

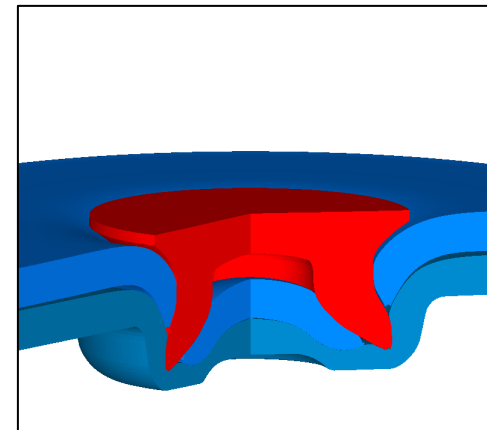
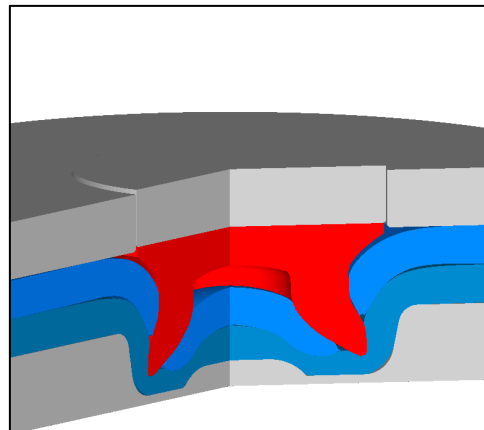
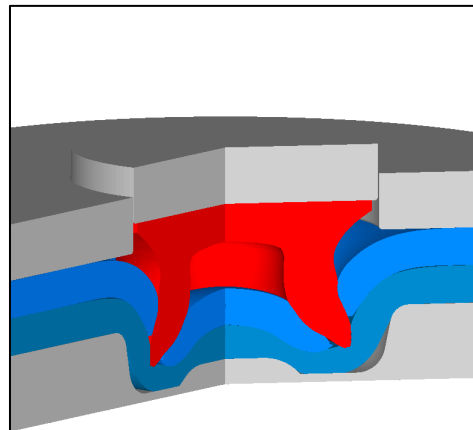
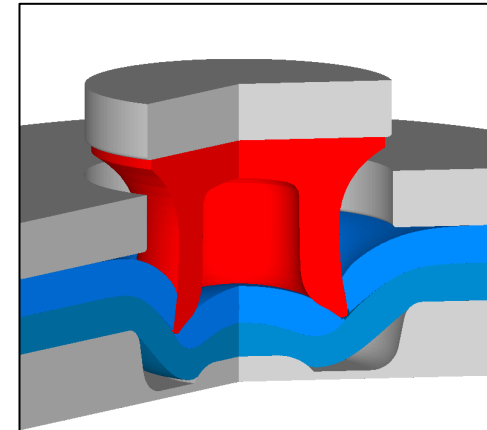
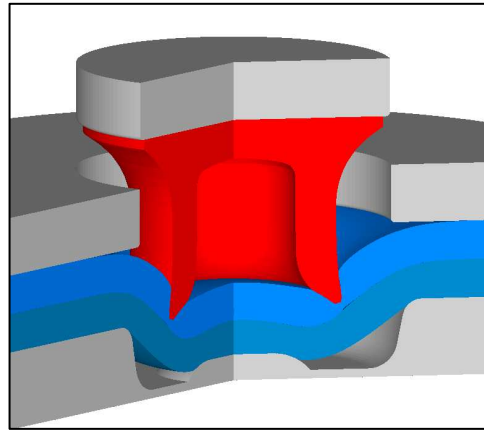
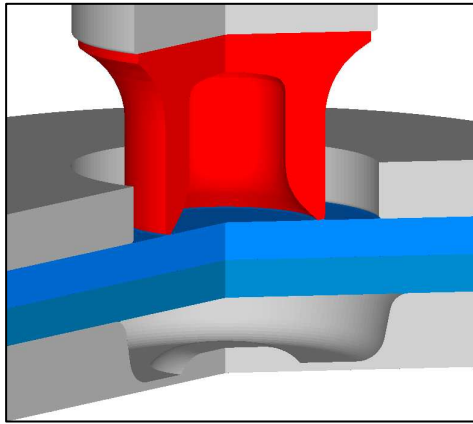
Stansnitning

I vilka material och tjocklekar är det möjligt?

