Size: 5.24in x 5.12in x 4.92in
(133mm x 130mm x 125mm)

FEATURES

- Universal 85-277VAC / 120-390VDC Input Voltage
- High Efficiency, High Reliability
- Continuous Static Power Margin of up to 112% (PN)
- Provides 5s Up to 150% (PN) Dynamic Power
- Active PFC, PF >0.97
- Support DC OK, AC OK, Remote Control Function
- Supports ModBus Communication Protocol
- Double-Sided Conformal Coating, Salt-Spray Proof, Explosion Proof
- Pollution Degree 2
- Supports 5+1 Parallel Redundancy, Current Sharing
- Output Short Circuit, Over Current, Over Voltage, and Over Temperature Protection
- OVC II
- OVC III (Design Refers to EN62477, 2000m)
- RoHS Compliant
- Meets ANSI/ISA 71.04-2013 G3 Corrosion Test
- Safety According to EN62368-1, BS EN62368-1 (Report); Design refers to IEC/UL62368-1, EN61558-1, IEC/EN/UL61010-1, GB4943.1, EN62477-1, IEC60079-0, EC60079-7, IEC60079-15, GB3836.1, and NB/T31017

DESCRIPTION

The PSHDN960 series of AC/DC power supplies offers 960 watts of power in a 5.24” x 5.12” x 4.92” din rail package. This series consists of single output models with a wide input voltage range of either 85-277VAC or 120-390VDC. Features of this series include high efficiency, high reliability, active PFC, DC OK, AC OK, and remote control function. It is also protected against output short circuit, over current, over voltage, and over temperature conditions and has safety according to EN62368-1, BS EN62368-1 (Report) and design refers to IEC/UL62368-1, EN61558-1, IEC/EN/UL61010-1, GB4943.1, EN62477-1, IEC60079-0, EC60079-7, IEC60079-15, GB3836.1, and NB/T31017.

MODEL SELECTION TABLE

Model Number	Input Voltage Range	Output Voltage	Output Voltage Adjustable Range	Output Current	Output Power(1)	Maximum Capacitive Load	Efficiency
PSHDN960-24S	85~277VAC (120~390VDC)	24V	24-28V	40A	960W	50000μF	95%
PSHDN960-48S		48V	48-56V	20A	960W	25000μF	95%

SPECIFICATIONS

All specifications are based on Ta=25°C, Humidity <75%, Nominal Input Voltage, and Rated Output Load unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION	TEST CONDITIONS		Min	Typ	Max	Unit
INPUT SPECIFICATIONS						
Input Voltage Range	AC Input		85		277	VAC
	DC Input		120		390	VDC
Maximum Input Voltage	Lasts for 2h without damage				305	VAC
Input Voltage Frequency			47		63	Hz
Input Current	115VAC				12	A
	230VAC				6	
Inrush Current	Cold Start	115VAC		20		A
		230VAC		20		
Input Switching Voltage			65		80	VAC
Input Turn-Off Voltage			55		70	VAC
Power Factor	115VAC		0.98			
	230VAC		0.97			
Input Fuse	Built-In Fuse			16		A
Hot Plug			Unavailable			
OUTPUT SPECIFICATIONS						
Output Voltage			See Table			
Voltage Accuracy	Full Load Range			±1.0		%
Line Regulation	Rated Load			±0.5		%
Load Regulation	0%-100% Load			±1		%
Output Power			See Table			
Output Current			See Table			
Maximum Capacitive Load			See Table			
Ripple & Noise(2)	20MHz bandwidth (Peak-Peak Value)	24V			100	mV
		48V			150	
Hold-Up Time	115VAC/230VAC		27			ms
Start Up Delay Time	115VAC/230VAC, Rated Load				3	S
Static Power	115VAC/230VAC, Works for a long time at room temperature			112		%Io
Dynamic Power	The shutdown time is adaptive according to different load conditions, long-term protection, self-recover		150%Io works 5s min			
DC OK Signal	Resistive Load		30VDC/1A Max.			

SPECIFICATIONS

All specifications are based on Ta=25°C, Humidity <75% RH, Nominal Input Voltage, and Rated Output Load unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION	TEST CONDITIONS			Min	Typ	Max	Unit
PROTECTION							
Short Circuit Protection[3]	Long-term short-circuit protection, self recovery			Hiccup mode, constant current operation (constant current tie adapts with different load conditions), output off for 5s			
Over Current Protection[3]				120		150	%Io
Over Voltage Protection	Output-Off or Clamping, Self-Recovery)	24V			≤35		VDC
		48V			≤60		
OVC				III			
Over Temperature Protection[4]	230VAC, Rated Load			Output-Off, Self-Recovery			
ENVIRONMENTAL SPECIFICATIONS							
Operating Temperature				-40		+85	°C
Storage Temperature				-40		+85	°C
Operating Humidity	Non-Condensing			10		95	%RH
Storage Humidity	Non-Condensing			20		90	%RH
Power Derating (Rated Power)	Operating Temperature Derating	-40°C to -30°C		2			%/°C
		+60°C to +75°C		2.5			
		+75°C to +85°C		4.5			
	Input Voltage Derating	85VAC-100VAC		2			%/VAC
MTBF	MIL-HDBK-217F @40°C			524,000			H
ENVIRONMENTAL CHARACTERISTICS							
High and Low Temperature Working	+85°C, -40°C			GB2423.1, IEC60068-2-1			
Sinusoidal Vibration	10-500Hz, 1g, three directions of X, Y, Z axis			GB2423.10, IEC60068-2-6			
Salt Mist	+35°C, 5%NACL, 48h			GB2423.17, IEC60068-2-11			
Alternating Hot and Humid	+25°C, 95%RH - +60°C, 95%RH			GB2423.4, IEC60068-2-30			
Low Temperature Storage	-40°C			GB2423.1, IEC60068-2-1			
High Temperature Storage	85°C			GB2423.2 IEC60068-2-2			
High Temperature Aging	60°C			GB2423.2, IEC60068-2-2			
Normal Temperature Aging	25°C			GB2423.1, IEC60068-2-1			
Temperature Shock	-40°C to 85°C			GB2423.22, IEC60068-2-14			
Temperature Cycle	-25°C to 60°C			GB2423.22, IEC60068-2-14			
Hot and Humid	+85°C, 85%/RH			GB2423.50, IEC60068-2-67			
High Temperature Elevation	60°C, 54KPa			GB2423.26, IEC60068-2-41			
Low Temperature Elevation	-25°C, 54KPa			GB2423.25, IEC60068-2-40			
Constant Humid and Hot	40°C, 95%RH			GB2423.3, IEC60068-2-78			
Packaging Drop	1m, one corner, three edges and six sides			GB2423.8, IEC68-2-32			
GENERAL SPECIFICATIONS							
Typ. Efficiency	230VAC			See Table			
Switching Frequency[5]	PFC			60		70	kHz
	DC-DC			40		120	
Isolation Test[6]	Electric strength test for 1min. Leakage Current <6mA (Isolation Test needs to remove the screw at the mark)		Input-⏚	2500			VAC
	Electric strength test for 1min. Leakage Current <5mA (Isolation Test needs to remove the screw at the mark)		Input-Output	4000			
			Output-⏚	500			
Insulation Resistance	Environment Temperature: 25±5°C Relative Humidity: <95%, Non-Condensing Test Voltage: 500VDC		Input-⏚	50			MΩ
			Input-Output	50			
			Output-⏚	50			
Leakage Current	264VAC		Touch Current		<0.5		mA
FUNCTIONAL SPECIFICATIONS							
Remote Control	Voltage Between ON/OFF and SGND	Power On		0		0.8	VDC
		Power Off		4		10	
DC OK Relay	Operating Voltage	24V			21.6		V
		48V			43.2		
	Release Voltage	24V			20.4		
		48V			40.8		
AC OK Signal	Input Voltage 85-305VAC			3		5	VDC
Current Sharing Accuracy	When multiple units are connected in parallel, the sub-modules shunt more than 50% of the rated load of a single power supply				±5		%
LED Signal	Main Output Status Indicator	Normal Output		LED ON			
		Power Off (No AC Power), Under-Voltage Protection, Remote Off, Short Circuit/Over-Current Protection, Over Voltage Backflow		LED OFF			
RS485-A, RS485-B	Based on ModBus Communication Protocol			RS485 Communication			

