

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 | | Set-up | a. UPPER (upper limit) b. LOWER (lower limit) c. TIMES (measuring frequency) d. CANCEL |
| Reproducibility | HRC : ± 1.0 HRC, HV : $\pm (3\%rdg)$ HV, HS : ± 1.0 HS, HBW : $\pm (3\%rdg)$ HBW | | | |
| 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 | | Alarm | Alarm (buzzer sound) |
| Digital display units | 1HV, 0.1HRC, 0.1HS, 1HBW, 1N/mm ² (tensile strength) | | | |
| 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 | | Frequency | Motorized / manual switchover type approx 69~71kHz |
| Dimensions | Display unit: 97mm(W) x 172mm(H) x 50mm(D), Probe diameter: 50mm, length: 170.5mm | | | |
| 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.

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Handy Hardness Tester

SONOHARD SH-21A



Perfect for use in making on-site measurements

Maintenance for large-scale structures, vehicles, ships, steel towers, bridges, aviation aircraft and so on carried out by making hardness measurements

Used for measuring the hardness difficult to get at areas, grooved areas and internal R-sections of compact parts, metal casts, gears, crank shafts and component parts

Special characteristics Strong points

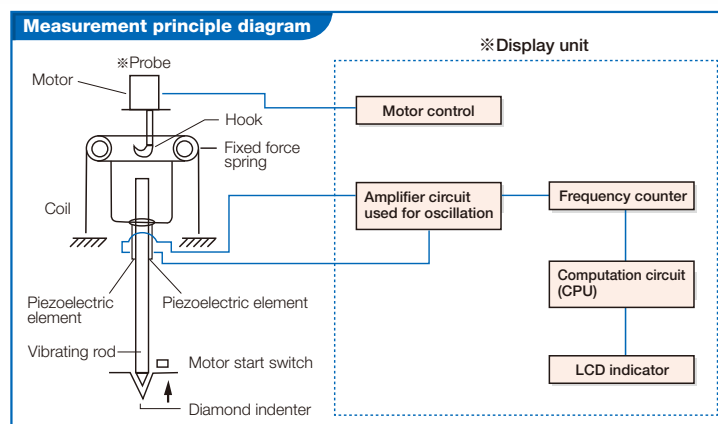
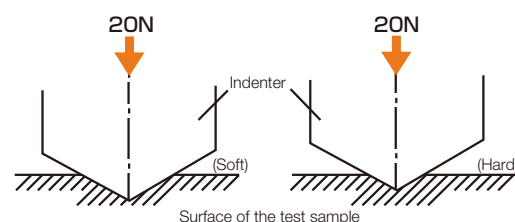
- Measurement possible in just a few seconds.**
Makes it possible to reduce measurement time.
- Extremely minute indentations (approximately 0.1mm²).**
Can be used for product inspections, as indentations are virtually unnoticeable.
- Direct reading of hardness values (HV, HRC, HS, and HB).**
The hardness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



Made in Japan by
JFE Advantech Co., Ltd.

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.



Calculation values of SH indentation

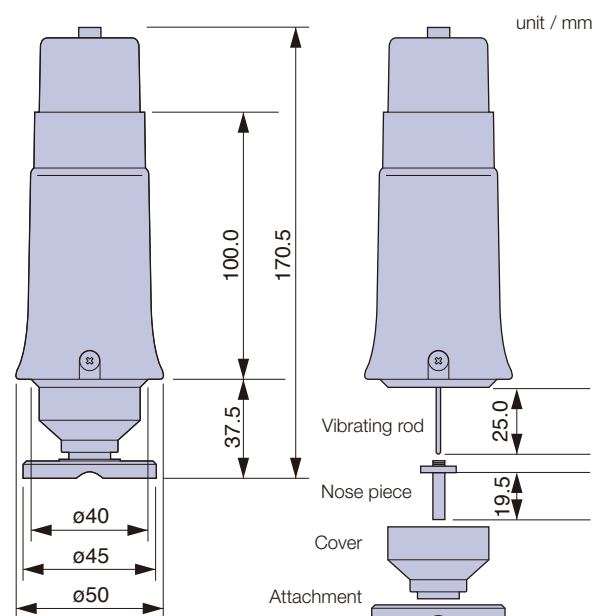
Load P= approx. 2kgf (approx. 20N)

