



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: August 31, 2021

Certificate Number: 2734.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 7}:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
DC Voltage ³ – Measure	(0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V	0.0069 % + 4.9 μV 0.0049 % + 15 μV 0.0041 % + 140 μV 0.0053 % + 1.9 mV 0.0052 % + 21 mV	Agilent 34410A
Resistance ³ – Measure	(0 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ	0.14 % + 6.0 mΩ 0.058 % + 29 mΩ 0.019 % + 290 mΩ 0.015 % + 2.9 Ω 0.041 % + 33 Ω 0.12 % + 1.2 kΩ	Agilent 34410A

II. Magnetic (MIZ-80, MIZ-81, MIZ-85)

Parameter/Equipment	Range ⁵	CMC ^{2,4} (±)	Comments
Receiver Amplifier Linearity ³ – Eddy Current Instrumentation	(0 to 100) % of Full Scale	0.51 %	Agilent 33250A
Receiver Quadrature ³ – Eddy Current Instrumentation	(0 to 360)°	0.023°	Agilent 33250A, ZETEC ACM/frequency, Tektronix TDS-3054B
Receiver Gain ³ – Eddy Current Instrumentation	(0 to 80) dB	0.26 %	Agilent 33250A, ZETEC ACM/frequency, Tektronix TDS- 3054 B

Parameter/Equipment	Frequency	CMC ^{2,4} (±)	Comments
Coil Driver Frequency ³ – Eddy Current Instrumentation	10 Hz to 6 MHz		Agilent 33250A, ZETEC ACM/frequency, Tektronix TDS- 3054 B & Agilent 34401A or 34410A
	JEAG-4208	0.0018 %	
	ASME BPVC Sections V & XI	0.12 %	
Receiver Frequency Bandwidth ³ – Eddy Current Instrumentation	(8 to 5000) Hz	0.23 %	Agilent 33250A, ZETEC ACM/frequency, Tektronix TDS- 3054 B

III. Time & Frequency

Parameter/Range	Frequency	CMC ^{2,4,8} (±)	Comments
Frequency ³ – Measure (10 to 100) mV _{rms}	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 300 kHz	1.2 % + 0.29 μHz 0.59 % + 0.29 μHz 0.36 % + 0.29 μHz 0.12 % + 250 μHz	Agilent 34410A
> 100 mV _{rms}	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 300 kHz	0.22 % + 0.29 μHz 0.15 % + 0.29 μHz 0.057 % + 0.29 μHz 0.012 % + 240 μHz	Agilent 34410A, & 53132A

IV. Time & Frequency (Ultrasound Instrumentation - Dynaray)

Parameter/Equipment	Frequency	CMC ^{2,4} (±)	Comments
Transmitter – Ultrasound Instrumentation ³ Pulse Repetition Frequency	0.1 Hz to 1 kHz (1 to 40) kHz	0.0026 % 0.0031 %	Tektronix TDS- 3032/3054 (A, B, or C), ZETEC ABUXE127A
Receiver – Ultrasound Instrumentation ³ Frequency Response:	(0.225 to 20) MHz		Agilent 33250A, Tektronix TDS- 3032/3054 (A, B, or C), ZETEC attenuator 10040260, ZETEC ABUXE127
Low Cutoff		None, HP1M, HP2M ≤ 4.0 %, all others ≤ 1.9 %	
High Cutoff		None, LP2M, LP5M, LP10M, LP15M, HP1M, HP2M, BP1- 5M ≤ 5.4 %, all others ≤ 1.9 %	
Bandwidth		None, HP1M, HP2M ≤ 4.0 %, all others ≤ 2.2 %	
Center		None, LP15M, HP1M, BP1-5M ≤ 3.7 %, all others ≤ 2.1 %	

Parameter/Equipment	Range ⁵	CMC ^{2, 4, 5} (\pm)	Comments
Transmitter – Ultrasound Instrumentation ³			
Output Impedance	< 5 Ω	0.17 Ω	Agilent 33250A, Tektronix TDS-3032/3054 (A, B, or C), ZETEC ABUXE127A, 50 ohms/10W load
Voltage	(25 to 250) V	2.5 %	
Reverberation (Overshoot)	(0 to 10) %	0.56 %	
Rise Time	(0 to 50) ns	1.3 ns	
Duration	(25 to 1000) ns	0.99 ns	
Linearity of Time Delays	(0 to 50) μ s	0.070 %	
Receiver – Ultrasound Instrumentation ³			
Linearity of Time Delays	(0 to 50) μ s	0.0063 %	Agilent 33250A, Tektronix TDS-3032/3054 (A, B, or C), ZETEC attenuator 10040260, ZETEC ABUXE127A
Gain Linearity	(0 to 80) dB	0.47 dB	
Channel Gain Variation	< 1.5 dB (Zetec) < 3.0 dB (Norm)	0.66 dB 0.66 dB	
Linearity of Vertical Display	(0 to 28) dB rel.	0.48 %	
Equivalent Input Noise	< 80 nVpp/Hz ^{0.5}	19 nVpp/Hz ^{0.5}	

