



Surge protection for closed-circuit television systems (CCTV)

Application, technical structure and application examples

Building Connections

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Application

Camera systems are used to monitor rooms, buildings and outdoor spaces, in order to record unauthorised access or criminal activities. Thus, the high availability of these systems must be guaranteed. CCTV (closed-circuit television) describes such camera monitoring systems. The difference to general camera systems is that the recorded images are only determined for a limited number of receivers (closed circuit), in contrast to transmissions for public television, for example.

CCTV camera systems are frequently installed outside buildings or on objects. During a thunderstorm, the devices

- can be completely destroyed by a direct lightning strike,
- or, if there is a remote lightning strike, can be damaged by surge voltages induced in transmission cables during the release of electromagnetic waves.



Technical structure

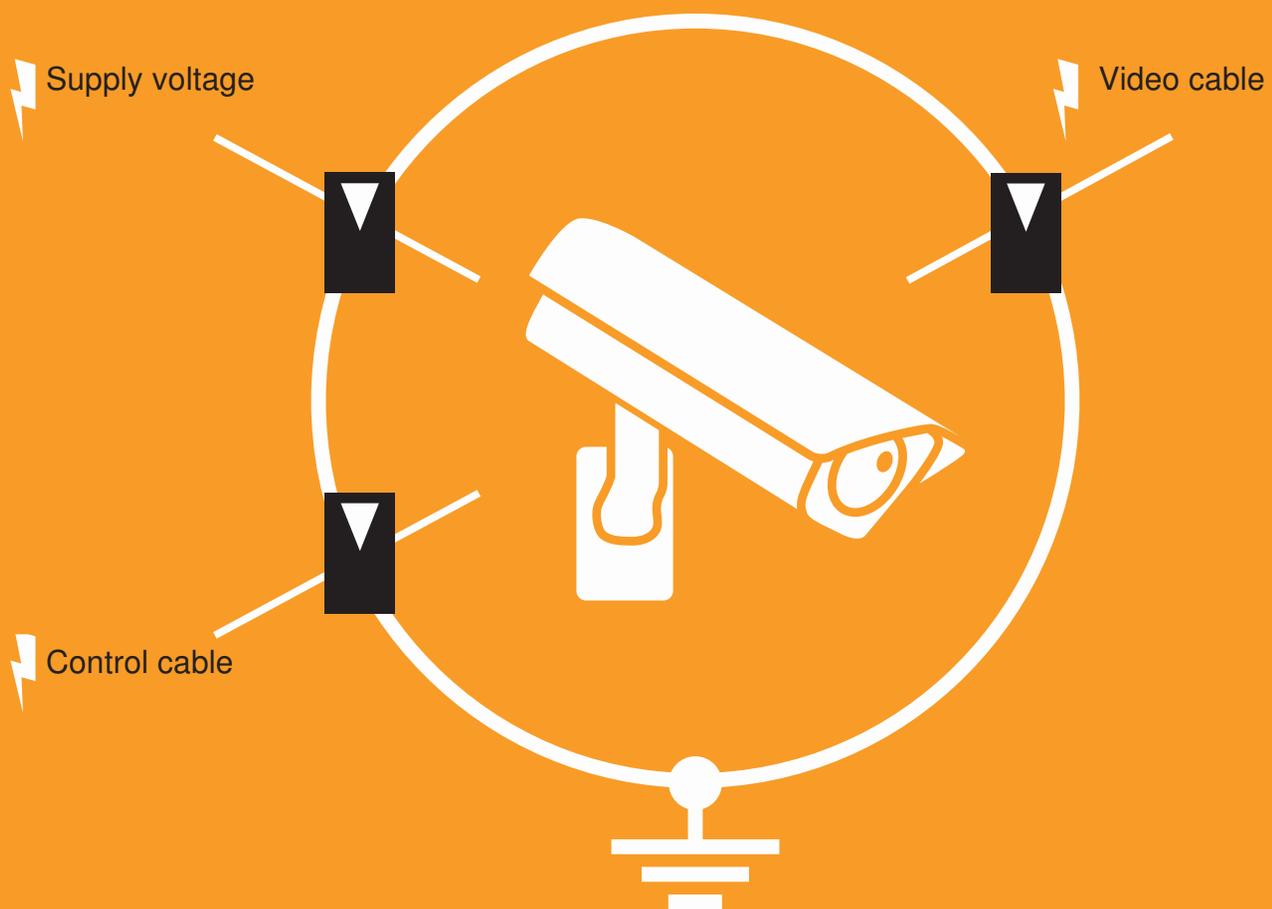
Camera system structures have various differences. For video transmission, a coaxial cable with a BNC plug connection is frequently used as a cable medium, or a two-core/twisted pair cable is used. If the camera possesses a control unit to swivel and tilt the camera head, this transmission is usually controlled via a serial RS485 interface via a two-core/twisted pair cable. A three-pole cable is used as the power supply.

