AIA SPECIFICATIONS & TECHNICAL DESCRIPTION
For 4.8, 6.0, 8.0, 10.0, 12.5, 16.7, 24.0, 33.0, 40.0, or 50.0 KVA
Cooper Lighting Solutions / Sure-Lites INV-T
Three-Phase Central Inverter System

This description contains all the necessary functional and technical information for the Three Phase Central Inverter Systems.

This specification also provides electrical and mechanical characteristics and an overall description of the typical operation of a Three Phase Central Inverter System.

For any further information, please contact our Authorized Sales Representative.

The manufacturer reserves the right to modify at any time, without notice, the technical characteristics, illustrations and weights indicated in this document.

1. GENERAL

1.1 SPECIFICATION

This specification defines the electrical and mechanical characteristics and requirements for a stand-by, three-phase, solid-state Uninterruptible power supply, hereafter referred to as the CIS (Central Inverter System). The CIS shall provide high quality, computer grade, true sine wave AC power for today's electronic lighting loads (power factor corrected and self-ballast fluorescent, incandescent, quartz re-strike and halogen, and HID) during emergency backup.

The CIS shall incorporate a high frequency pulse width modulated (PWM) inverter utilizing IGBT technology, a microprocessor controlled inverter and a temperature compensating battery charger, a user-friendly control panel with audible and visual alarms.

1.2 DESIGN STANDARDS

The CIS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall supersede.

- UL 924 Standard for Emergency Lighting and Power Equipment
- ANSI C62.41 (IEEE 587)
- ANSI C62.42.45 (Cat. A & B)
- National Electrical Code NFPA70
- Life Safety Code NFPA101
- OSHA

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements - Electronics Module

A. Nominal Input/Output Voltage

The input and output voltage of the CIS shall be pre-configured to match the user specified input and load requirements. Available voltages are 120/208 or 227/480 Vac.

Input: _____ Vac, 3-phase, 4-wire-plus-ground

Output: _____ Vac, 3-phase, ____-wire-plus-ground

B. Output Load Capacity

The output load capacity of the CIS shall be rated in kVA at unity power factor. The CIS shall be able to supply the rated kW from .5 lagging to .5 leading.

Rating: _____ kVA

1.3.2 Design Requirement - Battery System

A. Battery Cells

The CIS shall be provided with sealed, valve regulated lead acid batteries.

B. Reserve Time

The battery system shall be sized to provide the necessary reserve time to feed the inverter in case of a mains failure. Battery reserve time: 90 minutes.

C. Recharge Time

The battery charger shall recharge the fully discharged batteries within a 24-hour period. The charger shall be an integrated 3-step with equalize, microprocessor controlled and temperature compensating.

1.3.3 Modes of Operation

The CIS shall be designed to operate with less than a 2-millisecond (no break) transfer time:

A. Normal

The CIS Inverter is normally off and the commercial AC power continuously supplies the critical load. The input converter (bi-directional transformer) derives power from the commercial AC power source and supplies to the inverter while simultaneously providing floating charge to the batteries.

B. Emergency

Upon failure of the commercial AC power the inverter instantaneously, with a maximum of a 2-millisecond break, switches its power supply from the input converter to the battery system. There shall be no loss of power to the critical load upon failure or restoration of the utility source.

C. Recharge

Upon restoration of commercial AC power after a power outage, the input converter shall automatically restart and start charging the batteries. The critical loads are powered by the commercial AC power again.

1.3.4 Performance Requirements

1.3.4.1 AC Input to CIS

A. Voltage Configuration for Standard Units: 3-phase, 4-wire-plus-ground.

B. Voltage Range: (+10%, -15%)

C. Frequency: 60 Hz (+/- 3%)
D. Power Factor: . 5 leading/lagging
E. Inrush Current: 1.25 times nominal input current, 10 times 1 line cycle for incandescent loads
F. Current Limit: 125% of nominal input current
G. Current Distortion: Less than 3% THD maximum from 50% to full load
H. Surge Protection: Sustains input surges without damage per standards set in UL924

1.3.4.2 AC Output, CIS Inverter

A. Voltage Configuration for Standard Units: 3-phase, 3 or 4-wire-plus-ground
B. Static Voltage Stability: Load current changes +/- 2%
C. Dynamic Voltage Stability: +/- 2% (25% step load), +/- 3% (50% step load)
D. Dynamic Recovery Time to within 1% of nominal: 3Hz (0-100% load step)
E. Output Harmonic Distortion: < 3% (with linear load)
F. Frequency: 60 Hz (+/- .05Hz during emergency mode)
G. Load Power Factor Range: 0.5 lagging to 0.5 leading
H. Output Power Rating: kVA = kW
I. Overload Capability: to 100% continuous rating
to 115% for 5 minutes
to 125% for 12 line cycles
J. Crest Factor: <= 2.8

