



DILLINGER HÜTTE GTS

DI-MC 550

WELDABLE FINE-GRAINED STRUCTURAL STEEL
THERMOMECHANICALLY ROLLED

Specification DH-E05-A
Edition September 1999

DI-MC 550 is a thermomechanically rolled, fine-grained structural steel which has a minimum yield strength of 550 N/mm² in its delivery condition. Due to its chemical composition, it has a low carbon equivalent and hence good weldability.

The steel is preferentially used for steel structures with high requirements on the weldability.

Product description

Designation and range of application

DI-MC 550 plates can be delivered in thicknesses from 8 to 30 mm. Greater plate thicknesses may be possible on request.

Chemical composition

Limiting values for the ladle analysis in %:

C	Si	Mn	P	S	Al	N
≤ 0.14	≤ 0.50	≤ 2.00	≤ 0.020	≤ 0.006	≤ 0.06	≤ 0.012
Nb	Ti	V	Nb+Ti+V	CEV ¹⁾	PCM ¹⁾	
≤ 0.05	≤ 0.04	≤ 0.10	≤ 0.15	≤ 0.45	≤ 0.28	

¹⁾ The following carbon-equivalents are applicable:

IIW-formula: $CEV = C + Mn/6 + (Cr + Mo + V)/5 + (Cu + Ni)/15$

PCM-formula: $PCM = C + Si/30 + (Mn + Cu + Cr)/20 + Ni/60 + Mo/15 + V/10 + 5B$

Lower PCM-values can be agreed upon request, e.g. 0.24%.

Delivery condition

The plates are delivered in the thermomechanically rolled condition, if necessary with accelerated cooling (short designation TM or M).

Mechanical properties in the delivery condition

Tensile test at ambient temperature - transverse test specimens -

Minimum Yield strength R_{eH} ¹⁾ in N/mm ²	Minimum Tensile strength R_m in N/mm ²	Minimum Elongation A_5 in %
550	620	16

¹⁾ If not apparent, the yield strength $R_{p0.2}$ is measured.

Impact test with Charpy-V-longitudinal specimens

Test temperature in °C	Impact values A_v in J
-20	40
-40	28

The specified values are minimum values; they are the average of 3 specimens, whereby the lowest individual value may not be less than 70% of the specified minimum. For plate thicknesses below 10 mm the test on Charpy-V-specimens will be performed with reduced width. Therefore, the minimum value of the impact energy will be reduced in proportion to the reduction of the specimen's cross section.

Testing

Tensile test and impact tests are carried out once per heat and plate thickness at one end of a rolled plate in $\frac{1}{4}$ of the plate width.

The tensile test is carried out in accordance with EN 10 002-1. The impact test is carried out on Charpy-V-longitudinal specimens in accordance with EN 10 045-1. The test temperature is -40°C, if not otherwise specified.

Unless otherwise agreed, the test results are documented in a certificate 3.1.B in accordance with EN 10 204.

Identification of plates

The plates are at least marked by stamp with the following information:

- heat number
- plate number
- steel designation (DI-MC 550)
- manufacturer's brand

Fabricating properties

The entire fabrication and application techniques are of fundamental importance for the reliability of products manufactured with these steels. The fabricator should ensure that his calculation, design and manufacturing methods are suitable for the intended application, are state of the art and, that they correspond with the properties of the material. The customer is responsible for the selection of the material. The recommendations of the Stahl-Eisen-Werkstoffblatt 088 or ECSC Information Circular No. 2 should be observed.

Hot forming

Hot forming, i.e. forming at temperatures above the maximum allowable stress-relieving temperature of 580°C, leads to changes in the original microstructure. It is not possible to re-obtain the same material properties that had been achieved during the original manufacture through a further heat treatment.

Cold forming

DI-MC 550 has in general good cold forming properties, i.e. it can be formed at temperatures below 580°C, (bending radius $\geq 2 \times$ plate thickness for an angle $\leq 90^\circ$). The only point to note is that cold forming leads to an increase in the hardness and a decrease in the toughness of the steel. As a rule, this change in the mechanical properties can be partially recovered by a subsequent stress relieving. In case of higher cold forming ratios, it is advisable to consult the steel manufacturer prior to placing the order.

Weldability

DI-MC 550 has an excellent weldability if the general technical rules are observed (see specification SEW 088 or ECSC Information Circular No. 2). The risk of cold cracking is low. However, for manual arc welding we recommend to weld with re-dried basic electrodes with very low hydrogen input, in order to avoid hydrogen induced cold cracking.

Shielded type: minimum preheat and interpass temperature:
basic 80°C for a plate thickness of 30 mm

The $t_{8/5}$ -time should be between 5 and 30 s. Thus, the welding parameters should be chosen accordingly (calculation according to SEW 088). The electrodes should be treated according to the prescriptions of the manufacturer, i.e. re-dry as far as necessary before use.

Heat treatment

A stress relieving should be carried out between 530 and 580°C followed by cooling in still air. The total holding time should not exceed 150 minutes (even if multiple operations are carried out). For a holding time of more than 90 minutes, the lower limit of the temperature range should be aimed at. A heat treatment at higher temperatures may affect the mechanical properties.

Tolerances

Unless otherwise agreed, the tolerances will be in accordance with EN 10 029, with class A for thickness.

Surface quality

Unless otherwise agreed, the specifications will be in accordance with EN 10 163, class A2.

General notes

If particular requirements are demanded and not covered in this data sheet, please contact us with the specifications for our review and agreement prior to ordering.

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