TOOLOX®

ENGINEERING & TOOL STEEL

Toolox for plastic moulds

SSAB

Baris Yildirim
Key Account Manager Toolox (India, Turkey, Middle East and Russia)
Mechanical Engineer & Metallurgical Engineer
Tool Steel and Heat Treatment sector since 2004

SSAB in brief

75 BILLION SEK
annual net sales in 2018

Annual steel production capacity:
8.8 MILLION TONNES

Steel making since
1878

14,300
professionals
in 50 countries

OUR BUSINESSES:
SSAB Special Steels,
SSAB Europe,
SSAB Americas, Tibnor,
Ruukki Construction

STRENX™
PERFORMANCE STEEL

The high-strength, high-performance steel

HARDOX®
WEAR PLATE

The renowned hard and tough steel for aggressive environments

DOCOL®
THE AUTOMOTIVE STEEL

Safety for automotive

TOOLOX®
ENGINEERING & TOOL STEEL

The premium engineering and tool steel

ARMOX®
PROTECTION PLATE

Hardest steel for maximum protection

GREENCOAT®
COLORFUL STEEL

For harsh weather and greener living

SSAB
DOMEX / BORON
FORM /
WEATHERING
LASER® PLUS

Optimized families

SSAB


KASSETT
FILTER

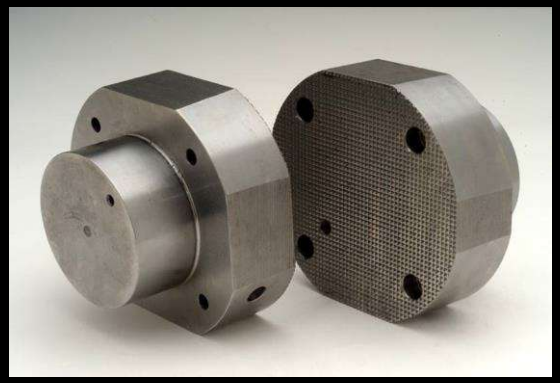

SMS

TOOLOX

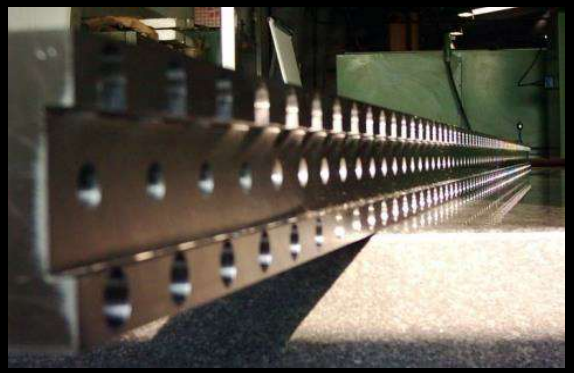
Plastic moulds

Cold forming

Hot forming



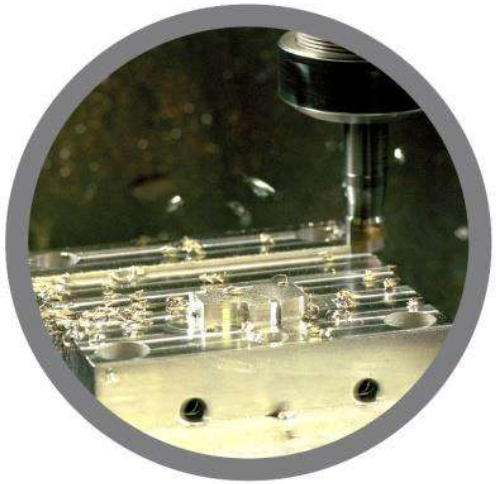
High friction
(Clamping/Holding)

