

INDENTRON® 400 Series Digital Rockwell Testing System

Specification Sheet
SS-NI400-0310
March 2010

The INDENTRON® Series hardness testers feature an innovative cantilevered indenter configuration that eliminates frictional inconsistencies typical of competitive testing systems. Using precision dead weights, the INDENTRON system ensures precise, accurate and repeatable measurements. The dead weights are used for both the major load and the preload. Automation in the timing, reduces the variation introduced by the flow of the material under load. If the operator inadvertently over loads or under loads the preload, the INDENTRON system prevents the test from being performed.

The indenter design is ideal for testing inside diameters and recesses, often impossible with more traditional hardness testers. Inside diameters as small as 1-1/2-inches can be tested with the standard indenter. Optional indenters can test diameters as small as 1/2-inch. Operators can test close to vertical surfaces, to within 1/4-inch with the standard indenter and up to 3/32-inch with optional special indenters. Testing is fast, accurate and there are fewer broken diamonds due to an outstanding viewing area.

The INDENTRON Series is supplied with our advanced electronic console. The console is used for setup and for viewing test results and statistical results including mean, range, min/max, standard deviation and CPk. The INDENTRON 400 Series is available with regular Rockwell scale loads, superficial scale loads or a combination.

Features

- Meets ASTM E18
- Easy-to-use and Comprehensive Display Console
- Hi/Lo Tolerance Settings
- Adjustable Time @ Load
- Scale Conversion
- Roundness Correction
- Minimum Thickness Calculation
- Average Test Group Results from 2-99 results
- Test Result Memory for up to 5000 results
- Split Memory
- RS232 Output
- Print and Display Statistics
 - Average
 - Range
 - Min/Max
 - Standard Deviation
 - CPk
- Sequence Numbering
- Lot Numbering
- Test Block Verification (ASMT D-785)

Specifications

Six Models:	Regular, Superficial or Combination
Vertical Capacities:	10- and 15-inch
Throat:	6-inch
Scales:	See Chart
Operating Temp:	50°F to 120°F 10°C to 49°C
Warranty:	1 year



Shown: INDENTEC 400 Series

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ASTM E-18 Conformance

The INDENTRON 400 Series conform to ASTM E-18.

The INDENTRON 400 Series may be specified for regular, superficial or combination Rockwell test methods.

Electronics Consoles

The INDENTRON 400 Series features our advanced electronics console. The LED display displays prompts that guide you through the setup process. The display also indicates the result, scale, and SPC results. The advanced keypad has a numeric keypad, function keypad and scale select keypad. Function keys include MODE (set/view timed load, minimum thickness calculation and automatic averaging); STAT (view statistics, clear results, view/change sequence number, view/change lot number, split memory); TOL (view/change HI/LO tolerance setpoints); CAL (calculate/clear hardness, calculate/clear displacement); ZERO SET (round correction); CONV (convert hardness results to different scale); ENTER (enter values into memory).

The 400 Series Scale Select keypad lets you change the hardness scale. The display provides prompts that guide the user and require the user to acknowledge various changes/options.

Secure Access

The INDENTRON 400 Series uses a security code that prevents unauthorized users from making changes to the tester's setup.

Hi/Lo Tolerance Setup

You may setup HIGH and LOW tolerance limits for your hardness results. Once you test is complete and the console displays the result, the result will be displayed with a HI when the measured result exceed the HI tolerance limit; with a LO when the measured result exceeds the LO tolerance limit; or an OK when the measured result is within the tolerance limits established.

Adjustable Time @ Load

The MODE function key on the advanced console used on the INDENTRON 400 Series is used to select the time at load. Time at load options are from 1 thru 99 seconds.

Scale Conversion

The INDENTRON 400 Series lets you convert your result from one scale to another, for example from HRC to HR15N. Once a test result is displayed, press the CONV key and select the required scale. The converted scale conforms to ASTM E-140.

Roundness Correction

Roundness correction is supplied on the INDENTRON 400 Series.

Minimum Thickness Calculation

This is another feature available with the advanced console electronics found on the 400 Series. When invoked, the 400 Series console will display the minimum thickness value for the last test. The thickness value is displayed with the associated hardness scale and may be represented in IN (inch) or MM (millimeter) units. Press the YES key to toggle between units.

Special Functions

The 400 Series has six different calculations available that are controlled using the CAL key: calibrate hardness, calibrate displacement, clear hardness, clear displacement, A/D factor, and Factory Set.

The calibrate hardness function is similar to a mechanical adjustment conforming to ASTM E-18. The limit of the adjustment range is ± 0.5 pt. You can adjust the hardness readout.

The other functions are all factory set and cannot be changed.

