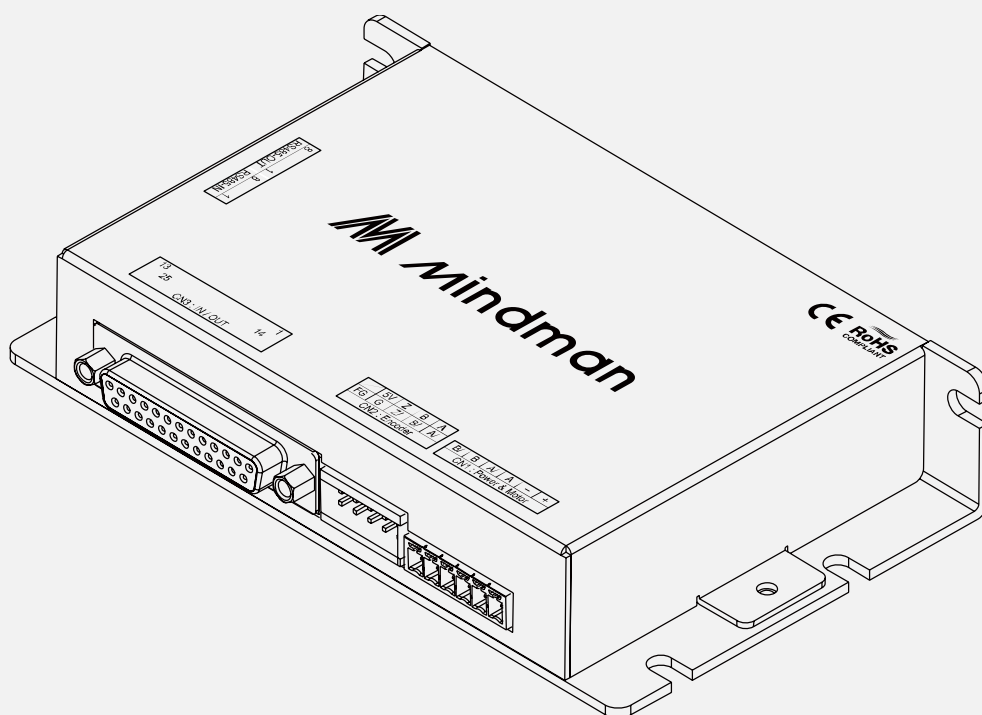


DRIVER



# CM20 series

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## User Manual

User Program (GUI) Function

Version 202204

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In order to communicate with the controller, the user should prepare the converter to connect with the PC.

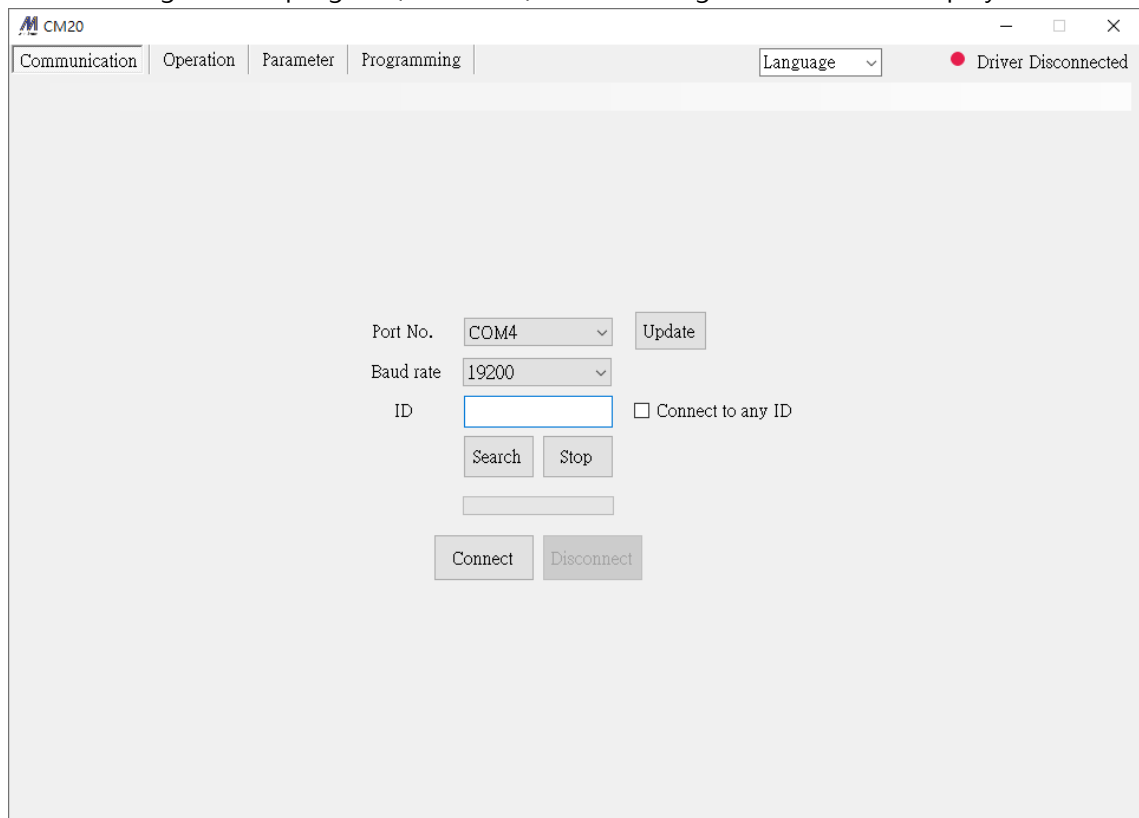
For more detailed information, please refer to "[CM20 instruction manual](#)".

The CM20 test software is composed of four parts:

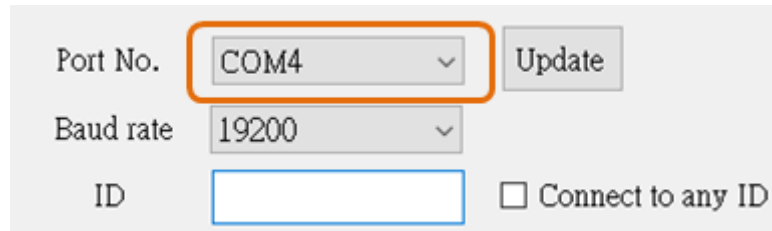
1. **Communication**
2. **Operation**
3. **Parameter**
4. **Programming**

## 1 · Communication

(1) After executing the GUI program(CM20.exe), the following window will be displayed.



(2) Select the COM port to connect to the device.

