Coolmay®
Automation expert

Coolmay M300 Series PLC Programming Manual

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Contents

Part I Overview

1.1 Coolmay M300 Blade PLC Main Advantages

The M300 series CPU module is a high-performance standard controller. Its M300 series CPU has built-in up to 8-axis (pulse type) positioning outputs, built-in up to 4 sets of high-speed counter inputs, and a variety of network communication options, providing users with powerful network functions. Through program settings, various network device links can be established. Through the built-in memory card function of the M300 series CPU module, system settings can be quickly backed up or restored. This manual explains the basic operating functions of the M300 system, allowing users to quickly get started with the M300 system.

1. Features

- ◆ It uses military-grade 32-bit CPU + ASIC dual processors, supports online monitoring and downloading , and the fastest execution speed of basic instructions is 0.24us .
- ◆ The host transistor output high-speed pulse output 8 axis Y0~Y7 can reach 200KHz . Support 4 groups of 200K Hz hardware high-speed counters.
- ◆ It comes with 1 RS232 and 1 RS485, both support modbus RTU/ASCII, free port and other protocols.
- ◆ Supports multiple interrupts, including input interrupt (rising edge, falling edge), timer interrupt, communication interrupt, high-speed counter interrupt and high-speed pulse output interrupt. External input interrupt supports 16 interrupt inputs.
- ◆ It supports motion positioning function and 2 groups of linear and circular interpolation motion (pulse + direction). Y0-Y3 is 1 axis group, Y4-Y7 is 2 axis group. 4-axis linkage is perfectly controlled with high precision.
- ◆ M302 supports CAN bus and can control servo motion and controller communication that supports CANBUS (CANOPEN protocol). Multiple servo bus control runs with high speed and real-time performance.
- ◆ M302 has optional network expansion, two network ports, and supports MODBUS-TCP and Ether Net/IP protocols.
- ◆ Supports special functions such as electronic cam, interpolation, G code, hand crank, etc.
- ◆ installed on DIN rail (35mm width) .

2. Larger program and data memory blocks

- ◆ M300 series CPU module, program capacity up to 32k steps. Built-in 12k data registers .

3. Support independent programming software

- ◆ For M300 series CPU modules, the programming software is Vtool PRO .
- ◆ Supports online editing mode, allowing users to update programs while the system is running without affecting system operation.
- ◆Supported programming languages: instruction, ladder diagram (LD), step ladder diagram (SFC) .

4. Versatile communication interface

- ◆ Equipped with 1 Type-C programming port for faster downloading speed.
- ◆ Provide 1 RS232 and 1 RS485 , support Delta DVP programming port protocol/ Modbus RTU, modbus ASCII protocol/ free port protocol, easily realize PLC interconnection and communication with external devices such as human-machine interface and inverter.

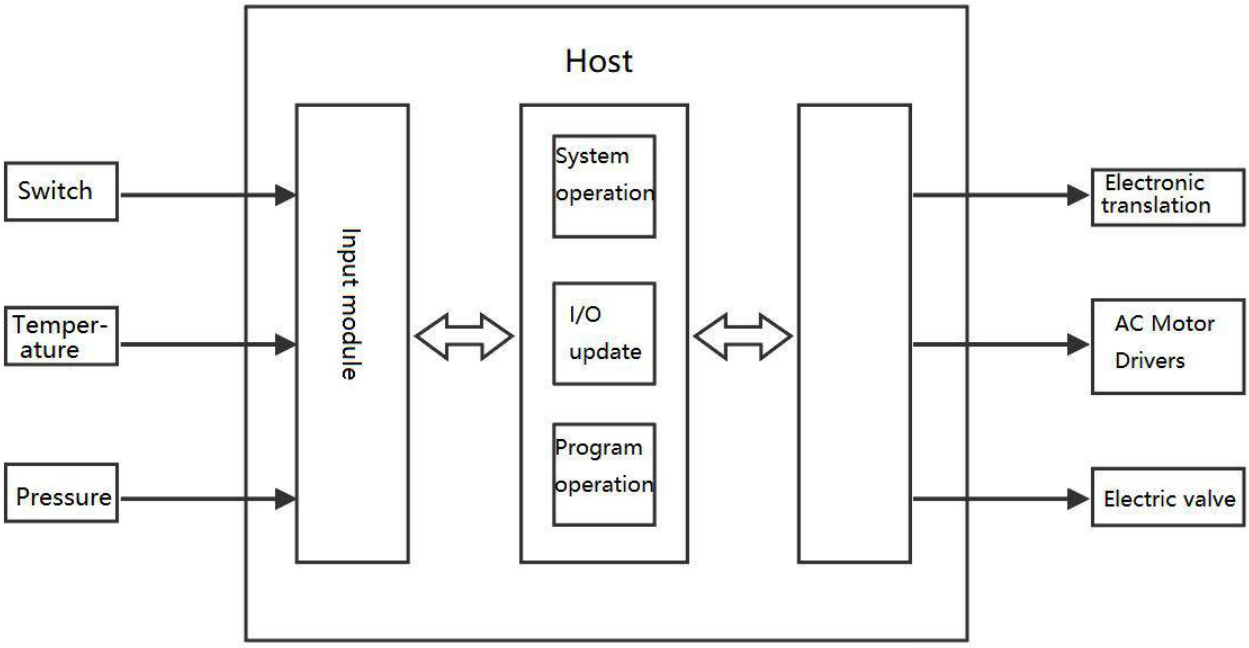
5. Support more I/O points

- ◆ The maximum I/O points of M301 can support 280 digital points (24 points for the host + 256 points for expansion), and up to 16 expansion modules;
  M302 can support 520 digital points (24 points for the host + 496 points for expansion), and up to 31 expansion modules.
- ◆ M301 can expand 1 axis control module (4 channels 200K Hz), M302 can expand 4 axis control modules (16 channels 200K Hz); neither occupies IO points.
- ◆Extended I/0 addresses do not require programming, are automatically assigned, and modules are plug-and-play. The extended addresses start from X20 , Y20.

1. 2 Host Operation Introduction

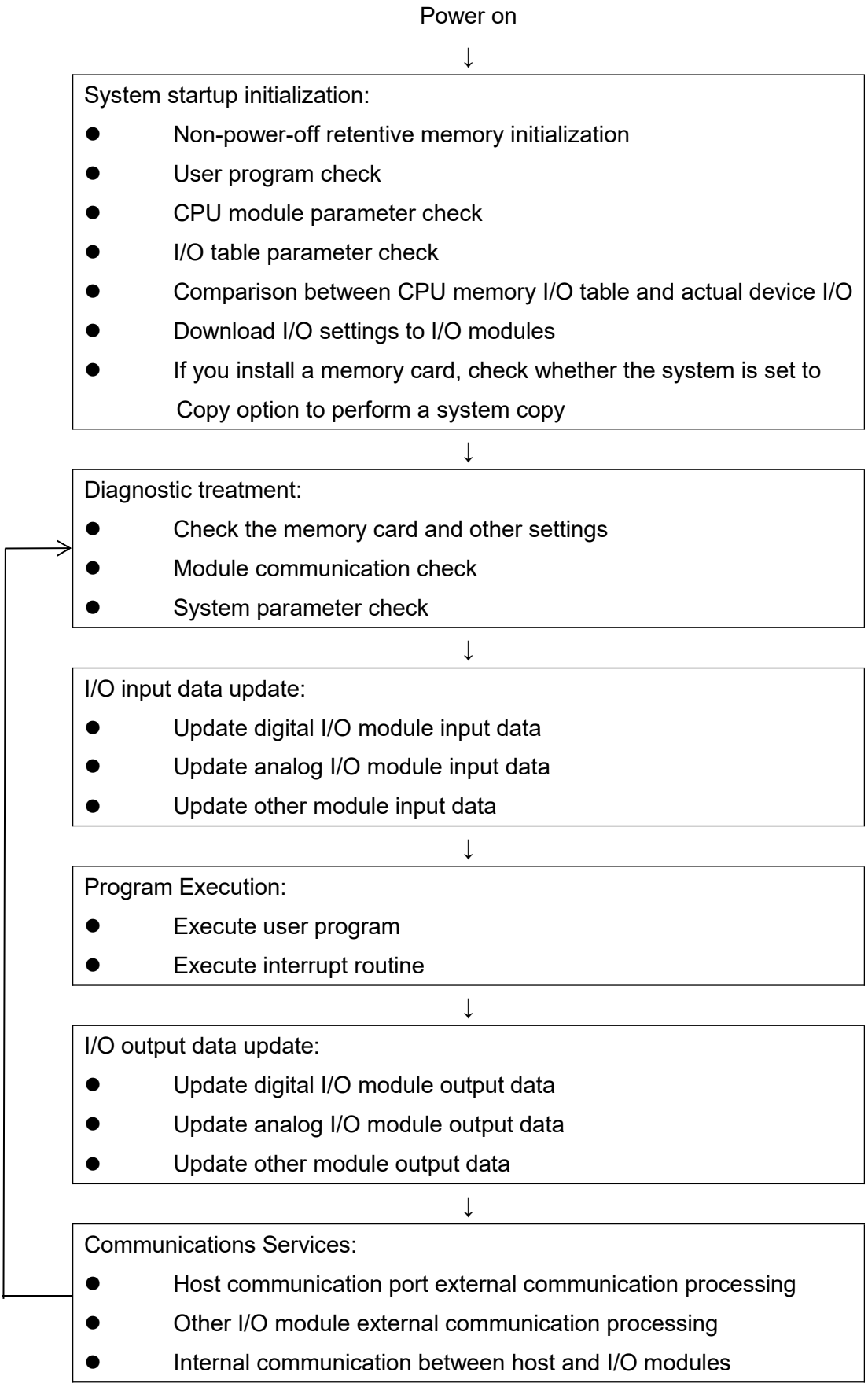
The host is the core component of the entire M300 series. In addition to executing the user's logic program, its main job is also responsible for all I/O data reception and data communication processing. The relationship between the M300 system established by the host and related modules and the actual external devices can be simply expressed as follows:

External input device M300 system external output device



The above is a simple expression of the host operation, which simplifies the system-side processes such as initialization, diagnosis, and communication, and the program-side processes

such as external interrupts and time interrupts. If the user is interested in a deeper understanding, he can refer to the complete instruction manual. The complete host operation process is listed below for reference.


Power on
System startup initialization:
Non-power-off retentive memory initialization
User program check
CPU module parameter check
I/O table parameter check
Comparison between CPU memory I/O table and actual device I/O
Download I/O settings to I/O modules
If you install a memory card, check whether the system is set to Copy option to perform a system copy
Diagnostic treatment:
Check the memory card and other settings
Module communication check
System parameter check
I/O input data update:
Update digital I/O module input data
Update analog I/O module input data
Update other module input data
Program Execution:
Execute user program
Execute interrupt routine
I/O output data update:
Update digital I/O module output data
Update analog I/O module output data
Update other module output data
Communications Services:
Host communication port external communication processing
Other I/O module external communication processing
Internal communication between host and I/O modules

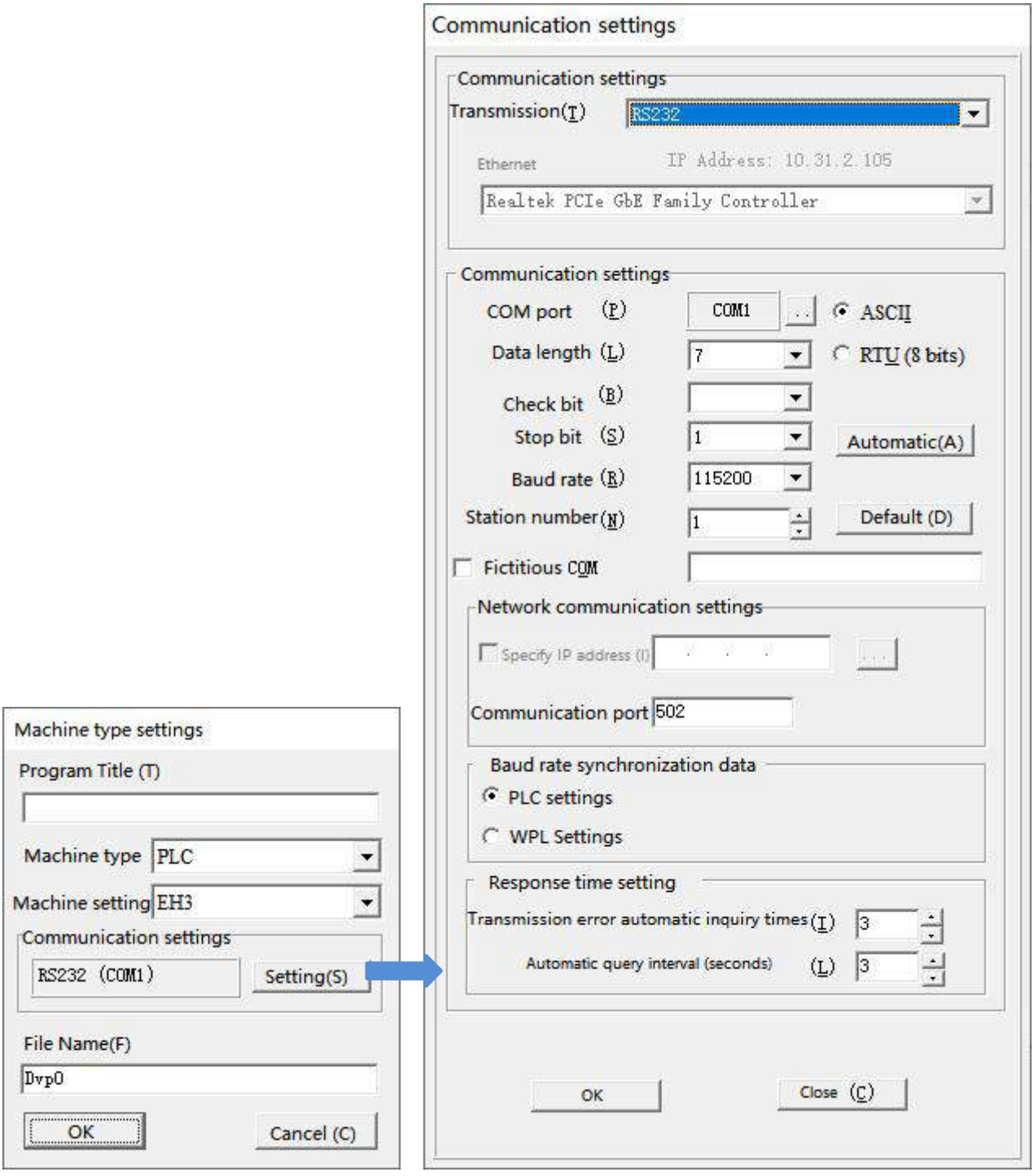
1. 3 M300 Series Host Brief Instructions

Product Type	M30 1	M30 2
Product images		
Dimensions	100*83*24mm	1 00 * 83 * 40 mm
Installation	35MM standard rail installation	
Supply voltage	DC24 V (-15%~20%)	
Grounding	The wire diameter of the grounding terminal wiring instructions must not be smaller than the wire diameter of the power line (when multiple PLCs are used at the same time, please make sure to ground at a single point)	
Operating/Storage Environment	Operation: Temperature -20℃ ~ 55 ℃ (non-condensing) , humidity 5 ~ 95% RH (non-condensing) Storage: Temperature -25 ℃ ~ 70 ℃ , humidity 5 ~ 95% RH (no condensation)	
Insulation resistance	5 MΩ or more	
No-load power consumption	1.2W	1.2W
Full load power consumption	2.4W	2.8W
Weight (g)	101g	117g
Switching points	12 in 12 out	16 in 16 out
Switch input level	Passive NPN or PNP , common terminal isolation ; input voltage: 24V $_{DC}$ ±10%	
Switching output level	Transistor output MT: low level NPN , COM connected to negative	
Switching output type and load	Transistor MT : 1A/point, 3.2A /4points COM; Voltage specification: 12V $_{DC}$ - 36V $_{DC}$	
High-speed counting input	Conventional 4 -way single-phase 200 KHz or 4- way AB phase 200 KHz	
High-speed pulse output	Normally, up to 8 channels Y0- Y7 are 200KHz Another axis control module can be expanded (4 channels 200K Hz)	Conventional 8- channel Y0~ Y7 is 200K Hz Another 4 axis control modules can be expanded (16 channels 200K Hz)
Ethernet	none	Support MODBUS TCP, Ether Net/IP
CAN communication	none	Support optional 1-way CANOPEN
EtherCAT	none	Support optional 1-way
Expansion Cards	none	Support 2
Serial Port	The total number of communication ports is 2. The default is 1 RS 485 and 1 RS 232 .	
Programming port	1 Type-C USB port	

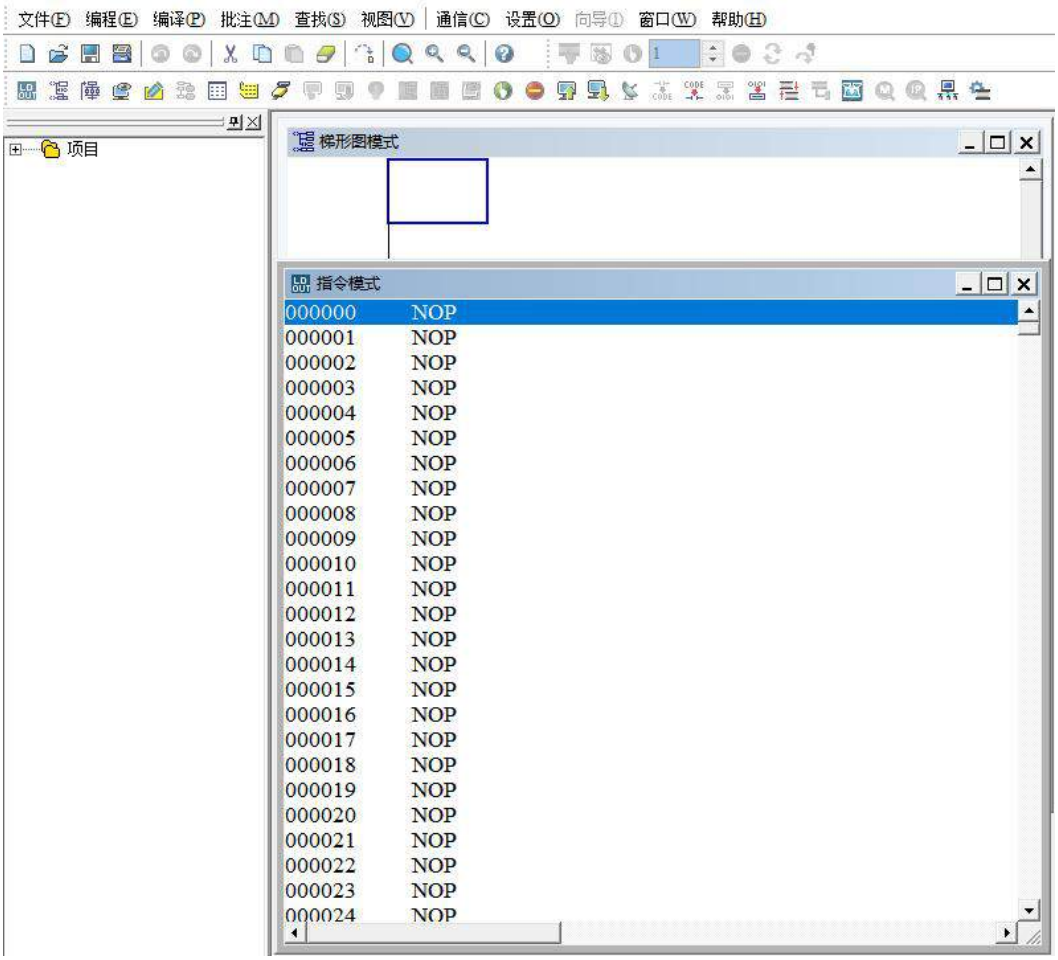
Programming software	Vtool PRO
Common models and specifications: M30 1 , M30 2 , please refer to: Coolmay M300 Series PLC Programming Manual , Coolmay M300 Series PLC User Manual	

1.4 M300 Series Host Programming Notes

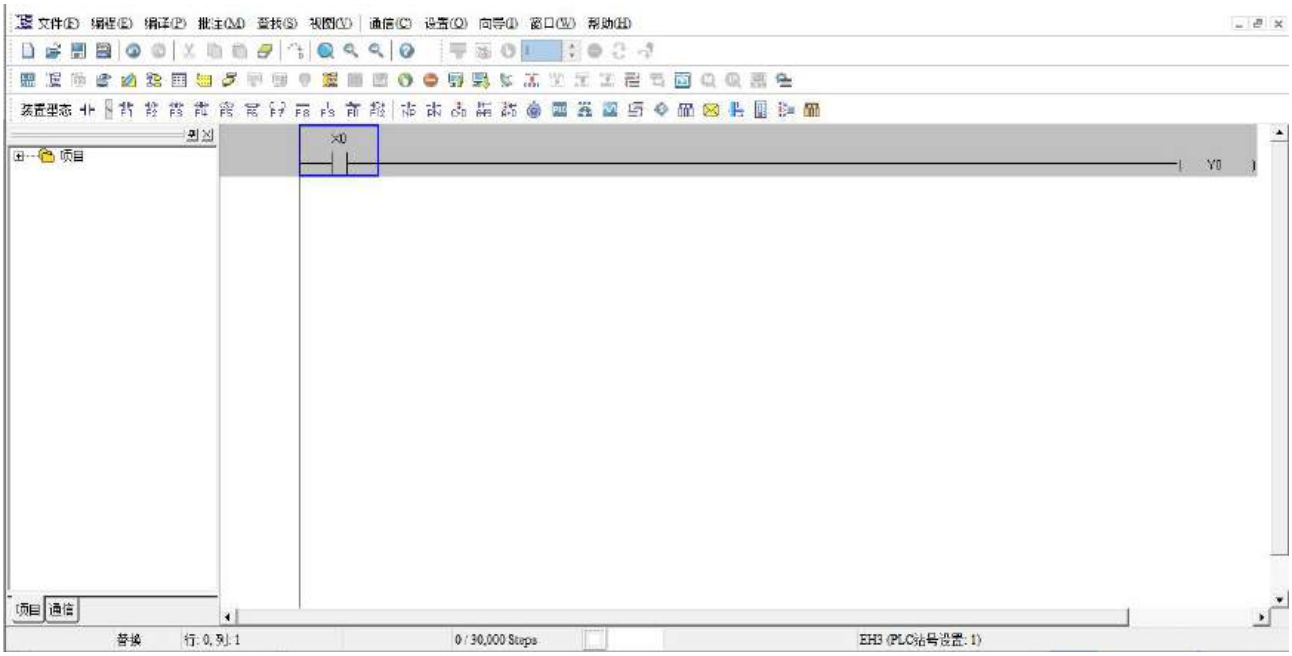
PLC uses Vtool PRO programming software . In the Model Settings window, you can specify the initial settings of the program, such as the program title, PLC model settings, program capacity (please refer to the model name and program capacity specifications of the PLC host used) and file name.



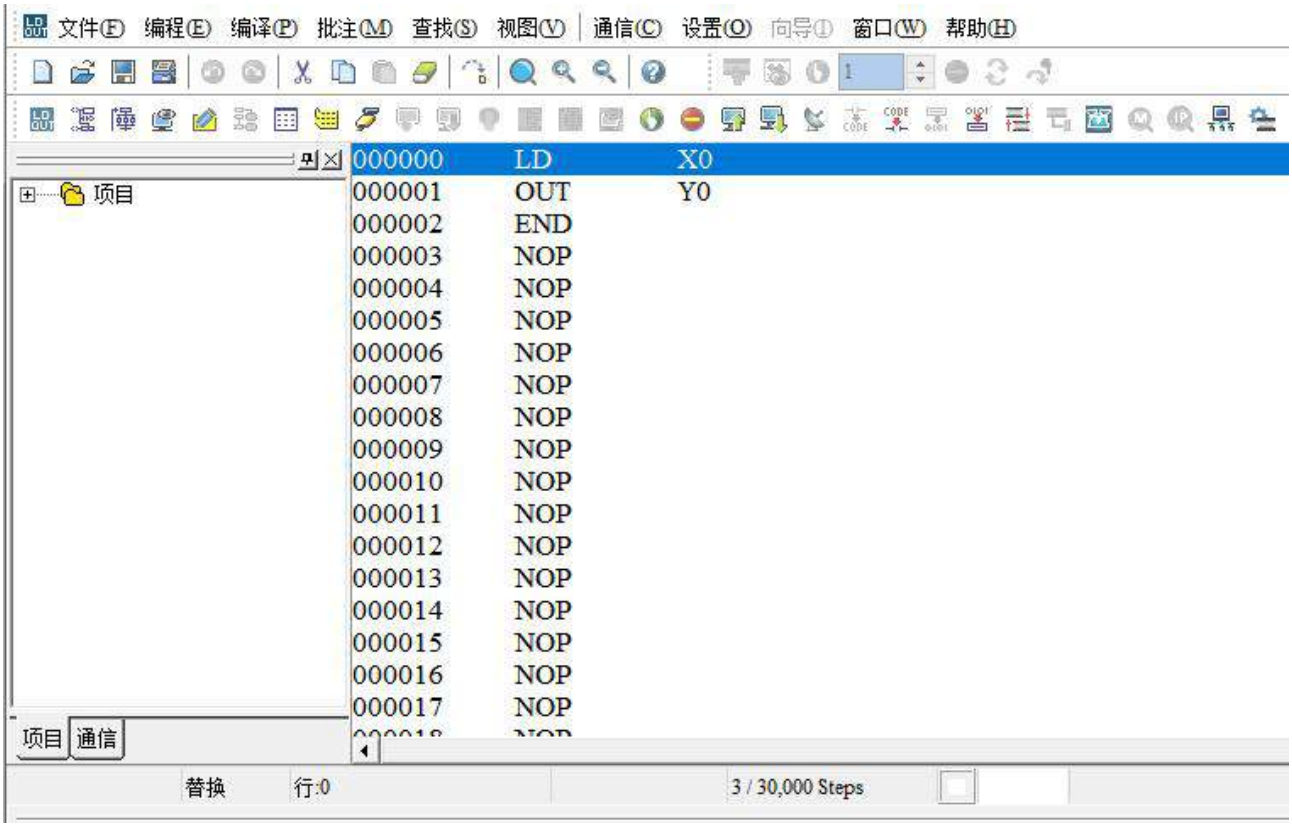
After completing the above settings, two sub-windows will appear: one is the ladder diagram mode window, and the other is the instruction mode window. Users can select the programming mode according to their familiar design habits to program the PLC program.



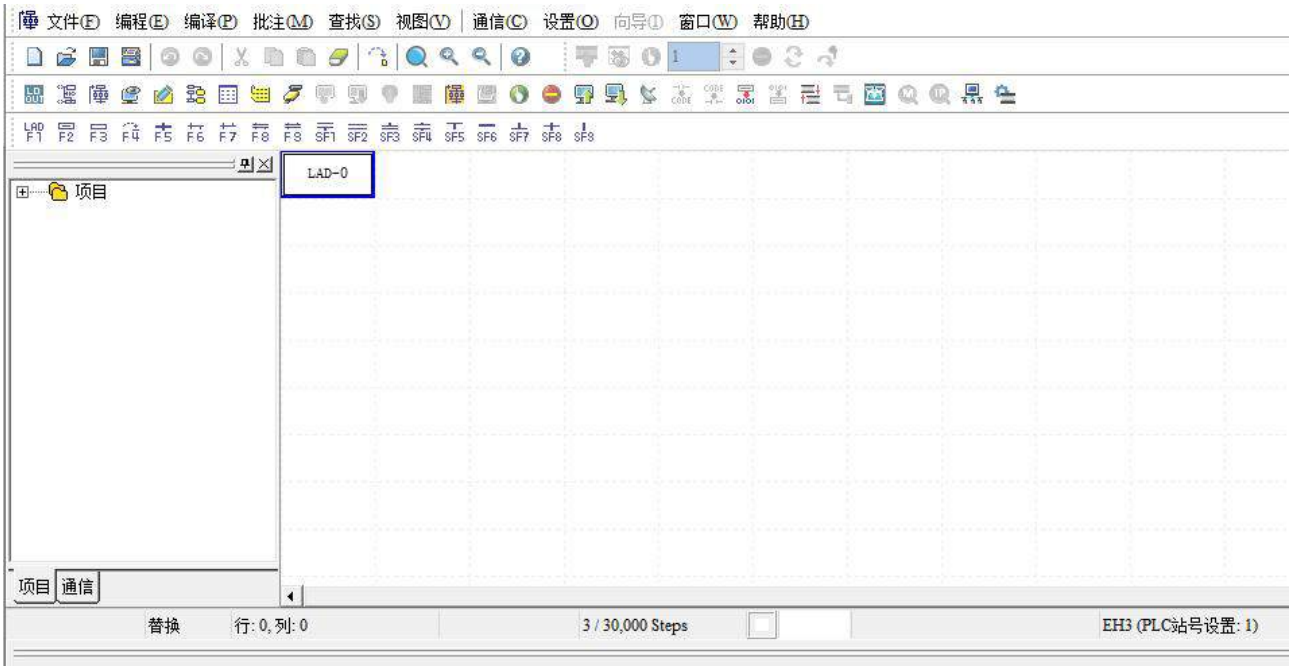
Ladder diagram mode: (Ladder diagram programming must be compiled and converted into instruction code or SFC diagram)



Instruction mode: (Instruction programming must be converted into ladder diagram or SFC diagram through compilation)



SFC programming mode: (SFC diagram programming must be converted into instruction code through compilation. If it is to be converted into a ladder diagram, it must be converted into a ladder diagram through compilation of instruction code)



1.5 M300 Series Host Hardware Information Introduction

1. Structure introduction

For details, please refer to the M300 Series User Manual.

2、Communication port description

◆M300 series host PLC comes with a USB programming port and 1 Type-C programming port for faster download speed .

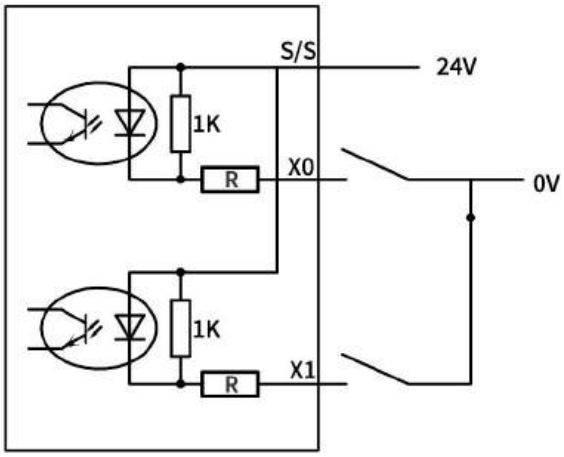
◆ Provide 1 RS232 (serial port 1), 1 RS485 (serial port 2), support Delta DVP programming port protocol/ Modbus RTU, modbus ASCII protocol/ free port protocol, easily realize PLC interconnection and communication with external devices such as human-machine interface and inverter.

3、Wiring method

The PLC input (X) is a two-phase optocoupler, and users can choose NPN or PNP connection when using it. However, please note that because the common ends of the input points are all connected, a module or a host can only have one wiring method and cannot be mixed.

◆ PLC switch input wiring:

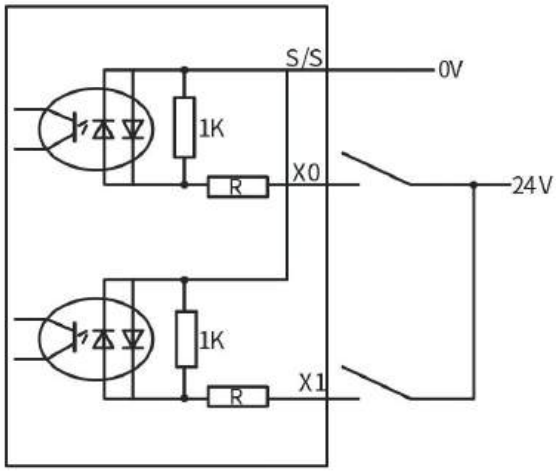
1.PLC input (X) is external power supply DC24V sink type (passive NPN), input signal is isolated from power supply. To use, S/S needs to be connected to the 24V positive of external power supply.



NPN 参考接线方式：

- 端口短接：PLC 输入端子的 S/S 接 24V，X 端子接电源 0V，即输入有信号;
- 两线制(磁控开关)：PLC 开关量输入接二线制的磁控开关，磁控开关的正极接 X 端子，负极接 0V；
- 三线制(光电传感器或编码器)：PLC 开关接三线制的光电传感器或者编码器，传感器或者编码器的电源接电源正极，信号线接 X 端；编码器和光电传感器要求是 NPN 类型。

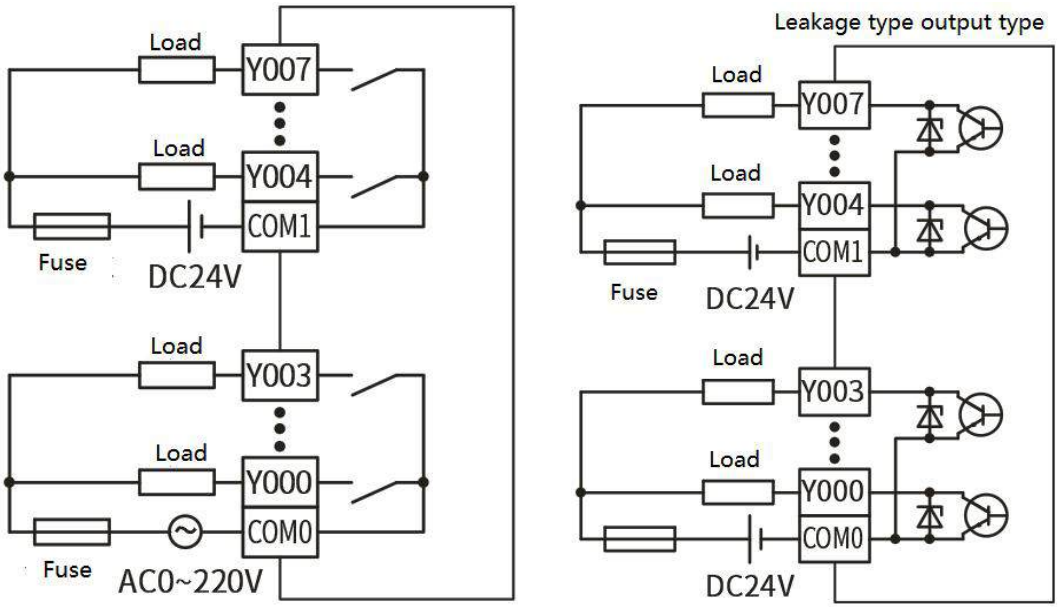
2.PLC input (X) is externally powered DC24V source type (passive PNP), and the input signal is isolated from the power supply. To use, S/S needs to be connected to the 0V of the external power supply.



PNP 参考接线方式：

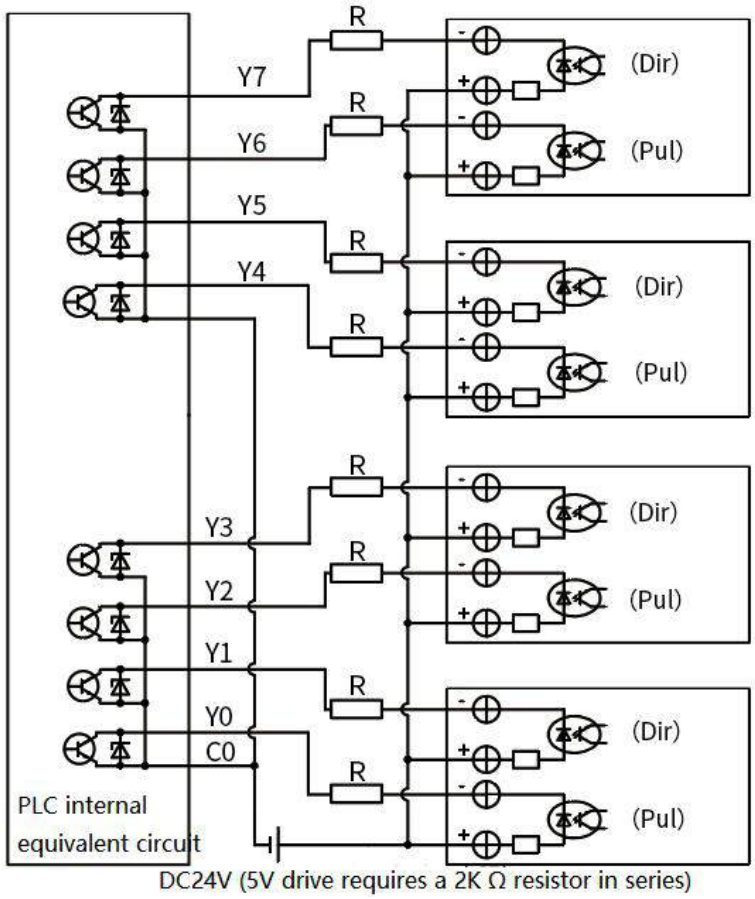
- 端口短接：PLC 输入端子的 S/S 接到 0V，X 端子接到电源 24V，即输入有信号;
- 两线制(磁控开关)：PLC 开关量输入接二线制的磁控开关，磁控开关的负极接到 X 端子，正极接到 24V；
- 三线制(光电传感器或编码器)：PLC 开关接三线制的光电传感器或者编码器，传感器或者编码器的电源接电源正极，信号线接 X 端；编码器和光电传感器要求是 PNP 类型。

◆ PLC switch output wiring:



Relay output equivalent circuit Transistor output equivalent circuit

- Relay output: The output terminals are divided into several groups, each group is electrically isolated, and the output contacts of different groups are connected to different power supply circuits. COM can be connected to the positive or negative pole.
- Transistor output: The output terminals are divided into several groups, each group is electrically isolated, and the output contacts of different groups can be connected to different power supply circuits; transistor output can only be used for DC24V load circuits. The output wiring method is NPN, COM common cathode.



- Note: When wiring the pulse, a 2KΩ resistor must be connected in series with the DC24V for a

5V driver; the designated pulse points are Y0~Y7, and the direction can be customized.

Part 2 Soft element number

2.1 List of Soft Component Numbers

Component name	content		
Input and output relays			
External input relay	X000~X 377	256 points	The software number is an octal number. Total input and output points : 512
External output relay	Y000~Y 377	256 points	
Auxiliary relay			
General use (can be modified to power off retention)	M0~M 499	500 points	The contact can be switched ON/OFF in the program Total 4096 points
Power failure retention	M500 ~ M991 , M2000~M4095	2586 points	
Special use (partially for power failure retention)	M1000~M1999	1000 points	
Timer (The timer specified by the TMR instruction, if the timing is reached, the contact with the same number T will be On)			
100ms is generally used	T0 ~ T19 9	200 points	0.1 ~ 3,276.7 seconds (T184 ~ T199 , 16 points, for subroutine)
100ms cumulative type (power failure retention)	T250 ~ T255	6 o'clock	0.1 ~ 3,276.7 seconds
10ms ※ 1General use	T200~T239	40 points	0.01 ~ 327.67 seconds
10ms cumulative type (power failure retention)	T240~T245	6 o'clock	0.01 ~ 327.67 seconds
1ms cumulative type (power failure retention)	T246 ~ T249	4 o'clock	0.001 ~ 32.767 seconds
Counter (the counter specified by the CNT (DCNT) instruction, if the count reaches the limit, the contact with the same number C will be On)			
Generally use up count (16 bits)	C0 ~ C 99	1 00 points	0 ~ 32,767 counter (can be modified to power-off retention)
Up count for power failure retention (16 bits)	C100 ~ C199	1 00 points	0 to 32,767
Generally use bidirectional (32 bits)	C200 ~ C219	20 o'clock	-2,147,483,648 ~ +2,147,483,647 Counter
Power failure retention, bidirectional (32 bits)	C220 ~ C234	15:00	-2,147,483,648 ~ +2,147,483,647 Counter
High-speed counter			

Software single-phase single-count input Bidirectional (32 bits) (power failure retention)	C 235 ~ C24 0 , 6 points	Counter from -2,147,483,648 to +2,147,483,647 Software Counter Single phase: up to 4 channels, maximum frequency 200kHz Dual-phase: 2x frequency: up to 4 channels, maximum frequency 200KHz 4x: up to 4 channels, maximum frequency 200 kHz	
Hardware single-phase single-count input Bidirectional (32 bits) (power failure retention)	C 2 41 ~ C24 4 , 4 points		
Hardware single-phase double counting input Bidirectional (32 bits) (power failure retention)	C246 ~ C2 49 , 4 points		
Hardware dual-phase dual-count input Bidirectional (32 bits) (power failure retention)	C251 ~ C25 4 , 4 points		
State step point (device used in step ladder diagram (SFC))			
Initial state	S0 ~ S9	10 points (used with IST command)	
For origin return	S10 ~ S19	10 o'clock	
Power failure retention (not retained)	S 20 ~ S 127	108 points	
General use	S 128 ~ S 899	771 points	
Alarm	S 900 ~ S 1023	124 points (S500-S1023 power failure retention)	
Data register (32 bits when used in pairs)			
General use (16 bits)	D0 ~ D 199	200 points	
Power failure retention (16 bits)	D 200 ~ D 999, D2000 ~ D11999	10800 points	
Special use (16 bits)	D 1 000 ~ D 1999	1000 points (partial power failure retention)	
For addressing (16 bits)	E 0 ~ E 7, F 0 ~ F 7	16:00	
pointer			
For CJ and CALL branches	P0 ~ P 255	256 points	For CJ instruction and CALL instruction
External input interrupt	I0□ □ ~ I 7 □□	8 points , X0-X7 (01, rising edge trigger; 00, falling edge trigger)	
Timer interrupt	I6□□, I7□□, 2 points (□□＝02~99, time base 1ms) I8□□, 1 point (□□＝05~99, time base 0.1ms) The time will be affected by the scan cycle time		
High-speed counting interrupt	I010 (C232) , I020 (C233), I030 (C241), I040 (C242), I050 (C234), I060 (C239), I070 (C240) 7-way high-speed counting . (Using high-speed counting interruption will not enable the high-speed counting setting device)		
Pulse interrupt insertion	I110、I120、I130、I140	4 o'clock	

Communication interruption insertion	I150, I160, I170	3 o'clock	
Nesting			
For master control	N0 ~ N7	8 o'clock	MC instruction
constant			
Decimal number (K)	16-bit	-32,768 ~ +32,767	
	32-bit	-2,147,483,648 ~ +2,147,483,647	
Hexadecimal number (H)	16-bit	000 0 ~ FFFF	
	32-bit	0000000 0 ~ FFFFFFFF	
Real number (E)	32-bit	-1.0×2128 ~ -1.0×2-126,0,1.0×2-126 ~ 1.0×2128 Can be expressed in decimal and exponential form	

Part 3 Special Relays and Registers

3.1 Special relay numbers and contents

serial number	Functional Description	Remark	serial number	Functional Description	Remark
M1000	Operation monitoring normally open contact (contact A)		M1330	Y12 port pulse output direction	
M1001	Operation monitoring normally closed contact (contact B)		M1336	Y0 port pulse output	
M1002	After RUN, the output is ON for one scan cycle.		M1337	Y2 port pulse output	
M1003	After RUN, the output is OFF for one scan cycle.		M1340	The start flag of interrupt number I110	
M1004	Syntax check error occurred		M1341	The start flag of interrupt number I120	
M1008	On Scan Timeout Timer (WDT)		M1342	The start flag of interrupt number I130	
M1011	10ms clock pulse	5ms On 5ms Off	M1343	The start flag of interrupt number I140	
M1012	100ms clock pulse	50ms On 50ms Off	M1345	CAN0 slave failure	
M1013	1s clock pulse	0.5s On 0.5s Off	M1347	CAN0 communication reset broadcast pre-run	
M1014	1min clock pulse	30s On 30s Off	M1356	CAN1 write flag	
M1015	High-speed connection timer		M1357	CAN0 master flag	
M1017	RTC Correction		M1358	CAN1 read flag	
M1020	Zero Flag		M1359	CAN0 communication timeout flag	
M1021	Borrow sign		M1360	CAN1 communication timeout flag	
M1022	Carry flag		M1377	Set to ON to enable the weighing module function (not supported yet)	
M1025	ON Communication error		M1378	If set to ON, the network card will be automatically reconfigured	Automatic reset
M1026	RAMP mode selection		M1408	Ethernet switch master control bits : ON turns off Ethernet, OFF turns on Ethernet	Power-off retention
M1028	T64~T126 , 10ms time switching flag	Off = 100ms On = 10ms	M1409	DCHP on/off	
M1029	Pulse output Y0 or CH0 (Y0, Y1) is completed		M1410	DNS on/off	

serial number	Functional Description	Remark	serial number	Functional Description	Remark
M1030	Pulse output Y1 is completed		M1411-M1499	System usage	
M1032	All power failure holding areas are cleared		M1502	Client mode on	
M1034	Disable all Y outputs		M1503	System usage	
M1035	Input point X7 as RUN/STOP switch		M1504	Initial network card information bit	ON Start OFF
M1036	ON is DZRN Y4 pulse output completed		M1505	Network card initialization completion flag	
M1037	ON is DZRN Y6 pulse output completed		M1507	Server mode on	
M1038	T200~T255 , 1ms time switching flag	Off = 10ms On = 1ms	M1520	Y4 pulse immediate shutdown flag	
M1039	Fixed time scan mode		M1521	Y6 pulse immediate shutdown flag	
M1040	Stepping Inhibit		M1522	Y4 port pulse output	
M1041	Step Start		M1523	Y6 port pulse output	
M1042	Start pulse		M1532	PLSV DRVA DRVI CH2 direction flag	Forward ON Reverse OFF
M1043	Return to origin completed		M1533	PLSV DRVA DRVI CH3 direction flag	
M1044	Origin conditions		M1549	Y10 pulse output flag	
M1045	All output reset disabled		M1559	Y12 pulse output flag	
M1046	STL status set to On		M1550	5th axis immediate shutdown flag	
M1047	STL monitoring is effective		M1551	5th axis pulse output completed	
M1048	Alarm point status flag		M1552	CAN OPEN1 message structure	ON for low speed OFF is high speed
M1049	Set alarm point monitoring flag		M1555	G code motion trigger flag	
M1050	Input interrupt (I000/I001 disabled)		M1556	G code motion communication mode start	
M1051	Input interrupt (I100/I101 disabled)		M1557	G code axis interpolation completed flag	

serial number	Functional Description	Remark	serial number	Functional Description	Remark
M1052	Input interrupt (I200/I201 disabled)		M1560	6th axis immediate shutdown flag	
M1053	Input interrupt (I300/I301 disabled)		M1561	6th axis pulse output completed	
M1054	Input interrupt (I400/I401 disabled)		M1570	ON weighing and peeling (not supported yet)	
M1055	Input interrupt (I500/I501 disabled)		M1571	ON integral mean filter weighing channel 1	OFF is limiting filter (Not supported yet)
M1056	Timer interrupt (I6 port disabled)		M1572	ON integral mean filter weighing channel 2	
M1057	Timer interrupt (I7 port disabled)		M1573	ON integral mean filter weighing channel 3	
M1061	An error occurred in the read check of the power-off holding area		M1574	ON integral mean filter weighing channel 4	
M1064	Incorrect operand usage		M1575	ON integral mean filter weighing channel 5	
M1065	Syntax Error		M1576	COM2 communication timeout flag	
M1066	Loop Error		M1577	Serial port 1 communication timeout flag	
M1067	Operation error		M1581	ON means port 1 is in link state	
M1068	Operation error latch (D1068)		M1582	ON means port 2 is in link state	
M1070	PWM instruction Y1 time base switch	On:100us Off: 1ms	M1583	ON means port 3 is in link state	
M1072	PLC RUN instruction execution		M1584	ON means port 4 is in link state	
M1079	ON is PLSR Y0 pulse immediately shuts down		M1585	ON means port 5 is in link state	
M1087	LV signal action flag		M1586	ON means port 6 is in link state	
M1102	ON PLSR Y4 means pulse output is completed		M1587	ON means port 7 is in link state	
M1103	ON PLSR Y6 means pulse output is completed		M1588	ON means port 8 is in link state	
M1114	ON is PLSR Y2 pulse immediately shuts down		M1589	Orthogonal encoding pulse output direction control bit	ON forward OFF Reverse
M1120	COM2 communication settings are kept	With D1120	M1590	Start quadrature encoding pulse output	
M1122	COM3 communication data sending	Automatic reset	M1591	Network cable disconnect flag	

serial number	Functional Description	Remark	serial number	Functional Description	Remark
M1123	COM3 port receiving completed	Manual reset	M1592	CAN RS instruction ID and length occupy device selection ON occupies 2 words, OFF occupies 1 word	
M1124	COM3 ON receiving waiting		M1594	CAN RS command 29-bit ID device selection ON 29-bit, OFF 11th place	
M1 127	Receive conversion completed		M1596	CH0 PLSV direction bit is on	
M1128	COM3 sending waiting		M1597	CH1 PLSV direction bit is on	
M1129	COM3 communication timeout flag		M1598	CH2 PLSV direction bit is on	
M1132	ON DPPMA, DCIMA, DPPMR instructions are being executed, M1102 ON means the execution is completed Y4 Y6		M1599	CH3 PLSV direction bit is on	
M1133	ON DPPMA, DCIMA, DPPMR instructions are being executed, M1029 ON means the execution is completed Y0 Y2		M1600	CH4 PLSV direction bit is on	
M1136	COM3 communication settings are kept	With D1109	M1601	CH5 PLSV direction bit is on	
M1138	COM1 communication settings are kept	With D1036	M1602	CAN1 PDO cycle station completed	
M1143	COM3 turns on RTU mode (when using RTU mode, the sent data must be set to 8-bit format, otherwise the highest bit of all data will be lost)		M1604	CAN1 PDO loop station	
M1148	DELAY command 100us/5us delay reference switching		M1606	CAN1 SDO automatic configuration PDO cycle station	
M1161	CRC 8/16 bit processing mode (On=8 processing mode)		M1611	Compensation pulse position	OFF forward , ON Reverse (Power failure hold)
M1162	Using floating point arithmetic SCLP		M1612	Compensation pulse position	
M1 184	PLC write SD card		M1613	Compensation pulse position	
M1 185	PLC write SD completed		M1614	Compensation pulse position	
M1 186	SD card write PLC		M1615	Compensation pulse position	
M1 187	SD card writing to PLC completed		M1616	Compensation pulse position	

serial number	Functional Description	Remark	serial number	Functional Description	Remark
M1239	C239 increase/decrease counting action		M1617	CAN1 NMT message sending	Power failure retention
M1240	C240 increase/decrease counting action		M1633	Trigger mode start flag	ON interpolation start
M1241	C241 increase/decrease counting action		M1634	Mode Start	ON interpolation cycle
M1242	C242 increase/decrease counting action		M1643	All modules on the right are scanned in one cycle.	Except IO modules
M1 257	DDRVA DDRVI S-curve and trapezoidal acceleration and deceleration switching		M1644	CAN OPEN0 automatic configuration completion flag	PDO Configuration 0
M1279	CAN BUS open success sign		M1646	CAN OPEN0 Send SDO message trigger flag in PDO mode	
M1280	CAN OPEN and CAN BUS Switching (OFF is CAN OPEN, ON for CAN BUS		M1648	CAN OPEN0 PDO synchronization message sending mode ON external synchronization signal OFF internal synchronization signal	
M1281	Y0 , Y2 linear interpolation acceleration and deceleration function is turned on	D1343 Acceleration and deceleration time setting	M1650	PDO is blocked and the message is lost	
M1282	Y4 , Y6 linear interpolation acceleration and deceleration functions are turned on ; Arc interpolation acceleration and deceleration start flag	D1353 Acceleration and deceleration time setting	M1652	CAN OPEN0 synchronization signal starts sending, and is used to update the interpolation table data when interpolation is performed.	Interpolation cycle needs to be greater than scanning cycle
M1285	I110 Disable CH0		M1654	Weighing channel 1 calibration	(Not supported yet)
M1286	I1 2 0 Disable CH 1		M1655	Weighing channel 2 calibration	(Not supported yet)
M1287	I1 3 0 Disable CH0		M1656	Weighing channel 3 calibration	(Not supported yet)
M1288	I1 4 0 Disable CH 1		M1657	Weighing channel 4 calibration	(Not

serial number	Functional Description	Remark	serial number	Functional Description	Remark
					supported yet)
M1289	I010 Prohibition		M1658	Weighing channel 5 calibration	(Not supported yet)
M1290	I0 2 0 Prohibited		M1659	Y12 DRVAI instruction is executing	
M1291	I0 3 0 Prohibited		M1660	ON 5-degree curve automatically calculates the cam table, OFF manual setting	
M1292	I0 4 0 Prohibit		M1662	Relative and absolute table modes	
M1293	I0 5 0 Prohibited		M1664	ECAM sync flag	
M1294	I0 6 0 Prohibited		M1665	C232 high speed counter trigger cam	
M1295	I0 7 0 Prohibited		M1666	chasing shear and flying shear curves	
M1296	I0 8 0 Prohibited		M1667	Robot coordinate system display	
M1303	XCH instruction high and low bit exchange flag		M1668	CNC coordinate system display	
M1305	PLSV , DRVA , DRVI CH0 direction sign	Forward ON Reverse OFF	M1669	Radians and degrees mode OFF angle mode (robot arm)	G95 Switch
M1306	PLSV , DRVA , DRVI CH1 Direction Sign	Forward ON Reverse OFF	M1670	ON executes the robot path	
M1312	COM1 communication data sending		M1671	Path execution completed flag	
M1316	COM2 communication data sending		M1672	Robot coordinates are written into the current updated linear interpolation XYZ coordinates	
M1318	COM2 (when acting as master) Receiving completed		M1673	ON executes CNC path	
M1319	CAN1 received		M1674	CNC path execution completed flag	
			M1675	CNC coordinates write current update	

3.2 Special register numbers and contents

serial number	Functional Description	Remark	serial number	Functional Description	Remark
D1 000	Watchdog Timer		D1377	CAN0 Status Register	
D1 001	PLC type and system version		D1380	CANBUS/1 bus data storage base address	

D1 002	PLC memory capacity	30000	D1382	The fourth pulse group CH4 (Y10, Y11) outputs the current value (Not supported yet)	Low
D1 003	Program memory content checksum		D1383		High
D1004	Syntax check error codes		D1384	The fifth pulse group CH5 (Y12, Y13) outputs the current value (Not supported yet)	Low
D1008	Step address of WDT timer ON		D1385		High
D1009	Record the number of times the LV signal has occurred		D1392	CAN OPEN0 NMT sends remote device ID number	0 for broadcast
D1 010	Scan Current Value	Unit: 0.1ms	D1393	CAN OPEN0 error code write 1/2/4 bytes data	
D1 011	Minimum scan time	Unit: 0.1ms	D1395	CAN OPEN0 slave error code	
D1 012	Maximum scan time	Unit: 0.1ms	D1397	CAN OPEN0 slave ID address register	
D1 015	0~32,767 adding type high-speed connection timer	Unit: 0.1ms	D1399	CAN1 ID number is 0 for master station and 1 for slave station. COM3 RS485 PLC_LINK initially queries whether the remote station is ready	
D1 018	πPI	Low	D1414	CAN1 master station wants to write data to the slave station ID number	
D1 019	πPI	High	D1424	CAN1 master station sending timeout	
D1 020	X0~X7 input filter	Unit: ms	D1425	CAN2 master station sending timeout	
D1021	X10~X17 input filter	Unit: ms	D1426	CAN1 baud rate setting	Power failure retention
D1022	AB phase counter frequency multiplication selection		D1427	CAN2 baud rate setting	Power failure retention
D1023	Pulse width detection storage register		D1430-D1431	CAN1 Global Status Register	
D1025	Communication request error code		D1435-D1436	CAN1 Status Register	
D1028	Pointer register E0		D1434	COM3 (RS-485) PLC_LINK The master station needs to read the data length setting in the corresponding address of the slave station	
D1029	Pointer register F0		D1439	CAN1 port remote node status	
D1030	PLSY Y0 pulse output number	Low	D1441	CAN1 synchronous message cycle sending timing, The time unit of SYNC is 1ms.	Adjust according to the number of devices

D1 031	PLSY Y0 pulse output number	High	D1443	CAN1 PDO mode slave end station	Required
D1 032	PLSY Y1 pulse output number	Low	D1445	CAN1 PDO mode slave start station	Required
D1 033	PLSY Y1 pulse output number	High	D1447	CAN1 and CAN2 slave mode PDO receiving data storage address pointer	
D1035	Set the X input point number used as RUN/STOP		D1450	COM3 (RS-485) Number of records written to the slave by PLC_LINK	
D1036	COM1 (RS-232) communication format		D1480-D1495	COM3 (RS-485) Data received by PLC_LINK	
D1038	When RS-485 communication is a slave station: data response delay time setting, setting range 0~10,000	Unit: 0.1ms	D1496	COM3 (RS-485) PLC_LINK to write data from the slave station	
D1039	Fixed scan time	Unit: ms	D1707	IJK plane	
D1067	Error code for operation error	Power failure retention	D1710	G code P axis	
D1068	Error address of operation error. When other errors occur, the contents of D1067 and D1069 are updated.	Power failure retention	D1712	G code Q axis	
D1069	Error address of operation error. When other errors occur, the content of D1068 will not be updated.		D1714	G code P axis	
D1070-D1085	The data received by COM3 (RS-485) is converted into HEX and saved in D1070-D1085		D1716	G code Q axis	
D1089-D1099	COM3 (RS-485) sends data to memory Use of FWD, REV, STOP and other instructions		D1719	Weighing channel 1 weight value (not supported yet)	
D1110	AD CH0 channel current value		D1729	The first address for storing the calibrated weight values of weighing channels 1-5 (not supported yet)	
D1111	AD CH1 channel current value		D1730	The current extension module is online.	
D1114	AD channel startup setting (BIT flag channel setting)		D1732	PLC Link data storage address	
D1116	Analog output CH0		D1741	Canopen1 NMT code setting	
D1117	Analog output CH1		D1743	CANOPEN0 automatically configures the send counter	

D1118	Set the AD sampling times and filter value (the larger the value, the slower the conversion speed)	The maximum value that can be set is 65535	D1745	G04 Parameters	
D1 120	COM2 communication protocol		D1746	The M code number of G code processing is 0-99, and the fault code D1067 is 1000 if it exceeds the range	
D1 121	PLC communication address		D1747	CAN When OPEN0 is the master station, PDO receives and saves the starting address	
D1 122	Number of remaining words of sent data		D1748	CAN When OPEN1 is the master station, PDO receives and saves the starting address	
D1 123	Remaining words of received data		D1749	Axis group 1 cam table execution spindle pulse counter	32bit
D1 124	Starting character definition		D1751	Axis group 1 cam table execution cam pulse counter	32bit
D1 125	First end character definition		D1753	Axis group 0 cam table execution spindle pulse counter	32bit
D1 126	The second end character definition		D1755	Axis group 0 cam table execution cam pulse counter	32bit
D1 129	PLC_LINK check communication timeout	COM3 (RS-485)	D1757	Axis group 0 stores the first address of the cam parameter setting register, the default value is 4000.	
D1130	COM2 (RS-485) communication error code		D1758	Axis group 1 stores the first address of the cam parameter setting register, the default value is 4100.	
D1137	The address where the instruction or operand error occurred is stored in		D1762	CA NOPEN1 The number of SDO configuration messages (7 words equals 1 SDO message).	
D1140	Total number of online expansion modules		D1769	32-bit data, storing the number of pulses in mm when the handwheel is in dimension mode.	
D1167	RS instruction , interrupt request when receiving special data characters , interrupt (I140) triggers	COM1	D1771	bit0=1 means CH 0 channel, bit=1 means CH1 channel, bit2=1 means CH2 channel, bit3=1 Then CH3 channel	
D1168	RS instruction , interrupt request when receiving special data characters , interrupt (I150) triggers	COM2	D1772	Cam actual pulse value	

D1169	RS instruction , interrupt request when receiving special data characters , interrupt (I160) triggers	COM3	D1774	Axis 1 homing mode	
D1 182	E 1 Contents of the index register		D1775	Axis 2 homing mode	
D1 183	Contents of F1 index register		D1776	Axis 3 homing mode	
D1 184	Contents of E2 index register		D1777	Axis 4 homing mode	
D1 185	Contents of F2 index register		D1778	Axis 5 homing mode	
D1 186	E 3 Index register contents		D1779	Axis 6 homing mode	
D1 187	F3 Index register contents		D1780	Stores the starting address of SDO configuration PDO data	CAN1
D1 188	E 4 Index register contents		D1782	PDO send start address setting	CANOPEN1
D1 189	Contents of F4 index register		D1784	PDO data setting start address setting	CANOPEN1
D1 190	E 5 Index register contents		D1786	G code Z axis	
D1 191	F5 Index register contents		D1788	G code A axis	
D1 192	E 6 Contents of the index register		D1790	G code B axis	
D1 193	Contents of F6 index register		D1792	G code C axis	
D1 194	E 7 Contents of the index register		D1880	Weighing 1 calibration value AD (factory value 0) (not supported yet)	
D1 195	F7 Index register contents		D1900	Weighing 1 Weighing zero tracking belt (not supported yet)	Factory value 100
D1220	CH0 specifies whether the PLSY instruction has a direction bit	0 means no direction, 1 means with direction	D1905	Weighing zero point tracking delay (0.1S) (not supported yet)	Factory value 10
D1221	CH1 specifies whether the PLSY instruction has a direction bit	0 means no direction, 1 means with direction	D1906-D1907	DRVA/DRVI/PLSY/PLSR/DZRN/PLSV/PTPO/VSPO maximum frequency limit	Default 200K
D1222	CH2 specifies whether the PLSY instruction has a direction bit	0 means no direction, 1 means with direction	D1908	Deceleration time multiplier during DRVA/DRVI interrupt operation	
D1223	CH3 specifies whether the PLSY instruction has a direction bit	0 means no direction, 1 means with direction	D1909	Weighing 1 digital filter number (not supported yet)	
D1249	COM1 check communication timeout		D1914-D1915	Local MAC address, software configuration (the first 4 bits are fixed at 02 08 xx xx xx xx).	
D1250	COM1 communication error code		D1916	CAN OPEN error status bit0-7 is CAN0, bit8-15 is CAN1	

D1252	Serial port 2 check communication timeout		D1917-D1920	Ethernet 8 port status display H0 : Off state H13 : Server initial port, client connection request status H14 : Server monitoring status H15 : Waiting for server response H17 : Connection established H1C : Received a request to close a port H22 : Port UDP mode	
D1253	COM3 communication error code		D1921	Ethernet port DNS resolution status, bit0-bit7 ON not re-resolving, OFF resolving, bit8-bit15 system reserved	
D1255	COM3 station number		D1922	Length of the client domain name storage area (calculated by word and stored in bytes) For example: Baidu www.baidu.com is 13 bytes and can be accommodated.	The default value is 10, which is 20 bytes.

D1260-D1271	Types of modules 9-20		D1925	Ethernet starts to run. After M1378 is OFF, the upper 8 bits display the parsing port number, and the lower 8 bits display D1921, which has the same meaning as the PLC power-on state D1925 value meaning: 1 Initialize network card system parameters 2Reset the network card 3 Obtain IP via DHCP 9 IP acquisition is successful, continue to check DNS information 11 After DHCP is successful, DNS domain name resolution is being performed (see the following description for M1378ON) 12Do not perform DNS, configure as IP information. 20DHCP failed 21 The network cable is not connected, and the network card function is canceled. PLC running M1378 Meaning of the network card status after ON: 0Initialize network card system parameters 2Reset the network card 5. Check the network cable 6. Check whether the IP address is in DHCP or manual mode 8 DHCP Enable 11 DNS Enabled 16 Start Server Preparation 17 Start client preparation 18 Run network card M1378OFF	
D1296-D1312	The PLC has a built-in RS-485 communication command MODRW. The system will automatically convert the ASCII character data of the register content specified by the user to HEX data values and store them in D1296~D1311		D1926	The default width of the Ethernet client receive data storage area is 10 words.	
D1313	Perpetual calendar (RTC) seconds 00~59		D1927	Ethernet client receives the first address of data storage	Default D7000

D1314	Perpetual calendar (RTC) 00~59		D1928	First weighing value (not supported yet)	
D1315	Perpetual calendar (RTC) 00~23		D1942	The Ethernet client and server send flag bit0-bit7 is ON and automatically turns OFF. bit8-bit15 is ON The corresponding port is set to data exchange mode (software configuration mode), otherwise it is set to common protocol mode (message protocol mode).	
D1316	Perpetual calendar (RTC) day 01~31		D1943	G code	
D1317	Perpetual calendar (RTC) month 01~12		D1944-D1952	G-code parameters	
D1318	Perpetual calendar (RTC) Monday to Sunday		D1954	The number of network ports, the upper 8 bits are the number of clients, and the lower 8 bits are the number of servers. For example: Open the client and server Function, D1954=0x0101 means there is one server and one client, port 0 is the server and port 1 is the client. For example: if the client and server functions are enabled, D1954=0x0202, there are 2 servers and 2 clients, ports 0-1 are servers, and ports 2-3 are clients.	
D1319	Perpetual calendar (RTC) year (AD) 00~99		D1955	Storage remote 0-7 port number IP address first address default D6650 (0 port number) D6651 (0 NetIP1.4) D6652 (0NetIP192.168)-----D6653 (1 port number) D6654 (1NetIP1.4) D6655 (1NetIP192.168) and so on, up to 8	
D1320-D1327	Types of modules 1-8		D1956	Ethernet client data transmission first address. For example: if the client port number is 0, the Ethernet message is stored starting from D6800. Even if the client port number starts from 3, the message address must also start from D6800.	

