

Getting the best results demands care. It all boils down to carefully selecting the right material. Through every step, in every component. Having Uddeholm as a partner gives you the sounding-board you need when it comes to finding cost-effective new solutions. To ensure we do the best possible job we want to be involved in the entire process – from your initial ideas right through to the finished product. Uddeholm is a world leader in developing and manufacturing tool steel. We are now going one step further by offering our steel know-how and steel grades, such as Uddeholm High Performance Steel.



Dragbike slider clutch made from seven different grades of Uddeholm steel.

The information in this brochure is based on our current know-how and is intended as a general description of our products and their areas of application. It should therefore not be regarded as a guarantee that the products described have particular properties or are suitable for specific purposes.

Better profitability with Uddeholm High Performance Steel

Uddeholm High Performance Steel is a new concept in the world of steel, with new areas of application for Uddeholm's first-class steels. By using Uddeholm steel instead of engineering steel in parts subject to large stresses and strains, you can benefit from the superior properties of tool steel.

Uddeholm High Performance Steel is a concept whereby the properties of tool steel are harnessed and used in contexts other than pure tool applications. Maintenance costs industry large sums of money each year. A high proportion of these costs can be avoided by selecting a steel with better material properties.

Uddeholm High Performance Steel offers more advanced steels that produce better results. Thanks to their improved strength and durability the steel grades have a longer life span, resulting in better overall economy. Go for a better steel – it pays.

Care in material selection leads to lower operating costs

When it comes to choosing materials for machine parts, care is key. This may seem obvious, but all too often companies simply do exactly what they usually do without considering that there could be a better solution than using the steel conventionally used for that application.

GENERAL ENGINEERING STEEL

- Machine steel
- Free-cutting steel
- Pressure vessel steel

ENGINEERING STEEL FOR HEAT TREATMENT

- Carburising steel
- Hardening and tempering steel
- Spring steel
- Nitride steel
- Ball bearing steel

HIGH-SPEED STEEL

TOOL STEEL

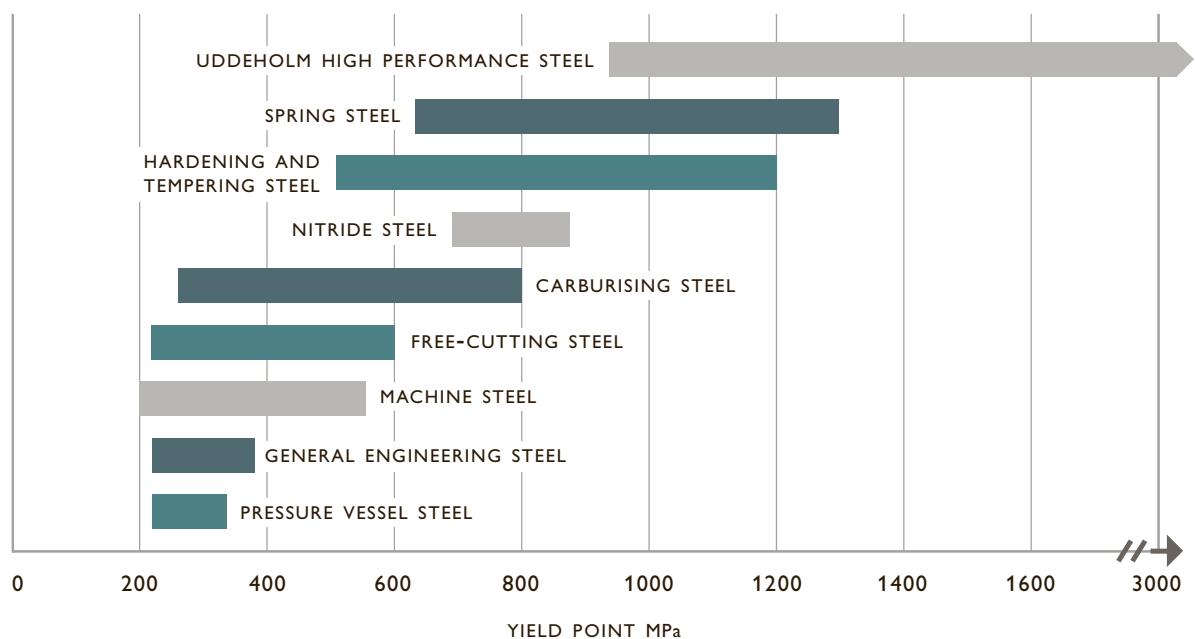
- Uddeholm High Performance Steel

REDUCE THE RISK OF BREAKDOWN WITH A REQUIREMENT ANALYSIS

Rather than following the conventional division between steels for machine parts and steels for construction, make sure a thorough need and requirement analysis is carried out. There are many advantages to be gained from using a better steel, such as a tool steel, and harnessing its unique properties.

