Spindle

Debugging Instructions

1 Basic operation

1.1 Basic display and operation

Seven-Segment Display:

Key:

MODE ESC Changing MODE (MODE).
Delete (ESC).

SHIFT ENT Shit the setting to the right(SHIFT)。
Confirm the model and numerical(ENT)。
Push this button for 1 more than second when confirming。

Choose servo model.
Reduce digital value (-1).

Choose Servo mode.
Add digital value (+1).

Press "***MODE/ESC***" key to switch between different categories of menus, there are four categories in total

Function menu, including jog, self-learning and other functions;

Monitoring menu, monitoring speed, input port status, current, etc.;

Parameter menu, used to adjust servo parameters;

System status menu, display servo status, alarm information, etc.;

The way to enter various menus is to press and hold the "***SHIIFT/EnT***" key for 3 seconds.

1.2 Parameter change

Use the 

key to adjust the display status to 

, press the  and 

keys to adjust to the parameter that needs to be changed, such as "***Pn-07***", as shown in Figure 1.1. Long press  for 3 seconds to enter the parameter setting interface, as shown in Figure 1.2. Parameters can be added or subtracted through  and  , short press  to choose to change the adjusted digits (ones place, tens place, etc.). After the parameter setting is correct, long press  to complete the parameter setting, and the display will return to "***Pn-07***".

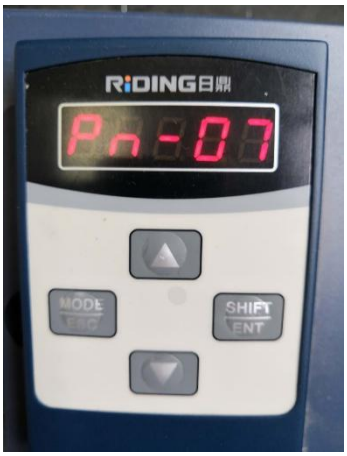

Figure 1.1

Figure 1.2

The method of switching PR parameters: short press the  key, the "***0***" and "***n***" letters in  will flash in sequence, when the "***n***" letter is pressed, press the  key to change "***n***" to "***r***", and continue to short press  key, you can adjust the parameters in the Pr parameter group. The Pr parameter display is shown in Figure 1.3.

Figure 1.3

1.3 Alarm display

OC1 ： Overcurrent 1

OC2 ： Overcurrent 2

OS ： Overspeed

HU ： Overvoltage

EH ： Current sampling loop damage

DE ： Storage error

EC ： Encoder communication

RH1 ： Regeneration resistance

OL ： Overload

OF ： Exceed permissible deviation

AH ： Drive overheating

The alarm can be eliminated by pressing and holding the "***SHIIFT/EnT***" key for 3 seconds to eliminate the alarm.

1.4 Commonly used parameters

No.	Default value and adjustment range	Definition	Need to power off
Pn-04	0 （0~3）	Change the speed direction and encoder signal output direction. When the spindle rotation direction and the system display direction are normal, select 0; when the spindle direction is reversed and the system display is normal, select 1; when the spindle rotation direction is normal and the system display is reversed, select 2; when the spindle rotation direction and system display are both reversed, select 3.	Needed
Pn-07	30（0~400）	Compensation factor	Not needed
Pn-23	35（0~2000）	Zero speed range, affecting parking performance	Not needed
Pn-24	0.010（0~1.000）	Zero speed judgment time, affecting parking performance	Not needed
Pn-25	250（0~400）	Maximum output torque	Not needed
Pn-31	80.0（0.0~3200.0）	Jog speed	Not needed
Pn-33	60.0（0~3200.0）	Preparatory action speed	Not needed
Pn-40	35（1~1000）	Position loop gain parameter	Not needed

Pn-41	55（1~1500）	Speed loop gain parameter	Not needed
Pn-42	40（0~4096）	Speed loop integral parameter	Not needed
Pn-66	0（0~1）	0: Perform pre-positioning action; 1: Do not perform pre-positioning action.	Not needed
Pn-68	35（0~100）	Z-angle self-learning torque	Not needed
Pn-93	10（0~100）	Stop torque limit value	Not needed
Pn-A3	600.0（0.0~3200.0）	Motor rated speed	Needed
Pn-A4	13.00 (0.1~150.00)	Motor rated current	Needed
Pn-B1	2500 (360~2500)	Number of encoder lines. Adjust according to the external encoder model.	Needed
Pr-11	0.4600 (0.0000~1.0000)	Velocity feedforward	Not needed
Pr-38	0 (0~1)	Control mode, 0: Encoder sleeve shaft installation； 1: Encoder gear installation.	Not needed

1.5 Commonly used monitoring

No.	Definition
On-01	Feedback speed (No digital filtering)
On-02	Command speed
On-03	Instantaneous current
On-07	Dc bus voltage
On-08	Encoder angle
On-09	Drive temperature
On-11	Input signal
On-27	Hall UVW value
On-31	Acceleration pulse number *360/10000=angle value
On-32	Deceleration pulse number *360/10000=angle value

2 Debugging instructions

The transformation of the machine according to the steps 2.1-2.4 can effectively avoid various problems. You can also skip 2.1 and 2.2 to directly perform zero alignment (2.3) and angle self-learning (2.4). The new machine can be debugged directly for 2.3 and 2.4 operations. Special attention should be paid to the operation of 2.3 and 2.4 to ensure that the servo enable is disconnected, that is, the alarm state,  or  is displayed.

