EMERSON
Industrial Automation

SolaHD is our line of premium power conversion and power quality brands. Our proven technologies power and protect throughout your facility for improved operational efficiency and productivity.

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.

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

Electrical Construction Materials

This group manufactures a broad range of electrical products including conduit and cable fittings, plugs and receptacles, enclosures and controls, conduit bodies, and industrial lighting. Whether the application is hazardous location, industrial, or commercial, the ECM group has the products to meet your needs.

Power Quality Solutions

This group offers the broadest power quality line including UPS, power conditioners, voltage regulators, shielded transformers, surge suppression devices and power supplies.

Heating Cable Systems

This group offers a broad range of electrical heating cable products for residential, commercial, and industrial applications.

Electrical Construction Materials

Appleton
OZ/GEDNEY
A.T.X.

Power Quality Solutions

SOLAHD

Heating Cable Systems

EASYHEAT
NELSON

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Version 6.1

PRODUCT CATALOG 006

SOLAHD

PRODUCT CATALOG 006

New from SolaHD

DC UPS with Battery Backup
(see page 58)

Data/Signal Line
Surge Suppression
(see page 27)

SDN-C Smaller, More Robust
DIN Rail Power Supplies
(see page 101)

SOLA HD

New Logo
(see page 3)

S4K2U-5 and S4K4U
Industrial UPS
(see pages 68 & 73)

Active Tracking® Filters
(see page 18)

Active Tracking® Filters
with Surge Protection
(see pages 21, 24)

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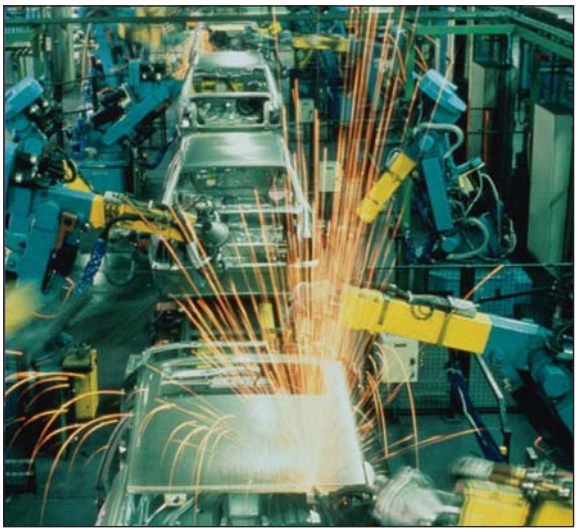
Anywhere in your facility from the service entrance to the most critical production equipment, SolaHD can power your process control applications with our power conversion and power quality products.

SolaHD offers industrial grade products to meet the most demanding applications worldwide.

- Factory automation
- Inspection, test and instrumentation equipment
- Laboratory and non-patient medical
- High efficiency applications (Energy Star®)
- UL508 environments such as waste water treatment
- Harsh environment and remote site locations
- Building automation
- Service automation
- Process control



Automotive/Industrial Control

SolaHD offers many products suited for harsh environments including our encapsulated power supplies and transformers. We also offer a wide range of Class 1 Division 2 products.

When Power Is Money

Power is a dynamic aspect in production and automation. Companies lose billions of dollars every year due to:

Disturbance	Cost/Event
Voltage Sags	$7,694
Momentary Outage	$11,027
1 Hr Outage: Notice	$22,973
1 Hr Outage: No Notice	$39,459
4 Hr Outage	$74,835

Cost of Poor Power Quality and Downtime by 1996 Duke Power Survey

Conditioning your incoming power keeps productivity high and costs down. Using compatible power conversion components ensures your system reliability.

Power Is Our Only Business

Our industrial power specialists are serious about your system performance. SolaHD has been a trusted name in power conversion and power quality since 1915. We provide innovative and reliable products with proven technologies to help control your equipment or facility's efficiency, productivity, and longevity. Our products meet strict global requirements and new efficiency standards. SolaHD delivers total power quality solutions to drive your system reliability, your return on investment (ROI) and your customer satisfaction.

Power Products (4 watts to 660 KVA)

Consider the Entire Picture

Sola/Hevi-Duty is now SolaHD. This name change reflects our continual investment in new technologies and product lines that enable our brand to deliver a complete power-quality offering. This singular name will be seen across all of our products and positions the brand for growth. More importantly, it signifies reliability and performance for your production lines and facilities.

SolaHD draws upon nearly 100 years of global experience in developing innovative solutions to optimize operational performance, improve efficiencies, preserve data and increase equipment longevity. Our comprehensive line of products stretch from entrances to load points to communications networks throughout facilities, making our total power quality solutions indispensable to today's industries.

Total power quality involves both power protection and power conversion. Power conversion choices made upstream can impact the type of power protection required downstream. Only SolaHD's products and expertise can save you time, money and space with combined power protection and conversion solutions that are right for your facility.

Power Protection + Power Conversion = Total Power Quality

Power Supplies

Power Supplies and Uninterruptible Power Supplies provide clean, consistent power. Both products safeguard equipment from power anomalies, such as fluctuations through complete power failures. Power Supply and UPS systems can also offer power conditioning benefits by filtering noise, harmonics and dangerous frequency variations.

Power Protection and Conditioning

Surge Protectors and Power Conditioners insulate equipment from the transient noise, voltage surges, harmonics and changing voltage conditions that cause 95% of all power quality issues.

Power Conversion

Transformers regulate voltage anywhere that the available voltage must be changed to accommodate electrical circuit or equipment requirements. Transformers are designed and built in a vast range of configurations to meet requirements for variables, such as size, heat, voltage capacity and environmental conditions.

Service & Support

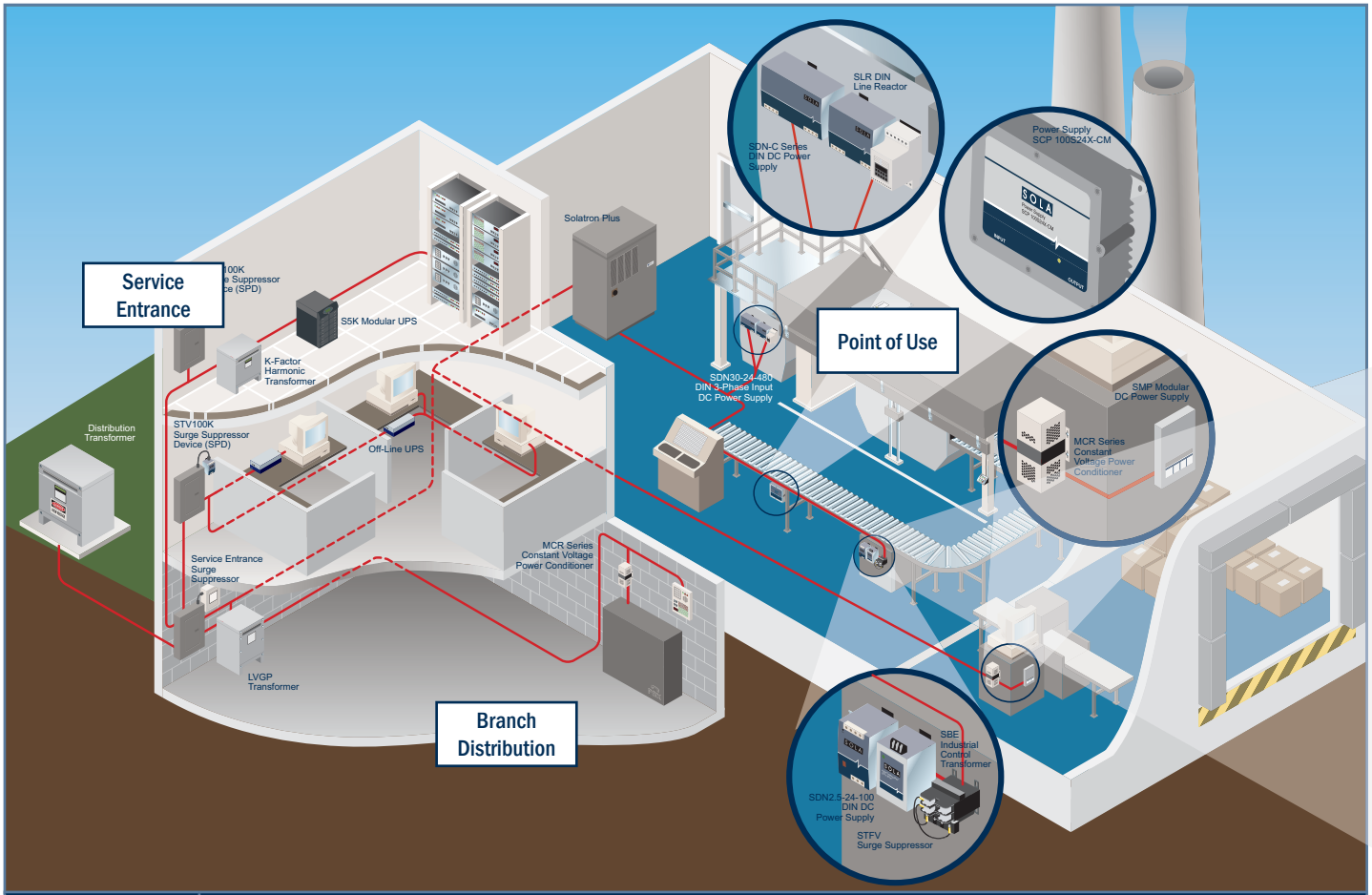
Selecting the proper power quality solution for your application can be tricky. Experienced and dedicated sales representatives, along with award-winning online tools, help you make the right choice, every time. Technical Service Representatives are available around the world for stock and support help 24/7.

Contact **Technical Services** at **(800) 377-4384** with any questions.
Visit our website at www.solahd.com.

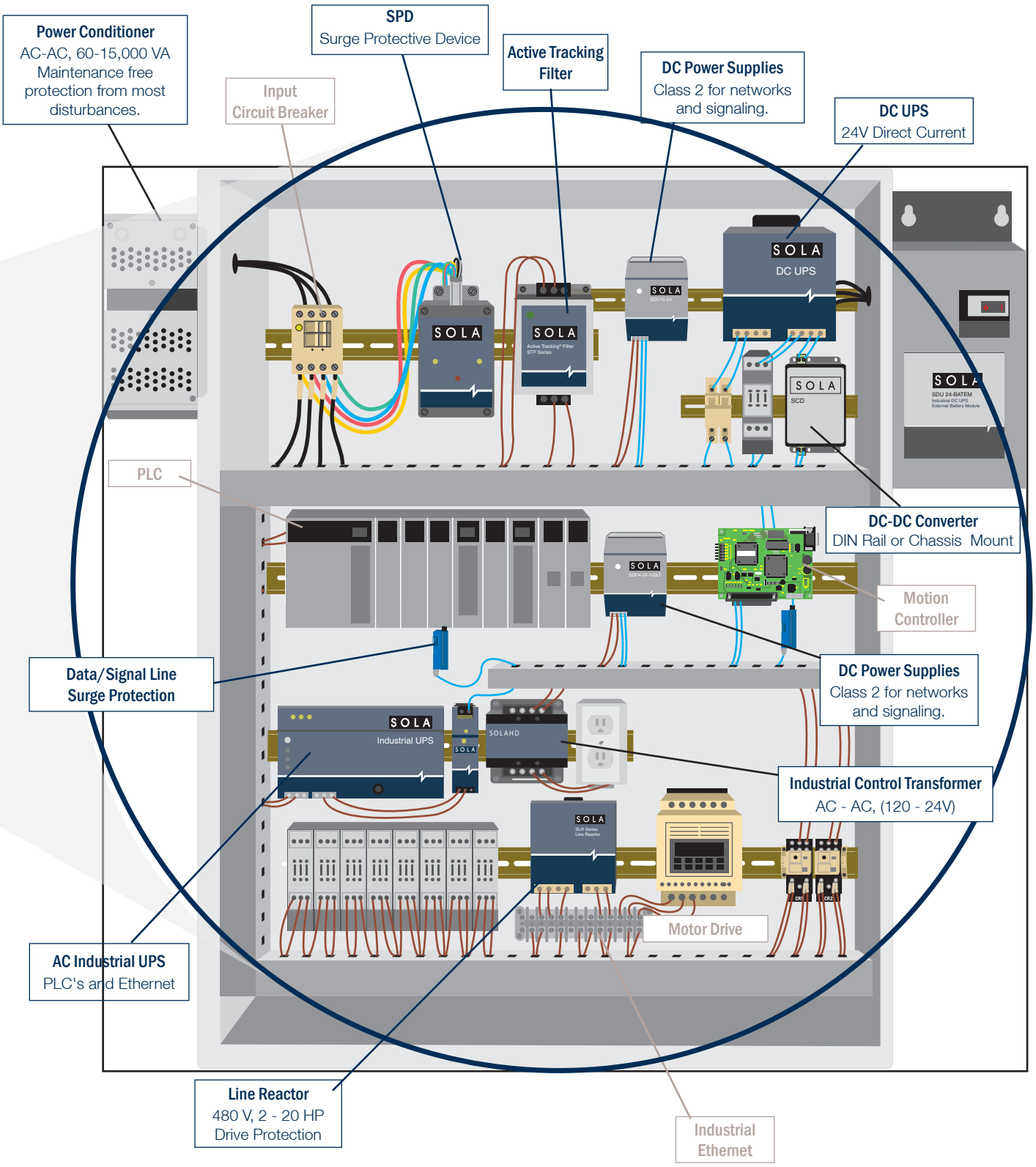
Total Power Quality Drives Performance

SolaHD is at work for you on the facility floor, branch panel, power distribution points and point-of-use applications.

Our products power the most demanding applications and environments and can be used in conjunction or alone to ensure controlled, reliable power at any part of the factory floor or machinery.



	Industrial Power Conversion and Protection Solutions					
	Power Conditioning	Line Reactors	SPD/Filters	Transformers	Power Supplies	UPS
Service Entrance			X	X		
Branch Panels			X	X		X
Networks	X		X		X	X
Large Machinery	X	X	X	X	X	X
Process Rooms	X		X		X	X
PLC's & Industrial PC's	X		X	X	X	X
Ethernet & Communications			X		X	X
DeviceNet™			X		X	X
Motion Control			X		X	X
Drives	X	X	X	X		X
Analog I/O			X		X	X



Total Power Quality Solutions

Impulse (Transient/Spike)

Definition	Narrow, high voltage or current impulse superimposed on the AC
Causes	Utility grid switching
	Contactor opening or closing
	Heavy industrial equipment starting
	Lightning
Effects	Equipment failure or damage
	System lock-up
	Data corruption/loss
	Component stress that can lead to breakdown
Solution	**Surge Protective Devices** **Active Tracking® Filters** **Power Conditioner**

Active Tracking® Filters and Surge Protection

Electrical Noise

Definition	Low amplitude, low current, high frequency disturbances
Causes	Non-linear loads
	Other loads
	Improper grounding
	Loose wiring
	Electromagnetic interference
Effects	Perceived software errors
	System lock-up
Solution	**Isolation Transformer** **Active Tracking® Filters** **Power Conditioner** **UPS**

Isolation Transformers

Sag

Definition	Temporary drop in RMS voltage, may last for several cycles
Causes	Large load start-up (ex. motors, air conditioner)
	Utility switching
Effects	Hardware crashes (ex. PLCs)
	Occasional equipment failure
	Reduced efficiency and life span of electrical equipment
Solution	**UPS** **Power Conditioner** **Voltage Regulator** **Power Supplies with sag immunity**

UPS

Surge (Swell)

Definition	Temporary rise in RMS voltage, may last for several cycles
Causes	Large load turning off (ex. motors, air conditioner)
	Utility shedding loads
Effects	Hardware damage
	Bright light
Solution	**UPS** **Power Conditioner** **Voltage Regulator**

Solatron™ Plus Power Conditioner

Brownout

Definition	Temporary drop in RMS voltage, may last for several hours
Causes	High demand on utility grid
	Service located at the end of grid
Effects	Hardware crashes
	Occasional equipment failure
	Reduced efficiency and life span of electrical equipment particularly motors
Solution	**Voltage Regulator**

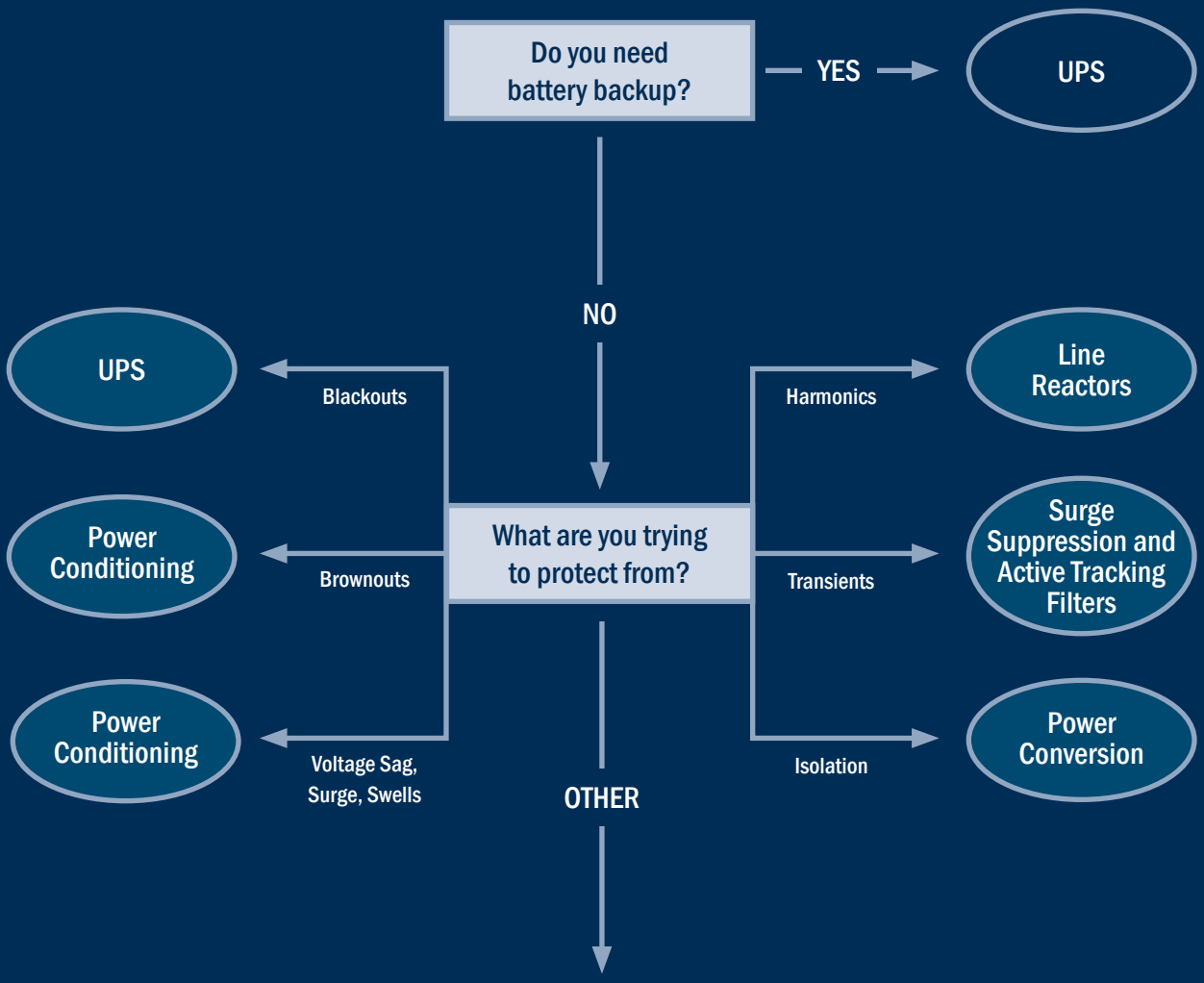
MCR Voltage Regulator

Harmonics

Definition	Distortion to the sine wave
Causes	Switch mode power supplies
	Non-linear loads
	Variable frequency drives
Effects	High neutral current
	Overheated neutral conductors and transformers
	Voltage distortion
	Breaker tripping
	Loss of system capacity
Solution	**Line Reactor** **K-Rated Transformers** **UPS** **Power Conditioner**

SLR Line Reactor

Whether protecting expensive equipment from sags and swells or ensuring the delivery of clean safe power, SolaHD's power quality products can be used individually or in combination to provide a complete solution.



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All of the pages in this catalog are also available for download in PDF format from the website at www.solahd.com

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Contact **Technical Services** at **(800) 377-4384** with any questions.
Visit our website at www.solahd.com.

Surge Protective Devices and Active Tracking® Filtering

Today's industries depend on their telecommunication, networking, computing and production equipment for optimized manufacturing performance. SolaHD's proven surge protection and filtering devices protect these critical operations across facilities from the continuous threat of transient spikes, noise and harmonic distortion.

Employing an entire facility protection strategy will safeguard the electrical system against most transients. Multi-stage protection involves clamping the initial high energy surge, filtering any remaining noise or transients to the protected sensitive equipment and finally, protecting the data/signal lines entering or leaving the control panel or the factory floor. This coordination of devices provides the lowest possible let through voltage to the equipment to ensure maximum productivity.

Surge Protective Devices

High-energy transients either externally or internally generated pose an immediate threat to the reliability and performance of your sensitive electronic equipment. Emerson Network Power Surge Protection recommends placing high-energy Surge Protective Devices (SPDs) on key panels throughout your facility. Within your facility, motors, inductive loads and various equipment load switching can cause damage or costly downtime.

Our surge protective devices focus on limiting high-voltage spikes to a level that is acceptable to most electronic equipment. Plus, they're a great first line of defense, using components that are placed in parallel with the line and serve as clamping mechanisms for high-energy impulses. Protection at this level is referred to in the industry as Sine Wave Tracking or electronic grade. Surge Protective devices are typically installed at service entrances, on larger distribution panels and at the point of use.

Active Tracking® Filtering with Surge Protection

Low-energy transients and high-frequency noise are the primary causes for system disruption and long-term degradation of microprocessor-based equipment within your facility. For more than 30 years, our Active Tracking Filters have proven to be the most effective solution in critical equipment protection within harsh industrial environments. Active Tracking Filters are built upon a unique multi-stage hybrid design. This design creates a foundation for a family of products that attenuate impulses that would normally go untouched by standard, parallel clamping devices.

Changing technology and dependence on total automation processes within modern facilities create a critical need for clean AC power at the equipment level. Active Tracking Filters are a perfect solution for your microprocessor-based products, including industrial PLCs, OEM applications and motion control systems.

Data/Signal Line Surge Protection

The rapid development of automated controls, telecommunications and fire/alarm/security systems make it imperative to have properly coordinated low-voltage surge protection. Modern networked industrial facilities require error-free transmission of information for maximum productivity and integrity of data, but these areas are often overlooked when it comes to power protection.

The need to protect all susceptible low-voltage cable routes entering a facility and at key points within the building is as critical as protecting the equipment from high-energy impulses. The importance of protecting at this level grows as your facility's reliance on sensitive instrumentation, networked automation, and uncorrupted data transmission increases. Our Data/Signal Line products utilize high-speed, high-energy components that come in a variety of voltage levels and unique packaging configurations.

STV 200/400K Series - Surge Protective Devices

SolaHD STV 200/400K Series offers continuous protection from damaging voltage transients and electrical noise commonly found at the service entrance or distribution panel. The modular design of the STV 200/400K allows for installation flexibility and its' robust design allows for installation in the most severe exposure locations. They are capable of handling the high-impulse, potentially damaging transients commonly found at the service entrance or distribution panels. The modular design of the STV 200/400K allows for installation flexibility. Its robust design allows for placement in the most severe exposure locations.

The STV 200/400K utilizes patented circuitry to monitor the status of all protection modes, including neutral to ground. Should protection be unavailable in any mode, the Green LED will be extinguished, and the Red LED will be illuminated. In addition, high isolation form C dry contacts provide remote monitoring of suppression system failure, under voltage, phase and power loss. The STV 200/400K patented suppression integrity monitoring indicates failure for both shorted or opened suppression components.

These devices are designed to meet UL 1449 (third edition), UL 1283 and cUL Listed. These units are ANSI/IEEE C62.11, C62.41, C62.45 Categories A, B, and C3 tested. They are built to meet your unique requirements, and are available in hardwire, three phase configuration. They are designed for years of trouble free operation and require little or no operator intervention after installation.

Features

- Modular design allows for flexibility
- Surge current capacity of 200 to 400 kA per phase
- Industry's highest surge current repeatability
- All modes transient protection (L-N, L-G, and N-G)
- Form C contact and audible alarm status indications
- Internal/external monitoring, including neutral to ground
- UL rated 200 kAIC with component level fusing for safe operation
- EMI/RFI Filtering
- UL 1449 (third edition), UL 1283, and cUL Listed
- ANSI/IEEE C62.11, C62.41, C62.45 Categories A, B, and C3 tested
- Tested to NEMA LS1, ISO 9001
- NEMA 12 enclosure, available options NEMA 3R, 4, and 4X
- Optional rotary disconnect, transient counter, and remote monitor panel
- 5 Year Limited Warranty

c UL us

Applications

The STV 200/400K Series can be a facility-wide product family and may be installed from service entrances to distribution panels to branch panels.

- Industrial Plants
- Commercial Buildings
- Institutional Facilities
- Any facility that has an environment with electronics based equipment

Related Products

- Power Conditioners
- Uninterruptible Power System
- Transformers
- STV 25K, STV 100K, STF, STFV and STC Series

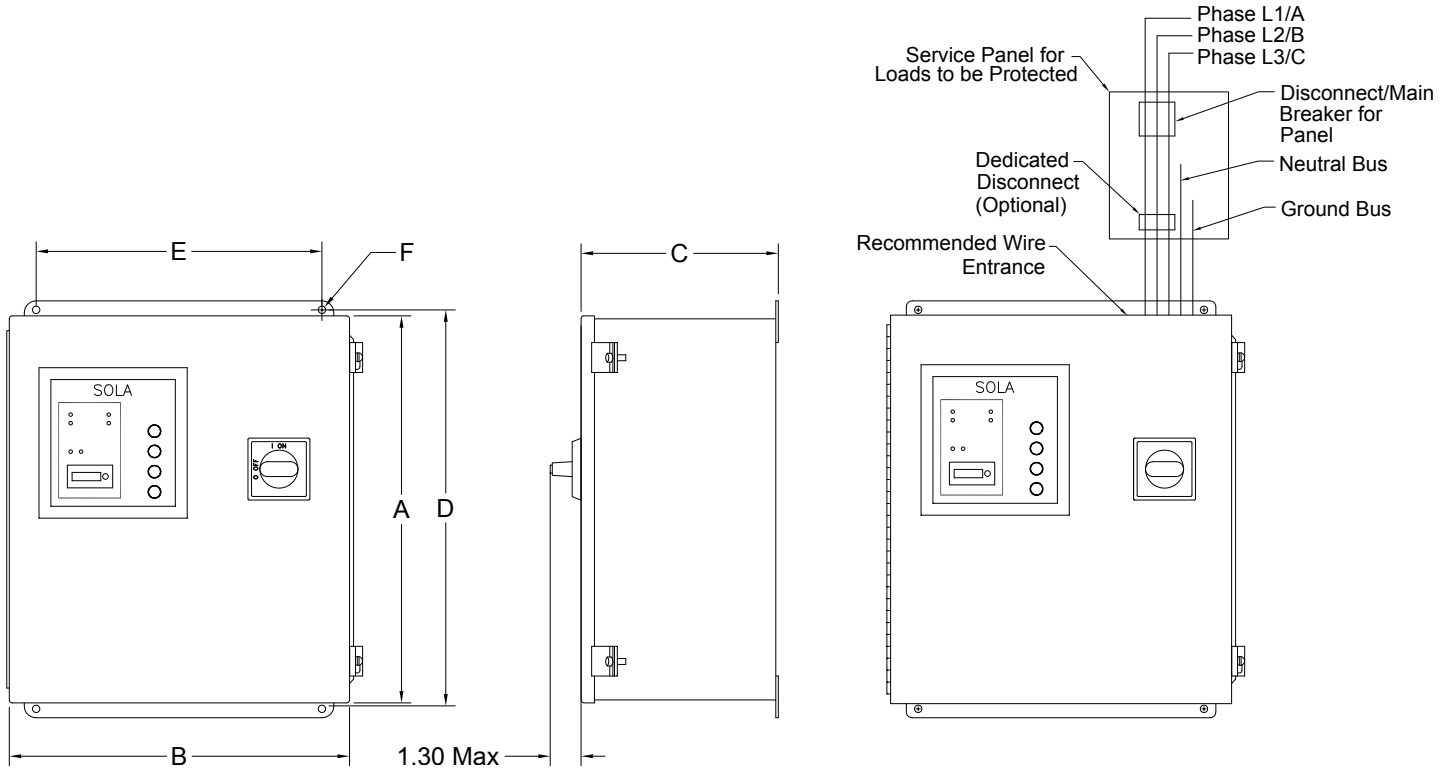
Selection Table

Catalog Number	Input Voltage	
STV 400K–10Y	120/208 V	Three Phase Wye 4 wire + Ground
STV 200K–10Y	120/208V	Three Phase Wye 4 wire + Ground
STV 400K–27Y	277/480 V	Three Phase Wye 4 wire + Ground
STV 200K–27Y	277/480 V	Three Phase Wye 4 wire + Ground
STV 400K–48D	480 V	Three Phase Δ 3 wire + Ground
STV 200K–48D	480 V	Three Phase Δ 3wire + Ground

STV 200/400K Specifications

Description	Catalog Number					
	STV 200K–10Y	**STV 200K–27Y**	**STV 200K–48D**	**STV 400K–10Y**	**STV 400K–27Y**	**STV 400K–48D**
Input Vac	120Y/208 V Three Phase Wye, 4 W + G	277Y/480 V Three Phase Wye, 4 W + G	480 V Three Phase Delta, 3 W + G	120Y/208 V Three Phase Wye, 4 W + G	277Y/480 V Three Phase Wye, 4 W + G	480 V Three Phase Delta, 3 W + G
Maximum Continous Operating Voltage (MCOV)	120 V = 125%, All others voltages 115%					
Line Frequency	47–63 Hz					
Connection/ Mounting Type	Internally connected/Wall Mounted (Mounting hardware 1/4 in.)					
Enclosure	NEMA 12 (NEMA 3R, 4, 4x optional)					
Modes of Protection	All Modes: L-N, L-L, L-G, N-G					
Saftey Agency Approvals	UL 1449 3rd Edition, UL 1283, cUL					
	UL 1449 (2nd Edition) Suppressor Classification					
L–N	400 V	700 V	N/A	400 V	700 V	N/A
L–L	700 V	1,500 V	1,500 V	700 V	1,500 V	1,500 V
L–G	400 V	700 V	1,500 V	400 V	700 V	1,500 V
N–G	400 V	700 V	N/A	400 V	700 V	N/A
AIG Rating	200 kAIC					
Status Indication	LED's status indicator, Audible alarm, and Form 'C' contact only relay					
Response Time	< 0.5 nsec.					
Operating Temperature	-40°C to +50°C					
Operating Humidity	0% to 95% Non-condensing					
Noise Attenuation	50 dB Maximum					
	Circuit Ampacity Limitations					
Per Phase	200 kA	200 kA	200 kA	400 kA	400 kA	400 kA
Line to Neutral	100 kA	100 kA	N/A	200 kA	200 kA	N/A
Line to Line	100 kA	100 kA	100 kA	200 kA	200 kA	200 kA
Line to Ground	100 kA	100 kA	100 kA	200 kA	200 kA	200 kA
Neutral to Ground	100 kA	100 kA	N/A	200 kA	200 kA	N/A
Warranty	5 year limited warranty					

Dimensional Drawings



Dimensional & Wiring Specifications

STV 200/400K Series											
Catalog Number	Dimensions (in/mm)						Weight lbs (kg)	Suggested Breaker Size	Suggested Wire Size (AWG)	Allowable Breaker Range	Allowable Wire Range
	A	B	C	D	E	F					
STV 200K	16.25	14.25	8.25	16.75	12	.31	35 (15.88)	40 A	#8	15 A–100 A	#14–#2
STV 400K	16.25	14.25	8.25	16.75	12	.31	42 (19.05)	100 A	#2	15 A–100 A	#14–#2

STV 200/400K Series with Rotary Disconnect											
Catalog Number	Dimensions (inches)						Weight lbs (kg)	Suggested Breaker Size	Suggested Wire Size (AWG)	Allowable Breaker Range	Allowable Wire Range
	A	B	C	D	E	F					
STV 200K	16.25	14.25	8.25	16.75	12	.31	38 (17.23)	40 A	#8	15 A–175 A	#14–2/0
STV 400K	16.25	14.25	8.25	16.75	12	.31	45 (20.41)	100 A	#2	15 A–175 A	#14–2/0

The STV 100K Series - Surge Protective Devices

SolaHD's STV 100K series is a hardwired surge protective devices are designed for installation at the service entrance, branch panel or a dedicated sensitive electronic load. These units feature all mode protection, LED and audible alarm status indication, sinewave tracking and form "C" dry contacts. The STV 100K series also contains the highest levels of safety built into the product including thermal fusing and a fault current fusing level of 65 kAIC.

Features

- 100,000 amp peak current rating provides all mode protection against severe transients
- Low clamping levels for more effective protection
- 65 kAIC fault current fusing level provides safety and NEC conformance
- LED status and audible alarms
- Listed to UL 1449, 3rd Edition
- Compact, rugged metal NEMA 12 enclosure

Applications

- Distribution Panels (<1200 A)
- Branch, Lighting and Control Panels
- Factory Automation Installations
- Dedicated Industrial Equipment

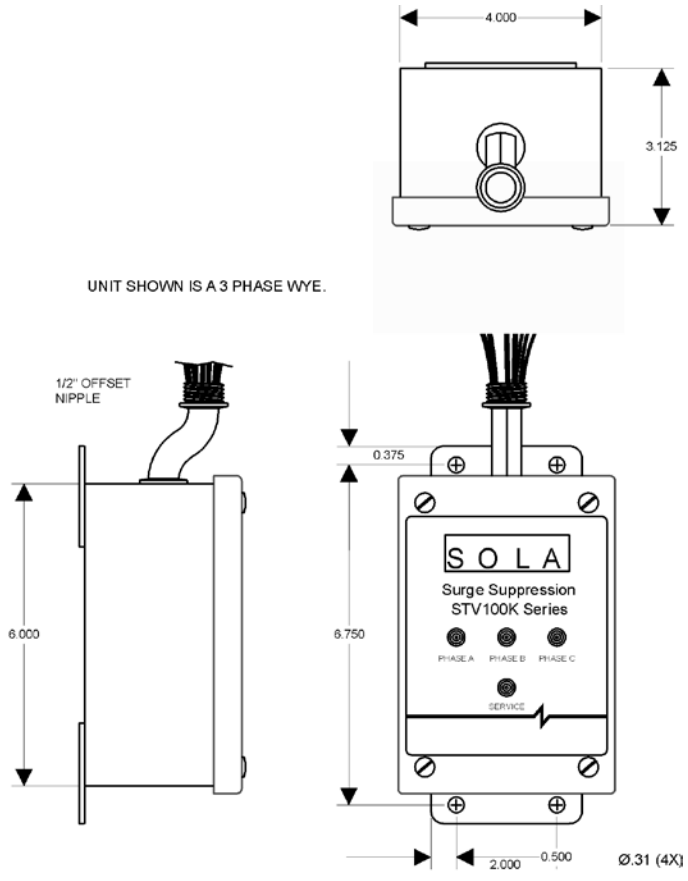
Related Products

- Power Conditioners
- UPS
- Drive Isolation and K-Factor Transformers

Selection Table

Catalog Number	Input Voltage	
STV 100K–10S	120/240 V	Single Phase 3 wire + Ground
STV 100K–10Y	208Y/120 V	Three Phase Wye 4 wire + Ground
STV 100K–10N	120 V	Single Phase 2 wire + Ground
STV 100K–24L	240 V	Single Phase 2 wire + Ground
STV 100K–23Y	380Y/220 V	Three Phase Wye 4 wire + Ground
STV 100K–27Y	480Y/277 V	Three Phase Wye 4 wire + Ground
STV 100K–24D	240 V	Three Phase Δ 3 wire + Ground
STV 100K–48D	480 V	Three Phase Δ 3 wire + Ground
STV 100K–10D4	240/120 CT	Three Phase Δ 4 wire + Ground
STV 100K–24D4	480/240 CT	Three Phase Δ 4 wire + Ground

Dimensions



Contact **Technical Services** at **(800) 377-4384** with any questions.
Visit our website at www.solahd.com.

STV 100K Specifications

Description	Catalog Number									
	STV 100K–10S	**STV 100K–10N**	**STV 100K–24L**	**STV 100K–10Y**	**STV 100K–23Y**	**STV 100K–27Y**	**STV 100K–24D**	**STV 100K–48D**	**STV 100K–10D4**	**STV 100K–24D4**
Input Vac	120/240 V	120 V	240 V	208Y/120 V	380Y/220 V	480Y/277 V	240 V	480 V	120/240 CT	240/480 CT
	Single Phase 3 wire + Ground	Single Phase 2 wire + Ground		Three Phase Wye 4 wire + Ground			Three Phase Δ 3 wire + Ground		Three Phase Δ 4 wire + Ground	
Maximum Continuous Operating Voltage (MCOV)	125% of the nominal level for 120 V; 115% for all other input voltages									
Line Frequency	47-63 Hz									
Connection/ Mounting Type	Parallel/Flange									
Enclosure	Metal, NEMA 12 Enclosure									
Dimensions – in (mm) (H x W x D)	4 x 6 x 4 (101.6 x 152.4 x 101.6)									
Weight (lbs/kg)	8 lb/3.63 kg max.									
Modes of Protection	All Mode: L - N, L - L, L - G, N - G									
Safety Agency Approvals	UL 1449 3rd Edition, cUL									
	UL 1449 (2nd Edition) Suppressor Classification									
L – N	400 V	400 V	N/A	400 V	800 V	800 V	N/A	N/A	400 V	800 V
L – L	800 V	N/A	800 V	800 V	1500 V	1500 V	1500 V	1500 V	800 V	1500 V
L – G	400 V	400 V	800 V	400 V	800 V	800 V	1500 V	1500 V	400 V	800 V
N – G	400 V	400 V	N/A	400 V	800 V	800 V	N/A	N/A	400 V	800 V
A/C Rating	65 kAIC									
Status Indication	3-Green LEDs, 1 per phase, 1-Red LED, Form C Contacts, Audible Alarm									
Response Time	< 0.5 nsec									
Operating Temperature	-40°C to +60°C									
Operating Humidity	0% to 95% Non-condensing									
Fusing	Thermal and Fault Current									
Noise Attenuation	40 dB Max									
	Peak Surge Current Capability									
Per Phase **Line to Neutral** **Line to Line** **Line to Ground** **Neutral to Ground**	100 kA 50 kA 50 kA 50 kA 50 kA	100 kA 50 kA N/A 50 kA 50 kA	100 kA N/A 50 kA 50 kA N/A	100 kA 50 kA 50 kA 50 kA 50 kA	100 kA 50 kA 50 kA 50 kA 50 kA	100 kA 50 kA 50 kA 50 kA 50 kA	100 kA N/A 50 kA 50 kA N/A	100 kA N/A 50 kA 50 kA N/A	100 kA 50 kA 50 kA 50 kA 50 kA	100 kA 50 kA 50 kA 50 kA 50 kA
Warranty	10 years									

The STV 25K DIN Rail Series - Surge Protective Devices

This series provides point-of-use protection, at the dedicated equipment level, against damaging transients. Ideal for installation in electronic control cabinets found in harsh industrial environments such as the factory floor or at remote locations. These devices provide 50,000 amps of surge protection, sinewave tracking, LED status indication and form "C" dry contacts. This DIN Rail series also provides protection on all electrical paths and comes with a standard ten year product warranty. The STV 25K DIN Rail series surge protective devices are UL recognized to Standard 1449, 3rd Edition.

Applications (20 Amp Max)

- Control Cabinets for Industrial Automation
- Point-of-Use Industrial/Service Equipment
- Remote Commercial or Industrial Equipment
- Instrumentation and Large Test Equipment
- Commercial and Building Automation Systems

Features

- Compact and narrow design maximizes panel space.
- Low clamping levels for more effective protection.
- Easy access terminal screws for quick mounting and installation.
- 50,000 amps of surge protection.
- Sine wave tracking and all mode protection provide consistent and reliable protection on all electrical paths.
- Patented thermal fusing prevents MOV overheating caused by excessive current levels.

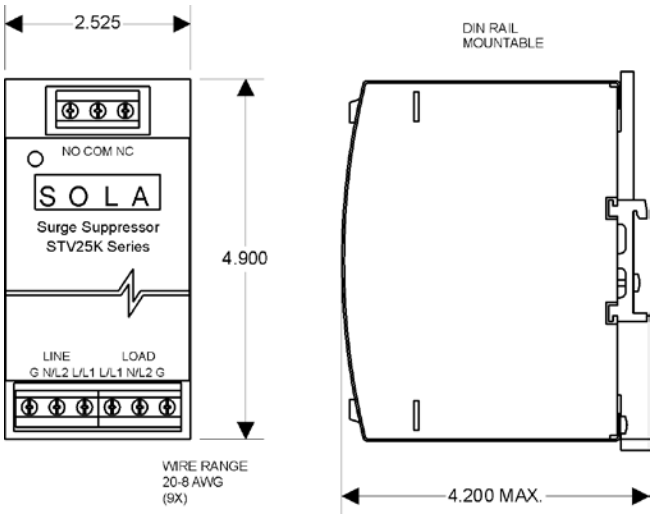
Related Products

- DIN Rail Power Supplies
- DIN Rail AC UPS
- Industrial Control Transformers
- Line Reactors
- Active Tracking® Filters

Selection Table

Catalog Number	Input Voltage	
STV 25K–10S	120 V	Single Phase (L - N)
STV 25K–24S	240 V	Single Phase (L1 - L2)

Dimensions



STV 25K Specifications

Description	Catalog Number	
	STV 25K–10S	**STV 25K–24S**
Input Voltage	120 Vac, Single Phase 0-135 VRMS	240 Vac, Single Phase 0-260 VRMS
Maximum Continuous Operating Voltage (MCOV)	120 Vac - 150 VRMS	240 Vac - 275 VRMS
Line Frequency	47-63 Hz	
Connection/Mounting Type	DIN Rail Mount (Chassis Mount Bracket Optional order SDN-PMBRK2) with screw terminals for #12 AWG.	
Input Current Rating	20 Amps	
Phase Configuration	2 wire + GND	
Weight – lbs (kg)	3 lbs/1.36 kg	
Dimensions (H x W x D)	4.87 x 2.5 x 4.375 (12.37 x 6.35 x 11.11) includes mounting bracket	
Modes of Protection	All Mode: L - N, L - L, L - G, N-G	
Safety Agency Approvals	UL 1449 3rd Edition	
UL 1449 (3rd Edition) Suppressor Classification **120 Vac Normal/Common Mode** **240 Vac Normal/Common Mode**	 400 Vac 800 Vac	
Status Indication	Green LED, Form C Contacts	
Packaging	Metal DIN Rail Mount Enclosure, IP20	
Response Time	< 0.5 nsec	
Operating Temperature	-40°C to +60°C	
Operating Humidity	0% to 95% Non-condensing	
	Noise Attenuation	
Normal Mode **Common Mode**	50 dB Min 40 dB Min	
	Peak Surge Current Capability (8 x 20 µs)	
Line to Neutral **Line to Ground** **Neutral to Ground**	25 kA 25 kA 25 kA	
Warranty	10 Years	

STF Series – Active Tracking® Filters

Low voltage/high frequency noise is caused by everyday events such as turning on machinery, motors, or equipment. Although noise is less dramatic than high voltage transients, the long term effects of these frequent disturbances can be as damaging. Filtering systems such as SolaHD Active Tracking® Filters provide clean AC power by eliminating lower voltage noise.

The SolaHD STF Series offers the original active tracking technology to guard against commonly occurring but very damaging, lower energy transients. Offering excellent noise reduction, the filter continuously tracks the input AC power line and responds instantly upon detecting extraneous high frequency noise.

The STF Series eliminates low voltage/high frequency noise via a low-pass or L-C filter. These filters are used for low energy, high frequency noise reduction and consist of a series of inductors, capacitors and resistors. STFs are load dependent which means that the series inductors located on each phase and neutral conductors are sized to handle the maximum current draw on the line. These inductors together with the capacitors and resistors form a circuit capable of absorbing a large bandwidth of noise.

These devices are designed to meet UL 1283, and CSA C22.2 for Electromagnetic Interference Filters. STFs attenuate or reduce the amplitude of noise to a minimum of 40dB that occurs in a frequency range of 50 KHz to 50 MHz. They also provide the industry's best IEEE Category "A" protection, typically reducing normal mode transients to +/- 5 volts.

Built to meet your unique requirements, these filters are available in a multitude of voltage and phase configurations. They are hardwired and designed for years of trouble free operation requiring little or no operator intervention after installation.

Active Tracking® Filters are one part of a total power quality solution. They can be used alone or in conjunction with other SolaHD products to solve more complex power quality problems.

Applications

- Branch and Control Panels
- Factory Automation Installations
- Point of Use Industrial Service Equipment
- Dedicated Industrial and Machine Tools Equipment
- Telecommunications Equipment

Features

- Non degrading, series filter technology for total durability
- High Frequency Noise filter, RLC Low-Pass filter
- Single Phase applications up to 30 Amp
- Three Phase applications up to 200 Amp
- Attenuates noise to 40 dB in frequency range of 50 kHz to 50 MHz
- Operating Temperature from -40°C to +45°C.
- Hardwired connection
- MTBF greater than 100,000 Hours, Mil Std. 217F
- UL 1283 Listed or Recognized (Single Phase models), CSA
- 10 Year Limited Warranty

Related Products

- Single and Three Phase Power Conditioners
- Uninterruptible Power System
- Transient Voltage Surge Suppressors
- Power Supplies

Selection Table

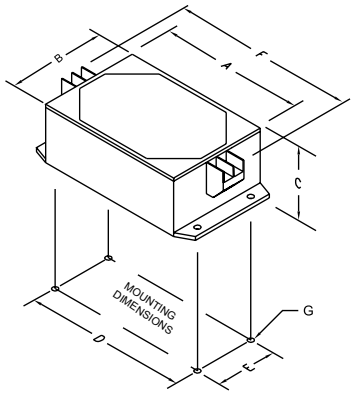
Catalog Number	Amps	Min. Wire Size (AWG Suggested)	Fuse/Circuit Breaker Ampacity		Case Dim. (in) A x B x C	Mounting Flange Dim. (in) D x E x F	Weight lbs (kg)	Design Style
			Suggest	Max				
Single–Phase Models (120 Vac)*								
STF0025–10N	2.5	26	2.5A	3.125A	4.0 x 2.88 x 1.81	4.38 x 2.12 x 5.31	2.0 (.91)	1
STF0050–10N	5.0	22	5A	6.25A	4.0 x 2.88 x 1.81	4.38 x 2.12 x 5.31	2.0 (.91)	1
STF0075–10N	7.5	18	7.5A	9.375A	4.75 x 4.75 x 2.35	5.25 x 3.5 x 6.25	3.0 (1.36)	1
STF0150–10N	15.0	14	15A	18.75	6.25 x 4.75 x 2.35	6.75 x 3.5 x 7.75	5.0 (2.27)	1
STF0200–10N	20.0	12	20A	25A	7.75 x 4.75 x 2.35	8.25 x 3.5 x 9.0	7.0 (3.17)	1
STF0300–10N	30.0	10	30A	37.5A	7.75 x 4.75 x 2.35	8.25 x 3.5 x 9.0	8.0 (3.63)	1
Single–Phase Models (240 Vac)*								
STF0025–24L	2.5	26	2.5A	3.125A	4.0 x 2.88 x 1.81	4.38 x 2.12 x 5.31	2.0 (.91)	1
STF0050–24L	5.0	22	5A	6.25A	4.0 x 2.88 x 1.81	4.38 x 2.12 x 5.31	2.0 (.91)	1
STF0075–24L	7.5	18	7.5A	9.375A	4.75 x 4.75 x 2.35	5.25 x 3.5 x 6.25	3.0 (1.36)	1
STF0150–24L	15.0	14	15A	18.75	7.75 x 4.75 x 2.35	8.25 x 3.5 x 9.0	5.0 (2.27)	1
STF0200–24L	20.0	12	20A	25A	7.75 x 4.75 x 2.35	8.25 x 3.5 x 9.0	7.0 (3.17)	1
STF0300–24L	30.0	10	30A	37.5A	7.75 x 4.75 x 2.35	8.25 x 3.5 x 9.0	8.0 (3.63)	1
Three–Phase Models (120/208 Vac WYE)**								
STF0150–10Y	15.0	14	15A	18.75A	14 x 12 x 6	14.75 x 10.0 x 15.5	38.0 (17.24)	4
STF0300–10Y	30.0	10	30A	37.5A	14 x 12 x 6	14.75 x 10.0 x 15.5	38.0 (17.24)	4
STF0500–10Y	50.0	4	50A	62.5A	20 x 16 x 9	21.25 x 10.0 x 22.5	85.0 (38.55)	2
STF1000–10Y	100.0	2	100A	125A	20 x 16 x 9	21.25 x 10.0 x 22.5	85.0 (38.55)	2
STF2000–10Y	200.0	3/0	200A	250A	24 x 20 x 9	25.25 x 14.0 x 26.5	110.0 (49.89)	2
Three–Phase Models (240 Delta)**								
STF0150-24D	15.0	14	15A	18.75A	14 x 12 x 6	14.75 x 10.0 x 15.5	38.0 (17.24)	4
STF0300-24D	30.0	10	30A	37.5A	14 x 12 x 6	14.75 x 10.0 x 15.5	38.0 (17.24)	4
STF0500-24D	50.0	4	50A	62.5A	20 x 16 x 9	21.25 x 10.0 x 22.5	85.0 (38.55)	2
STF1000-24D	100.0	2	100A	125A	20 x 16 x 9	21.25 x 10.0 x 22.5	85.0 (38.55)	2
STF2000-24D	200.0	3/0	200A	250A	24 x 20 x 9	25.25 x 14.0 x 26.5	110.0 (49.89)	2
Three–Phase Models (277/480 V WYE)**								
STF0150–27Y	15.0	14	15A	18.75A	14 x 12 x 6	14.75 x 10.0 x 15.5	38.0 (17.24)	4
STF0300–27Y	30.0	10	30A	37.5A	14 x 12 x 6	14.75 x 10.0 x 15.5	38.0 (17.24)	4
STF0500–27Y	50.0	4	50A	62.5A	20 x 16 x 9	21.25 x 10.0 x 22.5	85.0 (38.55)	2
STF1000–27Y	100.0	2	100A	125A	20 x 16 x 9	21.25 x 10.0 x 22.5	85.0 (38.55)	2
STF2000–27Y	200.0	3/0	200A	250A	24 x 20 x 9	25.25 x 14.0 x 26.5	110.0 (49.89)	2
Three–Phase Models (480 V Delta)**								
STF0150-48D	15.0	14	15A	18.75A	10.0 x 8.0 x 6.0	10.75 x 6.0 x 11.5	38.0 (17.24)	4
STF0300-48D	30.0	10	30A	37.5A	10.0 x 8.0 x 6.0	10.75 x 6.0 x 11.5	38.0 (17.24)	4
STF0500-48D	50.0	4	50A	62.5A	14.0 x 12.0 x 6.0	14.75 x 10.0 x 15.5	85.0 (38.55)	4
STF1000-48D	100.0	2	100A	125A	20.0 x 16.0 x 9.0	21.25 x 10.0 x 22.5	85.0 (38.55)	2
STF2000-48D	200.0	3/0	200A	250A	24.0 x 20.0 x 9.0	25.25 x 14.0 x 26.5	110.0 (49.89)	2

* With barrier strip at input and output
**Units are standard in NEMA 12 hinged enclosures

STF Specifications

Description	120 Vac Models	240 Vac Models	480 Vac Models
Input Voltage	0-150 VRMS	0-275 VRMS	0-520 VRMS
Line Frequency	50/60 Hz		
Transient Attenuation Response Time	Instantaneous		
Mean Time Between Failure (MTBF)	> 100,000 Hours (Mil Std. 217F)		
Packaging	Single phase units through 30 Amps housed in black, high impact plastic case, Vacuum impregnated magnetics, epoxy encapsulated; single phase greater than 30 Amps, 480 Vac, and three phase units housed in NEMA 12 enclosures		
Operating Temperature	-40°C to +45°C Derate Linearly to 60% at +70ºC		
Load Surge Current Rating	10m sec: 5 x Nominal		
	1 sec : 3 x Nominal		
	5 sec: 2 x Nominal		
Transient Reduction	Minimum of 40dB from 50 kHz through 50 MHz. Attenuation is greater than 50 dB to the surge withstand capability Ringwave test IEEE C62.41, Category "A" (IEEE Category A Ringwave 6 kV, 200A, 100 kHz) and "B" (IEEE Category B Ringwave 6 kV, 500 A, 100 kHz).		
Safety	ANSI / UL1283, CAN/CSA C22.2 No 8. Listed or Recognized "Electromagnetic Interference Filters"		
Warranty	10 years		

Dimensional Drawings



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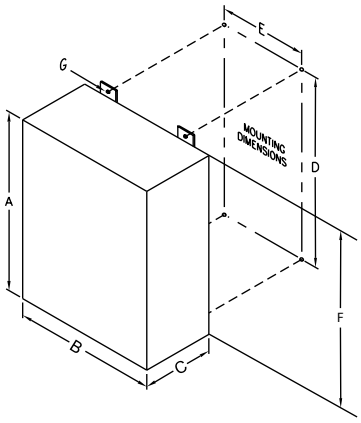

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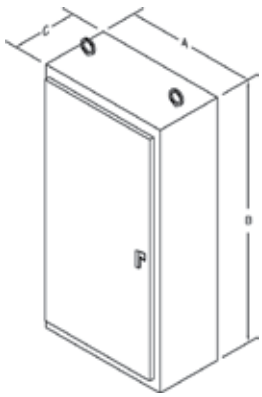

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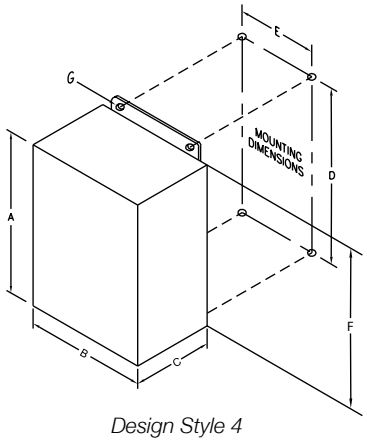


Design Style 4

Contact **Technical Services** at **(800) 377-4384** with any questions.
Visit our website at www.solahd.com.

STFV Plus Series – Active Tracking® Filtering with Surge Protection

The SolaHD STFV Plus Series combines Active Tracking® filtration for low energy noise and surge protection for high energy transients. It continuously tracks the input AC power line responding instantly into action upon detecting extraneous high frequency noise and high voltage transients caused by everyday events such as turning on machinery, motors, or equipment.

These devices are designed to meet UL 1283 for Electromagnetic Interference Filters. STFV Plus attenuates or reduces the amplitude of high frequency noise to a maximum of 90dB that occurs in a range of 100 kHz to 50 MHz. STFV Plus provides the industry's best IEEE C62.41 Category "A & B" Ringwave protection.

They are built to meet your unique requirements, and are available in hardwired, single phase configuration. They are designed for years of trouble free operation and require little or no operator intervention after installation.

Active Tracking® Filters Plus is one part of a total power quality solution. They can be used alone or in conjunction with other SolaHD products to solve more complex power quality problems.

Features

- Non degrading, series Filter/TVSS technology for total durability
- UL Listed surge current capacity – 25,000 Amps
- High impact plastic case, epoxy encapsulated enclosure
- Transient protection in all modes (L-N, L-G, and N-G)
- Single Phase applications up to 30 Amp
- Operating Temperature from -40°C to +60°C
- Hardwired connection
- LED power indication
- UL 1283
- 10 Year Limited Warranty

Applications

- Branch and Control Panels
- Factory Automation Installations
- Point of Use Industrial Service Equipment
- Programmable Logic Controllers
- Dedicated Industrial and Machine tools
- Telecommunications and IT equipment

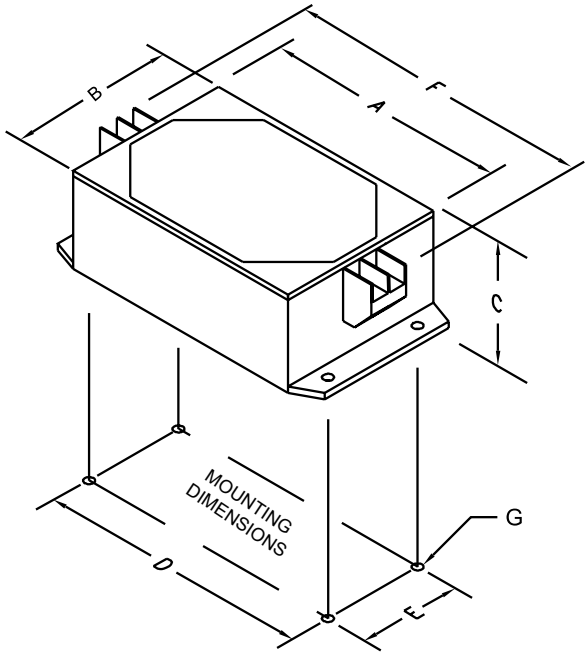
Related Products

- Power Conditioners
- Uninterruptible Power System
- Power Supplies

Selection Table

Catalog Number	Amps	Case Dim. (in) A x B x C	Mounting Flange Dim. (in) D x E x F x G	Number Min. Wire Size (AWG Suggested)	Screw Size	Fuse/Circuit Breaker Ampacity		Weight lbs (kg)
						Suggest	Max	
Single-Phase Models (120 Vac)								
STFV025–10N	2.5	4.0 x 2.88 x 1.81	4.38 x 2.12 x 5.31 x 0.19	26	#6	2.5	3.125	1.0 (.45)
STFV050–10N	5.0	4.0 x 2.88 x 1.81	4.38 x 2.12 x 5.31 x 0.19	22	#6	5	6.25	1.3 (.59)
STFV075–10N	7.5	4.75 x 4.75 x 2.35	5.25 x 3.5 x 6.25 x 0.19	18	#6	7.5	6.25	2.0 (.91)
STFV150–10N	15.0	6.25 x 4.75 x 2.35	6.75 x 3.5 x 7.75 x 0.19	14	#8	15	18.75	3.5 (1.59)
STFV300–10N	30.0	7.75 x 4.75 x 2.35	8.25 x 3.5 x 9.0 x 0.19	10	#8	30	37.5	6.0 (2.72)
Single–Phase Models (240 Vac)								
STFV025–24L	2.5	4.0 x 2.88 x 1.81	4.38 x 2.12 x 5.31 x 0.19	26	#6	2.5	3.125	1.3 (.59)
STFV050–24L	5.0	4.75 x 4.75 x 2.35	5.25 x 3.5 x 6.25 x 0.19	22	#6	5	6.25	2.0 (.91)
STFV075–24L	7.5	6.25 x 4.75 x 2.35	6.75 x 3.5 x 7.75 x 0.19	18	#6	7.5	9.375	3.5 (1.59)
STFV150–24L	15.0	7.75 x 4.75 x 2.35	8.25 x 3.5 x 9.0 x 0.19	14	#8	15	18.75	5.8 (2.63)
STFV300–24L	30.0	7.75 x 4.75 x 2.35	8.25 x 3.5 x 9.0 x 0.19	10	#8	30	37.5	6.0 (2.72)

Dimensions



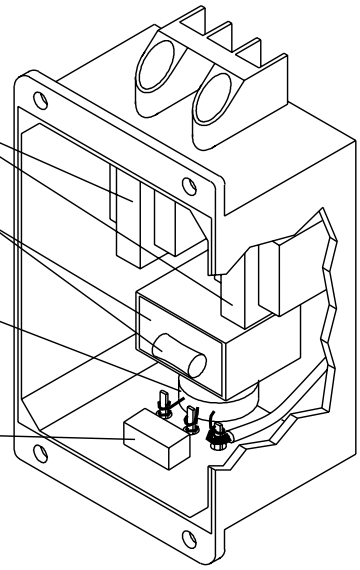
System Design

Series Blocking Inductors
smoothing inductors

Shunt Absorbing Components
sine wave tracking circuitry

MOV Transient Protection
high-energy transient protection
line to neutral, line to ground,
neutral to ground

Pulse Capacitor
high-frequency noise absorption



STFV Specifications

Description	Value	
Input Voltage	120 Vac Models	0-150 VRMS
	240 Vac Models	0-275 VRMS
Line Frequency	50/60 Hz	
Configuration	Single Phase (2 wire + ground)	
Response Time	< 5 ns	
Enclosure	High impact plastic case, 94V0, Vacuum impregnated magnetics, epoxy encapsulated	
Fusing	External	
Status Indication	Green LED	
Connection/Mounting Type	Series/Panel Mount	
Operating Temperature	-40°C to +60°C at full load Derate Linearly to 60% at +70ºC	
Operating Humidity	0% to 95% Non-condensing	
Mean Time Between Failure (MTBF)	Greater than 100,000 hours (Mil. Std. 217F)	
Packaging	High impact plastic case, Vacuum impregnated magnetics, epoxy encapsulated	
Peak Surge Current Capability (8 x 20 µs)	Per Phase	25,000 Amps
	Line to Neutral	12,500 Amps
	Line to Ground	12,500 Amps
	Neutral to Ground	12,500 Amps
Load Surge Current Rating	10m sec	5 x Nominal
	1 sec	3 x Nominal
	10 sec	2 x Nominal
Frequency Response (Forward Reverse)	100 kHz to 50 MHz	90 dB Max
Transient Reduction* (IEEE C62.41)	Typical Category A Ringwave (6 kV, 200A, 100 kHz)	< 10 volts peak
	Typical Category B Ringwave (6 kV, 500A, 100 kHz)	< 50 volts peak
Safety	ANSI / UL1283 Recognized “Electromagnetic Interference Filters”	
Warranty	10 years	

* All measurements in volts. IEEE test results with no AC applied.

STFE Elite Series - Active Tracking® Filters with Surge Protection

The SolaHD STF Elite DIN Rail Mount Series combines Active Tracking® technology with UL Listed surge protection to protect against the full spectrum of voltage transients and surges. It continuously tracks the input AC power line responding instantly into action upon detecting extraneous high frequency noise and high voltage transients caused by everyday events such as turning on machinery, motors, or equipment.

These devices are designed to meet UL 1449 3rd Edition, UL 1283, cUL recognized, and CE. STFE attenuates or reduces the amplitude of normal mode noise to a minimum of 90dB that occurs in a frequency range of 100KHz to 50MHz, and of common mode noise to a minimum of 60dB that occurs in a frequency range of 5MHz to 50MHz. STFE provides the industry's best IEEE C62.41 Category "A & B" Ringwave protection.

They are built to meet your unique requirements, and are available in hardwired DIN Rail mount, single phase configuration. They are designed for years of trouble free operation and require little or no operator intervention after installation.

Related Products

- Power Conditioners
- Uninterruptible Power System
- Power Supplies

Features

- Series connected DIN Rail mounted filter
- Patented durable metal mount clip
- UL Listed Surge current capacity – 45,000 Amps
- Transient protection in all modes (L-N, L-G, and N-G)
- Single Phase applications up to 20 Amp
- Operating Temperature from -40°C to +50°C
- Screw Terminal Connections
  - Reliable and convenient screw clamp connections
  - Accept 10-16 AWG wire
  - Meet IP20 specifications for ingress protection
- LED status indication
- Form C contact for remote monitoring
- UL 1449 3rd Edition, UL 1283, cUL recognized component, CE
- 5 Year Limited Warranty

Applications

- Control Panels
- Factory Automation Installations
- Point of Use Industrial Equipment
- Programmable Logic Controllers
- Dedicated Industrial and Machine Tools Equipment

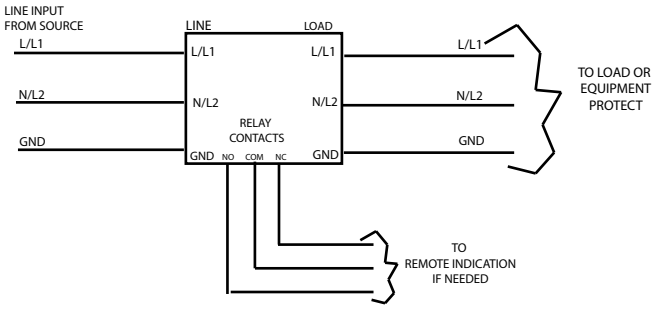
Selection Table

Catalog Number	Input Voltage	
STFE030–10N	120 V	Single Phase 2 Wire + Ground
STFE050–10N	120 V	Single Phase 2 Wire + Ground
STFE100–10N	120 V	Single Phase 2 Wire + Ground
STFE200–10N	120 V	Single Phase 2 Wire + Ground
STFE030–24L	240 V	Single Phase 2 Wire + Ground
STFE050–24L	240 V	Single Phase 2 Wire + Ground
STFE100–24L	240 V	Single Phase 2 Wire + Ground
STFE200–24L	240 V	Single Phase 2 Wire + Ground

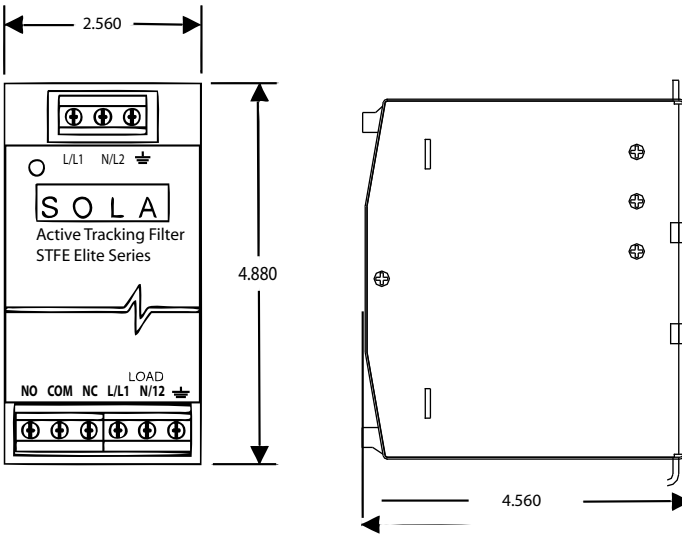
STFE Specifications

Description	STFEXXX–10N	STFEXXX–24L
Input Voltage	120 V (0-150 VRMS)	240 V (0-275 VRMS)
Line Frequency	47 - 63 Hz	
Response Time	< .5 ns normal mode, <5 ns common mode	
Enclosure	Fully Enclosed Metal Housing	
Fusing	Reference Fuse/Circuit Breaker Chart	
Status Indication	Green LED "OK"/Form C Contact/10 Amps @ 250 Vac or 5 Amps @ 100 Vdc	
Connection/Mounting Type	DIN Rail Mount	
Operating Temperature	-40°C to +50°C at full load Derate Linearly to 60% at +70ºC	
Weight (Kg)	1.7 lbs (0.7kg)	
Dimensions – in (mm) (H x W x D)	4.88 x 2.56 x 4.56 (124 x 65 x 116)	
Operating Humidity	0% to 95% Non-condensing	
Peak Surge Current Capability	Per Phase	30,000 Amps
	Line to Neutral	20,000 Amps
	Line to Ground	10,000 Amps
	Neutral to Ground	10,000 Amps
Load Surge Current Rating	10m Sec	5 x Nominal
	1 sec	3 x Nominal
	10 sec	2 x Nominal
Frequency Response		
Normal Mode (Forward–Reverse)	100 kHz to 50 MHz	90 dB Max
Common Mode (Forward–Reverse)	5 MHz to 50 MHz	60 dB Max
Transient Reduction (IEEE C62.41)	Typical Category A Ringwave (6 kV, 200A, 100 kHz)	< 60 V Peak
	Typical Category B Ringwave (6 kV, 500A, 100 kHz)	<100 V Peak UL 1449
Safety	UL 1449 3rd Edition, UL1283, cUL Recognized Component, CE	

Connection Diagram



Dimensional Diagram



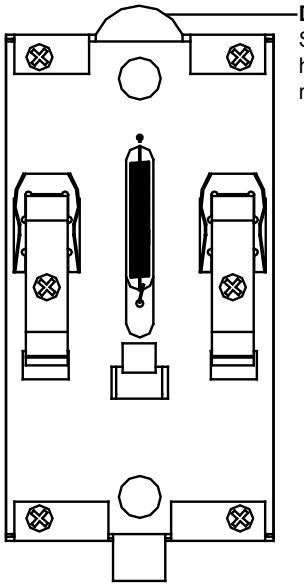
Wiring Specifications

Catalog Number	Amps	Min Wire Size* (AWG Suggested)	Fuse/Circuit Breaker Ampacity	
			Suggest	Max
Single–Phase Models (120 Vac)				
STFE030–10N	3.0	24	3A	3.75A
STFE050–10N	5.0	22	5A	6.25A
STFE100–10N	10.0	20	10A	12.5A
STFE200–10N	20.0	12	20A	25A
Single–Phase Models (240 Vac)				
STFE030–24L	3.0	24	3A	3.75A
STFE050–24L	5.0	22	5A	6.25A
STFE100–24L	10.0	20	10A	12.5A
STFE200–24L	20.0	12	20A	25A

*16 AWG wire or larger may be required by code dependent upon the application.

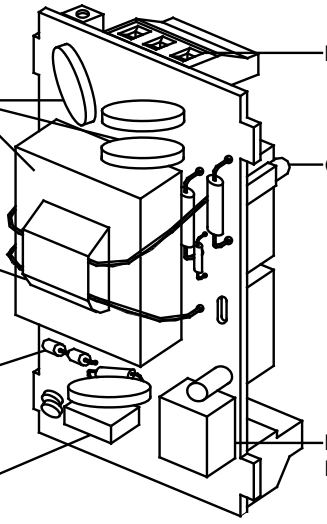
Internal Diagram

Rear View



DIN Connector
Strong all metal for horizontal or vertical mounting

Internal View of Components



Finger Safe Terminals

MOV Array
provides high-energy all mode protection

Green LED Unit Status Indicator

Series Blocking Inductor
blocks voltage, smooths current

Silicone Avalanche Diodes
fast responding surge suppressor

Form C Relay Contacts
DC OK signal

Pulse Capacitor
high-frequency noise absorption

STC Series – Data/Signal Line Surge Protection Devices for Transient Data

NEW

The rapid development of automated controls, telecommunications and fire/security systems has made it imperative to have properly coordinated low-voltage protection. Modern networked industrial facilities require error free transmission of information for maximum productivity and integrity of data.

The SolaHD STC series protects all susceptible low-voltage cable routes entering a facility and at key points within the building. These devices can be used as part of a multi-stage protection strategy which involves clamping the initial high-energy impulse, filtering any remaining noise or transients to the PLC or sensitive equipment and finally, protecting the Data/Signal lines entering and leaving the control panel. Modern, networked industrial facilities require error free transmission of information for maximum productivity and data integrity.

The hybrid design of these Data/Signal Line surge suppressors allows them to respond quickly with high energy absorption. These units are available in a variety of application specific voltage levels and packaging configurations. The STC series is used to protect network signal lines entering or leaving control panels including PLCs, universal remote I/O, DeviceNet™ and Data Highway Plus.

Related Products

- Single and Three Phase Power Conditioners
- Uninterruptible Power System
- Transient Voltage Surge Suppressors
- Active Tracking® Filters
- Power Supplies

Low Voltage - Data/Signal, STC Series

Series	Application
STC–POE	Power-over-Ethernet, Category 5 and Category 6
STC–DRS	DIN Rail mountable, single pair surge protection
STC–642	Two-Pair Data/Signal Protection
STC–CCTV	High-Frequency Coaxial protection for head and camera ends
STC–TEL	RJ11 Telephone Protection

STC-P0E Series, Category 5 and 6 Power-over-Ethernet Applications

The SolaHD STC Power-over-Ethernet (PoE) series is designed to work on Category 5 P0E transmission lines as well as Category 6 applications. They feature both female to female and male to female RJ-45 connection options for ease of installation.

Power-over-Ethernet is a technology for wired Ethernet LANs (Local Area Networks) that allows the electrical current to be carried by the data cables rather than power cords. This minimizes the number of wires that must be strung in order to install the network. The result is lower cost, less downtime, easier maintenance and greater installation flexibility than with traditional wiring.

P0E allows users to power devices over Ethernet cabling. Power and networking is provided over a single cable. PoE has tremendous advantages in industrial applications. The ease of combining signal and power in a single Ethernet cable connection is contributing to the already rapid evolution of Ethernet-based industrial control systems. Category 5e and Category 6 commonly known as Cat5e and Cat6 are the most widely used Ethernet connectivity methods on the market today. Cat5e and Cat6 are defined in ANSI/TIA/EIA 568-B standard for Unshielded Twisted Pair Cabling.

The STC-P0E series is ideally suited to protect expensive equipment and critical communication/data transfer from internally generated transients and noise.

Features

- Exceeds CAT 5 PoE & 6 Transmission Values
- Applications up to 60 Vdc @ 300 mA
- 3 Year Limited Warranty

Specifications

Description	STC–P0E–65FF	STC–P0E–65MF
Mode of Protection	Normal Mode (L-L) All Lines (1-8) Protected	
DC Breakover Voltage	65 Vdc	
Insertion Loss	< .1 dB	
Certified Transmission Speeds	10baseT, 100baseT, 1000baseT	
Peak Surge Energy	300 Watt	
Response Time	<1 ns	
Connectors	RJ-45 (Female — Female)	RJ-45 (Male — Female)
Dimensions - in (mm)	2.3 x 1.0 x .8 (5.84 x 2.54 x 2.032)	3.0 x 1.0 x .8 (7.62 x 2.54 x 2.032)
Warranty	3 years	

STC-DRS Series, DIN Rail Protection

Using three-stage hybrid technology, this DIN Rail mountable, single pair, surge suppressor attenuates over-voltage transients with gas tubes and silicon avalanche components while resetable fuses (PTCs) mitigate sneak currents. The PTC increases resistance by several orders of magnitude when over-currents exceed safe levels. A normal state resumes when over-currents are removed. The ability to self-restore in this manner significantly increases suppressor performance and survivability.

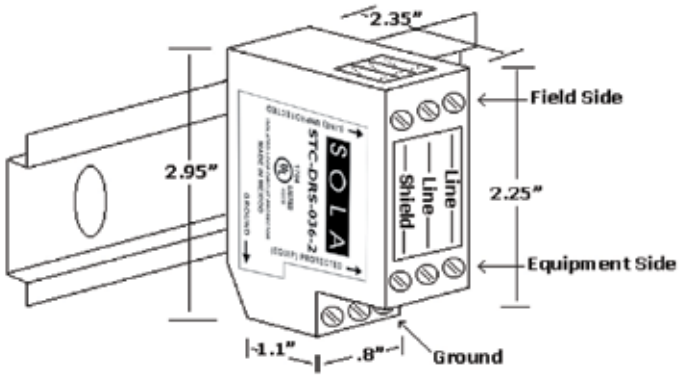
The STC-DRS Series mounts onto a standard 35 mm industrial DIN rail. There are three Field Side and three Electronics Side screw terminals. One is reserved for a shield. Three electrically tied ground terminals are provided for grounding the unit to building-approved ground. The shield is isolated from ground.

497B

Features

- Low-Voltage Data Surge Protection
- Three-Stage Hybrid Technology
- Sneak/Fault Current Protection With Resetable Fuses (PTCs)
- Low Profile Packaging
- Easy Installation
- Fits Standard 35 mm DIN Rail
- Fast Response Time <1 Nanosecond
- UL 497B Listed
- 5 Year Limited Warranty

Dimensions



Notes:
These protectors are intended for indoor use on communication loop circuits that have been isolated from the Public Switch Telephone Network.

The communication loop circuits shall not be exposed to accidental contact with the electric light or power conductors. The protectors shall be installed per the applicable requirements of the National Electric Code, ANSI/NFPA 70.

Selection Table

Catalog Number	Max Peak Signal Voltage	Nominal Breakdown Voltage	Max Current 1p 10X1000 ms (Occurrences)	Peak Current 8X20 ms	Typ. Cap (PF)	Max Continuous Current	Nominal Series Resistance
STC–DRS–232	15	22	>100	10KA	1500	150ma	5 Ω
STC–DRS–036	30	36	>100	10KA	1500	150ma	5 Ω
STC–DRS–060	52	60	>100	10KA	1500	150ma	5 Ω

STC-642 Series, Data/Signal Line Protection

The STC-642 series of surge suppressors are dual pair (four wire) modules using three-stage hybrid technology. This module addresses over voltage transients with gas tubes and silicon avalanche components. In addition, sneak and fault currents are mitigated with resetable fuses (PTCs). The PTCs increase resistance several orders of magnitude when over currents exceed safe levels. A normal state resumes when over currents are removed. The ability to self restore in this manner significantly increases suppressor performance and survivability.

The STC-642 card edge module is gold-plated, double sided and is designed to mate with the STC-642 gold-plated female terminal connector (sold separately). When snapped together, the data circuits pass thru the protector in a serial fashion from the four Field Side terminals to the four Electronics Side terminals. Terminals 1 or 10 of the STC-PCB1B must be attached to building approved ground.

Features

- Lightning Protection for Low Voltage Data
- Signal Lines
- Three-Stage Protection
- Sneak/Fault Current Protection
- Resetable Solid-State Fuses - PTCs
- Low Capacitance Option for High Speed Data
- Plug-in Module / Requires PCB1B Base
- Fast Response Time
- UL Listed 497B
- 5 Year Limited Warranty

Selection Table

Catalog Number	Description
STC–PCB1B	Base for all STC-642 models. Designed to accommodate up to 10 AWG wire. It offers Flat/ Phillips screws and can be mounted using 2 #6 size screws. Must be ordered separately.
STC–FM4–DRC	Optional DIN Rail Mounting Clip for STC-PCB1B

497B

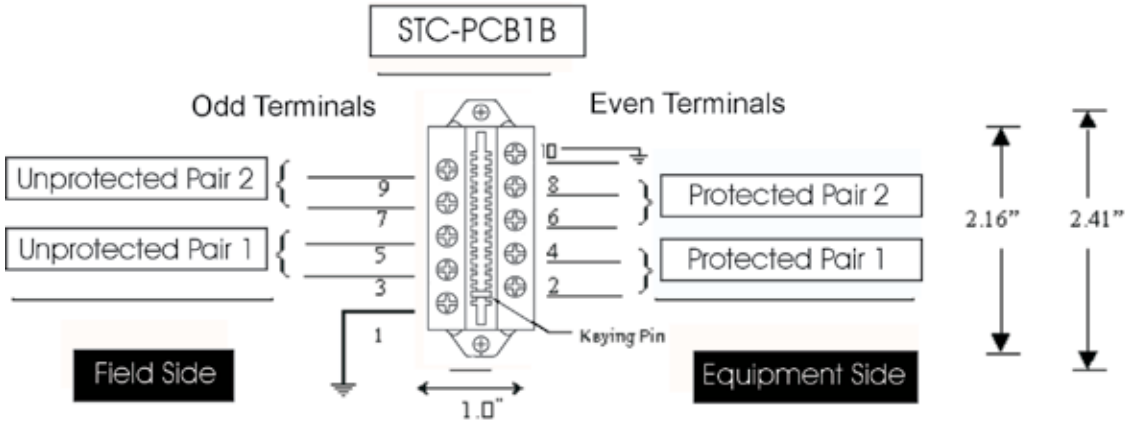
Specifications

Description	STC642–020*	STC642–036*
Peak Surge Current (10 times)	8x20 s .. 10kA 10x700 s 500A per line	
Life Expectancy	8x20 s (2000A) .. >100 occurrences 10x700 s (400A)	
Response Time	<1ns	
Voltage Clamp	20	36
Technology	SAD Hybrid	
Resistance	5 (typical)	
Capacitance (typical)	1500pf	
Operating Temperature	-40°C to +85°C	
Weight	2 oz.	
Dimensions H x W x L (STC–642 & PCB1B)	2.05 x 1.0 x 2.4	
Certifications	UL 497B	
Warranty	5 Years	

*Part number STC-PCBIB sold separately

STC-642 Series, Data/Signal Line Protection

Wiring Diagram (PIN Assignments)

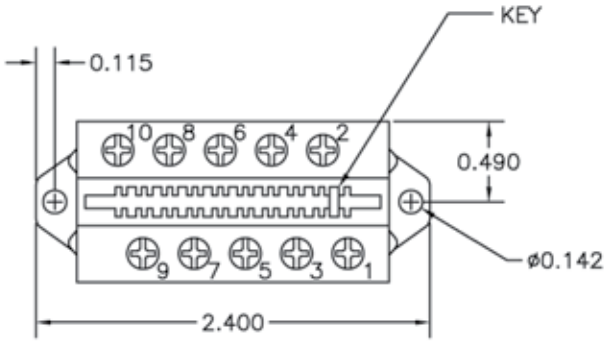


Ground Terminal 1 or 10 (internally tied together) to building approved ground. The STC-PCB1B accommodates 24 to 10 AWG wire.

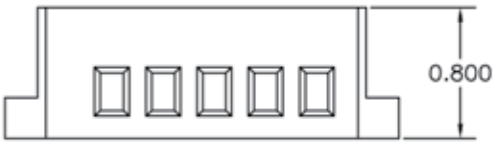
The hybrid design of this product includes series resistance. Do not place this product in service on any signal line capable of supplying more than 150 milliamperes continuously.

These protectors are intended for indoor use on communication loop circuits which have been isolated from the Public Switch Telephone Network.

The communication loop circuits shall not be exposed to accidental contact with the electric light or power conductors. The protectors shall be installed per the applicable requirements of the National Electric Code, ANSI/NFPA 70.



Top View



Side View

Part Numbers by Application

STC642-036 & STC-PCB1B for 4-20 ma Signal
STC642-020 & STC-PCB1B for RS232

STC-CCTV Coax Series

497B

The STC-CCTV Series is tailored specifically to CCTV, data, audio and cable applications. These units are single Coax Surge Protective Devices implementing three-stage hybrid technology. They address overvoltage transients with a primary gas tube, and secondary silicon avalanche components. Over-currents (e.g. sneak and fault currents) are mitigated with solid-state resetable fuses (PTCs). The STC-CCTV units are designed in accordance with NFPA 780 (2004 Edition) requirements, with up to 20kA of surge current capability. The STC-CCTV-75I model has an isolated ground and is recommended for use at the camera end.

Features

- Hybrid, three-stage technology
- Sneak/Fault Current Protection
- Low Insertion Loss
- Shielded Case
- 5 Year Limited Warranty

Application Guide

- CCTV Head End
- CCTV Camera End

Specifications

Description	STC–CCTV–75	STC–CCTV–75I
Operating Voltage	5	
Clamping Voltage	6	
Frequency Range	0 to 20 MHz	
Equipment Location	IEEE Category C, and Category B	
Rated Load Current	0.35 amperes	
Topology	2-port Series	
STC Technology	Primary Stage: Gas Tubes, Secondary Stage: Silicon Avalanche Components Third Stage: resetable fuses (PTCs)	
Modes of Protection	Signal to Ground	
Nominal Discharge Current per Mode	10.0 kA	
Maximum Discharge Current per Mode	20.0 kA	
EMI Attenuation	< 0.1 dB at 20 MHz	
VSWR	< 1.2	
Continuous Power	0.72 Watts	
Operating Humidity	0-95 % Non-condensing	
Operating & Storage Temperature	-40°C to +85°C	
Input & Output Connection Type	BNC, 50 Ohm	
Mounting	Flange	
Enclosure Type	Metal	
Certifications	UL 497B Pending, NFPA 780 (2004) Compliant for Communication Protectors	
Warranty	5 Years	

STC-TEL Series – RJ Connection Telephone Protection

The SolaHD STC-TEL series are single pair telephone or Data Line Protectors that use an advanced two-stage hybrid design. These units address over voltage transients with silicon breakover devices, while sneak and fault currents are mitigated with resetable fuses (PTCs).

These units use two screw terminals to connect a Telco line to the protector. The equipment to be protected then plugs into the female modular jack on the STC-TEL.

497A

Features

- <1 Nanosecond Response Time
- Solid State Silicon Breakover Technology
- Low Capacitance
- Over current Protection
- UL 497A Listed
- Line-to-Line, Line-to-Ground Protection
- Resetable Fuses PTCs
- 5 Year Limited Warranty

Applications

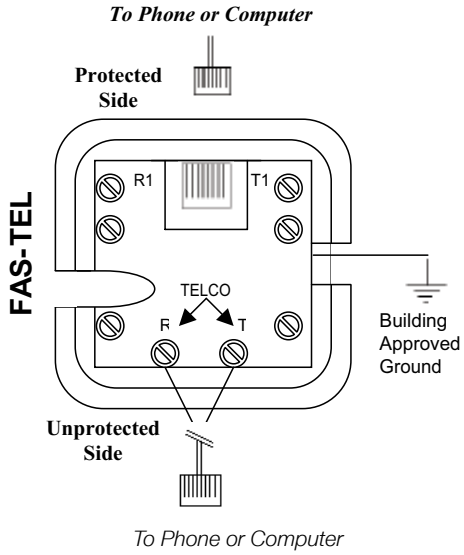
- Telephone Lines
- Data Lines

Specifications

Catalog Number	Max Peak Signal Voltage	Nominal Breakdown Voltage	Max Current 1p (10X1000ms) (Occurrences)	Max Clamp* Voltage @Ip	Typ. Cap (PF)	Max Continuous Current	Nominal Series Resistance
STC–TEL–200T	220	270	100 (T-G)(R-G)	10	50	150ma	8 Ω

* Forward voltage after breakover.

Installation



CVS Hardwired Series – Constant Voltage Transformers

Superior voltage regulation of ±1% sets the CVS series apart from other power conditioning technologies on the market. Extremely tight regulation is accomplished by SolaHD's patented ferroresonant transformer technology. The CVS recreates a well regulated sinusoidal waveform that is well isolated from input disturbances including:

- Impulses
- Brownouts
- Severe waveform distortion
- Swells
- Sags

No other power conditioning technology provides as complete a solution against these power quality disturbances. The CVS series is ideal for applications where even a small change in voltage level can lead to unscheduled downtime, misoperation, incorrect data or scrapped production.

Features

- Superior voltage regulation of ±1%
- Surge protection tested to ANSI/IEEE C62.41, Class A & B Waveform
- Harmonic filtering
- Hardwired
- Acts as a Step-up/Step-down Transformer
- Galvanic isolation provides exceptional circuit protection.
- 25 year typical Mean Time Between Failure
- No maintenance required

Applications

- Industrial automation and control equipment PLCs
- Analytical laboratory and factory automating equipment
- Photo processing equipment
- Sound/recording systems
- Photographic enlargers
- Broadcast equipment

Related Products

- On-line UPS (S4K Industrial)
- Surge Protection
- Three Phase Power Conditioners
- Active Tracking® Filters

Selection Tables: Single Phase

Group 1 – CVS Series, 60 Hz

VA	Catalog Number	Voltage Input	Voltage Output	Height (inch)	Width (inch)	Depth (inch)	Ship Weight (lbs)	Design Style	Elec Conn
30	**23–13–030–2**	120	120	7	4	5	9	1	J
60	**23–13–060–2**	120	120	7	4	5	9	1	J
120	**23–22–112–2**	120, 240	120	8	4	5	13	1	J
250	**23–23–125–8**	120, 240, 480	120	11	6	8	29	1	G
500	**23–23–150–8**	120, 208, 240, 480	120, 240	13	9	7	42	1	H
1000	**23–23–210–8**	120, 208, 240, 480	120, 240	17	9	7	65	1	H
2000	**23–23–220–8**	120, 208, 240, 480	120, 240	18	13	10	111	1	H
3000	**23–23–230–8**	120, 208, 240, 480	120, 240	19	13	10	142	1	H
5000	**23–23–250–8**	120, 208, 240, 480	120, 240	28	13	10	222	1	H
7500*	**23–28–275–6**	240, 480	120, 240	27	25	9	365	2	J

* This unit is not CSA Certified.

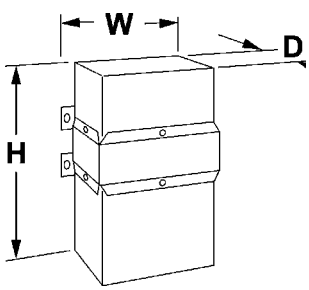
Specifications

Parameter	Condition	Value
	Input	
Voltage	Continuous at full load (lower input voltage possible at lighter load)	+10% to -20% of nominal
	For temporary surge or sags	+20% to -35% of nominal
Current[1]	at Full Load & 80% of nominal input voltage	$I_{in} \cong (VA/.87)/(V_{in} \times 80\%)$
Frequency	See Operating Characteristics section for details.	60 Hz
	Output	
Line Regulation	V_{in} >80% and <110% of nominal	±1%
Overload Protection	At Nominal Input Voltage	Current limited at 1.65 times rated current
Output Harmonic Distortion	At Full Load within Input Range	3% total RMS content
Noise Attenuation	-Common Mode -Transverse Mode	40 dB 40 dB
	General	
Efficiency	At Full Load	Up to 92%
Storage Temperature	Humidity <95% non-condensing	-20° to 80°C
Operating Temperature	Humidity <95% non-condensing	-20° to 50°C
Audible Noise	Full Resistive Noise	32 dBA to 65 dBA
Approvals	60 Hz Models	UL1012, CSA[2]
Warranty	See General Information section for details	10 Years

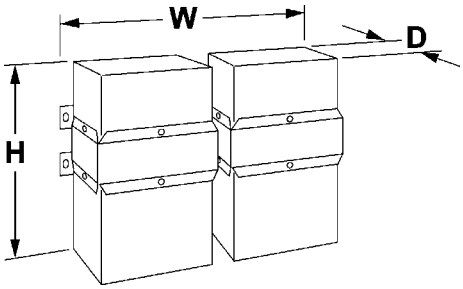
Notes:

1 - Consult user manual for fuse sizing.
2 - Applies to all models except 23-28-275-6.
3 - It is recommended that the unit run at a minimum of 40-50% load.
See the **Operating Characteristics** section of this chapter for more information.

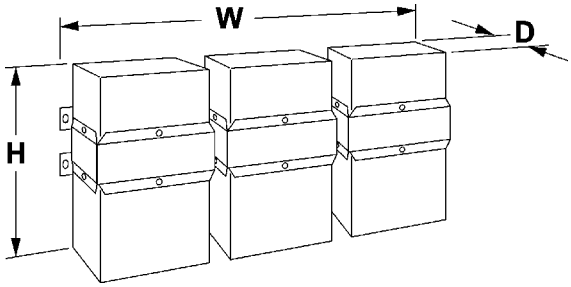
Design Styles (CVS and MCR Hardwired)



Style 1



Style 2



Style 3

These styles are single phase only.

MCR Hardwired Series – Power Line Conditioning with Voltage Regulation

The MCR Hardwired Series provides excellent noise filtering and surge protection to safeguard connected equipment from damage, degradation or misoperation. Combined with the excellent voltage regulation inherent to SolaHD's patented ferroresonant design, the MCR can increase the actual Mean Time Between Failure (MTBF) of protected equipment. The MCR is a perfect choice where dirty power, caused by impulses, swell, sags, brownouts and waveform distortion can lead to costly downtime because of damaged equipment.

Related Products

- On-line UPS (S4K Industrial)
- Surge Protection
- Three Phase Power Conditioners
- Active Tracking® Filters

Features

- ±3% output voltage regulation
- Noise attenuation
  - 120 dB common mode
  - 60 dB transverse mode
- Surge protection tested to ANSI/IEEE C62.41 Class A & B Waveform:
  - <10 V let through typical
- Acts as a step-up or step-down transformer
- Harmonic filtering
- Hardwired
- Galvanic isolation provides exceptional circuit protection.
- 25 year typical MTBF
- No maintenance required

Applications

- Industrial automation and control equipment PLCs
- Machine tools
- Computer loads and electronic equipment
- Robotics
- Semiconductor fabrication equipment

Selection Tables: Single Phase

Group 2 – MCR Series, 60 Hz Only

c UL us

VA	Catalog Number	Voltage Input	Voltage Output	Height (inch)	Width (inch)	Depth (inch)	Ship Weight (lbs)	Design Style	Elec Conn
120	**63–23–112–4**	120, 208, 240, 480	120	9	4	5	15	1	D
250	**63–23–125–4**	120, 208, 240, 480	120	10	6	8	27	1	D
500	**63–23–150–8**	120, 208, 240, 480	120, 208, 240	13	9	7	37	1	E
750	**63–23–175–8**	120, 208, 240, 480	120, 208, 240	14	9	7	52	1	E
1000*	**63–23–210–8**	120, 208, 240, 480	120, 208, 240	17	9	7	62	1	E
1500*	**63–23–215–8**	120, 208, 240, 480	120, 208, 240	17	13	9	95	1	E
2000*	**63–23–220–8**	120, 208, 240, 480	120, 208, 240	18	13	9	109	1	E
3000*	**63–23–230–8**	120, 208, 240, 480	120, 208, 240	19	13	9	142	1	E
5000*	**63–23–250–8**	120, 208, 240, 480	120, 208, 240	28	13	9	222	1	E
7500**	**63–28–275–8**	208, 240, 480	120, 208, 240	27	26	9	362	2	F
10000**	**63–28–310–8**	208, 240, 480	120, 208, 240	28	26	9	446	2	F
15000**	**63–28–315–8**	208, 240, 480	120, 208, 240	28	38	10	710	3	F

* Canadian option: cULus certified units must be ordered by changing "-8" (UL only) to "-C8".
** UL Listed Only. Use Group 3 for cULus.

Contact **Technical Services** at **(800) 377-4384** with any questions.
Visit our website at www.solahd.com.

Selection Tables: Single Phase

Group 3 – MCR Series, 60 Hz Only

VA	Catalog Number	Voltage Input	Voltage Output	Height (inch)	Width (inch)	Depth (inch)	Ship weight (lbs)	Design Style	Elec Conn
500	**63–31–150–8**	600	120, 208, 240	13	9	7	38	1	B
1000	**63–32–210–8**	600	120, 208, 240	17	9	7	62	1	B
2000	**63–32–220–8**	600	120, 208, 240	18	13	10	109	1	B
3000	**63–32–230–8**	600	120, 208, 240	19	13	10	142	1	B
5000	**63–29–250–8**	208, 240, 480, 600	120, 208, 240	28	13	10	221	1	A
7500	**63–29–275–8**	208, 240, 480, 600	120, 208, 240	27	25	10	360	2	A
10000	**63–29–310–8**	208, 240, 480, 600	120, 208, 240	28	25	10	441	2	A
15000	**63–29–315–8**	208, 240, 480, 600	120, 208, 240	28	38	10	706	3	A

Group 4 – MCR Series, 50 Hz Only (±5% output voltage regulation)

VA	Catalog Number	Voltage Input	Voltage Output	Height (inch)	Width (inch)	Depth (inch)	Ship weight (lbs)	Design Style	Elec Conn
120	**63–23–612–8**	110, 120, 220, 240, 380, 415	110, 120, 220, 240	9	6	8	24	1	C
250	**63–23–625–8**	110, 120, 220, 240, 380, 415	110, 120, 220, 240	11	6	8	27	1	C
500	**63–23–650–8**	110, 120, 220, 240, 380, 415	110, 120, 220, 240	13	9	7	40	1	C
1000	**63–23–710–8**	110, 120, 220, 240, 380, 415	110, 120, 220, 240	18	9	7	64	1	C
2000	**63–23–720–8**	110, 120, 220, 240, 380, 415	110, 120, 220, 240	18	13	10	113	1	C
3000	**63–23–730–8**	110, 120, 220, 240, 380, 415	110, 120, 220, 240	27	13	10	162	1	C
5000	**63–23–750–8**	110, 120, 220, 240, 380, 415	110, 120, 220, 240	30	13	10	266	1	C
7500	**63–28–775–8**	220, 240, 380, 415	110, 120, 220, 240	28	26	10	393	2	C1
10000	**63–28–810–8**	220, 240, 380, 415	110, 120, 220, 240	30	26	10	490	2	C2
15000	**63–28–815–8**	220, 240, 380, 415	110, 120, 220, 240	30	38	10	776	3	C2

Specifications

Parameter	Condition	Value
	Input	
Voltage	Continuous at full load (lower input voltage possible at lighter load)	+10% to -20% of nominal
	For temporary surge or sags	+20% to -35% of nominal
Current[1]	at Full Load & 80% of nominal input voltage	$I_{in} \cong (VA/.89)/(V_{in} \times 80\%)$
Frequency	See Operating Characteristics section for details.	50 Hz or 60 Hz depending on model
	Output	
Line Regulation	V_{in} >80% and <110% of nominal	± 5% for 50 Hz units, ± 3% for 60 Hz units
Overload Protection	At Nominal Input Voltage	Current limited at 1.65 times rated current
Output Harmonic Distortion	At full load within input range	3% total RMS content
Noise Attenuation	Common Mode Transverse Mode	120 dB 60 dB
	General	
Efficiency	At Full Load	Up to 92%
Storage Temperature	Humidity <95% non-condensing	-20° to +85°C
Operating Temperature	Humidity <95% non-condensing	-20° to 50°C
Audible Noise	Full Resistive Noise	35 dBA to 65 dBA
Approvals	60 Hz Models	UL1012, CSA evaluated by UL
	50 Hz Models	CE (EMC & LVD)
Warranty	See General Information section for details	10 + 2 Years

Notes: 1 - Consult user manual for fuse sizing.
2 - It is recommended that the unit run at a minimum of 40-50% load.

Contact **Technical Services** at **(800) 377-4384** with any questions.
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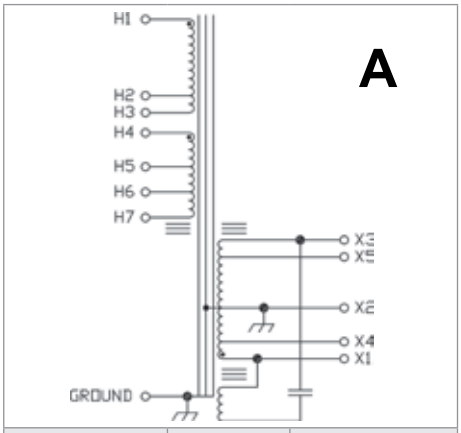
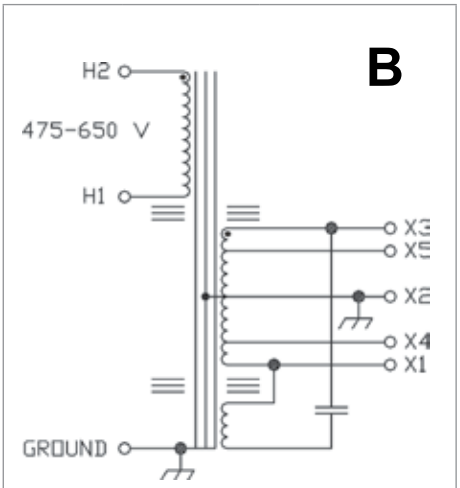
Electrical Connections



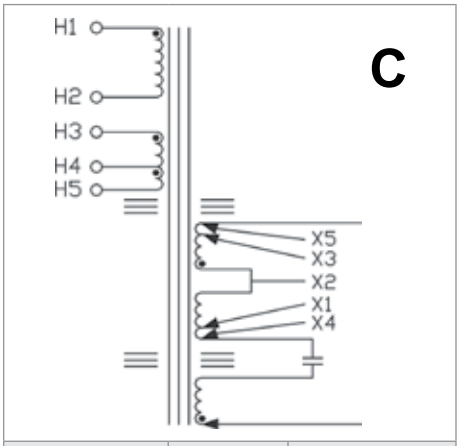
Primary Voltage	Interconnect	Connect Lines To
208	H1 to H4 H2 to H5	H1 & H5
240	H1 to H4 H3 to H6	H1 & H6
480	H3 to H4	H1 & H6
600	H3 to H4	H1 & H7
Secondary Voltage	**Interconnect**	**Connect Lines To**
120		X1 & X2 or X3 & X2
208		X4 & X5
240		X1 & X3

MCR 60 Hz 5000–15000 VA



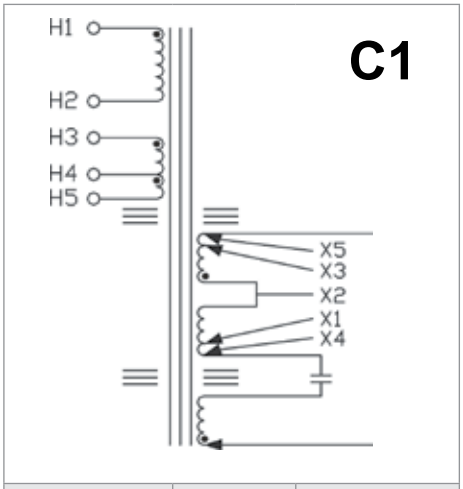
Primary Voltage	Interconnect	Connect Lines To
600		H1 & H2
Secondary Voltage	**Interconnect**	**Connect Lines To**
120		X1 & X2 or X3 & X2
208		X4 & X5
240		X1 & X3

MCR 60 Hz 500–3000 VA



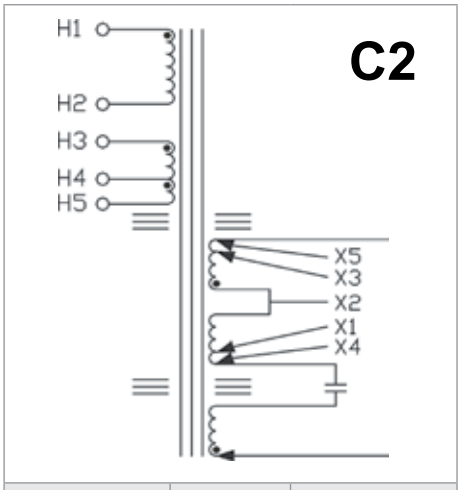
Primary Voltage	Interconnect	Connect Lines To
110-120	H1 to H3 H2 to H4	H1 & H4
220-240	H2 to H3	H1 & H4
380-415	H2 to H3	H1 & H5
Secondary Voltage	**Interconnect**	**Connect Lines To**
110		X1 & X2 or X3 & X2
120		X4 & X2 or X5 & X2
220		X1 & X3
240		X4 & X5

MCR 50 Hz 120–5000 VA



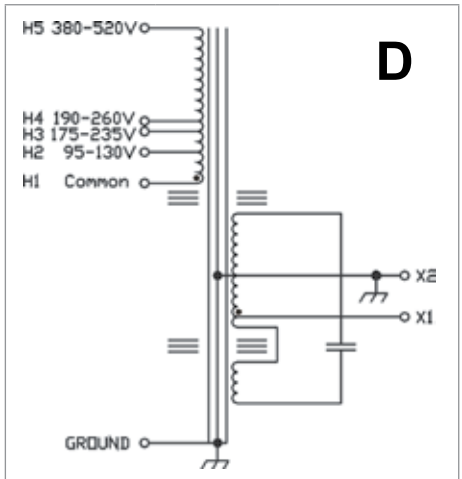
Primary Voltage	Interconnect	Connect Lines To
220-240	H1 to H3 H2 to H5	H1 & H5
380-415	H2 to H3	H1 & H4
Secondary Voltage	**Interconnect**	**Connect Lines To**
110		X1 & X2 or X2 & X3
120		X4 & X2 or X5 & X2
220		X1 & X3
240		X4 & X5

MCR 50 Hz 7500 VA



Primary Voltage	Interconnect	Connect Lines To
220-240	H2 to H3	H1 & H4
380-415	H2 to H3	H1 & H5
Secondary Voltage	**Interconnect**	**Connect Lines To**
110		X1 & X2 or X3 & X2
120		X4 & X2 or X5 & X2
220		X1 & X3
240		X4 & X5

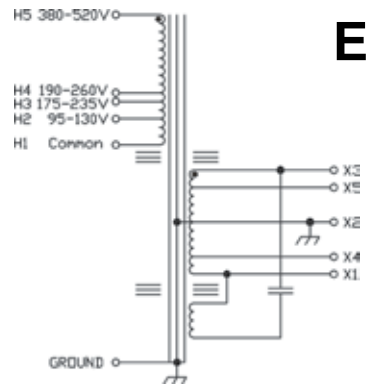
MCR 50 Hz 10000–15000 VA



Primary Voltage	Interconnect	Connect Lines To
120		H1 & H2
208		H1 & H3
240		H1 & H4
480		H1 & H5
Secondary Voltage	**Interconnect**	**Connect Lines To**
120		X1 & X2

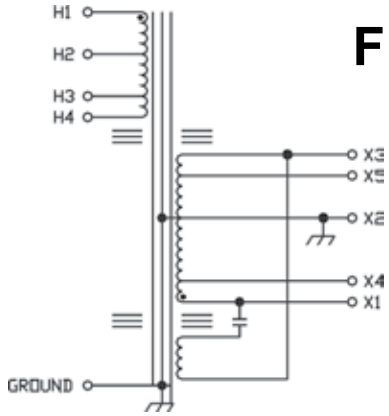
MCR 60 Hz 120–250 VA

Electrical Connections



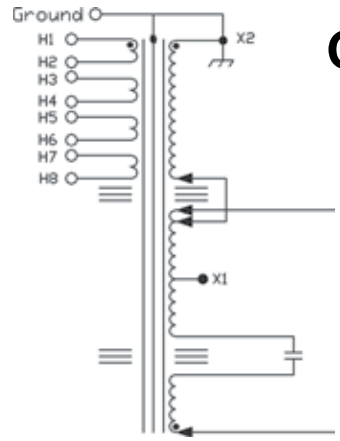
Primary Voltage	Interconnect	Connect Lines To
120		H1 & H2
208		H1 & H3
240		H1 & H4
480		H1 & H5
Secondary Voltage	**Interconnect**	**Connect Lines To**
120		X1 & X2 or X3 & X2
208		X4 & X5
240		X1 & X3

MCR 60 Hz 500–5000 VA



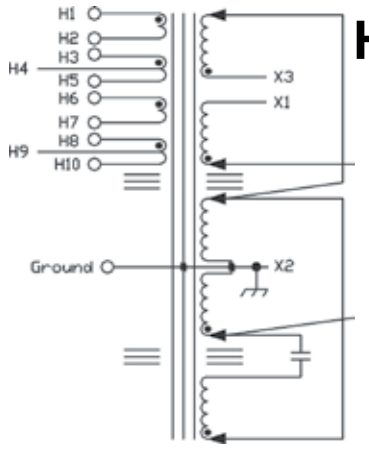
Primary Voltage	Interconnect	Connect Lines To
208		H2 & H3
240		H2 & H4
480		H1 & H4
Secondary Voltage	**Interconnect**	**Connect Lines To**
120		X1 & X2 or X3 & X2
208		X4 & X5
240		X1 & X3

MCR 60 Hz 7500, 10000 and 15000 VA



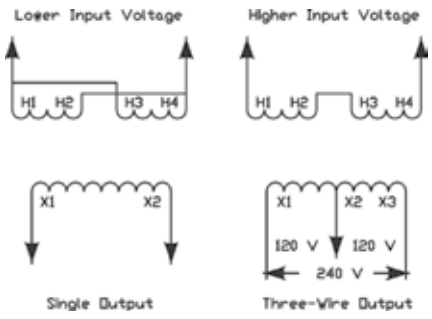
Primary Voltage	Interconnect	Connect Lines To
120	H1 to H3 to H5 to H7 H2 to H4 to H6 to H8	H1 & H2
240	H2 to H3 H6 to H7 H1 to H5 H4 to H8	H1 & H4
480	H2 to H3 H4 to H5 H6 to H7	H1 & H8
Secondary Voltage	**Interconnect**	**Connect Lines To**
120		X1 & X2

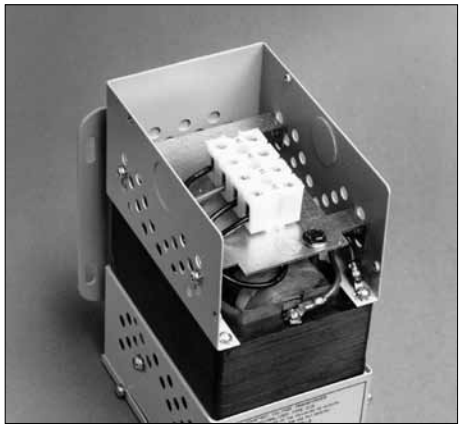
CVS 60 Hz 250 VA only



Primary Voltage	Interconnect	Connect Lines To
120	H1 to H3 to H6 to H8 H2 to H5 to H7 to H10	H1 & H2
208	H2 to H3 H7 to H8 H1 to H6 H4 to H9	H1 & H4
240	H2 to H3 H7 to H8 H1 to H6 H5 to H10	H1 & H5
480	H2 to H3 H5 to H6 H7 to H8	H1 & H10
Secondary Voltage	**Interconnect**	**Connect Lines To**
120		X1 & X2 or X3 & X2
240		X1 & X3

CVS 60 Hz 500–5000 VA





Open MCR/CVS terminal

30 & 60 VA Primary Voltage	120 VA Primary Voltage	7500 VA Primary Voltage	Interconnect	Connect Lines To
120	N/A	N/A	Note: H3 & H4 are not used	H1 & H2
N/A	120	240	H1 to H3 H2 to H4	H1 & H4
N/A	240	480	H2 to H3	H1 & H4
30 & 60 VA Secondary Voltage	**120 VA Secondary Voltage**	**7500 VA Secondary Voltage**	**Interconnect**	**Connect Lines To**
120	120	N/A		X1 & X2
N/A	N/A	120		X1 & X2 or X3 & X2
N/A	N/A	240		X1 & X3

Note: *Secondaries are not grounded. Ground X_2 per Code.*

CVS 60 Hz 30–120 VA & 7500 VA

MCR Portable Series – Power Line Conditioning with Voltage Regulation

The MCR provides excellent noise filtering and surge protection to protect connected equipment from damage, degradation or misoperation. Combined with the excellent voltage regulation inherent to SolaHD's patented ferroresonant design, they can increase the actual Mean Time Between Failure (MTBF) of protected equipment. These units are a perfect choice where dirty power caused by impulses, swell, sags, brownouts and waveform distortion can lead to costly downtime because of damaged equipment.

