

## Power Factor Considerations

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### Application

This Guidance Note applies to the installation of all Save It Easy® products installed in **switch start luminaires** with in-circuit power factor correction capacitors, with the exception of 2 foot modular quadruple and triple lamp fittings.

### About Power Factor

The Power Factor (PF) is the ratio of the '*useful*' power dissipated in a device compared to the '*total*' power supplied to it. It applies to all electrical devices that run on AC current that are not pure resistances.

If a device is a pure resistance, the '*useful*' power equals the '*total*' power and hence the PF is one. In all other cases, i.e. devices that contain capacitors and/or induction coils, the '*useful*' power is less than the '*total*' power, giving a PF of less than 1 and causing an extra load on the supply. This is generally undesirable as it means that the electricity generators have to produce more energy to meet the requirement.

If a device is an inductive load, e.g. an electromagnetic ballast, the PF is lagging, i.e. the current will peak *after* the voltage, whereas a capacitive load, e.g. a PF Correction Capacitor, has a leading PF because the current peaks *before* the voltage.

## Power Factor Correction Capacitors

Electromagnetic ballasts have a poor lagging PF, typically in the range 0.35 to 0.5, and thus can impose a significant extra load on the supply. To correct this problem, luminaire manufacturers normally install a PF correction capacitor in the ballast circuit to bring the PF up to a more acceptable level.

Save It Easy® is designed to produce a PF close to unity (in the range 0.92 to 0.98 depending on the adapter) when used in circuit with the existing electromagnetic ballast. This means it is much better than an electromagnetic ballast from the point of using the power supplied to it and so does not need a power factor correction capacitor in the circuit.

As a consequence, when Save It Easy® is installed in a luminaire that has a PF correction capacitor in-the ballast circuit, the effect of Save It Easy® combined with the PF correction capacitor will produce what is called an Over Compensation Effect.

This has two main effects.

The first is a low, leading, PF. The tables below show the change in PF for different values of capacitor compared with the existing ballast configuration for the most common lamp sizes.

The second is an increased current compared to Save It Easy® without the PF Correction capacitor in circuit and sometimes compared to that of the existing electromagnetic ballast system.

## Implications of a low leading Power Factor

Generally, it is undesirable that the PF, when measured at the point of the incoming supply for the site, has a leading value.

However, the PF at the incoming supply is a result of the combined effect of all the electrical equipment being used on the site and the balance is usually such that it will be improved by the addition of capacitance (i.e. equipment with a leading PF). Often power factor correction equipment is specifically installed precisely for this purpose. In such circumstances, the leading PF caused by the Over Compensation Effect will have beneficial consequences and therefore no action is normally required.

The only time that any corrective action to reduce or eliminate the leading PF is likely to be necessary is when the lighting circuits in which Save It Easy® is installed so dominate the incoming electrical supply that it may cause the PF at the point of incoming supply to go leading.

In the event of concern that the leading PF might be an issue, users should consult the tables shown below or contact ECSL Technical Support for further information as appropriate, to help assess the

position. A simple spreadsheet is also available that will provide guidance as to the likely Power Factor outcome based on the quantities and types of luminaire installed.

## Implications of an increased current

In most cases, the higher current produced as a result of the OCE will still be less than the current consumed by the original electromagnetic ballast circuit and therefore is of no concern.

However, practical experience indicates that in the case of 4 foot quad fittings, there is a tendency for the current to be sufficiently high that the MCB may be tripped and we therefore recommend that corrective action is taken.

## Corrective Action

To eliminate the effects of the OCE, when required, the solution is simply to remove the existing PF correction capacitor, which is wired across the incoming live and neutral, during the installation process.

Please note that although many luminaires with non-switch start electromagnetic ballasts are fitted with PF correction capacitors, the capacitor is normally installed in the starter circuit and, as a consequence, removed from the circuit as part of the standard installation process. Similarly, 2 foot modular quadruple and triple lamp fittings also have their capacitors removed during the installation process.

