MAINTENANCE GUIDE STARVERT – iP5A LS

- This guide contains safety information and basic troubleshooting and maintenance guidance. For more detailed information, refer to the user manual included with the product or contact your supplier.
- For your safety, carefully read the Maintenance Guide before you install and use the product.



Safety information

- Read and follow all safety instructions in this guide to understand the safe operating conditions for the equipment and to avoid property damage and personal injury.
- ► For your safety, Warning and Caution information is provided below.



Indicates an imminently hazardous situation which, if not avoided, may result in severe injury or death.



Indicates a potentially hazardous situation which, if not avoided, may result in injury or damage to property.

\land Warning

Do not open the inverter covers while it is energized or operating. Doing so may cause the inverter to malfunction or result in electric shock.

Do not allow objects, such as metal filings or other debris inside the inverter. Doing so may cause the inverter to malfunction or result in a fire.

Caution

- Ensure that cables are correctly specified for the inverter's rated voltage, cable entry, and terminal arrangement. Ensure that all wiring connections are installed correctly. Incorrect cable specifications and connections may cause the inverter to malfunction or result in a fire.
- Apply the correctly rated torque when tightening terminal screws.
 Loose screws or over tightened screws may result in an electric shock or a fire.
- Do not install the inverter near flammable objects. Doing so may cause a fire.
- Ensure that the inverter location or installation method is not affected by vibration. Vibration may affect the inverter's operation and result in an electric shock or fire.
- Ensure that the inverter is not serviced or repaired by unauthorized persons. Unauthorized work may result in an electric shock or a fire and void the warranty.
- Ensure the inverter load does not exceed the product's rated load and that the inverter is installed in accordance with the environmental conditions specified in the User's Manual.

Exceeding the rated load or incorrectly installing the inverter may cause the inverter to malfunction, overheat, or result in an electric shock or a fire.

Selecting inverter capacity

- Selecting the correct inverter capacity
- 1) Check that the required output for the load is within the inverter's rated output [KVA].
- 2) Check that the motor rating is within the inverter's rated output [KVA].
- 3) Check that the current for the actual load is within the inverter's rated current [A].
- When operating multiple motors with one inverter
- 1) Ensure the inverter 's rated output is greater that or equal to the combined rating of the motors.
- 2) Electronic Over-Current Relay (EOCR) protection is recommended. (Note: Over-current protection for all motors supplied by the inverter cannot

be provided.)

3) Not recommended for motors with large differences in ratings.

Caution

If an inverter's capacity is incorrect it may cause trip faults and also cause the inverter and connected motors to malfunction.

Safety information - Inverter installation

Installation conditions

- 1) The inverter must not vibrate and be installed on a wall that can support the inverter's weight.
- 2) Since the inverter may overheat during operation, it must be installed on a fire-resistant or flame-retardant surface and have adequate clearance around it.
- 3) The ambient temperature of the inverter's operational environment must be within -10 50℃.



Safety information – Inverter wiring

Things to check before wiring

- 1) Ensure the inverter is turned off before wiring.
- 2) After the inverter is turned off, ensure that the inverter's charging circuit is fully discharged. (Wait at least 10 minutes after the inverter is turned off.)
- Safety information for wiring
- 1) Do not allow objects, such as metal filings or cable off-cuts inside the inverter. Doing so may damage the inverter or cause inverter malfunction.
- 2) Apply the correctly rated torque when tightening screws. If screws are loose or over tightened, the inverter may malfunction or cause a short circuit.
- 3) If the forward command (Fx) is on, the motor should rotate counterclockwise when viewed from the load side of the motor. If the motor rotates in the reverse direction, switch the position of the U and V connections at the inverter.

Distance between inverter and motor	< 50 m	< 100 m	> 100 m
Allowed carrier frequency	< 15 kHz	< 5 kHz	< 2.5 kHz

Caution

When installing phase advance condensers, surge killer, or electronic noise filters on the output side of the inverter, the inverter protection function may perform or the surge killer may be damaged.

Warning

- Ensure the input terminals (R,S,T) and output terminals (U,V,W) are connected correctly.
- Transposing the input and output connections may damage the inverter.

Do not short-circuit the B1 and B2 terminals. This may damage the inverter.

