VC511 wheel cutting special servo function manual

Directory

        Note: The following parameters are for reference only, please set them

Chapter 1 All Parameters of Wheel Cut Control Mode

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.01	Slave axis position command source 0- Standard cam; 1- Special cam; 2- Universal cam; 3- Point cam;`	0-3	0	RW	Reset
P15.02	Current slave axis position command source 0- Standard cam; 1- Special cam; 2- Universal cam; 3- Point cam;	0-3	-	RO	-
P15.03	Spindle position command source 0- XY pulse input; 1- Second encoder input; 2- INFn.71 （DI6） Switch XY pulse \ second encoder input; 3- Simulation input; 4- Infun.71 Toggle XY pulse input/emulation input; 5- Infun. 71 Toggle second encoder input/emulation input;	0-5	0	RW	Reset
P15.04	Median filtering time constant of spindle pulse，units:ms	0-32	2	RW	Reset
P15.05	Low pass filtering time constant of spindle pulse，units:ms	0-128	10	RW	Reset
P15.06	Main shaft circumference，units:0.01mm	0.01-21474836.47	500.00	RW	Immediately
P15.08	Number of pulses per week of spindle , units:clk	1-2147483647	10000	RW	Immediately
P15.10	Slave shaft circumference，unit: 0.01mm	0.01-21474836.47	300.00	RW	Immediately
P15.12	Number of weekly pulses slave axis , units:clk	1-2147483647	10000	RW	Immediately
P15.14	When special CAM is used ， it will automatically switch to standard CAM when cutting short material. 0- Don't switch;	0-1	0	RW	Immediately

	1- Switch;				
P15.15	Low-pass filter time for slave axis speed reference, unit: ms	0-32	1	RW	Immediately
P15.16	Synchronous Angle，units:0.1°	0.0-360.0	30.0	RW	Immediately
P15.17	Angle of waiting position，units:0.1°	0.0-360.0	180.0	RW	Immediately
P15.18	The number of knives per week on the slave axis	1-16	1	RW	Reset
P15.19	CAM curve restart mode 0- No tangency signal， cut length restart CAM curve 1- The pointcut signal is only used to return to zero， and then the cut length is used 2- The tangent signal reopens the CAM curve	0-2	2	RW	Reset
P15.20	Order Source selection 0- don't switch， use order 1 1- DI Select order 2- Cycle switch	0-2	0	RW	Immediately
P15.21	Servo status after order completion 0- Clear all order times and switch the order cycle again 1- Stop from axle in holding position	0-1	0	RW	Immediately
P15.22	Cut the length of order 1，units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P15.24	Cut times of Order 1	0-65535	100	RW	Immediately
P15.25	Cut the length of order 2，units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P15.27	Cut times of Order 2	0-65535	100	RW	Immediately
P15.28	Cut the length of order 3，units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P15.30	Cut times of Order 3	0-65535	100	RW	Immediately
P15.31	Cut the length of order 4，units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P15.33	Cut times of Order 4	0-65535	100	RW	Immediately
P15.34	Order approaching threshold	0-65535	1	RW	Immediately
P15.35	Immediate shear length (sampling length)，	0.01-	300.00	RW	Immedia

	units:0.01mm	21474836.47			tely
P15.37	Modify the cut length step length，units: 0.01mm	0.00-655.35	5.00	RW	Immediately
P15.38	Minimum cut length ， % from shaft circumference	0-6553.5	80	RW	Immediately
P15.39	Electronic cam function bit BIT0 Modify XY pulse direction BIT1 Modify the pulse direction of the second encoder BIT2 Modify the motion direction of the Rotary Cut axis	0-65535	0	RW	Reset
P15.40	Simulation selection 0- Dynamic simulation ， slave axis motion 1- Static simulation，from axis static	0-1	0	RW	Reset
P15.41	Simulation speed，units:0.1m/min	0.1-1000.0	60.0	RW	Immediately
P15.42	Simulation acceleration and deceleration time, unit: 0.1s P15.42 is the time for the slave axis to accelerate from zero speed to 1000.0m/min	0.0-100.0	6.0	RW	Immediately
P15.43	Re-engagement or initial engagement 0－Memory location 1－Cutting length 2－The distance from the color scale to the tangent point 3－Meshing spindle preload P15.45 ，automatically find the tangent point;	0-3	3	RW	Immediately
P15.44	CAM meshing or disengagement acceleration and deceleration time ，units:0.1s	0-6553.5	500.0	RW	Immediately
P15.45	Meshing front amount, unit: 0.01mm During meshing, after the master axis travels the distance of P15.45, the slave axis and the master axis have the same linear speed, and when they encounter the tangent point, they start to run the normal cam.	0.01-21474836.47	150.00	RW	Immediately
P15.47	Cam disengagement stop method 0- Spindle leading amount stops at the waiting position 1－ The leading amount of the slave axis stops at the waiting position 2－ Immediately stop;	0-2	2	RW	Immediately

P15.48	Flying shear compensation coefficient , units:0.1%	50.0-150.0	100.0	RW	Immediately
P15.49	Correction thickness of chord arc , units:mm	0-20	0	RW	Immediately
P15.50	Gear stack percentage，units:0.1%	0.0-30.0	0.0	RW	Immediately
P15.51	Counter 1 source selection A. XXXX，A:Represents the data type，XXXX:Indicates the data address 0.XXXX :no-operation 1.XXXX XXXX : It is a signed 16 bit address 2.XXXX XXXX : Is a signed 32-bit address 3.XXXX XXXX : Is an unsigned 16-bit address 4.XXXX XXXX : Is an unsigned 32-bit address 5.XXXX XXXX : Is the number of DI (XXXX) trigger times 6.XXXX XXXX :Is the number of DO (XXXX) triggers	0.0000-6.5535	0.0000	RW	Immediately
P15.52	Counter 1 real-time value	0-4294967295	-	RO	-
P15.54	Counter 1 reaches its value	0-4294967295	100	RW	Immediately
P15.56	Counter 2 source selection A. XXXX，A:Represents the data type，XXXX:Indicates the data address ，0.XXXX :no-operation，1.XXXX XXXX : It is a signed 16 bit address ，2.XXXX XXXX : Is a signed 32-bit address ，3.XXXX XXXX : Is an unsigned 16-bit address，4.XXXX XXXX : Is an unsigned 32-bit address，5.XXXX XXXX : Is the number of DI (XXXX) trigger times ，6.XXXX XXXX :Is the number of DO (XXXX) triggers	0.0000-6.5535	0.0000	RW	Immediately
P15.57	Counter 2 real-time value	0-4294967295	-	RO	-
P15.59	Counter 2 reaches its value	0-4294967295	100	RW	Immediately
P15.61	Spindle phase shift step length , units: 0.01mm	0.00-655.35	5.00	RW	Immediately

P15.62	Spindle phase shift velocity, units: 0.1m/min	0-6553.5	5.0	RW	Immedia tely
P15.63	Spindle phase shift acceleration and deceleration time, units:0.1s This time is the time from zero speed to 1000m/min. Actual acceleration and deceleration time = speed change/1000*P15.63	0-6553.5	10.0	RW	Immedia tely
P15.64	Jogging speed of slave axis, unit: 0.1m/min	0-6553.5	5.0	RW	Immedia tely
P15.65	Slave axis jog acceleration and deceleration time, units:0.1s	0-6553.5	10.0	RW	Immedia tely
P15.66	The actual number of pulses per week of the slave axis	-2147483648-2147483647	-	RO	-
P15.68	The error of the actual number of pulses per week of the slave axis	-2147483648-2147483647	-	RO	-
P15.70	The cumulative value giving of the number of pulses by the principal axis, units:clk	-2147483648-2147483647	-	RO	-
P15.72	Feed length, units:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.74	Spindle position in current cycle	-21474836.48-21474836.47	-	RO	-
P15.76	Target position of slave axis in current cycle, units:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.78	Slave axis real-time error, units:0.01mm	-21474836.48-21474836.47	-	RO	-
P03.17	Real-time error of slave axis pulse, unit: 0.0001 circle	-2147483648-2147483647	-	RO	-
P15.82	Spindle real time speed, units:0.1m/min	-3276.8-3276.7	-	RO	-
P15.83	Real-time speed of slave axis, units: 0.1m/min	-3276.8-3276.7	-	RO	-
P15.84	Slave axis real time perspective, units: 0.1°	0.0-360.0	-	RO	-
P15.85	Current cut length setting, units:0.01mm	0-21474836.47	-	RO	-
P15.87	Current actual shear length, units:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.89	Current shear length error, units:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.91	Order 1 counts value	0-65535	-	RO	-
P15.92	Order 2 counts value	0-65535	-	RO	-
P15.93	Order 3 counts value	0-65535	-	RO	-
P15.94	Order 4 counts value	0-65535	-	RO	-

P15.95	slave axis weekly of Peak velocity ， units:rpm	-32768-32767	-	RO	-
P15.96	Weekly average torque of slave shaft ， units:0.1%	-3276.8-3276.7	-	RO	-
P15.97	Every weekly peak torque of slave axis，units:0.1%	-3276.8-3276.7	-	RO	-
P15.98	spindle need to compensated of length ， units:0.01mm	-21474836.48-21474836.47	-	RO	-
P16.01	tangent point Signal，units:0.1%	0.0-50.0	30.0	RW	Immediately
P16.02	Enable tangent point correction 0-Disable 1-Enable	0-1	0	RW	Immediately
P16.03	Tangent point correction Angle range ， units:0.1°	0.0°-180.0°	10.0	RW	Immediately
P16.04	The tangent point offsets the origin Angle，units:0.1°	0.0-180.0	0.0	RW	Immediately
P16.05	Automatic correction of the cutlery circumference of the slave axis 0-Disable 1-Enable	0-1	0	RW	Immediately
P16.06	Valid origin trigger count	0-65535	-	RO	-
P16.07	Valid tangent point trigger count	0-65535	-	RO	-
P16.08	Shear cumulative total (can be cleared)	0-4294967295	-	RO	-
P16.10	Shear cumulative total (can not be cleared)	0-4294967295	-	RO	-
P16.12	Cutting width，units:0.01mm	0.00-327.67	0.00	RW	Immediately
P16.13	Cutting width error threshold ， units：0.01mm	0.00-327.67	2.00	RW	Immediately
P16.14	The width of the tangent point detected，units:0.01mm	-327.67-327.67	-	RO	-
P16.15	CAM application mode 0- Cutting length mode 1- Triggering mode 2- Tracking mode	0-2	0	RW	Reset
P16.16	Colour mark function bit BIT0-Whether to chase multiple bids in the window BIT1-The nearest principle is used to calculate the compensation length	0-65535	2	RW	Reset
P16.18	Left window length of colour mark,units:0.01mm	0.00-21474836.47	50.00	RW	Immediately
P16.22	Distance from the colour mark to the tangent point，units:0.01mm	0.00-21474836.47	500.00	RW	Immediately

P16.24	The amount of adjustment from colour mark to tangent point，units:0.01mm	-327.68-327.67	0.00	RW	Immediately
P16.25	The distance of the detected colour mark to the tangent point，units:0.01mm	-21474836.48-21474836.47	-	RO	-
P16.27	The valid range of colour mark standard spacing，units:0.1%	0.0-100.0%	10.0%	RW	Immediately
P16.28	The colour mark standard spacing detected，units:0.01mm	-21474836.48-21474836.47	-	RO	-
P16.30	Colour mark width，units:0.01mm	0.00-655.35	0.00	RW	Immediately
P16.31	Colour mark width error threshold，units: 0.01mm	0.00-655.35	10.00	RW	Immediately
P16.32	The real colour mark width detected，units:0.01mm	0.00-655.35	-	RO	-
P16.35	Number of valid colour marks	0-65535	-	RO	-
P16.43	Number of consecutive lost colour marks	0-65535	-	RO	-
P16.44	Maximum number of lost colour marks allowed	0-65535	2	RW	Immediately
P16.45	Colour mark loss processing mode 0-Only output the DO 1-Enlarge the window search，output DO 2-Colour mark spacing search，output DO 3-Colour mark width search，output DO	0-3	1	RW	Immediately
P16.46	Find the color code afresh and enlarge the window range，units:1mm	0-65535	200	RW	Immediately
P16.48	Enable position error clearing when point cut 0-rising edge 1-falling edge	0-1	0	RW	Immediately
P16.49	Colour mark trace completion threshold，units:0.01mm	0.00-327.67	20.00	RW	Immediately
P16.51	Tool axis reversal disable protection option 0-no prohibition 1-When the spindle reverse speed is greater than P16.52，stop immediately 2-When the reverse speed is greater than P16.52 and the reverse displacement is greater than P16.53，stop immediately 3-Reverse position less than P16.53，slave axis stop，reverse position greater than P16.53，clear the reverse position	0-3	0	RW	Immediately
P16.52	Reverse speed threshold is prohibited of the slave axis，units:0.1m/min	0-6553.5	5.0	RW	Immediately

P16.53	Reverse position threshold is prohibited of the slave axis，units:mm	0-65535	100	RW	Immediately
P16.55	Whether to enable interrupt events 0-Disable 1-Enable	0-1	0	RW	Immediately
P16.56	Interrupt event function selection 0-DI trigger an interrupt and stops in the waiting position 1-DI triggers an interrupt and automatically returns to reengagement engage 2-DI triggers once. When the spindle position is greater than P16.59， the interrupt speed is executed. After returning to the waiting position， can also be used DI to re-engage	0-2	0	RW	Immediately
P16.57	Interrupt event running speed，units:rpm	0-65535	500	RW	Immediately
P16.58	Interrupt event run acceleration and deceleration time，units:ms This time is the time for the slave axis to accelerate from zero speed to rated speed P00.02.	0-65535	500	RW	Immediately
P16.59	Interruption event running lead amount, unit: 0.01mm	0.00-21474836.47	500.00	RW	Immediately
P16.61	CAM Angle The initial Angle of output 1，units:0.1°	0.0-360.0	0.0	RW	Immediately
P16.62	CAM Angle output 1 end Angle，units: 0.1°	0.0-360.0	45.0	RW	Immediately
P16.63	CAM Angle The initial Angle of output 2，units:0.1°	0.0-360.0	90.0	RW	Immediately
P16.64	CAM Angle output 2 end Angle，units: 0.1°	0.0-360.0	135.0	RW	Immediately
P16.65	CAM Angle The initial Angle of output 3，units:0.1°	0.0-360.0	180.0	RW	Immediately
P16.66	CAM Angle output 3 end Angle，units: 0.1°	0.0-360.0	225.0	RW	Immediately
P16.67	CAM Angle The initial Angle of output 4，units:0.1°	0.0-360.0	270.0	RW	Immediately
P16.68	CAM Angle output 4 end Angle，units: 0.1°	0.0-360.0	315.0	RW	Immediately
P16.99	Electronic CAM software version number	-32.767-32.767	-	RO	-
P17.03	The number of the starting section of CAM	1-32767	1	RW	Immedia

	engagement				tely
P17.04	End segment number of CAM meshing	1-32767	10	RW	Immediately
P17.05	Bit output segment number 1	1-32767	1	RW	Immediately
P17.06	Bit output segment number 2	1-32767	2	RW	Immediately
P17.07	Number of running laps	0-65535	0	RW	Immediately
P17.08	Running lap count	0-65535	-	R	-
P17.09	Universal cam disengagement method 0-Disconnect at the end of the current cycle 1-disengagement immediately	0-1	0	RW	Immediately
P17.20	Point cam operation mode 0-Colour mark to trigger 1-The spindle length 2-Dual color mark trigger mode 3-HONGJIN	0-3	0	RW	Reset
P17.21	Colour mark triggers selection 0-Main colour mark 1-Auxiliary colour mark 2-DI switch	0-2	0	RW	Immediately
P17.22	The total length of Slave shaft，unit:0.01mm	0.00-21474836.47	800.00	RW	Immediately
P17.24	Spindle front amount，unit:0.01mm	0.00-21474836.47	800.00	RW	Immediately
P17.26	Acceleration distance of the slave axis，units:0.01mm	0.00-21474836.47	300.00	RW	Immediately
P17.28	Deceleration distance of the slave axis，units:0.01mm	0.00-21474836.47	80.00	RW	Immediately
P17.30	Colour mark window threshold，units:0.01mm	0.00-21474836.47	0.00	RW	Immediately
P17.36	Deceleration mode of Deceleration section 0-Deceleration distance Deceleration P17.28 1-Deceleration time	0-1	0	RW	Immediately
P17.37	Deceleration time in the deceleration phase，units:ms Deceleration time in the deceleration phase，units:ms This time is the time to decelerate from the current speed to zero	0-65535	20	RW	Immediately
P17.38	Whether the deceleration section enables the position loop gain to be zero	0-1	0	RW	Immediately

	0-Disable 1-Enable				
P17.39	Whether to enable position overlay 0-Disable 1-Enable	0-1	0	RW	Immediately
P17.40	Superposition of distance，units:0.01mm	-327.67-327.67	0.00	RW	Immediately
P17.41	Superimposition speed，units:rpm	0-32767	50	RW	Immediately
P17.42	Superimposed acceleration and deceleration time，units:ms	0-65535	50	RW	Immediately
P17.43	Spindle position when superimposed ，units:0.01mm	0.00-21474836.47	0.00	RW	Immediately
P17.45	Point cam the way of the disengagement 0-Disconnect at the end of the current cycle 1-disengagement immediately	0-1	0	RW	Immediately

Chapter 2 Wheel Cut Related Input Function Bits

There are 10 physical DIs in the servo, which are DI1~DI10. Each entity DI can be assigned an input function bit INFn.xx, and the configuration parameters are P06.01-P06.10. The effective level of each entity DI can be set separately, and the setting parameters are P06.21-P06.30. Each entity DI can be forced to input a certain level through P06.14, or a certain DI can be forced to input through the modbus bit.

Note: DI function configuration P06.01-P06.10 and modbus bit communication can only be selected from two.

The internal logic of DI is as shown in the figure below.
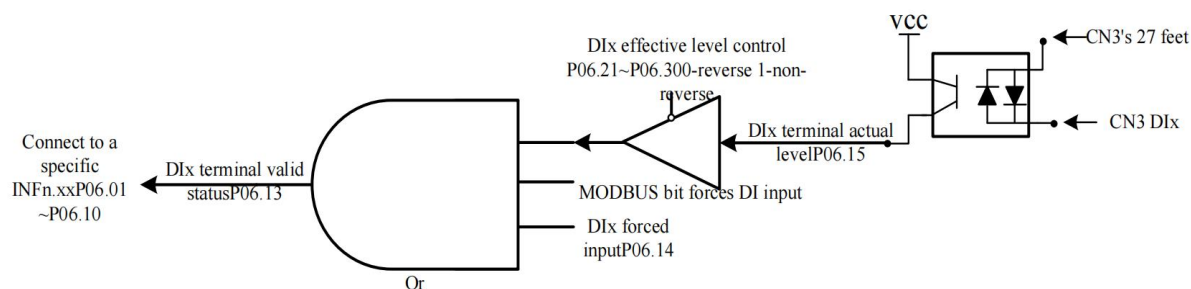
(Remarks: SW-DI: Pin 27 of CN3 is short-circuited with +24V for NPN mode; short-circuit with COM is for PNP mode.)

As can be seen from the above figure, to make the DIx terminal valid, you can modify the actual level of DIx, or set the MODBUS communication bit, or set the mandatory valid register P06.14. If input from an external terminal, a voltage difference of 24V needs to be input between the 27 pin of the servo CN3 terminal and the corresponding DIx pin.

Input Function No.	Parameter Description
INFn.01	Enable the servo
INFn.02	Reset the servo
INFn.171	Spindle position source switching,when it is valid, it comes from the second encoder, and when it is invalid, it comes from XY pulse. Fixed drive DI6.
INFn.172	Cam engagement is enabled, valid when the valid level is high, engages when valid, disengages when invalid
INFn.173	Cam pause signal, valid when the valid level is high; when valid, the slave axis will stop at the waiting position; after the pause is released, the cam is re-engaged
INFn.174	The origin returns to zero, the rising edge is valid, in the disconnected state, enable the servo, trigger INFn.174, find the tangent point, and then return to the waiting position P15.17.
INFn.175	Color mark signal input, fixed driver DI9.

