Hi-Tech® SX full-range current-limiting fuses

Trans-Guard® SX full-range current-limiting fuse

Provides both overload and fault current protection for distribution equipment in a single fuse body.

As a full-range fuse, this fuse is capable of interrupting any continuous current between the minimum current that can cause melting of its elements and its rated maximum interrupting current (50,000 A). The fuses are capable of interrupting in elevated ambient temperatures up to their rated maximum application temperature, which is 140 °C and 71 °C for the 2.2-inch and 3.3-inch diameter designs, respectively.

The Trans-Guard SX fuse is hermetically sealed and thus discharges no gases during fuse operation. An additional design distinction is its patented damage sensor that significantly reduces the potential for fuse failure in the event of element-damaging current surges.

- Patented damage sensor significantly reduces the risk of fuse failure should the fuse be subjected to an element damaging current surge
- Hermetically sealed construction ensures that no gases escape from the fuse during current interruption.
- All Trans-Guard SX fuses are helium mass spectrometer leak tested to ensure sealing system integrity
- Rugged machined brass end caps provide greater ferrule strength, resulting in less distortion and more secure fuse attachment in wet-well fuse holders
- Tested in accordance to ANSI/IEEE standards

Application:
Trans-Guard SX fuses are specifically designed to be installed in wet-well fuse holders for oil-filled padmounted switchgear and transformer applications (only 2.2-inch diameter designs are suitable for wet-well fuses holders mounted directly in transformers).

CAUTION: Trans-Guard SX fuses are NOT designed for any type of live switching operation.

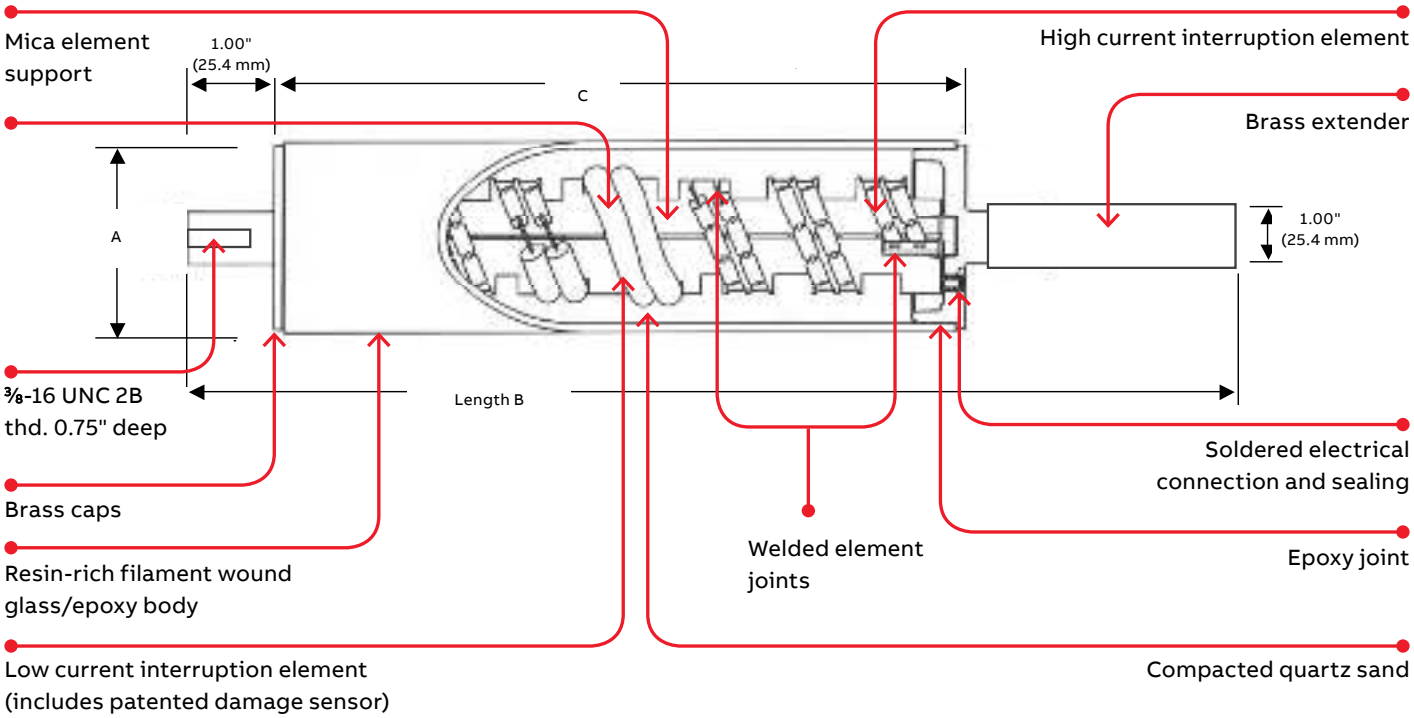
Hi-Tech® SX full-range current-limiting fuses