MCR Portable Series

Applications

- Computers/ Printers
- POS terminals
- Laboratory equipment
- Telephone/FAX systems
- Security systems
- LAN networks

Features

- ±3% output voltage regulation
- Noise attenuation
  - 120 dB common mode
  - 60 dB transverse mode
- Surge protection tested to ANSI/IEEE C62.41 Class A & B Waveform (<10 V let-through typical)
- Harmonic filtering
- Galvanic isolation provides exceptional circuit protection.
- Point-of-use Protection (cord & plug connected)
  - Easy & Flexible Installation
- 25 year typical MTBF
- No maintenance required

Related Products

- DIN Rail AC UPS (SDU)
- Off-Line UPS (S1K Mini-Tower)
- Line-Interactive UPS (S3K Mini-Tower)

Specifications

Parameter	Condition	Value
	Input	
Voltage	Continuous at full load (lower input voltage possible at lighter load)	+10% to -20% of nominal
	For temporary surge or sags	+20% to -35% of nominal
Current	At Full Load & 80% of nominal input voltage	$I_{in} \cong (VA/.89)/(V_{in} \times 80\%)$
Frequency	See Operating Characteristics section for details.	60 Hz depending on model
	Output	
Line Regulation	V_{in} >80% and <110% of nominal	± 3% for 60 Hz units
Overload Protection	At Nominal Input Voltage	Current limited at 1.65 times rated current
Output Harmonic Distortion	At full load within input range	3% total RMS content
Noise Attenuation	-Common Mode -Transverse Mode	120 dB 60 dB
Let–Through	ANSI/IEEE C62.41 Class A & B Waveform	<10V typical
	General	
Efficiency	At Full Load	92% Typical
Storage Temperature	Humidity <95% non-condensing	-20° to +85°C
Operating Temperature	Humidity <95% non-condensing	-20° to 40°C
Audible Noise	Full Resistive Noise	35 dBA to 65 dBA
Approvals	60 Hz Models	UL1012[1] ,CSA (or cUL)[1]
Warranty	See General Information section for details	10 + 2 Years

Notes: 1 - Depending on model, see selection tables to confirm agency approvals for specific model numbers.

Selection Tables: Single Phase

Group A – MCR Portable Series, 60 Hz Only

VA	Catalog Number	Voltage Input/Output	Height (inch)	Width (inch)	Depth (inch)	Ship Weight (lbs)	Receptacle (No.) Type (NEMA)	Plug (NEMA)
70	**63–13–070–6**	120	6	7	9	18	(4) 5-15R	5-15P
150	**63–13–115–6**	120	6	7	9	21	(4) 5-15R	5-15P
250	**63–13–125–6**	120	6	7	9	26	(4) 5-15R	5-15P
500	**63–13–150–6**	120	9	9	16	32	(4) 5-15R	5-15P
750	**63–13–175–6**	120	9	9	16	64	(4) 5-15R	5-15P
1000	**63–13–210–6**	120	9	9	16	69	(4) 5-15R	5-15P
1500*	**63–13–215–6**	120	11	11	17	95	(6) 5-15R	5-20P
2000**	**63–13–220–6**	120	11	11	17	115	(4) 5-15R, (1) L5-30R	L5-30P
3000**	**63–13–230–6**	120	11	11	17	143	(4) 5-15R, (1) L5-30R	5-50P

* This unit is $_{C}UL_{US}$ certified.

** This unit is not CSA certified.

Back Panels

60 Hz, 70 – 1000 VA, (4) 5-15R Receptacles

60 Hz, 2000–3000 VA, (4) 5-15R and (1) L5-30R Receptacle

Plug & Receptacle Reference Chart

Model Comparison

Description	Hardwired CVS	Hardwired MCR	Portable MCR
VA Ratings	30 to 7500 VA	120 to 15000 VA	70 to 3000 VA
Input Voltage Range	+10/-20% of nominal		
Voltage Regulation	±1% for an input line variation of +10/-20%. No loss of output for line loss of 3 msec.	±3% for an input line variation of +10/-20% (50 Hz hardwired units ±5%.) No loss of output for complete line loss of 3 msec.	
Overload	Limits output current to 1.65 x rated current at nominal input.		
Output Harmonic Distortion	3% total RMS content at full load.		
Noise Isolation	40 dB common and normal code.	120 dB common mode and 60 dB normal mode.	
Surge Protection	Up to 6000 Volt surges are suppressed to a let through of less than 1% per ANSI/IEEE C62.41 Class A & B waveforms.	ANSI/IEEE C62.41 Class A & B 6000 waveforms are suppressed to a let-through of less than 0.2%.	
Efficiency	Up to 92% at full load		Up to 90% at full load
Operating Temperature	-20°C to 50°C		-20°C to 40°C
Audible Noise	32 dB to 65 dB	35 dB to 65 dB	34 dB to 49 dB
Conformance	Listed to UL 1012. CSA Certified	UL Listed and CSA Certified. 50 Hz models in compliance with Low Voltage Directive Specification EN60950.	Listed to UL 1012. CSA Certified on all models except 3000 VA.
Warranty	10 years		

Note: All values are typical and may vary based on VA ratings of actual units.

BTU Output Chart for CVS and MCR Series

VA Ratings	120	250	500	750	1000	1500	2000	3000	5000	7500	10000	15000
Total BTU's	136	225	280	444	519	686	1229	1331	2117	2407	3209	4813

Note: Ratings are for a 40°C ambient temperature.

Operating Characteristics of the CVS & MCR Series

Regulation

SolaHD's CVS power conditioners will hold output voltages to ±1.0% or less with input variations as great as ±15% (115V ±15% or 120 V +10%/-20%). Units operated at less than rated load will maintain approximately ±1% regulation over a wider input line voltage variation. Output meets NEMA voltage specifications even when input voltage drops to 65% of nominal. The output versus input voltage relationship for a typical CVS is show in Figure A.

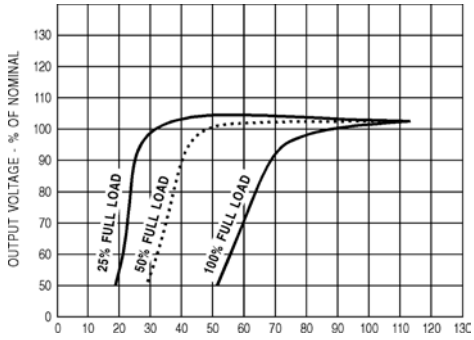


Figure A: Load Variation

Note: MCR line regulations: ±3% for 60 Hz; ±5% for 50 Hz. The typical performances shown in Figure B indicate that most of the residual changes take place near the lower (95 V) and upper (130 V) ends of the input range. It is possible to improve output regulation if line variations remain within a restricted range near the center of the nameplate range (for example, 100-120 V).

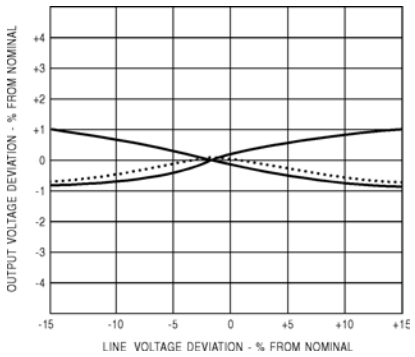


Figure B: Line Regulation

Normally, the output voltage will rise as the load is decreased. Typical percentages for changes in resistive load from full to zero load as shown below.

CVS Conditioner Rating – VA	Increase in Output Voltage due to Load Removal
30	3%
60 & 120	2%
250 & over	1%

Except as noted, all characteristics of Sola/HD's CVS products also apply to the MCR series.

Input Characteristics

SolaHD power conditioners include a resonant circuit that is energized whether or not it is serving load. The input current at no load or light load may run 50% or more of the full primary current. As a result, the temperature of the unit may rise to substantially full-load level, even at light or no load. Input power factor will average 90-100% at full load, but may drop to about 75% at half load and 25% at no load. In any case, the current is always leading. The input no load watts are about 12.5% of the VA rating.

Frequency

Output voltage varies linearly with a change of frequency of the input voltage. This change is about 1.5% of the output voltage for each 1% change in input frequency and in the same direction as the frequency change.

Power Factor

SolaHD power conditioners regulate any power factor load. Output voltage is a function of load current and load power factor (see Figure C). If lower voltage under lagging power factor is objectionable, correction may be made with capacitors at the load. "Median" value of output voltage will vary from the nameplate rating if the load has a power factor other than that for which the transformer was designed. Load regulation will also be relatively greater as the inductive load power factor is decreased (see Figure C). However, the resulting median values of output voltage will be regulated against supply line changes at any reasonable load or load power factor.

Operating Characteristics of the CVS & MCR Series

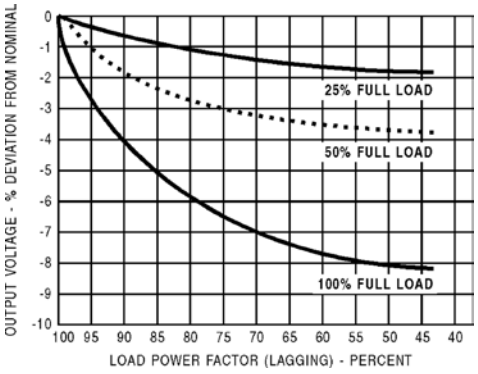


Figure C: Power Factor

Efficiency

The copper magnet wire and lamination material used in SolaHD ferroresonant products are selected to achieve efficiencies of 90% or higher. Whether or not an external load is being served, current will be drawn from the line whenever the primary is energized, since the capacitor remains connected in the circuit.

Overload and Short Circuits

When the load is increased beyond the regulator's rated value, a point is reached where the output voltage suddenly collapses and will not regain its normal value until the load is partially released. Under direct short circuit, the load current is limited to approximately 150-200% of the rated full load value and the input watts to less than 10% of normal.

A constant voltage regulator will protect both itself and its load against damage from excessive fault currents. Fusing of load currents may not be necessary. The actual value of short-circuit current varies with the specific design and rating. Units may be operated indefinitely at short-circuit. This characteristic protects the unit itself as well as the load and load circuit being served. Typical overload performance is shown in Figure D.

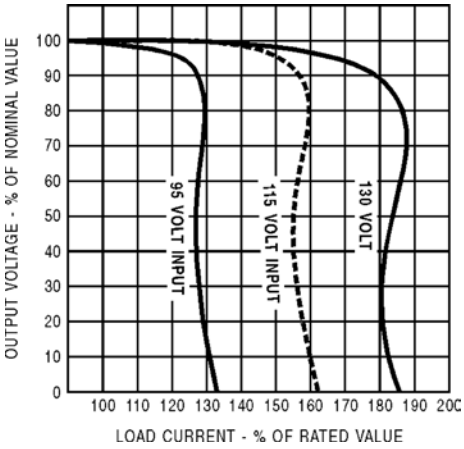


Figure D: Overload Performance

Motor Loads

Because of the fast response time of the SolaHD circuit, any current-limiting characteristic must be taken into account for transient overloads such as motor starting and solenoid operation. In general, the SolaHD constant voltage regulator must have a capacity nearly equal to the maximum demand made on it, even for an instant. To determine the power rating of the regulator, peak motor-starting current or solenoid inrush current should be measured or power factor correcting capacitors should be used to reduce the starting VA of the load.

Response Time

An important advantage of SolaHD's ferroresonant transformer is its fast response time compared with other types of AC regulators. Transient changes in supply voltage are usually corrected within 1½ cycles or less; the output voltage will not fluctuate more than a few percent, even during this interval.

Operating Characteristics of the CVS & MCR Series

Temperature

SolaHD's ferroresonant power conditioners are very stable with respect to temperature. The change in output voltage is only 0.025%/°C. Units are factory adjusted to +2%/-0% of nominal, with full load and nominal input voltage. This adjustment to the high side of nominal is to compensate for the natural temperature drift of about 1% that takes place during initial turn-on or warm-up. When the unit warms up to operating temperature, the voltage typically falls about 1%.

At a stable operating temperature, the output voltage will change slightly with varying ambient temperatures. This shift is equal to approximately 1% for each 40°C of temperature change. The normal maximum temperature rise of a SolaHD power conditioner may fall anywhere in the range of 40°C to 110°C depending on the type and rating. The nominal design ambient range is between -20°C and +50°C (-20°C to +40°C for 70 - 1000 VA, 60 Hz portable models).

External Magnetic Field

In almost all applications, this effect may be disregarded. The exclusive SolaHD "wide outside leg" construction (U.S. Patent 2,806,199) reduces stray magnetic fields to a practical minimum. On critical applications, care should be taken in orientation of the core with respect to critical circuits to minimize the effect of the field.

Phase Shift

The phase difference which exists between input and output voltages is in the range of 120 degrees to 140 degrees at full load. This phase difference varies with the magnitude and power factor of the load, and to a lesser extent, with changes in line voltage and load power factor.

Transient Protection

Ferroresonant power conditioners protect input transients (caused by lightning and load switching) from damaging the sensitive electronic load. A typical surge protective device (SPD) tries to 'clamp' a transient by diverting it to ground. A ferroresonant power conditioner "blocks" the transient. This 'blocking' action is achieved by total physical separation from input (primary) to output (secondary). Because of this difference in operation, it is difficult to apply the same specifications to a ferroresonant power conditioner. Some parallels can be made however.

One, is that under load, the let-through voltage of a ferroresonant power conditioner (SPD refers to "clamping voltage") is less than 10 V above the point where the sine wave would normally be at any given time. The ferroresonant power conditioner is an 'active tracking' suppressor with several advantages. The Ferro power conditioner will not shunt the transient to the ground line as SPD devices typically do. Shunting the transient to ground can cause the disturbance to be transmitted to other sensitive loads within a facility. This can pose serious problems with electronic or microprocessor-based equipment, especially if there is poor grounding within a facility. Other advantages provided by ferroresonant power conditioners include noise filtering, filtering of harmonic distortion and protection against voltage fluctuations such as sags or swells. These features are not provided by standard surge protection devices but are often misrepresented or misused by SPD manufacturers trying to market their product as a "Do All" power quality device.

SOLATRON™ Plus Series - Three Phase Power Conditioners

Features

- Rugged, industrial design
- High overload capability
- High MTBF - No fans used
- No power factor restriction on loads
- Tight regulation for protection against sag (-25%) and swell (+15%) conditions
- Fail-safe, no-break, auto-bypass
- Status indicating lights
- Shielded, copper wound isolation transformer
- Surge protection to ANSI/IEEE and IEC Standards
- High efficiency (96%) microprocessor controlled tap switcher
- Automatic under voltage protection
- UL1012, UL1449-2, $_{C}UL_{US}$ Listed
- Two Year Limited Warranty

Related Products

- STV 100K
- Isolation Transformers

Applications

- Automatic Packaging Machinery
- Large Machine Tool Equipment
- UPS Bypass Circuits
- Retail Store
- Process Equipment

Mechanical Specifications

Indicators	Indicating Lamps: 2 amber (over temperature and bypass mode), 1 green (regulated output present)			
Connections	Field wired, terminal blocks			
Size		H	W	D
	in	42	28	26
	mm	1016	712	661
Safety Agency Approvals	UL1012 and UL1449-2 cUL (Canadian Standard C22.2 No 125) Complies with Part 15 Subpart J of FCC rules for a Class A computing device.			

Environmental Specifications

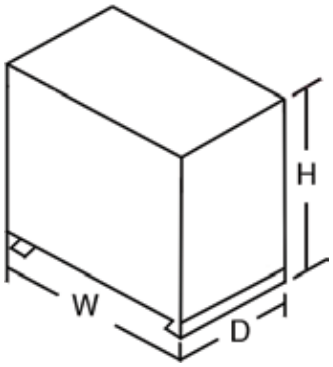
Audible Noise	Less than 50 dBA at 3 feet
Ambient Temperature	0° to 40°C Operating, 0° to 80°C Storage
Operating Altitude	10,000 feet without derating
Operating Humidity	95% relative (non-condensing)

Electrical Specifications

Power Ratings	20, 30, 50, 75 kVA, Three Phase*
Nominal Voltages	See Selection Table
Input Voltage Range	-25% to +15% of nominal rated voltage
Output Voltage Range	Regulated to a max of ± 5% (3% typical) of nominal voltage with an input voltage range of –25% to +15%.
Response Time	Responds to any line variation in <1.5 cycles typical.
Technology	Enhance Voltage Regulation (EVR), Microprocessor controlled electronic tap switching. 6 taps switched at zero current crossing with no output interruption.
Operating Frequency	57-63 Hz
Load Power Factor	No Restriction
Insulation Resistance	100 megohms from winding to core measured at 500 Vdc
Efficiency	96% typical
Overload Capability	1000% of rated load for 1 second 200% of rated load for 1 minute
EMI	Less than 0.2 gauss at a distance of 3 ft.

* Contact Technical Services for other ratings.

Design Style



Contact **Technical Services** at **(800) 377-4384** with any questions.
Visit our website at www.solahd.com.

Protection Specifications

Under Voltage	Output voltage will switch to bypass mode when input is less than 50% of nominal. Regulated output voltage will be re-established once input voltage is with specifications.
Short Circuit Protection	Input circuit breaker
Over Temperature Protection	Amber lamp indication of over temperature at approximately 180°C. Unit switches to by-pass mode until internal temperature is reduced to specified values.

Noise Suppression Performance Specifications

Common Mode Noise Attenuation	150 dB at 100 kHz
Normal Mode Noise Attenuation	65 dB at 100 kHz
Surge Protection	Tested to ANSI/IEEE standard C62.41 A&B

Selection Table

Output kVA	Catalog Number	Vac Input	Vac Output	Ship Weight (lbs/kg)
208 Vac Input, 208Y/120 Vac Output, 60 Hz				
20	**63TAA320**	208	208Y/120	600/273
30	**63TAA330**	208	208Y/120	750/341
50	**63TAA350**	208	208Y/120	950/432
75	**63TAA375**	208	208Y/120	1200/545
480 Vac Input, 208Y/120 Vac Output, 60 Hz				
20	**63TCA320**	480	208Y/120	600/273
30	**63TCA330**	480	208Y/120	750/341
50	**63TCA350**	480	208Y/120	950/432
75	**63TCA375**	480	208Y/120	1200/545
480 Vac Input, 480Y/277 Vac Output, 60 Hz				
20	**63TCC320**	480	480Y/277	600/273
30	**63TCC330**	480	480Y/277	750/341
50	**63TCC350**	480	480Y/277	950/432
75	**63TCC375**	480	480Y/277	1200/545
600 Vac Input, 208Y/120 Vac Output, 60 Hz				
20	**63TDA320**	600	208Y/120	600/273
30	**63TDA330**	600	208Y/120	750/341
50	**63TDA350**	600	208Y/120	950/432
75	**63TDA375**	600	208Y/120	1200/545
Custom Voltages	**240 Vac Input, 240Y/139 Vac Output, 60 Hz 480 Vac Input, 240Y/139 Vac Output, 60 Hz 600 Vac Input, 240Y/139 Vac Output, 60 Hz**			
Contact Technical Services for custom voltages.				

Line Reactors

Drive Isolation Transformers

2

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SLR Line Reactors

SolaHD introduces DIN Rail mounted line reactors as the latest addition to a family of power quality products with a reputation for increasing industrial automation system performance.

The SLR Series is a CE style, DIN Rail Mounted line reactor that provides safe, compact protection for high frequency drives and electronic equipment. The SLR inductive filter prevents damage to any three phase electronic system plagued by capacitor or large load switching. Other benefits include reduced harmonics and input line distortion.

For SCR drive protection, SolaHD recommends our Drive Isolation Transformers (from 7.5 to 440 kVA) to completely isolate the negative effects of SCR drive technology.

No matter what the drive protection, SolaHD has the complete solution.

E226325

Applications

- Variable Frequency Drives
- Any three phase electronic products subject to high current anomalies such as Power Factor Correction capacitor switching.
- SCR Drives

Related Products

- Drive Isolation Transformers
- K-13 Rated Transformers for Variable Speed Drives

Features

- Compact, IP 20 finger safe packaging
- 2-20 HP available
- DIN Rail mount through 20 HP
- Reduces stress on drive components keeping drives running longer
- Removes harmonics and helps keep line voltage smooth through notching
- Reduces nuisance tripping to provide stable system performance
- Eliminates drive cross-talk and interference
- 10-Year warranty

Selection Table

Catalog Number	Power	Output Amperage	Impedance (%Z)	mH	Phase	I/O Voltage	Mounting	Dimensions (H x W x D) – in (mm)	Ship Weight lbs (kg)
SLR–2H–480–3	2 HP	3.4 A	3	5513	3	480 VAC	DIN Rail	4.84 x 4.80 x 4.56 (123 x 122 x 116)	6 (2.72)
SLR–3H–480–3	3 HP	4.8 A		3675					6 (2.72)
SLR–5H–480–3	5 HP	7.6 A		2757					6 (2.72)
SLR–7H–480–3	7.5 HP	11.0 A		1838					7 (3.17)
SLR–10H–480–3	10 HP	14.0 A		1376					7 (3.17)
SLR–15H–480–3	15 HP	21.0 A		1050				4.84 x 5.90 x 4.56 (123 x 150 x 116)	9 (4.08)
SLR–20H–480–3	20 HP	27.0 A		817					16 (7.26)

Drive Isolation Transformers: 7.5–440 kVA, Three Phase

Special Voltages and kVA Sizes for Drive Applications

For SCR (Silicon Control Rectifier) variable speed motor drive applications, a transformer is needed to magnetically isolate the incoming line from the motor drive. The transformer must also provide a voltage change to match the required voltage of the SCR Drive. Standard designs are delta primary and wye secondary to match the common power sources required in most three phase rectifier circuits.

SolaHD drive isolation transformers are specifically designed to handle the mechanical stresses, voltage demands and harmonics associated with SCR applications.

c UL us E77014 UL Listed E25872

Features

- Available from 7.5 thru 440 kVA, 3 Phase, 60 Hz.
- Isolation minimizes load disturbances caused by the SCR drive.
- UL-3R enclosures when used with optional weather shield.
- Taps on all units for adjustments to incoming source voltage. Full capacity secondary neutral as required by the National Electric Code.
- Shielding attenuates line to ground noise.
- 10 year warranty

Related Products

- Surge Protective Devices
- Line Reactors
- K-13 Rated Transformers for Variable Frequency Drives

Accessories

- Weather Shields

Applications

- SCR Variable Speed Drives

Sizing Information (from Selection Table)

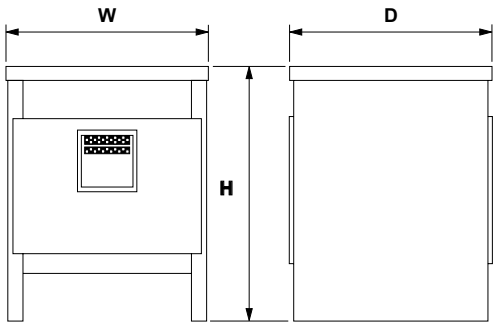
To properly size a drive isolation transformer, follow the drive manufacturer's recommendations or, if you know the motor horsepower, select the proper kVA from the Selection Table on the next page. See the Transformer Sizing section of Chapter 6 (Distribution Transformers).

Note: Other voltage combinations available. Contact Technical Services.

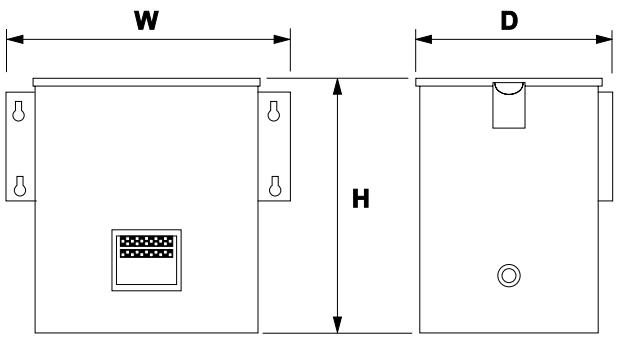
Available upon special order:

- Totally enclosed, non-ventilated units (Non-UL Listed)
- Copper wound transformers

Design Styles



Style 1- Ventilated



Style 4 - Encapsulated

Visit our website at www.solaheviduty.com or
contact **Technical Services** at **(800) 377- 4384** with any questions.

Selection Table: Three Phase

Listed E25872

kVA	Drive Horse Power	Group I Catalog Number	Group II Catalog Number	Group III Catalog Number	NEMA 3R Weather Shield[1]	Dimensions			Ship Weight lbs (kg)	Design Style
		460 D Primary 460Y/266 Secondary 60 Hz	460 D Primary 230Y/133 Secondary 60 Hz	575 D Primary 230Y/133 Secondary 60 Hz		Height (inch)	Width (inch)	Depth (inch)		
7.5[2]	5	**DT651F7.5S**	**DT661F7.5S**	**DT631F7.5S**	N/A[2]	17	20	10	236 (107)	4
11[3]	7.5	**DT651H11S**	**DT661H11S**	**DT631H11S**	WS-02	23	18	14	166 (72)	1
14[3]	10	**DT651H14S**	**DT661H14S**	**DT631H14S**	WS-02	23	18	14	180 (82)	1
20	15	**DT651H20S**	**DT661H20S**	**DT631H20S**	WS-02	23	18	14	210 (95)	1
27	20	**DT651H27S**	**DT661H27S**	**DT631H27S**	WS-14	28	23	16	277 (126)	1
34	25	**DT651H34S**	**DT661H34S**	**DT631H34S**	WS-14	28	23	16	309 (140)	1
40	30	**DT651H40S**	**DT661H40S**	**DT631H40S**	WS-14	28	23	16	329 (149)	1
51	40	**DT651H51S**	**DT661H51S**	**DT631H51S**	WS-14	28	23	16	372 (169)	1
63	50	**DT651H63S**	**DT661H63S**	**DT631H63S**	WS-30	34	28	22	479 (217)	1
75	60	**DT651H75S**	**DT661H75S**	**DT631H75S**	WS-30	34	28	22	510 (231)	1
93	75	**DT651H93S**	**DT661H93S**	**DT631H93S**	WS-30	34	28	22	637 (289)	1
118	100	**DT651H118S**	**DT661H118S**	**DT631H118S**	WS-10	44	33	21	910 (413)	1
145	125	**DT651H145S**	**DT661H145S**	**DT631H145S**	WS-10	44	33	21	920 (417)	1
175	150	**DT651H175S**	**DT661H175S**	**DT631H175S**	WS-11	46	36	24	1150 (522)	1
220	200	**DT651H220S**	**DT661H220S**	**DT631H220S**	WS-11	46	36	24	1280 (581)	1
275	250	**DT651H275S**	**DT661H275S**	**DT631H275S**	WS-11	46	36	24	1415 (642)	1
330	300	**DT651H330S**	**DT661H330S**	**DT631H330S**	WS-11	46	36	24	1525 (692)	1
440	400	**DT651H440S**	**DT661H440S**	**DT631H440S**	WS-12	65	45	35	2450 (1111)	1

1. Weather shields come in a set of two and must be ordered separately.
2. Encapsulated. No weather shield required. cULus E77014.
3. Units are CSA marked.

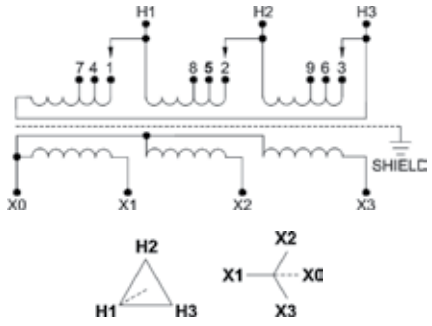
Electrical Connection Key

	Electrical Connection Number
Group I	
7.5 kVA	1
11-440 kVA	4
Group II	
7.5 kVA	2
11-440 kVA	5
Group III	
7.5 kVA	3
11-440 kVA	6

Electrical Connections

460 Δ Primary, 460Y/266 Volt Secondary
Taps: 1,5% FCAN; 1,5% FCBN

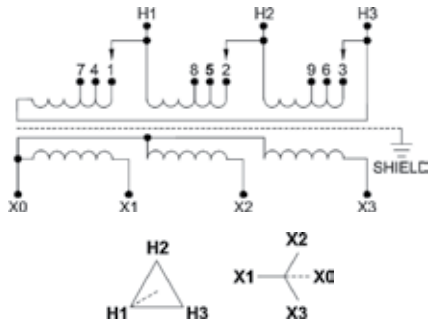
1



Primary Voltage	Connect	Line Leads
483	1-H1 & 2-H2 & 3-H3	H1, H2, H3
460	4-H1 & 5-H2 & 6-H3	H1, H2, H3
437	7-H1 & 8-H2 & 9-H3	H1, H2, H3
Secondary Voltage		**Line Leads**
460		X1, X2, X3
266		X0-X1, X2, X3

460 Δ Primary, 230Y/133 Volt Secondary
Taps: 1,5% FCAN; 1,5% FCBN

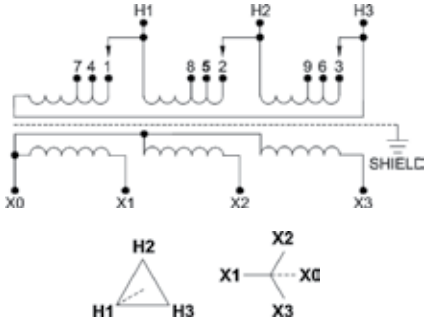
2



Primary Voltage	Connect Taps	Line Leads
483	1-H1 & 2-H2 & 3-H3	H1, H2, H3
460	4-H1 & 5-H2 & 6-H3	H1, H2, H3
437	7-H1 & 8-H2 & 9-H3	H1, H2, H3
Secondary Voltage		**Line Leads**
230		X1, X2, X3
133		X0-X1, X2, X3

575 Δ Primary, 230Y/133 Volt Secondary
Taps: 1,5% FCAN; 1,5% FCBN

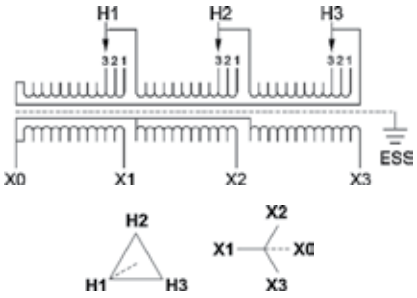
3



Primary Voltage	Connect Taps	Line Leads
604	1-H1 & 2-H2 & 3-H3	H1, H2, H3
575	4-H1 & 5-H2 & 6-H3	H1, H2, H3
546	7-H1 & 8-H2 & 9-H3	H1, H2, H3
Secondary Voltage		**Line Leads**
230		X1, X2, X3
133		X0-X1, X2, X3

460 Δ Primary, 460Y/266 Volt Secondary
Taps: 1,5% FCAN; 1,5% FCBN

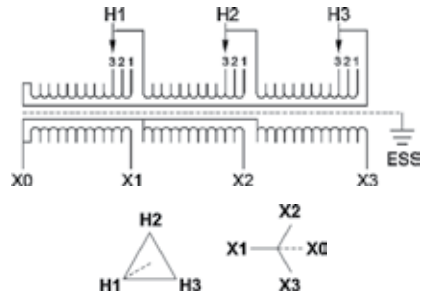
4



Primary Voltage	H1–H2–H3	Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0–X1, X2, X3
1	483	460	266
2	460		
3	437		

460 Δ Primary, 230Y/133 Volt Secondary
Taps: 1,5% FCAN; 1,5% FCBN

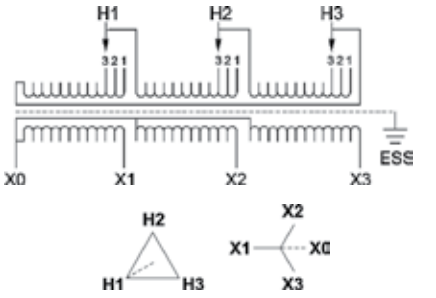
5



Primary Voltage	H1–H2–H3	Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0–X1, X2, X3
1	483	230	133
2	460		
3	437		

575 Δ Primary, 230Y/133 Volt Secondary
Taps: 1,5% FCAN; 1,5% FCBN

6



Primary Voltage	H1–H2–H3	Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0–X1, X2, X3
1	604	230	133
2	575		
3	547		

Selecting a UPS 56

SDU Direct Current DIN Rail UPS 58

SDU (500 VA & 850 VA) Off-line DIN Rail UPS..... 62

S1K (320 VA to 1.2 kVA) Off-line UPS..... 64

S3K (700 VA to 1.4 kVA) Line-Interactive UPS 66

S4K2U, 2U-5 (700 VA - 3000 VA) On-Line UPS..... 68

S4K4U 6 kVA On-Line UPS 73

S4K6U 10 kVA On-Line UPS 73

S4K5U 6 kVA International On-Line UPS 78

S5K Modular (4-20 kVA) On-Line UPS 83

UPS Extended Warranty for UPS up to 6 kVA..... 94

Field Service Programs for UPS 6 kVA and higher 95

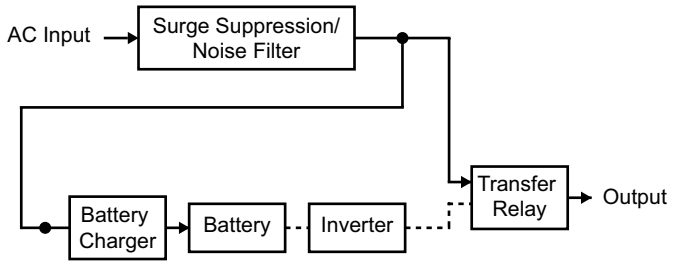
Frequently Asked Questions 237

Selecting a UPS

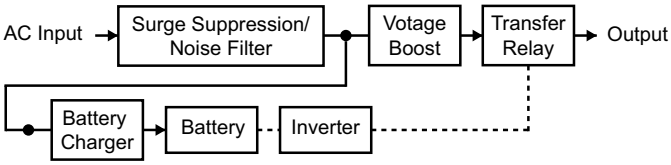
The SolaHD UPS product line consists of four topologies and classes of power protection:

DC topology provides cost effective, efficient back-up power for 24 V DC applications. The SolaHD DC UPS will support the load during AC power loss or power supply failure.

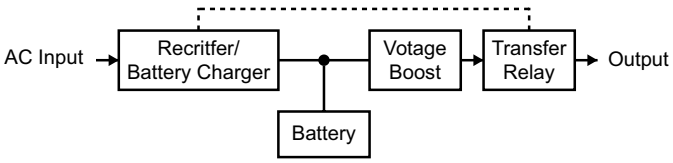
Off–Line topology (also called stand-by) is a cost-effective UPS choice for small, less critical, stand-alone applications such as isolated PLC, PCs and peripherals. Network communications are a useful option.



Line–Interactive topology provides highly effective power conditioning plus battery back-up. This is particularly applicable in areas where power outages are rare, but where there are frequent power fluctuations. Network communications are available and sometime necessary.



The **On–Line** alternative provides the highest levels of power protection, conditioning and power availability. True on-line topology is accomplished with double conversion technology. Network communications are often necessary to protect mission-critical applications.



How to choose the appropriate UPS for your application:

1. Add up the maximum electrical power requirements for all equipment to be protected. To obtain the power rating, multiply: Volts x Amps = VA. Volt and Amp ratings can be found on the nameplate of your equipment.

Equipment to be Protected	Volts	Amperes	VA (Volts x Amperes)
		Subtotal (VA)	
		Future Growth (VA)*	
		Total VA (Subtotal (VA) + Future Growth (VA))	
		Total Watts **	
		Appropriate Model (Based on both Total VA and Watts Calculations)	

2. Choose the level of protection appropriate to your application from Table 1.

3. Turn to the page indicated at the bottom of the matrix for sizes, specifications and other ordering information.

* When sizing the UPS, allow for future expansion. If not available, it is recommended to allow for at least 25% growth.

** Total Watt = Total VA x Power Factor (P.F.) for AC Power only. If power factor is not available, simply multiply VA by 0.7.

If you have any questions about sizing, contact our Technical Services group at (800) 377-4384 or via e-mail at tech@sola-hevi-duty.com.

Table 1: Selection by Technology

Feature	Benefits	DC	Off–Line		Line–Interactive	On–Line	
		SDU DC	SDU AC	S1K	S3K	S4K	S5K
Battery Back–up	Stop power interruptions from destroying data and work in progress	•	•	•	•	•	•
Surge Protection & Filtering	Prevent surges, spikes and noise from damaging your hardware		•	•	•	•	•
Voltage Regulation	Keep working during power sags, brownouts and high line voltage without draining your battery.			• (on 320, 520 & 1500 VA models only)	•	•	•
Sinewave Output	More compatible with sensitive loads				•	•	•
Extended Battery Option	Work through the longest blackouts with the extended battery option	•				•	•
Hardwired Input & Output Possible	Easy, permanent installation with less chance of "accidental" misuse.	•	•			•	•
On–Line "Zero Transfer Time" Performance	Mission-critical work requires on-line premium power protection.	•				•	•
Page Number		**58**	**62**	**64**	**66**	**68**	**81**

Table 2: Selection by Power Rating

VA	Series	Page	VA	Series	Page
240-480 VA DC	SDU DC	58	700-1440 VA	S3K	68
500-850 VA	SDU AC	62	700 VA - 10 kVA	S4K	68
320-1500 VA	S1K	64	4 kVA - 20 kVA	S5K	81

Table 3: Power Quality Problems

Power Problem	Description	Effect	Solution
Blackouts	Total loss of utility power	**Disruption:** Power interruptions stop work in progress and typically result in loss of time and valuable data.	SolaHD UPS
Brownouts (Sags/Swells)	Short-term reductions in utility voltage levels, lasting from a few moments to many hours. Causes include heavy start-up power requirements of nearby loads, and occasional overloading of the utility power system.	**Degradation:** Working in an electrically "dirty" environment reduces the accuracy, effectiveness and life span of all electronic equipment. Productivity and quality of work suffer.	SolaHD UPS
Surges, Spikes and Noise	Disturbances in utility power caused by a variety of sources, such as lightning, utility power switching, nearby noisy loads, electric motors, etc.	**Destruction:** Electrical disturbances typically cause the instantaneous or eventual destruction of valuable systems, data and work in progress.	SolaHD UPS

SDU Series, Direct Current Uninterruptible Power Supply (DC UPS) System

The SDU DIN Rail DC UPS is an advanced 24 Vdc uninterruptible power system that combines an industry leading design with a wide operational temperature range and unique installation options. The SDU DC UPS is a powerful, microprocessor controlled UPS that provides protection from power interruptions. With an input voltage range of 22.5 to 30.0 Vdc, the DC UPS is the ideal power back-up solution for your critical connected loads.

These units were designed specifically for use with SolaHD's popular SDN Series of power supplies. SolaHD's external battery module is the only one on the market that allows you to seal the electronics in the panel and maintain safety by placing the battery outside of a non-ventilated enclosure.

These units include easy to wire screw terminations for critical devices needing battery back-up. The SDU DC UPS includes an automatic self-test feature that checks the UPS and battery functions. Battery charging occurs automatically when input DC power is applied. When power fails, the DC UPS will switch to battery back-up. If the battery is no longer useful, the UPS will sound an alarm and an LED indicator will illuminate.

Back-up power protection in modern industrial applications depends mainly on AC UPS. AC is converted to DC, and converted back to AC in the AC UPS, then converted back to DC in the protected equipment power supply. By applying the new SolaHD SDU DIN Rail DC UPS, you avoid the inefficiencies of all these conversions. This design maximizes system up-time flexibility, and optimizes reliability assurance.

Applications

- Industrial/Machine Control
- Automation Process Control
- Computer-based Control Systems
- Conveying Equipment
- Material Handling
- Packaging Machines
- Semiconductor fabrication equipment
- DeviceNet™
- Amusement Park Equipment
- Pharmaceutical Applications
- Control Rooms

c UL us LISTED IND. CONT. EQ

c UL us E137632 I.T.E.

CE FC

Features

- Modular, rugged industrial grade design
- Microprocessor based controls
- Automatic self-test feature for UPS function and battery management check
- Power module wide operation temperature range (-20 to +50°C)
- Flexible batteries back-up expansion capabilities
- Overload protection in normal and battery modes
- User replaceable batteries
- Both power and battery modules are UL508 Listed
- IP-20 rated input and output screw terminals
- No internal fan, no extra cooling required
- Sturdy, reliable all metal DIN Rail mounting connector
- LED Status Indicators
- Universal Dry Contact Relay terminals provide remote signaling
- Monitoring, diagnostics, and remote turn-on and shut-off capabilities
- Limited two-year warranty

Related Products

- SDN-P Series DIN Rail Power Supplies
- SDN-C Series DIN Rail Power Supplies
- STV 25K Series Surge Protective Devices

Selection Table

Catalog Number	Description	Approx. Ship Weight lbs (kg)
SDU 10-24	240 VA, 24V/10A DIN Rail DC UPS power module, battery module is required	1.65 (0.65)
SDU 20-24	480 VA, 24V/20A DIN Rail DC UPS power module, battery module is required	1.65 (0.65)
SDU 24-BAT	24V DIN Rail/Panel Mount Battery Module (cable included)	12.0 (5.33)
SDU 24-BATEM	24V External Mount Battery Module (cable included)	16.0 (7.11)
SDU 24EXTBC6	Optional 6 ft. Battery Module cable to 24V DC UPS	0.5 (0.22)
SDU 24-DB9	Optional interface kit to convert relay contacts signals to DB9 signals	1.0 (0.45)
SDU-PMBRK	Optional chassis mount brackets to secure UPS to wall, panel, or enclosure	0.5 0(.22)

There are three individual hardware products when putting an SDU DC UPS system into operation:

1. 24 Vdc Power Supply (Recommended SolaHD SDN Series)
2. 24 Vdc SDU DC UPS Power Module
3. 24 Vdc SDU DC UPS Battery Module; or 24 Vdc SDU DC UPS External Battery Module

There are two models of the SDU DC UPS Power Module:

1. SDU 10-24, 24 Vdc/10amp (battery modules are required)
2. SDU 20-24, 24 Vdc/20amp (battery modules are required)

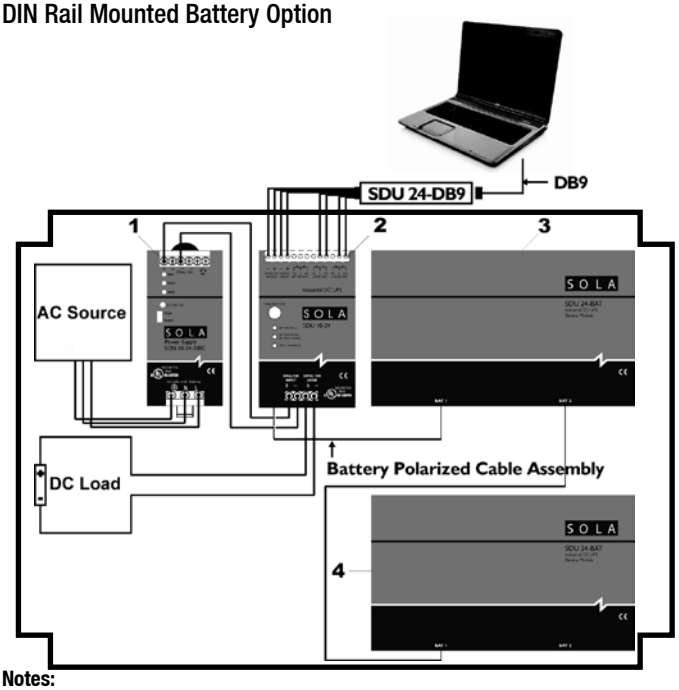
There are two models* of the SDU DC UPS Battery Modules:

1. SDU 24-BAT, DIN Rail/Panel mount for installation in ventilated enclosure, up to 4 battery modules can be connected to the SDU DC UPS.

2. SDU 24-BATEM, Panel mount, alternate battery module for external installation of non-ventilated enclosures, only 1 battery module can be connected to the SDU DC UPS.

*Can not use a combination of both models of the battery modules, only one model of the battery module can be connected to the SDU DC UPS.

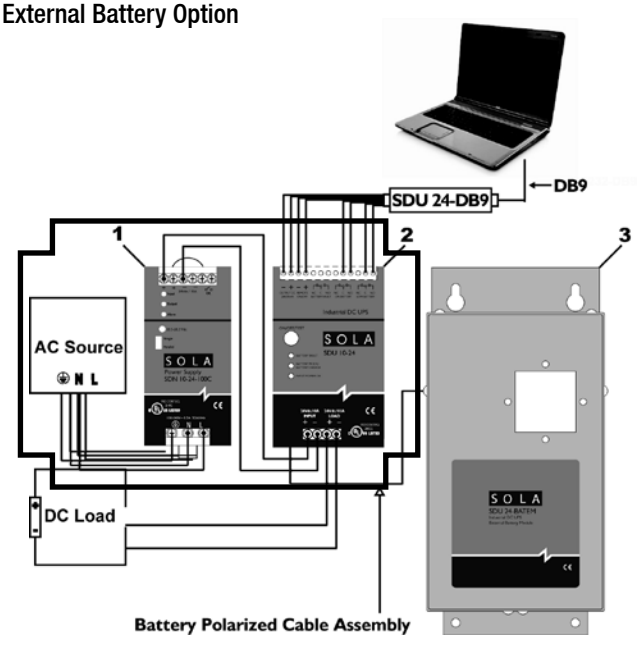
DIN Rail Mounted Battery Option



Notes:

1) AC/DC Power Supply
2) Power Module: SDU 10-24 or SDU 20-24
3) Battery Module: SDU 24-BAT
4) Optional battery module for extended Back-up.

External Battery Option



Notes:

1) AC/DC Power Supply
2) Power Module: SDU 10-24 or SDU 20-24
3) Battery Module: SDU 24-BATEM

SDU DC UPS Power Modules Specifications

Specification	SDU 10-24	SDU 20-24
Input		
Nominal Input Voltage	24 Vdc	
Input Voltage Range	22.5 - 30 Vdc	
Input Fuse	DC Fuse 30A	
Output		
Nominal Output Voltage	24 Vdc	
Output Voltage Range	22.5 - 30 Vdc	
Output Current	10A	20A
Current Limit	12A	22A
Protection		
Input Protection	Fuse for overload & short circuit protection	
Overload Protection	Electrical Circuit Protection	
Short Circuit	UPS output cut off immediately	
Battery Module		
Type	Sealed, maintenance-free lead acid batteries.	
Charging Current	0.5 A	
Typical Recharge Time (to 90% of full capacity)	8 Hours for 1 Battery Module 24 Hours for 2 Battery Module 12 Hours for each additional Battery Module	
Back–up Time (full load)[1]	14 minutes	4 minutes
Protection	UPS Shutdown when battery voltage drops below 22V, to prevent the complete depletion of the battery, short circuit protection by a 30A fuse.	
Physical		
Net Weight – lbs (kg)	1.65 (0.75)	
Dimensions H x W x D – in. (mm)	4.88 x 3.02 x 4.55 (124 x 77 x 116)	
Alarm		
Battery Low	Rapid Audible Indicator every 1 second	
Overload	Continuous Audible Indicator	
Environment		
Audible Noise	<40 dBA (1 meter from surface)	
Power Module Operating Temperature	-20°C to +50°C	
Storage Temperature	-20°C to +70°C	
Humidity	0-95%	
Max Elevation	3500 meters (11,483 feet)	
Shock & Vibration	According to ISTA 2A	
DC UPS System[2] Safety		
US Standard	UL 60950-1, UL508, FCC Part 15, Subpart B, Class A	
Canadian Standard	CAN/CSA C22.2 No 107.1-01, CAN/CSA C22.2 No. 60950-1	
CE	Low Voltage Directive IEC 60950-1 (CB Scheme)	
	Directive 2004/108/EC: EN 62040-2 Category C2 EN 55022 Class A + A1 + A2, CISPR 22 Class A (2005), IEC 61000-3-2, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6 + A1, IEC 61000-4-8, IEC 61000-2-2	
General		
MTBF	> 200,000 Hours, MIL-STD 217F	
Installation		
Output	Outputs are capable of providing high currents for short periods of time for inductive load startup or switching. Fusing may be required for wire/loads if 2x Nominal O/P current rating cannot be tolerated. Continuous current overload allows for reliable fuse tripping	
Mounting	Simple snap-on system for DIN Rail TS35/7.5 or TS35/15 or chassis-mounted, optional screw mounting set SDU-PMBRK.	
Connections	Input & Output: IP20-rated screw terminals, connector size range: 16-12 AWG (0.5-4 mm²) for copper conductors rated 90°.	
Relay Contact Terminal Connections	IP20 screw terminals; connector size range: 24-16 AWG (0.34-4mm²)	
Case	Fully enclosed metal housing with ventilation grid to keep out small particles.	
Free Space	20 mm above and 35 mm below, 20 mm left and right, 10 mm in front	

Notes:
1. See Battery Back-up Times on next page.
2. DC UPS System includes one power module (SDU 10-24 or SDU 20-24) and one or more battery modules (SDU 24-BAT or SDU 24BATEM)

SDN DC UPS Battery Module Specifications

Parameter	SDU 24-BAT	SDU 24-BATEM
Nominal Voltage	24 Vdc	
Protection	Fuse: 30A	Circuit Breaker: 24V, 25A
Charging Current	0.5A	0.8A
Enclosure Dimension in. (mm)	4.88 x 8.27 x 4.55 (124 x 210 x 116)	11.5 x 5.57 x 4.57 (292 x 142 x 116)
Enclosure Type	IP20	NEMA 1
Terminal Connector Type	Polarized Powerpole Connectors	
Batteries	Replaceable Batteries	
Accessories	1 ft. polarized battery cable	6 ft. polarized battery cable
Operating Temperature	-20° to +50°C	
Storage Temperature	-20° to +40°C	
Humidity	95% no condensation	
Safety Standard For DC UPS System*	UL60950-1, IEC 60950-1, UL508, CE CAN/CSA C22.2 No 107.1-01 CAN/CSA C22.2 No 60950-1	
Weight – lbs (kg)	12 (5.33)	16 (7.11)
Mounting	Simple snap-on system for DIN Rail TS35/7.5 or TS35/15 or chassis-mounted, optional screw mounting set **SDU–PMBRK**.	Wall/Chassis Mounting

SDU DC UPS Back-Up Times (Typical)

SDU 10–24 with SDU 24–BAT					
Load	**20% (2A)**	**40% (4A)**	**60% (6A)**	**80% (8A)**	**100% (10A)**
1 unit	113	45	30	21	14
2 units	247	114	74	48	38
3 units	396	178	117	80	58
4 units	531	233	148	111	81
SDU 10–24 with SDU 24–BATEM					
1 EBP	135	52	28	19	14
SDU 20–24 with SDU 24–BAT					
Load	**20% (4A)**	**40% (8A)**	**60% (12A)**	**80% (16A)**	**100% (20A)**
1 unit	46	21	10	06	04
2 units	116	50	28	17	10
3 units	178	80	46	31	20
4 units	237	113	65	43	31
SDU 20–24 with SDU 24–BATEM					
1 EBP	48	17	9	6	4

SDU Series, DIN Rail AC UPS

The SDU DIN Rail UPS combines an industry leading compact design with a wide operation temperature range and unique installation options. The SDU series provides economical protection from damaging impulses and power interruptions. These units include easy to wire screw terminations for critical devices needing battery back up such as computer based control systems.

UL 1778
Ind. Application
E179213

Features

- Lightweight, compact industrial design
- Wide operation temperature range (0-50°C)
- Cold start capability
- Phone/dataline surge protection
- Software and cable included for easy installation
- Simulated sinewave output
- RS232 Communication Port
- USB Communication Port (optional)
- Form C Dry Contact Relay (optional)
- Panel/Wall mounting brackets (optional)
- Remote turn-on and shut-off capabilities NEW
- Limited two-year warranty

Approvals

- 120V models are UL1778 recognized for industrial applications without derating.
  - No derating required in UL508 applications.
- 230V models are CE marked.

Applications

- Programmable Logic Controllers
- Factory Automation
- Robotics
- Conveying Equipment
- Computer-based Control Systems

Related Products

- Portable MCR Power Conditioners
- STV Surge Protective Devices
- SDN DIN Rail Power Supplies
- STFV Plus Active Tracking® Filters

Selection Table

Capacity (VA/W)	Catalog Number	Volts, Frequency In/Out	Typical Back–up Time (minutes)*	Input/Output Connections	Approx. Ship Weight – lbs (kg)
500/300	**SDU 500**	120 Vac, 50/60 Hz	4	IP20 touch proof, screw terminals. Wire range: 10 ~ 24 AWG.	10.7 (4.7)
850/510	**SDU 850**		2		11.4 (5.0)
500/300	**SDU 500-5**	230 Vac, 50/60 Hz	4		11.5 (5.2)
850/510	**SDU 850-5**		2		11.9 (5.4)

* At full load.

SDU Accessories

Catalog Number	Description	Approx. Ship Weight – lbs (kg)
RELAYCARD-SDU	Dry contact I/O relay box, IP20 touch proof screw terminals, wire size range 12~22 AWG (IEC 2.5mm); N.O./N.C. form "C" contact. Relay contact signal for "On Battery", "Low Battery" and "UPS Shutdown".	1.0 (0.45)
UPSMON-USB	RS232 to USB adapter cable	1.0 (0.45)
SDU-PMBRK	Mounting brackets to secure UPS to wall, back of panel or enclosure.	1.0 (0.45)

Specifications

Catalog Number	SDU 500	SDU 850	SDU 500-5	SDU 850-5
Capacity (VA/Watts)	500/300	850/510	500/300	850/510
Load Power Factor	0.6			
Dimensions – inches (mm)				
Unit (H x W x D)	4.88 x 11.1 x 4.55 (124 x 281 x 116)			
Weight – lbs (kg)	10.7 (4.7)	11.4 (5.0)	11.5 (5.2)	11.9 (5.4)
Input Parameters				
Voltage	120 V (+10%, -20%)		230 V (+/- 20%)	
Frequency	50 +/- 5 Hz or 60 Hz +/- 6 Hz (auto sensing)			
Output AC Parameters				
Voltage (Battery Mode)	Step sinewave			
	+/- 5%			
Frequency (On Battery)	50 or 60 Hz			
	+/- 0.3 Hz			
Overload Protection	UPS automatic shutdown if overload exceeds 105% of nominal at 20 seconds, 120% at 10 seconds, 130% at 3 seconds			
Short Circuit	UPS output cut off immediately			
Battery Parameters				
Battery Type	Sealed, non-spillable, maintenance-free lead acid batteries			
Transfer Time	4 - 6 ms typical			
Back–up Time* (minutes)	4.5/18	2.5/10	4.5/18	2.5/10
Recharge Time	8 hours to 90% capacity after full discharge			
Environmental				
Operating Temperature	32°F to 122°F (0°C to 50°C)			
Storage Temperature	5°F to 140°F (-15°C to 60°C)			
Relative Humidity	1% to 95%, non-condensing			
Ambient Operation	1-95% humidity non-condensing, 0-50°C up to 5,000 ft. (1500m)			
Audible Noise	< 40dBA (1 meter from surface)			
Standards				
Safety	UL 1778 Recognized components for industrial applications in accordance with UL508 without derating. CAN/CSA C22.2 No 107.1-01. Overvoltage Category 3, pollution degree 3. FCC Part 15, Subpart B, Class A		CE Marked; LVD: EN62040-1-1; EMC: EN50091-2, EN61000-3-2, EN61000-3-3, IEC60801-2, IEC60801-3, IEC60801-4, IEC61000-2-2.	
Elevation	5000 ft. without derating			
Shock & Vibration	According to the International Safe Transit Association standard ISTA 2A.			
Mounting	To be mounted on DIN TS35/7.5 or TS35/15 rail system. Chassis mounting permissible via optional brackets. Unit handles normal shock and vibration of industrial use and transportation without coming off rail.			

* At full load/half load.

S1K Mini-Tower Off-line UPS

The S1K series provides economical protection from damaging impulses and power interruptions. These units include two types of outlets; three for critical devices needing battery back-up and surge protection such as the CPU and one surge protected only outlet for non-critical devices like printers and fax machines. The S1K is ideal for point of sale and office applications.

E179213

Features

- Lightweight, compact design
- 4 NEMA 5-15R outlets, (3 Battery, 1 Surge)
- Data-line surge protection for phone or network included on every unit.
- DB9 Communications Interface
- Software and cable included
- Step sinewave output
- Limited two-year warranty

Applications

- PCs
- Workstations
- Computer Terminals

Related Products

- Surge Protective Devices
- Active Tracking® Filters
- Portable MCR Power Conditioners

Selection Table

Capacity (VA/W)	Catalog Number	Volts, Frequency In/Out	Typical Back–up Time (minutes)*	Input Plug/ Output Receptacle	Approx. Ship Weight lbs (kg)
320/240	**S1K320**	115 Vac, 50 or 60 Hz	10	5-15P / 5-15R (3) Battery (1) Surge	8.8 (4.0)
520/340	**S1K520**		15		11.6 (5.3)
650/390	**S1K650**		15		8.1 (3.7)
850/600	**S1K850**		25		10.8 (4.9)
1200/720	**S1K1200**		30		10.8 (4.9)
1500/900	**S1K1500**		70	5-15P / 5-15R (4) Battery	30.0 (13.6)

* For a typical PC with a 15" monitor.

S1K Accessory

Hardware for Wall/Panel Mount (order part number separately)

Catalog Number	Description	Approx. Ship Weight lbs (kg)
S1K-PMBRK*	Wall/panel mount bracket kit for S1K (320VA~1200VA) UPS	1.0 (0.45)

* Not applicable to S1K1500

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contact **Technical Services** at **(800) 377-4384** with any questions.

Specifications

Catalog Number	S1K320	S1K520	S1K650	S1K850	S1K1200	S1K1500
Capacity (VA/Watts)	320/240	520/340	650/390	850/600	1200/720	1440/900
Dimensions – inches (mm)						
Unit (H x W x D)	5.3 x 3.8 x 10.4 (135 x 97 x 264)	5.3 x 3.8 x 12.6 (135 x 97 x 320)	5.3 x 3.8 x 10.4 (135 x 97 x 264)		5.3 x 3.8 x 12.6 (135 x 97 x 320)	7.5 x 5.11 x 15 (191 x 130 x 381)
Weight – lbs (kg)	8.8 (4.0)	11.6 (5.3)	8.1 (3.7)		10.8 (4.9)	30 (13.6)
Input Parameters						
Voltage	115V + 20% / -25%		115V +/-15%			115V +/-25%
Frequency	50 or 60 Hz ± 10% (auto sensing)					
Input Power Cord	6 ft. with NEMA 5-15P					
Output AC Parameters						
Voltage (Battery Mode)	Step sinewave at 115V					
	±10%		±5%			
Frequency (On Battery)	50 or 60 Hz					
	±1 Hz		±0.3 Hz			±1 Hz
Auto Voltage Regulation (AVR function under Normal Mode)	AVR automatically increases output voltage 15% above input voltage if 91% to 75% of nominal. AVR decrease output voltage 13% below input voltage if 109% to 125% of nominal		N/A			AVR (See first column for definition)
Overload Protection	UPS automatic shutdown if overload exceeds 105% of nominal at 20 seconds, 120% at 10 seconds, 130% at 3 seconds					UPS automatic shutdown if overload exceeds 110% of nominal at 60 seconds, 130% at 3 seconds
Short Circuit	UPS output cut off immediately					
Battery Parameters						
Battery Type	Sealed, maintenance-free lead acid batteries					
Transfer Time	4 milliseconds, Typical					
Back–up Time* (minutes)	10-20	15-25	15-30	25-40	30-45	70-80
Recharge Time	4 hours		6 hours			
Environmental						
Operating Temp.	32°F to 104°F (0°C to 40°C)					
Storage Temp.	5°F to 122°F (-15°C to 50°C)					
Relative Humidity	0% to 90%, non-condensing					
Ambient Operation	0-95% humidity non-condensing, 0-40°C up to 10,000 ft. (3000m)					
Audible Noise	< 40dBA (1 meter from surface)					
Standards						
Safety	UL 1778, $_{c}UL_{us}$ Listed, FCC Part 15, Subpart B, Class A					
Surge Protection	Meets IEEE C62.41, Category A					

* For a typical PC with a 15” monitor.

S3K Mini-Tower Line-Interactive UPS

The S3K is an economical choice for those applications requiring the performance of a sinewave output, line interactive UPS with the mini-tower shape for cabinet installations. The S3K Series protects against most severe power disturbances through state-of-the-art, line-interactive technology. Most power disturbance corrections are accomplished without transferring to the internal battery. Utility power is continually protected by the S3K Series UPS's and internal battery life is optimized.

The UPS has built in protection for under and over voltage conditions including low-energy lightning surges introduced on the input power source. All S3K Series UPS are provided with an input circuit protector and surge protected data line connectors. The S3K Series UPS's are provided with a battery test function. Should the battery fail this test, the UPS will display a warning to indicate that the battery needs to be replaced.

E179213

Features

- Mini-Tower design for control cabinet installation.
- Automatic Voltage Regulation (AVR) topology saves battery power for deep voltage sag situations.
- Sine wave output
- User replaceable, "hot swappable" batteries (Downtime for battery replacement not required).
- RS-232 Communications port
- Built-in surge protection
- Cold start capability (DC power on)
- Telephone/Modem spike protection
- Power Management software is included (UPSMON).
- 50/60 Hz auto sensing
- Fully digitized, microprocessor controlled
- Protects against most adverse power conditions including:
  - Frequency variations
  - Sags
  - Blackouts
  - Surge
  - Spike
  - Over and under voltages
- Limited two-year warranty

Applications

- Workstations
- PLCs
- Robotics and Process Control
- Industrial Automation Systems
- Automatic Service & Dispensing Equipment

Related Products

- Portable MCR Power Conditioners
- Surge Protective Devices
- Active Tracking® Filters

Battery Back-up Times Chart

Load %	S3K700	S3K1000	S3K1600
20	45	37	27
40	21	18	12
50	14	13	10
70	9	8	6
100	5	4	3

Note:

Back–up times are at 25ºC, 77ºF, with 100% capacity batteries and resistive loads.

Selection Table

Capacity (VA/W)	Catalog Number	Volts, Frequency (In/Out)	Typical Back–up Time (minutes)*	Input Plug/Output Receptacle	Approx. Ship Weight lbs (kg)
700/480	**S3K700**	120/120, 50/60 Hz	5/14	(Detached) 5-15P / (4)5-15R	34.1 (15.5)
1000/750	**S3K1000**	120/120, 50/60 Hz	4/13	(Detached) 5-15P / (4)5-15R	37.0 (16.8)
1440/1200	**S3K1600**	120/120, 50/60 Hz	3/10	(Attached) 5-15P / (6)5-15R	70.4 (32.0)

* Full/Half Load (in minutes).

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contact **Technical Services** at **(800) 377-4384** with any questions.

Specifications

Catalog Number	S3K700	S3K1000	S3K1600
Power Rating (VA/Watts)	700/480	1000/750	1440*/1200
Dimensions inches (mm)			
Unit (H x W x D)	8.3 x 5.5 x 17.2 (210 x 140 x 436)		8.9 x 6.7 x 17.7 (226 x 170 x 450)
Shipping (H x W x D)	11.75 x 10.5 x 19.2 (300 x 265 x 492)		14.0 x 12.0 x 22.25 (358 x 307 x 581)
Approx. Shipping Weight – lbs (kg)	34.1 (15.5)	37 (16.8)	70.4 (32)
Input AC Parameters			
Voltage Range	103-132 Vac		
Plug	6 ft. detachable with NEMA 5-15P		Attached 5-15P
Line to Boost Transfer	Maintains output to 120 Vac; -14%, when input is 120 Vac, -25%		
Line to Buck Transfer	Maintains output to 120 Vac; +10%, when input is 120 Vac, +23%		
Frequency	45-55 Hz or 55-65 Hz; auto sensing		
Output AC Parameters			
Voltage	103 Vac to 132 Vac		
Receptacles	(4) NEMA 5-15R		(6) NEMA 5-15R
Frequency	50 Hz or 60 Hz ±0.5%		
Waveform	Sine wave		
Overload Warning	100-110% Nominal		
Overload Shutdown	200% Nominal		
Battery Parameters			
Type	Valve-regulated, non-spillable, lead acid		
Battery Time (mins) (FL/HL)	5/14	4/13	3/10
Qty. x Voltage x Rating	4 x 12 V x 7 AH		6 x 12 V x 7 AH
Transfer Time	2-4 ms typical		
Back–up Time	See Battery Back-up Times Charts		
Recharge Time	4 Hours to 90% rated capacity, after full discharge into resistive load		
Environmental			
Operating Temperature	+32°F to +104°F (0°C to +40°C)		
Storage Temperature	+5°F to +122°F (-15°C to +50°C)		
Relative Humidity	0% to 95%, non-condensing		
Operating Elevation	Up to 10,000 ft. (3000 m) at 35°C without derating		
Audible Noise	<40 dBA, (beyond 1 m)		<45 dBA, (beyond 1 m)
Agency			
Safety	UL 1778, cULus Listed		
Emissions	FCC Part 15, Subpart B, Class A		
Immunity	IEC 60801-2, Level 4 / IEC 60801-4, Level 4 / ANSI C62.41 Category A & B		

* Note: 1200W at 0.75 power factor equals 1600VA. Line cord limits total load to 1440 VA (max).

S4K2U-C and S4K2U-5C Industrial On-Line UPS

The new SolaHD S4KC is a single-phase, on-line (double-conversion) UPS system available in 500-3000VA, 120V and 230V. On-Line design means zero transfer time from external to internal power. When utility power fails, your critical load remains supported by a seamless flow of power. Rack or tower configurable, the SolaHD S4KC UPS offers customers a higher power factor, longer battery life, higher reliability and reduced cost of ownership. Housed in a slim 2U package, the SolaHD S4KC protects equipment from virtually all power disturbances due to blackouts, brownouts, sags, surges or noise interference. The UPS includes internal batteries. Optional, matching external battery cabinets, also in a slim 2U (3.5") size, offer extended battery runtime.

The LED display indicates battery capacity, percentage of UPS load, battery operation, bypass operation and UPS fault condition.

The rack-tower models are also supplied with securing flanges and rack slide mounting hardware. Units can be easily hardwired by removing the attached line cord and receptacle plate. All units include a conduit knockout cover in the box.

E179213

Features

- Hardwire capability for permanent installation
- Small 2U height maximizes available space
- Input and output noise suppression
- Higher Output Power Factor of 0.90
- PWM inverter reduces output voltage distortion
- Add on batteries for extended back-ups
- Integral sealed non-spillable batteries
- Hot swappable user replaceable battery
- Automatic restart
- Automatic and manual battery test
- Rack-mount or Stand-alone tower mounting
- Units are field configurable with a PC as a frequency converter (bypass will be disabled)
- Integral dynamic bypass reduces shutdowns
- Compatible with most standby generators
- Two-year limited warranty

Note:

The securing flanges do not support the weight of the UPS. Rack slides or shelves are required (sold separately).

Applications

- Industrial Automation Systems
- Critical Microprocessors and PC Based Systems
- Robotics and Process Control
- Programmable Logic Controllers (PLC)
- Mission Critical and High Speed Networks
- Enterprise Telecommunication Systems
- Pharmaceutical and Medical Diagnosis Equipment
- Printing and Publishing Machinery

Selection Table - S4K2U-C & S4K2U-5C Tower/Rack-Mount Models

Capacity (VA/W)	Catalog Number	Typical Back–up Times (minutes)*	Input Plug/Output Receptacle	Approx. Ship Weight – lbs (kg)
120 Vac, 50/60 Hz Models				c UL us
700/630	**S4K2U700-C**	6/14	5-15P / (6) 5-15R	52.9 (24)
1000/900	**S4K2U1000-C**	5/15	5-15P / (6) 5-15R	
1500/1350	**S4K2U1500-C**	5/16	5-15P / (6) 5-15R	57.3 (26)
2000/1800	**S4K2U2000-C**	4/11	5-20P / (6)5-20R (15/20 amp type)	61.7 (28)
3000/2700	**S4K2U3000-C**	4/14	L5-30P / (5)5-20R (15/20 amp type): (1) L5-30R	70.5 (32)
230 Vac, 50/60 Hz International Models				CE
1000/900	**S4K2U1000-5C**	5/15	IEC 320-C14 / (6) IEC 320/C13	44.0 (20)
2000/1800	**S4K2U2000-5C**	4/11	IEC 320-C20 / (6) IEC 320-C13	61.7 (28)
3000/2700	**S4K2U3000-5C**	4/14	IEC 320-C20 / (6) IEC 320-C13 (1) IEC 320-C19	70.5 (32)

* Full/Half Load (in minutes).

S4K2U-C, 120 Vac, 50/60 Hz Tower/Rack-Mount Models Specifications

Catalog Number	S4K2U700–C	S4K2U1000–C	S4K2U1500–C	S4K2U2000–C	S4K2U3000–C
Dimensions, D x W x H, in. [mm]					
Unit	19.7 x 16.9 x 3.4 [497 x 430 x 85]				23.7 x 16.9 x 3.4 [602 x 430 x 85]
Shipping	25.5 x 23.9 x 10.6 [647 x 607 x 270]				29.4 x 23.4 x 10.6 [747 x 5607 x 270]
Weight, lb. [kg]					
Unit	37.0 [16.8]		51.1 [23.2]	51.1 [23.2]	71.4 [32.4]
Shipping	44.1 [20.0]		57.3 [26.0]	57.3 [26.0]	79.4 [36.0]
Input AC Parameters					
Voltage Range (typical)	120 Vac nominal; variable based on output load				
90% to 100% Loading	90 Vac/140 Vac		102 Vac/140 Vac		
70% to 90% Loading	86 Vac/140 Vac		96 Vac/140 Vac		
30% to 70% Loading	77 Vac/140 Vac		84 Vac/140 Vac		
0% to 30% Loading	60 Vac/140 Vac		60 Vac/140 Vac		
Power Factor	0.99				
Frequency	40 Hz to 70 Hz; auto sensing				
Input Power Cord [1]	10 ft. attached with NEMA 5-15P plug			10 ft. attached with NEMA 5-20P plug	10 ft. attached with NEMA L5-30P plug
Output AC Parameters					
Output Receptacles [1]	5-15R x 6			5-20R x 6	L5-30R x 1 + 5-20R x 6
Voltage	110/115/120/127 Vac (user-configurable) ±3%				
Waveform	Sine wave				
Utility (Vac) Mode Overload	200% for 2 seconds; 150% for 50 seconds with transfer to bypass				
Power Factor	0.90				
Battery					
Type	Valve-regulated, non-spillable, lead acid				
Qty x V x Rating	4 x 12 V x 5.0 Ah		4 x 12 V x 7.2 Ah	4 x 12 V x 9.0 Ah	6 x 12 V x 9.0 Ah
Battery Mfr./Part Number	YUASA/NPH5-12; CSB/HR 1221W		Panasonic/UP-RW1236; CSB/GP 1272	Panasonic/UP-RW1245; CSB/HR 1234W F2	
Backup Time [2]	6/14	5/15	5/16	4/11	4/14
Recharge Time	3 hours to 90% capacity after full discharge with 100% load until UPS auto shutdown (internal batteries only)				
Environmental Requirements					
Operating Temperature	0°C to +40°C [+32°F to +104°F]; See Operating Temperature Parameters				
Storage Temperature	-15°C to +50°C [+5°F to +122°F]				
Relative Humidity	0% to 95%, non-condensing				
Operating Elevation	Up to 10,000 ft. [3,000 m] at +40°C [+104°F] without derating				
Storage Elevation	50,000 ft. [15,000 m] max.				

Notes:

1. Full/half load (in minutes.) See selection table for more information.
2. Input power cord and receptacles can be removed for hardwired applications.

S4K2U-C, 120 Vac, 50/60 Hz Tower/Rack-Mount Models Specifications cont.

Catalog Number	S4K2U700–C	S4K2U1000–C	S4K2U1500–C	S4K2U2000–C	S4K2U3000–C
Audible Noise	<43 dBA max. @ 3 ft. [1 m] front & sides; <46 dBA max. @ 3 ft. [1 m] rear	<45 dBA max. @ 3 ft. [1 m] front & sides; <50 dBA max. @ 3 ft. [1 m] rear	<46 dBA max. @ 3 ft. [1 m] front & sides; <45 dBA max. @ 3 ft. [1 m] rear	<48 dBA max. @ 3 ft. [1 m] front & sides; <48 dBA max. @ 3 ft. [1 m] rear	
Agency					
Safety	UL1778, cUL Listed				
RFI/EMI	FCC Part 15, Class A = CISPR22 Class B				
Surge Immunity	IEC62040-2 2nd Ed.				
Transportation	ISTA Procedure 1A				

Operating Temperature Parameters			
Ambient temperature	+25°C to +30°C [+77°F to +86°F]	+30°C to +35°C [+86°F to +95°F]	+35°C to +40°C [+95°F to +104°F]
Maximum output power factor derating at maximum load	100% to 93%	93% to 86%	86% to 79%

S4K2U-5C, 230 Vac, 50/60 Hz Tower/Rack-Mount Models Specifications

Catalog Number	S4K2U1000–5C	S4K2U2000–5C	S4K2U3000–5C
Dimensions, D x W x H, in. [mm]			
Unit	497 x 430 x 85 [19.6 x 16.9 x 3.3]		602 x 430 x 85 [23.7 x 16.9 x 3.3]
Shipping	717 x 570 x 262 [28.2 x 22.4 x 10.3]		717 x 570 x 262 [28.2 x 22.4 x 10.3]
Weight, lb. [kg]			
Unit	37.0 [16.8]	51.1 [23.2]	71.4 [32.4]
Shipping	44.1 [20.0]	57.3 [26.0]	79.4 [36.0]
Input AC Parameters			
Voltage Range (typical)	230 Vac nominal; variable based on output load		
90% to 100% Loading	177 Vac/280 Vac		196 Vac/280 Vac
70% to 90% Loading	168 Vac/280 Vac		184 Vac/280 Vac
30% to 70% Loading	150 Vac/280 Vac		161 Vac/280 Vac
0% to 30% Loading	115 Vac/280 Vac		115 Vac/280 Vac
Power Factor	0.99		
Frequency	40 Hz to 70 Hz; auto sensing		
Input Power Receptacle [1]	IEC 320 C14	IEC 320 C20	
Output AC Parameters			
Output Receptacles [1]	IEC 320 C13 x 6		IEC 320 C13 x 6; IEC 320 C19 x 1
Voltage	220/230/240 Vac (user-configurable) ±3%		
Frequency	50 Hz or 60 Hz		
Waveform	Sine wave		
Overload	200% for 2 seconds; 150% for 1 minute with transfer to bypass	200% for 2 seconds; 150% for 50 seconds with transfer to bypass	200% for 2 seconds; 150% for 55 seconds with transfer to bypass
Power Factor	0.90		
Battery			
Type	Valve-regulated, non-spillable, lead acid		
Qty x V x Rating	4 x 12 V x 5.0 Ah	4 x 12 V x 9.0 Ah	6 x 12 V x 9.0 Ah
Battery Mfr./Part Number	YUASA/NPH5-12; CSB/HR 1221W	Panasonic/UP-RW1245; CSB/HR 1234W F2	
Backup Time [2]	5/15	4/11	4/14
Recharge Time	3 hours to 90% capacity after full discharge with 100% load until UPS auto shutdown (internal batteries only)		
Environmental Requirements			
Operating Temperature	0°C to +40°C [+32°F to +104°F]; See Operating Temperature Parameters		
Storage Temperatures	-15°C to +50°C [+5°F to +122°F]		
Relative Humidity	0% to 95%, non-condensing		
Operating Elevation	Up to 3,000 m [10,000 ft.] at +40°C [+104°F] without derating		
Storage Elevation	15,000 m [50,000 ft.] max.		

Notes:
1. Full/half load (in minutes.) See selection table for more information.
2. Input power cord and receptacles can be removed for hardwired applications.

S4K2U-5C, 230 Vac, 50/60 Hz Tower/Rack-Mount Models Specifications

Catalog Number	S4K2U1000–5C	S4K2U2000–5C	S4K2U3000–5C
Audible Noise	<43 dBA max. @ 1 m [3 ft.] front & sides; <46 dBA max. @ 1 m [3 ft.] rear	<48 dBA max. @ 1 m [3 ft.] front & sides; <48 dBA max. @ 1 m [3 ft.] rear	
Agency			
Safety	EC/EN/AS 62040-1-1:2008		
RFI/EMI	IEC/EN/AS 62040-2 2nd Ed. = CISPR22 Class A		
Surge Immunity	IEC62040-2 2nd Ed.		
Transportation	ISTA Procedure 1A		

Operating Temperature Parameters			
Ambient temperature	+25°C to +30°C [+77°F to +86°F]	+30°C to +35°C [+86°F to +95°F]	+35°C to +40°C [+95°F to +104°F]
Maximum output power factor derating at maximum load	100% to 93%	93% to 86%	86% to 79%

External Battery Cabinets Specifications

Catalog Numbers	S4K2U48BATC	S4K2U96BATC
Used with UPS models	S4K2U700C, S4K2U1000C (-5), S4K2U1500C, S4K2U2000C (-5)	S4K2U3000C (-5)
Dimensions, D x W x H, in. [mm]		
Unit	19.7 x 16.9 x 3.4 [497 x 430 x 85]	23.7 x 16.9 x 3.4 [602 x 430 x 85]
Shipping	24.3 x 22.4 x 10.3 [617 x 570 x 262]	28.2 x 22.4 x 10.3 [717 x 570 x 262]
Weight, lbs. [kg]		
Unit	70.5 [32.0]	93.5 [42.4]
Shipping	77.2 [35.0]	101.4 [46.0]
Battery		
Type	Valve-regulated, non-spillable, lead acid	
Qty x V x Rating	2 x 4 x 12 V x 9.0 Ah	2 x 6 x 12 V x 9.0 Ah
Battery Mfr./Part Number	Panasonic/UP-RW1245; CSB/HR 1234W F2	
Backup Time	Battery Back-up Times Chart	
Environmental Requirements		
Operating Temperature	0°C to +40°C [+32°F to +104°F]	
Storage Temperatures	-15°C to +50°C [+19°F to +122°F]; High ambient temperatures will reduce battery life	
Relative Humidity	0% to 95%, non-condensing	
Operating Elevation	Up to 10,000 ft. [3,000 m] at +40°C [+104°F] without derating	
Storage Elevation	50,000 ft. [15,000 m] max.	
Agency		
Safety	UL1778, cUL Listed	
RFI/EMI	FCC Part 15, Class A = CISPR22 Class B	
Surge Immunity	IEC62040-2 2nd Ed.	
Transportation	ISTA Procedure 1A	

S4K2U-C and S4K2U-5C Battery Back-up Times[1]

Number of Batteries	Model VA[1]	Backup Time (minutes) at Load (watts)[2]												
		200 W	400 W	600 W	800 W	1000 W	1200 W	1400 W	1600 W	1800 W	2000 W	2500 W	100% Load	
		Minutes											Min.	W
Internal battery	700	26	14	6	--	--	--	--	--	--	--	--	6	630
	1000	28	15	9	5	--	--	--	--	--	--	--	4	900
	1500	--	26	16	10	8	5	--	--	--	--	--	4	1350
	2000	--	--	20	11	10	8	6	5	4	--	--	4	1800
	3000	--	--	--	25	20	14	10	9	8	5	4	4	2700
Internal battery + 1 external battery cabinet	700	126	78	54	--	--	--	--	--	--	--	--	50	630
	1000	128	74	52	41	--	--	--	--	--	--	--	27	900
	1500	--	110	72	48	36	28	--	--	--	--	--	24	1350
	2000	--	--	54	34	34	26	22	17	15	--	--	15	1800
	3000	--	--	--	102	80	56	50	44	38	26	22	18	2700
Internal battery + 2 external battery cabinets	700	264	122	88	--	--	--	--	--	--	--	--	82	630
	1000	252	126	84	60	--	--	--	--	--	--	--	58	900
	1500	--	208	132	94	74	54	--	--	--	--	--	48	1350
	2000	--	--	120	82	60	52	44	36	29	--	--	29	1800
	3000	--	--	--	124	114	106	92	74	66	62	46	44	2700
Internal battery + 3 external battery cabinets	700	280	140	120	--	--	--	--	--	--	--	--	116	630
	1000	320	148	118	80	--	--	--	--	--	--	--	78	900
	1500	--	310	204	138	102	90	--	--	--	--	--	82	1350
	2000	--	--	180	126	92	72	62	52	45	--	--	45	1800
	3000	--	--	--	174	150	122	110	105	104	76	62	62	2700
Internal battery + 4 external battery cabinet	700	560	300	146	--	--	--	--	--	--	--	--	140	630
	1000	600	250	138	116	--	--	--	--	--	--	--	109	900
	1500	--	400	256	180	144	110	--	--	--	--	--	100	1350
	2000	--	--	240	166	130	108	94	84	64	--	--	64	1800
	3000	--	--	--	184	172	150	128	120	119	105	92	84	2700

[1]Backup times are valid for all models rated with the listed VA

[2]Approximate backup times are in minutes and at +25°C [+77°F] with a resistive load

Note:
S4K2U–5C models are not available in 700VA or 1500VA.

S4K4U-C 6 kVA and S4K6U-C 10 kVA Industrial On-Line UPS

The new SolaHD S4K4U6000C and the S4K6U10KC Industrial UPS Series are the first true On-Line industrial UPS that provide higher output power factor, higher efficiency, flexible output voltage, an integrated maintenance bypass switch and internal batteries all in slim 4U (7.0”) and 6U (10.5") enclosures respectively.

The S4K4UC and S4K6UC features true On-Line (double conversion) topology providing the ultimate in protection against a wide range of potential power problems. The S4K4UC design of two 3 kVA, 120V inverters allow flexible output voltage to meet mixed load voltage requirements. The UPS automatically configures the output voltage to match the input configuration without requiring tap selections. Self diagnostics simplify maintenance and troubleshooting. The standard maintenance bypass switch provides an additional level of protection.

The S4K4UC and S4K6UC also feature a wide input voltage window to support the critical load without having to transfer to the battery. This extends system availability when back-up is truly needed.

Features

- True double conversion topology
- Higher Power Factor of 0.80 (6kVA) and 0.90 (10kVA)
- Both models offer 208/120V or 240/120V
- Configurable as a Tower or Rack mounting
- Highest density, 6 kVA in only 4U and 10 kVA in only 6U of rack space
- Easily installed in 18” to 32” deep rack using rack mount kit # SRS1832
- User replaceable, hot-swappable internal battery module
- Extended Battery Cabinets
- Includes both automatic and manual maintenance bypass switch
- Automatic frequency detection (60 or 50 Hz)
- Power Factor Correction
- Self-Diagnostics simplify maintenance and troubleshooting
- Remote Emergency Power Off (REPO)
- Intellislot™ USB and Terminal Block Communication ports
- Compatible with most standby generators
- Two-year limited warranty applications

Applications

- Industrial Computers
- Robotics and Process Controls
- Industrial Automation Systems
- Network Servers
- Enterprise Telecommunication Systems
- Printing and Publishing Machinery
- Pharmaceutical and Medical Diagnosis Equipment
- Industrial and Commercial Machinery
- Micro-processor Controlled Equipment
- Mission Critical Devices

Related Products

- Portable MCR Power Conditioners
- Surge Protective Devices
- Active Tracking® Filters

S4K 6 and 10 kVA Specifications

Table 1: UPS Specifications		
Parameters	**Model**	
	S4K4U6000C	**S4K6U10KC**
Rating	4800 W/6000 VA	9000 W/10000 VA
DIMENSIONS, W x D x H, in. [mm]		
Unit	6.8 x 26.1 x 16.9 [173 x 662 x 430]	10.3 x 26.5 x 16.9 [261 x 672 x 430]
Shipping	13.2 x 33.1 x 26.1 [336 x 842 x 662]	16.7 x 32.8 x 24.1 [424 x 832 x 612]
WEIGHT, lb. [kg]		
Unit	56.2 [25.5]	78.3 [35.5]
Shipping	70.5 [32.0]	92.6 [42.0]
INPUT AC PARAMETERS		
Nominal Operating Frequency	50 or 60 Hz (Factory default is 60 Hz)	
Factory Default V ac	120/208 V ac @ 120 degrees	
L1–L2 Factory Default Input Phase Angle	120 degrees	
Allowable Input Phase Angle	120, 180, 240 degrees; auto-sensing on application of alternating current (Restrictions for L–N voltage other than 120 V ac)	
Factory Default L1–N, L2–N V ac	120 V ac nominal	
User Configurable L1–N, L2–N V ac	100/110/115/120/127 V ac (Can be modified with configuration program)	
Input Frequency w/o Battery Operation	40–70 Hz	
Input Power Connection	Hardwire terminal block 3W + G (L–L–N–G)	
L1–N, L2–N Maximum Allowable V ac	150 V ac	
OUTPUT AC PARAMETERS		
Factory Default V ac	120/208 V ac @ 120 degrees	
L1–L2 Factory Default Output Phase Angle	120 degrees	
Allowable Output Phase Angle	120, 180, 240 degrees; auto-sensing on initial application of input alternating current	
Factory Default L1–N, L2–N V ac	120 V ac nominal	
User Configurable L1–N, L2–N V ac	100/110/115/120/127 V ac, ±2%	
L1–N, L2–N Operating Load Range		
105% to 130%	1 minute	
131% to 150%	10 seconds	
151% to 200%	1 second	
>200% (impact load)	At least 5 cycles	

S4K 6 and 10 kVA Specifications - continued

Table 2: UPS Specifications		
Parameters	**Model**	
	S4K4U6000C	**S4K6U10KC**
BYPASS PROTECTION LIMITS		
Disable Bypass Operation	If input voltage exceeds ±15% of the nominal voltage	
Re-enable Bypass Operation	If input voltage returns to within ±10% of nominal output voltage	
Disable Bypass Operation	When the input frequency prevents synchronous operation	
ENVIRONMENTAL REQUIREMENTS		
Operating Temperature	0°C to +40°C [+32°F to +104°F]; see Table 8 for operating temperature parameters	
Storage Temperature	-15°C to +50°C [+5°F to +122°F]	
Relative Humidity	0% to 95%, non-condensing	
Operating Elevation	Up to 10,000 ft. [3,000 m] at +40°C [+104°F] without derating	
Audible Noise	<55 dBA @ 3.2 ft. [1 m] rear; <50 dBA @ 3.2 ft. [1 m] front & sides	
AGENCY		
Safety	UL1778, cUL Listed (suitable for computer room applications)	
RFI/EMI	FCC Part 15, Subpart B, Class A, FCC Class A	
Surge Immunity	IEEE/ANSI C62.41 Category A & B	
Transportation	ISTA Procedure 1A	

Table 3: Operating Temperature Parameters		
Ambient Temperature	**S4K4U6000C**	**S4K6U10KC**
pf @ 30°C ±3°C [pf @ 86°F ±5.4°F]	0.8 pf	0.9 pf
pf @ 40°C ±3°C [pf @ 104°F ±5.4°F]	0.8 pf	0.8 pf

Table 4: Internal Battery Specifications		
Parameters	**Model Number**	
	S4K144INTBATC	**S4K288INTBATC**
Used with UPS Models	S4K4U6000C	S4K6U10KC
DIMENSIONS, W x D x H, in. [mm]		
Unit	2.8 x 19.3 x 8.1 [70 x 490 x 206]	5.3 x 19.7 x 8.1 [135 x 500 x 207]
Shipping	12.2 x 23.7 x 10.3 [310 x 602 x 262]	12.2 x 23.9 x 9.5 [310 x 607 x 242]
WEIGHT, lb. [kg]		
Unit	75.8 [34.4]	71.1 [32.3]
Shipping	81.1 [36.8]	76.4 [34.7]
BATTERY PARAMETERS		
Type	Valve-regulated, non-spillable, flame retardant, lead acid	
Qty x V x Rating	2 x 6 x 12 V x 9.0 Ah	2 x 12 x 12 V x 9.0 Ah
Battery Mfr./Part Number	Yuasa/REW 45-12	
Backup Time	See Table 13	
Recharge Time	3 hours to 90% capacity after full discharge into 100% load	
ENVIRONMENTAL REQUIREMENTS		
Operating Temperature	0°C to +40°C [+32°F to +104°F]	
Storage Temperature	-15°C to +50°C [+5°F to +122°F]	
Relative Humidity	0% to 95%, non-condensing	
Operating Elevation	Up to 10,000 ft. [3,000 m] at +40°C [+104°F] without derating	
AGENCY		
Safety	UL1778, cUL Listed (suitable for computer room applications	
RFI/EMI	FCC Part 15, Subpart B, Class A	
Transportation	ISTA Procedure 1A	

Table 5: External Battery Cabinet Specifications		
Parameters	**Model Number**	
	S4K144BATC	**S4K288BATC**
Used with UPS Models	S4K4U6000C	S4K6U10KC
DIMENSIONS, W x D x H, in. [mm]		
Unit (with bezel)	3.3 x 26.1 x 16.9 [85 x 662 x 430]	6.8 x 26.5 x 16.9 [173 x 672 x 430]
Shipping	25.8 x 34.3 x 12.3 [655 x 872 x 312]	13.2 x 33.1 x 24.5 [336 x 842 x 622]
WEIGHT, lb. [kg]		
Unit	99.9 [45.3]	29.8 [13.5]
Shipping	110.2 [50.0]	44.1 [20.0]
BATTERY PARAMETERS		
Type	Valve-regulated, non-spillable, flame retardant, lead acid	
Qty x V x Rating	2 x 6 x 12 V x 9.0 Ah	2 x 12 x 12 V x 9.0 Ah
Battery Mfr./Part Number	Yuasa/REW 45-12	
Backup Time	See Table 13	
ENVIRONMENTAL REQUIREMENTS		
Operating Temperature	0°C to +40°C [+32°F to +104°F]	
Storage Temperature	-15°C to +50°C [+5°F to +122°F]	
Relative Humidity	0% to 95%, non-condensing	
Operating Elevation	Up to 10,000 ft. [3,000 m] at +40°C [+104°F] without derating	
AGENCY		
Safety	UL1778, cUL Listed (suitable for computer room applications)	
RFI/EMI	FCC Part 15, Subpart B, Class A	
Transportation	ISTA Procedure 1A	

Table 6: Power Distribution Specifications for S4K4U6000C

Parameters	Model Number								
	S4KPAD2-HDWRC	S4KPAD2-HDWR-MBSC*	S4KPAD2-001C	S4KPAD2-002C	S4KPAD2-003C	S4KPAD2-004C	S4KPAD2-005C	S4KPAD2-006C	S4KPAD2-L630C
DIMENSIONS, W x D x H, in. [mm]									
Unit	5.2 x 15.5 x 3.5 [132 x 393 x 88]								4.7 x 13.2 x 4.1 [119 x 335 x 105]
Shipping	9.5 x 20.7 x 9.1 [242 x 527 x 230]								10.2 x 18.4 x 8.7 [119 x 335 x 105]
WEIGHT, lb. [kg]									
Unit	5.1 [2.3]	6.0 [2.7]	8.8 [4.0]	8.6 [3.9]	8.6 [3.9]	9.9 [4.5]	10.6 [4.8]	9.5 [4.3]	8.8 [4.0]
Shipping	7.3 [3.3]	8.2 [3.7]	11.0 [5.0]	10.8 [4.9]	10.8 [4.9]	12.1 [5.5]	12.8 [5.8]	11.7 [5.3]	11.0 [5.0]
ELECTRICAL SPECIFICATIONS									
Amp Rating	30 A 2-pole input breaker								
Input Power Connections	Hardwire terminal block 3W + G (L–L–N–G)		(1) L14-30R on a 300 mm cord						(1) L6-30P
Output Power Connections	Hardwire terminal block 3W + G (L–L–N–G)		(4) 5-20R (1) L14-30 (1) L6-30R	(2) 5-20R (2) L6-20R	(4) 5-20R (2) L6-30	(4) L5-20R (2) L5-30R	(4) L5-20R (2) L6-30R	(4) L6-20R	(2) L6-20R (2) L6-30R

Table 7: Power Distribution Specifications for S4K6U10KC

Parameters	Model Number					
	S4KPAD2-101C	S4KPAD2-102C	S4KPAD2-103C	S4KPAD2-104C	S4KPAD2-105C	S4KPAD2-106C
DIMENSIONS, W x D x H, in. [mm]						
Unit	7.4 x 5.7 [188 x 145]					
Shipping	11.9 x 20.6 x 8.7 [302 x 522 x 220]					
WEIGHT, lb. [kg]						
Unit	4.4 [2.0]	6.6 [3.0]			4.4 [2.0]	6.6 [3.0]
Shipping	6.6 [3.0]	8.8 [4.0]			6.6 [3.0]	8.8 [4.0]
ELECTRICAL SPECIFICATIONS						
Amp Rating	60 A 2-pole input breaker					
Input Power Connections	Hardwire terminal block 3W + G (L–L–N–G) to chassis					
Output Power Connections	(2) L6-30 (8) 5-20R	(4) L6-20R (4) 5-20R	(4) 5-20R (4) L6-30R	(4) 5-20R (2) L6-30R (2) L6-20R	(4) 5-20R (2) L5-30R (2) L5-20R	(4) L6-20R (4) L5-20R

*Standard on S4K4U6000C units

S4KC Accessories

Hardware for Rack Mount (order part number separately)

Catalog Number	Description	Approx. Ship Weight lbs (kg)
Rack Slide Kits		
SRS1832	Rack slide kit for racks with 18-32" deep support rails.	8 (3.6)

Optional Equipment

Catalog Number	Description
Communications Options	
SNMPWEB CARD	Ethernet communications kit, (Supports SNMP, HTTP and OCP) includes SNMP hardware, MIB, configuration cable and installation manual.
RELAYCARD-INT	Relay contact board, 2 relay contact signals each independently configured for "On Battery", "Low Battery", "On Bypass", "On UPS", "Summary Alarm" and "UPS Fault" (rated at 24V @ 1 Amp AC or DC).

Power A/C Distribution (PAD)

PADs provide output distribution, input connection and a rotary maintenance bypass switch.
The PAD is field installed by the customer and allows the UPS to be removed without interrupting power to the load.

Catalog Number	Description	Series
A2D115HW	120 Volt, Hardwired for use with 15 Amp Input	S4K2U-C (700 - 1500 VA Models)
A2D120HW	120 Volt, Hardwired for use with 20 Amp Input	S4K2U-C (2000 VA Model)
A2D130HW	120 Volt, Hardwired for use with 30 Amp input	S4K2U-C (3000 VA Model)
A2D220HW5	230 Volt, Hardwired for use with 10 Amp input	S4K2U-C (1000-2000 VA Model)
A2D230HW5	230 Volt, Hardwired for use with 15 Amp input	S4K2U-C (3000 VA Model)
S4KPAD2-001C	208/120 V or 240/120 V, Plug-n-Play L14-30P, (4)5-20 (1) L14-30 (1) L6-30R	S4K4U6000C
S4KPAD2-002C	208/120 V or 240/120 V, Plug-n-Play L14-30P, (2) 5-20R, (2) L6-20R	S4K4U6000C
S4KPAD2-003C	208/120 V or 240/120 V, Plug-n-Play L14-30P, (4) 5-20R, (2) L6-30	S4K4U6000C
S4KPAD2-004C	208/120 V or 240/120 V, Plug-n-Play L14-30P, (4) L5-20R, (2) L5-30R	S4K4U6000C
S4KPAD2-005C	208/120 V or 240/120 V, Plug-n-Play L14-30P, (4) L5-20R, (2) L6-30R	S4K4U6000C
S4KPAD2-006C	208/120 V or 240/120 V, Plug-n-Play L14-30P, (4) L6-20R	S4K4U6000C
S4KPAD2-101C	208/120 V or 240/120 V, Output Distribution, (2) L6-30 (8) 5-20R	S4K6U10KC
S4KPAD2-102C	208/120 V or 240/120 V, Output Distribution, (4) L6-20R, (4) 5-20R	S4K6U10KC
S4KPAD2-103C	208/120 V or 240/120 V, Output Distribution, (4) 5-20R, (4) L6-30R	S4K6U10KC
S4KPAD2-104C	208/120 V or 240/120 V, Output Distribution, (4) 5-20R, (2) L6-30R, (2) L6-20R	S4K6U10KC
S4KPAD2-105C	208/120 V or 240/120 V, Output Distribution, (4) 5-20R, (2) L5-30R, (2) L5-20R	S4K6U10KC
S4KPAD2-106C	208/120 V or 240/120 V, Output Distribution, (4) L6-20R, (4) L5-20R	S4K6U10KC

Note: PADs can only be used with units having matching receptacles for the line cords provided.

Table 8: Battery Backup Times

Number of Batteries	Load	Backup Time (minutes)	
		S4K4U6000C	S4K6U10KC
Internal battery	30%	23	26
	40%	17	18
	50%	12	13.5
	60%	10	11
	70%	7	8
	80%	5.5	7
	90%	4.5	6
	100%	4	4.5
Internal battery + 1 external battery cabinet	30%	53	60
	40%	38	39
	50%	29	32
	60%	24	25
	70%	20	21
	80%	16	18
	90%	14	16
	100%	12	13
Internal battery + 2 external battery cabinets	30%	86	92
	40%	72	70
	50%	48	52
	60%	41	41
	70%	35	34
	80%	28	29
	90%	24	26
	100%	21	23
Internal battery + 3 external battery cabinets	30%	124	125
	40%	86	90
	50%	72	72
	60%	54	60
	70%	47	47
	80%	38	39
	90%	34	35
	100%	30	32

Table 9: Battery Backup Times

Number of Batteries	Load	Backup Time (minutes)	
		S4K4U6000C	S4K6U10KC
Internal battery + 4 external battery cabinets	30%	158	180
	40%	110	120
	50%	88	90
	60%	72	72
	70%	63	65
	80%	49	54
	90%	45	47
	100%	41	39

Using the configuration program, the user may specify the number of external battery cabinets attached to the UPS. The factory default is programmed for internal batteries only. Table 13 shows the estimated battery backup times at different loads.

S4K5U-5C 6 kVA International On-Line UPS

The new SolaHD S4K5U6K5C Industrial On-Line UPS Series is designed for international usage and provides flexible output voltage, an integrated maintenance bypass switch and internal batteries all in a slim 5U (8.7") enclosure. The S4K5U-5C features true On-Line (double conversion) topology providing the ultimate in protection against a wide range of potential power problems. Flexible output voltages (220/230/240 Volt) are available through the configuration program to allow for international use. One of the three L-N output voltages is selected to match the local voltage. Self diagnostics simplify maintenance and troubleshooting, and the UPS can be serviced by the customer. The standard maintenance bypass switch provides an additional level of protection.
The S4K5U-5C also features a wide input voltage window to support the critical load without having to transfer to the battery. This extends system availability when back-up is truly needed.

CE

Features

- True double conversion topology
- Higher Power Factor of 0.80
- Flexible L-N output voltage (220/230/240V)
- Configurable as a Tower or Rack Mount model
- High density, 6 kVA in only 5U of rack space
- Easily installed in 18" to 32" deep rack using rack mount kit # SRS1832
- User replaceable, hot-swappable internal battery module
- Matching 3U Extended Battery Cabinets
- Includes both automatic and manual maintenance bypass switch
- Automatic frequency detection of either 60 or 50 Hz
- Power Factor Correction
- Self-Diagnostics simplify maintenance and troubleshooting
- Remote Emergency Power Off (REPO)
- IntellislotTM, USB, and terminal Block Communication ports
- Compatible with most standby generators
- Two Year Limited Warranty

Applications

- Industrial Computers
- Robotics and Process Controls
- Industrial Automation Systems
- Network Servers
- Enterprise Telecommunication Systems
- Printing and Publishing Machinery
- Industrial and Commercial Machinery
- Pharmaceutical and Medical Diagnosis Equipment

Related Products

- Portable MCR Power Conditioners
- Surge Protective Devices
- Active Tracking® Filters

Table 10: UPS Specifications	
Parameters	**Model Number: S4K5U6K5C**
Rating	6000 VA/4800 W
DIMENSIONS, D x W x H, mm [in.]	
Unit	570 x 430 x 220 [22.4 x 16.9 x 8.7]
Shipping	745 x 530 x 516 [29.3 x 20.9 x 20.3]
WEIGHT, kg [lb.]	
Unit	60 [132.2]
Shipping	71 [156.5]
INPUT AC PARAMETERS	
Nominal Operating Frequency	50 or 60 Hz (Factory default is 50 Hz)
Factory Default V ac	230 V ac
User-configurable V ac	220/230/240 V ac (Can be modified using included configuration program)
Operating Voltage Range without Battery Operation	176–280 V ac
Maximum Allowable V ac	280 V ac
Input Frequency without Battery Operation	40–70 Hz
Input Power Connection	S4KPAD2-CEHWMBSC Standard (See "3.3 Removable Power Distribution Box")
OUTPUT AC PARAMETERS	
Factory Default V ac	230 V ac
Output Connections	S4KPAD2-CEHWMBSC Standard (See "3.3 Removable Power Distribution Box")
Frequency	50 or 60 Hz, nominal
Wave form	Sine wave
Main Mode Overload	>200% for 5 cycles; 151– 200% for 1 second; 131–150% for 10 seconds; 105–130% for 1 minute
BYPASS PROTECTION LIMITS	
Disable Bypass Operation	If input voltage exceeds ±15% of the nominal voltage
Re-enable Bypass Operation	If input voltage returns to within ±10% of nominal output voltage
Disable Bypass Operation	When the input frequency prevents synchronous operation
ENVIRONMENTAL REQUIREMENTS	
Operating Temperature	0°C to +40°C [+32°F to +104°F]; See Table 9
Storage Temperature	-15°C to +50°C [+5°F to +122°F]
Relative Humidity	0% to 95%, non-condensing
Operating Elevation	Up to 1,000 m [3,281 ft.] at +30°C [+86°F] without derating
Audible Noise	<55 dBA @ 1 m [3.2 ft.] rear; <50 dBA @ 1 m [3.2 ft.] front & sides

Table 11: UPS Specifications	
Parameters	**Model Number: S4K5U6K5C**
AGENCY	
Safety	IEC62040-1:2008 Version
EMI/EMC	IEC/EN/AS 62040-2 2nd Edition (Cat 2—Table 6)
ESD	EN61000-4-2, Level 4, Criteria A
Radiated Susceptibility	EN61000-4-3, Level 3, Criteria A
Electrical Fast Transient	EN61000-4-4, Level 4, Criteria A
Surge Immunity	EN61000-4-5, Level 3, Criteria A
Transportation	ISTA Procedure 1A

Table 12: Operating Temperature Parameters	
Ambient Temperature	**Model Number: S4K5U6K5C**
pf @ 30°C ±3°C [pf @ 86°F ±5.4°F]	0.8 pf
pf @ 40°C ±3°C [pf @ 104°F ±5.4°F]	0.8 pf

Table 13: Power Distribution Specifications	
Parameters	**Model Number: S4KPAD2-CEHWMBSC**
Used with UPS Model	S4K5U6K5C
Power Distribution Box Includes:	Two (2) IEC320 C19 16 A/250 V Sockets Eight (8) C13 10 A/250 V Sockets Manual bypass switch with indicator lamp
Ampere Rating	32 A
Input/Output Power Connections	3-wire hard wired, 6–10 mm^2 (8–10 AWG)
User-supplied Input Branch Circuit Breaker	32 A

Table 14: Internal Battery Specifications	
Parameters	**Model Number: S4K240INTBATC**
Used with UPS Model	S4K5U6K5C
DIMENSIONS, D x W x H, mm [in.]	
Unit	390 x 113 x 184 [15.4 x 4.4 x 7.2]
Shipping	467 x 178 x 262 [18.4 x 7.0 x 10.3]
WEIGHT, kg [lb.]	
Unit	20.6 [45.1]
Shipping	23.0 [50.7]
BATTERY PARAMETERS	
Type	Valve-regulated, non-spillable, lead acid
Qty x V x Rating	20 x 12 V x 9.0 Ah
Battery Mfr./Part Number	Yuasa/REW 45-12
Backup Time	See Table 13
Recharge Time	3 hours to 90% capacity after full discharge into 100% load
ENVIRONMENTAL REQUIREMENTS	
Operating Temperature	0°C to +40°C [+32°F to +104°F]; see Table 9
Storage Temperature	-15°C to +50°C [+5°F to +122°F]
Relative Humidity	0% to 95%, non-condensing
Operating Elevation	Up to 3,000 m [10,000 ft.] at +40°C [+104°F] without derating
AGENCY	
Safety	IEC62040-1:2008 Version
Transportation	ISTA Procedure 1A

Table 15: External Battery Cabinet Specifications	
Parameters	**Model Number: S4K240BATC**
Used with UPS Model	S4K5U6K5C
DIMENSIONS, D x W x H, mm [in.]	
Unit (with bezel)	570 x 430 x 148 [22.4 x 16.9 x 5.8]
Shipping	745 x 530 x 407 [29.3 x 20.8 x 16.0]
WEIGHT, kg [lb.]	
Unit	50.4 [111]
Shipping	54.0 [119]
BATTERY PARAMETERS	
Type	Valve-regulated, non-spillable, lead acid
Qty x V	1 x 20 x 12 V
Battery Mfr./Part Number	Yuasa/NPH5-12
Backup Time	See Table 13
ENVIRONMENTAL REQUIREMENTS	
Operating Temperature	0°C to +40°C [+32°F to +104°F]
Storage Temperature	-15°C to +50°C [+5°F to +122°F]
Relative Humidity	0% to 95%, non-condensing
Operating Elevation	Up to 1,000 m [3,281 ft.] at +40°C [+104°F]
AGENCY	
Safety	IEC62040-1:2008 Version
Transportation	ISTA Procedure 1A

Table 16: Battery Backup Times										
Number of Batteries	Output to Connected Load, W									100% Load, W
	1400	1800	2200	2600	3000	3400	3800	4200	4600	
Internal battery	28	18	14	11	9.5	7.5	6.5	5	4	4800
Internal battery + 1 external battery cabinet	56	36	28	22	19	15	13	10	8	4800
Internal battery + 2 external battery cabinets	84	54	42	33	28.5	22.5	19.5	15	12	4800
Internal battery + 3 external battery cabinets	112	72	56	44	38	30	26	20	16	4800
Internal battery + 4 external battery cabinets	140	80	70	55	47.5	37.5	32.5	25	20	4800

Using the configuration program, the user may specify the number of external battery cabinets attached to the UPS. The factory default is programmed for internal batteries only. Table 13 shows the estimated battery backup times at different loads.

