RELIMANS
Reliability & Maintenance Specialists

How to measure the efficiency of an asynchronous electric motor?

In most of the plants that we visited, we have noticed that electric motors are purchased under a non-methodical manner.

That is, if previously a 50 kW electric motor was used, turns out that we must buy another one of 50 kW.

In many cases, electric motors are over-specified. If the required mechanical power is 25 kW, we are still buying the same 50 kW engine.

This results in an unnecessary waste of electricity. Under NEMA-standard motors, have their maximum efficiency to 75% of the maximum nominal power. Under European standard IEC motors have maximum efficiency at 100% of nominal power.

Therefore if we want to buy a motor suited to its mechanical performance requirements, and this mechanical provision is of 100 kW, if engine is under NEMA-standard, you should buy one of 133 kW, and if it is under IEC standard, it must be purchased of 100 kW.

How to make the calculation of the mechanical provision which will be to submit the electric motor is illustrated below.

How to make the calculation for efficiency:

The value kW that is read on the display of the Power Clamp should point, in order to apply to the following formula:

$$\text{Efficiency} = \frac{\%\ \text{HP load} \times 0.746}{\text{KW}} \times 100$$

For the calculation of the % load, the value in HP that is read on the plate of the motor, as well as the RPM will be considered at this power. With lamp strobe recorded the actual RPM of the engine working and will apply the following formula:

$$\%\ \text{Carga} = \frac{(\text{RPMsynchronous} - \text{RPMreal})}{(\text{RPMsynchronous} - \text{RPMMaximum nominal power})} \text{kWplate}$$

USE THE POWER CLAMP KWC-2000

First step: WR(L1)/FR(L1)

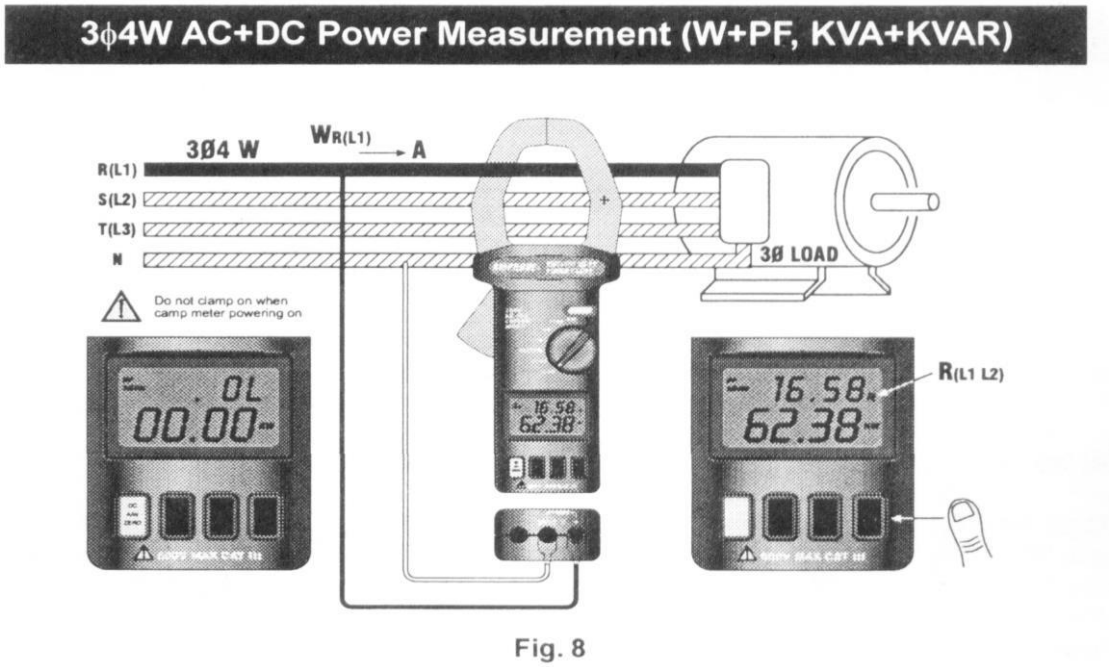

Fig. 8

1 Rotate the jog wheel to the 3o4w position, without attaching the clamp to any cable.
2. Always press once DCA/DCW ZERO, to wax the watts and current readings.
3. Insert the terminals at the bottom of the Power Clamp.
4. Connect the neutral line (phase-neutral) to the black terminal that is on the COMside of the Power Clamp.
5. Connect the red terminal V, the first phase or R.
6. Hook the clip in the first phase or R. The sign + of the jaw of the clamp should be giving face in the direction from where comes the power.
7. Wait until the reading is stable, press the NEXT button and the R symbol will disappear.

At this time, the value of WR (L1) /PFR (L1) will be saved in the memory, appearing the flashing S icon that instructs the user to take the following read WS (L2) /FS (L2).

Second step: WS(L2)/FS(L2)

