



TOOLOX®
ENGINEERING & TOOL STEEL

SMS
Swedish ME Steel



A NEW GENERATION OF STEEL

Toolox® is a modern quenched and tempered prehardened engineering and tool steel, delivered with measured and guaranteed mechanical properties.

The advantages of Toolox in comparison to standard steel grades are clear from the moment you start using it. Whether it's the homogeneous and tough structure, the dimensional stability, or the fact that there's no need for additional heat treatment, Toolox shows no compromises.

LOW CARBON CONCEPT

SSAB produces Toolox at its fully integrated, state of the art mill in Oxelösund, Sweden. By employing high quality raw materials, a low carbon metallurgical concept, and an advanced quenching and tempering process, SSAB has produced a steel with a seemingly impossible combination of hardness, toughness, and strength.

Additionally, Toolox is delivered with ESR properties ensuring excellent polishing, etching, and welding properties for high quality surfaces.

PERFORMANCE GUARANTEED

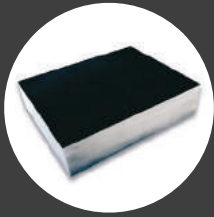
Every single plate and bar of Toolox undergoes a rigid testing procedure so as to provide exact values and guarantees for hardness, toughness, yield strength, and homogeneity.

Toolox is available in two hardness grades: Toolox 33 and Toolox 44.

Chemical Composition	Toolox 33	Toolox 44
Carbon (C)	0.22 - 0.24 %	0.32 %
Silicon (Si)	0.6 - 1.1 %	0.6 - 1.1 %
Manganese (Mn)	0.8 %	0.8 %
Phosphorous (P)	max 0.010 %	max 0.010 %
Sulfur (S)	max 0.002 %	max 0.002 %
Chromium (Cr)	1.0 - 1.2 %	1.35 %
Molybdenum (Mo)	0.30 %	0.80 %
Vanadium (V)	0.10 - 0.11 %	0.14 %
Nickel (Ni)	max 1.0 %	max 1.0 %

Mechanical Properties	Toolox 33	Toolox 44
Hardness	300 HBW	45 HRC
Yield Strength $R_{p0.2}$	850 MPa	1300 MPa
Tensile Strength R_m	980 MPa	1450 MPa
Elongation A_5	16 %	13 %
Toughness Charpy-V	100 J	30 J
Heat Conductivity	35 W/mK	34 W/mK
Thermal Expansion Coeff.	$13.1 \cdot 10^{-6}/K$	$13.5 \cdot 10^{-6}/K$
Inclusion Size	6 micron	6 micron
Area Fraction	0.015 %	0.015 %
Aspect Ratio	1.2	1.2

Advantages of Toolox



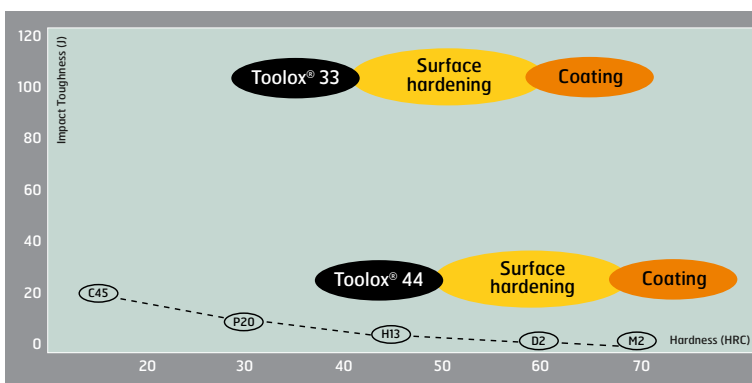
FASTER TO MARKET

Toolox is delivered fully hardened and tempered - ready to use. There's no need for heat treatment or stress relieving, which in turn allows you to dramatically reduce lead times and save costs in manufacturing.



