KALATEC AUTOMAÇÃO

XINJE

ZG3/ZGM/K-GPM20T series integrated PLC&HMI

Manual

ZG3/K-GPM-20 series Integrated PLC&HMI

User manual

This manual includes some basic precautions to be followed for the safety of your devices and yourself of cause. All mentioned precautions are warned with a triangle logo ahead. Referring to the other unmentioned notes, please follow the basic electrical procedures.

Precautions

Please follow the precautions. If not, your control system may be out of order, or a fortune loss caused in a severe situation.

Correct Application

This product and its components should only be used in situations mentioned in the catalog and technical specifications, and also be used with other devices produced by other manufactures which are admitted or recommended by our company.

Duty declaration

We have checked the contents of this manual in conformity with the hardware and software described in, but we still can't guarantee completely consistent because of some unavoidable mistakes. Even so, we will check data in this manual and update it frequently. Finally, welcome to put forward your valuable opinions.

2016.9

CATALOG

PREFACE

—— SIMPLIFIED INTRODUCTION ABOUT THIS MANUAL

Firstly, thank you for purchasing our ZG3/ZGM series product. Please read this manual carefully before related operations.

Manual purpose

- Users can operate and maintain ZG3/ZGM series products according to the related guidance and instructions, referring to characteristics, specifications and methods etc.
- This manual includes four parts, involving introduction, outside wiring, PLC programming and HMI screen editing. About methods of using PLC instructions and HMI, please refer to XC series programmable controller manual【instruction】and HMI TouchWin software programming manual.

➢ CHAPTER 1: introductions of characteristics, specification and installation on ZG3/ZGM series integrated PLC&HMI.
➢ CHAPTER 2: introductions of power specifications and I/O wiring on ZG3/ZGM series integrated PLC&HMI.
➢ CHAPTER 3: introductions of PLC programming and HMI screen editing on ZG3/ZGM series integrated PLC&HMI.
➢ APPENDIX: introductions of related function soft components on ZG3/ZGM series integrated PLC&HMI (PLC part).

Relevant person

This manual is suitable for persons below:

- Terminal users
- Debugging person
- Technical support staff

These persons mentioned above need to read the safety notes carefully before operating ZG3/ZGM series integrated PLC&HMI.

Scope

The content is only be applied for ZG3/ZGM series integrated PLC&HMI of XINJE.

Tele-document

We will offer the printed manual for you, but you can also acquire our tele-document through the following ways:

- DVD
  In the DVD， in addition to the application software, you can also find manuals and applied cases.
- Official website
  Log in www.xinje.com, then find “download center”, we will offer many kinds of tele-documents for you.

Contact us

If you have any questions about our products, welcome to contact us.

Phone: 0510-85134136 85123803
Fax: 0510-85111290
Address: Floor 4, 7#, Creativity industrial park, No.100, Dicui road,

SAFETY NOTES

Read this manual carefully and ensure its safety before your operation. The details below is only for ZG3/ZGM series product.

Please keep this manual well, and place it easy for operator to pick up and read. It should be handed up to your terminal user.

◎ NOTES ◎

NOTICE

- Do not put power cable and communication cable too close with each other, or even tied together. You should keep more than 10cm between the two cables.
- Do not remove the inside module and modify the wiring, or it may go wrong or make a fire.
- If it is smelly or noisy, please cut the power down immediately (the bursts of sound in buzzer is normal when you power on it)
- Do not press the screen with pen, screwdriver or other sharp tool, or it may cause your screen broken or went wrong.
- While installing this product, please tighten the screws to avoid to be fallen down.
- Please transport, install, store, assemble and maintain this product accurately, or it will be broken.

DAGER

- Please confirm the power voltage and wire connection before your power on to avoid broken.
- Please do not touch the terminals on the product to prevent you from an electric shock.
- Please do not open the back cover board.
- Please cut all the power down while you are installing or removing the product, or it will make your device went wrong.
- Please use this product in the prescribed conditions, or it will cause an accident.
- Ensure the product away from some conditions, such as high-frequency radiation and strong magnetic field, to avoid interference.

1 ZG3/ZGM/K-GPM20 SERIES INTRODUCTION

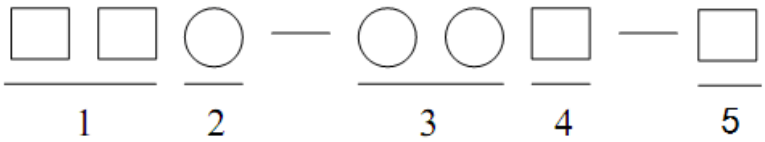
This chapter introduces ZG3/ZGM and K-GPM20T series in general, including the characteristics, specifications, presentations of all parts and its dimension.

1-1. Introduction

1-1-1. Characteristics

- It makes logic control and HMI integrated in one set
  Digital input: 16 points or 10 points, optical isolation, high-speed optical coupling. Refer to chapter 1-2-2
  Digital output: 14 points or 10 points, transistor output/relay output/transistor relay output
  Analog extension: Z-3AD3PT-BD, Z-4AD2DA-A-BD
- The HMI screen with rich functions is easy and simple to edit, and it support touch screen.
- Resolution ratio: 800*480 pixels (7inches) or 480*272 pixels (4.3 inches)
- LCD: 16.77 million nature color; LCD service life can be 50000 hours
- Support high-speed count, high-speed pulse and external interruption
- Waterproof level of front panel is IP65

1-1-2. Name rule



1：Series name `	ZG：16.77 million colors touch screen	
2：PLC type	3： XD3 series PLC	
	M：XDM series PLC	
3：I/O points	30：16 input 14 output	
	20：10 input 10 output	
4：Output type	NPN type	T：transistor output, two high-speed pulse
		RT：transistor relay output, two high-speed pulse
		R：relay output
		T4：transistor output, four high-speed pulse
	PNP type	PT：transistor output, two high-speed pulse
5：Screen dimension	7：7 inches’ touch screen	
	4：4.3 inches’ touch screen	

Model				Input points (DC24V)	Output points (R, T)
DC resource					
	Relay output	Transistor output	Transistor relay output		
NPN type	ZG3-30R-7	ZG3-30T-7	ZG3-30RT-7	16 points	14 points
	-	K-GPM-20T-4	-	10 points	10 points
	-	ZGM-30T4-7	-	16 points	14 points
PNP type	-	ZG3-30PT-7	-	16 points	14 points

Extension BD board

The models include: Z-3AD3PT-BD and Z-4AD2DA-A-BD

The specific parameters and applications of BD board, please refer to Z series extension BD board manual.

1-2. General specification

1-2-1. Product specification

Electrical spec.

Item		specification	
		ZG3-30R/T/RT-7, ZGM-30T4-7	K-GPM-20T-4
Electrical Char.	Input voltage	DC24V	
	Rated frequency	DC21.6V~26.4V	
	Allowable momentary power failure time	10ms DC24V	
	Withstanding voltage	10A DC26.4V	
	Insulation resistor	About 10MΩ, DC500V (between signal and ground)	
Environment	Operation temperature	0～50℃	
	Storage temperature	–10～60℃	
	Ambient humidity	20~85% (no condensation)	
	Vibration resistance	10~25Hz (X, Y, Z each direction is 30 minutes 2G)	
	Interference immunity	Voltage noisy: 1000Vp-p	
	Ambient air	No corrosive gas	
	Protective structure	Front board is IP65	
Structure	Cooling	Natural air cooling	
	Dimension	200.4*146.9*49.0	152.6*102.0*59.5
	Installation dimension	192.0*138.5	144.0*94.0

Interface	Download port	RS-232 (PLC) /USB (HMI)
	Communication port	RS-232/ RS-485 (PLC)

HMI specification

Item		specification	
		ZG3-30R/T/RT-7, ZGM-30T4-7	K-GPM-20T-4
Screen	Type	16.77 million nature color LCD	
	LCD size	7 inches	4.3 inches
	Service life	More than 50000 hours, 24 hours run under the ambient temperature 25℃	
	Display area	800*480	480*272
	Contrast	Adjustable	
	Language	Chinese: simplified/traditional, English, Japanese and so on	
	Font	Any font and size	
	Touch mode	4-wire resistive touch mode	
Memory	Screen	128MB	

PLC specification

ZG3/ K-GPM20T series:

Item		Specification	
Program execution mode		Circular scanning mode	
Programming mode		Instruction, ladder chart, visual C	
Operation speed		0.05μs	
Latched		Flash ROM and Li-battery	
User program capacity※1		128KB	
I/O points※2		Input 16, output 14 Input 10, output 10	
Internal coil (M, HM, SM)		11008 points	M0~M7999【HM0~HM959】※3
			Special use※4 SM0~SM2047
Flow (S, HS)		1152 points	S0~S1023【HS0~HS127】
Timer (T, HT, ET)	Points	704 points	T0~T575 【HT0~HT95】
			Precise timer ET0~ET31
	Spec	100ms timer: 0.1~3276.7s 10ms timer: 0.01~327.67s 1ms timer: 0.001~32.767s	
Counter (C, HC, HSC)	Points	704 points	C0~C575【HC0~HC95】

			High-speed counter HSC0~HSC31
	Spec	16-bit counter: K0~32,767 32-bit counter: -2147483648~＋2147483647	
Data register (D, HD, SD, HSD)		11548 words	D0~D7999【HD0~HD999】※3
			Special use※4 SD0~SD2047
			Special use※4 HSD0~HSD499
FlashROM register (FD, SFD)		7120 words	FD0~FD5119
			Special use※4 SFD0~SFD1999
Confidentiality register (FS)		48 words	FS0~FS47
Order function block WAIT special instructions coil (SEM)		128 points	SEM0~SEM127
High-speed processing function		High-speed count, pulse output, external interruption	
Password protection		6-bit ASCII	
Self-diagnosis		Power-on self-test, monitoring timer, grammar checking	

ZGM series:

