



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

ZETEC, CANADA  
875, boul. Charest ouest, Suite 100  
Quebec, QC, G1N 2C9 CANADA  
Ghislain Cournoyer, Systems Manufacturer & Services Manager

Phone: 418 263 3686

CALIBRATION

Valid To: August 31, 2019

Certificate Number: 2734.03

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations<sup>1</sup>:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
DC Voltage – Measure <sup>3</sup>	(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 34401A & 34410A
Resistance – Measure <sup>3</sup>	(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 34401A & 34410A

II. Magnetic (Eddy Current Instrumentation)

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Receiver Amplifier Linearity – Eddy Current Instrumentation <sup>3</sup>	(0 to 100) % of Full Scale	0.51 %	Agilent 33250A & 33120A
Receiver Quadrature – Eddy Current Instrumentation <sup>3</sup>	(0 to 360)°	0.023°	Agilent 33250A, ZETEC ACM/frequency, Tektronix TDS-3032 (A, B, or C)
Receiver Gain – Eddy Current Instrumentation <sup>3</sup>	(0 to 80) dB	0.26 %	Agilent 33250A, ZETEC ACM/frequency, Tektronix TDS-3032 (A, B, or C)

Parameter/Equipment	Frequency	CMC <sup>2,4</sup> (±)	Comments
Coil Driver Frequency – Eddy Current Instrumentation <sup>3</sup>	10 Hz to 6 MHz		Agilent 53132A, ZETEC ACM/frequency, Tektronix TDS-3032 (A, B, or C), & Agilent 34401A or 34410A
	JEAG-4208	0.0018 %	
	ASME BPVC Sections V and XI	0.12 %	
Receiver Frequency Bandwidth – Eddy Current Instrumentation <sup>3</sup>	(8 to 5000) Hz	0.23 %	Agilent 33250A, ZETEC ACM/frequency, Tektronix TDS-3032 (A, B, or C)

### III. Time & Frequency

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
Frequency – Measure <sup>3</sup>			
(10 to 100) mV <sub>rms</sub>	(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 34401A & 34410A
> 100 mV <sub>rms</sub>	(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 34401A, 34410A, & 53132A

### IV. Time & Frequency (Ultrasound Instrumentation - Dynaray)

Parameter/Equipment	Frequency	CMC <sup>2,4</sup> (±)	Comments
Transmitter – Ultrasound Instrumentation <sup>3</sup>			
Pulse Repetition Frequency	0.1 Hz to 1 kHz (1 to 40) kHz	0.0026 % 0.0031 %	Tektronix TDS-3032 (A, B, or C), ZETEC ABUXE127A
Receiver – Ultrasound Instrumentation <sup>3</sup>			
Frequency Response:	(0.225 to 20) MHz		
Low Cutoff		Low pass 5.4 % if ≤ 1 MHz otherwise 2.5 %	Agilent 33250A, Tektronix TDS-3032 (A, B, or C), ZETEC Attenuator 10040260, ZETEC ABUXE127
High Cutoff		High pass 2.6% if ≥ 5 MHz and ≤ 15 MHz otherwise 4.3 %	
Bandwidth		6.2% at 2 MHz otherwise 4.5%	
Center		Central frequency 3.7 % if ≤ 4.48 MHz otherwise 2.4%	

Parameter/Equipment	Range	CMC <sup>2, 4, 5</sup> (±)	Comments
Transmitter – Ultrasound Instrumentation <sup>3</sup>			
Output Impedance	< 5 Ω	0.17 Ω	Agilent 33250A, Tektronix TDS-3032 (A, B, or C), ZETEC ABUXE127A, 50 ohms/10W load
Voltage	(25 to 250) V	2.7 %	
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) μs	0.070 %	
Receiver – Ultrasound Instrumentation <sup>3</sup>			
Linearity of Time Delays	(0 to 50) μs	0.0063 %	Agilent 33250A, Tektronix TDS-3032 (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 <sup>0.5</sup>	19 nVpp/Hz <sup>0.5</sup>	