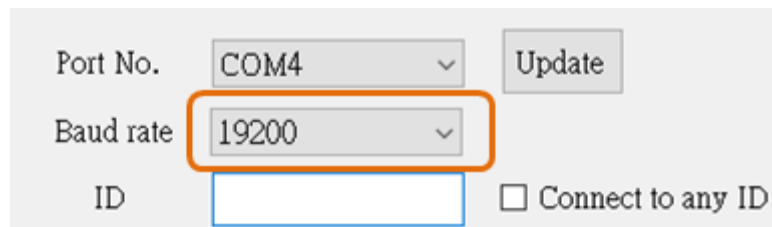


Port No. COM4 Update  
Baud rate 19200  
ID   Connect to any ID

\* If you don't know the port number, you can do the following:

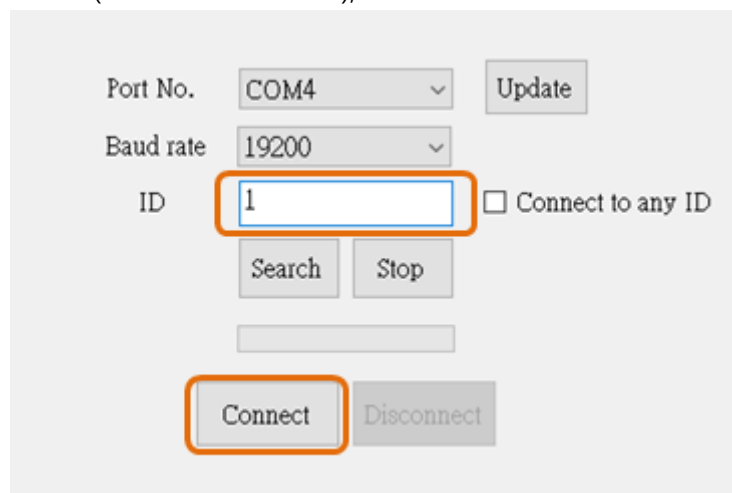
- I. Remove the communication cable and execute the CM20 software to view the communication port list.
- II. Connect the communication cable, click the "Update" button on the right side of the CM20 windows, and click the new communication port.

(3) Select the baud rate, the default value is 19200 bits/s.



Port No. COM4 Update  
Baud rate 19200  
ID   Connect to any ID

(4) Enter the controller ID (defaulted value is 1), and connect.



Port No. COM4 Update  
Baud rate 19200  
ID 1  Connect to any ID  
Search Stop  
Connect Disconnect

In addition, you can also click "Search" to find the controller ID automatically and connect it.

Port No.

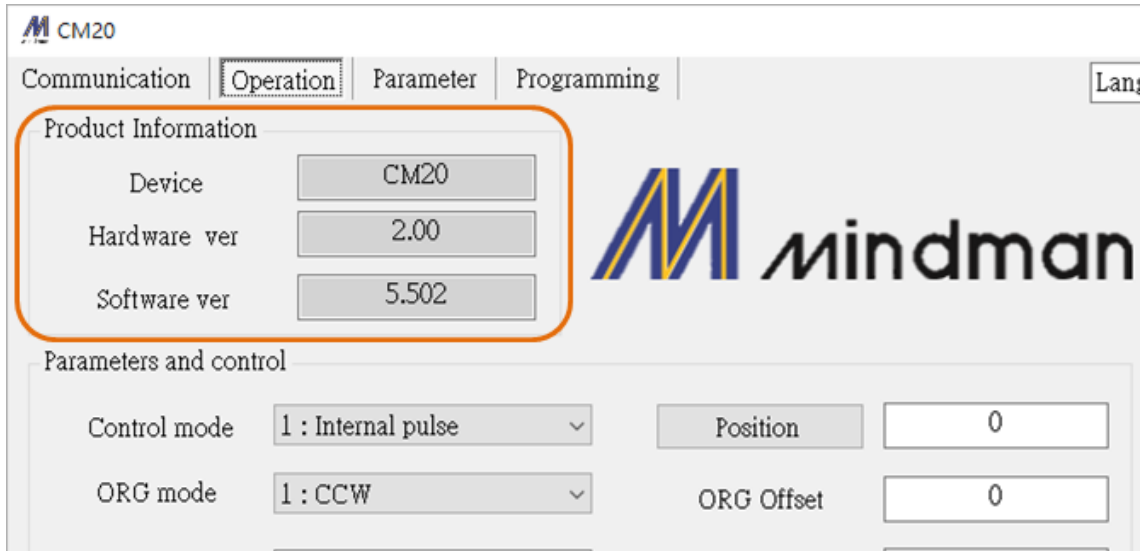
Baud rate

ID   Connect to any ID

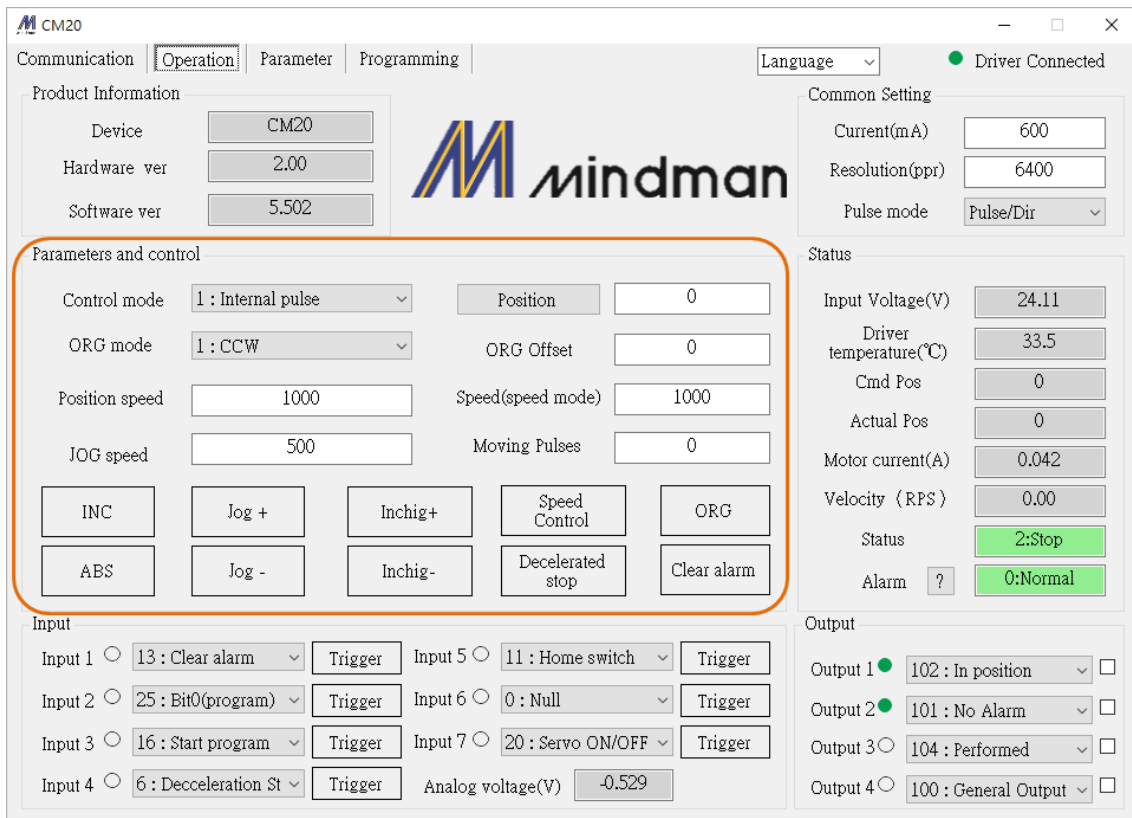
The search time is long, please be patient!