- ***** Ensure the total cable length does not exceed 200 m.
- We Shielded Twisted Pair (STP) cables for signal circuits used with remotely located motors that are connected to the inverter. Do not use 3 core cables.
- When using long cable lengths, decrease the carrier frequency and install a micro surge filter or sine wave filter.

Inverter operating conditions

Ideal operating conditions

ltem	Description
Ambient temperature Ambient humidity Environmental factors	-10 $^{\circ}$ C ~ 40 $^{\circ}$ C (ice free conditions) < 90 $^{\circ}$ rH (condensation free conditions) No exposure to corrosives, flammable gases, oil residue, or dust.
Vibration	< 1,000 m above sea level < 0.6 G, 5.9 m/s ²



Cautions for	r peripherals and	optional	device	configuration
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Nam	e	Description
\bigcirc	AC Power (Power source)	- Connect the inverter to the specified input power supply. (Phase to phase voltage: within 15 % below - 10 % over, nominal supply voltage.)
	MCCB (Circuit breaker /Current leakage breaker)	 Protects the power system from a short-circuit faults. High levels of in-rush current occur when the power is on, so select correctly rated MCCBs. (Contact the manufacturer for further information.)
	M/C (Magnetic contactor)	 Avoid starting and stopping the inverter unnecessarily. It may impact the lifespan and reliability of the product and cause switching noise. Select correctly rated M/Cs. (Contact the manufacturer for further information.)
1	Reactor (AC and DC reactors)	 Protects the inverter when a high load is connected, suppresses high frequency and improves power factor. Use a maximum cable length of 10 m. Select correctly rated reactors. (Contact the manufacturer for further information.
	EMC Filter	 Reduces electro-magnetic interference. Use a maximum cable length of 10 m. Select correctly rated filters. (Contact the manufacturer for further information.)
- Sp	Braking Resistor	 Used when the inverter requires electrical braking for vertical loads, or to shorten the deceleration time. It absorbs the regenerative energy at braking by turning it into heat. Ensure that B1 and B2 are not short-circuited when wiring. The rated capacity must be based on the amount of regenerated energy. Select correctly rated resistors. (Contact the manufacturer for further information.)
	Micro Surge Filter	 Reduces noise occurring at the input and output sides of cables and components that can affect inverter operation. Use a maximum cable length of 10 m. Select correctly rated filters. (Contact the manufacturer for further information.)

* Ensure optional devices are correctly connected to the inverter and correctly configured for the system. Incorrect connections and configurations may affect the product's lifespan and reliability and cause serious damage to the product.

Protective functions

Туре	Trip Name	Function	Description
	ост	Over Current	Inverter output current exceeds 200 % of the rated current.
	OC2	Over Current	Inverter detects a IGBT Arm short circuit or an output short circuit.
	OLT	Over load	The current value exceeds the motor's rated current. (Default value = 120 % of the motor's rated current)
Current	GFT	Ground trip	The sum of 3 phases current(Normal 0V) is higher than the level which is set and flowing through inverter output for the setting time.
Current	IOLT	Inverter over load	The inverter is operating at 110 % of the rated current for more than 60 sec or at 130 % of the rated current for 4 sec (this feature has inverse time characteristics).
	ETH	Electronic thermal	Stops the inverter operation to protect the motor when a current exceeding the motor rated current is supplied for a specific period of time (Default value = 130 % of the motor's rated current detected for 60 sec. This feature has inverse time characteristics). The inverter output current exceeds the motor's rated current
	оут	Over voltage	The internal DC circuit voltage exceeds the specified value. 200 V: 400 Vdc 400 V: 820 Vdc
Voltage	LVT	Low voltage	The internal DC circuit voltage is less than the specified value. 200 V: 180 Vdc (Reset level: 230 Vdc) 400 V: 360 Vdc (Reset level: 460 Vdc)
	-	Braking operation	IGBT braking is turned on as DC voltage has combined with regenerated voltage and exceeds the specified voltage. Turn On: 200 Vdc-390 Vdc , 400 Vdc-780 Vdc Turn Off: 200 Vdc-380 Vdc , 400 Vdc-760 Vdc

