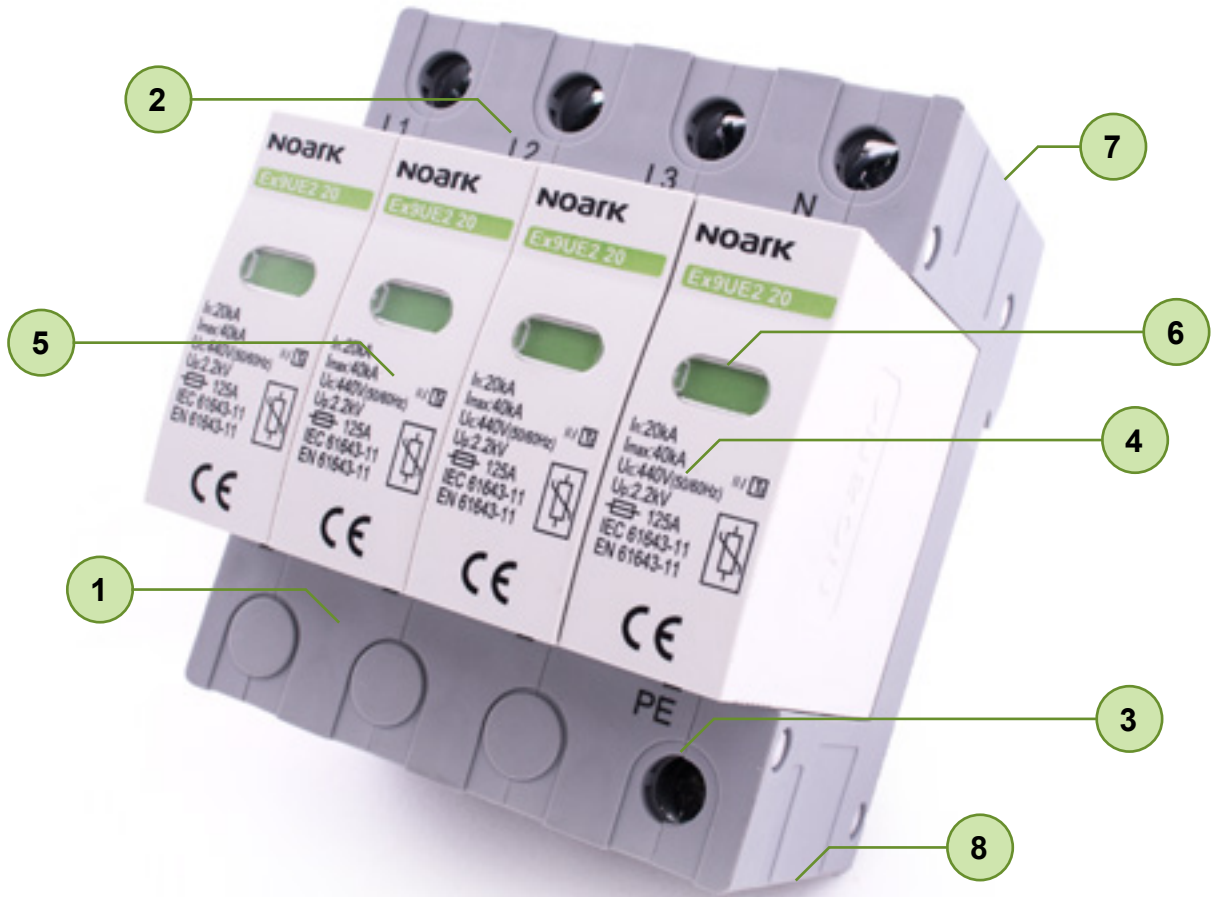


Surge Protection Devices



Surge Protection Devices

Professional Tips



- | | |
|---|---|
| 1 5 year warranty | 5 Plug-in module design |
| 2 Complete range of SPDs 1+2, 2, 3 | 6 Device status indicator on front side |
| 3 Connection modes X+0 and X+1 | 7 Variants with alarm contact available |
| 4 Max. continuous voltage 275 to 440 V AC | 8 Easy mounting on DIN rail |

Surge Protection Devices Ex9UE1+2, 25 kA



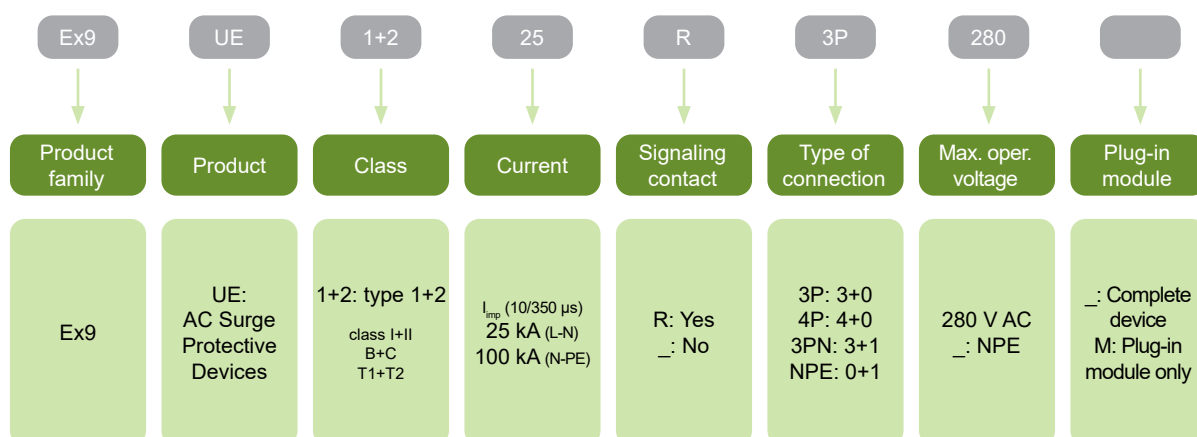
- Surge Protection Devices
- Type 1+2 (Class I+II, T1+T2, B+C)
- Tested according to EN 61643-11
- Max. impulse current I_{imp} 25 kA (10/350 μ s) per module and 100 kA for NPE module
- Maximum continuous operational voltage U_c 280 V AC
- Versions with 3+0, 3+1 and 4+0 connection
- Plug-in module design
- With and without remote indication contact
- Device status indicator

The Ex9UE1+2 25 line is a group of Class I+II Surge Protective Devices. They are intended as a protection against direct hit of lightning strokes of medium intensities. In standard three phase TN-C grid, they provides protection up to LPL I, II requirements given in EN 62305 with total lightning current introduced into electrical installation of 75 kA and total lightning stroke current 150 or 200 kA based on physical configuration and mutual position of grounding point of lightning rod, grounding point of the electrical installation and place of SPD installation.

The design of Ex9UE1+2 25 is hybrid based on combination of high energy Metal Oxide Varistors and isolation Spark Gap. This combination brings lower response time thanks to fast MOV and low voltage SG in comparison to a pure SG solution. The serial connection of MOV provides limitation of follow current characteristics for SG, but also full isolation due to serial connection of SG to MOV.

The main characteristics are defined by MOV part dominantly. Resulting protection level and response characteristics not only fulfill requirements of class I SPDs but also for class II ones. Ex9UE1+2 25 provides protection for both classes I and II. The modular design with plug in inserts allows simple and quick replacement of function modules in case of MOV is beyond if its lifespan due to high intensity or often occurrence of overvoltage peaks.

