

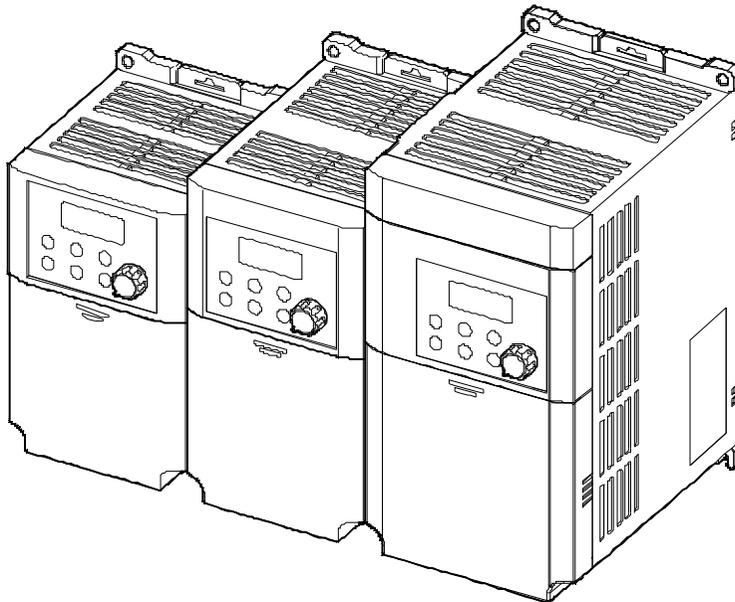
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LS ELECTRIC strives to maximize your profits in gratitude for choosing us as your partner.

# AC Variable Speed Drive

LSLV-M100 series

User's Manual  
0.1-2.2kW [200V]



## 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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# 10 Troubleshooting

This chapter explains how to troubleshoot a problem when inverter protective functions, fault trips, warning signals, or a fault occurs. If the inverter does not work normally after following the suggested troubleshooting steps, please contact the LS ELECTRIC customer service center.

## 10.1 Trips

When the inverter detects a fault, it stops the operation (trips) or sends out a warning signal. When a trip or warning occurs, the keypad displays the information. Users can read the warning message at Pr91–Pr95. When more than 2 trips occur at roughly the same time, the keypad (basic keypad with 7-segment display) displays the higher priority fault trip information.

The fault conditions can be categorized as follows:

- **Level:** When the fault is corrected, the trip or warning signal disappears and the fault is not saved in the fault history.
- **Latch:** When the fault is corrected and a reset input signal is provided, the trip or warning signal disappears.
- **Fatal:** When the fault is corrected, the fault trip or warning signal disappears only after the user turns off the inverter, waits until the charge indicator light goes off, and turns the inverter on again. If the inverter is still in a fault condition after powering it on again, please contact the supplier or the LS ELECTRIC customer service center.

### 10.1.1 Fault Trips

#### Protection Functions for Output Current and Input Voltage

Keypad Display	Item	Type	Description
	OLt (Over Load)	Latch	Displayed when the motor overload trip is activated and the actual load level exceeds the set level. Operates when Pr20 is set to a value other than 0.
	OCT (Over Current)	Latch	Displayed when inverter output current exceeds 200% of the rated current.
	Ovt (Over Voltage)	Latch	Displayed when internal DC circuit voltage exceeds the specified value.
	Lvt (Low Voltage)	Level	Displayed when internal DC circuit voltage is less than the specified value.
	GFt (Ground Trip)	Latch	Displayed when a ground fault trip occurs on the output side of the inverter and causes the current to exceed the specified value. The specified value varies depending on inverter capacity.
	EtH (E-Thermal)	Latch	Displayed based on inverse time-limit thermal characteristics to prevent motor overheating. Operates when Pr40 is set to a value other than 0.
	OPO (Out Phase Open)	Latch	Displayed when a 3-phase inverter output has one or more phases in an open circuit condition. Operates when bit 1 of Pr05 is set to 1.
	IOL (Inverter OLT)	Latch	Displayed when the inverter has been protected from overload and resultant overheating, based on inverse time-limit thermal characteristics. Allowable overload rate for the inverter is 150% for 1 min.
	rOt	Fatal	Displayed when the input power is unstable or an initial charging circuit trip occurs while supplying power to the inverter. <sup>1) 2)</sup>

1) The 'rOt' t trip occurs only in the 0.4–2.2 kW models.

