Medium Voltage Surge Arresters

Iskra®
Iskra MIS

GENERALLY - STANDARDS

Type 2SS15N and 2SS15N-N

Metal oxide medium voltage surge arresters are purposed for fitting in MV power network up to 35 kV as protection against direct lighting strikes. The top quality is ensured with:

- Top quality varistor block
- Rigid construction of housing
- Isolation from silicone rubber
- Varistors filled up with silicone
- 100% final control

General data:

- Temperature range T = -40°C up to +85°C
- Flame classification V-0 (UL-94)
- IEC test class I
- Made according to standards: SIST EN 60099-4:2005 (IEC 60099-4:2004), SIST EN 60099-5:1998 (IEC 60099-5:1996), SIST EN 60099-5:1998/A1:2002 (IEC 60099-5:1996/A:1999)

Description of activity

Varistors from zinc oxide are non-linear resistors at which is current depended from tension. Surge arresters with built-in ZnO varistors have large resistance. By occur of over voltage resistance decreases in time of 25 ns. Because of this surge arrester have ability of discharging enormous pulse currents in short time. When over voltage stops resistance increase back to primary condition. Surge arresters type **2SS15N** and **2SS15N-N** resists at least 20 strokes of atmospheric discharging.

Calculation and choice

It is necessary to grant special attention for selection of suitable type of ZnO surge arrester.

1. Data of electric network

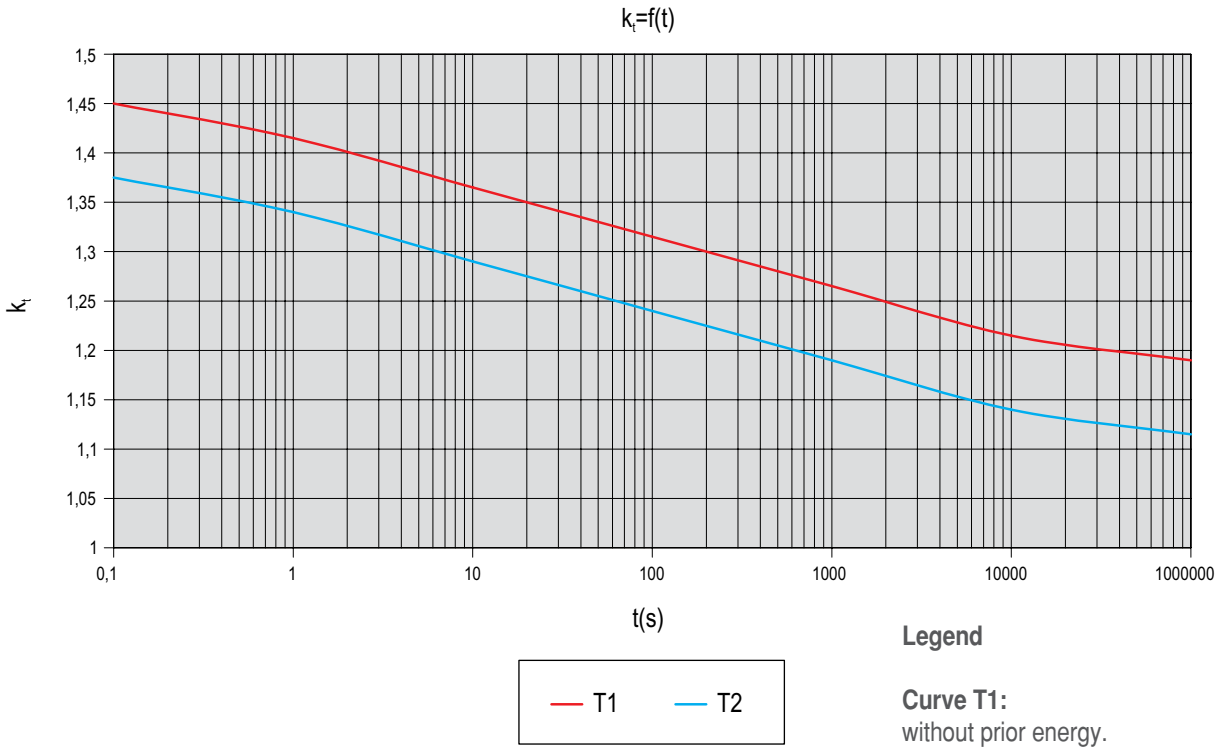
- U_m - maximum tension
- t - duration time of short circuit
- k_z - factor of grounding
  k_z = 1,40 - directly grounded
  k_z = 1,40 - 1,7 with little resistance
  k_z = 1,73 - 1,8 with neutral insulating spot

2. Data for surge arresters type 2SS15N and 2SS15N-N

- k_0 = 0,8
- k_t = factor of permanent operating voltage for over voltage duration time (Diagram 1).