D1328-D1329	CH2 pulse output compensation	Instructions PLSY , PLSR , DDRVA , DDRVI are used	D1957	The interval between the first address and the next data address of Ethernet client data transmission, for example: the interval is 5 words, the first Ethernet message is stored in D6800-D6804, the second is stored in D6805-D6809, and so on.	
D1330-D1331	CH3 pulse output compensation		D1959	Local network port number, default is 502	
D1332-D1333	CH4 pulse output compensation		D1960-D1961	Local network IP address, default 192.168.1.3	
D1334-D1335	CH5 pulse output compensation		D1962-D1963	Local network subnet mask, Default 255.255.255.0	
D1336	The first group of pulses CH0 (Y0, Y1) outputs the current value PLSY Y4 pulse output value	Low	D1964-D1965	Local network management, default 192.168.1.1	
D1337		High	D1966-D1967	Local network DNS, default 8.8.8.8	
D1338	The second group of pulses CH1 (Y2, Y3) outputs the current value PLSY Y6 pulse output value	Low	D1968	Overall processing time, including interrupts, etc. Accumulated time unit: 0.1ms	
D1339		High	D1969	Cam synchronization signal ON table number	
D1 340	CH0 start/end frequency		D1970	Cam synchronization signal OFF table number	
D1 341	CH1 start/end frequency		D1972	Cam 1 starting angle	
D1343	CH0 acceleration and deceleration time setting		D1974	Cam 1 end angle	
D1344 -D1345	CH0 pulse output compensation	Instructions PLSY , PLSR , DDRVA , DDRVI are used	D1976	Cam 2 starting angle	
D1346 -D1347	CH1 pulse output compensation		D1978	Cam 2 end angle	
D1 348	The third group of pulses CH2 (Y4, Y5) outputs the current value	Low	D1980	Cam 3 starting angle	
D1 349	The third pulse group CH2 (Y4, Y5) pulse current value	High	D1982	Cam 3 end angle	
D1 350	The fourth group of pulses CH3 (Y6, Y7) outputs the current value	Low	D1984	Cam 4 starting angle	
D1 351	The current value of the 4th pulse group CH3 (Y6, Y7)	High	D1986	Cam 4 end angle	

D1 352	CH2, CH4, CH5 start/end frequency		D1988	Cam 5 starting angle	
D1 353	CH1, CH4, CH5 acceleration and deceleration time settings		D1990	Cam 5 end angle	
D1 355	COM3 (RS-485) PLC_LINK master station needs to read the address corresponding to the slave station data		D1992	Cam 6 starting angle	
D1373	CH3 start/end frequency		D1994	Cam 6 end angle	
D1375	CH2 acceleration and deceleration time setting		D1996	Cam 7 starting angle	
D1376	CH3 acceleration and deceleration time setting		D1998	Cam 7 end angle	

Part 4 Function Instruction List

4.1 List of basic logic instructions

instruction	name	Function	Available software	Execution speed (us)	Step
General Instructions:					
LD	Pick	Normally open contact logic operation starts	X, Y, M, S, T, C	0.24(0.56)	1~3
LDI	Negation	Normally closed contact logic operation starts	X, Y, M, S, T, C	0.24(0.56)	1~3
AND	and	Normally open contacts in series	X, Y, M, S, T, C	0.24(0.56)	1~3
ANI	With reverse	Normally closed contacts in series	X, Y, M, S, T, C	0.24(0.56)	1~3
OR	Or pulse rising edge	Normally open contacts in parallel	X, Y, M, S, T, C	0.24(0.56)	1~3
ORI	or reverse	Normally closed contacts in parallel	X, Y, M, S, T, C	0.24(0.56)	1~3
ANB	Block and	Series connection of circuit blocks	-	0.24	1~3
ORB	Block or	Parallel connection of circuit blocks	-	0.24	1~3
MPS	Push	Store on stack	-	0.24	1~3
MRD	Reading the stack	Read the stack (pointer does not move)	-	0.24	1
MPP	Pop	Pop the stack	-	0.24	1
Output instructions:					
OUT	Output	Coil drive	Y, M, S	0.24(0.56)	1~3
SET	Set	Action hold (ON)	Y, M, S	0.24(0.56)	1~3
RST	Reset	Contact or register clear	Y, M, S, T, C, D, E, F	0.24(0.56)	3
Timers, counters:					
TMR	Timer	16-bit timer	TK or TD	9.6	4
CNT	counter	16-bit counter	CK or CD (16 bits)	12.8	4
DCNT	Double word counter	32-bit counter	CK or CD (32 bits)	14.3	6
Master control instructions:					
MC	Master	Connection circle instructions for common series points	N0~N7	5.6	3
MCR	Master reset	Elimination instructions for common concatenation points	N0~N7	5.7	3

Rising edge/falling edge detection instructions:					
LDP	Take the rising edge of the pulse	Detect rising edge and start calculation	X, Y, M, S, T, C	0.56(0.88)	3
LDF	Take the falling edge of the pulse	Detection of falling edge starts calculation	X, Y, M, S, T, C	0.56(0.88)	3
ANDP	With pulse rising edge	Series connection for detecting rising edge	X, Y, M, S, T, C	0.56(0.88)	3
ANDF	With the pulse falling edge	Series connection for falling edge detection	X, Y, M, S, T, C	0.56(0.88)	3
ORP	Or pulse rising edge	Parallel connection for detecting rising edge	X, Y, M, S, T, C	0.56(0.88)	3
ORF	Or pulse falling edge	Parallel connection for detecting falling edge	X, Y, M, S, T, C	0.56(0.88)	3
Rising/falling edge output instructions:					
PLS	pulse	Rising edge differential output	Y.M.	9.92	3
PLF	Falling edge pulse	Falling edge differential output	Y.M.	10.16	3
End instruction:					
END	Finish	End of program and Input and output and return to the beginning	-	0.24	1
Other instructions:					
NOP	No Operation	No Action	-	0.16	1
INV	Negation	Inversion of operation results	-	0.24	1
P	pointer	pointer	P0~P255	-	1
I	Interrupt input pointer	Interrupt input pointer	I □□□	-	1
MEP	MEP	Turn on when rising edge	-		
MEF	MEF	Turn on at falling edge	-		
Step ladder instructions:					
STL	start	The program jumps to the secondary bus	S	0.56	1
RET	return	The program returns to the main bus	-	0.24	1

4.2 Application instructions [in order of instruction type]

Classification	API	Instruction code	16-bit	32-bit	P instruction	Function

					(Pulse type)	
Loop Control	00	CJ	√	-	√	Conditional jump
	01	CALL	√	-	√	Calling a subroutine
	02	SRET	√	-	-	End of subroutine
	03	IRET	√	-	-	Interrupt Insertion Return
	04	EI	√	-	-	Interrupt insertion enabled
	05	DI	√	-	-	Interrupt insertion disable
	06	FEND	√	-	-	End of main program
	07	WDT	√	-	√	Timeout monitoring timer
	08	FOR	√	-	-	Loop start
	09	NEXT	√	-	-	End of loop
Transmission Comparison	10	CMP	√	√	√	Comparison setting output
	11	ZCP	√	√	√	Regional comparison
	12	MOV	√	√	√	Data Migration
	13	SMOV	√	-	√	Bit transfer
	14	CML	√	√	√	Reverse transmission
	15	BMOV	√	-	√	Send All
	16	FMOV	√	√	√	Multi-point movement
	17	XC	√	√	√	Data Exchange
	18	BCD	√	√	√	BIN→BCD conversion
	19	BIN	√	√	√	BCD→BIN conversion
Four logical operations	20	ADD	√	√	√	BIN addition
	twenty one	SUB	√	√	√	BIN Subtraction
	twenty two	MUL	√	√	√	BIN multiplication
	twenty three	DIV	√	√	√	BIN division
	twenty four	INC	√	√	√	BIN plus one
	25	DEC	√	√	√	BIN minus one
	26	WAND	√	√	√	Logical AND operation
	27	WOR	√	√	√	Logical OR operation
	28	WXOR	√	√	√	Logical exclusive OR (XOR) operation
	29	NEG	√	√	√	Negative number (2's

						complement)
Cyclic displacement	30	ROR	√	√	√	Right loop
	31	ROL	√	√	√	Left loop
	32	RCR	√	√	√	Loop right with carry flag
	33	RCL	√	√	√	Loop left with carry flag
	34	SFTR	√	-	√	Bit shift right
	35	SFTL	√	-	√	Bit Shift Left
	36	WSFR	-	-	-	Shift register right
	37	WSFL	-	-	-	Shift register left
	38	SFWR	-	-	-	Displacement Write
	39	SFRD	√	-	√	Displacement readout
Data processing	40	ZRST	√	-	√	Area Clearance
	41	DECO	√	-	√	Decoder
	42	ENCO	√	-	√	Encoder
	43	SUM	√	√	√	Number of On Positions
	44	BON	√	√	√	On position determination
	45	MEAN	√	√	√	average value
	46	ANS	√	-	-	Alarm point output
	47	ANR	√	-	√	Alarm point reset
	48	SQR	√	√	√	BIN square root
	49	FLT	√	√	√	BIN integer → binary floating point conversion
High-speed processing	50	REF	√	-	√	I/O Update Processing
	51	REFF	√	-	-	Change input response time
	52	MTR	√	-	-	Matrix Input
	53	DHSCS	-	√	-	Comparison setting (high-speed counter)
	54	DHSCR	-	√	-	Compare clear (high-speed counter)
	55	DZD	-	√	-	Area comparison (high-speed counter)
	56	SPD	√	-	-	Speed Detection
	57	PLSY	√	√	-	Pulse output 1Mhz pulse
	58	PWM	√	-	-	Pulse Width Modulation
	59	PLSR	√	√	-	Pulse output additional

						deceleration 1Mhz pulse
Convenience instructions	60	IST	-	-	-	Manual/automatic control
	61	SER	√	√	√	More comparisons
	62	ABSD	√	√	-	Absolute cam control
	63	INCD	√	-	-	Relative cam control
	64	TTMR	√	-	-	Cross-conduction timer
	65	STMR	√	-		Special timer
	66	ALT	√	-	√	On/Off Alternation
	67	RAMP	√	-	-	Tilt signal
	68	DTM	√	-	√	Data conversion and movement instructions
	69	SORT	√	-	-	Data Sorting
External setting display	70	TKY	√	√	-	10-key keyboard input
	71	HKY	√	√	-	16-key keyboard input
	72	DSW	√	-	-	DIP switch input
	73	SEGD	√	-	√	Seven-segment display decoding
	74	SEGL	-	-	-	Seven-segment display scan output
	75	ARWS	-	-	-	arrow keyboard input
	76	ASC	-	-	-	ASCII code conversion
	77	PR	√	-	-	ASCII code output
Serial I/O	78	FROM	√	*	-	Extension module CR data readout
	79	TO	√	*	-	Extension module CR data writing
	80	RS	√	-	-	Serial Data Transmission
	81	PRUN	√	√	√	Octal bit transfer
	82	ASCI	√	-	√	HEX to ASCII
	83	HEX	√	-	√	ASCII to HEX
	84	CCD	√	-	√	Sum check
	85	VRRD	√	-	√	Knob readout
	86	VRSC	√	-	√	Knob scale readout
	87	ABS	√	√	√	Absolute value
	88	PID	√	√	-	PID Operation
other	89	PLS	√	-	-	Upper differential output

	90	LDP	√	-	-	Rising edge detection action starts
	91	LDF	√	-	-	Falling edge detection action starts
	92	ANDP	√	-	-	Rising edge detection series connection
	93	ANDF	√	-	-	Falling edge detection series connection
	94	ORP	√	-	-	Rising edge detection parallel connection
	95	ORF	√	-	-	Falling edge detection parallel connection
	96	TMR	√	-	-	Timer
	97	CNT	√	√	-	counter
	98	INV	√	-	-	Invert the result of the operation
	99	PLF	√	-	-	Lower differential output
communication	100	MODRD	√	-	-	MODBUS data reading
	101	MODWR	√	-	-	MODBUS data writing
	102	FWD	-	-	-	VFD-A inverter forward command
	103	REV	-	-	-	VFD-A inverter reverse command
	104	STOP	-	-	-	VFD-A inverter stop command
	105	RDST	-	-	-	VFD-A inverter status reading
	106	RSTEF	-	-	-	VFD-A inverter abnormal reset
	107	LRC	√	-	-	and check LRC mode
	108	CRC	√	-	-	and check CRC mode
	113	ETHZW	√	-	-	Etherenet communication read and write
Four arithmetic operations	114	MUL16 / MUL 32	√	√	-	16/32-bit dedicated BIN multiplication
	115	DIV16 / DIV 32	√	√	-	16/32-bit dedicated BIN division
Floating-point operations	110	DECMP	-	√	√	Binary floating point comparison
	111	DEZCP	-	√	√	Binary floating point area comparison
	112	DMOVR	-	√	√	Floating point data

						movement
	116	DRAD	-	√	√	Angle → Radius
	117	DDEG	-	√	√	Diameter → Angle
	118	DEBCD	-	√	√	Binary floating point → decimal floating point
	119	DEBIN	-	√	√	Decimal floating point → binary floating point
	120	DEADD	-	√	√	Binary floating point addition
	121	DESUB	-	√	√	Binary floating point subtraction
	122	DEMUL	-	√	√	Binary floating point multiplication
	123	DEDIV	-	√	√	Binary floating point division
	123	DEXP	-	√	√	Binary floating point exponentiation
	125	DLN	-	√	√	Take the natural logarithm of a binary floating point number
	126	DLOG	-	√	√	Logarithm of a binary floating point number
	127	DESQR	-	√	√	Binary floating point square root
	128	DPOW	-	√	√	Floating point weight instructions
	129	DINT	-	√	√	Binary floating point → BIN integer conversion
Trigonometric operations	130	DSIN	-	√	√	Binary floating point SIN operation
	131	DCOS	-	√	√	Binary floating point COS operation
	132	DTAN	-	√	√	Binary floating point TAN operation
	133	DASIN	-	√	√	Binary floating point ASIN calculation
	134	DACOS	-	√	√	Binary floating point ACOS operation
	135	DATAN	-	√	√	Binary floating point ATAN operation
	136	DSINH	-	√	√	Binary floating point SINH operation

	137	DCOSH	-	√	√	Binary floating point COSH operation
	138	DTANH	-	√	√	Binary floating point TANH operation
other	109	SWRD	-	-	-	Digital switch reading
	143	DELAY	√	-	-	Delay Instructions
	144	GPWM	√	-	-	Pulse Width Modulation
	145	FTC	-	-	-	Fuzzy temperature control
	146	CVM	√	-	-	Valve position control
	147	SWAP	√	√	-	Up/down BYTE conversion
	148	MEMR	-	-	-	Archive register readout
	149	MEMW	-	-	-	Archive register write
communication	150	MODRW	√	-	-	MODBUS Read and Write
other	151	PWD	-	-	-	Input pulse width detection
	152	RTMU	√	-	-	I Interrupt execution time measurement on
	153	RTMD	√	-	-	I Interrupt execution time measurement ends
	154	RAND	√	√	√	Random Value
	168	MVM	√	√	√	Move designated position
	176	MMOV	√	-	√	Zoom in
	177	GPS	-	-	-	(GPS) Receive communication instructions
	178	DSPA	-	-	-	Solar panel position command
	179	WSUM	√	√	√	Sum
	196	HST	√	-	-	High-speed timer
Floating-point operations	172	DADDR	-	√	-	Adding floating point numbers
	173	DSUBR	-	√	-	Subtract floating point values
	174	DMULR	-	√	-	Multiplication of floating point numbers
	175	DDIVR	-	√	-	Floating point division
Positioning	155	DABSR	-	-	-	ABS current value

control						readout
	156	D Z	-	√	-	Return to origin
	157	PLSV	-	√	-	Pulse output
	158	DRVI	-	√	-	Relative positioning
	159	DRVA	-	√	-	Absolute addressing
	191	DPPMR	-	√	-	Dual-axis relative point-to-point motion
	192	DPPMA	-	√	-	Dual-axis absolute point-to-point motion
	193	DCIMR	-	√	-	Biaxial relative position arc interpolation
	194	DCIMA	-	√	-	Dual-axis absolute position arc interpolation
	195	DPTPO	-	√	-	Single axis meter pulse output
	197	DCLLM	-	-	-	Closed loop positioning control
	198	DVSPO	-	√	-	Variable speed pulse output
	199	DICF	-	√	-	Change pulse speed immediately
Perpetual calendar	160	TCMP	√	-	√	Comparison of perpetual calendar data
	161	TZP	√	-	√	Comparison of perpetual calendar data areas
	162	TADD	√	-	√	Perpetual calendar data addition
	163	TSUB	√	-	√	Subtraction of perpetual calendar data
	166	TRD	√	-	√	Perpetual calendar data readout
	167	TWR	√	-	√	Write calendar data
	169	HOUR	√	√	-	schedule
Gray code	170	GRY	√	√	√	BIN → GRY code conversion
	171	GBIN	√	√	√	GRY code → BIN conversion
matrix	180	MAND	√	-	√	Matrix AND
	181	MOR	√	-	√	Matrix OR
	182	MXOR	√	-	√	Matrix XOR

	183	MXNR	√	-	√	Matrix XNR
	184	MINV	√	-	√	Matrix Inversion
	185	MCMP	√	-	√	Matrix comparison
	186	MBRD	-	-	-	Matrix bit readout
	187	MBWR	-	-	-	Matrix bit write
	188	MBS	√	-	√	Matrix bit shift
	189	MBR	√	-	√	Matrix bit rotation
	190	MBC	√	-	√	Matrix bit state count
other	202	SCAL	√	-	√	Proportional value operation
	203	SCLP	√	-	√	Parametric proportional value operation
	205	CMPT	√	√	√	Servo drive read and write instructions
	207	CSFO	-	-	-	Capture speed and follow-up output instructions
communication	206	ASDRW	√	-	-	Server Communication Instructions
	340	CANRS	√	-	-	CAN BUS data writing
Contact morphological logic operation	215	LD&	√	√	-	S1 & S2
	216	LD|	√	√	-	S1 | S2
	217	LD^	√	√	-	S1 ^ S2
	218	AND&	√	√	-	S1 & S2
	219	AND|	√	√	-	S1 | S2
	220	AND^	√	√	-	S1 ^ S2
	221	OR&	√	√	-	S1 & S2
	222	OR|	√	√	-	S1 | S2
	223	OR^	√	√	-	S1 ^ S2
Contact type comparison instructions	224	LD=	√	√	-	S1 = S2
	225	LD>	√	√	-	S1 ＞ S2
	226	LD<	√	√	-	S1 ＜ S2
	228	LD<>	√	√	-	S1 ≠ S2
	229	LD<=	√	√	-	S1 ≦ S2
	230	LD>=	√	√	-	S1 ≧ S2
	232	AND=	√	√	-	S1 ＝ S2
	233	AND>	√	√	-	S1 ＞ S2
	234	AND<	√	√	-	S1 ＜ S2
	236	AND<>	√	√	-	S1 ≠ S2
	237	AND<=	√	√	-	S1 ≦ S2
	238	AND>=	√	√	-	S1 ≧ S2
	240	OR=	√	√	-	S1 ＝ S2

	241	OR>	√	√	-	S1 ＞ S2
	242	OR<	√	√	-	S1 ＜ S2
	244	OR<>	√	√	-	S1 ≠ S2
	245	OR<=	√	√	-	S1 ≦ S2
	246	OR>=	√	√	-	S1 ≧ S2
Character device bit instructions	266	BOUT	√	√	-	Character device bit output
	267	BSET	√	√	-	Character device bit action remains On
	268	BRST	√	√	-	Character device bit clear
	269	BLD	√	√	-	Character device position load A contact
	270	BLDI	√	√	-	Character device position load B contact
	271	BAND	√	√	-	Character device bit serial A contact
	272	BANI	√	√	-	Character device bit serial B contact
	273	BOR	√	√	-	Character device bit parallel A contact
	274	BORI	√	√	-	Character device bit parallel B contact
Floating point contact type comparison instructions	275	FLD=	-	√	-	S1 = S2
	276	FLD>	-	√	-	S1 ＞ S2
	277	FLD<	-	√	-	S1 ＜ S2
	278	FLD<>	-	√	-	S1 ≠ S2
	279	FLD<=	-	√	-	S1 ≦ S2
	280	FLD>=	-	√	-	S1 ≧ S2
	281	FAND=	-	√	-	S1 ＝ S2
	282	FAND>	-	√	-	S1 ＞ S2
	283	FAND<	-	√	-	S1 ＜ S2
	284	FAND<>	-	√	-	S1 ≠ S2
	285	FAND<=	-	√	-	S1 ≦ S2
	286	FAND>=	-	√	-	S1 ≧ S2
	287	FOR=	-	√	-	S1 ＝ S2
	288	FOR>	-	√	-	S1 ＞ S2
	289	FOR<	-	√	-	S1 ＜ S2
	290	FOR<>	-	√	-	S1 ≠ S2
	291	FOR<=	-	√	-	S1 ≦ S2
	292	FOR>=	-	√	-	S1 ≧ S2
Contact type	296	LDZ>	√	√	-	| S 1 - S 2 | > | S 3 |

absolute value comparison instructions	297	LDZ<	√	√	-	| S 1 - S 2 | < | S 3 |
	298	LDZ=	√	√	-	| S 1 - S 2 | = | S 3 |
	299	LDZ>=	√	√	-	| S 1 - S 2 | ≧ | S 3 |
	300	LDZ<=	√	√	-	| S 1 - S 2 | ≦ | S 3 |
	301	LDZ<>	√	√	-	| S 1 - S 2 | ≠ | S 3 |
	302	ANDZ>	√	√	-	| S 1 - S 2 | > | S 3 |
	303	ANDZ<	√	√	-	| S 1 - S 2 | < | S 3 |
	304	ANDZ=	√	√	-	| S 1 - S 2 | = | S 3 |
	305	ANDZ>=	√	√	-	| S 1 - S 2 | ≧ | S 3 |
	306	ANDZ<=	√	√	-	| S 1 - S 2 | ≦ | S 3
	307	ANDZ<>	√	√	-	| S 1 - S 2 | ≠ | S 3 |
	308	ORZ>	√	√	-	| S 1 - S 2 | > | S 3 |
	309	ORZ<	√	√	-	| S 1 - S 2 | < | S 3 |
	310	ORZ=	√	√	-	| S 1 - S 2 | = | S 3 |
	311	ORZ>=	√	√	-	| S 1 - S 2 | ≧ | S 3 |
	312	ORZ<=	√	√	-	| S 1 - S 2 | ≦ | S 3 |
	313	ORZ<>	√	√	-	| S 1 - S 2 | ≠ | S 3 |
	343	$MOV	-	-	-	String data movement

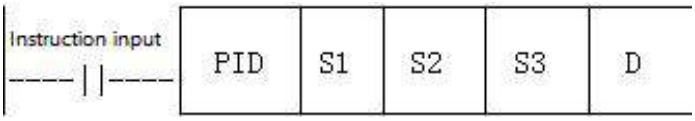
Part 5 Special instruction usage

5.1 PID instruction

1. Overview: This instruction is used to execute PID control to change the output value according to the change of input.

2. PID instruction format and parameter description .

Instruction format:



Parameter Description:

Operand Type	content	Data Types	Word software element
S1	Data register number to store the target value (SV)	BIN16 bits	D
S2	Data register number for storing measured value (PV)	BIN16 bits	D
S3	Data register number for saving parameters (16-bit instructions occupy 20 consecutive devices, 32-bit instructions occupy 21 consecutive devices)	BIN16/32 bits	D
D	Data register number to store output value (MV)	BIN16 bits	D

3. Function and action description

- 16-bit operation (PID): After setting the target value S1, measured value S2, and parameters S3~S3+6 in the execution program, the operation result (MV) is saved in the output value D every sampling time S3.
- A special instruction for PID operation control. The PID operation action is performed only after the sampling time is reached. PID stands for "proportional, integral and differential". PID control is widely used in mechanical equipment, pneumatic equipment and electronic equipment.
- S1: target value (SV), S2: current value (PV), 16-bit instruction S3~S3+19, 32-bit instruction S3 ~ S+20: After all parameters are set, the PID instruction will be executed, and the result will be temporarily stored in D. For the content of D, please specify the data register interval without power-off retention function. (If you want to specify the data register interval with power-off retention, please add the data register of the power-off retention interval to initialize and clear it to 0 at the beginning of the program)

  Complete the parameter setting before executing the PID instruction

  Parameters S3~S3+20 list

Setting items (16-bit devices)		Setting content	Remark
S3	Sampling time (Ts) (unit:	1~2,000(ms)	How often is the calculation performed and the

	10ms)			output value (MV) updated? The minimum setting value of T s must be greater than the program scan cycle .
S3+1	Proportional gain (Kp)		0~32767(%)	The error amplification ratio between the set value and the current value
S3+2	Integral gain (Ki)		0~32767(%)	Control mode K0-K9
S3+3	Differential gain (Kd)		-30000-30000%	Control mode K0-K9
S3+4	Control Mode	K0-K9	K0: Automatic control direction K1: Positive action (E=SV-PV) K2: Reverse action (E=PV-SV) K3: Automatic adjustment parameter function dedicated to temperature control. Change to K4 and fill in the most suitable parameters such as KP, KI and KD (32-bit instructions do not provide this function) K4: Adjusted temperature control dedicated function (32-bit command does not provide this function) K5: Automatic control direction (with limited integral saturation upper and lower limits) K7: Manual control 1, at this time, the MV value is determined by the user, but the PID will continue to accumulate the integral amount based on the error amount. It is recommended to use it in a control environment with slow environmental changes. K8: Manual control 2. At this time, the MV value is determined by the user, but the PID internal cumulative integral stops integrating until the manual switch is switched to automatic (K5 mode is recommended). The PID instruction will automatically convert the appropriate cumulative integral amount for subsequent control output based on the final output value (MV). K9: Automatic control direction (including cumulative integral correction). When the output value (MV) reaches the upper and lower limits of saturation, the cumulative integral will be automatically corrected by the formula. If there are upper and lower limits of integral saturation, it will be limited within the upper and lower limits.	
S3+5	Deviation non-action range		0~32767	If you set it to 5, the output value will remain unchanged if the deviation is between -5 and 5.
S3+6	Output upper limit setting value		-32768 ~ 32767	Set value Maximum output value
S3+7	Output lower limit setting value		-32768 ~ 32767	Set value minimum output value
S3+8	Integral saturation upper limit		-32768 ~ 32767	
S3+9	Integral saturation lower limit		-32768 ~ 32767	
S3+10.11	Temporarily store		Floating point	No action required

	accumulated points	numbers	
S3+12.13	Temporarily save the previous value	-32768 ~ 32767	No action required
S3+14~19	System usage		No action required

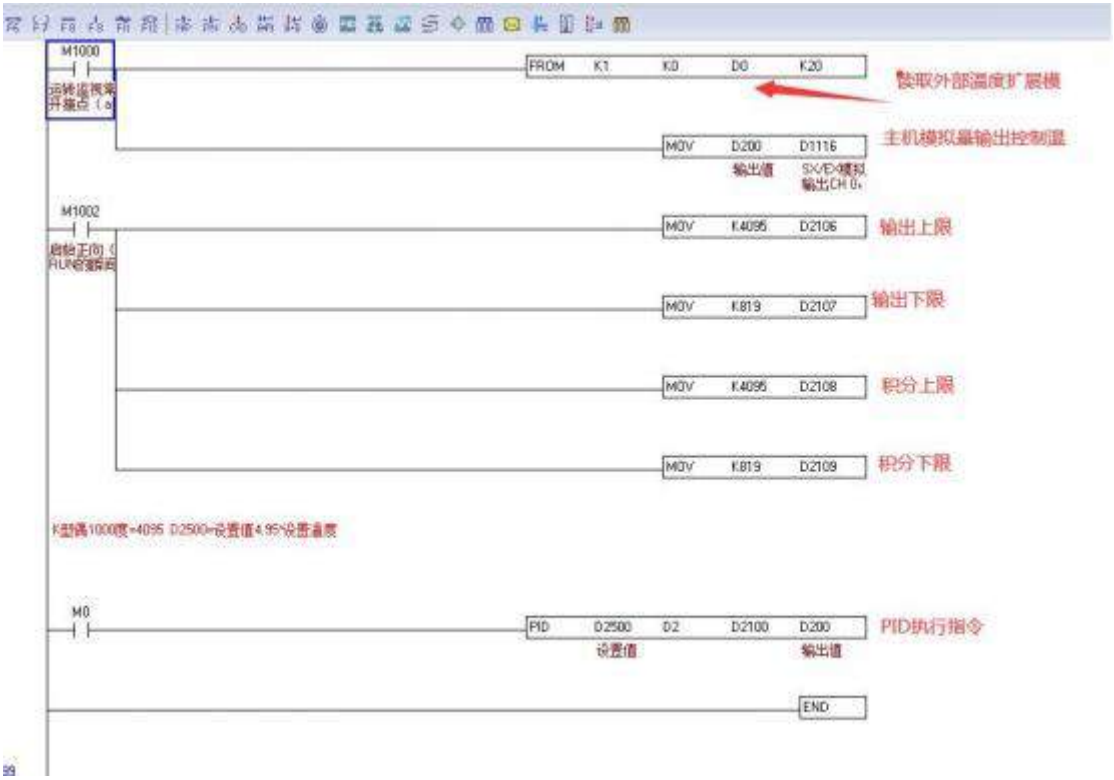
Setting items (32-bit devices)			Setting content	Remark
S3	Sampling time (Ts) (unit: 10ms)		1~2,000(ms)	How often is the calculation performed and the output value (MV) updated? The minimum setting value of T s must be greater than the program scan cycle .
S3+1	Proportional gain (Kp)		0~32767(%)	The error amplification ratio between the set value and the current value
S3+2	Integral gain (Ki)		0~32767(%)	Control mode K0-K9
S3+3	Differential gain (Kd)		-30000-30000%	Control mode K0-K9
S3+4	Control Mode	K0-K9	K0: Automatic control direction K1: Positive action (E=SV-PV) K2: Reverse action (E=PV-SV) K3: Automatic adjustment parameter function dedicated to temperature control. Change to K4 and fill in the most suitable parameters such as KP, KI and KD (32-bit instructions do not provide this function) K4: Adjusted temperature control dedicated function (32-bit command does not provide this function) K5: Automatic control direction (with limited integral saturation upper and lower limits) K7: Manual control 1, at this time, the MV value is determined by the user, but the PID will continue to accumulate the integral amount based on the error amount. It is recommended to use it in a control environment with slow environmental changes. K8: Manual control 2. At this time, the MV value is determined by the user, but the PID internal cumulative integral stops integrating until the manual switch is switched to automatic (K5 mode is recommended). The PID instruction will automatically convert the appropriate cumulative integral amount for subsequent control output based on the final output value (MV). K9: Automatic control direction (including cumulative integral correction). When the output value (MV) reaches the upper and lower limits of saturation, the cumulative integral will be automatically corrected by the formula. If there are upper and lower limits of integral saturation, it will be limited within the upper and lower limits.	
S3+5.6	Deviation non-action range		0~32767	If you set it to 5, the output value will remain unchanged if the deviation is between -5 and 5.
S3+7.8	Output upper limit setting		-32768 ~ 32767	Set value Maximum output value

	value		
S3+9.10	Output lower limit setting value	-32768 ~ 32767	Set value minimum output value
S3+11.12	Integral saturation upper limit	-32768 ~ 32767	
S3+13.14	Integral saturation lower limit	-32768 ~ 32767	
S3+20.21	Temporarily store accumulated points	Floating point numbers	No action required
S3+22.23	Temporarily save the previous value	-32768 ~ 32767	No action required
S3+15~17	System usage		No action required

4、Points to note

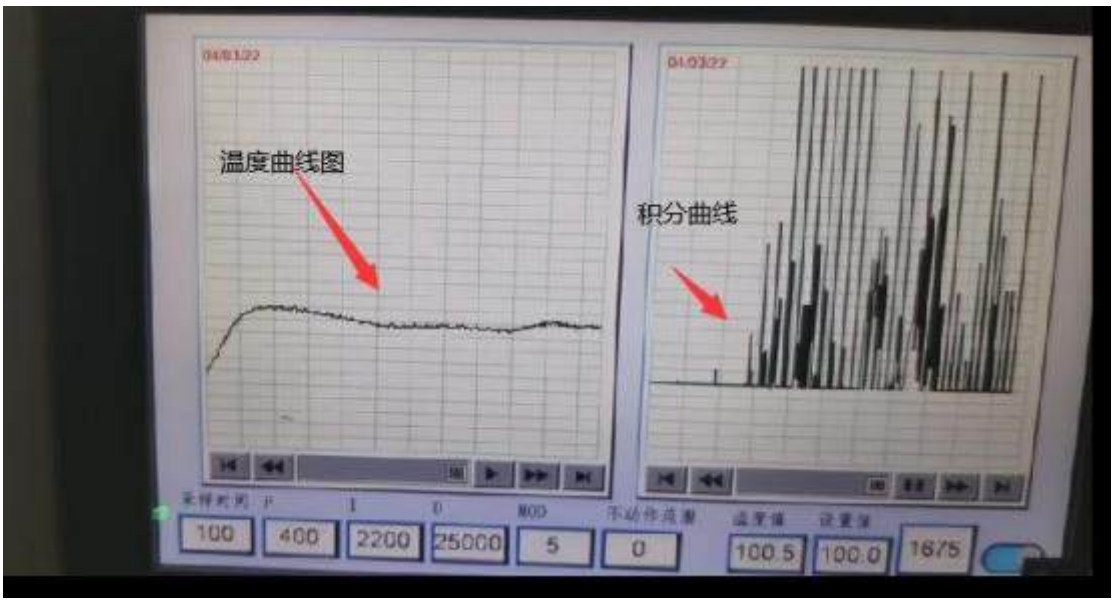
- If the user parameter setting exceeds the range, the left and right limits will be used as the setting value. However, if the action direction (DIR) exceeds the range, it will be preset to 0.
- PID instructions can also be used in interrupt insertion subroutines, step points and CJ instructions.
- The maximum difference of sampling time Ts is -(1 scan cycle + 1ms) ~ +(1 scan cycle). If the error value affects the output, please fix the scan cycle or use it in the time interrupt subroutine.
- The PID measured value (PV) must be a stable value before the PID performs calculation actions.
- 32-bit instruction S3 occupies 21 registers. If S3 specifies the parameter setting area of PID instruction as D100~D120, before the PID instruction starts to execute, you must first use the MOV instruction to transfer the setting value to the register area specified by the parameter for setting. If the register specified by the parameter is a register in the power-off retention area, use the MOVP instruction to perform a single transfer.

5. Examples

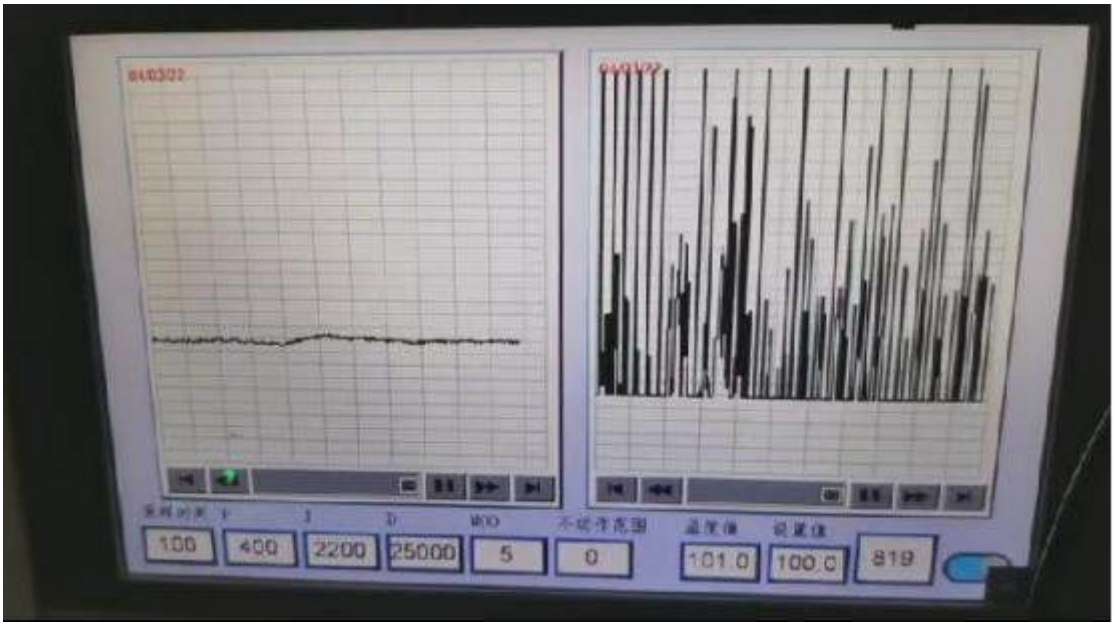


The temperature probe is bundled with the soldering iron head. The PLC reads the temperature value of the K-type thermocouple of the expansion module and stores it in the D2 register. After the PID instruction is processed, the output value D200 is written into the D1116 analog channel 0 to output a 0-10V voltage, which is limited to 0-20ma by a 500Ω resistor to drive the solid-state voltage regulator module to control the heating of the soldering iron. A closed-loop control system is formed.

The touch screen is connected to the PLC via Ethernet to adjust the PID parameters and monitor the temperature curve and integral value curve.



By adjusting the manual PID parameters, the temperature finally reaches a stable state.



5. 2 DTM instructions

1. Overview: Data transformation and transfer instructions.

2. DTM instruction format and parameter description .

type	instruction	Source Device	Target starting	Parameter	Source data character
P	**DTM**	**S1**	**D**	**m**	**n**

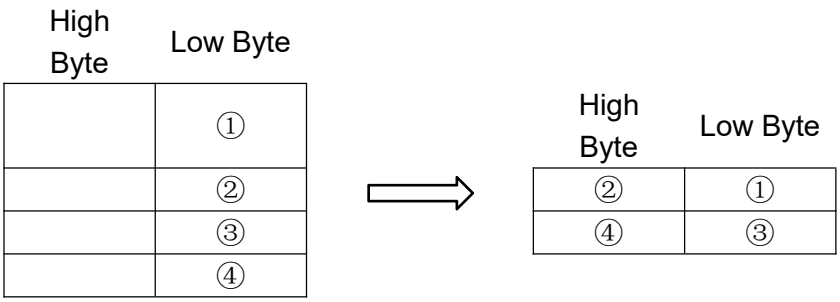
- **S1:** Source starting device. **D:** Target starting device. **m:** parameter setting. **n:** Source data character length (n=1~256).
- **the m** operand. The components used are K, H, and D. When the parameter setting code is not within the specified value, no conversion or transmission will be performed, and no error message will be generated.
- Operand **n indicates the length of the source data to be converted. The length setting range is 1~256. If it exceeds the minimum or maximum, the minimum and maximum values are used. The components used are K, H, and D.**
- **m** parameter setting instructions:
  - Parameter K0: When n=4, 8-bit data is converted to 16-bit data (upper 8 bits, lower 8 bits). The conversion icon is as follows:

High Byte	Low Byte
	①
	②
	③
	④

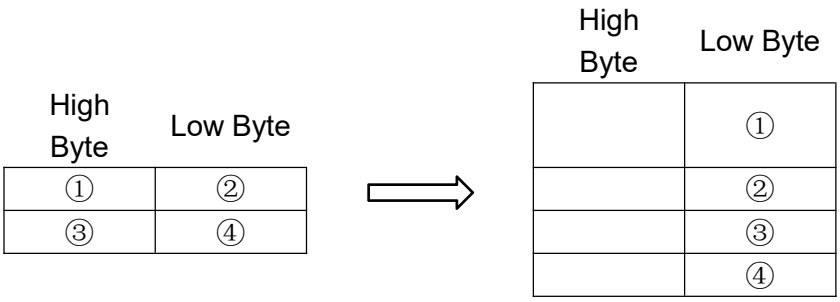
⟹

High Byte	Low Byte
①	②
③	④

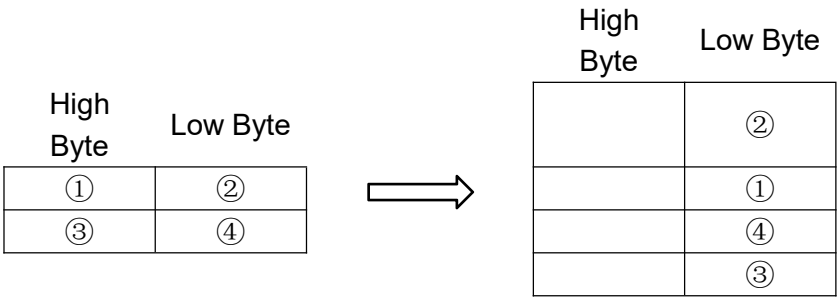
  - Parameter K 1 : When n=4, 8-bit data is converted to 16-bit data (lower 8 bits, upper 8 bits). The conversion icon is as follows



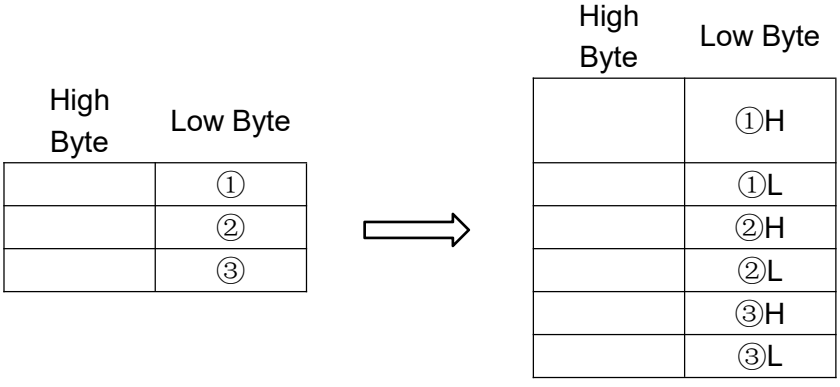
- parameter K 2 : n = 2 , 16-bit data (upper 8 bits, lower 8 bits) is converted to 8- bit data. The conversion icon is as follows:



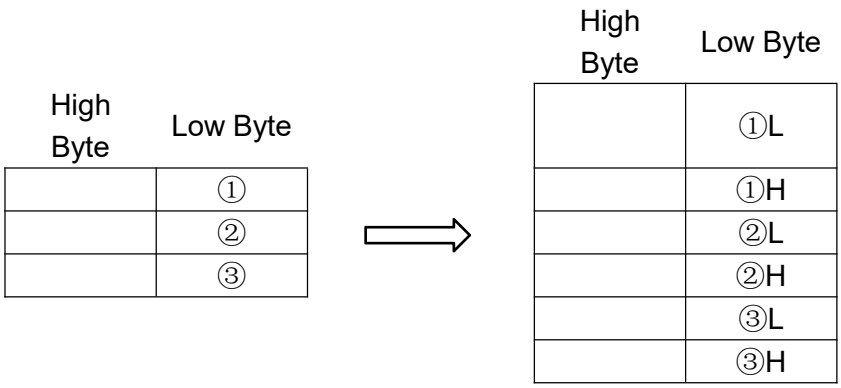
- parameter K 3 : n = 2 , 16-bit data (lower 8 bits, upper 8 bits) is converted to 8- bit data. The conversion icon is as follows:



- parameter K 4 : n = 3 , 8-bit HEX data (upper 4 bits, lower 4 bits) is converted to ASCII data. The conversion icon is as follows:

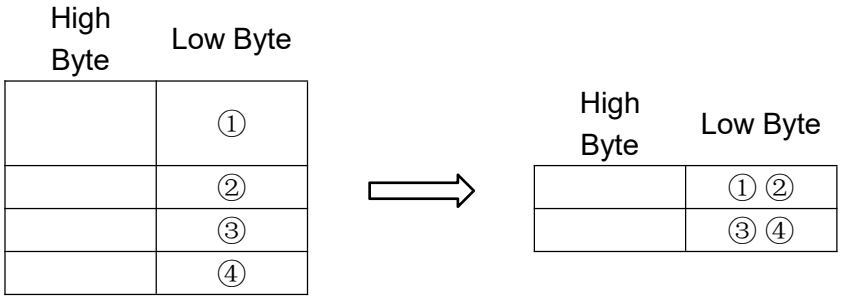


- parameter K 5 : n = 3 , 8-bit HEX data (lower 4 bits, upper 4 bits) is converted to ASCII data. The conversion icon is as follows:

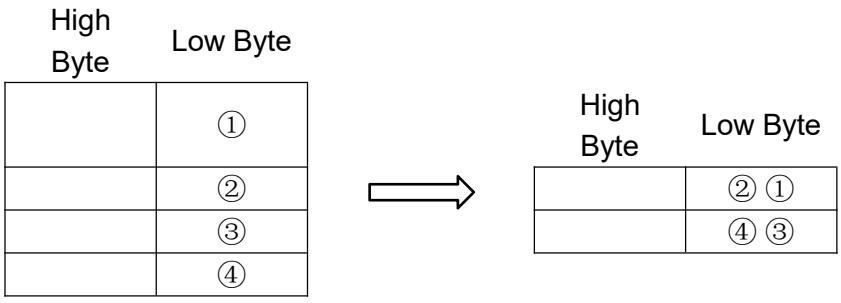


- parameter K 6 : n = 4 , 8-bit ASCII data is converted to HEX data (upper 4 bits, lower 4 bits). The conversion icon is as follows:

The ASCII conversion values are 0 ~ 9 (0x30 ~ 0x39), A ~ F (0x41 ~ 0x46), a ~ f (0x61 ~ 0x66).



- parameter K 7 : n = 4 , 8-bit ASCII data is converted to HEX data (lower 4 bits, upper 4 bits). The conversion icon is as follows:



5. 3 PR Instructions

1. Summary: ASCII code output instructions.

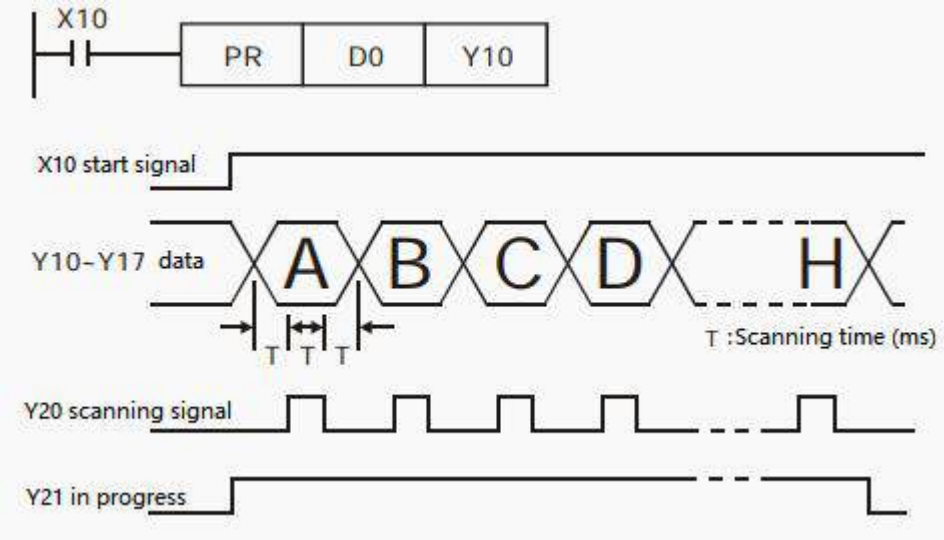
2. PR instruction format and parameter description .

type	instruction	Device for storing	External output point for
	PR	**S**	**D**

- This instruction will output the ASCII codes stored in the 4 registers starting with S in sequence from the output point specified by D.
- The PR instruction can only be used n times in the same program, but only one instruction can

be started at a time, otherwise the instruction will not run normally.

- Flag: M1029 is the execution completion flag.
- Program example:
  - First use the ASC instruction to convert A~H into ASCII codes and store them in D0~D3, then use this instruction to output A~H in sequence.
  - When M1027=Off, X20=On changes, the instruction is executed, and Y10 (lower position) ~ Y17 (upper position) are designated as data output points, the scan signal is designated as Y20 , and the monitoring signal in execution is designated as Y11. This mode can execute 8-word sequential output. And during the output, if the conditional contact is Off, the data output will be stopped immediately, and all outputs will turn Off.
  - X10 turns Off during instruction execution , data output is interrupted. When X10 turns On again, data is resent.



Additional Notes:

- This instruction must use transistor type output.
- When using this instruction, please fix the scan cycle, or put this instruction in the timer interrupt insertion subroutine for execution.

5. 4 SPD instruction

1. Summary: Pulse frequency detection instruction: Calculate the number of pulses received by the input terminal specified by S1 within the time (unit: ms) specified by S2, and the result is stored in the register specified by **D.**

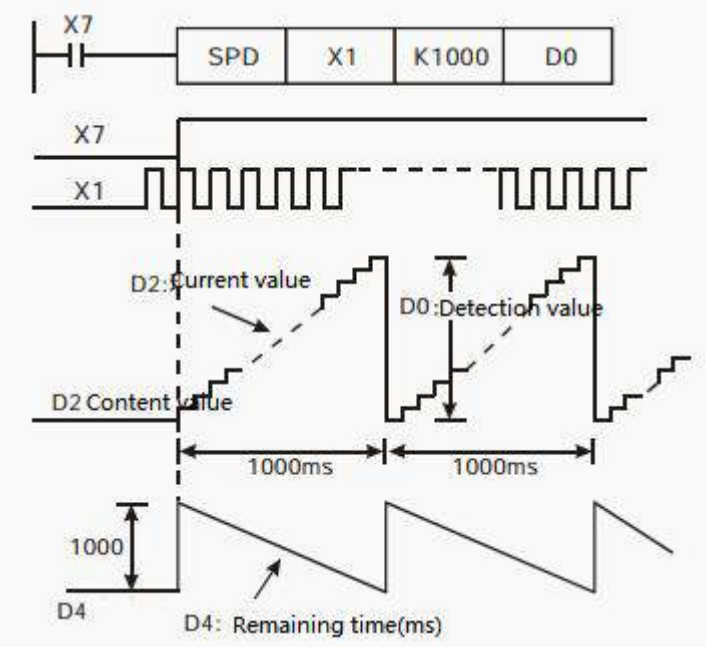
2. SPD instruction format and parameter description .

type	instruction	External pulse input	Receive pulse time	Test results
	SPD	**S 1**	**S2**	**D**

- **D** occupies 5 registers, **D+1** and **D** are the previous pulse detection values, **D+3** and **D+2** are the current pulse accumulation values, and **D+4** shows the remaining time of the timing, which can reach a maximum of 32,767ms.
- SPD specifies 7 ports . X2-X7 and X16 (high-speed SPD port can reach 500K, **please note that when using this port, please do not use the high-speed pulse output CH4/Y10 channel)** . There is no limit on the number of instructions, and all ports can be collected at the same time. Except for X4 and X5 (only 1 phase collection is supported at the same time).

- X2-X5 (upper limit 100K) X6-X7 (upper limit 5K).

- Program Example
  - SPD instruction starts. When M1100 (SPD instruction sampling once flag) = On, SPD instruction executes one sampling. SPD instruction will capture once at the moment when M1100 changes from Off to On, and then stop. To continue capturing, M1100 must be set to On. Off and the SPD instruction must be restarted.
  - When X7=On, D2 calculates the high-speed pulse input by X1, and automatically stops calculating after 1000ms, and the result is stored in D0.
  - When the 1000ms timing is completed, the content of D2 is cleared to 0. When X7 is turned on again, D2 starts counting again.



Part 6 High-speed counting and interruption function application

6.1 Built-in high-speed counter input allocation table

High-speed counters are divided into hardware high-speed counters and software high-speed counters (hardware high-speed counting is fast and accurate, while software high-speed counting is slightly worse and slow). When using multiple high-speed counters at the same time, the counting frequency needs to be reduced. When using high-speed counting interrupts, the high-speed counting bit device cannot be set and cannot be reused.

D1830 is the single-phase hard high-speed counter filter setting, with a range of 0-15 (saved at power failure).

D8131 is the filter setting for the AB phase hard high-speed counter, with a range of 0-15 (saved after power failure). The smaller the value, the higher the frequency width.

count / port	C232	C233	C234	C235	C236	C237	C238	C239	C240	C241	C242	C243	C244	C245	C246	C251	C252
X0	hard		soft									hard					
X1	hard			soft													
X2					soft												
X3		hard				soft*							hard				
X4		hard					soft										
X5														hard		hard	
X6																hard	
X7															hard		hard
X10																	hard
X11								soft									
X12									soft								
X13										soft							
X14											soft						
U/D	U/D	U/D	U	U	U	U	U	U	U	U	U	U/D	U/D	U/D	U/D	U/D	U/D
Frequency	200	200	10	10	10	10	10	10	10	10	10	200	200	200	200	200	200
type	AB	AB	one	one	one	one	one	one	one	one	one	one	one	one	one	AB	AB
Positiv	No	No	M1200	M1201	M1202	M1203	M1204	M1205	M1206	M1208	M1209	M1209	M1210	M1211	M1212	No	No
HSC S/ HSCR	4 times	4 times	4 times	4 times	4 times	4 times	4 times	4 times	4 times	4 times	4 times	4 times	4 times	4 times	4 times	4 times	4 times
limit Pulse	Y11	Y10										Y11	Y10	Y3	Y1	Y3	Y1
length	32-bit	32-bit	32-bit	32-bit	32-bit	32-bit	32-bit	32-bit	32-bit	32-bit	32-bit	32-bit	32-bit	16 -bit	16 -bit	16-bit	16-bit
Numerical Presets	M1748 After On D1864 Write C232	M1749 After On D1864 Write C233														M1146 After On D1864 Write C251	M1147 After On D1864 write C252

Filterin	have	have										have	have	have	have	have	have
Remar							Not			Not							

U: Up count input D: Down count input Single : Single phase input A B: Dual phase input

Hard: Hardware counter. All hardware counters are related to positioning instructions. Please distinguish them when using them.

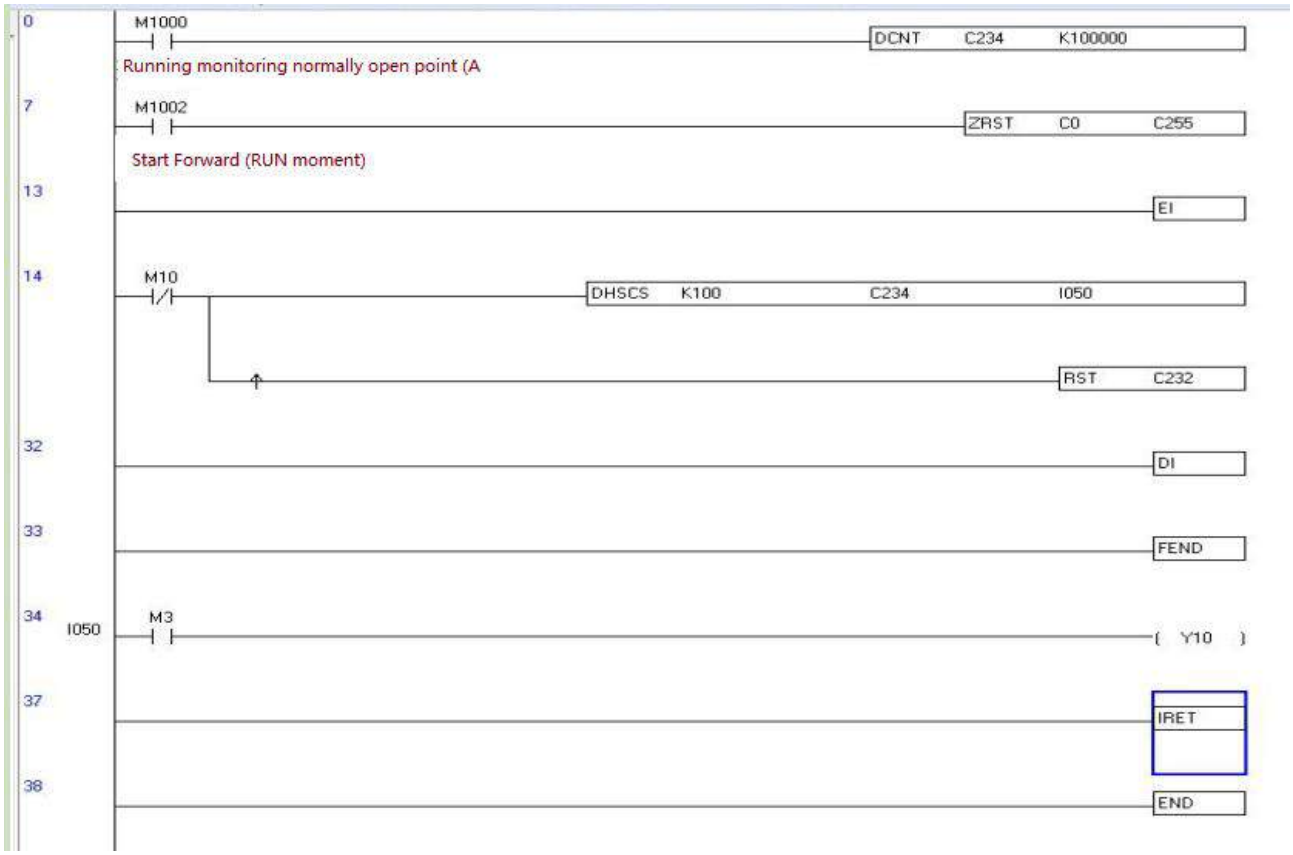
Soft: Software high-speed counter

Single-phase: software counting up to 6 channels, maximum frequency 10KHz; hardware counting up to 4 channels, maximum frequency 200KHz

Dual-phase (C232, C233, C251, C252): 2x frequency: up to 4 channels, maximum frequency 200KHz; 2x frequency enable flag D1022 = 2

4x frequency: up to 4 channels, maximum frequency 200KHz; 4x frequency enabling flag D1022=4

Program example:



The program first starts the high-speed counter C232 (X0, X1 AB phase external rotary encoder), in this example, the running program resets the count value of C0-C255, opens interrupt EI, starts the high-speed count setting instruction, the count value is 100, and the pulse signal with a phase difference of 90 degrees is input to X0 and X1 ports for forward counting and reverse counting. When the count value of C232 becomes 100, the main program jumps to interrupt I050 for execution. After execution, it returns to the main program to continue execution.

6.2 Interrupt Application

Statement : The priority of interrupt pointer I is external interrupt, time interrupt, high-speed counter interrupt, pulse interrupt insertion, and communication interrupt.

6.2.1 External Interrupt

X0~X7 input terminals is triggered on the rising edge or falling edge, the processing of the special hardware design circuit in the PLC host will not be affected by the scan cycle. It will immediately interrupt the currently executing program and jump to the specified interrupt insertion subroutine pointer I00□(X0), I10□(X1), I20□(X2), I30□(X3), I40□(X4), I50□(X5), I60 □ (X6), I70 □ (X7) for execution. When the IRET instruction is executed, it returns to the original position and continues to execute.

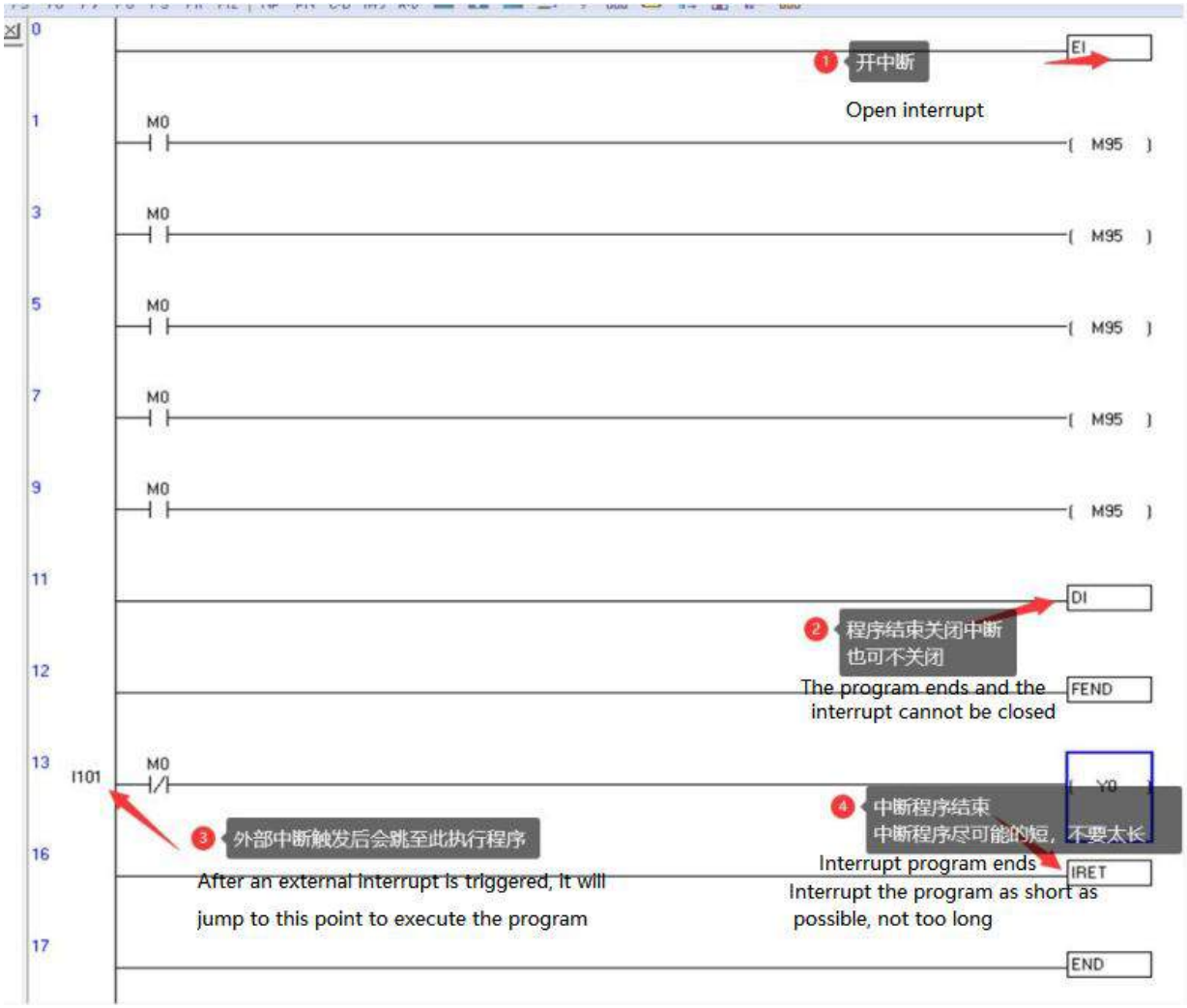
External interrupt pointer insertion prohibition flag signal:

Corresponding port	Flag signal	Functional Description	Remark
X0	M1050	External interrupt insertion I00□ Disable	□ is 0 or 1
X1	M1051	External interrupt insert I 1 0□ Disable	
X2	M1052	External interrupt insertion I 2 0□ Disable	
X3	M1053	External interrupt insertion I 3 0□ Disable	
X4	M1054	External interrupt insertion I 4 0□ Disable	
X5	M1055	External interrupt insertion I 5 0□ Disable	
X6	M1056	External interrupt insertion I 6 0□ Disable	
X7	M1057	External interrupt insertion I 7 0□ Disable	

Note: All interrupt priorities: The last interrupt has the highest priority. The last interrupt will terminate the executing program or the previous interrupt, and will resume execution of the previous program after execution.

Program example:

The program first turns on the interrupt enable EI. The EI to DI time period allows the external X1 rising edge to trigger an interrupt. When X1 is ON during the interrupt time period, the program jumps to the interrupt number I101 to execute program Y0, which is ON. Because this interrupt is a pulse edge interrupt, the I101 segment will not be polled and executed. After the interrupt program is executed, it will jump to the breakpoint of the main program and continue to run the main program.



6.2.2 Timer Interrupt

Add timer interrupt T timer I602~I699, I702~I799, I805 ~I899. 3 points, the time is not affected by the scan cycle time.

Flag signal	Functional Description	Remark
M1490	I600 ~ I699 prohibited	Time base = 1ms
M1491	I 7 00 ~ I 7 99 Prohibited	
M1492	I 8 00 ~ I 8 99 Prohibited	

Note: All interrupt priorities: The last interrupt has the highest priority. The last interrupt will terminate the executing program or the previous interrupt, and will resume execution of the previous program after execution.

When there are multiple timer interrupt subroutines, for example, I620, I730, and I850, I6=20ms, I7=30ms, and I8=50ms. When the scan cycle is greater than 50ms, only I6 will be executed (I6 has the highest priority). Improper time setting will cause interrupt reentry.

6.2.3 Positioning Interrupt

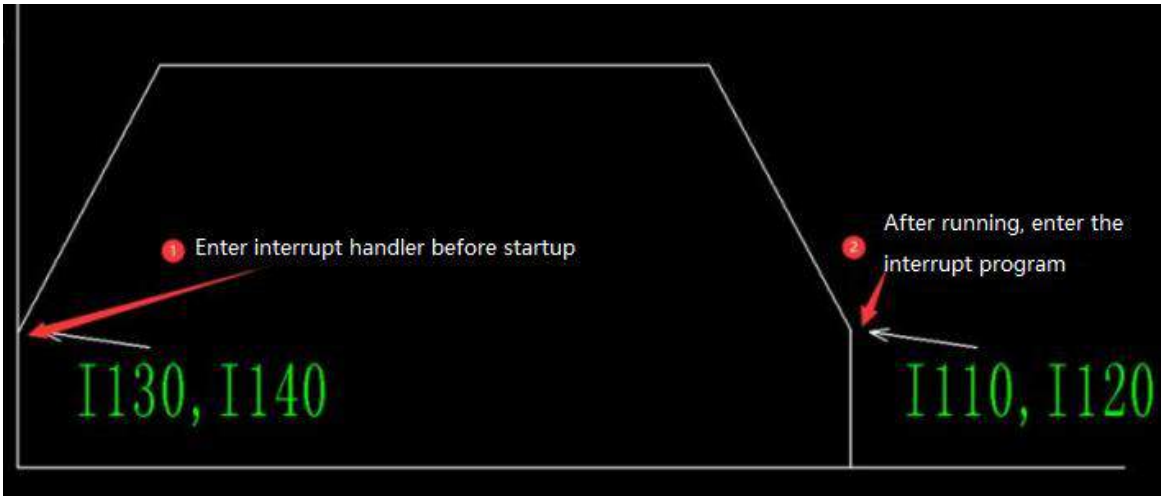
Added support for pulse output interrupt insertion into I110, I120, I130, I140.

Flag signal	Functional Description
M1285	Disable interrupt CH0/I110
M1286	Disable interrupt CH 1 /I1 2 0

M1287	Disable interrupt CH 2 /I1 3 0
M1288	Disable interrupt CH 3 /I1 4 0
M1340	After the CH0 pulse is sent out, interrupt I110 is generated
M1341	After the CH 1 pulse is sent out, an interrupt I1 is generated 2 0
M1342	After the CH 2 pulse is sent out, an interrupt I1 3 0 is generated
M1343	After the CH 3 pulse is sent out, an interrupt I1 is generated 4 0

Note: All interrupt priorities: The last interrupt has the highest priority. The last interrupt will terminate the executing program or the previous interrupt, and will resume execution of the previous program after execution.

The interrupt modes when starting and stopping are as follows:



6.2.4 High-speed counter interrupt

The high-speed counter interrupt addresses are 010, 020, 030, 040, 050, 060, 070, and 080. The DHSCS instruction can be used to jump to the corresponding interrupt address.

Flag signal	Functional Description
M1289	Disable interrupt I1 0 10
M1290	Disable interrupt I1 02 0
M1291	Disable interrupt I1 03 0
M1292	Disable interrupt I1 04 0
M1293	Disable interrupt I1 05 0
M1294	Disable interrupt I1 06 0
M1295	Disable interrupt I1 07 0
M1296	Disable interrupt I1 08 0

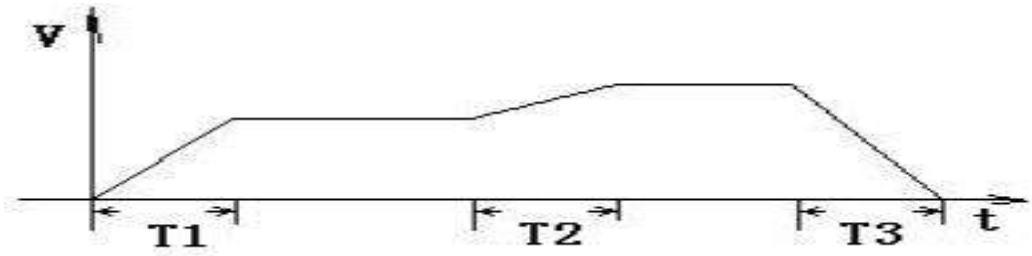
Part 7 High-speed pulse output application

7.1 High-speed pulse output

7.1.1 Special register description

Note: ①When using the Y10, Y11 high-speed pulse output channel, the X0, X1, X3, X4 hard high-speed counting function cannot be used, and vice versa. ②When using the Y1, Y3 high-speed pulse output channel, the X4, X5, X6, X7 hard high-speed counting function cannot be used, and vice versa.

Coolmay M300 series PLC high-speed pulse output conventional 8 channels, 200KHz . Support variable speed, the initial/final speed of start/stop is 0, the chart is as follows:



Acceleration and deceleration time T calculation: (target speed --- current speed) * acceleration and deceleration time / maximum speed

For example: target speed = 50000, current speed = 20000, acceleration time 100 (ms), maximum speed = 100000, T = 30ms.

Pulse point / Functional Description	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Pulse operation monitoring	M1 336	M1 337	M1 522	M1 523	M1 549	M1 659	M1 680	M1 684
Pulse stop position	M1 079	M1 114	M1 520	M1 521	M1 550	M1 560	M1 678	M1 682
Pulse transmission completion bit	M1029	M1030	M1102	M1103	M1326	M1328	M1679	M1683
Direction flag	M1305	M1306	M1532	M1533	M1037	M1058	M1084	M1085
Axis Trapezoidal and S-shaped Acceleration/d	M1726	M1727	M1728	M1729	M1730	M1731	M1732	M1733

eceleration switching								
Pulse current value (32-bit)	D1 3 36, D13 37	D1 3 38 , D13 39	D1 3 48, D13 49	D1 3 5 0 , D13 5 1	D1 030, D1 03 1	D1 032, D1 033	D1 1 05, D11 06	D1 1 07, D11 08
Direction port specification	D1690 Default 0x508 (Y10)	D169 1 default 0x509 (Y11)	D169 2 default 0x50A (Y12)	D169 3 default 0x50B (Y13)	D169 4 default 0x50C (Y14)	D169 5Defau lt 0x50D (Y15)	D169 6 default 0x50E (Y16)	D169 7 default 0x50F (Y17)
Direction Setting Register (0,3 without direction bit 1,2 with direction bit)	D1220	D122 1	D12 29	D12 30	D12 39	D12 4 0	D124 1	D12 42
Direction mark reverse position	D1848 (bit0-bit9)							
Maximum frequency limit (default 200KHz)	D1906, D1907 (applicable instructions DRVA/DRVI/PLSY/PLSR/DZRN/PLSV/PTPO/VSPO)							

1、PLSR Special Register

Register Number	Function	Remark
D1340	Y0 Minimum frequency setting	Power-off retention
D1341	Y1 minimum frequency setting	Power-off retention
D1352	Y2, Y6, Y7 minimum frequency setting	Power-off retention
D1373	Y3, Y4, Y5 minimum frequency setting	Power-off retention

2、DRVI/DRVA Special Registers

Software	Function	Remark
M1115	Switch Y0-Y9 acceleration and deceleration and set the minimum frequency separately	
M1611	Y0 gap compensation forward and reverse selection switch	OFF forward (counterclockwise
M1612	Y1 gap compensation forward and reverse selection switch	

M1613	Y2 gap compensation forward and reverse selection switch	) ON reverse (clockwise)
M1614	Y3 gap compensation forward and reverse selection switch	
M1615	Y4 gap compensation forward and reverse selection switch	
M1616	Y5 gap compensation forward and reverse selection switch	
M1681	Y6 gap compensation forward and reverse selection switch	
M1685	Y7 gap compensation forward and reverse selection switch	
M1708	Y0 immediate stop and deceleration stop selection	ON stop/ OFF reduction and stop
M1709	Y1 Immediate stop and deceleration stop selection	
M1710	Y2 Immediate stop and deceleration stop selection	
M1711	Y3 Immediate stop and deceleration stop selection	
M1712	Y4 Immediate stop and deceleration stop selection	
M1713	Y5 Immediate stop and deceleration stop selection	
M1714	Y6 Immediate stop and deceleration stop selection	
M1715	Y7 Immediate stop and deceleration stop selection	
D1343	Y0,Y5,Y6 acceleration and deceleration time setting	Use when M1115=OFF
D1353	Y1, Y4, Y7 acceleration and deceleration time setting	
D1375	Y2 acceleration and deceleration time setting	
D1376	Y3 acceleration and deceleration time setting	
D1340	Y0,Y4 minimum frequency setting	Use when M1115=OFF
D1341	Y1,Y5 minimum frequency setting	
D1352	Y2,Y6 minimum frequency setting	
D1373	Y3,Y7 minimum frequency setting	
D1344-D1345	Y0 position gap compensation setting	Cumulative compensation, each circle will compensate the set value
D1346-D1347	Y1 position gap compensation setting	
D1328-D1329	Y2 position gap compensation setting	
D1330-D1331	Y3 position gap compensation setting	
D1332-D1333	Y4 position gap compensation setting	
D1334-D1335	Y5 position gap compensation setting	
D1670-D1671	Y6 position gap compensation setting	
D1672-D1673	Y7 position gap compensation setting	

3、DRVI/DRVA/ZRN Special Registers

Software	Function	Remark
D1520	Y0 acceleration and deceleration time setting	
D1521	Y1 acceleration and deceleration time setting	Use when

D1522	Y2 acceleration and deceleration time setting	M1115=ON
D1523	Y3 acceleration and deceleration time setting	
D1524	Y4 acceleration and deceleration time setting	
D1525	Y5 acceleration and deceleration time setting	
D1526	Y6 acceleration and deceleration time setting	
D1527	Y7 acceleration and deceleration time setting	
D1530	Y0 minimum frequency setting	Use when M1115=ON
D1531	Y1 minimum frequency setting	
D1532	Y2 minimum frequency setting	
D1533	Y3 minimum frequency setting	
D1534	Y4 minimum frequency setting	
D1535	Y5 minimum frequency setting	
D1536	Y6 minimum frequency setting	
D1537	Y7 minimum frequency setting	

4、ZRN Special Register

Software	Function	Remark
M1264	Is the ZRN return direction of the Y0-Y7 channel fixed? ON is automatic direction OFF is fixed reverse	Default: Fixed reverse direction return to zero
D1774	Y0 homing mode setting	Power failure does not retain, power failure restores to default parameters
D1775	Y1 homing mode setting	
D1776	Y2 Home mode setting	
D1777	Y3 Home mode setting	
D1778	Y4 Home mode setting	
D1779	Y5 Home mode setting	
D1806	Y6 Home mode setting	
D1807	Y7 Home mode setting	
D1343	Y0 acceleration and deceleration time setting	Power-off retention
D1353	Y1,Y4,Y5,Y6,Y7 acceleration and deceleration time setting	
D1375	Y2 acceleration and deceleration time setting	
D1376	Y3 acceleration and deceleration time setting	
D1340	Y0 minimum frequency setting	
D1341	Y1 minimum frequency setting	
D1352	Y2,Y4,Y5,Y6 minimum frequency setting	
D1373	Y3,Y7 minimum frequency setting	
D1680	Y0 DZRN limit switch setting	Power failure does not retain, power failure restores to default parameters
D1681	Y1 DZRN limit switch setting	
D1682	Y2 DZRN limit switch setting	
D1683	Y3 DZRN limit switch setting	
D1684	Y4 DZRN limit switch setting	
D1685	Y5 DZRN limit switch setting	
D1686	Y6 DZRN limit switch setting	
D1687	Y7 DZRN limit switch setting	

5、DCIMA circular interpolation dedicated register

Software	Function	Remark
M1336	CH0 (such as Y0-Y1) X Running	
M1522	CH0 Y Running	

M1133	OFF after CH0 interpolation is completed	
M1155	CH0 ON starts acceleration and deceleration	
M1549	CH1 (such as Y2-Y3) X Running	
M1680	CH1 Y Running	
M1134	OFF after CH1 interpolation is completed	
M1155	CH1 ON starts acceleration and deceleration	
M1102	CH1 turns on after interpolation is completed	
D1343	CH0 acceleration and deceleration time setting default: 200ms	Power-off retention
D1340	CH0 minimum frequency setting default: 100HZ	
D1353	CH1 acceleration and deceleration time setting default: 200ms	
D1352	CH1 minimum frequency setting default: 100HZ	

6、DPPMA Linear interpolation dedicated register

Software	Function	Remark
M1336	CH0 X Running	
M1522	CH0 Y Running	
M1133	OFF after CH0 interpolation is completed	
M1281	CH0 ON starts acceleration and deceleration	
M1029	CH0 turns on after interpolation is completed	
M1549	CH1 X Running	
M1680	CH1 Y Running	
M1134	OFF after CH1 interpolation is completed	
M1282	CH1 ON starts acceleration and deceleration	
M1102	CH1 turns on after interpolation is completed	

7、DCIMA/DPPMA Common Registers

Software	Function	Remark
D1336	CH0 X Current position	ArcCH0
D1348	CH0 Y Current position (general version is D1338)	ArcCH0
D1030	CH1 X Current location	ArcCH1
D1105	CH1 Y Current position (general version is D1032)	ArcCH1

7.2 Interpolation Description

7.2.1 DCIMA Instructions

1. Overview: Dual-axis absolute position circular interpolation. When **the DCIM A** instruction is activated, the set output device **D** performs dual-axis point-to-point "circular interpolation" motion with the set **S1 and S2** output pulse numbers and the set resolution **S. S1 and S2** represent the specified pulse output numbers of **the X-** axis and **Y** -axis respectively (absolute coordinate position specification), and the positive and negative signs represent the positive and negative directions.

