

DIGITAL ROCKWELL HARDNESS TESTER

# FR-X Series

FR-X1, FR-X2, FR-X3, FR-X1L, FR-X2L, FR-X3L FR-XA



# FR-X Series

**FR-X1, FR-X2, FR-X3**

**FR-X1L, FR-X2L, FR-X3L**

Obtained the supreme precision and overwhelming reliability by the adoption of entirely new designing and precision manufacturing with no compromise!

By the adoption of stealth type double information panel, improved the remarkable visibility and operation!



## Features

### ■ EMPHASIZED HIGH PRECISION

Reviewed the popular FR-e series and achieved the supreme precision.

### ■ STRENGTHENED BODY

Achieved the remarkable improvement of hardness measurement by the adoption of newly designed strong body.

### ■ STABLE LOADING AXIS MECHANISM

Adopted highly sensitive load shaft to prevent the side shift by the introduction of ball guide at the top and bottom. The stable measurement of hardness has become possible for the cylindrical and spherical surface.

### ■ STANDARD COMPENSATION FUNCTION

Low, middle, high compensation of multiple points to meet the each standard. Obtain the test result which is comply with the different standard for all hardness range.

### ■ SHAPE COMPENSATION FUNCTION

Obtain the test result which is comply with the standard by entering the diameter of spherical surface & cylindrical specimen.

### ■ DISPLAY OF MAX.DEPTH OF INDENTER

Display the max.depth of indenter together with test result. Be able to evaluate the elastic amount of different sample in hardness value.

### ■ STEALTH TYPE DOUBLE INFORMATION PANEL

Display the various information of OK/NO judgement and conversion and at the same time, display the measurement results.(Load and release of the test road, and hardness indication are automatic)

### ■ FUNCTION OF DATA JUDGEMENT

Display the judgement of measurement data (HI, OK, LO), if you set the maximum value and minimum one and the mean value, if you set measurement point on the sub-information panel.

### ■ LED LIGHT

Obtained the supreme visibility of specimen in the dark environment and achieved the minute positioning.

## FR-X SERIES STANDARD SPECIFICATION (EXCLUDING FR-XA)

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MINOR LOAD POSITION SETTING                 | Automatic setting (Electronic sound monitoring )                                                                                                                                                                                                                                                                                                                                                                  |
| LOAD CONTROL                                | Automatic (Application-holding-release)                                                                                                                                                                                                                                                                                                                                                                           |
| START OPERATION                             | Automatic start / Manual start                                                                                                                                                                                                                                                                                                                                                                                    |
| LOAD REQUIRED TIME                          | 1-8 sec (Constant speed)                                                                                                                                                                                                                                                                                                                                                                                          |
| DWELL TIME                                  | 1- 999 sec (Key entry in unit of 1 sec / Factory setting : 5 sec)                                                                                                                                                                                                                                                                                                                                                 |
| PLASTIC MEASUREMENT MODE                    | Standard function (Time up to hardness value display after release of test load : 1 to 999 sec                                                                                                                                                                                                                                                                                                                    |
| HARDNESS CONVERSION                         | Capable in compliance with SAE (J -417b) & ASTM (E-140).                                                                                                                                                                                                                                                                                                                                                          |
| STANDARD CORRECTION                         | Low, middle, high (3levels) compensation of multiple points to meet the each standard.                                                                                                                                                                                                                                                                                                                            |
| SHAPE CORRECTION                            | Compensate and display the hardness value of cylindrical (CYL) and spherical (SPH) specimen.<br>(Enter the radius of cylindrical specimen. Enter the diameter of spherical specimen.)                                                                                                                                                                                                                             |
| MAX.DEPTH OF INDENTER<br>MEASURING FUNCTION | Display the value of max.depth of indenter.                                                                                                                                                                                                                                                                                                                                                                       |
| AVERAGE VALUE CALCULATION FUNCTION          | Calculate the average value. (Enter the number of measuring point)                                                                                                                                                                                                                                                                                                                                                |
| OK / NG CRITERIA                            | Upper and lower limit setting, and HI / OK / LO display (HR 0 to 130, min. 0.1 hardness setting)                                                                                                                                                                                                                                                                                                                  |
| DATA TRANSFER FUNCTION                      | USB (B2.0) Connector (Option)                                                                                                                                                                                                                                                                                                                                                                                     |
| OUTPUT SIGNAL                               | RS232C (Baud rate : 9,600 bps)                                                                                                                                                                                                                                                                                                                                                                                    |
| RS-232C OUTPUT &<br>PRINTOUT MODE           | <div>①Measurement data only</div> <div>②Measurement data and evaluation results<br/>(Max. value, min. value &amp; HI / OK / LO)</div> <div>③Measurement data and conversion data</div> <div>④Measurement data, conversion data and evaluation results<br/>(Max. value, min. value &amp; HI / OK / LO)</div> <div>⑤Measurement data and average value</div> <div>⑥Max.depth of indenter and measurement data</div> |
| COMPLIANT STANDARD                          | Conform to ASTM E18 A1, JIS B-7726                                                                                                                                                                                                                                                                                                                                                                                |
| POWER SUPPLY                                | Single phase AC 100V, 50 / 60Hz in Japan and AC 100 ~ 240V,<br>50 / 60Hz available for Export Model. (Select when ordering)                                                                                                                                                                                                                                                                                       |