QUALITY MATERIAL

The unique structure of Toolox surpasses established steel standards and the advanced CSR casting technology gives Toolox ESR properties. These properties make for a very clean steel with excellent surface finish, toughness, and homogeneity.



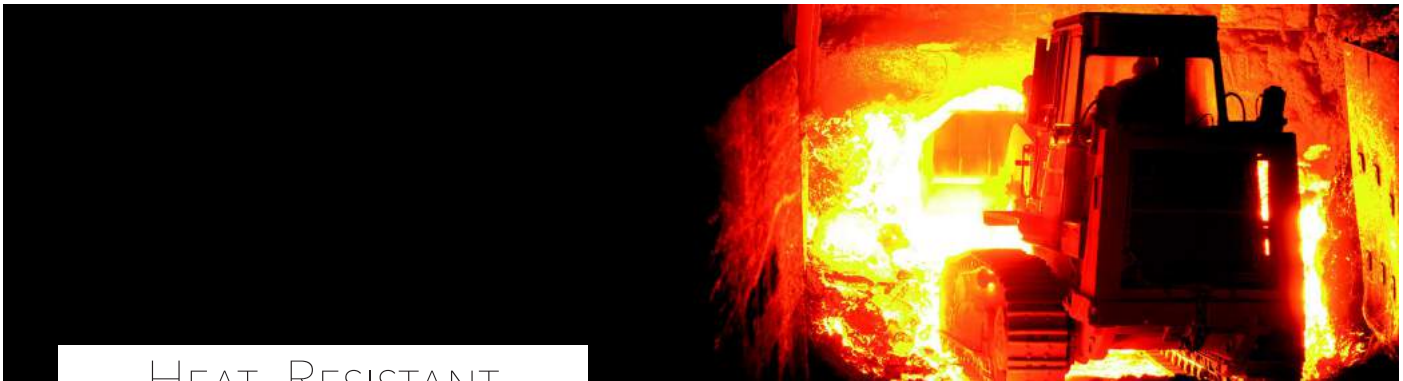
Toolox 44 + Nitriding
250,000 shots and running



D2 / 1.2379 at 60 HRC
crack after 10,000 shots

CRACK RESISTANCE

A minimum of inclusions, low carbon content, and an advanced quenching and tempering process give Toolox toughness and fatigue properties far superior to comparable steels. Simply put, no cracks and a much longer lifetime. And the surface indicates fatigue life.



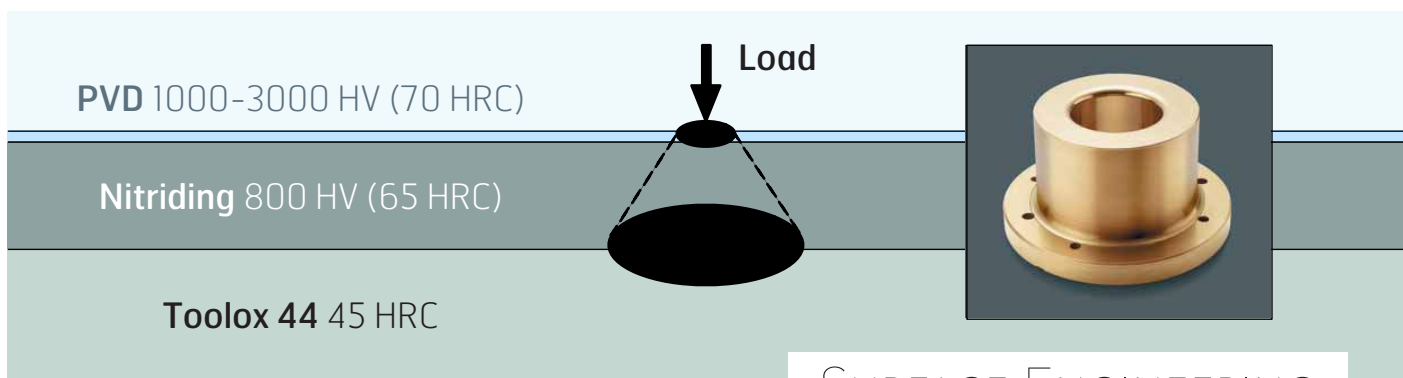
HEAT RESISTANT

Toolox is able to maintain wear properties, impact toughness, and high compressive yield strength at elevated temperatures and prolonged soaking times.



