No. SCA_300_023

Measurement of Carburized Case Depth of Steel with Shimadzu Micro Hardness Tester Model HMV

G21 Series

■ Introduction

Micro hardness testers are indispensable instruments for hardness evaluation, including surface composition, surface quenching layers, and machining transformation layers in research and development as well as quality control of parts of precision instruments, wires, metal foils, and electronic elements. The method for measuring the depth of layers hardened by carburizing or carburizing and quenching is specified in JIS-G-0557 "Method of measuring case depth hardened by carburizing treatment for steel." According to it, the effective depth or whole depth of hardened layer should be determined from the hardness distribution curve obtained on the cross section perpendicular to the hardened layer by use of a micro hardness tester.

The Shimadzu Micro Hardness Tester, which features very high reliability and excellent operability due to its built-in data processing functions, is best suitable for efficient measurement of the depth of carburized layers. The following is an example of such a measurement.

■ Measurement of hardness distribution in a carburized layer of Ni-Cr-Mo steel

A specimen was prepared by molding a cross section of steel into resin and finished by buffing. Hardness was measured at every 0.1mm on the test surface. The printer output is shown in **Fig.1**. The hardness distribution plotted from the measured data is shown in **Fig.2** JIS-G-0557 defines the effective depth of hardened layer as the distance between the surface and the point at which Vickers hardness matches 550. In this test, the effective depth is 0.6 mm. Shimadzu Micro Hardness Tester, featuring completely automatic load change, loading, and unloading, is used for quality control of low to high hardness's of small parts such as the gears and cams of watches, sewing machines, cameras and optical devices, and electronic elements like ICs and LSIs.

Date of test	Date 1987 2 14
Testing parameter file No	File No.
Specimen Number	Sample No.
Number of tests	Test 13
Number of lots	Lot 1
Testing mode	Vickers
Type of specimen surface	Flat
Repetitive number to read data	Read 2
Testing load	Load 200 GF
Load duration time	Loading Time 15 Sec
Correction coefficient	Correct 0,1273 µm
Number of lots and number of tests for a specimen	Lot = 1, Test = 1
Diagonal length of the indentation	D1 = 22,8
	D2 = 22,6
Vickers hardness	HV = 718
	Lot = 1, Test = 2
	D1 = 22,2
	D2 = 22,6
	HV = 735
	Lot = 1, Test = 3
	D1 = 22,3
	D2 = 22,6
	HV = 734
	Lot = 1, Test = 4
	D1 = 30,9
	D2 = 31,5
	HV = 380
Result of statistical calculation	--Statistics--
Measuring mode	HV
Number of lots	Lot = 1
Mean hardness	X = 572
Standard deviation	S = 143,7
Coefficient of variation	CV = 25,08 %
Minimum value in the lot	Min. = 380
Maximum value in the lot	Max. = 739

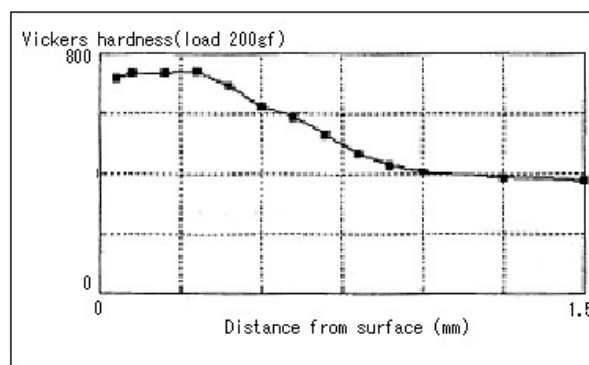Fig. 1 Printer output of measured values

Fig. 2 Hardness Distribution in Carburized layer

* Please be advised that data obtained before the implementation of the current Weights and Measures Law may be presented in terms of gravimetric unit.