ADS310 Series Smart Single Phase Solar inverter

User Manual

Preface

Thank you for choosing ADS310 series AC Drive. The ADS310 series is manufactured using high-quality components, material and incorporating the latest microprocessor technology available.

Getting Started

This manual will help in the installation, parameter setting, troubleshooting, and daily maintenance of the AC motor drive. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the AC motor drive. Keep this operating manual handy and distribute to all users for reference.

ADS310 series drive is design to high standards of EMC. Conforms with the following standards:

CE marked for low voltage directive.

UL508C Power conversion equipment.

IEC664-1 Insulation coordination for equipment within low voltage system.

EN61000-2,3,4 Generic Immunity / Emissions standards (EMC) .

⚠ WARNING

Always read this manual thoroughly before using ADS310 series AC Motor Drives.

DANGER! **AC input power must be disconnected before any maintenance. Do not connect or disconnect wires and connectors while power is applied to the circuit. Maintenance must be performed by qualified technicians.**

CAUTION! There are highly sensitive MOS components on the printed circuit boards.
These components are especially sensitive to static electricity. To avoid damage to these components, do not touch these components or the circuit boards with metal objects or your bare hands.

DANGER! A charge may still remain in the DC-link capacitor with hazardous voltages even if the power has been turned off. To avoid personal injury, do not remove the cover of the AC drive until all "DISPLAY LED" lights on the digital keypad are off. Please note that there are live components exposed within the AC drive. Do not touch these live parts.

CAUTION! Ground the ADS310 using the ground terminal. The grounding method must comply with the laws of the country where the AC drive is to be installed. Refer to Basic Wiring Diagram.

DANGER! The AC drive may be destroyed beyond repair if incorrect cables are connected to the input/output terminals. Never connect the AC drive output terminals

U/T1, V/T2 directly to the AC main circuit power supply.

CHAPTER 1 RECEIVING AND INSPECTION

This ADS310 AC drive has gone through rigorous quality control tests at the factory before shipment. After receiving the AC drive, please check for the following:

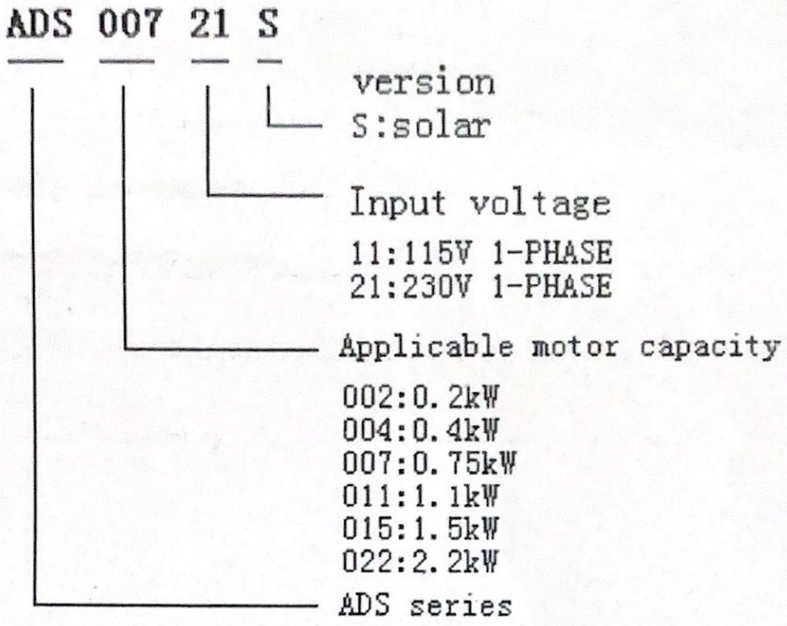
Receiving

- Check to make sure that the package includes an AC drive, the User Manual, dust covers and rubber bushings.

- Inspect the unit to insure it was not damaged during shipment.

