

jetQ[®] – optimized AHSS material

for geometrically complex crash structures

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thyssenkrupp Steel Europe



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JFE



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jetQ[®]: optimized AHSS material for geometrically complex crash structures

More safety and efficiency in vehicle bodies



Highly ductile AHSS with optimized local and global forming properties



Robust processing in the press shop



Optimized AHSS for new cost cutting and light-weighting potential



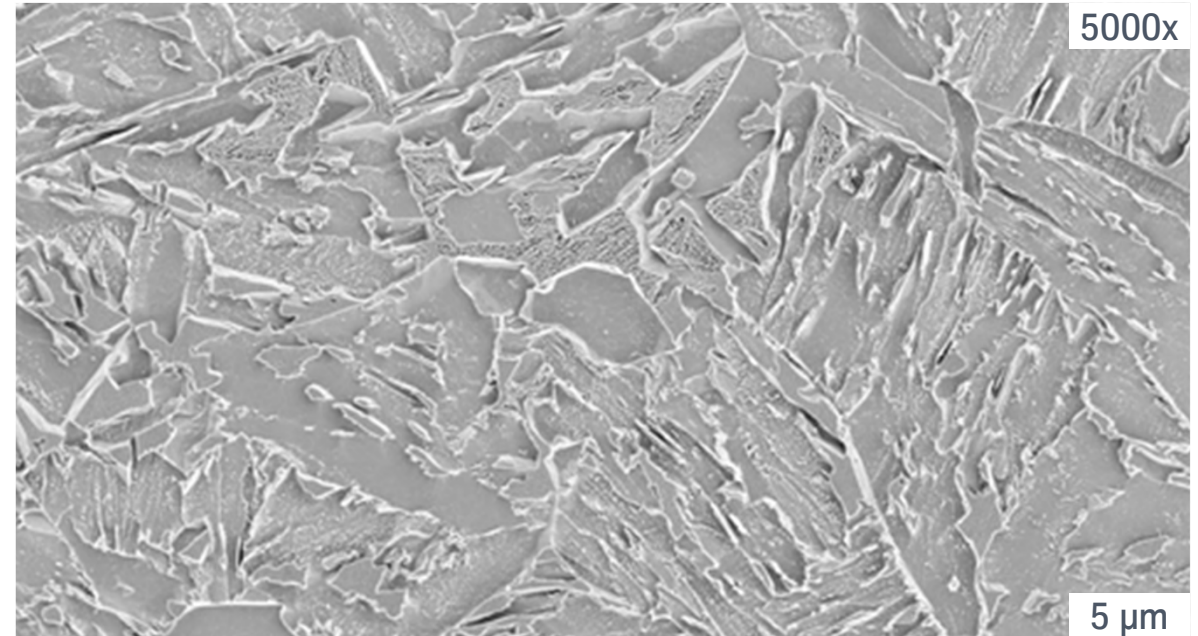
Good hole expansion capability and high resistance to sheared edge failure



Better crash performance compared with conventional DP steels thanks to increased yield strength



AHSS with optimized property profile for greater safety and efficiency in vehicle bodies



- Moderate alloying concepts
 - Homogeneous distribution of tensile strength across the microstructural components
- Excellent processing properties in the tensile strength class > 980 MPa



Characteristics of jetQ®

High yield strength – excellent local ductility



Mechanical properties

- High yield strength
- High local ductility

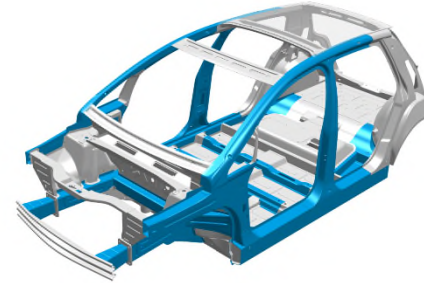


Parts performance

- High energy absorption
- High stretch flangeability

jetQ® is result of a technical cooperation between JFE & tkSE

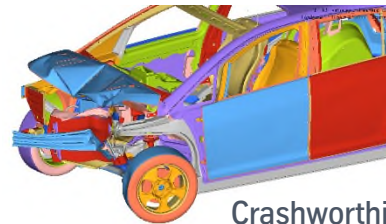
Potential applications



- Front side member
- Rear side member
- Rocker
- Seat cross member
- A pillar applications
- B pillar applications