SPECIFICATIONS

All specifications are based on Ta=25°C, Humidity <75% RH, Nominal Input Voltage, and Rated Output Load unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION	TEST CONDITIONS					Min	Typ	Max	Unit
PHYSICAL SPECIFICATIONS									
Weight							5.51lbs (2.5kg)		
Dimensions (L x W x H)							5.24in x 5.12in x 4.92in (133mm x 130mm x 125mm)		
Case Material							Metal (AL5052, SUS304)		
Cooling							Free Air Convection		
SAFETY CHARACTERISTICS									
Safety Standards[7]							EN62368-1, BS EN62368-1 (Report) Design refers to IEC/UL62368-1, EN61558-1, IEC/EN/UL61010-1, GB4943.1, EN62477-1, IEC60079-0, EC60079-7, IEC60079-15, GB3836.1, NB/T31017, ANSI/ISA 71.04-2013		
Safety Class							Class I		
EMI	CE	General Standard	CISPR32 EN55032				Class B		
		Industry/Light Industry	IEC61000-6-3		AC Port		Class B		
					DC Port		Class A		
			IEC61000-6-4		AC Port		Class A		
		Classification Society	GD22-2015		10kHz-30MHz, EMC1				
		Power Station/Subsation	IEC61850-3				Class A		
		Railway	IEC62236-3-2 (EN50121-3-2)		Output Port		Class A +20dB		
			IEC62236-4 (EN50121-4)		Output Port		Class A +20dB		
			IEC62236-5 (EN50121-5)		AC Port		Class A		
	RE	General Standard	CISPR32 EN55032				Class B		
		Industry/Light Industry	IEC61000-6-3				Class B		
			IEC61000-6-4				Class A		
		Classification Society	GD22-2015				150KHz-2GHz, EMC1		
		Power Station/Subsation	IEC61850-3				Class A		
		Railway	IEC62236-3-2 (EN50121-3-2)				Class B		
			IEC62236-4 (EN50121-4)				Class B		
			IEC62236-5 (EN50121-5)				Class B		
	Harmonic Current	General Standard	IEC/EN6100-3-2				Class A and Class D		
		Railway	IEC62236-3-2 (EN50121-3-2) 50Hz-2KHz						
			IEC62236-4 (EN50121-4) 50Hz-2KHz						
EMS	ESD	General Standard	IEC/EN61000-4-2	Output Port	Contact ±8kV/Air ±15kV		Perf. Criteria A		
		Industry/Light Industry	IEC61000-6-1		Contact ±4kV/Air ±8kV		Perf. Criteria B		
			IEC61000-6-2		Contact ±4kV/Air ±8kV		Perf. Criteria B		
		Wind Power	NB/T 31017-2011		Contact ±6kV/Air ±8kV		Perf. Criteria A		
		Classification Society	GD22-2015		Contact ±6kV/Air ±8kV		Perf. Criteria B		
		Power Station/Subsation	IEC61850-3		Contact ±6kV/Air ±8kV		Perf. Criteria A		
			IEC61000-6-5		Contact ±6kV/Air ±8kV		Perf. Criteria A		
		Railway	IEC62236-3-2 (EN50121-3-2)		Contact ±6kV/Air ±8kV		Perf. Criteria B		
			IEC62236-4 (EN50121-4)		Contact ±6kV/Air ±8kV		Perf. Criteria B		
			IEC62236-5 (EN50121-5)		Contact ±6kV/Air ±8kV		Perf. Criteria B		

SPECIFICATIONS

All specifications are based on Ta=25°C, Humidity <75% RH, Nominal Input Voltage, and Rated Output Load unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION		TEST CONDITIONS			Min	Typ	Max	Unit
SAFETY CHARACTERISTICS (Cont.)								
EMS	RS	General Standard	IEC/EN 61000-4-3	10V/m				Perf. Criteria A
		Industry/Light Industry	IEC61000-6-1	80M-1GHz, 3V/m; 1.4G-6GHz, 3V/m				Perf. Criteria A
			IEC61000-6-2	80M-1GHz, 10V/m; 1.4G-2GHz, 3V/m; 2-2.7GHz, 1V/m				Perf. Criteria A
		Wind Power	NB/T 31017-2011	80M-1GHz, 10V/m				Perf. Criteria A
		Classification Society	GD22-2015	80M-2GHz, 10V/m				Perf. Criteria A
		Power Station/Subsation	IEC61850-3	80M-3GHz, 10V/m				Perf. Criteria A
			IEC61000-6-5	80M-1GHz, 10V/m; 1G-2.7GHz, 3V/m; 2.7G-6GHz, 1V/m				Perf. Criteria A
		Railway	IEC62236-3-2 (EN50121-3-2)	80M-1GHz, 20V/m; 1.4GHz-2GHz, 10V/m; 2G – 2.7GHz, 5V/m; 2.7G-6GHz, 3V/m				Perf. Criteria A
			IEC62236-4 (EN50121-4)	80M-800MHz, 10V/m; 800MHz-1GHz, 20V/m; 1.4G – 2GHz, 10V/m; 2G-2.7GHz, 5V/m, 5.1G-6GHz, 3V/m				Perf. Criteria A
			IEC62236-5 (EN50121-5)	80M-800MHz, 10V/m; 800MHz-1GHz, 20V/m; 1.4G – 2GHz, 10V/m; 2G-2.7GHz, 5V/m, 5.1G-6GHz, 3V/m				Perf. Criteria A
	EFT	General Standard	IEC/EN 61000-4-4	±4kV				Perf. Criteria A
		Industry/Light Industry	IEC61000-6-1	DC input, output and signal control port: ±0.5kV, 5/100KHz, AC input and output port: ±1KV, 5V/100KHz				Perf. Criteria B
			IEC61000-6-2	DC input, output and signal control port: ±0.5KV, 5/100KHz, AC input and output port: ±1KV, 5/100KHz				Perf. Criteria B
		Wind Power	NB/T 31017-2011	Power source and PE: ±4KV, 5/100KHz, signal and control port: ±2KV, 5/100KHz (Capacitive coupling clamp)				Perf. Criteria A
		Classification Society	GD22-2015	±1KV, 5KHz; ±2KV, 2.5KHz				Perf. Criteria B
		Power Station/Subsation	IEC61850-3	AC, DC input output port, signal port, ground port: ±2KV				Perf. Criteria A
			IEC61000-6-5	AC, DC input output port: ±2KV; signal port: cable <3m: ±2KV, cable >3m: ±4KV				Perf. Criteria A
		Railway	IEC62236-3-2 (EN50121-3-2)	Signal, control port: ±2KV, 5KHz (Capacitive coupling clamp), AC, DC input output port: ±2KV, 5KHz				Perf. Criteria A
			IEC62236-4 (EN50121-4)	Signal, control port: ±2KV, 5KHz (Capacitive coupling clamp), AC, DC input output port: ±2KV, 5KHz, PE ground/shell: ±1KV, 5KHz				Perf. Criteria A
			IEC62236-5 (EN50121-5)	Signal, control port: ±2KV, 5KHz (Capacitive coupling clamp), AC, DC input output port: ±4KV, 5KHz, PE ground/shell: ±1KV, 5KHz				Perf. Criteria A
	Surge	General Standard	IEC/EN 61000-4-5	AC Input Port: ±3KV/±6KV				Perf. Criteria A
		Industry/Light Industry	IEC61000-6-1	DC input and output port: ±0.5KV/±1KV, AC input and output port: ±1KV/±2KV, signal and control port: ±1KV common mode				Perf. Criteria B
			IEC61000-6-2	DC input and output port: ±0.5KV/±0.5KV, AC input and output port: ±1KV/±2KV, signal and control port: ±1KV common mode				Perf. Criteria B
		Wind Power	NB/T 31017-2011	AC, DC power source port: ±1KV/±2KV				-
		Classification Society	GD22-2015	AC, DC power source: ±0.5KV/±1KV				Perf. Criteria B
		Power Station/Subsation	IEC61850-3	AC, DC power source, signal port: ±1KV/±2KV, power carrier communication port: ±2kV/4kV				Perf. Criteria B
			IEC61000-6-5	Signal, control port: ±1KV common mode (if the cable <10m, no test is required), DC input and output port: ±1KV/±2KV, AC input and output port: ±2KV/4KV				Perf. Criteria B
		Railway	IEC62236-3-2 (EN50121-3-2)	Battery port, AC input port: ±1KV/±2KV (42Ω output impedance)				Perf. Criteria B
			IEC62236-4 (EN50121-4)	DC power source, signal, control port: ±1KV/±2KV (42Ω output impedance), AC power source port: ±1KV/±2KV				Perf. Criteria B
			IEC62236-5 (EN50121-5)	DC input and output, signal, control port: ±1KV/±2KV, AC input and output port: ±2KV/±4KV				Perf. Criteria B

SPECIFICATIONS

All specifications are based on Ta=25°C, Humidity <75% RH, Nominal Input Voltage, and Rated Output Load unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION	TEST CONDITIONS				Min	Typ	Max	Unit
SAFETY CHARACTERISTICS (Cont.)								
EMS	CS	General Standard	IEC/EN61000-4-6	10Vr.m.s				Perf. Criteria A
		Industry/Light Industry	IEC61000-6-1	AC input and output, signal, control port: 0.15M-80MHz, 3V				Perf. Criteria A
			IEC61000-6-2	AC input and output, signal, control port: 0.15M-80MHz, 10Vr.m.s				Perf. Criteria A
		Wind Power	NB/T 31017-2011	0.15M-80MHz, 10Vr.m.s				Perf. Criteria A
		Classification Society	GD22-2015	0.15M-80MHz, 10Vr.m.s, Low frequency conduction immunity: AC input port, harmonic <15 times 10%Un, harmonic = 15-100 times, from 10%Un to 1%Un, harmonic = 100-200 times, 1%Un; DC input port, 10%Un, 50-10kHz, apply power ≤2W (Can reduce the applied voltage)				Perf. Criteria A
		Power Station/Subsation	IEC61850-3	AC DC input, output signal, control port, PE port: 0.15M-80MHz, 10Vr.m.s				Perf. Criteria A
			IEC61000-6-5	AC, DC input, output, signal, control port: 0.15M-80MHz, 10Vr.m.s				Perf. Criteria A
		Railway	IEC62236-3-2 (EN50121-3-2)	AC/Battery input, signal, control port: 0.15M-80MHz 10Vr.m.s				Perf. Criteria A
			IEC62236-4 (EN50121-4)	AC, DC input, output, signal, control port: 0.15M-80MHz, 10Vr.m.s				Perf. Criteria A
			IEC62236-5 (EN50121-5)	AC, DC input, output, signal, control port, PE port: 0.15M-80MHz, 10Vr.m.s				Perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	General Standard	IEC/EN61000-4-11	0%, 70%				Perf. Criteria B
		Industry/Light Industry	IEC61000-6-1	0%, 0.5/1 period, 70%, 25/30 period @50/60Hz, 0%, 250/300 period @50/60Hz				Perf. Criteria B and C
			IEC61000-6-2	0%, 1 period, 0%, 250/300 period @50/60Hz, 40%, 10/12 period @50/60Hz				Perf. Criteria B and C
		Power Station/Subsation	IEC61850-3	AC input and output port: 100%, 5/50 period, DC input and output pot: 100%, 0.05s				Perf. Criteria B
			IEC61000-6-5	AC input and output port: 70%, 1 period, 40%, 50 period, 0%, 5 period, 0%, 50 period				Perf. Criteria B
		Power Station/Subsation	IEC61850-3	DC input and output, signal/control port: 30V continuous, 300V/1s				Perf. Criteria A
			IEC61000-6-5	DC input and output, signal/control (cable >30m) port: 30V continuous, 300V/1s				Perf. Criteria A
	Power Frequency Magnetic Field	General Standard	IEC/EN61000-4-8	100A/m continuous, 1KA/m 1s				Perf. Criteria A
		Industry/Light Industry	IEC61000-6-1	50/60Hz, 30A/m				Perf. Criteria A
			IEC61000-6-2	50/60Hz. 30A/m				Perf. Criteria A
		Power Station/Subsation	IEC61850-3	100A/m continuous, 1KA/m 1s				Perf. Criteria A
			IEC61000-6-5	100A/m continuous, 1KA/m 1s				Perf. Criteria A
		Railway	IEC62236-4 (EN50121-4)	50Hz, 100A/m, DC 300A/m				Perf. Criteria A
			IEC62236-5 (EN50121-5)	50Hz, 100A/m, DC 300A/m				Perf. Criteria A
	Intercom Interference Test		MS-SOP-DQC-007					Perf. Criteria B

