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Quick Start Guide

Frequency Inverter ST300

Introduction

This abridged manual briefly describes the external wiring, the terminals, the keypad, the quick start steps, as well as some essential function parameter settings and the most commonly occurring errors and their solutions for Sourcetronic ST300 series frequency inverters.

Visit www.sourcetronic.com for more information or refer to the detailed full version of the e-manual.

Warning!	
⚠	This guide only contains the most basic information on installation and commissioning. Failure to observe the safety instructions and the installation and commissioning instructions in the corresponding documentation can lead to accidents, including damage to the appliance, injuries or even death. Only trained and qualified specialists may carry out the relevant work!
Danger!	
⚠	Never carry out work such as wiring, inspection or replacement of components while the power supply is switched on. Before carrying out this work, ensure that all input power supplies have been disconnected and wait at least the time specified on the VFD (min. **5 minutes** for ST300 models) or until the DC bus voltage is less than 36 V.

1 External Wiring

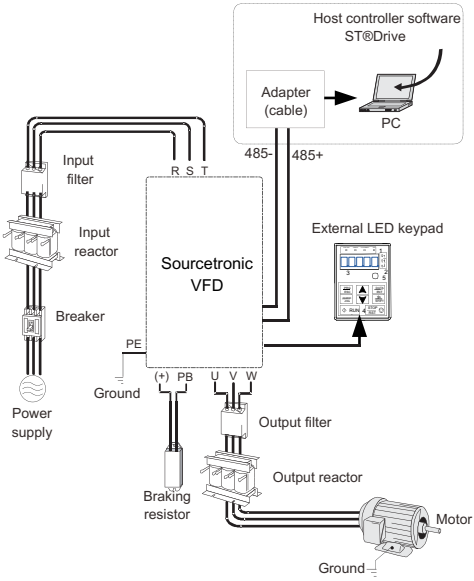

Figure 1-1 System Configuration

2 Terminals

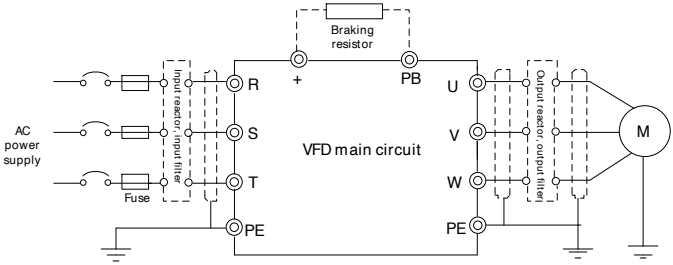

Figure 2-1 Main Circuit Wiring

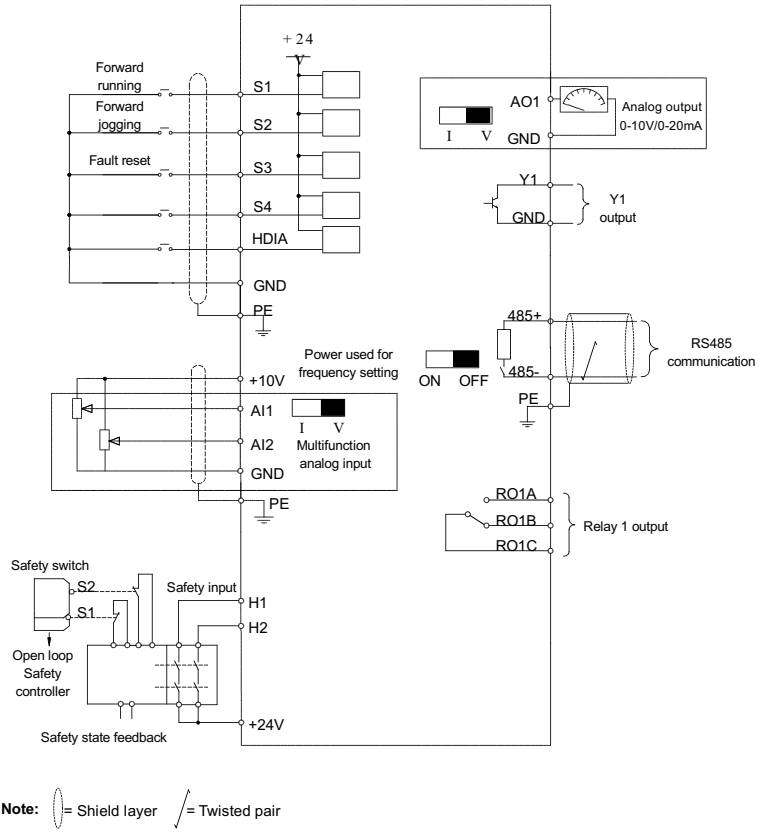

Figure 2-2 Control Circuit Wiring

Table 2-1 Terminal Descriptions

Terminal	Description
Main Circuit Terminal	
R, S, T	3PH (or 1PH) AC input terminals, connected to the grid.
U, V, W	3PH (or 1PH) AC output terminals, typically connected to the motor.
(+)	Connect to the external braking resistor terminals.
PB	
⏚ PE	Grounding terminals. The PE terminals of each machine must be grounded reliably.
Control Circuit Terminals	
+10V	Locally provided 10V power supply
AI1	Analog input. The default input type is voltage, which can be changed through the related jumper cap, DIP switch, or parameter.
AI2	
GND	Reference ground of +10V
AO1	Analog output. Range: 0–10V or 0–20mA
RO1A	Relay output. RO1A: NO; RO1B: NC; RO1C: common Contact capacity: 3A/AC 250V, 1A/DC 30V
