EACON 易控

Professional AC Drive Manufacturer

SMA Series AC Drive

Quick Guide V1.0

Electronic instruction

Quick Guide of SMA

1. Preface

Thank you for choosing the SMA series of economic AC drive.

Before using the AC drive, please read the instructions carefully so that you can install and use the machine correctly, to give full play to its functions and ensure safety. Please save this instruction perpetually, for later maintenance and overhaul. AC drive is the power electronics product, so, for your safety, please be sure to install, debug and adjust parameters by qualified professional electrical engineers. The symbols such as danger ↯ and ! Note in the instruction remind you of the safety precautions when carrying, installing, running and checking the AC drive. Please operate in accordance with this instruction, to make the AC drive safer.

If you have any doubts, please contact our agents all over the country, and our professionals are willing to serve you.

This instruction is subject to change without notice.

↯ Dangerous or wrong operation may cause casualties.

↯ Danger

- Be sure to turn off the power supply before implementing the wiring.
- If the charging indicator doesn't go out after the AC power is cut off, it means that there is still high voltage in the AC drive, which is very dangerous, and do not touch the internal circuit and components.
- Do not check the parts and signals on PCB when running.
- Do not disassemble and change the internal wiring or components of the AC drive by yourself.
- Please be sure to connect the ground end of the AC drive to the ground.
- It is strictly forbidden to refit and replace the control panel and components privately, otherwise there will be dangers such as electric shock and explosion.

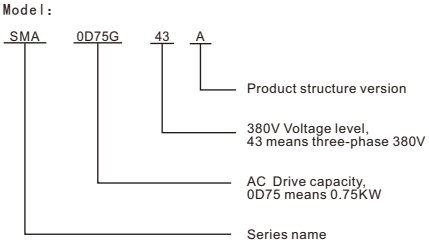
! Note that it may cause damage to transducer or mechanical system under wrong operation.

! Note

- Do not carry out voltage test for the components inside the AC drive, because these semiconductor parts are easily subject to damage under high voltage.
- It is strictly forbidden to connect the inverter output terminal U.V.W to the AC source.
- The main circuit boards of CMOS and IC are susceptible to impact and damage of static electricity, so do not touch the main circuit board.
- Only qualified professionals can install, debug and maintain the AC drive.
- If the AC drive is scrapped, please treat it as industrial waste, and it is strictly forbidden to burn it.

2. Standard specification of products

2.1 Nameplate description of SMA series



2.2 General specification of products

Product name		SMA
Control mode		SVPM
Input power supply		380Vpower: 330～440; 220Vpower: 170～240
Five-bit digital tube displays the status		Display frequency, current, speed, voltage, PID, temperature, forward and reverse state, fault and so on.
Operating temperature		-10～50℃
Humidity		0～95% Relative humidity(non-condensation)
Vibration		Under 0.5G
frequency control	Range	0.10-800.0Hz
	Accuracy	Digital: 0.1% (-10～50℃) Analogue: 0.1% (25℃)
	Set resolution	Digital: 0.1Hz; Analogue: 1‰of the maximum Operating frequency
	Output resolution	0.10-800.0Hz
	Keyboard setting method	Encoder setting
	Simulation setting method	External voltage 0-10V, 0-20mA
general control	Other functions	The lower frequency limit, starting frequency, stopping frequency
	Acceleration and deceleration control	The acceleration and deceleration time(0.5-6500seconds) can be selected arbitrarily
	V/F curve	The V/F curve can be set arbitrarily
	Torque control	Torque boost can be set, and the maximum 100% of starting torque can reach 150% at 1.0Hz.
	Digital input	6 multi-functional digital input terminals, forward and reverse running, forward and reverse jog, UP/DOWN function, counter, external emergency stop and other functions.
	Analog input	2 multifunctional digital input ports: Input voltage range: 0V～10V Input impedance: 22kΩ
	Digital output	2 multi-functional digital output terminals, indications and alarms during operation, frequency, external abnormality, program operation, etc.
	Analog output	1 multifunctional digital output ports: Output voltage range: 0V～10V Output current range: 0mA～20mA

	Other functions	Automatic voltage regulation (AVR), deceleration stop or free stop, DC brake, carrier adjustable, up to 10 KHz, etc.
Protection function	Overload protection	Electronic relay protects the AC drive (constant torque 150% per minute).
	FUSE protection	The motor stops when FUSE fusing.
	Overvoltage	220Vline: DC voltage >400V; 380Vline: DC voltage >800V
	Insufficient voltage	220Vline: DC voltage <200V; 380Vline: DC voltage <400V
	Stall Prevention	Stall prevention in acceleration and deceleration
	Output short circuit	Electronic circuit protection
	Other functions	Overheat protection of heat sink, reversal limit, direct startup afterstarting the machine, fault reset function, parameter locking, etc.

3. Storage and installation

3.1 Storage

This product must be placed in the packing box before installation. If not for use, please pay attention to the following items when storing:

●It must be placed in a dustless and dry place;

●The temperature of the storage environment should be from -20℃ to +65℃;

●The relative humidity of storage should be between 0% and 95%, with noncondensation;

●There should be no corrosive gas and liquid in the storage environment;

●It’s best to put them on shelves and store them in proper packing;

●The AC drive should not be stored for a long time. Long time of storage will lead to the deterioration of electrolytic capacitor. If long time of storage is needed, it is necessary to ensure to be electrified at least once a year, with the electrified time of at least 5 hours, and the voltage must be slowly increased to the rated voltage by the voltage regulator.