2.1 Confirm IO connection

When the encoder line is not connected, the driver is in an alarm state at this time, and the digital tube displays EC when it is powered on, as shown in Figure 2.1.

Figure 2.1

Figure 2.2

Press the  key to adjust the display status to  , press the  and  keys to adjust the display to On-11, and press the  key for 3 seconds to enter the display interface. On-11 displays the state of input and output. When the control line is not connected, the normal display state of On-11 is shown in Figure 2.3. Each of the five digital tubes represents an input, and its meaning is shown in Figure 2.4.

Figure 2.3

Figure 2.4

Among the five signals, the forward rotation, reverse rotation, and preparation signals correspond to the keys on the control panel.

The enable signal corresponds to the brake DIP switch on the console. When this bit is equal to 0, the drive is enabled, which is equivalent to the brake disc working state and the motor is locked; when this bit is equal to 1, the drive is disabled and the motor is in a free state.

The main control brake signal is a signal directly connected from the electronic control chip to control the spindle to stop.

Test steps:

Toggle the console brake DIP switch, the fourth digit displayed on On-11 changes between "***0***" and "***1***";

Figure 2.5

a) When the brake DIP switch is valid, press the forward button to test the forward signal, and the On-11 display is shown in Figure 2.6

Figure 2.6

Figure 2.7

b) When the brake DIP switch is valid, press the reverse button to test the reverse signal, On-11 display is shown in Figure 2.7

c) When the brake DIP switch is valid, press the preparation button to test the preparation signal, On-11 display is shown in Figure 2.8

Figure 2.8

2.2 Confirm encoder signal

After the first test is completed, turn off the power of the electric control box. Wait for the spindle drive display to go out completely, then power on again. Toggle the "***brake***" DIP switch of the console until the drive displays P-PoF or n-SoF, as shown in Figure 2.9.

Figure 2.9

Press the M key to adjust the display status to O, press the U and D keys to adjust the display to On-08, and press the E key for 3 seconds to enter the display interface. Manually rotate the main shaft of the machine, and the value of On-08 changes, which means that the encoder wiring is normal, as shown in Figure 2.10. For a 2500-line encoder, the value of On-08 varies from 0 to 9999; for a 360-line encoder, the value of On-08 varies from 0 to 1439.

Figure 2.10

2.3 Zero calibration

When the encoder signal is normal, the mechanical zero position can be calibrated through the display value of On-08. First align the encoder to 0°, then rotate the encoder (the encoder is not fastened at this time), when On-08 displays between 0~30 or 9970~9999, fix the encoder and complete the mechanical zero calibration.

2.4 Angle self-learning

After finishing the mechanical zero point and encoder zero-point adjustment, angle self-learning is required, otherwise various abnormal situations will occur. Angle self-learning

must be performed when the motor is not enabled, that is, the drive displays P-PoF or n-SoF.

The driver can perform self-learning when connected to the faucet, but it is necessary to manually adjust the spindle to a smaller torque range. Then press 

key to 

, press  and  keys to adjust to Fn-15. Long press 

for 3 seconds to display 

(AnL), long press 

again for 3 seconds, and display 
to indicate that the drive has started the angle self-learning process. The angle self-learning is divided into two stages: the first stage 6 items of operation to determine whether the A, B, Z, U, V, W signals are correct, the motor will rotate a small distance at regular intervals; the second stage, the motor will run 6 Seconds, learn Z signal, U, V, W Hall signal. The total time is 32s, and the drive displays 

after completion. The angle self-learning is complete and you can start running.

If 

(FAIL) is displayed during self-learning, it means an error occurred during self-learning. The solution is as follows:

Phenomenon	Solution
Jogging twice or so shows failure	1. Confirm whether the main shaft is at the cam point, which causes the torque to be too large to run; 2. Try to increase the Pn-68 parameter, the maximum value is 50; 3. Change the V phase and W phase of the motor power line;
Jogging multiple times shows failure	1. Confirm whether the main shaft is at the cam point, which causes the torque to be too large to run; 2. Try to increase the Pn-68 parameter, the maximum value is 50;
After continuous running shows failure	1、 Check whether the Hall wire of the motor is well connected 2、 Monitor the UVW Hall value through On-27, and slowly rotate the spindle manually to observe whether the value of On27 contains 1, 2, 3, 4, 5, 6, and 6 values of normal Hall signal are indispensable. If it is missing, it means that the Hall signal line or Hall has a problem

*：In the solution, first try 1. After the description of 1 is eliminated, try 2.

**：If the faucet is heavy, remove the faucet belt.

***：After self-learning, you need to confirm the motor rotation direction and main control angle. If there is a problem, you need to adjust Pn-04.

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