BREAKDOWN OF A MACHINE PART CAN LEAD TO

- Production standstills
- Delayed deliveries
- Overtime
- Increased costs



A manufacturing company's maintenance costs correspond to 6–10% of sales. In Sweden alone, the financial impact of inadequate maintenance and operational reliability is estimated at around 24 billion € (\$35bn) a year. Roughly half of that amount relates to maintenance costs and loss of income in the manufacturing industry. Many of these costs can be avoided by devoting a little more time – and taking a fresh approach – when selecting materials for the technical design and manufacture of machine parts.

* Source: Swedish Centre for Maintenance Management

THE BENEFITS OF UDDEHOLM HIGH PERFORMANCE STEEL COMPARED WITH CONVENTIONAL ENGINEERING STEELS

The benefits of Uddeholm High Performance Steel can be divided into four main areas:

- Durability
- Strength
- Corrosion resistance
- High-temperature stability

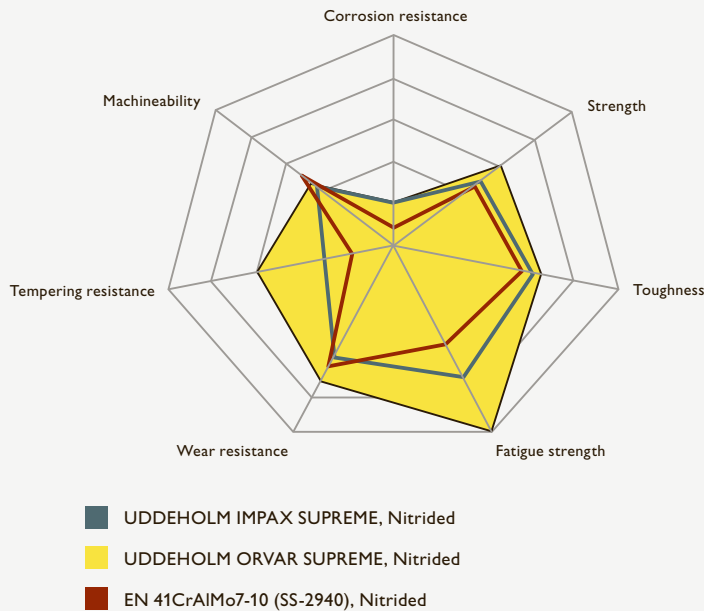


Higher wear resistance – longer life span

Uddeholm's product programme includes steels from 200–400 HB in delivery condition, as well as steels that can be hardened to 68 HRC with a carbide content of up to 25%. The carbides have a Vickers hardness of 1600–2800 and vary in size from 1 to 15 microns. The durability is determined by the fundamental hardness and the percentage and type of carbides, their hardness

and size. Durability can therefore be balanced with other desirable properties such as toughness and ductility. The durability of most Uddeholm High Performance Steels can be enhanced by means of various recognised surface treatment or surface hardening methods on the market, such as CVD, PVD, nitriding, carburising and induction hardening.

COMPARISON OF PROPERTIES FOR NITRIDE STEEL AND HARDENED/NITRIDED STEELS WITHIN THE UDDEHOLM HIGH PERFORMANCE STEEL PROGRAMME