The relevant software components are as follows:

Software	Function	Remark
M1336	CH0 (such as Y0-Y1) X Running	
M1522	CH0 Y Running	
M1133	OFF after CH0 interpolation is completed	
M1155	CH0 ON starts acceleration and deceleration	
M1549	CH1 (such as Y2-Y3) X Running	
M1680	CH1 Y Running	
M1134	OFF after CH1 interpolation is completed	
M1155	CH1 ON starts acceleration and deceleration	
M1102	CH1 turns on after interpolation is completed	
D1343	CH0 acceleration and deceleration time setting default: 200ms	Power-off retention
D1340	CH0 minimum frequency setting default: 100HZ	
D1353	CH1 acceleration and deceleration time setting default: 200ms	
D1352	CH1 minimum frequency setting default: 100HZ	
D1336	CH0 X Current position	ArcCH0
D1348	CH0 Y Current position (general version is D1338)	ArcCH0
D1030	CH1 X Current location	ArcCH1
D1105	CH1 Y Current position (general version is D1032)	ArcCH1

2. DCIMA command format and parameter description .

type	instruction	X-axis	Y- axis	Frequency value,	Pulse output
D	**DCIMA**	**S 1**	**S2**	**S**	**D**

- **S1** and **S2** must be -2,147,483,648 ~ + **2,147,483,647** values, M1281, M1282 acceleration and deceleration functions.
- The interpolation function does not support the direction bit reversal function of D184 8, and the

direction bit is fixed.

◆ **S1** is the X-axis position; **S2** is the Y-axis position;

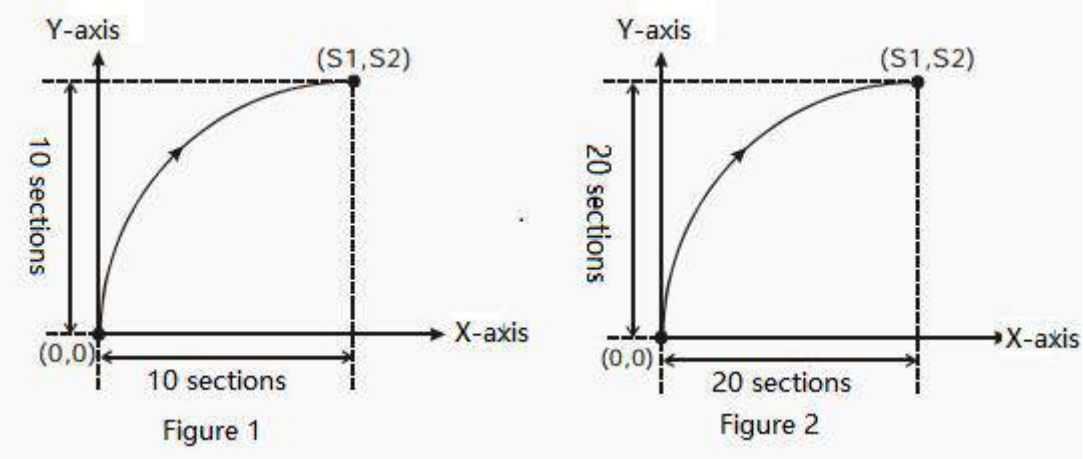
of S are the frequency value (How*1000 of S), and the low 8 bits are the order and resolution:

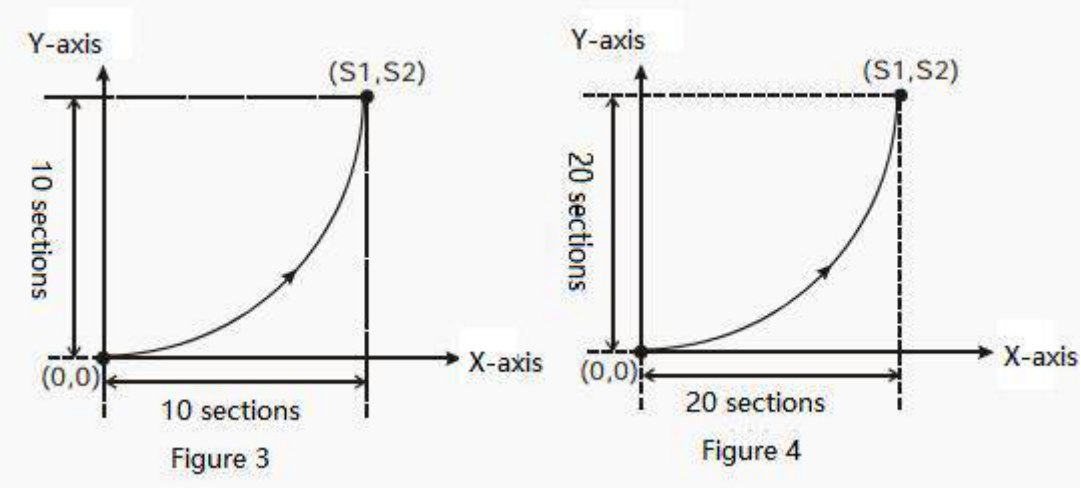
H0 is the arc resolution of 10, as shown in Figure (1), H2 is the arc resolution of 20, as shown in Figure (2);

H1 is the reverse arc resolution of 10, as shown in Figure (3), H3 is the reverse arc resolution of 20, as shown in Figure (4);

H4 and H5 (40) --- HA and Hb (100) The highest bit resolution is 100 (increments every 20).

If the high 8 bits of **S** are 0, the frequency will be automatically changed to 100K operation (the maximum supported frequency is 100K operation).



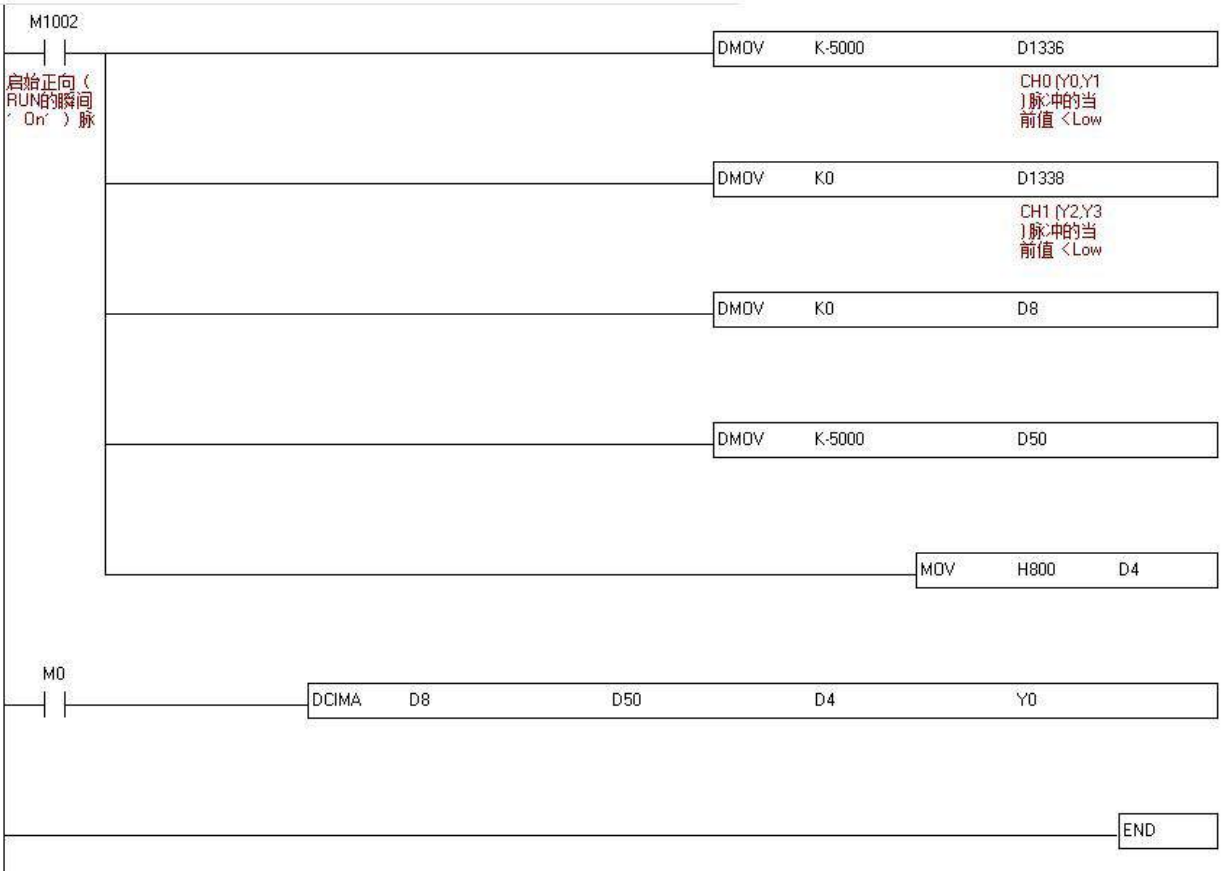


◆ D pulse output device, when Y0 is specified, Y0 is the first group of X-axis pulse output device, Y1 is the first group of X-axis direction signal, Y2 is the first group of Y-axis pulse output device, and Y3 is the first group of Y-axis direction signal;

When Y4 is specified, Y4 is the second group of X-axis pulse output devices, Y5 is the second group of X-axis direction signals, Y6 is the second group of Y-axis pulse output devices, and Y7 is the second group of Y-axis direction signals.

When the direction signal is output, it will not turn off immediately after the pulse output ends. The direction signal will turn off only when the command condition contact turns off.

Program example:



Start M0 to draw a three-quarter circle clockwise.

7.2.2 DPPMA Directive

1. Overview: Dual-axis absolute point-to-point motion (the execution method is linear interpolation, not simple point-to-point) . After **the DPPMA** instruction is activated, the output device **D** performs a two-axis point-to-point "linear" motion with the set **S1 and S2** output pulse numbers and the set speed frequency **S , where S1 and S2** represent the X- axis and Y -axis specified pulse output numbers (absolute coordinate position designation), and the positive and negative signs represent the positive and negative directions. The Y-axis setting value is compared with D1348 to perform positive and negative direction motion.

The relevant software components are as follows:

Software	Function	Remark
M1336	CH0 X Running	
M1522	CH0 Y Running	
M1133	OFF after CH0 interpolation is completed	
M1281	CH0 ON starts acceleration and deceleration	
M1029	CH0 turns on after interpolation is completed	
M1549	CH1 X Running	

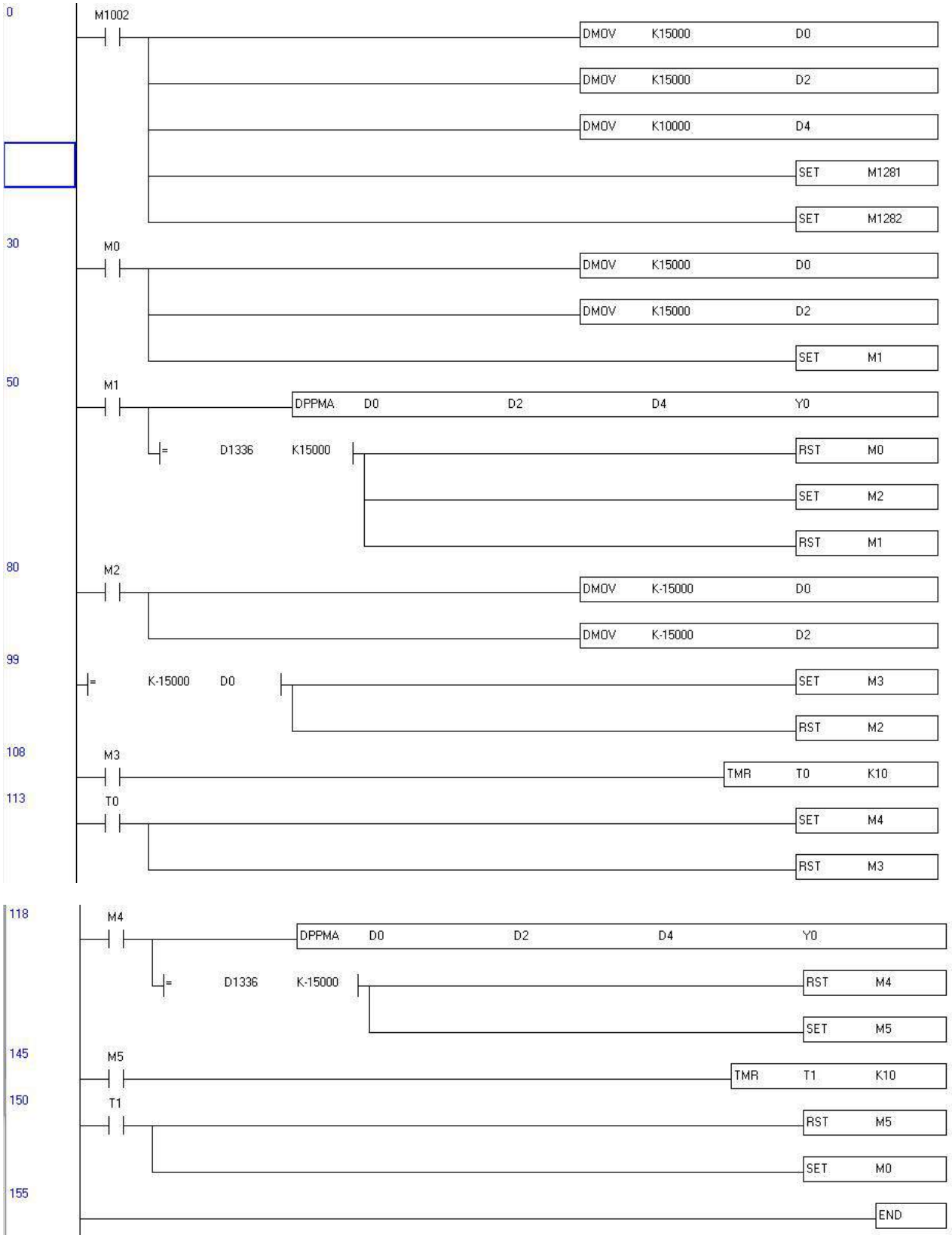
M1680	CH1 Y Running	
M1134	OFF after CH1 interpolation is completed	
M1282	CH1 ON starts acceleration and deceleration	
M1102	CH1 turns on after interpolation is completed	
D1336	CH0 X Current position	ArcCH0
D1348	CH0 Y Current position (general version is D1338)	ArcCH0
D1030	CH1 X Current location	ArcCH1
D1105	CH1 Y Current position (general version is D1032)	ArcCH1

2. DPPMA instruction format and parameter description .

type	instruction	X-axis pulse	Y- axis pulse	Maximum output frequency	Pulse output
D	**PPM A**	**S 1**	**S2**	**S**	**D**

- **S1** and **S2** must be 0~ **+2,147,483,647** values, M1281, M1282 acceleration and deceleration functions.
- **D** pulse output device, when Y0 is specified, Y0 is the first group of X-axis pulse output device, Y1 is the first group of X-axis direction signal, Y2 is the first group of Y-axis pulse output device, and Y3 is the first group of Y-axis direction signal;
  When Y4 is specified, Y4 is the second group of X-axis pulse output devices, Y5 is the second group of X-axis direction signals, Y6 is the second group of Y-axis pulse output devices, and Y7 is the second group of Y-axis direction signals. When the direction signal is output, it will not turn off immediately after the pulse output ends. The direction signal will turn off only when the instruction condition contact turns off.

Program example:

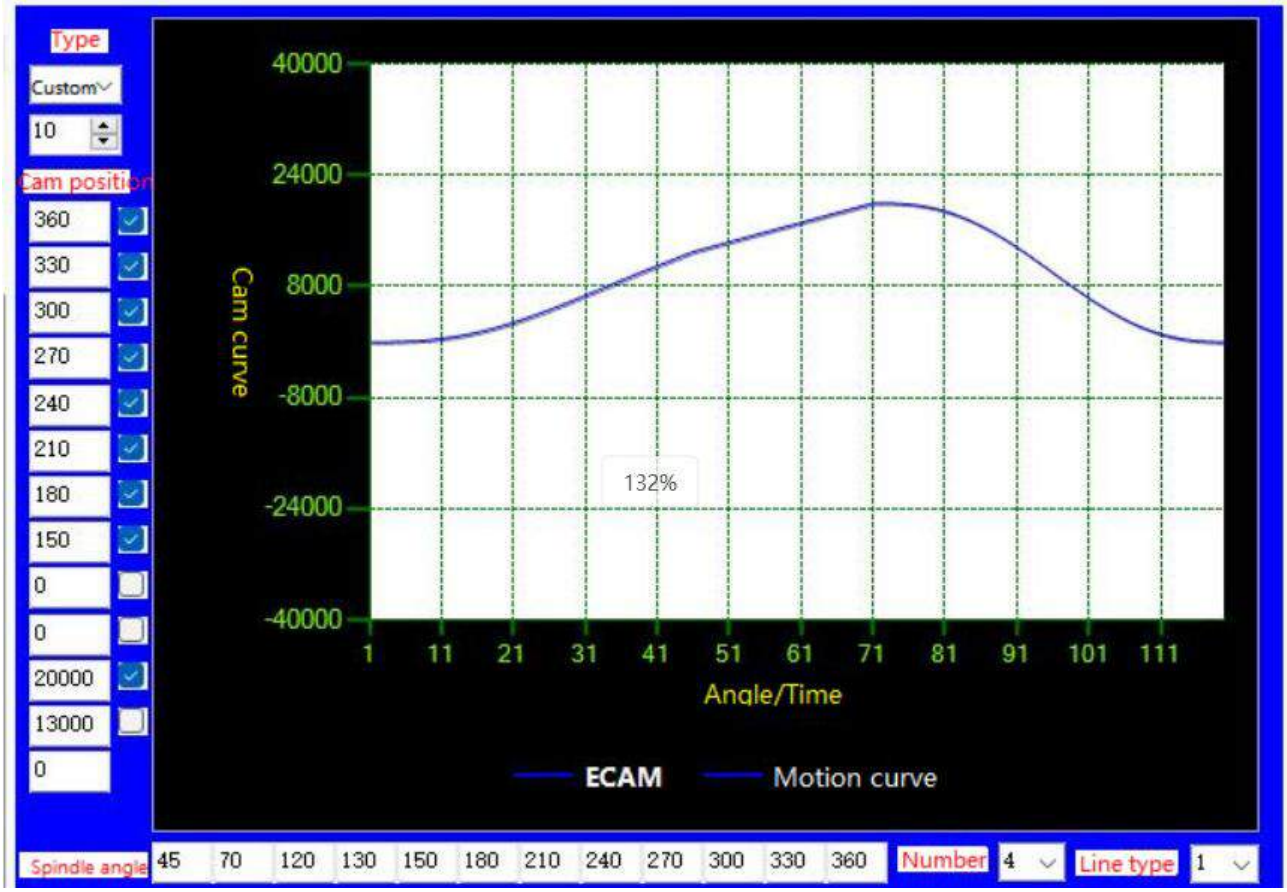


Dual-axis linear interpolation program: When PLC RUN and M0=ON, the first point-to-point motion is executed at a frequency of 10kHz.
After the first point-to-point motion is completed, M2 is set to automatically execute the second point-to-point motion, and so on.
Until the fourth point-to-point motion is completed.

7.3 Quick commissioning instructions for flying shear

1. Understanding the Chasing/Flying Shear Curve

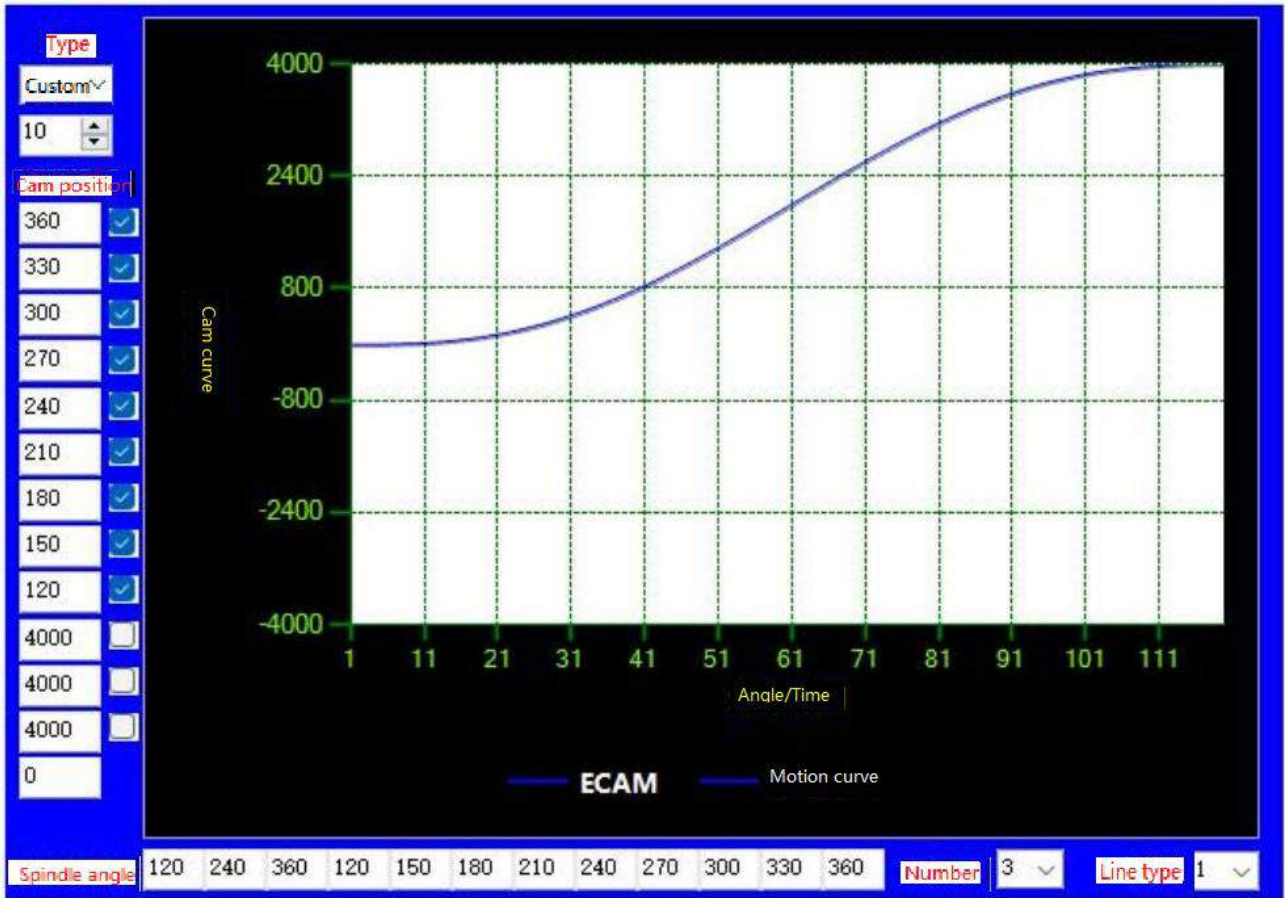
1、What is a shear curve?



The shear chasing curve is a curve with equal ends. The curve contains an acceleration zone, a synchronization zone, a deceleration zone, and a return zone. A complete cycle of walking is a complete shear chasing curve.

Note: If the shape of your curve is significantly different from that of this curve, for example, the beginning and the end are not equal, it is a pure straight line, or the shape is weird, it means that there is an error in your curve data and it needs to be readjusted.

2、What is a shear curve?



The flying shear curve is a curve with unequal ends. The curve also contains acceleration area, synchronization area and deceleration area. A complete cycle is a complete flying shear curve.

Note: If the shape of your curve is significantly different from that of this curve, for example, the beginning and the end are equal, it is a pure straight line, or the shape is weird, it means that there is an error in your curve data and it needs to be readjusted.

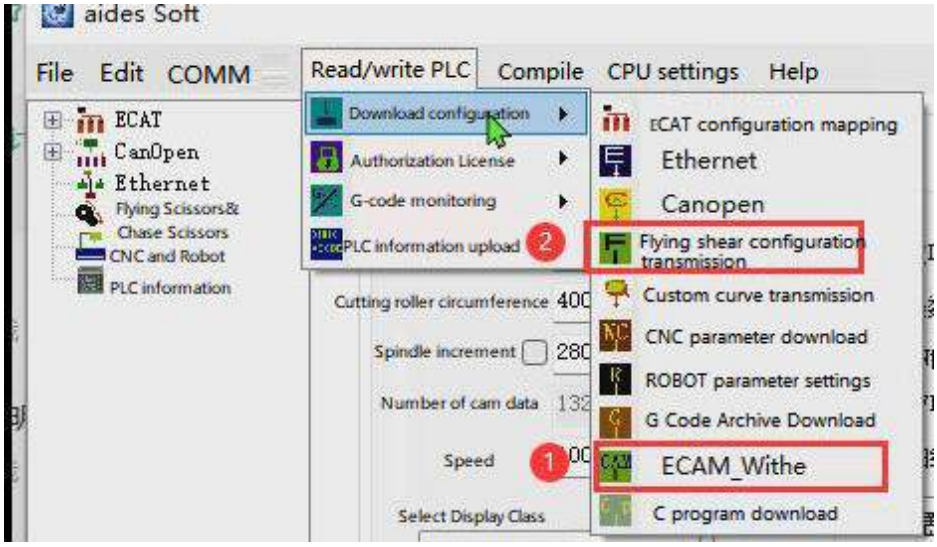
二、 The difference between internal and external shafts

Internal axis: As the name implies, it is the main axis controlled by the PLC itself (the default is Y0/Y10), Y1/Y11 is the chasing/flying shear axis, and the user only needs to adjust the running speed of the internal axis .

External axis: An axis controlled by external devices (frequency converter, PLC) or other devices is called a powered external axis. An unpowered roller that moves by friction or force provided by other devices is called an unpowered external axis. Encoders are required to collect information such as the speed, position, and direction of the external axis. The collected information is uniformly processed by the PLC .

Note: During debugging, please pay attention to whether the control method is internal axis or external axis. Different control methods require different programs.

三、 Configuration Download



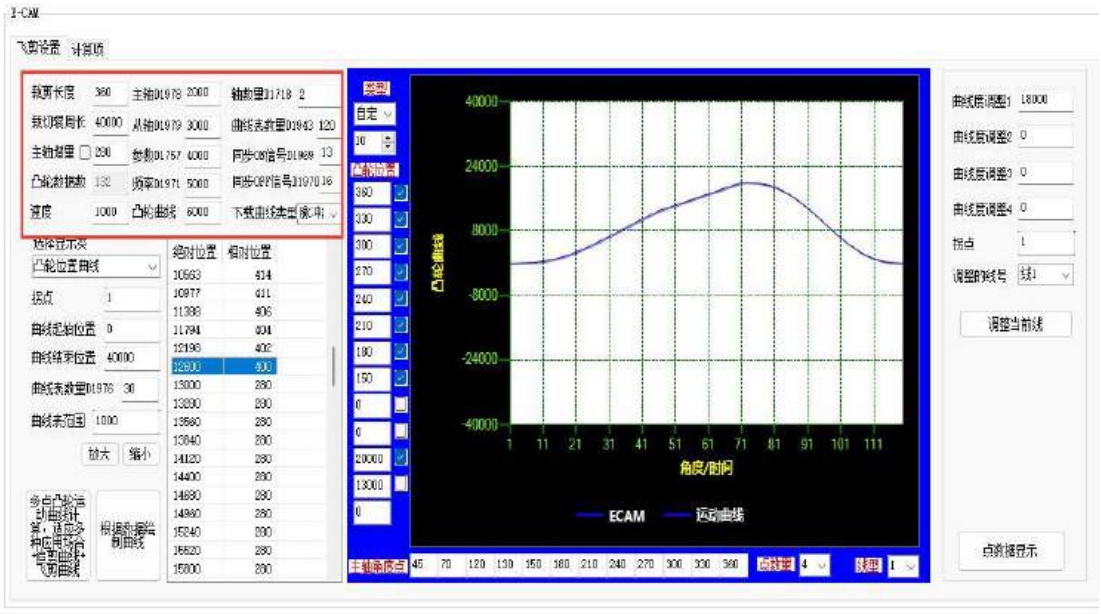
It is recommended to download the configuration in order, first download ECAM_Withe, then download the flying shear configuration transfer.

Note: 1. If ECAM_Withe is not downloaded, the chasing shear cannot be started.

2. ECAM_Withe only needs to be downloaded once, and there is no need to download subsequent curve changes unless the PLC is restored to factory settings.

3. If the download fails during the download process, be sure to reopen the host computer software and reconfigure it before downloading again.

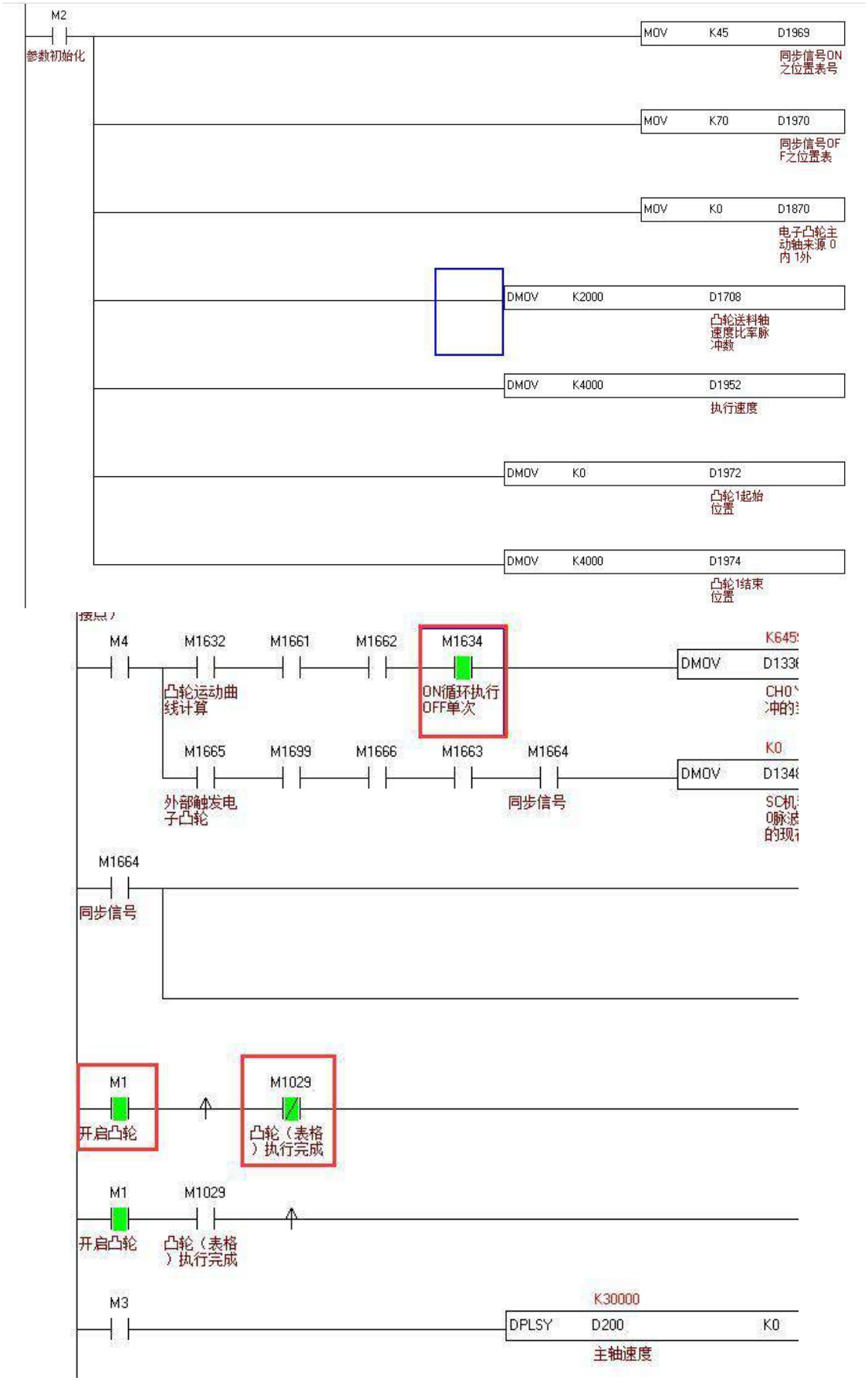
四、 Comparison between program and host computer



The program used must be consistent with the one in the red circle, especially the number of curve tables, number of axes, master axis D1978, slave axis D1979, etc.....

Note: Inequality may cause abnormal chasing and flying shearing actions

五、 Start flying shear and chasing shear



For any curve debugged by the host computer software, please follow the following startup operations:

1. Internal axis control: start M2 (reset immediately after activation), M1634 (normally open for

cycle, normally closed for single), M1 (normally open), M1029 (normally closed), and no other operations are required.

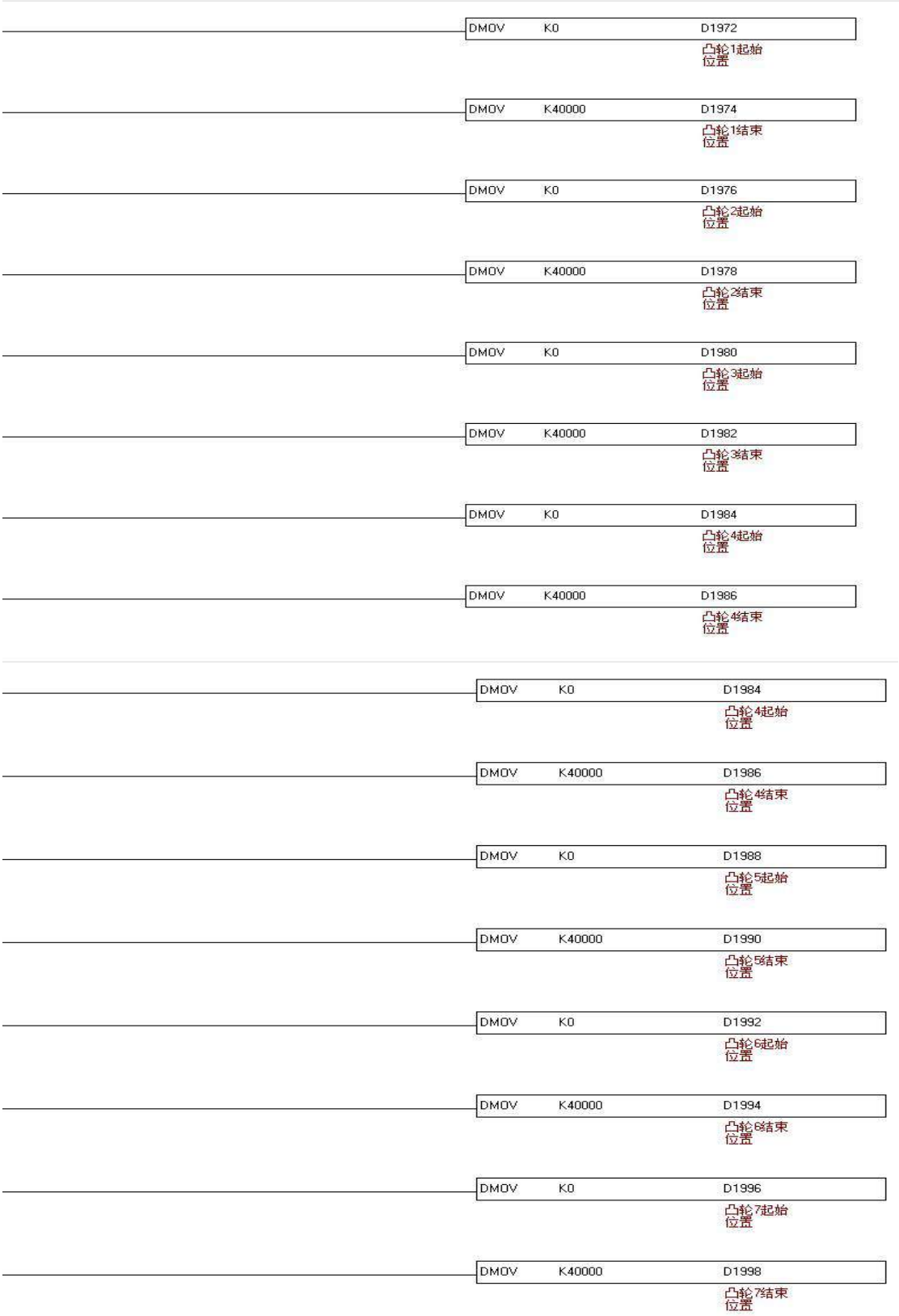
2. External axis control: move M2 (reset immediately after activation), M1634 (normally open for cycle, normally closed for single), M1 (normally open), M1029 (normally closed), M3 (the external axis in this case is controlled by the PLC body), and no other operations are required.

Note: No matter it is tracking shear or flying shear, as long as the curve is debugged by software, do not start the M1632 cam curve calculation. Starting it will cause the downloaded curve to be disordered. M1632 is a program used to manually calculate the curve table.

六、 Configuration of multiple slave axes

This PLC supports multi-slave axis mode. The chasing shear/flying shear can set multiple slave axes, and can support up to 7 slave axes.

1. Program configuration:



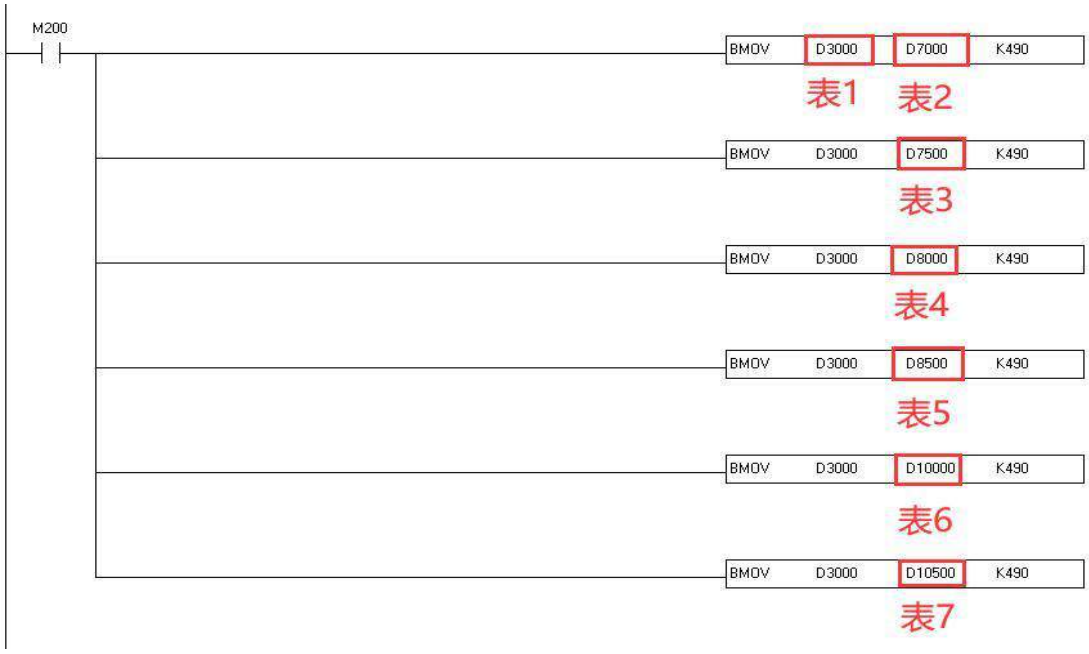
Configure the table header address, start position, and end position of each axis as required. It is recommended to refer to the total number of curve points of the host computer.

Note: 1. You need to configure as many tables as there are slave axes, and make sure to configure them completely. 2. Calculate the number of table points for each axis and allocate the intervals. Improper configuration will cause the table data of other axes to be overwritten, resulting in abnormal overall operation.

2. Download the table of each axis

Determine the download method based on the table data of each axis

2.1. As the table data of each axis used in this case is consistent, it is only necessary to download the first table data in the host computer software, and then use BMOV in the PLC program to copy the table data, so as to achieve the purpose of fast downloading.



2.2. If the table data of each axis are different, it can only be downloaded multiple times through the host computer software. The specific operations are as follows:

From the appeal process, we know that D3000 onwards is the table data of axis 1, D7000 onwards is the table data of axis 2, D7500 onwards is the table data of axis 3, and so on.....The following figure downloads the table data from axis 1

When we need to download the table data from axis 2, we only need to change 3000 to 7000, and then click the flying shear configuration transmission to download the table data from axis 2 to the PLC.

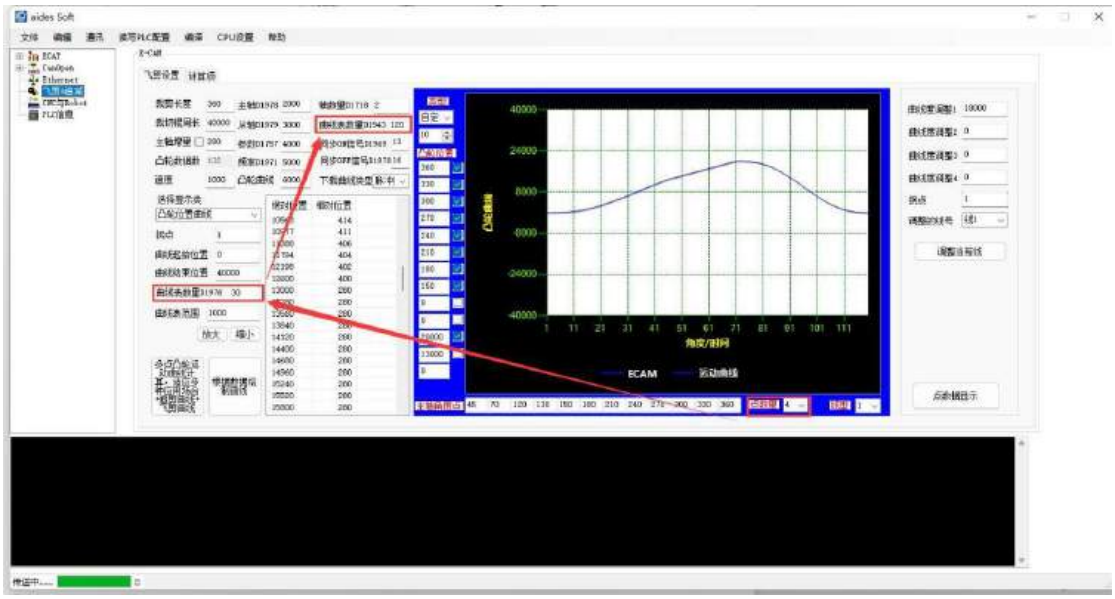
Similarly, slave axis 3, slave axis 4, slave axis 5, slave axis 6...are also downloaded in sequence using this method.

Note: X axes need to be downloaded X times, and the omitted axes will not be executed.

2.3. For multi-axis startup, refer to Section 5.

七、 Quantity calculation of curve table

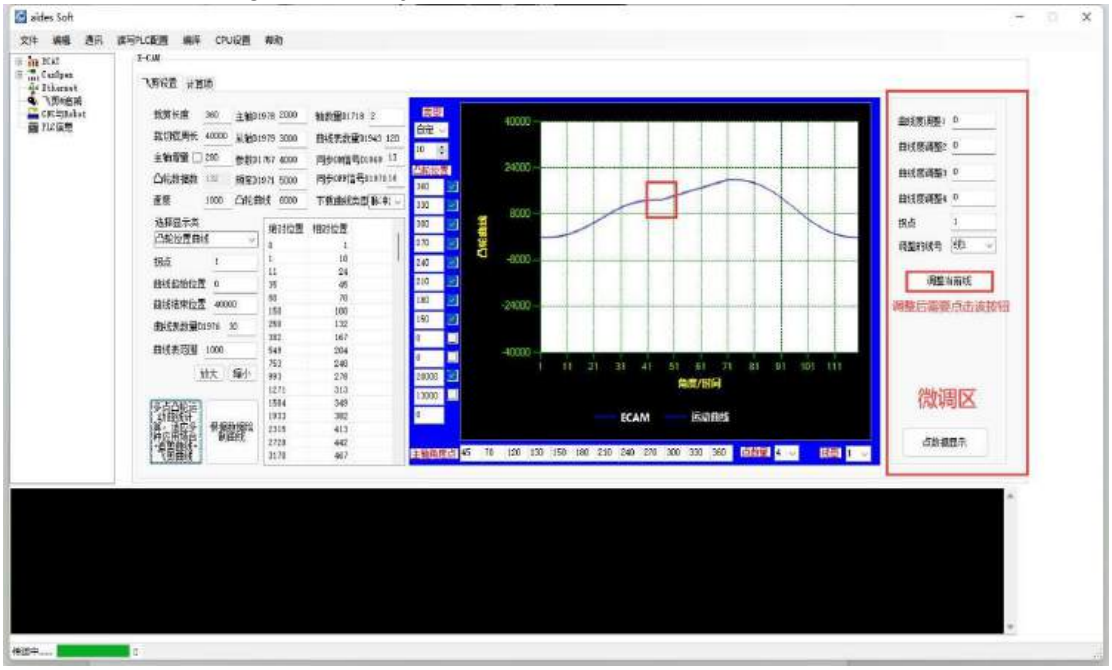
As shown in the figure: Curve table quantity D1943 = curve table quantity D1976 * number of points



Note: The number of curve tables D1976 and the number of points are adjustable, adjust as needed

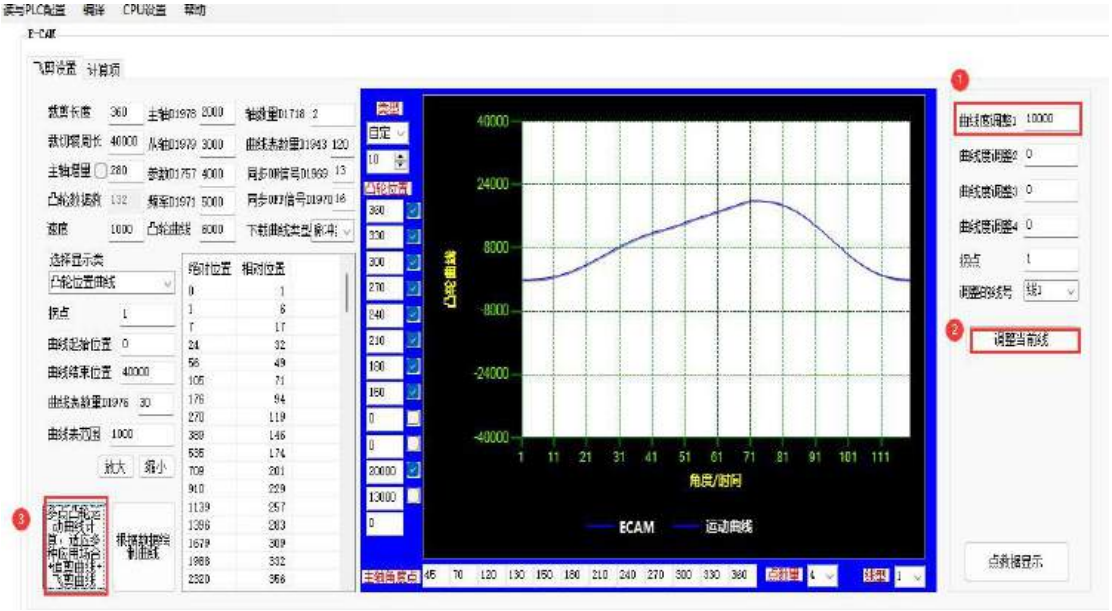
八、 Use of fine-tuning area

Taking the chase shear as an example, observing the figure below, we can clearly see that in the synchronization area, the curve has an obvious inflection point. This is an extremely undesirable curve. In actual movement, when the chase shear moves to the inflection point, there will be a significant deceleration, giving people a sense of stuttering visible to the naked eye. In this case, we need to use the fine-tuning area to adjust the curve.



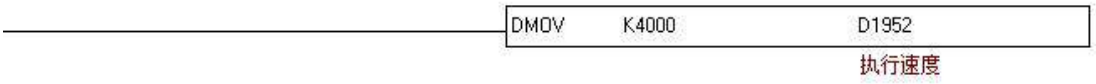
Take the following figure as an example: 1. Enter the adjustment value 2. Click to adjust the current

line 3. Click to calculate the curve and check the effect until the ideal effect is achieved.

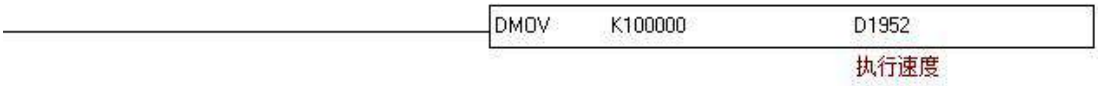


Note: The adjustment values given in this figure are the initial adjustment values. In fact, the curve needs to be adjusted multiple times until the ideal effect is achieved.
During flying shearing, this adjustment area can adjust the phase advance and phase retardation of the flying shear synchronization area.
For example, when the fine-tuning value is a positive number, the phase of the synchronization zone moves forward as a whole; when the fine-tuning value is a negative number, the phase of the synchronization zone moves backward as a whole; the adjustment method is the same as that of the chase shear, so it will not be elaborated here.

九、 Use of D1952 execution frequency



When the D1952 execution frequency is in the internal axis, it controls the actual operating frequency of the spindle.
For example, if D1952=K5000, the main axis running frequency is 5K, and the actual speed is 30r/min. When the slave axis is synchronized, the speed of the slave axis is also 30r/min.



When the D1952 execution frequency is in the external axis, it actually controls the maximum speed of the slave axis.
For example, D1952=k5000. When the actual speed of the external spindle is 30r/min, when the slave axis is synchronized, the speed of the slave axis cannot reach 30r/min. We need to adjust the execution frequency of D1952. It is recommended to set the value to 100K or 200K to avoid this problem.

Note: 1. There is a certain proportional relationship between the speeds of the master and slave axes. Only on the basis of the correct relationship can their speeds be compared. 2. If there is no following effect, check whether the D1952 execution frequency setting is appropriate. If it is appropriate, then there are other reasons.

十、 Explanation of the proportional relationship of the external axes

The spindle servo has 10,000 pulses per revolution, and the encoder has 4,000 pulses per revolution (2x frequency) , so the speed ratio of the encoder to the spindle is 4,000/10,000=0.4, that is, if the spindle is 12r/min, the camshaft is 12*0.4=4.8r/min. If you want the camshaft to display the same speed as the spindle, you need to change the camshaft pulses per revolution to 4,000 to keep the encoder and camshaft consistent. At this time, the spindle is 12r/min and the camshaft is also 12r/min.

If 4 times the frequency is used, the 4000 pulses of the encoder will become 8000 pulses per circle. Similarly, the cam servo needs to be adjusted to 8000 pulses .

Note: 1. In order to see whether the speed of the synchronization zone is synchronized, it is recommended to adjust the electronic gear ratio so that their relationship ratio is 1:1; of course, it is not impossible not to adjust it, you must be clear about the conversion relationship between them. 2. The material length of 4 times the frequency is half of that of 2 times the frequency.

十一、 Relationship between angle and synchronization zone

1. When all parameters are set to default, the more spindle angle points there are, the shorter the synchronization zone will be.

Such as: Spindle angle point synchronization area length

1	20
2	10
3	6
4	4

2. When the spindle angle points are determined, the length of the synchronization zone (long/short) can be changed by adjusting the first angle of the spindle angle point.

For example, if the number of spindle angle points is 3, and the angles are 120°, 240°, and 360° respectively, the synchronization zone angle has only 6 lengths.

We just need to change 120° to 180°, and then we can see that the synchronization area angle has a length of 10.

We just need to change 120° to 90°, and then we can see that the synchronization area angle has 4 lengths.

Note: Due to the influence of parameter settings, the data may not be consistent. It is only for debugging reference and is subject to actual debugging.

十二、 Material length calculation formula

Formula 1: Total pulse number = curve table number D1943 * synchronization area data

Formula 2: Material length = total number of pulses * (actual stroke (mm) / number of pulses per revolution of the slave shaft)

Glossary:

Preset amount (feeding axis length storage address - 2) : used in scenarios where the

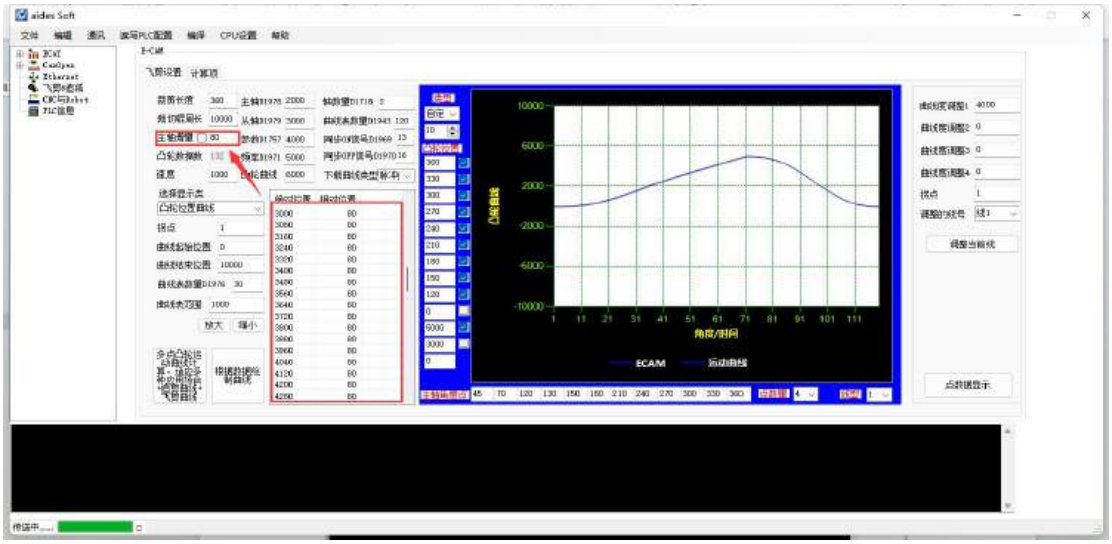
material length needs to be adjusted frequently, so that the chasing shear/flying shear axis is empty. **Please note that this data can only be ≥ 0. Negative numbers are abnormal** . When the material length does not need to be adjusted, it can be = 0.

Synchronous area data: Check the red circle relative position. The data with the same growth is considered as the synchronous area. You need to fill in the spindle increment.

Curve table quantity D1943: See explanation in Section 7.

Actual stroke (mm): refers to the actual distance the actuator travels in one pulse circle, which must be accurate.

Number of pulses per spindle revolution: Check the number of pulses per servo revolution (internal axis)/number of pulses per encoder revolution*2 (external axis).



Demonstration of formula calculation without preset amount:

Assuming that the number of pulses per revolution of the master and slave shafts is 4000, the actual travel of 4000 pulses of the master and slave shafts is 103mm.

As can be seen from the above figure, the number of curve tables D1943 = 120, the synchronous area data = 80, and there is no preset quantity.

Calculated according to formula 1: total number of pulses = 120*120, total number of pulses = 14400.

Calculated according to formula 2: material length = 14400* $^{103}/_{10000}$, material length = 148.32mm.

Therefore, we calculate the actual material length. If the material length does not meet our needs, we can achieve the required material length by changing the curve table quantity D1943 or the synchronization area data.

Note: The modifications mentioned here can only be made in the upper computer software, and after the modification, you need to check whether the curve is normal before writing it into the PLC. Do not blindly modify it directly from the PLC, otherwise it will easily cause abnormal curves and abnormal chasing shear movements.

Demonstration of formula calculation with preset amount:

Assuming that the number of pulses per revolution of the master and slave shafts is 4000, the actual travel of 4000 pulses of the master and slave shafts is 103mm.

As can be seen from the above figure, the number of curve tables D1943 = 120, the synchronization

area data = 80, under the condition of (preset quantity = 9817).

Calculated according to formula 1: total number of pulses = 9817 + 120 * 80, total number of pulses = 19417.

Calculated according to formula 2: material length = 19417* $^{103}/_{4000}$, material length = 499.98mm.

Therefore, we calculate the actual material length. If the material length does not meet our needs, we can achieve the required material length by changing the preset amount without adjusting the curve through the upper computer.

Note: When using the host computer software to make a curve, the minimum size should be taken into consideration. If the curve is smaller than the minimum size, the material length can be modified at will. For example, if the minimum size of a product is 245mm, the material length of the curve we make should be less than 245mm, within an appropriate range, such as 220 or 200, and not too small.

十三、 Use case of fixed material length by internal axis of shearing

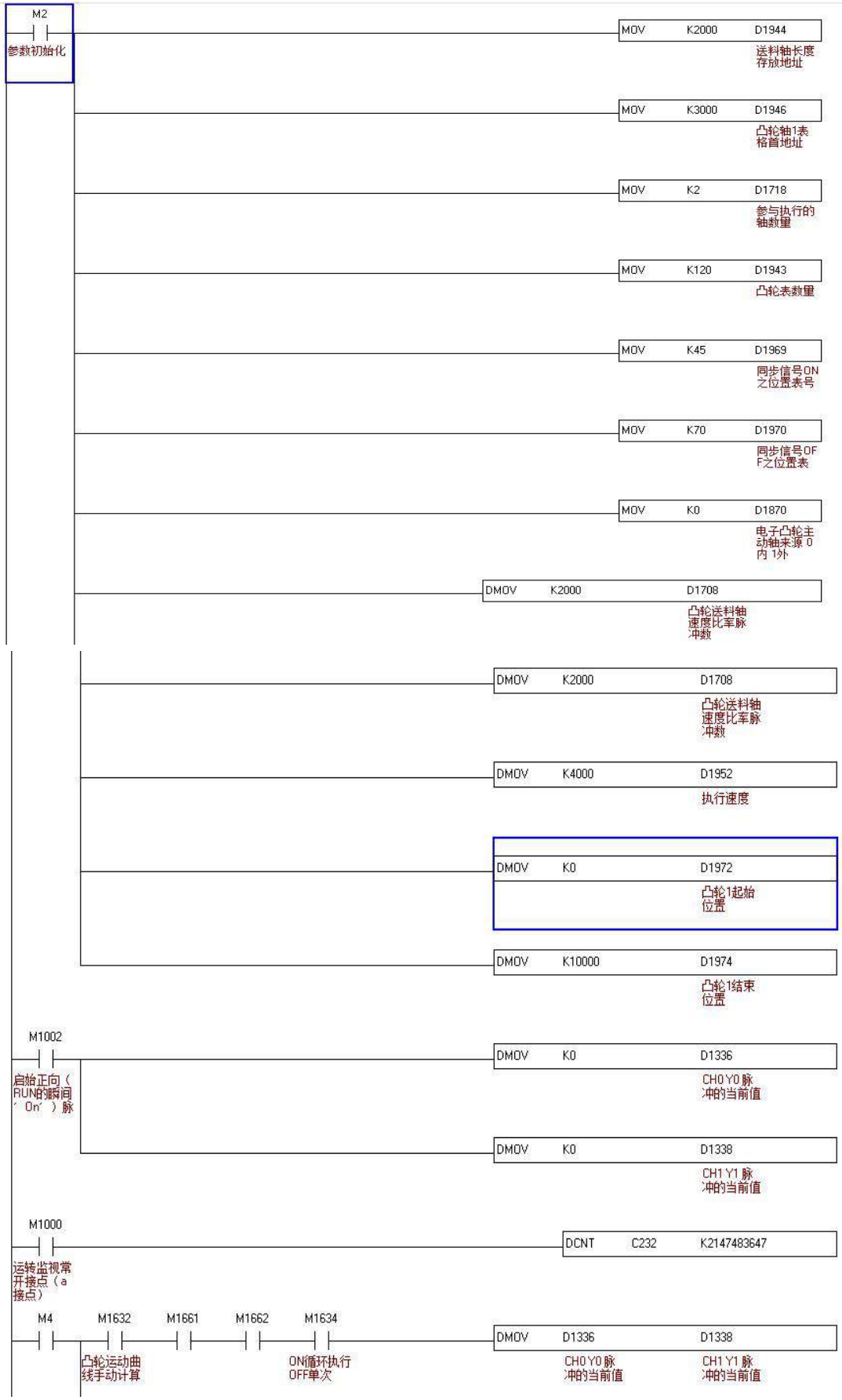
Next, we will use the internal shaft to make a fixed-length shear, with each section being 247.20 mm long.

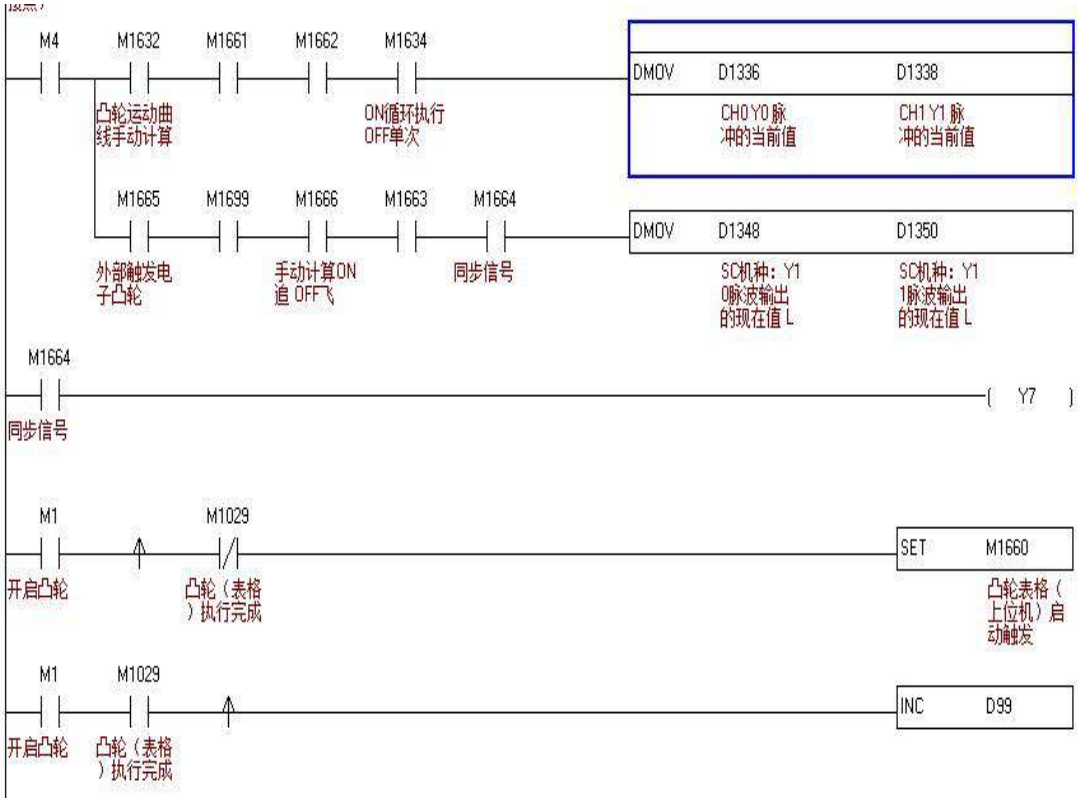
In this case, the number of pulses per revolution of the master and slave axes is 4000, and the actual travel of the master and slave axes with 4000 pulses is 103 mm.

Calculated according to formula 1: total number of pulses = 0 + 120 * 80, total number of pulses = 9600.

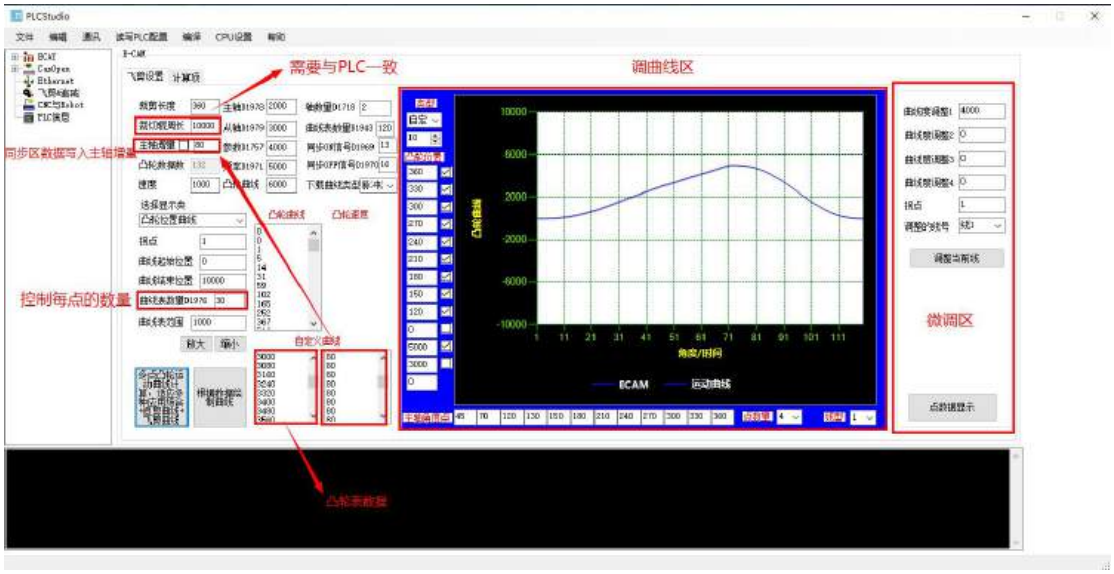
Calculated according to formula 2: material length = 9600* $^{103}/_{4000}$, material length = 247.20mm.

1. First, write and download the PLC program. The program must be consistent with this case.

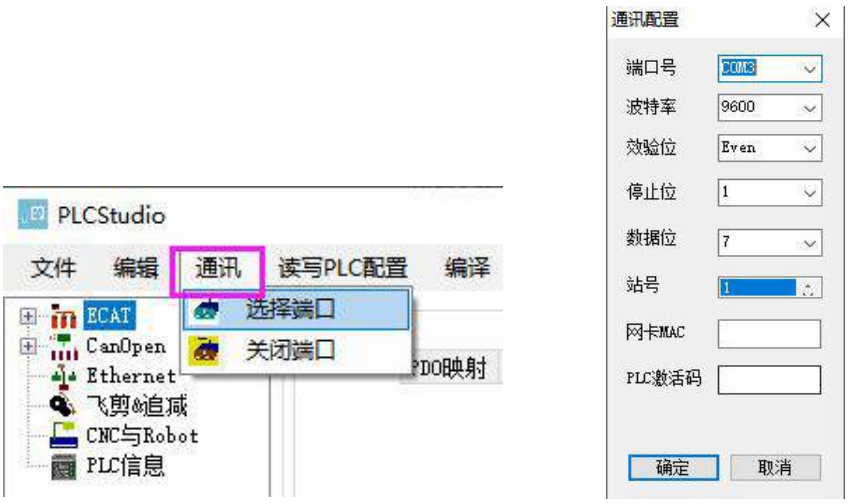

M2
参数初始化
MOV K2000 D1944
送料轴长度存放地址
MOV K3000 D1946
凸轮轴1表格首地址
MOV K2 D1718
参与执行的轴数量
MOV K120 D1943
凸轮表数量
MOV K45 D1969
同步信号ON之位置表号
MOV K70 D1970
同步信号OFF之位置表
MOV K0 D1870
电子凸轮主动轴来源 0内 1外
DMOV K2000 D1708
凸轮送料轴速度比率脉冲数
DMOV K2000 D1708
凸轮送料轴速度比率脉冲数
DMOV K4000 D1952
执行速度
DMOV K0 D1972
凸轮1起始位置
DMOV K10000 D1974
凸轮1结束位置
M1002
启始正向（RUN的瞬间On）脉
DMOV K0 D1336
CH0 Y0 脉冲的当前值
DMOV K0 D1338
CH1 Y1 脉冲的当前值
M1000
运转监视常开接点（a接点）
DCNT C232 K2147483647
M4
M1632
M1661
M1662
M1634
凸轮运动曲线手动计算
ON循环执行OFF单次
DMOV D1336 D1338
CH0 Y0 脉冲的当前值
CH1 Y1 脉冲的当前值



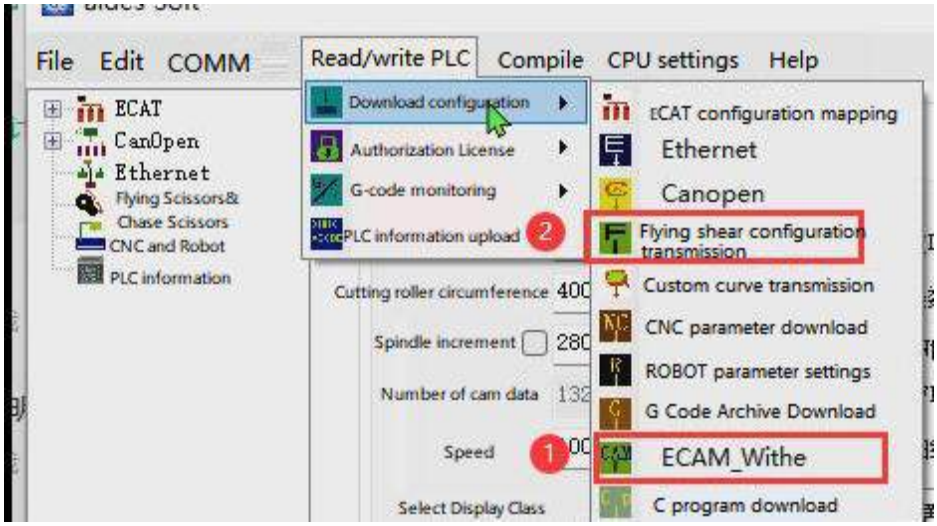
2. Configure the parameters according to the figure below. All parameters must be consistent with this figure.



