

Appendix I-3: Macro and Microscopic Examination of Samples from GRW Tanker J3564 Figures 51-101

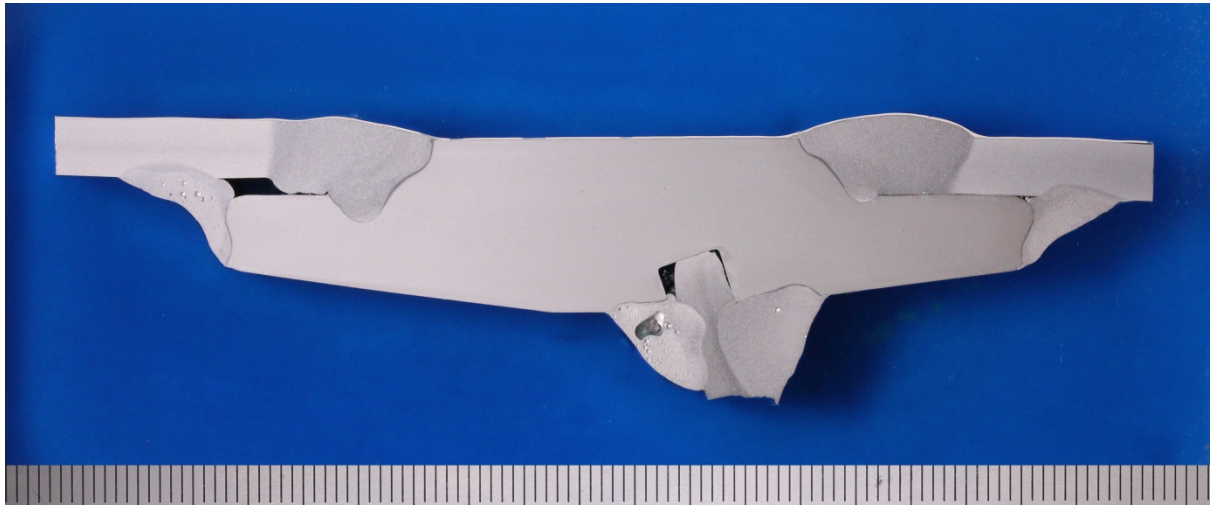


Figure I51 J3564 sample W05-06, slice 1. Significant misalignment present on left side and a large gas pore in the bulkhead joint.

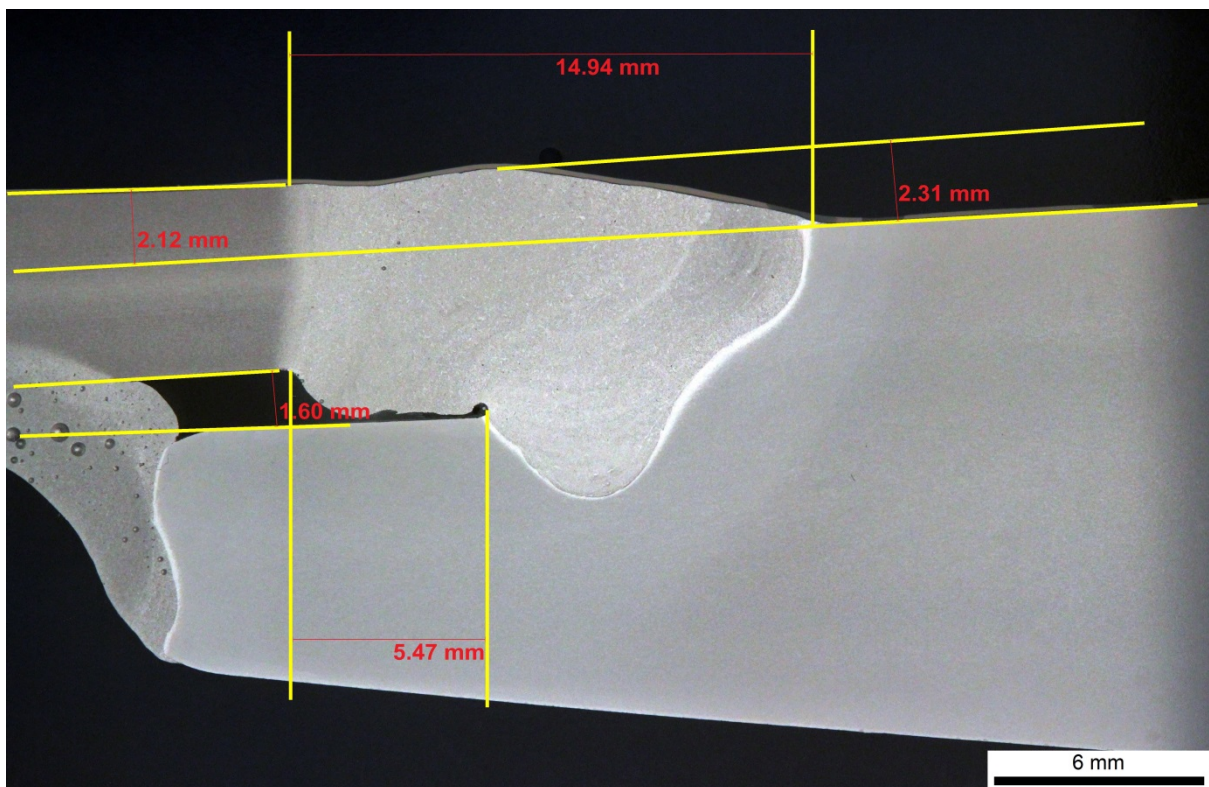


Figure I52 J3564 sample W05-06, slice 1, left hand side of Figure I51. Misalignment is 1.50mm with a small gas pore at the root.

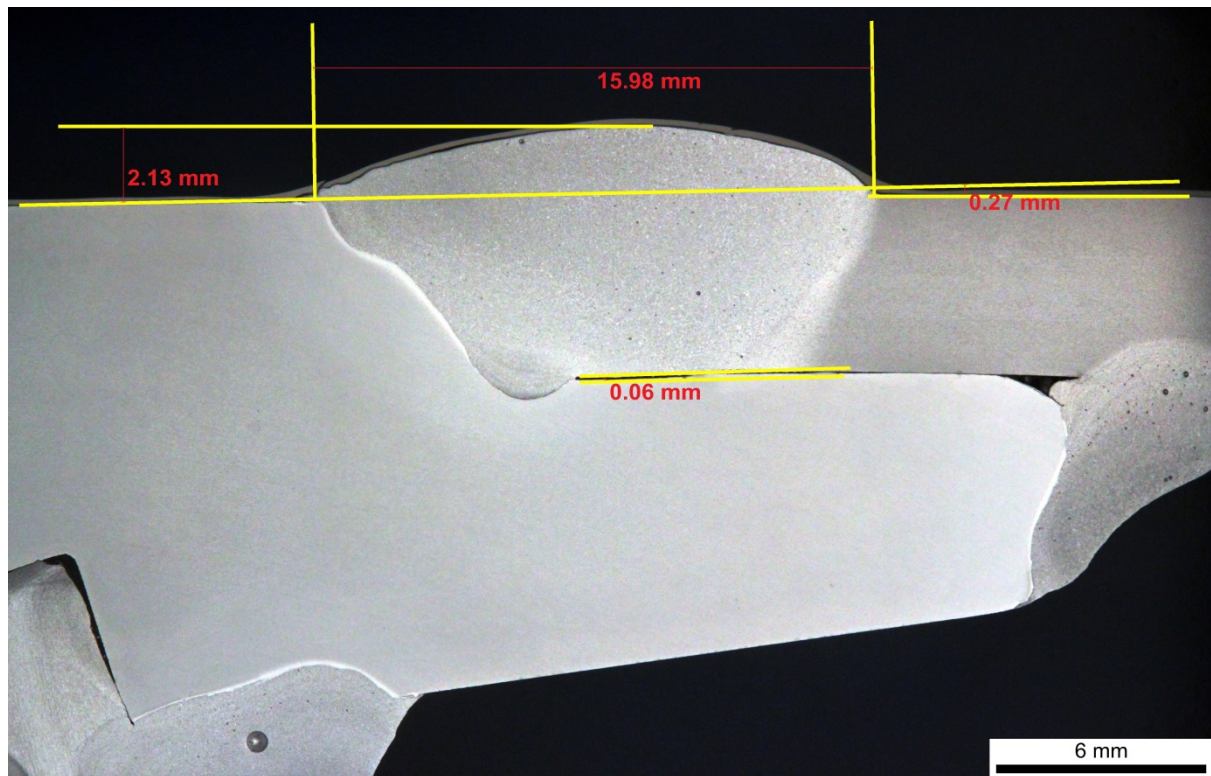


Figure I53 J3564 sample W05-06, slice 1, right hand side of Figure I51. No significant crack-like defect present.

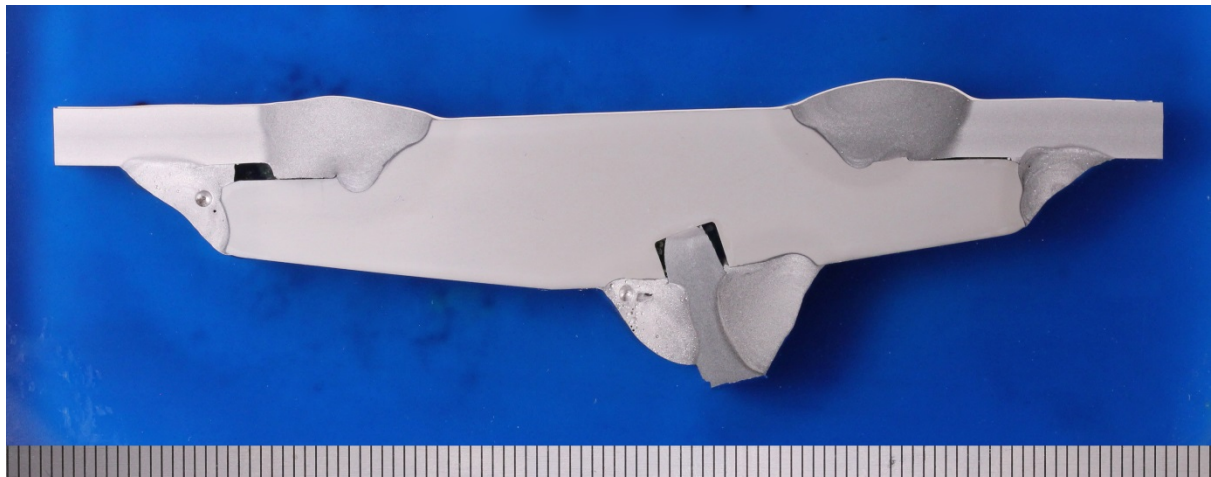


Figure I54 J3564 sample W05-06, slice 2. Significant misalignment present.

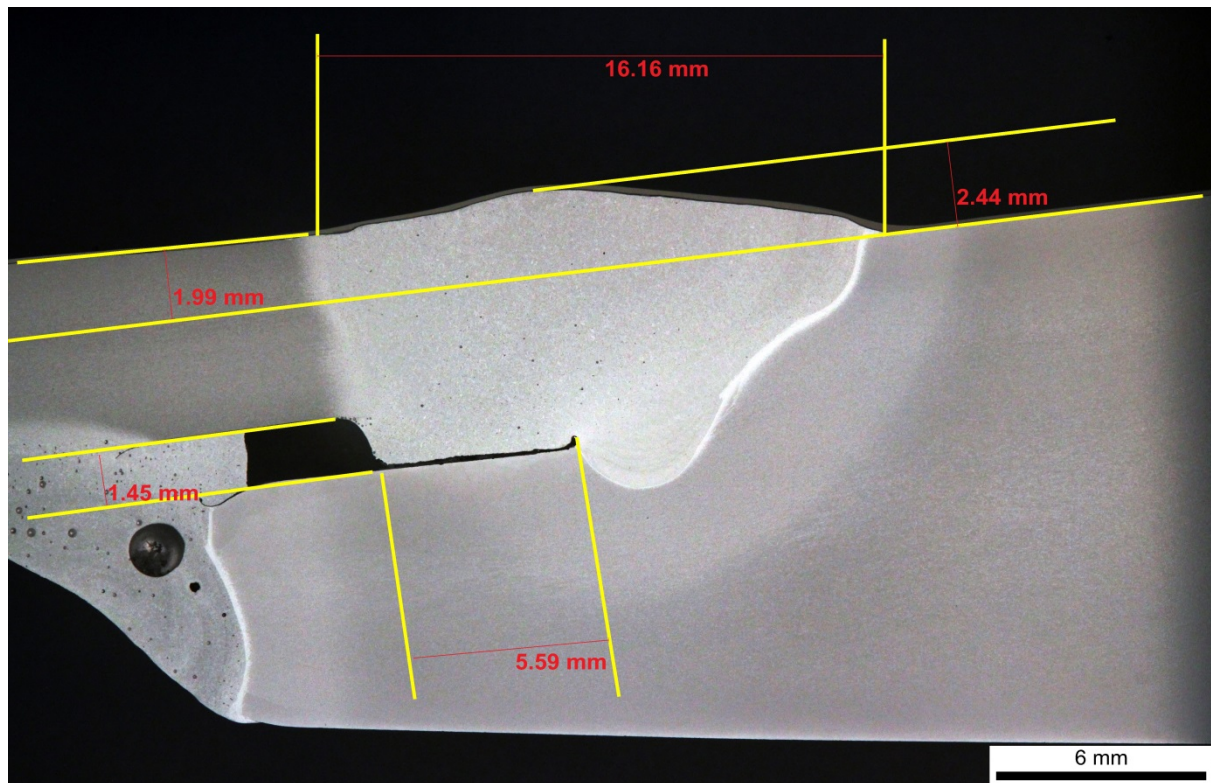


Figure I55 J3564 sample W05-06, slice 2, left hand side of Figure I54. Misalignment is 1.45mm with a small root defect. Significant gas pore and lack of fusion at the internal fillet weld.

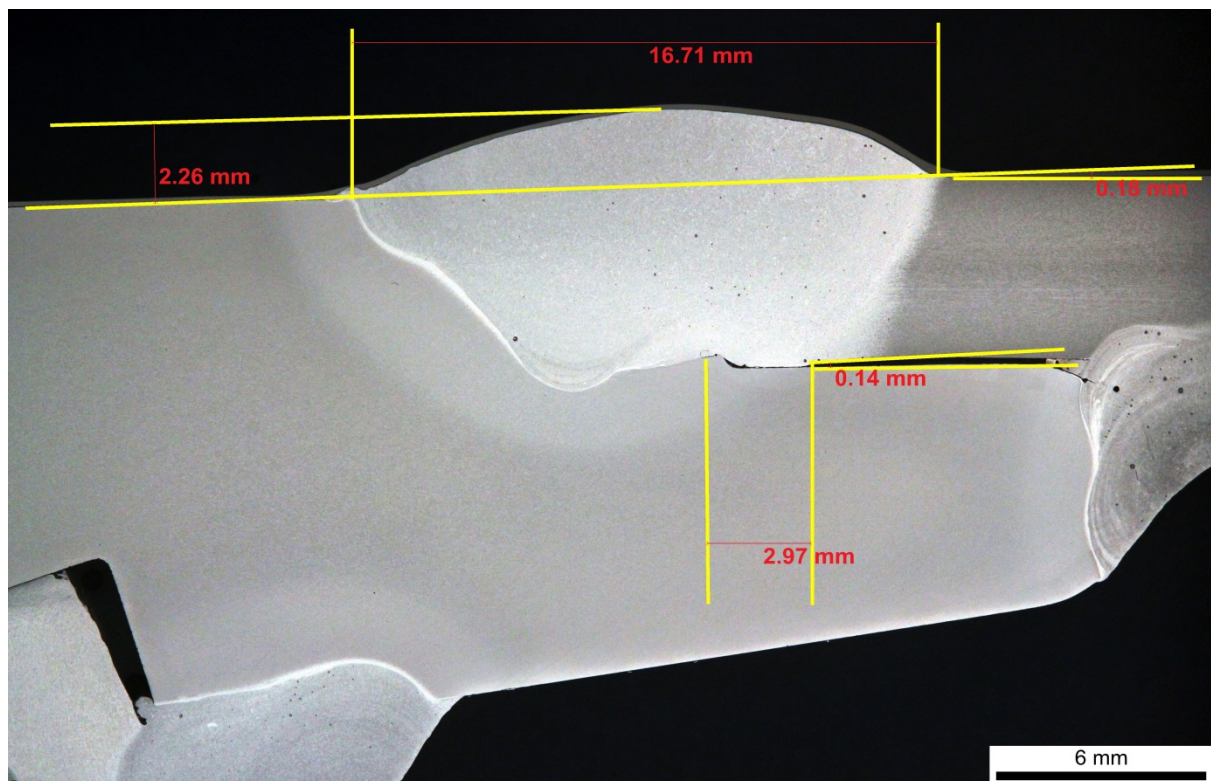


Figure I56 J3564 sample W05-06, slice 2, right hand side of Figure I54. No significant crack-like defect present.

