

Stress-Strain Curves

Hot forming Steels - Ductibor® 1000 treated

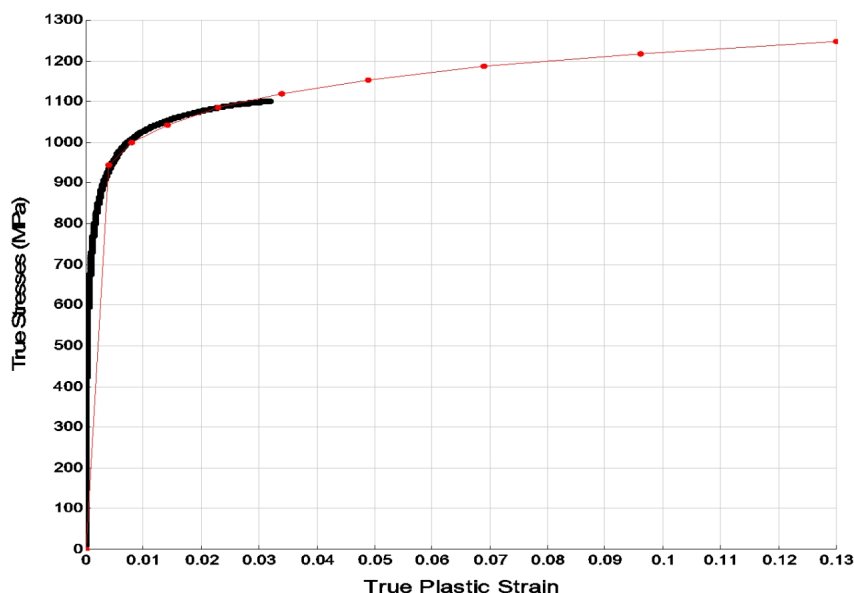


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Thickness (mm) 1.6

Coating AS150

Hollomon law



Parameters identified between 0.4 and 3.2 %

K (MPa) 1468
n 0.08

$$\sigma = K\varepsilon^n$$

Test conditions

Test direction	0°
Test Type	Uniaxial Tensile Test
Test procedure	NF EN ISO 6892-1
Procedure to determine "n"	ISO 10275
Procedure to determine "r"	ISO 10113
Sample geometry (b0xL0)	20*80
Gauge length (mm)	80

Test temperature	Room Temperature
Initial width of the calibrated zone (mm)	20.0
Initial thickness (mm)	1.58
Loading rate (MPa/s)	23
Strain rate before yielding (/s)	0.0025
Strain rate after yielding (/s)	0.008

Engineering properties

Ultimate Tensile Strength (MPa)	1067
Upper Yield Stress (MPa)	-
Lower Yield Stress (MPa)	-
Proof stress (MPa)	849

Ae (%)	-
Ag (%)	3.2
A (%)	5.6
n (3% - 20%/Ag%)	0.03
r (3% - 20%/Ag%)	0.56

AY0708/Rheo-TU-3100

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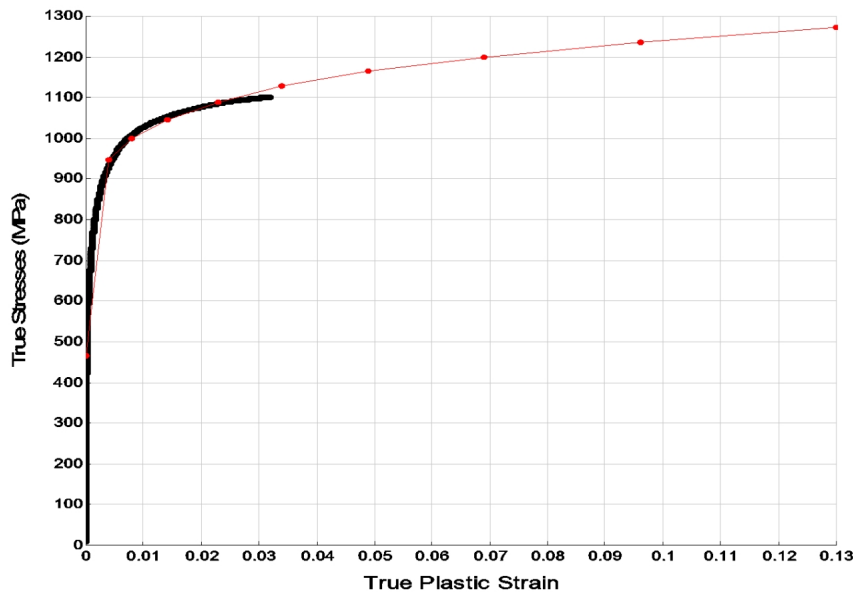
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Thickness (mm) 1.6