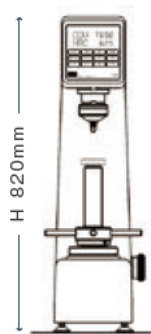
## STANDARD ACCESSORIES

| CODE No.  | ITEM                                                                                                                 |                                           | FR-X1 | FR-X1L | FR-X2 | FR-X2L | FR-X3 | FR-X3L |
|-----------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------|--------|-------|--------|-------|--------|
| R - 0 1 2 | HARDNESS<br>STANDARD BLOCK                                                                                           | HRC                                       | 1     |        | —     |        | 1     |        |
| R - 0 1 4 |                                                                                                                      | HRBS or HRBW                              | 1     |        | —     |        | 1     |        |
| R - 0 1 5 |                                                                                                                      | HR30N                                     | —     |        | 1     |        | 1     |        |
| R - 0 1 6 |                                                                                                                      | HR30TS or HR30TW                          | —     |        | 1     |        | 1     |        |
| R - 0 0 2 | DIAMOND<br>INDENTER                                                                                                  | For ROCKWELL Type                         | 1     |        | —     |        | —     |        |
| R - 0 0 3 |                                                                                                                      | For SUPERFICIAL & TWIN Type               | —     |        | 1     |        | 1     |        |
| R - 0 0 4 | STEEL BALL INDENTER OR CARBIDE BALL INDENTER<br>( $\phi$ 1/16" / $\phi$ 1.588mm)<br>※SELECT EITHER ONE WHEN ORDERING |                                           | 1     |        | 1     |        | 1     |        |
| R - 0 0 8 | SPARE STEEL BALL OR<br>SPARE CARBIDE BALL<br>( $\phi$ 1/16" / $\phi$ 1.588mm)<br>※SELECT EITHER ONE<br>WHEN ORDERING | WHEN STEEL BALL INDENTER<br>IS SELECTED   | 10    |        | 10    |        | 10    |        |
|           |                                                                                                                      | WHEN CARBIDE BALL<br>INDENTER IS SELECTED | 2     |        | 2     |        | 2     |        |
| R - 0 2 1 | ANVIL                                                                                                                | FLAT ( $\phi$ 60mm)                       | 1     |        | 1     |        | 1     |        |
| R - 0 2 2 |                                                                                                                      | V-SHAPE (LARGE)                           | 1     |        | 1     |        | 1     |        |
| R - 0 4 2 | POWER CABLE (3P-2.5mm)                                                                                               |                                           | 1     |        | 1     |        | 1     |        |
| R - 0 4 3 | LEVEL ADJUSTING LEG                                                                                                  |                                           | 4     |        | 4     |        | 4     |        |
| R - 0 4 4 | MACHINE COVER                                                                                                        |                                           | 1     |        | 1     |        | 1     |        |
|           | INSTRUCTION AND MAINTENANCE MANUAL                                                                                   |                                           | 1     |        | 1     |        | 1     |        |
| R - 0 4 5 | ACCESSORY BOX                                                                                                        |                                           | 1     |        | 1     |        | 1     |        |

