

Photoelectric Encoder on CNC Machines Troubleshooting and Solutions

CNC machines is the abbreviation of “Computer Numerical Control” machines.

It is an automatic machine tool with program control system. The control system can logically process the programs with control codes or other symbolic instructions, decode them and express them with coded numbers. Next, the coded numbers will be input into the numerical control device through the information carrier.

After calculation and processing, the numerical control device sends out various control signals to control the action of the machine tool. CNC machine can automatically produce parts or other products according to the shape and size specified by the drawings.



Figure 1: A worker operates a CNC cutting machine.

Photoelectric encoder is an important part of the servo system of CNC machines, which serves to detect the displacement and speed of each operating axis, so that the signal result can work and react with each to be a closed-loop system.

For CNC machines, photoelectric pulse encoder is used as the component of speed and position detection, and the failure rate is quite high. The performance of the fault vary according to the exact problems.

In the maintenance practice, we have summarized and classified common errors of photoelectric pulse encoders. We hope our article can help you to solve the photoelectric

pulse encoder problems more easily.



Figure 2: AMCI Encoder DC25F-S2FPRGMCS

1. Understand the Measurement Mode of Encoder

First of all, we need to know the measurement method of the photoelectric encoder on the CNC machine - whether it's direct measurement or indirect measurement?

According to the measurement mode of the equipment, check the components that may be at problem.

1.1 Direct Measurement

Direct measurement means that linear detection elements are used to measure the linear displacement of the CNC machine.

Common detecting elements in direct measurement usually include 3360 linear inductosyn, measuring grating, magnetic ruler and laser interferometer. So you should check these devices for the problem.

1.2 Indirect Measurement

Indirect measurement is the measurement that using rotary detection elements to measure the linear displacement of CNC machines.

Its common inspection elements usually include: photoelectric encoder, resolver, circular inductosyn, circular grating and circular magnetic grating.

When the photoelectric encoder of CNC machines has the following defects, we should consider whether they are caused by the problems of the detection element.

2. CNC Machine Problems and Solutions

2.1 Mechanical Vibration During Acceleration and Deceleration

Pulse Encoder Failure

When you check the encoder, inspect the terminal of the reaction line on the speed unit to see if the voltage drops at a certain point. If it goes down, it means that the pulse encoder (electronic steering wheel) is with problem.

You can replace the photoelectric encoder with a new one to solve this problem.

Cross Slide Coupling Damaged

If the shaft speed is not synchronized with the detected speed, you can also solve it by replacing the photoelectric encoder of the CNC machine.

Tachogenerator Problem

Repair or replace the tachogenerator.

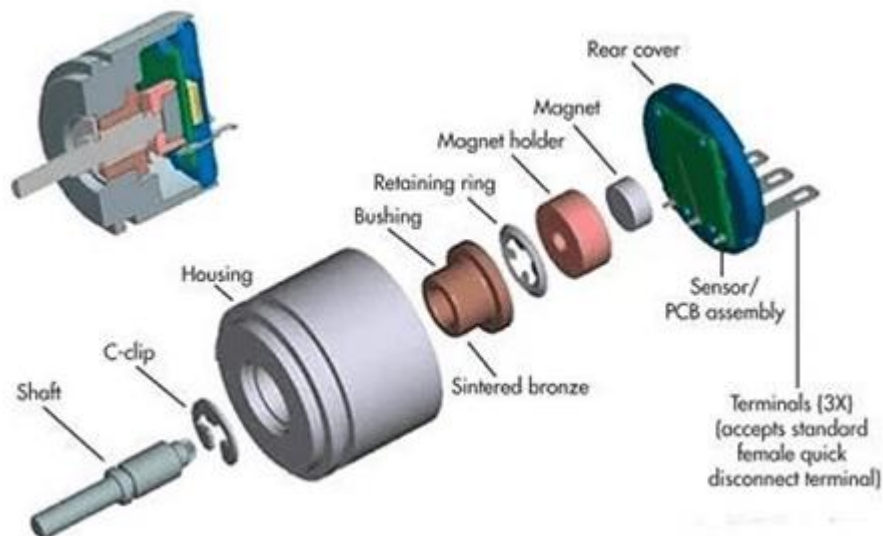


Figure 3: Components of photoelectric encoder.

2.2 Axis Vibration

When you check whether the motor coil is short circuited, whether the mechanical feed screw is well connected with the motor, and whether the servo system is stable as a whole, you also need to check the following 3 problems at the same time: whether the pulse code is good, whether the coupling is stable, and whether the speed machine is firm.

2.3 Spindle not Oriented

When you observe the setting and adjustment of the direction operation circuit, check the direction board, adjust the spindle to operate the printed circuit board, please also inspect whether the direction detector (encoder) is bad, and measure the output waveform of the encoder.

2.4 Mechanical Error of Photoelectric Encoder

When you check the orientation unit and speed unit of the CNC machine, you should check the following parts.

Check whether the wiring of photoelectric encoder (encoder type selection) of CNC machine tool is wrong, and whether the wiring of encoder is positive, and whether phase A and phase B are connected reversely.

Examine whether coupling between the encoder and the CNC machine is damaged. If it is, you should replace a new one.

Confirm whether the excitation signal line is wrong when the terminals of CNC machine and photoelectric encoder speed generator are connected reversely.



Figure 4: Allen-Bradley Encoder 1734-IK

2.5 Alarms Caused by Program and Operation Error

For example, the numerical control alarm 090.091 of FANUC 6ME system is considered to be due to main circuit fault and low feed speed.

Common reasons for the alarms are as follows:

The photoelectric encoder of CNC machine tool is faulty.

The power supply voltage of the encoding device of the CNC machine tool is too low. At present, the power supply voltage is adjusted to 15V, so that the voltage value of the 5V terminal of the main substrate is less than 4.95-5.10V.

There is no one touch signal input to the photoelectric encoder of the CNC machine tool, and the reference point is not fulfilled normally.

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