bodine

Inverter Application Guide

Emergency Lighting

Inverters

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Safety Precautions

Safety Warnings and Instructions for Design-In and Manufacturing

- Do not use damaged or defective contacts or housings.
- Do not service the inverter when mains voltage is connected; this includes connecting or disconnecting the luminaire.
- Do not use damaged products.
- Cap off all unused wires to prevent accidental contact with the luminaire, inverter housing, or other conductive surface.
- The luminaire manufacturer is responsible for its own luminaire design and must comply with all relevant safety standards.
- Design-in support is available to answer other safety concerns not mentioned here; Please contact your Bodine sales representative for more information.
- Bodine emergency lighting inverters are intended for built-in use and should not be exposed to the elements such as snow, rain, ice, and other types of moisture. Exposure can lead to corrosion of the inverter housing and should be avoided. It is the installer's responsibility to prevent exposure. Bodine emergency lighting inverters are specified for UL damp and dry locations only. These emergency lighting inverters must be installed in accordance with national and local electrical codes.
- Avoid touching live parts
- Do not use inverters with damaged wiring
- Disconnect AC power and inverter connector before servicing

Applications

Emergency Lighting Inverter Applications

Bodine emergency lighting inverters allow selected normal LED luminaires to be converted into code-required emergency light sources.

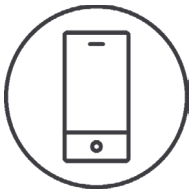
Depending on your application requirements, there are a variety of inverters at different power ratings. These range from as low as 10 watts all the way up to 400 watts. The 10W inverter is considered unit equipment and can even be installed inside the luminaire.

This design-in guide (DIG) can be a useful resource to help with selecting the best Bodine emergency lighting inverter for your application.

Specification sheets and installation instructions for our inverter products are also available on our website (www.bodine.com/inverter). Product specifications and proper installation requirements are also provided here.

Product Naming Convention:

- **ELI** = Emergency Lighting Inverter
- **S** = Sinusoidal Output
- **185 or other number** = Maximum Output Power
- **2HR** = Extended runtime of 2 Hours, only on extended runtime products
- **Final Name**: ELI-S-185 2Hr



Technical support (Mon-Fri, 8AM-5PM CST)

(888) 263-4638, Option 2

Or email us at **BodineTech@Signify.com**

If questions arise during installation, Bodine provides free technical support during normal business hours (Mon.- Fri. 8 AM - 5 PM CST).

For a more in-depth review of a particular application, completely confidential design-in services are available free of charge. Contact your local Bodine sales representative for more information.

Battery Installation

Battery Installation and Connections

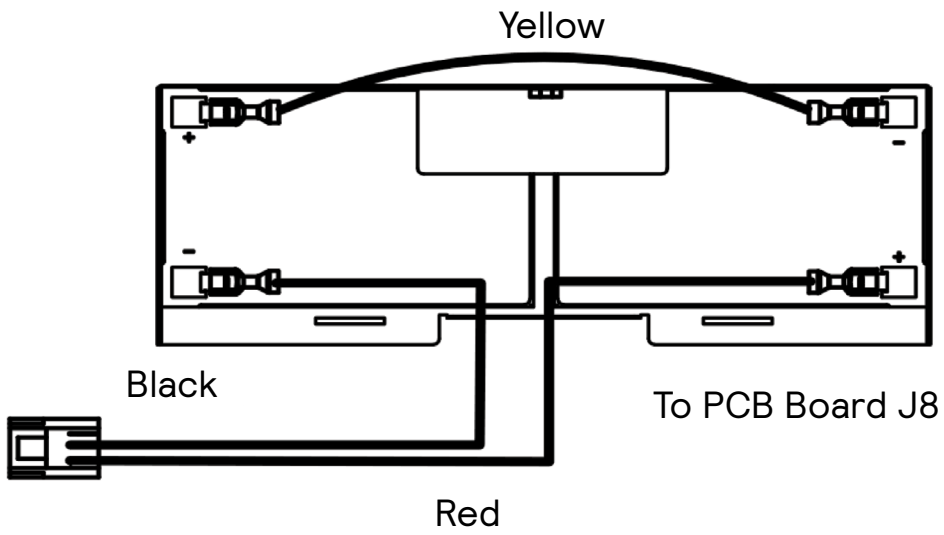
Most Bodine emergency lighting inverters use maintenance-free sealed lead acid (SLA) batteries. Since these batteries use SLA chemistry, they must be charged immediately upon installation and within eight (8) months of the batteries' manufacturer's date code.

