Uddeholm Stainless Concept

RUST NEVER SLEEPS – GO FOR A BETTER STEEL

UDDEHOLM
a voestalpine company

CONTENT

This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should not therefore be construed as a warranty of specific properties of the products described or a warranty for fitness for a particular purpose.

Classified according to EU Directive 1999/45/EC
For further information see our “Material Safety Data Sheets”.

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THE PROBLEMS ARE WELL-KNOWN, THE RIGHT STEEL IS THE SOLUTION

Plastic moulding is a part of our everyday lives. Car parts, mobile phones, spectacles, computer chassis are all manufactured by moulds. However the materials needed to make these moulds often require unique and demanding characteristics. This is why it is crucial to select the correct steel grade for your specific mould.

Many of the most well-known brands use Uddeholm tool steel in their manufacturing processes, since plastic moulding is a demanding and evolving industry. Harsh environments put steel under considerable stress. The problems are well-known, choosing the right tool steel is the solution. Rust never sleeps – go for a better steel!

A COMBINATION OF PERFORMANCE, QUALITY AND FLEXIBILITY

Uddeholm Stainless Concept is our own system of metallurgically balanced stainless grades. Grades that have been specially developed and continually refined to meet the needs of the evolving plastic moulding industry. Rust problems are common with moulds – surfaces that need to be repolished, cooling channels that have to be redrilled and parts that rust together. Choosing the right product within Uddeholm Stainless Concept will minimise these problems. Normally, stainless steel grades have relatively low wear resistance and strength. With Uddeholm Stainless Concept we have solved this problem and can offer a unique combination of corrosion resistance, wear resistance and high strength. These sought-after mechanical properties make steel grades from Uddeholm Stainless Concept perfect not only in traditional tooling applications, but also for manufacturing components with high demands.