## 2 · Operation

(1) View the product information.



(2) Select the command to test the motion.



\* Use software to test motor motion control, please select "1: Internal pulse".

a) **Control mode:**

- 1) 0: External pulse
- 2) 1: Internal pulse
- 3) 4: Analog speed

Parameters and control

Control mode	1 : Internal pulse
ORG mode	1 : Internal pulse
Position speed	4 : Analog speed
JOG speed	500

b) **ORG method:**

- 1) 0: Return to origin in CW
- 2) 1: Return to origin in CCW
- 3) 2: Return to +Limit sensor
- 4) 3: Return to -Limit sensor
- 5) 8: +Z phase return
- 6) 9: -Z phase return
- 7) 12: Return to origin in CW and Z phase
- 8) 15: Return to origin in CCW and Z phase
- 9) 16: Return to +Limit and Z phase
- 10) 17: Return to -Limit and Z phase

Parameters and control

Control mode	1 : Internal pulse
ORG mode	1 : CCW
Position speed	1 : CCW
JOG speed	4 : Null

INC

ABS

Input

Input 1  13 : Cle

Input 2  25 : Bit

Parameters and control

Control mode	1 : Internal pulse	Position	0
ORG mode	1 : CCW	ORG Offset	0
Position speed	1000	Speed(speed mode)	1000
JOG speed	500	Moving Pulses	0

INC Jog + Inchig+ Speed Control ORG

ABS Jog - Inchig- Decelerated stop Clear alarm

\* After triggering the origin or limit signal, it will exit the trigger point in the reverse direction, and then back at the "ORG slow speed".

- c) **INC**: Click the button, it will move to the position based on the current position add the "Moving Pulses", and the speed is the value in the "Position Speed" field (unit: 0.01 RPS).

Parameters and control

Control mode	1 : Internal pulse	Position	0
ORG mode	1 : CCW	ORG Offset	0
Position speed	1000	Speed(speed mode)	1000
JOG speed	500	Moving Pulses	0
INC	Jog +	Inchig+	Speed Control
ABS	Jog -	Inchig-	Decelerated stop
			ORG
			Clear alarm

- d) **ABS**: Click the button to trigger the command, the "Cmd Pos" will be changed to the value in the "Moving Pulses" field, and the speed will be changed to the value in the "Position Speed" field (unit: 0.01 RPS).

Parameters and control

Control mode	1 : Internal pulse	Position	100
ORG mode	1 : CCW	ORG Offset	0
Position speed	1000	Speed(speed mode)	1000
JOG speed	500	Moving Pulses	10000
INC	Jog +	Inchig+	Speed Control
ABS	Jog -	Inchig-	Decelerated stop
			ORG
			Clear alarm



- e) **JOG:** Press and hold the button, it will move at the "**JOG speed**" until the button is released (unit: 0.01 RPS). ◦

Parameters and control

Control mode	1 : Internal pulse	Position	100
ORG mode	1 : CCW	ORG Offset	0
Position speed	1000	Speed(speed mode)	1000
JOG speed	500	Moving Pulses	10000

INC	Jog +	Inchig+	Speed Control	ORG
ABS	Jog -	Inchig-	Decelerated stop	Clear alarm

- f) **Inchig:** Click the trigger button, and the new target will move with the current position pluses/minuses the value in "**Moving Pulses**". The speed is the value in the "**Position Mode Speed**" field (unit: 0.01 RPS).

Parameters and control

Control mode	1 : Internal pulse	Position	100
ORG mode	1 : CCW	ORG Offset	0
Position speed	1000	Speed(speed mode)	1000
JOG speed	500	Moving Pulses	10000

INC	Jog +	Inchig+	Speed Control	ORG
ABS	Jog -	Inchig-	Decelerated stop	Clear alarm

- g) **Speed Control:** Click the button to trigger, and keep moving at the "**Speed(speed mode)**" until the "**Decelerated stop**" is clicked to stop. The sign of the value in the field changes the moving direction.

Parameters and control

Control mode	1 : Internal pulse	Position	100
ORG mode	1 : CCW	ORG Offset	0
Position speed	1000	Speed(speed mode)	1000
JOG speed	500	Moving Pulses	10000

INC	Jog +	Inchig+	Speed Control	ORG
ABS	Jog -	Inchig-	Decelerated stop	Clear alarm

- h) **Position:** The current "actual position" can be changed by setting the value in the field. The position "0" is considered as the origin.

Parameters and control

Control mode	1 : Internal pulse	Position	100
ORG mode	1 : CCW	ORG Offset	0

- (3) Status: The current status of the controller can be monitored.

Language ▼ ● Driver Connected

**mindman**

Common Setting

Current(mA)	600
Resolution(ppr)	6400
Pulse mode	Pulse/Dir

Status

Input Voltage(V)	24.11
Driver temperature(°C)	35.1
Cmd Pos	0
Actual Pos	0
Motor current(A)	0.041
Velocity (RPS)	0.00
Status	2:Stop
Alarm	0:Normal

- (4) Input/Output: Input/output function setting and I/O trigger simulation.

Input				Output			
Input 1	<input type="radio"/> 13 : Clear alarm	Trigger	Input 5	<input type="radio"/> 11 : Home switch	Trigger	Output 1	<input checked="" type="checkbox"/> 102 : In position
Input 2	<input type="radio"/> 25 : Bit0(program)	Trigger	Input 6	<input type="radio"/> 0 : Null	Trigger	Output 2	<input checked="" type="checkbox"/> 101 : No Alarm
Input 3	<input type="radio"/> 16 : Start program	Trigger	Input 7	<input type="radio"/> 20 : Servo ON/OFF	Trigger	Output 3	<input type="checkbox"/> 104 : Performed
Input 4	<input type="radio"/> 6 : Deceleration St	Trigger	Analog voltage(V)		-0.531	Output 4	<input type="checkbox"/> 100 : General Output

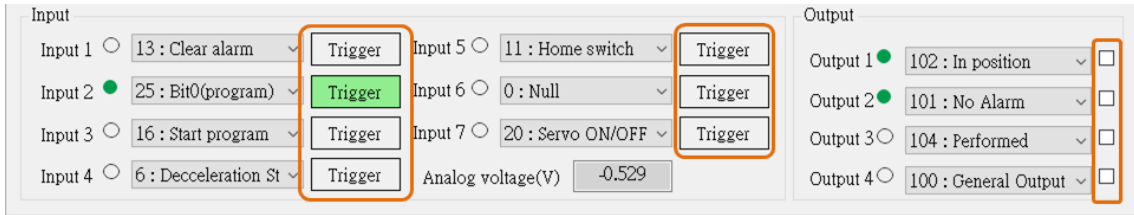
a) I/O signals:

Whether the I/O is triggered can be judged by the light. Green light means that the signal is activated.

