Schedule of Accreditation
issued by
United Kingdom Accreditation Service
2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

0201 **Accredited to ISO/IEC 17025:2005**	**UK Calibrations Ltd** **Issue No**: 034 **Issue date:** 29 April 2019	
	Unit 1 **John Samuel Building** **Arthur Drive** **Hoo Farm Industrial Estate** **Kidderminster** **Worcestershire** **DY11 7RA**	**Contact: Mr C Thorpe** **Tel: +44 (0)1562-822924** **Fax: +44 (0)1562-822962** **E-Mail: enquiries@ukcalibrations.co.uk** **Website: www.ukcalibrations.co.uk**
Calibration performed by the organisation at the locations specified below		

Locations covered by the organisation and their relevant activities

Site activities performed away from the locations listed above:

Location details		**Activity**	**Location code**
Any customer's premises	Contact: Mr C Thorpe	Hardness	Site

DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks	Location Code
CERTIFICATION OF HARDNESS TESTING MACHINES IN SERVICE			NOTES	All Sites
Direct verification of Vickers & Knoop hardness tesitng machines	Vickers scales: HV 5 to HV 100 HV 0.1 to HV 3 HV 0.05 to HV 0.010	See note 3	1 The calibration/ verification shall be in accordance with the requirements of BS EN ISO 6508:2015 & ASTM E18-19.	
	Force	0.24%		
	Time	0.1 second	2 The calibration/ verification shall be in accordance with the requirements of BS EN ISO 6506:2018, ASTM E10-18.	
	Length	2 µm		
Indirect verification of Vickers & Knoop hardness testing machines & indentation measuring devices	Vickers scales:	See note 3	3 The verification shall be in accordance with the requirements of BS EN ISO 6507:2005, ASTM E92-17 & ASTM E384-16. and ISO 4545.	
	HV 100 200	1.2 HV		
	HV 100 400	3.4 HV		
	HV 100 700	4.1 HV		
	HV 50 200	1.9 HV		
	HV 50 400	3.5 HV		
	HV 50 700	6.3 HV		
	HV 30 200	2.0 HV		
	HV 30 400	4.4 HV		
	HV 30 700	9.3 HV		
	HV 20 200	2.5 HV		
	HV 20 400	6.2 HV		
	HV 20 700	11.0 HV		
	HV 10 200	3.1 HV		
	HV 10 400	7.7 HV		
	HV 10 700	14.9 HV		
	HV5 200	3.9 HV		
	HV5 400	11.0 HV		
	HV5 700	19.7 HV		
	HV3 200	6.9 HV		
	HV3 400	16.3 HV		
	HV3 700	31.0 HV		
	HV2.5 200	6.0 HV		
	HV2.5 400	12.6 HV		
	HV2.5 700	25.3 HV		
	HV2 200	6.7 HV		
	HV2 400	14.0 HV		
	HV2 700	29.7 HV		
	HV1 200	8.7 HV		
	HV1 400	21.4 HV		
	HV1 700	44.0 HV		

Calibration performed by the Organisation at the locations specified

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks	Location Code
Indirect verification of Vickers & Knoop hardness testing machines & indentation measuring devices (cont'd)	HV 0.5 200	5.0 HV		
	HV 0.5 400	15.0 HV		
	HV 0.5 700	17.0 HV		
	HV 0.3 200	6.0 HV		
	HV 0.3 400	16.0 HV		
	HV 0.3 700	19.0 HV		
	HV 0.2 200	7.0 HV		
	HV 0.2 400	17.0 HV		
	HV 0.2 700	20.0 HV		
	HV 0.1 200	10.0 HV		
	HV 0.1 400	30.0 HV		
	HV 0.1 700	40.0 HV		
	HV 0.05 80	11.5 HV		
	HV 0.05 115	11.5 HV		
	HV 0.025 100	19.0 HV		
	HV 0.025 200	19.0 HV		
	Knoop scales:	See note 3		
	HK1 200	9.1 HK		
	HK1 400	16.7 HK		
	HK1 700	29.2 HK		
	HK 0.5 200	10.5 HK		
	HK 0.5 400	19.5 HK		
	HK 0.5 700	34.8 HK		
	HK 0.3 200	11.7 HK		
	HK 0.3 400	22.1 HK		
	HK 0.3 700	40.5 HK		
	HK 0.2 200	12.8 HK		
	HK 0.2 400	24.8 HK		
	HK 0.2 700	45.9 HK		
	HK 0.1 200	15.7 HK		
	HK 0.1 400	30.8 HK		
	HK 0.1 700	58.0 HK		
	HK 0.05 200	7.0 HK		
	HK 0.05 400	19.0 HK		
	HK 0.05 700	44.0 HK		
	HK 0.025 200	9.5 HK		
	HK 0.025 400	27.0 HK		
	HK 0.025 700	62.5 HK		