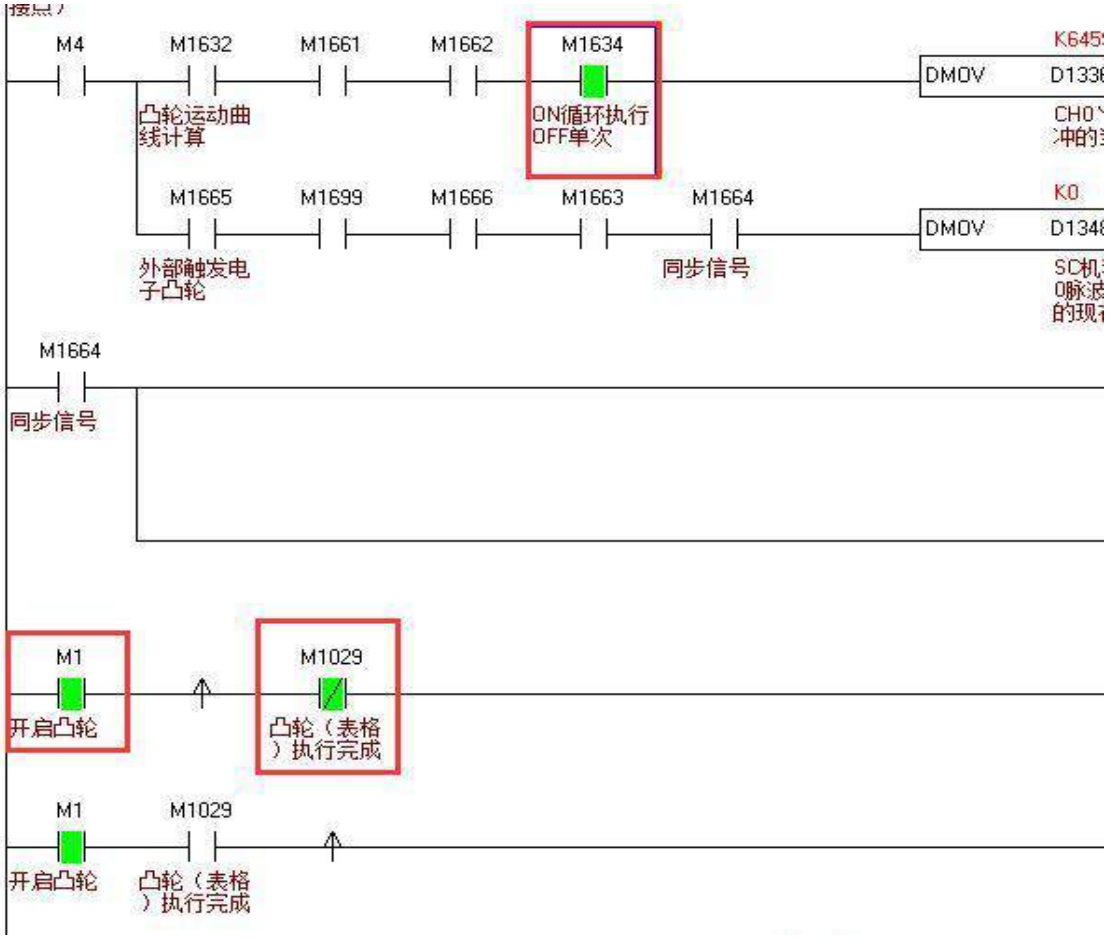
3. Click Communication, select the port, confirm the communication configuration and click OK.



4. Click Read and Write PLC Configuration, select Download Configuration, download ECAM_Withe first, then download the flying shear configuration transmission.



5. Start M2 (reset immediately after activation), M1634 (normally open), M1029 (normally closed), and M1 (normally open). No other operations are required (except speed regulation).



Notice:

1、The synchronization signal is automatically triggered and no manual triggering is required.

2、The start and end areas of the synchronization signal are adjustable and need to be filled in according to the table.

3、Please refer to this case if the material length is not modified.

十四、 Example of using the internal shearing axis to modify the material length

Next, we will use the internal axis to make a fixed-length shear (supporting one-click modification of material length), and the length of each section is 300.01mm.

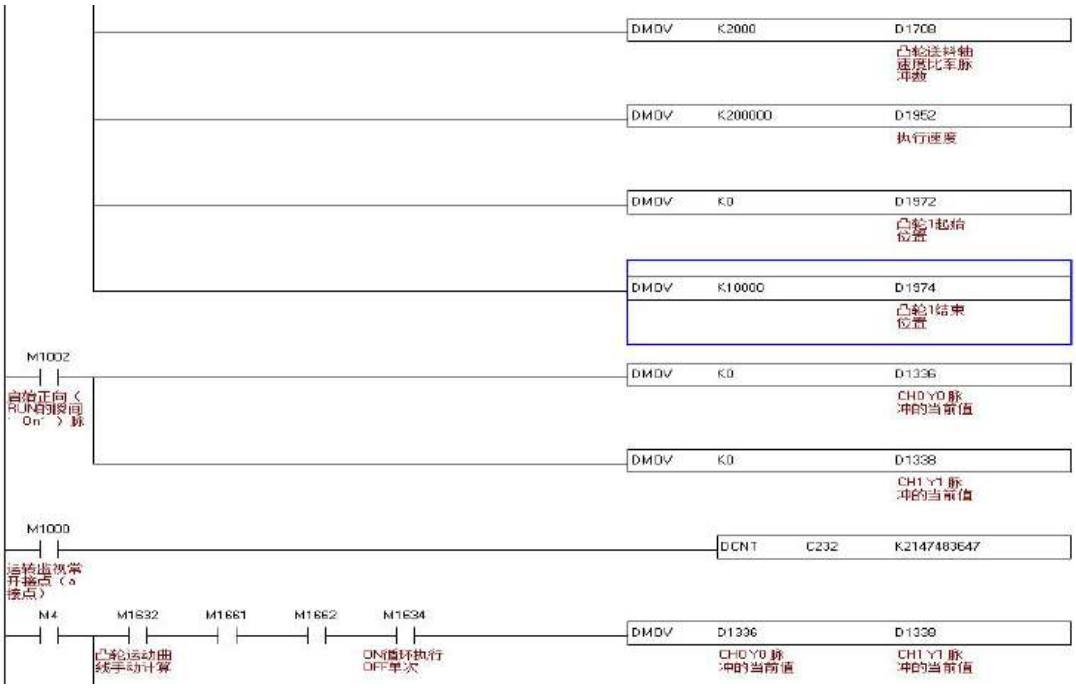
In this case, the number of pulses per revolution of the master and slave axes is 4000, and the actual travel of the master and slave axes with 4000 pulses is 103 mm.

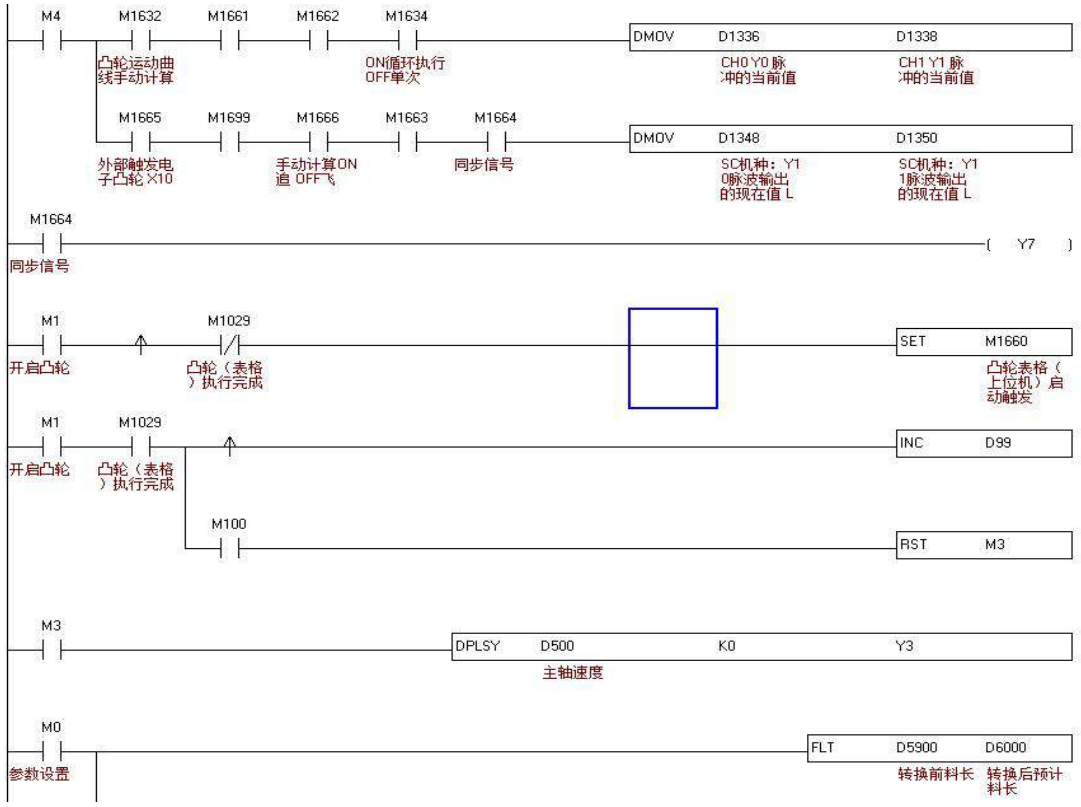
Calculated according to formula 1: total number of pulses = 2166 + 120 * 80, total number of pulses = 11766.

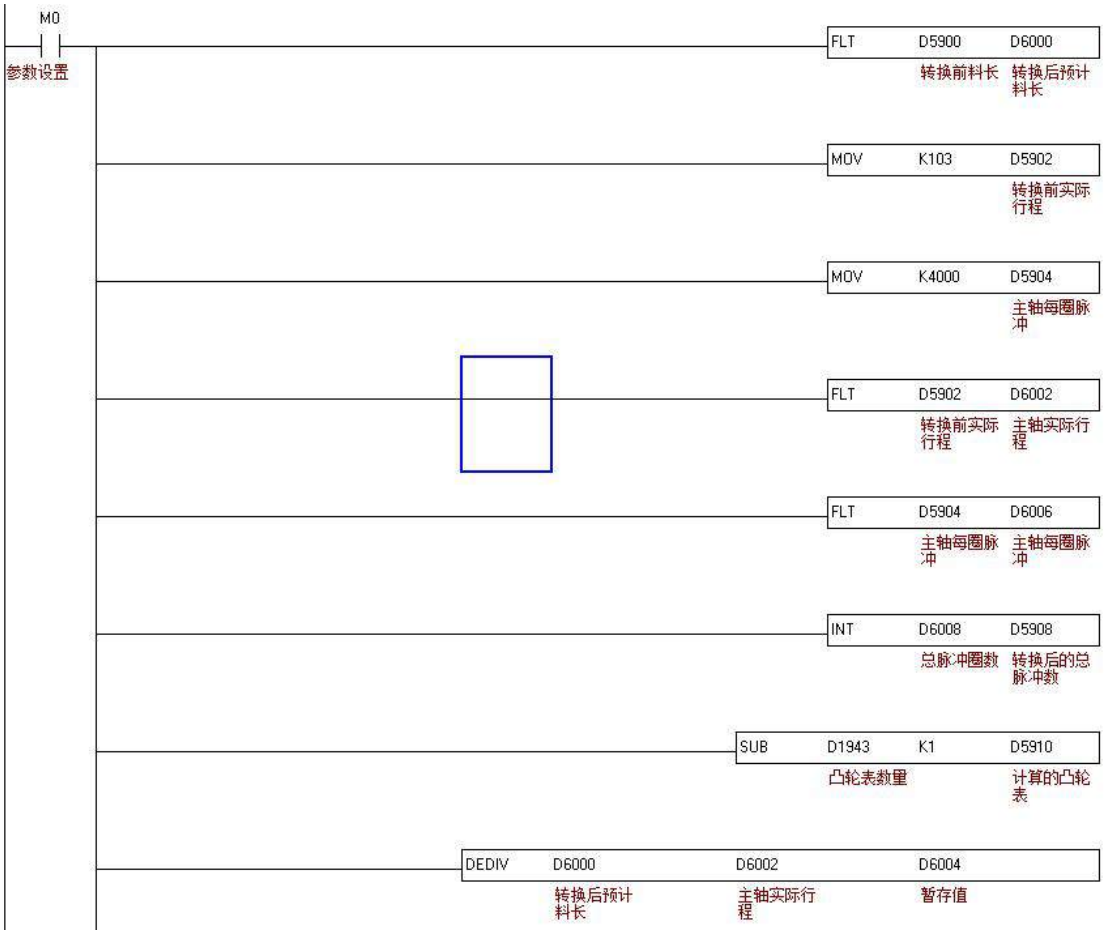
Calculated according to formula 2: material length = 11766* $^{103}/_{4000}$, material length = 300.01mm.

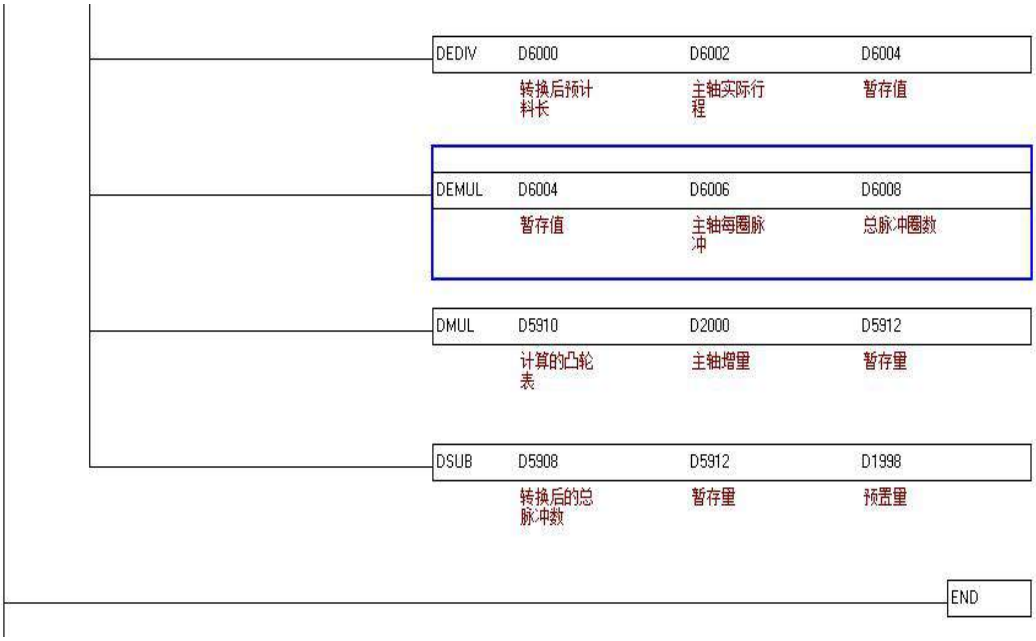
1. First, write and download the PLC program. The program must be consistent with this case.


M2
参数初始化
MOV K2000 D1944
送料轴长度存放地址
MOV K3000 D1946
凸轮轴1表格首地址
MOV K2 D1718
参与执行的轴数量
MOV K120 D1943
凸轮表数量
MOV K45 D1969
同步信号ON之位置表号
MOV K70 D1970
同步信号OFF之位置表
MOV K0 D1870
电子凸轮主动轴来源 0内 1外
DMOV K2000 D1708
凸轮送料轴速度比率脉冲数

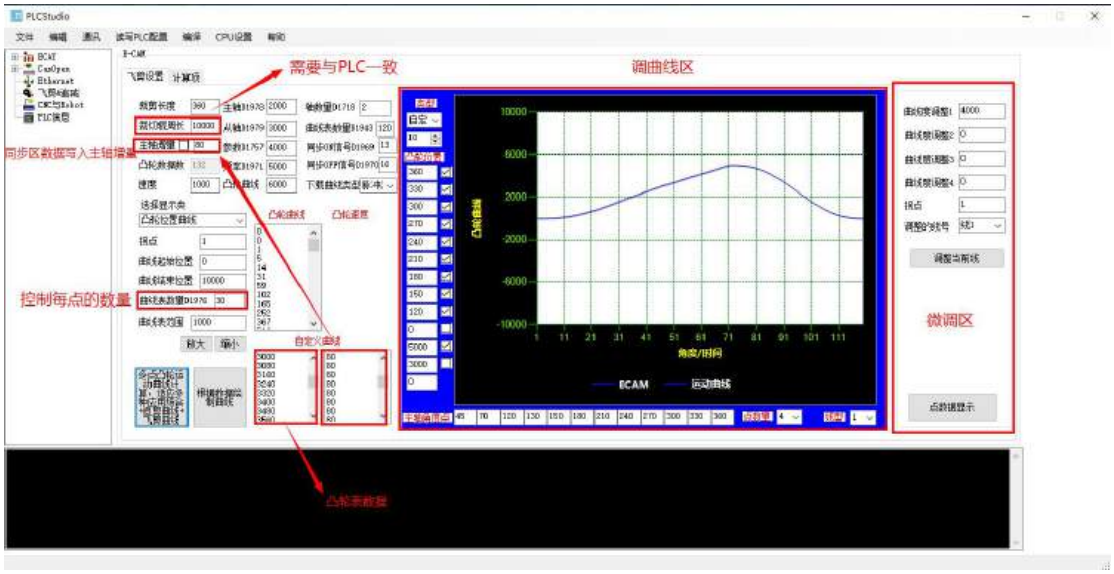

DMOV K2000 D1708
凸轮送料轴速度比率脉冲数
DMOV K200000 D1952
执行速度
DMOV K0 D1972
凸轮1起始位置
DMOV K10000 D1974
凸轮1结束位置
M1002
启始正向（RUN后瞬间On）脉
DMOV K0 D1336
CH0 Y0 脉冲的当前值
DMOV K0 D1338
CH1 Y1 脉冲的当前值
M1000
运转监视常开接点（a接点）
DCNT C232 K2147483647
M4
M1532
凸轮运动曲线手动计算
M1661
M1662
M1534
ON循环执行OFF单次
DMOV D1336 D1338
CH0 Y0 脉冲的当前值
CH1 Y1 脉冲的当前值


M4
M1632
M1661
M1662
M1634
凸轮运动曲线手动计算
ON循环执行 OFF单次
DMOV D1336 D1338
CH0 Y0 脉冲的当前值
CH1 Y1 脉冲的当前值
M1665
M1699
M1666
M1663
M1664
外部触发电子凸轮 X10
手动计算ON 追 OFF飞
同步信号
DMOV D1348 D1350
SC机种：Y1 0脉波输出的现在值 L
SC机种：Y1 1脉波输出的现在值 L
M1664
同步信号
(Y7)
M1
M1029
开启凸轮
凸轮（表格）执行完成
SET M1660
凸轮表格（上位机）启动触发
M1
M1029
开启凸轮
凸轮（表格）执行完成
INC D99
M100
RST M3
M3
DPLSY D500 K0 Y3
主轴速度
M0
参数设置
FLT D5900 D6000
转换前料长
转换后预计料长


M0
参数设置
FLT D5900 D6000
转换前料长
转换后预计料长
MOV K103 D5902
转换前实际行程
MOV K4000 D5904
主轴每圈脉冲
FLT D5902 D6002
转换前实际行程
主轴实际行程
FLT D5904 D6006
主轴每圈脉冲
主轴每圈脉冲
INT D6008 D5908
总脉冲圈数
转换后的总脉冲数
SUB D1943 K1 D5910
凸轮表数里
计算的凸轮表
DEDIV D6000 D6002 D6004
转换后预计料长
主轴实际行程
暂存值



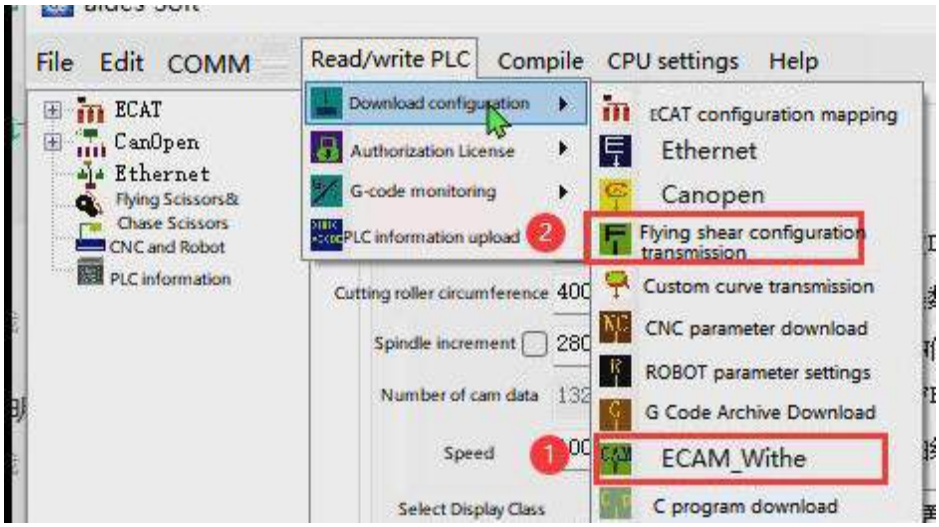
2. Configure the parameters according to the figure below. All parameters must be consistent with this figure.



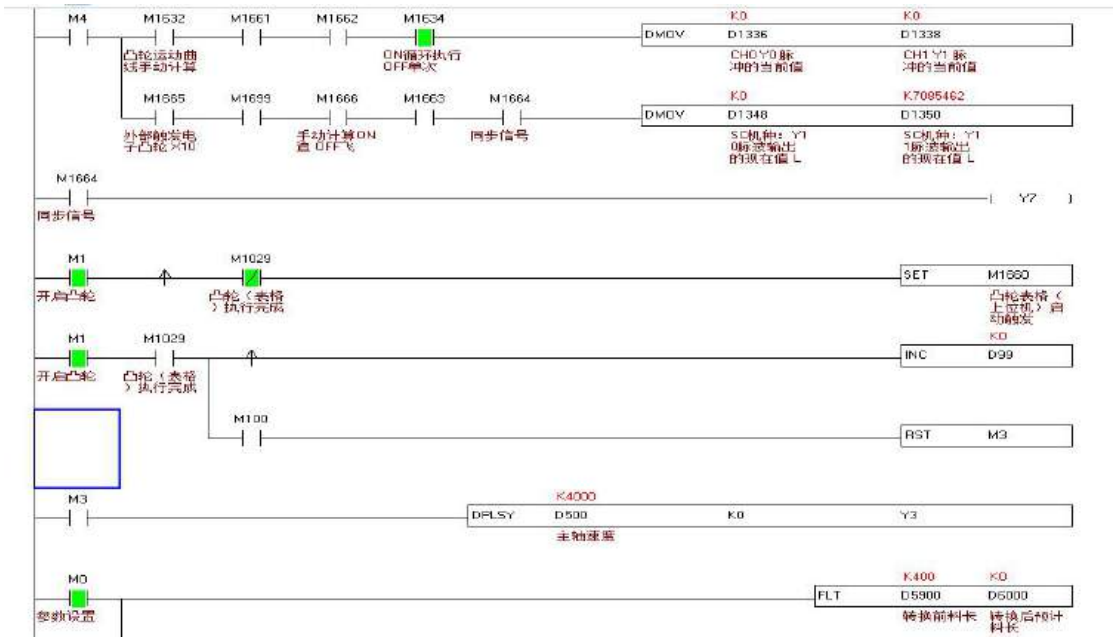
3. Click Communication, select the port, confirm the communication configuration and click OK.

4. Click Read and Write PLC Configuration, select Download Configuration, download

ECAM_Withe first, then download the flying shear configuration transmission.



5. Start M0 (normally open), input the required material length (unit: MM) in D5900, automatically calculate the preset quantity, and write the preset quantity into D1998, M1634 (normally open), M1029 (normally closed), M1 (normally open), and no other operation is required (except speed regulation).



Notice:

1、If you need to modify the material length, please refer to this case. It does not distinguish between internal axis, external axis, chasing shear and flying shear, and the usage is the same!

2、The material length can only be modified based on the shortest material length debugged by the host computer software (assuming it is 120mm). The material length can only be increased here and cannot be lower than the shortest material length of the host computer, otherwise the curve motion will be abnormal. For example: at this time, the material length is changed to 1200mm and needs to be shortened again. At this time, the shortest can only be modified to 120mm, that is, 120mm-1200mm can be adjusted at will.

3、It is recommended that when making a curve, the minimum size should be taken into

consideration. If the curve is made smaller than the minimum size, the material length can be modified at will.

十五、 Use case of external shear axis

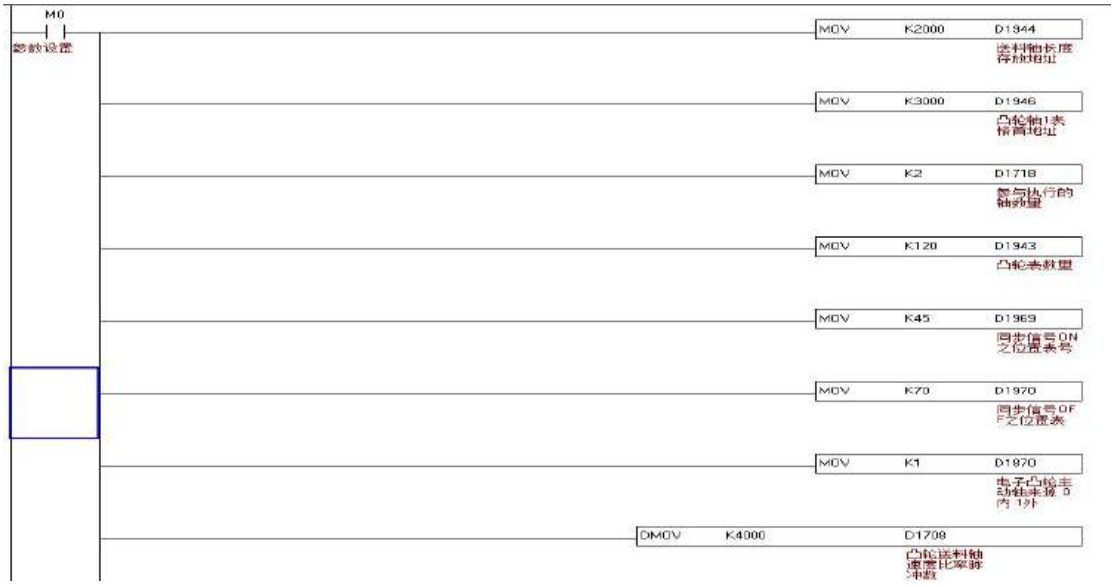
Next, we will use the external shaft to make a fixed-length shear, with each section being 247.20 mm long.

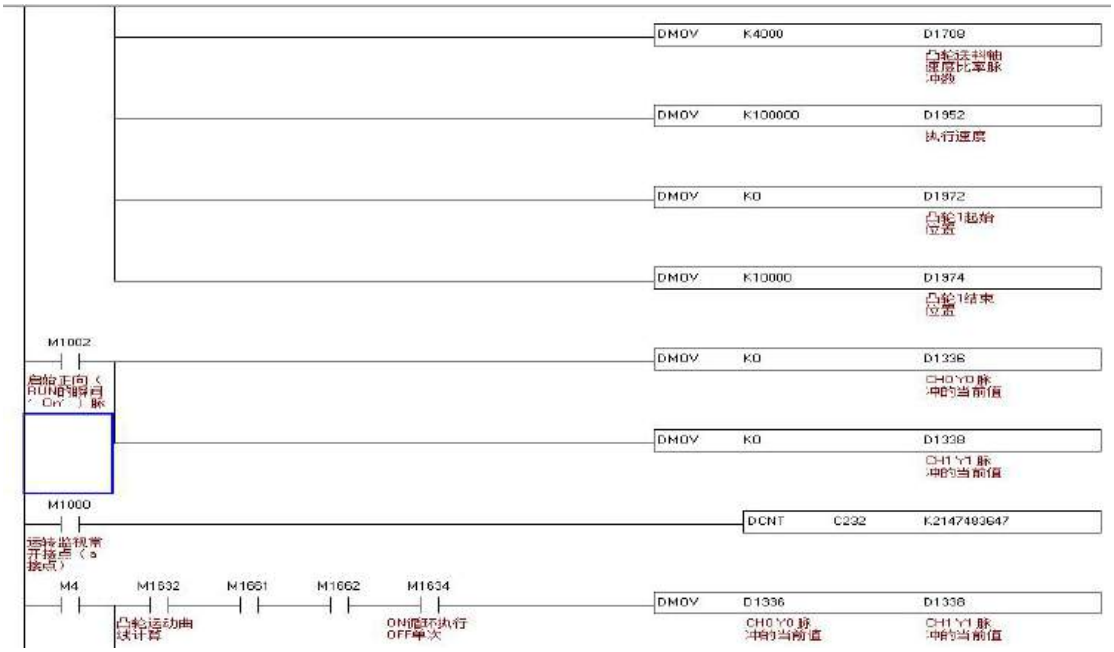
In this case, the number of pulses per revolution of the spindle is 4000, and the actual travel of the spindle with 4000 pulses is 103mm.

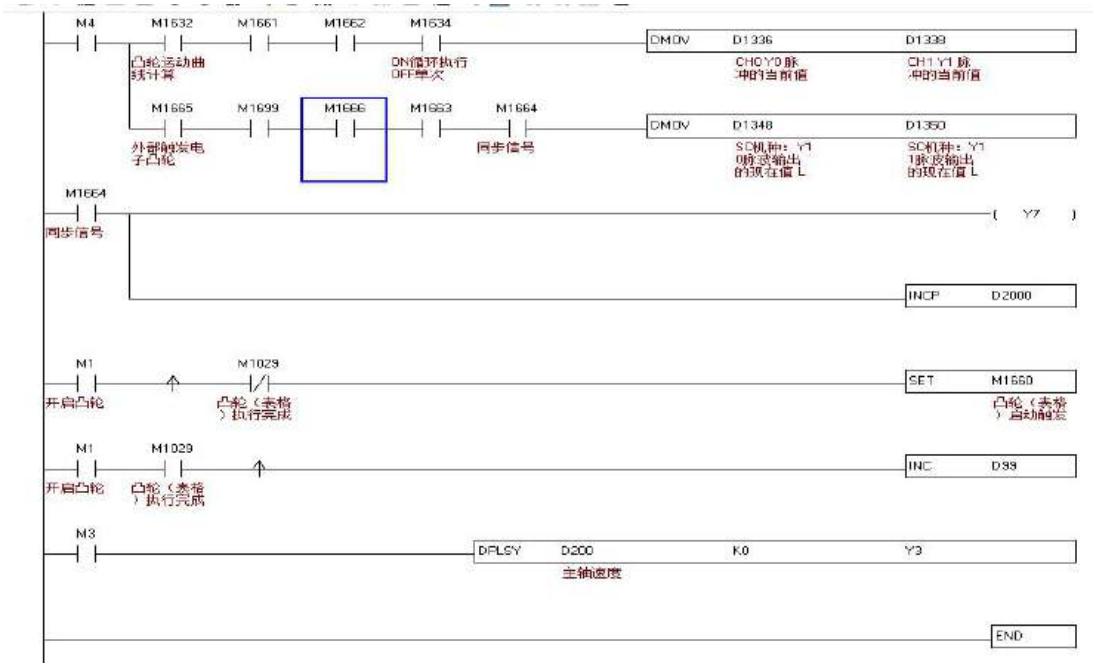
Calculated according to formula 1: total number of pulses = 120*80, total number of pulses = 9600.

Calculated according to formula 2: material length = 9600* $^{103}/_{4000}$, material length = 247.20mm.

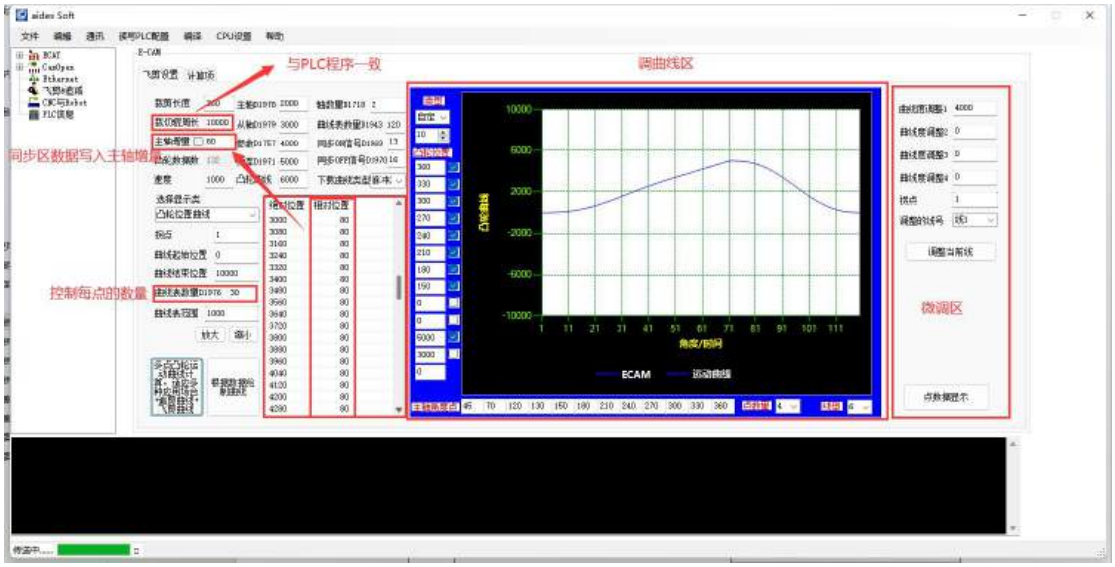
1. Write and download the PLC program. The program must be consistent with this case.







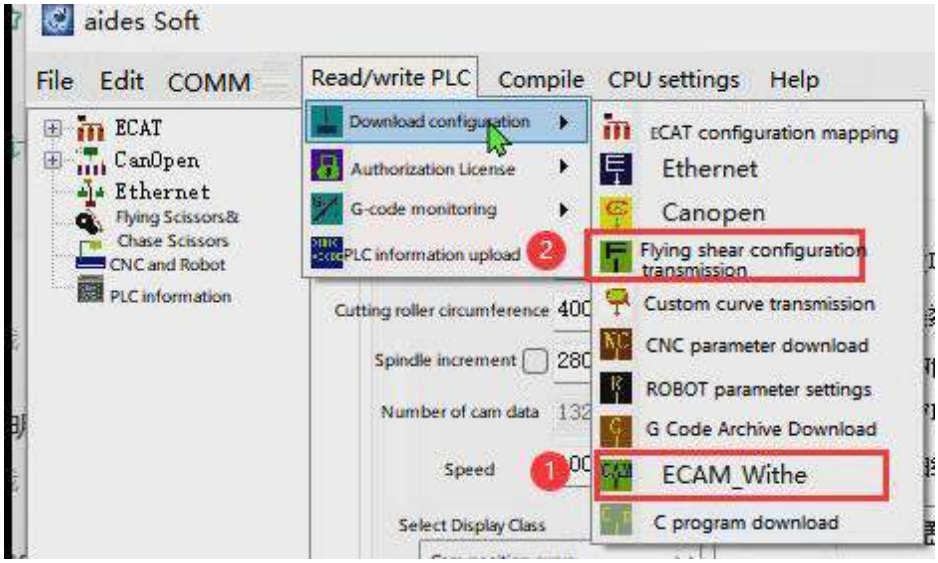
2. Configure the parameters according to the figure below. All parameters must be consistent with this figure.



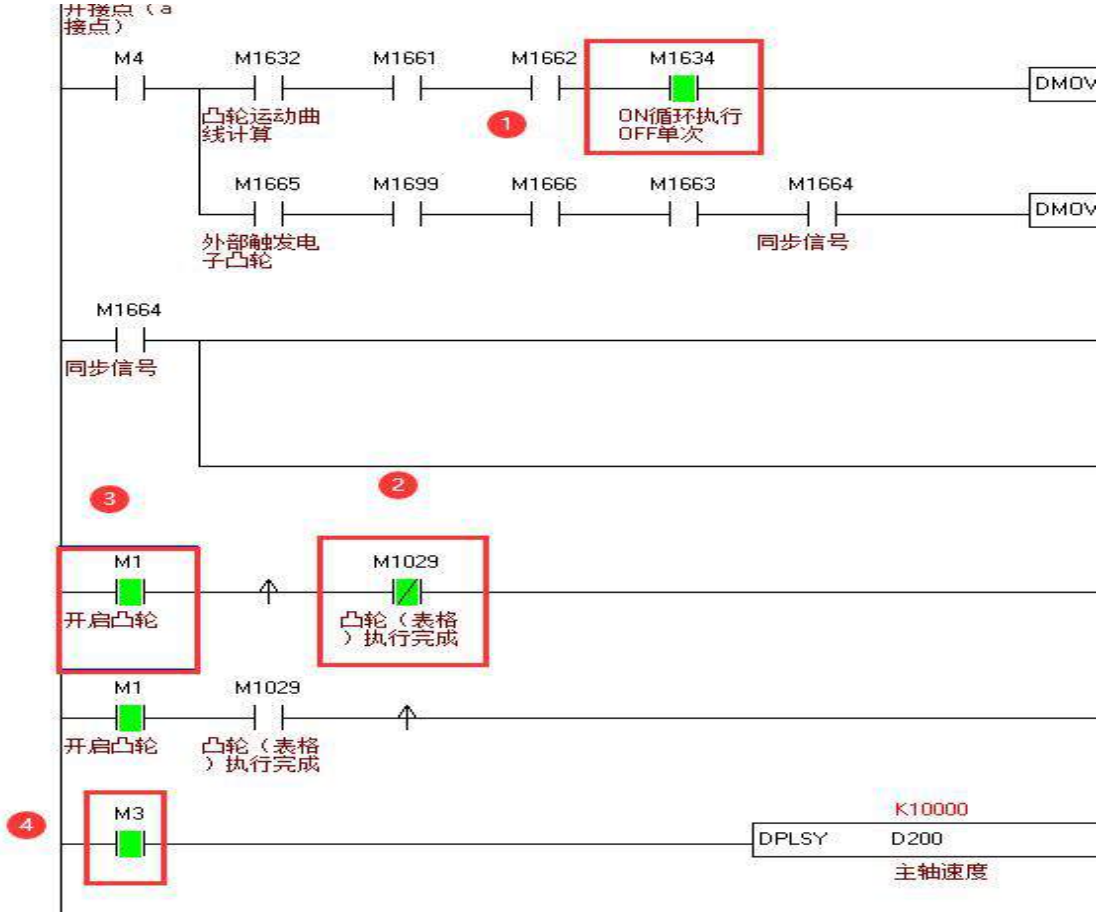
3、Click Communication, select the port, confirm the communication configuration and click OK.

4. Click Read and Write PLC Configuration, select Download Configuration, download

ECAM_Withe first, then download the flying shear configuration transmission.



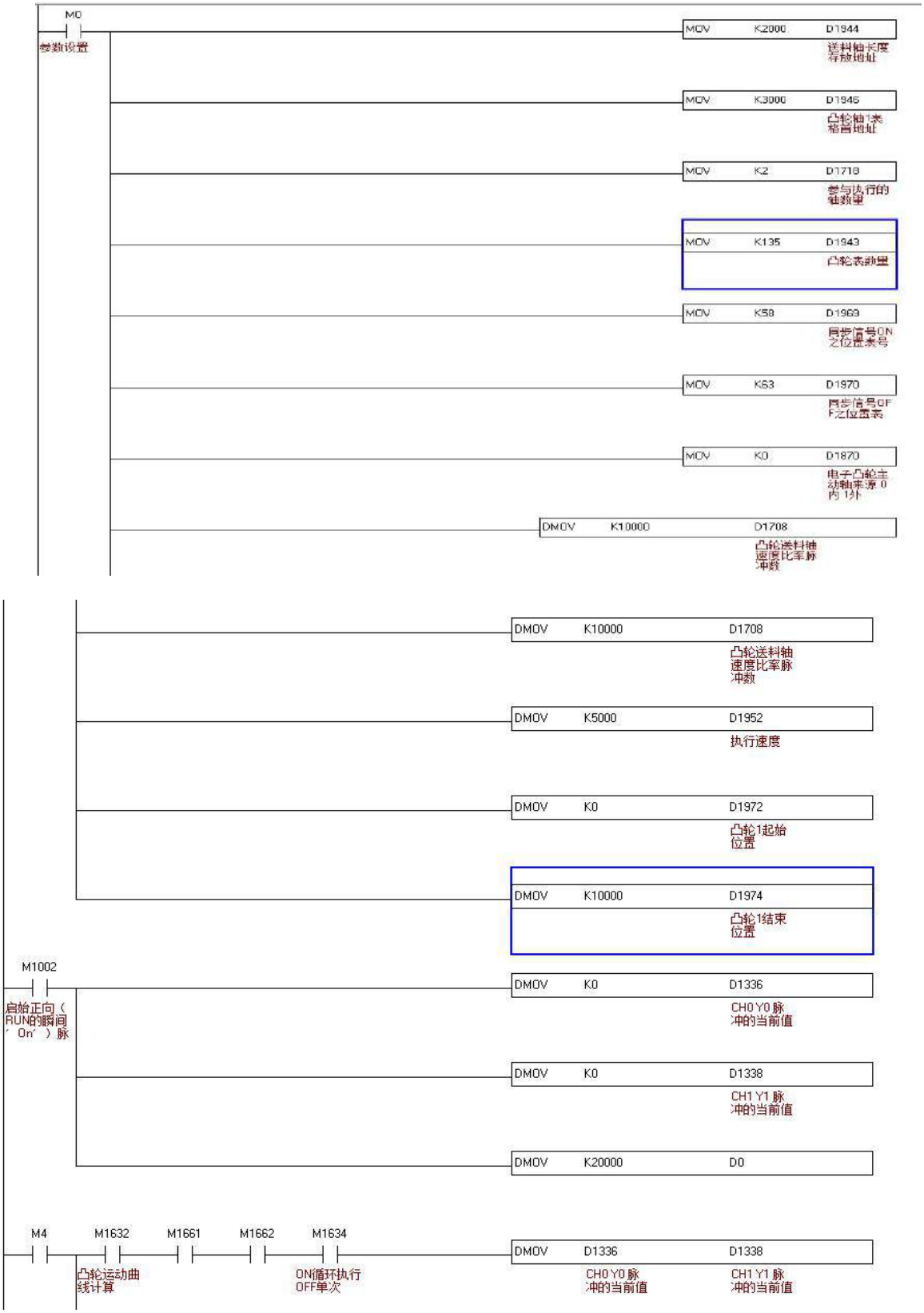
5、Start M0 (reset immediately after activation), D200 (need to set value), M1634 (normally open), M1029 (normally closed), M1 (normally open), M3 (last opened). No other operations are required (except speed regulation).

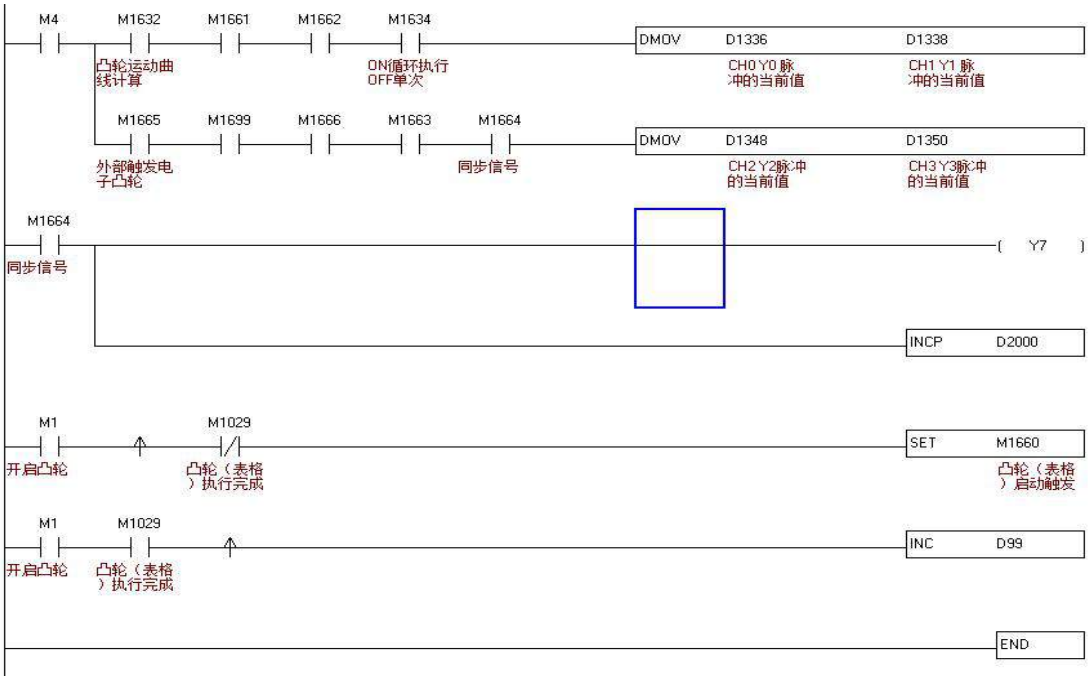


Note: 1. C232 needs to be counted up, otherwise the shearing may be abnormal. 2. If it is counted down, swap the AB harness or switch the spindle pulse direction. 3. If necessary, you can enable 4 times the frequency, let D1022 = K4. 4. If you want to check the synchronous speed, you need to adjust the electronic gear ratio. Please refer to Section 10 for details. I will not repeat it here.

十六、 Flying shear internal shaft use case

1. Write and download the PLC program. The program must be consistent with this case.



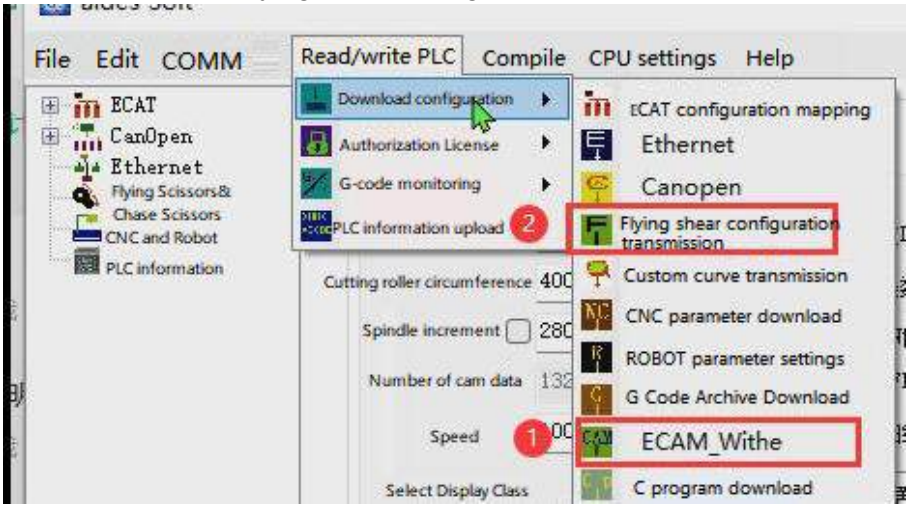


2. Configure the parameters according to the figure below. All parameters must be consistent with this figure.

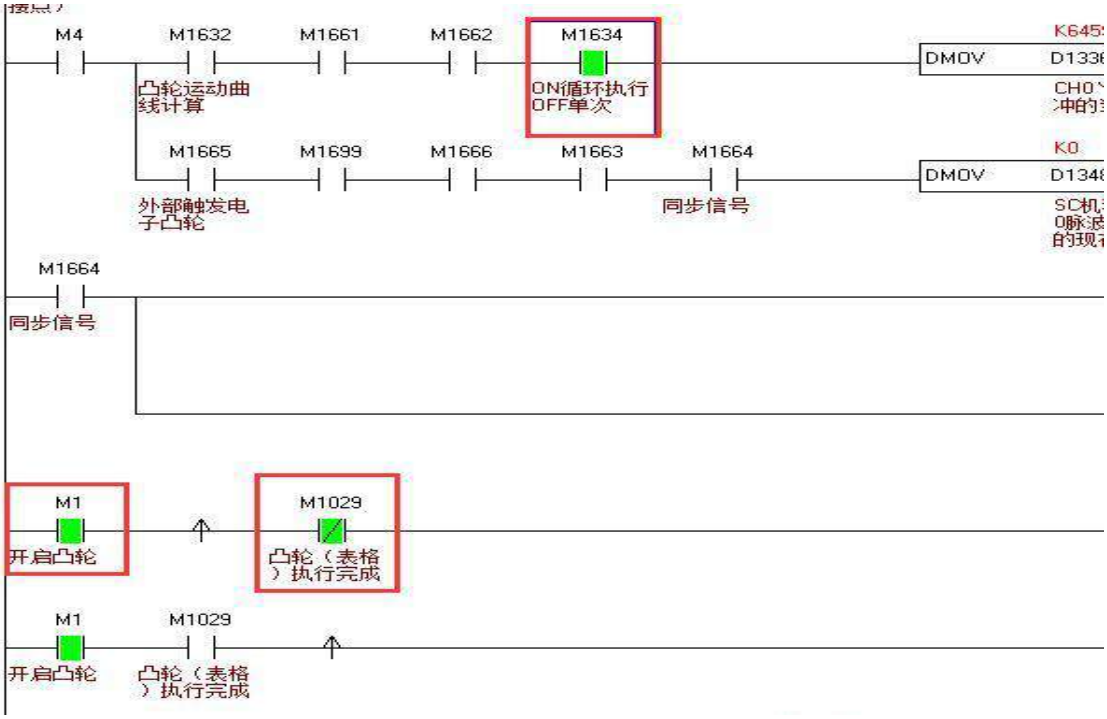
3. Click Communication, select the port, confirm the communication configuration and click OK.

4. Click Read and Write PLC Configuration, select Download Configuration, first download

ECAM_Withe, then download the flying shear configuration transmission.

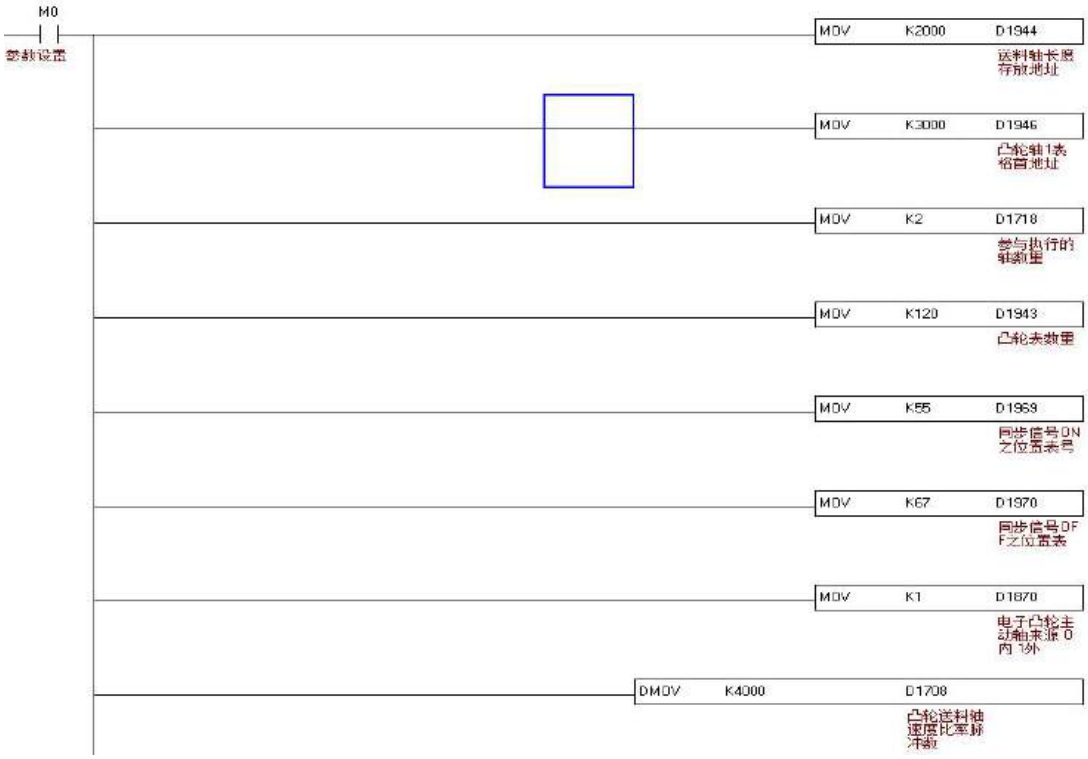


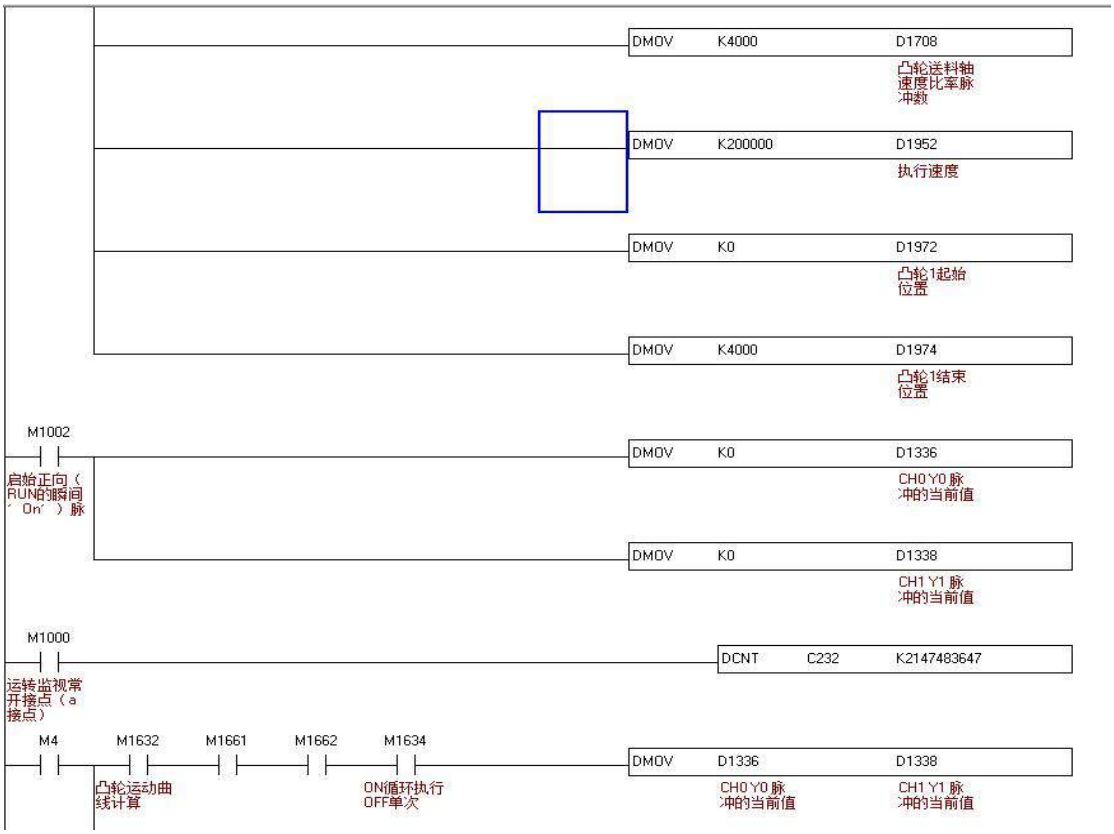
5. Start M0 (reset immediately after activation), M1634 (normally open), M1029 (normally closed), and M1 (normally open). No other operations are required (except speed regulation).

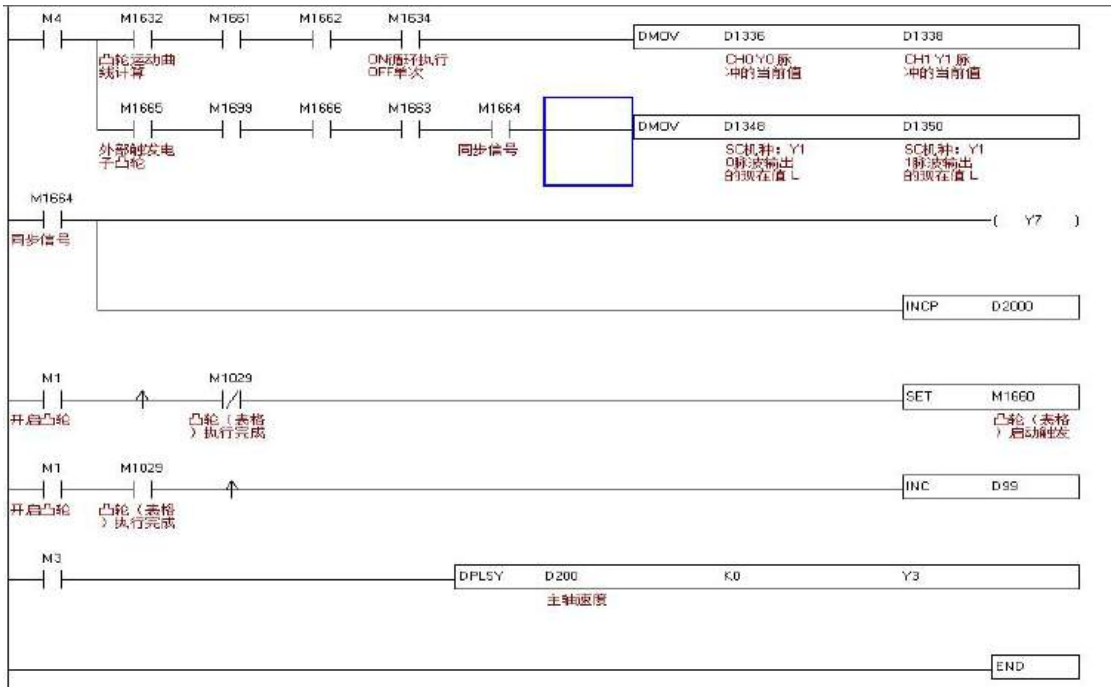


十七、 Flying shear external shaft use case

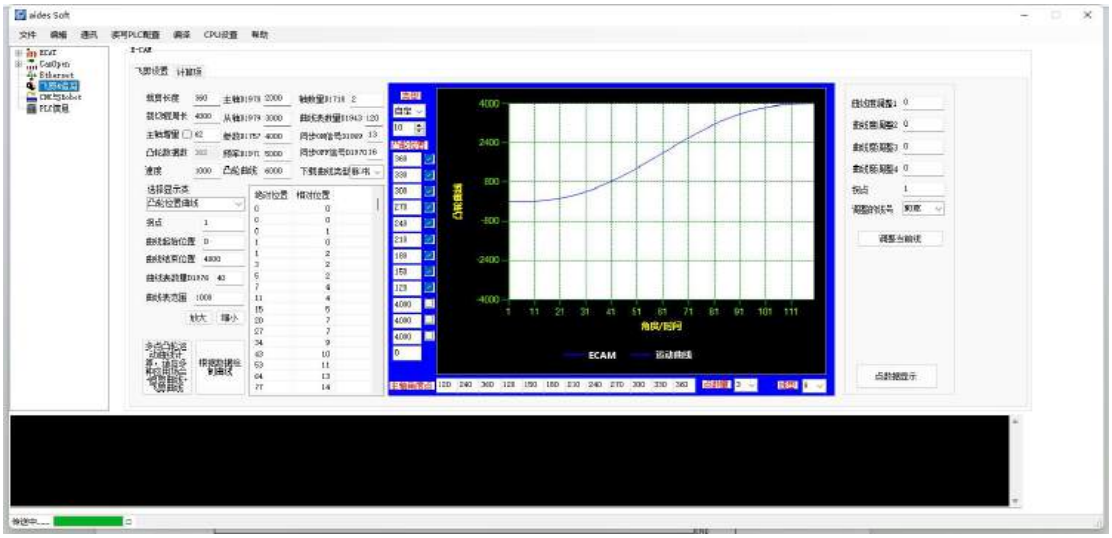
1. Write and download the PLC program. The program must be consistent with this case.


M0
参数设置
MOV K2000 D1944
送料轴长度存放地址
MOV K3000 D1946
凸轮轴1表格首地址
MOV K2 D1718
参与执行的轴数量
MOV K120 D1943
凸轮表数量
MOV K55 D1969
同步信号ON之位置表号
MOV K67 D1970
同步信号OFF之位置表
MOV K1 D1870
电子凸轮主动轴来源 0内 1外
DMOV K4000 D1708
凸轮送料轴速度比率脉冲数


DMOV K4000 D1708
凸轮送料轴速度比率脉冲数
DMOV K200000 D1952
执行速度
DMOV K0 D1972
凸轮1起始位置
DMOV K4000 D1974
凸轮1结束位置
M1002
启始正向（RUN的瞬间 On ）脉
DMOV K0 D1336
CH0 Y0 脉冲的当前值
DMOV K0 D1338
CH1 Y1 脉冲的当前值
M1000
运转监视常开接点（a接点）
DCNT C232 K2147483647
M4
M1632
M1661
M1662
M1634
凸轮运动曲线计算
ON循环执行 OFF单次
DMOV D1336 D1338
CH0 Y0 脉冲的当前值
CH1 Y1 脉冲的当前值



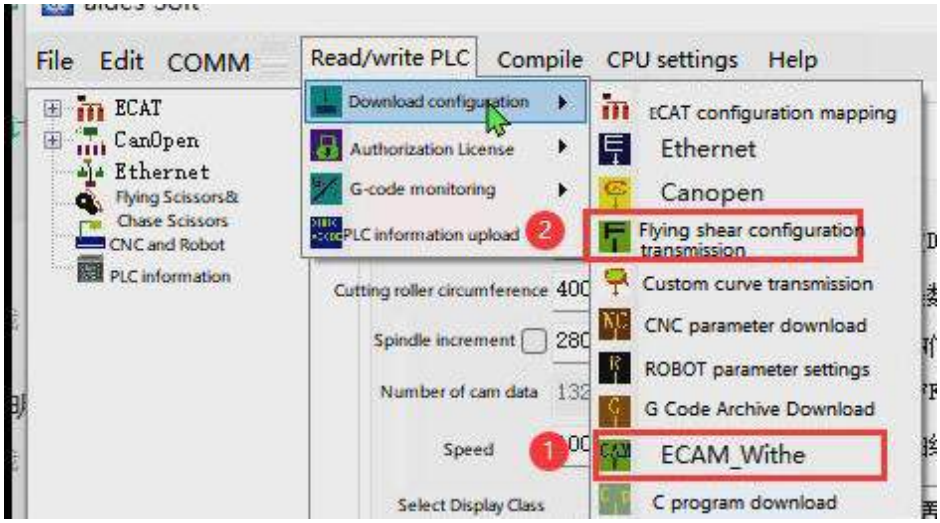
2. Configure the parameters according to the figure below. All parameters must be consistent with this figure.



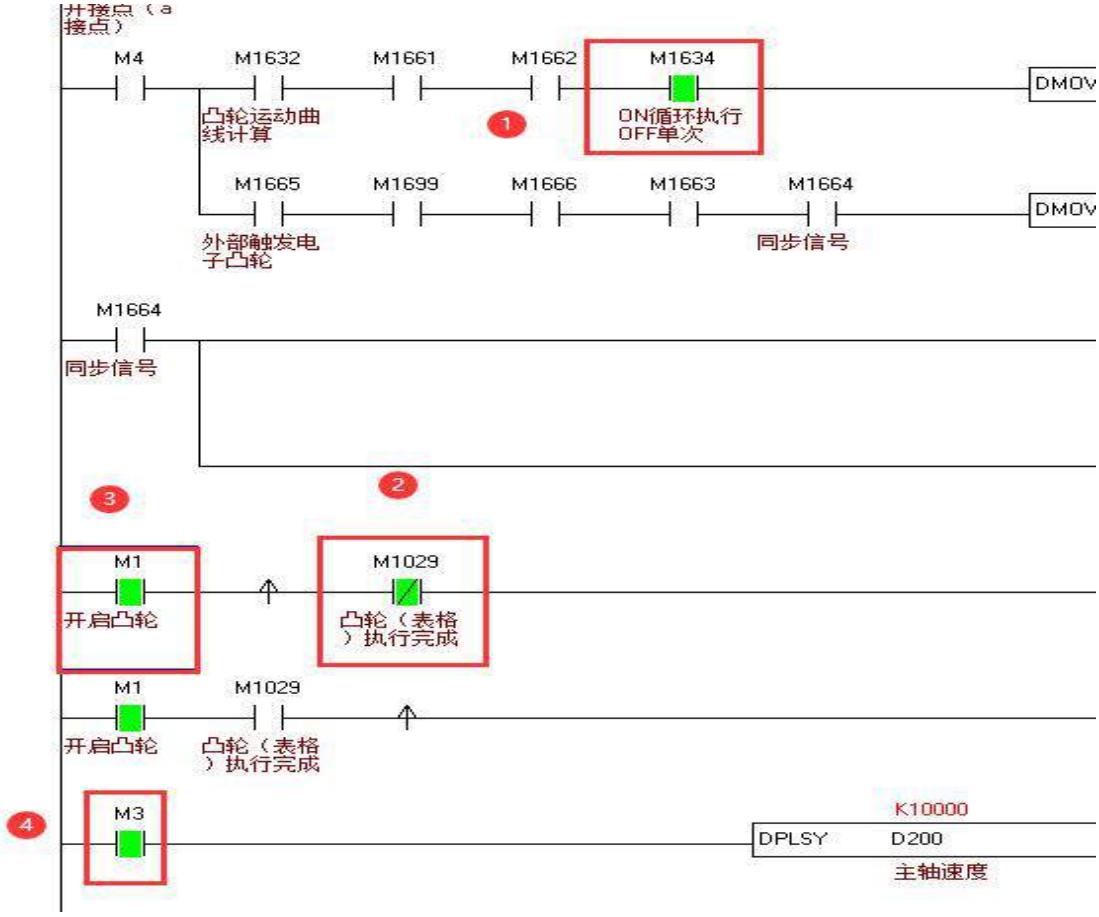
3. Click Communication, select the port, confirm the communication configuration and click OK.

4. Click Read and Write PLC Configuration, select Download Configuration, first download

ECAM_Withe, then download the flying shear configuration transmission.



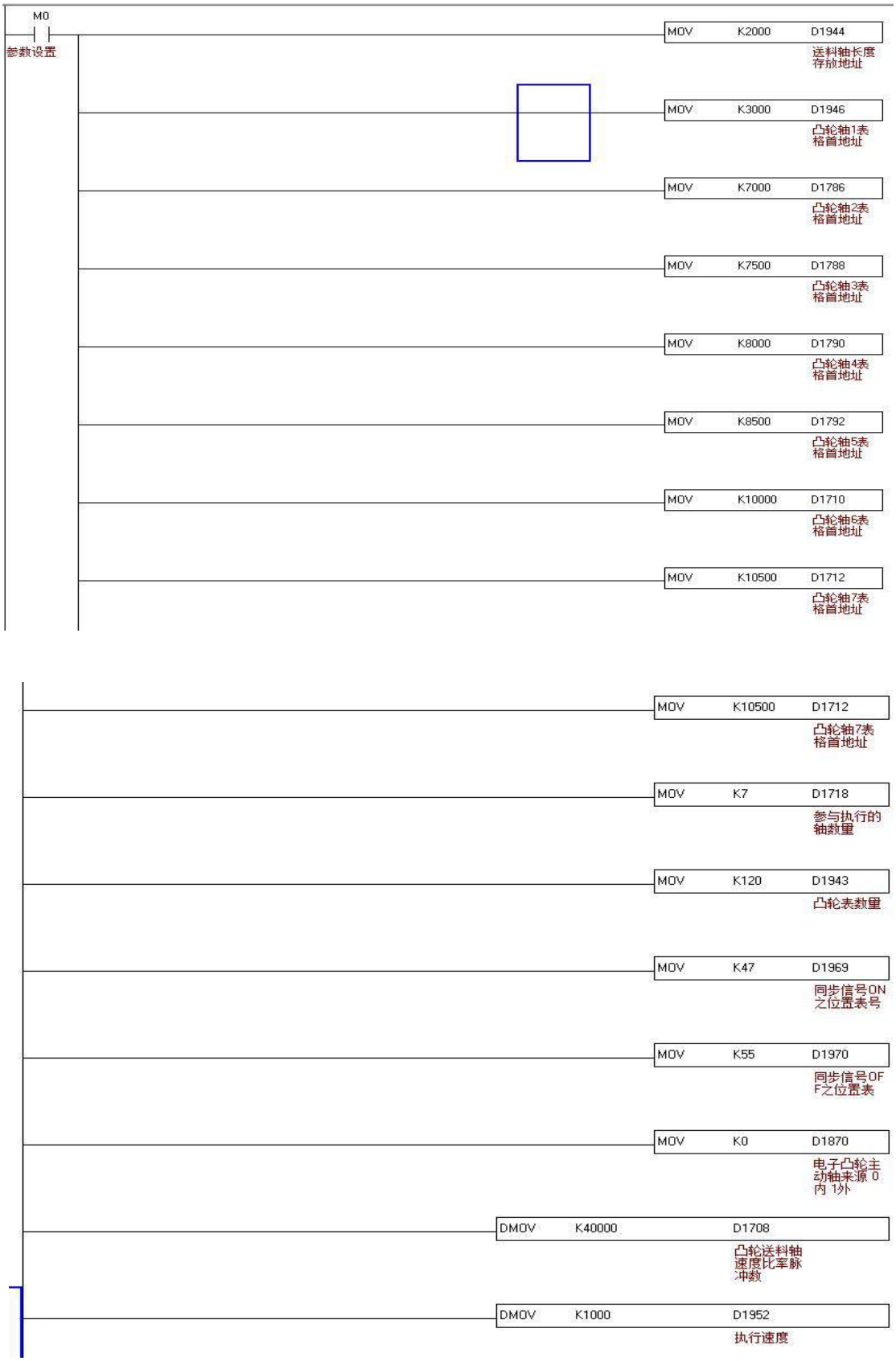
5. Start M0 (reset immediately after activation), D200 (need to set value), M1634 (normally open), M1029 (normally closed), M1 (normally open), M3 (open last). No other operations are required (except speed regulation).