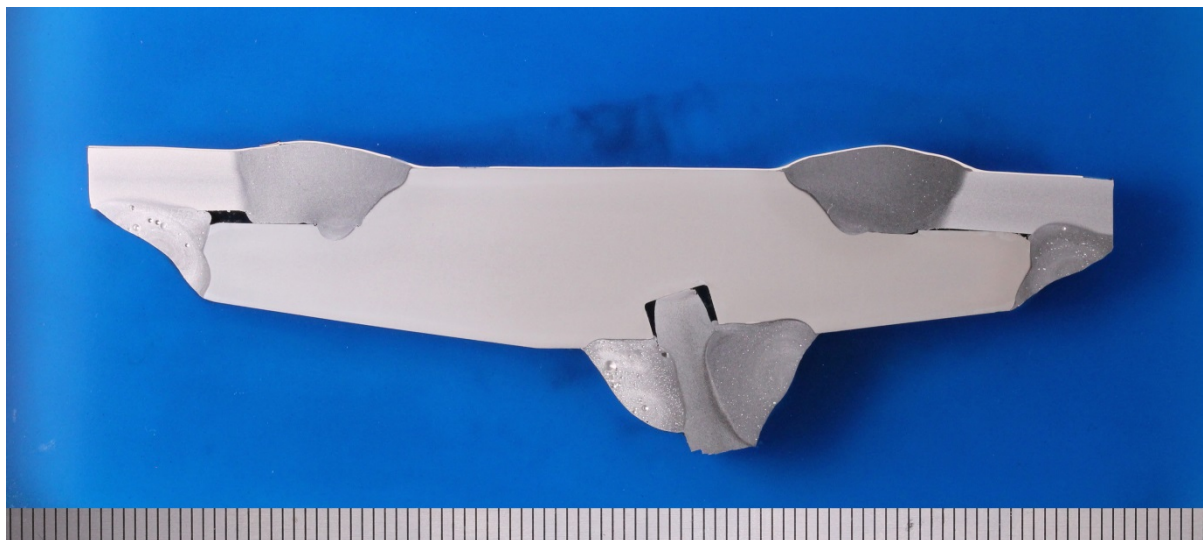


Figure I57 J3564 sample W05-06, slice 3.

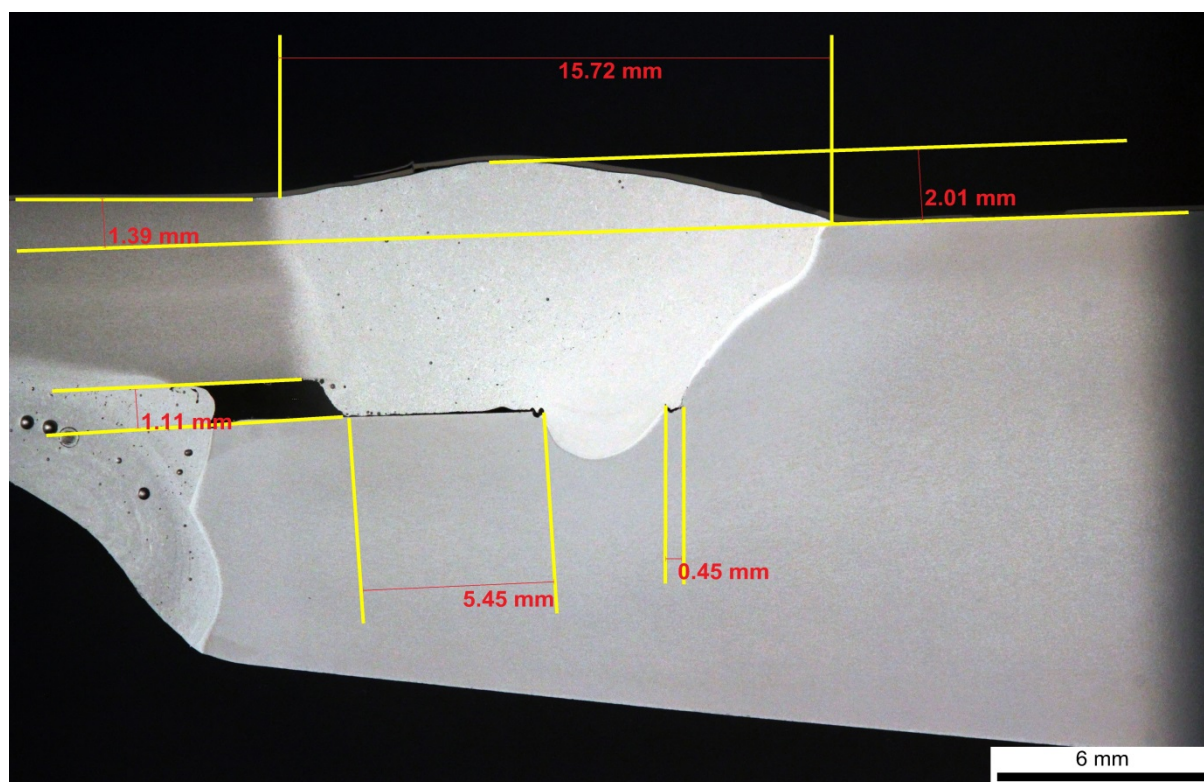


Figure I58 J3564 sample W05-06, slice 3, left hand side of Figure I57. Small embedded defect at the root.

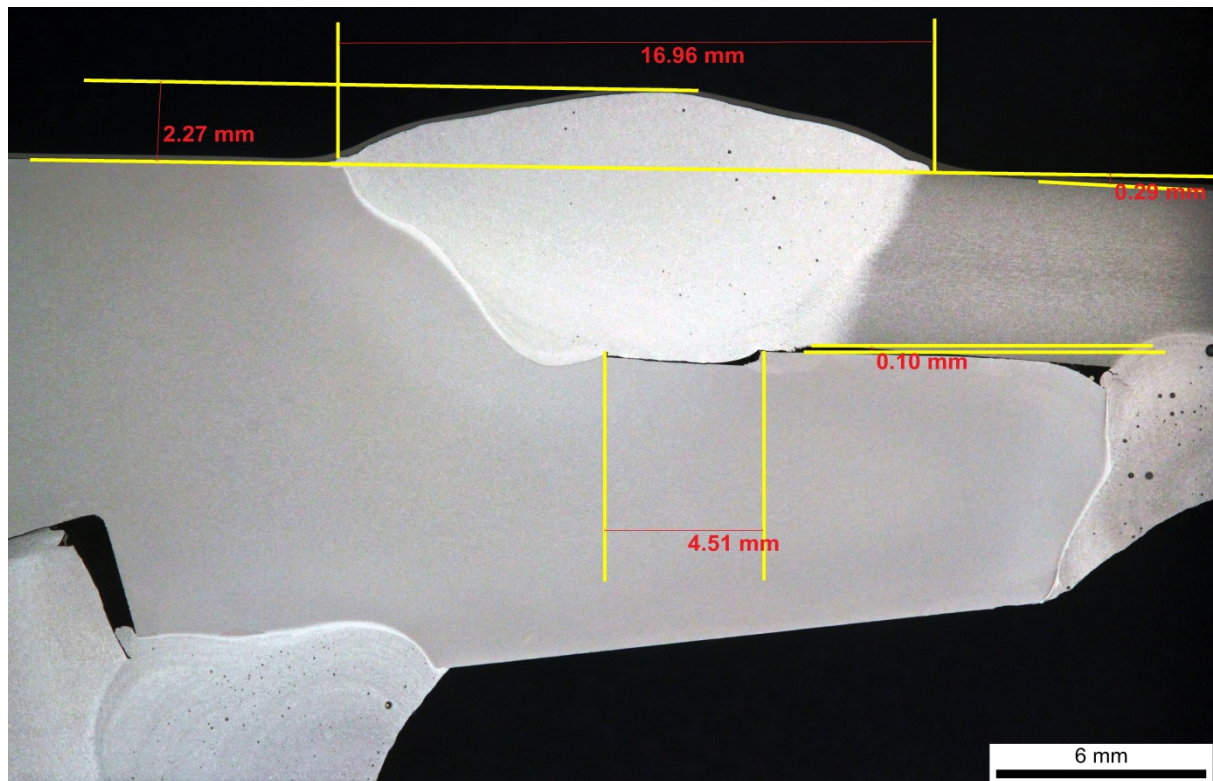


Figure I59 J3564 sample W05-06, slice 3, right hand side of Figure I57. No significant crack-like defect present.

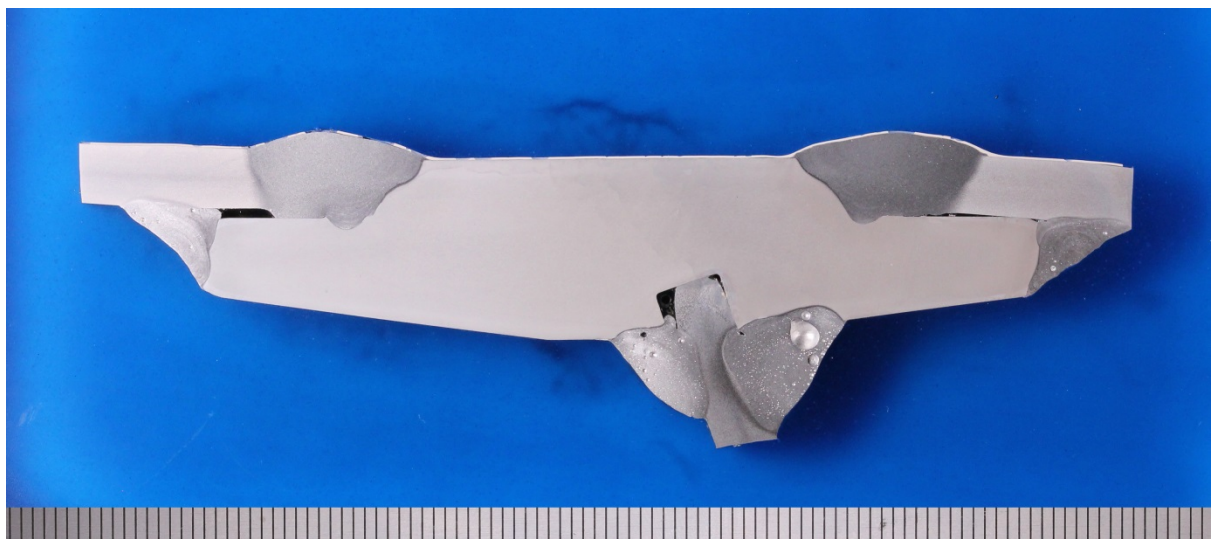


Figure I60 J3564 sample W05-06, slice 4.

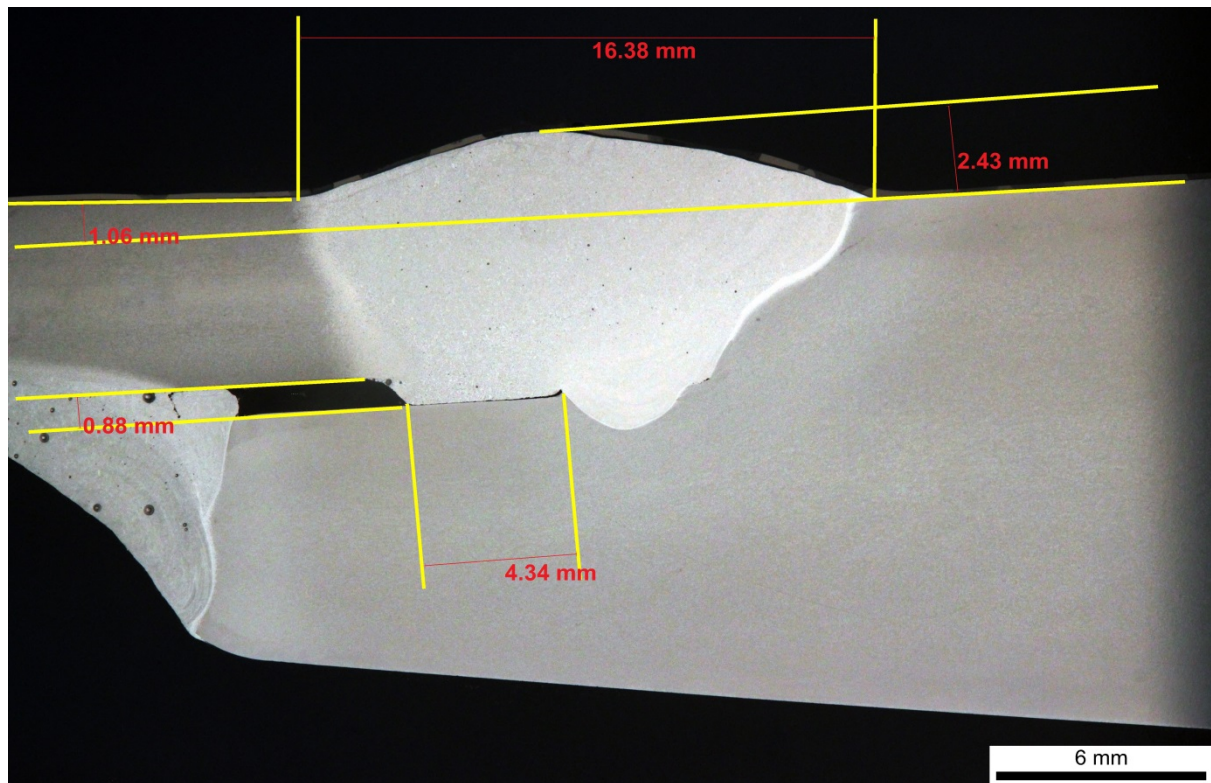


Figure I61 J3564 sample W05-06, slice 4, left hand side of Figure I60. Porosity and a small crack-like defect in the internal fillet weld.

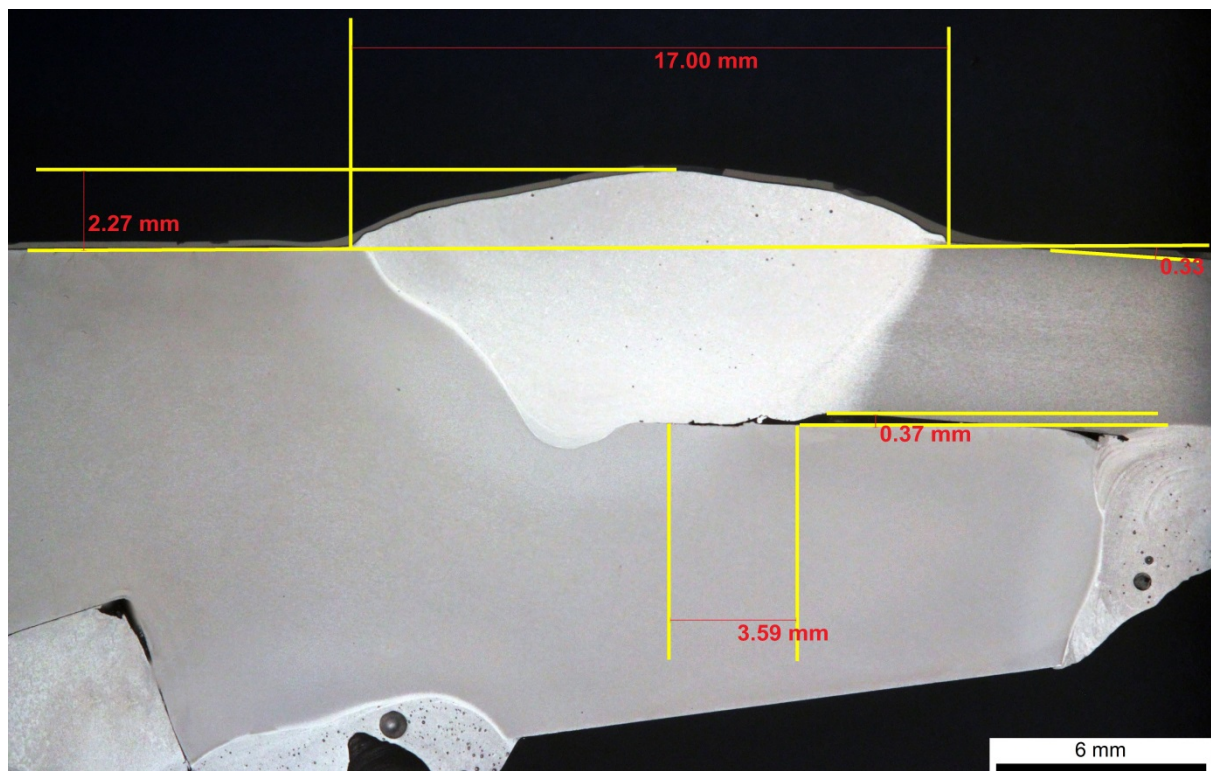


Figure I62 J3564 sample W05-06, slice 4, right hand side of Figure I60. Significant gas pore in the fillet weld between bulkhead and extrusion band.

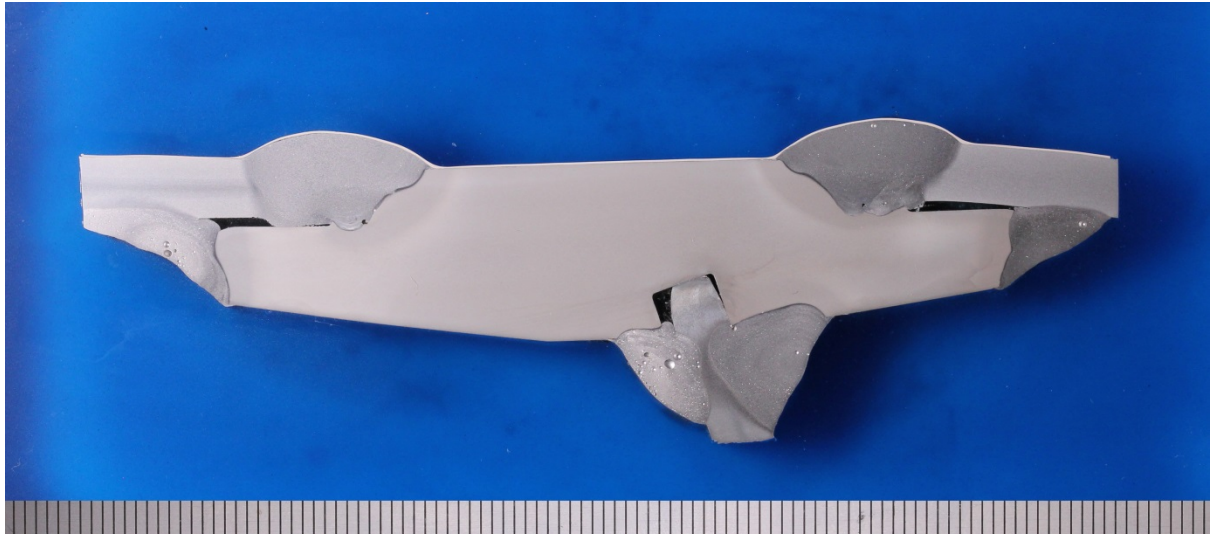


Figure I63 J3564 sample W05-06, slice 5. Evidence of severe bending of tanker shell in fit up.