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks	Location Code
Direct verification of Brinell hardness testing machines	Brinell scales: From HB 10/3000 to HB 1/30 Force	See note 2 0.24% force		
	Time	0.1 second time		
	Length	10 μm		
Indirect verification of Brinell hardness testing machines	Scale 10/3000 600HBW to 140 HBW	See Note 2 8.0 HBW to 2.2 HBW		
	Scale 10/1500 299 HBW to 55 HBW	4.1 HBW to 1.2 HBW		
	Scale 10/1000 169 HBW to 55 HBW	2.3 HBW to 1.2 HBW		
Indirect verification of Brinell hardness testing machines (cont'd)	Scale 10/500 100 HBW to 200 HBW	1.71 HBW		
	Scale 5/750 600 HBW to 140 HBW	9.8 HBW to 2.4 HBW		
	Scale 5/250 169 HBW to 55 HBW	2.7 HBW to 1.3 HBW		
	Scale 2.5/187.5 600 HBW to 140 HBW	16 HBW to 2.9 HBW		
	Scale 2.5/62.5 169 HBW to 55 HBW	10 HBW to 2.3 HBW		
	Scale 1/30 600 HBW to 96 HBW	31.6 HBW to 2.9 HBW		
	Scale 1/10 141 HBW	3.6 HBW		
	Scale 1/1 21.8 HBW to 3.18 HBW	1.04 HBW to 0.09 HBW		
Direct verification of Rockwell hardness testing machines	Rockwell scales: A, B, C, D, E, F, G, H, K,L,M,P,R,S,V, N,T,W,X & Y Force	See note 1 0.24%		
	Length	0.40 μm		
	Time	0.1 second		

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks	Location Code
Indirect verification of Rockwell hardness testing machines	Rockwell scales: HRA Scale 80 to 88 70 to 75 20 to 40	See note 1 0.15 HRA 0.16 HRA 0.28 HRA		
	Rockwell scales: HRB Scale 80 51 to 79 10 to 50	See Note 1 0.42 HRB 0.87 HRB 1.36 HRB		
	HRC Scale 60 to 70 40 to 59 20 to 39	 0.31 HRC 0.32 HRC 0.37 HRC		
	HRD Scale 70 to 80 50 to 69 40 to 49	 0.17 HRD 0.25 HRD 0.27 HRD		
	HRE Scale 89 75 to 88 65 to 87	 0.54 HRE 0.54 HRE 0.54 HRE		
	HRF Scale 87 70 to 86 40 to 69	 0.40 HRF 0.40 HRF 0.54 HRF		
	HRG Scale 80 40 to 79 10 to 39	 0.30 HRG 0.30 HRG 0.76 HRG		
	HRH Scale 90 80 to 89 60 to 79	 0.40 HRH 0.40 HRH 0.68 HRH		
	HRK Scale 70 30to69 10to29	 0.40 HRK 0.40 HRK 0.64 HRK		
	HRL Scale 115 90 to 114	 0.35 HRL 0.35 HRL		
	HRM Scale 100 70 to 99	 0.56 HRM 0.56 HRM		

