

### CEGB/Nuclear Electric/B.Energy/ EDF Energy Type Test Approvals

The instrumentation that AMELEC offers to the market place is based on analogue techniques, using readily available discrete components. The instruments **do not contain** any Software, Firmware or Utility, time dependent or Microprocessor based circuitry!

The design principles used throughout the ranges of instruments are based on well tried and proven in use for over forty years, linear operational amplifier circuitry. The instrument circuits can be considered as a number of functional blocks assembled together to produce a specific control function. The analogue circuit blocks we use today are essentially the same as the ones we have used for the last forty years.

To confirm that the instruments are compliant with the latest standards and minimise the expense at the test houses, we have submitted a range of different instruments including all of the various circuit blocks in them. The reference standards used at the test houses have been: IEEE323 / IEEE344, the CEGB's EES1980 / EES1989, the BS6667, IEC801 and more recently the IEC61000 standard to the full Generic Industrial test levels.

Where we supply the 'K' option products, the instruments offered will comply with the Radio Frequency Immunity testing in accordance with the CEGB's DN5, IEC801-3 / IEC61000-4-3:2006/A2:2010. When applied to instruments the standards allow for an error of up to  $\pm 1\%$  max when the equipment is subjected to RF interference in the frequency range of 20 to 1000MHz, in a field strength of up to 10V per metre. The AMELEC instrument range has also been successfully tested and approved over the higher frequency ranges and field strengths.

Where we supply instrumentation to those area's that require Seismic qualification, the units will have the Surface or Keyhole plate mounting arrangements. These modules were qualified on a tri-axial seismic table to the Sizewell B spectra 5 x OSE tests (20% SSE), 1x SSE test. In addition they were shaken to 0.25g & 0.4g all sites spectra, passing all tests and giving considerable confidence in their seismic capability, achieving Class 1E Qualification for continuous duty Analogue equipment to perform their safety function.

All instruments are suitable for use as elements within Sil 1, SIL 2 & SIL 3 rated (IEC61508) Safety instrumented System (SIS) loop applications, and covered by up to 10 Years warranty.

*Extract below is from a summary memo we received in 2016, further to additional independent 3<sup>rd</sup> party Type Testing on a mix of AMELEC instruments recently used on EDF Energy (HAR/HYA) projects;*

#### **Classification:** UNCLASSIFIED

XXXXXXXXXX Nuclear have used Amelec units as part of equipment that they have supplied and as part of the qualification process, type testing was undertaken. The following is a list of Amelec units that were subjected to testing along with a summary of the tests carried out.

Amelec Units Used: ADM230K, ADM231K, ADM240KX, ADT132DIKTX, ADM239KX

Summary of EMC tests carried out (with levels indicated where appropriate);  
BS EN 61000-4-4:2004+A1:2010 (3kV on dc power ports, 2kV on dc control ports)  
EN61000-4-3:2006+A2:2010 at the following frequencies and field strengths:  
165 MHz 30 V/m, 385 MHz 30 V/m, 454 MHz 30 V/m, 873 MHz 30 V/m,  
889 MHz 40 V/m, 1.75 GHz 40 V/m, 1.93 GHz 14 V/m, 2.44 GHz 10 V/m,  
2.60 GHz 14 V/m, 5.25 GHz 10 V/m, 5.60 GHz 30 V/m, 5.80 GHz 4 V/m.  
BS EN 61000 4 5:2006 (20V/m over 80MHz - 1GHz, 10V/m over 1.4GHz - 2.0GHz, 3V/m 2.0GHz - 2.7GHz)  
BS EN 61000-4-6 (10V over 150kHz to 80MHz)  
BS EN 61000-4-2:2009 (8kV contact)  
BS EN 61000-6-4:2007+A1:2011 (BS EN 55011:2009)

All tests were passed satisfactorily.