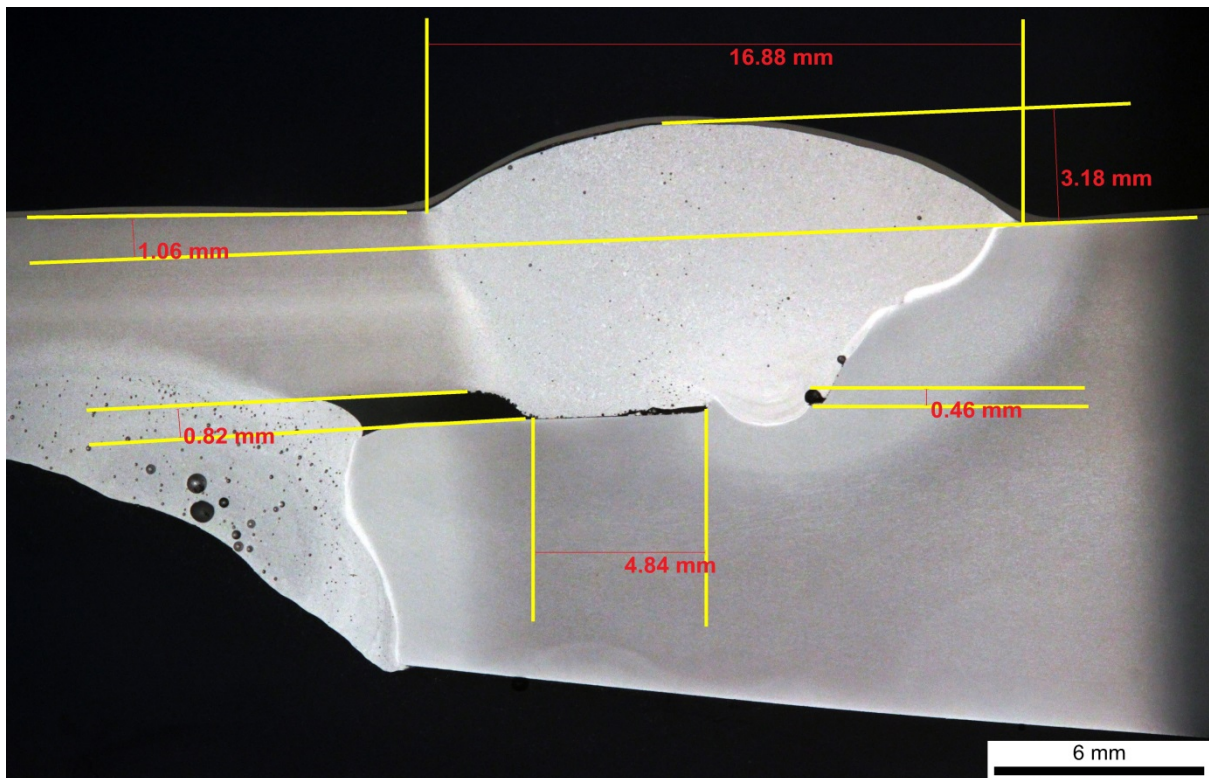


Figure I64 J3564 sample W05-06, slice 5, left hand side of Figure I63. Volumetric defect at root of weld. Significant straining of shell plate material (bending).

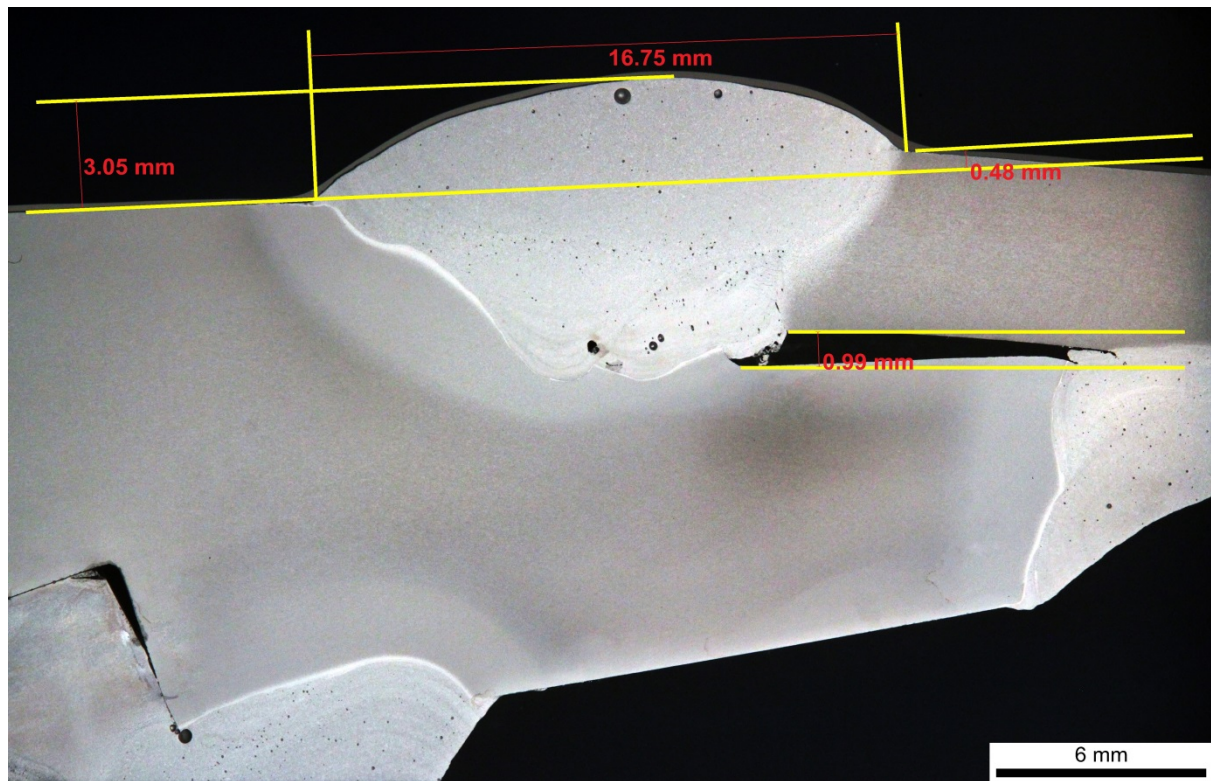


Figure I65 J3564 sample W05-06, slice 5, right hand side of Figure I63. Small lack of fusion defect at root of internal fillet weld. Scattered porosity. Significant bending of tanker shell.

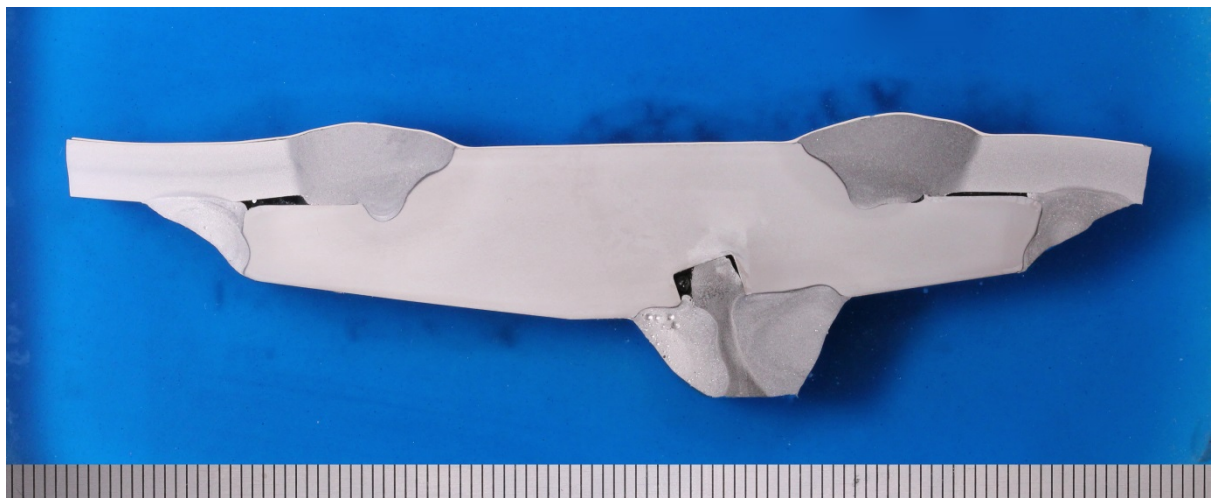


Figure I66 J3564 sample W05-06, slice 6. Evidence of severe bending of shell in fit up.

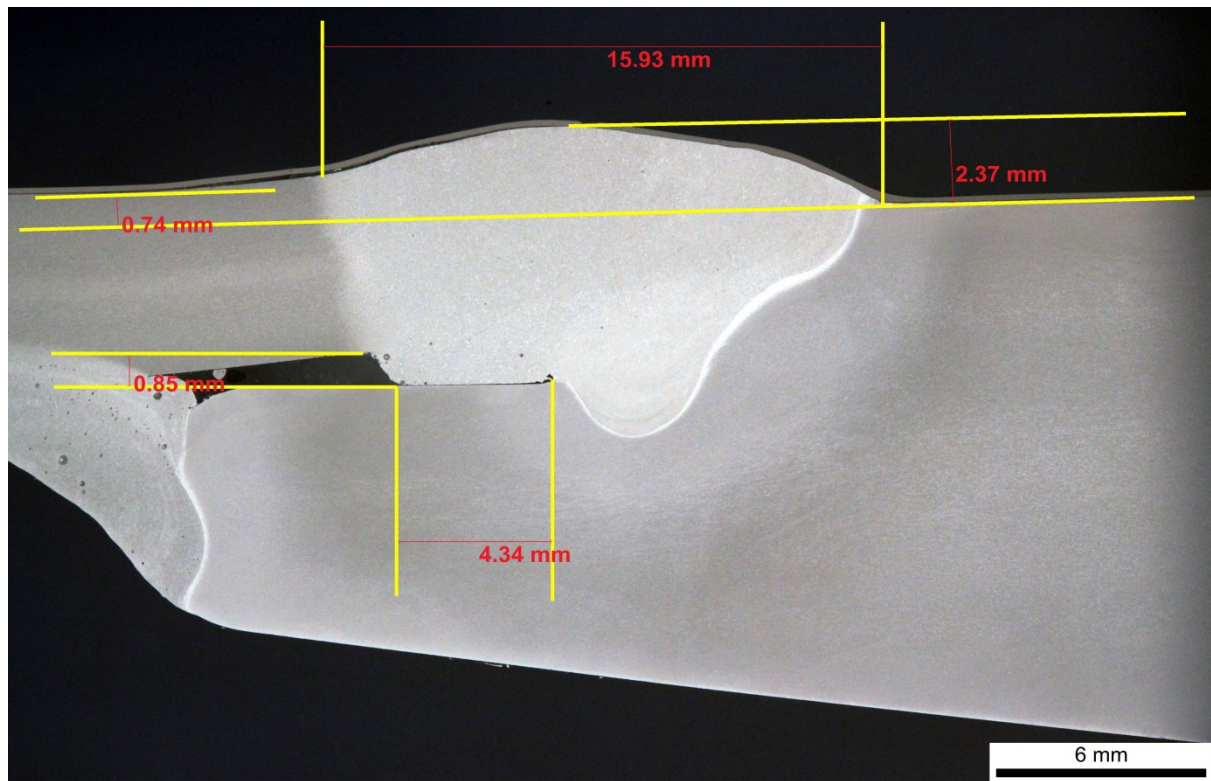


Figure I67 J3564 sample W05-06, slice 6, left hand side of Figure I66. No significant crack-like defect present.

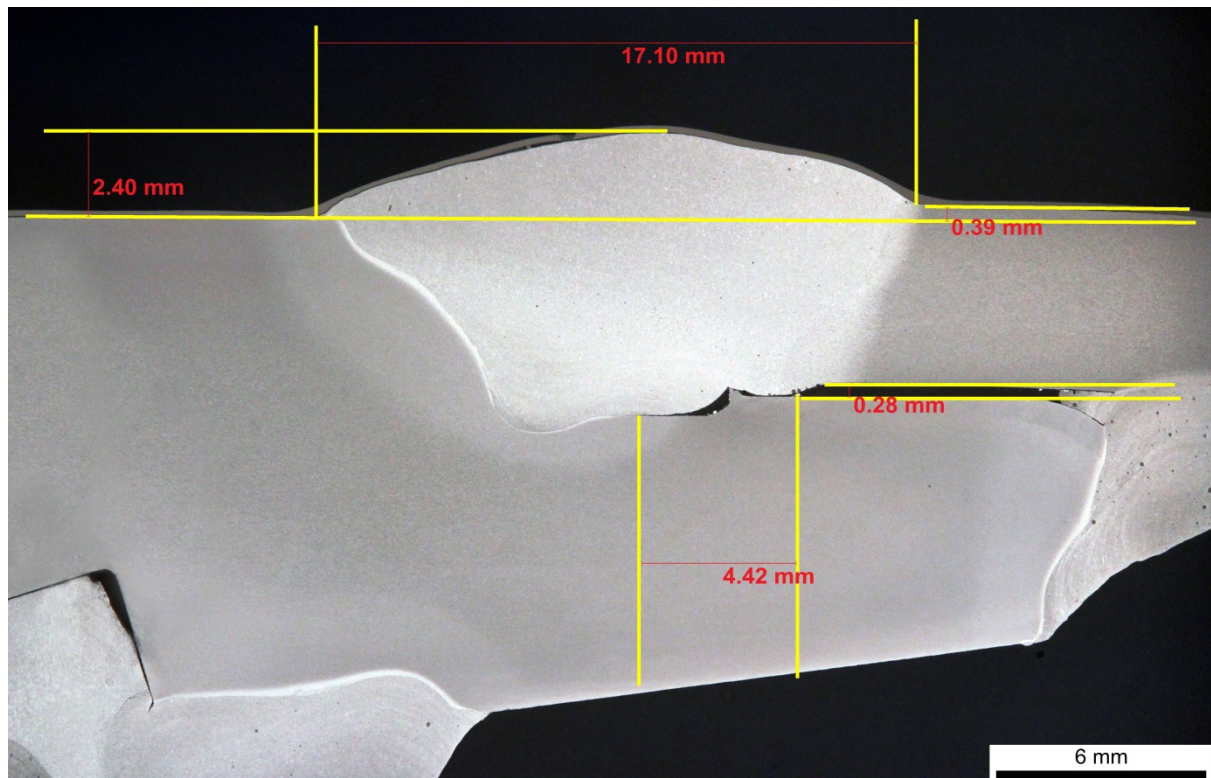


Figure I68 J3564 sample W05-06, slice 6, right hand side of Figure I66. No significant crack-like defect present.

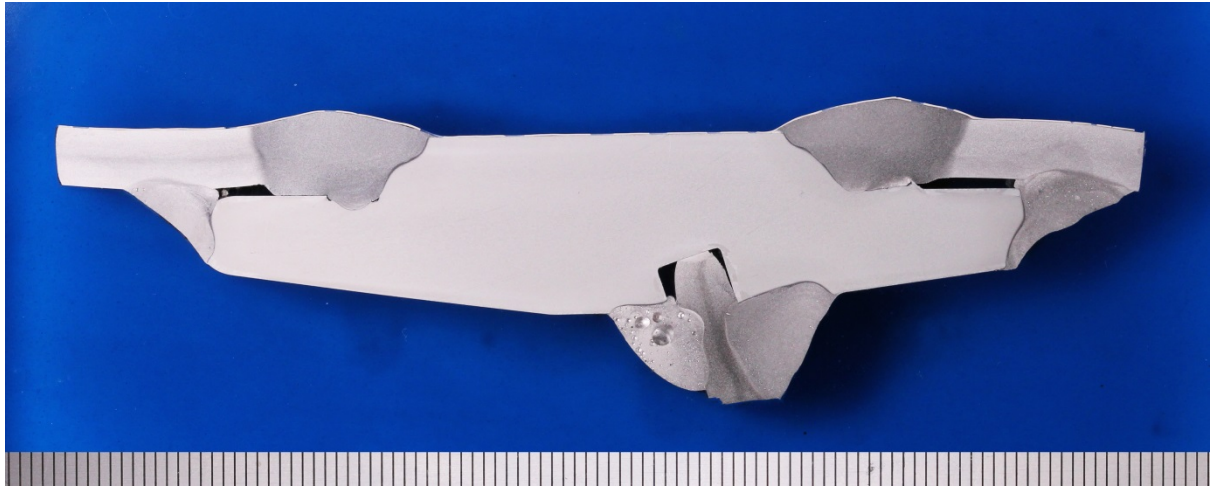


Figure I69 J3564 sample W05-06, slice 7.