Fault trip troubleshooting

Display		Cause	Remedy
Over Current	 Deceleration time is too short. The inverter output current exceeds the rated capacity. Over current occurs when the inverter power is turned on. The actual current value is different from the value displayed. Output voltage is applied to the motor when it's idling. 		 Set the Acc/Dec time. Decrease the load or replace the inverter with a higher-rated model. Adjust the torque boost. Contact the supplier. Give a run signal after motor is completely stopped or set the speed search function
Over Current2 (Arm short)	 IGBT phase to phase fault. There is a short circuit in the wiring on the output side. Motor oput cables are too long. Surge voltages occur at the output terminals. 		 Check for a phase to phase short circuit at the the IGBT. Check the output cables. Use the correct length for motor cables. Reduce the carrier frequency. Resolve the surging voltage condition.
Ground Fault	 A ground fault has occurred in the output side of the inverter. Phase to phase difference of output voltage has occurred. The motor's insulation is damaged. 		 Check the output cables. Check the voltages between the phases are balanced. Check the motor's insulation resistance.
Over Heat	 Cooling system fault. Cooling fan fault. The ambient temperature around the panel is too high. The carrier frequency is too high. 		 Check that foreign objects are obstructing the vent. Replace the cooling fan. Reduce the ambient temperature to below 40 °C. Reduce the carrier frequency.
	Note Cooling fan faults can be inspected by sound and the exterior condition. If the fan is malfunctioning it may damage the inverter.		an be inspected by sound and n. If the fan is malfunctioning, inverter.

Fault trip troubleshooting

Keypad display		Cause	Remedy
Inverter over load &	 The load is higher than the inverter rating. High torque boost setting value. 		 Ensure the motor and the i nverter are correctly rated. Adjust the torque boost.
Over load trip	Note	The difference between OLT and IOLT is the reference current (OLT-motor's rated current, IOLT-inverter's rated current).	
Output phase open	 The magnetic contactor on the output side has a connection fault. Output side wiring is faulty ,or the 3-phase inverter output has one or more phases in an open circuit condition. IGBT is faulty. 		 Check the magnetic contactor. Check the output cables. Contact the supplier.
	Note The output phase op usting the parameter		en trip mode can be set by adj
Input phase open	 The magnetic contactor on the input side has a connection fault. The input side wiring has one or more phases in an open circuit condition. The capacitor inside the inverter is broken due to long-term use. 		 Check the magnetic contactor. Check the input cables. Replace the capacitor.
	Note The input phase open trip mode can be set by adjusting the parameter.		en trip mode can be set by neter.

Fault trip troubleshooting

Keypad display	Cause	Remedy
Over voltage	 Deceleration time is too short for load inertia (GD2). Regenerative load is at the inverter output. Input voltage is too high. 	 Increase the acceleration time. Use the braking unit. Ensure the input voltage is at the specified value.
Low voltage	 Input voltage too low. A load greater than the power capacity is connected to the inverter. (e.g., a welder, direct motor connection, etc.). The magnetic contactor on the input side has a connection fault. 	 Ensure the input voltage is at the specified value Increase the power capacity. Replace the magnetic contactor.
E-Thermal	 Motor overheat. Higher load than rated capacity. ETH setting level is low. Incorrect V/F pattern. Driving in low speed for a long time. 	 Reduce the load capacity. Increase the inverter capacity. Adjust ETH setting level. Adjust V/F pattern. Install the additional fan using separated power source.
COM Err	 Communication error between the loader and inverter. CPU fault. 	 Reconnect the loader cable. Contact the supplier.
H/W-Diag	Hardware fault.	Contact the supplier.
NTC open	 Insulated Gate Bipolar Transistor (IGBT) temperature sensor fault. 	 Contact the supplier.

Troubleshooting other faults

Туре	Cause	Remedy
The inverter is not responding when power is supplied	 There is an input power fault. Loader fault and a loader and inverter contact fault. Switched-mode power supply (SMPS) fault. 	 Ensure the input voltage is correct. Check the circuit breaker and magnetic contactor (before the input terminal). Replace the loader. Contact the supplier.
The motor does not rotate	 Current is not supplied at the inverter output(U, V, W). Motor cable fault or peripheral device connection fault. 	 Check the operation and frequency commands. If the inverter is not operating, even if the Run Lamp is on and the frequency command is correct, contact the supplier. Check the wiring and peripheral devices.
The motor does not accelerate or decelerate	 Operation and frequency command values are incorrect. The load is too high and an over-current control condition exists. The maximum frequency or frequency limit is set. 	 Check the operation and frequency commands. Reduce the load or increase the inverter rating. Adjust the parameter.
The inverter is overheating	 The charging resistor is damaged. 	 Check the input and output cables, braking resistor, and connections (ground etc.).

