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Increasing the performance of hot-stamping tools with the new premium tool steel UH1

使用新型优质模具钢UH1提高热冲压模具的性能

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- Brief profile of the Kind&Co Group
- Introduction of UH1
 - Development
 - Mechanical and physical properties
 - Use in industry
- Kind & Co集团简介
- UH1介绍
 - 研发目的
 - 机械和物理性能
 - 行业应用

Globally operating hot-work tool steel specialist

全球运营的热作工具钢专家

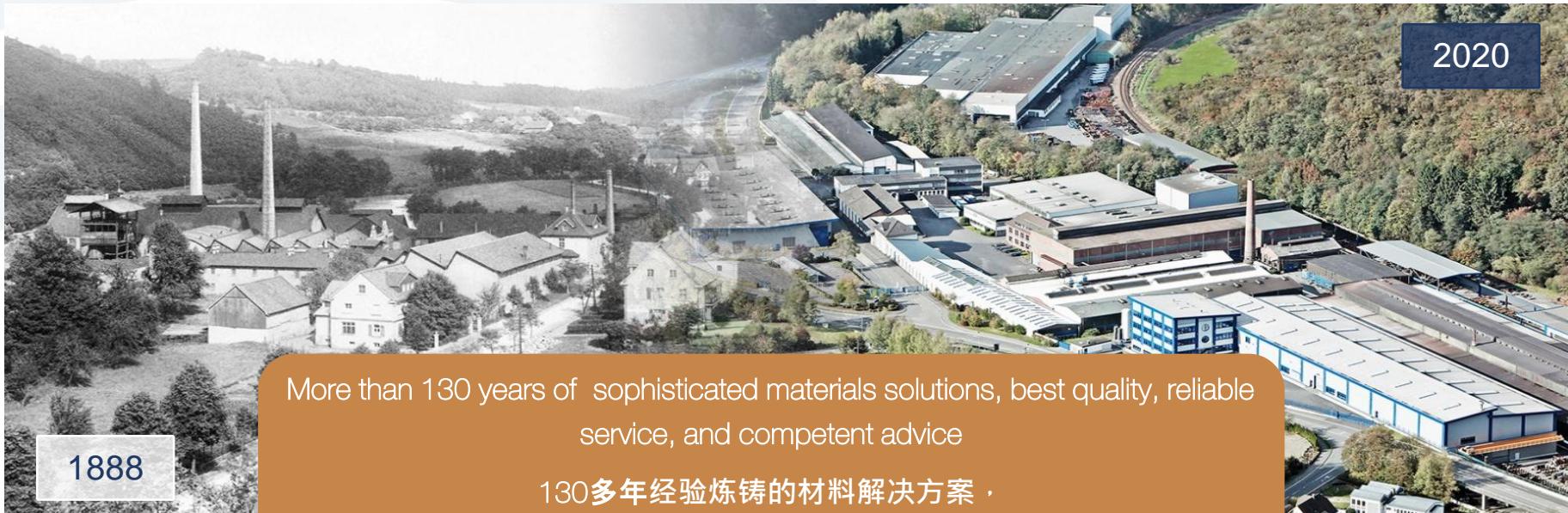


Brief profile of the KIND&CO Group

- Tradition and modernity
- Processing depth
- Global network

Kind & Co集团简介

- 传统与现代
- 深度加工
- 全球网络



Tradition 传统

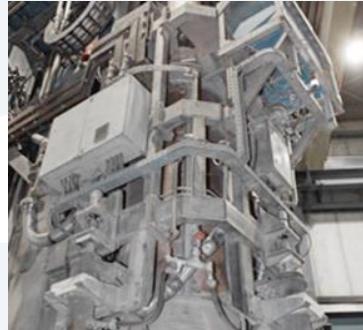
- Experience and know-how 经验和诀窍
- Sustainability 可持续发展
- Commitment and respect in cooperation 合作中的承诺与尊重
- Linked with our home region 与家乡地区的紧密联系

Modernity 现代

- Up to date production technology 最新的生产技术
- Professionalism in service 专业的服务
- Quick decision processes 快速决策流程
- Internationality 国际化