Construction

Dimensional information

Wet well holder (kV)	Nominal fuse voltage rating (kV)	Current rating (amps)	Dimensions in. (mm) A	B	C
8.3	5.5	100–250	3.29 (83.6)	19.06 (484.1)	14.66 (372.4)
	8.3	5–75	2.22 (56.3)	19.06 (484.1)	7.93 (201.4)
		90–160	3.29 (83.6)	19.06 (484.1)	11.85 (300.1)
	15.5*	5–75	2.22 (56.3)	19.06 (484.1)	12.24 (310.9)
		90–150	3.29 (83.6)	19.06 (484.1)	14.66 (372.4)
15.5	15.5	5–75	2.22 (56.3)	21.12 (536.4)	12.24 (310.9)
		90–150	3.29 (83.6)	21.12 (536.4)	14.66 (372.4)
23.0	23.0	10–65	2.22 (56.3)	21.12 (536.4)	15.05 (382.3)

* To order a 15.5 kV fuse that will fit in an 8.3 kV wet-well fuseholder, replace the 7th character (“0”) in the catalog number with a “2” (example: HTSX242050).
See page 57.



Hi-Tech® SX full-range current-limiting fuses

Electrical characteristics

Electrical characteristics of Trans-Guard® SX fuses

Nominal fuse voltage rating (kV)	Current rating (N2) (amps)	Fuse cat. no. (N1)	Rated maximum voltage (kV)	Maximum continuous current (in oil @ 60 °C) (N5)	Peak arc voltage (N6) (kV)	Minimum melt I^2t (amp^2-sec)	Maximum melt I^2t (N3) (N4) (amp^2-sec)
5.5	100	HTSX320100	5.5	114.0	15	22,100	110,000
	150	HTSX320150		147.0		56,700	280,000
	175	HTSX320175		172.0		78,300	380,000
	225	HTSX320225		230.0		176,000	860,000
	250	HTSX320250		253.0		259,000	1,270,000
8.3	5	HTSX230005	10.0	5.0	30	100	350
	10	HTSX230010		11.5	32	620	2,700
	12	HTSX230012		14.0	28	800	4,000
	15	HTSX230015		17.0	28	800	4,000
	20	HTSX230020		22.5	26	920	8,000
	25	HTSX230025		25.0	26	1,310	9,500
	30	HTSX230030		30.0	26	1,620	11,000
	40	HTSX230040		43.0	26	3,660	22,000
	50	HTSX230050		53.0	26	5,250	30,000
	65	HTSX230065		65.0	26	8,700	50,000
	75	HTSX230075		75.0	26	12,800	70,000
	90	HTSX330090	8.3	92.0	25	25,200	100,000
	100	HTSX330100		105.0		47,500	185,000
	150	HTSX330150		150.0		78,300	330,000
	160	HTSX330160		163.0		115,150	480,000
15.5	5	HTSX240005	17.2	5.0	51	100	510
	10	HTSX240010		11.5	54	620	2,600
	12	HTSX240012		14.0	46	800	3,700
	15	HTSX240015		17.0	46	800	3,700
	20	HTSX240020		22.5	43	920	6,500
	25	HTSX240025		25.0	45	1,310	8,000
	30	HTSX240030		30.0	45	1,620	10,000
	40	HTSX240040		43.0	45	3,660	22,000
	50	HTSX240050		53.0	45	5,250	30,000
	65	HTSX240065		65.0	45	8,700	50,000
	75	HTSX240075		75.0	45	12,800	70,000
	90	HTSX340090	15.5	98.0	40	25,200	110,000
	100	HTSX340100		117.0		39,400	185,000
	150	HTSX340150		150.0		80,000	380,000

