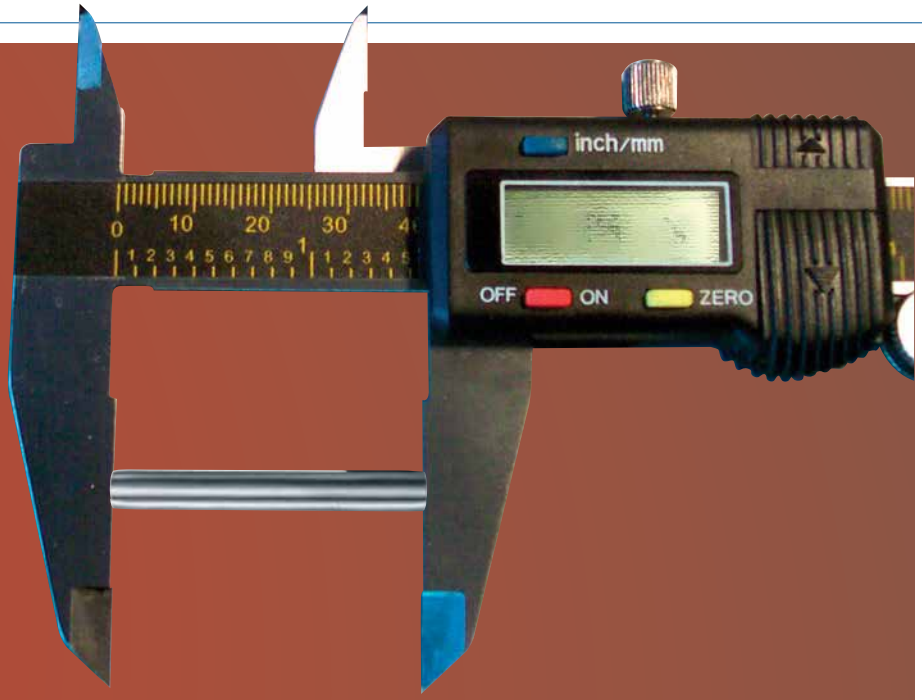
SPIROL®

COILED SPRING PINS



MEASUREMENT TECHNIQUES FOR THE INSPECTION OF COILED SPRING PINS

Measurement Techniques for the Inspection of Coiled Pins

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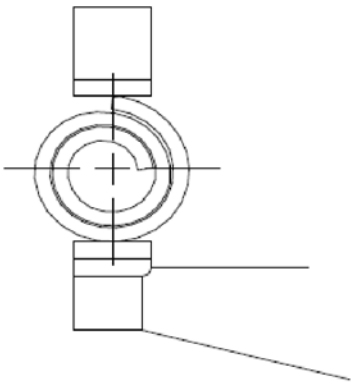
Diameter

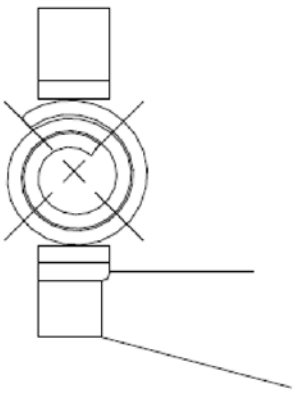
Coiled pin design is such that, diameter will be within specification over a minimum of 270° of the circumference. This design characteristic ensures that diameter at the seam will remain equal to, or less than, that at any other point in the plane of rotation. This feature prevents the seam from damaging the host component.

Diameter is measured utilizing a micrometer. Micrometer measurements are taken at 0°, 45°, and 90° to the seam as depicted in the diagrams below. A micrometer with a reduced diameter anvil is used to measure very small pins. Regardless of anvil size, it is critical that the pin be centered between the upper and lower anvils. It is also critical that the micrometer not be tightened beyond the point at which it contacts the pin as excess compression may yield incorrect readings. Diameter is to be measured a minimum of one pin diameter in length from the end of the pin. This eliminates measurement error relating to the transition from chamfer to tenon diameter. For example, when measuring a Ø4.00mm coiled pin, diameter would be measured no closer than 4.00mm to the end of the pin.