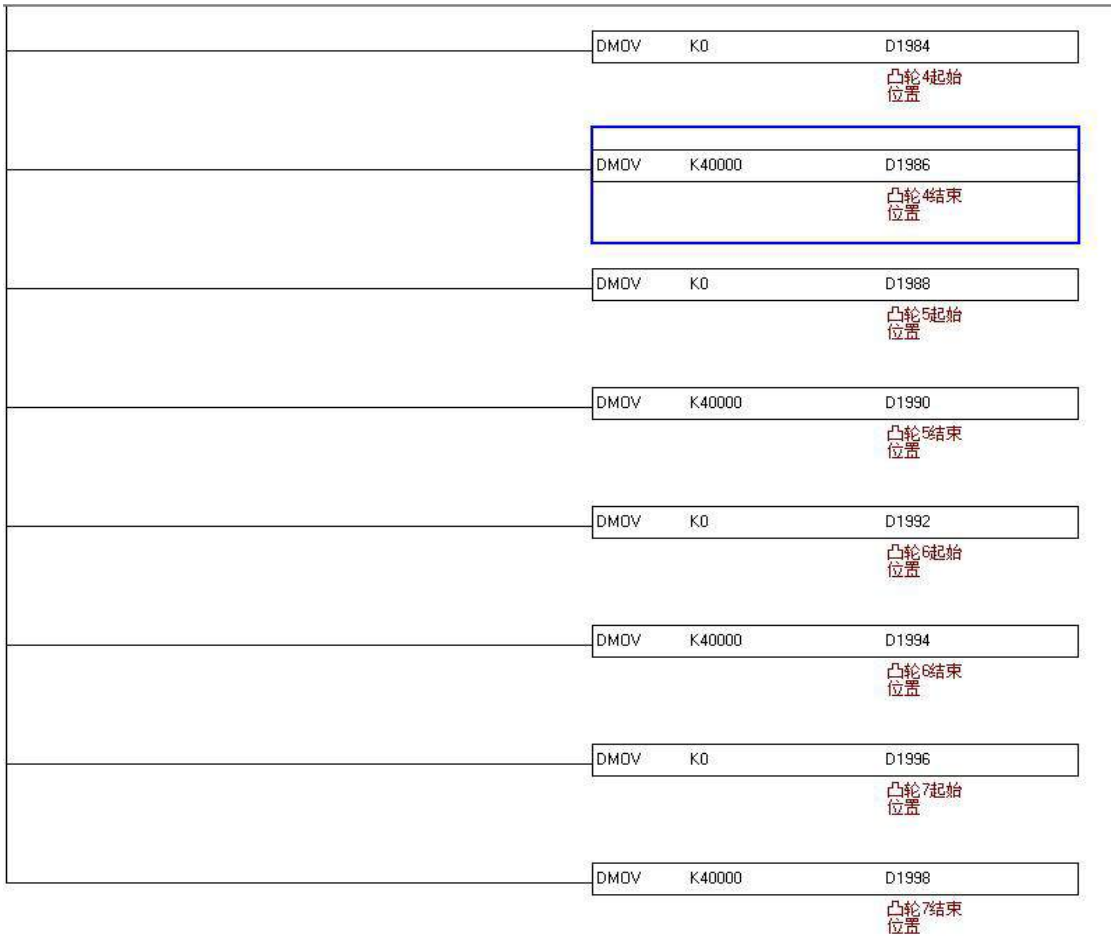
Note: 1. C232 needs to be counted up, otherwise the flying shear may be abnormal. 2. If it is counted down, swap the AB harness or switch the spindle pulse direction. 3. If necessary, you can enable 4 times the frequency, let D1022 = K4. 4. If you want to check the synchronous speed, you need to adjust the electronic gear ratio. Please refer to Section 10 for details. I will not repeat it here.

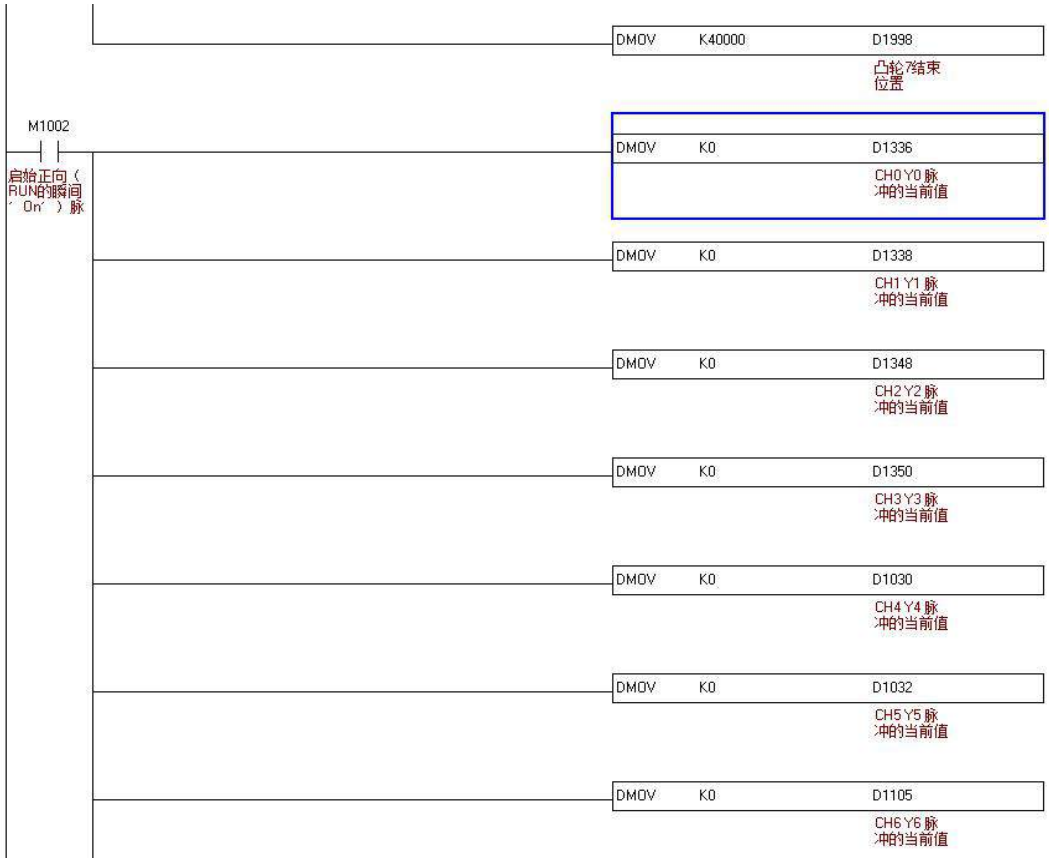
十八、 Case of multiple slave axes in the internal axis of the shear

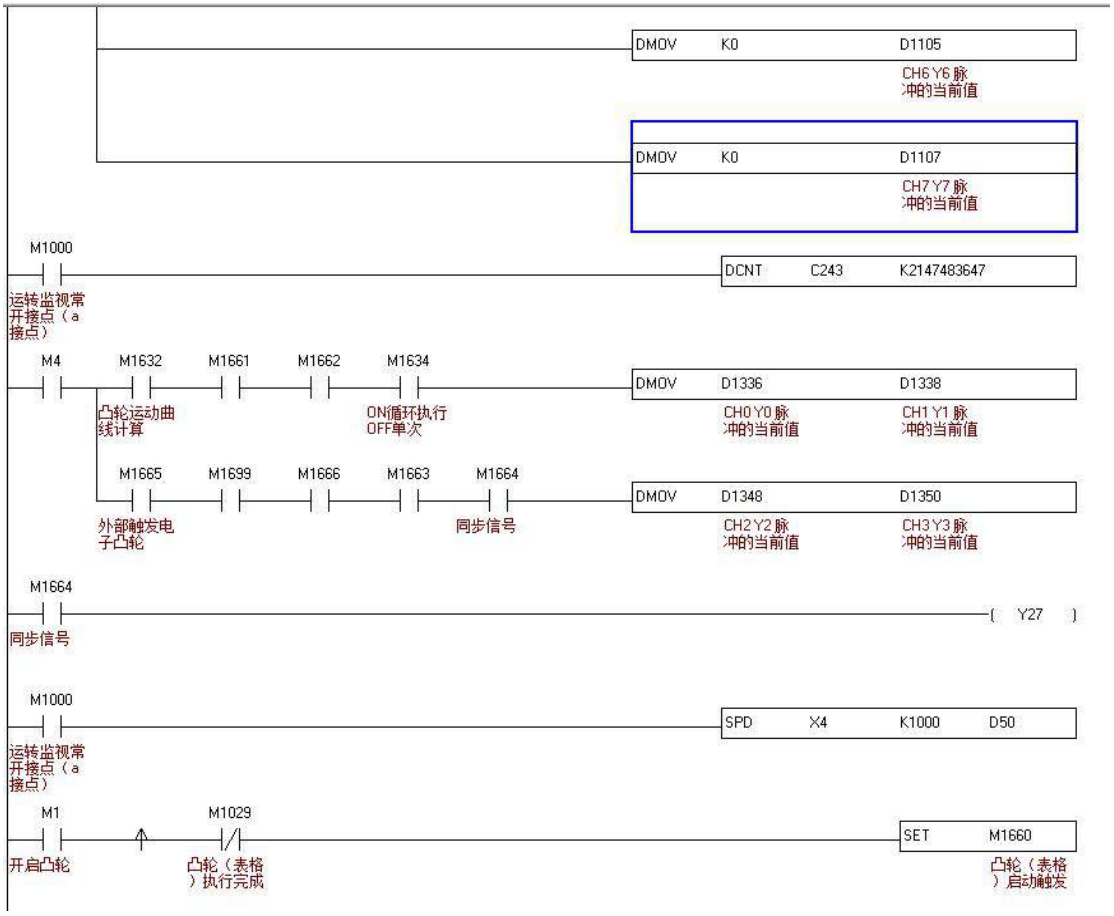
1、Write and download the PLC program. The program must be consistent with this case.

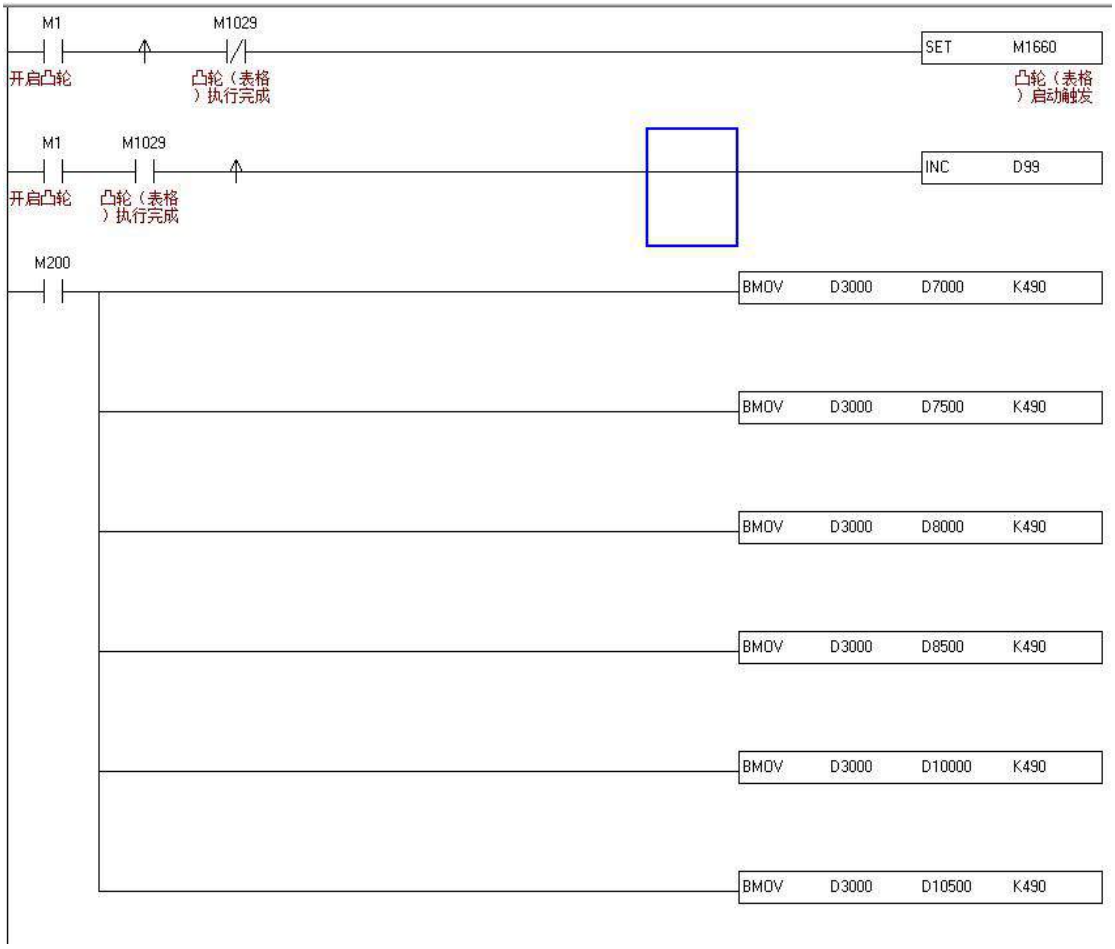



DMOV K10000 D1952
执行速度
DMOV K0 D1972
凸轮1起始位置
DMOV K40000 D1974
凸轮1结束位置
DMOV K0 D1976
凸轮2起始位置
DMOV K40000 D1978
凸轮2结束位置
DMOV K0 D1980
凸轮3起始位置
DMOV K40000 D1982
凸轮3结束位置
DMOV K0 D1984
凸轮4起始位置

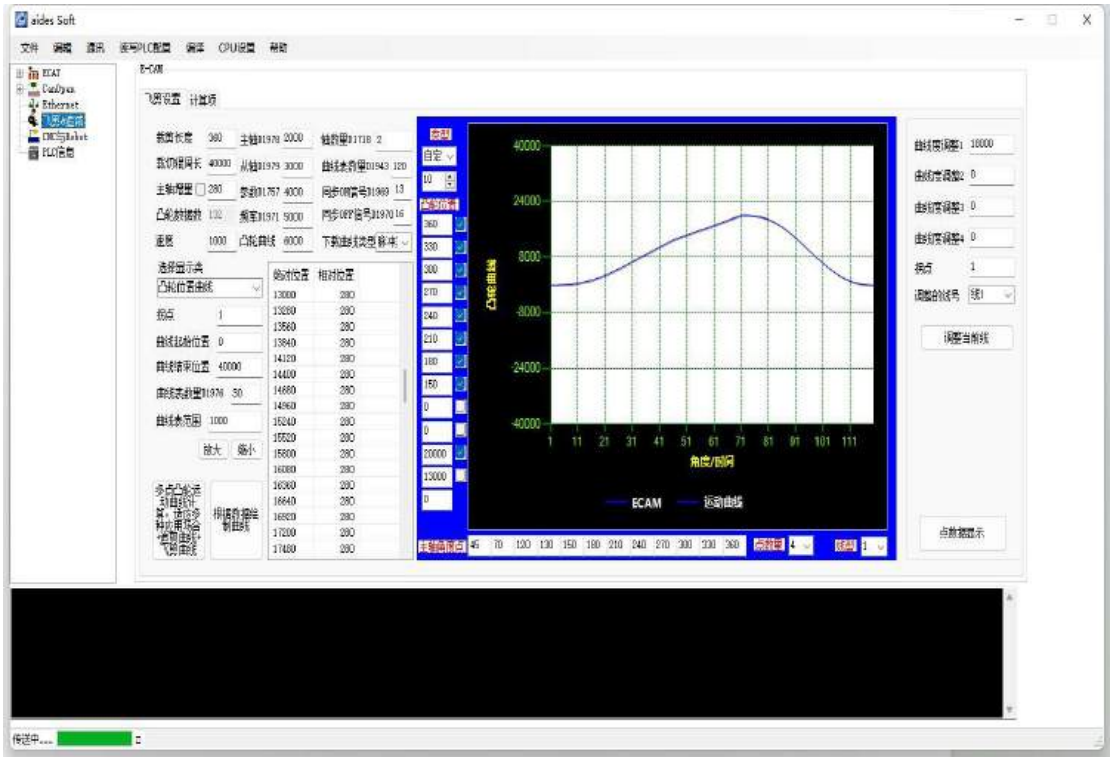

DMOV K0 D1984
凸轮4起始位置
DMOV K40000 D1986
凸轮4结束位置
DMOV K0 D1988
凸轮5起始位置
DMOV K40000 D1990
凸轮5结束位置
DMOV K0 D1992
凸轮6起始位置
DMOV K40000 D1994
凸轮6结束位置
DMOV K0 D1996
凸轮7起始位置
DMOV K40000 D1998
凸轮7结束位置


DMOV K40000 D1998
凸轮?结束位置
M1002
启始正向（RUN的瞬间On）脉
DMOV K0 D1336
CH0 Y0 脉冲的当前值
DMOV K0 D1338
CH1 Y1 脉冲的当前值
DMOV K0 D1348
CH2 Y2 脉冲的当前值
DMOV K0 D1350
CH3 Y3 脉冲的当前值
DMOV K0 D1030
CH4 Y4 脉冲的当前值
DMOV K0 D1032
CH5 Y5 脉冲的当前值
DMOV K0 D1105
CH6 Y6 脉冲的当前值


DMOV K0 D1105
CH6 Y6 脉冲的当前值
DMOV K0 D1107
CH7 Y7 脉冲的当前值
M1000
运转监视常开接点（a接点）
DCNT C243 K2147483647
M4
M1632
M1661
M1662
M1634
凸轮运动曲线计算
ON循环执行OFF单次
DMOV D1336 D1338
CH0 Y0 脉冲的当前值
CH1 Y1 脉冲的当前值
M1665
M1699
M1666
M1663
M1664
外部触发电子凸轮
同步信号
DMOV D1348 D1350
CH2 Y2 脉冲的当前值
CH3 Y3 脉冲的当前值
M1664
同步信号
Y27
M1000
运转监视常开接点（a接点）
SPD X4 K1000 D50
M1
M1029
开启凸轮
凸轮（表格）执行完成
SET M1660
凸轮（表格）启动触发

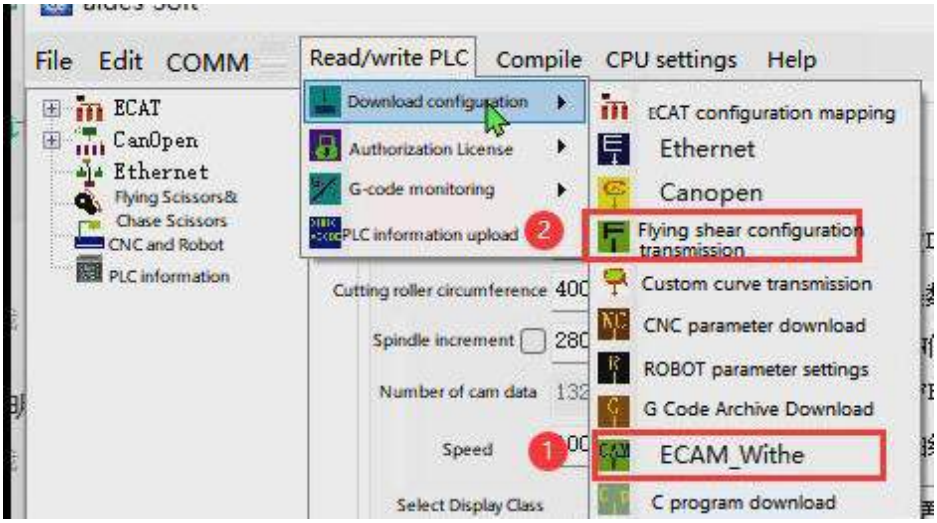


2. Configure the parameters according to the figure below. All parameters must be consistent with this figure.

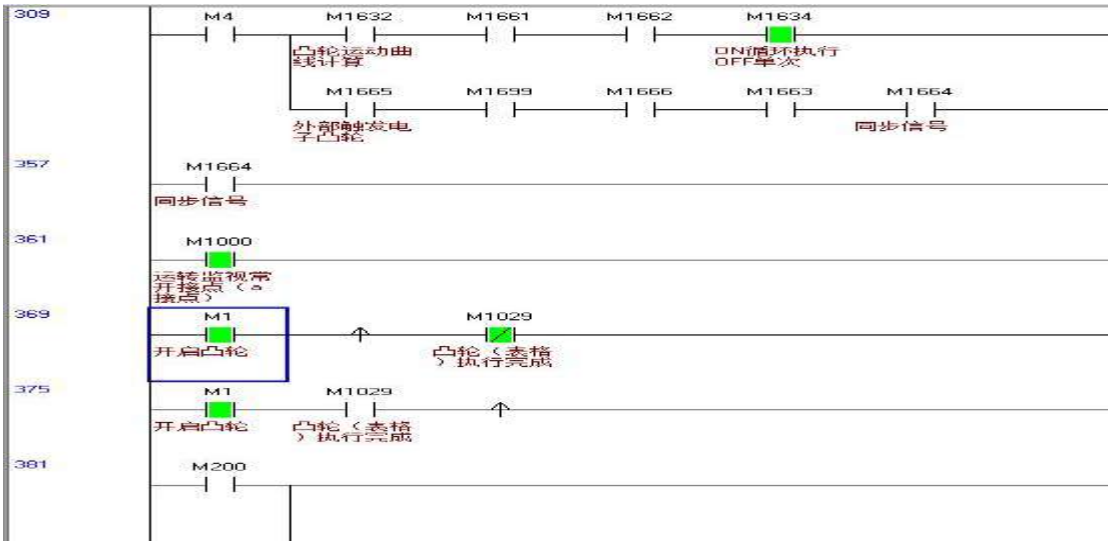


3. Click Communication, select the port, confirm the communication configuration and click OK.

4. Click Read and Write PLC Configuration, select Download Configuration, download ECAM_Withe first, then download the flying shear configuration transmission.



5. Start M0 (reset immediately after activation), M200 (reset immediately after activation), M1634 (normally open), M1029 (normally closed), M1 (normally open), and no other operations are required (except speed regulation).



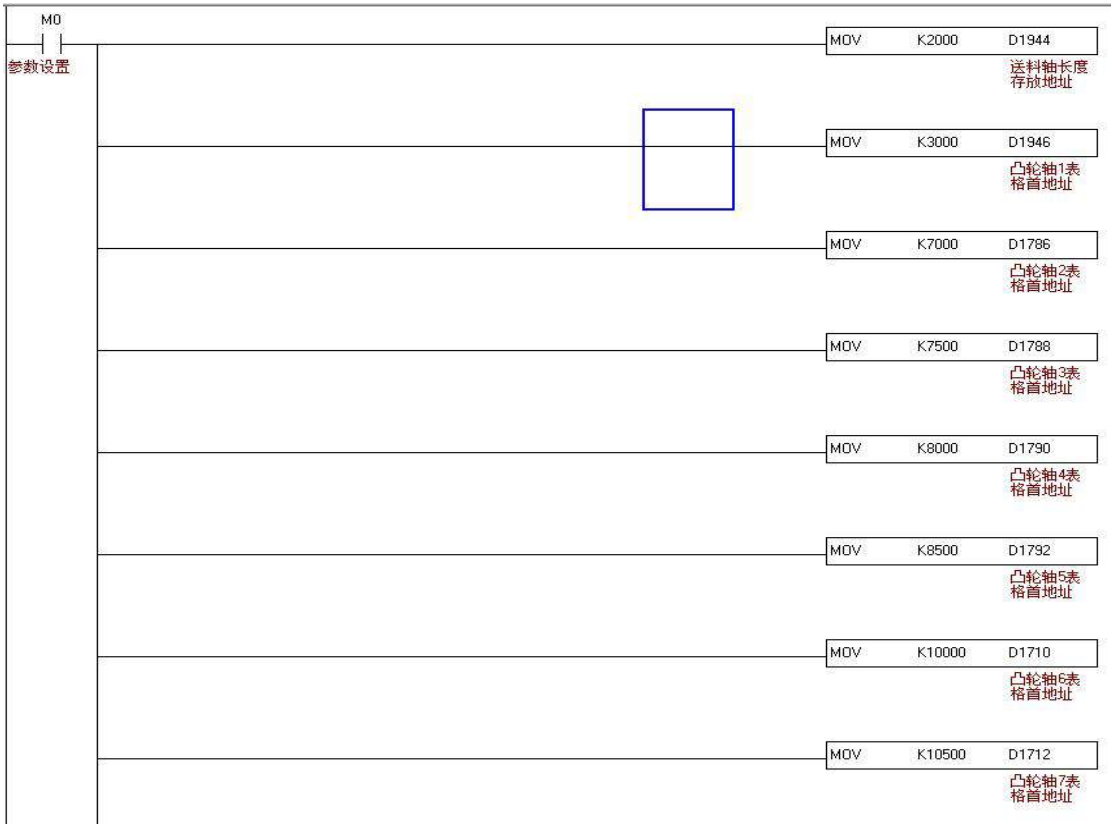
Note: 1. There is no problem with 7 axes (1 master and 6 slaves), but an error occurs after 8 axes (1 master and 7 slaves) run one circle.

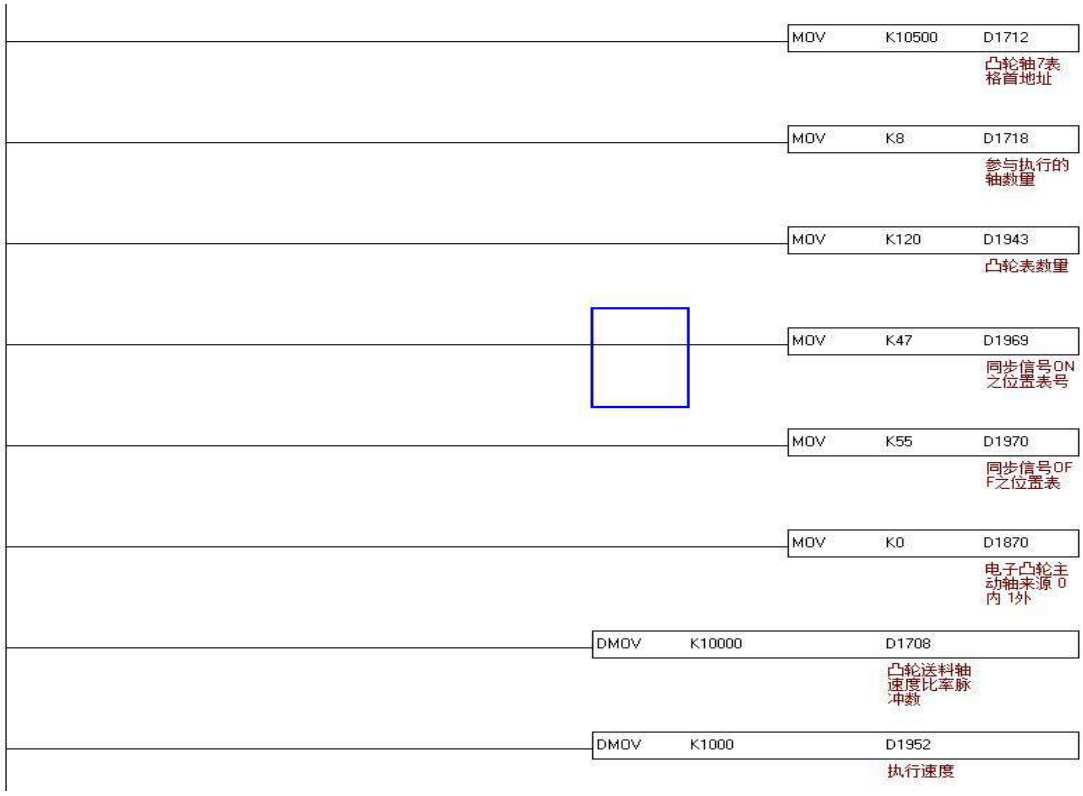
2. The maximum speed of 7 axes is 7K. If it exceeds 7K, an error will be reported (the

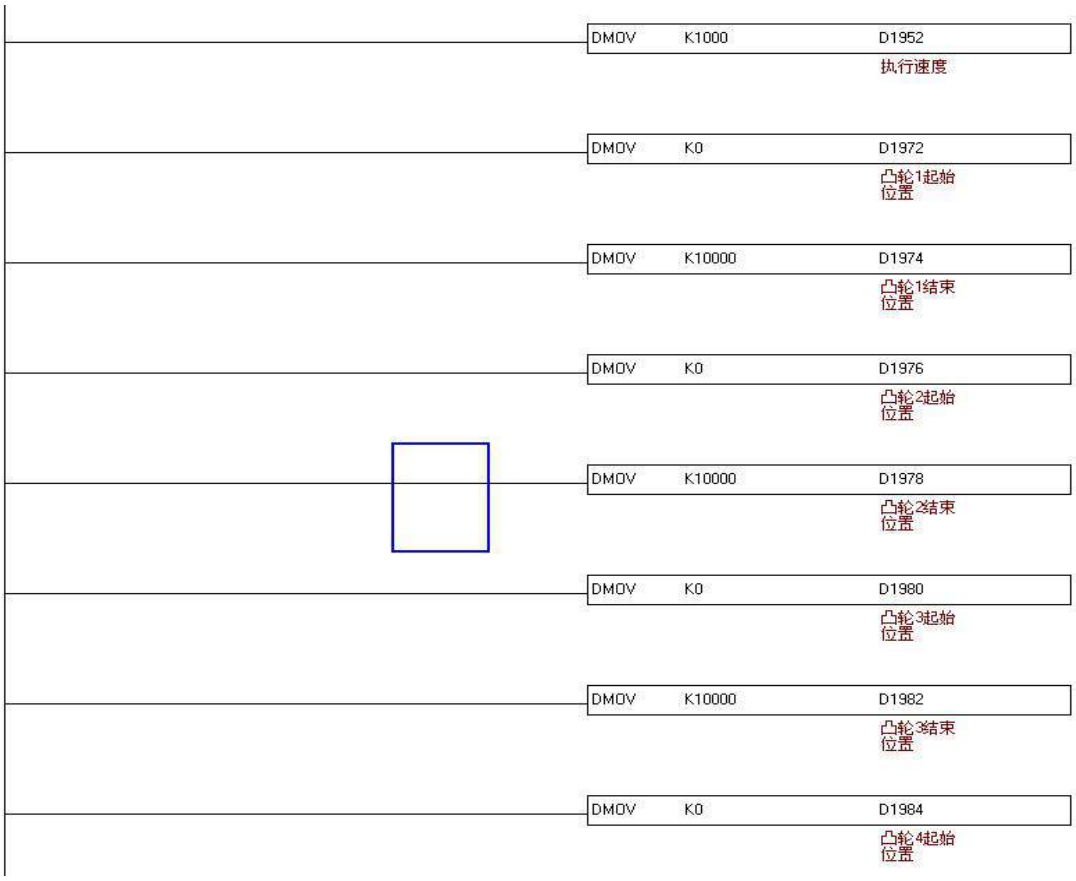
program will stop automatically and only one POWER light will remain).

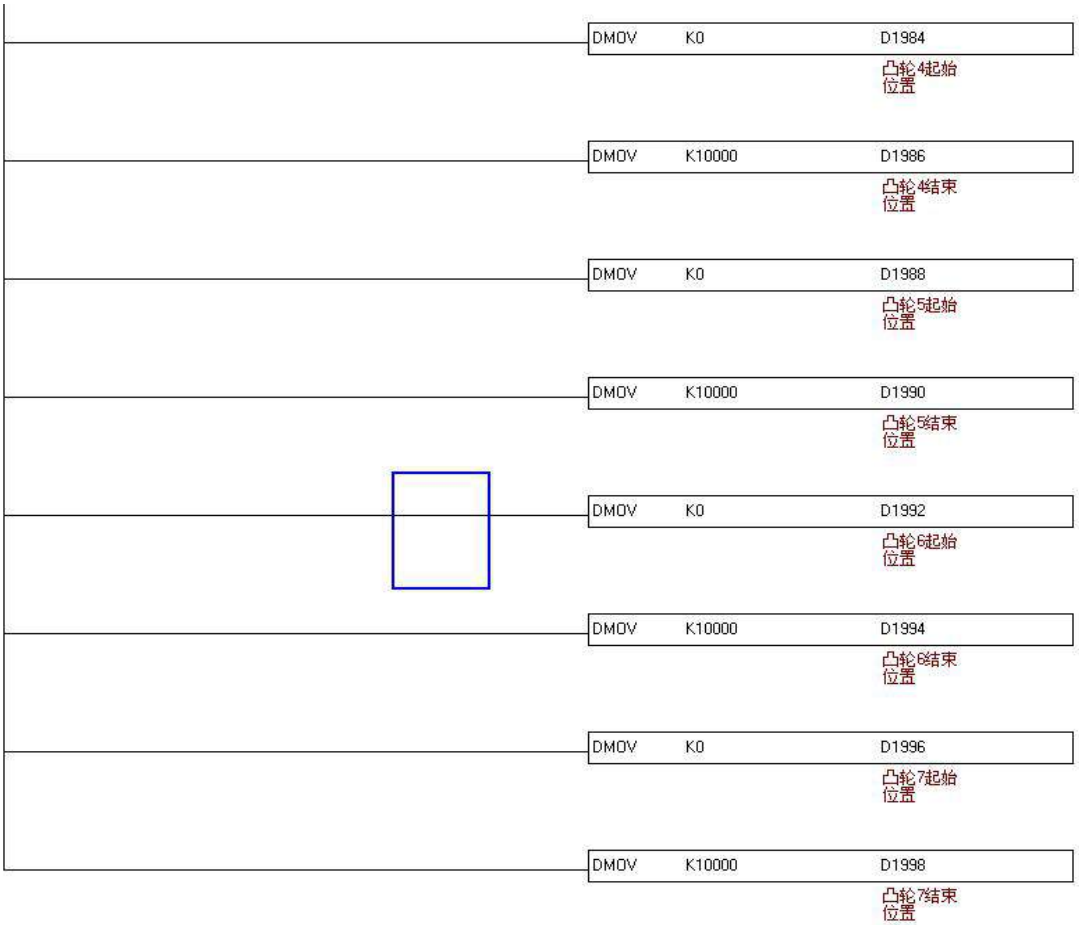
十九、 Case study of multiple slave axes in the internal axis of flying shear

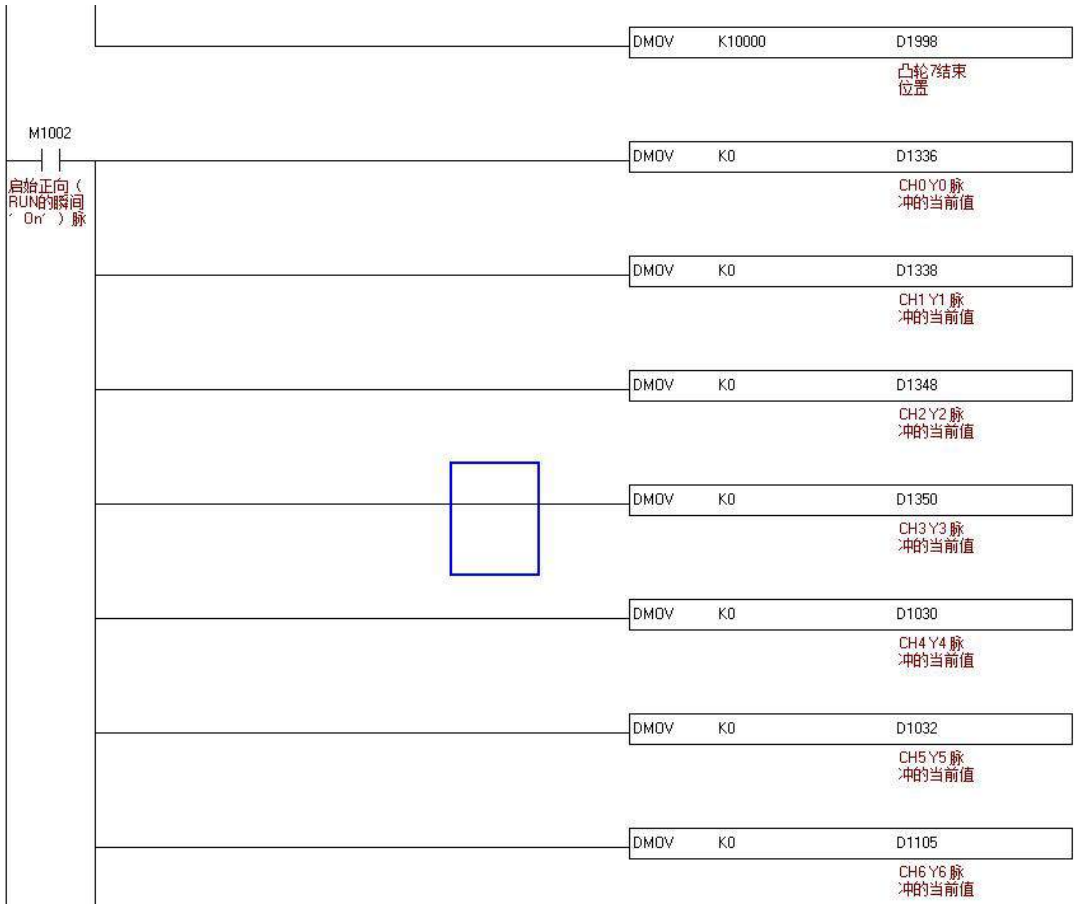
1. Write and download the PLC program. The program must be consistent with this case.

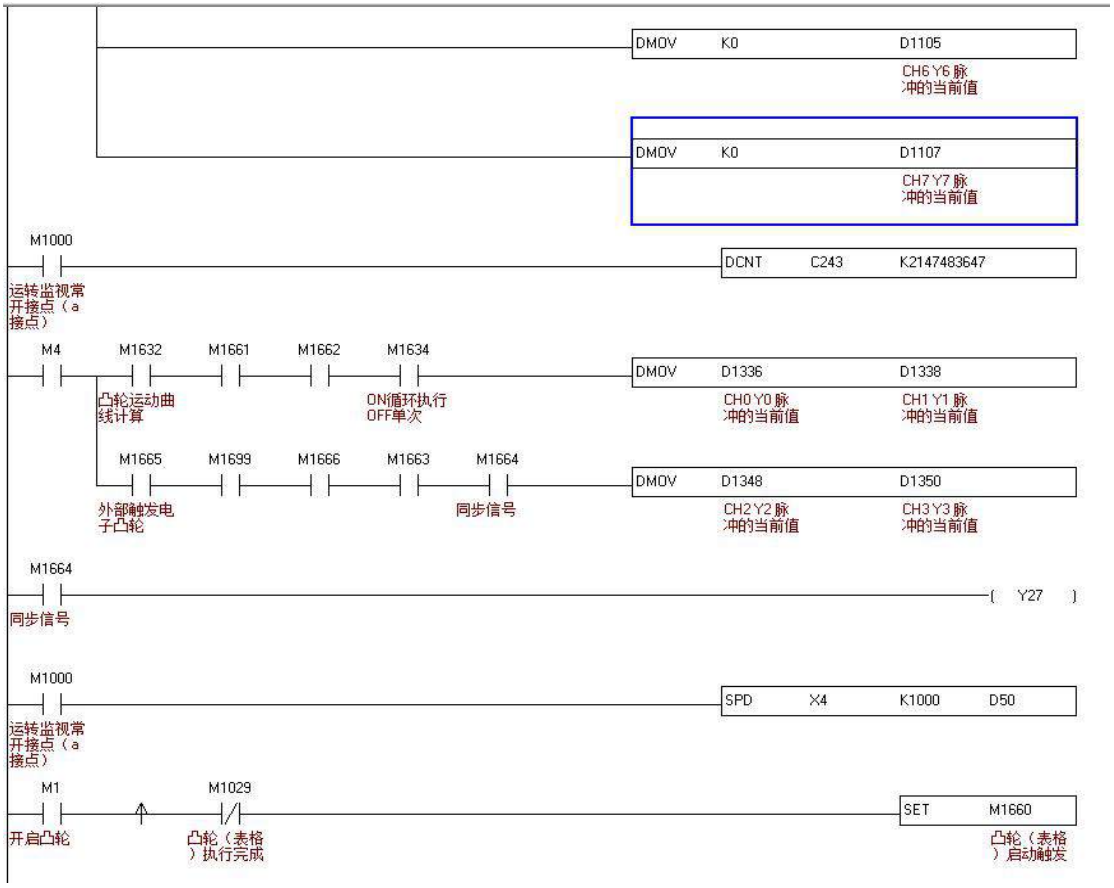


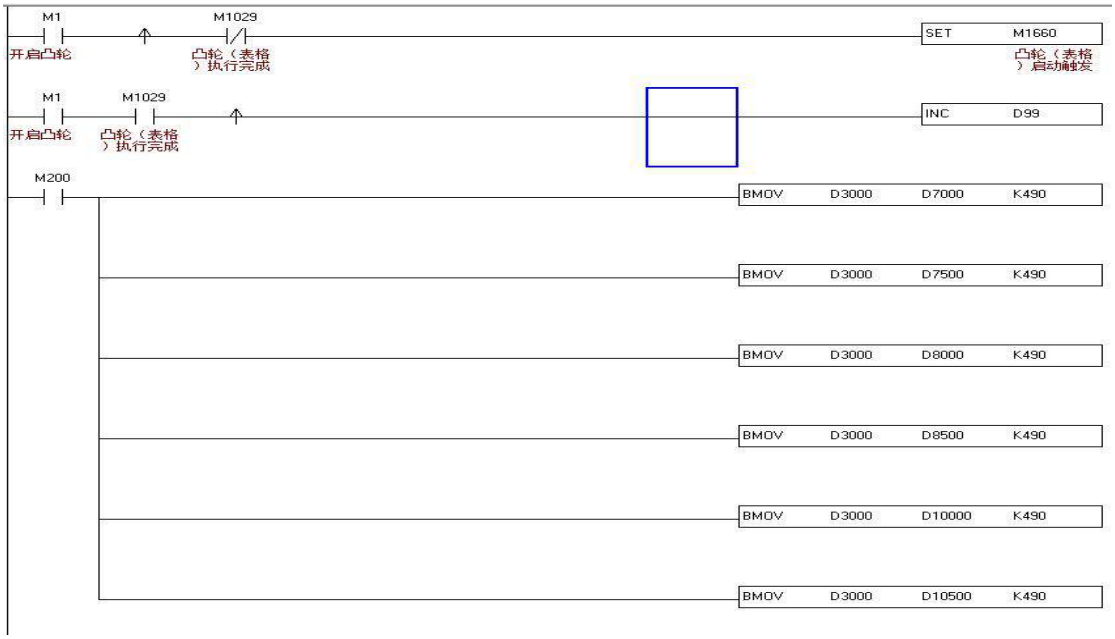



DMOV K1000 D1952
执行速度
DMOV K0 D1972
凸轮1起始位置
DMOV K10000 D1974
凸轮1结束位置
DMOV K0 D1976
凸轮2起始位置
DMOV K10000 D1978
凸轮2结束位置
DMOV K0 D1980
凸轮3起始位置
DMOV K10000 D1982
凸轮3结束位置
DMOV K0 D1984
凸轮4起始位置

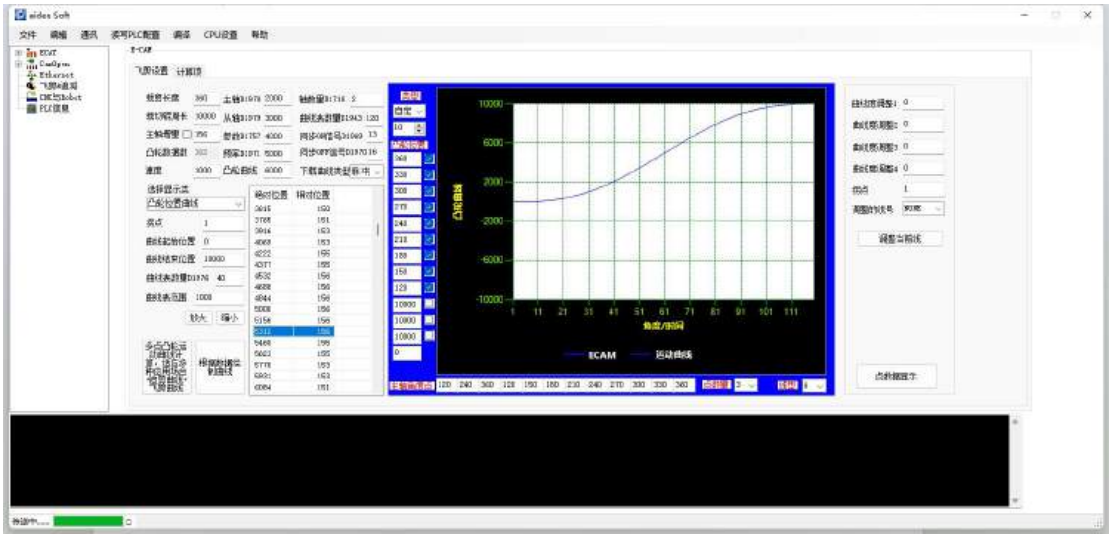

DMOV K0 D1984
凸轮4起始位置
DMOV K10000 D1986
凸轮4结束位置
DMOV K0 D1988
凸轮5起始位置
DMOV K10000 D1990
凸轮5结束位置
DMOV K0 D1992
凸轮6起始位置
DMOV K10000 D1994
凸轮6结束位置
DMOV K0 D1996
凸轮7起始位置
DMOV K10000 D1998
凸轮7结束位置


DMOV K10000 D1998
凸轮?结束位置
M1002
启始正向（RUN的瞬间 On ）脉
DMOV K0 D1336
CH0 Y0 脉冲的当前值
DMOV K0 D1338
CH1 Y1 脉冲的当前值
DMOV K0 D1348
CH2 Y2 脉冲的当前值
DMOV K0 D1350
CH3 Y3 脉冲的当前值
DMOV K0 D1030
CH4 Y4 脉冲的当前值
DMOV K0 D1032
CH5 Y5 脉冲的当前值
DMOV K0 D1105
CH6 Y6 脉冲的当前值


DMOV K0 D1105
CH6 Y6 脉冲的当前值
DMOV K0 D1107
CH7 Y7 脉冲的当前值
M1000
运转监视常开接点（a接点）
DCNT C243 K2147483647
M4 M1632 M1661 M1662 M1634
凸轮运动曲线计算
ON循环执行 OFF单次
DMOV D1336 D1338
CH0 Y0 脉冲的当前值
CH1 Y1 脉冲的当前值
M1665 M1699 M1666 M1663 M1664
外部触发电子凸轮
同步信号
DMOV D1348 D1350
CH2 Y2 脉冲的当前值
CH3 Y3 脉冲的当前值
M1664
同步信号
Y27
M1000
运转监视常开接点（a接点）
SPD X4 K1000 D50
M1
开启凸轮
M1029
凸轮（表格）执行完成
SET M1660
凸轮（表格）启动触发

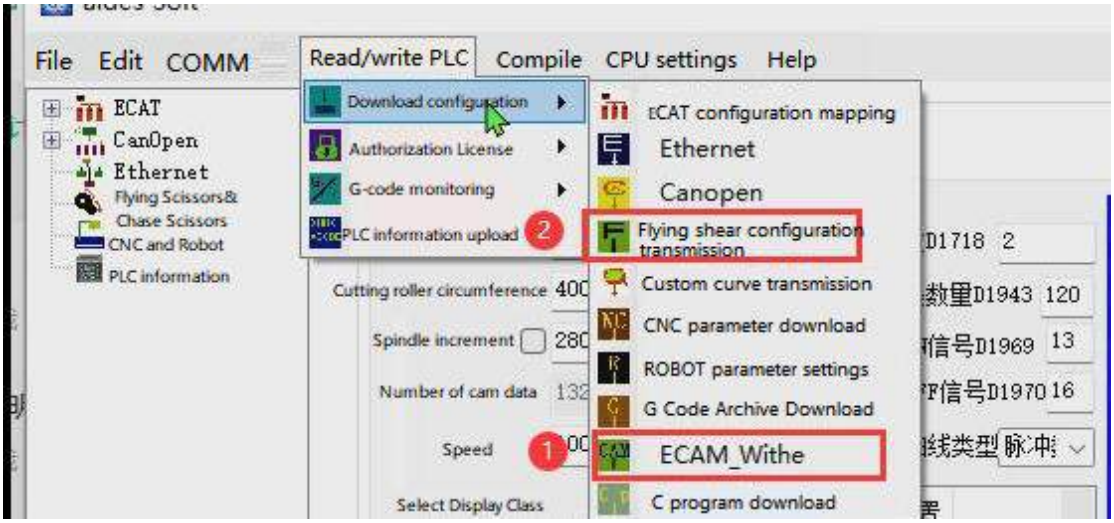


2、Configure the parameters according to the figure below. All parameters must be consistent with this figure.

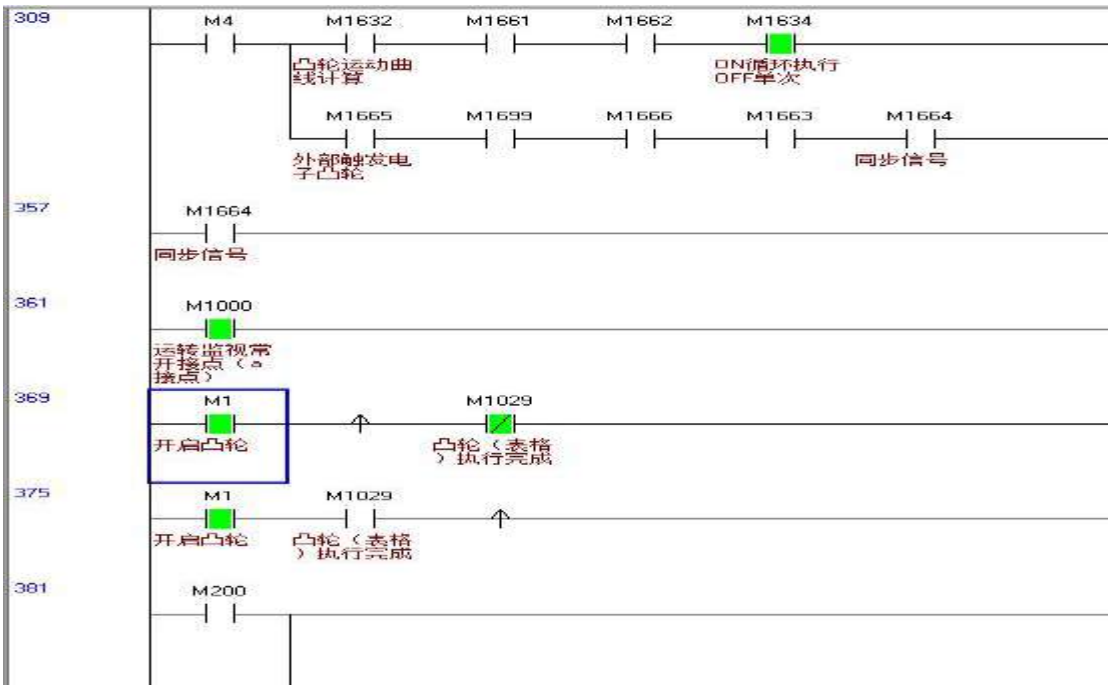


3. Click Communication, select the port, confirm the communication configuration and click OK.

4. Click Read and Write PLC Configuration, select Download Configuration, download ECAM_Withe first, then download the flying shear configuration transmission.



5. Start M0 (reset immediately after activation), M200 (reset immediately after activation), M1634 (normally open), M1029 (normally closed), M1 (normally open), and no other operations are required (except speed regulation).



Note: 1. There is no problem with 8 axes (1 master and 7 slaves).

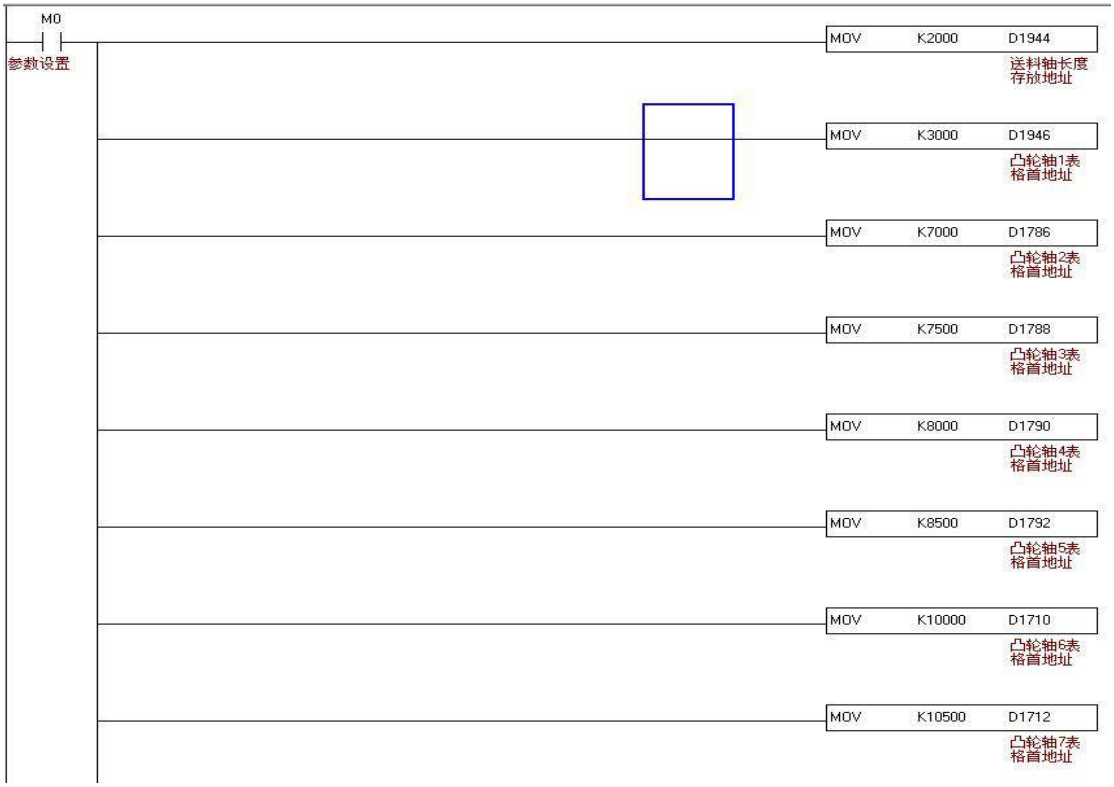
2. The maximum speed of 8-axis is 20K. If it exceeds 20K, an error will be reported (the program will stop automatically and only one POWER light will remain).

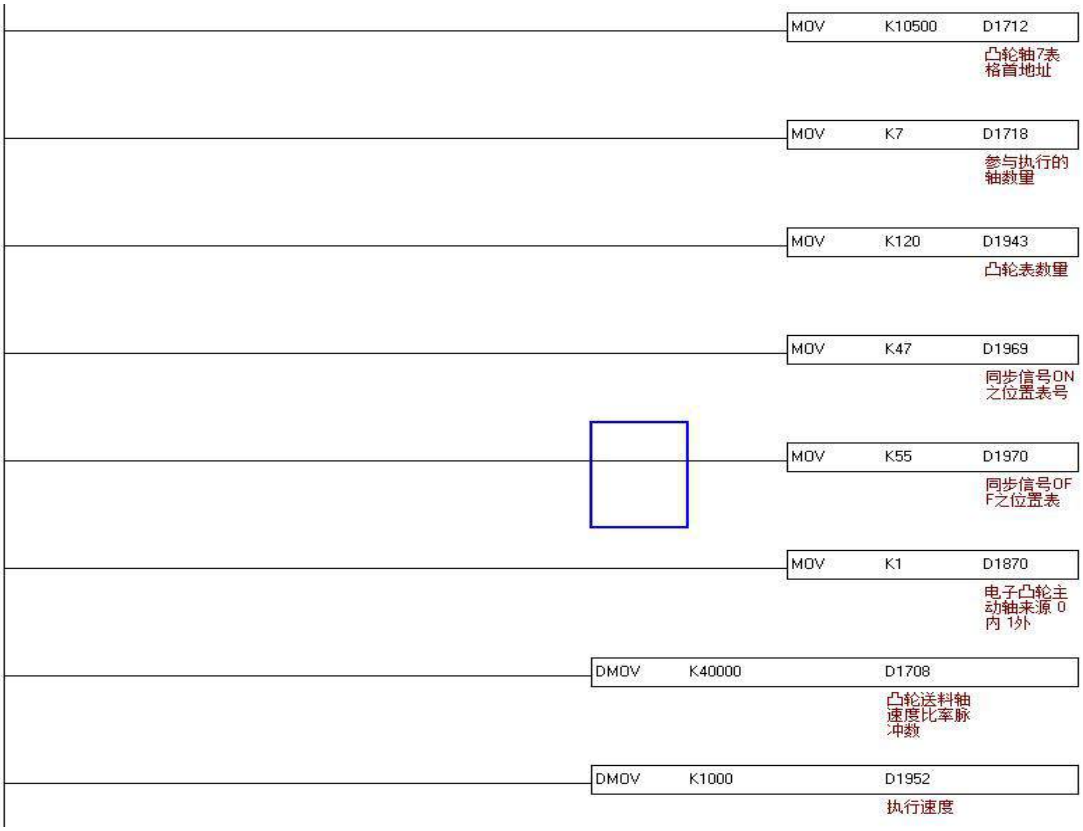
3. The maximum speed of 7-axis is 24K. If it is faster than that, an error will be reported (the program will stop automatically and only one POWER light will remain).

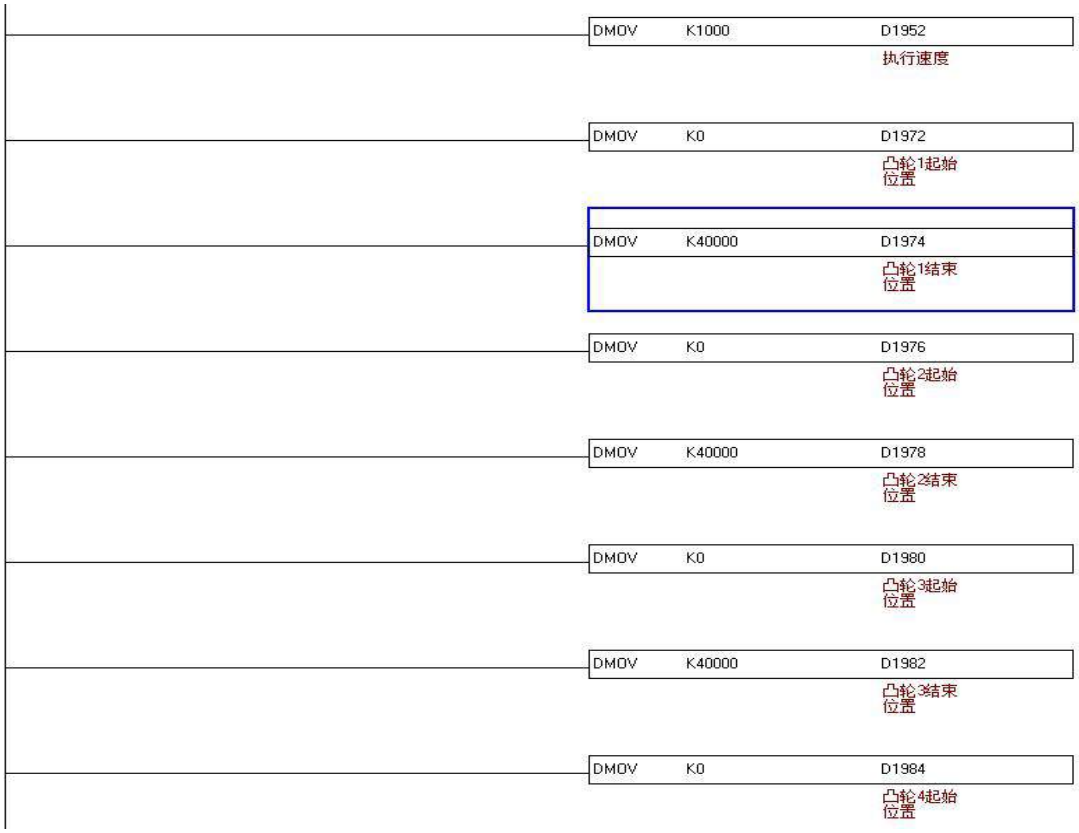
4. When the execution speed is 4K (including 4K), the spindle running speed does not jitter. When it exceeds 4K, the spindle running speed starts to jitter.

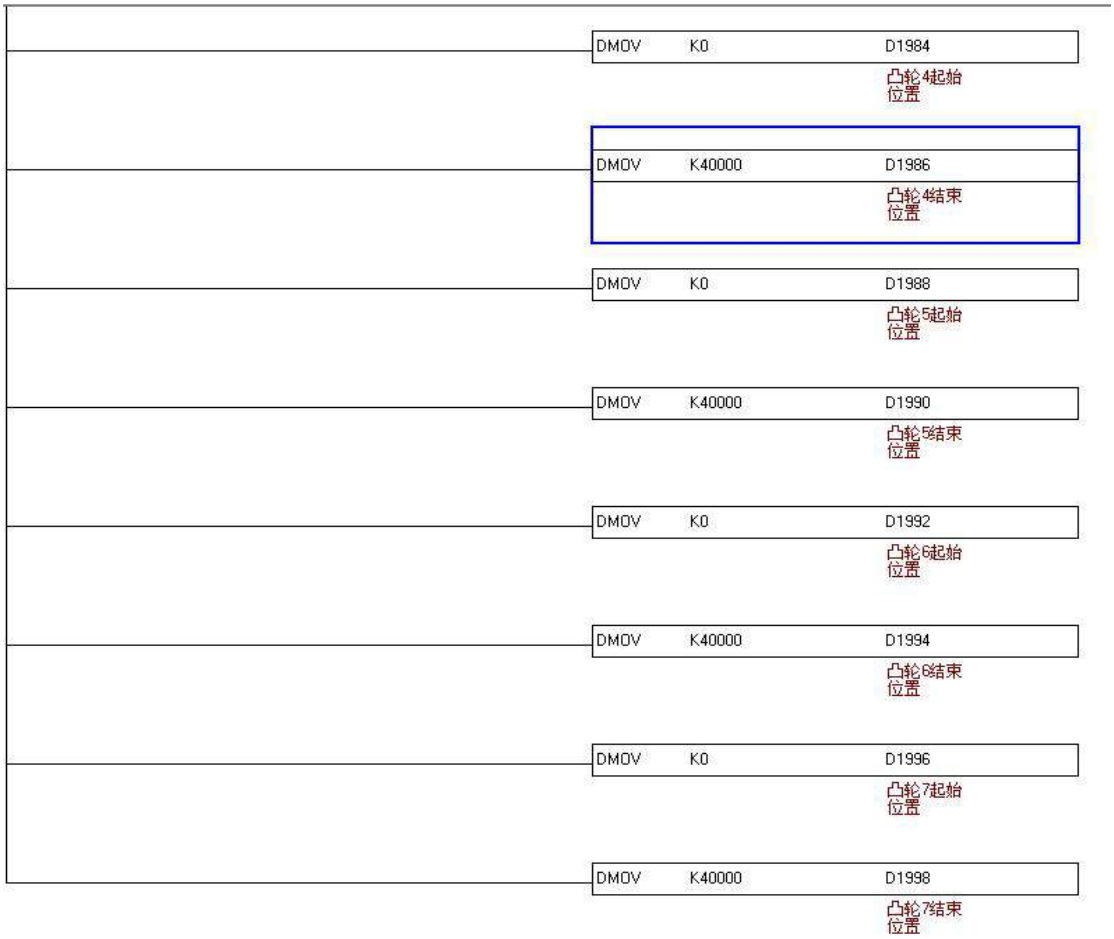
二十、 Case of multiple slave axes with external shear

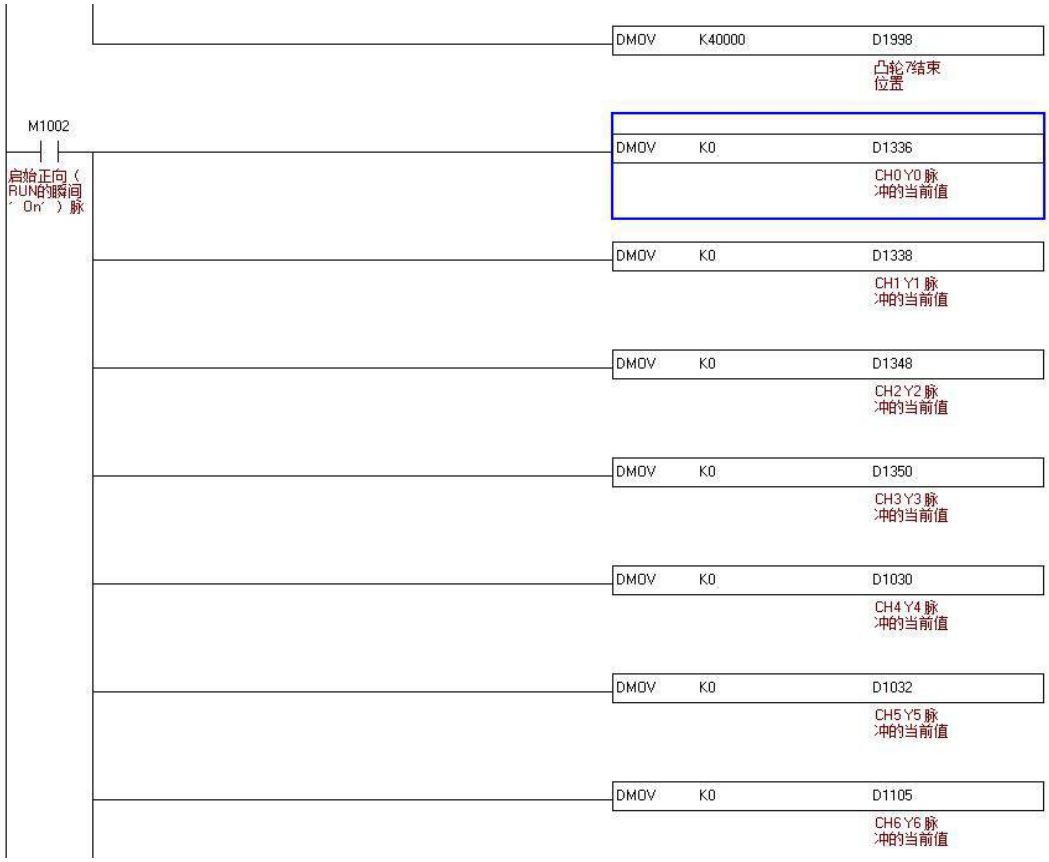
1. Write and download the PLC program. The program must be consistent with this case.

