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AC Variable Speed Drive

LSLV-G100 Quick Startup Guide

User's Manual

0.4 – 22 kW (0.5 – 30 HP) [Three Phase 200V/400V]

Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment.
- Keep this manual within easy reach for quick reference.

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1. Introduction of Startup Guide

- This quick startup guide is intended for users with basic knowledge of electricity and electric devices.
- SLSV-G100 is the official name for the G100 series inverters.
- For detailed information on installation and commissioning, the full version of the G100 manual can be downloaded at <https://www.ls-electric.com>.

2. Verify & Identify Delivery

- Inspect the drive for any damage. If the drive appears damaged upon receipt, contact your supplier.
- Verify receipt of the correct model by checking the information on the nameplate as shown below. If you have received the wrong model, contact your supplier. (The nameplate is on the side of the product.)

L S L V 0 0 2 2 G 1 0 0 (C) - 4 E O F N T	
INPUT	200-240V 3Phase 50/60Hz 10A
OUTPUT	0~input V 3Phase 0.01~400Hz 3.8kVA Ser. No 55025310146 Inspected by D. K. YU KCC-REM-LSR-XXXXXX
Important!! ■ Verify that the input voltage rating matches the voltage source which will be applied to the VFD. ■ Confirm that the output power of the VFD is equal to or greater than the rating of the motor which will be connected.	
Motor Capacity	0004 - 0.4kW 0110 - 11kW 0008 - 0.75kW 0150 - 15kW 0015 - 1.5kW 0185 - 18.5kW 0022 - 2.2kW 0220 - 22kW 0040 - 4.0kW 0255 - 2.5kW 0075 - 7.5kW
Series name	C = Compact type(0.4~4.0kW)
Input Voltage	2 = 3 phase 200V ~ 240V 4 = 3 phase 380V ~ 480V
Keypad	E = LED Keypad
UL Type	0 = UL Open Type E = UL Type 1
EMC Filter	N = Non Built-in EMC Filter F = Built-in EMC Filter(C3)
Reactor	N = Non Reactor
Safety	Blank = Non-Safety T = Safety

* For information on safety products, please refer to the Safety Manual.

3. Caution in Installation

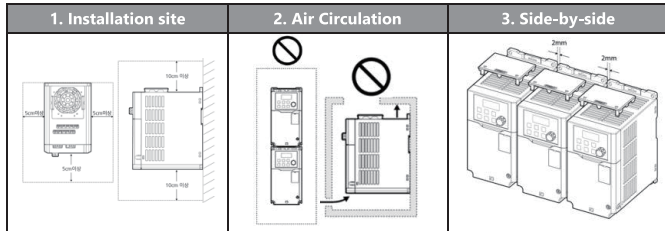
- Installation Site
The location must be free from vibration, and the inverter must be installed on a wall that can support the inverter's weight.

2) Air Circulation

The inverter can become very hot during operation. Install the inverter on a surface that is fire-resistant or flame-retardant and with sufficient clearance around the inverter to allow air to circulate. The illustrations below detail the required installation clearances.

3) Side-by-Side

If you are installing multiple inverters in one panel, arrange them side-by-side and remove the top covers. The top covers MUST be removed for side-by-side installations for proper heat dissipation. Use a flat head screwdriver to remove the top covers. (Din-rail installation is also available)



- Inverters are composed of sensitive electronic components. Therefore, the installation environment can significantly impact the lifespan and reliability of the product. The table below details the ideal operation and installation conditions for the inverter.

Items	Description
Ambient temperature ¹	Heavy load: -10~50℃, Normal load: -10~40℃
Ambient humidity	Less than 95% relative humidity (no condensation)
Storage temperature	-20~65℃
Environmental factors	An environment free from corrosive or flammable gases, oil residue, or dust
Operation Altitude/Oscillation	Lower than 3,280 ft (1,000 m) above sea level, less than 1G (9.8 m/sec2)
Air Pressure	70~106 kPa

4. Lead Connection

1) Power Terminal

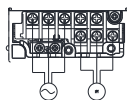
Utilize the below wiring diagrams to properly wire the main power connections to the inverter. **This step should be done with power OFF!** Refer to the User Manual for proper wire gauge recommendations. Be sure to follow good wiring and grounding practices. Follow applicable local codes if needed.