3.2 Installation site and environment

Please install the AC drive in the following sites:

●The site with ambient temperature of -10℃～50℃, and good ventilation;

●The site with no dripping and low humidity;

●The site with no dripping and low humidity;

●The site without sunlight, high strength and serious dust falling;

●The site without corrosive gas and liquid;

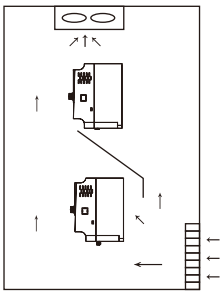
●The site with less dust, oil and gas and metal powder;

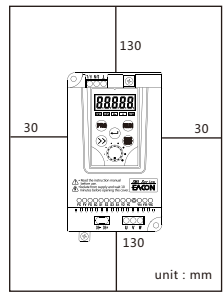
●The site with no vibration, which is easy for maintenance and check;

●The site with no electromagnetic interference;

3.3 Installation space and direction

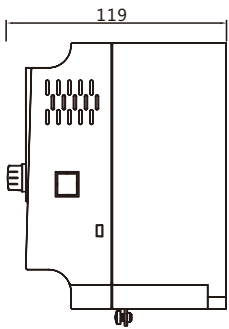
●In terms of convenience for cooling and maintenance, there must be enough space around the AC drive, as shown in the figure:
●In order to obtain the good cooling effect, the AC drive must be installed vertically, and ensure the smooth flow of air.
●If the installation is not stable, install it after placing a flat plate under the base of the AC drive. If installing it on the loose surface, the stress may cause the damage of the main circuit parts, and the AC drive will be damaged.
●The wall for installation should use the non-flammable materials such as iron plate.
●If several AC drives are installed in the same cabinet, install them in the up and down direction, and attention should be paid to the distance among them. In addition, please add the diversion baffle in the gap, as shown in the figure.

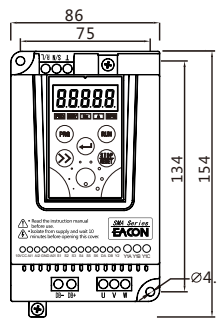




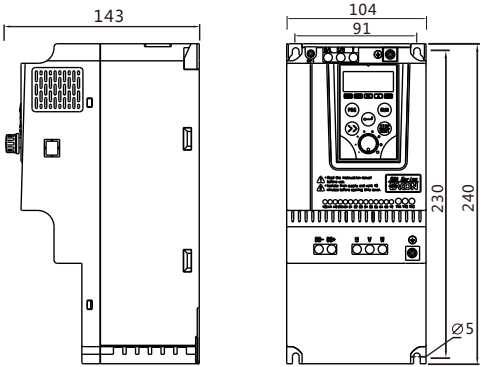
3.4 Product size

SMA10 Size





SMA20 Size



Product Specification

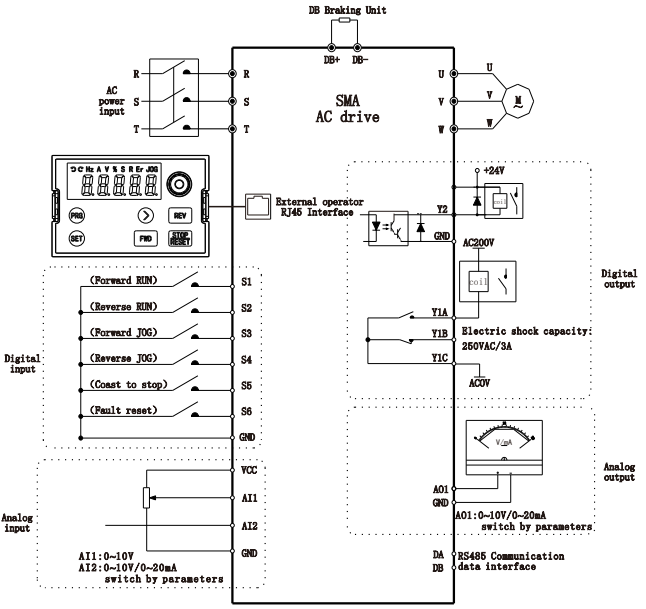
Farme	Type	Input Voltage	Power (KW)	Output Current (A)	Applicable Motor (KW)
SMA10	SMA00D4G23A	Single/three-phase 220V	0.4	2.1	0.4
	SMA0D75G23A		0.75	3.8	0.75
	SMA01D5G23A		1.5	7.0	1.5
	SMA02D2G23A		2.2	9.0	2.2
SMA20	SMA04D0G23A	Three-phase 220V	4.0	17.0	4.0
	SMA05D5G23A		5.5	20.0	5.5
SMA10	SMA0D75G43A	Three-phase 380V	0.75	3.4	0.75
	SMA01D5G43A		1.5	4.8	1.5
	SMA02D2G43A		2.2	6.2	2.2
SMA20	SMA04D0G43A		4.0	11.0	4.0
	SMA05D5G43A		5.5	14.0	5.5
	SMA07D5G43A		7.5	17.0	7.5

4. Basic wiring diagram of AC drive

4.1 Wiring part

It is divided into main circuit and control circuit. The user can lift the lid of the case, and then the main circuit terminal and the control circuit terminal can been seen. The user must connect accurately according to the following diagram.