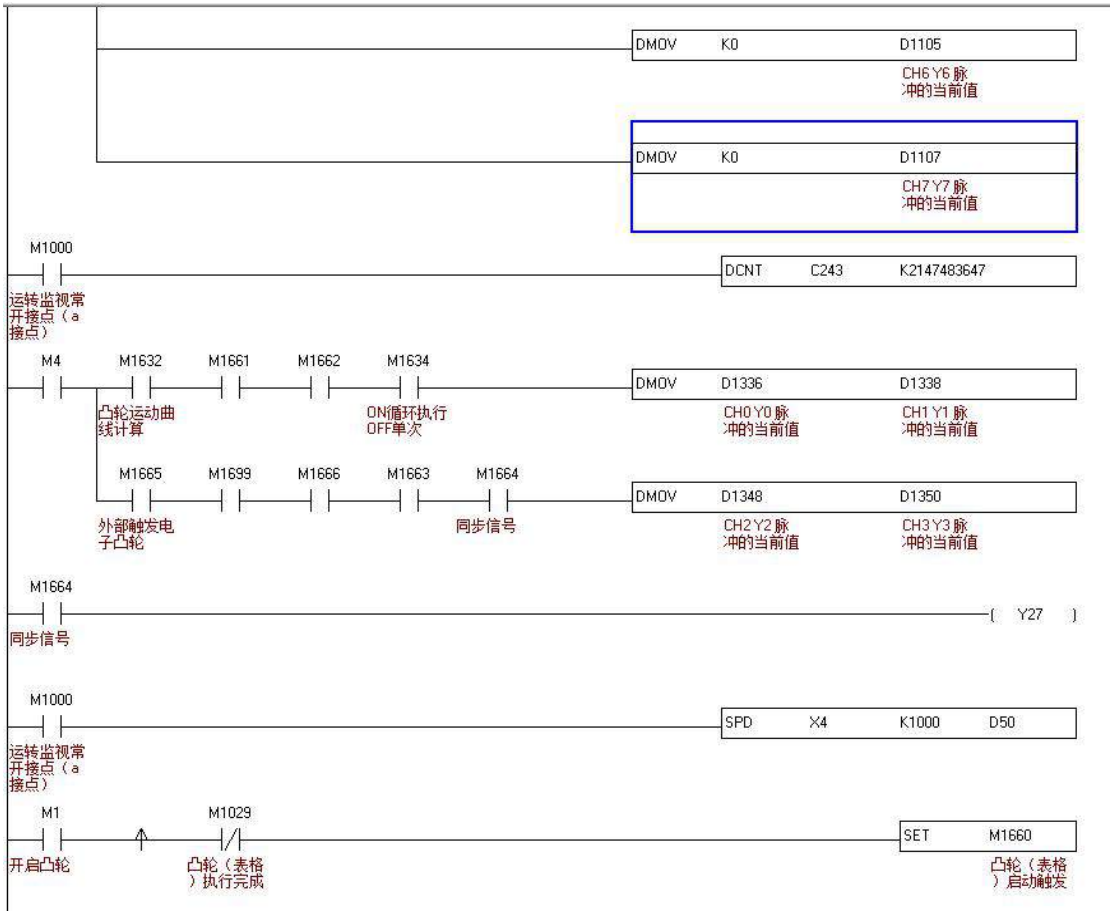

M0
参数设置
MOV K2000 D1944
送料轴长度存放地址
MOV K3000 D1946
凸轮轴1表格首地址
MOV K7000 D1786
凸轮轴2表格首地址
MOV K7500 D1788
凸轮轴3表格首地址
MOV K8000 D1790
凸轮轴4表格首地址
MOV K8500 D1792
凸轮轴5表格首地址
MOV K10000 D1710
凸轮轴6表格首地址
MOV K10500 D1712
凸轮轴7表格首地址

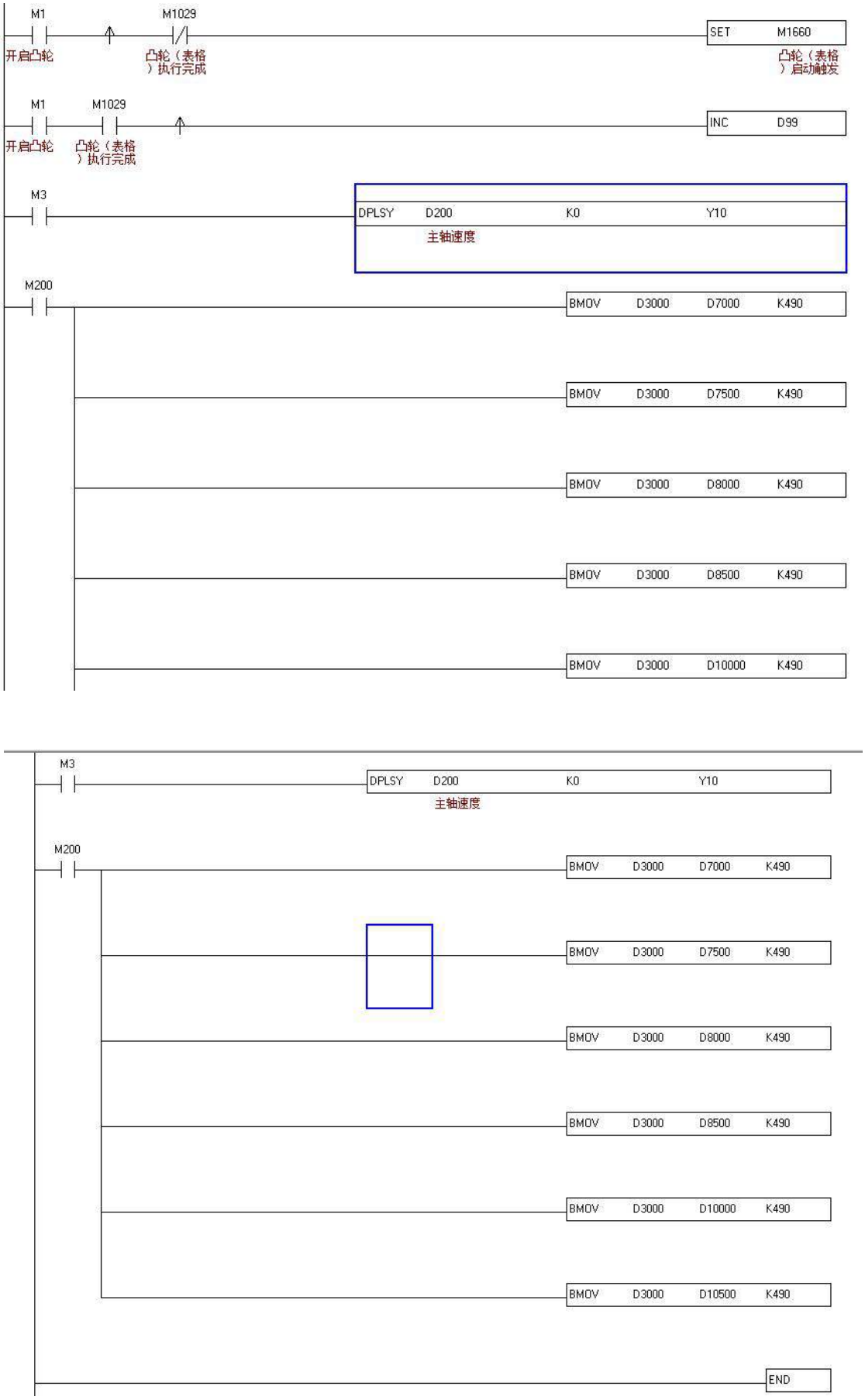

MOV K10500 D1712
凸轮轴7表格首地址
MOV K7 D1718
参与执行的轴数量
MOV K120 D1943
凸轮表数量
MOV K47 D1969
同步信号ON之位置表号
MOV K55 D1970
同步信号OFF之位置表
MOV K1 D1870
电子凸轮主动轴来源 0内 1外
DMOV K40000 D1708
凸轮送料轴速度比率脉冲数
DMOV K1000 D1952
执行速度


DMOV K1000 D1952
执行速度
DMOV K0 D1972
凸轮1起始位置
DMOV K40000 D1974
凸轮1结束位置
DMOV K0 D1976
凸轮2起始位置
DMOV K40000 D1978
凸轮2结束位置
DMOV K0 D1980
凸轮3起始位置
DMOV K40000 D1982
凸轮3结束位置
DMOV K0 D1984
凸轮4起始位置

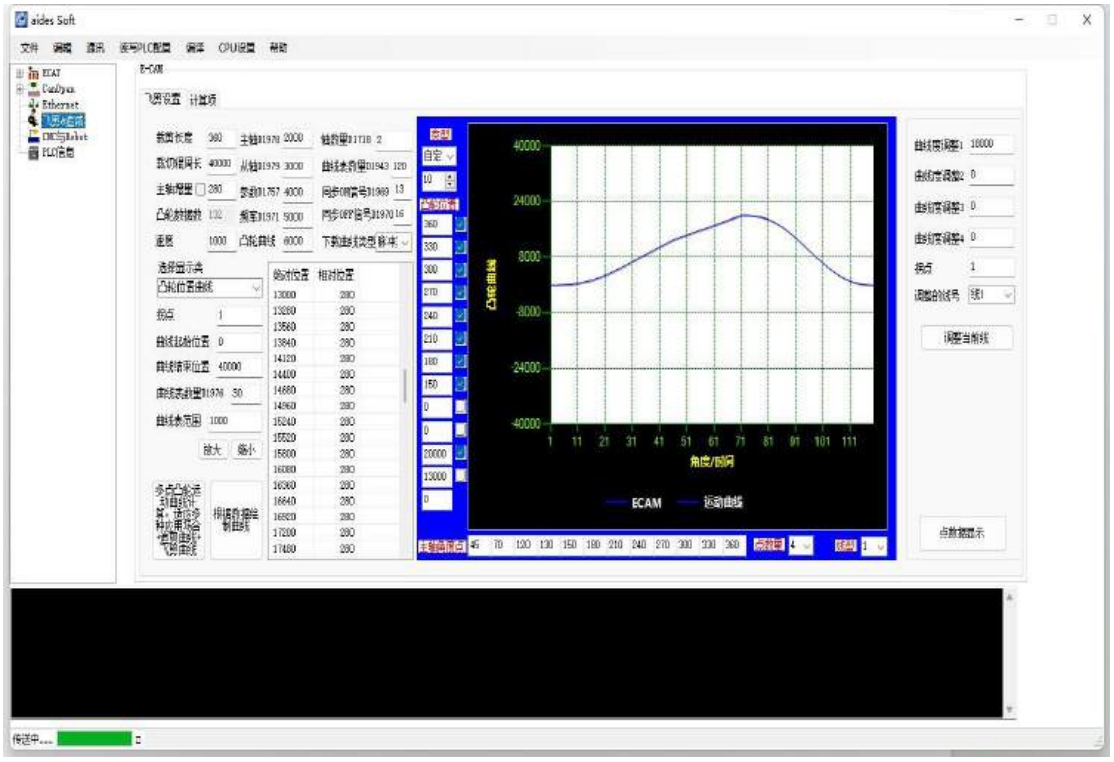

DMOV K0 D1984
凸轮4起始位置
DMOV K40000 D1986
凸轮4结束位置
DMOV K0 D1988
凸轮5起始位置
DMOV K40000 D1990
凸轮5结束位置
DMOV K0 D1992
凸轮6起始位置
DMOV K40000 D1994
凸轮6结束位置
DMOV K0 D1996
凸轮7起始位置
DMOV K40000 D1998
凸轮7结束位置


DMOV K40000 D1998
凸轮?结束位置
M1002
启始正向（RUN的瞬间On）脉
DMOV K0 D1336
CH0 Y0 脉冲的当前值
DMOV K0 D1338
CH1 Y1 脉冲的当前值
DMOV K0 D1348
CH2 Y2 脉冲的当前值
DMOV K0 D1350
CH3 Y3 脉冲的当前值
DMOV K0 D1030
CH4 Y4 脉冲的当前值
DMOV K0 D1032
CH5 Y5 脉冲的当前值
DMOV K0 D1105
CH6 Y6 脉冲的当前值


DMOV K0 D1105
CH6 Y6 脉冲的当前值
DMOV K0 D1107
CH7 Y7 脉冲的当前值
M1000
运转监视常开接点（a接点）
DCNT C243 K2147483647
M4
M1632
M1661
M1662
M1634
凸轮运动曲线计算
ON循环执行OFF单次
DMOV D1336 D1338
CH0 Y0 脉冲的当前值
CH1 Y1 脉冲的当前值
M1665
M1699
M1666
M1663
M1664
外部触发电子凸轮
同步信号
DMOV D1348 D1350
CH2 Y2 脉冲的当前值
CH3 Y3 脉冲的当前值
M1664
同步信号
Y27
M1000
运转监视常开接点（a接点）
SPD X4 K1000 D50
M1
M1029
开启凸轮
凸轮（表格）执行完成
SET M1660
凸轮（表格）启动触发

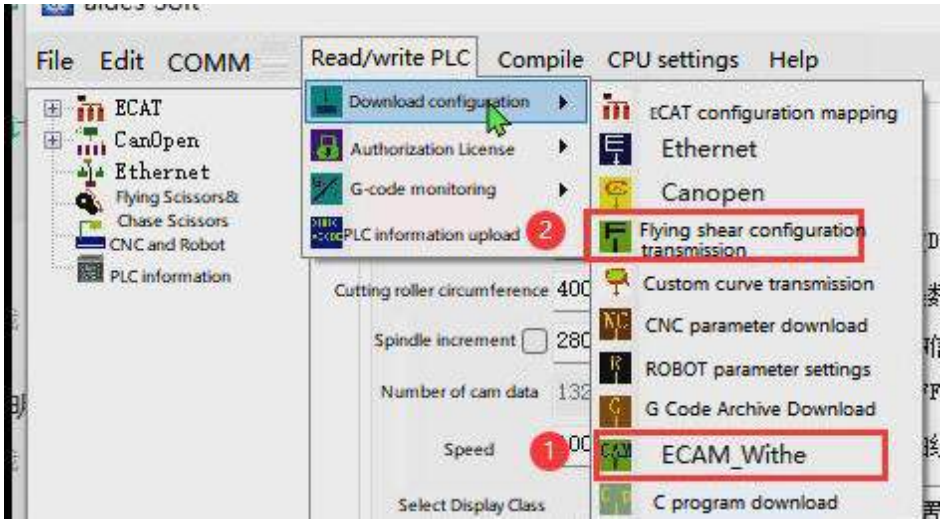


2. Configure the parameters according to the figure below. All parameters must be consistent with this figure.

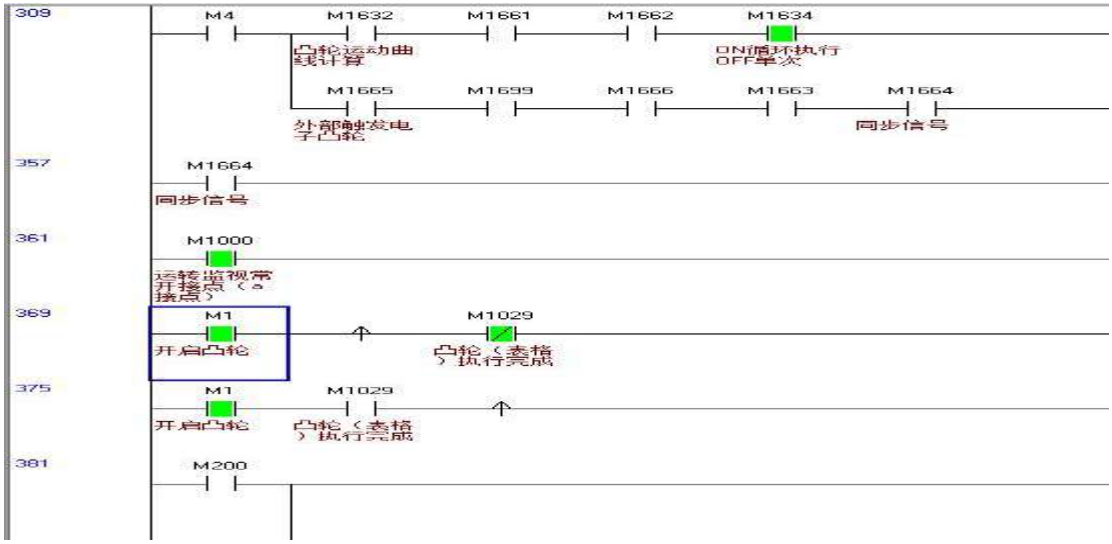


3. Click Communication, select the port, confirm the communication configuration and click OK.

4. Click Read and Write PLC Configuration, select Download Configuration, download ECAM_Withe first, then download the flying shear configuration transmission.

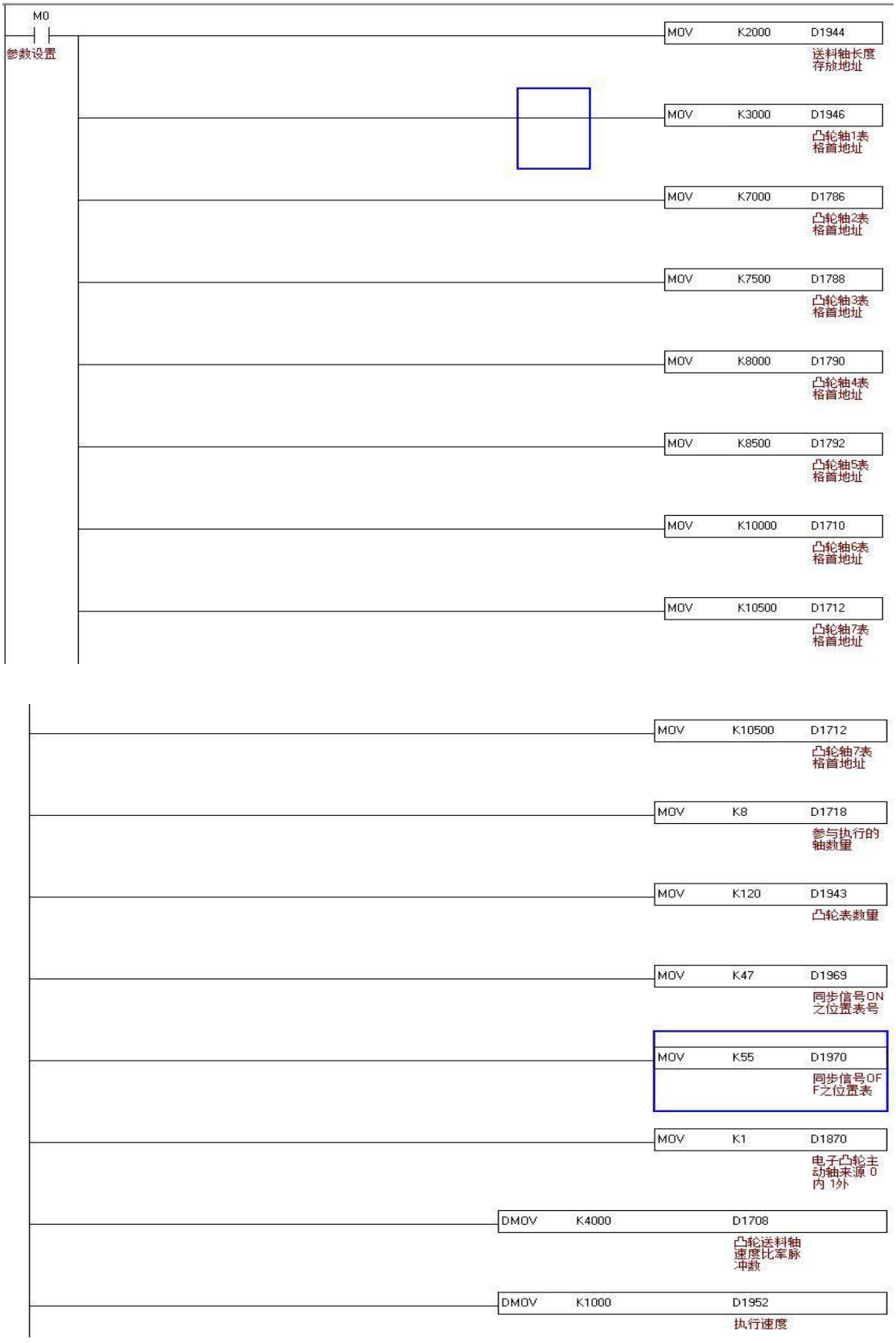


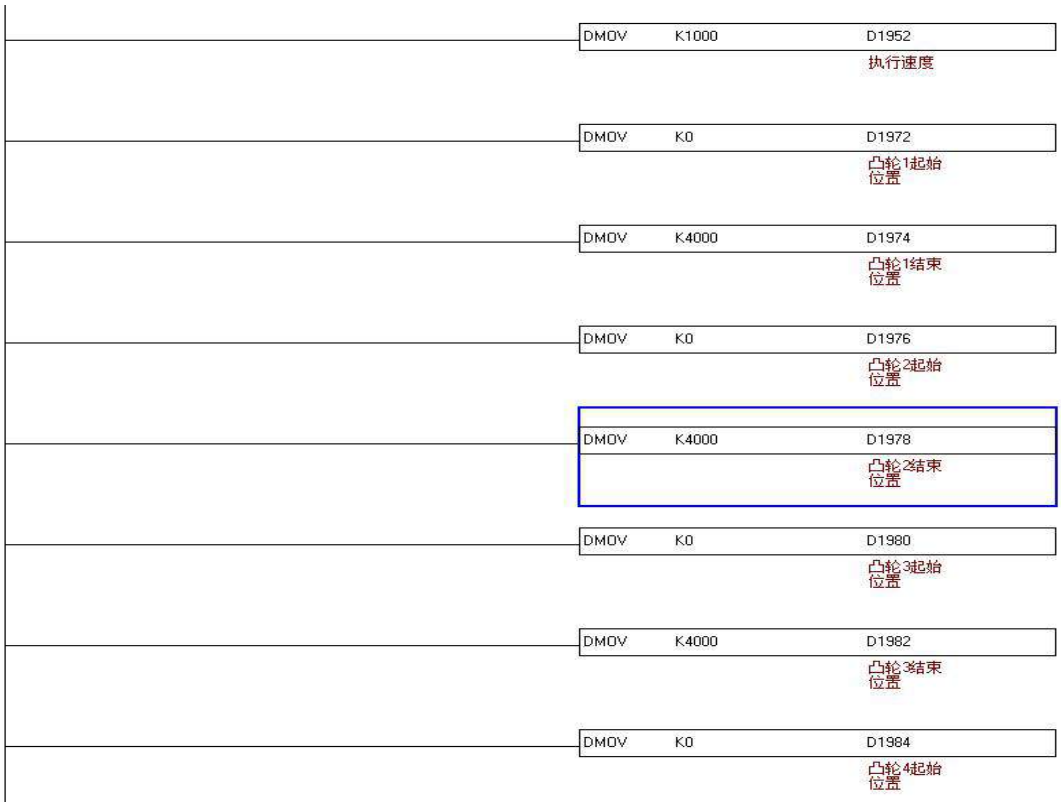
5. Start M0 (reset immediately after activation), M200 (reset immediately after activation), M1634 (normally open), M1029 (normally closed), M1 (normally open), and no other operations are required (except speed regulation).

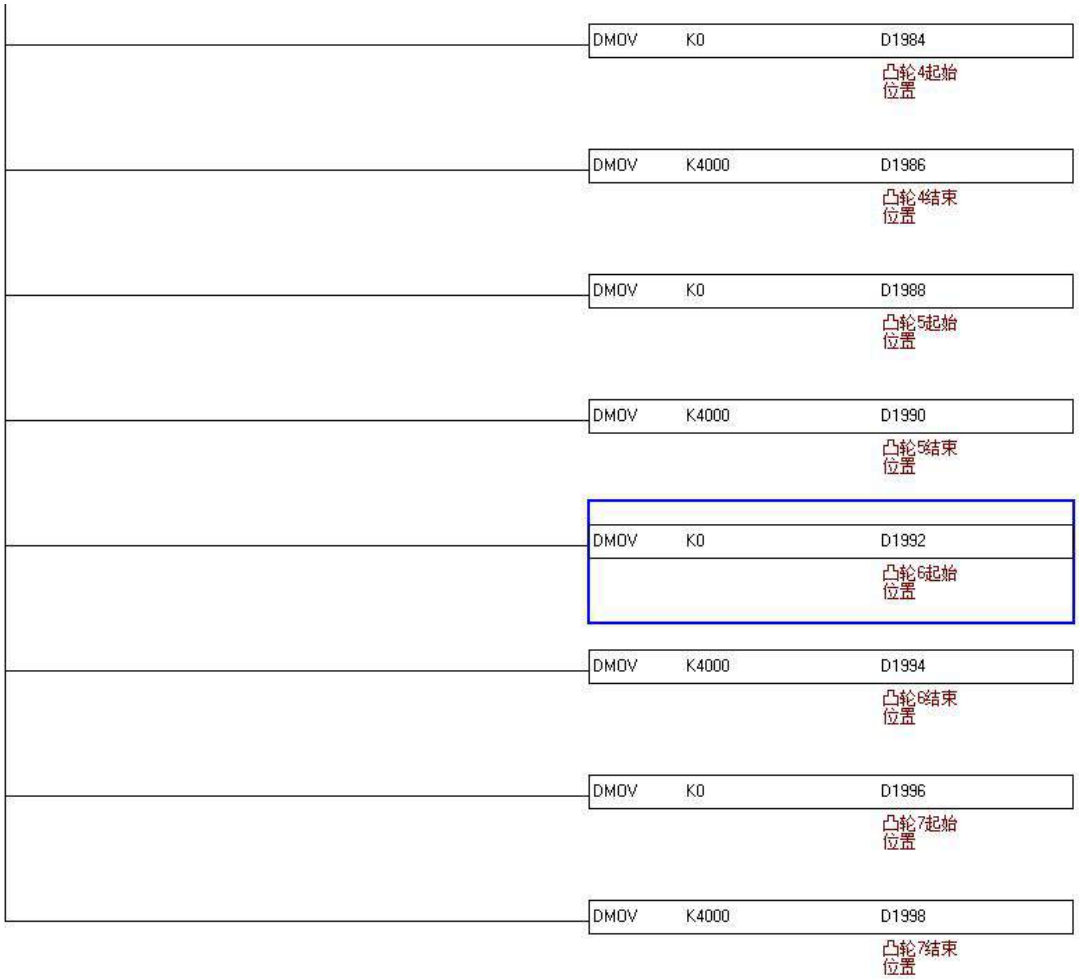


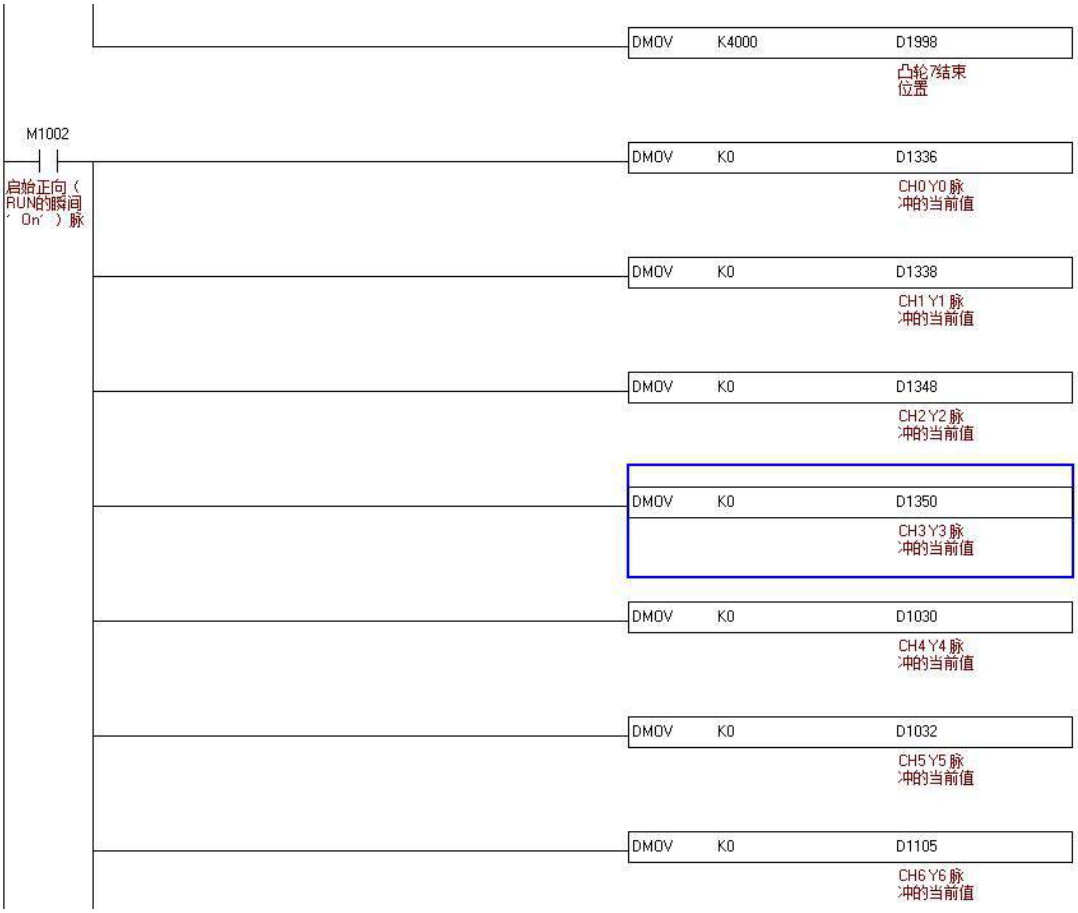
二十一、 Flying shear external axis multiple slave axis case

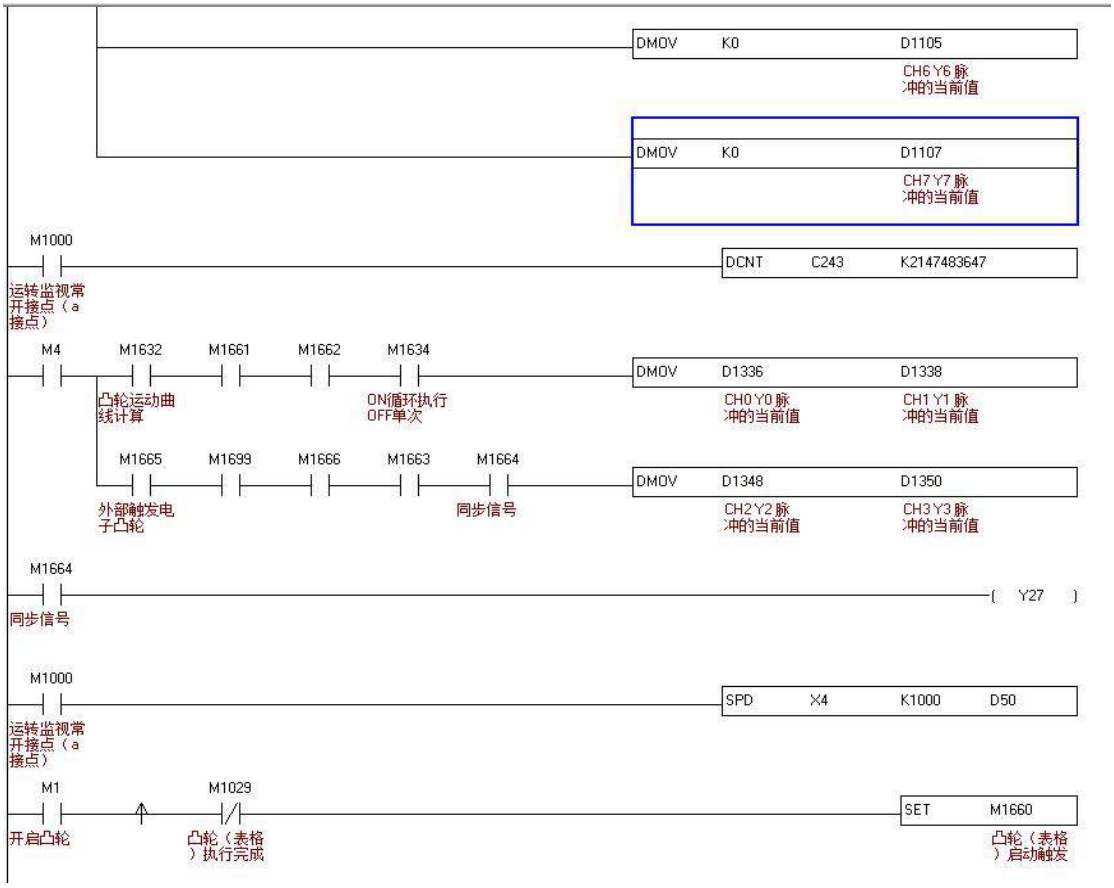
1. Write and download the PLC program. The program must be consistent with this case.

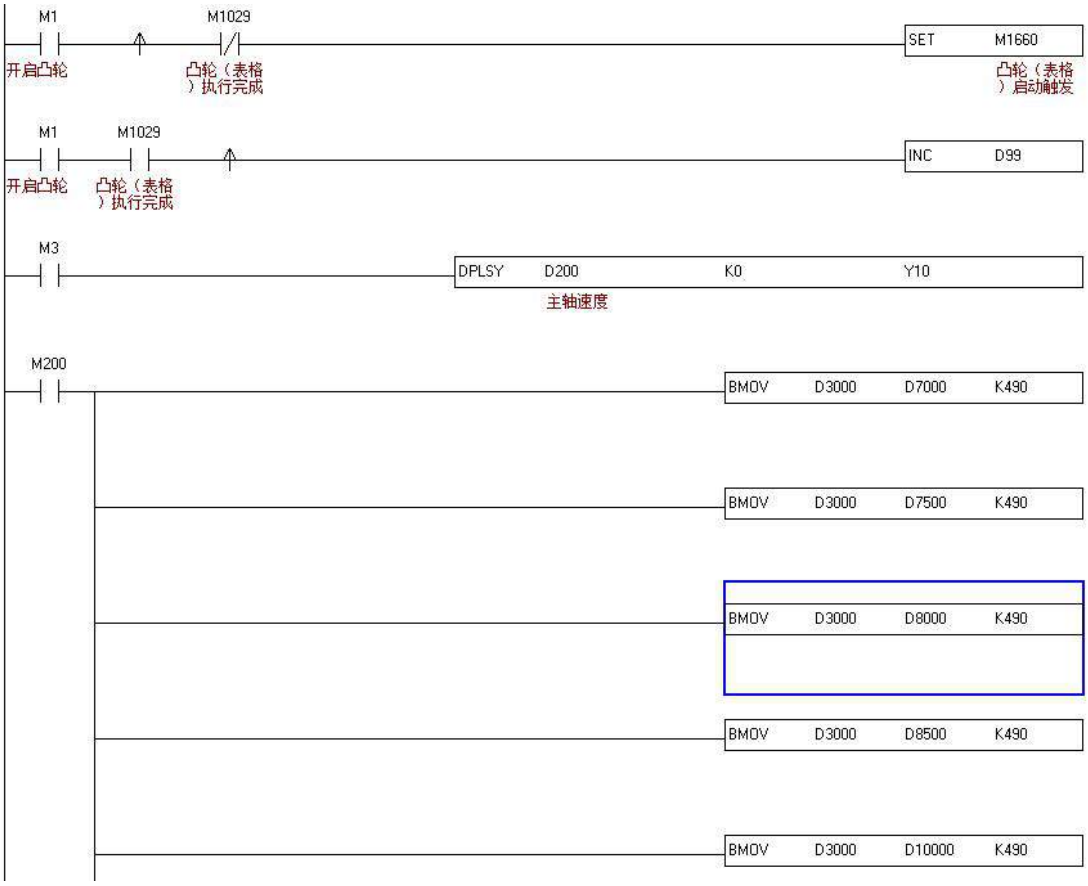

M0
参数设置
MOV K2000 D1944
送料轴长度存放地址
MOV K3000 D1946
凸轮轴1表格首地址
MOV K7000 D1786
凸轮轴2表格首地址
MOV K7500 D1788
凸轮轴3表格首地址
MOV K8000 D1790
凸轮轴4表格首地址
MOV K8500 D1792
凸轮轴5表格首地址
MOV K10000 D1710
凸轮轴6表格首地址
MOV K10500 D1712
凸轮轴7表格首地址
MOV K10500 D1712
凸轮轴7表格首地址
MOV K8 D1718
参与执行的轴数量
MOV K120 D1943
凸轮表数量
MOV K47 D1969
同步信号ON之位置表号
MOV K55 D1970
同步信号OFF之位置表
MOV K1 D1870
电子凸轮主动轴来源 0内 1外
DMOV K4000 D1708
凸轮送料轴速度比率脉冲数
DMOV K1000 D1952
执行速度

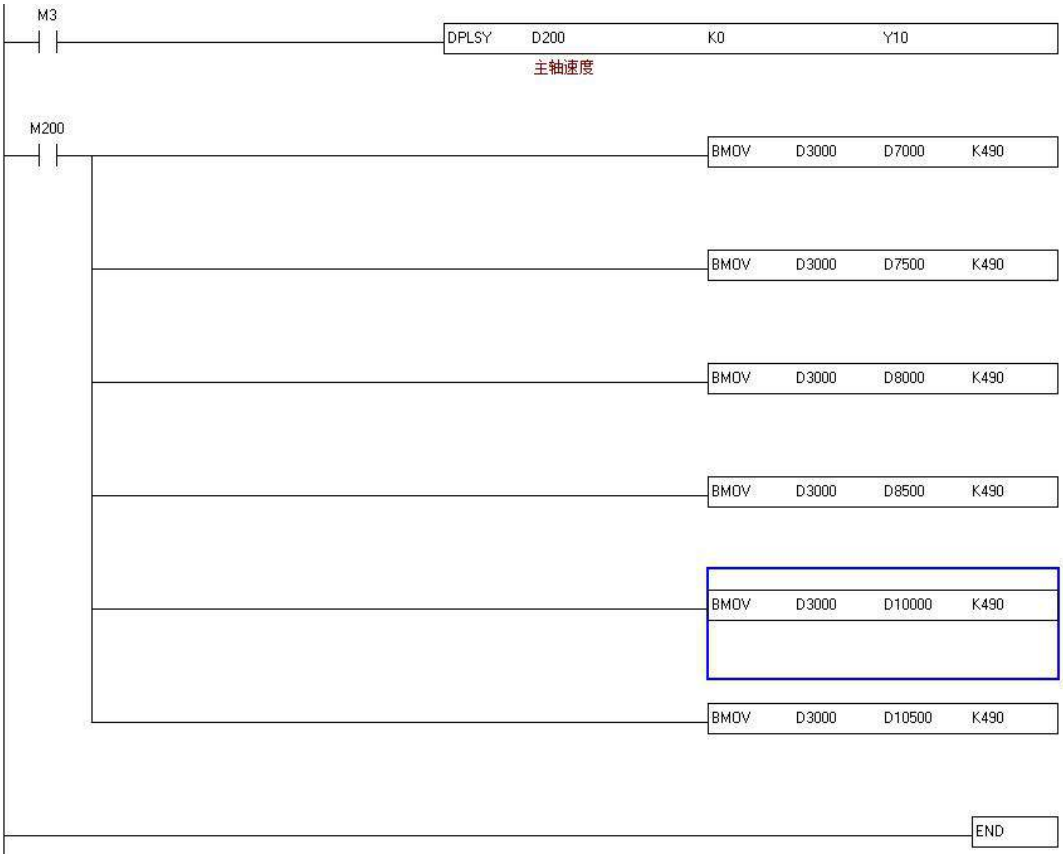

DMOV K1000 D1952
执行速度
DMOV K0 D1972
凸轮1起始位置
DMOV K4000 D1974
凸轮1结束位置
DMOV K0 D1976
凸轮2起始位置
DMOV K4000 D1978
凸轮2结束位置
DMOV K0 D1980
凸轮3起始位置
DMOV K4000 D1982
凸轮3结束位置
DMOV K0 D1984
凸轮4起始位置


DMOV K0 D1984
凸轮4起始位置
DMOV K4000 D1986
凸轮4结束位置
DMOV K0 D1988
凸轮5起始位置
DMOV K4000 D1990
凸轮5结束位置
DMOV K0 D1992
凸轮6起始位置
DMOV K4000 D1994
凸轮6结束位置
DMOV K0 D1996
凸轮7起始位置
DMOV K4000 D1998
凸轮7结束位置

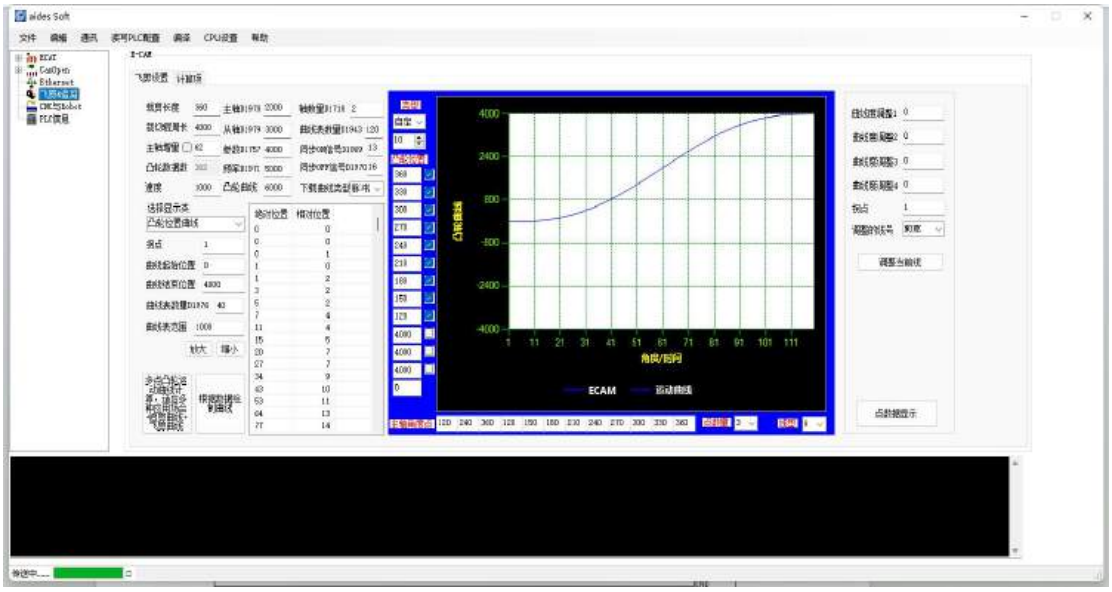

DMOV K4000 D1998
凸轮7结束位置
M1002
启始正向（RUN的瞬间‘On’）脉
DMOV K0 D1336
CH0 Y0 脉冲的当前值
DMOV K0 D1338
CH1 Y1 脉冲的当前值
DMOV K0 D1348
CH2 Y2 脉冲的当前值
DMOV K0 D1350
CH3 Y3 脉冲的当前值
DMOV K0 D1030
CH4 Y4 脉冲的当前值
DMOV K0 D1032
CH5 Y5 脉冲的当前值
DMOV K0 D1105
CH6 Y6 脉冲的当前值


DMOV K0 D1105
CH6 Y6 脉冲的当前值
DMOV K0 D1107
CH7 Y7 脉冲的当前值
M1000
运转监视常开接点（a接点）
DCNT C243 K2147483647
M4
M1632
M1661
M1662
M1634
凸轮运动曲线计算
ON循环执行OFF单次
DMOV D1336 D1338
CH0 Y0 脉冲的当前值
CH1 Y1 脉冲的当前值
M1665
M1699
M1666
M1663
M1664
外部触发电子凸轮
同步信号
DMOV D1348 D1350
CH2 Y2 脉冲的当前值
CH3 Y3 脉冲的当前值
M1664
同步信号
Y27
M1000
运转监视常开接点（a接点）
SPD X4 K1000 D50
M1
M1029
开启凸轮
凸轮（表格）执行完成
SET M1660
凸轮（表格）启动触发

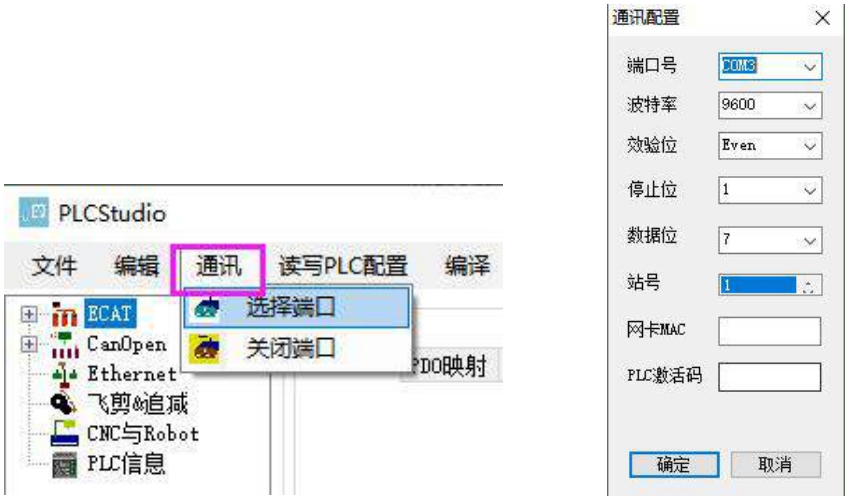




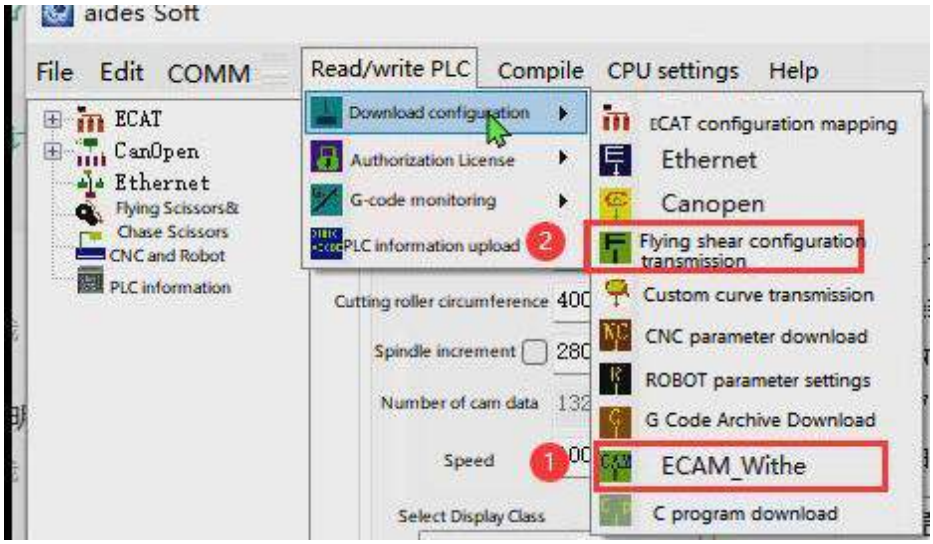
2. Configure the parameters according to the figure below. All parameters must be consistent with this figure.



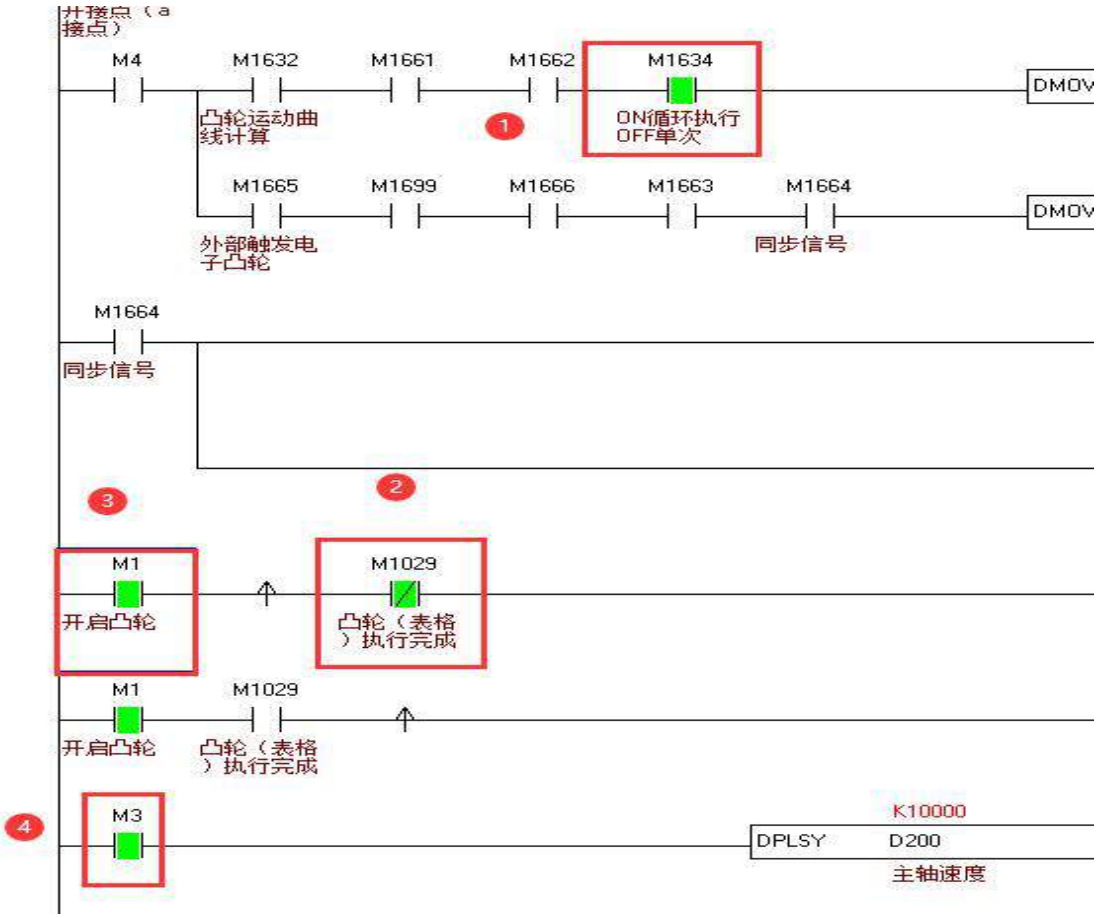
3. Click Communication, select the port, confirm the communication configuration and click OK.



4. Click Read and Write PLC Configuration, select Download Configuration, first download ECAM_Withe, then download the flying shear configuration transmission.



5. Start M0 (reset immediately after activation), D200 (need to set value), M1634 (normally open), M1029 (normally closed), M1 (normally open), M3 (open last). No other operations are required (except speed regulation).



7.4 Pulse Width Modulation PWM

1. Overview: This instruction is used to specify the pulse output of the pulse cycle and ON time.

2. PWM command format and parameter description .

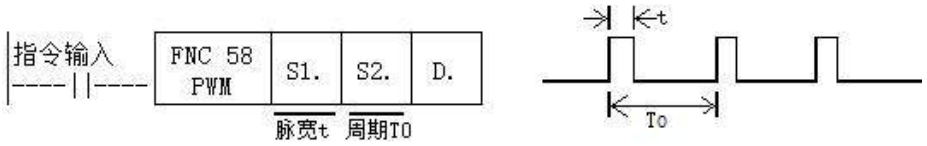
Instruction format:

Parameter Description:

Operand Type	content	Data Types	Word software element	Value range	Remark
S1	Pulse output width	BIN16 bits	KnX, KnY, KnM, KnS, T, C, D, E, F, K, H	0~32767ms	S1≤S2
S2	Pulse output period	BIN16 bits	KnX, KnY, KnM, KnS, T, C, D, E, F, K, H	1~32767ms	
D	Output pulse soft element (Y) number	BIN16 bits	Y0-Y3	Y0-Y3	

3. Function and action description

16-bit operation (pwm): Outputs a pulse with an ON pulse width of [S1.ms] in units of period [S2.ms].



Points to note

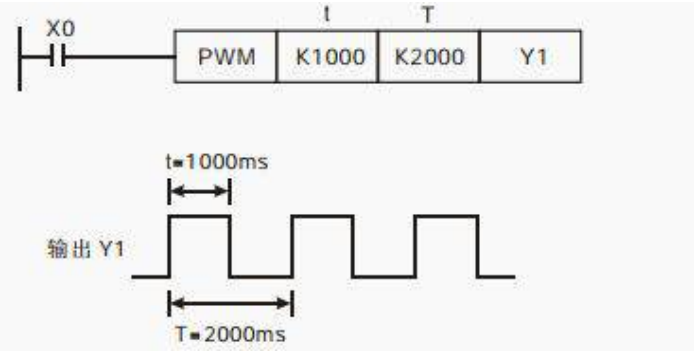
- The values of pulse width S1 and period S2 need to be set to S1 ≦ S2; when S1＝S2, D output is always On.
- When the command input is OFF, the D output is also OFF.
- S1=1 , S2=2, the maximum frequency can be outputted is 50K .
- When S1<=0, S2<=0, S1>S2, the output state is maintained and OxEE7 parameter error is reported.
- When the instruction is executed, M1258=ON and the output signal cannot be reversed. Only before starting, M1258=ON.
- The command duty cycle is the ratio of the S1 parameter to the S2 parameter. When the ratio does not reach 1%, the signal state remains unchanged. The D1336 register value will not change.
- Do not operate the pulse output mode setting switch while the pulse is being emitted.

Special registers

Soft component number	name	Remark
M1258	PWM command Y0 pulse output signal inversion	
M1259	PWM command Y 1 pulse output signal inversion	
M1526	PWM command Y 2 pulse output signal inversion	
M1527	PWM command Y 3 pulse output signal inversion	
M1070	PWM command , Y0 pulse output unit time switch , default : OFF=1ms	Cooperate with D1371 to adjust the time base
M1186	PWM command , Y 1 pulse output unit time switching, default : OFF=1ms	

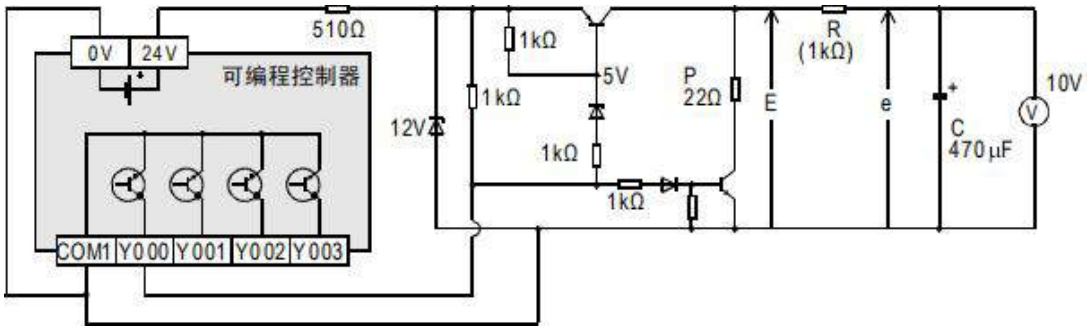
M1071	PWM command , Y 2 pulse output unit time switching, default : OFF=1ms	Cooperate with D1372 to adjust the time base
M1188	PWM command , Y 3 pulse output unit time switching, default : OFF=1ms	
D1371, D1372	0=10us , 1=10us , 2=1ms , 3=10ms	Default 10 us

4. Program Example



When X0=On, Y1 outputs the following pulses, and when X0=Off, Y1 output also turns Off.

Example of a smoothing loop



R>>P

t = R(K Ω)* C(μ F) = 470ms >>T0

τ of the filter is extremely large compared to the pulse period T0.

Δe in the average output current e is approximately $\frac{\Delta e}{e} \leqq \frac{T0}{\tau}$

7.5 Handwheel pulse function

The hand wheel pulse generator is commonly known as the electronic hand wheel or hand wheel. It is mainly used for setting the working origin of the CNC machine tool, manual stepping fine adjustment, interruption insertion during processing, etc. It is widely used in CNC engraving and

milling machines , CNC milling machines , CNC lathes , machining centers, CNC wire cutting machines , CNC EDM machines, printing equipment, textile machinery and other fields.

Coolmay M300 series PLC supports the hand wheel function (only supports servo motors, not stepper motors). With the cooperation of M300 PLC, the hand wheel is used to control the rotation of the motor. When the hand wheel rotates one pulse, the motor also rotates the corresponding number of pulses.

Special signs

Soft component number	name	property	Object directives
D1812	Hand crank gear ratio numerator	R/W	Default 1
D1813	Hand crank gear ratio denominator	R/W	Default 1
D1814	Hand crank minimum frequency limit L	R/W	Default 100HZ
D1815	Hand crank minimum frequency limit H	R/W	
D1816	Hand wheel controlled follower axis 1-8	R/W	Default is 1 (Y0), 0 (cancel following)
D1817	The upper limit of the hand wheel frequency L	R/W	Default 10000HZ
D1818	The maximum frequency limit of the hand wheel H	R/W	
M1743	Hand crank start	R/W	

Hand wheel pulse and direction

Soft component number	pulse	direction	Remark
Y0	Y0	Y10	Fixed combination, cannot be modified
Y1	Y1	Y11	
Y2	Y2	Y12	
Y3	Y3	Y13	
Y4	Y4	Y14	
Y5	Y5	Y15	
Y6	Y6	Y16	
Y7	Y7	Y17	

Instruction format and parameter description when using the hand crank .

Instruction format:

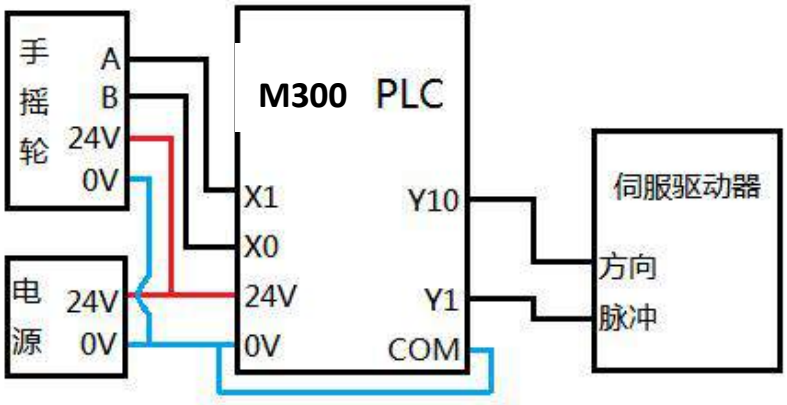
指令输入 ----||----	DCNT	S	D

Parameter description: DCNT is the start instruction of 32-bit counters C200 to C255.

Operands	content	Data Types	Word software element
C2xx	C200~C255	BIN32 bits	C
Numeric	K-2,147,483,648~K2,147,483,647; D0~D9999	BIN32 bits	K,D

◆ When the DCNT instruction is Off, the counter stops counting, but the original count value will not be cleared. The count value and its contacts can be cleared using the instruction RST C2XX. The high-speed add/subtract counters C235~C255 can use externally specified input points to clear the count value and their contacts.

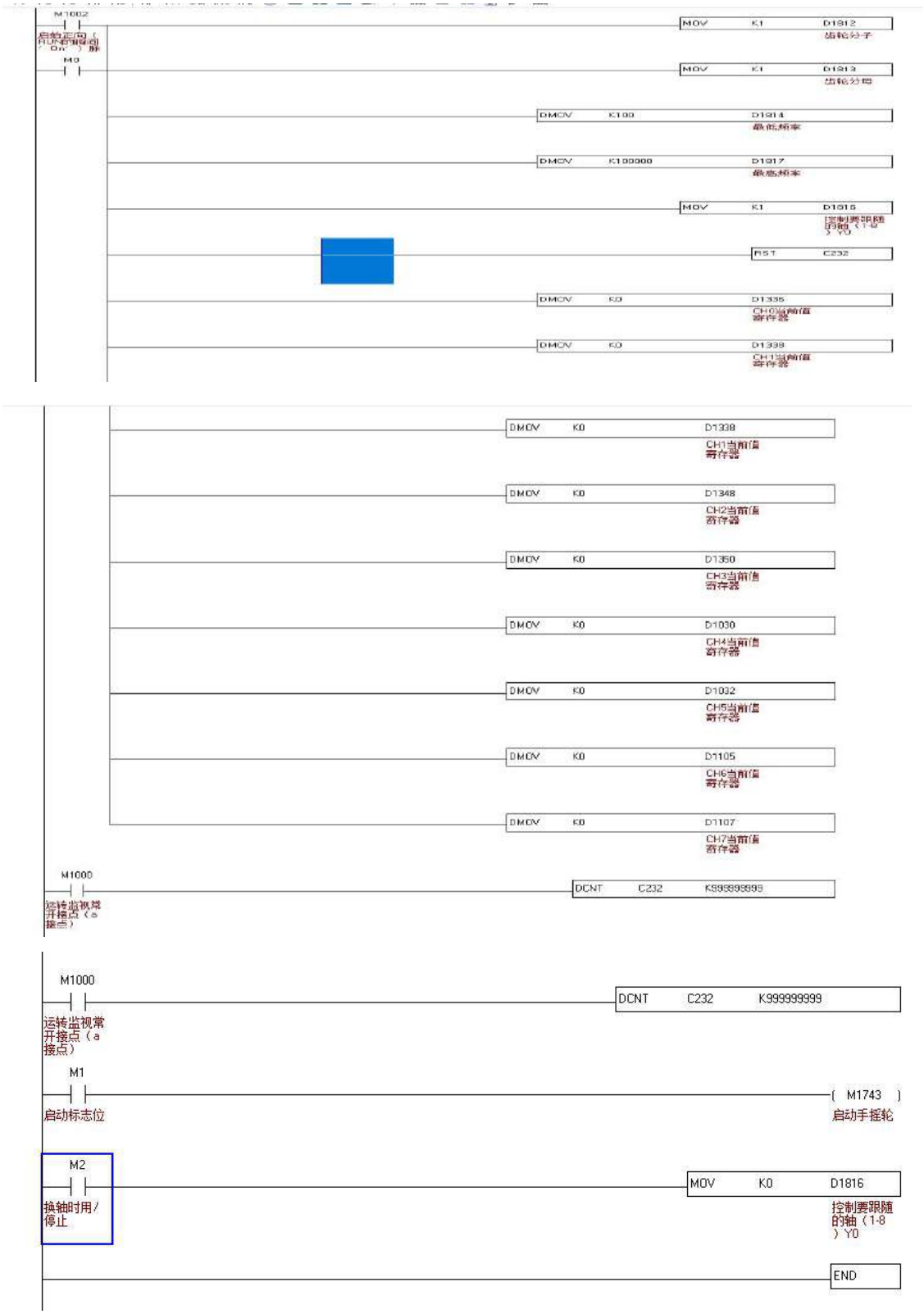
The wiring diagram of the hand crank is shown below:



The hand wheel function program is shown in the figure below:

Operation process: Initialize the handwheel parameters (M0) after power-on, set M1 to start the handwheel following, then the ports of handwheel Y0 and Y10 change with the value of C232 and the handwheel shaking speed. When the handwheel speed is lower than the lower limit speed, Y0 and Y10 output pulses at the lowest speed until the output position is equal to the C232 value, after which no output is made.

Stop handwheel process: Set M2 to clear the following axis; then set M1 to OFF to complete the handwheel stop operation.



Note: If there are any abnormalities, please refer to the following precautions and seek corresponding solutions.

1. After adjusting the gear ratio numerator and denominator (D1812/D1813), you need to first turn off M1743, then assign 0 (or a number other than 1-8) to the following axis number D1816, then change it back to the following axis number, and then restart M1743, so that the numerator and denominator can take effect, that is, it takes effect after restart, not immediately.

2. Pulse display values D1336 (Y0), D1338 (Y1), etc. cannot be cleared directly. If they are cleared directly, the follower axis will automatically and quickly return to the position recorded by C232, which may easily lead to safety accidents. Remember!!! Please follow the following steps if you need to clear them:

2.1 Turn off M1743, that is, turn off the hand crank function.

2.2 Send 0 value to D1816 to cancel axis following. The pulse display value can be cleared only after the above two steps are completed.

3. When changing the axis (changing D1816), even if M1743 is in the off state, as long as C232 has a value, the replaced axis will immediately run to the value of C232. This action poses a safety risk. When changing the axis, be sure to clear C232.

4. When K7, K8 (Y6, Y7) preset download and other axes (Y0-Y5) are changed to K7, K8 (Y6, Y7), directly start M1743, the PLC will freeze, not run, restart to recover. Solution: When changing to K7, K8 (Y6, Y7), start M1743 first, then change to K7, K8 (Y6, Y7), the PLC will not freeze

5. When M1743 is not turned off, even if the hand wheel is not working, replacing the axis at this moment will cause the direction light of the previous axis to be always on and the pulse of the next axis to be incorrect. Solution: You need to turn off M1743 before replacing the axis.

7.6 G code function introduction

Software	name	property	Object directives
D1336	X axis current position	R	
D1338	Y axis current position	R	
D1348	Z axis current position	R	
D1350	A axis current position	R	
D1030	B axis current position	R	
D1032	C axis current position	R	
D1714	P axis current position	R	
D1716	Q axis current position	R	
D1944	(32bit)=X position setting	R/W	
D1946	(32bit) = Y position setting	R/W	
D1786	(32bit) = Z position setting	R/W	
D1788	(32bit)=A position setting	R/W	
D1790	(32bit)=B position setting	R/W	
D1792	(32bit) = C position setting	R/W	
D1710	(32bit)=P position setting	R/W	
D1712	(32bit)=Q position setting	R/W	
D1718	Axis quantity setting	R/W	
D1704	G code space length setting	R/W	
D1707	IJK plane	R/W	
D1948	IOffset	R/W	
D1950	JOffset	R/W	
D1708	KOffset	R/W	
D1952	Execution frequency	R/W	
D1343	Acceleration and deceleration time setting ms	R/W	
M1555	G code start flag	R/W	M1555 ON turns off M1557,

			M1558
M1556	COM1 G code communication, transmit G code commands via RS232	R/W	
M1557	X axis completes M1557 ON	R/W	
M1558	Y axis complete M1558 ON	R/W	
G00	G00 rapid positioning (without acceleration and deceleration function) 2-axis rapid positioning		CNC Mode
G01	G01 dual-axis linear interpolation, supports acceleration and deceleration		CNC Mode
G02	G02 clockwise arc interpolation, supports acceleration and deceleration		CNC Mode
G03	G03 counterclockwise circular interpolation, supports acceleration and deceleration		CNC Mode
G04	G04 delay/100ms		D1745(16bit)=delay time/100ms Delayed completion M1555 OFF
G17	XY plane selection		When the plane is an arc operation
G18	XZ plane selection		When the plane is an arc operation
G19	YZ plane selection		When the plane is an arc operation
G22	G22 Cycle		
G25	Memory axis position coordinates		
G33	Memory X current coordinate		
G34	Memory Y current coordinate		
G35	Memory Z current coordinate		
G36	Memory A current coordinates		
G37	Memory B current coordinates		
G38	Memory C current coordinates		
G39	Memory P current coordinates		
G40	Memory Q current coordinates		
G61	Multi-axis simultaneous memory point return		
G90	Absolute value programming		
G91	Relative value programming		
G96	4-axis CNC parameter initialization		
G99	4-axis robot arm parameter initialization		
G0	Robotic arm point-to-point motion		Robotic Arm Mode
G1	Robotic arm XYZ moves in a straight line		Robotic Arm Mode
G2	Robotic arm XYZ moves in an arc		Robotic Arm Mode
G3	Robotic arm XYZ moves in reverse arc		Robotic Arm Mode

G261	X axis back to memory point		
G262	Y axis back to memory point		
G263	Z axis back to memory point		
G264	A axis back to memory point		
G265	B axis back to memory point		
G266	C axis back to memory point		
G267	P axis back to memory point		
G268	Q axis back to memory point		
G605	Jump to the specified Nth step to execute		D1745 specifies the line number
G606	Check whether the data is equal, if not, return to step 0 and execute		D1908 stores address numbers from 0 to 11999 D1745 Comparison Value
G607	D register value increases by one		D1908 stores address numbers from 0 to 11999
G608	Decrement the value of the D register by one		D1908 stores address numbers from 0 to 11999
G609	Set the D register value		D1908 stores address numbers from 0 to 11999 D1745 setting value
G610	Set I to ON to jump to the specified teaching step number		D1745 sets the jump step number
G611	Set M and O points to OFF		D1908M and O point address
G612	Set M and O points to ON		D1908M and O point address
G613	Wait for M and I points to be ON and continue scanning and checking		D1908M and I point address
G614	Wait for M and I points, and then skip after waiting for a while		D1908M and I point address, D1745 delay
G615	Initialize timing. Called before executing G04 and G614		
G616	X-axis positive motion		Combined with G632 to form joint inch movement
G617	X-axis reverse motion		Combined with G632 to form joint inch movement
G618	Y-axis positive motion		Combined with G632 to form joint inch movement
G619	Y-axis reverse motion		Combined with G632 to form joint inch movement
G620	Z-axis positive motion		Combined with G632 to form joint inch movement
G621	Z-axis reverse motion		Combined with G632 to form joint inch movement
G622	A-axis positive motion		Combined with G632 to form joint inch movement

G623	A-axis reverse motion		Combined with G632 to form joint inch movement
G624	B axis positive motion		Combined with G632 to form joint inch movement
G625	B-axis reverse motion		Combined with G632 to form joint inch movement
G626	C-axis positive motion		Combined with G632 to form joint inch movement
G627	C-axis reverse motion		Combined with G632 to form joint inch movement
G628	P axis positive motion		Combined with G632 to form joint inch movement
G629	P axis reverse motion		Combined with G632 to form joint inch movement
G630	Q axis positive motion		Combined with G632 to form joint inch movement
G631	Q-axis reverse motion		Combined with G632 to form joint inch movement
G632	All axes stop		Combine G616-G631 to form an inch
G650	Robot arm X linear motion +		Combined with G632 to form coordinate jog
G651	Robot arm X linear inch motion-		Combined with G632 to form coordinate jog
G652	Robot arm Y linear inch motion+		Combined with G632 to form coordinate jog
G653	Robot arm Y linear inch motion		Combined with G632 to form coordinate jog
G654	Robotic arm Z linear inch motion+		Combined with G632 to form coordinate jog
G655	Robotic arm Z linear inch motion		Combined with G632 to form coordinate jog
G656	Robotic arm A linear inch motion		Combined with G632 to form coordinate jog
G657	Robotic arm A linear inch motion		Combined with G632 to form coordinate jog
G985	Axis emergency stop		
G1000	The M code number is stored in D1746, which represents the M function code (this M code is the same as the CNC and also requires ladder diagram editing. The M code number corresponds to the PLC internal subroutine. A subroutine must be written to use the M code. Note: Unedited subroutine numbers cannot be called . After the M code function ends,		

	M1557M1558 must be turned on to ensure that the G code program continues to execute).

7.7 CNC function description

Using Coolmay 's PLC to develop CNC equipment controllers, you can use the human-machine interface to make a G code editor and interconnect with the PLC to form a CNC system, or you can develop PC host software to make a human-machine interface and a G code editor. Because VB.net is more convenient and flexible to develop a host computer, the software can be run on a single-board computer with a Windows system.

This PLC supports 4-axis G code (linked interpolation supports 8 axes). As long as the G code or coordinates are written, each axis (XYZA) will directly perform interpolation movement. The interpolation algorithm uses a high-precision and fast calculation method with good anti-aliasing effect.

G codes are case-sensitive. Uppercase characters are actual parameter values. Lowercase characters are the specified PLC internal register numbers (D registers). 7.6 Introduction to G code functions .

7.7.1 Introduction to soft component functions

Software	name	property	Object directives
D1938	The first physical mechanical parameter area maps the first address. 2000 default value (starting from D2000)	R/W	
D1939	The first address of the second physical mechanical parameter area mapping. 2050 default value (starting from D2050)	R/W	
D1938+0	X-axis motor pulses per revolution	R/W	
D1938+2	Speed ratio of X-axis reducer	R/W	
D1938+4	The length of the X-axis screw guide or synchronous wheel around the circle, in mm	R/W	
D1938+6	Y-axis motor pulses per revolution	R/W	
D1938+8	Y-axis equipped with reducer speed ratio	R/W	
D1938+10	The length of the Y-axis screw guide or synchronous wheel around one circle, in mm	R/W	
D1938+12	Z-axis motor pulses per revolution	R/W	
D1938+14	Z axis equipped with reducer speed ratio	R/W	
D1938+16	The length of the Z-axis screw guide or synchronous wheel around the circle, in mm	R/W	
D1938+18	A-axis motor pulses per revolution	R/W	
D1938+20	A-axis equipped with reducer speed ratio	R/W	
D1938+22	The length of the A-axis screw guide or synchronous wheel around the circle, in mm	R/W	
D1938+34	Number of recorded coordinate points (set points are saved during manual teaching and automatically incremented)	R/W	
D1938+35	Modify a step of the trial teaching	R/W	
D1938+37	Current path number (trial teaching run)	R/W	
D1938+38	**200. Fast movement**	R/W	

Write the axis 0 position (unit: mm) to (1939)+0)
Write the axis 1 position (in mm) to (1939)+2).
.
.
.
Write the axis 8 position (unit: mm) to (1939)+14) and quickly move to the specified position and stop.

201.Linear interpolation

Write the axis X position (unit: mm) to (1939)+0)
Write the axis Y position (in mm) to (1939)+2).
.
.
.
Write the axis Q position (unit: mm) into (1939)+14) and perform linear interpolation to the specified position, then stop.

