Coolmay®
Automation Expert

FX3GC PLC User Manual

Thank you for choosing Coolmay FX3GC series PLC. This manual mainly explains the features, general specifications and wiring methods of FX3GC series. More detail programming information please refer to "Coolmay CX3G&FX3GC PLC Programming Manual".
The FX3GC series is a compact PLC with the following features:
1. Highly integrated. Digital at most 16DI/16DO (digital type can be customized transistor, relay or mixed). Analog at most 8AI 6AO, input can be customized temperature, current, voltage or mixed (support-5~5V/ -10V~10V), output can be customized current and voltage.
2. Comes with two PLC programming ports: MiniB USB port (faster download speed) and RS232 port.
3. Support multi-channel high-speed counting and high-speed pulse functions. High-speed counting normally single-phase 6 60KHz, or AB (Z) phase 2 60KHz + AB phase 1 10KHz. High-speed pulse is normally 8 channels, Y0-Y3 is 100KHz, Y4-Y7 is 10KHz. Acceleration and deceleration are independent; the total of high-speed counting + high-speed pulse cannot exceed 480KHz.
4. Support special encryption. Setting the password to 12345678 can completely prohibit reading programs. [Note: Only 8-bit password encryption is supported]
5. Convenient wiring, using 3.5mm pitch pluggable terminals.

Production Information

◆ Naming rules

FX3GC ① − 16 ② M ③ RT ④ − 8AD ⑤ 4DA ⑥ − V ⑦ − A0 ⑧ − 1C1 ⑨ − 1P ⑩ − 485/CAN ⑪

1. Series: FX3GC: FX3GC series PLC
2. I/O points: 16: 8DI 8DO 30: 16DI 14DO 32: 16DI 16DO
3. Module M: Main Module
4. DO type: R: Relay; T: Transistor; RT: Relay and transistor mixed
5. AI 0-8 channels are optional
6. AO 0-6 channels are optional
7. AI type PT: PT100 PT1000: PT1000 NTC: Thermistor (10K/50K/100K)
   V: 0 -10V V5: 0-5V V_: -10~10V V5_: -5~5V A0: 0-20mA A4: 4-20mA
   E: E type thermocouple (K type/T type/S type/J type can be customized, supporting negative temperature)
8. AO type V: 0-10V V5: 0-5V A0: 0-20mA A4: 4-20mA V_: -10~10V V5_: -5~5V
   [Note: Optional negative voltage occupies two DA channels]
9. C1 means single-phase high-speed counting, C2 means AB phase counting, and C3 means ABZ phase counting. Normally single phase 6 channels 60KHZ, or AB (Z) phase 2 channels 60KHz + AB phase 1 channel 10KHz.
10. P0 means 10KHz high-speed pulse, P means 100KHz high-speed pulse. High-speed pulse normally 8 channels, Y0-Y3 is 100KHz, Y4-Y7 is 10KHz; acceleration and deceleration are independent; high-speed counting + high-speed pulse total cannot exceed 480KHz.
11. COM port. Refer to【Table 1: Basic parameters】

◆ Basic parameters

Table 1: Basic parameters

Model	Digital points		Analog (optional)		Com ports (optional)		High-speed counting			High-speed pulse	Size
	DI	DO	MAX AI	MAX AO	RS485	CAN (2.0A/B)	Single phase	AB phase	ABZ phase	Output	Dimensions (mm)
FX3GC-16M	8	8	6	4	2	1	Normally single phase 6 channels 60KHz	Normally AB phase 2 channel 60KHz+ 1 channel 10KHz	Normally ABZ phase 2 channel 60KHz	Normally 8 channels, Y0-Y3 is 100KHz, Y4-Y7 is 10KHz; HSC + HSP can not exceed 480KHz.	90*65*32
			8	4	1	1					
			8	6	1	None					
FX3GC-30M	16	14	None	None	1	None					
FX3GC-32M	16	16			None	None					

MT: Y0-Y7 is MOS tube output, Y10-Y17 is transistor output; MR: relay output; MRT: mixed output. Optional according to customer requirements.

