Specifications

Model name	Handy Hardness Tester **SONOHARD** SH-21A-E (Motorized/manual switchover type probe)		Display make-up	a. Measured value: 3 digits b. TIMES: 2 digits (measuring frequency) c. MAX value: 3 digits d. MIN value: 3 digits e. σ: 4 digits (standard deviation) f. $\bar{x}$: 4 digits (average value)
Measuring indenter	Diamond indenter for Micro-Vickers (facing-to- surface angle of 136°)			
Test load and control no. CE making complied models are required to add (CE) with control no.	1. Approx 2kgf (roughly 20N)	SH-21A-E2		
	2. Approx 1kgf (roughly 10N)	SH-21A-E1		
Measuring range	1. Rockwell hardness 10.0～70.0 HRC 2. Vickers hardness 100～999 HV 3. Shore hardness 20.0～99.9 HS 4. Brinell hardness 85～550 HBW			
Reproducibility	HRC : ± 1.0HRC, HV : ± (3%rdg)HV, HS : ± 1.0HS, HBW : ± (3%rdg)HBW		Set-up	a. UPPER (upper limit) b. LOWER (lower limit) c. TIMES (measuring frequency) d. CANCEL
Applicable test materials	With steel as the principle material, other metallic materials may also be measured by calibrating against a standard hardness test block.			
Display of measured values	Digital display (LCD, 4 digits) with EL backlight			
Data memory	2000 pieces			
Digital display units	1HV, 0.1HRC, 0.1HS, 1HBW, 1N/mm² (tensile strength)		Alarm	Alarm (buzzer sound)
Allowable operating temperature	0～50°C		Output	RS-232C output used for data transmission or printing
Power source	AC adapter(100～240V) or lithium ion rechargeable battery operatable for continuous 8 hours (with new battery)			
Continious operating hours	5 hours when featuring a rechargeable BL; 8 hours without BL *BL= backlight			
Dimensions	Display unit: 97mm(W) x 172mm(H) x 50mm(D), Probe diameter: 50mm, length: 170.5mm		Frequency	Motorized / manual switchover type approx 69～71kHz
Weight	Display unit: approx. 400g (including battery), Probe and cable: approx. 430g			
Carrying case dimensions	389mm(W) x 132mm(H) x 200mm(D)			
Standard components	1 display unit, 1 probe (including standard attachment/UA5410), 1 hardness standard test block (arround 55HRC), 1 probe cable 1.5m, 1 AC adapter 100～240V (A10WN-09010I), 1 recharger (MK-8220), 1 lithium ion battery (MK-8401),1 carrying case (MK-9701), 1 instruction manual, 1 inspection sheet		Conversion	Compliant with SAE J417, JIS B 7731
Options	Standard hardness test blocks around 600HV, 50HS,300HB for scale calibration, Measuring stand for small objects (SH-P07), Probe attachment for pipes materials (SH-P06), Probe attachment for inner races (SH-P05), Printer model DPUH245AS with cable, Printer paper (TP-H241L), Stand for the main unit (SH-P03)			

- When using the tester installed in automated machinery, please contact our hardness tester sales department for specifications concerning the testers used for automatic machines.
- The SONOHARD SH-21A-E is calibrated using the standard hardness test block produced in compliance with JIS B7730/ ISO 6508-3 and JIS B7735/ ISO 6507-3 by Yamamoto Scientific Tool Laboratory Co., Ltd., Japan, who has the quality management system approved under ISO 9001. The values measured by SH-21A-E are therefore guaranteed by us.
  (Accuracy of measurement under calibration with other makers' test blocks is out of our guarantee.)
- The model name on the catalog is SH-21A-E, while it is referred to as SH-21A-E only in the relevant operation manual, test certificate and ISO certificate, etc.
- A standard export model of SH-21A-E is not CE-Marking complied, but a CE-Marking complied model is also available by factory modification on request and order beforehand.