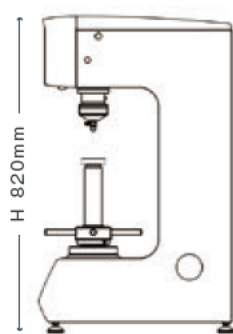
**FR-X3**

## FR-X3

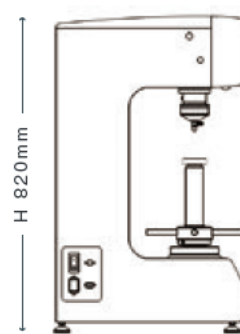
|                                                         |                                        |  |  |                                       |  |  |                                                                                 |  |  |
|---------------------------------------------------------|----------------------------------------|--|--|---------------------------------------|--|--|---------------------------------------------------------------------------------|--|--|
| MINOR LOAD                                              | N: 98.07<br>kgf: 10                    |  |  | N: 29.42<br>kgf: 3                    |  |  | N: 29.42 & 98.07<br>kgf: 3 & 10                                                 |  |  |
| TEST LOAD                                               | N: 588.4 980.7 1471<br>kgf: 60 100 150 |  |  | N: 147.1 294.2 441.3<br>kgf: 15 30 45 |  |  | N: 147.1 294.2 441.3<br>kgf: 15 30 45<br>N: 588.4 980.7 1471<br>kgf: 60 100 150 |  |  |
| MAX.SPECIMEN HEIGHT<br>(WITHOUT LEAD SCREW COVER)       | 255mm                                  |  |  |                                       |  |  | 221mm                                                                           |  |  |
| MAX.SPECIMEN HEIGHT<br>(WITH LEAD SCREW COVER ATTACHED) | 135mm                                  |  |  |                                       |  |  | 101mm                                                                           |  |  |
| MAX.SPECIMEN DEPTH                                      | 165mm                                  |  |  |                                       |  |  |                                                                                 |  |  |
| DIMENSIONS                                              | W196×D487×H820mm                       |  |  |                                       |  |  |                                                                                 |  |  |
| WEIGHT                                                  | 82kg                                   |  |  | 80kg                                  |  |  | 83kg                                                                            |  |  |



W 196mm



D 487mm



D 487mm





## FR-X1L

## FR-X2L

## FR-X3L

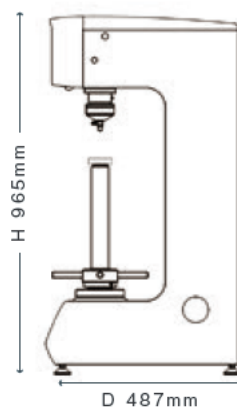


### SPECIFICATIONS

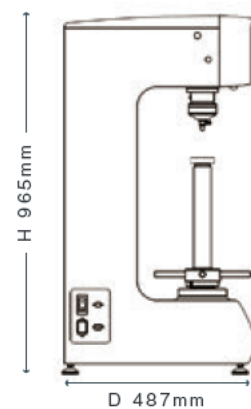
| SPECIFICATIONS                                          | FR-X1L                                 |  |  |  | FR-X2L                                |  |  |  | FR-X3L                                                                          |  |  |  |
|---------------------------------------------------------|----------------------------------------|--|--|--|---------------------------------------|--|--|--|---------------------------------------------------------------------------------|--|--|--|
| MINOR LOAD                                              | N: 98.07<br>kgf: 10                    |  |  |  | N: 29.42<br>kgf: 3                    |  |  |  | N: 29.42 & 98.07<br>kgf: 3 & 10                                                 |  |  |  |
| TEST LOAD                                               | N: 588.4 980.7 1471<br>kgf: 60 100 150 |  |  |  | N: 147.1 294.2 441.3<br>kgf: 15 30 45 |  |  |  | N: 147.1 294.2 441.3<br>kgf: 15 30 45<br>N: 588.4 980.7 1471<br>kgf: 60 100 150 |  |  |  |
| MAX.SPECIMEN HEIGHT<br>(WITHOUT LEAD SCREW COVER)       | 435mm                                  |  |  |  |                                       |  |  |  | 401mm                                                                           |  |  |  |
| MAX.SPECIMEN HEIGHT<br>(WITH LEAD SCREW COVER ATTACHED) | 325mm                                  |  |  |  |                                       |  |  |  | 291mm                                                                           |  |  |  |
| MAX.SPECIMEN DEPTH                                      |                                        |  |  |  | 165mm                                 |  |  |  |                                                                                 |  |  |  |
| DIMENSIONS                                              |                                        |  |  |  | W196×D487×H965mm                      |  |  |  |                                                                                 |  |  |  |
| WEIGHT                                                  | 87kg                                   |  |  |  | 85kg                                  |  |  |  | 88kg                                                                            |  |  |  |



