



ISO 6508-2:2015 Table 2 – Permissible repeatability range and bias of the testing machine

Rockwell hardness scale	Hardness range of the reference block	Permissible bias Rockwell units ^b	Permissible repeatability range of the testing machine ^a r
A	20 to 75 HRA >75 to 95 HRA	± 2 HRA ± 1.5 HRA	$\leq 0.02 (100 - \bar{H})$ or 0.8 HRA Rockwell units ^b
B	10 to 45 HRBW >45 to 80 HRBW >80 to 100 HRBW	± 4 HRBW ± 3 HRBW ± 2 HRBW	$\leq 0.04 (130 - \bar{H})$ HRBW Rockwell units
C	10 to 70 HRC	± 1.5 HRC	$\leq 0.02 (100 - \bar{H})$ or 0.8 HRC Rockwell units ^b
D	40 to 70 HRD >70 to 77 HRD	± 2 HRD ± 1.5 HRD	$\leq 0.02 (100 - \bar{H})$ or 0.8 HRD Rockwell units ^b
E	70 to 90 HREW >90 to 100 HREW	± 2.5 HREW ± 1.5 HREW	$\leq 0.04 (130 - \bar{H})$ HREW Rockwell units
F	60 to 90 HRFW >90 to 100 HRFW	± 3 HRFW ± 2 HRFW	$\leq 0.04 (130 - \bar{H})$ HRFW Rockwell units
G	30 to 50 HRGW >50 to 75 HRGW >75 to 94 HRGW	± 6 HRGW ± 4.5 HRGW ± 3 HRGW	$\leq 0.04 (130 - \bar{H})$ HRGW Rockwell units
H	80 to 100 HRHW	± 2 HRHW	$\leq 0.04 (130 - \bar{H})$ HRHW Rockwell units
K	40 to 60 HRKW >60 to 80 HRKW >80 to 100 HRKW	± 4 HRKW ± 3 HRKW ± 2 HRKW	$\leq 0.04 (130 - \bar{H})$ HRKW Rockwell units
15N, 30N, 45N	All ranges	± 2 HR-N	$\leq 0.04 (100 - \bar{H})$ or 1.2 HR-N Rockwell units ^b
15T, 30T, 45T	All ranges	± 3 HR-TW	$\leq 0.06 (100 - \bar{H})$ or 2.4 HR-TW Rockwell units ^b

a \bar{H} is the mean hardness value.

b The one with a greater value becomes the permissible repeatability range of the testing machine.

NOTE The requirements for permissible repeatability range, r , and/or permissible bias, b , might be different in ASTM E 18.

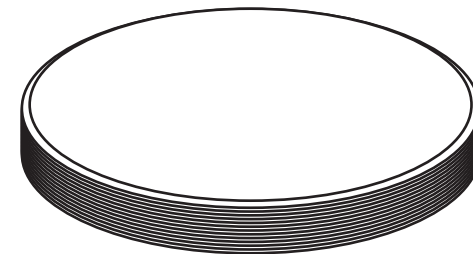
ASTM E18-15 TABLE A1.3 Maximum Allowable Repeatability and Error of Testing Machines for Ranges of Standardized Test Blocks

	Range of Standardized Test Blocks ^a	Maximum Repeatability, R (HR units)	Maximum Error, E (HR units)
HRA	< 70 ≥ 70 and < 80 ≥ 80	2.0 1.5 1.0	± 1.0 ± 1.0 ± 0.5
HRBW	< 60 ≥ 60 and < 80 ≥ 80	2.0 1.5 1.5	± 1.5 ± 1.0 ± 1.0
HRC	< 35 ≥ 35 and < 60 ≥ 60	2.0 1.5 1.0	± 1.0 ± 1.0 ± 0.5
HRD	< 51 ≥ 51 and < 71 ≥ 71	2.0 1.5 1.0	± 1.0 ± 1.0 ± 0.5
HREW	< 84 ≥ 84 and < 93 ≥ 93	1.5 1.5 1.0	± 1.0 ± 1.0 ± 1.0
HRFW	< 80 ≥ 80 and < 94 ≥ 94	1.5 1.5 1.0	± 1.0 ± 1.0 ± 1.0
HRGW	All ranges	2.0	± 1.0
HRHW	All ranges	2.0	± 1.0
HRKW	< 65 ≥ 65 and < 85 ≥ 85	1.5 1.0 1.0	± 1.0 ± 1.0 ± 1.0
HR15N	< 78 ≥ 78 and < 90 ≥ 90	2.0 1.5 1.0	± 1.0 ± 1.0 ± 0.7
HR30N	< 55 ≥ 55 and < 77 ≥ 77	2.0 1.5 1.0	± 1.0 ± 1.0 ± 0.7
HR45N	< 37 ≥ 37 and < 66 ≥ 66	2.0 1.5 1.0	± 1.0 ± 1.0 ± 0.7
HR15TW	< 81 ≥ 81 and < 87 ≥ 87	2.0 1.5 1.5	± 1.5 ± 1.0 ± 1.0
HR30TW	< 57 ≥ 57 and < 70 ≥ 70	2.0 1.5 1.5	± 1.5 ± 1.0 ± 1.0
HR45TW	< 33 ≥ 33 and < 53 ≥ 53	2.0 1.5 1.5	± 1.5 ± 1.0 ± 1.0
HR15WW ^b HR30WW ^b HR45WW ^b HR15XW ^b HR30XW ^b HR45XW ^b HR15YW ^b HR30YW ^b HR45YW ^b		2.0	± 1.0