Depending on the version, the data and video interfaces are frequently run together, for example through an RJ45 network connection. Modern IP cameras possess a single RJ45 connection, which transmits both the data and video signal and also the power supply via Power over Ethernet (PoE).

To prevent a failure of cameras and display systems, the components must be protected against atmospheric discharges and surge voltages.

OBO Bettermann offers tailor-made surge protection solutions for these applications, in order to guarantee safe system operation.

Surge protection concept



To fulfil a comprehensive surge protection concept, all the parts of a terminal or any equipment that are able to carry current must be included in the equipotential bonding. In the case of camera systems, these are the different interfaces which the camera possesses. Depending on the version, the number varies from one to three.



Variants

The surge protective devices are available in the following variants:

PND-3in1-C-OS To protect the power, data and video cable in one device in the case of surge voltages and lightning currents.		
Protection class:		Type 2+3/D1+C2
Connections	Power:	3-pole (screw terminal)
	Data:	4-pole (screw terminal)
	Video:	Coaxial BNC socket

PND-2in1-C-OS To protect the power, data and video cable in one device in the case of surge voltages and lightning currents.		
Protection class:		Type 2+3/D1+C1+C2
Connections	Power:	3-pole (screw terminal)
	Data + video:	RJ45 socket

ND-CAT6/E-B To protect the RJ45 Power-over-Ethernet interface in the case of surge voltages and lightning currents.		
Protection class:		Type 1/D1
Connections	Power + Data + video:	RJ45 socket

ND-CAT6/E-F To protect the RJ45 Power-over-Ethernet interface in the case of surge voltages.		
Protection class:		Type 2+3/C2+C1
Connections	Power + Data + video:	RJ45 socket

In addition, OBO can offer the matching housing for every variant for installation in outdoor areas.

Application examples

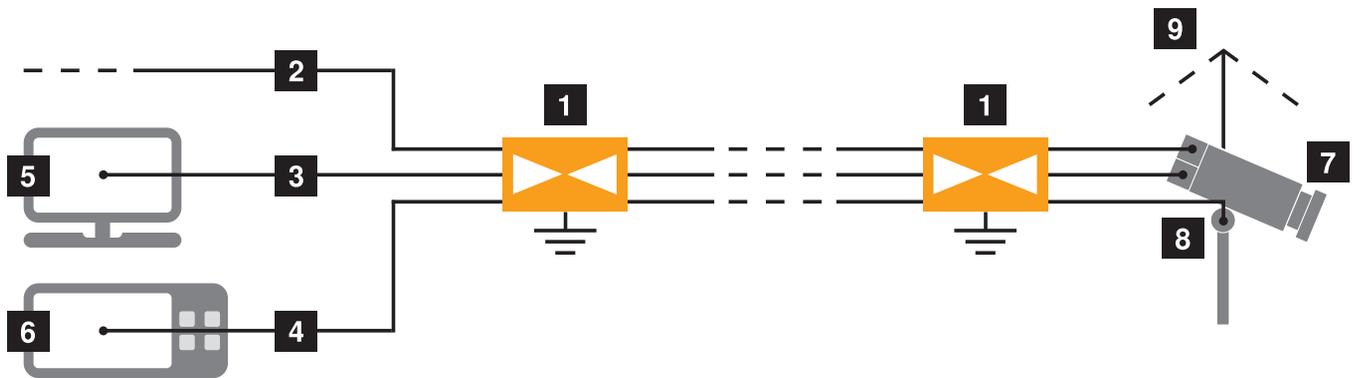
The following application examples offer a schematic diagram of the structure and protection of the most common camera monitoring systems for surge voltages and lightning currents. A connection box can be used to house the surge protective devices, for example on the camera pole. The surge protective devices should be installed as close as possible to the device to be protected, allowing the protection level and the risk of coupling on the protected side to be kept low. In addition, the length of the connection from the surge protective device to the local equipotential bonding should be kept as short as possible.