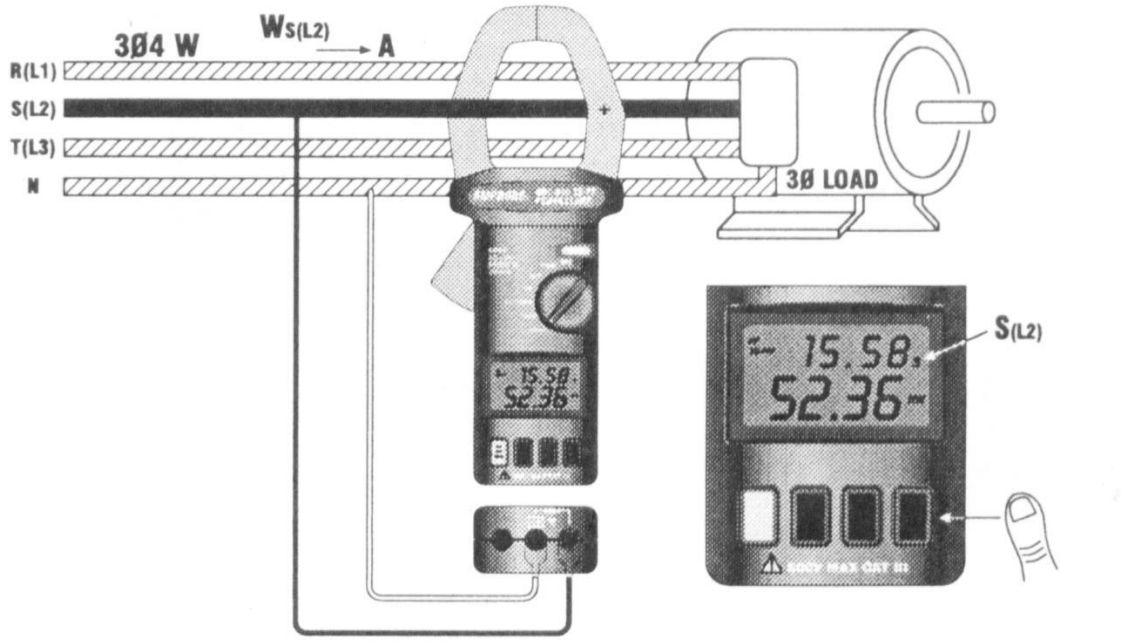

Fig. 9

1. Disconnect the red terminal on the first phase where the clip is hooked.
2. Connect the red terminal V, to the second phase (L2 or S).
3. Unhook the clip from the first phase and close the jaws of the clamp.
4. Always press once DCA/DCW ZERO, to wax the watts and current readings.
5. Place clamp embracing the same phase where is the red terminal (second phase).The sign + of the jaw of the clamp should be giving face in the direction from where comes the power.
6. Wait until the reading stabilizes, press the NEXT button, and disappears the symbol S.

At this point, the value of WS (L2) /PFS (L2) will be saved in memory, appearing the intermittent T symbol that instructs the user to take the following read WT (L3) /FT (L3).

Third measure: WT(L3)/FT(L3)

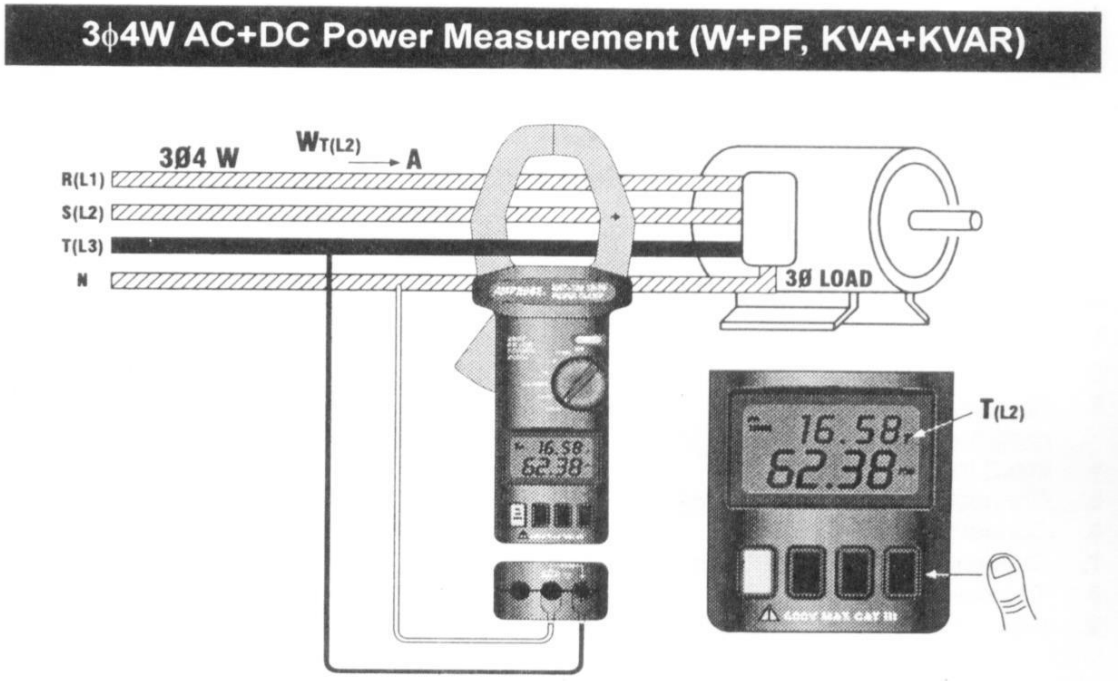

Fig. 10

1. Disconnect the red terminal of the second phase where the clip is hooked.
2. Connect the red terminal V, to the third phase (L3 or T).
3. Unhook the clip from the second phase and close the jaws of the clamp.
4. Always press once DCA/DCW ZERO, to wax the watts and current readings.
5. Place clamp embracing the same phase where is the red terminal (third phase). The sign + of the jaw of the clamp should be giving face in the direction from where comes the power.
6. Wait until the reading stabilizes, press the NEXT button, and disappears the T symbol, appearing instead the RST symbol indicating that the three phases have already measured.

At this point, the value of WT (L3) /PFT (L3) will be saved in the memory.

Power Factor measurements, KW, KVA and KVAR:

Once you press NEXT, Power Clamp will process the values read in the three previous measurements, and the Power Factor value will be displayed on the top line of the total power in KW will be shown on the bottom line.

Optional:
To display the values of the KVAR (on the top line) and the kVA (on the bottom line), simply press KVAR-KVA Power Clamp.

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