The following figure is the standard wiring diagram of SMA when it comes out of the factory.



Legend: 1、Symbol ◎ represents the main circuit terminal;
2、Symbol ○ represents the control circuit terminal.

4.2 Description of main circuit terminal

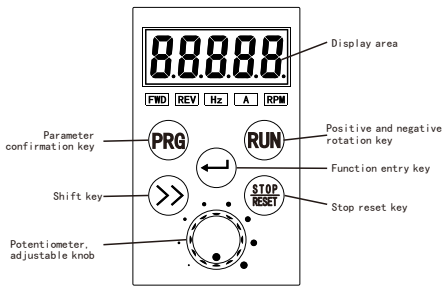
Terminal mark	Description
R.S.T	The power input terminal (220V class, single-phase and three-phase sharing, optional two terminals access for single-phase).
U.V.W	Output terminal of the AC drive
DB+ DB-	Connection terminal of brake resistance

4.3 Description of control circuit terminal

Terminal	Description	Factory setting
VCC	Power VCC	+10V +10V/+24V can be provided, and P2-23 can choose to switch
AI1	Analog input terminal 1	Input voltage
AI2	Analog input terminal 2	Input voltage Voltage and current switching, and P2-12 can choose to switch
GND	GND common terminal	AC drive grounding
AO1	Analog output terminal	Output voltage Voltage and current switching, and P2-17 can choose to switch
S1	Multifunctional input 1	Positive rotation
S2	Multifunctional input 2	Negative rotation
S3	Multifunctional input 3	Coast to stop
S4	Multifunctional input 4	Multi-speed SS1
S5	Multifunctional input 5	Multi-speed SS2
S6	Multifunctional input 6	Multi-speed SS4
DA	RS485 interface	9600BPS,8N2
DB		
Y2	Transistor digital output	Running
Y1A	Relay output normally open contact	Fault output
Y1B	Relay output normally closed contact	
Y1C	Relay comman	

5. Description of digital operator

5.1 Operator panel



5.2 Indicator description

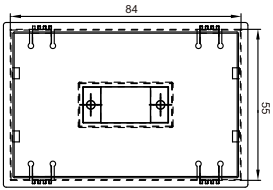
Indicator	Status	Description
FWD	on	Forward rotation status of the motor
REV	on	Reverse rotation status of the motor
Hz	on	Frequency interface
A	on	Current interface
RPM	on	Speed interface

5.3 Description of operating examples

Display	Explanation
F 50.0	Output frequency
A 0.00	Output current
U 380	Output voltage
E 530	EDC voltage
F 20	Temperature
550.0	Set frequency
b 0.0	PID

5.4 Installation hole size of external pull frame of operation panel

Hole size of sheet metal installation: 84×55



6. Function Code Table

P0 Basic parameters group				
Function Code	Parameter Name	Setting Range	Default	Address
P0-00	Operation panel frequency setting	0～P0-03 Frequency setting sorce when frequency is set by panel	50.0	0000H
P0-01	Source of operation command	0～3 0: Operation panel control 1: Terminal AI1 control 2: Terminal AI2 control 3: RS485 control	0	0001H
P0-02	Source of frequency command	0～3 0: Operation panel set frequency 1: Terminal AI1 control 2: Terminal AI2 control 3: RS485 control	0	0002H
P0-03	The maximum frequency	5.0～800Hz The maximum frequency of AC drive output.	50.0Hz	0003H
P0-04	Acceleration time	0.5～6500.0s Set the output frequency time decide by the start frequency reach the highest frequency time.	10.0s	0004H
P0-05	Deceleration time	0.5～6500.0s Set the output frequency time decide by the start frequency reach the lowst frequency time.	10.0s	0005H

P0-06	Stopping mode	0～1 0: Ramp to stop 1: Coast to stop	0	0006H
P0-07	Rotation direction	0～1 0: Forward 1: Reverse	0	0007H
P0-08	Carrier frequency	1.0～10.0 1-10K Set to scale	Model dependent	0008H
P0-09	Motor rated frequency	0～maximum frequency Set the rated frequency of the motor	50.0Hz	0009H
P0-10	Motor rated voltage	48～480V Set the rated voltage of the motor	Model dependent	000AH
P0-11	Motor rated current	0.10～100.00A The nameplate setting value of the motor can be used to limit the output current of the AC drive, prevent over current and protect the motor. If the motor current exceeds this value, the AC drive will be protected	Model dependent	000BH
P0-12	Monitoring selection	2～6 2: output frequency, outpout current, outpot voltage 3: output frequency, output current, output voltage, DC voltage 4: output frequency, output current, outpout voltage, DC Voltage, PID 5: output frequency, outpou current, output voltage, DC Voltage, PID, set frequ-ency current voltage 6: output frequency, outpou current, output voltage, DC Voltage, PID, set frequ-ency current voltage, temperture	3	000CH
P0-13	Display mode	0～3999 0: 0.1Hz 1: 0.1% 2～39:120*Frequency command/A04(Set motor number)=r/min 400～3999:Bit 4 sets the decimal point position Bit 3-1 determines 100% frequency setting value	0	000DH
P0-14	Parameters selection	0～65535 0: Change parameter 7: Restore factory settings 10:Save user data 210: recover user data	0	000EH