Input				Output			
Input 1	<input type="radio"/> 13 : Clear alarm	Trigger	Input 5	<input type="radio"/> 11 : Home switch	Trigger	Output 1	<input checked="" type="checkbox"/> 102 : In position
Input 2	<input checked="" type="radio"/> 25 : Bit0(program)	Trigger	Input 6	<input type="radio"/> 0 : Null	Trigger	Output 2	<input checked="" type="checkbox"/> 101 : No Alarm
Input 3	<input type="radio"/> 16 : Start program	Trigger	Input 7	<input type="radio"/> 20 : Servo ON/OFF	Trigger	Output 3	<input type="checkbox"/> 104 : Performed
Input 4	<input type="radio"/> 6 : Deceleration St	Trigger	Analog voltage(V)		-0.529	Output 4	<input type="checkbox"/> 100 : General Output

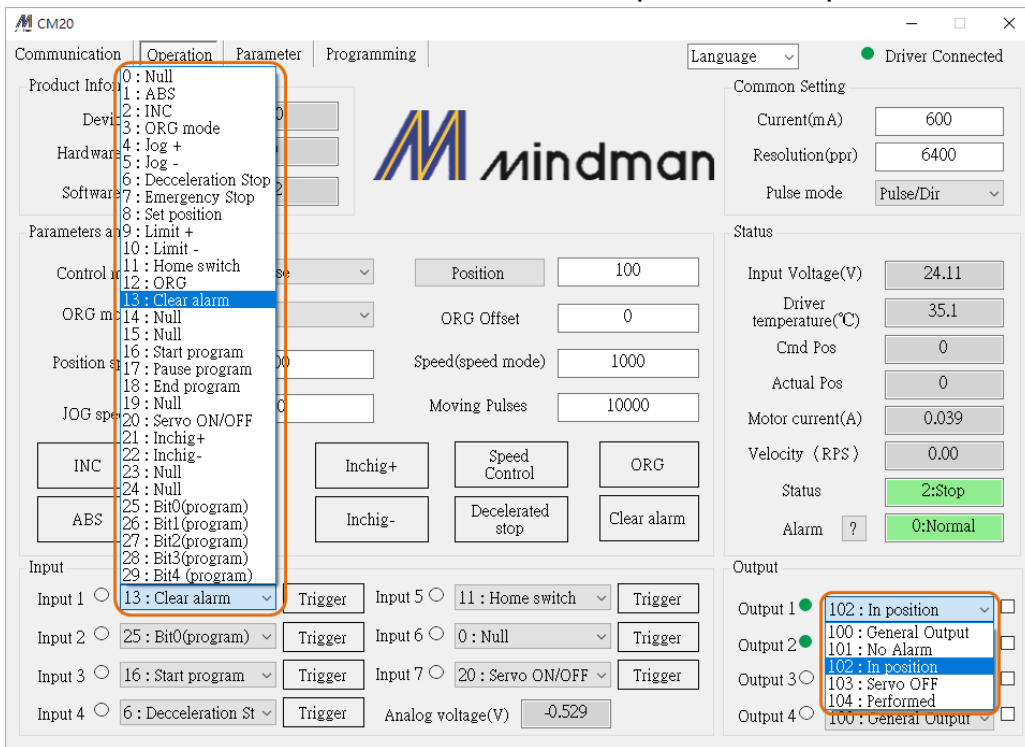
## b) I/O simulation function:

Only the pins defined as "Null" or "Generic Output" can be controlled by simulate I/O. If the pins were defined as specific states, the actual state output shall prevail.

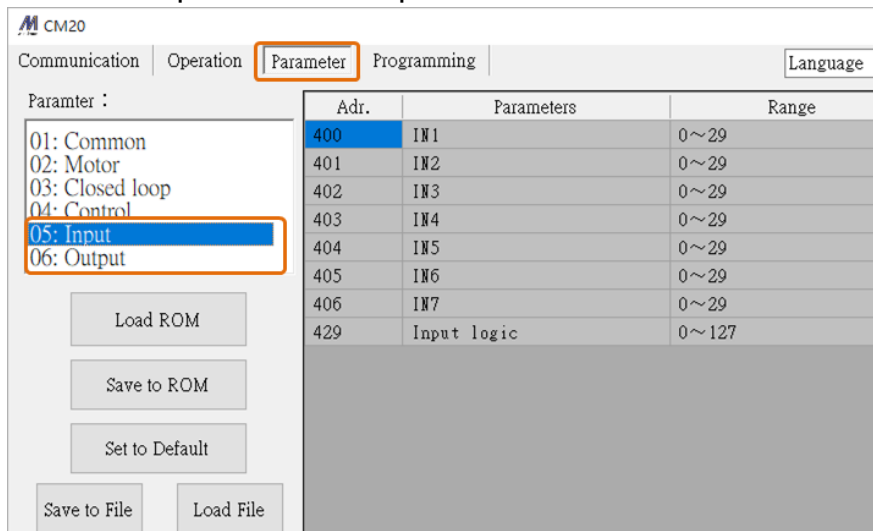


## c) I/O function setting:

The I/O function can be defined. Set in the "Input" and "Output" list.

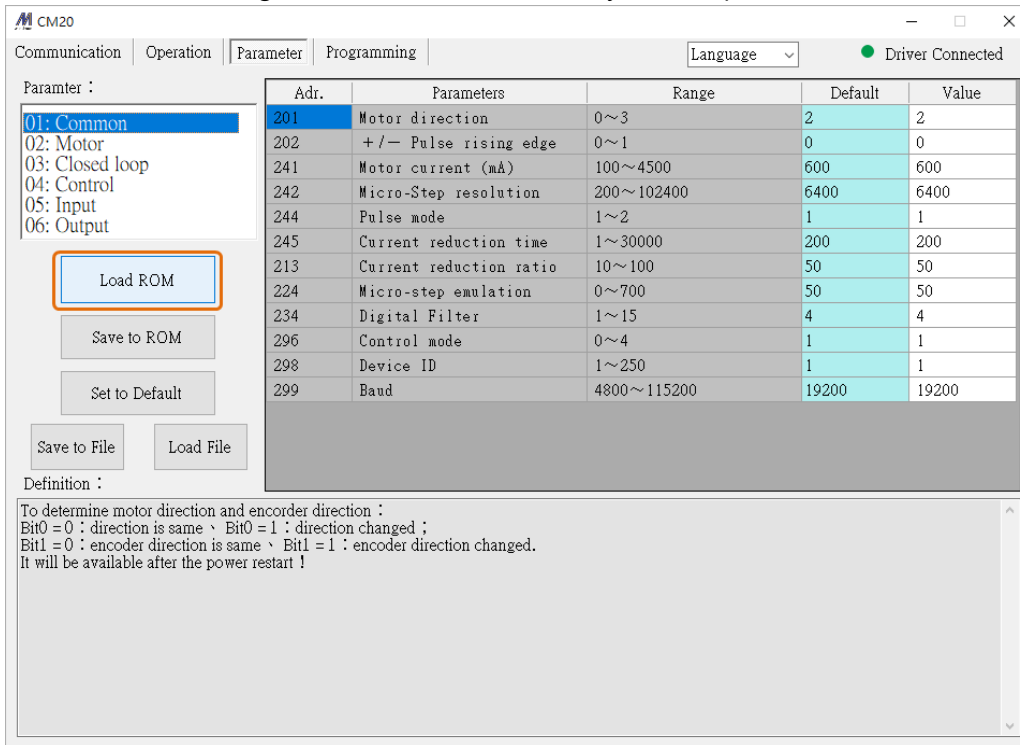


The definition of "05: Input" and "06: Output" can also be set in the "Parameter" page.

