



钢铁之家

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全球钢号百科!

Global Steel Grade Encyclopedia



涵盖的行业或国家与地区类别



国际材料与试验协会

GJB

国家军用标准



动力机械工程师协会

EU

前欧洲标准化

AISI

美国钢铁学会



德国工业标准

AMS

航空航天材料规范



国际标准

JASO

日本汽车标准组织

EN

欧洲标准

JB

中国机械行业标准

UNS

统一编号系统

UNI

意大利标准



美国机械工程师协会

SS

瑞典标准



国家标准



日本工业标准

WR15E[®]

WR15E[®] is a precipitation or age-hardened mould steel with a uniform through hardness of approximately 40 HRC. It is a very clean steel with uniform grain structure, uniform hardness, and excellent dimensional stability.

UNIQUE CHARACTERISTICS:

40 HRC hardness ; age-hardened for uniformity of hardness throughout, even in heavy sections ; possibility of repair welding ; machining speed increase by 10-20% against typical plastic mould steels (f.i. P20) ; never needs stress relieving, even after heavy machining ; possibility of nitriding; polishability high gloss

CHEMICAL ANALYSIS: %

C	Mn	Ti	N	Ni	Cu	Al
0,15	1,40	0,015	0,013	2,8	0,9	0,9

PHYSICAL PROPERTIES :

Coefficient of thermal expansion	20-100 °C [10 ⁻⁶ m/(m x K)]	20-200 °C [10 ⁻⁶ m/(m x K)]	20-300 °C [10 ⁻⁶ m/(m x K)]
		11,3	12,6
Thermal conductivity	100 °C [W/(m x K)]	200 °C [W/(m x K)]	
		41,3	42,2

ULTRASONIC:

ASTM A388 - FBH max. 3 mm (1/8 inch) or
 SEP 1921 – test group 3 – class E , e or acc. to your request

DELIVERY CONDITION :

Age-Hardened with approx. 40 HRC

CLEANLINESS:

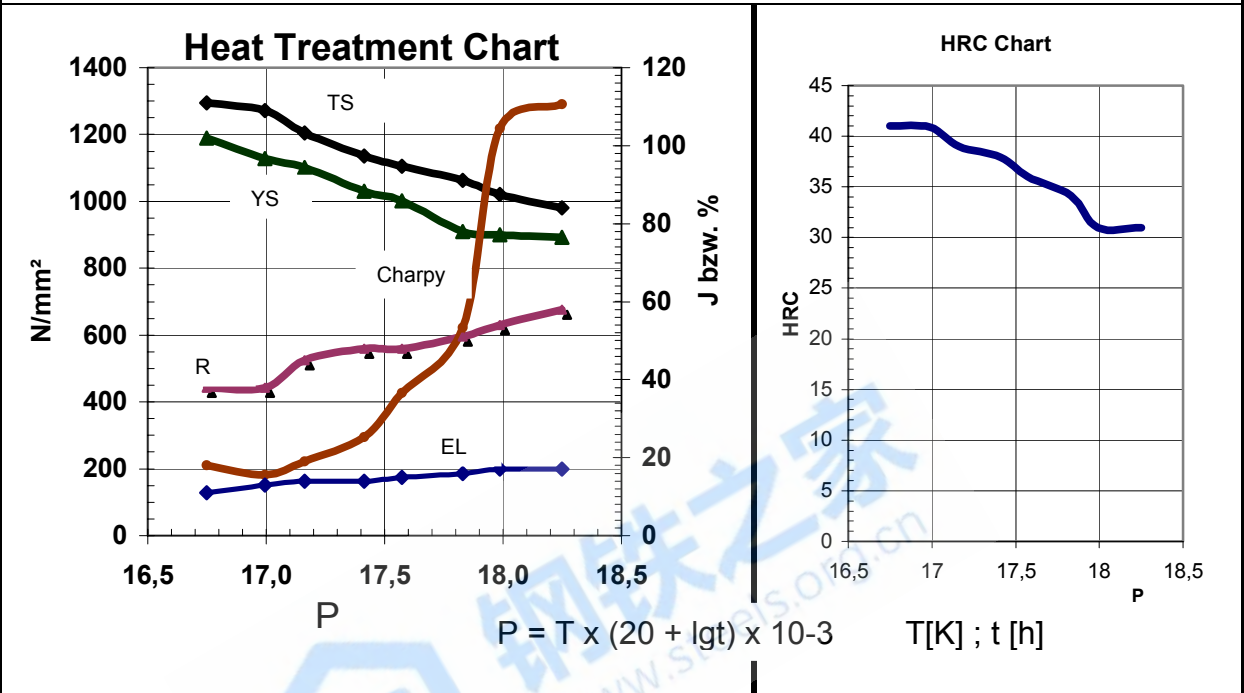
ASTM E45- Method A with type A, B, C ≤ 1,0 ;D each ≤ 2 or
 DIN 50602– K1 ≤ 10 or
 acc. to your request

HEAT TREATMENT:

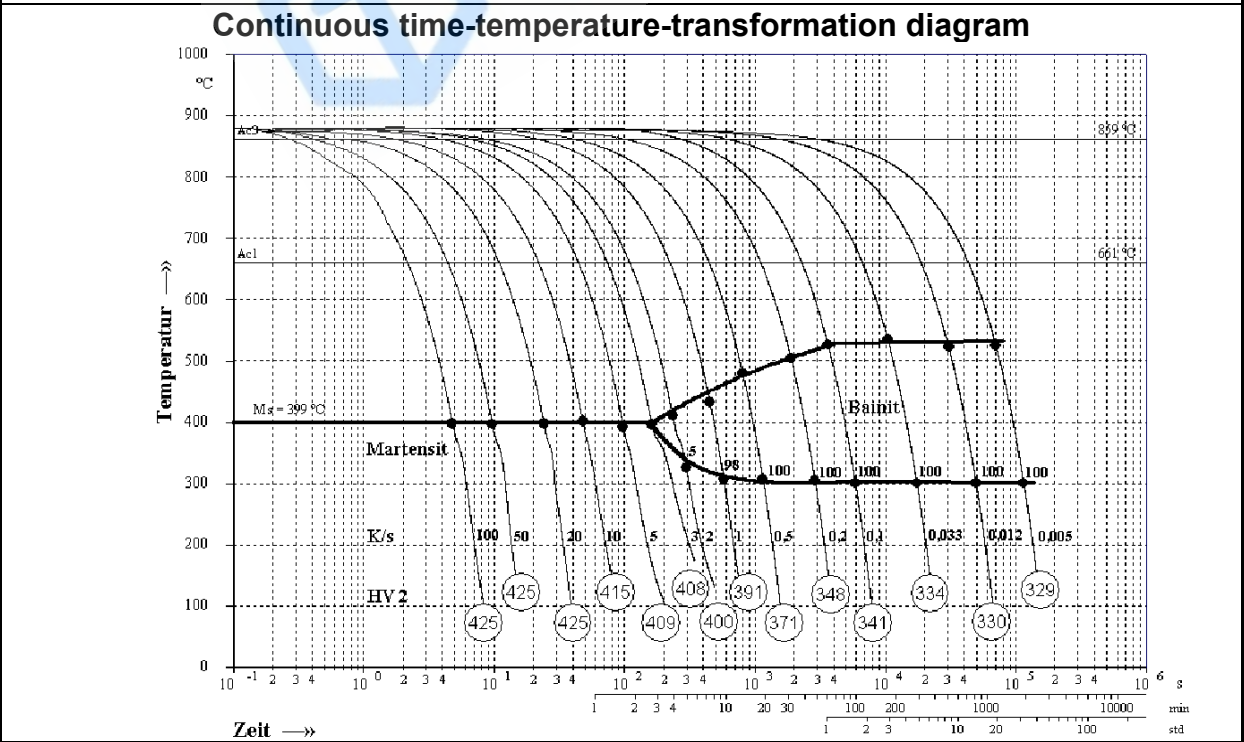
<i>Hot forming</i>	<i>Soft Annealing</i>	<i>Austenitizing</i>	<i>Tempering/Ageing</i>
1100 – 850 °C	640 – 660 °C	880 – 920 °C	~550 °C (depends on usage)

WR15E [®]

TEMPERING DIAGRAM:



CCT GRAPH:



The details and values in this data sheet are typical values, no guarantee promises. Changes of the material, the qualities and/or performance data we reserve for us.

WR15E[®]

STRUCTURE (magnification 400:1)



DIMENSIONAL STABILITY:

Because of its age-hardened grain structure, WR15E[®] will not distort by any process carried out at temperatures below the age hardening point of 550° C. This refers to, f.i. machining (grinding/drilling/milling/cutting etc.) also by EDM. The “white layer” by EDM is more easily removed than with other grades, because it is thinner.

HARDNESS/COMPRESSIVE STRENGTH/TOUGHNESS:

The material is delivered with a working hardness of ~ 40 HRC. Because of the precipitation hardening, both the compressive strength as well as the toughness (impact strength in J) show excellent values, too (see diagram).

This warrants very good wear properties. Care should be taken when two surfaces of WR15E[®] are sliding (touching) against each other, which would result in a potential excess wear and lead to jamming. For the counterpart a piece with about 10 HRC less should be selected.

In the finished mould, the overall wear conditions will remain stable at temperatures up to the age-hardening point.

POLISHING:

Due to its cleanliness and structure the material is high-gloss polishable, by wet grinding with later buffing. Use medium pressure only, otherwise – if overpolishing – you risk surface defects even after the finishing process.

SURFACE IMPROVEMENTS:

Because of ~0,9 % Al are part of the analysis this WR15E[®] is very suitable for NITRIDING, reaching a surface hardness of over 60 HRC.

This steel grade is also very suitable for other surface improvements like coating with Titanium, Chrome, Nickel and others.

WELDING:

Should be made only with rods of an analysis identical with the matrix material, suitable for the same precipitation – hardening process. It is to be noted that the welded part must be age hardened the same way as the original matrix, holding time at least 90 minutes.

Use TIG or Heli-Arc welding rods, copper coated. For preparing of the welding please see the following instructions. In case of any doubts please ask for our technical support.

WELDING INSTRUCTION:

- 1.) The material must be absolutely clean
- 2.) The defects must be completely removed
- 3.) The corner radius should be min. 3 mm
- 4.) Preheating in a furnace by 10 up to 50°C per hour (depends on mould execution) to 320-400°C, holding time 30 minutes per 25 mm thickness
- 5.) Welding (DC polarity) by lowest possible amperage for small weld beads with smallest possible diameter rod.

Attention: The temperature at the welding place should be not lower than 320°C.

- 6.) An immediate heat treatment process at 460-520°C for a minimum time of 90 minutes (depending on number of layers and thickness of weld bead) after welding is absolutely necessary in order to avoid hardness differences. Cooling slowly to room temperature.
- 7.) The a.m. procedure (Item 4-6) must be done after every three welding layers
- 8.) This instruction is only valid for preheating and heat treatment in a furnace.