P1 V/F control parameters gropu

Function Code	Parameter Name	Setting Range		Default	Address
P1-00	V/F Selection	0～4	0: Linear 1: Set p1-0～p1-10 parameters to obtain any VF relation curve. 2: 1.3 power down torque curve 3: 1.7 power down torque curve 4: 2.0 power down torque curve	0	0100H
P1-01	Multi-point V/F frequency(F1)	0.0～P1-03		1.0Hz	0101H
P1-02	Multi-point V/F voltage (V1)	0.0～P1-04		3.0%	0102H
P1-03	Multi-point V/F frequency(F2)	P1-01～P1-05		10.0Hz	0103H
P1-04	Multi-point V/F voltage (V2)	P1-02～P1-06		28.0%	0104H
P1-05	Multi-point V/F frequency(F3)	P1-03～P1-07		25.0Hz	0105H
P1-06	Multi-point V/F voltage (V3)	P1-04～P1-08		55.0%	0106H
P1-07	Multi-point V/F frequency(F4)	P1-05～P1-09		37.5Hz	0107H
P1-08	Multi-point V/F voltage (V4)	P1-06～P1-10		78.0%	0108H
P1-09	Multi-point V/F frequency(F5)	P1-07～P0-03		50.0Hz	0109H
P1-10	Multi-point V/F voltage (V5)	P1-08～100.0%		100.0%	010AH
P1-11	JOG frequency	0.00～P0-03 Jogging frequency is when the multi-function contact input is selected as jogging frequency command		6.0Hz	010BH
P1-12	Minimum output frequency	0.00～50.00Hz The minimum output frequency of AC drive		1.0Hz	010CH
P1-13	Upper limit of operation frequency	P1-14～100% Upper limit of frequency command, set the maximum value of frequency command in 1% bit unit of the highest frequency		100%	010DH
P1-14	Lower limit of operation frequency	0%～P1-13 Minimum frequency		0%	010EH

P2 Terminal function group

Function Code	Parameter Name	Setting Range	Default	Address
P2-00	S1 input terminal function selection	0～14 0: No function 1: Forward RUN(FWD) 2: Reverse RUN(REV) 3: Theree-Wire control 4: Forward JOG(FJOG) 5: Reverse JOG(RJOG) 6: Coast to stop 7: Fault reset(RESET) 8: External fault input 9: Terminal UP(UP) 10: Terminal DOWN(DW) 11: UP and DOWN setting clear 12: Multi-reference terminal SS1 13: Multi-reference terminal SS2 14: Multi-reference terminal SS4	1	0200H
P2-01	S2 input terminal function selection		2	0201H
P2-02	S3 input terminal function selection		6	0202H
P2-03	S4 input terminal function selection		12	0203H
P2-04	S5 input terminal function selection		13	0204H
P2-05	S6 input terminal function selection		14	0205H
P2-06	Y1 function	0～4 0: NO function 1: Fault 2: Running 3: Frequency reached 4: Frequency upper limit reached 5: Frequency lower limit reached	1	0206H
P2-07	Y2 function		2	0207H
P2-08	Reserved		3	0208H
P2-09	AI1 gain	0%～200.0% Gain of external analog input adjusted as a per-centage	100.0%	0209H
P2-10	AI1 offset	-100%～100% Offset of external analog input adjusted as a per-centage	0%	020AH
P2-11	AI1 filter time	0.00～10.00s Filtering time of external analog input	0.10s	020BH
P2-12	AI2 input selection	0～2 0: voltage input 1: 0-20MA input 2: 4-20MA input	0	020CH

P2-13	AI2 gain	0%～200.0% Gain of external analog input adjusted as a percentage	100.0%	020DH
P2-14	AI2 offset	-100%～100% Offset of external analog input adjusted as a percentage	0.0%	020EH
P2-15	AI2 filter time	0.00～10.00s Filtering time of external analog input	0.10s	020FH
P2-16	AO1 output function selection	0: Set frequency 1: Output frequency 2: Output current 3: Output voltage 4: Mechanical speed 5: Reserved 6: Reserved 7: PID setting 8: PID feedback 9: Reserved 10: DC-BUS voltage 11: Input voltage 12: AI1 input value 13: AI2 input value 14: Reserved 15: Reserved 16: Internal temperature 17: Reserved 18:Reserved 19: Communication set value	0	0210H
P2-17	AO1 output signal selection	0～2 0: 0～10V 1: 4.00～20.00ma 2: 0.00～20.00ma	0	0211H
P2-18	AO1 output gain	25.0～200.0% Used to adjust the value of analog output of (AO1) terminal.	100.0%	0212H
P2-19	AO1 output signal offset	-10.0～10.0% Used to adjust the zero point of the (AO1) terminal output signal.	0.0%	0213H
P2-20	Up/Dw acceleration/deceleration time	0.1～6500.0s The frequency increment and decrement degree when the up/down terminal controls the frequency.	30.0s	0214H
P2-21	Terminal control of prohibition against reverse	0～1 0: Terminal control running, allowing reverse 1: Terminal control running, no reverse	0	0215H
P2-22	Terminal control operation mode	Two-wire system 1: The terminal set to 1 runs forward; The terminal set to 2 runs in reverse.	0	0216H