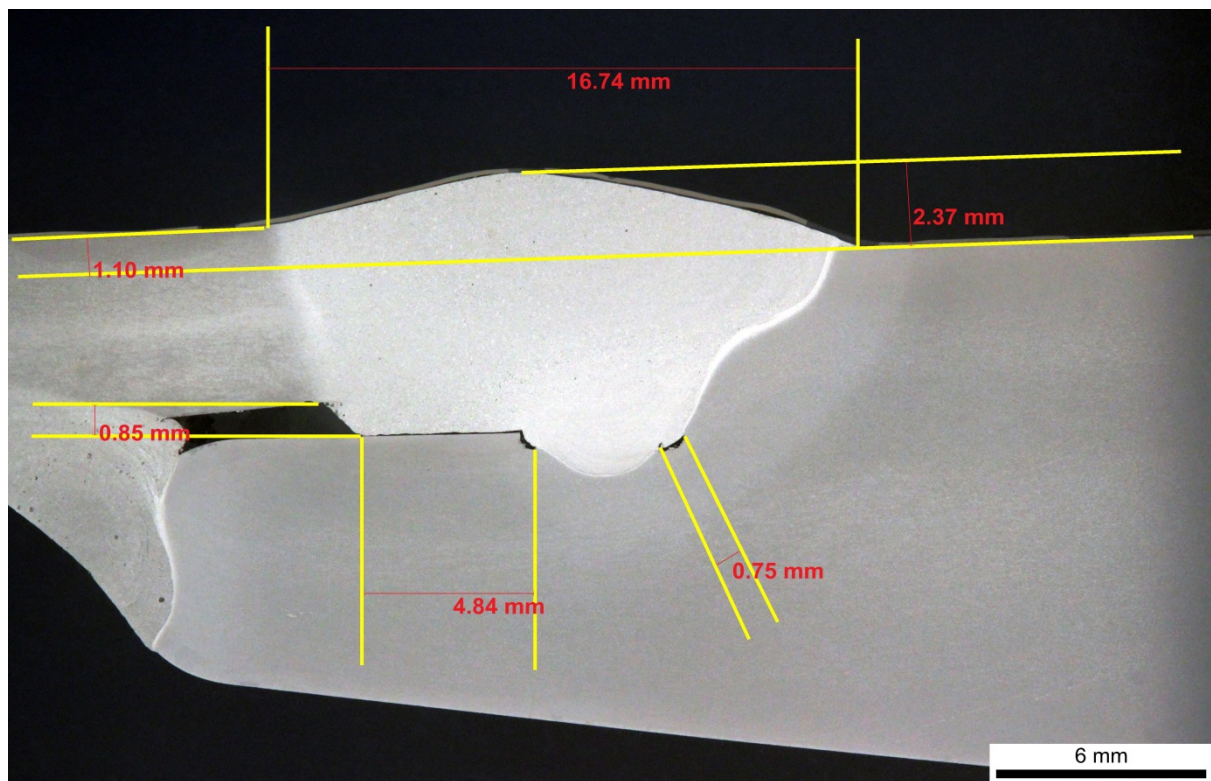


Figure I70 J3564 sample W05-06, slice 7, left hand side of Figure I69. Small lack of side wall fusion at root.

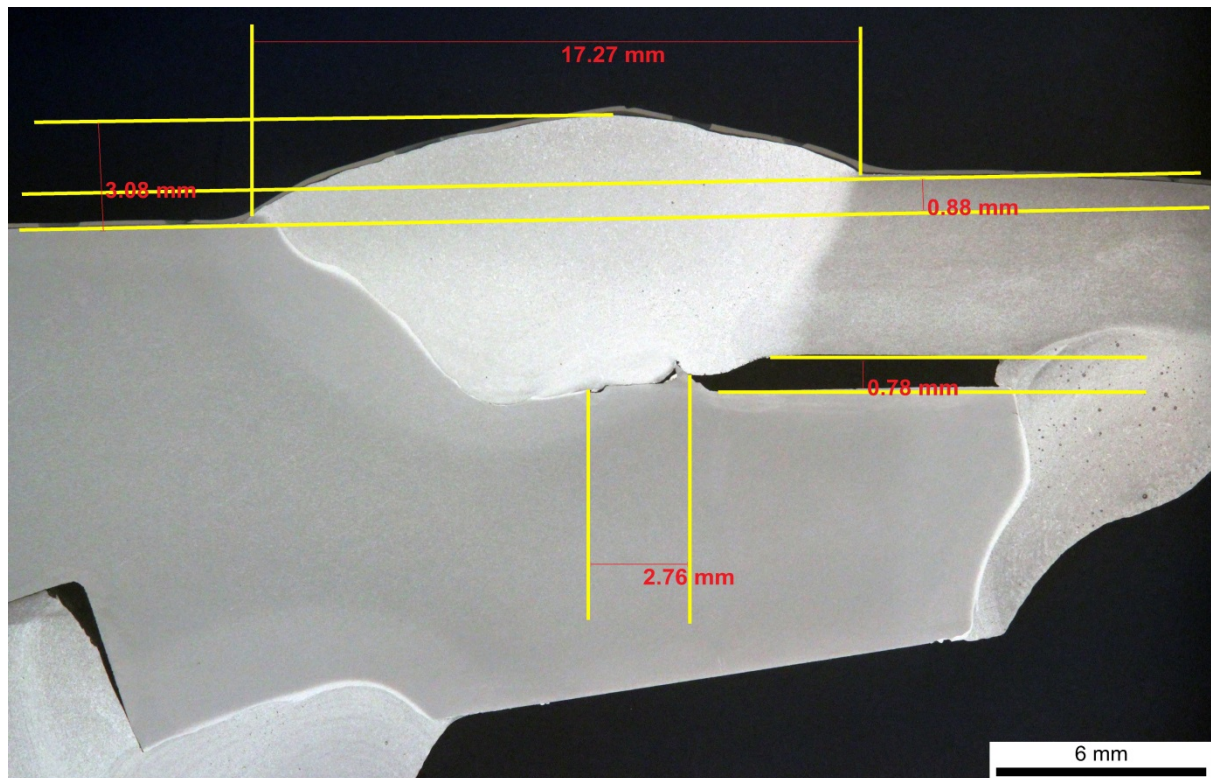


Figure I71 J3564 sample W05-06, slice 7, right hand side of Figure I69. No significant crack-like defect present.

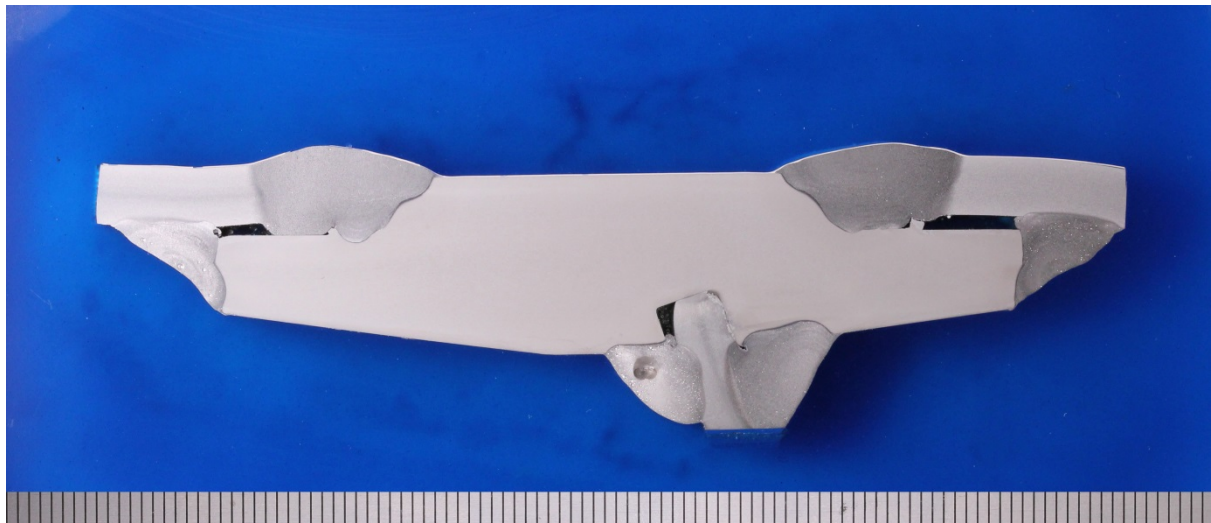


Figure I72 J3564 sample W05-06, slice 8.

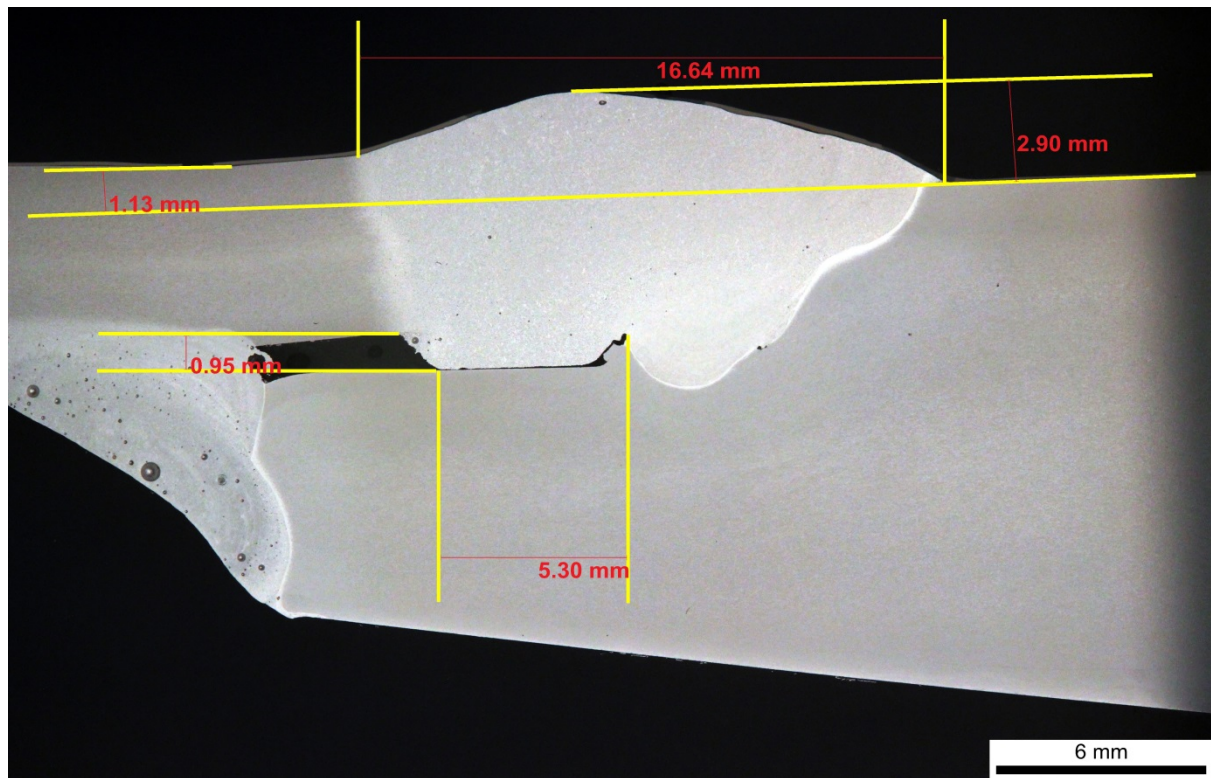


Figure I73 J3564 sample W05-06, slice 8, left hand side of figure I72. Lack of fusion evident.

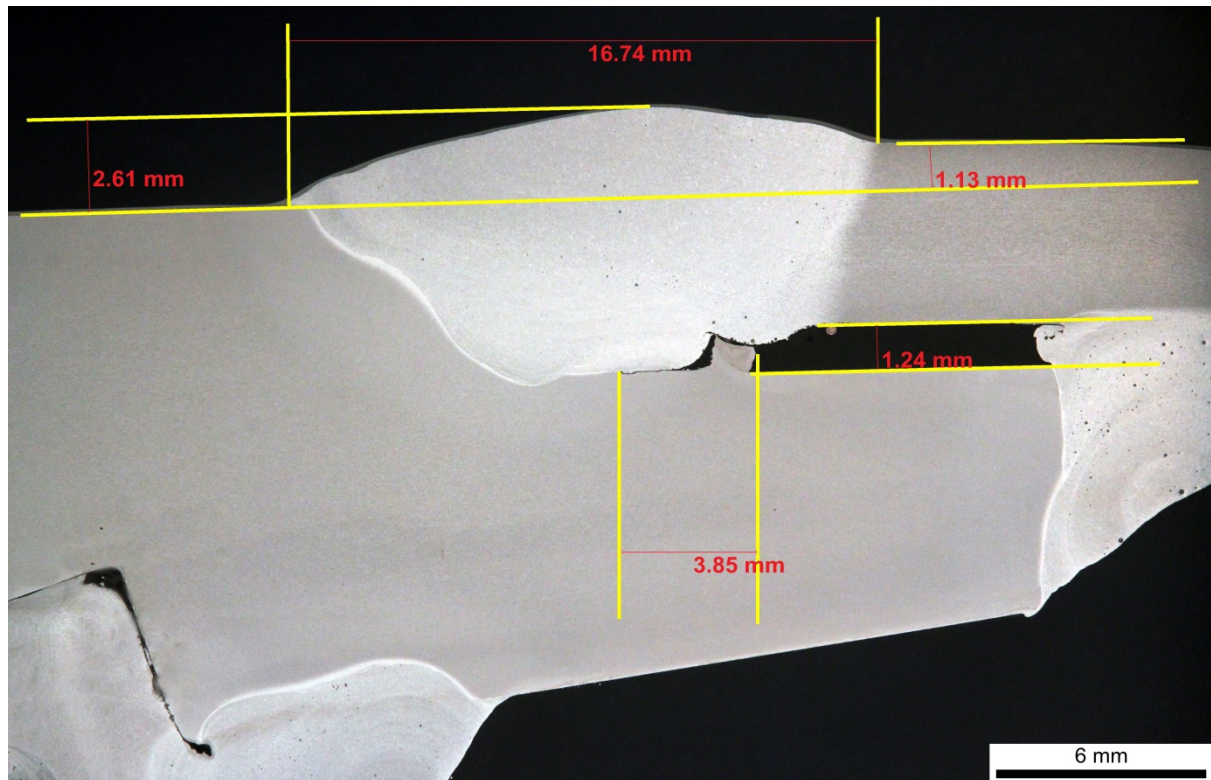


Figure I74 J3564 sample W05-06, slice 8, right hand side of Figure I72. Positioner lip has not been fused or properly removed.

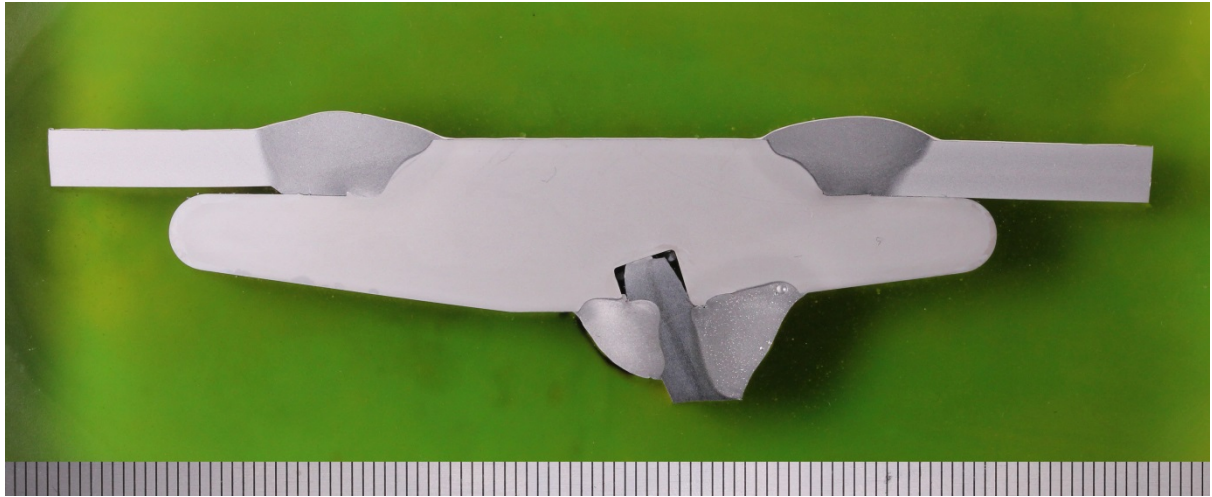


Figure I75 J3564 sample W07-08, slice 1.

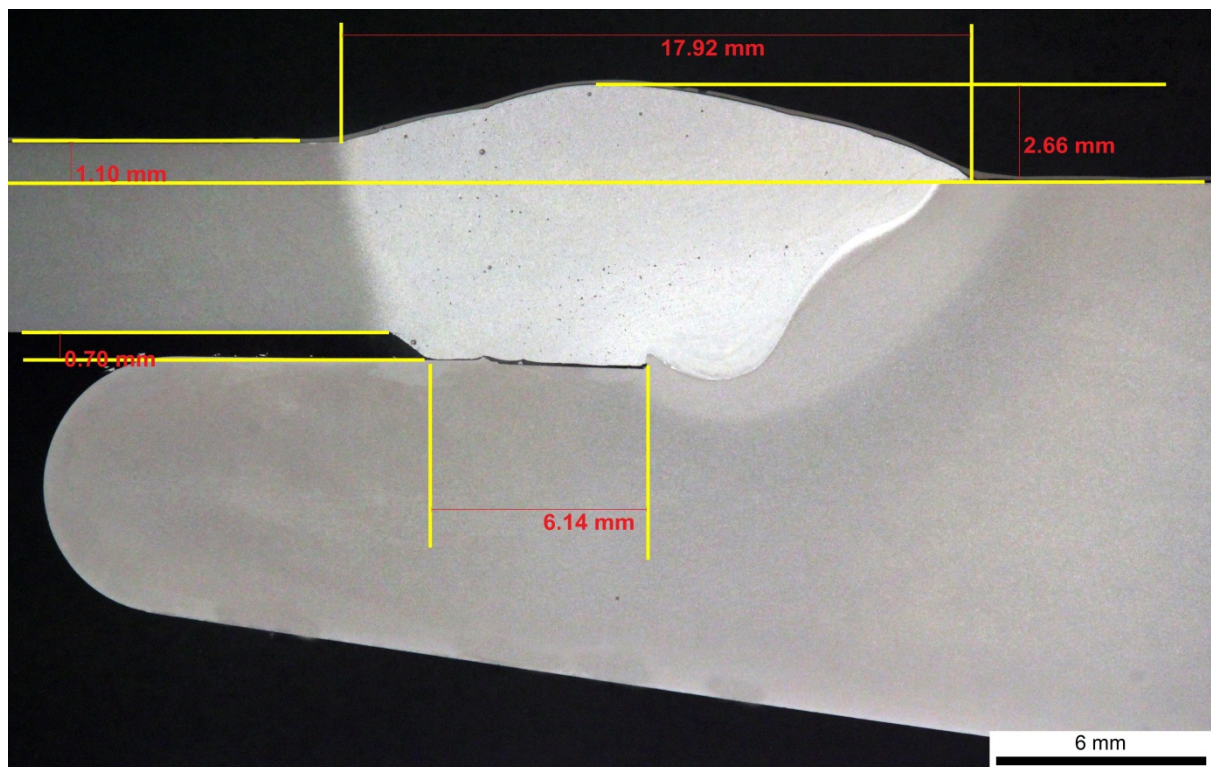


Figure I76 J3564 sample W07-08, slice 1, left hand side of Figure I75. No crack-like defect present.