Type Key



Certification marks



Surge Protection Devices Ex9UE1+2

Type 1+2 SPDs (Class I+II, T1+T2, B+C) complete devices, $I_{imp} = 25 \text{ kA (10/350 } \mu\text{s)}$

- Maximum impulse current I_{imp} 25 kA (10/350 μs) per module and 100 kA (10/350 μs) for NPE (+1) module
- Nominal discharge current I_n 25 kA (8/20 μs) per module and 100 kA (8/20 μs) for NPE (+1) module
- Maximum discharge current I_{max} 60 kA (8/20 μs) per module and 100 kA (8/20 μs) for NPE (+1) module
- Maximum continuous operational voltage U_c 280 V AC per module and 255 V AC for NPE (+1) module
- Due to I_{imp} 25 kA per module suitable for LPL I - IV according to EN 62305 in standard 3-phase TN-C and TN-S installations



Operating voltage	Connection	Signaling contact	Article No.	Type	Packing
280 V AC	3+0	no	105503	Ex9UE1+2 25 3P 280	1/27
280 V AC	3+0	yes	105504	Ex9UE1+2 25R 3P 280	1/27
280 V AC	3+1	no	105505	Ex9UE1+2 25 3PN 280	1/18
280 V AC	3+1	yes	105506	Ex9UE1+2 25R 3PN 280	1/18
280 V AC	4+0	no	105507	Ex9UE1+2 25 4P 280	1/18
280 V AC	4+0	yes	105508	Ex9UE1+2 25R 4P 280	1/18

Type 1+2 spare modules, $I_{imp} = 25 \text{ kA (10/350 } \mu\text{s)}$



Max. oper. voltage U_c	Max. imp. current I_{imp}	Article No.	Type	
280 V AC	25 kA	105495	Ex9UE1+2 25 1P 280 M	1/81
255 V AC	100 kA	105496	Ex9UE1+2 100 NPE M	1/81

Surge Protection Devices Ex9UE1+2, 12.5 kA

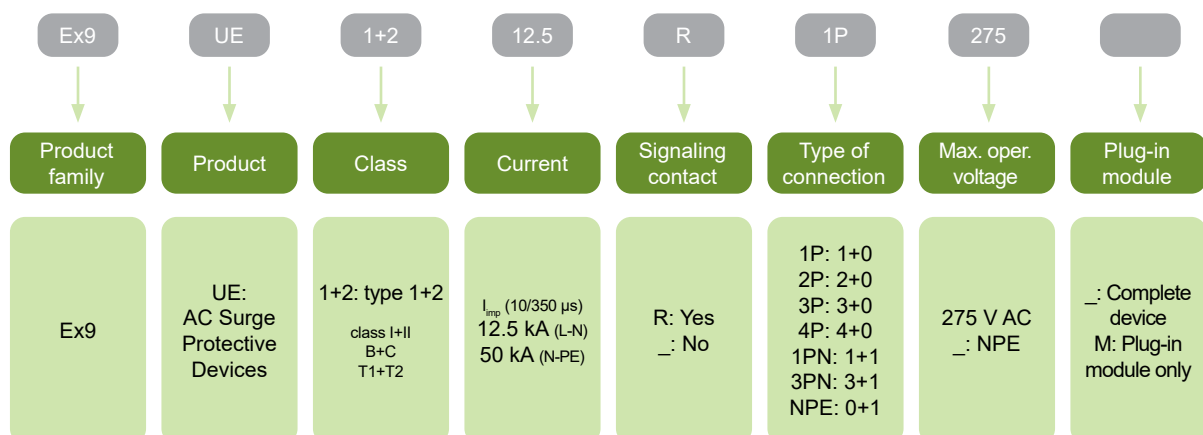


- Surge Protection Devices
- Type 1+2 (Class I+II, T1+T2, B+C)
- Tested according to EN 61643-11
- Max. impulse current I_{imp} 12.5 kA (10/350 μ s) per module and 50 kA for NPE module
- Maximum continuous operational voltage U_c from 275 V up to 440 V AC
- Versions with 1+0, 1+1, 2+0, 3+0, 3+1 and 4+0 connection
- Plug-in module design
- With and without remote indication contact
- Device status indicator

The Ex9UE1+2 12.5 line is a group of Class I+II Surge Protective Devices. They are intended as a protection against indirect and low intensity direct hits of lightning strokes. In standard three phase TN-C grid, they provide protection to LPL III, IV requirements given in EN 62305 with total lightning current introduced into electrical installation of 37.5 kA and total lightning stroke current 75 or 100 kA based on physical configuration and mutual position of grounding point of lightning rod, grounding point of the electrical installation and place of SPD installation.

The design of Ex9UE1+2 12.5 is based on high energy Metal Oxide Varistors. Such design provides low response time and ensures characteristics for both classes I and II. The modular design with plug in inserts allows simple and quick replacement of function modules in case of MOV is beyond if its lifespan due to high intensity or often occurrence of overvoltage peaks.

Type Key



Certification marks



Surge Protection Devices Ex9UE1+2, 12.5 kA

Type 1+2 SPDs (Class I+II, T1+T2, B+C) complete devices, $I_{imp} = 12.5 \text{ kA (10/350 } \mu\text{s)}$

- Maximum impulse current I_{imp} 12.5 kA (10/350 μs) per module and 50 kA (10/350 μs) for NPE (+1) module
- Nominal discharge current I_n 25 kA (8/20 μs) per module and 50 kA (8/20 μs) for NPE (+1) module
- Maximum discharge current I_{max} 50 kA (8/20 μs)
- Maximum continuous operational voltage U_c 275 V AC per module and 255 V AC for NPE (+1) module
- Due to I_{imp} 12.5 kA per module suitable for LPL III and LPL IV according to EN 62305 in standard 3-phase TN-C and TN-S installations



Operating voltage	Connection	Signaling contact	Article No.	Type	Packing
275 V AC	1+0	no	103332	Ex9UE1+2 12.5 1P 275	1/96
275 V AC	1+0	yes	103333	Ex9UE1+2 12.5R 1P 275	1/96
275 V AC	1+1	no	103334	Ex9UE1+2 12.5 1PN 275	1/60
275 V AC	1+1	yes	103335	Ex9UE1+2 12.5R 1PN 275	1/60
275 V AC	2+0	no	103336	Ex9UE1+2 12.5 2P 275	1/60
275 V AC	2+0	yes	103337	Ex9UE1+2 12.5R 2P 275	1/60
275 V AC	3+0	no	103338	Ex9UE1+2 12.5 3P 275	1/54
275 V AC	3+0	yes	103339	Ex9UE1+2 12.5R 3P 275	1/54
275 V AC	3+1	no	103340	Ex9UE1+2 12.5 3PN 275	1/45
275 V AC	3+1	yes	103341	Ex9UE1+2 12.5R 3PN 275	1/45
275 V AC	4+0	no	103342	Ex9UE1+2 12.5 4P 275	1/45
275 V AC	4+0	yes	103343	Ex9UE1+2 12.5R 4P 275	1/45

Type 1+2 spare modules, $I_{imp} = 12.5 \text{ kA (10/350 } \mu\text{s)}$



Max. oper. voltage U_c	Max. imp. current I_{imp}	Article No.	Type
275 V AC	12.5 kA	103330	Ex9UE1+2 12.5 1P 275 M
N-PE	50 kA	103331	Ex9UE1+2 NPE M

Surge Protection Devices Ex9UE2



- Surge Protection Devices
- Type 2 (Class II, T2, C)
- Tested according to EN 61643-11
- Nominal discharge current I_n 20 kA (8/20 μ s) per module and 40 kA for NPE module
- Maximum continuous operational voltage U_c from 275 V up to 440 V AC
- Versions with 1+0, 1+1, 2+0, 3+0, 3+1 and 4+0 connection
- Plug-in module design
- With and without remote indication contact
- Device status indicator

The Ex9UE2 line is a group of Class II Surge Protective Devices. They are intended as a protection against transient overvoltage caused by fast switching operations or indirect hits of lightning strokes (residuum effects).

It is recommended to install Class II SPDs every 10 – 20 meters of cable length repetitively, typically to main and sub distribution boards. The Ex9UE2 20 440 are designed for direct coordination with Class I SPDs of line Ex9UE1 35. In case of Ex9UE2 20 275, the coordination with the line Ex9UE1 35 is done by means of 10 m cable length.

The design of Ex9UE2 is based on Metal Oxide Varistors. Such design provides very low response time. The modular design with plug in inserts allows simple and quick replacement of function modules in case of MOV is beyond if its lifespan due to often occurrence of overvoltage peaks.

