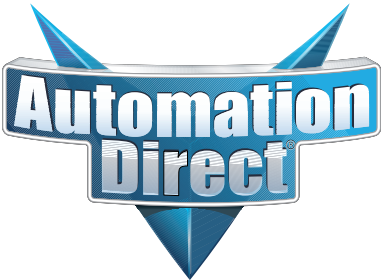


# Rhino Battery Control Module PSM24-BCM360S

## Operating Instructions



# RHINO BATTERY CONTROL MODULE PSM24-BCM360S

## Before operating

- Read these operating instructions carefully and completely.
- Check that the input wiring is sufficiently protected and is the correct size.
- Check that the output wiring is rated for the maximum output current, connected with the correct polarity and properly protected.
- Verify that sufficient cooling is assured.
- Caution: The temperature of the housing can become very high, depending on the ambient temperature and load.



**Warning:** The PSM24-BCM360S is designed and constructed in accordance with the safety requirements of IEC 60950-1, EN 60950-1 UL 60950-1, CSA 22.2 No. 60950-1-07, EN 60204, EN 50178 and CSA 22.2 No. 107.

It is designed especially for use in process automation and other industrial applications.

Components with dangerously high voltage and high stored energy are located in the device; however, these are inaccessible. Failure to properly maintain the PSM24-BCM360S can result in death, severe personal injury or substantial property damage. The PSM24-BCM360S shall be installed and put into operation by qualified personnel only. The corresponding national regulations (e.g. UL, ANSI, VDE, DIN) must be observed. The successful and safe operation of this module is dependent on proper storage, handling, installation and operation.

The potentiometer to adjust the output voltage must be actuated using only an insulated screwdriver, because accidental contact may be made with parts inside the power supply carrying dangerous voltages.



**Caution:** Risk of electrical shock and electrical discharge. Only qualified and trained personnel should open the PSM24-BCM360S or the power supply. Do not open the PSM24-BCM360S or the power supply until at least 5 minutes after complete disconnection of the main power and battery. Electrostatic sensitive device. Failure to follow all instructions and limitations in these instructions may impair operation of the PSM24-360S or damage or destroy the BCM or power supply.

**Danger:** Never work on the PSM24-BCM360S or power supplies if power is applied or battery is connected! Before installation ensure that the main switch is switched off and locked out. Touching of any live components or improper usage of PSM24-BCM360S or power supply can result in severe injury or death.



**Warning:** To minimize the risk of potential safety problems, follow all applicable local and national codes regulating the installation and operation of this equipment. These codes vary from area to area and it is your responsibility to determine which codes should be followed, and to verify that the equipment, installation, and operation are in compliance with the latest revision of these codes. Failure to follow all applicable codes, or exceeding the limiting value can impair the function and electrical safety and destroy the power supply. Serious injury to personnel can result from the failure to follow all applicable codes and standards. We do not guarantee the products described in this publication to be suitable for your particular application, nor do we assume any responsibility for your product design, installation or operations.

## Description

The PSM24-BCM360S together with a PSM power supply (PSM24-090S, PSM24-180S, or PSM24-360S) form an uninterruptible DC power supply (UPS) with a professional battery management for a connected lead-acid battery. The battery delivers the energy to the output load when the input voltage has failed. The bridging time depends on the size of the battery and the load current.

The UPS system is a “Standby Parallel Operated” UPS system, where the battery is directly connected to the output of the applied load. This UPS configuration is well known in telecommunication systems and highly regarded for its high reliability and the absence of voltage dips on the DC output during a mains power failure. It has to be considered that the battery is not charged by a separate charge converter but directly by the feeding PSM power supply. The power supply will supply the output load and the battery. The maximum current available for the load and battery must be set by a jumper on the BCM module. A deeply discharged battery will reduce the output voltage, however the output current is maintained.

With a fully charged battery, the battery is trickle charged only; this keeps the battery fully charged without overcharging. The resistance of the battery is tested regularly. During the test, the input voltage from the power supply is slightly reduced, and the output operates from the battery to simulate the AC fault condition.

