

Frequently Asked Questions (FAQ) :

Standard Rated Power (kW) Steps

Is the allowance of intermediate steps in "IEC &/Or IS" permitted ?

Preamble

Induction motors are the reliable **"workhorses" of industries**, readily available **off-the-shelf** to streamline inventory and minimize lead times and **ensure fast availability**.

However, the standardization of motor ratings has created a **misconception that only these "preferred" ratings can be used**.

Induction motors are commonly available in ratings such as **45 kW, 55 kW, 75 kW, and 90 kW**. While these are suitable for general applications, **intermediate ratings can be more efficient in specific cases**.

For instance, **consider 100 pumps requiring 57 kW each**. With a 15% reserve margin, the motor rating should be 65.55 kW, rounded to **67 kW (or 90 hp, as was prevalent in earlier days)**.

Opting for the next standard rating of 75 kW instead introduces challenges:

Comparative Analysis of 4Pole, 415V: 67 kW vs. 75 kW for a 57 kW Load

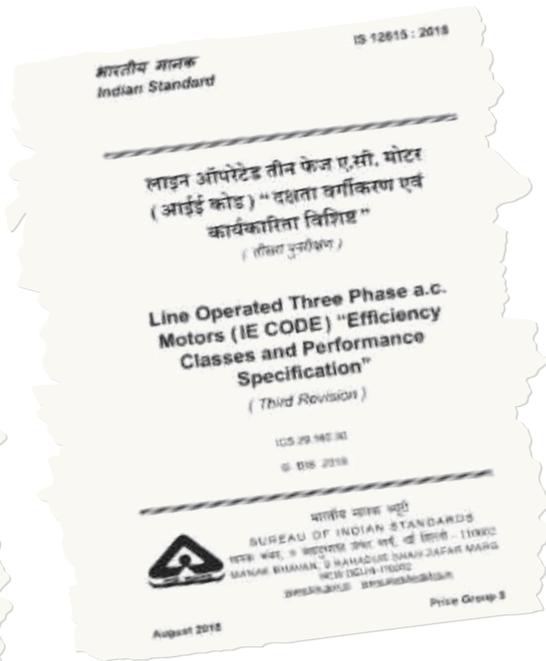
Parameter	67 kW Motor	75 kW Motor	Advantages of 67 kW <i>(Intermediate Steps)</i>
Rated Current (A)	~121 A	~134 A	Lower current reduces cable and starter sizes.
Starting Current for IE2 Eff. Class(A)	~847 A	~938 A	Lower starting current minimizes transformer and breaker sizing.
Efficiency @ Operating Load (%)	~93.0% <i>(at 85% load)</i>	~92.6% <i>(at 76% load)</i>	Higher operating efficiency reduces energy costs.
Power Factor @ Operating Load	~0.83	~0.81	Better power factor lowers reactive power demand.
Cable Size (mm ²)	~25 mm ²	~35 mm ²	Smaller cable size reduces capital cost.
Motor Input Power (KVA)	~73.8 kVA	~76.0 kVA	Energy savings due to reduced losses.
Fixed Load Price <i>(Electricity Board)</i>	Lower	Higher	Reduced electricity charges due to optimized motor usage.

Benefits of Intermediate Power Steps:

1. **Energy Efficiency:** Motors rated closer to the actual load operate more efficiently, reducing energy waste and costs.
2. **Optimized Cost:** Lower rated currents lead to lower electricity charges.
3. **Improved Power Factor:** Motors closer to their rated load achieve improved power factor, reducing reactive power demand.
4. **System Reliability:** Reduced stress and heat generation enhance motor & switch gear lifespan and reliability.

Standards Permitting Intermediate Power Steps

IEC 60034-30-1 and IS 12615 explicitly allow for intermediate power steps.



5.4.5 Interpolation of nominal efficiency limits of intermediate rated powers for 50 Hz mains supply frequency

To determine normative nominal efficiency limits of 50 Hz motors with rated powers not given in the tables above within the range of 0.12 kW up to 200 kW the following formula shall be applied:

$$\eta_N = A \cdot \left[\log_{10} \left(\frac{P_N}{1 \text{ kW}} \right) \right]^3 + B \cdot \left[\log_{10} \left(\frac{P_N}{1 \text{ kW}} \right) \right]^2 + C \cdot \log_{10} \left(\frac{P_N}{1 \text{ kW}} \right) + D$$

where A, B, C, D = interpolation coefficients (see Tables 11 and 12); P_N is given in kW.

15.4.4 Interpolation of nominal efficiency limits of intermediate rated powers for 50 Hz mains supply frequency.

To determine normative nominal efficiency limits for 50 Hz motor with rated powers not given in the tables above within the range of 0.12kW up to 200kW the following formula shall be applied:

$$\eta_N = A \cdot \left[\log_{10} \left(\frac{P_N}{1 \text{ kW}} \right) \right]^3 + B \cdot \left[\log_{10} \left(\frac{P_N}{1 \text{ kW}} \right) \right]^2 + C \cdot \log_{10} \left(\frac{P_N}{1 \text{ kW}} \right) + D$$

where, A, B, C, D = interpolation coefficients (see Table 5 and Table 6) ; P_N is given in kW

As mentioned in Standard:

"To determine normative nominal Efficiency limits for 50 Hz motor with rated powers not given in the tables abovecan be calculated from above formula."

Above standards are designed to accommodate specific industrial requirements, **enabling the use of motors with ratings like 67 kW when necessary**. This flexibility helps achieve an optimal balance between standardization and application-specific needs.

Conclusion

Adopting intermediate power ratings strikes a balance between standardization and tailored performance, delivering technical and environmental benefits. Industries should actively consider this approach to optimize their operations and contribute to a more sustainable future.