Item		Specification	
Program execution mode		Circular scanning mode	
Programming mode		Instruction, ladder chart, visual C	
Operation speed		0.05μs	
Latched		Flash ROM and Li-battery	
User program capacity※1		384KB	
I/O point※2		Input 16, Output 14	
Internal coil (M, HM, SM)		92000 points	M0~M74999【HM0~HM11999】※3
			Special use※4 SM0~SM4999
Flow (S, HS)		9000 points	S0~S7999【HS0~HS999】
Timer (T, HT, ET)	point	7040 points	T0~T4999【HT0~HT1999】
			Precise timer ET0~ET39
	spec	100ms timer: 0.1~3276.7s 10ms timer: 0.01~327.67s 1ms timer: 0.001~32.767s	
Counter (C, HC, HSC)	point	7040 points	C0~C4999【HC0~HC1999】
			High-speed counter HSC0~HSC39
	spec	16-bit counter: K0~32,767 32-bit counter: -2147483648~＋2147483647	

Data register (D, HD, SD, HSD)	101024 words	D0~D69999【HD0~HD24999】※3
		Special use※4 SD0~SD4999
		Special use※4 HSD0~HSD1023
FlashROM register (FD, SFD)	14192 words	FD0~FD8191
		Special use※4 SFD0~SFD5999
Confidentiality register (FS)	48 words	FS0~FS47
Order function block WAIT special instructions coil (SEM)	128 points	SEM0~SEM127
High-speed processing function	High-speed count, pulse output, external interruption	
Password protection	6-bit ASCII	
Self-diagnosis	Power-on self-test, monitoring timer, grammar checking	

※1：the max capacity of secret download mode

※2：I/O numbers means the input and output terminal numbers

※3：register area in【】 is the power-off retentive area, not for other uses

※4：special use: special register, not for other uses. Refer to the appendix to know in detail.

※5：serial number of input coil, output relay/transistor is octal number, and other registers are decimal number.

1-2-2. High-speed count, high-speed pulse output, external interruption

Notice:

(1). Only specifications below. If you want to know more about parameters and using guide, please refer to XD series PLC manual【basic instructions】and【position control】.

(2). counting function of Z phase signal is still in research.

1. high-speed count

ZG3-30T/R/RT-7, K-GPM-20T-4												
	Incremental mode							AB phase mod				
	HSC0	HSC2	HSC4	HSC6	HSC8	HSC10	HSC12	HSC0	HSC2	HSC4	HSC6	HSC8
Max frequency	80K	10K	10K					50K	5K	5K		
4-time frequency								2/4	2/4	2/4		

Count interruption	√	√	√					√	√	√		
X000	U							A				
X001								B				
X002								Z				
X003		U							A			
X004									B			
X005									Z			
X006			U							A		
X007										B		
X010										Z		
X011												

ZGM-30T4-7												
	Single phase incremental mode							AB frase mode				
	HSC0	HSC2	HSC4	HSC6	HSC8	HSC10	HSC12	HSC0	HSC2	HSC4	HSC6	HSC8
Max frequency	80K	80K	80K	80K				50K	50K	50K	50K	
4-time frequency								2/4	2/4	2/4	2/4	
Count interruption	√	√	√	√				√	√	√	√	
X000	U							A				
X001								B				
X002								Z				
X003		U							A			
X004									B			
X005									Z			
X006			U							A		
X007										B		
X010										Z		
X011				U							A	
X012											B	
X013											Z	

2. high-speed pulse output

- T type: Y0, Y1, max speed 200KHz
- T4 type: Y0, Y1, Y2, Y3, max speed 200KHz
- RT type: Y0, Y1, max speed 200KHz
- R type: not support

3. external interruption

Input terminal	Pointer		Suppress interruption
	Rising interruption	Falling interruption	
X2	I0000	I0001	SM050
X3	I0100	I0101	SM051
X4	I0200	I0201	SM053
X5	I0300	I0301	SM054
X6	I0400	I0401	SM055
X7	I0500	I0501	SM056
X10	I0600	I0601	SM056
X11	I0700	I0701	SM057
X12	I0800	I0801	SM058
X13	I0900	I0901	SM059

Notice:

external interruption will not be executed after suppress interruption coil is ON.

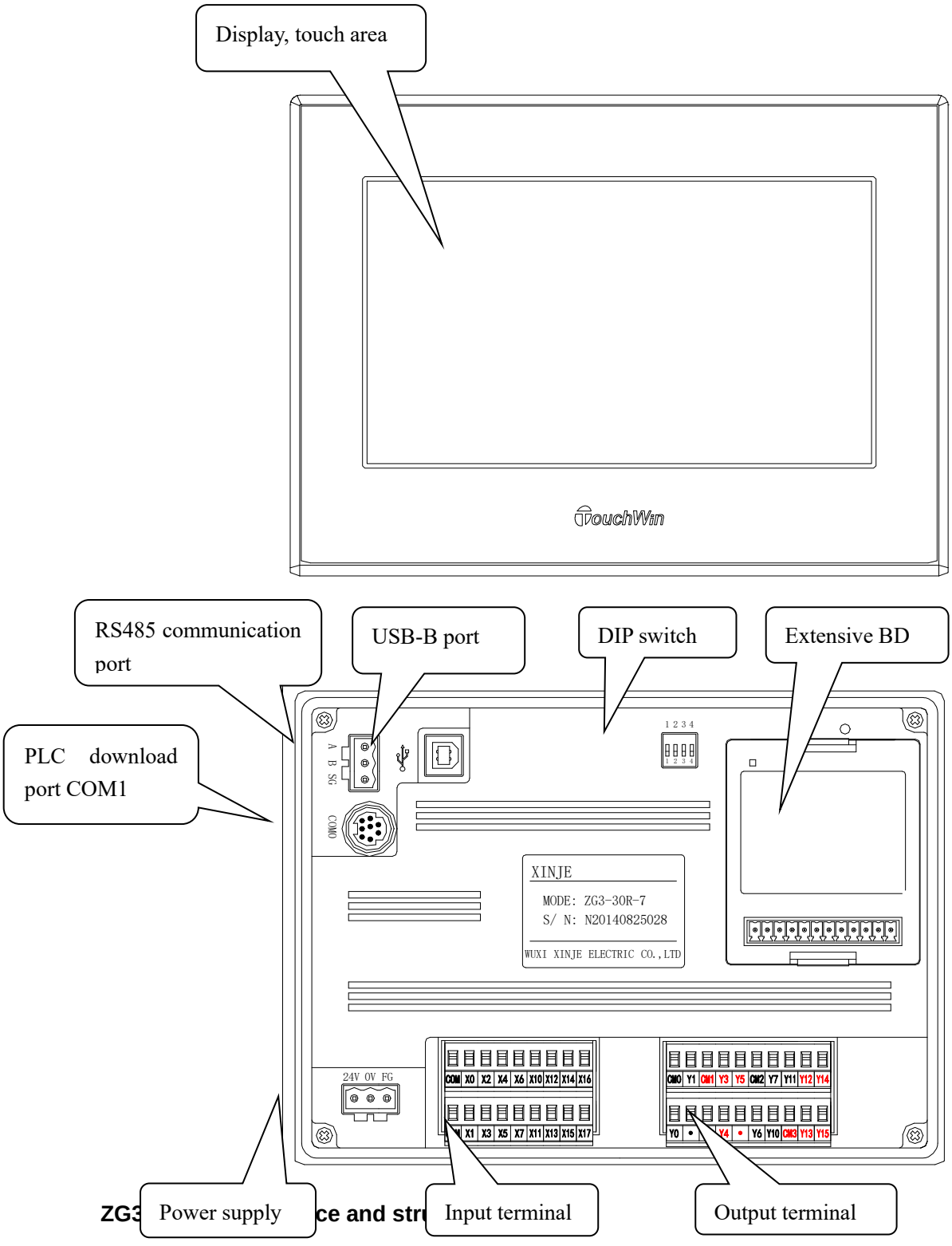
4. frequency measurement

Model		XID	Max frequency
ZG3 K-GPM	30T/R/RT 20T	X0	80 KHz
		X3	10 KHz
		X6	10 KHz
ZGM series	30T4	X0	80 KHz
		X3	80 KHz
		X6	80 KHz
		X11	80 KHz

