

Indicative characteristics of high-voltage equipment that can potentially be used at the facilities

| Parameter name | | Unit of measurement | Circuit breakers | Disconnectors | Current transformers | Voltage transformers | Power transformers | Surge arresters | |
|---|--|---------------------|--|--|--|---|-----------------------------|------------------------------------|--|
| Rated frequency | | Hz | 50 | | | | | | |
| Ambient temperature | | °C | -40 ; +40 | | | | | | |
| Seismic resistance (EMS-98). EMS-98 intensity scale denotes how strongly an earthquake affects a specific place. | NPC Ukrenergo, Distribution System, Power generating companies | points | 7 | | | | | | |
| | Distribution networks of JSC "Ukrainian railways" | | 3 | | | | | | |
| USCD / IEC 60815. USCD stands for Unified Specific Creepage Distance, which is a measure of the minimum creepage distance per unit of phase-to-ground voltage for an insulator to withstand pollution. IEC 60815 is a series of technical specifications that provide guidance on how to select and dimension high-voltage insulators for polluted conditions. The series consists of four parts: Part 1: Definitions, information and general principles1 Part 2: Ceramic and glass insulators for a.c. systems2 Part 3: Polymer insulators for a.c. and d.c. systems3 Part 4: Insulators for d.c. systems4 The main objective of these specifications is to help the user to determine the reference USCD from the site pollution severity class, and to apply correction factors for various factors such as altitude, insulator shape, size, position, etc. The specifications also provide examples of insulator profiles and design verification methods. | | mm/kV | 34,7 - C / 43,3 - D | | | | | | |
| Internal insulating environment. | | | ≤ 35 kV - vacuum and SF6 >35 kV - SF6 and Oil but are trying to move away from oil filled components | - | ≤ 35 kV - solid insulation (less than) >35 kV - SF6/ oil-impregnated sand (greater than) | ≤ 35 kV - dry / oil (less than) >35 kV - oil (greater than) | - | | |
| Rated mains voltage | NPC Ukrenergo | kV | 6; 10; 15,75;20; 35; ;110; 150; 220; 330; 400; 750 | | | 6; 10; 15,75; 35; 110; 150 | | 72,5; 110; 150; 220; 330; 400; 750 | |
| | Distribution System | | 0,4; 6; 10; 20; 35; ;110; 150 | | | 6; 10; 20; 35; 110; 150 | | 0,4; 6; 10; 20; 35; ;110; 150 | |
| | Distribution networks of JSC "Ukrainian railways" | | 3 (DC); 6; 10; 27,5; 35; 110; 150 | | 0,66; 6; 10; 27,5; 35; 110; 150 | | 6; 10; 27,5; 35; 110; 150 | | 3 (DC); 3,3 (DC); 6; 10; 27,5; 35; 110; 150 |
| | Power generating companies | | 35; 110; 154; 220; 330; 400; | | | 6; 35; 110; 154; 220; 330 | | 35; 110; 154; 220; 330; | |
| Maximum operating voltage | NPC Ukrenergo | kV | 7,2; 12;17,5;24; 40,5; 123; 170; 245; 362; 420; 800 (according to IEC) | | | | | | |
| | Distribution System | | 7,2; 12; 24; 40,5; 123 (according to IEC) | | | | | | |
| | Distribution networks of JSC "Ukrainian railways" | | 3,6 (DC); 7,2; 12; 30; 40,5; 123; 170 | | 0,72; 7,2; 12; 30; 40,5; 123; 170 | | 7,2; 12; 30; 40,5; 123; 170 | | 4 (DC); 4,5(DC); 7,2; 12; 30; 40,5; 70; 73; 115; 170 |
| | Power generating companies | | 7,2; 12;17,5;24; 40,5; 72,5;123; 170; 245; 362; 420; (IEC) | | | | | | |
| Rated current | NPC Ukrenergo | A | 600-750-1000-1200-1500-2000-3000-4000 | | | - | | - | |
| | Distribution System | | 6-10-16-25-32-50-63-80-100-200-300-400-600-750-1000-1200-1500-2000-3000 | | | - | | - | |
| | Distribution networks of JSC "Ukrainian railways" | | 400; 630; 1000; 1600; 2000; 2500; 3000; 3150; 4000; 5000 | 400; 630; 1000; 1125; 1600; 2000; 2500; 3000; 3150; 4000; 5000 | 10; 12,5; 15; 20; 100; 125; 150; 200; 1000; 1200; 1250; 1500; 2000 | - | | depending on voltage and power | |
| | Power generating companies | | 600-750-1000-1200-1500-2000 | | | - | | - | |
| Thermal resistance current | NPC Ukrenergo | kA | 31,5; 40; 50; 63 | | | - | | 31,5; 40; 50; 63 | |
| | Distribution System | | 16; 20; 31,5; 40; 50; 63 | | | - | | 16; 20; 31,5; 40; 50; 63 | |
| | Distribution networks of JSC "Ukrainian railways" | | 31,5; 40; 50; 63 | | | - | | 31,5; 40; 50; 63 | |
| | Power generating companies | | 31,5; 40; 50; 63 | | | - | | 31,5; 40; 50; 63 | |