RO1B	
RO1C	
Y1	Switch capacity: 50mA/30V. Output frequency range: 0–1kHz
485+	RS485 differential signal communication port. The standard communication interface should use shielded twisted pair. Determine whether to connect the 120 Ω terminal matching resistor of RS485 communication through the DIP switch or jumper.
485-	
+24V	User power supply provided by the VFD. Max. output current: 100 mA
S1–S4	Programmable Digital Input Terminals (the functions of which can be set via specific parameters): • High level input range: 10–30 V • Low level input range: 0–5 V • Max. input frequency: 1 kHz
HDIA	Channel For Both High-Speed Pulse Input And Digital Input: • Max. input frequency: 50 kHz • Duty ratio: 30%–70%

H1	Safe Torque Off (STO) Inputs: • STO redundant input, connected to the external NC contact. When the contact opens, STO acts and the VFD stops output. • Safety input signal wires use shielded wires whose length is within 25m. • The H1 and H2 terminals are short connected to +24V by default. Remove the jumper from the terminals before using the STO function.
H2	

3 Keypad

You can use the VFD's standard LED keypad to start and stop the device, read data, and configure various parameters. For further more detailed information regarding operation of the keypad, see the full e-manual.

Figure 3-1 Standard Keypad

The display area displays a 5-digit value, including error alarm code, set frequency, output frequency, and functional status data.

Display	Means	Display	Means	Display	Means	Display	Means
0	0	1	1	2	2	3	3
4	4	5	5	6	6	7	7
8	8	9	9	A	A	b	b
C	C	d	d	E	E	F	F
H	H	I	I	L	L	N	N
n	n	O	O	P	P	r	r
S	S	t	t	U	U	v	v
.	.	-	-				

Figure 3-2 Display Area

4 Quick Start

4.1 Check Before Power-On

	• Ensure that all terminals have been securely connected. • Ensure that the motor power matches that of the VFD.

4.2 First Operation

After making sure the wiring and power supply are correct, close the AC power supply air switch on the input side of the VFD to turn it on. The keypad will display 8.8.8.8.8. at power-up, followed by the set frequency (for example 50.00Hz), indicating that the VFD is initialized and ready for operation.