 **Danger!** 

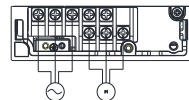
Lethal voltages are present. Be sure that all power is turned OFF while performing the recommended power wiring. Reinstall all protective covers on the G100 before reapplying power

Below is the proper wiring for both Three phase applications. The physical terminal layout will change across the different G100 capacities and enclosure types. Terminal names (e.g. R, S, T, etc) will remain consistent.

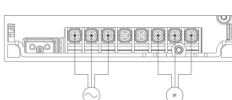
■ [G100C 0.4~0.8kW]



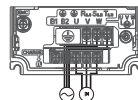
[G100C 1.5~2.2kW]



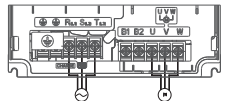
■ [G100C 4.0kW]



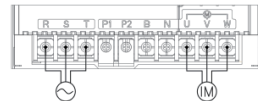
[G100 0.4~4.0kW]




■ [G100 5.5~7.5kW]



[G100 11~22kW]



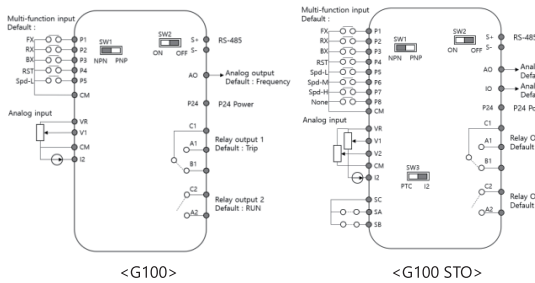
Terminal Label	Name	Description
	Ground Terminal	Connect earth grounding.
R(L1)/S(L2)/T(L3)	AC power input terminal	Mains supply AC power connections.
B1/B2	Brake resistor terminals	Brake resistor wiring connection.
U/V/W	Motor output terminals	3-phase induction motor wiring connections.

¹ The ambient temperature is the temperature measured at a point 2" (5cm) from the surface of the inverter.

2) Control Terminal

The illustration below shows the detailed layout of control wiring terminals, and control board switches.

Switch	Description
SW1	NPN/PNP mode selection switch
SW2	Terminating resistor selection switch
SW3	I2/PTC selection switch



■ Input terminal labels and descriptions

Labels	Linked Parameters	Description/Factory default
P1~P5	IN-65~69	• Functions for digital input terminals P1: FX, P2: RX, P3: BX, P4: RST, P5: Speed-L
P1~P8 (Safety Type)	IN-65~72	P6 : Speed-M, P7 : Speed-H, P8 : None
VR	-	• Power source for analog freq. source (12Vout)
V1	IN-05~16	• Voltage analog input1
V2	IN-18~30	• Voltage analog input2
I2 (Safety Type)	IN-50~62	• Current analog input
CM	-	• Common terminal

*For Safety Type, SW3 operates as I2 when set to the right and as PTC when set to the left

■ Output/Communication terminal labels and descriptions

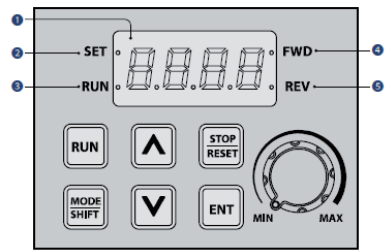
Labels	Linked Parameters	Description/Factory default
A1/B1/C1	OU-31	• Relay output 1 Default: Trip
A2/C2 Q1/EG*	OU-33	• Relay output 2 Default: Run
AO	-	• Analog voltage output terminal Default: Output Frequency
IO	-	• Analog current output terminal Default: Output Frequency
(Safety Type)	-	• External 24V power source
24	-	• External 24V power source
S+/S-	-	• RS-485 signal line

*G100C series models support Q1/EG terminal as a substitute for A2/C2 terminal








■ Safety function input terminal labels and descriptions

Labels	Linked Parameters	Description/Factory default
SA/SB	-	• Safety input A/B
SC	-	• Safety input power

5. Keypad display



No.	Name	Function
1	7-Segment Display	Displays current operational status and parameter information.
2	SET Indicator	LED flashes during parameter configuration and when the ESC key operates as the multi-function key.
3	RUN Indicator	LED turns on (steady) during an operation, and flashes during acceleration or deceleration.
4	FWD Indicator	LED turns on (steady) during forward operation.
5	REV Indicator	LED turns on (steady) during reverse operation.