P2-22	Terminal control operation mode	Two-wire system 2: The terminal set to 1 starts running; The terminal set to 2 operates in reverse direction. Three-wire system 1: The terminal set to 1 runs forward; The terminal set to 2 runs in reverse; The terminal set to 3 stops running. Three-wire system 2: The terminal set to 1 starts running; The terminal set to 2 switches forward and backward; The terminal set to 3 stops running.	0	0216H
P2-23	VCC port voltage selection	0～1 0:+10V 1: +24V	0	0217H

P3 Axxiliary function group

Function Code	Parameter Name	Setting Range	Default	Address
P3-00	AVR function	0～2 0: No function 1: Deceleration without AVR 2: AVR in the whole process	1	0300H
P3-01	Variable carrier function	0～1 0: no change 1: change,detect radiator temperature, then halve carrier frequency for above 75 degrees, and recover carrier frequency for below 70 degrees	0	0301H
P3-02	Braking voltage value	0.0～100% This parameter is set to offer DC motor braking voltage when starting and stopping. By adjusting this parameter, different braking voltages can be obtained. When adjusting this parameter, it must increase slowly from small value, until getting enough braking torque.	3.0%	0302H
P3-03	Braking time at startup	0～500.0s Set up the DC braking time at startup. When 0.0S is set, no DC brake will be implemented at startup.	0.0	0303H

P3-04	Braking time at stop	0～500.0s Set up the DC braking time at stop. When 0.0S is set, no DC brake will be implemented at stop.	0.0	0304H
P3-05	Torque compensation ratio	0～30% In terms of large pressure drop in the low speed range or due to the large distance between the AC drive and the motor, the compensation can be made by increasing percentage of the highest voltage.	10%	0305H
P3-06	Cut-off frequency of torque compensation	0～100% Then compensation cut-off frequency is given according to the percentage of the rated frequency of the motor.	35%	0306H
P3-07	Differential compensation	0～10% The method of increasing the output frequency of AC drive by proportional to the motor load torque, is applied to reduce the motor speed change in accordance with the load torque.	0.0%	0307H
P3-08	No-load current	10～100% Set the no-load current of the motor as the reference value of the slip compensation	30%	0308H
P3-09	DC Braking voltage value	110～150% The DC voltage value of the braking resistor is adjusted by percentage.	Model dependent	0309H

P4 Fault and protection parameters group

Function Code	Parameter Name	Setting Range	Default	Address
P4-00	Motor overload protection	0～2 0: No overload protection 1: Normal motor overload protection 2: AC drive overload protection	0	0400H
P4-01	Reserved	-	-	0401H

P4-02	Under-voltage protection	40～100% Set value of under-voltage protection	65%	0402H
P4-03	Detection datum for overflow stall	60～180% 1.5*Rated current of the AC drive	150%	0403H
P4-04	Lower limit frequency of overflow stall	1～100% When the current exceeds the limit value, drop the frequency until the current does not exceed the limit or change the set value.	12%	0404H
P4-05	Frequency reduction of overfolw stall	0.5～100.0s Deceleration time of overflow stall	5.0s	0405H
P4-06	Running time	Read-only Total cumulative running time	NC	0406H
P4-07	Running time	Read-only Total cumulative running time	NC	0407H
P4-08	Historical fault 1	Read-only 1st fault type	NC	0408H
P4-09	Historical fault 2	Read-only 2nd fault type	NC	0409H
P4-10	Historical fault 3	Read-only 3rd fault type	NC	040AH
P4-11	Historical fault 4	Read-only 4th fault type	NC	040BH
P4-12	Fault EDC	Read-only DC bus voltage of the latest fault	NC	040CH
P4-13	Fault current	Read-only Output current value of the latest fault	NC	040DH
P4-14	Fault frequency	Read-only Output frequency value of the latest fault	NC	040EH

P5 PID control parameters group

Function Code	Parameter Name	Setting Range	Default	Address
P5-00	PID control selection	0～1 0: OFF 1: ON	0	0500H

P5-01	Operation panel digital PID setting	0.00～P5-02Mpa	0.30Mpa	0501H
P5-02	Maximum range of feedback singal	0.0～10.00Mpa	1.00Mpa	0502H
P5-03	Feedback signal gain	0.00～10.00	1.00	0503H
P5-04	Proportional gain P	0.00～100.00	1.00	0504H
P5-05	Integral time I	0.00～10.00s	1.00s	0505H
P5-06	Differential time D	0.00～10.00s	0.00s	0506H
P5-07	Sampling period	0.00～100.00s	0.10s	0507H
P5-08	Upper limit of integral	0～109%	100%	0508H
P5-09	Output filter time	0.0～2.5s	0.0s	0509H
P5-10	Datum of dormancy pressure	0.0～P5-02Mpa Set the pressure value of the main pump to enter dormancy	0.30Mpa	050AH
P5-11	Datum duration of dormancy pressure	0.0～3600.0s Feedback value > duration of wake-up	60.0s	050BH
P5-12	Wake-up pressure reference	0.1～P5-02 The pressure value of a dormancy state switching to a wake-up state	0.15Mpa	050CH
P5-13	Datum duration of wake-up referency	0.0～3600.0s Feedback value < duration of wake-up	60.0s	050DH