The quick start flowchart is as follows:

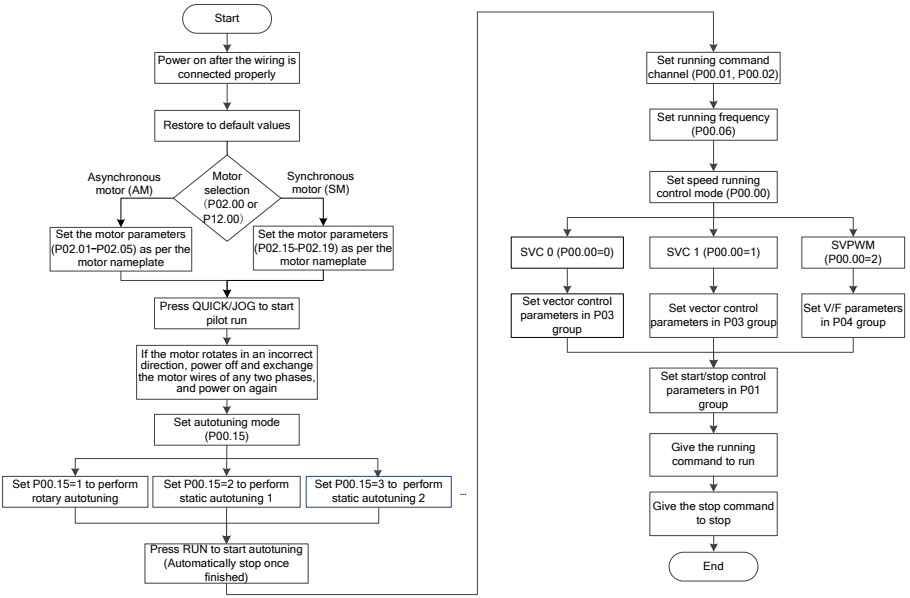

Figure 4-1 Quick Start Flowchart

5 Function Parameter Settings

Only a few common function parameters and typical values are briefly described below.

"○" indicates that the value of the parameter can be changed when the VFD is in stop or operating mode.

"◎" indicates that the value of the parameter cannot be changed while the VFD is in operation.

"●" indicates that the value of the parameter is recognized and saved, but cannot be changed.

(The VFD automatically checks parameter changes and restricts them to prevent invalid settings.)

Table 5-1 Excerpt of the Most Common Function Parameters

Function Code	Name	Description	Default	Modifiable?
P00.00	Speed Control Mode	0: SVC 0 1: SVC 1 2: Space voltage vector control mode	2	◎
P00.01	Channel of Operating Commands	0: Keypad 1: Terminals 2: Communication	0	○
P00.03	Max. Output Frequency	P00.04–599.00Hz	50.00Hz	◎
P00.04	Upper Limit of Operating Frequency	P00.05–P00.03	50.00 Hz	◎
P00.05	Lower Limit of Operating Frequency	0.00 Hz–P00.04	0.00 Hz	◎
P00.06	Channel for Frequency Reference A	0: Keypad (P00.10) 1: AI1 2: AI2 3: AI3 4: HDIA 5: Simple PLC program 6: Multi-step speed operation 7: PID control 8: Modbus communication	0	○
P00.07	Channel for Frequency Reference B		1	○
P00.10	Setting the Frequency Through the Keypad	0.00 Hz–P00.03	50.00Hz	○
P00.11	ACC Time 1	0.0–3600.0s	Model-dependent	○

P00.12	DEC Time 1		Model-dependent	○
P00.13	Running Direction	0: Run in default direction (forward) 1: Run in reverse direction (backward) 2: Disable reverse running	0	○
P00.15	Motor Parameter Autotuning	0: Disable 1: Rotary autotuning 1 2: Static autotuning 1 (comprehensive) 3: Static autotuning 2 (partial autotuning)	0	◎
P00.18	Function Parameter Reset	0: Disable 1: Reset to default values (excluding motor para-me-ters) 2: Clear error records 3: Lock all function codes	0	◎
P01.00	Start Mode	0: Direct start 1: Start after DC braking	0	◎
P01.08	Stop Mode	0: Decelerate to stop 1: Coast to stop	0	○
P01.09	Starting Frequency Of DC Braking For Stop	0.00Hz–P00.03	0.00Hz	○
P01.11	DC Braking Current	0.0–100.0%	0.0%	○
P01.12	DC Braking Time	0.00–50.00s	0.00s	○
P01.18	Terminal-Based Operating Command Protection at Power-On	0: Terminal-based operating commands are invalid at power-on. 1: Terminal-based operating commands are valid at power-on.	0	◎
P02.00	Type Of Motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0	◎
P02.01	Rated Power Of AM 1	0.1–3000.0kW	Model-dependent	◎
P02.02	Rated Frequency Of AM 1	0.01Hz–P00.03	50.00Hz	◎
P02.03	Rated Speed Of AM 1	1–60000RPM	Model-dependent	◎
P02.04	Rated Voltage Of AM 1	0–1200V	Model-dependent	◎
P02.05	Rated Current Of AM 1	0.8–6000.0A	Model-dependent	◎