Kind & Co 的专业技能贯穿价值链中的每一步

Melting 熔炼
ESR-Remelting 电渣重熔



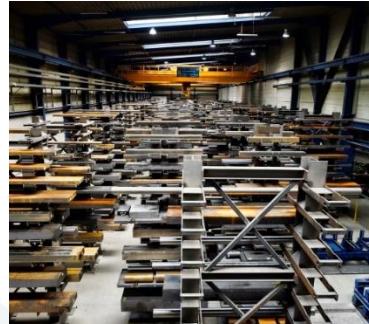
Forging 锻造



Hardening Annealing
淬火 退火



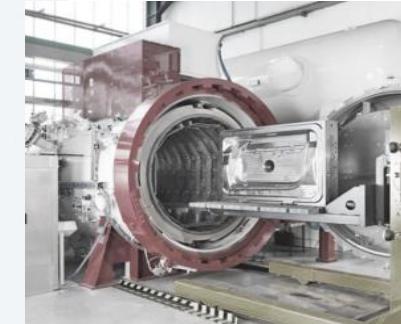
Stocking and sawing
仓储和锯切



Machining 机械加工



Vacuum hardening 真空淬火
Nitriding/annealing 氮化回火



To be able to serve the global market, Kind&Co provides a global network with uniformly high service standards 为了服务全球市场，Kind & Co提供了统一高标准的全球服务网络



Increasing the performance of hot-stamping tools with the new premium tool steel UH1

新型优质工具钢UH1提高热冲压模具的性能

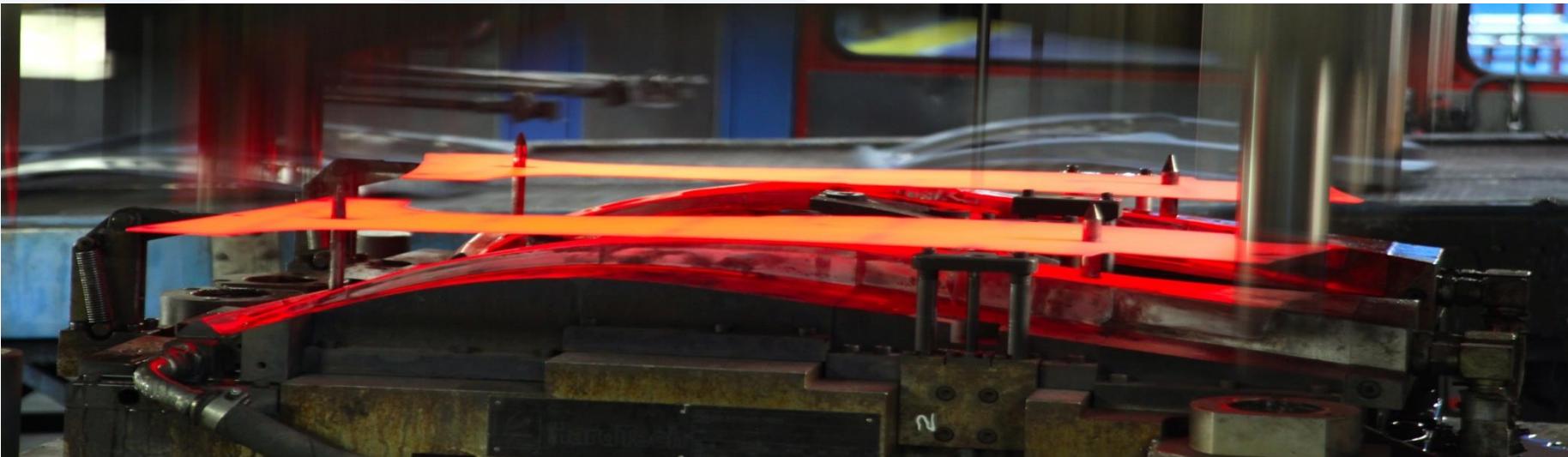


Introduction of UH1

- Development and trends
- Superior mechanical properties
- Physical properties optimizing cycle times
- Use case in industry