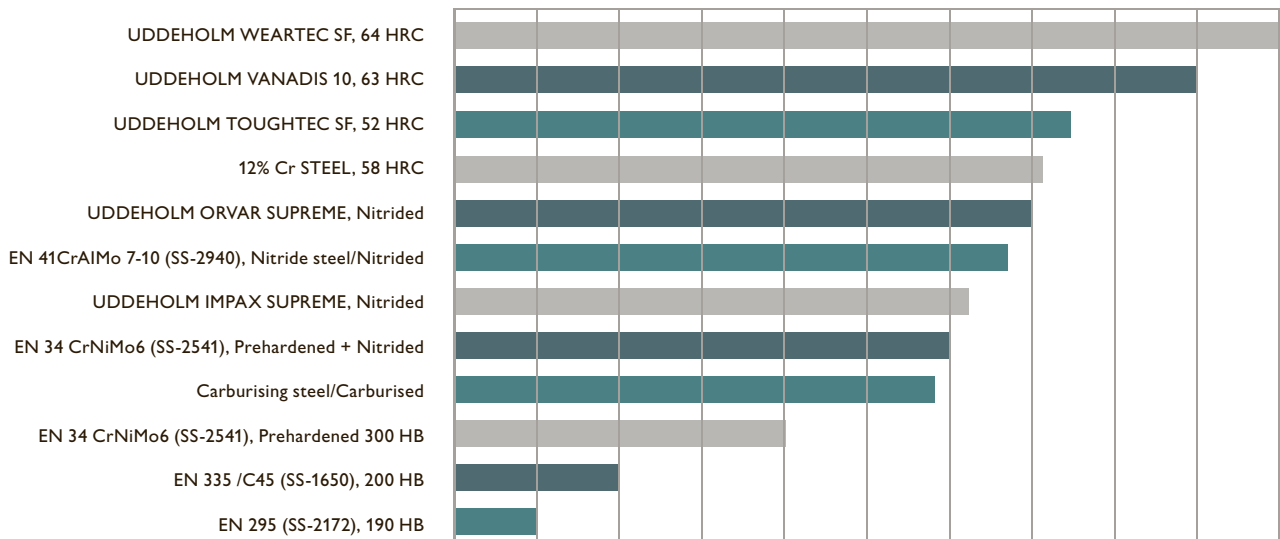


EXAMPLE OF APPLICATION COARSE TYRE FRAGMENTATION

Fittings: 18+8+2 knives
 Production until knife sharpening:
 Original knife, 8% Cr: 1,000 tonnes
 UDDEHOLM TOUGHTTEC SF: 1,700 tonnes

