



PHAsis-one – Phased Array Spotweld Inspection System

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Abstract. PHAsis.one is the first phased array ultrasonic inspection device offering a previously unattained physical resolution of the spot weld diameter better than 0.35 mm. PHAsis.one can determine defective areas fast and precisely.

PHAsis.one ultrasonic inspection device was designed for the accurate inspection of resistance welded spots of steel- and aluminum sheets. 121 ultrasonic elements and an 11 x 11 matrix grant for a physical resolution better than 0.35 mm for the inspection of the spot weld diameter. More than 700 measuring points are recorded per spot weld.

The probes are connected to the test part by means of the water path and its reliable bubble technique. If needed a fixed rexolite wedge can also be used. The inspection time is just a few seconds per spot. As for the conventional spot weld inspection during production with so far only one ultrasonic element approx. 500 to 800 spots can be inspected per shift.

PHAsis.one provides data on the diameter of the welding spot, the remaining wall thickness of the welded area as well as the sound attenuation caused by structural transformation as possible evaluation criteria for zinc adhesion bonding.

All data is organized by means of the PHAsis.manager administration software and synchronized with the PHAsis.one ultrasonic inspection device. The communication with the customer's data base is realised by individually adapted interfaces. The data and user administration as well as the creation of various inspection plans are clearly designed for easy and fast editing.

PHAsis.device inspection and evaluation software developed by VOGT Ultrasonics` on the basis of the PHAsis.one inspection device is designed for quick use during production and guarantees an intuitive operation and minimum need of training.



The fast non-destructive quality control of weldings is essential for the protection of humans and environment especially in the automotive industry. The goal is to ensure the load capacity of components saving costs and resources simultaneously.

Resistance spot welding is the most important joining method for large series production of motorcar bodies and subject to a high quality standard. During the welding process a number of critical defects can occur. The welded spot may be too small to guarantee sufficient stability. There might be adhesions, inclusions within the welding or even no welding at all. Therefore, it is necessary to check spot welded joints systematically.

Optimizing production costs by means of Phased Array Technology

Using Phased Array technology PHAsis^{one} provides the basis for an optimized cost-saving spot welding process (fig.1). Its strength lies in the outstanding and previously unattained high precision measuring of the spot weld diameter. 121 ultrasonic elements and an 11 x 11 matrix grant for a physical resolution better than 0.35mm for the inspection of spot weld diameters. More than 700 measuring points are recorded per spot weld. Thanks to this reliable data the welding parameters can be optimized in order to achieve an ideal spot weld quality.



Fig. 1.: PHAsis^{one} portable inspection device with a laptop as minimal configuration of the complete system

Up to now this data is collected by the cost-intensive destructive inspection. Bodies in white are destroyed by means of the conventional hammer and chisel testing. Quality features are the spot weld diameter and its breaking characteristics.

PHAsis^{one} completely replaces the cost-intensive destructive inspection thanks to its reliable and accurate inspection results regarding the spot weld diameter.

Ideal for quick use during the production process

PHAsis^{one} provides data on the diameter of the welded spot, the remaining wall thickness of the welded area as well as the sound attenuation caused by structural transformation as possible evaluation criteria for zinc adhesion bonding. The compact and robust housing and its low weight of 3.5 kgs make PHAsis^{one} the ideal equipment for mobile operation. The probes are connected to the test part by means of the water path and its reliable bubble technique. If needed a fixed rexolite wedge can also be used. The inspection time is just a few seconds per spot. As for the conventional spot weld inspection during production with so far only one ultrasonic element approx. 500 to 800 spots can be inspected per shift.