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks	Location Code
Indirect verification of Rockwell hardness testing machines (cont'd)	HRP Scale 85 40 to 84	 0.65 HRP 0.91 HRP		
	Rockwell Scales: HRR Scale 120 100 to 119	See Note 1 0.23 HRR 0.40 HRR		
	HRS Scale 112 110 to 111	 0.19 HRS 0.91 HRS		
	HRV Scale 104 80 to 103	 0.20 HRV 0.61 HRV		
	HR15N Scale 90to95 80to89 40to79	 0.18 HR15N 0.18 HR15N 0.39 HR15N		
	HR15T Scale 88 to 100 80 to 87 20 to 79	 0.21 HR15T 0.21 HT15T 0.37 HR15T		
	HR15W Scale 89 to 100 80 to 88	 0.53 HR15W 0.44 HR15W		
	HR15X Scale 88 to 100 80 to 87	 0.33 HR15X 0.62 HR15X		
	HR15Y Scale 94 to 100 85 to 93	 0.63 HR15Y 1.30 HR15Y		
	HR30N Scale 77 to 85 60 to 76 40 to 59	 0.27 HR30N 0.27 HR30N 0.55 HR30N		
	HR30T Scale 57 to 85 50 to 56 20 to 49	 0.39 HR30T 0.66 HR30T 0.90 HR30T		
	HR30W Scale 65 to 100 40 to 64	 0.76 HR30W 0.90 HR30W		
	HR30X Scale 79 to 100 60 to 78	 0.15 HR30X 0.99 HR30X		

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks	Location Code
Indirect verification of Rockwell hardness testing machines (cont'd)	Rockwell Scales: HR30Y Scale 88 to 100 60 to 87 HR45N Scale 67 to 75 50 to 66 10 to 49 HR45T Scale 50 to 75 40 to 49 10 to 39 HR45W Scale 49 to 100 10 to 47 HR45X Scale 69 to 100 40 to 68 HR45Y Scale 82 to 100 60 to 81	See Note 1 0.37 HR30Y 0.82 HR30Y 0.18 HR45N 0.21 HR45N 0.43 HR45N 0.40 HR45T 0.40 HR45T 0.73 HR45T 0.12 HR45W 0.29 HR45W 0.34 HR45X 0.81 HR45X 0.29 HR45Y 0.94 HR45Y		
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 uncertainty of measurement 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 CIPM-ILAC definition of the CMC is as follows:

A CMC is a calibration and measurement capability available to customers under normal conditions:
(a) as published in the BIPM key comparison database (KCDB) of the CIPM MRA; or
(b) as described in the laboratory's scope of accreditation granted by a signatory to the ILAC Arrangement.

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 CMC is calculated according to the procedures given in M3003 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 CMC in certificates issued under its accreditation.

The CMC may be described using various methods in the Schedule of Accreditation:

As a single value that is valid throughout the range.
As an explicit function of the measurand or of a parameter (see below).
As a range of values. The range is stated such that the customer can make a reasonable estimate of the likely uncertainty at any point within the range.
As a matrix or table where the CMCs depend on the values of the measurand and a further quantity.
In graphical form, providing there is sufficient resolution on each axis to obtain at least two significant figures for the CMC.

Expression of CMCs - symbols and units

In general, only units of the SI and those units recognised for use with the SI are used to express the values of quantities and of the associated CMCs. Nevertheless, other commonly used units may be used where considered appropriate for the intended audience. For example, the term "ppm" (part per million) is frequently used by manufacturers of test and measurement equipment to specify the performance of their products. Terms like this may be used in Schedules of Accreditation where they are in common use and understood by the users of such equipment, providing their use does not introduce any ambiguity in the capability that is being described.

When the CMC is expressed as an explicit function of the measurand or of a parameter, this often comprises a relative term (e.g., percentage) and an absolute term, i.e. one expressed in the same units as those of the measurand. This form of expression is used to describe the capability that can be achieved over a range of values. Some examples are shown below. It should be noted that these expressions are *not* mathematical formulae but are instead written in a commonly used shorthand for expressing uncertainties - therefore, for purposes of clarity, an indication of how they are to be interpreted is also provided below.

<u>DC voltage, 100 mV to 1 V:</u> 0.0025 % + 5.0 µV

Over the range 100 mV to 1 V, the CMC is $0.0025\,\%\cdot V + 5.0\ \mu V$, where V is the measured voltage.

<u>Hydraulic pressure, 0.5 MPa to 140 MPa:</u> 0.0036 % + 0.12 ppm/MPa + 4.0 Pa

Over the range 0.5 MPa to 140 MPa, the CMC is $0.0036\,\%\cdot p + (0.12\cdot 10^{-6}\cdot p\cdot 10^{-6}) + 4.0$ Pa, where p is the measured pressure in Pa.

It should be noted that the percentage symbol (%) simply represents the number 0.01. In cases where the CMC is stated only as a percentage, this is to be interpreted as meaning percentage of the measured value or indication.

Thus, for example, a CMC of 1.5 % means $1.5 \cdot 0.01 \cdot i$, where i is the instrument indication.