INFn.176	Origin signal input, fixed driver DI10.
INFn.177	Color mark manual shielding input, valid when the valid level is high, When valid, the color mark trigger is invalid
INFn.178	Feed detection signal， valid when the active level is high
INFn.179	Cut the signal immediately， the rising edge is valid
INFn.180	Trigger the interrupt event， the rising edge is valid
INFn.181	Switch from interrupt event to cam mode, cam re-engages, rising edge valid
INFn.182	Clear the number of valid cut points P16.07, valid when the valid level is high
INFn.183	Clear the total cutting times P16.08, order 1 count P15.91, order 2 count P15.92, order 3 count P15.93, order 4 count P15.94, valid when the valid level is high
INFn.184	Clear the color mark count P16.35, valid when the active level is high
INFn.185	The current order count is cleared, valid when the valid level is high
INFn.186	Wheel cut forward jog， valid when the valid level is high
INFn.187	Wheel cut reverse jog， valid when the valid level is high
INFn.188	Spindle Forward jog phase shift， valid when the valid level is high
INFn.189	Spindle reverse jog phase shift， valid when the valid level is high
INFn.196	Enable the servo and enable the cam
INFn.197	Switching between fixed length or tracking
INFn.198	Clear wheel cutting alarm
INFn.199	The point cut is confirmed, the rising edge is valid, For specific usage, please refer to 5.18.
INFn.200	Order toggle switch 1, valid when the active level is high
INFn.201	Order toggle switch 2, valid when the active level is high
INFn.202	Positive phase shift of the spindle, trigger once, the spindle increases the displacement of P15.61, the rising edge is valid
INFn.203	Negative phase shift of the spindle, trigger once, the spindle reduces the displacement of P15.61, the rising edge is valid
INFn.204	Increase the cutting length of the current order, trigger once, the current order increases the length of P15.37, the rising edge is valid
INFn.205	Decrease the cutting length of the current order, trigger once, the current order will reduce the length of P15.37, the rising edge is valid
INFn.206	Counter 1 clearing bit, clearing P15.52, valid when the effective level is high
INFn.207	Counter 2 clearing bit, clearing P15.57, valid when the effective level is high
INFn.208	Clear the lost label count P16.43, valid at the rising edge
INFn.209	Sampling length, the next cycle runs according to the immediate cutting length, the rising edge is valid
INFn.210	Cam emergency stop
INFn.211	In point cam mode, switch to auxiliary color scale. When in effect, a secondary color scale is used.
INFn.212	In point cam mode, auxiliary color scale.

Chapter 3 Wheel Cut Control Mode Output Function Bits

The servo has 6 entity DOs, DO1~DO6 respectively. Each DO can be assigned an output function bit OUTFn.xx, and the configuration parameters are P06.41-P06.46. The effective level of each entity DO can be set individually, or a DO bit can be output through the forced register of P06.50. The effective level output of DO finally drives an optocoupler. Once the optocoupler is turned on, DOx outputs the voltage of pin 11 of CN3 port.
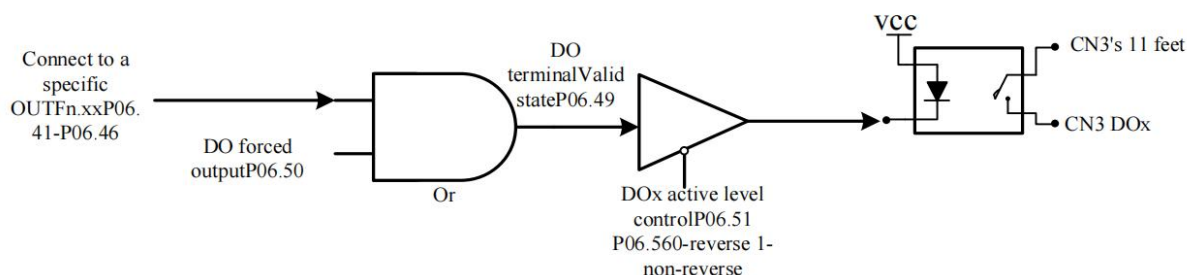
(Note: SW-DO: Pin 11 of CN3 is short-circuited with COM for NPN mode; short-circuited with +24V is for PNP mode.)

Output Function Number	Parameter Description
OUTFn.09	Drive fault
OUTFn.40	Output in meshing state, output valid signal when meshing
OUTFn.41	The output is valid when the slave axis is in the synchronization zone
OUTFn.42	The order is close to the output, When the actual number of cuts of the current order + the order approach threshold P15.34 is greater than or equal to the set times of the current order cut, the output order approach signal
OUTFn.43	Order completion output, when the actual number of cuts of the current order is greater than or equal to the set times of the current order, the order completion signal is output
OUTFn.44	The number of color mark loss reached, When the number of consecutive lost bids P16.43 is greater than or equal to the maximum allowable number of lost bids P16.44, the signal that the number of lost bids has reached is output.
OUTFn.45	Counter 1 reaches the output, When P15.52 is greater than or equal to P15.54,the output counter 1 reaches the signal
OUTFn.46	Cam curve segment output of 2, When P15.57 is greater than or equal to P15.59, the output counter 2 reaches the signal
OUTFn.47	Output angle range 1 of slave axis
OUTFn.48	Output angle range 2 of slave axis

OUTFn.49	Output angle range 3 of slave axis
OUTFn.50	Output angle range 4 of slave axis
OUTFn.51	Color mark trigger valid range output, If the spindle position of the current cam cycle is in the effective window of the color code, it will output a high level.
OUTFn.52	Output signal the colour mark trace success
OUTFn.53	Curve running output
OUTFn.54	Cam curve segment output of 1
OUTFn.55	Cam curve segment output of 2
OUTFn.56	Automatically correct the tangent point output
OUTFn.57	Point Cam allows first color mark triggering
OUTFn.58	Point Cam allows secondary color mark triggering
OUTFn.59	Point Cam Alarm
OUTFn.60	Point cam speed is too fast

Chapter 4 Fault Codes and Solutions

Fault Code	Fault Description	Cause
Er.614	Point cam initialization failed	When the running length of the slave axis is less than (the acceleration length of the slave axis + the deceleration length of the slave axis), this fault is reported.
Er.615	Cam initialization failed	Failed to initialize cam for addition and subtraction distance setting
Er.616	Origin search failed	After four cuts, the origin signal has not been found
Er.620	The initialization of the special cam with optional stop angle of the cutter failed to initialize	The cut length setting is too short, increase the cut length; or select the standard cam mode
Er.621	The waiting position cannot be in the sync zone	When the rotary cutting waiting position angle P15.17 is within the range of the rotary cutting synchronization angle P15.16, this fault is reported
Er.622	Cut short material, color mark tracking cannot use trigger mode	When cutting short material, the trigger mode cannot be used for color mark tracking. The specific length of material that can be cut can be seen through simulation.
Er.613	Slave shaft reverse rotation protection	When the slave axis is reversed, it will be processed according to the options of P16.51
Er.630	Firmware mismatch	ARM firmware does not match FPGA

Chapter 5 Standard cam and special cam function description

Standard cams and special cams have most of the same functions. The main differences are in the following points:

1.The standard cam has the function of cam superimposed gear, and the special cam does not.

2.Standard cams have a chord arc correction function, but special cams do not.

5.1 Order function

The order function can be used to customize different cutting material lengths, and can flexibly switch between different material lengths. Switching between orders can be reached with the DI selection or with the number of cuts. There are signals of order completion output and order close to completion output, and the function of order count clearing can realize repeating the current order.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.20	Order Source selection 0- don't switch， use order 1 1- DI Select order 2- Cycle switch	0-2	0	RW	Immedia tely

Parameter details:

INFn.200	INFn.201	order selection
invalid	invalid	1
valid	invalid	2
invalid	valid	3
valid	valid	4

◆ P15.20=0, Don't switch the order length, just use the length of order 1.

◆ P15.20=1, Select the corresponding order through DI, the DI function number is INFn.200, INFn.201.

◆ P15.20=2, The order first works according to the cutting length of the first group of orders and the first group of cutting times. After the order is completed, it will automatically switch to the second group of orders, and cut in sequence. If the number of the next order is 0, then judge whether the next order is completed. When the 4th group is processed, the system will process it according to the selection of P15.21.

After the order is completed and the processing method.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.21	Servo status after order completion 0-Clear all order times and switch the order cycle again 1-Stop from axle in holding position	0-1	0	RW	Immediately

Note: P15.21 is only valid when P15.20=2.

◆ P15.21=0，After the order is completed, clear the actual cutting times P15.91, P15.92, P15.93, and P15.94 of all orders, and cyclically judge and select the order. If the set number of orders for all orders is 0, select order 1.

◆ P15.21=1，After the order is completed, the slave axis stops at the waiting position.

Order related parameters

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.22	Cut the length of order 1，units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P15.24	Cut times of Order 1	0-65535	100	RW	Immediately
P15.25	Cut the length of order 2，units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P15.27	Cut times of Order 2	0-65535	100	RW	Immediately
P15.28	Cut the length of order 3，units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P15.30	Cut times of Order 3	0-65535	100	RW	Immediately
P15.31	Cut the length of order 4，units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P15.33	Cut times of Order 4	0-65535	100	RW	Immediately
P15.38	Minimum cut length，% from shaft circumference	0-6553.5	80	RW	Immediately

Cut length correction
The cutting length of the current order can be modified according to DI, and each time the modified length is the modified cutting length step length P15.37.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.37	Modify the cut length step length，units: 0.01mm	0.00-655.35	5.00	RW	Immediately

Input Function Number	Parameter Description
INFn.204	Increase the cutting length of the current order, trigger once, the current order increases the length of P15.37, the rising edge is valid
INFn.205	Decrease the cutting length of the current order, trigger once, the current order will reduce the length of P15.37, the rising edge is valid

Order is Approaching

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.34	Order approaching threshold	0-65535	1	RW	Immediately

If the current cutting length is the length of order 1, when the count value of order 1 P15.91+ P15.34>= order 1 cutting times P15.24, the order close to output OUTFn.42 is valid.

Order complete

When the actual number of cuts of the current order >= the set times of the current order, the order completion signal is output.

Output Function Number	Parameter Description
OUTFn.42	The order is close to the output, When the actual number of cuts of the current order + the order approach threshold P15.34 is greater than or equal to the set times of the current order cut, the output order approach signal
OUTFn.43	Order completion output, when the actual number of cuts of the current order is greater than or equal to the set times of the current order, the order completion signal is output

If the current cut length is the length of order 1, when the count value of order 1 P15.91 >= order 1 cutting times P15.24, the order close to output OUTFn.43 is valid.

Related parameters for order monitoring

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.85	Current cut length setting，units:0.01mm	0-21474836.47	-	RO	-
P15.87	Current actual shear length，units:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.89	Current shear length error，units:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.91	Order 1 counts value	0-65535	-	RO	-
P15.92	Order 2 counts value	0-65535	-	RO	-
P15.93	Order 3 counts value	0-65535	-	RO	-
P15.94	Order 4 counts value	0-65535	-	RO	-

5.2 function of Cut the immediately

This function is only valid when the material is long, that is, there is a waiting position. When the slave axis is in the meshing state, and the cutting knife is from the tangent point position to the end of the waiting period, the immediate cutting signal input INFn.179 allows detection. When INFn.179 transitions from invalid to valid, immediate cropping function can be triggered. After triggering the immediate cutting function, the cutting length of the current cam cycle is modified to P15.35. If P15.35 is too small, it cannot follow the normal cutting length of P15.35. For the actual cutting length setting value, please check the current cutting length setting value P15.85

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.35	Immediate shear length (sampling length)，units:0.01mm	0.01-21474836.47	300.00	RW	Immediately

Input Function No.	Parameter Description
INFn.179	Cut the signal immediately, the rising edge is valid

5.3 Sampling length

When the cam is engaged, INFn.209 is triggered, and the next cutting of the system will be cut according to the length of P15.35.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.35	Immediate shear length (sampling length), units:0.01mm	0.01-21474836.47	300.00	RW	Immediately

Input Function No.	Parameter Description
INFn.209	Sampling length, the next cycle runs according to the immediate cutting length, the rising edge is valid

5.4 Simulation function

The simulation function is to virtualize a spindle speed P15.41 from the axis, output relevant data about the cam, and observe the curve through VECObserve, which is convenient for users to debug. There are two simulation modes: 0-Dynamic simulation, no need to input pulse from the master axis, after enabling the slave axis, the slave axis can realize the function of cam, and the slave axis moves; 1-Static simulation, no need to input pulse from the master axis, without enabling the slave axis The slave axis can output cam-related data, but the slave axis is stationary. If simulation is required, P15.03=3, P15.43=1.

Relevant parameters

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.40	Simulation selection 0-Dynamic simulation, slave axis motion 1-Static simulation, from axis static	0-1	0	RW	Reset
P15.41	Simulation speed, units:0.1m/min	0.1-1000.0	60.0	RW	Immediately
P15.42	Simulation acceleration and deceleration time, unit: 0.1s P15.42 is the time for the slave axis to accelerate from zero speed to 1000.0m/min	0.0-100.0	6.0	RW	Immediately

5.5 Selection of special cam stop position

When the slave axis position command source P15.01=0, the slave axis position comes from the standard cam, and the position of the slave axis cycle stop can only be 180°; when the slave axis position command source P15.01=1, the slave axis position source is special cam, The cycle stop position of the slave axis can be the angle P15.17 of the rotary cutting waiting position. Note: P15.17 cannot be located within the synchronization area angle P15.16, otherwise fault Err.611 will be reported..

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.01	Slave axis position command source 0-Standard cam; 1-Special cam; 2-Universal cam; 3-Point cam;	0-3	0	RW	Reset
P15.17	Angle of waiting position，units:0.1°	0.0-360.0	180.0	RW	Immediately

5.6 Standard cam stacking gear function

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.50	Gear stack percentage，units:0.1%	0.0-30.0	0.0	RW	Immediately

When the cam stacking gear is enabled, the speed and position of the slave axis are superimposed by the gear ratio and the cam. The ratio of gear speed and position to the main shaft is P15.50 %.

5.7 Flying shear compensation factor

In order to reduce the shear resistance in the synchronous area during rotary cutting, or the material after shearing can be thrown out slightly faster than the main axis speed. This function is to change the actual linear speed of the slave axis in the synchronization area. When P15.48<100.0%, the line speed of the slave axis synchronization area will be lower than the master line speed. When P15.48>100.0%, the line speed of the slave axis synchronization area will be higher than the master line speed. However, it is not a linear scale, and the specific speed can be seen through simulation. This function is only valid when P15.01=0.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.48	Flying shear compensation coefficient，units:0.1%	50.0-150.0	100.0	RW	Immediately

5.8 Cam angle output

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.61	CAM Angle The initial Angle of output 1，units:0.1°	0.0-360.0	0.0	RW	Immediately
P16.62	CAM Angle output 1 end Angle，units: 0.1°	0.0-360.0	45.0	RW	Immediately
P16.63	CAM Angle The initial Angle of output 2，units:0.1°	0.0-360.0	90.0	RW	Immediately
P16.64	CAM Angle output 2 end Angle，units: 0.1°	0.0-360.0	135.0	RW	Immediately
P16.65	CAM Angle The initial Angle of output 3，units:0.1°	0.0-360.0	180.0	RW	Immediately
P16.66	CAM Angle output 3 end Angle，units: 0.1°	0.0-360.0	225.0	RW	Immediately
P16.67	CAM Angle The initial Angle of output 4，units:0.1°	0.0-360.0	270.0	RW	Immediately
P16.68	CAM Angle output 4 end Angle，units: 0.1°	0.0-360.0	315.0	RW	Immediately

Output Function No.	Parameter Description
OUTFn.47	Slave axis angle range 1 output, when the slave axis real-time angle P15.79 is in the [P16.61, P16.62] range, the output is valid
OUTFn.48	Slave axis angle range 2 output, when the slave axis real-time angle P15.79 is in the [P16.63, P16.64] range, the output is valid
OUTFn.49	Slave axis angle range 3 output, when the slave axis real-time angle P15.79 is in the [P16.65, P16.66] range, the output is valid
OUTFn.50	Slave axis angle range 4 output, when the slave axis real-time angle P15.79 is in the [P16.67, P16.68] range, the output is valid

5.9 Cam engagement function

When the cam engagement enable signal INFn.172 is valid, the system will first engage according to the cam engagement selection method P15.43, and follow the normal cam curve after the engagement is completed.

Re(initial) meshing cut length selection
.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.43	Re-engagement or initial engagement 0-Memory location 1-Cutting length 2-The distance from the color scale to the tangent point 3-Meshing spindle preload P15.45，automatically find the tangent point;	0-3	3	RW	Immediately

Parameter details:
◆ P15.43=0, When this function is selected, the tangent point position will not change whether it is cycle stop or cam pause. The system runs the cam based on the memorized master and slave axis positions.
◆ P15.43=1, Spindle cutting length, select the current order length for cutting.
◆ P15.43=2, After the valid color mark is triggered, the system will cut according to the distance P16.22 from the color mark to the tangent point, and compensate the spindle position so that the cutter cuts at the position of the color mark.
◆ P15.43=3, After the spindle runs from the current position to the length of P15.45, the slave axis and the spindle reach the synchronous line speed until the effective tangent point signal is found, and this position is considered to be the tangent point position, and the cam is activated to cut.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.45	Meshing front amount, unit: 0.01mm During meshing, after the master axis travels the distance of P15.45, the slave axis and the master axis have the same linear speed, and when they encounter the tangent point, they start to run the normal cam.	0.01-21474836.47	150.00	RW	Immediately

P16.22	Distance from the colour mark to the tangent point，units:0.01mm	0.00-21474836.47	500.00	RW	Immediately

Input Function No.	Parameter Description
INFn.172	Cam engagement is enabled, valid when the valid level is high, engages when valid, disengages when invalid

Output Function No.	Parameter Description
OUTFn.40	Output in meshing state, output valid signal when meshing

5.10 Cam Disengagement Function

When INFn.172 is invalid, the system executes the cam disengagement function according to P15.47.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.47	Cam disengagement stop method 0-Spindle leading amount stops at the waiting position 1-The leading amount of the slave axis stops at the waiting position 2-Immediately stop;	0-2	2	RW	Immediately

Parameter details:
◆ P15.47=0, After INFn.172 is invalid, the cam will stop at the waiting position.
◆ P15.47=1, After INFn.172 is invalid, even if the spindle speed is zero, it will automatically stop at the waiting position.
◆ P15.47=2, Stop immediately after INFn.172 becomes invalid.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.17	Angle of waiting position，units:0.1°	0.0-360.0	180.0	RW	Immediately

5.11 Cam Pause Function

The purpose of this function is to control the cam pause through DI (INFn.173) in the cam engagement state. When this DI is valid, the cam will run to the waiting position set by P15.17 and then stop, until this DI is deactivated, after which the cam is re-engaged.

Input Function No.	Parameter Description
INFn.173	Cam pause signal, valid when the valid level is high; when valid, the slave axis will stop at the waiting position; after the pause is released, the cam is re-engaged

5.12 interrupt event

This function can only be triggered and executed when the cam is in the engaged state. When the interrupt event function P16.55 is enabled, the system will choose to execute the interrupt function according to the interrupt event function. The interrupt function is that the slave axis no longer follows the position of the master axis, and runs the running curve according to the interrupt event running speed P16.57 and the interrupt event acceleration and deceleration time P16.58, and finally stops at the waiting position.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.55	Whether to enable interrupt events 0-Disable 1-Enable	0-1	0	RW	Immediately
P16.56	Interrupt event function selection 0-DI trigger an interrupt and stops in the waiting position 1-DI triggers an interrupt and automatically returns to reengagement engage 2-DI triggers once. When the spindle position is greater than P16.59， the interrupt speed is executed. After returning to the waiting position， can also be used DI to re-engage	0-2	0	RW	Immediately

Detailed description of interrupt function:

◆ P16.56=0，After INFn.180 is valid, the slave axis does not run at the position following the master axis, and immediately runs the curve according to the interrupt event running speed P16.57 and the interrupt event acceleration and deceleration time P16.58, and finally stops at the waiting position P15.17.。

◆ P16.56=1，After INFn.180 is triggered once, it will run the interrupt function, and then automatically return to the re-engagement function.