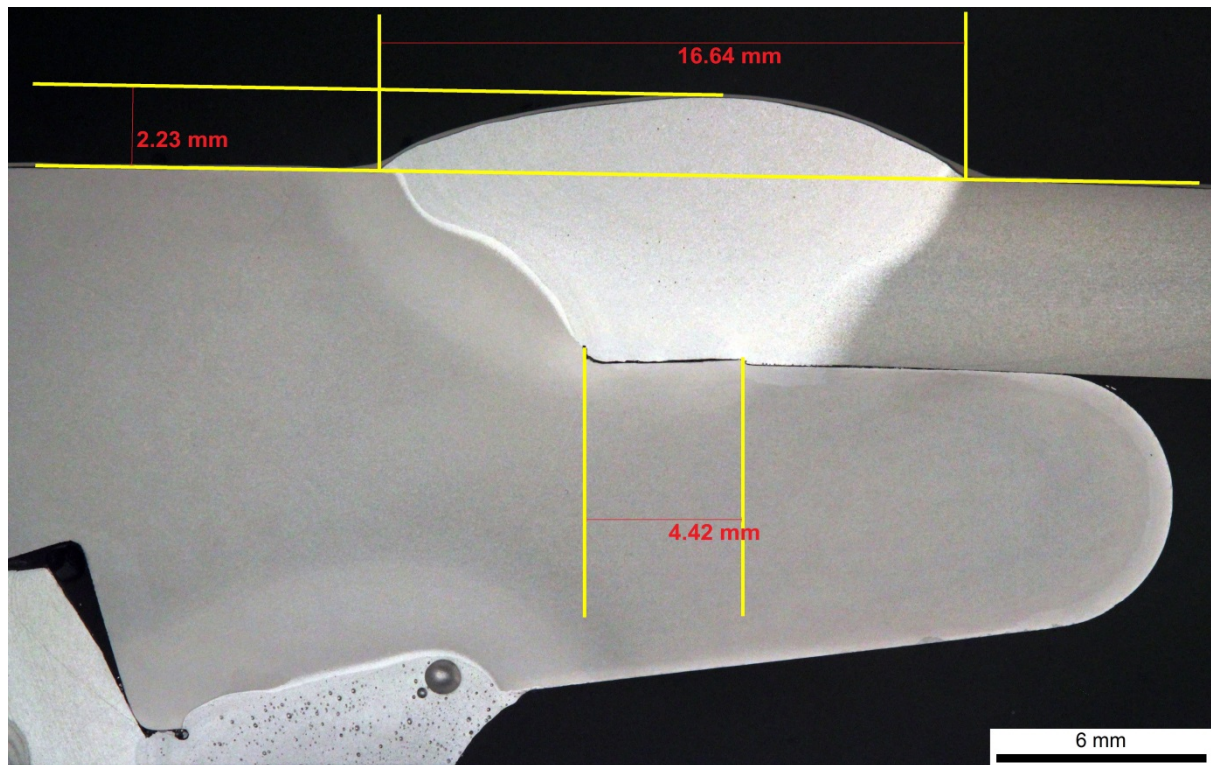


Figure I77 J3564 sample W07-08, slice 1, right hand side of Figure I75. No crack-like defect present.

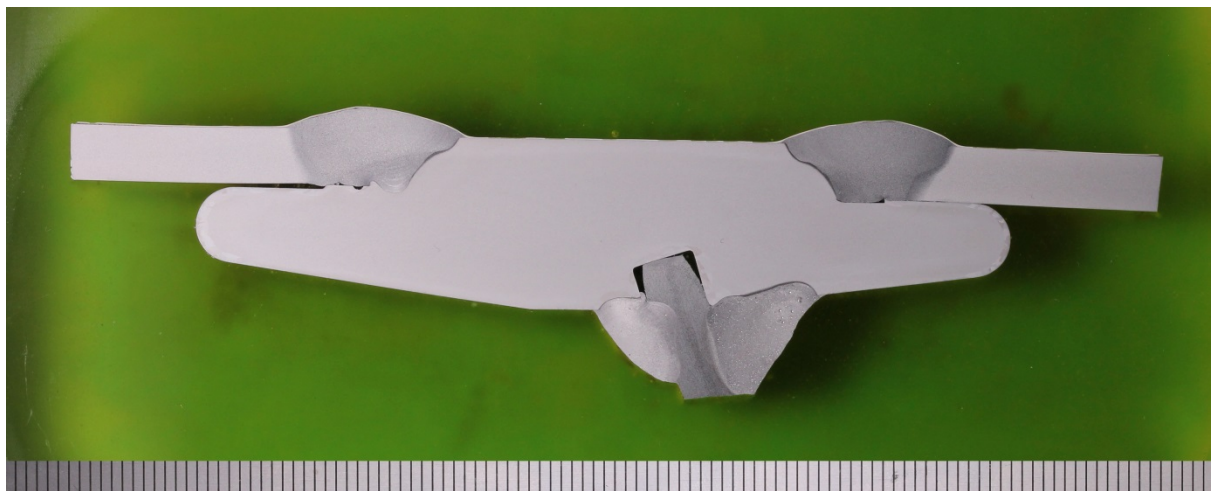


Figure I78 J3564 sample W07-08, slice 2.

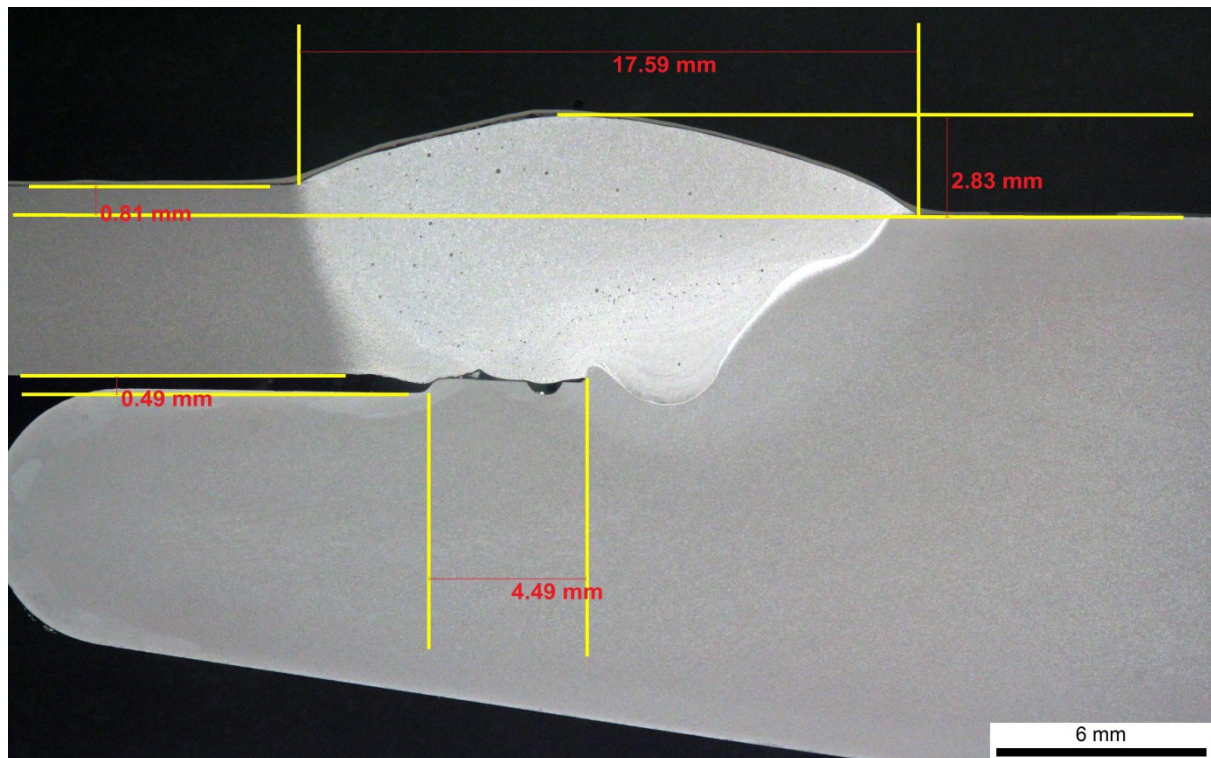


Figure I79 J3564 sample W07-08, slice 2, left hand side of Figure I78. No crack-like defect present.

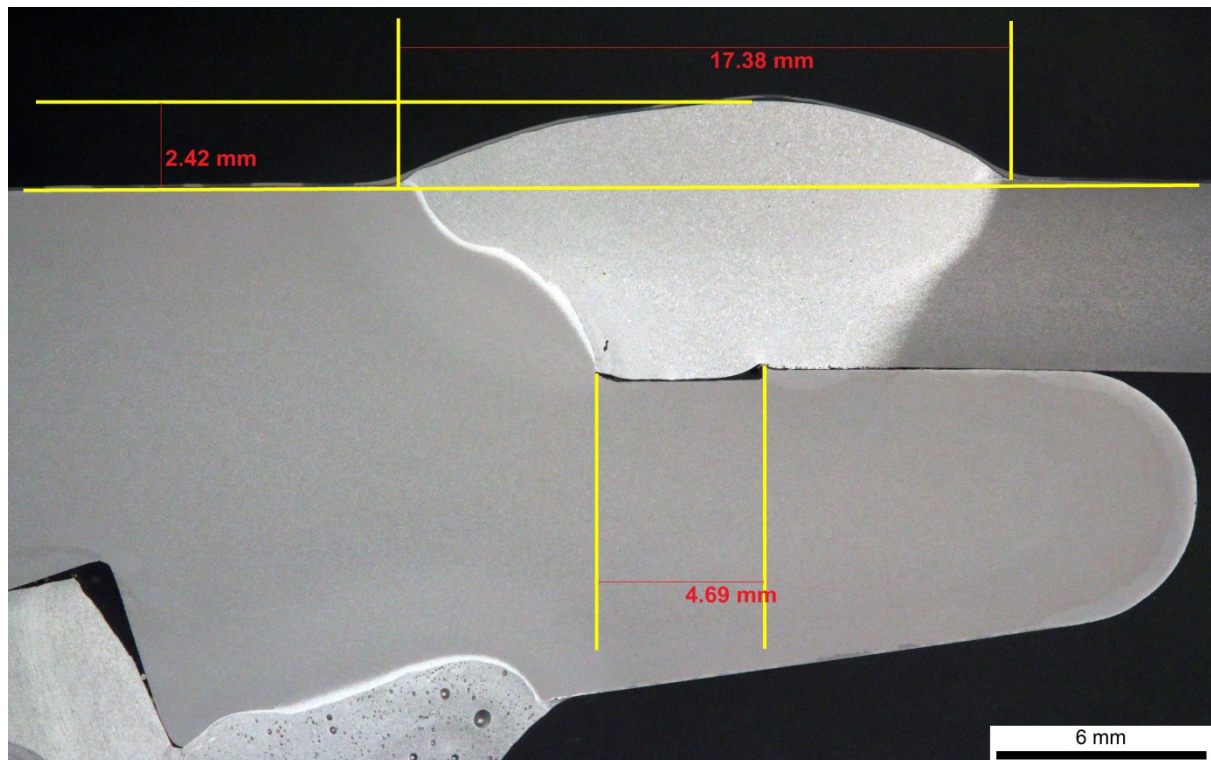


Figure I80 J3564 sample W07-08, slice 2, right hand side of Figure I78. Small crack-like defect observed at root (measurement not available).

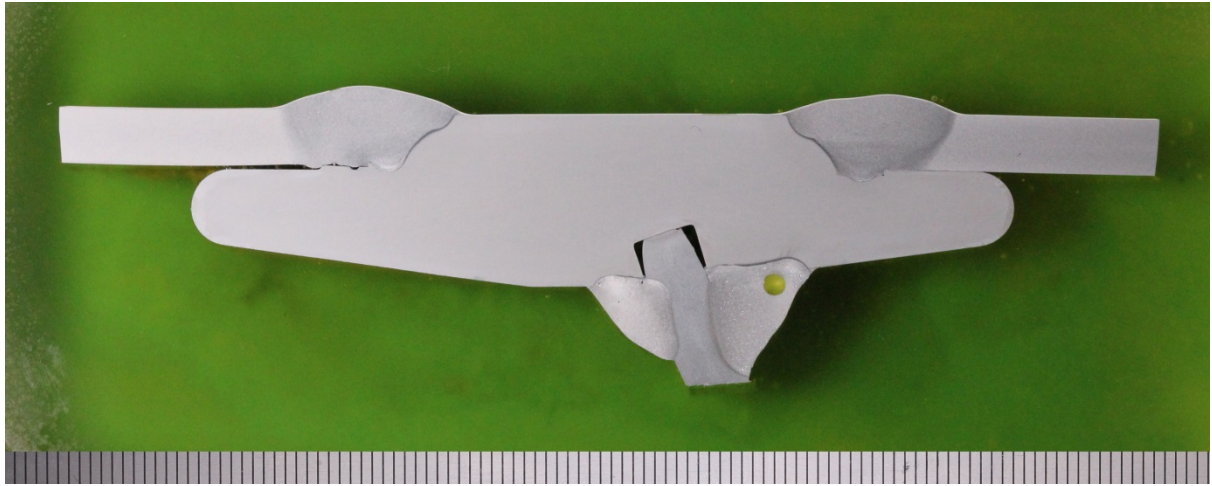


Figure I81 J3564 sample W07-08, slice 3.

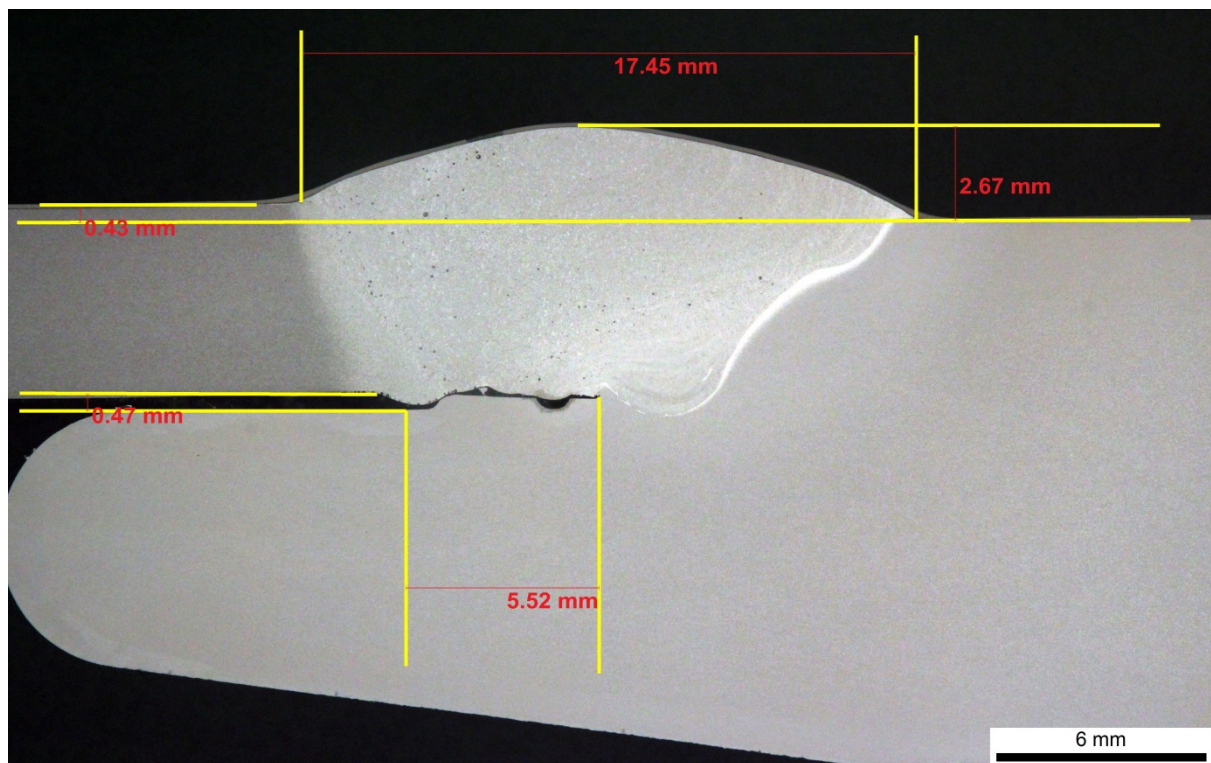


Figure I82 J3564 sample W07-08, slice 3, left hand side of Figure I81. No crack-like defect present.

