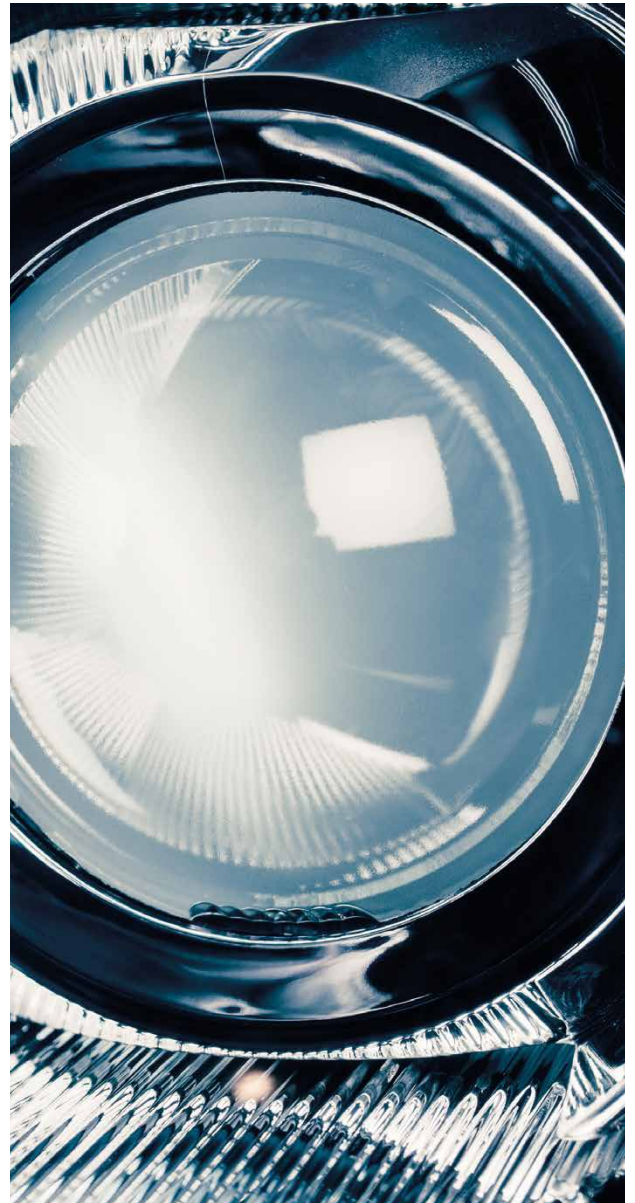


Formadur PH X Superclean

The corrosion-resistant steel
that sets polishability standards



**Swiss
Steel**
Group

Plastic mould manufacturing's gem

The current tendency in plastic mould manufacturing is to incorporate two mould features – corrosion resistance and the very best in polishability.

The advantage of moulds of this nature is their ability to withstand condensation and cooling water. They are also resistant to plastics such as PVC or aminoplasts—materials which usually corrode tool steels through the separation of acids during processing. The other even more significant key feature, especially when viewed from a standpoint of shortened production times, is exceptional polishability. Deutsche Edelstahlwerke's tool specialists answer to this challenge was the development of the precipitation-hardenable high-performance steel Formadur PH X Superclean.

In contrast to the majority of corrosion-resistant steel grades commonly used in mould manufacturing, Formadur PH X Superclean contains a minimum of carbides. As a result of the material's homogeneous microstructure, stress-relief annealing after rough machining is unnecessary – a further advantage over conventional steels.

Formadur PH X Superclean's outstanding polishability, corrosion resistance and dimensional stability have set a new standard in the world of plastic mould construction.



In the world of plastics processing, profitability is highly dependent on the performance, reliability and quality of the steel grade used for the mould. Thanks to Formadur PH X Superclean's superior advantages, the plastic manufacturer is able to achieve significant increases in profitability, productivity and quality when using this steel grade.

Formadur PH X Superclean – when you demand the very best polishability from a corrosion-resistant steel.

