



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

**Starr Instrument Service
Division of Starr Calibrations, Inc.
Starr-Chek (an affiliate laboratory)
1101 West Lawrence Highway
Charlotte, Michigan 48813**

has been assessed by ANAB
and meets the requirements of international standard

ISO/IEC 17025:2005

and national standard

ANSI/NCSL Z540-1-1994

while demonstrating technical competence in the field of

CALIBRATION

Refer to the accompanying Scope of Accreditation for information regarding the types of calibrations to which this accreditation applies.

AC-1360
Certificate Number


ANAB Approval

Certificate Valid: 10/05/2016-12/19/2018
Version No. 003 Issued: 10/05/2016



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



ANSI-ASQ National Accreditation Board

**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994**

Starr Instrument Service
Division of Starr Calibrations, Inc.
Starr-Chek (an affiliate laboratory)
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CALIBRATION

Valid to: December 19, 2018

Certificate Number: AC-1360

I. Electromagnetic - DC/Low Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment	Methods
Electrical Calibration of Thermocouple Indicating Devices Measure *				
Type E	(-200 to 1 370) °C	0.22 °C	Fluke725 (&/or) 744 Process Control Calibrators	AMS 2750 (&/or) AIAG CQI-9, Starr Calibration Procedures
Type J	(-200 to -100) °C (-100 to 982) °C	0.31 °C 0.22 °C		
Type K	(-200 to 0) °C (0 to 800) °C (800 to 1 300) °C	0.32 °C 0.28 °C 0.42 °C		
Type N	(-200 to -100) °C (-100 to 1 371) °C	0.36 °C 0.23 °C		
Type R	(-20 to 100) °C (100 to 1 767) °C	0.55 °C 0.37 °C		
Type S	(0 to 200) °C (200 to 1 400) °C (1 400 to 1 767) °C	0.62 °C 0.44 °C 0.38 °C		



Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment	Methods
Electrical Calibration of Thermocouple Indicating Devices Measure (cont.)* Type T	(-250 to -200) °C (-200 to 0) °C (0 to 400) °C	0.7 °C 0.21 °C 0.18 °C	Fluke725 (&/or) 744 Process Control Calibrators	AMS 2750 (&/or) AIAG CQI-9, Starr Calibration Procedures
Electrical Calibration of Thermocouple Indicating Devices Source * Type E	(-200 to -100) °C (-100 to 600) °C (600 to 1 000) °C	0.29 °C 0.22 °C 0.19 °C	Fluke725 (&/or) 744 Process Control Calibrators	
Type J	(-200 to -100) °C (-100 to 1 200) °C	0.21 °C 0.17 °C		
Type K	(-200 to 0) °C (0 to 800) °C (800 to 1 300) °C	0.54 °C 0.65 °C 0.45 °C		
Type N	(-200 to -100)°C (-100 to 900) °C (900 to 1 300) °C	0.51 °C 0.26 °C 0.22 °C		
Type R	(-20 to 0) °C (0 to 100) °C (100 to 1 767) °C	0.68 °C 0.53 °C 0.35 °C		
Type S	(0 to 200) °C (200 to 1 400) °C (1 400 to 1 767) °C	0.7 °C 0.34 °C 0.43 °C		
Type T	(-250 to -200) °C (-200 to 400) °C	0.57 °C 0.17 °C		
DC Voltage - Measure*	Up to 300 V	0.0073 V		
DC Voltage - Source*	Up to 15 V	0.00097 V		
DC Current - Measure*	Up to 110 mA	0.037 mA	Fluke 744 Process Control Calibrators	
DC Current - Source*	(2 to 22) mA	0.0067 mA		

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(\pm)]	Reference Standard or Equipment	Methods
Resistance – Measure*	(0 to 3 200) Ω	0.67 Ω	Fluke 744 Process Control Calibrators	AMS 2750 (&/or) AIAG CQI-9, Starr Calibration Procedures
Resistance – Source*	(0 to 3 200) Ω	0.1 Ω		

II. Time & Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(\pm)]	Reference Standard or Equipment	Methods
Timers*	0 s to 36 000 s	0.56 s	Stopwatch or NIST Phone System	Starr Calibration Procedure

