



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 (R2002)

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: 11/07/2018-12/19/2020
Version No. 005 Issued: 11/07/2018



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 April 2017).



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005 AND
ANSI/NCSL Z540-1-1994 (R2002)**

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

1101 West Lawrence Highway
Charlotte, Michigan 48813
Robin Shuten
517-543-8089

CALIBRATION

Valid to: **December 19, 2020**

Certificate Number: **AC-1360**

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Electrical Calibration of Thermocouple Indicating Devices Measure ¹			
Type E	(-200 to 1 000) °C	0.4 °C	Fluke725 (&/or) 744 Process Control Calibrators AMS 2750 (&/or) AIAG CQI-9, Starr Calibration Procedures
Type J	(-200 to -100) °C (-101 to 1 200) °C	0.51 °C 0.31 °C	
Type K	(-180 to 1 300) °C	0.58 °C	
Type N	(-200 to 1 300) °C	0.64 °C	
Type R	(-20 to 1 767) °C	0.72 °C	
Type S	(0 to 1 767) °C	0.71 °C	



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Electrical Calibration of Thermocouple Indicating Devices Measure (cont.) ¹ Type T	(-250 to 400) °C	0.7 °C	Fluke725 (&/or) 744 Process Control Calibrators
Electrical Calibration of Thermocouple Indicating Devices Source ¹			
Type E	(-200 to 1000) °C	0.33 °C	Fluke725 (&/or) 744 Process Control Calibrators AMS 2750 (&/or) AIAG CQI-9, Starr Calibration Procedures
Type J	(-200 to 1300) °C	0.51 °C	
Type K	(-200 to 1300) °C	0.67 °C	
Type N	(-200 to 1300) °C	0.42 °C	
Type R	(-20 to 1 767) °C	0.47 °C	
Type S	(0 to 200) °C (200 to 1 767) °C	1.1 °C 0.43 °C	
Type T	(-250 to 400) °C	0.51 °C	
DC Voltage – Measure ¹	Up to 300 V	0.014 V	Fluke 725 or Fluke 744 Process Control Calibrators
DC Voltage – Source ¹	Up to 15 V	0.000 96 V	AMS 2750 (&/or) AIAG CQI-9, Starr Calibration Procedures
DC Current – Measure ¹	Up to 110 mA	0.035 mA	Fluke 744 Process Control Calibrators
DC Current – Source ¹	(2 to 22) mA	0.006 6 mA	AMS 2750 (&/or) AIAG CQI-9, Starr Calibration Procedures



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Resistance – Measure ¹	(0 to 11 000) Ω	0.62 Ω	Fluke 744 Process Control Calibrators AMS 2750 (&/or) AIAG CQI-9, Starr Calibration Procedures
Resistance – Source ¹	(0 to 3 200) Ω	0.1 Ω	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Brinell Scopes ¹	Up to 7 mm	16 μm	Stage Micrometer
Micrometers ¹	Up to 24 in	(72 + 8.85L) μin	Gage Blocks, Micrometer Standards
Calipers ¹	Up to 120 in	(94 + 5.78L) μin	Gage Blocks, Caliper Master, Check Master
Indicators ¹	Up to 4 in	(130.7 + 1.96L) μin	Micrometer Head Digital Display, Gage Blocks
Depth Micrometers ¹	(0.001 to 12) in	(73.5 + 4.35L) μin	Gage Blocks
Height Gages ¹	Up to 48 in	(29.7 + 20.3L) μin	Gage Blocks, Check Master
Bore Gages ¹	Up to 12 in	(132.6 + 2.7L) μin	Micrometer Head Digital Display
Measuring Microscopes ¹	Up to 1 in Up to 14 in	170 μin 160 μin	Stage Micrometer ASTM E1951 Starr Calibration Procedure
Optical Comparators, Toolmakers Microscope ¹ Scales Squareness Magnification	Up to 12 in Up to 12 in 10X to 200X	390 μin 240 μin 290 μin	Glass Master ASTM E1951 Starr Calibration Procedure
Stage Micrometers ¹	Up to 25 mm	1.47 μm	Microscope, Micrometer Head



Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Linear Measuring Gages ¹	Up to 84 in	(34 + 9.6L) μin	Gage Blocks, Long Blocks
Protractors ¹	Up to 360°	0.58 °	Angle Blocks, Surface Plate