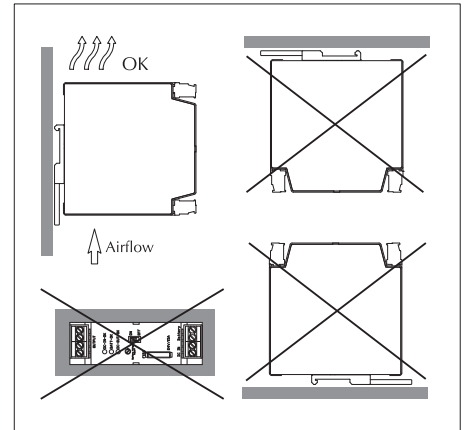
The battery voltage is temperature compensated. The battery temperature is measured with the included temperature sensor.

The battery is protected by an under voltage lockout relay against deep discharge.

For monitoring purposes the BCM provides relay contact outputs, which report the operational status of the BCM and the battery.

## Mechanical Installation

The PSM24-BCM360S is a built-in device and must be mounted in an electrical rack which must provide protection against access to dangerous voltages, hot devices and be resistant to flammability and causing fire hazards. Mount the unit horizontally on a flat vertical surface, as shown, to provide proper ventilation. DO NOT mount the unit vertically, upside down, or on a horizontal surface. A minimum free space of 80mm [3.15 in.] is required above and below the PSM24-BCM360S; leave a minimum space of 25mm [1.0 in.] (which allows air convection) on each side. The air temperature, as measured 10mm [0.39 in.] below the device, must not exceed the values specified in these instructions. The power derating above ambient temperatures of 40°C is the same as specified for the PSM power supplies.



### DIN Rail Mounting

A sufficiently strong DIN rail, such as DN-R35S1, shall be used. Observe mounting position and orientation requirements stated above.

To attach the module to the DIN rail, hook top part of clip on the DIN rail, then push down and inward until you hear a clicking sound. To remove the device, pull the latch of the clip using an insulated flathead screwdriver. When the clip has cleared the bottom of the DIN rail remove the screwdriver from recess. Lift the device off the DIN rail.

### Direct Mounting

Wall-mounting or chassis-mounting can be achieved by use of optional mounting bracket PSM-PANEL1. Observe mounting position and orientation requirements stated above. Remove the DIN clips by removing the screws and place the mounting brackets in the same place as the DIN clips. Use the countersink screws, which are included with the wall mounting kit to attach the mounting brackets to the PSM24-BCM360S (tightening torque 0.8-0.9Nm).

## Electrical Installation

### Step by Step Wiring Instructions

Only qualified personnel should carry out the installation. The device is equipped with a COMBICON connector. This reliable and easy-to-assemble connection method provides a fast connection of the device.

Following correct mounting of both the PSM Power Supply and the Battery Connector Module (BCM), the following steps shall be followed to ensure correct connection and commissioning of the system.

1. Make sure the mains power is switched off, secured against switch on and not yet connected to the power supply.
2. Next connect the PSM Power Supply output to J1 of the BCM (DC-IN).
3. Connect the Remote Link wire between the PSM Power Supply and J3 of the BCM.
4. The potentiometer of the **PSM power supply** (not the BCM) should now be adjusted fully counter-clockwise ( $V_{out min}$ ).
5. Next ensure the blade fuse is correctly inserted into the BCM.
6. The System ON/OFF switch on the BCM should now be set to the ON position.
7. Configure the BCM module to use your actual power supply (PSM24-090S, PSM24-180S, or PSM24-360S) by choosing the jumper position J6 as described below.
8. Exercising caution, the AC power wires should now be connected. Ensure that AC power is disabled by external isolation switch or circuit breaker.
9. When AC supply connection wires are connected and safe isolation is verified, AC power can now be switched on.



10. Now the PSM Power Supply will switch on the BCM and the UPS system is operational.
11. The potentiometer on the BCM is set by the factory to suit Valve Regulated Lead Acid Battery from Panasonic and equivalent types (the recommended battery type) and should not be adjusted by the user, unless other Lead Acid Batteries of different voltage temperature characteristics are connected.
12. If a non recommended battery is applied to the circuit, the output voltage of the BCM module needs to be adjusted to a different "End of Charge Voltage." This voltage value can be obtained from battery manufacturer's datasheets.
13. The Temperature Sensor should now be fixed to the battery and connected to J5 on the BCM
14. Next the battery wires should be connected on the BCM module; **DO NOT connect to the battery first.**
15. Then connect the battery wires on the battery.
16. Next the Load can be connected to J2 of the BCM.
17. To verify proper functionality, switch off the input AC power at the external circuit breaker and output power should be supplied from the battery if a fully charged battery has been connected.
18. For proper operation, a new system should always start up with a fully charged battery. If a fully charged battery is not connected, the battery should be charged in full over night before any load is applied to the output of the BCM module.
19. The system is now fully operational and the output load can be connected.