Scenario 1:

Three-cable camera system with/without external lightning protection

The camera is integrated into the system via three separate cables (power, data, video). Each of the three cables must be separately equipped with surge protection, in order to protect all the interfaces. As the PND-3in1-C-OS is a type 2+3 combination arrester for the power supply and type 1+2 (D1/C2) for data cable protection, it can be used with camera systems with and

without lightning protection and protects all the named interfaces with a single device. For monitoring if the device is functioning, the device also possesses a visual display. If it goes out, then the surge protection device should be replaced immediately.



The data and video transmission and the power supply are each carried out separately.

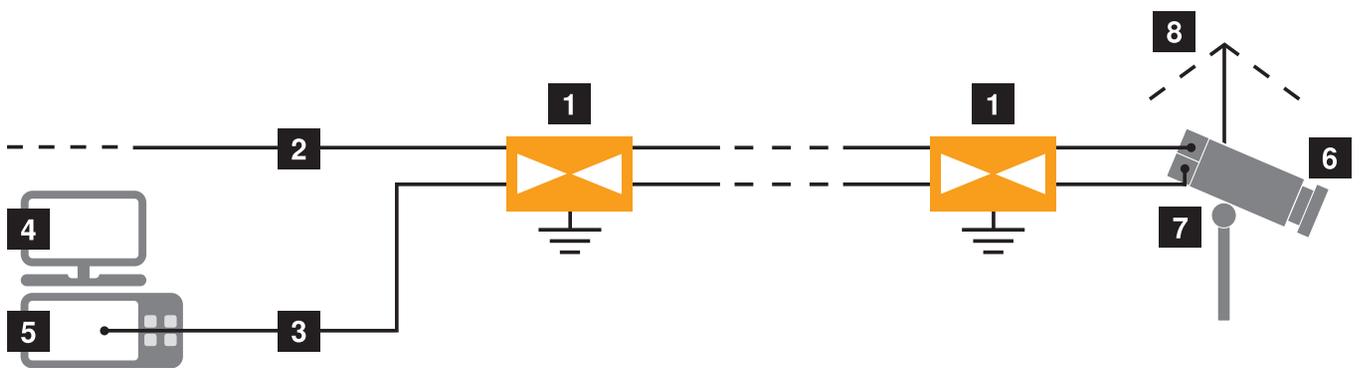
1	PND-3in1-C-OS (item no.: 5081072)
2	230 V
3	Video cable (Coax/BNC)
4	Data cable (RS485)
5	Monitor
6	Camera control unit
7	Camera
8	Swivel and tilt head
9	External lightning protection with protection angle

Scenario 2:

Two-cable camera system with/without external lightning protection

The video signal is transmitted jointly with the data signal for the movement controller via a network connection (RJ45). The voltage to the camera is supplied separately. The PND-2in1-C-OS surge protection device offers the matching interfaces for such cases in a single device. Here too, the property of a combination arrester is given, meaning that it can also be used for camera

systems with external lightning protection, providing reliable protection against surge voltages. In addition, as is the case with the PND-3in1-C-OS, the device possesses a visual display to monitor if the device is functioning.



