



STANDALONE 24 VDC FIELD POWER SUPPLY REDUCES COSTS AND SIMPLIFIES
CONNECTIVITY FOR DISTRIBUTED I/O DEVICES ON INDUSTRIAL MACHINERY.



Increased demand for machine device control and communication has made distributed field power designs more expensive and complicated to install. A sealed 24 Volts DC (Vdc) field power supply from SolaHD promises to lower the cost of delivering field power to machines by eliminating separate power supply enclosures and simplifying power supply wiring.

Typical 24 Vdc supplies used for field power are designed to be used in a protective enclosure. SolaHD's IP67 SCP-X power supplies come in an environmentally-sealed, machine-mountable and compact package compliant with IP66 and IP67 ratings. The corrosion-resistant housing withstands dust and water while efficiently dissipating heat. This allows full power operation in ambient temperatures from -40 to +60°C. The device includes mini-DIN connections that can be adapted to a wide variety of additional connection types.

INCREASING USE OF DISTRIBUTED FIELD POWER

As industrial machinery is increasingly controlled remotely by industrial networks such as DeviceNet, Profibus, Interbus, ASI, and others, the demand for “distributed field power” for machine device control and communication is increasing.

Although no standards have been adopted industry-wide, field power at 24 Vdc in the <100 watt range is increasingly becoming the de facto standard of machine input/output devices. It is sufficient to power most sensors, relays, hydraulic and pneumatic actuators, valves, and communications devices such as Ethernet hubs and distribution blocks. It can also be distributed as direct current over modest distances and presents minimal shock, burn, or fire ignition hazard.

A power supply's size, proximity and protection from the operating environment are emerging as significant engineering and cost issues as machines employ more intelligent I/O devices. This is especially true in manufacturing environments where water, dust and other potential contaminants pose a threat to the power supply.

In the past, it was common to house the power supply in an external enclosure and cable power to the machine's control devices. Machine designers and systems integrators now require greater flexibility than power supplies housed in a traditional enclosure can cost effectively provide.

A LOOK AT ENCLOSING A TRADITIONAL FIELD POWER SUPPLY

To understand the design rationale for the IP67 SCP-X power supply, it is helpful to look at a typical power supply setup. A 24 Vdc power supply is typically DIN rail mounted inside an enclosure that has a special environmental rating such as IP67. Therefore, a traditional power supply is not designed with any special resistance to water or other contaminants. Dissipation of excess heat from power transistors, transformer windings and other on-board thermal sources is accomplished through ventilation of the power supply into the enclosure. Together, these factors make a typical power supply enclosure fairly large. Size historically was not a problem when a machine had plenty of space in its working envelope, or if I/O cabling to and from an off-machine enclosure was not too complex and costly.

However, adding more I/O devices to individual machines to take full advantage of automation network capabilities changes the situation significantly. Both space constraints and cost can create headaches when the demand for field power increases in automated environments.

The cost of enclosures can easily equal or exceed the cost of the power supplies they protect. Enclosure size is also an increasingly important issue on complex machines where space is at a premium. If the enclosure cannot be mounted directly on the machine, routing cabling to and from a large number of devices can become a complex issue with reliability, maintenance and operator safety issues.

It is challenging to reduce the size of a conventional enclosure when considering environmental sealing integrity and thermal management. The latter is a special concern for power supplies that operate at full rated power. For example, even a 100 watt power supply operating at full capacity and 90% efficiency will radiate 38 BTU per hour into its enclosure. Without a large enclosure and active ventilation, interior temperatures can quickly rise to destructive conditions.