Key	Name	Function
	[RUN] key	Used to run the inverter
	[STOP/RESET] key	STOP: Stops the inverter. RESET: Resets the inverter if a fault or failure occurs.
	[MODE/SHIFT] key	Moves between groups or moves to the digit on the left when setting the parameter. Press the MODE/SHIFT key once again on the maximum number of digits to move to the minimum number of digits.
	[ENT] key	Switches from the selected state of parameter to the input state. Edits parameter and apply change. Accesses the operation information screen during failure on the failure screen.
	[▲] key, [▼] key	Switches between codes, or increases or decreases parameter values.
	[Volume]	Used to set the operation frequency.
	[ESC]	ESC to the initial display.

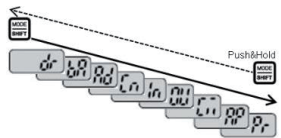
6. Basic Commissioning

1) Parameter Group Navigation and Setting

[Operation Group]

- 14 basic parameters are categorized in the operation group
- Codes can be accessed by pressing [▲] and [▼] keys.
- Items can be accessed by pressing [ENT] key.

[Parameter Groups and settings]



- Groups can be accessed with the [MODE/SHIFT] key.
- Group access in the other direction can be accessed by pressing the [MODE/SHIFT] key for more than 1sec.
- Parameters can be accessed with [▲] and [▼] keys.
- Press the [ENT] key to change the setting of the parameter.
- Press the [ENT] x2 to save the settings.

2) Motor Direction Verification

This step explains how to check motor direction by running the motor at a low speed via the keypad. Verify that the power and motor wiring matches the previous step and covers are installed before applying power.

[Speed Setting]

At the very first power up, the display will look like the "0.00". This indicates the frequency reference of 0.00 Hz.



Press the [ENT] key.



Set LED illuminates. Press [MODE/SHIFT]x3 key to shift over the digits.



Press [▲] key until 10.00 is displayed. Then Press the [ENT] x2 to save the value.

[Setting Command Source]



Press [▲]x4 key until drv is displayed.

Then press [ENT] to display the setting.



Press [▼] key to change setting to 0. Then Press the [ENT] x2 to save the setting.

※ This activates the RUN/STOP keys as the command source

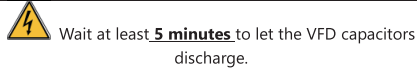


To return to the frequency display use the [ESC] key by pressing the following:
- [▲] + [▼],
- [▲] + [MODE/SHIFT],
or
- [▼] + [MODE/SHIFT]

[Checking Direction]

Check that it is safe to run the motor at low speed.
When ready, press [RUN] key to run the motor. The display will briefly show the output frequency of the VFD until it reaches 10Hz.

Look at the motor shaft to verify the rotation. Press the [STOP/RESET] key stop.
If motor direction is **incorrect**, stop the motor with the [STOP/RESET] key, and power down the VFD.



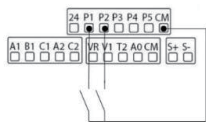
Swap any two **output** leads between the inverter and the motor. This will change motor direction. Verify correct rotation via the previous steps.

3) Start/Stop and speed source settings

[Run command source setting]



2-wire Control (1: Fx/Rx-1)



0	Keypad
1	FX/RX-1
2	FX/RX-2
3	Int 485
4	Field Bus

- Press [**▲**]**x3** key until drv is displayed. Then press [ENT] to display the setting.