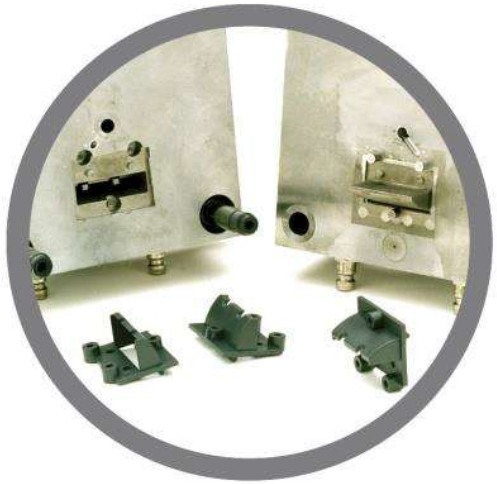


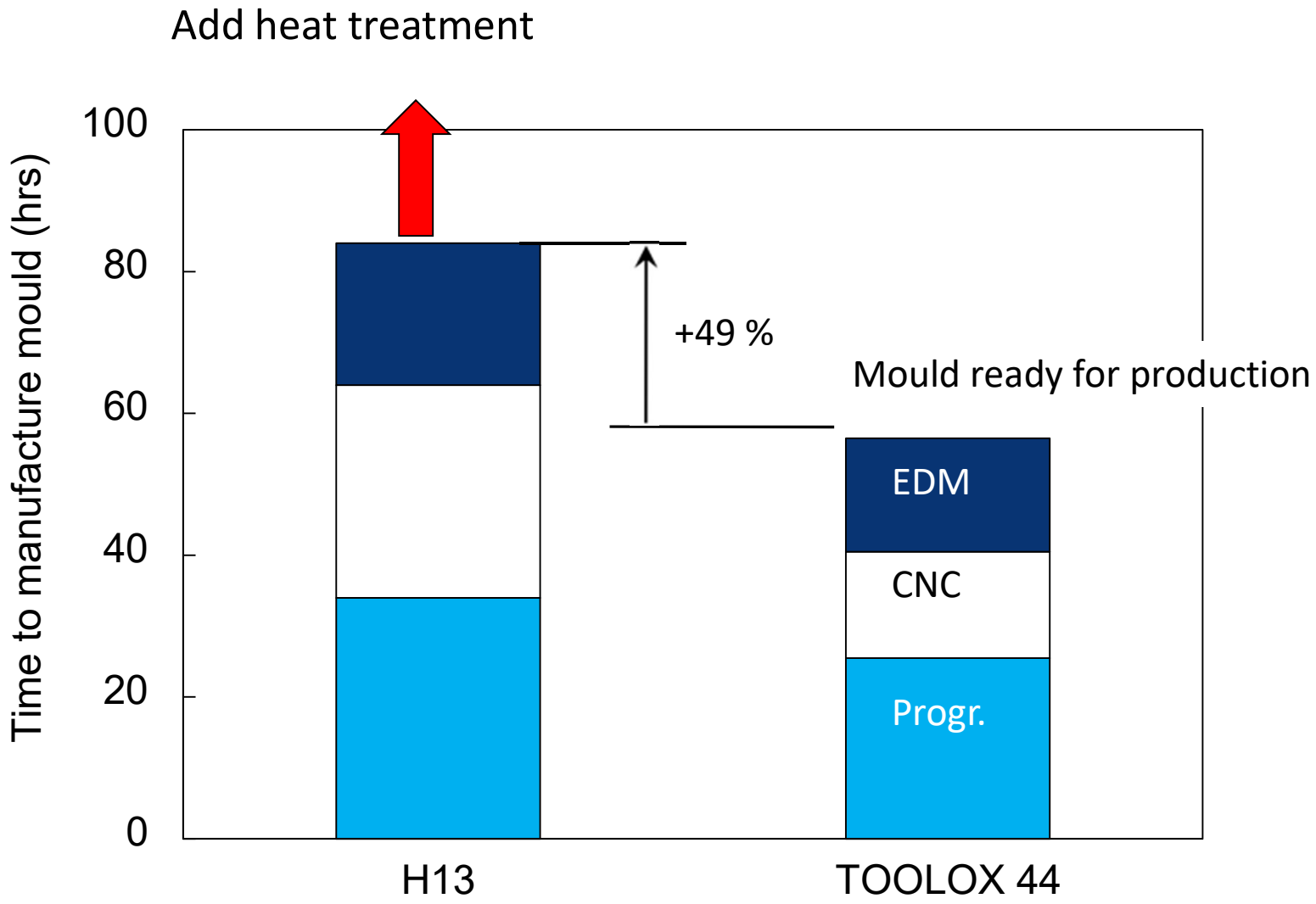
Low friction
(Sliding/Guiding)

