



SECURE 500

Protection Steels



**ILSENBURGER
GROBBLECH**

A Member of the Salzgitter Group

Armour steel	Steel grade	Material No.	Issue
	ILG-Short Name	EN-Short Name	
Heavy plate	SECURE 500	30CrMoNb5-2 30NiCrMo14-5	- April 2022 1.6947

SCOPE

This Material Specification applies to the alloyed, liquid-quenched and tempered high-strength special steel **SECURE 500** for civil use, produced in thicknesses from 6 mm up to 90 mm. This steel is delivered with defined properties of ballistic protection. The Delivery above 90 mm and up to 150 mm in thickness requires special agreement.

APPLICATION

The steel may be used at the discretion of the purchaser for purposes of ballistic protection mainly for applications such as armoured limousines and transporters of valuables. The entire processing technique is of fundamental importance for the good performance of the products made of this steel. The processor must assure himself that his methods of calculation, design and working conform with the material to be used, meet the latest requirements of technical progress and are suited to the proposed application.

The selection of the material is up to the purchaser.

CHEMICAL COMPOSITION (heat analysis, %)

thick-ness	C	Si	Mn	P	S	Cr	Mo	Ni	Al
≤ 50 mm	≤ 0.32	≤ 0.40	≤ 1.00	≤ 0.015	≤ 0.005	≤ 1.50	≤ 0.50	≤ 0.70	≤ 0.110
> 50 mm	≤ 0.32	≤ 0.40	≤ 0.50	≤ 0.015	≤ 0.005	≤ 1.50	≤ 0.60	≤ 3.70	≤ 0.050

The steel additionally may contain Ti, Nb and B.

DELIVERY CONDITION:

quenched and tempered (see paragraph „Heat treatment“)

HARDNESS AT AMBIENT TEMPERATURE:

480 - 530 HBW (other hardness ranges according to customers requirements are possible). The hardness shall be determined in accordance with ISO 6506-1. The hardness is to be determined about 1 mm below plate surface.

TYPICAL MECHANICAL PROPERTIES in the state of delivery condition at room temperature (transverse specimens according to ISO 6892-1, method B), Charpy-V-test acc. ISO 148-1 (transverse specimens).

Yield Strength ReH *)	Tensile Strength Rm	Elongation at Fracture A	Impact Energy
MPa	MPa	%	- 40 °C, J
1,300	1,600	9	25

*) If yielding occurs, the yield is determined as $R_{p0.2}$.

BALLISTIC PROPERTIES

Plates from **SECURE 500** exhibit an increased resistance against ballistic threat. If a certain ballistic resistance is desired against a standardized ballistic threat, then it is necessary for reaching the desired performance that the customer specifies the appropriate examination and certification in the order. Orientation values for the minimum plate thickness for bullet resistance are summarized in the annex. The orientation values do not replace however a standardized examination and certification, which must be given in the order, if the customer wishes the suitability for a certain ballistic threat.

NUMBER OF TESTS

Unless otherwise agreed upon in the order, the tests listed below will be performed during inspection: Hardness testing will be determined once per 40 t of a heat. The following options are possible in addition and must be agreed upon separately. If the customer doesn't take any use from these options at the time of the inquiry and ordering, the products are to be delivered in accordance with the base specifications of this document.

- ultrasonic testing acc. to EN 10160, class S1/E1
- bullet resistance testing can be performed according to customers requirements

All test results are documented by inspection certificates following EN 10204-3.1.

Independently of the requirements specified in the order the ballistic properties SECURE 500-plates with a thickness up to 14.5 mm are examined according to an ILG-internally specified testing procedure.

GENERAL PROCESSING INFORMATION

For those, who process this steel for the first time it is recommended to consult the steel supplier to take advantage of the experiences gathered so far. The general information below can only cover a few important points. The information outlined in Stahl-Eisen-Werkstoffblatt 088 (weldable fine grain structural steels, processing directions especially for welding) applies equally to this steel. Recommendations for welding are also given in EN 1011 part 1 and part 2 - Welding, Recommendation for welding of metallic materials. Based on application, the customer is responsible for the correct selection of the material as well as the appropriate processing based on current technology. In principle, the processing recommendation of EN 1011 and CEN/TR 10347 apply.

COLD FORMING

Plates of the steel grade **SECURE 500** can be cold formed at ambient temperature under consideration of their strength. The forming force and the amount of elastic recovery are greater than that of conventional structural steels. Cutting edges must be ground, flash trimmed and smoothly rounded before forming. Cold forming of plates must be performed at low forming speed at room temperature. Preheating is not recommended. Stress relieve heat treatment after forming should be avoided because of the decrease of hardness. Detailed information is given in our processing recommendations.

HEAT TREATMENT

In general this steel obtains its mechanical properties through austenitization followed by conventional quenching and tempering. The heat treatment depends on the chemical composition and the product thickness. To avoid decrease of hardness, **SECURE 500** must not be heated above 200 °C.

THERMAL CUTTING

For plate thickness up to 15 mm the laser-cutting process is preferably used. For plates up to 40 mm in thickness plasma cutting under water is recommended. Flame cutting is also possible. According to the plate thickness a sufficient pre- and post-heating is required. Detailed information is given in our processing recommendation for cutting.