P6 Communication control function parameter group

Function Code	Parameter Name	Setting Range	Default	Address
P6-00	Address	1～247	1	0600H
P6-01	Baud rate selection	0～7 0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps 6: 57600bps 7: 115200bps	3	0601H

P6-02	Data format	0～5 0: (N, 8, 1)No check, data format:8,stop bit:1 1: (E, 8, 1)Even parity check, data format:8, stop bit:1 2: (O, 8, 1)Odd Parity check, data format:8, stop bit:1 3: (N, 8, 2)No check, data format:8,stop bit:2 4: (E, 8, 2)Even parity check, data format:8, stop bit:2 5: (O, 8, 2)Odd Parity check, data format:8, stop bit:2	3	0602H
P6-03	Communication proportion setting	0.000～5.000	1.000	0603H
P6-04	Communi-cation response delay	0～0.500s	0.000s	0604H
P6-05	Communi-cation timeout failure time	0.1～100.0s	1.0s	0605H
P6-06	Transmission response processing	0～1 0: Write response 1: Write no response	0	0606H

P7 Multi-frequency parameter group

Function Code	Parameter Name	Setting Range	Default	Address
P7-00	Multi-frequency 2	0～maximum frequency When the multi segment speed frequency command is valid, the frequency source of is composed of SS1, SS2 and SS4 terminals to deter-mine the selected frequency term	0.00Hz	0700H
P7-01	Multi-frequency 3		0.00Hz	0701H
P7-02	Multi-frequency 4		0.00Hz	0702H
P7-03	Multi-frequency 5		0.00Hz	0703H
P7-04	Multi-frequency 6		0.00Hz	0704H
P7-05	Multi-frequency 7		0.00Hz	0705H
P7-06	Multi-frequency 8		0.00Hz	0706H

PU Monitoring parameter group

Function Code	Parameter Name	Setting Range	Default	Address
PU-00	Set frequency	Read-only	0.00Hz	2110H
PU-01	Output frequency	Read-only	0.00Hz	2111H
PU-02	Output current	Read-only	0.0A	2112H
PU-03	Input current	Read-only	0V	2113H
PU-04	Output voltage	Read-only	0V	2114H
PU-05	Mechanical speed	Read-only	0.0M/S	2115H
PU-06	Bus voltage	Read-only	0V	2116H
PU-07	Reserved	Read-only	--	2117H
PU-08	Module temperature	Read-only	0℃	2118H
PU-09 ～ PU-12	Reserved	Read-only	--	2119H ～ 211CH
PU-13	PID setting	Read-only	0.0%	211DH
PU-14	PID feedback	Read-only	0.0%	211EH
PU-15	Input terminal X on state	Read-only	0	211FH
PU-16	Output terminal Y on state	Read-only	0	2120H
PU-17	Anolog AI1 input value	Read-only	0.0%	2121H
PU-18	Anolog AI2 input value	Read-only	0.0%	2122H
PU-19 ～ PU-20	Reserved	Read-only	--	2123H ～ 2124H
PU-21	Anolog output A01	Read-only	0.0%	2125H
PU-22 ～ PU-24	Reserved	Read-only	--	2126H ～ 2128H
PU-25	Power-on cumulative time	Read-only	0.0Hour	2129H
PU-26	Power-on running time	Read-only	Hour	212AH

PU-27	Running cumulative time	Read-only	Hour	212BH
PU-28	AC drive running status	Read-only	--	212CH
PU-29	Maximum current value	Read-only	--	212DH
PU-30	Maximum EDC	Read-only	--	212EH
PU-31	Maximum temperature	Read-only	--	212FH
PU-32	Minimum EDC	Read-only	--	2130H
PU-33	AC drive power level	Read-only	0.0kW	2131H
PU-34	AC drive rated voltage	Read-only	0V	2132H
PU-35	AC drive rated current	Read-only	0.1A	2133H
PU-36	Software version	Read-only	--	2134H
PU-37	Reserved	Read-only	0.01Hz	2135H

7. Fault information and description

Fault display	Name	Description
SC	Output short circuit	The output is short and the current is too large.
OU	Over-voltage	The DC voltage of the main circuit exceeds the OU value
LU	Under-voltage	The DC voltage of the main circuit is less than LU value
OI1	Motor overload	The output value of the AC drive exceeds the rated overload value of the motor
OI2	AC drive overload	The output current of the AC drive exceeds its rated overload value.
OC	Overcurrent	The output current of the AC drive exceeds the OC value
OH	Overheated	The temperature of the radiator exceeds the allowable value
Err	Parameter setting error	Error setting of the maximum and intermediate value of frequency or voltage (Note 1).
Eff	External fault input	Multi-function contact input external fault

Note 1: for example, if the intermediate frequency is set greater than the maximum frequency, it will generate "Err" information, then change to the correct value, and press STOP to cancel the "Err" information.