□ Front view



□ Right view



□ Left view

# FR-X Series

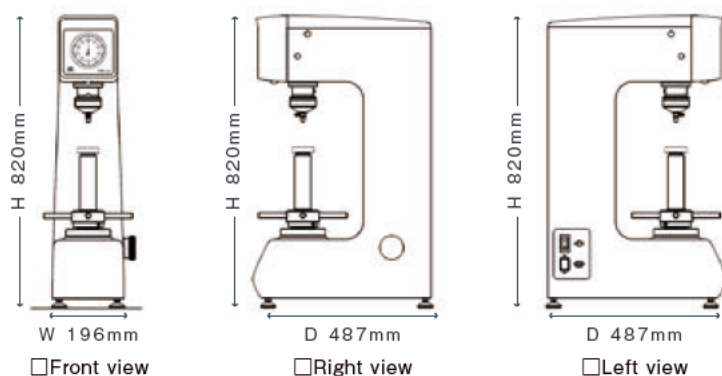
## ANALOG ROCKWELL TYPE HARDNESS TESTER

### FR-XA

High Reliability with Simple Structure and Strong Body.  
Economical Model made much of Utility.



(HARDNESS DISPLAY)



## FR-XA SPECIFICATIONS

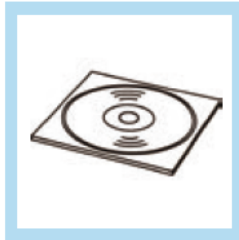
| CONSTRUCTION                |            | Dial Gauge / Motorized                                                                         |  |  |
|-----------------------------|------------|------------------------------------------------------------------------------------------------|--|--|
| LOAD                        | MINOR LOAD | N: 98.07<br>kgf: 10                                                                            |  |  |
|                             | TEST LOAD  | N: 588.4   980.7   1471<br>kgf: 60   100   150                                                 |  |  |
|                             |            | Dial Changing Type                                                                             |  |  |
| MINOR LOAD POSITION SETTING |            | Manual setting on Green Range of Dial Gauge                                                    |  |  |
| LOAD CONTROL                |            | Automatic (Application — Holding — Release)                                                    |  |  |
| START OPERATION             |            | Manual start                                                                                   |  |  |
| LOAD REQUIRED TIME          |            | 1-8 sec (Constant speed)                                                                       |  |  |
| DWELL TIME                  |            | Approx. 2 sec (fixed)                                                                          |  |  |
| SCALE DISPLAY               |            | Read on Hardness Display<br>For A, C, D Scale : White figures<br>For Other Scale : Red figures |  |  |
| MAX. SPECIMEN HEIGHT        |            | 255mm (With lead screw cover attached : 135mm)                                                 |  |  |
| MAX. SPECIMEN DEPTH         |            | 165mm                                                                                          |  |  |
| DIMENSIONS                  |            | W196×D487×H820mm                                                                               |  |  |
| WEIGHT                      |            | 82kg                                                                                           |  |  |
| COMPLIANT STANDARD          |            | Conform to ASTM E18 A1 • JIS B-7726                                                            |  |  |
| POWER SUPPLY                |            | AC100/115/220V (Select either one when ordering), 50/60Hz                                      |  |  |

