Nader Electrical · Foresee the Future

NDU series Surge Protective Device

2016 Edition

Nader

COMPANY PROFILE

Shanghai Liangxin Electrical Co., LTD. one of the leading low-voltage electrical component manufacture in the high-end market, was established in 1999. Nader was successfully listed at Shenzhen Stock Exchange on 21st Jan. 2014.

Holding the spirit that client's demand drives our R&D process and client's value requires for our innovation, we endeavor to solve customer's challenge, win competitive edge for them and positive safe, reliable and energy saving low-voltage appliance for them.

Our company focus on low-voltage electrical components area. According to excellent corporate culture,good service system,positive business policy, reliable inspection and manufacture equipment and industrial leading client's applications, we received a good reputation and established an important industrial position.

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1. Product overview

Product models	NDU1				NDU2					
	NDU1-10	NDU1-20	NDU1-40	NDU1-65	NDU2-80 275	NDU2-100 275	NDU2-120 275	NDU2-80 440	NDU2-100 440	NDU2-120 440
Maximum continuous operating voltage Uc (V)	AC 275/320/385/440/550/255				AC 275			AC 440		
Nominal discharge current In (8/20us)	5	10	20	30	40	50	60	40	50	60
Maximum discharge current Imax (8/20us)	10	20	40	65	80	100	120	80	100	120
Maximum impact current limp (10/350us)	/				/					
Test grade	T2				T2					

Product models	NDU2Z		NDU3	
	NDU2Z-40 600	NDU2Z-40 1000	NDU3-15	NDU3-50
Maximum continuous operating voltage Uc (V)	DC 600	DC 1000	AC 320/385	AC 275
Nominal discharge current In (8/20us)	20	20	50	50
Maximum discharge current Imax (8/20us)	40	40	/	
Maximum impact current limp (10/350us)	/		15	50
Test grade	T2		T1	

2. Product features

● Scope of application and purpose

NDU series surge protective devices (SPDs) are used to protect surge caused by lightning or other transient over-voltage, discharge the large surge current on the power wire to the ground, and limit the overvoltage. They are applicable to protection of power supplies for industrial, construction, civil aviation, finance, securities, telecommunications, ports and other systems, suppression of transient over-voltage amplitude of lightning, over-voltage operation, etc., discharge of surge energy and protection of system circuit and equipment safety. Among them, NDU3 surge protective device can be installed within the lightning protection LPZ0B/LPZ1 zone to protect the overhead lines in a 50/60Hz AC power distribution system with rated operating voltage of 220/380V from non-attenuated direct lightning.

● Design features

- Maximum discharge current 120KA (8/20 waveform), high-energy surge protection
- Maximum continuous operating voltages for different products: 255V~550V; DC600V and DC1000V for DC products
- Built-in failure thermal tripping device, safer
- Equipped with 3+1 wiring form and common wiring form, applicable to different grid formats
- Standard 35mm guide rail installation
- Pluggable module design, easy for maintenance and replacement
- Equipped with failure indication and remote signaling interface (with normally open and normally closed contacts)
- Equipped with anti-reversing mechanism

● Structural features

- NDU1 external structural drawing

1: Input terminal

2: Status indication window

3: Grounding terminal

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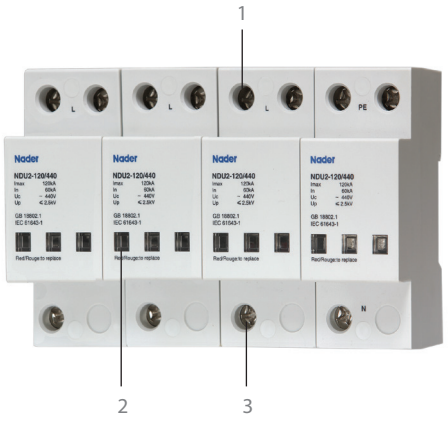
- NDU2 external structural drawing



1: Input terminal

2: Status indication window

3: Grounding terminal

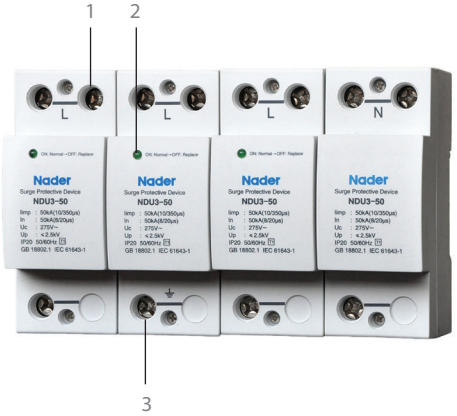
- NDU2Z external structural drawing

1: Input terminal

2: Status indication window

3: Grounding terminal

- NDU3 external structural drawing



1: Input terminal

2: Status indication window

3: Grounding terminal

Meeting the following standards

- GB18802.1 Part 1: Surge protective devices connected to low-voltage power distribution systems - Requirements and tests
- IEC 61643-1 Surge Protective devices connected to low-voltage power distribution systems Part 1

3. Application scope

Applicable environment

- Temperature of the working environment/storage temperature

  Temperature of the working environment: -40℃-+85℃

  Storage temperature: -45℃ ~ +85℃

- Altitude

  Installation site altitude ≤ 2,000m.

- Relative humidity for operation/Relative humidity for storage

  The relative humidity of atmosphere is not more than 50% at the ambient air temperature of +40℃; at a lower temperature, a higher relative humidity is allowed, for example, 90% at 20℃. Special measures should be taken to deal with occasional condensation due to temperature change.