Type Key

Ex9	UE	1+2	12.5	R	1P	275	
Product family	Product	Class	Current	Signaling contact	Type of connection	Max. oper. voltage	Plug-in module
Ex9	UE: AC Surge Protective Devices	2: type 2 class II C T2	I_n (8/20 μ s) 20 kA (L-N) 40 kA (N-PE)	R: Yes _: No	1P: 1+0 2P: 2+0 3P: 3+0 4P: 4+0 1PN: 1+1 3PN: 3+1 NPE: 0+1	275 V AC 320 V AC 385 V AC 440 V AC _: NPE	_: Complete device M: Plug-in module only

Certification marks



Surge Protection Devices Ex9UE2

Type 2 SPD (Class II, T2, C) complete devices, $I_n = 20 \text{ kA}$ (8/20 μs)

- Nominal discharge current I_n 20 kA (8/20 μs) per module and 40 kA (8/20 μs) for NPE (+1) module
- Maximum discharge current I_{max} 40 kA (8/20 μs)



Max. oper. voltage U_c	Connection	Signaling contact	Article No.	Type	Packing
275 V AC	1+0	no	103347	Ex9UE2 20 1P 275	1/96
275 V AC	1+0	yes	103348	Ex9UE2 20R 1P 275	1/96
275 V AC	1+1	no	103349	Ex9UE2 20 1PN 275	1/60
275 V AC	1+1	yes	103350	Ex9UE2 20R 1PN 275	1/60
275 V AC	2+0	no	103351	Ex9UE2 20 2P 275	1/60
275 V AC	2+0	yes	103352	Ex9UE2 20R 2P 275	1/60
275 V AC	3+0	no	103353	Ex9UE2 20 3P 275	1/54
275 V AC	3+0	yes	103354	Ex9UE2 20R 3P 275	1/54
275 V AC	3+1	no	103355	Ex9UE2 20 3PN 275	1/45
275 V AC	3+1	yes	103356	Ex9UE2 20R 3PN 275	1/45
275 V AC	4+0	no	103357	Ex9UE2 20 4P 275	1/45
275 V AC	4+0	yes	103358	Ex9UE2 20R 4P 275	1/45
320 V AC	1+0	no	103754	Ex9UE2 20 1P 320	1/96
320 V AC	1+0	yes	103755	Ex9UE2 20R 1P 320	1/96
320 V AC	1+1	no	103756	Ex9UE2 20 1PN 320	1/60
320 V AC	1+1	yes	103757	Ex9UE2 20R 1PN 320	1/60
320 V AC	2+0	no	103758	Ex9UE2 20 2P 320	1/60
320 V AC	2+0	yes	103759	Ex9UE2 20R 2P 320	1/60
320 V AC	3+0	no	103760	Ex9UE2 20 3P 320	1/54
320 V AC	3+0	yes	103761	Ex9UE2 20R 3P 320	1/54
320 V AC	3+1	no	103762	Ex9UE2 20 3PN 320	1/45
320 V AC	3+1	yes	103763	Ex9UE2 20R 3PN 320	1/45
320 V AC	4+0	no	103764	Ex9UE2 20 4P 320	1/45
320 V AC	4+0	yes	103765	Ex9UE2 20R 4P 320	1/45
385 V AC	1+0	no	103766	Ex9UE2 20 1P 385	1/96
385 V AC	1+0	yes	103767	Ex9UE2 20R 1P 385	1/96
385 V AC	1+1	no	103768	Ex9UE2 20 1PN 385	1/60
385 V AC	1+1	yes	103769	Ex9UE2 20R 1PN 385	1/60
385 V AC	2+0	no	103770	Ex9UE2 20 2P 385	1/60
385 V AC	2+0	yes	103771	Ex9UE2 20R 2P 385	1/60
385 V AC	3+0	no	103772	Ex9UE2 20 3P 385	1/54
385 V AC	3+0	yes	103773	Ex9UE2 20R 3P 385	1/54
385 V AC	3+1	no	103774	Ex9UE2 20 3PN 385	1/45
385 V AC	3+1	yes	103775	Ex9UE2 20R 3PN 385	1/45
385 V AC	4+0	no	103776	Ex9UE2 20 4P 385	1/45
385 V AC	4+0	yes	103777	Ex9UE2 20R 4P 385	1/45
440 V AC	1+0	no	103359	Ex9UE2 20 1P 440	1/96
440 V AC	1+0	yes	103360	Ex9UE2 20R 1P 440	1/96
440 V AC	1+1	no	103361	Ex9UE2 20 1PN 440	1/60
440 V AC	1+1	yes	103362	Ex9UE2 20R 1PN 440	1/60
440 V AC	2+0	no	103363	Ex9UE2 20 2P 440	1/60
440 V AC	2+0	yes	103364	Ex9UE2 20R 2P 440	1/60
440 V AC	3+0	no	103365	Ex9UE2 20 3P 440	1/54
440 V AC	3+0	yes	103366	Ex9UE2 20R 3P 440	1/54
440 V AC	3+1	no	103367	Ex9UE2 20 3PN 440	1/45
440 V AC	3+1	yes	103368	Ex9UE2 20R 3PN 440	1/45
440 V AC	4+0	no	103369	Ex9UE2 20 4P 440	1/45
440 V AC	4+0	yes	103370	Ex9UE2 20R 4P 440	1/45

Type 2 SPD spare modules, $I_n = 20 \text{ kA}$ (8/20 μs)



Max. oper. voltage U_c	Nominal current I_n	Article No.	Type
275 V AC	20 kA	103344	Ex9UE2 20 1P 275 M
320 V AC	20 kA	103752	Ex9UE2 20 1P 320 M
385 V AC	20 kA	103753	Ex9UE2 20 1P 385 M
440 V AC	20 kA	103345	Ex9UE2 20 1P 440 M
N-PE	40 kA	103346	Ex9UE2 40 NPE M

Surge Protection Devices Ex9UE3



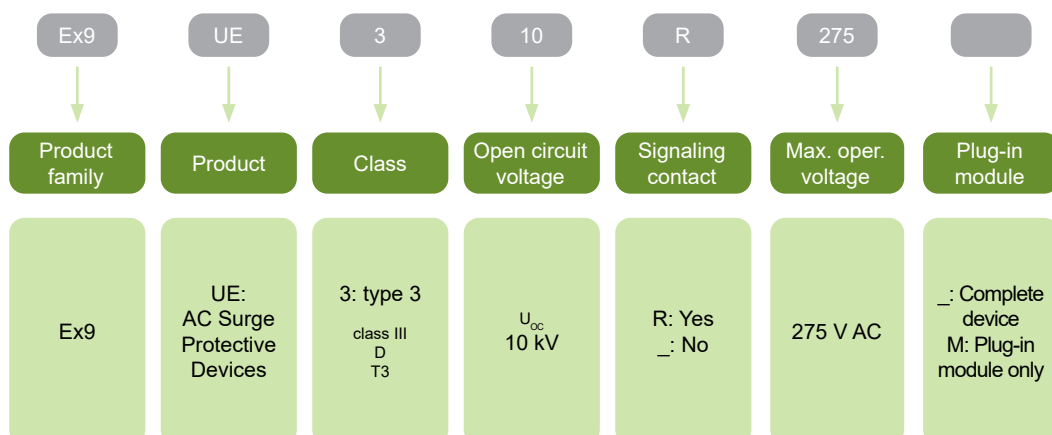
- Surge Protection Devices
- Type 3 (Class III, T3, D)
- Tested according to EN 61643-11
- Maximum continuous operational voltage U_c 275 V AC
- Design based on Y connection of functional elements
- Plug-in module design
- With and without remote indication contact
- Device status indicator on the front side

The Ex9UE3 line is a group of Class III Surge Protective Devices. They are intended as a fine protection against transient overvoltage, installed downstream to Class II SPDs. The application field of Ex9UE3 is protection of sensitive electronics used in or close to distribution board, typically home automation, IT systems etc. The Y connection of functional elements provides balanced protection of L and N conductor towards PE thanks to identical MOVs for both working conductors and full isolation due to connection to PE via Spark Gap.

Class III SPDs should be installed maximum 5 meters from the protected device. Coordination with Class II SPDs Ex9UE2 20 is defined also for near installation. To reach best parameters, it is recommended to install both classes with mutual distance of 5 meters of connecting cables.

The design of Ex9UE3 is based on Metal Oxide Varistors. Such design provides very low response time. The modular design with plug in inserts allows simple and quick replacement of function modules in case of MOV is beyond if its lifespan due to often occurrence of overvoltage peaks.