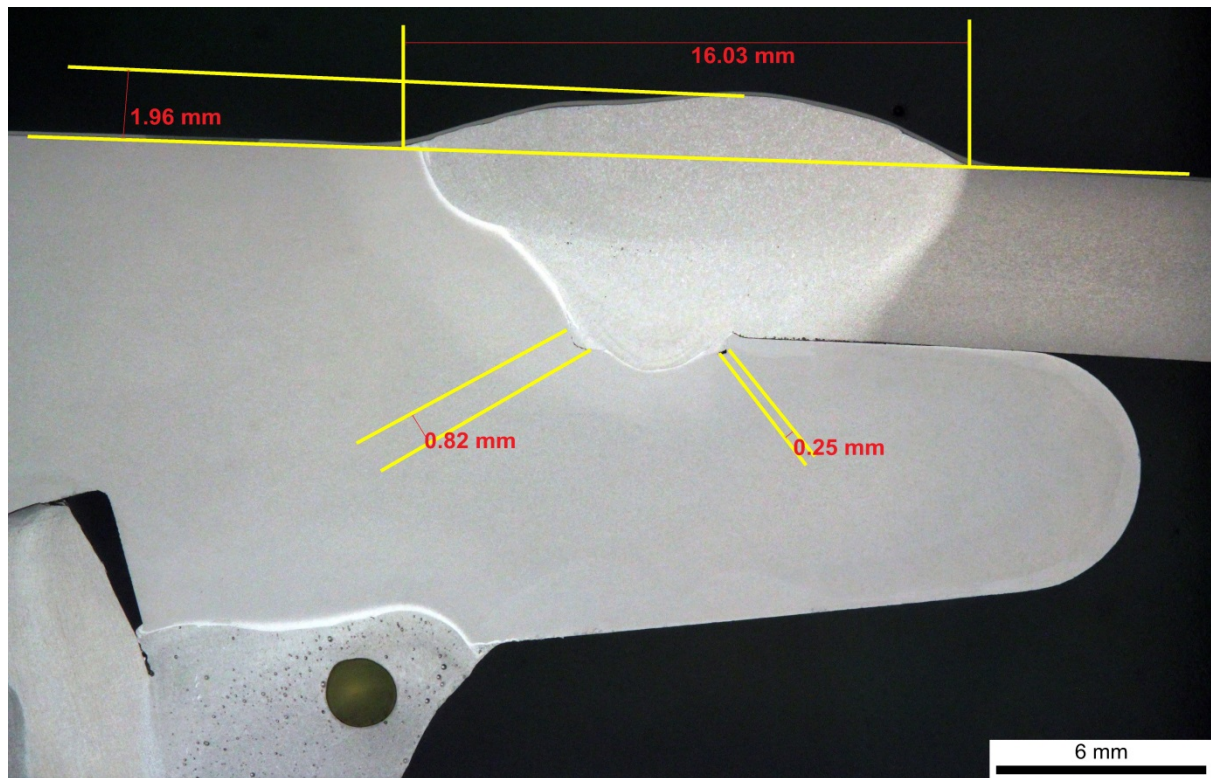


Figure I83 J3564 sample W07-08, slice 3, right hand side of Figure I81. Lack of side wall fusion defects present at weld root, but small height. Large gas pore in fillet weld joining bulkhead to extrusion band.

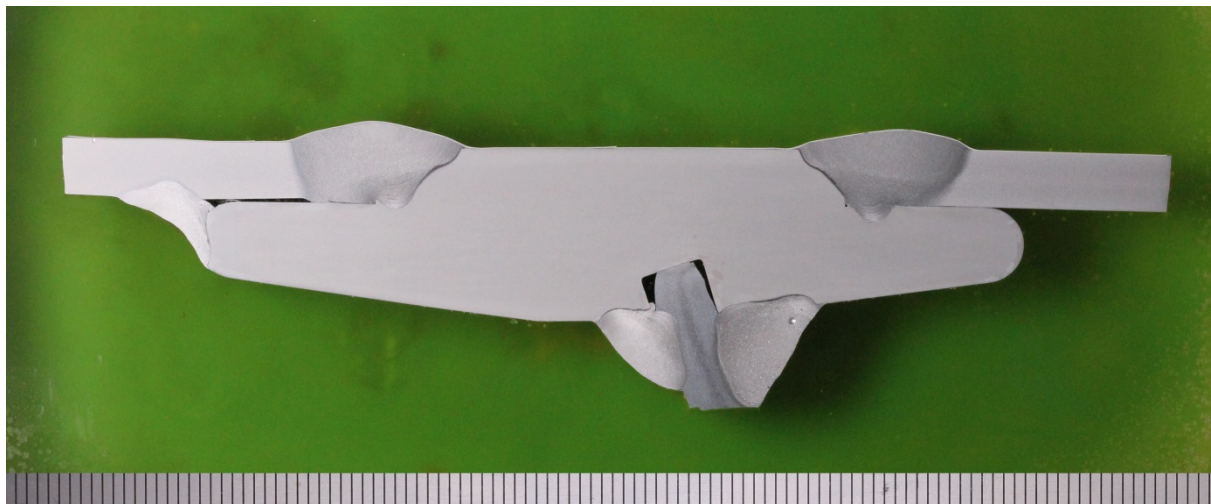


Figure I84 J3564 sample W07-08, slice 4.

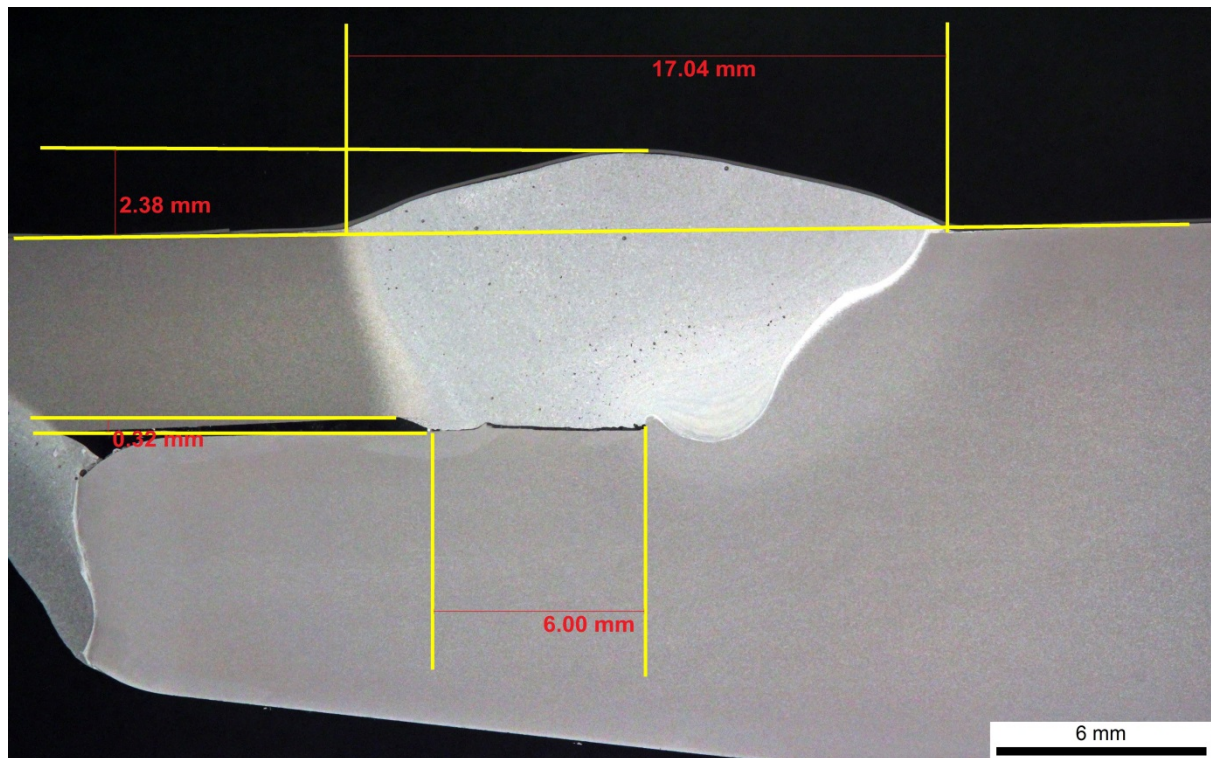


Figure I85 J3564 sample W07-08, slice 4, left hand side of Figure I84. No crack-like defect present in joint.

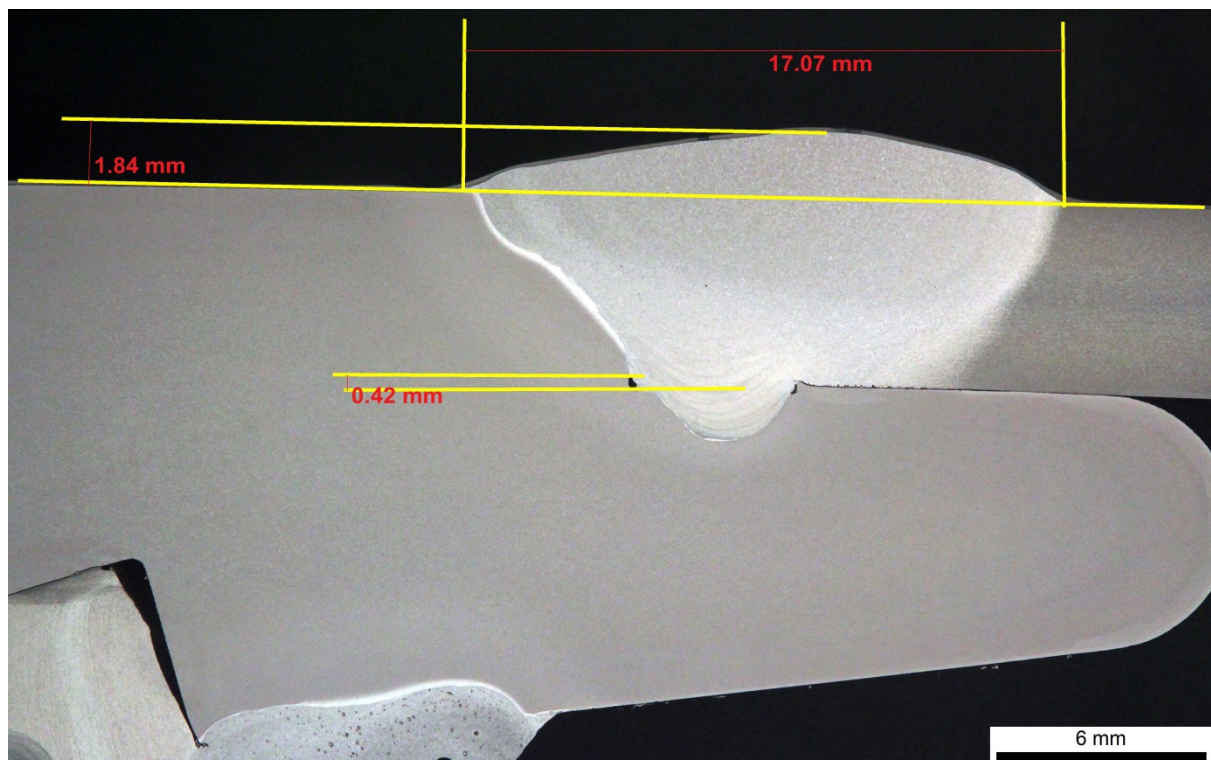


Figure I86 J3564 sample W07-08, slice 4, right hand side of Figure I84. Lack of side wall fusion, volumetric defect at weld root.

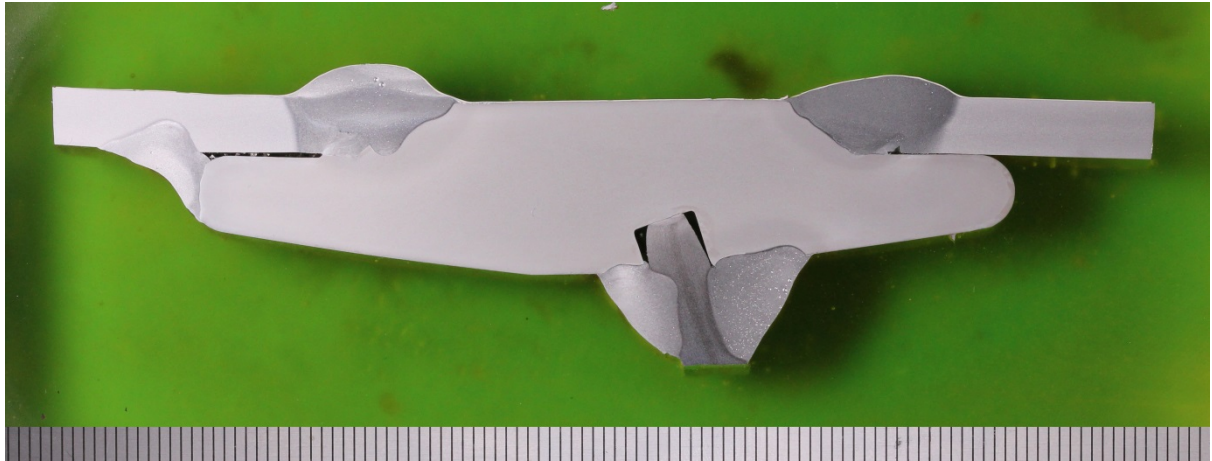


Figure I87 J3564 sample W07-08, slice 5

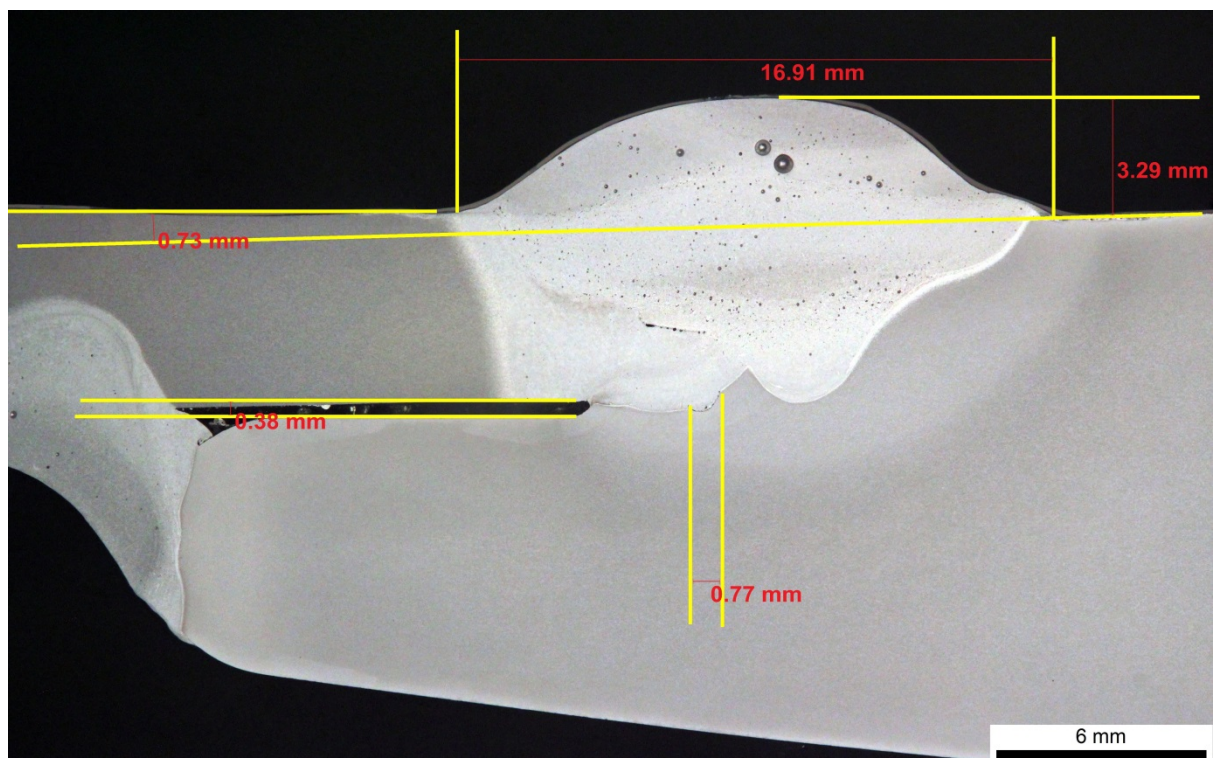


Figure I88 J3564 sample W07-08, slice 5, left hand side of Figure I87. Lack of fusion defect at weld root.

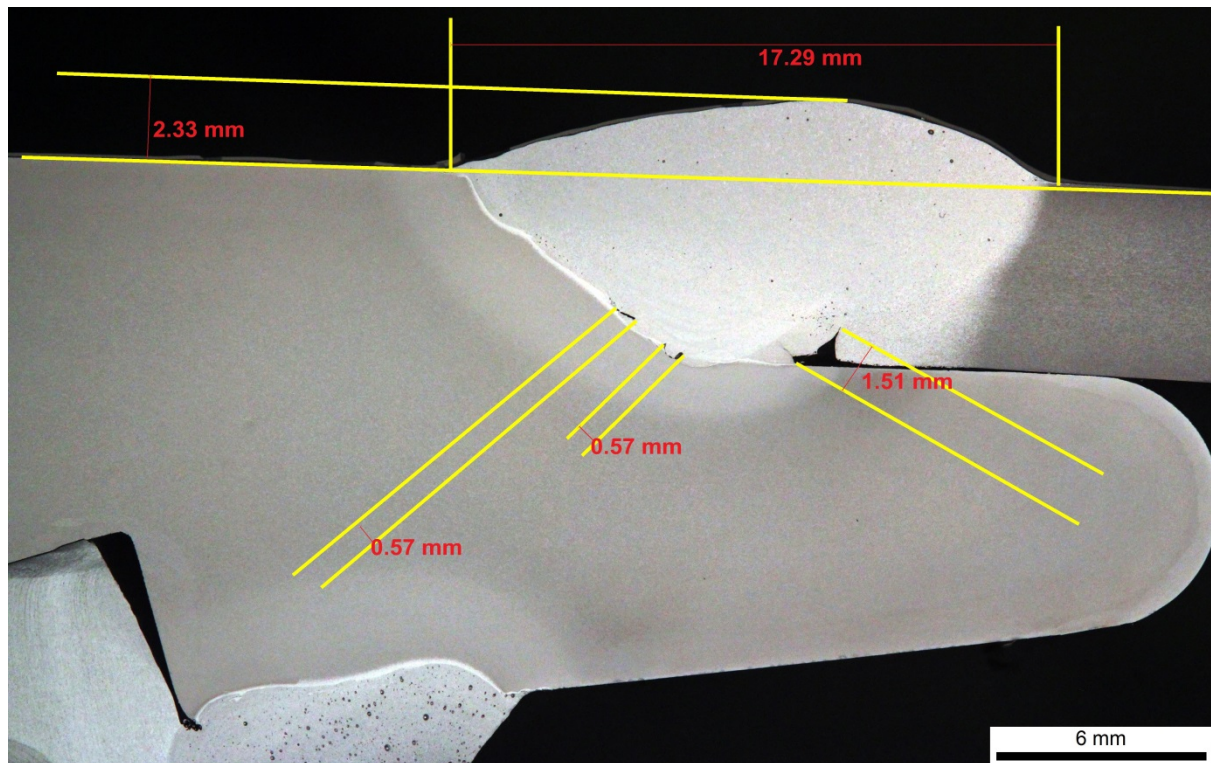


Figure I89 J3564 sample W07-08, slice 5, right hand side of Figure I87. Multiple lack of side wall fusion defects present.