Notes:
N1. Designs have maximum interrupting capability of 50 kA, except 17.2 kV 5A (HTSX24*005) which was tested at 44 kA.
N2. Fuses rated 75 A and below are 2.25" in diameter. Higher ratings are 3.3" in diameter.
N3. Tabulated maximum total I^2t values are for currents of 50,000 A at the nominal voltage of the fuse. Fuses which have a rated maximum voltage higher than their Nominal Voltage Rating will have a higher I^2t let-through when applied at voltages up to these higher values. For example, maximum total I^2t values are increased by approximately 30% when 8.3 kV fuses are applied at 10 kV and approximately 25% when 15.5 kV fuses are used at 17.2 kV.
N4. Maximum total I^2t values are reduced for currents below 50,000A. For example, at 10,000A, I^2t values are approximately 15% less than the published values.
N5. Maximum continuous currents at different ambient temperatures: These may be determined by derating the fuses by 0.2% per degree C over 60 °C (for example at 80 °C the derating would be 20 x 0.2 = 4%, making the maximum continuous current of a 20 A fuse 22.5 x 0.96 = 21.6 A) or rerating the fuses by 0.2% per degree C under 60 °C (for example, at 40 °C the rerating would be 20 x 0.2 = 4%, making the maximum continuous current of a 20 A fuse 22.5 / 0.96 = 23.4 A). The long time melting current of the fuses (approximately one hour and longer) due to different ambient temperatures is the same as described above for “Maximum Continuous Currents”. See time current characteristics for melting characteristics in this time region.
N6. Peak arc voltages quoted are for 50,000 A currents at the rated maximum voltage listed. Reduced currents and voltages will reduce the peak arc voltage.
Consult the factory for further information.

Hi-Tech® SX full-range current-limiting fuses

Electrical characteristics (continued)

Electrical characteristics of Trans-Guard® SX fuses (continued)

Nominal fuse voltage rating (kV)	Current rating (N2) (amps)	Fuse cat. no. (N1)	Rated maximum voltage (kV)	Maximum continuous current (in oil @ 60 °C) (N5)	Peak arc voltage (N6) (kV)	Minimum melt I^2t (amp^2-sec)	Maximum melt I^2t (N3) (N4) (amp^2-sec)
23.0	10	HTSX250010	23.0	11.5	67	620	3,100
	12	HTSX250012		14.0	61	800	4,800
	15	HTSX250015		17.0	61	800	4,800
	20	HTSX250020		22.5	60	920	8,300
	25	HTSX250025		25.0	60	1,310	11,200
	30	HTSX250030		30.0	60	1,620	13,000
	40	HTSX250040		42.0	60	3,660	28,000
	50	HTSX250050		51.0	60	5,250	38,000
	65	HTSX250065		65.0	60	8,700	61,000

Notes:
N1. Designs have maximum interrupting capability of 50 kA, except 17.2 kV 5A (HTSX24*005) which was tested at 44 kA.
N2. Fuses rated 75 A and below are 2.25" in diameter. Higher ratings are 3.3" in diameter.
N3. Tabulated maximum total I^2t values are for currents of 50,000 A at the nominal voltage of the fuse. Fuses which have a rated maximum voltage higher than their Nominal Voltage Rating will have a higher I^2t let-through when applied at voltages up to these higher values. For example, maximum total I^2t values are increased by approximately 30% when 8.3 kV fuses are applied at 10 kV and approximately 25% when 15.5 kV fuses are used at 17.2 kV.
N4. Maximum total I^2t values are reduced for currents below 50,000 A. For example, at 10,000 A, I^2t values are approximately 15% less than the published values.
N5. Maximum continuous currents at different ambient temperatures: These may be determined by derating the fuses by .2% per degree C over 60 °C (for example at 80 °C the derating would be 20 x .2 = 4%, making the maximum continuous current of a 20 A fuse 22.5 x .96 = 21.6 A) or rerating the fuses by .2% per degree C under 60 °C (for example, at 40 °C the rerating would be 20 x .2 = 4%, making the maximum continuous current of a 20 A fuse 22.5 / .96 = 23.4 A). The long time melting current of the fuses (approximately one hour and longer) due to different ambient temperatures is the same as described above for “Maximum Continuous Currents”. See time current characteristics for melting characteristics in this time region.
N6. Peak arc voltages quoted are for 50,000 A currents at the rated maximum voltage listed. Reduced currents and voltages will reduce the peak arc voltage.
Consult the factory for further information.