Type Key



Certification marks



Surge Protection Devices Ex9UE3

Type 3 SPDs (Class III, T3, D) - complete devices, $I_{\max} = 10 \text{ kA (8/20 } \mu\text{s)}$

- Maximum discharge current $I_{\max} 10 \text{ kA (8/20 } \mu\text{s)}$
- Nominal discharge current $I_n 5 \text{ kA (8/20 } \mu\text{s)}$
- Maximum continuous operational voltage $U_c 275 \text{ V AC}$
- Open circuit voltage $U_{oc} 10 \text{ kV}$



Max. oper. voltage U_c	Connection	Signaling contact	Article No.	Type	Packing
275 V AC	1+1	no	106858	Ex9UE3 10 275	1/60
275 V AC	1+1	yes	106857	Ex9UE3 10R 275	1/60

Type 3 SPDs (Class III, T3, D) - spare modules



Max. oper. voltage U_c	Max. discharge current $I_{\max}$	Article No.	Type	
275 V AC	10 kA	106859	Ex9UE3 10 275 M	1

Technical Data Ex9UE1+2

Surge Protection Devices Type 1+2, $I_{imp} = 25 \text{ kA}$ (10/350 μs)

General parameters

Suitable for protection of electrical installations against transient overvoltage caused by direct and indirect lightning strokes or switching processes

Plug-in module design

Indication window and optional remote-signaling contact help users to know the status of device

Due to I_{imp} 25 kA per module suitable for LPL I - IV according to EN 62305 in standard 3-phase TN-C and TN-S installations

Electrical parameters

	3+0, 4+0, 3+1 (L-N/PE/PEN connection)	3+1 (+1 N-PE connection)
Tested according to	EN 61643-11	
Classified type (test class)	Type 1+2 (Class I+II, B+C, T1+T2)	
Technology	MOV+GTD (Varistor+Spark-gap)	GDT (Spark-gap)
Rated operational voltage U_n	230 / 400 V AC	
Reference test voltage U_{REF}	255 V AC	
Rated load current I_L	125 A	
Max. continuous operational voltage U_c	280 V AC	255 V AC
Nominal frequency f	50/60 Hz	
Nominal discharge current I_n (8/20 μs)	25 kA per pole	100 kA per pole
Max. impulse current I_{imp} (10/350 μs)	25 kA per pole	100 kA per pole
Impulse current specific energy W/R	156 kJ/ Ω	2500 kJ/ Ω
Max discharge current I_{max} (8/20 μs)	60 kA per pole	60 kA per pole, 100 kA NPE
Protection voltage U_p at I_n	1.5 kV	1.5 kV
Protection voltage U_p at I_{max}	2.0 kV	-
Protection voltage U_p at 5 kA (8/20 μs)	< 1.3 kV	-
Follow current interrupting rating I_{fi}	-	100 A
Temporary overvoltage U_T (withstand)		
5 s	335 V	1200 V
200 ms	335 V	-
Residual current I_{PE} at U_{REF}	$\leq 1 \text{ mA}$	-
Response time	$\leq 100 \text{ ns}$	$\leq 100 \text{ ns}$
Max. back-up fuse	315 A gG	-
Short-circuit current rating I_{SCCR}	10 kA	-
Short-circuit withstand capability	25 kA	-
Current factor k	1.6	-
Number of ports	1	
Type of LV system	TN-C, TN-S, TN-C-S, TT (3+1)	
Remote contact (optional)	1 changeover (CO)	
Remote contact op. voltage / current		
AC U_{max} / I_{max}	250 V AC / 1 A	
DC U_{max} / I_{max}	30 V DC / 1 A	

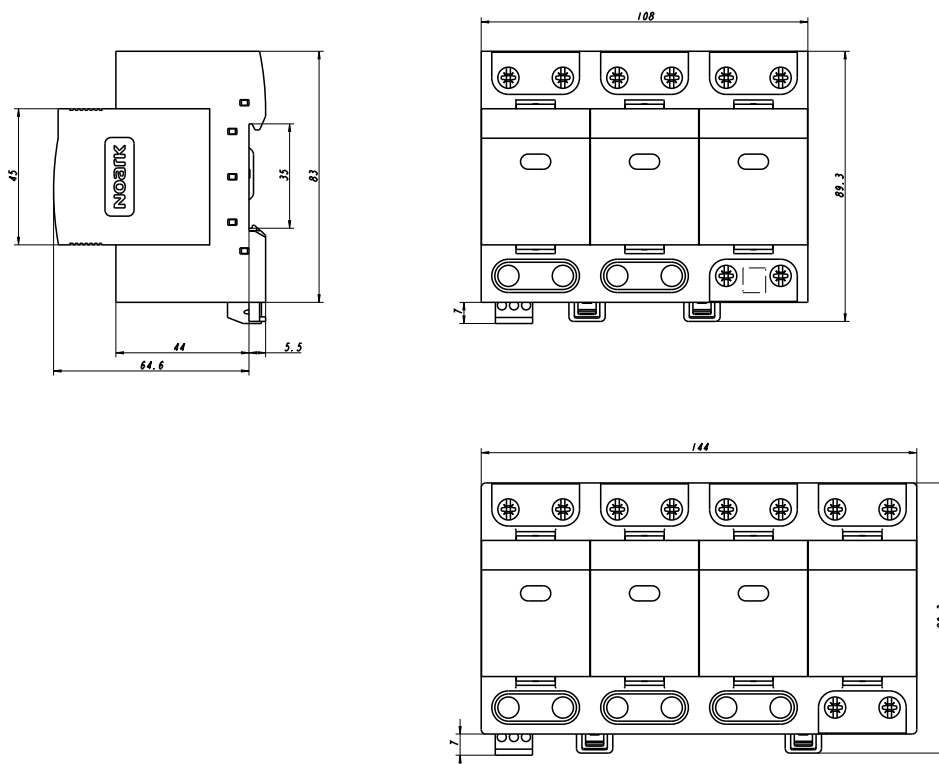
Technical Data Ex9UE1+2

Surge Protection Devices Type 1+2, $I_{imp} = 25 \text{ kA}$ (10/350 μs)

Mechanical parameters

Device width	36 mm (per pole/module)
Device height	83 mm (89 mm including rail clip)
Frame size	45 mm
Method of mounting	fixed
Mounting	easy fastening onto 35 mm device rail (DIN)
Mounting position	arbitrary
Degree of protection	IP40, terminals IP20
Terminals	lift, M5 screws
Terminal capacity	10 — 50 mm ²
Fastening torque of terminals	2.5 — 3.5 Nm
Remote contact terminal capacity	0.14 — 1.5 mm ²
Location	indoor
Ambient temperature	-40 — +80 °C
Altitude	≤ 2000 m
Relative humidity	30 — 90 %
Weight (3P / 3P+N / 4P)	0.78 / 1.00 / 1.08 kg

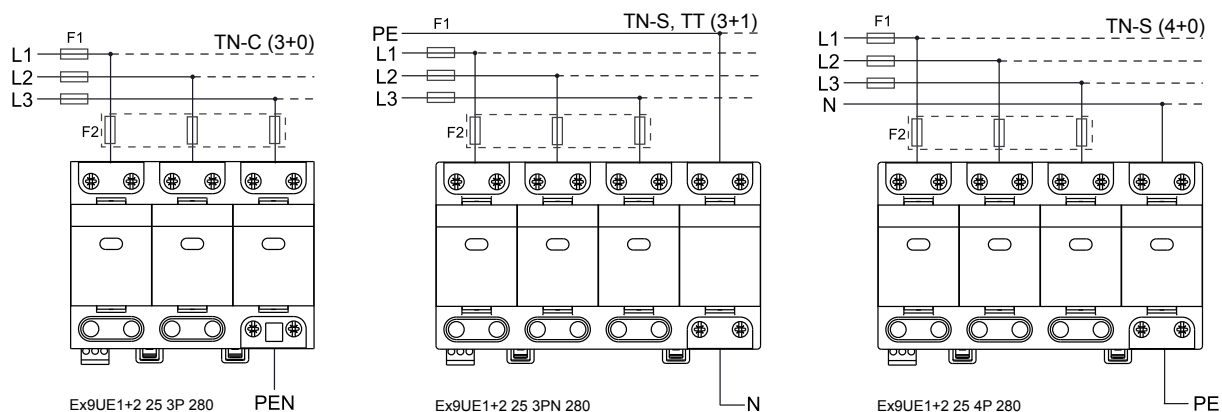
Dimensions



Technical Data Ex9UE1+2

Surge Protection Devices Type 1+2, $I_{imp} = 25 \text{ kA}$ (10/350 μs)

Connection diagrams, protection mode



Technical Data Ex9UE1+2

Surge Protection Devices Type 1+2, $I_{imp} = 12.5 \text{ kA}$ (10/350 μs)

