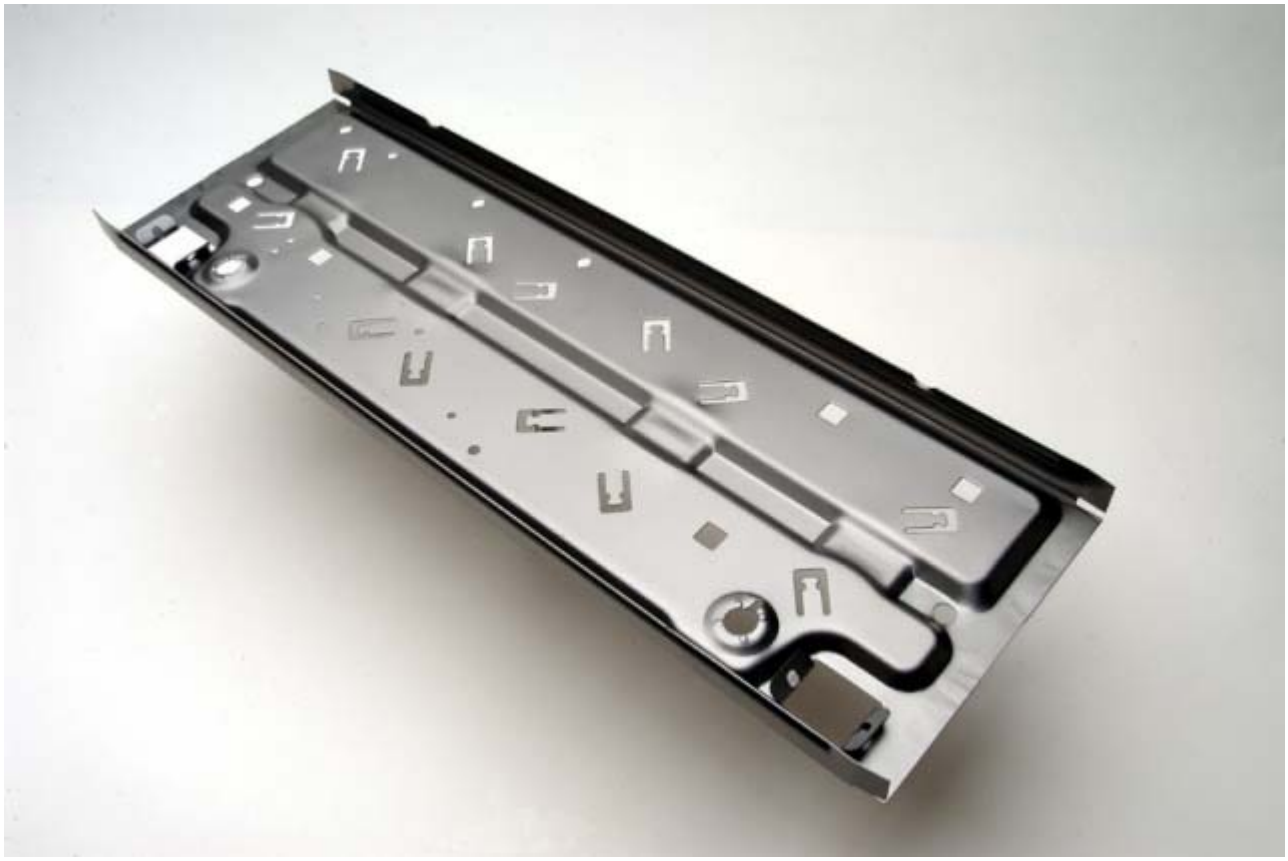
TOOLOX®

PREHARDENED TOOL & MACHINE STEEL

Moulds and dies



TOOLOX is a registered trademark by SSAB Oxelösund AB, Sweden

SSAB OXELÖSUND

Application areas

- Plastic and rubber moulds.
- Pressure die casting.
- Sheet metal forming.
- Ceramic moulds.

Note; All application cases were controlled in January 2007.
For a current update please contact respective contact person.

Normally, the german W.Nr. designations have been used to describe the steels replaced.