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Standardized Rockwell Hardness Test Blocks	≥ 80 HRA (60 to 80) HRA ≤ 60 HRA	0.19 HRA 0.21 HRA 0.23 HRA	Rockwell Hardness Tester ASTM E-18 Starr Calibration Procedure
	≥ 80 HRBW (60 to 80) HRBW ≤ 60 HRBW	0.24 HRBW 0.25 HRBW 0.28 HRBW	
	≥ 60 HRC (40 to 60) HRC ≤ 40 HRC	0.16 HRC 0.19 HRC 0.22 HRC	
	≥ 80 HRD (62 to 80) HRD ≤ 62 HRD	0.27 HRD 0.22 HRD 0.19 HRD	
	≥ 80 HREW (65 to 80) HREW ≤ 65 HREW	0.20 HREW 0.25 HREW 0.19 HREW	
	≥ 80 HRFW (70 to 80) HRFW ≤ 70 HRFW	0.22 HRFW 0.2 HRFW 0.23 HRFW	
	≥ 80 HRGW (40 to 80) HRGW ≤ 40 HRGW	0.19 HRGW 0.19 HRGW 0.22 HRGW	
	≥ 95 HRHW ≤ 95 HRHW	0.20 HRHW 0.25 HRHW	



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Standardized Rockwell Hardness Test Blocks (cont.)	≥ 75 HRKW ≤ 75 HRKW	0.26 HRKW 0.25 HRKW	Rockwell Hardness Tester ASTM E-18 Starr Calibration Procedure
	≥ 90 HR15N (80 to 90) HR15N < 80 HR15N	0.20 HR15N 0.23 HR15N 0.17 HR15N	
	≥ 79 HR30N (60 to 79) HR30N ≤ 60 HR30N	0.20 HR30N 0.22 HR30N 0.22 HR30N	
	≥ 65 HR45N (50 to 65) HR45N ≤ 50 HR45N	0.2 HR45N 0.25 HR45N 0.21 HR45N	
	≥ 100 HR15TW (80 to 100) HR15TW ≤ 80 HR15TW	0.19 HR15TW 0.23 HR15TW 0.26 HR15TW	
	≥ 70 HR30TW (50 to 70) HR30TW ≤ 55 HR30TW	0.24 HR30TW 0.23 HR30TW 0.18 HR30TW	
	≥ 50 HR45TW (25 to 50) HR45TW ≤ 25 HR45TW	0.25 HR45TW 0.29 HR45TW 0.25 HR45TW	
	≥ 86 HR15WW < 86 HR15WW	0.19 HR15WW 0.26 HR15WW	
	≥ 90 HR15XW < 90 HR15XW	0.27 HR15XW 0.29 HR15XW	
	≥ 95 HR15YW < 95 HR15YW	0.38 HR15YW 0.25 HR15YW	
	≥ 105 HRMW ≤ 105 HRMW	0.23 HRMW 0.25 HRMW	



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Standardized Rockwell Hardness Test Blocks (cont.)	≥ 120 HRRW < 120 HRRW	0.29 HRRW 0.23 HRRW	Rockwell Hardness Tester ASTM E-18 Starr Calibration Procedure
	≥ 120 HRSW < 120 HRSW	0.3 HRSW 0.19 HRSW	
Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers ¹	≥ 80 HRA (60 to 80) HRA ≤ 60 HRA	0.24 HRA 0.27 HRA 0.28 HRA	Starr-Chek Rockwell Hardness Test Blocks ASTM E-18 Starr Calibration Procedure
	≥ 80 HRBW (60 to 80) HRBW ≤ 60 HRBW	0.28 HRBW 0.31 HRBW 0.35 HRBW	
	≥ 60 HRC (40 to 60) HRC ≤ 40 HRC	0.20 HRC 0.24 HRC 0.26 HRC	
	≥ 80 HRD (62 to 80) HRD ≤ 62 HRD	0.32 HRD 0.27 HRD 0.25 HRD	
	≥ 100 HREW (75 to 100) HREW ≤ 75 HREW	0.26 HREW 0.31 HREW 0.25 HREW	
	≥ 80 HRFW (70 to 80) HRFW ≤ 70 HRFW	0.26 HRFW 0.26 HRFW 0.28 HRFW	
	≥ 80 HRGW (40 to 80) HRGW ≤ 40 HRGW	0.24 HRGW 0.25 HRGW 0.26 HRGW	
	≥ 95 HRHW ≤ 95 HRHW	0.26 HRHW 0.32 HRHW	
	≥ 75 HRKW < 75 HRKW	0.33 HRKW 0.32 HRKW	
	≥ 105 HRMW < 105 HRMW	0.23 HRMW 0.32 HRMW	
	≥ 120 HRRW < 120 HRRW	0.33 HRRW 0.31 HRRW	