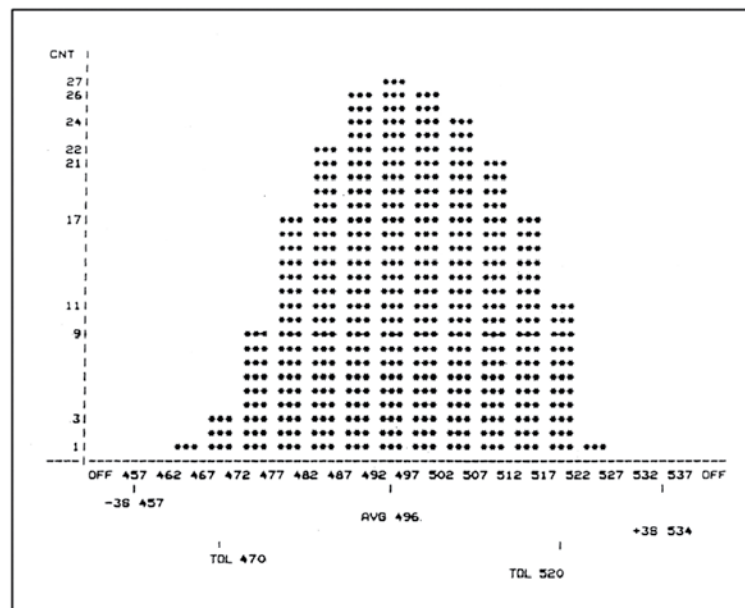
Statistic Outputs

The 400 Series can be setup to display statistics on your test results. When statistics are invoked, the display will indicate the mean and standard deviation (uses [n-1] method).

The 400 Series lets you print out statistics including mean, range, min/max, standard deviation, and CPK values. Histograms of your results may also be printed.

LOT #	102687930	SEQ #	64	Z-DSP	100.0	CAL		LOWTOL	63.0	HIGHTOL	64.0							
TOT	64	GOOD	43-67%	LOW	3- 5%	HIGH	18-28%	MIN	62.5	MAX	65.4	CPK	.09	ZCALCMIN	1.136	ZCALCMAX	.275	
RANGE	2.9	AVG	63.80	VAR	.501	STD DV	(N-1)	STD DEV	(N)	.702	PRED % OUT LOW	(Z-TABLE MIN)	12.71	PRED % OUT HIGH	(Z-TABLE MAX)	39.19		
Z TABLE VALUES GREATER THAN .5%																		

Shown: totals printer output format.



Shown: Histogram printout- Values on X axis are Rockwell values; decimal places are omitted to make room for more cells.

Result Averaging

Automatic averaging of your results can be setup on the 400 Series electronic console. You may request averaging on from 2 to 10 results. The console will display the average of your results. When printing out the results, the printout would show each result value for as many tests as you request to be averaged (up to 10). Plus, the print out will show the range, average and *H symbol next to the highest result in the range and *L next to the lowest result in the range. When averaging is used the average is saved in memory and not the individual test results for the range.

Save Results to Memory

Up to 5000 results may be saved in memory on either the INDENTRON 400 Series or 300 Series.

Split Memory

The 400 Series lets you store data from different parts in unique file or scale locations so that SPC can be performed on "like results" from the same scale, for example, in the carbide industry where 0.2 HRA separates carbide scale. With the 400 Series multiple calibrations may be performed to insure the optimum accuracy in a given range. Up to twenty (20) separate files (10 for diamond and 10 for ball) may be configured.

RS232 Output

The RS232 output on the INDENTRON Series can be used to print histograms or interface with a personal computer with our DataView™ application software for advanced data management and analysis.

Sequence Numbering

Sequence numbering can be used to further identify individual test results within a group or series of tests. Each time a test is performed, a unique sequence number is applied to that result. Up to 65,335 sequence numbers are available. The sequence number is appended to the test result on printouts. Sequence numbering is available on the 400 Series only.

Lot Numbering

Using the 400 Series console, the user may specify a lot number that is assigned to a specific set of test results for further identification. When selected, the lot number accompanies the results on your printout.

Innovative Indenter Design

The INDENTRON indenter makes it ideal for testing inside diameters. Using the standard indenter, inside diameters as small as 1-1/2" can be tested. An optional indenter and shortened indenter can test inside diameters as small as 1/2". The operator may also test close to vertical surfaces to within 1/4" with the standard indenter or 3/32" with a special indenter. The indenter design also provides the operator with an excellent view of the testing location.



Shown: The indenter assembly design provides excellent visibility over the testing area.



Shown: With the optional DATAVIEW software, users have a variety of analysis and data management tools available.

