



***TOOLOX***<sup>®</sup>  
ENGINEERING & TOOL STEEL

***SMS***<sup>®</sup>  
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

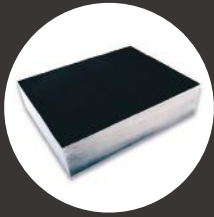
Every single plate and bar of Toolox undergoes a rigid testing procedure so as to provide exact values and guarantees for hardness, toughness, yield strength, and homogeneity.

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



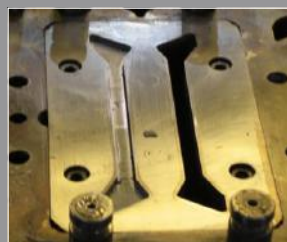
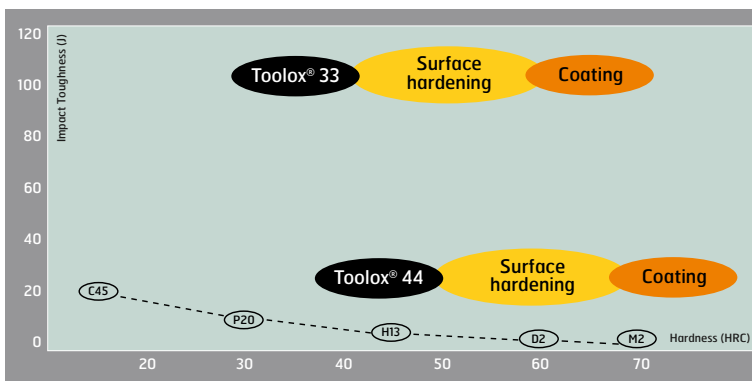
### FASTER TO MARKET

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.



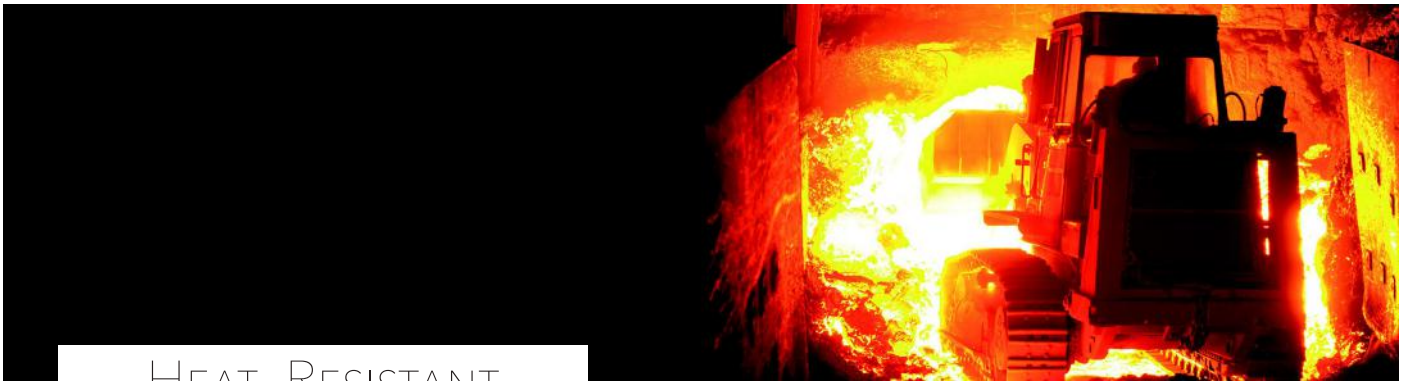
Toolox 44 + Nitriding  
250,000 shots and running



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.



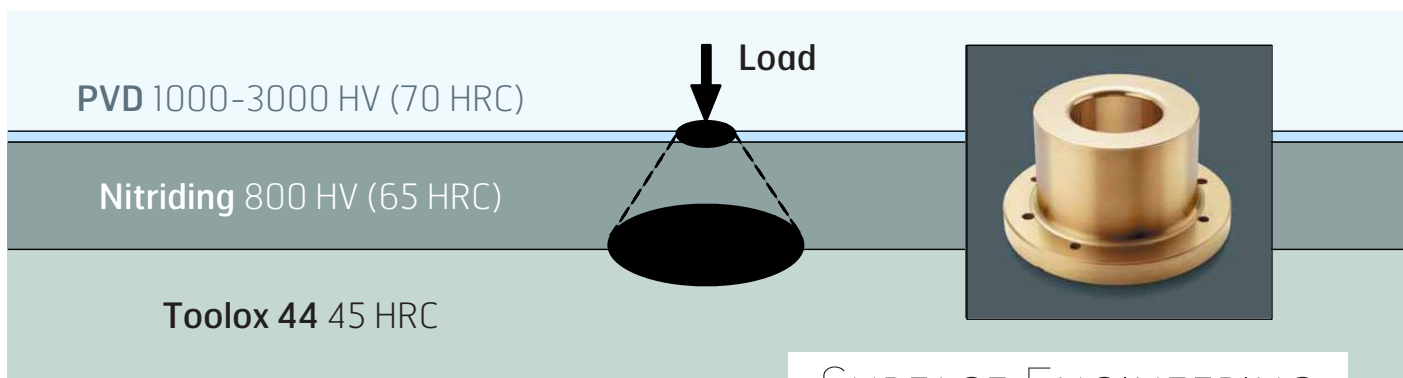
## HEAT RESISTANT

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.

