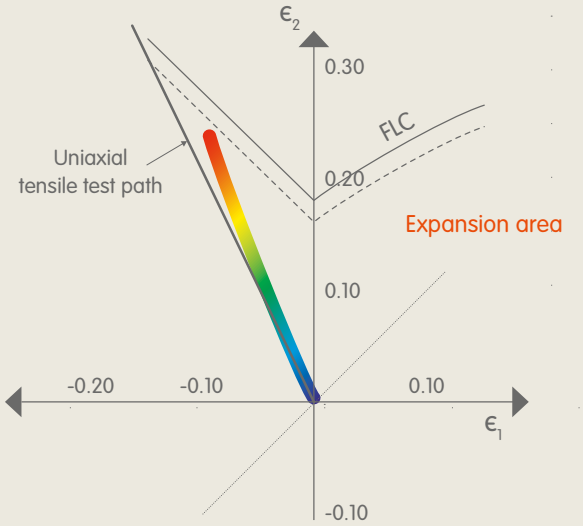
	Gauge	Elongation, n-value	r-value	Yield stress	YPE% - Lüders effect	Microstructure	H Grain / C Grain cut
Shape complexity	■	■	■				■
Denting resistance	■			■			
Resistance (axial…)				■			
Aesthetic - Surface					■	■	
High speed welding		■				■	
Shaping technique		■	■				■
Height variation			■				

Market segments

- Shaped aerosols
- Syrup cans
- Party kegs
- Three pieces bottles
- Miscellaneous

Strain is not pure expansion strain



Steel for 3P Shaped Bodies

To create complex 3D surfaces, three-piece bodies are shaped using fluid or solid pressure. Whatever the technique, the metal is strained in a uniaxial mode (equivalent to the uniaxial tensile test), although the manufacturing process is commonly described as "expansion". The expansion rate is typically up to 15% for mechanical forming, and up to 30% for pressurised fluid forming. Issues to overcome are the risk of the metal body bursting, and excessive variation in the body height.

The key metal features to ensure excellent forming performance at the can-making plant are:

- Guaranteed minimum metal elongation in order to be able to produce the most complex shapes (with an expansion rate of up to about 30% or non-axisymmetric shape)
- Guaranteed r-Lankford value (high average value and low industrial dispersion - Cpk) to minimise variation in the finished body height.

ArcelorMittal best performers are TS245/TS260. For the most demanding manufacturing processes, tight tolerances on rheological properties are available.

When developing a new shape, the metal specifications have to be considered at an early stage. Moreover, the maximum "expansion" rate of a given shape does not totally represent the severity of the strain. Geometry is key (for example, unstrained areas at mid-height of the welded body are more demanding). ArcelorMittal has developed some Finite Element Modelling (FEM) tools to support its customers in this kind of development work.

Product offer for shaped cans