EDELSTAHL WITTEN-KREFELD GMBH

Play it safe

ULTRAFORT 6355

The steel for ballistic protection

ULTRAFORT 6355 – the high-tech steel fo

An ultra-hard grade that helps to save weight

When it comes to technology, Edelstahl Witten-Krefeld is one of the world's leading manufacturers of engineering steels. Our long-standing experience and tailor-made complete solutions make us the market leader in the particularly demanding field of bullet-proof plates. On the basis of targeted melting and alloying of the steel, advanced rolling technology and special know-how in the heat treatment sector, we can provide you with plates for components with maximum hard-core resistance and virtually unlimited service life or use. Compared to other steels, these products allow a substantial reduction in plate thickness and thus also in weight.

Ultrafort 6355 is equally suitable for monoplate solutions and composite solutions, which we develop in cooperation with renowned fibre manufacturers.

An ultra-hard grade with optimum processing properties

In contrast to quenched and tempered steels, where the necessary hardness is set by means of appropriate heat treatment prior to processing, we supply our Ultrafort 6355 maraging steel with a relative low hardness, good cold workability and excellent weldability. The desired hardness is achieved by ageing once processing has been completed. The intelligent steel composition permits the manufacture of complex components with minimum distortion. Edelstahl Witten-Krefeld ensures optimum heat treatment of the components at the factory, or carries it out itself on the customer's premises. Our specialists are at your disposal to provide detailed advice concerning the versatile range of processing options. Make use of our know-how. We can also put you in touch with companies offering laser and water-jet cutting services and are thus your partner for a complete solution. You can also contact us in connection with subsequent reutilisation and recycling.

Use our hotline: Fax +49 23 02/29 22 89

ULTRAFORT 6355 – Protection by more technology, not by more mass

or optimum ballistic protection

ULTRAFORT 6355

Material No.

1.6355

Chemical composition

Typical analysis in % by weight

C	Ni	Mo	Co	Ti
≤0.03	18.0	5.0	10.0	0.5 – 1.0

Form supplied

Plates: 2.5 – 9.5 mm, thickness tolerance: +0.5/-0.0 mm
Plate size: min: 500 x 1000 mm,
max: 800 x 2000 mm (depending on plate thickness, plate weight approx. 100 kg)

Mechanical properties

Heat treatment condition	Hardness in HRC
As-rolled condition	≤38
Precipitation hardened	≤60

Bullet resistance

[1] *Full-jacket pointed bullet with Fe core*

[2] *Full-jacket pointed bullet with lead core and steel penetrator (Type SS 109)*

[3] *Full-jacket pointed bullet with hard core and incendiary filler*

[4] *Full-jacket pointed bullet with steel hard core (core mass 3.8 g; hardness min. 63 HRC)*

Weapon type Example	Ammunition				Test conditions		Class acc. to DIN EN 1522, 1999	Required plate thickness (mm)
	Calibre	Type	Mass ±0.1 (g)	Energy (J)	Firing distance ±0.5 (m)	Striking velocity ±10(m/s)		
Revolver, Smith & Wesson 586, Colt Python	.357 Magnum	FJ, CB SC	10.2	943	5	430	FB3	3.0[a]
Revolver, Smith & Wesson 629, Colt Anaconda	.44 Magnum	FJ, FN SC	15.6	1,510	5	440	FB4	3.4[a]
Rifle, AK 47 (Kalaschnikov)	7.62 x 39	FJ, PB, SCP[1]	8.0	1,936	10	700	–	5.0[a]
Rifle, Heckler & Koch HK 50, M16	5.56 x 45	FJ, PB, SCP[2]	4.0	1,805	10	950	FB5	6.0[b]
Rifle, FN NATO FAL 7.62	7.62 x 51	FJ, PB, SC	9.5	3,272	10	830	FB6	6.5[b]
Rifle, AK 47 (Kalaschnikov)	7.62 x 39	API-HC[3]	7.8	2,106	10	745	–	7.2[b]
Rifle, FN NATO FAL 7.62	7.62 x 51	FJ, Sp, HC[4]	9.8	3,295	10	820	FB7	9.3[b]

[a] *Precipitation hardened to 50 ±2 HRC* [b] *Precipitation hardened to 57 ±2 HRC*

Hot forming and heat treatment

Hot forming [°C]	Cooling	Solution annealing [°C]	Duration min. [h]	Cooling
1200 – 800	Air	820 – 900	1	Air

Precipitation hardening: We recommend having the moulded plates precipitation hardened to our specifications at the TES hardening shop in Lüdenscheid, Germany, in order to achieve optimum bullet resistance.

Physical properties

[1] *Precipitation hardened*

Density	Modulus of elasticity [GPa] at temperature in °C					Thermal conductivity at 20 °C	Specific heat capacity at 20 °C
[g/cm³]	20	100	200	300	400	[W/m·K]	[J/g·K]
8.10	203	199	194	187	181	23.57[1]	0.44[1]

Condition	Thermal expansion [10⁻⁶/°C] between 20 °C and				Electric resistance at 20 °C
	100 °C	200 °C	300 °C	400 °C	[Ωmm²/m]
As-rolled	9.9	10.7	11.1	11.2	0.47
Precipitation hardened	10.3	11.0	11.2	11.5	0.47

Form supplied

Ultrafort 6355 displays good formability and machinability in solution-annealed or rolled condition as a result of its microstructure (nickel martensite). Data on maximum bending angles are available on request.
A marginal change in volume (contraction of approx. 0.5 mm/m) occurs after subsequent precipitation hardening.

Welding

Weldability: Good weldability by the TIG method
Filler metals: Same or similar, DIN 8555: SG3-370-590 (e.g. Fontargen A 770 M; A 770 W)
Preheating: Not necessary

Applications

Ultrafort 6355 is particularly suitable for ballistic protection against hard-core ammunition. The necessary plate thickness depends on the prevailing protection requirements. The results can be attested by official test certificates upon request.

Better protection,
lighter construction
ULTRAFORT 6355
the “intelligent shield”
from Edelstahl Witten-Krefeld

Cover/rear photo:
Ultrafort specimen after testing with hard-core ammunition

EDELSTAHL WITTEN-KREFELD GMBH
Auestrasse 4, D-58452 Witten
Telephone +49 2302/294511 · Telefax +49 2302/292289
Internet: www.edelstahl-witten-krefeld.de

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