Hi-Tech® SX full-range current-limiting fuses

Recommendations

Recommended Trans-Guard® SX for switchgear (mounted in a wet-well fuseholder with a max. oil temp. of 60 °C)

Recommended fuse current ratings (amps)																		
Fuse voltage									**(5.5 kV) 8.3 kV**						**15.5 kV**		**23 kV**	
1-phase transformer											**Transformer 1-phase voltage rating (kV) phase-to-ground**							
	2.4		**4.16**		**4.8**		**7.2**		**7.62**		**12**		**14.4**		**16**		**19.9**	
kVA	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
10	–	10	–	10[a]	–	5	–	5[a]	–	5[a]	–	5[a]	–	5[a]	–	5[a]	–	10[a]
15	–	12	–	10[a]	–	10[a]	–	5	–	5	–	5[a]	–	5[a]	–	5[a]	–	10[a]
25	20[b]	25	–	12	–	12	–	10[a]	–	10[a]	–	5	–	5[a]	–	5[a]	–	10[a]
37.5	30[b]	40	–	20	–	20[a]	–	12	–	12[a]	–	10[a]	–	10[a]	–	10[a]	–	10[a]
50	40[b]	50	25[b]	30	20[b]	25	–	15	–	15	–	10	–	10[a]	–	10[a]	–	10[a]
75	50	65	30	40	30[b]	40	20[b]	25	–	20	–	15	–	12	–	12[a]	–	10[a]
100	65	(100)	40	50	40[b]	50	25	30	25	30	–	20	–	15	–	15	–	12
167	(150)[b]	(175)	65	(100)	50	75	40	50	40[b]	50	25	30	25[b]	30	20[b]	25	–	20
250	(150)	(225)	(100)	(150)	75	(100)	50	75	50	65	40[b]	50	30	40	30[b]	40	25[b]	30
333	(225)	–	(150)	(175)	(150)[b]	(175)	75	90	65	90	50	65	40	50	40[b]	50	30	40
500	(250)[c]	–	(175)	(250)	(150)	(225)	100	150	100	150	65	90	50	75	50	65	40	50
833	–	–	(250)[c]	–	(250)	–	160	–	160	–	100	150	90	100	75	–	65	–
1000	–	–	–	–	(250)[c]	–	–	–	160[c]	–	150	–	100	150	–	–	–	–
1500	–	–	–	–		–	–	–	–	–	150[c]	–	150	–	–	–	–	–

Note: Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating. See additional notes on page 58.

Recommended Trans-Guard SX for switchgear: protecting delta connected transformers (mounted in a wet-well fuseholder with a max. oil temp. of 60 °C)