This date code is in the form of MMDDY. Thus, a date code of 12191 means the battery was manufactured on December 19, 2021 and must be charged within eight (8) months of this date. If your battery has an earlier date code, check the float voltage. If it is less than 12VDC, it should be replaced.

Another concern is battery discharge when the unit is not in use (not charging). If AC power will not be present to the inverter for extended periods, the battery cable connection to the inverter's printed circuit board should be disconnected to prevent damage to the battery due to deep discharge.

Refer to your product's installation instructions for more detailed information concerning this and overall product wiring.

Ilustration 4
Battery Wiring Connections



Attach the battery wires as shown in the illustration.

This is a typical installation for the ELI-S-100. See your product's specific instruction sheet for installation instructions

External Connections and Wiring

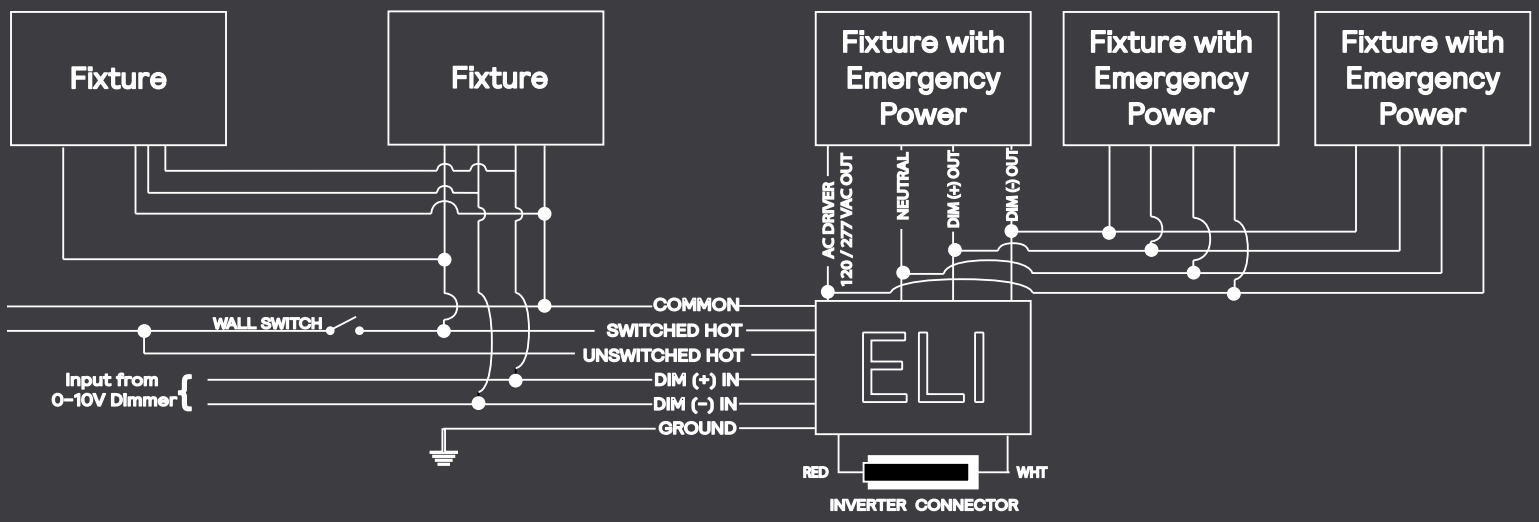
Typical connections to the normal AC LED driver and LED load are shown below.

The switched AC power source to the inverter can also be used to connect normal non-emergency luminaires on the same circuit.

The unswitched hot connection is used for battery charging and for sensing the AC line to determine when inverter/emergency operation from the battery should initiate.

The dimming connections are for feed-throughs to the emergency luminaires and for power control during emergency operation to adjust the luminaires to the proper output power.

For internal connections (screw terminal inside inverter), you will require a Phillips-head screwdriver.



Note: not all inverters have an inverter connector. See your specific product's installation instruction sheet for information

Dimming

Auto-Dimming

One of the premier features of Bodine emergency lighting inverters is Auto-dimming. The auto-dimming function is available on the ELI-S-10, ELI-S-100, and ELI-S-250. In this mode, the installer can connect a large number of luminaires to the inverter for emergency backup.