Pollution grade

- 2 poles

Protection grade

- Product protection grade: IP20

Installation way

- Installed on the TH35mm × 7.5 standard guard rail

Installation direction

- Vertical installation, with the gradient between the installation plane and the vertical plane ≤ ± 5 °
- Horizontal installation

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4. Technical characteristics of the product

4.1 Description of specifications and models

ND	U	□	□ - □ / □ / □ / □
1	2	3	4 5 6 7 8

Serial No.	Serial No. name	NDU				
1	Enterprise code	ND: Nader brand low-voltage apparatus				
2	Model	U: surge protective device				
3	Design serial No.	1	2		3	
4	DC code	/	/	Z	/	
5	Maximum current code	Maximum discharge current Imax(8/20us): 10kA, 20kA, 40kA, 65kA	Maximum discharge current Imax (8/20us): 80kA, 100kA, 120kA	Maximum discharge current Imax(8/20us): 40kA	Maximum impact current limp (10/350us): 15kA	Maximum impact current limp (10/350us): 50kA
6	Maximum continuous operating voltage Uc	AC255V, 275V , 320V, 385V , 440V, 550V	AC275V, 440V	DC600V, DC1000V	320V, 385V	275V
7	Number of poles	1P , 1PN , 2P , 3P , 3PN , 4P	1P , 1PN , 2P , 3P , 3PN , 4P	3P	1P , 2P , 3P , 4P	
8	Remote signaling	S means remote signaling is provided, and blank means remote signaling is not provided.	S means remote signaling is provided, and blank means remote signaling is not provided.	S means remote signaling is provided, and blank means remote signaling is not provided.	S means remote signaling is provided, and blank means remote signaling is not provided.	

4.2 Technical parameters

4.2.1. NDU1 technical parameters

Model	NDU1-10			
Specifications	NDU1-10/275	NDU1-10/320	NDU1-10/385	NDU1-10/NPE
Maximum continuous operating voltage Uc (V)	275	320	385	255
Frequency （Hz）	50/60			
Maximum discharge current Imax(8/20us)	10kA			
Nominal discharge current In(8/20us)	5kA			
Voltage protection level Up	≤1.0kV	≤1.2kV	≤1.35kV	≤1.2kV
Ambient temperature	-40℃ ~ +85 ℃			
Response time	≤25ns			
Protection grade	IP 20			
Remote signaling contact operating parameters (maximum value)	1.5A 250VAC			
Connecting wire section	SPD connecting wire: BVR-16mm^2 ； Grounding wire: BVR-25mm^2			
Product certification	Type test report of Beijing Lightning Protective Device Testing Center			

Model	NDU1-20				
Specifications	NDU1-20/275	NDU1-20/320	NDU1-20/385	NDU1-20/440	NDU1-20/NPE
Maximum continuous operating voltage Uc (V)	275	320	385	440	255
Frequency （Hz）	50/60				
Maximum discharge current Imax(8/20us)	20kA				
Nominal discharge current In(8/20us)	10kA				
Voltage protection level Up	≤1.1kV	≤1.2kV	≤1.5kV	≤1.8kV	≤1.5kV
Ambient temperature	-40℃ ~ +85 ℃				
Response time	≤25ns				
Protection grade	IP 20				
Remote signaling contact operating parameters (maximum value)	1.5A 250VAC				
Connecting wire section	SPD connecting wire: BVR-16mm^2 ； Grounding wire: BVR-25mm^2				
Product certification	Type test report of Beijing Lightning Protective Device Testing Center				

Model	NDU1-40					
Specifications	NDU1-40/275	NDU1-40/320	NDU1-40/385	NDU1-40/440	NDU1-40/550	NDU1-40/NPE
Maximum continuous operating voltage Uc (V)	275	320	385	440	550	255
Frequency (Hz)	50/60					
Maximum discharge current Imax (8/20us)	40kA					
Nominal discharge current In (8/20us)	20kA					
Voltage protection level Up	≤1.3kV	≤1.5kV	≤1.8kV	≤2.2kV	≤2.8kV	≤1.5kV
Ambient temperature	-40℃ ~ +85 ℃					
Response time	≤25ns					
Protection grade	IP 20					
Remote signaling contact operating parameters (maximum value	1.5A 250VAC					
Connecting wire section	SPD connecting wire: BVR-16mm^2 ; Grounding wire: BVR-25mm^2					
Product certification	Type test report of Beijing Lightning Protective Device Testing Center					

Model	NDU1-65					
Specifications	NDU1-65/275	NDU1-65/320	NDU1-65/385	NDU1-65/440	NDU1-65/550	NDU1-65/NPE
Maximum continuous operating voltage Uc (V)	275	320	385	440	550	255
Frequency (Hz)	50/60					
Maximum discharge current Imax (8/20us)	65kA					
Nominal discharge current In (8/20us)	30kA					
Voltage protection level Up	≤1.5kV	≤1.8kV	≤2kV	≤2.5kV	≤3kV	≤1.5kV
Ambient temperature	-40℃ ~ +85 ℃					
Response time	≤25ns					
Protection grade	IP 20					
Remote signaling contact operating parameters (maximum value	1.5A 250VAC					
Connecting wire section	SPD connecting wire: BVR-16mm^2 ; Grounding wire: BVR-25mm^2					
Product certification	Type test report of Beijing Lightning Protective Device Testing Center					