TRADITIONAL ENCLOSED POWER SUPPLY VS. IP67 SCP-X POWER SUPPLY

Item	List Price
Enclosure	\$350.00
DC Power Supply	\$280.00
Input Connector	\$14.03
Output Connector	\$22.78
Terminal Block	\$5.98
Optional Input Fuse	\$7.70
Optional Output Fuse	\$7.70
Miscellaneous wire and mounting hardware	\$11.00
Estimated Labor (0.5 hours @\$60/hour)	\$33.00
TOTAL (USD):	\$732.19

Item	List Price
IP67 SCP-X	\$321.92
DC Power Supply	—
Input Connector	—
Output Connector	—
Terminal Block	—
Optional Input Fuse	—
Optional Output Fuse	—
Miscellaneous wire and mounting hardware	\$4.00
Estimated Labor (0.5 hours @\$60/hour)	\$10.56
TOTAL (USD):	\$336.48

* Calculation does not include the input or output connection cables (for the enclosed power supply, these are the cables that are outside of the actual enclosure).
List Price based on September 2014 SolaHD Price Book.

A SIDE-BY-SIDE COMPARISON OF INSTALLED COSTS FOR TRADITIONAL ENCLOSED POWER SUPPLIES VS. IP67 SCP-X POWER SUPPLIES

While the self-encapsulated design of the IP67 SCP-X power supply is intuitively superior to current technologies, the true value is revealed in a cost analysis that compares it to a traditional field power supply mounted in an enclosure. As the comparison shows, the traditional enclosed power supply requires assembly of seven parts plus miscellaneous wire and mounting hardware. The labor cost indicated is for assembly only. The costs of researching, specifying and ordering the parts are not included. The SolaHD IP67 SCP-X power supply, by contrast, comes fully assembled and ready to connect at a price over \$300 below the traditional unit.

SELF-ENCLOSING AND DOWNSIZING A 24 VDC POWER SUPPLY

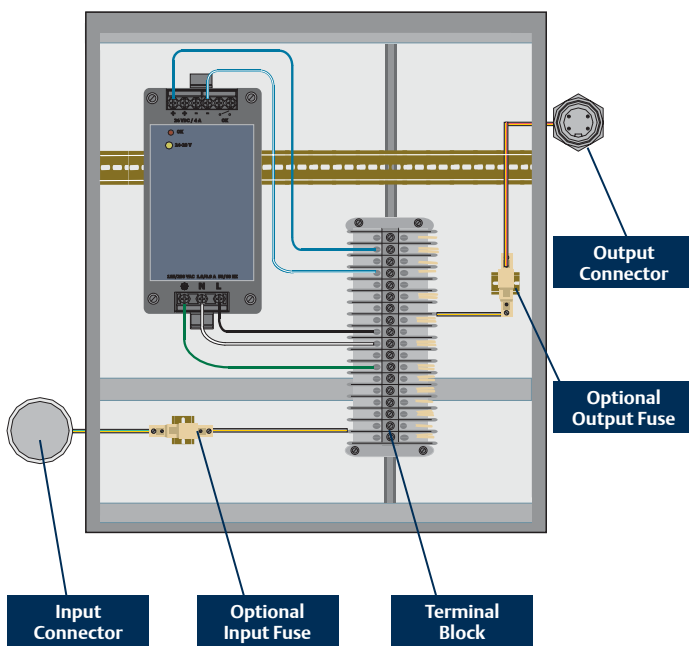
Rather than trying to reconfigure the enclosure, engineers at SolaHD examined the possibility of making the power supply a compact, stand-alone, self-protected unit that could mount directly on machines or as a freestanding element of a production line. In addition to eliminating the expense and bulk of a non-ventilated enclosure, direct machine mounting would significantly reduce the amount of cabling between the power supply and consuming devices on the machine.

The power supply that evolved has a number of distinct features. It is significantly more compact than a power supply installed in a traditional

enclosure. The rugged housing gives the unit resistance to 3g shock and it provides IP66, and IP67 ingress protection. Weighing just over 2.2 lbs for 100 Watt models and 3.3 lbs for dual 100 Watt models, the IP67 SCP-X can be mounted in any orientation via chassis mounting tabs without the need to de-rate the output power.

Thermal management is accomplished by the internal design features that result in very efficient passive convection cooling (i.e. no fans). The unit requires only 1 inch of free space on all sides except the mounted base. It delivers full rated power across a wide range of ambient temperatures from -40 to +60°C.

