DIFENDER 600 PH

High strength armoured steel

Material data sheet, edition October 2023[1]

DIFENDER 600 PH is an alloyed, high strength quenched and tempered steel with special suitability for press hardening (PH). In service condition, it is characterized by particularly high resistance to bullets, which is why it is also suitable for additional superstructures to break the bullet core and thus prevent penetration into softer (protection) steels, e.g. the vehicle structure. Due to the steel's exceptional ballistic performance, customers use it for vehicle armor in both the civilian and military sectors. It is preferably used where the armor must be as light as possible. Due to its chemical composition, it is particularly suitable for hot forming for the production of 3D structural parts.

Product description

Definition and range of application

DIFENDER 600 is an alloyed, high strength quenched and tempered steel, with a maximum hardness of up to 640 HBW. The achievable hardness depends on the quenching and tempering process.

DIFENDER 600 PH can be supplied in the thickness range between 6 - 25 mm.
Dimensions are to be agreed during inquiry.

Chemical composition

For the ladle analysis, the following max. values in % are applicable:

C	Si	Mn	P	S	Cr	Ni	Mo
0.55	1.2	1.50	0.010	0.005	1.50	4.50	0.70

Typical values for carbon equivalent (CEV) can be submitted upon request.

Delivery condition

The plates are supplied in the soft annealed condition.

[1]) The current version of this material data sheet can also be found on https://www.dillinger.de/products/.

Mechanical and ballistic properties

Hardness

In the quenched and tempered condition, a surface hardness of up to 640 HBW can be achieved at room temperature. The achievable hardness at the surface of the parts depends on the quenching and tempering process and is the responsibility of the manufacturing company.

Ballistic properties

Since the material is supplied untempered and only acquires its final mechanical-technological properties during processing at the customer's site, no ballistic properties are confirmed the factory.

Testing and documentation

The test results are documented together with the chemical analysis and the plate dimensions in a certificate 3.1 according to EN 10204.
On request, the hardness in the soft annealed condition can be determined per melt.

Identification of plates

Unless otherwise agreed the marking is carried out via perforated steel stamps with at least the following information:

- steel grade (DIFENDER 600 PH)
- heat number
- number of mother plate and individual plate
- the manufacturer’s symbol
- inspector’s sign

Processing

The entire processing and application techniques are of fundamental importance to the reliability of the products made from this steel. The user should ensure that his design, construction and processing methods are aligned with the material, correspond to the state-of-the-art that the fabricator has to comply with and are suitable for the intended use. The customer is responsible for the selection of the material. The recommendations in accordance with EN 1011 should be observed. The high tensile properties of the armoured steel can lead to a higher crack probability while processing.

Welding and thermal cutting

The heat input during welding and thermal cutting can lead to a decrease in hardness in a small area adjacent to or in the weld seam. This can have an impact on the bullet resistance properties of DIFENDER 600 PH. The manufacturer is advised to take this into account in his design.

Forming

Due to its chemical composition, DIFENDER 600 PH is suitable for hot-press hardening of 3D structural parts. The steel obtains its hardness by accelerated cooling from the austenitizing temperature. Care must be taken to ensure that the martensite temperature is quickly and reliably undershot over the entire cross-section. Subsequent tempering gives the component its application properties, e.g. bullet resistance. The usual quenching and tempering parameters for the plate can be provided on request.

Heat treatment

The heat treatment must be carried out under the conditions described above in the chapter Forming.

Machining

DIFENDER 600 PH is easily machinable in the soft annealed condition.

General technical delivery requirements

Unless otherwise agreed, the general technical delivery requirements in accordance with EN 10021 apply.

Tolerances

Unless otherwise agreed the following tolerances apply:

For width and length tolerances EN 10029 table 2 and 3 will apply.

Thickness [mm]	6 ≤ t ≤ 16	16 < t ≤ 20	20 < t ≤ 25
Tolerance [mm]	-0 / +0.8	-0 / +0.9	-0 / +1.0

Unless otherwise agreed, the flatness tolerances will be in accordance with EN 10029, table 4, steel group H.
Smaller flatness and/or thickness tolerances may be agreed upon request.

Surface quality

Unless otherwise agreed, the indications in accordance with EN 10163-2, class B3, apply.

Surface protection

Upon request the plates can be shot blasted and / or primer coated with a product at the manufacturer's choice. In case you wish the application of a shop primer, but you do not specify the shop primer in detail, Dillinger offers shop primers as standard: you will find more information in our brochure „Shot blasted and primer coated heavy plates“ (https://www.dillinger.de/downloads/).

Ultrasonic examination

Unless otherwise agreed, indications be in accordance with EN 10160, class S2/E2 apply.

General note

If particular requirements, which are not covered in this material data sheet, are to be met by the steeldue to its intended use or processing, these requirements are to be agreed before placing the order.

The information in this technical data sheet is a product description. This material data sheet is updated at irregular intervals. The current version is available from the mill or as download at https://www.dillinger.de/products/.

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