- Make sure that the part number indicated on the nameplate corresponds with the part number of your order.

1.1Model Explanation:



1.2 Technical specifications

Inverter model	Input voltage	Rated output power(kW)	Rated input current(A)	Rated output current(A)	Adaptive motor	Base No.
ADS 002 21 S	1-phase 220V ±10% or DC 200~380V	0.2	3.8	1.6	0.2	M1
ADS 004 21 S		0.4	5.1	2.5	0.4	M1
ADS 007 21 S		0.75	7.9	4	0.75	M1
ADS 011 21 S		1.1	11.2	5.6	1.1	M1
ADS 015 21 S		1.5	14	7	1.5	M1
ADS 022 21 S		2.2	22.5	11	2.2	M1

1.3 Standard specifications

Items			Specifications
Power	Voltage and frequency levels		Single-phase 220V, 50/60Hz DC 200~380V
	Allowable fluctuation		Voltage:±10% Frequency:±5%
Control system	Control system		High performance vector control, inverter based on DSP
	Control method		vector control
	Automatic torque boost function		Realize low frequency (1Hz) and large output torque control under the V/F control mode.
	Acceleration/deceleration control		Time range is 0.0 to 600S.
	Over load capability		Rated current 150% - 1 minute, rated current 180% - 2 seconds
	Maximum frequency		0 to 400Hz
	Carrier Frequency		0.5 to 16kHz; automatically adjust carrier frequency according to the load characteristics.
	Input frequency resolution		Digital setting: 0.01Hz Analog setting: maximum frequency×0.1%
	Speed range		1:100 (vector control)
	Steady-speed precision		Vector control: ≤ ± 0.5% (rated synchronous speed)
	Torque response		≤ 40ms (vector control)
	DC braking		DC braking frequency: 0.0Hz to max. frequency, braking time: 0.0 to 100.0 seconds, braking current value: 0.0% to 100.0%
	Jog control		Jog Frequency Range: 0.00Hz to max. frequency; Jog Ac/deceleration time: 0.0s to 600.0s
	Multi-speed operation		Achieve up to 3-speed operation through the control terminal
	Automatic voltage regulation(AVR)		Automatically maintain a constant output voltage when the voltage of electricity grid changes
Personalization function	Self-inspection of peripherals after power-on		After powering on, peripheral equipment will perform safety testing, such as ground, short circuit, etc.
	Quick current limiting		The current limiting algorithm is used to reduce the inverter over current probability, and improve whole unit anti-interference capability.
Running	Input signal	Running method	Keyboard/terminal/communication
		Frequency setting	4 frequency settings available, including adjustable DC(0 to 10V), adjustable DC(4 to 20mA), panel potentiometer, etc.
		Start signal	Rotate forward/reverse
		Multi-speed	At most 3-speed can be set(run by using the multi-function terminals or program)
		Emergency stop	Interrupt controller output
		Fault reset	When the protection function is active, you can automatically or manually reset the fault condition.
	Output signal	Running status	Motor status display, stop, ac/deceleration, constant speed, program running status.
		Fault output	Contact capacity :normally closed contact 5A/AC 250V, normally open contact 3A/AC 250V, 1A/DC 30V.
		Analog output	Two-way analog output, 16 signals can be selected such as frequency, current, voltage and other, output signal range (0 to 10V / 0 to 20mA).