NOTES

1. When the output voltage rises, the total power of the product should not exceed the rated power.
2. Tip and barrel method is used for ripple and noise test, output parallel 47uF electrolytic capacitor and 0.1uF ceramic capacitor, contact factory for more information.
3. Over current protection mode and short circuit protection mode see product characteristic curves.
4. Over temperature protection put the product into a high temperature box. After the ambient temperature stabilizes, increases the temperature slightly (3°C to 5°C) and the load remains unchanged. After the product reaches thermal equilibrium, increase the temperature until the product triggers over-temperature protection.
5. The power supply has two converters with two different switching frequencies. Intermittent operation mode will be entered in light load or no load.
6. ① Remove screw at the ⏚ when the product is subjected to withstand voltage test. ② The gas discharge tube built into the device effectively protects the power supply against damage by asymmetric disturbance variables (eg EN 61000-4-5). Each power supply continuous withstand voltage test will cause extremely high load to the power supply. Therefore, unnecessary loading or damage to the power supply due to excessive test voltage should be avoided. If necessary, disconnect the gas discharge tube built into the device to use a higher test voltage. After successful completion of the test, reconnect the gas discharge tube. Contact factory for specific operation methods.
7. This product is Listed to applicable standards and requirements by UL.
8. Contact factory for related LED signal and control logic and usage instructions
9. When multiple units work with current sharing, the output voltage deviation of each power supply working along shall not exceed 100mV.
10. Perf Criteria
    A: The equipment shall continue to operate as intended without operator intervention
    B: After the test, the equipment shall continue to operate as intended without operator intervention.
    C: Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturers instructions.
11. Room temperature derating of 5°C/1000m is needed for operating altitude greater than 2000m.
12. In order to improve the efficiency at high input voltage, there will be audible noise generated, but it does not affect product performance and reliability.
13. Customization is available, please contact factory.
14. Product customization is available. Please contact factory.
15. The out case needs to be connected to PE (⏚) of system when the terminal equipment is operating.
16. Key to adjust Δ key for voltage increase, ▽ key for voltage decrease.
17. Products classified to ISO14001 and related environmental laws and regulations and should be handled by qualified units.

**Due to advances in technology, specifications subject to change without notice.*

WARNINGS

WARNING: Risk of electrical shock, fire, personal injury or death:

1. Do not use the power supply without proper grounding (Protective Earth). Use the terminal on the input block for earth connection and not one of the screws on the housing.
2. Turn power off before working on the device, protect against inadvertent re-powering.
3. Make sure that the wiring is correct by following all local and national codes
4. Do not modify or repair the unit.
5. Do not open the unit as high voltages are present inside.
6. Use caution to prevent any foreign objects from entering the housing.
7. Do not use in wet locations or in areas where moisture or condensation can be expected
8. Do not touch during power-on or immediately after power-off, hot surfaces may cause burns 
9. For ambient temperature ≤60°C, use ≥90°C – copper wire only; for ambient temperature >60°C to 85°C, use ≥105°C – copper wire only; use only wires with a minimum dielectric strength of 300V (input) and 60V (output)

**Due to advances in technology, specifications subject to change without notice.*

CHARACTERISTIC CURVES

Temperature vs Output Power

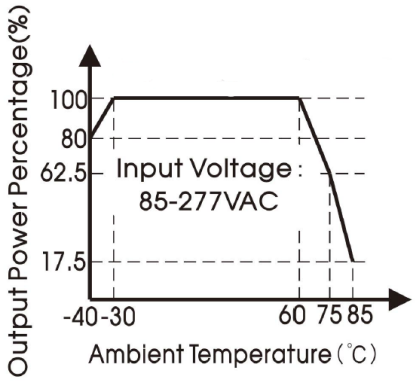


Figure 1

Temperature vs Output Power

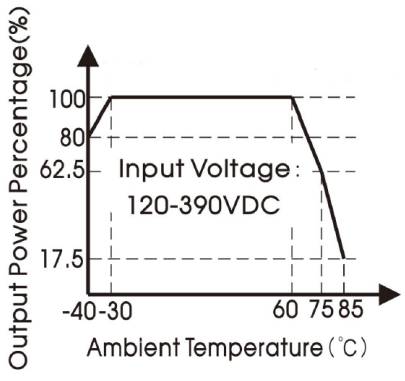


Figure 2

Input Voltage vs Output Power

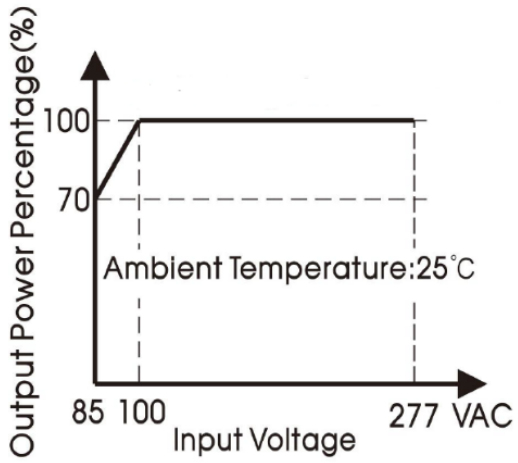


Figure 3

Input Voltage vs Output Power

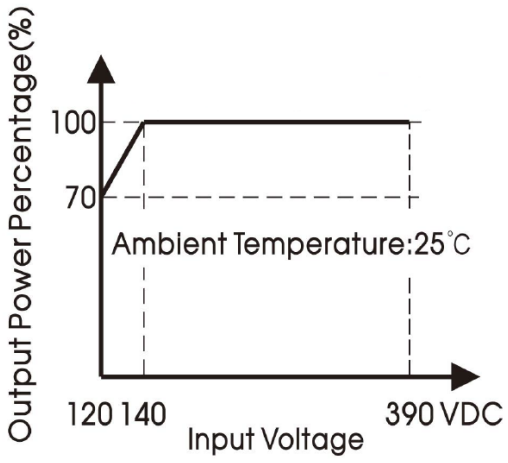


Figure 4

PF vs Input Voltage (Full Load

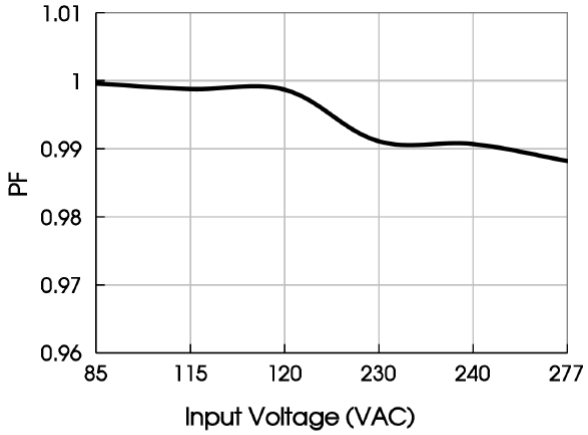


Figure 5

PF vs Output Load (Vin=230VAC)

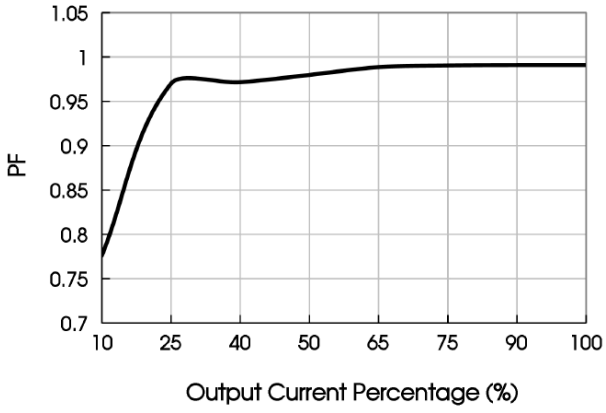


Figure 6

THD vs Input Voltage (Full Load)