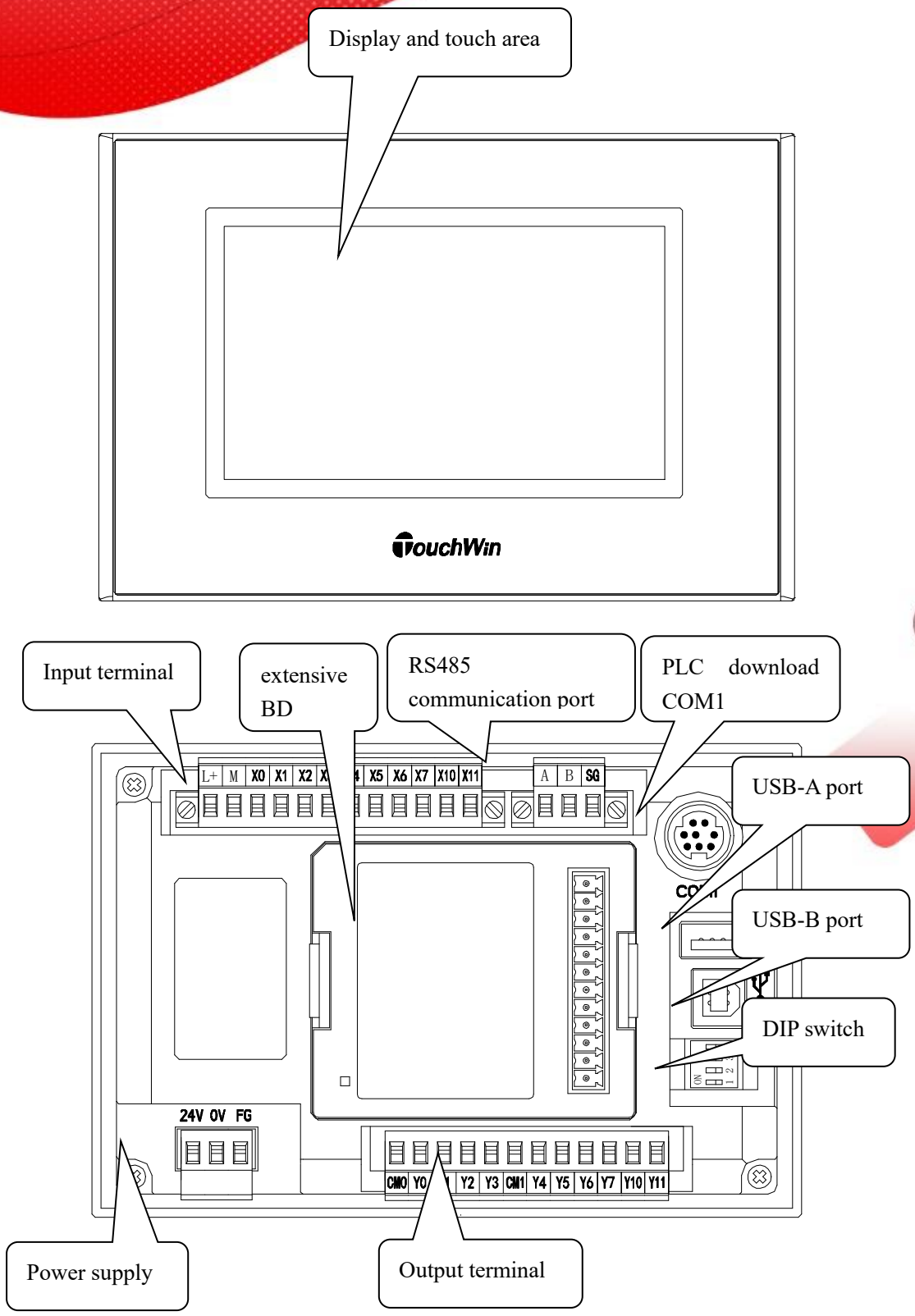
1-3. Part introduction

1-3-1. Structure

ZG3-30R/T/RT-7, ZGM-30T4-7 appearance and structure:



ZG3 ce and stru


Display and touch area
TouchWin
Input terminal
extensive BD
RS485 communication port
PLC download COM1
USB-A port
USB-B port
DIP switch
Power supply
Output terminal
L+ M X0 X1 X2 X5 X6 X7 X10 X11
A B SG
24V 0V FG
COM0 Y0 Y2 Y3 COM1 Y4 Y5 Y6 Y7 Y10 Y11

1-3-2. Termial order

1. Power terminals

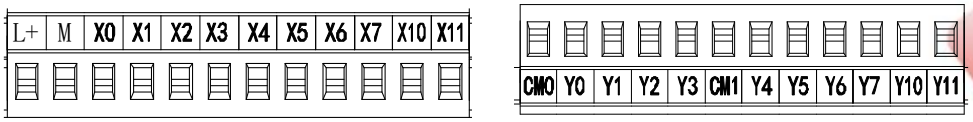
Power supply: DC24V

0V
24V
FG

2. Input/output terminals

ZG3-30R/T/RT-7, ZGM-30T4-7:

ZG3-20T-4:



NOTICE:

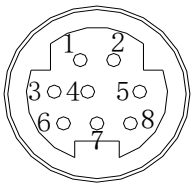
(1) For input wiring in ZG3-20T-4, you need to use 24V power supply, connecting 24V+ to L+, and 24V- to M

(2) M is a public terminal. If you connect the X to M terminal after powering on, signal inputting will be on.

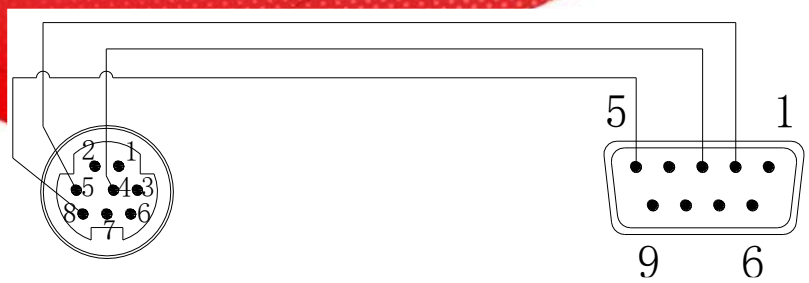
1-3-3. Download port (COM1)

Download port COM1 accords to RS232. It can be used for downloading and debugging. The appearance and main pins of COM1 is as below:

Pin NO.	function
Pin4	RxD
Pin5	TxD
Pin6	VCC
Pin8	GND



Please use the special programming cable of our company for downloading. If you have none, you can also make it by yourself. The connection of programming port and 9 pins of PC is as follows.



Mini Din 8 core plug (pins)　　DB9 plug (hole)

NOTICE:

(1) communication parameters of COM1 (PLC serial port 1) cannot be modified, otherwise the PLC cannot connect to the PC.

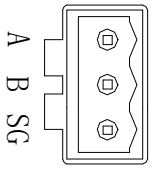
(2) COM1 port default communication mode is X-NET, but can be modified to MODBUS mode

1-3-4. AB communication port

Communication port of ZG3/ZGM and K-GPM-20T series integrated PLC&HMI is PLC communication port , accords to RS485 (serial port 2)

When PLC is in the state of factory settings, you can also use this port for downing or uploading, it is mainly used for communicating with external sensors, instrument, equipment and other devices.

AB port appearance and main pins:



Communication parameters	
Station number	Modbus station 1~254, 255 (FF) is free format communication
Baud rate	300bps~115.2Kbps
Data bit	8 data bits, 7 data bits
Stop bit	2 stop bits, 1 stop bit
checking	Even, odd, no parity

Parameter setting	A, B port support MODBUS, free format and X-NET Bus communication. communication parameters can be modified by XINJEConfig tool. Refer to XD series PLC【basic instructions】. Communication parameters: station number is 1, baud rate 19200bps, 8 data bits, 1 stop bit, even parity.

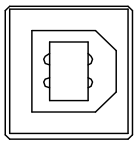
1-3-5. USB download port

1. USB-A port:

USB-A port can import and export the data of HMI by inserting the Flash disk.

2. USB-B port:

USB-B downloading port is only for HMI to download and debug program, and it can be used for downloading program in high speed. Transmission rate is up to 480Mbps



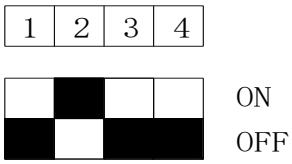
If your program can not be downloaded in a special situation, or HMI screen cannot be displayed after downloading, you need to use the function of forced download.

Steps:

(1) Please make ZG3/ZGM power off, turn on switch 2

(2) Please make ZG3/ZGM power on, linking with USB cable to download the program

(3) When it finished, turn off switch 2, re-power on the ZG3/ZGM



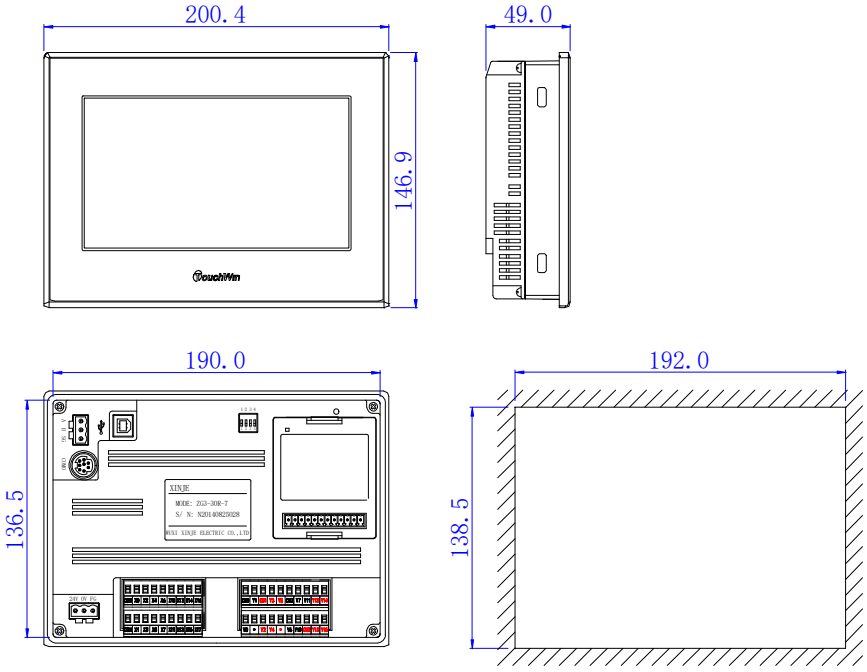
4-bits DIP switch functions is shown as follows:

Switch	Switch1	Switch2	Switch3	Switch4	function
State	ON	OFF	OFF	OFF	Not defined
	OFF	ON	OFF	OFF	Forced download
	OFF	OFF	ON	OFF	System menu; time calibration; touch calibration
	OFF	OFF	OFF	ON	Internal inspection mode (not recommended)