Coating AS150



Ludwig law



Parameters identified between 0.4 and 3.2 %

σ_0 (MPa)	466
K (MPa)	1092
n	0.15

$$\sigma = \sigma_0 + K\varepsilon^n$$

Test conditions

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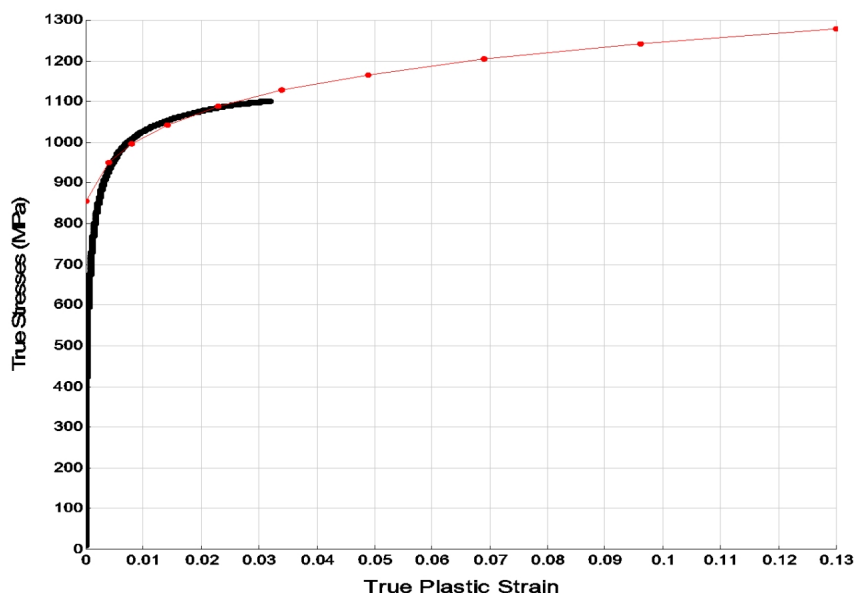
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Thickness (mm) 1.6

Coating AS150



Swift law



Parameters identified between 0.4 and 3.2 %

ε_0	0.0020
K (MPa)	1551
n	0.10

$$\sigma = K(\varepsilon_0 + \varepsilon)^n$$

Test conditions

Test direction	0°
Test Type	Uniaxial Tensile Test
Test procedure	NF EN ISO 6892-1
Procedure to determine "n"	ISO 10275
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Engineering properties

Ultimate Tensile Strength (MPa)	1067
Upper Yield Stress (MPa)	-
Lower Yield Stress (MPa)	-
Proof stress (MPa)	849

Ae (%)	-
Ag (%)	3.2
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n (3% - 20%/Ag%)	0.03
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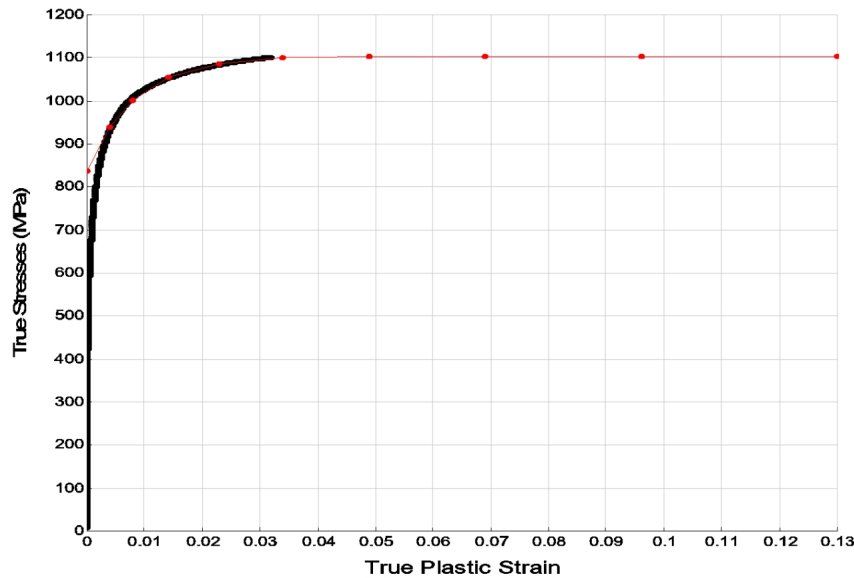
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Thickness (mm) 1.6