◆ P16.56=2，Length judgment continuous cutting, after INFn.180 is triggered once, when the spindle position is greater than the interrupt event running pre-quantity P16.59, the interrupt function will run, and then stop at the waiting position. When the spindle position is greater than the interrupt event running pre-quantity P16.59, the interrupt function will be run again, and the cycle will continue. When the slave axis runs to the waiting position, it can be switched to the cam engagement mode through INFn.181, and the cam will be engaged according to the re-or initial engagement process P15.43.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.57	Interrupt event running speed， units:rpm	0-65535	500	RW	Immediately
P16.58	Interrupt event run acceleration and deceleration time，units:ms This time is the time for the slave axis to accelerate from zero speed to rated speed P00.02.	0-65535	500	RW	Immediately
P16.59	Interruption event running lead amount, unit: 0.01mm	0.00-21474836.47	500.00	RW	Immediately

Input Function No.	Parameter Description
INFn.180	Trigger the interrupt event， the rising edge is valid
INFn.181	Switch from interrupt event to cam mode, cam re-engages, rising edge valid

5.13 Interference filtering

You can try this function when the spindle input is disturbed, but if the setting is too large, it may cause lag and lead to inaccurate length. Especially when there are multiple axes in coordination, it should not be set too large.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.04	Median filtering time constant of spindle pulse，units:ms	0-32	2	RW	Reset
P15.05	Low pass filtering time constant of spindle pulse，units:ms	0-128	10	RW	Reset
P15.15	Low-pass filter time for slave axis speed reference, unit: ms	0-32	1	RW	Immediately

5.14 Disable the reverse protection

This function is used for tool axis reverse rotation protection. When the spindle pulse is in the negative direction, the system will process it according to the tool axis reverse rotation prohibition protection option P16.51.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.51	Tool axis reversal disable protection option 0-no prohibition 1-When the spindle reverse speed is greater than P16.52，stop immediately 2-When the reverse speed is greater than P16.52 and the reverse displacement is greater than P16.53，stop immediately 3-Reverse position less than P16.53，slave axis stop ，reverse position greater than P16.53，clear the reverse position	0-3	0	RW	Immediately
P16.52	Reverse speed threshold is prohibited of the slave axis，units:0.1m/min	0-6553.5	5.0	RW	Immediately
P16.53	Reverse position threshold is prohibited of the slave axis，units:mm	0-65535	100	RW	Immediately

5.15 Counter function

There are 2 unsigned 32-bit counters in the special servo for wheel cutting
Related parameters.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.51	Counter 1 source selection B. XXXX ， A:Represents the data type ， XXXX:Indicates the data address 0.XXXX :no-operation 1.XXXX XXXX : It is a signed 16 bit address 2.XXXX XXXX : Is a signed 32-bit address 3.XXXX XXXX : Is an unsigned 16-bit address 4.XXXX XXXX : Is an unsigned 32-bit address 5.XXXX XXXX : Is the number of DI (XXXX) trigger times 6.XXXX XXXX :Is the number of DO (XXXX) triggers	0.0000-6.5535	0.0000	RW	Immediately
P15.52	Counter 1 real-time value	0-4294967295	-	RO	-
P15.54	Counter 1 reaches its value	0-4294967295	100	RW	Immediately
P15.56	Counter 2 source selection A. XXXX ， A:Represents the data type ， XXXX:Indicates the data address 0.XXXX :no-operation 1.XXXX XXXX : It is a signed 16 bit address 2.XXXX XXXX : Is a signed 32-bit address 3.XXXX XXXX : Is an unsigned 16-bit address 4.XXXX XXXX : Is an unsigned 32-bit address 5.XXXX XXXX : Is the number of DI	0.0000-6.5535	0.0000	RW	Immediately

	(XXXX) trigger times 6.XXXX XXXX :Is the number of DO (XXXX) triggers				
P15.57	Counter 2 real-time value	0-4294967295	-	RO	-
P15.59	Counter 2 reaches its value	0-4294967295	100	RW	Immediately

Related input function bits

Input Function No.	Parameter Description
INFn.206	Counter 1 clearing bit, clearing P15.52, valid when the effective level is high
INFn.207	Counter 2 clearing bit, clearing P15.57, valid when the effective level is high

Related output function bits

Output Function No.	Parameter Description
OUTFn.45	Counter 1 reaches the output, When P15.52 is greater than or equal to P15.54,the output counter 1 reaches the signal
OUTFn.46	Cam curve segment output of 2, When P15.57 is greater than or equal to P15.59, the output counter 2 reaches the signal

5.16 Origin return function

This function can only be run when the cam is disconnected. After configuring the origin return enable signal INFn.174 and the origin signal input INFn.176, enable the servo, trigger the INFn.174 to be valid, and the servo will run at the speed of P15.64 , until INFn.176 is valid, after continuing to run the origin offset tangent point angle P16.04, this point is the tangent point, and then continue to run to the rotary cutting waiting position P15.17. If the position of the tangent point is incorrect, you can modify the physical position of the origin signal or modify the origin offset tangent point angle P16.04.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.04	The tangent point offsets the origin Angle，units:0.1°	0.0-180.0	0.0	RW	Immediately
P15.64	Jog speed of from axis，units:0.1m/min	0-6553.5	5.0	RW	Immediately
P15.65	Slave axis jog acceleration and deceleration time，units:0.1s	0-6553.5	10.0	RW	Immediately

Input Function No.	Parameter Description
INFn.174	The origin returns to zero, the rising edge is valid, in the disconnected state, enable the servo, trigger INFn.174, find the tangent point, and then return to the waiting position P15.17.
INFn.176	Origin signal input, fixed driver DI10.

5.17 Wheel cut jog function

When the cam is disengaged, the slave axis can be jogged by triggering INFn.186 and INFn.187. After encountering the origin signal, when the cutter tip is at the tangent position, trigger INFn.199, and the system will automatically record Tangent point position, and automatically calculate the angle P16.04 that the tangent point offsets the origin.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.04	The tangent point offsets the origin Angle，units:0.1°	0.0-180.0	0.0	RW	Immediately
P15.64	Jogging speed of slave axis, unit: 0.1m/min	0-6553.5	5.0	RW	Immediately
P15.65	Slave axis jog acceleration and deceleration time，units:0.1s	0-6553.5	10.0	RW	Immediately

Input Function No.	Parameter Description
INFn.199	The point cut is confirmed, the rising edge is valid, For specific usage，please refer to 5.18.
INFn.186	Wheel cut forward jog，valid when the valid level is high
INFn.187	Wheel cut reverse jog，valid when the valid level is high

5.18 Cam important parameter monitoring

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.02	Current slave axis position command source 0-Standard cam; 1-Special cam; 2-Universal cam; 3-Point cam;	0-3	-	RO	-
P15.66	The actual number of pulses per week of the slave axis	-2147483648-2147483647	-	RO	-
P15.68	The error of the actual number of pulses per week of the slave axis	-2147483648-2147483647	-	RO	-
P15.70	The cumulative value giving of the number of pulses by the principal axis，units:clk	-2147483648-2147483647	-	RO	-
P15.72	Feed length，units:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.74	Spindle position in current cycle,unit:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.76	Target position of slave axis in current cycle，units:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.78	Slave axis real-time error，units:0.01mm	-21474836.48-21474836.47	-	RO	-
P03.17	Real-time error of slave axis pulse, unit: 0.0001 circle	-2147483648-2147483647	-	RO	-
P15.82	Spindle real time speed，units:0.1m/min	-3276.8-3276.7	-	RO	-
P15.83	Real-time speed of slave axis，units：0.1m/min	-3276.8-3276.7	-	RO	-
P15.84	Slave axis real time perspective，units:0.1°	0.0-360.0	-	RO	-
P15.85	Current cut length setting，units:0.01mm	0-21474836.47	-	RO	-

P15.87	Current actual shear length , units:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.89	Current shear length error , units:0.01mm	-21474836.48-21474836.47	-	RO	-
P15.91	Order 1 counts value	0-65535	-	RO	-
P15.92	Order 2 counts value	0-65535	-	RO	-
P15.93	Order 3 counts value	0-65535	-	RO	-
P15.94	Order 4 counts value	0-65535	-	RO	-
P15.95	slave axis weekly of Peak velocity , units:rpm	-32768-32767	-	RO	-
P15.96	Weekly average torque of slave shaft , units:0.1%	-3276.8-3276.7	-	RO	-
P15.97	Every weekly peak torque of slave axis，units:0.1%	-3276.8-3276.7	-	RO	-
P15.98	spindle need to compensated of length，units:0.01mm	-21474836.48-21474836.47	-	RO	-
P16.06	Valid origin trigger count	0-65535	-	RO	-
P16.07	Valid tangent point trigger count	0-65535	-	RO	-
P16.08	Shear cumulative total (can be cleared)	0-4294967295	-	RO	-
P16.10	Shear cumulative total (can not be cleared)	0-4294967295	-	RO	-
P16.25	The distance of the detected colour mark to the tangent point , units:0.01mm	-21474836.48-21474836.47	-	RO	-
P16.28	The colour mark standard spacing detected，units:0.01mm	-21474836.48-21474836.47	-	RO	-
P16.32	The real colour mark width detected , units:0.01mm	0.00-655.35	-	RO	-
P16.35	Number of valid colour marks	0-65535	-	RO	-
P16.43	Number of consecutive lost colour marks	0-65535	-	RO	-

5.19 Point cut related functions

Note: The tangent point (origin) signal input port is fixed on the servo DI10.

Cut point masking

As an external DI input signal, it is often disturbed. In order to filter out this interference, this masking setting can be sampled, and P16.07 is incremented by 1 when the tangent point is valid.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.01	tangent point Signal，units:0.1%	0.0-50.0	30.0	RW	Immediately

Parameter description: Valid range of tangent point:

$$\left| \frac{\text{Cut point signal position - Theoretical cut point position}}{\text{The number of pulses per week for the slave axis}} \right| \le 0.5 \times P16.01$$

Cut point width

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.12	Cutting width，units:0.01mm	0.00-327.67	0.00	RW	Immediately
P16.13	Cutting width error threshold ， units : 0.01mm	0.00-327.67	2.00	RW	Immediately
P16.14	The width of the tangent point detected， units:0.01mm	-327.67-327.67	-	RO	-

If P16.12 is not zero,|P16.12- P16.14|<= P16.13, is a valid cut point.

If P16.12 is zero, the rising edge is a valid trigger.

Slave axis of tangent offset correction

When the initial position is uncertain, the calculated synchronization area is not in one-to-one correspondence with the actual synchronization area required by the actual knife stick. At this time, it is feasible to use this function.

When the tangent point correction enable P16.02=1, the slave axis tangent point offset correction is enabled. When the |tangent point signal offset angle of the theoretical tangent point| is greater than the tangent point correction angle range P16.03, adjust the tangent point signal To the midpoint of the synchronization area, if it is less than, it will not be corrected. Frequent adjustments may result in inaccurate cut lengths. Note: This function is only valid when P15.19=1 is selected for the tangential restart curve.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.02	Enable tangent point correction 0-Disable 1-Enable	0-1	0	RW	Immediately
P16.03	Tangent point correction Angle range， units:0.1°	0.0°-180.0°	10.0	RW	Immediately

tangent point offset origin angle

Sometimes the origin (tangent point) signal cannot be installed at the real tangent point position due to the limitation of physical structure. At this time, P16.04 can be adjusted to make the tangent point in a reasonable position.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.04	The tangent point offsets the origin Angle，units:0.1°	0.0-180.0	0.0	RW	Immediately

Automatic correction of cutter circumference

When the setting of the perimeter of the cutter is not accurate, there will be a phenomenon of deviation. At the same time, when the precision of the perimeter of the cutter cannot meet the requirements, this function can be used to automatically correct the perimeter of the cutter. To use this function, there must be an origin signal (INFn.176), and it is corrected by the origin signal. When the following conditions are met, the correction will be performed automatically.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.05	Automatic correction of the cutlery circumference of the slave axis 0-Disable 1-Enable	0-1	0	RW	Immediately

tangent point count function

When the tangent point is valid, the effective cut point trigger count P16.07 increases by 1.

In the meshing state, the accumulated total count P16.08 of one shearing at the over cut point is increased by 1.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.06	Valid origin trigger count	0-65535	-	RO	-
P16.07	Valid tangent point trigger count	0-65535	-	RO	-
P16.08	Shear cumulative total (can be cleared)	0-4294967295	-	RO	-
P16.10	Shear cumulative total (can not be cleared)	0-4294967295	-	RO	-

Input Function No.	Parameter Description
INFn.176	Origin signal input, fixed driver DI10.
INFn.183	Clear the total cutting times P16.08, order 1 count P15.91, order 2 count P15.92, order 3 count P15.93, order 4 count P15.94, valid when the valid level is high

5.20 Color scale related functions

Note: The color mark signal input port is fixed on servo DI9.

For the reference color punctuation points, when engaging for the first time, (P16.33+1) color scales are automatically used as the reference color punctuation points. When selecting the reference color mark point, if the material has an interfering color mark, manually shield the input bits through the INFn.177 color mark, and shield those invalid color marks. When the effective color mark is about to be triggered by visual inspection, INFn.177 is invalid, and the color mark is valid when it is triggered Color code.

The system waits for the meshing to be completed before the left and right windows of the color scale will work.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.18	Left window length of colour mark,units: 0.01mm	0.00-21474836.47	50.00	RW	Immediately

Color mark width

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.30	Colour mark width，units:0.01mm	0.00-655.35	0.00	RW	Immediately
P16.31	Colour mark width error threshold，units: 0.01mm	0.00-655.35	10.00	RW	Immediately
P16.32	The real colour mark width detected，units:0.01mm	0.00-655.35	-	RO	-

If P16.30=0.00, the color code is valid on the rising edge.

If P16.30 is not equal to 0, the detected color scale width must satisfy | P16.30-P16.32|<= P16.31, and the color scale is valid.

Note: Neither the color code width nor the error threshold of the color code width can be zero.

Bid selection function

In the effective window, you can set the conversion relationship between the cutting length and the color code spacing to separate the color code.

Note: For example, if one color code is separated, set the cutting length of P15.22 order 1 to twice the color code spacing. If two color codes are separated, set the cutting length of P15.22 order 1 to three times the color code spacing.

This function is used when there are other color codes near the color code to be tracked. At this time, the window setting is narrow, and it is easy to select the wrong color code to track.

Color mark tracking method selection

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.15	CAM application mode 0-Cutting length mode 1-Triggering mode 2-Tracking mode	0-2	0	RW	Reset

Parameter details:

◆ P16.15=0, do not track the color mark, and go to the normal cut length mode.

◆ P16.15=1, color mark trigger mode, window shielding method is invalid, DI shielding is valid; and this function can only be used when cutting long materials, when the (P16.33+1)th color mark is triggered, the system It will adjust the position according to the distance from the color mark to the tangent point, and cut to the position of the color mark.

◆ P16.15=2, in this mode, the color mark spacing should be uniform, and the color mark shielding method can be manual or automatic.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.22	Distance from the colour mark to the tangent point，units:0.01mm	0.00-21474836.47	500.00	RW	Immediately
P16.24	The amount of adjustment from colour mark to tangent point，units:0.01mm	-327.68-327.67	0.00	RW	Immediately
P16.25	The distance of the detected colour mark to the tangent point，units:0.01mm	-21474836.48-21474836.47	-	RO	-

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.35	Number of valid colour marks	0-65535	-	RO	-

When INFn.184 is valid, P16.35 is cleared.

Input Function No.	Parameter Description
INFn.175	Color mark signal input, fixed driver DI9.
INFn.177	Color mark manual shielding input, valid when the valid level is high, When valid, the color mark trigger is invalid
INFn.184	Clear the color mark count P16.35, valid when the active level is high

5.21 Color mark is lost, how to deal with it

This function can only be used in color mark tracking mode. When the number of continuously lost color marks P16.43 is greater than or equal to the maximum allowable number of lost color marks P16.44, the servo will process the lost marks according to the selection of P16.45.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.43	Number of consecutive lost colour marks	0-65535	-	RO	-
P16.44	Maximum number of lost colour marks allowed	0-65535	2	RW	Immediately
P16.45	Colour mark loss processing mode 0-Only output the DO	0-3	1	RW	Immediately

	1-Enlarge the window search，output DO 2-Colour mark spacing search，output DO 3-Colour mark width search，output DO				
P16.46	Find the color code afresh and enlarge the window range，units:1mm	0-65535	200	RW	Immediately

Parameter details:

◆ P16.45=0, After the label is lost, only output OUTFn.44 is valid.

◆ P16.45=1, After losing the mark, expand the window and find the mark again. After the normal color mark is found and can catch up with the color mark, the color mark masking area is restored to the initial value set by the user.

◆ P16.45=2, After losing the mark, judge whether the color mark is a valid color mark according to the error between the color mark spacing and the cut length. If it is invalid, continue to search for the mark. If it is valid, find a normal color mark and catch up with the color mark. Restores to the initial value set by the user.

◆ P16.45=3, When the width of the color patch meets the error range of the set value, the normal color patch is found.

Input Function No.	Parameter Description
INFn.208	Clear the lost label count P16.43, valid at the rising edge

Output Function No.	Parameter Description
OUTFn.44	The number of color mark loss reached, When the number of consecutive lost bids P16.43 is greater than or equal to the maximum allowable number of lost bids P16.44, the signal that the number of lost bids has reached is output.

5.22 Master and slave axis position and direction change

Parameter P15.39 can change the pulse direction of the master axis and the motion direction of the slave axis.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.39	Electronic cam function bit BIT0 Modify XY pulse direction BIT1 Modify the pulse direction of the second encoder BIT2 Modify the motion direction of the Rotary Cut axis	0-65535	0	RW	Reset

5.23 Standard cam chord arc compensation function

For the occasions where the shearing material thickness is large, the chord arc correction function is required. This function only needs to enter a material thickness. When P15.49=0, this function is not activated. This function is only valid when P15.01=0 standard cam.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.49	Correction thickness of chord arc，units:mm	0-20	0	RW	Immediately

5.24 Spindle phase shift function

This function can move the spindle phase through DI. When DI is triggered, the spindle position will increase or decrease the length of P15.61. Sometimes it is impossible to confirm that the phase shift is required, and the position can be generated from a fixed phase shift speed by means of DI jogging and compensated to the spindle.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.61	Spindle phase shift step length，units: 0.01mm	0.00-655.35	5.00	RW	Immediately
P15.62	Spindle phase shift velocity ， units :	0-6553.5	5.0	RW	Immediately

	0.1m/min				
P15.63	Spindle phase shift acceleration and deceleration time，units:0.1s This time is the time from zero speed to 1000m/min. Actual acceleration and deceleration time = speed change/1000*P15.63	0-6553.5	10.0	RW	Immediately

Input Function No.	Parameter Description
INFn.202	Positive phase shift of the spindle, trigger once, the spindle increases the displacement of P15.61, the rising edge is valid
INFn.203	Negative phase shift of the spindle, trigger once, the spindle reduces the displacement of P15.61, the rising edge is valid
INFn.188	The spindle forward the jog phase, and when DI is valid, the servo compensates to the spindle at the forward compensation speed of P15.62.
INFn.189	The spindle reverses the jog phase, and when DI is valid, the servo compensates to the spindle at the reverse compensation speed of P15.62.

