Before installation and commissioning, please read the commissioning manual carefully and operate according to the commissioning steps

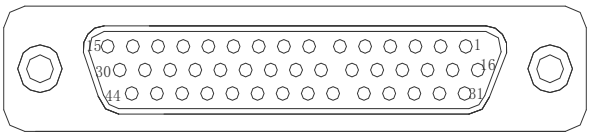
SD500 wiring diagram and commissioning steps

Main circuit wiring:

Braking Resistor + PB	Input Power R S T	Output Motor U V W

Please refer to the manual for the selection of braking resistor resistance and power.

Control circuit CN1 pin definition and wiring diagram:

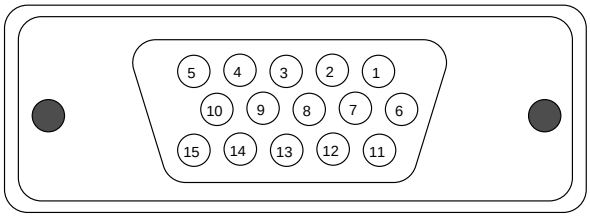


Function	Pin No.	Signal	Function Details	Function	Pin No.	Signal	Function Details
Analog signal input	16	AI2	0～10V Input	**SC is I/O common terminal, 24V and SC shorted-NPN connection**	42	COM	24V power supply ground
	18	AGND	Analog GND		12	24V	Internal 24V+
Pulse signal (AB quadrature, pulse + direction, CW + CCW)	20	PULS+	Pulse command+		27	SC	I/O common terminal
	5	PULS-	Pulse command-	**DI input (If CNC analog and digital are common ground, AGND and COM are shorted)**	11	X1	Forward rotation
	19	SIGN+	Command direction+		26	X2	Reverse rotation
	4	SIGN-	Command direction-		41	X3	Quasi-stop home return
Frequency divider output Connection to system encoder interface	22	OA+	Frequency divider output OA+		10	X4	Speed position switching
	7	OA-	Frequency divider output OA-		15	TA1	Home return arrival signal
	21	OB+	Frequency	**DO output:**	44	TC1	

			divider output OB+		**Y1 and COM form a circuit**			
	6	OB-	Frequency divider output OB-			14	TA2	Fault alarm signals
	36	OZ+	Frequency divider output OZ+			29	TB2	
	35	OZ-	Frequency divider output OZ-			43	TC2	
						13	Y1	Speed and position switching completion signal output

X5~X7 are not listed

CN2 encoder terminal pin definition (standard with dual encoder interface):