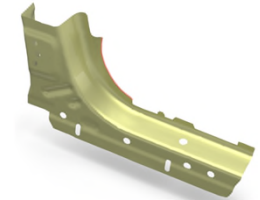
Customer Benefits

Weight & LCA saving



Crashworthiness

Production safety



Stretch flange



Global supply and availability

jetQ[®]: serving needs of globally acting OEM



Grade	CR ¹⁾	GI ²⁾	GA ¹⁾	Reference Grade, Standard ¹
jetQ [®] 700Y980T	●	●	●	JSC980YH, CR700Y980T-DH
jetQ [®] 850Y1180T	●	●	●	JSC1180YH, CR850Y1180T-FH ²

Availability and supply

- Already commercially available
- Under development

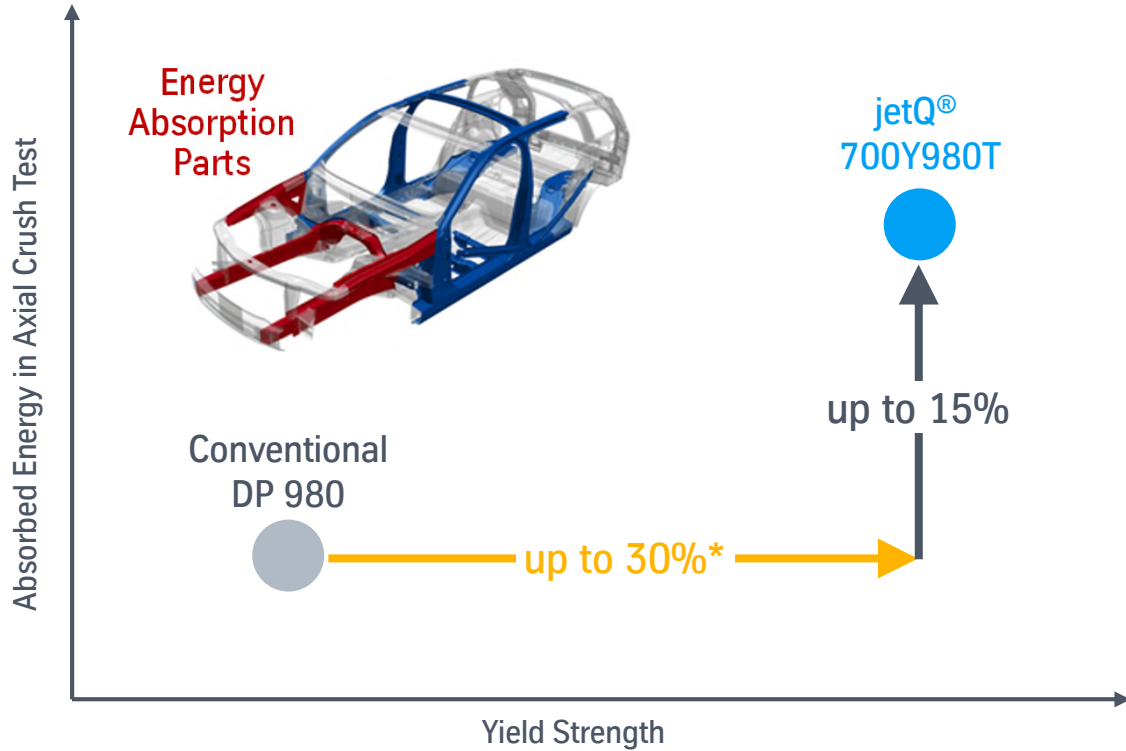
- 1) CR (UC) and Galvannealed (GA) products supplied by JFE
- 2) GI-coated products supplied by tkSE