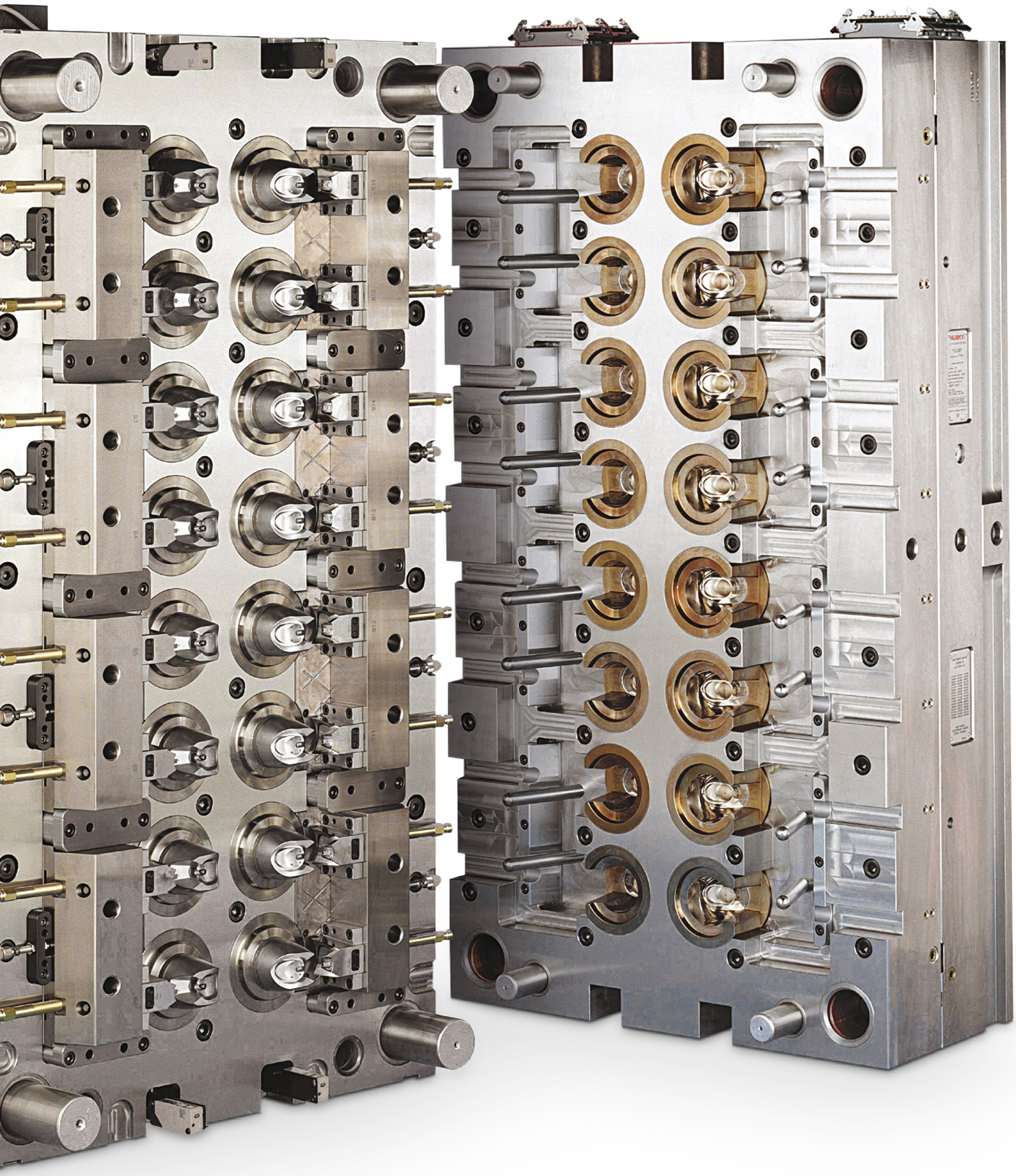
GO FOR A BETTER STEEL

You and your customers will achieve:
- increased mould quality
- increased productivity
- improved end-product finish and quality
- reduced maintenance costs
- trouble free production

A WIDE RANGE OF CORROSION RESISTANT TOOL MATERIALS

The initial Uddeholm Stainless Concept was coined many years ago. Since then, our state-of-the-art products have continuously been improved and developed to meet our customers' requirements and increasing demands.

TAKING STANDARDS TO A NEW LEVEL



Uddeholm RoyAlloy™

EXCELLENT MACHINABILITY FOR MOULD BASES

Uddeholm RoyAlloy is a prehardened corrosion resistant holder steel specifically designed for mould base applications. It offers excellent machinability, a characteristic that is beneficial in a number of ways: shorter lead times for mould manufacturing, less tool wear and more efficient machining time. In other words, it will help you meet the demands of your customers.

Uddeholm RoyAlloy provides very good stability combined with uniform hardness in all dimensions. Its good corrosion resistance properties help keep water-cooling channels clean and maintain cycle time consistency. RoyAlloy is widely used for mould bases, inserts and plastic and rubber moulds with low demands on surface finish.

Uddeholm RoyAlloy properties:
- Excellent machinability
- Good corrosion resistance
- Uniform, consistent hardness in all dimensions
- Excellent stability and flatness
- Good resistance to indentation
- Superior toughness and ductility
- Safe and simple weld repair
- Pre-hardened to approximately 30–35 HRC

Figure 1: Milling with Cemented Carbide Inserts

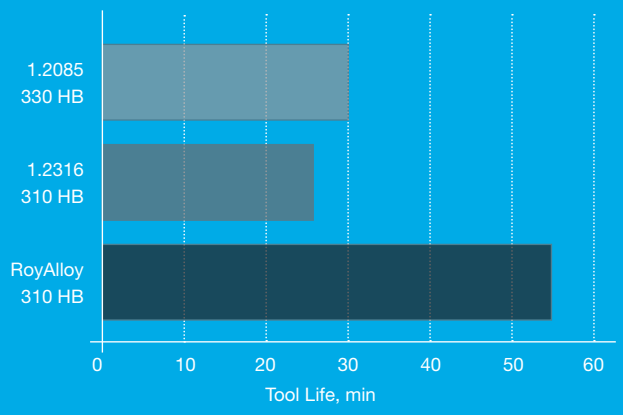


Figure 1: During cavity milling the tool life is almost double when cutting with the same speed, 270 m/min. Alternatively, the cutting speed can be increased considerably with the same tool life as with 1.2085.

