

ELECTRICAL POWER SYSTEMS ENGINEERING

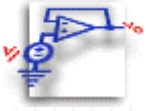


Table 3.2.1 Typical Transformer Impedances (Tables (a) and (b))

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(a) Standard Reactances and Impedances for Ratings 500 KVA and below (for 60 cycle Transformers).

* For three-phase transformers, use 1/3 of the three-phase KVA rating, and enter table with rated line-to-line voltages.

+ Average Reactance in %

++Average Impedance in %

Single Phase KVA Rating*	2.5		15		25		69	
	Av. React.+	Av. Imp.++	Av. React.+	Av. Imp.++	Av. React.+	Av. Imp.++	Av. React.+	Av. Imp.++
3	1.1	2.2	0.8	2.8				
10	1.5	2.2	1.3	2.4	4.4	5.2		
25	2	2.5	1.7	2.3	4.8	5.2		
50	2.1	2.4	2.1	2.5	4.9	5.2	6.3	6.5
100	3.1	3.3	2.9	3.2	5	5.2	6.3	6.5
500	4.7	4.8	4.9	5	5.1	5.2	6.4	6.5

(b) Standard Range in Impedances for Two-Winding Power Transformers Rated at 55C Rise (Both 25- and 60-cycle transformers.)

Table (b) requires definitions of transformer classes:

OA: Oil-immersed, self-cooled

OW: Oil-immersed, water-cooled.

OA/FA: Oil-immersed, self-cooled/forced-air-cooled

OA/FA/FOA: Oil-immersed, self-cooled/forced-air-cooled/forced-oil-cooled

FOA: Oil-immersed, forced-oil-cooled with forced air cooler

FOW: Oil-immersed, forced-oil-cooled with water cooler

+ High-Voltage Winding Inulation Class (KV)

++ Low-Voltage Winding Inulation Class (KV)

* The impedances are expressed in percent on the self-cooled rating of OA/FA and OA/FA/FOA.

		Impedance Limit in %			
		Class OA, OW, OA/FA*, OA/FA/FOA*		Class FOA, FOW	
High-Voltage+	Low-Voltage++	Min	Max	Min	Max
15	15	4.5	7	6.75	10.5
25	15	5.5	8	8.25	12
34.5	15	6	8	9	12
34.5	25	6.5	9	9.75	13.5
46	25	6.5	9	9.75	13.5
46	34.5	7	10	10.5	15
69	34.5	7	10	10.5	15
69	46	8	11	12	16.5
92	34.5	7.5	10.5	11.25	15.75
92	69	8.5	12.5	12.75	18.75
115	34.5	8	12	12	18
115	69	9	14	13.5	21
115	92	10	15	15	23.25
138	34.5	8.5	13	12.75	19.5
138	69	9.5	15	14.25	22.5
138	115	10.5	17	15.75	25.5
161	46	9.5	15	13.5	21
161	92	10.5	16	15.75	24
161	138	11.5	18	17.25	27
196	46	10	15	15	22.5
196	92	11.5	17	17.25	25.5
196	161	12.5	19	18.75	28.5
230	46	11	16	16.5	24
230	92	12.5	18	18.75	27
230	161	14	20	21	30