Chapter 6 Standard Cam and Special Cam Trial Operation
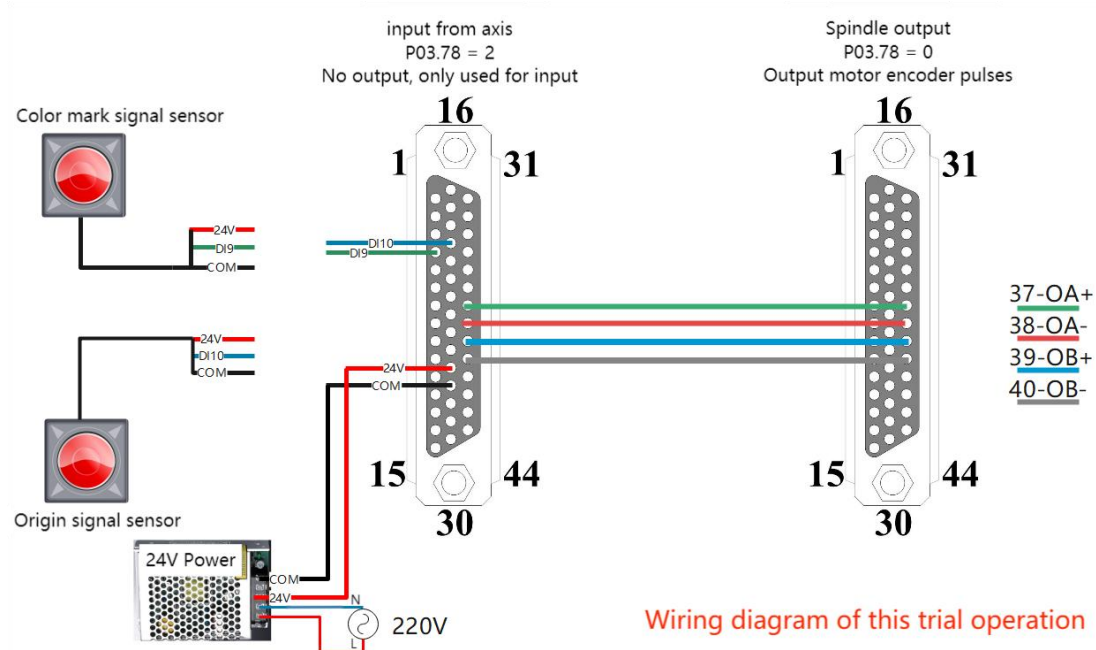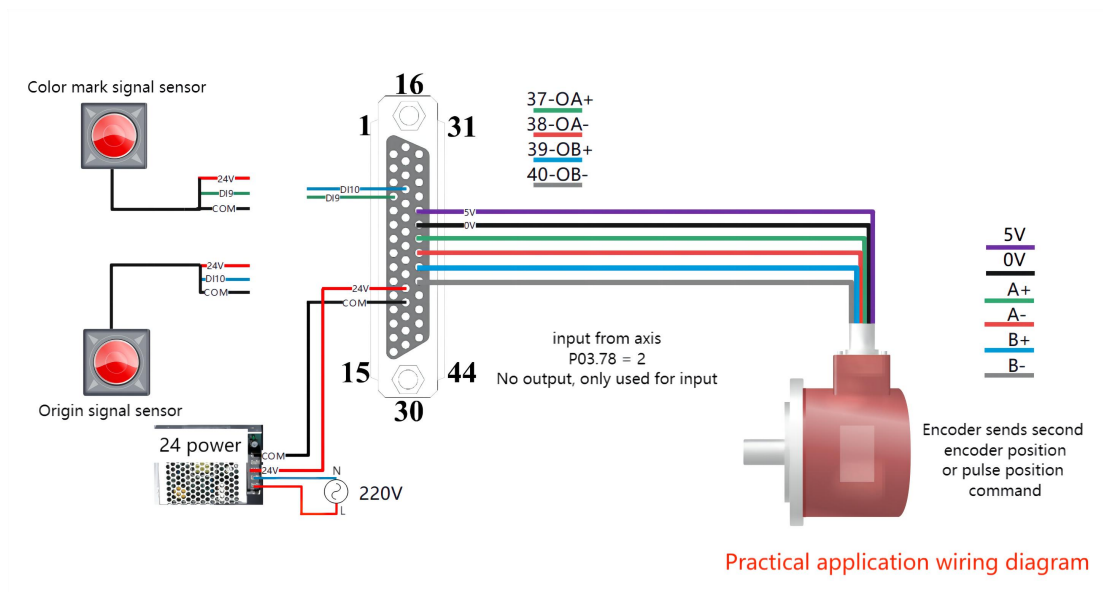
Setting Procedure

6.1 Cut length mode

Note: The following parameters are for reference only, please set them according to the actual mechanical parameters.

6.1.1 wiring

Select the wiring method according to the source of the spindle position command. The second encoder input is selected as an example below

① The P03.78 of the spindle servo is set to 0 - the pulse of the motor encoder is output.

② P03.78 of the slave axis servo is set to 2-no output, and it is used as input.

③ P02.01 of slave axis servo = 7 special control mode.

④ Connect the 37~40 pins (AO+, AO-, BO+, BO-) of the CN3 signal input and output end of the main axis, and the 37~40 pins (AO+, AO-, BO+, BO-) of the CN3 signal input and output end of the slave axis) are in one-to-one correspondence.

⑤ P06.10 = 176, configure DI10 as 176-round cut origin signal input, the input bit of this function is fixed at DI10.

⑥ After configuring DI9 and DI10, you need to connect the color mark signal and cut point signal sensor to DI9 and DI10.

Wiring diagram of this trial operation

37-OA+
38-OA-
39-OB+
40-OB-

5V
0V
A+
A-
B+
B-

input from axis
P03.78 = 2
No output, only used for input

Encoder sends second
encoder position
or pulse position
command

Practical application wiring diagram

6.1.2 Select master and slave axis position source

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.01	Slave axis position command source 0-Standard cam; 1-Special cam; 2-Universal cam; 3-Point cam;	0-3	0	RW	Reset
P15.03	Spindle position command source 0-XY pulse input; 1-Second encoder input; 2-INFn.71 （ DI6 ） Switch XY pulse \ second encoder input; 3-Simulation input; 4-Infun.71 Toggle XY pulse input/emulation input; 5-Infun. 71 Toggle second encoder input/emulation input;	0-5	0	RW	Reset
P15.39	Electronic cam function bit BIT0 Modify XY pulse direction BIT1 Modify the pulse direction of the second encoder BIT2 Modify the motion direction of the Rotary Cut axis	0-65535	0	RW	Reset

Set P15.01=0 to select standard cam.

P15.03=1, the spindle position comes from the second encoder input, namely pins 37, 38, 39, and 40 of the CN3 interface, set P03.78=2.

If P15.03=0, the spindle position comes from the XY pulse input, that is, pins 31, 32, 33, and 34 of the CN3 interface. It is necessary to set P03.02 to select the XY pulse type.

P15.01 = 0 Select Standard Cam.

P15.03 = 1 Select the second encoder input.

P15.39 = 2 Change the direction of the second encoder (make the accumulated value of the pulse number of P15.70 spindle feed positive).

6.1.3 Set the mechanical parameters

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.06	Main shaft circumference, units:0.01mm	0.01-21474836.47	500.00	RW	Immediately
P15.08	Number of pulses per week of spindle, units:clk	1-2147483647	10000	RW	Immediately
P15.10	Slave shaft circumference, unit: 0.01mm	0.01-21474836.47	300.00	RW	Immediately
P15.12	Number of weekly pulses slave axis, units:clk	1-2147483647	10000	RW	Immediately
P15.16	Synchronous Angle, units:0.1°	0.0-360.0	30.0	RW	Immediately
P15.17	Angle of waiting position, units:0.1°	0.0-360.0	180.0	RW	Immediately
P15.18	The number of knives per week on the slave axis	1-16	1	RW	Reset

P15.06 = 170 Spindle circumference length (fill in according to the mechanical parameters, if the value is too large or too small, it will affect the accuracy of the system when it is working).

P15.08 = 10000 The number of pulses of the spindle per week (fill in according to the number of pulses for one revolution of the spindle motor).

P15.10=120 The circumference of the slave shaft (fill in according to the mechanical parameters).

P15.12 = 10000 The number of pulses per week of the slave axis (fill in according to the number of pulses in one revolution of the motor).

6.1.4 Cam Curve Restart Selection

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.19	CAM curve restart mode 0-No tangency signal， cut length restart CAM curve 1-The pointcut signal is only used to return to zero， and then the cut length is used 2-The tangent signal reopens the CAM curve	0-2	2	RW	Reset

P15.19 = 1, cam curve restart selection 1-point cut signal is only used for returning to zero, and then the number of pulses per week is used. (Install the origin signal, configure DI10 as INFn.176, set P15.19=1, the cut point signal is only used for returning to zero, and the number of pulses per week is used after that.)

6.1.5 Set the effective area of the tangent point

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.01	tangent point Signal，units:0.1%	0.0-50.0	30.0	RW	Immediately

P16.01 = 30, the effective area of the cut point signal is set to 30.0%, unit: 0.1%. (If the system uses the point-cut signal, it is necessary to set the effective area of the point-cut reasonably.)

6.1.6 Source selection of cut length

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.20	Order Source selection 0-don't switch， use order 1 1-DI Select order 2-Cycle switch	0-2	0	RW	Immediately

P15.20 = 0, order source selection 0 - no switching, use order 1.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.22	Cut the length of order 1, units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P15.24	Cut times of Order 1	0-65535	100	RW	Immediately

P15.22 = 1000, The cutting length of order 1 is set to 1000, unit: 0.01mm.
P15.24 = 100, Order 1 cut times is set to 100.

6.1.7 Select the first time (re-engagement method)

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.43	Re-engagement or initial engagement 0-Memory location 1-Cutting length 2-The distance from the color scale to the tangent point 3-Meshing spindle preload P15.45, automatically find the tangent point;	0-3	3	RW	Immediately
P15.45	Meshing front amount, unit: 0.01mm During meshing, after the master axis travels the distance of P15.45, the slave axis and the master axis have the same linear speed, and when they encounter the tangent point, they start to run the normal cam.	0.01-21474836.47	150.00	RW	Immediately

When P15.43=3, from when the meshing signal is valid, after the master axis runs P15.45, the slave axis accelerates to the synchronous speed along with the master axis.
P15.45 = 150, the pre-engagement amount is set to 150, unit: 0.01mm. (The smaller the value, the faster the acceleration into the synchronization area)

6.1.8 Select cut length mode

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.15	CAM application mode 0-Cutting length mode 1-Triggering mode 2-Tracking mode	0-2	0	RW	Reset

P16.15 = 0, the cam application mode selects 0-cut length mode.

6.1.9 Configuration function input bits

Input Function No.	Parameter Description
INFn.172	Cam engagement is enabled, valid when the valid level is high, engages when valid, disengages when invalid
INFn.174	The origin returns to zero, the rising edge is valid, in the disconnected state, enable the servo, trigger INFn.174, find the tangent point, and then return to the waiting position P15.17.

P06.03 = 172，DI3 is configured as 172 - Cam Enable.
P06.04 = 174，DI4 is configured as 174 - return to zero input bit.

6.1.10 Origin back to zero

Refer to "Origin Return to Zero Function". Can not return to zero.

6.1.11 Enable the Cam

Servo is enabled, the trigger cam engagement signal INFn.172 is valid, the cam will run the cam according to the customer's initial engagement mode P15.43, and after reaching the tangent signal, the cam curve will run normally.

If the movement of the slave axis is abnormal, check whether the direction of the master axis pulse is normal. If the value of P15.70 is negative, you need to adjust the direction of the master axis pulse; if the movement direction of the slave axis is opposite, change the direction of the slave axis. The parameter to change the master-slave direction is P15.39.

6.1.12 Trial run waveform analysis in cut-length mode
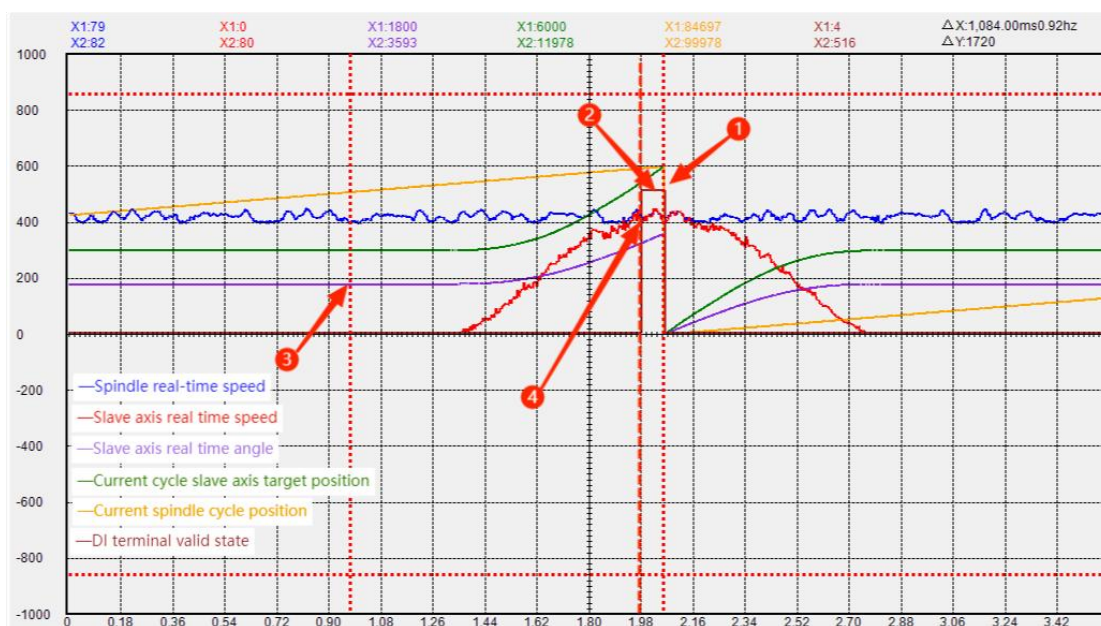
① The current cycle spindle position, when the spindle position is equal to the order 1 cut length, the system will cut.

② P06.13, DI terminal valid status, DI10 terminal is configured as 176 - origin signal input valid bit, when the system is cutting, DI terminal valid status displays 512, because DI3 in the system is configured as 172 - cam enable, so Display 516 of the valid state of the DI terminal.

③ P15.17, waiting position angle, when the spindle position in the current cycle does not reach the set length of the order 1 cut length, the cutter is at the waiting position angle waiting for triggering.

④ P15.45, the pre-engagement amount, when P15.43 = 3, the pre-engagement amount of the main shaft is P15.45, and the tangent point is automatically searched.
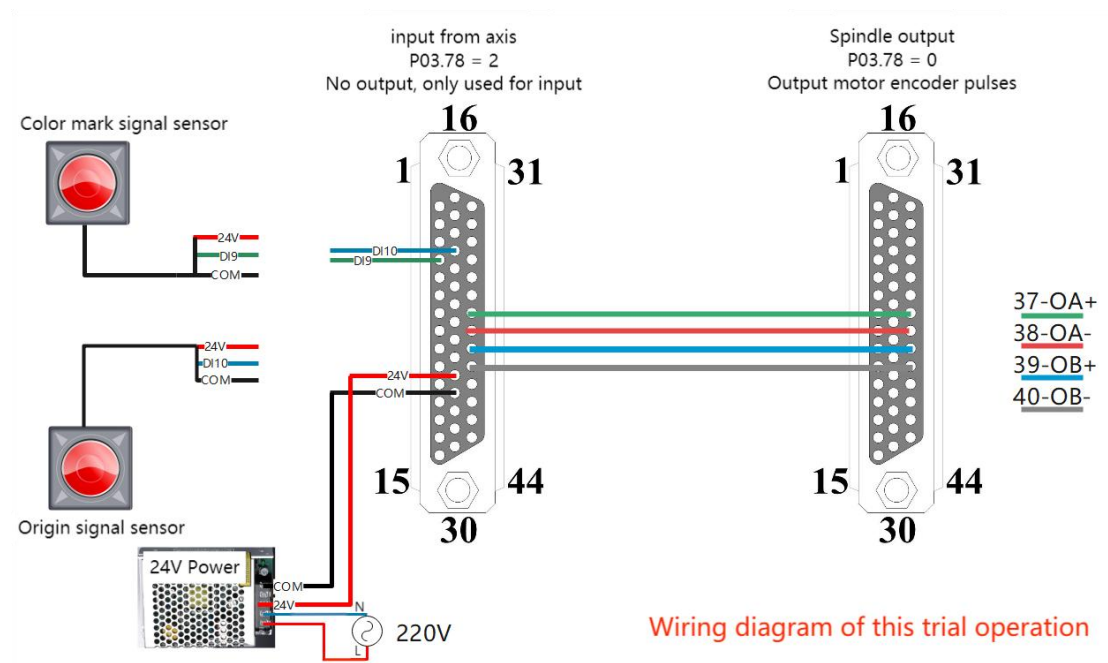
6.2 Color Mark Tracking Mode

Note: The following parameters are for reference only, please set them according to the actual mechanical parameters.
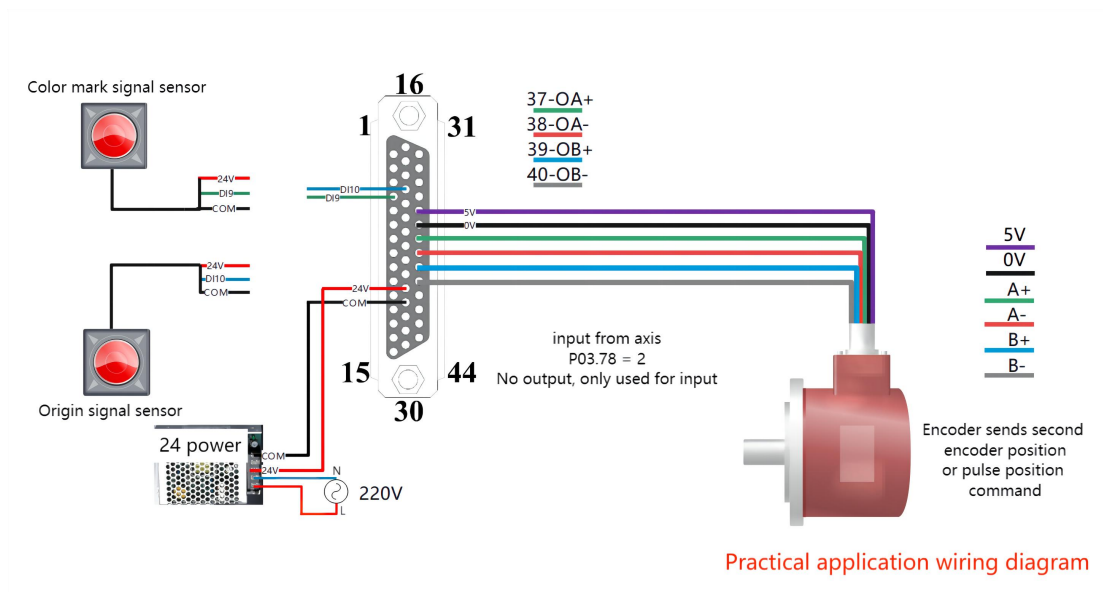
6.2.1 wiring

Select the wiring method through the source of the spindle position command. The following selects the second encoder input as an example to illustrate

① P03.78 of the spindle servo is set to 0 - output the pulse of the motor encoder.

② P03.78 of the slave axis servo is set to 2 - no output, used as input.

③ P02.01 of slave axis servo = 7 special control mode.

④ And input the CN3 signal of the main shaft to the 37~40 pins of the output terminal (AO+, AO-, BO+, BO-), and the CN3 signal input and output terminals of the slave axis to the 37~40 pins (AO+, AO-, BO+, BO-) One-to-one correspondence.

⑤ P06.09 = 175, configure DI9 as 175-color mark signal input, the input bit of this function is fixed at DI9.

⑥ P06.10 =176, configure DI10 as 176-origin signal input, the input bit of this function is fixed at DI10.

⑦ After configuring DI9 and DI10, you need to connect the color mark signal and cut point signal sensor to DI9 and DI10.

Practical application wiring diagram

6.2.1 Select master and slave axis position source

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.01	Slave axis position command source 0-Standard cam; 1-Special cam; 2-Universal cam; 3-Point cam;	0-3	0	RW	Reset
P15.03	Spindle position command source 0-XY pulse input; 1-Second encoder input; 2-INFn.71 （ DI6 ） Switch XY pulse \ second encoder input; 3-Simulation input; 4-Infun.71 Toggle XY pulse input/emulation input; 5-Infun. 71 Toggle second encoder input/emulation input;	0-5	0	RW	Reset
P15.39	Electronic cam function bit BIT0 Modify XY pulse direction BIT1 Modify the pulse direction of the second encoder BIT2 Modify the motion direction of the Rotary Cut axis	0-65535	0	RW	Reset

P15.03=1, the spindle position comes from the second encoder input, namely pins 37, 38, 39, and 40 of the CN3 interface, set P03.78=2.

If P15.03=0, the spindle position comes from the XY pulse input, that is, pins 31, 32, 33, and 34 of the CN3 interface. It is necessary to set P03.02 to select the XY pulse type.

P15.01 = 0 Select Standard Cam.
P15.03 = 1 Select the second encoder input.
P15.39 = 2 Change the direction of the second encoder (make the accumulated value of the pulse number of P15.70 spindle feed positive).

6.2.2 Set the mechanical parameters

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.06	Main shaft circumference , units:0.01mm	0.01-21474836.47	500.00	RW	Immediately
P15.08	Number of pulses per week of spindle, units:clk	1-2147483647	10000	RW	Immediately
P15.10	Slave shaft circumference , unit: 0.01mm	0.01-21474836.47	300.00	RW	Immediately
P15.12	Number of weekly pulses slave axis, units:clk	1-2147483647	10000	RW	Immediately
P15.16	Synchronous Angle, units:0.1°	0.0-360.0	30.0	RW	Immediately
P15.17	Angle of waiting position , units:0.1°	0.0-360.0	180.0	RW	Immediately
P15.18	The number of knives per week on the slave axis	1-16	1	RW	Reset

P15.06 = 170 Spindle circumference length (fill in according to the mechanical parameters, if the value is too large or too small, it will affect the accuracy of the system when it is working).

P15.08 = 10000 The number of pulses of the spindle per week (fill in according to the number of pulses for one revolution of the spindle motor).

P15.10=120 The circumference of the slave shaft (fill in according to the mechanical parameters).

P15.12 = 10000 The number of pulses per week of the slave axis (fill in according to the number of pulses in one revolution of the motor).