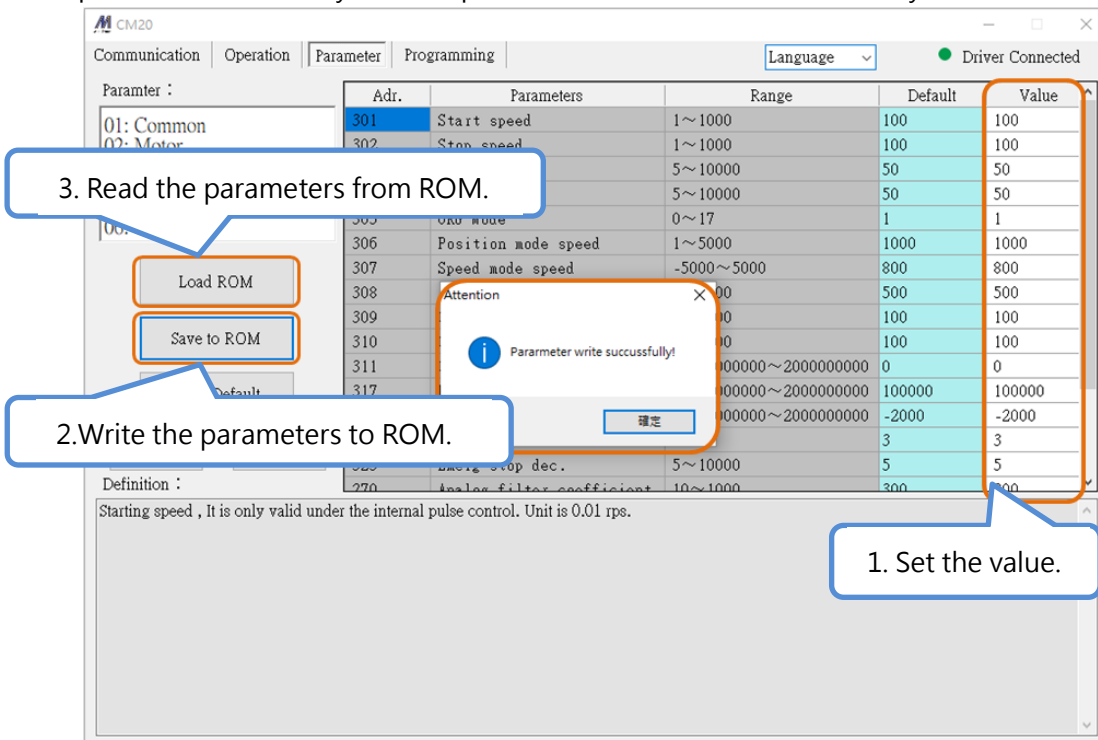


## 3 · Parameter

(1) Load ROM: When starting the software, it is necessary to read parameters from the drive.

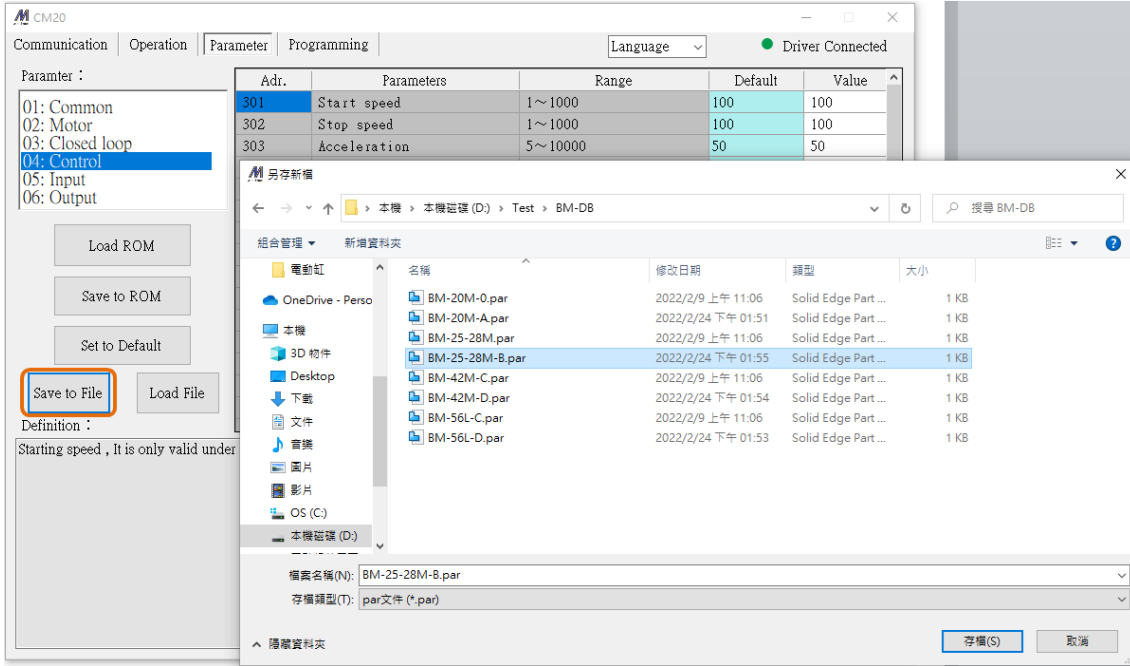


(2) Save to ROM: After modifying the parameters, please save the parameters to the drive. Load the parameters and verify that the parameters are modified successfully.

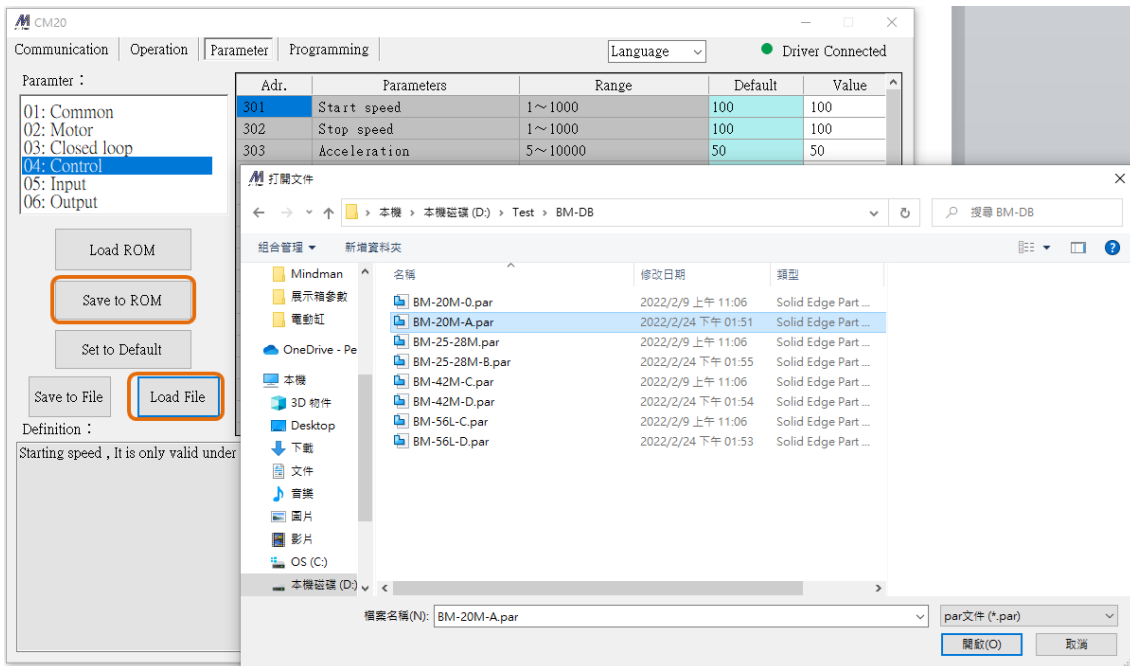


\* After some parameters are modified, the driver must be restarted.