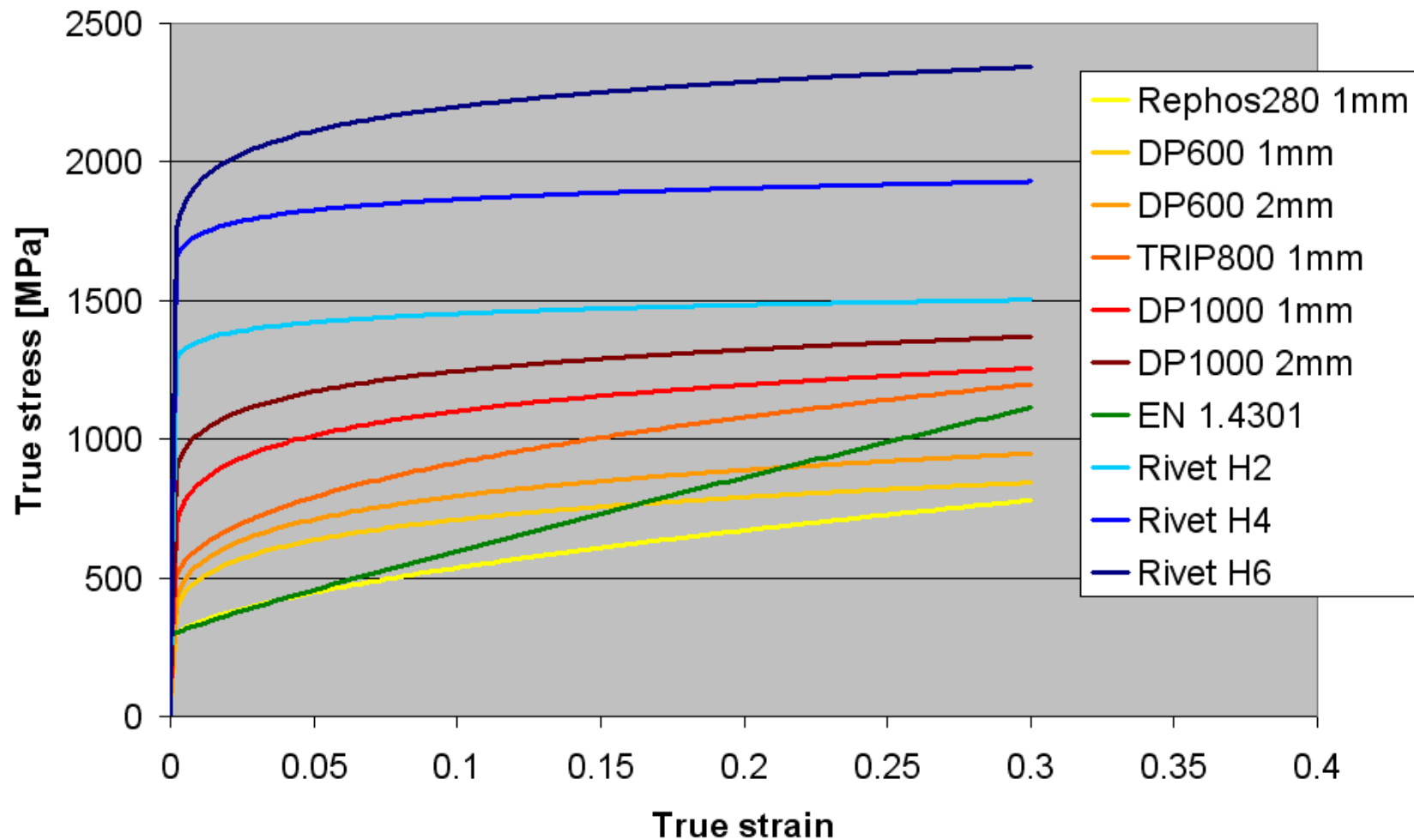
Johannes Gårdstam

2009-02-04

Stansnitning- processen

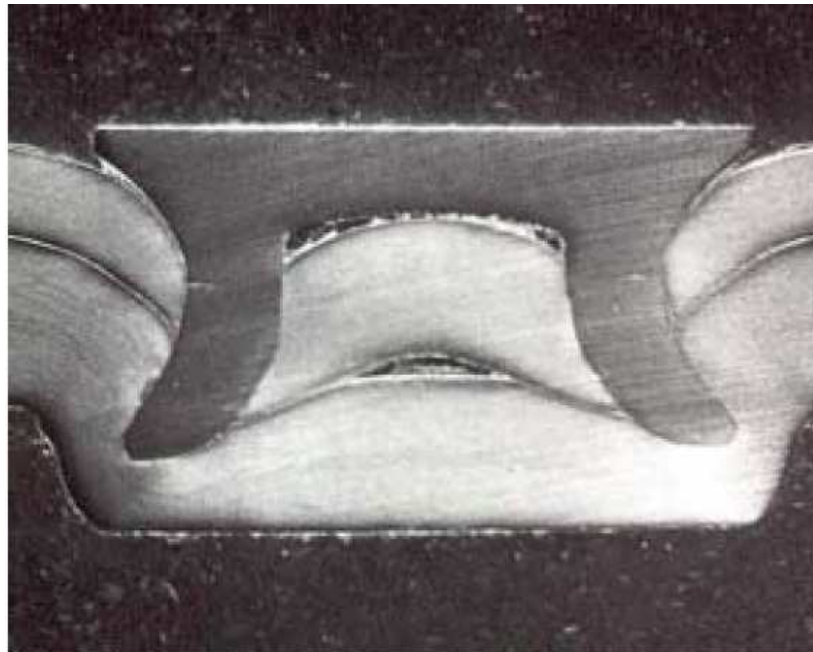


Stansnitning- Materialegenskaper



Stansnitning- DP600

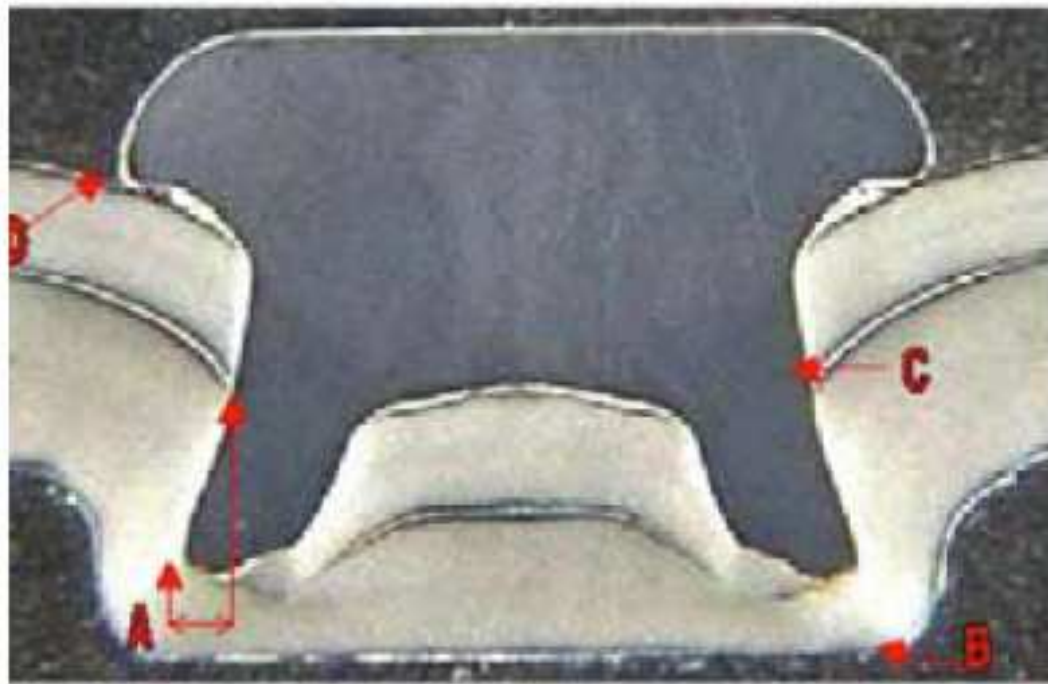
- 1+2mm DP600 – Gräns för hydraulisk montering (50 kN)



*Figure 47. DP600_1+2_C50546A_DF09-150
Riveting trial with electric setter[2].*

Stansnitning- TRIP800

- 1+2mm TRIP800 - höga sättningskrafter



Stansnitning- DP1000

- 1+1mm DP1000 240 Bars tryck (50kN)

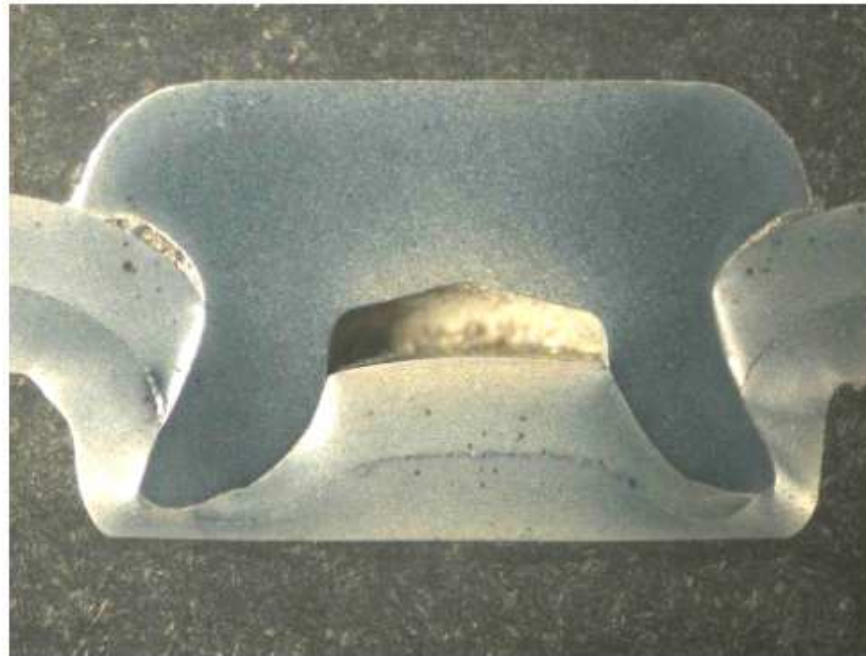


Figure 4.11. Successful joint in 1+1mm DP1000

Stansnitning- DP1000

- 1+2mm DP1000 (80 kN)



Figure 4.57. XP5 (bore a) rivet. Shear strength = 9 kN, Peel strength = 2 kN

Stansnitning- Kombinationsförband

1.2mm DP1000 + 1.3mm Rephos280



Figure 4.83. Section of a joint in 1.2mm DP1000 + 1.3mm Rephos280

1.5mm DP1000 + 1.3mm Rephos280



Figure 4.86. Section of a joint in 1.5mm DP1000 + 1.3mm Rephos280

Experimental trial:

Rivet setter: Hydraulic

Setting Pressure: 200 Bar (40 kN)

Clamp Pressure: 100 Bar

Rivet: Development XP7

Die: DF10

Mechanical properties:

Static Shear strength = 8868 N (rivet pulls out of lower sheet)

Static Peel strength = 2026 N (rivet pulls out of lower sheet)

Experimental trial:

Rivet setter: Hydraulic

Setting Pressure: 240 Bar

Clamp Pressure: 100 Bar

Rivet: Development XP1

Die: DF10

Mechanical properties:

Static Shear strength = 8802 N (rivet pulls out of lower sheet)

Static Peel strength = 1829 N (rivet pulls out of lower sheet)