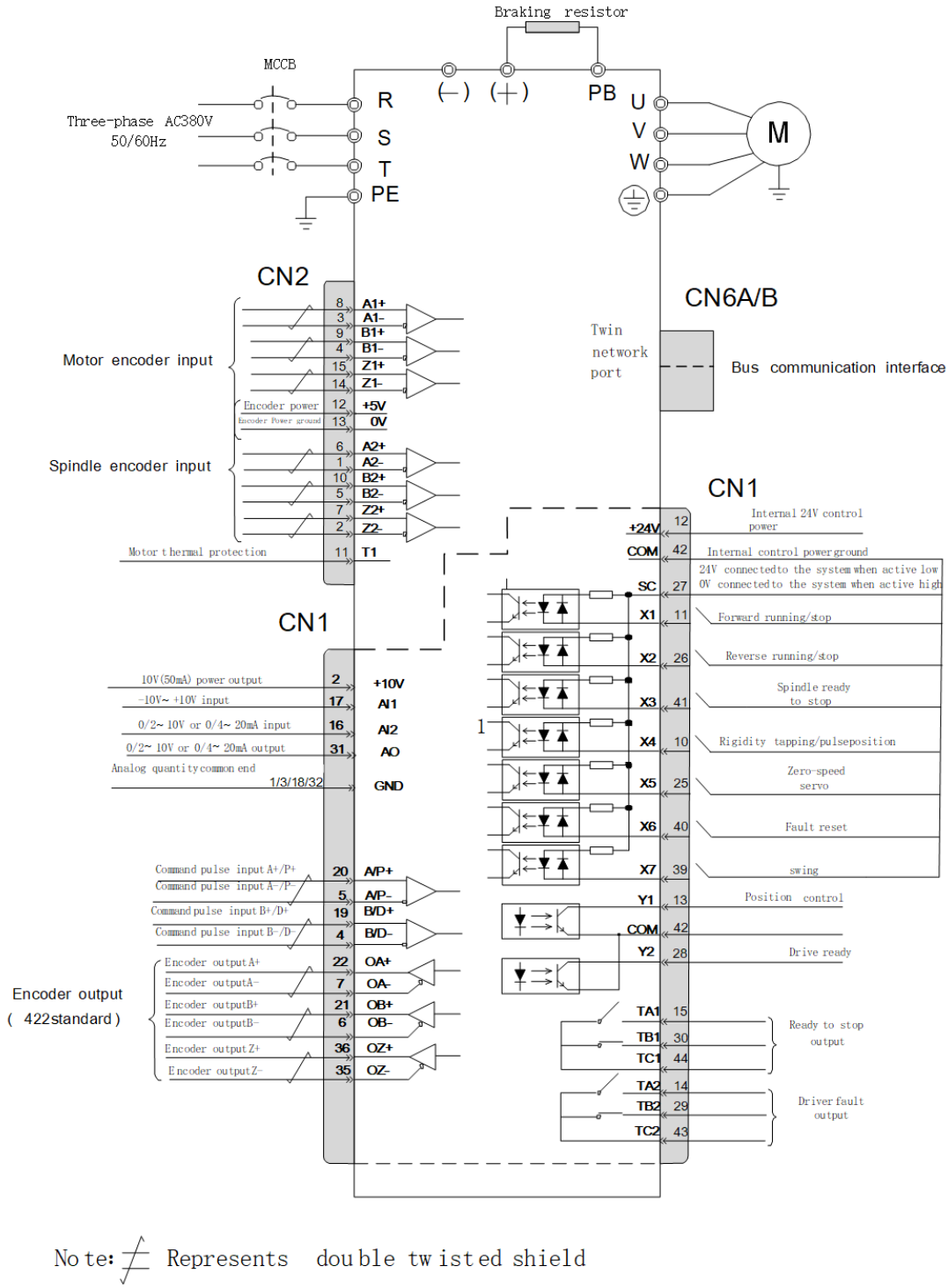


CN2 Encoder Interface					
Pin No.	Signal Name	Function	Pin No.	Signal Name	Function
1	U-	Spindle encoder signal A-	8	A+	Motor encoder signal A+
2	W-	Spindle encoder signal Z-	9	B+	Motor encoder signal B+
3	A-	Motor encoder signal A-	10	V+	Spindle encoder signal B+
4	B-	Motor encoder signal B-	11	T1	Motor overheat
5	V-	Spindle encoder signal B-	12	5V	Encoder power supply 5V
6	U+	Spindle encoder signal A+	13	0V	Encoder power supply 0V
7	W+	Spindle encoder signal	14	Z-	Motor encoder signal Z-

		Z+			
Casing	Shield	-	15	Z+	Motor encoder signal Z+

Whether it is a motor encoder or spindle encoder, if only one encoder is connected, please connect the motor encoder signal. The signal name is different from the following figure, please refer to the pin definition

If the wiring is still unclear, please refer to the basic operation wiring:



Commissioning steps:

