V-STAR S8 Demonstration
Measurement Report for

Samsung Heavy Industries
Korea

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Object Measured

Two areas were measured as part of the V-STARS demonstration. Each area had two pipe flanges that required measurement.

The primary objective of these measurements was to determine the centre point of the pipe flanges as well as the coordinates of four bolt holes for each pipe.

Equipment Used

1. V-STARS S8 INCA3 Camera (INCA3 camera shown in image below)
2. Scale Bars
3. AutoBar
4. Coded targets
5. Single dot targets
6. Edge targets
**Measurement Objectives**

1. Demonstrate INCA3 camera use
2. Determine location of key centre points
3. Create planes, circles and lines

**Targeting**

The necessary targeting for the measurements was very similar for both areas. The targeting used for the first measurement is shown below.

1. AutoBar for initial coordinate system
2. Reference coded targets to tie photography together
3. Two scale bars
4. Single dot targets
5. Edge targets
## Measurement Statistics

<table>
<thead>
<tr>
<th></th>
<th>Area 1</th>
<th>Area 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of photos</td>
<td>70</td>
<td>42</td>
</tr>
<tr>
<td>No. of points</td>
<td>377</td>
<td>156</td>
</tr>
<tr>
<td>Accuracy RMS X,Y,Z</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>0.016mm</td>
<td>0.023mm</td>
</tr>
<tr>
<td>Y</td>
<td>0.017mm</td>
<td>0.015mm</td>
</tr>
<tr>
<td>Z</td>
<td>0.010mm</td>
<td>0.016mm</td>
</tr>
<tr>
<td>Scale Agreement</td>
<td>= 0.010mm</td>
<td>= 0.020mm</td>
</tr>
</tbody>
</table>
Typical V-STARS measurement image

The diagram below illustrates the geometry used to create the point cloud for the first and second area.
**Point Cloud**

The point cloud produced for the first area is shown below:

![Point Cloud Image](image)

**Piece Alignment**

No alignment was carried out on either measurement area.

**Area 1 - Piece Analysis**

The data collected was used to create some key planes, circles and lines. The geometric items created are shown in the image below:

![Area 1 - Piece Analysis Image](image)
Area 2 - Piece Analysis

The second area measured is shown in the image below:
The data collected was used to create the following geometric analysis.

Flange \( r = 311.34 \text{mm} \)
\((-215.31, 1106.34, -1094.65)\)

Bolt \( r = 282.30 \text{mm} \)

Bolt \( r = 255.03 \text{mm} \)

In-t Angle = 89.3363°
\((-0.59, 0.33, -1107.49)\)

\((0.00, 0.00, 0.00)\)
Time Summary

<table>
<thead>
<tr>
<th></th>
<th>Area 1</th>
<th>Area 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Investigation</td>
<td>1 minute</td>
<td>1 minute</td>
</tr>
<tr>
<td>Targeting</td>
<td>10 minutes</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Photography</td>
<td>2 minutes</td>
<td>2 minutes</td>
</tr>
<tr>
<td>Processing</td>
<td>2 minutes</td>
<td>2 minutes</td>
</tr>
<tr>
<td>Analysis</td>
<td>5 minutes</td>
<td>5 minutes</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20 minutes</strong></td>
<td><strong>15 minutes</strong></td>
</tr>
</tbody>
</table>

Concluding Remarks

The measurement undertaken has shown that V-STARS can be a very powerful measurement tool. The results of the measurement undertaken were very accurate and produced quickly.

GSI would like to thank Samsung for welcoming us into their facility. We will be happy to discuss the results of this report or any other aspect of the technology presented.