Figure 2: Drilling with HSS Drills

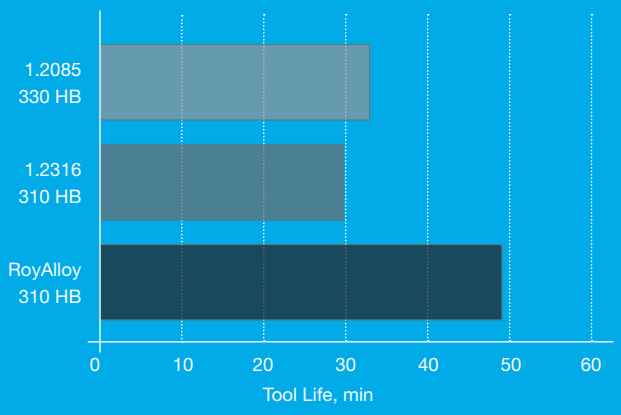


Figure 2: When drilling, the cutting speed can be increased up to 40% with the same tool life of the drill, 1000 mm.

Uddeholm Ramax® HH

HIGH PREHARDENED HARDNESS

Uddeholm Ramax HH provides several benefits in comparison with other prehardened, corrosion resistant grades for mould bases. Uddeholm Ramax HH gives you uniform hardness in all dimensions combined with excellent indentation resistance. By choosing this product you can prevent clogging of the water cooling channels that could otherwise affect cycle time consistency. Uddeholm Ramax HH is supplied at ~36 HRC, a hardness level that is higher than other corrosion resistant prehardened grades for mould bases. This gives you a more durable mould with a longer life span. Uddeholm Ramax HH can also be used for other applications with low demands on surface finish as well as for extrusion dies.

TAKE A SHORT CUT

Fast tool making and low maintenance are of key importance for many different types of moulds and products

Uddeholm Mirrax® 40

SPECIALLY DEVELOPED FOR FASTER TOOL MAKING

Complicated mould designs are made easy with Uddeholm Mirrax 40. This new steel grade is pre-hardened, which eliminates the need for further heat treatment. Combined with excellent machinability, it will allow you to dramatically reduce your lead times for mould manufacturing. In addition, Uddeholm Mirrax 40 is produced using the electroslag remelting (ESR) technique in order to achieve a very pure material with excellent polishability and higher toughness.

Uddeholm Mirrax 40 is an excellent choice for corrosive and recycled plastics such as PVC and acetates, as well as complicated mould designs where heat treatment can cause distortion or dimensional changes. It is also well suited for moulds that require excellent surface finish properties and very high corrosion resistance.

UDDEHOLM MIRRAX 40 ADVANTAGES

Pre-hardened to 40 HRC
- No extra hardening risks or costs
- No need for further heat treatment
- No distortion
- Easier modifications

Electroslag remelted (ESR)
- Very clean steel
- Low non-metallic inclusions
- Low sulphur content
- Excellent polishability

Combines high hardness with toughness
- Good resistance to indentation
- Minimises risk of unexpected failures
- Safer mould usage
- Longer mould life

Excellent corrosion resistance
- Less corrosion from aggressive and recycled plastics
- Lower production costs as cooling channels are less affected by corrosion, ensuring consistent cycle time
- Lower mould maintenance costs

TOUGHER IS NOT A PROBLEM

Uddeholm Mirrax® ESR

MEETS THE DEMANDS FOR LARGER AND TOUGHER MOULDS

Larger tools require materials with excellent hardenability to achieve a high degree of toughness after heat treatment. Uddeholm Mirrax ESR is specially developed for larger moulds in environments where corrosion resistance is also a requirement.

Uddeholm Mirrax ESR is a remelted tool steel. This results in a very pure material, with a minimum of inclusions. Purity is necessary to achieve a high surface finish. It also contributes to higher toughness.

Uddeholm Mirrax ESR properties and advantages:

- Excellent through hardening properties
  Needed for good properties in large dimensions
- Excellent ductility and toughness
  Needed for safe production
- High corrosion resistance
  Needed for low maintenance
- Excellent polishability
  Needed for aesthetic quality and function
- Excellent wear resistance
  Needed for a longer life span

