

# Fixed PFC of Transformers and Motors

## POWER FACTOR CORRECTION OF MV/LV TRANSFORMERS

The transformers for the distribution of electrical energy can be made in two different types: oil transformers, whose cooling does not require special aids and transformers insulated in resin, forced or natural cooled.

It is always advisable to provide for a **fixed power factor correction of the MV / LV transformers**, since even if they operate without load (for example during the night), they absorb **reactive power** that must be compensated.

The calculation of the necessary **capacitive power** can be performed using the approximate formula:

$$Q = I_0\% * \frac{P_n}{100}$$

$I_0$  = no-load current (supplied by the transformer manufacturer)

$P_n$  = rated power of the transformer

Alternatively, if the requested data is not available, the following table can be used, differentiated by type of transformer with normal leakage characteristics.

Approximately it is possible to tell that every 7 degrees of temperature increase means half the duration.

REACTIVE POWER REQUIRED for the VACUUM REFUSAL of MT / BT TRANSFORMERS (kvar)  
(indicative values)

Transformer power (kVA)	Transformers in OIL	Transformers in RESIN
100	5	2,5
160	7,5	5
200	7,5	5
250	7,5	7,5
315	10	7,5
400	10	7,5
500	12,5	7,5
630	15	10
800	17,5	10
1000	22,5	12,5
1250	25	15
1600	30	20
2000	35	22,5
2500	45	30
3150	55	45

## P.F.C. OF THREE-PHASE ASYNCHRONOUS MOTORS

One of the most common loads is the three-phase asynchronous motor, which can be re-phased locally, with the advantage of having the power cable run through by a lower current.

The capacitance of the capacitors must not exceed the reactive power at no load of the motor due to the risk of self-excitation and resonance phenomena between the capacitor and the inductance of the machine. The following table shows the power factor correction power in the case of a cage motor. For motors with wound rotor, an increase of 5% is recommended.

Rated motor power		2 poles		4 poles		6 poles		8 poles	
		3000 rpm		1500 rpm		1000 rpm		750 rpm	
<i>HP</i>	<i>kW</i>	<i>no load</i>	<i>load</i>	<i>no load</i>	<i>load</i>	<i>no load</i>	<i>load</i>	<i>no load</i>	<i>load</i>
1	0,74	0,5	0,6	0,5	0,7	0,6	0,8	0,75	1
2	1,5	0,8	1	1	1,2	1,1	1,4	1	1,5
3	2,2	1,1	1,4	1,2	1,5	1,4	1,8	1,5	2
5,5	4,1	1,7	2,2	1,9	2,5	2,1	2,8	2,5	3,5
7,5	5,5	2,3	3	2,5	3,4	2,8	3,7	3	4,5
10	7,4	3	4,4	3,6	4,6	4,1	5,4	4,5	6
15	11	4	6,5	5,5	7,2	6	8	7	9
30	22	10	12,5	11	13,5	12	15	12,5	16
50	37	17,5	24	20	27	22	30	17,5	27,5
100	74	28	45	32	49	37	54	35	55
150	110	40	64	46	70	52	76	55	80
200	150	50	81	58	89	65	95	70	105
250	180	60	98	72	105	82	115	90	130
350	257	70	113	80	130	90	146	125	185