Stansnitning- Kombinationsförband

- 2.0mm Polypropylene +1.5mm Rephos 220

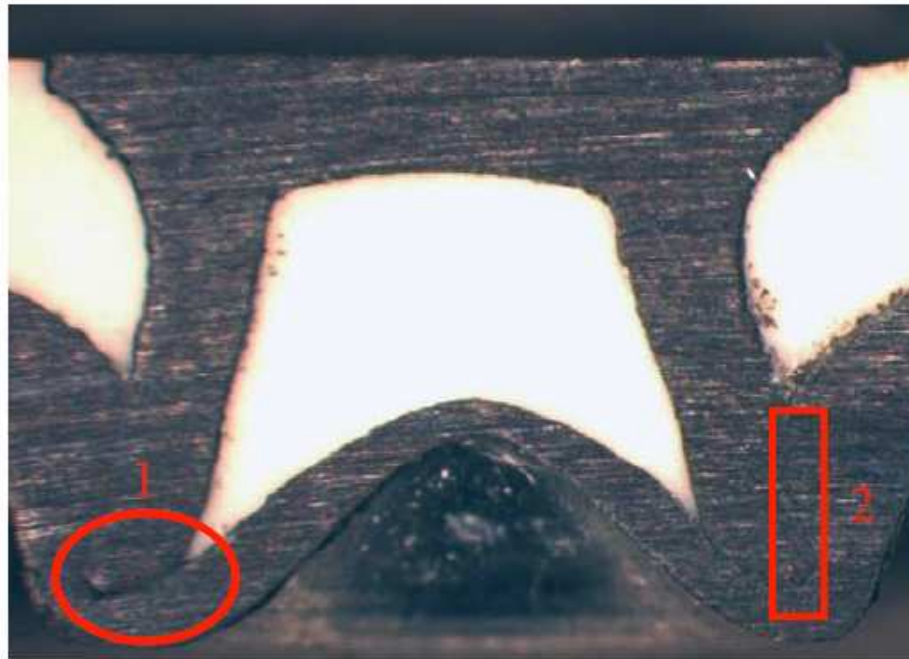


Figure 6-3 Polypropylene.

Stansnitning- Kombinationsförband

- 1.5mm Glass fibre reinforced epoxy +1.5mm Rephos 220

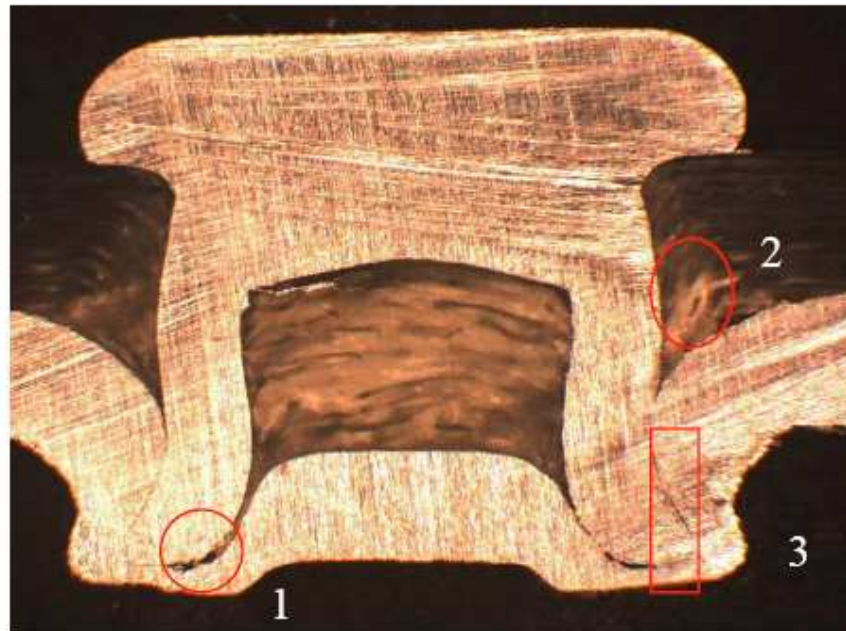


Figure 6-2 Glass fibre reinforced epoxy.

Stansnitning- Simulering

- 1+1mm DP1000

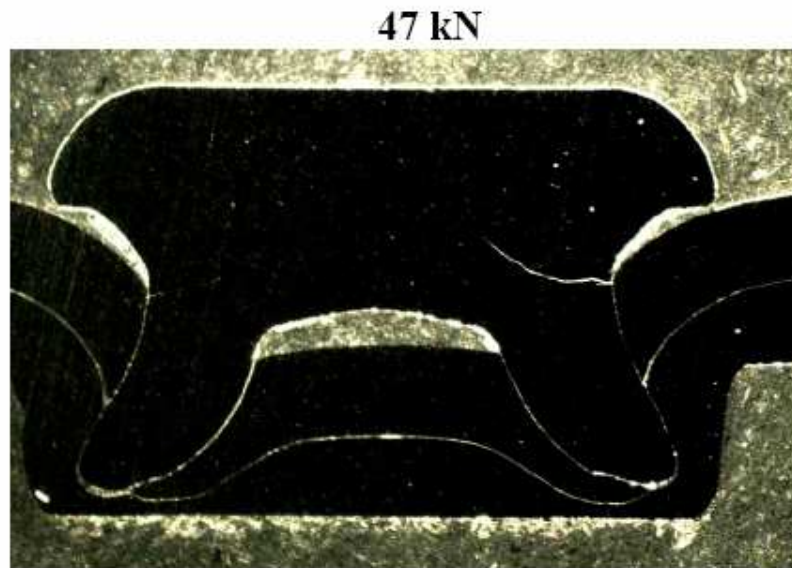


Figure 4.7. Setting force 47 kN, fracture occurs.

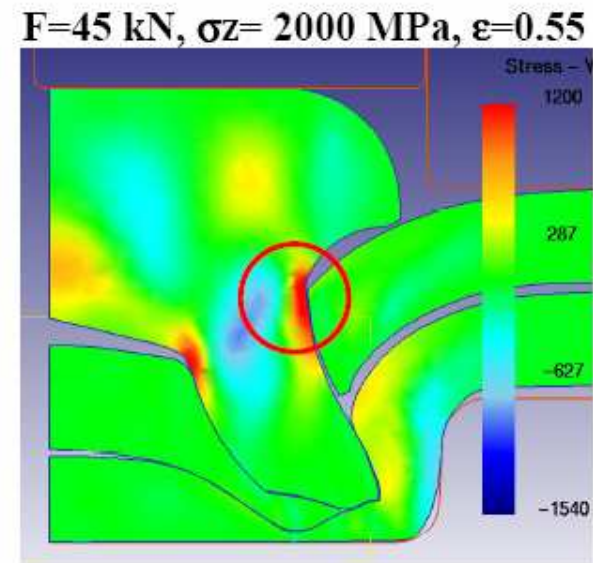
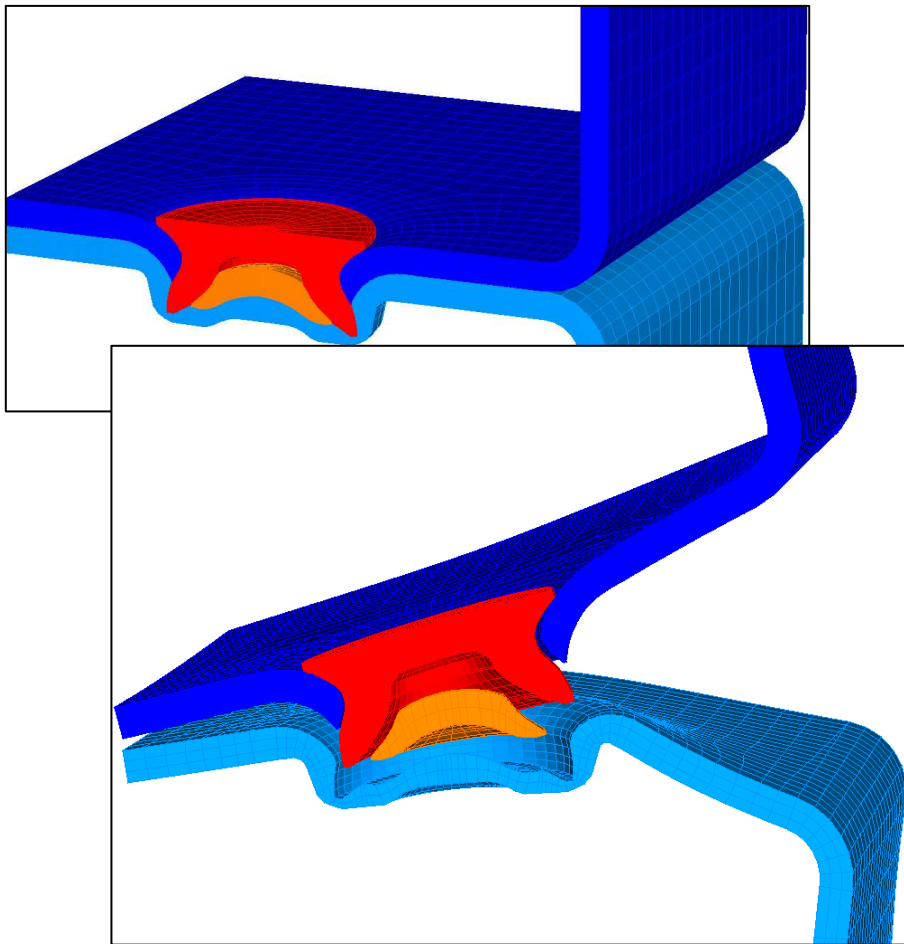