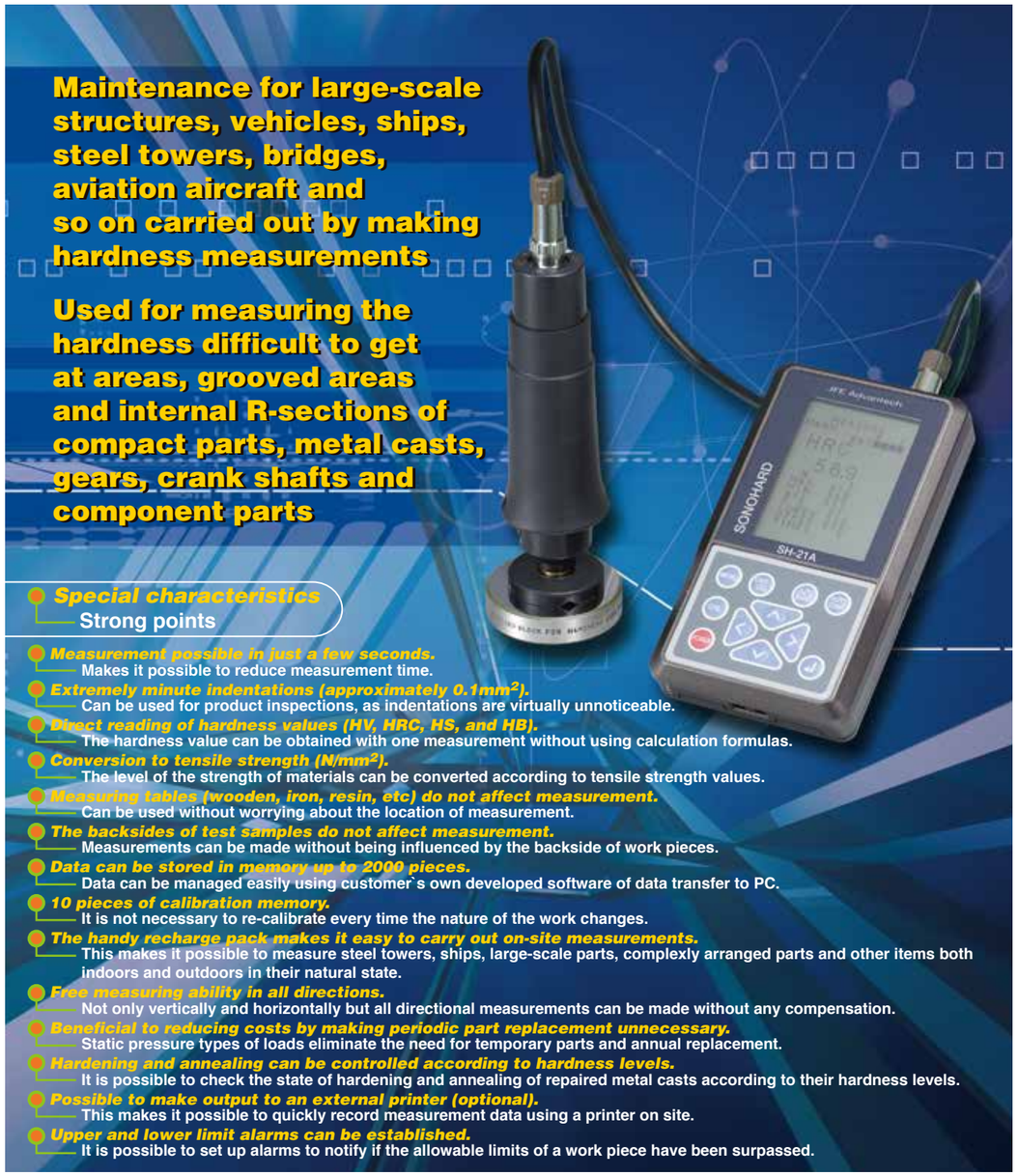
※ Please read the user's manual before undertaking operations.
※ Specifications may be changed without prior notice due to product revisions.