4.2.2. NDU2 technical parameters

Model	NDU2Z-40 600	NDU2Z-40 1000	NDU2-80 275 (Y)	NDU2-100 275 (Y)	NDU2-120 275 (Y)	NDU2-80 440 (Y)	NDU2-100 440 (Y)	NDU2-120 440 (Y)
Number of poles	3P	3P	1P, 1PN, 2P, 3P, 3PN, 4P (only 3PN, 4P for integrated structure) (Y means integrated)					
Protection grade	Grade B	Grade B	Grade B			Grade B		
Rated voltage	DC600V	DC1000V	AC230V			AC400V		
Nominal discharge current（8/20us）	20kA	20kA	40kA	50kA	60kA	40kA	50kA	60kA
Maximum discharge voltage（8/20us）	40kA	40kA	80kA	100kA	120kA	80kA	100kA	120kA
Voltage protection level	≤2.8Kv (Adjustable to 2.85Kv)	≤3.8	≤2.5	≤2.5	≤2.5	≤2.5	≤2.5	≤2.5
Maximum continuous running voltage	600V	1000V	275V			440V		
Operation voltage	≥750V	≥1800V	≥430V			≥680V		
Response time	≤20nS	≤20nS	≤20nS			≤20nS		
Leakage current	≤30uA	≤30uA	≤30uA			≤30uA		
Protection mode		L-PE/N-PE	L-PE/N-PE			L-PE/N-PE		
Connecting wire section	SPD connecting wire: BVR-16mm^2 Grounding wire: BVR-25mm^2							
Shell material	Flame-retardant material							
Working environment	Temperature: 85℃: -40℃ Relative humidity: < 95%							
Installation location			Incoming line terminal for power supply of general distribution box or distribution box					
Number of ports	One port							
Structure type	Pluggable		Assembly/integrated design					
Protection type	IP20							
Protection type	Voltage limiting type							
Product certification	Type test report of Beijing Lightning Protective Device Testing Center							

4.2.3. NDU3技术参数

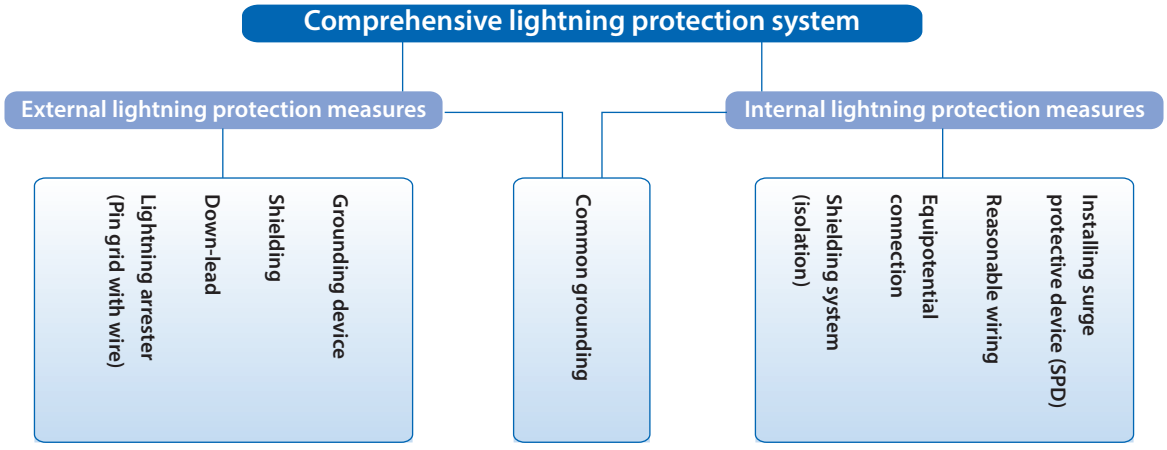
型号	NDU3-15/320	NDU3-15/385	NDU3-50/275
额定工作电压Ue（VAC）	220/380		220/380
最大持续工作电压Uc（VAC）	320	385	275
频率Hz	50/60	50/60	275
最大冲击电流Iimp（kA）10/350μs	15		50
电荷量Q（As）	7.5		25
标称放电电流In（kA）8/20μs	50		50
电压保护水平Up（kV）	2.2	2.5	2.5
响应时间 ns	≤25		≤100
额定断开续流能力kA	不适用		3
防护等级	IP20		
保护模式	L/N-PE		
外壳材料	阻燃材料PA6		
工作环境	温度：-40℃~+70℃；相对湿度：＜95%		
端口数量	一端口		
过电流保护功能	无		
遥信功能	有		有
连接导线截面	4-25mm^2		4-35mm^2
极数	1，2，3，4		
后备保护	保险丝：125AgL　断路器：NDM3-125 125		
产品认证	北京雷电防护装置测试中心型式试验报告		

5. Surge protection system analysis

5.1 Surge protection system design and analysis

It is required to carry out multifaceted analysis before the design of a surge protection system, which includes the following main points:

- Risk assessment of surge hazard: Before designing a surge protection system, assessment of lightning strike-surge risk (mainly lightning electromagnetic pulse effect), importance of equipment and severity of lightning strike consequences should be carried out.
- Lightning environment for buildings and incoming lines: It is required to investigate thunderstorm days, surrounding geological terrains, building density, line laying, etc. of a building area.
- Sizes of buildings and incoming lines: The plane sizes and heights of a building, incoming line length and other data are required, which determine its lightning attraction area.
- Basic lightning protection measures for buildings and equipment: Some external and internal lightning protection measures before the installation of SPD, such as lightning arrester, grounding device, shielding, wiring and so on.

