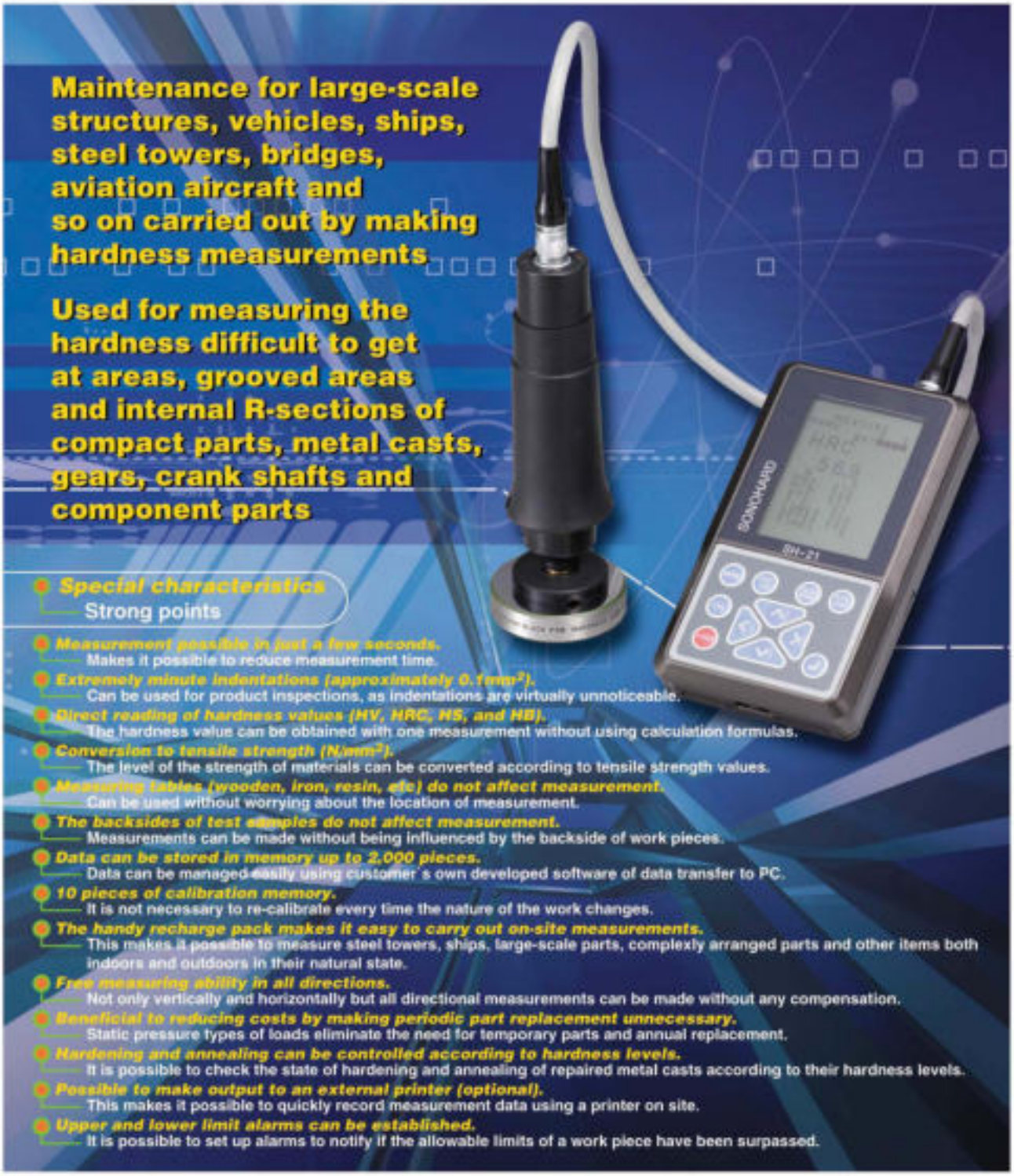
NEW

# Handy Hardness Tester

## SONOHARD® SH-21(E)

ISO9001
JQA0950

Perfect for use in making on-site measurements CE




**Special characteristics**
Strong points

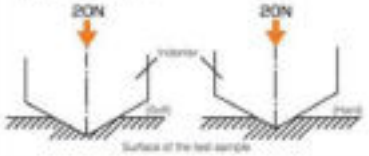
- ***Measurement possible in just a few seconds.***
  Makes it possible to reduce measurement time.
- ***Extremely minute indentations (approximately 0.1mm²).***
  Can be used for product inspections, as indentations are virtually unnoticeable.
- ***Direct reading of hardness values (HV, HRC, HS, and 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 2,000 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.