SIZE COMPARISON



TRADITIONAL ENCLOSED POWER SUPPLY
14" x 16" x 6"



IP67 SCP-X SELF-SEALED POWER SUPPLY
5.4" x 7" x 1.8"



VERSATILE INTER-CONNECTIVITY

The IP67 SCP-X power supply comes equipped with widely used mini-DIN connections that conform with industry standard EN1775301-803 (formerly DIN 43650) for electrical connections. The AC input side uses a 3-PIN IP67 rated molded plug externally threaded with 7/8"-16 UN mounting thread, and the DC output side provides 24 Vdc power through a 4-PIN IP67 rated molded receptacle internally threaded

with 7/8"-16 UN mounting thread. A wide variety of adapters are available to easily connect the IP67 SCP-X supply to virtually any connection style. Unlimited devices can be operated from a single power supply as long as continuous power consumption does not exceed 94W (3.8A).

A REVIEW OF KEY ENCLOSURE RATINGS

Industrial enclosures can come with a variety of ratings that typically specify protection against particulates, water and other contaminants. Here are a few relevant definitions from the National Electrical Manufacturers Association (NEMA) and the International Electrotechnical Commission (IEC).

NEMA Type 4 enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose-directed water; and to be undamaged by the formation of ice on the enclosure.

NEMA Type 4X – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose directed water, and corrosion; and that will be undamaged by the external formation of ice on the enclosure.

NEMA Type 6 enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against hose-directed water and the entry of water during temporary submersion at a limited depth; and to be undamaged by the formation of ice on the enclosure.

NEMA Type 6P enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against hose-directed water and the entry of water during prolonged submersion at a limited depth; and to be undamaged by the formation of ice on the enclosure.

NEMA Type 12 and 12K enclosures are constructed (with knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, circulating dust, lint, fibers, and flyings, and against dripping and light splashing of liquids (oil and coolant seepage).

IEC Enclosure Classifications begin with the letters “IP”, which stand for “Ingress Protection.” Two numbers follow; the first refers to protection against solid objects and dust, and the second refers to protection against water. Three IEC protection classes are especially relevant to industrial power supplies:

- IEC IP66 – Totally protected against dust, protected against heavy streaming water, limited ingress permitted (e.g. ship deck)
- IEC IP67 – Totally protected against dust, protected against the effect of short term immersion between 15 cm and 1 m

SolaHD is our premium line of power-conversion and power quality solutions products under Appleton Group, a business unit of Emerson Industrial Automation.

Emerson Industrial Automation brings integrated manufacturing solutions to diverse industries worldwide. Our comprehensive product line, extensive experience, world-class engineering and global presence enable us to implement solutions that give our customers the competitive edge.

For over 150 years, our electrical product brands have been providing a rich tradition of long-term, practical, high quality solutions with applications ranging from the construction and safe operation of petrochemical and process plants to providing quality power that precisely controls automotive robotic production.

Engineers, distributors, contractors, electricians and site maintenance professionals around the world trust Emerson Industrial Automation brands to make electrical installations safer, more productive and more reliable.

Appleton Group is organized into three focused businesses that provide distributors and end-users expert knowledge and excellent service.

Electrical Construction Materials

This group is made up of the Appleton, Nutsteel and O-Z/Gedney brands. They manufacture a broad range of electrical products including conduit and cable fittings, plugs and receptacles, enclosures and controls, conduit bodies and industrial and hazardous lighting. Whether the application is hazardous location, industrial or commercial, the electrical construction materials group has the products to meet your needs.

Power Quality Solutions

The SolaHD brand offers the broadest power quality line, including uninterruptible power supplies, power conditioners, voltage regulators, shielded transformers, surge protection devices and power supplies.

Heating Cable Systems

This group is made up of the EasyHeat and Nelson brands. They offer a broad range of electrical heating cable products for residential, commercial and industrial applications.

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