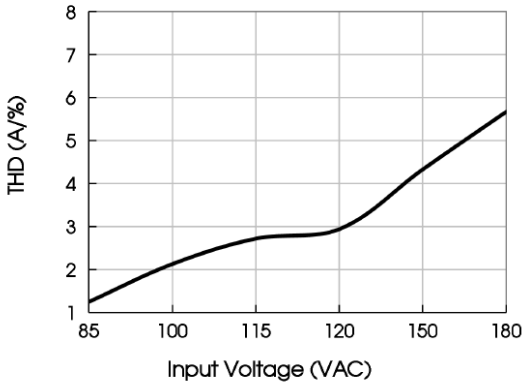


Figure 7

THD vs Output Load (Vin=230VAC)

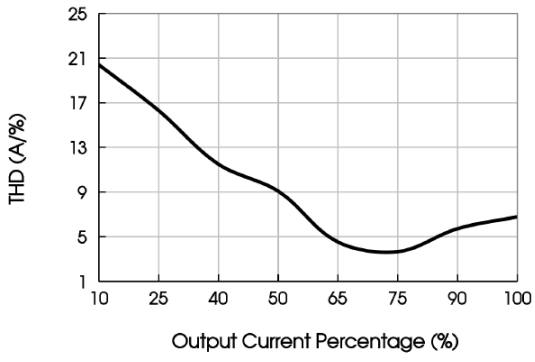


Figure 8

Load vs Input Voltage (Full Load)

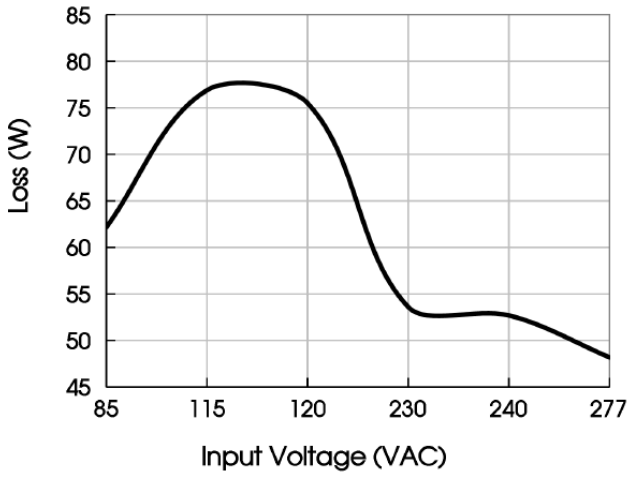


Figure 9

Loss vs Output Load (Vin=230VAC)

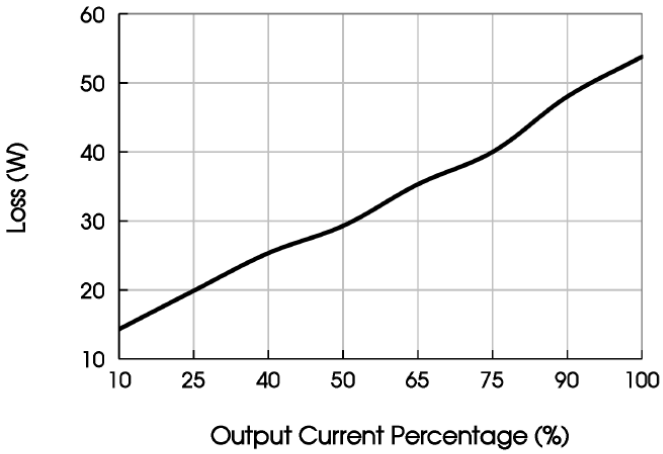


Figure 10

Note:
1. All curves are for 24V output, measured at input 230VAC, 50Hz output to ambient temperature 25°C, unless otherwise stated.
2. With AC input voltage between 85-100VAC and DC input between 120-140VDC, output power must be derated per the temperature derating curve.0
3. This product is suitable for applications using natural air cooling. For applications in closed environments, contact factory or more details.

Efficiency vs Input Voltage (Full Load)

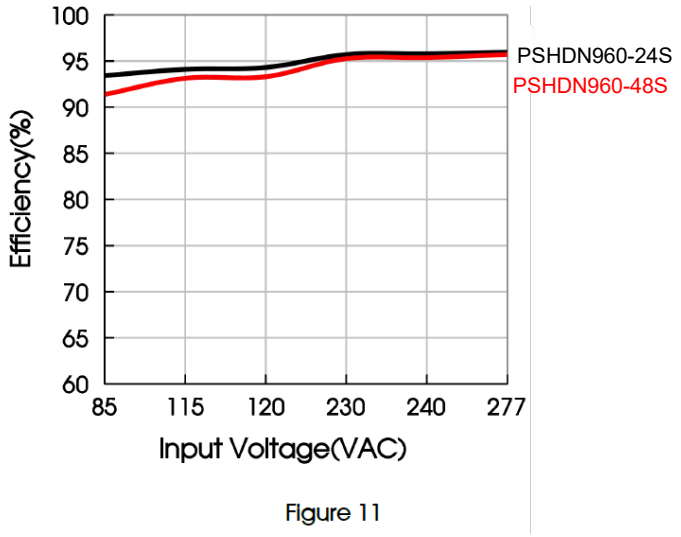


Figure 11

Efficiency vs Output Load (Vin=230VAC)

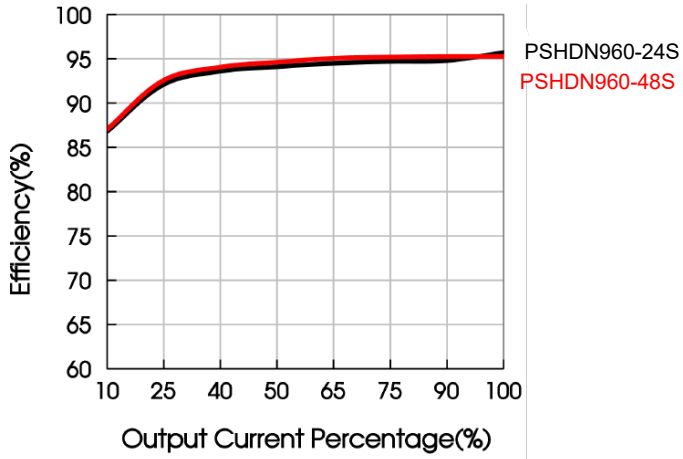
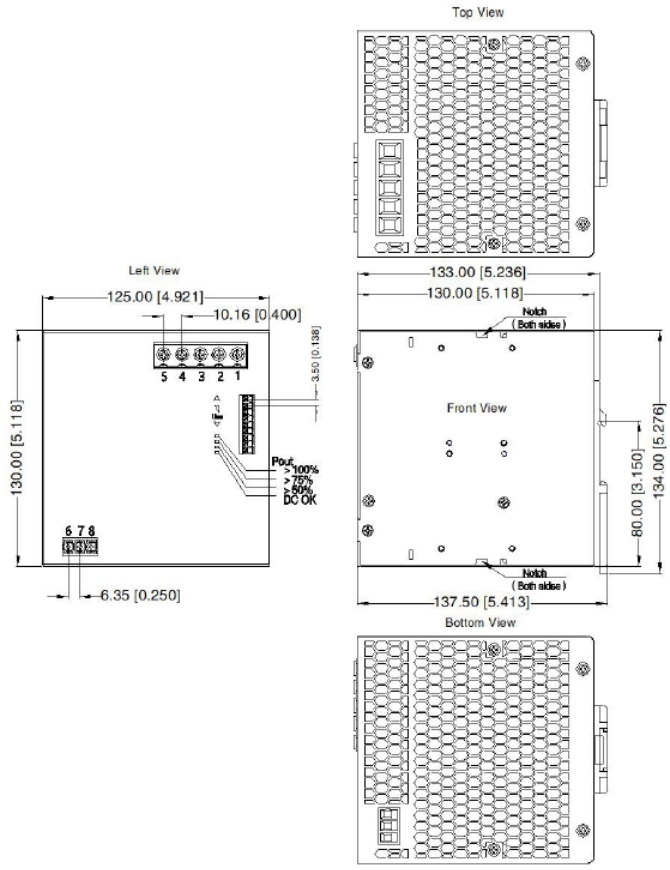


Figure 12

MECHANICAL DRAWINGS

THIRD ANGLE PROJECTION



Pin Out

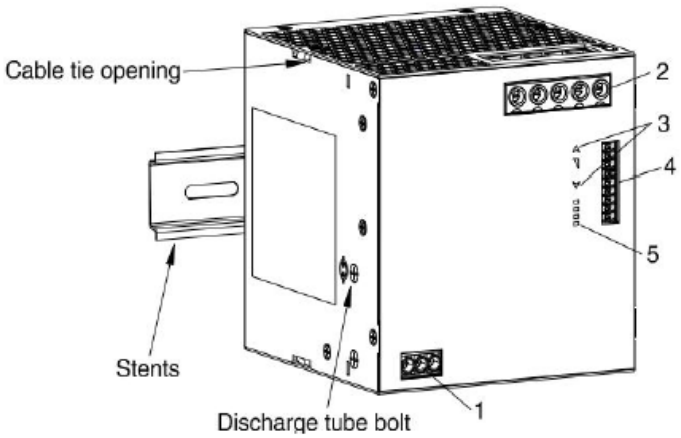
Pin	Mark
1	+Vo
2	+Vo
3	-Vo
4	-Vo
5	-Vo
6	⏚
7	AC(N)
8	AC(L)