| 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



Precautions on measurements

1. The affect of surface roughness

| 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 |

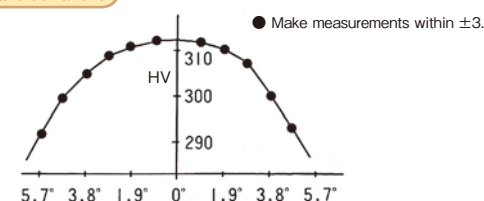
● For items with a roughness of 3.2a or greater, you will need to polish the surface before making measurements. If decarbonization occurs, make measurements after having removed it.

2. Measurable dimensions

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

- Size : 15mm wide x 15mm long or greater
- Thickness $t \geq 7$ mm or greater
- Minimum diameter of sphere : 50mm

3. Angles and deviations



Utilization of the Handy Hardness tester SH-21A

Examples of quality control and maintenance usage by measuring hardness



● Processed goods, Press parts, Metal mold



● Tapered parts



● Car wheels



● Diagnosing wear and tear using hardness measurements



● Drill blade

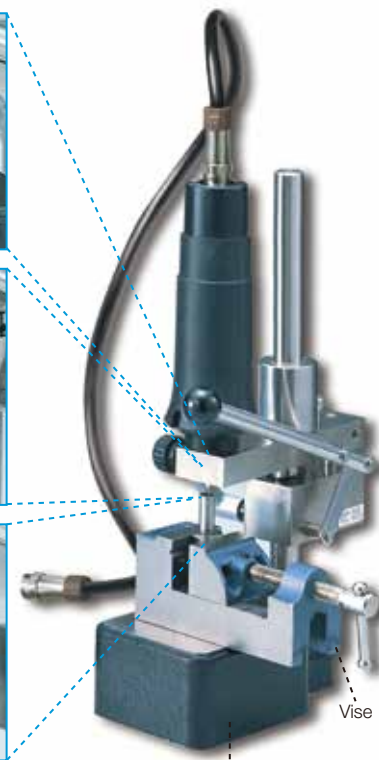


● Measuring the strength of welding sections (Checking tension strength)

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

SH-22 Specifications

| Probe | | | | | |
|---|---------------------|---|---|--------------------|--------------------|
| Model | | SH-22-S005 | SH-22-E1 | SH-22-E2 | SH-22-E4 |
| Indenter | | Micro Vickers diamond indenter | | | |
| Indenting force | | 1N (Approx. 0.1kgf) | 10N (Approx. 1kgf) | 20N (Approx. 2kgf) | 40N (Approx. 4kgf) |
| Measuring range | Vickers hardness | 400-1000HV* ¹ (Hardness value in scales of HRC, HRB, HS, HBW are also indicated for reference.) | 100 - 1000HV | | |
| | Rockwell C hardness | | 10.0 - 70.0HRC | | |
| | Rockwell B hardness | | 60.0 - 100.0HRB | | |
| | Shore hardness | | 20.0 - 100.0HS | | |
| | Brinell hardness | | 85 - 550HBW | | |
| Reproducibility (With measuring stand) | Vickers hardness | ± (5%rdg)HV* ¹ | ± (3%rdg)HV | | |
| | Rockwell C hardness | | ±1.0HRC | | |
| | Rockwell B hardness | | ±2.0HRB | | |
| | Shore hardness | | ±1.0HS | | |
| | Brinell hardness | | ± (3%rdg)HBW | | |
| Nonlinearity (With measuring stand) | | 400 to 1000HV ± (5%rdg)HV (Measuring on standard hardness block) | 200 to 1000HV ± (5%rdg)HV (Measuring on standard hardness block) | | |
| Allowable measuring angle | | Within ±3° | | | |