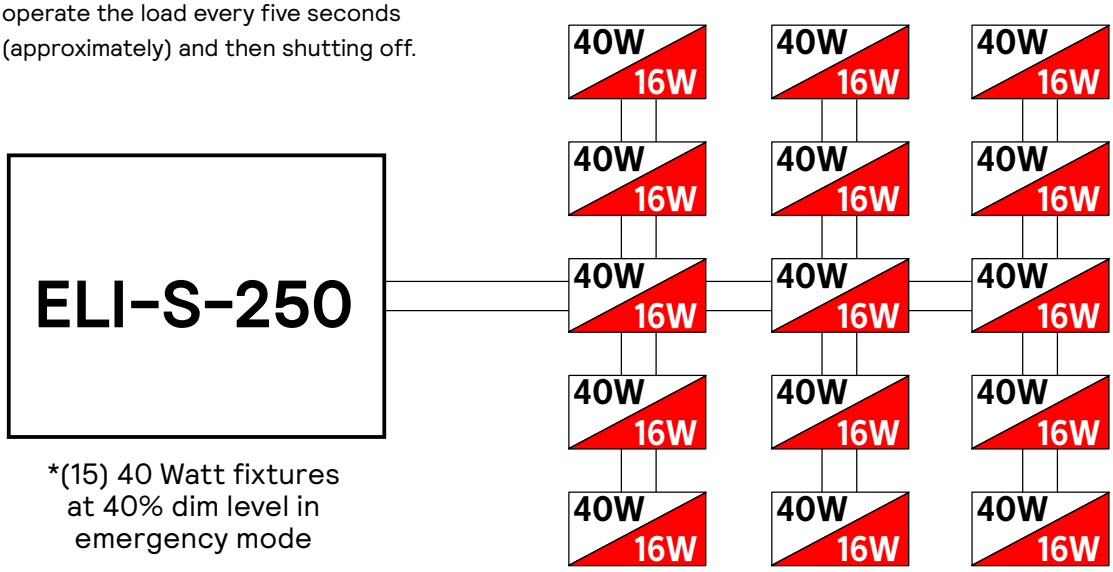
(ELI-S-10 is the exception, which is only intended to be used with a single luminaire.)

When AC power connects to the inverter, the inverter begins powering up its connected load at approximately a 10% dimming level (about 1VDC dimming control output signal) and gradually increases the dimming signal until the inverter output is at full power.

All auto-dimming inverters come with a maximum connected load power rating. If too many luminaires are connected to the inverter, even at 10% dimming levels, the inverter will not operate properly until the load is reduced to the inverter's output ratings. Improper operation is typically indicated by the inverter attempting to operate the load every five seconds (approximately) and then shutting off.

In the example below, fifteen 40W fixtures are connected to the ELI-S-250 inverter (250 VA), dimmed to 40% automatically, providing 16W to each fixture. 15 multiplied by 16W equals 240 VA, thus the ELI-S-250 is effectively able to power all fixtures at 16W.

The ELI-S-100 also offers manual dimming using preset dip switches. See product instructions for more information.