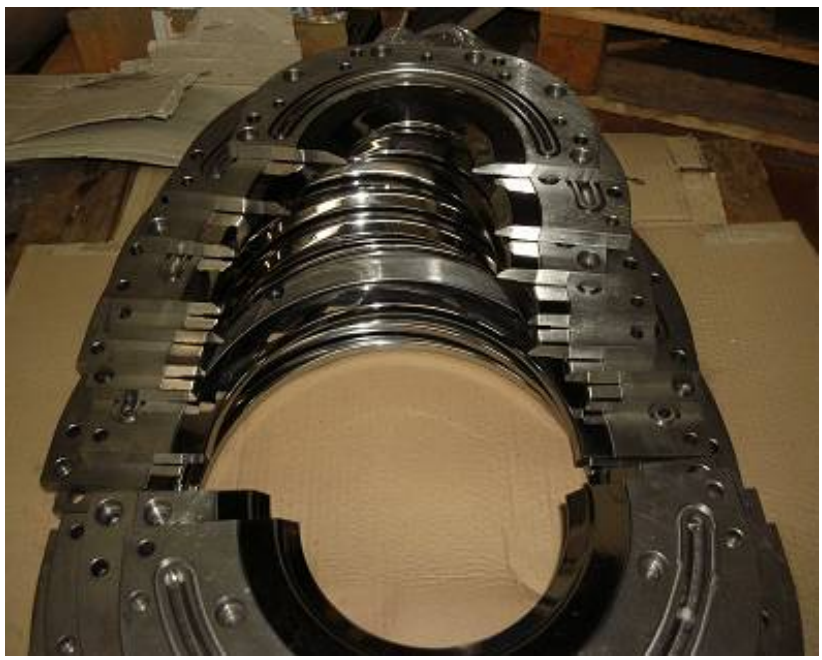
TOOLOX®

PREHARDENED TOOL & MACHINE STEEL

- The only tool steel available on the market as pre-hardened to 45 HRC.
- Delivered with guaranteed properties.
- ESR-properties for highest polishing demands.
- Perfect to make prototypes and final mould in the same tool.
- Excellent substrate for surface engineering, i.e. nitriding and PVD-coating.

TOOLOX®

Plastic mould in TOOLOX 33



Function
Plastic mould for manufacture of a head-light glass. Since the cover is transparent, the surface quality of the mould is very important.
The mould has two parts, one is seen in the photo to the right, the other in the upper left photo.

Plastic
Polycarbonate (PC).

Previous steel
For the internal thicker part, W.Nr 1.2738 was used. For the thinner pieces, W.Nr 1.2311 was used. The customer had significant problems to obtain a good flatness of the thinner pieces.

Manufacturing
Blanks made of 250x12 mm TOOLOX 33 were used.
The customer was very satisfied with the dimensional stability. A very good surface quality could be obtained.

Experience
The mould was put into use in June 2005. Since then more than 100,000 pieces have been made with fully satisfactorily result.

Contact person
Christer Offerman, SSAB Oxelösund.

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TOOLOX 33 in rubber mould for sealing

Function
Prototype moulds made by Hutchinson France. TOOLOX 33 is used in the moulding parts of the mould. The rubber piece manufactured is used as sealing in car motors.

Previous steel solution
Steel grade W.Nr. 2311

Manufacture
Machining, polishing and rectification went well. Same parameters as with 2311 were used. The surface quality was considered better. Also, the dimensional stability was satisfactorily.

No surface treatment such as nitriding was carried out

Experience
The manufactured moulds are used within the Hutchinson factory. Since 2006, several moulds have been used with fully satisfying result

A mould for the subsequent serial production has also been manufactured and will be put into use during first half of 2007

Country
France

Contact person
Håkan Engström, SSAB Oxelösund.

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TOOLOX®

TOOLOX 44 in plastic mould for cellular phone cover

Function
Mobile phone cover.

Plastic
Polycarbonate (PC).

Manufacturing
TOOLOX 44 is used in the moveable part of the mould. Orvar (W.Nr 1.2344) heat treated to 52-54 HRC is used in the fixed part.