Longer life span and less sharpening
 extend useful life by a factor of 2.5

WEAR RESISTANCE – A COMPARISON

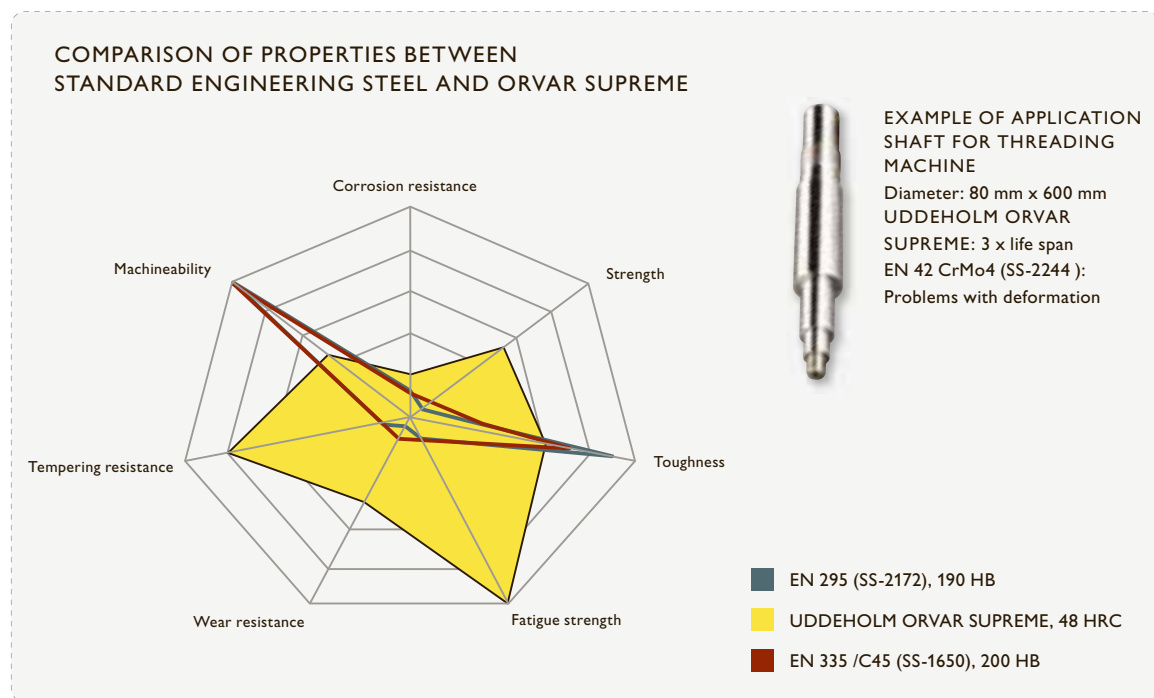


Fewer stoppages and higher strength

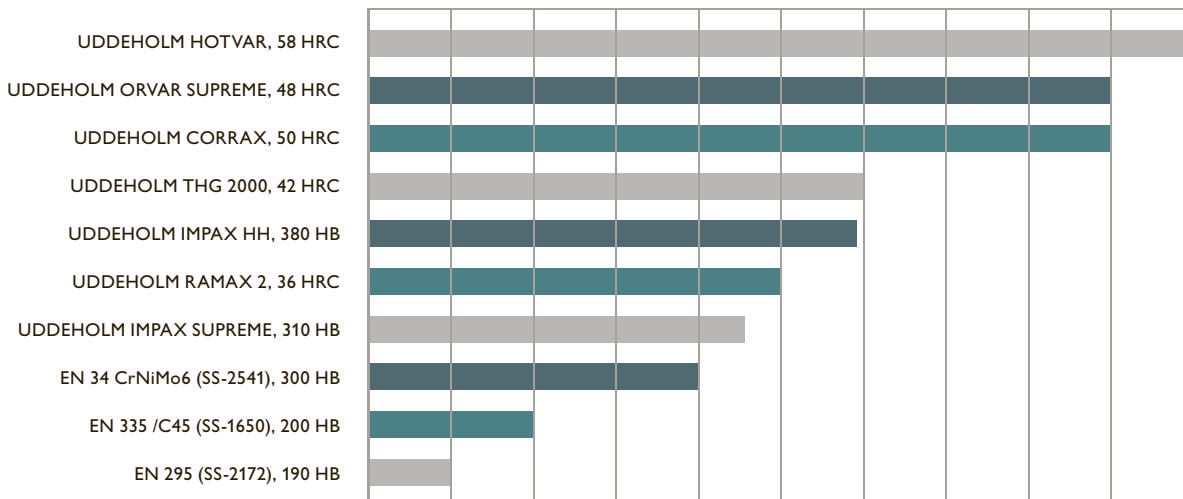
Usually the term 'strength' not only refers to the yield point and breaking point, but also fatigue strength, toughness and ductility.

The breaking point increases linearly with hardness, while a higher breaking point can mean lower toughness, i.e. the ability to resist brittle fracture. Ductility is the ability to resist initial cracking and can be improved through a higher purity of steel. This means fewer

and smaller-sized slag inclusions, which has a positive impact on fatigue strength. Selecting the appropriate steel and method of heat treatment makes it possible to increase strength whilst maintaining ductility and increasing fatigue strength. It may also enable a reduction in dimensions and a lighter construction. Care should however be taken with applications subject to below-zero temperatures, as the transition temperature is generally above 0°C.



STRENGTH – A COMPARISON

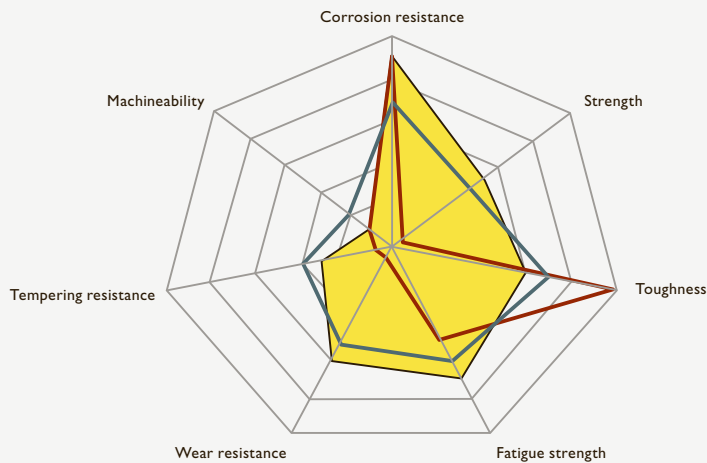


Corrosive environments demand high quality

Stainless steel is generally used in corrosive environments. If the environment also produces wear and tear, these types of steel are not generally durable enough. In these cases a corrosion-resistant steel with more durability is required. The heat treatable, corrosion-

resistant Uddeholm High Performance Steels have a hardness of 36–58 HRC and a corrosion resistance equivalent to 18/8 stainless steel, which is suitable for lightly corrosive environments.