Table 2 Electrical parameters

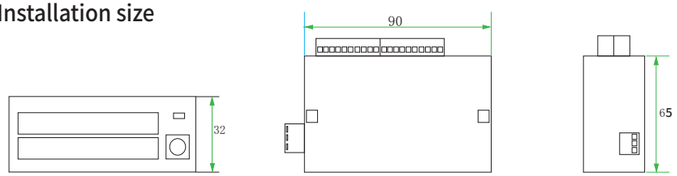
Electrical parameters		
Input voltage	DC 24V	
Digital input index		
Isolation mode	Photoelectric coupling	
Input resistance	High-speed input 3.3KΩ	Common input 4.3Ω
Input ON	Electric current of high-speed input is higher than 5.8mA/24V	Electric current of common input is Higherthan 9.9mA/24V
Input OFF	Electric current of high-speed input is higer than 4.5mA/19V	Electric current of common input is Higher than 4mA/17V

(Continued from the table above)

Filter function	With filter function, the filter time can be set among 0-60ms, defaulted as 10ms
High-speed counting	Normally single phase 6 channels 60KHz or AB (Z) phase 2 channels 60KHz + AB phase 1 channel 10KHz
Input level	Passive NPN, common terminal isolation, S/S connected to 24V+
Digital relay output index	
Max current	2A/point, 5A/8point COM
Load voltage	Below DC30V/ Below AC220V
Circuit insulation	Relay mechanical insulation
On response time	About 10ms
Mechanical life (no load)	10 million times
Electrical life (rated load)	300,000 times
Output level	Normally open dry contact output, COM can be connected to positive or negative
Digital transistor output index	
Max current	MOS tube: 2A/point, 4A/4point COM, 5A/12point COM; MT: 0.5A/point, 0.8A/4point COM, 1.6A/12point COM
Load voltage	DC24V
Circuit insulation	Optocoupler insulation
Isolation voltage (power supply-external terminal)	1500VAC
On response time	High-speed output: 10μs, other 0.5ms
High-speed frequency output	Normally 8 channels, Y0-Y3 is 100KHz, Y4-Y7 is 10KHz High-speed counting + high-speed pulse total does not exceed 480KHz
Output level	Low level NPN, COM connected to negative
Analog input index	
Input signal	PT100/PT1000/thermocouple/NTC/0-10V/0-5V/-10~10V/-5~5V/0-20mA/4-20mA other customization
Response time	1 scan cycle
Analog input quantity	0-8 Channel
Accurary	12 bits
Analog output index	
Output signal	0-5V/0-10V/-10~10V/-5~5V/0-20mA/4-20mA/other customization
Analog output quantity	0-6 Channel
Accurary	12 bits
External interface	
Programming port	Comes with 2 programming ports: Mini B USB port (faster download speed) and Rs232
COM port	Refer to【Table 1: Basic parameters】
Environment	
Operating temperature	0°C~50°C
Relative humidity	5%~95%RH
Storage temperature	-20°C~70°C
Vibration frequency	10-57Hz, amplitude 0.035mm; 57Hz-150Hz, acceleration speed 4.9m/s² (10 times each on X, Y, Z, total 80 minutes each)

Mechanical Design Reference

◆ Installation size



Dimensions 90*65*32(mm)
Installation size: DIN rail (35mm)
Diagram 1 Installation dimension drawing

Electrical Design Reference

◆ Product structure

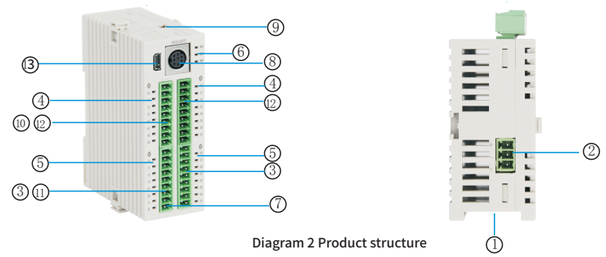


Diagram 2 Product structure

1. 35mm rail installation
2. Terminal block for power input signal
3. Digital output terminal block
4. Digital input display LED
5. Digital output display LED
6. PWR: Indicates the power-on state RUN: The light is on when the PLC is running ERR: The indicator light flashes when the program error occurs (the indicator light is on when the CPU error occurs)
7. Optional RS485
8. PLC programming port
9. RUN/STOP PLC operation switch
10. Analog input (optional 485)
11. Analog output (optional CAN)
12. Digital input terminal block
13. Mini USB programming port (faster download speed)