WELDING

If due consideration is given to the general rules for welding, this steel is weldable both manually and automatically. To prevent cold cracking in the welded joints only welding consumables should be used that lead to the lowest possible hydrogen content in the weld metal. The use of the austenitic welding consumable type 18 8 Mn is recommended. For plate thicknesses up to 25 mm preheating is generally not necessary. For high loaded welds, welded with a ferritic welding consumable, preheating should be carried out for the thicknesses specified in Stahl-Eisen-Werkstoffblatt 088. The height of the preheating temperature for welding depends on plate thickness and residual stress behavior of the construction. Inter-pass temperatures above 200 °C should be avoided. Detailed information is given in our processing recommendation for welding.

DIMENSIONS AND TOLERANCE

		Quarto Plate
Thickness		6 - 150 mm*
Thickness Tolerance	≥ 6.0 and ≤ 13.0 mm:	-0 / +0.8 mm
	>13.0 and ≤ 20.0 mm:	-0 / +1.0 mm
	> 20.0 and ≤ 40.0 mm:	-0 / +1.2 mm
	> 40.0 and ≤ 60.0 mm:	-0 / +1.6 mm
	> 60.0 and ≤ 80.0 mm:	-0 / +2.0 mm
	> 80.0 and ≤ 110.0 mm:	-0 / +2.4 mm
	≥ 110 mm:	-0 / +3.0 mm
Width		1,250 - 3,200 mm**
Length		4,000 - 12,000 mm

* lower thickness on request

** depending on the plate thickness

GENERAL INFORMATION

Unless otherwise agreed upon in the order, the delivery will be subjected to the conditions outlined in EN 10021.

The admissible tolerances for plates are based on EN 10029 for four-high mill plates, unless other terms have been agreed upon.

Thickness tolerances are according to the table shown above (paragraph on „Dimensions and tolerances“).

The plates will be supplied with a maximum flatness tolerance according to EN 10029, class N (smaller flatness tolerances by special agreement). The flatness is determined in acc. to EN 10029.

For surface quality requirements EN 10163 is applicable.

As per special agreement it is possible to supply plates descaled or descaled and primed.

PUBLISHER'S ADDRESSES

EN, ISO STANDARDS

Beuth Verlag GmbH, D-10772 Berlin

STAHL-EISEN-Werkstoffblätter

Beuth Verlag GmbH, D-10772 Berlin

Recommendation for thermal cutting of SECURE steels

Ilseburger Grobblech GmbH, Veckenstedter Weg 10,
38871 Ilseburg

Recommendation for welding of SECURE steels

Ilseburger Grobblech GmbH, Veckenstedter Weg 10,
38871 Ilseburg

Ilseburger Grobblech GmbH Steel brochure

“SECURE Protection Steels.”

Ilseburger Grobblech GmbH, Veckenstedter Weg 10,
38871 Ilseburg

Classification	Weapon		Bullet		Test Conditions	SECURE 500 (480-530 HB)	
EN 1063 / EN 1522	Type	Calibre	Type	Mass [g]	Shot distance [m]	Bullet speed ¹⁾ [m·s ⁻¹]	Orientation values for minimum thickness ²⁾ for bullet resistance [mm]
BR / FB 3	handgun	.357 Magnum	FJ/CB/SC	10.2	5	430 ± 10	3.0 ³⁾
BR / FB 4		.44 Magnum	FJ/FN/SC	15.6	5	440 ± 10	3.0 ³⁾
BR / FB 5	rifle	5,56 mm x 45 (SS 109) twist length: 178 + 10 mm	FJ/PB/SCP1	4.0	10	950 ± 10	6.5
BR / FB 6		7,62 mm x 51	FJ/PB/SC	9.5	10	830 ± 10	6.5
BR / FB 7		7,62 mm x 51 (AP) twist length: 254 + 10 mm	FJ/PB/HC1	9.8	10	820 ± 10	15.0
		.44 Magnum	FJ/FN/SC	15.6	3	435 - 455	3.0 ³⁾
without classification	handgun	7,62 mm x 39 (Kalashnikow)	FJ/PB/SC	7.9	25	710 ± 15	4.0 ³⁾
			API	7.7	25	730 ± 15	12.0
	rifle	7,62 mm x 51	FJ/PB/SC	9.5	10	785 - 795	5.5 ³⁾
		7,62 mm x 51 (AP)	FJ/PB/HC1	9.8	25	800 - 810	14.5
		5,56 mm x 45 (SS 92)	FJ/PB/SC	3.6	25	965 - 975	9.0

FOOTNOTES:

1) without classification: Bullet velocity in 2.5 m behind of muzzle
 EN 1522, EN 1063: Impingement bullet velocity ≤ 2.5 m from front of sample

2) Values for the minimum thicknesses, given in the table, are nominal thicknesses

3) The required thickness of plate lies under the minimum delivery thickness of 3mm

TERMS AND ABBREVIATIONS:

FJ/RN: Full metal jacket bullet, round nose
 FJ/FN: Full metal jacket bullet, flat nose
 FJ/PB: Full metal jacket bullet, pointed bullet
 FJ/CB: Full metal jacket bullet, coned bullet
 SC: Soft core (lead)
 SCP1: Soft core (lead) and steel penetrator (type SS 109)
 HC1: Steel hard core, mass 3.7 ± 0.1 g, > 63 HRC
 API: Armoured piercing ignition

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