8. Braking Resistor Selection Schedule

Farme	AC Drive Model	Resistor Specifications		Braking Torque%	Suited Motor/KW Model G
		Power W	Resistance Ω		
SMA10	SMA00D4G23A	80	200	125	0.4
	SMA0D75G23A	100	200	125	0.75
	SMA01D5G23A	300	100	125	1.5
	SMA02D2G23A	300	70	125	2.2
SMA20	SMA04D0G23A	400	40	125	4.0
	SMA05D5G23A	500	27.2	125	5.5
SMA10	SMA0D75G43A	80	750	125	0.75
	SMA01D5G43A	300	400	125	1.5
	SMA02D2G43A	300	250	125	2.2
SMA20	SMA04D0G43A	500	125	125	4.0
	SMA05D5G43A	500	100	125	5.5
	SMA07D5G43A	1000	75	125	7.5

9.SMA series-RS485 Communication Protocol

●Introduction to communication protocol

SMA series AC drives are equipped with RS485 communication interface as standard, and adopt the international standard ModBus communication protocol for master-slave communication. Users can realize centralized control through PC/PLC, upper computer, master AC drive, etc. (setting AC drive control commands, operating frequency, modification of related function code parameters, monitoring of AC drive working status and fault information, etc.) to adapt specific application requirements.

●Application method

1.SMA series AC drives have a "single-master and multiple-slave" control network connected to RS485 bus. When the master uses the broadcast command (the slave address is 0), the slave does not respond.

2. SMA only provides RS485 interface, asynchronous half-duplex. If the communication port of the external device is RS232, an Rs232/RS485 converter is required.

3. The ModBus protocol defines the information content and format of asynchronous transmission in serial communication, which can be divided into RUT mode and ASCII mode. SMA is RTU (Remote Terminal Unit) mode.

●Communication frame structure

The communication data format is as follows:Byte composition: including start bit, 8 data bits, parity bit and stop bit.

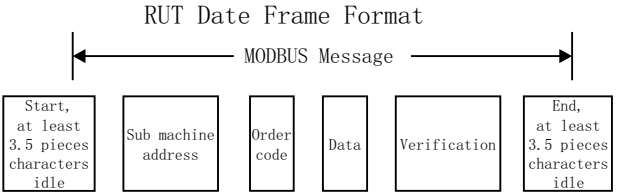
Start Bit	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Parity Bit	Stop Bit

The information of a frame must be transmitted in a continuous data stream. If the interval time exceeds 1.5 bytes before the end of the entire frame transmission, the receiving device will clear the incomplete information and mistakenly believe that the next byte is a new one.

The address field part of the frame. Similarly, if the interval between the start of a new frame and the previous frame is less than 3.5 bytes, the receiving device will consider it to be the continuation of the previous frame. Due to the frame disorder, the final CRC check value is incorrect, resulting in communication error. Standard structure of RTU frame:

Frame header	3.5 bytes transmission time
Slave address	Mail address: 0-247 (decimal)　(0 is broadcast address)
Command code	03h: read slave parameters 06h: write slave parameters 08h: loop self test
Data area	Parameter address, number of parameters, parameter value, etc
CRC CHK low	Test value: 16 bit CRC test value
CRC CHK high	
Frame tail	3.5 bytes transmission time

In RTU mode, a new frame starts with a transmission time pause interval of at least 3.5 bytes. The data fields transmitted next are: slave address, operation command code, data and CRC check word. The transmitted bytes in each field are hexadecimal 0...9, A...F. The network device continuously detects the network bus, including the pause interval. When receiving the first field (address information), each network device decodes the byte to determine whether it is sent to itself. After the transmission of the last byte is completed, a transmission time interval of at least 3.5 bytes is used to indicate the end of the frame. After this, a new message can begin.



●Command code and communication data description

Command code: 03H, read N words (Word), up to 5 words can be read continuously. For example: the AC drive whose slave address is 01H, the memory start address is 2100H ([C-00]),read 3 consecutive words, then the structure of the frame is described as follows:

RTU host command information

START	3.5 pieces bytes transmit time
Sub machine address	01H
Start address high position	21H
Start address low position	00H
Data quantity high position	00H
Data quantity low position	03H
CRC CHK low position	0FH
CRC CHK high position	F7H
END	3.5 bytes transmit time

RTU sub machine responding information(when normal)

START	3.5 pieces bytes transmit time
Sub machine address	01H
Order code	03H
Bytes quantity low position	06H
Data address 2100H high position	13H
Data address 2100H low position	88H
Data address 2101H high position	00H

Data address 2101H low position	00H
Data address 2102H high position	00H
Data address 2102H low position	00H
CRC CHK low position	EDH
CRC CHK high position	5DH
END	3.5 bytes transmit time

RTU sub machine responding information (when abnormal)

START	3.5 bytes transmit time
Sub machine address	01H
Order code	88H
Error code	03H
CRC CHK low position	06H
CRC CHK high position	01H
END	3.5 bytes transmit time

Order code:06H, write one word

Function: write one word data into appointed data address, can use into modify the frequency transformer parameter value.