V. Time & Frequency (Ultrasound Instrumentation – Zircon, Topaz16, Topaz32, Quartz)

Parameter/Equipment	Frequency	CMC ^{2,4} (±)	Comments
Transmitter – Ultrasound Instrumentation ³ Pulse Repetition Frequency	0.1 Hz to 1 kHz, (1 to 40) kHz	0.0024 % 0.0035 %	Tektronix TDS-3032/3054 (A, B, or C), ZETEC 10040371
Receiver – Ultrasound Instrumentation ³ Frequency Response – Zircon: Low Cutoff High Cutoff Bandwidth Center – Phased Array Center – Conventional	(0.225 to 20) MHz	≤ 1.2 % None, LP2M, LP5M, LP10M, HP1M, BP1-5M ≤ 2.9 %, all others ≤ 1.6 % LP2M ≤ 1.8 %, all others ≤ 1.0 % LP2M ≤ 2.2 %, all others ≤ 1.4 % LP2M ≤ 2.1 %, all others ≤ 1.3 %	Agilent 33250A, Tektronix TDS-3032/3054 (A, B, or C), ZETEC attenuator 10040260, ZETEC 10040371

Parameter/Equipment	Frequency	CMC ^{2,4} (±)	Comments
Receiver – Ultrasound Instrumentation ³ (cont)			Agilent 33250A, Tektronix TDS-3032/3054 (A, B, or C), ZETEC attenuator 10040260, ZETEC 10040371
Frequency Response – Topaz32 and Quartz:	(0.225 to 20) MHz		
Low Cutoff		≤ 1.2 %	
High Cutoff		None, LP2M, LP5M, LP10M, HP1M, BP1-5M ≤ 2.9 %, all others ≤ 1.6 %	
Bandwidth		LP2M ≤ 1.8 %, all others ≤ 1.2 %	
Center – Phased Array		LP2M ≤ 2.2 %, all others ≤ 1.4 %	
Center – Conventional		LP2M ≤ 2.1 %, all others ≤ 1.3 %	
Frequency Response – Topaz16:	(0.50 to 18) MHz		
Low Cutoff		≤ 1.2 %	
High Cutoff		None, LP2M, LP5M, LP10M, HP1M, BP1-5M ≤ 2.9 %, all others ≤ 1.6 %	
Bandwidth		LP2M ≤ 1.8 %, all others ≤ 1.2 %	
Center – Phased Array		LP2M ≤ 2.2 %, all others ≤ 1.4 %	
Center – Conventional		LP2M ≤ 2.1 %, all others ≤ 1.3 %	

Parameter/Equipment	Range ⁵	CMC ^{2,4,5} (±)	Comments
Transmitter – Ultrasound Instrumentation ³			
Output Impedance –			Agilent 33250A, Tektronix TDS-3032/3054 (A, B, or C), ZETEC 10040371, 50 ohms/10W load
Phased Array	< 25 Ω	1.3 Ω	
Conventional	< 5 Ω	0.76 Ω	
Voltage –			
Phased Array	(35 to 100) V	2.0 %	
Conventional	(25 to 250) V	2.4 %	
Reverberation (Overshoot), Manual –			
Phased Array	(0 to 10) %	0.18 %	
Conventional	(0 to 10) %	0.20 %	
Rise Time –			
Phased Array	(0 to 50) ns	1.6 ns	
Conventional	(0 to 50) ns	0.35 ns	
Duration –			
Phased Array	(25 to 500) ns	0.59 ns	
Conventional	(25 to 500) ns	0.46 ns	
Linearity of Time Delays	(0 to 20) μs	0.052 %	
Receiver – Ultrasound Instrumentation ³			
Linearity of Time Delays	(0 to 20) μs	0.013 %	Agilent 33250A, Tektronix TDS-3032/3054 (A, B, or C), ZETEC attenuator 10040260, ZETEC 10040371
Gain Linearity –			
Phased Array	(0 to 70) dB	0.26 dB	
Conventional	(0 to 70) dB	0.26 dB	

Parameter/Equipment	Range ⁵	CMC ^{2,4,5} (±)	Comments
Receiver – Ultrasound Instrumentation ³ (cont)			
Channel Gain Variation –			Agilent 33250A, Tektronix TDS-3032/3054 (A, B, or C), ZETEC attenuator 10040260, ZETEC 10040371.
Phased Array	< 1.5 dB (Zetec) < 3.0 dB (Norm)	0.36 dB 0.36 dB	
Conventional	< 1.5 dB (Zetec)	0.36 dB	
Linearity of Vertical Display	28 dB rel.	0.32 %	
Equivalent Input Noise	< 80 nVpp/Hz ^{0.5}	4.7 nVpp/Hz ^{0.5}	

¹ This laboratory offers commercial and field calibration service.

² Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMCs represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

³ Field calibration service is available for this calibration and this laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

⁴ In the statement of CMC, percentages represent percent of reading unless otherwise noted.

⁵ References to decibels (dB) refer to dB in voltage.

⁶ The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.

⁷ This scope meets A2LA's P112 Flexible Scope Policy.

⁸ The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.





Accredited Laboratory

A2LA has accredited

ZETEC, INCORPORATED

Snoqualmie, WA

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets R205 – Specific Requirements: Calibration Laboratory Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).



Presented this 26th day of August 2019.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2734.01
Valid to August 31, 2021

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.