◆ Hardware interface

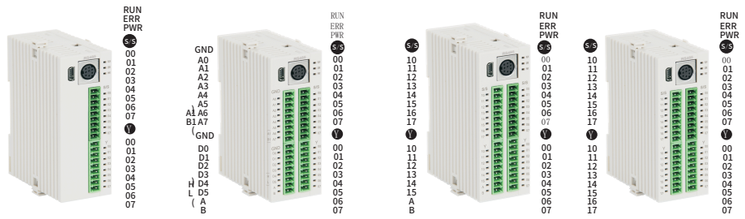


Diagram 3 FX3GC-16MR/MT/MRT
Diagram 4 FX3GC-16M communication port/analog expansion
Diagram 5 FX3GC-30MR/ MT/MRT
Diagram 6 FX3GC-32MR/ MT/MRT

Note: S/S is the common terminal of digital input, which is connected to the positive pole of 24V;
Ⓥ is the public terminal of switch output; GND is the common terminal of analog input/analog output

Terminal wiring specifications: 22-14AWG wire. The terminals of this series of models are all pluggable terminals. For special model interfaces, please refer to the product silk screen.

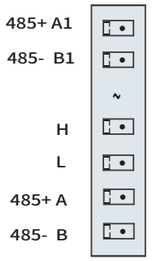


Diagram 8 Optional communication port

RS232 programming port pin definition

Pin No.	Signal	Description
4	RXD	Receive
5	TXD	Send
8	GND	Ground

Diagram 7 RS232 programming port

Comes with two programming ports:
Mini B-type USB port (faster download speed) and RS232 (8-pin mouse female socket)
16M can expand at most 2 RS485, 1 CAN port (2.0A/B), 6 inputs and 4 outputs analog
Or 1 RS485, 1 CAN port (2.0A/B), 8 inputs and 4 outputs simulation
Or 1 RS485, 8 inputs and 6 outputs analog
Or 2 RS485, 1 CAN port (2.0A/B)

Communication port description

◆ Serial port 1: RS422 (PLC programming port): Supports Mitsubishi programming port protocol, which can be used to download PLC programs or communicate with devices that support Mitsubishi programming port protocol.
◆ Serial port 2: RS485 (AB port): Support Mitsubishi programming port protocol, Mitsubishi BD protocol, RS protocol and Modbus RTU protocol.
※ Support RS, RS2, WR3A, RD3A, ADPRW instructions.
◆ Serial port 3: RS485 (A1B1 port): Supports Mitsubishi programming port protocol, RS2 protocol and Modbus RTU protocol.
※Support RS2, WR3A, RD3A, ADPRW instructions.
◆ CAN port: supports RS2 protocol and Modbus RTU protocol.
※Support RS2, WR3A, RD3A, ADPRW instructions.

※ Note: For detailed settings, please refer to "Coolmay CX3G&FX3GC Series PLC Programming Manual"

Equivalent Circuit

The PLC input (X) is an externally powered DC24V sink type (passive NPN) with the input signal isolated from the power supply. When using, connect S/S to 24V positive external power supply.