| Object to be measured | | General specifications | |
|-------------------------------|--|------------------------|--|
| Material to be measured | Steel and metals which can be measured with hardness standard block made of the material | Power supply | AC adapter (100-240V), or rechargeable lithium ion battery |
| Size of object to be measured | Bigger than 15mm × 15mm, thicker than 6mm*2 | Operating temperature | 0 - 50 °C |
| Measurable curvature | Shaft/Pipe OD: bigger than 10mm Ball radius: bigger than 20mm (At use of standard attachment) | Dimensions | Display unit 97mm(W)×170mm(H)×50mm(D) Probe head diameter 20mm (With grip) 8mm (Without grip) Probe length 195mm Carrying case 389mm (W)×132mm (H)×200mm (D) |
| Surface roughness | Under Ra1.6 | Mass | Display unit Approx. 405g Probe Approx. 270g |

| Display | |
|---------------------------|--|
| Scale conversion | HV, HRC, HRB, HS, HBW, N/mm ² |
| Display of measured value | 4 digits |
| Display resolution | 1HV, 0.1HRC, 0.1HRB, 0.1HS, 1HBW, 1N/mm ² |
| Display contents | Measured value, Measuring times, Maximum value, Minimum value, Standard deviation, Average value |

| Standard configuration |
|--|
| 1 Display unit, 1 Probe (with grip), 1 Probe cable (1.5m), 1 Hardness standard block: around 55HRC, (For SH-22-S005: around 600HV), 1 AC adapter, 1 Recharger, 1 Lithium ion battery, 1 Carrying case, 1 Instruction manual, 1 test report, 1 guarantee card |

| Options |
|--|
| Standard hardness block around HV600 (included in standard configuration of SH-22-S005)/around 50HS/around 300HBW, Measuring stand (SH-P07), Thermal printer (DPU-S245, with connecting cable), Printer paper in roll, Stand for main unit (SH-P03), Grip*3, Nosepiece for narrower area |

*1 Contact us about measurement of the hardness which is over/under the range showed here.
 *2 Contact us about measurement with SH-22-S005 (of 100g indenting force, designed for thinner material checking)
 *3 Contact us about specification details

- Contact us about CE version.
[TEL.03-5825-7362](tel:03-5825-7362) [FAX.03-5825-5591](tel:03-5825-5591)
- Contact us about request for installation in automatic testing system, or one for use of contact point signal.
- SONOHARD SH-22 is calibrated with standard hardness block made by Yamamoto Scientific Tool Co., Ltd. Hardness blocks are manufactured complying to ISO6508-3/JIS B7730 and ISO6507-3/JIS B7735.
 Our performance guarantee is based on hardness standard blocks made by Yamamoto Scientific Tool Co., Ltd.

Read an instruction manual before use of our products. Specifications may be changed without notice.

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Ultrasonic Hardness Tester

SONOHARD SH-22



Perfect for hardness check on narrow/curved surface of quenched material

Features

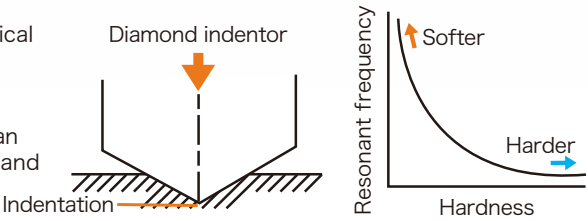
- Narrow / curved surface can be measured by small diameter probe (comparing with our model SH-21)
- High durability - More than 1 million measurements
- Measurement in just 2 seconds
- Static loading method with Vickers indenter
- Tiny indentation (Approx. 0.1mm)
- Measurement is not affected by material / mass of measuring base
- Measurement can be done in all directions
- Free from periodic parts replacement by adoption of static loading method
- Upper / Lower limit alarm setting available



Made in Japan by
JFE Advantech Co., Ltd.

The Handy Hardness Tester (SONOHARD) model SH-22 completely differs from conventional testers which measure sizes of indentations on test samples using microscopes. SH-22 applies a diamond indenter equipped on a vibrating rod that presses on a test surface at a fixed force and then measures the hardness by fluctuation of ultrasonic vibration.