1. VDA 239-100 or JFS A 2001 and A 3011; 2. Proposal for Revision VDA 239-100

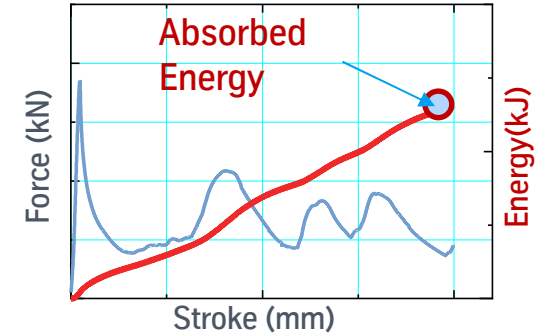


Crashworthiness – energy absorption

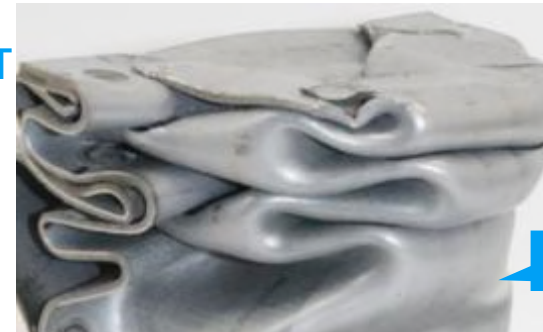
jetQ[®]: stable in axial deformation and therefore excellent for energy absorption parts



Axial crash test



jetQ[®]
700Y980T



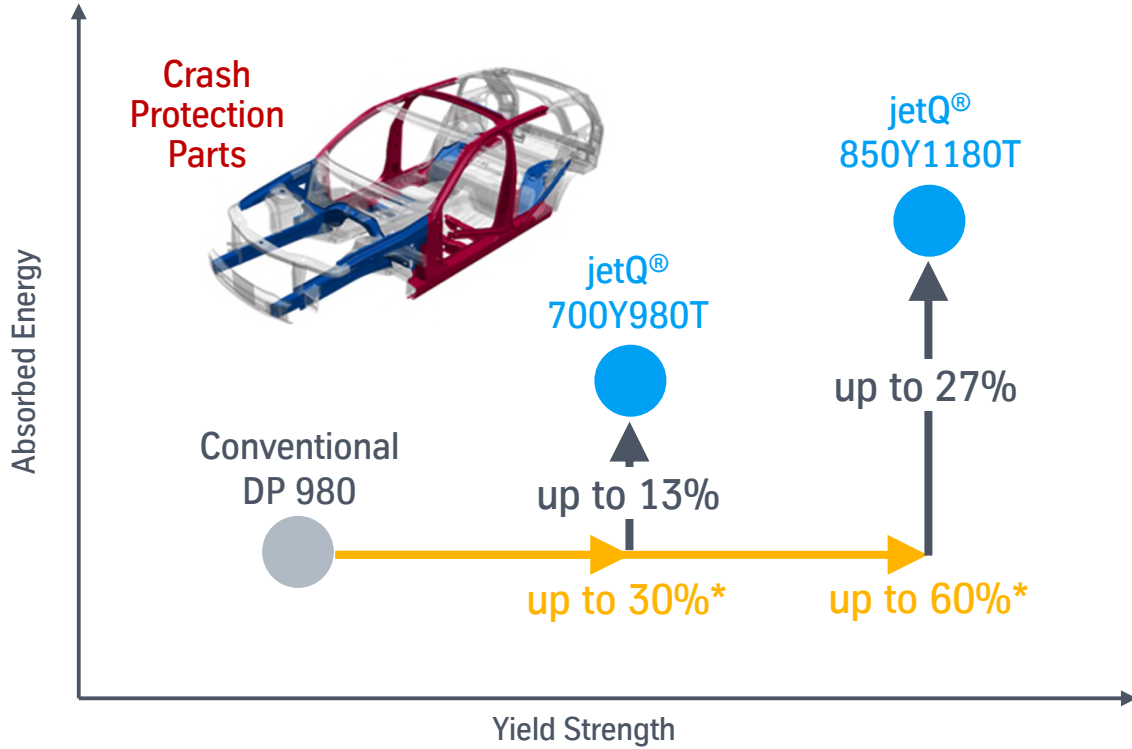
Stable deformation

jetQ[®] 700Y980T has a higher absorbed energy due to its higher yield strength than conventional DP 980