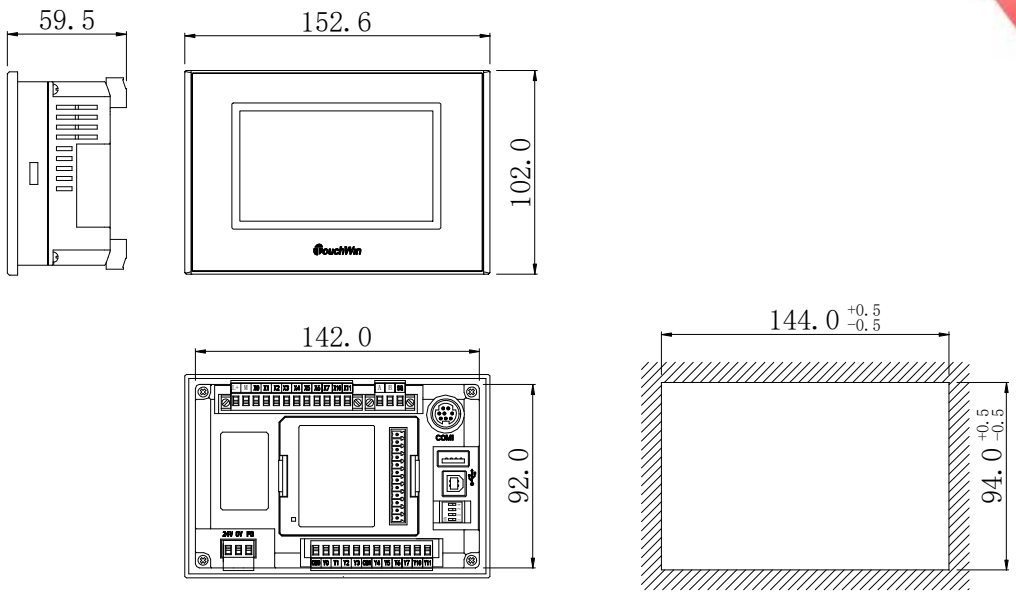
1-4. Dimension

■ Appearance and hole dimension (unit: mm)

ZG3-30R/T/RT-7, ZGM-30T4-7



K-GPM-20T



2 I/O and wiring

This chapter explains the I/O specification and wiring method of ZG3/ZGM series

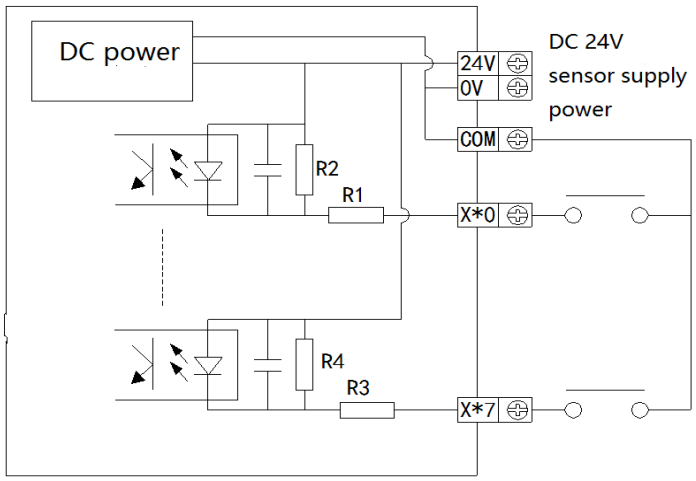
2-1. Input specification

Basic unit

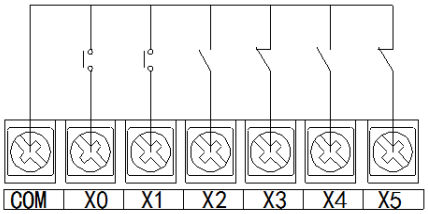
Input signal voltage	DC24V±10%
Input signal current	7mA/DC24V
Input ON current	Above 4.5mA
Input OFF current	Below 1.5mA
Input response time	About 10ms
Input signal format	Point input/ open collector NPN transistor
Circuit insulation	Optical coupling insulation
Input action display	LED light is ON when inputting ON

Input wiring

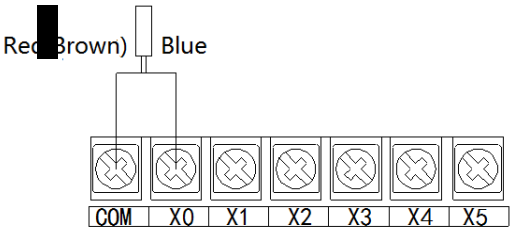
Input current of ZG3/ZGM series is supplied by its internal 24V power **(K-GPM-20T has no 24V power inside, need external power).** So, if using external power supply to drive the optical-electricity sensor, the external power supply should be DC24V±4V, the output transistor of sensor should be NPN open collector.



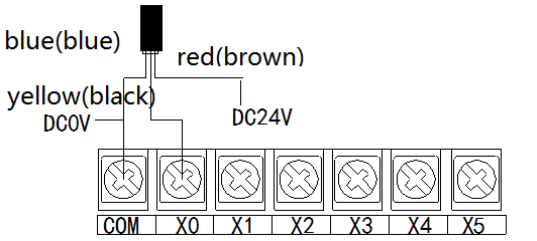
NPN wiring example:



button wiring example



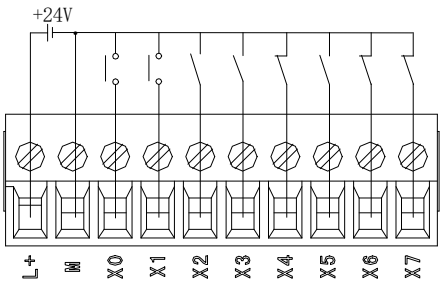
two wires (normally open/closed) proximity switch wiring example



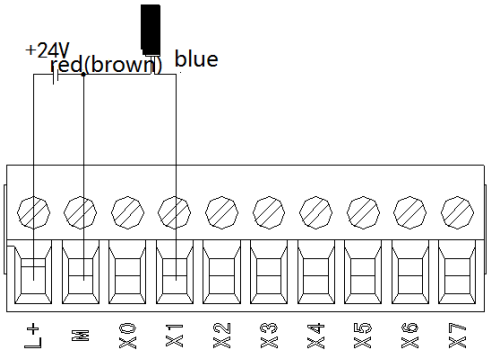
Three wires (NPN) proximity switch wiring example

Notes: When using the internal DC24V of PLC, it no needs to link DC0V to the COM, If using external power supply, it should be connected.

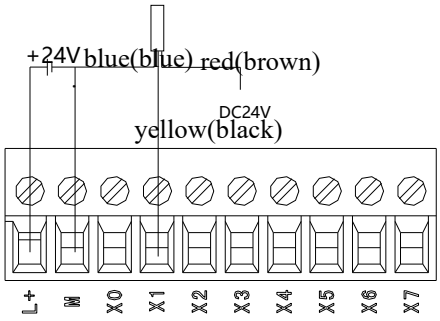
K-GPM-20T NPN type wiring



button wiring



two wires proximity (normally open/closed) switch wiring



Three wires proximity (NPN) switch wiring

Notes: when wiring the K-GPM-20T, you need to use external power supply, and link 24V+ to L+, 24V- to

M.

Input spec

- Input points

If using the no voltage contact or NPN open collector transistor between input points and COM (or M), the input need to be ON

- Input circuit

Use the optical coupler to make insulation isolation between the first loop and the secondary loop of inputting, and set C-R filter in the secondary loop to avoid the noise produced by vibration of input points, mixture of input line or wrong operation. So for the transformation of ON→OFF, OFF→ON, the response delay time is about 10ms in the product. Input terminal has a built-in digital filter

- input sensitivity

The input current of integrated PLC&HMI is DC24V 7mA, but for the reliable action, the current is above 3.5mA if ON, and it is below 1.5mA if OFF.

2-2. Relay output specification and circuit

Relay output spec

External power		Below AC250V, DC30V
Circuit insulation		Machinery insulation
Action command		Make a “close” sound
Max loader	Resistance load	3A
	Inductance load	80VA
	Lamp load	100W
Min loader		DC5V 2mA
Response time	OFF→ON	10ms
	ON→OFF	10ms

Relay output circuit

- **Output points**

Relay output has 4 common points. So, different units can drive the load of different power voltage system.

- **Circuit isolation**

It is electric isolated between relay output points and output circuit, also between internal, external and load circuit.

- **Action indication**
  Relay output circuit makes a “close” sound when it is ON, and its output points is ON.

- **Response time**
  Transferring the ON or OFF signal from relay output coil to its output connection, the response time is always about 10ms.

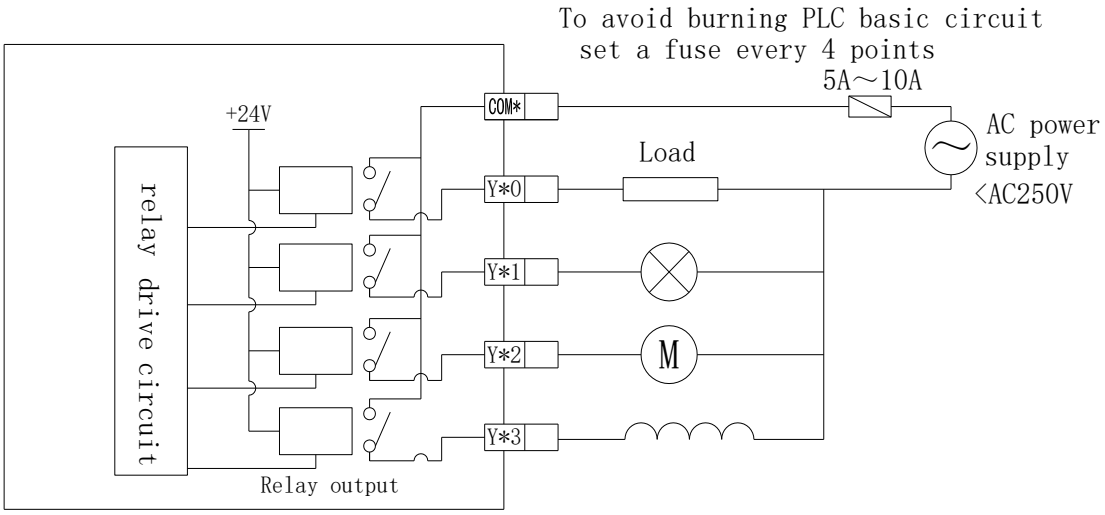
- **Output current**
  For voltage below AC250V, output current to drive resistance load is 3A/point.
  Inductance load is below 80VA (AC100V/AC200V) and lamp load is below 100W (AC100V/AC200V)

- **Open leakage current**
  There is no leakage current when output point is ON, and it can drive neon light etc.

