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Protection against short-circuit and overload current

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Single-phase Transformers

Transformer protection

primary circuit

- short-circuit risk protection in primary circuit
- for transformers up to 630 VA fuse rating must be approximately equal to 1,5… 2 x I_{PRI}
- for transformers over 630 VA fuse rating must be approximately equal to 2… 2,5 x I_{PRI}

The fuse rating must be higher than the primary current value, for the transformer tripping value is higher than the primary current. The fuse must have a time lag characteristic.

Should the primary current not be known, it may be calculated approximately:

- for transformers up to 630 VA, primary current is roughly equal to

$$1{,}2 \times \frac{P_S}{U_{PRI}}$$

- for transformers over 630 VA, primary current is roughly equal to

$$1{,}1 \times \frac{P_S}{U_{PRI}}$$

(single-phase transformers)

$$1{,}1 \times \frac{P_S}{\sqrt{3} \times U_{PRI}}$$

(three-phase transformers)

Table 1

Protection of primary and secondary windings of transformers against short circuit and overload current

Nominal values (A) of primary and secondery protection of safety, control and isolating transformers

P	PRI						SEC										
VA	U=230V			U=400V			U=24V (2x12V)			U=48V (2x24V)		U=115V		U=230V (2x115V)			
	Fuse EN60898	Circuit breaker	Circuit breaker	Fuse EN60898	Circuit breaker	Circuit breaker	Fuse EN60127	Fuse EN60898	Circuit breaker	Fuse EN60898	Circuit breaker	Fuse EN60898	Circuit breaker	Fuse EN60127	Fuse EN60898	Circuit breaker
	aM	C	D	aM	C	D	5x20 6,3x32	gG	C	gG	C	gG	C	5x20 6,3x32	gG	C
10	0,5	1	0,5	0,5	1	0,5	0,5	0,5								
30	0,5	1	0,5	0,5	1	0,5	1,25	2	2							
40	1	1	1	0,5	1	0,5	2	2	2					0,5		
63	1	2	1	0,5	1	0,5	3,15	4	4					0,315		
100	1	3	1	1	2	1	5	6	6	2	2	1		0,5	0,5	0,5
160	2	6	2	1	2	1		10	10	4	4	2	2	0,8	2	2
250	2	6	2	2	4	2		12	16	6	6	2	2	1,6	2	2
400	4	10	4	2	6	2		20	20	10	10	4	4		2	2
630	6	16	6	4	10	4		32	32	16	16	6	6		4	4
1000	10	20	10	6	16	6		50	50	25	25	10	10		6	6
1600	16		16	10	20	10		80		40	40	16	16		8	8
2500	20		20	16		16		100		50	50	25	25		12	16
4000	32		32	20		20						40	40		20	20
6300	40		40	32		32						63	63		32	32
10000	63		63	40		40						100			50	50

Secondary circuit

- boverload or short-circuit protection in secondary circuit
- fuse rating must be equal or just above secondary current value

Fuse has quick acting or time lag characteristic.

Table 2

Single-phase low voltage transformers with secondary protection
(max. fuse value 6,3 A and on demand)

Single-phase low voltage transformers with secondary protection (A)

	safety chapter 1.2		isolating chapter 2.2		control chapter 3.1 & 3.3	
Ps/Usec	24V	2x12V	230V	2x115V	24V	230V
40VA					EDR 24TC40 F **2 A**	EDR 230TC40 F **0,2 A**
63VA	EDR 24TS63 F **3,15 A**	EDR 212TS63 F **3,15 A**	EDR 230TI63 F **0,315 A**	EDR 2115TI63 F **0,315 A**	EDR 24TC63 F **3,15 A**	EDR 230TC63 F **0,315 A**
100VA	EDR 24TS100 F **5 A**	EDR 212TS100 F **5 A**	EDR 230TI100 F **0,5 A**	EDR 2115TI100 F **0,5 A**	EDR 24 TC100 F **5 A**	EDR 230TC100 F **0,5 A**
160VA			EDR 230TI160 F **1 A**	EDR 2115TI160 F **1 A**		EDR 230TC160 F **1 A**
250VA			EDR 230TI250 F **1,6 A**	EDR 2115TI250 F **1,6 A**		E 230TC250 F **1,6 A**