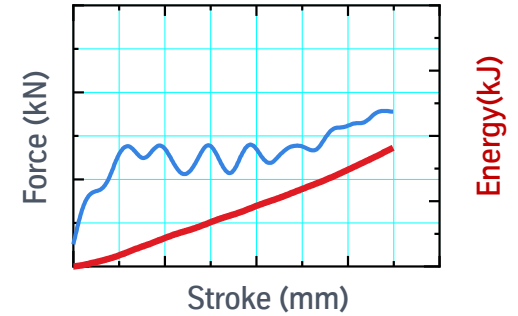
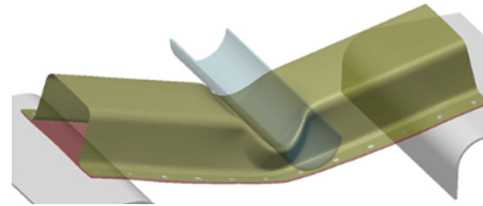
*depending on reference values

Crashworthiness – crash protection

jetQ[®]: stable in bending deformation and therefore excellent for crash protection



Three-point bending test



jetQ[®] 980



jetQ[®] 1180



Stable deformation

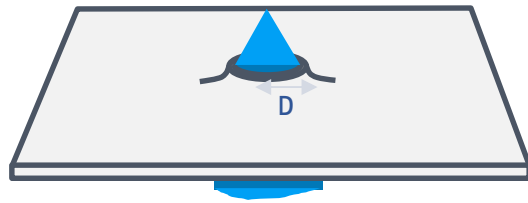
jetQ[®] 700Y980T/850Y1180T have a higher absorbed energy due to its higher yield strength than conventional DP 980

*depending on reference values

Stretch flange formability

Excellent stretch flangeability of jetQ®

Example:
Hole expansion test* of GI steels

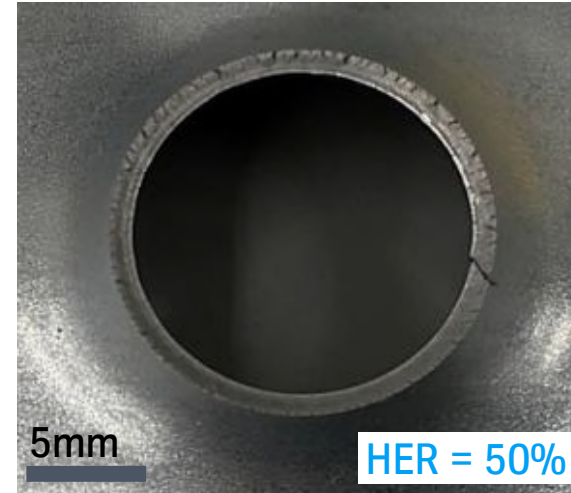


Hole Expansion Ratio (HER, %)
 $= (D_{\text{after}} - D_{\text{before}}) / D_{\text{before}} \times 100$

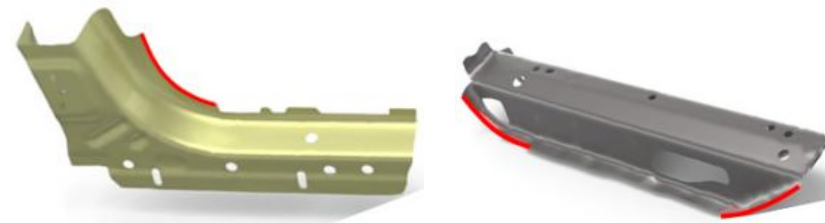
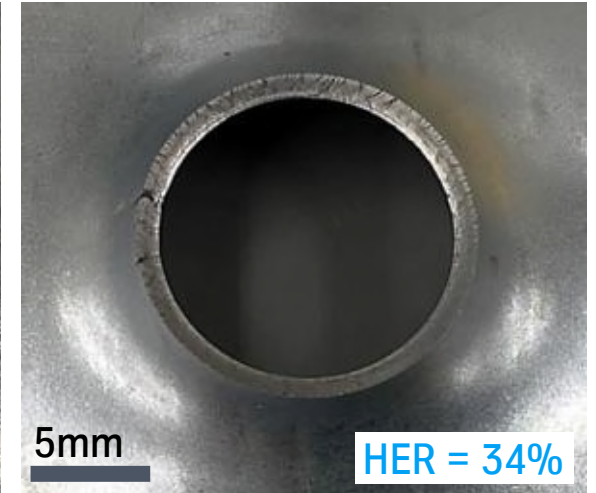
Conventional DP 980



