

SPECIAL-HIGH-PERFORMANCE
HOT-WORK TOOL STEEL **GSF**



THE INNOVATIVE, HIGH-PERFORMANCE
STEEL FOR DIES, FORMING TOOLS
AND MACHINE COMPONENTS

KIND & CO
EDELSTAHLWERK

From the casting of steel to finished die...



LONG-STANDING KNOWLEDGE, INNOVATIVE MATERIALS TECHNOLOGY, AND ADVANCED EQUIPMENT ALL FORM THE BASIS FOR TOP QUALITY

For over 125 years KIND & CO. Edelstahlwerk has been developing expertise in producing, finishing and developing high-alloy steels. Our experience has managed to extend our services to a truly global platform, while maintaining our traditional values.

Customer orientation and quality: these are the benchmarks for our daily operations using advanced technology and flexible production as well as a proven quality management system.

In addition to a broad range of tool steels and corrosion, acid and heat resistant steels, we offer a large selection of special steel grades as well as titanium- and nickel-based alloys. Furthermore, KIND & CO. has developed specific materials for various special applications.

Our steels can be found in all major industries including die casting, plastics, extrusion, pipe engineering, die forging, power engineering, aviation, mechanical and apparatus engineering, amongst others.

Our customers receive everything in one single package: high quality steel as well as die processing and finishing services to match their specific requirements.



Our flexibility allows us to develop tailored techniques and processes aligned with your requirements to help you achieve top performance.

Each one of our global customers is unique. Yet we are proud to state that they all have one thing in common: steel by KIND & CO.

This is why we constantly work to further enhance our high quality and customer-focused service. We are large enough to serve every customer but still small enough to find individual solutions.

Do not settle with less than the best.



GSF – THE INNOVATIVE HIGH-PERFORMANCE STEEL FOR DIES, FORMING TOOLS AND MACHINE COMPONENTS

- OUTSTANDING TOUGHNESS
- EXCELLENT HEAT RESISTANCE
- HIGH YIELD POINT RATIO
- GOOD MACHINABILITY
- VERY GOOD THROUGH-HARDENING CAPABILITY
- READILY TEMPERED TO WORKING HARDNESS

MATERIAL PROPERTIES

GSF is an innovative high-performance NiCrMoV alloy steel that was designed for dies, which are used under forging hammers, or for large-scale dies. GSF represents an advancement of the 55NiCrMoV7 standard steel (1.2714) and is distinguished by improved toughness, heat resistance and weldability.

Due to its outstanding mechanical properties in a tempered state, GSF is well suited for various dies and heavy-duty machine components. GSF is an exceptional alternative to common tempering steels, especially when it comes to large cross-sections or diameters of up to 650mm and strengths of more than 1000 MPa.

APPLICATION

Typical applications include:

- Hammer forging dies in steel forming, specifically for deep contours prone to cracking
- Press dies where high toughness and good heat resistance is required (e.g dies for medium sized or larger hydraulic presses)
- Calibration and deburring dies for forging presses
- Hammers and press saddles, hammer heads, jaws in forging machines
- Roughing rolls (forging rolls)
- Dies for the extrusion industry including mandrel holders, die holders, press columns, piston rods, return plungers, nuts
- Piercers and piercing sleeves for production of seamless steel bottles
- Rolling mandrels and tapered rolls in the rolling technology sector
- Die holders and armoring with strengths of up to 1450 MPa
- Shafts and heavy-duty machine components with yield points of 750 > MPa

AS-DELIVERED CONDITION

GSF is usually supplied pre-tempered to 38 - 44 HRC thus eliminating any additional cost and risk involved with external heat treatment.

GSF is easily weldable and excellently suited for filler/overlay welding. Due to the reduced C content, the risk of cracking in the welding transition zone is limited.

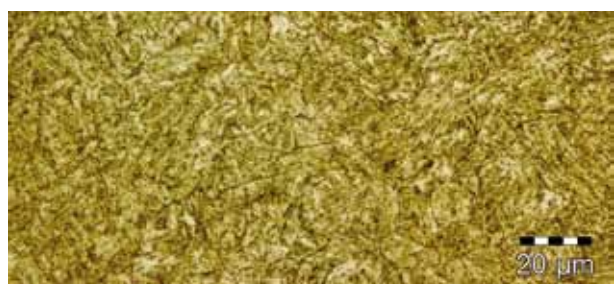
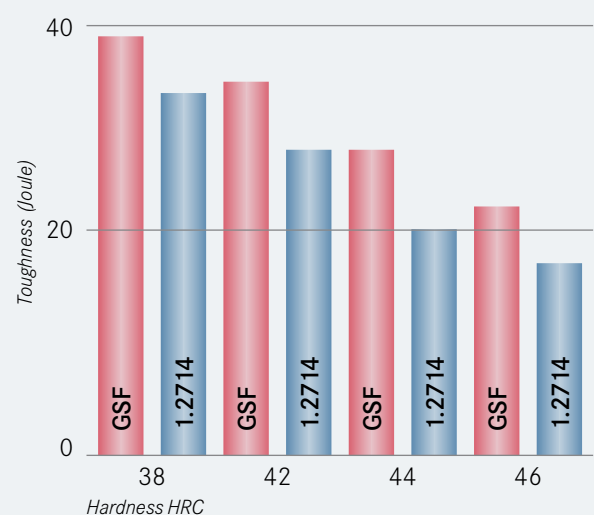
GSF is nitridable.