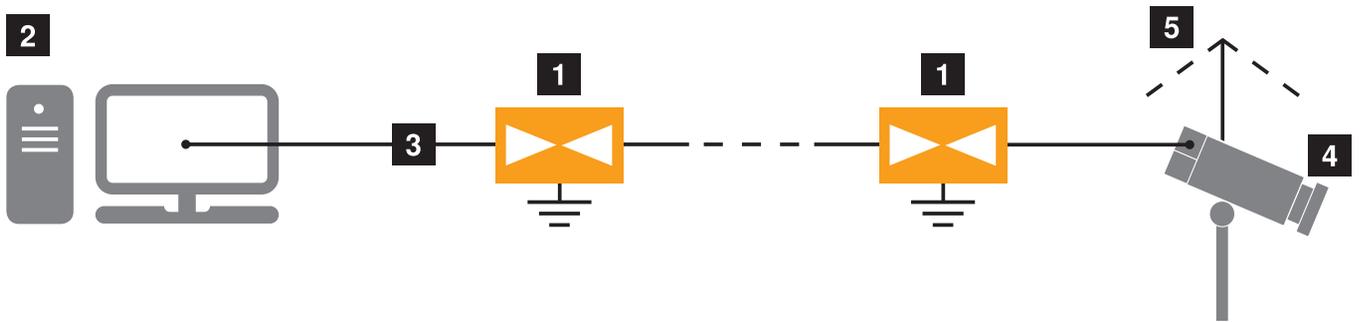
1	PND-2in1-C-OS (item no.: 5081070)
2	230 V
3	Data and video cable (RJ45)
4	Monitor
5	Camera control unit
6	Camera
7	Swivel and tilt head
8	External lightning protection with protection angle

Scenario 3:

IP camera system

IP cameras only require one cable between the command centre and the camera. This cable transmits both the data and video signal and also the power supply via Power over Ethernet. The high amount of cabling work is not necessarily, as transmission via IP is versatile

and can easily be integrated in existing systems. The ND-CAT6/E-B (type 1) can be used in lightning protection zones from 0 to 1. For lightning protection zones 1 to 3, ND-CAT6/E-F must be used.



1	ND-CAT6/E-B (item no.: 5081804) or ND-CAT6/E-F (item no.: 5081802)
2	PC as command centre
3	LAN/PoE cable
4	Camera
5	External lightning protection with protection angle

Combined protection device 2in1 for CCTV camera systems

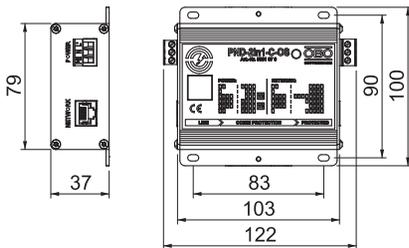


Type	Maximum continuous voltage (L-N) V	Maximum discharge current (8/20 μs) kA	Pack Piece	Weight kg/100 pc.	Item no.
PND-2in1-C-OS	255	10	1	27.000	5081070

Combination protection device for IP-based TV/camera systems

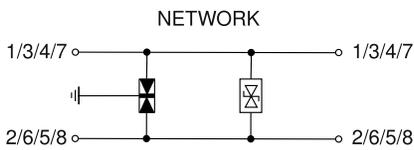
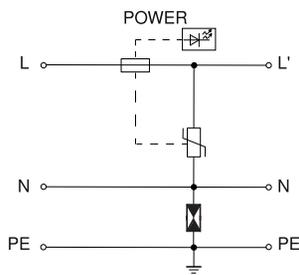
- Protection of power and data interface in a single device
- In aluminium housing
- Simple mounting with adapter plug
- Two-stage protection circuit
- Three-pole power connection for the power interface
- RJ45 connection for the data interface
- With LED operation display (OS)
- Incl. DIN rail fastening set