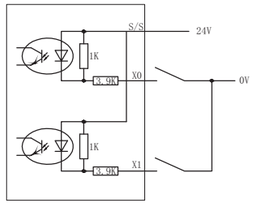


Diagram 9 Input wiring diagram

PLC digital input wiring:
Port short connection: The S/S of the PLC input terminal is connected to 24V, and the X terminal is connected to the power supply 0V, that is, the input has a signal;
Two-wire system (magnetic control switch): PLC switch input is connected to a two-wire magnetic control switch, the positive pole of the magnetic control switch is connected to the X terminal, and the negative pole is connected to 0V;
Three-wire system (photoelectric sensor or encoder): PLC switch is connected to a three-wire photoelectric sensor or encoder, the power supply of the sensor or encoder is connected to the positive power supply, and the signal line is connected to the X terminal; the encoder and photoelectric sensor are required to be of NPN type (PNP needs special customization).
PLC digital output wiring:
Transistor: The output is NPN, COM is connected to the negative pole, and Y is connected to the positive pole of the power supply after the load;
Relay: dry contact output, COM can be connected to positive or negative.

Diagram 10 shows the equivalent circuit diagram of the relay output module. The output terminals are in several groups, and each group is electrically isolated. The output contacts of different groups are connected to different power circuits.

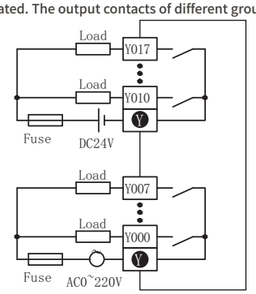


Diagram 10 Relay output equivalent circuit

The equivalent circuit of the transistor output type PLC output part is shown in Diagram11. From the Diagram, the output terminals are in several groups, and each group is electrically isolated. The output contacts of different groups can be connected to different power circuits; the transistor output can only be used for DC 24V load circuits. The output wiring mode is NPN, COM common cathode.

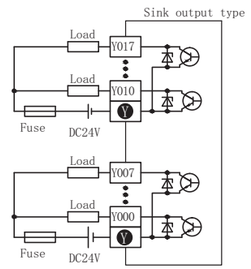


Diagram 11 Transistor output equivalent circuit

For the inductive load connected to the AC loop, the external circuit should consider the RC instantaneous voltage absorption circuit; for the inductive load of the DC loop, consider adding a freewheeling diode, as shown in Diagram 12. The wiring of stepper or servo motor is shown in Diagram 13. The default Y0-Y7 of 3G series PLC are pulse points, and the direction can be customized.

Note: The 5V driver must have a 2KΩ resistor in the DC24V string.

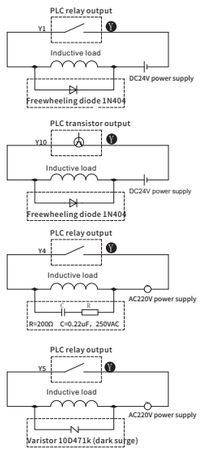
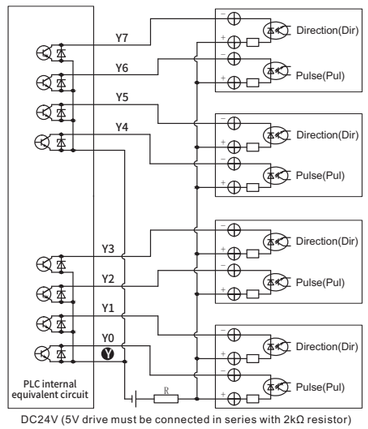


Diagram 12 Inductive load absorption circuit schematic

※ Note: All the internal circuit shown only as a reference



DC24V (5V drive must be connected in series with 2kΩ resistor)