(3) Save to File: Package the parameters as files and save in the computer.



(4) Load File: Optionally load parameter files in the computer. After importing the parameters, write the parameters to the controller, and then restart the drive. It should be noted that different motors have different specifications.



\* For more information, please refer to the " CM20 instruction manual ", please pay attention to the rated current to avoid damage to the motor.

## 4 · Programming

(1) Editor:

- ① Up to 64 commands can be written.
- ② "Segment No." will automatically increase by 1 when the paragraph command ends.
- ③ Select needed motion in "Command" field.
- ④ According to each "Command", set the required parameters .

(2) Motor Control: Perform simple position control of the motor.

(3) Program Control: You can specify the section to be executed, start, pause, and stop the programs.

(4) Program Management:

- ① Programs can be stored as files.
- ② Load the saved file.
- ③ Read the driver.
- ④ Write the program to drive.

The screenshot displays the CM20 software interface with four main sections highlighted by callouts:

- Editor Interface:** A table with columns: No., Segment No., Command, Parameter 1, Parameter 2, Parameter 3, and Remark. The table contains 24 rows of programming data.
- Motor Control:** A panel with input fields for Actual Pos (0) and Moving Pulses (0), and buttons for Jog -, Jog +, ABS, INC, Decelerated, and ORG.
- Program Control:** A panel with input fields for Run No. (0), I/O Segment No. (0), and Assigned Segment No. (0), and buttons for Start, Pause, and Stop.
- Program Management:** A panel with buttons for Load, Save, UpLoad, and Download.

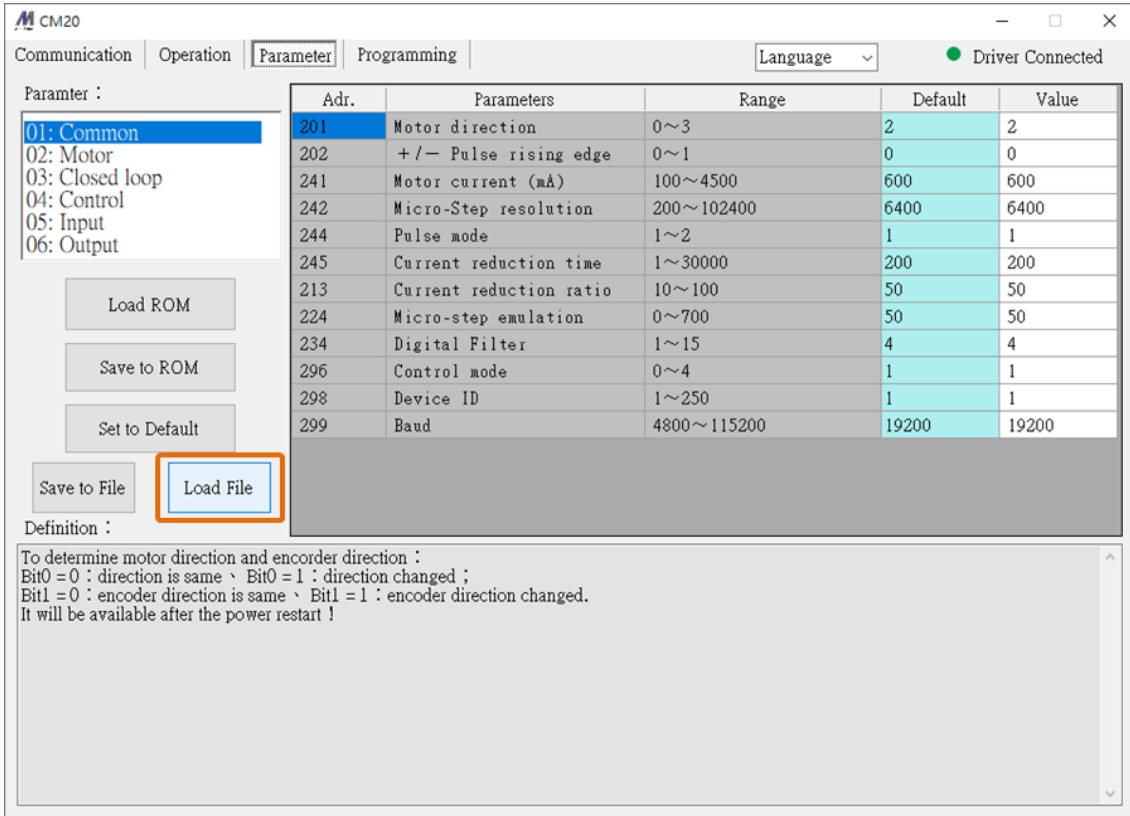
No.	Segment No.	Command	Parameter 1	Parameter 2	Parameter 3	Remark
0	0	Acc	100			
1	0	Dec	100			
2	0	Start speed	100			
3	0	Output	0			
4	0	ORG	1			
5	0	End section				
6	1	Acc	200			
7	1	Dec	200			
8	1	Start speed	100			
9	1	Position speed	4000			
10	1	ABS	80000			
11	1	Wait jump	2000	-1	0	
12	1	Position speed	2000			
13	1	INC	-20000			
14	1	Wait jump	1000	-1	0	
15	1	Position speed	2000			
16	1	INC	-20000			
17	1	Wait jump	1000	-1	0	
18	1	Position speed	4000			
19	1	INC	-30000			
20	1	Wait jump	500	-1	0	
21	1	Position speed	200			
22	1	ABS	0			
23	1	Wait jump	2000	6	0	
24	1	End section				