Dimensions



Application: Protection of CCTV, video signals, (IP) cameras and/or TV systems

Connection options



PND-2in1-C-OS

Temperature range	θ	-20 - +80 °C
Installation type		Installation
Protection rating		IP20
Earthing via:		Connection cable/DIN rail
Lightning protection zone LPZ		1→3
Power		
SPD to IEC 61643-11		Class II+III
SPD to EN 61643-11		Type 2+3
Maximum continuous voltage (L-N)	U_C	255 V
Rated current	I_n	16 A
Protection level	U_p	<1,3 kV
Idle voltage	U_{OC}	10 kV
Nominal discharge current (8/20 μs)	I_n / I_{L-N}	5 kA
Maximum discharge current (8/20 μs)	I_{max}	10 kA
Network		
Maximum continuous voltage AC	U_C	5,65 V
Maximum continuous voltage DC	U_C	8 V
Category		Type 1+2+3 / D1+C2+C1
Impulse durability wire-wire		C1: 0,3 kV / 0,15 kA (8/20μs)
Impulse durability wire-earth		C2: 3 kV / 1,5 kA (8/20μs)
Protection level wire-wire		<40 V
Protection level wire-earth		<450 V
Frequency range		0 - 100 MHz
Shielding connection available		Yes
Shield connection		Direct
Testing standard		IEC 61643-21

Combined protection device 3in1 for CCTV camera systems



Type	Maximum continuous voltage (L-N) V	Maximum discharge current (8/20 μs) kA	Pack Piece	Weight kg/100 pc.	Item no.
PND-3in1-C-OS	255	10	1	29.900	5081072

Combination protection device for coaxial TV/camera systems

- Protection of power and data interfaces in a single device
- In aluminium housing
- Simple mounting with adapter
- Two-stage protection circuit
- Three-pole power connection for the power interface
- With LED operation display (OS)
- Incl. DIN rail fastening set

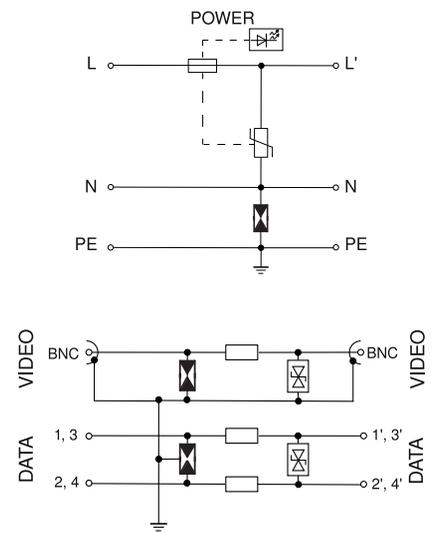


Application: Protection of CCTV, video signals, cameras and/or TV systems

PND-3in1-C-OS

Lightning protection zone LPZ		1→3
Earthing via:		Connection cable/DIN rail
Protection rating		IP20
Power		
SPD to IEC 61643-11		Class II+III
SPD to EN 61643-11		Type 2+3
Maximum continuous voltage (L-N)	U_C	255 V
Rated current	I_n	16 A
Protection level	U_n	<1,3 kV
Nominal discharge current (8/20 μs)	$I_n / L-N$	5 kA
Maximum discharge current (8/20 μs)	I_{max}	10 kA
Data		
Maximum continuous voltage AC	U_C	5,65 V
Maximum continuous voltage DC	U_C	8 V
SPD to IEC 61643-21		Class I+II / D1+C2
Category		Type 1+2 / D1+C2
Impulse durability wire-wire		C2: 10 kV / 5 kA (8/20μs)
Impulse durability wire-earth		C2: 10 kV / 5 kA (8/20μs)
Impulse current (10/350)	I_{imp}	1 kA
Protection level wire-earth		<450 V
Protection level wire-wire		<65 V
Frequency range		0-100 MHz
Video		
Maximum continuous voltage AC	U_C	5,65 V
Maximum continuous voltage DC	U_C	8 V
SPD to IEC 61643-21		Class I+II / D1+C2
Category		Type 1+2 / D1+C2
Impulse durability wire-earth		C2: 10 kV / 5 kA (8/20μs)
Impulse durability wire-wire		C2: 10 kV / 5 kA (8/20μs)
Impulse current (10/350)	I_{imp}	1 kA
Protection level wire-wire		<90 V
Protection level wire-earth		<150 V
Frequency range		0-100 MHz
Screen connection		Yes
Screening		Direct
Temperature range	ϑ	-20 - +80 °C