Handy Hardness Tester

SONOHARD SH-21A

ISO9001 JQA-0950

Perfect for use in making on-site measurements



Special characteristics
Strong points

- ***Measurement possible in just a few seconds.***
  Makes it possible to reduce measurement time.
- ***Extremely minute indentations (approximately 0.1mm²).***
  Can be used for product inspections, as indentations are virtually unnoticeable.
- ***Direct reading of hardness values (HV, HRC, HS, and HB).***
  The hardness value can be obtained with one measurement without using calculation formulas.
- ***Conversion to tensile strength (N/mm²).***
  The level of the strength of materials can be converted according to tensile strength values.
- ***Measuring tables (wooden, iron, resin, etc) do not affect measurement.***
  Can be used without worrying about the location of measurement.
- ***The backsides of test samples do not affect measurement.***
  Measurements can be made without being influenced by the backside of work pieces.
- ***Data can be stored in memory up to 2000 pieces.***
  Data can be managed easily using customer's own developed software of data transfer to PC.
- ***10 pieces of calibration memory.***
  It is not necessary to re-calibrate every time the nature of the work changes.
- ***The handy recharge pack makes it easy to carry out on-site measurements.***
  This makes it possible to measure steel towers, ships, large-scale parts, complexly arranged parts and other items both indoors and outdoors in their natural state.
- ***Free measuring ability in all directions.***
  Not only vertically and horizontally but all directional measurements can be made without any compensation.
- ***Beneficial to reducing costs by making periodic part replacement unnecessary.***
  Static pressure types of loads eliminate the need for temporary parts and annual replacement.
- ***Hardening and annealing can be controlled according to hardness levels.***
  It is possible to check the state of hardening and annealing of repaired metal casts according to their hardness levels.
- ***Possible to make output to an external printer (optional).***
  This makes it possible to quickly record measurement data using a printer on site.
- ***Upper and lower limit alarms can be established.***
  It is possible to set up alarms to notify if the allowable limits of a work piece have been surpassed.

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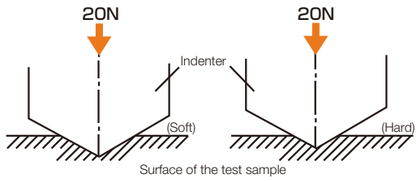
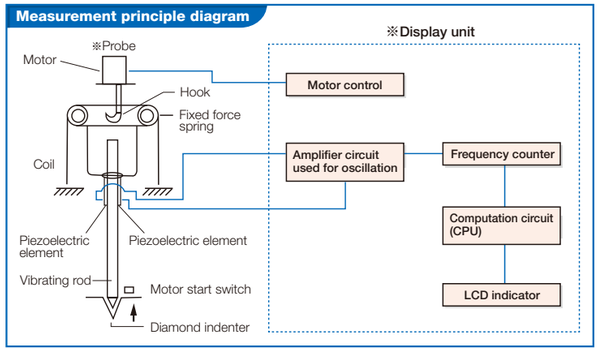
The Handy Hardness Tester (SONOHARD) model SH-21A-E differs completely from traditional hardness testers from a viewpoint that instead of measuring the size of the indentation of the test sample using a microscope, it employs a diamond indenter equipped with a vibrating rod that presses on the test surface at a fixed force and then measures its hardness by applying ultrasonic vibrations.

When the vibrating rod is applied to a soft-surfaced test sample with identical qualities and at a fixed force, it makes a deep indentation and gets locked into the groove. Due to this, the resonance frequency increases. Conversely, it does not get locked in when used on hard test samples and the resonance frequency drops. The test sample's hardness can be calculated using the correlation between this deviation and the tested hardness.



Measurement principle diagram



Calculation values of SH indentation

Load P= approx. 2kgf (approx. 20N)

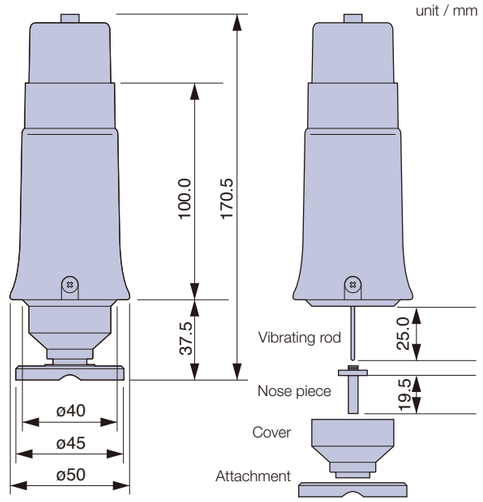
Hardness HV	Calculation value, Size of indentation (mm)	Calculation value, Depth of indentation (mm)	Conversion value, HRC
100	0.193	0.028	—
200	0.136	0.019	(11)
300	0.111	0.016	30
400	0.096	0.014	41
500	0.086	0.012	49
600	0.079	0.011	55
700	0.073	0.010	60
800	0.068	0.010	64
900	0.064	0.009	67