jetQ® 700Y980T



jetQ® 850Y1180T



Stretch flange forming
in actual parts

— Stretch flange

Complex shape parts can be press formed with jetQ

* According to ISO 16630

Potential of jetQ[®] 700Y980T

Application & economic efficiency – microstory: front side member

Customer Requirement

High energy absorption in a crash situation

High ductility requirements for crash

Medium to high forming complexity

Benefit by jetQ[®] 700Y980T

Higher yield strength

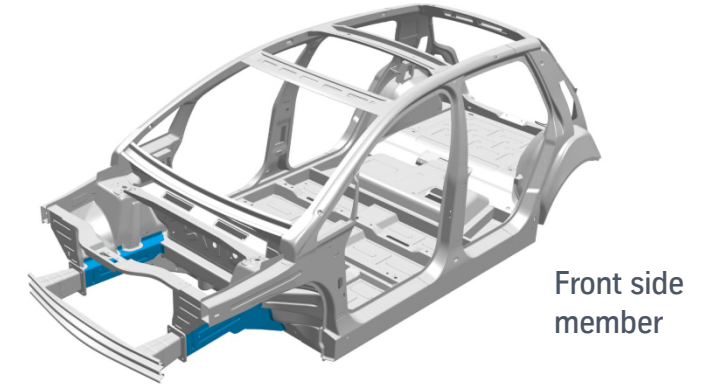
Less sensitive to cracking

Excellent local ductility

✓ Formability

✓ Crash safety

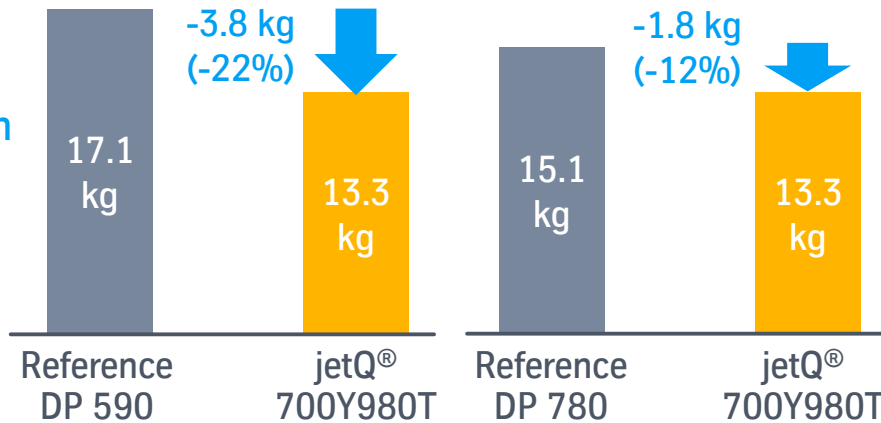
✓ Lightweight design



Front side member



Weight reduction per vehicle



A lightweight front side member is achieved by jetQ[®] 700Y980T keeping the crashworthiness of conventional DP 590/780.