[Frequency source setting]

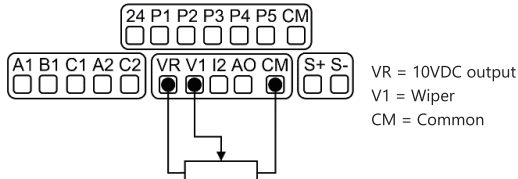


0	KeyPad-1
1	KeyPad-2
2	V1
4	V0
5	I2
6	Int 485
8	Field Bus

- Press [**▲**]**x4** key until frq is displayed. Then press [ENT] to display the setting.

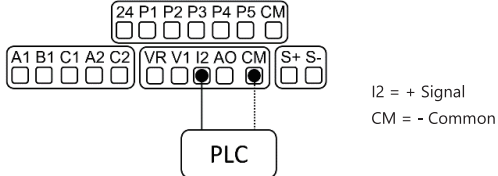
- Speed Potentiometer Wiring (2: V1, 0-10V)

Controlling the VFD with an external speed POT can be accomplished by setting frq=2 and wiring like below. For 0-10VDC signals from a PLC or Controller simply wire to V1 and CM



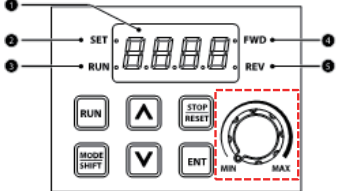
- PLC or Controller Wiring (5: I2, 4-20mA)

For speed control over a 4-20mA signal set frq=5.



- Built-in pot (4: V0)

For speed control over the built-in potentiometer.



4) Acceleration and Deceleration Time example.

- Press [**▲**] key from the main display (0.00) until Acc is displayed.
- Press [**ENT**] key to display the current setting.
- Use the [**▲**] and [**▼**] key to increase and decrease the value.
- Use the [**MODE/SHIFT**] key to move the cursor over to the next digit.
- Press the [**ENT**] **x2** to save the setting.
- Acc will be displayed again indicating the parameter change has taken effect.

5) Required Motor Parameters

- Set the below motor parameters based on the motor nameplate.

Grp	Code	Name	Setting
dr	14	Motor Capacity	Motor capacity setting
	18	Base Frequency	Motor capacity setting
bA	11	Poles	Motor capacity (2-12)
	12	Motor Rated Slip	Motor capacity setting (rPM)
	13	Motor Rated Current	Motor capacity setting
	15	Motor Voltage	Motor capacity setting

- HP to kW conversion chart

HP	1/4	1/2	1	2	3	5	7.5	10	15	20	25	30
kW	0.2	0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15	18.5	22

- Motor Poles to synchronous rPM

Poles	2	4	6	8
Hz	50	60	50	60
rPM	3000	3600	1500	1800

If the motor nameplate is 1750, set bA11_poles=4 and bA12_Motor rated slip=50
(Rated slip is the difference between the synchronous rPM – nameplate rPM)

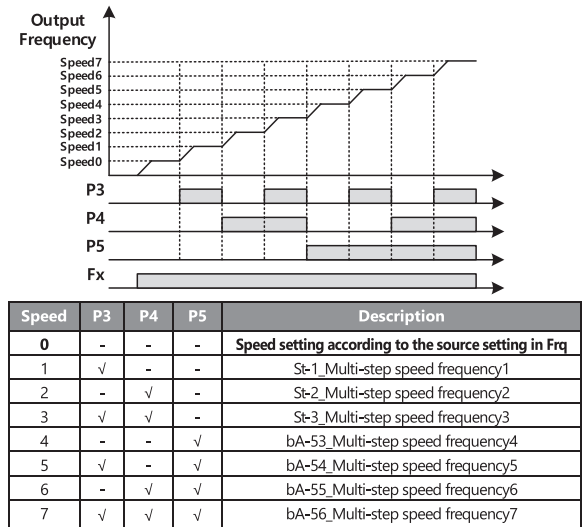
7. Frequently Used Features

1) Multi-step Frequency

- This step shows how to set up and use the multi-step frequency of the inverter.

Grp	Code	Name	Setting
In	65	P1 function setting	7: Speed-L 8: Speed-M 9: Speed-H
	66	P2 function setting	
	67	P3 function setting	
	68	P4 function setting	
	69	P5 function setting	
	70	P6 function setting	
	71	P7 function setting	
	72	P8 function setting	

- Digital input of Speed-L/M/H function as a binary sequence that defines the different multi-steps from 1-7. (ex. P3=Speed-L, P4=Speed-M, P5=Speed-H)



2) Power-on Run

- To automatically start after a power loss or start as soon as the inverter is powered up, set **Ad-10 Power-on Run=1**.

