

System calibration

Laser Weld Monitoring (LWM) Technology

The new version of the AWS C7.4 Laser Welding Standards will contain the requirements to calibrate the LWM system as part of the Equipment Qualification (EQ) and the Procedure Qualification (PQ) processes.

Background

Before using the HDE LWM systems, HDE's exclusive '**Pulsed Laser Welding Algorithm**' may be used to compute the optimum laser welding parameters. Based on the material, weld penetration and other quality requirements these algorithms (well tested over the past several years) deliver the optimum energy per pulse, pulse width, pulse shape and the range of allowable laser settings. The HDE Algorithms and training how to use them supplied with the HDE LWM systems.

The very same (computed) laser weld parameters are programmed in to the HDE LWM computer and the laser welding equipment!

The effects of the process variables on the weld can be now measured to a great accuracy.

As an example on **Figure 1, 2 and 3** we show an excerpt from the Operators Manual that shows how to calibrate the effect of 'longitudinal gaps' in the weld geometry.

Similar procedures are followed for transverse gaps, off-sets, pin holes, seam misalignment, changes in shield gas flow rate and direction, focus shift, etc.

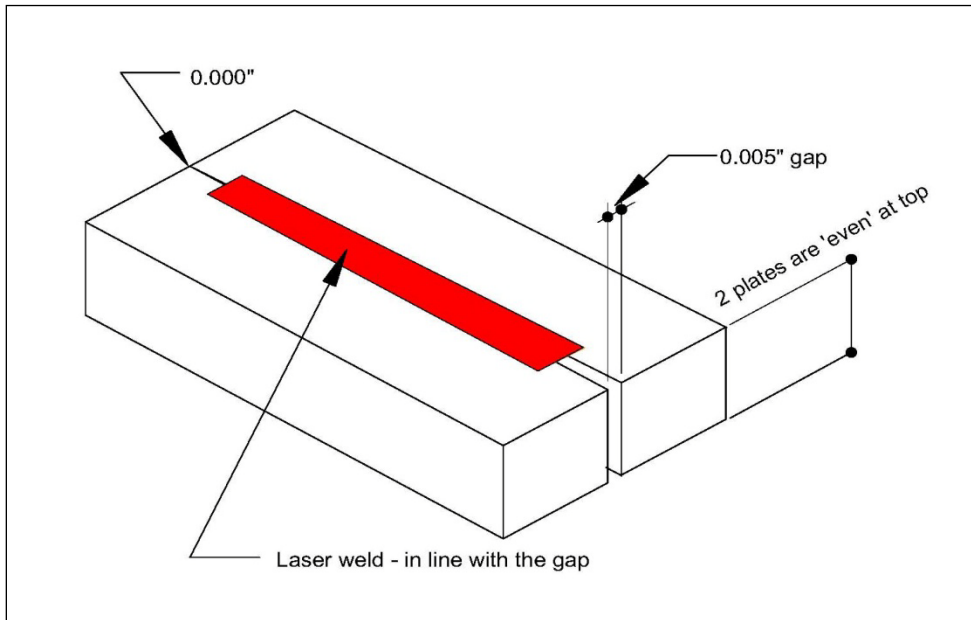


Figure 1. This calibration involves the staging of two piece parts, made from the same metal used to fabricate the ‘product’, creating a known gap between them.