1.4 ENVIRONMENTAL CONDITIONS

The CIS shall be capable to operate within the specified design and performance criteria provided that the following environmental conditions are met:

A. Storage/Transport Temperature:
-4° to 158°F (-20° to 70°C) without batteries
0° to 104°F (-18° to 40°C) with batteries
NOTE: Maximum recommended storage temperature for batteries is 25°C for up to six months. Storage at up to 40°C is acceptable for a maximum of three months.
B. Relative Humidity: 0 to 95% non-condensing
C. Altitude: Operating: to 10,000 ft. (3,000 m) above sea level
De-rated 5% per km above 3 km
Storage/Transport: to 40,000 ft. (12.2 km) above sea level
D. Audible Noise: 45 dBA @ 1 meter from surface of the CIS on emergency

1.5 SUBMITTALS

1.5.1 Proposal Submittals

Submittals with the proposal shall include the following:

A. System configuration with single-line diagrams
B. Functional relationship of equipment including weights dimensions and heat dissipation
C. Descriptions of equipment to be furnished, including deviations from these specifications

D. Size and weight of units to be handled by installing contractor
E. Detailed layouts of customer power and control connections
F. Detailed installation drawings including all terminal locations

1.5.2 Central Inverter System Delivery Submittals
Submittals upon CIS delivery shall include:

- A complete set of submittal drawings
- One set of instruction manuals. Manuals shall include a functional description of the equipment, installation, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

1.6 WARRANTY

1.6.1 Central Inverter Module
The inverter manufacturer shall warrant the CIS module against defects in materials and workmanship for 12 months after initial start-up or 18 months after ship date, whichever occurs first.

1.6.2 Battery
The battery manufacturer's standard warranty shall be passed through to the end user. Sealed Lead Calcium VRLA, 10-year life expectancy one-year full replacement warranty plus an additional nine years pro-rata.

1.7 QUALITY ASSURANCE

1.7.1 Factory Testing
Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

2.0 PRODUCT

2.1 FABRICATION
All materials of the CIS shall be new, of current manufacture, high grade, free from all defects and shall not have been in prior service except as required during factory testing.

The CIS module shall be housed in a single freestanding NEMA type 1 enclosure. Battery cabinets are designed to allow stacking to minimize the overall system's footprint. Front access only shall be required for installation, adjustments and expedient servicing (MTTR: < 15 minutes). All components shall have a modular design and quick disconnect means to facilitate field service.

The CIS shall be painted with a powder coat finish in the manufacturer's standard color. The inverter shall be constructed of replaceable subassemblies. Like assemblies and like components shall be interchangeable.

Cooling of the CIS shall be forced-air in emergency mode with internally mounted fans to minimize audible noise. Fans shall not operate in the battery charge / standby mode. Fan power shall be provided by the inverter. Maximum acoustical noise on emergency at one meter from the cabinet surface shall be no greater than 50 dBA.

2.2 COMPONENTS

The CIS shall be comprised of the following components:

• CIS Module - The inverter module shall contain an inverter, an AC distribution panel with an input circuit breaker, control, and monitoring subsystems.

• Battery Module - The battery module shall contain the battery plant required to produce the reserve energy to supply the inverter during abnormal AC mains conditions. The battery module may be contained in an external cabinet(s) depending on the system VA.

2.2.1 Battery Charger

A. General

In the standard configuration the charger converts AC voltage to DC voltage. With commercial power present, the inverter power transformer is powered and the IGBT modules are microprocessor controlled to recharge the batteries. The temperature compensated battery charger circuit supplies constant voltage and constant current to the batteries. Once the batteries have received a full recharge, a constant trickle charge maintains batteries at maximum level. Recharge time is 24 hours maximum at nominal AC input voltage. The AC ripple current of the DC output meets the battery manufacturer specification, thus ensuring the maximum battery lifetime.

B. AC Input Current

The charger unit is provided with an AC input current limiting circuit whereby the maximum input current shall not exceed 125% of the output full current rating.

C. Automatic Restart

Upon restoration of utility AC power, after a utility AC power outage and after a full CIS automatic end-of-discharge shutdown, the CIS will automatically restart, performing the normal CIS start up.

D. DC Filter

The charger shall have and output filter to minimize AC ripple voltage into the battery. Under no conditions shall ripple voltage into the battery exceed 2% RMS.