Figure 4.8. Simulation results, vertical stress

Stansnitning- Simulering



Stansnitning- Nya idéer

- 1+2mm DP1000 (80 kN)

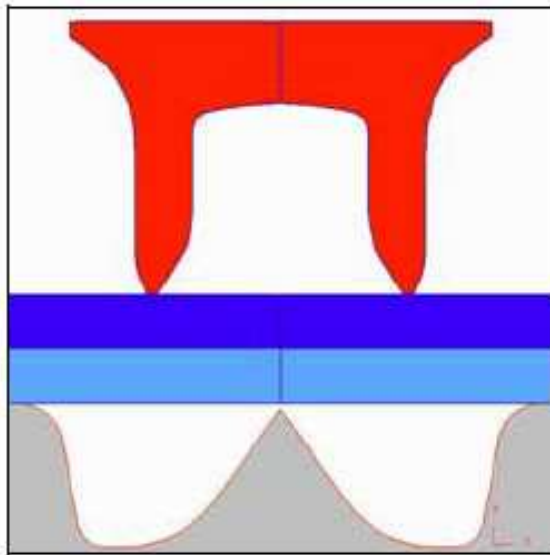


Figure 9. Start geometry for centred breakthrough.

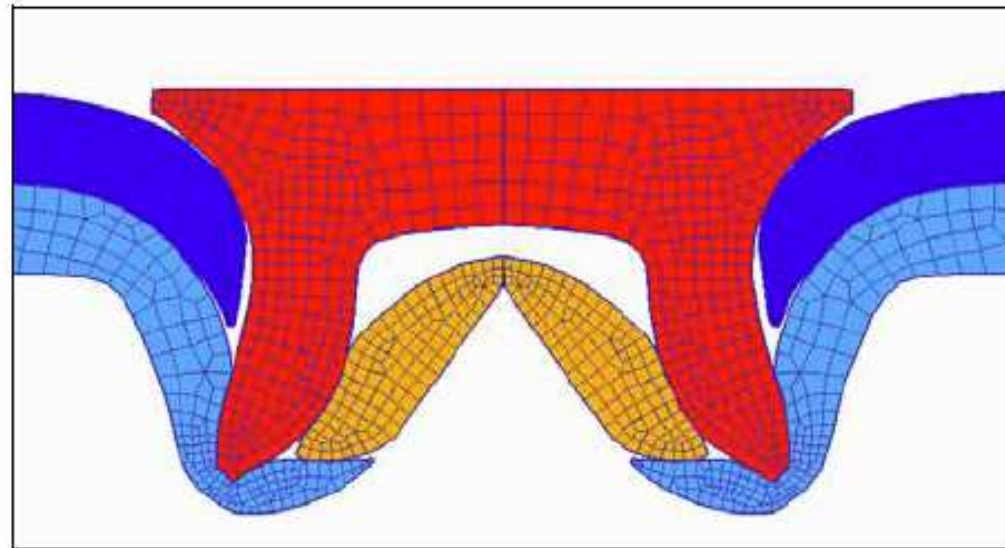


Figure 10. Final geometry of the joint with centred breakthrough.



Stansnitning

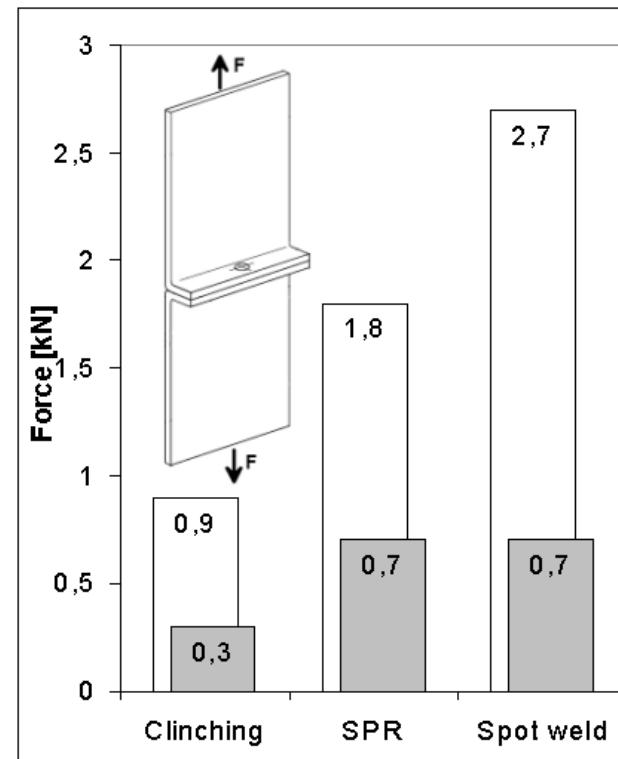
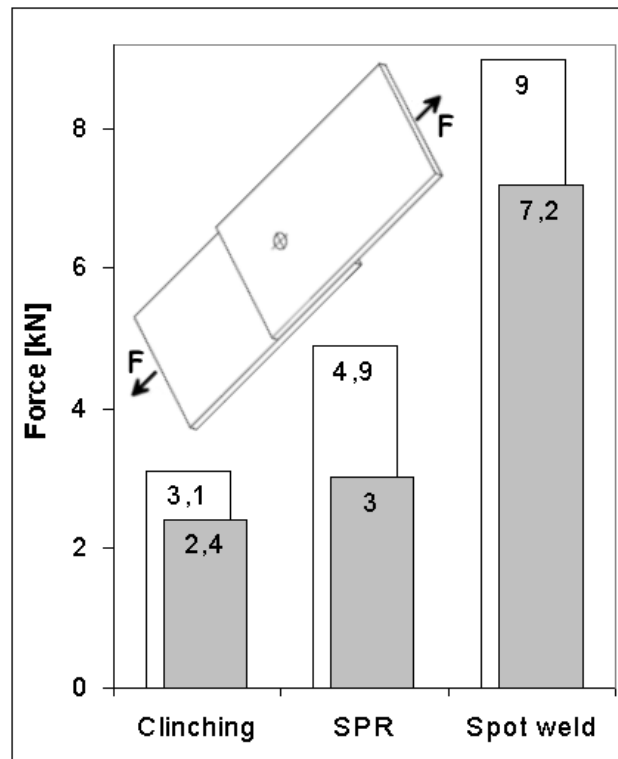
Hållfasthetsegenskaperna jämfört med
punktsvetsning

