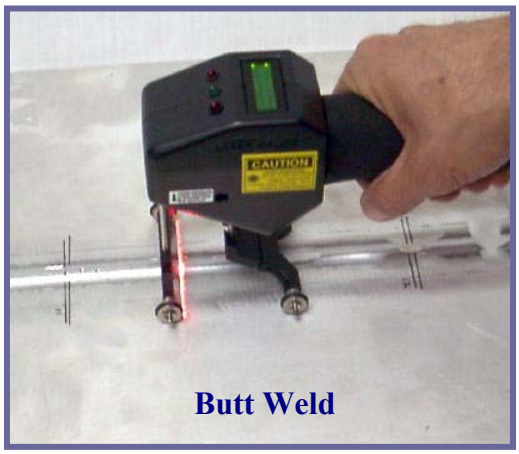
LASER GAUGE® APPLICATION

Welds

Inspection Problem

Potential weaknesses in a weld can be revealed in the evaluation of its surface characteristics. The height, width and area of a butt weld are factors in its strength. Also, the fit-up and angle of the panels welded together have a bearing on the integrity of the weld.

Inspection of welds on space vehicles during production and after repair is mandatory. Ultrasonic techniques are used to locate subsurface cracks in the welds; however, the surface features must be inspected using other methods. Operators are able to visually isolate areas of concern on the weld but they are unable to measure the features with mechanical tools accurately or repeatably.



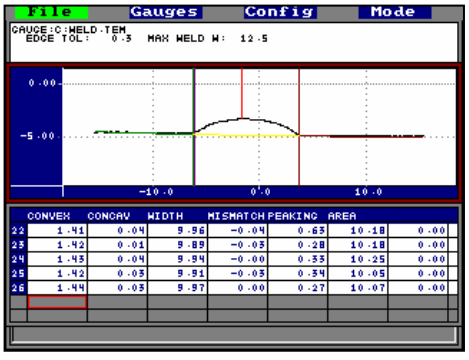
Butt Weld

Requirements

Measurements - Tolerances for weld width, height and surface area are expressed in thousandths of an inch. If the weld bead is below the adjacent panel surfaces, it is said to be concave, and the concavity must be measured. The fit of the panels before welding, meaning whether there is difference in the surface heights of the panels and whether the panels are at an angle to each other, also determines the integrity of the weld and must be inspected.

Instrument - Inspections must be done quickly due to critical flight schedule requirements. Welded panels are inspected throughout huge assembly facilities. The inspection instrument must be portable.

LaserGauge® Solution



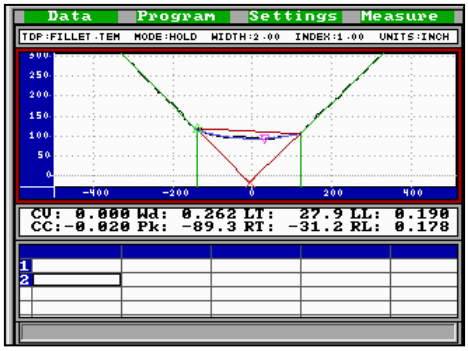
LaserGauge System - A sensor that has a field-of-view that is two to three times the nominal width of the weld bead is recommended. For welds other than very small laser-welds, an HS300 series sensor with a 0.50", 1.2" or 2.4" FOV is recommended. The LG1102 controller provides a graphical display of the surface profile of the weld as the measurements are being taken.

Measurements - All measurements are automatic. The operator positions the laser stripe over the weld and releases the trigger. The edges of the weld are found based on the edge tolerance selected, and all of the parameters are calculated: weld bead convexity (height), concavity, width, panel mismatch, peaking (panel angle) and weld area.

Advantages Realized

Saves Time - An inspection at one location on a weld takes less than three seconds. Entire welds can be inspected in the time it would take an operator to manually measure and record the parameters at just one location.
Results are Reliable - Measurements are accurate and repeatable, without regard to operator.
Results are Traceable - Results are written directly into a file without fear of transposition errors. Data is retrieved to a PC and archived for future reference.

Related Applications



FILLET WELDS - Fillet welds are used when two panels are joined at a 90° angle to each other. Since the only thing visible to an inspector is top surface of the weld between the two panels, there is practically no manual or mechanical means of measuring parameters of a fillet weld.

LaserGauge System - Depending on the width of the weld being inspected and the resolution required, an HS300 sensor with a 0.5", 1.2" or 2.4" field-of-view is recommended. An LG1102 controller will provide the graphic feedback necessary to position the sensor over the weld.

Measurements - The final angle between the panels is important to make sure that they were fit up correctly before the welding process. The LaserGauge® measures not only the angle between the two panels but also measures the length of the panels covered by the weld. These are called leg lengths and are determined by extrapolating the two parent surfaces to an intersection point beneath the weld. The width of the surface between the two legs, also called the weld width, is measured. Using the leg lengths and the weld width, the area of the weld is calculated.

A toe angle is the angle of the weld relative to a side panel and the toe angle on both sides of the weld is measured. Concavity and convexity of the weld is determined relative to a line between the two weld edges.

Distributed by:

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