202.Clockwise circular interpolation

Write the axis X position (unit: mm) to (1939)+0)
Write the axis Y position (in mm) to (1939)+2).
.
.
.
Write the axis Q position (unit: mm) to (1939)+14)
XY circular interpolation to the specified position (the plane can be pre-set) ZABCPQ coordinated interpolation to the specified position, stop

20 3. Reverse circular interpolation

Write the axis X position (unit: mm) to (1939)+0)
Write the axis Y position (in mm) to (1939)+2).
.
.
.
Write the axis Q position (unit: mm) to (1939)+14)
XY reverse arc interpolation to the specified position (the plane can be pre-set) ZABCPQ coordinated interpolation to the specified position, stop

8. Alarm clear

1. Erase point record D1938+34 clear 0
   D1938+35 clear 0
   D1938+36 clear 0
   D1938+37 clear 0
   D1938+38 clear 0
   Stop after function execution.
2. No effect
3. Point record storage
   Specify register data G code
   Gcode/XYZABCPQ/IJK/Space

	plane/F/Acceleration/Deceleration/IO/Delay/ D1939+30 write (D1938+220) offset (D1938+34) After the function is executed, the step number automatically increments and stops after the offset. 4. Modify a certain step of the trial teaching Specify register data G code After adjusting the offset (D1938+34), execute function 3 (point record storage) Stop after function execution. 5. One-step verification Specify register data G code Set the step number (D1938+35) to execute the G code movement. Stop after the function is executed. 6.M1673 ON executes a single cycle of the trial teaching path Specify register data G code (D1938+37) equals (D1938+34) stop Each time a line is executed (D1938+37), it increases incrementally. Stop after all G codes are executed once 7. M1673 ON executes the trial teaching path in an infinite loop Specify register data G code 9. M1673 ON executes CNC single-step G code (PLC register) String type G code Set the step number (D1938+35) to execute the G code movement. Stop after the function is executed. 10.M1673 ON executes CNC file path single cycle (PLC register) String type G code (D1938+37) equals (D1938+34) stop Each time a line is executed (D1938+37), it increases incrementally. Stop after all G codes are executed once 11. M1673 ON executes the CNC file path continuous loop execution mode as string (PLC register) String type G code 12. ROM area memory single step G code (32K word space) String type G code Set the step number (D1938+35) to execute the G code movement. Stop after the function is executed. 13. ROM area memory M1673ON executes CNC path single cycle (32K word space) String type G code (D1938+37) equals (D1938+34) stop Each time a line is executed (D1938+37), it		

	increases incrementally. Stop after all G codes are executed once 14. ROM area memory M1673 ON executes CNC path continuous cycle (32K word space) String type G code 15. ROM area memory displays G code instructions (32K word space) 101. Pause 102. Continue		
D1938+39	CNC cycle counter	R/W	
D1939+0	Set the X-axis coordinate	R/W	
D1939+2	Set the Y axis coordinate	R/W	
D1939+4	Set the Z axis coordinate	R/W	
D1939+6	Set the A-axis coordinates	R/W	
D1939+8	Set the B axis coordinates	R/W	
D1939+10	Set the C-axis coordinates	R/W	
D1939+12	Set the P axis coordinates	R/W	
D1939+14	Set the Q axis coordinate	R/W	
D1939+16	I coordinate vector	R/W	In radius mode, this register is set to R
D1939+18	J coordinate vector	R/W	
D1939+20	K coordinate vector	R/W	
D1939+30	X back-calculation interpolation coordinates	R/W	
D1939+32	Y reverse interpolation coordinates	R/W	
D1939+34	Z back-calculation interpolation coordinates	R/W	
D1939+36	A Back-calculation interpolation coordinates	R/W	
D1939+46	Set the positive limit of the X-axis coordinate	R/W	
D1939+48	Set the inverse limit of the X-axis coordinate	R/W	
D1939+50	Set the positive limit of the Y axis coordinate	R/W	
D1939+52	Set the Y-axis coordinate inverse limit	R/W	
D1939+54	Set the positive limit of the Z axis coordinate	R/W	
D1939+56	Set the Z-axis coordinate inverse limit	R/W	
D1939+58	Set the positive limit of the A-axis coordinate	R/W	
D1939+60	Set the A-axis coordinate inverse limit	R/W	
D1938+220	The parameter of the trial teaching section D1938 + 220 = D2220 starts (recorded G commands and coordinate parameters)	R/W	
D1705	Speed Percent	R/W	
D1706	Alarm data information (8-axis over-limit alarm flag) Bit0=ON axis 0 positive limit exceeded Bit1=ON axis 0 negative limit exceeded Bit2 = ON axis 1 positive limit Bit3 = ON axis 1 negative limit Bit4=ON axis 2 positive limit exceeded	R/W	D1938+38 write 8 to clear the alarm and then write 0 (not

	Bit5=ON axis 3 negative limit Bit6 = ON axis 4 positive limit Bit7=ON axis 4 negative limit Bit8=ON axis 5 positive limit exceeded Bit9=ON axis 5 negative limit Bit10=ON axis 6 positive limit exceeded Bit11=ON axis 6 negative limit exceeded Bit12 = ON axis 7 positive limit exceeded Bit13 = ON axis 7 negative limit Bit14 = ON axis 8 positive limit Bit15 = ON axis 8 negative limit		clearing alarms)
M1555	G96 CNC parameter configuration calculation	R/W	
M1557	Action completed sign	R	
M1668	CNC coordinate system display	R/W	
M1673	Perform a trial programming test	R/W	
M1675	Inverse coordinate system	R/W	
M1676	ON prohibits the G buffer area command address from increasing. OFF allows the increase.	R/W	ON prohibits D1938+37 from increasing during automatic execution
M1677	ON indicates that the host computer allows the next G code to be sent to the buffer.	R/W	After the host computer sends the G code, it is set to OFF
M1742	CNC function start ON start OFF close	R/W	CNC functions can only be executed after it is turned on

7.7.2 Function Introduction

Use the "touch screen" to set the CNC functions and trial teaching of the PLC.

Step 1: Import the G code file from the USB flash drive to the HMI device

G code files can be generated from CAD drawing software or edited through CAXA programming assistant. The exported G code files can be copied to a USB drive and inserted into the HMI.

Note: 1. The CNC file must be placed in the root directory of the USB disk, otherwise the file

cannot be recognized;

2. The USB disk and HMI USB interface cannot be used at the same time, otherwise the USB disk cannot be recognized;

3. HMI only supports USB flash drives with a transmission rate of 2.0

Restart the HMI, and after the startup program starts, "click the screen continuously" to enter the touch screen parameter setting screen, where you can set network parameters, time, backlight brightness, volume, update and delete project files, update lower computer programs and PLC programs, and import CNC programs.

In the system parameter setting interface:

- Click the "CNC Program Import" option, expand the file display list on the left, and select the file to be imported.
- Click "Import" in the lower right corner, and it will display "Program import completed, please restart HMI". Click "OK" to complete the CNC file import.

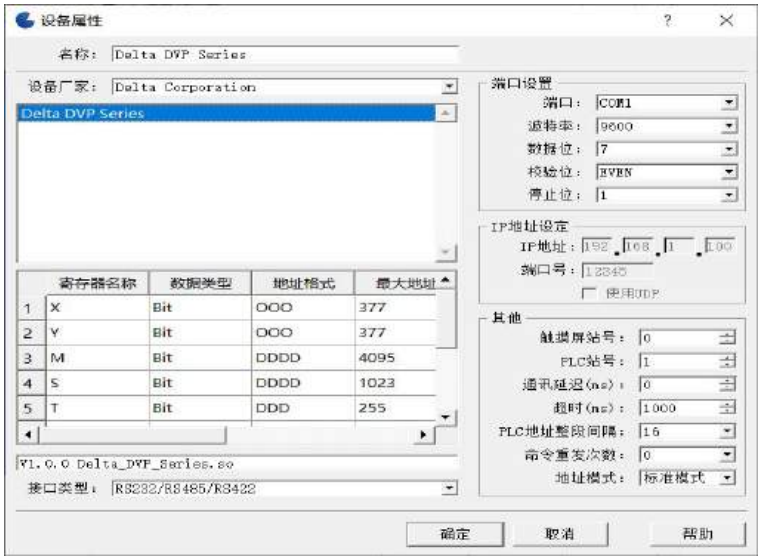
Step 2: HMI imports G code to M300

The LB9210 system register is used as the CNC control screen. Use the bit state switch to turn on the register to expand the CNC list in the HMI interface:

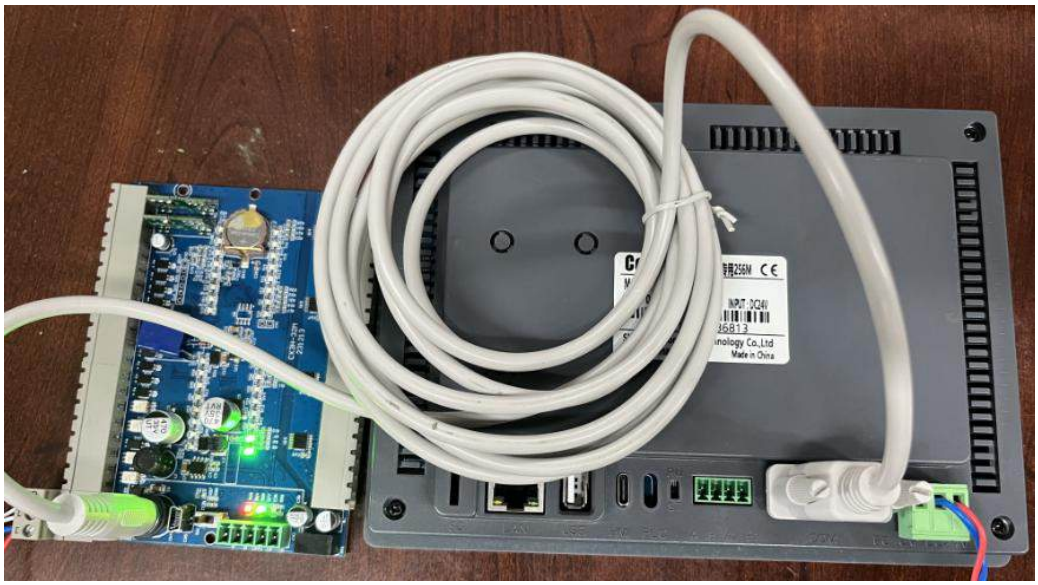
- In the startup system parameter setting interface, the CNC project file imported from the USB flash drive is stored in the local location. Select the CNC file and click "Download" to import it into the M300. In PLC;

- You can also directly save the CNC file in the root directory of the USB drive and insert the USB drive into the HMI USB port, enter the CNC list, the storage location is displayed as: U disk, select the CNC file, click "Download" to download it and import it into M300 In PLC;

- HMI The configuration project needs to add the " Delta DVP Series " device protocol and the port setting is: COM1/9600/7/E/1.



- M300 PLC and HMI are connected using DB9-round hole 9-pin communication cable. Expand the CNC list interface, "Select CNC file", click "Download", and wait for the progress bar to complete. HMI imports G code to M300 PLC .



All operations are to write the corresponding function code to the PLC internal register. For details, see the register table and G code.

Part 8 Coolmay M300 Series PLC Communication User Manual

The M300 series PLCs are equipped with a programming port (RS232), two RS485 ports , a CAN port, and a network port to meet the needs of users to connect to several types of devices.

8.1 MODBUS instruction explanation and communication address

When PLC is used as the host, it supports MODRW instruction, MODRD instruction, and MODWR instruction. This section explains these three instructions.

8.1.1Read / write data instruction function and action description

Modbus data reading:

MODRD	S1	S2	n

S 1 indicates the station number of the slave device being read, ranging from K0 to K254 ;

S2 indicates the target address of the data to be read . If the address is illegal for the designated slave , the slave will respond with an error message **,** and the PLC will store the error code in D1130, and M1141 will be set to On. ;

n represents the number of registers read, ranging from 1 to 15 (please use the MODRW instruction if more than 15 are read) . The read data is saved in the host **D1070-D1085 in sequence** . (If the received data is read in ASCII mode, it is converted to HEX and saved in **D1296~D1311**)

Modbus data writing:

MODWR	S1	S2	n

S1 indicates the station number of the slave device being written, ranging from K0 to K254 .

S2 indicates the address to write data. If the address is illegal for the designated slave , an error message will be responded **, the error code will be stored in D1130, and M1141** will be set to On.

n represents the number of registers to be written, range 1 (please use MODRW instruction if it exceeds) .

8.1.2 MODRW instruction function and action description

following functions of MODBUS RTU :

H02: Read multiple bit devices
H03: Read multiple characters (Word) device
H04: Read multiple word devices (for read-only components)
H05: Single bit device status write
H06: Single character (Word) device data writing
H0F: Multiple bit device status write
H10: Write multiple character (Word) device data
H17: Read/write multiple character (Word) device data

Modbus data

MOD RW	S1	S2	S3	S	n

reading and writing:

S1 indicates the station number of the slave device to be read or written , ranging from K0 to K254 . (Function codes K2, K3, K4 and K23 cannot specify the address as K0.)

S2 indicates the function code. (i.e. K2 (H02), K3 (H03), K4 (H04), K5 (H05), K6 (H06), K15 (H0F), K16 (H10), K23 (H17))

S3 indicates the address for reading and writing data. The internal device address of the online device. If the address is illegal for the specified device, the online device will respond with an error message, the PLC will store the error code, and the error flag will be On. When using function code H17, S3 can only use the D device, and define S3 as the address for reading data, and S3+1 as the address for writing data ;

S represents the data to be read or written. The user sets the register and stores the data of the length to be written into the register in advance or stores the register after the data is read. When the function code K23 (H17) is used, S is the index of the D device element stored after the data is read, and S+1 is the index of the D device element storing the written data.

n represents the length of the read/write data. (In MODBUS function code H05, it is the forced ON/OFF state, n=0 represents Off, n=1 represents On).

the S3, S, n operands are as follows according to different function codes:

Function code	S3	S	n
H02	to read the data from	The data to be read is stored in the register	Read data length()
H03	to read the data from	The data to be read is stored in the register	Read data length
H04	to read the data from	The data to be read is stored in the register	Read data length
H05	The address to which the data is to be written	Meaningless	Write status value
H06	The address to which the data is to be written	The data to be written is stored in the register	Meaningless
H0F	The address to which the data is to be written	The data to be written is stored in the register	Write data length
H10	The address to which the data is to be written	The data to be written is stored in the register	Write data length
H17	**S3:** Address of the data to be read **S3+1:** Address where data is to be written	**S:** The address of the data to be read **S+1:** Address where data is to be written	**n:** read data length **n+1:** length of data to be written

8.1.3 Soft component communication address number

Device	scope	category	Correspondence address (Hex)	Modbus communication address (Dec)
S	0~255	Bit	0~FF	1~256
S	256~511	Bit	100~1FF	257~512
S	512~767	Bit	200~2FF	513~768
S	768~1023	Bit	300~3FF	769~1024
X	0~377	Bit	400~4FF	1025~1280
Y	0~377	Bit	500~5FF	1281~1536
T	0~255	Bit	600~6FF	1537~1792
		Word	600~6FF	1537~1792
M	0~255	Bit	800~8FF	2049~2304
M	256~511	Bit	900~9FF	2305~2560
M	512~767	Bit	A00~AFF	2561~2816
M	768~1023	Bit	B00~BFF	2817~3072
M	1024~1279	Bit	C00~CFF	3073~3328
M	1280~1535	Bit	D00~DFF	3329~3584
M	1536~1791	Bit	B000~B0FF	45057~45312
M	1792~2047	Bit	B100~B1FF	45313~45568
M	2048~2303	Bit	B200~B2FF	45569~45824
M	2304~2559	Bit	B300~B3FF	45825~46080
M	2560~2815	Bit	B400~B4FF	46081~46336
M	2816~3071	Bit	B500~B5FF	46337~46592
M	3072~3327	Bit	B600~B6FF	46593~46848
M	3328~3583	Bit	B700~B7FF	46849~47104
M	3589~3839	Bit	B800~B8FF	47105~47360
M	3840~4095	Bit	B900~B9FF	47361~47616
C	0~199（16 Bit）	Bit	E00~EC7	3585~3784
		Word	E00~EC7	3585~3784
	200~255 (32 Bit)	Bit	EC8~EFF	3785~3840
		Dword	700~76F	3785~3840
D	0~4095	Word	1000~1FFF	4097~8192
D	4096~11999	Word	9000~AEDF	36865~444750

8. 2 Serial port 1: RS232 (corresponding to system COM1)

Support Delta DVP programming port protocol, free port protocol and MODBUS RTU/ASCII protocol;

The special relays and special registers involved in this serial port are as follows:

action	Serial port 1	Serial Port 2	Serial port 3	Functional Description
Protocol Settings	M1138	M1120	M1136	Communication settings hold
	M1139	M1320	M1143	ASCII/RTU mode selection ; on-bit

				RTU mode
	D1036	D1120	D1109	Communication Protocol
	D1121	D1121	D1255	PLC communication address (When acting as a host, this value must be set to the maximum value of K255)
Communication interval	D1038	D1038	D1038	RTU communication interval, generally set to 30ms
Send Request	M1312	M1316	M1122	Communication command sending request sending flag
	D1249	D1252	D1129	Communication timeout abnormal time , time definition (ms)
Received	M1314	M1318	M1124	Communication command data reception completed flag
error message	M1025	M1025	M1025	Communication command data receiving error flag
	D1025	D1025	D1025	Communication error code
	-	M1129	-	Receive timeout
	-	M1140	-	Communication command data receiving error
	-	M1141	-	The exception code is stored in D1130
	-	D1130	-	MODBUS return error code record
Data bit switching	M1161	M1161	M1161	8-bit/16-bit mode distinction flag; 8-bit when on

When acting as a master station, the receiving data address range is D0-D6000

In RS485 mode, there is no response to the broadcast address. Station number 0 is the broadcast function. PLC does not receive the return value. The station number range is 0 to 254. When the slave address is smaller than the master address, the master can receive data correctly.

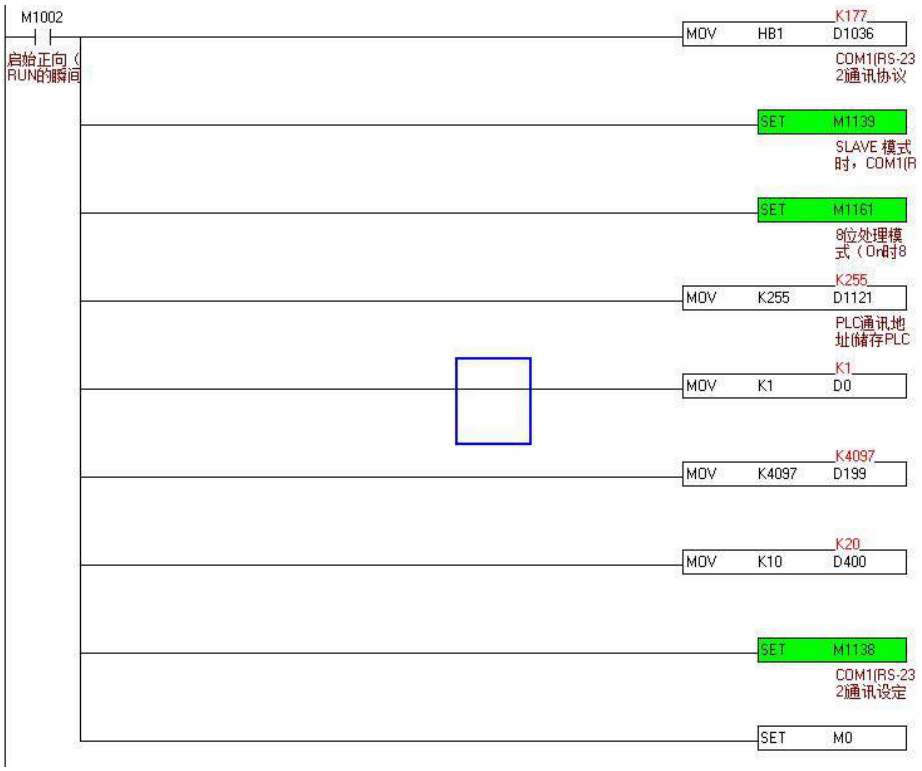
D1 036 parameter setting

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

b0	Data length 0: 7 bits 1: 8 bits
b1 b2	Parity(b2,b1) 00: None; 01: Odd; 11: Even
b3	Stop bits 0: 1 position 1: 2 positions

b4 b5 b6 b7	Baud rate (b7,b6,b5,b4) (0001):110bps (0010):150bps (0011):300bps (0100):600bps (0101):1200bps (0110):2400bps (0111):4800bps (1000):9600bps (1001):19200bps (1010):38400bps (1011):57600bps (1101):115200bps (1101):500000bps (1110):31250bps (1111):921000bps
b8 b9 b10 b11	Setting 0
b12	Setting 0
b13	Setup 1
b14	Setup 1
b15	Setting 0

8.2.1 Serial port 1 Modbus RTU master communication program configuration



Note: The target station address must not be higher than the host station address, otherwise the communication will be abnormal.

8.2.2 Serial port 1 MODRD (Modbus data read) program

MODRD D0 D199 D400

D0: Read the target station address

D199: Read target address

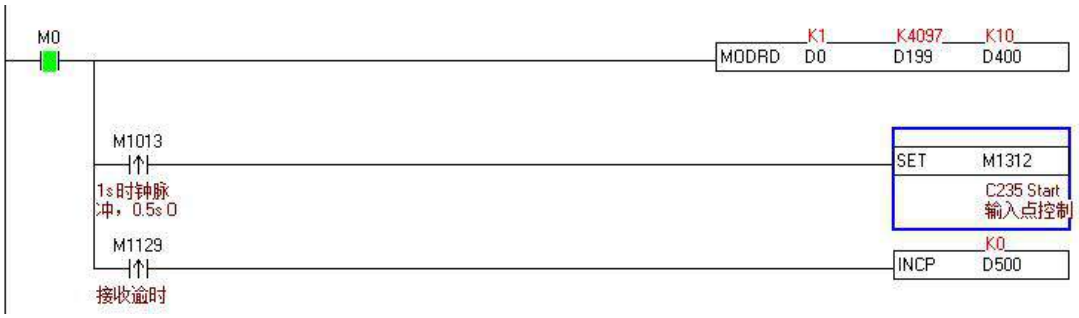
D400: Read the number

Note: A maximum of 15 words can be read. If the limit is exceeded, please use the MODRW

instruction.

The received data is converted to HEX and saved in D1070-D1085

If the received data is read in ASCII mode, it is converted to HEX and stored in **D1296~D1311**



Send: 01 03 10 00 00 0A C1 0D

Receive: 01 03 16 00 01 00 02 00 03 00 04 00 05 00 06 00 07 00 08 00 09 00 0A AC F4

The received data is converted into HEX and saved in D1070-D1085

装置名称	批注	状态	设置值	当前值（16bits）
D1070	Modbus通讯指令数据处理，PLC内建RS-485通讯			K769
D1071	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1044
D1072	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1101
D1073	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1101
D1074	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1075	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1076	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1077	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1078	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1079	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1080	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1081	Modbus通讯指令数据处理，PLC内建RS-485通讯			K-28338
D1082	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0
D1083	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0
D1084	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0
D1085	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0

The data received in ASCII mode is converted to HEX and saved in D1296-D1312

D1296	K1641	有号10进制
D1297	K1641	有号10进制
D1298	K1641	有号10进制
D1299	K1641	有号10进制
D1300	K1641	有号10进制
D1301	K1641	有号10进制
D1302	K1641	有号10进制
D1303	K1641	有号10进制
D1304	K1641	有号10进制
D1305	K1641	有号10进制
D1306	K1641	有号10进制
D1307	K1641	有号10进制
D1308	K1641	有号10进制
D1309	K1641	有号10进制
D1310	K1641	有号10进制

Note: If the MODRD received data exceeds the storage data range (D1070-D1085, D1296-D1312), it will not be stored in the corresponding memory and the received data will be lost. If the length is too long, please use MODRW to read.

D1296-D1312 PLC has built-in RS-485 communication convenient instruction MODRW. The system will automatically convert the ASCII character data of the register content specified by the user to HEX and store it in D1296~D1311 (RTU mode does not require conversion).

8.2.3 Serial port 1 MODWR (Modbus data write) program

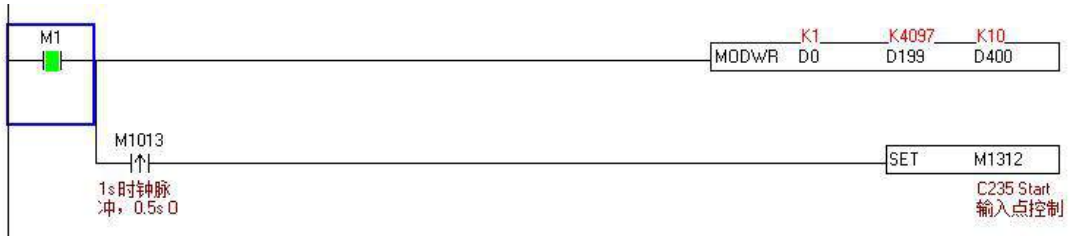
MODWR D0 D199 D400

D0: Station address

D199: Write to the target address

D400: Write value

Note: Only 1 word can be written. If it exceeds the limit, please use the MODRW instruction.



Send: 01 06 10 00 00 0A 0D 0D

Receive: 01 06 10 00 00 0A 0D 0D

8.2.4 Serial port 1 MODRW (Modbus data read and write) program

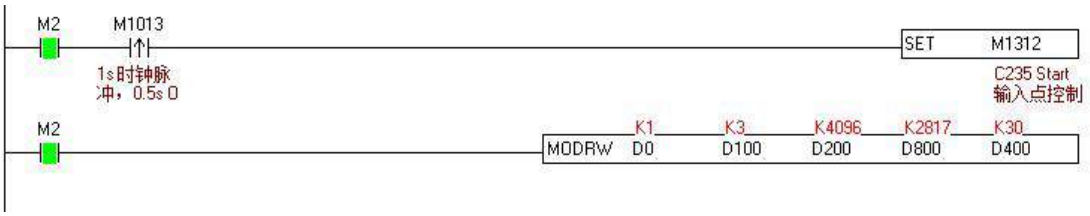
MODRW D0 D100 D200 D800 D400

D0: Station address

D100: Function code

D200: Target address
D800: The first address for storing the sent (received) data
D400: Length of data sent (received)

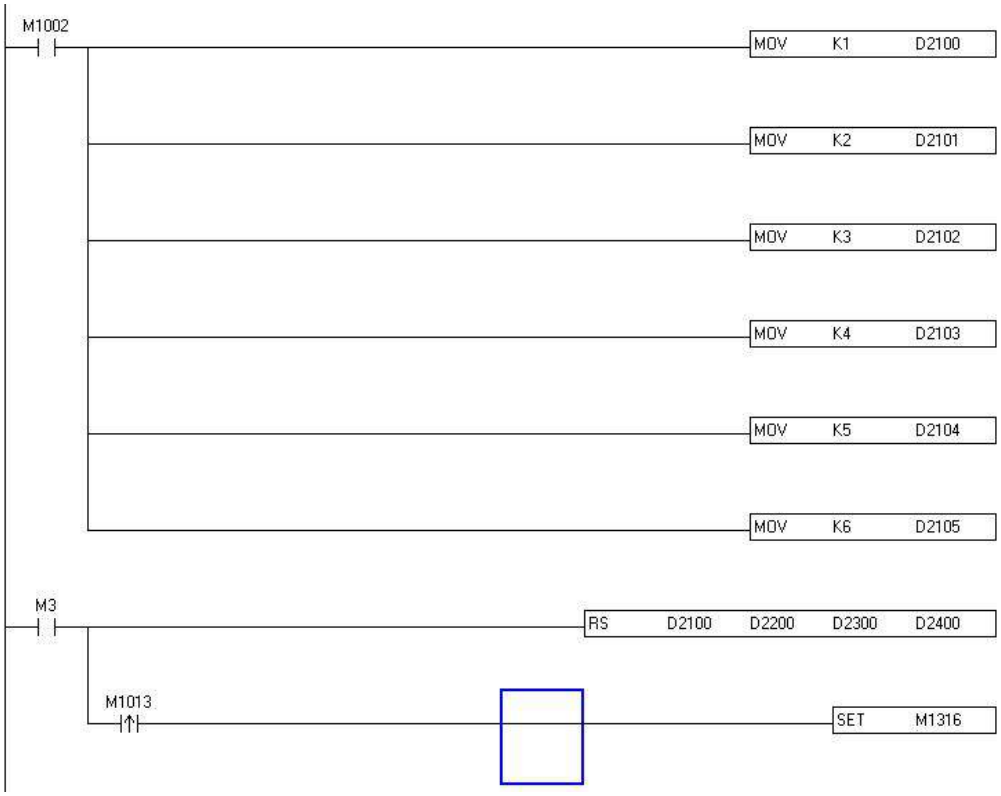
Communication function code
H02: Read multiple bit devices
H03: Read multiple characters (Word) device
H04: Read multiple characters (Word) device
H05: Single bit device status write
H06: Single character (Word) device data writing
H0F: Multiple bit device status write
H10: Write multiple character (Word) device data
H17: Read and write multiple character (Word) device data



Send: 01 03 10 00 00 1E C1 02
Receive: 01 03 3C 00 01 00 02 00 03 00 04 00 05 00 06 00 07 00 08 00 09 00 0A 00 0B 00 0C 00 0D 00 0E 00 0F 00 10 00 11 00 12 00 13 00 14 00 15 00 16 00 17 00 18 00 19 00 1A 00 1B 00 1C 00 1D 00 1E A8 F4

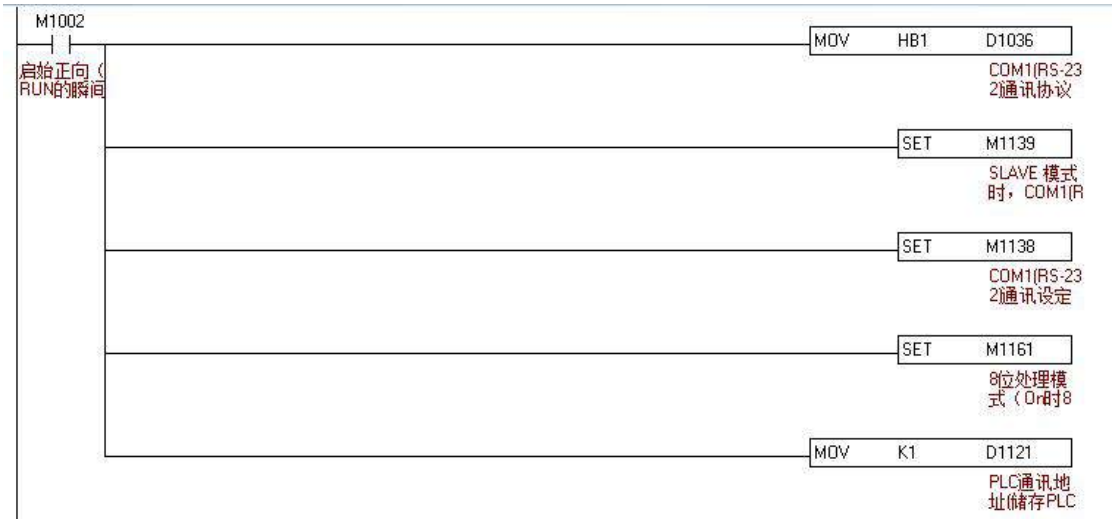
8.2.5 Serial port 1 RS (free protocol read and write) program

RS D2100 D2200 D2300 D2400
D2100: Starting position of data transmission
D2200: Number of data transmitted
D2300: Starting position of received data
D2400: Number of received data



Date: 01 02 03 04 05 06

8.2.6 Serial port 1 slave program configuration



8. 3Serial port 2: RS485 (A 1 B 1) (corresponding to system COM2)

Support Delta DVP programming port protocol, free port protocol and MODBUS RTU/ASCII protocol;

The special relays and special registers involved in this serial port are as follows:

action	Serial port 1	Serial Port 2	Serial port 3	Functional Description
Protocol Settings	M1138	M1120	M1136	Communication settings hold
	M1139	M1320	M1143	ASCII/RTU mode selection ; on-bit RTU mode
	D1036	D1120	D1109	Communication Protocol
	D1121	D1121	D1255	PLC communication address (When acting as a host, this value must be set to the maximum value of K255)
Communication interval	D1038	D1038	D1038	RTU communication interval, generally set to 30ms
Send Request	M1312	M1316	M1122	Communication command sending request sending flag
	D1249	D1252	D1129	Communication timeout abnormal time , time definition (ms)
Received	M1314	M1318	M1124	Communication command data reception completed flag
error message	M1025	M1025	M1025	Communication command data receiving error flag
	D1025	D1025	D1025	Communication error code
	-	M1129	-	Receive timeout
	-	M1140	-	Communication command data receiving error
	-	M1141	-	The exception code is stored in D1130
	-	D1130	-	MODBUS return error code record
Data bit switching	M1161	M1161	M1161	8-bit/16-bit mode distinction flag; 8-bit when on

When acting as a master station, the receiving data address range is D0-D6000

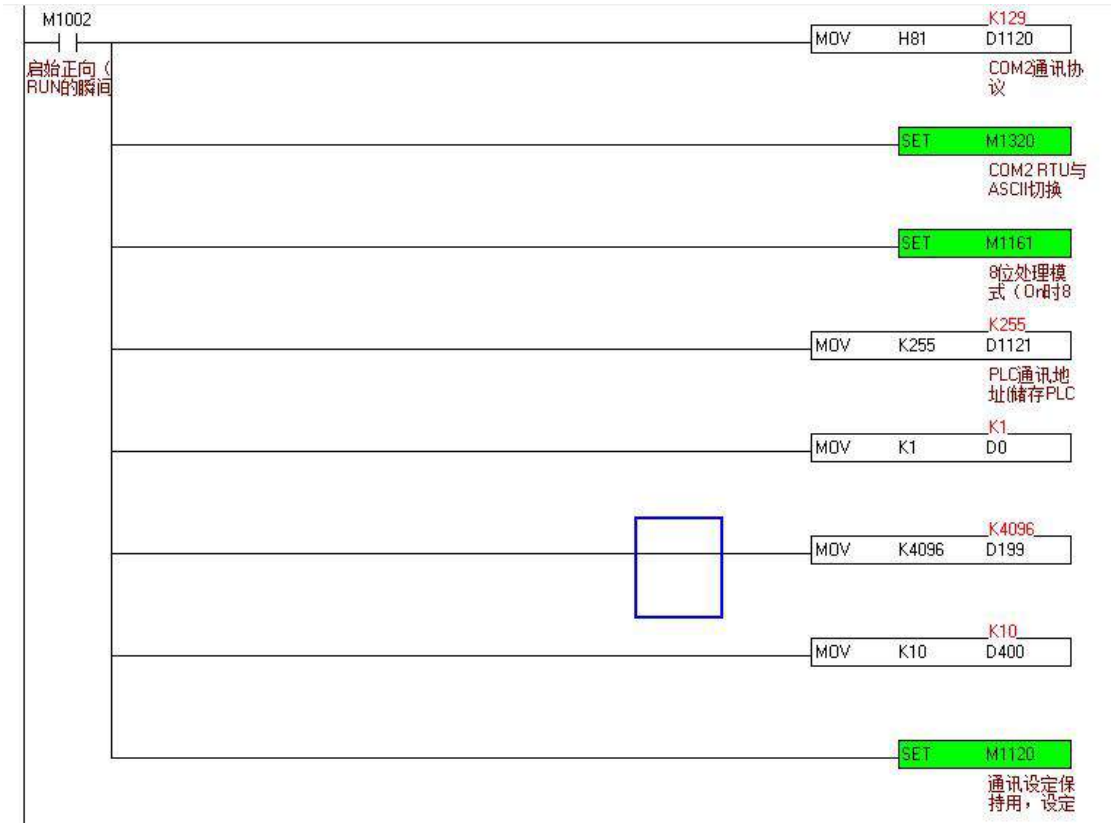
In RS485 mode, there is no response to the broadcast address. Station number 0 is the broadcast function. PLC does not receive the return value. The station number range is 0 to 254. When the slave address is smaller than the master address, the master can receive data correctly.

D1 120 parameter setting

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

b0	Data length 0: 7 bits 1: 8 bits
b1 b2	Parity(b2,b1) 00: None; 01: Odd; 11: Even
b3	Stop bits 0: 1 position 1: 2 positions
b4 b5 b6 b7	Baud rate (b7,b6,b5,b4) (0001):110bps (0010):150bps (0011):300bps (0100):600bps (0101):1200bps (0110):2400bps (0111):4800bps (1000):9600bps (1001):19200bps (1010):38400bps (1011):57600bps (1101):115200bps (1101):500000bps (1110):31250bps (1111):921000bps
b8 b9 b10 b11	Setting 0
b12	Setting 0
b13	Setup 1
b14	Setup 1
b15	Setting 0

8.3.1 Serial port 2 Modbus RTU master communication program configuration



Note: The target station address must not be higher than the host station address, otherwise the communication will be abnormal.

8.3.2 Serial port 2 MODRD (Modbus data reading) program

MODRD D0 D199 D400

D0: Read the target station address

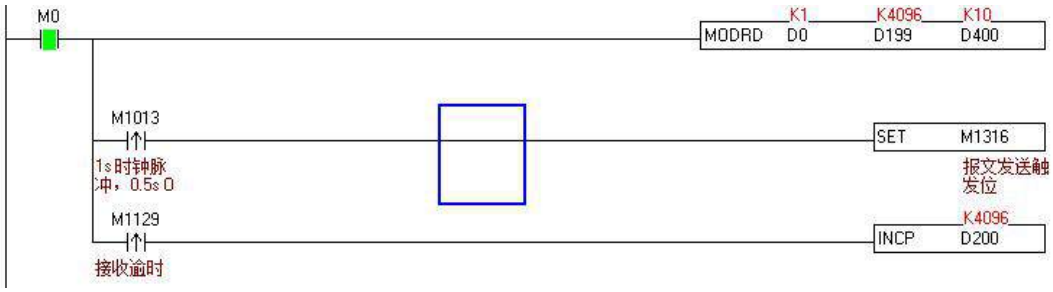
D199: Read target address

D400: Read the number

Note: A maximum of 15 words can be read. If the limit is exceeded, please use the MODRW instruction.

The received data is converted to HEX and saved in D1070-D1085

If the received data is read in ASCII mode, it is converted to HEX and stored in **D1296~D1311**



Send: 01 03 10 00 00 0A C1 0D

Receive: 01 03 16 00 01 00 02 00 03 00 04 00 05 00 06 00 07 00 08 00 09 00 0A AC F4

The received data is converted to HEX and saved in D1070-D1085

装置名称	批注	状态	设置值	当前值 (16bits)
D1070	Modbus通讯指令数据处理，PLC内建RS-485通讯			K769
D1071	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1044
D1072	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1101
D1073	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1101
D1074	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1075	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1076	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1077	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1078	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1079	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1080	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1081	Modbus通讯指令数据处理，PLC内建RS-485通讯			K-28338
D1082	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0
D1083	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0
D1084	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0
D1085	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0

The received data is finally converted into HEX and saved in D1296-D1312

D1296	K1641	有号10进制
D1297	K1641	有号10进制
D1298	K1641	有号10进制
D1299	K1641	有号10进制
D1300	K1641	有号10进制
D1301	K1641	有号10进制
D1302	K1641	有号10进制
D1303	K1641	有号10进制
D1304	K1641	有号10进制
D1305	K1641	有号10进制
D1306	K1641	有号10进制
D1307	K1641	有号10进制
D1308	K1641	有号10进制
D1309	K1641	有号10进制
D1310	K1641	有号10进制

Note: If the MODRD received data exceeds the storage data range (D1070-D1085, D1296-D1312), it will not be stored in the corresponding memory and the received data will be lost. If the length is too long, please use MODRW to read.

D1296 -D1312 PLC has built-in RS-485 communication convenient instruction MODRW. The system will automatically convert the ASCII character data of the register content specified by the user to HEX and store it in D1296~D1311 (RTU mode does not require conversion).

8.3.3 Serial port 2 MODWR (Modbus data write) program

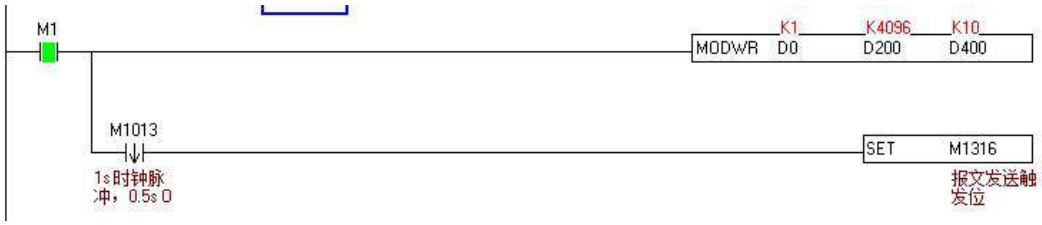
MODWR D0 D200 D400

D0: Station address

D200: Write to the target address

D400: Write value

Note: Only 1 word can be written. If it exceeds the limit, please use the MODRW instruction.



Send: 01 06 10 00 00 0A 0D 0D

Receive: 01 06 10 00 00 0A 0D 0D

8.3.4 Serial port 2 MODRW (Modbus data read and write) program

MODRW D0 D100 D200 D800 D400

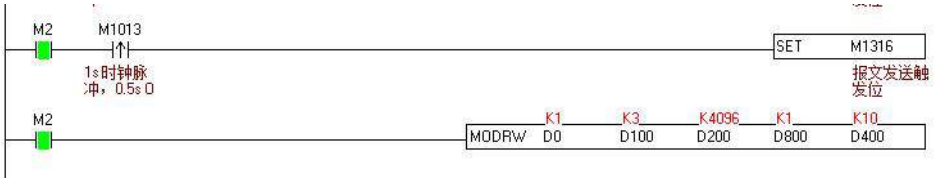
D0: Station address

D100: Function code

D200: Target address

D800: The first address for storing the sent (received) data
D400: Length of data sent (received)

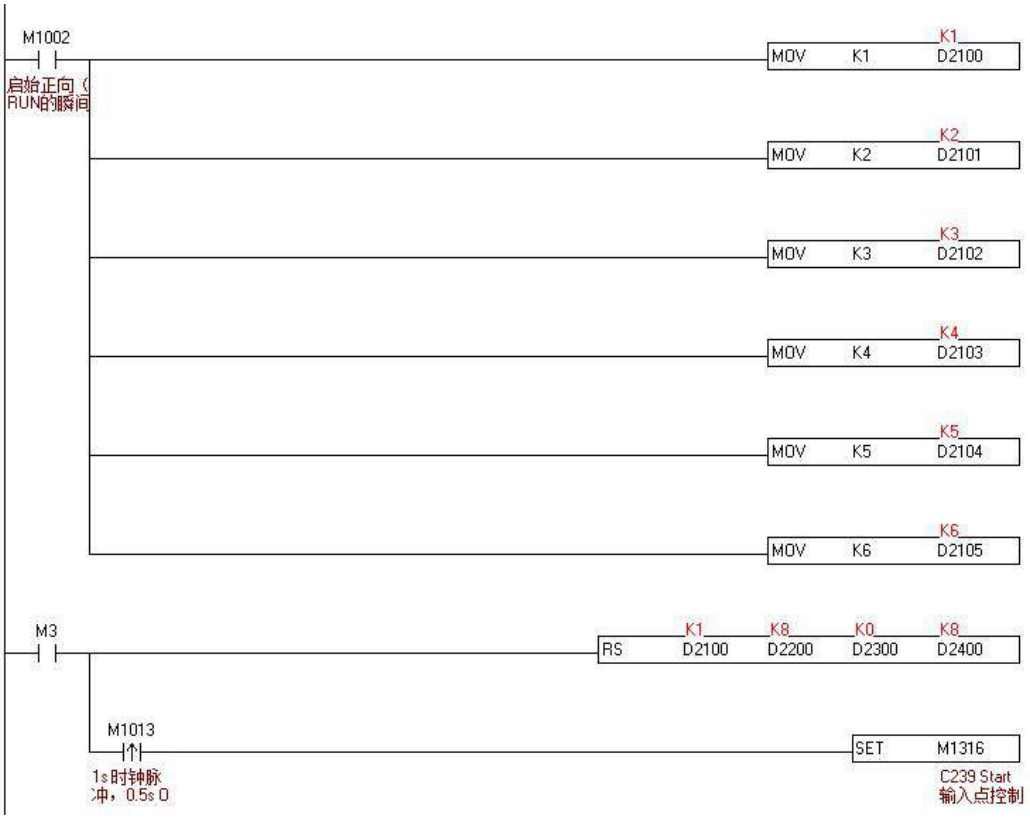
Communication function code
H02: Read multiple bit devices
H03: Read multiple characters (Word) device
H04: Read multiple characters (Word) device
H05: Single bit device status write
H06: Single character (Word) device data writing
H0F: Multiple bit device status write
H10: Write multiple character (Word) device data
H17: Read and write multiple character (Word) device data



Send: 01 03 10 00 00 0A C1 0 D
Receive: 01 03 16 00 01 00 02 00 03 00 04 00 05 00 06 00 07 00 08 00 09 00 0A AC F4

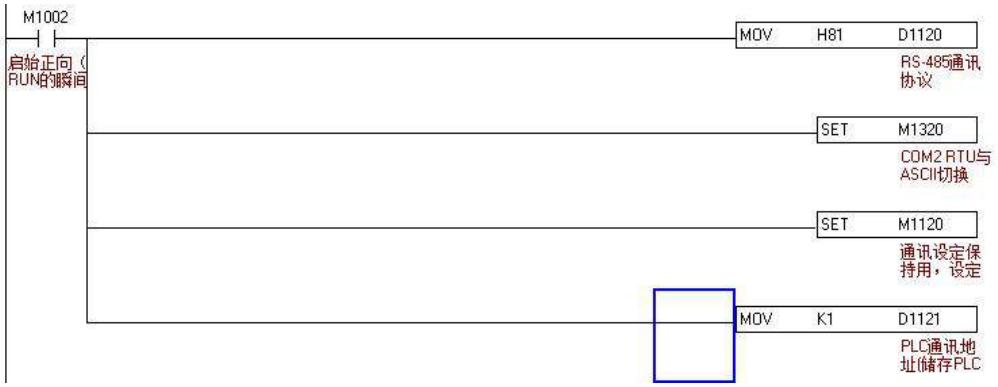
8.3.5 Serial port 2 RS (free protocol read and write) program

RS D2100 D2200 D2300 D2400
D2100: Starting position of data transmission
D2200: Number of data transmitted
D2300: Starting position of received data
D2400: Number of received data



Date: 01 02 03 04 05 06

8.3.6 Serial port 2 slave program configuration



8. 4 Serial port 3: RS485 (AB) / RS232 (corresponding to system COM3)

Support Delta DVP programming port protocol, free port protocol and MODBUS RTU/ASCII protocol;

The special relays and special registers involved in this serial port are as follows:

action	Serial port 1	Serial Port 2	Serial port 3	Functional Description
Protocol Settings	M1138	M1120	M1136	Communication settings hold
	M1139	M1320	M1143	ASCII/RTU mode selection ; on-bit RTU mode
	D1036	D1120	D1109	Communication Protocol
	D1121	D1121	D1255	PLC communication address (When acting as a host, this value must be set to the maximum value of K255)
Communication interval	D1038	D1038	D1038	RTU communication interval, generally set to 30ms
Send Request	M1312	M1316	M1122	Communication command sending request sending flag
	D1249	D1252	D1129	Communication timeout abnormal time , time definition (ms)
Received	M1314	M1318	M1124	Communication command data reception completed flag
error message	M1025	M1025	M1025	Communication command data receiving error flag
	D1025	D1025	D1025	Communication error code
	-	M1129	-	Receive timeout
	-	M1140	-	Communication command data receiving error
	-	M1141	-	The exception code is stored in D1130
	-	D1130	-	MODBUS return error code record
Data bit switching	M1161	M1161	M1161	8-bit/16-bit mode distinction flag; 8-bit when on

When acting as a master station, the receiving data address range is D0-D6000

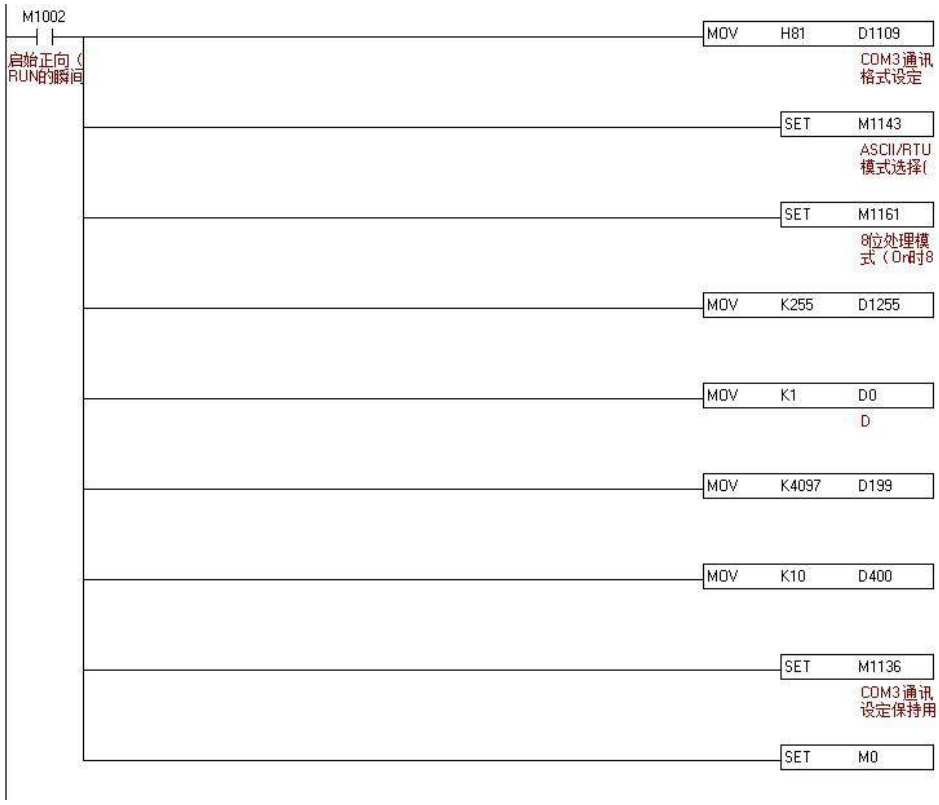
In RS485 mode, there is no response to the broadcast address. Station number 0 is the broadcast function. PLC does not receive the return value. The station number range is 0 to 254. When the slave address is smaller than the master address, the master can receive data correctly.

D1 109 parameter setting

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

b0	Data length 0: 7 bits 1: 8 bits
b1 b2	Parity(b2,b1) 00: None; 01: Odd; 11: Even
b3	Stop bits 0: 1 position 1: 2 positions
b4 b5 b6 b7	Baud rate (b7,b6,b5,b4) (0001):110bps (0010):150bps (0011):300bps (0100):600bps (0101):1200bps (0110):2400bps (0111):4800bps (1000):9600bps (1001):19200bps (1010):38400bps (1011):57600bps (1101):115200bps (1101):500000bps (1110):31250bps (1111):921000bps
b8 b9 b10 b11	Setting 0
b12	Setting 0
b13	Setup 1
b14	Setup 1
b15	Setting 0

8.4.1 Serial port 3 Modbus RTU master communication program configuration



Note: The target station address must not be higher than the host station address, otherwise the communication will be abnormal.

8.4.2 Serial port 3 MODRD (Modbus data reading) program

MODRD D0 D199 D400

D0: Read the target station address

D199: Read target address

D400: Read the number

Note: A maximum of 15 words can be read. If the limit is exceeded, please use the MODRW instruction.

The received data is converted to HEX and saved in D1070-D1085

If the received data is read in ASCII mode, it is converted to HEX and stored in **D1296~D1311**

Send: 01 03 10 00 00 0A C1 0D

Receive: 01 03 16 00 01 00 02 00 03 00 04 00 05 00 06 00 07 00 08 00 09 00 0A AC F4

The received data is converted to HEX and saved in D1070-D1085

装置名称	批注	状态	设置值	当前值 (16bits)
D1070	Modbus通讯指令数据处理，PLC内建RS-485通讯			K769
D1071	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1044
D1072	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1101
D1073	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1101
D1074	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1075	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1076	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1077	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1078	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1079	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1080	Modbus通讯指令数据处理，PLC内建RS-485通讯			K1102
D1081	Modbus通讯指令数据处理，PLC内建RS-485通讯			K-28338
D1082	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0
D1083	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0
D1084	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0
D1085	Modbus通讯指令数据处理，PLC内建RS-485通讯			K0

The received data is finally converted into HEX and saved in D1296-D1312

D1296	K1641	有号10进制
D1297	K1641	有号10进制
D1298	K1641	有号10进制
D1299	K1641	有号10进制
D1300	K1641	有号10进制
D1301	K1641	有号10进制
D1302	K1641	有号10进制
D1303	K1641	有号10进制
D1304	K1641	有号10进制
D1305	K1641	有号10进制
D1306	K1641	有号10进制
D1307	K1641	有号10进制
D1308	K1641	有号10进制
D1309	K1641	有号10进制
D1310	K1641	有号10进制

Note: If the MODRD received data exceeds the storage data range (D1070-D1085, D1296-D1312), it will not be stored in the corresponding memory and the received data will be lost. If the length is too long, please use MODRW to read.

D1296-D1312 PLC has built-in RS-485 communication convenient instruction MODRW. The system will automatically convert the ASCII character data of the register content specified by the user to HEX and store it in D1296~D1311 (RTU mode does not require conversion).

8.4.3 Serial port 3 MODWR (Modbus data write) program

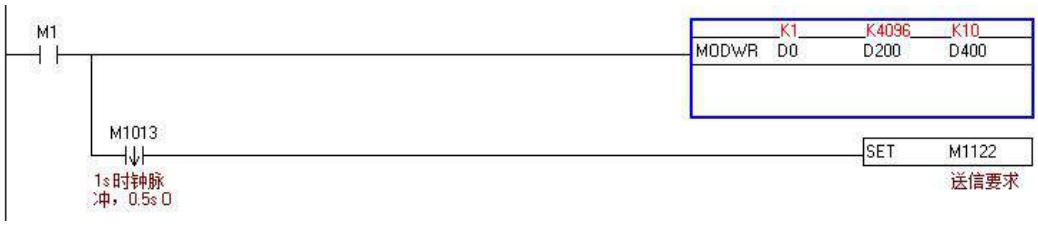
MODWR D0 D200 D400

D0: Station address

D200: Write to the target address

D400: Write value

Note: Only 1 word can be written. If it exceeds the limit, please use the MODRW instruction.



Send: 01 06 10 00 00 0A 0D 0D

Receive: 01 06 10 00 00 0A 0D 0D

8.4.4 Serial port 3 MODRW (Modbus data read and write) program

MODRW D0 D100 D200 D800 D400

D0: Station address

D100: Function code

D200: Target address

D800: The first address for storing the sent (received) data

D400: Length of data sent (received)

Communication function code

H02: Read multiple bit devices

H03: Read multiple characters (Word) device

H04: Read multiple characters (Word) device

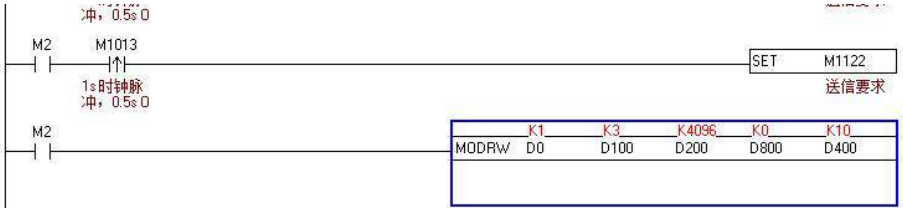
H05: Single bit device status write

H06: Single character (Word) device data writing

H0F: Multiple bit device status write

H10: Write multiple character (Word) device data

H17: Read and write multiple character (Word) device data



Send: 01 03 10 00 00 0A C1 0 D

Receive: 01 03 16 00 01 00 02 00 03 00 04 00 05 00 06 00 07 00 08 00 09 00 0A AC F4

8.4.5 Serial port 3 RS (free protocol read and write) program

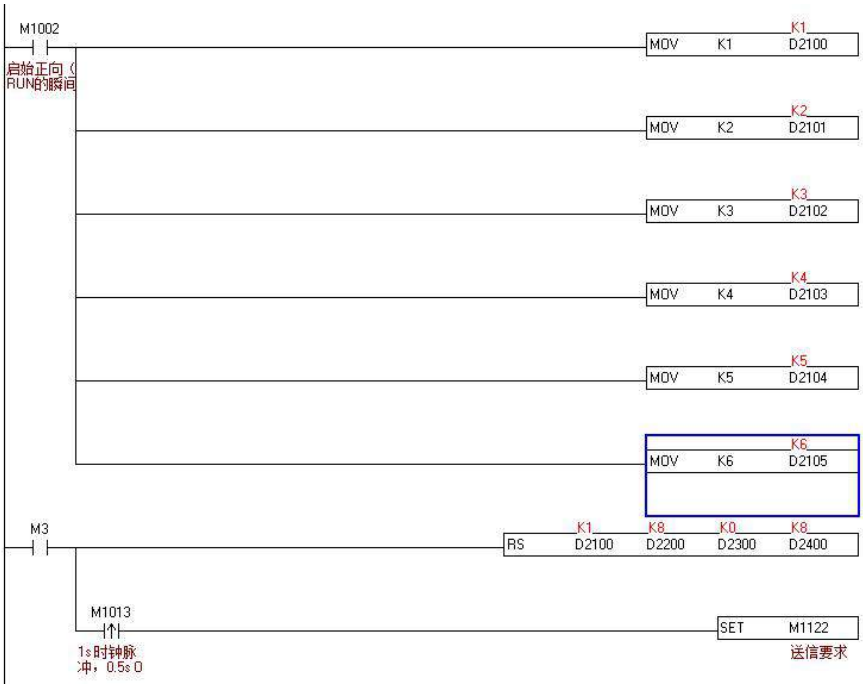
RS D2100 D2200 D2300 D2400

D2100: Starting position of data transmission

D2200: Number of data transmitted

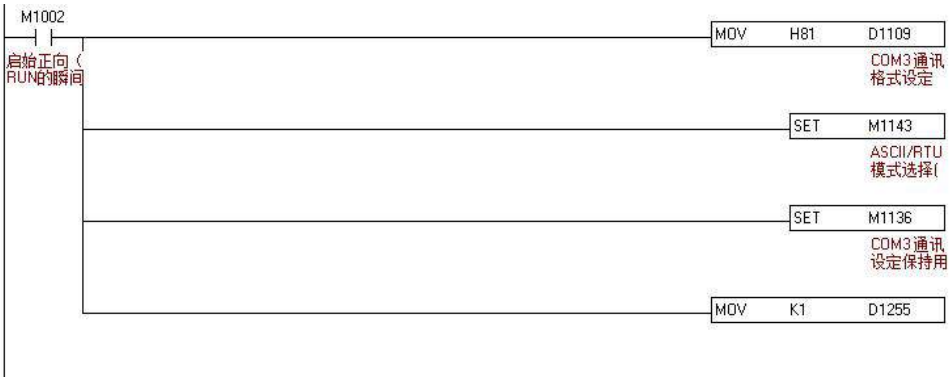
D2300: Starting position of received data

D2400: Number of received data



Date: 01 02 03 04 05 06

8.5.6 Serial port 3 slave program configuration



8.5 Network Communication

on . When there is a network chip, M1504 = 1, network ready.

The special relays, special registers and registers used by the IP addresses involved are as follows:

Network Usage	Functional Description	property	Remark
M1504	ON Initial network card information	R/W	
M1505	ON Check whether the network port is normal	R/W	
M1378	ON Network card restart configuration	R/W	
M1591	ON Network port is not connected to the network cable	R/W	
M1502	Client logo	R/W	
M1408	Network card function enabled	R/W	
M1409	DHCP function is enabled	R/W	
M1410	DNS function is enabled	R/W	
M1507	Server Logo	R/W	
M1737	If no data is received in 30 seconds, the Ethernet port will be automatically closed. Reconnect the port again. OFF will cancel the function. ON will enable the function.	R/W	
M1700	ETHRW instruction receiving timeout flag (timeout time D1588)	R/W	
M1701	ETHRW command switches TCP and UDP, M1002 is set or reset	R/W	Default UDP
M1702	Whether the data returned by the ETHRW instruction is a message or parsed data	R/W	Default data mode
M1703	ETHRW command starts automatic retransmission after timeout	R/W	Automatic resend is disabled by default
M1704	ETHRW command UDP slave station settings (see the program for details)	R/W	
D1959	Port number setting	R/W	
D1960-D1961	IP address	R/W	
D1962-D1963	Mask	R/W	
D1964-D1965	network management	R/W	
D1966-D1967	DNS	R/W	
D1923-D1924	Alternative DNS	R/W	
D1954	Client and server settings : The upper 8 bits are the number of clients, and the lower 8 bits are the number of servers. For example: if the client and server functions are enabled, D1954=0x0101, then there is 1 server and 1 client, port	R/W	

	0 is the server, and port 1 is the client. For example: if the client and server functions are enabled, D1954=0x0202, there are 2 servers and 2 clients, ports 0-1 are servers, and ports 2-3 are clients.		
D1955	Store remote port number 0-7 IP address first address	R/W	
D1956	Ethernet client data sending first address	R/W	
D1957	The interval between the first address and the next data address of Ethernet client data transmission	R/W	
D1926	The default width of the Ethernet client receiving data storage area is 10 words	R/W	
D1927	Ethernet client receives the first address of data storage	R/W	
D1922	DNS domain name length setting	R/W	
D1942	The Ethernet client sends the trigger flag bit0-bit7, which is ON and automatically OFF. Bit8-bit15 is used as the data exchange start bit	R/W	
D1917	The state machine of the current port Ethernet 8 port status display H0 closed state H13 Server initial port, client connection request status Page 13 H14 server monitoring status H15 Waiting for server response H17 Connection Establishment H1C receives a request to close the port H22 port UDP mode	R/W	
D1921	Current port number status, whether it is enabled	R/W	
D1925	Status of the network card after startup Ethernet starts to run. After M1378OFF, the upper 8 bits show the parsed port number, and the lower 8 bits show D1921, which has the same meaning. **Meaning of PLC power-on status D1925 value:** 1 Initialize network card system parameters 2 Reset the network card 3 Obtain IP via DHCP 9 IP acquisition is successful, continue to check DNS information 11 After DHCP is successful, DNS domain name resolution is being performed (see the following description when M1378 is ON) 12 DNS is not performed, configuration is based on IP information. 20 DHCP failed twenty one The network cable is not connected, and	R/W	

	the network card function is disabled. **Meaning of network card status after M1378 is turned on during PLC operation:** 0 Initialize network card system parameters 2 Reset the network card 5 Check the network cable 6 Check DHCP or manual IP mode 8 DHCP Enable 11 DNS Enabled 16 Start server preparation 17 Start client preparation 18 Run network card M1378 OFF		
D1587	D1587=0 means the network cable is disconnected : Bit8-Bit15 corresponds to 8 ports, ON means receiving is completed, software resets Bit0: Establishing a connection Bit1: time out Bit2: TCP requesting connection/UDP sending Bit3: (TCP mode or UDP mode) Socket open	R/W	ETHRW instruction
D1588	ETHRW command timeout setting, unit: 100us	R/W	Default: 3000
D1589	The ETHRW instruction specifies one of the ports 0-7 as the UDP protocol, and the remaining ports of the server and client must be specified.	R/W	The default port is 7 for UDP
D1833	Ethernet timeout retransmission setting register (restore factory value: default)	R/W	Default: 500(*100us)
D1834	Ethernet timeout retransmission times register (restore factory value: default)	R/W	Default: 3 times

Note: The Ethernet timeout retransmission setting register D1833 value recommends the default value, which should not exceed the scan time of D1000.

type	instruction	Source Device	Target starting	Parameter	Source data character
Ethernet communication	**ETHZW**	S1	S2	D	n

S1 : Parameters specify the remote device IP, station number, and function code.

S2: Parameter specifies the read and write remote device register address (indirect specification method: K200 specifies the data in D200).

D: Parameter is the starting address for receiving data storage.

n : Read/write data length (indirect designation method: K300 designates the data in D300).

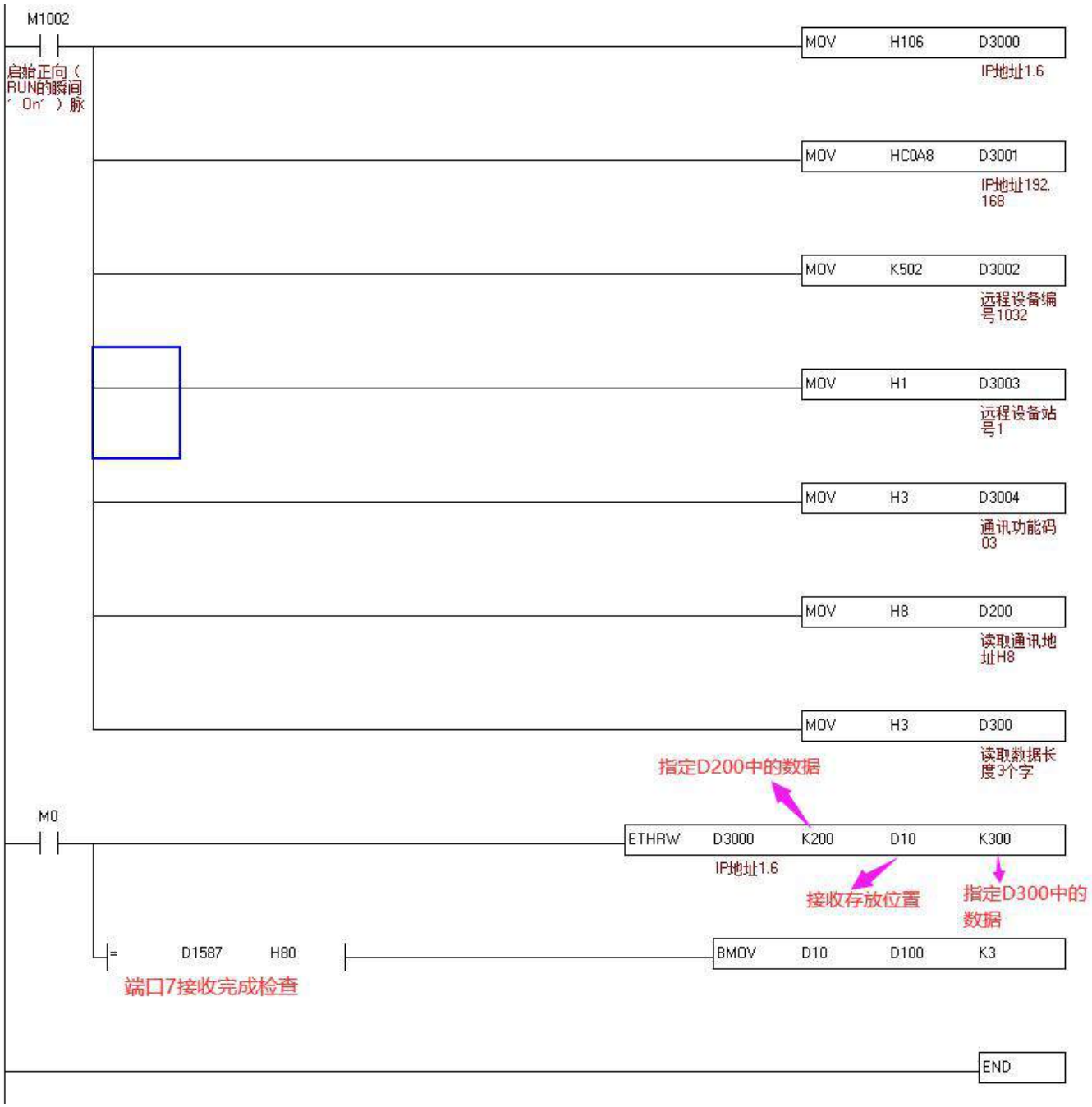
Note: If the communication cable is disconnected, you must re-power it on to reconnect.

M1702 is the data receiving mode. OFF means the parsed pure data is saved in the D parameter. When ON, the message and data received by the master station are saved in the D parameter area.

After power-on, use M1002 to initialize the remote device information, communication mode, and receiving mode. After executing the ETHWR instruction, the parameters will be used to start the network port. After the ETHWR instruction is enabled, the master station

and the slave station will interact with each other (the interaction mode is one question and one answer). After the master station sends a request and the slave station responds, the master station will continue the next request, otherwise the master station will report an error communication timeout. When programming, the timeout flag is generally used to restart the master station to send (the timeout automatic resend function can also be started through M1703).

Example 1: The ETHRW instruction is to read and write data from the left Ethernet module. This PLC uses the Ethernet port on the host as the instruction driver. The ladder diagram drives the instruction to send and receive data on the network port. Multiple instructions are allowed in the program, but only one instruction can be executed at the same time.



Example explanation: M1002 completes the parameter initialization setting in advance. After setting to M0, the master PLC automatically reads the 3-word data of the slave address 08H, and saves the data read from the slave into the register starting from D10. After receiving the data, the host automatically starts the next slave data read (loop execution). It stops when M0 is turned off.

8.6 CANOPEN communication

Supports CANOPEN to operate servo motors.

1. First set the servo working mode to H6060
2. Then enable motor H6040
3. Execute the operation

8.6.1 CANOPEN related software components

serial number	name	property	Object directives
M1552	M1552 is set to ON to start the low-speed CANOPEN message format (suitable for all CANOPEN devices). OFF to start the high-speed message format	R/W	SDO only
M1279	CANOPEN bus initialization completed	R	
M1280	Switching between SD 0 (service data object) and PD 0 (process data object)	R/W	
M1355	CANOPEN sends the trigger bit	R/W	
M1347	Start remote node (bus management) and automatically turn off after execution is completed	R/W	Operation with D1700
M1357	CANOPEN master station flag.	R/W	
M1349	Start CAN bus	R/W	
M1318	CANOPEN received	R/W	
M1359	CANOPEN receive timeout flag	R/W	
M1617	Automatically turns OFF after NMT (Network Management Service) command is issued independently (bus management)	R/W	Executed with D1392 and D1741
M1606	Automatically configure remote nodes and execute them after downloading from the host computer. Automatically turns off after completion	R/W	After completion, M1644 turns ON
M1644	Remote node mapping configuration completed flag	R/W	Program reset
M1648	When ON, the remote device's synchronization signal is used. When OFF, the PLC generates a synchronization signal.	R/W	Used with D1441, in PDO mode
M1652	PLC generates synchronous cycle signal	R/W	Used with D1441, in PDO mode
M1602	When ON, it indicates that the PLC is communicating with the remote power-saving device. OFF execution completed	R/W	Used with D1397, in PDO mode
M1736	SDO table execution completion flag in PDO mode	R/W	
M1345	When the device internal error flag is 0x80+ID	R/W	Use with D1395
M1746	CANOPEN bus initialization completion flag. Automatically turns on after initialization is completed	R/W	
D1399	The ID number is 0 for the master station and 1 for the slave station by default.	R/W	As a slave device
D1400	The ID number is 0 for the master station and 2 for the	R/W	

	slave station by default.		
D1414	ID number of the slave to which the CANOPEN master station wants to write data	R/W	
D1397	The remote node ID number of the current PDO scan	R/W	Use with D1443
D1424	Master station send timeout setting	R/W	
D1426	Transfer rate setting 1000(1M) , 800(800K) , 500(500K) , 250(250K) , 125(125K) , 100(100K) , 50(50K) , 20(20K) , 10(10K)	R/W	Only the above values can be set. Other values are not supported. If the transmission rate value is entered incorrectly, it will automatically change to 1M rate.
D1439	Monitors the status of slaves when CANOPEN is used as the master.	R/W	
D1743	The current number of configuration information. You can compare the number with the host computer to see if it is correct.	R	
D1441	Synchronous signal cycle x1ms	R/W	
D1443	Total number of nodes on the bus	R/W	
D1445	Remote node start ID number	R/W	Use with D1397
D1747	Tx PDO mapping address	R/W	
D1762	Number of remote node configuration messages	R/W	
D1782	CANOPEN's PDO sending start address setting, default 6522 = D6522	R/W	Configuration area, system occupied
D1392	The device ID that sends the NMT command	R/W	Set to 0 for broadcast
D1784	CANOPEN PDO data setting start address setting, default 6844 = D6844	R/W	Operation area, used by developers
D1741	NMT command (refer to D1700 and related manuals)	R/W	
D1761	Amount of data sent in SDO table in PDO mode	R/W	
D1916	CANOPEN communication error indication	R/W	The value of the lower 8 bits
D1700	Bus network management 0:0x81 Application layer reset 1:0x82 Communication reset 2:0x80 Enter the pre-running remote node 3:0x01 Start remote node	R/W	Default 0x3210 M1357 Only executed when ON
D1395	When receiving the synchronization signal from the slave, it is cleared to 0 SDO Primary index 0x8101 Internal communication error Primary index 0x8130 CANopen bus communication error Primary index 0x8210 PDO data length is insufficient	R/W	
D1447	CAN slave mode PDO 200, 300, 400, 500 receiving data storage address pointer 10 word space range (a total of 40 D)	R/W	Impact D1380
D1380	CAN custom protocol storage first address 10 word	R/W	Use with D1447

	space range (a total of 40 D)		
D1785	CANOPEN NMT remote device status register first address points to 0: The corresponding slave communication is reset or the application layer is reset/the slave node notifies the master node that it has entered the boot-up state from the initialization state 1: Disconnect 2: Link 3: Preparation 4: The corresponding slave is in shutdown state 5: The corresponding slave is in operation 7F: The corresponding slave is in pre-operation state	R/W	Default D6010 start (node 1)
D1393	Index error when receiving as master device	R/W	Error code 0x0CA
D1878 D1789	CANOPEN bus hardware interface status bit31: 24 = Receive error counter bit23: 16 = 9 bits of the lower 8 bits of the send error counter bit6: 4 = last error code 000: no error; 001: Bit filling error; 010: The format is wrong; 011: Acknowledgement (ACK) error; 100: Hidden dislocation; 101: dominant dislocation; 110: CRC error; 111: Set by software. bit2 = offline flag Bit1 = Error passive flag Bit0 = Error warning flag	R	
D1877	CANOPEN SDO sending mode in PDO mode: single sending and SDO configuration table cyclic sending settings Setting 1: SDO data stored in D6251 is sent. Setting 2: SDO configuration table cyclic transmission (cyclic transmission starts when D1761>0 and M1318=ON)	R/W	The PDO mode works only when M1280 is ON.
D1876	SDO received message storage address setting	R/W	Default: D6000
D1873	Setup 1 SDO table performs a round of transmission Setup 2 SDO table execution cyclic transmission Set 3 to execute a transmission in the SDO table. D1872 sets a certain item in the SDO table and changes to 4 immediately after execution.	R/W	Default: 2
D1782	Set the bar number in the SDO table.	R/W	0-n lines
D1820	CANOPEN initializes the execution state. State	R/W	Default 1

	changes 1-6. Automatically returns to 1 upon completion.		
D1821	CANOPEN communication function block call: 0x0010: CANOPEN bus initialization (remote device configuration) completed to 0	R/W	Default 0

8.6.2 CANOPEN termination code description

Check the termination code based on the status value of D1916.