Johannes Gårdstam

2009-02-04

Hållfasthetsegenskaper - Statiskt

- Statiskt



Hållfasthetsegenskaper - Statiskt

- Statiskt- 1+1mm Rostfritt EN 1.4301

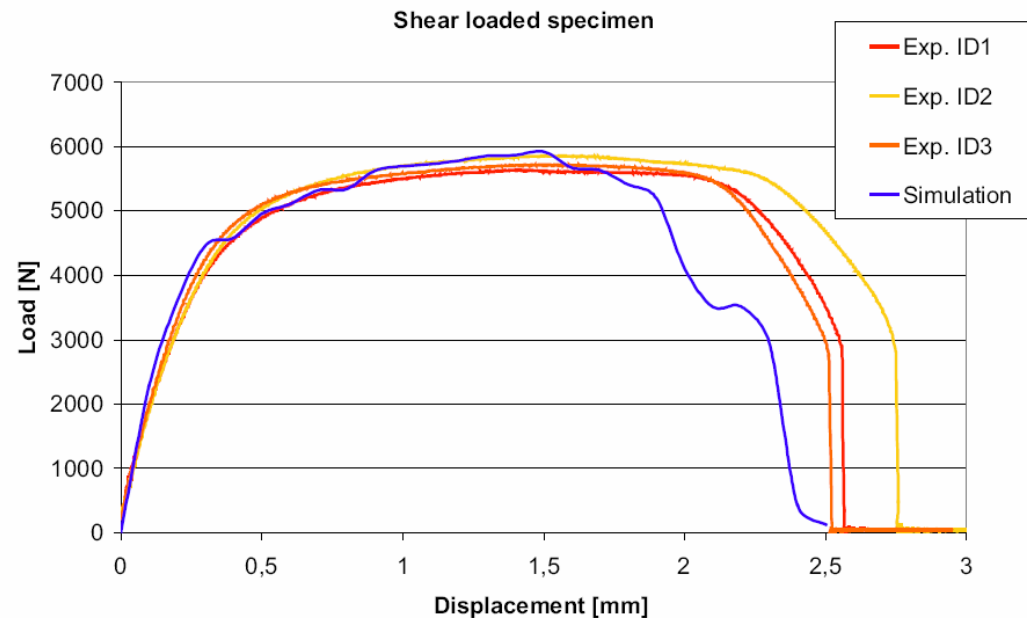
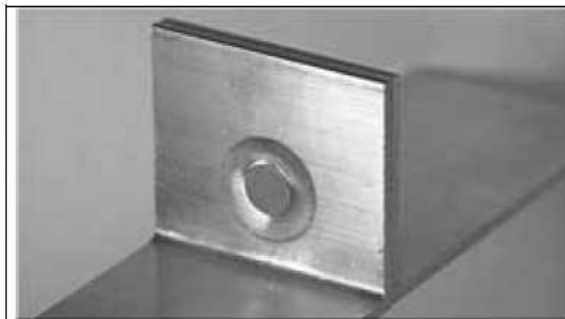


Figure 15. Comparison of shear strength between experimental results and simulated results (reference).

- Punktsvetsar når ofta maxkraften vid ca 1.5mm

Hållfasthetsegenskaper - Krock

- Krock hastighetsberoende

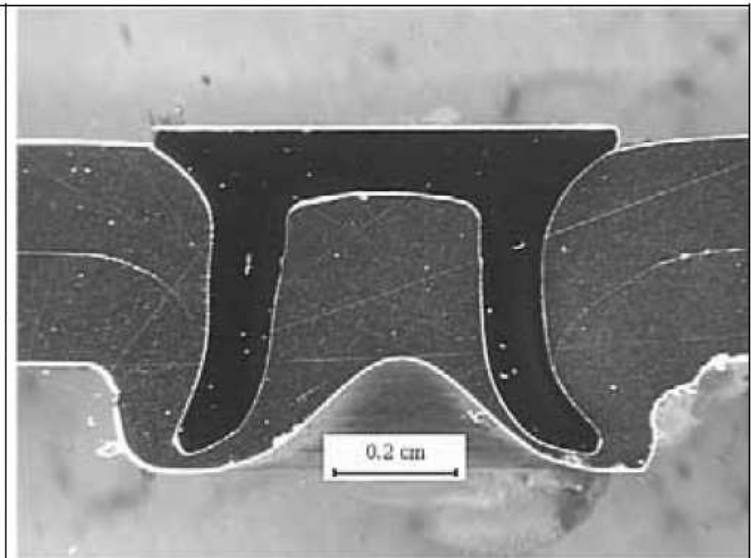


Top side of the joint.



Bottom side of the joint.

i) AA6063, (2+2)mm, self-piercing riveted joint.



*Rivet length=6.5 mm.
Rivet diameter=5.3 mm.*

Hållfasthetsegenskaper - Krock

- Krock hastighetsberoende

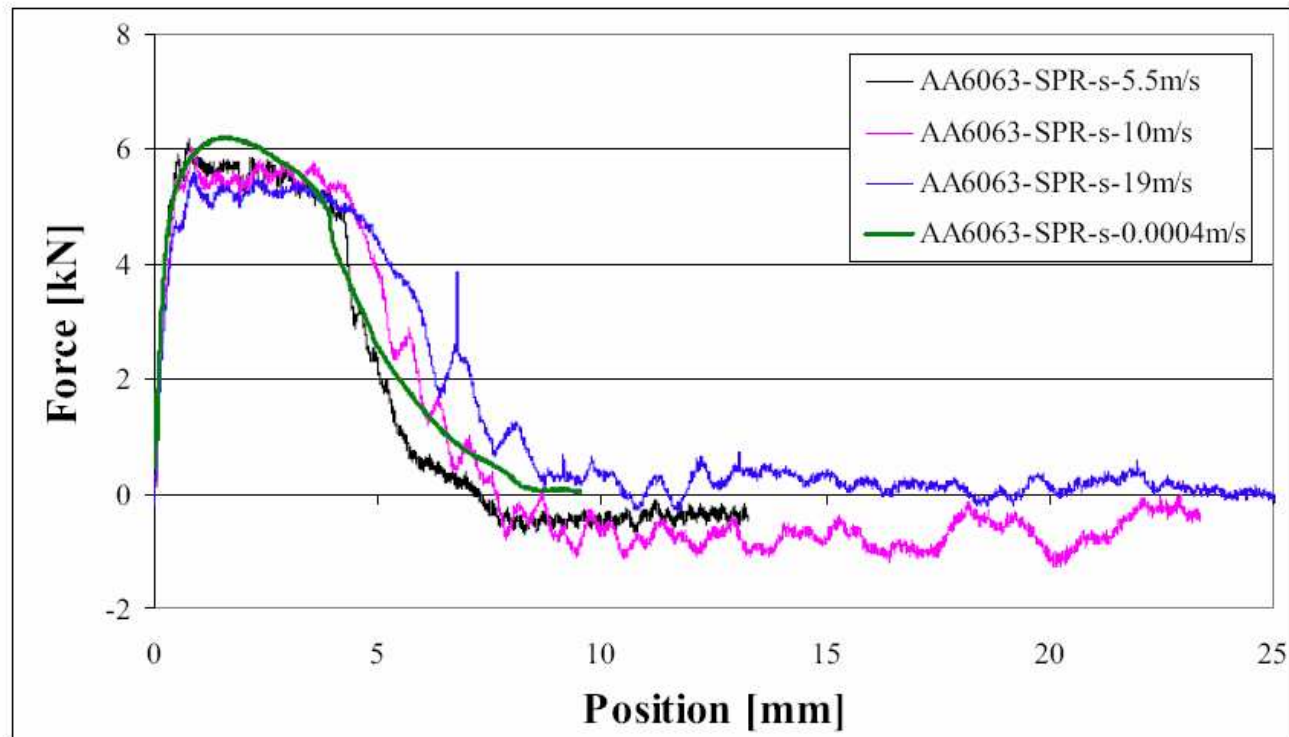
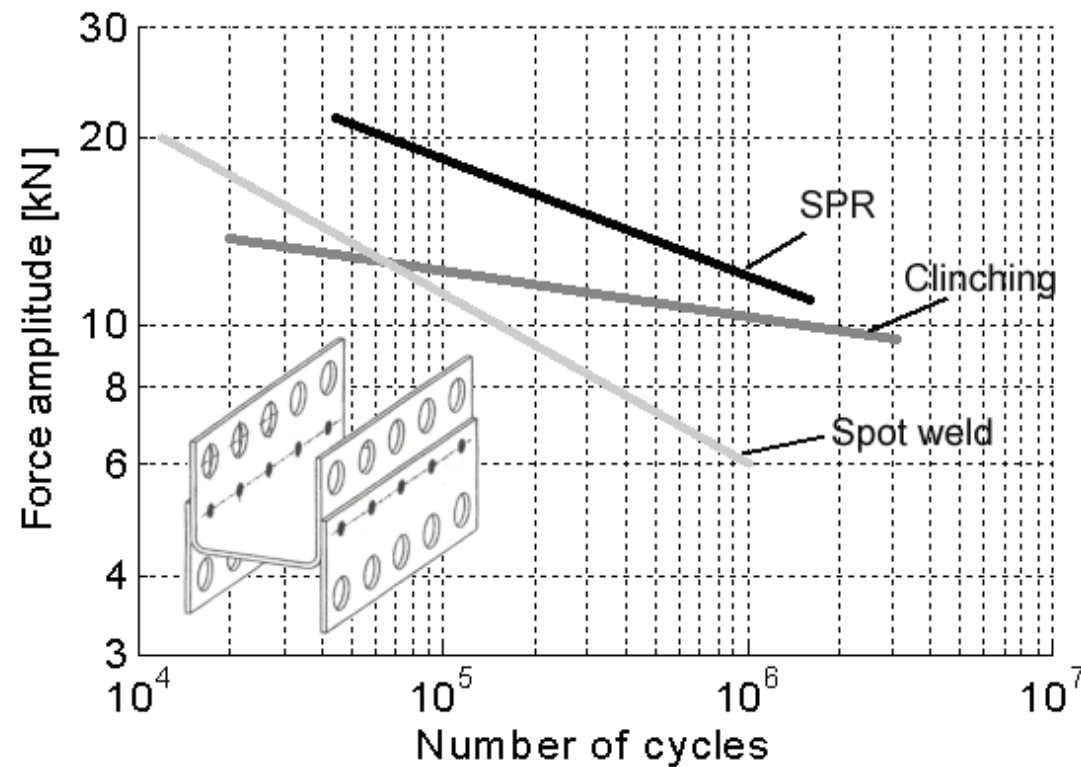