Material	Short name	C	Si	Mn	Cr	Mo	Ni	V
PWM	55NiCrMoV7	0.55	0.30	0.80	1.10	0.45	1.70	0.10
GSF		0.28	0.30	0.70	2.80	0.60	1.00	0.40

Handling instructions

Soft annealing	740 - 760 °C 6 - 8 h furnace cooling
Hardness annealed	max. 230 HB
Stress relief annealing	approx. 630 °C slow cooling
Hardening	Hardening 920 - 940 °C in oil, polymer or vacuum hardening cooling must be interrupted at 150 - 180 °C
Quenched hardness	approx. 51 HRC for 60 mm Ø and oil or polymer quenching
Tempering	400 - 650 °C as needed, see tempering illustration. Usually GSF comes tempered with a hardness of 38 - 44 HRC
Nitriding or Tenifer treatment	possible
Preheating of dies	100 - 250 °C is recommended prior to use

Comparison of toughness



Fine tempered microstructure for best toughness

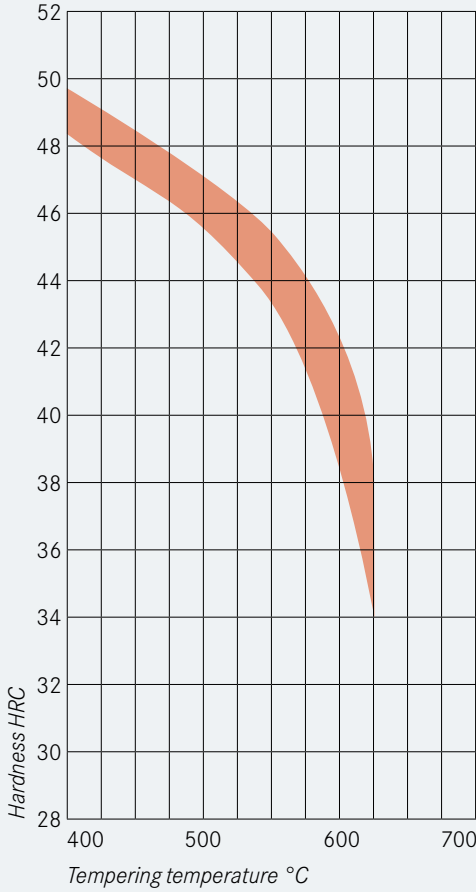


▲ GSF hammer die with fine engraving, performance increased by currently 47% compared to 1.2714

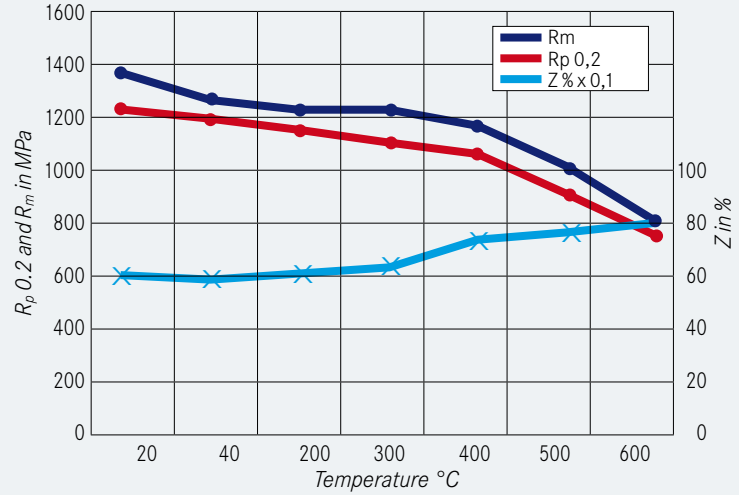
▼ Typical application - hammer die with contour prone to overload