- **Service life of relay output point**

Standard service life of inductance load such as contactor and solenoid valve: according to our experiments result, 20VA load is about 3 million times, 35VA load is 1 million times and 80VA load is about 0.2 million times. But the service life will be longer if load relates to surge absorber in parallel.

Typical output wiring

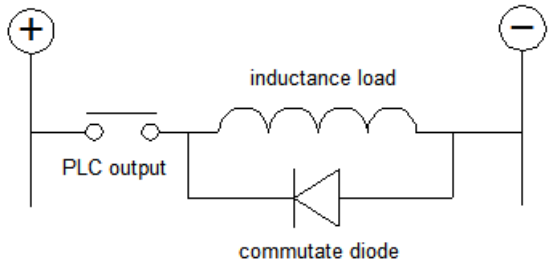


(Notes: T type: Y0, Y1 cannot be supplied by 220V, or your product will be damaged)

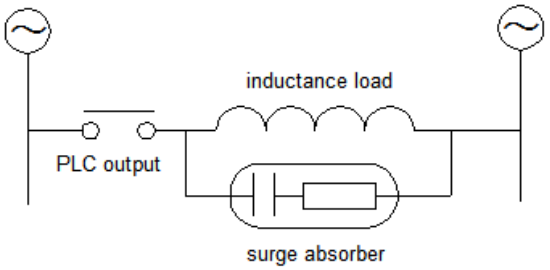
Output circuit

- DC inductive load, fly-wheel diode need to be in parallel. If not, the service life of junction will be low. Please select the diode whose forward current is higher than the load current, allowing reverse pressure over load voltage 5 ~ 10 times.
- AC inductive load, surge absorber need to be in parallel. It will reduce noise and extend the service life of relay.

DC load



AC load



2-3. Transistor output circuit

Transistor output has two types, including high-speed pulse output and ordinary transistor.

High-speed pulse output

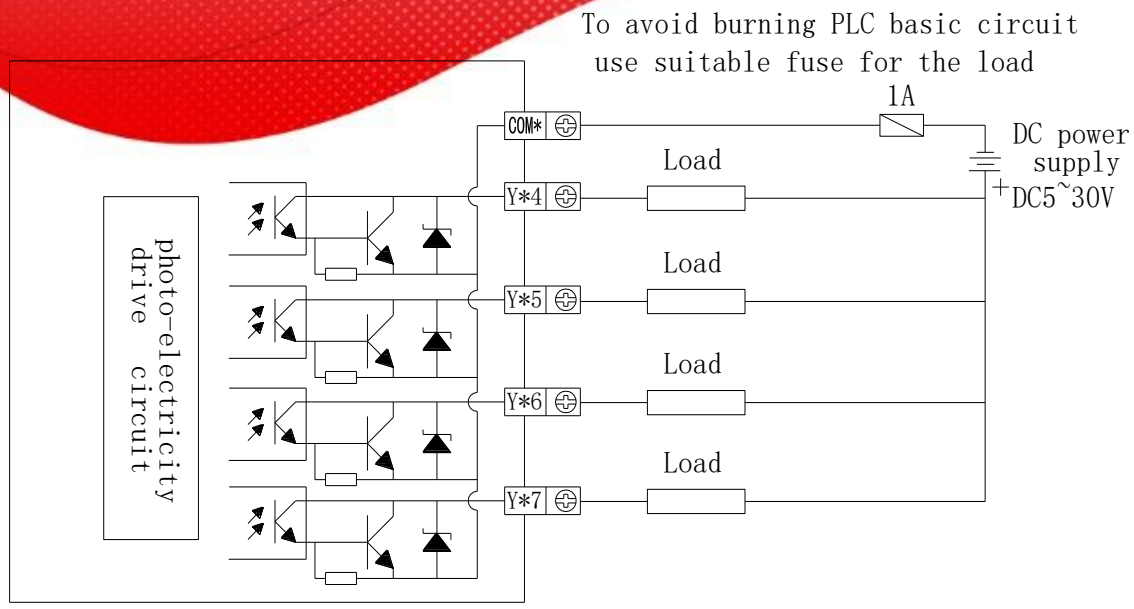
Model	T/RT	T4
Output bit	Y0~Y1	Y0~Y3
External power supply	Below DC5~30V	
Max current	50mA	
Max frequency of pulse output	200KHz	

Ordinary transistor output

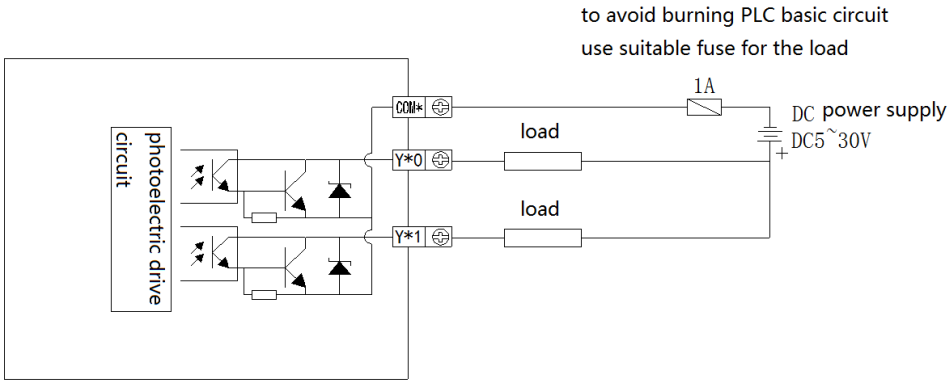
Model		T	T4
Output bit		Y2~Y15	Y4~Y15
External power supply		Below DC5~30V	
Circuit insulation		Coupling light insulation	
Max load	Resistance load	0.3A	
	Inductance load	7.2W/DC24V	
	Lamp load	1.5W/DC24V	
Min load		DC5V 2mA	
Response time	OFF→ON	Below 0.2ms	
	ON→OFF	Below 0.2ms	

Ordinary transistor

- Output points
  Transistor output of integrated PLC&HMI has a common point output
- External power supply
  The power to drive load is DC5~30V regulated power supply
- Circuit insulation
  It is insulated isolation by photoelectric coupler between its internal loop and output transistor
- Action instruction
  while driving the optical coupling, output transistor is ON
- Response time
  The time is below 0.2ms from photoelectric coupler driving (cut down) to transistor ON(OFF)
- Output current
  The output current is 0.3A each 1 point. But total current is 0.5A each output 4 points
- Open circuit current
  Below 0.1mA.



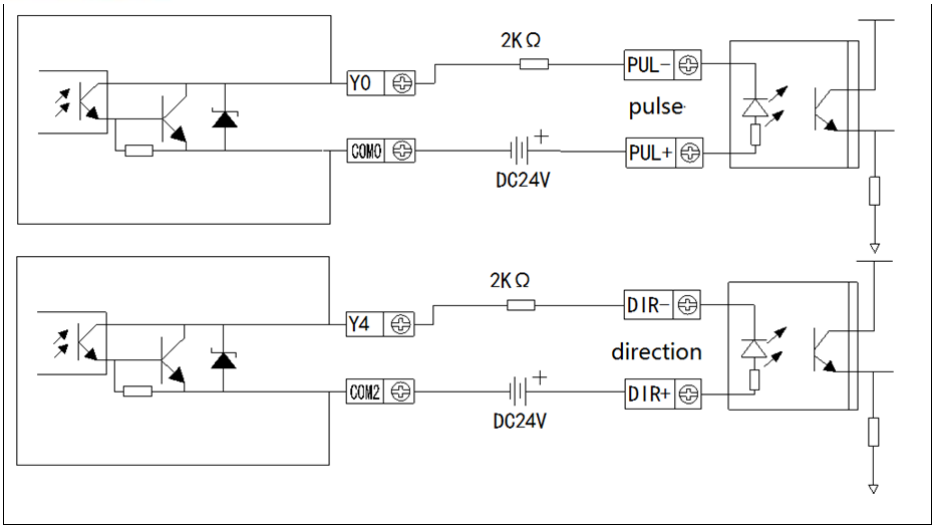
High-speed pulse output circuit



Below is wiring of T type integrated PLC&HMI and servo drive

ZG3/ZGM

Servo drive



(make sure the current of servo driver optical coupling input is 8~15mA)

3 PLC and HMI programming

This chapter has the notes of programming PLC and editing HMI screen.

3-1. PLC programming

While programming, please use V3.4 and above version of the software for ZG3/ZGM series

3-2. Instruction list

Notes: about how to use PLC instruction of ZG3/ZGM, please refer to XD series PLC manual【basic instruction】and【position control】.