P02.15	Rated Power Of SM 1	0.1–3000.0kW	Model-dependent	◎
P02.16	Rated Frequency Of SM 1	0.01Hz–P00.03	50.00Hz	◎
P02.17	Number Of Pole Pairs Of SM 1	1–128	2	◎
P02.18	Rated Voltage Of SM 1	0–1200V	Model-dependent	◎
P02.19	Rated Current Of SM 1	0.8–6000.0A	Model-dependent	◎
P02.23	Counter-EMF Of SM 1	0–10000	300	○
P03.00	Speed-Loop Proportional Gain 1	0.0–200.0	20.0	○
P03.01	Speed-Loop Integral Time 1	0.000–10.000s	0.200s	○
P03.03	Speed-Loop Proportional Gain 2	0.0–200.0	20.0	○
P03.04	Speed-Loop Integral Time 2	0.000–10.000s	0.200s	○
P03.11	Torque Setting Channel	0–1: Keypad (P03.12) 2: AI1 3: AI2 4: AI3 5: Pulse frequency HDI 6: Multi-step torque 7: Modbus communication	0	○
P04.01	Torque Boost Of Motor 1	0.0% (Automatic torque boost); 0.1%–10.0%	0.0%	○
P04.09	V/F Slip Compensation Gain Of Motor 1	0.0–200.0%	100.0%	○
P04.10	Low-Frequency Oscillation Control Factor Of Motor 1	0–100	10	○
P04.11	High-Frequency Oscillation Control Factor Of Motor 1	0–100	10	○

P05.01	S1 Function	0–95 (for the complete list, see the full e-manual) 0: No function selected 1: Forward-running operation 2: Reverse-running operation 3: Three-wire control mode 4: Jog forward 5: Jog reversely 6: Coast to stop 7: Reset errors 8: Pause running 9: External error input 10: Increase frequency setting (UP) 11: Decrease frequency setting (DOWN)	1	◎
P05.02	S2 Function		4	◎
P05.03	S3 Function		7	◎
P05.04	S4 Function		0	◎
P05.05	S5 Function		0	◎
P05.06	S6 Function		0	◎
P05.07	S7 Function		0	◎
P05.08	S8 Function		0	◎
P05.09	HDIA Function		0	◎
P05.37	AI2 Lower Limit	-10.00V–P05.39	-10.00V	○
P05.39	AI2 Upper Limit	P05.37–10.00V	10.00V	○
P06.01	Y1 Output	0–63 (for the complete list, see the full e-manual) 0: Disable 1: Operating (Running) 2: Forward running operation 3: Reverse running operation 4: Jogging 5: VFD in error state 6: Frequency level detection FDT1 7: Frequency level detection FDT2 8: Frequency reached	0	○
P06.03	RO1 Output		1	○
P06.14	AO1 Output	0–63 (for the complete list, see the full e-manual) 0: Operating frequency (100% corresponds to max. output frequency) 1: Set frequency (100% corresponds to max. output frequency) 2: Ramp reference frequency (100% corresponds to max. output frequency) 3: Rotational speed (100% corresponds to the speed corresponding to the max. output frequency) 4: Output current (100% corresponds to twice the VFD rated current) 5: Output current (100% corresponds to twice the motor rated current) 6: Output voltage (100% corresponds to 1.5 times the VFD rated voltage)	0	○

