WHITE PAPER

CHECKBOXES VERSUS CALIBRATIONS

MASTER CALIBRATORS

INTRODUCTION

In some parts of the electrical industry, there is a misunderstanding that a meter check using a check box can be deemed as a calibration, be considered equivalent to a full calibration, or even replace calibrations. This document has been put together to show why this not true, and whilst check boxes do have their place for quick and regular verifications or checks, they have no place in replacing regular full calibrations.

DEFINITIONS

Calibration: The most concise and basic definition of calibration is "comparison of the device under test against a traceable reference Standard (Calibrator) and documentation of the results".

A more detailed definition is that Calibration is the process of comparing the Instrument Under Test (IUT), to a Calibrator of known output and high accuracy, which is known as a 'Standard'. The second device is known as the Instrument Under Test (IUT), which is the client's electrical meter/s. To meet the generally accepted definition of a calibration, the 'Standard' should be more accurate than the IUT by a factor of 4. When performing an electrical calibration, one makes a detailed comparison between a Standard (Calibrator) and the Instrument Under Test (IUT) and records the results. These results are provided to the owner of the IUT, generally with Pass/Fail advice for each function of the electrical meter. The Pass/Fail is given according to whether results are within the electrical instruments (or electrical meters) manufacturers advised calibration tolerances or not.

Check: An instrument check is simply verification that an instrument's functions are operational and working. A check does not asses the accuracy of these functions, it simply assesses whether they work correctly, or not. Check boxes are therefore, by definition, designed for users to check their instruments on a regular basis to ensure functionality and safety, not to replace calibrations.

RANGE OF TESTS

A calibration will not only test across all of the functions of an IUT, but also the full range of all of the functions that the IUT has. A calibration will also take into consideration the meters actual specifications and tolerances that are outlined in the manufacturers specifications. A calibration will ensure the accuracy of the meter under test across the all functions, and the full range of those functions. A checkbox will generally just check the operation of functions across a very small and limited section of the meters functionality.

As an example, most popular check boxes on the market often only check the functionality of the 30mA and 150mA on an RCD tester. In order to fully comply with the definition of a calibration, you are required to verify that all the RCD ranges that the IUT has, are within manufacturer's specified tolerances, even if you never use them (most domestic electricians will state they only ever use 30mA). To use an example as to why this is not a valid argument, if your motor vehicles lights do not work, you will not pass a Road Worthy, even if you say you only drive during the day. Once again a checkbox is only verifying functionality on these limited tests, and not proving accuracy.

When performing a calibration, an IUT can often be proved accurate on one part of the range on any given function, and still fail in other sections of that same function. Therefore, if an IUT is functioning at 240V AC on a check box, it doesn't by any means ensure that it is correct or functioning at all at other voltages, including 415V AC. A verification that AC Voltage is functioning also doesn't mean that any of the DC function whatsoever is working or accurate. Once again a checkbox is only verifying functionality, and not proving accuracy. It is also worth noting that a checkbox will usually only check Voltage at 240V AC. Checkboxes that offer a voltage check can only output the supply voltage that it is plugged into.

Given the above information, use of a check box cannot be classed as a calibration.

ACCURACY

As mentioned above, to meet the generally accepted definition of a calibration, the 'Standard' used to calibrate an instrument, should be more accurate than the IUT by a factor of 4. Check boxes will not meet these criteria in almost all cases.

To meet this factor of 4 for most instruments on the market, the check box would need to be significantly more accurate than any of the common models on the market are.

Alternatively, to meet this factor of 4 using most commonly available checkboxes, the instrument would need to have extremely wide tolerances and be extremely inaccurate. On these criteria alone, use of a check box cannot be classed as a calibration.

An interesting side note is that there is also a clear requirement in AS/NZS3000, that system voltages are tested, and that they are within a certain tolerance (+10%/-6% in Aust, +6%/-6% in NZ).

Without performing proper calibrations, which allow you to know the accuracy of your instruments, you are not able to ascertain if any installation tested with your instrument, meets that AS/NZS3000 tolerance requirement (you need to know the uncertainty of your instrument to do that, something that is provided on calibration exports).

Clause 1.6.2(c) Supply characteristics of AS3000 (pg. 51) states the nominal voltage and tolerances for low voltage supply systems and electrical installations are –
a.   For Australia, 230/400 V +10% to -6% and
b.   For NZ, 230/400 V +6% to -6%

NOTE: Checkboxes that offer a voltage check can only output the supply voltage that it is plugged into, and do not measure, display or verify what that voltage actually is, making it impossible to ascertain the uncertainty of your instrument from this check.

REPORTING

ISO17025 is a very clear and concise standard, designed to define how paperwork and record keeping is controlled for a calibration laboratory and/or services. For any testing, verifications or checks to be considered as a calibration, it should meet this standard.

In most cases, the user of a checkbox is not reporting his results whatsoever, and if there is any record keeping, it will almost certainly not meet the requirements of ISO17025.

All reputable Calibration providers on the other hand, will always provide certification that is compliant with ISO170125. This means a calibration certificate is provided showing all the tests undertaken (tests applied and result, and resulting accuracy), accuracy and uncertainty statements on the Standard that was used, traceability information on the Standard that was used, authorised signatories and much more. Without this level of documentation, any checks performed simply cannot be considered to be a calibration, and are by definition is simply a check.

COMPLIANCE

In conclusion, to fully comply with legislative requirements and manufacturer's specifications, a checkbox neither has the accuracy, range of capabilities or general technology to effectively verify that an IUT's functions are within the manufacturer's allowed tolerances across the full ranges of all functions. A calibrator is specifically designed with hardware and software to effectively verify all functions and ranges on a meter to the correct tolerances, and a reputable Calibration company will report these results in compliance with ISO17025, which ensures it is done in a manner than ensures traceability and compliance of the calibration.

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