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Three-phase Transformers

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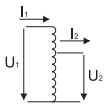
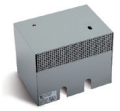
Three-phase transformers
Dreiphasen-Transformatoren

Auto transformers – Spartransformatoren – Classic Range – EN60076 – Chapter/Kapitel 6.4

	Upri = 3 x 230V Y+N or / oder 3 x 400V Y+N		Upri 230V Y+N			Upri 400V Y+N			Usec 230V Y+N		Usec 400V Y+N		Kast/Boîtier IP20
			Ipri	Type C	Type D	Ipri	Type C	Type D	Isec	Type C	Isec	Type C	
Ps VA	Type		A	A	A	A	A	A	A	A	A	A	Type
2750	ATT 2750		6,97	20	10	4,01	16	8	6,90	8	3,97	4	K20EI190
4400	ATT 4400		11,2	32	20	6,46	20	13	11,0	12	6,35	8	K20EI190
6800	ATT 6800		17,2	50	25	9,87	32	16	17,1	20	9,81	10	K20EI220
11000	ATT 11000		27,8	–	40	16,0	50	25	27,6	32	15,9	16	U 222 752
17500	ATT 17500		44,1	–	63	25,4	63	32	43,9	50	25,3	25	U 222 752
25000	ATT 25000		63,0	–	80	36,2	–	40	62,8	63	36,1	40	U 2222 720
40000	ATT 40000		101	–	125	58,2	–	63	100	100	57,7	63	U 2222 721
50000	ATT 50000		126	160 (*)		72,5	–	80	125	125	72,2	80	U 2222 721
63000	ATT 63000		158	200 (*)		90,9	–	100	158	160 (*)	90,9	100	U 2222 721
95000	ATT 95000		241	250 (*)		139	160 (*)		238	250 (*)	137	160 (*)	U 2222 722
120000	ATT 120000		304	400 (*)		175	200 (*)		301	320 (*)	173	200 (*)	U 2222 723
145000	ATT 145000		368	500 (*)		212	250 (*)		364	400 (*)	209	250 (*)	U 2222 723

Separating-transformers – Transformatoren mit getrennten Wicklungen – Classic Range – EN60076 – Chapter/Kapitel 6.1 – 6.2

	Upri = 3 x 230V Δ or / oder 3 x 400V Y+N		Upri 230V Δ			Upri 400V Y+N			Usec 230V Δ		Usec 400V Y+N		Kast/Boîtier IP20
		–				Upri 400V Δ			Usec 230V Δ		Usec 400V Y+N		Kast/Boîtier IP20
		Upri = 3 x 400V Δ	Ipri	Type C	Type D	Ipri	Type C	Type D	Isec	Type C	Isec	Type C	
Ps VA	Type		A	A	A	A	A	A	A	A	A	A	Type
1000	SPT 1000	SPT 1000/D	2,68	10	6	1,52	6	3	2,51	3	1,44	2	K20EI150
1600	SPT 1600	SPT 1600/D	4,26	16	8	2,43	10	6	4,02	4	2,31	3	K20EI190
2500	SPT 2500	SPT 2500/D	6,57	25	13	3,80	16	8	6,28	8	3,61	4	K20EI220
4000	SPT 4000	SPT 4000/D	10,6	32	16	6,10	20	10	10,0	10	5,77	6	U 222 752
6300	SPT 6300	SPT 6300/D	16,5	63	32	9,50	40	20	15,8	16	9,09	10	U 222 752
10000	SPT 10000	SPT 10000/D	26,1	–	50	15,0	63	32	25,1	25	14,4	16	U 2222 720
16000	SPT 16000	SPT 16000/D	42,3	–	63	24,3	–	40	40,2	40	23,1	25	U 2222 720
20000	SPT 20000	SPT 20000/D	52,5	–	80	30,2	–	50	50,2	50	28,9	32	U 2222 720
25000	SPT 25000	SPT 25000/D	65,1	–	100	37,4	–	63	62,8	63	36,1	40	U 2222 720
31500	SPT 31500	SPT 31500/D	81,5	–	125	46,9	–	80	79,1	80	45,5	50	U 2222 722
40000	SPT 40000	SPT 40000/D	102	160 (*)		59,1	–	100	100	100	57,7	63	U 2222 722
50000	SPT 50000	SPT 50000/D	129	200 (*)		74,4	–	125	126	125	72,2	80	U 2222 723
63000	SPT 63000	SPT 63000/D	162	250 (*)		93,1	160 (*)		158	160 (*)	90,9	100	U 2222 723
80000	SPT 80000	SPT 80000/D	206	320 (*)		118	200 (*)		200	200 (*)	115	125	K20EI500/004
100000	SPT 100000	SPT 100000/D	258	400 (*)		148	250 (*)		251	250 (*)	144	160 (*)	K20EI500/003