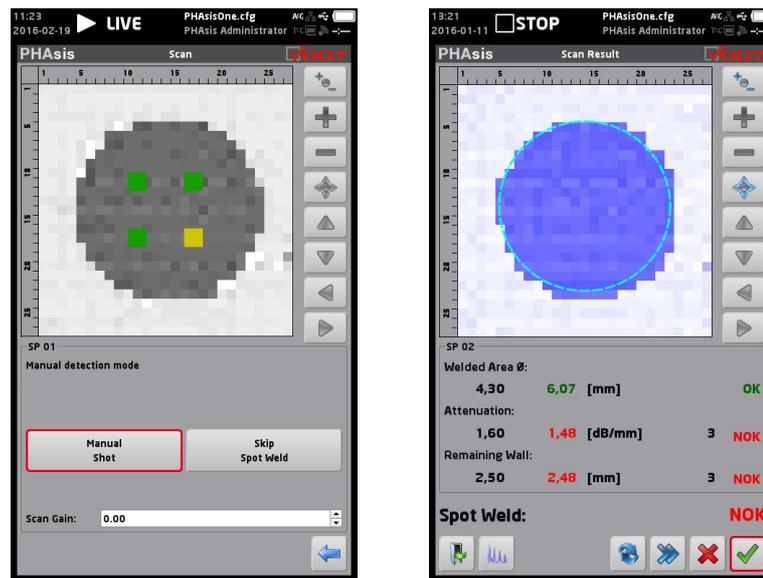


Fig. 2.: Imaging Phased Array Technology. Left: C/D-scan for an optimum focussing of the probe on the spot weld. The four fields light up green when the probe is perfectly positioned. Right: Automatically provided evaluation proposal by D-Scan freezing.

In addition to the excellent ultrasonic features PHAsis focusses on a user-friendly software specifically designed by VOGT Ultrasonics for quick use during production. The intuitive operation guarantees a minimum need of training.

The imaging display of the phased array technology ensures the safe evaluation of the inspection results. The software of the device provides a combined C/D-scan which supports the user to ensure the optimum focussing of the probe on the spot weld to be inspected. The probe is perfectly positioned, if all four fields of the display light up green (fig. 2, left).

PHAsis also supports the user with the evaluation. By freezing the D-scan the inspection system automatically provides an evaluation proposal (fig 2, right)

Central administration for a clear perspective

For central administration of all inspection data VOGT Ultrasonics designed the windows based PHAsis^{manager} software. Like every software package developed by VOGT, PHAsis^{manager} focusses on a clear design for easy and fast editing (fig. 3). The data and user

administration as well as the creation of various inspection plans can be done in just a few simple steps.

