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Docol 1000 LCE – the ultra-high strength steel with outstanding spot and laser welding characteristics



The utilisation of high strength steels continues to increase in the automotive and other industries. Nowadays these steel grades, with tensile strengths of 1000 MPa or more, are used for such things as chassis components and other components which are important to safety, including seat rails and side impact beams. The increased strength means that it is possible to manufacture parts which are stronger, and thus safer. At the same time, the fact that less material is required means that vehicles weigh less, resulting in reduced fuel consumption.

Normally the percentage of alloying elements is increased in order to achieve higher strength. With high strength steel grades, however, this can render the steel less suitable for resistance spot welding or laser welding. This is why SSAB has developed its new ultra-high strength steel Docol 1000 LCE (low carbon equivalent) with a minimum tensile strength of 1000 MPa, finetuning its chemical composition such that it does not create any problems with these welding methods. By changing the chemical composition and process parameters in the manufacture of this steel, Docol 1000 LCE has also been given outstanding forming characteristics.

Fracture behaviour of spot welds

Some applications in the automotive industry place particular demands on the fracture behaviour of spot welds. Spot welds can fracture during a collision. Particular attention is paid to ensuring that this material behaviour does not occur unless there is an extremely high level of force exerted. In addition, it is also important that all of the spot welds within a construction exhibit a similar type and manner of behaviour in the event of a collision.

There are three different types of fractures that can be defined for a spot weld: interfacial fracture, partial plug fracture and full plug fracture. The full plug fracture is often the only acceptable type of fracture, as it is possible to determine the size of the spot welds. Highly alloyed steels in particular often exhibit partial plug fractures or even interfacial fractures.

Highest tensile strength and 100 percent full plug fractures

»Spot welding is currently one of the most frequently used joining methods – particularly in the automotive industry,« says Tony Nilsson, Manager of the Joining Department, SSAB Strip Products Division. »For a long time, utilising high strength steel grades in the automotive industry posed difficulties due to the fact that it was not possible to achieve a 100-percent full plug fracture rate in tests. With Docol 1000 LCE we are now able to guarantee our customers this 100 percent whenever this steel is welded.

In addition to spot welding, other welding methods also benefit from the excellent weldability of Docol 1000 LCE: »Anytime that there is a fast cooling speed when welding – e.g. with laser welding – Docol 1000 LCE offers advantages,« states Tony Nilsson.

Docol 1000 LCE simplifies the welding of high strength steel grades

»Increasingly, the automotive industry is not only looking for high strength steel grades – it also expects these steels to offer particularly good welding characteristics,« says David Sánchez, Geographical Sales Manager, Light Vehicles & Industries at SSAB China. »In the past, spot welding did not pose a problem, as there were only a few components within the chassis made of high strength steel, and these were welded to low-alloyed steel parts. As the use of high strength steel grades has since increased considerably, however, these must be welded directly to one another more often than in the past. Docol 1000 LCE leaves absolutely nothing to be desired in this respect,« declares David Sánchez.

The best weldability with outstanding mechanical characteristics

The technical characteristics of Docol 1000 LCE are outstanding. »Our customers demand a material with good welding characteristics, yet this cannot come at the expense of the mechanical characteristics or formability,« reports Dr. Björn Carlsson, who is Technical Consultant at SSAB Germany. »With Docol 1000 LCE, we are able to offer our customers a material which meets these demands. Its use is particularly advantageous in fields where it has been difficult to weld high strength steels,« says Dr. Björn Carlsson.

Test material

In order to ensure that those interested in testing this steel in their own production systems are able to do so, SSAB is able to supply coils, slit strips and sheet from its test stocks at short notice. Another product offered by SSAB is electro-galvanised Docol 1000 LCE.

You will find printable picture files for downloading in the “Media” section of our website at:
www.ssabtunnplat.com.



Photos:

- 1.) Interfacial fracture, partial plug fracture and full plug fracture (from top to bottom).
In the event of a fracture, Docol 1000 LCE only exhibits full plug fractures.*
- 2.) Docol 1000 LCE with full plug fracture.*
- 3.) Tony Nilsson, Manager of the Joining Department at SSAB Strip Products Division.*

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As a global steel manufacturer in the field of advanced high strength steel products, SSAB is not only a market leader, but is also at the forefront in terms of productivity. SSAB develops solutions that increase the competitiveness of its customers. In 2007 the SSAB Group employed 10,000 people and achieved annual sales of approx. 48 billion Swedish krona (approx. 5.1 billion euros).