Signal	Pin-Out	
	Pin	Mark
S-1 S-2 S-3 S-4 S-5 S-6 S-7 S-8 S-9	S-1	DC
	S-2	OK
	S-3	RS485-A
	S-4	RS485-B
	S-5	ON/OFF
	S-6	SGND
	S-7	AC OK
	S-8	PCS
	S-9	PCS

Note:
Unit: mm [inch]
Wire Range: Input: 14-12AWG
Output: 24V: 6AWG
48V: 12-8AWG
Signal: 24-16AWG
Tightening Torque: Max 0.5N·m
Output: Max 1.2 N·m
Mounting Torque: TS35, Rail needs to connect safety ground
General Tolerances: ±1.00 [±0.039]

APPLICATION NOTES

1. Mechanical Specification

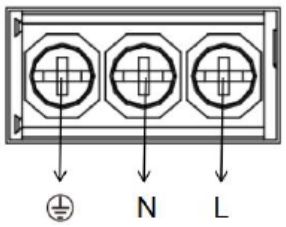


Structure instruction	
1	Input terminal (CN1)
2	Output terminal (CN2)
3	Voltage adjustment button
4	Signal connection terminal (CN5)
5	Power indicating (LED)

Fig. 1 Appearance Information of PSHDN960

1.1 Input Terminal Block (CN1)

3 Position 6.35mm Barrier Terminal Blocks is used as Input Terminal

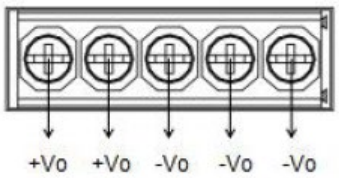


Pin	Features
L	Live
N	Neutral
⏚	Protective Earth

Line Size: 14-12AWG
Torque: Max 0.5Nm

1.2 Output Terminal (CN2)

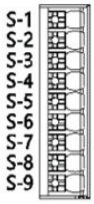
6 Position 10.16mm Barrier Terminal Blocks is used as Output terminal



Pin	Features
+Vo	Positive Output
-Vo	Negative Output

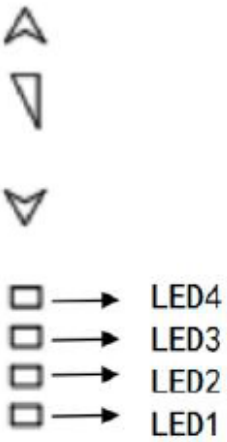
Line size: 24V: 6AWG
48V: 2-8AWG
Torque: Max 0.5 Nm

1.3 Signal Connection Terminal (CN5)

Signal	Pin-Out	
	Pin	Mark
	S-1	DC
	S-2	OK
	S-3	RS485-A
	S-4	RS485-B
	S-5	ON/OFF
	S-6	SGND
	S-7	AC OK
	S-8	PCS
	S-9	PCS

Line Size: 24-16AWG
Torque: Max 0.5Nm

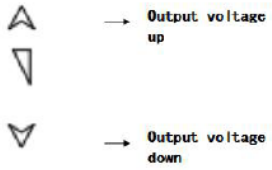
1.4 Status Display LED



Power Status Indicator LED

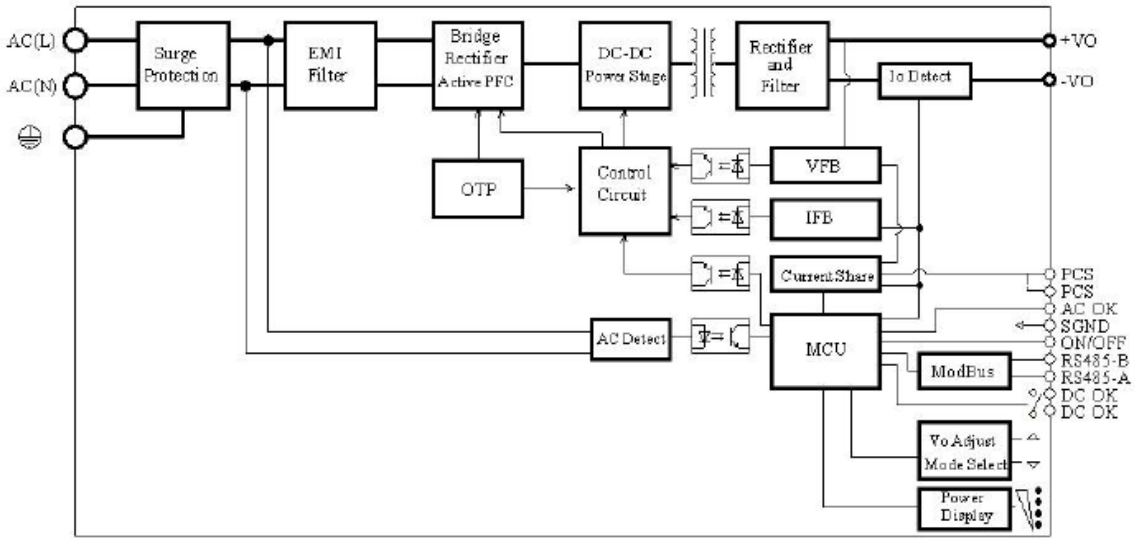
LED	State
LED1 ON	DC-OK, Output Power ≤50%
LED1-LED2 ON	75%≥Output Power >50%
LED1-LED3 ON	100%≥Output Power >75%
LED1-LED4 ON	Output Power >100%
LED4 Flashing	Output Power >125%

1.5 Output Voltage Regulation



Model	Rated Output Voltage	Output Voltage Adjustable Range
PSHDN960-24S	24VDC	24VDC-28VDC
PSHDN960-48S	48VDC	48VDC-56VDC

2. Circuit Block Diagram



3. Function Manual

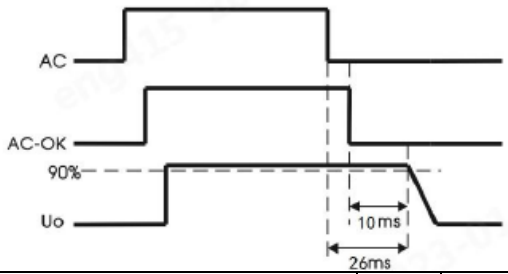
3.1 Input Requirements

The AC input voltage and DC input voltage must be within the defined voltage range (refer to data sheet), otherwise the power supply may not work properly or could fail. 16A/250VAC fuse is connected to the power module. To better protect the power module, you are advised to use a circuit breaker larger than 16A (strengthen protection, not necessary to access requirements).

3.2 Output Requirements

At any output voltage value, if it is necessary to operate normally, the highest pull current and power must not exceed the rated specified value, and the output current must not exceed the maximum output current value.

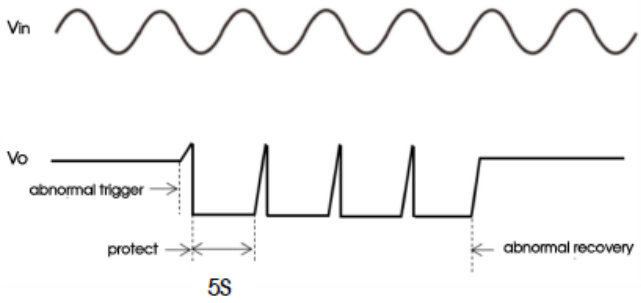
3.3 Power Failure Holding Time and AC OK Advance Warning Time



Item	Working Conditions		Min.	Typ.	Max.	Unit
Power-Off Hold Time	115VAC/230VAC, Full Load		-	26	-	ms
AC OK Advance Warning Time	115VAC/230VAC, full load	The warning time is higher than Uo*90%	-	10	-	ms

3.4 Output Over-Voltage Protection (OVP)

The main circuit output will be off when the output voltage reaches the over-voltage protection value. When it occurs, the output enters the hiccup mode with 5s. After the abnormality is removed, the output returns to normal.



3.5 Output Over-Current and Short Circuit Protection (OCP and SCP)

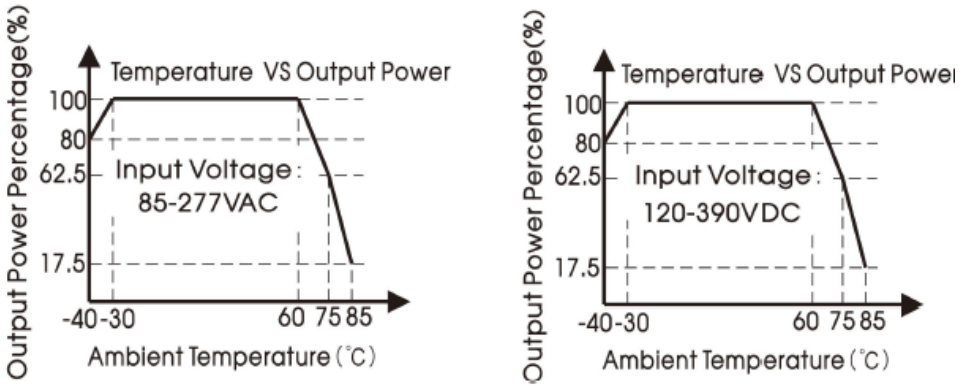
Static Power Mode: The static power of the product is 112%Io (typ.), which can work for a long time and does not enter the protection state.
Dynamic power mode: The dynamic power point of the product is 150%Io (typ.), and the product will enter the static power mode after working for 5s (typ). The working time and shutdown time can be self-adopted according to different load conditions, which can provide long-term protection and self-recover.