Connection options



Surge protection for high-speed networks up to 1 GBit (Class ND-CAT6/E-F)



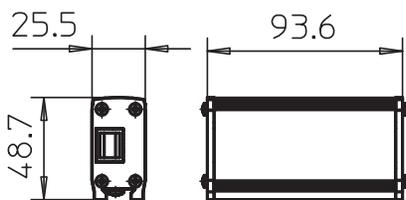
Type	Version	Connection system	Pack Piece	Weight kg/100 pc.	Item no.
ND-CAT6/E-F	Fine protection, 8 wires + shield	RJ45 8(8)	1	16.380	5081802

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Data cable protection device for high-speed networks

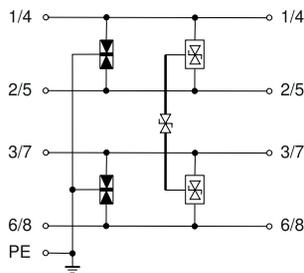
- Protection class: Fine protection
- High-quality RJ45 sockets
- Low protection level at high current load
- Earthing via DIN rail or connection cable
- Support of Power over Ethernet ++ (PoE++/4PPoE) to 1 A in accordance with IEEE 802.3
- Tested transmission quality in networks up to 1 GBit/s (Class E) or CAT6
- Rapid installation through plug-in version
- Incl. DIN rail fastening set and earthing cable

Dimensions



Application example: 1 GBit Ethernet, 10/100 MBit Ethernet, PoE applications, IP camera systems, ISDN S0 interfaces

Connection options



ND-CAT6/E-F

Maximum continuous voltage AC U_c	41 V
Maximum continuous voltage DC U_c	58 V
Category	Type 2+3 / C2+C1
Lightning protection zone LPZ	1→3
Channel performance ISO/IEC	Class E
Channel performance Ansi/EA	CAT 6
Number of poles	8
Rated current I_n	1 A
Impulse durability wire-wire	C1: 0,3 kV / 0,15 kA (8/20 μ s)
Impulse durability wire-earth	C2: 3 kV / 1,5 kA (8/20 μ s)
Total discharge current (8/20)	5 kA
Protection level wire-wire	<40 V
Protection level wire-earth	<900 V
Frequency range	>250 MHz
Temperature range θ	-40 - +80 °C
Installation type	Connector/cable adapter
Connection system	RJ45 8(8)
Protection rating	IP10
Shielding connection available	Yes
Shield connection	Direct
Earthing via:	Connection cable/DIN rail
Testing standard	IEC 61643-21

Surge protection for high-speed networks up to 1 GBit (Class ND-CAT6/E-B)



Type	Version	Connection system	Pack Piece	Weight kg/100 pc.	Item no.
ND-CAT6/E-B	Basic protection, 8 wires + shield	RJ45 8(8)	1	16.220	5081804

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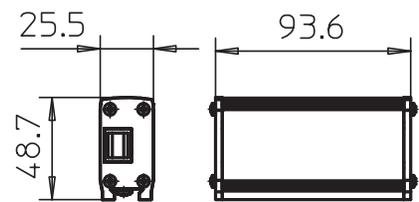
Data cable protection device for high-speed networks

- Protection class: Basic protection
- High-quality RJ45 sockets
- Low protection level at high current load
- Earthing via DIN rail or connection cable
- Support of Power over Ethernet ++ (PoE++/4PPoE) to 1 A in accordance with IEEE 802.3
- Tested transmission quality in networks up to 1 GBit/s (Class E) or CAT6
- Rapid installation through plug-in version
- Incl. DIN rail fastening set and earthing cable