Items			Specifications
	Output signal		At most 3-way output, there are 40 signals each way
	Run function		Limit frequency, jump frequency, frequency compensation
	Running command channel		Three channels: operation panel, control terminals and serial communication port.
	Frequency source		Total 5 frequency sources: multi-speed, analog voltage, analog current, communication ,keypad potentiometer.
	input terminals		4 digital input terminals, compatible with active PNP or NPN input mode, 1 analog input terminals for voltage or current input.
	Output terminals		One relay output terminal;
Protection function	Inverter protection		Overvoltage protection, undervoltage protection, overcurrent protection, overload protection, overheat protection, overvoltage stall protection, , communication error
	Inverter fan control		Will work when the inverter is working
	Parameter protection function		Protect inverter parameters by setting administrator Password and decoding
Display	LED display keyboard	Running information	Monitoring objects including: running frequency, set frequency, bus voltage, output voltage, output current, output power, analog AI value, motor Actual running speed
		Error message	At most save six times error message, and the fault code can be queried when the failure is occurred.
	LED display		Display parameters
Communication	RS485		The optional completely isolated RS485 communication module can communicate with the host computer.
Environment	Environment temperature		-10 ℃ to 40 ℃ (temperature at 40 ℃ to 50 ℃, please derating for use)
	Storage temperature		-20 ℃ to 65 ℃
	Environment humidity		Less than 90% R.H, no condensation.
	Vibration		Below 5.9m/s² (= 0.6g)
	Application sites		Indoor where no sunlight or corrosive, explosive gas and water vapor, dust, flammable gas, oil mist, water vapor, drip or salt, etc.
	Altitude		Below 1000m
	Pollution degree		2
Product standard	Product adopts safety standards.		IEC61800-5-1:2007
	Product adopts EMC standards.		IEC61800-3:2005
Cooling method			Forced air cooling and natural air cooling

CHAPTER 2 STORAGE AND INSTALLATION

2.1 Storage:

The AC drive should be kept in the shipping carton before installation. In order to retain the

warranty coverage, the AC drive should be stored properly when it is not to be used for an extended period of time.

2.2 Ambient Conditions:

Operation Air Temperature: -10oC to +40oC (14oF to 104oF)

Atmosphere pressure: 86 to 106 kPa

Installation Site Altitude: below 1000m

Storage Temperature: -20oC to +60oC (-4oF to 140oF)

Relative Humidity: Less than 90%, no condensation allowed

Atmosphere pressure: 86 to 106 kPa

Transportation Temperature: -20oC to +60oC (-4oF to 140oF)

Relative Humidity: Less than 90%, no condensation allowed

Atmosphere pressure: 86 to 106 kPa

2.3 Installation:

CAUTION!

The control, power supply and motor leads must be laid separately. They must not be fed through the same cable conduit / trunking.

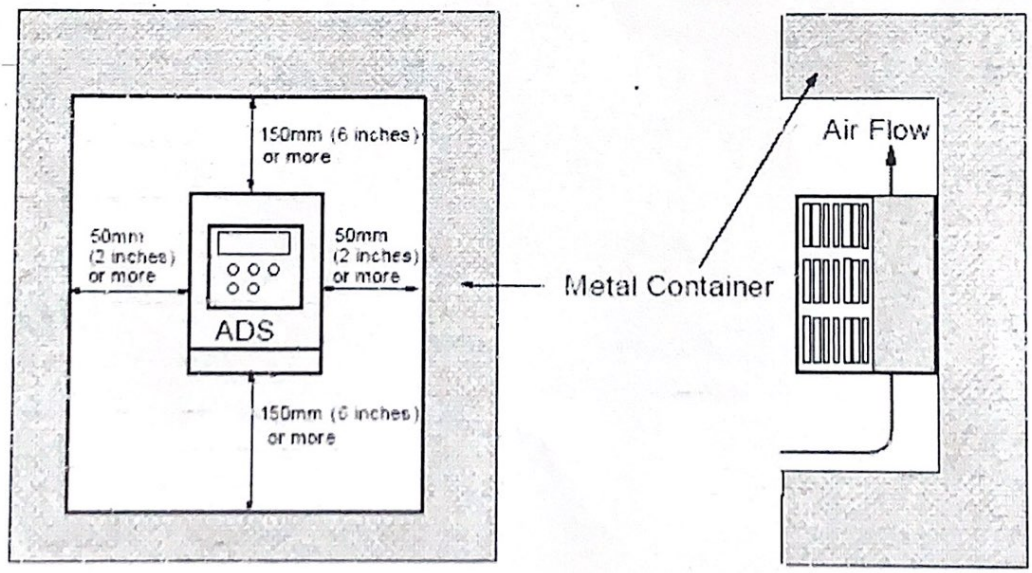
High voltage insulation test equipment must not be used on cables connected to the drive.