III. Thermodynamic

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(\pm)]	Reference Standard or Equipment	Methods
Dew Point and Relative Humidity - Measure* Ambient Air	(-61 to 69) $^{\circ}\text{F}$	1.5 $^{\circ}\text{F}$	Alnor Model 7000U Dew Point Analyzer	Starr Calibration Procedure
Compressed Air or Dry Nitrogen	(-61 to 17) $^{\circ}\text{F}$	0.57 $^{\circ}\text{F}$	Super Systems Model DP2000 Dew Point Analyzer	
Temperature - Measure*	(100 to 800) $^{\circ}\text{C}$ (800 to 1 300) $^{\circ}\text{C}$	0.37 $^{\circ}\text{C}$ 1.8 $^{\circ}\text{C}$	Fluke 725 or 744 Process Control Calibrator, Thermocouple	AMS 2750 (&/or) AIAG CQI-9, Starr Calibration Procedures
Ovens - Temperature Uniformity Surveys*	(0 to 1 200) $^{\circ}\text{F}$ (1 200 to 2 000) $^{\circ}\text{F}$	1.1 $^{\circ}\text{F}$ 0.9 $^{\circ}\text{F}$	SSI Data Logger & Certified Thermocouple Wire	AMS 2750, Boeing BAC 5621, AIAG CQI-9, Starr Calibration Procedure

IV. Mechanical

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment	Methods
Standardized Rockwell Hardness Test Blocks	≥ 80 HRA (60 to 80) HRA ≤ 60 HRA	0.18 HRA 0.21 HRA 0.20 HRA	Wilson 2000 Hardness Tester	ASTM E-18, Starr Calibration Procedure
	≥ 80 HRBW (60 to 80) HRBW ≤ 60 HRBW	0.18 HRBW 0.20 HRBW 0.23 HRBW		
	≥ 60 HRC (40 to 60) HRC ≤ 40 HRC	0.13 HRC 0.18 HRC 0.18 HRC		
	≥ 80 HRD (62 to 80) HRD ≤ 62 HRD	0.20 HRD 0.20 HRD 0.20 HRD		
	≥ 80 HREW (65 to 80) HREW ≤ 65 HREW	0.21 HREW 0.22 HREW 0.20 HREW		
	≥ 80 HRFW (70 to 80) HRFW ≤ 70 HRFW	0.21 HRFW 0.21 HRFW 0.22 HRFW		
	≥ 80 HRGW (40 to 80) HRGW ≤ 40 HRGW	0.18 HRGW 0.21 HRGW 0.18 HRGW		
	≥ 95 HRHW ≤ 95 HRHW	0.22 HRHW 0.26 HRHW		
	≥ 75 HRKW ≤ 75 HRKW	0.23 HRKW 0.23 HRKW		
	≥ 105 HRMW ≤ 105 HRMW	0.21 HRMW 0.26 HRMW		
	≥ 120 HRRW < 120 HRRW	0.21 HRRW 0.25 HRRW		
	≥ 120 HRSW < 120 HRSW	0.20 HRSW 0.20 HRSW		
	≥ 90 HR15N (80 to 90) HR15N < 80 HR15N	0.21 HR15N 0.20 HR15N 0.20 HR15N		



Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment	Methods
Standardized Rockwell Hardness Test Blocks (cont.)	<p>≥ 79 HR30N (60 to 79) HR30N ≤ 60 HR30N</p> <p>≥ 65 HR45N (50 to 65) HR45N ≤ 50 HR45N</p> <p>≥ 100 HR15TW (80 to 100) HR15TW ≤ 80 HR15TW</p> <p>≥ 70 HR30TW (50 to 70) HR30TW ≤ 55 HR30TW</p> <p>≥ 50 HR45TW (25 to 50) HR45TW ≤ 25 HR45TW</p> <p>≥ 86 HR15WW < 86 HR15WW</p> <p>≥ 90 HR15XW < 90 HR15XW</p> <p>≥ 95 HR15YW < 95 HR15YW</p>	<p>0.22 HR30N 0.20 HR30N 0.19 HR30N</p> <p>0.20 HR45N 0.25 HR45N 0.23 HR45N</p> <p>0.22 HR15TW 0.22 HR15TW 0.22 HR15TW</p> <p>0.20 HR30TW 0.21 HR30TW 0.23 HR30TW</p> <p>0.24 HR45TW 0.23 HR45TW 0.20 HR45TW</p> <p>0.21 HR15WW 0.27 HR15WW</p> <p>0.23 HR15XW 0.20 HR15XW</p> <p>0.28 HR15YW 0.25 HR15YW</p>	Wilson 2000 Hardness Tester	ASTM E-18, Starr Calibration Procedure
Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers*	<p>≥ 80 HRA (60 to 80) HRA ≤ 60 HRA</p> <p>≥ 80 HRBW (60 to 80) HRBW ≤ 60 HRBW</p> <p>≥ 60 HRC (40 to 60) HRC ≤ 40 HRC</p> <p>≥ 80 HRD (62 to 80) HRD ≤ 62 HRD</p> <p>≥ 100 HREW (75 to 100) HREW ≤ 75 HREW</p>	<p>0.27 HRA 0.30 HRA 0.30 HRA</p> <p>0.27 HRBW 0.35 HRBW 0.41 HRBW</p> <p>0.19 HRC 0.27 HRC 0.26 HRC</p> <p>0.30 HRD 0.27 HRD 0.30 HRD</p> <p>0.30 HREW 0.35 HREW 0.30 HREW</p>	Starr-Chek Rockwell Hardness Test Blocks	ASTM E-18, Starr Calibration Procedure