Figure 3.34. Comparison of AA6063-SPR shear specimens tested at three different velocities.

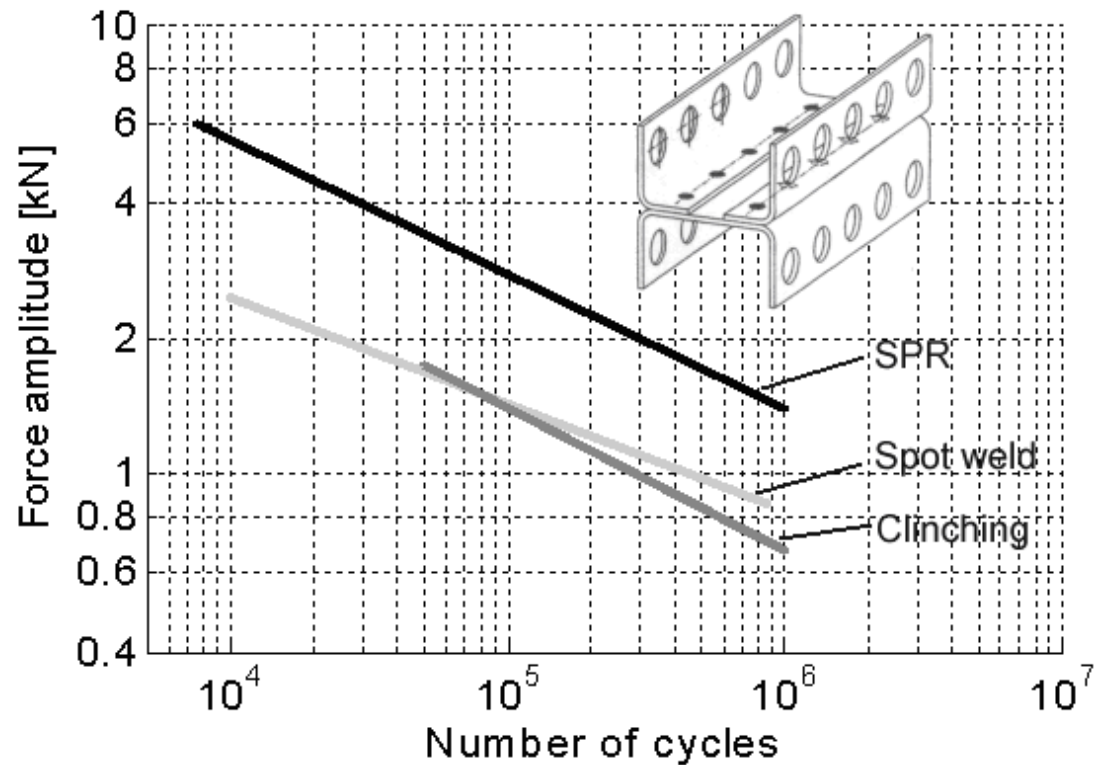
Hållfasthetsegenskaper - Utmattning

- Utmattning - skjuv



Hållfasthetsegenskaper - Utmattning

- Utmattning - fläk



Hållfasthetsegenskaper - Utmattning

- Utmattning - skjuv

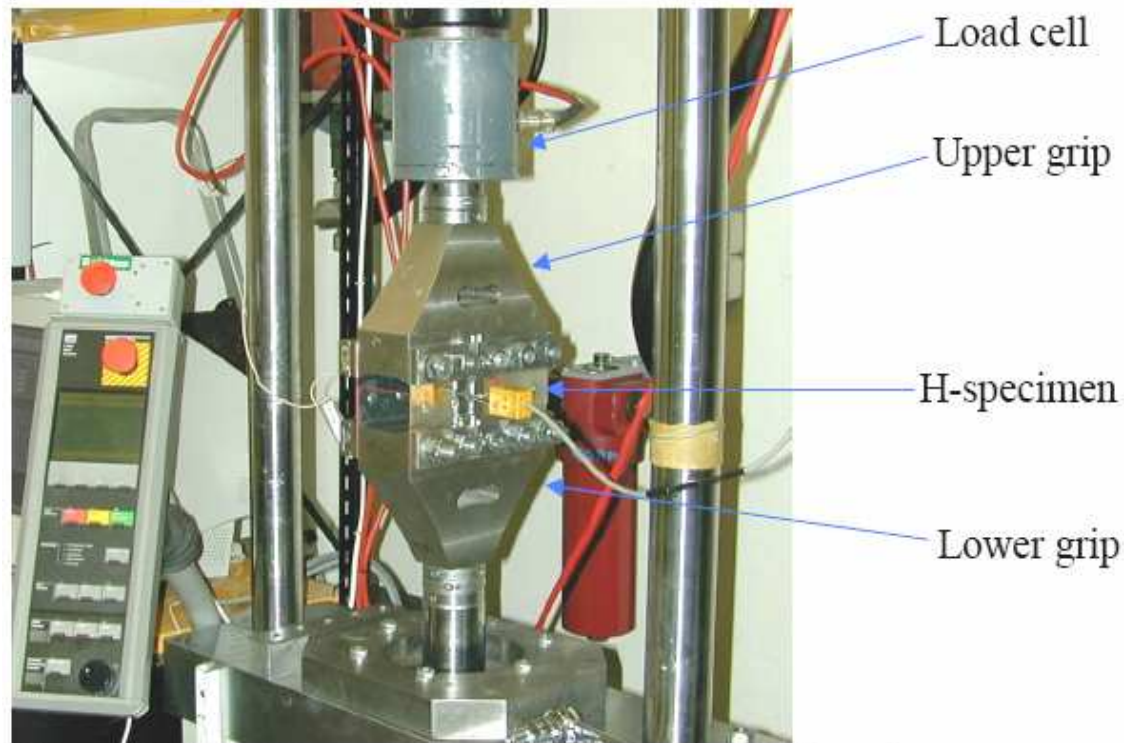


Figure 3.4. An H-specimen mounted in the MTS equipment.