UPS Extended Warranty Offering for the SolaHD 1K, S3K and S4K Series

S1K

Catalog Number	Description
1–Year Extended Warranty	
1EWPS1K320	1-year extended warranty for S1K320
1EWPS1K520	1-year extended warranty for S1K520
1EWPS1K650	1-year extended warranty for S1K650
1EWPS1K850	1-year extended warranty for S1K850
1EWPS1K1200	1-year extended warranty for S1K1200
1EWPS1K1500	1-year extended warranty for S1K1500
3–Year Extended Warranty	
3EWPS1K320	3-year extended warranty for S1K320
3EWPS1K520	3-year extended warranty for S1K520
3EWPS1K650	3-year extended warranty for S1K650
3EWPS1K850	3-year extended warranty for S1K850
3EWPS1K1200	3-year extended warranty for S1K1200
3EWPS1K1500	3-year extended warranty for S1K1500

S3K

Catalog Number	Description
1–Year Extended Warranty	
1EWPS3K700	1-year extended warranty for S3K700
1EWPS3K1000	1-year extended warranty for S3K1000
1EWPS3K1600	1-year extended warranty for S3K1600
3–Year Extended Warranty	
3EWPS3K700	3-year extended warranty for S3K700
3EWPS3K1000	3-year extended warranty for S3K1000
3EWPS3K1600	3-year extended warranty for S3K1600

S4K4UC AND S4K6UC – Maintenance Bypass Switch

Catalog Number	Description
1–Year Extended Warranty	
1EWPS4K06KPAD	1-year extended warranty for S4K4UC PADs
1EWPS4K10KPAD	1-year extended warranty for S4K6UC PADs
3–Year Extended Warranty	
3EWPS4K06KPAD	3-year extended warranty for S4K4UC PADs
3EWPS4K10KPAD	3-year extended warranty for S4K6UC PADs

S4KC Industrial – UPS Models

The extended warranty program extends the standard two-year product warranty by the term of the extension purchased, 1-year or 3 years. This results in warranty terms of 3 or 5 years (depending on the extension selected) from the date of purchase. SolaHD will repair or replace the unit at any point during the extension period, subject to the same conditions as the standard warranty. The warranty extension is not transferable.

Catalog Number	Description
1–Year Extended Warranty	
1EWPS4K2U700C	1-year extended warranty for S4K2U700C
1EWPS4K2U1000C	1-year extended warranty for S4K2U1000C
1EWPS4K2U1500C	1-year extended warranty for S4K2U1500C
1EWPS4K2U2000C	1-year extended warranty for S4K2U2000C
1EWPS4K2U3000C	1-year extended warranty for S4K2U3000C
1EWPS4K4U6000C	1-year extended warranty for S4K4U6000C
1EWPS4K6U10KC	1-year extended warranty for S4K6U10KC
3–Year Extended Warranty	
3EWPS4K2U700C	3-year extended warranty for S4K2U700C
3EWPS4K2U1000C	3-year extended warranty for S4K2U1000C
3EWPS4K2U1500C	3-year extended warranty for S4K2U1500C
3EWPS4K2U2000C	3-year extended warranty for S4K2U2000C
3EWPS4K2U3000C	3-year extended warranty for S4K2U3000C
3EWPS4K4U6000C	3-year extended warranty for S4K4U6000C
3EWPS4K6U10KC	3-year extended warranty for S4K6U10KC

Note: Warranty on S4K4U6000 covers electronics and internal battery.

S4KC Industrial – Battery Cabinets

Catalog Number	Description
1–Year Extended Warranty	
1EWPS4K2U48BATC	1-year extended warranty for S4K2U48BATC
1EWPS4K2U96BATC	1-year extended warranty for S4K2U96BATC
1EWPS4K144BATC	1-year extended warranty for S4K144BATC
1EWPS4K288BATC	1-year extended warranty for S4K288BATC
3–Year Extended Warranty	
3EWPS4K2U48BATC	3-year extended warranty for S4K2U48BATC
3EWPS4K2U96BATC	3-year extended warranty for S4K2U96BATC
3EWPS4K144BATC	3-year extended warranty for S4K144BATC
3EWPS4K288BATC	3-year extended warranty for S4K288BATC

Field Service Programs for the S4K4UC/6UC Industrial and S5K Series

These programs are for Domestic coverage (valid only within the continental United States and Canada); additional travel expenses may be billed to customers with site locations more than 150 miles from a major metropolitan area.

S4K4UC/6UC Industrial Start-Up Programs

Start–Up expands the warranty to include remedial onsite parts and labor for 2 years (in lieu of the 2-year parts/depot labor included with the standard unit). Start-up includes one site trip with in the contiguous 48 states by a customer service engineer, after the UPS has been installed. Any additional trips by the customer service engineer as a result of the site not being ready for start-up may result in additional costs to the customer. The site trip includes the following services for one UPS module: non powered inspection, UPS electrical and operation check out, full parts and labor for any remedial work required on the UPS or battery cabinets, and customer operation training at the time of start-up. Two plans are offered: Monday-Friday, 8 a.m. to 5 p.m. and 7 days/week, 24 hours/day.

Start–Up Plus includes the standard start-up as defined above plus one preventive maintenance (PM) service site trip within the contiguous 48 states. The PM must be scheduled during the two-year warranty period and during normal business hours (Monday through Friday, 8 a.m. to 5 p.m.). The PM will include the following services for one UPS module: consult with personnel responsible for the equipment, visually inspect internal subassemblies and major components, check all mechanical connections for tightness and heat discoloration, clean any foreign material and dust from internal compartments, calibrate equipment to manufacturer's specifications, check the normal operation of the system, check battery transfer/discharge and perform a short duration battery run, perform any required engineering field changes, return unit to operational service with the normal load and verify output power. Two plans are offered: Monday-Friday, 8 a.m. to 5 p.m. and 7 days/week, 24 hours/day.

S5K Modular Start-Up Programs

Start–Up is included in the cost of the S5K Modular UPS.

A separate Preventative Maintenance Only plan is available in addition to the standard Start-Up plan included in the cost of the S5K UPS.

Service Programs - S4K4UC/6UC and S5K Series

Preferred service level options include 6-hour on-site response, 24x7 within 150 miles of nearest service centers. 24x7 emergency service includes parts (including internal batteries), labor, and travel. Also includes one (1) Preventive Maintenance (PM) visit per year, scheduled at the customer's convenience (24x7).

Essential service level options include 6-hour on-site response, 24x7 within 150 miles of nearest service centers. 24x7 emergency service includes parts (including internal batteries), labor, and travel. Also includes one (1) Preventive Maintenance (PM) visit per year, scheduled by the customer for M-F 8AM-5PM.

Basic service level options include 6-hour on-site response, 24x7 within 150 miles of nearest service centers. 24x7 emergency service includes parts (excluding internal batteries), labor, and travel. Preventive Maintenance (PM) not included and is not available if the Basic Service plan is selected.

Field Service Programs for the S4K4UC, S4K6UC Industrial and S5K Series - continued

S4K4UC and S4K6UC Industrial Start-Up Programs

Catalog Number	Description
Domestic Only (Monday – Friday, 8am – 5pm)	
SUS4K061UM	6 kVA Start-Up
SUS4K101UM	10 kVA Start-Up
SUS4K061PM	6 kVA Start-Up Plus
SUS4K101PM	10 kVA Start-Up Plus
Domestic Only (7–Days/Week, 24 Hrs/Day)	
SUS4K061U7	6 kVA Start-Up
SUS4K101U7	10 kVA Start-Up
SUS4K061P7	6 kVA Start-Up Plus
SUS4K101P7	10 kVA Start-Up Plus

S4K4UC and S4K6UC Industrial Service Programs

Preferred Service (w/ 1 PM)	
Catalog Number	**Equipment**
MUUS4K06PR1	S4K4U6000C
MEUS4KBATPR1	S4K144BATC & S4K288BATC
MUUS4K10PR1	S4K6U10KC

Essential Service (w/ 1 PM)	
Catalog Number	**Equipment**
MUUS4K06ES1	S4K4U6000C
MEUS4KBATES1	S4K144BATC & S4K288BATC
MUUS4K10ES1	S4K6U10KC

Basic Service (PM not available)	
Catalog Number	**Equipment**
MUUS4K06BA0	S4K4U6000C
MEUS4KBATBA0	S4K144BATC & S4K288BATC
MUUS4K10BA0	S4K6U10KC

S4K4UC and S4K6UC Industrial Service Programs

1 PM Only (Mon–Fri, 8 am – 5 pm)	
Catalog Number	**Equipment**
MS4K061PM85	S4K4U6000C
MS4KBAT1PM85	S4K144BATC & S4K288BATC
MUUS4K10PM85	S4K6U10KC

1 PM Only (7 days, 24 hours)	
Catalog Number	**Equipment**
MS4K061PM24	S4K4U6000C
MS4KBAT1PM24	S4K144BATC & S4K288BATC
MUUS4K10PM24	S4K6U10KC

S5K Modular Service Programs

Contact Technical Services to obtain the catalog number for any of the Preferred, Essential or Basic Services (catalog number depends on the S5K configuration).

X = Number of Power Modules (#1 through #6)

YY = Number of Battery Modules (# 01 through #11)

Catalog Number	Service Program
MUUS5KXPRYY	Preferred Service
MUUS5KXESYY	Essential Service
MUUS5KXBAYY	Basic Service
MS5K1PM24	PM Only (7-Days/Week, 24 Hrs/Day) for all configurations

Note: Service programs are valid for one year.

S5K Modular Series On-Line Uninterruptible Power Systems (UPS)

This easily upgraded and flexible UPS provides the protection you want, when you need it.

The 5K Modular is scalable from 4 to 20 kVA, offering many flexible options by adding a few standard modules. Designed to be fully configured, tested and shipped in the configuration you need, the 5K Modular also has the ability to be easily upgraded in the field to either higher VA ratings (up to 20 kVA maximum), longer back-ups or to add N+x parallel redundancy. Configurations can be cost-effectively upgraded keeping your 5K Modular current without a large reinvestment in a new system.

The optional N+x redundancy provides a fault-tolerant group of power modules and controls. The modular design is easy to upgrade so the UPS can grow with the needs of the system that is being protected.

Each of the modular components, including 4 kVA power modules, battery modules and system control modules, can be hot-swapped making it easy to increase power, extend your back-up or add redundancy while still providing power protection to the load.

This fault-tolerant system uses intelligent power and battery modules which take themselves off-line if there is a problem without interrupting power to the load. Self-diagnostic capabilities simplify maintenance and troubleshooting. Each unit incorporates an internal automatic bypass.

Applications

- Network Servers
- Enterprise Telecommunications Systems
- LAN gateways, Bridges and Routers
- Mini-computers, Superservers and Server Clusters
- Clusters of PCs or Workstations and Peripherals
- RAID arrays and other large-scale Data Handling Systems

E179213

Features

- Scalable for capacity, redundancy, or battery back-up offering unbelievable flexibility.
- Built-in intelligence is provided for each individual module using microprocessor controls, increasing functionality, communications and reliability.
- N+x parallel redundancy is easily achieved by adding extra control, power and battery modules.
- Any failed module will automatically take itself off-line while the other modules continue to support the connected equipment.
- Multiple and simultaneous communication ports
- Variable input voltage range minimizes battery operation to increase battery life.
- An automatic internal bypass for maximum availability of output power.
- Continuous sinewave output
- Power factor corrected input reduces reflected distortion and optimizes utility power.
- Limited two-year warranty (Includes factory start up), See the Extended Warranty at the end of this section for details.

Chassis Options

The S5K Modular has three chassis available to build on:

- The “A” chassis can accommodate up to 8 modules.
- The “B” chassis can accommodate up to 12 modules and supplies 16 kVA of power, with N+1 redundancy.
- The “C” chassis can accommodate up to 12 modules and supplies a full 20 kVA of power, with N+1 redundancy.

System control modules are not included in module count. All chassis can accommodate up to two system control modules. Select the proper chassis based on your futures need for expansion or redundancy. In most standard (non-redundant) applications, the “A” chassis is the most popular.

Selection Steps

1. Determine the maximum kVA you will need for future expansion.

2. Determine the kVA and run time value for your immediate need.

3. Determine if you need redundancy. If the exact run time is the critical need, use the fully redundant option (see Selection Charts on the following pages).

4. Select the unit that meets both your immediate requirements, and is expandable to your future needs in the “Maximum Upgrade” column in the selection table. The Maximum Upgrade column shows the highest kVA expansion that particular configuration is capable of without removing any of the battery modules from the original configuration.

Specifications

Capacity (VA/Watts)	4 kVA / 2.8 kW to 20 kVA / 14 kW in 4 kVA / 2.8 kW increments
Dimensions – inches	
Unit (H x W x D)	8 module capacity “A” Chassis 41” x 20” x 28” 12 module capacity “B” or “C” Chassis 54” x 20” x 28”
Shipping (H x W x D)	56 in x 32 in x 42 in
Input AC Parameters	
Voltage Range (typical)	170-276 Vac Low line limit variable with load 170 Vac from 80 to 100% load 144 Vac from 20 to 90% load 127 Vac from 20 to 70% load 100 Vac at less than 30% load
Voltage Configuration and Connection	Single phase, 2-wire plus ground (L1-L2-G)
Frequency	60 Hz nominal 40 - 70 Hz range without operating from battery
Input Connector	Hardwired only
Power Factor	.98 typical
Output AC Parameters	
Voltage	240, 208, 240/120 (120-0-120) or 208/120 (120-0-88)
Receptacles	Optional with use of external Maintenance Bypass
Voltage Regulation	±3 %
Voltage Distortion	Maximum 3% THD for linear loads, maximum 7% THD for full non-linear loads.
Transient Response	< 7% for 100% step load; recovery within 96 ms.
Frequency	60 Hz
Frequency Slew Rate	Selectable up to 5 Hz/sec
Frequency Sync Range	Selectable up to ±5 Hz
Overload	100 to 110% for 10 minutes minimum 111 to 150% 10 seconds 151 to 200% for 2 Cycles
Battery Parameters	
Battery Type	Sealed, lead acid
Recharge Rate	3 to 5 Hrs to 90% capacity
Battery Back–up	See Battery Selection Tables for specific configurations Autonomy time is 6 minutes with an equal number of battery & power modules in a non-redundant configuration at full load
Battery Voltage	120 Vdc Nominal
Maximum charge current (full load)	3A
Environmental	
Operating Temperature	+32°F to +104°F (0°C to +40°C)
Storage Temperature	+5°F to +122°F (-15°C to +50°C)
Relative Humidity	0% to 95%, non-condensing
Operating Elevation	Up to 10,000 ft. (3000m) at 104°C (40°C) without derating
Storage Elevation	15.000m (50,000 ft.) maximum
Heat Dissipation	1062 BTU / Hour per fully loaded power module (4kVA / 2.8kW)
Audible Noise	< 62 dBA @ 1 meter
Agency	
Safety	UL 1778 listed; c-UL
Compliant Immunity Standards	ANSI C62.41, Class A & B
Routine Maintenance	Keep the UPS clean and cool to enhance system reliability. Occasionally clean or replace the fan intake filters and ensure proper airflow. Do not use liquid or aerosol cleaning fluids. Periodically review the UPS alarm logs

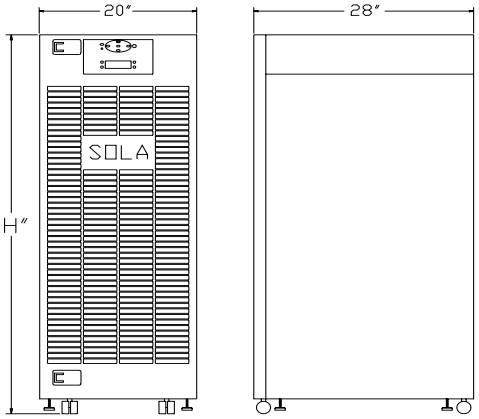
Recommended Part Numbers

(See selection charts for other options)

kVA / kW	Catalog Number		Back–up (Min@FL/HL)
	Standard	Redundant	
4/2.8	**S5KA4N1A6**	**S5KA4R1A6**	7/18
8/5.6	**S5KA8N2A6**	**S5KA8R2A6**	7/18
12/8.4	**S5KA12N3A6**	**S5KA12R3A6**	7/18
16/11.2	**S5KA16N4A6**	**S5KB16R4A6**	7/18
20/14	**S5KC20N5A6**	**S5KC20R5A6**	7/18

Mechanical Diagram

CHASSIS	HEIGHT "H"
A	41"
B	54"
C	54"



Part Number Configuration

The S5K modular is available in many combination. Use the part number template below to identify the description of any given part number.

Series Designation	Chassis Size	kVA Rating	Unit Type	Number of Battery Modules	Output Voltage	Frequency
	A = 8 Module, 16 kVA Capacity	**4, 8, 12, 16** or **20** kVA **00** = External Battery	**N** = Standard (Not Redundant)	* Must be at least one per 4 kVA of capacity	**A** = 208/120	**6** = 60 Hz
	B = 12 Module, 16 kVA Capacity		**R** = Redundant Power & Control			
	C = 12 Module, 20 kVA Capacity		**X** = Redundant Power, Battery & Control			
	D = External Battery Cabinet		**B** = Battery Cabinet			
Example: 4 kVA Load, Future Expandable to 16 kVA with 7 minutes of Back-up. What is the part number?						
S5K	A	4	N	1	A	6
Resulting catalog number is "S5KA4N1A6"						

Chassis A: 8 Module, 4 kVA Enclosure Selection Chart

System Model Number	Qty of Power Modules Included	Qty of Battery Modules Included	Qty of System Control Modules Included	Unit Weight (lbs)	Back–up Full/Half Load (minutes)	Maximum Upgrade[2]
4 kVA / 2.8kW						
S5KA4N1A6	1	1	1	441	7/18	16kVA
S5KA4N2A6	1	2	1	506	19/42	16kVA
S5KA4N3A6	1	3	1	571	30/61	16kVA
S5KA4N4A6	1	4	1	636	42/82	16kVA
S5KA4N5A6	1	5	1	701	52/98	12kVA
S5KA4N6A6	1	6	1	766	62/110	8kVA
S5KA4N7A6	1	7	1	831	75/140	N/A
Redundant (power & control only)						
S5KA4R1A6	2	1	2	472	7/18	12kVA
S5KA4R2A6	2	2	2	537	19/42	12kVA
S5KA4R3A6	2	3	2	602	30/61	12kVA
S5KA4R4A6	2	4	2	667	42/82	12kVA
S5KA4R5A6	2	5	2	732	52/98	8kVA
S5KA4R6A6	2	6	2	797	62/110	N/A
Full Redundant (battery, power & control)[1]						
S5KA4X2A6	2	2	2	537	7/18	12kVA
S5KA4X3A6	2	3	2	602	19/42	12kVA
S5KA4X4A6	2	4	2	667	30/61	8kVA
S5KA4X5A6	2	5	2	732	42/82	N/A
S5KA4X6A6	2	6	2	797	52/98	N/A

Notes:

1. Full redundant units include one redundant battery module. Back–up given does not include this extra module, so actual achieved Back–up will be longer than published.
2. The S5K modulars are easily upgraded by adding extra battery and/or power modules as long as the number of modules (battery plus power) does not exceed the number of modules the enclosure is designed to contain.
   – Control modules do not count toward the 8 module max. (2 max control modules per system).
   – There must be at least one battery module per power module installed.

Chassis A: 8 Module Enclosure Selection Chart

System Model Number	Qty of Power Modules Included	Qty of Battery Modules Included	Qty of System Control Modules Included	Unit Weight (lbs)	Back–up Full/Half Load (minutes)	Maximum Upgrade[2]
8 kVA / 5.6kW						
S5KA8N2A6	2	2	1	532	7 / 19	16kVA
S5KA8N3A6	2	3	1	597	13 / 30	16kVA
S5KA8N4A6	2	4	1	662	19 / 42	16kVA
S5KA8N5A6	2	5	1	727	25 / 52	12kVA
S5KA8N6A6	2	6	1	792	30 / 62	N/A
Redundant (power & control only)						
S5KA8R2A6	3	2	2	563	7 / 19	12kVA
S5KA8R3A6	3	3	2	628	13 / 30	12kVA
S5KA8R4A6	3	4	2	693	19 / 42	12kVA
S5KA8R5A6	3	5	2	758	25 / 52	N/A
Full Redundant (battery, power & control)[1]						
S5KA8X3A6	3	3	2	628	7 / 19	12kVA
S5KA8X4A6	3	4	2	693	13 / 30	N/A
S5KA8X5A6	3	5	2	758	19 / 42	N/A
12 kVA / 8.4kW						
S5KA12N3A6	3	3	1	623	7 / 19	16kVA
S5KA12N4A6	3	4	1	688	11 / 27	16kVA
S5KA12N5A6	3	5	1	753	15 / 34	N/A
Redundant (power & control only)						
S5KA12R3A6	4	3	2	654	7 / 19	N/A
S5KA12R4A6	4	4	2	719	11 / 27	N/A
Full Redundant (battery, power & control)[1]						
S5KA12X4A6	4	4	2	719	7 / 19	N/A
16 kVA / 11.2kW						
S5KA16N4A6	4	4	1	714	7 / 19	N/A

Notes:

1. Full redundant units include one redundant battery module. Back–up given does not include this extra module, so actual achieved Back–up will be longer than published.

2. The S5K modulars are easily upgraded by adding extra battery and/or power modules as long as the number of modules (battery plus power) does not exceed the number of modules the enclosure is designed to contain.
   – Control modules do not count toward the 8 module max. (2 max control modules per system).
   – There must be at least one battery module per power module installed.

Chassis B: 12 Module, 4 kVA Enclosure Selection Chart

System Model Number	Qty of Power Modules Included	Qty of Battery Modules Included	Qty of System Control Modules Included	Unit Weight (lbs)	Back–up Full/Half Load (minutes)	Maximum Upgrade[2]
4 kVA / 2.8 kW						
S5KB4N1A6	1	1	1	496	7 / 18	16 kVA
S5KB4N2A6	1	2	1	561	19 / 42	16 kVA
S5KB4N3A6	1	3	1	626	30 / 61	16 kVA
S5KB4N4A6	1	4	1	691	42 / 82	16 kVA
S5KB4N5A6	1	5	1	756	52 / 98	16 kVA
S5KB4N6A6	1	6	1	821	62 / 110	16 kVA
S5KB4N7A6	1	7	1	886	75 / 140	16 kVA
S5KB4N8A6	1	8	1	951	92 / 170	16 kVA
S5KB4N9A6	1	9	1	1016	100 / 190	12 kVA
S5KB4N10A6	1	10	1	1081	110 / 220	8 kVA
S5KB4N11A6	1	11	1	1146	120 / 250	N/A
Redundant (power & control only)						
S5KB4R1A6	2	1	2	527	7 / 18	16 kVA
S5KB4R2A6	2	2	2	592	19 / 42	16 kVA
S5KB4R3A6	2	3	2	657	30 / 61	16 kVA
S5KB4R4A6	2	4	2	722	42 / 82	16 kVA
S5KB4R5A6	2	5	2	787	52 / 98	16 kVA
S5KB4R6A6	2	6	2	852	62 / 110	16 kVA
S5KB4R7A6	2	7	1	917	75 / 140	16 kVA
S5KB4R8A6	2	8	1	982	92 / 170	12 kVA
S5KB4R9A6	2	9	1	1047	100 / 190	8 kVA
S5KB4R10A6	2	10	1	1112	110 / 220	N/A
Full Redundant (battery, power & control)[1]						
S5KB4X2A6	2	2	2	592	7 / 18	16 kVA
S5KB4X3A6	2	3	2	657	19 / 42	16 kVA
S5KB4X4A6	2	4	2	722	30 / 61	16 kVA
S5KB4X5A6	2	5	2	787	42 / 82	16 kVA
S5KB4X6A6	2	6	2	852	52 / 98	16 kVA
S5KB4X7A6	2	7	2	917	62 / 110	16 kVA
S5KB4X8A6	2	8	2	982	75 / 140	12 kVA
S5KB4X9A6	2	9	2	1047	92 / 170	8 kVA
S5KB4X10A6	2	10	2	1112	100 / 190	N/A

Notes:

1. Full redundant units include one redundant battery module. Back–up given does not include this extra module, so actual achieved Back–up will be longer than published.

2. The S5K modulars are easily upgraded by adding extra battery and/or power modules as long as the number of modules (battery plus power) does not exceed the number of modules the enclosure is designed to contain.
   – Control modules do not count toward the 8 module max. (2 max control modules per system).
   – There must be at least one battery module per power module installed.

Chassis B: 12 Module, 8 kVA Enclosure Selection Chart

System Model Number	Qty of Power Modules Included	Qty of Battery Modules Included	Qty of System Control Modules Included	Unit Weight (lbs)	Back–up Full/Half Load (minutes)	Maximum Upgrade[2]
8 kVA / 5.6kW						
S5KB8N2A6	2	2	1	587	7 / 19	16kVA
S5KB8N3A6	2	3	1	652	13 / 30	16kVA
S5KB8N4A6	2	4	1	717	19 / 42	16kVA
S5KB8N5A6	2	5	1	782	25 / 52	16kVA
S5KB8N6A6	2	6	1	847	30 / 62	16kVA
S5KB8N7A6	2	7	1	912	38 / 75	16kVA
S5KB8N8A6	2	8	1	977	43 / 92	16kVA
S5KB8N9A6	2	9	1	1042	47 / 100	12kVA
S5KB8N10A6	2	10	1	1107	54 / 110	N/A
Redundant (power & control only)						
S5KB8R2A6	3	2	2	618	7 / 19	16kVA
S5KB8R3A6	3	3	2	683	13 / 30	16kVA
S5KB8R4A6	3	4	2	748	19 / 42	16kVA
S5KB8R5A6	3	5	2	813	25 / 52	16kVA
S5KB8R6A6	3	6	2	878	30 / 62	16kVA
S5KB8R7A6	3	7	2	943	38 / 75	16kVA
S5KB8R8A6	3	8	2	1008	43 / 92	12kVA
S5KB8R9A6	3	9	2	1073	47 / 100	N/A
Full Redundant (battery, power & control)[1]						
S5KB8X3A6	3	3	2	628	7 / 19	16kVA
S5KB8X4A6	3	4	2	693	13 / 30	16kVA
S5KB8X5A6	3	5	2	758	19 / 42	16kVA
S5KB8X6A6	3	6	2	878	25 / 52	16kVA
S5KB8X7A6	3	7	2	943	30 / 62	16kVA
S5KB8X8A6	3	8	2	1008	38 / 75	12kVA
S5KB8X9A6	3	9	2	1073	43 / 92	N/A

Notes: (Apply to all 12 Module Tables)

1. Full redundant units include one redundant battery module. Back–up given does not include this extra module, so actual achieved Back–up will be longer than published.

2. The S5K modulars are easily upgraded by adding extra battery and/or power modules as long as the number of modules (battery plus power) does not exceed the number of modules the enclosure is designed to contain.
   – Control modules do not count toward the 8 module max. (2 max control modules per system).
   – There must be at least one battery module per power module installed.

Chassis B: 12 Module, 12 and 16 kVA Enclosure Selection Chart

System Model Number	Qty of Power Modules Included	Qty of Battery Modules Included	Qty of System Control Modules Included	Unit Weight (lbs)	Back–up Full/Half Load (minutes)	Maximum Upgrade[2]
12 kVA / 8.4kW						
S5KB12N3A6	3	3	1	678	7 / 19	16kVA
S5KB12N4A6	3	4	1	743	11 / 27	16kVA
S5KB12N5A6	3	5	1	808	15 / 34	16kVA
S5KB12N6A6	3	6	1	873	18 / 41	16kVA
S5KB12N7A6	3	7	1	938	24 / 50	16kVA
S5KB12N8A6	3	8	1	1003	27 / 58	16kVA
S5KB12N9A6	3	9	1	1068	29 / 63	N/A
Redundant (power & control only)						
S5KB12R3A6	4	3	2	709	7 / 19	16kVA
S5KB12R4A6	4	4	2	774	11 / 27	16kVA
S5KB12R5A6	4	5	2	839	15 / 34	16kVA
S5KB12R6A6	4	6	2	904	18 / 41	16kVA
S5KB12R7A6	4	7	2	969	24 / 50	16kVA
S5KB12R8A6	4	8	2	1034	27 / 58	N/A
Full Redundant (battery, power & control)[1]						
S5KB12X4A6	4	4	2	719	7 / 19	16kVA
S5KB12X5A6	4	5	2	839	11 / 27	16kVA
S5KB12X6A6	4	6	2	904	15 / 34	16kVA
S5KB12X7A6	4	7	2	969	18 / 41	16kVA
S5KB12X8A6	4	8	2	1034	24 / 50	N/A
16 kVA / 11.2kW						
S5KB16N4A6	4	4	1	769	7 / 19	N/A
S5KB16N5A6	4	5	1	834	11 / 27	N/A
S5KB16N6A6	4	6	1	899	15 / 34	N/A
S5KB16N7A6	4	7	1	964	16 / 38	N/A
S5KB16N8A6	4	8	1	1029	19 / 43	N/A
Redundant (power & control only)						
S5KB16R4A6	5	4	2	800	7 / 19	N/A
S5KB16R5A6	5	5	2	865	10 / 25	N/A
S5KB16R6A6	5	6	2	930	12 / 30	N/A
S5KB16R7A6	5	7	2	995	16 / 38	N/A
Full Redundant (battery, power & control)[1]						
S5KB16X5A6	5	5	2	865	7 / 19	N/A
S5KB16X6A6	5	6	2	930	10 / 25	N/A
S5KB16X7A6	5	7	2	995	12 / 30	N/A

Note: See previous page.

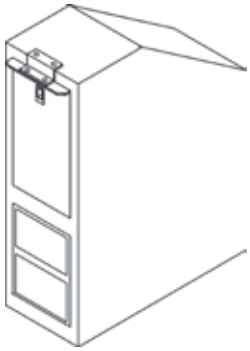
Chassis C: 12 Module, 12, 16 and 20 kVA Enclosure Selection Chart

System Model Number	Qty of Power Modules Included	Qty of Battery Modules Included	Qty of System Control Modules Included	Unit Weight (lbs)	Back–up Full/Half Load (minutes)	Maximum Upgrade[2]
12 kVA / 8.4 kW						
S5KC12N3A6	3	3	1	744	7 / 19	20 kVA
S5KC12N4A6	3	4	1	809	12 / 24	20 kVA
S5KC12N5A6	3	5	1	874	16 / 36	20 kVA
S5KC12N6A6	3	6	1	939	20 / 43	20 kVA
S5KC12N7A6	3	7	1	1004	24 / 51	20 kVA
S5KC12N8A6	3	8	1	1069	28 / 60	16 kVA
S5KC12N9A6	3	9	1	1134	32 / 68	N/A
Redundant (power & control only)						
S5KC12R3A6	4	3	2	775	7 / 19	20 kVA
S5KC12R4A6	4	4	2	846	12 / 24	20 kVA
S5KC12R5A6	4	5	2	905	16 / 36	20 kVA
S5KC12R6A6	4	6	2	970	20 / 43	20 kVA
S5KC12R7A6	4	7	2	1035	24 / 51	16 kVA
S5KC12R8A6	4	8	2	1100	28 / 60	N/A
Full Redundant (battery, power & control)[1]						
S5KC12X4A6	4	4	2	840	7 / 19	20 kVA
S5KC12X5A6	4	5	2	905	12 / 24	20 kVA
S5KC12X6A6	4	6	2	970	16 / 36	20 kVA
S5KC12X7A6	4	7	2	1035	20 / 43	16 kVA
S5KC12X8A6	4	8	2	1100	24 / 51	N/A
16 kVA / 11.2 kW						
S5KC16N4A6	4	4	1	835	7 / 19	20 kVA
S5KC16N5A6	4	5	1	900	9 / 25	20 kVA
S5KC16N6A6	4	6	1	965	13 / 31	20 kVA
S5KC16N7A6	4	7	1	1030	17 / 37	20 kVA
S5KC16N8A6	4	8	1	1095	19 / 43	N/A
Redundant (power & control only)						
S5KC16R4A6	5	4	2	866	7 / 19	20 kVA
S5KC16R5A6	5	5	2	931	9 / 25	20 kVA
S5KC16R6A6	5	6	2	996	13 / 31	20 kVA
S5KC16R7A6	5	7	2	1061	17 / 37	N/A
Full Redundant (battery, power & control)[1]						
S5KC16X5A6	5	5	2	931	7 / 19	20 kVA
S5KC16X6A6	5	6	2	996	9 / 25	20 kVA
S5KC16X7A6	5	7	2	1061	13 / 31	N/A
20 kVA / 13 kW						
S5KC20N5A6	5	5	1	926	7 / 19	N/A
S5KC20N6A6	5	6	1	991	9 / 24	N/A
S5KC20N7A6	5	7	1	1056	12 / 29	N/A
Redundant (power & control only)						
S5KC20R5A6	6	5	2	957	7 / 19	N/A
S5KC20R6A6	6	6	2	1033	9 / 24	N/A
Full Redundant (battery, power & control)[1]						
S5KC20X6A6	6	6	2	1022	7 / 19	N/A

Note: See previous page.

Maintenance Bypass Options

The S5K Modular Series Maintenance Bypass Cabinet provides complete "wrap around" protection and allows the UPS to be pulled from service without interrupting power to the loads.



Front View

The Maintenance Bypass Cabinet controls are located behind a lockable front panel to provide operation security. Controls include a manual by-pass transfer switch, UPS input disconnect switch, and a branch rated output circuit breaker. Indicator lamps provide visual confirmation that the UPS input, UPS output, and bypass source are available. Models are available with and without an isolation transformer in the bypass path. The Maintenance Bypass with Transformer option provides isolation in the bypass path as well as flexibility with utility voltages. The transformer provides simultaneous output voltages of 120/120/208/240 V regardless of whether the input voltage is 208 or 240 V.

The Maintenance Bypass ships on a wooden pallet with a metal pull out ramp. The bypass cabinet includes casters and leveling feet as well as floor mounting brackets (brackets are used to secure bypass cabinet to pallet during shipping).

The Maintenance Bypass has a two year parts and labor warranty. Basic start-up is included, if the bypass cabinet is purchased at the same time as the S5K Modular UPS. Start-up of the Maintenance Bypass must occur at the same time as start-up of the UPS.

The S5KMBS-00-ISO hardwired Maintenance Bypass can be reconfigured by removing the provided plates and adding the Receptacle Kit options. The S5KMBS-00-ISO has 8 blank plates. Each plate can be removed and a Receptacle Kit option installed by a qualified electrician or electrical contractor. The hardwired output provision may also be removed adding slots for two (2) more Receptacle Kits (for a total of 10 Kits Maximum per MBS). Reassembled configurations are available for those who would prefer the MBS arrive with any needed receptacles already installed. Contact your local SolaHD Sales Representative for details.

MBS Wiring Kit Options

Optional wiring kits include all necessary conduit, wiring and conduit fittings to make the input and output connections between the UPS and the Maintenance Bypass.

Catalog Number	Description (right or left side as viewed from front)
S5KWKITR	Bypass without transformer, mounted on right of UPS
S5KWKITL	Bypass without transformer, mounted on left of UPS
S5KWKITR-ISO	Bypass with transformer, mounted on right of UPS
S5KWKITL-ISO	Bypass with transformer, mounted on left of UPS

Maintenance Bypass Switch (MBS)

Catalog Number	Description	Dimensions (H x W x D) – in (mm) Weight (lbs/kg)
Hardwired MBS		
S5KMBS-00-ISO	Hardwired Bypass w/ 120/120/208/240 V output with isolation transformer	30.4 x 9.5 x 26.5 (775 x 241 x 700) 300 (130)
S5KMBS-00*	Hardwired Bypass w/ 208 or 240 V output (does not support 120 V loads)	
S5KMBS-C0-ISO	Hardwired Bypass w/ 120/120/208/240 V output with 20 kVA isolation transformer	
S5KMBS-C0*	Hardwired Bypass w/ 208 or 240 V output	
MBS with pre–configured distribution options		
S5KMBS-01-ISO	Bypass w/ 120/120/240 V output with isolation transformer & the following receptacle options: (10) Duplex 5-15R	30.4 x 9.5 x 26.5 (775 x 241 x 700) 300 (130)
S5KMBS-02-ISO	Bypass w/ 120/120/240 V output with isolation transformer & the following receptacle options: (6) Duplex 5-15R (2) Duplex 5-20R (1)L14-30R 120/120/240 V	
S5KMBS-03-ISO	Bypass w/ 120/120/240V output with the following receptacle options: (4) Duplex 5-20R (2) L5-20R (2) L6-20R - 240 V (2) L6-30R - 240	

***Note:** Unit does not include an isolation transformer and does not support 120V loads.

Receptacle Kit Options (max qty 10 per MBS)

Catalog Number	Description
S5K120HW15KIT	Hardwire kit, 120 V, 15A (1) Pole Breaker, ½" & ¾" knockout
S5K208HW15KIT	Hardwire kit, 208 V, 15A (2) Pole Breaker, ½" & ¾" knockout
S5K240HW15KIT	Hardwire kit, 240 V, 15A (2) Pole Breaker, ½" & ¾" knockout
S5K515R2KIT	Duplex NEMA 5-15R Receptacle Kit
S5KL515RKIT	Duplex NEMA L5-15R Receptacle Kit
S5K615R2KIT208	NEMA 6-15R 208 Vac Receptacle Kit
S5K615R2KIT240	NEMA 6-15R 240 Vac Receptacle Kit
S5KL615R2KIT208	NEMA L6-15R 208 Vac Receptacle Kit
S5KL615R2KIT240	NEMA L6-15R 240 Vac Receptacle Kit
S5K120HW20KIT	Hardwire kit, 120 V, 20A (1) Pole Breaker, ½" & ¾" knockout
S5K208HW20KIT	Hardwire kit, 208 V, 20A (2) Pole Breaker, ½" & ¾" knockout
S5K240HW20KIT	Hardwire kit, 240 V, 20A (2) Pole Breaker, ½" & ¾" knockout
S5K520R2KIT	Duplex NEMA 5-20R Receptacle Kit
S5KL520RKIT	NEMA L5-20R Receptacle Kit
S5KL620RKIT208	NEMA L6-20R 208 Vac Receptacle Kit
S5KL620RKIT240	NEMA L6-20R 240 Vac Receptacle Kit
S5KL1420RKIT	NEMA L14-20R 120/120/240 Receptacle Kit
S5K120HW30KIT	Hardwire kit, 120 V, 30A (1) Pole Breaker, ½" & ¾" knockout
S5K208HW30KIT	Hardwire kit, 208 V, 30A (2) Pole Breaker, ½" & ¾" knockout
S5K240HW30KIT	Hardwire kit, 240 V, 30A (2) Pole Breaker, ½" & ¾" knockout
S5KL530RKIT	NEMA L5-30R Receptacle Kit
S5KL630RKIT208	NEMA L6-30R 208 Vac Receptacle Kit
S5KL630RKIT240	NEMA L6-30R 240 Vac Receptacle Kit
S5KL1430RKIT	NEMA L14-30R 120/120/240 Receptacle Kit

External Battery Options*

Catalog Number	Number of Battery Modules	Shipping Weight – lbs (kg)
S5KD00B1200	12	1107 (502.13)
S5KD00B1100	11	1041 (472.19)
S5KD00B1000	10	975 (442.25)
S5KD00B0900	9	909 (412.32)
S5KD00B0800	8	843 (382.38)
S5KD00B0700	7	777 (352.44)
S5KD00B0600	6	711 (322.50)
S5KD00B0500	5	645 (292.57)
S5KD00B0400	4	579 (262.63)
S5KD00B0300	3	513 (232.69)
S5KD00B0200	2	447 (202.75)
S5KD00B0100	1	381 (172.82)
Pluggable Cables for Extended Battery Options		
S5KEXTBC3	3 ft. pluggable battery cable for connection between extended battery cabinet and UPS	
S5KEXTBC15	15 ft. pluggable battery cable for connection between extended battery cabinet and UPS	
S5KEXLBCKIT	External battery cable adapter (allows hardwire of up to 25 ft. of customer supplied battery cable and conduit, (2) required for use with extended battery cabinet	

* Pluggable cables for external battery options.

Optional Equipment

Expansion Module Options		
Catalog Number	**Description**	**Approx. Ship Weight**
S5K4KPWR	4 kVA / 2.8 kW Power Module	30 (13.61)
S5KBATT	Battery Module	70 (31.75)
S5KCNTRL	Control Module	7 (3.17)
Communication Options		
Catalog Number	**Description**	
SNMP WEB CARD	Ethernet communications kit, (Supports SNMP, HTTP & OCP) includes SNMP hardware, MIB, configuration cable and installation manual.	
RELAY CARD-INT	Relay contact board, relay contact signals for "On Battery", "Low Battery", "On Bypass", "On UPS", "Summary Alarm" and "UPS Fault".	
S5KREPOKIT	Remote Emergency Power Off Kit includes 50' length of cable with connector to UPS and external push button switch.	
External Battery Connections		
S5KEXTBC3	3 ft. Battery Connection Cable	
S5KBATKIT	Battery Connection Kit allows up to 25' or customer supplied cable and conduit.	

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Visit our website at www.solahd.com or
contact Technical Services at (800) 377-4384 with any questions.

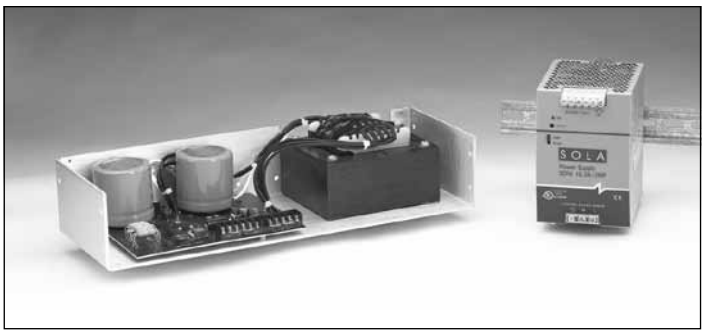
SolaHD has a broad range of standard power supplies to suit almost any industrial application. Updated approvals and user friendly features make power system design easy. The product line includes one of the broadest ranges of DIN Rail and linear-based power supplies in the marketplace. The DIN Rail products feature full CE compliance (including all the elements of CE design engineers need to worry about: safety/LVD, EMC, and ingress protection). UL 508 approvals eliminate derating in UL 508 listed panel systems. Global inputs are available for installations around the world.

Three phase input options are available on many of the SDN DIN Rail products that convert 380/480 three phase directly to 24 Vdc. They provide extremely stable, regulated low voltage without the need for a step down transformer saving space and money.

SolaHD now offers a DC UPS to provide backup power to the power supply in the event of a blackout.

Linear vs. Switcher

SolaHD has provided both linear and switching technology products for many years. As a leading supplier of power products to the industrial market, both technologies are still important. Switching technology (most of Sola'HDs DIN Rail line) is the predominant method of AC-DC conversion for almost any type of electronic system sold today in the world, from PLC's to desktop PC's.



Linear vs. Switcher

Linear Power Supplies for a broad range of applications

The small size, lightweight and high efficiency of the switching products give them significant advantages over the linear technology products (Sola's SL and 83 series). SolaHD switching products provide well filtered and regulated DC of typically less than 1% deviation from the nominal output voltage.

Linears are about 50% efficient while their switching counterparts are typically over 80% efficient. Switchers are light enough to mount on a DIN Rail, while only the smallest linears are capable of being securely mounted to a DIN Rail. Linears are still popular today because they do provide very tight regulation (<.01% typically), almost perfectly clean DC, fast transient response and their low component count helps provide a lower material cost for its user. Linears are typically open frame because of the excessive heat dissipation from their low efficiency.

SolaHD's industry standard linears, however, are available with optional covers for safety. Most linears are recognized to UL 60950 and cannot meet the stricter temperature requirements of the UL 508 Listing, such as with SolaHD's DIN Rail power supplies.

DC Power Supply Selection Process

Power supplies can be selected online by visiting our website. Enter your power requirements and a list of matching power supplies will list. You can also manually select a power supply by following the directions below:

1) Gather the required information.
   - Input voltage and frequency?
   - Wattage needed?
   - Number of outputs?
   - Voltage of each output?
   - Amperage of each output?
   - Don't forget to take into account the peak loading of each output.
   - Battery Backup

2) Calculate the power (wattage) of the DC power supply you need. If more than one output is required, do the following calculation:
   - Multiply the Voltage times the amperage of each output to calculate the wattage of each output. Next, add together the wattage of each output to get the total wattage for the supply.

3) Determine which models from the Power Supply Selection Chart (on the next page) meet all of the required specifications.

4) Download the specifications sheets from our web site (www.solaheviduty.com).

5) Check the mounting style, connections and physical size of the power supply to ensure its suitability for the intended application.

6) Check for applicable safety approvals for the country and application the power supply will be used in.

Try our online product selector at
www.solahd.com/psselect.
Enter your power requirements and a list of matching power supplies will list.
It's fast and easy.

Selection Worksheet

Output:

_____ Vdc x _____ Amps = _____ Watts
_____ Vdc x _____ Amps = _____ Watts
_____ Vdc x _____ Amps = _____ Watts
_____ Vdc x _____ Amps = _____ Watts
_____ Vdc x _____ Amps = _____ Watts
_____ Vdc x _____ Amps = _____ Watts
_____ Vdc x _____ Amps = _____ Watts
_____ Vdc x _____ Amps = _____ Watts

Add Watts from each output to calculate

Total Watts = _____

Physical Dimensions:

_____H x _____W x _____D

Mounting:

_____ DIN Rail
_____ Chassis
_____ Other

Other required features or options:

_____
_____
_____
_____
_____
_____

If you have filled out this form and cannot find the appropriate power supply, please fax (800-367-4384) or e-mail (tech@solahd.com) this information to the Technical Services group.

Power Supply Selection Table

This chart is intended only as a guide for selecting a series of DC power supply, some of the series listed may not work in all applications.

Series	Input Voltage				Output Voltage						Power Range (Total Watts)	Number of Outputs				Notes	Page
	DC	115 Vac	230 Vac	380/480 Vac	3.3 V	5 V	12 V	15 V	24 V	48 V		Single	Dual	Triple	>4		
SDN™	X	X	X	X					X		60 – 960	X				- DIN Rail mount - DC Battery Back-up Available - Redundant options - NEC Class 2/DeviceNet™	101
SDP™	X	X	X			X	X	X	X	X	15 – 100	X				- DIN Rail mount compact	118
SCP	X	X	X		X	X	X	X	X	X	30 – 100	X	X	X		- DIN Rail mount/Chassis	124
SCD	X					X	X	X	X	X	30	X	X			- DIN Rail mount/Chassis - DC input	128
SCL		X	X			X	X	X			4 – 10	X	X	X		- DIN Rail mount/Chassis	126
SFL		X	X				X		X	X	75 – 600	X				- DIN Rail mount - Adjustable Pot, Red or UPS option	134
GL OEM Switchers		X	X		X	X	X	X	X		25 – 500	X	X	X	X	- 40 - 110 Watt, open frame, Molex type connections - 200 Watt, enclosed with connected screw terminals	143
SHP		X	X			X	X	X	X	X	1500 – 2000	X	X	X	X	- Modular design - Screw Terminals (OEM) supply - Configurable Voltage Output	151
Silver Line Linears		X	X			X	X	X	X		15 – 244	X	X	X		- Industry standard footprint - Screw terminals and optional covers	137

DIN Rail Selection Guide

		Output Voltages									
		48	24	15	12	10	5	±15	±12	5/24	5/12/12
AMPS	1	SDP 1–48–100T	SDP 06–24–100T					SCL 4D15–DN	SCL 4D12–DN	SCP 30D524–DN SCP 30S524B–DN	SCL 10T512–DN
		SFL 1.5–48–100	SDP 1–24–100T	SCP 30S15–DN				SCL 10D15–DN	SCL 10D12–DN		SCP 30T512–DN
	2.5		SDN 2.5–24–100P SDP 2–24–100T		SDP 2–12–100T SCP 30S12B–DN			SCP 30D15–DN	SCP 30D12–DN		
	3			SDP 3–15–100T		SDP 2–12–100T					
	3.8		SCP 100S24X–CM SDN 4–24–100LP SDP 4–24–100LT								
	4		SDP 4–24–100RT								
	5	SDN 5–48–100P	SDN 5–24–100P SDN 5–24–100C SDN 5–24–480 (3Ø)				SDP 5–5–100T SCP 30S5B–DN				
	6	SFL 6–48–100									
	9				SDN 9–12–100P						
	10		SDN 10–24–100P SDN 10–24–100C SDN 10–24–480 (3Ø)								
	12	SFL 12–48–100	SFL 12–24–100								
	16				SDN 16–12–100P						
	20		SDN 20–24–100C SDN 20–24–100P SDN 20–24–480C (3Ø)								
	25		SFL 24–24–100								
	30		SDN 30–24–480 (3Ø)								
	40		SDN 40–24–480 (3Ø)								

Visit our website at www.solahd.com or
contact Technical Services at (800) 377-4384 with any questions.

SDN-C Compact DIN Rail Series

The SDN-C DIN rail power supplies are the next generation of the popular SDN series. These models combine high efficiency and compact size with new visual diagnostic LEDs to offer the most performance available from SolaHD. Essential industrial features such as Sag Immunity, Power Factor Correction, and universal voltage input have been retained in this series. Wide temperature operating range and parallel operation capability make the new SDN-C units suitable to a variety of industrial applications.

Features

- Compact packaging to save space on the DIN rail
- New visual diagnostic LEDs for input and output status at a glance
- High MTBF means high reliability and long life
- Higher efficiency saves energy and lowers amount of heat generated in panel
- PowerBoost™ overload capability to start high inrush loads
- Accepts Universal voltage 85-264 Vac, 50/60 Hz input
- Single phase models meet SEMI F47 Sag Immunity standard
- Power Factor Correction (meets EN61000-3-2)
- Class I, Div. 2 Hazardous Locations
  - ATEX approval (pending)
  - Single and three-phase input available
- Patented DIN rail mounting clip
- User Adjustable output voltage accessible via front face
- Parallel capability standard
- Industrial grade design
  - -25°C to 60°C operation without derating
  - Rugged metal case and DIN connector
- User-friendly
  - LEDs for status
  - Large, rugged, accessible screw terminals
  - Easy on/off DIN mounting
- Fully tested and burned-in at factory
- RoHS compliant

UL 508 Listed
IND. CONT. EQ.
E61379

UL 60950
E137632
CUL/CSA-C22.2
No. 234-M90

EMC and Low Volt. Directive

Related Products

- SDN-P series
- SDP™ series
- SFL series
- SCP series
- SDU UPS

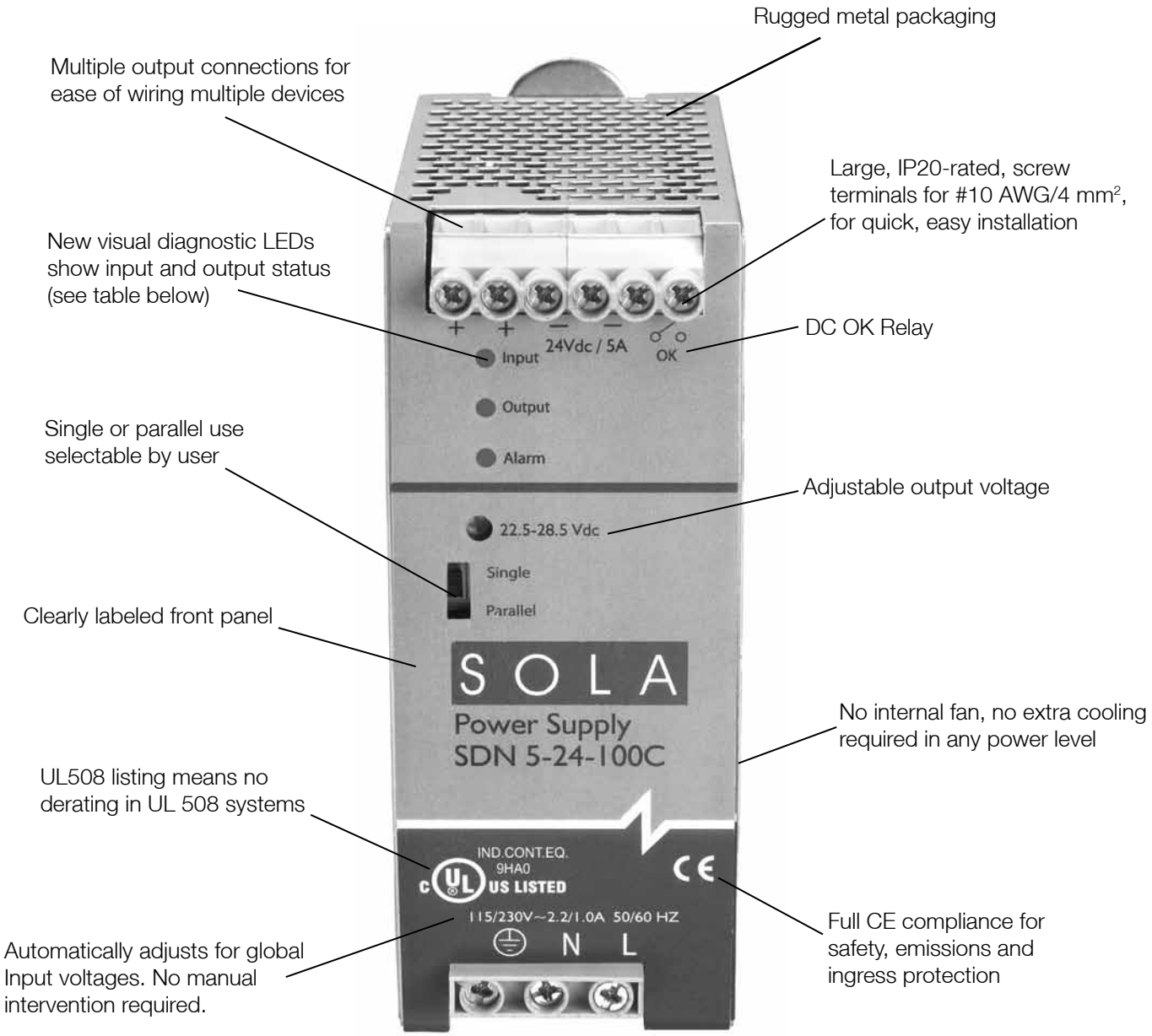
Applications

- Industrial Machine Control
- Process Control
- Conveying Equipment
- Material Handling
- Vending Machines
- Packaging Equipment
- Amusement Park Equipment
- Semiconductor Fabrication Equipment
- DeviceNet™

Accessories

- Chassis Mount Bracket (SDN-PMBRK2)

The SolaHD Difference



New narrow width saves panel space

LED Light Status Conditions

	Normal	AC Power Loss	AC Input Low	No DC	High Load	Overload	Hot	Too Hot
Input	Green	-	Yellow	Green	Green	Green	Green	Green
Output	Green	-	Green	-	Yellow	Yellow	Green	-
Alarm	-	-	-	Red	Yellow	Red	Yellow	Yellow

Visit our website at www.solahd.com or
contact Technical Services at (800) 377-4384 with any questions.

SDN-C Specifications (Single Phase)

Description	Catalog Number		
	SDN 5–24–100C	SDN 10–24–100C	SDN 20–24–100C
Input			
Nominal Voltage	115/230 Vac		
–AC Range	85 - 264 Vac		
–DC Range[1]	90 - 375 Vdc		
–Frequency	43-67 Hz		
Nominal Current[2]	1.65 - 0.55 A	3.2 - 1.0 A	6A / 3A
–Inrush current max.	Typ. < 15 A	Typ.< 30 A	< 40 A
Efficiency (Losses[3])	> 90% typ. (12 W)	> 90% typ. (24 W)	> 92% (38 W)
Power Factor Correction	Active power factor correction to better than 0.92		
Output			
Nominal Voltage	24 V (23.5~28.5 Vdc Adj.)		
–Tolerance	< ±2 % overall (combination Line, load, time and temperature related changes)		
Initial Voltage Setting	24.5V ± 1%		
–Ripple[4]	< 50 mVpp		<100mVpp
PARD	PARD (Periodic and Random Deviation) = 100 mV peak-peak max		
Overvoltage Protection	> 30.5 but < 33 Vdc, auto recovery		
Power Back Immunity	< 35V		
Nominal Current	5 A (120 W)	10 A (240 W)	20 A (480W)
–Peak Current[5]	1.5 x Nominal Current for 2 seconds minimum while holding voltage > 20 Vdc		
–Short Circuit Current	1.5 x Nominal Current at near zero volts at short circuit condition		
–Current Limit	PowerBoost™		
Parallel Operation	Switch selectable single unit or parallel unit operation. Units will not be damaged by parallel operation (regardless of switch position setting).		
Holdup Time	>20 ms (Full load, 100 Vac Input @ T_{amb}=+25°C) to 95% output voltage		
Voltage Fall Time	<150 mS from 95% to 10% rated voltage @ full load (T_{amb}=+25°C)		
Line and Load Regulation	< 0.5%		
General			
EMC: –Emissions	EN61000-6-2:2001, EN61000-6-3:2001, Class B EN55011, EN55022 Radiated and Conducted including Annex. A, EN61000-3-2		
–Immunity	EN61000-6-1:2001, EN61000-6-2:2001, EN61000-4-2 Level 4, EN61000-4-3 Level 3, EN61000-4-6 Level 3, EN61000-4-4 Level 4 input and level 3 output. EN61000-4-5 Isolation class 4, EN61000-4-11, IEC 61000-4-34 voltage dip immunity standard		
Approvals	UL508 Listed, cULus; UL 60950-1, cURus; IEC60950-1; Class I, Div. 2, Hazadous location approval; CE (LVD 73/23 & 2004/108/EC), (EMC 89/336 & 93/68/EEC); EN61000-3-2		
Temperature[7]	Storage: -40°C to + 85°C, Operation -25°C to +60°C full power, with linear derating to half power from 60 to 70°C (Convection cooling, no forced air required). Operation up to 50% load permissible with sideways or front side up mounting orientation.		
MTBF[6]	> 550,000 hrs		> 450,000 hrs
Warranty	5 Years		
General Protection/Safety	Protected against continuous short -circuit, continuous overload, continuous open circuit. Protection Class 1 (IEC536), degree of protection IP20 (IEC60529) Safe low voltage: SELV (acc. IEC60950-1)		
Status Indicators	**Visual:** 3 status LEDs (Input, Output, Alarm) **Relay:** N.O. contact rated 200ma/50 Vdc		
Installation			
Fusing –Input	Internally fused		
–Output	Outputs are capable of providing high currents for short periods of time for inductive load startup or switching. Fusing may be required for wire/loads if 2x Nominal O/P current rating cannot be tolerated. Continuous current overload allows for reliable fuse tripping.		
Mounting	Simple snap-on to DIN TS35/7.5 or TS35/15 rail system.		
Connections	**Input:** Screw terminals, connector size range: 16-10 AWG (1.5-6 mm^2) for solid conductors. **Output:** Two terminals per output, connector size range: 16-10 AWG (1.5-6 mm^2) for solid conductors.		
Case	Fully enclosed metal housing with fine ventilation grid to keep out small parts.		
–Free Space	15 mm in front, 25 ~ 40 mm above and below, 10 mm left and right.		
H x W x D (inches/mm)	4.88 × 1.97 × 4.55 (124 × 50 × 116)	4.88 × 2.36 × 4.55 (124 × 60 × 116)	4.88 x 3.42 x 4.98 (124 x 87 x 126.6)
Weight (lbs/kg)	1.65 (0.75)	1.98 (0.9)	2.6 (1.2)

1. Not UL listed for DC input.
2. Input current ratings are conservatively specified with low input, worst case efficiency and power factor.
3. Losses are heat dissipation in watts at full load, nominal input line.
4. Ripple/noise is stated as typical values when measured with a 20 MHz, bandwidth scope and 50 Ohm resistor.
5. Peak current is calculated at 24 Volt levels.
6. Demonstrated through extended life test.
7. Contact tech support for operation at -25°C.

Visit our website at www.solahd.com or
contact Technical Services at (800) 377-4384 with any questions.

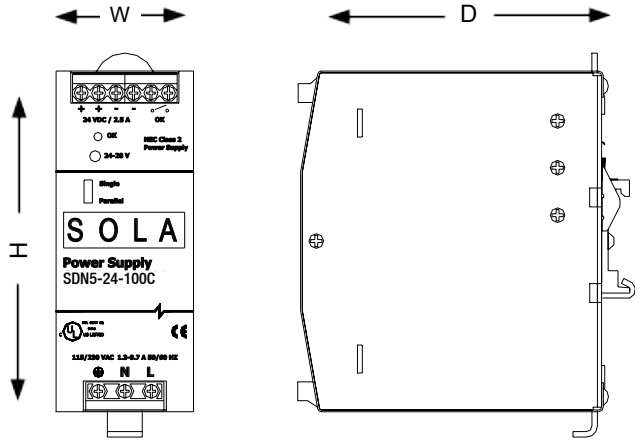
SDN-C Specifications (Three Phase)

Description	Catalog Number	
	SDN 20–24–480CC	SDN 40–24–480C
Input		
Nominal Voltage	380 - 480 Vac	
Two–phase input	Yes [1]	
–AC Range Continuous [2]	320 - 540 Vac	
–DC Range Continuous	450 - 760 Vdc	TBD
–DC Range Short Term [3]	420 - 780 Vdc	TBD
–Frequency	50 - 60 Hz	
Nominal Current [4]	3 x 0.9 A or 2 x 1.3 A	3 x 1.6 A
–Inrush Current Max.	Negligible	Negligible
Efficiency (Losses [5])	93% (42 W)	94% (78 W)
Power Factor Correction	Active Power Factor Correction	
Output		
Turn on Time	Typ. 1s	
Voltage Rise Time	< 100mS full resistance load (T_{amb}=+25°C)	
Power Back Immunity	< 35V	
Overvoltage Protection	> 30.5 but < 33 Vdc, auto recovery	
Nominal Voltage	24V (24-28Vdc Adjustable)	
Voltage Regulation	< ± 2% overall	
Initial Voltage Setting	24.5V ± 1%	
–Ripple [6]	< 100mVpp	
PARD	PARD (Periodic and Random Deviation) = 200mV peak-peak max	
Nominal Current	20 A (480 W) (constant power, not constant)	40 A (960 W)
–Peak Current [7]	1.5 × Nominal Current for 4 seconds minimum while holding voltage > 20 Vdc	
–Current Limit	PowerBoost™	
Derating (T amb=60–70 °C)	typ. 24W/°C	typ. 48 W/°C
Holdup Time	>20 ms	>15 ms
Voltage Fall Time	<50 mS from 95% to 10% rated voltage @ full load (T_{amb}=+25°C)	
Parallel Operation [8]	Single or parallel operation selectable via front switch. For redundant operation, use of external diode module is preferred	SDN 40 uses active paralleling
General		
Case	Fully enclosed metal housing with fine ventilation grid to keep out small parts.	
Min. Required Free Space	70mm above and below, 10mm left and right (same as manual)	70mm above and below, 15mm in front, 25mm left & right
Max. Dimensions HxWxD (in/mm)	4.85 x 2.56 x 4.68 (123.3 x 85 x 118.8)	4.85 x 7.09 x 4.85 (123.3 x 180 x 123.17)
Weight (lbs/g)	2.8 lb (1300 g)	5.3 lb (2400 g)
EMC: –Emissions	EN61000-6-3:2001, Class B EN55011, EN55022 Radiated and Conducted including Annex. A, EN61000-3-2	
–Immunity	EN61000-6-1:2001, EN61000-6-2:2001, EN61000-4-2 Level 4, EN61000-4-3 Level 3, EN61000-4-6 Level 3, EN61000-4-4 Level 4 input and level 3 output. EN61000-4-5 Isolation class 4, EN61000-4-11, Semi F47 sag immunity	
Approvals	UL508 Listed, cULus; UL60950-1, cURus; IEC60950-1; ISA 12.12.01 Class 1 Div 2, CE (LVD 73/23 & 2004/108/EC), (EMC 89/336 & 93/68/EEC); EN61000-3-2,EN 60079-15 (Class 1, Zone 2)	
Temperature	Storage: -40°C to + 85°C, Operation -25°C to +60°C full power, with linear derating to half power from 60°C to 70°C (Convection cooling, no forced air required). Operation up to 50% load permissible with sideways or front side up mounting orientation.	
Humidity	< 90% RH, noncondensing; IEC 60068-2-2, 68-2-3	
Altitude	0 to 3000 meters (0 to 10,000 feet)	
Vibration	2.5(g) RMS, 10-2000 Hz (random); three axes for 20 minutes each - IEC 60068-2-6	
Shock	3(g) peak, three axes, 11mseconds for each axis - IEC 60068-2-27	
Warranty	5 Years	
MTBF	> 550,000 hrs MTBF (Nominal voltage, full load, T ambient = 25°C	
General Protection/Safety	Protected against short -circuit, overload, open circuit. Protection class 1 (IEC536), degree of protection IP20 (IEC 529), Safe low voltage: SELV (acc. EN60950)	
Over–Temperature Protection	LED Alarm, Output shutdown with automatic restart	
Status Indicators	**Visual:** 3 status LEDs (Input, Output, Alarm); **Relay:** SSR or dry relay contact, signal active when Vout = 18.5Vdc = +/-5%	
Installation		
Fusing: –Input	Externally fused	
–Output	Not fused. Output is capable of providing high currents (PowerBoost) for motor load startup.	
Mounting	Simple snap-on to DIN TS35/7.5 or TS35/15 rail system. Unit should handle normal shock and vibration of industrial use and transportation without falling off the rail.	
Connections [9]	**Input:** screw terminals, Wiring for the connector will be ground on the left (when looking at the front of the unit), connector size range: 16-10AWG (1.5-6mm²) for solid conductors. **Output:** connector size range, wire gauge 6-7 AWG for SDN40; all other models: 16-10AWG (1.5-6mm²) for solid conductors. The connector color will be gray or off-white.	

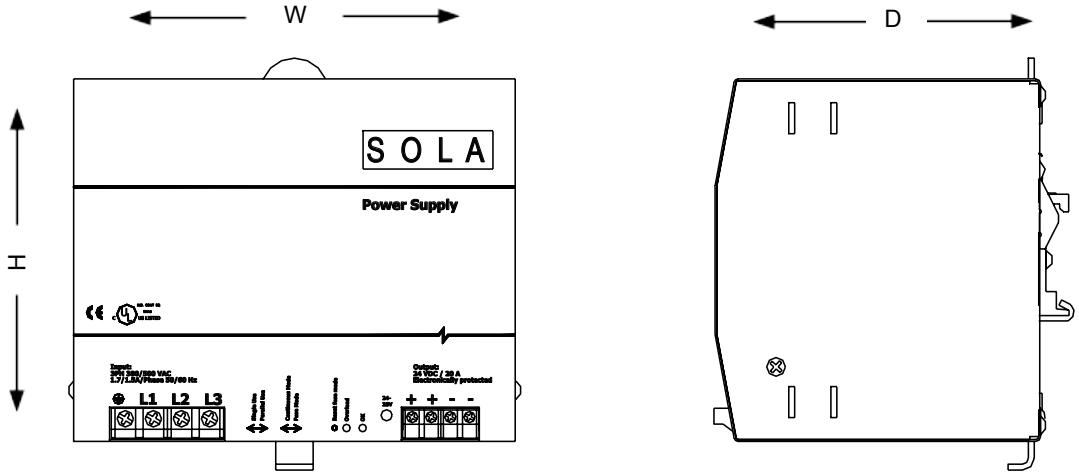
1. SDN20 will operate at 75% load and SDN40 will operate at 50% load under loss of 1 phase. Units will shut down if thermal threshold is exceeded under this condition.
2. Unit passed input voltage overstress test at 600 Vac maximum without failure.
3. DC operation will require the user to provide the proper input circuit protection.
4. Input current ratings are specified with low input, line conditions, worst case efficiency values and power factor spikes. Input current at nominal input settings will be typically half these values.
5. Losses are heat dissipation in watts at full load, nominal line.
6. Ripple/noise is stated as typical values when measured with a 20 MHZ, bandwidth scope and 50 Ohm resister.
7. SDN 20 and SDN 40 unit will go to HICCUP mode. SDN 5 and SDN 10 will maintain min 4 secs to deliver 150% load then drops to almost zero V out. The output voltage will immediately drop to almost zero when load rises above 150%.
8. All models except the 40amp unit are capable of parallel operation by use of a jumper pin, accessible by the end user. 40amp has current sharing signal.
9. SDN40-24-480 only = Output signaling terminal block features (Shut down, Power Good, Current Monitor, Current Balance, signal GND).

Visit our website at www.solahd.com or
contact Technical Services at (800) 377-4384 with any questions.

SDN-C Series Dimensions



Catalog Number	Dimensions – inches (mm)		
	H	W	D
SDN 5–24–100C	4.88 (124)	1.97 (50)	4.55 (116)
SDN 10–24–100C	4.88 (124)	2.36 (60)	4.55 (116)
SDN 20–24–100C	4.88 (124)	3.42 (87)	4.98 (126.6)
SDN 20–24–480CC	4.85 (123)	2.56 (85)	4.68 (118.8)



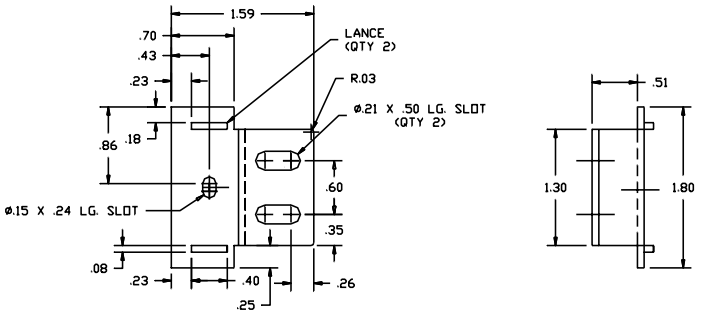
Catalog Number	Dimensions – inches (mm)		
	H	W	D
SDN 40–24–480C	4.85 (123)	7.09 (180)	4.85 (123)

SDN-C Series Mounting (cont.)

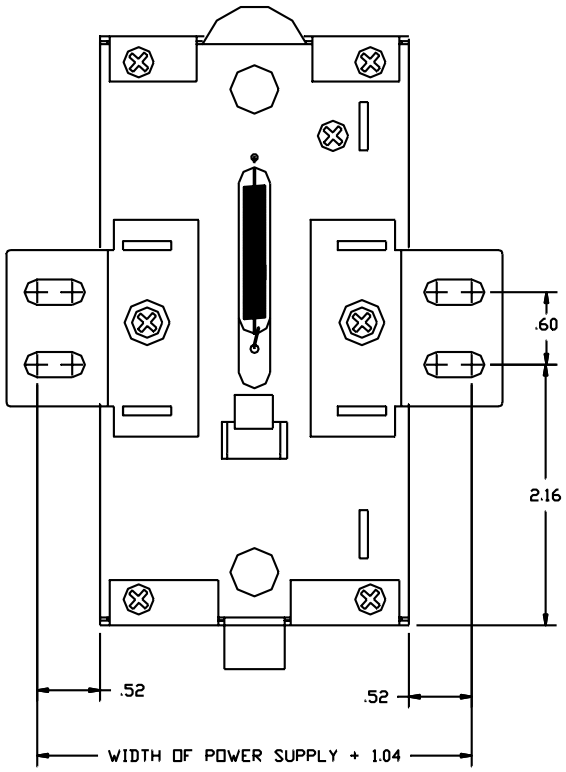
Chassis Mounting

Instead of snapping a Sola SDN™ unit on the DIN Rail, you can also attach it using the screw mounting set SDN-PMBRK2.

This set consists of two metal brackets, which replace the existing two aluminum profiles.



Dimensions



SDN-C Series Mounting

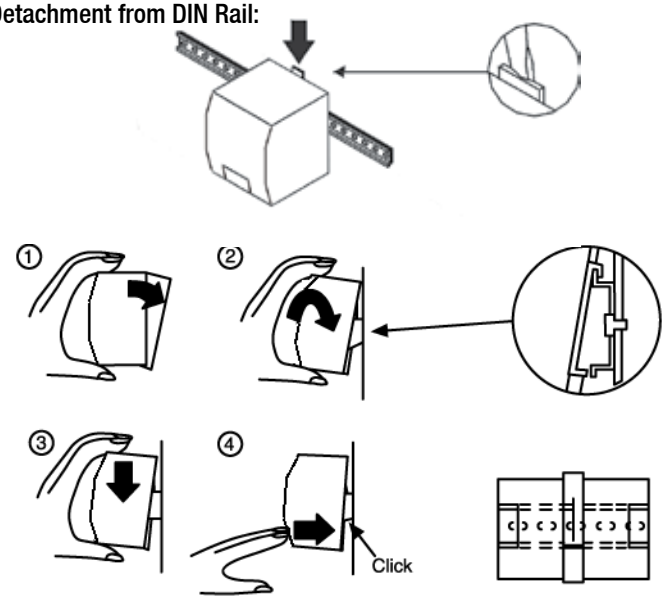
DIN Rail Mounting

Snap on the DIN Rail:

1. Tilt unit slightly backwards
2. Put it onto the DIN Rail
3. Push downwards until stopped
4. Push at the lower front edge to lock
5. Shake the unit slightly to ensure that the retainer has locked

Alternative Panel Mount: Using the optional SDN–PMBRK2 accessory, the unit can be screw mounted to a panel.

Detachment from DIN Rail:



SDN-P DIN Rail Series

The SDN DIN Rail power supplies provide industry leading performance. Sag Immunity, transient suppression and noise tolerant, the SDN series ensures compatibility in demanding applications. Power factor correction to meet European directives, hazardous location approvals and optional redundant accessories allow the SDN series to be used in a wide variety of applications. Wide operation temperature range, high tolerance to shock and vibration and reliable design make the SDN series the preferred choice of users everywhere.

UL 508 Listed IND. CONT. EQ. E61379

UL 60950 E137632 CUL/CSA-C22.2 No. 234-M90

EMC and Low Volt. Directive

Features

- Power Factor Correction (per EN61000-3-2)
- Auto Select 115/230 Vac, 50/60 Hz Input
- Single Phase models meet SEMI F47 Sag Immunity
- Class 1, Zone 2 Hazardous Locations
  - ATEX approval on 2.5 through 10A, 24 Vdc single phase models
- Improved metal mounting clip
- DC OK Signal
- Adjustable Voltage
- Parallel Capability standard on all units
- Industrial grade design
  - -10°C to 60°C operation without derating. Indefinite short circuit, overvoltage and overtemperature protection.
  - Powers high inrush loads without shutdown or foldback
  - Rugged metal case and DIN connector
- SDN2.5-24-100P and SDN4-24-100LP meet NEC Class 2
- Narrow width on rail for space critical applications
- User-friendly front panel
  - Large, rugged, accessible, multiple connection screw terminations
  - Easy installation
- Broad range of product to fit almost any application – 2.5 A through 40 A, 24 Vdc
- Single and three phase inputs available
- 12 Vdc and 48 Vdc single phase models available
- Highly efficient >90% switching technology
- High MTBF and reliability
- RoHS compliant

Related Products

- SDP™ Series
- SFL Series
- SCP Series
- SCL Series
- SDU UPS

Applications

- Industrial/Machine Control
- Process Control
- Conveying Equipment
- Material Handling
- Vending Machines
- Packaging Equipment
- DeviceNet™
- Amusement Park Equipment
- Semiconductor Fabrication Equipment

Accessories

- Chassis Mount Bracket (SDN-PMBRK2)

SDN-P Specifications (Single Phase), 24 Vdc Output

CE Ex II 3G DEMKO 06 ATEX 05 21715U

Description	Catalog Number				
	SDN 2.5–24–100P	SDN 4–24–100LP	SDN 5–24–100P	SDN 10–24–100P	SDN 20–24–100P
Input					
Nominal Voltage	115/230 Vac auto select				
–AC Range	85-132/176-264 Vac				
–DC Range[1]	90-375 Vdc	210-375 Vdc			N/A
–Frequency	47 - 63 Hz				
Nominal Current[2]	1.3 A. / 0.7 A	2.1 A / 1.0 A	2.2 A / 1.0 A	5 A / 2 A typ.	9 A/ 3.9 A
–Inrush current max.	typ. < 25 A	typ. < 20 A		typ. < 40 A	
Efficiency (Losses[3])	> 87.5% typ. (8.6 W)	> 88% typ. (13.1 W)	> 88% typ. (16.4 W)	> 88% typ. (32.7 W)	> 90% typ. (48 W)
Power Factor Correction	Units Fulfill EN61000-3-2				
Output					
Nominal Voltage	24 Vdc (22.5 - 28.5 Vdc adj.)	24 Vdc (22.5 - 25.5 Vdc adj.)	24 Vdc (22.5 - 28.5 Vdc adj.)		
–Tolerance	< ±2% overall (combination Line, load, time and temperature related changes)				
–Ripple[4]	< 50 mVpp				
Overvoltage Protection	> 30 Vdc, but < 33 Vdc, auto recovery				
Nominal Current	2.5 A (60 W)	3.8 A (92 W)	5 A (120 W)	10 A (240 W)	20 A (480 W)
–Current Limit	Fold Forward (Current rises, voltage drops to maintain constant power during overload up to max peak current)				
Holdup Time[5]	> 50 ms	> 100 ms			
Parallel Operation	Single or Parallel use is selectable via Front Panel Switch (SDN 2.5, 4 should not be used in parallel as Class 2 rating would be violated.)				
General					
EMC: –Emissions	EN61000-6-3, -4; Class B EN55011, EN55022 Radiated and Conducted including Annex A.				
–Immunity	EN61000-6-1, -2; EN61000-4-2 Level 4, EN61000-4-3 Level 3; EN61000-4-6 Level 3; EN61000-4-4 Level 4 input and Level 3 output; EN61000-4-5 Isolation Class 4, EN61000-4-11;				
Approvals	EN60950; UL508 Listed, cULus; UL60950, cRUus, CE (LVD 73/23 & 93/68/EEC). EN61000-3-2, IEC60079-15 (Class 1, Zone 2, Hazardous Location, Groups A, B, C, D w/ T3A), SEMI F47 Sag Immunity. SDN 2.5 & SDN 4 - UL60950 testing to include approval as Class 2 power supply in accordance with UL1310.				
Temperature	Storage: -25°C...+85°C Operation. -10°-60°C full power with operation to 70°C possible with a linear derating to half power from 60°C to 70°C (Convection cooling, no forced air required). Operation up to 50% load permissible with sideways or front side up mounting orientation.				
Humidity	The relative humidity is < 90% RH, noncondensing; IEC 68-2-2, 68-2-3.				
MTBF:	> 820,000 hours	> 640,000 hours		> 600,000 hours	> 510,000 hours
– Standard	Bellcore Issue 6 Method 1 Case 3 @ 40°C				MIL STD 217F @ 30°C
Warranty	5 years				
General Protection/ Safety	Protected against continuous short-circuit, overload, open-circuit. Protection Class 1 (IEC536), degree of protection IP20 (IEC 529) Safe low voltage: SELV (acc. EN60950)				
Status Indicators	Green LED and DC OK signal (N.O. Solid State Contact rated 200 mA / 60 Vdc)				
Installation					
Fusing –Input	Internally fused. External 10 A slow acting fusing for the input is recommended to protect input wiring.				
–Output	Outputs are capable of providing high currents for short periods of time for inductive load startup or switching. Fusing may be required for wire/loads if 2x Nominal O/P current rating cannot be tolerated. Continuous current overload allows for reliable fuse tripping.				
Mounting	Simple snap-on system for DIN Rail TS35/7.5 or TS35/15 or chassis-mounted (optional screw mounting set SDN-PMBRK2 required).				
Connections	**Input:** IP20-rated screw terminals, connector size range: 16-10 AWG (1.5-6 mm²) for solid conductors. 16-12 AWG (0.5-4 mm²) for flexible conductors. **Output:** Two connectors per output, connector size range: 16-10 AWG (1.5 - 6 mm²) for solid conductors.				
Case	Fully enclosed metal housing with fine ventilation grid to keep out small parts.				
–Free Space	25 mm above and below, 25 mm left and right, 10 mm in front		25 mm above and below, 25 mm left and right, 15 mm in front	70 mm above and below, 25 mm left and right, 15 mm in front	
H x W x D (inches/mm)	4.88. x 1.97 x 4.55 (124 x 50 x 116)	4.88 x 2.56 x 4.55 (124 x 65 x 116)		4.88 x 3.26 x 4.55 (124 x 83 x 116)	4.88 x 6.88 x 4.55 (124 x 175 x 116)
Weight (lbs/kg)	1 (.45)	1.5 (.68)		2.2 (0.1)	3 (1.36)

1. Not UL listed for DC input.
2. Input current ratings are conservatively specified with low input, worst case efficiency and power factor.
3. Losses are heat dissipation in watts at full load, nominal input line.
4. Ripple/noise is stated as typical values when measured with a 20 MHz, bandwidth scope and 50 Ohm resistor.
5. Full load, 100 Vac Input @ T_{amb} = +25°C

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contact Technical Services at (800) 377-4384 with any questions.

SDN-P Specifications (Single Phase), 12 Vdc and 48 Vdc Output

CE Ex II 3G DEMKO 06 ATEX 05 21715U

Description	Catalog Number		
	SDN 9–12–100P	SDN 5–48–100P	SDN 16–12–100P
Input			
Nominal Voltage	115/230 Vac auto select		
–AC Range	85-132/176-264 Vac		
–DC Range[1]	210-375 Vdc		
–Frequency	47-63 Hz, 400 Hz		
Nominal Current[2]	2.0 A / 1.5 A	4 A / 2.3 A	3.3 A / 1.7 A
–Inrush current max.	Typ. < 20 A	typ. < 40 A	
Efficiency[2] (Losses[3])	> 84% typ. (17.28 W)	> 88% typ. (28.8 W)	> 84% typ. (30.72 W)
Power Factor Correction	Units fulfill EN61000-3-2		
Output			
Nominal Voltage	12 V (11.8-15.2 Vdc Adj.)	48 V (35.8 - 52 Vdc Adj.)	12 V (11.6-14.0 Vdc Adj.)
Tolerance	< ±2 % overall (combination Line, load, time and temperature related changes)		
–Line Regulation	< 0.5%		
–Load Regulation	< 0.5%		
–Time & Temp. Drift	< 1%		
Ripple[3]	< 50 mVpp		
Overvoltage Protection	< 16 Vdc with auto-recovery	< 60 Vdc with auto-recovery	< 16 Vdc with auto-recovery
Nominal Current	9 A (108 W)	5 A (240 W)	16 A (192 W)
–Current Limit[4]	110% of nominal - Fold Forward (Current rises, voltage drops to maintain constant power during overload up to max peak current)		
Holdup Time[5]	>20 ms (Full load, 100 Vac Input @ T_{amb}=+25°C) to 95% output Voltage		
Parallel Operation	Supplies will not be damaged with parallel operation		
Power Back Immunity	16 Vdc	60 Vdc	16 Vdc
General			
EMC: –Emissions	EN61000-6-3, EN61204-3, EN55022 Class B, EN61000-3-2, EN61000-3-3		
–Immunity	EN61000-6-2, EN61204-3, EN55024, IEC61000-4-2, IEC61000-4-3, IEC61000-4-4, IEC61000-4-5, IEC61000-4-6, IEC61000-4-8, IEC61000-4-11		
Approvals	UL508 Listed, cULus; UL 60950-1, cURus; CE (LVD 73/23 & 93/68/EEC), (EMC 89/336 & 93/68/EEC). EN61000-3-2; UL 60079-15 (Class 1, Zone 2 hazardous location, Groups IIA, IIB, IIC w/ T3 temp. class up to 40°C Ambient.); SEMI F47 Sag Immunity, RoHS		
Temperature	Storage: -25 to +85°C, Operation -10 to +60°C full power; with linear derating to half power from 60 to 70°C (Convection cooling, no forced air required). Operation up to 50% load permissible with sideways or front side up mounting orientation.		
Humidity	< 90% RH, non-condensing; IEC 68-2-2, 68-2-3		
MTBF:	>500,000 hrs		
– Standard	Telcordia/Bellcore, Issue Case 3 @25°C		
Warranty	5 years		
General Protection/Safety	Protected against continuous short -circuit, continuous overload, continuous open circuit. Protection Class 1 (IEC536), Degree of Protection IP20 (IEC 529) Safe low voltage: SELV (acc. EN60950)		
Status Indicators (Visual)	Green LED on when V_{out} > 75% (with ± 5% tolerance) of nominal output voltage		
Status Indicators (Relay)	Normally Open solid state relay - signal active when V_{out} >70% of nominal output voltage (rated up to 200 mA, 60 Vdc)		
Installation			
Fusing –Input	Internally fused		
–Output	Outputs are capable of providing high currents for short periods of time for inductive load startup or switching. Fusing may be required if Nominal O/P current rating cannot be tolerated. Continuous current overload allows for reliable fuse tripping.		
Mounting	Simple snap-on to DIN TS35/7.5 or TS35/15 rail system. Unit should handle normal shock and vibration of industrial use and transportation without falling off the rail.		
Connections	**Input:** Screw terminals, connector size range: 16-10 AWG (1.5-6mm²) for solid conductors. **Output:** Two terminals per output, connector size range: 16-10 AWG (1.5-6mm²) for solid conductors.		
Case	Fully enclosed metal housing with fine ventilation grid to keep out small parts.		
–Free Space	70 mm above and below, 25 mm left and right, 15mm in front		
H x W x D (inches/mm)	4.88 × 2.56 × 4.55 (124 x 65 × 116)	4.88 × 3.26 × 4.55 (124 × 83 × 116)	
Weight (lbs/kg)	2.4 (1.05)	3.3 (1.48)	

1. Input current ratings are specified with low input, line conditions and worst case efficiency values. Input current at nominal input settings will be typically half these values.
2. Losses are heat dissipation in watts at full load, nominal line.
3. Ripple/ noise is stated as typical values when measured with a 20 MHz bandwidth scope and 50 Ohm resister.
4. Unit shall not shutdown or 'hiccup' during overload or short circuit. Maximum current value shown shall be maintained indefinitely without damage to the supply. Voltage shall drop according to amount of overload to protect supply from damage.

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contact Technical Services at (800) 377-4384 with any questions.

SDN-P Specifications (Three Phase)

Description	Catalog Number				
	SDN 5–24–480	SDN 10–24–480	SDN 20–24–480C	SDN 30–24–480	SDN 40–24–480
Input					
Nominal Voltage	1Ø or 3Ø 380-480 Vac		1Ø or 3Ø 380-480 Vac[1]	3Ø 380 - 480 Vac	
–AC Range	340 - 576 Vac				
–DC Range[2]	450 - 820 Vdc				
–Frequency	47 - 63 Hz				
Nominal Current[3]	0.5 A	0.8 A	1.5 A	2.0 A	3.0 A
–Inrush current max.	typ. < 18 A			typ. < 30 A	
Efficiency (Losses[4])	> 90% typ. (12 W)	> 90% typ. (48 W)		> 90% typ. (72 W)	> 90% typ. (96 W)
Power Factor Correction	Units Fulfill EN61000-3-2				
Output					
Nominal Voltage	24 Vdc (22.5 - 28.5 Vdc adj.)				
–Tolerance	< ±2% overall (combination Line, load, time and temperature related changes)				
–Ripple[5]	< 50 mVpp				
Overvoltage Protection	> 30 Vdc, but < 33 Vdc, auto recovery				
Nominal Current	5 A (120 W)	10 A (240 W)	20 A (480 W)	30 A (720 W)	40 A (960 W)
–Peak Current	6A, 2x Nominal Current < 2 sec.	12A, 2x Nominal Current < 2 sec.	25A, 2x Nominal Current < 2 sec.	35A, 2x Nominal Current < 2 sec.	45A, 2x Nominal Current < 2 sec
–Current Limit	Fold Forward (Current rises, voltage drops to maintain constant power during overload up to max peak current)				
Holdup Time[6]	> 40 ms		> 28 ms	> 20 ms	
Parallel Operation	5A through 30A units may be passively paralleled by selecting the "P" position of the switch on the unit. The SDN 40 contains active current balancing.				
General					
EMC: –Emissions	EN61000-6-3, -4; Class B EN55011, EN55022 Radiated and Conducted including Annex A.				
–Immunity	EN61000-6-1, -2; EN61000-4-2 Level 4, EN61000-4-3 Level 3; EN61000-4-6 Level 3; EN61000-4-4 Level 4 input and Level 3 output; EN61000-4-5 Isolation Class 4, EN61000-4-11;				
Approvals	CB Scheme, EN60950; UL508 Listed, cULus; UL60950, cRUus, CE (LVD 73/23 & 93/68/EEC). EN61000-3-2, UL60079-15 Class 1, Zone 2 Hazardous Location, Groups IIA, IIB, IIC w/T3.				
Temperature	Storage: -25°C...+85°C Operation. -10°C -60°C full power with operation to 70°C possible with a linear derating to half power from 60°C to 70°C (Convection cooling, no forced air required). Operation up to 50% load permissible with sideways or front side up mounting orientation. The relative humidity is < 90% RH, noncondensing; IEC 68-2-2, 68-2-3.				
MTBF:	> 1,110,000 hours	> 940,000 hours	> 550,000 hours	> 620,000 hours	> 490,000 hours
– Standard	MIL STD 217F @ 30°C				
Warranty	5 years				
General Protection/ Safety	Protected against continuous short-circuit, overload, open-circuit. Protection Class 1 (IEC536), degree of protection IP20 (IEC 60529) Safe low voltage: SELV (acc. EN60950)				
Status Indicators	Green LED on when V_{out} = 18V or greater.				
Installation					
Fusing –Input	Internally fused				
–Output	Outputs are capable of providing high currents for short periods of time for inductive load startup or switching. Fusing may be required for wire/loads if 2x Nominal O/P current rating cannot be tolerated. Continuous current overload allows for reliable fuse tripping.				
Mounting	Simple snap-on system for DIN Rail TS35/7.5 or TS35/15 or chassis-mounted (optional screw mounting set SDN-PMBRK2 required).				
Connections[7]	**Input:** IP20-rated screw terminals, connector size range: 16-10 AWG (1.5-6 mm²) for solid conductors. 16-12 AWG (0.5-4 mm²) for flexible conductors. **Output:** Two connectors per output, connector size range: 16-10 AWG (1.5-6 mm²) for solid conductors.				
Case	Fully enclosed metal housing with fine ventilation grid to keep out small parts.				
–Free Space	25 mm above and below, 25 mm left and right, 15 mm in front		70 mm above and below, 25 mm left and right , 15 mm in front		
H x W x D (inches/mm)	4.88 x 2.91 x 4.55 (124 x 73 x 116)	4.88 x 3.5 x 4.55 (124 x 89 x 116)	4.88 x 5.9 x 4.55 (124 x 150 x 116)	4.88 x 9.72 x 4.55 (124 x 247 x 116)	4.88 x 11.1 x 4.55 (124 x 282 x 116)

1. For the SDN 20-24-480C, single phase input is permissible, but output is derated to 75% (15 Amps @ 24 Vdc).
2. Not UL listed for DC input.
3. Input current ratings are conservatively specified with low input, worst case efficiency and power factor.
4. Losses are heat dissipation in watts at full load, nominal input line.
5. Ripple/noise is stated as typical values when measured with a 20 MHz, bandwidth scope and 50 Ohm resistor.
6. Full load, 100 Vac Input @ T_{amb} = +25°C
7. For the SDN 40-24-480, output: one (+) two (-) connectors, size range 16-5 AWG (1.5016 mm²) solid conductor.

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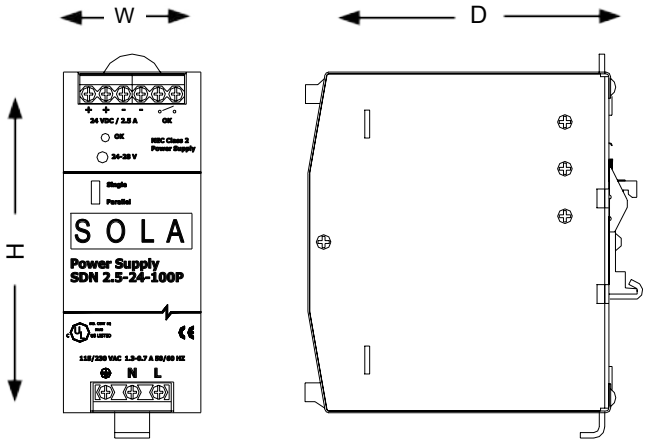
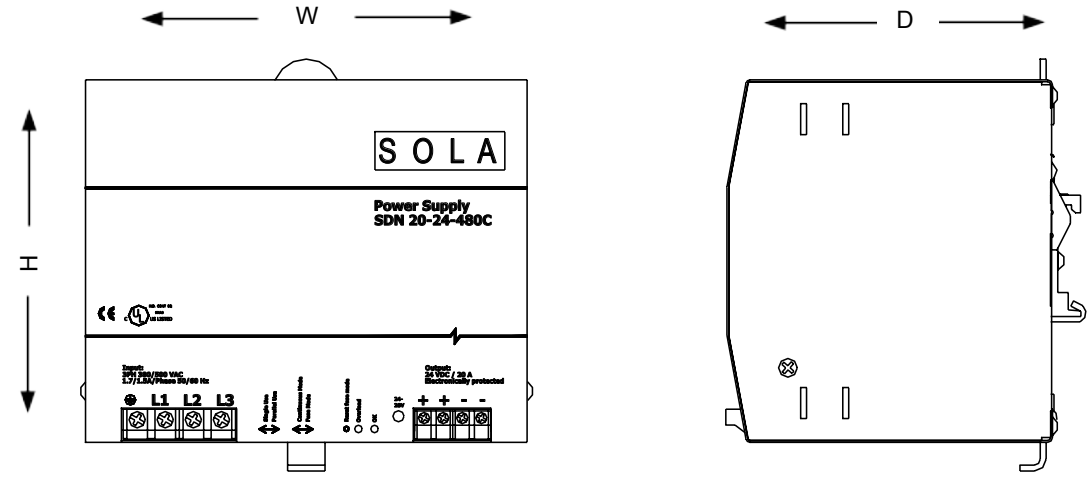
contact Technical Services at (800) 377-4384 with any questions.

SDN-P Series Dimensions



Catalog Number	Dimensions – inches (mm)		
	H	W	D
12 Vdc			
SDN 9–12–100P	4.88 (124)	2.56 (65)	4.55 (116)
SDN 16–12–100P	4.88 (124)	3.26 (83)	4.55 (116)
24 Vdc			
SDN 2.5–24–100P	4.88 (124)	1.97 (50)	4.55 (116)
SDN 4–24–100LP	4.88 (124)	2.56 (65)	4.55 (116)
SDN 5–24–100P	4.88 (124)	2.56 (65)	4.55 (116)
SDN 5–24–480	4.88 (124)	2.91 (73)	4.55 (116)
SDN 10–24–100P	4.88 (124)	3.26 (83)	4.55 (116)
SDN 10–24–480	4.88 (124)	3.5 (89)	4.55 (116)
48 Vdc			
SDN 5–48–100P	4.88 (124)	3.26 (83)	4.55 (116)



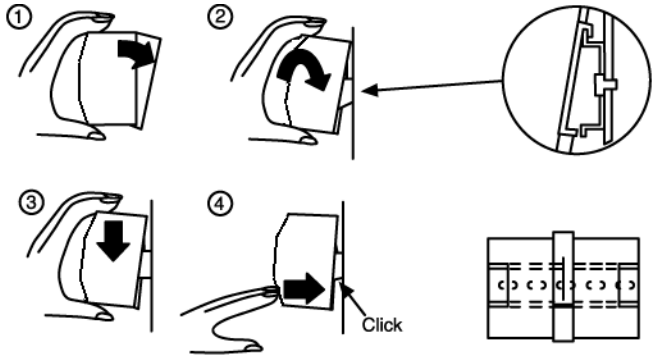
Catalog Number	Dimensions – inches (mm)		
	H	W	D
SDN 20–24–100P	4.88 (124)	6.88 (175)	4.55 (116)
SDN 20–24–480C	4.88 (124)	5.90 (150)	4.55 (116)
SDN 30–24–480	4.88 (124)	9.72 (247)	4.55 (116)
SDN 40–24–480	4.88 (124)	11.10 (282)	4.55 (116)

SDN-P Series Mounting

DIN Rail Mounting

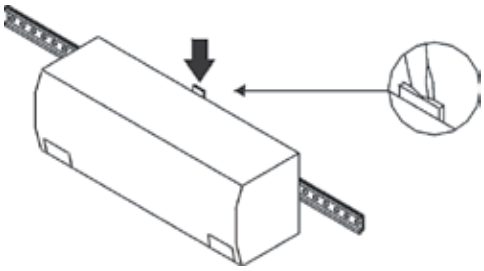
Snap on the DIN Rail:

1. Tilt unit slightly backwards
2. Put it onto the DIN Rail
3. Push downwards until stopped
4. Push at the lower front edge to lock
5. Shake the unit slightly to ensure that the retainer has locked



Alternative Panel Mount: Using the optional SDN–PMBRK2 accessory, the unit can be screw mounted to a panel.

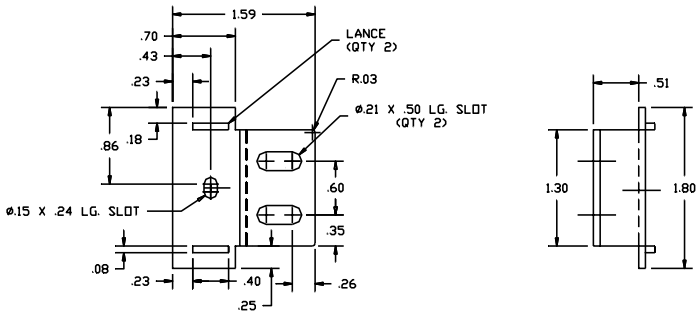
Detachment from DIN Rail:



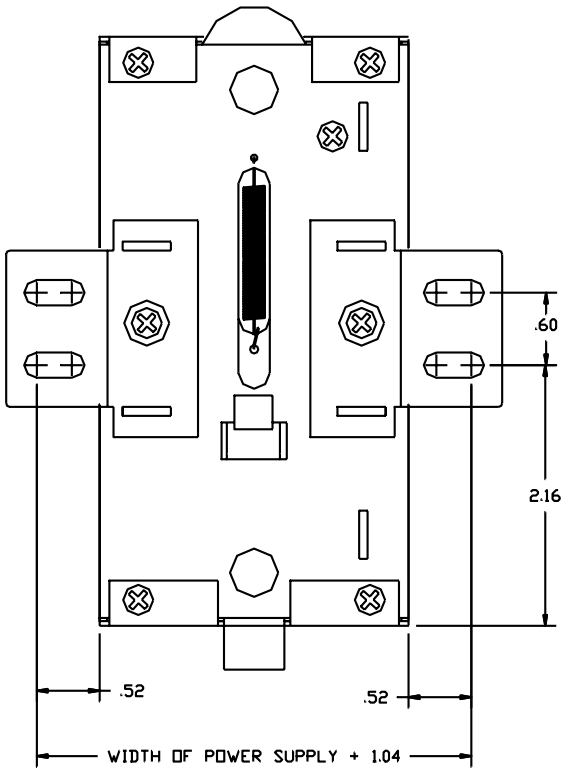
Chassis Mounting

Instead of snapping a Sola SDN™ unit on the DIN Rail, you can also attach it using the screw mounting set SDN-PMBRK2.

This set consists of two metal brackets, which replace the existing two aluminum profiles.



Dimensions



SDN™ DeviceNet™ Series

As members of the Open DeviceNet™ Vendors Association (ODVA), SolaHD has designed two power supplies specifically for DeviceNet™ applications. Sola's SDN DeviceNet™ models meet ODVA specifications for power supplies for either thin or thick cable applications.

The SDN 4-24-100LP has the highest output current possible while still meeting the requirements for NEC Class 2 and UL 1310. This is necessary for installations to meet the National Electrical Code (NEC) or the Canadian Electric Code (CE code) without the need for secondary fusing.

The SDN 10-24-100P is designed for installations that utilize the full 8A capability of the Thick Cable system. Note – local codes may prohibit the use of the full capacity of the power supply.

UL 508 Listed
IND. CONT.
EQ. E61379

UL 60950
E137632
CUL/CSA-C22.2
No. 234-M90

EMC and
Low Volt.
Directive

Features (General)

- Power Factor Correction
- SEMI F47 Sag Immunity Standard
- Class 1, Div. 2 Hazardous Locations
- DC Okay Signal
- Industrial Grade Design
  - Indefinite short-circuit, overvoltage and overtemperature protection
  - Rugged metal case and DIN connector
- Narrow width on rail for space critical applications
- User-friendly front panel
  - Large, rugged, accessible multiple connection screw terminations
  - Easy installation
- High efficiency for cooler operation and less heat losses
- High MTBF & reliability
- High grade and low stress design components
- No fans used or required
- RoHS Compliant
- Five year warranty

Features (SDN 4-24-100LP only)

- Meets the requirements of NEC Class 2 & UL 1310
- No derating from -10°C to 60°C, operation to 70°C possible with a linear derating to half power from 60°C to 70°C.

Related Products

- SDP™ Series
- SCD Series
- SCP Series
- SCL Series

Applications

- Industrial Control
- Process Control
- Building Automation
- DeviceNet™

SDN™ DeviceNet™ Specifications

Description	Catalog Number	
	SDN 5–24–100P	SDN 10–24–100P
Input		
Nominal Voltage	115/230 Vac auto select	
–AC Range	85-132/176-264 Vac	
–DC Range[1]	210-375 Vdc	
–Frequency	47 - 63 Hz	
Nominal Current[2]	2.2 A / 1.0 A	5 A / 2 A typ.
–Inrush current max.	typ. < 20 A	typ. < 40 A
Efficiency (Losses[3])	> 88% typ. (16.4 W)	> 88% typ. (32.7 W)
Power Factor Correction	Units fulfill EN61000-3-2	
Output		
Nominal Voltage	24 Vdc (22.5 - 28.5 Vdc adj.)	
–Tolerance	< ±2% overall (combination Line, load, time and temperature related changes)	
–Ripple[4]	< 50 mVpp	
Overvoltage Protection	> 30 Vdc, but < 33 Vdc, auto recovery	
Nominal Current	5 A (120 W)	10 A (240 W)
–Current Limit	Fold Forward (Current rises, voltage drops to maintain constant power during overload up to max peak current)	
Holdup Time[5]	> 100 ms	
Parallel Operation	Single or Parallel use is selectable via Front Panel Switch (SDN 2.5, 4 should not be used in parallel as Class 2 rating would be violated.)	
General		
EMC: –Emissions	EN61000-6-3, -4; Class B EN55011, EN55022 Radiated and Conducted including Annex A.	
–Immunity	EN61000-6-1, -2; EN61000-4-2 Level 4, EN61000-4-3 Level 3; EN61000-4-6 Level 3; EN61000-4-4 Level 4 input and Level 3 output; EN61000-4-5 Isolation Class 4, EN61000-4-11;	
Approvals	EN60950; UL508 Listed, cULus; UL60950, cRUus, CE (LVD 73/23 & 93/68/EEC). EN61000-3-2, IEC60079-15 (Class 1, Zone 2, Hazardous Location, Groups A, B, C, D w/ T3A temp class up to 60°C Ambient.) SEMI F47 Sag Immunity. SDN 2.5 & SDN 4 - UL60950 testing to include approval as Class 2 power supply in accordance with UL1310.	
Temperature	Storage: -25°C...+85°C Operation. -10°...-60°C full power with operation to 70°C possible with a linear derating to half power from 60°C to 70°C (Convection cooling, no forced air required). Operation up to 50% load permissible with sideways or front side up mounting orientation. The relative humidity is < 90% RH, noncondensing; IEC 68-2-2, 68-2-3.	
MTBF:	> 640,000 hours	> 600,000 hours
– Standard	Bellcore Issue 6 Method 1 Case 3 @ 40°C	
Warranty	5 years	
General Protection/Safety	Protected against continuous short-circuit, overload, open-circuit. Protection Class 1 (IEC536), degree of protection IP20 (IEC 529) Safe low voltage: SELV (acc. EN60950)	
Status Indicators	Green LED and DC OK signal (N.O. Solid State Contact rated 200 mA / 60 Vdc)	
Installation		
Fusing –Input	Internally fused. External 10 A slow acting fusing for the input is recommended to protect input wiring.	
–Output	Outputs are capable of providing high currents for short periods of time for inductive load startup or switching. Fusing may be required for wire/loads if 2x Nominal O/P current rating cannot be tolerated. Continuous current overload allows for reliable fuse tripping.	
Mounting	Simple snap-on system for DIN Rail TS35/7.5 or TS35/15 or chassis-mounted (optional screw mounting set SDN-PMBRK2 required).	
Connections	**Input:** IP20-rated screw terminals, connector size range: 16-10 AWG (1.5-6 mm^2) for solid conductors. 16-12 AWG (0.5-4 mm^2) for flexible conductors. **Output:** Two connectors per output, connector size range: 16-10 AWG (1.5 - 6 mm^2) for solid conductors.	
Case	Fully enclosed metal housing with fine ventilation grid to keep out small parts.	
–Free Space	25 mm above and below, 25 mm left and right, 15 mm in front	70 mm above and below, 25 mm left and right, 15 mm in front
H x W x D (inches/mm)	4.88 x 2.56 x 4.55 (124 x 65 x 116)	4.88 x 3.26 x 4.55 (124 x 83 x 116)
Weight (lbs/kg)	1.5 (.68)	2.2 (0.10)

1. Not UL listed for DC input.
2. Input current ratings are conservatively specified with low input, worst case efficiency and power factor.
3. Losses are heat dissipation in watts at full load, nominal input line.
4. Ripple/noise is stated as typical values when measured with a 20 MHz, bandwidth scope and 50 Ohm resistor.
5. Full load, 100 Vac Input @ T_{amb} = +25°C

SDN™ Series Redundant Options

The SDN Series standard options allow for operation in a wide variety of applications. With the addition of an external redundancy module, the SDN can also be used for true redundant operation including 2N and N+x configurations.