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| Parameter name | | Unit of measurement | Circuit breakers | Disconnectors | Current transformers | Voltage transformers | Power transformers | Surge arresters |
|----------------------------|---|---------------------|--|--|--|--|---|---|
| Features of the equipment. | NPC Ukrenergo | | The drive type - spring. The spring factory voltage ~220 V. Coil voltage - =220 V. | 35-220 kV - horizontal rotary (one break per phase), three-pole/single-pole; 330 kV - horizontal rotary/semi-pantograph, single-pole; 750 kV - horizontal rotary/semi-pantograph, single-pole. Drive supply voltage - ~380 V | 1; 5 A 0,25/0,25/10P/10P/10P/10P 20/20/40/40/40/40 BA | 100V3/100/100V3(100/3) 0,2(0,5)/3P/3P 50/100/100 BA | Transformers for own needs: 6(10; 15.75; 35)/0.4 kV (two-winding); 400-630-1000-2500 kVA; Y/D; D/Yn; Yn/Yn; Y/Yn (0-11). Power transformers: 110(150)/35/6(10) (three-winding); 25000-40000-50000-63000 kVA; Y/Yn/D (0-11). | Line discharge class - 2, 3, 4, 5. Rated voltage of the arrester, kV: 108; 138; 192; 288; 350; 612. Maximum operating voltage, kV: 83; 110; 154; 230; 280; 490. |
| | Distribution System | | The drive type - spring. The spring factory voltage ~220 V. Coil voltage - =220 V. | 35-150 kV - horizontal rotary (one break per phase), three-pole/single-pole; Drive supply voltage - ~380 V | 5 A 0,25/0,25/10P/10P/10P/10P 20/20/40/40/40/40 VA | 100V3/100/100V3(100/3) 0,2(0,5)/3P/3P 50/100/100 VA | Transformers: 6(10; 20; 35)/0.4 kV (two-winding); 400-630-1000-2500-4000-6300-10000-16000 kVA; Y/zigzag n; Y/D; D/Yn; Yn/Yn; Y/Yn (0-11). Power transformers: 110(150)/35/6(10) (two or three-winding); 25000-40000-63000-10000-16000-25000-40000-50000-63000-80000 kVA; Y/Yn/D (0-11). | Line discharge class - 1, 2, 3, 4, 5. |
| | Distribution networks of JSC "Ukrainian railways" | | Function: Circuit-Breaker Failure Protection, Overcurrent Protection, OVP(Overvoltage Protection) Rated closing voltage of operating mechanism: 220 V Rated switching voltage of operating mechanism: 220 V Standard: IEC62271-100 | - 1-Pole or 3-Pole - Motor Operated (with Emergency Manual Handle or without Emergency Manual Handle) or Manual Operated - Auxiliary Contacts - Horizontal rotary, one break per phase - Drive supply voltage - ~380 V - Standard: IEC62271-102 | Accuracy classes combination: 0,25/10P10 0,25/10P15 0,2/10P20 0,2/10P15 0,2/10P20 0,5/10P10 0,5/10P15 0,5/10P20 0,25/0,2/10P10 0,25/0,2/10P20 | Rated voltage (kV): 6/V3; 10/V3; 27,5/V3; 35/V3; 110/V3; 150/V3 Accuracy class (Normal): 0,5/150 3P/100 0,2/75 0,5/75 | Transformers for own needs: 6(10; 27,5; 35)/0.4 kV (two-winding); 400-630-1000-2000-2500 kVA; Y/D; D/Yn; Yn/Yn; Y/Yn (0-11). Power transformers: 110(150)/27,5(35)/6(10) (three-winding); 25000-40000-50000-63000 kVA; Y/Yn/D (0-11). | Line discharge class - 2, 3, 4, 5. Rated voltage of the arrester, kV: 108; 138; 192; 288; 350; 612. Maximum operating voltage, kV: 83; 110; 154; 230; 280; 490. |
| | Power generating companies | | Actuator type is spring-loaded. Factory spring voltage = 220 V. Coil voltage - = 220 V. 220 V DC. | 35-220 kV - horizontal rotary (one break per phase), three-pole/single-pole; 330 kV - horizontal rotary three-pole/single-pole; Drive supply voltage - ~380 V | 110kV-2000/1A; 600/5A 154kV - 600-1200/5A; 1200/5A 220kV - 1200/1A 330kV - 2000/1A 0,25/0,25/0,5/10P/10P/10P/10P 30/30/30/50/50/50/50 VA | 110000/V3V -100/V3 - 100/V3 - 100 0,2 - 3P- 3P 100/400/400 VA 150000/V3 V - 100/V3 - 100/V3 - 100 0,2 - 3P- 3P 100/400/400 VA 220000/V3 V - 100/V3 - 100/V3 - 100 0,2 - 3P- 3P 100/400/400 VA 330000/V3 V - 100/V3 - 100/V3 - 100 0,2 - 3P- 3P 100/400/400 VA | Power transformers: 110(150)/6 (three-winding); 25000-40000kVA; Y/Dn/D (11-11). 242/18kV; 200000kVA; Y/Dn/D - 11 Autotransformers: 220/110kV; 330/154kV; 330/220kV; 400/330/36.8kV(single phase) 400/231/34kV(single phase) 200000kVA 250000kVA 240000kVA 210000kVA 133000kVA Y0 auto/Δ-11; Un auto/D-0-11 | Line discharge class - 2, 3, 4, 5. Rated voltage of arrester, kV: 35; 110; 154; 220; 330; Maximum operating voltage, kV: 48; 138; 192; 288; 363; |