		7: Output power (100% corresponds to twice the motor rated power) 8: Set torque (100% corresponds to twice the motor rated torque) 9: Output torque (Absolute value, 100% corresponds to twice the motor rated torque)		
P06.17–P06.21	AO1 Output Upper/Lower Limit Settings	For details, see the full e-manual.		○
P07.00	User Password	0–65535	0	○
P14.00	Local Communication Address	1–247 **Note:** The communication address of a slave cannot be set to 0.	1	○
P14.01	Communication Baud Rate	0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps 6: 57600 bps 7: 115200 bps	4	○
P14.02	Data Bit Check Setting	0: No check (N, 8, 1) for RTU 1: Even check (E, 8, 1) for RTU 2: Odd check (O, 8, 1) for RTU 3: No check (N, 8, 2) for RTU 4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU	1	○

6 Errors and Solutions

Table 6-1 The Most Common Possible Errors

Error Code	Error Type	Possible Cause	Solution
E4	Overcurrent During ACC	• The ACC/DEC time is too short. • The mains voltage is too low. • The power of the VFD is too low. • Load transient or exception occurred. • Output current imbalance at 3PH. • Strong external sources of interference (contactor switching/incorrect grounding).	• Increase the ACC/DEC time. • Increase the mains input voltage. • Select a VFD with higher power. • Check whether the motor is blocked, whether there is a short-circuit or whether there are any errors at the load device. • Check whether the 3PH output voltage of the VFD and the 3PH resistance of the motor are unbalanced. • Check for sources of strong interference. (Make sure the motor cable is far away from the contactor and the system is reliably grounded).
E5	Overcurrent During DEC		
E6	Overcurrent When Operating at Constant Speed		
E7	Overvoltage During ACC	• The ACC/DEC time is too short. • An error has occurred in the input voltage. • The motor starts during rotation. • The energy recovery of the load is too high. • Dynamic braking is deactivated.	• Increase the ACC/DEC time. • Check the input voltage. • Wait until the motor stops smoothly and then start the VFD. • Install dynamic braking components or regenerative units. • Set the parameters of the dynamic braking function.
E8	Overvoltage During DEC		
E9	Overvoltage When Operating at Constant Speed		
E10	Bus Undervoltage Error	• The mains voltage is too low. • Abnormal voltage display. • Abnormal closing of the buffer contactor.	• Increase the mains input voltage. • Contact the manufacturer. • Contact the manufacturer.
E11	Motor Overload	• The mains voltage is too low. • The rated motor current is set incorrectly. • The motor is stalled or the load suddenly changes too much.	• Increase the mains input voltage. • Reset the rated motor current in the motor parameter group. • Check the load and adjust the value for the torque gain.
E12	VFD Overload	• The ACC is too fast. • Motor restarts while rotating.	• Increase the ACC time. • Avoid a restart after a stop.

		• The mains voltage is too low. • The load is too high. • The power of the VFD is too low.	• Increase the mains input voltage. • Choose a VFD with more power.
E13	Input Phase Loss	• Phase loss or strong fluctuations occur at the RST inputs. • Screws on the input side are loose.	• Check that the input power is normal and that the input cables are secure. • Configure P11.00 to hide the error.
E14	Output Phase Loss	• The output cables are broken or shorted to ground. • UVW phase loss (or the three phases of the load are highly asymmetrical)	• Check whether the output cables are loose or broken and replace them if necessary. • Check for strong load fluctuations or an imbalance in the 3PH resistance of the motor.
E16	Inverter Module Overheating	• The air duct is blocked or the cooling fan is damaged. • The ambient temperature is too high. • Long-term overload operation.	• Ventilate the air duct or replace the cooling fan. • Ensure good ventilation to reduce the ambient temperature. • Select a VFD with more power.
E18	RS485 Communication Error	• Incorrect baud rate. • Error in the communication line. • Incorrect communication address. • The communication suffers from severe interference.	• Set a suitable baud rate. • Check the wiring of the communication port. • Set the communication address correctly. • It is recommended to use shielded cables to improve interference suppression.
E20	Motor Autotuning Error	• The power of the motor does not match the power of the VFD. This error can occur if the difference in performance difference is more than five power classes. • The motor parameters are not set correctly. • Parameters after autotuning deviate greatly from standard parameters. • Autotuning timeout. • Pulse current set too high.	• Replace the VFD model or use the V/F control mode. • Check the motor wiring, the motor type and the parameter settings. • Relieve the motor and repeat the auto-tuning. • Check whether the upper frequency limit is greater than 2/3 of the rated frequency. • Reduce the pulse current setting accordingly.
E34	Speed Deviation Error	• The load is too heavy or is jammed.	• Check for overload, increase the detection time for speed deviations or increase the ACC/DEC time.