UH1的介绍

- 发展与趋势
- 优越的机械性能
- 利于优化生产周期的物理性能
- 行业应用实例

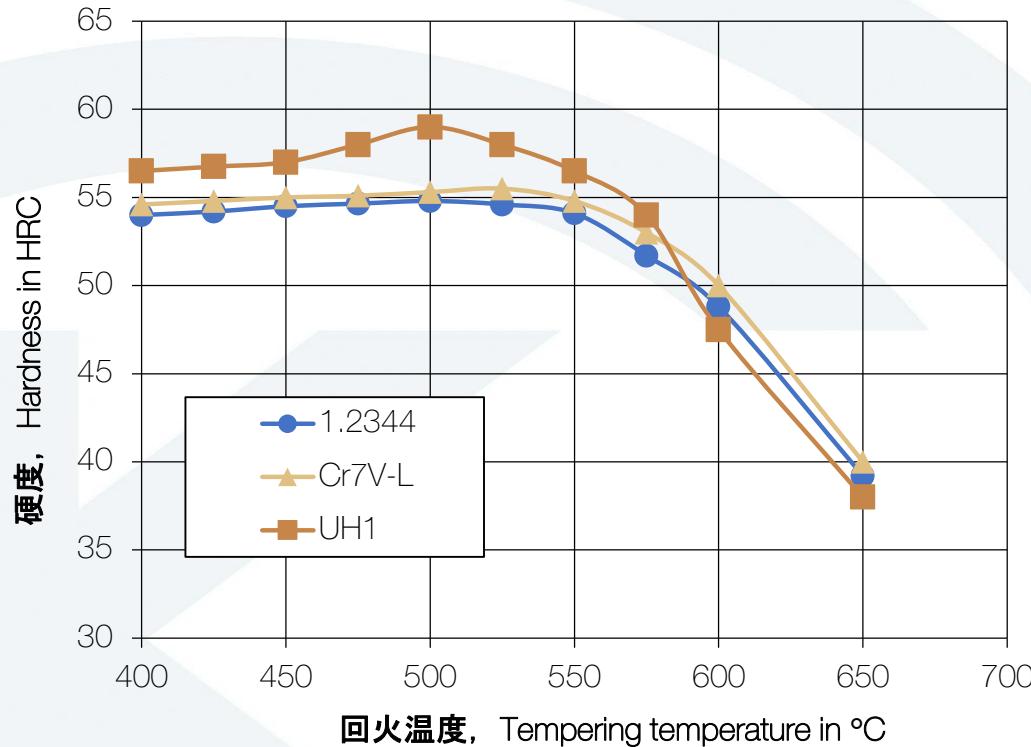


- Hot-stamping industry demands for higher wear resistance and longer tool life.
- To shorten cycle time the die design is improved by reduction of the wall thickness.
- Cr7V-L is an established premium steel developed by Kind&Co. The combination of properties of the steel is specially tailored to the requirements of hot-stamping.
- Premium steel UH1: The proportion of carbide-forming alloying elements (C, Cr, Mo and V) has been further increased to increase the hardness and wear resistance of this steel. By using electro-slag remelting metallurgy (ESR), the steel achieves a significantly improved level of macro and micro cleanliness.

- 热冲压零件要求更高的耐磨性和更长的模具寿命。
- 通过减小壁厚来缩短生产周期，需钢材更高的韧性
- Cr7V-L是Kind & Co开发的成熟优质钢。钢的性能组合是专门针对热冲压的要求量身定制的。
- 优质钢UH1：碳化物形成合金元素（C, Cr, Mo和V）的比例进一步增加，以提高钢材的硬度和耐磨性。
通过使用电渣重熔冶金（ESR），钢的宏观和微观清洁度大大提高。