Power-on check

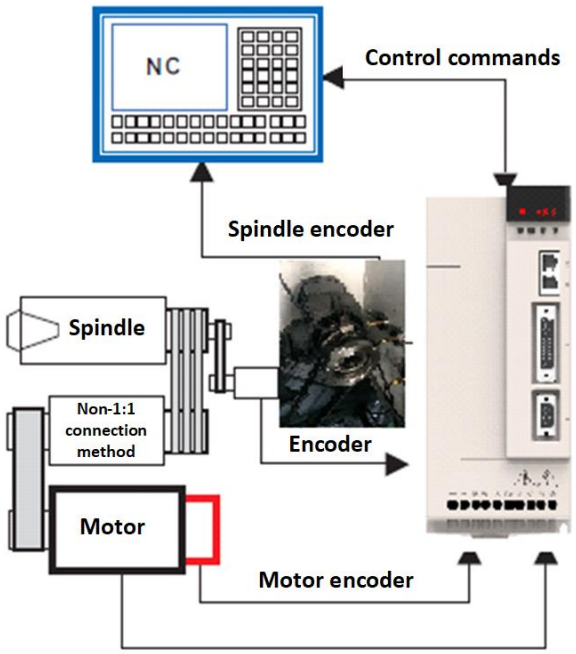
Check whether the main circuit wiring and control circuit wiring are correct before power-on, and check whether there are warnings and fault prompts after power-on.

Please follow the basic operation wiring method to ensure that the required function wiring is consistent with the defined I/O input and output terminals.

Self-learning

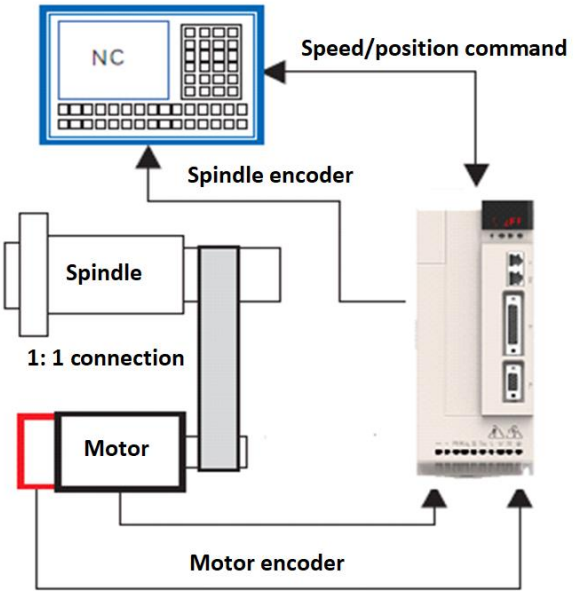
The first step is to determine the application solution for the machine spindle. There are three connection options: dual encoder, single motor encoder, and single spindle encoder.

Dual encoder: Both motor and spindle encoder signals are connected to the CN2 port of the drive, and the drive frequency division output to the CNC, which is suitable for non-1:1 transmission ratio control with high accuracy.



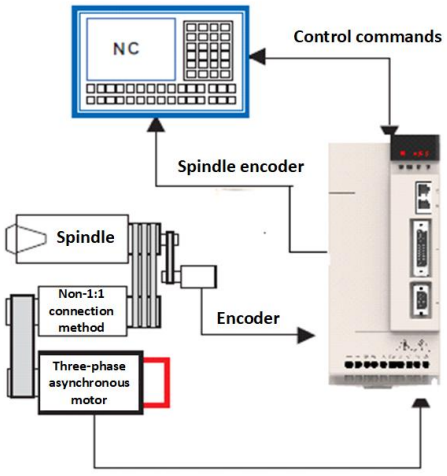
1. Set F02.33 the number of motor encoder cables (If use VEICHI motors, factory default, no need to set again).
2. Set F02.40=2, positioning encoder is selected as spindle encoder;
3. Set F02.43 the spindle encoder wire number.
4. Set F02.45 ones digit = 1, frequency division output spindle encoder signal.
5. Set F02.07=1, and long press SET key for 1s to execute self-learning (self-learning can directly learn the encoder transmission ratio F15.28/29 and write it into the parameter).

Single motor encoder: Connect the motor encoder to the CN2 motor encoder signal, and the drive frequency division output to CNC, suitable for 1:1 transmission ratio.



