Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

9361

Accredited to ISO/IEC 17025:2017

The Validation Centre (TVC) Ltd

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Calibration performed by the Organisation at the locations specified below

Laboratory location:

Location details	Activity	Location code
Address Unit 15 Brinell Way Harfreys Industrial Estate Great Yarmouth NR31 0LU United Kingdom **Local contact** Mr Chris Cathles Tel: +44 (0)1493 443800 Fax: +44 (0)1493 443900 Email: chriscathles@tvcalx.co.uk Website: www.tvcalx.co.uk	Electrical verification of ultrasonic flaw detection equipment in accordance with the Group 2 tests described in: BS EN 12668-1:2010 BS EN ISO 22232-1:2020 Electrical verification of ultrasonic thickness measuring equipment in accordance with the Group 2 tests described in BS EN 15317:2013. Calibration of TVC Arc Loggers Additional electrical and time measurements	Permanent Laboratory

Site activities performed away from the location listed above:

Location details	Activity	Location code
Calibrations may be performed in suitable areas within the customers' premises. The customers' premises must be suitable for the nature of the particular calibrations undertaken and will be the subject of contract review arrangements between the laboratory and the customer. Contact as above	Electrical verification of ultrasonic flaw detection equipment in accordance with the Group 2 tests described in: BS EN 12668-1:2010 BS EN ISO 22232-1:2020 Electrical verification of ultrasonic thickness measuring equipment in accordance with the Group 2 tests described in BS EN 15317:2013. Calibration of Arc Loggers Calibration of gas flow and nozzle flow meters Additional electrical and time measurements	Site Calibration

Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location code
ELECTRICAL VERIFICATION of ULTRASONIC THICKNESS MEASURING EQUIPMENT				Permanent Laboratory and Site Calibration
As BS EN 15317:2013 Group 2 tests and including the following calibrations and quantities:	9.6: Battery warning and cut off voltage	0.28 %		
	9.7: Battery warning and cut off current	0.24 %		
	9.9: Pulse repetition frequency	1.3 %		
	9.10: Pulse Voltage V_{50}	3.5 %		
	9.10: Pulse Risetime t_r	0.91 ns		
	9.10: Pulse Duration t_d	1.3 ns		
	9.12: Maximum and minimum thickness using gauges	0.20 mm		
ELECTRICAL VERIFICATION of ULTRASONIC FLAW DETECTION EQUIPMENT				
As BS EN 12668-1:2010 and including the following calibrations and quantities:	Stability after warm up (height)	1.2 % of screen height		
	Stability after warm up (width)	1.2 % of screen width		
	Jitter - screen height	1.2 % of screen height		
	Jitter - screen width	1.2 % of screen width		
	Stability against voltage variation (height)	1.2 % of screen height		
	Stability against voltage variation (width)	1.2 % of screen width		
	Pulser Voltage	3.5 %		
	Pulser Risetime	0.91 ns		
	Pulser Reverberation	3.7 % of pulser voltage		
	Pulse duration	1.3 ns		
	Frequency response *0.2 MHz to 30 MHz*	4.1 % at -3 dB point		
	Equivalent input noise	5.4 x 10^{-9} V/√Hz		
	Calibrated attenuator	0.30 dB		
	Vertical Linearity	1.2 % of screen height		
	Linearity of timebase	0.39 % of screen width		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location code
ELECTRICAL VERIFICATION of ULTRASONIC FLAW DETECTION EQUIPMENT (continued) As BS EN ISO 22232-1:2020 Group 2 tests and including the following calibrations and quantities:				Permanent Laboratory and Site Calibration
	Pulser Voltage Pulser Risetime Pulse duration	3.5 % 0.91 ns 1.3 ns		
	Frequency response *0.2 MHz to 30 MHz*	4.1 % at -3 dB point	For instruments designed to comply with BS EN 12668-1:2010, the centre frequency f_0 is calculated using $f_0 = \sqrt{(f_u \times f_l)}$, otherwise the expression $f_0 = (f_u + f_l)/2$ is used.	
	Equivalent input noise	15 %	Using Method A as described in Section 9.4.3.2 of BS EN ISO 22232-1:2020.	
	Equivalent input noise	5.4×10^{-9} V/√Hz	Using Method B as described in Section 9.4.3.3 of BS EN ISO 22232-1:2020.	
	Calibrated attenuator Gain linearity Vertical Linearity	0.30 dB 0.27 dB 1.2% of screen height		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location code
CALIBRATION OF ARC LOGGERS			Other instruments of similar characteristics may also be calibrated.	Permanent Laboratory and Site Calibration
DC Voltage	1 V to 120 V	0.060 %		
DC Current	1 A to 10 A 10 A to 2.5 kA	0.39 % to 0.47 % 0.68 %	Simulated current using multi turn coil.	
Electrical simulation of temperature	-100 °C to +1370 °C	0.42 °C	Type K thermocouple simulation including cold junction compensation.	
AC Voltage at 50 Hz	75 V to 750 V	0.24 %		
AC Current at 50 Hz	1 A to 10 A 10 A to 2.5 kA	0.77 % to 0.97 % 1.7 %	Simulated current using multi turn coil.	
DC Energy	50 kJ to 600 kJ	0.48 %	Measured over 50 s interval	
Velocity	2.5 m/min to 20 m/min	1.5 %	For calibration of fixtures used for wire velocity tests.	
Velocity	0.5 m/min to 2 m/min	2.4 %	For calibration of fixtures used for pipe diameter tests.	
Gas flow				
Calibration of turbine flow meters using Argon gas.	0 l/min to 100 l/min	2.0 l/min	By comparison with a mass flow controller.	
OTHER ELECTRICAL CALIBRATIONS				
Stopwatch calibration	5 s to 60 s	0.30 s	Comparison against reference clock.	
Frequency calibration	40 Hz to 2 kHz	0.12 %	For the calibration of the frequency function of clamp on ammeters and similar devices.	

END

Appendix - Calibration and Measurement Capabilities

Introduction

The definitive statement of the accreditation status of a calibration laboratory is the Accreditation Certificate and the associated Schedule of Accreditation. This Schedule of Accreditation is a critical document, as it defines the measurement capabilities, ranges and boundaries of the calibration activities for which the organisation holds accreditation.

Calibration and Measurement Capabilities (CMCs)

The capabilities provided by accredited calibration laboratories are described by the Calibration and Measurement Capability (CMC), which expresses the lowest measurement uncertainty that can be achieved during a calibration. If a particular device under calibration itself contributes significantly to the uncertainty (for example, if it has limited resolution or exhibits significant non-repeatability) then the uncertainty quoted on a calibration certificate will be increased to account for such factors.

The CMC is normally used to describe the uncertainty that appears in an accredited calibration laboratory's schedule of accreditation and is the uncertainty for which the laboratory has been accredited using the procedure that was the subject of assessment. The measurement uncertainty is calculated according to the procedures given in the GUM and is normally stated as an expanded uncertainty at a coverage probability of 95 %, which usually requires the use of a coverage factor of $k = 2$. An accredited laboratory is not permitted to quote an uncertainty that is smaller than the published measurement uncertainty in certificates issued under its accreditation.

Expression of CMCs - symbols and units

It should be noted that the percentage symbol (%) represents the number 0.01. In cases where the measurement uncertainty is stated as a percentage, this is to be interpreted as meaning percentage of the measurand.
Thus, for example, a measurement uncertainty of 1.5 % means $1.5 \times 0.01 \times q$, where q is the quantity value.

The notation Q[a, b] stands for the root-sum-square of the terms between brackets: $Q[a, b] = [a^2 + b^2]^{1/2}$