^a The user may find that high, medium and low range test blocks are unavailable commercially for some scales. In those cases one or two standardized blocks where available may be used. It is recommended that all high range test blocks for Rockwell scales using a ball indenter should be less than 100 HR units.

^b Appropriate ranges of standardized test blocks for the L, M, P, R, S, V, W, X, and Y scales shall be determined by dividing the usable range of the scale into two ranges, if possible.

Hardness Reference Block Calibration Certificate



CC-2374



Fmi Calibration Laboratory

B-7/12, MIDC Area, Miraj, Dist. Sangli, Maharashtra 416 410

Ph. No. : +91 9503874245, Fax : +91 2332644913


e-mail : response@finemanufacturing.com

web : www.finemanufacturing.com

Date of Calibration	†Recommended date for next calibration	Date of Issue	Page	Certificate Number
24 September 2018	23 September 2023	12 October 2018	1 of 2	ULR-CC237421000100452F

Customer:	Fine Manufacturing Industries, B-7/12, MIDC area, Miraj, District Sangli, Maharashtra, India Pin: 106410

Reference Hardness Block Scale:	HR15N
Reference Hardness block Thickness:	11.54 mm
Shape:	Circular
Temperature:	(23.8 ± 1)° C
Humidity:	(48 ± 10)%



The above Reference Hardness Block is calibrated on a standardising machine at FMI Calibration Laboratory. The standardising machine is directly calibrated as per the requirements of ISO 6508-3:2015 and ASTM E18-20 annex A2. The standardising machine is calibrated using devices traceable to SI system of units realised at NPL-India, NPL-UK, IMGC, NIST or PTB either directly or through NABL, UKAS, NVALP, A2LA or DAKKS accredited

Validity: ISO 6508-3:2015 Clause 10: The hardness Reference Block is only valid for the scale for which it was calibrated. The duration of the calibration validity should be limited to 5 years. Attention is drawn to the fact that, for Al- and Cu-alloys, the calibration validity could be reduced to two years to three years.

Calibration Method: FMICL/SOP/Rockwell based on ASTM E18-20 annex A4, ISO 6508-3:2015 and IS 1586 (Part 3):2018

Approved Signatory:

A K Mirashi
K S Mirashi
R G Ponshe

Date of Calibration	†Recommended date for next calibration	Date of Issue	Page	Certificate Number (ULR)
24 September 2018	23 September 2023	12 October 2018	2 of 2	ULR-CC237421000100452F

Results			
After the preliminary visual inspection of the test surface and supporting surface of the block, at least one impression was taken on the block for seating purpose and its hardness value was ignored. Then the hardness was measured at five different places uniformly distributed throughout the test surface of the block.			
Observations	Mean Hardness Value (H_{mean}):	73.44 HR15N	
	Maximum Hardness Value (H_{max}):	73.63 HR15N	
	Minimum Hardness Value (H_{min}):	73.34 HR15N	
	Indentation 1:	73.44 HR15N	
	Indentation 2:	73.63 HR15N	
	Indentation 3:	73.38 HR15N	
	Indentation 4:	73.34 HR15N	
	Indentation 5:	73.42 HR15N	
	Non-uniformity of the Block (R):		0.29 HR15N
	Magnitude	Preliminary Test force:	29.42 N
	Total Test Force:	147.11 N	
Dwell Time	Preliminary Test force:	3.0 secs	
	Total Test Force:	5.0 secs	
	Elastic Recovery:	4.0 secs	

Expanded Uncertainty of Measurement:	± 0.45 HR15N (k = 1.96) Thickness: ± 0.007 mm Dwell Time: ± 0.3 secs
---	--

Remarks:

- The reported expanded uncertainty of calibration of the hardness block includes the standard uncertainty due to non-uniformity of the block and the CMC of the standardising machine. The reported expanded uncertainty is based on combined standard uncertainty multiplied by coverage factor k (as reported above) providing a level of confidence of approximately 95%
- The above Reference Hardness Block was found to comply with the requirements of ISO 6508-3 clause 7, IS 1586 (Part 3) clause 7 and ASTM E18 Table A4.2

Note:	1) This certificate refers only to the particular item submitted for calibration. 2) This certificate shall not be reproduced, except in full, unless prior written permission from CEO, FMICL. This certificate is invalid without signature. 3) †The recommended date of next calibration is computed on the basis of validity clause of ISO 6508-3. The customer may select different date as per their own requirements.
--------------	--