GENERALLY - STANDARDS

Power frequency voltage versus time characteristics



Legend

Curve T1:
without prior energy.

Curve T2:
100 kA, 4/10 µs prior energy.

Diagram 1 / Diagram 1

3. Calculation and choice

- Permanent operating voltage of system:

$$U_{CS} = \frac{U_m}{\sqrt{3}} \quad [kV]$$

- Preliminary operating voltage of surge arrester:

$$U_{C1} = \frac{U_{CS}}{k_0} \quad [kV]$$

- Highest expected transient over voltage of surge arrester:

$$U_{time} = k_z \frac{U_m}{\sqrt{3}} \quad [kV]$$

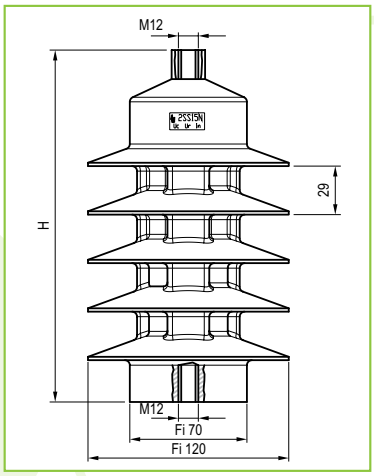
- Permanent operating voltage of surge arrester:

$$U_{C2} = \frac{U_{time}}{k_t} \quad [kV]$$

We choose suitable surge arrester from table “Commercial data” on page 16 based on higher calculated value between U_{C1} and U_{C2} so, that we choose first higher value of permanent operating voltage U_C

OUTDOOR FITTING

Outdoor fitting - tip 2SS15N



Electrical data

Rated voltage U_R	3,7 - 45 kV
Continuous operating voltage U_C	3 Ð 36 kV
Nominal discharge current (8/20) I_n	10 kA
High impulse current (4/10)	100 kA
Long-duration current	320 A
Short-circuit current	20 kA
Energy absorption capability (long duration)	2,8 kJ/kVU_c
Energy absorption capability (high current)	4,8 kJ/kVU_c
Bending moment	250 Nm
Torsion moment	80 Nm

Technical data

Code	Creeping distance (mm)	Arcing distance (mm)	Minimum distances (mm)		H (mm)
			to wall	between phases	
21 48 01 21 48 02 21 48 03	265	139	60 80 100	90 100 120	147
21 48 04 21 48 05 21 48 06	425	185	120 140 160	140 160 180	193
21 48 07 21 48 08 21 48 09	505	235	180 200 220	200 220 240	243
21 48 10 21 48 11 21 48 12	585	262	240 260 270	260 280 300	270
21 48 13 21 48 14 21 48 15	665	309	320 340 360	320 340 360	317
21 48 16 21 48 17	905	362	295 380	380 400	370
21 48 18 21 48 19	985	369	400 420	420 440	404

OUTDOOR FITTING

Commercial data

Code	Cont. operating voltage Uc (kV)	Rated voltage Ur (kV)	Residual voltage Ures (kV)	
			5 kA (8/20)	10 kA (8/20)
21 48 01	3	3,75	7,6	9,0
21 48 02	4	5,00	11,1	13,1
21 48 03	6	7,50	18,7	22,1
21 48 04	8	10,00	26,3	31,2
21 48 05	10	12,50	29,8	35,2
21 48 06	12	15,00	33,2	39,2
21 48 07	14	17,50	40,8	47,4
21 48 08	16	20,00	44,3	51,3
21 48 09	18	22,50	51,9	60,2
21 48 10	20	25,00	55,4	64,1
21 48 11	21	26,25	59,6	68,4
21 48 12	22	27,50	63,1	72,4
21 48 13	24	30,00	66,5	76,3
21 48 14	26	32,50	74,1	85,0
21 48 15	28	35,00	77,4	88,9
21 48 16	30	37,50	85,2	97,7
21 48 17	32	40,00	88,6	101,6
21 48 18	34	42,50	96,3	110,4
21 48 19	36	45,00	99,7	114,3

Calculation of shielding distance

2. Data of electric network

Level of protection for devices on power lines is dependent from distance between protected device and surge arrester. Surge arrester protect in certain distance from spot where is mounted. For calculation are necessary at least next data:

- l_z - shielding distance of surge arrester
- U_z - allowed trigger voltage of insulating equipment
- U_{res} - maximum value of remained voltage for chosen type of surge arrester

- v - speed of spreading of shock wave through electric wires
  v = 300 m/μs - overhead wire
  v = 150 m/μs - cable

- S - anticipated steepness of over voltage stroke of lightning
  S = 1550 kV/μs - wooden poles
  S = 800 kV/μs - grounding brackets

OUTDOOR FITTING

2. Calculation
Simplified formula for calculation of shielding distance:

$$I_z = \frac{U_z - U_{res}}{2 * S} v$$

In general for shielding distance is valid that surge arrester should be mounted as near as possible to device that protects.

Ordering example:
On order we wrote code of surge arrester type **2SS15N**, which we have chosen on base of calculation for permanent operating voltage U_C from table "Commercial data" on page 16.

MV surge arrester type 2SS15N
code: 21 48 13

Chosen medium voltage surge arrester type **2SS15N** have permanent operating voltage **U_c = 24 kV** and rated voltage **U_r = 30 kV**.

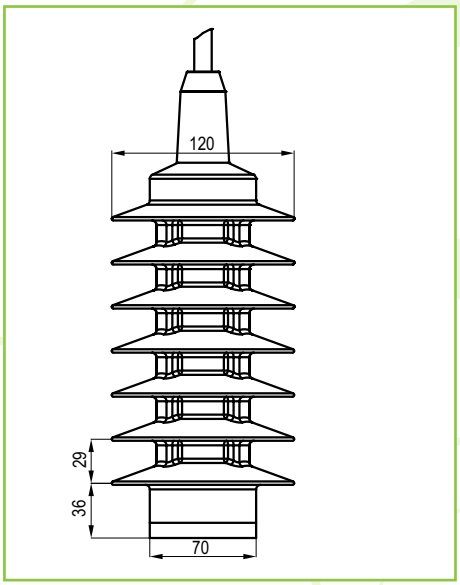
Varistor control

Measurement of leakage current

Measurement of reference current

INDOOR FITTING

Indoor fitting - type 2SS15N-N



Indoor fitting - type 2SS15N-N

Commercial data

Code	Cont. operating voltage Uc (kV)	Rated voltage Ur (kV)	Residual voltage Ures (kV)	
			5 kA (8/20)	10 kA (8/20)
21 49 01	3	3,75	7,6	9,0
21 49 02	4	5,00	11,1	13,1
21 49 03	6	7,50	18,7	22,1
21 49 04	8	10,00	26,3	31,2
21 49 05	10	12,50	29,8	35,2
21 49 06	12	15,00	33,2	39,2
21 49 07	14	17,50	40,8	47,4
21 49 08	16	20,00	44,3	51,3
21 49 09	18	22,50	51,9	60,2
21 49 10	20	25,00	55,4	64,1
21 49 11	21	26,25	59,6	68,4
21 49 12	22	27,50	63,1	72,4
21 49 13	24	30,00	66,5	76,3
21 49 14	26	32,50	74,1	85,0
21 49 15	28	35,00	77,4	88,9
21 49 16	30	37,50	85,2	97,7
21 49 17	32	40,00	88,6	101,6
21 49 18	34	42,50	96,3	110,4
21 49 19	36	45,00	99,7	114,3
Isolated connection conductor 35 mm^2			L=700 mm ±5%	

FITTINGS ACCESSORIES

Basic accessories

Code (complete)		**21 48 98**
Material		Stainless steel
Set	**Screw M12x25 DIN 933**	2 pcs
	Plain washer M12 DIN 125	2 kos / pcs
	Single spring washer M12 DIN 127	2 pcs
Tightening torque		36 Nm
Weight		0,2 kg
Packing		20 sets

Suspension clamp - bare conductor

Code	**21 48 95**
Material	Stainless steel
Tightening torque	36 Nm
Section of conductors	AlFe 25/4 up to 120 mm^2
Weight	0,15 kg
Packing	20 pcs

Suspension clamp (PAS)

Code	**21 48 96**
Material	Al alloy, hot dip galvanized steel
Tightening torque	36 Nm
Section of conductors	PAS 35 up to 70 mm^2
Weight	0,15 kg
Packing	20 pcs

Disconnecting device

Code	**21 48 21**
Tightening torque	8 Nm
Intention of application	2SS15N
Fastening screw	M12x16 mm
Weight	0,1 kg
Packing	20 pcs

Notes

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