EASY MACHINING

The low carbide content, homogeneity, and permanent dimensional stability of Toolox form the basis for great machinability. It is possible to machine in any direction, closer to the final contours, and with higher intensity. Plus, finish machining can follow rough machining in one process with a single clamp set up.



SURFACE ENGINEERING

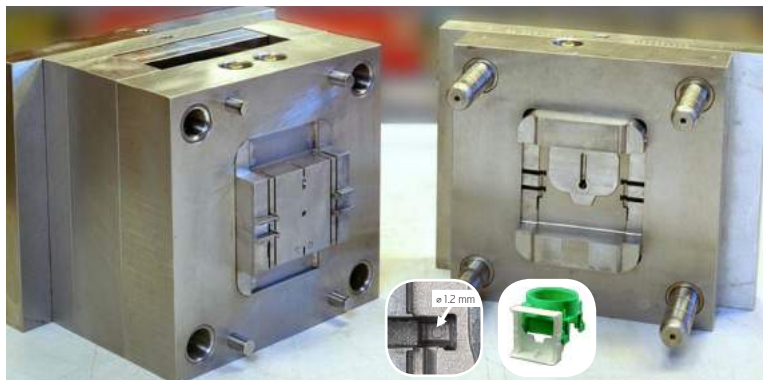
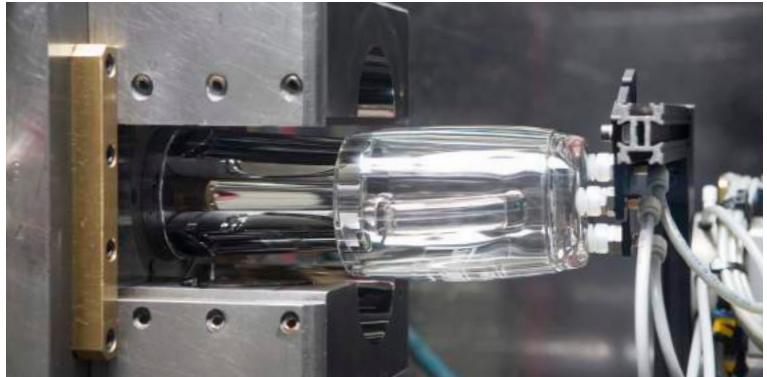
Toolox is a nitriding steel and an excellent substrate for surface engineering. Treatments include nitriding, PVD coating, and induction hardening. The high toughness of Toolox prevents cracks from the surface to be propagated into the substrate.

PLASTIC MOULDS

Toolox is an excellent solution in the field of mould construction. Mould makers and end customers around the world are increasingly selecting Toolox as the new standard over the traditional grades of P20, H13, and 420.

- ✓ Rapid mould making with no need for heat treatment, adjusting, and multiple setups.
- ✓ Excellent polishing and texturing capabilities.
- ✓ Perform complex operations with no need to stress relieve.
- ✓ Use less material with unmatched flatness and narrow thickness tolerances giving more precise allowances in milling and grinding.

Mould Requirements & Proposed Material				
	100,000	500,000	1,000,000	> 1,000,000
GENERAL PLASTICS PP, PS, PE	Toolox 33	Toolox 33	Toolox 44	Toolox 44 + NITRIDING
ENGINEERING PLASTICS PA, PC, ABS, PMMA, PPE, PBT, PET	Toolox 33	Toolox 44	Toolox 44 + NITRIDING	Toolox 44 + NITRIDING
ADVANCED PLASTICS PA66, PI, PES	Toolox 44	Toolox 44 + NITRIDING	Toolox 44 + NITRIDING	-



Top - Plastic mug produced with 15% lower cost than H13 / 1.2344
Bottom - PA6 electrical cover. Toolox 44 replaced AISI 420 to save production time.

