

# What is the difference between IEEE and IEC standards in terms of kW, kVAR, and PF (power factor)?

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## Issue

Understanding and interpreting the sign of a power factor (PF) value.

## Resolution

**A lagging power factor denotes that on the phasor diagram, the current lags (is behind) the voltage, and a leading power factor denotes that the current leads (is ahead) the voltage.**

**For inductive loads (e.g. induction motors, coils, lamps), the current lags behind the voltage, thus having a lagging power factor.**

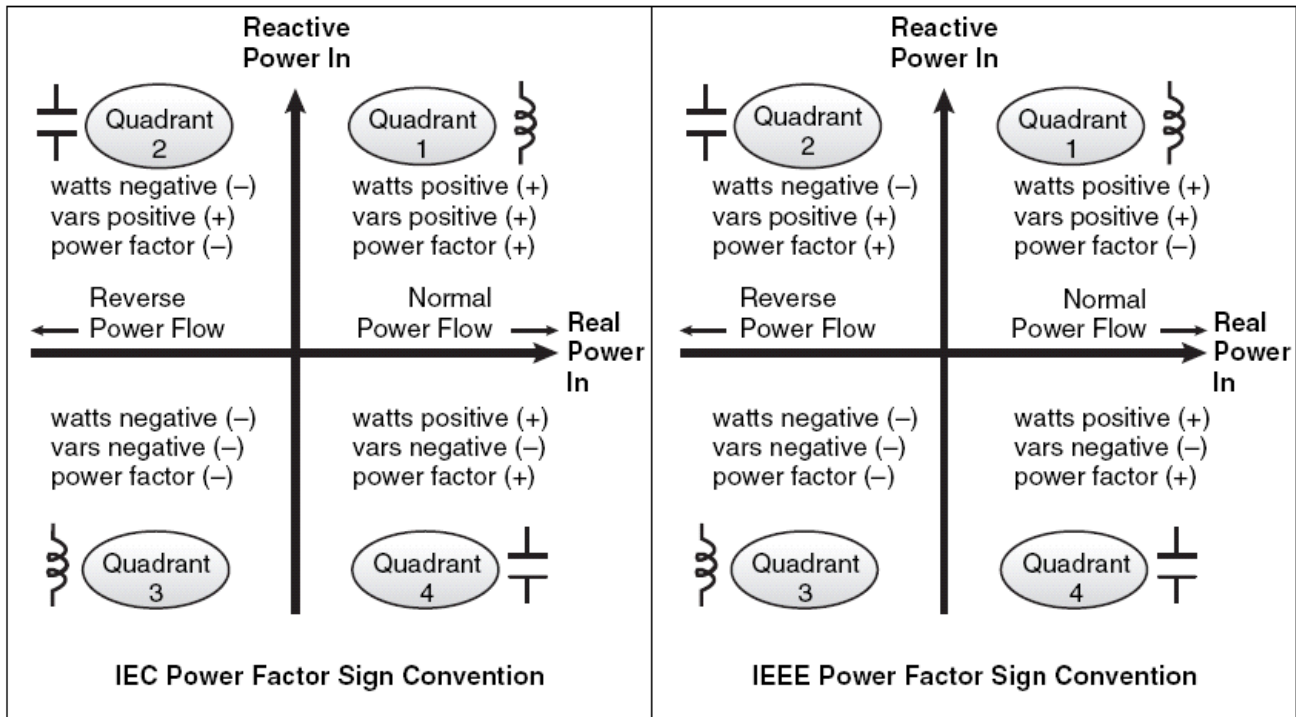
**For capacitive loads (Synchronous condensers, capacitor banks) , the current leads the voltage, thus having a leading power factor.**

**The lagging or leading distinction does NOT equate to an positive or negative value. Rather, lagging corresponds to an inductive load, while leading corresponds to a capacitive load.**

**The negative and positive sign that precedes the power factor value displayed is determined by the standard used, that is either the IEEE or IEC standards.**

This can be seen in the diagrams below.

The following diagrams show the correlation between kW, kVAR, PF, and inductive or capacitive loads for both the IEEE and IEC standards.



According to the IEC convention, (left on the figure above), the Power Factor sign is solely dependent on the direction of Real Power flow, and is independent of the load being Inductive or Capacitive.

The power factor is positive for normal (positive) Real Power flow, that is when Real Power flows into a load, i.e energy is being consumed by the load.

The power factor is negative for reverse (negative) Real Power flow, that is when Real power flows out of the load. i.e energy is being generated by the load (as would be the case for any power generation plant)

According to the IEEE convention, (right on the figure above), the Power Factor sign is solely dependent on the nature of the load (that is Capacitive or Inductive). In this case, it is independent on the direction of Real Power flow.

For an Inductive load the Power Factor is negative.

For a Capacitive load, the power factor is positive.

**NOTE that load here refers to whatever is being monitored for power and energy usage.**

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