1. Set F02.33 the number of motor encoder cables (If use VEICHI motor, factory default, no need to set again).
2. Set F02.07=1, and long press SET key for 1s to execute self-learning.

Single spindle encoder: Connect the encoder signal on the mechanical spindle to the CN2 motor encoder signal, and the drive frequency division output to CNC, suitable for non-1:1 transmission ratio with three-phase asynchronous motor, and need to set the transmission ratio manually.



1. Set F02.33 number of encoder cables.
2. Set F02.40=1 to position the encoder selection.
3. Set F02.07=1, and long press SET key for 1s to execute self-learning (self-learning can directly learn the encoder ratio F2.35/36 and write it into the parameter).

Test run

First determine the frequency giving method: full pulse (F01.02=10), analog + pulse, analog (F01.02=3)

Rotation direction

Enable forward rotation, observe whether the direction is correct, if the rotation direction is wrong, the pulse signal is reversed by adjusting F15.02 pulse counting mode, and the analog signal is adjusted by F07.05.

Transmission ratio

If there is a small deviation between the CNC display speed and the commanded speed when running in dual PG mode, fine adjustment can be made by F15.28/F15.29 (after fine adjustment, forward and reverse rotation should be re-enabled).

Speed mode

If speed mode running or stopping sound with strange noise, first ensure that the numerator denominator of the transmission ratio is set correctly and then check the rigidity of F03.00 and F03.01ASR to change 0. It is also appropriate to adjust the speed loop gain (F03.02) lower (the value of F03.02 cannot be lower than 5).

The speed loop gain can be increased appropriately when there is a drop in speed when turning threads.

If the upper limit value of AI2 (C00.17) , the maximum frequency as well as the upper limit frequency needs to be adjusted when the analogue quantity is given, you need to be based on the voltage corresponding to the maximum speed fed back from the CNC system.

When the pulse is given, the pulse type sent by the CNC system should be consistent with the F15.02 parameter. For example, if the system sends a pulse+direction signal, F15.02 needs to be changed to 2 or 6. If the maximum speed does not go up, please increase the default maximum frequency and upper limit frequency.

Position Mode

When the X4 terminal is active, the speed mode is switched to position mode, which is mainly used for the home return of the system to send pulses (SYNTEC（新代）and LNC（宝元）system), indexing, rigid tapping, etc. In the low speed or even very low speed state operation requires a certain rigidity and cannot appear jitter, that is, rigidity cannot be too strong, adjustable speed loop, position ring gain parameters. If vibration or sound noise occurs during operation, please adjust F15.11 (position loop gain) down; if the swing is large after indexing in place, first increase the value of F15.25 (position control ASR proportional gain), then adjust the value of F15.11 (position loop gain), follow the principle of adjusting the inner loop before adjusting the outer loop, and appropriately extend the value of F15.07 (position given smooth filtering time) can reduce the gain After increasing the swing; in high-speed rigid tapping, the position loop gain and position loop feedforward gain need to be increased, for different occasions need to adjust the different gain parameters.

Quasi-stop

After the X3 terminal is active, machines enters the quasi-stop mode, and the rigidity of quasi-stop can be adjusted by F24.20~F24.24 parameters.

Home setting: enter C04.00 to check the current value and keep pressing for 3 seconds, then exit the current value to indicate successful setting.

The Home parameter will be set into F24.07 spindle indexing offset (before 65.10 software version). The 3 terminals X5~X7 (set to 81~83 respectively) can be combined with 8 segments of quasi-stop, and the desired position can be set to F24.08~F24.15 by F04.26 (spindle encoder) or F05.26 (motor encoder) monitoring parameters.

Handling of problems that may be faced

1.Slow quasi-stop speed: increase the value of F24.21 and F24.24 appropriately.

2.Self-learning times reporting E.PG02, probably related to the motor encoder cable number setting error.