COMPARISON OF PROPERTIES FOR 18/8 STEEL AND CORROSION-RESISTANT STEELS WITHIN THE UDDEHOLM HIGH PERFORMANCE STEEL PROGRAMME



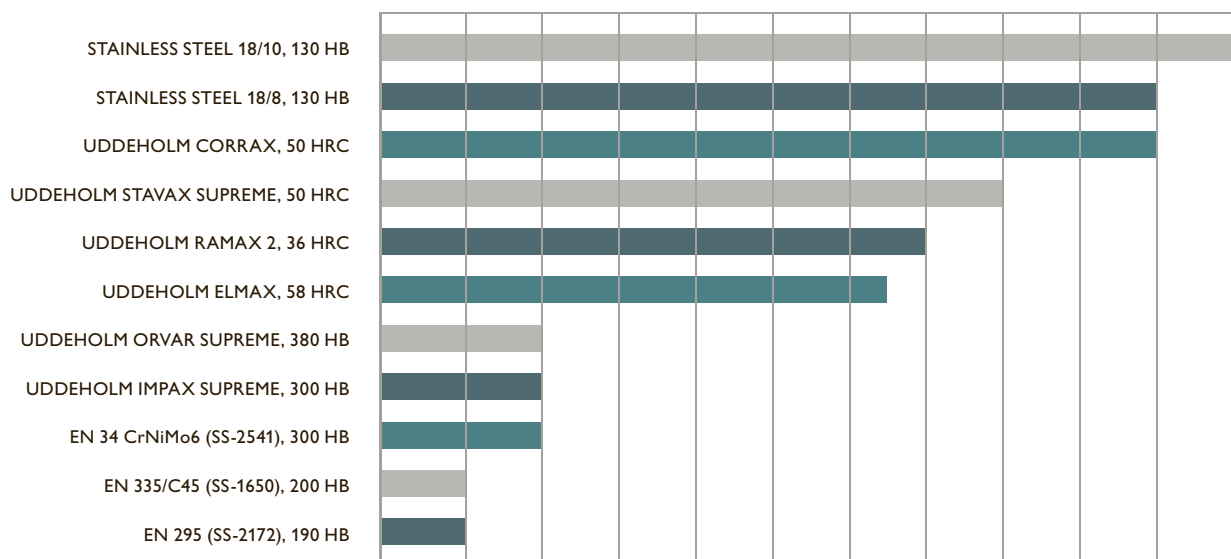
INJECTION NOZZLE FOR DIESEL ENGINES

Pulsating pressure 1,500 bar at 300°C. Abrasive particles in the diesel oil with high sulphur content induce corrosion/erosion damage. Life span of at least one year is a requirement, Uddeholm Elmax is now standard.