Application example: 1 GBit Ethernet, 10/100 MBit Ethernet, PoE applications, IP camera systems, ISDN S0 interfaces



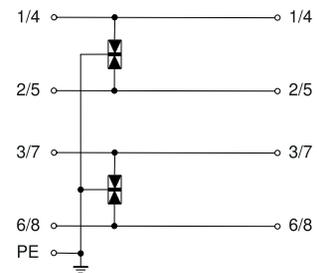
Dimensions



ND-CAT6/E-B

Maximum continuous voltage AC U_c	46 V
Maximum continuous voltage DC U_c	65 V
Category	Type 1 / D1
Lightning protection zone LPZ	0→1
Channel performance ISO/IEC	Class E
Channel performance Ansi/EA	CAT 6
Number of poles	8
Rated current I_L	1 A
Impulse durability wire-wire	C2: 3 kV / 1,5 kA (8/20 μ s)
Impulse durability wire-earth	C2: 3 kV / 1,5 kA (8/20 μ s)
Total discharge current (8/20)	10 kA
Protection level wire-wire	<1100 V
Protection level wire-earth	<900 V
Frequency range	>250 MHz
Temperature range ϑ	-40 - +80 °C
Installation type	Connector/cable adapter
Connection system	RJ45 8(8)
Protection rating	IP10
Shielding connection available	Yes
Shield connection	Direct
Earthing via:	Connection cable/DIN rail
Testing standard	IEC 61643-21

Connection options



Surge protection for high-speed networks up to 10 GBit (Class EA/CAT6A)

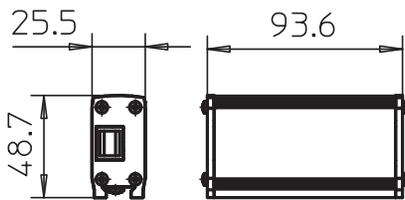


Type	Version	Connection system	Pack Piece	Weight kg/100 pc.	Item no.
ND-CAT6A/EA	Fine protection, 8 wires + shield	RJ45 8(8)	1	16.600	5081800

Data cable protection device for high-speed networks

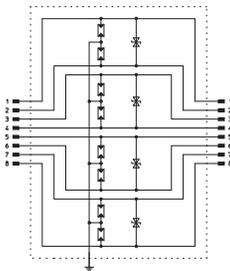
- Protection class: Fine protection
- High-quality RJ45 sockets
- Low protection level at high current load
- Earthing via DIN rail or connection cable
- Support of Power over Ethernet ++ (PoE++/4PPoE) to 1 A in accordance with IEEE 802.3
- Tested transmission quality in networks up to 10 GBit/s (Class EA) or CAT6
- Rapid installation through plug-in version
- Incl. DIN rail fastening set and earthing cable