Improper installation of the AC drive will greatly reduce its life. Be sure to

observe the following precautions when selecting a mounting location.

Failure to observe these precautions may void the warranty!

- ✧ Do not mount the AC drive near heat-radiating elements or in direct sunlight.
- ✧ Do not install the AC drive in a place subjected to high temperature, high humidity, excessive vibration, corrosive gases or liquids, or airborne dust or metallic particles.
- ✧ Mount the AC drive vertically and do not restrict the air flow to the heat sink fins.
- ✧ The AC drive generates heat. Allow sufficient space around the unit for heat dissipation.



Minimum Clearances and Air Flow

CHAPTER 3 WIRING

DANGER!

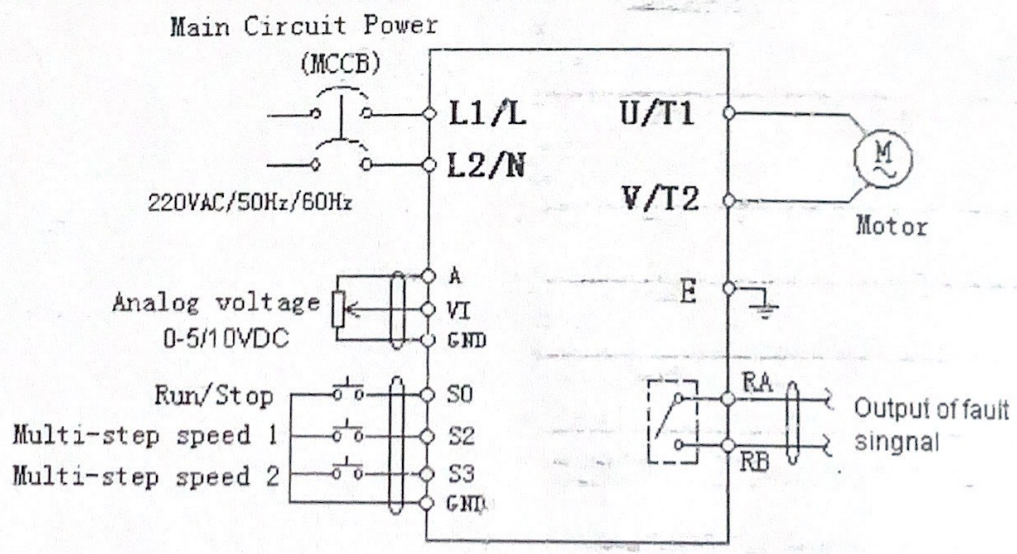
3.1 Hazardous Voltage

Before accessing the AC drive:

- Disconnect all power to the AC drive.
- Wait five minutes for DC bus capacitors discharge.

3.2 Basic Wiring Diagram

Users must connect wiring according to the circuit diagram shown below. Please follow all National and State wiring codes, when wiring the ADS310.



3.3 Terminal Explanations

Terminal Symbol	Explanation of Terminal Function
L1/L, L2/N	AC line input terminals
U/T1,V/T2	AC drive output terminals motor connections
E	Earth Ground

3.4 Control Terminals Explanations

Wire Gauge :22-24AWG

Terminal Symbols	Terminal Functions
S0	Run/Stop
S2	Multi-step speed 1
S3	Multi-step speed 2
A	Potentiometer power source（+5/10VDC）
VI	Analog voltage input (0~~5/10VDC)
GND	Common signal

3.5 Wiring Notes: PLEASE READ PRIOR TO INSTALLATION.

1. **CAUTION:** Do not connect the AC power to the U/T1, V/T2 terminals, as it will damage the AC drive.