3.Pulse speed control electronic gear ratio parameters F15.28, F15.29, pulse position control electronic gear ratio parameters F15.04, F15.05, common positioning encoder transmission ratio F02.35, F02.36;

4.If overshoot occurs in driving electric spindle, single motor PG or dual PG mode at high speed, PI-F03.01:0001 will be turned on, but it is not available in single spindle PG mode, and there will be a clicking noise during operation;

5.The high-speed rigid tapping spindle drive of the drilling center needs to match the Z-axis drive gain. The Z-axis drive gain should be appropriately reduced, the spindle gain should be increased, and the feedforward is the most effective;

FAQ:

Inaccurate running position

In order to machine more complex planes or surfaces, as well as to position to the characteristic precise position of the workpiece, C-axis linkage operation is required. However, customers often report problems with inaccurate position runs on site. In general, there should not be any inaccurate position running without software update or using temporary software.

Cause analysis:

1. The number of received pulses is incorrect;

2. The actual internal control has not arrived (it will not happen under normal circumstances);

Solutions:

1.Determine whether the difference between the command pulse C5.20 received by SD500 and the feedback pulse C4.25 (double PG) or C5.25 run by SD500 is consistent, if consistent, please refer to step 2; if inconsistent, please recalculate according to the electronic gear ratio *C5.20, if there is still a difference, it should be judged whether the force is above the spindle at this time, or whether the position loop gain is extremely small.

2.Determine whether the number of pulses sent by CNC is consistent with the command pulse C5.20 received by SD500; if it is consistent, please re-determine whether the position pulse is wrong; if it is not consistent, it is considered that there is a fault or error at the software setting or hardware circuit at this time.

3.Consider that generally the problem can be solved after the above judgment is determined.

PG fault

Spindle servo drives require higher accuracy than traditional inverters and are generally equipped with one to two encoders with higher numbers of cable. Due to the unevenness of the encoders and the difference of the SD500 software and hardware for each encoder reception, the encoder failure problem often occurs during operation.

Summary of fault type:

1. Encoder Z pulse failure (PG 02/07)
2. Encoder Z pulse loss (PG 10/11)
3. Encoder Z logic failure (PG 08/09)
4. Encoder cable disconnection fault (PG 05/06)

Cause analysis:

1. Cable number setting error;
2. The encoder power signal is not effective, the shield wire is not grounded, and the interference is serious during operation;
3. Poor contact of encoder channel, such as loose contact of connecting wire;
4. Encoder quality problem;

Solutions:

	Z pulse failure	Z pulse loss	Z logic failure	Cable disconnection fault
Fault Display	PG02/07	PG 10/11	PG 08/09	PG 05/06
Fault code	4402/4407	4410/4411	4408/4409	4405/4406
Occurrence probability	Low	High	High	Low
Encoder type		Magnetic ring encoder	Magnetic ring encoder	
Can be shielded or not	Unable to shield	Shieldable F2.46=0	Unable to shield	Shieldable (generally not shielded) F2.38=0
Cause of failure	Cable number setting error	The installation distance of encoder sensor is far , Z pulse width is too narrow	No self-learning, serious field interference, encoder installation	Encoder fault, cable not plugged in
Solution	Re-judge the number of encoder cable	F15.31=1100, otherwise shielded	Reinstall the sensor	Look for wiring and encoder itself problems

Note: 1. The above are incremental encoders; 2. The current faults are mostly magnetic ring encoders, which have a certain relationship with their installation and thickness.

Loud Noise

The drive may generate a large electromagnetic noise during control, which is a poor sensory experience for the user.

Cause analysis:

1. Speed loop gain is too strong;
2. The carrier is low;
3. Mechanical sound;

Solution:

1. Decrease F3.02 and F3.06 for speed control and F15.25 for position control.
2. A small increase in feedback filtering F2.37.
3. Adjust the carrier period F1.40 to 8k.

Note： In case of a parameter disorder, all parameters can be initialized by setting F00.03 to 22.