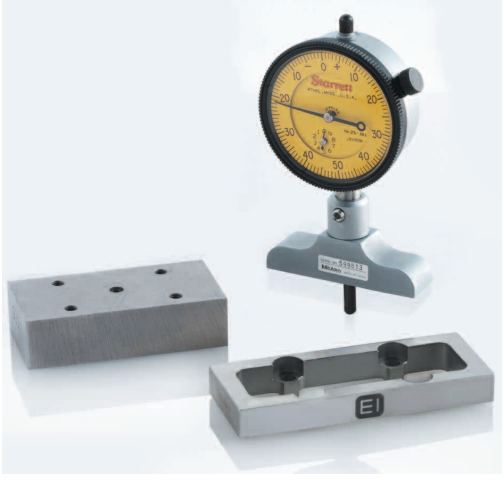
Almen Product Innovations from Electronics Inc.

Electronics Inc. (EI) is pleased to introduce innovative Almen products that will enhance a shot peening facility's ability to accurately and efficiently measure intensity. The first product is the Almen Holder Flatness Gage, a tool to verify the flatness of Almen holders. The second is a new product line and methodology for measuring intensity in components with small or inaccessible areas: The EI Almen Mini-Strip and Gage.



The EI Almen Holder Flatness gage verifies flatness without removing an Almen strip holder from test components.

The Almen Holder Flatness Gage

We're stating the obvious, but when measuring the arc of a peened Almen strip, the initial flatness of the strip and its holder are important. In fact, many specifications cite flatness requirements. For example, SAE J442 requires a flatness limit of ±0.1mm for the Almen strip holder. Since Almen gage holders are often permanently mounted to fixtures, monitoring the holder's flatness is difficult as removing the holder is time-consuming. EI's new gage solves the problem because it's simple to attach to the fixture and its dial indicator is easy to read. The procedure is accomplished in three steps:

1) Attach the flatness checker's frame to the Almen strip holder with the four supplied screws. Note: EI designed the frame's screw holes to verify the accuracy of the holder's screw locations. If you're able to attach the flatness checker's frame to the holder, the holder's hole locations are within tolerances required by SAE J442. Proper hole location is also a Nadcap requirement.
2) Place the dial indicator on the frame and traverse the length and width of the frame.
3) Observe the indicator readings. If they are within ±0.1mm, the holder surface is in compliance with SAE J442.

Other specifications may require different flatness measurements. An inch version of the gage is also available.

The Mini-Strip Product Line

The new EI mini-strip will verify intensity in small and/or inaccessible areas. This approach replaces the laborious shaded-strip procedure with a faster and more accurate process. Shot peening technicians in aerospace and spring and gear manufacturers will appreciate the ease and convenience of the new process.

The New Intensity Verification Procedure

The mini-strips measure 1'' x 1/8'' and can be attached with double-sided tape directly to a test component or simulated fixture—no need to allow room for a standard Almen holder. Plus, they're ready-to-go—no need to make a shaded strip. Their small size makes them ideal for measuring intensity in small or hard-to-reach areas like dove-tail slots in jet engine disks, gear roots, and the internal bore of springs, without creating a complicated test fixture.

The correlation between full-size Almen strips and the new mini-strips must first be established before the intensity in small and difficult-to-reach locations can be determined. The procedure requires:

1) Standard (full-size) Almen strips and a standard strip holder to develop saturation curves at both the minimum and maximum intensity range and,
2) EI mini-strips to obtain corresponding arc height.

The new Electronics Inc. Almen Mini-Strips and patent-pending TSP-M Gage.

The appropriate arc height curvature of the mini-strips must be established for the low and high intensity limits. This is done by establishing the T1 times for the upper and lower intensity limits and then exposing the mini-strips to the shot blast at these T1 times. The procedure is as follows:

1) Mount a standard Almen holder on a test fixture and attach a standard Almen strip. Peen the Almen strip and measure the arc height on the Almen gage. (Be sure to zero the gage first.) Repeat as necessary to obtain a saturation curve at the lower end of the specified intensity range (a minimum of four data points with increasing exposure times is required). EI recommends Dr. Kirk's free Curve Solver program* as the quickest and most accurate method of obtaining calculated intensity T1 from the arc height data.

   When you've obtained the proper machine adjustments that yield the lower intensity, attach a mini-strip to a convenient holder (flat surface) using double-sided tape and expose it to the blast stream for the T1 time. Place the peened mini-strip onto the new TSP-M gage. Position the strip securely on the flat supports and against the back stops. If it's not convenient to adjust the machine settings to provide the T1 exposure time, then use an exposure time near to T1. This gives you the correlation of the mini-strip to the full-size strip.

2) Repeat this procedure again to establish the T1 time for the upper intensity limit.

3) When complete, you will have a range of acceptable arc height readings for the mini-strips.

Now that you've established the correlated parameters for the lower and upper intensity range of your specification between the standard strip and the mini-strip, you must develop the process parameters to duplicate these readings on a test component or simulated test fixture. Attach the mini-strips to the test component or test fixture with double-sided tape (see page 8 for an example). Develop and record process parameters that will produce an arc height between the lower and higher correlated arc heights obtained in steps 1-3. ●

**Request the free download of Dr. Kirk's Curve Solver at www.shotpeener.com*

An Almen mini-strip mounted on the gage.

