 0...1aw                                                                                                        |
|                                     | dielectric coefficient 1...6                                                                                                  |
|                                     | temperature 0°C...100°C *                                                                                                     |
| degree of accuracy<br>@25°C Typical | moisture 10% or 10ppm, whichever is larger.                                                                                   |
|                                     | density 2% or 5kg.m-3 Take the larger value of the two.                                                                       |
|                                     | viscosity 5% or 1cP takes the larger value.                                                                                   |
|                                     | Water activity 3%                                                                                                             |
|                                     | dielectric coefficient 5%                                                                                                     |
|                                     | temperature 0.5°C                                                                                                             |
| resolution ratio                    | moisture 1ppm                                                                                                                 |
|                                     | density 0.1 kg.m-3                                                                                                            |
|                                     | viscosity 0.1cP                                                                                                               |
|                                     | Water activity0.001                                                                                                           |
|                                     | dielectric coefficient 0.01                                                                                                   |
|                                     | temperature 0.1°C                                                                                                             |
| Response time                       | Less than 30 seconds (first time), the data is refreshed once per second.                                                     |
| digital output                      | RS485 MODBUS RTU                                                                                                              |
| supply voltage                      | DC 9V-32V@RS485, DC20V-32V@4-20mA                                                                                             |
| Power consumption of whole machine  | < 20mA@24Vdc RS485                                                                                                            |
| Probe withstand voltage             | Max 10bar (please consult our engineer 021-58073569 for a wider range)                                                        |
| Fluid temperature                   | 0°C... 100°C                                                                                                                  |
| ambient temperature                 | -40°C... 85°C                                                                                                                 |
| Storage temperature                 | -40°C... 80°C                                                                                                                 |
| Shell material                      | Hastelloy 316/304 Stainless Steel                                                                                             |
| Mechanical interface                | G 1-1/2"                                                                                                                      |
| weight                              | 550g                                                                                                                          |
| the protection grades               | IP65                                                                                                                          |
| Sealing material                    | FKM fluoroadhesive                                                                                                            |
| cable jumper                        | 2m M12 8 core                                                                                                                 |
| peak flow rate                      | < 0.3 m/s                                                                                                                     |



|          |          |
|----------|----------|
| 8) Red   | +24V DC  |
| 5) Black | GND      |
| 1) White | RS485+/A |
| 3) Green | RS485-/B |

## Structural dimension (mm)

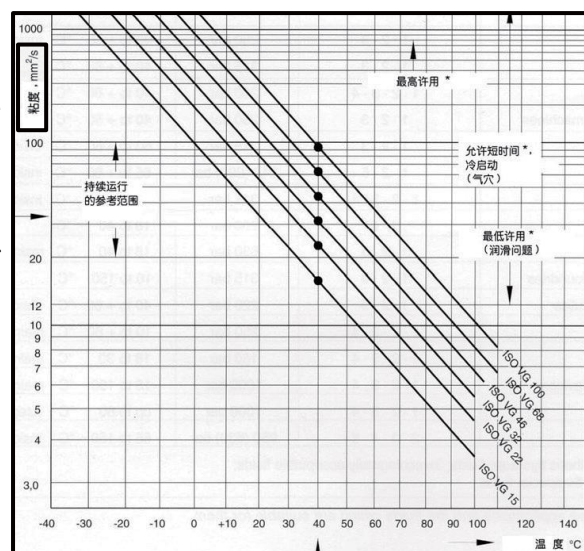


## High viscosity sample detection (bottle sampling detection)

As shown in the viscosity-temperature curve on the right: the viscosity of oil changes with the change of temperature, and the lower the oil temperature, the greater the viscosity; The higher the oil temperature, the lower the viscosity.

For some samples with high viscosity (viscosity over 100 centimetres), the gas pressure bottle sampler should be selected. (pressurization device) to ensure the accuracy of the oil cleanliness detector. The air pressure bottle sampler can not only assist the oil cleanliness detector to detect high viscosity samples, but also remove bubbles from the samples.

Connection method: Just connect the liquid inlet pipe of the oil cleanliness tester with the liquid outlet of the pressurizing device, as shown in the following figure.



Gifts: 1. Glass purification sampling bottle 2. Negative pressure sampler (tension type) can effectively prevent oil from adhering to the oil tank and external impurities from polluting the oil sample during sampling. As shown in figure:



Off-line detection of oil bubble treatment: ultrasonic cleaning machine can be selected, with ultrasonic vibration defoaming and degassing function, which can disperse large particles in the oil to eliminate bubbles in the oil sample, and can also reduce the viscosity of the oil sample by heating.



## Calibration period

The calibration period of oil detector is generally 12 months, and the longest is no more than 24 months. Calibration should be carried out immediately after the instrument is found to be abnormal or the maintenance and re-adjustment that affect the measurement and counting ability of the oil cleanliness detector are carried out.

## routine test

Before leaving the factory, the instruments are strictly inspected and the Factory Inspection Report is issued. The standard materials used are "GBW(120017(ACFTD particle standard material) or GBW(E)120083 (oil-based MTD particle standard material).



## After-sales service commitment

Based on the principle of equality, friendship and mutual respect, our company is willing to make the following commitments and provide the following services for users who purchase our products:

1. The installation, debugging and acceptance of instruments shall be carried out at the place specified by the buyer. Within 3 working days after the goods arrive at the designated place and receive the installation notice, the supplier shall go to the buyer's site for installation, debugging and acceptance. After the installation, debugging and acceptance, the supplier's engineer will conduct practical operation training for the demander's personnel, so as to ensure that the demander's operators can independently operate the instrument, maintain, simply troubleshoot and process experimental data.

2, the warranty period:

From the date of acceptance, our company will guarantee the whole product for free for 12 months; The core component sensor is guaranteed for 24 months; Responsible for life-long maintenance outside the warranty period.

3, technical services:

During the warranty period, the supplier shall be responsible for free maintenance or replacement of accessories for any equipment failure caused by the quality problems of the equipment (instrument) itself, and the expenses shall be borne by the supplier. Normal instrument consumables are not included in the warranty. Outside the warranty period, the supplier shall ensure long-term supply of spare parts and high-quality maintenance services to ensure the production demand of the buyer.

The supplier is responsible for the lifelong maintenance of the equipment (instrument). When the equipment (instrument) fails, the supplier will reply within 24 hours after receiving the maintenance notice. If it is necessary to send someone to repair, the maintenance personnel will arrive at the buyer's use site within 3 working days and troubleshoot. If the instrument cannot be used normally within 10 working days.

In order not to affect the normal use of customers, our company will provide users with one instrument of the same kind and model, and exchange it after the original instrument is normal.

The supplier will visit the demander from time to time to learn about the use of the instrument by the demander, and communicate in application to ensure the normal use of the instrument for a long time. During or outside the warranty period of equipment (instrument), the supplier can provide lifelong preferential technical support for equipment (instrument). The technical maintenance personnel of the supplier shall pay a return visit to the user at least twice a year (in the form of on-site or telephone, etc.).

The supplier shall provide the latest information on instruments and applications to the buyer in a timely manner, and help the buyer to improve and upgrade feasible instruments-related software, so as to keep the buyer at an advanced level in instruments and technical information.

Product physical display:



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