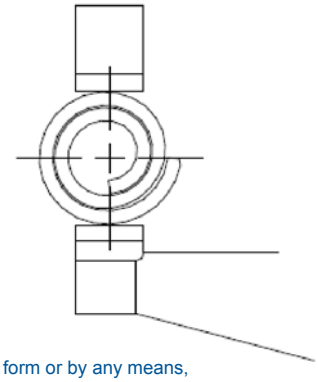
Orientation at 0° to the seam



Orientation at 45° to the seam



Orientation at 90° to the seam

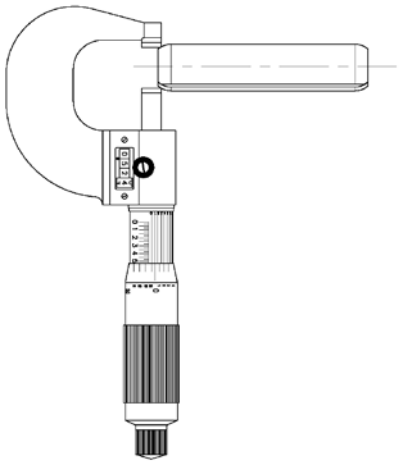


Length

The length of a coiled pin is easily measured utilizing a caliper or micrometer. It is critical that the pin be positioned squarely between the anvils of the measuring tool. See the photograph below:

Chamfer Diameter ('B' Max)

The chamfer diameter or 'B' maximum is designed to be smaller than the minimum recommended hole. This feature can be measured with a micrometer, caliper, or optical comparator. The easiest method by which to inspect is to open a micrometer to the specified 'B' max dimension, lock it, and ensure the pin 'catches' or fits between the upper and lower anvils. Please note the diagram, which demonstrates proper measurement technique utilizing a micrometer (most common method).



Hardness Inspection

Hardness is inspected utilizing either of two methods. The preferred method is a micro-harness test. The second method is superficial Rockwell testing.

Superficial Rockwell testing can provide valid results if employed correctly. The Rockwell testing scale is determined by the thickness of the strip being tested. See below:

TABLE 1

HARDNESS TESTING SCALE BASED ON MATERIAL THICKNESS
FOR FINISHED PRODUCTS

.001 to .015*----------Vickers

.015 to .025----------15N SCALE

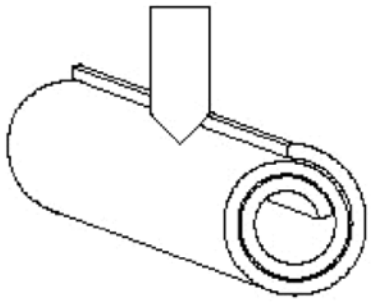
.025 to .035----------A-SCALE

.035 to .050----------D-SCALE

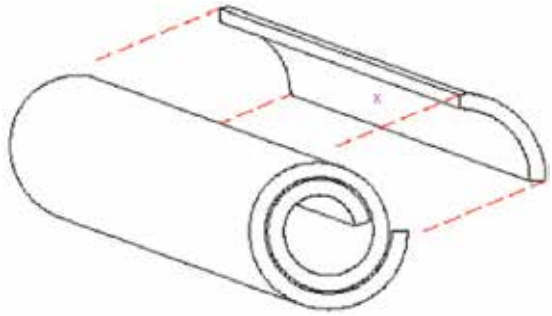
.050 & UP----------C-SCALE

*As indicated, strip measuring .001 to .015" thick, must be measured using the Vickers scale however, the Vickers scale may be used to measure any strip thickness.