2. **WARNING:** Ensure all screws are tightened to the proper torque rating.

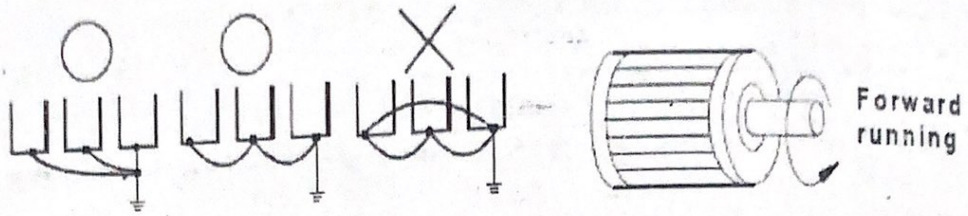
3. During installation, follow all local electrical, construction, and safety codes for the country the drive is to be installed in.

4. Ensure that the appropriate protective devices (circuit breaker or fuses) are connected between the power supply and AC drive.

5. Make sure that the leads are connected correctly and the AC drive is properly grounded. (Ground resistance should not exceed 0.1_.)

6. Use ground leads that comply with AWG/MCM standards and keep them as short as possible.

7. Multiple ADS310 units can be installed in one location. All the units should be grounded directly to a common ground terminal. The ADS310 ground terminals may also be connected in parallel, as shown in the figure below. **Ensure there are no ground loops.**



8. When the AC drive output terminals U/T1, V/T2 are connected to the motor terminals U/T1, V/T2 respectively, the motor will rotate counterclockwise (as viewed from the shaft ends of the motor) when a forward operation command is received.

9. Make sure that the power source is capable of supplying the correct voltage and required current to the AC drive.

10. Do not attach or remove wiring when power is applied to the AC drive.

11. Do not monitor the signals on the circuit board while the AC drive is in operation.

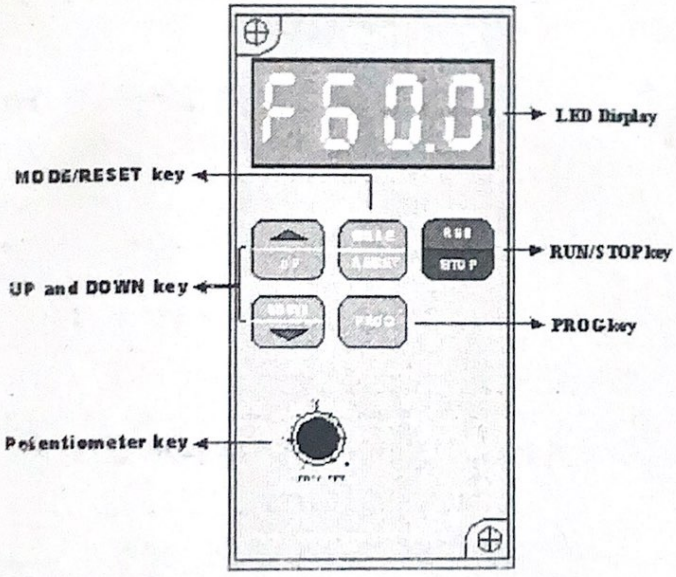
12. Route the power and control wires separately, or at 90 _ angle to each other.

13. When using a GFCI (Ground Fault Circuit Interrupt), select current sensor with sensitivity of 200mA, and not less than 0.1-second detection to avoid nuisance tripping.

CHAPTER 4 DIGITAL KEYPAD OPERATION

4.1 Description of Digital Keypad

This digital keypad includes two parts: Display panel and keypad. Display panel provides the parameter display and shows operation status of the AC drive. Keypad provides programming interface between users and AC drives.