High speed milling, etching, polishing worked well. Polishing is made to the most demanding surface quality. No problems with carbide spots as is often the case with regular tool steels. The only complication with TOOLOX 44 has been threading.

Experience
The first mould for the phone was made in 2002. Since then 10-12 more moulds have been made. Each mould have a lifetime of around 600,000 pieces. An estimation is that totally 3 - 4 million pieces have been made with good result.
In January 2007 the phone model went out of production.

During service the mould was regularly welded and inserts were filled in where the mould was too worn. These maintenance procedures were also successfully carried out.

Contact person
Tomas Berglund, SSAB Oxelösund.

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TOOLOX 44 in a plastic mould for a head-lamp lens

Function
Mould for manufacturing of a lens to a motorcycle head lamp. The lens is made in Polycarbonate (PC), crystal quality.

Previous steel solution
W.Nr 1.2344 in ESR-quality. Heat treated to 45 - 48 HRC. This solution was used due to high demands on polishability. The time to manufacture the mould is typically eight 8 weeks.

Manufacturing
The mould was made by the company Fabrilcar, in Oliveira de Azemeis. All parts of the mould were made in TOOLOX 44. Starting with 125 mm thick blanks of approximately 500x300 mm in size. Milling was found to be similar to W.Nr. 1.2344 in heat treated condition. Polishing went well with a high surface quality obtained. The only complication was drilling. Besides lowering the cost significantly as heat treatment could be avoided, the manufacturing time was reduced with more than one week.

Experience
The mould will be put into use at the Fabrilcar factory during the first part of 2007. The annual production is estimated to be 600,000 components.
If possible, maintenance of the mould will be avioded.

Contact person
Håkan Engström, SSAB Oxelösund.

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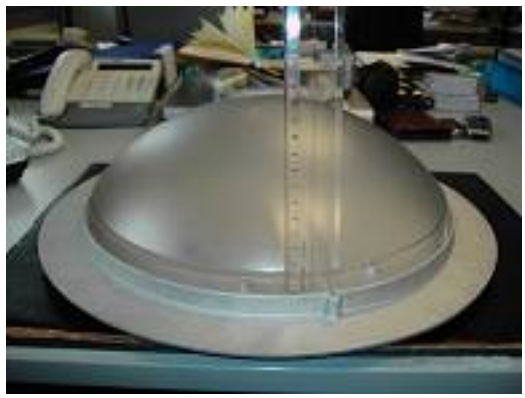
TOOLOX 44 for lamp manufacturing



Function
Moulds for lamp manufacturing. The lamp contains an aluminium part, made via aluminium die casting as well as a transparent plastic part.

Material
Aluminium and Polycarbonate plastic.

Previous steel
W.Nr 1.2343 in ESR-quality, heat treated to around 46 - 48 HRC was used in the aluminium mould as well as in the plastic mould.

Manufacturing
TOOLOX 44 was used in both moulds. For the plastic mould it was crucial to obtain a good polished surface.

Extensive milling was carried out. The TOOLOX 44 blank of 130 mm thickness was milled off until only 20 mm remained in the thinnest part of the mould.

Manufacturing went well with a satisfying surface obtained. No surface hardening was carried out on the moulds produce

Experience
25,000 pieces have been made with fully satisfactorily result both in the aluminium die casting mould as well as in the plastic mould.

The surface quality of the plastic parts is still after 25,000 compnents produced very good.

Contact person
Christer Offerman, SSAB Oxelösund.