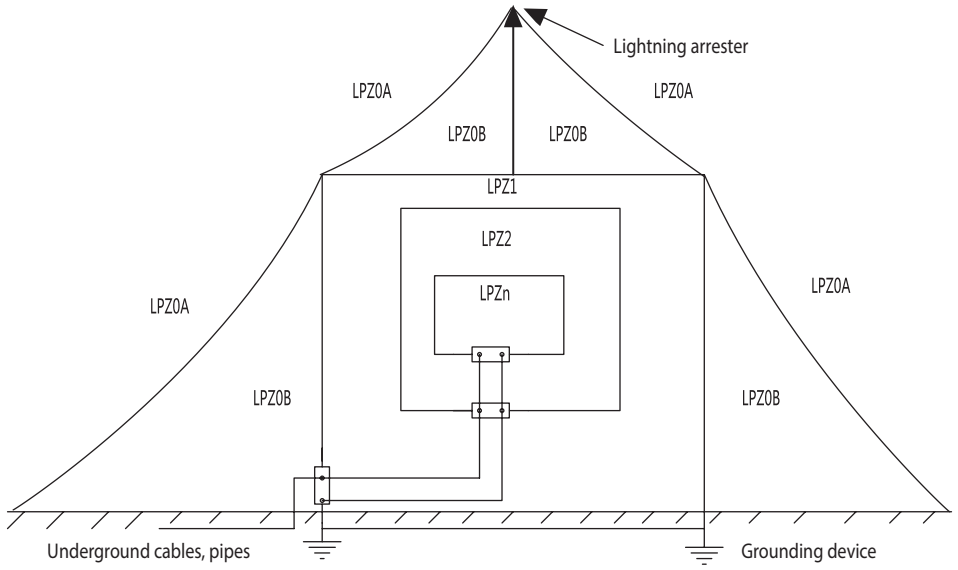


5.2 Surge protective device (SPD) related terms and definitions

- Nominal discharge current In: The peak current of current wave withstood during ground discharge of the input terminal of each phase or each module of SPD according to specified times and waveforms under the condition of no substantial damage to SPD.
- Maximum discharge current Imax: Flowing through SPD, with peak value of 8/20 waveform current, and with value determined by the Level II operating load procedure.
- Maximum impact current Iimp: Flowing through SPD, with peak value of 10/350 waveform current, and with value determined by the Level I operating load procedure.
- Maximum protection level Up: Maximum instantaneous voltage value at the two ends of the SPD after it is triggered.
- Residual voltage Ures: Voltage peak between its terminals when the discharge current flows through SPD.
- Grade B SPD (Grade III): SPD that can withstand the energy of direct lightning and release some current of direct lightning strike.
- Grade C SPD (Grade III): SPD that can release surge caused by remote distance or conduction of lightning strikes and switching.
- Grade D SPD (Grade III): Precise SPD designed to protect the terminal load.
- Protection fuse at the front end of SPD (backup fuse): Pre-fuse must be installed at the front end of any SPD connecting a phase line.

5.3 Division of lightning protection zone

The following is the building lightning protection distribution diagram



Note:

: Indicates equipotential grounding terminal board on different lightning protection zone interfaces

: Indicates external walls of buildings, rooms or other shields with shielding effect

Dotted line: Indicates the scope of protection of LPS calculated by rolling sphere method

Division of lightning protection zones is to divide a building requiring protection and control of electromagnetic pulse environment of lightning into different lightning protection zones from outside to inside, as shown in the figure above.

- LPZ0A: In this zone, the electromagnetic field does not attenuate, all kinds of objects may be subject to direct lightning strike, and it is an undefended area that is completely exposed;
- LPZ0B: The electromagnetic field does not attenuate, all kinds of objects rarely suffer direct lightning strike, and it is a LPZ0B fully exposed;
- LPZ1: Due to the barrier measures of a building, the lightning current flowing through all kinds of conductors is lower than that at the LPZ0B, the electromagnetic field has been initially attenuated, and it is impossible for all kinds of objects to suffer direct lightning strike;
- LPZ2: Subsequent protection zone introduced to further reduce guided lightning current or electromagnetic field;
- LPZn: Subsequent protection zone required to further reduce the electromagnetic pulse of lightning in order to protect the equipment with high level of sensitivity.

5.4 Recommended SPD selection for lightning protection zone

The following steps can be taken to select an SPD:

- Determine the surge protection object: Carry out risk assessment and analysis of surge hazard and calculation of lightning strike-surge intrusion probability.
- Divide surge protection grade: The surge protection grade may be divided according to GB50343 to determine the maximum discharge current.
- Determine SPD parameters and structure types: Determine the maximum continuous operating voltage and protection mode based on the grounding type of power distribution system (3PN products are recommended for TT system and TN-S system, and 4P products may be selected for other power distribution systems). Determine the voltage protection level of SPD based on the rated impact resistant overvoltage of the equipment needing to be protected.
- SPD layout and configuration: The construction department should complete installation and wiring of SPD according to the national standards.