3.6 Over Temperature Protection (OTP)

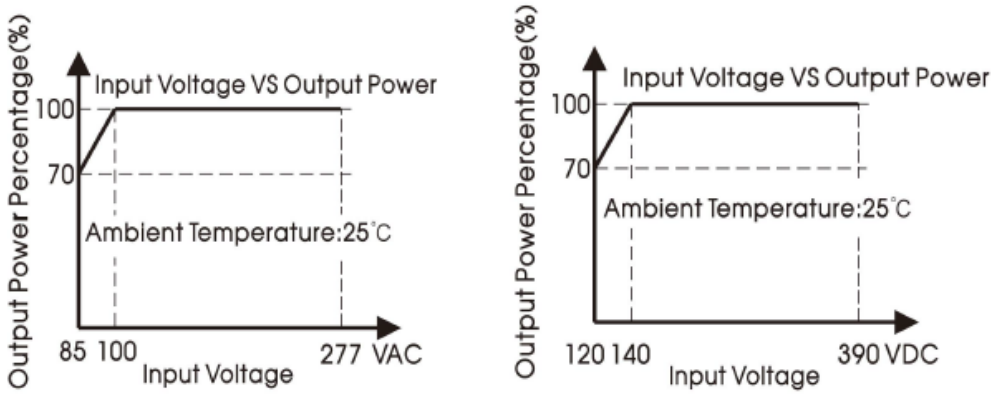
When the ambient temperature of the power supply exceeds the rated temperature for a period of time, the power supply will be turned off and enter the hiccup state. After ambient temperature drops to the set value, the power supply will resume normal operation.

3.7 Output Power Derating

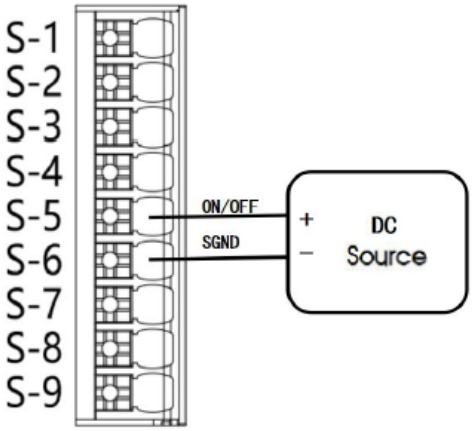
When the input voltage is greater than 100VAC (or 140VDC), only need to derate according to the temperature derating curve.



When the input voltage is lower than 100VAC (or 140VDC), the output power will be derated according to the following input voltage derating curve requirements after temperature derating.



3.8 Remote Control Switch



ON/OFF (S-5) and SGND (S-6) Switch	Output Status
DC Source power supply voltage is less than 0.8VDC	Normal Output
DC Source supply voltage is greater than 4VDC less than 20VDC	Output Off

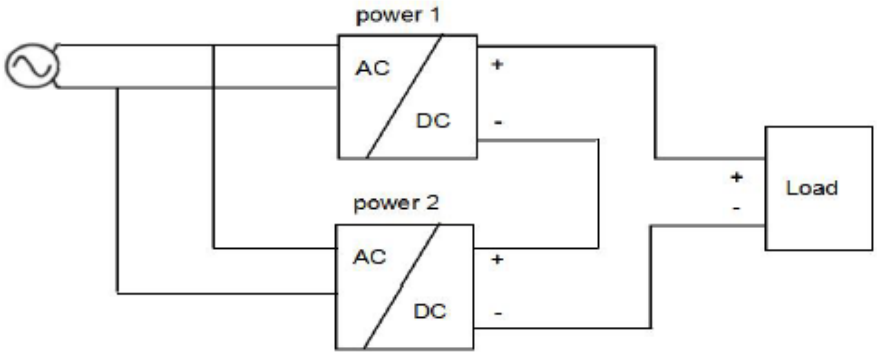
If the power module is connected to the power supply, the ON and OFF of its output can be controlled by applying an external voltage between the ON/OFF signal pin and SGND.

3.9 DC_OK Signal

The DC_OK signal is used to monitor whether the power supply is working normally, at the first and second pins of the signal terminals. When the output voltage is greater than 90% of the rated output voltage, the DC_OK signal acts, the DC_OK at the output terminal is connected and LED1 lights up. When the output voltage is less than 85% of the rated output voltage, the DC_OK of the output terminal is disconnected, and LED1 is off.

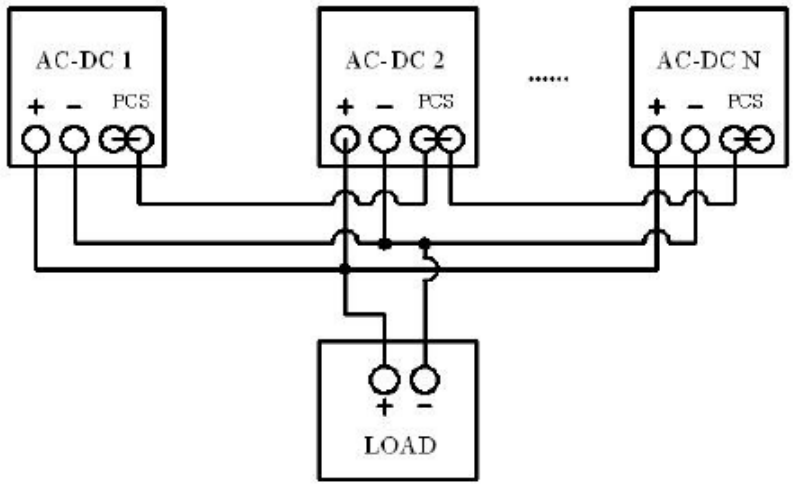
3.10 Used in Series

The same type of power supply can be connected in series to increase the output voltage. As long as the total output voltage does not exceed 150VDC, you can connect as many power supplies as you need. Voltages in excess of 60VDC are no longer considered Safety Extra Low Voltage Circuits (SELV) and can therefore be dangerous. When installing such voltages, it must be protected against touch.
Please avoid generating feedback voltage to the output terminals (eg from a decelerating motor or battery).
Keep a 15mm (left/right) installation gap between the two power supplies and avoid installing the power supplies on top of each other. Do not connect the power supplies in series in an installation orientation (input terminals down).
Note that the leakage current, electromagnetic interference, inrush current and harmonics will increase when multiple power supplies are used.
Refer to the figure below for wiring method:



3.11 Work in Parallel

The PSU supports 6 PCS in parallel current equalization.
The current sharing bus (PCS) between multiple units can be short connected to each other, and can be connected by jumper wire.
The output voltage difference of each single module is less than 100mV, which can obtain a better line-end output voltage and current sharing comprehensive effect. The connection mode of the current-sharing function is shown in the figure below:



Note:
1. When used in parallel, the number of parallel modules cannot exceed 6 PCS.
2. When the power modules work in parallel, there is an active current sharing circuit inside to ensure that the current between each module remains balanced.
Active current sharing circuit adopts automatic master-slave current sharing mode. Each power module has a current sharing bus signal (PCS). When working in parallel, the current sharing buses of all power modules must be connected together. It can be connected through jumper wires. The power terminal has reserved two internal connected PCS ports of the current sharing bus signal, namely, two pins of port bit 8 and 9, which can be connected to one of the pins in use.
The output voltage of each power module will affect the current sharing accuracy. The output voltage of the power module is rated voltage ±100mV. In practical applications, if the output voltage value needs to be adjusted, the output voltages of all parallel power modules need to be adjusted to the same voltage. The recommended voltage range is: target voltage value ±100mV.
After the output load of each power module is greater than 50% of the rated load, the current sharing accuracy is required to be ±5%. The calculation formula of current sharing is:

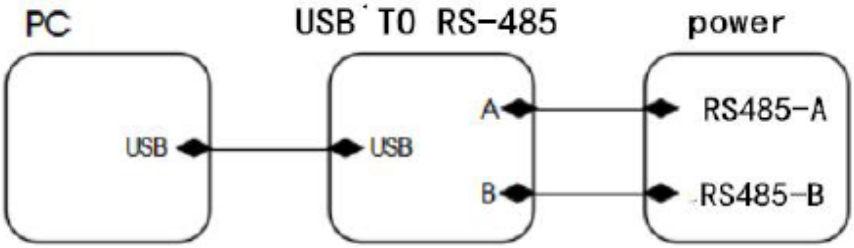
$$\text{Power supply 1's average accuracy} = \frac{Io_1 - (Io_1 + Io_2)/2}{(Io_1 + Io_2)/2} * 100\%$$

$$\text{Power supply 2's average accuracy} = \frac{Io_2 - (Io_1 + Io_2)/2}{(Io_1 + Io_2)/2} * 100\%$$

Io_1: The output current value of the power supply 1 in the parallel power module.
Io_2: The output current value of the power supply 2 in the parallel power module.

3.12 PC Monitoring

In a parallel system, if you need to identify the information of the power models, you need to monitor each parallel power module by the host computer. The connection diagram is as follows.