			• Check the settings of the motor parameters and repeat autotuning of the motor parameters. • Ensure that the parameters for speed loop control are set correctly.
E35	Maladjustment Error	• An error occurred during loading. • The SM parameters are set incorrectly. • The parameters after autotuning are inaccurate. • The VFD is not connected to the motor. • Use of flux weakening.	• Check for overload or stalling. • Check the motor parameters and the settings of the back EMF. • Repeat autotuning of the motor parameters. • Increase the time for detecting adjustment errors. • Set the flux weakening coefficient and the current loop parameters again.

Appendix A Energy Efficiency Data

Table A-1 Relative Losses and IE Class of ST300 Series VFDs

Product Model	Relative Loss (%)								Standby Loss (W)	IE Class
	(0;25)	(0;50)	(0;100)	(50;25)	(50;50)	(50;100)	(90;50)	(90;100)		
ST300-0R4G1	2.2	2.3	2.7	0.8	1.3	1.5	0.9	1.7	5	IE2
ST300-0R7G1	1.5	1.8	2.4	0.8	1.4	2.4	1.0	2.4	5	IE2
ST300-1R5G1	1.2	1.1	1.8	0.9	1.1	2.1	0.7	2.0	5	IE2
ST300-2R2G1	0.9	1.2	1.6	0.9	1.2	2.1	1.2	2.2	5	IE2
ST300-0R7G3	1.5	0.9	0.3	2.5	1.2	0.8	2.0	1.6	7	IE2
ST300-1R5G3	2.4	1.6	5.4	1.1	1.3	2.0	1.4	2.2	7	IE2
ST300-2R2G3	0.6	0.8	1.5	0.5	0.8	1.6	0.8	1.9	8	IE2
ST300-003G3	0.7	0.6	0.3	0.8	1.0	1.1	1.8	1.8	8	IE2
ST300-004G3	1.3	1.6	2.6	1.2	1.8	2.7	1.5	2.9	8	IE2
ST300-5R5G3	0.7	0.9	1.6	0.6	1.0	1.8	0.9	1.9	9	IE2
ST300-7R7G3	0.4	0.7	0.4	0.3	0.5	1.4	0.6	2.7	9	IE2

Table A-2 Rated Specifications of ST300 Series VFDs

Product Model	Apparent Power (kVA)	Output Power (kW)	Input Current (A)	Output Current (A)	Max. Working Temperature	Rated Power Frequency
ST300-0R4G1	0.9	0.4	6.5	2.5	50°C	50Hz or 60Hz Allowed Range: 47–63Hz
ST300-0R7G1	1.6	0.75	11	4.2		
ST300-1R5G1	2.8	1.5	18	7.5		
ST300-2R2G1	3.8	2.2	24.3	10		
ST300-0R7G3	1.6	0.75	4.5	2.5		
ST300-1R5G3	2.5	1.5	6.5	3.7		
ST300-2R2G3	3.9	2.2	8.8	5.5		
ST300-003G3	5.1	3	12.2	7.5		
ST300-004G3	6.4	4	15.6	9.5		
ST300-5R5G3	9.2	5.5	22.3	14		
ST300-7R5G3	12.1	7.5	28.7	18.5		