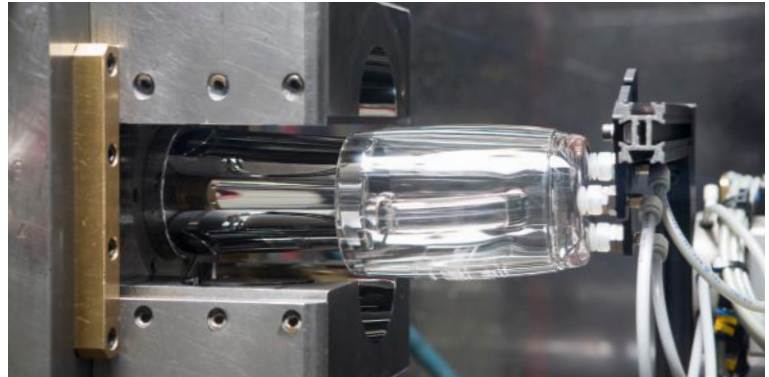


## PLASTIC MOULDS

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           |
| <b>GENERAL PLASTICS</b><br>PP, PS, PE                           | Toolox 33 | Toolox 33             | Toolox 44             | Toolox 44 + NITRIDING |
| <b>ENGINEERING PLASTICS</b><br>PA, PC, ABS, PMMA, PPE, PBT, PET | Toolox 33 | Toolox 44             | Toolox 44 + NITRIDING | Toolox 44 + NITRIDING |
| <b>ADVANCED PLASTICS</b><br>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.



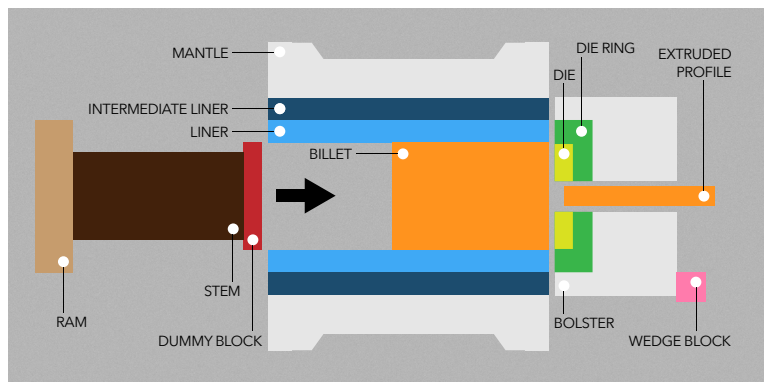
Top - Press tool with Toolox 44 for base plate in Electrolux refrigerator. Made 1,600,000 pieces.  
Bottom - Forming die. Toolox 44 produced 3x lifetime of D2 / 1.2379 (60 HRC)

## 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            |

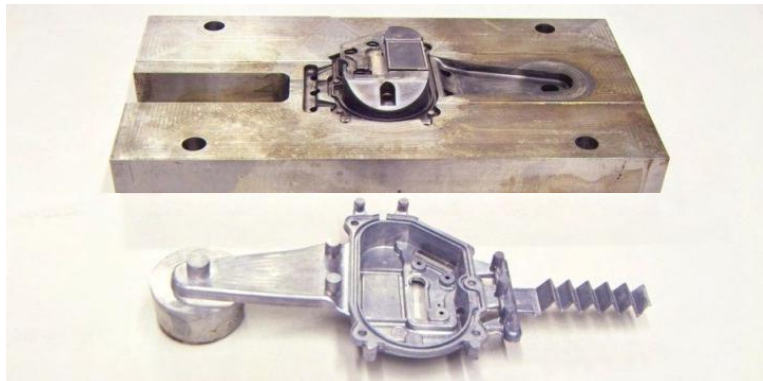
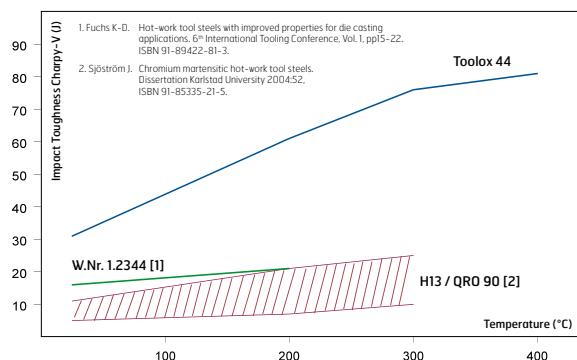


Top - SAPA extrusion die. Toolox replaced Dievar for a lower price and faster production.  
Bottom - Prolong the life of various components of extrusion equipment with Toolox.