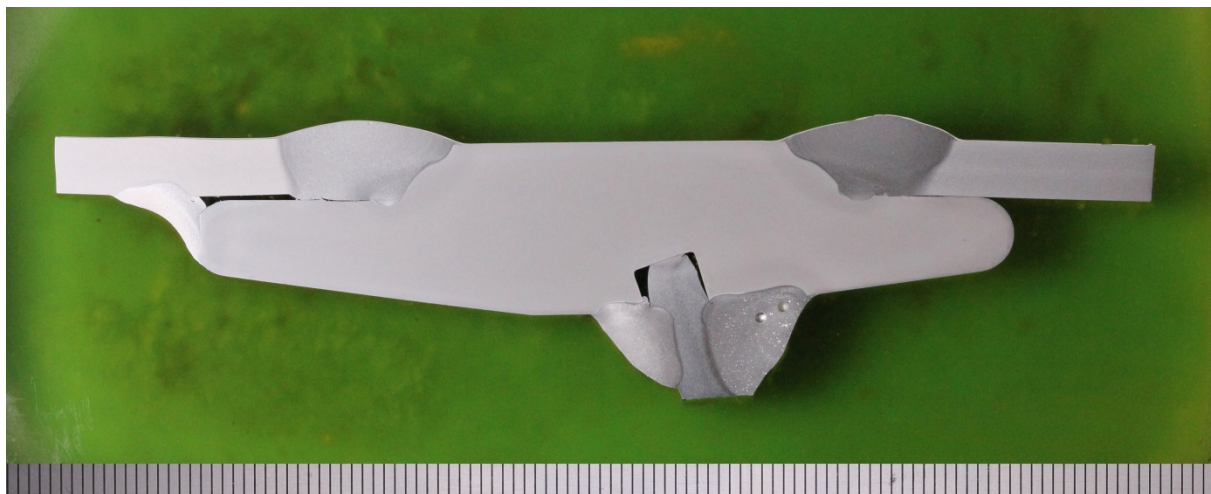


Figure I90 J3564 sample W07-08, slice 6.

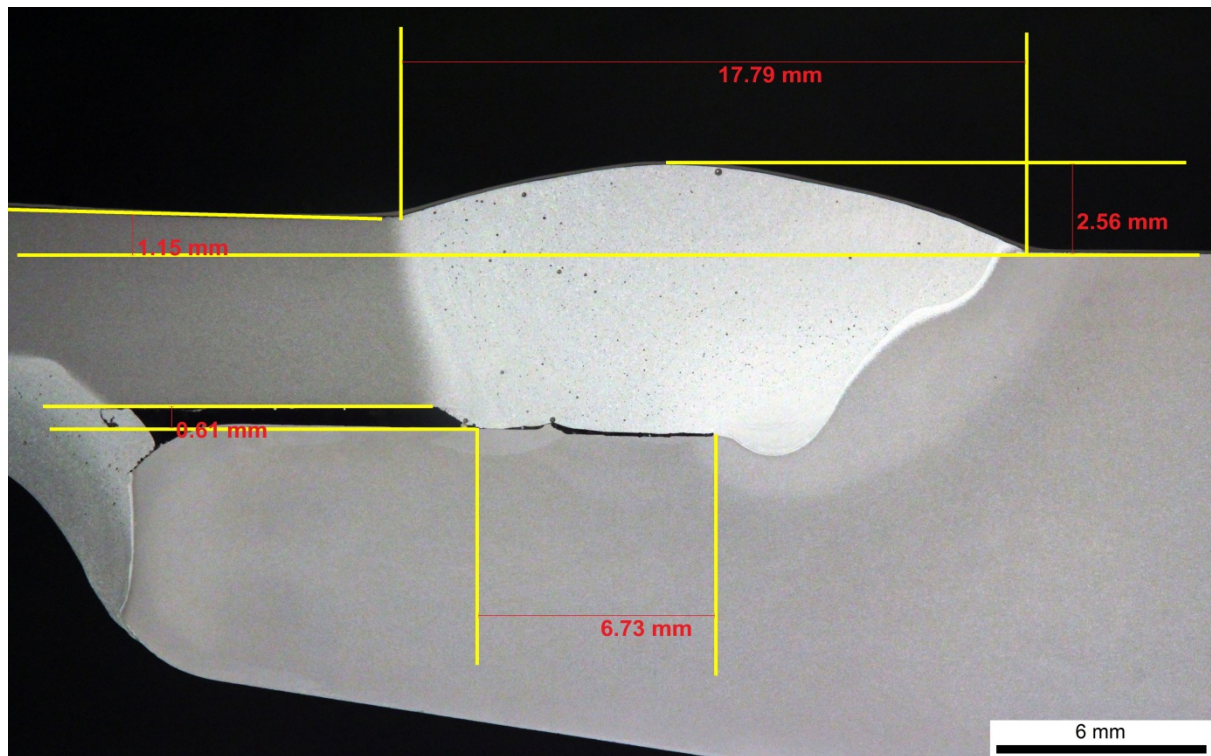


Figure I91 J3564 sample W07-08, slice 6, left hand side of Figure I90. No crack-like defect present.

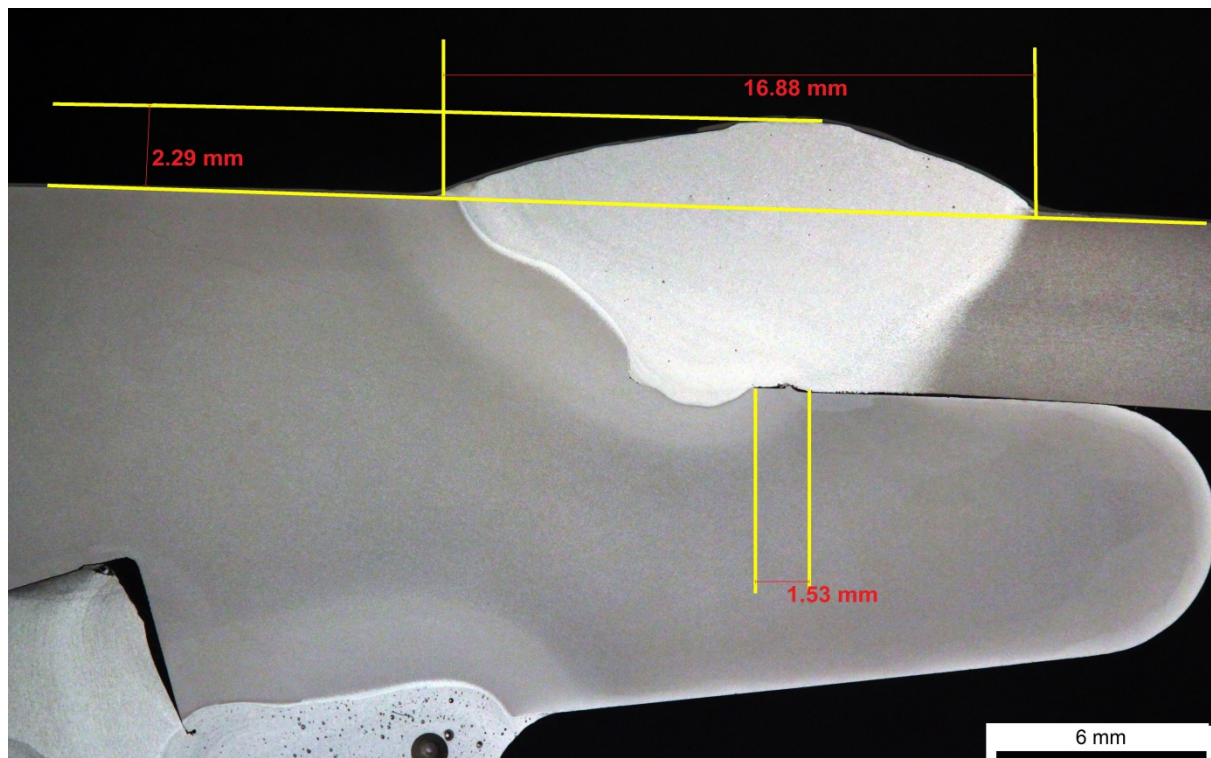


Figure I92 J3564 sample W07-08, slice 6, right hand side of Figure I90. No significant crack-like feature.

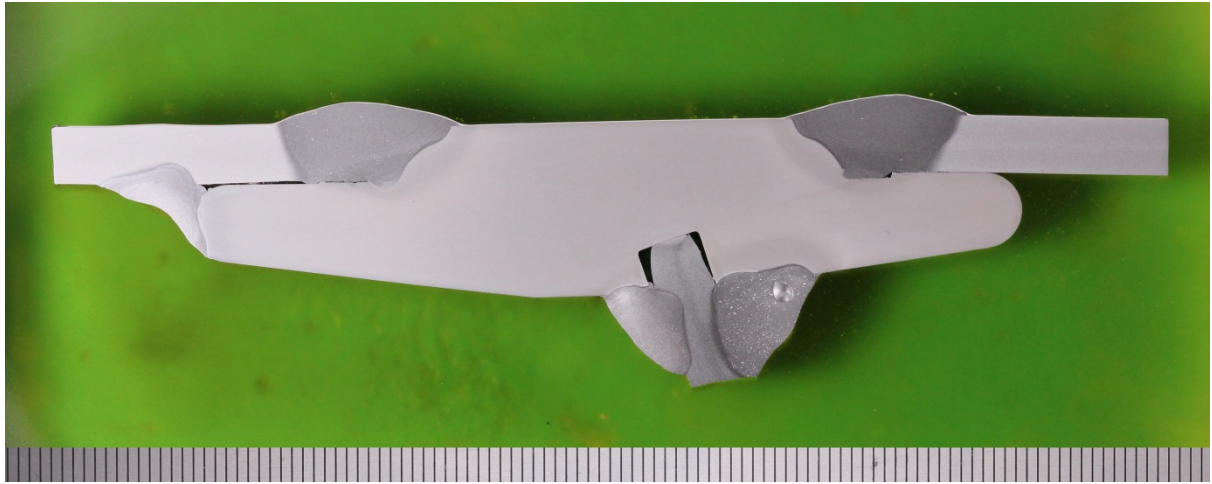


Figure I93 J3564 sample W07-08, slice 7.

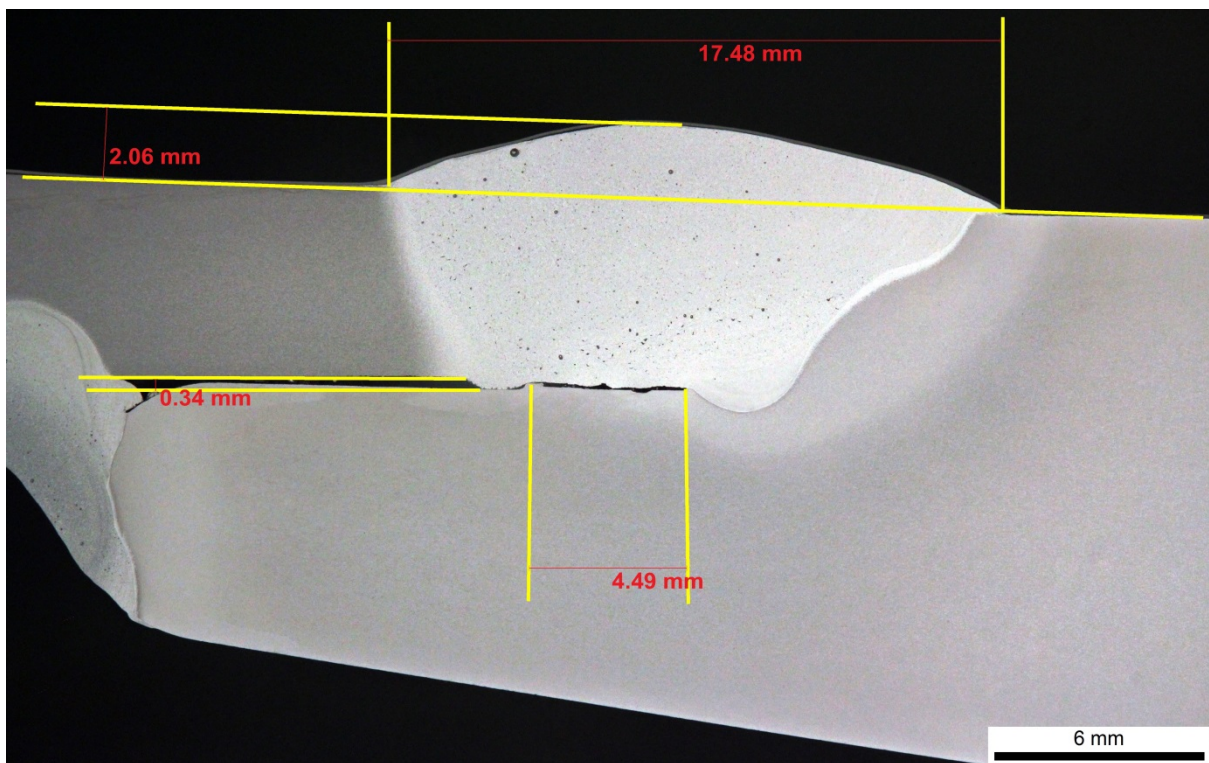


Figure I94 J3564 sample W07-08, slice 7, left hand side of Figure I93. No crack-like defect present.

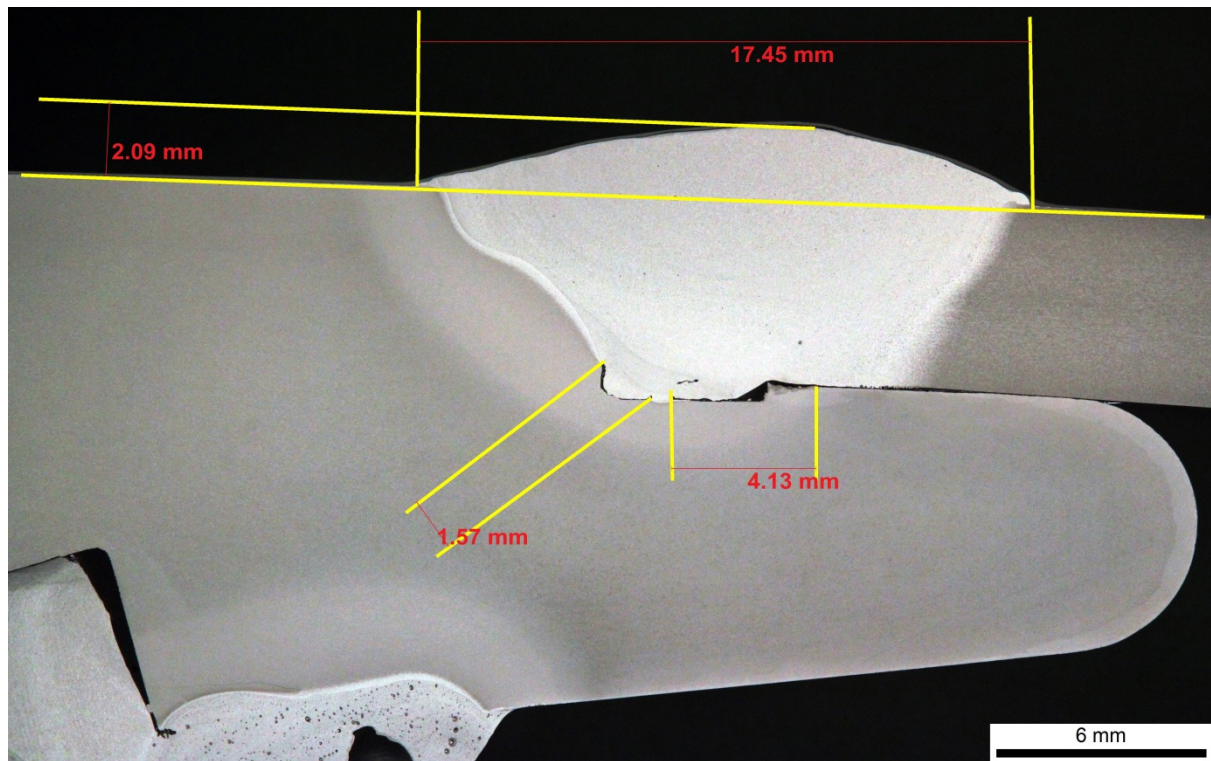


Figure I95 J3564 sample W07-08, slice 7, right hand side of Figure I93. Lack of side wall fusion root defect present. Large gas pore in fillet weld joining extrusion band to bulkhead.

