Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

UKAS CALIBRATION

0231

Accredited to ISO/IEC 17025:2017

Foundrax Engineering Products Ltd

Issue No: 041 **Issue date:** 20 July 2020

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Calibration performed by the Organisations at the locations specified below

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details		Activity	Location code
Address Wessex Park Somerton Somerset TA11 6SB	**Local contact** Chris Wall	Calibration of Brinell Reference blocks Calibration of Rockwell Reference blocks Direct and Indirect Verification of Brinell Machines including portable machines and Indentation Measuring Equipment Direct & Indirect verification of Rockwell Hardness Calibration machines Verification of ball Indentors	P

Site activities performed away from the locations listed above:

Location details	Activity	Location code
At Customers Premises	Direct and Indirect Verification of Brinell Machines including portable machines and Indentation Measuring Equipment	S

DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks	Location Code
HARDNESS				
Calibration of Reference Hardness Blocks: Brinell scales	Ratio (F/D²) = 30	See Note 1	Note 1 The calibration shall be in accordance with the requirements of BS EN ISO 6506-3:2014 and/or ASTM E10-18.	P
	10/3000 500HBW to 600 HBW	4.8 HBW		
	10/3000 400HBW to 500 HBW	2.7 HBW		
	10/3000 370HBW to 400 HBW	2.3 HBW		
	10/3000 330HBW to 370 HBW	2.1 HBW		
	10/3000 300HBW to 330 HBW	1.9 HBW		
	10/3000 270HBW to 300 HBW	1.7 HBW		
	10/3000 230HBW to 270 HBW	1.5 HBW		
	10/3000 200HBW to 230 HBW	1.3 HBW		
	10/3000 170HBW to 200 HBW	1.1 HBW		
	10/3000 140HBW to 170 HBW	0.93 HBW		
	5/750 500 HBW to 600 HBW	4.4 HBW		
	5/750 400 HBW to 500 HBW	3.6 HBW		
	5/750 370 HBW to 400 HBW	3.1 HBW		
	5/750 330 HBW to 370 HBW	2.8 HBW		
	5/750 300 HBW to 330 HBW	2.5 HBW		
	5/750 270 HBW to 300 HBW	2.3 HBW		
	5/750 230 HBW to 270 HBW	2.0 HBW		
	5/750 200 HBW to 230 HBW	1.7 HBW		
	5/750 170 HBW to 200 HBW	1.5 HBW		
	5/750 140 HBW to 170 HBW	1.2 HBW		
	2.5/187.5 500 HBW to 600 HBW	4.4 HBW		
	2.5/187.5 400 HBW to 500 HBW	3.6 HBW		
	2.5/187.5 370 HBW to 400 HBW	3.1 HBW		
	2.5/187.5 330 HBW to 370 HBW	2.8 HBW		
	2.5/187.5 300 HBW to 330 HBW	2.5 HBW		
	2.5/187.5 270 HBW to 300 HBW	2.3 HBW		
	2.5/187.5 230 HBW to 270 HBW	2.0 HBW		
	2.5/187.5 200 HBW to 230 HBW	1.7 HBW		
	2.5/187.5 170 HBW to 200 HBW	1.5 HBW		
	2.5/187.5 140 HBW to 170 HBW	1.2 HBW		
	Ratio (F/D²) = 15	See Note 1		P
	10/1500 270 HBW to 299 HBW	1.7 HBW		
	10/1500 230 HBW to 270 HBW	1.5 HBW		
	10/1500 200 HBW to 230 HBW	1.3 HBW		
	10/1500 170 HBW to 200 HBW	1.1 HBW		
	10/1500 140 HBW to 170 HBW	0.93 HBW		
	10/1500 110 HBW to 140 HBW	0.75 HBW		
	10/1500 99 HBW to 110 HBW	0.63 HBW		
	10/1500 55 HBW to 99 HBW	0.46 HBW		