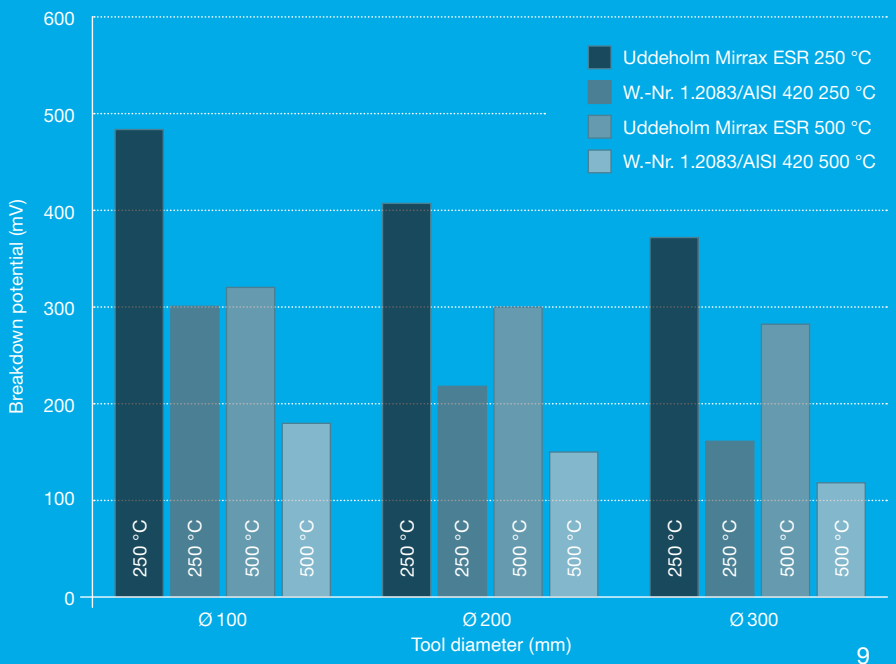
Uddeholm Mirrax ESR can be used when moulding LCD or plasma front panels

CORROSION RESISTANCE OF UDDEHOLM MIRRAX® ESR

Pitting corrosion can be the start of further corrosion, for example stress corrosion cracking which in some cases can lead to rapid failure of moulds. The diagram shows that by using Uddeholm Mirrax ESR the risk of pitting corrosion is reduced at both low and high tempering temperature compared with standard stainless mould steel. The difference in pitting corrosion sensitivity is more pronounced the slower the cooling rate, i.e. the larger the dimension. This is one of the reasons why Uddeholm Mirrax ESR is recommended for larger sized moulds.

Cooling time can be translated to a corresponding material diameter if the cooling rate of the furnace is known. The tool diameters shown in the diagram correspond to the cooling rate achieved in a 5 bar vacuum furnace.

Breakdown potential; the higher the value is, the lower the risk of pitting corrosion will be.



STAINLESS CONCEPT – WHEN CORROSION IS UNACCEPTABLE

Uddeholm RoyAlloy™

This corrosion resistant holder steel is a new addition to the Uddeholm range. It is widely used for mould bases, inserts and plastic and rubber moulds with low demands on surface finish.

Uddeholm Ramax® HH

Uddeholm Ramax HH is supplied at a higher hardness level than other corrosion resistant prehardened grades. This gives you a more durable mould suitable for holders and bolsters, dies for extrusion and engineering parts.

Uddeholm Mirrax® 40

This new steel grade, Uddeholm Mirrax 40, is pre-hardened for faster mould manufacturing. Its high purity and excellent corrosion resistance make it an excellent choice for corrosive or recycled plastics and complicated mould designs.

Uddeholm Mirrax® ESR

The perfect steel for larger, tougher moulds. Uddeholm Mirrax ESR is a remelted tool steel, resulting in a very pure material with excellent hardening properties.

Uddeholm Stavax® ESR

Uddeholm Stavax ESR is the original corrosion resistant steel and the right choice in environments where corrosion is totally unacceptable and the demands on hygiene are extra high.

Uddeholm Polmax™

Uddeholm Polmax is one of the cleanest mould steel grades on the market, making it possible to achieve surface finishes that surpass any conventional tool steel.