Higher level of hardness attainable with UH1

UH1 可达到更高的硬度

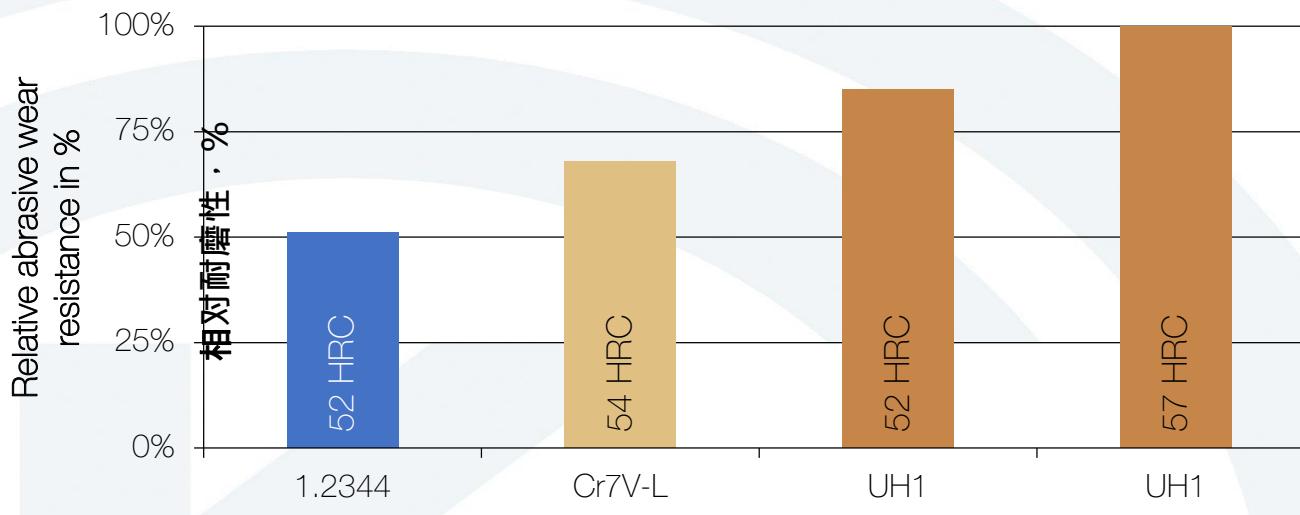


- Good Standard 良好标准
- ▲ Premium 优质标准

- With 59 HRC UH1 has the highest secondary hardness of these steels.
- UH1 shows a better tempering resistance over the entire working temperature range.
- 具有59 HRC的UH1具有这些钢中最高的二次硬度。
- UH1在整个工作温度范围内显示出更好的抗回火性。

UH1 shows excellent wear resistance – more than double compared to a standard steel

UH1具有出色的耐磨性—是标准1.2344钢材的两倍以上



- Abrasive wear resistance depends on hardness and carbide content but also on the carbide types and carbide distribution.
- The greater carbide content of UH1 contributes to the higher wear resistance, even at the same working hardness.
- 耐磨性取决于硬度和碳化物含量，还取决于碳化物类型和碳化物分布。
- 即使在相同的工作硬度下，由于UH1的碳化物含量更高，因此耐磨性也更好。

Wear tests on steels for hot-stamping – experimental setup

热冲压用钢的磨损测试-实验装置



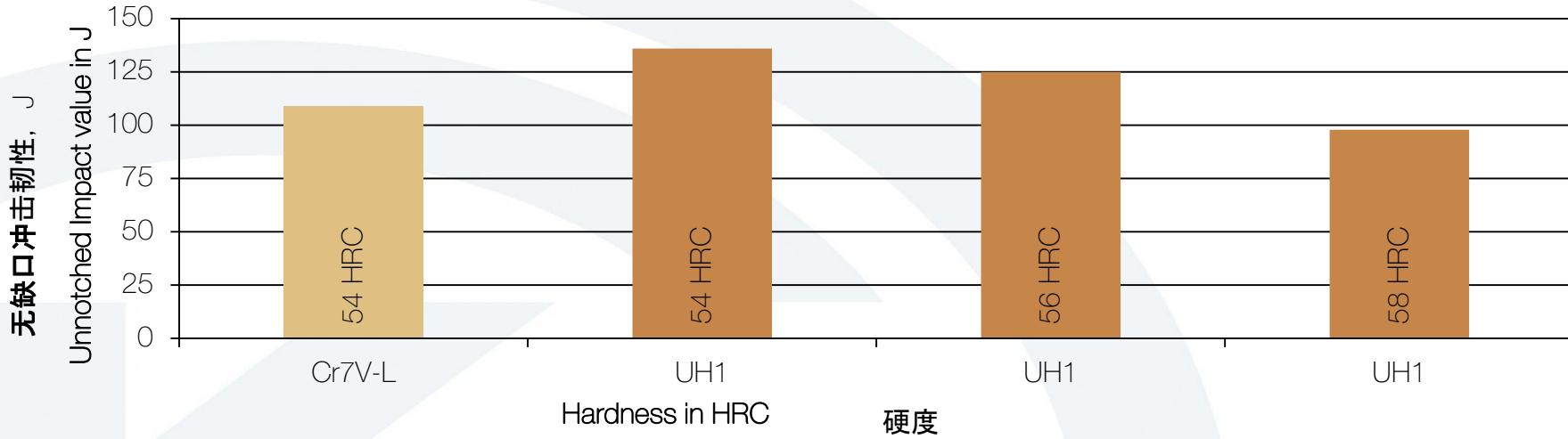
Test parameters „pin on disc“ method 摩擦磨损测试仪测试参数