### DC-Input (Connector J1, pin 1 & pin 2)

Make the 24 VDC connection using the -Vin (-DC In) and +Vin (+DC In) connections following all local regulations. Properly sized wiring must be used. To achieve a reliable and shockproof connection, strip the connecting ends according to the table below. If flexible wires are used, terminate them using ferrules.

### Battery In (Connector J1, pin 3 and pin 4)

Make the battery connection using the "+Bat In" and "-Bat In" connections. *Make sure that the battery lines are sized according to the maximum output current (see Connections and Terminal Assignments table below) or are separately protected.* The wires on the secondary side should have large cross sections to keep the voltage drops on these lines as low as possible. To achieve a reliable and shockproof connection, strip the connecting ends according to table below. If flexible wires are used, terminate them using ferrules.

### Connections and Terminal Assignments

Device	Terminals	Function	Solid or Stranded Wires		Torque Nm	Stripping Length, mm
			mm <sup>2</sup>	AWG		
PSM24-090S PSM24-180S	+Vin & - Vin	Input voltage (24 VDC)	0.5 to 2.5	24 to 12	0.5 to 0.6	7.0
	+Bat & - Bat	Battery voltage (24 VDC)				
	+Vout & - Vout	Output voltage (24 VDC)				
	Signal	Relay inputs and relay outputs				
PSM24-360S	+Vin & - Vin	Input voltage (24 VDC)	1.0 to 2.5	18 to 12	0.5 to 0.6	7.0
	+Bat & - Bat	Battery voltage (24 VDC)				
	+Vout & - Vout	Output voltage (24 VDC)				
	Signal	Relay inputs and relay outputs				

### Output (Connector J2, pin 1, pin 2, pin 3 & pin 4)

The 24VDC connection is made using the "+Vout" and "-Vout" terminals. All output terminals should be connected to the load. *Make sure that all output lines are sized according to the maximum output current (see Connections and Terminal Assignments table above) or are separately protected.* The wires on the secondary side should have large cross sections in order to keep the voltage drops on these lines as low as possible.

To achieve a reliable and shockproof connection, strip the connecting ends according to the table above. If flexible wires are used, terminate them using ferrules.

The device is protected against overload and short circuit.

### **Signaling (Connector J5, pins 1, 2, 3, 4, 5 & 6)**

The DC Input-OK, Batt-OK and DC Output-OK are alarm contacts that monitor the functions of the PSM24-BCM360S, the connected PSM power supply and the connected lead acid battery.

The DC Input-OK alarm contact (connector J5, pins 1 and 2) is monitoring the PSM power supply input at the DC IN terminal. This contact is closed when the power supply is present.

The Battery OK alarm contact (connector J5, pins 3 and 4) is monitoring the Battery Input at the battery input terminals. This contact is closed when the battery is present.

The DC Output OK alarm contact (connector J5, pins 5 and 6) is monitoring the output voltage of the PSM24-BCM360S. This contact is closed when an output is present.

Three LEDs also enable a visual evaluation of the function of the PSM24-BCM360S, input voltage, and battery directly on site and are parallel to the signal relay contacts.

Status Indicators			
Alarm	LED Color	ON State	OFF State
DC Input - OK	Green	DC Input present	DC Input failure
Battery - OK	Green	Battery present	Battery failure
DC Output - OK	Green	Normal Operation	Output failure

### **Remote ON/OFF Function (Connector J5, pins 7 & 8)**

The PSM24-BCM360S device provides an external remote ON/OFF function using pin 7 and pin 8 at connector J5. Using a switch, a connection must be made between connector J5 pin 7 and connector J5 pin 8 to switch off the power supply and PSM24-BCM360S. At open connection between J5 pin 7 and J5 pin 8 the device is providing the adjusted output voltage. A switch is also available on the face of the PSM24-BCM360S to switch off the system on site (in the control cabinet).