6.2.3 Cam Curve Restart Selection

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.19	CAM curve restart mode 0-No tangency signal， cut length restart CAM curve 1-The pointcut signal is only used to return to zero， and then the cut length is used 2-The tangent signal reopens the CAM curve	0-2	2	RW	Reset

P15.19 = 1,Cam curve restart selection 1-The point-cut signal is only used for returning to zero, after which the number of pulses per week is used. (Install the origin signal, configure DI10 as INFn.176, set P15.19=1, the point cut signal is only used to return to zero, and then use the cut length.)

6.2.4 Set the cut point effective area

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.01	tangent point Signal，units:0.1%	0.0-50.0	30.0	RW	Immediately

P16.01 = 30, the effective area of the cut point signal is set to 30.0%, unit: 0.1%. (If the system uses the point-cut signal, the effective area of the point-cut should be set reasonably.)

6.2.5 Source selection of cut lengths

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.20	Order Source selection 0-don't switch， use order 1 1-DI Select order 2-Cycle switch	0-2	0	RW	Immediately

P15.20 = 0, order source selection 0 - no switching, order 1 is used.

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.22	Cut the length of order 1, units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P15.24	Cut times of Order 1	0-65535	100	RW	Immediately

Set the cutting length P15.22 of order 1 and the number of times of order 1 P15.24.

Note: The cutting length should be strictly set according to the color mark spacing.

P15.22 = 230, order 1 is cut to length, when no valid color mark is detected, the system will run to cut length.

P15.24 = 100, the number of cuts for order 1 is set to 100.

6.2.6 Select the first time (re-engagement process)

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.43	Re-engagement or initial engagement 0-Memory location 1-Cutting length 2-The distance from the color scale to the tangent point 3-Meshing spindle preload P15.45，automatically find the tangent point;	0-3	3	RW	Immediately

P15.43=2, after the cam enable signal is valid, wait for the color mark signal to be triggered, then compensate the spindle position and switch to the color mark.

6.2.7 Select tracking mode

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.15	CAM application mode 0-Cutting length mode 1-Triggering mode 2-Tracking mode	0-2	0	RW	Reset

P16.15=2, the slave axis runs in the color mark tracking mode, the system will correct the position of the main shaft according to the trigger position of the color mark, so that the cutter just cuts on the color mark.

6.2.8 Set the parameters related to the color mark

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.22	Distance from the colour mark to the tangent point，units:0.01mm	0.00-21474836.47	500.00	RW	Immediately

P16.22 = 230, the distance from the color mark to the tangent point, unit: 0.01mm. (This value needs to be set for the cutter to precisely cut to the color mark).

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.18	Left window length of colour mark,units: 0.01mm	0.00-21474836.47	50.00	RW	Immediately

P16.18 = 50, the length of the left window of the color mark, unit: 0.01mm.

6.2.9 Set the post-processing method when the color scale is lost

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.45	Colour mark loss processing mode 1-Enlarge the window search，output DO	0-1	1	RW	Immediately

P16.45=1, after losing the mark, expand the window and find the mark again. After the normal color mark is found and can catch up with the color mark, the color mark masking area is restored to the initial value set by the user.

6.2.10 Origin back to zero

Refer to "Origin Return to Zero Function". You can choose not to return to zero. If the first knife needs to cut to the color mark, it must be returned to zero.

6.2.11 Enable the cam

Servo is enabled, the trigger cam engagement signal INFn.172 is valid, the cam will run the cam according to the customer's initial engagement mode P15.43, and after reaching the tangent signal, the cam curve will run normally.

    If the movement of the slave axis is abnormal, check whether the direction of the master axis pulse is normal. If the value of P15.70 is negative, you need to adjust the direction of the master axis pulse; if the movement direction of the slave axis is opposite, change the direction of the slave axis. The parameter to change the master-slave direction is P15.39.

6.2.12 Waveform analysis of color mark tracking test run
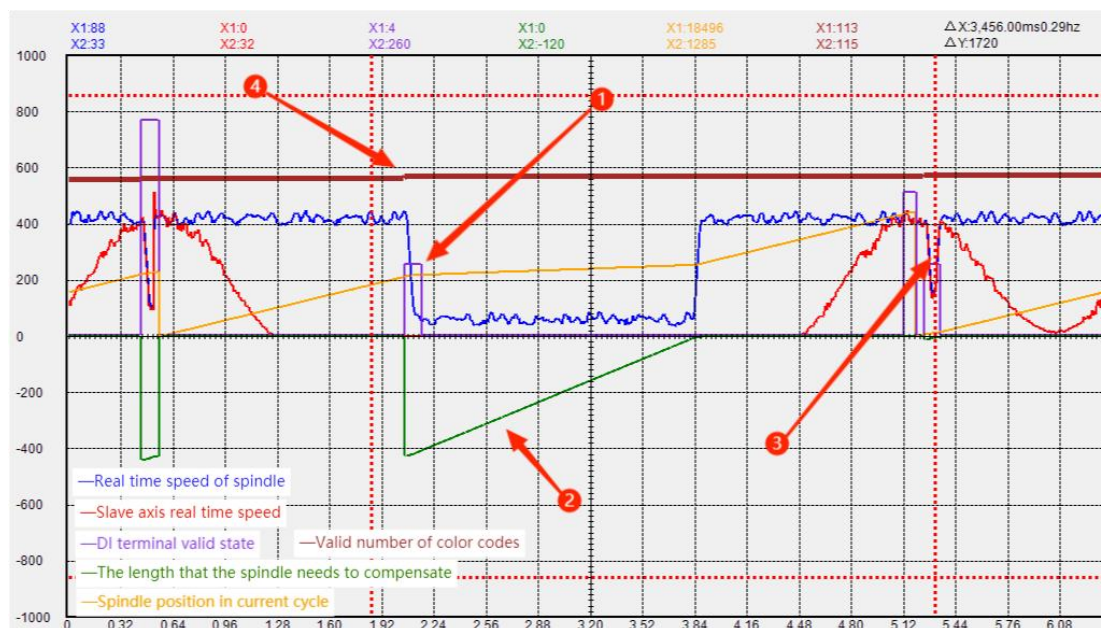
    ① The system recognizes a valid color mark, and DI9 is configured as a 75-color mark signal input.

    ② P15.98 The length of the spindle that needs to be compensated, the synchronization internal algorithm calculates the length that needs to be compensated, and sets the P16.36 color mark compensation speed source for compensation.

    ③ P16.36 Spindle speed percentage, when P16.36 color mark compensation speed is derived from the spindle speed percentage, it is necessary to set P16.36, over 100%, the cutter may be reversed.

    The system recognizes a valid color mark, and the valid number of color marks increases.

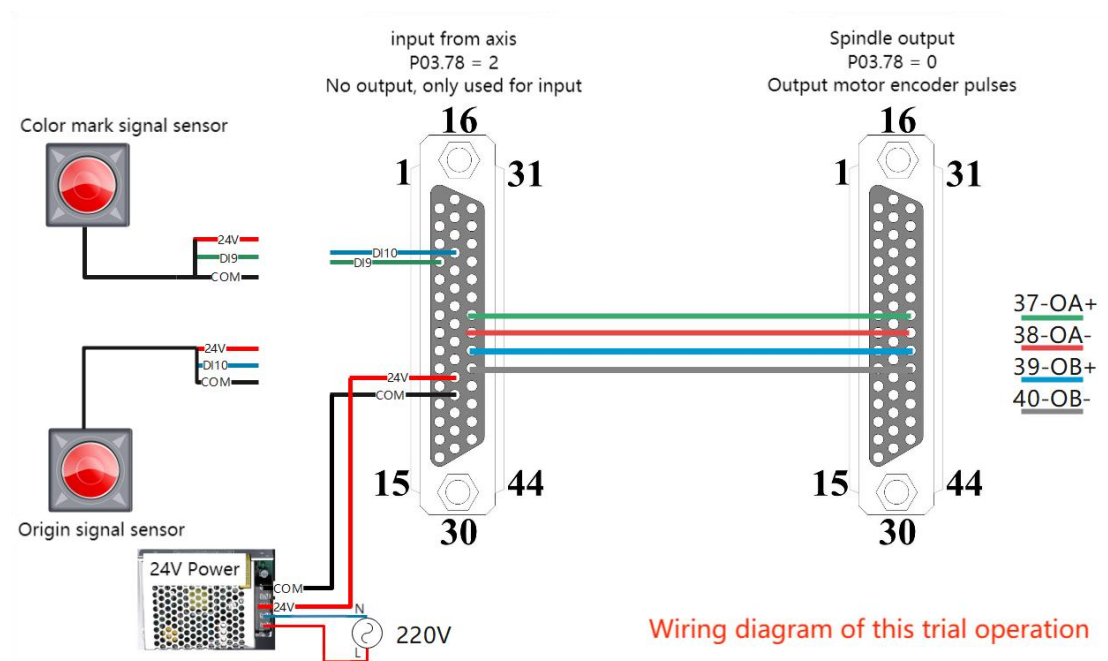## 6.3 Simple step configuration for Trigger Mode commissioning

Note: The following parameters are for reference only, please set them according to the actual mechanical parameters.
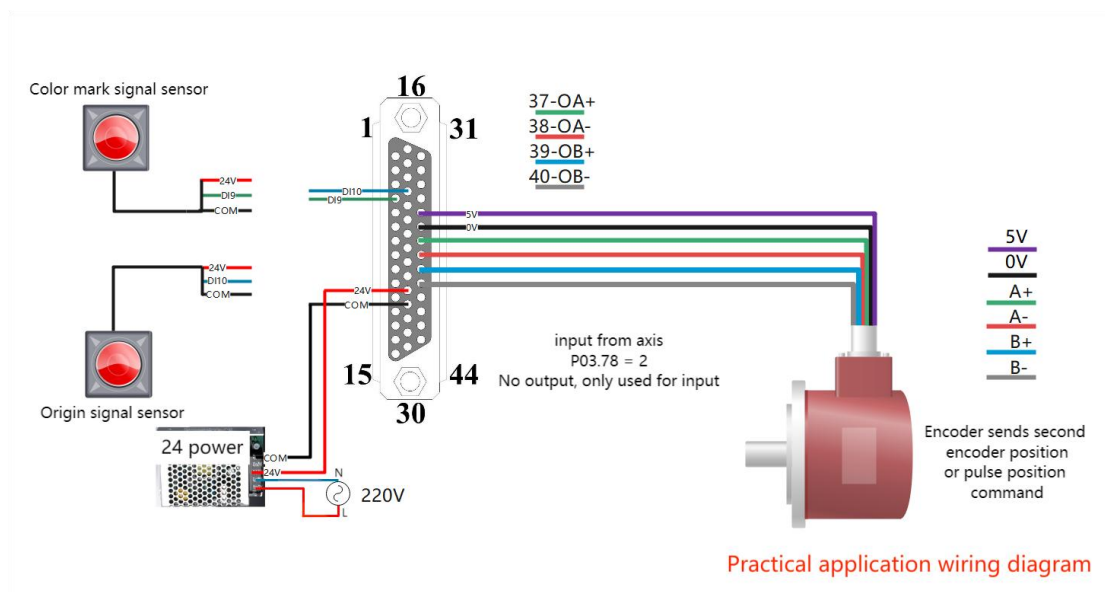
6.3.1 wiring

Select the wiring method through the source of the spindle position command. The second encoder input is selected as an example below

① P03.78 of the spindle servo is set to 0 - output the pulse of the motor encoder.

② P03.78 of the slave axis servo is set to 2 - no output, used as input.

③ P02.01 of slave axis servo = 7 special control mode.

④ Connect the 37~40 pins (AO+, AO-, BO+, BO-) of the CN3 signal input and output end of the main axis, and the 37~40 pins (AO+, AO-, BO+, BO-) of the CN3 signal input and output end of the slave axis) in one-to-one correspondence.

⑤ P06.09 = 175, configure DI9 as 175-color mark signal input, the input bit of this function is fixed at DI9.

⑥ P06.10 =176, configure DI10 as 176-origin signal input, the input bit of this function is fixed at DI10.

⑦ After configuring DI9 and DI10, you need to connect the color mark signal and cut point signal sensor to DI9 and DI10.

Practical application wiring diagram

6.3.2 Select master and slave axis position source

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.01	Slave axis position command source 0-Standard cam; 1-Special cam; 2-Universal cam; 3-Point cam;	0-3	0	RW	Reset
P15.03	Spindle position command source 0-XY pulse input; 1-Second encoder input; 2-INFn.71 （ DI6 ） Switch XY pulse \ second encoder input; 3-Simulation input; 4-Infun.71 Toggle XY pulse input/emulation input; 5-Infun. 71 Toggle second encoder input/emulation input;	0-5	0	RW	Reset
P15.39	Electronic cam function bit BIT0 Modify XY pulse direction BIT1 Modify the pulse direction of the second encoder BIT2 Modify the motion direction of the Rotary Cut axis	0-65535	0	RW	Reset

P15.03=1, the spindle position comes from the second encoder input, namely pins 37, 38, 39, and 40 of the CN3 interface, set P03.78=2.

If P15.03=0, the spindle position comes from the XY pulse input, that is, pins 31, 32, 33, and 34 of the CN3 interface. It is necessary to set P03.02 to select the XY pulse type.

P15.01 = 0 Select the Standard Cam.

P15.03 = 1 Select the second encoder input.

P15.39 = 2 Change the direction of the second encoder (make the accumulated value of the pulse number of P15.70 spindle feed positive).

6.3.3 Set the mechanical parameters

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.06	Main shaft circumference , units:0.01mm	0.01-21474836.47	500.00	RW	Immediately
P15.08	Number of pulses per week of spindle， units:clk	1-2147483647	10000	RW	Immediately
P15.10	Slave shaft circumference , unit: 0.01mm	0.01-21474836.47	300.00	RW	Immediately
P15.12	Number of weekly pulses slave axis，units:clk	1-2147483647	10000	RW	Immediately
P15.16	Synchronous Angle，units:0.1°	0.0-360.0	30.0	RW	Immediately
P15.17	Angle of waiting position , units:0.1°	0.0-360.0	180.0	RW	Immediately
P15.18	The number of knives per week on the slave axis	1-16	1	RW	Reset

P15.06 = 170 Spindle circumference length (fill in according to the mechanical parameters, if the value is too large or too small, it will affect the accuracy of the system when it is working).

P15.08 = 10000 The number of pulses per week of the spindle (fill in according to the number of pulses in one revolution of the spindle motor).

P15.10=120 The circumference of the slave shaft (fill in according to the mechanical parameters).

P15.12 = 10000 The number of pulses per week of the slave axis (fill in according to the number of pulses in one revolution of the motor).

6.3.4 Cam Curve Restart Selection

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.19	CAM curve restart mode 0-No tangency signal, cut length restart CAM curve 1-The pointcut signal is only used to return to zero, and then the cut length is used 2-The tangent signal reopens the CAM curve	0-2	2	RW	Reset

P15.19 = 1, the cam curve restart selection 1-point cut signal is only used for returning to zero, and the number of pulses per week is used thereafter.

6.3.5 Set the cut point effective area

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.01	tangent point Signal，units:0.1%	0.0-50.0	30.0	RW	Immediately

P16.01 = 30, the effective area of the cut point signal is set to 30.0%, unit: 0.1%. (If the system uses the point-cut signal, the effective area of the point-cut should be set reasonably.)

6.3.6 Cut length source selection

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.20	Order Source selection 0-don't switch, use order 1 1-DI Select order 2-Cycle switch	0-2	0	RW	Immediately

P15.20 = 0, order source selection 0 - no switching, use order 1.

6.3.7 Select the first time (re-engagement process)

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.43	Re-engagement or initial engagement 0-Memory location 1-Cutting length 2-The distance from the color scale to the tangent point 3-Meshing spindle preload P15.45，automatically find the tangent point;	0-3	3	RW	Immediately
P16.22	Distance from the colour mark to the tangent point，units:0.01mm	0.00-21474836.47	500.00	RW	Immediately

P15.43 = 2, Re or initial meshing process selection 2-Distance of color scale to tangent point.

P16.22 = 230, The distance from the color mark to the tangent point, unit: 0.01mm. (By setting this value, you can cut to offset or precisely cut to the color stop)

6.3.8 Select the cut length mode

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P16.15	CAM application mode 0-Cutting length mode 1-Triggering mode 2-Tracking mode	0-2	0	RW	Reset

P16.15 = 1, select 0-trigger mode for cam application mode.

6.3.9 Configuration function input bits

Input Function No.	Parameter Description
INFn.172	Cam engagement is enabled, valid when the valid level is high, engages when valid, disengages when invalid
INFn.174	The origin returns to zero, the rising edge is valid, in the disconnected state, enable the servo, trigger INFn.174, find the tangent point, and then return to the waiting position P15.17.

P06.03 = 172, DI3 is configured as 172-cam enable.
P06.04 = 174, DI4 is configured for 174 rounds of switching back to zero input bits.

6.3.10 Origin back to zero

Refer to "Origin Return to Zero Function". You can choose not to return to zero.

6.3.11 Enable the cam

Servo is enabled, the trigger cam engagement signal INFn.172 is valid, the cam will run the cam according to the customer's initial engagement mode P15.43, and after reaching the tangent signal, the cam curve will run normally.

If the movement of the slave axis is abnormal, check whether the direction of the master axis pulse is normal. If the value of P15.70 is negative, you need to adjust the direction of the master axis pulse; if the movement direction of the slave axis is opposite, change the direction of the slave axis. The parameter to change the master-slave direction is P15.39.

6.3.12 Waveform Analysis of Trigger Mode Trial Run

①   Interference color scale, the system does not process.
②   The valid number of color mark is accumulated.
③   The system recognizes a valid color mark, and the system cuts it.

Chapter 7 Description of General Cam Functions

7.1 Cam engagement

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.03	The number of the starting section of CAM engagement	1-32767	1	RW	Immediately
P17.04	End segment number of CAM meshing	1-32767	10	RW	Immediately

After the cam enable INFn.172 is valid, the system engages according to the curve segment of P17.03 and P17.04.

7.2 Bit output segment number

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.05	Bit output segment number 1	1-32767	1	RW	Immediately
P17.06	Bit output segment number 2	1-32767	2	RW	Immediately

When the system runs P17.05 and the bit output segment number 1 curve, the output of OUTFn.54 is valid.

When the system runs P17.06 and the bit output segment number 2 curve, the output of OUTFn.55 is valid.