JFE

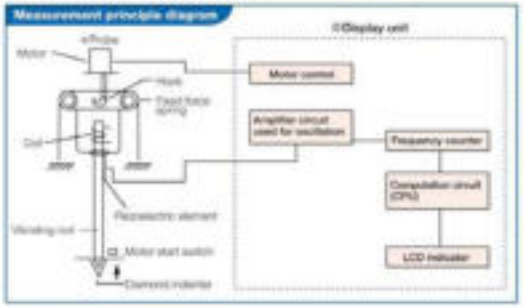
Made in Japan by
JFE Advantech Co., Ltd.
formerly Kawatetsu Advantech co.,Ltd.

**The Handy Hardness Tester (SONOHARD®) model SH-21(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

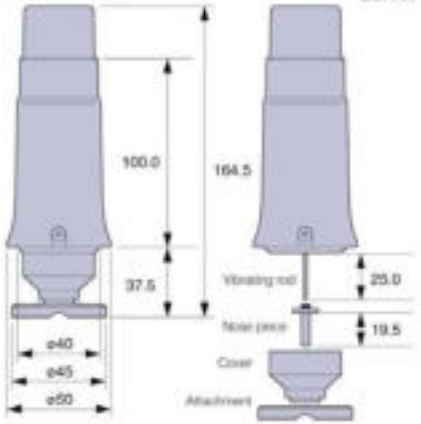
Load P= approx. 2kgf (approx. 20N)

| 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 | 15 |
| 300 | 0.111 | 0.016 | 31 |
| 400 | 0.096 | 0.014 | 41 |
| 500 | 0.086 | 0.012 | 49 |
| 600 | 0.079 | 0.011 | 55.5 |
| 700 | 0.073 | 0.010 | 60.5 |
| 800 | 0.068 | 0.010 | 64.5 |
| 900 | 0.064 | 0.009 | 67.5 |

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 | 15 |
| 300 | 0.079 | 0.011 | 31 |
| 400 | 0.068 | 0.010 | 41 |
| 500 | 0.061 | 0.009 | 49 |
| 600 | 0.056 | 0.008 | 55.5 |
| 700 | 0.051 | 0.007 | 60.5 |
| 800 | 0.048 | 0.007 | 64.5 |
| 900 | 0.045 | 0.006 | 67.5 |

## Probe dimensions




## Precautions on measurements

1. The affect of surface roughness

| Hardness | Surface roughness | 0.8a | 1.0a | 3.2a |
|---|---|---|---|---|
| HRC31.6 | X | 31.6 | 31.7 | 30.9 |
| | σ | 0.4 | 0.5 | 0.8 |
| HRC62.8 | X | 62.8 | 62.8 | 62.3 |
| | σ | 0.3 | 0.3 | 0.6 |
| HRC65.5 | X | 65.4 | 65.2 | 65.1 |
| | σ | 0.2 | 0.2 | 0.4 |

X: Average value σ: Standard deviation Measurement frequency per 10T

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

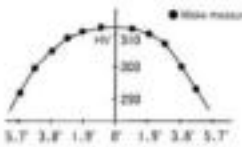
2. Measurable dimensions (For loading of 2kgf (approx. 20N))

① Size : 15mm wide x 15mm long or greater ② Thickness t= 7mm or greater

● For items smaller in dimension than those listed above, you will need to use a stand with dimensions of ø30 x 15mm or greater, and make measurements after securing the item in the stand by applying oil and after increasing the virtual mass.

● For loading of 1kgf (approx. 10N) it is possible to make measurements even at t= 1mm or less.