All SDN units include built in current sharing for parallel and redundant operation. All models ending in P also include a DC OK status relay contact. The external modules SDN 2.5-20RED and SDN 30/40RED increase the reliability by isolating the supplies and adding more signal options. Paralleling for increased power does not require the use of these modules.

CE EMC and Low Volt. Directive

Module Compatibility

Two separate modules are available to provide the maximum flexibility in size, cost and signaling capability. Refer to the chart below for information on which module can be used for each SDN power supply.

Power Rating – A simple Yes or No indication that this module can or cannot handle the power rating of that power supply.

Input/Output Signals – Yes indicates that each power supply would have an independent relay contact to provide power supply status, and the DC bus output from the redundant module has it's own DC OK relay contact. Output only indicates that only the output of the redundant module would have a DC OK relay contact.

Features

- DC OK Relay Contact
- True Isolation
- High availability
- SDN features and quality

Related Products

- SDN™ Series
- SFL Series

Applications

- Process Control
- Remote Location
- Critical Production

Redundancy Module Compatibility Chart

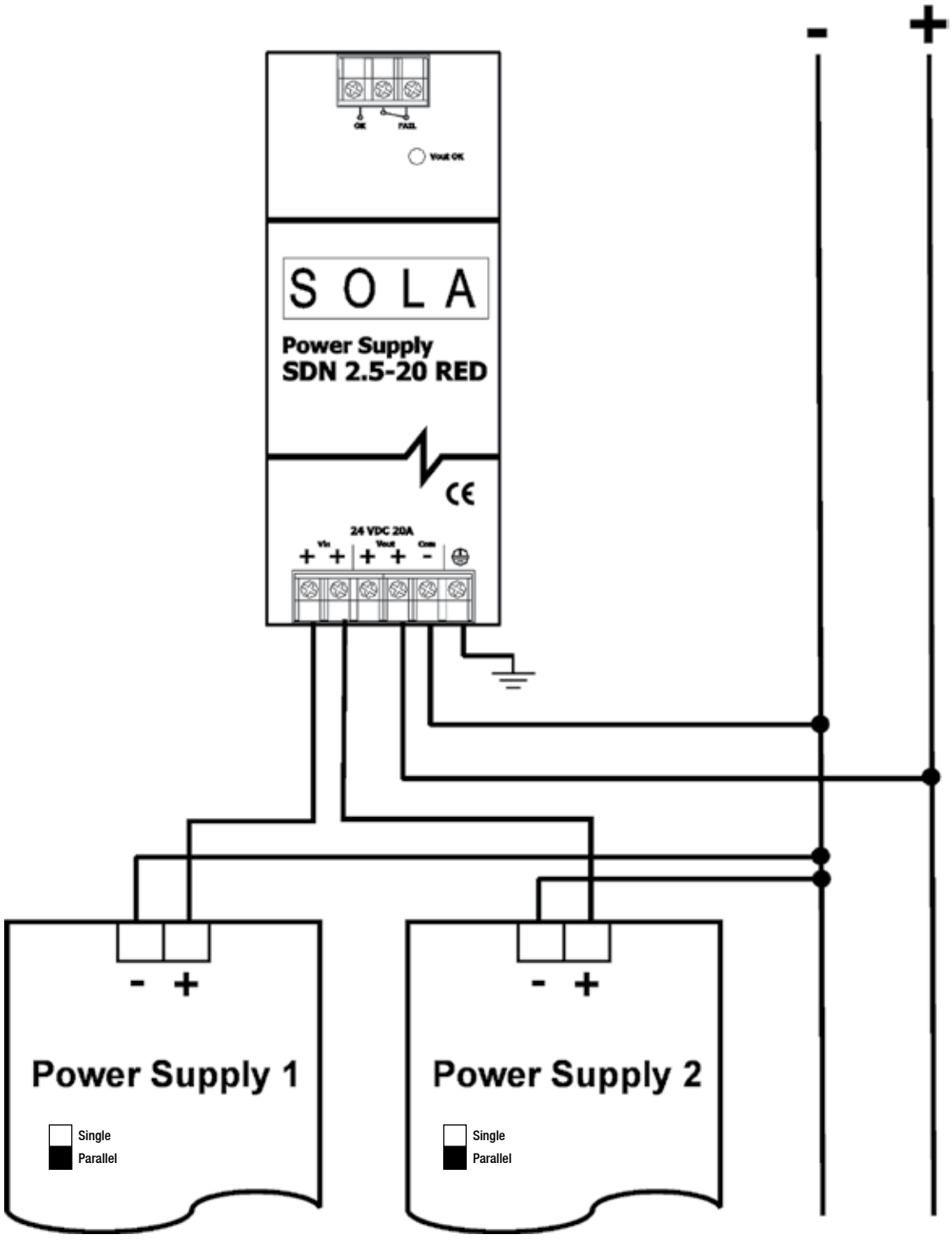
Single Phase SDN Series						
		SDN 2.5–24–100P*	**SDN 4–24–100P***	**SDN 5–24–100P**	**SDN 10–24–100P**	**SDN 20–24–100P**
SDN 2.5–20RED	Power Rating	Yes	Yes	Yes	Yes	Yes
	Input / Output Signals	Yes	Yes	Yes	Yes	Yes
SDN 30/40RED	Power Rating	Yes	Yes	Yes	Yes	Yes
	Input / Output Signals	Yes	Yes	Yes	Yes	Yes
Three Phase SDN Series						
		SDN 5–24–480	**SDN 10–24–480**	**SDN 20–24–480**	**SDN 30–24–480**	**SDN 40–24–480**
SDN 2.5–20RED	Power Rating	Yes	Yes	Yes	No	No
	Input / Output Signals	Output Only	Output Only	Output Only	N/A	N/A
SDN 30/40RED	Power Rating	Yes	Yes	Yes	Yes	Yes
	Input / Output Signals	Yes	Yes	Yes	Yes	Yes

* Paralleling will violate Class 2 current limits.

SDN™ Redundant Series Specifications for SDN2.5-20RED and SDN 30/40RED

Catalog Number		
Description	**SDN 2.5–20RED**	**SDN 30/40RED**
Concept		
By means of a separate redundancy module, you can interconnect several identical SDN power supply units in a N+1 redundant mode. These external modules decouple the power supply outputs from each other so that, in case of failure, one power supply unit cannot overload the other units. The modules incorporate DC OK relay contacts. The switch on front of the SDN power supply should be placed in parallel mode (not single mode) when power supplies are used with redundant module.		
Electrical Characteristics		
Voltage		
–Nominal Value	24 Vdc	
–Max. Rated	35 V	
Voltage Drop		
–V_{in} –> V_{out}	Typ. 0.6 V	
Current Handling Capacity		
–Maximum Value	20 A	40 A
Inverse Battery Protection	Yes	
Connection	Via captive screw terminals	
–Connector size range	Solid: 16-10 AWG (1.5 - 6 mm^2) Stranded: 16-12 AWG (1.5 - 4 mm^2)	Solid: 16-5 AWG (1.5 - 16 mm^2) Stranded: 16-8 AWG (1.5 - 10 mm^2)
	Note: GND must be connected to module for voltage monitor to operate properly. See Connectors and Wiring diagrams on next page.	
Relay Contacts		
DC Okay Contacts (qty) description	(1) V_{out} "OK" - N.O. & N.C. Contact	(1) V_{out} "OK" - N.O. Contact (2) V_{in} "OK" - N.O. Contact
–Voltage Set Point	> 18 Vdc ±5%	
–Contact Rating	30 Vdc @ 2A / 250 V @ 2A	
DC OK LED	V_{out} "OK" Green LED	
–Voltage Set Point	> 18 Vdc ±5%	
Dimensions		
H x W x D – inches (mm)	4.88 in x 1.97 in x 4.55 in (124 mm x 50 mm x 116 mm)	4.88 in x 2.56 in x 4.55 in (124 mm x 65 mm x 116 mm)
Free Space for Ventilation – inches (mm)	Above/Below: 0.39 in. (10 mm) recommended Left/Right: 0.39 in. (10 mm) recommended	
Weight lbs (kg)	1.38 (625)	1.43 (646)
General		
Ambient Temperature	Storage: -25°C...+85°C Operation: -10°C...+60°C full power with operation to 70°C possible with a linear derating to half power from 60°C to 70°C (Convection cooling, no forced air required). Operation up to 50% load permissible with sideways or front side up mounting orientation. The relative humidity is < 90% RH, noncondensing.	

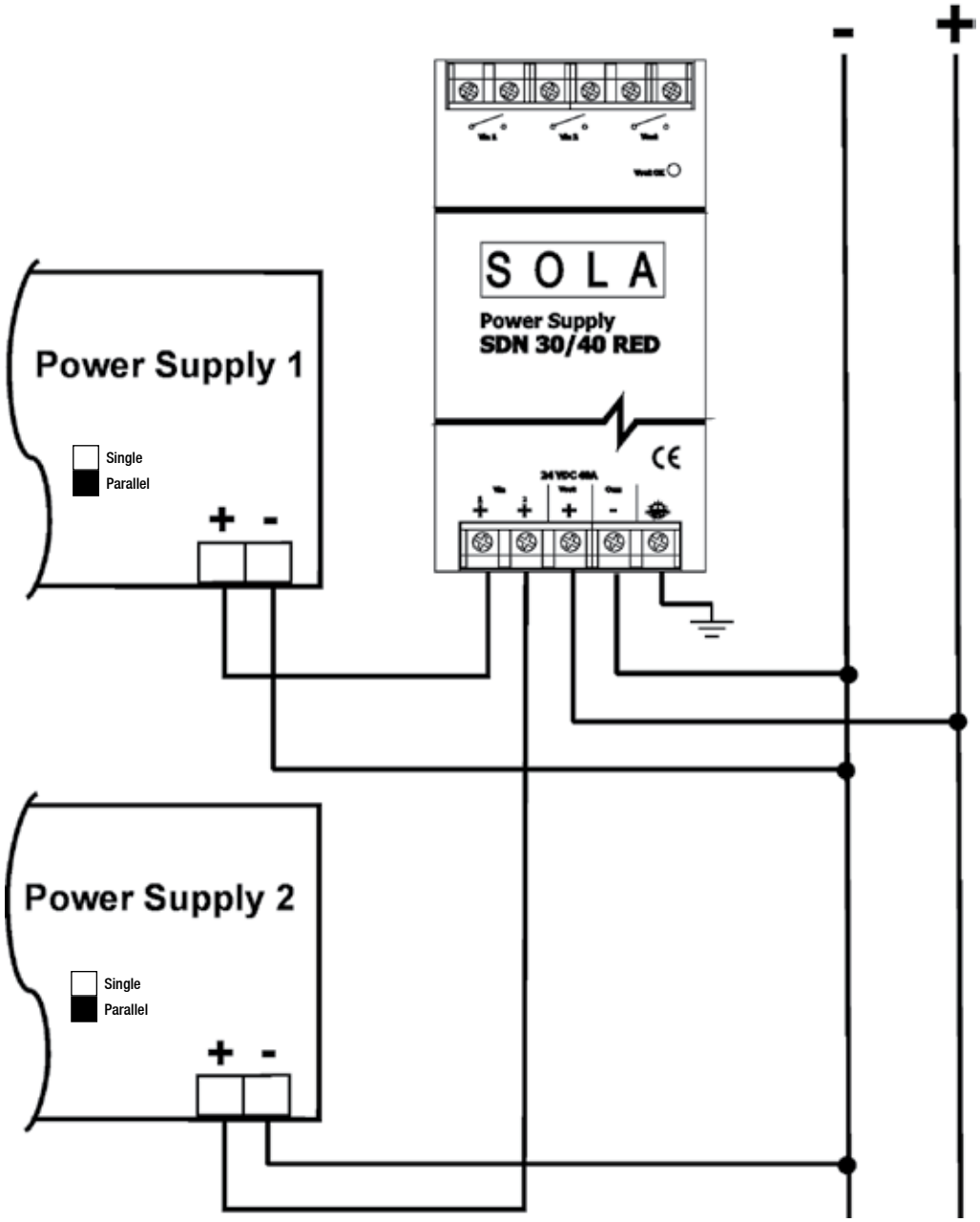
Wiring Diagram for SDN 2.5-20RED



Notes:

1. The Common (marked “COM -“) connection to the module is required for voltage monitoring (DC OK Contacts), and is not meant to be part of the current path from the power supply to the load.
2. Protective earth connection only provides protective ground to the metal case of the module. This connection is isolated from the positive and common connections.

Wiring Diagram for SDN 30/40RED



Notes:

1. The Common (marked “COM -“) connection to the module is required for voltage monitoring (DC OK Contacts), and is not meant to be part of the current path from the power supply to the load.
2. Protective earth connection only provides protective ground to the metal case of the module. This connection is isolated from the positive and common connections.

SDP™ Low Power DIN Rail Series

The compact, lightweight DIN Rail power supplies come in output voltages from 5 to 48 Vdc and power ratings of up to 100 Watts. These extra small, efficient units are designed specifically for the industrial environment. Each unit is rated from -10ºC to 70ºC, with no derating necessary until above 60ºC.

Many extra "industrial" features are standard for the SDP PowerBoost™ overload circuitry can start up industrial loads (i.e. motors, relays, solenoids and DC-DC converters), that can cause ordinary power supplies to foldback or shutdown. Each unit contains a DC indicator and front panel adjustment potentiometer. With the Sola SDP series, you can count on a high grade design.

UL 508 Listed
IND. CONT.
EQ.E6l379

UL 60950
E137632
CUL/CSA-C22.2
No. 234-M90

EMC and
Low Volt.
Directive

Features

- Ultra slim 15W footprint
- No tools required for mounting
- Adjustable output
- PowerBoost™ industrial overload design
- Overvoltage, short circuit protection
- NEC Class 2 Current Limited
- Continuous short circuit protection
- Low output noise
- Screw terminal connections
- RoHS Compliant
- Three year warranty

Related Products

- SDN™ Series
- SCP Series
- SCL Series

Applications

- Industrial Control
- Process Control
- Machine Control
- Building Automation
- Instrumentation

Selection Table

Catalog Number	DC Output Voltage	Output Current	Ripple / Noise	Size (H x W x D)
SDP 5–5–100T	5 - 6 V	5 A	<50 mVpp	2.95 in x 1.77 in x 3.58 in (75 mm x 45 mm x 91 mm)
SDP 2–12–100T	10 - 12 V	3 - 2.5 A		
SDP 3–15–100T	12 - 15 V	4.2 - 3.4 A		
SDP 1–48–100T	48 - 56 V	1 A		
SDP 06–24–100T	24-28 Vdc	0.6 A		2.95 in x 0.9 in x 3.8 in (75 mm x 22.8 mm x 96.7 mm)
SDP 1–24–100T		1.3 A		2.95 in x 1.77 in x 3.58 in (75 mm x 45 mm x 91 mm)
SDP 2–24–100T		2.1 A		
SDP 4–24–100LT		3.8 A		2.95 in x 2.85 in x 3.8 in (75 mm x 72.5 mm x 96.7 mm)
SDP 4–24–100RT*		4.2 A		

* NEC Class 1

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contact Technical Services at (800) 377-4384 with any questions.

SDP™ Series Specifications (24 V models)

Description	Catalog Number				
	SDP 06–24–100T	SDP 1–24–100T	SDP 2–24–100T	SDP 4–24–100LT	SDP 4–24–100RT
Input					
Input Voltage[1]	85-264 Vac, 90-375 Vdc			85-132 / 176-264 Vac, 210-375 Vdc	
Input Frequency	47-63 Hz				
Input Current	0.4 A / 0.25 A	0.7 A / 0.4 A	1.1 A / 0.7 A	1.8 A / 1.0 A	2.2 A / 1.2 A
External Fusing	Not required. Unit provides internal fuse (T3A, not accessible)				
Hold–Up Time	> 25 ms				
Efficiency	> 80% typ.	> 83% typ.	> 86% typ.	> 88% typ.	
Losses	< 3.75 W typ.	< 6.1 W typ.	< 8.1 W typ.	< 12 W typ.	
Output					
Output Voltage	24 V (22.5 - 28.5 Vdc Adj.)			24 V (24 - 25.7 Vdc Adj.)	24 V (22.5 - 28.5 Vdc Adj.)
Voltage Regulation	Static 0.5% V_{out}, dynamic + 2% V_{out} overall\				
Ripple/Noise[2]	< 50 mVpp				
Overvoltage Protection (OVP)	> 30 Vdc, but < 33 Vdc, auto recovery			> 26 Vdc, but < 27.2 Vdc, auto recovery	> 30 Vdc, but < 33 Vdc, auto recovery
Output Noise Suppression	Radiated EMI values below EN61000-6-2				
Rated Continuous Loading	0.63 A @ 24 Vdc / 0.54 A @ 28 Vdc	1.3 A @ 24 Vdc / 1.1 A @ 28 Vdc	2.1 A @ 24 Vdc / 1.8 A @ 28 Vdc	3.8 A @ 24.5 Vdc	4.2 A @ 24.5 Vdc / 3.6 A @ 28 Vdc
Overload Behavior	Continuous operation at overload/short-circuit: up to 1.5 x Nominal Current Continuous				
Protection	Unit is continuously protected against short-circuit, overload and open-circuit.				
Power Back Immunity	35 V				
Installation					
Status Indicators	Green LED on, when V_{out} "OK".				
Case & Mounting	Molded plastic housing using UL 94 approved flameproof material rating 94V-2. Simple snap-on to DIN TS35/7.5 or TS35/15 rail system.				
Dimensions					
(H x W x D) (in/mm)	2.95 x 0.9 x 3.8 (75 x 22.8 x 96.7)	2.95 x 1.77 x 3.58 (75 x 45 x 91)		2.95 x 2.85 x 3.8 (75 x 72.5 x 96.7)	
Weight – lbs (kg)	0.35 lbs (.16 kg)	0.5 lbs (.23 kg)		0.7 lbs (.32 kg)	
Mounting Orientation	Standard: Vertical; Optional: Horizontal or on top (Contact Technical Services).				
Ventilation/Cooling •Free space for cooling	Normal convection, no fan required; Above/below: 25 mm recommended.				
Connection •Connector size range	Input: screw terminals, connector size range: 20-12AWG (1.5 - 6 mm^2) for solid or stranded conductors.				
General					
Temperature	**Storage:** -25°C...+85°C **Operation:** -10°...+60°C full power with linear derating to half power from 60°C to 70°C. (Convection cooling, no forced air required).				
MTBF	> 500,000 hours according to Telcordia/Bellcore Document SR-332, Issue 1.				
Humidity	Up to 90% RH, noncondensing; IEC 68-2-2, 68-2-3				
Electromagnetic Emissions (EME)	EN61000-6-3 (Includes EN61000-6-4) Class B (EN 55022) incl. Annex A				
Electromagnetic Immunity (EMI)	EN61000-6-2 (Includes EN61000-6-1) (EN55024) Criterion A: no derogation of performance				
Safe Low Voltage	SELV (acc. EN60950)				
Protection Class/Voltage	IP20 (IEC529), Protection Class 1 (IEC536)				
Warranty	3 years				
Safety					
CB Scheme, EN60950, UL60079-15 (Class 1, Zone 2 Hazardous Locations, Temp Class T3), UL508 Listed, cULus, UL 60950, cURus, CE (LVD 73/23 & 93/68/EEC). (EMC 89/336 & 93/68/EEC). EN61000-3-2, NEC Class 2 power supply acc. To NFPA 70 art. 725-41 (a)(2).[3]					

Notes:

1. Not UL listed for DC input.
2. Ripple/noise is stated as typical values when measured with a 20 MHz, bandwidth scope and 50 Ohm resistor.
3. For all models except SDP 4-24-100LT.

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SDP™ Series Specifications (Other Voltages)

Description	Catalog Number			
	SDP 5–5–100T	SDP 2–12–100T	SDP 3–15–100T	SDP 1–48–100T
Input				
Input Voltage[1]	85-264 Vac, 90-375 Vdc			
Input Frequency	47-63 Hz			
Input Current	0.6 A @ 102 Vac; 0.33 A @196 Vac		1.0 A @ 102 Vac; 0.6 A @ 196 Vac	<1.0 A @ 100 Vac; <0.6 A @ 196 Vac
External Fusing	Not required. Unit provides internal fuse (T3A, not accessible)			
Hold–Up Time	> 25 ms			
Efficiency	> 80% typ.		> 86% typ.	> 90% typ.
Losses	7.5 W typ.	8.1 W typ.	< 8.1 W typ.	
Output				
Output Voltage	5 - 5.5 Vdc (5 - 6 min adj.)	12 Vdc (9.9 - 12.1 min adj.)	15 Vdc (11.9 - 15.1 min adj.)	48 Vdc (48 - 56 min adj.)
Voltage Regulation	< 2% Dynamic; < 0.5% Static			
Ripple/Noise[2]	< 50 mVpp			
Overvoltage Protection (OVP)	> 6.7 Vdc	> 18 Vdc	> 20 Vdc	> 56 Vdc
Output Noise Suppression	Radiated EMI values below EN61000-6-2			
Rated Continuous Loading	I_{out} = 5A @ V_{out} = 5.1V	3A @ 10 Vdc 2.5A @12 Vdc	4.2A @ 12 Vdc 3.4A @ 15 Vdc	Up to 1.05A @ 48 V 0.9A @ 56 V
Overload Behavior	Continuous operation at overload/short-circuit: up to 1.5 x Nominal Current Continuous			
Protection	Unit is continuously protected against short-circuit, overload and open-circuit.			
Power Back Immunity	10 V	22 V		80 V
Installation				
Status Indicators	Green LED on, when V_{out} "OK".			
Case & Mounting	Molded plastic housing using UL 94 approved flameproof material rating 94V-2. Simple snap-on to DIN TS35/7.5 or TS35/15 rail system.			
Dimensions				
(H x W x D) (in/mm)	2.95 x 1.77 x 3.58 (75 x 45 x 91)			
Weight – lbs (kg)	0.5 lbs (.23 kg)			
Mounting Orientation	**Standard:** Vertical; **Optional:** Horizontal or On Top (Contact Technical Services).			
Ventilation/Cooling •Free space for cooling	Normal convection, no fan required; Above/below: 25 mm recommended.			
Connection •Connector size range	Input: screw terminals, connector size range: 20-12 AWG (1.5 - 6 mm^2) for solid or stranded conductors.			
General				
Temperature	**Storage:** -25°C...+85°C **Operation:** -10°...+60°C full power with linear derating to half power from 60°C to 70°C. (Convection cooling, no forced air required).			
MTBF	> 500,000 hours according to Telcordia/Bellcore Document SR-332, Issue 1.			
Humidity	Up to 90% RH, noncondensing; IEC 68-2-2, 68-2-3			
Electromagnetic Emissions (EME)	EN61000-6-3 (Includes EN61000-6-4) Class B (EN 55022) incl. Annex A			
Electromagnetic Immunity (EMI)	EN61000-6-2 (Includes EN61000-6-1) (EN55024) Criterion A: no degradation of performance			
Safe Low Voltage	SELV (acc. EN60950)			
Protection Class/Voltage	IP20 (IEC529), Protection Class 1 (IEC536)			
Warranty	3 years			
Safety				
CB Scheme, EN60950, UL60079-15 (Class 1, Zone 2 Hazardous Locations, Temp Class T3), UL508 Listed, cULus, UL 60950, cURus, CE (LVD 73/23 & 93/68/EEC), (EMC 89/336 & 93/68/EEC). EN61000-3-2, NEC Class 2 power supply acc. To NFPA 70 art. 725-41 (a)(2).[3]				

Notes:

1. Not UL listed for DC input.
2. Ripple/noise is stated as typical values when measured with a 20 MHz, bandwidth scope and 50 Ohm resistor.
3. Not to exceed 30 watts total.

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SCP-X Extreme Environment Series

9HAO
IND. CONT. EQ.
Also listed I.T.E.
Power Supply

E234790
Class 1 Zone 2
AEx nA IICT4
Ex nA IICT4 U

DEMK0 06 ATEX 05
21715U
EEX nA IIC T4 U
−40°C ≤ Tam ≤ +60°C

The SCP-X is a rugged power supply designed for use in extreme environments. The metal case reduces costs by eliminating separate enclosures. Quick change connectors simplify connectivity for distributed I/O devices on industrial machinery. This model provides 24 Vdc output with limited power to meet Class 2 requirements. Three models are currently offered based on application.

Features

- IP66/67 Versatile/NEMA 4X Rated
- 24 Vdc, 115/230 Vac, 3.8A Nominal Current
- Listed power supply for stand alone applications
- Can be mounted in any orientation without limitation
- Universal input
- High ambient temperature up to 60°C without derating
- DC OK Green LED
- Worldwide approvals
- Limited five-year warranty

Related Products

- SDN Series
- SCP Series

Accessory

Catalog Number	Description	Approx. Ship Weight lbs (kg)
SCP–DINBKT	Mounting bracket to secure SCP-X to DIN Rail (included)	1 (.45)

Selection Table

Catalog Number	Output Current	Output Voltage	Output Power
SCP 100S24X–CP	3.8 A	24 Vdc	95 W
SCP 100S24X–DVN			

Control Power (-CP) Applications

The SCP100S24X-CP is designed for Control Power applications where a grounded power supply output is required (Figure 2). The output power is limited to approx 96 total watts.

- Input connector: 3-pole, male receptacle **externally** threaded with ½-14NPT mounting thread.
- Output connector: 4-pole, female receptacle **internally** threaded with ½-14 NPT mounting thread.

DeviceNet™ (-DVN) Applications

The SCP100S24X-DVN is designed for DeviceNet™ application where an isolated output from ground is required (Figure 2).

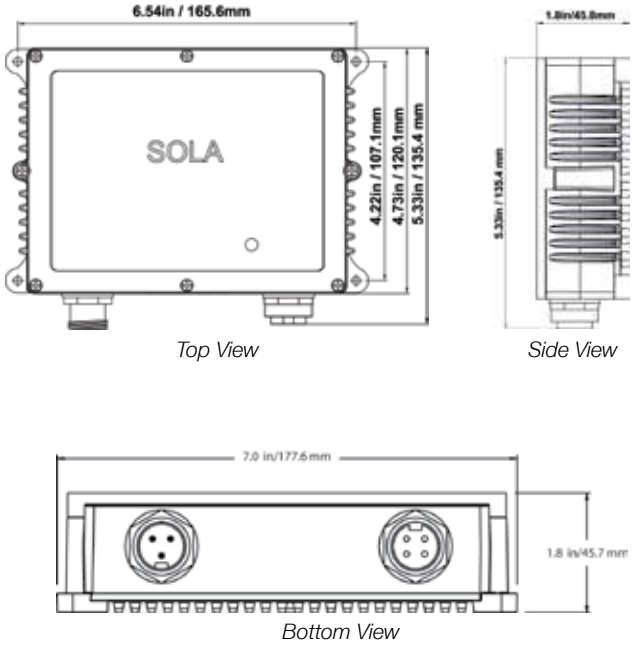
- Input connector: 3-pole, male receptacle **externally** threaded with ½-14NPT mounting thread.
- Output connector: 4-pole, female receptacle **internally** threaded with ½-14 NPT mounting thread.

Recommended Electrical Connections(1)

Catalog Number	Input 3–PIN Connections	Output 4–PIN Connections
SCP 100S24X–CP	Daniel Woodhead P/N 103000A01FXX0(2)	Turck RSM46*M *length in meters
SCP 100S24X–DVN		

1. Connections to be provided by the user.
2. XX is the length of the cordset in foot.

SCP100S24X-CP and SCP100S24X-DVN Mechanical Diagrams

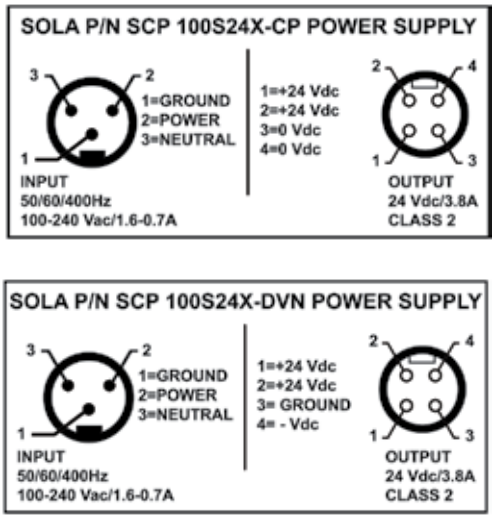


Top View *Side View*

Bottom View

Figure 2

Electrical Connections



1. Vdc connections are internally bonded to ground
2. V- is isolated from ground. V- is a separately derived source so it is permissible to bond to ground if required in the application.

SCP-X Specifications

Input	
Nominal Voltage	Any voltage from 100 to 240 Vac Input
–AC Range	85-264 Vac Universal Input
–DC Range	100-353 Vdc
Nominal Current[1]	1.6A/0.7A
–Inrush current max.	Typ. <25A
Power Factor Correction[2]	0.95
Frequency	50/60/400 Hz
Output	
Power Back Immunity	35 V
Overvoltage Protection	25-25.5 Vdc, autorecovery
Nominal Voltage	24 Vdc
Tolerance	< +/-2% overall (combination line, load, time and temperature related changes)
– Line Regulation	< 0.5%
– Load Regulation	< 0.5%
– Time & Temp. Drift	< 1%
Ripple[3]	< 50 mVpp
Total Nominal Current	3.8A
Holdup Time	> 25 ms (Full load, 100 Vac Input @ T_{amb}=+25°) to 95% output voltage
General	
Case	IP66/67 versatile ingress protection; also meets UL50 Type 4X enclosure.
Min. Required Free Space	1 in. (25 mm) all sides but mounted base (permissible to mount in any orientation)
H x W x D (inches/mm)	4.7 x 7 x 1.8 (119 x 178 x 46)
Weight – lbs (kg)	2.6 lbs (1.16 kg)
EMC	
Emissions	EN61000-6-3, EN61204-3, EN55022 Class B, EN61000-3-2, EN61000-3-3
Immunity	EN61000-6-2, EN61204-3, EN55024, IEC61000-4-2, IEC61000-4-3, IEC61000-4-4, IEC61000-4-5, IEC61000-4-6, IEC61000-4-8, IEC61000-4-11
Approvals	UL508, cULus; UL60950, cULus; UL60079-15 cRUus; IEC60950; CE (LVD 73/23 & 93/68/EEC). (EMC 89/336 & 93/68/EEC). EN61000-3-2, EN50021 (Class 1, Division 2 Hazardous Location, EEX nA IIC T4 U up to 60°C Ambient.)[4]
Temperature	**Storage:** -40° to +85°C, **Operation:** -40° to +60°C full power with linear derating to half power from 60° to 70°C (Convection cooling, no forced air required). Operation up to 100% load permissible with sideways or front side up mounting orientation.
Humidity	Up to 100% RH with condensation.
Altitude	0 to 3,000 meters (0 to 10,000 feet)
Vibration	1.0 gravity (g) peak, 10-500 Hz (random wave). Passed random vibration test conditions for 3 axes for 60 minutes duration while energized and operating.
Shock	4 g peak, 22 milliseconds half-sine pulse, 3 times on 6 faces while energized and operating
Warranty	5 years
MTBF	>500,000 hours according to Telecordia/Bellcore SR-332 Issue 1, (V_{in} 120 Vac, T_{amb}=40°C)
General Protection/Safety	Protected against continuous short-circuit, continuous overload, continuous open circuit. Protection Class 1 (IEC536), degree of protection IP66/67 versatile (IEC 529). Safe low voltage: SELV (acc. IEC60950)
Status Indicators – Visual	DC OK LED
Installation	
Fusing	
–Input	Internally fused, fuses not replaceable
–Output	Inherently limited current to meet Class 2 requirements per UL1310
Mounting	Chassis mounted via built in mounting tabs. Removal and replacement of the unit shall be possible from front of panel.
Connections	**Input:** 3 pin IP67 molded plug (quick disconnect). **Output:** 4 pin IP67 molded receptacle (quick disconnect).

1. Input current ratings are specified with low input, line conditions, worst case efficiency values and power factor.
2. Power Factor Correction at 50/60 Hz only.
3. Ripple/noise is stated as typical AC values when measured with a 20 MHZ, bandwidth scope and 50 Ohm termination.
4. Additional installation requirements apply when used in hazardous locations (refer to user manual).

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SCP Series, 30 Watt; Single, Dual and Triple

UL 60950
E137632
CUL/CSA-C22.2
No. 234-M90

EMC and
Low Volt.
Directive

These switchers are compact, rugged power supplies designed to power many of your industrial control and instrumentation devices and equipment, with high reliability and tight regulation through the most difficult factory-floor conditions around the globe. “User friendly” applies to these unique power supplies that feature easy-to-install DIN Rail and chassis mounting. Terminations are also easy to access (AC and DC terminations are well separated) and simple to wire. Safety is another aspect where the SCP distinguishes itself. The encapsulated design meets IP20 specifications, and the wide range of voltages will reliably support almost any low-power device in your cabinet or system for years to come.

Features

- International approvals for global use
- DIN Rail or Chassis Mount
- Rugged, encapsulated design to resist environment
- IP20 protection
- Many output voltages, 3.3-48 Volts; single, dual, triple
- Five year warranty

Packaging and Mounting Specifications

- Simple snap-on for DIN Rail TS35/7.5 or TS35/15
- M3 screw clamp terminations
- Chassis mounting possible on -DN Low-Profile versions by removing DIN clips (simply unscrew at the back of the unit).

Selection Table

Low Profile Catalog Number	Description	Output Voltages						Min Load V1 A	Efficiency %
		V1		V2		V3			
		Vdc	A	Vdc	A	Vdc	A		
SCP 30S3.3–DN	3.3 V	3.3	6.0	-	-	-	-	0	≥ 62
SCP 30S5–DN	5 V	5	6.0	-	-	-	-	0	≥ 70
SCP 30S12–DN	12 V	12	2.5	-	-	-	-	0	≥ 75
SCP 30S15–DN	15 V	15	2.0	-	-	-	-	0	≥ 75
SCP 30S24–DN	24 V	24	1.3	-	-	-	-	0	≥ 77
SCP 30S48–DN	48 V	48	0.6	-	-	-	-	0	≥ 77
SCP 30D12–DN	Dual O/P +/- 12 V	12	1.2	-12	1.2	-	-	0.12	≥ 68
SCP 30D15–DN	Dual O/P +/- 15 V	15	1.0	-15	1.0	-	-	0.15	≥ 68
SCP 30D512–DN	Dual O/P 5 V & 12 V	5	3.0	12	1.2	-	-	0.3	≥ 68
SCP 30D524–DN	Dual O/P 5 V & 24 V	5	3.0	24	0.6	-	-	0.3	≥ 68
SCP 30T512–DN	Triple O/P 5/12/12 V	5	3.0	-12	0.6	12	0.6	0.3	≥ 68
SCP 30T515–DN	Triple O/P 5/15/15 V	5	3.0	-15	0.5	15	0.5	0.3	≥ 68

Please order using the following model number suffixes:

–DN: Low Profile – DIN Rail or Chassis Mount (ie: SCP30S3.3-DN).

B–DN: Slim Line – DIN Rail Mount Availability Only (ie: SCP30S3.3B-DN).

Note: Slim line version not available on SCP30D512-DN

Options and Accessories

- SCP-MDC – Pair of metal DIN clips
- SCP-PDC – 1 plastic DIN clip with lever for removal from rail

Standards

- UL60950, E137632
- EN60950
- CE and IP20

Specifications

Parameter	Condition	Value
Input		
AC Input Voltage		85…264 Vac
DC Input Voltage		100…375 Vdc
Input Frequency		50/60 HZ
Filtering EMI/RFI		EN 55011/B, 55022/B
Switching Frequency		Typ. 100 kHz
Input Fusing Required		Use 2.0 A Slow Fuse
Output		
Output Voltage Accuracy	V_{in} = 230V, I_{out} = max, 25°C	V1 ≤ ±1%, V2/3 ≤ ±3%
Ripple	V_{in}=min, I_{out}=max, 25°C	≤1%, V_{out}
Noise	V_{in}=min, I_{out}=max, 25°C	≤2%, V_{out}
Line Regulation	V_{in}=min/max 25°C I_{out} = max, 25°C	≤+0.5%, V_{out}
Load Regulation	I_{out} = 10…90…10%, 25°C V_{in} = 230Vac, 25°C	≤+0.5%, V_{out}
Overcurrent Protection		105…130% I_{nom}
Load Regulation Timing	10...90...10%, 25°C	<4 ms
Temperature Coefficient	T_{amb} = -25...+65°C	0.01%/K
Overload/Short Circuit	Continuous	
Derating Single/Dual/Triple	T_{amb} >50°C	2/3/5%/K max
General		
Holdup Time	V_{in} =230 Vac	>50 ms
Operating Temperature		-25…+65°C
Storage Temperature	T_{amb} = 25°C	45...+85°C
Case Temperature Rise at Full Load		45 K max
MTBF at 25°C (input/output)	acc. MIL-HDBK-217F	800,000 hrs
Transient Protection		EN61000-4-2, 3, 4, 5
Cooling		Convection
Weight – lbs (kg)	0.75 lbs (.34 kg)	0.84 lbs (.38 kg)
Case Material/Potting		UL94-VO
CSA Power Supply Class		Level 3
Protection		IP20
Visual Indicators		Green LED indicates DC OK for B-DN Slim Line versions only

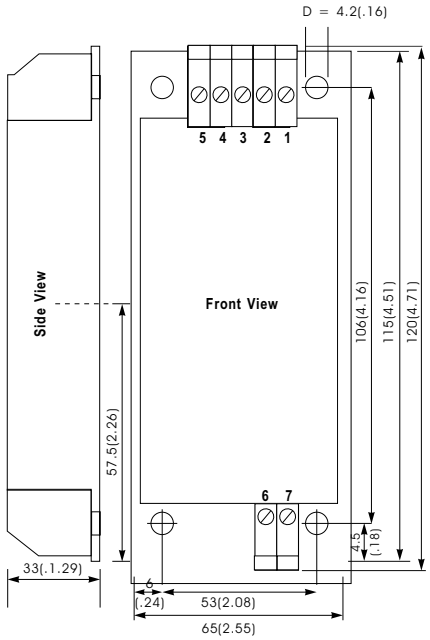
Dimensions (H x W x D)

- **Low Profile "–DN"**
  4.72 x 2.55 x 1.29 inches (120 x 65 x 33 mm)
  (Takes up 2.55 inches or 65 mm on DIN Rail)

- **Slim Line "B–DN"**
  4.72 x 1.29 x 2.68 inches (120 x 33 x 68 mm)
  (Takes up 1.29 inches or 33 mm on DIN Rail)

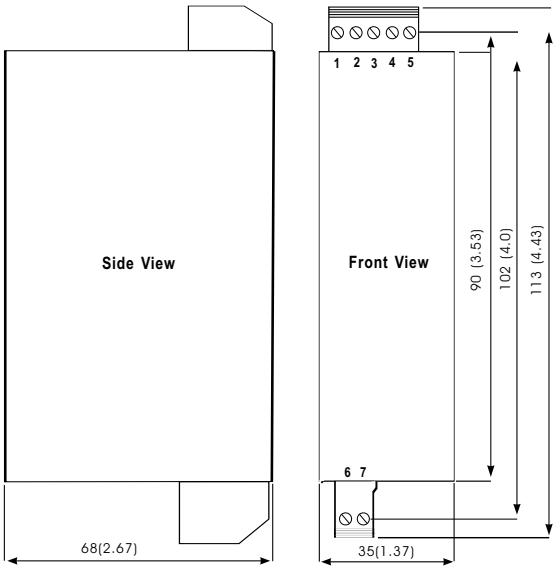
Dimensions – mm (inches)

Low Profile DIN Rail (–DN) or Chassis Mount*



* Unscrew DIN connector for chassis mounting.

Slim Line DIN Rail Mount only (B–DN)



Pin-Out

SCP 30	1	2	3	4	5	6	7
Single				RETURN	+V1	IN	IN
Dual sym			-V2	COM	+V1	IN	IN
Dual asym		COM (V1)	+V1	COM V3	+V3	IN	IN
Triple	-V2	COM (V1)	COM (V2/3)	+V1	+V3	IN	IN

Visit our website at www.solahd.com or
contact Technical Services at (800) 377-4384 with any questions.

SCL Series, 4 and 10 Watt CE Linears

UL 508 Listed IND. CONT. EQ.E6I379

UL 60950 E137632 CUL/CSA-C22.2 No. 234-M90

EMC and Low Volt. Directive

The 4 and 10 Watt encapsulated linears are available in dual and triple outputs for applications with sensitive electronics and analog circuitry. The rugged enclosed encapsulated package, with screw terminals and DIN Rail clips, make for easy installation and maintenance. These low-noise modules are capable of being DIN Rail or Chassis mounted.

Features

- Quiet, low noise DC Linear technology
- DIN Rail or Chassis mount for easy installation
- Rugged encapsulated design
- Global specifications including CE and UL 508
- Two year warranty

Packaging and Mounting Specifications

- Simple snap-on for DIN Rail TS35/7.5 or TS35/15
- M3 screw clamp terminations
- Chassis mounting possible on -DN Low-Profile versions by removing DIN clips (simply unscrew at the back of the unit).

Selection Table

Catalog Number	Description	Output Voltages					
		V1		V2		V3	
		Vdc	A	Vdc	A	Vdc	A
4 Watt; Linear DC Power Supply; DIN Rail Mount							
SCL 4D12–DN	Dual O/P ±12 V	12	0.13	-12	0.13	-	-
SCL 4D15–DN	Dual O/P ±15 V	15	0.1	-15	0.1	-	-
10 Watt; Linear DC Power Supply; DIN Rail Mount							
SCL 10D12–DN	Dual O/P ±12 V	12	0.35	-12	0.35	-	-
SCL 10D15–DN	Dual O/P ±15 V	15	0.3	-15	0.3	-	-
SCL 10T512–DN	Triple O/P, 5 V ±12 V	5	0.2	12	0.3	-12	0.3
SCL 10T515–DN	Triple O/P, 5 V ±15 V	5	0.2	15	0.25	-15	0.25

Note: Dual output units can be series connected for 24V or 30V applications.

Standards

- UL60950, E137632
- EN60950
- CE and IP20
- UL 508 Listed

Dimensions (H x W x D)

- 4 watt: 4.31 x 2.0 x 0.90 inches
  110 x 51 x 23 mm
- 10 watt: 4.71 x 2.55 x 1.29 inches
  120 x 65 x 33 mm

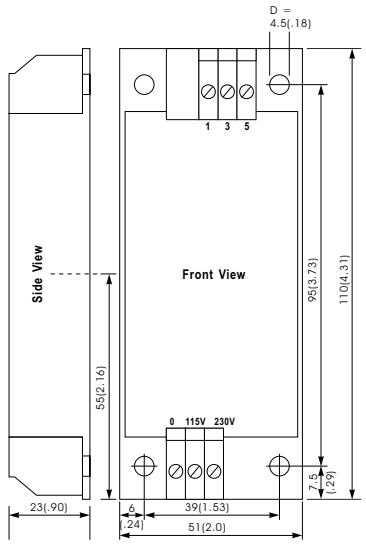
SCL Series

Specifications

Parameter	Condition	Value
Input		
AC Input Voltage		115/230 ±10% Vac Field Selectable
Input Frequency		47-63 Hz
Input Current 115/230 V		10 Watt: 0.2 A/0.1 A max 4 Watt: 0.1 A/0.05 A max
Efficiency		Typ. 50%
Filtering		10 Watt Only: VDE 871/B
Output		
Trimming		Fixed, preset
Ripple	V_{in}=min, I_{out}=max, 25°C	<5 mVpp
Noise	V_{in}=min, I_{out}=max, 25°C	<5 mVpp
Regulation Accuracy	100...50%, 25°C	<0.05%
Load Regulation Timing	10...90...10%, 25°C	100 ms
Temperature Coefficient	T_A = -25...+65°C	0.01%/K typ.
Holdup Time		min. 20 ms
Overload/Short Circuit		Continuous
General		
Conducted Emissions		EN 55 011, Level B
Inducted Noise **ESD** **HF** **Burst**		EN 61000-4-2, Level 4 ENV 50140 (10 V/m) EN 61000-4-4, Level 4
Isolation Voltage (input/output)	T_A = 25°C	3.0k Vac, EN 60 950
Isolation Resistance	V = 230 Vac, 50 Hz	>100 MOhm
Leakage Current	2 cm side, middle case	<0.05 mA
Operating Temperature		10 W: -20...+70°C 4 W: -25...+70°C
Derating	T_A > 50°C	3%/K
Storage Temperature		-40...+85°C
Cooling		Convection
Weight – lbs (kg)		10 Watt: 1.2 lbs (.55 kg) 4 Watt: 0.44 lbs (.20 kg)
Case Material/Potting		UL94-VO
SELV	Protection Class	Class 2

Dimensions – mm (inches)

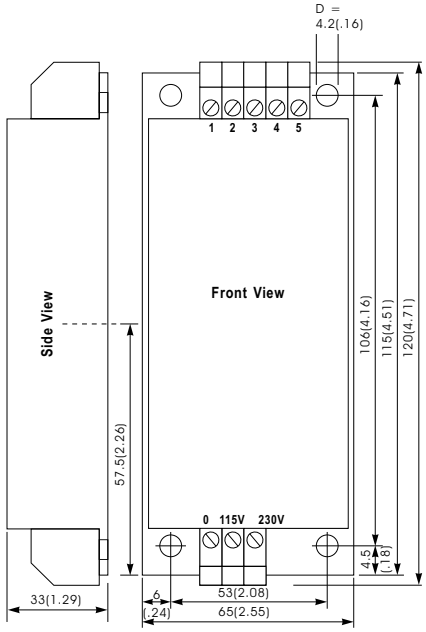
SCL 4 Watt Linear



Pin-Out

SCL 4	1	3	5	6	7	8
Dual	12/15V	COM 12/15V	-12/-15V	IN	IN	IN

SCL 10 Watt Linear



Pin-Out

SCL 10	1	2	3	4	5	6	7	8
Dual	-12/15V		GND 12/15V		12/15V	IN	IN	IN
Triple	-12/15V	5V	GND 12/15V	COM 5V	12/15V	IN	IN	IN

SCD Series, Encapsulated, Industrial DC to DC Converter

These compact, rugged DC to DC converters are power supplies designed to power industrial control instrumentation devices and equipment where AC power is not convenient or accessible. With high reliability and wide input range, these units can operate through the most difficult factory-floor conditions around the globe. “User friendly” applies to these unique power supplies that feature easy-to-install DIN Rail and chassis mounting. Terminations are also easy to access and simple to wire. Encapsulated design meets IP20 specifications for use in harsh environments.

UL 508 Listed IND. CONT. EQ.E6I379

UL 60950 E137632 CUL/CSA-C22.2 No. 234-M90

EMC and Low Volt. Directive

Features

- DIN Rail or Chassis mount by removing DIN clips
- Rugged, encapsulated design to resist environment
- IP20 protection
- Wide 20 to 72 Vdc input range
- M3 screw clamp terminations
- Simple snap-on for DIN Rail TS35/7.5 or TS35/15
- Galvanic isolation
- 5 year warranty

Options and Accessories

- SCP–MDC – Pair of metal DIN clips
- SCP–PDC – 1 plastic DIN clip with lever for removal from rail

Standards

- UL60950, E137632
- EN60950
- CE and IP20
- UL 508 Listed

Applications

These units regulate voltage for sensitive electronic equipment run from battery power. For example, a 24 Vdc battery system where the battery voltage can be 30 volts, sometimes higher during charging, and dip below 22 volts under heavy load. The SCD can be used to stabilize the voltage for those devices not designed to handle wider voltage swings.

They are also a convenient and inexpensive alternative to running AC power through a large industrial machine. The SCD can use 24 Vdc commonly available on many parts of the machine to create other voltages needed to run sensors, transducers and other devices that the machine requires to work properly.

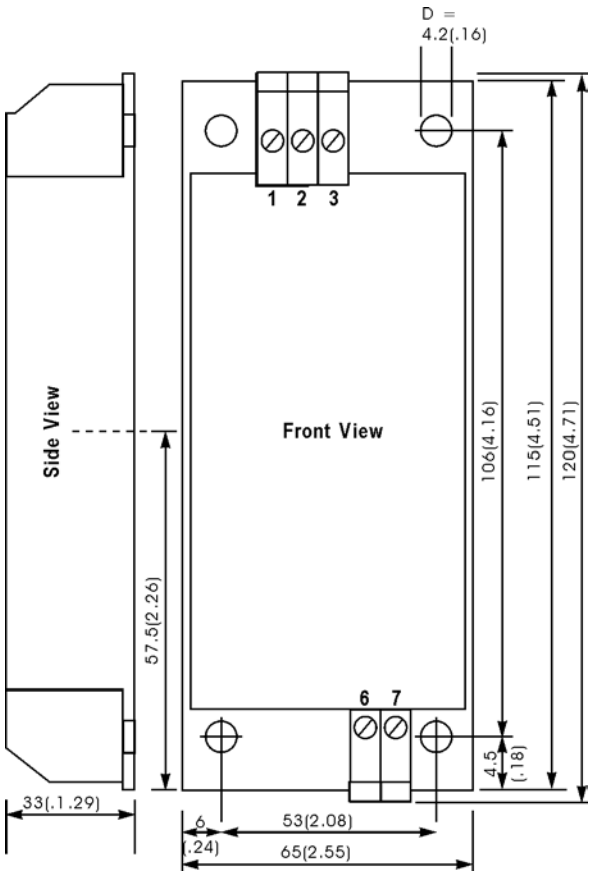
- Industrial
  - Encoders, special sensors, communications and instrumentation
- Telecommunications systems
- Remote Site/Harsh Environment

SCD Series, Encapsulated, Industrial DC to DC Converter

Selection Table

Low Profile Catalog Number	Description	Output Voltages				Min Load V1 A
		V1		V2		
		Vdc	A	Vdc	A	
30 Watts; Switching DC Power Supply						
SCD 30S5–DN	5 V	5	5	-	-	0
SCD 30S12–DN	12 V	12	2.5	-	-	0
SCD 30S15–DN	15 V	15	2	-	-	0
SCD 30S24–DN	24 V	24	1.3	-	-	0
SCD 30S48–DN	48 V	48	0.6	-	-	0
SCD 30D15–DN	Dual O/P+15 V	15	0.8	-15	0.8	0.15

Dimensions



Pin-Out

SCD 30	1	2	3	6	7
Single	+V1	-V1		+IN	-IN
Dual	V1	COM	V2	+IN	-IN

Specifications

Parameter	Condition	Value
Input		
Input Voltage		20…72 Vdc
Filtering EMI/RFI		EN 55011/B, 55022/B
Switching Frequency		Typ. 100 kHz
Output		
Output Voltage Accuracy	V_{in} = 48V, I_{out} = max, 25°C	V1 ≤ ±1%, V2 ≤ ±4%
Ripple	V_{in}= min, I_{out}=max, 25°C	≤1%, V_{out}
Noise	V_{in}= min, I_{out}= max, 25°C	≤2%, V_{out}
Line Regulation	V_{in}=min/max 25°C I_{out} = max, 25°C	≤+0.5%, V_{out}
Load Regulation	I_{out} = 10…90…10%, 25°C, V_{in} = 48 V, 25°C	≤+0.5%, V_{out}
Overcurrent Protection		105…130% I_{nom}
Load Regulation Timing	10...90...10%, 25°C	<4 ms
Temperature Coefficient	T_A = -25...+65°C	0.01%/K
Overload/Short Circuit	Continuous	
Derating Single/Dual/ Triple	T_A >50°C	5%/K max
General		
Holdup Time	V_{in} = 48 V	>10 ms
Operating Temperature		-25…+65°C
Storage Temperature	T_A = 25°C	45...+85°C
Case Temperature Rise at Full Load		45 K max
MTBF at 25°C (input/output)	acc. MIL-STD-217F	800,000 hrs
Transient Protection		EN61000-4-2, 3, 4, 5
Cooling		Convection
Weight – lbs (kg)		0.86 lbs (.39 kg)
Case Material/Potting		UL94-VO
CSA Power Supply Class		Level 3
Protection		IP20

Note: No input protection against reverse voltage.

SDU Series, Direct Current Uninterruptible Power Supply (DC UPS) System

The SDU DIN Rail DC UPS is an advanced 24 Vdc uninterruptible power system that combines an industry leading design with a wide operational temperature range and unique installation options. The SDU DC UPS is a powerful, microprocessor controlled UPS that provides protection from power interruptions. With an input voltage range of 22.5 to 30.0 Vdc, the DC UPS is the ideal power back-up solution for your critical connected loads.

These units were designed specifically for use with Sola's popular SDN Series of power supplies. Sola's external battery module is the only one on the market that allows you to seal the electronics in the panel and maintain safety by placing the battery outside of a non-ventilated enclosure.

These units include easy to wire screw terminations for critical devices needing battery back-up. The SDU DC UPS includes an automatic self-test feature that checks the UPS and battery functions. Battery charging occurs automatically when input DC power is applied. When power fails, the DC UPS will switch to battery back-up. If the battery is no longer useful, the UPS will sound an alarm and an LED indicator will illuminate.

Back-up power protection in modern industrial applications depends mainly on AC UPS. AC is converted to DC, and converted back to AC in the AC UPS, then converted back to DC in the protected equipment power supply. By applying the new Sola SDU DIN Rail DC UPS, you avoid the inefficiencies of all these conversions. This design maximizes system up-time flexibility, and optimizes reliability assurance.

Applications

- Industrial/Machine Control
- Automation process Control
- Computer-based Control Systems
- Conveying Equipment
- Material Handling
- Packaging Machines
- Semiconductor Fabrication Equipment
- DeviceNet™
- Amusement Park Equipment
- Pharmaceutical Applications
- Control Rooms

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Features

- Modular, rugged industrial grade design
- Microprocessor based controls
- Automatic self-test feature for UPS function and battery management check
- Power module wide operation temperature range (-20° to +50°C)
- Flexible batteries back-up expansion capabilities
- Overload protection in normal and battery modes
- User replaceable batteries
- IP20 rated input and output screw terminals
- No internal fan, no extra cooling required
- Sturdy, reliable all metal DIN Rail mounting connector
- LED Status Indicators
- Universal Dry Contact Relay terminals provide remote signaling
- Monitoring, diagnostics, and remote turn-on and shut-off capabilities
- Two year warranty

Related Products

- SDN-P Series DIN Rail Power Supplies
- SDN-C Series DIN Rail Power Supplies
- STV 25K Series Surge Suppressors

Selection Table

Catalog Number	Description	Approx. Ship Weight lbs (kg)
SDU 10–24	240 VA, 24V/10A DIN Rail DC UPS power module, battery module is required	1.65 (0.65)
SDU 20–24	480 VA, 24V/20A DIN Rail DC UPS power module, battery module is required	1.65 (0.65)
SDU 24–BAT	24V DIN Rail/Panel Mount Battery Module (cable included)	12.0 (5.33)
SDU 24–BATEM	24V External Mount Battery Module (cable included)	16.0 (7.11)
SDU 24EXTBC6	Optional 6 ft. Battery Module cable to 24V DC UPS	0.5 (0.22)
SDU 24–DB9	Optional interface kit to convert relay contacts signals to DB9 signals	1.0 (0.45)
SDU–PMBRK	Optional chassis mount brackets to secure UPS to wall, panel, or enclosure	0.5 0(.22)

There are three individual hardware products when putting an SDU DC UPS system into operation:

1. 24 Vdc Power Supply (Recommended Sola SDN Series)
2. 24 Vdc SDU DC UPS Power Module
3. 24 Vdc SDU DC UPS Battery Module; or
   24 Vdc SDU DC UPS External Battery Module

There are two models of the SDU DC UPS Power Module:

1. SDU 10-24, 24 Vdc/10amp (battery modules are required)
2. SDU 20-24, 24 Vdc/20amp (battery modules are required)

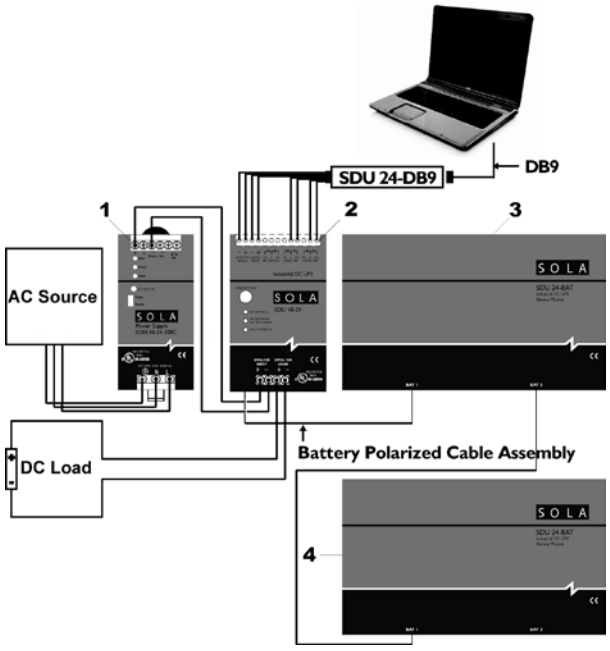
There are two models* of the SDU DC UPS Battery Modules:

1. SDU 24-BAT, DIN Rail/Panel mount for installation in ventilated enclosure, up to 4 battery modules can be connected to the SDU DC UPS.

2. SDU 24-BATEM, Panel mount, alternate battery module for external installation of non-ventilated enclosures, only 1 battery module can be connected to the SDU DC UPS.

*Can not use a combination of both models of the battery modules, only one model of the battery module can be connected to the SDU DC UPS.

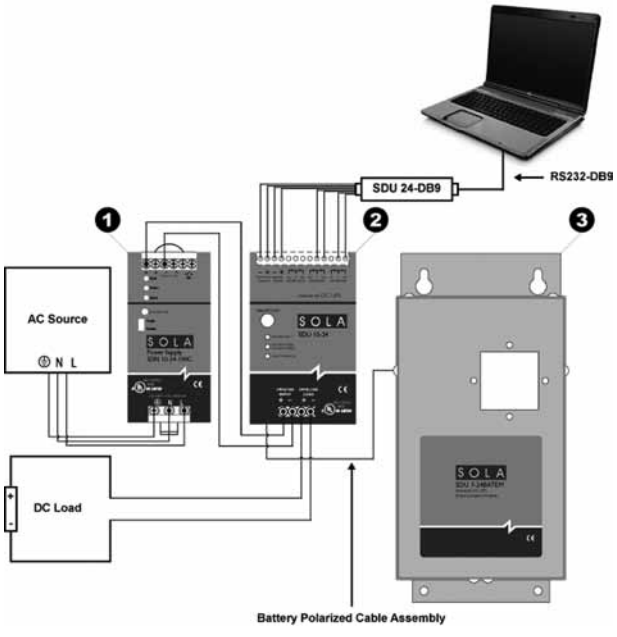
DIN Rail Mounted Battery Option



Notes:

1) AC/DC Power Supply
2) Power Module: SDU 10-24 or SDU 20-24
3) Battery Module: SDU 24-BAT
4) Optional battery module for extended runtime.

External Battery Option



Notes:

1) AC/DC Power Supply
2) Power Module: SDU 10-24 or SDU 20-24
3) Battery Module: SDU 24-BATEM

Visit our website at www.solahd.com or
contact Technical Services at (800) 377-4384 with any questions.

SDU DC UPS Power Modules Specifications

Specification	SDU 10–24	SDU 20–24
Input		
Nominal Input Voltage	24 Vdc	
Input Voltage Range	22.5 - 30 Vdc	
Input Fuse	DC Fuse 30A	
Output		
Nominal Output Voltage	24 Vdc	
Output Voltage Range	22.5 - 30 Vdc	
Output Current	10A	20A
Current Limit	12A	22A
Protection		
Input Protection	Fuse for overload & short circuit protection	
Overload Protection	Electrical Circuit Protection	
Short Circuit	UPS output cut off immediately	
Battery Module		
Type	Sealed, maintenance-free lead acid batteries.	
Charging Current	0.5 A	
Typical Recharge Time (to 90% of full capacity)	8 Hours for 1 Battery Module 24 Hours for 2 Battery Module 12 Hours for each additional Battery Module	
Back–up Time (full load)[1]	14 min.	4 min.
Protection	UPS Shutdown when battery voltage drops below 22V, to prevent the complete depletion of the battery, short circuit protection by a 30A fuse.	
Physical		
Net Weight – lbs (kg)	1.65 (0.75)	
Dimensions H x W x D – in. (mm)	4.88 x 3.02 x 4.55 (124 x 77 x 116)	
Alarm		
Battery Low	Rapid Audible Indicator every 1 second	
Overload	Continuous Audible Indicator	
Environment		
Audible Noise	<40 dBA (1 meter from surface)	
Power Module Operating Temperature	-20°C to +50°C	
Storage Temperature	-20°C to +70°C	
Humidity	0-95%	
Max Elevation	3500 meters (11,483 feet)	
Shock & Vibration	According to ISTA 2A	
DC UPS System[2] Safety		
US Standard	UL 60950-1, UL508, FCC Part 15, Class A	
Canadian Standard	CAN/CSA C22.2 No 107.1-01, CAN/CSA C22.2 No. 60950-1	
CE	Low Voltage Directive IEC 60950-1 (CB Scheme)	
	Directive 2004/108/EC: EN 62040-2 Category C2 EN 55022 Class A + A1 + A2, CISPR 22 Class A (2005), IEC 61000-3-2, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6 + A1, IEC 61000-4-8, IEC 61000-2-2	
General		
MTBF	> 200,000 Hours, MIL-STD HDBK-217F	
Installation		
Output	Outputs are capable of providing high currents for short periods of time for inductive load startup or switching. Fusing may be required for wire/loads if 2x Nominal O/P current rating cannot be tolerated. Continuous current overload allows for reliable fuse tripping	
Mounting	Simple snap-on system for DIN Rail TS35/7.5 or TS35/15 or chassis-mounted, optional screw mounting set SDU-PMBRK.	
Connections	Input & Output: IP20-rated screw terminals, connector size range: 16-12 AWG (0.5-4 mm^2) for copper conductors rated 90°.	
Relay Contact Terminal Connections	IP20 screw terminals; connector size range: 24-16 AWG (0.34-4mm^2)	
Case	Fully enclosed metal housing with ventilation grid to keep out small particles.	
Free Space	20 mm above and 35 mm below, 20 mm left and right, 10 mm in front	

Notes:
1. See Battery Back-Up Times on next page.
2. DC UPS System includes one power module (SDU 10-24 or SDU 20-24) and one or more battery modules (SDU 24-BAT or SDU 24BATEM)

SDN DC UPS Battery Module Specifications

Parameter	SDU 24–BAT	SDU 24–BATEM
Nominal Voltage	24 Vdc	
Protection	Fuse: 30A	Circuit Breaker: 24V, 25A
Charging Current	0.5A	0.8A
Enclosure Dimension in. (mm)	4.88 x 8.27 x 4.55 (124 x 210 x 116)	11.5 x 5.57 x 4.57 (292 x 142 x 116)
Enclosure Type	IP20	NEMA 1
Terminal Connector Type	Polarized Powerpole Connectors	
Batteries	Replaceable Batteries	
Accessories	1 ft. polarized battery cable	6 ft. polarized battery cable
Operating Temperature	-20° to +50°C	
Storage Temperature	-20° to +40°C	
Humidity	95% no condensation	
Safety Standard For DC UPS System*	UL60950-1, IEC 60950-1, UL508, CE CAN/CSA C22.2 No 107.1-01 CAN/CSA C22.2 No 60950-1	
Weight – lbs (kg)	12 (5.33)	16 (7.11)
Mounting	Simple snap-on system for DIN Rail TS35/7.5 or TS35/15 or chassis-mounted, optional screw mounting set **SDU–PMBRK**.	Wall/Chassis Mounting

SDU DC UPS Back-Up Times (Typical)

SDU 10–24 with SDU 24–BAT					
Load	**20% (2A)**	**40% (4A)**	**60% (6A)**	**80% (8A)**	**100% (10A)**
1 unit	113	45	30	21	14
2 units	247	114	74	48	38
3 units	396	178	117	80	58
4 units	531	233	148	111	81
SDU 10–24 with SDU 24–BATEM					
1 EBP	200	82	44	30	21
SDU 20–24 with SDU 24–BAT					
Load	**20% (4A)**	**40% (8A)**	**60% (12A)**	**80% (16A)**	**100% (20A)**
1 unit	46	21	10	06	04
2 units	116	50	28	17	10
3 units	178	80	46	31	20
4 units	237	113	65	43	31
SDU 20–24 with SDU 24–BATEM					
1 EBP	84	30	16	11	7

SFL Series, 75–600 Watt

The SFL series is a DIN Rail switching power supply series that complements the Sola SDN™ products with more input voltage, output voltage and power levels to give an even broader range of industrial DC power solutions.

These products are available in 12, 24 and 48 Vdc output and 115/230 Vac Input. They feature pluggable screw connectors* (mating connectors are included in each box sold) for easy installation and service. The products feature a DIN Rail connection, front panel DC OK indicators, and easily accessible AC and DC connections.

For parallel operation with power sharing, a redundant version is available for the 300 W (24 V/12 A) and 600 W (24 V/24 A) models.

UL 508 Listed
IND. CONT.
EQ.E6I379

UL 60950
E137632
CUL/CSA-C22.2
No. 234-M90

EMC and
Low Volt.
Directive

Features

- DIN Rail Mount regulated switch mode power supplies
- 12 V, 24 V, and 48 V outputs available from 1.5-24 A
- Easy-to-wire pluggable* and screw terminal connectors
- Adjustable output voltage
- Selectable input: 115/230 Vac
- UL1604 Listed for Class 1, Division 2 hazardous locations (except -RED and -UDS versions)
- UL 508 Listed (except -RED and -UDS versions). No derating necessary.
- Two year warranty

* Except 600 watt models.

- Fully Integrated Redundant models available:
  - RED (For SFL24-24-100 and SFL12-24-100 only) Designed for N + 1 redundant power supply systems, these units provide active current sharing and allow up to 5 power supplies to be paralleled. Decoupling diodes and an alarm output to signal a unit failure are included in this option. Multiple units are required for redundancy.
- Models with optional battery back-up available:
  - UDS (For SFL24-24-100 and SFL12-24-100 only) Contact Technical Services for details.

Selection Table

Catalog Number	Input Voltage Selectable	Output Power Maximum	Output Voltage Nominal	Output Current Maximum
SFL 6–12–100 **SFL 1.5–48–100**	115/230 Vac	75 Watt	12 Vdc 48 Vdc	6 A 1.5 A
SFL 3–48–100		150 Watt	48 Vdc	3 A
SFL 12–24–100 **SFL 6–48–100**		300 Watt	24 Vdc 48 Vdc	12 A 6 A
SFL 24–24–100 **SFL 12–48–100**		600 Watt	24 Vdc 48 Vdc	24 A 12 A
Redundant Models				
SFL 12–24–100RED **SFL 24–24–100RED**	115/230 Vac	300 Watt 600 Watt	24 Vdc	12 A 24 A

SFL Specifications

Parameter	Value	
Input		
Input voltages nominal (user selectable)	93-132 Vac / 187-264 Vac	
Input Frequency	47-63 Hz	
Input current at full load (typical) **– 75 W (12 V/6 A, 24 V/3 A, 48 V/1.5 A)** **– 150 W (24 V/6 A, 48 V/3 A)** **– 300 W (24 V/12 A, 48 V/6 A)** **– 600 W (24 V/24 A, 48 V/12 A)**	115 Vac 1.7A 3.0A 5.4A 10.5A	230 Vac 0.9 A 1.7 A 3.3 A 6.4 A
Inrush current (max.) **– 75 W** **– 150 W** **– 300 W** **– 600 W**	115 Vac 16.5 A 35.0 A 35.0 A 70.0 A	230 Vac 33.0 A 70.0 A 70.0 A 80.0 A
Internal fuse (slow blow) not accessible **– 75 W / 150 W** **– 300 W** **– 600 W**	4.0 A 6.3 A 12.0 A	
Output		
Voltage Adjustment Range **– 12 V models** **– 24 V models** **– 48 V models**	12 – 14 Vdc 24 – 28 Vdc 48 – 52 Vdc	
Output Regulation **– Line voltage variation** **– Load variation 10–90%** **75W, 150W models** **300W, 600W models**	±0.2% max. ±1.0% max. ±0.5% max.	
Ripple and noise (20 MHz bandwidth)	< 50 mVpp	
Electronic short circuit protection / current limitation	110 % typ. (constant current)	
Parallel Operation **– SFL12–24–100RED** **– SFL24–24–100RED**	Up to 5 units	
Overvoltage Protection, trigger point at	140% typical out nominal	
Holdup Time	min. 20 mS	

Parameter	Value	
General		
Operating Temperature Range **Derating above 50°C**	-25°C...+70°C 2%/°C	
Storage Temperature	-25°C...+85°C	
Humidity (non condensing)	95% rel H max.	
Switching Frequency **– 75 W** **– 150 W/300 W/600 W**	100 kHz typical 67 kHz typical	
Efficiency	>85%	
Operation Indication	LED, DC OK	
Isolation Voltage **– Input/output** **– Input/case** **– Output/case**	3,000 Vac (1 minute) 2,000 Vac (1 minute) 500 Vac (1 minute)	
Safety Class (IEC536)	Class 1	
Safety Standards Met	IEC950,EN60950,CE marked for LVD, UL60950 recognized and UL 508.	
Conducted EMI according to:	EN55022 Class B, EN55011 Class B, FCC-B	
Electromagnetic Susceptibility **– Electrostatic discharge ESD.** **– RF field susceptibility.** **– Electrical fast transients/ bursts on main line.** **– Immunity to conducted radio frequency disturbances above 9 kHz.** **– Mains frequency field**	EN61000-4-2 EN61000-4-3 EN61000-4-4 EN61000-4-6 EN61000-4-8	4 kV/8 kV 10 V/m 2 kV 10 V 30 A/m
Case protection according to IEC529	IP 20	
Case material	Steel	
Mounting	Snap-on 35 mm DIN Rail as per EN50022 or Chassis mounting option available	

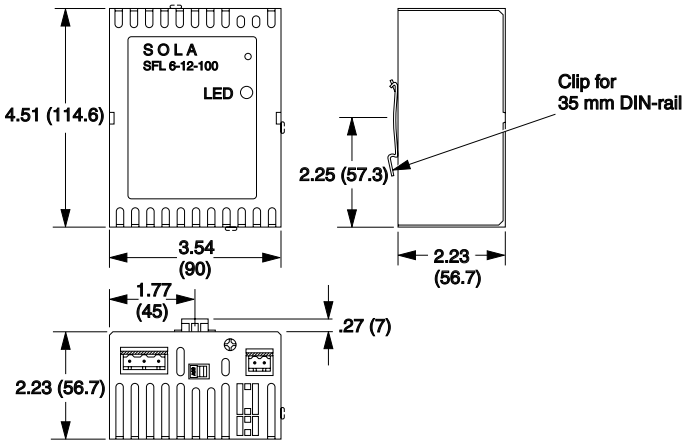
Mounting Brackets

For easy conversion to panel or chassis mounting.

Catalog Number	Output Power Maximum
SFL 75–PMBRK	75 Watt
SFL 150–PMBRK	150 Watt
SFL 300–PMBRK	300 Watt
SFL 600–PMBRK	600 Watt

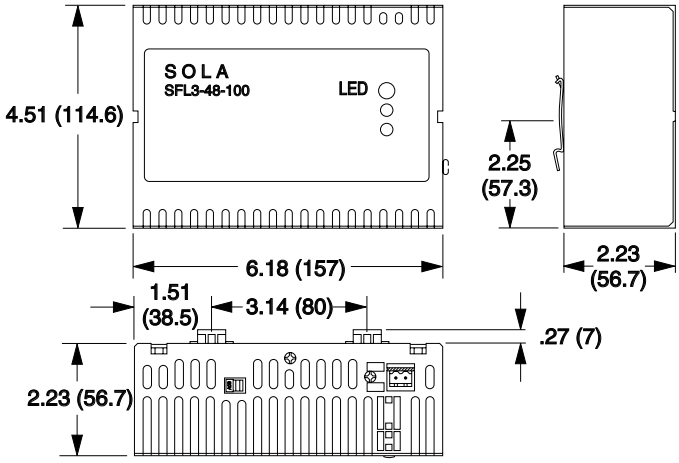
SFL Series Dimensions (inches/mm)

SFL 75 Watt (12 V/6 A, 48 V/1.5 A)



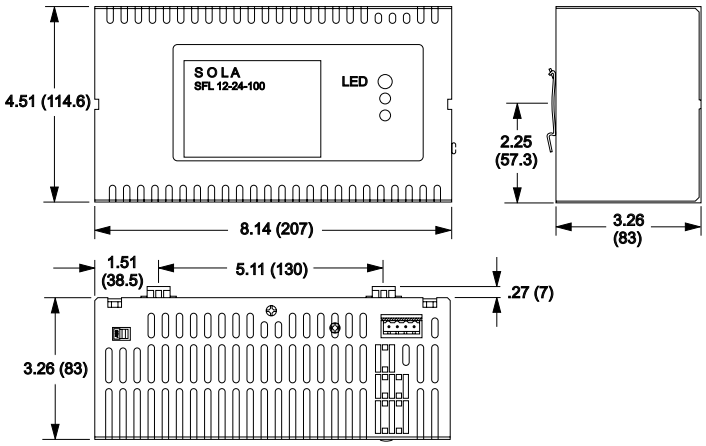
Weight: 1.06 lbs/.48 kg approx.

SFL 150 Watt (SFL 3-48-100)



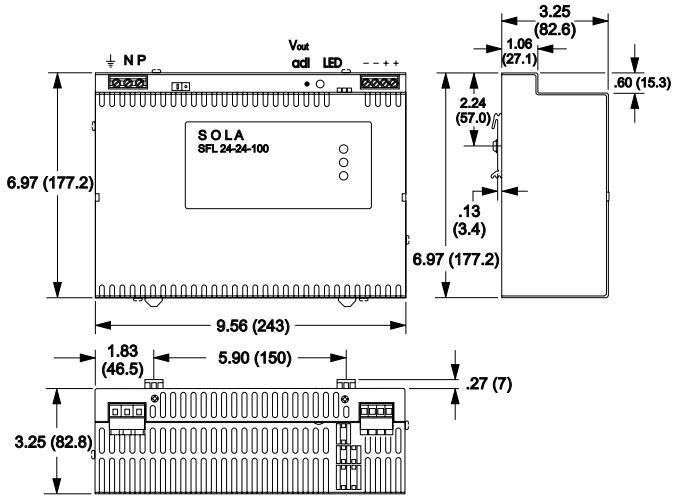
Weight: 1.6 lbs/.73 kg approx.

SFL 300 Watt (SFL 12-24-100[RED], SFL 6-48-100)



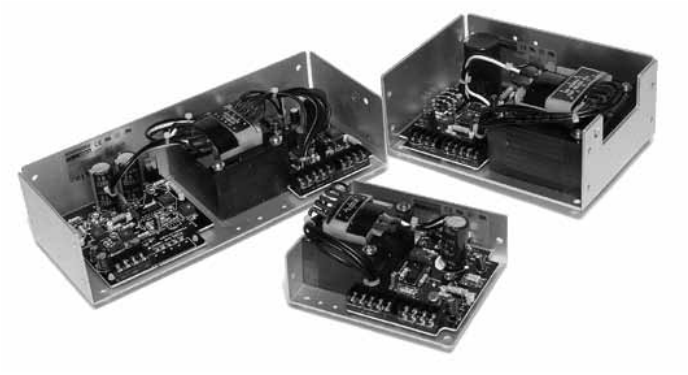
Weight: 3.09 lbs/1.4 kg approx.

SFL 600 Watt (SFL 12-48-100, SFL 24-24-100[RED])



Weight: 4 lbs/1.81 kg approx.

Silver Line Series – Single & Multi-Output Linears



UL 60950
E137632

LVD

The Silver Line series follows the industry accepted footprint for open frame, linear power supplies. Standard screw terminal connections and optional covers are offered for safety considerations.

Features

- Easy-to-install screw terminal connections
- Cover options
- Industry standard footprint
- Universal input and approvals (115/230 Vac)
- Low noise, extremely quiet DC output. For noise sensitive or analog circuitry.
- Fast transient response. Ideal for test applications.
- Built-in OVP on 5 V models and optional on 12, 15 and 24 V models
- Automatic resetting overload protection
- Short circuit protected
- Two year warranty

Applications

- Industrial Control Circuits and Components
- Instrumentation
- Drives
- CNC Machinery
- Equipment for food industry
- Microprocessor Circuits
- Analog Circuits
- Noise sensitive Circuitry and Sensors

Specifications

Parameter	Condition	Limit
Input		
Input Voltage		100/120/220/230/240 Vac Selectable
Input Frequency		47-63 Hz
Output		
Line Regulation	for 10% change	0.05%
Load Regulation	for 50% change	0.05%
Ripple		3.0 mV maximum Peak-to-Peak
DC Output Adjustment Range		±5% Minimum
Overvoltage Protection		All 5-Volt outputs include build-in OVP as standard (setting is 6.2 V ±0.4 V) OVP is optionally available on other types
Transient Response Time	at 50% Load Changes	50 msec.
Overload Protection		Automatic current limit foldback
Remote Sensing	Available to compensate for output voltage drop on selected models.	0.5 Vdc
General		
Operating Temperature Range	Derate to 40% at +70°C	0 to +50°C
Storage Temperature Range		-25°C to +85°C
Temperature Coefficient (Typical)		0.01% 0°C
Stability	After warm-up	±.5%
EMI/RFI	Linear power supplies have inherently low conducted and radiate noise levels	For most system applications they will meet requirements of FCC Class B and VDE 0871 for Class B
Cover Option	Derate power by an additional 15%	
Cooling	Forced air. 20 CFM required for full rating Derate 30% without cooling	

Specifications are typical. Load Regulation on outputs without Remote Sense, .1% typical.

SL Series Selection Table

Catalog Number	Output 1	Output 2	Output 3	Case
SLS–05–030–1T	5 V @ 3 A*#	–	–	A
SLS–05–060–1T	5 V @ 6 A*#	–	–	B1
SLS–05–090–1T	5 V @ 9 A*#	–	–	C
SLS–05–120–1T	5 V @ 12 A*#	–	–	I2
SLS–12–017T1	12 V @ 1.7 A# or 15 V @ 1.5 A	–	–	A
SLS–12–034T	12 V @ 3.4 A#	–	–	B1
SLS–12–051T	12 V @ 5.1 A#	–	–	C
SLS–12–068T	12 V @ 6.8 A#	–	–	I2
SLS–15–045T	15 V @ 4.5 A#	–	–	C
SLS–15–060T	15 V @ 6 A#	–	–	I2
SLS–24–012T	24 V @ 1.2 A#	–	–	A
SLS–24–024T	24 V @ 2.4 A#	–	–	B2
SLS–24–036T	24 V @ 3.6 A#	–	–	C
SLS–24–048T	24 V @ 4.8 A#	–	–	I2
SLS–24–072T	24 V @ 7.2 A#	–	–	K
SLS–24–120T	24 V @ 12.0 A#	–	–	L
SLD–12–1010–12T[1]	12 V @ 1 A or 15 V @ .8 A	-12 V @ 1 A or -15 V @ .8	–	H1
SLD–12–1818–12T[1]	12 V @ 1.8 A or 15 V @ 1.5 A	-12 V @ 1.8 A or -15 V @ 1.5 A	–	D
SLD–12–3434–12T	12 V @ 3.4 A#	-12 V @ 3.4 A#	–	I3
SLD–15–3030–15T	15 V @ 3 A#	-15 V @ 3 A#	–	I3
SLD–12–6034–05T	5 V @ 6 A*#	12 V @ 3.4 A#	–	I1
SLD–12–3015–05T	5 V @ 3 A*#	12 V@ 1.5 A	–	C1
SLT 12–20404–12T[1]	5 V @ 2 A*#	12 V @ .4 A or 15 V @ .4 A	-12 V @ .4 A or -15 V @ .4 A	H2
SLT 12–31010–12T1	5 V @ 3 A*#	12 V @ 1 A# or 15 V @ .8 A	-12 V @ 1 A# or -15 V @ .8 A	F
SLT 12–61818–12T1	5V @ 6A*#	12 V @1.8 A or 15 V @1.5 A	-12 V @ 1.8 A or -15 V @ 1.5 A	G2
Over Voltage Protector (OVP)				
SLO–12–000–1	6.2 V to 34 V Adjustable @ 8 A	For Cases B through K		J1
SLO–12–000–TB	6.2 V to 34 V Adjustable @ 8 A	For Case A or Cases B through K (when used with a cover)		J2

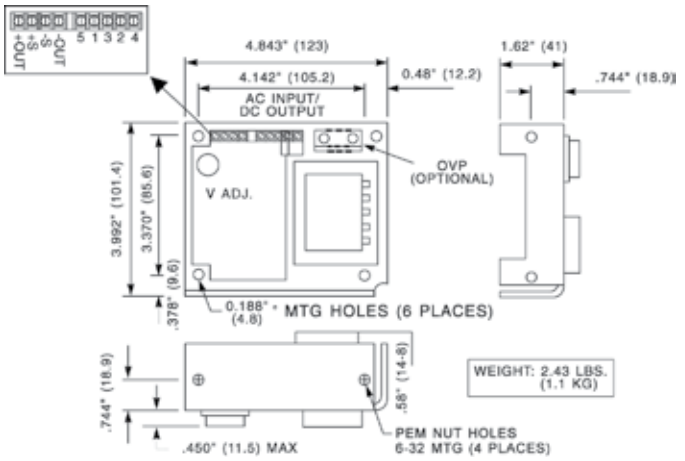
Notes:

* With Built-In OVP

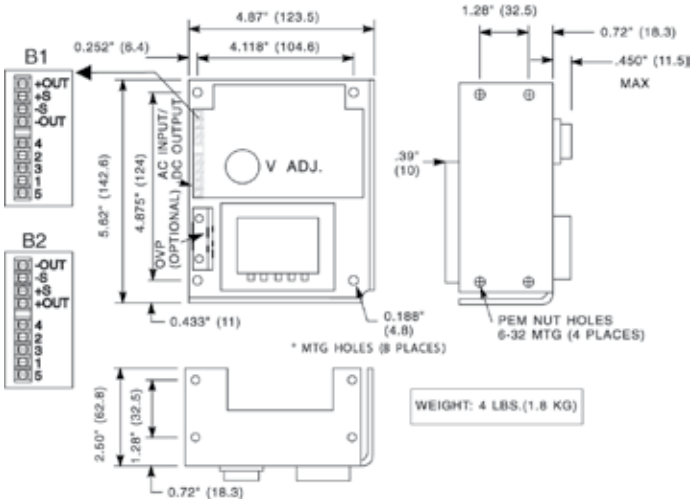
\# With Remote Sense (R.S.)

1. 12/15 Volt models are factory set for 12 Volt operation. 15 Volt operation is field adjustable.

Dimensions - inches (mm)



Case A



Case B

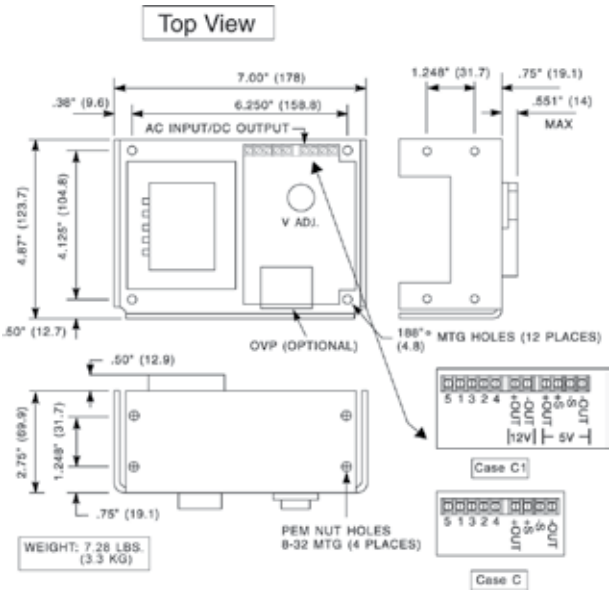
Cover Options

Catalog Number	Description	Catalog Number	Description
SLCASA–CVR	Cover for Case A	**SLCASI–CVR**	Cover for Cases I1, I2, & I3
SLCASB–CVR	Cover for Case B	**SLCASK–CVR**	Cover for Case K
SLCASC–CVR	Cover for Case C	**SLCASL–CVR**	Cover for Case L

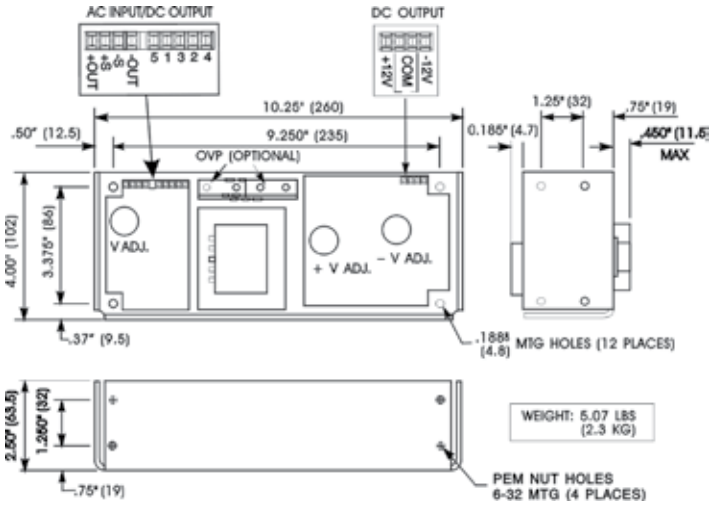
Note:

Covers are sold separately. When used, derate the power supply by 15% of its rated value.

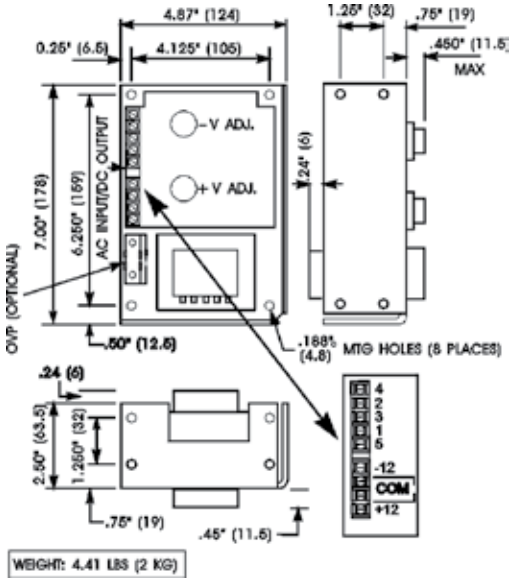
Silver Line Dimensions (inches/mm)



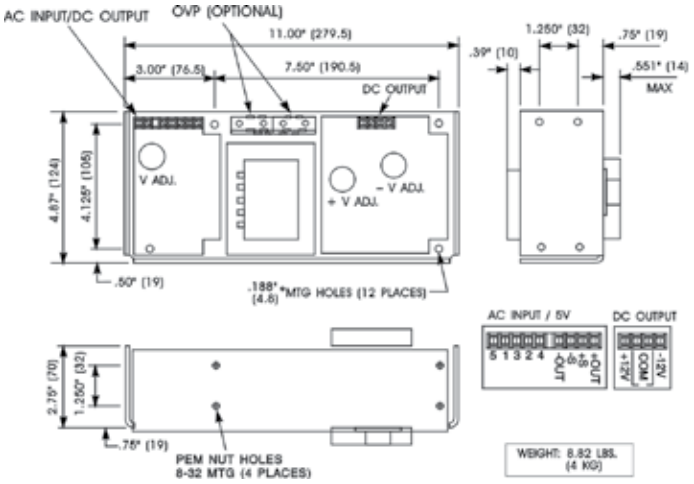
Cases C and C1



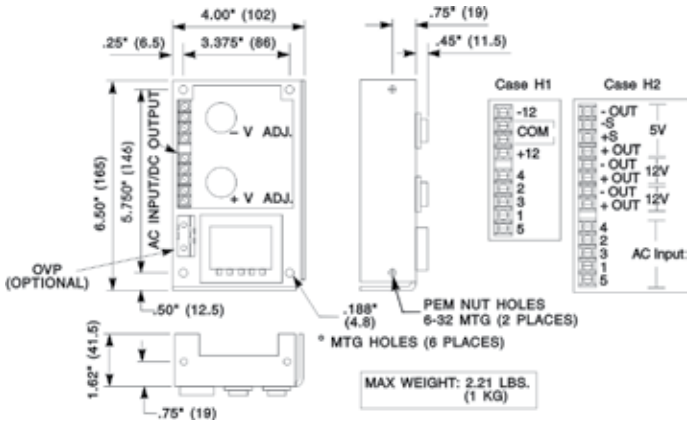
Case F



Case D



Case G2

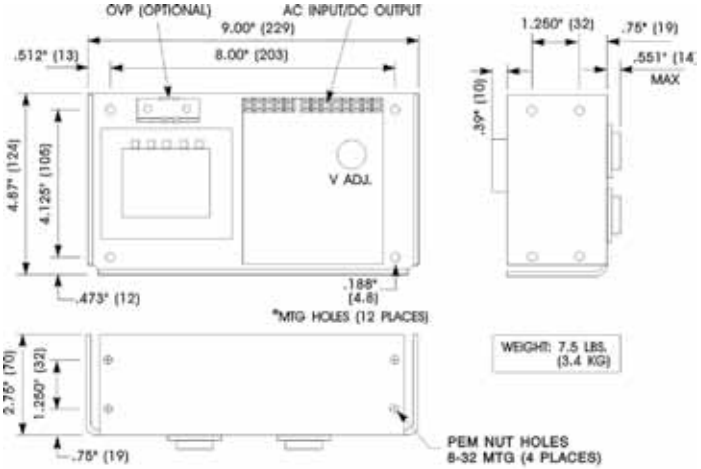


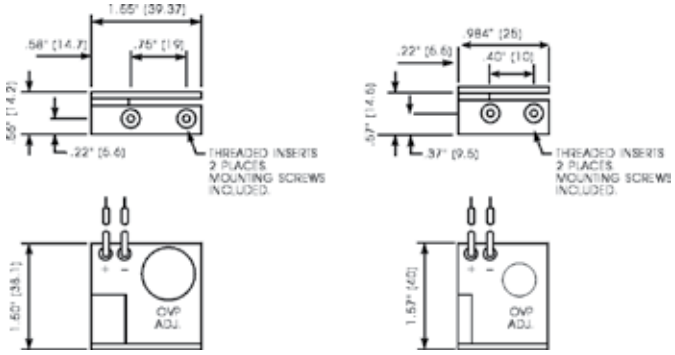
Cases H1 and H2

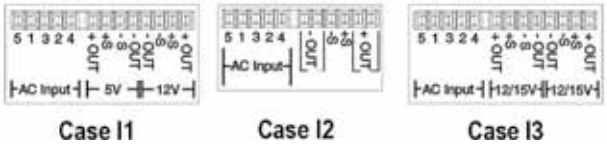
AC Input Jumper Connections

For use at:	100 Vac	120 Vac	220 Vac	230/240 Vac
Connect:	1-3, 2-4	1-3, 2-4	2-3	2-3
Apply AC:	1 & 5	1 & 4	1 & 5	1 & 4

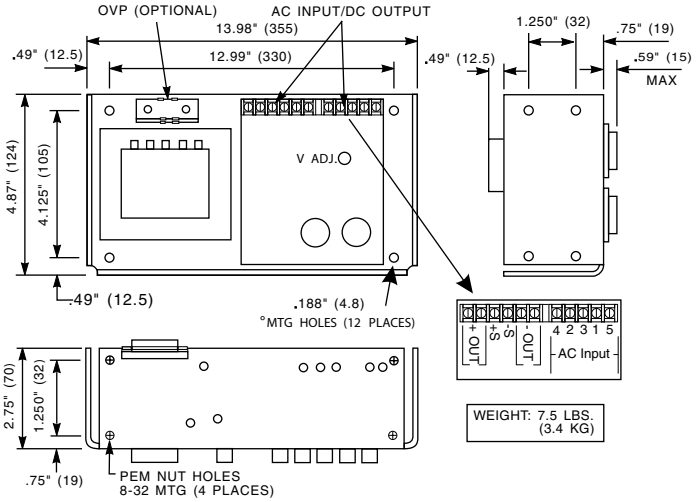
Silver Line Dimensions (inches/mm)



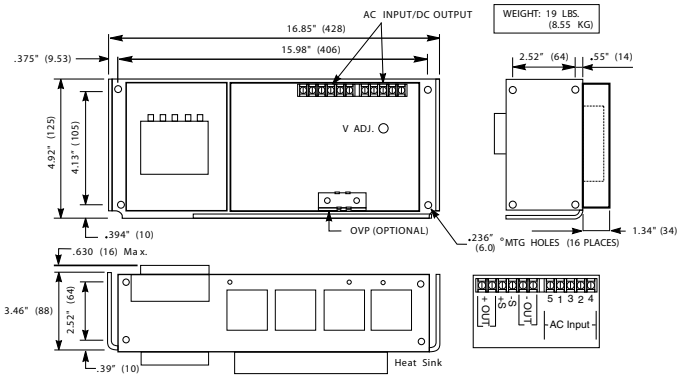




Cases I1, I2 and I3



Case K



Case L

Notes:

All dimensions in inches (mm). Dimensions may change and should not be used for construction purposes.

Be sure to specify the complete part number when ordering. Orders may be placed with your local SolaHD distributor.

GL Series: Single & Multi Output Switchers

UL 60950
EN 60950

The new GL series provides a broad range of AC/DC power supply solutions that covers power ratings from 25 watts to 500 watts for use in various industrial and medical applications requiring standard footprint size and very high reliability.

These low-profile AC/DC switchers offer universal input voltage with no switches or jumpers, ideal for higher volume worldwide applications.

All models feature:

- Industry standard footprints
- Universal input
- Full power to 50°C
- High demonstrated MTBF
- Automatic overvoltage protection
- Overload protection
- Built-in EMI Filtering
- Extensive safety approvals
- Derated operation to 70°C
- 250 VA and higher VA size enclosed
- Two year limited warranty

Many models feature:

- EN61000-3-2 Compliance
- Supervisory outputs (5 V/12 V)
- Wide-adjustable floating 4th output
- Single wire current share
- Medical approvals
- Remote Sense
- Adjustable main output
- Power Fail and DC Good signals
- Wide-adjustable on single output models

Cover and Bracket Options

- Cover options can be ordered separately. They are designed to simplify mechanical integration of the power supplies into systems and add an extra measure of electrical safety for service personnel.
- Bracket kits can be ordered separately for GL110 series only. It is needed when the cover option is used.

Catalog Number	Description
GLX40	Enclosure kit for the GL20 and GL40
GLX50	Enclosure kit for the GL50 and GL100-M
GLX60	Enclosure kit for the GL60
GLX110–B	Bracket kit for the GL110
GLX110–C	Cover kit for the GL110
GLX120	Enclosure kit for the GLS120 and GLQ120
GLX140–C	Cover kit for the GLQ140
GLX140–CF	Cover with top fan kit for the GLQ140
GLX150–C	Cover kit for the GL150
GLX17Q–C	Cover kit for the quad output GL170
GLX17S–C	Cover kit for the single output GL170
GLX200	Enclosure kit for the GL200-M
GLX250–CEF	Cover end fan kit for the GL250
GLX250–CF	Cover with top fan kit for the GL250/350

(Table 1)

Mating Connectors

- Can be ordered separately for units with Molex connection
- Kits include mating housing and pins for input and output connection

Catalog Number	Description
70–841–006	GLX40, GLX50 and GLX60 Mating Connector Kit
70–841–007	GLS110 Mating Connector Kit
70–841–008	GLQ110 Mating Connector Kit
70–841–020	GLS120 Mating Connector Kit
70–841–012	GLQ123 Mating Connector Kit
70–841–017	GLQ142 Mating Connector Kit
70–841–009	GLS150 Mating Connector Kit
70–841–010	GLQ150 Mating Connector Kit
70–841–015	GLQ170 Mating Connector Kit
70–841–016	GLS170 Mating Connector Kit
70–841–005	GLX250 Mating Connector Kit
70–841–024	GLS500 Mating Connector Kit

(Table 2)

Specifications

	GL20, GL40	GL50	GL60, GL110	GLQ120, GLS120	GL140	GL150	GL170	GL250, GL350	GL500
Input									
Input Voltage (1)	85 - 264 Vac; 120 - 300 Vdc	90 - 264 Vac 127 - 300 Vdc	85 - 264 Vac 120 - 300 Vdc			85 - 132 Vac or 170 - 264 Vac auto-selected. 220 - 300 Vdc	85 - 264 Vac; 120 - 300 Vdc		85 - 264 Vac
Frequency	47-63 Hz , 400± 40 Hz					47-63 Hz			
Inrush Current	GL20: <15A peak @ 115 Vac; <30A peak @ 230 Vac, cold start @ 25°C. GL40: <18A peak @ 115 Vac; <36A peak @ 230 Vac, cold start @ 25°C	<60A peak @ 230 Vac, cold start @ 25°C	<18A peak @ 115 Vac, <36 A peak @ 230 Vac, cold start @ 25°C	GLQ120: 38 A max., cold start @ 25°C GLS120: 40A max., cold start @ 25°C	38 A max, cold start @ 25°C			GL250: 20 A max., cold start @ 25°C. GL350: 38 A max., cold start @ 25°C.	50 A max., cold start @ 25°C
Efficiency	70% typical at full load	80% - 85% typical at full load	70% typical at full load	GLQ120: 65% typical at full load. GLS120: 80% typical at full load	75% typical at full load				85% typical at full load, nominal line
EMI/RFI	FCC Class B ; CISPR 22 Class B ; EN55022 Class B								
Safety Ground Leakage Current	Non-Medical: <0.5 mA Medical: < 75 µA @ 50/60 Hz, 264 Vac input	Non-medical: <0.5mA Medical: 275 µA @ 50/60 Hz; 264 Vac input for Class I; <0.25mA @ 50/60 Hz; 264 Vac input for Class II (for single output only)	Non-Medical: <0.5 mA Medical: < 75µA @ 50/60 Hz; 264 Vac input	GLQ120: <1 mA @ 50/60 Hz, 264 Vac input. GLS120: 0.5mA @ 50/60 Hz, 264 Vac input	1.0 mA @ 50/60 Hz, 264 Vac input	<0.5 mA @ 50/60 Hz, 264 Vac input	Non-Medical: 0.1 mA Medical: < 250 µA 1.0 mA @ 50/60 Hz, 264 Vac input	<0.5 mA @ 50/60 Hz, 264 Vac input	Non-Medical: <0.5 mA Medical: <0.3mA @ 50/60 Hz, 264 Vac input
Output									
Power	Refer to the selection table								
Adjustment Range on Main Output	-5, +10% minimum	±20% minimum for single output only models	GL60: -5, +10% minimum GL110: ±5% on main, 5-25 V on 4th output	±5% minimum	3.3 - 5.5V on main; -12 - 15V on 3rd output 3.3 - 25 V on 4th output	±5% minimum on main, 5-25 V on 4th output	2:1 wide ratio minimum	2:1 wide ratio	±5%
Hold–up Time	20 ms @ full load, 115 Vac nominal line	10/20 ms 115/230 Vac Input line	20 ms @ full load, 115 Vac nominal line						
Overload	Short circuit protection on all outputs. Primary overload protection								
Overvoltage Protection	5 V output; 5.7 to 6.7 Vdc. Other outputs 10% to 25% above nominal output	30-50% above nominal output	5 V output; 5.7 - 6.7 Vdc. Other outputs 10% to 25% above nominal output	3.3 V and 5 V output: 20% to 35% above nominal output	Tracks outputs 1, 3 & 4; 10 to 35%	5 V output: 5.7 to 6.7 Vdc. Other outputs10% to 25% above nominal output	10% to 40% above nominal output	5 V output: 5.7 to 6.7 Vdc. Other outputs 10% to 25% above nominal output	20-35% above nominal output
Remote Sense	Compensates for 0.5 V lead drop minimum; Will operate without remote sense connected, Reverse connection protected								
General									
Temperature (2)	**Storage:** -40°C to +85°C; **Operating:** 0° to 50°C ambient. Derate each output 2.5% per degree from 50° to 70°C, -20°C start up.								
Electro–magnetic Susceptibility	Designed to meet IEC 801, -2, -3, -4, -5, -6, Level 3 or EN61000-4; -2, -3, -4, -5, -6, -8, -11 Level 3								
Humidity	Operating; non-condensing up to 95% RH								
Vibration	Three orthogonal axes, sweep at 1 oct/min, 5 min. dwell at four major resonances 0.75G peak 5Hz to 500 Hz (2 G peak 8 Hz to 500 Hz for GL500)								
MTBF	>550,000 hours demonstrated at full load and 25°C ambient conditions								
Safety	Non-Medical: EN60950, UL UL60950 E132002, CSA CSA 22.2-234 Level 3 LR53982C, CB Certificate and report; CE Mark (LVD) Medical: UL 2601; CSA 22.2 No. 601.1; EN 60601-1								

Notes:

(1) Proper circuit protection required when operating with a DC input voltage. (2) Regulation and ripple may deviate from the spec at -20°C start up.

Visit our website at www.solahd.com or
contact Technical Services at (800) 377-4384 with any questions.