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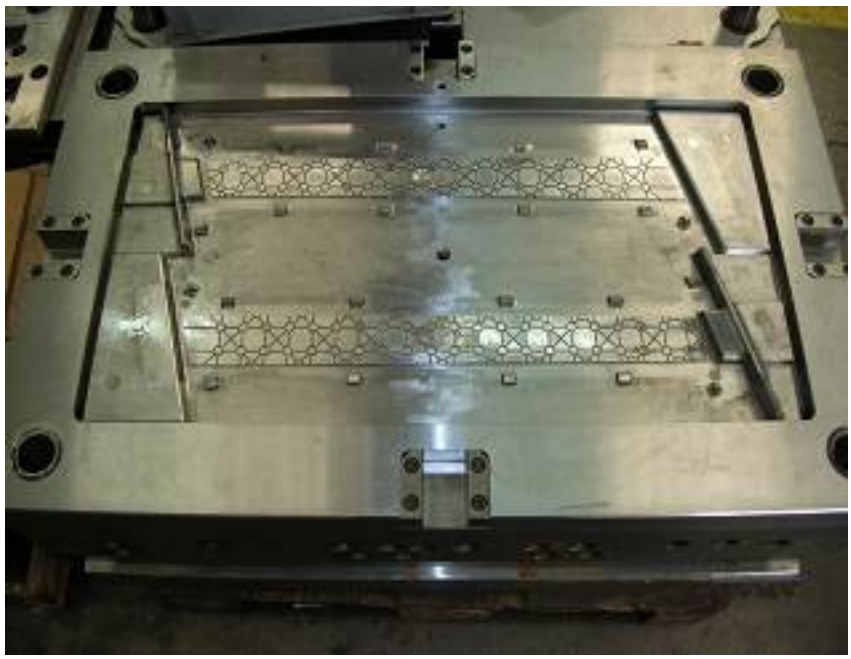
TOOLOX 44 in an injection mould



Function
Mould for injection moulding of an automotive security belt guide. The temperature of the molten plastic during injection is estimated to 220°C.
This gives an estimated mould surface temperature of 80°C.

Previous steel solution
Tool steel with subsequent heat treatment after machining of the mould.

Manufacturing
A 600x400x110 mm TOOLOX 44 blank was used.
Due to elimination of heat treatment in mould production, manufacturing time was reduced by
25-30 %. The total mould cost was decreased with around 2.5 €/kg

The mould maker experienced slightly more difficulties during machining as compared to the previously material used. Electro-erosion was made with good result and very sma deformations.
No surface hardening was carried out.

Experience
The mould was put into use in July 2006 and is, so far, running with good result.

Contact person
Christer Offerman, SSAB Oxelösund.

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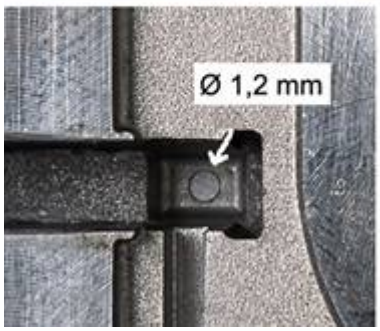
Plastic mould in TOOLOX 44



Function
The plastic detail is a fixture for an electrical box, used in electrical installations.

Material
Plastic PA 6 (”nylon plastic”). No filler material.

Previous steel solution
Stavax (AISI 420 mod.).

Manufacturing
Manufacturing has, in general, worked well. The only problem has been threading. Using machine taps there were difficulties in removing the chips from the holes.
Changing to taps having straight threads pushing the chips forward solved the problem.

Experience
The mould has, since commissioning in 2001, been used for an annual manufacturing of up to 50,000 pieces. This gives a total of around 200,000 details. The result is fully satisfactorily.
Besides the mould on the photo, TOOLOX 44 has also been used for the inserts in several other moulds. The major benefit with TOOLOX 44 is to save time in mould production as heat treatment and adjustment of the mould are eliminated.
Today, the customer more and more buys manufactured moulds. When those moulds need to be repaired or modified, TOOLOX is always used.

Contact person
Tomas Berglund, SSAB Oxelösund.

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TOOLOX 44 in plastic injection mould

Function
Mould for injection moulding of rear door handle for the Fiat Grande Punto car.

Material
Low abrasive standard plastic.

Previous steel solution
W.Nr 1.2343 hardened and tempered.
That steel was selected as the number of components produced is high and high production reliability was demanded.

Manufacturing
No major complications during manufacture of the moulds were reported.
No surface hardening was carried out.
Significant reduction in tool manufacturing time was obtained as, using TOOLOX 44, the need of heat treatment was eliminated.

Experience
The mould was made in May 2006 and put into service in June 2006.
So far the result is fully satisfactorily.

Contact person
Christer Offerman, SSAB Oxelösund.