General parameters

Suitable for protection of electrical installations against transient overvoltage and indirect lightning strikes
Plug-in module design
Indication window and optional remote-signaling contact helps users to know the status of device
Due to I_{imp} 12.5 kA per module suitable for LPL III and LPL IV according to EN 62305 in standard 3-phase TN-C and TN-S installations

Electrical parameters

	1+0, 2+0, 3+0, 4+0, 1+1, 3+1 (L-N/PE/PEN connection)	1+1, 3+1 (x+1 N-PE connection)
Tested according to	EN 61643-11	
Classified type (test class)	Type 1+2 (Class I+II, B+C, T1+T2)	
Technology	MOV (Varistor)	GDT (Spark-gap)
Rated operational voltage U_n	230 / 400 V AC	
Reference test voltage U_{REF}	255 V AC	
Max. continuous operational voltage U_c	275 V AC	255 V AC
Nominal frequency f	50/60 Hz	
Nominal discharge current I_n (8/20 μs)	25 kA per pole	50 kA per pole
Impulse current specific energy W/R	156.25 kJ/ Ω	
Max. impulse current I_{imp} (10/350 μs)	12.5 kA per pole	50 kA per pole
Max. discharge current I_{max} (8/20 μs)	50 kA per module	
Protection voltage U_p at I_n	1.5 kV	1.5 kV
Protection voltage U_p at I_{max}	1.8 kV	1.5 kV
Protection voltage U_p at 5 kA (8/20 μs)	1 kV	-
N-PE follow current interrupting rating I_n	-	100 A
Temporary overvoltage U_T (withstand)		
5 s	335 V	335 V
200 ms	335 V	1200 V
Residual current I_{PE} at U_{REF}	$\leq 1 \text{ mA}$	-
MOV voltage of 1mA point	387 - 473 V	
Response time	$\leq 25 \text{ ns}$	$\leq 100 \text{ ns}$
Max. back-up fuse	max. 160 A gG	-
Short-circuit withstand capability	50 kA	-
Short-circuit current rating I_{SCCR}	10 kA	-
Current factor k	1.6	-
Number of ports	1	
Type of LV system	TN-C, TN-S, TN-C-S, TT (1+1, 3+1), IT (1+1, 3+1)	
Remote contact (optional)	1 changeover (CO)	
Remote contact op. voltage / current		
AC U_{max} / I_{max}	250 V AC / 1 A	
DC U_{max} / I_{max}	30 V DC / 1 A	

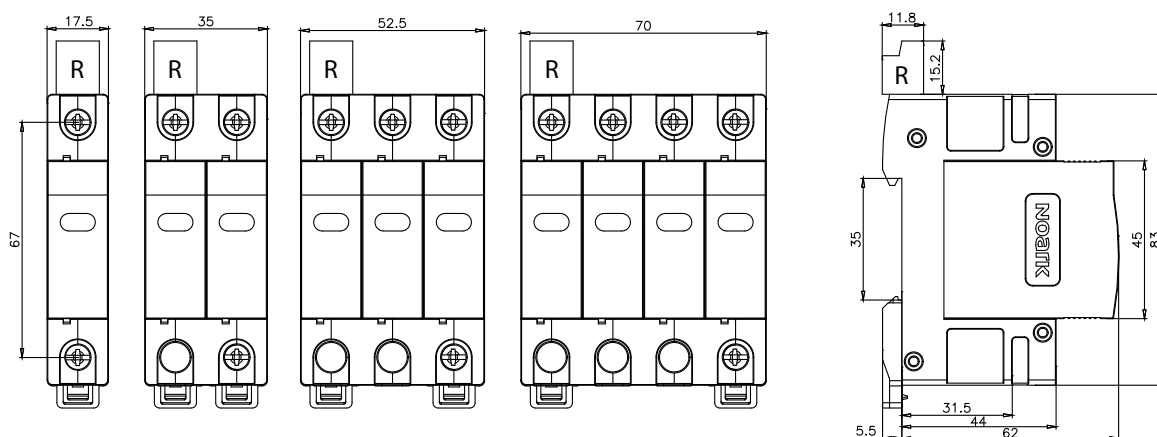
Technical Data Ex9UE1+2

Surge Protection Devices Type 1+2, $I_{imp} = 12.5 \text{ kA (10/350 } \mu\text{s)}$

Mechanical parameters

Device width	17.5 mm (per pole/module)
Device height	83 mm (89 mm including rail clip)
Frame size	45 mm
Method of mounting	fixed
Mounting	easy fastening onto 35 mm device rail (DIN)
Mounting position	arbitrary
Degree of protection	IP40, terminals IP20
Terminals	combined lift + open mouthed, M5 screws
Terminal capacity	2.5 — 35 mm ²
Fastening torque of terminals	2 — 3.5 Nm
Remote contact terminal capacity	0.14 — 1.5 mm ²
Location	indoor
Ambient temperature	-40 — +80 °C
Altitude	≤ 2000 m
Relative humidity	30 — 90 %
Weight (per pole)	0.15 kg

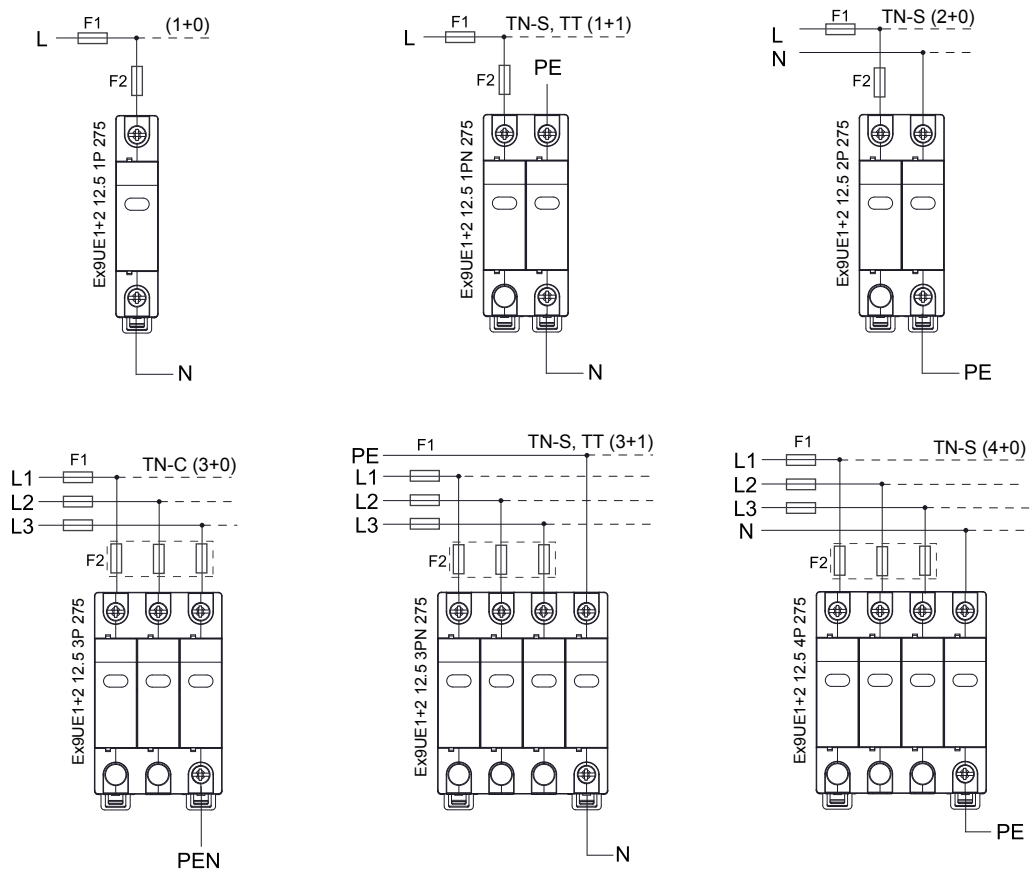
Dimensions



Technical Data Ex9UE1+2

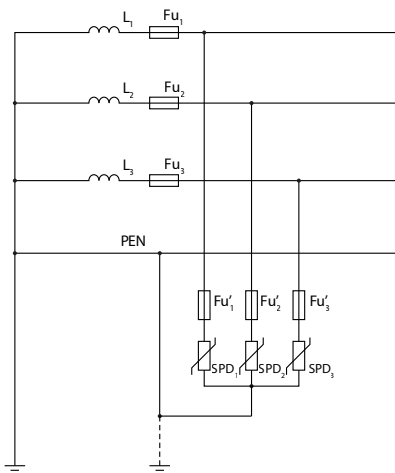
Surge Protection Devices Type 1+2, $I_{imp} = 12.5 \text{ kA (10/350 } \mu\text{s)}$

Connection diagrams, protection mode



Surge Protection Devices Type 1+2 and Type 2

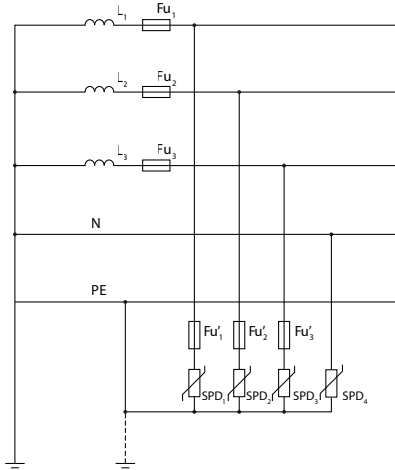
Wiring diagrams



3+0 TN-C

Connection type 3+0 in TN-C system consists of three identical SPDs.