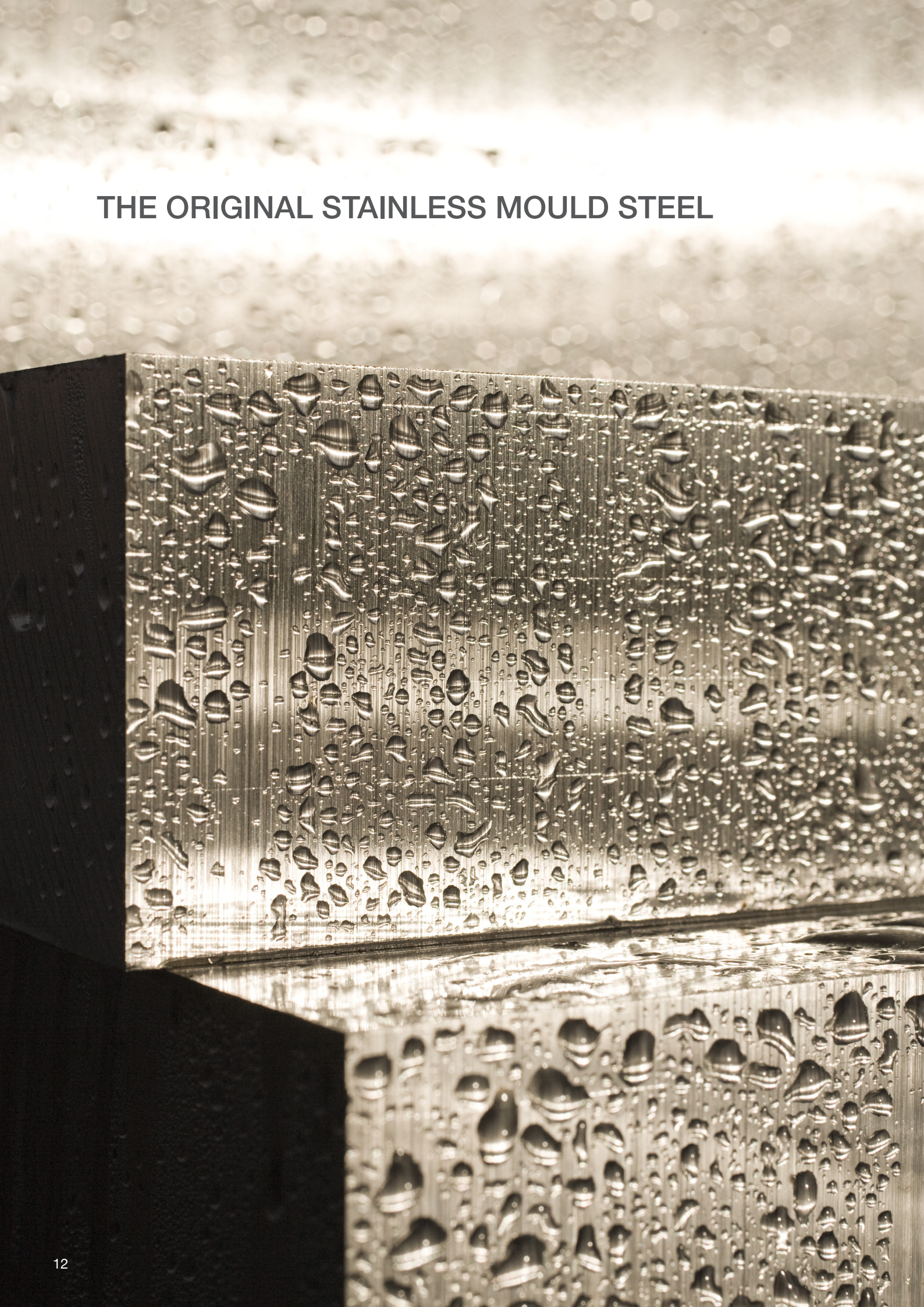
Uddeholm Corrax®

Designed for extreme corrosion resistance in all conditions as well as easy heat treatment, Uddeholm Corrax is perfectly suited for injection moulds for highly corrosive rubber and plastics.

Uddeholm Elmax®

The ultimate steel for high-tech applications, such as electronics and engineering. It has excellent dimensional stability and high cleanliness along with high abrasive wear resistance and corrosion resistance.

THE ORIGINAL STAINLESS MOULD STEEL



The familiar PET bottles are produced in two steps: first injection moulding of the preforms and then blow moulding of the preforms to the finished bottle. The preforms are produced in the millions by one and the same mould. Stoppages in production for maintenance are not accepted. A high quality steel like Uddeholm Stavax ESR meets the requirements for corrosion and wear resistance, which are both necessary properties in a long-run mould.

Uddeholm Stavax® ESR

PERFECT FOR SMALL AND MEDIUM INSERTS AND CORES

Uddeholm Stavax ESR is the original corrosion resistant steel. It has been included in Uddeholm Stainless Concept since the 1970s, and it remains one of the most attractive materials. Uddeholm Stavax ESR combines corrosion and wear resistance with excellent polishability, good machinability and stability in hardening; all sought-after properties which give you greater overall economy.