Selection Table

	Catalog Number	Output 1	Output 2	Output 3	Output 4	Case [3]	Pin Assignments [3]	Mating Connectors [3]
GL20 [40 W] 25 W	**GLS22**	5 V @ 5 A [8 A] [6]	-	-	-	1	1A	1B
	GLS23	12 V @ 2.1 A [3.3 A] [6]	-	-	-			
	GLS24	15 V @ 1.7 A [2.7] [6]	-	-	-			
	GLT22	5 V @ 3 A [4 A] [7]	12 V @ 1.5 A [2 A] [7]	-12 V @ 0.5 A [0.7 A]	-		2A	
	GLT23	5 V @ 4 A [5 A] [7]	12 V @ 0.5 A [0.7 A]	-12 V @ 0.5 A [0.7 A]	-			
	GLT24	5 V @ 3 A [4 A] [7]	12 V @ 1.5 A [2 A] [7]	-5 V @ 0.5 A [0.7 A]	-			
	GLT25	5 V @ 3 A [4 A] [7]	15 V @ 1.5 A [2 A] [7]	-15 V @ 0.5 A [0.7 A]	-			
GL40 [55 W] 40 W [1] [40 W] 25 W [2]	**GLS42** [4]	5 V @ 8 A [11 A] [6]	-	-	-	1	3A	1B
	GLS43 [4]	12 V @ 3.3 A [4.5] [6]	-	-	-			
	GLS44 [4]	15 V @ 2.6 A [3.6 A] [6]	-	-	-			
	GLS45 [4]	24 V @ 1.6 A [2.3 A] [6]	-	-	-			
	GLT42 [4]	5 V @ 4 A [5 A] [7]	12 V @ 2 A [2.5 A] [7]	-12 V @ 0.5 A [0.7 A]	-		4A	
	GLT43	5 V @ 6 A [8 A] [7]	12 V @ 0.5 A [0.7 A]	-12 V @ 0.5 A [0.7 A]	-			
	GLT44	5 V @ 4 A [5 A] [7]	12 V @ 2 A [2.5 A] [7]	-5 V @ 0.5 A [0.7 A]	-			
	GLT45 [4]	5 V @ 4 A [5 A] [7]	15 V @ 2 A [2.5 A] [7]	-15 V @ 0.5 A [0.7 A]	-			
	GLT46	5 V @ 4 A [5 A] [7]	24 V @ 1 A [1.5 A] [7]	+12 V @ 0.5 A [0.7 A]	-			
GL50 [50 W] 50 W	**GLT52** [4]	5 V @ 8 A [7]	12 V @ 3 A [7]	-12 V @ 0.5 A	-	2	5A	2B
	GLT53 [4]	5 V @ 8 A [7]	15 V @ 2.4 A [7]	-15 V @ 0.5 A	-			
	GLT54 [4]	5 V @ 8 A [7]	24 V @ 1.5 A [7]	12 V @ 0.5 A	-			
GL50 [60 W] 60 W	**GLS52** [4]	5 V @ 11 A	-	-	-	3	6A	2B
	GLS53–I [5]	12 V @ 5A	-	-	-			
	GLS53 [4]	12 V @ 5 A [6]	-	-	-			
	GLS54 [4]	15 V @ 4 A [6]	-	-	-			
	GLS55 [4]	24 V @ 2.5 A [6]	-	-	-			
	GLS58 [4]	48 V @ 1.25 A [6]	-	-	-			
GL60 [80 W] 60 W [1] [60 W] 40 W [2]	**GLS62**	5 V @12 A [16 A] [6]	-	-	-	4	7A	3B
	GLS63 [4]	12 V @ 5 A [6.7 A] [6]	-	-	-			
	GLS64 [4]	15 V @ 4 A [5.3 A] [6]	-	-	-			
	GLS65 [4]	24 V @ 2.5 A [3.3 A] [6]	-	-	-			
	GLT62 [4]	5 V @ 7 A [8 A] [7]	12 V @ 3 A [3.5 A] [7]	-12 V @ 0.7 A [1 A]	-		8A	4B
	GLT63 [4]	5 V @ 7 A [8 A] [7]	15 V @ 2.8 A [3.3 A] [7]	-15 V @ 0.7 A [1 A]	-			
	GLT64	5 V @ 7 A [8 A] [7]	12 V @ 3 A [3.5 A] [7]	-5 V @ 0.7 A [1 A]	-			
	GLT65	5 V @ 7 A [8 A] [7]	24 V @ 1.5 A [2 A] [7]	+12 V @ 0.7 A [1 A]	-			
GL110 [110 W] 80 W [1] [90 W] 70 W [2]	**GLS114**	15 V @ 5.3 A [7.3 A] [6]	-	-	-	5	9A	5B
	GLS115	24 V @ 3.3 A [4.6 A] [6]	-	-	-			
	GLQ112	5 V @ 9 A [11 A] [8]	12 V @ 4.5 A [5 A]	-12 V @ 0.7 A [1 A]	±5-25 V @ 2.5 A [3 A] [6]		10A	6B
	GLQ113	5 V @ 9 A [11 A] [8]	15 V @4.5 A [5 A]	-15 V @ 0.7 A [1 A]	±5-25 V @ 2.5 A [3 A] [6]			
	GLQ114	5 V @ 9 A [11 A] [8]	12 V @ 4.5 A [5 A]	-12 V @ 0.7 A [1 A]	24 V @ 3.5 A [4.5 A] [8]			

Notes:

[ ] Rating with 30 CFM of air

(1) Power rating when no cover option is used

(2) Power rating when the cover/enclosure option is used

(3) Refer to GL Series Dimensions and the sections that follow

(4) Add "-M" suffix for the medical model numbers

(5) Industrial version - Operating temperature -40°C to 80°C

(6) Floating output

(7) Approximate minimum loading: 10%

(8) Approximate minimum loading: 23%

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Selection Table (continued)

	Catalog Number	Output 1	Output 2	Output 3	Output 4	Case [5]	Pin Assignments [5]	Mating Connectors [5]
GLQ120 [120 W] 70 W	**GLQ123**	3.3 V @ 14 A [25 A]	5 V @ 12.5 A [24 A] [9]	+12 V @ 1 A [2 A]	-12 V @ 0.5 A [1 A]	6	11A	7B
GLS120 [130 W] 80 W	**GLS122**	5 V @ 16 A [26 A] [8]	-	-	-	7	12A	8B
	GLS123	12 V @ 6.6 A [10.8 A] [8]	-	-	-			
GL140 [145 W] 80 W	**GLQ142**	5 V @ 12 A [25 A] (3.3 V - 5 V)	12 V @ 5 A [6 A]	-12 V @ 1 A [1.5 A] (-12 V - 15 V)	±3.3-25 V @ 1.5 A [4.5 A] [8] [10]	8	13A	9B
GL150 [150 W] 110 W [1] [130 W] 75 W [2]	**GLS152**	5 V @ 22 A [30 A] [8]	-	-	-	9	14A	10B
	GLS153	12 V @ 9.1 A [12.5 A] [8] (12 V- 15 V)	-	-	-			
	GLS155	24 V @ 4.5 A [6.2 A] [8] (24 V - 28 V)	-	-	-			
	GLQ152	5 V @ 15 A [22 A] [9]	12 V @ 2.6 A [8 A] [11]	-12 V @ 2 A [2.5 A] [11]	±5-25 V @ 2.5 A [3 A] [8]	10	15A	11B
	GLQ153	5 V @ 15 A [22 A] [9]	15 V @ 4.8 A [6.4 A] [11]	-15 V @ 1.6 A [2 A] [11]	±5-25 V @ 2.5 A [3 A] [8]			
	GLQ154	5 V @ 15 A [22 A] [9]	12 V @ 6 A [8 A] [11]	-12 V @ 2 A [2.5 A] [11]	24 V @ 3.5 A [4.5 A] [9]			
GL170 [175 W] 110 W [1] [130 W] 75 W [2]	**GLS172** [6]	5 V @ 22 A [35 A] [8] (2.5 V - 6 V)	-	-	-	11	16A	12B
	GLS173 [6]	12 V @ 9.1 A [15 A] [8] (6 V- 12 V)	-	-	-			
	GLS174 [6]	15 V @ 7.3 A [12 A] [8] (12 V - 24 V)	-	-	-			
	GLS175 [6]	24 V @ 4.5 A [7.5] [8] (24 V - 54 V)	-	-	-			
	GLQ172	5 V @ 15 A [30 A] (3.3 V - 5.5 V)	12 V @ 6 A [8 A] [10]	-12 V @ 0.2 A [3 A] (-12 V - 15 V)	±3.3-25 V @ 2 A [5 A] [8]	12	17A	13B
GL250 [250 W] [3] [4]	**GLS253–C**	12 V (6-12 V) @ [21 A]	-	-	-	13	18A	14B
	GLS255–C	24 V (24-48) @ [10.4 A] [8]	-	-	-			
	GLQ252–C	5 V @ [35 A] [11]	12 V @ [10 A]	-12 V @ [6 A]	±5-25 V @ [6 A] [8]	14	19A	
	GLQ253–C	5 V @ [35 A] [11]	15 V @ [10 A]	-15 V @ [6A]	±5-25 V @ [6 A] [8]			
GL350 [350 W] [3] [4]	**GLS352–C**	5 V (3-6 V) @ [70 A]	-	-	-	15	20A	15B
	GLS353–C	12 V (6-12 V) @ [29.2 A] [8]	-	-	-			
	GLS354–C	15 V (12-24 V) @ [23.3 A] [8]	-	-	-			
	GLS355–C	24 V (24-48 V) @ [14.6 A] [8]	-	-	-			
	GLS355–CEF	24 V (24-48 V) @ [14.6 A] [8]	-	-	-			
	GLQ352–C	5 V @ [50 A] [11]	12 V @ [12 A]	-12 V @ [6 A]	±3.3-24 V @ [6 A] [8]	16	21A	16B
	GLQ352–CEF	5 V @ [50 A] [11]	12 V @ [12 A]	-12 V @ [6 A]	±3.3-24 V @ [6 A] [8]			
GL500 [500 W] 200 W	**GLS503–CF** [7]	12 V @ 16.6 A [41.7 A]	-	-	-	17	22A	17B
	GLS505–CF [7]	24 V @ 8.3 A [20.8 A]	-	-	-			
	GLS508–CF [7]	48 V @ 4.2 A [10.4 A]	-	-	-			

Notes:

[ ] Rating with 30 CFM of air

(1) Power rating when no cover option is used

(2) Power rating when the cover/enclosure option is used

(3) Optional fan cover, See Table 1

(4) Optional end fan cover, See Table 1

(5) Refer to GL Series Dimensions and the sections that follow

(6) Add "-M" suffix for the medical models numbers.

(7) Insert (-M) as in GLS 50x-M-CF for medical model numbers

(8) Floating output

(9) Approximate minimum loading: 16%

(10) Approximate minimum loading: 30%

(11) Approximate minimum loading: 10%

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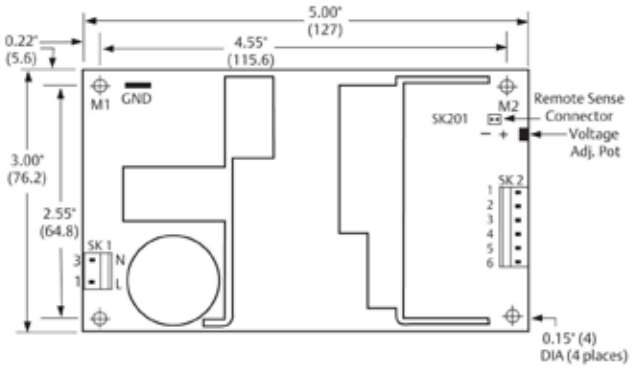
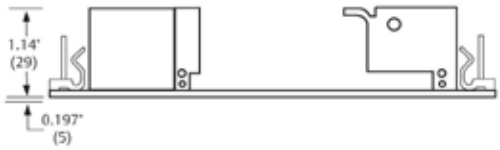
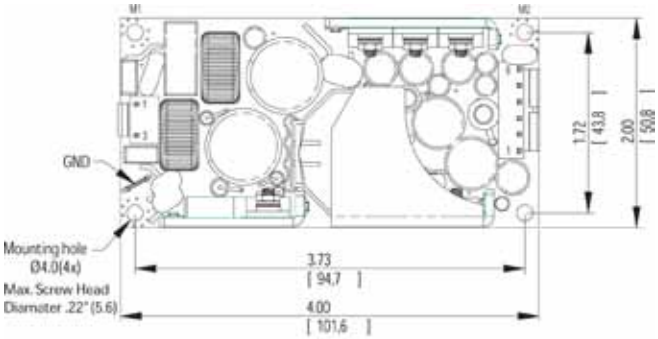
GL Series Dimensions

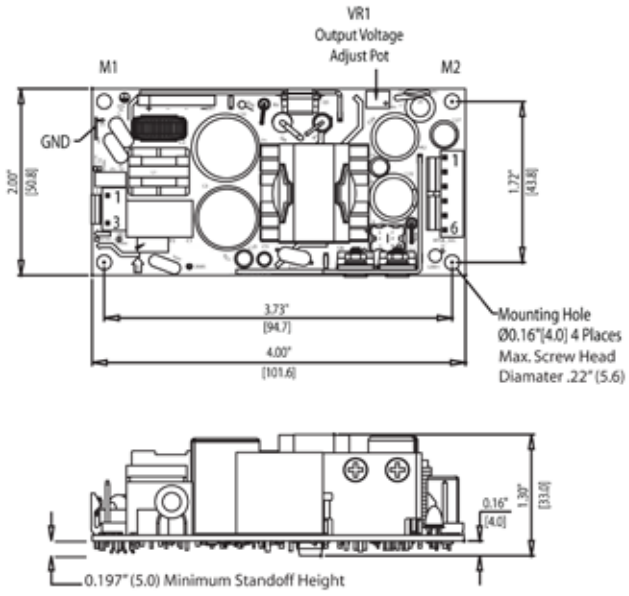




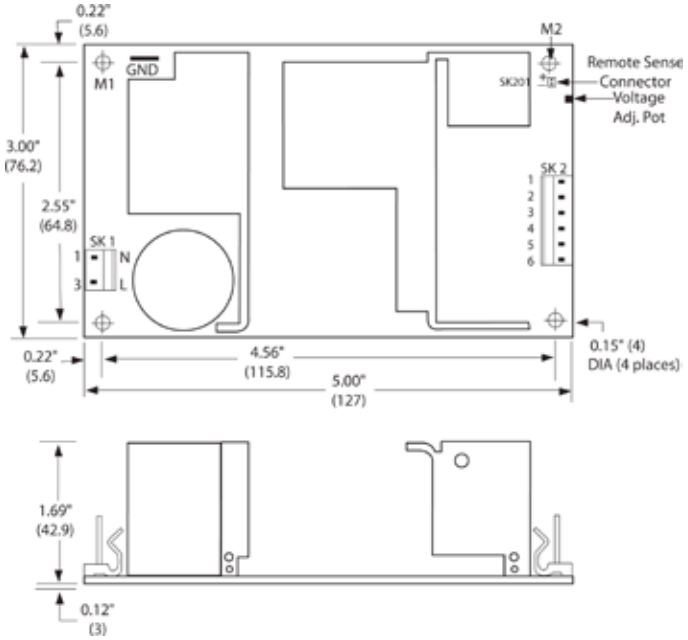
Case 1
(Weight: 0.5 lbs/0.23 kg approx.)



Case 2
(Weight: 0.45 lbs/0.20 kg approx.)



Case 3
(Weight: 0.41 lbs/0.18 kg approx.)



Case 4
(Weight: 0.75 lbs/0.34 kg approx.)

Notes:

1. Specifications subject to change without notice.
2. All dimensions in inches (mm), tolerance is ±0.02" (±0.5 mm)
3. Mounting holes M1 and M2 should be grounded for EMI purposes.
4. Mounting hole M1 is safety ground connection.
5. Specifications are for convection rating at factory settings at 115 Vac input, 25°C unless otherwise stated.

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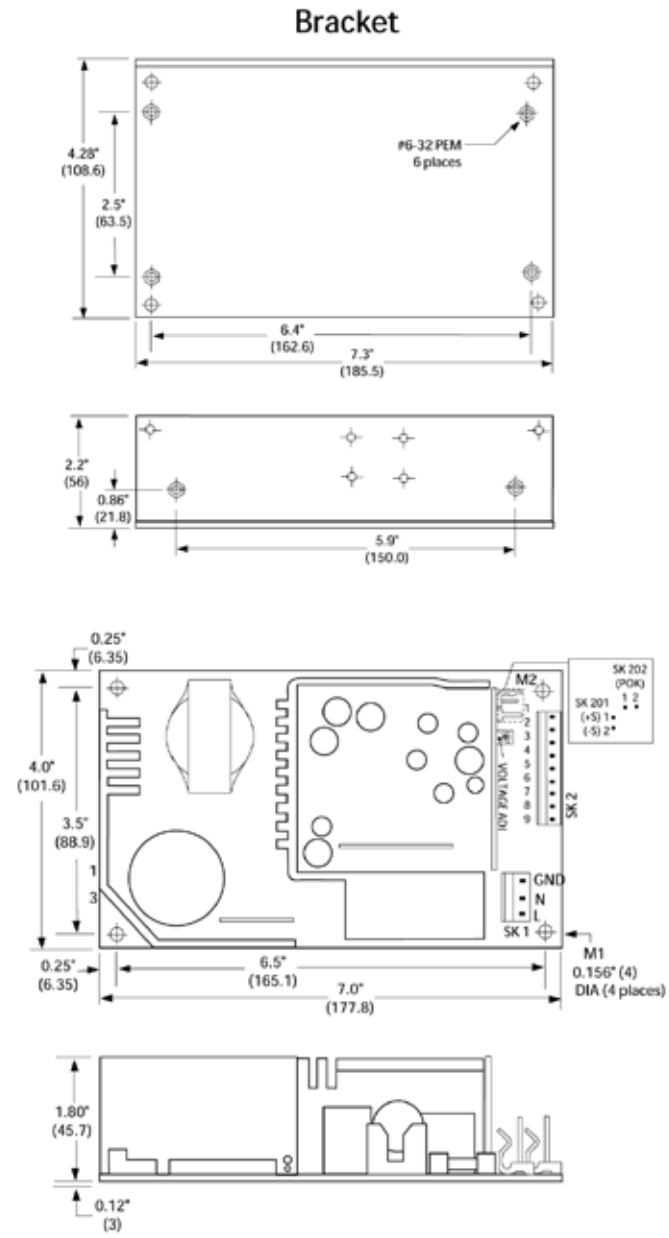
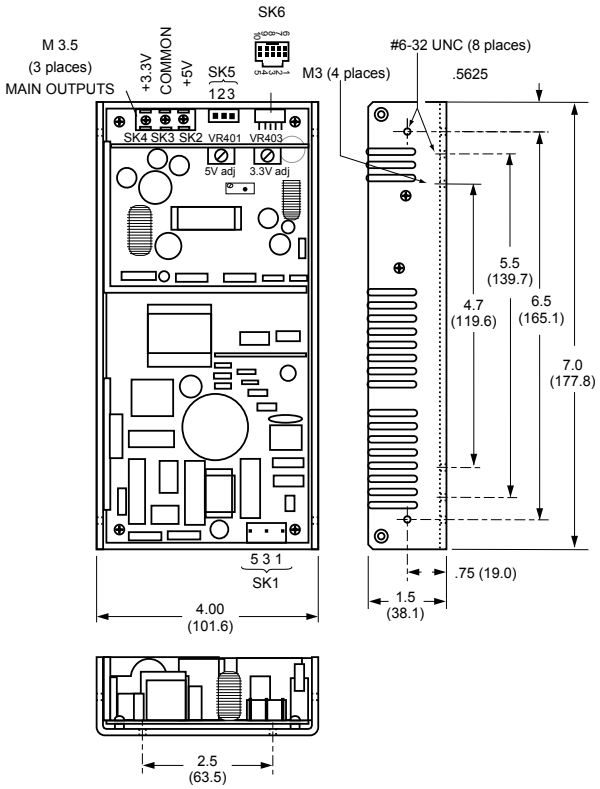
GL Series Dimensions (continued)



Case 5
(Weight: 1.25 lbs/0.57 kg approx.)

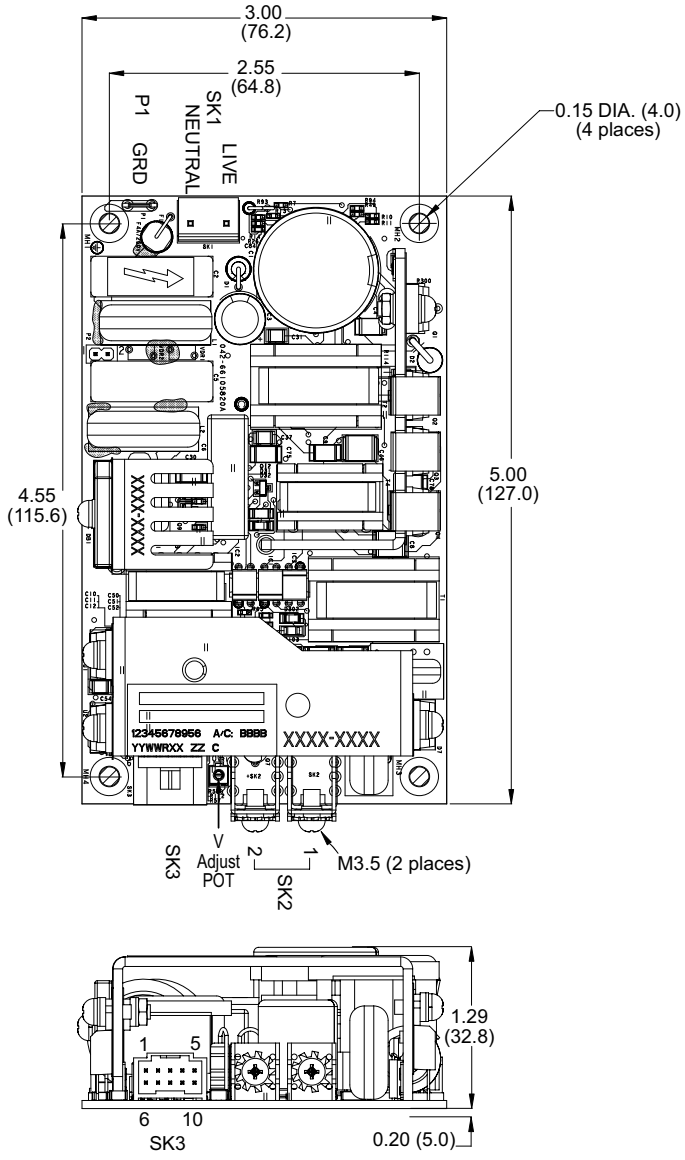


Case 6
(Weight: 1.38 lbs/0.63 kg approx.)
(See notes 7 & 8)

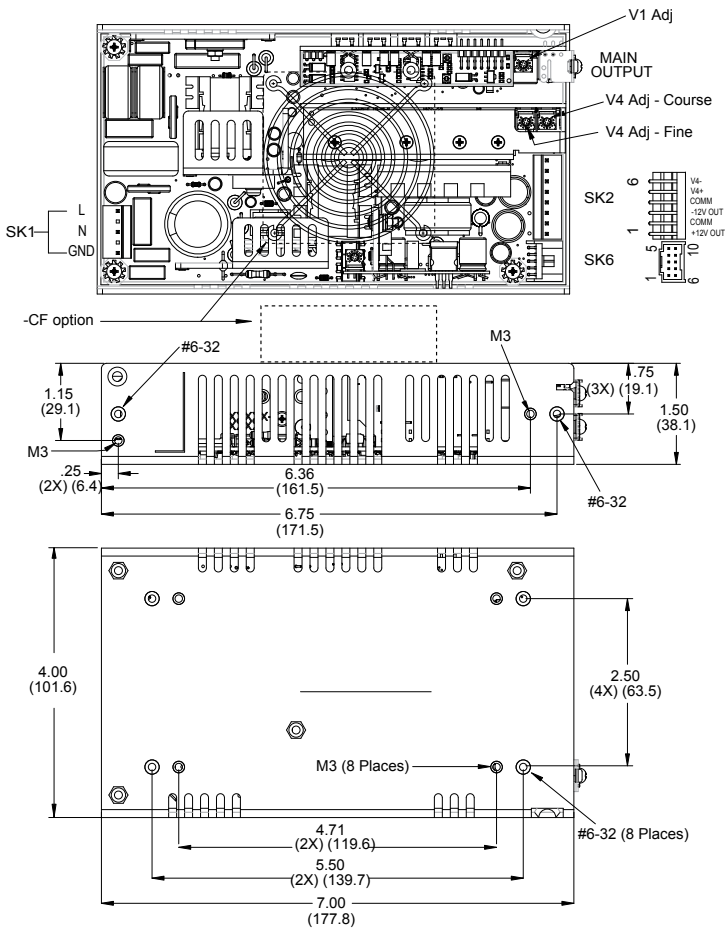
Notes:

1. Specifications subject to change without notice.
2. All dimensions in inches (mm), tolerance is ±0.02".
3. Specifications are for convection rating at factory settings unless otherwise stated.
4. Mounting holes M1 and M2 should be grounded for EMI purposes.
5. Mounting hole M1 is safety ground connection.
6. L Bracket mounting (6-32) maximum insertion depth is .20" (5).
7. Remote inhibit requires an external 5 V @ 10 mA to activate.
8. Mounting maximum insertion depth is 0.12".

GL Series Dimensions (continued)



Case 7
(Weight: .71 lbs/0.32 kg approx.)



Case 8
(Weight: 1.63 lbs/0.74 kg approx.)
(See notes 6 & 7)

Notes:

1. Specifications subject to change without notice.
2. All dimensions in inches (mm), tolerance is ±0.02".
3. Mounting holes MH1, MH2 and MH3 should be grounded for EMI purposes.
4. Mounting hole M1 is safety ground connection.
5. This power supply requires mounting on metal standoffs 0.20" (5 m) in height.
6. Specifications are for convection rating at factory settings at 115 Vac input 25°C unless otherwise stated.
7. Mounting screw maximum insertion depth is 0.12".

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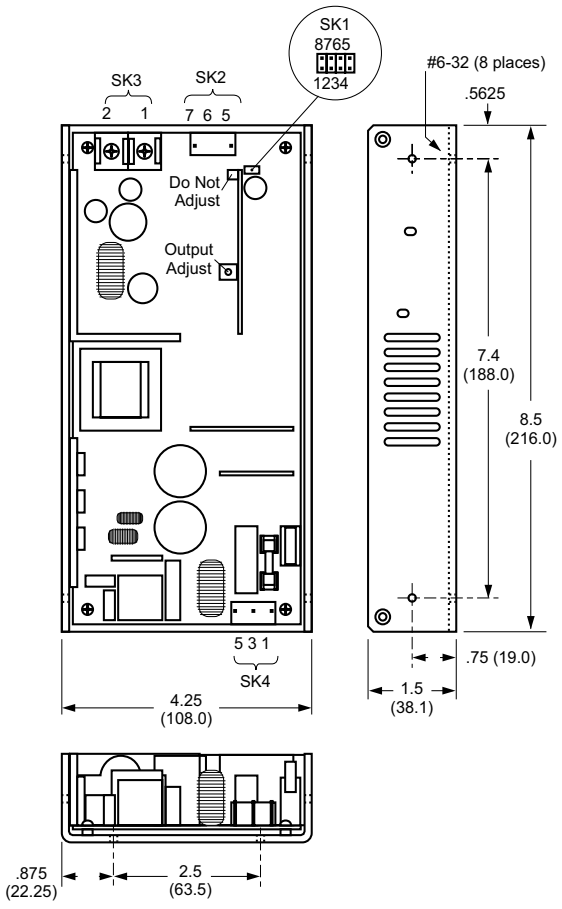
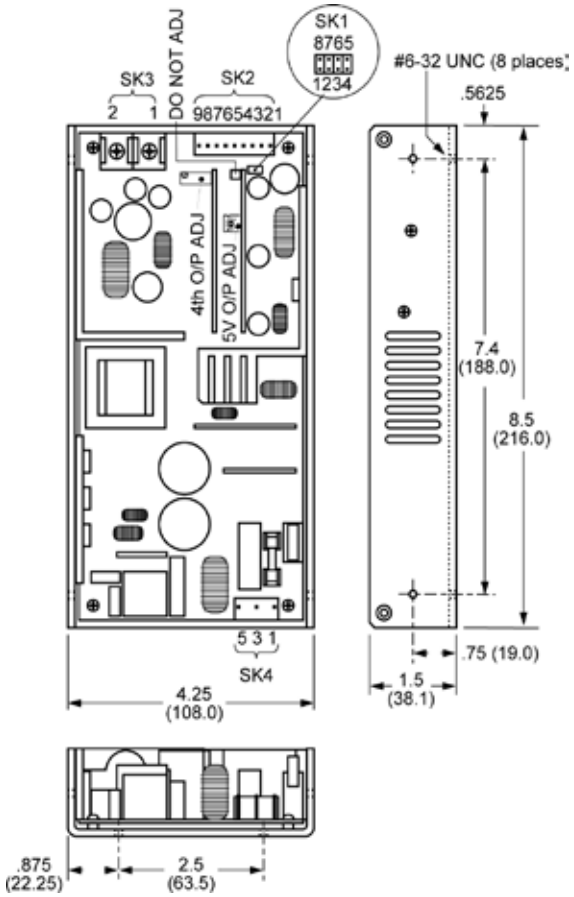
GL Series Dimensions (continued)



Case 9
(Weight: 1.75 lbs/0.80 kg approx.)

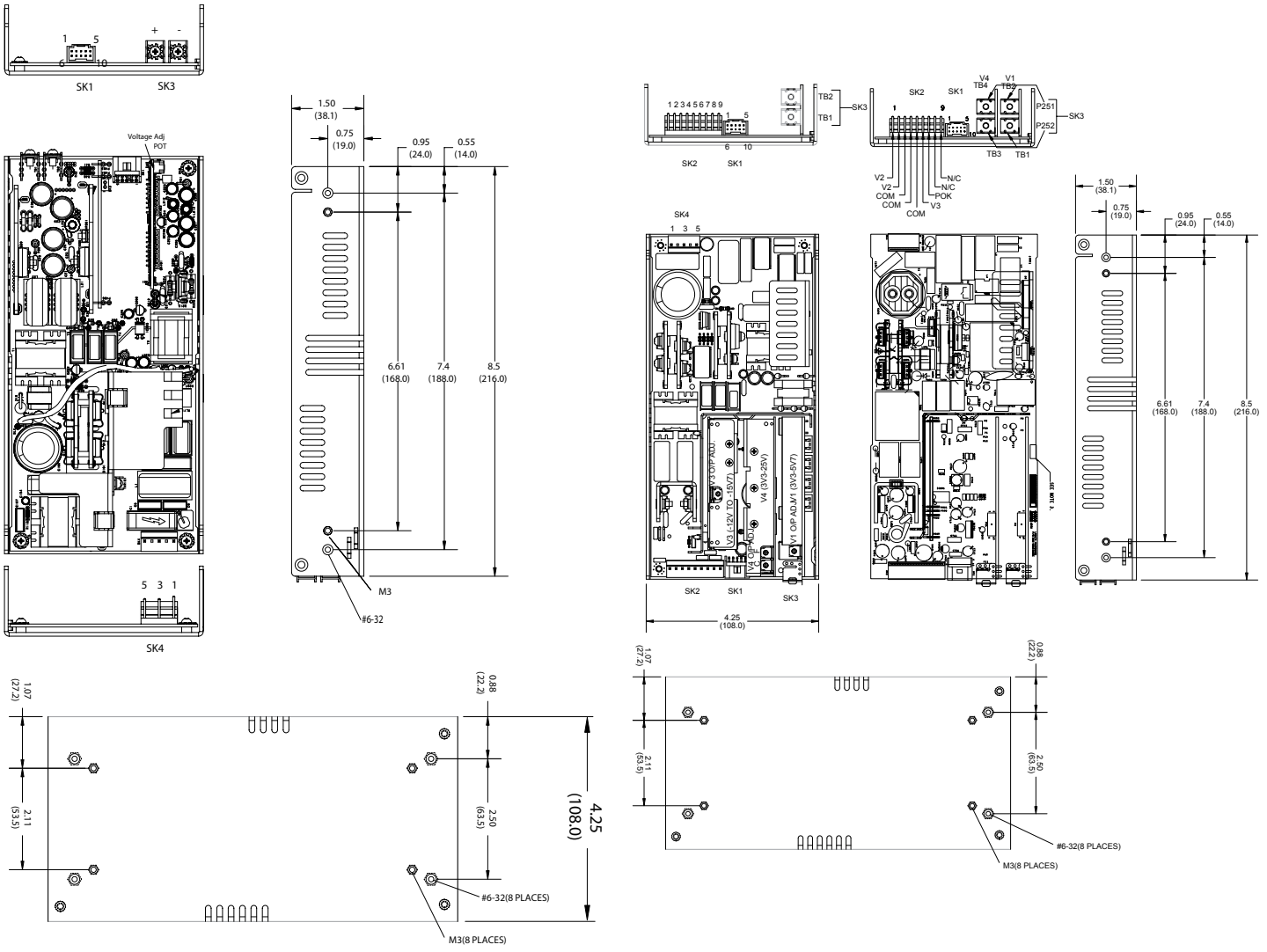


Case 10
(Weight: 1.75 lbs/0.80 kg approx.)

Notes:

1. Specifications subject to change without notice.
2. All dimensions in inches (mm), tolerance is ±0.02”.
3. Specifications are for convection rating at factory settings unless otherwise stated.
4. Remote inhibit requires an external 5 V @ 10 mA to activate.
5. Mounting (6-32) maximum insertion depth is 0.12”.

GL Series Dimensions (continued)



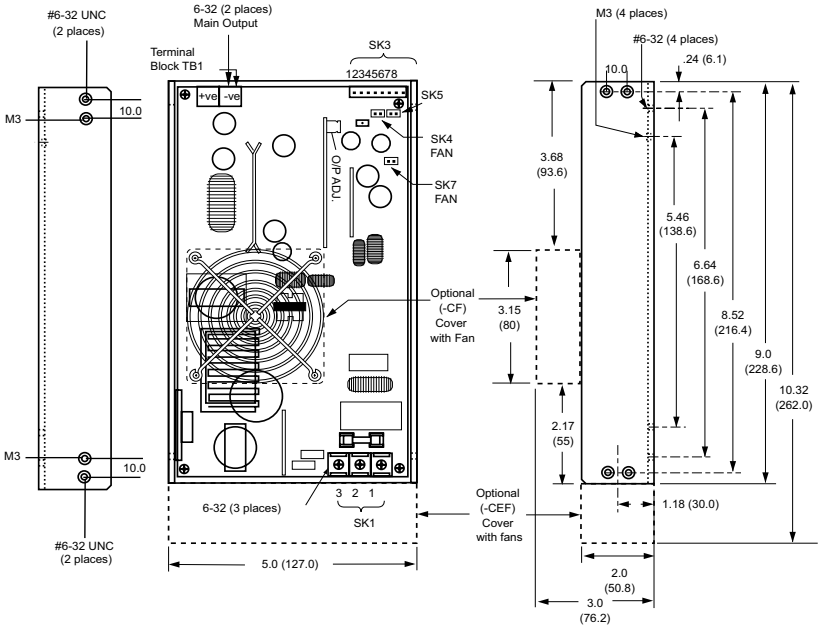
Case 11
(Weight: 0.5 lb/0.23 kg approx.)

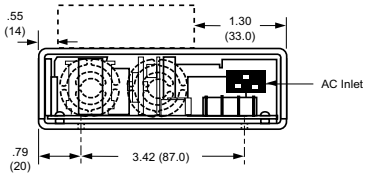
Case 12
(Weight: 2 lbs/0.91 kg approx.)
(See notes 1-4)

Notes:

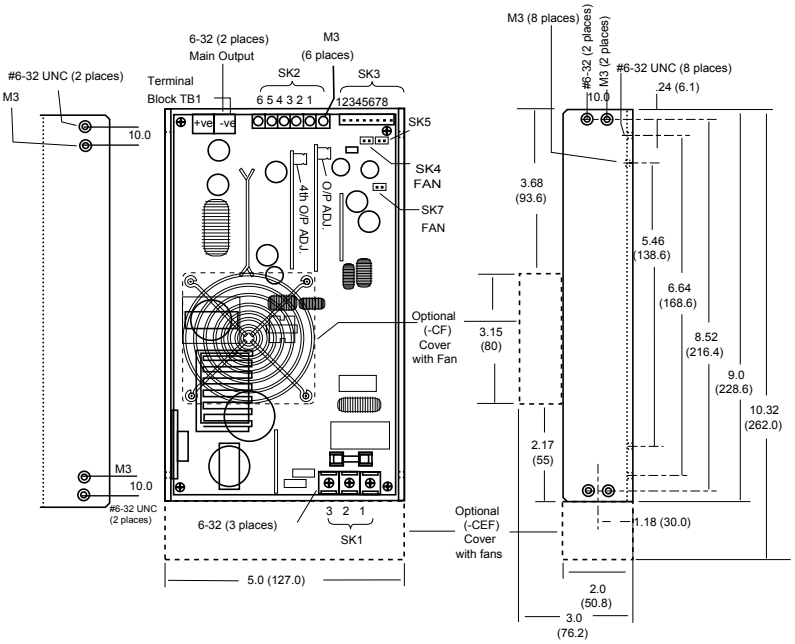
1. Specifications subject to change without notice.
2. All dimensions in inches (mm), tolerance is ±0.02".
3. Specifications are for convection rating at factory settings at 115 Vac input, 25°C unless otherwise stated.
4. Mounting screw maximum insertion depth is 0.12".
5. Mounting holes M1 and M2 should be grounded for EMI purposes.
6. Mounting hole M1 is safety ground connection.

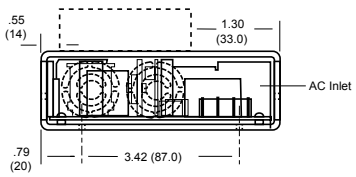
GL Series Dimensions (continued)





Case 13
(Weight: 2.6 lbs/1.19 kg approx.)



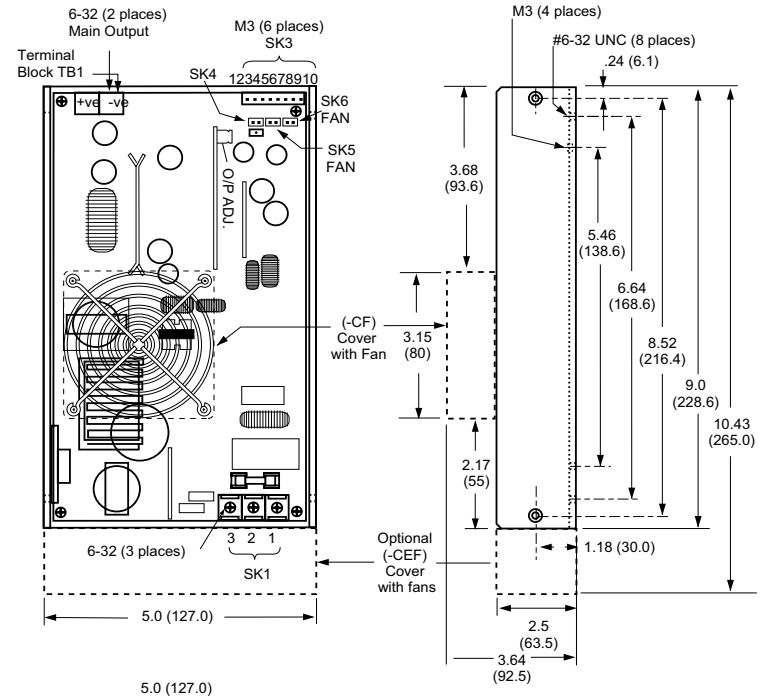


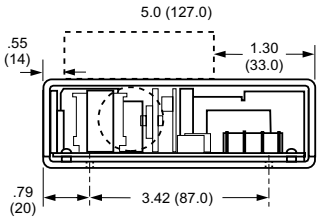
Case 14
(Weight: 3.1 lbs/1.41 kg approx.)

Notes:

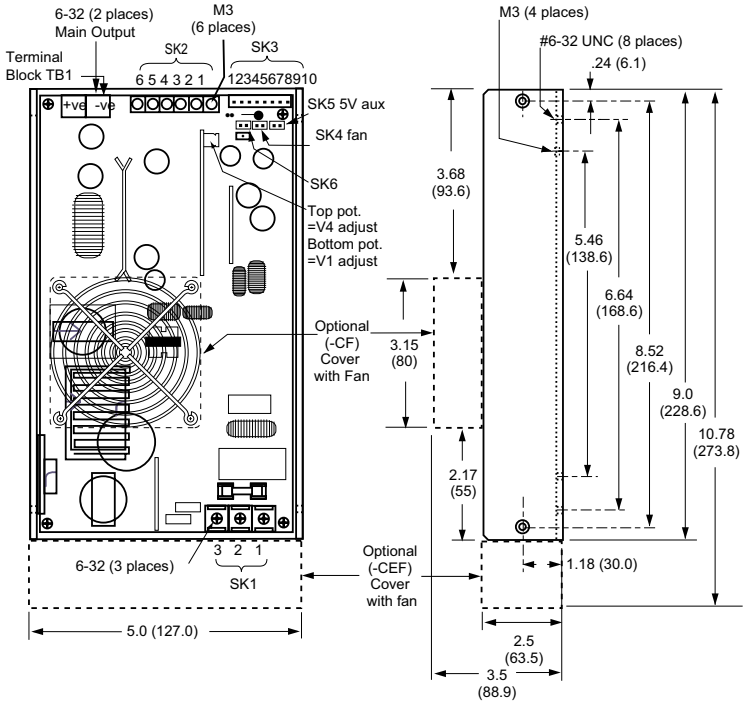
1. Specifications subject to change without notice.
2. All dimensions in inches (mm), tolerance is ±0.02".
3. Specifications are at factory settings.
4. To enable normally closed remote inhibit, cut jumper J1.
5. Mounting maximum insertion depth is 0.12".

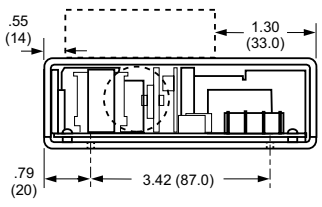
GL Series Dimensions (continued)





Case 15
(Weight: 3.6 lbs/1.64 kg approx.)



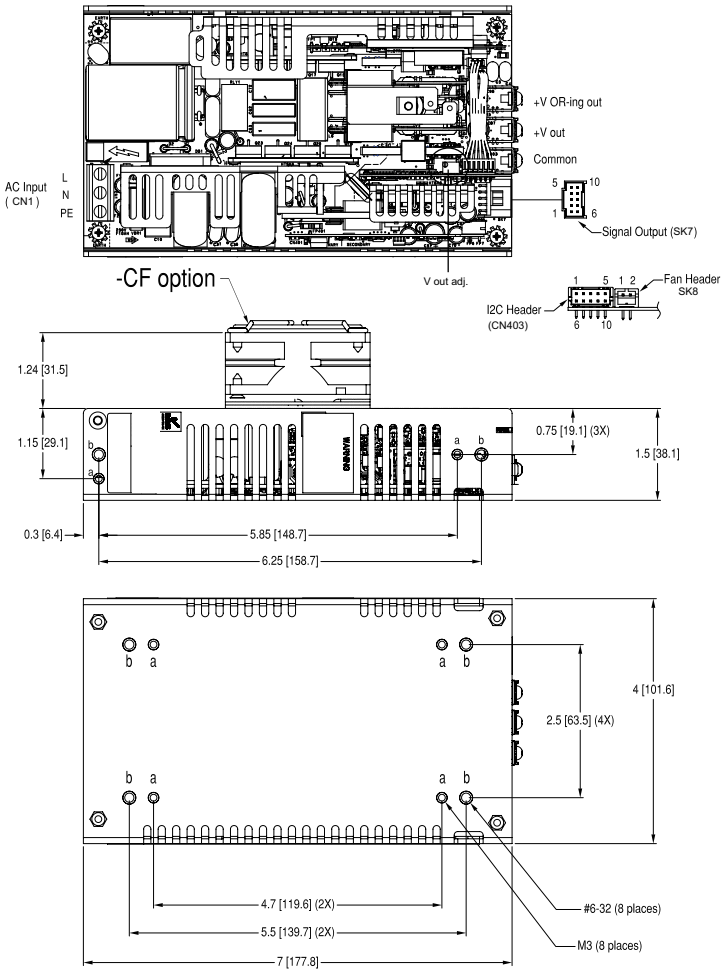


Case 16
(Weight: 4 lbs/1.8 kg approx.)

Notes:

1. Specifications subject to change without notice.
2. All dimensions in inches (mm), tolerance is ±0.02".
3. Specifications are at factory settings.
4. To enable normally closed remote inhibit, cut jumper J1.
5. Mounting maximum insertion depth is 0.12".

GL Series Dimensions (continued)



Case 17
(Weight: 3.016 lbs/1.18 kg approx.)

Notes:

1. Specifications subject to change without notice.
2. All dimensions in inches (mm), tolerance is ±0.02".
3. Specifications are at factory settings.
4. Mounting maximum insertion depth is 0.12".

GL Series Pin Assignments

1A

Connector		GLS22	GLS23	GLS24
SK1	PIN 1	Line		
	PIN 3	Neutral		
SK2	PIN 1	+5 V	+12 V	+15 V
	PIN 2	+5 V	+12 V	+15 V
	PIN 3	+5 V	+12 V	+15 V
	PIN 4	Common		
	PIN 5	Common		
	PIN 6	Common		
SK201	PIN 1	+Sense		
	PIN 2	-Sense		

GL Series Pin Assignments (continued)

2A

Connector		GLT22	GLT23	GLT24	GLT25
SK1	PIN 1	Line			
	PIN 3	Neutral			
SK2	PIN 1	+12 V	+12 V	+12 V	+15 V
	PIN 2	+5 V	+5 V	+5 V	+5 V
	PIN 3	+5 V	+5 V	+5 V	+5 V
	PIN 4	Common			
	PIN 5	Common			
	PIN 6	-12 V	-12 V	-5 V	-15 V
SK201	PIN 1	+Sense			
	PIN 2	-Sense			

3A

Connector		GLS42*	GLS43*	GLS44*	GLS45*
SK1	PIN 1	Line			
	PIN 3	Neutral			
SK2	PIN 1	+5 V	+12 V	+15 V	+24 V
	PIN 2	+5 V	+12 V	+15 V	+24 V
	PIN 3	+5 V	+12 V	+15 V	+24 V
	PIN 4	Common			
	PIN 5	Common			
	PIN 6	Common			
SK201	PIN 1	+Sense			
	PIN 2	-Sense			

4A

Connector		GLT42*	GLT43	GLT44	GLT45	GLT45*
SK1	PIN 1	Line				
	PIN 3	Neutral				
SK2	PIN 1	+12 V			+15 V	+24 V
	PIN 2	+5 V				
	PIN 3	+5 V				
	PIN 4	Common				
	PIN 5	Common				
	PIN 6	-12 V		-5 V	-15 V	+12 V
SK201	PIN 1	+Sense				
	PIN 2	-Sense				

5A

Connector		GLT52*	GLT53*	GLT54*
SK1	PIN 1	Neutral		
	PIN 3	Line		
SK2	PIN 1	+5 V		
	PIN 2	+5 V		
	PIN 3	Common		
	PIN 4	Common		
	PIN 5	-12 V	-15 V	+12 V
	PIN 6	+12 V	+15 V	+24 V

* Same Pin Assignments are attributed to both the non-medical and medical models.

GL Series Pin Assignments (continued)

6A

Connector		GLS52*	GLS53*	GLS54*	GLS55*	GLS58*
SK1	PIN 1	Line				
	PIN 3	Neutral				
SK2	PIN 1	+5 V	+12 V	+15 V	+24 V	+48 V
	PIN 2	+5 V	+12 V	+15 V	+24 V	+48 V
	PIN 3	Common				
	PIN 4	Common				
	PIN 5	-Sense				
	PIN 6	+Sense				

7A

Connector		GLS62	GLS63 (GLS62–M)	GLS64 (GLS63–M)	GLS65
SK1	PIN 1	Neutral			
	PIN 3	Line			
SK2	PIN 1	5 V	+12 V	+15 V	+24 V
	PIN 2	5 V	+12 V	+15 V	+24 V
	PIN 3	5 V	+12 V	+15 V	+24 V
	PIN 4	Common			
	PIN 5	Common			
	PIN 6	Common			
SK201	PIN 1	+Sense			
	PIN 2	-Sense			

8A

Connector		GLT62	GLT63	GLT64	GLT65
SK1	PIN 1	Neutral			
	PIN 3	Line			
SK2	PIN 1	+12 V	+15 V	+12 V	+24 V
	PIN 2	+5 V	+5 V	+5 V	+5 V
	PIN 3	+5 V	+5 V	+5 V	+5 V
	PIN 4	Common			
	PIN 5	Common			
	PIN 6	-12 V	-15 V	-5 V	+12 V
SK201	PIN 1	+Sense			
	PIN 2	-Sense			

9A

Connector		GLS114	GLS115
SK1	PIN 1	Ground	
	PIN 3	Neutral	
	PIN 5	Line	
SK2	PIN 1	+15 V	+24 V
	PIN 2	+15 V	+24 V
	PIN 3	+15 V	+24 V
	PIN 4	Common	
	PIN 5	Common	
	PIN 6	Common	
	PIN 7	Common	
	PIN 8	+15 V	+24 V
	PIN 9	+15 V	+24 V
SK201	PIN 1	+Sense	
	PIN 2	-Sense	
SK202	PIN 1	Power OK	
	PIN 2	Ground	

10A

Connector		GLQ112	GLQ113	GLQ114
SK1	PIN 1	Ground		
	PIN 3	Neutral		
	PIN 5	Line		
SK2	PIN 1	+5 V		
	PIN 2	+5 V		
	PIN 3	+5 V		
	PIN 4	Common		
	PIN 5	Common		
	PIN 6	Common		
	PIN 7	Common		
	PIN 8	+12 V	+15 V	+12 V
	PIN 9	+12 V	+15 V	+12 V
	PIN 10	-12 V	-15 V	-12 V
	PIN 11	+5-25 V	+5-25 V	+24 V
	PIN 12	-5-25 V	-5-25 V	Common
SK201	PIN 1	+Sense		
	PIN 2	-Sense		
SK202	PIN 1	Power OK		
	PIN 2	Ground		

11A

Connector		GLQ123
SK1	PIN 1	Ground
	PIN 3	Neutral
	PIN 5	Line
SK5	PIN 1	+12 V
	PIN 2	Common
	PIN 3	-12 V
SK6	PIN 1	3.3 V Single Wire Parallel
	PIN 2	-3.3 V Sense
	PIN 3	+3.3 V +Sense
	PIN 4	5 V Single Wire Parallel
	PIN 5	Common
	PIN 6	+5 V Sense
	PIN 7	-5 V Sense
	PIN 8	+ Inhibit
	PIN 9	- Inhibit
	PIN 10	Power Fail

12A

Connector		GLS120
SK1	PIN 1	Neutral
	PIN 3	Line
SK2	TB-1	Common
	TB-2	Main Output
SK3	PIN 1	+V1 Remote Sense
	PIN 2	-V1 Remote Sense
	PIN 3	+Remote Inhibit
	PIN 4	-Remote Inhibit
	PIN 5	+Power Fail
	PIN 6	Common
	PIN 7	Single Wire Parallel
	PIN 8	+12 V
	PIN 9	12 V Common
	PIN 10	+5 V Standby

* Same Pin Assignments are attributed to both the non-medical and medical models.

GL Series Pin Assignments (continued)

13A

Connector		GLQ142
SK1	PIN 1	Ground
	PIN 3	Neutral
	PIN 5	Line
SK2	PIN 1	+12 V
	PIN 2	Common
	PIN 3	-12 V
	PIN 4	Common
	PIN 5	+5 V to +25 V (Float)
	PIN 6	Common (Float)
SK4	TB-1	Common
	TB-2	+5 V
SK3	PIN 1	No Connection
	PIN 2	DC Power Good
	PIN 3	No Connection
	PIN 4	V1 Single Wire Parallel
	PIN 5	Common
	PIN 6	+V1 Sense
	PIN 7	Sense Common
	PIN 8	+Inhibit
	PIN 9	-Inhibit
	PIN 10	Power Fail

14A

Connector		GLS152	GLS153	GLS155
SK1	PIN 1	Inhibit -ve		
	PIN 2	Inhibit +ve		
	PIN 3	VCC		
	PIN 4	No Connection		
	PIN 5	Common		
	PIN 6	-Sense		
	PIN 7	+Sense		
	PIN 8	Current Share		
SK2	PIN 5	Common		
	PIN 6	Pin Removed		
	PIN 7	Power OK		
SK3	TB-1	Common		
	TB-2	+5 V	+12 V to +15 V	+24 V to +28 V
SK4	PIN 1	Ground		
	PIN 3	Line		
	PIN 5	Neutral		

15A

Connector		GLQ152	GLQ153	GLQ154
SK1	PIN 1	Inhibit -ve		
	PIN 2	Inhibit +ve		
	PIN 3	+12 V	+15 V	+12V
	PIN 4	No Connection		
	PIN 5	Common		
	PIN 6	-Sense		
	PIN 7	+Sense		
	PIN 8	I Share		
SK2	PIN 1,2	+12 V	+15 V	+12 V
	PIN 3,4,5	Common	Common	Common
	PIN 6	-12 V	-15 V	-12 V
	PIN 7	Power OK		
	PIN 8	+5 V to +25 V (Float)		+24 V
	PIN 9	Common (Float)		Common
SK3	TB-1	Common		
	TB-2	+5 V		
SK4	PIN 1	Ground		
	PIN 3	Line		
	PIN 5	Neutral		

16A

Connector		GLS17x*
SK1	PIN 1	+12 V
	PIN 2	5 V Standby
	PIN 3	Common
	PIN 4	V1 Single Wire Parallel
	PIN 5	Common
	PIN 6	+V1 Sense
	PIN 7	Sense Common
	PIN 8	Remote Inhibit
	PIN 9	DC Power Good
	PIN 10	Power OK
SK2	TB-1	Common
	TB-2	Main Output
SK3	PIN 1	Ground
	PIN 2	Line
	PIN 5	Neutral

* Same Pin Assignments are attributed to both the non-medical and medical models.

17A

Connector		GLQ172	GLQ173
SK1	PIN 1	No Connection	V4 Single Wire Parallel
	PIN 2	5 V Standby	
	PIN 3	No Connection	+V4 Sense
	PIN 4	V1 Single Wire Parallel	
	PIN 5	Common	
	PIN 6	+V1 Sense	
	PIN 7	Sense Common	
	PIN 8	Remote Inhibit	
	PIN 9	DC Power Good	
	PIN 10	Power OK	
SK2	PIN 1,2	+12 V	
	PIN 3,4,5	Common	
	PIN 6	-12 V	
	PIN 7	Power OK	
	PIN 8	+3.3 V to +25 V (Float)	No Connection
	PIN 9	Common (Float)	No Connection
SK3	TB-1,3	Common	
	TB-2	+5 V (3.3 V to 5.5 V)	
	TB-4	No Connection	+5 V (3.3 V to 5.5 V)
SK4	PIN 1	Ground	
	PIN 3	Line	
	PIN 5	Neutral	

18A

Connector		GLS250
SK1	PIN 1	Neutral
	PIN 2	Line
	PIN 3	Ground
SK3	PIN 1	+Remote Sense
	PIN 2	-Remote Sense
	PIN 3	Remote Inhibit (N.O)
	PIN 4	Remote Inhibit (N.C)
	PIN 5	Common
	PIN 6	Current Share
	PIN 7	Power Fail
	PIN 8	DC Power Good
SK4	PIN 1	+Fan's power source (12 V @ 500 mA)
	PIN 2	-Fan's power source (12 V @ 500 mA)
SK5	PIN 1	+Supervisory output supply (5 V @ 100 mA)
	PIN 2	-Supervisory output supply (5 V @ 100 mA)
SK7	PIN 1	+Fan's power source (12 V @ 500 mA)
	PIN 2	+Fan's power source (12 V @ 500 mA)

Visit our website at www.solahd.com or
contact Technical Services at (800) 377-4384 with any questions.

GL Series Pin Assignments (continued)

19A

Connector		GLQ250
SK1	PIN 1	Neutral
	PIN 2	Line
	PIN 3	Ground
SK2	PIN 1	+12 / 15 V
	PIN 2	Common
	PIN 3	Common
	PIN 4	-12 / 15 V
	PIN 5	5-25 V RET Float
	PIN 6	5-25 V Float
SK3	PIN 1	+Remote Sense
	PIN 2	-Remote Sense
	PIN 3	Remote Inhibit (N.O.)
	PIN 4	Remote Inhibit (N.C.)
	PIN 5	Common
	PIN 6	Current Share
	PIN 7	Power Fail
	PIN 8	DC Power Good
SK4	PIN 1	+Fan's power source (12 V @ 500 mA)
	PIN 2	+Fan's power source (12 V @ 500 mA)
SK5	PIN 1	+Supervisory output supply (5 V @ 100 mA)
	PIN 2	-Supervisory output supply (5 V @ 100 mA)
SK7	PIN 1	+Fan's power source (12 V @ 500 mA)
	PIN 2	+Fan's power source (12 V @ 500 mA)

20A

Connector		GLS350
SK1	PIN 1	Neutral
	PIN 2	Line
	PIN 3	Ground
SK3	PIN 1	No Connection
	PIN 2	No Connection
	PIN 3	+Sense
	PIN 4	-Sense
	PIN 5	Power OK
	PIN 6	Current Share
	PIN 7	DC Power Good
	PIN 8	Inhibit (N.O.)
	PIN 9	Inhibit (N.C.)
	PIN 10	Common
SK4	PIN 1	+5 V aux (5 V @ 100 mA)
	PIN 2	-Common
SK5	PIN 1	+Fan 1 (12 V @ 150 mA)
	PIN 2	-Common
SK6	PIN 1	+Fan 2 (12 V @ 150 mA)
	PIN 2	-Common

* Same Pin Assignments are attributed to both the non-medical and medical models.

21A

Connector		GLQ350
SK1	PIN 1	Neutral
	PIN 2	Line
	PIN 3	Ground
SK2	PIN 1	+12 / 15 V
	PIN 2	Common
	PIN 3	Common
	PIN 4	-12 / 15 V
	PIN 5	3.3-25 V RET Float
	PIN 6	3.3-25 V Float
SK3	PIN 1	+Sense V4
	PIN 2	-Sense V4
	PIN 3	+Sense V1
	PIN 4	-Sense V1
	PIN 5	Power OK
	PIN 6	Current Share
	PIN 7	DC Power Good
	PIN 8	Inhibit (N.O.)
	PIN 9	Inhibit (N.C.)
	PIN 10	Common
SK4	PIN 1	+Fan 1 (12 V @ 150 mA)
	PIN 2	-Common
SK5	PIN 1	+5 V aux (5 V@ 100 mA)
	PIN 2	-Common
SK6	PIN 1	+Fan 2 (12 V @ 150 mA)
	PIN 2	-Common

22A

Connector		GL500*
CN1	PIN 1	Line
	PIN 3	Neutral
	PIN 5	Ground
SK7 	PIN 1	V1 Single Wire Parallel
	PIN 2	-Remote Sense
	PIN 3	+Remote Sense
	PIN 4	5 VSB (Standby)
	PIN 5	5 VSB Return
	PIN 6	+12 V
	PIN 7	Common
	PIN 8	Inhibit
	PIN 9	DC Power Good
	PIN 10	Power Fail (POK)
CN403 	PIN 1	5 V_I²C
	PIN 2	Ground
	PIN 3	A2
	PIN 4	A0
	PIN 5	SVCC2_OR
	PIN 6	I²C_SDA
	PIN 7	I²C_SLC
	PIN 8	A1
	PIN 9	No Connection
	PIN 10	+12V_RTN_CTRL
Adjustment Potentiometers		
P1	+V1 Output Adjust	

GL Series Mating Connectors

1B*

Connector Kit #70-841-006 includes the following:	
AC Input:	Molex 09-50-8031 (USA) Not required for (-T) option 09-91-0300 (UK) PINS: 08-52-0113 (-0111 for medical)
DC Outputs:	Molex 09-50-8061 (USA) Not required for (-T) option 09-91-0600 (UK) PINS: 08-52-0113 (-0111 for medical)
Remote Sense:	Molex 22-01-2025 PINS: 08-52-0123 (-0114 for medical)

2B*

Connector Kit #70-841-006 includes the following:	
AC Input:	Molex 09-50-8031 (USA) 09-91-0300 (UK) PINS: 08-52-0113
DC Outputs:	Molex 09-50-8061 (USA) 09-91-0600 (UK) PINS: 08-52-0113

3B*

Connector Kit #70-841-006 includes the following:	
AC Input:	Molex 09-50-8031 (USA) Not required for (-T) option 09-91-0300 (UK) PINS: 08-58-0111 (-0113 for medical)
DC Outputs:	Molex 09-50-8061 (USA) Not required for (-T) option 09-91-0600 (UK) PINS: 08-58-0113
Remote Sense:	Molex 22-01-2025 PINS: 08-52-0113

4B*

Connector Kit #70-841-006 includes the following:	
AC Input:	Molex 09-50-8031 (USA) 09-91-0300 (UK) PINS: 08-58-0111
DC Outputs:	Molex 09-50-8061 (USA) 09-91-0600 (UK) PINS: 08-52-0113
Remote Sense:	Molex 22-01-2025 PINS: 08-52-0113

5B

Connector Kit #70-841-007 includes the following:	
AC Input:	Molex 09-50-8051 (USA) 09-91-0500 (UK) PINS: 08-58-0111
DC Outputs:	Molex 09-50-8091 (USA) 09-91-0900 (UK) PINS: 08-58-0111
Remote Sense/ Power Fail:	Molex 22-01-1022 (USA) 22-01-1023 (UK) PINS: 08-50-0114

6B

Connector Kit #70-841-008 includes the following:	
AC Input:	Molex 09-50-8051 (USA) 09-91-0500 (UK) PINS: 08-58-0111
DC Outputs:	Molex 09-50-8121 (USA) 09-91-1200 (UK) PINS: 08-58-0111
Remote Sense/ Power Fail:	Molex 22-01-1022 (USA) 22-01-1023 (UK) PINS: 08-50-0114

7B

Connector Kit #70-841-012 includes the following:	
(SK1) AC Input:	Molex 09-50-8051 (USA) 09-91-0500 (UK) PINS: 08-58-0111
SK2,3,4:	Molex series 19141-0058/0063
(SK5) ±12V:	Molex: 09-50-8031 (USA) Molex: 09-91-0300 (UK) PINS: 08-58-0111
(SK6) Control Signals:	Molex: 90142-0010; PINS: 90119-2110 or AMP: 87977-3; PINS: 87309-8

8B

Connector Kit #70-841-020 includes the following:	
(SK1) AC Input:	Molex 09-50-8031 (connector) PINS: 08-52-0113
(SK2) DC Outputs:	Molex series 19141-0058/0063 Spade lug
(SK3) Control Signals:	Molex: 90142-0010 (USA) PINS: 90119-2110 or AMP: 87977-3 PINS: 87309-8

9B

Connector Kit #70-841-017 includes the following:	
(SK1) AC Input:	Molex 09-50-8051 (USA) 09-91-0500 (UK) PINS: 08-58-0111
(SK2) Aux DC Outputs:	Molex: 09-50-8061 (USA) Molex: 09-91-0600 (UK) PINS: 08-58-0111
(SK6) Control Signals:	Molex: 90142-0010 (USA) PINS: 90119-2110 or AMP: 87977-3 PINS: 87309-8
(SK4) Main Output:	Molex: BB-124-08

* Same Mating Connectors are attributed to both standard and medical models.

GL Series Mating Connectors (continued)

10B

Connector Kit #70-841-009 includes the following:	
(SK4) AC Input:	Molex: 09-50-8051 (USA) Molex:09-91-0500 (UK) PINS: 08-58-0111
(SK2) Power Fail:	Molex: 09-50-8031 (USA) Molex: 09-91-0300 (UK) PINS: 08-58-0111
(SK1) Remote Sense/ Remote Inhibit:	Molex 51110-0851 (USA) PINS: 50394-8100

11B

Connector Kit #70-841-010 includes the following:	
(SK4) AC Input:	Molex: 09-50-8051 (USA) Molex:09-91-0500 (UK) PINS: 08-58-0111
(SK2) Aux DC Outputs/ Power Fail:	Molex: 09-50-8091 (USA) Molex: 09-91-0900 (UK) PINS: 08-58-0111
(SK1) Remote Sense/ Remote Inhibit:	Molex 51110-0851 (USA) PINS: 503-94-8100

12B*

Connector Kit #70-841-016 includes the following:	
(SK4) AC Input:	Molex: 09-50-8051 (USA) Molex:09-91-0500 (UK) PINS: 08-58-0111
(SK3) DC Outputs:	Molex: 19141-0058
(SK1) Remote Sense/ Remote Inhibit:	Molex 90142-0010 (USA) PINS: 90119-2110 Amp: 87977-3 PINS: 87309-8

13B

Connector Kit #70-841-015 includes the following:	
(SK4) AC Input:	Molex 09-50-8051 (USA) Molex:09-91-0500 (UK) PINS: 08-58-0111
(SK3) Main Output:	Molex series 19141-0058/0063
(SK2) Aux DC Outputs/ Power Fail:	Molex 09-50-8091 (USA) Molex:09-91-0900 (UK) PINS: 08-58-0111
(SK1) Control Signals:	Molex: 90142-0010 (USA) PINS: 90119-2110 or AMP: 87977-3 PINS: 87309-8

14B

Connector Kit #70-841-005 includes the following:	
SK3	Molex 22-01-1084; PINS: 08-70-0057
SK4	Molex 22-01-3027; PINS: 08-50-0114
SK5	Molex 22-01-3027; PINS:08-50-0114
SK7	Molex: 22-01-3027 PINS: 08-50-0114

15B

Connector Kit #70-841-011 includes the following:	
SK3	Molex 22-01-1104; PINS: 08-70-0057
SK4	Molex 22-01-3027; PINS: 08-50-0114
SK5	Molex 22-01-3027; PINS:08-50-0114
SK6	Molex: 22-01-3027; PINS: 08-50-0114

16B

Connector Kit #70-841-011 includes the following:	
SK3	Molex 22-01-1084; PINS: 08-70-0057
SK4	Molex 22-01-3027; PINS: 08-50-0114
SK5	Molex 22-01-3027; PINS:08-50-0114
SK6	Molex: 22-01-3027; PINS: 08-50-0114

* Same Mating Connectors are attributed to both standard and medical models.

17B

Connector Kit #70-841-024 includes the following:	
SK4,5,6	Molex 19141-0058
SK7 Control Signals	Molex 90142-0010; PINS: 90119-2110 or AMP: 87977-3; PINS: 87309-8
SK8	Molex 22-01-2025; PINS:08-52-0123
CN403	JST PHDR-10VS PINS: JST 5PHD-002T-PO.5-L/P or Landwin 2050 S1000; PINS: 2053T011P

GL Compact Series: Single Output Switchers

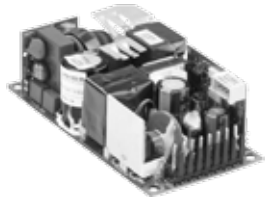
NEW

The GL Compact Series combines both medical and non-medical approvals into one unit. These models offer very high reliability, high efficiency, active Power Factor Correction, compact size and very low ground leakage current.

Each model of GL100-M and GL200-M series complies with the medical and ITE safety standards, enabling it to be used for both medical or non-medical standard applications.

Features:

- Medical Approvals
- Smaller Size
- Dual Rating
- High demonstrated MTBF
- Automatic overvoltage protection
- Overload protection
- Extensive safety approvals
- Two year limited warranty



Specifications

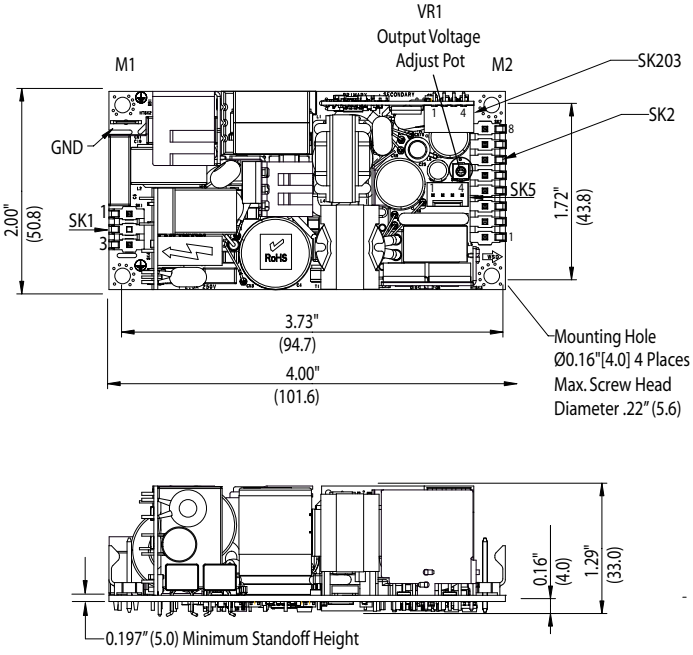
	GL100–M Series	GL200–M Series
Input		
Input Voltage	90 - 264 Vac; 120 - 300 Vdc	
Frequency	47-63 Hz	
Inrush Current	50 A max., cold start @ 25°C	
Efficiency	88% typical at full load	
EMI/RFI	FCC Class B conducted; CISPR 22 Class B conducted; EN55022 Class B conducted; VDE0878PT3 Class B conducted	
Power Factor	0.99 typical	
Safety Ground Leakage Current	275 uA @ 50/60 Hz, 264 Vac input	
Output		
Power	100 W convection (80 W for GLS102-M)	125 W for convection; 200W
Adjustment Range on Main Output	±10% minimum on the main outputs	
Fan Output	12 V @ 1 A isolated, ±5%	
Hold–up Time	10 ms @ 150 W load, 120 Vac input	16 ms @ 250 W load, 120 Vac input
Overload	Short circuit protection on all outputs. Case overload protected @ 110-160% above rating	
Overvoltage Protection	15-35% above nominal output	
Logical Control		
Power Failure	Open collector logic signal goes high 100-500 msec after main output; it goes low at least 6 msec before loss of regulation	
Remote Sense	Compensates for 0.5 V lead drop minimum; Will operate without remote sense connected, Reverse connection	
General		
Temperature	**Storage:** -40°C to +85°C; **Operating:** 0° to 50°C ambient. Derate each output 2.5% per degree from 50° to 70°C, -20°C start up.	
Electromagnetic Susceptibility	Designed to meet EN61000-4; -2, -3, -4, -5, -6, -8, -11 Level 3	
Humidity	Operating; non-condensing 10% to 95% RH	
Vibration	IEC68-2-6 to the levels of IEC721-3-2	
MTBF	>550,000 hours demonstrated at full load, and 25°C ambient conditions	
Safety	IEC/EN/UL 60950-1, IEC/EN/UL 60601-1	

Selection Table

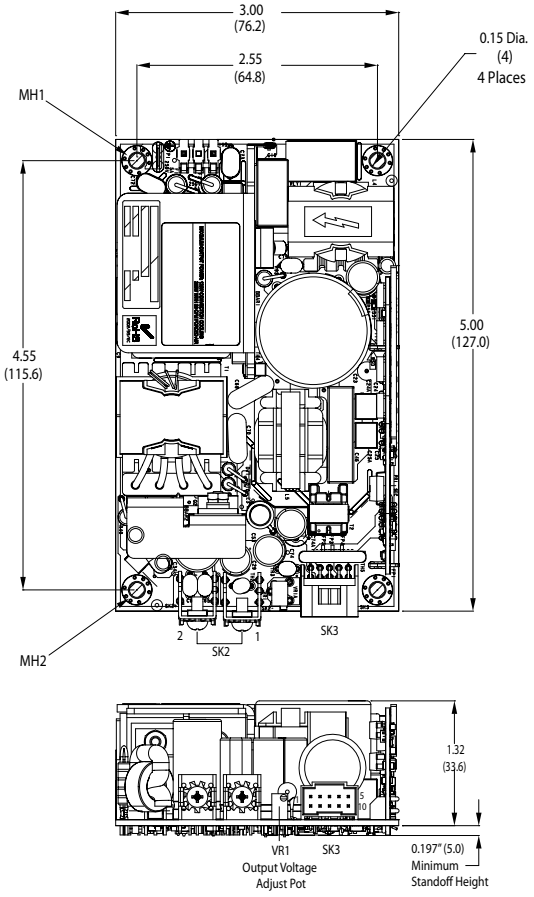
Medical and Non–Medical Series									
	Catalog Number	**Description**	**Output 1**	**Output 2**	**Output 3**	**Output 4**	**Case***	**Pin Assignments***	**Mating Connectors***
GL100–M	**GLS102–M**	5 V 150W 2" X 4"	5 V @ 16 A [24 A]	-	-	-	1	1A	1B
	GLS103–M	12 V 150W 2" X 4"	12 V @ 8.3 A [12.5 A]	-	-	-			
	GLS104–M	15 V 150W 2" X 4"	15 V @ 6.7 A [10 A]	-	-	-			
	GLS105–M	24 V 150W 2" X 4"	24 V @ 4.2 A [6.3 A]	-	-	-			
	GLS108–M	48 V 150W 2" X 4"	48 V @ 2.1 A [3.1 A]	-	-	-			
GL200–M	**GLS202–M**	5 V 250W 3" X 5"	5 V @ 20 A [40 A]	-	-	-	2	2A	2B
	GLS203–M	12 V 250W 3" X 5"	12 V @ 10.3 A [20.8 A]	-	-	-			
	GLS204–M	15 V 250W 3" X 5"	15 V @ 8.3 A [16.6 A]	-	-	-			
	GLS205–M	24 V 250W 3" X 5"	24 V @ 5.2 A [10.4 A]	-	-	-			
	GLS208–M	48 V 250W 3" X 5"	48 V @ 2.6 A [5.2 A]	-	-	-			

* Refer to GL Series Dimensions and the sections that follow

GL Compact Series Dimensions



Case 1
(Weight: 0.44 lb/0.20 kg approx.)



Case 2
(Weight: 0.75 lb/0.34 kg approx.)

Notes:

1. Specifications subject to change without notice.
2. All dimensions in inches (mm), tolerance is ±0.02".
3. Mounting holes MH1, MH2, MH3 should be grounded for EMI purposes.
4. Mounting MH1 is safety ground connection.
5. Specifications are for convection rating at factory settings at 115 Vac input 25°C unless otherwise stated.
6. This power supply requires mounting on metal standoffs 0.20" (5 m) in height.

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contact Technical Services at (800) 377-4384 with any questions.

GL Compact Series Pin Assignments

1A

Connector		GLS102M	GLS103M	GLS104M	GLS105M	GLS108M
SK1	PIN 1	Neutral				
	PIN 3	Line				
SK2	PIN 1	Ground				
	PIN 2	Ground				
	PIN 3	Ground				
	PIN 4	Ground				
	PIN 5	+5	+12	+15	+24	+48
	PIN 6					
	PIN 7					
	PIN 8					
SK 203	PIN 1	Ground				
	PIN 2	Power Fail				
	PIN 3	-Remote Sense				
	PIN 4	+Remote Sense				
SK5	PIN 1	+12 V Fan				
	PIN 2	+12 V Fan				
	PIN 3	Fan Ground				
	PIN 4	Fan Ground				

2A

Connector		GLS202M	GLS203M	GLS204M	GLS205M	GLS208M
SK1	PIN 1	Neutral				
	PIN 3	Line				
SK2	TB-1	Common				
	TB-2	+5	+12	+15	+24	+48
SK3	PIN 1	+V1 Remote Sense				
	PIN 2	-V1 Remote Sense				
	PIN 3	No Connection				
	PIN 4	No Connection				
	PIN 5	+Power Fail				
	PIN 6	Common				
SK 203	PIN 7	No Connection				
	PIN 8	Common				
	PIN 9	+12 V Fan				
	PIN 10	+12 V Fan Ground				

GL Compact Series Mating Connectors

1B

Connector Kit #70-841-025 includes the following:	
(SK1) AC Input:	Molex P/N 09-50-3031 or Landwin P/N: 3060S0302
(SK2) DC Outputs:	Molex P/N 09-50-3081 or Landwin P/N: 3060S0802
(SK203) Remote Sense:	Molex P/N 35155-0400 or Landwin P/N: 2640S04A0
(SK5) Fan:	Molex P/N 22-10-2047 or Landwin P/N: 2510S0400

2B

Connector Kit #70-841-018 includes the following:	
(SK1) AC Input:	Molex 09-50-8031 (connector) PINS: 08-52-0113
(SK2) DC Outputs:	Molex 19141-0058/0063 Spade lug
(SK3) Control Signals:	Molex: 90142-0010 (USA) PINS: 90119-2110 or Amp: 87977-3 / PINS: 87309-8

SHP Series: Heavy Duty Modular Power Supplies

These high power, modular power supplies, from 1500 through 2000 watts, are capable of up to 12 independent outputs. Modular design makes these units easy to customize for unusual voltage and power combinations. All units have power factor corrected inputs, an end mounted fan for cooling and a variety of built-in signals and controls. High reliability and a flexible design make these an excellent choice for process control and semiconductor fabrication applications.

UL 60950
E137632

Features

- Capable of up to 12 outputs
- Single output 24 V up to 87.4 A
- IEC 801 immunity standards
- Current Share on all outputs
- End mounted fan
- Voltage adjustment on all outputs ±10%
- Overload protection on all outputs
- Power factor correction (.99 typ.)
- Margining on all outputs
- Modular Construction
- Signals
  - Global and individual module inhibits/enable
- Single phase and three phase inputs
- Two year warranty

Applications

- Process Controls
- Semi-conductor Fabrication
- Automated Service Equipment

Related Products

- Surge Suppression
- SCD DC to DC Converters
- Active Tracking® Filters

Specifications

Parameter	Condition	Limit
Input		
Input Voltage	SH Series	86 to 264 Vac (1Ø)
	S3H Series	180 to 264 (3Ø)
Frequency		47 to 440 Hz
Protection		Internally Fused
Inrush Current		40A Max
Output		
Line Regulation	Full Rated Load	0.2% or 5mV max
Load Regulation	Full Rated Load	0.2% or 5mV max
Minimum Loading	Where indicated	
Temp. Coefficient		±0.02%/ °C
Hold up Time	Full Rated Load	No less than 20ms
Overvoltage Protection		2-5 V 122% to 134%
Short–Circuit Protec–tion	Continuous	Protected for short-cir-cuit, auto-recovery
Output Ripple		0.1% or 10mV RMS
General		
Operating Temperature	Full Rated Load	-10 to 50°C
Storage Temperature		-55 to +85°C
Efficiency	Full Rated Load	75% to 82%
MTBF		>500,000 hours
Shock & Vibration		MIL-HDBK 810E
EMI		CISPR 22, EN55022 Level B
Safety	All Models	UL, CE and CSA
Cooling		Internal DC fan 24

Selection Tables

Single Phase 1500 Watt, SH15 Series

Catalog Number	Output 1	Output 2	Output 3	Output 4	Maximum Output
SH15–Q2	3.3 V, 300 A	-	-		1500 W
SH15–Q3	5 V, 300 A	-	-		1500 W
SH15–Q4	12 V, 125 A	-	-		1500 W
SH15–Q5	15 V, 100 A	-	-		1500 W
SH15–Q6	24 V, 62.4 A	-	-		1500 W
SH15–Q7	28 V, 53.4 A	-	-		1500 W
SH15–Q8	36 V, 41.6 A	-	-		1500 W
SH15–Q9	48 V, 31.2 A	-	-		1500 W
SH20–P3T53J4	5 V, 150 A	24 V, 10.5 A	12 V, 25 A	12 V, 20 A	1500 W
SH20–P3T54J5	5 V, 150 A	24 V, 10.5 A	15 V, 20 A	15 V, 20 A	1500 W

Single Phase 2000 Watt, SH20 Series

Catalog Number	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Maximum Output
SH20–Q3K3–7	5 V, 420 A	-	-	-	-	-	2000 W
SH20–Q6K6–7	24 V, 87.4 A	-	-	-	-	-	2000 W
SH20–Q9K9–7	48 V, 43.7 A	-	-	-	-	-	2000 W
SH20–M3K2	5 V, 240 A	3.3 V, 120 A	12 V, 4 A	-	-	-	2000 W
SH20–Z6Z7M3	5 V, 240 A	12 V, 21 A	12 V, 20 A	5 V, 50 A	15 V, 10 A	24 V, 5 A	2000 W

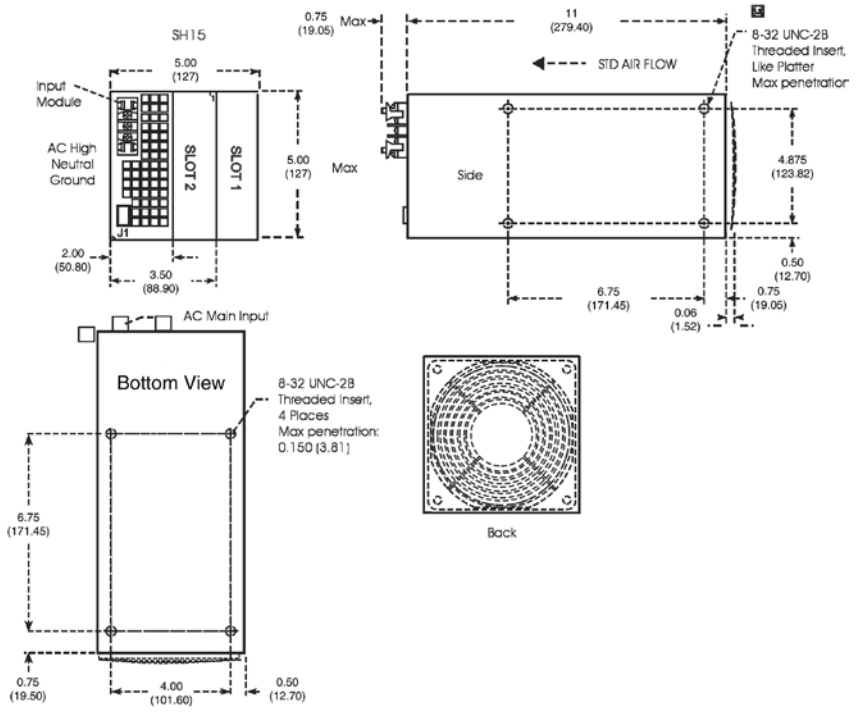
Three Phase 1500 Watt, S3H15 Series

Catalog Number	Output 1	Output 2	Output 3	Output 4	Maximum Output
S3H15–Q2	3.3 V, 300 A	-	-	-	1500 W
S3H15–Q3	5 V, 300 A	-	-	-	1500 W
S3H15–Q4	12 V, 125 A	-	-	-	1500 W
S3H15–Q5	15 V, 100 A	-	-	-	1500 W
S3H15–Q6	24 V, 62.4 A	-	-	-	1500 W
S3H15–Q7	28 V, 53.4 A	-	-	-	1500 W
S3H15–Q8	36 V, 41.6 A	-	-	-	1500 W
S3H15–Q9	48 V, 31.2 A	-	-	-	1500 W
S3H20–P3T53J4	5 V, 150 A	24 V, 10.5 A	12 V, 25 A	12 V, 20 A	1500 W
S3H20–P3T54J5	5 V, 150 A	24 V, 10.5 A	15 V, 20 A	15 V, 20 A	1500 W

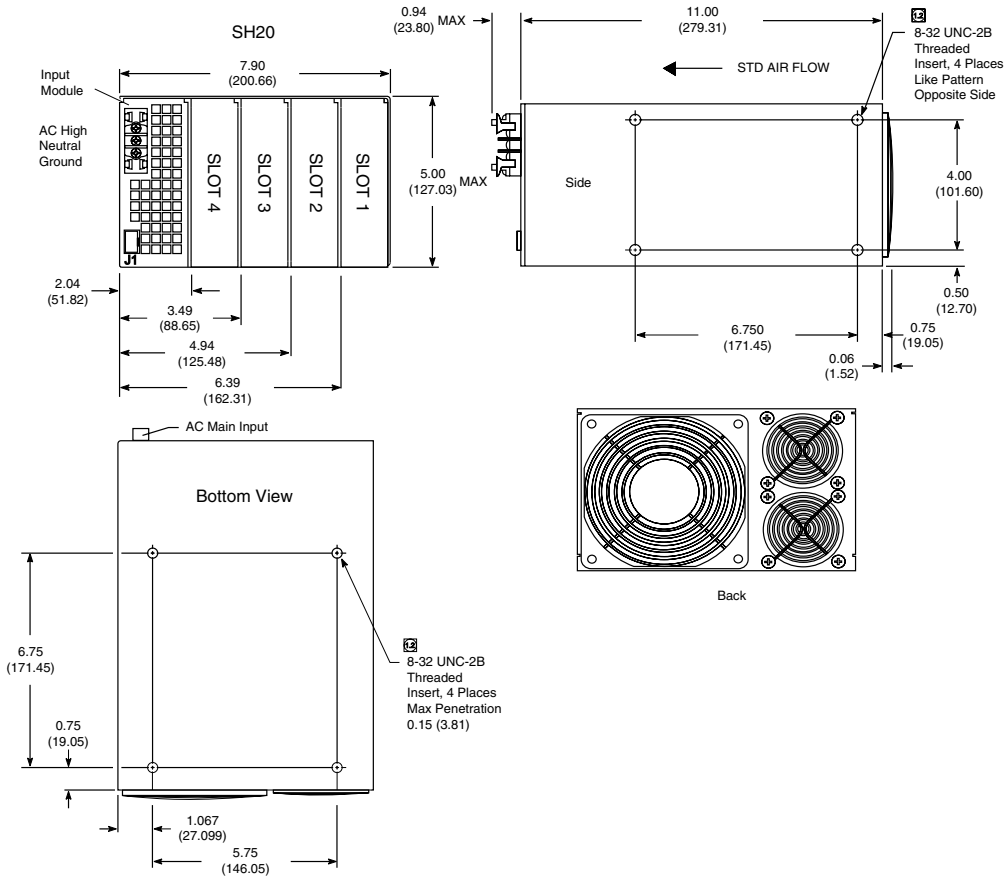
Three Phase 2000 Watt, S3H20 Series

Catalog Number	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Maximum Output
S3H20–Q3K3–7	5 V, 420 A	-	-	-	-	-	2000 W
S3H20–Q6K6–7	24 V, 87.4 A	-	-	-	-	-	2000 W
S3H20–Q9K9–7	48 V, 43.7 A	-	-	-	-	-	2000 W
S3H20–M3K2	5 V, 240 A	3.3 V, 120 A	-	-	-	-	2000 W
S3H20–Z6Z7M3	5 V, 240 A	12 V, 21 A	12 V, 20 A	5 V, 50 A	15 V, 10 A	24 V, 5 A	2000 W

SH15 & S3H15 Dimensions



SH20 & S3H20 Dimensions



39 Series Copper Line

E47379

Features

- Full range adjustable output voltage and current
- Universal 120/240 Vac, 50/60 Hz input
- Single supply for multiple applications
- Parallel operation for increased power output
- UL Recognized

Applications

- Engineering bench supply
- Test equipment
- Manufacturing test applications
- Automotive product testing

Selection Table

Power Watts	Catalog Number	Maximum Current		Shipping Weight lbs (kg)
		Amps* @25 Vdc (Adj. 2.5-25 Vdc)	Amps* @50 Vdc (Adj. 5-50 Vdc)	
300	**39–407**	12 A	6 A	23 (10.4)
600	**39–408**	24 A	12 A	30 (13.6)
1200	**39–409**	48 A	24 A	73 (33.1)

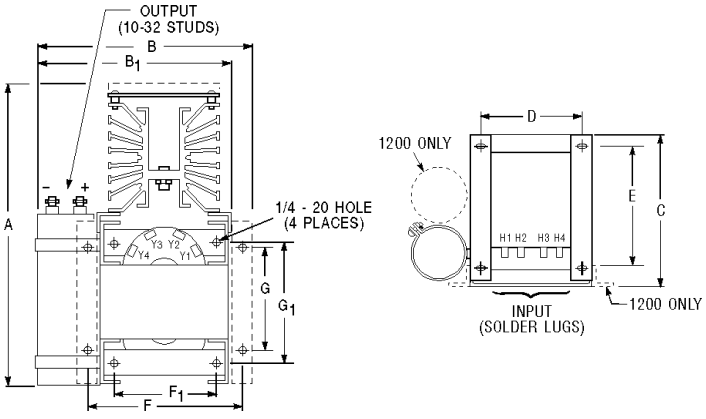
** Current listed is the maximum at any voltage in that range.*

Model	A	B	B1	C	D	E	F	F1	G	G1
39–407	10.4	-	7.7	6.8	3.8	5.3	-	3.5	-	3.6
39–408	11.4	-	7.7	6.8	3.8	5.3	-	3.5	-	4.6
39–409	14.0	11.1	-	10.0	6.0	8.0	8.3	-	3.5	-

Specifications

Parameter	Condition	Limit
Input		
Input Voltage		105-130/210-260 Vac (user selectable)
Input Frequency		47 to 440 Hz
Input Protection		Ext. Slow- blow fuse required
Output		
Line Regulation		0.1% or 50 mV
Load Regulation		0.1% or 50 mV
Ripple	Full Rated Load	<1% RMS
Controls		
Current Limit Adjust		0-100%
Output Volt Adjust		10-100% Coarse Adjust (may be mounted remotely). Fine adjust fine tunes output for no loads and full load conditions.
General		
Operating Temperature	Full Rated Load	0° to 50°C
Storage Temperature	Full Rated Load	-20° to +70°C
Efficiency	Full Rated Load	75%
Vibration		Designed to meet MIL-STD-810D, Method 514.3, Category Procedure 1.
Shock		Designed to meet MIL-STD-810D, Method 516.3, Category Procedure 3.

Dimensions



Sizing 158

Selection Chart 159

SBE 55°C Rise, Copper,
Encapsulated, 50 VA - 1000 VA 161

SBE Accessories..... 165

SBE 55°C Rise, Copper
Open Style, 1500 VA - 5000 VA 167

SMT 80°C Rise, Aluminum Windings
1000 VA - 5000 VA 168

International Series,
CE Touchproof, 50 VA - 750 VA 169
ICE International Series, 750 - 2000 VA..... 172

HSZ Enclosed
1 kVA - 10 kVA..... 174

Frequently Asked Questions 241

Design Choices

SolaHD offers a broad range of industrial control solutions for the most demanding industrial applications. Our products exceed NEMA ratings for inrush and regulation to ensure control systems are powered correctly. Electromagnetic control components demand inrush currents up to 10 times the transformer's nominal rating. While this inrush is occurring, the output side of the transformer must not fall below 85% of nominal as specified by NEMA ST-1, Part 4. Using a transformer that does not meet these ratings may cause erroneous shutdowns of downstream processes.

To meet your complete control needs, SolaHD four series of control transformers, all of which exceed the NEMA standards. The Selection Chart can be used to identify the appropriate transformer for your application.

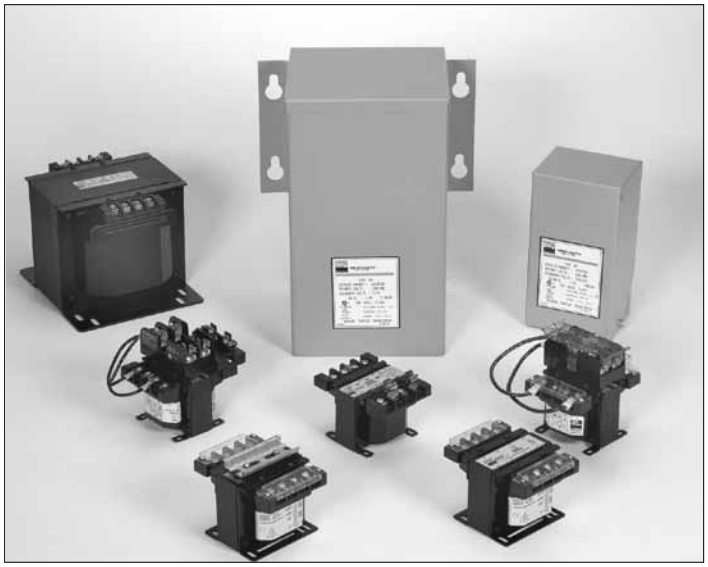
The **SBE series** is available from 50 - 5000 VA, 55°C rise and features copper windings and encapsulation (through 1000 VA) for longer life and protection from the environment. This low temperature performance can mean smaller cabinet size or longer life for any electronic components that may be nearby.

The **SMT series** are 115°C rise, aluminum wound and for applications where good voltage regulation and higher power capacities (1000-5000 VA) are required.

The **International series** meets IEC requirements and IP20 (touch proof covers ordered separately for E models) for European applications.

The **HSZ series** rounds out SolaHD's line with an enclosed series of control transformers from 1 - 10 KVA that feature either an UL-3R, NEMA 4X or NEMA 4/12 enclosure. This unique design, featuring copper windings and encapsulated construction, can help system designers meet harsher environmental standards or design for a safer installation outside of a control cabinet. The HSZ series is for applications where cost or heat issues make mounting the transformer outside the control panel necessary.

SolaHD is pleased to offer custom transformers 1 KVA and larger. If you can't find what you are looking for here, we are happy to provide a quote on a custom transformer if available. Contact Technical Services for more information.



Sizing an Industrial Control Transformer

For proper transformer selection, three characteristics of the load circuit must be determined in addition to the minimum voltage required to operate the circuit. These are total steady state (sealed) VA, total inrush VA, and inrush load power factor.

A. Sealed VA – Total steady state sealed VA is the volt-amperes that the transformer must deliver to the load circuit for an extended period of time.

B. Inrush VA – Total inrush VA is the volt-amperes that the transformer must deliver upon initial energization of the control circuit. Energization of electromagnetic devices takes 30-50 milliseconds. During this inrush period the electromagnetic control devices draw many times normal current – 3-10 times normal is typical.

C. Inrush Load Power Factor is difficult to determine without detailed vector analysis of all the load components. Generally such an analysis is not feasible, therefore, a safe assumption is 40% power factor. Until recently 20% PF was commonly used for transformer calculations, however, tests conducted on major brands of control devices indicate that 40% PF is a safer default assumption.

Selection Steps

1. Determine the supply and load voltages. The supply voltage is the available voltage to the control transformer. The load voltage is the operating voltage of the devices that will be connected to the transformer output.

2. Calculate the total sealed VA by adding the VA requirements of all components that will be energized together (timers, contactors, relays, solenoids, pilot lamps, etc.). Sealed VA data is available from the control device manufacturer.

3. Add the inrush VA of all components that will be energized together. Be sure to include the sealed VA of components that don't have an inrush, (lamps, timers, etc.) as they present a load to the transformer during maximum inrush.

4. Calculate selection inrush VA in one of the following two ways:

   A. Selection inrush VA =

$$\sqrt{(\text{VA sealed})^2 + (\text{VA inrush})^2}$$

Alternative Method

B. VA sealed + VA inrush = Selection inrush

Method B will result in a slightly oversized transformer.

5. If your line voltage varies 10% or more, contact ***Technical Services*** for assistance.

6. Utilizing the Regulation Data chart on pg. 250, select the transformer VA needed for your application from the "Transformer VA Rating" column. Check to be sure that the nameplate VA rating exceeds the sealed VA of the control circuit calculated in Step 1. If it does not, select a larger transformer VA that exceeds the circuit sealed VA.

By following the above procedure, the secondary voltage delivered by the transformer will be 90% of the nameplate secondary voltage under maximum inrush conditions at rated input voltage.

Now refer to the Selection Tables on the following pages for the style you have chosen. Select your transformer according to your required voltage and VA capacity.

Chart A: Voltage Code Chart

Voltage Code	Primary Voltage	Secondary Voltage	Hertz
None	240 x 480 230 x 460 220 x 440	120 115 110	60 50/60 50/60
A	240/480/600 230/460/575	120/99 115/95	50/60
D	240 x 480	24	60
E	120 x 240	24	60
JL	208/240/277	120/24	60
JN	208/240/480/600 200/230/460/575	120/24 115/23	60
R	480	240	50/60
TC	208/240/415 200/230/400 - /220/380	120/ - /24 115/24/23 110/23/ -	50/60
TE	208/240/415 - /277/480 200/230/400 - /220/380	24 24 24 23	50/60 60 50/60 50/60
TF	208/240/415/480/600* 200/230/400/460/575* 220/277*/380	120 115 110	50/60 50/60 50/60
TH	240/415/480 230/400/460 220/380/440	120/240 115/230 110/220	50/60 50/60 50/60
MH	208/240/415/480/600 200/230/400/460/575 - /220/380/440/550	120/240 115/230 110/220	50/60 50/60 50/60
MC	208/240/415/480/600 200/230/400/460/575 - /220/380/440/550	120/ - /24 115/24/23 110/23/ -	50/60 50/60 50/60

* 60 Hz only at 277, 575 or 600 V.

Note: "-" indicated tap not used.

You can also use our online transformer product selector at **www.solahd.com/select**. Enter your voltage requirements, hit the submit button and the models that meet your requirements will be listed.

Choosing the Correct Series

The **SBE** series of industrial control transformers provide voltage regulation which exceeds NEMA standards. The SBE series are a 55°C rise and have copper windings and are 50/60 Hz rated. The SBE series can handle significant inrush with a minimal drop in output voltage.

The **SMT** series are 115°C rise, aluminum wound and are for applications where good voltage regulation and higher power capacities are required.

The **International** series have multiple voltage taps for easy application. These units also meet IEC 61558-1, 61558-2-2 and are CE marked for easy export to European countries.

The **HSZ** series is for applications where cost or heat issues make mounting the transformer outside the control panel necessary. This series has 80°C rise and have copper winding for industrial applications. These units are enclosed with NEMA 3R rating. Also available in NEMA 12, 4 and 4X.

Selection Chart

VA	SBE ENCAPSULATED					SBE OPEN	SMT OPEN	HSZ* NEMA 3R		
	––	D	E	JL	JN	––	––	––	A	R
Temp	55°C						115°C	80°C		
50	E050	E050D	E050E	E050JL	E050JN					
75	E075		E075E							
100	E100	E100D	E100E	E100JL	E100JN					
150	E150		E150E		E150JN					
200	E200		E200E							
250	E250	E250D	E250E	E250JL	E250JN					
300	E300		E300E							
350	E350		E350E							
500	E500	E500D	E500E	E500JL	E500JN					
750	E750		E750E							
1000	E1000						T1000	HZ1000	HZ1000A	HZ1000R
1500						Y1500	T1500	HZ1500	HZ1500A	HZ1500R
2000						Y2000	T2000	HZ2000	HZ2000A	HZ2000R
3000						Y3000	T3000	HZ3000	HZ3000A	HZ3000R
5000						Y5000	T5000	HZ5000	HZ5000A	HZ5000R
75000								HZ75000	HZ75000A	HZ75000R
100000								HZ10000	HZ10000A	HZ10000R

* Change HZxxxx to HZ12xxxx for NEMA 12 or 4 applications or HZ4Xxxxx for NEMA 4X applications.

Selection Chart - International Series

VA	INTERNATIONAL SERIES ENCAPSULATED						
	TC	TE	TF	TH	TH	MH	MC
Temp	55°C				80°C		
50	E050TC	E050TE	E050TF	E050TH			
100	E100TC	E100TE	E100TF	E100TH			
150	E150TC	E150TE	E150TF	E150TH			
250	E250TC	E250TE	E250TF	E250TH			
500	E500TC	E500TE	E500TF	E500TH			
750			E750TF	E750TH			CE750MC
1000					CE1000TH	CE1000MH	CE1000MC
1500					CE1500TH	CE1500MH	CE1500MC
2000					CE2000TH	CE2000MH	

Note: Contact Technical Services for higher VA sizes of the MH and TH units.

Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

The SBE - Encapsulated Series

The SBE Encapsulated industrial control transformers are epoxy encapsulated to seal the transformer windings against moisture, dirt and industrial contaminants. Extra deep, molded terminal barriers reduce the chance of electrical failure as the result of arcing or frayed lead wires. The rugged construction and proven reliability of the SBE design is uniquely suited for all industrial environments.

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E77014

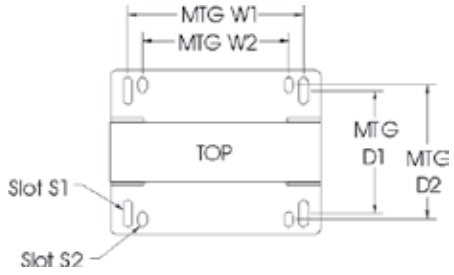
Features

- 50 - 1000 VA, 50/60 Hz – suitable for worldwide applications.
- Interleaved copper windings reduce I^2R losses and maximize efficiency.
- 55°C Rise, 105°C insulation system to minimize heat
- Epoxy encapsulated to protect cores and coils against moisture, dirt, and other contaminants.
- Meets or Exceeds NEMA Standard ST 1 and ANSI C89.1 for load inrush capability.
- Integrally molded, flame retardant (IEC 707/ISO Class 1210) Terminal Blocks provide greater terminal contact area and improved conductivity.
- Heavy gauge steel mounting plate
- Mounting dimensions are compatible with similar control transformers.
- ***Secondary fuse holders (FB2X) included for 13/32 x 1½ cartridges (fuses not included).***
- ***Factory–installed fuse holders are available (See W, WA & WB options).***
- 10 year warranty

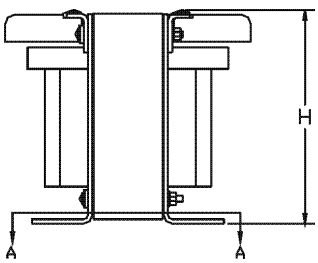
Related Products

- Linear Power Supplies
- DIN Rail DC Power Supplies
- Constant Voltage Transformers
- Line Reactors

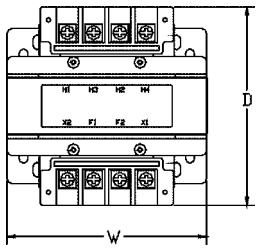
SBE Mounting Profiles



Mounting Dimensions



Profile



Top View

Accessories

Catalog Number	Description
FBP	Primary "CC" Rejection Type Fuse Holder (Finger Safe covers not available)
FB2	Secondary Fuse Holder only (Glass or Ceramic, ¼" x 1¼" fuse)
FB2X	Secondary Fuse Holder only included where applicable. Not sold separately. (Midget Cartridge Type, 13/32" x 1½" fuse)
FBPC1	Primary "CC" Rejection Type Fuse Holder and Finger Safe Cover Kit
IP20	IEC Touchproof Cover Kit
SBEDIN	IEC Fuse Holder Adaptor Kit
W	Factory installed Primary Fuse Holder with Midget Type (no covers)
WA	Factory installed Fuse Holder with Glass/Ceramic Type and Covers
WB	Factory installed Fuse Holder with Midget Type and Covers

SBE Encapsulated Series Selection Tables

Group 1 – 120 x 240 Volt Primary, 24 Volt Secondary, 60 Hz

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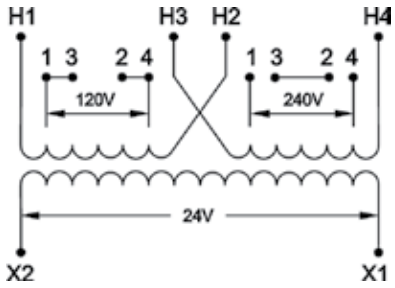
VA	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (inches) S1 / S2	Approx. Ship Weight lbs (kg)
50	**E050E**	2.72	3.01	3.99	2.51 / NA	2.02 / NA	.20 x .33 / .20 x .33	3 (1.36)
75	**E075E**	2.96	3.39	4.36	2.81 / 2.50	2.10 / NA	.20 x .50 / .20 x .50	4 (1.82)
100	**E100E**	2.96	3.39	4.61	2.81 / 2.50	2.37 / NA	.20 x .50 / .20 x .50	5 (2.27)
150	**E150E**	3.89	4.5	4.48	3.74 / 3.12	2.56 / 2.87	.20 x .65 / .20 x .33	8 (3.64)
200	**E200E**	3.89	4.5	4.79	3.74 / 3.12	2.87 / 3.18	.20 x .65 / .20 x .33	10 (4.55)
250	**E250E**	3.89	4.5	5.21	3.74 / 3.12	3.29 / 3.61	.20 x .65 / .20 x .33	11 (5.00)
300	**E300E**	4.53	5.25	4.66	4.38 / 3.75	3.10 / NA	.31 x .71 / .31 x .71	12 (5.45)
350	**E350E**	4.53	5.25	5.07	4.38 / 3.75	3.54 / NA	.31 x .71 / .31 x .71	15 (6.82)
500	**E500E**	4.53	5.25	5.75	4.38 / 3.75	4.33 / NA	.31 x .85 / .31 x .85	19 (8.64)
750	**E750E**	5.56	6.38	6.93	5.32 / 4.37	4.25 / 5.75	.31 x .85 / .31 x .85	31 (14.09)



Note: Includes FB2X Secondary fuse holder.

Group 1A – Factory Installed Primary Fuse Holder Class "CC" and:

W – Secondary Fuse Holder (Midget Cartridge, 13/32" x 1½" fuse) supplied, no covers
WA – Secondary Fuse Holder (Glass or Ceramic – Type 3AG, ¼" x 1¼" fuse type)
WB – Secondary Fuse Holder (Midget Cartridge, 13/32" x 1½" fuse)

VA	Primary Fuse Holder Class "CC"			Dimensions						
	W Option – Midget Type Catalog Number	WA Option – Type 3AG w/ Covers Catalog Number	WB Option – Midget Type w/ Covers Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (inches) S1 / S2	Approx. Ship Weight lbs (kg)
50	**E050EW**	**E050EWA**	**E050EWB**	4.18	3.01	3.99	2.51 / NA	2.02 / NA	.20 x .33 / .20 x .33	3 (1.36)
75	**E075EW**	**E075EWA**	**E075EWB**	4.41	3.39	4.36	2.81 / 2.50	2.10 / NA	.20 x .50 / .20 x .50	4 (1.82)
100	**E100EW**	**E100EWA**	**E100EWB**	4.41	3.39	4.61	2.81 / 2.50	2.37 / NA	.20 x .50 / .20 x .50	5 (2.27)
150	**E150EW**	**E150EWA**	**E150EWB**	5.36	4.5	4.48	3.74 / 3.12	2.56 / 2.87	.20 x .65 / .20 x .33	8 (3.64)
200	**E200EW**	**E200EWA**	**E200EWB**	5.36	4.5	4.79	3.74 / 3.12	2.87 / 3.18	.20 x .65 / .20 x .33	10 (4.55)
250	**E250EW**	**E250EWA**	**E250EWB**	5.36	4.5	5.21	3.74 / 3.12	3.29 / 3.61	.20 x .65 / .20 x .33	11 (5.00)
300	**E300EW**	**E300EWA**	**E300EWB**	5.99	5.25	4.66	4.38 / 3.75	3.10 / NA	.31 x .71 / .31 x .71	12 (5.45)
350	**E350EW**	**E350EWA**	**E350EWB**	5.99	5.25	5.07	4.38 / 3.75	3.54 / NA	.31 x .71 / .31 x .71	15 (6.82)
500	**E500EW**	**NA**	**E500EWB**	5.99	5.25	5.75	4.38 / 3.75	4.33 / NA	.31 x .85 / .31 x .85	19 (8.64)
750	**E750EW**	**NA**	**E750EWB**	7.01	6.38	6.93	5.32 / 4.37	4.25 / 5.75	.31 x .85 / .31 x .85	31 (14.09)

Notes: WA and WB suffix include Finger Safe covers. Fuses not included.
FB2 sold separately for W option. Secondary fusing assembly required.

SBE Control Transformer without Covers - *W Option*

Option
W

SBE Control Transformer with Covers - *WA & WB Option*

Option	Secondary Fusing	
WA	Glass/Ceramic - Type 3AG (FB2)	
WB	Midget Type (FB2X)	

SBE Encapsulated Series Selection Tables

Group 2 – 220 x 440 Volt Primary, 110 Volt Secondary, 50/60 Hz
230 x 460 Volt Primary, 115 Volt Secondary, 50/60 Hz
240 x 480 Volt Primary, 120 Volt Secondary, 60 Hz

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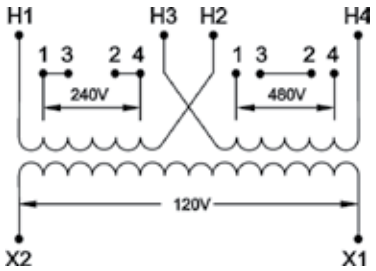
VA	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (inches) S1 / S2	Approx. Ship Weight lbs (kg)
50	**E050**	2.72	3.01	3.99	2.51 / NA	2.02 / NA	.20 x .33 / .20 x .33	3 (1.36)
75	**E075**	2.96	3.39	4.36	2.81 / 2.50	2.10 / NA	.20 x .50 / .20 x .50	4 (1.82)
100	**E100**	2.96	3.39	4.61	2.81 / 2.50	2.37 / NA	.20 x .50 / .20 x .50	5 (2.27)
150	**E150**	3.89	4.5	4.48	3.74 / 3.12	2.56 / 2.87	.20 x .65 / .20 x .33	8 (3.64)
200	**E200**	3.89	4.5	4.79	3.74 / 3.12	2.87 / 3.18	.20 x .65 / .20 x .33	10 (4.55)
250	**E250**	3.89	4.5	5.21	3.74 / 3.12	3.29 / 3.61	.20 x .65 / .20 x .33	11 (5.00)
300	**E300**	4.53	5.25	4.66	4.38 / 3.75	3.10 / NA	.31 x .71 / .31 x .71	12 (5.45)
350	**E350**	4.53	5.25	5.07	4.38 / 3.75	3.54 / NA	.31 x .71 / .31 x .71	15 (6.82)
500	**E500**	4.53	5.25	5.75	4.38 / 3.75	4.33 / NA	.31 x .85 / .31 x .85	19 (8.64)
750	**E750**	5.56	6.38	6.93	5.32 / 4.37	4.25 / 5.75	.31 x .85 / .31 x .85	31 (14.09)
1000	**E1000**	5.56	6.38	7.36	5.32 / 4.37	4.68 / 6.18	.31 x .85 / .31 x .85	36 (16.36)



Note: Includes FB2X Secondary fuse holder.