COLD FORMING

Toolox is suitable in a broad range of applications including sheet forming, punching, blanking, and cutting. Dies require resistance against abrasive and adhesive wear, chipping, plastic deformation, and cracks.

- ✓ Toughness and ESR properties virtually eliminate chipping and cracks as modes of failure, greatly extending lifetime.
- ✓ Excellent surface finish reduces friction.
- ✓ Complicated shapes and larger dies can be machined with Toolox easier than comparable steels.



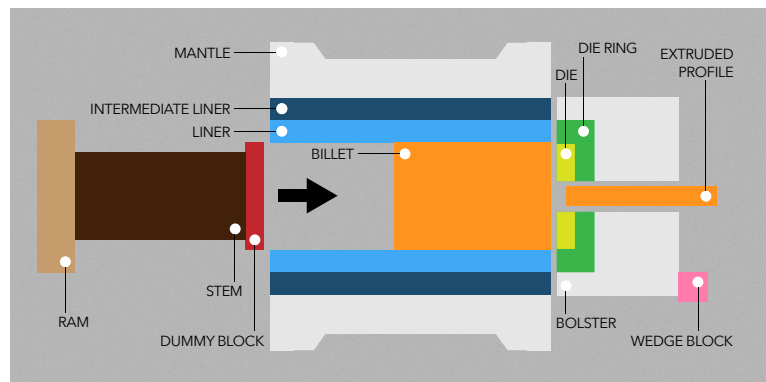
Top - Press tool with Toolox 44 for base plate in Electrolux refrigerator. Made 1,600,000 pieces.
Bottom - Forming die. Toolox 44 produced 3x lifetime of D2 / 1.2379 (60 HRC)

ALUMINIUM EXTRUSION

Extrusion dies are subject to high wear and pressure at elevated temperatures. This makes it essential to select a high quality steel. Toolox is a great solution with faster setup and better service life.

- ✓ Excellent high temperature properties including hardness and compressive yield strength.
- ✓ Faster die making with no heat treatment.
- ✓ Suitable for nitriding.
- ✓ Homogeneity guarantees consistent properties throughout material.

Component	Current Solution	Suggestion
Die	1.2344 / H13	Toolox 44
Die Ring	1.2344 / H13, 1.2714	Toolox 44
Liner	1.2344 / H13	Toolox 44
Mantle	1.2738 / P20, 1.2344 / H13	Toolox 33, Toolox 44
Support Tools	1.2738 / P20	Toolox 33

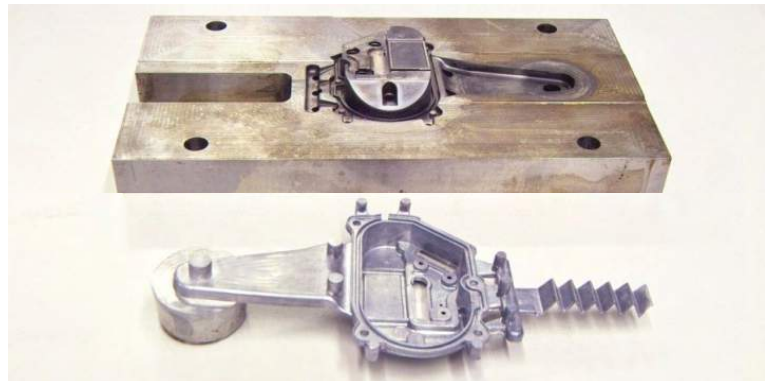
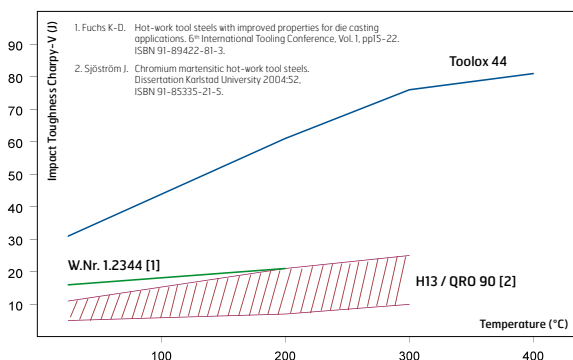