Choosing Uddeholm Stavax ESR means reduced mould maintenance requirements by ensuring that cavity surfaces retain their original finish over extended operating periods. When compared with non-stainless mould steel, Uddeholm Stavax ESR offers lower production costs by maintaining clean cooling channels that assure uniform cooling conditions plus consistent cycle times throughout the life of the mould. This classic stainless tool steel is the right choice where rust in production is totally unacceptable and where the requirements for good hygiene are extra high – within the medical industry, basic optics and for other high quality transparent articles.

Uddeholm Stavax ESR properties:

- Good corrosion resistance
- Good polishability
- Good wear resistance
- Good machinability
- Good stability in hardening

PURE PRECISION

Uddeholm Polmax®

FOR EXTREME SURFACE FINISH REQUIREMENTS

To meet the most extreme demands of the plastic mould industry, Uddeholm Polmax stands out as one of the best innovations from Uddeholm. It is one of the cleanest mould steel grades on the market and offers unparalleled polishability.

It also offers excellent corrosion resistance from the most aggressive attacks. Uddeholm Polmax is a high performance steel grade which achieves surface finishes that go well beyond conventional tool steel.

To make the cleanest steel possible Uddeholm Polmax passes through several separate cleaning stages. The combination of these processes makes the steel completely unique.

Uddeholm Polmax properties:
- Excellent polishability
- Good corrosion resistance
- Good wear resistance
- Good machinability
- Good stability in hardening

Uddeholm Polmax is specially engineered for cavities, cores and inserts, as well as a broad range of product applications that require superior surface finishes. Examples include optical, ultra clean medical applications.

UDDEHOLM POLMAX™ FULFILLS THE REQUIREMENTS FOR POLISHABILITY

Uddeholm Polmax fulfills the high demand for cleanliness required to obtain good surfaces by polishing. Composition and delivery hardness is measured as well as inclusion level. The inclusion level is measured according to international standard.


DON’T COMPROMISE

Uddeholm Corrax is used as a core material in the mould for production of this garden saw handle

Production of PVC tubes or fittings places very high demands on the corrosion resistance of the mould

Uddeholm Corrax®

MEETS THE DEMANDS FOR EXTREME CORROSION RESISTANCE

Uddeholm Corrax is designed to handle the toughest of corrosive moulding environments, while providing simplicity in heat treatment. No matter what hardness range Uddeholm Corrax is used in, its general corrosion resistance will be excellent.

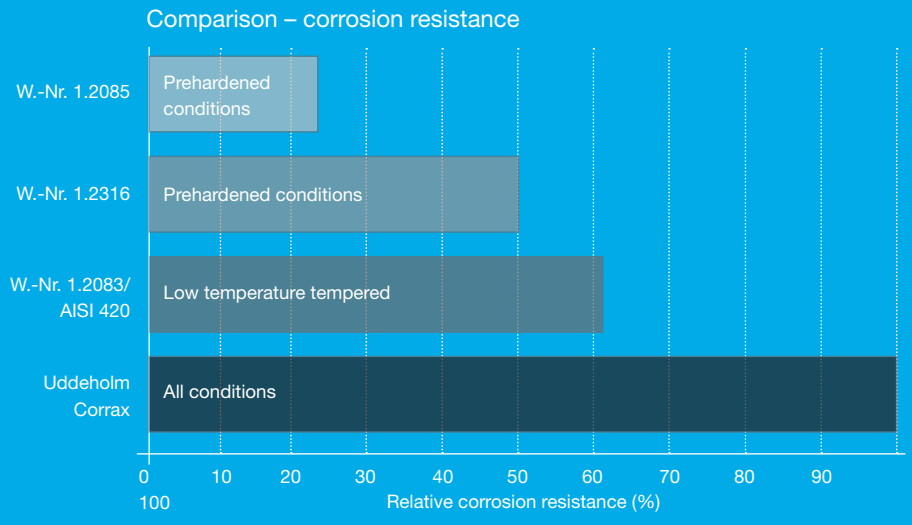
Plastic and rubber moulding conditions, containing corrosive additives, excessive contaminants in the cooling system, or high humidity can all be solved by the use of Uddeholm Corrax. With an ability to achieve hardness levels up to 50 HRC, this grade is also suitable for long-running tools. This hardness capability exceeds the ability of other precipitation hardening corrosion resistant steel grades, giving Uddeholm Corrax a better wear resistance.

Uddeholm Corrax properties:
- Extreme corrosion resistance
- Easy heat treatment with predictable dimensional change
- High uniformity of properties, even for large dimensions
- Very good weldability – no preheating necessary

Uddeholm Corrax is a very suitable mould steel for plastic parts with complicated design. Typical application areas include injection moulds for highly corrosive rubber and plastics, extrusion dies and injection moulds for plastics used for medical products and food processing.