When the vibration rod is applied to a softer surface object of identical material at a fixed force, it makes a deeper indentation and is constrained. Due to this, the resonance frequency highly increases. Conversely, vibration rod is less constrained when it applied on hard object surface and resonance frequency do less. Hardness value can be calculated using the correlation between the frequency changes and hardnesses.



*SH-22 is calibrated with standard hardness block made with steel before shipment from our works. Recalibrate your SH-22 at measurement of other materials than steel for correct measurement.

Function / Display

Choose a scale from HV, HRC, HRB, HS, HBW.

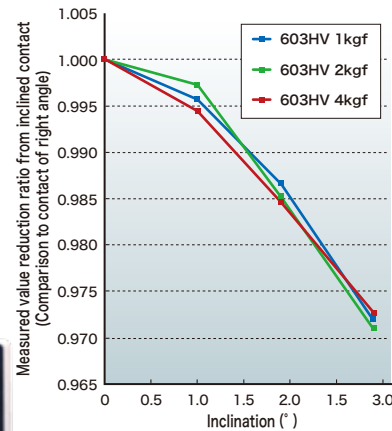
Statistics function :
Maximum value, Minimum value,
Average value, Standard deviation

Setting of measurement times for
statistical calculation

Calibration factor (ex. Approx. 1.000
for measurement of steel)



Influence from contact angle



Model lineup

| Model lineup | SH-22-S005 | SH-22-E1 | SH-22-E2 | SH-22-E4 |
|---------------------|---|---|---|--|
| Indenting force | 1N (Approx. 0.1kgf) | 10N (Approx. 1kgf) | 20N (Approx. 2kgf) | 40N (Approx. 4kgf) |
| Typical application | Press-formed metal sheet Gravure printing roll (chrome/copper plated) Thin metal sheet, Thin plated sheet | Crankshaft Camshaft Gravure printing roll (copper plated) Gear, Small parts Narrow measuring area, Bearing, Nitrided part | Crankshaft Camshaft Heat treated parts Carburized part | Crankshaft (Rougher surface) Camshaft (Rougher surface) Object of rougher surface Welded part, forged parts (Mainly adopted to be equipped automatic testing machines) |

Indentation size

Relationship between Vickers hardness value and indentation size

$HV_{xxx} = 0.1891 \times P/d^2$ P : Indenting force (N) d : Indentation depth (mm)
or $HV_{xxx} = 1.8544 \times P/d^2$ P : Indenting force (kgf) d : Indentation depth (mm)

| Hardness (HV) | At indentation force of 1N (approx. 0.1kgf) | | | At indentation force of 10N (approx. 1kgf) | | | At indentation force of 20N (approx. 2kgf) | | | At indentation force of 40N (approx. 4kgf) | | |
|---------------|---|--------------------------------------|--------------------------|--|--------------------------------------|--------------------------|--|--------------------------------------|--------------------------|--|--------------------------------------|--------------------------|
| | Indentation size (calculated value) | Indentation depth (calculated value) | Reference hardness (HRC) | Indentation size (calculated value) | Indentation depth (calculated value) | Reference hardness (HRC) | Indentation size (calculated value) | Indentation depth (calculated value) | Reference hardness (HRC) | Indentation size (calculated value) | Indentation depth (calculated value) | Reference hardness (HRC) |
| 200 | 0.030 | 0.004 | (11) | 0.096 | 0.014 | (11) | 0.136 | 0.019 | (11) | 0.193 | 0.028 | (11) |
| 400 | 0.021 | 0.003 | 41 | 0.068 | 0.010 | 41 | 0.096 | 0.014 | 41 | 0.136 | 0.020 | 41 |
| 800 | 0.015 | 0.002 | 64.5 | 0.048 | 0.007 | 64.5 | 0.068 | 0.010 | 64.5 | 0.096 | 0.014 | 64.5 |

Application examples of SH-22



Measurement of a gear



With grip Without grip
(Grip can be removed for check on narrow area)



Measurement of a crankshaft



Measurement of a camshaft

Options



Vise is not our product.

Measuring stand
SH-P07



Thermal printer
DPU-S245

Examples of use