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks	Location Code
HARDNESS (cont'd)				
Calibration of Reference Hardness Blocks: Brinell scales (cont.)	Ratio (F/D²) = 10 10/1000 140 HBW to 169HBW 10/1000 110 HBW to 140HBW 10/1000 90 HBW to 110HBW 10/1000 55 HBW to 90HBW	See Note 1 0.93 HBW 0.75 HBW 0.60 HBW 0.44 HBW		P
	5/250 140 HBW to 169HBW 5/250 110 HBW to 140HBW 5/250 90 HBW to 110HBW 5/250 55 HBW to 90HBW	1.2 HBW 1.0 HBW 0.80 HBW 0.58 HBW		
	Ratio (F/D²) = 5 10/500 90 HBW to 100 HBW 10/500 55 HBW to 90 HBW	See Note 1 0.57 HBW 0.44 HBW		P
Brinell reference indentation reading blocks	0.6 mm up to 6 mm diameter	1.8 µm on indentation diameter	Using a high resolution measuring system	P
Direct verification of indentation measuring equipment for Brinell hardness	1.2 mm to 6.0 mm	See Note 2 1.4 µm	Note 2 The calibration shall be in accordance with the requirements of BS EN ISO 6506-2:2018 and /or BS EN ISO 6506-3:2014 and/or ASTM E10-18.	P & S
Verification of Brinell ball indenters	1 mm to 10 mm	See note 3	Note 3 The verification shall be in accordance with the requirements of BS EN ISO 6506-2:2018 and/or ASTM E10-18.	P
Direct & Indirect verification of Brinell Hardness Calibration Machines, Hardness Testing Machines and Indentation Measuring devices	Brinell scales: HBW 10/3000 to HBW 2.5/187.5	See Note 4	Note 4 The calibration shall be in accordance with the requirements of BS EN ISO 6506-2:2018 or BS EN ISO 6506-3:2014 and/or ASTM E10-18.	P & S
	Force 30 kN to 2 kN Force 30 kN to 1 kN	0.06 % 0.2 %		
	Time	0.1 second		
	Scale 10/3000 600HBW to 140 HBW	See Note 4 8.0 HBW to 2.2 HBW		S
	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		
	Scale 5/750 600 HBW to 140 HBW	9.8 HBW to 2.4 HBW		

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks	Location Code
HARDNESS (cont'd)				
Direct & Indirect verification of Brinell Hardness Calibration Machines, Hardness Testing Machines and Indentation Measuring devices	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 Scale 2.5/62.5 135.8 HBW	 16 HBW to 2.9 HBW 3.0 HBW		
Direct verification of Rockwell Hardness Calibration machines	Rockwell scale: A, B, C, D, E, F, G, H, K, L, M, P, R, S and V	See Note 5	Note 5 The calibration shall be in accordance with the requirements of BS EN ISO 6508-3:2015 and/or ASTM E18-20.	P
	Force	0.06 %		
	Depth	0.09 µm		
	Time	0.1 second		
Verification of Rockwell ball indenters	1.5875 mm to 12.7 mm	See Note 6	Note 6 The verification shall be in accordance with the requirements of BS EN ISO 6508-2:2015 and/or BS EN ISO 6508-3:2015 and/or ASTM E18-20.	P
Calibration of Rockwell Standardised Hardness Blocks	HRA Steel Scale 80 to 86.5 70 to 79 60 to 69	See Note 7 0.15 HRA 0.16 HRA 0.28 HRA	Note 7 The calibration shall be in accordance with the requirements of BS EN ISO 6508-3:2015 and/or ASTM E18-20.	P
	HRB Scale 80 to 120 51 to 79 10 to 50	 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 75 to 89 65 to 74	 0.54 HRE 0.54 HRE		

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks	Location Code
HARDNESS (cont'd)				
Calibration of Rockwell Standardised Hardness Blocks (cont'd)	HRF Scale			
	87	0.40 HRF		
	70 to 86	0.40 HRF		
	40 to 69	0.54 HRF		
	HRG Scale			
	80	0.30 HRG		
	40 to 79	0.30 HRG		
	10 to 39	0.76 HRG		
	HRH Scale			
	90	0.40 HRH		
	80 to 89	0.40 HRH		
	60 to 79	0.68 HRH		
	HRK Scale			
	70	0.40 HRK		
	30 to 69	0.40 HRK		
	10 to 29	0.64 HRK		
	HRL Scale			
	115	0.35 HRL		
	90 to 114	0.35 HRL		
	HRM Scale			
	100	0.56 HRM		
	70 to 99	0.56 HRM		
	HRP Scale			
	85	0.65 HRP		
	40 to 84	0.91 HRP		
	HRR Scale			
	120	0.23 HRR		
	100 to 119	0.40 HRR		
	HRS Scale			
	112	0.19 HRS		
	110 to 111	0.91 HRS		
	HRV Scale			
	104	0.20 HRV		
	80 to 103	0.61 HRV		

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 %·V + 5.0 µV, 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.