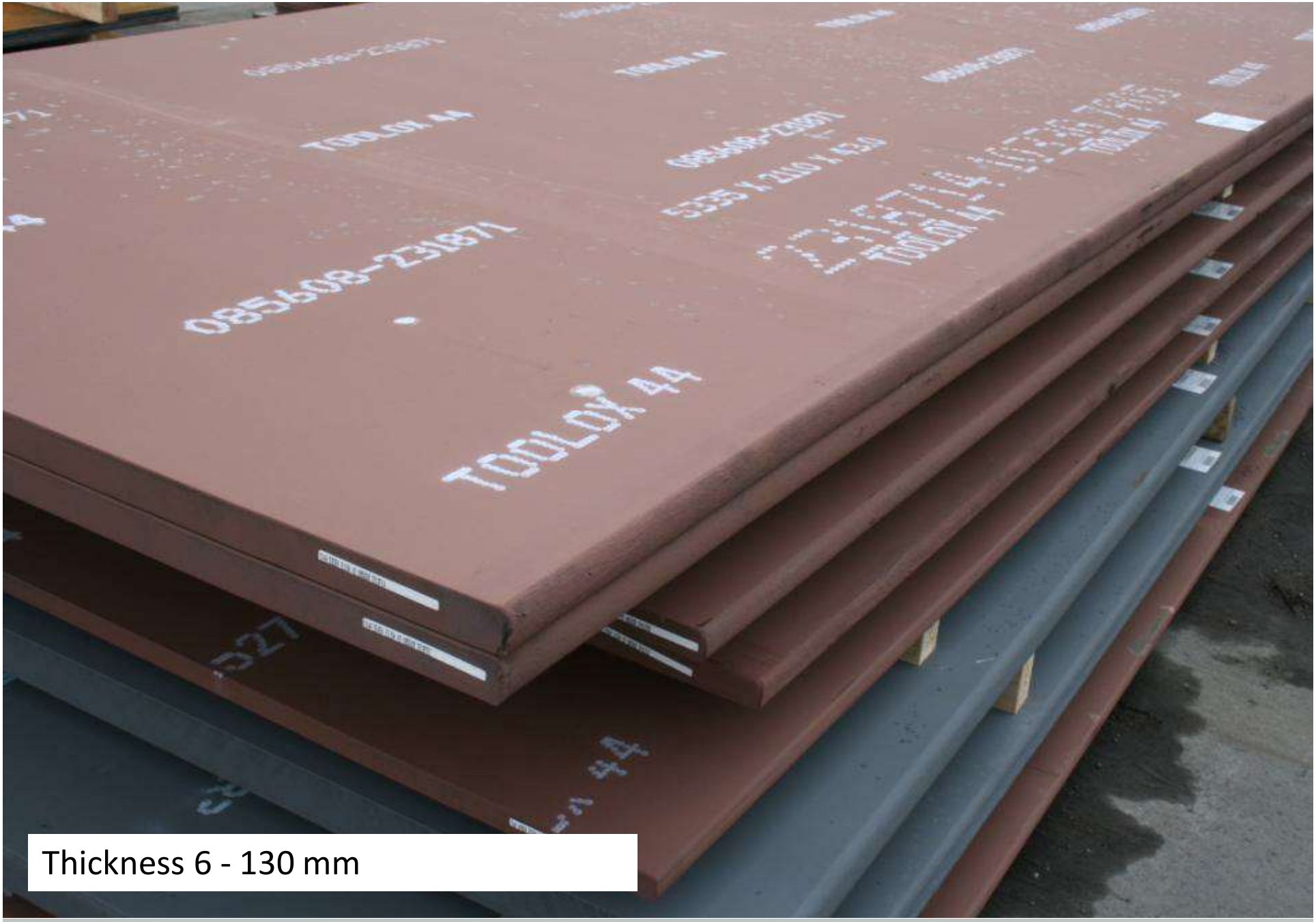
Structures
(Mechanical properties,
High temp.)