Ordering

INDENTRON Systems - Regular

Model	Vertical Capacity	Major Loads
NI-400RD	10 inch	60, 100, 150 kgf
NI-400RD15	15 inch	60, 100, 150 kgf

INDENTRON Scales - Regular

Scale	Ball Type	Standard
A	Diamond	Yes
B	1/16" Ball	Yes
C	Diamond	Yes
D	Diamond	Yes
E	1/8" Ball	Option
F	1/16" Ball	Yes
G	1/16" Ball	Yes
H	1/8" Ball	Option
K	1/8" Ball	Option
L	1/4" Ball	Option
M	1/4" Ball	Option
P	1/4" Ball	Option
R	1/2" Ball	Option
S	1/2" Ball	Option
V	1/2" Ball	Option

Regular INDENTRON 400 Series include:

- C Scale, Diamond
- C and B Test Blocks

INDENTRON Systems - Superficial

Model	Vertical Capacity	Major Loads
NI-400SRD	10 inch	15, 30, 45 kgf
NI-400SRD15	15 inch	15, 30, 45 kgf

INDENTRON Scales - Superficial

Scale	Ball Type	Standard
N	Diamond	Yes
T	1/16" Ball	Yes
W	1/8" Ball	Option
X	1/4" Ball	Option
Y	1/2" Ball	Option

Superficial INDENTRON 400 Series include:

- N Scale, Diamond
- 30N and 30T Test Blocks

INDENTRON Systems - Combination

Model	Vertical Capacity	Major Loads
NI-400C	10 inch	15, 30, 45, 60, 100, 150 kgf
NI-400C15	15 inch	15, 30, 45, 60, 100, 150 kgf

INDENTRON Scales - Combination

Scale	Ball Type	Standard
A	Diamond	Yes
B	1/16" Ball	Yes
C	Diamond	Yes
D	Diamond	Yes
E	1/8" Ball	Option
F	1/16" Ball	Yes
G	1/16" Ball	Yes
H	1/8" Ball	Option
K	1/8" Ball	Option
L	1/4" Ball	Option
M	1/4" Ball	Option
N	Diamond	Yes
P	1/4" Ball	Option
R	1/2" Ball	Option
S	1/2" Ball	Option
T	1/16" Ball	Yes
V	1/2" Ball	Option
W	1/8" Ball	Option
X	1/4" Ball	Option
Y	1/2" Ball	Option

Combination INDENTRON 400 Series include:

- C & N Scale, Diamond
- C, B, 30N and 30T Test Blocks

Ordering

INDENTRON Indenters

Part No.	Description
<i>Diamond Indenters for INDENTRON, ME-2 and Wilson® Style</i>	
8103-07	C & A Scale, Diamond Indenter with Certificate
8105-07	C, N, & A Scale, Diamond Indenter with Certificate
8109-07	N Scale, Diamond Indenter with Certificate
8110-07	C Scale, Diamond Indenter with Certificate
<i>Diamond and Ball Indenters for INDENTRON Only</i>	
NI-SP3	Short Form, Diamond Indenter
NI-SP4	Short Form, 1/16" Carbide Ball Indenter
NI-SP8	3/4" Ball Indenter
NI-SP22A-07	Diamond Indenter for NI-SP22 Clamping Adapter
<i>Carbide Ball Indenters</i>	
8111W07	1/16" Carbide Ball Indenter with Certificate
8112W07	1/8" Carbide Ball Indenter with Certificate
8113W07	1/4" Carbide Ball Indenter with Certificate
8114W07	1/2" Carbide Ball Indenter with Certificate
<i>Steel Ball Indenters</i>	
8111S	1/16" Steel Ball Indenter, includes 50 Extra Balls
8112S	1/8" Steel Ball Indenter, includes 10 Extra Balls
8113S	1/4" Steel Ball Indenter
8114S	1/2" Steel Ball Indenter
<i>Ball Indenter Components</i>	
AT/5116S	1/16" Steel Balls, 50 each
AT/5116W	1/16" Carbide Ball with Certificate, 1 each
AT/5117S	1/8" Steel Balls, 10 each
AT/5117W	1/8" Carbide Ball with Certificate, 1 each
AT/5121S	1/4" Steel Balls, 10 each
AT/5121W	1/4" Carbide Ball with Certificate, 1 each
8118	1/16" Ball Indenter, Cap only

INDENTRON Anvils

Part No.	Description
NI-SP10	Anvil Table, 8-inch
NI-SP11	Workrest, Short
NI-SP12	Workrest, Extended
NI-SP13A	Flat Anvil, 70 mm (2-3/4")
NI-SP13B	Standard Combination Spot and Vee Anvil
NI-SP17	Self-Aligning Cylinder Vee Anvil (for NI-SP12)
NI-SP19	Adjustable Cylinder-type Vee Anvil
NI-SP21	Diamond Spot Anvil
NI-SP25	Extended Spot Anvil, 2-inch (includes locking ring)
AT-5323	Adapter for use with VERSITRON Anvils in 3/4" (NI) hole

Accessories and Options

Part No.	Description
NI-SP18	External Jack Support (for 10" models)
NI-SP20	Vinyl Dust Cover (please specify model)
NI-SP22	Clamping Adapter for INDENTRON Models
NI130-B	Floor Cabinet with Locking Door and Drawer
NI-07	Adapter, for Wilson A Style (no internal thread)
AT130-PR	Printer, Dot-Matrix, Serial with Cable (plain paper)
DATAVIEW	DataView Application Software Kit
NI/5510	Gooseneck Lamp
NI-08	Indenter, Gripsel
SC00346	Indenter, Holding Screw
ATD98	Printer Cable, 25-pin, 6 ft (2 m) length



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