Power system SPD selection reference table

Lightning protection zone	Building lightning protection category			Protection grade	Installation location
	Category I	Category II	Category III		
LPZ0A	80	60	40	Grade 1	Before main incoming line power distribution box
Except LPZ0A	40			Grade 2	Before UPS or power distribution box
	20			Grade 3	Before power distribution system of important equipment
	10			Grade 4	Before the working power supply of electronic equipment

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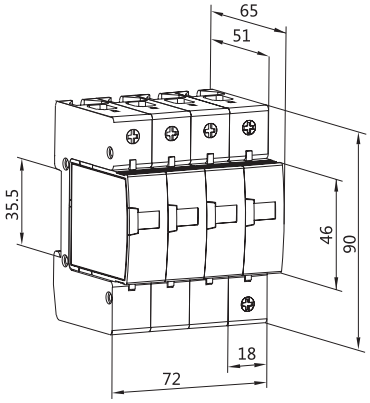
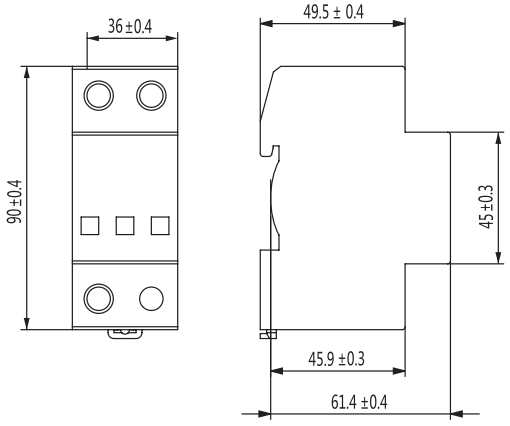
6. Product outline/installation dimension