3) Speed Search

- When a fault occurs and if you wish to operate a free running motor without an additional fault, speed search after fault needs to be set

Grp	Code	Name	Setting	Description
Cn	71	Speed search selection	-- 1 -- (0010)	Initialization after a fault

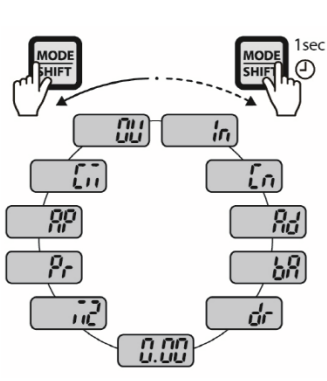
4) Automatic restart

- Automatic restart function is only operable with terminal (Fx/Rx-1/2) run command. Settings: Pr-08_Auto Restart select= 1, Pr-09_Restart No., Pr-10_Restart delay time

8. Parameter List

Operation group

0.00	Target frequency
ACC	Acceleration time
dEC	Deceleration time
drv	Command Source
Frq	Frequency reference source
St1	Multi-step speed frequency 1
St2	Multi-step speed frequency 2
St3	Multi-step speed frequency 3
CUR	Output current
rPM	Motor revolutions per minute
dCL	Inverter DC voltage
vOL	Inverter output voltage
nOn	Out of order signal
drC	Select rotation direction



09	Control mode	26	Auto torque boost filter gain
11	Jog Frequency	27	Auto torque boost motoring gain
14	Motor capacity	28	Auto torque boost regeneration gain
15	Torque boost mode	91	Smart copy
16	Forward Torque boost	93	Parameter initialization
17	Reverse torque boost	97	Software version
18	Base frequency	98	Display I/O board version
20	Maximum frequency		

Basic(bA)

04	2nd command source	19	Input power voltage
05	2nd frequency source	20	Auto tuning
10	Input power frequency	53	Multi-step speed frequency 4
11	Number of motor poles	54	Multi-step speed frequency 5
12	Rated slip speed	55	Multi-step speed frequency 6
13	Motor rated current	56	Multi-step speed frequency 7
15	Motor rated voltage		

Advanced(Ad)

01	Acceleration pattern (Linear/S-curve)	44	Brake release Forward frequency
02	Deceleration pattern (Linear/S-curve)	45	Brake release Reverse frequency
07	Start Mode	47	Brake engage frequency
08	Stop Mode	50	Energy saving operation
09	Run prevention options	64	Cooling fan control
10	Starting with power on	66	Output contact On/Off control options
20	Dwell frequency on acceleration	70	Safe operation selection
22	Dwell frequency during deceleration	74	Selection of regeneration evasion function for press
24	Frequency limit	79	DB Unit turn on voltage level
27	Frequency jump	80	Fire Mode selection

Control (Cn)

04	Carrier frequency	29	Speed compensation gain at no-load
09	Initial excitation time	30	Speed response adjustment gain
21	Out torque compensation gain at low speed	53	Torque limit setting
22	Out torque compensation gain	71	Speed search operation selection
23	Speed compensation sub gain	77	Energy buffering selection
24	Speed compensation main gain		

Input(In)

01	Frequency for maximum analog input	11	V1 output at Maximum voltage (%)
05	V1 input voltage display	16	Changing rotation direction of V1
06	V1 input polarity selection	17	V1 quantization level
07	Time constant of V1 input filter	65-	P1-P8 define
08	V1 Minimum input voltage	-72	P1-P8 define
09	V1 output at Minimum voltage (%)	87	Multi-function input terminal NO/NC selection
10	V1 Maximum input voltage	90	Multi-function input terminal status

Output(OU)