	TOOLOX 33	W.Nr 1.2738 (P20+Ni)	TOOLOX 44	W.Nr 1.2344 (H13)
Hardness	280-330 HBW	280-325 HBW	410-475 HBW	None
Toughness	Min 27 J @ RT	None	Min 18 J @ RT	None
ESR-prop.	Yes	No	Yes	Optional
C	0.21-0.26	0.35-0.45	0.30-0.34	0.37-0.43
Si	1.0-1.2	0.20-0.40	1.0-1.2	0.90-1.20
Mn	0.7-0.9	1.30-1.60	0.7-0.9	0.30-0.50
P	Max 0.010	Max 0.035	Max 0.010	Max 0.030
S	Max 0.003	Max 0.035	Max 0.003	Max 0.030
Cr	1.0-1.3	1.80-2.10	1.3-1.4	4.80-5.50
Ni	-	0.90-1.20	-	-
Mo	0.15-0.40	0.15-0.25	0.75-0.85	1.20-1.50
V	0.09-0.12	-	0.13-0.15	0.90-1.10
CE_{IIW}	0.61-0.73	1.01-1.27	0.90-0.94	1.80-2.13






Add heat treatment
Time to manufacture mould (hrs)
100
80
60
40
20
0
+49 %
Mould ready for production
EDM
CNC
Progr.
H13
TOOLOX 44



Thickness 6 - 130 mm

Toolox 33	300 HB
Toolox 44	45 HRc

+ Nitriding, PVD etc

SSAB

SSAB EMEA AB, SE-613 80 OXELÖSUND, Sweden A01

Inspection certificate A02	Issuing department A05	Purchaser order no A07	Our order no A08	Invoice no A19	Certificate no and date A03
EN 10 204 - 3.1	Quality inspection	SC 93 527 - 232	10056586-190		17220868 2018-04-10

Purchaser A11
46172

SSAB Oxelösund AB
C/O Bvba Thor Shipping & Transport
Quay 117-123, Vrieskaaiport
2030 Antwerpen
Belgium

Product B01
Tool steel

Marking (Stamping) B06
Manufacturer, MATERIAL ID

Customer marks B15

Quantity B08	Dimensions [mm] B09-B11	Weight [kg] B12	Deliv. Cond. B04	Internal code B16
1	T 66 W 2115 L 5040	5662	Q	20794

Consignee A06
SSAB Oxelösund AB C/O Bvba Thor Shipping & Transport Quay 117-123, Vrieskaaiport 2030 Antwerpen Belgium

Standard/rules B02
OX
Steel grade TOOLOX 44

MATERIAL ID B07
085782-231717

Chemical composition C71-C92

Heat no	C	Si	Mn	P	S	Cr	Ni	Mo	V	Ti	Cu	Al	Nb	B	N
085782	.32	1.08	.78	.007	.001	1.32	.05	.778	.138	.013	.02	.013	.016	.002	.005

Carbon equivalent etc C93-C99

Testtype C04	Millcode C00	Specimen position C01	Direc-tion C02	Treat-ment B05	Specimen type C10	Temp [degr C] C03	Test results			
Impact test (1/4 T)	427234	Tail end	Longitudinal	Delivery condition	Charpy-V 10x10	20	C42 E [J] 26	C42 E [J] 26	C42 E [J] 29	C43 Ave [J] 27
Hardness test (HBW)	427247	Tail end		Delivery condition			C32 Ave 456			
Tensile Test	427250	Tail end	Longitudinal	Delivery condition	Round		C11 Rp0.2 [MPa] 1310	C12 Rm [MPa] 1472	C13 A5 [%] 13	

Ultrasonic testing: Satisfactory results according to:

TOOLSTEEL

This certificate is produced with EDP and valid without signature Z02

Quality Inspection Department/ A Backlund / S Koekkoek

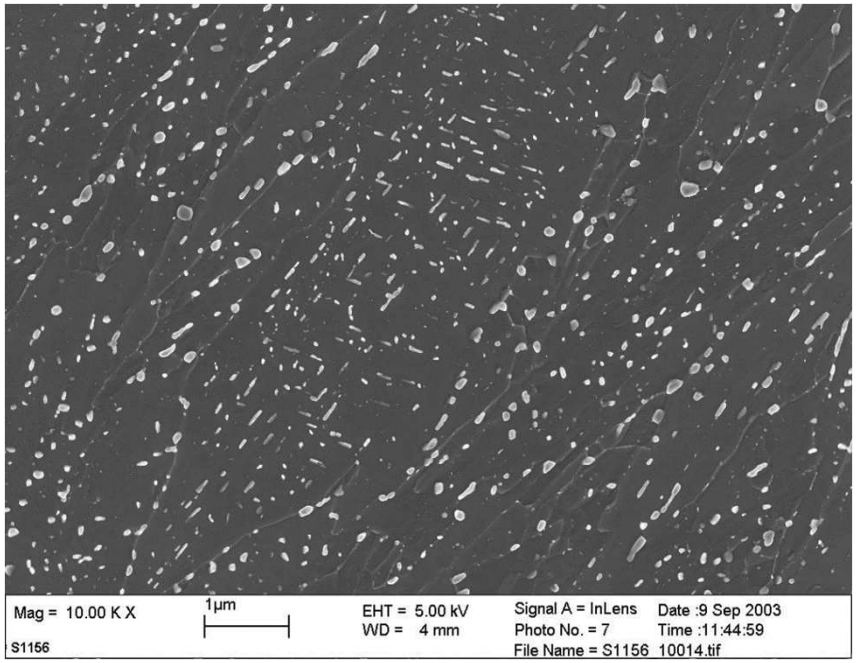
It is hereby certified that the material described above complies with the requirements of the order. Z01