Mode

By pressing the "mode" key repetitively, the display will show status at the AC drive such as the reference frequency, output frequency, and output current. If the drive stops due to a fault, correct the fault first, then press this key to reset the drive.

PROG

Pressing the "PROG" key will store entered data or can show factory stored data.

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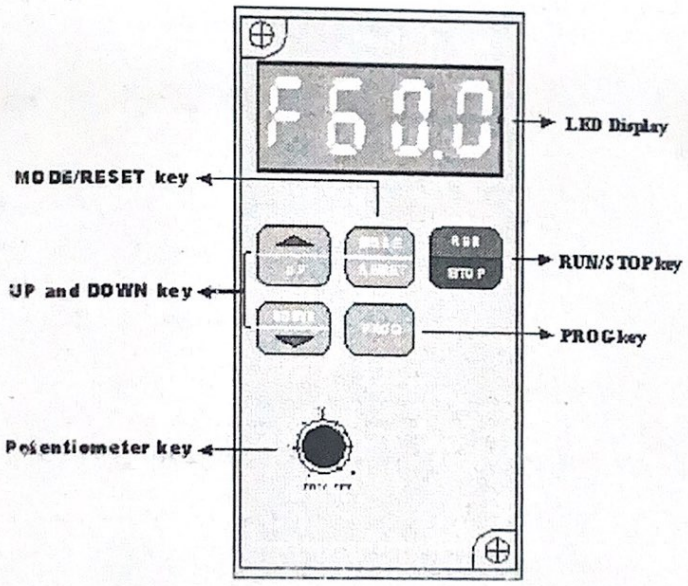

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Run/Stop

Press to Start or Stop the AC drive operation. This key can only be used to Stop the AC Drive when the drive is controlled by the External Control Terminals.

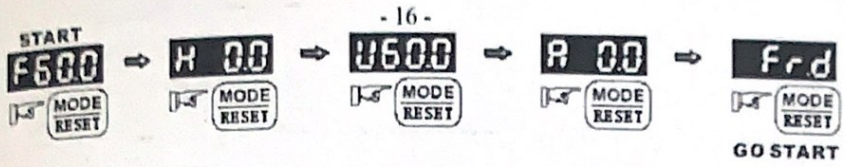
Up / Down

Press the "Up" or "Down" keys momentarily to change parameter settings. These keys may also be used to scroll through different operating values or parameters. Pressing the "Up" or "Down" key momentarily, will change the parameter settings in single-unit increments. To quickly run through the range of settings, press down and hold the key.

Display Message	Descriptions
F60.0	The AC drive Master Frequency
H60.0	The Actual Operation Frequency present at terminals U/T1, V/T2.
U310	The DC-BUS voltage
E220	The output voltage
0-	The specified parameter group
0-00	The specified parameter
d 0	The actual value stored within the specified parameter.
End	"End" displays for approximately 0.5 second if input has been accepted. After a parameter value has been set, the new value is automatically stored in memory. To modify an entry, use the "UP" and "DOWN" keys.

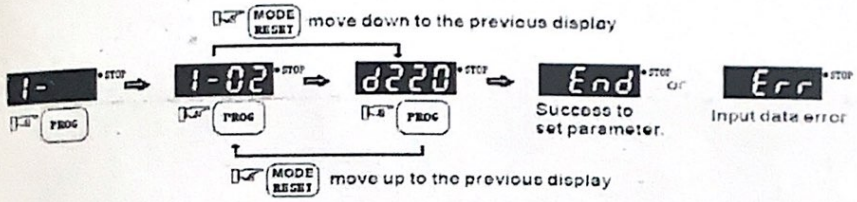
Err	"Err" displays, if the input is invalid.

Setting Mode



NOTE: In the selection mode, press "PROG" key to set the parameters.

Setting Parameters



NOTE: In the parameter setting mode, you can press MODE RESET to return the selecting mode.