Load P= approx. 1kgf (approx. 10N)

Hardness HV	Calculation value, Size of indentation (mm)	Calculation value, Depth of indentation (mm)	Conversion value, HRC
100	0.136	0.019	—
200	0.096	0.014	(11)
300	0.079	0.011	30
400	0.068	0.010	41
500	0.061	0.009	49
600	0.056	0.008	55
700	0.051	0.007	60
800	0.048	0.007	64
900	0.045	0.006	67

Probe dimensions

unit / mm



Precautions on measurements

1. The affect of surface roughness

x̄:Average value σ:Standard deviation Measurement frequency per 100

Hardness	Surface roughness	0.8a	1.6a	3.2a
31.5HRC	$\bar{X}$	31.5	31.7	30.9
	σ	0.4	0.5	0.8
50.8HRC	$\bar{X}$	50.5	50.5	50.3
	σ	0.3	0.3	0.6
65.5HRC	$\bar{X}$	65.4	65.3	65.1
	σ	0.2	0.2	0.4

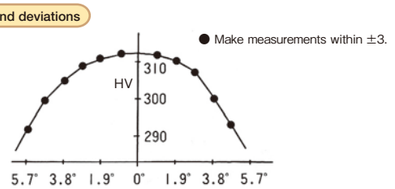
● For items with a roughness of 3.2a or greater, you will need to polish the surface before making measurements. If decarbonization occurs, make measurements after having removed it.

2. Measurable dimensions (For loading of 2kgf/approx. 20N)

[1] Size : 15mm wide x 15mm long or greater
[2] Thickness t= 7mm or greater
[3] Minimum diameter of sphere : 50mm

3. Angles and deviations

● Make measurements within ±3.



Utilization of the Handy Hardness tester SH-21A

Examples of quality control and maintenance usage by measuring handness

● Processed goods, Press parts, Metal mold

● Tapered parts

● Car wheels

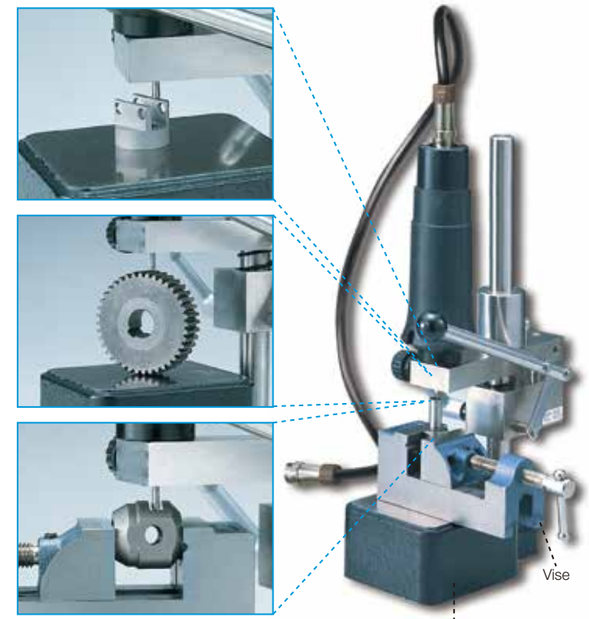
● Diagnosing wear and tear using hardness measurements

● Drill blade

● Measuring the strength of welding sections (Checking tension strength)

Measuring metal fatigue in steel towers, bridges and reinforcing bars

Measurements with Measuring stand for small objects



※Measuring stand SH-P07 is available as option. Vise is not manufactured by us.

Measuring stand SH-P07