

Development and application of the whole automatic determination machine for antibiotic tube dish method / turbidity method

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Abstract: product is developed on the basis of the technical cooperation projects of the Shandong Xinyuan Thai Letter Electronic Technology Co., Ltd., using the Luoyang LanFei PLC and touch screen, and spectrophotometer. It is easy to realize adding sample, full automatic measurement and reporting. A dose, dose and dose of antibiotics and other methods can be realized.

Introduction

Traditional antibiotic turbidity method or tube plate method microbiological assays need a variety of experimental equipment, manual operation is complicated and there are many man-made factors, an increase in the experimental results of error rate; furthermore, sterile laboratory established, not only need to increase the test space, and add test cost.

Antibiotic microbiological automatic determination instrument system in order to solve the problems existing in manual operation, use antibiotic microbiological test principle, according to requirements of the new edition of the "Pharmacopoeia of antibiotic titer determination method, integrated modern optics, electronics and automation technology and years of practical experience and design.

Equipment system and function

Antibiotic all-in-one evaluation by cylinder-plate method/turbidity method fully automatic, including lab automatic constant temperature purification plant, steel pipe automatic placement device, automatic sampling device, automatic constant temperature water bath device, AGAR culture medium bracket device, automatic turbidity measurement device, eight-part motion platform device and control system.

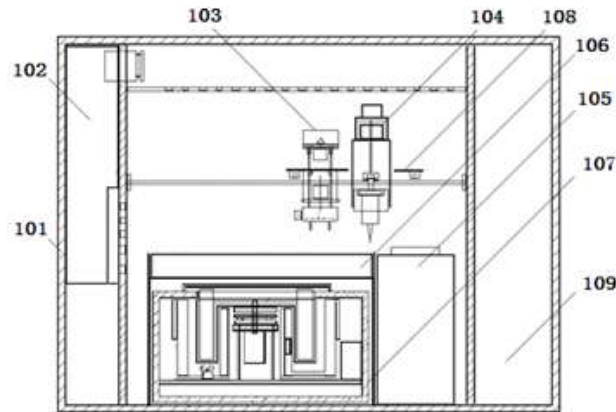


Fig.1 schematic

Automatic sampling system for turbidity

Automatic standard solution for testing and testing, The culture fluid of bacteria, formaldehyde and other solution of the quantitative accurate filling; and can carry out 8 tube at the same time efficient sample.

Wavelength adjustable optical detection system

The wavelength range from 325 to 800nm is arbitrary, and the optical detection system has automatic wavelength correction function.. In addition to the monitoring of the whole process of bacterial liquid growth in the test tube of turbidity method, it can also carry out the determination of the concentration of bacteria suspension, and the spectrophotometric determination of drug.

Multi-function workstation system

1)turbidity method automatic operation, measurement workstation: can realize automatic operation, automatic measurement, automatic recording, automatic display of the test tube bacterial growth curve and absorbance changes;and can be automatically or manually generate test report, standard curve drawing and historical data query function;

2)The automatic measurement workstation of B and bacteria suspension: can realize the concentration of bacteria suspension, read directly the absorbance of the bacteria;

3)spectrophotometry determination workstation: can achieve the transmittance of multi group liquid medicine test, absorbance test and standard curve method test.

Operating system

Through the touch screen to achieve man-machine dialogue, visual operation, simple and easy to understand. Automatic measurement workstation, bacterial suspension measuring workstation and spectrophotometer for measuring multiple workstations with turbidity method.

Air temperature and air cleaning air system (optional) and ultraviolet sterilization system in test chamber

To provide the experiment with the environment of sterile and constant temperature, and guarantee the accuracy of the experiment results. The sterilizing ultraviolet lamp sterilization operation in confined space. Through the PLC temperature adjustment module, the PID temperature adjustment, the error is no more than 0.1 degrees Celsius.

Absorption cell ultra large rotating plate

The test analysis of a batch of samples can be completed at a dose of up to eight batches of samples at the same time for testing.

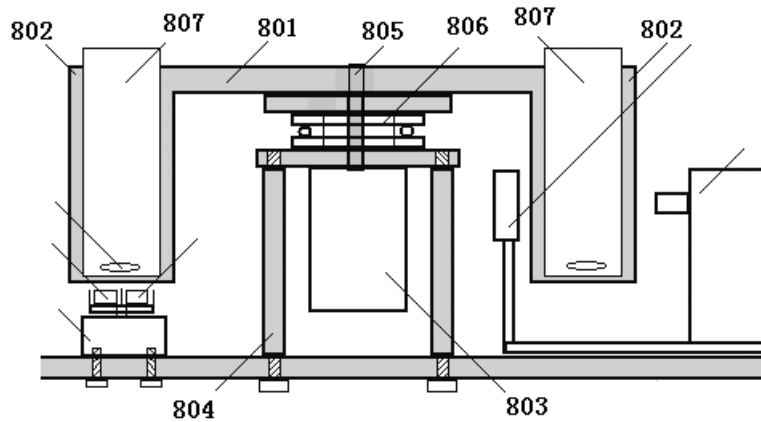


Fig.2 double loop automatic constant temperature device

Control system design

Control system composition

The control system consists of PC and PLC control system, PC in Beijing Kunlun Pass state MCGS as the core, equipped with printers, 8GU disc etc., the operation of the testing instrument for real-time monitoring. Lower machine to Luoyang blue fly PLC as the core, drug control system of spectrophotometer, stepping motor, an electromagnetic relay, a photoelectric switch control.