3. Angles and deviations




4. Reproducibility When making measurements on a standard test block using a measuring stand

| | | Standard block | Stand measurement | Hand-held measurement |
|---|---|---|---|---|
| HV hardness | Average value | HV300 | 198 | 231 |
| | | 500 | 504 | 508 |
| | | 800 | 806 | 790 |

※ 30 measurements

## Utilization of the Handy Hardness tester SH-21

### Examples of quality control and maintenance usage by measuring hardness

● Processed goods, Press parts, Metal mold

● Tapered parts

● Aluminum 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

## Specifications

| | | | | |
|---|---|---|---|---|
| Model name | Handy Hardness Tester **SONOHARD**® SH-21(E)<br>(Motorized/manual switchover type probe) | | Display make-up | a. Measured value: 3 digits<br>b. TIMES: 2 digits<br>(measuring frequency)<br>c. MAX value: 3 digits<br>d. MIN value: 3 digits<br>e. $\sigma$: 4 digits<br>(standard deviation)<br>f. $\chi$: 4 digits<br>(average value) |
| Measuring indenter | Diamond indenter for Micro-Vickers<br>(facing-to- surface angle of 136°) | | | |
| Test load and control no.<br>CE making complied models are required to add (CE) with control no. | 1. Approx 2kgf (roughly 20N) | SH-21-E2 | | |
| | 2. Approx 1kgf (roughly 10N) | SH-21-E1 | | |
| | 3. Approx 4kgf (roughly 40N)<br>(special type manual probe only) | SH-21-E4 | | |
| Measuring range | 1. Rockwell hardness HRC 10~70<br>2. Vickers hardness HV 50~999<br>3. Shore hardness HS20.0~99.9<br>4. Brinell hardness HB 85~550 | | | |
| Reproducibility | HRC : ± 1.0HRC, HV : ± (3%rdg)HV,<br>HS : ± 1.0HS, HB : ± (3%rdg)HB | | Set-up | a. UPPER<br>(upper limit)<br>b. LOWER<br>(lower limit)<br>c. TIMES<br>(measuring frequency)<br>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 | 2,000 pieces | | | |
| Digital display units | 1HV, 0.1HRC, 0.1HS, 1HB, 1N/mm² (tensile strength) | | Alarm | a. Alarm (buzzer sound) |
| Allowable operating temperature | 0~50°C | | Output | a. RS-232C output<br>used for data<br>transmission or printing |
| Power source | AC adapter(100~240V) or lithium ion rechargeable battery | | | |
| Continious operating hours | 5 hours when featuring a rechargeable BL; 8 hours without BL<br>*BL= backlight | | | |
| Dimensions | Display unit: 97(W) x 50(D) x 170(H) mm,<br>Probe diameter: 40mm, length: 164mm | | Frequency | 1. Motorized / manual<br>switchover type<br>approx 69~71kHz<br>2. Manual type (special type)<br>approx 38~40kHz |
| Weight | Display unit: approx. 400g (including battery),<br>Probe and cable: approx. 400g | | | |
| Carrying case dimensions | 400(W) x 220(D) x 140(H) mm | | | |
| Standard components | 1 display unit, 1 probe (including standard attachment / UA5410),<br>1 hardness standard test block (arround HRC55),<br>1 probe cable 1.5m, 1 AC adapter 100~240V (A05C1-09MI),<br>1 recharger (MK-8220), 1 lithium ion battery (MK-8401),<br>1 carrying case (MK-9701) | | Conversion | HV, HRC, HS, HB, N/mm²<br>according to JIS B 7731,<br>ASTM E 140, DIN 50150 |
| Options | Standard hardness test blocks HV600, HS50, HB300 used for scale calibration,<br>Measuring stand for small objects (SH-S02), Probe attachment for pipes materials (UA4-4005),<br>Probe attachment for inner races (UA4-4006), Printer model DPUH245AS with cable,<br>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.
- In order to make it possible to propose ideas regarding the unique loads, jigs and measuring methods to our customers, we humbly request that you fill out a specification confirmation form when making inquiries concerning usage.
- The SONOHARD SH-21(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-21(E) are therefore guaranteed by us.
  (Measured values under the calibration using other makers' test blocks are out of our guarantee.)
- The model name on the catalog is SH-21(E), while it is referred to as SH-21 only in the relevant operation manual, test certificate and ISO certificate, etc.
- A standard export model of SH-21(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.

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