Troubleshooting other faults

Туре	Cause	Remedy
The motor vibrates severely, does not rotate normally, and stalls.	 There are large load fluctuations. The input voltage is not stable. The torque boost value is too high. 	 Adjust the load to the rated value. Ensure the input voltage is correct Adjust the torque boost value.
The motor is overheating.	 The motor has been operating continuously at low speed. The base frequency is set incorrectly. 	 Adjust the operation speed setting or install an extra cooling system for the motor. Ensure the motor rating is correct and set the base frequency correctly.

Maintenance

Consumable parts

Name	Replacement indications	Recommended replacement cycle
Cooling fan	Check for fan noise and cooling efficiency.	3 years
DC link capacitor	The top of the capacitor swells.	4 years
Relay	Check the relay operation sound when power is supplied to the inverter. LV trips occur when the motor runs.	After inspection

Maintenance

- The replacement cycle for parts varies depending on the operating environment, including ambient temperature and ventilation efficiency. It also depends on the use rate, load, and time operating under load.
- Conditions that reduce the lifespan and affect reliability of the product and its components are as follows:
- 1) The inverter is located in a space that is exposed to high and significant changes in temperature and humidity.
- 2) The motors run and stop frequently.
- 3) The inverter is exposed to significant changes in power supply and load, including changes in voltage, frequency, and waveform distortion.
- 4) The inverter is exposed to regular vibration.
- 5) The inverter is exposed to corrosive or flammable substances, oil residue, or dust.
- 6) The inverter has been in storage for a long time or has been stored incorrectly.
- 7) The power capacity exceeds the inverter rating. (10 times greater)

Indications for part replacement after long term use)

Part	Description
Main capacitor	 Increased motor noise. Fault trips occur (OCT, OC2, GFT etc.,). Inverter malfunction due to SMPS damage and long term use of SMPS.
Cooling fan	 Decreased fan speed and increased fan noise. Fan over current condition occurs due to fan malfunctions. Reduced fan efficiency and fan speed cause an OHT trip and result in deterioration of internal parts due to the high temperature conditions inside the inverter. Over current at the fan causes SMPS damage.

Service network

Head Office LS Tower (South Korea)

(Address) LS Tower, 127, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-Do, 431-848 (Tel) INV : PLC/HMI :

U.S.A

- TAURUS (OR) Tel : 1-503-692-9004 Email : <u>obtaurus@tauruspower.com</u>
- E-MEC (NJ) Tel : 1-201-816-1124 Email : <u>kevin@electmec.com</u>
- K+S Service (MI) Tel : 1-734-374-0400 Email : esyto@k-and-s.com

BRAZIL

• HIGH-END (SP) Tel : 55-19-9788-4426 Email : winderson@heautomacao.com.br

SPAIN

• VMC (Barcelona) Tel : 34-935-747-017 Email : xgarcia@vmc.es

GERMANY

• HEIGL (Rosbach) Tel : 49-6003-3457 Email : t.heigl@heigl-antriebe.de

RUSSIA

 PNEUMO (Saint-Petersburg) Tel: 49-6003-3457 Email: t.heigl@heigl-antriebe.de

TURKEY

• ANT (Istanbul) Tel : 90-216-499-9111 Email : <u>ayaz@antmuh.com</u>

INDIA

• CECO (Calcutta) Tel : 91-33-2248-5448 Email : <u>akbasu@cecoelectronics.in</u>

VIETNAM

- ICA (Hanoi) Tel : 84-4-568-0582 Email : <u>ceo_indochina@fpt.vn</u>
- HAN MY VIET (HCM City)
 Tel: 84-8-3821-6710
 Email: sasbo@hcm.vnn.vn

INDONESIA

• PT SARANA (Jakarta) Tel : 62-21-612-7535 Email : slim@sts.co.id