MICRO-EPSILON

Measurement and inspection of laser-welded seams

In modern production processes efficient and therefore more economical production techniques are continually sought - this also now includes the substitution of expensive screw joints by welding using automated laser welding techniques. In this respect quality monitoring in the form of a 100% inspection is often essential to obtain fault-free welded joints. The fully automatic measurement system detects shape deviations and fault locations on the welded seam as well as foreign bodies (welding wire residue). Previously, automation was unsuccessful due to the high demands with regard to cycle time and accuracy with fast amortization.

The measurement technique used is a non-contacting laser-based optical profile sensor, scanCONTROL 2810, which is constructed without any moving mechanical components.
The profile sensor beams a laser line onto the target. The diffusely reflected light is imaged by a camera optical system onto the CMOS array. The controller computes the profile data from the camera image.
As a priority, the height of the welded seam on the test object is dimensionally monitored; limits previously saved in the system can be simply called and applied. Simultaneously, the width and optionally also the cross-sectional area are checked with this system for conformance to article-specific limits.
Furthermore, parts are classified as defective which in the installed state could cause faults and failures. This is the case, for example, when welding wire residues loosely cling on and are released later in operation.

Ambient conditions

The inspection occurs directly after the welding process while the parts are still hot so that tolerance infringements are detected at an early stage and can be passed on for rework. Different diameters of the target are covered by the large Z measurement range of the system, similar to the variation in the X position of the welded seam. For a few product types the sensor is mechanically repositioned in the X axis. The parts are slightly oily, the surfaces shiny metallic and partially reflecting. Expansions to new types can be made by the customer.

Primary system requirements are:

- Control of the welded seam height.
- Control of the welded seam width.
- Detection of interruptions in the welded seam.
- Detection of welding wire residues clinging to the welded seam.
- A feed of up to 30 m per minute.

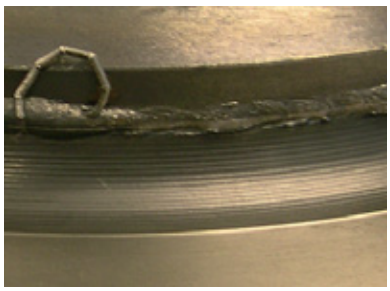
100% of the passed parts are inspected. A classification is made into passed and rejected parts. In addition parameters of the welded seam can be computed, compared with the saved limits and a pass/reject assessment carried out.

Measurement system requirements

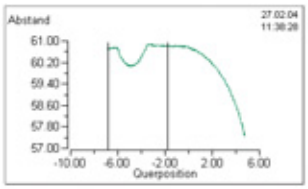
- Measurement range, Z axis: Up to 245mm
- Measurement range, X axis: Up to 140mm
- Profile frequency: Up to 1000 profiles per second
- Operating temperature: 0...50°C
- Smallest detectable wire diameter: 0.8 mm at 30 m per minute feed

Reasons for the system selection

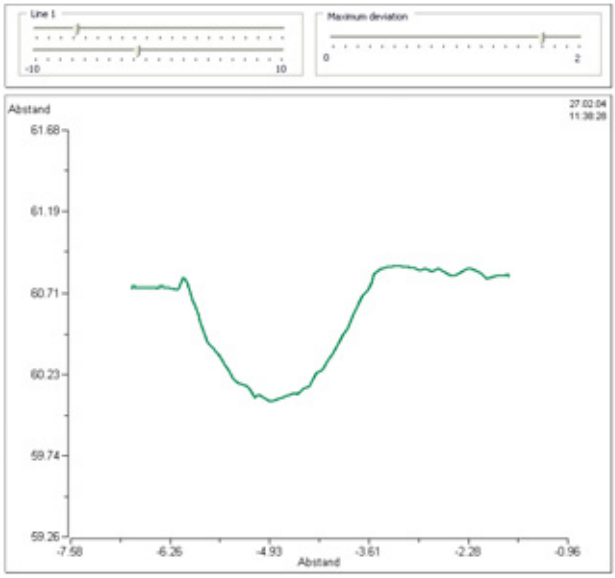
- Short cycle time can be realized (high profile frequency).
- High accuracy (also small faults detectable).
- Simple automation.
- High versatility.
- Simple operation, parameterization via notebook / PC.
- Easily adapted for new parts.



NOK: defect welded seam (flat profile and welding wire residues)



Welded seam **OK**



Screenshot of the OK welded seam

MICRO-EPSILON

A member of micro-epsilon group.

Koenigbacher Str. 15
94496 Ortenburg / Germany

Tel.: 0 85 42/1 68-0
Fax: 0 85 42/1 68 90

info@micro-epsilon.com
www.micro-epsilon.com

Certified DIN EN ISO 9001 : 2000
Modifications reserved Y9781141