Diagram 13 Pulse output wiring diagram

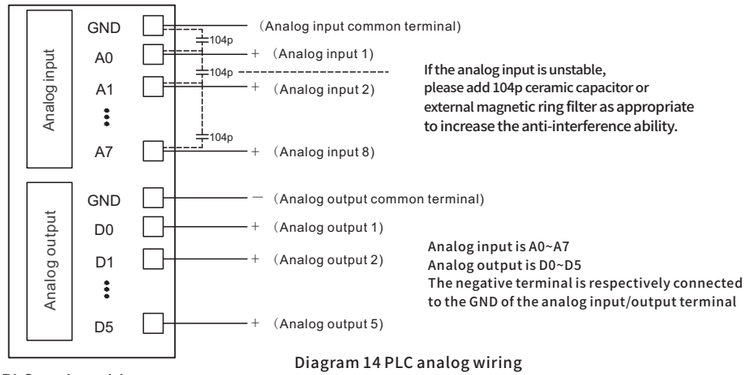


Diagram 14 PLC analog wiring

PLC analog wiring

Two-wire system: the positive pole of the power supply is connected to the positive pole of the transmitter, the negative pole of the transmitter is connected to the AD terminal, and the negative pole of the power supply is connected to the GND terminal; generally the wiring mode of the 0~20mA/ 4~20mA transmitter;

Three-wire system: the positive pole of the power supply is connected to the positive pole of the transmitter, the negative pole of the power supply and the negative pole of the signal output are the same terminal, and the signal output of the transmitter is connected to the AD terminal;

Four-wire system: the positive pole and negative pole of the power supply are respectively connected to the positive and negative poles of the power supply of the transmitter, and the positive and negative poles of the signal output of the transmitter are respectively connected to the AD terminal and the GND terminal;

The temperature analog is connected to the AD terminal and the GND terminal respectively. If it is a three-wire PT100, it needs to be connected in two lines. The GND common terminal of analog input and output can be shared.

PLC anti-interference processing

1. Strong and weak power should be separately routed, not common; when there is strong electrical interference, add a magnetic ring at the power supply end; and perform proper and effective grounding according to the type of casing.
2. When the analog quantity is disturbed, 104 ceramic capacitors can be added for filtering and correct and effective grounding.

※ Note: For more details, please refer to Coolmay official website "PLC anti-interference processing method"

Programming Reference

◆ Devices Distribution and Statement of Power-down Save

	FX3GC-16M	FX3GC-30M	FX3GC-32M
Digital input X	X00-X07 8 point	X00-X17 16 point	X00-X17 16 point
Digital output Y	Y00-Y07 8 point	Y0-Y15 14 point	Y00-Y17 14 point

Auxiliary relay M	[M0~M383] 384point general / [M384~M1535] 1152point keep / [M1536~M7679] 6144point general		
	[M8000~M8511] 512point special		
State S	[S0-S9] 10point Initial state/ [S10~S999] 990point keep/ [S1000~S4095] 3096point general		
Timer T	[T0~T199] 200point 100ms general / [T250~T255] 6point 100ms keep		
	[T246~T249] 4 point 1ms grand total keep/ [T256~T319] 64 point 1ms general		
	[T200~T245] 46 points 10ms for general ※The 10ms timer is affected by the scan cycle. If the scan period is 12ms, the timer becomes 12ms and executes once.		
Counter C	16-bit up counter	32-bit up and down counter	High-speed counter
	[C0~C15] 16point general [C16~C199] 184point keep	[C200~C219] 20point general [C220~C234] 15point keep	[C235~C245 single phase counting] [C246~C250 Single phase dual counting] [C251~C255 dual phase counting]
Data register D	[D0~D127] 128point general/ [D128~D7999] 7872point keep/ [D8000~D8511] 512points special		
Data register V, Z	[V0~V7] [Z0~Z7] 16point indexing		
Extended file register R	[R0~R22999] 23000point support for retentive/ [R23000~R23999] 1000point internal use		
Pointer JUMP, CALL branch	[P0~P255] 256 point / [P0~P1280] 1281 point (26232 and above version)		
Nested pointer	[N0~N7] 8 points master control		
Interruption	[I0□□ ~ I5□□] 6 points input interruption / [I6□□ ~ I8□□] 3 points timer interruption / [I010~I060] 6 points counter interruption		
Constant K	16-bit -32,768~32,767	32-bit -2,147,483,648~2,147,483,647	
Constant H	16 bits 0~FFFFH	32-bit 0~FFFFFFFFH	

◆ Analog input register (AD means analog input, precision 12 bit); supports FROM instruction or direct register reading

FROM instruction can read directly: FROM K0 K0 D400 K8, read out 8 analog inputs.
Register read directly: D[8030]~D[8037] is the input value of analog [AD0~AD7];
The constant scan time is changed to D8059, which is started by M8039 (this function is available in version 26232 and above). When the analog input has a thermocouple type, only 7 channels can be used, and AD4 (D8034) is the ambient temperature of the thermocouple.
8 channels can be used when there is no thermocouple type.