Potential of jetQ[®] 850Y1180T

Application & economic efficiency – microstory: rocker

Customer Requirement

Benefit by jetQ[®] 850Y1180T

High crash deformation resistance

Higher yield strength

Medium ductility requirements for crash

Less sensitive to cracking

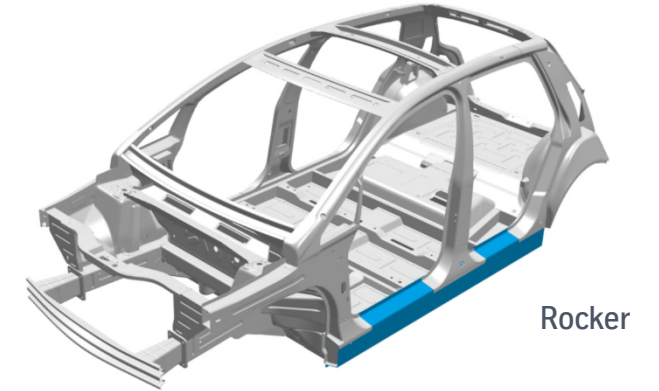
Medium to high forming complexity

Excellent local ductility

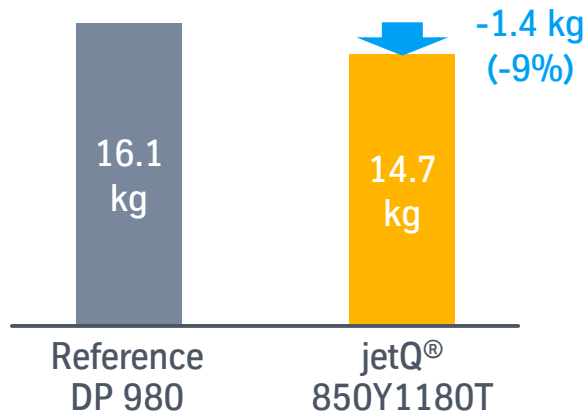
✓ Formability

✓ Crash safety

✓ Lightweight design



Weight reduction per vehicle



A weight reduction with similar crashworthiness is achieved by jetQ[®] 850Y1180T due to its increased yield strength compared to conventional DP 980.

In addition, jetQ[®] 850Y1180T has better formability than conventional DP 1180.

Mechanical properties – according to European standard

High yield strength & excellent hole expansion ratio



Grade	Coating	YS (MPa)	TS (MPa)	T-EL (%)	HER ¹ (%)	Remarks
jetQ [®] 700Y980T	GI	830	1030	14	40	-
Ref. 980DP		720	1030	12-17	20	DP 700/1000 WAS ²
jetQ [®] 850Y1180T	GI	1020	1200	15	25	-
Ref. 1180DP		880	1235	10-14	N/A	DP 800/1180 WAS ²
jetQ [®] 700Y980T	CR (UC)	810	1040	16	60	-
Ref. 980DP		720	1030	12-17	20	DP 700/1000 WAS ²
jetQ [®] 850Y1180T	CR (UC)	950	1220	13	40	-
Ref. 1180DP		880	1235	10-14	N/A	DP 800/1180 WAS ²

1. Hole Expansion Ratio, 2. from WAS (FSV Overview Report)



Mechanical properties – according to Japanese standard

High yield strength & excellent hole expansion ratio



Grade	Coating	YS (MPa)	TS (MPa)	T-EL (%)	HER ¹ (%)	Remarks
jetQ [®] 700Y980T	GA	850	1030	15	60	-
Ref. 980DP		720	1030	12-17	20	DP 700/1000 WAS ²
jetQ [®] 850Y1180T	GA	Under development				
Ref. 1180DP		880	1235	10-14	N/A	DP 800/1180 WAS ²
jetQ [®] 700Y980T	CR (UC)	810	1040	18	60	-
Ref. 980DP		720	1030	12-17	20	DP 700/1000 WAS ²
jetQ [®] 850Y1180T	CR (UC)	950	1220	15	40	-
Ref. 1180DP		880	1235	10-14	N/A	DP 800/1180 WAS ²

1. Hole Expansion Ratio, 2. from WAS (FSV Overview Report)



Mechanical properties – according to US standard

High yield strength & excellent hole expansion ratio



Grade	Coating	YS (MPa)	TS (MPa)	T-EL (%)	HER ¹ (%)	Remarks
jetQ [®] 700Y980T	GI	830	1030	15	40	-
Ref. 980DP		720	1030	12-17	20	DP 700/1000 WAS ²
jetQ [®] 850Y1180T	GI	1020	1200	16	25	-
Ref. 1180DP		880	1235	10-14	N/A	DP 800/1180 WAS ²
jetQ [®] 700Y980T	CR (UC)	810	1040	17	60	-
Ref. 980DP		720	1030	12-17	20	DP 700/1000 WAS ²
jetQ [®] 850Y1180T	CR (UC)	950	1220	14	40	-
Ref. 1180DP		880	1235	10-14	N/A	DP 800/1180 WAS ²

1. Hole Expansion Ratio, 2. from WAS (FSV Overview Report)



jetQ®: optimized AHSS material for geometrically complex crash structures

More safety and efficiency in vehicle bodies



The ideal balance between strength, formability and processing



Increased yield strength and local ductility for improved crash behavior



Local and global forming properties combined



Expanding application of cold forming in lightweight body structure

The ideal balance between strength, formability and processing



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