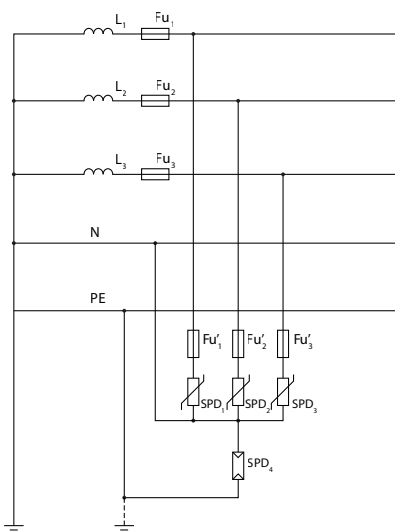
Fu_1 - Fu_3 represent main protection (fuses, circuit breaker) in the installation. In case when $Fu_1, Fu_2, Fu_3 > \text{Max. back-up fuse for given SPDs}$, Fu'_1, Fu'_2, Fu'_3 have to be used. $Fu'_1, Fu'_2, Fu'_3 \leq \text{Max. back-up fuse of the SPDs}$.



4+0 TN-S

Connection type 4+0 in TN-S system consists of four identical SPDs. This type of connection is suitable mainly to suppress longitudinal type of transient overvoltage, typically caused by atmospheric stroke. The advantages lay in uniform conducting of lightning current from phase and N-conductors. It also effectively protects insulation of conductors suffered with consecutive effects of a lightning stroke. This connection does not provide optimum protection in case transversal overvoltage (typically caused by wanted and unwanted fast switching processes) and thus it is not the best solution for protection of equipment and end consumers. It follows from the fact that residual transversal overvoltage between L and N conductors is given by protection level of two SPDs connected in a series. (e.g. Up of $SPD_1 + SPD_4$ for L_1 -N

Fu_1 - Fu_3 represent main protection (fuses, circuit breaker) in the installation. In case when $Fu_1, Fu_2, Fu_3 > \text{Max. back-up fuse for given SPDs}$, Fu'_1, Fu'_2, Fu'_3 have to be used. $Fu'_1, Fu'_2, Fu'_3 \leq \text{Max. back-up fuse of the SPDs}$.



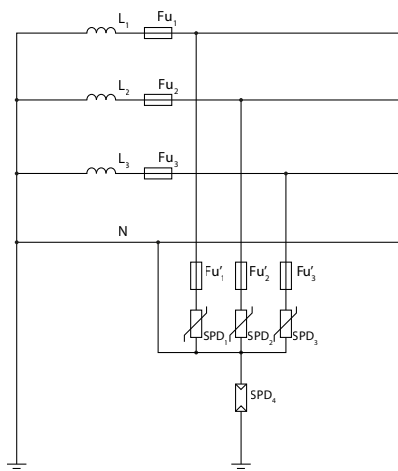
3+1 TN-S

Connection type 3+1 in TN-S system consists of three identical SPDs and one sum spark gap. It is suitable mainly to suppress transversal type of transient overvoltage, typically caused by wanted and unwanted fast switching processes. Main advantage is minimization of residual transversal overvoltage between L and N, which is defined dominantly by protection level of a single SPD. This diagram is recommended for protection of end consumers in TN-S system. A disadvantage for suppression of atmospheric longitudinal overvoltage follows from non-uniform protection of L and N conductors. When used for protection against longitudinal effects, usually as a protection against lightning stroke current (SPD class I), I_{imp} of sum spark gap SPD_4 must be min. $4 \times I_{imp}$ of SPD_1, SPD_2, SPD_3 .

Fu_1 - Fu_3 represent main protection (fuses, circuit breaker) in the installation. In case when $Fu_1, Fu_2, Fu_3 > \text{Max. back-up fuse for given SPDs}$, Fu'_1, Fu'_2, Fu'_3 have to be used. $Fu'_1, Fu'_2, Fu'_3 \leq \text{Max. back-up fuse of the SPDs}$.

Surge Protection Devices Type 1+2 and Type 2

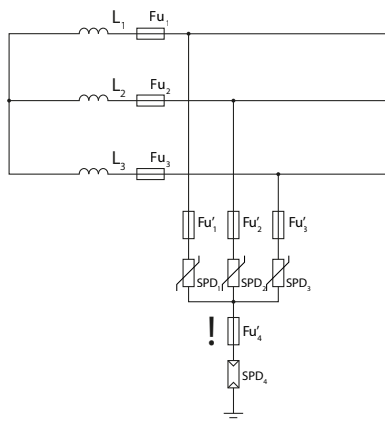
Wiring diagrams



3+1 TT

In order to keep insulation status between N conductor and ground potential, connection 3+1 is recommended for TT systems. It provides maximum protection against transversal transient overvoltage and significantly limits longitudinal one.

Fu₁-Fu₃ represent main protection (fuses, circuit breaker) in the installation. In case when Fu₁, Fu₂, Fu₃ > Max. back-up fuse for given SPDs, Fu'₁, Fu'₂, Fu'₃ have to be used. Fu'₁, Fu'₂, Fu'₃ ≤ Max. back-up fuse of the SPDs.

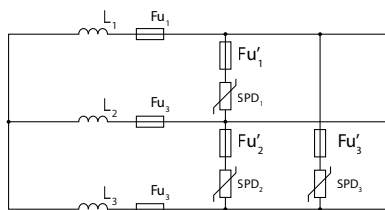


3+1 IT

3+1 connection in IT system is suitable for protection against both transversal as well as longitudinal overvoltage. Due to grounded sum spark gap allows effective reduction of effects caused by lightning currents. Particular SPDs are dimensioned to "phase" voltage of the system (i.e. to 230 V in 230/400V grid). An important difference to 3+1 connection in TN-S system is back up fuse for sum spark gap. This protection has to be used in IT systems. It ensures insulation status in case of spark gap malfunction like uninterrupted follow currents.

Fu₁-Fu₃ represent main protection (fuses, circuit breaker) in the installation. In case when Fu₁, Fu₂, Fu₃ > Max. back-up fuse for given SPDs, Fu'₁, Fu'₂, Fu'₃ have to be used. Fu'₁, Fu'₂, Fu'₃ ≤ Max. back-up fuse of the SPDs. Fu'₄ ≤ Max. back up fuse of the sum spark gap SPD₄.

Note: Connection diagram is indicative only. There have to be observed and fulfill potential other requirements, e.g. insulation tests of sum spark gap etc., in actual IT system.



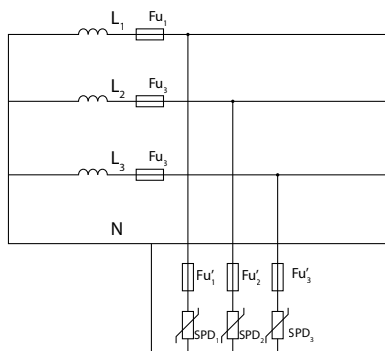
3+0 IT

This type of connection is suitable for protection against transversal overvoltage caused by switching processes. Particular SPDs must be dimensioned for phase-phase voltage.