Turning the system to the OFF state (by switch or remote on/off function) during battery discharge operation will fully switch off the system and disconnect the battery. In this condition the system cannot be switched on again until mains power is restored. If mains power returns and the system is still on the OFF state, the battery will remain disconnected but a very low output voltage may appear (typically 2 VDC, pulsing). Turning the system to the ON state (by switch or remote on/off function) will bring the system back to full function including battery charging and battery condition test.

### **PSM Power Supply Model (Jumper J6, positions 1, 2, and 3)**

The PSM24-BCM360S module is designed to provide the remaining output current for battery charging up to a maximum of 15A. To assure the connected PSM power supply is not overloaded, even if a discharged battery is connected, the jumper J6 must be set properly. The factory setting (position 1) is for use with a PSM24-360S. The jumper J6 must be set to position 2 for use with a PSM24-180S and position 3 for use with a PSM24-090S.

Note: Total maximum input current is shared by load and battery.

Power Supply Type	PSM Power Supply $I_{out\ Nom}$	J6 Jumper Position	BCM Module Input Current Limitation $I_{in\ Limit}$
PSM24-360S	15.0 A	1	12.8 A (factory setting)
PSM24-180S	7.5 A	2	6.4 A
PSM24-90S	3.75 A	3	3.2 A

### **Battery test (Jumper J4)**

The PSM24-BCM360S module is designed to monitor the battery's condition. The battery is loaded with a test current pulse as long as the input power is present to monitor the battery's condition. The time between the current pulses can be set to either 15 seconds (J4, Pin 1 & 2) or to 10 minutes (J4, Pin 2 & 3)

### **Temperature sensing (optional) (Connector J5, pins 9 & 10)**

The PSM24-BCM360S module is designed to operate with temperature compensation required for proper operation of the battery. The temperature is detected using an external NTC sensor, PSM-TSK (10k), connected to the signal connector J5 pin 9 and pin 10. If the sensor is not connected, the device automatically switches to +25°C constant temperature operation mode. Before connecting the sensor you must set the battery voltage as recommended for +25°C ambient using the potentiometer. When the sensor is connected, the device will automatically detect it and will start adjusting the correct voltage for the battery.

### **Operating Temperature Ranges and Load Derating**

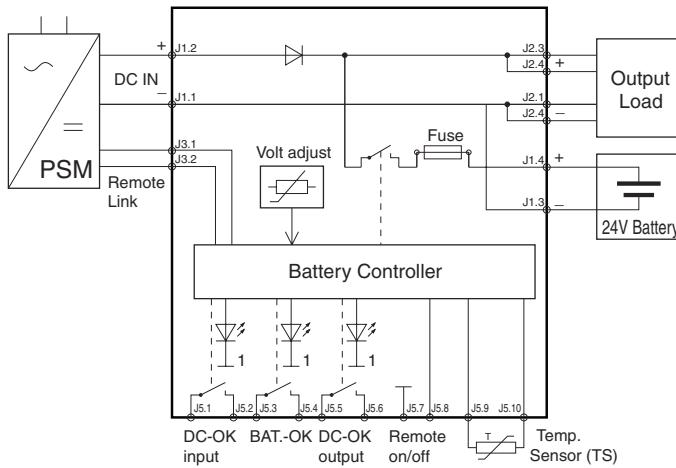
Operating temperature ranges and load derating depend on the PSM power supply connected to the PSM24-BCM360S. Please see operating temperature range and load derating listed in the PSM power supplies data sheet or PSM operating instructions.

# Technical Specifications

Input Specifications				
Part Number	Input	Max. Input Power	* Output Voltage	**Max. Output Current
<b>PSM24-BCM360S</b> <i>(includes terminal plugs)</i>	24 VDC power supply and 24 VDC battery	360 Watt	24 VDC	15.0 A 360 W

\*Output voltage adjustable \*\* Maximum current at Vout nom.