3-2-1. Basic instructions

Instruction	Function
LD	Initial logic normally open contactor
LDD	Directly from the contact read state
LDI	Initial logic normally close contactor
LDDI	Direct read normally closed contact
LDP	Rising edge detection algorithm
LDF	Falling edge detection operation began
AND	Serial connection normally open contactor
ANDD	Directly from the contact read state
ANI	Serial connection normally close contactor
ANDDI	Direct read normally closed contact
ANDP	Rising edge detection in series connection
ANDF	Falling edge detection in series connection
OR	Parallel connection normally open contactor
ORD	Directly from the contact read state
ORI	Parallel connection normally close contactor
ORDI	Direct read normally closed contact
ORP	Pulse rising edge detection parallel connection
ORF	Parallel connection of pulse falling edge detection
ANB	Series connection of parallel circuit block
ORB	Parallel connection of series circuit block
OUT	Coil drive
OUTD	Output to the contactor
SET	Keep the coil ON
RST	Clear the coil-ON state
PLS	Rising edge detection instruction
PLF	Falling edge detection instruction

MCS	Connecting coil instruction for common serial points
MCR	Removal of common serial points
ALT	Negate the coil
RST	Reset the contactor, clear the current value
TMR	Timer drive
END	Operate output/input and return to step 0
GROUP	Block folding start
GROUPE	Block folding end

3-2-2. Application instructions

type	Instruction	Function
PROCESS	CJ	Condition jump
	CALL	Call the subprogram
	SRET	Subprogram return
	STL	Process start
	STLE	Process end
	SET	Open assigned process, close current process
	ST	Open assigned process, not close current process
	FOR	Cycle start
	NEXT	Cycle end
	FEND	Main program end
Data comparison	LD＝	Initial logic ON when (S1)=(S2)
	LD＞	Initial logic ON when (S1)＞(S2)
	LD＜	Initial logic ON when (S1＜(S2)
	LD＜＞	Initial logic ON when (S1)≠(S2)
	LD＜＝	Initial logic ON when (S1)≥(S2)
	LD＞＝	Initial logic ON when (S1)≤(S2)
	AND＝	Serial connection ON when (S1)=(S2)
	AND＞	Serial connection ON when (S1)>(S2)
	AND＜	Serial connection ON when (S1)<(S2)
	AND＜＞	Serial connection ON when (S1)≠(S2)
	AND＜＝	Serial connection ON when (S1)≤(S2)
	AND＞＝	Serial connection ON when (S1)≥(S2)
	OR＝	Parallel connection ON when (S1)=(S2)
	OR＞	Parallel connection ON when (S1)>(S2)
	OR＜	Parallel connection ON when (S1)<(S2)
	OR＜＞	Parallel connection ON when (S1)≠(S2)
	OR＜＝	Parallel connection ON when (S1)≤(S2)
	OR＞＝	Parallel connection ON when (S1)≥(S2)
Data transmission	CMP	Data comparison
	ZCP	Data zone comparison

	MOV	Data transmission
	BMOV	Data block transmission
	FMOV	Multi-point repeat transmission
	EMOV	Float transmission
	FWRT	Write into FlashROM
	MSET	Multi-set on
	ZRST	Multi-reset
	SWAP	Exchange the high byte and low byte
	XCH	Exchange two values
Data calculation	ADD	Addition
	SUB	Subtraction
	MUL	Multiplication
	DIV	Division
	INC	Plus 1
	DEC	Minus 1
	MEAN	Get the mean value
	WAND	Logic and
	WOR	Logic or
	WXOR	Logic xor
	CML	Negate
	NEG	Negative
Data shift	SHL	Arithmetic shift left
	SHR	Arithmetic shift right
	LSL	Logic shift left
	LSR	Logic shift right
	ROL	Rotate left
	ROR	Rotate right
	SFTL	Bit shift left
	SFTR	Bit shift right
	WSFL	Word shift left
	WSFR	Word shift right
Data conversion	WTD	Word convert to double word
	FLT	16-bit integer convert to float
	FLTD	64-bit integer convert to float
	INT	Float convert to integer
	BIN	BCD convert to binary
	BCD	Binary convert to BCD
	ASCI	Hex convert to ASCII
	HEX	ASCII convert to hex
	DECO	Decoding
	ENCO	High-bit encoding
	ENCOL	Low-bit encoding
	GRY	Binary convert to gray code

	GBIN	Gray code convert to binary
Float calculation	ECMP	Float comparison
	EMOV	Float transmission
	EZCP	Float zone comparison
	EADD	Float addition
	ESUB	Float subtraction
	EMUL	Float multiplication
	EDIV	Float division
	ESQR	Float square
	SIN	Float sine
	COS	Float cosine
	TAN	Float tangent
	ASIN	Float arcsine
	ACOS	Float arccosine
	ATAN	Float arctangent
Clock	TRD	Read clock data
	TWR	Write clock data
	TCMP	Clock comparison

3-2-3. Special instructions

Type	Instruction	Function
Pulse output	PLSR	Multiple pulse output
	DRVI	Absolute location
	DRVA	Relative location
	PLSF	Variable frequency pulse output
	STOP	Pulse stop
	GOON	continue to pulse
	ZRN	Mechanical origin regression
High-speed count	DMOV	32 bit high-speed count read
	DMOV	32 bit high speed count write
	RST	High-speed count reset
Modbus communication	COLR	MODBUS read coil
	INPR	MODBUS read input coil
	COLW	MODBUS write single coil
	MCLW	MODBUS write multi-coil
	REGR	MODBUS read register
	INRR	MODBUS read input register
	REGW	MODBUS write single register
	MRGW	MODBUS write multi-register
	BIT_READ	X-NET Read instruction
	BIT_WRITE	X-NET Write instruction

	REG_READ	X-NET Read register instruction
	REG_WRITE	X-NET Write register instruction
Precise timing	STR	Precise timing
	STRR	Read precise timing register
	STRS	Stop precise timing
Interruption	EI	Enable the interruption
	DI	Disable the interruption
	IRET	Interruption return
BLOCK	SBSTOP	Stop BLOCK
	SBGOON	Continue running the stop block
Others	PID	PID control
	NAME_C	C block
	FRQM	Frequency measurement
	PWM	Pulse width modulation

3-2-4. Interpolation instruction（only for ZGM）

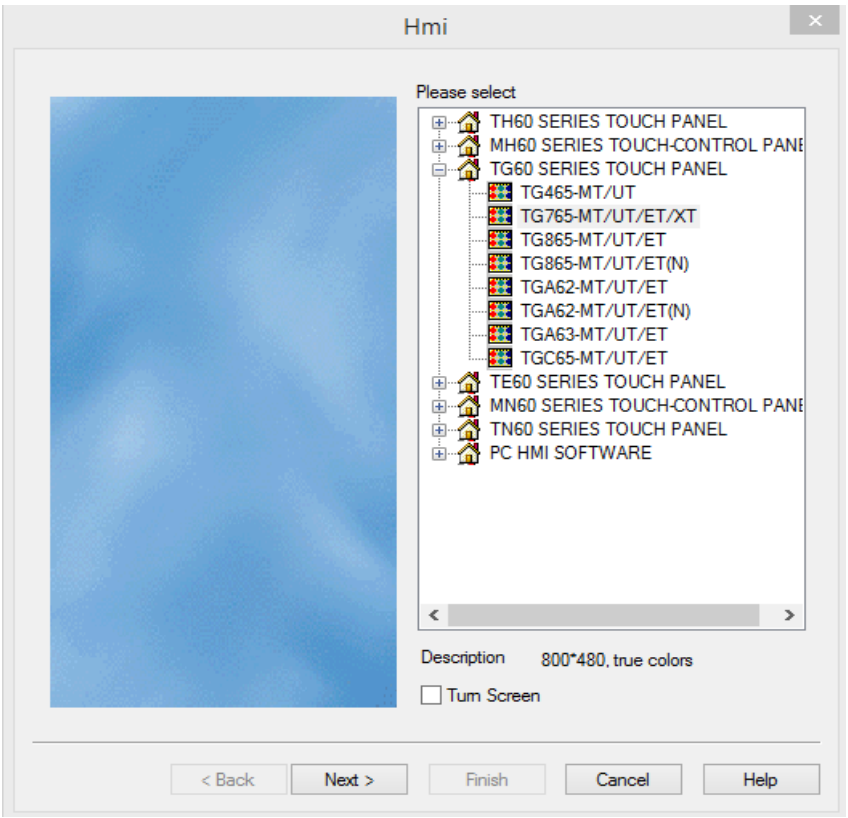
Type	Instruction	Function
Quick positioning	DRV quick positioning	Quick positioning
	DRVR quick positioning (polar coordinates)	Quick positioning, polar coordinates mode (unavailable now)
Linear interpolation	LIN line	Linear interpolation
	LIN line VM	Linear interpolation, can specify max speed
	LIN line VBEM	Linear interpolation，can specify start point speed, end point speed and max speed
Arc interpolation	CW clockwise arc	clockwise arc interpolation
	CW clockwise arc VM	clockwise arc interpolation, can specify max speed
	CW clockwise arc VBEM	clockwise arc interpolation, can specify start point speed, end point speed and max speed
	CCW counterclockwise arc	counterclockwise arc interpolation
	CCW counterclockwise arc VM	counterclockwise arc interpolation, can specify max speed
	CCW counterclockwise arc VBEM	counterclockwise arc interpolation，can specify start point speed, end point speed and max speed
	CW_R clockwise arc	clockwise arc interpolation (specified radius)
	CW_R clockwise arc VM	clockwise arc interpolation (specified radius), can specify max speed
	CW_R clockwise arc VBEM	clockwise arc interpolation (specified radius), can specify start point speed, end point speed and max

		speed
	CCW_R	counterclockwise arc interpolation (specified radius)
	CCW_R clockwise arc VM	counterclockwise arc interpolation (specified radius), can specify max speed
	CCW_R clockwise arc VBEM	counterclockwise arc interpolation (specified radius), can specify start point speed, end point speed and max speed
	ARC 3-point arc	3-point arc
	ARC 3-point arc VM	3-point arc, can specify max speed
	ARC 3-point arc VBEM	3-point arc, can specify start point speed, end point speed and max speed
Follow-up instruction	FOLLOW	Single-phase follow-up instruction
	FOLLOW_AB	AB-phase instruction

3-3. HMI programming

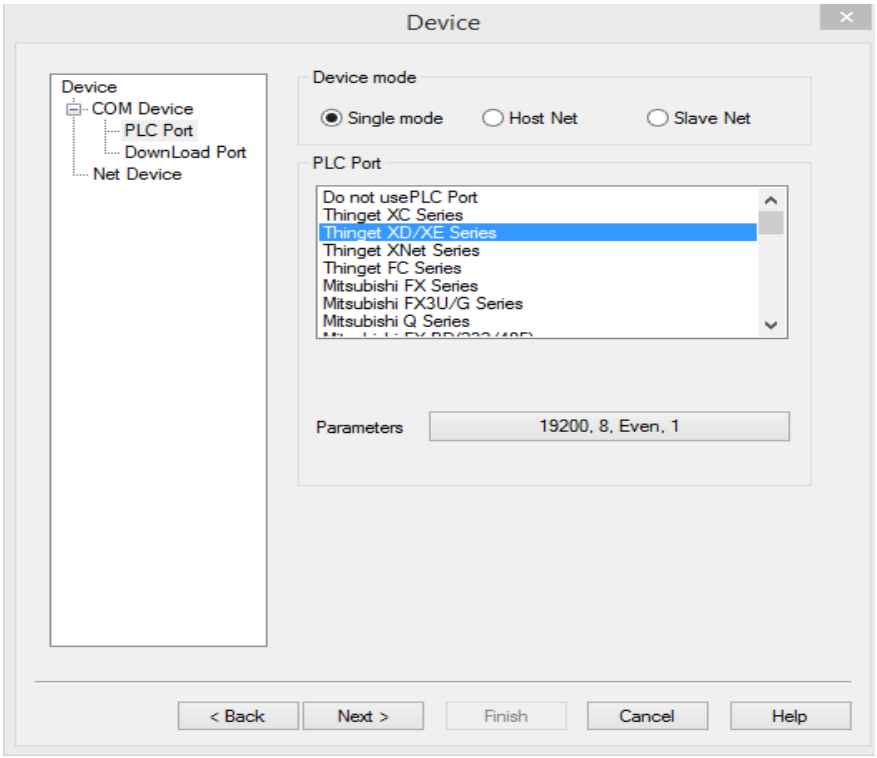
HMI screen of ZG3/ZGM series need to be programmed in HMI software. The software is TouchWin editing tools, the version is V2. D or above it.