6.1 Outline dimension

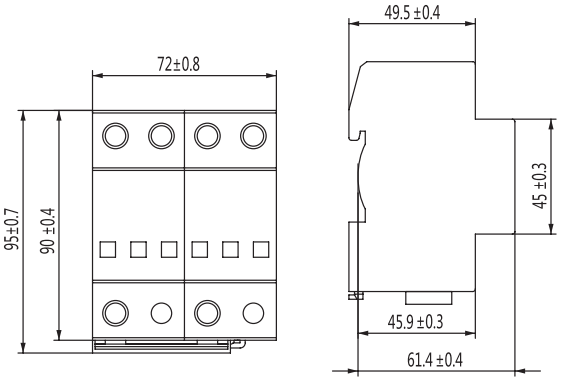
6.1.1. NDU1 Outline dimension



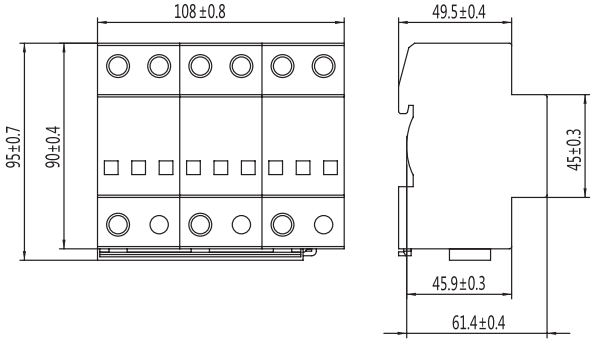
6.1.2. NDU2 Outline dimension



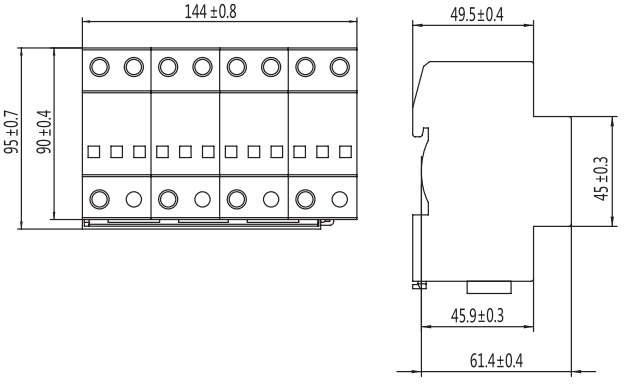
1P



1PN/2P

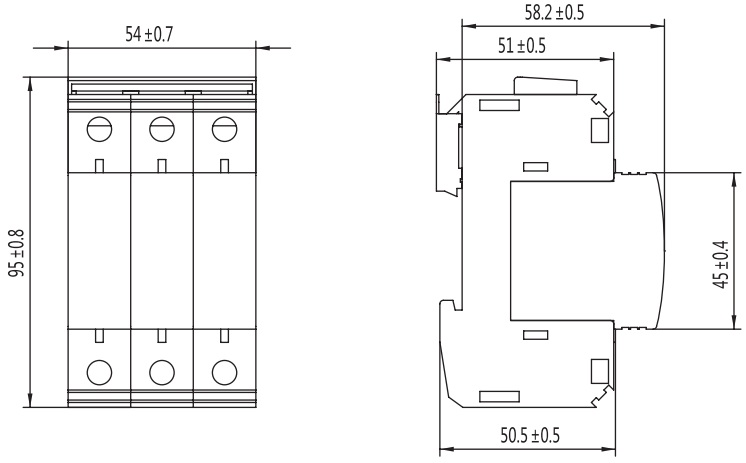


3P

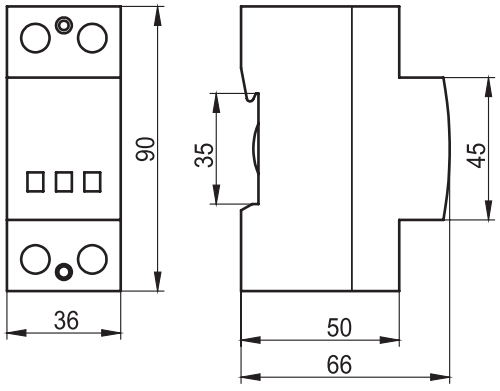


3PN/4P

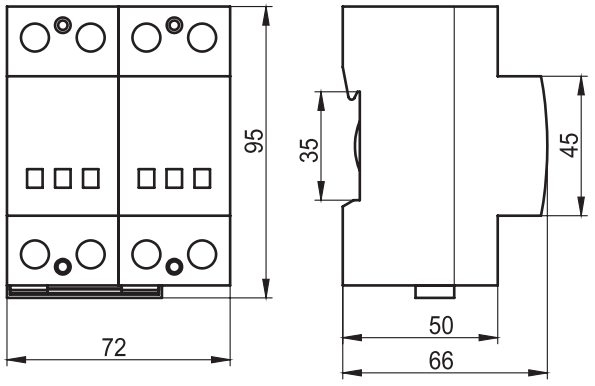
6.1.3. NDU2Z Outline dimension



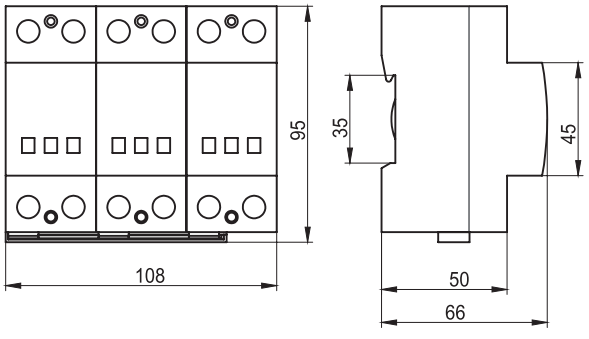
6.1.4. NDU3 Outline dimension



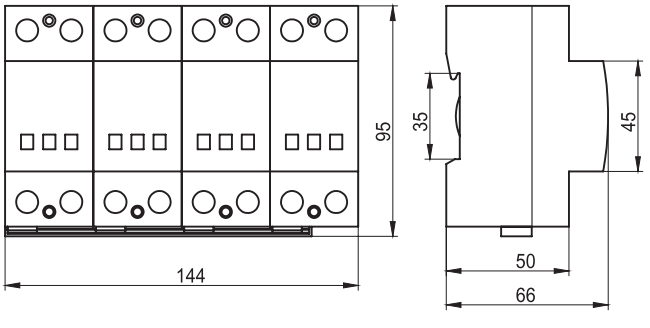
1P



2P



3P



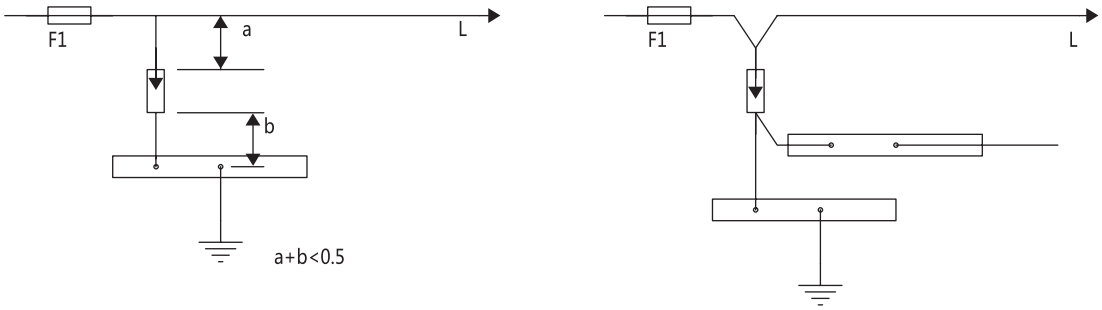
4P

6.2 Product wiring methods

6.2.1. Common wiring method

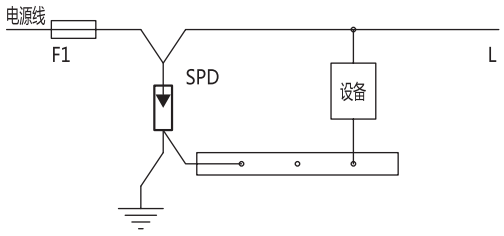
The connecting wire of protector plays a decisive role in obtaining the best protection voltage level; according to the IEC wiring regulations, the wiring length of protector power wire and the distance from the protector to the equipotential bonding should be less than 0.5m, or V-shaped wiring be used, as shown in the figure below:

SPD wiring diagram

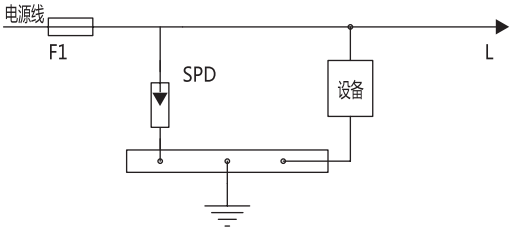


6.2.2. Kevin wiring method

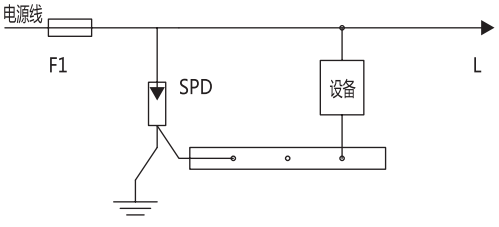
In some installation sites, the wiring length of SPD cannot meet the requirements of ≤0.5m due to the installation location; in this case, V-shaped wiring method (Kevin wiring method) may be used, as shown in the figure below:



a. The installation location of SPD is away from the power distribution box and main grounding bar



