

Application Example: Quality Control

Sheet Metal: Measurement of Fixtures in Automotive Production

Measuring Systems: TRITOP

Keywords: Welding fixture, jig, clamps, adjustment pin

In automotive production, the individual parts are hold in fixtures. For checking these jigs, they are measured with TRITOP and readjusted, if required.



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Quality Control / Sheet Metal

Measurement of Fixtures in Automotive Production

Measuring Systems: TRITOP

Keywords: Welding fixture, jig, clamps, adjustment pin

In automotive production, the individual parts are held in fixtures during mounting and are combined such that precise components and assemblies result.

When using large body sheet metals that are not stable themselves, it is particularly important that the fixture forces the sheet metal into the correct shape. Thus, solid welding and rebated joints can be produced and the shape of the assemblies complies with the specifications.

In production, Ford uses 60 welding fixtures in the production chain for the right and also for the left side panel. These so-called jigs can be adjusted for holding and clamping the side panel of the 3 and 5 door Ford Fiesta and the Ford Fusion.

During spot welding of the individual sheet metal parts onto the side panel, an excessive shower of sparks occurred. Probably, some jigs did not combine the sheet metals seamlessly. In order to check this assumption, the jigs need to be measured and readjusted, if required.



Fig. 1: Welding fixture of a side panel before measuring in the production environment (with Invar scale bars and orientation crosses)

With the method of tactile measuring technology used so far, the jigs are removed from the production environment, set up in a measuring machine and measured there. Just measuring the jigs takes more than eight hours. Not forgetting the expensive transport of each jig.

The mobile coordinate measuring machine TRITOP is well suited to fulfill such tasks fast, efficiently and precisely on site in the production environment.

When using the TRITOP system, the clamps and adjustment pins need to be prepared for photogrammetry with reference points and measuring adapters. In addition, two scale bars and orientation crosses with coded reference points are put on the fixture.



Fig. 2: Detail view of a clamping fixture to fix the sheet metals. The reference point on the bearing area is visible.



Fig. 3a: Detail view of reference points: reference point with point adapter



Fig. 3b: Detail view of reference points: cylinder adapter with magnetically fixed on the adjustment pin

Now, images are taken from different viewing angles using a high-resolution measuring camera (see Fig. 4). These images are transferred to the computer via WLAN or using a memory card. From this image set, the TRITOP software automatically computes the 3D coordinates of the reference points and the measuring adapters.



Fig. 4a: Measuring using the TRITOP camera

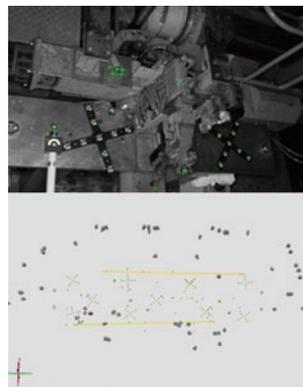


Fig. 4b: Measuring images and 3D coordinates of the reference points

Then, the measured 3D points are transformed into the coordinate system of the jigs. For this purpose, the coordinates of the reference bores which, as can be seen in Fig. 3, are optically captured by the point adapter. Fig. 5 shows the current measuring values and deviations of these points from the nominal data after the data was registered to the coordinate system of the car by means of the reference bores.

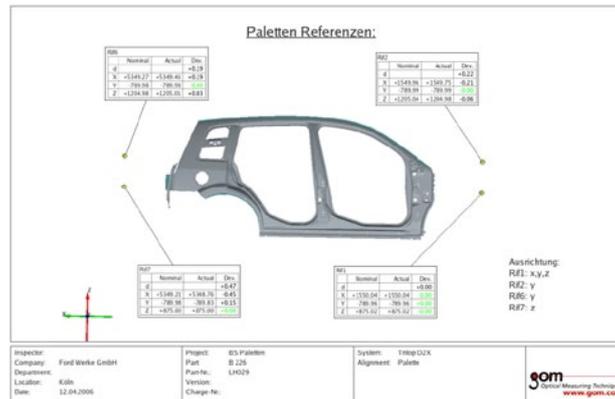


Fig. 5: Measuring the alignment points, visualized together with the CAD data

To check the measured clamping areas, the CAD data of the side panel is loaded into the TRITOP measuring project. Fig. 6 shows the deviations of the clamping points from the loaded nominal data. Now, it becomes clear that deviations from the bearing surface of more than +/- 1 mm are the reason for the different welding qualities.

In a next step, the evaluation was automated and the required adapters were provided. The complete measurement of a jig from its preparation to the final measuring report according to Fig. 5 and 6 now takes less than two hours compared to more than eight hours when using conventional tactile methods.

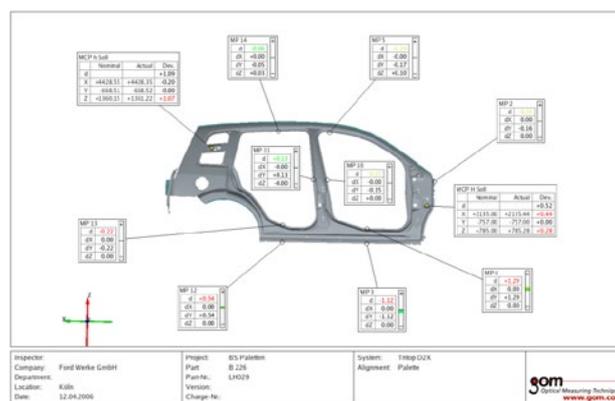


Fig. 6: Measured contact points and their deviation from the nominal position, displayed with CAD data.

Based on the TRITOP measuring technology, Ford Köln will now correct the contact points on the respective jigs and check them in regular intervals in order to readjust them, if required. Thus, it is guaranteed that optimum welding joints and dimensionally accurate car bodies will be manufactured. For series measurements of welding fixtures, GOM provides macros by means of which measurements may be automated such that recurrent measuring tasks may efficiently be performed by the users.

By courtesy of Ford Köln.