7.3 Cam disengagement

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.09	Universal cam disengagement method 0-Disconnect at the end of the current cycle 1-disengagement immediately	0-1	0	RW	Immediately
P15.44	CAM meshing or disengagement acceleration and deceleration time，units:0.1s	0-6553.5	500.0	RW	Immediately

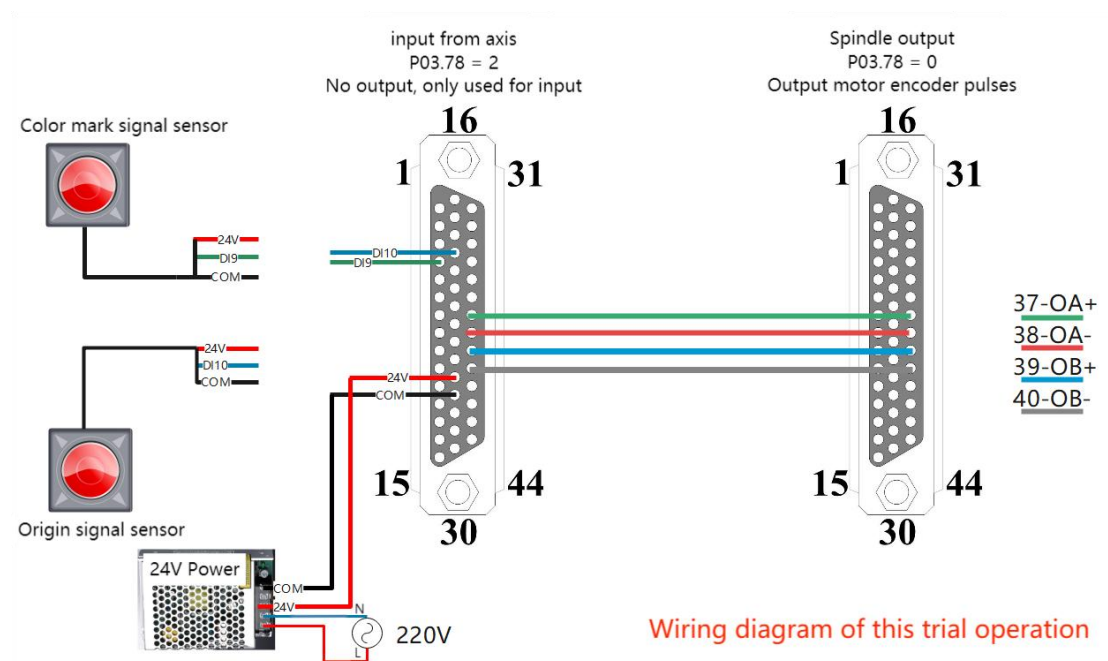## 7.4 Setting procedure of general cam trial operation

Note: The following parameters are for reference only, please set them according to the actual mechanical parameters.
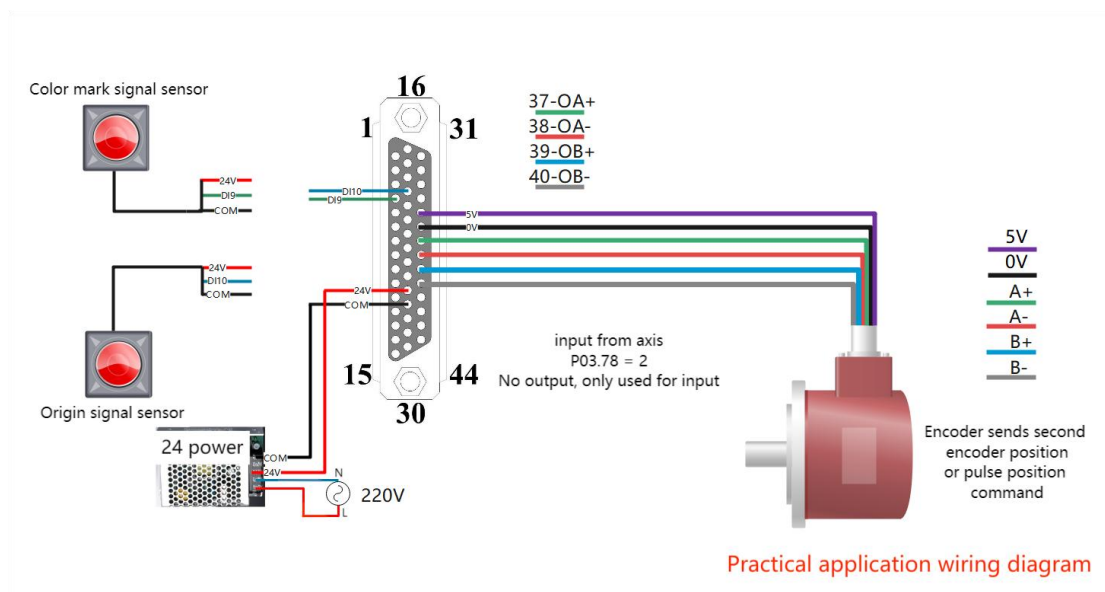
7.4.1 wiring

Select the wiring method through the source of the spindle position command. The following selects the second encoder input as an example to illustrate

① P03.78 of the spindle servo is set to 0 - output the pulse of the motor encoder.

② P03.78 of the slave axis servo is set to 2-no output, and it is used as input.

③ P02.01 of slave axis servo = 7 special control mode.

④ And input the CN3 signal of the main shaft to the 37~40 pins of the output terminal (AO+, AO-, BO+, BO-), and the CN3 signal input and output terminals of the slave axis to the 37~40 pins (AO+, AO-, BO+, BO-) One-to-one correspondence.

⑤ P06.09 = 175, configure DI9 as 175-color code signal input, the input bit of this function is fixed at DI9.

⑥ P06.10 =176, configure DI10 as 176-origin signal input, the input bit of this function is fixed at DI10.

⑦ After configuring DI9 and DI10, you need to connect the color mark signal and cut point signal sensor to DI9 and DI10.

Practical application wiring diagram

7.4.2 Select master and slave axis position source

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.01	Slave axis position command source 0-Standard cam; 1-Special cam; 2-Universal cam; 3-Point cam;	0-3	0	RW	Reset
P15.03	Spindle position command source 0-XY pulse input; 1-Second encoder input; 2-INFn.71 （ DI6 ） Switch XY pulse \ second encoder input; 3-Simulation input; 4-Infun.71 Toggle XY pulse input/emulation input; 5-Infun. 71 Toggle second encoder input/emulation input;	0-5	0	RW	Reset

(Note: Fill in truthfully, otherwise there will be situations such as inaccurate cutting)

P15.01 = 2 to select the general cam.

P15.03 = 1 selects the second encoder input.

P15.39 = 2 to change the direction of the second encoder (make the accumulated value of the pulse number of P15.70 spindle feed positive).

7.4.3 Set the mechanical parameters

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.06	Main shaft circumference , units:0.01mm	0.01-21474836.47	500.00	RW	Immediately
P15.08	Number of pulses per week of spindle， units:clk	1-2147483647	10000	RW	Immediately
P15.10	Slave shaft circumference , unit: 0.01mm	0.01-21474836.47	300.00	RW	Immediately
P15.12	Number of weekly pulses slave axis， units:clk	1-2147483647	10000	RW	Immediately

P15.06 = 170 Spindle circumference length (fill in according to the mechanical parameters, if the value is too large or too small, it will affect the accuracy of the system when it is working).

P15.08 = 10000 The number of pulses per week of the spindle (the number of pulses in one revolution of the spindle motor).

P15.10=120 The circumference of the slave axis (fill in according to the mechanical parameters).

P15.12 = 10000, the number of pulses per week of the slave axis (the number of pulses in one revolution of the motor).

7.4.4 Cam parameter setting

| parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.09	Universal cam disengagement method 0-Disconnect at the end of the current cycle 1-disengagement immediately	0-1	0	RW	Immediately

P17. 09 = 0 General cam disengagement mode selection 0 - disengagement at the end of the current period.
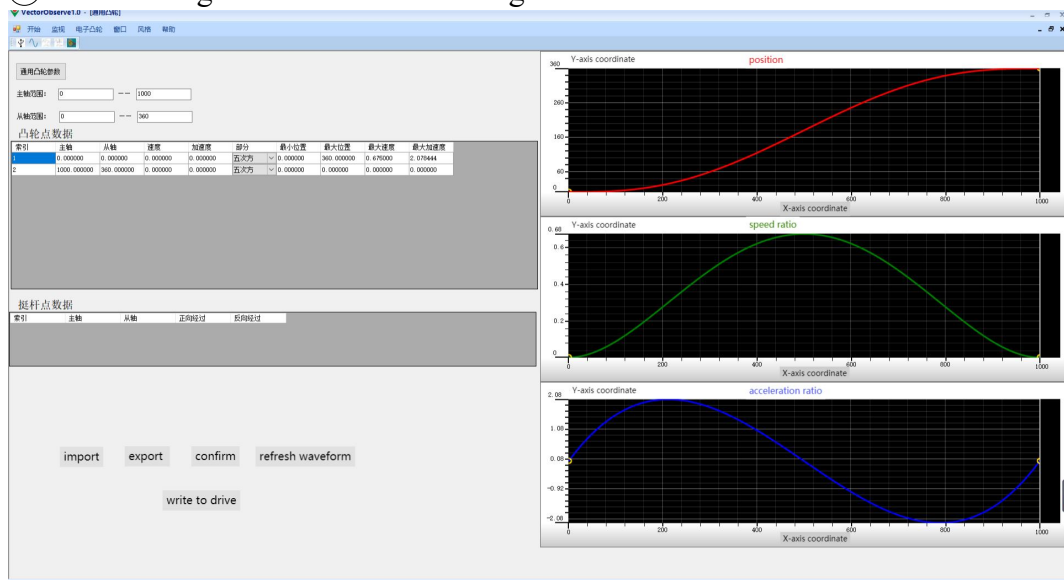
7.4.5 Generic cam curve import
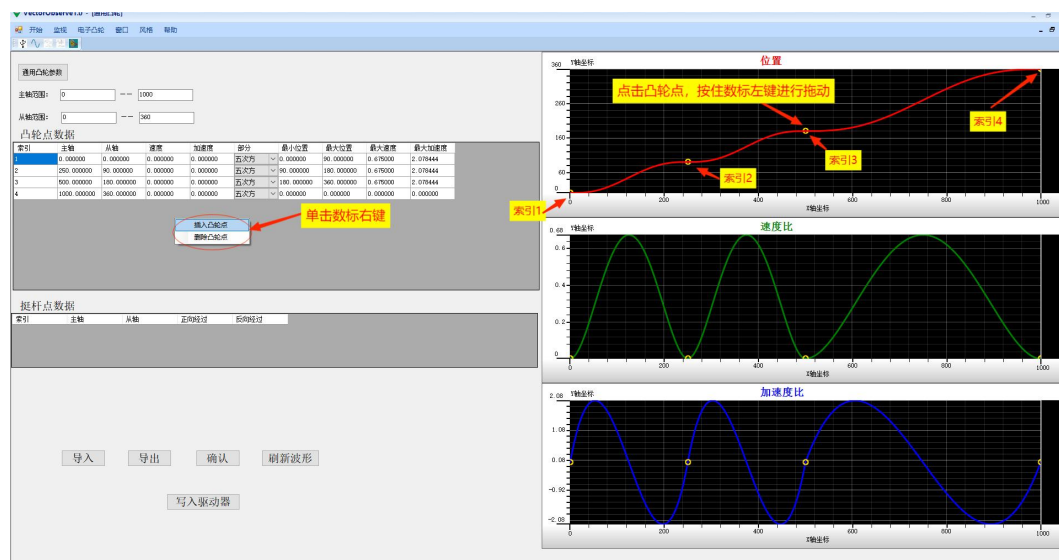
① Open the software and enter the software interface
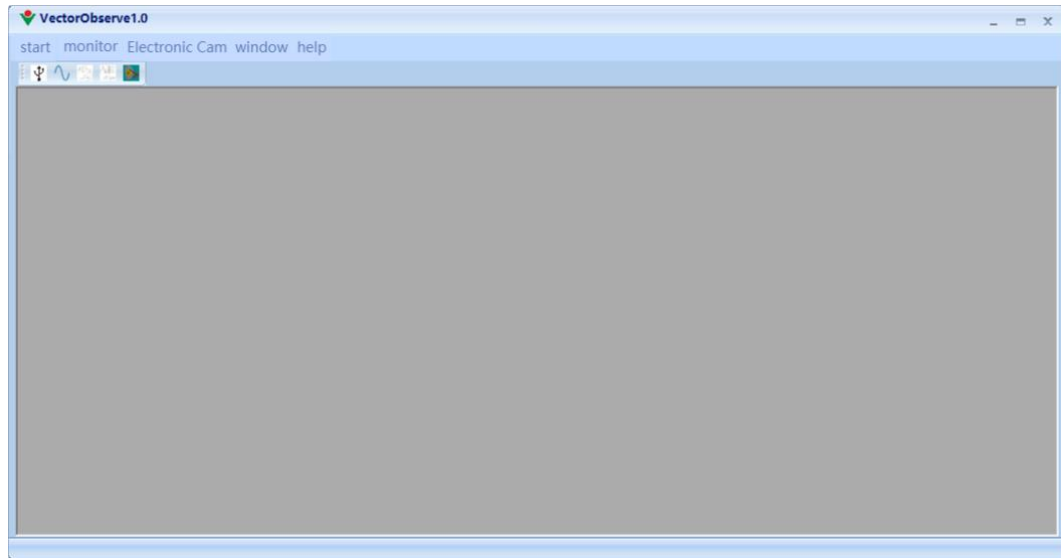
② Click Electronic Cam to select Universal Cam or click
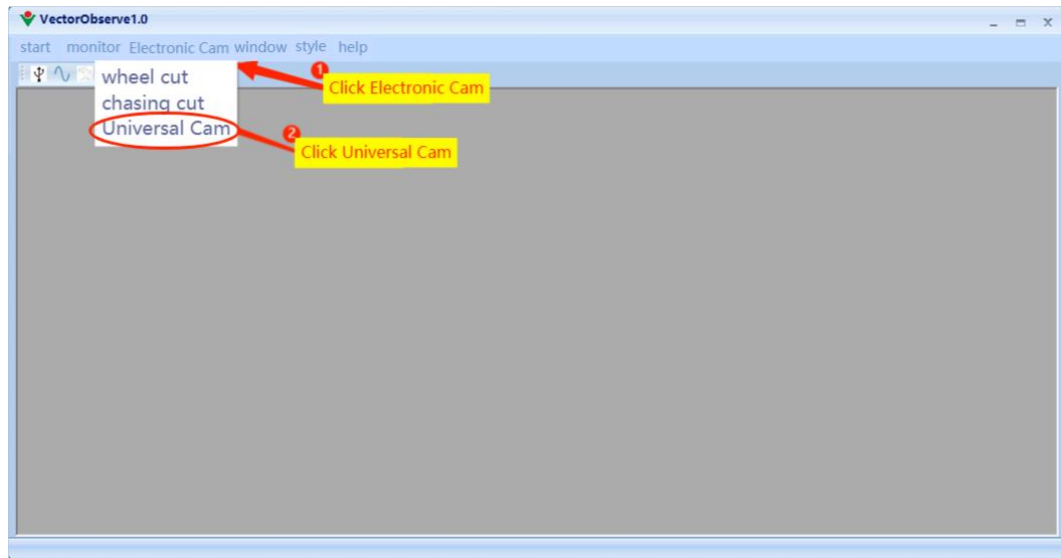
③ Enter the general cam curve setting interface

④ According to the motion track of the desired cam, click the right button of the number to insert the cam point, and drag the cam point to form the desired cam curve.


⑤ After clicking to confirm, refresh the waveform and click to write to the drive, enable the engaging cam, and the cam can move according to the movement track of the cam.
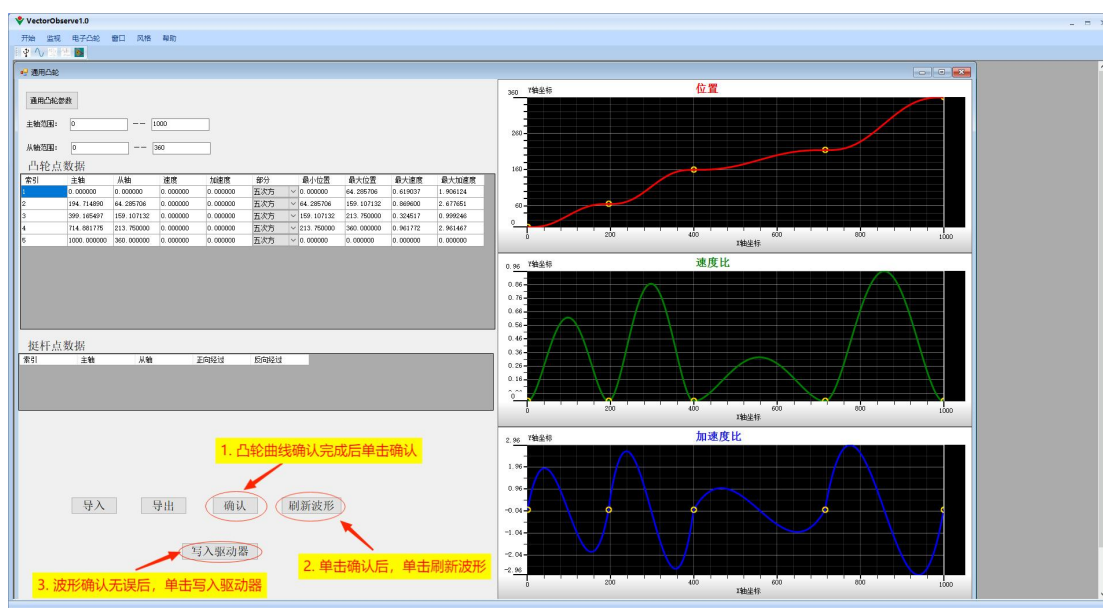
7.4.6 running

Enable the spindle running speed mode or jog FN001, trigger DI3 to make the slave axis search for the origin, after the origin search is completed, the slave axis stops at the waiting position angle P15.17, and triggers DI4 to enable the cam. At this time, you can use the oscilloscope page of the VECObserve software Observe the waveform.

7.4.7 Test run waveform analysis
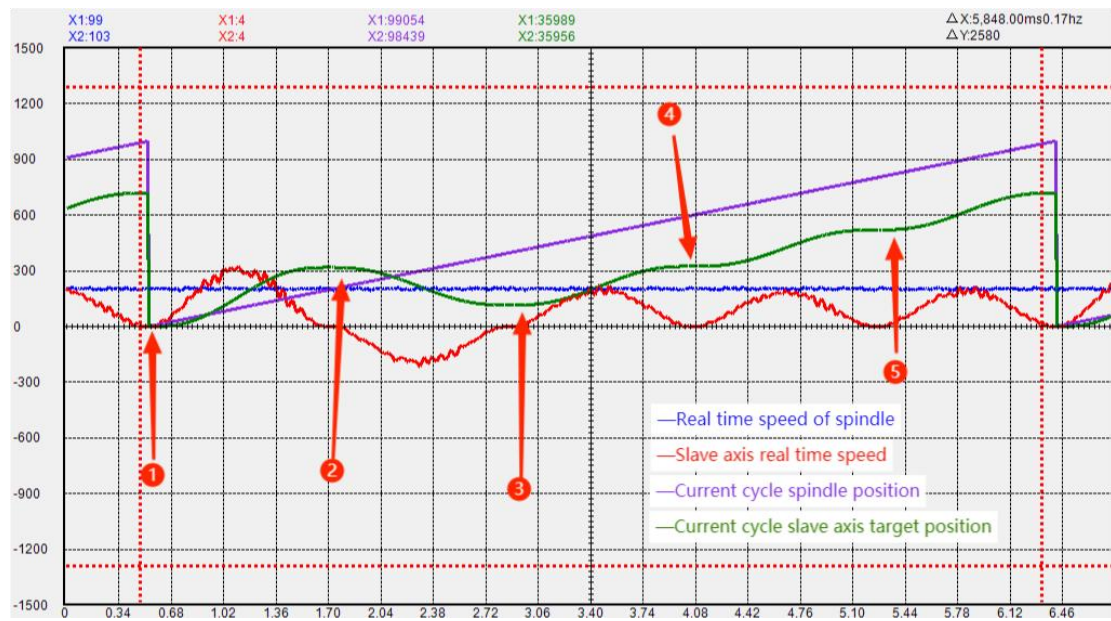
1. Corresponds to index 1 of the generic cam curve
2. Corresponds to index 2 of the generic cam curve
3. Corresponds to index 3 of the generic cam curve
4. Corresponds to index 4 of the generic cam curve
5. Corresponds to index 5 of the generic cam curve

Chapter 8 Description of Point Cam Function

8.1 Operation mode of point cam

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.20	Point cam operation mode 0-Colour mark to trigger 1-The spindle length 2-Dual color mark trigger mode 3-HONGJIN	0-3	0	RW	Reset
P15.22	Cut the length of order 1，units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately

Parameter Description:

P17.20=0，A valid color mark triggers once, and the cam runs once.

P17.20=1，The spindle position P15.22 is used as a cycle, and the cam runs once.

8.2 point cam curve parameters

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.22	The total length of Slave shaft，unit:0.01mm	0.00-21474836.47	800.00	RW	Immediately
P17.24	Spindle front amount，unit:0.01mm	0.00-21474836.47	800.00	RW	Immediately
P17.26	Acceleration distance of the slave axis，units:0.01mm	0.00-21474836.47	300.00	RW	Immediately
P17.28	Deceleration distance of the slave axis，units:0.01mm	0.00-21474836.47	80.00	RW	Immediately

The parameters need to meet the conditions: P17.26+ P17.28<= P17.22, otherwise fault Er.614 will be reported.

8.3 Color mark mask

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.30	Colour mark window threshold, units: 0.01mm	0.00-21474836.47	0.00	RW	Immediately
P16.30	Colour mark width, units:0.01mm	0.00-655.35	0.00	RW	Immediately
P16.31	Colour mark width error threshold, units: 0.01mm	0.00-655.35	10.00	RW	Immediately
P16.32	The real colour mark width detected, units:0.01mm	0.00-655.35	-	RO	-

When the spindle position P15.74 of the current cycle is greater than the color mark window threshold P17.30, the color mark is allowed to be detected. If P16.30=0, the rising edge of the color mark is valid; if P16.30=1, the condition |P16.30-P16.32|<= P16.31 is required to be considered as a valid color mark.