To shift data

CHAPTER 5 SUMMARY OF PARAMETER SETTINGS

	Parameters	Functions	Settings	Factory Setting
☆	0-03	Start-up display of AC drive	0: F (Frequency command) 1: H (output frequency) 2: U (user-defined unit) 3: A (output current)	0
☆	0-04	Content of Multi-Function Display	0: Display User-Defined Unit (u) 3: Display DC-BUS Voltage (u) 4: Display output voltage (E)	0

	0-07	Unlock password Input	0 to 999	0
	0-08	Password Set	0 to 999	0
	1-00	Maximum operation Freq.	50.0 ~ 400Hz	50.0
	1-01	Maximum setting Freq.	10.0 ~ 400Hz	50.0
	0-07	Unlock password Input	0 to 999	0
	0-08	Password Set	0 to 999	0
☆	1-09	Accel time	0.1 ~ 600 Sec	5.0
☆	1-10	Decel time	0.1 ~ 600 Sec	10.0
	2-00	Source of frequency command	0: Digital keypad 1: 0 ~ 10V from AVI 2: 4 ~ 20mA from AVI 3: Controlled by V.R on drive 4: RS-485 communication interface	1
	2-01	Source of operation command	0: By digital keypad 1: By external terminals, keypad STOP enable 2: By external terminals, keypad STOP disable 3: By RS-485 communication interface, keypad STOP enable 4: By RS-485 communication interface, keypad STOP disable	1
☆	4-00	Potentiometer bias freq.	0.0 ~ 100%	0.0
☆	4-01	Potentiometer bias polarity	0: positive bias 1: negative bias	0
☆	4-02	Potentiometer freq. gain	1 ~200%	100
	4-04	Multi-function input terminal1 (S1)	0: not used 1: S0: RUN/STOP	1
	4-05	Multi-function input terminal 2(S2)	6: RESET 7: multi-step speed command 1	7
	4-06	Multi-function input terminal 3(S3)	8: multi-step speed command 2	8
	5-00	1st step speed freq.	0.0 ~ 400Hz	0
	5-01	2nd step speed freq.	0.0 ~ 400Hz	0
	5-02	3rd step speed freq.	0.0 ~ 400Hz	0
	6-07	Present fault recor	0: No fault occurred 1: oc (over current) 2: ov (over voltage) 3: oH (over heat) 4: oL (over load) 5: oL1 (electronic thermal)	0
	6-08	Second most rece fault record		
	6-09	Third most recent fault record		
	6-10	Forth most recent fault record		
	6-11	Fifth most recent fault record		
	6-12	Sixth most recent fault record		

Communication Parameters

	Parameter	Functions	Settings		Factor Setting
☆	9-00	Communication address	1 ~ 247		1
☆	9-01	Transmission speed	0: Baud rate 4800 1: Baud rate 9600 2: Baud rate 19200		1
☆	9-02	Transmission fault treatment	0: Warn and continue running 1: Warn and ramp to stop 2: Warn and coasting stop 3: No warn and keep running		0
☆	9-03	Modbus communication watchdog timer	0: Disable 1~20: 1 ~ 20 Sec		0
☆	9-04	Communication protocol	ASC mod	0: 7,N,2 1: 7,E,1 2: 7,O,1 3: 8,N,2 4: 8,E,1 5: 8,O,1	0
			RTU mod	6: 8,N,2 7: 8,E,1 8: 8,O,1	

Switch 1	Switch 2	Parameters	Speed
OFF	OFF		The current speed setting value (50Hz)
ON	OFF	5-00	1st step speed freq.
OFF	ON	5-01	2nd step speed freq.
ON	ON	5-02	3rd step speed freq.

CHAPTER 6 Troubleshooting and Fault Information

The ADS310 AC drive has a comprehensive fault diagnostic system that includes several different alarms and fault messages. Once a fault is detected, the corresponding protective functions will be activated. The following faults are displayed on the AC drive digital keypad.