Recommended fuse current ratings (amps)																
Fuse voltage								**(5.5 kV) 8.3 kV**					**15.5 kV**		**23 kV**	
3-phase transformer										**Transformer 3-phase voltage rating (kV) phase-to-phase**						
	2.4		**4.16**		**4.8**		**7.2–7.96**		**8.32**		**12.47**		**13.2–14.4**		**20.8**	
kVA	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
15	–	10[a]	–	5	–	5	–	5[a]	–	5[a]	–	5[a]	–	5[a]	–	10[a]
22.5	–	12	–	10[a]	–	10[a]	–	5	–	5[a]	–	5[a]	–	5[a]	–	10[a]
30	–	15	–	10	–	10[a]	–	10[a]	–	5	–	5[a]	–	5[a]	–	10[a]
45	20[b]	25	–	15	–	12	–	10	–	10[a]	–	5	–	5	–	10[a]
75	30	40	20[b]	25	–	20	–	12	–	12	–	10[a]	–	10[a]	–	10[a]
100	40	50	25	30	25[b]	30	–	20	–	15	–	12[a]	–	10[a]	–	10[a]
112.5	40	65	30[b]	40	25	30	–	20	–	20[a]	–	12	–	12[a]	–	10[a]
150	65	75	40[b]	50	30	40	25[b]	30	20[b]	25	–	15	–	15	–	10
200	75	(100)	50	65	40	50	30	40	25	30	–	20	–	20	–	12
225	75	(100)	50	75	40	65	30	40	30[b]	40	20[b]	25	–	20	–	15
300	(150)[b]	(175)	65	(100)	65	75	40	50	40[b]	50	25	30	25	30	–	20
500	(175)	(250)	(150)[b]	(175)	(100)	(150)	65	90	50	75	40	50	40[b]	50	25	30
750	(250)	–	(150)	(225)	(150)	(225)	90	150	75	100[d]	50	75	50	65	40[b]	50
1000	–	–	(225)	–	(175)	(250)	150	160	100[d]	150[d]	75	90	65	90	50	65
1500	–	–	(250)[c]	–	(250)	–	160	–	150[d]	–	100	150	100	150	65	–
2000	–	–	–	–	–	–	–	–	–	–	150	–	150	–	–	–
2500	–	–	–	–	–	–	–	–	–	–	150[c]	–	150	–	–	–
3000	–	–	–	–	–	–	–	–	–	–	–	–	150[c]	–	–	–

Note: Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating. See additional notes on page 58.

Hi-Tech® SX full-range current-limiting fuses

Recommendations

Recommended Trans-Guard® SX for switchgear: Protecting GNDY-GNDY* connected transformers with less than 50% Delta connected secondary load (mounted in a wet-well fuseholder with a max. oil temp. of 60 °C)

Recommended fuse current ratings (amps)																				
Fuse voltage													**(5.5 kV) 8.3 kV**				**15.5 kV**		**23 kV**	
													Transformer 3-phase voltage rating (kV) phase-to-phase							
3-phase transformer	**2.4**		**4.16**		**4.8**		**7.2–7.96**		**8.32**		**12.47**		**13.2–14.4**		**20.8**		**22.9–24.9**		**34.5**	
kVA	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
15	–	10[a]	–	5	–	5	–	5[a]	–	5[a]	–	5[a]	–	5[a]	–	5[a]		5[a]	–	10[a]
22.5	–	12	–	10[a]	–	10[a]	–	5	–	5[a]	–	5[a]	–	5[a]	–	5[a]		5[a]	–	10[a]
30	–	15	–	10	–	10[a]	–	10[a]	–	5	–	5[a]	–	5[a]	–	5[a]		5[a]	–	10[a]
45	20[b]	25	–	15	–	12	–	10	–	10[a]	–	5	–	5	–	5[a]		5[a]	–	10[a]
75	30	40	20[b]	25	–	20	–	12	–	12	–	10[a]	–	10[a]	–	5		5	–	10[a]
100	40	50	25	30	25[b]	30	–	20	–	15	–	12[a]	–	10[a]	–	10[a]		10[a]	–	10[a]
112.5	40	65	30[b]	40	25	30	–	20	–	20[a]	–	12	–	12[a]	–	10[a]		10[a]	–	10[a]
150	65	75	40[b]	50	30	40	25[b]	30	20[b]	25	–	15	–	15	–	10		10[a]	–	10[a]
200	75	(100)	50	65	40	50	30	40	25	30	–	20	–	20	–	12		12	–	10[a]
225	75	(100)	50	75	40	65	30	40	30[b]	40	20[b]	25	–	20	–	15		12	–	10[a]
300	(150)[b]	(175)	65	(100)	65	75	40	50	40[b]	50	25	30	25	30	–	20		20[a]	–	12
500	(175)	(250)	(150)[b]	(175)	(100)	(150)	65	(100)	50	75	40	50	40[b]	50	25	30	25[b]	30	–	20
750	(250)	–	(150)	(225)	(150)	(225)	(100)	(150)	75	(100)	50	75	50	65	40b	50	40[b]	50	25[b]	30
1000	–	–	(225)	–	(175)	(250)	(150)	(175)	(150)[b]	(175)	75	90	65	90[d]	50	65	40	50	30	40
1500	–	–	(250)[c]	–	(250)	–	(175)	(250)	(150)	(225)	100	150	100[d]	150[d]	65	90	65	75	40	50
2000	–	–	–	–	–	–	(225)	–	(225)	–	150	–	150[d]	–	75	100	75	90	50	–
2500	–	–	–	–	–	–	(250)[c]	–	(250)	–	160	–	150[d]	–	100	150	90	150	65	–
3000	–	–	–	–	–	–	–	–	–	–	160[c]	–	–	–	150		100	150	–	–

* Phase-to-ground rated fuses are commonly used for gndY/gndY connected transformers having no more than 50% delta connected secondary load.