- Formadur PH X Superclean is a precipitation-hardenable remelted steel grade exhibiting exceptional corrosion resistance and outstanding polishability. This unusually pure premium steel is a development based on Formadur 2316.
- Formadur PH X Superclean is particularly suitable in fulfilling most demanding requirements when it comes to high quality surfaces. Its microstructure and working hardness are the key to its excellent polishability.
- Specific technology is applied to Formadur PH X Superclean during production, resulting in exceptionally low stress and outstanding shape retention at the machining stage.
- Formadur PH X Superclean requires no additional heat treatment as it is supplied at a standard hardness of 38 to 42 HRC.

Comparison of properties

	Formadur PH X Superclean	1.2316
Machinability	++	++
Corrosion resistance	++++	++
Thermal conductivity	+	+
Toughness	+++	+
Polishability	++++	++
Shape retention	++++	++

Formadur PH X Superclean

Benefits for the plastics-manufacturing industry

Moulds and mould inserts are typical operational applications for Formadur PH X Superclean in the automotive industry – for headlight reflectors for example – as in the optical industry (e.g. spectacle lenses and optical inserts). This especially pure steel is likewise favoured for components in the chemical and aeronautics industries.

When it comes to high-level polishability, shape retention and corrosion resistance, Formadur PH X Superclean is the perfect solution, offering manufacturers of plastic components very considerable advantages:

- necessary maintenance and cleaning activities are reduced to a minimum, particularly in demanding climatic conditions such as high humidity or sea air with a high salt content
- the very high resistance to corrosion results in a long service life
- water flow and heat dissipation are not impeded by substances resulting from corrosion in the cooling channels
- there is no risk of contact corrosion when using a combination of mould frames made of Corroplast together with inserts made of Formadur PH X Superclean

Machinig values for Formadur PH X Superclean (Hardness 38 - 42 HRC)

Tool	Hobbing/ Kayway cutter	Surface milling Ø 120	Round plate Ø 66	Drilling Ø 17.7	Tapping
Cutting material	P 20 - P 30	P 40 coated	P 40 coated	SCD	PM
Cutting speed v_c in m/min	40 - 60	80 - 100	80 - 120	35 - 45	3 - 4
Feed per tooth f_z in mm	0.12 - 0.15	0.25 - 0.45	0.35 - 0.60	0.2 mm/U	–
Depth of cut a_p in mm	5.0 - 8.0	3.0 - 7.0	2.0	5.0 x D	15 x D
Width of cut a_e in mm	100% D	75% D	45	D	–
Stability of the machine, clamping + workpiece	+++	+++	+++	+++	+++



Formadur PH X Superclean

Chemical composition in weight-%

C	Cr	Ni	Cu	Nb
0.05	15.00	4.50	3.50	+

Special properties

Formadur PH X Superclean is a corrosion-resistant, precipitation-hardened steel with high strength. It shows excellent polishability due to the applied remelting process.

Compared to 1.2316, hardness in as-delivered condition and corrosion resistance are improved.

Heat treatment

Formadur PH X Superclean is usually supplied in precipitation-hardened condition with a hardness of 40 HRC.

Applications

Formadur PH X Superclean is recommended for tools used in the processing of corrosive plastics. Further applications for components in aircraft and chemical industries.

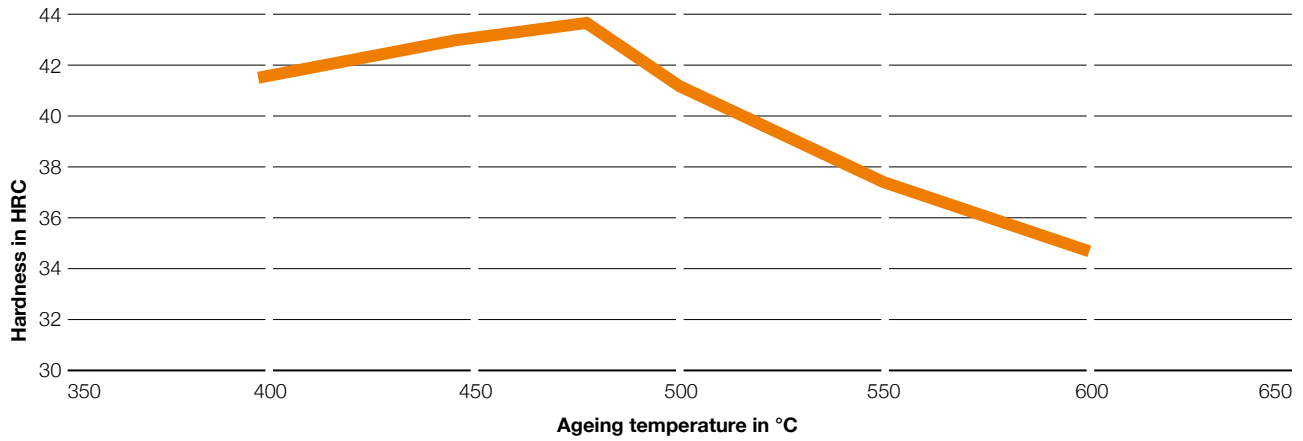
Coefficient of thermal expansion in precipitation hardened condition in 10⁻⁶/K