8.4 Processing related to deceleration section

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.36	Deceleration mode of Deceleration section 0-Deceleration distance Deceleration P17.28 1-Deceleration time	0-1	0	RW	Immediately
P17.37	Deceleration time in the deceleration phase, units:ms Deceleration time in the deceleration phase, units:ms This time is the time to decelerate from the current speed to zero	0-65535	20	RW	Immediately
P17.38	Whether the deceleration section enables the position loop gain to be zero 0-Disable 1-Enable	0-1	0	RW	Immediately

8.5 Overlay position

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.39	Whether to enable position overlay 0-Disable 1-Enable	0-1	0	RW	Immediately
P17.40	Superposition of distance，units:0.01mm	-327.67-327.67	0.00	RW	Immediately
P17.41	Superimposition speed，units:rpm	0-32767	50	RW	Immediately
P17.42	Superimposed acceleration and deceleration time，units:ms	0-65535	50	RW	Immediately
P17.43	Spindle position when superimposed，units:0.01mm	0.00-21474836.47	0.00	RW	Immediately

When P17.39=1, and the spindle position P15.74 in the current cycle is equal to P17.43, the system will rebound. The rebound distance is P17.40, the speed is P17.41, and the acceleration/deceleration time is P17.42.

8.6 Cam disengagement method

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.45	Point cam the way of the disengagement 0-Disconnect at the end of the current cycle 1-disengagement immediately	0-1	0	RW	Immediately

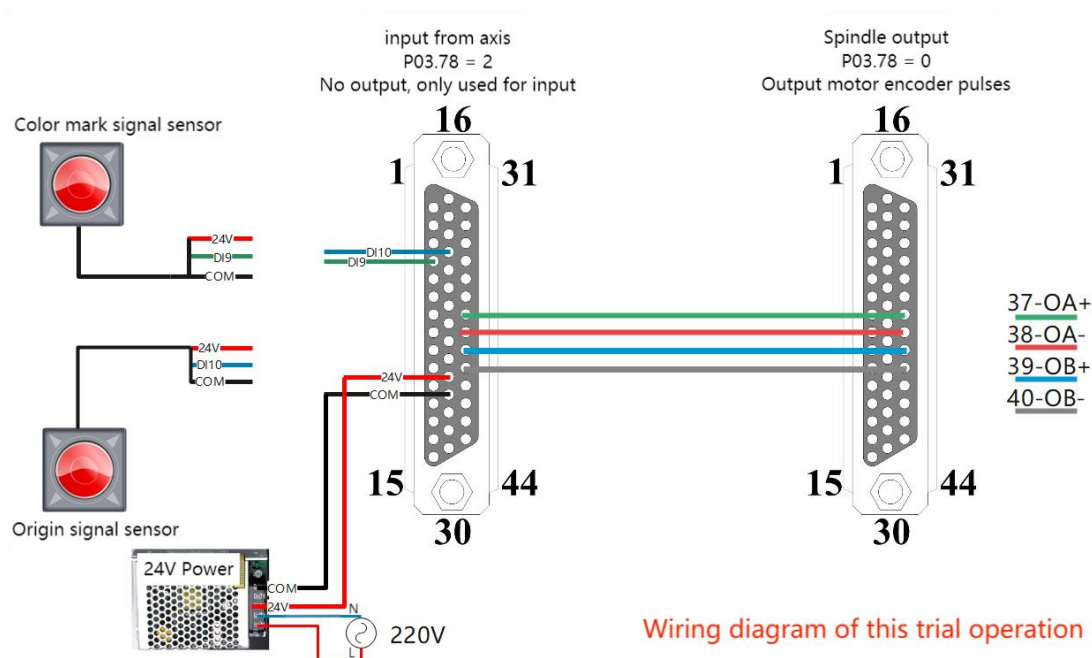# Chapter 9 Setting Steps for Trial Operation of Point Cam

Note: The following parameters are for reference only, please set them according to the actual mechanical parameters.
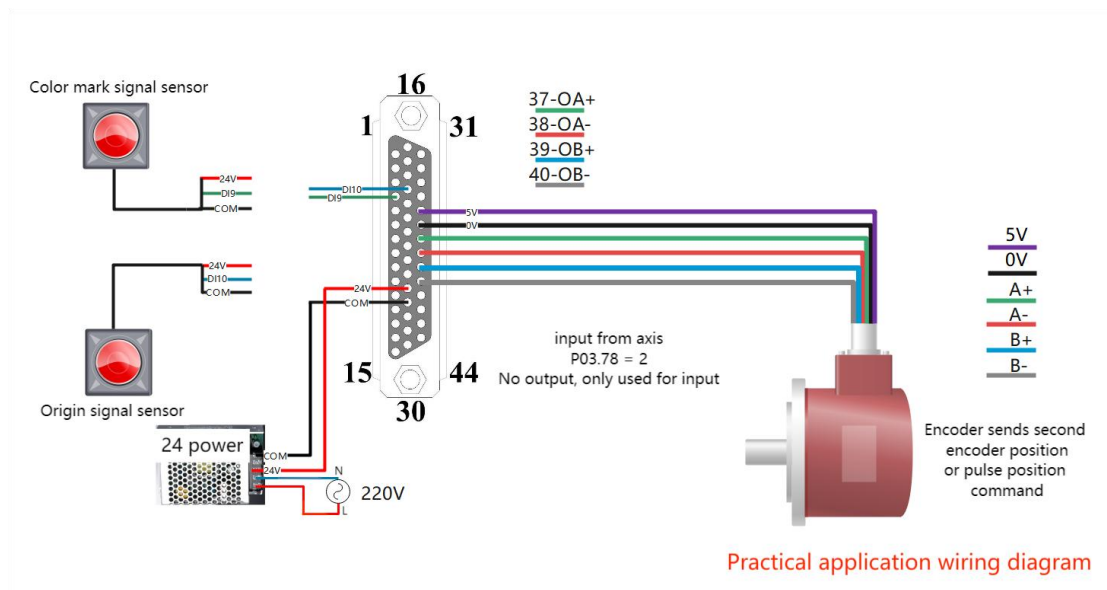
9.1 wiring

Select the wiring method through the source of the spindle position command. The second encoder input is selected as an example below

① P03.78 of the spindle servo is set to 0 - output the pulse of the motor encoder.

② P03.78 of the slave axis servo is set to 2 - no output, used as input.

③ P02.01 of slave axis servo = 7 special control mode.

④ And input the CN3 signal of the main axis to the 37~40 pins of the output terminal (AO+, AO-, BO+, BO-), and the 37~40 pins of the CN3 signal input and output terminal of the slave axis (AO+, AO-, BO+, BO-) One-to-one correspondence.

⑤ P06.09 = 175, configure DI9 as 175-color mark signal input, the input bit of this function is fixed at DI9.

⑥ P06.10 = 176, configure DI10 as 176-origin signal input, the function input bit is fixed at DI10.

⑦ After configuring DI9 and DI10, you need to connect the color mark signal and cut point signal sensor to DI9 and DI10.

Practical application wiring diagram

9.2 Select master and slave axis position source

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.01	Slave axis position command source 0-Standard cam; 1-Special cam; 2-Universal cam; 3-Point cam;	0-3	0	RW	Reset
P15.03	Spindle position command source 0-XY pulse input; 1-Second encoder input; 2-INFn.71 （ DI6 ） Switch XY pulse \ second encoder input; 3-Simulation input; 4-Infun.71 Toggle XY pulse input/emulation input; 5-Infun. 71 Toggle second encoder input/emulation input;	0-5	0	RW	Reset
P15.39	Electronic cam function bit BIT0 Modify XY pulse direction BIT1 Modify the pulse direction of the second encoder BIT2 Modify the motion direction of the Rotary Cut axis	0-65535	0	RW	Reset

Set P15.01=3 to select point cam. P15.03=0, P15.03=1, the spindle position comes from the second encoder input, namely pins 37, 38, 39, and 40 of the CN3 interface, set P03.78=2. If the spindle position comes from the XY pulse input, that is, pins 31, 32, 33, and 34 of the CN3 interface, you need to set P03.02 to select the XY pulse type.

P15.01 = 3, Select the point cam.

P15.03 = 1, Select the second encoder input.

P15.39 = 2, Change the direction of the second encoder (make the accumulated value of the pulse number of P15.70 spindle feed positive).

9.3 Set the mechanical parameters

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P15.06	Main shaft circumference , units:0.01mm	0.01-21474836.47	500.00	RW	Immediately
P15.08	Number of pulses per week of spindle，units:clk	1-2147483647	10000	RW	Immediately
P15.10	Slave shaft circumference , unit: 0.01mm	0.01-21474836.47	300.00	RW	Immediately
P15.12	Number of weekly pulses slave axis，units:clk	1-2147483647	10000	RW	Immediately

P15.06 = 170, Spindle circumference length (fill in according to the mechanical parameters, if the value is too large or too small, it will affect the accuracy of the system when it is working).

P15.08 = 10000, The number of pulses of the spindle per week (fill in according to the number of pulses for one revolution of the spindle motor).

P15.10=120, The circumference of the slave shaft (fill in according to the mechanical parameters).

P15.12 = 10000, The number of pulses per week of the slave axis (fill in according to the number of pulses in one revolution of the motor).

9.4 Set the Cam Parameters

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.22	The total length of Slave shaft，unit: 0.01mm	0.00-21474836.47	800.00	RW	Immediately
P17.24	Spindle front amount，unit:0.01mm	0.00-	800.00	RW	Immediately

		21474836.47			
P17.26	Acceleration distance of the slave axis，units:0.01mm	0.00-21474836.47	300.00	RW	Immediately
P17.28	Deceleration distance of the slave axis，units:0.01mm	0.00-21474836.47	80.00	RW	Immediately

The parameters need to meet the conditions: P17.26+ P17.28<= P17.22, otherwise fault Er.614 will be reported.

    P17.22 = 600, Total length of slave shaft.
    P17.24 = 100, Spindle front amount.
    P17.26 = 100, Acceleration distance of the slave axis.
    P17.28 = 50, Deceleration distance of the slave axis.

9.5 Set the cam operation related parameters

parameter no.	Parameter Description	set range	Defaults	Type of read and write	Effective way
P17.20	Point cam operation mode 0-Colour mark to trigger 1-The spindle length 2-Dual color mark trigger mode 3-HONGJIN	0-3	0	RW	Reset
P15.22	Cut the length of order 1，units:0.01mm	0.01-21474836.47	1000.00	RW	Immediately
P17.39	Whether to run rebound selection after the completion of cam operation 0-No rebound 1-resilience	0-1	0	RW	Immediately
P17.40	Springback Distance，units:0.01mm	-327.67-327.67	0.00	RW	Immediately
P17.41	Rebound speed，units:rpm	0-32767	50	RW	Immediately
P17.42	Rebound acceleration and deceleration time，units:ms	0-65535	50	RW	Immediately
P17.43	Spindle position during rebound，units:0.01mm	0.00-21474836.47	0.00	RW	Immediately

Select the operation mode of the point cam.
P17.20 = 1, Point cam operation mode selection 1-spindle length.
P15.22 = 1000, Cut length for order 1.
P17.39 = 1, Whether to run the rebound after the cam operation is completed select 1-rebound.
P17.40 = 50, After the cam operation is completed, the rebound distance is set to

50mm.

P17.41 = 300, The rebound speed after the cam runs (because the unit of this value is rpm, if you want to convert it into m/min, you need to convert it through the following formula).

$$\text{motor speed}（m/min）= \text{Motor rotation speed}（rpm/min）\times$$
$$\text{Circumference of the slave shaft}（m/rpm）$$

P17.42 = 500, Rebound acceleration and deceleration time after the cam operation is completed.

P17.43 = 50, The position of the spindle during rebound.

9.6 Configuration function input bits

| Input Function No.	Parameter Description
INFn.172	Cam engagement is enabled, valid when the valid level is high, engages when valid, disengages when invalid
INFn.174	The origin returns to zero, the rising edge is valid, in the disconnected state, enable the servo, trigger INFn.174, find the tangent point, and then return to the waiting position P15.17.

P06.03 = 172，DI3 is configured as 172 - Cam Enable.

P06.04 = 174，DI4 is configured as 174 - return to zero input bit.

9.7 Enable the cam

Servo is enabled, the trigger cam engagement signal INFn.172 is valid, the system will automatically plan the curve according to the cam parameters.

If the movement of the slave axis is abnormal, check whether the direction of the master axis pulse is normal. If the value of P15.70 is negative, you need to adjust the direction of the master axis pulse; if the movement direction of the slave axis is opposite, change the direction of the slave axis. The parameter to change the master-slave direction is P15.39.

9.8 Test run waveform analysis
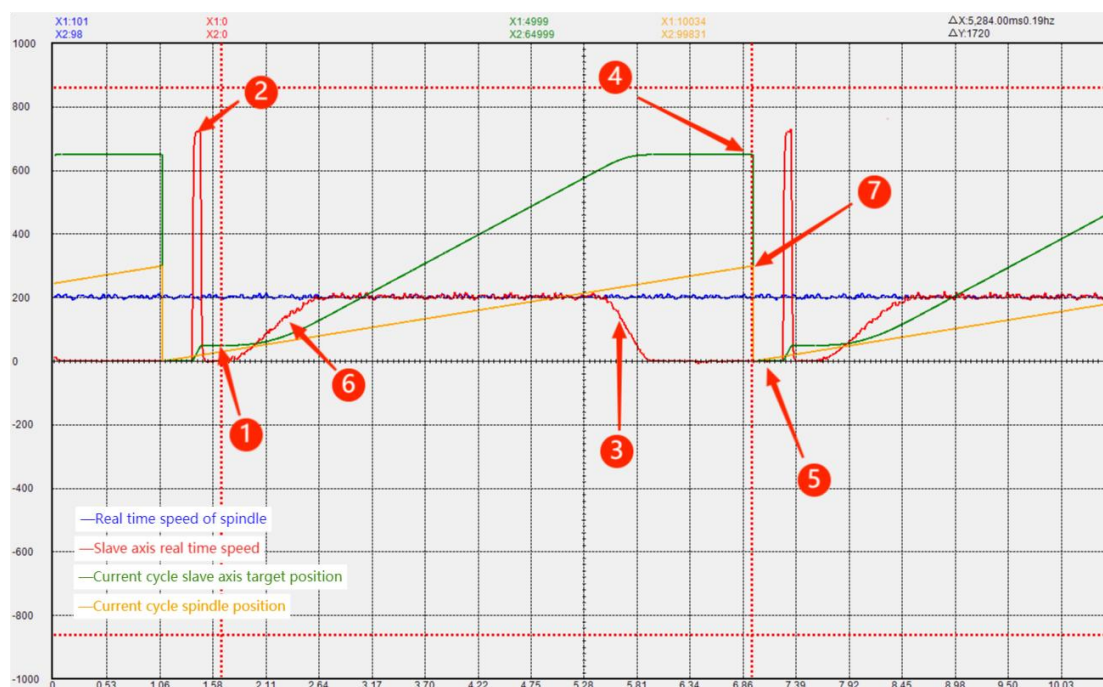
①   The rebound distance is controlled by (P17.40 rebound distance after cam operation is completed).

②   The rebound speed is controlled by (P17.41 rebound speed after cam operation is completed).

③   For the deceleration time or deceleration distance after the cam operation is completed, the deceleration time or deceleration distance can be selected by setting P17.36 (deceleration stage mode). , if the deceleration distance is selected, use P17.28 (slave axis deceleration distance) to set the length of the deceleration distance.

④   The total length of the slave axis is set through P17.22. Note that the parameters need to meet the conditions: P17.26 (acceleration distance from the master) + P17.28 (deceleration distance from the slave axis) <= P17.22 (total length of the slave axis), otherwise Error Er.614 is reported.

⑤   The spindle position at the time of rebound, the (P17.43) parameter is used to set the position of the spindle when the cam is finished running and the rebound will occur.

⑥   The spindle advance amount is set by P17.24.

⑦   Spindle length, set by P15.22 Order Cut Length 1.

Chapter 10 Wiring

10.1 Main circuit wiring

10.2 Input and output lines

In order to facilitate communication with the upper controller, the VECServo drive provides 10 groups of digital input terminals and 6 groups of digital output terminals that can be arbitrarily configured. In addition, it also provides XY pulse input and encoder differential output signals OA+, OA-, OB+, OB- and analog input and output signals that can be arbitrarily divided.

Depending on the type of the host controller, the DI and DO signals of the VECServo drive are designed to be selected by jumpers.

1）DIx jumper selection

SW-DI (pin 27 of CN3) and +24V (pin 26) are short-circuited as NPN, and SW-DI (pin 27 of CN3) and COM (pin 25) are short-circuited as PNP;

2）DOx jumper selection

SW-DO (pin 11 of CN3) and COM (pin 25) are short-circuited as NPN, and SW-DO (pin 11 of CN3) and +24V (pin 26) are short-circuited as PNP;

Remarks: Connect external DC24V power supply to pin 9 (COM) and pin 10 (+24V).
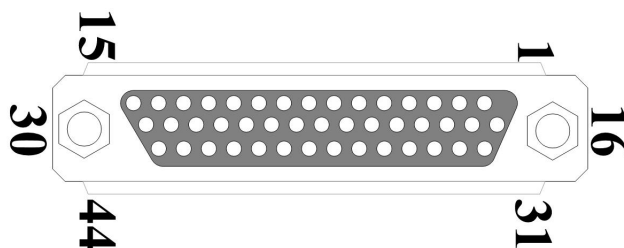
| 44PIN pin definition					
Pin No.	Define	Functional Description	Pin No.	Define	Functional Description
10、26	+24V	External DC24V power supply, for DI, DO work	21	RST	Reset
9、25	COM		12	AGND	Built-in Analog Ground
3	DO1	Programmable Digital Output	14	AI1	Analog input
18	DO2		15	AI2	
2	DO3		44	AO1	Programmable Analog Output
17	DO4		28	Y2+	High-speed pulse position command input
1	DO5		29	Y2-	
			13	X2+ (SIG+)	(Default high-speed pulse position command input (can be customized as Tension sensor signal input, the tension sensor can be powered through pins 35 and 36 (only for rewinding and unwinding)) Two functions can be selected)
16	DO6		30	X2- (SIG-)	
24	DI1	Programmable digital	37	OA+	Select the encoder signal frequency division output or the second encoder input through parameter
8	DI2		38	OA-	
23	DI3		39	OB+	

7	DI4	input	40	OB-	P03.78
22	DI5		41	OZ+	Encoder Z point signal output
6	DI6		42	OZ-	
5	DI7		35	+5V	Built-in +5V power
20	DI8		36	0V	
4	DI9		11	SW-DO	DO's NPN/PNP jumper
19	DI10		27	SW-DI	DI's NPN/PNP jumper
31	X+	Position command input, input signal type can choose differential signal or open collector	43	XYPH	XY input pull-up resistor
32	X-		Case	Shielded network layer	Connect to the ground wire of the driver
33	Y+				
34	Y-				

10.3 Position command pulse signal wiring

The following describes the wiring method of the position command input in the CN3 port in detail. There are two options for the input signal type, namely differential signal input and open collector input. Details are as follows:

(1) When differential signal input

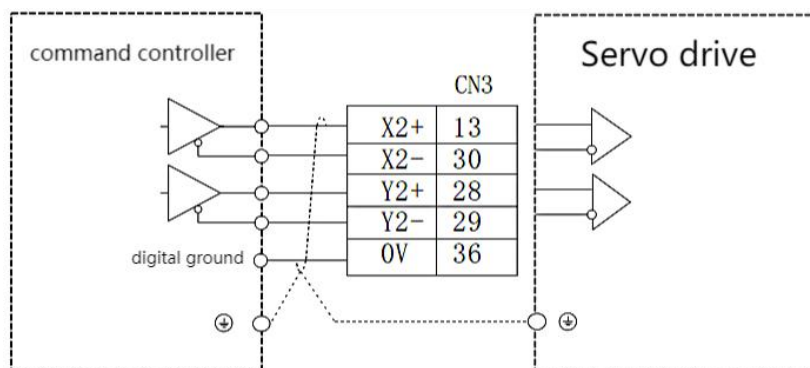Maximum input frequency ≦ 500KHz (before frequency multiplication)
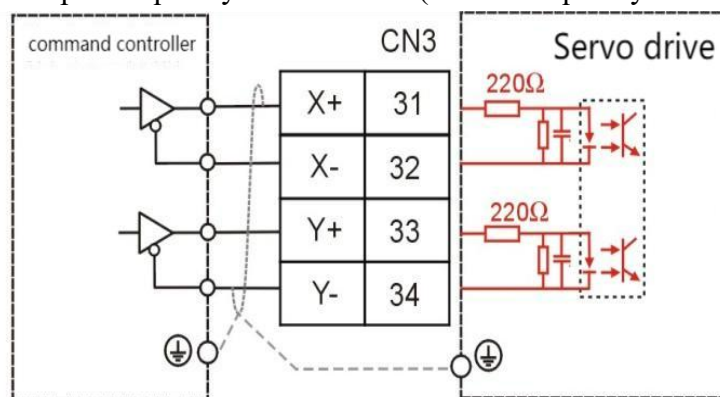
When working, please ensure that:

● 3.2V≤[(high level)-(low level)]≤5.1V

If the above formula cannot be satisfied, the input pulse of the servo drive will be unstable, and the phenomenon of pulse loss or command inversion may occur.