Fu₁-Fu₃ represent main protection (fuses, circuit breaker) in the installation. In case when Fu₁, Fu₂, Fu₃ > Max. back-up fuse for given SPDs (transformed to single phase voltage), Fu'₁, Fu'₂, Fu'₃ have to be used. Fu'₁, Fu'₂, Fu'₃ ≤ Max. back-up fuse of the SPDs.

Surge Protection Devices Type 1+2 and Type 2

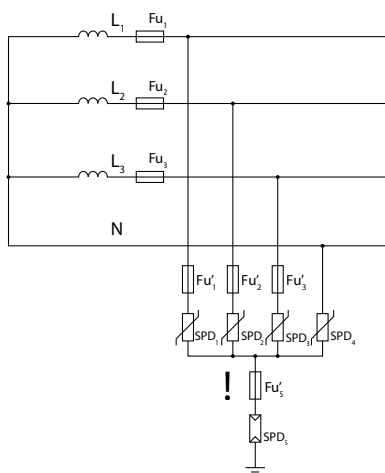
Wiring diagrams



3+0 local isolated system with N conductor (hospitals, chemical industry, etc.)

This type of connection is suitable for protection against transversal overvoltage caused by switching processes. Because such system is designed in order to maximize availability of main voltage, there must be assumed first fault in the system as a standard operational regime. Due to this reason, particular SPDs must be dimensioned for phase-phase voltage (i.e. to 400 V in 230/400 V system).

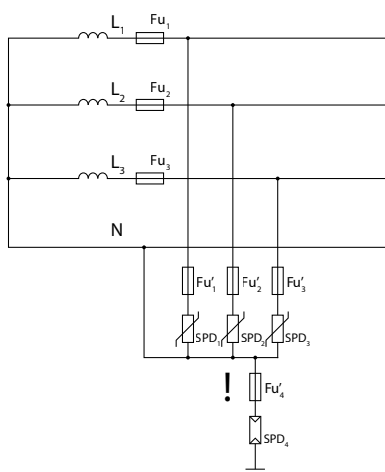
Fu_1 - Fu_3 represent main protection (fuses, circuit breaker) in the installation. In case when $Fu_1, Fu_2, Fu_3 > \text{Max. back-up fuse for given SPDs}$, Fu'_1, Fu'_2, Fu'_3 have to be used. $Fu'_1, Fu'_2, Fu'_3 \leq \text{Max. back-up fuse of the SPDs}$.



4+1 local isolated with N conductor (hospitals, chemical industry, etc.)

This connection is suitable for limitation of both transversal as well as longitudinal surges. Thanks to SPD_4 , it provides much fine and balanced protection of all phase conductors in comparison to connection 3+1. It also more effectively limits phase – phase transversal overvoltage. Particular devices SPD_1 - SPD_4 are dimensioned for phase voltage (i.e. to 230 V in 230/400 V system). As in standards IT system, sum spark gap SPD_5 has to be protected with back up fuse to ensure insulation of the system. **Local requirements on the sum spark gap have to be followed in particular applications.**

Fu_1 - Fu_3 represent main protection (fuses, circuit breaker) in the installation. In case when $Fu_1, Fu_2, Fu_3 > \text{Max. back-up fuse for given SPDs}$, Fu'_1, Fu'_2, Fu'_3 have to be used. $Fu'_1, Fu'_2, Fu'_3 \leq \text{Max. back-up fuse of the SPDs}$. $Fu_5 \leq \text{Max. back up fuse of the sum spark gap } SPD_5$.



3+1 local isolated with N conductor (hospitals, chemical industry, etc.)

Situation is similar to 4+1 connection. Particular devices SPD_1 - SPD_3 are dimensioned for phase - phase voltage (i.e. to 400 V in 230/400 V system) not to be overloaded in case of the first, generally non-tripped, fault. This connection is suitable for consumers for which transient overvoltage between phase and N conductors matters most. Sum spark gap SPD_4 has to be protected with back up fuse. **Local requirements on the sum spark gap have to be followed in particular applications.**

Fu_1 - Fu_3 represent main protection (fuses, circuit breaker) in the installation. In case when $Fu_1, Fu_2, Fu_3 > \text{Max. back-up fuse for given SPDs}$, Fu'_1, Fu'_2, Fu'_3 have to be used. $Fu'_1, Fu'_2, Fu'_3 \leq \text{Max. back-up fuse of the SPDs}$. $Fu_4 \leq \text{Max. back up fuse of the sum spark gap } SPD_4$.

Technical Data Ex9UE2

Surge Protection Devices Type 2, $I_n = 20 \text{ kA}$ (8/20 μs)

General parameters

Suitable for protection of electrical installations against transient overvoltage
Plug-in module design
Indication window helps users to know the status of device
Optional remote-signaling contact

Electrical parameters

	1+0, 2+0, 3+0, 4+0, 1+1, 3+1 (L-N/PE/PEN connection)				1+1, 3+1 (x+1 N-PE connection)
Tested according to	EN 61643-11				
Classified type (test class)	Type 2 (Class II, C, T2)				
Technology	MOV (Varistor)				GDT (Spark-gap)
Rated operational voltage U_n	230 / 400 V AC				
Reference test voltage U_{REF}	255 V AC				
Max. continuous operational voltage U_c	275 V AC	320 V AC	385 V AC	440 V AC	255 V AC
Nominal frequency f	50/60 Hz				
Nominal discharge current I_n (8/20 μs)	20 kA per pole				40 kA per pole
Max. impulse current I_{imp} (10/350 μs)	-				12 kA per pole
Max. discharge current I_{max} (8/20 μs)	40 kA per pole				
Protection voltage U_p at I_n	1.4 kV	1.6 kV	1.9 kV	2.2 kV	1.5 kV
Protection voltage U_p at I_{max}	2 kV	2.3 kV	2.5 kV	2.8 kV	1.5 kV
Protection voltage U_p at 5 kA (8/20 μs)	1 kV	1.15 kV	1.3 kV	1.5 kV	-
N-PE follow current interrupting rating I_{fi}	-				100 A
Temporary overvoltage U_t (withstand)	335 V	405 V	490 V	580 V	1200 V
Residual current I_{PE} at U_{REF}	$\leq 1 \text{ mA}$				-
MOV voltage of 1mA point	387-473 V	460-561 V	554-677 V	639-781 V	-
Response time	$\leq 25 \text{ ns}$				$\leq 100 \text{ ns}$
Max. back-up fuse	max. 125 A gG				-
Short-circuit withstand capability	50 kA				-
Short-circuit current rating I_{SCCR}	10 kA				-
Current factor k	1.6				-
Number of ports	1				
Type of LV system	TN-C, TN-S, TN-C-S, TT (1+1, 3+1), IT (1+1, 3+1)				
Remote contact (optional)	1 changeover (CO)				
Remote contact op. voltage / current	250 V AC / 1 A 30 V DC / 1 A				
AC U_{max} / I_{max} DC U_{max} / I_{max}					

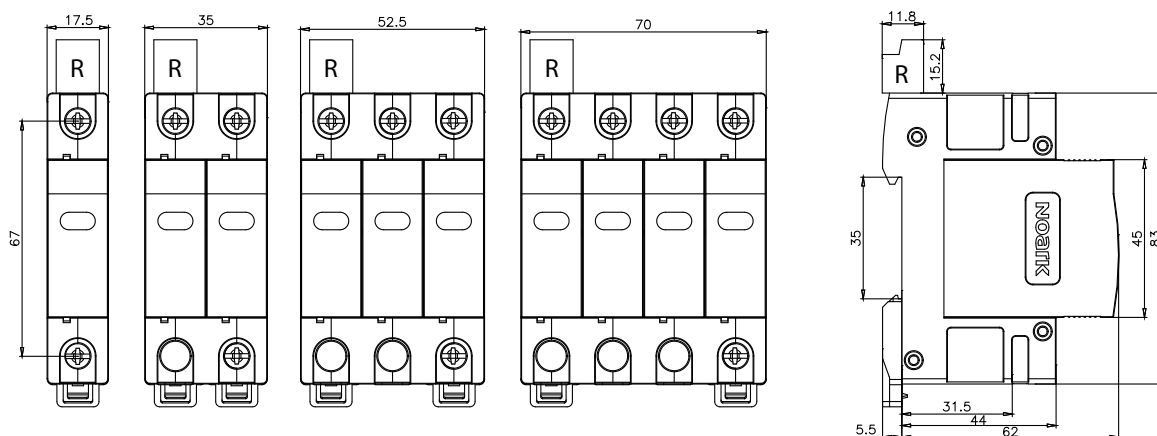
Technical Data Ex9UE2

Surge Protection Devices Type 2, $I_n = 20 \text{ kA}$ (8/20 μs)