- UDDEHOLM RAMAX 2, 36 HRC
- UDDEHOLM CORRAX, 50 HRC
- STAINLESS STEEL 18/8, 130 HB

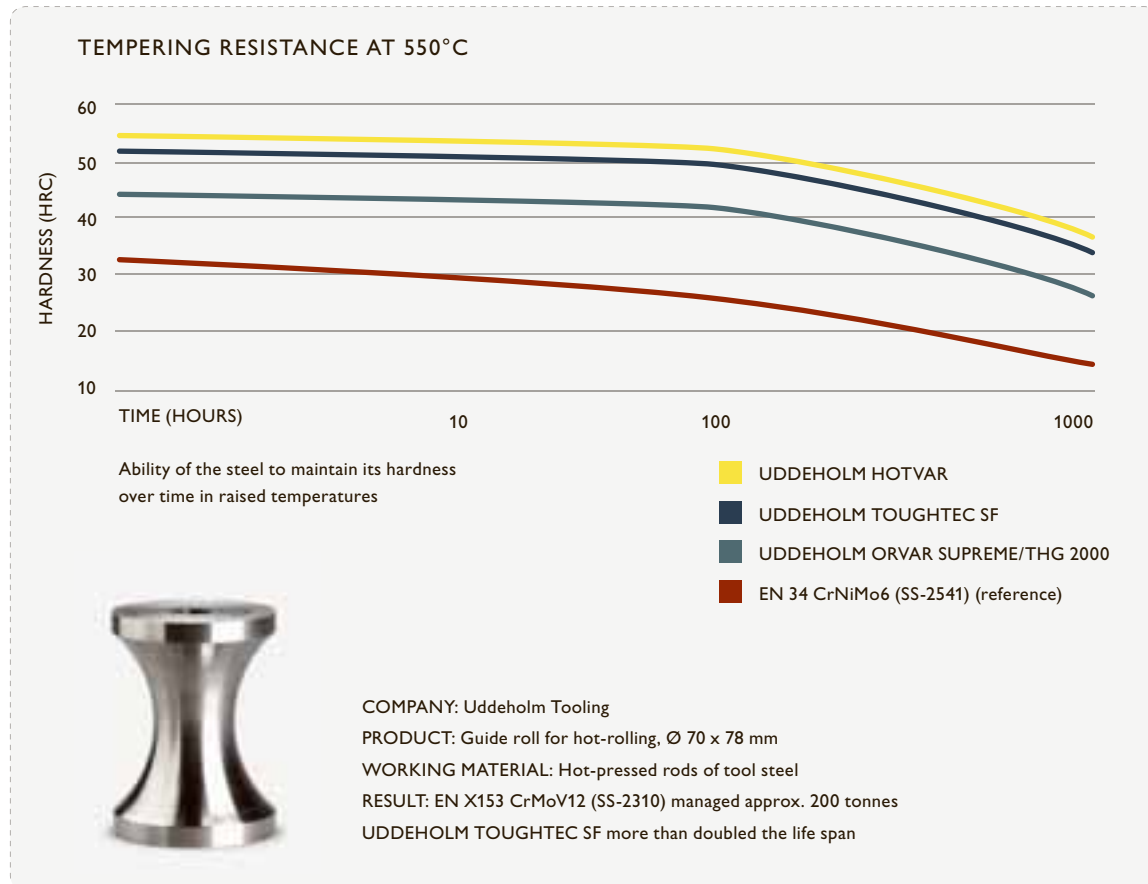
CORROSION RESISTANCE – A COMPARISON



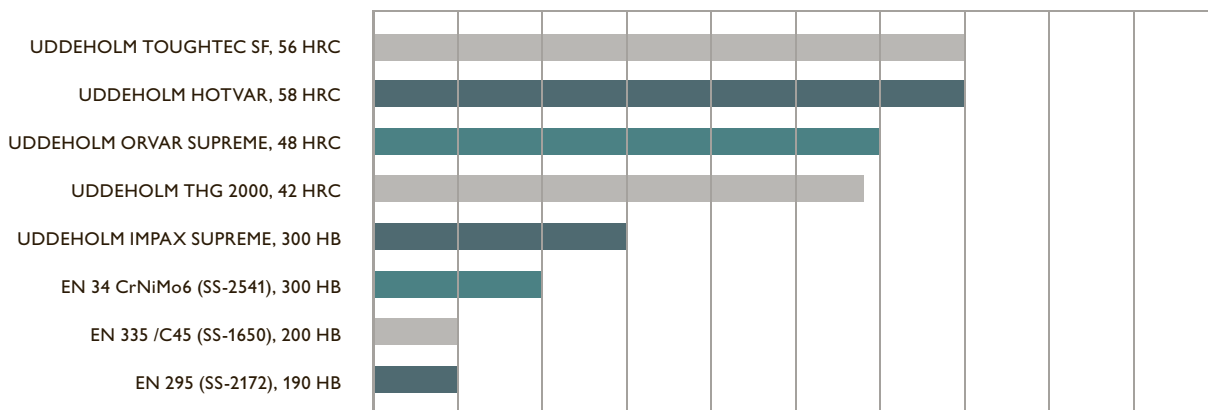
Special steels withstand wear at high temperatures

Certain steel grades within the Uddeholm High Performance Steel programme have been specially developed to withstand wear at high temperatures. As a result they are particularly suitable for use in forging and aluminium foundries, and in hot-pressing copper and steel, for example. In steel and metal workshops and the rest of

the processing industry, heat is applied or generated during the process. These types of environment are often thick with oxide scale, metallic dust, fibres, gravel and grit. Using Uddeholm High Performance Steel can be a distinct advantage here.