20 - 100 °C	10.4
20 - 150 °C	10.6
20 - 200 °C	10.9
20 - 250 °C	11.1
20 - 300 °C	11.4
20 - 350 °C	11.5
20 - 400 °C	11.7
20 - 450 °C	11.9
20 - 500 °C	12.0

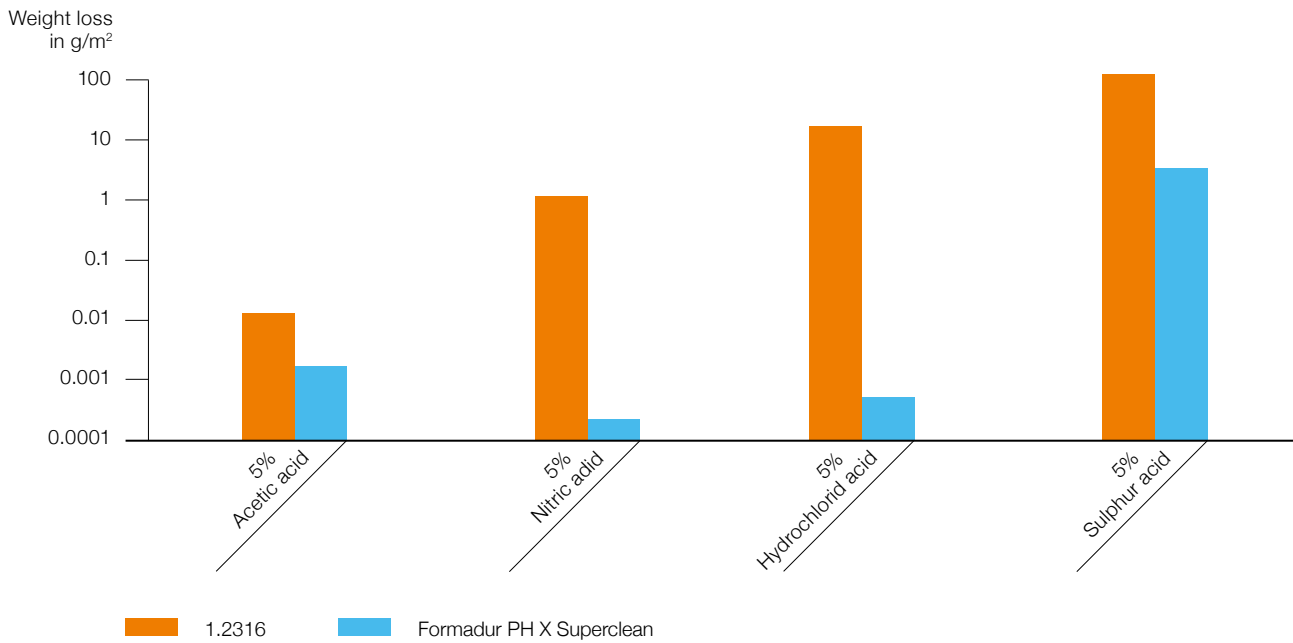
Thermal conductivity in precipitation hardened condition in W/(m K)

23 °C	26.1
150 °C	20.1
300 °C	22.1
350 °C	22.8
400 °C	23.3
500 °C	24.1

Tempering diagram



Weight loss diagram



General note (liability)

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