Group 2A – Factory Installed Primary Fuse Holder Class "CC" and:
W – Secondary Fuse Holder (Midget Cartridge, 13/32" x 1½" fuse) supplied, no covers
WA – Secondary Fuse Holder (Glass or Ceramic – Type 3AG, ¼" x 1¼" fuse type)
WB – Secondary Fuse Holder (Midget Cartridge, 13/32" x 1½" fuse)

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E77014

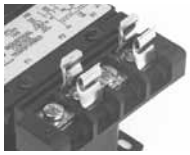
VA	Primary Fuse Holder Class "CC"			Dimensions						
	W Option – Midget Type Catalog Number	WA Option – Type 3AG w/ Covers Catalog Number	WB Option – Midget Type w/ Covers Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (inches) S1 / S2	Approx. Ship Weight lbs (kg)
50	**E050W**	**E050WA**	**E050WB**	4.18	3.01	3.99	2.51 / NA	2.02 / NA	.20 x .33 / .20 x .33	3 (1.36)
75	**E075W**	**E075WA**	**E075WB**	4.41	3.39	4.36	2.81 / 2.50	2.10 / NA	.20 x .50 / .20 x .50	4 (1.82)
100	**E100W**	**E100WA**	**E100WB**	4.41	3.39	4.61	2.81 / 2.50	2.37 / NA	.20 x .50 / .20 x .50	5 (2.27)
150	**E150W**	**E150WA**	**E150WB**	5.36	4.5	4.48	3.74 / 3.12	2.56 / 2.87	.20 x .65 / .20 x .33	8 (3.64)
200	**E200W**	**E200WA**	**E200WB**	5.36	4.5	4.79	3.74 / 3.12	2.87 / 3.18	.20 x .65 / .20 x .33	10 (4.55)
250	**E250W**	**E250WA**	**E250WB**	5.36	4.5	5.21	3.74 / 3.12	3.29 / 3.61	.20 x .65 / .20 x .33	11 (5.00)
300	**E300W**	**E300WA**	**E300WB**	5.99	5.25	4.66	4.38 / 3.75	3.10 / NA	.31 x .71 / .31 x .71	12 (5.45)
350	**E350W**	**E350WA**	**E350WB**	5.99	5.25	5.07	4.38 / 3.75	3.54 / NA	.31 x .71 / .31 x .71	15 (6.82)
500	**E500W**	**E500WA**	**E500WB**	5.99	5.25	5.75	4.38 / 3.75	4.33 / NA	.31 x .85 / .31 x .85	19 (8.64)
750	**E750W**	**E750WA**	**E750WB**	7.01	6.38	6.93	5.32 / 4.37	4.25 / 5.75	.31 x .85 / .31 x .85	31 (14.09)
1000	**E1000W**	**E1000WA**	**E1000WB**	7.01	6.38	7.36	5.32 / 4.37	4.68 / 6.18	.31 x .85 / .31 x .85	36 (16.36)

Notes: WA and WB suffix include Finger Safe covers. Fuses not included. W option for secondary fusing requires assembly (FB2 sold separately).

SBE Control Transformer without Covers - *W Option*

Option
W

SBE Control Transformer with Covers - *WA & WB Option*

Option	Secondary Fusing	
WA	Glass/Ceramic - Type 3AG (FB2)	
WB	Midget Type (FB2X)	

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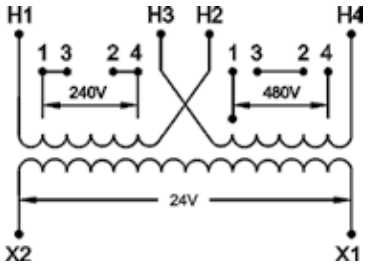
SBE Series Selection Tables - continued

Group 3 – 240 x 480 Volt Primary, 24 Volt Secondary, 60 Hz

E77014

VA	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (inches)	Approx. Ship Weight lbs (kg)
50	**E050D**	2.72	3.01	3.99	2.51/NA	2.02/N/A	.20 x .33	3 (1.36)
100	**E100D**	2.96	3.39	4.61	2.81/2.50	2.37/NA	.20 x .50	5 (2.27)
250	**E250D**	3.89	4.5	5.21	3.74/3.12	3.29/3.61	.20 x .65	11 (5.00)
500	**E500D**	4.53	5.25	5.75	4.38/3.75	4.33/NA	.31 x .71	19 (8.64)

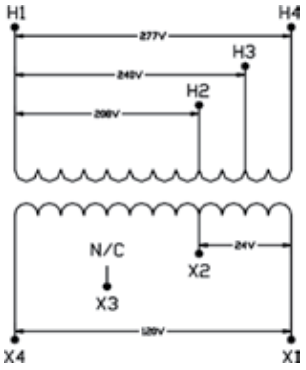


Note: Includes FB2X Secondary fuse holder.

Group 4 – 208/240/277 Volt Primary, 120/24 Volt Secondary, 60 Hz

E77014

VA	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (inches)	Approx. Ship Weight lbs (kg)
50	**E050JL**	2.72	3.01	3.99	2.51/NA	2.02/N/A	.20 x .33	3 (1.36)
100	**E100JL**	2.96	3.39	4.61	2.81/2.50	2.37/NA	.20 x .50	5 (2.27)
250	**E250JL**	3.89	4.5	5.21	3.74/3.12	3.29/3.61	.20 x .65	11 (5.00)
500	**E500JL**	4.53	5.25	5.75	4.38/3.75	4.33/NA	.31 x .71	19 (8.64)

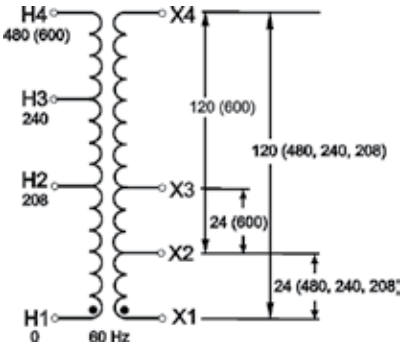


Note: Will only accept one FB2 secondary fuse holder. Will not accept FB2X secondary fuse holder.

Group 5 – 208/240/480/600 Volt Primary, 120/24 Volt Secondary, 60 Hz
200/230/460/575 Volt Primary, 115/23 Volt Secondary, 60 Hz

E77014

VA	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (inches)	Approx. Ship Weight lbs (kg)
50	**E050JN**	2.96	3.39	4.36	2.81/2.50	2.10/NA	.20 x .50	4 (1.81)
100	**E100JN**	3.89	4.5	4.48	3.74/3.12	2.56/2.87	.20 x .65	8 (3.67)
150	**E150JN**	3.89	4.5	5.21	3.74/3.12	3.29/3.61	.20 x .65	11 (5.00)
250	**E250JN**	4.53	5.25	5.07	4.38/3.75	3.54/NA	.31 x .71	15 (6.82)
500	**E500JN**	5.56	6.38	6.93	5.32/4.37	4.25/5.75	.31 x .85	30 (13.64)



Note: Will only accept one FB2 secondary fuse holder. Will not accept FB2X secondary fuse holder.

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SBE Accessories (For Group 1 & 2 voltage configurations only)

FBP: Field installed primary fuse holder kit designed to accommodate two Class "CC" rejection type fuses. Finger safe covers not available.

FB2: Field installed secondary fuse holder kit designed to accommodate one Glass or Ceramic, ¼" x 1¼" fuse.

SBEDIN: Field installed IEC Fuse Holder Adaptor Kit

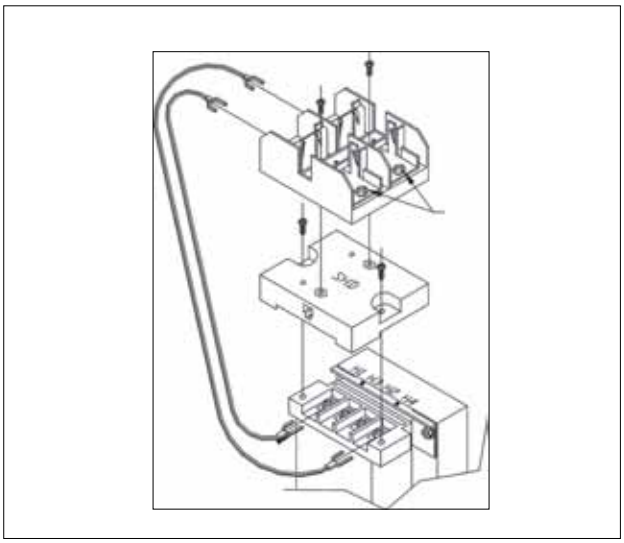
See the Technical Notes section for recommended fuse sizes.

FBPC1: Field installed primary fuse holder designed to accommodate two Class "CC" rejection type fuses with Primary and Secondary Finger Safe Covers Kit.

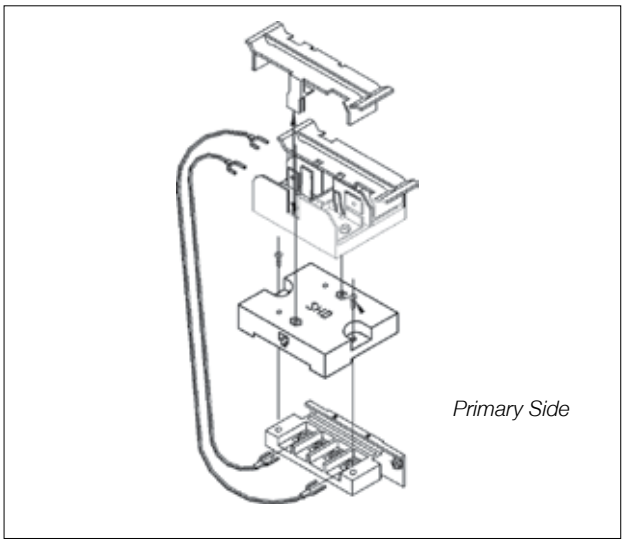
FB2X: Field installed secondary fuse holder designed to accommodate one 13/32" x 1½" (Midget type) cartridge fuse (included with applicable transformer purchase only).

IP20: Field installed Primary and Secondary IEC Touch Proof Cover Kit.

FBP Fuse Block - Primary Side



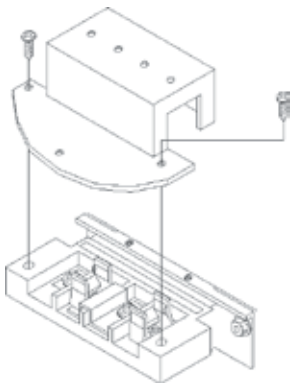
FBPC1 Fuse Block and Finger Safe Cover Kit



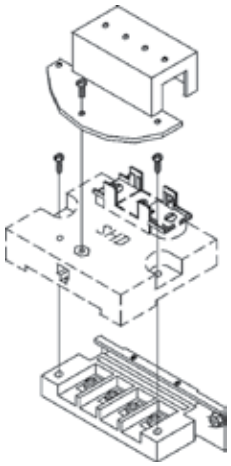
Primary Side

FBPC1 Secondary Cover - For use with either FB2X or FB2 options.

FB2X Option



FB2 Option

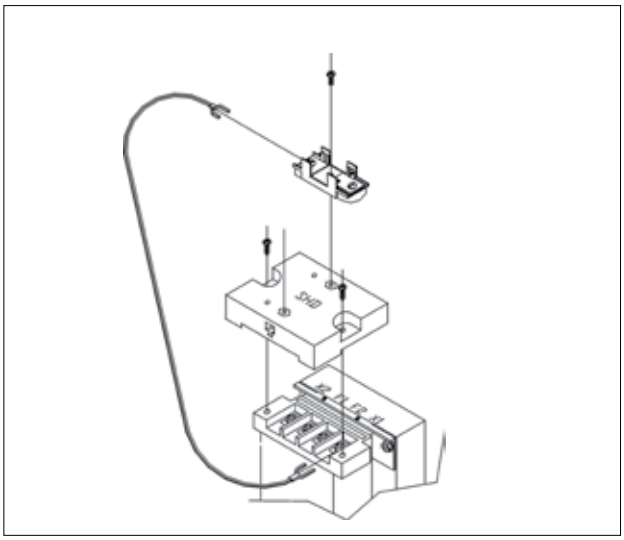


Secondary Side

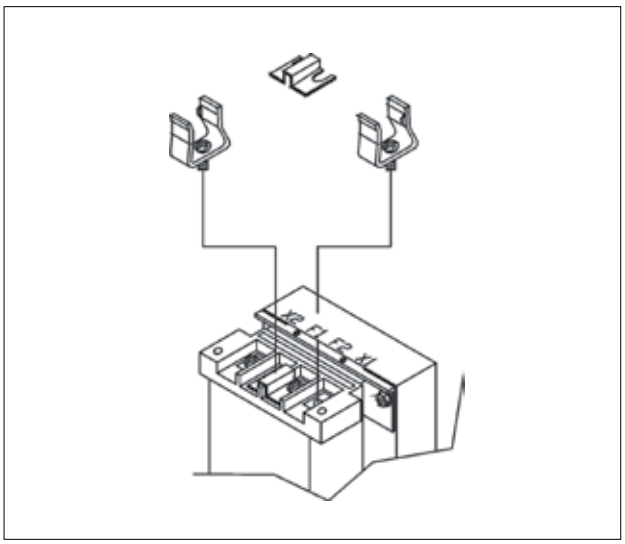
Order FB2 separately

SBE Additional Accessories - continued

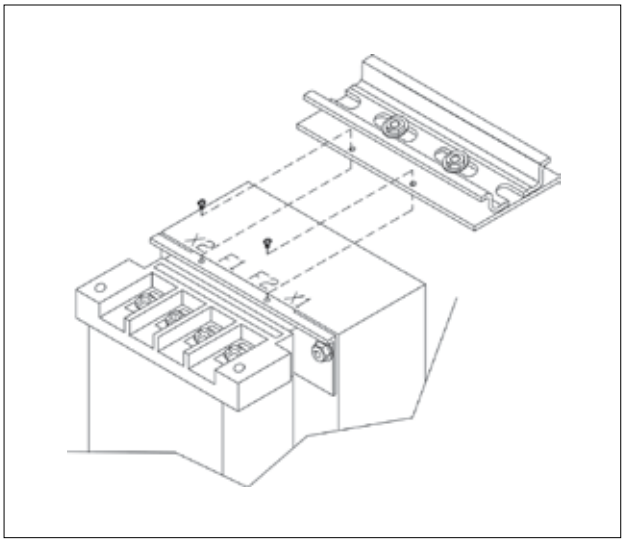
FB2 Fuse Block - Secondary Side



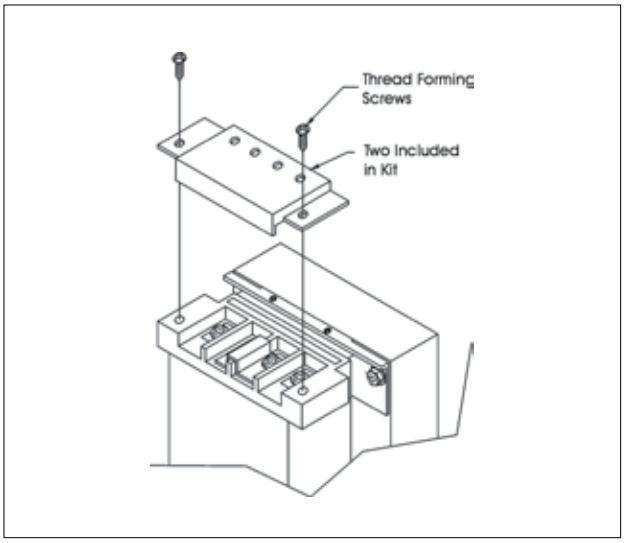
FB2X Fuse Block - Secondary Side



SBE DIN Circuit Breaker Mounting



IP20 Terminal Covers (Two Covers Per Kit)



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SBE - Copper Wound, Open Style Design - SBE performance in larger VA (1500 - 5000) sizes

The open style SBE Series provides voltage regulation in excess of NEMA recommendations without exceeding **55°C rise**. These higher power capacity transformers are the best choice when 80% or more of the load components are electromagnetic devices.

E77014 LR-14328-4

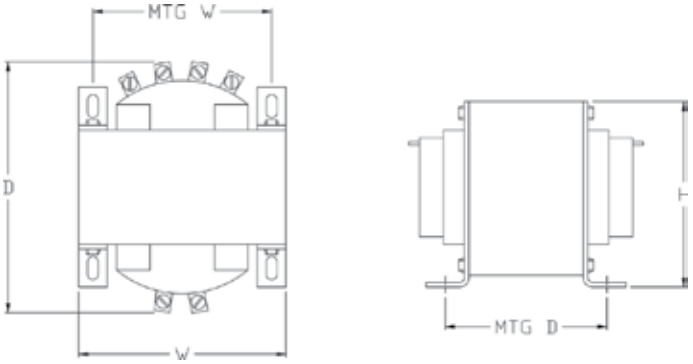
Features

- Interleaved copper windings reduce I^2R losses and maximize efficiency.
- Ratings 60 Hz unless noted 50/60 Hz
- Meets or exceeds electrical requirements of NEMA, ANSI, NMTBA and JIC
- 55°C rise, 105°C insulation system
- High quality silicon steel core

Related Products

- Linear Power Supplies
- DIN Rail DC Power Supplies
- Constant Voltage Transformers
- Line Reactors

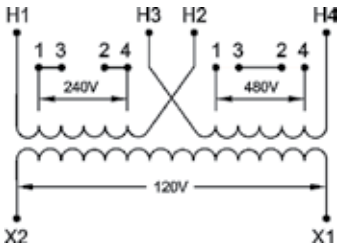
SBE Design Style



Selection Table

Group 1 – 240 X 480 Volt Primary, 120 Volt Secondary 60 Hz
230 X 460 Volt Primary, 115 Volt Secondary 50/60 Hz
220 X 440 Volt Primary, 110 Volt Secondary 50/60 Hz

VA	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width	Mtg Depth	Slot Size (inches)	Approx. Ship Weight lbs (kg)
1500	**Y1500**	6.25	6.75	8.75	5.75	6.38	.44 x .69	43 (19.55)
2000	**Y2000**	6.25	6.75	10	5.75	7.75	.44 x .69	55 (25.00)
3000	**Y3000**	8	9	9.63	8	6	.44 x .69	74 (33.64)
5000	**Y5000**	8	9	12	8	8.75	.44 x .69	120 (54.55)



Note: Fuse holders are not available for this voltage configuration.

SMT Series - Aluminum Wound, Open Style Design

The SMT series is economical and compact with traditional open wound varnished coils. Ratings are from 1 KVA through 5 KVA with Class 180°C insulation system and **115°C rise** under full load. SMT transformers provide excellent cost benefits with NEMA regulation characteristics and electrical performance specifications.

E77014 LR-14328-4

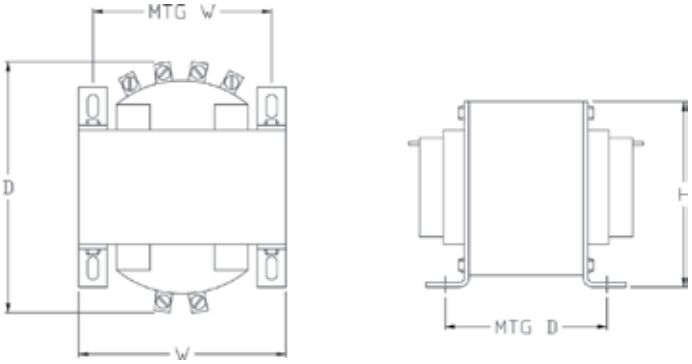
Features

- Available from 1000–5000 VA, 60 Hz unless noted
- Meets or exceeds electrical requirements of NEMA, ANSI, NMTBA and JIC

Related Products

- Linear Power Supplies
- DIN Rail DC Power Supplies
- Constant Voltage Transformers
- Line Reactors

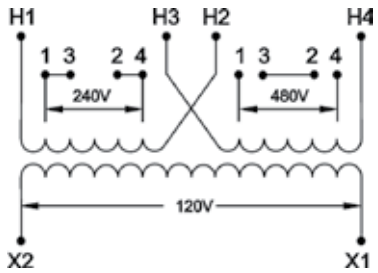
SMT Design Style



Selection Table

Group 1 – 240 X 480 Volt Primary, 120 Volt Secondary 60 Hz
230 X 460 Volt Primary, 115 Volt Secondary 50/60 Hz
220 X 440 Volt Primary, 110 Volt Secondary 50/60 Hz

VA	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width	Mtg Depth	Slot Size (inches)	Approx. Ship Weight lbs (kg)
1000	**T1000**	5.63	6.38	6.38	5.31	4.25	.31 x .69	22 (10.00)
1500	**T1500**	6.25	6.75	8.25	5.75	5.63	.44 x .69	28.3 (12.86)
2000	**T2000**	6.25	6.75	9.13	5.75	6.63	.44 x .69	38.5 (17.5)
3000	**T3000**	8	9	9.3	8	5.81	.44 x .69	55 (25.00)
5000	**T5000**	8	9	11.3	8	7.5	.44 x .69	91 (41.36)



Note: Fuse holders are not available for this voltage configuration.

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International Series Control Transformers

Electromagnetic control components demand inrush currents up to 10 times the transformers nominal rating without sacrificing secondary voltage stability beyond practical limits. The International series transformers fully comply with IEC and NEMA standards and are available with IEC touchproof covers (IP20).

E77014

Note: IP20 covers sold separately.

Features

- Epoxy encapsulated for cooler operation
- Interleaved copper windings reduce I^2R losses and maximize efficiency.
- 50/60 Hz
- 55°C Rise, 105°C insulation system for harsh, heavy duty applications
- Exceeds IEC, NEMA, ANSI, NMTBA, JIC and automotive standards

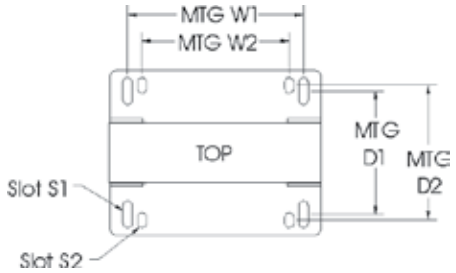
Accessories

- IP20
  - Field installed Primary and Secondary IEC Touch Proof Cover Kit
- SBEDIN
  - Field installed IEC Fuse Holder Adaptor Kit

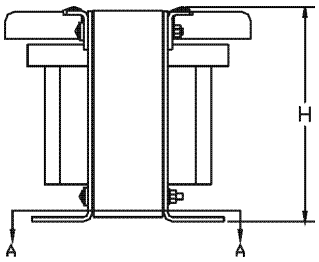
Related Products

- DIN Rail Power Supplies
- 63 Series Power Conditioners
- Surge Protective Devices

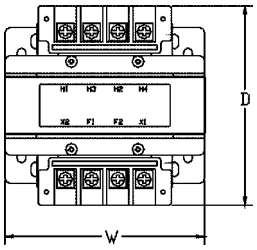
Design Style



Mounting Dimensions



Profile



Top View

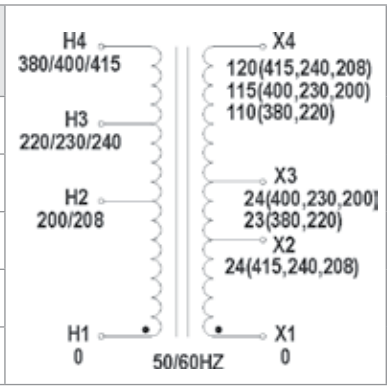
International Certifications

UL	CE
E77014 Vol. 1	IEC 61558-1 61558-2-2

Selection Tables: International Series

Group 1 – 208/240/415 Volt Primary, 120/24 Secondary, 50/60 Hz
200/230/400 Volt Primary, 115/23 Secondary, 50/60 Hz

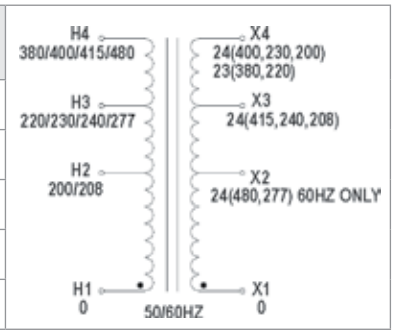
Continuous VA	Instantaneous VA*	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (mm) S1/S2	Approx. Ship Weight lbs (kg)
50	105	**E050TC**	2.96	3.39	4.36	2.81/2.50	2.10/NA	5.08 x 12.7 / 5.08 x 12.7	4 (1.82)
100	230	**E100TC**	3.89	4.5	4.48	2.56/2.87	2.87/3.18	5.08 x 16.5 / 5.08 x 8.4	8 (3.67)
150	420	**E150TC**	3.89	4.5	5.21	3.74/3.12	3.29/3.61	5.08 x 16.5 / 5.08 x 8.4	11 (5.00)
250	675	**E250TC**	4.53	5.25	5.07	4.38/3.75	3.54/NA	7.87 x 21.59 / 7.87 x 21.59	15 (6.82)
500	1600	**E500TC**	5.56	6.38	6.93	5.32/4.37	4.25/5.75	7.87 x .85 / 7.87 x 21.59	30 (13.64)



* At 50% PF (Power Factor), 95% Nominal Secondary Voltage.

Group 2 – 208/240/415 Volt Primary, 24 Volt Secondary, 50/60 Hz
277/480 Volt Primary, 24 Volt Secondary, 60 Hz
200/230/400 Volt Primary, 24 Volt Secondary, 50/60 Hz
220/380 Volt Primary, 23 Volt Secondary, 50/60 Hz

Continuous VA	Instantaneous VA*	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (mm) S1/S2	Approx. Ship Weight lbs (kg)
50	105	**E050TE**	2.96	3.39	4.36	2.81 / 2.50	2.10 / NA	5.08 x 12.7 / 5.08 x 12.7	4 (1.82)
100	230	**E100TE**	3.89	4.5	4.48	2.56 / 2.87	2.87 / 3.18	5.08 x .65 / 5.08 x .33	8 (3.67)
150	420	**E150TE**	3.89	4.5	5.21	3.74 / 3.12	3.29 / 3.61	5.08 x .65 / 5.08 x .33	11 (5.00)
250	675	**E250TE**	4.53	5.25	5.07	4.38 / 3.75	3.54 / NA	7.87 x 18.0 / 7.87 x 18.0	15 (6.82)
500	1600	**E500TE**	5.56	6.38	6.93	5.32 / 4.37	4.25 / 5.75	7.87 x 21.6 / 7.87 x 21.6	30 (13.64)



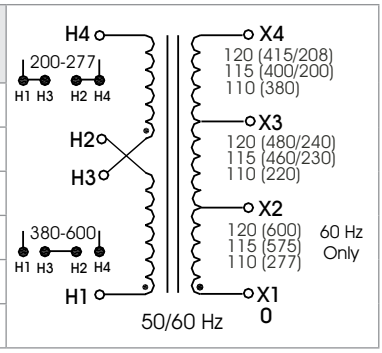
* At 50% PF (Power Factor), 95% Nominal Secondary Voltage.

Note: Fuse holders are not available for these voltage configurations.

Selection Tables: International Series - continued

Group 3 – 208/240/415/480/600* Volt Primary, 120 Volt Secondary, 50/60 Hz
200/230/400/460/575* Volt Primary, 115 Volt Secondary, 50/60 Hz
220/277*/380 Volt Primary, 110 Volt Secondary, 50/60 Hz

Continuous VA	Instantaneous VA**	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (mm) S1/S2	Approx. Ship Weight lbs (kg)
50	93	**E050TF**	2.96	3.39	4.36	2.81 / 2.50	2.10 / NA	5.08 x 12.7 / 5.08 x 12.7	4 (1.82)
100	205	**E100TF**	3.89	4.5	4.48	3.74 / 3.12	2.56 / 2.87	5.08 x 16.5 / 5.08 x 8.38	8 (3.67)
150	390	**E150TF**	3.89	4.5	5.21	3.74 / 3.12	3.29 / 3.61	5.08 x 16.5 / 5.08 x 8.38	11 (5.00)
250	630	**E250TF**	4.53	5.25	5.07	4.38 / 3.75	3.54 / NA	7.9 x 18.0 / 7.9 x 18.0	15 (6.82)
500	1200	**E500TF**	5.56	6.38	6.93	5.32 / 4.37	4.25 / 5.75	7.9 x 21.6 / 7.9 x 21.6	30 (13.64)
750	2290	**E750TF**	5.56	6.38	7.36	5.32 / 4.37	4.68 / 6.18	7.9 x 21.6 / 7.9 x 21.6	34 (15.45)

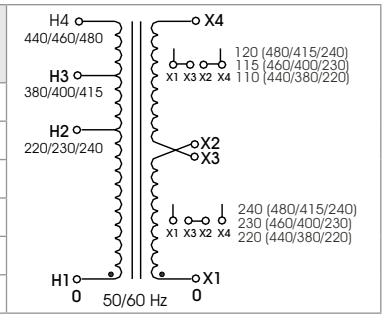


* 60 Hz Only

** At 50% PF (Power Factor), 95% Nominal Secondary Voltage.

Group 4 – 240/415/480 Volt Primary, 120/240 Volt Secondary, 50/60 Hz
230/400/460 Volt Primary, 115/230 Volt Secondary, 50/60 Hz
220/380/440 Volt Primary, 110/220 Volt Secondary, 50/60 Hz

Continuous VA	Instantaneous VA*	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width W1 / W2	Mtg Depth D1 / D2	Slot Size (mm) S1/S2	Approx. Ship Weight lbs (kg)
50	110	**E050TH**	2.96	3.39	4.36	2.81 / 2.50	2.10 / NA	5.08 x 12.7 / 5.08 x 12.7	4 (1.82)
100	235	**E100TH**	3.89	4.5	4.48	3.74 / 3.12	2.56 / 2.87	5.08 x 16.5 / 5.08 x 8.38	8 (3.67)
150	470	**E150TH**	3.89	4.5	5.21	3.74 / 3.12	3.29 / 3.61	5.08 x 16.5 / 5.08 x 8.38	11 (5.00)
250	730	**E250TH**	4.53	5.25	5.07	4.38 / 3.75	3.54 / NA	7.9 x 20.59 / 7.9 x 18.0	15 (6.82)
500	1670	**E500TH**	5.56	6.38	6.93	5.32 / 4.37	4.25 / 5.75	7.9 x 21.59 / 7.9 x 21.59	30 (13.64)
750	2250	**E750TH**	5.56	6.38	7.36	5.32 / 4.37	4.68 / 6.18	7.9 x 21.59 / 7.9 x 21.59	34 (15.45)



* At 50% PF (Power Factor), 95% Nominal Secondary Voltage.

Note: Fuse holders are not available for these voltage configurations.

International Series - Fuse Recommendations

VA	Maximum Current Rating of Fuse		
	24 VAC	115 VAC	230 VAC
50	2	0.5	0.25
100	4	1	0.5
150	6	1.6	0.8
250	10	2	1
500	20	4	2
750	*	6	4
1000	*	8	4
1500	*	12	6
2000	-	16	8

Primary Fusing: *Consult local Electrical Code*
Secondary Fusing: *per IEC EN61558-2-2*

* See 500 VA fuse rating for MC design.

ICE International Series: 750 - 2000 VA

International CE marked transformers include IP20 touchproof terminations and copper windings in an encapsulated design. These units range from 750 to 2000 VA with 80°C temperature rise. The design is highly flexible due to the use of the standardized primary coil for multiple worldwide voltage combinations. CE marked and cULus approval make the ICE International Series the perfect choice for OEM export equipment.

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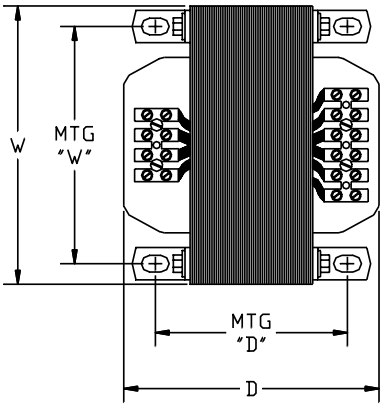
Features

- IP20 Touch-Proof terminals
- Copper windings
- Epoxy encapsulated for cooler operation and increased reliability
- 80°C rise temp, 130°C insulation system for harsh, heavy-duty standards
- 50/60 Hz Frequency
- Meets or exceeds electrical requirements of NEMA, ANSI and IEC
- CE marked and cULus listed

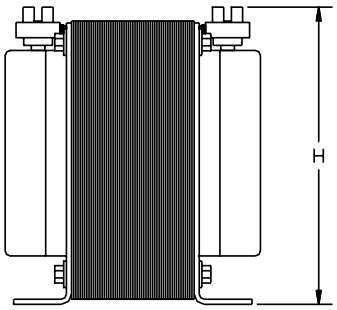
Related Products

- DIN Rail Power Supplies
- 63 Series Power Conditioners
- Surge Protective Devices

Design Style



Top View

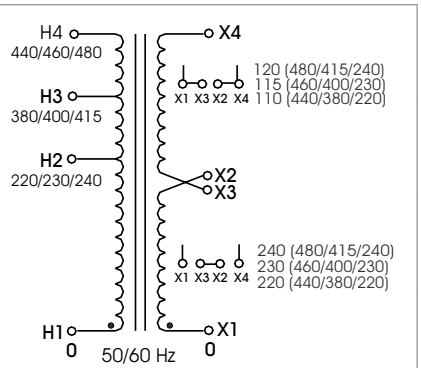


Profile

Selection Tables: International Series

Group 5 – 240/415/480 Volt Primary, 120/240 Volt Secondary, 50/60 Hz
230/400/460 Volt Primary, 115/230 Volt Secondary, 50/60 Hz
220/380/440 Volt Primary, 110/220 Volt Secondary, 50/60 Hz

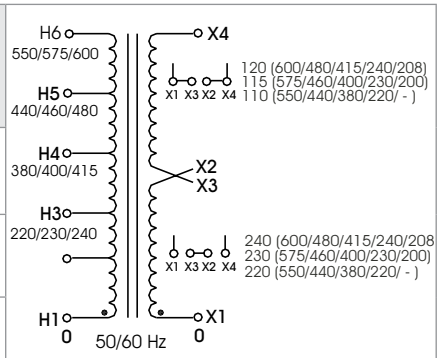
Continuous VA	Instantaneous VA*	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width "W"	Mtg Depth "D"	Slot Size – inches (mm)	Approx. Ship Weight lbs (kg)
1000	2500	**CE1000TH**	5.63	6.38	6	5.31	4.25	.31 x .69 (7.87 x 17.52)	25 (11.36)
1500	4200	**CE1500TH**	5.63	6.38	6.75	5.31	5	.31 x .69 (7.87 x 17.52)	32 (14.55)
2000	6000	**CE2000TH**	5.63	6.38	7.75	5.31	6	.31 x .69 (7.87 x 17.52)	37 (16.82)



* At 50% PF (Power Factor), 95% Nominal Secondary Voltage.

Group 6 – 208/240/415/480/600 Volt Primary, 120/240 Volt Secondary, 50/60 Hz
200/230/400/460/575 Volt Primary, 115/230 Volt Secondary, 50/60 Hz
– /220/380/440/550 Volt Primary, 110/220 Volt Secondary, 50/60 Hz

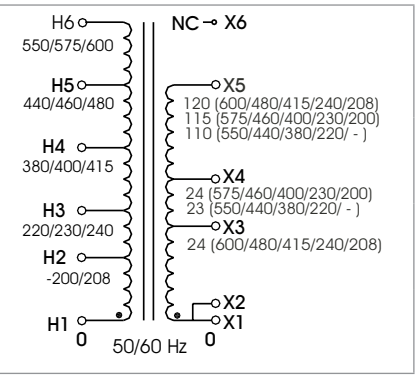
Continuous VA	Instantaneous VA*	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width "W"	Mtg Depth "D"	Slot Size – inches (mm)	Approx. Ship Weight lbs (kg)
1000	2500	**CE1000MH**	5.63	6.38	6	5.31	4.25	.31 x .69 (7.87 x 17.52)	25 (11.36)
1500	4200	**CE1500MH**	5.63	6.38	6.75	5.31	5	.31 x .69 (7.87 x 17.52)	32 (14.55)
2000	6000	**CE2000MH**	5.63	6.38	7.75	5.31	6	.31 x .69 (7.87 x 17.52)	37 (16.82)



* At 50% PF (Power Factor), 95% Nominal Secondary Voltage.

Group 7 – 208/240/415/480/600 Volt Primary, 120/ – /24 Volt Secondary, 50/60 Hz
200/230/400/460/575 Volt Primary, 115/24/23 Volt Secondary, 50/60 Hz
– /220/380/440/550 Volt Primary, 110/23/– Volt Secondary, 50/60 Hz

Continuous VA	Instantaneous VA*	Catalog Number	Height (inch)	Width (inch)	Depth (inch)	Mtg Width "W"	Mtg Depth "D"	Slot Size – inches (mm)	Approx. Ship Weight lbs (kg)
750	1875	**CE750MC**	5.63	6.38	6	5.31	4.25	.31 x .69 (7.87 x 17.52)	25 (11.36)
1000	3000	**CE1000MC**	5.63	6.38	6.75	5.31	5	.31 x .69 (7.87 x 17.52)	32 (14.55)
1500	4500	**CE1500MC**	5.63	6.38	7.75	5.31	6	.31 x .69 (7.87 x 17.52)	37 (16.82)



* At 50% PF (Power Factor), 95% Nominal Secondary Voltage.

Notes: 24V output 500 VA maximum load.
Fuse holders are not available for these voltage configurations.

HSZ Series Industrial Control Transformers

The HSZ series of industrial control transformers are designed for applications requiring special mounting and are available in ratings from 1 through 10 KVA.

Features

- UL Class 180°C insulation system, 80°C temperature rise under full load
- Meets or exceeds NEMA regulation standards
- Copper magnet wire windings
- Encapsulated

Available Styles

- NEMA 3R (rain proof)
- NEMA 4 (wash down & dust proof)
- NEMA 4X (corrosion proof)
- NEMA 12 (dust proof)

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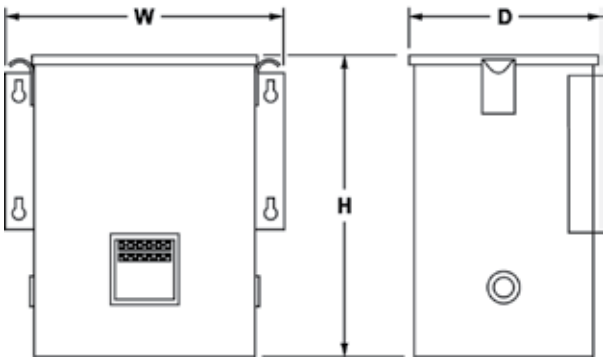
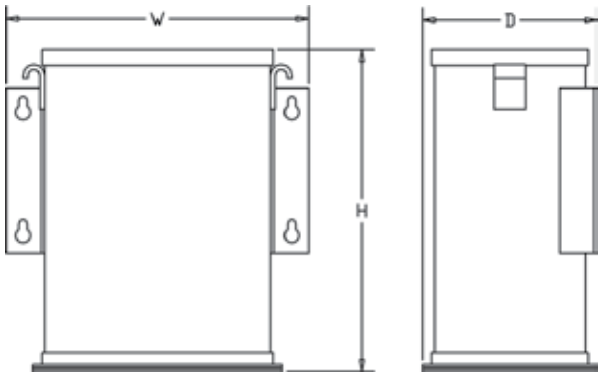
Related Products

- Linear Power Supplies
- DIN Rail DC Power Supplies
- Constant Voltage Transformers
- Line Reactors

HSZ Design Style 1 - NEMA 3R



HSZ Design Style 2 - NEMA 12, NEMA 4, NEMA 4X

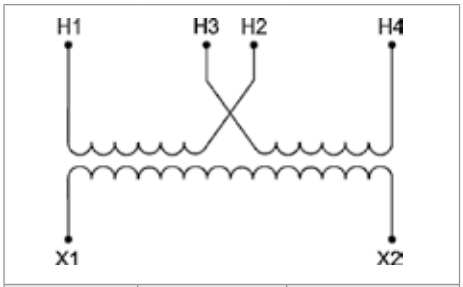


Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

HSZ Series Selection Tables and Electrical Connections

Group 1 – 240/480, 230/460, 220/440 Volt Primary, 120/115/110 Volt Secondary, 50/60 Hz

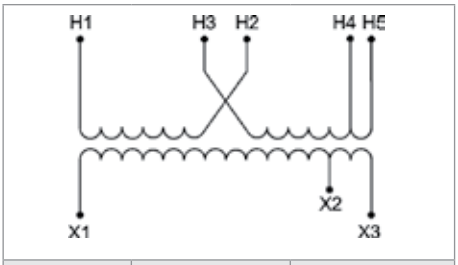
KVA	Catalog Number NEMA–3R	Catalog Number NEMA–4/12	Catalog Number NEMA–4X	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight lbs (kg)
1	HZ1000	HZ12–1000	HZ4X–1000	12	10	7	43 (19.55)
1.5	HZ1500	HZ12–1500	HZ4X–1500	12	10	7	55 (25.00)
2	HZ2000	HZ12–2000	HZ4X–2000	12	10	7	68 (30.91)
3	HZ3000	HZ12–3000	HZ4X–3000	17	14	9	108 (49.09)
5	HZ5000	HZ12–5000	HZ4X–5000	17	14	9	138 (62.73)
7.5	HZ7500	HZ12–7500	HZ4X–7500	17	14	9	173 (78.64)
10	HZ10000	HZ12–10000	HZ4X–10000	17	17	12	210 (95.45)



Primary Voltage	Interconnect	Connect Lines to
480	H2-H3	H1 & H4
240	H1-H3, H2-H4	H1 & H4
Secondary Voltage	**Interconnect**	**Connect Lines to**
120		X1 & X2

Group 2 – 230/460/575 Volt Primary, 115/95 Volt Secondary, 50/60 Hz

KVA	Catalog Number NEMA–3R	Catalog Number NEMA–4/12	Catalog Number NEMA–4X	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight lbs (kg)
1	HZ1000A	HZ12–1000A	HZ4X–1000A	12	10	7	43 (19.55)
1.5	HZ1500A	HZ12–1500A	HZ4X–1500A	12	10	7	55 (25.00)
2	HZ2000A	HZ12–2000A	HZ4X–2000A	12	10	7	68 (30.91)
3	HZ3000A	HZ12–3000A	HZ4X–3000A	17	14	9	108 (49.09)
5	HZ5000A	HZ12–5000A	HZ4X–5000A	17	14	9	138 (62.73)
7.5	HZ7500A	HZ12–7500A	HZ4X–7500A	17	14	9	173 (78.64)
10	HZ10000A	HZ12–10000A	HZ4X–10000A	17	17	12	210 (95.45)



Primary Voltage	Interconnect	Connect Lines to
230	H1-H3, H2-H4	H1 & H4
460	H2-H3	H1 & H4
575	H2-H3	H1 & H5
Secondary Voltage	**Interconnect**	**Connect Lines to**
115		X1 & X3
95		X1 & X2

Group 3 – 480 Volt Primary, 240 Volt Secondary, 50/60 Hz

KVA	Catalog Number NEMA–3R	Catalog Number NEMA–4/12	Catalog Number NEMA–4X	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight lbs (kg)
1	HZ1000R	HZ12–1000R	HZ4X–1000R	12	10	7	43 (19.55)
1.5	HZ1500R	HZ12–1500R	HZ4X–1500R	12	10	7	55 (25.00)
2	HZ2000R	HZ12–2000R	HZ4X–2000R	12	10	7	68 (30.91)
3	HZ3000R	HZ12–3000R	HZ4X–3000R	17	14	9	108 (49.09)
5	HZ5000R	HZ12–5000R	HZ4X–5000R	17	14	9	138 (62.73)
7.5	HZ7500R	HZ12–7500R	HZ4X–7500R	17	14	9	173 (78.64)
10	HZ10000R	HZ12–10000R	HZ4X–10000R	17	17	12	210 (95.45)

Note: Contact Technical Services for lead times on enclosures.

Primary Voltage	Interconnect	Connect Lines to
480		H1 & H2
Secondary Voltage	**Interconnect**	**Connect Lines to**
240		X1 & X2

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Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

SolaHD Family of Transformers

SolaHD offers a broad range of transformers to meet many applications. These dry-type transformers are offered encapsulated, ventilated or non-ventilated, 600 Volt Class, isolation type, single and three phase, through 500 kVA. Indoor and outdoor models are available.

Applications

Transformers are useful where the available voltage must be changed to accommodate the voltage required by the load. For many electrical circuits, the National Electrical Code (NEC) requires a separately derived neutral secondary connection provided by Delta-Wye connected transformers. Typical applications include:

- Hospitals
- Industrial Plants
- Commercial Buildings
- Apartment Buildings
- Institutional Buildings
- Office Buildings
- Schools
- Shopping Centers
- High Rise Buildings

General purpose transformers can be located close to the load. No vaults are required for installation and no long, expensive feeder lines are needed. Common applications include inductive and resistive loads such as motors, lighting and heating.

SolaHD general purpose transformers are manufactured to meet applicable industry standards, are listed in accordance with UL 506 and UL 1561 specifications and are classified as isolation transformers. The family of transformers includes:

Distribution Transformers - Ventilated 15 kVA to 500 kVA

General Purpose
These industry workhorses feature dry type construction and are classified as isolation transformers.

Low Temperature Rise
Lower thermal stress on transformer insulation increases useful life.

K–Factor
Designed to reduce the heating effects of harmonic currents created by solid state loads.

Copper Wound
SolaHD general purpose transformers have standard aluminum coil windings. As an option, we offer a selection with copper windings.

Automation Transformers - Non-Ventilated 50 VA to 45 kVA, Drive Isolation 7.5 kVA to 440 kVA and Industrial Control 50 VA to 10 kVA

General Purpose
Dry-type transformers, 600 Volt Class, isolation type, single and three phase. Indoor and outdoor models available.

Hazardous Location (Encapsulated)
Comply with Article 500 of the NEC for Class I, Division 2, Group A-D locations.

Buck–Boost
Used for outdoor or designer low voltage lighting. When connected properly, these transformers can be used to raise or lower the supply voltage to match the needs of the load.

Drive Isolation
Designed to handle the mechanical stresses, voltage demands and harmonics associated with SCR applications. See Section 2.

Industrial Control
The units supply inrush current demands of electromagnetic loads and control applications. See Section 5.

Selection Steps

A. An online transformer product selector is available in the Transformer section of our website or you can use the following steps below to manually select a transformer.

B. Find the electrical load requirements. These are:

1. Load operating voltage.
2. Load frequency (expressed in Hz).
3. Determine load size - usually expressed in kVA, amperage or horsepower.
4. Is the load designed to operate on single phase or three phase power?

This information is available from the equipment manufacturer and is typically listed on the nameplate of the equipment.

C. Know the supply voltage conditions:

1. Available source voltage.
2. Available source frequency (a transformer will not change frequency. The frequency of the supply voltage and the needed load voltage must be equal).
3. Number of phases on power source.

D. Determine the transformer kVA rating:

1. If the load is expressed in kVA, select the appropriate transformer from the following selection charts (make sure the selected transformer's kVA rating is equal to or greater than the required load kVA).

2. If the load is expressed in amperage, use either the appropriate kVA formula listed below or the appropriate sizing chart on the next page.

$$kVA\ (1Ø) = \frac{Volts \times Amps}{1000}$$

$$kVA\ (3Ø) = \frac{Volts \times Amps \times 1.732}{1000}$$

3. If the load is expressed in wattage, either utilize the formula below to convert to kVA or refer to the equipment nameplate to obtain amperage requirement.

$$kVA = \frac{Wattage}{(1000 \times Power\ Factor\ of\ the\ load)}$$

4. If the load is a motor and expressed in horsepower, refer to the motor horsepower charts on the next page.

Some sizes may require an optional weather shield (order separately) for outdoor use.

Always size the transformer to the load requirements.

Single Phase: Full Load Current Chart

kVA Rating	120 V	208 V	240 V	277 V	480 V	600 V
Amperes						
0.05	0.42	0.24	0.21	0.18	0.1	0.08
0.075	0.63	0.36	0.31	0.27	0.16	0.13
0.1	0.83	0.48	0.42	0.36	0.21	0.17
0.15	1.3	0.72	0.63	0.54	0.31	0.25
0.25	2.1	1.2	1	0.9	0.52	0.42
0.5	4.2	2.4	2.1	1.8	1.4	0.83
0.75	6.3	3.6	3.1	2.7	1.6	1.3
1	8.3	4.8	4.2	3.6	2.1	1.7
1.5	12.5	7.2	6.3	5.4	3.1	2.5
2	16.7	9.6	8.3	7.2	4.2	3.3
3	25	14.4	12.5	10.8	6.3	5
5	41.7	24	20.8	18.1	10.4	8.3
7.5	62.5	36.1	31.3	27.1	15.6	12.5
10	83.3	48.1	41.7	36.1	20.8	16.7
15	125	72.1	62.5	54.2	31.3	25.0
25	208.3	120.2	104.2	90.3	52.1	41.7
37.5	312.5	180.3	156.3	135.4	78.1	62.5
50	416.7	240.4	208.3	180.5	104.2	83.3
75	625	361	313	271	156	125.0
100	833	481	417	361	208	167.0
167	1392	803	696	603	348	278.0
200	1667	962	833	722	417	333.0
250	2083	1202	1042	903	521	417.0

Three Phase: Full Load Current Chart

kVA Rating	208 V	240 V	480 V	600 V
Amperes				
3	8.3	7.2	3.6	2.9
6	16.7	14.4	7.2	5.8
9	25	21.7	10.8	8.7
15	41.6	36.1	18	14.4
30	83.3	72.2	36.1	28.9
45	125	108.3	54.1	43.3
75	208.2	180.4	90.2	72.2
112.5	312	271	135	108.0
150	416	361	180	144.0
225	625	541	271	217.0
300	833	722	361	289.0
500	1388	1203	601	481.0

Single Phase Motor Chart: AC, Motor Horsepower Amperage

Horse Power	115 V	208 V	230 V	460 V	575 V	Mini Tfmr. kVA	Std. NEMA kVA Size
1/6	4.4	2.4	2.2	1.1	0.9	0.53	0.75
¼	5.8	3.2	2.9	1.4	1.2	0.7	0.75
1/3	7.2	4	3.6	1.8	1.4	0.87	1
½	9.8	5.4	4.9	2.5	2	1.2	1.5
¾	13.8	7.6	6.9	3.5	2.8	1.7	2
1	16	8.8	8	4	3.2	1.9	2
1½	20	11	10	5	4	2.4	3
2	24	13.2	12	6	4.8	2.9	3
3	34	18.7	17	8.5	6.8	4.1	5
5	56	30.8	28	14	11.2	6.7	7.5
7.5	80	44	40	21	16	9.6	10
10	100	55	50	26	20	12	15

Three Phase Motor Chart: AC, Motor Horsepower Amperage

Horse Power	208 V	230 V	460 V	575 V	Mini Tfmr. kVA	Std. NEMA kVA Size
½	2.2	2	1	0.8	0.9	3.0
¾	3.1	2.8	1.4	1.1	1.2	3.0
1	4	3.6	1.8	1.4	1.5	3.0
1½	5.7	5.2	2.6	2.1	2.1	3.0
2	7.5	6.8	3.4	2.7	2.7	3.0
3	10.7	9.6	4.8	3.9	3.8	6.0
5	16.7	15.2	7.6	6.1	6.3	9.0
7½	24	22	11	9	9.2	15.0
10	31	28	14	11	11.2	15.0
15	46	42	21	17	16.6	30.0
20	59	54	27	22	21.6	30.0
25	75	68	34	27	26.6	30.0
30	88	80	40	32	32.4	45.0
40	114	104	52	41	43.2	45.0
50	143	130	65	52	52	75.0
60	170	154	77	62	64	75.0
75	211	192	96	77	80	112.5
100	273	248	124	99	103	112.5
125	342	312	156	125	130	150.0
150	396	360	180	144	150	150.0
200	528	480	240	192	200	225.0

Three things to keep in mind:

A. Motor horsepower charts are based on 1800 RPM squirrel cage induction motors. If using another type of motor, check running amperage against the chart and adjust as necessary.

B. Increase required transformer kVA by 20% if motors are started more than once per hour.

C. If your motor service factor is greater than 1, proportionally increase full load amperage. (i.e. – if service factor is 1.10, increase full load amperage by 10%).

Are there any special application considerations?

A. **For ambient conditions over 40°C,** derate the transformer nameplate kVA by 8% for each 10°C above 40°C.

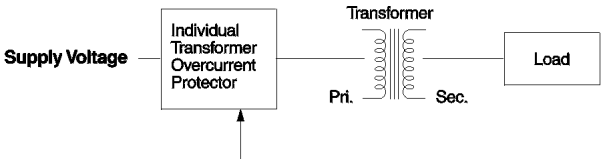
B. **For high altitude applications,** derate the transformer nameplate kVA by 0.3% for every 330 feet over 3300 feet above sea level. This assures proper transformer convection cooling.

C. Some applications may require a transformer design that limits the BTU output of the unit at full load or a design to withstand and mitigate specific electrical anomalies.

Overcurrent Protection

Fusing and circuit breaker protection. How to overcurrent protect 600 Volt class transformers and associated wiring per NEC 450-3(b) and NEC 240-3.

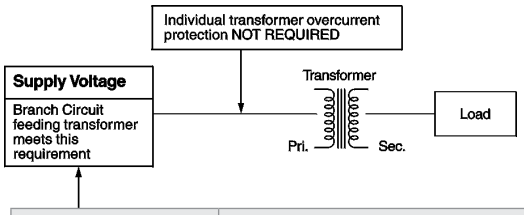
1. Primary protection only is required if the transformer is single-phase and the secondary has only two wires. Overcurrent protection rating and location are shown in Diagram A.



Primary Current	Overcurrent Protection Rating
Less than 2 amps	300% maximum
2 to 9 amps	167% maximum
9 amps or more	125% of rated primary current (or next highest standard rating)

Diagram A

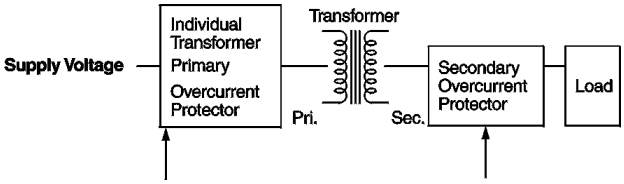
2. If the branch circuit feeding the transformer has overcurrent protection to meet the individual protection requirements in Example 1, then individual transformer protection is ***not*** required.



Primary Current	Overcurrent Protection Rating
Less than 2 amps	300% maximum
2 to 9 amps	167% maximum
9 amps or more	125% of rated primary current (or next highest standard rating)

Diagram B

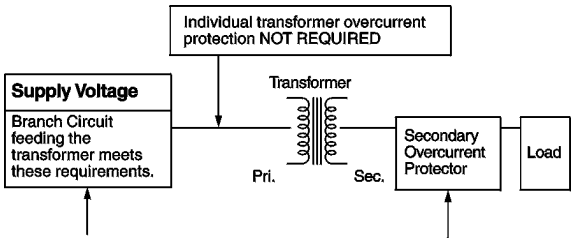
3. Primary and secondary protection is required if the transformer has more than two wires on the secondary circuit.



Primary Current	Secondary Current	Overcurrent Protection Rating
250% primary current	Less than 9 amps	167% maximum
Not more than 250%	9 amps or more	125% (or next higher standard rating)

Diagram C

4. If the branch circuit feeding the transformer has overcurrent protection to meet the individual primary overcurrent protection requirements in Example 3, then individual primary protection is ***not*** required. Secondary OCP is required as shown below.



Primary Current	Secondary Current	Overcurrent Protection Rating
250% primary current	Less than 9 amps	167% maximum
Not more than 250%	9 amps or more	125% (or next higher standard rating)

Diagram D

Section 240.6 (a) of the 2008 National Electrical Code*

The standard ampere ratings for fuses and inverse time circuit breakers shall be considered 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 700, 800, 1000, 1200, 1600, 2000, 2500, 3000, 4000, 5000 and 6000 amperes. Additional standard ratings for fuses shall be considered 1, 3, 6, 10 and 601. The use of fuses and inverse time circuit breakers with nonstandard ampere ratings shall be permitted.

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Primary Fuse Recommendations

	Primary Voltage												
V_{in}	120	200	208	220	230	240	277	440	460	480	550	575	600
VA													
50	1.25 (2)	.75 (1.25)	.6 (1.13)	.6 (1.13)	.6 (1)	.6 (1)	.5 (.8)	.3 (.5)	.3 (.5)	.3 (.5)	.25 (.4)	.25 (.4)	.25 (.4)
75	1.8 (3)	1.13 (1.8)	1 (1.8)	1 (1.6)	.8 (1.6)	.8 (1.5)	.8 (1.25)	.5 (.8)	.4 (.8)	.4 (.75)	.4 (.6)	.3 (.6)	.3 (.6)
100	2.5 (4)	1.5 (2.5)	1.4 (2.25)	1.25 (2.25)	1.25 (2)	1.25 (2)	1 (1.8)	.6 (1.13)	.6 (1)	.6 (1)	.5 (.8)	.5 (.8)	.5 (.8)
150	3.5 (6.25)	2.25 (3.5)	2 (3.5)	2 (3.2)	1.8 (3.2)	1.8 (3)	1.6 (2.5)	1 (1.6)	.8 (1.6)	.8 (1.5)	.8 (1.25)	.75 (1.25)	.75 (1.25)
200	5 (8)	3 (5)	2.8 (4.5)	2.5 (4.5)	2.5 (4)	2.5 (4)	2 (3.5)	1.25 (2.25)	1.25 (2)	1.25 (2)	1 (1.8)	1 (1.5)	1 (1.6)
250	3 (5)	3.5 (6.25)	3.5 (6)	3.2 (5.6)	3.2 (5)	3 (5)	2.5 (4.5)	1.6 (2.8)	1.6 (2.5)	1.5 (2.5)	1.25 (2.25)	1.25 (2)	1.25 (2)
300	4 (6.25)	4.5 (7.5)	4 (7)	4 (6.25)	3.5 (6.25)	3.5 (6.25)	3.2 (5)	2 (3.2)	1.8 (3.2)	1.8 (3)	1.6 (2.5)	1.5 (2.5)	1.5 (2.5)
350	4.5 (7)	5 (8)	5 (8)	4.5 (7.5)	4.5 (7.5)	4 (7)	3.5 (6.25)	2.25 (3.5)	2.25 (3.5)	2 (3.5)	1.8 (3)	1.8 (3)	1.75 (2.5)
500	6.25 (10)	4 (6.25)	4 (6)	3.5 (5.6)	3.5 (5)	3 (5)	5 (9)	3.2 (5.6)	3.2 (5)	3 (5)	2.5 (4.5)	2.5 (4)	2.5 (4)
750	10 (15)	6.25 (9)	6 (9)	5.6 (8)	5 (8)	5 (7.5)	8 (12)	5 (8)	4.5 (8)	4.5 (7.5)	4 (6.25)	3.5 (6.25)	3.5 (6.25)
1000	12 (20)	8 (12)	8 (12)	7.5 (10)	7 (10)	6.25 (10)	10 (17.5)	3.5 (5.6)	3.6 (5)	3 (5)	5 (9)	5 (8)	5 (8)
1500	17.5 (30)	12 (15)	12 (15)	10 (15)	10 (15)	10 (15)	15 (25)	5.6 (8)	5 (8)	5 (7.5)	4.5 (6.25)	4.5 (6.25)	4.5 (6.25)
2000	25 (40)	15 (25)	15 (20)	15 (20)	12 (20)	12 (20)	20 (35)	7.5 (10)	7 (10)	6.25 (10)	6 (9)	5.6 (8)	5 (8)
3000	35 (60)	20 (35)	20 (35)	17.5 (30)	17.5 (30)	20 (30)	35 (50)	10 (15)	10 (15)	10 (15)	9 (12)	8 (12)	8 (12)
5000	60 (100)	35 (60)	30 (60)	30 (50)	30 (50)	30 (50)	60 (90)	15 (25)	15 (25)	15 (25)	12 (20)	12 (20)	12 (20)
7500	80 (150)	50 (90)	45 (90)	45 (80)	45 (80)	40 (70)	90 (125)	25 (40)	25 (40)	20 (35)	20 (30)		
10K	110 (200)	70 (125)	60 (110)	60 (110)	60 (110)	60 (100)	110 (175)	30 (50)	30 (50)	30 (50)	25 (45)		
15K	175 (300)	100 (175)	90 (175)	90 (150)	90 (150)	80 (150)	175 (250)	45 (80)	45 (80)	40 (70)	35 (60)		
25K	300 (500)	175 (300)	150 (300)	150 (250)	150 (250)	150 (250)	90 (250)	60 (70)	70 (125)	70 (125)	60 (110)		
37K						200 (350)				100 (175)			80 (150)
50K						300 (500)				150 (250)			110 (200)
75K						400 (750)				200 (350)			175 (300)
100K						600 (1000)				300 (500)			225 (400)
167K						900 (1600)				450 (850)			350 (650)

*Fuse = I*300% next size smaller if primary current is less than 2 amp. No secondary fusing required.*
*(Fuse) = (I*500%) next size smaller if used for a motor control circuit per NEC 430-72[C] exception No. 4*

*Fuse = I*167% next size smaller if primary current is less than 9 amp. No secondary fusing required.*
*(Fuse) = (I*250%) next size smaller if primary current is less than 9 Amps. Secondary fusing is required see chart for size.*

*Fuse = I*125% next size higher if primary current is 9 amp. or higher. No secondary fusing required.*
*(Fuse) = (I*250%) next size smaller if primary current is 9 Amps. or higher. Secondary fusing is required see chart for size.*

Recommended fuse sizes per UL 508 and NEC450-3 (B) (1), NED 430-72 and commercially available type fuses.

Primary Overcurrent Protection

A transformer has all the same component parts as a motor, and like a motor, exhibits an inrush when energized. This inrush current is dependent upon where in the sine wave the transformer was last turned off in relation to the point of the sinewave you are when you energize the transformer. Although transformer inrush could run up to 30 to 35 times full load current under no load, it typically is the same as a motor...about 6 to 8 times normal running current. For this reason it is important to use a dual element slow blow type fuse - the same type of fuse you would use with a motor. If using a circuit breaker, select a breaker with a time delay – again the same type you would use with a motor. If the time delay is not sufficient, you may experience "nuisance tripping" – a condition where the breaker trips when energizing the transformer but when you try it again, it works fine.

Secondary Overcurrent Protection

Overcurrent devices are used between the output terminals of the transformer and the load for three reasons:

1. Protect the transformer from load electrical anomalies.
2. Since short circuit current is minimized, a smaller gauge wire may be used between the transformer and the load.
3. Per NEC, a larger primary fuse may be used to reduce nuisance tripping.

Secondary Fuse Recommendations

Secondary Voltage							
V_{OUT}	24	110	115	120	220	230	240
VA	Secondary Time Delay Dual Element Slow–Blow Fuse						
50	3.2	0.75	0.6	0.6	0.3	0.3	0.3
75	5	1.125	1	1	0.5	0.5	0.5
100	6.25	1.5	1.4	1.25	0.75	0.6	0.6
150	10	2.25	2	2	1.13	1	1
200	12	3	2.8	2.5	1.5	1.4	1.25
250	15	3.5	3.5	3.2	1.8	1.8	1.6
300	20	4.5	4	4	2.25	2	2
350	20	5	5	4.5	2.5	2.5	2.25
500	30	7.5	7	6.25	3.5	3.5	3.2
750	40	10	10	10	5.6	5	5
1000		12	12	12	7	7	6.25
1500		17.5	17.5	17.5	10	10	10
2000		25	25	25	12	12	12
3000		35	35	35	17.5	17.5	17.5
5000		60	60	60	30	30	30
7500		90	90	80	45	45	40
10K		125	110	110	60	60	60
15K		175	175	175	90	90	80
25K		300	300	300	150	150	150
37.5K				400			200
50K				600			300
75K				800			400
100K				1200			600
167K				1800			900

Fuse = I*167% next size smaller if secondary current is less than 9 amp.

Fuse = I*125% next size smaller if secondary current is 9 amp. or higher.

The Energy Policy Act of 2005 (H.R. 6) requires Distribution Transformers manufactured after January 1, 2007 to meet specific energy efficiency requirements. EPAct 2005 defines the term “distribution transformers” as any transformer which:

- Has an input voltage of 34.5 kVA or less
- Has an output voltage of 600 V or less
- Is rated for operation at a frequency of 60 Hz
- Has a capacity of 10 kVA to 2500 kVA for liquid-immersed units and 15 kVA to 2500 kVA for dry-type units

The following special purpose transformers are excluded from the definition of “distribution transformers” and are, therefore, not required to meet the energy efficiency standards at this time:

- Autotransformers
- Drive (isolation) transformers
- Grounding transformers
- Machine-tool (control) transformers
- Non-ventilated transformers
- Rectifier and Regulating transformers
- Sealed transformers
- Special-impedance transformers
- Testing transformers
- Transformer with tap range of 20% or more
- Uninterruptible power supply transformers
- Welding transformers

Benefiting from Higher Energy Efficiencies

Increasing the energy efficiency of a transformer allows the unit to operate at the same level of power with less energy being wasted in the process. Decreasing usage through reduced waste by just .03% over the next 20 years cuts the need for new power generation in the United States by 60 to 66 million kw.

SolaHD has been engineering and producing energy efficient transformers for the past six years. The SolaHD E version transformers are optimized to meet NEMA’s TP-1 limits for load losses calculated to 35% of the name plate rating, yet are the same compact size and footprint as its’ conventional 150˚C rise units.

The example pictured in Figure 1 shows the differences in efficiency for the old standard model compared to the compliant model. At 35% load, the absolute difference in efficiency is only 1.7%. However, that represents a 52% reduction in wasted energy. Taking that 52% reduction in wasted energy and multiplying it across all the energy consumed results in substantial savings.

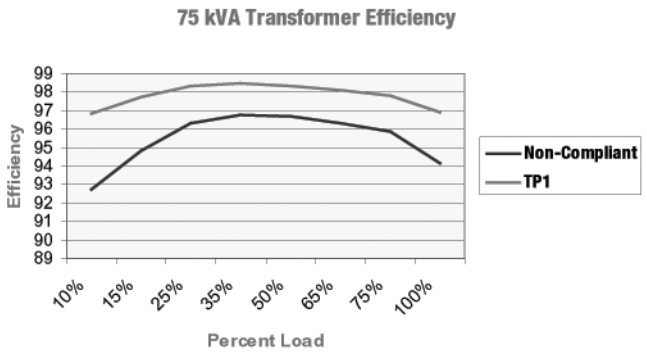

Figure 1

SolaHD offers the following family of transformers that meet the strict efficiency standards. The efficiencies of these transformers are optimized for the load losses calculated at 35% of the name plate rating. This 35% represents an industry average load of most LVGP transformers.

Applications

Any situation where the available voltage must be changed to accommodate the voltage required by the specific electrical circuit or connected equipment. For many electrical circuits, the National Electrical Code (NEC) requires a separately derived neutral secondary connection provided by Delta-Wye connected transformers.

Distribution transformers can be located close to the load. No vaults are required for installation and no long, expensive feeder lines are needed. Common applications include inductive and resistive loads such as motors, lighting and heating.

General Purpose Transformers

Transformers designed to meet the high energy efficiencies required by NEMA Standard TP-1.

Low Temperature Rise Transformers

Transformers designed to limit the temperature rise of the core and coil assembly to either 80°C or 115°C above a 40°C ambient. Reduction in temperature rise increases reliability.

K-Factor Transformers

Transformers designed to withstand the electrical anomalies associated with solid state equipment and DC power supplies (excluding SCR variable speed motor drives) without derating the nameplate kVA.

Copper Wound Transformers

SolaHD general purpose transformers have standard aluminum coil windings. As an option, we offer a selection with copper windings.

General Purpose

Energy efficient dry-type transformers 600 Volt Class, isolation type, single and three phase, 15 kVA through 500 kVA. Indoor and outdoor models available.

UL Listed
E25872

Accessories and Optional Design Styles

- Electrostatic shield for quality power
- Wall mounting brackets (500 lbs maximum) (Item WB1C)
- Weather Shields (UL-3R)*
- Stainless Steel Enclosures
- Totally enclosed non-ventilated designs (TENV) (Non UL)
- Open core and coil designs (UL Recognized)
- Copper Wound designs
- Low temperature designs

Features

- UL-3R ventilated outdoor enclosures when used with optional weather shields (order separately)
- UL Class 220°C insulation system, 150°C temperature rise under full load
- Terminal board connections and spacious wiring compartment
- Panel enclosure design reduces labor time. Wiring diagram on inside front cover.
- High efficiency for low cost operation
- Compliant to NEMA TP-1 Standards
- Single and three phase availability
- Fast delivery
- 10 year warranty

Selection Tables: Single Phase

Group 1: 240 x 480 Volt Primary, 120/240 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ES5H15S**	**WS–15**	28	16	16	210	1	1	62.5/31.3	125/62.5
25	**ES5H25S**	**WS–15**	28	16	16	245	1	1	104/52.1	208/104
37.5	**ES5H37S**	**WS–17**	31	18	18	340	1	1	156/78	313/156
50	**ES5H50S**	**WS–17**	31	18	18	415	1	1	208/104	416/208
75	**ES5H75S**	**WS–09**	44	23	21	610	1	1	313/156	625/313
100	**ES5H100S**	**WS–09**	44	23	21	705	1	1	417/208	833/417
167	**ES5H167S**	**WS–16**	46	26	24	980	1	1	695/348	1392/695

Group 2 – 120/208/240/277 Volt Primary, 120/240 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn	Primary Amps @ 277 V	Secondary Amps
15	**ES12H15S**	**WS–15**	28	16	16	215	1	2	54.2	125/62.5
25	**ES12H25S**	**WS–15**	28	16	16	250	1	2	90.3	208/104

Notes:

* Weather shields (set of two) must be ordered separately.

**Design Style and Electrical Connections can be found on pages 204-205.

Selection Tables: Single Phase

Group 3 – 600 Volt Primary, 120/240 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ES10H15S**	**WS–15**	28	16	16	175	1	4	25	125/62.5
25	**ES10H25S**	**WS–15**	28	16	16	265	1	4	41.7	208/104
37.5	**ES10H37S**	**WS–17**	31	18	18	340	1	4	62.5	313/156
50	**ES10H50S**	**WS–17**	31	18	18	410	1	4	83.3	416/208
75	**ES10H75S**	**WS–09**	44	23	21	655	1	4	125	625/313
100	**ES10H100S**	**WS–09**	44	23	21	750	1	4	167	833/417
167	**ES10H167S**	**WS–16**	46	26	24	980	1	4	278	1392/695

Group 4 – Export 190/200/208/220/380/400/415/440 Volt Primary, 110/220 Secondary, 50/60 Hz
Export 200/208/–/230/400/415/–/460 Volt Primary, 115/230 Secondary, 50/60 Hz
Export 208/–/–/240/415/–/–/480 Volt Primary, 120/240 Secondary, 60 Hz only

CE UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height inch (mm)	Width inch (mm)	Depth inch (mm)	Approx. Ship Weight – lbs (kg)	Design Style**	Elec Conn	Primary Amps @ 220/440 V	Secondary Amps
15	**ES14H15S**	**WS–15**	28 (711.2)	16 (406.4)	16 (406.4)	210 (95.25)	1	3	68.2/34.1	136.4/68.2
25	**ES14H25S**	**WS–15**	28 (711.2)	16 (406.4)	16 (406.4)	265 (120.20)	1	3	113.6/56.8	227.3/113.6

Notes:

* Weather shields (set of two) must be ordered separately.
**Design Style and Electrical Connections can be found on pages 199-200.

Selection Tables: Three Phase

Group A: 480 Volt Δ Primary, 208/120 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET2H15***	**WS–02**	23	18	14	187	1	5	18.1	41.7
	ET2H15S									
30	**ET2H30***	**WS–14**	28	23	16	292	1	5	36.1	83.4
	ET2H30S									
45	**ET2H45***	**WS–14**	28	23	16	376	1	5	54.2	125.0
	ET2H45S									
75	**ET2H75***	**WS–30**	34	28	22	569	1	5	90.3	208.0
	ET2H75S									
112.5	**ET2H112S**	**WS–30**	34	28	22	768	1	5	135.0	313.0
150	**ET2H150S**	**WS–10**	44	33	21	933	1	5	181.0	417.0
225	**ET2H225S**	**WS–11**	46	36	24	1342	1	5	271.0	625.0
300	**ET2H300S**	**WS–11**	46	36	24	1525	1	5	361.0	834.0
500	**ET2H500S**	**WS–12**	65	45	35	2460	1	5	602.0	1390.0

Notes:

* Weather shields (set of two) must be ordered separately.
** Design Style and Electrical Connections can be found on pages 199-200.
*** Unshielded model.

Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

Selection Tables: Three Phase

Group B: 480 Volt Δ Primary, 240 Volt Δ, Secondary with reduced capacity center tap***, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	ET5H15****	WS–02	23	19	14	189	1	6	18.1	36.1
	ET5H15S									
30	ET5H30****	WS–14	28	23	16	292	1	6	36.1	72.3
	ET5H30S									
45	ET5H45****	WS–14	28	23	16	381	1	6	54.2	108.0
	ET5H45S									
75	ET5H75****	WS–30	34	28	22	560	1	6	90.3	181.0
	ET5H75S									
112.5	ET5H112S	WS–30	34	28	22	760	1	6	135.0	271.0
150	ET5H150S	WS–10	44	33	21	940	1	6	181.0	361.0
225	ET5H225S	WS–11	46	36	24	1342	1	6	271.0	542.0
300	ET5H300S	WS–11	46	36	24	1525	1	6	361.0	723.0
500	ET5H500S	WS–12	65	45	35	2460	1	6	602.0	1204.0

Group C: 480 Volt Δ Primary, 480Y/277 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	ET81H15S	WS–02	23	18	14	189	1	8	18.1	18.1
30	ET81H30S	WS–14	28	23	16	295	1	8	36.1	36.1
45	ET81H45S	WS–14	28	23	16	380	1	8	54.2	54.2
75	ET81H75S	WS–30	34	28	22	560	1	8	90.3	90.3
112.5	ET81H112S	WS–30	34	28	22	780	1	8	135.0	135.0
150	ET81H150S	WS–10	44	33	21	933	1	8	181.0	181.0
225	ET81H225S	WS–11	46	36	24	1342	1	8	271.0	271.0
300	ET81H300S	WS–11	46	36	24	1525	1	8	361.0	361.0
500	ET81H500S	WS–12	65	45	35	2460	1	8	602.0	602.0

Group D: 208 Volt Δ Primary, 480Y/277 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	ET84H15S	WS–02	23	18	14	195	1	10	41.7	18.1
30	ET84H30S	WS–14	28	23	16	295	1	10	83.4	36.1
45	ET84H45S	WS–14	28	23	16	375	1	10	125.0	54.2
75	ET84H75S	WS–30	34	28	22	570	1	10	208.0	90.3
112.5	ET84H112S	WS–30	34	28	22	780	1	10	313.0	135.0
150	ET84H150S	WS–10	44	33	21	972	1	10	417.0	181.0

Notes:

* Weather shields (set of two) must be ordered separately.
** Electrical Connections and Design Style can be found on pages 197 and 204 respectively.
*** See the Technical Notes section with respect to capacity of center tap.
**** Unshielded model.

Selection Tables: Three Phase

Group E: 208 Volt Δ Primary, 208Y/120 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET3H15S**	**WS–02**	23	18	14	190	1	9	41.7	41.7
30	**ET3H30S**	**WS–14**	28	23	16	295	1	9	83.4	83.4
45	**ET3H45S**	**WS–14**	28	23	16	380	1	9	125.0	125.0
75	**ET3H75S**	**WS–30**	34	28	22	570	1	9	208.0	208.0
112.5	**ET3H112S**	**WS–30**	34	28	22	805	1	9	313.0	313.0
150	**ET3H150S**	**WS–10**	44	33	21	972	1	9	416.0	416.0

Group F: 240 Volt Δ Primary, 208Y/120 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET6H15S**	**WS–02**	23	18	14	190	1	11	36.1	41.7
30	**ET6H30S**	**WS–14**	28	23	16	295	1	11	72.3	83.4
45	**ET6H45S**	**WS–14**	28	23	16	380	1	11	108.0	125.0
75	**ET6H75S**	**WS–30**	34	28	22	570	1	11	181.0	208.0
112.5	**ET6H112S**	**WS–30**	34	28	22	805	1	11	271.0	313.0
150	**ET6H150S**	**WS–10**	44	33	21	972	1	11	361.0	417.0

Group G: 240 Volt Δ Primary, 480Y/277 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET85H15S**	**WS–02**	23	18	14	190	1	12	36.1	18.1
30	**ET85H30S**	**WS–14**	28	23	16	295	1	12	72.3	36.1
45	**ET85H45S**	**WS–14**	28	23	16	380	1	12	108.0	54.2
75	**ET85H75S**	**WS–30**	34	28	22	560	1	12	181.0	90.3
112.5	**ET85H112S**	**WS–30**	34	28	22	805	1	12	271.0	135.0
150	**ET85H150S**	**WS–10**	44	33	21	972	1	12	361.0	181.0

Group H: 600 Volt Δ Primary, 208Y/120 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET7H15S**	**WS–02**	23	18	14	190	1	13	14.5	41.7
30	**ET7H30S**	**WS–14**	28	23	16	292	1	13	28.9	83.4
45	**ET7H45S**	**WS–14**	28	23	16	376	1	13	43.4	125.0
75	**ET7H75S**	**WS–30**	34	28	22	570	1	13	72.3	208.0
112.5	**ET7H112S**	**WS–30**	34	28	22	770	1	13	108.0	313.0
150	**ET7H150S**	**WS–10**	44	33	21	933	1	13	145.0	417.0
225	**ET7H225S**	**WS–11**	46	36	24	1325	1	13	217.0	625.0
300	**ET7H300S**	**WS–11**	46	36	24	1525	1	13	289.0	834.0
500	**ET7H500S**	**WS–12**	65	45	35	2460	1	13	482.0	1390.0

Notes:

* Weather shields (set of two) must be ordered separately.

** Design Style and Electrical Connections can be found on pages 204-205.

Selection Tables: Three Phase

Group I: 600 Volt Δ Primary, 480Y/277 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET71H15S**	**WS–02**	23	18	14	190	1	14	14.5	18.1
30	**ET71H30S**	**WS–14**	28	23	16	292	1	14	28.9	36.1
45	**ET71H45S**	**WS–14**	28	23	16	380	1	14	43.4	54.2
75	**ET71H75S**	**WS–30**	34	28	22	560	1	14	72.3	90.3
112.5	**ET71H112S**	**WS–30**	34	28	22	770	1	14	108.2	135.3
150	**ET71H150S**	**WS–10**	44	33	21	933	1	14	144.3	180.4

Group J: 480 Volt Δ Primary, 380Y/220 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET79H15S**	**WS–02**	23	18	14	190	1	7	18.1	22.8
30	**ET79H30S**	**WS–14**	28	23	16	292	1	7	36.1	45.6
45	**ET79H45S**	**WS–14**	28	23	16	380	1	7	54.2	68.4
75	**ET79H75S**	**WS–30**	34	28	22	360	1	7	90.3	114.0
112.5	**ET79H112S**	**WS–30**	34	28	22	770	1	7	135.3	170.9
150	**ET79H150S**	**WS–10**	44	33	21	933	1	7	180.4	227.9

Group K: 480 Volt Δ Primary, 208Y/120 Secondary, 60 Hz, Copper-Wound

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET2H15SCU**	**WS–02**	23	18	14	205	1	5	18.1	41.7
30	**ET2H30SCU**	**WS–14**	28	23	16	305	1	5	36.1	83.4
45	**ET2H45SCU**	**WS–14**	28	23	16	405	1	5	54.2	125.0
75	**ET2H75SCU**	**WS–30**	34	28	22	535	1	5	90.3	208.0
112.5	**ET2H112SCU**	**WS–30**	34	28	22	805	1	5	135.0	313.0
150	**ET2H150SCU**	**WS–10**	44	33	21	972	1	5	181.0	417.0
225	**ET2H225SCU**	**WS–11**	46	36	24	1325	1	5	271.0	625.0
300	**ET2H300SCU**	**WS–11**	46	36	24	1515	1	5	361.0	834.0
500	**ET2H500SCU**	**WS–12**	65	45	35	2460	1	5	602.0	1390.0

Notes:

* Weather shields (set of two) must be ordered separately.

** Design Style and Electrical Connections can be found on pages 204-205.

Low Temperature Rise

SolaHD low temperature rise transformers feature a 220°C insulation system and temperature rise of only 80°C or 115°C under full nameplate load. The result is 13-21% lower operating losses than conventional 150°C rise units. Reduction in temperature rise increases reliability.

The 35°C thermal reserve on 115°C rise units and 70°C reserve on 80°C rise units definitely mean higher reliability. The extra benefit is being able to operate either of these transformers as a 150°C rise unit and have a short term overload capacity of 15-30% *without* compromising normal life expectancy (See Figure 2).

Low temperature rise transformers are designed for any critical application requiring extra overload capability, lower than average total losses and/or cooler operating temperatures. All are available with either a 115°C or 80°C thermal rise and a Class 220°C insulation system.

Accessories and Optional Design Styles

- Wall mounting brackets (500 lbs maximum) (Item WB1C)
- Weather Shields (UL-3R)*
- Stainless Steel Enclosures
- Totally enclosed non-ventilated designs (TENV) (Non UL)
- Open core and coil designs (UL Recognized)
- Copper Wound designs
- Compliant to NEMA TP-1 standards

* Not all optional designs are UL listed. Contact Technical Services.

UL Listed E25872

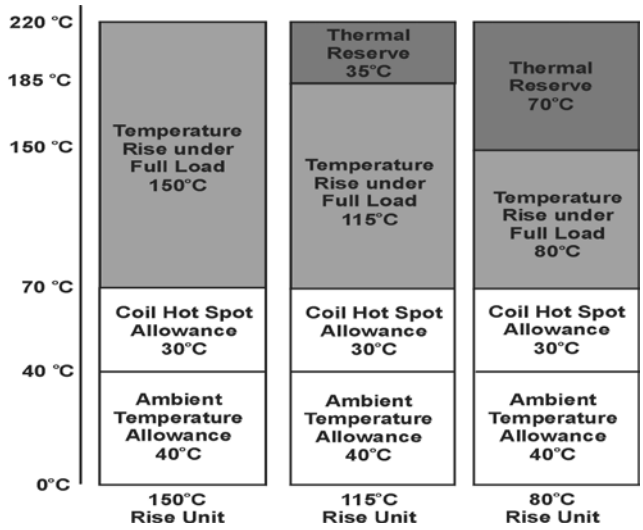

Figure 2

Selection Tables: Low Temperature Rise, Single Phase, *80°C Rise*

Group 1: 240 x 480 Volt Primary, 120/240 Secondary, 60 Hz, *80°C Rise*

UL Listed E25872

kVA	Catalog Number 80°C Rise	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ES5HB15S**	**WS–15**	28	16	16	265	1	1	62.5/31.3	125/62.5
25	**ES5HB25S**	**WS–17**	31	18	18	340	1	1	104/52.1	208/104
37.5	**ES5HB37S**	**WS–17**	31	18	18	425	1	1	156/78	313/156
50	**ES5HB50S**	**WS–09**	44	23	21	655	1	1	208/104	416/208
75	**ES5HB75S**	**WS–09**	44	23	21	750	1	1	313/156	625/313
100	**ES5HB100S**	**WS–16**	46	26	24	980	1	1	417/208	833/417

Notes:

* Weather shields (set of two) must be ordered separately.

**Design Style and Electrical Connections can be found on pages 204-205.

Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

Selection Tables: Low Temperature Rise, Single Phase, *80°C Rise*

Group 2: 600 Volt Primary, 120/240 Secondary, 60 Hz, *80°C Rise*

UL Listed E25872

kVA	Catalog Number 80°C Rise	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ES10HB15S**	**WS–15**	28	16	16	265	1	4	25.0	125/62.5
25	**ES10HB25S**	**WS–17**	31	18	18	340	1	4	41.7	208/104
37.5	**ES10HB37S**	**WS–17**	31	18	18	425	1	4	62.5	313/156
50	**ES10HB50S**	**WS–09**	44	23	21	655	1	4	83.3	416/208
75	**ES10HB75S**	**WS–09**	44	23	21	750	1	4	125.0	625/313
100	**ES10HB100S**	**WS–16**	46	26	24	980	1	4	167.0	833/417

Selection Tables: Low Temperature Rise, Three Phase, *80°C Rise*

Group A: 480 Δ Primary, 208Y/120 Secondary, 60 Hz, *80°C Rise*

UL Listed E25872

kVA	Catalog Number 80°C Rise	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET2HB15S**	**WS–14**	28	23	16	292	1	5	18.1	41.7
30	**ET2HB30S**	**WS–14**	28	23	16	376	1	5	36.1	83.4
45	**ET2HB45S**	**WS–30**	34	28	22	569	1	5	54.2	125.0
75	**ET2HB75S**	**WS–30**	34	28	22	768	1	5	90.3	208.0
112.5	**ET2HB112S**	**WS–10**	44	33	21	933	1	5	135.0	313.0
150	**ET2HB150S**	**WS–11**	46	36	24	1342	1	5	181.0	417.0
225	**ET2HB225S**	**WS–11**	46	36	24	1525	1	5	271.0	625.0
300	**ET2HB300S**	**WS–12**	65	45	35	2460	1	5	361.0	834.0

Group B: 480 Δ Primary, 240 Δ Secondary with 120V Reduced Capacity Center Tap*,** *80°C Rise*

UL Listed E25872

kVA	Catalog Number 80°C Rise	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET5HB15S**	**WS–14**	28	23	16	292	1	6	18.1	36.1
30	**ET5HB30S**	**WS–14**	28	23	16	381	1	6	36.1	72.3
45	**ET5HB45S**	**WS–30**	34	28	22	580	1	6	54.2	108.0
75	**ET5HB75S**	**WS–30**	34	28	22	760	1	6	90.3	181.0
112.5	**ET5HB112S**	**WS–10**	44	33	21	940	1	6	135.0	271.0
150	**ET5HB150S**	**WS–11**	46	36	24	1342	1	6	181.0	361.0
225	**ET5HB225S**	**WS–11**	46	36	24	1525	1	6	271.0	542.0
300	**ET5HB300S**	**WS–12**	65	45	35	2460	1	6	361.0	723.0

Notes:

* Weather shields (set of two) must be ordered separately.

**Design Style and Electrical Connections can be found on pages 204-205.

***See the Technical Notes section with respect to capacity of center tap.

Selection Tables: Low Temperature Rise, Single Phase, *115°C Rise*

Group 1: 240 x 480 Volt Primary, 120/240 Secondary, 60 Hz, *115°C Rise*

UL Listed E25872

kVA	Catalog Number 115°C Rise	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ES5HF15S**	**WS–15**	28	16	16	210	1	1	62.5/31.3	125/62.5
25	**ES5HF25S**	**WS–15**	28	16	16	245	1	1	104/52.1	208/104
37.5	**ES5HF37S**	**WS–17**	31	18	18	340	1	1	156/78	313/156
50	**ES5HF50S**	**WS–17**	31	18	18	425	1	1	208/104	416/208
75	**ES5HF75S**	**WS–09**	44	23	21	610	1	1	313/156	625/313
100	**ES5HF100S**	**WS–09**	44	23	21	750	1	1	417/208	833/417

Group 2: 600 Volt Primary, 120/240 Secondary, 60 Hz, *115°C Rise*

UL Listed E25872

kVA	Catalog Number 115°C Rise	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ES10HF15S**	**WS–15**	28	16	16	175	1	4	25	125/62.5
25	**ES10HF25S**	**WS–15**	28	16	16	265	1	4	41.7	208/104
37.5	**ES10HF37S**	**WS–17**	31	18	18	340	1	4	62.5	313/156
50	**ES10HF50S**	**WS–17**	31	18	18	425	1	4	83.3	416/208
75	**ES10HF75S**	**WS–09**	44	23	21	655	1	4	125	625/313
100	**ES10HF100S**	**WS–09**	44	23	21	750	1	4	167	833/417

Notes:

* Weather shields (set of two) must be ordered separately.

**Design Style and Electrical Connections can be found on pages 204-205.

Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

Selection Tables: Low Temperature Rise, Three Phase, *115°C Rise*

Group A: 480 Δ Primary, 208Y/120 Secondary, 60 Hz, *115°C Rise*

UL Listed E25872

kVA	Catalog Number 115°C Rise	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET2HF15S**	**WS–02**	23	18	14	187	1	5	18.1	41.7
30	**ET2HF30S**	**WS–14**	28	23	16	292	1	5	36.1	83.4
45	**ET2HF45S**	**WS–14**	28	23	16	378	1	5	54.2	125.0
75	**ET2HF75S**	**WS–30**	34	28	22	569	1	5	90.3	208.0
112.5	**ET2HF112S**	**WS–30**	34	28	22	768	1	5	135.0	313.0
150	**ET2HF150S**	**WS–10**	44	33	21	933	1	5	181.0	417.0
225	**ET2HF225S**	**WS–11**	46	36	24	1342	1	5	271.0	625.0
300	**ET2HF300S**	**WS–11**	46	36	24	1525	1	5	361.0	834.0

Group B: 480 Volt Δ Primary, 240 Volt Δ, Secondary with reduced capacity center tap, 60 Hz, *115°C Rise*

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield**	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**ET5HF15S**	**WS–02**	23	19	14	189	1	6	18.1	36.1
30	**ET5HF30S**	**WS–14**	28	23	16	292	1	6	36.1	72.3
45	**ET5HF45S**	**WS–14**	28	23	16	381	1	6	54.2	108.0
75	**ET5HF75S**	**WS–30**	34	28	22	560	1	6	90.3	181.0
112.5	**ET5HF112S**	**WS–30**	34	28	22	760	1	6	135.0	271.0
150	**ET5HF150S**	**WS–10**	44	33	21	940	1	6	181.0	361.0
225	**ET5HF225S**	**WS–11**	46	36	24	1342	1	6	271.0	542.0
300	**ET5HF300S**	**WS–11**	46	36	24	1525	1	6	361.0	723.0

Notes:

* Weather shields (set of two) must be ordered separately.

**Design Style and Electrical Connections can be found on pages 204-205.

***See the Technical Notes section with respect to capacity of center tap.

K-Factor Transformers

K-Factor transformers are designed to reduce the heating effects of harmonic currents created by loads like those shown in Chart A. The K-Factor rating is an index of the transformer's ability to withstand harmonic content while operating within the temperature limits of its insulating system. SolaHD K-Factor transformers have UL ratings of K-4, K-13, and K-20.

The SolaHD K-Factor design is a specialized transformer that offers these benefits:

- Conductors capable of carrying the harmonic currents of non-linear loads without exceeding the temperature rating of the insulation system.
- A transformer design that takes into account the increase in naturally occurring "stray" losses caused by non-linear loads. These losses cause standard transformers to dramatically overheat and substantially shorten design life.
- A core and coil design that manages the DC flux caused by triplen harmonics. As these harmonics increase, they cause additional current to circulate in the delta winding. This produces a DC flux in the core which leads to core saturation, voltage instability and overheating.

Features

- Conductors to carry harmonics of a K-rated load without exceeding insulation temperature ratings
- UL 1561 listed up to K-20 rated protection
- Rated temperature rise of 150°C, 220°C insulation
- Shielded for quality power
- Basic design takes "stray losses" into account and functions within safe operating temperatures
- Core and coil design engineered to manage the zero sequence flux caused by triplen harmonics
- Provides 100% rated current without overheating the windings or saturating the core

Listed
E25872

Accessories and Optional Design Styles*

- Wall mounting brackets (500 lbs maximum) (Item WB1C)
- Weather Shields (UL-3R)
- Totally enclosed non-ventilated designs (TENV) (Non UL)
- Low temperature rise units available
- Open core and coil designs (UL Recognized)
- Copper Wound designs
- Alternate voltages
- Compliant to NEMA TP-1 Standards

* Not all optional designs are UL listed. Contact Technical Services.

Chart A: Typical Load K-Factors

Load	K-Factor
Electric discharge lighting	K-4
UPS with optional input filter	K-4
Welders	K-4
Induction heating equipment	K-4
PLCs and solid state controls	K-4
Telecommunications equipment (e.g.. PBX)	K-13
UPS without input filtering	K-13
Multiwire receptacle circuits in general care areas of health care facilities and classrooms of schools, etc.	K-13
Multi-wire receptacle circuits supplying inspection or testing equipment on an assembly or production line	K-13
Mainframe computer loads	K-20
Solid state motor drives (variable speed drives)	K-20

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Selection Tables: Three Phase

Group A: K–4 Rated 480 Δ Primary, 208Y/120 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**3H4T2H15S**	**WS–02**	23	18	14	187	1	5	18.1	41.7
30	**3H4T2H30S**	**WS–14**	28	23	16	292	1	5	36.1	83.4
45	**3H4T2H45S**	**WS–14**	28	23	16	376	1	5	54.2	125.0
75	**3H4T2H75S**	**WS–30**	34	28	22	569	1	5	90.3	208.0
112.5	**3H4T2H112S**	**WS–30**	34	28	22	768	1	5	135.0	313.0
150	**3H4T2H150S**	**WS–10**	44	33	21	933	1	5	181.0	417.0
225	**3H4T2H225S**	**WS–11**	46	36	24	1342	1	5	271.0	625.0
300	**3H4T2H300S**	**WS–11**	46	36	24	1525	1	5	361.0	834.0
500	**3H4T2H500S**	**WS–12**	65	45	35	2460	1	5	602.0	1390.0

Group B: K–13 Rated 480 Δ Primary, 208Y/120 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**3H13T2H15S**	**WS–14**	28	23	16	305	1	5	18.1	41.7
30	**3H13T2H30S**	**WS–14**	28	23	16	405	1	5	36.1	83.4
45	**3H13T2H45S**	**WS–30**	34	28	22	590	1	5	54.2	125.0
75	**3H13T2H75S**	**WS–30**	34	28	22	805	1	5	90.3	208.0
112.5	**3H13T2H112S**	**WS–10**	44	33	21	972	1	5	135.0	313.0
150	**3H13T2H150S**	**WS–11**	46	36	24	1325	1	5	181.0	417.0
225	**3H13T2H225S**	**WS–11**	46	36	24	1515	1	5	271.0	625.0
300	**3H13T2H300S**	**WS–12**	65	45	35	2460	1	5	361.0	834.0

Group C: K–20 Rated 480 Δ Primary, 208Y/120 Secondary, 60 Hz

UL Listed E25872

kVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
15	**3H20T2H15S**	**WS–14**	28	23	16	305	1	5	18.1	41.7
30	**3H20T2H30S**	**WS–14**	28	23	16	405	1	5	36.1	83.4
45	**3H20T2H45S**	**WS–30**	34	28	22	590	1	5	54.2	125.0
75	**3H20T2H75S**	**WS–30**	34	28	22	805	1	5	90.3	208.0
112.5	**3H20T2H112S**	**WS–10**	44	33	21	972	1	5	135.0	313.0
150	**3H20T2H150S**	**WS–11**	46	36	24	1325	1	5	181.0	417.0
225	**3H20T2H225S**	**WS–11**	46	36	24	1515	1	5	271.0	625.0
300	**3H20T2H300S**	**WS–12**	65	45	35	2460	1	5	361.0	834.0

Notes:

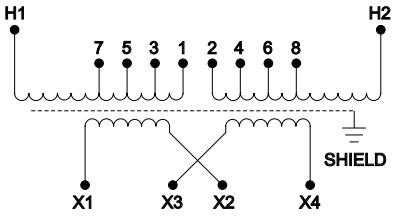
* Weather shields (set of two) must be ordered separately.

**Design Style and Electrical Connections can be found on pages 204-205.

Electrical Connections (Single Phase)

240 x 480 Volt Primary,
120/240 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2**½**% FCBN

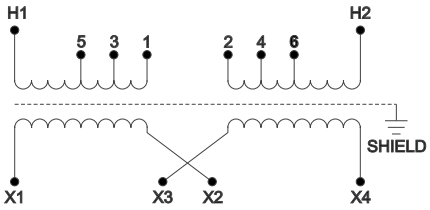
1



Primary Voltage	Interconnect	Connect Lines To
504	1 to 2	H1 & H2
492	2 to 3	H1 & H2
480	3 to 4	H1 & H2
468	4 to 5	H1 & H2
456	5 to 6	H1 & H2
444	6 to 7	H1 & H2
432	7 to 8	H1 & H2
252	H1 to 2 H2 to 1	H1 & H2
240	H1 to 4 H2 to 3	H1 & H2
228	H1 to 6 H2 to 5	H1 & H2
216	H1 to 8 H2 to 7	H1 & H2
Secondary Voltage	**Interconnect**	**Connect Lines To**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1-X2-X4
120	X1 to X3 X2 to X4	X1 & X4
ES5 Series		

120/208/240/277 Volt Primary,
120/240 Volt Secondary
Taps: None

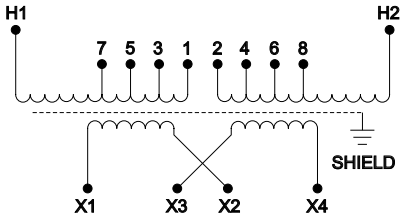
2



Primary Voltage	Interconnect	Connect Lines To
277	1 to 2	H1 & H2
240	3 to 4	H1 & H2
208	5 to 6	H1 & H2
120	H1 to 4 H2 to 3	H1 & H2
Secondary Voltage	**Interconnect**	**Connect Lines To**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1-X2-X4
120	X1 to X3 X2 to X4	X1 & X4
ES12 Series		

600 Volt Primary,
120/240 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

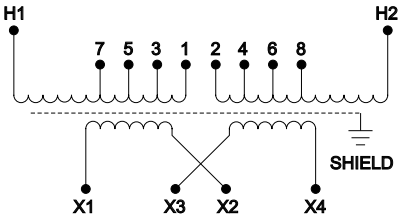
4



Primary H1-H2-H3	Interconnect	Connect Lines To
630	1 to 2	H1 & H2
615	2 to 3	H1 & H2
600	3 to 4	H1 & H2
585	4 to 5	H1 & H2
570	5 to 6	H1 & H2
555	6 to 7	H1 & H2
540	7 to 8	H1 & H2
Secondary Voltage	**Interconnect**	**Connect Lines To**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1-X2-X4
120	X1 to X3 X2 to X4	X1 & X4
ES10 Series		

190/200/208/220/380/400/415/440 Volt Pri.,
110/220 Volt Secondary
Taps: None

3

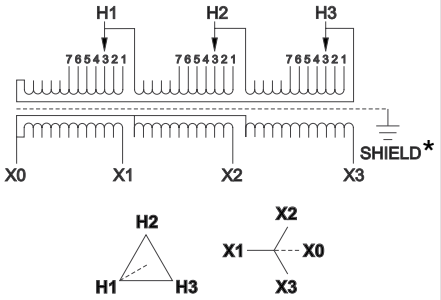


Primary Voltage	Interconnect	Connect Lines To
440	1 to 2	H1 & H2
415	3 to 4	H1 & H2
400	5 to 6	H1 & H2
380	7 to 8	H1 & H2
220	H1 to 2 1 to H2	H1 & H2
208	H1 to 4 3 to H2	H1 & H2
200	H1 to 6 5 to H2	H1 & H2
190	H1 to 8 7 to H2	H1 & H2
Secondary Voltage	**Interconnect**	**Connect Lines To**
220	X2 to X3	X1 & X4
110-0-110	X2 to X3 X2 to ⏚	X1-X2-X4
110	X1 to X3 X2 to X4	X1 & X4
ES14 Series		

Electrical Connections (Three Phase)

480 Δ Volt Primary,
208Y/120 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

5



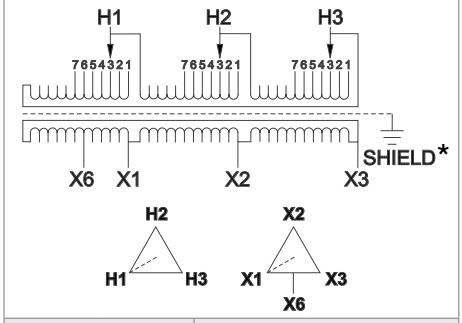
Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0- X1, X2, X3
1	504	208	120
2	492		
3	480		
4	468		
5	456		
6	444		
7	432		

ET2 and 3H Series

**Shield available in electrostatically shielded units only.*

480 Δ Volt Primary,
240 Δ W/120 CT Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

6



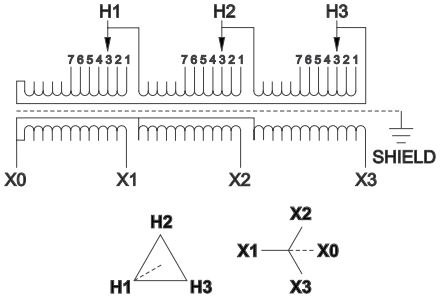
Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X6-X1, X6-X3
1	504	240	120
2	492		
3	480		
4	468		
5	456		
6	444		
7	432		

ET5 Series

**Shield available in electrostatically shielded units only.*

480 Δ Volt Primary
380/220 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

7

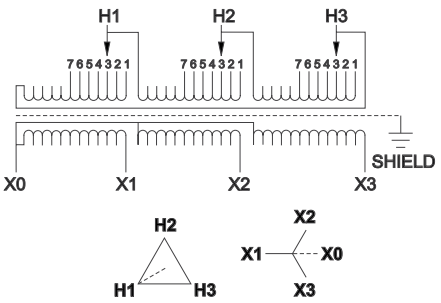


Primary H1–H2–H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0– X1, X2, X3
1	504	380	220
2	492		
3	480		
4	468		
5	456		
6	444		
7	432		

ET79 Series

480 Δ Volt Primary
480Y/277 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

8

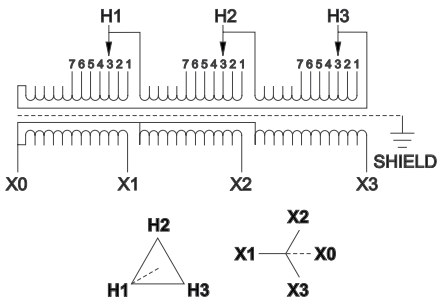


Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0- X1, X2, X3
1	504	480	277
2	492		
3	480		
4	468		
5	456		
6	444		
7	432		

ET81 Series

208 Δ Volt Primary
208Y/120 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

9

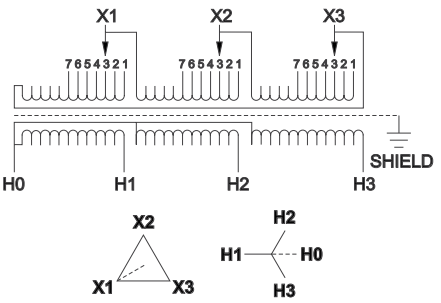


Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0- X1, X2, X3
1	218	208	120
2	213		
3	208		
4	203		
5	198		
6	192		
7	187		

ET3 Series

208 Δ Volt Primary
480Y/277 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

10



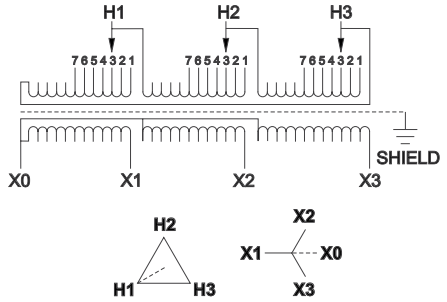
Primary X1-X2-X3		Secondary Voltage	
@ Tap	Voltage	H1-H2-H3	H0-H1, H2, H3
1	218	480	277
2	213		
3	208		
4	203		
5	198		
6	192		
7	187		

ET84 Series

Electrical Connections (Three Phase)

240 Δ Volt Primary
208Y/120 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

11

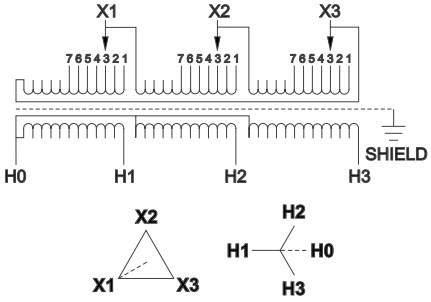


Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0- X1, X2, X3
1	252	208	120
2	246		
3	240		
4	234		
5	228		
6	222		
7	216		

ET6 Series

240 Δ Volt Primary
480Y/277 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

12

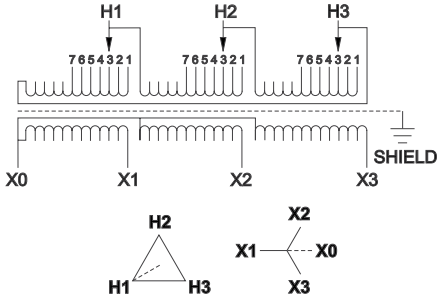


Primary X1–X2–X3		Secondary Voltage	
@ Tap	Voltage	H1, H2, H3	H0– H1, H2, H3
1	252	480	277
2	246		
3	240		
4	234		
5	228		
6	222		
7	216		

ET85 Series

600 Δ Volt Primary
208Y/120 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

13

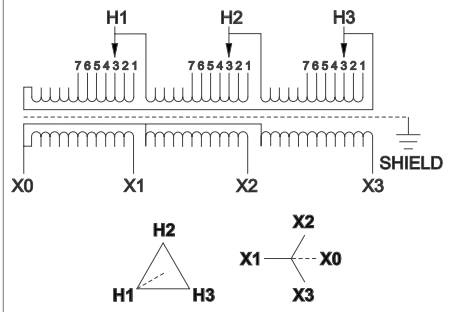


Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0- X1, X2, X3
1	630	208	120
2	615		
3	600		
4	585		
5	570		
6	555		
7	540		

ET7 Series

600 Δ Volt Primary
480Y/277 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

14



Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0- X1, X2, X3
1	630	480	277
2	615		
3	600		
4	585		
5	570		
6	555		
7	540		

ET71 Series

Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

Automation Transformers - Non-Ventilated 50 VA to 45 kVA

SolaHD encapsulated transformers are rated for Hazardous Locations (Class 1, Division 2, Group A-D) as well as harsh industrial environments. Encapsulation and rugged NEMA 3R enclosures protect the transformer from dust, moisture, and provide extra shock and vibration resistance. SolaHD UL listed transformers fully comply with the latest addition of the National Electrical Code for Class 1, Division 2, Group A-D locations when installed in compliance with NEC 501.100(B).

c UL us
E25872
E77014

Features

Single Phase: .05 – .250 kVA

- UL-3R non encapsulated enclosure for indoor and outdoor service
- Low temperature rise, UL Class 130°C or 180°C insulation system, 80°C temperature rise under full load
- Conduit knockouts for side entry into wiring compartment
- Copper lead wire terminations
- Class 1, Division 2

Single Phase: 0.500 – 25 kVA
Three Phase: 3 – 45 kVA

- UL-3R encapsulated enclosure for indoor and outdoor service
- Electrostatically shielded for quality power on sizes 1 kVA and larger
- UL Class 180°C or 200°C insulation system, 115°C temperature rise under full load
- Conduit knockouts for side entry into wiring compartment
- Copper lead wire terminations
- .500 - 45 kVA units are encapsulated with electrical grade silica and epoxy for industrial applications

Related Products

- Some SolaHD DC power supplies are available with Class 1, Division 2 ratings or encapsulation.
- Surge Protective Devices

Accessories and Optional Design Styles*

- Wall mounting brackets (500 lbs maximum) (Item WB1C)
- Weather Shields
- Stainless Steel Enclosures
- Totally enclosed non-ventilated designs (TENV)
- Open core and coil designs
- Copper Wound designs
- NEMA 4/12 or 4X Encapsulated Enclosures
- Low temperature designs available.