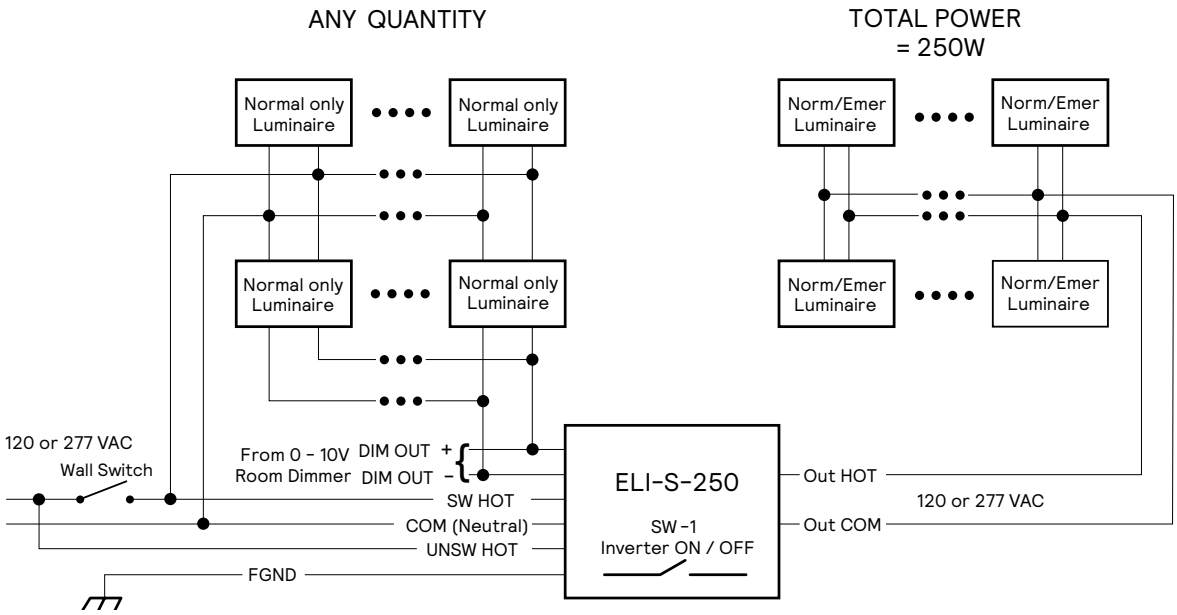


*(15) 40 Watt fixtures at 40% dim level in emergency mode

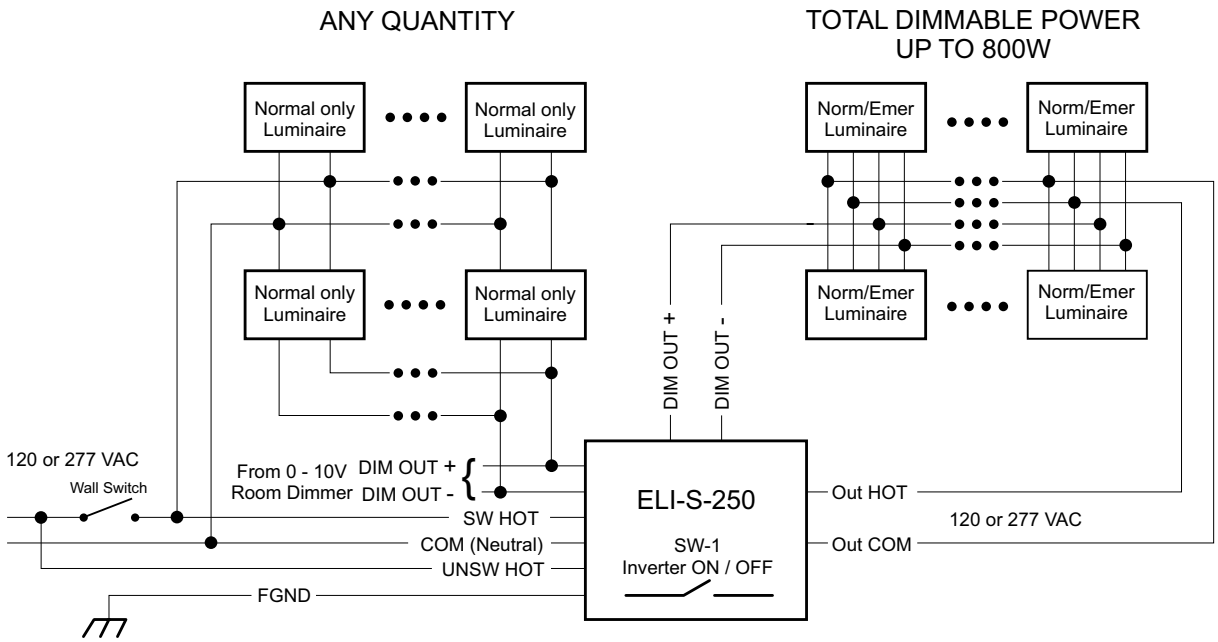
Dimming

Auto-Dimming Wiring

Non-Dimmable Emergency Lighting System



Dimmable Emergency Lighting System



Inverter Operation

Emergency Lighting Inverter Operation

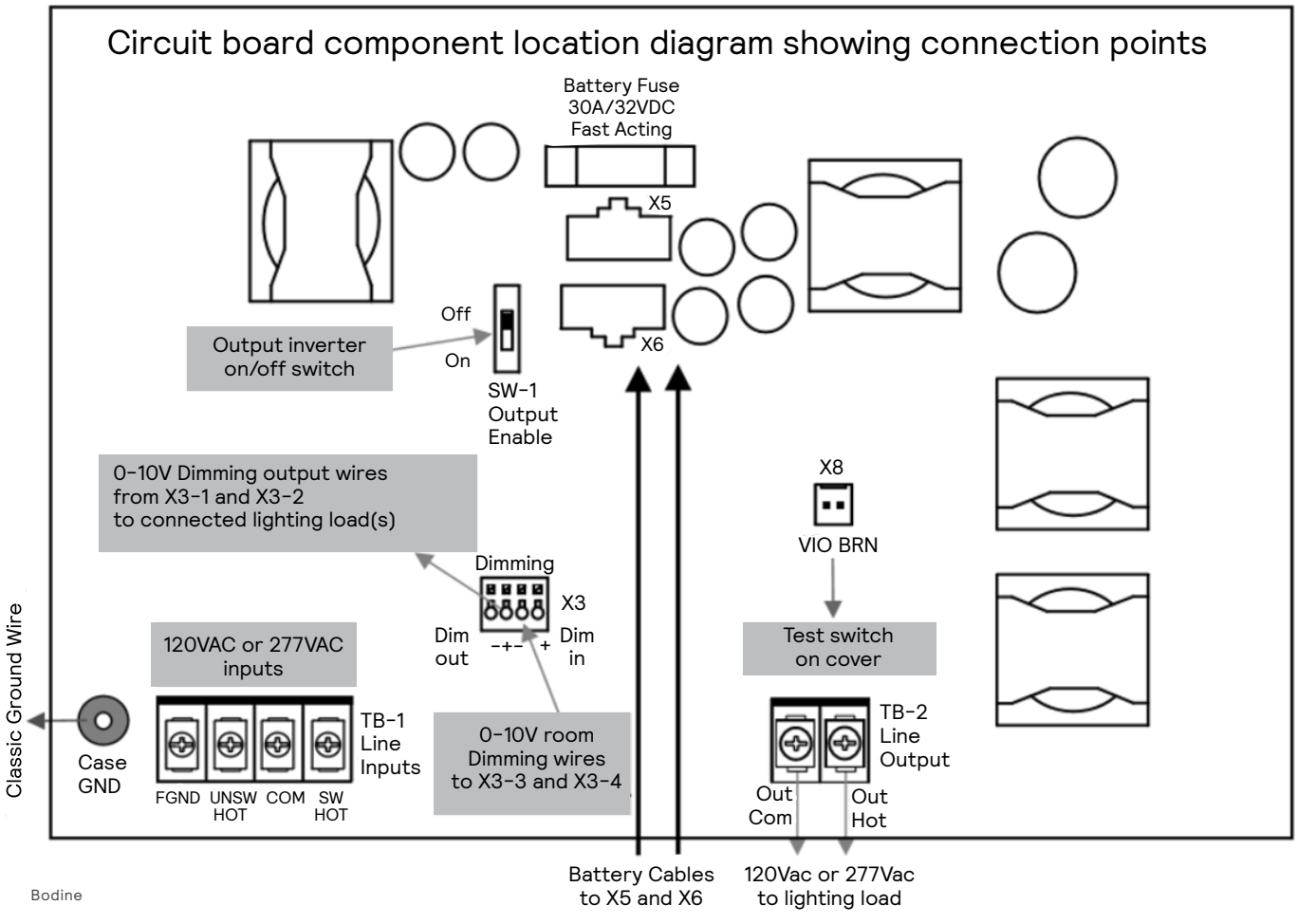
Once you have installed your inverter per the instructions, AC power is applied to the inverter and the inverter connector is closed or switch SW1 OUTPUT ENABLE is in the ON position (only on ELI-S-250 and ELI-S-185 2HR, see figure below). You can now check for proper load operation in normal and emergency modes if battery is sufficiently charged.

In normal mode, the luminaires connected to the inverter should operate as they normally do. The local switching means and/or 0-10VDC dimming should control these luminaires.

When emergency mode is activated, either by depressing the test switch or turning off the circuit breaker feeding the inverter and luminaires, the inverter-connected luminaires should operate at their normal output power levels (if the total connected load is less than the inverter's output power rating) or at lower output power levels as set by the auto-dimming circuit or the manual dip-switch settings.