Temperature 温度	20 °C
Ball	Al_2O_3
Contact force 接触压力	5 N
Rotational speed, 旋转速度	25 mm/s
Path length 路径长度	2000 m

- Tested materials: 1.2344, Cr7V-L, UH1
- For the experiments in each run 3 samples with a hardness of 52-57 HRC were used.
- The scratch groove (depth, width) was determined by profilometer measurement.
- 被测材料：1.2344, Cr7V-L, UH1
- 对于每个实验，使用3个硬度为52-57 HRC的样品。
- 划痕槽（深度，宽度）通过轮廓仪测量来确定。

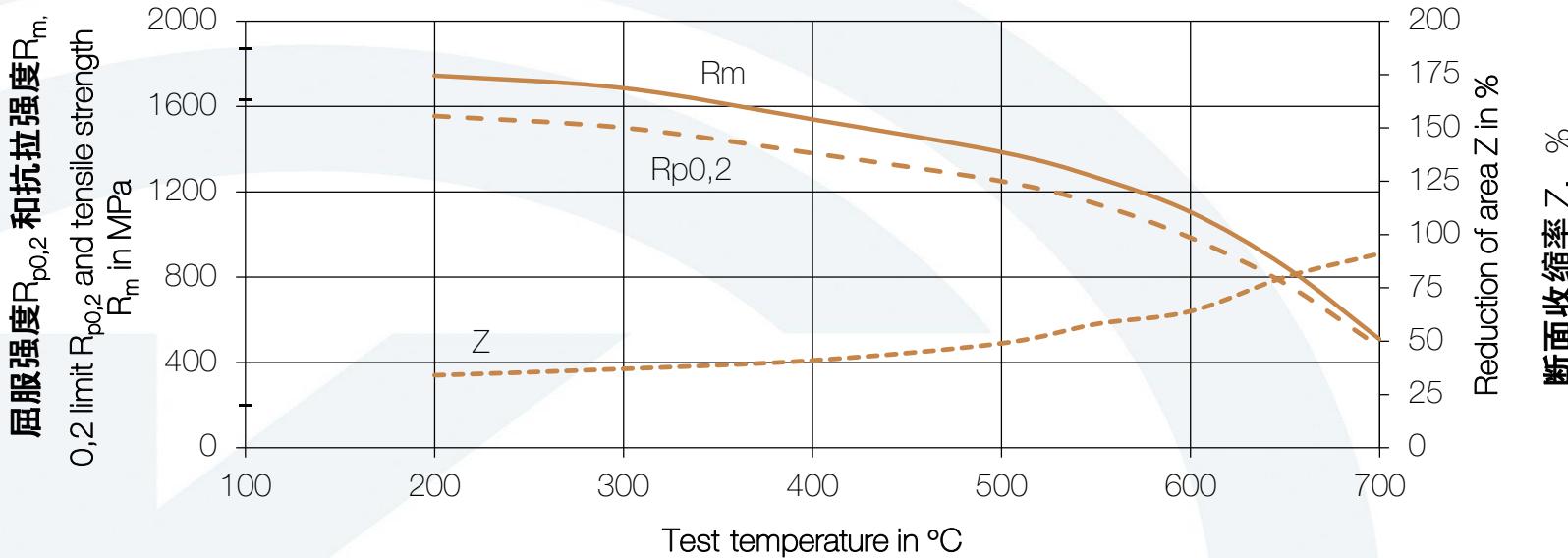
Despite the high hardness UH1 shows good toughness values

