

General information

Sizing capacitors at the motor load

Sizing Capacitors at the Motor Load

When the determination is made that power factor correction capacitors ARE a good investment for a particular electrical system, you need to know:

- How many capacitors are needed?
- What sizes are appropriate?

The capacitor provides a local source of reactive current. With respect to inductive motor load, this reactive power is the magnetizing or "no-load current" which the motor requires to operate.

A capacitor is properly sized when its full load current rating is 90% of the no-load current of the motor. This 90% rating avoids overcorrection and the accompanying problems such as overvoltages.

One Selection Method: Using Formulas

If no-load current is known . . .

The most accurate method of selecting a capacitor is to take the no-load current of the motor, and multiply by .90 (90%). Take this resulting figure, turn to the appropriate catalog page, and determine which kvar size is needed, catalog number, enclosure type, and price.

EXAMPLE: Size a capacitor for a 100hp, 460V 3-phase motor which has a full load current of 124 amps and a no-load current of 37 amps.

1. Multiply the no-load current figure of 37 amps by 90%.

$$37 \text{ no load amps} \times 90\% = 33 \text{ no load amps}$$

2. Turning to the catalog page for 480 volt, 3-phase capacitors, find the closest amp rating to, but NOT OVER 33 amps. See Table 1, sample catalog pricing chart. Per the sample chart the closest amperage is 32.5 amps. The proper capacitor unit, then is 27 kvar and the appropriate catalog number depends on the type enclosure desired.

NOTE: The formula method corrects power factor to approximately .95

If the no load current is not known . . .

If the no-load current is unknown, a reasonable estimate for 3-phase motors is to take the full load amps and multiply by 30%. Then take that figure and multiply times the 90% rating figure being used to avoid overcorrection and overvoltages.

EXAMPLE: Size a capacitor for a 75hp, 460V 3-phase motor which has a full load current of 92 amps and an unknown no-load current.

1. First, find the no-load current by multiplying the full load current times 30%.
 $92 \text{ (full load amps)} \times 30\% = 28 \text{ estimated no-load amps}$
2. Multiply 28 no-load amps by 90%.
 $28 \text{ no-load amps} \times 90\% = 25 \text{ no-load amps}$
3. Now examine the capacitor pricing and selection chart for 480 volt, 3-phase capacitors. Refer again to Table 1. Here it will be seen that the closest capacitor to 25 amps full load current without going over is a 20 kvar unit, rated at 24.1 amps.
4. The correct selection, then, is 20 kvar!

TABLE 1
480 VOLT, 60 Hz., 3-Phase

Enclosure Size	kvar Rating	Rated Current Per Phase	Approx. Shipping Weight (Lbs.)	Indoor – Nema 1	Outdoor – Nema 3	Indoor – Nema 12
				Catalog Number	Catalog Number	Catalog Number
	1.5	1.8	8	C44G1.5	C44R1.5	C44D1.5
	2	2.4	8	C44G2	C44R2	C44D2
	2.5	3.0	8	C44G2.5	C44R2.5	C44D2.5
	3	3.6	8	C44G3	C44R3	C44D3
	4	4.2	8	C44G4	C44R4	C44D4
	20	24.1	13	C44G20	C44R20	C44D20
	22.5	27.1	13	C44G22.5	C44R22.5	C44D22.5
	24	28.9	13	C44G24	C44R24	C44D24
	25	30.1	13	C44G25	C44R25	C44D25
	27	32.5	13	C44G27	C44R27	C44D27
	30	36.1	13	C44G30	C44R30	C44D30
	32.5	36.1	13	C44G32.5	C44R32.5	C44D32.5
	35	42.1	22	C44G35	C44R35	C44D35
	37.5	45.1	22	C44G37.5	C44R37.5	C44D37.5