Additional Product Information

The EI Almen Mini-Strips

These are made from SAE 1070 cold-rolled steel in a special process assuring hardness of Rockwell 44-50 HRc. Strips are available in "A" thickness .051 inch and "N" thickness .031 inch.

The EI TSP-M Almen Gage

This Almen gage has many of the features of the EI #2 Advanced Almen Gage gage but the Almen strip platform has been designed to accommodate the smaller and lighter strip. Features include:

- Digital Accuracy
- Flat Check Block
- Adjustable Magnetic Grip
- One-Year Warranty
- Inch/Metric Convertible
- Data Port Output
- Convenient Battery Replacement

For more product information or to order, call Electronics Inc. at 1-800-832-5653 or 574-256-5001.

Mini-Strips Will Solve Problem

It was recently brought to my attention that many engineering drawings stipulate to shot peen all over a part's surface to a given intensity. Because the engineering drawing always takes precedence over a specification, I believe this is a problem for all shot peeners that has been overlooked since the beginning of the shot peening industry.

AMS-2430-R, section 3.2.1.4, states: "Each set-up shall be qualified for each part number. Either a scrap piece or representative fixture shall be fitted with sufficient test strip holders oriented essentially in the same manner, with the same surrounding features as the part, to represent the actual designated surface. Peening time and a saturation curve shall be established for each Almen test strip." To the best of my knowledge, this has been the standard practice throughout the shot peening industry to measure the intensity on any given part. However, in my opinion, this section leaves us in a precarious situation. Who decides what number constitutes "sufficient test strip holders" or determines test locations that are "oriented essentially in the same manner"? More importantly, how can such a non-defined requirement be reliably audited?

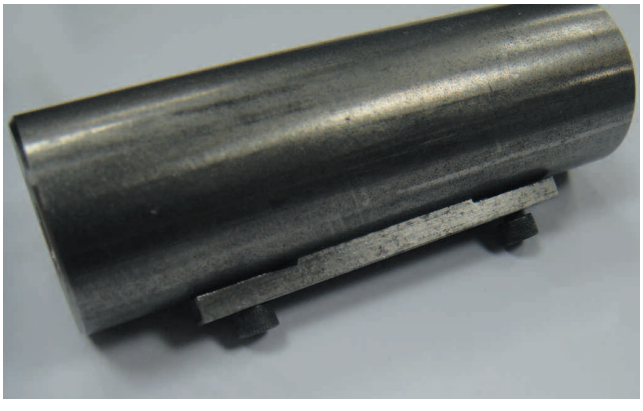
According to the Defense Contract Management Agency (DCMA), anyone performing shot peening to a drawing that "states shot peen all over to a given intensity" *must verify intensity on all surfaces all over*. Sampling the intensity in select locations is a direct violation of the engineering drawing. Current methods of intensity verification make this both impossible to do and technically impossible to certify.

Where does that leave the shot peener? A new solution is available. Over the past few months, Peening Technologies has been evaluating Electronics Incorporated's new Almen mini-strips for potential use in our job shops. Shot peening intensity verification has always been a problem in hard-to-reach areas or areas that are smaller than the standard Almen test strip. Often expensive and complex test fixtures are made or a scrap part is cut up to install Almen holders for standard Almen strips. If a scrap part is available, these expensive, complex test fixtures will be a thing of the past. All one has to do is to affix the EI Almen mini-strip to the desired surface using double-sided tape. Testing is still necessary to validate the correlation between mini-strips and standard strips, but I can see the day where intensity can be accurately and easily measured in areas that may have never been measured before. While this alone will not completely solve the problem of verifying intensity all over, it does provide a much more detailed idea of what is happening to the part in areas that were not previously tested. Couple this verification method with a closed-loop CNC/Robotic shot peening machine, and you can further enhance the reliability and repeatability of the process.

Due to the recent DCMA finding, parts designers (at least for the U.S. Military) are likely going to have to revise old drawings to detail the locations for intensity measurement and do the same on future designs. Ironically, the now-cancelled Mil Spec Mil/AMS-S-13165 Section 6.2 Acquisition requirements paragraph G specifically stated: "Designation of locations to be peened (**including intensity verification areas**), or locations to be free from peening as applicable." This was rarely if ever done in practice.

It is this shot peener's recommendation that designers specify the following on their engineering drawing:

- areas requiring shot peening,
- areas where peening is optional and may be incomplete,
- areas where peening is prohibited,
- areas where intensity verification is required (preferably with a diagram detailing Almen strip holder orientation),
- peening media and hardness to be used (give a range if possible), and
- amount of coverage.



Shot peening technicians at Peening Technologies in Connecticut constructed this test fixture to simulate a component that requires lance-peening of a hole. To the left is an EI Almen mini-strip attached to a holder with double-sided tape. Above, the strip holder has been attached to the fixture with the mini-strip facing inside the pipe.