E. Battery Recharge

The charger is capable of producing battery-charging current sufficient enough to recharge the fully discharged battery bank within a 24-hour period. After the battery is recharged, the charger shall maintain full battery charge until the next emergency operation.

F. Over-voltage Protection

The charger is equipped with a DC over-voltage protection circuit so that if the DC voltage rises above the pre-set limit, the charger is to shut down automatically and initiate an alarm condition.

2.2.2 Inverter

A. General

The inverter converts DC voltage supplied by the battery to AC voltage of a precisely stabilized amplitude and frequency that is suitable for powering most sophisticated electrical equipment. The inverter output voltage is generated by sinusoidal pulse width modulation (PWM). The use of a high carrier frequency for PWM and a dedicated AC filter circuit consisting of a transformer and capacitors, ensure a very low distortion of the output voltage (THD<3% on linear loads).

B. Overload Capability

The inverter during emergency modes shall be capable of supplying current and voltage for overloads exceeding 100% and up to 125% of full load current for 12 line cycles, 115% for 5 minutes and 110% for 10 minutes.

C. Output Power Transformer

A dry type power transformer provides the inverter AC output. The transformer is built with copper wiring exclusively. The hottest winding temperature of the transformer shall not exceed the temperature limit of the transformer insulation class of material at ambient temperature.

2.2.3 Display and Controls

A. Monitoring and Control

The CIS system provides operation monitoring and control, audible alarms, LED indicators, and diagnostics. The front-mounted control panel includes a 2-line 20-character LED display, a keypad to control and monitor the internal operation of the system. This allows the operator to easily “watch” system functions as they occur and check on virtually any aspect of the system's operation. Monitoring and control are microprocessor-based for accuracy and reliability. To ensure only authorized personnel can operate the unit, the system is multi-level password protected for all control functions and parameter changes.

B. Metering

Scrolling through the meter functions can monitor the following measurements:

- Utility input voltage
- System output voltage
- Battery voltage
- Battery current
- System output current
- System output VA
- Inverter wattage
- System temperature

- Date & time

C. LED Indication

The front panel with integrated LEDs, allows a quick check of the CIS operating status.

- AC Present (Green)
- System Ready (Green)
- Battery Charging (Yellow)
- Battery Power (Yellow)
- Fault (Red)

D. Audible Alarm

Audible alarm will activate with any of the following conditions and automatically store the 50 most recent events.

- High battery charger voltage
- Low battery charger voltage
- High AC input voltage
- Low AC input voltage
- Near low battery voltage
- Low battery voltage
- Load reduction fault
- High Ambient temperature
- Inverter fault
- Output fault
- Output overload

2.2.4 RS-232 Interface

The system shall be equipped with an RS-232 serial port (DB9) for remote communications.

2.2.5 Manual and Programmable Testing

The system shall incorporate a manual test function and two automatic test modes. The system will perform a programmable, self-diagnostic monthly test for 5 minutes which is preset for the 15th of every month and the user can program the event time of day. The yearly self-diagnostic test is for 90 minutes and the user can program the time of the day the event is to take place. The microprocessor automatically records the last 75 test events in its own separate test result log.

2.2.6 Battery Assembly

The batteries are sealed, lead-acid valve regulated battery cells with a ten year prorated warranty.

Precut cable wires are included to provide easy installation. A means of disconnect shall be included for isolation of battery assembly from the CIS module.

2.2.7 OPTIONS

The central inverter system shall include the following options:

____ Fast Charge

____ Summary Form C Contacts

3.0 EXECUTION

3.1 WIRING

All wiring shall be installed in conduit. Input and output wiring shall enter the cabinet in separate conduits.

3.2 UNIT START-UP and SITE TESTING

Site start-up and testing shall be provided by the manufacturer's field service representative during normal working hours (Mon. - Friday, 8 a.m. - 5 p.m.). Individual scheduling requirements can usually be met with 7 working days advance notice. Site testing shall consist of a complete test of the CIS and accessories by the inverter manufacturer in accordance with manufacturer’s standards. Manufacturer's approved service representative must perform commissioning for two-year warranty to apply.

3.3 REPLACEMENT PARTS

Parts shall be available through Field Service Centers throughout the country and directly from the factory. Recommended spare parts shall be fully stocked by local field service personnel with back up available from manufacturing location.

3.4 MAINTENANCE CONTRACTS

A complete offering of preventive and full-service maintenance contracts for both the inverter system and batteries shall be available. An extended warranty and preventive maintenance package shall be available. Factory-trained service personnel shall perform warranty and preventive maintenance service. A five-year maintenance contract option will include a unit start-up and site testing.