## FR-XA STANDARD ACCESSORIES

| CODE No. | ITEM                                                                                                   |                 | Q'TY                                                                                      |
|----------|--------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------|
| R-012    | HARDNESS STANDARD BLOCK                                                                                | HRC             | 1                                                                                         |
| R-014    |                                                                                                        | HRBS or HRBW    | 1                                                                                         |
| R-002    | DIAMOND INDENTER                                                                                       |                 | 1                                                                                         |
| R-004    | STEEL BALL INDENTER OR CARBIDE BALL INDENTER (φ 1/16" / φ 1.588mm)<br>※SELECT EITHER ONE WHEN ORDERING |                 | 1                                                                                         |
| R-008    | SPARE STEEL BALL OR SPARE CARBIDE BALL (φ 1/16" / φ 1.588mm)<br>※SELECT EITHER ONE WHEN ORDERING       |                 | When steel ball indenter is selected : 10 /<br>When Carbide ball indenter is selected : 2 |
| R-021    | ANVIL                                                                                                  | FLAT (φ 60mm)   | 1                                                                                         |
| R-022    |                                                                                                        | V-SHAPE (LARGE) | 1                                                                                         |
| R-042    | POWER CABLE (3P-2.5m)                                                                                  |                 | 1                                                                                         |
| R-043    | LEVEL ADJUSTING LEG                                                                                    |                 | 4                                                                                         |
| R-044    | MACHINE COVER                                                                                          |                 | 1                                                                                         |
| —        | INSTRUCTION AND MAINTENANCE MANUAL                                                                     |                 | 1                                                                                         |
| —        | HARDNESS CONVERSION CHART                                                                              |                 | 1                                                                                         |
| R-045    | ACCESSORY BOX                                                                                          |                 | 1                                                                                         |



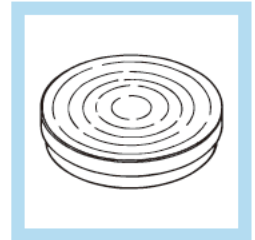
## OPTIONAL ACCESSORIES



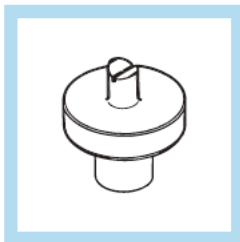
R-050  
EXCEL DATA TRANSFER  
SOFTWARE ATTACHED  
WITH RS232C CABLE



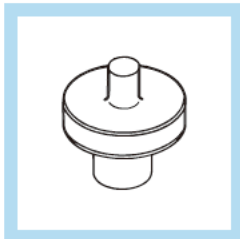
R-001  
DIGITAL PRINTER



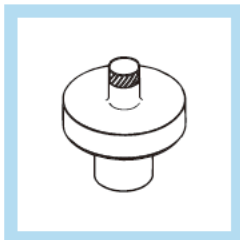
R-028  
ROUND TABLE  $\phi$ 200mm



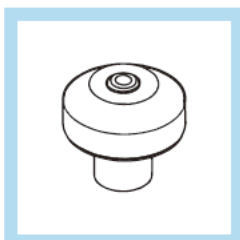
R-023  
ANVIL V-SHAPE (Small)



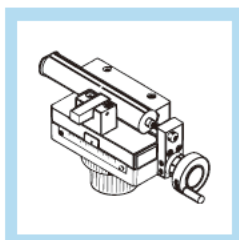
R-025  
ANVIL SPOT  
(Flat tip  $\phi$  about 8.5 mm)