CORROSION RESISTANCE OF UDDEHOLM CORRAX®

Uddeholm Corrax has very good corrosion resistance, better than the corrosion resistance of standard grades used for plastic moulding. The corrosion resistance is the same in all heat-treated conditions.



HIGHER OUTPUT

Uddeholm Elmax®

SPECIALLY DEVELOPED FOR HIGH-TECH APPLICATIONS

Higher output, less rework and reduced maintenance are the results when using Uddeholm Elmax as a mould steel. Excellent dimensional stability and high cleanliness make it well-suited to high-tech applications – such as in the electronics industry.

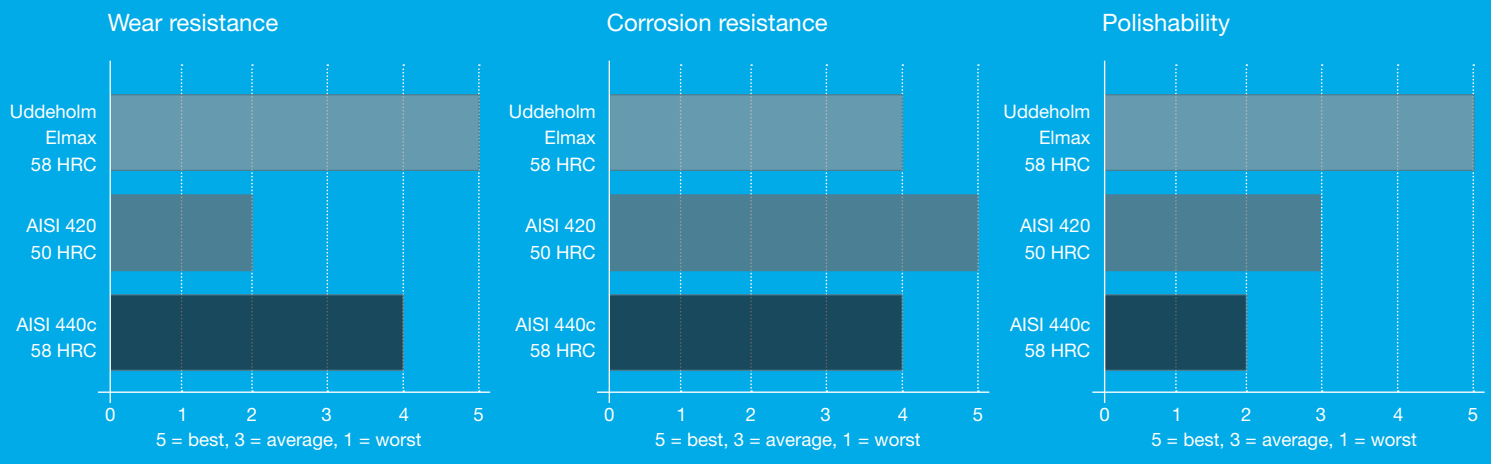
Uddeholm Elmax is a powder steel with several unique properties. New types of engineering plastics, with high filler content, place greater demands on the tooling material. The steel should have both high abrasive wear resistance and corrosion resistance.

Uddeholm Elmax has a unique combination of good corrosion resistance and very high abrasive wear resistance. Other important properties are EDM-ing (Electro Discharge Machining) ability, very good surfaces after EDM-ing, high polishability and dimensional stability during heat treatment and in production. This steel makes it possible to make long-life, low-maintenance moulds which provide the best overall tooling economy.

This steel has been specially developed for high-tech applications. These include products within the electronics industry, such as connectors, plugs, switches, resistors and integrated circuits. Uddeholm Elmax can also be used for engineering applications, such as the food processing industry or for fragmentation of plastics.

When producing electronic parts, corrosion resistance and dimensional stability are critical properties for the tool.

UDDEHOLM ELMAX® PROPERTIES



Relative property profile for Uddeholm Elmax, AISI 420 and AISI 440C in plastic moulds.

Manufacturing solutions for generations to come

SHAPING THE WORLD®

We are shaping the world together with the global manufacturing industry. Uddeholm manufactures steel that shapes products used in our every day life. We do it sustainably, fair to people and the environment. Enabling us to continue shaping the world – today and for generations to come.

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