That is, connect the RS485-A and RS485-B of the signal terminals to the USB to interface module.
The upper computer “MThings” of Modbus can be used to read and configure the power supply products, or the relevant instructions can be sent directly through the corresponding address.
Function name and corresponding address, quantity and coefficient of ModBus are shown below:

ID	Name	Value	Unit	Read	Command	Write	Block	Address	Count	Offset	Digit	Coefficient
1	SN	20221111001110		Read	-	Write	RW	0	32	0	512	1
2	Product Type	PSHDN960-24S		Read	-	Write	RW	32	32	0	512	1
3	Firmware Version	3		Read	-	Write	RW	64	1	0	16	1
4	Control Mode	0X0001		Read	-	Write	RW	65	1	0	16	1
5	MODBUS ID	0		Read	-	Write	RW	66	1	0	16	1
6	MODBUS Baud Rate SET	1		Read	-	Write	RW	67	1	0	16	1
7	Run Time	0.381152	h	Read	-	Write	RW	72	2	0	32	0.000277
8	Vo Set	24.000000	V	Read	-	Write	RW	74	2	0	32	1
9	Input Voltage	228.412827	V	Read	-	Write	RW	76	2	0	32	1
10	Output Voltage	24.079004	V	Read	-	Write	RW	80	2	0	32	1
11	Output Current	9.890471	A	Read	-	Write	RW	82	2	0	32	1
12	Output Power	238.158234	W	Read	-	Write	RW	84	2	0	32	1
13	Inside Temp.	84.000000	°C	Read	-	Write	RW	86	2	0	32	1
14	Output State1	0X0003		Read	-	Write	RW	88	1	0	16	1
15	Warning State2	0X0000		Read	-	Write	RW	89	1	0	16	1
16	Remaining Service Life	43676.978848	h	Read	-	Write	RW	90	2	0	32	0.000277
17	Remote ON/OFF	1		Read	-	Write	RW	128	1	0	16	1
18	Running Time from ACON	185	s	Read	-	Write	RW	130	2	0	32	1
19	Output OVP Times	0		Read	-	Write	RW	132	1	0	16	1
20	Output OCP	0		Read	-	Write	RW	133	1	0	16	1
21	Input UVP Times	0		Read	-	Write	RW	136	1	0	16	1
22	Input OVP Times	0		Read	-	Write	RW	137	1	0	16	1
23	OTP Times	0		Read	-	Write	RW	138	1	0	16	1

Note:
1. Open the upper computer software, import the configuration, click batch read to obtain the related information. In the command column, input relevant information can be configured, such as the output voltage configuration.
2. The default baud ate is 9600bps. Configure the baud rate as follows.

Configuration Instructions	Baud Rate (bps)
1	9600
2	38400
3	57600
4	115200

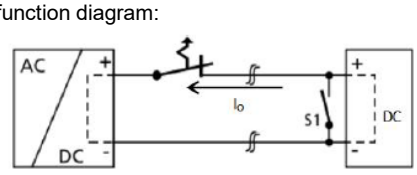
3. After the serial power communication address (ModBus ID) is configured, power off the device and restart it to take effect one minute later.
4. Function and data format definition of MODBUS communication register.
In byte type data 4, the high half word comes first and the low half word comes last.

Address	Data Type	Name of Variable	Function Description	Read and Write Permissions
0-31	Chair	SN_MODEL	Product Serial Number	Read-Only
32-63	Chair	Product_MODEL	Product Model Number	Read-Only
64	Uint16	Version	Product firmware version	Read-Only
66	Uint16	Add	Serial communication address (ModBus ID)	Read/Write
67	Uint16	Baud	Baud rate of serial port communication	Read/Write
72 73	Uint32	RUNTIME	Accumulated running time (unit “s”, converted to “h” by the host computer/user)	Read-Only
74 75	Float32	Set_VOL	Output Voltage Configuration	Read/Write
76 77	Float32	VAC_RMS	AC Input Voltage	Read-Only
80 81	Float32	Vout	Output Voltage	Read-Only
82 83	Float32	Iout	Output Current Current	Read-Only
84 85	Float32	Pout	Power Output	Read-Only
86	Float32	Temperature	Internal Temperature	Read-Only
88	Uint16	State1	Output State (0~3byte): DC-OK (0), AC-OK (1), OVP (2), OCP (3); 1 for OK or Protection State, 0 for NOK	Read-Only
89	Uint16	State2	Warning State2 (0~5byte): Input UV Warning (1), Input OV Warning (2), Remaining Service Life Warning (3), Over Temperature Warning (4), Failure Warning (5); 1 for Warning, 0 for Normal	Read-Only
90 91	Float32	Life	Remaining Service Life (unit “s”, converted to “h” by the host computer/user)	Read-Only
128	Uint16	ON/OFF	Remote ON/OFF, 1 for ON, 0 for OFF	Read/Write
130 131	Uint32	RUNING TIME	Running Time (unit “s”, converted to “h” by the host computer/user)	Read-Only
132	Uint16	OVP_TIMES	Output OVP Times	Read/Write for Reset to Zero
133	Uint16	OCP_TIMES	Output OCP Times	Read/Write for Reset to Zero
136	Uint16	INPUT_UVP_TIMES	Input UVP Times	Read/Write for Reset to Zero
137	Uint16	INPUT_OVP_TIMES	Input OVP Times	Read/Write for Reset to Zero
138	Uint16	OTP_TIMES	OTP Times	Read/Write for Reset to Zero

3.13 Back Voltage Load

Loads such as decelerating motors, inductors can feed voltage back into the power supply. This property is also known as feedback voltage resistance to opposing electromagnetic forces.
PSHDN960-24S: ① The feedback voltage within 30V, product will not shut down, and it will automatically recover after no feedback voltage in; ② If the feedback voltage exceeds 30V and is less than 35V, the output will be shut down and restart after 5s.
PSHDN960-48S: ① The feedback voltage within 57V, product will not shut down, and it will automatically recovery after no feedback voltage in; ② If the feedback voltage exceeds 57V and is less than 63V, the output will be shut down and restart after 5s.

The power supply is resistant to the voltage that the load feeds back into the power supply and will not fail regardless of whether the power supply is on or off. The following function diagram:



Maximum allowable feedback voltage	
Model	Maximum Feedback Voltage
PSHDN960-24S	35VDC
PSHDN960-48S	63VDC

4. Installation Requirements

4.1 Safety Introduction

Warning: Risk of electric shock during high voltage working with this equipment
During high voltage operating

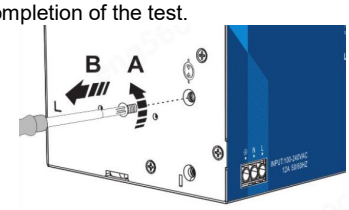
- After the power module is disconnected from the input AC or the DC power leave it for at least one minute before starting to operate it.
- When installing the input cable to the power module, first connect the ground terminal first, and then connect the L and the N cables.
- When removing the input wire, first remove the L wire and the N wire first, and then remove the ground wire.
- When disassembling and assembling, make sure that no objects fall into the power module
- Be careful of high temperature burns
- After the power module works in a high temperature environment, wait for its shell to cool down before operating.
- This product needs to be installed by professionals and needs to be used with other equipment.

4.2 Safety Requirements

When installing, pay attention to the primary side and the protective ground, the creepage distance and the electrical clearance of the primary side and the secondary side meet the safety requirements, refer to EN/UL61010.

4.3 Withstand Voltage Test

The screw at the side mark of the casing should be removed when the product is tested for pressure resistance  .
The built-in gas discharge tube protects the power supply from asymmetric interference variables (e.g. EN 61000-4-5). Each power supply sustained voltage test will cause a very high load on the power supply. Therefore, unnecessary load or damage to the power supply caused by high test voltage should be avoided. Disconnect the device's built-in gas discharge tube if necessary to use a higher test voltage. Reconnect the gas discharge tube after successful completion of the test.

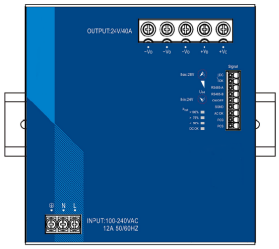


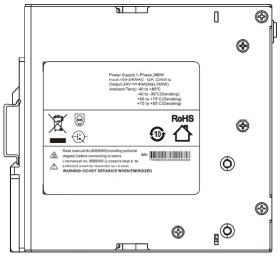
Danger: Using the wrong gas discharge tube bolts can result in an electric shock hazard or power supply damage.To connect the gas discharge tube, use only the gas discharge tube bolts originally installed in the power supply.

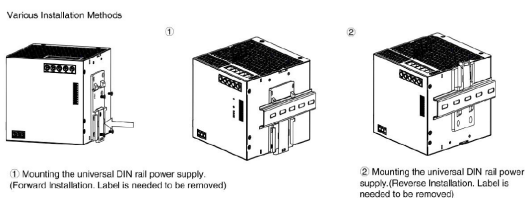
Disconnect the gas discharge tube by performing the following steps.
1. Disconnect the power supply to the unit
2. Completely unscrew the  bolt to ensure that the gas discharge tube is connected to a safe position. Now that the gas discharge tube has been disconnected, it no longer functions.
3. Perform sustained voltage test on the power supply
4. After successful voltage test, screw the gas discharge tube back to the power supply completely.