HOT HARDNESS – A COMPARISON



UDDEHOLM HIGH PERFORMANCE STEEL

OVERVIEW OF STEELS

STEEL TYPE	C	Cr	Mo	V	Mn	Si	Other	Delivery hardness
UDDEHOLM IMPAX SUPREME	0.37	2.0	0.2		1.4	0.3	Ni 1.0	310
UDDEHOLM RAMAX 2	0.12	13.4	0.5	0.2	1.3	0.2	N 0.10 S 0.10 Ni 1.6	340
UDDEHOLM IMPAX HI HARD	0.37	2.0	0.2		1.4	0.3	Ni 1.0	380
UDDEHOLM THG 2000	0.39	5.3	1.3	0.9	0.4	0.5	S max 0.03	185
UDDEHOLM STAVAX SUPREME	0.24	13.3	0.35	0.35	0.5	0.3	N 0.12 Ni 1.4	250
UDDEHOLM ORVAR SUPREME	0.38	5.2	1.4	0.9	0.4	1.0		180
UDDEHOLM CORRAX	0.03	12.0	1.40		0.3	0.3	Ni 9.2 Al 1.6	310
UDDEHOLM TOUGHTTEC SF	1.6	5.0	2.3	7.2	0.5	0.4		215
UDDEHOLM UNIMAX	0.5	5.0	2.3	0.5	0.5	0.2		185
UDDEHOLM HOTVAR	0.55	2.6	2.25	0.85	0.75	1.0		210
UDDEHOLM ELMAX	1.7	18.0	1.0	3.0	0.3	0.8		250
UDDEHOLM SLEIPNER	0.9	7.8	2.5	0.5	0.5	0.9		235
UDDEHOLM WEARTEC SF	2.8	7.0	2.3	8.9	0.7	0.8		270
UDDEHOLM VANADIS 10	2.9	8.0	1.5	9.8	0.5	0.5		300
UDDEHOLM VANCRON 40	1.1	4.5	3.2	8.5	0.4	0.5	W 3.7 N 1.8	300

This is a selection of steels offered within the Uddeholm High Performance Steel programme.
Detailed factual information is available at www.uddeholm.com

	Hardening temp. °C	Normal use hardness (HRC)	Yield point Rp0.2 (MPa)	Breaking point (MPa)	Typical applications
	850	33	870	1000	Axles, pistons, machine components for medium and high stress
	1000	34	910	1100	Moderately stressed machine parts in lightly corrosive environments
	850	40	1080	1180	Machine components requiring high yield point and moderate durability
	1020	42	1200	1400	Machine parts and axles requiring extensive swarf removal and high yield point
	1010	50	1240	1750	Highly stressed machine parts in lightly corrosive environments
	1020	48	1350	1600	Machine parts and axles requiring high yield point and fatigue strength
	Precipitation hardening	45	1420	1480	Machine parts for high stress which demand high toughness at low temperatures, also suitable for lightly corrosive environments
	1050	54	1790*		Knives and counter blades for fragmentation
	1020	56	1800	2150	Machine components requiring high yield point and durability as well as good toughness
	1050	55	1850	2300	Machine parts subject to heat influence and high stress
	1050-1100	58	1900*		Stainless PM steel for parts subject to wear in corrosive environments
	950-1080	60	2230*		Wearing parts with high abrasive wear and knives
	1050	63	2650*		Wearing parts for maximum abrasive wear
	1020–1060	62	2650*		PM steel for wearing parts subject to extremely high wear
	1000–1100	63	2900*		Wearing parts requiring low friction properties and high wear resistance

*Data from compressive strength testing

**PROPERTIES – ENGINEERING STEEL
EN 295 (SS-2172)**

C: 0.18 Cr: 0.3 Mn: 1.3 Si: 0.3

Normal use hardness: 170 HB

Yield point: 320 MPa

Breaking point: 490–590 MPa

Typical applications: Engineering steels frequently used in machine components

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Uddeholm is present on every continent. This ensures you high-quality Swedish tool steel and local support wherever you are. Assab is our wholly-owned subsidiary and exclusive sales channel, representing Uddeholm in various parts of the world. Together we secure our position as the world's leading supplier of tooling materials.

Uddeholm is the world's leading supplier of tooling materials. This is a position we have reached by improving our customers' everyday business. Long tradition combined with research and product development equips Uddeholm to solve any tooling problem that may arise. It is a challenging process, but the goal is clear – to be your number one partner and tool steel provider.

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For more information, please visit www.uddeholm.com or www.assab.com

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