The Wiring Regs: Do Your Installations Really Comply?

If you're responsible for an electrical installation in the UK, it will almost certainly need to meet the requirements of the **IET Wiring Regulations** (BS 7671). Very likely it will have been certified as doing so, but can you be sure? **Julian Grant** of **Chauvin Arnoux** raises some thought-provoking issues.

From the very first edition, which was published as long ago as 1882, the IET Wiring Regulations have been formulated as an aid to ensuring that electrical installations are safe and pose minimal risk to users. An important factor is and has always been ensuring that conductors and equipment are properly sized for the currents they are required to handle. And final confirmation that this requirement is being met, especially after an installation has been modified or extended, is to measure the current and confirm that this is within the permissible ratings of the cables and equipment.

Making measurements under operating conditions is without doubt an excellent way of assessing the performance and safety of an electrical installation – but there's a trap for the unwary. This statement is only true if the measurements are accurate and reliable. But why wouldn't they be? Most current measurements are likely to be made with a fairly modern clampmeter and, provided that this was procured from a reputable manufacturer and has been calibrated at appropriate intervals, surely it can be relied on to give accurate results?

The answer is yes – and no! That clampmeter may well give accurate results when used in the conditions for which it was designed, but those conditions may not reflect what's going on in many of today's electrical installations. Let's cut to the chase. There are two factors that may affect the accuracy of current measurements made with a typical clampmeter, including some that are still on the market today. These issues are harmonics and DC currents.

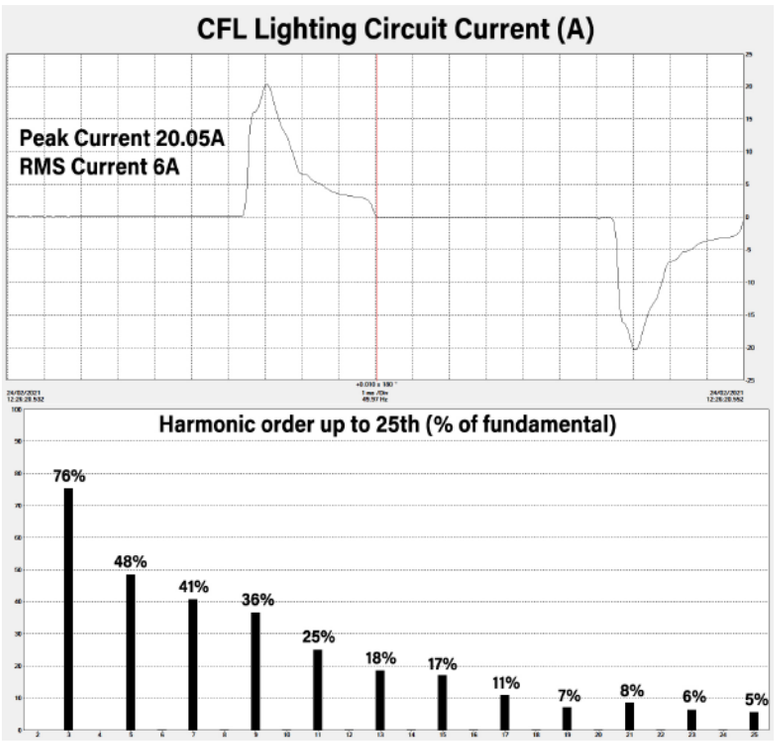
A few years ago, neither of these was a particular problem, especially in domestic installations, but that situation has changed. Factories, offices, shops and even our homes are now full of non-linear loads like LED lighting systems, televisions, computers, audio equipment, vacuum cleaners, air conditioning systems, washing machines and many others. All of these loads have the potential to produce harmonics so it's no longer safe to assume that harmonics are an issue that's confined to large industrial installations. Some of these types of load and also some renewable energy systems, such as solar PV installations, can also inject DC currents into the supply and, once again, this can happen in domestic as well as commercial and industrial environments.