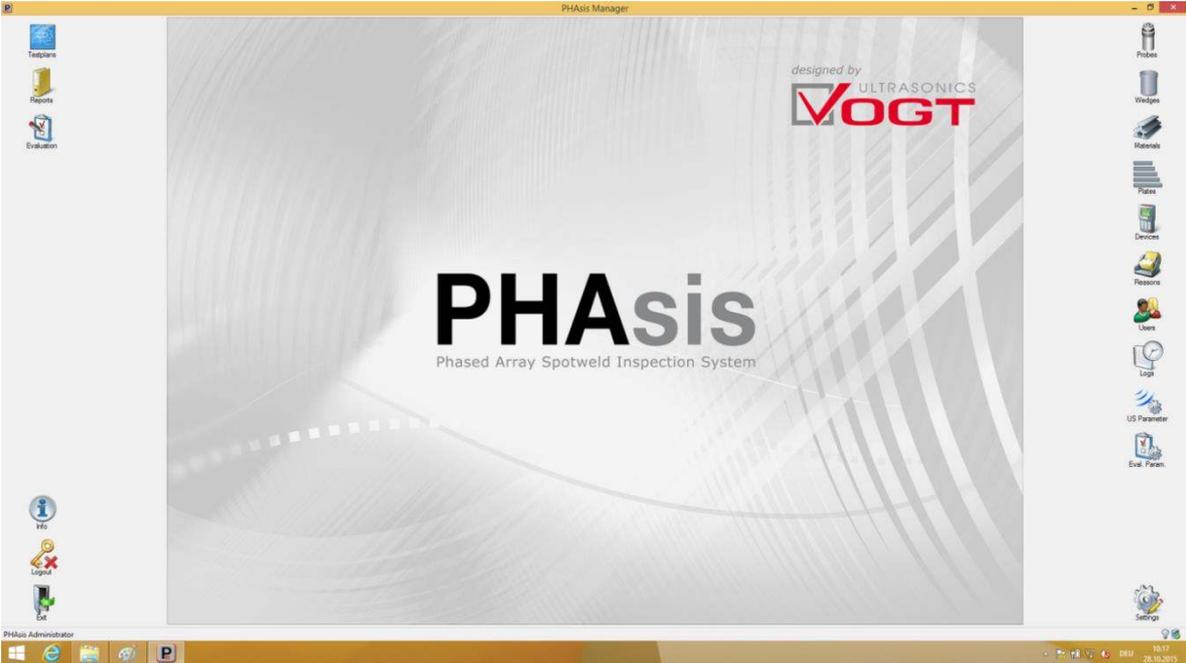


Fig. 3.: Main Menu of the PHAsis^{manager} administration software

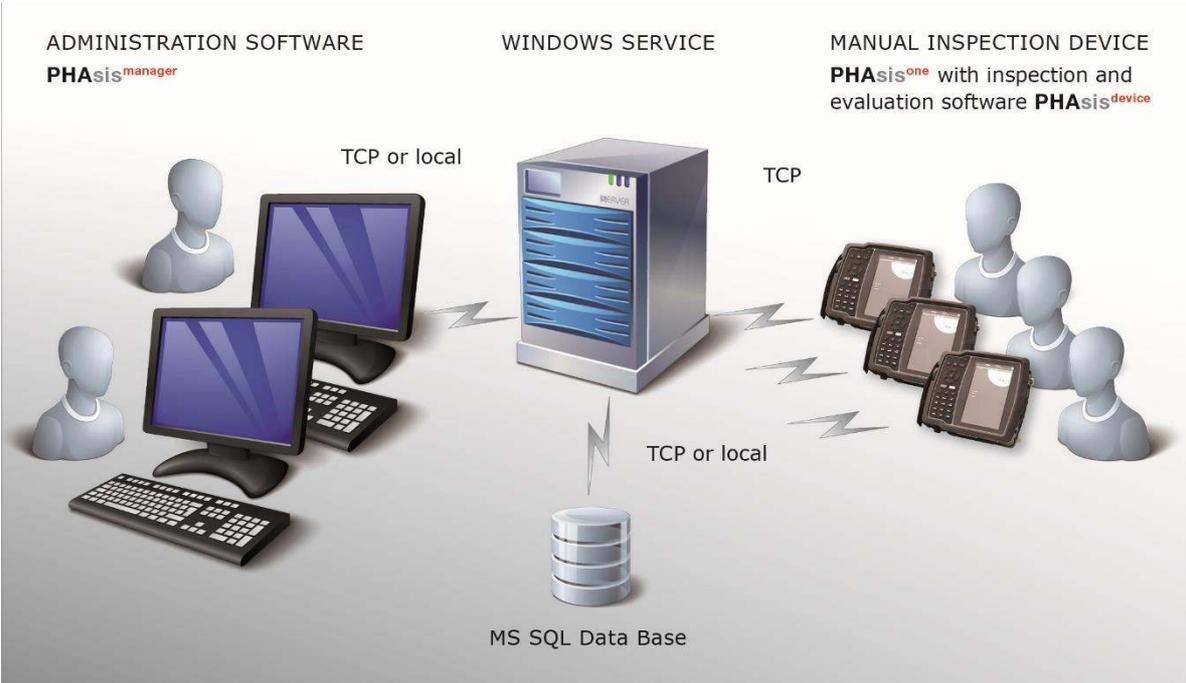


Fig. 4.: Distributed system with various manual inspection devices

All data is organized by means of the PHAsis^{manager} administration software and synchronized with the PHAsis^{one} ultrasonic inspection device. The communication with the customer’s data base is realised by individually adapted interfaces (fig 4).