## 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

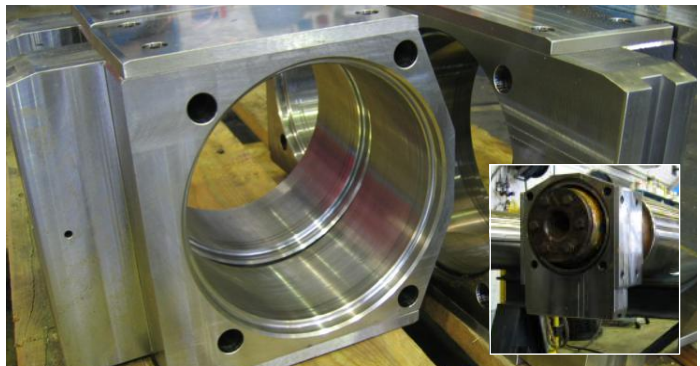
There is an endless permutation of applications, each with a set of performance requirements. Traditionally a choice had to be made from a long list of engineering and tool steels to meet these requirements.

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<br>(J at 20°C) | Machining | Low Residual<br>Stresses | Yield Strength<br>(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](http://swedishmesteel.com).

## STOCK PROGRAM

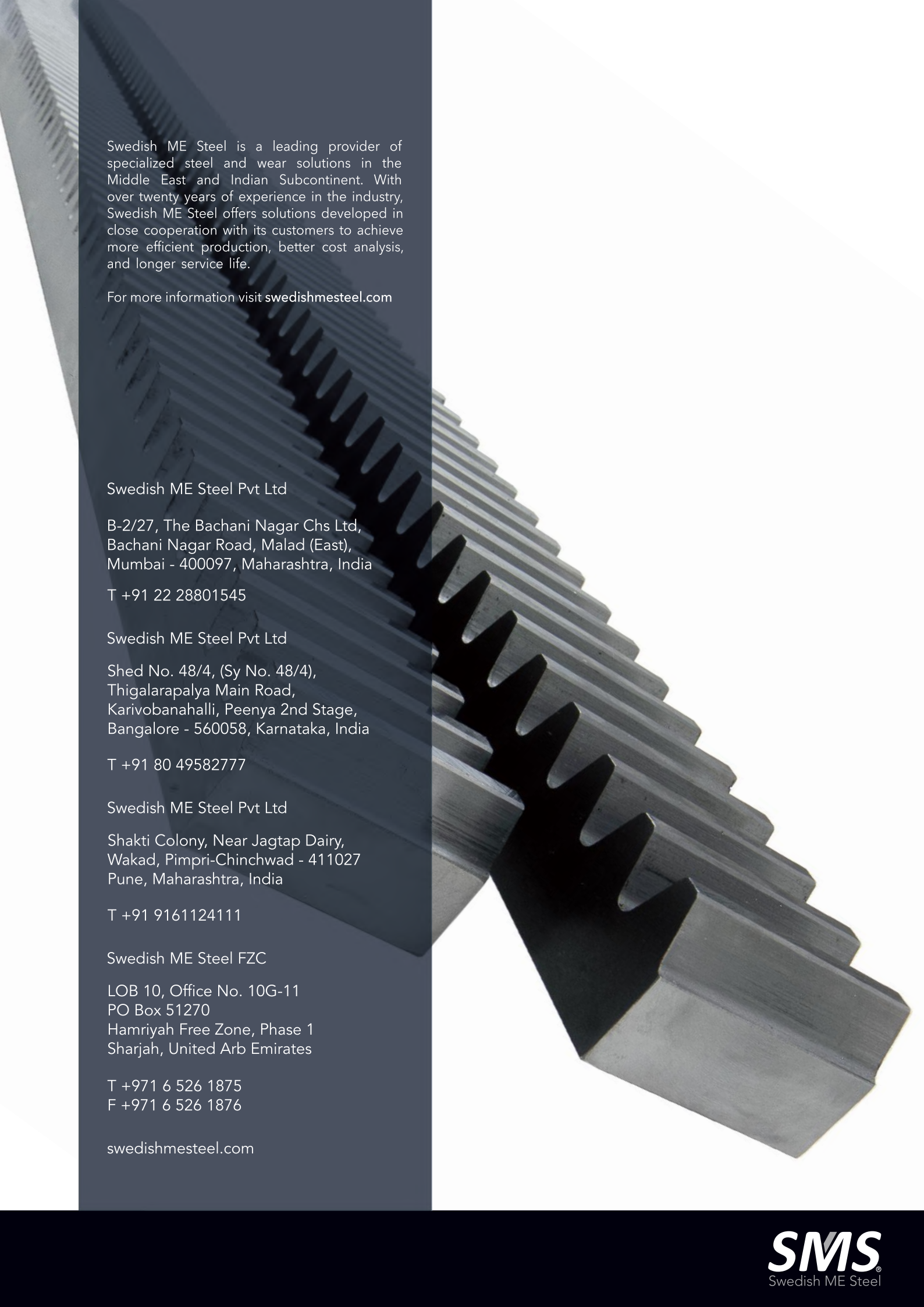
Comprehensive local stocks are available in the UAE and India serving the region with readily available Toolox plates and round bars.

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](http://swedishmesteel.com)

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