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TOOLOX 44 in plastic mould for Campari bottle gadget

Function
Small gadget placed on Campari bottles.

Plastic
Polycarbonate (PC).

Previous steel
W.Nr 1.2343 heat treated to around 46 - 48 HRC.

Manufacturing
A lot of small holes in the product make the machining tolerances very severe. In each mould six components are made in a single shot.

No major complications during manufacturing were reported. No surface hardening was carried out.

Experience
The mould has been taken out of production
as the total series of 100,000 pieces has been produced with fully satisfactorily result.

Contact person
Christer Offerman, SSAB Oxelösund.

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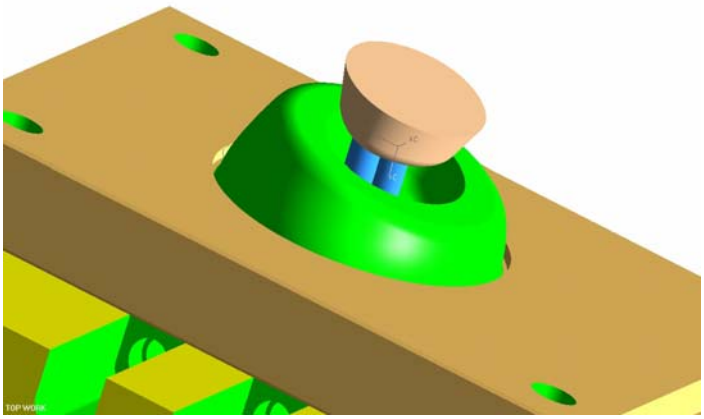
TOOLOX®

Plastic injection mould in TOOLOX 44



Function
Core to be inserted into a two shot injection mould tool.

The moulder wanted a material harder than P20, but was not specific about the hardness.
Normally, W.Nr. 1.2344 would have been used. Rough machined, hardened and finish machined. But using 1.2344 the customer felt it would be difficult to reach the flat shape on the back side of the tool. Therefore TOOLOX 44 was selected.

Material
Polypropylene TPE.

Manufacturing
By using TOOLOX 44 at least five days were saved in the manufacture of this core. Two to three days in heat treatment and two days extra wire erosion and machining.

Using tungsten carbide tooling on high speed machining centres, the customer has reported no machining problems using similar speeds and feeds to P20.
Drilling was no problem using TiN coated drills. 8mm holes 15mm deep were drilled and then EDM spiral tapped. The core was given a light polish.

Experience
The mould has been used since summer 2003 with no negative feedback.

Contact person
Tomas Berglund, SSAB Oxelösund.

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TOOLOX 44 in plastic injection mould

Function
Tap to cover cables.

Plastic
Nylon (PA) with 15 % glass fibre.

Previous steel
Customer used in the past W.Nr. 1.2343 hardened and tempered and thereafter nitrided the surface.

Manufacturing
This mould is a two parts mould with direct injection. The forming parts of the mould are in TOOLOX 44. The trial of the mould has been done with standard hardness of 45 HRC.
Later on, before production, the mould has received Ionic Nitriding to 61 - 62 HRC .

Experience
Around 10,000 pieces were made monthly until the total number of 50,000 were made. Thereafter, the production stopped as the total production volume was reached. The mould was still fully operative.
The customer has since then bought TOOLOX 44 again.

Contact person
Christer Offerman, SSAB Oxelösund.

TOOLOX®

TOOLOX 44 in plastic injection mould

Function
Plastic mould for production of pump impellers.

Plastic
Nylon (PA) with glass fibre reinforcment.

Previous steel solution
W.Nr 1.2343 heat treated to 46 - 48 HRC. After heat treatment, nitriding was done to increase wear resistance.

Manufacturing
TOOLOX 44 was used to reduce the manufacturing time of the mould. Time savings related to eliminating heat treatment are estimated to 50 % of the manufacturing time. Furthermore, the estimated total manufacturing cost has been reduced with around 30%.
No complications reported during manufacture.
Nitriding was carried out as with the previous steel used.

Experience
The mould went into service in the end of 2006. So far, with a satisfactorily result.

Contact person
Christer Offerman, SSAB Oxelösund.

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