2) There is a possibility of ROT trip when power is turned on within 1 second after LVT trip due to power OFF.

**Protection Functions Using Abnormal Internal Circuit Conditions and External Signals**

Keypad Display	Item	Type	Description
	OHt (Over Heat)	Latch	Displayed when the temperature of the inverter heat sink exceeds the specified value.
	ntC (NTC Open)	Latch	Displayed when an error is detected in the temperature sensor of the Insulated Gate Bipolar Transistor (IGBT).
	FAn (Fan Trip)	Latch	Displayed when an error is detected in the cooling fan <sup>2)</sup> .
 	EtA,EtB (External Trip A,B)	Latch	When the multi-function input terminal of the I/O is set to EtA or EtB, the input terminal is used as the signal. <ul style="list-style-type: none"> <li>EtA is displayed when the CM and short signal are generated when the multi-function input is NPN or P24 and the short signal is generated when multi-function input is PNP.</li> <li>EtB is displayed when the CM and open signal are generated when multi-function input is NPN or P24 and open signal is generated when multi-function input is PNP.</li> </ul>
	COM (Communication trip)	Latch	Displayed when communication between the Main DSP and the IO CPU is disconnected for more than 500 ms.
	nbr	Latch	Displayed when the inverter's output current is below the value set at Ad41 during the external brake signal operation based on the multi-function terminal function setting. Set OU31 or OU32 to 19 (Brake signal setting).

2) The cooling fan trip can be occurred when it is overloaded, its connectors are disconnected, or its components break. When the problems are solved, Fan Trip is cleared and the fan operates normally.

## 10.2 Troubleshooting Fault Trips

When a fault trip or warning occurs due to a protection function, refer to the following table for possible causes and remedies.

Item	Cause	Remedy
OLt (Over Load)	The load is greater than the motor's rated capacity.	Ensure that the motor and inverter have appropriate capacity ratings.
	The set value for the overload trip level (Pr21) is too low.	Increase the set value for the overload trip level.
OCt (Over Current)	Acc/Dec time is too short, compared to load inertia (bA16).	Increase Acc/Dec time.
	The inverter load is greater than the rated capacity.	Replace the inverter with a model that has increased capacity.
	The inverter supplied an output while the motor was idling.	Operate the inverter after the motor has stopped or use the speed search function (Cn71).
	The mechanical brake of the motor is operating too fast.	Check the mechanical brake.
Ovt (Over Voltage)	Deceleration time is too short for the load inertia (bA16).	Increase the acceleration time.
	A generative load occurs at the inverter output.	Use the braking unit.
	The input voltage is too high.	Determine if the input voltage is above the specified value.
Lvt (Low Voltage)	The input voltage is too low.	Determine if the input voltage is below the specified value. Adjust the bA19 (Inverter input voltage) value.
	A load greater than the power capacity is connected to the system (e.g., a welder, direct motor connection, etc.)	Increase the power capacity.
	The magnetic contactor connected to the power source has a faulty connection.	Replace the magnetic contactor.
GFt (Ground Trip)	A ground fault has occurred in the inverter output wiring.	Check the output wiring.
	The motor insulation is damaged.	Replace the motor.