NOTE: Faults can be cleared by a reset from the keypad (pressing " MODE" key)

Common Problems and Solutions:

Fault Name	Fault Descriptions	Corrective Actions
oc	The AC drive detects an abnormal increase in current.	1. Check whether the motors horsepower corresponds to the AC drive output power. 2. Check the wiring connections between the AC drive and motor for possible short circuits. 3. Increase the Acceleration time. 4. Check for possible excessive loading conditions at the motor. 5. If there are any abnormal conditions when operating the AC drive after short-circuit being removed, it should be sent back to manufacturer.
ou	The AC drive detects that the DC bus voltage has exceeded its maximum allowable value.	1. Check whether the input voltage falls within the rated AC drive input voltage. 2. Check for possible voltage transients.

		3. Bus over-voltage may also be caused by motor regeneration. Increase the decel time.
oH	The AC drive temperature sensor detects excessive heat.	1. Ensure that the ambient temperature falls within the specified temperature range. 2. Make sure that the ventilation holes are not obstructed. 3. Remove any foreign objects on the heatsinks and check for possible dirty heat sink fins. 4. Provide enough spacing for adequate ventilation.
Lv	The AC drive detects that the DC bus voltage has fallen below its minimum value.	Check whether the input voltage falls within the rated AC drive's input voltage.
oL	The AC drive detects excessive drive output current.	1. Check whether the motor is overloaded. 2. Increase the AC drive's output capacity.
oL 1	Internal electronic overload trip	1. Check for possible motor overload. 2. Check electronic thermal overload setting.

		3. Increase motor capacity.
oL2	Motor overload.	1. Reduce the motor load.
HPF	Hardware protection failure	Return to the factory.

CHAPTER 7 SPECIFICATIONS

Voltage Class			230V					
Model Nomber ADS☐☐☐21S			002	004	007	011	015	022
Aplicable Motor Output (kW)			0.2	0.4	0.75	1.1	1.5	2.2
Output Rating	Max. Output Voltage (V)		1-phase corresponds to input voltage					
	Rated Frequency (Hz)		1.0~60Hz					
Power	Rated Input Current (A)		4.9	6.5	9.7	12	15.7	24
	Input voltage Tolerance		Single –phase 180~264V 50/60Hz					
	Frequency tolerance		5%					
Control Characteristics	Control system		SVPWM (Sinusoidal Pulse Width Modulation, carried frequency 10kHz)					
	Output Frequency Resolution		0.1Hz					
	Overload Endurance		150% of rated current for 1 minute					
	Accel/Decel Time		0.1~600Sec. (can be set individually)					
	V/F pattern		V/F pattern adjustable					
	Stall Prevention Level		200%, setting of Rated Current					
Operating Characteristics	Frequency Setting	Keypad	Setting by ▲ ▼ keys					
		External Signal	multi-function inputs1 to 3 (3steps, communication setting					

	Operation Setting	Keypad	Setting by RUN//STOP keys
	Signal	External Signal	S0,S2,S3 can be combined to offer various modes of operation,
Other Function			Over-Voltage Stall Prevention, Fault Records,Over-Current Stall Prevention, Momentary Power Loss restart, Frequency Limits, Parameter Lock/Reset
Protection			Over Voltage, Over Current, Under Voltage, Overload, Electronic thermal,Overheating, Self-testing
Cooling			Forced air-cooling
Environment		Installation Location	Altitude 1,000 m or below, keep from corrosive gasses, liquid and dust
		Ambient Temperature	-10℃-40℃ (Non-Condensing and not frozen)
		Storage Temperature	-20℃to 60℃
		Ambient Humidity	Below 90%RH (non-condensing)
		Vibration	9.80665m/s2(1G) less than 20Hz, 5.88m/s2 (0.6Gat) 20 to 50Hz

✧ Any modification shall be subject to the delivery condition, and no beforehand or further notice will be given for all changes in design and size.