Value of D1916	Termination Code	illustrate
1	06010002	
2	08000000	
3	08000022	
4	05030000	
5	05040000	
6	05040001	
7	05040005	
8	06010000	
9	06010001	
10	06040041	
11	06040042	
12	06040043	
13	06040047	
14	06060000	
15	06070010	
16	06070012	
17	06070013	
18	06090011	
19	06090030	
20	06090031	
twenty one	06090032	
twenty two	06090036	
twenty three	08000023	
twenty four	08000024	

8.6.3 CANOPEN User Manual

CAN bus rate: 10K, 20K, 50K, 100K, 125K, 250K, 500K, 800K, 1000K (device default communication rate is 1M).

CAN0 is CANOPEN protocol and custom protocol. CAN1 is CANOPEN and custom protocol (standard function is to expand the bus interface, AD, DA, TC module bus).

CAN0 communication is not affected by the scanning cycle (when the send flag is triggered, the frame message will be sent immediately, with a maximum delay of 100us). After it is enabled, the processing mechanism is every 100us, and the custom protocol can receive dozens of frames each

time.

The following is the process of starting CANOPEN, which can also be driven by function functions (convenient and easy to operate, with high readability)

The process of starting CAN is as follows:

1. The M1279 flag is OFF; (CAN port initialization flag. To start CAN, you must reset M1279 first. After initialization is completed, M1279 is set to ON, and CAN port initialization is completed).

2. The M1280 flag is OFF; (M1280 is the protocol selection flag, OFF is CANOPEN protocol, ON is custom protocol).

3. M1347 flag is ON; (M1347 is the bus start flag. If it is ON, the devices on the bus will be started and operated. If it is OFF, pre-operation processing and other operations will not be performed).

4.M1357 flag is ON; (M1357 is the master station flag, ON sets the machine as the master station, OFF sets it as the slave station).

5. M1349 flag is ON; (CANBUS start flag, M1349 can be set only after the above operations are completed, otherwise the bus execution error cannot communicate).

6. The above operation is the complete process of starting the CANOPEN bus (set the flag M1349 to ON according to the steps and the device will automatically execute the whole process.

7.M1355 flag: This bit is the sending trigger bit, which is triggered by edge (it will automatically reset after startup and does not require a program reset.

8.M1318 flag: This is the reception completion flag. M1318 is turned ON when the slave station sends to the master station.

Definition of the send register:

register	Function (high 8 bits H)	Function (lower 8 bits L)
D6250	Request ID	Command code (fixed as 01)
D6251	reserve	The data length of the message written to the slave station is: (the read message is fixed at 8) (the write message is 5, 6, 8). 5: Write 1 byte, request code + object index L + object index H + object sub-index + BYTE0 6: Write 2 bytes, request code + object index L + object index H + object sub-index + BYTE0 + BYTE1 8: Write 4 bytes, request code + object index L + object index H + object sub-index + BYTE0 + BYTE1 + BYTE2 + BYTE3
D6252	Type: 0x100 and 0x200 0x100 is for reading messages (reading data to the master station), and 0x200 is for writing messages (writing data to the slave station)	Node address: The ID of the slave station to communicate with
D6253	Master index: Set the slave register address index to be read or written	
D6254	reserve	Sub-index: Set the sub-index of the slave register address to be read or written.
D6255	Data 1	Data0
D6256	Data 3	Data 2

Example 1: Read the 32-bit data of register address 2003 of slave ID3

D6252 type is 0x103.

D6253 primary index is 0x2003.

D6254 subindex is 0.

Example 2: Write data 0x12542356 to the 32-bit data of register address 0x2005 of slave ID5.

D6252 type is 0x205.

D6253 primary index is 0x2005.

D6254 subindex is 0.

D6255 data 0x2356.

D6256 data 0x1254.

8.6.4 CANOPEN related cases

Single machine communication: (communication instructions with Coolmay servo)

1. Set the servo parameters, download the PLC program, and power off and restart the servo and PLC at the same time.

2. Start M0, M1, M9, M26, turn off M1318 and start M5 to check whether the servo status changes. Is the servo = 50nr or 51nr?

3. When the servo = 50nr, turn off M5, M1280, M1355, and M1318, and check whether the parameters of M26 and M9 are transmitted normally. If yes, start M5. If not, start M26, M9, and then M5. After this operation, the servo will become 51nr.

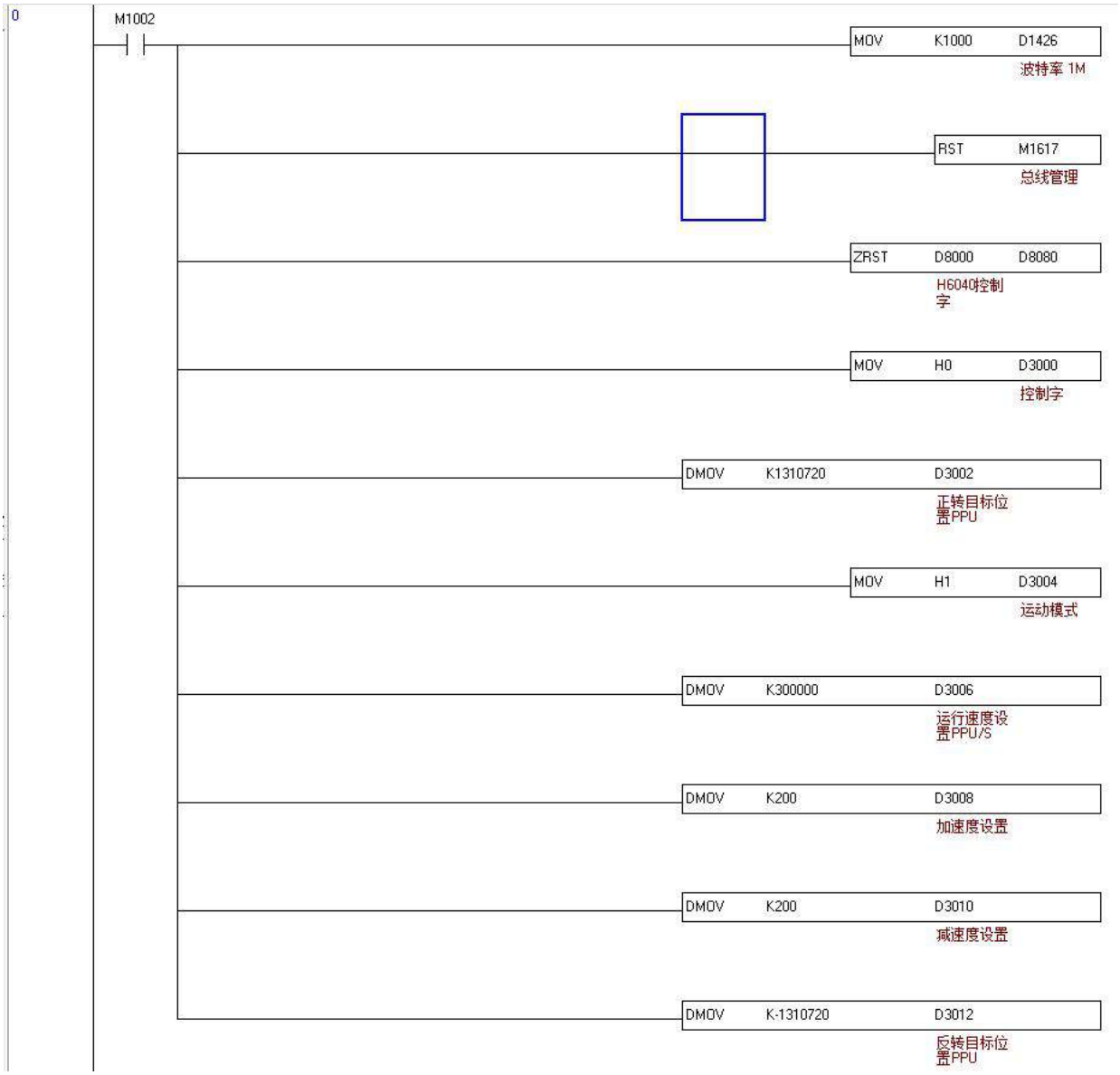
4. When servo = 51nr, start M24 and you can see the motor rotates forward.

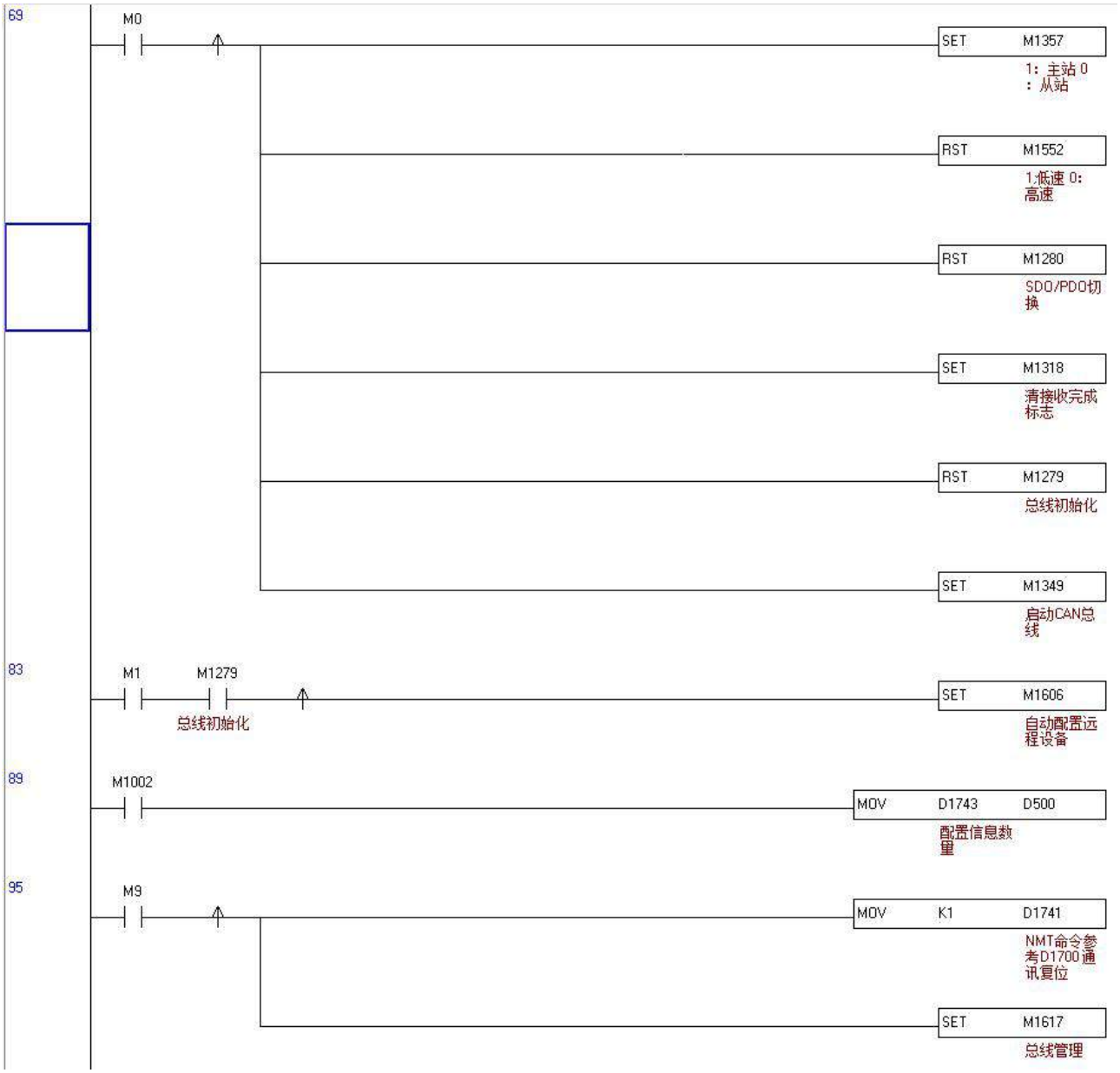
5. If you need to reverse, transfer the parameters of M27, start M24 and you can see the motor reverse.

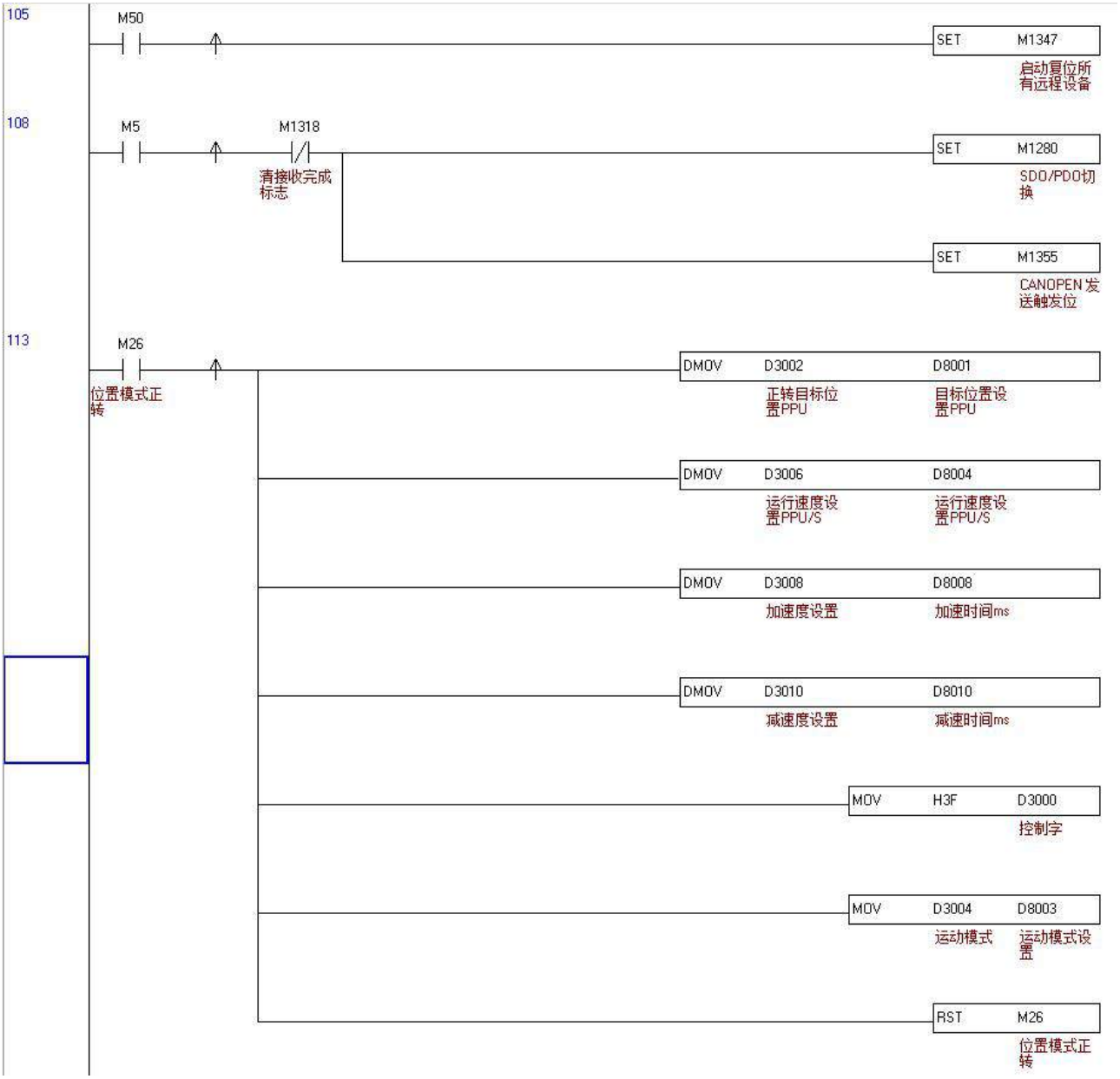
6. If you need to rotate forward again, transfer the parameters of M27, start M24 and you can see the motor rotate forward.

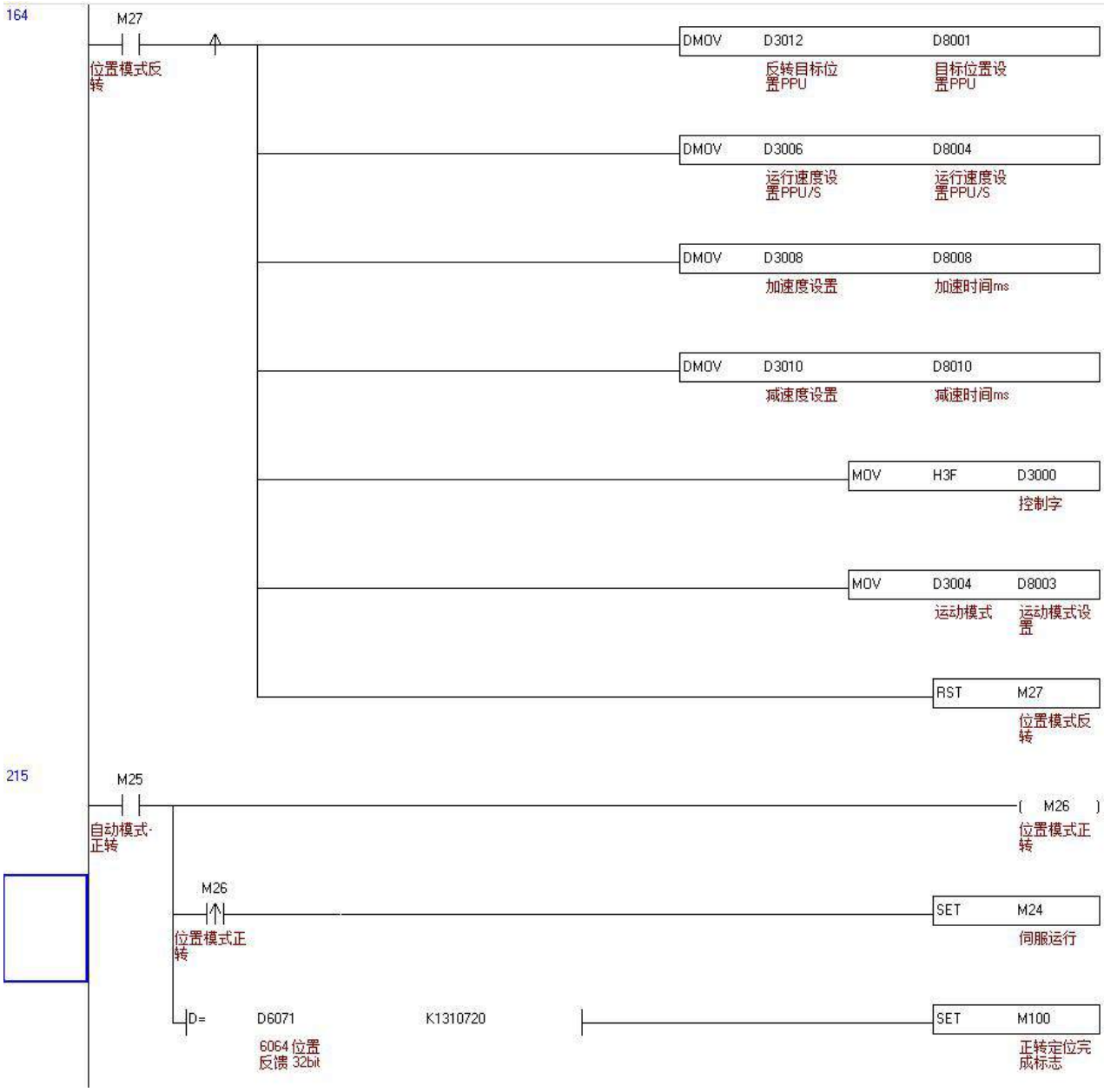
7. You can also start M25 to start automatic control

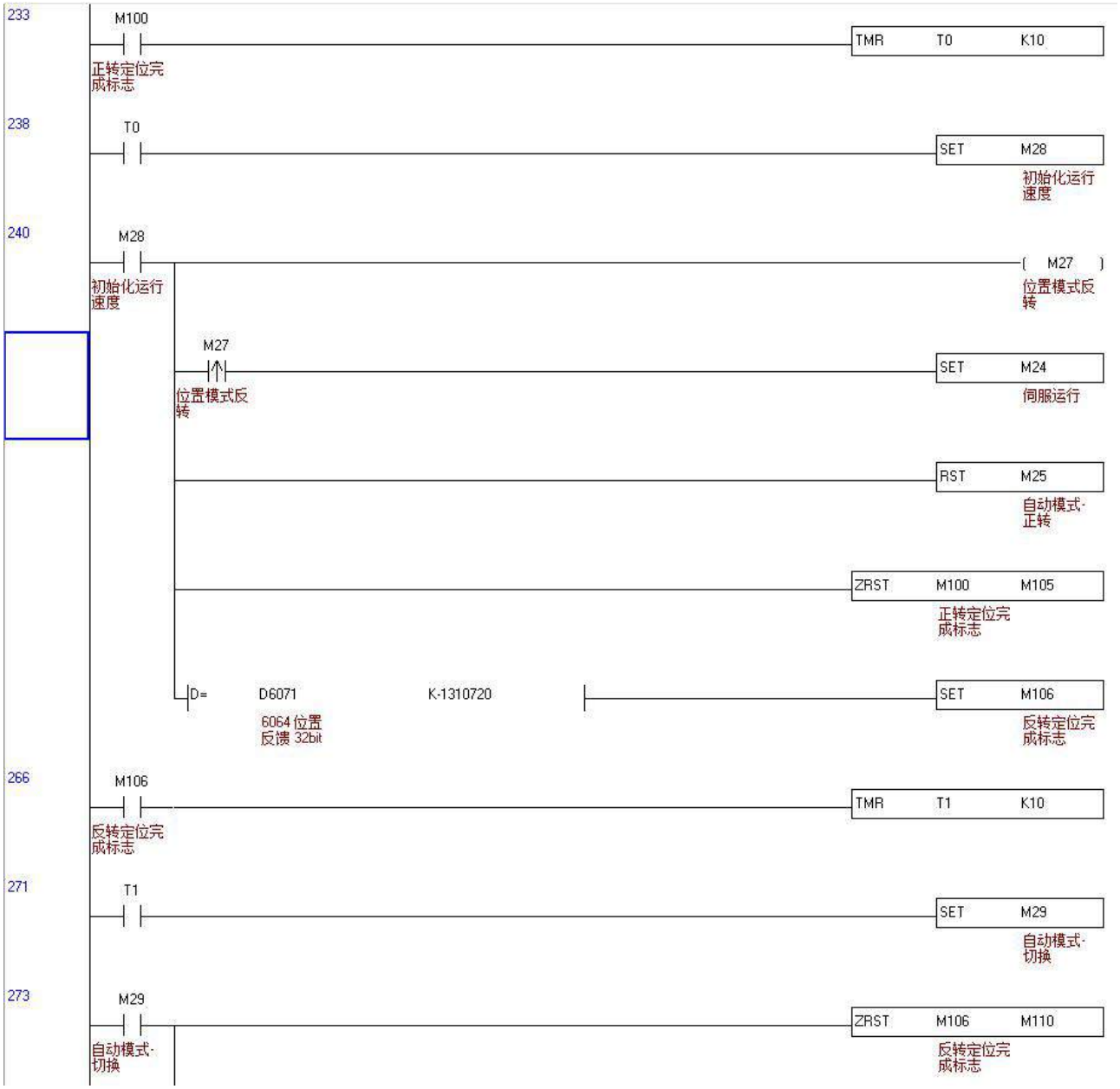
8. No need to connect 120Ω terminal resistor

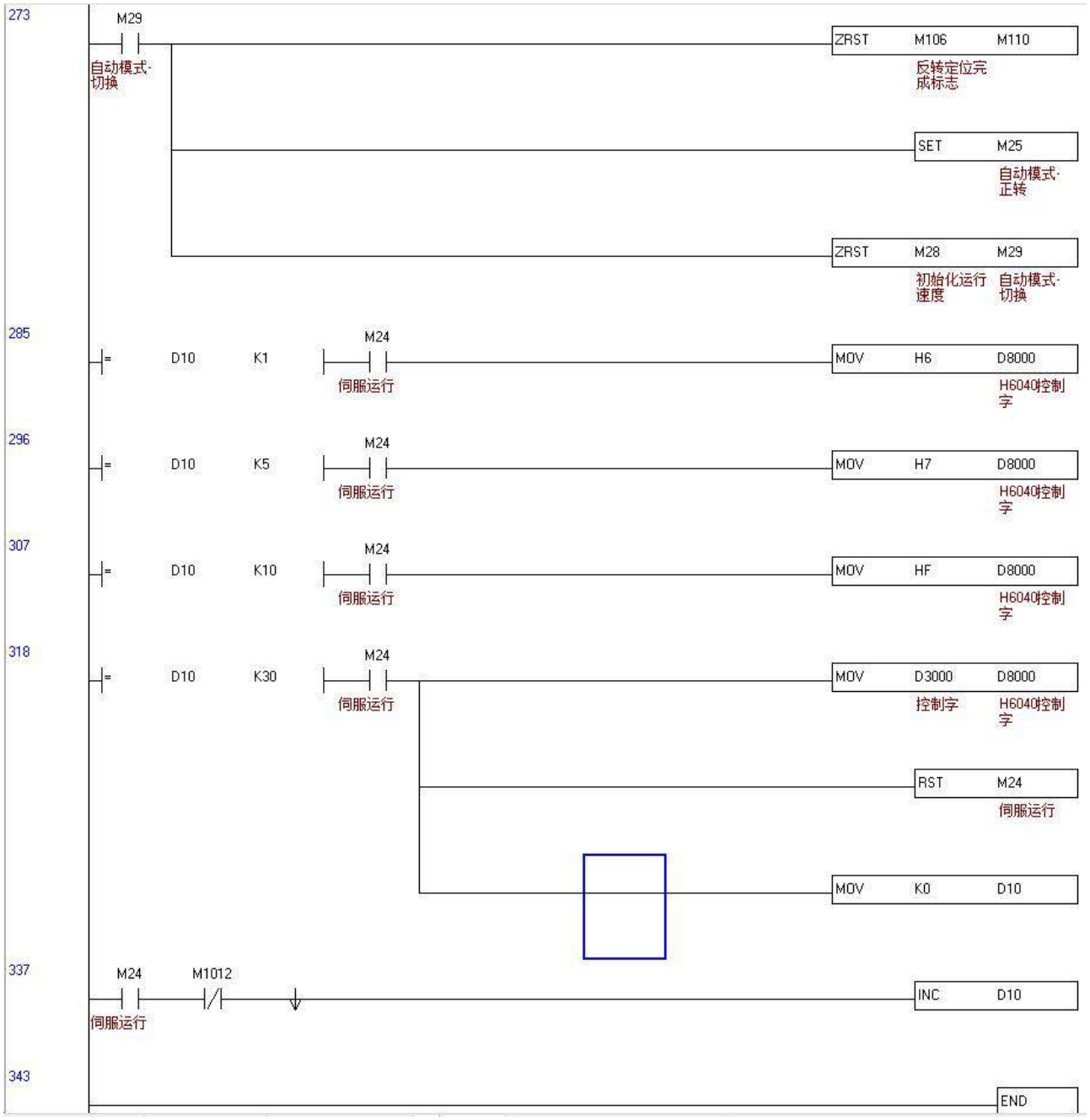

0
M1002
MOV K1000 D1426
波特率 1M
RST M1617
总线管理
ZRST D8000 D8080
H6040控制字
MOV H0 D3000
控制字
DMOV K1310720 D3002
正转目标位置PPU
MOV H1 D3004
运动模式
DMOV K300000 D3006
运行速度设置PPU/S
DMOV K200 D3008
加速度设置
DMOV K200 D3010
减速度设置
DMOV K-1310720 D3012
反转目标位置PPU


69
M0
SET M1357
1：主站 0：从站
RST M1552
1:低速 0:高速
RST M1280
SDO/PDO切换
SET M1318
清接收完成标志
RST M1279
总线初始化
SET M1349
启动CAN总线
83
M1
M1279
总线初始化
SET M1606
自动配置远程设备
89
M1002
MOV D1743 D500
配置信息数量
95
M9
MOV K1 D1741
NMT命令参考D1700通讯复位
SET M1617
总线管理


105
M50
SET M1347
启动复位所有远程设备
108
M5
M1318
清接收完成标志
SET M1280
SDO/PDO切换
SET M1355
CANOPEN发送触发位
113
M26
位置模式正转
DMOV D3002 D8001
正转目标位置PPU
目标位置设置PPU
DMOV D3006 D8004
运行速度设置PPU/S
运行速度设置PPU/S
DMOV D3008 D8008
加速度设置
加速时间ms
DMOV D3010 D8010
减速度设置
减速时间ms
MOV H3F D3000
控制字
MOV D3004 D8003
运动模式
运动模式设置
RST M26
位置模式正转


164
M27
位置模式反转
DMOV D3012 D8001
反转目标位置PPU
目标位置设置PPU
DMOV D3006 D8004
运行速度设置PPU/S
运行速度设置PPU/S
DMOV D3008 D8008
加速度设置
加速时间ms
DMOV D3010 D8010
减速度设置
减速时间ms
MOV H3F D3000
控制字
MOV D3004 D8003
运动模式
运动模式设置
RST M27
位置模式反转
215
M25
自动模式-正转
(M26)
位置模式正转
M26
位置模式正转
SET M24
伺服运行
D= D6071 K1310720
6064 位置反馈 32bit
SET M100
正转定位完成标志


233
M100
正转定位完成标志
TMR T0 K10
238
T0
SET M28
初始化运行速度
240
M28
初始化运行速度
(M27)
位置模式反转
M27
位置模式反转
SET M24
伺服运行
RST M25
自动模式-正转
ZRST M100 M105
正转定位完成标志
D= D6071 K-1310720
6064 位置反馈 32bit
SET M106
反转定位完成标志
266
M106
反转定位完成标志
TMR T1 K10
271
T1
SET M29
自动模式-切换
273
M29
自动模式-切换
ZRST M106 M110
反转定位完成标志


273
M29
自动模式-切换
ZRST M106 M110
反转定位完成标志
SET M25
自动模式-正转
ZRST M28 M29
初始化运行速度
自动模式-切换
285
D10 K1
M24
伺服运行
MOV H6 D8000
H6040控制字
296
D10 K5
M24
伺服运行
MOV H7 D8000
H6040控制字
307
D10 K10
M24
伺服运行
MOV HF D8000
H6040控制字
318
D10 K30
M24
伺服运行
MOV D3000 D8000
控制字
H6040控制字
RST M24
伺服运行
MOV K0 D10
337
M24
M1012
伺服运行
INC D10
343
END

Part 9 Coolmay M300 Series PLC Hardware Identification and Address Assignment

The M300 series PLC host can expand the switch quantity and analog quantity according to customer needs. This chapter introduces the host's hardware identification and address allocation of expansion modules.

9.1Extension module type view

The type and function of the expansion module can be viewed through the following registers:

register	Functional Description	Module type definition	Remark
D1140	Number of expansion modules	0 : Switch input (reserved) 1: Analog input (4AD) 2: Switch output (reserved) 3: Analog output (4DA) 4: Mixed switch quantity (8 input and 8 output) 5: Mixed switch quantity (16 input and 16 output) 6: Mixed analog (4 inputs and 2 outputs) 7: 4RTD 8: 4TC 9: 4NTC 10: 2LC 11: Switch quantity 8 input 12: Switch quantity 16 input 13: Switch quantity 32 input 14: Switch quantity 8 outputs 15: Switch quantity 16 output 16: Switch quantity 32 outputs 48: 1-axis positioning module 49: 2-axis positioning module 50: 4-axis positioning module	
D1320	The first and second expansion module types		The lower 8 bits of the register indicate the type of the first expansion module, and the upper 8 bits indicate the type of the second expansion module; If the value of D1320 is H0504, then the types of the first and second expansion modules are mixed switch quantity (8 inputs and 8 outputs) and mixed switch quantity (16 inputs and 16 outputs) respectively.
D1321	3rd and 4th expansion module types		
D1322	5th and 6th expansion module types		
D1323	7th and 8th expansion module types		
D1324	9th and 10th expansion module types		
D1325	1st 1 , 12th expansion module type		
D1326	13th and 14th expansion module types		
D1327	1st 5th and 16th expansion module types		
D1260	1st 7th and 18th expansion module types		
D1261	19th and 20th expansion module types		
D1262	21 , 22 expansion module types		
D1263	23. 24 Extension module types		
D1264	25th , 26th expansion module type		
D1265	27 , 28 expansion module types		
D1266	29th and 30th expansion module types		
D1267	31 , 32 expansion module		

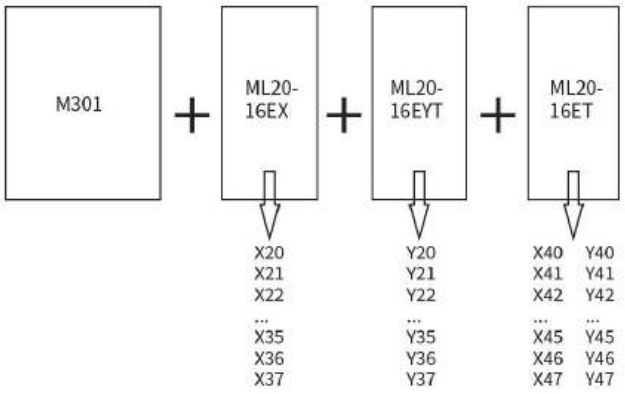
	types		

9.2 Address assignment of switch input and output modules

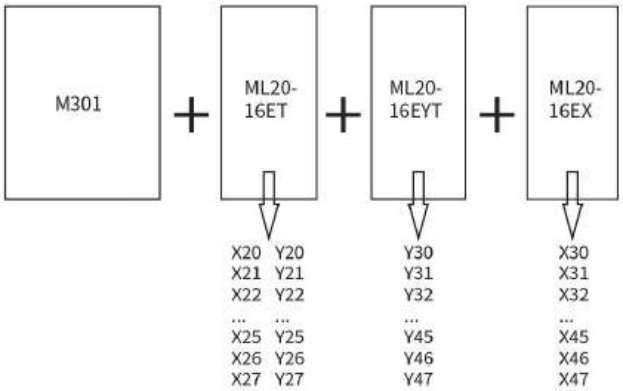
When the host detects the expansion of switch input and output, it will automatically sort from left to right starting from X20 or Y20.

Taking the host M301, switch input module ML20-16EX, switch output module ML20-16EYT, and mixed switch ML20-16ET as examples, when the order of the expansion modules is different, the address allocation is also different.

The addresses of each expansion module in order are shown in the figure below:



The addresses of each expansion module in sorting 2 are shown in the figure below:



9.3 Reading analog input and output modules

9.3.1 Module register definition

Register Number	Function	Data Types	access	default value
0	Module Type	16-bit	R	
1	Module version number	16-bit	R	
2	CH0--AD/DA value	16-bit	R	
3	CH 1 --AD/DA value	16-bit	R/W	
4	CH 2 --AD/DA value	16-bit	R/W	
5	CH 3 --AD/DA value	16-bit	R/W	
6	CH0 Humidity	16-bit	R/W	When it is not RTD type, the default value is 0xFFFF
7	CH1 Humidity	16-bit	R/W	When it is not RTD type, the default value is 0xFFFF
8	TC type cold junction temperature	16-bit	R/W	In TC type, the default is 25℃ when no cold end is connected. In non-TC type, the default is 0xFFFF
9	CH0--AD original value (24-bit precision)	32-bit	R	0x0-0xFFFFFF

11	CH1--AD original value (24-bit precision)	32-bit	R	0x0-0xFFFFFF
13	CH2--AD original value (24-bit precision)	32-bit	R	0x0-0xFFFFFF
15	CH3--AD original value (24-bit precision)	32-bit	R	0x0-0xFFFFFF
17	CH0--Type	16-bit	R/W	Default value 0
18	CH1--Type	16-bit	R/W	Default value 0
19	CH2--Type	16-bit	R/W	Default value 0
20	CH3--Type	16-bit	R/W	Default value 0
twenty one	CH0--coefficient	32-bit	R/W	
twenty three	CH1--Coefficient	32-bit	R/W	
25	CH2--Coefficient	32-bit	R/W	
27	CH3--Coefficient	32-bit	R/W	
29	Control Word =1: Calibration =7707: Save type, coefficient =2: Restore default values	16-bit	R/W	When executing, it is the command value, and becomes 255 after execution.

Use the FROM and TO instructions to operate the module's CR register to execute functions.

AD module calibration method:

AD: 4-channel AD connected to 10V standard signal

PT100: Connect all 250R resistors

TC: All input 64.13mv

NTC: All connected to 75KΩ resistor

The CR29 register is set to 1, calibrated, the coefficient is automatically calculated, and the self-reset coefficient is K255; monitor whether the CR21-CR27 data changes, CR29 is set to 7707, and the parameters are saved. This can only be saved once.

9.3.2 Extended analog module types

Extended analog module input type:

Input signal type	Range	Register reading value	Resolution	Accuracy Total range	Remark
K-type thermocouple	-240～1370℃	-2400～13700	0.1℃	1%	Thermocouple type should be ungrounded
T-type thermocouple	-240～400℃	-2400～4000	0.1℃	1%	
S-type thermocouple	-50～1690℃	-500～16900	0.1℃	1%	
J-type thermocouple	-120～1200℃	-1200～12000	0.1℃	1%	
Type E Thermocouple	-110～730℃	-1100～7300	0.1℃	1%	
PT100	-200～800℃	-2000～8000	0.1℃	1%	
Thermistor NTC10K	-30～210℃	-300～2100	0.1℃	1%	The default value of B is 3435
Voltage analog Type1	0-10V	0～32000	0.3mV	1%	
Voltage analog Type2	-10-10V	-32000～32000	0.3mV	1%	
Current analog Type1	0～20mA	0～32000	0.6uA	1%	
Current analog Type2	4～20mA	0～32000	0.5uA	1%	

The type of analog input needs to be set. For specific settings, refer to the table below:

serial number	Reading Values	Representation Type	Remark
CR17-CR20	0	-10~10V (or 0~20mA); NTC (3435); K-type thermocouple; PT100【Break value: -200】	Different types of wiring methods
CR17-CR20	1	4~20mA; [Break value: 32767] 2~10V	When the current is greater than 4mA, the digital value is obtained. When the current is less than 4mA, the line is considered disconnected.
CR17-CR20	5	E-type thermocouple [Broken wire value: 730]	When the thermocouple is not connected, the default value is the disconnection value. When the cold end is not connected, the default value is 25℃
CR17-CR20	7	T-type thermocouple [Broken wire value: 385]	
CR17-CR20	9	S-type thermocouple [Broken wire value: 1730]	
CR17-CR20	11	J-type thermocouple [Broken wire value: 1187]	

Extended analog module output type:

Number Read Value	Output signal type	Range	Setting value range	Resolution	Remark
0	Voltage analog	0-10V	0～32000	0.3mV	The wiring methods for current and voltage types
1	Voltage analog	2-10V	0～32000	0.25mV	
0	Current analog Type1	0～20mA	0～32000	0.6uA	
1	Current analog Type2	4～20mA	0～32000	0.5uA	

9.3.3 Example of extended analog reading and writing

Note:

The communication between the master control and the module is to write the module data and then read it after the ladder diagram END.

When using each module FROM and TO instructions, multiple instructions cannot be executed simultaneously (one FROM and one TO are allowed to be executed simultaneously).

type	instruction	The location of the	The module	Storage start	The length of the
D	**FROM**	**m 1**	**m 2**	**D**	**n**

m 1 : The number of the expansion module, that is, the position of the module.

m 2 : The number of the expansion module to be read, that is, the register number defined in 9.3.1 Module Register .

D : Stores the starting address of the read data . **n** : The number of data records read at one time.

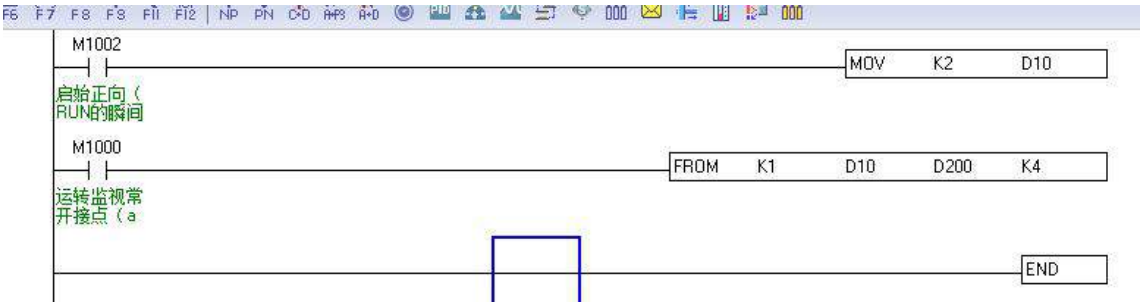
type	instruction	The location of the	The module	Data source start	The length of the
D	**TO**	**m 1**	**m 2**	**S**	**n**

m 1 : The number of the expansion module, that is, the position of the module.

m 2 : The number of the expansion module to be written , that is, the register number defined in 9.3.1 Module Register .

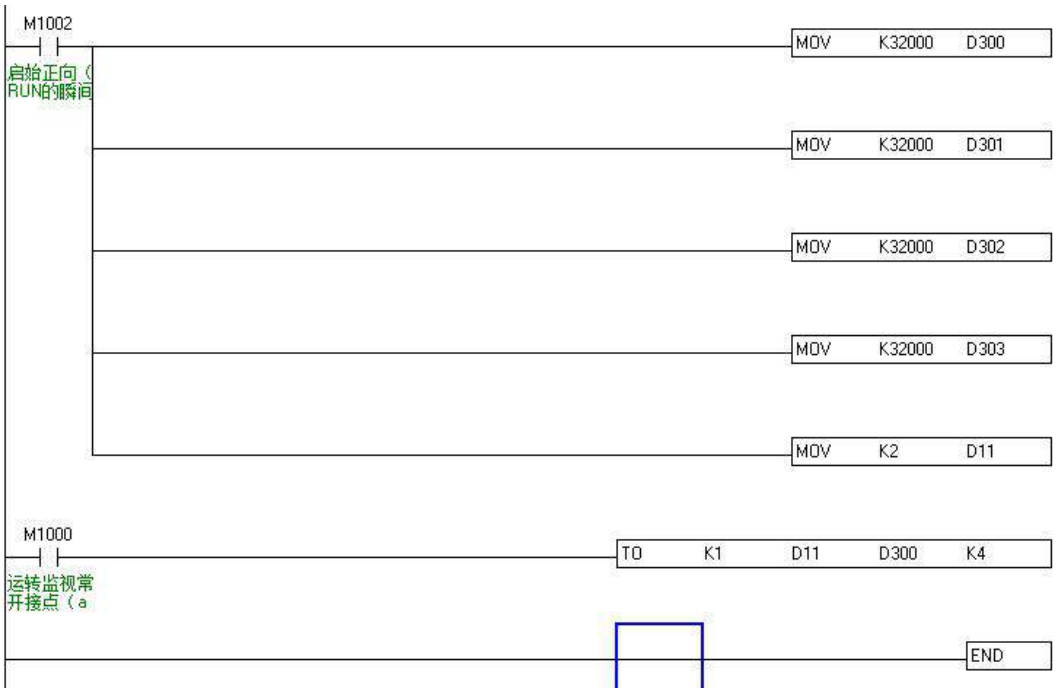
S : Stores the starting address of the data source to be written . **n** : The number of data records written at one time .

Example 1 : Get the AD value of CH0-CH3



FROM reads the 4 AD values of the first module CH0-CH3 (numbered K2-K5) and stores them in D200-D203.

Example 2 : CH0-CH3 output 10V voltage



The DA value to be output is preset to 10V, that is, the value is K32000 in register D300-D303, and the TO instruction is written to CH0-CH3 (numbered K2-K5) of the first module.

9.4 Axis Control Module Extension Instructions

M301 can expand 1 axis control module (4 channels 200K Hz), M302 can expand 4 axis control modules (16 channels 200K Hz); neither occupies IO points. The host and the module read through the FROM instruction and write to the module through the TO instruction.

9.4.1 Axis module description

1. Corresponding interface function

aisle	Pulse port	Direction port	Zero	limit
CH0	Y0	Y1	X0	X1
CH1	Y2	Y3	X2	X3
CH2	Y4	Y5	X4	X5
CH3	Y6	Y7	X6	X7

2. Axis module address

Address Number	Functional Description	property	Remark
0	Module Type Number Register	R	
1	Software version number register	R	0x4514
2	Axis 0 acceleration and deceleration time setting	R/W	100
3	Axis 1 acceleration and deceleration time setting	R/W	100
4	Axis 2 acceleration and deceleration time setting	R/W	100
5	Axis 3 acceleration and deceleration time setting	R/W	100

6	Axis Control Registers Bit0: ON Axis 0 is running Bit1: ON Axis 1 is running Bit2: ON Axis 2 running Bit3: ON Axis 3 is running Bit4: ON axis 0 emergency stop Bit5: ON Axis 1 emergency stop Bit6: ON Axis 2 emergency stop Bit7: ON Axis 3 emergency stop Bit8: ON axis 0 clear positioning completion flag CR47 bit0=0 Bit9: ON axis 1 clears the positioning completion flag CR47 bit1=0 Bit10: ON axis 2 clears positioning completion flag CR47 bit2=0 Bit11: ON axis 3 clear positioning completion flag CR47 bit3=0	R/W	0
7	Axis operation mode register Axis 0 Bit0-Bit3: = 0: absolute positioning , = 1: relative positioning , = 4: origin return Axis 1 Bit4-Bit7: = 0: absolute positioning, = 1: relative positioning, = 4: origin return Axis 2 Bit8-Bit11: = 0: Absolute positioning, = 1: Relative positioning, = 4: Origin return Axis 3 Bit12-Bit15: = 0: Absolute positioning, = 1: Relative positioning, = 4: Origin return	R/W	0
8	Axis 0 target position PPU	R/W	0
10	Axis 0 Target speed HZ	R/W	0
12	Axis 1 target position PPU	R/W	0
14	Axis 1 Target speed HZ	R/W	0
16	Axis 2 target position PPU	R/W	0
18	Axis 2 target speed HZ	R/W	0
20	Axis 3 target position PPU	R/W	0
twenty two	Axis 3 target speed HZ	R/W	0
twenty four	All axes return to origin at high speed	R/W	0
26	All axes return to origin at low speed	R/W	0
27	Axis movement direction Bit0: CH0 axis motion reverse flag Bit1: CH1 axis movement reverse flag Bit2: CH2 axis movement reverse flag Bit3: CH3 axis movement reverse flag Axis zero return direction Bit 4 : CH0 axis = 0: fixed negative direction, = 1: automatic direction determination Bit 5 : CH1 axis = 0: fixed negative direction, = 1: automatic direction determination Bit 6 : CH2 axis = 0: fixed negative direction, = 1: automatic	R/W	0

	direction determination Bit7 : CH3 axis = 0: fixed negative direction, = 1: automatic direction determination Acceleration and deceleration curve Bit8: CH0 axis trapezoidal and S-shaped acceleration and deceleration switch, default trapezoidal acceleration and deceleration Bit9: CH1 axis trapezoidal and S-shaped acceleration and deceleration switch, default is trapezoidal acceleration and deceleration Bit10: CH2 axis trapezoidal and S-shaped acceleration and deceleration switch, the default is trapezoidal acceleration and deceleration Bit11: CH3 axis trapezoidal and S-shaped acceleration and deceleration switch, default is trapezoidal acceleration and deceleration Backlash compensation positive and negative selection Bit 12 : CH0 axis = 0: positive compensation, = 1: negative compensation Bit 13 : CH1 axis = 0: positive compensation, = 1: negative compensation Bit 14 : CH2 axis = 0: positive compensation, = 1: negative compensation Bit15: CH3 axis = 0: forward compensation, = 1: reverse compensation		
33	Axis 0 position backlash compensation	R/W	0
34	Axis 1 position backlash compensation	R/W	0
35	Axis 2 position gap compensation	R/W	0
36	Axis 3 position gap compensation	R/W	0
37	Axis 0 speed lower limit	R/W	100
38	Axis 1 speed lower limit	R/W	100
39	Axis 2 speed lower limit	R/W	100
40	Axis 3 speed lower limit	R/W	100
41	Axis homing mode register Axis 0 : Bit 0-Bit 3, Axis 1 : Bit 4 -Bit 7, Axis 2 : Bit 8 -Bit 11, Axis 3: Bit 12 -Bit 15 = 0: Low speed after detecting ORG ON, stops after ORG OFF. = 1: Reverse low speed when ORG ON is detected, and stops after ORG OFF. = 2: Check limit ON and then reverse to find ORG ON, reverse to ORG OFF and stop.	R/W	0
42	Axis status: bit1 =1 Axis 0 command is being executed, =0 command is being stopped Axis status: bit2 =1 Axis 1 command is being executed, =0 The	R/W	0

	command is stopped Axis status: bit2 =1 Axis 2 command is being executed, =0 Command is stopped Axis status: bit3 =1 Axis 3 command is being executed, =0 Command is stopped		
43	Axis in place: bit0 =1 Axis 0 is in place, =0 is not in place or the axis is moving or stopped Axis in place: bit1 =1 Axis 1 is in place, =0 is not in place or the axis is moving or stopped Axis in place: bit2 =1 Axis 2 is in place, =0 is not in place or the axis is moving or stopped Axis in place: bit3 =1 Axis 3 is in place, =0 is not in place or the axis is moving or stopped	R/W	0
44	Axis 0 Current position	R/W	0
56	Axis 1 Current position	R/W	0
48	Axis 2 Current position	R/W	0
50	Axis 3 Current position	R/W	0

9.4.2 Axis module example

The communication between the master control and the module is to write the module data and then read it after the ladder diagram END.

When using the positioning module, you cannot rely solely on judging the positioning completion flag to execute the next positioning function. This is because when positioning at a short distance, the module status cannot be updated in real time due to the delay when reading and writing the module (the PLC module refresh method can be adjusted). You need to use the TO instruction to clear the positioning completion flag first, and then determine whether the positioning is completed when executing positioning. When using FROM and TO instructions, multiple FROM and TO instructions cannot be executed at the same time. Multiple FROM and TO instructions can only start one FORM or TO instruction (one FROM and one TO are allowed to be executed at the same time).

type	instruction	The module number	The module	Starting	Data length
D	**FROM**	**m 1**	**m 2**	**D**	**n**

m 1 : The number of the expansion module, that is, the position of the module.

m 2: The number of the expansion module to be read, that is, the module address number in the above table .

the starting address of the read data .

n : The number of data records read at one time.

type	instruction	The module number	The module	Starting	Data length
D	**TO**	**m 1**	**m 2**	**S**	**n**

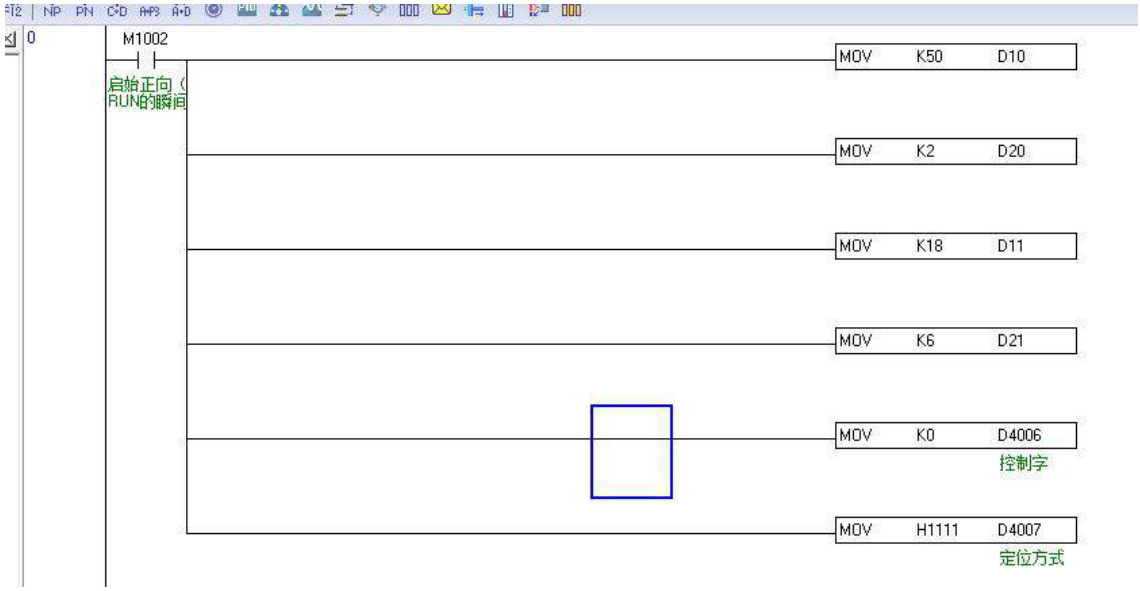
m 1 : The number of the expansion module, that is, the position of the module.

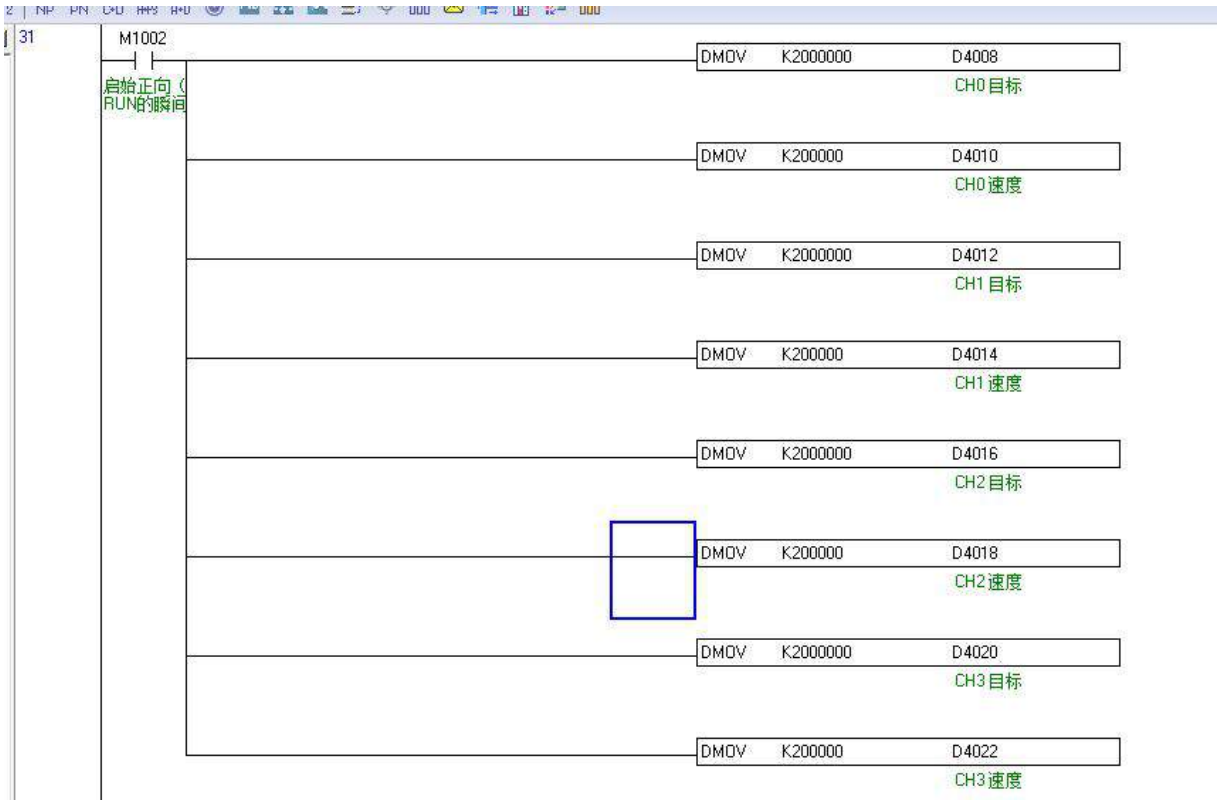
m 2: The number of the expansion module to be written , that is, the module address number in the above table .

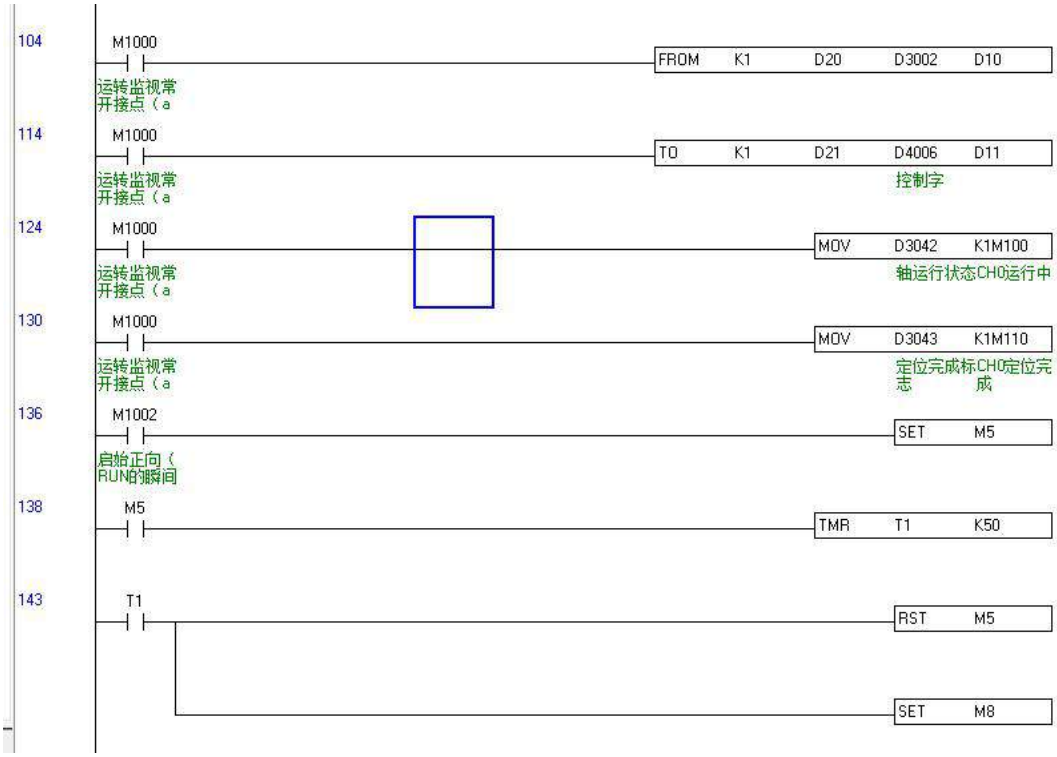
S : Stores the starting address of the data source to be written .

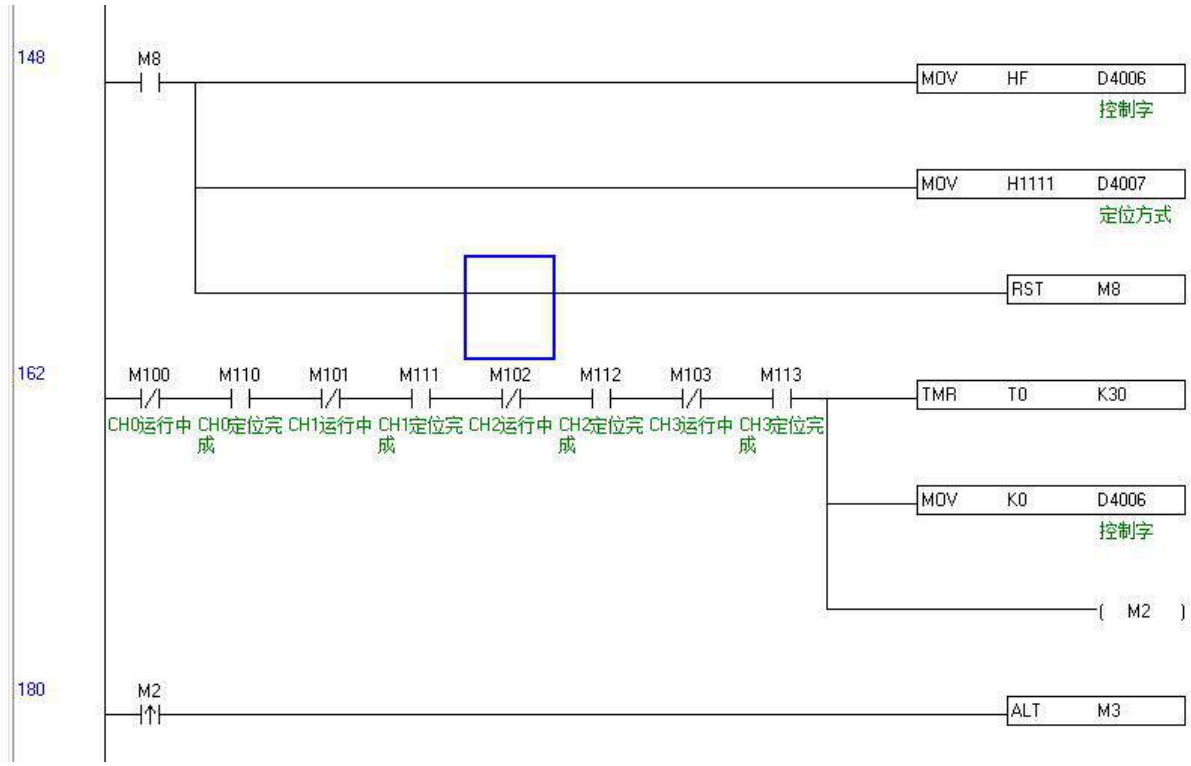
n : The number of data records written at one time .

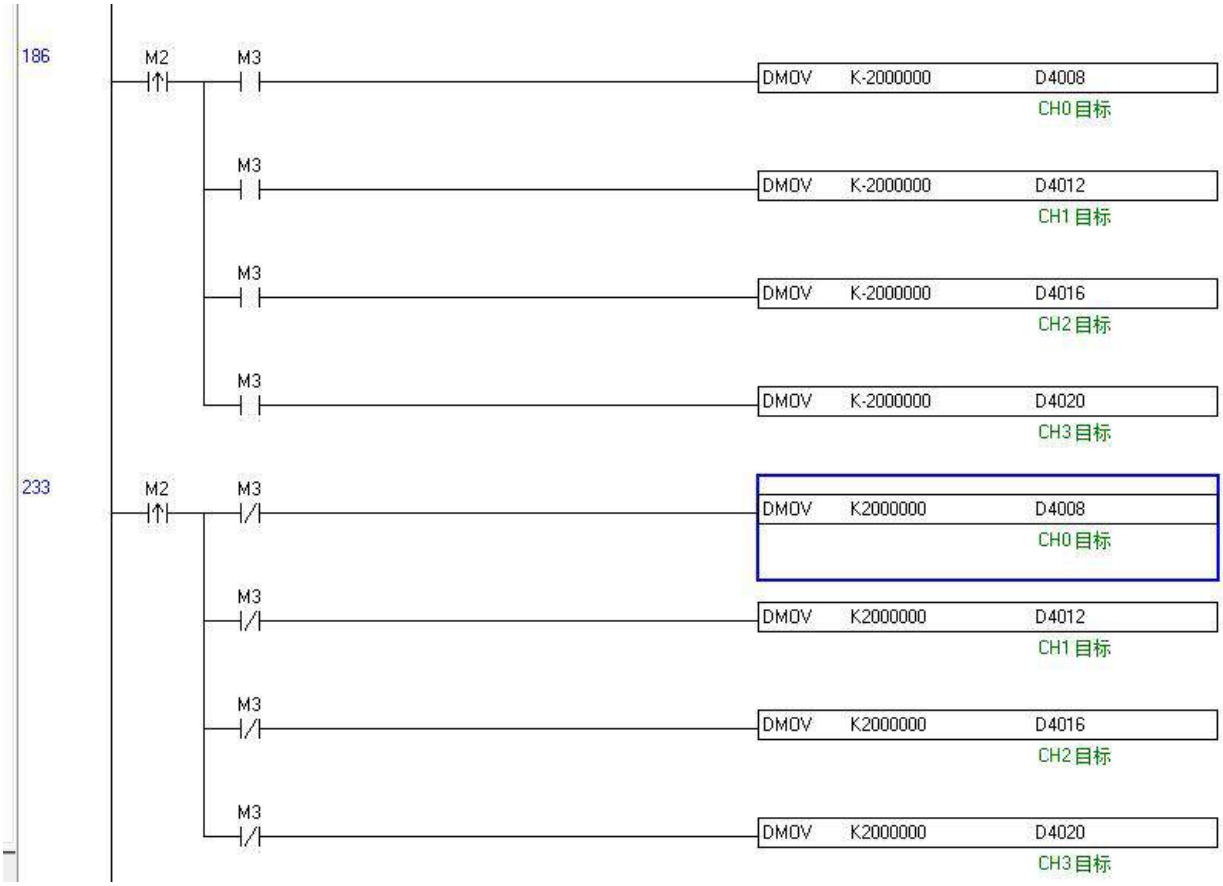
For example: The following ladder diagram realizes 2,000,000 pulses in the forward direction and 2,000,000 pulses in the reverse direction.

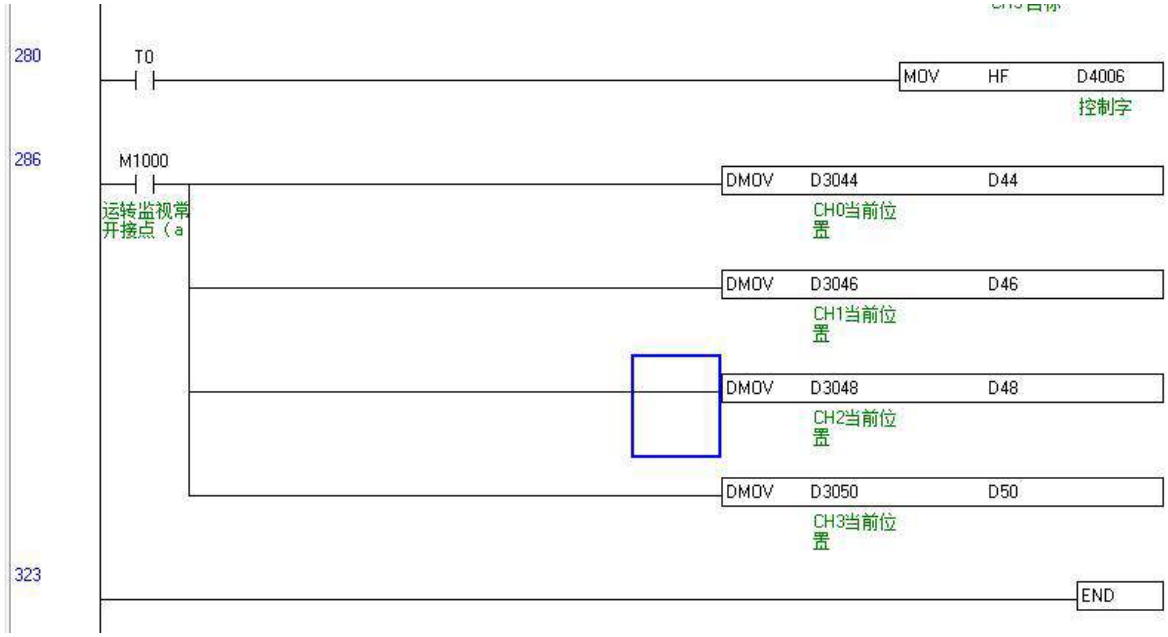





104
M1000
运转监视常开接点（a
FROM K1 D20 D3002 D10
114
M1000
运转监视常开接点（a
TO K1 D21 D4006 D11
控制字
124
M1000
运转监视常开接点（a
MOV D3042 K1M100
轴运行状态CH0运行中
130
M1000
运转监视常开接点（a
MOV D3043 K1M110
定位完成标志
CH0定位完成
136
M1002
启始正向（RUN的瞬间
SET M5
138
M5
TMR T1 K50
143
T1
RST M5
SET M8


148
M8
MOV HF D4006
控制字
MOV H1111 D4007
定位方式
RST M8
162
M100
CH0运行中
M110
CH0定位完成
M101
CH1运行中
M111
CH1定位完成
M102
CH2运行中
M112
CH2定位完成
M103
CH3运行中
M113
CH3定位完成
TMR T0 K30
MOV K0 D4006
控制字
(M2)
180
M2
ALT M3


186
M2
M3
DMOV K-2000000 D4008
CH0目标
M3
DMOV K-2000000 D4012
CH1目标
M3
DMOV K-2000000 D4016
CH2目标
M3
DMOV K-2000000 D4020
CH3目标
233
M2
M3
DMOV K2000000 D4008
CH0目标
M3
DMOV K2000000 D4012
CH1目标
M3
DMOV K2000000 D4016
CH2目标
M3
DMOV K2000000 D4020
CH3目标


280
T0
MOV HF D4006
控制字
286
M1000
运转监视常开接点（a
DMOV D3044 D44
CH0当前位置
DMOV D3046 D46
CH1当前位置
DMOV D3048 D48
CH2当前位置
DMOV D3050 D50
CH3当前位置
323
END

Appendix Version Change History

date	Changed version	Changes
2024-11	V24.111	◆ First version released