*Not all optional designs are UL listed. Contact Technical Services.

Note: Weights and dimensions may change and should not be used for construction purposes.

Selection Table: Single Phase

Group 1: 240 x 480 Primary, 120/240 Secondary, 60 Hz

c UL us E77014 E25872

kVA	Catalog Number Group I Rolled Steel	Catalog Number Group II Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn*	Primary Amps	Secondary Amps
Non–Encapsulated										
.050	**HS1B50**	**N/A**	6	4	3	3	2	15	.208/.104	0.416/0.208
.075	**HS1B75**		6	4	3	3	2	15	.312/.156	0.625/0.312
.100	**HS1B100**		6	4	3	4	2	15	.417/.208	0.833/0.417
.150	**HS1B150**		8	4	4	5	2	15	.625/.313	1.25/.625
.250	**HS1B250**		8	4	4	8	2	15	1.04/.512	2.08/1.04
Encapsulated										
0.5	**HS1F500B**	**HSS1F500B**	10	6	5	22	3	15	2.08/1.04	4.16/2.08
0.75	**HS1F750B**	**HSS1F750B**	10	6	5	27	3	15	3.13/1.56	6.25/3.13
1	**HS1F1BS**	**HSS1F1BS**	10	6	5	28	3	16	4.17/2.08	8.33/4.17
1.5	**HS1F1.5AS**	**HSS1F1.5AS**	12	10	7	38	4	16	6.25/3.13	12.5/6.25
2	**HS1F2AS**	**HSS1F2AS**	12	10	7	45	4	16	8.33/4.17	16.7/8.33
3	**HS5F3AS**	**HSS5F3AS**	12	10	7	55	4	17	12.5/6.25	25.0/12.5
5	**HS5F5AS**	**HSS5F5AS**	17	14	9	131	4	17	20.8/10.4	41.6/20.8
7.5	**HS5F7.5AS**	**HSS5F7.5AS**	17	14	9	156	4	18	31.3/15.6	62.5/31.3
10	**HS5F10AS**	**HSS5F10AS**	17	14	9	156	4	18	41.7/20.8	83.3./41.7
15	**HS5F15AS**	**HSS5F15AS**	30	29	12	549	4	18	62.5/31.2	125.0/62.5
25	**HS5F25AS**	**HSS5F25AS**	30	29	12	637	4	18	104.0/52.0	208.0/104.0

Group 2: 600 Volt Primary, 120/240 Secondary, 60 Hz

c UL us E77014

kVA	Catalog Number Group 1 Rolled Steel	Catalog Number Group 2 Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style*	Elec Conn*	Primary Amps	Secondary Amps
Non–Encapsulated										
.100	**HS10B100**	**N/A**	6	4	3	4	2	21	0.167	.833/.417
.150	**HS10B150**		8	4	4	5	2	21	0.25	1.25/.625
.250	**HS10B250**		8	4	4	8	2	21	0.417	2.08/1.04
Encapsulated										
.500	**HS10F500B**	**HSS10F500B**	10	6	5	22	3	21	0.833	4.16/2.08
.750	**HS10F750B**	**HSS10F750B**	10	6	5	23	3	21	1.25	6.25/3.13
1	**HS10F1BS**	**HSS10F1BS**	10	6	5	28	3	21	1.67	8.33/4.17
1.5	**HS10F1.5AS**	**HSS10F1.5AS**	12	10	7	38	4	21	2.5	12.5/6.25
2	**HS10F2AS**	**HSS10F2AS**	12	10	7	60	4	21	3.33	16.7/8.33
3	**HS10F3AS**	**HSS10F3AS**	12	10	7	66	4	22	5.0	25.0/12.5
5	**HS10F5AS**	**HSS10F5AS**	17	14	9	100	4	22	8.3	41.6/20.8
7.5	**HS10F7.5AS**	**HSS10F7.5AS**	17	14	9	135	4	22	12.5	62.5/31.3
10	**HS10F10AS**	**HSS10F10AS**	17	14	9	150	4	22	16.7	83.3/41.7

Note:

* Design Style and Electrical Connections can be found on pages 204-205.

Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

Selection Table: Single Phase

Group 3: 120/208/240/277 Volt Primary, 120/240 Secondary, 60 Hz

c UL us E77014

kVA	Catalog Number Group 1 Rolled Steel	Catalog Number Group 2 Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style*	Elec Conn*	Primary Amps @ 277 V	Secondary Amps
Encapsulated										
1	**HS12F1BS**	**HSS12F1BS**	10	6	5	29	3	19	3.6	8.33/4.17
1.5	**HS12F1.5AS**	**HSS12F1.5AS**	12	10	7	40	4	20	5.4	12.5/6.25
2	**HS12F2AS**	**HSS12F2AS**	12	10	7	60	4	20	7.2	16.7/8.33
3	**HS12F3AS**	**HSS12F3AS**	12	10	7	66	4	20	10.8	25.0/12.5
5	**HS12F5AS**	**HSS12F5AS**	17	14	9	104	4	20	18.0	41.6/20.8
7.5	**HS12F7.5AS**	**HSS12F7.5AS**	17	14	9	135	4	20	27.1	62.5/31.3
10	**HS12F10AS**	**HSS12F10AS**	17	14	9	156	4	20	36.1	83.3/41.7

Note:

* Design Style and Electrical Connections can be found on pages 204-205.

Group 4: Export 190/200/208/220/380/400/415/440 Volt Primary, 110/220 Secondary, 50/60 Hz Copper wound
Export 200/208/230/400/415/460 Volt Primary, 115/230 Secondary, 50/60 Hz Copper wound
Export 208/240/415/480 Volt Primary, 120/240 Secondary, 60 Hz only Copper wound

c UL us CE
E77014

kVA	Catalog Number Group 1 Rolled Steel	Catalog Number Group 2 Stainless Steel	Height inch (mm)	Width inch (mm)	Depth inch (mm)	Ship Weight Approx. – lbs (kg)	Design Style*	Elec Conn*	Primary Amps**	Secondary Amps
Encapsulated, Copper Wound										
1	**HS14F1BS**	**HSS14F1BS**	10 (254.0)	6 (152.4)	5 (127.0)	34 (15.42)	3	23	4.5/2.3	9.1/4.5
1.5	**HS14F1.5BS**	**HSS14F1.5BS**	12 (304.8)	10 (254.0)	7 (177.8)	40 (18.13)	4	24	6.8/3.4	13.6/6.8
2	**HS14F2BS**	**HSS14F2BS**	12 (304.8)	10 (254.0)	7 (177.8)	60 (27.21)	4	24	9.1/4.5	18.2/9.1
3	**HS14F3BS**	**HSS14F3BS**	12 (304.8)	10 (254.0)	7 (177.8)	73 (33.11)	4	24	13.6/6.8	27.3/13.6
5	**HS14F5BS**	**HSS14F5BS**	17 (431.8)	14 (355.6)	9 (228.6)	100 (45.36)	4	24	22.7/11.4	45.5/22.7
7.5	**HS14F7.5BS**	**HSS14F7.5BS**	17 (431.8)	14 (355.6)	9 (228.6)	140 (63.50)	4	24	34.1/17.0	68.2/34.1
10	**HS14F10BS**	**HSS14F10BS**	17 (431.8)	14 (355.6)	9 (228.6)	175 (79.38)	4	24	45.5/22.7	90.9/45.5

Notes:

* Design Style and Electrical Connections can be found on pages 204-205.

** Amperage calculated at 220/440 Volts on primary. UL Listed, CSA Certified and CE Marked. 240 & 480 V not available at 50 Hz.

Selection Tables: Three Phase

Group A: 480 Volt Δ Primary, 208Y/120 Secondary, 60 Hz

c UL us E77014 E25872

kVA	Catalog Number Group I Rolled Steel	Catalog Number Group II Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style	Elec Conn**	Primary Amps**	Secondary Amps
3	**HT1F3AS**	**HTS1F3AS**	13	16	9	105	4	27	3.6	8.3
6	**HT1F6AS**	**HTS1F6AS**	13	16	9	110	4	27	7.2	16.6
9	**HT1F9AS**	**HTS1F9AS**	17	20	11	250	4	27	10.8	25.0
15	**HT1F15AS**	**HTS1F15AS**	17	20	11	261	4	27	18.1	41.7
30*	**HT1F30AS**	**HTS1F30AS**	30	29	12	696	4	27	36.1	83.4
45*	**HT1F45AS**	**HTS1F45AS**	30	29	12	844	4	27	54.2	125.0

Group B: 208 Volt Δ Primary, 208Y/120 Secondary, 60 Hz

c UL us E77014

kVA	Catalog Number Group I Rolled Steel	Catalog Number Group II Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
3	**HT3F3AS**	**HTS3F3AS**	13	16	9	97	4	26	7.2	8.3
6	**HT3F6AS**	**HTS3F6AS**	13	16	9	141	4	26	14.4	16.6
9	**HT3F9AS**	**HTS3F9AS**	17	20	11	256	4	26	21.7	25.0

Group C: 480 Volt Δ Primary, 240 Volt Δ 120 Secondary with reduced capacity center tap, 60 Hz***

c UL us E77014 E25872

kVA	Catalog Number Group I Rolled Steel	Catalog Number Group II Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
3	**HT5F3AS**	**HTS5F3AS**	13	16	9	105	4	28	3.6	7.2
6	**HT5F6AS**	**HTS5F6AS**	13	16	9	110	4	28	7.2	14.4
9	**HT5F9AS**	**HTS5F9AS**	17	20	11	250	4	28	10.8	21.7
15	**HT5F15AS**	**HTS5F15AS**	17	20	11	305	4	28	18.1	36.1
30*	**HT5F30AS**	**HTS5F30AS**	29	25	12	698	4	28	36.1	72.2
45*	**HT5F45AS**	**HTS5F45AS**	29	25	12	876	4	28	54.2	108.3

Group D: 240 Volt Δ Primary, 208Y/120 Secondary, 60 Hz

c UL us E77014

kVA	Catalog Number Group I Rolled Steel	Catalog Number Group II Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
3	**HT6F3AS**	**HTS6F3AS**	13	16	9	97	4	25	7.2	8.3
6	**HT6F6AS**	**HTS6F6AS**	13	16	9	141	4	25	14.4	16.6
9	**HT6F9AS**	**HTS6F9AS**	17	20	11	256	4	25	21.7	25.0

* cUL Underwriters tested to CSA standards.

** Design Style and Electrical Connections can be found on pages 204-205.

*** See the Technical Notes section with respect to capacity of center tap.

Selection Tables: Three Phase

Group E: 480 Volt Δ Primary, 380Y/220 Secondary, 60 Hz

c UL us E77014

kVA	Catalog Number Group I Rolled Steel	Catalog Number Group II Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
3	**HT79F3AS**	**HTS79F3AS**	13	16	9	121	4	29	3.6	4.6
6	**HT79F6AS**	**HTS79F6AS**	13	16	9	141	4	29	7.2	9.1
9	**HT79F9AS**	**HTS79F9AS**	17	20	11	255	4	29	10.8	13.6

Group F: 600 Volt Δ Primary, 208Y/120 Secondary, 60 Hz

c UL us E77014

kVA	Catalog Number Group I Rolled Steel	Catalog Number Group II Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Ship Weight Approx. (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
3	**HT7F3AS**	**HTS7F3AS**	13	16	9	116	4	30	2.9	8.3
6	**HT7F6AS**	**HTS7F6AS**	13	16	9	145	4	30	5.8	16.6
9	**HT7F9AS**	**HTS7F9AS**	17	20	11	225	4	30	8.7	25.0

Group G: 208 Volt Δ Primary, 480Y/277 Secondary, 60 Hz

c UL us E77014

kVA	Catalog Number Group I Rolled Steel	Catalog Number Group II Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style	Elec Conn**	Primary Amps**	Secondary Amps
3	**HT84F3AS**	**HTS84F3AS**	13	16	9	97	4	31	8.3	3.6
6	**HT84F6AS**	**HTS84F6AS**	13	16	9	141	4	31	16.6	7.2
9	**HT84F9AS**	**HTS84F9AS**	17	20	11	256	4	31	25.0	10.8

Group H: 240 Volt Δ Primary, 480Y/277 Secondary, 60 Hz

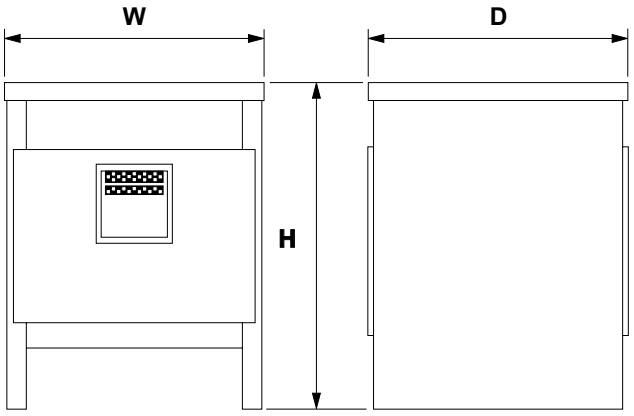
c UL us E77014

kVA	Catalog Number Group I Rolled Steel	Catalog Number Group II Stainless Steel	Height (inch)	Width (inch)	Depth (inch)	Approx. Ship Weight (lbs)	Design Style**	Elec Conn**	Primary Amps	Secondary Amps
3	**HT85F3AS**	**HTS85F3AS**	13	16	9	97	4	32	7.2	3.6
6	**HT85F6AS**	**HTS85F6AS**	13	16	9	141	4	32	14.4	7.2
9	**HT85F9AS**	**HTS85F9AS**	17	20	11	256	4	32	21.6	10.8

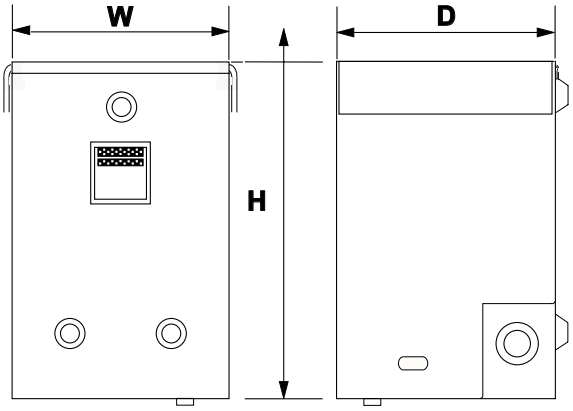
* cUL Underwriters tested to CSA standards.

** Design Styles and Electrical Connections can be found on pages 204-205.

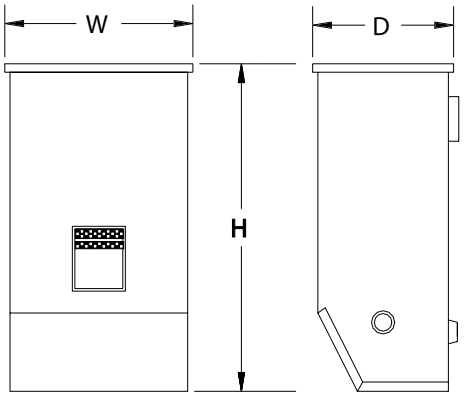
Design Styles



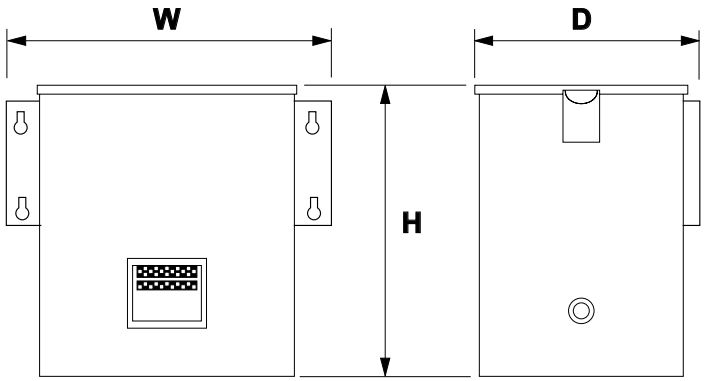
Style 1 - Ventilated



Style 2 - Non-Encapsulated

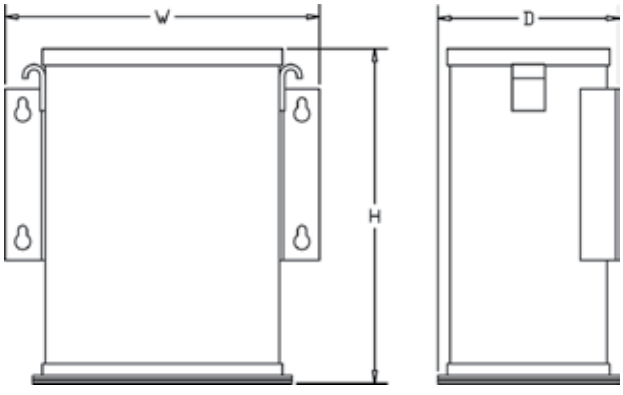


Style 3 - Encapsulated



Style 4 - Encapsulated

Customized Enclosures - Contact Technical Services



Style 5 - Encapsulated

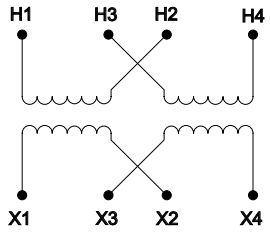
Available for all encapsulated kVA sizes (For NEMA 4, 12 and 4X)

Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

Electrical Connections (Single Phase)

240 X 480 Volt Primary
120/240 Volt Secondary
Taps: None

15

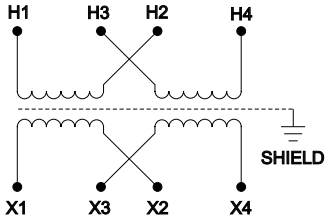


Primary Voltage	Interconnect	Connect Lines to
480	H2 to H3	H1 & H4
240	H1 to H3 H2 to H4	H1 & H4
Secondary Voltage	**Interconnect**	**Connect Lines to**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1-X2-X4
120	X1 to X3 X2 to X4	X1 & X4

HS1 Series

240 X 480 Volt Primary
120/240 Volt Secondary
Taps: None

16

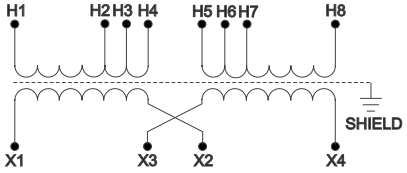


Primary Voltage	Interconnect	Connect Lines to
480	H2 to H3	H1 & H4
240	H1 to H3 H2 to H4	H1 & H4
Secondary Voltage	**Interconnect**	**Connect Lines to**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1-X2-X4
120	X1 to X3 X2 to X4	X1 & X4

HS1 Series

240 X 480 Volt Primary
120/240 Volt Secondary
Taps: 2, 2½% FCAN & FCBN

17

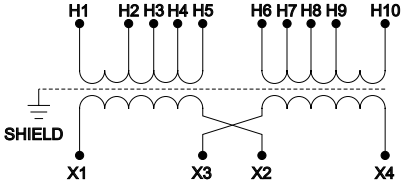


Primary Voltage	Interconnect	Connect Lines to
504	H4 to H5	H1 & H8
492	H3 to H5	H1 & H8
480	H3 to H6	H1 & H8
468	H2 to H6	H1 & H8
456	H2 to H7	H1 & H8
252	H1 to H5 H4 to H8	H1 & H8
240	H1 to H6 H3 to H8	H1 & H8
228	H1 to H7 H2 to H8	H1 & H8
Secondary Voltage	**Interconnect**	**Connect Lines to**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1-X2-X4
120	X1 to X3 X2 to X4	X1 & X4

HS5 Series

240 X 480 Volt Primary,
120/240 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

18

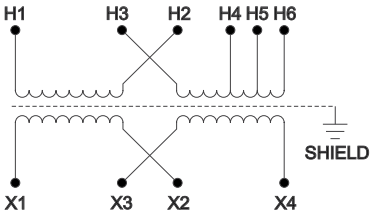


Primary Voltage	Interconnect	Connect Lines to
504	H5 to H6	H1 & H10
492	H4 to H6	H1 & H10
480	H4 to H7	H1 & H10
468	H3 to H7	H1 & H10
456	H3 to H8	H1 & H10
444	H2 to H8	H1 & H10
432	H2 to H9	H1 & H10
252	H1 to H6 H5 to H10	H1 & H10
240	H1 to H7 H4 to H10	H1 & H10
228	H1 to H8 H3 to H10	H1 & H10
216	H1 to H9 H2 to H10	H1 & H10
Secondary Voltage	**Interconnect**	**Connect Lines to**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1-X2-X4
120	X1 to X3 X2 to X4	X1 & X4

HS5 Series

120/208/240/277 Volt Primary
120/240 Volt Secondary
Taps: None

19

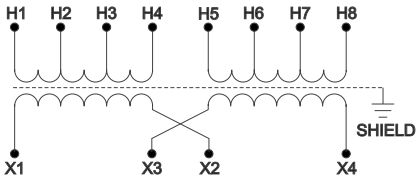


Primary Voltage	Interconnect	Connect Lines to
277	H2 to H3	H1 & H6
240	H2 to H3	H1 & H5
208	H2 to H3	H1 & H4
120	H1 to H3 H2 to H5	H1 & H5
Secondary Voltage	**Interconnect**	**Connect Lines to**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1-X2-X4
120	X1 to X3 X2 to X4	X1 & X4

HS12 Series (1 kVA only)

120/208/240/277 Volt Primary
120/240 Volt Secondary
Taps: None

20



Primary Voltage	Interconnect	Connect Lines to
277	H4 to H5	H1 & H8
240	H3 to H6	H1 & H8
208	H2 to H7	H1 & H8
120	H1 to H6 H3 to H8	H1 & H8
Secondary Voltage	**Interconnect**	**Connect Lines to**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1-X2-X4
120	X1 to X3 X2 to X4	X1 & X4

HS12 Series

⏚ = Earth Ground

Note:

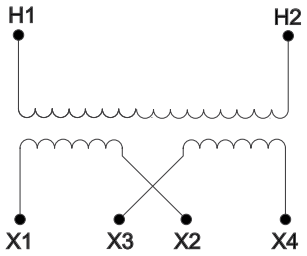
Connect the electrostatic shield to the equipment ground (green) or to both the equipment ground and the system ground (white). Specifications are subject to change without notice.

Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

Electrical Connections (Single Phase)

600 Volt Primary,
120/240 Volt Secondary
Taps: None

21

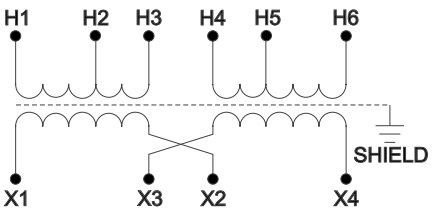


Primary Voltage	Interconnect	Connect Lines to
600		H1 & H2
Secondary Voltage	**Interconnect**	**Connect Lines to**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1, X2 & X4
120	X1 to X3 X2 to X4	X1 & X4
HS10 Series		

Note: 1 through 2 kVA units have electrostatic shielding.

600 Volt Primary
120/240 Volt Secondary
Taps: 2, 5% FCBN

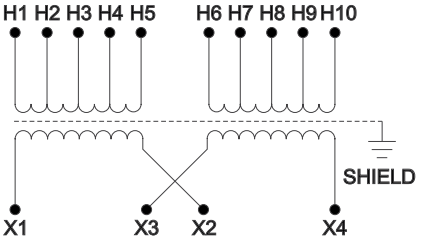
22



Primary Voltage	Interconnect	Connect Lines to
600	H3 to H4	H1 & H6
570	H2 to H4	H1 & H6
540	H2 to H5	H1 & H6
Secondary Voltage	**Interconnect**	**Connect Lines to**
240	X2 to X3	X1 & X4
120-0-120	X2 to X3 X2 to ⏚	X1-X2-X4
120	X1 to X3 X2 to X4	X1 & X4
HS10 Series		

190/200/208/220/380/400/415/440 Volt Pri.
110/220 Volt Secondary
Taps: None

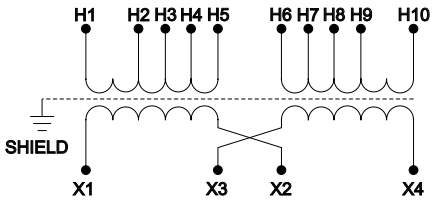
23



Primary Voltage	Interconnect	Connect Lines to
440	H5 to H6	H1 & H10
415	H4 to H6	H1 & H9
400	H3 to H6	H1 & H8
380	H2 to H6	H1 & H7
220	H1 to H6 H5 to H10	H1 & H10
208	H1 to H6 H4 to H9	H1 & H9
200	H1 to H6 H3 to H8	H1 & H8
190	H1 to H6 H2 to H7	H1 & H7
Secondary Voltage	**Interconnect**	**Connect Lines to**
220	X2 to X3	X1 & X4
110-0-110	X2 to X3 X2 to ⏚	X1, X2 & X4
110	X1 to X3 X2 to X4	X1 & X4
HS14 Series (1 kVA only)		

190/200/208/220/380/400/415/440 Volt Pri.
110/220 Volt Secondary
Taps: None

24



Primary Voltage	Interconnect	Connect Lines to
440	H5 to H6	H1 & H10
415	H4 to H7	H1 & H10
400	H3 to H8	H1 & H10
380	H2 to H9	H1 & H10
220	H1 to H6, H5 to H10	H1 & H10
208	H1 to H7, H4 to H10	H1 & H10
200	H1 to H8, H3 to H10	H1 & H10
190	H1 to H9 H2 to H10	H1 & H10
Secondary Voltage	**Interconnect**	**Connect Lines to**
220	X2 to X3	X1 & X4
110-0-110	X2 to X3 X2 to ⏚	X1, X2 & X4
110	X1 to X3 X2 to X4	X1 & X4
HS14 Series		

⏚ = Earth Ground

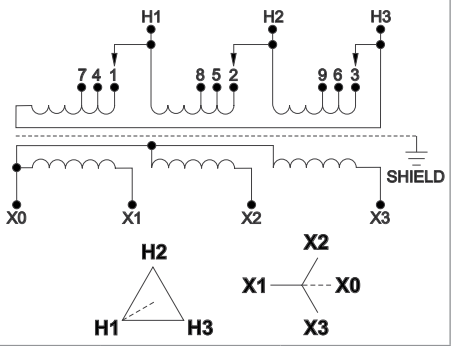
Notes:

Connect the electrostatic shield to the equipment ground (green) or to both the equipment ground and the system ground (white). Specifications are subject to change without notice.

Electrical Connections (Three Phase)

240 Δ Volt Primary 208Y/120 Volt Secondary
Taps: 2, 5% FCBN

25

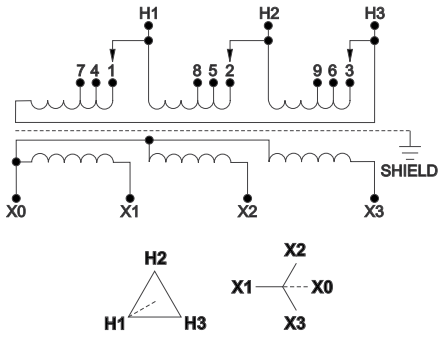


Primary Voltage	Connect Taps	Connect Lines To
240	1-H1 & 2-H2 & 3-H3	H1, H2, H3
228	4-H1 & 5-H2 & 6-H3	H1, H2, H3
216	7-H1 & 8-H2 & 9-H3	H1, H2, H3
Secondary Voltage		**Connect Lines To**
208		X1, X2, & X3
120		X0, X1, X2, X3

HT6 Series

208 Δ Volt Primary
208Y/120 Volt Secondary
Taps: 2, 5% FCBN

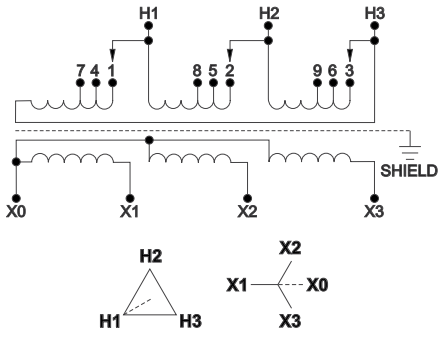
26



Primary Voltage	Connect Taps	Connect Lines To
208	1-H1 & 2-H2 & 3-H3	H1, H2, H3
198	4-H1 & 5-H2 & 6-H3	H1, H2, H3
187	7-H1 & 8-H2 & 9-H3	H1, H2, H3
Secondary Voltage		**Connect Lines To**
208		X1, X2, & X3
120		X0, X1, X2, X3

HT3 Series

480 Δ Volt Primary
208Y/120 Volt Secondary
Taps: 2, 5% FCBN

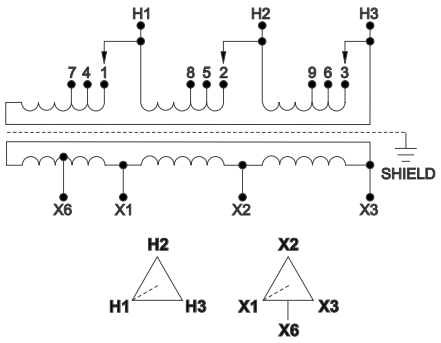


Primary Voltage	Interconnect	Connect Lines to
480	1-H1 & 2-H2 & 3- H3	H1, H2, H3
456	4-H1 & 5-H2 & 6- H3	H1, H2, H3
432	7-H1 & 8-H2 & 9- H3	H1, H2, H3
Secondary Voltage		**Connect Lines to**
208		X1, X2, & X3
120		X0, X1, X2, X3

HT1 Series

480 Δ Volt Primary
240 Δ w/120 CT Volt Secondary
Taps: 2, 5% FCBN

28

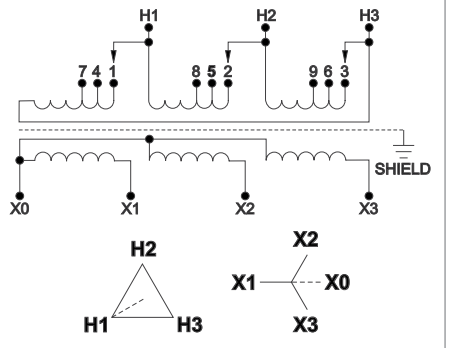


Primary Voltage	Connect Taps	Connect Lines To
480	1-H1 & 2-H2 & 3-H3	H1, H2, H3
456	4-H1 & 5-H2 & 6-H3	H1, H2, H3
432	7-H1 & 8-H2 & 9-H3	H1, H2, H3
Secondary Voltage	**Interconnect**	**Connect Lines To**
240		X1, X2, X3
120-0-120	X6 to ⏚	X1-X6-X3

HT5 Series

480 Δ Volt Primary
380Y/220 Volt Secondary
Taps: 2, 5% FCBN

29



Primary Voltage	Interconnect	Connect Lines to
480	1-H1 & 2-H2 & 3-H3	H1, H2 & H3
456	4-H1 & 5-H2 & 6-H3	H1, H2 & H3
432	7-H1 & 8-H2 & 9-H3	H1, H2 & H3
Secondary Voltage	**Interconnect**	**Connect Lines to**
380		X1, X2, X3
220		X0, X1, X2, X3

HT79 Series

⏚ = Earth Ground

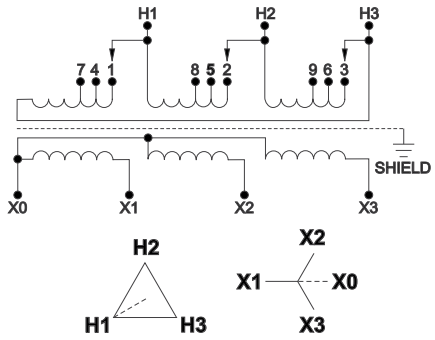
Notes:

Connect the electrostatic shield to the equipment ground (green) or to both the equipment ground and the system ground (white). Specifications are subject to change without notice.

Electrical Connections (Three Phase)

600 Δ Volt Primary
208Y/120 Volt Secondary
Taps: 2, 5% FCBN

30

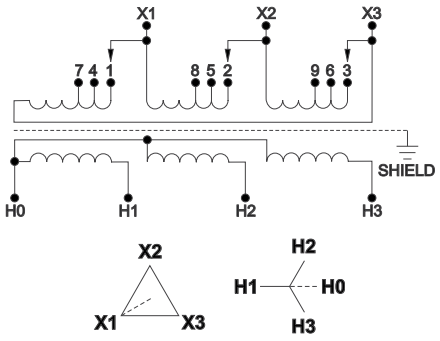


Primary Voltage	Connect Taps	Line Leads
600	1-H1 & 2-H2 & 3-H3	H1, H2, H3
570	4-H1 & 5-H2 & 6-H3	H1, H2, H3
540	7-H1 & 8-H2 & 9-H3	H1, H2, H3
Secondary Voltage		**Line Leads**
208		X1, X2, X3
120		X0, X1, X2, X3

HT7 Series

208 Δ Volt Primary
480Y/277 Volt Secondary
Taps: 2, 5% FCBN

31

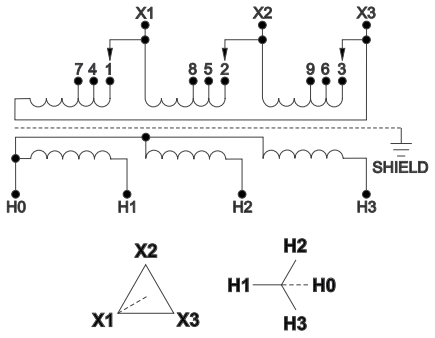


Primary Voltage	Connect Taps	Line Leads
208	1-X1 & 2-X2 & 3-X3	X1, X2, X3
198	4-X1 & 5-X2 & 6-X3	X1, X2, X3
187	7-X1 & 8-X2 & 9-X3	X1, X2, X3
Secondary Voltage		**Line Leads**
480		H1, H2, H3
277		H0, H1, H2, H3

HT84 Series

240 Δ Volt Primary
480Y/277 Volt Secondary
Taps: 2, 5% FCBN

32



Primary Voltage	Connect Taps	Line Leads
240	1-X1 & 2-X2 & 3-X3	X1, X2, X3
228	4-X1 & 5-X2 & 6-X3	X1, X2, X3
216	7-X1 & 8-X2 & 9-X3	X1, X2, X3
Secondary Voltage		**Line Leads**
480		H1, H2, H3
277		H0, H1, H2, H3

HT85 Series

Notes:

Connect the electrostatic shield to the equipment ground (green) or to both the equipment ground and the system ground (white). Specifications are subject to change without notice.

Custom Transformers

If you can't find what you are looking for here, please fill out the information below and submit to our Technical Services Group. We are happy to provide a quote on a custom transformer if available. SolaHD is pleased to offer the broadest range of transformers on the market including many custom designs.

Date:						
Customer Information						
Contact:				Phone/Fax:		
Address:				Email:		
City/State:						
Specifications*						
*Size (Required)		*Quantity		Temperature Rise (Check One)		
	☐ kVA		☐ One Time Buy	☐ 80°C ☐ 115°C ☐ 150°C		
	☐ VA		☐ Annual Usage			
Check all that apply:				**Enclosure Type (Check One)**		
Three Phase		Single Phase		VENTILATED	ENCAPSULATED	ENCLOSED (NON-UL)
☐ 50 Hz		☐ 60 Hz (Standard)		☐ Open Coil **	☐ NEMA 3R	☐ TENV
☐ Copper Windings		☐ Aluminum Windings (Standard)		☐ NEMA 1	☐ NEMA 3R (SS)	☐ TENV (SS)
No Electrostatic Shield				☐ NEMA 1 (SS)	☐ NEMA 4/12 (SS)	
☐ LVGP		☐ SCR Drive Isolation		☐ NEMA 3R (WSXX)	☐ NEMA 4X (SS)	
☐ Energy Star		☐ K-Factor 13		☐ NEMA 3R (SS)		
☐ K-Factor 4		☐ K-Factor 20		(SS) STAINLESS STEEL GRADE: ☐ Standard (304) ☐ Optional (316)		
☐ Other:						
Industrial Control Transformers						
☐ ICE ☐ HSZ Series ☐ Other:						
***Primary Voltage**				**Secondary Voltage**		
☐ 120	Taps:	☐ Standard		☐ 120		
☐ 208		☐ Other		☐ 208		
☐ 240				☐ 240		
☐ 480	If 3 Phase:	☐ Delta (Standard)		☐ 480	If 3 Phase:	☐ Delta (Standard)
☐ 600		☐ Wye		☐ 600		☐ Wye
☐ Other Voltage: _____				☐ Other Voltage: _____		
Agency Certifications						
Check all that apply: ☐ UL ☐ CSA or cUL ☐ CE ☐ Other: _____						
Additional Information						
Please quote a Catalog or Design Number ☐ Similar to :						
(if "similar to" note changes above) ☐ Exactly Like:						
*Does this request pertain to a bid specification? ☐ Yes ☐ No						

Specification Guide for Low Voltage, General Purpose, Dry Type Transformers (600 Volt Class) - .05 kVA to 500 kVA

General

Single and three phase distribution transformers (600 Volt and below)

- Provide and install, as referenced on the electrical plans, enclosed dry type transformers as manufactured by SolaHD or approved equal.

Standards

- Transformers must be listed by Underwriters Laboratory, evaluated to CSA standards and designed, constructed and rated in accordance with NEMA ST 20 and applicable IEEE & OSHA specifications. Certain units are compliant with the TP-1 standards enacted by the Energy Policy Act of 2005.

Construction

Cores

- All transformer cores shall be constructed of low loss, high quality, electrical grade laminate steel. By design, the flux density is to be kept well below the saturation level to reduce audible sound level and minimize core losses. The core volume shall allow operation at 10% above rated primary voltage at no load without exceeding the temperature rise of the unit.

Coils

- Coil conductors shall be either aluminum or copper and must be continuous. The entire core and coil assembly shall be impregnated with a thermal setting varnish and cured to reduce hot spots in the coils and seal out moisture. Coils with exposed magnet wire will not be acceptable. Transformers shall have common core construction.

- All transformers 1 kVA or larger shall incorporate a faraday (electrostatic) shield between primary and secondary windings for the attenuation of voltage spikes, line noise and voltage transients.

- General purpose transformers are classified as isolation transformers.

Electrostatic Shield

- For power conditioning purposes, it is recommended that isolation transformers be equipped with electrostatic shielding between the primary and secondary windings. An electrostatic shield provides a conducting path to ground that reduces the effect of coupling between primary and secondary windings and improves the isolation transformer's ability to isolate its' load from the common-mode noise present on the input power source. Electrostatic shields significantly reduce or eliminate electrical disturbances on the line from being transmitted to the sensitive load.

Enclosures

- Transformer enclosures shall be constructed of heavy gauge sheet steel and coated with a grey powder paint finish (ANSI 61). Enclosures shall be UL/NEMA Type 1/3R rated for outdoor use. This information must be listed on the transformer nameplate.

- Maximum transformer enclosure temperature will not exceed 65°C rise above a 40°C ambient under full load.

- The transformer enclosure must be grounded by the installer in accordance with the latest edition of the National Electric Code and any local codes or ordinances.

Performance

- Audible sound levels will not exceed limits established in NEMA ST20:

Less than 10 kVA	40 db
10 to 50 kVA	45 db
51 to 150 kVA	50 db
151 to 300 kVA	55 db
301 to 500 kVA	60 db

- Transformers shall incorporate a UL recognized insulation system.

Warranty

- Transformers are warranted against material, performance and workmanship defects for a period of ten (10) years from date of manufacture with the provision for an additional two (2) years. Custom transformers come with a 1-year warranty.

Approval

- Typical performance and dimensional data on similar units must be submitted on all transformers for approval. Factory testing must have been conducted in accordance with NEMA ST20. Submitted performance and dimensional data must include, but is not limited to the following:

  A. Height, width, depth, mounting dimensions, conduit entry locations and lifting provisions
  B. Weight
  C. Transformer losses
  D. Potential tests both applied and induced
  E. Temperature - ambient and rise under full load
  F. Insulation class
  G. % excitation current
  H. Electrical schematic including taps
  I. Polarity and phase rotation
  J. kVA, frequency and voltage rating
  K. IR, IX, and IZ percentages at reference temperature
  L. Audible sound level

7

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Buck-Boost transformers are small, single phase, dry type distribution transformers designed and shipped as insulating/isolating transformers. They have a dual voltage primary and a dual voltage secondary. These transformers can be connected for a wide range of voltage combinations. The most common use is to buck (lower) or boost (raise) the supply voltage a small amount, usually 5 to 27%. Buck-boost transformers are in compliance with NEC Article 210-9, Exception 1 when field connected as an autotransformer.

The major advantages of Buck-boost transformers are their low cost, compact size and light weight. They are also more efficient and cost less than equivalent isolation transformers. When connected as an autotransformer, they can handle loads up to 20 times the nameplate rating. A buck-boost transformer is the ideal solution for changing line voltage by small amounts.

When a buck-boost has the primary and secondary windings connected, per recommended instructions, it becomes an autotransformer. Now only the secondary windings are transforming voltage and current. The majority of the kVA load passes directly from the supply to the load. This is the reason buck-boost transformers can supply a load with a much larger kVA rating than the nameplate indicates.

Low voltage lighting control applications

SolaHD buck-boost transformers are designed to supply power to low voltage lighting circuits, control panels or other systems requiring 12, 16, 24, 32, or 48 Volts. When connected as an insulating transformer (by following the wiring diagram located after the specification tables on the inside of the transformer case), the transformer's capacity matches the nameplate kVA rating.

SolaHD buck-boost transformers are also suited for low voltage landscape lighting. They are UL listed for outdoor service and their compact size makes them the perfect solution for providing power to accent lighting applications. Electrical Connection diagrams are shown at the end of this chapter.

When using dimmers for low voltage lighting applications, use dimmers on the output of the transformer that are designed and rated for use with magnetic loads. We strongly recommend contacting the dimmer manufacturer for advice on your specific lighting application

Accessories

- Surge Protective Devices
- Active Tracking® Filters

Selection Steps

1. Input Line Voltage

   Measure the supply voltage with a voltmeter.

2. Voltage Required for the Load

   Check the load equipment to determine the voltage requirement.

3. kVA or Ampere Rating of the Load

   Find either the load kVA or the load amperage requirements. This information is listed on the nameplate of the load equipment.

4. Frequency

   Either 50 or 60 Hz. The frequency of the transformer must match the frequency of the load.

5. Number of Phases

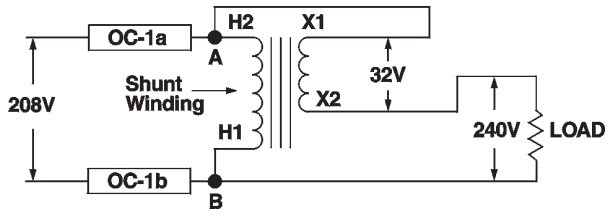
   Single or three phase line and load must match. (A transformer cannot convert single to three phase.) A common application is to make a single phase connection from a three phase supply by using one phase of the three phase supply circuit. Be careful not to overload that phase of the three phase supply. For buck-boost applications the supply must provide load kVA – not just the nameplate rating of the buck-boost. Refer to the Selection Tables on the following pages.

Three phase, buck-boost applications require two or three transformers. Check the "Quantity Required" column of the Three Phase Selection Tables for the exact quantity.

Fusing Buck-Boost Transformers

For determining the correct size of breaker or fuse for a given range of input or output ampere ratings, refer to Section 450-4, of the National Electric Code (NEC).

> " 450-4, Autotransformers 600 Volts, Nominal or Less.
> (a) Overcurrent Protection. Each autotransformer 600 volts, nominal or less shall be protected by an individual overcurrent device installed in series with each ungrounded input conductor. Such overcurrent device shall be rated or set at not more than 125 percent of the rated full-load input current of the auto-transformer. An overcurrent device shall not be installed in series with the shunt winding ...".
>
> " ...Exception. Where the rated input current of an autotransformer 9 amperes or more and 125 percent of this current does not correspond to a standard rating of a fuse or non-adjustable circuit breaker, the next higher standard rating described in Section 240-6 shall be permitted. Where the rated input current is less than 9 amperes, an overcurrent device rated or set at no more than 167 percent of the input current shall be permitted...".



Overcurrent devices OC-1a and OC-1b are shown correctly installed in accordance with 450-4. Locating an overcurrent device in series with the shunt winding anywhere between A and B is not permitted. The shunt winding is the winding common to both the input and the output circuits.

Using the Selection Tables

1. Determine if you are trying to Boost (raise) or Buck (lower) your voltage. Select an input/output voltage combination that comes closest to matching your application from the appropriate single or three phase charts on the following pages.

2. Move across your selected input/output voltage row to the amperage or kVA rating closest to, but greater than the rating required by your load.

3. Reading the top of the column will give you the catalog number of the exact buck-boost transformer you need. See the Specification Tables on the next page.

4. Connect the transformers according to the diagram indicated. See the Electrical Connections section at the end of this chapter. Connection diagrams are packed with each transformer.

Specification Tables

Group 1 – 120 x 240 Volt Primary, 12/24 Volt Secondary

c UL us E77014

KVA	Catalog Number	Maximum Secondary Amperage		Height (inch)	Width (inch)	Depth (inch)	Ship Weight lbs (kg)	Design Style	Elec Conn
		12 V	24 V						
Non-Encapsulated - 50/60 Hz, Single Phase									
0.05	HS19B50	4.16	2.08	6	4	3	2 (0.91)	2	1
0.1	HS19B100	8.33	4.16	6	4	3	4 (1.82)	2	1
0.15	HS19B150	12.5	6.25	7.5	4	4	5 (2.27)	2	1
0.25	HS19B250	20.8	10.4	7.5	4	4	8 (3.64)	2	1
Encapsulated - 60 Hz, Single Phase									
0.5	HS19F500B	41.6	20.8	10	6	5	22 (10.0)	3	1
0.75	HS19F750B	62.5	31.2	10	6	5	27 (12.27)	3	1
1	HS19F1B	83.3	41.6	10	6	5	28 (12.73)	3	1
1.5	HS19F1.5A	125	62.5	12	10	7	38 (17.27)	4	1
2	HS19F2A	166.6	83.3	12	10	7	45 (20.45)	4	1
3	HS19F3A	250	125	12	10	7	55 (25.0)	4	1
5	HS19F5A	416.5	208.3	17	14	9	100 (45.45)	4	1
7.5	HS19F7.5A	625	312.5	17	14	9	135 (61.36)	4	1

Group 2 – 120 x 240 Volt Primary, 16/32 Volt Secondary

c UL us E77014

KVA	Catalog Number	Maximum Secondary Amperage		Height (inch)	Width (inch)	Depth (inch)	Ship Weight lbs (kg)	Design Style	Elec Conn
		16 V	32 V						
Non-Encapsulated - 50/60 Hz, Single Phase									
0.15	HS20B150	9.38	4.69	8	4	4	6 (2.73)	2	2
0.25	HS20B250	15.6	7.81	8	4	4	8 (3.64)	2	2
Encapsulated - 60 Hz, Single Phase									
0.5	HS20F500B	31.2	15.6	10	6	5	22 (10.0)	3	2
0.75	HS20F750B	46.8	23.4	10	6	5	27 (12.27)	3	2
1	HS20F1B	62.5	31.2	10	6	5	28 (12.73)	3	2
1.5	HS20F1.5A	93.7	46.8	12	10	7	38 (17.27)	4	2
2	HS20F2A	125	62.5	12	10	7	45 (20.45)	4	2
3	HS20F3A	187.5	93.7	12	10	7	55 (25.0)	4	2
5	HS20F5A	312	156	17	14	9	100 (45.45)	4	2
7.5	HS20F7.5A	468	234	17	14	9	135 (61.36)	4	2

Note: Weights and dimensions may change and should not be used for construction purposes.

Specification Tables – continued

Group 3 – 240 x 480 Volt Primary, 24/48 Volt Secondary

c UL us E77014

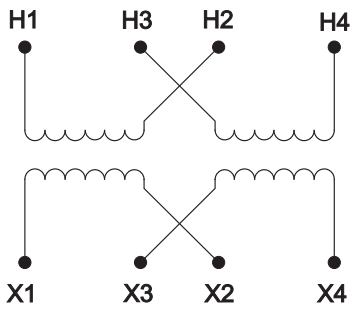
KVA	Catalog Number	Maximum Secondary Amperage		Height (inch)	Width (inch)	Depth (inch)	Ship Weight (lbs)	Design Style	Elec Conn
		24 V	48 V						
Non-Encapsulated - 50/60 Hz, Single Phase									
0.15	HS22B150	6.25	3.13	8	4	3	5	2	3
0.25	HS22B250	10.4	5.2	8	4	3	8	2	3
Encapsulated - 60 Hz, Single Phase									
0.5	HS22F500B	20.8	10.4	8	6	5	22	3	3
0.75	HS22F750B	31.2	15.6	10	6	5	27	3	3
1	HS22F1B	41.6	20.8	10	6	5	28	3	3
1.5	HS22F1.5A	62.5	31.2	12	10	7	38	4	3
2	HS22F2A	83.3	41.6	12	10	7	45	4	3
3	HS22F3A	125	62.5	12	10	7	55	4	3
5	HS22F5A	208	104	17	14	9	100	4	3
7.5	HS22F7.5A	312	156	17	14	9	135	4	3

Electrical Connections for Low Voltage Applications

⏚ = Earth Ground

120 X 240 Volt Primary,
12/24 Volt Secondary
Taps: None

1

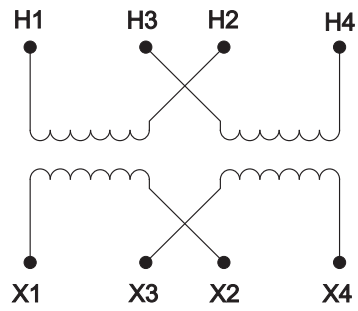


Primary Voltage	Interconnect	Connect Lines To
240	H2 to H3	H1 & H4
120	H1 to H3 H2 to H4	H1 & H4
Secondary Voltage	**Interconnect**	**Connect Lines To**
24	X2 to X3	X1 & X4
12-0-12	X2 to X3 X2 to ⏚	X1-X2-X4
12	X1 to X3 X2 to X4	X1 & X4

HS19 and S19 Series

120 X 240 Volt Primary,
16/32 Volt Secondary
Taps: None

2

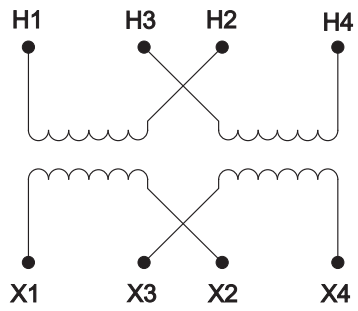


Primary Voltage	Interconnect	Connect Lines To
240	H2 to H3	H1 & H4
120	H1 to H3 H2 to H4	H1 & H4
Secondary Voltage	**Interconnect**	**Connect Lines To**
32	X2 to X3	X1 & X4
16-0-16	X2 to X3 X2 to ⏚	X1-X2-X4
16	X1 to X3 X2 to X4	X1 & X4

HS20 and S20 Series

240 X 480 Volt Primary,
24/48 Volt Secondary
Taps: None

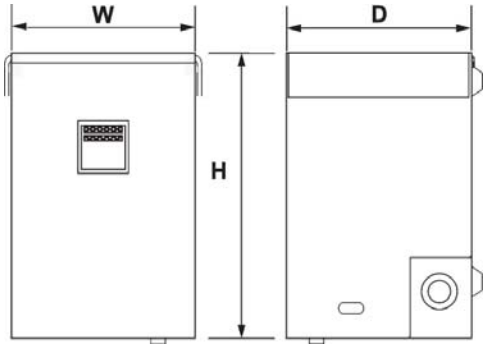
3



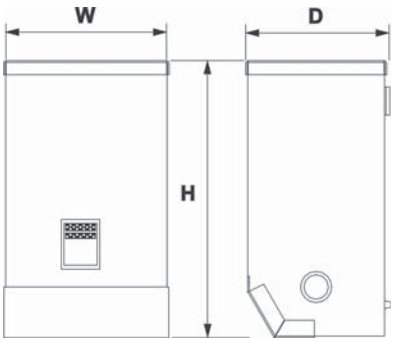
Primary Voltage	Interconnect	Connect Lines To
480	H2 to H3	H1 & H4
240	H1 to H3 H2 to H4	H1 & H4
Secondary Voltage	**Interconnect**	**Connect Lines To**
48	X2 to X3	X1 & X4
24-0-24	X2 to X3 X2 to ⏚	X1-X2-X4
24	X1 to X3 X2 to X4	X1 & X4

HS22 and S22 Series

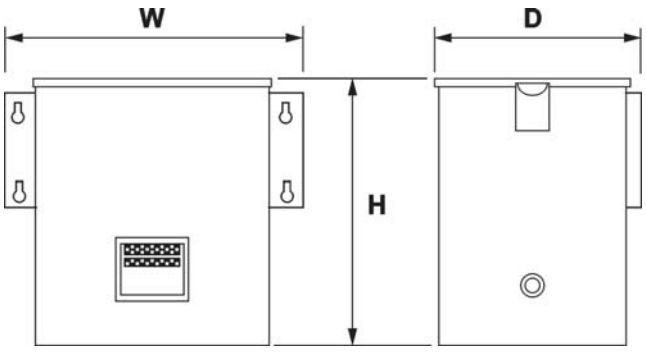
Design Styles



Style 2 - Non-Encapsulated

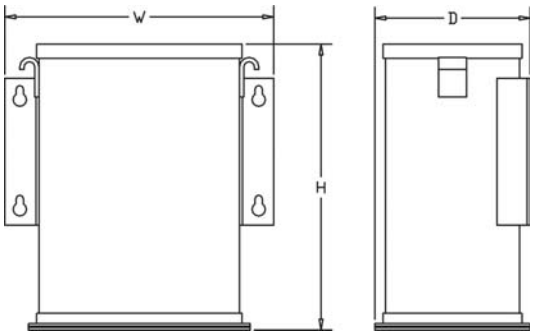


Style 3 - Encapsulated



Style 4 - Encapsulated

Custom Design Styles



Style 5 - Encapsulated

Available for all encapsulated KVA sizes (For NEMA 4, 12 and 4X)

Selection Tables: Single Phase

Table 1: Using Group 1 (120 x 240 V Primary, 12/24 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Con-nection Diagram*	Application Data	Catalog Number						
					HS19B50	HS19B100	HS19B150	HS19B250	HS19F500B	HS19F750B	HS19F1B
BOOSTING											
100	120	1	B1	KVA	0.25	0.5	0.75	1.25	2.5	3.75	5.0
				Load Amps	2.08	4.16	6.25	10.4	20.8	31.2	41.6
				Fuse Size	6.0	10.0	15.0	25.0	35.0	50.0	70.0
109	120	1	A1	KVA	0.5	1.0	1.5	2.5	5.0	7.5	10.0
				Load Amps	4.16	8.33	12.5	20.8	41.6	62.5	83.3
				Fuse Size	10.0	15.0	20.0	30.0	60.0	90.0	125.0
189	208	1	D1	KVA	0.43	0.87	1.3	2.16	4.33	6.49	8.65
				Load Amps	2.08	4.16	6.25	10.4	20.8	31.2	41.6
				Fuse Size	6.0	10.0	15.0	15.0	30.0	45.0	60.0
197	208	1	C1	KVA	0.87	1.73	2.6	4.33	8.65	13.0	17.3
				Load Amps	4.16	8.33	12.5	20.8	41.6	62.5	83.3
				Fuse Size	6.0	15.0	20.0	30.0	60.0	90.0	110.0
208	229	1	D1	KVA	0.48	0.95	1.43	2.38	4.77	7.15	9.54
				Load Amps	2.08	4.16	6.25	10.4	20.8	31.2	41.6
				Fuse Size	6.0	10.0	15.0	15.0	30.0	45.0	60.0
218**	240	1	D1	KVA	0.5	1.0	1.5	2.5	5.0	7.5	10.0
				Load Amps	2.08	4.16	6.25	10.4	20.8	31.2	41.6
				Fuse Size	6.0	10.0	15.0	15.0	30.0	45.0	60.0
229	240	1	C1	KVA	1.0	2.0	3.0	5.0	10.0	15.0	20.0
				Load Amps	4.16	8.33	12.5	20.8	41.6	62.5	83.3
				Fuse Size	6.0	15.0	20.0	30.0	60.0	90.0	110.0
BUCKING											
132**	120	1	A2	KVA	0.55	1.1	1.65	2.75	5.5	8.25	11.0
				Load Amps	4.58	9.16	13.75	22.9	45.8	68.7	91.6
				Fuse Size	10.0	15.0	20.0	30.0	60.0	80	110
144**	120	1	B2	KVA	0.3	0.6	0.9	1.5	3.0	4.5	6.0
				Load Amps	2.5	5.0	7.5	12.5	25	37.5	50.0
				Fuse Size	6.0	10.0	15.0	15.0	30.0	40.0	60.0
229	208	1	D2	KVA	0.48	0.95	1.43	2.38	4.77	7.15	9.54
				Load Amps	2.29	4.58	6.88	11.4	22.9	34.4	45.8
				Fuse Size	6.0	10.0	15.0	15.0	30.0	40.0	60.0
252**	240	1	C2	KVA	1.04	2.1	3.15	5.25	10.5	15.7	21
				Load Amps	4.34	8.75	13.13	21.8	43.7	65.6	87.5
				Fuse Size	10.0	15.0	15.0	30.0	60.0	80.0	110.0
264**	240	1	D2	KVA	0.55	1.1	1.65	2.75	5.5	8.25	11.0
				Load Amps	2.29	4.58	6.88	11.4	22.9	34.3	45.8
				Fuse Size	6.0	10.0	15.0	15.0	30.0	40.0	60.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Single Phase

Table 1: Using Group 1 (120 x 240 V Primary, 12/24 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number				
					HS19F1.5A	HS19F2A	HS19F3A	HS19F5A	HS19F7.5A
BOOSTING									
100	120	1	B1	KVA	7.5	10.0	15.0	25.0	37.5
				Load Amps	62.5	83.3	125.0	208.0	312.0
				Fuse Size	100.0	125.0	200.0	350.0	500.0
109	120	1	A1	KVA	15.0	20.0	30.0	49.9	75.0
				Load Amps	125.0	167.0	250.0	416.0	625.0
				Fuse Size	175.0	250.0	350.0	600.0	1000.0
189	208	1	D1	KVA	13.0	17.3	26.0	43.3	64.9
				Load Amps	62.5	83.3	125.0	208.0	312.0
				Fuse Size	90.0	125.0	175.0	300.0	450.0
197	208	1	C1	KVA	26.0	34.7	52.0	86.5	130.0
				Load Amps	125.0	167.0	250.0	416.0	625.0
				Fuse Size	175.0	225.0	350.0	600.0	1000.0
208	229	1	D1	KVA	14.3	19.1	28.6	47.6	71.4
				Load Amps	62.5	83.3	125.0	208.0	312.0
				Fuse Size	90.0	125.0	175.0	300.0	450.0
218**	240	1	D1	KVA	15.0	20.0	30.0	49.9	74.9
				Load Amps	62.5	83.3	125.0	208.0	312.0
				Fuse Size	90.0	125.0	175.0	300.0	450.0
229	240	1	C1	KVA	30.0	40.1	60.0	99.8	150.0
				Load Amps	125.0	167.0	250.0	416.0	625.0
				Fuse Size	175.0	225.0	350.0	600.0	1000.0
BUCKING									
132**	120	1	A2	KVA	16.5	22.0	33.0	54.9	82.5
				Load Amps	137.5	183.3	275.0	457.6	687.5
				Fuse Size	175.0	225.0	350.0	600.0	800.0
144**	120	1	B2	KVA	9.0	12.0	18.0	30.0	44.9
				Load Amps	75.0	100.0	150.0	249.6	374.4
				Fuse Size	80.0	110.0	175.0	300.0	400.0
229	208	1	D2	KVA	14.3	19.1	28.6	47.6	71.4
				Load Amps	68.8	91.6	137.5	228.8	343.2
				Fuse Size	80.0	110.0	175.0	300.0	400.0
252**	240	1	C2	KVA	31.5	42.0	63.0	104.8	157.5
				Load Amps	131.3	174.9	262.5	436.8	656.3
				Fuse Size	175.0	225.0	350.0	600.0	800.0
264**	240	1	D2	KVA	16.5	22.0	33.0	54.9	78.6
				Load Amps	68.8	91.6	137.5	228.8	343.2
				Fuse Size	80.0	110.0	175.0	300.0	400.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Single Phase

Table 2: Using Group 2 (120 x 240 V Primary, 16/32 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number				
					HS20B150	HS20B250	HS20F500B	HS20F750B	HS20F1B
BOOSTING									
95	120	1	B1	KVA	0.6	0.9	1.9	2.8	3.8
				Load Amps	4.7	7.8	15.6	23.4	31.2
				Fuse Size	10.0	15.0	25.0	40.0	50.0
106	120	1	A1	KVA	1.1	1.9	3.7	5.6	7.5
				Load Amps	9.4	15.6	31.2	46.8	62.5
				Fuse Size	15.0	25.0	45.0	70.0	90.0
183	208	1	D1	KVA	1.0	1.6	3.2	4.9	6.5
				Load Amps	4.7	7.8	15.6	23.4	31.2
				Fuse Size	10.0	15.0	25.0	35.0	45.0
195	208	1	C1	KVA	2.0	3.2	6.5	9.7	13.0
				Load Amps	9.4	15.6	31.2	46.8	62.5
				Fuse Size	15.0	25.0	45.0	70.0	90.0
208	236	1	D1	KVA	1.1	1.8	3.7	5.5	7.4
				Load Amps	4.7	7.8	15.6	23.4	31.2
				Fuse Size	10.0	15.0	25.0	40.0	50.0
225	240	1	C1	KVA	2.3	3.7	7.5	11.2	15.0
				Load Amps	9.4	15.6	31.2	46.8	62.5
				Fuse Size	15.0	25.0	45.0	70.0	90.0
240**	272	1	D1	KVA	1.3	2.1	4.2	6.4	8.5
				Load Amps	4.7	7.8	15.6	23.4	31.2
				Fuse Size	10.0	15.0	25.0	35.0	45.0
BUCKING									
136**	120	1	A2	KVA	1.3	2.1	4.2	6.4	8.5
				Load Amps	10.6	17.7	35.4	53.2	70.8
				Fuse Size	15.0	20.0	40.0	60.0	80.0
152**	120	1	B2	KVA	0.7	1.2	2.4	3.6	4.7
				Load Amps	6.0	9.9	19.8	29.6	39.5
				Fuse Size	10.0	15.0	20.0	30.0	40.0
236	208	1	D2	KVA	1.1	1.8	3.7	5.5	7.4
				Load Amps	5.3	8.9	17.7	26.5	35.4
				Fuse Size	6.0	15.0	20.0	30.0	40.0
256**	240	1	C2	KVA	2.4	4.0	8.0	12.0	16.0
				Load Amps	10.0	16.6	33.3	50.0	66.7
				Fuse Size	15.0	20.0	40.0	60.0	80.0
272**	240	1	D2	KVA	1.3	2.1	4.2	6.4	8.5
				Load Amps	5.3	8.8	17.7	26.5	35.4
				Fuse Size	10.0	15.0	20.0	30.0	40.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Single Phase

Table 2: Using Group 2 (120 x 240 V Primary, 16/32 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number				
					HS20F1.5A	HS20F2A	HS20F3A	HS20F5A	HS20F7.5A
BOOSTING									
95	120	1	B1	KVA	5.6	7.5	11.2	18.7	28.0
				Load Amps	46.8	62.5	93.7	156.0	234.0
				Fuse Size	80.0	100.0	150.0	250.0	400.0
106	120	1	A1	KVA	11.2	15.0	22.5	37.4	56.2
				Load Amps	93.7	125.0	187.5	312.0	468.0
				Fuse Size	150.0	200.0	300.0	450.0	700.0
183	208	1	D1	KVA	9.7	13.0	19.5	32.4	48.6
				Load Amps	46.8	62.5	93.7	156.0	234.0
				Fuse Size	70.0	90.0	150.0	225.0	350.0
195	208	1	C1	KVA	19.5	26.0	39.0	64.9	97.3
				Load Amps	93.7	125.0	187.5	312.0	468.0
				Fuse Size	125.0	175.0	250.0	450.0	700.0
208	236	1	D1	KVA	11.0	14.7	22.0	36.8	55.2
				Load Amps	46.8	62.5	93.7	156.0	234.0
				Fuse Size	70.0	90.0	150.0	225.0	350.0
225	240	1	C1	KVA	22.5	30.0	45.0	74.8	112.3
				Load Amps	93.7	125.0	187.5	312.0	468.0
				Fuse Size	125.0	175.0	250.0	450.0	700.0
240**	272	1	D1	KVA	12.7	17.0	25.5	42.4	63.6
				Load Amps	46.8	62.5	93.7	156.0	234.0
				Fuse Size	70.0	90.0	150.0	225.0	350.0
BUCKING									
136**	120	1	A2	KVA	12.7	17.0	25.5	42.4	63.6
				Load Amps	106.2	141.7	212.5	353.6	530.4
				Fuse Size	125.0	175.0	250.0	400.0	600.0
152**	120	1	B2	KVA	7.1	9.5	14.3	23.7	35.6
				Load Amps	59.4	79.2	118.8	197.6	296.4
				Fuse Size	60.0	80.0	125.0	200.0	300.0
236	208	1	D2	KVA	11.1	14.8	22.1	36.8	55.2
				Load Amps	53.2	70.9	106.4	177.0	265.5
				Fuse Size	60.0	80.0	125.0	200.0	300.0
256**	240	1	C2	KVA	24.0	32.0	48.0	79.9	119.8
				Load Amps	99.9	133.3	200.0	332.8	499.2
				Fuse Size	125.0	175.0	250.0	400.0	600.0
272**	240	1	D2	KVA	12.8	17.0	25.5	42.4	63.6
				Load Amps	53.2	70.8	106.3	176.8	265.2
				Fuse Size	60.0	80.0	125.0	200.0	300.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Single Phase

Table 3: Using Group 3 (240 x 480 V Primary, 24/48 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number				
					HS22B150	HS22B250	HS22F500B	HS22F750B	HS22F1B
BOOSTING									
200	240	1	B1	KVA	0.75	1.25	2.50	3.74	4.99
				Load Amps	3.10	5.20	10.40	15.60	20.80
				Fuse Size	6.00	10.00	15.00	20.00	30.00
230**	277	1	B1	KVA	0.87	1.44	2.88	4.22	5.76
				Load Amps	3.10	5.20	10.40	15.60	20.80
				Fuse Size	10.00	15.00	20.00	25.00	35.00
346	380	1	D1	KVA	1.20	1.98	3.95	5.93	7.90
				Load Amps	3.10	5.20	10.40	15.60	20.80
				Fuse Size	6.00	10.00	15.00	20.00	30.00
362	380	1	C1	KVA	2.40	3.95	7.90	11.86	15.81
				Load Amps	6.30	10.40	20.80	31.20	41.60
				Fuse Size	10.00	15.00	30.00	40.00	60.00
378	416	1	D1	KVA	1.30	2.16	4.33	6.49	8.65
				Load Amps	3.10	5.20	10.40	15.60	20.80
				Fuse Size	6.00	10.00	15.00	25.00	30.00
436	480	1	D1	KVA	1.50	2.50	4.99	7.49	9.98
				Load Amps	3.10	5.20	10.40	15.60	20.80
				Fuse Size	6.00	10.00	15.00	25.00	30.00
458**	480	1	C1	KVA	3.00	4.99	9.98	14.98	19.97
				Load Amps	6.30	10.40	20.80	31.20	41.60
				Fuse Size	15.00	15.00	30.00	45.00	60.00
BUCKING									
277**	230	1	B2	KVA	0.86	1.44	2.88	4.33	5.76
				Load Amps	3.80	6.26	12.53	18.79	25.05
				Fuse Size	6.00	10.00	15.00	20.00	30.00
398	380	1	C2	KVA	2.50	4.14	8.28	12.40	16.60
				Load Amps	6.50	10.89	21.79	32.70	43.60
				Fuse Size	10.00	15.00	30.00	40.00	60.00
418**	380	1	D2	KVA	1.30	2.18	4.35	6.52	8.69
				Load Amps	3.40	5.72	11.40	17.20	22.90
				Fuse Size	6.00	10.00	15.00	20.00	30.00
504**	480	1	C2	KVA	3.10	5.24	10.50	15.70	21.00
				Load Amps	6.60	10.40	21.80	32.80	43.70
				Fuse Size	15.00	15.00	30.00	45.00	60.00
528**	480	1	D2	KVA	1.65	2.75	5.49	8.24	11.00
				Load Amps	3.40	5.72	11.44	17.16	22.88
				Fuse Size	6.00	10.00	15.00	20.00	30.00

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Single Phase

Table 3: Using Group 3 (240 x 480 V Primary, 24/48 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number				
					HS22F1.5A	HS22F2A	HS22F3A	HS22F5A	HS22F7.5A
BOOSTING									
200	240	1	B1	KVA	7.49	9.98	15.0	24.96	37.44
				Load Amps	31.2	41.6	62.5	104.0	156.0
				Fuse Size	50.0	70.0	90.0	150.0	225.0
230**	277	1	B1	KVA	8.64	11.52	17.31	28.81	43.21
				Load Amps	31.2	41.6	62.5	104.0	156.0
				Fuse Size	50.0	70.0	100.0	175.0	250.0
346	380	1	D1	KVA	11.86	15.81	23.75	39.52	59.28
				Load Amps	31.2	41.6	62.5	104.0	156.0
				Fuse Size	45.0	60.0	90.0	150.0	225.0
362	380	1	C1	KVA	23.75	31.65	47.5	79.04	118.56
				Load Amps	62.5	83.3	125	208	312.0
				Fuse Size	90.0	110.0	175.0	300.0	450.0
378	416	1	D1	KVA	12.98	17.31	26.0	43.26	64.9
				Load Amps	31.2	41.6	62.5	104.0	156.0
				Fuse Size	50.0	60.0	90.0	150.0	225.0
436	480	1	D1	KVA	14.98	19.97	30.0	49.92	74.88
				Load Amps	31.2	41.6	62.5	104.0	156.0
				Fuse Size	45.0	60.0	90.0	150.0	225.0
458**	480	1	C1	KVA	30.0	39.98	60.0	99.84	149.76
				Load Amps	62.5	83.3	125.0	208.0	312.0
				Fuse Size	90.0	110.0	175.0	300.0	450.0
BUCKING									
277**	230	1	B2	KVA	8.64	11.5	17.3	28.8	43.2
				Load Amps	37.6	50.1	75.3	125.3	187.9
				Fuse Size	40.0	60.0	80.0	150.0	200.0
398	380	1	C2	KVA	24.8	33.1	49.8	82.8	124.2
				Load Amps	65.4	87.1	130.9	217.9	326.8
				Fuse Size	80.0	110.0	175.0	300.0	400.0
418*	380	1	D2	KVA	13.0	17.4	26.1	43.5	65.2
				Load Amps	34.3	45.8	68.8	114.4	171.6
				Fuse Size	40.0	60.0	80.0	150.0	200.0
504**	480	1	C2	KVA	31.4	41.9	63.0	104.8	157.2
				Load Amps	65.5	87.4	131.3	218.4	327.6
				Fuse Size	90.0	110.0	175.0	300.0	450.0
528**	480	1	D2	KVA	16.5	22.0	33.0	54.9	82.4
				Load Amps	34.3	45.8	68.8	114.4	171.6
				Fuse Size	40.0	60.0	80.0	150.0	200.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Three Phase

Table 4: Using Group 1 (120 x 240 V Primary, 12/24 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number						
					HS19B50	HS19B100	HS19B150	HS19B250	HS19F500B	HS19F750B	HS19F1B
BOOSTING											
188	208	2	F1	KVA	0.749	1.5	2.25	3.75	7.51	11.3	15.0
				Load Amps	2.08	4.16	6.25	10.4	20.8	31.25	41.6
				Fuse Size	6.0	10.0	15.0	15.0	30.0	45.0	60.0
198	208	2	E1	KVA	1.5	3.0	4.5	7.51	15.0	22.5	30.0
				Load Amps	4.16	8.32	12.5	20.8	41.6	62.5	83.3
				Fuse Size	6.0	15.0	25.0	30.0	60.0	90.0	110.0
208	229	2	F1	KVA	0.825	1.65	2.48	4.13	8.26	12.4	16.5
				Load Amps	2.08	4.16	6.25	10.4	20.8	31.25	41.6
				Fuse Size	6.0	10.0	15.0	15.0	30.0	45.0	60.0
208	229	3	J1	KVA	1.65	3.3	4.96	8.26	16.5	24.8	33.1
				Load Amps	4.16	8.32	12.5	20.8	41.6	62.5	83.3
				Fuse Size	10.0	15.0	20.0	30.0	60.0	90.0	125.0
228**	240	2	E1	KVA	1.73	3.46	5.2	8.68	17.3	26	34.6
				Load Amps	4.16	8.32	12.5	20.8	41.6	62.5	83.3
				Fuse Size	6.0	15.0	20.0	30.0	60.0	90.0	110.0
416	436	3	L1	KVA	3.15	6.29	9.44	15.8	31.5	47.2	62.9
				Load Amps	4.16	8.32	12.5	20.8	41.6	62.5	83.3
				Fuse Size	6.0	15.0	20.0	30.0	60.0	90.0	110.0
416	458	3	M1	KVA	1.65	3.31	4.96	8.27	16.5	24.8	33
				Load Amps	2.08	4.16	6.25	10.4	20.8	31.25	41.6
				Fuse Size	3.0	6.0	10.0	15.0	30.0	45.0	60.0
BUCKING											
218	208	2	E2	KVA	1.57	3.14	4.73	7.85	15.7	23.6	31.4
				Load Amps	4.36	8.72	13.1	21.8	43.6	65.5	87.2
				Fuse Size	10.0	15.0	20.0	30.0	60.0	80.0	110.0
229	208	2	F2	KVA	0.824	1.65	2.48	4.12	8.25	12.4	16.5
				Load Amps	2.29	4.58	6.88	11.4	22.9	34.4	45.8
				Fuse Size	6.0	10.0	15.0	15.0	30.0	40.0	60.0
252**	240	2	E2	KVA	1.82	3.63	5.46	9.08	18.2	27.3	36.3
				Load Amps	4.37	8.74	13.1	21.8	43.7	65.6	87.4
				Fuse Size	6.00	10.00	15.00	30.00	60.00	80.00	110.00
264**	240	2	F2	KVA	0.951	1.9	2.86	4.76	9.51	14.3	19.00
				Load Amps	2.29	4.58	6.88	11.44	22.9	34.4	45.8
				Fuse Size	6.0	6.0	10.0	15.0	30.0	40.0	60.0
418	378	3	M2	KVA	1.5	3.0	4.5	7.49	15.0	22.5	30.0
				Load Amps	2.29	4.58	6.88	11.44	22.9	34.4	45.8
				Fuse Size	6.0	6.0	10.0	15.0	30.0	40.0	60.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Three Phase

Table 4: Using Group 1 (120 x 240 V Primary, 12/24 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number				
					HS19F1.5A	HS19F2A	HS19F3A	HS19F5A	HS19F7.5A
BOOSTING									
188	208	2	F1	KVA	22.5	30.0	45.0	75.1	112.5
				Load Amps	62.5	83.3	125.0	208.3	312.5
				Fuse Size	90.0	125.0	175.0	300.0	450.0
198	208	2	E1	KVA	45.0	60.0	90.1	150.1	225.2
				Load Amps	125.0	166.6	250.0	416.6	625.0
				Fuse Size	175.0	225.0	350.0	600.0	1000.0
208	229	2	F1	KVA	24.8	33.1	49.6	82.6	123.9
				Load Amps	62.5	83.3	125.0	208.3	312.5
				Fuse Size	90.0	125.0	175.0	300.0	450.0
208	229	3	J1	KVA	49.6	66.1	99.2	165.3	247.9
				Load Amps	125.0	166.6	250.0	416.6	625.0
				Fuse Size	175.0	250.0	350.0	600.0	1000.0
228**	240	2	E1	KVA	52.0	69.3	103.9	173.2	259.8
				Load Amps	125.0	166.6	250.0	416.6	625.0
				Fuse Size	175.0	250.0	350.0	600.0	1000.0
416	436	3	L1	KVA	94.4	125.8	188.79	314.6	472.0
				Load Amps	125.0	166.6	250.0	416.6	625.0
				Fuse Size	175.0	250.0	350.0	600.0	1000.0
416	458	3	M1	KVA	49.6	66.1	99.2	165.3	247.9
				Load Amps	62.5	83.3	125.0	208.3	312.5
				Fuse Size	90.0	125.0	175.0	300.0	450.0
BUCKING									
218	208	2	E2	KVA	47.2	62.7	94.4	157.3	236.0
				Load Amps	131.0	174.0	262.0	436.6	655.0
				Fuse Size	175.0	225.0	350.0	600.0	800.0
229	208	2	F2	KVA	24.8	33.0	49.6	82.5	123.9
				Load Amps	68.8	91.6	137.6	229.0	344.1
				Fuse Size	80.0	110.0	175.0	300.0	400.0
252**	240	2	E2	KVA	54.6	72.5	109.1	181.8	272.8
				Load Amps	131.3	174.3	262.5	437.4	656.3
				Fuse Size	175.0	225.0	350.0	600.0	800.0
264**	240	2	F2	KVA	28.6	38.0	57.2	95.1	142.9
				Load Amps	68.8	91.5	137.5	228.8	343.8
				Fuse Size	80.0	110.0	175.0	300.0	400.0
418	378	3	M2	KVA	45.0	59.9	90.1	149.9	225.2
				Load Amps	68.8	91.6	137.6	228.9	343.9
				Fuse Size	80.0	110.0	175.0	300.0	400.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Three Phase

Table 5: Using Group 2 (120 x 240 V Primary, 16/32 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number				
					HS20B150	HS20B250	HS20F500B	HS20F750B	HS20F1B
BOOSTING									
184	208	2	F1	KVA	1.69	2.81	5.63	8.44	11.3
				Load Amps	4.69	7.8	15.6	23.4	31.2
				Fuse Size	10.0	15.0	25.0	35.0	45.0
195	208	2	E1	KVA	3.38	5.63	11.3	16.9	22.5
				Load Amps	9.38	15.6	31.2	46.9	62.5
				Fuse Size	15.0	25.0	45.0	70.0	90.0
208	236	2	F1	KVA	1.92	3.19	6.39	9.58	12.8
				Load Amps	4.69	7.8	15.6	23.4	31.2
				Fuse Size	10.0	15.0	25.0	35.0	45.0
208	236	3	J1	KVA	3.83	6.38	12.8	19.2	25.6
				Load Amps	9.38	15.6	31.2	46.9	62.5
				Fuse Size	15.0	25.0	45.0	70.0	90.0
225	240	2	E1	KVA	3.9	6.5	13.0	19.5	26.0
				Load Amps	9.38	15.6	31.2	46.9	62.5
				Fuse Size	15.0	25.0	45.0	70.0	90.0
416	443	3	L1	KVA	7.2	12.0	24.0	36.0	48.0
				Load Amps	9.38	15.6	31.2	46.9	62.5
				Fuse Size	15.0	25.0	45.0	70.0	90.0
416	471	3	M1	KVA	3.83	6.37	12.8	19.1	25.5
				Load Amps	4.69	7.8	15.6	23.4	31.2
				Fuse Size	10.0	15.0	25.0	35.0	45.0
BUCKING									
222	208	2	E2	KVA	3.61	6.0	12.0	18.0	24.0
				Load Amps	10.0	16.6	33.3	50.1	66.7
				Fuse Size	15.0	20.0	40.0	60.0	80.0
236	208	2	F2	KVA	1.92	3.19	6.38	9.56	12.8
				Load Amps	5.32	8.85	17.7	26.5	35.4
				Fuse Size	10.0	10.0	20.0	30.0	40.0
256**	240	2	E2	KVA	4.16	6.92	13.8	20.8	27.7
				Load Amps	10.1	16.6	33.3	50.0	66.7
				Fuse Size	15.0	20.0	40.0	60.0	80.0
272**	240	2	F2	KVA	2.21	3.67	7.35	11.0	14.7
				Load Amps	5.32	8.84	17.7	26.5	35.4
				Fuse Size	10.0	15.0	20.0	30.0	40.0
432	380	3	M2	KVA	3.51	5.84	11.7	17.5	23.3
				Load Amps	5.33	8.87	17.7	26.6	35.5
				Fuse Size	10.0	10.0	20.0	30.0	40.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Three Phase

Table 5: Using Group 2 (120 x 240 V Primary, 16/32 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number				
					HS20F1.5A	HS20F2A	HS20F3A	HS20F5A	HS20F7.5A
BOOSTING									
184	208	2	F1	KVA	16.9	22.5	33.8	56.3	84.4
				Load Amps	46.9	62.5	93.8	156.0	234.0
				Fuse Size	60.0	90.0	150.0	225.0	350.0
195	208	2	E1	KVA	33.8	45.0	67.6	112.6	168.9
				Load Amps	93.7	125.0	187.5	312.0	468.0
				Fuse Size	125.0	175.0	250.0	450.0	700.0
208	236	2	F1	KVA	19.2	25.6	38.2	63.9	95.8
				Load Amps	46.9	62.5	93.7	156.0	234.0
				Fuse Size	70.0	90.0	150.0	225.0	350.0
208	236	3	J1	KVA	38.2	51.1	76.6	127.7	191.6
				Load Amps	93.7	125.0	187.5	312.0	468.0
				Fuse Size	150.0	200.0	300.0	450.0	700.0
225	240	2	E1	KVA	71.9	52.0	77.9	129.9	194.0
				Load Amps	93.7	125.0	187.5	312.0	468.0
				Fuse Size	125.0	175.0	250.0	450.0	700.0
416	443	3	L1	KVA	71.9	95.9	143.9	239.8	359.7
				Load Amps	93.7	125	187.5	312.0	468.0
				Fuse Size	125.0	175.0	250.0	450.0	700.0
416	471	3	M1	KVA	38.2	51.0	76.5	127.5	191.2
				Load Amps	46.9	62.5	93.8	156.0	234.0
				Fuse Size	70.0	90.0	150.0	225.0	350.0
BUCKING									
222	208	2	E2	KVA	36.0	48.1	72.1	120.0	179.9
				Load Amps	100.0	133.4	200.1	333.0	499.5
				Fuse Size	125.0	175.0	250.0	400.0	600.0
236	208	2	F2	KVA	19.2	25.5	38.8	63.8	95.6
				Load Amps	53.2	70.9	106.4	177.0	265.5
				Fuse Size	60.0	80.0	125.0	200.0	300.0
256**	240	2	E2	KVA	41.5	55.4	83.1	138.3	207.5
				Load Amps	99.9	133.3	200.0	332.8	499.2
				Fuse Size	125.0	175.0	250.0	400.0	600.0
272**	240	2	F2	KVA	22.1	29.4	44.2	73.5	110.2
				Load Amps	53.2	70.8	106.3	176.8	265.2
				Fuse Size	60.0	80.0	125.0	200.0	300.0
432	380	3	M2	KVA	35.1	46.8	70.2	116.7	175.1
				Load Amps	53.3	71.1	106.6	177.3	266.0
				Fuse Size	60.0	80.0	125.0	200.0	300.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Three Phase

Table 6: Using Group 3 (240 x 480 V Primary, 24/48 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number				
					HS22B150	HS22B250	HS22F500B	HS22F750B	HS22F1B
BOOSTING									
173	208	2	G1	KVA	1.12	1.88	3.75	5.63	7.5
				Load Amps	3.12	5.2	10.4	15.6	20.8
				Fuse Size	6.0	10.0	20.0	25.0	35.0
200	240	2	G1	KVA	1.3	2.16	4.33	6.5	8.66
				Load Amps	3.12	5.2	10.4	15.6	20.8
				Fuse Size	6.0	10.0	20.0	25.0	35.0
362	380	2	E1	KVA	3.91	6.52	13	19.6	26.1
				Load Amps	6.24	10.4	20.8	31.2	41.6
				Fuse Size	10.0	15.0	30.0	45.0	60.0
346	416	3	K1	KVA	2.25	3.75	7.5	11.3	15.0
				Load Amps	3.12	5.2	10.4	15.6	20.8
				Fuse Size	6.0	10.0	20.0	25.0	35.0
400	480	3	K1	KVA	2.59	4.33	8.65	13.0	17.3
				Load Amps	3.12	5.2	10.4	15.6	20.8
				Fuse Size	10.0	15.0	20.0	25.0	35.0
436	480	2	F1	KVA	2.59	4.33	8.65	13	17.3
				Load Amps	3.12	5.2	10.4	15.6	20.8
				Fuse Size	6.0	10.0	15.0	25.0	30.0
468	492	2	E1	KVA	5.2	8.66	17.3	26.0	34.6
				Load Amps	6.24	10.4	20.8	31.2	41.6
				Fuse Size	15.0	15.0	30.0	45.0	60.0
BUCKING									
250	208	2	G2	KVA	1.35	2.25	4.5	6.75	9.01
				Load Amps	3.75	6.25	12.5	18.7	25.0
				Fuse Size	6.0	10.0	15.0	20.0	30.0
457	380	3	K2	KVA	2.47	4.12	8.23	12.3	16.5
				Load Amps	3.75	6.25	12.5	18.8	25.0
				Fuse Size	6.0	10.0	15.0	20.0	30.0
499	416	3	K2	KVA	2.7	4.49	8.99	13.5	18.0
				Load Amps	3.74	6.24	12.5	18.7	24.9
				Fuse Size	6.0	10.0	15.0	20.0	30.0
504**	480	2	E2	KVA	5.45	9.08	18.2	27.2	36.3
				Load Amps	6.56	10.9	21.8	32.8	43.7
				Fuse Size	15.0	15.0	30.0	40.0	60.0
528**	480	2	F2	KVA	2.85	4.76	9.51	14.3	19.0
				Load Amps	3.43	5.72	11.4	17.2	22.9
				Fuse Size	6.0	10.0	15.0	20.0	30.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Selection Tables: Three Phase

Table 6: Using Group 3 (240 x 480 V Primary, 24/48 V Secondary) Transformers

c UL us E77014

Input Voltage	Output Voltage	Quantity Req'd	Connection Diagram*	Application Data	Catalog Number				
					HS22F1.5A	HS22F2A	HS22F3A	HS22F5A	HS22F7.5A
BOOSTING									
173	208	2	G1	KVA	11.3	15	22.5	37.5	56.3
				Load Amps	31.2	41.6	62.5	104.0	156.0
				Fuse Size	50.0	70.0	100.0	175.0	250.0
200	240	2	G1	KVA	13.0	17.3	26.0	43.3	65.0
				Load Amps	31.2	41.6	62.5	104.0	156.0
				Fuse Size	50.0	70.0	100.0	175.0	250.0
362	380	2	E1	KVA	39.1	52.2	78.4	130.4	195.6
				Load Amps	62.4	83.2	125	208.0	312.0
				Fuse Size	90.0	125.0	175.0	300.0	450.0
346	416	3	K1	KVA	22.5	30.0	45.0	75.1	112.6
				Load Amps	31.2	41.6	62.5	104.0	156.0
				Fuse Size	50.0	70.0	100.0	175.0	250.0
400	480	3	K1	KVA	26.0	34.6	52.0	86.6	129.9
				Load Amps	31.2	41.6	62.5	104.0	156.0
				Fuse Size	50.0	70.0	100.0	175.0	250.0
436	480	2	F1	KVA	26.0	34.6	52.0	86.6	129.9
				Load Amps	31.2	41.6	62.5	104.0	156.0
				Fuse Size	45.0	60.0	90.0	150.0	225.0
468	492	2	E1	KVA	52.0	69.3	103.9	173.2	259.8
				Load Amps	62.4	83.2	125.0	208.0	312.0
				Fuse Size	90.0	110.0	175.0	300.0	450.0
BUCKING									
250	208	2	G2	KVA	13.5	18.0	27.1	45.0	67.5
				Load Amps	37.5	50.0	75.1	125.0	187.5
				Fuse Size	40.0	60.0	80.0	150.0	200.0
457	380	3	K2	KVA	24.7	32.9	49.5	82.3	123.5
				Load Amps	37.5	50.0	75.2	125.1	187.6
				Fuse Size	40.0	60.0	80.0	150.0	200.0
499	416	3	K2	KVA	27.0	36.0	54.0	89.9	134.8
				Load Amps	37.4	49.9	75.0	124.7	187.1
				Fuse Size	40.0	60.0	80.0	150.0	200.0
504**	480	2	E2	KVA	54.5	72.6	109.1	181.6	272.4
				Load Amps	65.5	87.4	131.3	218.4	327.6
				Fuse Size	80.0	110.0	175.0	300.0	400.0
528**	480	2	F2	KVA	28.5	38.0	57.2	95.1	142.7
				Load Amps	34.3	45.8	68.8	114.4	171.6
				Fuse Size	40.0	60.0	80.0	150.0	200.0

* For connection diagrams, refer to pages 231-234.

** Shaded items are 60 Hz only (All other ratings shown are 50/60 Hz).

Alternate Electrical Connections for Buck-Boost Applications

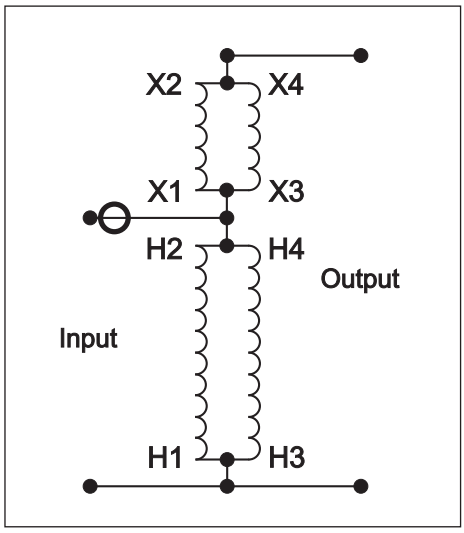


Diagram A1 – Boosting

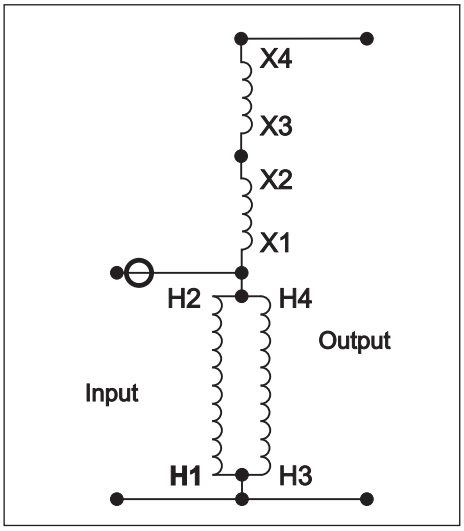


Diagram B1 – Boosting

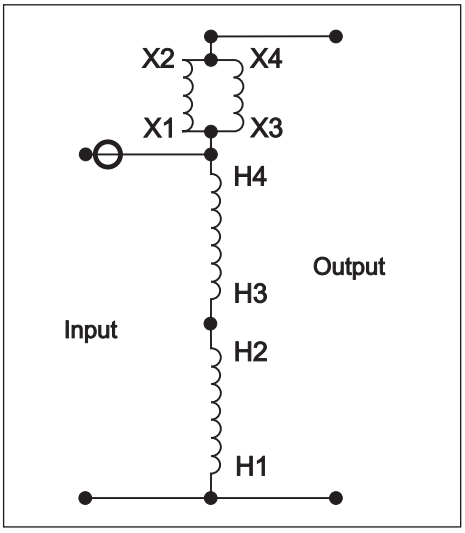


Diagram C1 – Boosting

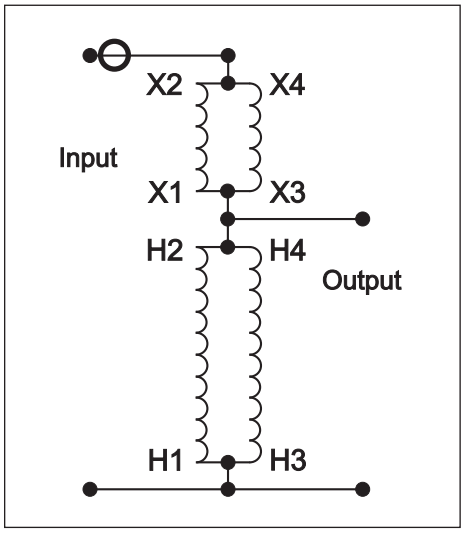


Diagram A2 – Bucking

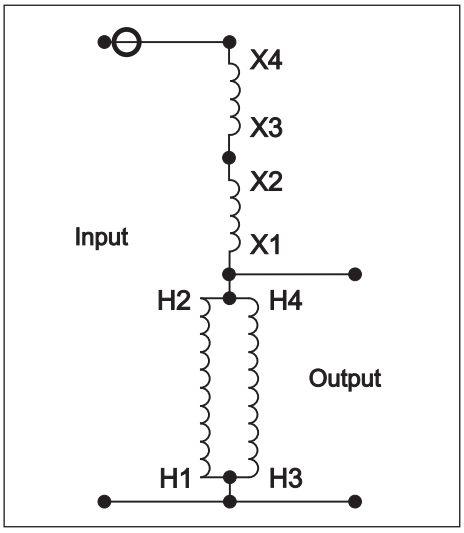


Diagram B2 – Bucking

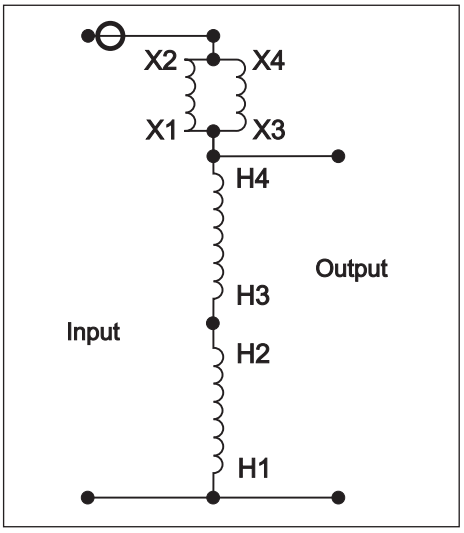


Diagram C2 – Bucking

The o symbol shown on these connection diagrams indicates where fuses or breakers should be field installed for line to neutral applications. For line to line applications, fuses or breakers should be installed on both lines.

Application Note: On all auto-wye connections, the source neutral must be present and connected to the transformer bank. If source neutral is not present, do not use an auto-wye connection.

Alternate Electrical Connections for Buck-Boost Applications

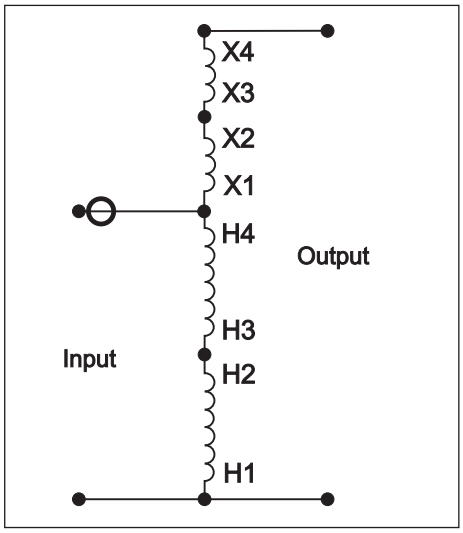


Diagram D1 – Boosting

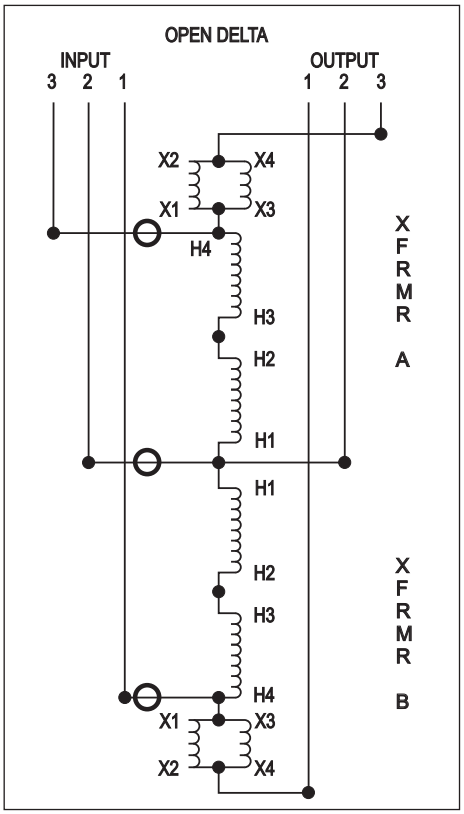


Diagram E1 – Boosting

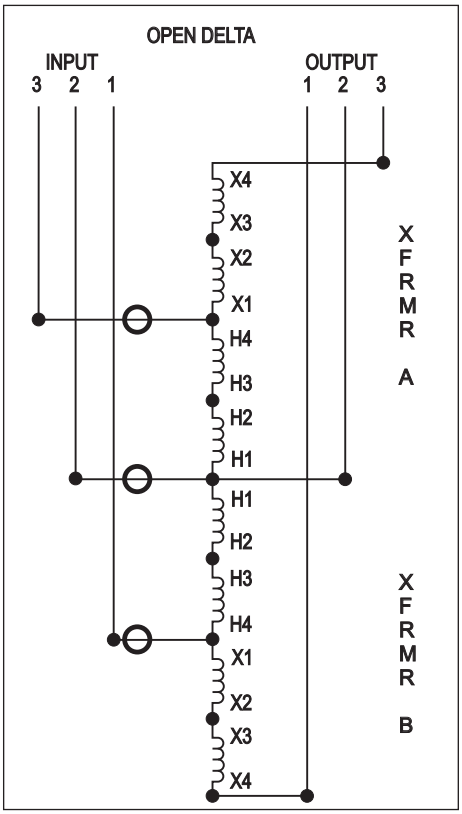


Diagram F1 – Boosting

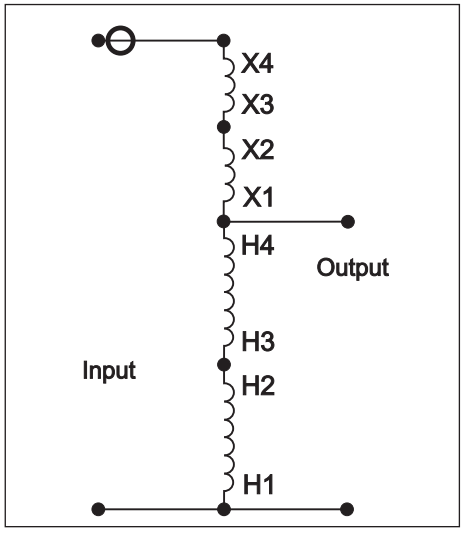


Diagram D2 – Bucking

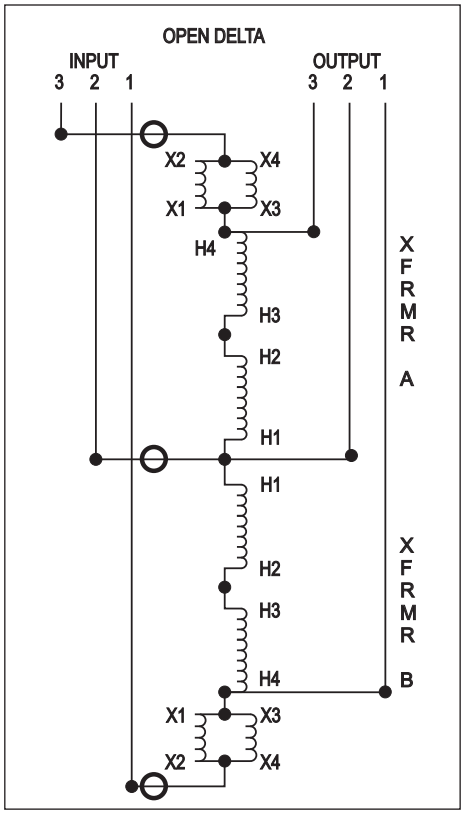


Diagram E2 – Bucking

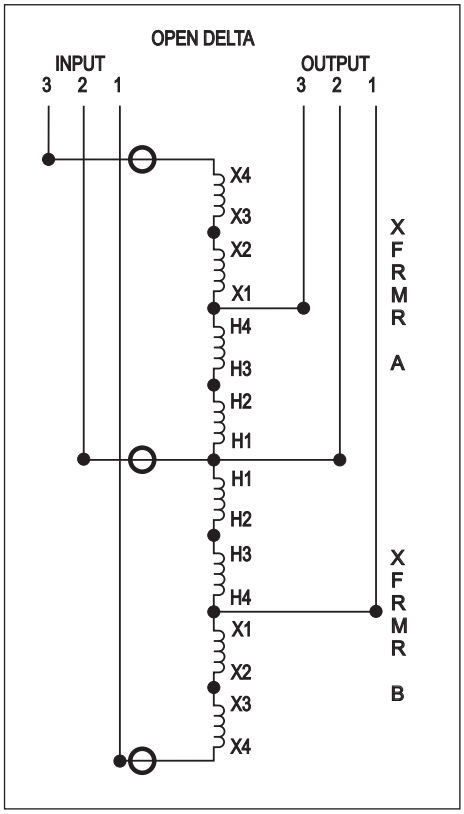


Diagram F2 – Bucking

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contact **Technical Services** at **(800) 377-4384** with any questions.