If this is the first test of the inverter, this is a good opportunity to ensure light levels meet LSC (NFPA 101 Life Safety Code) requirements. As with any emergency lighting device, it should be tested for 30 seconds once every 30 days, and for 90 minutes once every year. This is code-required testing necessary to ensure your emergency lighting system is operational and adequate for egress purposes.

ELI-S-250-Installation Quick Reference Guide



Electromagnetic Compatibility/CEC (Title 20)

Electromagnetic Compatibility

Most Bodine emergency lighting inverters are designed to meet EMC requirements set forth in FCC Title 47 Part 15 Class A regulation.

Compliance to this standard means our products are suitable for commercial and industrial applications.

See FCC Title 47 CFR Part 15 for details regarding performance requirements in the FCC regulation. Check your product's individual spec sheet to determine if it meets these EMC requirements.

CEC Compliance (Title 20)

Most Bodine emergency lighting inverters are designed to meet battery charger requirements per CEC Title 20. Compliance to this standard means our products are suitable for commercial and industrial use in California.

A complete list of registered products can be found at **cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx** using the search tool and entering "Signify" under the company tab.

Product spec sheets and labels with the BC (Battery Charger logo, shown below, demonstrate they comply with CEC Title 20 requirements. Check your product's individual spec sheet or label to determine if it meets these requirements.

Electrical/Thermal Specifications

Electrical Specifications

Bodine emergency lighting inverters provide a nearly sinusoidal output voltage to the load in the event of an AC power outage. In addition to this sinusoidal voltage specification, these inverters also provide the following output regulation:

Output voltage regulated to ±10% for both 120VAC and 277VAC. Output frequency regulated to ±5% for 60 Hz.

Thermal Specifications

The inverter ambient temperature ranges are listed below. If the installation environment requires a higher surge rating than provided, extra surge protection may be required. This protection will be necessary on the un-switched hot connection (AC normal mains).

Other Features

All Bodine emergency lighting inverters are UL listed to UL 924 and CSA C22.2 No. 141 for use in the U.S. and Canada except for the ELI-S-400, which is ETL Listed to these standards.

They are also provided with a charging indicator light/test-switch that can be used for quick testing of the inverter operation in emergency mode.

These inverters are for indoor or damp location use. They are not for use in wet or hazardous locations.

Inverter	Ambient Temperature Range
ELI-S-10	0-50°C
ELI-S-20	0-50°C, 20W Output; 0-45°C, 25W Output
ELI-S-100	0-40°C
ELI-S-185 2Hr	20-30°C
ELI-S-250	20-30°C
ELI-S-400	20-30°C

Power and Apparent Power/ Mechanical Mounting

Considerations in Lighting Design

Power vs. Apparent Power in an Inverter

The power rating of an inverter assumes a load with unity, or 100% power factor (resistive load). Thus, an ELI-S-100 would provide a theoretical 100W to a purely resistive load.

Most connected lighting loads do not have a unity power factor, even those with high efficiency LED drivers. There are often conditions where the lighting load power factor and efficiency do not reach 0.9, or 90%. When an LED driver is dimmed, for example, its loading characteristics change and its power factor and efficiency then reduce. The type of dimming (linear or logarithmic) can affect the power factor and efficiency as well. Understanding the rating of the inverter product is therefore critical.

For our inverter products, the "power" rating of the inverter provides for a load unity power factor. If the load's power factor is lower than unity (which it likely is), then the power provided by the inverter is apparent power with a unit of volt-amps (VA).

Using the ELI-S-100 again as an example, if the load's power factor is 0.9 (leading or lagging), the total apparent power would be 100VA with only 90W of real power being delivered to the load.

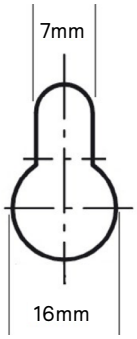
This must be a consideration in the lighting design as it could reduce the number of total luminaires connected to the inverter.

Mechanical Mounting of Inverter

As with many higher power inverters, their enclosures and contents are much heavier than typical unit equipment. For example, the ELI-S-400 weighs nearly 100 lbs.

A mounting shelf capable of supporting the weight of the inverter is necessary. Steps should be taken to ensure the inverter is securely mounted and adequately supported.

Mounting hardware is not provided with the inverter. There are fastener keyhole knockouts, as shown to the right, on the back of the inverter enclosure to permit securing of the enclosure to a rigid surface like a cinderblock wall using appropriately rated lag screws and concrete anchors.



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