Control system design

In order to make with 45 absorption pool of super large rotating disk precise positioning, the Sen a stepper motor control: dosing motor retractable arm and put in place, sample end to return to the origin. Therefore, the small power step enter motor control; add formaldehyde kind and need to be accurate to ml, peristaltic pump is controlled by step motor to achieve. A unit of production in Shanghai light photometer need and the PLC serial communication, and the PLC CPU with a Modbus RTU protocol of serial port, therefore need to another with communication port expansion module YF0A-COMM (RS232).

In touch screen click open the photometric button, and the PLC output end is connected with the coil of the relay power, this time luminosity meter electric operation is completed; after touching the screen to send on-line command (connect), PLC and spectrophotometric meter online communication, PLC sends fixed command word to the spectrophotometer, photometric meter according to the provisions of the format of the data return data to the PLC.

PLC through the CPU module comes with RS485 serial port and the serial port support Modicon serial protocol, and Beijing Kunlun Pass state touch screen MCGS communication. The different positions of the large rotary table are distributed according to the numerical value, and the absorption of the light absorption is stored in the different data space of the touch screen.. In the script programs of PC, according to the new edition of the "Pharmacopoeia of antibiotic titer method for the determination of a dose of a group, a dose of second batch, a dose group, the second dose of a group, second dose group, the second dose three batches and three dose analysis calculation. Large rotary table rotates a circle, 45 stations spectrophotometric worth measurement, to make an intermediate results of analysis and calculation, bacteria to enter the natural linear

growth phase automatically the intermediate results of the comprehensive analysis and calculation, and will report intermediate and final result is transmitted to the U disk or network printer to

PLC serial communication with PC MCGS

Because the CPU of the Luoyang LAN flying PLC comes with a serial port, and supports standard Modbus-RTU protocol, the intermediate relay and the output relay with 0 zones, data memory with 4 zones, 1 and 2 districts reserved.

When using Modbus protocol to read write PLC internal double word integer data memory involves a storage format, there are two kinds of storage format: big endian format and the small end of the format. Big endian format used for the project. Communication settings and channel interface.

PLC and spectrophotometer serial communication

Line Interface Command, such as the DOS interface, is the basic form of the communication protocol of the project..

A command uses two basic formats:

1)command word + command end of line (end of the character generally for the Enter key character \r, sixteen 0x0D decimal 13,Here said)

for example: enter characters on-line command, Connect

2)command word + space + parameters + command end of line (end of the character generally for the Enter key \r, sixteen 0x0D decimal 13)

For example: read command (read the current energy energy 20 times), GetE 20ASCII code mode

Data is received and transmitted by ASCII code.. Need to decode and decoding in the PLC side, otherwise the data is incorrect.

MCGS data analysis

A dose method was used in the linear curve method, the two dose method and the three dose method were used to calculate the confidence limits and the credible limit of the results of the experiment and the intermediate report.

The results of the 12 intermediate calculations of the bacteria were calculated and the final report was formed..

Specific calculation formula and method because of space constraints, will not go into the details here, please the contents of the new reference to "the Chinese Pharmacopoeia" 100 page to page 149.

Because of the limited ability of PLC to process data, all data analysis and processing is realized by MCGS.

Experimental results analysis

The whole high degree of automation, instruction input, automatically filling of the base, bacteria liquid, liquid, formaldehyde solution, real-time monitoring of bacterial culture growth dynamic and automatic measurement of the reaction tube bacterium liquid absorption degree, and at the end of the experiment, the automatic data processing and output test report.

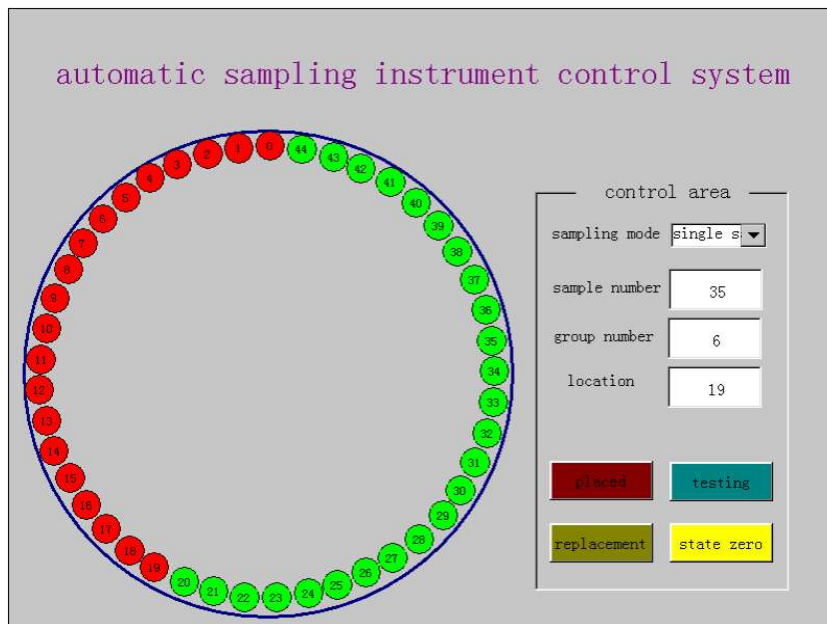


Fig.3 sample control interface

The method can not only carry out the test of the antibiotic turbidity method, but also can carry out the concentration of the bacteria suspension, spectrophotometry, etc.. Since the development of the instrument, has been sold to major hospitals, pharmaceutical companies and drug, reliable results.

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