



# WELDABILITY

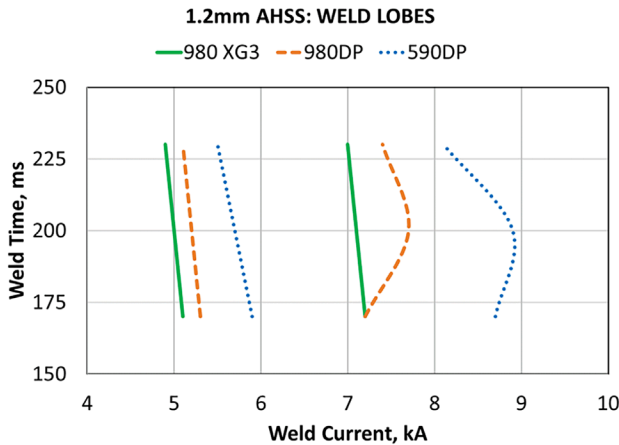
## AUTOMOTIVE SOLUTIONS



# STRENGTH IN PRODUCTION

## Weld Lobes

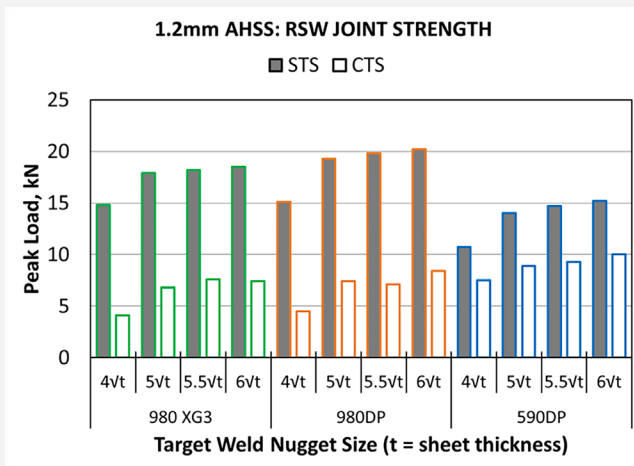
The weld lobe defines the process window for a particular material and thickness where resistance spot welds of sufficient size and quality are produced under specific conditions. Weld lobes for U. S. Steel 980 XG3, 980DP and 590DP are shown here (1.2mm thickness). Each material shows a current range greater than 2 kA thereby indicating suitability for production. In this example, carbon equivalent ( $[C]_{eq}$ ) values for 980 XG3, 980DP and 590DP are 0.78, 0.74 and 0.41, respectively, where  $[C]_{eq}, wt \% = [C] + [Mn + Si]/6$ .



## RSW Joint Strength

Resistance spot weld (RSW) joint strength (peak load) is commonly measured by shear-tension strength (STS) and cross-tension strength (CTS). For this analysis, the weld time was 200 ms, and spot welds were created with the following target weld nugget sizes:  $4\sqrt{t}$ ,  $5\sqrt{t}$ ,  $5.5\sqrt{t}$ , and  $6\sqrt{t}$ , where  $t$  is the measured sheet thickness.

For this set of materials, actual thickness values were: 980 XG3 (1.18mm); 980DP (1.21mm), and 590DP (1.25mm). The RSW joint strength (STS, CTS) of U. S. Steel 980 XG3 is similar to that of 980DP.



## RSW Cross-Sections

Shown here are example RSW cross-sections for U. S. Steel 980 XG3, 980DP and 590DP with a target weld nugget size of  $5\sqrt{t}$ . The hardness profiles of 980 XG3 and 980DP are very similar, and the weld nugget hardness and substrate hardness are substantially higher (vs 590DP).