Notes:

1. Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating.
2. Recommended fuses meet inrush criteria of 12 times transformer full load current for .1 second and 25 times transformer full load current for .01 second. Fuses also meet cold load pickup criteria of 6 times transformer full load current for 1 second and 3 times transformer full load current for 10 seconds.
3. Ratings in parentheses are 5.5 kV rated fuses.

a Fuse allows more than 300% of transformer rating.

b Fuse allows more than 200% of transformer rating.

c Fuse allows at least 125% of transformer rating.

d 15.5 kV fuse must be used for voltages over 8.32 kV for delta configurations or 13.8 kV gndY/8.32 kV.

Hi-Tech® SX full-range current-limiting fuses

Trans-Guard® SX fuse ordering information

To order the proper fuse for a particular application, first determine the correct fuse voltage and current rating using the published performance data (pages 55-56). Then refer to the chart below to determine the appropriate catalog number. Alternatively, fuse selection can be determined using the accompanying charts on pages 57-58.

Ordering information for Trans-Guard SX fuses

Continuous current rating (amps)	Cat. no. 5.5 kV	8.3 kV	15.5 kV	23.0 kV
5	–	HTSX230005	HTSX240005	–
10	–	HTSX230010	HTSX240010	HTSX250010
12	–	HTSX230012	HTSX240012	HTSX250012
15	–	HTSX230015	HTSX240015	HTSX250015
20	–	HTSX230020	HTSX240020	HTSX250020
25	–	HTSX230025	HTSX240025	HTSX250025
30	–	HTSX230030	HTSX240030	HTSX250030
40	–	HTSX230040	HTSX240040	HTSX250040
50	–	HTSX230050	HTSX240050	HTSX250050
65	–	HTSX230065	HTSX240065	HTSX250065
75	–	HTSX230075	HTSX240075	–
90	–	HTSX330090	HTSX340090	–
100	HTSX320100	HTSX330100	HTSX340100	–
150	HTSX320150	HTSX330150	HTSX340150	–
160	–	HTSX330160	–	–
175	HTSX320175	–	–	–
225	HTSX320225	–	–	–
250	HTSX320250	–	–	–

Note: To order a 15.5 kV fuse that will fit in an 8.3 kV wet-well fuseholder, replace the 7th character (“0”) in the catalog number with a “2” (example: HTSX242050).

Important notice when using Trans-Guard SX fuses

When replacing the obsolete AB Chance SL fuse with a Hi-Tech Trans-Guard SX fuse, it is important to recognize that the SX fuse designs should not be used on distribution systems where the primary line-to-line voltage exceeds the rated maximum voltage of the fuse as shown in the chart to the right:

This should be considered when choosing a proper replacement for the AB Chance SL fuse as they were, in some cases, used on systems having line-to-line voltages greater than that of the current-limiting fuse component of the assembly.

Again, when choosing the appropriate Hi-Tech SX fuse to replace the AB Chance SL fuse, care must be taken to ensure that the rated maximum voltage of the SX fuse exceeds the system line-to-line voltage.

The only exception to this requirement is when all the transformers that are downstream from the switches where the SX fuses are to be installed are GNDY-GNDY connected with less than 50% delta connected secondary load. In that case, a fuse having a rated maximum voltage exceeding the system line-to-neutral voltage may be used.

Trans-Guard SX

Nominal fuse voltage rating (kV)	Current rating (amps)	Rated maximum voltage (kV)
5.5	100–250	5.5
8.3	5–75	10.0
	90–160	8.3
15.5	5–75	17.2
	90–150	15.5
23.0	10–65	23.0