All of this is bad news if you're trying to make accurate current measurements using a typical clampmeter. Many of these are designed in such a way that they read correctly only when the current being measured has a pure sinusoidal waveform or something very close to it. With instruments of this type, the waveform distortions introduced by harmonics will seriously degrade measurement accuracy.

And there's another issue: frequency response. A lot of clampmeters have a frequency response that extends no

further than around 500 Hz, so they will measure currents at higher frequencies inaccurately if, indeed, they measure them at all. That may not sound too bad – after all 500 Hz is the tenth harmonic on a 50 Hz supply system – but experience shows that today's non-linear loads frequently generate harmonics well beyond this – 11th, 13th, 15th and even higher harmonics are by no means unusual.

This deficiency is significant because the heating effect of harmonic currents can often be higher than that of the fundamental current, and in some equipment is proportional to the square of the harmonic order. In the example shown of a CFL lighting circuit there are significant quantities of odd harmonics, relative to the fundamental current. In this case a "standard" clampmeter from a leading brand under reported the RMS current by 50% – displaying a reading of 2.9A versus the actual 6A RMS present in the circuit.



The final problem with traditional clampmeters is not connected with high frequencies, but with DC. This is because many of them simply don't respond to DC, so that if there's a DC component in the current be measured, it will be ignored.

In summary, if you're using a typical clampmeter to check an electrical installation, the current measurements it produces may well be inaccurate, for the reasons we've discussed. And if your current measurements are inaccurate, how can you be sure that your installation satisfies the requirements of the IET Wiring Regulations? Fortunately, there is a simple solution to this conundrum, and that's to acquire one of the new generations of clampmeters which has been designed from the ground up to take into account the conditions likely to be found in today's electrical installations.

Excellent examples are the F407 and F607 clampmeters from Chauvin Arnoux. These measure currents up to and including the 25th harmonic (1250 Hz), and they also feature true RMS measurement, which means that the accuracy of the results they deliver does not depend on the current or voltage being measured having a sinusoidal waveform. They also include any DC component in current measurement results.

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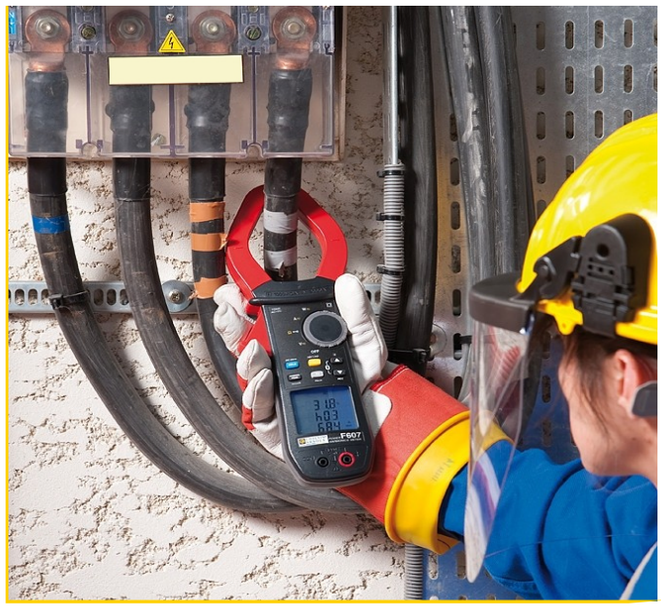
The F407 and F607 will, therefore, provide complete certainty that current measurements made with them reflect the true operating conditions of the installation. But that's not all they can do. These versatile instruments also measure true inrush current for motors and inductive loads, as well as power factor and active, reactive and apparent power. Investing in an instrument of this type is money well spent because with it you not only have a valuable tool for installation testing and diagnostics, but you can also use the results it produces for reassurance that your electrical installations really do meet the requirements of both the IET Wiring Regulations and Electricity at Work Regulations.



Chauvin Arnoux Ltd
Unit 1 Nelson Ct, Flagship Sq, Shaw Cross Business Park
Dewsbury, West Yorkshire - WF12 7TH
Tel: +44 1924 460 494
Fax: +44 1924 455 328
info@chauvin-arnoux.co.uk