Mechanical parameters

Device width	17.5 mm (per pole/module)
Device height	83 mm (89 mm including rail clip)
Frame size	45 mm
Method of mounting	fixed
Mounting	easy fastening onto 35 mm device rail (DIN)
Mounting position	arbitrary
Degree of protection	IP40, terminals IP20
Terminals	combined lift + open mouthed, M5 screws
Terminal capacity	2.5 — 35 mm ²
Fastening torque of terminals	2 — 3.5 Nm
Remote contact terminal capacity	0.14 — 1.5 mm ²
Location	indoor
Ambient temperature	-40 — +80 °C
Altitude	≤ 2000 m
Relative humidity	30 — 90 %
Weight (per pole)	0.11 kg

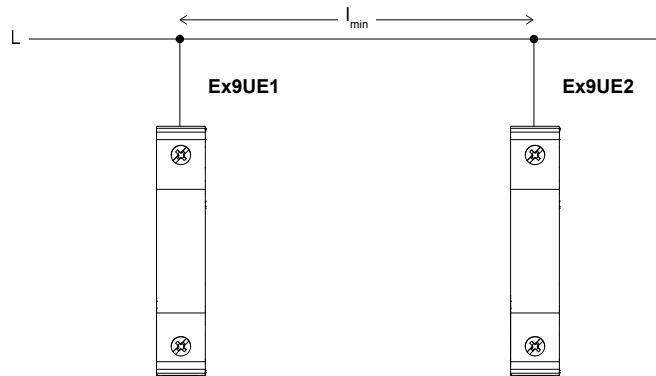
Dimensions



Technical Data Ex9UE2

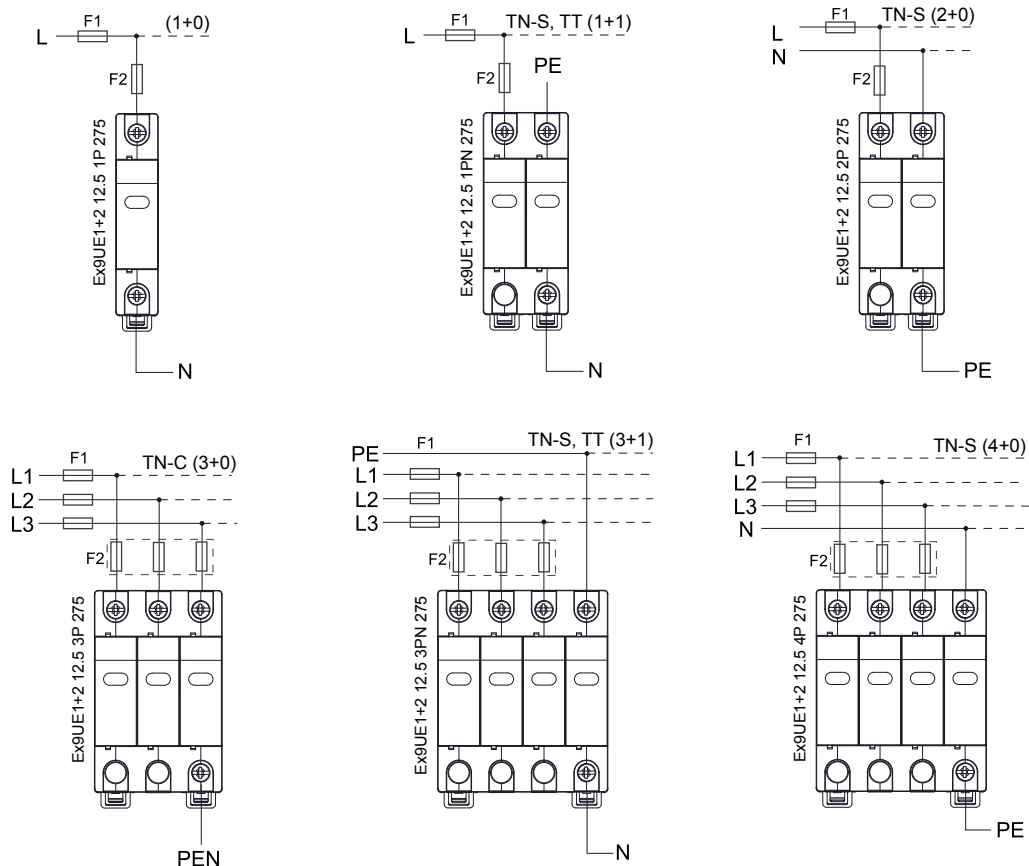
Surge Protection Devices Type 2, $I_n = 20 \text{ kA}$ (8/20 μs)

SPD coordination



Class I	Class II	Min. cable length $I_{\min}$
Ex9UE1 35	Ex9UE2 x x 440	0
Ex9UE1 35	Ex9UE2 x x 275	$\geq 10 \text{ m}$

Connection diagrams, protection mode



Technical Data Ex9UE3

Surge Protection Devices Type 3, $U_{oc} = 10 \text{ kV}$

General parameters

Suitable for protection of electrical installation and devices against transient overvoltage
Plug-in module design
Indication window helps users to know the status of device
Optional remote-signaling contact

Electrical parameters

Tested according to	EN 61643-11
Classified type (test class)	Type 3 (Class III, D, T3)
Technology	MOV (Varistor) + Spark gap
Protection function	overcurrent
Protection mode	L → N L → PE N → PE
Connection configuration	Y
Nominal voltage U_n	230 / 400 V AC
Max. continuous oper. voltage U_c	275 V AC
Nominal frequency f	50 / 60 Hz
Nominal discharge current I_n (8/20 μs)	5 kA per pole
Max. discharge current I_{max} (8/20 μs)	10 kA per pole
Nominal load current I_L	25 A
Open circuit voltage U_{oc}	10 kV
Protection voltage U_p at U_{oc}	
L-N	1.25 kV
N-PE	1.5 kV
N-PE follow current I_{fi}	-
Residual current I_{PE}	< 1 mA
Temporary overvoltage U_t (withstand)	
L-N, 5 s	335 V
N-PE, 200 ms	440 V
MOV voltage of 1mA point	387 - 473 V
Max. back-up fuse	10 A MCB with C characteristic
Type of LV system	TN or TT
SPD overload behaviour mode	OCM
Remote contact (optional)	1 changeover (CO)
Number of ports	1
Remote contact op. voltage / current	
AC U_{max} / I_{max}	250 V AC / 1 A
DC U_{max} / I_{max}	30 V DC / 1 A

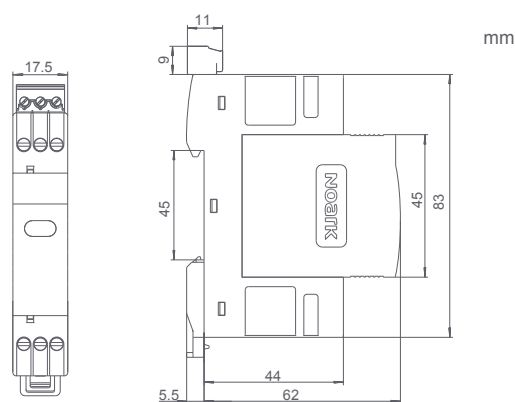
Technical Data Ex9UE3

Surge Protection Devices Type 3, $U_{oc} = 10 \text{ kV}$

Mechanical parameters

Device width	17.5 mm
Device height	83 mm (89 including rail clip)
Frame size	45 mm
Mounting method	fixed
Mounting	easy fastening onto 35 mm device rail (DIN)
Mounting position	arbitrary
Degree of protection	IP40, terminals IP20
Terminals	lift
Terminal capacity	1 — 4 mm ²
Fastening torque of terminals	0.3 — 0.5 Nm
Remote contact terminal capacity	0.14 — 1.5 mm ²
Location	indoor
Installation class	III
Pollution degree	2
Accessibility	inaccessible
Ambient temperature	-5 — +40 °C
Altitude	≤ 2000 m
Relative humidity	30 — 90 %
Weight	0.08 kg

Dimensions



Connection diagrams, protection mode