## Battery Control Module Function Diagram

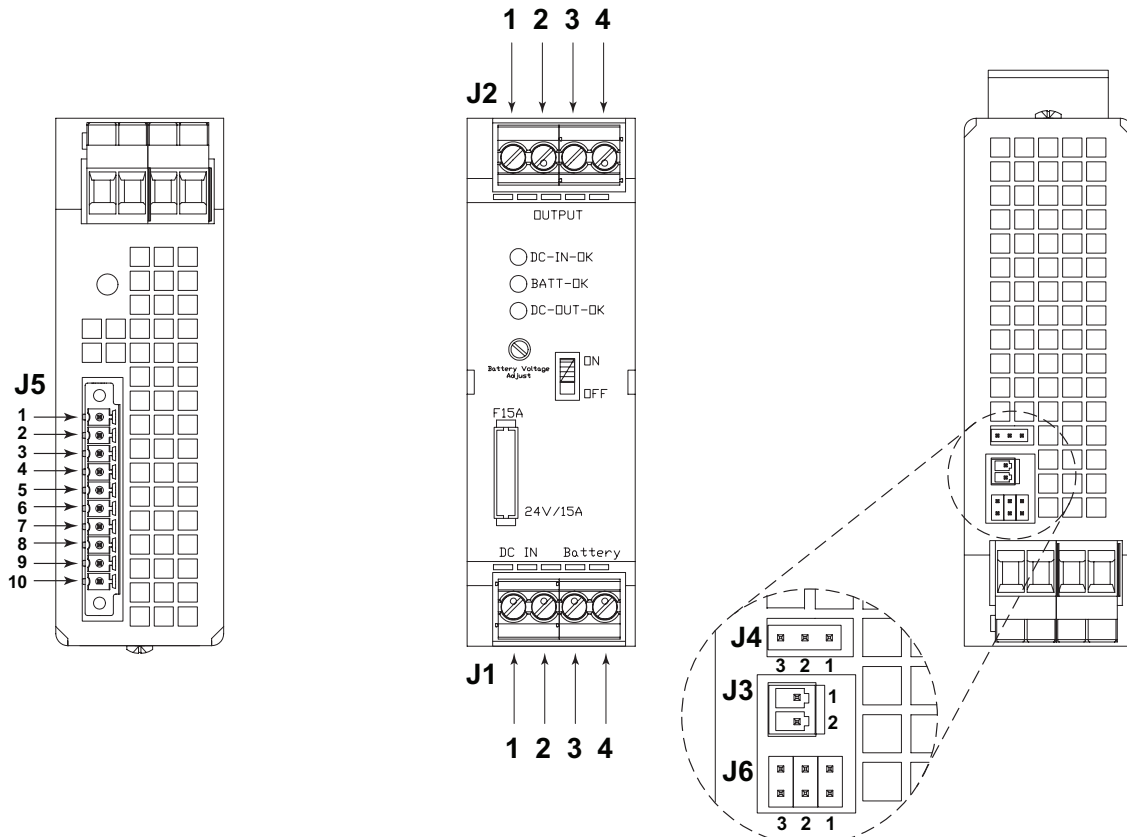


Output Specifications	
<b>Output Voltage Adjustable Range with Potentiometer</b>	24 to 28 VDC
<b>Ripple and Noise (20 MHz Bandwidth)</b>	at $V_{in}$ nom and $I_{out}$ max 200 mV peak-to-peak max
<b>Maximum Capacitive Load</b>	unlimited

