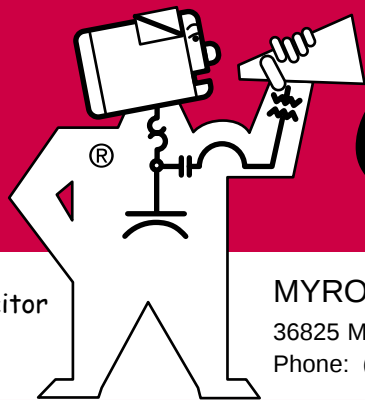




MYRON ZUCKER ^{INC}

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No. 109

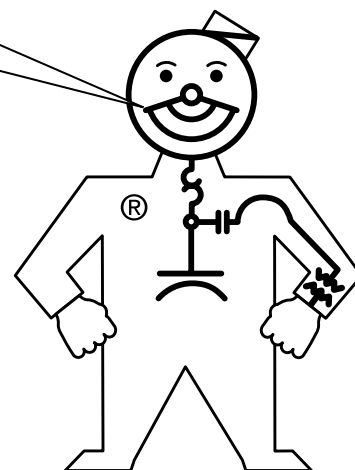
A Letter to CAL (KVAR vs. HP)

Dear CAL,

Can you come up with a rule-of-thumb for sizing a single capacitor to correct the power factor of multiple motors?

Signed,
"Single in Cincinnati"

I can help!



Dear "Single,"

If we look at ranges in the **Myron Zucker, Inc.** CALmanual* (page 9, Table 3, in the 1800-rpm column), we see that the KVAR as a percentage of HP goes from 50% for a 2-HP motor to 24% for a 500-HP motor. This can also be described as a multiplier times HP to determine KVAR. For example, 0.50 would be the multiplier for a 2-HP motor, resulting in a 1-KVAR capacitor.

This inconsistency is due to the following:

- A. Inductances vary by motor manufacturers, affecting the resultant magnetic currents. Magnetic current being motor no-load current.
- B. These tables are based on the average magnetic current of all motor manufacturers.
- C. The capacitor manufacturers have selected the nearest standard KVAR rating for these motors.

* The **Myron Zucker, Inc.** CALmanual can be found on our website: www.myronzucker.com.

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Using the table in the CALmanual, if you consider all the multipliers used, you will find that the average is 0.317. But if we use a 0.33 multiplier as a rule-of-thumb, we get the following results:

<u>HP</u>	<u>Results</u>
2-10	Low KVAR Values
15-25	O.K.
30	High KVAR Values
40-50	Low KVAR Values
60-100	O.K.
125-300	High KVAR Values

So let's use this rule-of-thumb on some multiple motors and see what happens.

Example:

For 1800-rpm "T-frame" nema "Design B" motors:

KVAR Values

<u>HP</u>	<u>by Table 3</u>	<u>Rule-of-Thumb</u>
25	7.5 KVAR	8.25 KVAR
50	17.5 KVAR	16.5 KVAR
75	25 KVAR	25 KVAR
100	30 KVAR	32.5 KVAR

Totals: 250 HP 80 KVAR 82.25 KVAR
(1) 250 HP 60 KVAR

Results:

(1) 250 HP by Table 3 is 60 KVAR.

Total 250 HP using individual capacitors is 80 KVAR.

Total 250 HP using rule-of-thumb is 82.25 KVAR.

Now we have three (3) different KVAR values: 60, 80 and 82.25 KVAR.

Using Total HP (250) by Table 3 results in 60 KVAR. Larger motors have lower magnet currents. So if we add up the HP and take the total (250 HP) and use Table 3, we end up with a lower power factor on your system.

Using the rule-of-thumb, we end up with a higher KVAR sometimes, but only by an insignificant amount. So if only the total HP is known, using the rule-of-thumb 0.33 multiplier will get us in the ballpark.

But if individual motor HP is known, **Myron Zucker, Inc.** recommends using the individual capacitor amount of 80 KVAR, for the following reasons:

- A. These Tables have been used for more than 40 years with no known problems.
- B. The higher KVAR value 80 KVAR will not cause a leading power factor.
- C. On the electrical system or main bus, there are other loads that also need to be corrected:
 - small motors
 - inductive loads
- D. The only disadvantage with the above is that, if some motors are not on the system—let's say half (50%) or more of the motors are off-line—the result could be a leading power factor. If the motor program (time on/off) is known, then the average HP total should be used from Table 3.

If you have any questions for **CAL** about your power factor capacitors, simply write to **Myron Zucker, Inc.**, or e-mail us at info@myronzucker.com.

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