Item	Cause	Remedy
EtH (E-Thermal)	The motor has overheated.	Reduce the load or operation frequency.
	The inverter load is greater than the rated capacity.	Replace the inverter with a model that has increased capacity.
	The inverter has been operated at low speed for an extended duration.	Replace the motor with a model that supplies extra power to the cooling fan.
OPO (Out Phase Open)	The magnetic contactor on the output side has a connection fault.	Check the magnetic contactor on the output side.
	The output wiring is faulty.	Check the output wiring.
IOL (Inverter OLT)	The load is greater than the rated motor capacity.	Replace the motor and inverter with models that have increased capacity.
	The torque boost level is too high.	Reduce the torque boost level.
OHt (Over Heat)	There is a problem with the cooling system.	Determine if a foreign object is obstructing the air inlet, outlet, or vent.
	The inverter cooling fan has been operated for an extended period.	Replace the cooling fan.
	The ambient temperature is too high.	Keep the ambient temperature below 50°C.
ntC (NTC Open)	The ambient temperature is too low.	Keep the ambient temperature above -10°C.
	There is a fault with the internal temperature sensor.	Contact the retailer or the LS ELECTRIC customer service center.
FAn (Fan Trip)	A foreign object is obstructing the fan's air vent.	Remove the foreign object from the air inlet or outlet.
	The cooling fan needs to be replaced.	Replace the cooling fan.
rOt (Relay Open Trip)	The input power is unstable or an initial charging circuit trip occurs while supplying power to the inverter.	Turn off and on the power again. If the problem continues, stop using the inverter and contact the retailer or the LS ELECTRIC customer service center.

## 10.3 Troubleshooting Other Faults

When a fault other than those identified as fault trips or warnings occurs, refer to the following table for possible causes and remedies.

Item	Cause	Remedy
Parameters cannot be set.	The inverter is in operation (driving mode).	Stop the inverter to change to program mode and set the parameter.
	The parameter access is incorrect.	Check the correct parameter access level and set the parameter.
	The password is incorrect.	Check the password, disable the parameter lock and set the parameter.
	Low voltage is detected.	Check the power input to resolve the low voltage and set the parameter.
The motor does not rotate.	The frequency command source is set incorrectly.	Check the frequency command source setting.
	The operation command source is set incorrectly.	Check the operation command source setting.
	Power is not supplied to the terminal R/S/T.	Check the terminal connections R/S/T and U/V/W.
	The charge lamp is turned off.	Turn on the inverter.
	The operation command is off.	Turn on the operation command (RUN).
	The motor is locked.	Unlock the motor or lower the load level.
	The load is too high.	Operate the motor independently.
	An emergency stop signal is input.	Reset the emergency stop signal.

Item	Cause	Remedy
The motor does not rotate.	The wiring for the control circuit terminal is incorrect.	Check the wiring for the control circuit terminal.
	The input option for the frequency command is incorrect.	Check the input option for the frequency command.
	The input voltage or current for the frequency command is incorrect.	Check the input voltage or current for the frequency command.
	The PNP/NPN mode is selected incorrectly.	Check the PNP/NPN mode setting.
	The frequency command value is too low.	Check the frequency command and input a value above the starting frequency (dr19).
	The [STOP] key is pressed.	Check that the stoppage is normal, if so resume operation normally.
	Motor torque is too low.	If the fault remains, replace the inverter with a model with increased capacity.
The motor rotates in the opposite direction to the command.	The wiring for the motor output cable is incorrect.	Determine if the cable on the output side is wired correctly to the phase (U/V/W) of the motor.
	The signal connection between the control circuit terminal (forward/reverse rotation) of the inverter and the forward/reverse rotation signal on the control panel side is incorrect.	Check the forward/reverse rotation wiring.
The motor only rotates in one direction.	Reverse rotation prevention is selected.	Remove the reverse rotation prevention.
	The reverse rotation signal is not provided, even when a 3-wire sequence is selected.	Check the input signal associated with the 3-wire operation and adjust as necessary.

## Troubleshooting

Item	Cause	Remedy
The motor is overheating.	The load is too heavy.	Reduce the load. Increase Acc/Dec time.
		Check the motor parameters and set the correct values.
		Replace the motor and the inverter with models with appropriate capacity for the load.
	The ambient temperature of the motor is too high.	Lower the ambient temperature of the motor.
	The phase-to-phase voltage of the motor is insufficient.	Use a motor that can withstand phase-to-phase voltages surges greater than the maximum surge voltage.
Only use motors suitable for applications with inverters.		
Connect the AC reactor to the inverter output (set the carrier frequency (Cn04) to 2 kHz).		
	The motor fan has stopped or the fan is obstructed with debris.	Check the motor fan and remove any foreign objects.
The motor stops during acceleration or when connected to load.	The load is too high.	Reduce the load.
		Replace the motor and the inverter with models with appropriate capacity for the load.
The motor does not accelerate. /The acceleration time is too long.	The frequency command value is low.	Set an appropriate value.
	The load is too high.	Reduce the load and increase the acceleration time. Check the mechanical brake status.