Dimensions



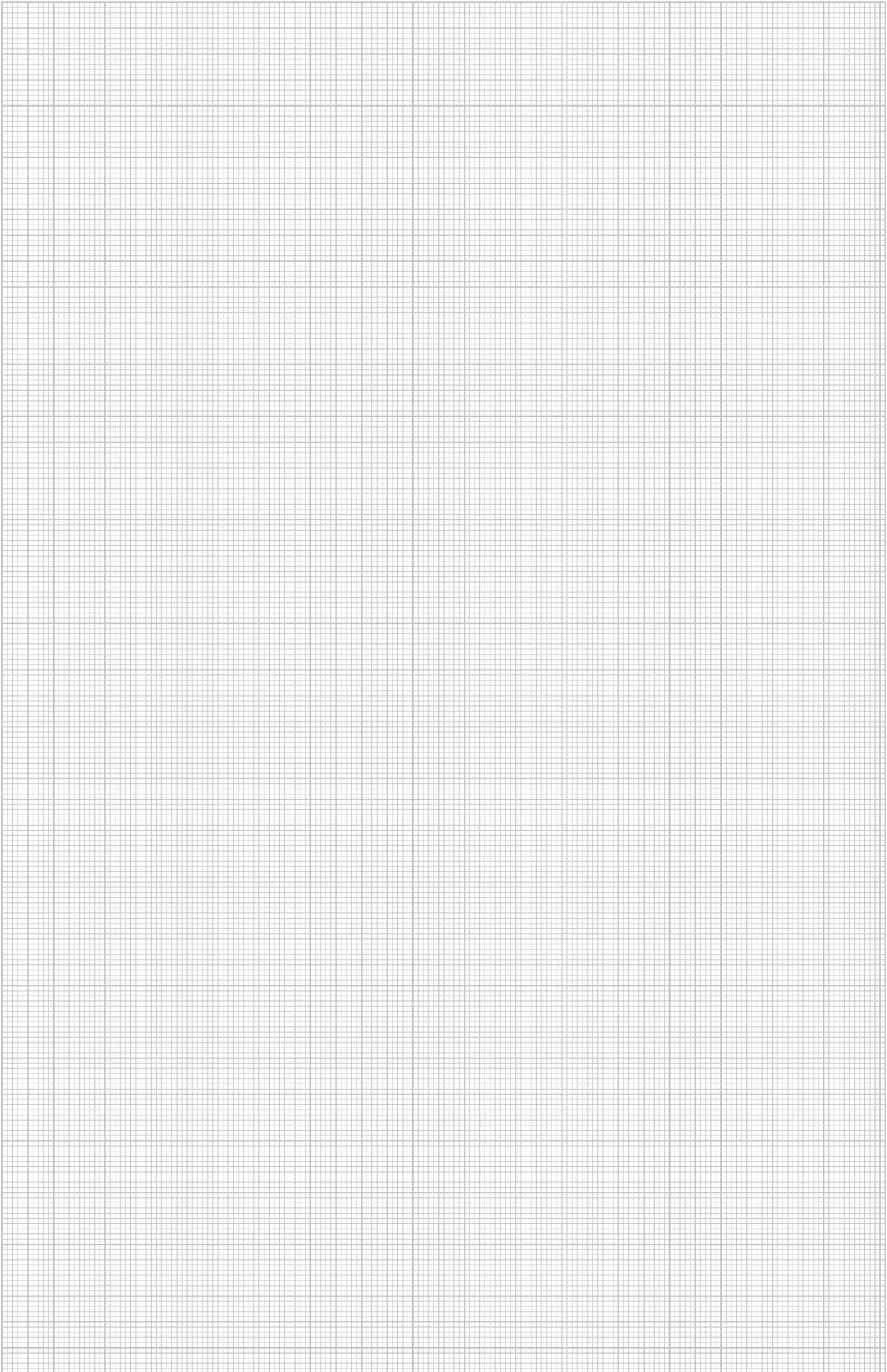
Application example: 10 GBit Ethernet, 10/100 MBit Ethernet, PoE applications, IP camera systems, ISDN S0 interfaces

Connection options



ND-CAT6A/EA

Maximum continuous voltage AC	U_c	41 V
Maximum continuous voltage DC	U_c	58 V
Category		Type 2+3 / C2+C1
Lightning protection zone LPZ		1→3
Channel performance ISO/IEC		Class EA
Channel performance Ansi/EA		CAT 6A
Number of poles		8
Rated current	I_L	1 A
Impulse durability wire-wire		C1: 0,3 kV / 0,15 kA (8/20 μ s)
Impulse durability wire-earth		C2: 2 kV / 1 kA (8/20 μ s)
Total discharge current (8/20)		7 kA
Protection level wire-wire		<120 V
Protection level wire-earth		<700 V
Frequency range		>500 MHz
Temperature range	θ	-40 - +80 °C
Installation type		Connector/cable adapter
Connection system		RJ45 8(8)
Protection rating		IP10
Shielding connection available		Yes
Shield connection		Direct
Earthing via:		Connection cable/DIN rail
Testing standard		IEC 61643-21



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