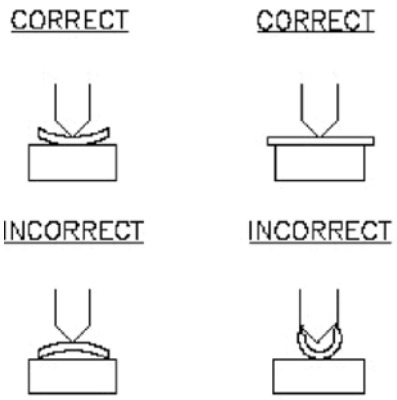
To employ the superficial Rockwell test method, a strip of the pin must be removed perpendicular to its axis. The strip must then be placed on the anvil in such a manner that it is fully supported. Because a coiled pin is round, care must be taken to ensure the strip radius does not contact the top anvil. See the following diagrams for proper sample preparation and strip orientation in reference to the test anvil:



REMOVE TEST STRIP PERPENDICULAR
TO PINS AXIS AS SHOWN



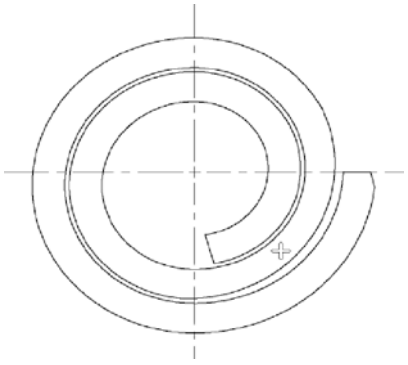
*Note ‘X’ marks correct test location at center of strip.



Micro-hardness testing of a coiled pin is the preferred method. To test using this method, the pin is cross-sectioned and one of the resultant pieces mounted for test. The mount is then polished to remove cutting marks. It is critical to note that the cutting and polishing operations must be performed with proper coolants to prevent excessive heating of the sample.

Photograph of a mounted and polished coiled spring pin.
This pin is now prepared for microhardness inspection.

Once the mount has been polished, the pins are tested in the middle of the center coil using the Vickers microhardness test method. Refer to the 'X' on the middle coil below.



Proper test location on a coiled spring pin

The Vickers diamond must be placed at least 1 diamond width from the edge of the material. When taking multiple hardness readings, each diamond must be placed so that the distance between any two diamonds is greater than twice the distance of any stress deformation that may occur when the indent is made. All hardness numbers are reported in HV (hardness Vickers).

SPIROL has developed a list of appropriate Vickers microhardness test loads to be used based on the raw material thickness being inspected. Refer to table 2.

TABLE 2

Strip Thickness vs. Microhardness Test Load

Strip Thickness/ Inches	Load (Grams)
.000 through .001	100
.002 through .004	200
.005 through .007	300
.008 and up	500

Straightness Inspection

Per ASME B18.8.2-2000 and ASME B18.8.100M-2000, the straightness of a coiled pin should be measured with a straightness gage as follows:

The straightness over the length of spring (coiled) pins shall be such that pins will pass freely through a ring gage of length as documented in Table 3 for the respective pin lengths. The maximum diameter of the ring gage hole must be equivalent to the maximum diameter of the pin free diameter plus the straightness diameter allowance documented in table 3.

TABLE 3

Inch Coiled Pin Straightness Specifications		
Nominal pin length	**Straightness Gage length +/-.005”**	**Straightness Diameter Allowance (max pin diameter plus)**
Up to 1” inclusive	1.000”	.007”
1-2” inclusive	2.000”	.010”
Over 2”	3.000”	.013”

Metric Coiled Pin Straightness Specifications		
Nominal pin length	**Straightness Gage length +/-.015**	**Straightness Diameter Allowance (max pin diameter plus)**
Up to 24mm inclusive	25mm	.18mm Min - .20mm Max
24-50mm inclusive	50mm	.30mm Min - .34mm Max
Over 50mm	75mm	.42mm Min - .48mm Max

SPIROL® Innovative fastening solutions. Lower assembly costs.

*Please refer to **www.SPIROL.com** for current specifications and standard product offerings.*

Reference Materials:
[1] ASM Handbook Volume 8 – Mechanical Testing
[2] ASME B18.8.2 2000
[3] ASME B18.8.100M2000

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ISO 9001 Certified

L. Labbe / M. Pasko 3/28/2006

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