Hållfasthetsegenskaper - Utmattning

- Utmattning - skjuv

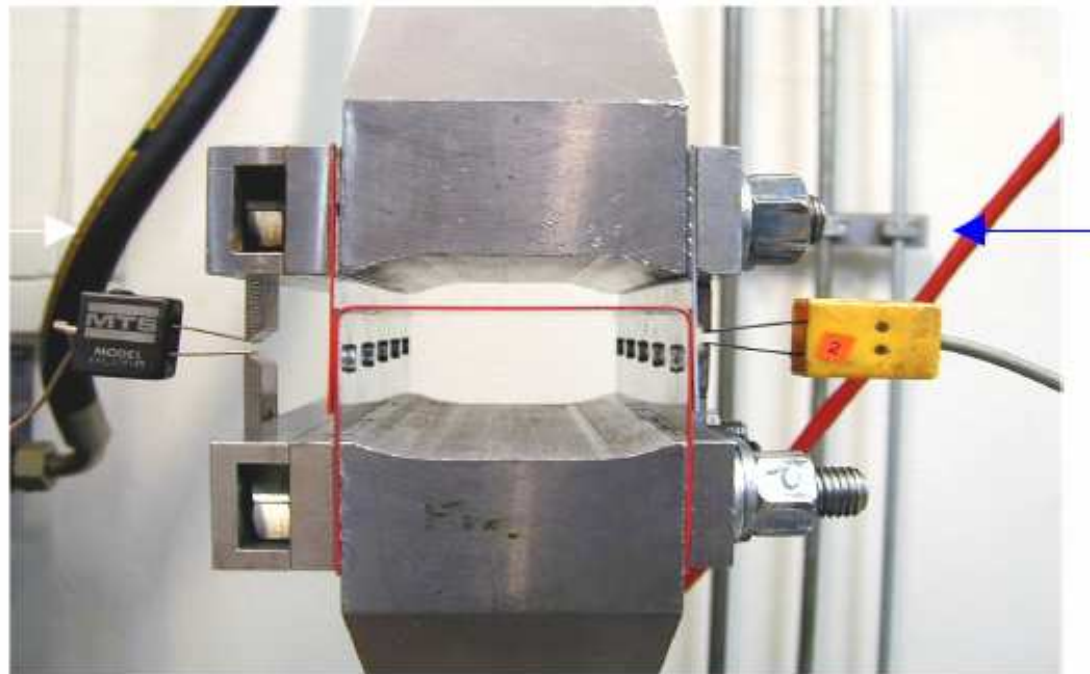
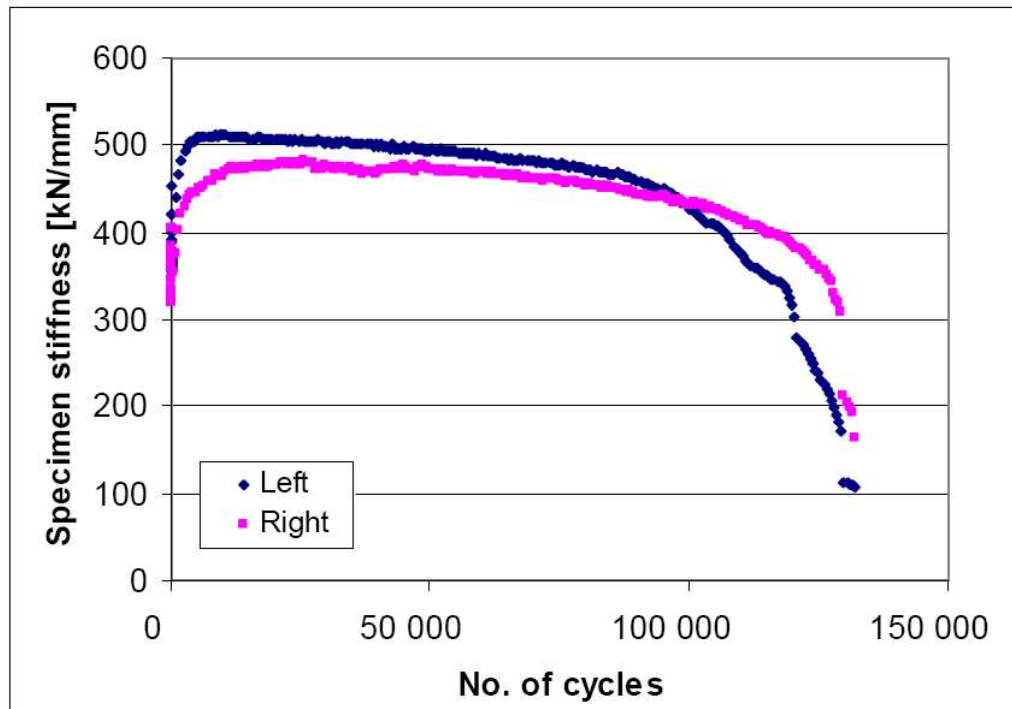


Figure 3.5. A specimen in the MTS fatigue testing machine with one extensometer on each side

Hållfasthetsegenskaper - Utmattning

- Utmattning – styvhetsfall - skjuv



b) $P_{max}=40 \text{ kN}$.