## 5 · Motor Specification Parameter Setting

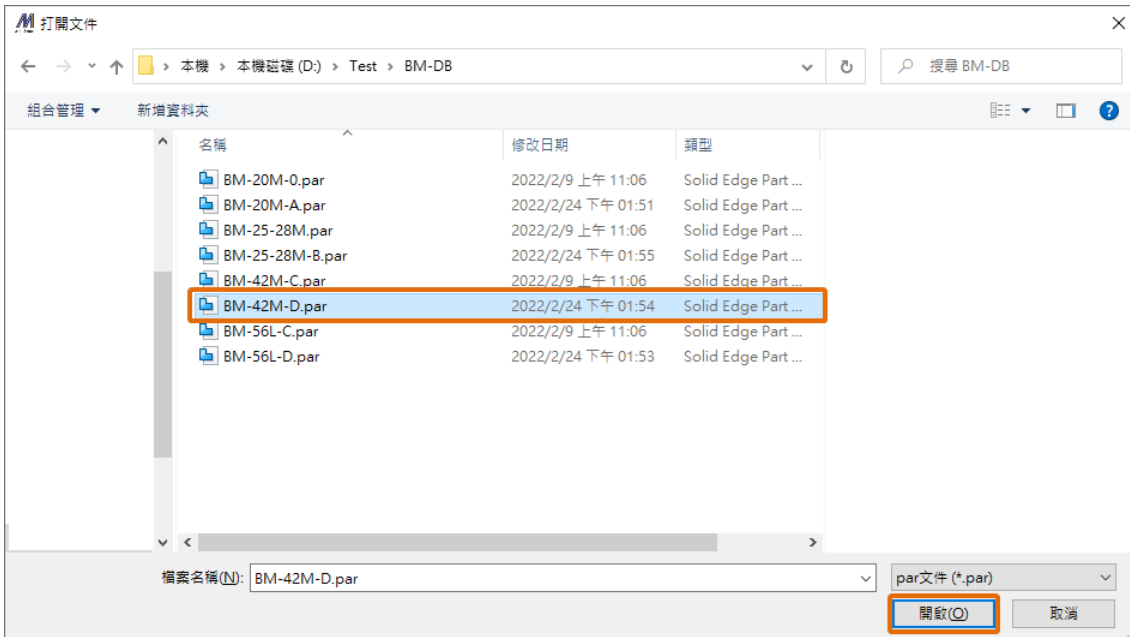
The controller can be applied to different motors by setting parameters. The following is the setting example of □42 motor.

Step 1: The controller is disconnected to the motor, turn on the controller and start the software.

Step 2: " Load File " on the "Parameter" page.



Step 3: Select the file of the motor specification parameter on the browse window.





Step 4: Click "Save to ROM" and restart the controller to complete the motor specification setting.

The screenshot shows the CM20 software interface with the 'Parameter' tab selected. The 'Save to ROM' button is highlighted with a red box. The parameter table is as follows:

Adr.	Parameters	Range	Default	Value
201	Motor direction	0~3	2	2
202	+/- Pulse rising edge	0~1	0	0
241	Motor current (mA)	100~4500	600	2000
242	Micro-Step resolution	200~102400	6400	16000
244	Pulse mode	1~2	1	1
245	Current reduction time	1~30000	200	200
213	Current reduction ratio	10~100	50	50
224	Micro-step emulation	0~700	50	50
234	Digital Filter	1~15	4	4
296	Control mode	0~4	1	1
298	Device ID	1~250	1	1
299	Baud	4800~115200	19200	19200

Definition :  
 To determine motor direction and encoder direction :  
 Bit0 = 0 : direction is same 、 Bit0 = 1 : direction changed ;  
 Bit1 = 0 : encoder direction is same 、 Bit1 = 1 : encoder direction changed.  
 It will be available after the power restart !

### Specification of Motor

Size		□20	□25	□28	□35	□42	□56
Series	-	BM					
Drive Method	-	Bi-Polar					
Number of Phases	-	2					
Current per Phase	A	0.6	1	1	1.5	2	3
Holding Torque	N.m	0.036	0.085	0.085	0.28	0.51	1.53
Rotor Inertia	$g \cdot cm^2$	2.9	8	8	40	75	490
Weight	g	70	120	120	300	400	1150
Insulation Resistance	Mohm	100 MIN.(at 500VAC)					
Insulation Class	-	Class B					
Operating Temperature	°C	0~50					
Incremental Optical Encoder Resolution	PPR	6,400	9,600	9,600	12,800	16,000	16,000

**Warning:** If you want to change the parameter setting of the motor specification, please be sure to complete the parameter setting before connect to the motor.

## 6 · Example

No.	Seg. No.	Command	Para.1	Para.2	Para.3	Remark
0	0	Acc	20			Unit: rps <sup>2</sup>
1	0	Dec	20			Unit: rps <sup>2</sup>
2	0	Start Speed	100			Unit: (1/100) rps
3	0	Output	0			All "Output" pins <b>close</b>
4	0	ORG	8			ORG mode: 8
5	0	End Section				When Segment No. 0(bit0 = 0) is over, increase Segment No. 1.
6	1	Acc	20			When bit0 = 1, excute Segment No. 1.
7	1	Dec	20			
8	1	Start Speed	100			
9	1	Position Speed	1000			Unit: (1/100) rps
10	1	ABS	5000			pulse
11	1	Wait Jump	2000	-1		Wait 2000 milliseconds to go to next step.*
12	1	Position Speed	20			Unit: (1/100) rps
13	1	INC	-5000			The minus represent the other side.
14	1	Wait Jump	2000	-1		Wait 2000 milliseconds to go to next step.
15	1	Loop	2	10		Go back to Segment No. 13, execute the loop 2 times
16	1	Output	9			9=1001(B) ; Out1, Out4 trigger
17	1	Position Speed	100			
18	1	Set Position	-1000			Set current position to -1000.
19	1	Wait Jump	0	-1	11	11(D)=1011(B), wait for Input3 pin to <b>trigger</b> *
20	1	Speed Control	-300			<b>Reverse</b> at 3 rps.
21	1	Wait Jump	0	-1	3	3(D)=0011(B), wait for Input3 pin to <b>close</b>
22	1	Dec Stop				
23	1	Wait Jump	100	9		After waiting for 100 milliseconds, jump to line 9 to execute.
24	1	End Section				

- \* If "Parameter 2" of the "Wait Jump" command is set -1, the execution will start from the next step after the condition is met; if the value is 0~63, it will be executed by the corresponding "No". Take 9 as an example, it means that after the condition is met, jump to "No. 9" to execute. Note that this function cannot span program "Segment No."
- \* The "parameter 3" of the "Wait Jump" command needs to be converted from decimal to binary to determine the program command. For example, the decimal "11" is converted to binary "1011", the highest bit represents the switch state of the pin, "0" represents the Input pin "off", "1" represents the Input pin "triggered"; the other 3 bits represents the position of the pin, "001" represents "Input1", "010" represents "Input2", and "011" represents "Input3".