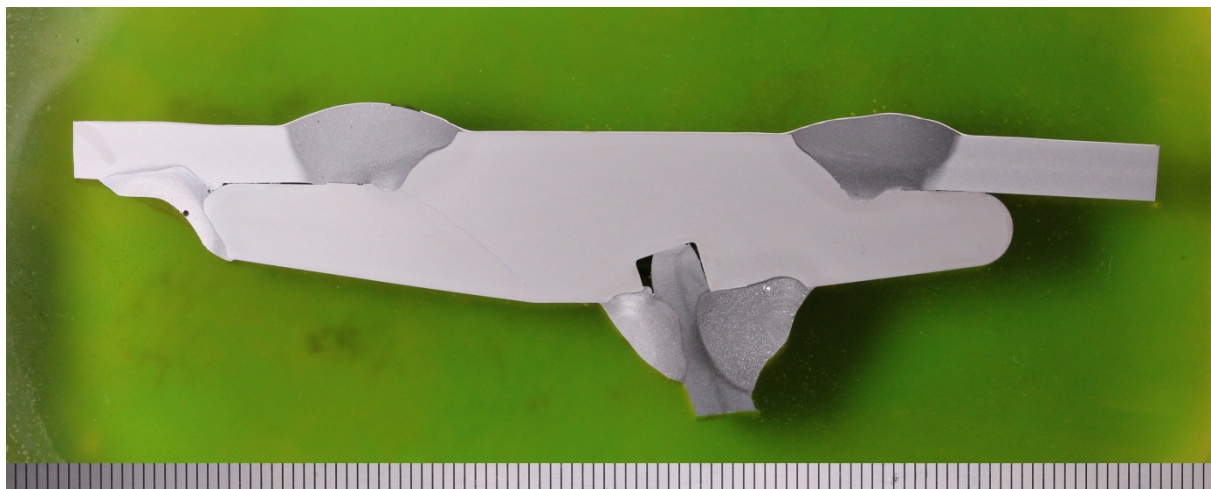


Figure I96 J3564 sample W07-08, slice 8.

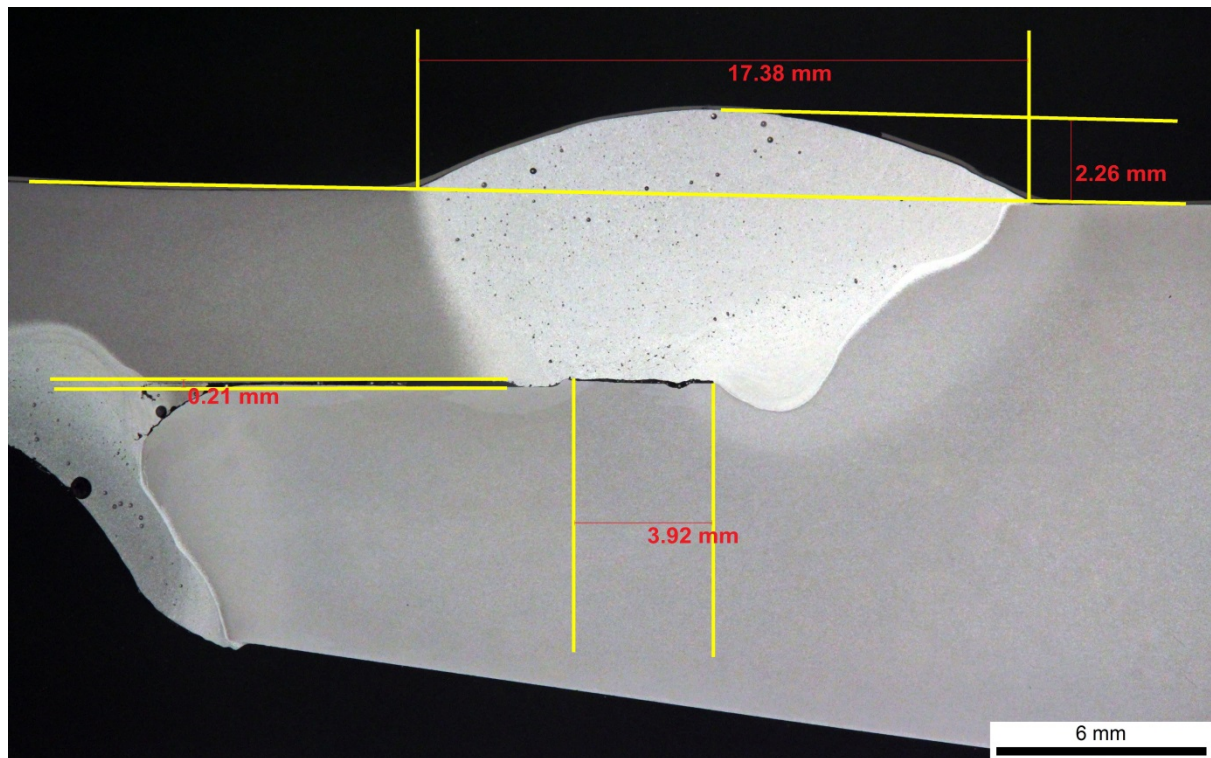


Figure I97 J3564 sample W07-08, slice 8, left hand side of Figure I96. Significant porosity and narrow throat size of internal fillet weld. Lack of fusion at weld root.

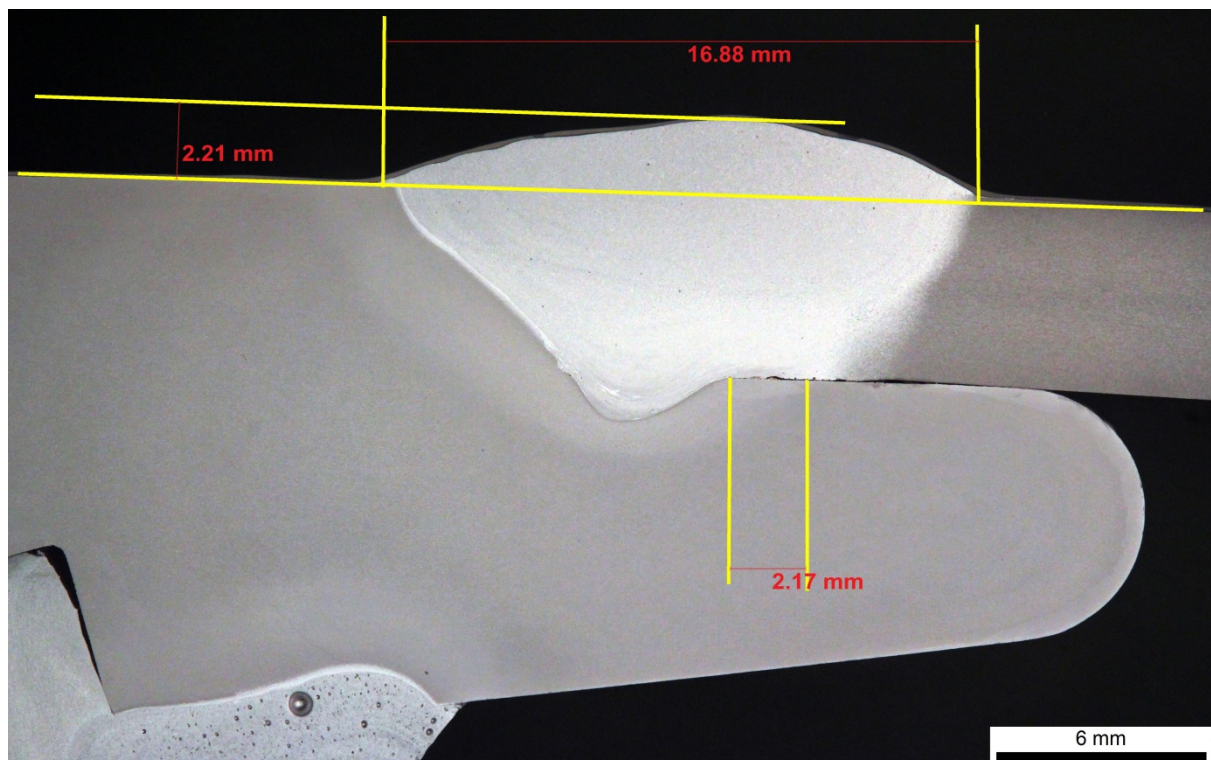


Figure I98 J3564 sample W07-08, slice 18 right hand side of Figure I96. No crack-like defect present.

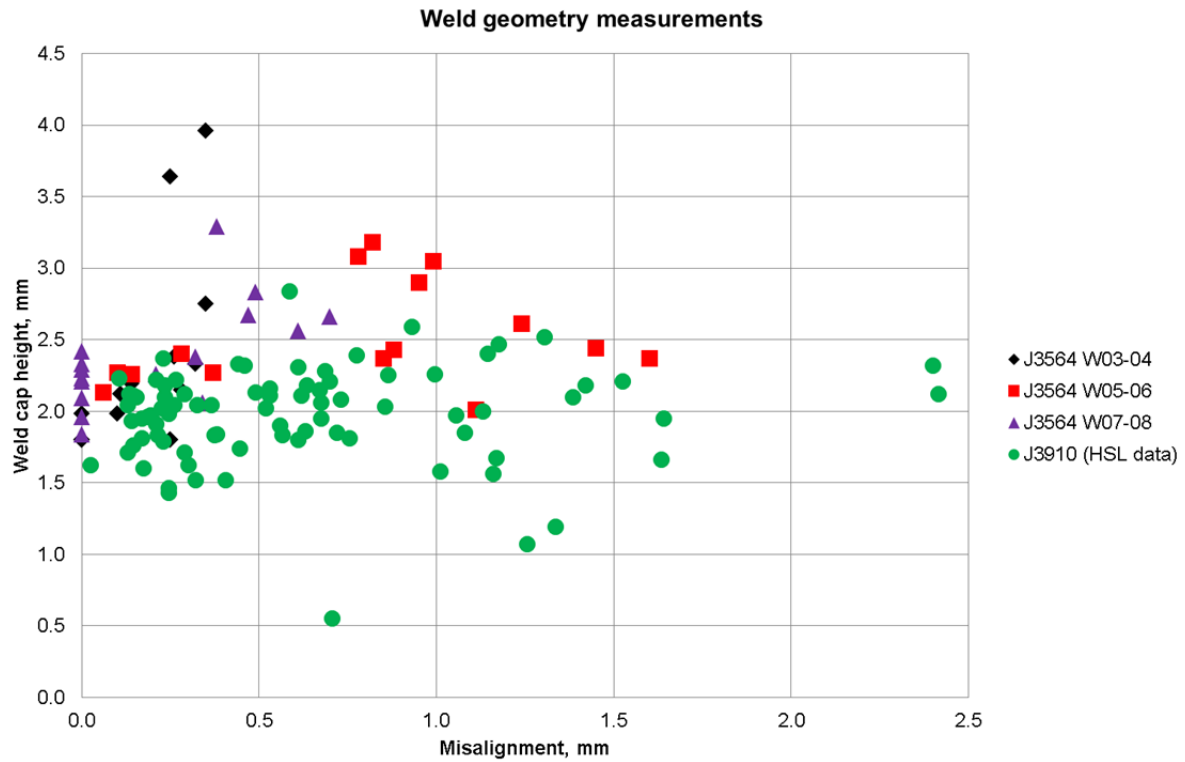


Figure I99 Measurements of weld cap height and misalignment from J3564 and J3910.

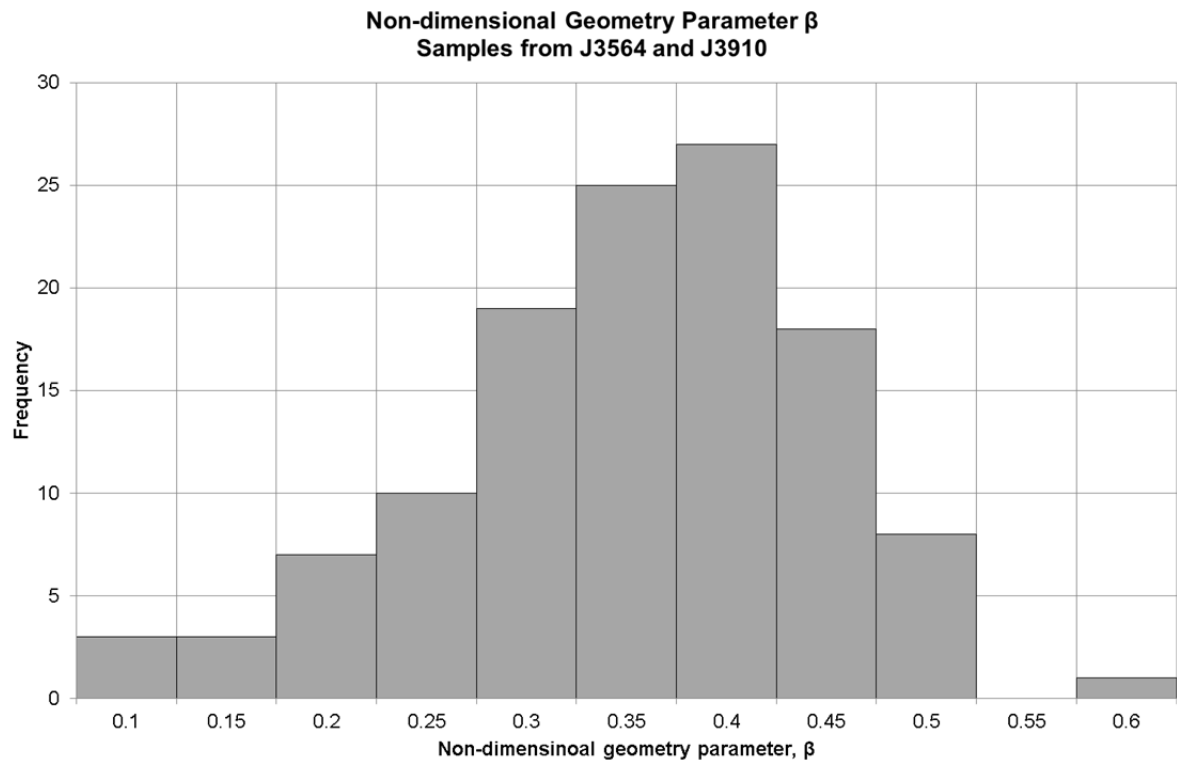


Figure I100 Histogram of non-dimensional geometry parameter $\beta = (h-m)/5$ for the J3564 and J3910 data shown in Figure I99. The data follows nearly a Gaussian distribution.

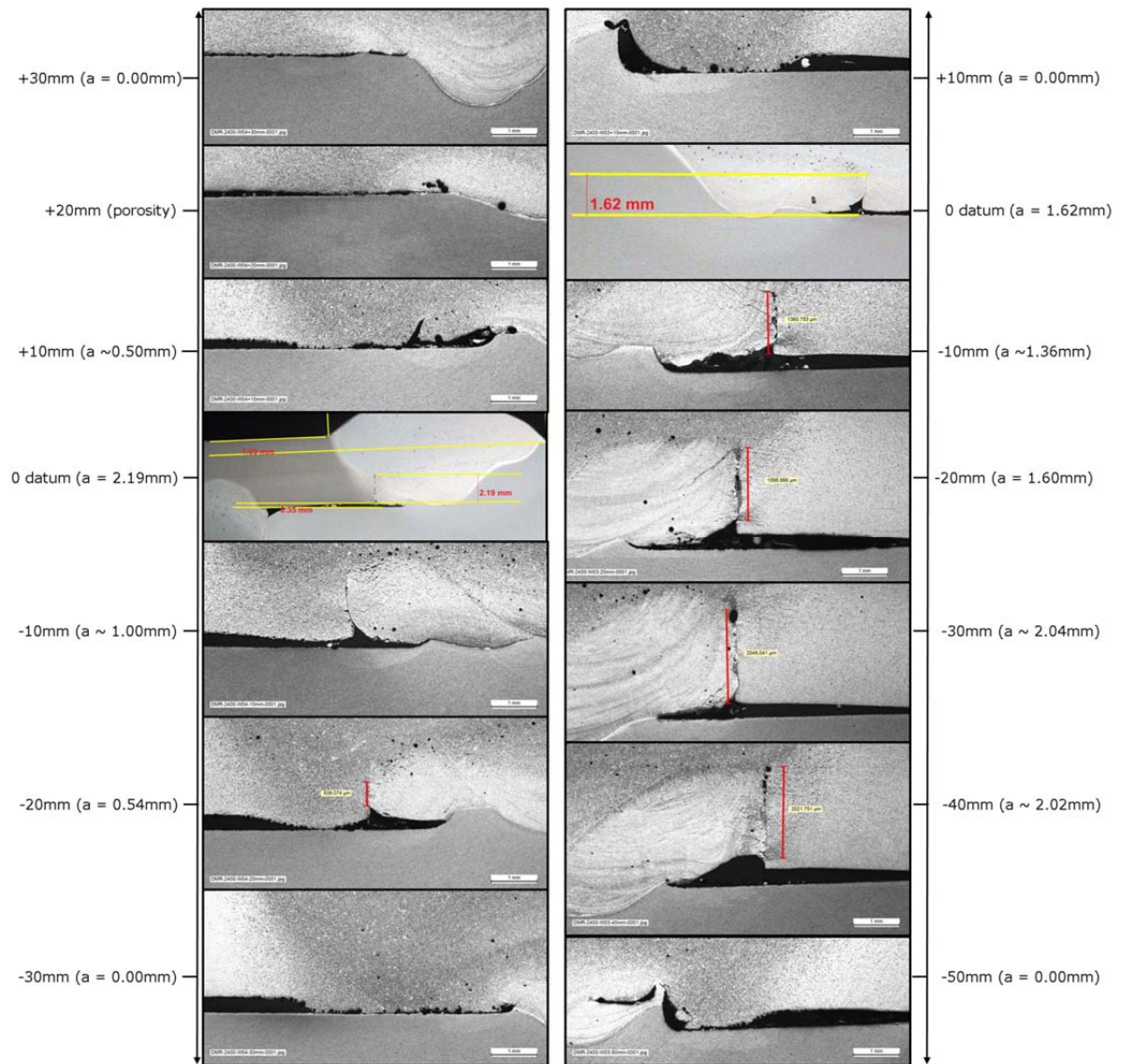


Figure I101 Illustration of the additional sectioning of the sample from J3564 that contained the 2.19mm and 1.62mm defects.