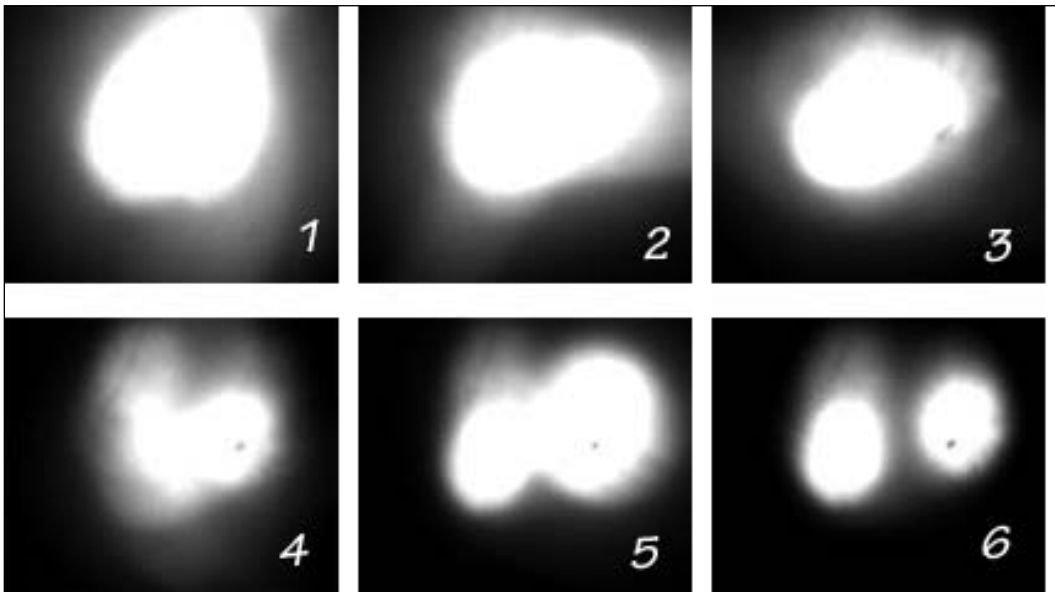


Figure 2. Referring to **Figure 1**, images are recorded as the laser weld is performed starting at the location where there is NO gap between the 2 pieces – Image 1. The system is trained on Image 1 as the desirable image.

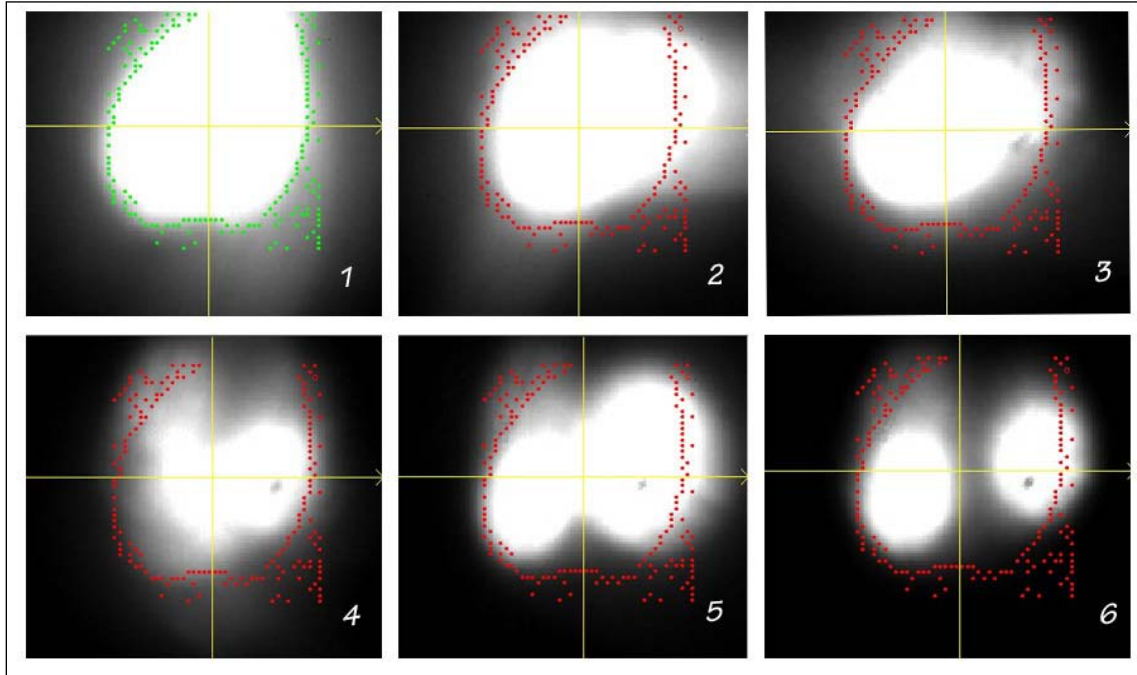


Figure 3. Images shown in **Figure 2** are evaluated. The LWM computer is trained on Image No. 1. The 'green' spots identify the edges of the image. The other images are rejected since they are different from the 'master' image. The data generated by the HDE LWM includes the images of each and every weld, the Correlation Value and the Statistical Analysis of each welded assembly and then the Statistical Analysis of the entire lot of assemblies. For more information, click on the icon **'Data and Statistics'** on the opening page of this web site. The end user may decide, as an example, that the weld shown in Image No. 2 is still acceptable, and adjust the Upper Control and Lower Control Limits to accept that Image! The other welds are not accepted based on the images and the Correlation Values.

Disclaimers

The HDE Pulsed Laser Weld Monitor (LWM) systems are designed to identify changes and variations in the laser welding process with great accuracy in real time, analyze the data and report it to the end user. The accuracy of the data and the reports are subject to a number of process related variables and their interactions with each other and the process limits set by the end user.

The end user is advised to NOT use the HDE Pulsed LWM systems as devices to determine the final absolute quality of the welded product. HDE recommends that the end user continues the normal inspection and testing of the laser welds and the laser welded product as the end user has been doing in the past and as it was approved by the Industry Specific Regulatory Agency.

HDE is not accepting any responsibility as to the accuracy of the HDE Pulsed LWM systems and the final quality and utility of the laser welded components.

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