Example: write the 5000(1388H) in the 3000H address of sub machine address 1 frequency transformer. Then the structure description of this frame as below:

RTU main machine order information

START	3.5 bytes transmit time
Sub machine address	01H
Order code	06H
Check the code high position	30H
Check the code low position	00H
Data high position	13H
Data low position	88H
CRC CHK low position	8BH
CRC CHK high position	9CH
END	3.5 bytes transmit time

RTU sub machine responding information(when normal)

START	3.5 bytes transmit time
Sub machine address	01H
Order code	06H
Check the code high position	30H
Check the code low position	00H

Data high position	13H
Data low position	88H
CRC CHK low position	8BH
CRC CHK high position	9CH
END	3.5 bytes transmit time

RTU sub machine responding information(when abnormal)

START	3.5 pieces bytes transmit time
Sub machine address	01H
Order code	86H
Error code	01H
CRC CHK low position	83H
CRC CHK high position	A0H
END	3.5 bytes transmit time

Order code: 08H, loop self-test

Function: send back the sub machine responding information which same to the main machine order information, used to check whether the signal transmit between main machine and sub machine are normal.

The detection code and data can be set arbitrarily.

RTU host command information

Communication frame error checking method:

The standard Modbus serial network uses two error detection methods. The parity check is used to check each character, and the CRC check is used to check a frame of data.

1. Parity check

The user can configure the controller to have odd or even parity, or no parity. This will determine how the parity bit in each character is set. If odd or even parity is specified, the number of "1" bits will be counted into the number of bits per character (7 data bits in ASCII mode, 8 data bits in RTU). For example, the RTU character frame contains the following 8 data bits: 1 1 0 0 0 1 0 1 The number of the entire "1" is 4. If even parity is used, the parity bit of the frame will be 0, and the entire The number of "1" is still 4. If odd parity is used, the parity bit of the frame will be 1, and the total number of "1"s will be 5. If the parity bit is not specified, there will be no check bit during transmission and no check check will be performed. Instead of an additional stop bit, it is filled into the character frame to be transmitted.

2. CRC-16 (cyclic redundancy check)

Using the RTU frame format, the frame includes a frame error detection field calculated based on the CRC method. The CRC field detects the content of the entire frame. The CRC field is two bytes and contains a 16-bit binary value. This CRC calculation method uses the international standard CRC verification rule. When editing the CRC algorithm, the user can refer to the CRC algorithm of the relevant standard and write a CRC calculation program that truly meets the requirements.

● Definition of communication data address

This part is the address definition of communication data, which is used to control the operation of the AC drive, obtain the status information of the AC drive and set the relevant function parameters of the AC drive.

(1) SMA series function parameter address expression rules

Take the AC drive function parameter serial number as the register address, which is divided into high byte and low byte. The high byte indicates the group serial number of the function parameter, and the low byte indicates the group serial number of the function parameter,which needs to be converted into hexadecimal. For the address of specific parameters, please see the communication address column in the parameter column table of the chapter

Note: Due to the possibility of frequent rewriting of parameter values in communication, if the EEPROM is frequently stored, the service life will be reduced. For users, some function code parameters do not need to be stored in the communication mode, and only need to change the value in the on-chip RAM to meet the requirements. The SMA communication protocol stipulates that when the write command (06H) is used, it will only be written into the RAM of the AC drive and will not be stored after power failure. If the write command (41H) is used, it will be written into the EEPROM, which means it will be stored after power failure.

Parameter address definition of communication protocol

Control order function instruction	Address definition	Data meanings instruction		R/W characteristics
Communication running control order	2000H	BIT0	0-stop RUN 1-RUN	W
		BIT1	0-FORWARD RUN 1-REVERSE RUN	
		BIT2	0-NO ORDER 1-JOG RUNNING	
		BIT3	0-NO ORDER 1-RESET OPERATION	
		BIT 4-7	DO1-DO4	
		BIT 8	COMMUNICATION FAULT INPUT	
		BIT 9-15	RESERVE	
Communication frequency setting value	2001H	Setting range: 0-Maximum frequency		W
Communication frequency setting value	2002H	Reserve		
Communication frequency setting value	2003H	Reserve		
Communication frequency setting value	2004H	Reserve		
Communication AO1 output value	2005H	Setting range: 0-100.0%		W

Monitor command function instruction	Address definition	Data meanings instruction		R/W charac-teristics
AC drive operation status	2100H	BIT0	RUN	R
		BIT1	REV	
		BIT2	Ready	
		BIT3	Fault	
		BIT4	Jogging	
		BIT5	Pre-alarm	
		BIT6-15	NC	
AC drive fault type	2101	0 - No fault 1 SC IGBT unit failure 2 OC1 Acceleration over-current 3 OC2 Constant speed over-current 4 OC3 Deceleration over-current 5 OU1 Acceleration over-voltage 6 OU2 Constant speed over-voltage 7 OU3 Deceleration over-voltage 8 LU Undervoltage 9 OL1 AC drive overload 10 OL2 Motor overload 11 OH2 Radiator overheated 12 EFF External input failure 13 EPF0 Power unit power setting data lost 14 EPF1 Power unit user setting data lost 15 EPF2 Power unit user data memory is damaged 16 EPFA1 Control unit user data is lost 17 EPFA2 Control unit user data memory is damaged		R

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