



Motors Applied to Variable Frequency Drives (VFD's)

Electric motors can be detrimentally affected when applied with variable frequency drives (VFD's). The non-sinusoidal waveforms of VFD's have harmonic content which causes additional motor heating; and high voltage peaks and short rise times, which result in increased insulation stress, especially when long power cable lengths are used. Standard motors utilized with VFD's must be limited to those application considerations defined in **NEMA MG-1 Part 30**.

NEMA MG-1 Part 31 defines performance and application considerations for Definite-Purpose Inverter Fed motors. To insure satisfactory performance and reliability, Nidec Motor Corporation offers and recommends nameplated inverter duty motor products which meet the requirements of NEMA MG-1 Part 1. The use of non-inverter duty motors may result in unsatisfactory performance or premature failure, which may not be warrantable under the Terms and Conditions of Sale. Contact your Nidec Motor corporation Field Sales Engineer for technical assistance in motor selection, application and warranty details.





ELECTRIC MOTOR LOAD TEST USING THE WATT HOUR METER

In the analysis of electric motors it is sometimes desirable to conduct an accurate load check on a particular installation to determine whether the motor is operating within the rating and horsepower for which it was designed. Since most pumps installations have their own watt hour power meters, accurate readings will permit a load check via the following formula:

K = Disc constant (watts per revolution of disc per hour). This is typically found on the meter face.

R = Revolutions of disc in watt meter within the time of the test.

T = Time of test, in seconds.

Transformer ratio = Stated on meter face. Must be included where current transformers are used with watt meters.

To obtain input kilowatts:

$$\frac{\text{Input KW} = K \times R \times 3.6}{T}$$

To obtain input horsepower:

$$\frac{\text{Input HP} = K \times R \times 4.83 \times \text{Transformer Ratio}}{T}$$

The watt hour meter measures power consumed over a period of time. It is necessary to establish the rate at which power is being consumed by the work being done. We establish this rate by counting the revolutions of the disc in a given time. Here is a typical example of a load check:

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- Pump motor to be load checked is rated 100 HP, 1800 RPM, 3-phase, 60 Hz, 1.15 service factor, 91.0 Percent Efficiency.
- Disc constant (K) found on face of meter = 40.
- Transformer ratio found on face of meter = 3.

DATA FOUND FROM TESTS

With stop watch, disc was observed to revolve 10 times in exactly 49 seconds. Therefore, R = 10; T = 49.

THUS

$$\frac{\text{Input HP} = 40 \times 10 \times 4.83 \times 3}{49} = 118.29$$

$$\begin{aligned} \text{Output HP} &= \text{Input HP} \times \text{Motor Efficiency} \\ \text{Output HP} &= 118.29 \times 91\% = 107.54 \end{aligned}$$

CONCLUSION

The output HP (107.54) is greater than output HP shown on nameplate (100 HP) but is well within the 1.15 service factor which applies to this motor.



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