## Jumper Table

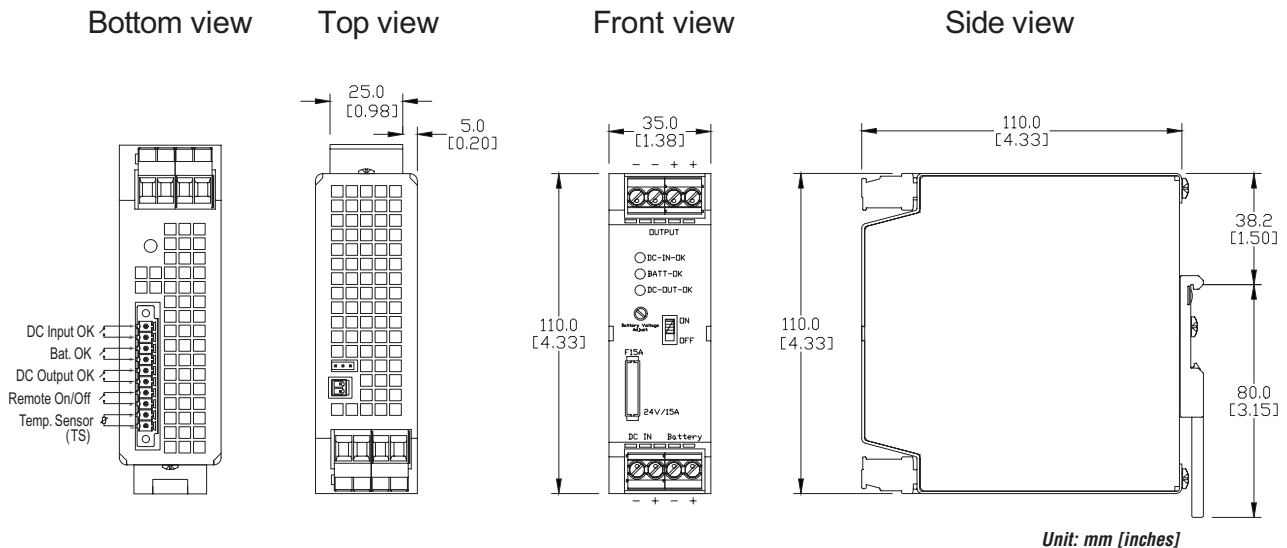
	J1	J2	J3	J4	J5	J6
Pin 1	- Vin (DC In)	GND (-)	S+	15 sec test	DC-IN-OK Signal	PSM24-360S (factory setting)
Pin 2	+ Vin (DC In)	GND (-)	S-	Common	DC-IN-OK Relay contact	PSM24-180S
Pin 3	- Bat in	Vout (+)	—	10 min test	Bat-OK Signal	PSM24-090S
Pin 4	+ Bat in	Vout (+)	—	—	Bat-OK Relay Contact	
Pin 5	—	—	—	—	DC-OUT-OK Signal	
Pin 6	—	—	—	—	DC-OUT-OK Relay contact	
Pin 7	—	—	—	—	Remote ON/OFF	
Pin 8	—	—	—	—	Remote ON/OFF	
Pin 9	—	—	—	—	Temperature Sensing	
Pin 10	—	—	—	—	Temperature Sensing	

## Battery Control Module Connector Positions





## PSM24-BCM360S Dimensions



## General Specifications

General Specifications	
<b>Battery Protection</b>	Over voltage, deep discharge, overcharge, short-circuit and reverse connection (built-in fuse)
<b>Status Signals</b>	DC-OK input, DC-OK output, BAT OK all relay contact closed at status OK; All LEDs on (green) at status OK
<b>Rating per Relay Contact</b>	30 VDC / 0.6 A max.
<b>Remote Link Wire 0.5m</b>	One cable included with PSM24-BCM360S module
<b>Remote ON/OFF</b>	by external contact: ON = J5.7 + J5.8 not shorted OFF = J5.7 + J5.8 shorted
<b>Temperature</b>	Operating (ambient): -25°C to +70°C max (-13°F to 158°F). Above +40°C(104°F) load derating 1.5%/°C Storage (non-operating): -25°C to +85°C max (-13°F to 185°F). Temperature drift: 0.02%/°C. Cooling: convection, no internal fan
<b>Humidity</b>	95% (non-condensing) relative humidity maximum
<b>Isolation</b>	According to IEC/EN 60950-1, UL 60950-1, EN50178, EN60204
<b>Over-temperature Protection</b>	When the TS-1 cable is used, the battery charging function will stop if the temperature sensor indicates the battery is over temperature. When the temperature sensor detects that the temperature has returned to a safe range, normal battery charging operation will automatically restart.
<b>Vibration</b>	IEC 60068-2-6: 3 axis, sine sweep, 10-55 Hz, 1g, 1 oct/min
<b>Shock</b>	IEC 60068-2-27: 3 axis, 15g half sine, 11ms
<b>Enclosure Rating</b>	IP20 (IEC 529)
<b>Enclosure Material</b>	Aluminum (chassis) / zinc plated steel (cover)
<b>Mounting</b>	Snap-on with self-locking spring for 35mm DIN rails per EN 50022-35x15/75, or wall mount with bracket (PSM-PANEL1 sold separately)
<b>Connection</b>	Pluggable screw terminals (plugs included) 2 terminals per output

Note: Unless otherwise stated, all specifications are valid at nominal input voltage, full load and +25°C after warmup time.

General Specifications – Safety Standards		
Specification	Standard	Document Number
<b>Electromagnetic Compatibility (EMC), Emissions</b>	EMC, Emissions	Corresponds to connected units ( no internal switching device)
<b>Electromagnetic Compatibility (EMC), Immunity</b>	EMC, Immunity	Corresponds to connected units ( no internal switching device)
<b>Pollution Degree</b>	2	