Top - SAPA extrusion die. Toolox replaced Dievar for a lower price and faster production.
Bottom - Prolong the life of various components of extrusion equipment with Toolox.

DIE CASTING

Die casting places very high demands on the selected die steel. Toolox offers real savings in production and tooling costs while meeting the requirements of the application.

- ✓ High impact toughness prevents cracks.
- ✓ Toolox maintains compressive yield strength at elevated temperatures and prolonged soaking times.
- ✓ Resistance to thermal fatigue.



Top - Aluminium die casting. Toolox 44 offered faster manufacturing and good surface polish.
Bottom - Brass die casting. Toolox 44 replaced QRO 90 to save time and material cost.

MACHINE COMPONENTS

There is an endless permutation of applications, each with a set of performance requirements. Traditionally a choice had to be made from a long list of engineering and tool steels to meet these requirements.

The unique chemical and mechanical properties of Toolox make that choice easier and more economical. Toolox can contribute to an optimized design, faster manufacturing, increased service life, and lower maintenance costs.

Toolox has been used in clamping, holding, wedges, supports, guides, machine frames, bearing houses, hydraulics, gears, racks, wheels, hubs, knives, crushers, buckets, tippers, material transport systems and more.

Common 300 HBW Engineering Steels				
	Toughness (J at 20°C)	Machining	Low Residual Stresses	Yield Strength (MPa)
1.7218 / 4130	45	+	++	600
1.6582 / 4340	35 - 45	+	++	700
1.7225 / 4140	30 - 35	+	+	675
1.2312 / P20 + S	~ 25	++	++	850
1.2738 / P20 + Ni	~ 22	+	++	850
Toolox 33	~ 100	+++	+++	850

- ✓ Toughness and fatigue properties increase the lifetime of machine components significantly.
- ✓ Consistent hardness ensures uniform wear.
- ✓ Toolox easily exceeds machining requirements thanks to its flatness, tight tolerances, dimensional stability, homogeneity, and low residual stresses.
- ✓ Low carbon equivalent makes weld repairs a safe and valid option.
- ✓ High temperature wear capabilities.



Bearing House - Toolox 33 is extremely stable and allows fast machining.



Press Brake Tool - Faster milling with Toolox 33 and deflection < 0.7 mm over 3 meters.



Gear Rack - Toolox 33 gas cut and machined. Much longer life than 42CrMo4.



Slag Remover Attachments - Toolox 44 replaced W.Nr. 1.2344 to increase service life.



Hot Bucket - Toolox 33 had a lifetime of 8 months vs 8 weeks with other materials.

TOOLOX SUBSTITUTIONS

Toolox 33 has replaced...

W. Nr.	DIN EN ISO 4957	AISI	Brand	Application Field
1.0037	-	-	St37-2	Machine Components
1.0044	-	-	St44-2	Machine Components
1.0503	C45	1045	En 8	Machine Components
1.0570	-	-	St52-3	Machine Components
1.0601	C60	1060	En 9	Machine Components
1.1191	Ck45 / C45E	1045		Machine Components
1.1730	C45W / C45U	1045		Machine Components
1.2311	40CrMnMo7	P20		Moulding, Mould Bases
1.2312	40CrMnNiMo8-6-4	P20 + S		Moulding, Mould Bases
1.2738	40CrMnNiMo8-6-4	P20 + Ni	Impax	Moulding, Hot Working, Machine Components
-	-	-	En 16	Machine Components
1.6523	20NiCrMo2-2	8620		Machine Components
1.6565	40NiCrMo6	4340	En 24	Machine Components
1.6587	17CrNiMo6	4820		Machine Components
1.7214	25CrMo4	4130		Machine Components
1.7225	42CrMo4	4140	En 19	Machine Components
1.8550	34CrAlNi7	-		Machine Components

Toolox 44 has replaced...