Click out HMI programing software and create a new project, then choose TG60 series HMI in the pop-up “display” dialog box, such as TG765-MT/UT/ET/XT or TG465-MT/UT (as below):



The programming of ZG3/ZGM and K-GPM series is similar as TG series.

The difference: when you create a new project, your PLC port should choose XINJE XD/XE series, or the HMI and PLC of ZG3/ZGM and K-GPM cannot communicated with each other. As follows:



About programming of screen, please refer to TouchWin editing tools manual.

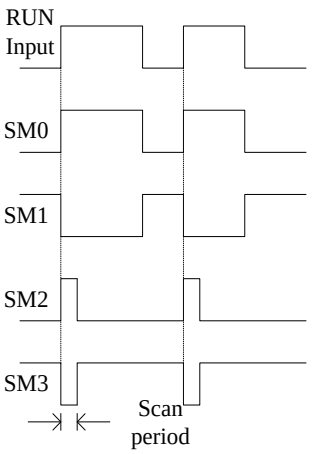
Appendix. Special soft component list

This part will introduce functions of special soft components, data register and FlashROM register in ZG3/ZGM and K-GPM series PLC, then you can find what you want.

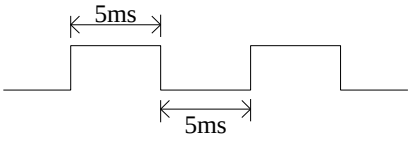
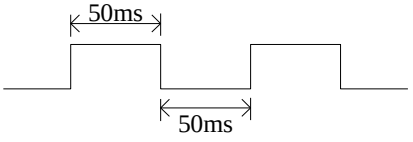
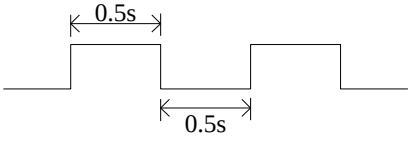
But it doesn't include pulse output and interpolation instructions. Please refer to XD series PLC manual 【position control】.

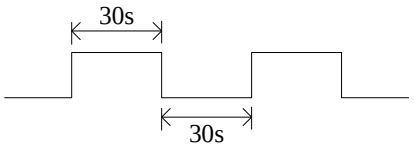
Appendix 1. Special auxiliary relay list

Initial status (SM0-SM5)

ID	Function	Description	
SM000	Coil ON when running		SM000 keeps ON when PLC running
SM001	Coil OFF when running		SM001 keeps OFF when PLC running
SM002	Initial positive pulse coil		SM002 is ON in first scan cycle
SM003	Initial negative pulse coil		SM003 is OFF in first scan cycle
SM005	Alarm coil when power is low	When voltage is below 2.5V, SM5 will be ON (now please replace the battery as soon as possible, or the data will be lost)	

Clock (SM11-SM14)

ID	Function	Description
SM011	10ms frequency cycle	
SM012	100ms frequency cycle	
SM013	1s frequency cycle	

SM014	1min frequency cycle	

Mark (SM20-SM29)

ID	Function	Description
SM020	Zero bit	SM020 is ON when plus/minus operation result is 0
SM021	Borrow bit	SM021 is ON when minus operation overflows
SM022	Carry bit	SM022 is ON when plus operation overflows

PC Mode (SM32-SM34)

ID	Function	Description
SM032	Retentive register reset	When SM032 is ON, ON/OFF mapping memory of HM, HS and current values of HT, HC, HD will be reset.
SM033	Clear user's program	When SM033 is ON, all PLC user's program will be cleared.
SM034	All output forbidden	When all output of PLC is OFF, external light will be in original status. If it is used for pulse output, software will also monitor to the pulse of change, but not the actual output.

Stepping Ladder

ID	Function	Description
SM040	Program is executing symbol	When program is executing, SM040 is ON

Interruption (SM50-SM80)

ID	Address	Function	Description
SM050	I0000/I0001	Forbid input interruption 0	After executing EI instruction, the input interruption couldn't act independently when M acts, even if the interruption is allowed. E.g.: when SM050 is ON,
SM051	I0100/I0101	Forbid input interruption 1	
SM052	I0200/I0201	Forbid input interruption 2	
SM053	I0300/I0301	Forbid input interruption 3	
SM054	I0400/I0401	Forbid input interruption 4	
.....	.....	.....	

SM069	I1900/I1901	Forbid input interruption 19	I0000/I0001 is forbidden.
SM070	I40**	Forbid timing interruption 0	After executing EI instruction, the input interruption couldn't act independently when M acts, even if the interruption is allowed.
SM071	I41**	Forbid timing interruption 1	
SM072	I42**	Forbid timing interruption 2	
SM073	I43**	Forbid timing interruption 3	
SM074	I44**	Forbid timing interruption 4	
.....	.....	.....	
SM089	I59**	Forbid timing interruption 19	
SM090		Forbid all interruptions	Forbid all interruptions

Sequence Function BLOCK (SM240-SM339)

ID	Function	Description
SM300	BLOCK1 running flag	SM300 will be ON when block1 is running
SM301	BLOCK2 running flag	SM301 will be ON when block1 is running
SM302	BLOCK3 running flag	SM302 will be ON when block1 is running
SM303	BLOCK4 running flag	SM303 will be ON when block1 is running
SM304	BLOCK5 running flag	SM304 will be ON when block1 is running
SM305	BLOCK6 running flag	SM305 will be ON when block1 is running
.....	.....	
SM396	BLOCK97 running flag	SM396 will be ON when block1 is running
SM397	BLOCK98 running flag	SM397will be ON when block1 is running
SM398	BLOCK99 running flag	SM398 will be ON when block1 is running
SM399	BLOCK100 running flag	SM399 will be ON when block1 is running

SM069	I1900/I1901	Forbid input interruption 19	I0000/I0001 is forbidden.
SM070	I40**	Forbid timing interruption 0	After executing EI instruction, the input interruption couldn't act independently when M acts, even if the interruption is allowed.
SM071	I41**	Forbid timing interruption 1	
SM072	I42**	Forbid timing interruption 2	
SM073	I43**	Forbid timing interruption 3	
SM074	I44**	Forbid timing interruption 4	
.....	.....	.....	
SM089	I59**	Forbid timing interruption 19	
SM090		Forbid all interruptions	Forbid all interruptions

Sequence Function BLOCK (SM240-SM339)

ID	Function	Description
SM300	BLOCK1 running flag	SM300 will be ON when block1 is running
SM301	BLOCK2 running flag	SM301 will be ON when block1 is running
SM302	BLOCK3 running flag	SM302 will be ON when block1 is running
SM303	BLOCK4 running flag	SM303 will be ON when block1 is running
SM304	BLOCK5 running flag	SM304 will be ON when block1 is running
SM305	BLOCK6 running flag	SM305 will be ON when block1 is running
.....	.....	
SM396	BLOCK97 running flag	SM396 will be ON when block1 is running
SM397	BLOCK98 running flag	SM397will be ON when block1 is running
SM398	BLOCK99 running flag	SM398 will be ON when block1 is running
SM399	BLOCK100 running flag	SM399 will be ON when block1 is running

Error check (SM400-SM413)

ID	Function	Description
SM400	I/O error	ERR LED keeps ON, PLC cannot run and output, check when power on
SM401	Expansion module communication error	
SM402	BD communication error	
.....		
SM405	No user program	Internal code check wrong
SM406	User's program error	Implement code or configuration table check wrong
SM407	SSFD check error	ERR LED keeps ON, PLC cannot run and output, check when power on
SM408	Memory error	Cannot clear or write Flash in
SM409	Calculation error	
SM410	Offset overflow	Offset exceeds soft element range
SM411	FOR-NEXT overflow	Reset when power on or users can also reset by hand.
SM412	Invalid data fill	When offset of register overflows, the return value will be SM372 value
SM413		

Error Message (SM450-SM452)

ID	Function	Description	
SM450	System error check		
SM451			
SM452			

Expansion Modules, BD Status (SM500)

ID	Function	Description	
SM500	Module status read is finished		

Communication (SM130-SM1319)

	ID	Function	Description
COM1	SM150	Modbus read and write instruction is running	When instruction is executed, SM150 is ON When instruction is finished, SM150 is OFF
	SM151		
	SM152	Free sending logo	When instruction is executed, SM152 is ON When instruction is finished, SM152 is OFF
	SM153	Free sending finished	When receiving a frame data，SM153 is ON If program is needed, SM153 is OFF
	SM154		
	……		
	SM159		
	SM160	Modbus read and write instruction is running	When instruction is executed, SM160 is ON When the execution is finished, SM160 is OFF

COM2	SM161		
	SM162	Free sending logo	When instruction is executed, SM162 is ON When the sending is finished, SM162 is OFF
	SM163	Free sending finished	When receiving a frame data，SM163 is ON If program is needed, SM163 is OFF
	SM164		
	……		
	SM169		
COM3	SM170 ~SM179		
COM4	SM180 ~SM189		
COM5	SM190 ~SM199		

Appendix 2. Special data register list

Battery (SD005)

ID	Function	Description
SD005	Battery level display register	SD005 is 100 when voltage is 3V: SD005 is 0 when voltage is below 2.5V. now please replace battery as soon as possible, or the data will be kept when power off.