(2) High-speed pulse position command input (differential signal input)

Maximum input frequency ≦ 4MHz (before frequency multiplication)

When working, please ensure that:

● 3.2V≤[(high level)-(low level)]≤5.1V

If the above formula cannot be satisfied, the input pulse of the servo drive will be unstable, and the phenomenon of pulse loss or command inversion may occur.

(3) Open collector input

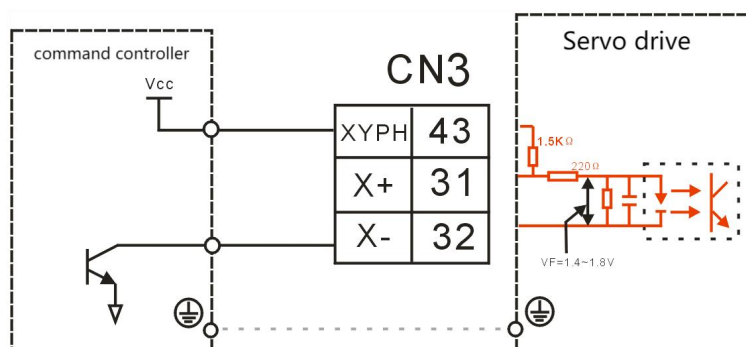Maximum input frequency ≦ 300KHz (before frequency multiplication)

① The upper controller is NPN type (Japanese PLC such as Mitsubishi, Panasonic, Omron, etc.)

a.When using the drive's internal 5V power supply:
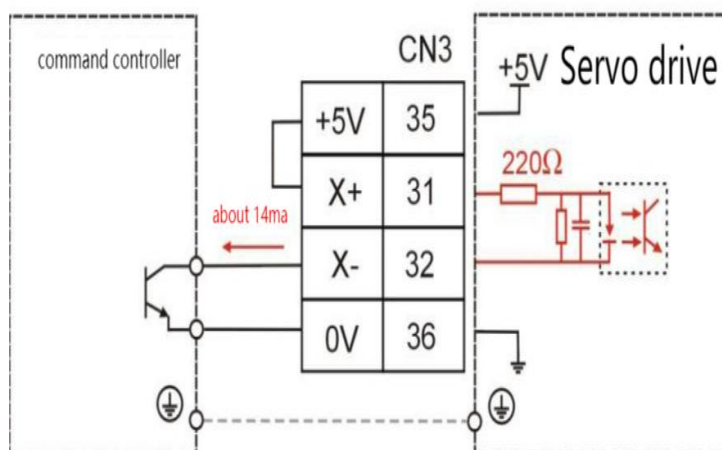
● The wiring of Y+ (33 feet) and Y- (34 feet)
is the same as that of X+ and X-.

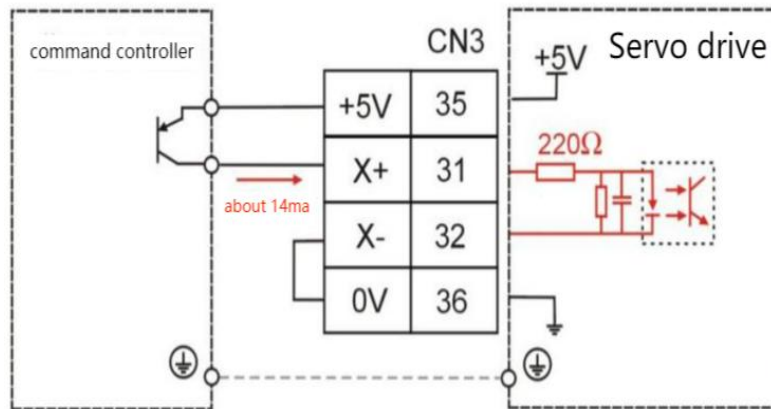b. When using an external power supply prepared by the user:

● The wiring of Y+ (33 feet) and Y- (34 feet)
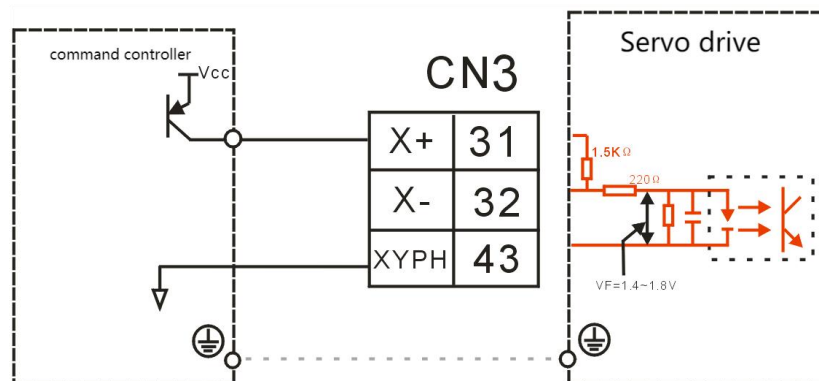is the same as that of X+ and X-.

● VCC=24V。

②The upper controller is PNP type (European PLC such as Siemens)
a. When using the drive's internal 5V power supply:

● The wiring of Y+ (33 feet) and Y- (34 feet)
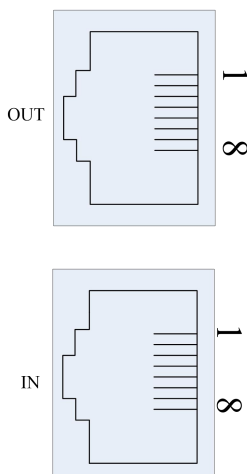   is the same as that of X+ and X-.

b. Use a user-prepared external power supply

● The wiring of Y+ (33 feet) and Y- (34 feet)
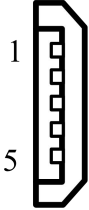   is the same as that of X+ and X-.
● VCC=24V。

10.4 Communication wiring

Pin assignment and definition of the E-structure communication port (CN1)

| Location and function	Terminal shape	Description
CN1	OUT (RJ45 1-8) IN (RJ45 1-8)	Both interfaces are defined the same. | Pin.No	Position	Description
1	NC	dangling
2	NC	dangling
3	GND	power ground
4	SG+	The signal of RS485 is positive
5	SG-	The signal of RS485 is negative
6	NC	dangling
7	NC	dangling
8	GND	power ground | **(1)It is necessary to connect the power ground of the controller (PLC) with the power ground of the servo drive** **(2)When multiple drives use the RS485 bus in parallel, please add a 120 Ω terminal resistor between the SG+ and SG- terminals of the most remote drive**

Note: When wiring, please connect the GND terminal of the host device and the GND terminal of the servo drive together.
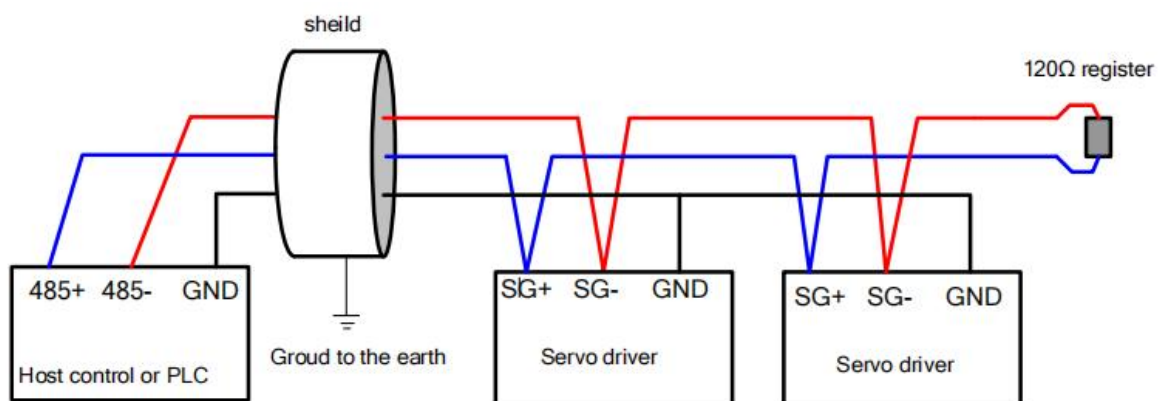
E structure monitoring port pin assignment and definition

Location and function	Terminal shape	Description		
CN5	1 5	Pin No.	Define	Description
		1	GND	power ground
		2	NC	dangling
		3	TXD	RS232 send
		4	RXD	RS232 receive
		5	NC	dangling

The connection to the computer is as shown below:
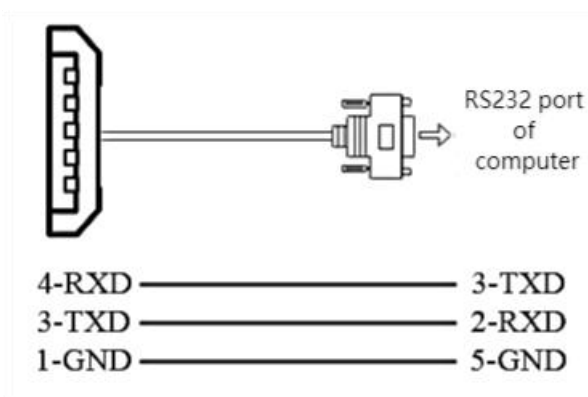
RS232 baud rate selection parameters are as follows:

| parameter no.	Parameter Description	Setting range	Units	Function	Setting method	Effective way	Defaults	read and write method
P08.26	RS232 monitor port baud rate 0- 9600 1- 38400 2- 115200	0~2	bps	Set the baud rate of the RS232 monitor port.	anytime	immediately	2	RW

10.5 Classic Wiring Diagram of Wheel Cut
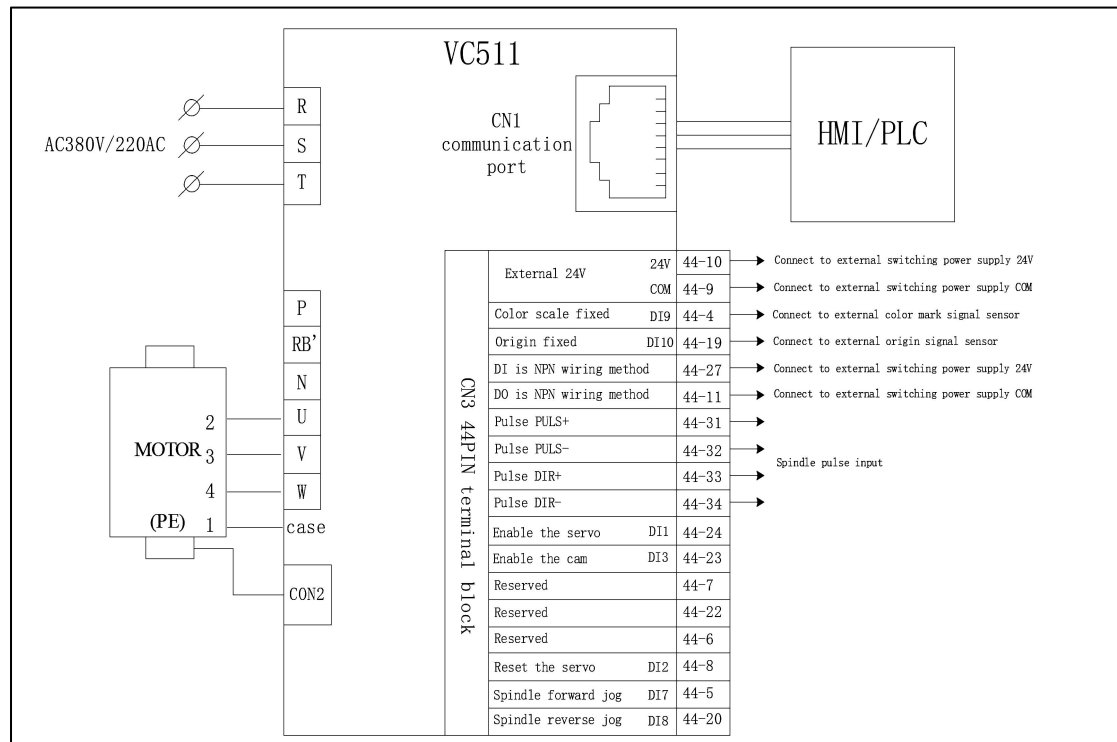
Notice:
1、The GND of the motor cable must be connected to the ground.
2、The shielded wire of CN3 should be connected to the shell.
3、The momdbus communication line should be connected to pin 3 GND.
4、Strong wires and weak wires should not be routed in the same trunking.

Chapter 11 Modbus Communication Protocol

Related parameters are as follows.

parameter no.	Parameter Description	Setting range	Units	Function	Setting method	Effective way	Defaults	read and write method
P08.20	Modbus Baud Rate Register 0- 4800 1- 9600 2- 19200 3- 38400 4- 57600 5- 115200	0~5	bps	Set the communication rate between the driver and the host computer. The communication rate of the servo drive must be consistent with the communication rate of the host computer, otherwise the communication cannot be performed.	anytime	Immediately	1	RW
P08.21	Modbus data format registers 0-No parity, 2 stop bits 1-No parity, 1 stop bit 2-Even parity, 1 stop bit 3-Odd parity, 1 stop bit	0~3	-	Set the data verification method when the drive communicates with the upper computer.	anytime	Immediately	1	RW
P08.22	32-bit address access high and low byte order 0-When accessing a	0~1	-	Sets the transmission format for	anytime	Immediately	1	RW

	32-bit address, the high-order 16 bits are first 1-When accessing a 32-bit address, the lower 16 bits are in front			32-bit data when using MODBUS communication.				
P08.23	Modbus Slave Address	1~255	-	Set Modbus slave address.	anytime	Immediately	1	RW
P08.24	Modbus fault register	-	-	An error code is displayed when a communication failure occurs.	-	-	-	RO
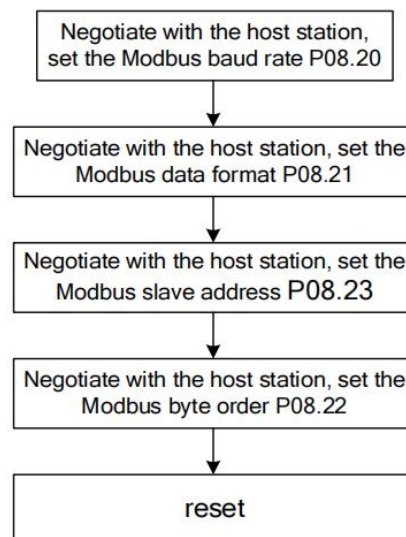
Function codes supported by Modbus

The servo drive only supports communication in Modbus RTU format. The function codes of the internally implemented Modbus protocol stack are shown in the table below.

Function code (decimal)	Function Description
1	Read bits
2	Read bits
3	Read registers
4	Read registers
5	Write Bit
6	Write 16-bit registers
16	write 32-bit registers

Servo DI bit address = function number + 40.

If the servo is enabled (INFn.01), the input function code is 1, and the location address is 41=40+1.

MODBUS Bit Addresses	Function	Valid rules
41	INFn.01	Enable the servo
42	INFn.02	Reset the servo

Servo DO bit address = function number + 140.

Such as servo failure (OUTFn.09), the output function code is 09, and the bit address is 149=09+140.

MODBUS Bit Addresses	Function	Valid rules
149	OUTFn.09	Fault output function
180	OUTFn.40	Output in meshing state, output valid signal when meshing
181	OUTFn.41	The output is valid when the slave axis is in the synchronization zone
182	OUTFn.42	The order is close to the output, When the actual number of cuts of the current order + the order approach threshold P15.34 is greater than or equal to the set times of the current order cut, the output order approach signal
183	OUTFn.43	Order completion output, when the actual number of cuts of the current order is greater than or equal to the set times of the current order, the order completion signal is output
184	OUTFn.44	The number of color mark loss reached, When the number of consecutive lost bids P16.43 is greater than or equal to the maximum allowable number of lost bids P16.44, the signal that the number of lost bids has reached is output.
185	OUTFn.45	Counter 1 reaches the output, When P15.52 is greater than or equal to P15.54,the output counter 1 reaches the signal
186	OUTFn.46	Cam curve segment output of 2, When P15.57 is greater than or equal to P15.59, the output counter 2 reaches the signal
187	OUTFn.47	Output angle range 1 of slave axis
188	OUTFn.48	Output angle range 2 of slave axis
189	OUTFn.49	Output angle range 3 of slave axis
190	OUTFn.50	Output angle range 4 of slave axis
191	OUTFn.51	Color mark trigger valid range output, If the spindle position of the current cam cycle is in the effective window of the color code, it will output a high level.
192	OUTFn.52	Output signal the colour mark trace success
193	OUTFn.53	Curve running output
194	OUTFn.54	Cam curve segment output of 1
195	OUTFn.55	Cam curve segment output of 2
196	OUTFn.56	Automatically correct the tangent point output
197	OUTFn.57	Point Cam allows first color mark triggering

198	OUTFn.58	Point Cam allows secondary color mark triggering
199	OUTFn.59	Point Cam Alarm
200	OUTFn.60	Point cam speed is too fast

All Pxx.yy parameters of the servo drive can be read, and the corresponding parameter register address is xx*100+yy. The parameter address of most host computers should be set to "parameter register address + 1". Such as servo parameter P15.01, the parameter address is 1501=15*100+01.

Chapter 12 Gain Adjustment

parameter no.	Parameter Description	General adjustment range	Recommended value
P07.01	Current loop P gain Reduce this value when the motor whistle, The speed following difference will increase this value	60-150	100
P07.02	Current loop I gain If the motor whistle, reduce this value. The speed following difference will increase this value	10-50	20
P07.03	Speed loop P gain speed jitter, decrease this value The speed following is poor, the position error is large, and the inertia is large, increase this value	1000-3000	2000
P07.04	Speed loop I gain Speed jitter, large inertia, reduce this value If the position error is large and the rigidity is strong, increase this value	10-100	20
P07.05	Position loop P gain speed jitter, decrease this value If the position error is large, then increase this value	50-100	100
P07.10	Torque feedforward Jitter at low speed, reduce this value If the speed following is poor and the inertia is large, increase this value	0-150	50
P07.20	Gain adjustment mode Please set it to 0	0	0

Chapter 13 Cutting Exception Handling

No.	Problem Description	Possible causes and their solutions	
1	Low cutting repetition accuracy	possible reason	Solution
		1、 Spindle slip	Increase the friction between the spindle and the material
		2、Spindle speed is not stable	The feeding power is unstable, the spindle is not standard round, or the spindle pulse is disturbed
		3、 Servo position loop error is large	When the torque is sufficient, adjust the gain.
2	Cut length suddenly becomes longer or shorter	possible reason	Solution
		1、 Spindle slip	Increase the friction between the spindle and the material
		2 、 The spindle pulse is disturbed	Observe whether the wiring is reasonable, whether the shielded wire is grounded, whether it is subject to strong electrical interference , etc.
3	When cutting, the material arches	possible reason	Solution
		1 、 The mechanical parameters are wrong, the actual speed of the spindle is greater than the speed of the tool axis during synchronization	Re-measure mechanical parameters
		2 、 The cutting point is installed incorrectly, and it is not in the synchronization area when cutting the material	Observe point cut signal installation
4	Each section of the cut material is longer than the set length	possible reason	Solution
		1 、 The mechanical parameters are wrong, and the perimeter of the slave axis is set incorrectly	Re-measure mechanical parameters
5	Always rotate at a constant speed when the slave axis returns to zero	possible reason	Solution
		1 、 DI10 no origin signal input	Check if wiring is correct

6	After setting P15.19=2, the length of shearing length changes alternately, and after setting 15.19=1, the slave axis jumps.	possible reason	Solution
		1、Slave roller/cutter (large inertia, shaking left and right after running)	Increase the rigidity of the motor
		2、The trigger position of the origin signal is different each time	

7	Color mark tracking mode, each crop is too large or too small	possible reason	Solution
		1、 The distance from the color scale to the origin P16.22 is not set	Appropriately increase or decrease the distance from the color scale to the origin P16.22 according to the actual situation
		2 、 The jitter caused by cutting causes the pulley to vibrate, so that there is an error in detecting the color mark.	Reduce the slack of the feeding pulley, or appropriately increase the position of the color mark signal detection point and the cutting point

Version Update Record

version	change date	Change the content
1.01	2022-3-4	The function number of INFn.xx is changed, AI3 and AO2 are reduced in hardware, and AI3 and AO2 are deleted in the manual.
1.02	2022-3-12	Complete the test run steps