Hållfasthetsegenskaper - Utmattning

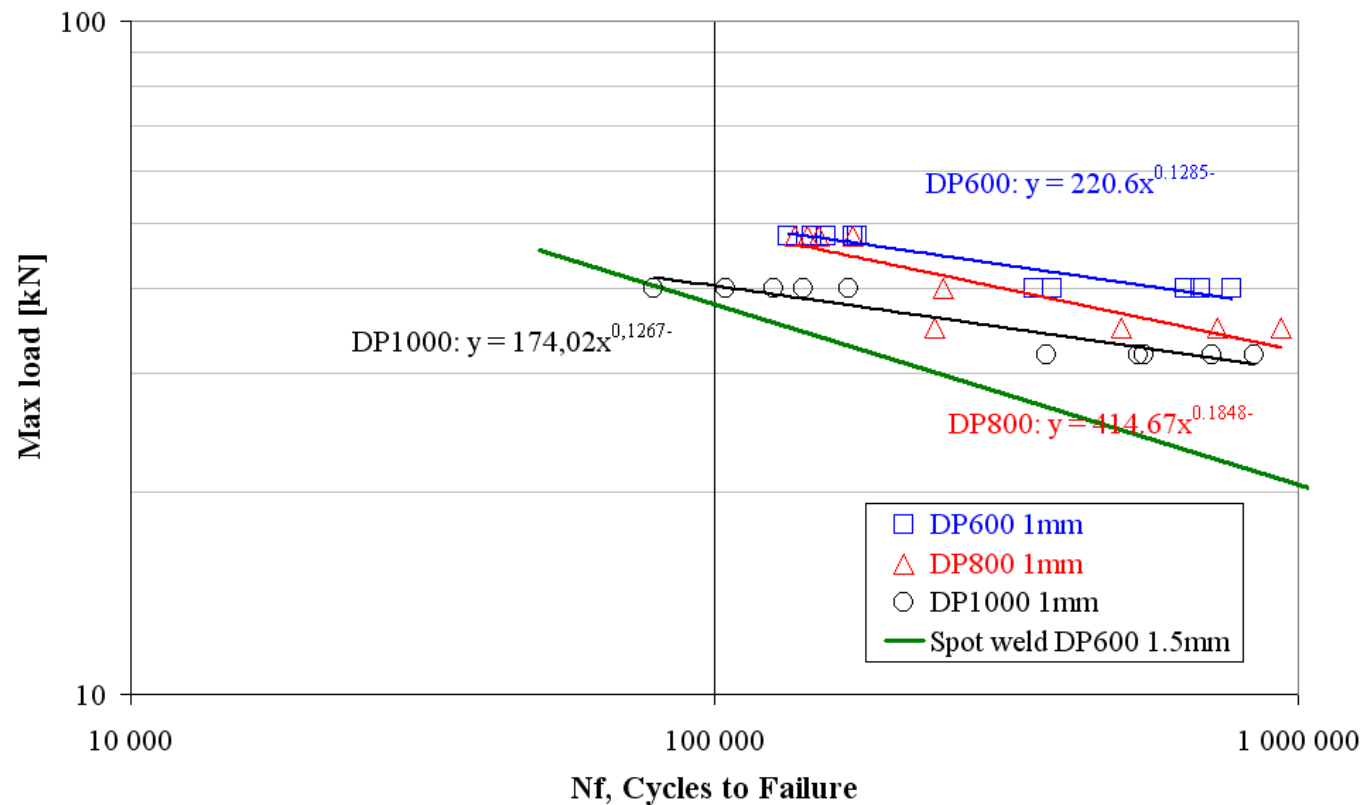
- Utmattning – brott-skjuv



*Figure 4.92. A shear H-specimen after fatigue testing.
In all joints failure occurred in the rivet leg.*

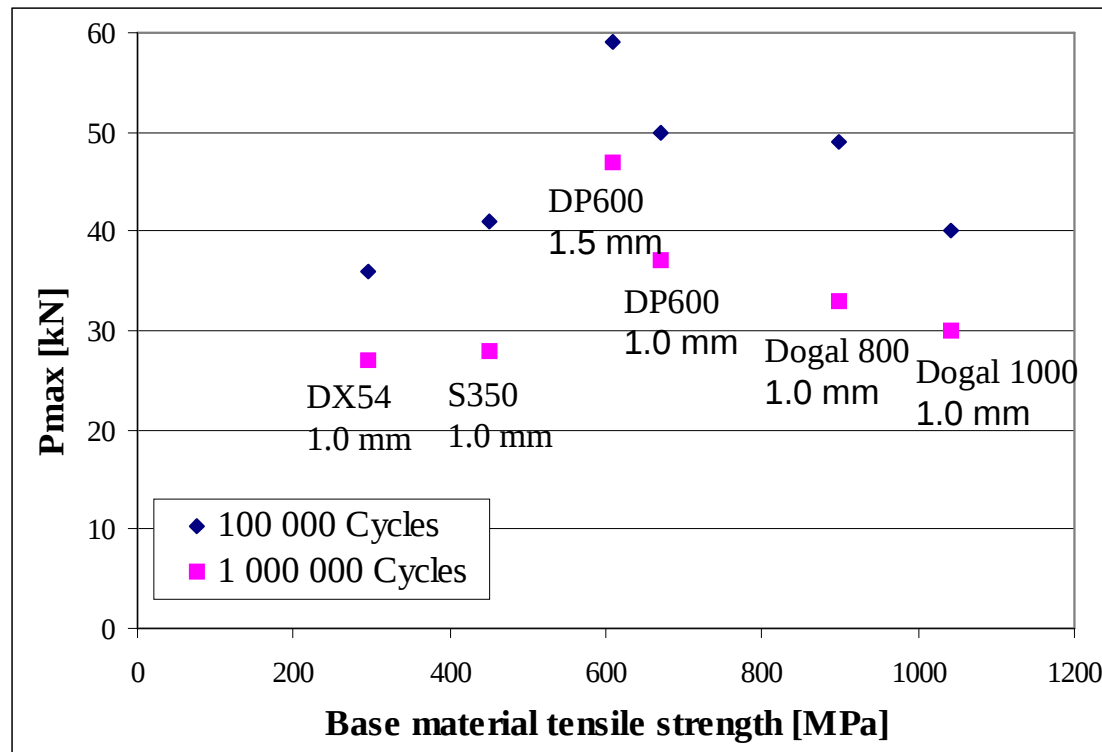
Hållfasthetsegenskaper - Utmattning

- Utmattning - skjuv



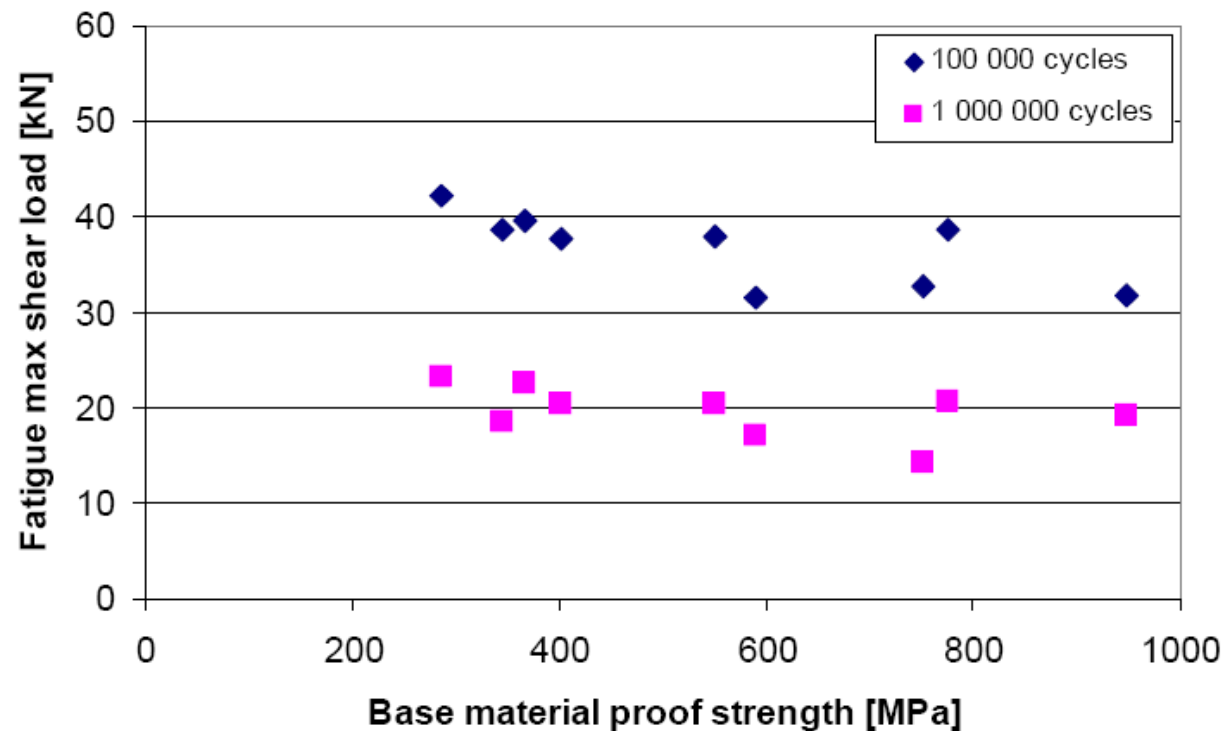
Hållfasthetsegenskaper - Utmattning

- Utmattning- stansnit vs materialhållfasthet



Hållfasthetsegenskaper - Utmattning

- Utmattning- punktsvets vs materialhållfasthet (1.5mm)



Referenser

- Durability of surface treated mixed material joints for the automotive industry: Pre-study, KIMAB-2006-539 (open 2009-03-31)
- Fatigue properties of self-piercing riveted joints of steel sheet with different thickness in shear and peel loading, IM-2004-567
- Optimisation and property characterisation of self piercing riveting joints of the ultra high strength steel DP1000, IM-2006-526
- Fatigue properties of SPR/adhesive joints between aluminium and steel, IM-2005-541
- Energy absorption and forces during crash testing of spot welded, self-piercing riveted and spot friction stir welded joints, IM-2004-550
- Simulation of self piercing riveting of the steel TRIP800 in 1 and 2mm thickness, IM-2002-551
- Simulation of self piercing riveting of TRIP800 sheet steel in 1+1mm thickness, IM-2003-515