Tempering diagram 60 mm Ø, 930 °C oil



High temperature strength diagram



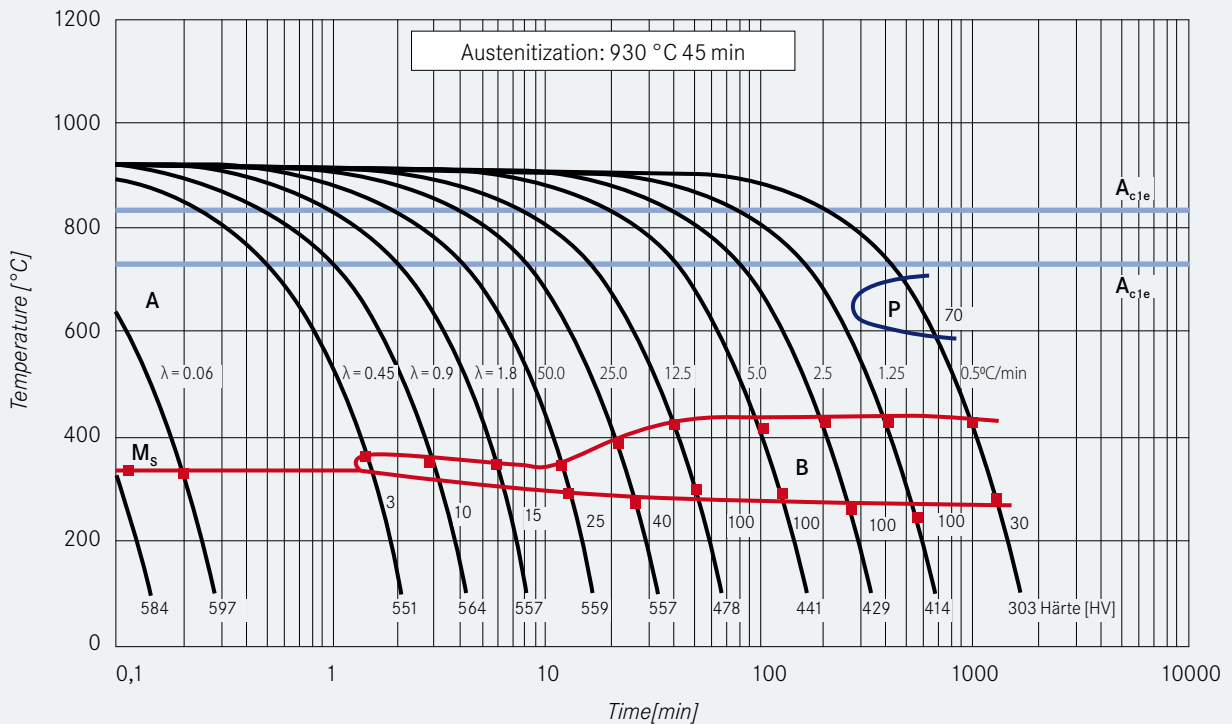
Mechanical properties at different strength classes

Ø / mm Applicable	Yield point Rp 0.2 / MPa	Tensile Strength Rm / MPa	Elongation A5 / %	Notch impact strength ISO-V / Joule
250 - 500	min. 950	1300 - 1450	min. 12	min. 25
	min. 880	1150 - 1300	min. 14	min. 30
	min. 780	1000 - 1150	min. 16	min. 40

Physical-mechanical properties of GSF

Temperature	°C	20	100	200	300	400	500	600
Thermal conductivity	W/(m x K)	31	34	34	34	33	33	31
Coefficient of linear thermal expansion	10 ⁻⁶ / K	11.8	11.8	12.0	13.0	13.0	14.0	14.0
Density		7.76 g / cm ³						

TTT-Diagram Austenitizing temperature 930 °C



FILLER WELDED HIGH PERFORMANCE DIES WITH GSF

Mass production molds of all types such as dies or tapered rolls in ring production – specifically for contours leading to increased wear – call for a combination of high isotropic hot toughness and maximum hot wear resistance. Due to the specific material properties and the reduced C content, GSF makes for an ideal tool steel for filler welding.

MACHINING

GSF is well suited for machining even in its tempered state as delivered. Optimal machining parameters may vary due to material condition, machine, workpiece clamping, die clamping and machining strategy.

KIND & CO. provides application and project advice from selection of the right die to a suitable machining strategy to optimizing process parameters for machining operations.

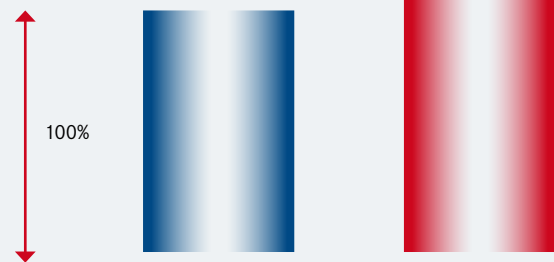
Our technical consultants will be happy to provide advice on the right dies for your machining applications.



Increased performance using Co-based alloy (Stellite) welded on GSF

1.2714 42-44 HRC

GSF 42-44 HRC, welded



TAILORED QUALITY DIES FOR PEAK PERFORMANCE



PRODUCTS

HOT WORK TOOL STEELS
COLD WORK TOOL STEELS
DIE STEELS
PLASTIC MOULD STEELS

INDUSTRIES

DIE CASTING
DIE FORGING
EXTRUSION
PIPE PRODUCTION
PLASTICS TECHNOLOGY



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