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
	≥ 120 HRSW < 120 HRSW	0.34 HRSW 0.25 HRSW	
Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers ¹	≥ 90 HR15N (80 to 90) HR15N < 80 HR15N	0.26 HR15N 0.28 HR15N 0.23 HR15N	Starr-Chek Rockwell Hardness Test Blocks ASTM E-18 Starr Calibration Procedure
	≥ 79 HR30N (60 to 79) HR30N ≤ 60 HR30N	0.26 HR30N 0.27 HR30N 0.27 HR30N	
	≥ 65 HR45N (50 to 65) HR45N ≤ 50 HR45N	0.26 HR45N 0.3 HR45N 0.27 HR45N	
	≥ 85 HR15TW (65 to 85) HR15TW ≤ 65 HR15TW	0.25 HR15TW 0.28 HR15TW 0.3 HR15TW	
	≥ 70 HR30TW (50 to 70) HR30TW ≤ 55 HR30TW	0.28 HR30TW 0.28 HR30TW 0.23 HR30TW	
	≥ 50 HR45TW (25 to 50) HR45TW ≤ 25 HR45TW	0.33 HR45TW 0.36 HR45TW 0.3 HR45TW	
	≥ 86 HR15WW < 86 HR15WW	0.25 HR15WW 0.33 HR15WW	
	≥ 90 HR15XW < 90 HR15XW	0.34 HR15XW 0.35 HR15XW	
	≥ 95 HR15YW < 95 HR15YW	0.43 HR15YW 0.3 HR15YW	
Indirect Verification of Microindentation & Macro Vickers Hardness Testers ¹ Knoop Scale	(10 to 50) g ≤ 500 HK ≥ 500 HK	2.5 HK 2.5 HK	Starr-Chek Knoop Scale Microindentation Hardness Test Blocks ASTM E-92 and E384 Starr Calibration Procedure
	(50 to 100) g ≤ 500 HK ≥ 500 HK	2.5 HK 2.5 HK	
	(100 to 1 000) g ≤ 500 HK ≥ 500 HK	3.2 HK 3.2 HK	



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Vickers Scale	(10 to 50) g ≤ 500 HV ≥ 500 HV	2.7 HV 2.7 HV	Starr-Chek Vickers Scale Microindentation Hardness Test Blocks ASTM E-92 and E384 Starr Calibration Procedure
	(50 to 100) g ≤ 500 HV ≥ 500 HV	4.1 HV 4.1 HV	
	(100 to 1000) g ≤ 500 HV ≥ 500 HV	4.8 HV 4.8 HV	
Macro Vickers Scale	(1 to 50) kg ≤ 500 HV ≥ 500 HV	3.4 HV 3.4 HV	Starr-Chek Macro Vickers Scale Hardness Test Block ASTM E-92 and E384 Starr Calibration Procedure
Standardized Brinell Hardness Test Blocks	(2.5 to 4.8) MM	0.018 MM	Optical Scanning System, Brinell Test Bar ASTM E-10 Starr Calibration Procedure
Indirect Verification of Brinell Hardness Testers ¹	(2.5 to 4.8) MM	0.07 MM	Starr-Chek Brinell Hardness Test Bars ASTM E-10 Starr Calibration Procedure
Portable Hardness Testers - Rockwell ¹	≥ 60 HRC ≤ 60 HRC	0.83 HRC 0.83 HRC	Starr-Chek Rockwell Hardness Test Blocks ASTM E-110 Starr Calibration Procedure
Portable Hardness Testers – Leeb ¹	≤ 750 LD	3.32 LD	Calibration Standard Test Block ASTM A-956 Starr Calibration Procedure



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Portable Hardness Testers Brinell ¹	(2.5 to 4.8) MM	0.07 MM	Starr-Chek Brinell Hardness Test Bars ASTM E-10 and E-110 Starr Calibration Procedure
Optical Scanning Systems ¹	(0 to 6) mm	0.019 mm	Starr-Chek Brinell Test Bar and B.O.S.S. Certified Calibration Standard
Direct Verification of Hardness Testers ¹ Rockwell: Test Force Depth Measurement Diamond Indenter Ball Indenter Grade 25	(3 to 10) kg (15 to 150) kg 14 mm	0.14 kg 0.14 kg 1.8 μm	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 Load Cell, Brinell Optical Scanning System ASTM E-10 Starr Calibration Procedure
Scales & Balances ¹	0 to 10 000 g 0 to 500 lb	1.3 g 0.74 lb	Class F Weights
Force Tension / Compression ¹	(0 to 100) lb (101 to 500) lb (501 to 1 000) lb (1 001 to 10 000) lb	0.22% of reading 0.3% of reading 0.33% of reading 0.3% of reading	Load Cells Certified Weight Sets

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Dew Point and Relative Humidity – Measure ¹ Ambient Air Compressed Air or Dry Nitrogen	(-61 to 69) °F	0.72 °F	Alnor Model 7000U Dew Point Analyzer

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Temperature – Measure ¹	(0 to 800) °C (800 to 1 300) °C	0.37 °C 1.8 °C	Fluke 725 or 744 Process Control Calibrator, Thermocouple AMS 2750 (&/or) AIAG CQI-9 Starr Calibration Procedure
Ovens - Temperature Uniformity Surveys ¹	(100 to 1 200) °F (1 200 to 2 000) °F	1.1 °F 0.9 °F	SSI Data Logger & Certified Thermocouple Wire AMS 2750 (&/or) AIAG CQI-9 Starr Calibration Procedure

Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Timers ¹	0 s to 36 000 s	0.56 s	Stopwatch or NIST Phone System

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ($k=2$), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, 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.
2. L = Length in inches.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1360.



Vice President