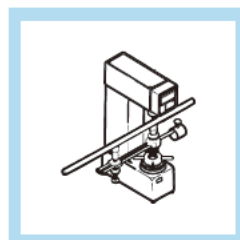
R-026  
ANVIL CARBIDE SPOT



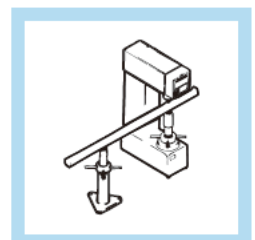
R-027  
ANVIL DIAMOND SPOT



R-029  
MICRO TEST TABLE  
FOR JOMINY TEST



R-030  
LONG SPECIMEN  
TESTING JIG VARI-REST



R-031  
LONG SPECIMEN  
TESTING JIG JACK-REST



R-005  
STEEL BALL INDENTER  
 $\phi$  1/8"



R-006  
STEEL BALL INDENTER  
 $\phi$  1/4"



R-007  
STEEL BALL INDENTER  
 $\phi$  1/2"

## ROCKWELL HARDNESS SCALE AND ITS INFORMATION

| SCALE | HARDNESS | INDENTER       | PRE FORCE<br>F <sub>0</sub><br>(N) | TEST FORCE<br>F<br>(N) | CONSTANT<br>S<br>(mm) | EACH SCALE<br>CONSTANT<br>N | FIELD OF APPLICATION      |
|-------|----------|----------------|------------------------------------|------------------------|-----------------------|-----------------------------|---------------------------|
| A     | HRA      | DIAMOND CONE   | 98.07                              | 588.4                  | 0.002                 | 100                         | 20 ~ 95 HRA               |
| B     | HRB      | BALL 1/16 inch | 98.07                              | 980.7                  | 0.002                 | 130                         | 10 ~ 100 HRB              |
| C     | HRC      | DIAMOND CONE   | 98.07                              | 1 471                  | 0.002                 | 100                         | 20 <sup>a)</sup> ~ 70 HRC |
| D     | HRD      | DIAMOND CONE   | 98.07                              | 980.7                  | 0.002                 | 100                         | 40 ~ 77 HRD               |
| E     | HRE      | BALL 1/8 inch  | 98.07                              | 980.7                  | 0.002                 | 130                         | 70 ~ 100 HRE              |
| F     | HRF      | BALL 1/16 inch | 98.07                              | 588.4                  | 0.002                 | 130                         | 60 ~ 100 HRF              |
| G     | HRG      | BALL 1/16 inch | 98.07                              | 1 471                  | 0.002                 | 130                         | 30 ~ 94 HRG               |
| H     | HRH      | BALL 1/8 inch  | 98.07                              | 588.4                  | 0.002                 | 130                         | 80 ~ 100 HRH              |
| K     | HRK      | BALL 1/8 inch  | 98.07                              | 1 471                  | 0.002                 | 130                         | 40 ~ 100 HRK              |

Note) The field of application can be extended to 10 HRC if the indenter possesses the appropriate dimensions.

## ROCKWELL SUPERFICIAL SCALE AND ITS INFORMATION

| SCALE | HARDNESS | INDENTER       | PRE FORCE<br>F <sub>0</sub><br>(N) | TEST FORCE<br>F<br>(N) | CONSTANT<br>S<br>(mm) | EACH SCALE<br>CONSTANT<br>N | FIELD OF APPLICATION |
|-------|----------|----------------|------------------------------------|------------------------|-----------------------|-----------------------------|----------------------|
| 15N   | HR15N    | DIAMOND CONE   | 29.42                              | 147.1                  | 0.001                 | 100                         | 70 ~ 95 HR15N        |
| 30N   | HR30N    | DIAMOND CONE   | 29.42                              | 294.2                  | 0.001                 | 100                         | 42 ~ 86 HR30N        |
| 45N   | HR45N    | DIAMOND CONE   | 29.42                              | 441.3                  | 0.001                 | 100                         | 20 ~ 77 HR45N        |
| 15T   | HR15T    | BALL 1/16 inch | 29.42                              | 147.1                  | 0.001                 | 100                         | 67 ~ 93 HR15T        |
| 30T   | HR30T    | BALL 1/16 inch | 29.42                              | 294.2                  | 0.001                 | 100                         | 29 ~ 82 HR30T        |
| 45T   | HR45T    | BALL 1/16 inch | 29.42                              | 441.3                  | 0.001                 | 100                         | 10 ~ 72 HR45T        |