Coating AS150



Voce law



Parameters identified between 0.4 and 3.2 %

σ_0 (MPa)	838	m	119.56	$\sigma = \sigma_0 + R_{sat}(1 - \exp(-m\varepsilon))$
R_{sat} (MPa)	266			

Test conditions

Test direction	0°	Test temperature	Room Temperature
Test Type	Uniaxial Tensile Test	Initial width of the calibrated zone (mm)	20.0
Test procedure	NF EN ISO 6892-1	Initial thickness (mm)	1.58
Procedure to determine "n"	ISO 10275	Loading rate (MPa/s)	23
Procedure to determine "r"	ISO 10113	Strain rate before yielding (/s)	0.0025
Sample geometry (b0xL0)	20*80	Strain rate after yielding (/s)	0.008
Gauge length (mm)	80		

Engineering properties

Ultimate Tensile Strength (MPa)	1067	Ae (%)	-
Upper Yield Stress (MPa)	-	Ag (%)	3.2
Lower Yield Stress (MPa)	-	A (%)	5.6
Proof stress (MPa)	849	n (3% - 20%/Ag%)	0.03
		r (3% - 20%/Ag%)	0.56

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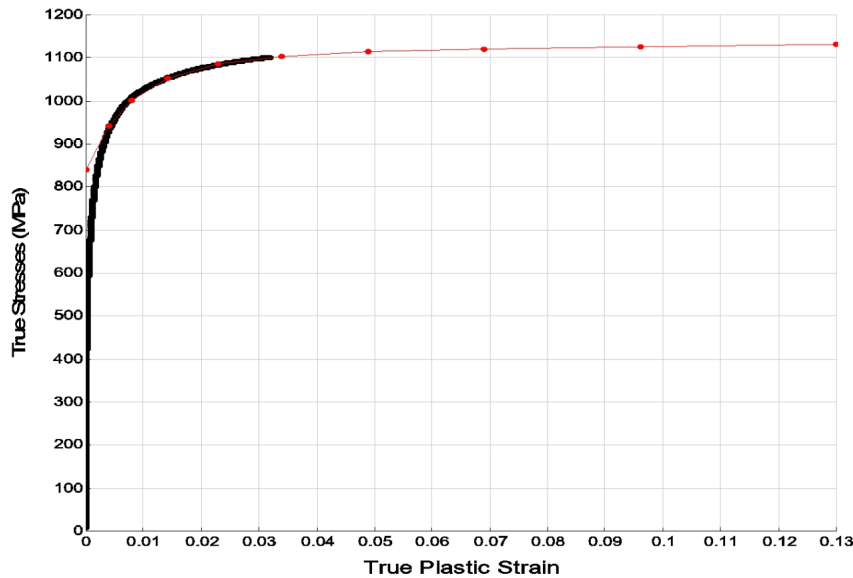


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Thickness (mm) 1.6

Coating AS150

Swift-Voce law (Recommended model)



Parameters identified between 0.4 and 3.2 %

ε_0	0.0020	R_{sat} (MPa)	266
K (MPa)	1551	m	119.56
n	0.10	α	0.84
σ_0 (MPa)	838		

$$\sigma = (1 - \alpha)K(\varepsilon + \varepsilon_0)^n + \alpha (\sigma_0 + R_{sat}(1 - \exp(-m\varepsilon)))$$

Test conditions

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