尽管硬度很高，UH1仍表现出良好的韧性



- Common problem: cracks starting from the cooling channels
- High toughness helps to avoid crack formation and crack growth in stressed areas.
- Although UH1 is more alloyed and has more carbide forming elements than Cr7V-L, its toughness is still higher thanks to the electro-slag remelting.
- At a hardness level of 58 HRC UH1 offers significantly higher toughness than comparable cold work steels.

- 常见问题：从冷却水道开始出现裂纹
- 高韧性有助于避免应力区的裂纹形成和裂纹扩展。
- 尽管UH1比Cr7V-L合金化程度更高，并且具有更多的碳化物形成元素，但由于电渣重熔，其韧性仍然更高。
- 硬度为58 HRC UH1的韧性明显高于同类冷作钢。



- UH1 develops a very good tensile strength and the curve drops only slightly.
- The high tensile strength helps to avoid plastic deformation of the die.
- High values of the reduction of area Z reflect the good toughness of UH1.
- UH 1表现出非常好的抗拉强度，曲线仅略有下降。
- 高拉伸强度有助于避免模具的塑性变形。
- 高的断面收缩率 Z 值反映了 UH1 良好的韧性。

With UH1 the cycle time can be reduced

使用UH1可以缩短生产周期



Brand name 密度 g/cm ³	23°C	Thermal expansion coefficient 胀系数 10 ⁻⁶ m/mK				热膨	Thermal conductivity 系数 W/mK		
		20-100°C	20-200°C	20-400°C	20-600°C		23°C	200°C	400°C
1.2344	7,8	10,3	11,3	12,2	12,8	25,5	27,1	27,7	
Cr7V-L	7,79	11,4	11,9	12,5	13,1	26,7	29,8	30,8	
UH1	7,79	11,0	11,6	12,2	12,7	25,0	28,2	29,0	

- The thermal conductivity, important for the efficiency of hot-stamping, has not been significantly changed.
- The discernible differences lie in the magnitude of the measurement accuracy of the test methods used.
- With the use of UH1 the cycle time can be significantly reduced with the combination of good thermal conductivity and the possibility of reducing the distance between the cooling channels and the working surface.

- 对于热冲压效率很重要的导热系数尚未显著改变。
- 可辨别的差异在于所用测试方法的测量精度的影响。
- 通过使用UH1，材料的良好导热性和冷却水道与工作表面之间的距离减小相结合的方式可大大缩短生产周期。

Only proper heat treatment enables optimum properties

只有适当的热处理才能实现最佳性能



To set optimum properties, tools made of UH1 require hardening tailored to the chemical composition of the steel. Kind&Co recommends the following parameters:

- Hardening temperature: 1050 °C
- Holding time: 45 minutes

为了达到最佳性能，UH1的模具需要根据钢材的化学成分进行适当的热处理。

Kind & Co建议使用以下参数：

- 淬火温度：1050°C
- 保温时间：45分钟

Successful use of UH1 at FORD

UH1在福特汽车的成功应用



- UH1 is the only steel specified at FORD for Schuler PCH flex technology in Germany and USA
- Remachining of 0,7 mm was planned after 250 000 produced pieces
- After 350 000 strokes, Ford remachined for the first time, 0.7mm.
- Meanwhile UH1 has been used successfully in several European companies for hot-stamping tools
- UH1是福特汽车在德国和美国工厂的舒勒PCH flex生产线上指定使用的唯一钢材
- 原计划在生产25万个零件后模具降面0.7毫米
- 经过35万冲次后，福特进行了第一次降面·0.7mm。
- 同时，UH1已成功应用于多家欧洲公司的热冲压模具上

Thank you very much
for your attention

感谢聆听！

David Wang 王旭军

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