※ **Note: For analog input range and register corresponding value, please refer to "Coolmay CX3G&FX3GC Series PLC Programming Manual"**

※ The temperature type is one bit after the decimal point, ie 182=18.2 degrees.

※ Sampling of analog inputs

The number of filter cycles=(R23600~R23607)*PLC scan time, the default is 100, the data cannot be less than or equal to 0. If R23600=1, a PLC scan cycle is sampled once and the value in the first analog input is changed once. The larger the value of R23600~R23607 is set, the more stable the result value is.

D8073 is the smoothing filter coefficient of all analog inputs, the setting range is 0~999.

◆ Analog output register (DA means analog output, precision 12 bits); support TO instruction or direct register assignment operation

TO command output directly: T0 K0 K0 D500 K6, output 6 analog quantities.
Register direct assignment operation: D[8050]~D[8055] correspond to the analog output value of [DA0~DA5], which occupies 2DA when negative voltage output is selected, and the set value range is as follows:

Serial NO.	Register address	Set value range	Output type
DA0	D8050	0-4000	When D8058.0~D8058.5=0, the type is 0~20mA; When D8058.0~D8058.5=1, the type is 4~20mA.
DA1	D8051	0-4000	
DA2	D8052	0-4000	
DA3	D8053	0-4000	
DA4	D8054	0-4000	
DA5	D8055	0-4000	

FX3GC PLC's soft components are permanently maintained after power-off, that is, all soft components in the holding area will not be lost after the module is powered off.
The real-time clock uses a rechargeable battery to ensure that the clock is the current time. All power-down retention functions must ensure that the voltage of the DC24V power supply is above 23V after loading, and the PLC power-on time is longer than 2 minutes, otherwise the power-down function will be abnormal.

Programming software Compatible with "PLC programming software GX Developer8.86Q and GX Works2"
For details, please refer to "Coolmay CX3G&FX3GC Series PLC Programming Manual"
"FX3GC PLC User Manual" and **"Coolmay PLC instruction programming manual"**

TIPS

FX3GC PLC User Manual

—— Before using this product, please read the relevant manuals carefully.
Use the product under the environmental conditions specified in the manual.

1. Please confirm the power supply voltage range of this product (Regular product power supply is only 24V DC! The recommended output power of the power supply is 18W and above) and correct wiring before turning on the power to avoid damage.
2. When installing this product, please tighten the screws or clamp the guide rails to avoid falling off.
3. Avoid wiring and plugging or unplugging the cable plug in a live state, otherwise it is easy to cause electric shock or circuit damage. When the product emits peculiar smell or abnormal sound, please turn off the power switch immediately. During screw hole processing and wiring, do not drop metal chips and wire ends into the ventilation holes of the controller, which may cause product failure and misoperation.
4. Please do not tie the power cord and the communication cable together or get too close, keep a distance of more than 10cm. Strong current and weak current should be separated and properly and effectively grounded. In severe interference situations, shielded cables should be used for communication and high-frequency signal input and output cables to improve anti-interference performance. The grounding terminal FG on this machine must be grounded correctly to improve the anti-interference ability.
5. The digital input is external power supply DC24V drain type (passive NPN), and the input signal is isolated from the power supply. When in use, connect S/S to the 24V positive of the external power supply.
6. The COM of the digital output (transistor) is a common cathode.
7. Please do not disassemble the product or modify the wiring at will. Otherwise it may cause failure, malfunction, loss, or fire.
8. When installing and disassembling the product, please turn off all power supplies, otherwise it will cause the equipment to malfunction or fault.

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Version 2021/06
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