



## Special focus on installations operating at 400 Hz

In general, the **frequencies of industrial AC supplies** are usually either **50 Hz** (Europe, Asia, Africa) or **60 Hz**, as in North America. Some electrical applications, however, use a different fundamental frequency.

For example, **400 Hz** is used in **civil and military aviation**. Designed specially for such applications, the transformers and motors operating at 400 Hz are much more compact and lightweight than their 50 or 60 Hz equivalents.

At such frequencies, the current cannot be transmitted over long distances at low cost, so the use of 400 Hz supplies is usually restricted to vehicles or buildings for **economic** reasons.

The main advantages of 400 Hz equipment and motors are their compact size and light weight, which is why they are used in the aviation sector. Furthermore, 400 Hz applications usually have a power of few hundred kW with relatively low short-circuit currents which rarely reach 4 times the rated voltage.

## MAINTENANCE

400 Hz network

Harmonics

Electrical  
disturbances

## Even at 400 Hz, there are still harmonics present...

The waveform of the current consumed by the loads hooked up to the electricity distribution network is often no longer purely sinusoidal. This current distortion leads to voltage distortion which also depends on the source impedance.



The **disturbances** called **harmonics** are caused by the use of non-linear loads on the network, such as equipment containing power electronics, switching power supplies, variable speed drives, etc. They may have immediate consequences on some electrical appliances: functional problems (synchronization, switching), untimely tripping, measurement errors on energy meters, etc. More seriously and more expensively, the additional heating which results may reduce the life span of rotating machines, capacitors, transformers and neutral conductors in the medium term. To avoid these problems, regular **preventive maintenance** is carried out.

## At 400 Hz, some disturbances are amplified...

When an aircraft is parked at the stand, it is recharged either via a jetway or by a mobile generator set. When the power is supplied via a jetway fitted with a 400 Hz transducer upstream, new disturbances introduced by the earth bond may appear.

On a source with a fundamental frequency of 400 Hz, the harmonics will cause high earth leakage currents due to stray capacitances between a piece of equipment or conductor and the earth. They offer a possible route for the leakage currents whose effects may include untimely tripping of RCDs.

Overheating of cables carrying harmonic currents occurs even more quickly on all parts of the installation. As 400 Hz sources are usually low-power, the values of their harmonics are higher.

Although specific cables are available for these applications, harmonic filtering solutions must be implemented after taking the necessary **measurements**. These filters will be sized according to the harmonic frequencies encountered and their amplitudes.

## How to perform the measurements

Our F407 & F607 clamps can be used for installation maintenance on 50 Hz, 60 Hz, 400 Hz and 800 Hz electrical networks. They are ideal for all the measurements needed: power values, harmonics with harmonic decomposition, Min/Max values, etc.



F407 SCREEN  
H3 harmonic measurement with a 400 Hz fundamental frequency

F407 clamp



F607 clamp