W. Nr.	DIN EN ISO 4957	AISI	Brand	Application Field
1.2080	X210Cr12	D3		Cold Working
1.2343	X37CrMoV5-1	H11		Moulding, Hot Working
1.2344	X40CrMoV5-1	H13	Orvar	Moulding, Hot Working
-	-	-	Dievar	Moulding, Hot Working
1.2358	60CrMoV18-5	-	Calmax	Cold Working
1.2363	X100CrMoV5-1	A2	Rigor	Cold Working
1.2365	32CrMoV12-28	H10		Moulding, Hot Working
1.2367	X38CrMoV5-3	-		Moulding, Hot Working
1.2379	X153CrMoV12	D2	Sverker 21	Cold Working
1.2436	X210CrW12	D6	Sverker 3	Cold Working
1.2510	100MnCrW4	O1	Arne	Cold Working
1.2550	60WCrV7	S1		Cold Working
1.2714	56NiCrMoV7	L6		Moulding, Hot Working, Cold Working
1.2718	55 NiCr 10	P20 + Ni		Moulding, Hot Working, Cold Working
1.2738	40CrMnNiMo8-6-4	P20 + Ni	Impax	Moulding, Hot Working, Machine Components
1.2761	-	-		Moulding, Hot Working
1.2767	X45NiCrMo4	6F7		Machine Components, Cold Working
1.2842				Cold Working
1.6511	36CrNiMo4	9840		Machine Components
1.6580	30CrNiMo8	-		Machine Components
1.6582	34CrNiMo6	4337/4340	En 24	Machine Components
1.6587	17CrNiMo6	4820		Machine Components

THANK YOU

Thank you and welcome to the world of Toolox and the new concepts it introduces.

Toolox is based on one thing - simplicity. Whether you are looking to upgrade your steel solution or make a new design, we are ready to provide you with the expertise, the support, and the steel to make that happen.


Take advantage of the wealth of case studies, recommendations, and workshop videos available at swedishmesteel.com.

STOCK PROGRAM

Comprehensive local stocks are available in the UAE and India serving the region with readily available Toolox plates and round bars.

Plates of Toolox are available with thicknesses from 6 mm to 165 mm. Round bars of Toolox are available with diameters from 16 mm to 400 mm.





Swedish ME Steel is a leading provider of specialized steel and wear solutions in the Middle East and Indian Subcontinent. With over twenty years of experience in the industry, Swedish ME Steel offers solutions developed in close cooperation with its customers to achieve more efficient production, better cost analysis, and longer service life.

For more information visit swedishmesteel.com

Swedish ME Steel Pvt Ltd

B-2/27, The Bachani Nagar Chs Ltd,
Bachani Nagar Road, Malad (East),
Mumbai - 400097, Maharashtra, India

T +91 22 28801545

Swedish ME Steel Pvt Ltd

Shed No. 48/4, (Sy No. 48/4),
Thigalarapalya Main Road,
Karivobanahalli, Peenya 2nd Stage,
Bangalore - 560058, Karnataka, India

T +91 80 49582777

Swedish ME Steel Pvt Ltd

Shakti Colony, Near Jagtap Dairy,
Wakad, Pimpri-Chinchwad - 411027
Pune, Maharashtra, India

T +91 9161124111

Swedish ME Steel FZC

LOB 10, Office No. 10G-11
PO Box 51270
Hamriyah Free Zone, Phase 1
Sharjah, United Arab Emirates

T +971 6 526 1875

F +971 6 526 1876

swedishmesteel.com