01	Analog output 1 item	31	Multi-function relay 1 item
02	Analog output 1 gain	33	Multi-function relay 2 item
03	Analog output 1 bias	41	Multi-function output monitor
04	Analog output 1 filter	52	Multi-function output contact selection
05	Analog constant output1	57	Detection frequency
06	Analog output1 monitor	58	Detection frequency band

Communication(CM)

01	Built-in communication inverter ID	03	Built-in communication speed
02	Built-in communication protocol		

Application(AP)

	Refer to the manual for PID operation		
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Protection(Pr)			
04	Load level setting	50	Stall prevention motion and flux braking
05	Input/output open-phase protection	59	Flux braking Gain value
08	Selection of startup on trip reset	66	DB resistor warning level
12	Motion at speed command loss	73	Speed deviation Error
17	Overload warning selection	78	Pre-overheat warning operation selection
20	Motion at overload fault	79	Cooling fan fault selection
25	Under load warning selection	80	Motion selection at option trip
27	Under load fault selection	82	LV2 Selection
31	No motor motion at detection	87	Fan exchange warning level
40	Electronic thermal fault selection	91-	Fault history 1-
41	Motor cooling fan type	-95	Fault history -5
45	BX trip mode	96	Fault history deletion

Troubleshooting Fault Trips

Please refer to the manual for detailed troubleshooting solution.

Frequently Asked Questions(FAQ)

1	Manual Torque Boost	Slightly increase the forward or reverse boost in dr-16 or dr-17 If the torque boost level is too high, a trip may occur such as IOL.
2	Auto Torque Boost (ATB)	Set dr-15 to 1, And then adjust the values in dr-26-28.
3	Start Frequency	Slightly increase the start frequency in dr-19. (ex. 0.5 → 1.0 → 1.5 → 2.0Hz)
4	User V/f Pattern	When bA-07 is set to 2(User V/f), User V/f pattern can be set up according to the applications and motor characteristics.

- Question: There is a disturbing humming sound at the motor.**
Solution: Slightly increase or decrease the carrier frequency in Cn-04.
- Question: When the drive is running, my Earth-Leakage Circuit Breaker(ELCB) trips.**
Cause: The ELCB will disconnect the power if leakage current flows to grounding during drive operation.
Solution 1: Connect the drive to a grounding terminal.
Solution 2: Check if the ground resistance is less than 100Ω for 200V class.
Solution 3: check the capacity of the ELCB and connect it to the drive according to the rated current of the drive.
Solution 4: reduce the carrier frequency in Cn-04.
Solution 5: Attempt to keep the cable distance from the drive to motor short as possible.
- Question: How do I reset the drive back to factory default settings?**
Solution: Set dr-93 to 1 (All groups) and press the [ENTER] **x2**. dr-93 is displayed again when the initialization has been completed.
- Question: How do I adjust the time it takes the motor to speed up or down?**
Solution: Adjust the acceleration time in ACC and deceleration time in dEC.
- Question: How do I prevent the drive from tripping on an OV fault (overvoltage) while the motor is ramping down?**
Solution 1: Increase the deceleration time in dEC.
Solution 2: Activate flux braking in Pr-50. Activate the very first bit on the left.
Solution 3: A DB resistor may be installed due to the characteristics of the load.
- Question: How do I prevent the drive from tripping on an OLT (overload) while the motor is ramping up or down?**
Solution: Verify motor rated current in bA-13 and motor overload parameter setting in Pr-20 (Overload trip selection), Pr-21 (Overload trip level), and Pr-22 (Overload trip time).
- Question: How do I run the motor above the nominal motor speed?**
Answer: Increase the maximum frequency in dr-20. At V/f mode, maximum frequency range is 400Hz and 120Hz at sensorless mode. If you are using analog input to operate above nominal frequency (50/60 Hz), please change the analog frequency setting at In-01 (Freq. at 100%)
- Question: Does the drive create harmonics? If so, are they a problem?**
Solution: All standard drives create 5th and 7th harmonic frequencies. Occasionally, depending on the applications, there may be issues and harmonics can cause problems such as transformer heating or interference with other communication devices installed near the drive. To reduce interference, the installation of noise filters or line filters may be required. Additionally, it may be helpful to adjust the carrier frequency to the minimum value in Cn-04.