Clock (SD010-SD019)

ID	Function	Description
SD010	Current scan cycle	100us, us is the unit
SD011	Min scan time	100us, us is the unit
SD012	Max scan time	100us, us is the unit
SD013	Second (clock)	0~59 (BCD code)

SD014	Minute (clock)	0~59 (BCD code)
SD015	Hour (clock)	0~23 (BCD code)
SD016	Day (clock)	0~31 (BCD code)
SD017	Month (clock)	0~12 (BCD code)
SD018	Year (clock)	2000~2099 (BCD code)
SD019	Week (clock)	0 (Sunday) ~6 (Saturday) (BCD code)

Flag (SD020-SD031)

ID	Function	Description
SD020	Information of type	
SD021	Information of type	
:		
SD030	Information of type	
SD031	Information of type	

Step ladder (SD040)

ID	Function	Description
SD40	Flag of the executing process S	

High Speed Count (SD100-SD109)

ID	Function	Description	
SD100	Current segment (No. n segment)		HSC00
SD101	Current segment (No. n segment)		HSC02
SD102	Current segment (No. n segment)		HSC04
SD103	Current segment (No. n segment)		HSC06
SD104	Current segment (No. n segment)		HSC08
SD105	Current segment (No. n segment)		HSC10
SD106	Current segment (No. n segment)		HSC12
SD107	Current segment (No. n segment)		HSC14
SD108	Current segment (No. n segment)		HSC16
SD109	Current segment (No. n segment)		HSC18

Sequence Function Block (SD300-SD399)

ID	Function	Description
SD300	Executing instruction of BLOCK1	The value will be used when BLOCK monitoring
SD301	Executing instruction of BLOCK2	The value will be used when BLOCK monitoring
SD302	Executing instruction of BLOCK3	The value will be used when BLOCK monitoring
SD303	Executing instruction of BLOCK4	The value will be used when BLOCK monitoring
SD304	Executing instruction of BLOCK5	The value will be used when BLOCK monitoring
SD305	Executing instruction of BLOCK6	The value will be used when BLOCK monitoring
……	……	……
SD396	Executing instruction of BLOCK97	The value will be used when BLOCK monitoring
SD397	Executing instruction of BLOCK98	The value will be used when BLOCK monitoring
SD398	Executing instruction of BLOCK99	The value will be used when BLOCK monitoring
SD399	Executing instruction of BLOCK100	The value will be used when BLOCK monitoring

Error check (SD400-SD413)

ID	Function	Description
SD400		
SD401	The NO. of communication error expansion module	
SD402	BD number of communication error	
……		
SD405		
SD406		
SD40		

7		
SD408		
SD409	Operation error code number	1: Divided by zero error 2: Former operand's address less than the latter ones of MRST, MSET 3: ENCO, DECO encoding, decoding instruction data bit overruns. 4: BCD code error 7: Square root error
SD410	Numbers of shift register D when migration overruns	
SD411		
SD412		
SD413		

High-speed pulse (SD450-SD452)

ID	Function	Description	
SD450	1: watchdog run (default 200ms) 2: apply control block failed 3: Access is not legal address		
SD451	Hardware error types 1: packet error 2: bus error 3: usage error		
SD452	Hardware error number		

Expansion Modules, BD Status (SD500-SD516)

ID	Function	Description	
SD500	Module number Expansion modules: #1～16 BD: #10001～10005		
SD501~516	Expansion module, BD status		16 registers

Modules Information (SD520-SD855)

ID	Function	Description	
SD520		Expansion module 1	Each expansion module occupies 16 registers
……			
SD535			
……	……	……	
SD760		Expansion module 16	
……			
SD775			
SD776		BD module 1	Each BD module occupies 16 registers
……			
SD791			
……	……	……	
SD840		BD module 5	
……			
SD855			

Expansion Module Error Information

ID	Function	Description	
SD860	Error times of module read		Expansion module 1
SD861	Error types of module read	1. Expansion's CRC parity error 2. Expansion's address error 3. Expansion accepted data length error 4. Expansion's accept buffer zone overflows 5. Expansion timeout error 6. CRC parity error when PLC is accepting data 7. Unknown error	
SD862	Error times of module write		
SD863	Error types of module write		
SD864	Error times of module read		Expansion module 2
SD865	Error types of module	1. Expansion's CRC parity error	

	read	2. Expansion's address error 3. Expansion accepted data length error 4. Expansion's accept buffer zone overflows 5. Expansion timeout error 6. CRC parity error when PLC is accepting data 7. Unknown error	
SD866	Error times of module write		
SD867	Error types of module write		
……			
SD920	Error times of module read		Expansion module 16
SD921	Error types of module read	1. Expansion's CRC parity error 2. Expansion's address error 3. Expansion accepted data length error 4. Expansion's accept buffer zone overflows 5. Expansion timeout error 6. CRC parity error when PLC is accepting data 7. Unknown error	
SD922	Error times of module write		
SD923	Error types of module write		
SD924	Error times of module read		BD module 1
SD925	Error types of module read		
SD926	Error times of module write		
SD927	Error types of module write		
……			
SD940			BD module 5
SD941			
SD942			
SD943			

	ID	Function	Description
COM1	SD150	Executive result of Modbus read and write instructions	0: correct 1: cannot support function number 2: address error (overstep) (length error) 3: data error 4: substation error 6: substation busy 7: acceptance error 8: memory error (clear and write FLASH abnormal) 9: station number error 10: accept CRC error 11: accept LRC error 12: accept overtime
	SD151	X-Net communication result	0: correct 1: communication overtime 2: memory error 3: accept CRC error
	SD152	Free send result	0: correct 13: send buffer overflow
	SD153	Free accept result	0: correct 7: receive error 10: no initial symbol 11: no terminal symbol 12: receive overtime
	SD154	Free receive data numbers	In bytes, does not contain the initial and terminal symbol
	……		
	SD159		
COM2	SD160	Executive result of Modbus read and write instructions	0: correct 1: cannot support function number 2: address error (overstep) (length error) 3: data error 4: substation error 6: substation busy 7: acceptance error 8: memory error (clear and write FLASH abnormal)

			9: station number error 10: accept CRC error 11: accept LRC error 12: accept overtime
	SD161	X-Net communication result	0: correct 1: communication overtime 2: memory error 3: accept CRC error
	SD162	Free send result	0: correct 13: send buffer overflow
	SD163	Free accept result	0: correct 7: receive error 10: no initial symbol 11: no terminal symbol 12: receive overtime
	SD164	Free receive data numbers	In bytes, does not contain the initial and terminal symbol
	……		
	SD169		
COM3	SD170~SD 179		
COM4	SD180~SD 189		
COM5	SD190~SD 199		

Appendix 3. Special flash register list

*** means it works only after repowering on**

I filtering

ID	Function	Description	
SFD0*	Input filter timer value		
SFD2*	Watchdog run-up time, default value is 200ms		

I Mapping

ID	Function	Description	
SFD10*	I00 corresponds to X**	Input terminal 0 corresponds to X** number	0xFF means terminal bad, 0xFE

			means terminal idle
SFD11*	I01 corresponds to X**		
SFD12*	I02 corresponds to X**		
……	……		
SFD73*	I77 corresponds to X**	Default value is 77 (Octonary)	

O Mapping

ID	Function	Description	
SFD74*	O00 corresponds to Y**	Output terminal 0 corresponds to Y** number	0xFF means terminal broken, 0xFE means terminal idle
		Default value is 0	
……	……		
SFD134*	O77 corresponds to Y**	Default value is 77 (Octonary)	

I Attribute

ID	Function	Description	
SFD138*	I00 **Attribute**	Attribute of input terminal 0	0: positive logic Others:negative logic
SFD139*	I01 **Attribute**		
……	……		
SFD201*	I77 **Attribute**		

High Speed Counting

ID	Function	Description
SFD320	HSC0 frequency times	2: 2 times frequency; 4: 4 times frequency (effective in AB phase counting mode)
SFD321	HSC2 frequency times	Ditto
SFD322	HSC4 frequency times	Ditto
SFD323	HSC6 frequency times	Ditto
SFD324	HSC8 frequency times	Ditto
SFD325	HSC10 frequency times	Ditto

SFD326	HSC12 frequency times	Ditto
SFD327	HSC14 frequency times	Ditto
SFD328	HCS16 frequency times	Ditto
SFD329	HCS18 frequency times	Ditto
SFD330	Bit selection of HSC absolute and relative (24 segment)	bit0 corresponds to HSC0, bit1corresponds to HSC2, and so on, bit9 corresponds to HSC18 0: relative 1: absolute
SFD331	Interrupt circulating of 24 segments high speed counting	bit0 corresponds to HSC0, bit1corresponds to HSC2, and so on, bit9 corresponds to HSC18 0: single 1: loop
SFD332	CAM function	bit0 corresponds to HSC0, bit1 corresponds to HSC2, and so on, bit9 corresponds to HSC18 0: do not support CAM function 1: support CAM function

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- Facebook - kalatecautomação

NOSSAS FILIAIS

Matriz Campinas – SP
Rua Salto, 99
Jd. do Trevo
(19) 3045-4900

Filial São Paulo – SP
Av. das Nações Unidas,
18.801 – 11o Andar
(11) 5514-7680

Filial Joinville – SC
R. Almirante Jaceguay, 3659
Bairro Costa e Silva
(47) 3425-0042