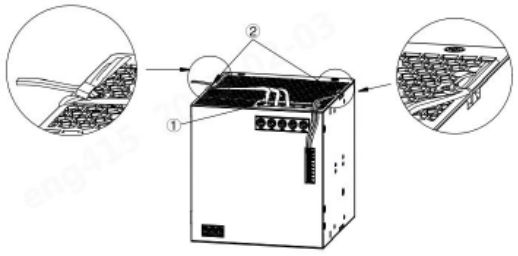
4.4 Installation Method

Installation direction: When installing, the part of the output end should be upward, and the port of the input end should be downward (See Below).
Note:
1. Pay attention to the temperature rise of the device in different installation modes. Derate the device according to the actual situation.
2. Keep the following installation clearances: 20mm on top, 20mm on the bottom, 5mm on the left and right sides are recommended when the device is loaded permanently with more than 50% of the rated power. Increase this clearance to 15mm in case the adjacent device is a heat source (e.g. another power supply)

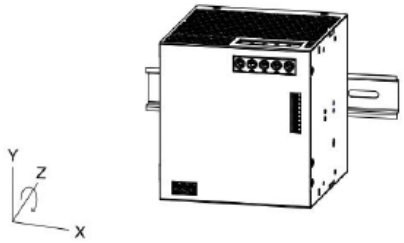




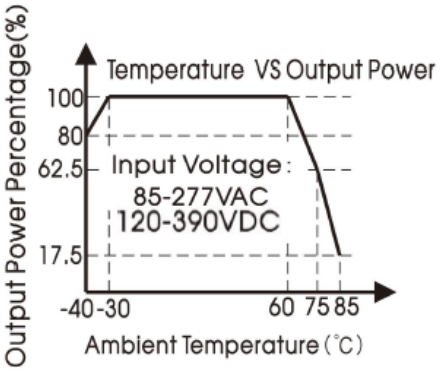


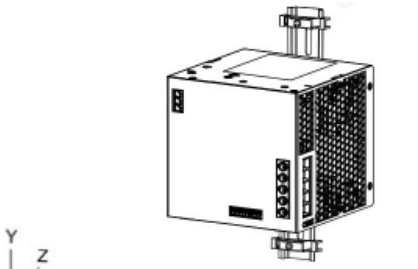


① After connecting the terminal to the connecting wire, lay and align the connecting wire.
② Tie up the stripes with cables and fix the connecting wires through the gaps on the both sides of the shell.

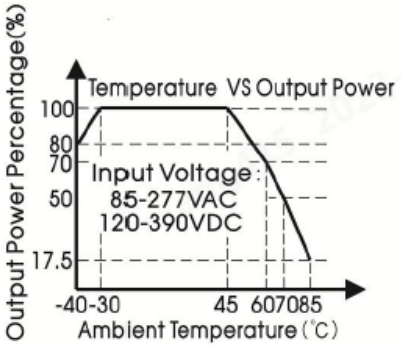


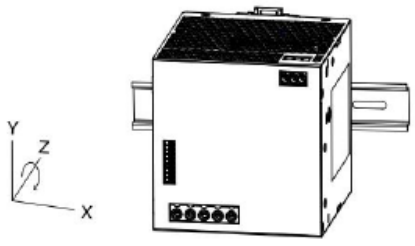
Rotate the installation position
(0° Z-Axis)



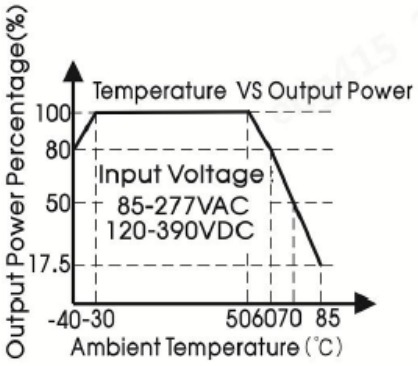


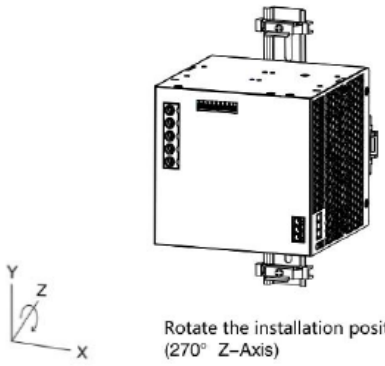
Rotate the installation position
(90° Z-Axis)



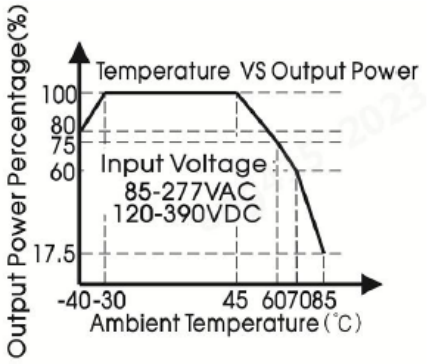


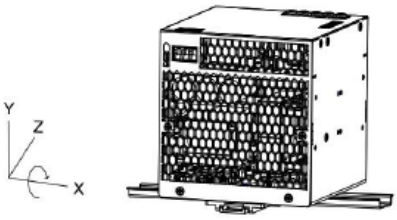
Rotate the installation position
(180° Z-Axis)



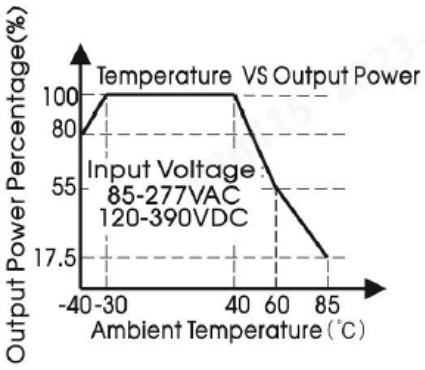


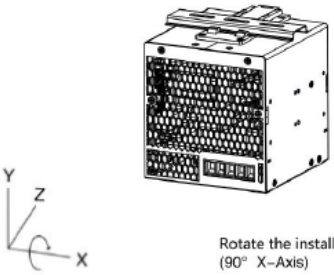
Rotate the installation position
(270° Z-Axis)



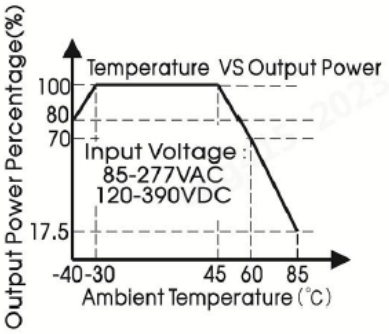


Rotate the installation position
(270° X-Axis)





Rotate the installation position
(90° X-Axis)



Materials required in the installation		
1	Product	1PCS
2	Phillips screwdriver Slotted screwdriver	1PCS
3	TS35/7.5 or TS35/15	1PCS
4	24~10AWG Wire	/ PCS
5	The content is for reference only. Regarding the actual wire diameter and tightening torque, refer to the dimensional drawing.	

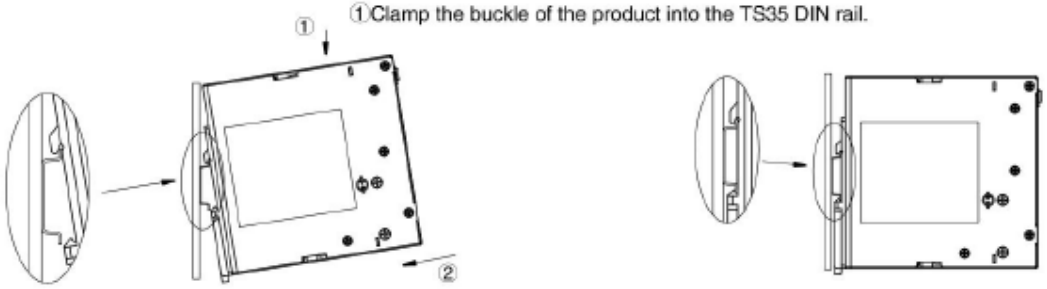
Product

Phillips screwdriver
Slotted screwdriver
Diameter : 3mm

TS35/7.5 or TS35/15

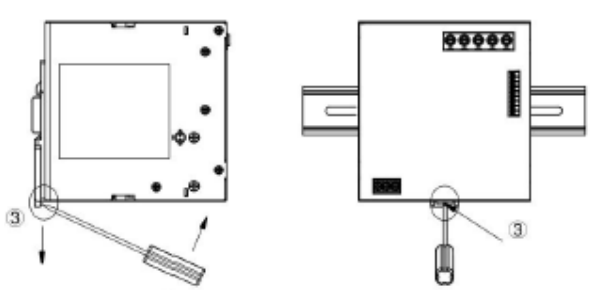
Installation steps ①-②

①Clamp the buckle of the product into the TS35 DIN rail.

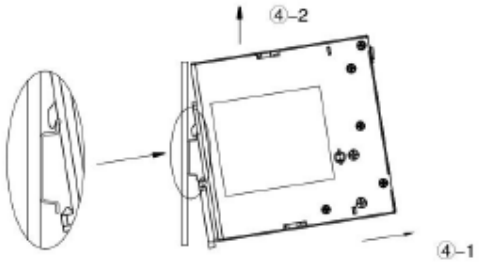


②Push the product vertically towards the TS35 DIN rail until hearing the sound of the buckle snapping into it.

Disassembly Steps③–④

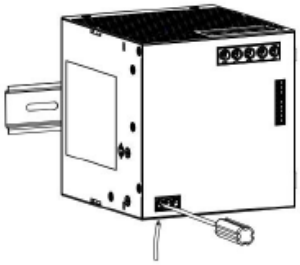


③After inserting the slotted screwdriver into the square groove at the bottom of the buckle, push the slider of the buckle downward in the direction shown in the figure.

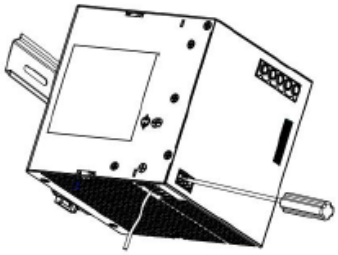


④Hold the bottom of the product and push it outwards while pushing down the slider, then lift the product up to take the product out of the DIN rail.

Wiring / Unwiring Steps ⑤–⑥



⑤Turn the Phillips screwdriver to the left to loosen the terminal screws, insert the head of the wire into the bottom of the terminal, and then turn the screwdriver to the right to tighten the terminal screws



⑥Turn the Phillips screwdriver to the left to loosen the terminal screw and pull the wire out of the bottom of the terminal

COMPANY INFORMATION

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