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment	Methods
Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers* (cont.)	≥ 80 HRFW (70 to 80) HRFW ≤ 70 HRFW	0.30 HRFW 0.30 HRFW 0.30 HRFW	Starr-Chek Rockwell Hardness Test Blocks	ASTM E-18, Starr Calibration Procedure
	≥ 80 HRGW (40 to 80) HRGW ≤ 40 HRGW	0.24 HRGW 0.27 HRGW 0.23 HRGW		
	≥ 95 HRHW ≤ 95 HRHW	0.30 HRHW 0.38 HRHW		
	≥ 75 HRKW < 75 HRKW	0.41 HRKW 0.41 HRKW		
	≥ 105 HRMW < 105 HRMW	0.30 HRMW 0.38 HRMW		
	≥ 120 HRRW < 120 HRRW	0.30 HRRW 0.41 HRRW		
	≥ 120 HRSW < 120 HRSW	0.25 HRSW 0.25 HRSW		
	≥ 90 HR15N (80 to 90) HR15N < 80 HR15N	0.30 HR15N 0.27 HR15N 0.30 HR15N		
	≥ 79 HR30N (60 to 79) HR30N ≤ 60 HR30N	0.30 HR30N 0.27 HR30N 0.30 HR30N		
	≥ 65 HR45N (50 to 65) HR45N ≤ 50 HR45N	0.30 HR45N 0.30 HR45N 0.34 HR45N		
	≥ 85 HR15TW (65 to 85) HR15TW ≤ 65 HR15TW	0.30 HR15TW 0.30 HR15TW 0.30 HR15TW		
	≥ 70 HR30TW (50 to 70) HR30TW ≤ 55 HR30TW	0.27 HR30TW 0.30 HR30TW 0.26 HR30TW		
	≥ 50 HR45TW (25 to 50) HR45TW ≤ 25 HR45TW	0.39 HR45TW 0.39 HR45TW 0.30 HR45TW		

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment	Methods
Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers* (cont.)	≥ 86 HR15WW < 86 HR15WW ≥ 90 HR15XW < 90 HR15XW ≥ 95 HR15YW < 95 HR15YW	0.30 HR15WW 0.41 HR15WW 0.39 HR15XW 0.32 HR15XW 0.39 HR15YW 0.30 HR15YW	Starr-Chek Rockwell Hardness Test Blocks	ASTM E-18, Starr Calibration Procedure
Indirect Verification of Microindentation & Macro Vickers Hardness Testers* Knoop Scale	(10 to 50) g ≤ 500 HK ≥ 500 HK (50 to 100) g ≤ 500 HK ≥ 500 HK (100 to 1 000) g ≤ 500 HK ≥ 500 HK	2.5 HK 2.5 HK 2.5 HK 2.5 HK 3.2 HK 3.2 HK	Starr-Chek Knoop Scale Microindentation Hardness Test Blocks	ASTM E-384, Starr Calibration Procedure
Vickers Scale	(10 to 50) g ≤ 500 HV ≥ 500 HV (50 to 100) g ≤ 500 HV ≥ 500 HV (100 to 1000) g ≤ 500 HV ≥ 500 HV	2.7 HV 2.7 HV 4.1 HV 4.1 HV 4.8 HV 4.8 HV	Starr-Chek Vickers Scale Microindentation Hardness Test Blocks	
Macro Vickers Scale	(3 to 50) kg ≤ 500 HV ≥ 500 HV	3.4 HV 3.4 HV	Starr-Chek Macro Vickers Scale Hardness Test Blocks	
Standardized Brinell Hardness Test Blocks	(2.50 to 4.80) MM	0.03 MM	Optical Scanning System, Brinell Test Bar	
Indirect Verification of Brinell Hardness Testers*	(2.50 to 4.80) MM	0.04 MM	Starr-Chek Brinell Hardness Test Bars	ASTM E-10, Starr Calibration Procedure