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

Parameter/Equipment	Frequency	CMC <sup>2,4</sup> (±)	Comments
Transmitter – Ultrasound Instrumentation <sup>3</sup>  Pulse Repetition Frequency	0.1 Hz to 1 kHz,  (1 to 40) kHz	0.0024 %  0.0043 %	Tektronix TDS-3032 (A, B, or C), ZETEC 10040371
Receiver – Ultrasound Instrumentation <sup>3</sup>  Frequency Response – Zircon:  Low Cutoff  High Cutoff	(0.225 to 20) MHz	Low pass 4.4 % if $\leq 1$ MHz otherwise 2.3 %  High pass 3.7 % if $\leq 5$ MHz otherwise 1.1 %	Agilent 33250A, Tektronix TDS-3032 (A, B, or C), ZETEC Attenuator 10040260, ZETEC 10040371

Parameter/Equipment	Frequency	CMC <sup>2,4</sup> (±)	Comments
Receiver – Ultrasound Instrumentation <sup>3</sup> (cont)			Agilent 33250A, Tektronix TDS-3032 (A, B, or C), ZETEC Attenuator 10040260, ZETEC 10040371
Frequency Response – Zircon:	(0.225 to 20) MHz		
Bandwidth		5.0 % if $\leq 2.5$ MHz otherwise 2.1 %	
Center – Phased Array		Central frequency 6.1 % if $\leq 3$ MHz otherwise 2.2%	
Center – Conventional		Central frequency 3.1 % if $\leq 2.25$ MHz otherwise 1.1 %	
Frequency Response – Topaz32 and Quartz:			
Low Cutoff		Low pass 4.4 % if $\leq 2$ MHz otherwise 0.97 %	
High Cutoff		High pass 3.7 % if $\leq 2.2$ MHz otherwise 1.1 %	
Bandwidth		6.0 % if $\leq 3.53$ MHz otherwise 2.2 %	
Center – Phased Array		Central frequency 6.0 % if $\leq 3.53$ MHz otherwise 2.2 %	
Center – Conventional		Central frequency 3.1 % if $\leq 2.25$ MHz otherwise 1.1 %	

Parameter/Equipment	Range <sup>5</sup>	CMC <sup>2,4,5</sup> (±)	Comments
Transmitter – Ultrasound Instrumentation <sup>3</sup>			
Output Impedance –			Agilent 33250A, Tektronix TDS-3032 (A, B, or C), ZETEC 10040371, 50 ohms/10W load
Phased Array	< 25 Ω	0.14 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 <sup>3</sup>			
Linearity of Time Delays	(0 to 20) μs	0.013 %	Agilent 33250A, Tektronix TDS-3032 (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 <sup>5</sup>	CMC <sup>2,4,5</sup> (±)	Comments
Receiver – Ultrasound Instrumentation <sup>3</sup> (cont)			
Channel Gain Variation –			Agilent 33250A, Tektronix TDS-3032 (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 <sup>0.5</sup>	4.7 nVpp/Hz <sup>0.5</sup>	

<sup>1</sup> This laboratory offers commercial and field calibration service.

<sup>2</sup> 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.

<sup>3</sup> 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.

<sup>4</sup> In the statement of CMC, percentages represent percent of reading unless otherwise noted.

<sup>5</sup> References to decibels (dB) refer to dB in voltage





## *Accredited Laboratory*

A2LA has accredited

**ZETEC CANADA**

*Quebec, QC, CANADA*

for technical competence in the field of

**Calibration**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *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 8 January 2009).



Presented this 7<sup>th</sup> day of August 2017.

A handwritten signature in black ink, written over a horizontal line.

President and CEO  
For the Accreditation Council  
Certificate Number 2734.03  
Valid to August 31, 2019

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