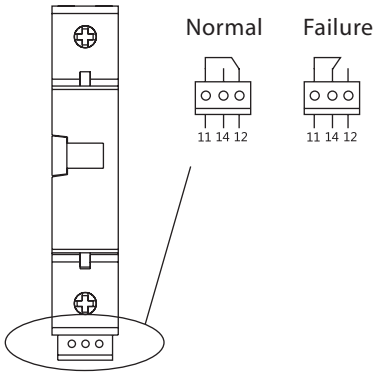
b. The SPD is installed near the grounding bar



c. The SPD is installed near the power distribution box

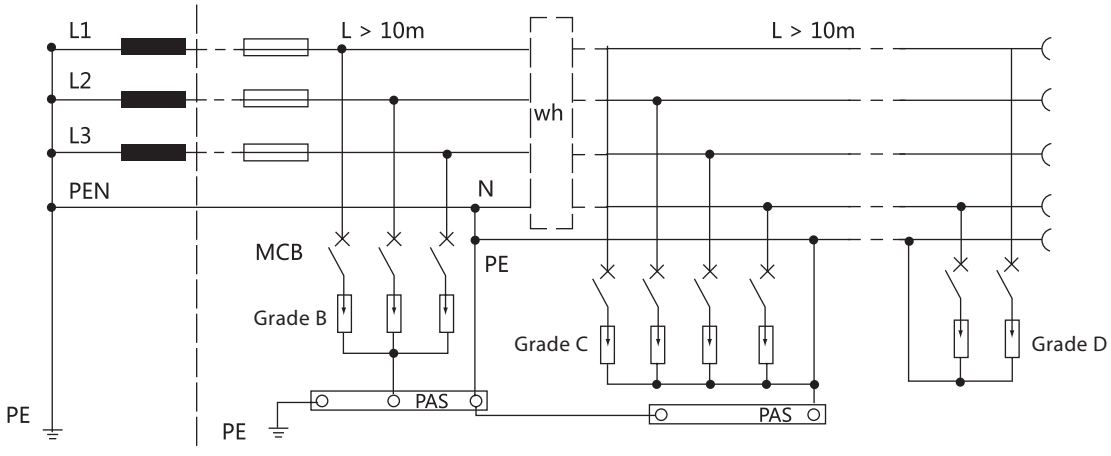
6.3 Remote signaling wiring instructions

Remote signaling wiring is shown in the left figure below, and the wiring may be subject to the following parameters:



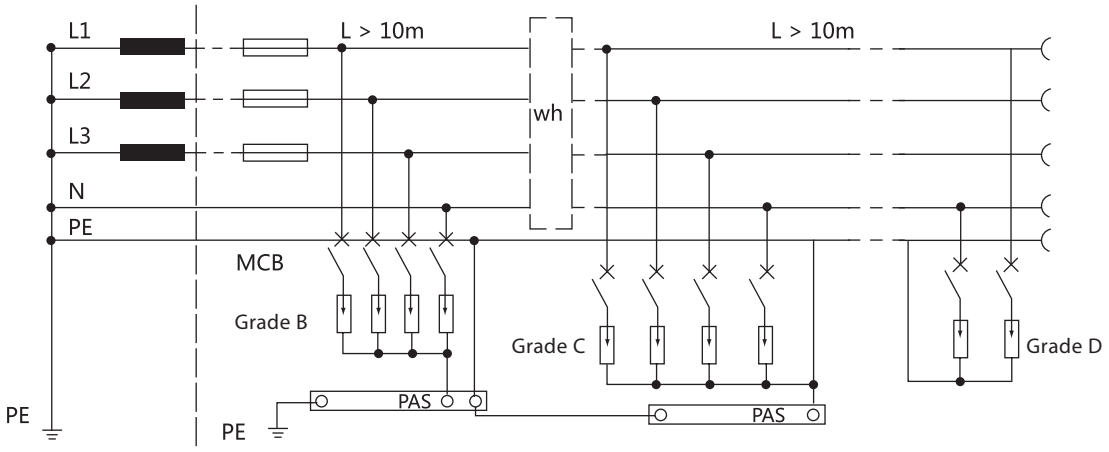
7. Wiring diagrams for different power distribution systems