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment	Methods
Portable Hardness Testers - Rockwell*	≥ 60 HRC ≤ 60 HRC	1.3 HRC 1.2 HRC	Starr-Chek Rockwell Hardness Test Blocks	ASTM E-110, Starr Calibration Procedure
Brinell*	(2.50 to 4.80) MM	0.04 MM	Starr-Chek Brinell Test Bars	
Portable Hardness Testers – Leeb*	≤ 750 LD	3.32 LD	Equotip Calibration Standard Test Block	ASTM A-956, Starr Calibration Procedure
Portable Hardness Testers Brinell*	< 3.6 mm > 3.6 mm	0.04 mm	Starr-Chek Brinell Test Bars	ASTM E-110, Starr Calibration Procedure
Optical Scanning Systems*	(0 to 6) mm	0.019 mm	Starr-Chek Brinell Test Bar and B.O.S.S. Certified Calibration Standard	Starr-Chek Calibration Procedure
Direct Verification of Hardness Testers* Rockwell: Test Force Depth Measurement Diamond Indenter Ball Indenter Grade 25	(3 to 10) kg (15 to 150) kg 0.05 mm	0.14 kg 0.14 kg 0.0018 mm	Certified Load Cell, Certified Ceramic Gage Blocks	ASTM E-18, Starr Calibration Procedure
Brinell: Force Application Measuring Device Indenter Grade 25	(500 to 3000) kg (2.8 to 4.7) mm	1.8 kg 0.019 mm	Certified Proving Ring or Load Cell, Brinell Optical Scanning System	ASTM E-10, Starr Calibration Procedure
Microindentation & Macro Vickers Hardness Test Force Microindentation Knoop & Vickers Scale	(10 to 1000) g	1.2 g	Certified Load Cell	ASTM E-384, Starr Calibration Procedure
Macro Vickers Scale	(1 to 50) kg	0.14 kg		
Hardness Files	(45 to 65) HRC	0.2 HRC	Wilson Digital 2000 Rockwell Hardness Tester	Starr Calibration Procedure
Scales & Balances*	0 to 10 000 g 0 to 500 lb	1.3 g 0.74 lb	Class F Weights	

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(\pm)]	Reference Standard or Equipment	Methods
Force Tension / Compression*	(50 to 500) lb (500 to 5 000) lb (5 000 to 30 000) lb (30 000 to 100 000) lb	0.22% of reading 0.30% of reading 0.33% of reading 0.30% of reading	Load Cells Certified Weight Sets	ASTM-E-4, Starr Calibration Procedures

V. Dimensional

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(\pm)]	Reference Standard or Equipment	Methods
Brinell Scopes*	Up to 7 mm	16 μ m	Stage Micrometer	Starr Calibration Procedure
Micrometers*	Up to 24 in	(72 + 8.85L) μ in	Gage Blocks, Micrometer Standards	
Calipers*	Up to 120 in	(94 + 5.78L) μ in	Gage Blocks, Caliper Master, Check Master	
Indicators*	Up to 4 in	(130.7 + 1.96L) μ in	Gage Blocks, Digital Display	
Depth Micrometers*	(0.001 to 12) in	(73.5 + 4.35L) μ in	Gage Blocks	
Height Gages*	Up to 48 in	(29.7 + 20.3L) μ in	Gage Blocks, Check Master	
Bore Gages*	Up to 12 in	(132.6 + 2.7L) μ in	Sunnen Gage	
Measuring Microscopes*	Up to 1 in Up to 14 in	170 μ in 160 μ in	Stage Micrometer	ASTM E1951, Starr Calibration Procedure

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(\pm)]	Reference Standard or Equipment	Methods
Optical Comparators, Toolmakers Microscope* Scales Squareness Magnification	Up to 12 in Up to 12 in 10X to 200X	390 μ m 240 μ m 290 μ m	Glass Master	ASTM E1951, Starr Calibration Procedure
Stage Micrometers*	Up to 25 mm	1.47 μ m	Microscope, Micrometer Head	Starr Calibration Procedure
Linear Measuring Machines*	Up to 84 in	(34 + 9.6L) μ m	Gage Blocks, Long Blocks, Laser	
Digital Readout*	Up to 96 in	0.00039 in	0.000050 Indicator, Gage Blocks, Mitutoyo Step Master	
Protractors*	Up to 45°	0.58 °	Angle Blocks, Surface Plate	

Notes:

1. Calibration and Measurement Capabilities (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of $k=2$.
2. This laboratory offers calibration services in its laboratory and on-site at customer-designated locations. Since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
3. Asterisks (*) identify parameters available for on-site calibration.
4. The CMC term s represents time in seconds.
5. The CMC term L represents the Length measurement in either inches or mm.
6. This laboratory uses the latest valid editions of referenced standards in accordance with ISO/IEC 17025, clause 5.4.2.
7. This scope is formatted as part of a single document including the Certificate of Accreditation No.AC-1360.



 Vice President