Isolating-transformers – Energy Efficient – Energieeffiziente Trenntransformatoren (BTE) – EN61558-2-4 – Chapter/Kapitel 6.3

blue e²	Upri = 3 x 230V Δ or / oder 3 x 400V Y+N		Upri 230V Δ			Upri 400V Y+N			Usec 230V Δ		Usec 400V Y+N		Kast/Boîtier IP20
		–				Upri 400V Δ			Usec 230V Δ		Usec 400V Y+N		Kast/Boîtier IP20
		Upri = 3 x 400V Δ	Ipri	Type C	Type D	Ipri	Type C	Type D	Isec	Type C	Isec	Type C	
Ps VA	Type		A	A	A	A	A	A	A	A	A	A	Type
1000	SPT 1000/BTE	SPT 1000/D/BTE	2,63	10	6	1,52	6	3	2,51	3	1,44	2	K20BTE/005
1600	SPT 1600/BTE	SPT 1600/D/BTE	4,17	16	8	2,41	10	6	4,02	4	2,31	3	K20BTE/010
2500	SPT 2500/BTE	SPT 2500/D/BTE	6,5	25	13	3,75	16	8	6,28	8	3,61	4	K20BTE/020
4000	SPT 4000/BTE	SPT 4000/D/BTE	10,4	32	16	5,99	20	10	10,0	10	5,77	6	K20BTE/030
6300	SPT 6300/BTE	SPT 6300/D/BTE	16,3	63	32	9,41	40	20	15,8	16	9,09	10	K20BTE/030
10000	SPT 10000/BTE	SPT 10000/D/BTE	25,9	–	50	14,9	63	32	25,1	25	14,4	16	K20BTE/040
11000	ECT 11000/IRC	ECT 11000/D/IRC	28,6	32	32	16,5	16	16	–	–	16	16	K20ECT/040
16000	SPT 16000/BTE	SPT 16000/D/BTE	41,2	–	63	23,7	–	40	40,2	40	23,1	25	K20BTE/040
20000	SPT 20000/BTE	SPT 20000/D/BTE	51,4	–	80	29,5	–	50	50,2	50	28,9	32	K20BTE/050
22000	ECT 22000/IRC	ECT 22000/D/IRC	57,2	63	63	33,0	32	32	–	–	32	32	K20ECT/050
25000	SPT 25000/BTE	SPT 25000/D/BTE	64,1	–	100	36,9	–	63	62,8	63	36,1	40	K20BTE/050
31500	SPT 31500/BTE	SPT 31500/D/BTE	80,6	–	125	46,4	–	80	79,1	80	45,5	50	K20BTE/060
44000	ECT 44000/IRC	ECT 44000/D/IRC	112,0	125	125	64,8	63	63	–	–	63	63	K20ECT/060

(*) = MCCB = Moulded Case Circuit Breaker

Transforming since 1933

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