7.1 TN-C-S TN-C-S System wiring diagram

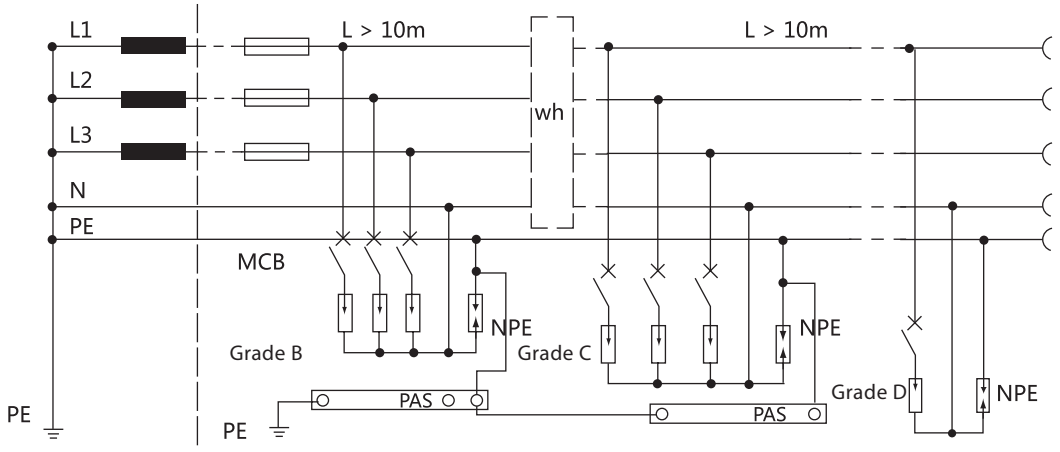


Note: The TN-CS power supply system wiring diagram is shown in the figure above; in such system, Grade B (basic protection) SPD only needs to choose three lightning protection modules, the SPD is connected in parallel to three phase lines (L1, L2, L3), and the phase lines are connected to PEN line through the SPD.

7.2 TN-S System wiring diagram



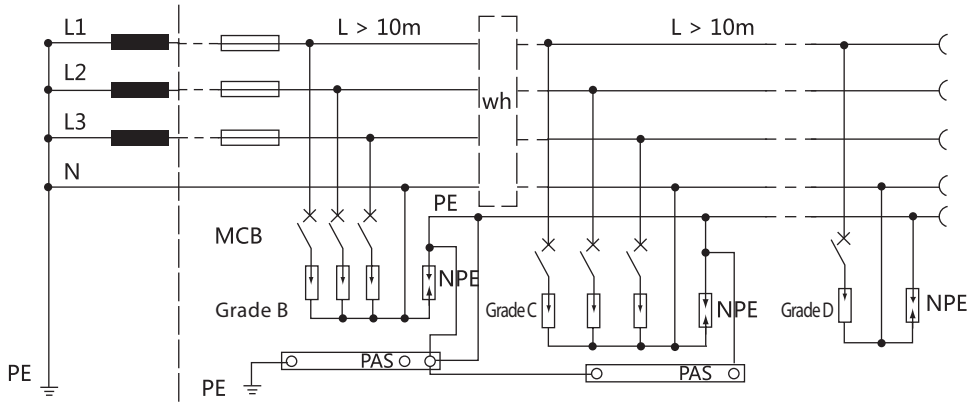
4P product



3PN product

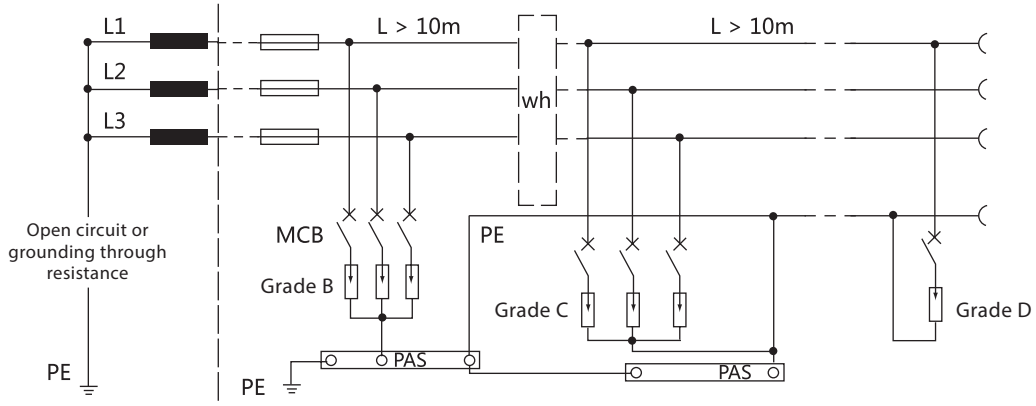
Note: The TN-S power supply system wiring diagram is shown in the figure above; in such system, Grade B (basic protection) SPD has a 3+1 structure. In the 3+1 structure, three phase lines are connected through SPD to neutral line which is connected to the protective earth (PE) line via a spark gap. This circuit structure can prevent short-circuit current of SPD as a result of short-time overvoltage due to mains failure.

7.3 TT System wiring diagram (3PN product)



Note: The TT power supply system wiring diagram is shown in the figure above; in such system, Grade B (basic protection) SPD has a 3+1 structure. In the 3+1 structure, three phase lines are connected through SPD to neutral line which is connected to the protective earth (PE) line via a spark gap. This circuit structure can prevent short-circuit current of SPD as a result of short-time overvoltage due to mains failure.

7.4 System wiring diagram



8. Specifications for ordering and selection (Tick √ in □)

User unit			Number of units ordered:	Date of order:
Model	□NDU1	□NDU2	□NDU2Z	□NDU3
Maximum discharge current Imax	□65 □40 □20 □10	□80 □100 □120	□40	/
Maximum impact current Iimp	/	/	/	□15 □50
Maximum continuous operating voltage Uc	□255V □275V □320V □385V □440V □550V	□275V □440V	□DC600V □DC1000V	□275V □320V □385V
Number of poles	□1P □2P □1PN □3P □3PN □4P		□3P	□1P □2P □3P □4P
Remote signaling function	□S: With remote signaling function □: Without remote signaling function			

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