Alternate Electrical Connections for Buck-Boost Applications

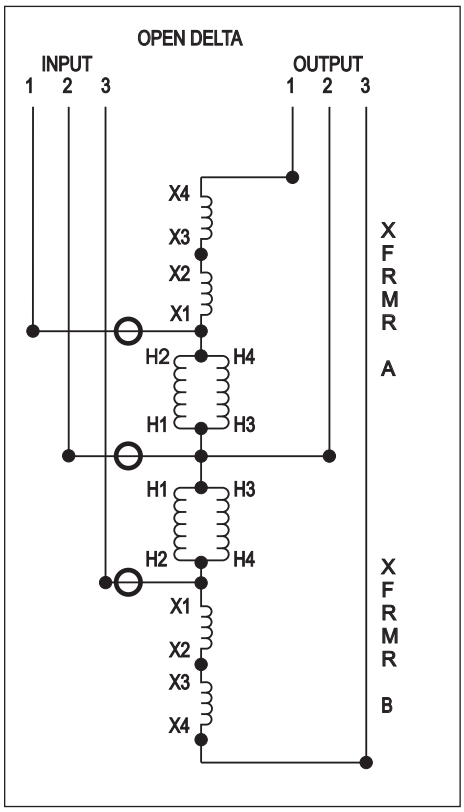

Diagram G1 – Boosting

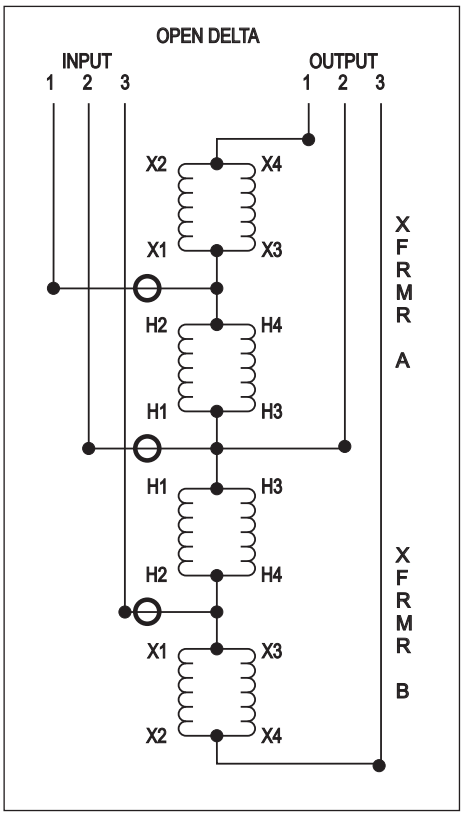

Diagram H1 – Boosting

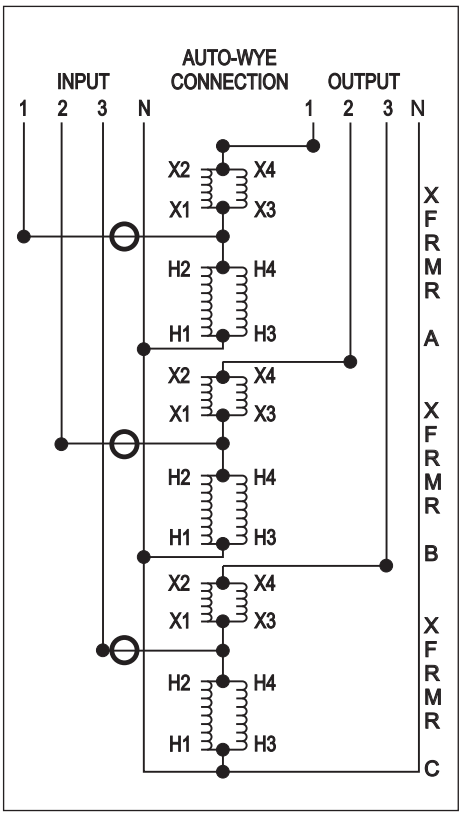

Diagram J1 – Boosting

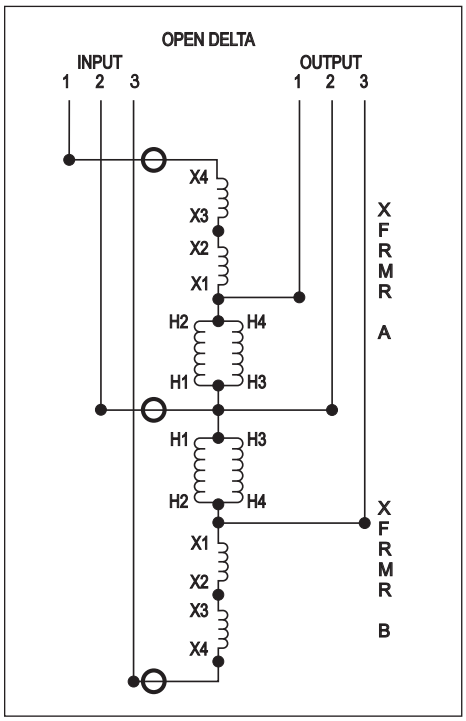

Diagram G2 – Bucking

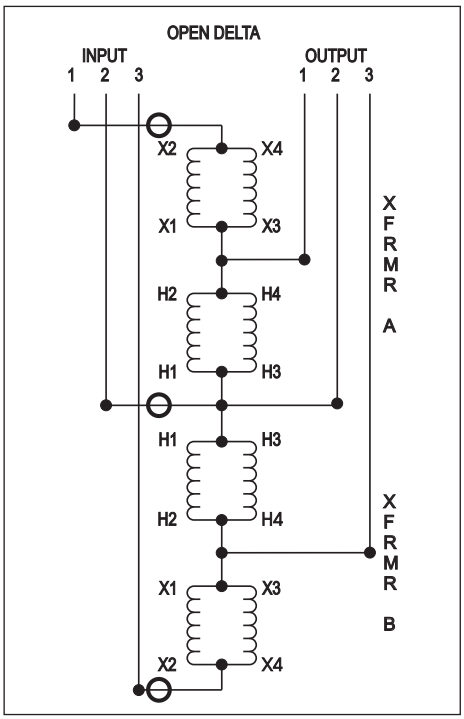

Diagram H2 – Bucking

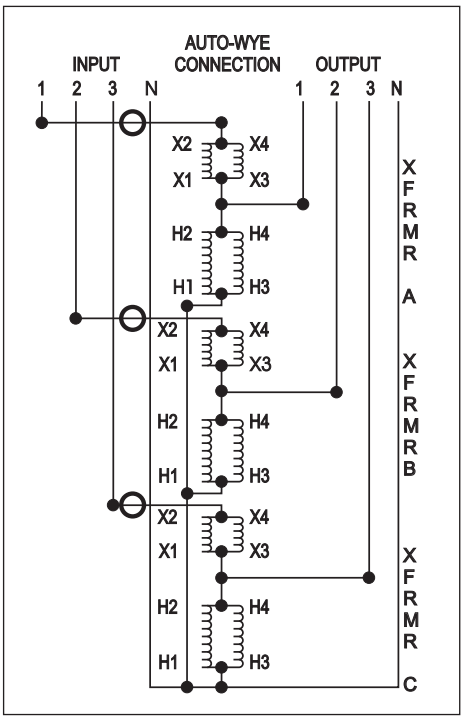

Diagram J2 – Bucking

Alternate Electrical Connections for Buck-Boost Applications

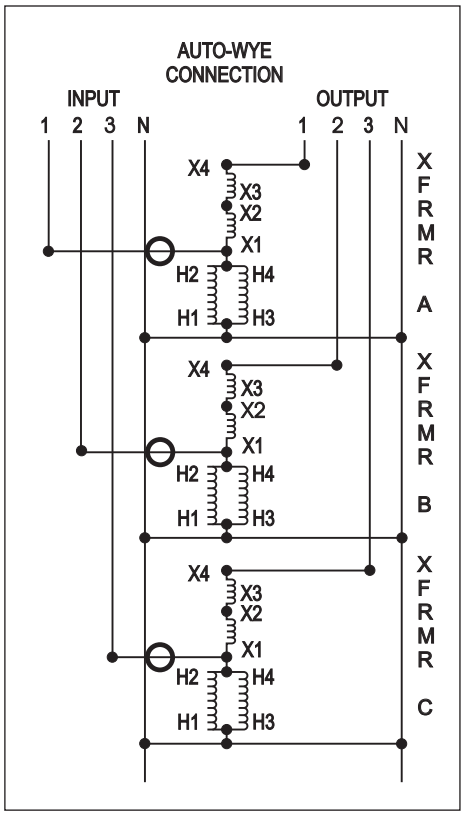

Diagram K1 – Boosting

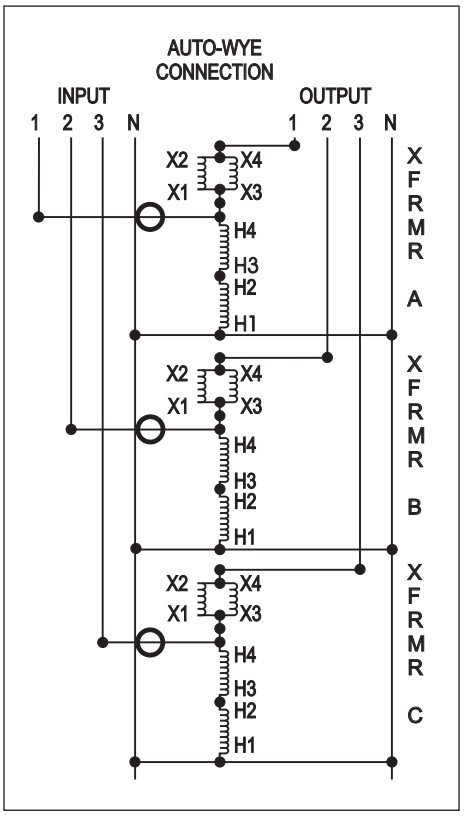

Diagram L1 – Boosting

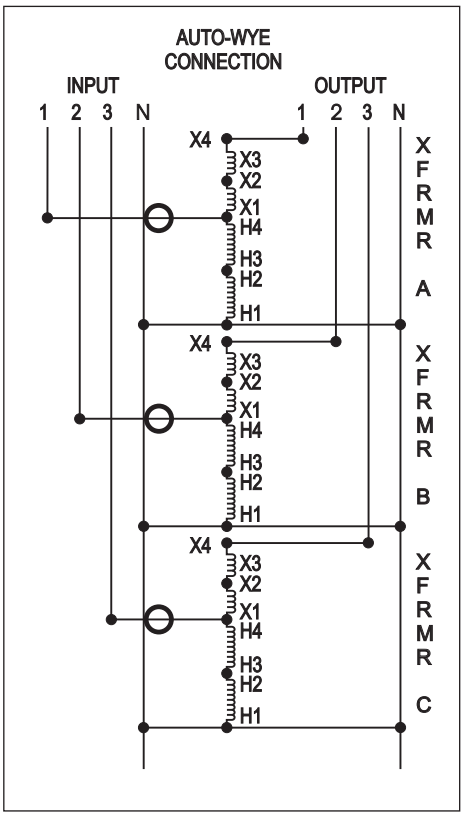

Diagram M1 – Boosting

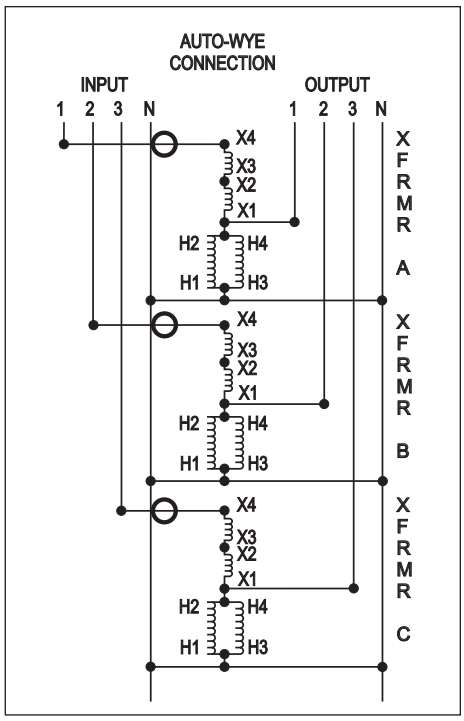

Diagram K2 – Bucking

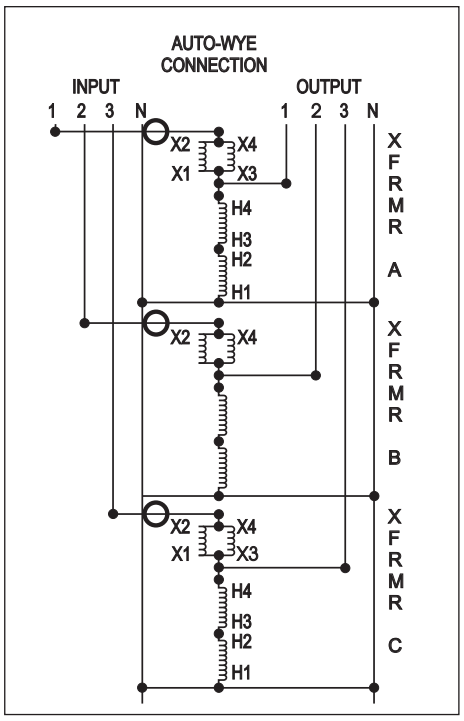

Diagram L2 – Bucking

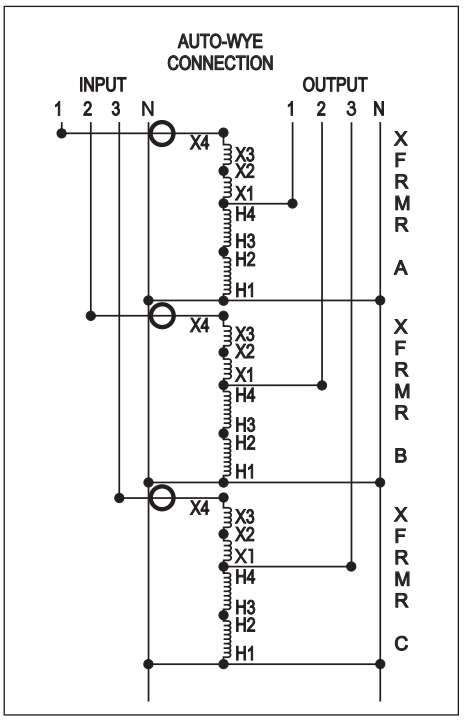

Diagram M2 – Bucking

Application Note

Application Limitations with Buck-Boost Transformers

1. A Buck-Boost transformer cannot be used to develop a three phase, four wire wye circuit from a three phase, three wire delta circuit.

   A delta to wye connection does not supply enough current carrying capability to provide for unbalanced currents flowing in the neutral wire of the four wire circuit. The neutral created is not stable and under load will not deliver desired line to neutral voltages. This connection would also be in violation of the National Electric Code, Article 210-9.

2. Buck-Boost transformers cannot be used in a closed delta connection.

   A closed delta requires more KVA capacity than a wye or an open delta connection, plus phase shifting comes into play on the output side.

3. Buck-Boost transformers should not be used to correct for voltage drop on a long circuit run where the load fluctuates.

   Voltage drop varies with the load and buck-boost transformers are connected for a specific voltage change. If a buck-boost transformer was used to correct voltage drop during peak loading conditions, high voltages may result under light load conditions. This could be equally detrimental to the load and possibly pose safety hazards.

4. Buck-Boost transformers cannot be used to create a 240/120 Volt, single phase service from a 208Y/120 Volt three phase supply.

   Two problems are created if you were to try this:

   A. Two neutrals would exist on the same circuit. Since neutrals must be grounded according to the National Electric Code, a short circuit would be created.

   B. Unbalanced line to output neutral voltages would be created; one line would read 120 Volts, the other 130+ Volts.

What is a Buck-Boost transformer and why is it used?

Isolation transformers have separate primary and secondary windings, electrically insulated and isolated from one another. With a relatively high voltage primary (typically 120, 240 or 480 Volts) and a relatively low voltage secondary (typically 12, 16, 24, 32 or 48 Volts), buck-boost transformers are designed to be field connected as autotransformers. These are transformers with one continuous winding, a portion of which is jointly shared between the input and the output. No electrical isolation is present in an autotransformer.

Buck-Boost transformers have two major uses:

1. When field connected as an autotransformer, they can be used to Buck (lower) or Boost (raise) available line voltage in the range of 5 to 27% and at a KVA rating many times that listed on the transformer nameplate.

2. When left as an isolation transformer, they can be used to supply power to low voltage circuits at the nameplate rating listed.

The importance of altering available line voltage.

Electrical equipment is designed to operate at maximum efficiency at a specific standard supply voltage. Your voltage may not be at the standard supply voltage level. Causes can be proximity to a large utility transformer, losses in the line voltage due to loads on that circuit, or a difference between the standard supply voltage available and the standard supply voltage needed to run the equipment.

Normally the problem is having low voltage available. Low voltage on a circuit, even as little as 5% lower can cause a decrease in incandescent light output, and a decrease in resistive heat output. With motors low voltage can cause a decrease in motor torque, an increase in motor amperage requirements, an increase in motor temperature and decrease in motor life expectancy.

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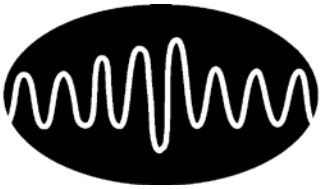
Frequently Asked Power Quality Questions

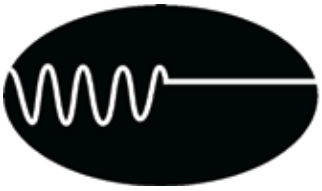
Q. What is a power disturbance?

A. There are many types of disturbances as listed below.



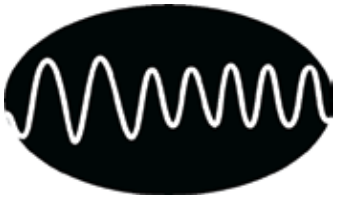
Voltage Surges or Swells

A line swell, also called a voltage surge, is a temporary rise in the voltage level lasting at least one half cycle. Voltage swells can be caused by high-power electric motors, switching off, and the normal cycling of HVAC systems.



Blackouts

All power is lost, ranging from milliseconds to hours, or even longer. To keep critical equipment running, a new power source must be provided either from stored energy (Uninterruptible Power Supplies) or from a mechanical generator.



Brownouts

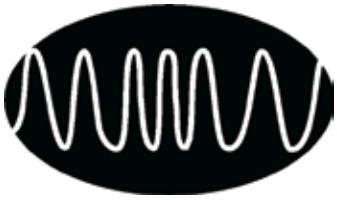
During periods of high power demand, the power utility may intentionally reduce line voltage by up to 15%. Brownouts can last up to several days and create many forms of abnormal equipment behavior.

Voltage Sags

A line sag, sometimes called a voltage dip, is a temporary decrease in the voltage level lasting at least one half cycle. Sags are usually caused by sudden nearby increases in the electrical load, and can degrade equipment performance for several seconds at a time.

Voltage Transients or Spikes (impulses)

Sudden massive increases in voltage, such as those caused by lightning striking a power line or the nearby ground, can cause a damaging voltage pulse to enter electronic equipment and destroy sensitive solid-state circuitry. Lasting only a few milliseconds, storm-induced voltage transient spikes are responsible for huge losses every year.

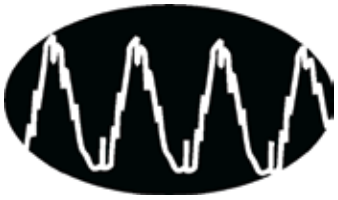


Frequency Variations

Rare in utility power, frequency variations are most common with buck-up power systems such as standby generators. Many UPS's cannot handle frequency problems, which can cause system crashes and equipment damage. And, of course, it can negate the value of having back-up capability!

Harmonics

Non-linear loads such as personal computers, office equipment, variable-frequency drives and solid-state electronics use switchmode power supplies to generate DC voltage, sometimes causing currents that are out of phase with voltage. These harmonics distort voltage waveforms, and can cause overheating, nuisance tripping, and the loosening of electrical connectors.



Electrical Noise

Random electrical disturbances can be caused by distant lightning, switching power supplies, poor electronic circuits, poor brush contacts on motors, utility switching and many other sources. These random signals are superimposed on voltage waveforms, and can cause computer bugs, glitches, and other problems that are difficult to diagnose.

Frequently Asked Power Conditioning Questions

Q. What is a constant voltage power conditioner?

A. Although a constant voltage power conditioner (sometimes referred to as constant voltage transformer or voltage regulator) is a transformer like device, its design and function are totally different. The function of a constant voltage power conditioner is to provide a voltage across its secondary terminals within a specified tolerance (usually ±5%) as long as the voltage impressed on the primary is within the specified bandwidth (usually +10% to -20%). See the Power Conditioning section of this catalog for more information.

Q. What are the differences between SolaHD power conditioners?

A. All three of these products use SolaHD's patented ferroresonant technology. The primary design considerations for the CVS series were voltage stabilization and magnetic isolation. This group provides ±1% output voltage regulation with an input voltage range of +10%/-20% with moderate (1000:1) normal (transverse) noise attenuation.

The MCR series was designed to address both voltage regulation and magnetic isolation. This group offers ±3% output regulation with an input range of +10%/-20% but also offers magnetic isolation for excellent 1,000,000:1 common mode and 1000:1 normal (transverse) mode attenuation.

The MPC series incorporates all of the benefits of the MCR series in addition to exceeding the low leakage current requirements of UL 544 and providing identifiable output receptacles to indicate they are safe for hospital grade use (orange with green triangles).

The Three Phase power conditioners utilize micro-processor-based tap switching technology to provide ±5% regulation in three phase installations. The CV, MCR and MPC are single phase only.

Q. Can constant voltage power conditioners be used to power motor loads?

A. Care needs to be exercised when constant voltage power conditioners (CVPC) are used to power motor loads. When a motor is energized, the lock rotor amperage required to get the motor started is normally 6 to 8 times the normal running amperage, or 600-800% of the load. When the load is increased beyond the CVPC's rated value, a point is reached where the output voltage suddenly collapses and will not regain its normal value until the load is partially released. Under direct short circuit, the load current is limited to approximately 150-200% of the rated full load value and the input watts to less than 10% of normal. Therefore, under short circuit conditions, the SolaHD CVPC actually runs cooler than at no load.

A constant voltage power conditioner, such as the MCR, will protect both itself and its load against damage from excessive fault currents. Fusing of load currents may not be necessary. The actual value of short-circuit current varies with the specific design and rating. Units may be operated indefinitely at short-circuit. This characteristic protects the unit itself as well as the load and load circuit being served. Typical overload performance is shown in the load current chart below (Figure 1).

To properly size a constant voltage power conditioner for use with a motor, be sure to size the CVPC so the nameplate rating is equal to or greater than the lock rotor requirement of the motor.

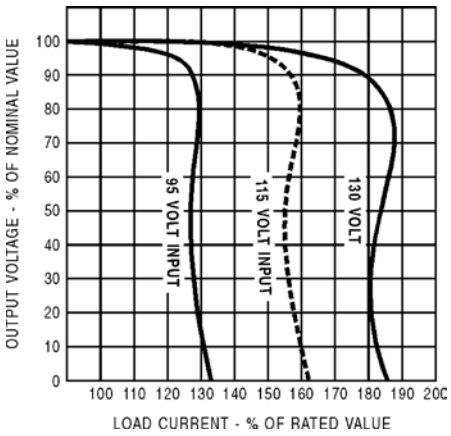


Figure 1

Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

Frequently Asked Power Conditioning Questions

Q. Are there any special considerations needed when I select a constant voltage power conditioner?

A. Special consideration must be given to the type of load to be powered (inductive loads need to be sized to start up currents), load power factor, ambient temperature and where the unit will be installed.

Q. What exactly is Ferroresonance?

A. Ferroresonance is the principle behind SolaHD's very popular CVS and MCR power conditioners. Ferroresonance is the property of a transformer design in which the transformer contains two separate magnetic paths with limited coupling between them. The output contains a parallel resonant tank circuit and draws power from the primary to replace power delivered to the load. Note that "resonance" in ferroresonance is similar to that in linear circuits with series or parallel inductors and capacitors, where the impedance peaks at a particular frequency. In a nonlinear circuit, such as SolaHD's ferroresonant transformers, "resonance" is used to reduce changes in supply voltage to provide a more consistent voltage to the load.

A magnetic device is nonlinear. Its reluctance changes abruptly above a certain magnetic flux density. At this point, the magnetic device is defined as being in saturation. The design of the SolaHD transformer allows one magnetic path (the resonant path) to be in saturation, while the other is not (See Figure 2). As a result, further change in the primary voltage will not translate into changes in the saturated or secondary voltage and voltage regulation results.

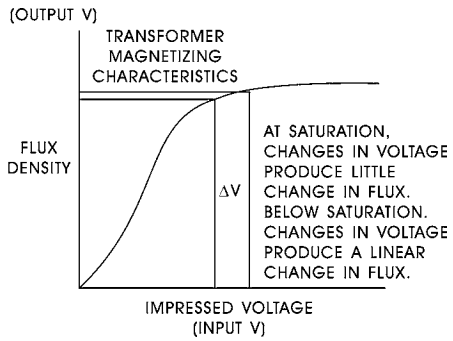


Figure 2

Q. How reliable is ferroresonant technology?

A. The MTBF (mean time between failures as measured in accordance with Mil. Std 217E) ranges from 10 to 25 years, depending on the model, with typical life being approximately 50 years. All SolaHD Constant Voltage Power Conditioners are backed by our exclusive 10 + 2 warranty.

Q. Is there any problem with phase shift between the input and output voltages of constant voltage power conditioners (CVPC)?

A. The phase difference that exists between input and output voltages is in the range of 120 degrees to 140 degrees at full load. This phase difference varies with the magnitude and power factor of the load, and to a lesser extent, with changes in line voltage and load power factor.

Q. We have experienced some temperature problems with other makes of power conditioners. Has SolaHD addressed this problem?

A. SolaHD's ferroresonant power conditioners are very stable with respect to temperature. The change in output voltage is only 0.025% per degree centigrade. Units are factory adjusted to +2%/-0% of nominal, with full load and nominal input voltage. This adjustment to the high side of nominal is to compensate for the natural temperature drift of about 1% that takes place during initial turn on or warm up. When the unit warms up to operating temperature, the voltage typically falls about 1%. This is why no load "cold steel" voltage measurements may be slightly on the high side. At a stable operating temperature, the output voltage will change slightly with varying ambient temperatures.

This shift is equal to approximately 1% for each 40°C of temperature change. The normal maximum temperature rise of a SolaHD power conditioner may fall anywhere in the range of 40°C to 110°C depending on the type and rating. The nominal design ambient rage is between -20°C and +50°C. (-20°C to +40°C for 70 to 1000 VA, 60 Hz portable models.)

Frequently Asked Power Conditioning Questions

Q. Will harmonic currents affect ferroresonant power conditioners?

A. A SolaHD ferroresonant power conditioner will have essentially harmonic-free output because of the addition of a neutralizing coil. This coil neutralizes the harmonics in a manner best explained by first considering the device as a conventional transformer with the neutralizing coil disconnected. Though this coil is now open circuited, it has a voltage induced in it as a portion of the magnetic flux passes through the center leg of the core to the outer legs. Since some of the primary flux links this coil, fundamental voltage is present. The resultant voltage has a high odd-harmonic content due to the leakage flux from the output winding.

This leakage flux can return to the output winding by two paths. One bypasses the neutralizing coil. The other path links the neutralizing coil completely. By controlling the reluctances of these magnetic paths, one can control the degree of secondary flux coupled to the neutralizing coil. The neutralizing coil is connected with its polarity additive to the secondary (or output coil) as shown in Figure 3. The output of the newly formed regulator has constant voltage with a waveshape almost completely free of harmonics.

The harmonics are still present in the output winding and also in the neutralizing coil. Since those harmonics present in the neutralizing coil are induced by the flux from the secondary winding, the harmonics in each coil are approximately 180° out of phase. This results in their cancellation. Proper control of turns ratio and magnetic path reluctance contribute to the generation of a sinusoidal output – even with a square wave input!

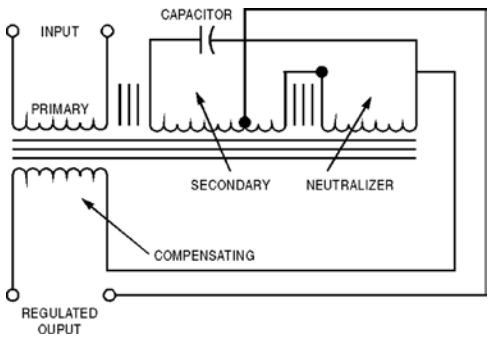


Figure 3

Q. Are there different constant voltage power conditioner designs?

A. Yes, there are two basic design concepts. A tap switching design utilizes an electronic circuit along with a traditional transformer core and coil assembly to control the output voltage. As a result, the output voltage tends to be a stepped waveform rather than a smooth sine wave.

A ferroresonant design utilizes the electromagnetic induction principle exclusively to produce the desired output voltage. Consequently, the output voltage waveform is a smooth sinewave. The ferroresonant design attenuates transient electrical noise, provides surge suppression per ANSI/IEEE Standards and provides a harmonic free output. These important benefits are not always available with other designs.

Q. Should I use a constant voltage power conditioner instead of a UPS?

A. Your question involves two different technologies used for differing reasons. 95% of all power quality problems are caused by transient noise, voltage surges, harmonics or frequently changing voltage conditions. Ferroresonant power conditioners provide the solutions for most all of these power quality problems.

The primary function of any uninterruptible power supply (UPS) is to provide an alternative voltage source (batteries) to a critical load for some period of time should a complete a power failure occur. Complete power failures account for less than 5% of all power quality problems. For the other 95% of all power quality problems, ***unless the UPS is the on–line version, the UPS is of no help.***

Q. How about response time? Will constant voltage power conditioners work as well as other AC regulator types?

A. An important advantage of SolaHD's ferroresonant CVPC is its exceedingly fast response time, compared with other types of AC regulators. Transient changes in supply voltage are usually corrected within 1-1/2 cycles or less; the output voltage will not fluctuate more than a few percent, even during this interval.

Frequently Asked Transformer Questions

Q. Can single phase transformers be banked together for three phase operation?

A. Yes, this is a common application. Standard configurations include delta-wye and delta-delta connections. Advantages to banking single phase units are:

- They are normally available from local stocks.
- Offer greater application flexibility.
- In the event of a failure of one unit in a delta-delta connection, the other transformers can be made to operate in open delta service at 57% of normal bank capacity.

While banking two or three single phase transformers in a three phase bank is often expedient, it is more expensive than using one three phase transformer.

Q. What are voltage adjustment taps?

A. In many instances, the supply voltage delivered to the input (primary) of the transformer does not exactly match the voltage rating described. If this happens, the output (secondary) voltage will vary from its nameplate rating because the transformer turns ratio (voltage ratio) is fixed by design. During design and manufacture of the transformer, additional terminations are added to the primary winding to slightly alter the turns ratio.

By closely matching the voltage being applied to the appropriate tap, a desirable output voltage can be obtained. Taps are typically located on the primary winding to correct for either sustained high or low voltage conditions on the source. Taps are expressed as a percentage of the nameplate voltage and are designated as FCAN (full capacity above normal) or FCBN (full capacity below normal).

Q. How and why is grounding of transformers important?

A. Grounding removes static charges that accumulate within a transformer. Grounding also reduces the chance of static discharge causing personal harm and possible equipment damage should the transformer windings accidently come in contact with the core or enclosure. The actual method of grounding a transformer is simple, defined in NEMA Publication No. ST20, Part 1, Page 4:

> *"ST20-1 19 GROUNDED Grounded means connected to earth or to some extended conducting body which serves instead of the earth, whether the connection is intentional or accidental. Effectively grounded means grounded through a grounding connection of sufficiently low impedance that fault grounds which may occur cannot build up voltages in excess of established limits..."*

Before grounding, make sure all contact surfaces are clean and free of any non-conductive protective coating. Any surface where connections are made must be free of rust, scale and any impediments. Make sure the flexible grounding jumper between the core and coil assembly and case is intact and tight.

The metal enclosure, or frame, of any transformer connected to a circuit operating at more than 30 Volts to ground must be effectively grounded. A grounding conductor for the transformer will have a current carrying capacity in accordance with either the National Electric Code or the National Electrical Safety Code. Make sure grounding or bonding meets NEC and local codes. It is important to note the secondary side of a transformer should be grounded as well. Since the secondary circuit is a separately derived source in an isolation transformer, the secondary side needs to be grounded properly for normal function and measurements.

For further information on grounding, refer to NEC 2005 Article 250 and NEMA ST20. These publications go into greater detail concerning grounding than space permits here.

Frequently Asked Transformer Questions

Q. How does transformer temperature relate to losses, BTU's and enclosures?

A. Transformers generate heat! They all do. There is no way of getting around it. Heat is a by-product of the transformation process and heat is due to losses in both the core and coils of the transformer. For most applications, the heat generated is of little concern. But it becomes a concern when determining how much cooling must be provided to compensate for the heat or when the temperature of the enclosure could become a problem.

Transformer losses are dependent on loading. A transformer operating at its nameplate kVA generates maximum losses. This is considered to be 100% losses at 100% load, full load losses. A transformer loaded at less than 100% doesn't generate as many losses, but it is not in direct proportion to the amount of the load as indicated in the table below. Transformer losses are expressed in watts.

Description	% Load			
	25%	50%	75%	100%
% of total heat losses generated (approx.)	20%	30%	60%	100%
% of maximum top enclosure temperature (approx.)	10%	30%	60%	100%

The top panel of a transformer enclosure may reach a maximum surface temperature of 65°C (per NEMA ST20) above the ambient temperature. In order to determine the total temperature of the enclosure, add the ambient room temperature to the °C rise. Ambient temperatures may be expressed in °F (Fahrenheit), so make sure to use the correct temperature conversion scale:

$$°C = .555 (°F - 32)$$

$$°F = (1.8 \times °C) + 32$$

Transformer losses are measured in watts. Watts must be converted to British Thermal Units (BTU's) in order to determine the amount of heat generated:

BTU's = 3.41 x watts/hour

Temperature Conversion Table			
°C	°F	°C	°F
0	32	120	248
10	50	130	266
20	68	140	284
30	86	150	302
40	104	160	320
50*	122*	170	338
60	140	220	428
70	158	190	374
80	176	200	392
90	194	210	410
100	212	220	428
110	230		

* Approximate threshold of comfort for continuous touching.

Q. How can transformer sound be controlled?

A. All energized transformers "hum". This "hum" is due to the alternating flux in the core producing a phenomenon known as magnetostriction. Transformer "hum", commonly referred to as "noise", is primarily produced by the core at a fundamental frequency of twice the applied frequency. Noise is an inherent characteristic of the core and cannot be completely eliminated. SolaHD utilizes the highest quality core steel in its complete line of dry type transformers, to minimize audible sound levels.

When selecting a transformer, make certain that the sound levels presented by the manufacturer have been measured in accordance with the American National Standards Institute, and certified by the manufacturer. NEMA Publication No. ST20 and ANSI Standard C89.2 establishes maximum sound levels for dry type transformers. These levels are:

kVA Range	Maximum Sound Level
up to 9 kVA	40 db
10 to 50 kVA	45 db
51 to 150 kVA	50 db
151 to 300 kVA	55 db
301 to 500 kVA	60 db

Frequently Asked Transformer Questions

SolaHD has low transformer sound levels due to advanced designs and the manner in which the core and coils are internally isolated from the enclosure. This is done by allowing the entire unit to "float" on vibration dampening pads.

One of the major reasons for transformer noise complaints is improper installation. Improper installation and location can increase transformer sound levels 10 decibels or more. Considering that a 3 decibel increase in sound level has the effect of approximately doubling the sound volume as detected by the human ear, a 10 decibel increase in sound level cannot (in most cases) be tolerated.

The first step in low sound level transformer installation is specifying the proper location. With the increased popularity in cost saving advantages of high voltage distribution in modern buildings today, it is necessary to locate small dry type transformers relatively close to (or within) occupied areas. Transformers should be located in areas where the noise would be the least objectionable. The maximum sound limit of the transformer to be installed should be compared to the ambient sound level of the installation location. If the transformer is expected to be louder than the ambient of the site, it should be located elsewhere.

Don't place a transformer near multiple reflective surfaces. An example of a poor transformer location would be in a corner near the ceiling or the floor. Either of these locations present three reflecting surfaces, and these surfaces will act as a megaphone for the transformer sound. Halls are undesirable too, because of the short distance between opposing reflecting surfaces. When the best possible location has been found, the next step is mounting. Transformers should be mounted on a floor, wall or structure with as great a mass as possible. One guideline is that the mounting surface should weigh at least ten times as much as the transformer. Take care not to mount a transformer on a thin wall (i.e. plywood or a curtain wall) as they amplify the noise much like a drumhead. The prime noise source in the transformer is in the core and coil. The noise from this source is amplified and reflected by any structure solidly connected to it. This includes incoming conduit and conductors. (Flexible devices may be used for this purpose). Good transformer installations try to isolate the transformer from all other components and structures.

Q. Is one insulation system better than another?

A. During recent years, the terminology used by electrical equipment manufacturers regarding insulation systems has undergone a major change. Letter designations, such as Class A, B, F and H are now Class 105, 150, 180 (sometimes referred to as 185) and 220 respectively. The preceding designations pertain only to the rating of the insulation system. The transformer's rating has also been changed – from Class A, B, F and H, to 55°C rise, 80°C rise, 115°C rise and 150°C rise. What previously was a Class H transformer is now a 150°C rise transformer utilizing a Class 220 insulation system.

The insulation rating is the maximum allowable operating temperature for normal transformer life expectancy. The insulation rating is the sum of the transformer rating, ambient operating temperature and hot spot allowance. These maximum temperature limits are set by NEMA standards. Exceeding any one of these will shorten transformer life expectancy.

A well designed transformer, operating within the temperature limits of its insulation system, will have a life expectancy of 20 to 25 years. The design life of transformers having different insulation systems is the same, (lower temperature systems will have the same life as higher temperature systems). The class of insulation used in a particular transformer is a design consideration and such factors as voltage regulation, material cost and availability are factors that the designer must consider.

Frequently Asked Transformer Questions

Q. What is balanced loading and why is it important?

A. Balancing transformer loads means being sure the transformer winding directly feeding a load is not overloaded beyond its capacity. Most single phase transformer applications involve secondary windings rated for 120/240 volts. These are frequently connected for three wire service. Since the transformer has two 120 volt secondary windings, each one is capable of supplying only one-half of the transformer's rated kVA capacity. If care is not taken, it is possible to apply a combination of 120 and 240 volt loads that will, while not exceeding the total nameplate rating, exceed the rating of one of the 120 volt windings.

The same is true of three phase transformers, especially those with 208Y/120 Volt or 480Y/277 Volt secondaries. Remember, each of the three secondary windings of a three phase transformer has a maximum capacity of one-third the nameplate kVA rating. It is always necessary to distribute the single and three phase loads as evenly as possible across the three secondary windings without exceeding their capacity.

Q. What is a triple-rated design?

A. Triple rated units are designed for applications where the AC voltage source may vary. In triple rated transformers the ratio is maintained while the unit remains fully rated at VA size for 100% loads. For example, 220, 230, or 240 voltages could all be applied to the same terminal but depending on the input, there will be different outputs, such as 110, 115, or 120 respectively.

There are different ways to express the multiple inputs and outputs depending on the voltage source used. Triple rated units labeled in catalog are a similar format as below:

240 X 480 Primary • 120 V Secondary
230 X 460 Primary • 115 V Secondary
220 X 440 Primary • 110 V Secondary

Another example of the same triple rated transformer could be written as follows:

240/230/220 X 480/460/440 Primary • 120/115/110 V Secondary

Q. What is impedance?

A. Impedance is defined as the vector sum of resistance and reactance which limits the current flow in an AC circuit. When dealing with a transformer, impedance indicates the current limiting effect should you have a short circuit on the secondary. Expressed as a percentage and usually designated as %IZ, impedance along with X/R ratio is used for coordination of fuses and/or circuit breakers. It is also used for calculating the proper interrupting rating of overcurrent protection devices.

Calculate the interrupting capacity of a circuit breaker used to protect the primary of a transformer using the following steps:

Example

If we had a 25 kVA, single phase, 60 Hz transformer, with a 480 volt primary, and 5% impedance, we would first have to determine the full load primary amperage:

$$\text{Full Load Primary Amps} = \frac{\text{Nameplate kVA rating x 1000}}{\text{Primary Voltage}}$$

$$= \frac{25 \times 1000}{480}$$

$$= \frac{25{,}000}{480}$$

Now determine maximum short circuit current:

$$\text{Maximum Short Circuit Current} = \frac{\text{Full load primary amps}}{\text{Impedance}}$$

$$= \frac{52.1 \text{ amps}}{5\%}$$

$$= \frac{52.1}{0.05}$$

The minimum interrupting capacity the circuit breaker ***must*** have will be 1042 amps.

Typically impedance of distribution transformers runs between 2% and 7%. These percentages vary depending on manufacturer, transformer size, voltage, conductor material and many other factors.

Frequently Asked Transformer Questions

Q. What are the different NEMA enclosure types and application definitions?

A.

NEMA Enclosure Types		
Type	**Description**	**Typical Applications**
NEMA–1	General Purpose	Indoor use; Guard against incidental contact
NEMA–2	Drip-proof	Indoor
NEMA–3	Protects against wind blown dust, Rain-resistant	Outdoor
NEMA–3R	Rainproof	Outdoor use to protect against falling rain, sleet, and ice protection
NEMA–4	Water-tight, Dust-tight	Indoor or outdoor use to protect against wind-blown dust and rain, splashing and hose directed water
NEMA–4X	Water-tight, Dust-tight, Corrosion-resistant	Indoor or outdoor use to protect against corrosion, wind-blown dust and rain, splashing and hose directed water
NEMA–6	Submersible, Water-tight	
Dust–tight	Indoor and outdoor	
NEMA–7	Class I (Hazardous)	Indoor use in Class I areas, per NEC
NEMA–8	Class I (Hazardous)	Indoor use in Class I, oil-immersed equipment
NEMA–9	Class II (Hazardous)	Indoor use in Class II areas, per NEC
NEMA–10	Bureau of Mines	
NEMA–11	Corrosion-resistant & Drip-proof	Indoor oil-immersed
NEMA–12	Industrial Use, Dust-tight	Indoor use to protect against dust, falling dirt and dripping noncorrosive liquids
NEMA–13	Oil-tight and Dust-tight	Indoor

Q. What are the UL enclosure types?

A. Underwriters Laboratories adopted a system for rating transformer enclosures which differs somewhat from the NEMA system. The UL system lists just three enclosure types. A UL Type 1 enclosure is intended for indoor service and offers a degree of protection from contact with the device inside the enclosure. UL Type 2 enclosures are also intended for indoor service and provide protection of the equipment inside the enclosure from limited amounts of falling dirt and water. UL Type 3R enclosures can be used either indoors or outdoors and provide protection against rain, sleet, snow and ice formation. The proper UL enclosure rating is listed on the transformer nameplate.

Q. Can 60 Hz transformers be used on 50 Hz?

A. Yes. 60 Hz transformers can be used on 50 Hz if special precautions are taken. The change in frequency will impact the flux density of the transformer causing it to run hot, as if it were overloaded. To offset this effect, you must decrease the input voltage by approximately 17% (1/6th). This means that a transformer rated for a 480 Volt, 60 Hz input could run at 50 Hz but with a maximum input voltage of 398 volts. On the other hand, 50 Hz transformers can be run on 60 Hz with no ill effects.

Frequently Asked Transformer Questions

Q. Is there a quick rule of thumb for determining what transformer K-factor rating is needed for an application?

A. Although it is not very scientific and may result in a K-factor rating larger than actually needed, there is a quick and easy method to estimate K-factor. Take a look at all of the loads that will be powered by the transformer. As you examine the loads ask yourself the following questions:

1. What is the amperage draw of this load while it is operating? Be sure to adjust inductive loads for their true power consumption.

2. Is the load electronic or electrical? Many loads may be a hybrid of the two but try to put it into one classification or another.

Once this has been done, add up all of the "electrical" loads that will be on the circuit. Do the same thing for "electronic" loads. When comparing the percentage of "electrical" loads vs. "electronic" loads, if the transformer loading is:

- 0% "electronic", 100% "electrical" – Use a standard (K-1 rated) transformer.

- 25% "electronic", 75% "electrical" – Use a K-4 rated transformer.

- 50% "electronic", 50% "electrical"– Use a K-9 rated transformer.

- 75% "electronic", 25% "electrical" – Use a K-13 rated transformer.

- 100% "electronic", 0% "electrical" – Use a K-20 rated transformer.

Although "electronic" load will vary in their K-factor rating, by considering all "electronic" loads to be the same, you are assured the sizing is correct and most probably will allow for additional "electronic" loads to be added later.

Q. Is there a more technical way to calculate K-Factor?

A. 1. List the kVA value for each load category to be supplied. Next, assign an ILK value that corresponds to the relative level of harmonics drawn by each type of load. See Table 1.

2. Multiply the kVA of each load times the ILK rating that corresponds to the assigned K-factor rating. This result is an indexed kVA-ILK value:

   kVA x ILK = kVA_ILK

3. Tabulate the total connected load kVA for all load categories to be supplied.

4. Next, add-up the kVA_ILK values for all loads or load categories to be supplied by the transformer.

5. Divide the grand total kVA_ILK value by the total kVA load to be supplied. This will give an average ILK for that combination of loads.

   (Total kVA_ILK) ÷ (Total kVA) = average ILK

6. From Table 2, find the K-factor rating whose ILK is equal to or greater than the calculated ILK. Corresponding to this ILK is the K-factor of the transformer required.

Load	K-Factor	ILK
Incandescent Lighting	K-1	0.00
Control Transformers/Electromagnetic Control Devices	K-1	0.00
Motor Generators (without solid state drives)	K-1	0.00
Distribution Transformers	K-1	0.00
Electric discharge lighting	K-4	25.82
UPS with optional input filter	K-4	25.82
Welders	K-4	25.82
Induction heating equipment	K-4	25.82
PLCs and solid state controls	K-4	25.82
Telecommunications equipment (e.g.. PBX)	K-13	57.74
UPS without input filtering	K-13	57.74
Multiwire receptacle circuits in general care areas of health care facilities and classrooms of schools, etc.	K-13	57.74
Multi-wire receptacle circuits supplying inspection or testing equipment on an assembly or production line	K-13	57.74
Mainframe computer loads	K-20	80.94
Solid state motor drives (variable speed drives)	K-20	80.94
Multiwire Receptacle Circuits in Critical Care, Operating and Recovery Room areas of hospitals	K-20	80.94
Multiwire Receptacle Circuits in Industrial, Medical and Educational Laboratories	K-30	123.54
Multiwire Receptacle Circuits in Commercial Office Spaces	K-30	123.54
Other Loads Identified as Producing Very High Amounts of Harmonics	K-40	208.17

Table 1: Sample of Typical Load K-Factors
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Frequently Asked Transformer Questions

K–Factor	K–1	K–4	K–9	K13	K–20	K–30	K–40
I_{LK}	0.0	25.82	44.72	57.74	80.94	123.54	208.17

Table 2: Index of Load K-Ratings

Problem 1

Calculate the overall K-factor for several non-linear loads.

Load Category kVA Load x ILK = kVA_ILK Value

Welders (4.0 x 25.82)	=	103.28
UPS no input filter (5.0 x 57.74)	=	288.70
Main frame computers (3.0 x 80.94)	=	242.82
Motor w/drive (0.75 x 80.94)	=	60.71
Motor w/o drive (3.0 x 0.00)	=	0.00
Totals (15.75)	=	695.51

Total kVA_ILK / Total kVA = average ILK
695.51/15.75 = 44.16 = average ILK

From Table 2, the nearest K-factor greater than or equal to the average ILK of 44.16 is K-9 with an ILK of 44.72.

Problem 2

Calculate the amount of additional K-20 load that can be handled by a 25 kVA, K-13 transformer with 9 kVA of spare capacity.

1. Determine the available spare K-13 kVA_ILK, using the ILK that corresponds to the transformer's K-factor rating.

   spare kVA x ILK = spare kVA_ILK
   9 x 57.74 = 519.66 spare kVA - ILK

2. Divide the spare kVA_ILK by the Index of Load K-rating for the load to be supplied. The ILK for a K-20 load is 80.94

   spare kVA_ILK / new load ILK@K–20 = maximum additional kVA
   519.66 / 80.94 = 6.4 kVA maximum additional kVA

3. Therefore, an additional 6.4 kVA of K-20 load could be added to this transformer. This additional loading represents the absolute maximum non-linear loading for that transformer.

For a transformer already partially loaded, any additional kVA loading must take into consideration the K-factor of each of the new loads to be added.

Q. What transformers should be used for low voltage lighting applications and are there any special considerations?

A. Buck-boost transformers are ideally suited for handing 12 or 24 Volt low voltage lighting. Although normally field connected as an autotransformer and used for voltage correction, buck-boost transformers can also be used as an isolation transformer to go from 120 or 240 Volts down to 12 and/or 24 Volts. A few tips when using transformers for low voltage lighting applications:

1. Be careful about the size of the conductor running to the lights. Resistance in a wire decreases as you increase the cross sectional size of the wire. In other words, the larger the gauge of wire, the lower the resistance. The lower the resistance, the lower the voltage drop. Losing 2 Volts due to line resistance can be critical when you're only starting with 12 Volts.

2. Try to limit the length of wire run. Again, the longer the run of wire, the greater the resistance. Many times you are better off using two smaller sized transformers and have two lighting circuits.

3. If possible, locate the transformer in the middle of the lighting run. In other words, run parallel circuits instead of one long continuous circuit. Be careful when using dimmers for low voltage applications. Locate the dimmer on the low voltage side of the transformer. This will result in a larger dimmer but dimming on the input (high voltage) side will impact the operation of the transformer. We strongly recommend you to contact the dimmer manufacturer for advice on your specific lighting application and to make sure that the dimmer is designed and rated for use with magnetic loads.

Frequently Asked Transformer Questions

Q. How do I determine the correct overcurrent (primary) protection for a 600 Volt class transformer?

A. **Primary Overcurrent Protection**

A transformer has all the same component parts as a motor, and like a motor, exhibits an inrush when energized. This inrush current is dependent upon where in the sine wave the transformer was last turned off in relation to the point of the sinewave you are when you energize the transformer. Although transformer inrush could run up to 30 to 35 times full load current under no load, it typically is the same as a motor...about 6 to 8 times normal running current. For this reason it is important to use a dual element slow blow type fuse - the same type of fuse you would use with a motor. If using a circuit breaker, select a breaker with a time delay – again the same type you would use with a motor. If the time delay is not sufficient, you may experience "nuisance tripping" – a condition where the breaker trips when energizing the transformer but when you try it again, it works fine.

Secondary Overcurrent Protection

Overcurrent devices are used between the output terminals of the transformer and the load for three reasons:

1. Protect the transformer from load electrical anomalies.
2. Since short circuit current is minimized, a smaller gauge wire may be used between the transformer and the load.
3. Per NEC, a larger primary fuse may be used to reduce nuisance tripping.

Recommended Fuse Sizes per UL508, NEC450.3(B) and NEC430-72(C) are listed on the following pages.

Recommended Secondary Fuse Sizes

	Secondary Voltage						
V_{out}	24	110	115	120	220	230	240
VA	Secondary Time Delay Dual Element Slow–Blow Fuse						
50	3.2	0.75	0.6	0.6	0.3	0.3	0.3
75	5	1.125	1	1	0.5	0.5	0.5
100	6.25	1.5	1.4	1.25	0.75	0.6	0.6
150	10	2.25	2	2	1.13	1	1
200	12	3	2.8	2.5	1.5	1.4	1.25
250	15	3.5	3.5	3.2	1.8	1.8	1.6
300	20	4.5	4	4	2.25	2	2
350	20	5	5	4.5	2.5	2.5	2.25
500	30	7.5	7	6.25	3.5	3.5	3.2
750	40	10	10	10	5.6	5	5
1000		12	12	12	7	7	6.25
1500		17.5	17.5	17.5	10	10	10
2000		25	25	25	12	12	12
3000		35	35	35	17.5	17.5	17.5
5000		60	60	60	30	30	30
7500		90	90	80	45	45	40
10K		125	110	110	60	60	60
15K		175	175	175	90	90	80
25K		300	300	300	150	150	150
37.5K				400			200
50K				600			300
75K				800			400
100K				1200			600
167K				1800			900

Fuse = I*167% next size smaller if secondary current is less than 9 amp.

Fuse = I*125% next size smaller if secondary current is 9 amp. or higher.

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Frequently Asked Transformer Questions

Primary Fuse Recommendations

	Primary Voltage												
V_{in}	120	200	208	220	230	240	277	440	460	480	550	575	600
VA													
50	1.25 (2)	.75 (1.25)	.6 (1.13)	.6 (1.13)	.6 (1)	.6 (1)	.5 (.8)	.3 (.5)	.3 (.5)	.3 (.5)	.25 (.4)	.25 (.4)	.25 (.4)
75	1.8 (3)	1.13 (1.8)	1 (1.8)	1 (1.6)	.8 (1.6)	.8 (1.5)	.8 (1.25)	.5 (.8)	.4 (.8)	.4 (.75)	.4 (.6)	.3 (.6)	.3 (.6)
100	2.5 (4)	1.5 (2.5)	1.4 (2.25)	1.25 (2.25)	1.25 (2)	1.25 (2)	1 (1.8)	.6 (1.13)	.6 (1)	.6 (1)	.5 (.8)	.5 (.8)	.5 (.8)
150	3.5 (6.25)	2.25 (3.5)	2 (3.5)	2 (3.2)	1.8 (3.2)	1.8 (3)	1.6 (2.5)	1 (1.6)	.8 (1.6)	.8 (1.5)	.8 (1.25)	.75 (1.25)	.75 (1.25)
200	5 (8)	3 (5)	2.8 (4.5)	2.5 (4.5)	2.5 (4)	2.5 (4)	2 (3.5)	1.25 (2.25)	1.25 (2)	1.25 (2)	1 (1.8)	1 (1.5)	1 (1.6)
250	3 (5)	3.5 (6.25)	3.5 (6)	3.2 (5.6)	3.2 (5)	3 (5)	2.5 (4.5)	1.6 (2.8)	1.6 (2.5)	1.5 (2.5)	1.25 (2.25)	1.25 (2)	1.25 (2)
300	4 (6.25)	4.5 (7.5)	4 (7)	4 (6.25)	3.5 (6.25)	3.5 (6.25)	3.2 (5)	2 (3.2)	1.8 (3.2)	1.8 (3)	1.6 (2.5)	1.5 (2.5)	1.5 (2.5)
350	4.5 (7)	5 (8)	5 (8)	4.5 (7.5)	4.5 (7.5)	4 (7)	3.5 (6.25)	2.25 (3.5)	2.25 (3.5)	2 (3.5)	1.8 (3)	1.8 (3)	1.75 (2.5)
500	6.25 (10)	4 (6.25)	4 (6)	3.5 (5.6)	3.5 (5)	3 (5)	5 (9)	3.2 (5.6)	3.2 (5)	3 (5)	2.5 (4.5)	2.5 (4)	2.5 (4)
750	10 (15)	6.25 (9)	6 (9)	5.6 (8)	5 (8)	5 (7.5)	8 (12)	5 (8)	4.5 (8)	4.5 (7.5)	4 (6.25)	3.5 (6.25)	3.5 (6.25)
1000	12 (20)	8 (12)	8 (12)	7.5 (10)	7 (10)	6.25 (10)	10 (17.5)	3.5 (5.6)	3.6 (5)	3 (5)	5 (9)	5 (8)	5 (8)
1500	17.5 (30)	12 (15)	12 (15)	10 (15)	10 (15)	10 (15)	15 (25)	5.6 (8)	5 (8)	5 (7.5)	4.5 (6.25)	4.5 (6.25)	4.5 (6.25)
2000	25 (40)	15 (25)	15 (20)	15 (20)	12 (20)	12 (20)	20 (35)	7.5 (10)	7 (10)	6.25 (10)	6 (9)	5.6 (8)	5 (8)
3000	35 (60)	20 (35)	20 (35)	17.5 (30)	17.5 (30)	20 (30)	35 (50)	10 (15)	10 (15)	10 (15)	9 (12)	8 (12)	8 (12)
5000	60 (100)	35 (60)	30 (60)	30 (50)	30 (50)	30 (50)	60 (90)	15 (25)	15 (25)	15 (25)	12 (20)	12 (20)	12 (20)
7500	80 (150)	50 (90)	45 (90)	45 (80)	45 (80)	40 (70)	90 (125)	25 (40)	25 (40)	20 (35)	20 (30)		
10K	110 (200)	70 (125)	60 (110)	60 (110)	60 (110)	60 (100)	110 (175)	30 (50)	30 (50)	30 (50)	25 (45)		
15K	175 (300)	100 (175)	90 (175)	90 (150)	90 (150)	80 (150)	175 (250)	45 (80)	45 (80)	40 (70)	35 (60)		
25K	300 (500)	175 (300)	150 (300)	150 (250)	150 (250)	150 (250)	90 (250)	60 (70)	70 (125)	70 (125)	60 (110)		
37K						200 (350)				100 (175)			80 (150)
50K						300 (500)				150 (250)			110 (200)
75K						400 (750)				200 (350)			175 (300)
100K						600 (1000)				300 (500)			225 (400)
167K						900 (1600)				450 (850)			350 (650)

Fuse = I*300% next size smaller if primary current is less than 2 amp. No secondary fusing required.
(Fuse) = (I*500%) next size smaller if used for a motor control circuit per NEC 430-72[C] exception No. 4

Fuse = I*167% next size smaller if primary current is less than 9 amp. No secondary fusing required.
(Fuse) = (I*250%) next size smaller if primary current is less than 9 Amps. and secondary fusing is required see chart for size.

Fuse = I*125% next size higher if primary current is 9 amp. or higher. No secondary fusing required.
(Fuse) = (I*250%) next size smaller if primary current is 9 Amps. or higher. Secondary fusing is required see chart for size.

Recommended fuse sizes per UL 508 and NEC450-3 (B) (1), NED 430-72 and commercially available type fuses.

Frequently Asked Transformer Questions

Primary and Secondary Fuse Recommendations for all Three Phase Transformers

Primary General Purpose Transformers					Secondary General Purpose Transformers			
VA	**208**	**240**	**480**	**600**	**208**	**240**	**380**	**480**
3K	12 (20)	9 (17.5)	5 (9)	4 (7)	12	9	6	5
6K	25 (40)	20 (35)	9 (15)	8 (12)	25	20	12	9
9K	35 (60)	30 (50)	15 (25)	12 (20)	35	30	18	15
15K	60 (100)	50 (90)	25 (45)	20 (35)	60	50	30	25
30K	110 (200)	100 (175)	50 (90)	40 (70)	110	100	60	50
45K	175 (300)	150 (250)	70 (125)	60 (100)	175	150	90	70
75K	300 (500)	250 (450)	125 (225)	100 (175)	300	250	150	125
112.5K	400 (750)	350 (650)	175 (300)	150 (250)	400	350	225	175
150K	600 (1000)	500 (900)	250 (450)	200 (350)	600	500	3900	250
225K	--	--	350 (650)	300 (500)	800	700	450	350
300K	--	--	500 (900)	400 (700)	1200	1000	600	500
500K	--	--	800 (1500)	650 (1200)	1800	1600	1000	800

Primary Drive Isolation Transformers				Secondary Drive Isolation Transformers	
VA	**230**	**460**	**575**	**230**	**460**
7.5K	25 (45)	12 (20)	10 (17.5)	25	12
11K	35 (60)	17.5 (30)	15 (25)	35	17.5
14K	45 (85)	25 (40)	20 (35)	45	25
20K	70 (125)	35 (60)	30 (50)	70	35
27K	85 (150)	45 (80)	35 (60)	90	45
34K	110 (200)	60 (100)	45 (80)	110	60
40K	150 (250)	70 (125)	60 (100)	150	70
51K	175 (300)	80 (150)	70 (150)	175	80
63K	200 (350)	100 (175)	80 (150)	200	100
75K	250 (450)	125 (225)	100 (175)	250	125
93K	300 (500)	150 (250)	125 (225)	300	150
118K	400 (700)	200 (350)	150 (250)	400	200
145K	500 (800)	250 (450)	200 (350)	500	250
175K	--	300 (500)	225 (400)	600	300
220K	--	350 (650)	300 (500)	700	350
275K	--	450 (850)	350 (600)	900	450
330K	--	600 (1000)	450 (800)	1200	600
440K	--	700 (1350)	600 (1000)	1400	700

Fuse = I*125% next size higher if primary current is 9 Amp or higher. No secondary fusing required.
(Fuse) = (I*250%) next size smaller if primary current is 9 Amps. or higher. Secondary fusing is required. See chart for size.

OUTPUT FUSE = 1*125% next size higher if secondary current is 9 Amps or higher. Recommended fuse size per NEC450.3[B] and commercially available fuse types.

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contact **Technical Services** at **(800) 377-4384** with any questions.

Frequently Asked Transformer Questions

Q. What is a Buck-Boost transformer and why is it used?

A. Isolation transformers have separate primary and secondary windings, electrically insulated and isolated from one another. With a relatively high voltage primary (typically 120, 240 or 480 Volts) and a relatively low voltage secondary (typically 12, 16, 24, 32 or 48 Volts), buck-boost transformers are designed to be field connected as autotransformers. These are transformers with one continuous winding, a portion of which is jointly shared between the input and the output. No electrical isolation is present in an autotransformer.

Buck-Boost transformers have two major uses:

1. When field connected as an autotransformer, they can be used to **Buck** (lower) or **Boost** (raise) available line voltage in the range of 5 to 27% and at a kVA rating many times that listed on the transformer nameplate.

2. When left as an isolation transformer, they can be used to supply power to low voltage circuits at the nameplate rating.

Q. What is the importance of altering available line voltage?

A. Electrical equipment is designed to operate at maximum efficiency at a specific standard supply voltage. Your voltage may not be at the standard supply voltage level. Causes can be proximity to a large utility transformer, losses in the line voltage due to loads on that circuit, or a difference between the standard supply voltage available and the standard supply voltage needed to run the equipment.

Normally the problem is having low voltage available. Low voltage on a circuit, even as little as 5% lower can cause a decrease in incandescent light output, and a decrease in resistive heat output. With motors low voltage can cause a decrease in motor torque, an increase in motor amperage requirements, an increase in motor temperature and decrease in motor life expectancy.

Q. What are the pros and cons of using a Buck-Boost transformer?

A. When deciding whether or not a buck-boost transformer is right for your application, consider the following:

Cost

For most applications, buck-boost transformers are generally less than 25% of the cost of a comparable transformer.

Size

Buck-Boost transformers can provide five to ten times their nameplate kVA rating. They are smaller, lighter and less expensive than a standard isolation transformer. Because of their small size they are quieter, more efficient and may be better suited for applications where size is critical and an isolation transformer just won't fit.

Isolation

Buck-Boost transformers will not provide any circuit isolation when connected as an autotransformer nor are they capable of generating a neutral.

Life

Buck-Boost transformers have the same life expectancy as other distribution transformers, typically 20 to 25 years.

Q. Why are Buck-Boost transformers sold as isolation transformers instead of being preconnected for specific voltage applications?

A. Flexibility in the field. By providing buck-boost transformers as four winding isolation transformers, you get, when considering all single and three phase possibilities, 24 different wiring configurations. Add to that the possibility of four different low voltage isolation connections for low voltage lighting or control applications and you can see the flexibility and versatility of buck-boost transformers.

Frequently Asked Transformer Questions

Q. Are copper windings better than aluminum windings?

A. As with most questions of this type pertaining to transformers, a lot depends upon the application and the individual preferences of the person specifying the transformer. Quite often the reason cited for specifying copper windings is copper's high electrical conductivity.

During World War II, copper became scarce and was used primarily for the war effort. Several industries turned to aluminum as alternative to copper because it was in good supply, was very stable price-wise and was less expensive than copper. In the 1940's high-power transmission power lines were converted from copper to aluminum and secondary power distribution networks began utilizing aluminum in the 1950's. Today, virtually all standard transformer lines from the major manufacturers are wound with aluminum. Although copper wound transformers tend to be smaller than comparable aluminum wound transformers offer some distinct advantages over copper wound units:

- Both copper and aluminum oxidize over time. Aluminum conductors oxidize until all exposed aluminum surfaces are covered with and oxide layer. At that point oxidation stops unless the aluminum oxide barrier is somehow broken and the aluminum conductor is re-exposed to the air. Aluminum oxide inhibits chemical reaction of the metal with the wire insulation. Aluminum oxide is also a good electrical insulator. Copper on the other hand oxidizes completely over time. Copper also acts as a mild catalyst, hastening the decay of the wire insulation. All of these factors combine to give aluminum wound transformers a longer life than comparable copper wound units, typically about five years.

- The heat storage capacity of aluminum is approximately 2.33 times that of copper (specific heat of aluminum is 0.214 cal/gram/°C, specific heat of copper is 0.092 cal/gram/°C). With aluminum wound transformers having a superior thermal storage capacity than copper wound units, they can withstand more surge and overload currents than copper units (normal exhibited when a motor starts.)

- Although the conductivity of copper is better than that of aluminum, on a per pound basis aluminum is over twice as good a conductor as copper.

Aluminum wire has received a negative connotation over the year primarily because of the care that must be taken in making connections. Copper proponents are quick to refer to hotel and mobile home fires that occurred where aluminum wire was present. Upon close examination it was found that the root causes of these problems is related to incorrect wiring devices being used. Copper and aluminum expand at different rates when heated. If aluminum wire is used with wiring devices solely rated for use with copper wire, the connection could loosen as the connection heats up causing the resistance of the connection to increase and the temperature to continue to escalate. Most transformer manufacturers address this problem by making a transition between the aluminum windings, either to a copper lead wire (or bus bar) or by terminating to an Al/Cu lug (or connector).

Q. So why are copper wound transformers still specified?

A. Copper wound units may be specified because of space limitations. Copper wound units can also be specified due to the environment in which the transformer will be exposed. If the environment would be corrosive to aluminum, copper wound transformers would make sense. Of course, some people may just like copper wound transformers for their own reasons. SolaHD manufactures aluminum wound transformers but can manufacture copper wound transformers upon special order. Contact your SolaHD representative for pricing and manufacturing lead times.

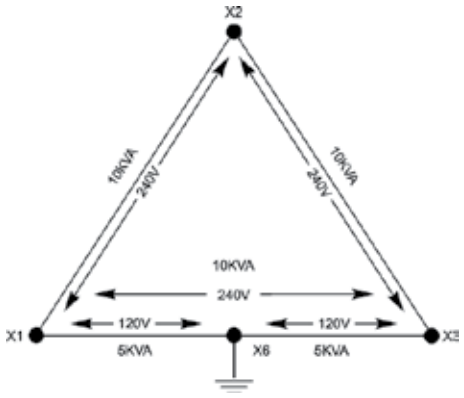
Frequently Asked Transformer Questions

Q. What is the capacity of the center tap on a 240 delta connection with one phase tapped?

A. This is one of the most common transformer application questions. If the transformer is a SolaHD T5H series the tap is full capacity, but we must define what full capacity means on one phase of a three phase transformer. A three phase transformer built by SolaHD in a ventilated enclosure (standard construction on 15 kVA and above) has a per phase capacity equal to 1/3 of the nameplate rating. Therefore, the tapped phase of a T5H30S has a total capacity of 10 kVA (1/3 of 30 kVA). The 120 volt tap is at the center of this 240 volt winding so the capacity is 5 kVA on either side of the tap (X1 to X6 and X3 to X6).

To determine the available capacity of the center tap, you must know the three phase load applied to the 240 delta. Each phase will supply 1/3 of the kVA to the three phase load. If the T5H30 has a 21 kVA, 3 phase load connected to it, each phase is loaded at 7 kVA. Therefore, the tapped phase has 3 kVA available (10 kVA - 7 kVA = 3 kVA). The center tap can be loaded to 3 kVA without over loading the transformer, but the load must be split so that no more than 1.5 kVA (1/2 the available capacity) is connected to either side of the tap (X1 to X6 and X3 to X6). The general formula is:

$$\frac{\text{Transformer kVA - 3Ø Load kVA}}{6} = \text{kVA of each Center Tap Circuit}$$



Note:

All 480 delta to 240 delta transformers stocked by SolaHD are equipped with a center tap.

Q. Ventilated transformers are 150°C rise, and Hardshell® units are 115°C rise. Why are the Hardshell® units so much warmer to the touch?

A. Ventilated transformers are free standing devices placed in a metal housing to protect the unit from the atmosphere, and people from electrical hazards. Ventilated units are surrounded by air, which acts as a cooling medium. The natural convection created by the heat of the transformer causes heat to ventilate through the top of the unit while cool air is drawn in from the bottom (chimney effect).

Hardshell® are placed in an enclosure that is filled with electrical grade sand and epoxy. All the air is displaced within this solid epoxy block, so any heat is radiated directly to the enclosure surface. This makes the entire enclosure of the transformer act like a heat sink. All SolaHD enclosed transformers are UL and CSA listed, your guarantee that the surface temperatures will not rise more than 50°C above ambient.

Q. What is regulation?

A. Under no load, a transformer is not providing voltage to the output. When a load is applied, the voltage will drop slightly. The difference in the output voltage under load vs. unloaded is referred to as the transformer's output regulation and is normally expressed as a percentage. If under no load a transformer had an output voltage of 240 Volts but under load the output voltage was 230 Volts, the difference would be 10 Volts and the regulation would be 10/240 or 4.17%. The power factor of the load can impact the transformer's regulation. General purpose transformers can be used with a variety of loads, the most common being inductive motor loads and resistive loads. For that reason, it is common to express transformer regulation at 100% power factor and also at 80% power factor.

Frequently Asked Transformer Questions

Q. What do the terms “peak inrush current” and “exciting current” mean and how do they relate to transformers?

A. ***Exciting current*** is the amount of amperage a transformer draws under a no load condition. Another way to look at it is that exciting current is the transformer’s “idling” current. Exciting current could also be referred to as no load current although this is not technically accurate. Exciting current is actually made up of two components: no load losses (normally expressed in watts) and reactive power (normally expresses in kVAR). Exciting current varies as a percent of the transformer’s nameplate rating depending upon the transformer size. It is not unusual to have an exciting current of approximately 10% on very small transformers (under 1 kVA). On larger transformers, exciting current could be as low as a half of one percent.

Peak inrush current is the amount of amperage a transformer draws instantaneously when it is turned on. A transformer has an iron core and works under the principle of magnetic induction. Alternating current flows through a coil of wire (primary winding) and generates a magnetic field. The iron core of the transformer contains most of the magnetism and conducts this magnetism to where it passes through a second coil of wire (secondary winding).

Since alternating current travels in the form of a sine wave, the amount of magnetism will fluctuate depending upon the point in the sine wave. As this magnetism cuts through the path of the second coil of wire, it induces a voltage into it. When the transformer is turned off, the iron core retains an amount of residual magnetism depending on where in the sine wave the unit was when turned off. When the transformer is turned on, the greater the difference in the sine wave from the “turn off” point to the “turn on” point determines the amount of inrush current. Inrush current could be very small if everything was in phase, or it could be as high as 20 to 30 times full load current. Although this inrush condition disappears rapidly (in 6 to 10 electrical cycles - one tenth to one sixth of a second) it is the first half electrical cycle that sees the peak amount of inrush. This condition can cause problems with overcurrent devices. If the fuse or breaker is of a “quick trip” variety or not properly sized according to the National Electric Code, the inrush may cause it to trip falsely.

Q. Can general purpose transformers be used to power industrial control devices?

A. The answer to this question is strictly application related. Industrial control transformers (sometimes referred to as machine tool transformers or control transformers) are specifically design to meet the demands required to power Industrial control devices such as contactors, solenoids and relays. Industrial control devices typically have two power requirements – inrush capacity (the power required to energize or seal the contacts) and sealed capacity (the power required to keep the contacts sealed). It is not uncommon for inrush requirements to be 5, 10 or 15 times the sealed requirements.

It is critical that during this period of time requiring the inrush VA requirement that the voltage powering the device remain as steady as possible. Industrial control transformers are designed to provide excellent voltage regulation under inrush conditions. Transformer design engineers accomplish this via a number of different methods. Common methods include compensating transformer secondary windings (to offset secondary winding losses), using a larger conductor on the secondary windings (to cut winding losses) and designing a slightly larger (and usually more expensive) transformer.

General purpose transformers provide good voltage regulation up to full nameplate load but the output voltage may drop slightly when the transformer is subjected to a momentary overload. This voltage drop may be beyond what the industrial control device can tolerate. Care needs to be taken if industrial control devices are to be powered from a general purpose transformer. It is not recommended to use a general purpose unit if you are powering one or two devices from the transformer or if you have multiple devices that all “turn on” at the same time. A general purpose transformer may be preferable if you have multiple devices to power that do not “turn on” at the same time and space within the motor control panel is at a premium. Normally a general purpose transformer can be located on the outside of the motor control panel.

Frequently Asked Transformer Questions

Q. Are there any special considerations when powering electric motors?

A. Different product react differently to motor loads and some are better suited for motor loads than others. For example:

- UPS products (uninterruptible power supplies) are designed to provide power to critical loads where the loss of power could cause massive problems (such as computer loads). Normally motor loads are not considered to be critical. If your application rates a motor load as critical, you must size the UPS to the inrush requirements of the motor (typically 6 to 10 times running load current).

- Constant voltage power conditioners are ferroresonant devices that provide clean, highly regulated power to critical loads. Because of the design of the product, the output voltage of a constant voltage power conditioner will go to zero when the load reaches 200% of nameplate rating. Since motor inrush is typically 600 to 1000% of nameplate motor load, constant voltage power conditioners must also be sized to the inrush demands of the motor. Unless circumstances are highly unusual, neither UPS systems or constant voltage power conditioners should be used with motor loads.

- Transformers are designed to power motor loads. Although output voltage may momentarily drop when subjected to the motor's inrush current, the transformer will act somewhat like a soft start device. If your application calls for a motor to be powered from one transformer, the running load amperage of the motor should not exceed 2/3 of the transformer's nameplate amperage rating (66%). The reason is as voltage decreases due to motor inrush conditions, motor torque and horsepower also drop proportionally. If voltage were to drop to 80%, torque and horsepower would drop to 64% (80% squared). If torque were to drop to within 50% nameplate rating, the motor could overheat due to excess current draw. This condition could exist without tripping the overcurrent device and could result in failure of the motor or transformer.

Q. What effect does ambient temperature have on transformer operation?

A. Other conditions that need be considered when sizing a transformer to a motor load are ambient temperature (derate the transformer nameplate rating by 8% for ever 10°C above 40°C), altitude (derate nameplate rating by .3% for every 300 feet above 3300 feet), and motor loads that frequently start and stop. If a motor starts several times an hour (such as an air conditioner), the calculated transformer size required should be increased by 20% to offset the effects of inrush heating. If the motor starts very frequently (such as an elevator), the service factor of the load must be used to calculate the proper transformer size. If the service factor of the load is 1.25, the calculated transformer size should be increased by 25%.

Remember

Each 10°C over the rated temperature rise cuts the life of your transformer by one half.

Q. Can a Delta Primary (three wire) transformer be used on a Wye (four wire) source?

A. Yes, any delta primary transformer can be connected to a wye source simply by not using the neutral of the source. This connection will not cause any adverse effects in the operation of the transformer or the source.

Frequently Asked Transformer Questions

Q. Can transformers be operated at voltages other than nameplate voltages?

A. In some cases transformers may be operated at voltages less than nameplate voltage. **In no case should a transformer be operated at a voltage above nameplate voltage** unless taps are provided for this purpose. When operating below nameplate voltage the kVA rating of the transformer is reduced due to the increase in current. For example a 10 kVA 480-240 transformer can have a secondary load of 41.6 amps, if the same transformer was operated at 240-120 the same current draw of 41.6 amps equates to a 5 kVA transformer.

Q. What transformer VA should I use if I know my inrush VA?

A. Select the VA needed for your application from the chart below.

Regulation Data – Inrush VA at 20% and 40% Power Factor

Selection Inrush VA*				Transformer VA Rating
Type SBE		Type SMT		
20% PF**	40% PF**	20% PF**	40% PF**	
294	207	N/A	N/A	50
515	363	N/A	N/A	75
696	490	N/A	N/A	100
1362	959	N/A	N/A	150
2131	1501	N/A	N/A	200
2883	2031	N/A	N/A	250
3608	2541	N/A	N/A	300
4777	3364	N/A	N/A	350
7601	5353	N/A	N/A	500
12939	9112	N/A	N/A	750
18703	13171	8277	5829	1000
23814	16066	17182	12100	1500
34586	24356	22834	16080	2000
45633	32770	34506	24300	3000
158000	111000	71284	50200	5000

** Assuming the transformer is to deliver a minimum of 90% secondary voltage during inrush conditions.*
*** See Note C on page 158.*

Q. Can a single-phase transformer be connected to a three-phase source?

A. Yes, the transformer output will be single phase. By connecting two wires from the source (three or four wire) to the transformers primary leads. Care must be used to ensure transformer loading does not create a phase imbalance on the source.

Q. Can transformers be reverse connected?

A. Dry type transformers can be reverse connected without a derating of kVA size, with certain limitations. SolaHD three-phase, Delta-Delta transformers and all single-phase transformers rated at 1 kVA and above can be reverse connected without any loss in kVA rating.

SolaHD does not recommend reverse connecting single phase transformers less than 1 kVA since the turns ratio compensation on the low voltage winding will provide voltages lower than name plate voltage. This voltage will be lower for lower kVA sizes.

SolaHD does not recommend “reverse feeding” of Delta-Wye transformers for the following reasons:

- No taps for adjustment of primary to source.
- Corner grounding of Delta per local code. (Center tapping of one leg on secondary side is not possible.)
- Unbalanced loading causing imbalanced voltages (possible 2X line to line).
- Neutral connected to source may cause circulating currents in secondary windings (one phase loss causes short to the other two phases).

The first two bullets only apply to Delta-Delta configurations, whereas, all bullets apply to Delta-Wye transformers. The correct method would be to choose the transformer that has the appropriate primary and secondary voltages. Contact your local representative for a quotation on a custom transformer.

A custom design may already exist to match your application. Most transformer designs can be manufactured in less than three weeks depending upon availability of materials. “Starship” service is available for current designs at an additional fee. Contact Technical Services for “Starship” availability.

Frequently Asked Surge Protective Device (SPD) Questions

Q. What is the Joule rating of a SPD?

A. Energy (Joule) rating is a misleading specification used in the SPD industry to define the amount of "energy" absorbed by the suppressor. The term "Joule Ratings" is currently not recognized by ANSI, NEMA, IEEE, or IEC as being relevant to AC surge protection devices. No actual standard exists to properly define this measurement and manufacturers resort to adding the number of components used in the product to determine the joule rating. A larger joule rating isn't always better. Testing for energy dissipation (joules) is not uniform and this rating doesn't add much value to the specification of the SPD. In spite of the controversy surrounding this term, it is still commonly used primarily in the SPD receptacle & plug strip industry.

Q. Does a SPD provide energy savings?

A. Don't be misled by the myth that SPDs will provide energy savings. A SPD by design is a passive device wired in parallel with the load it is protecting. SPD devices in general are intended only to lower the energy level of a surge (micro to nano seconds disturbance). This protection is not the same as providing energy savings.

Q. How should a SPD be applied?

A. • SPDs should be installed with the shortest lead length possible and as close as possible to the load it is protecting.

- SPDs protecting panels should be wired in parallel with the service entrance or distribution panels. A disconnecting means must be provided for servicing and for short circuit and over current protection.
- When a circuit breaker cannot be installed, install a tap on the buss or lugs. Wire in a fused disconnect to provide the above mentioned protection for the SPD. This method of installation allows the SPD to be replaced safely without shutting down the power.
- SPDs must be wired and grounded according to the (NEC) National Electrical Codes.
- Using Whole Facility Protection would safeguard your electrical system against most transients. This means that the protection is staged; service entrance protection, sub-panel protection, and point of use protection.

Frequently Asked UPS Questions

Q. Why should only an On-line UPS be used with a standby generator?

A. An On-line UPS accepts input power with relatively wide variations in voltage and frequency, a common occurrence in power produced by standby generators. The true on-line (double conversion) technology provided by an On-Line UPS handles these variations by converting the input power from AC to DC and then converting DC to AC output power. Generators should be equipped with an electronic governor to minimize frequency variations. Always check the frequency range of the generator output as the use of a mechanical governor does allow for large changes in frequency to reach the load. A wide frequency swing may cause the UPS to switch to the battery more frequently.

An Off-line or Line-interactive UPS is not recommended for use with a standby generator. An Off-line UPS passes utility power straight through to the load. When a variation is detected, it can protect the load from the frequency variations of the standby generator by transferring to battery power. Occasionally, the input frequency will match the specifications of the Off-line UPS and it will transfer back from battery. These occurrences are infrequent and short lived, but the battery may not have sufficient time to recharge. It will support the load only until it is completely depleted and then shut down the load. A Line-interactive UPS faces the same issue as the Off-line. The power conditioning (tap switching) functions of the Line-interactive units focus on correcting voltage variations and have no effect on frequency variations. It reacts to out-of-spec frequencies similar to the Off-line UPS.

The same input frequency variations that would cause an Off-line or a Line-interactive UPS to transfer to battery are of little concern or have no effect on the On-line UPS. On-Line UPS's compensate for generator frequency variations while prolonging battery life.

Q. What loads should not be powered by a UPS?

A. Loads that are highly inductive may cause a UPS to malfunction. Examples of equipment that should NOT be powered by a UPS include:

- Air Conditioners
- Motor Load
- Sump Pump
- Solenoid
- Drills
- Space Heaters
- Vacuum Cleaners
- Buffing Machines
- Fans
- Laser Printers
- Transformers (step up/step down)

The majority of loads that require UPS protection are electronic type loads. For example; process control, automation equipment, computer, and telecommunication. A UPS is also recommended to support microprocessor-based technology type loads.

In addition, CVS and MCR power conditioner products are not recommended for use on the input and or output side of the UPS.

Q. What is the advantage of a manual Maintenance Bypass Switch (MBS)?

A. The MBS is designed to allow the UPS to be taken out of service for maintenance, repair, or replacement. There are two types of MBS: Make-Before-Break (MBB) and Break-Before-Make (BBM). As the name implies, a MBB has continual contact so the load does not need to be shut down. A limitation of the MBB bypass is that the input voltage and frequency to the UPS must be exactly equal to the output voltage.

Frequently Asked UPS Questions

Q. Where can I get a copy of the MultiLink™ software for the S3K, S4K and S5K UPS?

A. MultiLink™ software can be downloaded, free of charge, off of our website at www.solahd.com.

Q. I am getting 'Communications Loss - Not Protected'?

A. This occurs when MultiLink™ software is not able to communicate with the monitored device.

Resolution:

- The cable to the UPS is not connected securely or to the correct port on the Computer or UPS.
- You system is unable to open the serial port, possibly because of a port conflict.
- If connected to a MultiPort 8, you are not on the Smart Port.
- If a MultiPort 4 is used, you must be connected to the built-in RS232 port on the UPS not the connector on the MultiPort 4.
- The connected UPS is not a Series S3K, S3K2U, S4K or S5K Modular. SolaHD only supports these models for serial communications. If you do not have one of these models, then you need to switch to the contact closure method of communications. See Contact Closure below.
- An SNMP card is installed in the unit. When you install the SNMP card in the Series S3K, S3K2U, S4K, or S5K Modular the serial port on the DB9 connector disables Transmit and Receive pins, but leaves the contact closure pins functioning. Your only option is to use the contact closure method of communication. See Contact Closure section of this page.
- You are using the cable that came in the box with the UPS, part number: SML9P9S. This cable is wired for contact closure only. You can obtain the correct cable (SML39P9S), or switch to the contact closure cable.

Contact Closure

If any one of the last three bullets above is true you will need to change the Monitoring type to Contact Closure. Under the Overview tab, right click on the device icon under MultiLink™ Device Network and select Properties. Change the Device Type from Serial UPS to Contact Closure.

Q. How do I add licenses so I can shut down more than one computer?

A. Go to the drop down menu Configure and select Upgrade License. A window will open and allow you to enter the location of the upgrade license. Contact Technical Services for more information on license upgrade options. MultiLink™ License Kits enable in-band shutdown on more than one computer, or the management of multiple UPS and software installations.

Part Number	Description
MLLKB	MultiLink License Kit, 5 Computers
MLLKC	MultiLink License Kit, 10 Computers
MLLKD	MultiLink License Kit, 20 Computers
MLLKG	MultiLink License Kit, 100 Computers
MLLKU	MultiLink License Kit, Unrestricted
MLLNA	MultiLink Network Administration License

Frequently Asked UPS Questions

Q. Which cable do I use for my MultiLink™ application?

A. See table below. If still unsure, contact Technical Services.

Catalog Number	Description	Function	UPS Support
SML39P9S	MultiLink™ Serial Interface cable for use with MultiLink™ 3.0	Connects UPS to computer running MultiLink™ 3.0. Provides detailed instrumentation & parametric data.	Series S3K, S4K and S5K Modular
SML9P9S	MultiLink™ Contact Closure Interface cable	Connects UPS to computer running MultiLink™ 1.x or 3.0. Provides On-Battery, Low-Battery signals only.	UPS models equipped with DB9 ports (including Series S3K, S4K and S5K Modular

Q. Can I build my own cable?

A. Yes, see instructions on our website at http://www.solahd.com/products/ups/software/ml3/Cable.htm or contact Technical Services.

Frequently Asked Power Supply Questions

Q. What Is A DC Power Supply?

A. A DC power supply is a device that takes alternating current (AC) and converts it to a stable, well regulated, direct current (DC) output (or outputs) at specified voltage and current levels. AC power is supplied by the utility because it is easy to generate and distribute. Most applications require various levels of DC power to operate. DC power supplies convert the AC power to DC power and regulate the voltage to the necessary level.

Q. What is a NEC Class 2 power supply?

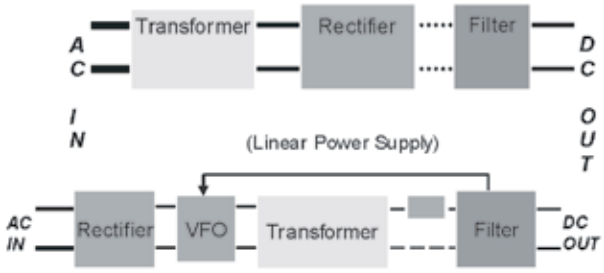
A. A Class 2 power supply is defined by article 725.41 of the National Electrical Code (NEC code book), and has limited output power to 100 watts. This makes this type of supply useful for wiring in circuits which have less restrictions than if the supply did not meet this rating.

Q. Can a DIN rail power supply be mounted in any orientation?

A. DIN rail power supplies are designed to operate up to full ratings when mounted on a horizontal DIN rail. This allows the power supply to dissipate heat through convection cooling via the “chimney effect”. If a power supply is mounted in another orientation, care must be taken to avoid thermal damage to the power supply. If the unit is mounted sideways or front side up, then the continuous output rating must be derated. A rule-of-thumb is to derate the output by 50%, but please contact Technical Services for recommendations on specific models or unusual applications.

Q. How does a power supply work?

A. A ***Linear*** DC power supply operates as follows: The AC input voltage is transformed to another level. Then it is rectified into pulsating DC and is filtered (smoothed) to reduce the ripple.



(Switch Mode Power Supply)

Regulation keeps the output level constant

A ***Switchmode*** DC power supply operates as follows:

The AC input is rectified into DC then converted by the Variable Frequency Oscillator (VFO) into high frequency AC. The high frequency AC passes through an isolation transformer then is rectified and filtered to a smooth regulated DC output. Regulation is achieved by adjusting the frequency through the isolation transformer.

Linear vs. Switcher

Specification	Linear	Switcher
Output Regulation	.05 to .1 %	1 to 3 %
Output Ripple	.5 to 2.0 mV	25 to 100 mV
Input Voltage	± 10%	± 40 to 50%
Efficiency	40 to 55%	70 to 90%
Power Density	.5 watts/cu. in	2 to 3 watts/cu. in
Transient Recovery	1.0 msec	10 msec
Hold-Up Time	2 to 3 msec	25 to 30 msec

Power Solutions Flow Charts

We have provided some quick charts below to help migrate through our product catalog. Your specific application and environment will always determine the most suitable product. The following is a guide to help you determine the type of application you have.

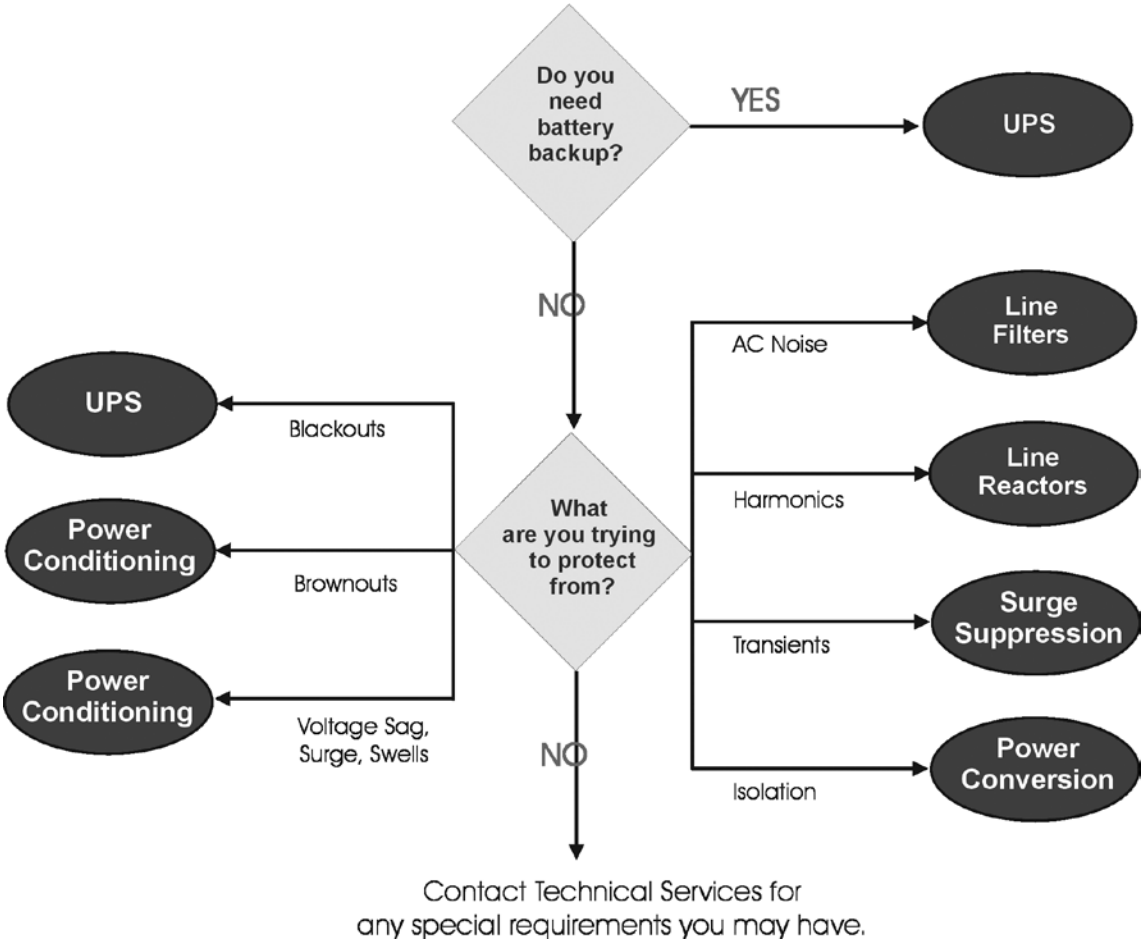
Our solutions can be divided into two main categories:

- Power Conversion - Manipulating AC or DC power to another state.
- Power Quality - Regulate, isolate, filter, protect or backup AC or DC power.

Power Quality

SolaHD provides a broad array of power quality products to fit your application and your budget. SolaHD's most relied upon industrial power quality solution, the voltage regulating power conditioner, is complemented by many surge, filter, UPS (Standby) and UPS (Online) options.

Whether you are protecting your expensive equipment, backing up power for outages or sags, or delivering clean, safe power to your sensitive devices for maximum productivity, SolaHD can provide the solution. Many of these products can be used in combination in your system or across your facility to provide a complete solution.

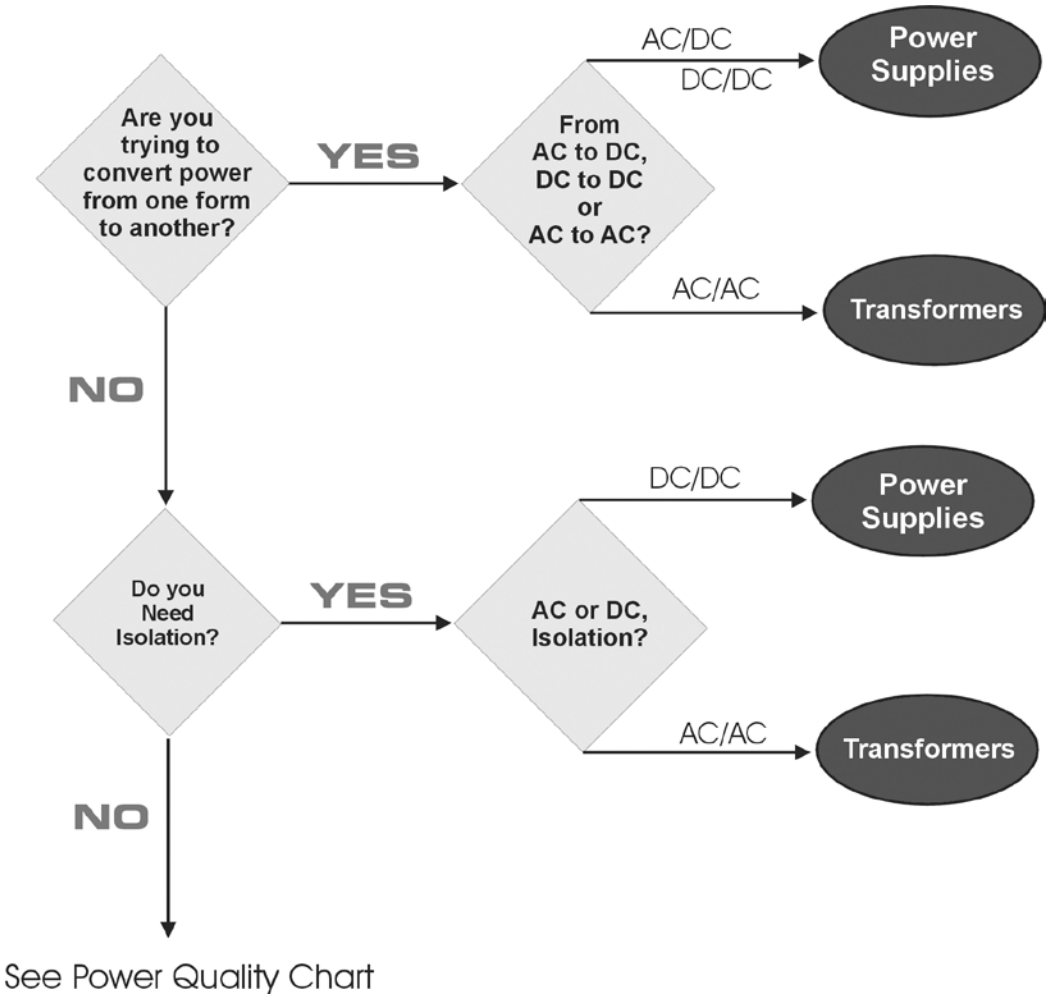


Visit our website at www.solahd.com or
contact **Technical Services** at **(800) 377-4384** with any questions.

Power Conversion

SolaHD offers a broad range of standard products to meet almost all of your industrial AC-AC, AC-DC, and DC-DC needs. DIN Mount, chassis and rackmount products are offered in many conversion topologies to meet your exact mounting and performance requirements.

SolaHD products are differentiated by industrial performance ratings such as wide temperature ratings, high MTBF, lack of fans in designs, continuous short circuit capabilities, high densities, and rugged packaging. Global specifications and high efficiency designs make industrial system design easy.



Glossary of Terms

2/50 Voltage Wave

Voltage surge with a virtual front time of 1.2 ms and a time to half-value of 50 ms delivered across an open circuit.

8/20 Current Wave

Current surge with a virtual front time of 8 μs and a time to half-value of 20 μs delivered into a short circuit.

AC (Alternating Current)

Current that reverses direction in response to voltage that is changing polarity.

AC Power Interface

The electrical points where an SPD is electrically connected to the AC power system.

Active Tracking® Filter

A Surge Suppressor/Electrical Noise filter device, that suppresses both transient and Low voltage electrical noise found on the AC line.

Active Tracking® Filter Plus:
A device that both divert or clamp high amplitude transients, and attenuate low-energy, high frequency noise.

Air-Cooled

A product cooled by the natural circulation of air.

Ambient Noise Level

The sound level of the area measured in decibels.

Ambient Temperature

The temperature of the air surrounding a product.

Ampacity

The current-carrying capacity of an electrical conductor or device.

Ampere

The practical unit of electric current.

Attenuation

Decrease in signal voltage or power.

Autotransformer

A transformer in which part of one winding is common to both the primary and secondary circuits associated with that winding.

Banked

Two or more transformers connected together to increase kVA.

Basic Impulse Level (BIL)

A measure of the ability of the insulation system to withstand very high voltage surges. For example, a 600-volt class transformer has a 10 kV BIL rating.

Battery Run Time

The amount of time (in minutes) a battery system can support a load.

Blackout

Slang term for the total loss of electrical power for more than one minute.

Breakdown Voltage

The maximum AC or DC voltage which may be applied from input to output and/or chassis of a power supply. *See Hi–Pot.*

Brownout

Slang term for an extended voltage reduction (more than a few cycles) of more than 10%.

Bypass

A mechanical or electronic switch to provide an alternate path for the line current.

CBEMA

An acronym for Computer and Business Equipment Manufacturers Association. Replaced by the Information Technology Industry Council (ITIC).

CE Mark

(Conformité Européenne) - A marking that shows the product meets the fundamental safety, health, environmental and consumer protection requirements of the European Community.

Chassis

The metal framework or case in which an electrical circuit or system is constructed.

Combination Wave

Also called combination surge. A surge delivered by a generator which has the inherent capability of applying a 1.2/50 ms voltage wave across an open circuit and delivering an 8/20 ms current wave into a short circuit. The exact wave that is delivered is determined by the generator's fictive impedance.

Common-Mode Noise

Noise that occurs between the current carrying conductors and ground.

Compensated Transformer

A transformer with a turn's ratio which provides a higher rated voltage at no-load and rated voltage at rated load. Normally used on units rated 2 kVA or smaller.

Constant Current Power Supply

A power supply that regulates its output current for changes in line, load, ambient temperature, and time.

Constant Voltage Power Supply

A power supply that regulates its output voltages for changes in line, load, ambient temperature and time.

Constant Voltage Transformer (CVT)

A power conditioner that provides a stable and regulated sinewave output voltage.

Continuous Duty

The service requirement that demands operation at a constant load for an indefinite period of time.

Control Transformer

Usually referred to as an Industrial Control transformer. Designed for good voltage regulation characteristics when low power factor and /or large inrush currents are drawn (5 to 15 times normal).

Conductor Losses

Losses in the transformer winding that are incidental to the carrying of the load. These losses include those due to resistance as well as to stray and eddy currents.

Core

The steel that carries the magnetic flux in a transformer.

Core Loss

Losses caused by a magnetization of the core.

Glossary of Terms

Crest Factor

The ratio of the peak value and RMS value of a voltage or current waveform.

Cross-Regulation

In a multiple output power supply, the percent voltage change at one output caused by the load change on another output.

Crowbar

An overvoltage protection circuit which rapidly places a low resistance shunt across the power supply output terminals if a predetermined voltage is exceeded.

CSA

Canadian Standard Association

Current Limiting

See Output Current Limiting.

DC

(Direct Current) Current that flows in only one direction.

Decibel (db)

A unit used to express the magnitude of a change in signal or sound level, either an increase or decrease.

Delta Connection

A method used for connecting the three windings of a three-phase transformer (or three single-phase transformers). The windings are connected in series, the three-phase supply being taken from or supplied to the junctions.

Delta-Wye

The method of connection for both primary and secondary windings of a three-phase transformer bank.

Derating

The specified reduction in an operating parameter to improve reliability.

Differential Mode Noise

Noise that occurs between the current carrying conductors.

DIN Rail

A standard rail (typically 35 mm wide) that mounts to the chassis and allows other electrical components to be installed and replaced easily.

Distribution Transformer

Any transformer rated between 3 and 500 kVA and a primary voltage of 601 volts or less.

Double Conversion UPS

See On–line UPS

Double Wound Transformer

A transformer with double wound coils on both the primary and secondary.

Drift

The change in output voltage of a power supply over a specified period of time, following a warm-up period, with all other operating parameters such as line, load, and ambient temperature held constant.

Drive Isolation Transformer

A transformer designed to withstand the additional heat and mechanical stress caused by DC drives.

Dry Type Transformer

A transformer cooled by a medium other than a liquid, usually through the circulation of air.

Dual Wound Coils

Two part windings that can be connected in series or parallel to adjust the voltage or current.

Dynamic Load Regulation

The ratio of change in output voltage to change in load current.

Eddy Currents

Additional currents caused by a magnetic field.

Efficiency

A measure of energy loss in a circuit.

Electronic Tap Changing Regulator

An electronic switching system used to adjust for changes in line voltage to maintain the output voltage within acceptable levels.

Electrostatic Shield

A grounded conductor placed between the primary and secondary winding to greatly reduce or eliminate line-to-line or line-to-ground noise. Often referred to as a “Faraday shield”.

EMC

(Electromagnetic Compatibility) A directive necessary to get the CE Mark, which shows the electrical device will not create high levels of EMI and will not fail due to normal levels of EMI.

EMI

See Noise/Electrical Noise.

Encapsulated

A method of sealing a device with epoxy to resist environmental effects.

ESR

Equivalent Series Resistance. The amount of resistance in series with an ideal capacitor which exactly duplicates the performance of a real capacitor.

Excitation Current

The steady rate current that keeps the transformer energized after the inrush has dissipated, with all other windings open-circuited. Also called “magnetizing” or “no-load current.”

Faraday Shield

See Electrostatic Shield.

FCAN and FCBN Taps

Acronyms for Full Capacity Above Normal and Full Capacity Below Normal.

Ferroresonance

A method of producing a constant voltage by use of a special saturated transformer. Invented and patented by Joseph Sola in 1938.

Ferroresonant Power Supply

A stabilized power supply (CVDC) driven by a constant voltage transformer.

Filter

A device that reduces unwanted electrical noise.

FL

Full-load

Flyback Converter

A power supply switching circuit which normally uses a single transistor. During the first half of the switching period the transistor is on and energy is stored in a transformer primary; during the second half period this energy is transferred to the transformer secondary and the load.

Glossary of Terms

Foldback Current Limiting

A power supply output protection circuit whereby the output current decreases with increasing overload, reaching a minimum at short circuit.

Force Air Cooled

A means of accelerating heat dissipation to lower the temperature rise of an electrical device.

Forward Converter

A power supply switching circuit in which energy is transferred to the transformer secondary when the switching transistor is on. In this circuit minimal energy is stored in the transformer.

Frequency (Hertz)

Cycles per second.

Full Bridge Rectifier

A power switching circuit in which four diodes are connected in a bridge configuration.

Ground Loop

The condition of having two or more ground references in a common system.

Half Bridge Rectifier

A power switching circuit similar to the full bridge converter except that only two diodes are used.

Harmonics Distortion

The distortion of the AC waveform due to the addition of sinewaves of different frequencies being added to the AC voltage.

Hi-Pot Test

High Potential Test. A test to determine if the breakdown voltage of a transformer or power supply exceeds the minimum requirement.

Holdup Time

The length of time a power supply's output voltage remains within specifications following the loss of input power.

Impulse

A high amplitude, short duration spike (milliseconds) superimposed on the normal voltage or current.

Input Line Filter

A low-pass or band-reject filter at the input of a power supply which reduces line noise fed to the supply. This filter may be external to the device.

Input Voltage Range

The high and low input voltage limits within which a device meets its specifications.

Inrush Current

The peak instantaneous input current drawn by a device at turn-on.

Inrush Current Limiting

A circuit which limits the inrush current during turn-on of a device.

Inverter

A power converter that changes DC input power into AC output power.

Isolation Transformer

A transformer in which the input winding and the output winding are not electrically connected.

Isolation

The electrical separation between input and output of a circuit.

Isolation Voltage

The rated AC or DC voltage which may be continuously applied from input to output and/or chassis of a device. *See Hi–Pot.*

kVA Rating

A measurement of apparent power. 1 kVA = 1000 VA.

KW Rating (kilowatts)

A measurement of real power delivered to a load 1 KW = 1000 VA x Power Factor

Leakage Current

The AC or DC current flowing from input to output and/or chassis of an isolated device at a specified voltage.

Line Regulation

The change in output voltage due to a variation in input voltage.

Linear Power Supply

A power supply that uses a control device, like a transistor, in series (or parallel) with the load. The control device adjusts the effective resistance to give a constant voltage output.

Linear Regulator

See Linear Power Supply.

Load Regulation

The change in output voltage due to a variation in load.

Local Sensing

Using the power supply output voltage terminals as the sense points to provide feedback to the voltage regulator.

Low Voltage Transients

High frequency noise

LVD

Acronym for Low Voltage Directive. A European Community directive which shows the device is not a shock or fire hazard.

Maximum Continuous Operating Voltage (MCOV)

The maximum designated root-mean-square (rms) value of the power frequency voltage that may be continuously applied to the mode of protection of an SPD.

Modes of Protection

Electrical paths where the SPD offers defense against transient overvoltages. Examples include Line to Neutral (L-N), Line to Ground (L-G), Line to Line (L-L) and Neutral to Ground (N-G).

MOV

Acronym for Metal-Oxide-Varistor. A voltage sensitive device used to limit overvoltage conditions on AC power and data lines.

MTBF

Acronym for Mean Time Between Failure. The statistical failure rate of a device.

Glossary of Terms

Noise/Electrical Noise

Also called electromagnetic interference, or EMI. Unwanted electrical signals that produce undesirable effects and otherwise disrupt the control system circuits.

Nominal Value

The stated or objective value for a quantity.

Normal Mode Noise

See Differential Mode Noise.

Off-Line UPS

A UPS where the inverter is normally off until there is a power failure. Also known as a Standby UPS.

On-Line UPS

A UPS where the inverter is always powering the load. AC is converted to DC to charge the battery then DC is converted to AC to power the load. On-Line UPS are often referred to as a "Double Conversion UPS".

Output Current Limiting

An output protection feature which limits the output current to a predetermined value in order to prevent damage to the device under overload conditions.

Output Voltage

The nominal value of the voltage at the output terminals of a device.

Overload Protection

See Output Current Limiting.

Overshoot

A transient change in output voltage, in excess of specified output accuracy limits, which can occur when a power supply is turned on or off, or when there is a step change in line or load.

OVP

Acronym for Overvoltage Protection. A power supply feature which shuts down the supply, or crowbars or clamps the output, when its voltage exceeds a preset level.

Parallel Operation

The connection of the outputs of two or more identical devices to obtain a higher output power.

PARD

Acronym for Periodic and Random Deviation. A term used for the sum of all ripple and noise components measured over a specified band width and stated in either peak-to-peak or RMS values.

PE

Acronym for Protective Earthing. The incoming earthing conductor provided by the utility.

PI Filter

A commonly used filter at the input of a switching supply or DC/DC converter to reduce reflected ripple current. The filter usually consists of two parallel capacitors separated by a series inductance and is generally built into the supply.

Post Regulator

A linear regulator used on the output of a switching power supply to improve line and load regulation and reduce output ripple voltage.

Power Boost™

Describes the advanced overload capability of the SDN and SDP power supplies to power high inrush loads without oversizing.

Power Factor

The ratio of true power Watts) to apparent power (VA).

Power Fail Detection

A power supply option which monitors the input voltage and provides an isolated logic output signal when there is loss of line voltage.

Pre-regulation

The regulation at the front-end of a power supply, generally by a type of switching regulator, this is followed by output regulation, either by a linear or switching type regulator.

PWM Inverter

Acronym for Pulse Width Modulation. An efficient method of creating sinewave power.

Push-Pull Converter

A power switching circuit which uses a center-tapped transformer and two power switches which are driven on and off alternately. This circuit does not provide regulation by itself.

Rated Output Current

The continuous load current that a device was designed to provide.

Rectification

The conversion of alternating current to direct current.

Redundancy

The addition of extra devices to provide a backup in the event of the loss of one of those devices.

Remote Sensing

The ability for a power supply to sample the load voltage located a distance away, and adjust for the resulting voltage drop.

Return

The name for the common terminal of the output of a power supply; it carries the return current for the outputs.

Reverse Voltage Protection

A feature which protects a power supply against a reverse voltage applied at the input or output terminals.

Ripple

A small AC voltage on the DC output of a power supply that remains after filtering.

Ripple and Noise Pertibations

Small AC voltage on the output of a DC power supply at a specified bandwidth. This is the result of feed through of the rectified line frequency, internal switching transients and other random noise.

Glossary of Terms

Sag

A temporary drop in the RMS voltage, which may last from one cycle to a few seconds.

Short-Circuit Protection

A feature which protects the device from a short-circuit so that the device will not be damaged.

SNMP

Acronym for Simple Network Management Protocol. A standard for LAN management messaging and control of network devices and their functions.

Soft Start

A feature which limits the start-up switching currents of a switching supply and causes the output voltage to rise gradually to its final value.

SPD

Surge Protective Device. Divert or clamp high amplitude transients.

Standby UPS

See Off–Line UPS.

Static UPS

See On–Line UPS.

Step-Up/Step-Down Transformers

A transformer that either increases or decreases the input voltage.

Swell

A temporary increase in the RMS voltage, which may last from a half cycle to a few seconds.

Switching Frequency

The rate at which the voltage is switched in a DC-DC converter or switching power supply.

Switching Regulator

A high efficiency circuit used to regulate output voltages.

Switchmode Power Supplies (SMPS)

A power supply that uses a switching regulator.

Temperature Coefficient

The average percent change in output voltage per degree Centigrade change in ambient temperature over a specified temperature range.

Temperature Range, Operating

The ambient temperature range within which a device may be safely operated and meets its specifications.

Temperature Range, Storage

The ambient temperature range within which a device may be safely stored, non-operating, with no degradation in its subsequent operation.

Thermal Protection

An internal safeguard circuit that shuts down the unit in the event of excess internal temperatures.

THD

Acronym for Total Harmonic Distortion. The ratio of the harmonic content to the fundamental frequency expressed as a percent of the fundamental.

Transfer Time

The amount of time a device takes to switch from one mode of operation to another.

Transformer

An electrical device that changes AC voltage from one level to another.

Transformer Turns Ratio

The ratio of primary turns to secondary turns.

Transient

A high amplitude, short duration (milliseconds) spike superimposed on the normal voltage or current. Sometimes called a **spike** or a **surge**.

Transient Recovery Time

The time required for the output voltage of a device to settle within specified output accuracy limits following a step change in output load current or a step change in input voltage.

Transverse Mode Noise

See Differential Mode Noise.

TVSS

Transient Voltage Surge Suppressor. Also known as SPD

UL

Acronym for Underwriters Laboratories tested.

UL Recognized

Designation given to components that when used properly in an end product are deemed to be safe.

UL Listed

Designation given to products ready for end use.

Undervoltage

*See **Brownout.***

UPS

Acronym for Uninterruptible Power Supply. A device which supplies power to the critical load when the existing AC line voltage is not within normal operating values, or fails completely.

VA

Acronym for Voltamp. A measure of power. 1000 VA = 1 kVA.

VFD

Variable Frequency Drive.

Voltage Balance

The difference in magnitude, in percent, between the two output voltages of a dual output power supply where the voltages have equal nominal values with opposite polarities.

Warm-Up Drift

The initial change in output voltages of a device from turn-on until it reaches thermal equilibrium.

Warm-Up Time

The time required, after initial turn-on, for a device to meet its performance specifications.

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