## 7 · Closed Loop Gain Adjustment Instructions

Category No.	Address	Parameters	Range	Default	Unit	Note
01	201	Motor Direction*	0~3	0		bit0=0 : Motor CW bit0=1 : Motor CCW bit1=0 : Encoder CW bit1=1 : Encoder CCW
01	241	Motor Current	100~8000	3000	mA	Motor Current per Phase
01	242	Micro-Step Resolution*	200~102400	6400	PPR	Resolution of Motor
03	217	Motor Control*	0~2	0		0 : open-loop 1 : close-loop
03	246	Encoder Resolution*	200~65535	6400	PPR	Resolution of Motor
03	251	Velocity Loop Kp	0~30000	1000		Proportional Gain
03	255	Position Loop Kp	0~30000	800		
03	258	Position Error	1~30000	1000		Maximum Tracking Error
03	264	KD Filter Factor	0~1000	50		Differential Gain
03	265	KD Gain	0~1000	50		

Please adjust the appropriate gain parameters in the following order:

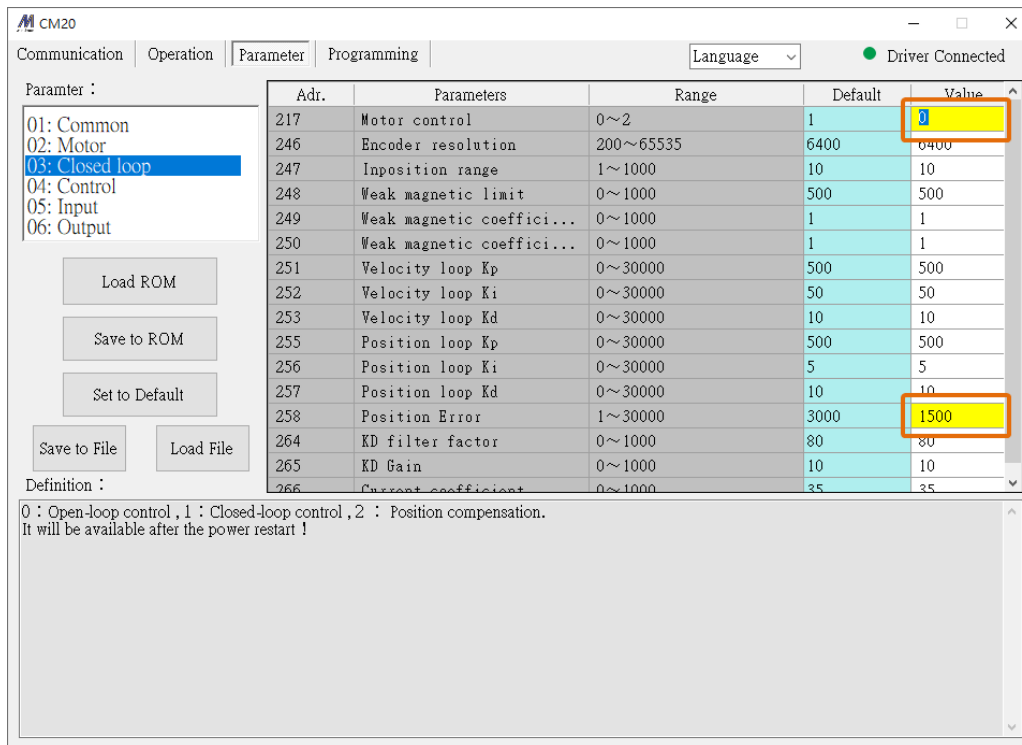
Step 1 : The controller is disconnected to the motor, turn on the controller and start the software.

Step 2 : Complete the "motor specification parameter setting".

Step 3 : Set "217 Motor Control" to 0 for the open loop mode.

Set "258 position error" according to the application.

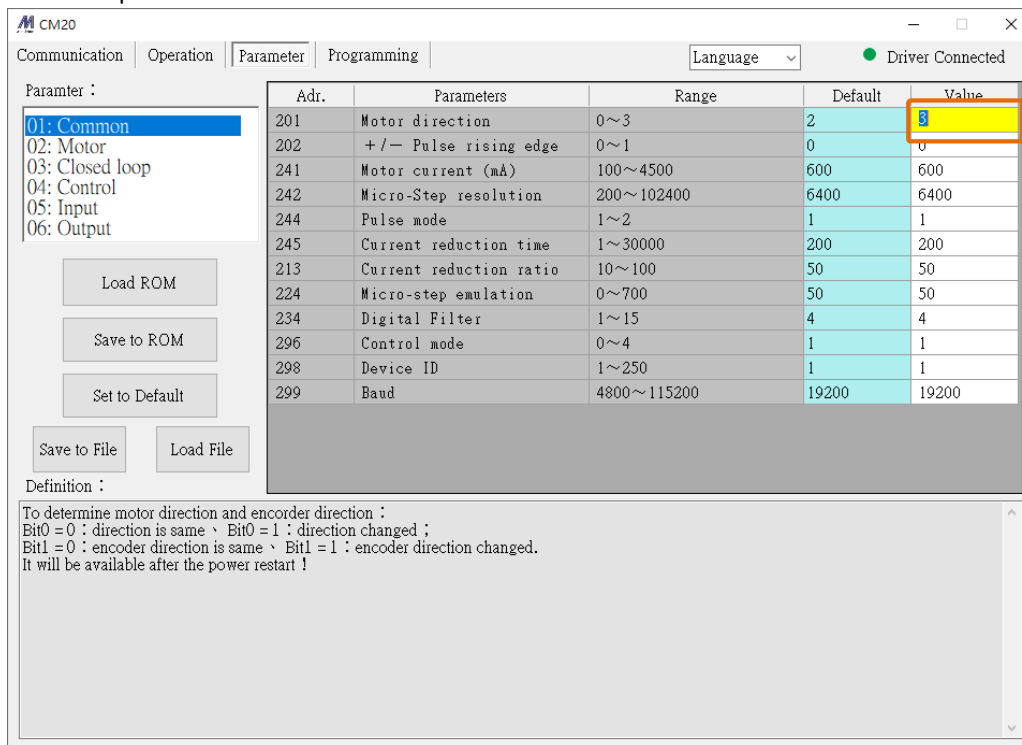
Turn off the controller after saving the parameters.



Step 4 : Connect the controller, motor and the encoder, and then turn on the controller.

Step 5 : Use the internal pulse mode to perform the JOG test, observe the motor running direction, command position, and actual position, and modify the "201 Motor Direction" parameter to "2" or "3" according to the required motor running direction.

After the modification, set "217 Motor Control" to 1, which is closed-loop mode, and then save the parameters and restart the controller.



Step 6 : Observe the state of the motor or mechanism, and adjust the rigidity of the motor by the Kp parameter. The larger the Kp parameter value, the stronger the rigidity.

When the encoder resolution is higher, the Kp parameter should be adjusted appropriately. Generally speaking, "251 Velocity Loop Kp" and "255 Position Loop Kp" will be adjusted at the same time.

It can improve overshoot and vibration problems by tuning Kd value appropriately.

Parameter :

Adr.	Parameters	Range	Default	Value
217	Motor control	0~2	1	1
246	Encoder resolution	200~65535	6400	6400
247	Inposition range	1~1000	10	10
248	Weak magnetic limit	0~1000	500	500
249	Weak magnetic coeffici...	0~1000	1	1
250	Weak magnetic coeffici...	0~1000	1	1
251	Velocity loop Kp	0~30000	500	400
252	Velocity loop Ki	0~30000	50	50
253	Velocity loop Kd	0~30000	10	10
255	Position loop Kp	0~30000	500	300
256	Position loop Ki	0~30000	5	5
257	Position loop Kd	0~30000	10	10
258	Position Error	1~30000	3000	3000
264	KD filter factor	0~1000	80	80
265	KD Gain	0~1000	10	10
266	Current coefficient	0~1000	35	35

Definition :

Velocity loop Kp.

If the motor still cannot run appropriately after adjusting above parameters, or the performance cannot achieve the requirements, please consult technical support.