Item	Cause	Remedy
The motor does not accelerate. /The acceleration time is too long.	The acceleration time is too long.	Change the acceleration time.
	The combined values of the motor properties and the inverter parameter are incorrect.	Change the motor related parameters.
	The stall prevention level during acceleration is low.	Change the stall prevention level.
	The stall prevention level during operation is low.	
	Starting torque is insufficient.	If the fault remains, replace the inverter with a model with increased capacity.
Motor speed varies during operation.	There is a high variance in load.	Replace the motor and inverter with models that have increased capacity.
	The input voltage varies.	Reduce input voltage variation.
	Motor speed variations occur at a specific frequency.	Adjust the output frequency to avoid a resonance area.
The motor rotation is different from the setting.	The V/F pattern is set incorrectly.	Set a V/F pattern that is suitable for the motor specification.
The motor deceleration time is too long even with Dynamic Braking (DB) resistor connected.	The deceleration time is set too long.	Change the setting accordingly.
	The motor torque is insufficient.	If motor parameters are normal, it is likely to be a motor capacity fault. Replace the motor with a model with increased capacity.
	The load is higher than the internal torque limit determined by the rated current of the inverter.	Replace the inverter with a model with increased capacity.
Operation is difficult in underload applications.	The carrier frequency is too high.	Reduce the carrier frequency.
	Over-excitation has occurred due to an inaccurate V/F setting at low speed.	Reduce the torque boost value to avoid over-excitation.

Item	Cause	Remedy
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## Troubleshooting

Item	Cause	Remedy
While the inverter is in operation, a control unit malfunctions or noise occurs.	Noise occurs due to switching inside the inverter.	Change the carrier frequency (Cn04) to the minimum value.
		Install a micro surge filter in the inverter output.
When the inverter is operating, the earth leakage breaker is activated.	An earth leakage breaker will interrupt the supply if current flows to ground during inverter operation.	Connect the inverter to a ground terminal.
		Check that the ground resistance is less than 100 $\Omega$ for 200 V inverters.
		Check the capacity of the earth leakage breaker and make the appropriate connection, based on the rated current of the inverter.
		Reduce the carrier frequency (Cn04).
The motor vibrates severely and does not rotate normally.	Phase-to-phase voltage of 3-phase power source is not balanced.	Make the cable length between the inverter and the motor as short as possible.
		Check the input voltage and balance the voltage.
The motor makes humming, or loud noises.	Resonance occurs between the motor's natural frequency and the carrier frequency.	Check and test the motor's insulation.
		Slightly increase or decrease the carrier frequency (Cn04).
		Slightly increase or decrease the carrier frequency.
	Resonance occurs between the motor's natural frequency and the inverter's output frequency.	Use the frequency jump function to avoid the frequency band where resonance occurs. (Ad27-33)

Item	Cause	Remedy
The motor vibrates/hunts.	The frequency input command is an external, analog command.	In situations of noise inflow on the analog input side that results in command interference, change the input filter time constant (In07, In52, In57).
	The wiring length between the inverter and the motor is too long.	Ensure that the total cable length between the inverter and the motor is less than 100 m.
The motor does not come to a complete stop when the inverter output stops.	It is difficult to decelerate sufficiently, because DC braking is not operating normally.	Adjust the DC braking parameter.
		Increase the set value for the DC braking current.
		Increase the set value for the DC braking stopping time. (Ad15)
The output frequency does not increase to the frequency reference.	The frequency reference is within the jump frequency range.	Set the frequency reference higher than the jump frequency range.
	The frequency reference is exceeding the upper limit of the frequency command.	Set the upper limit of the frequency command higher than the frequency reference.
	Because the load is too heavy, the stall prevention function is working.	Replace the inverter with a model with increased capacity.