A22

A04
TOOLOX®
PREHARDENED TOOL STEEL
www.toolox.com

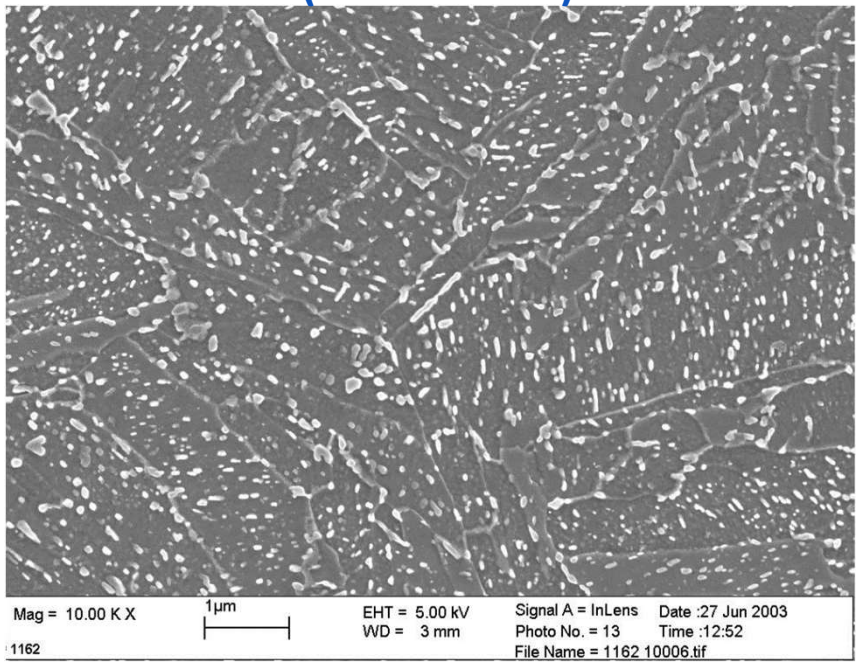
Differences in carbide morphology

TOOLOX 33

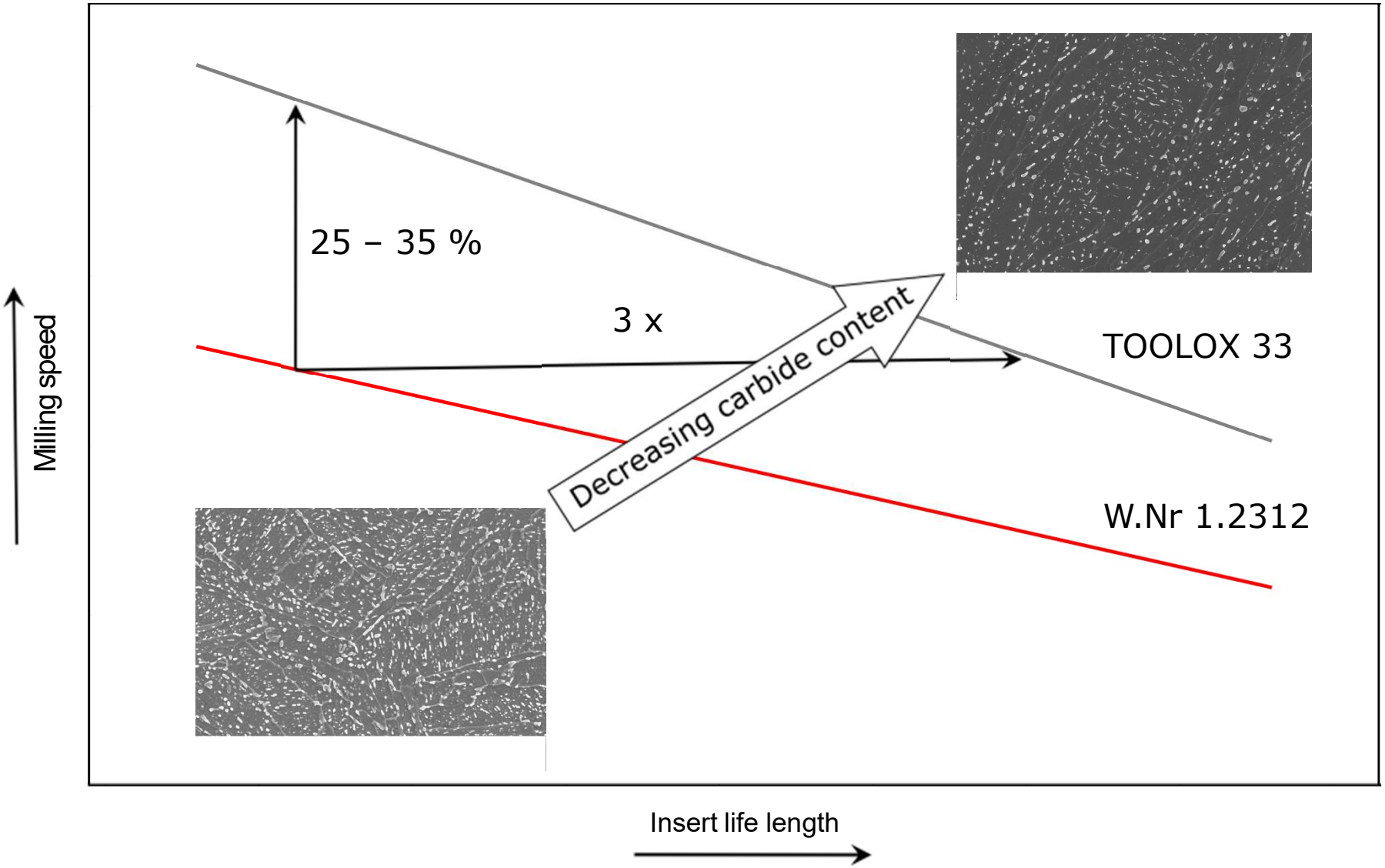


- Area fraction of carbides 6.4 %

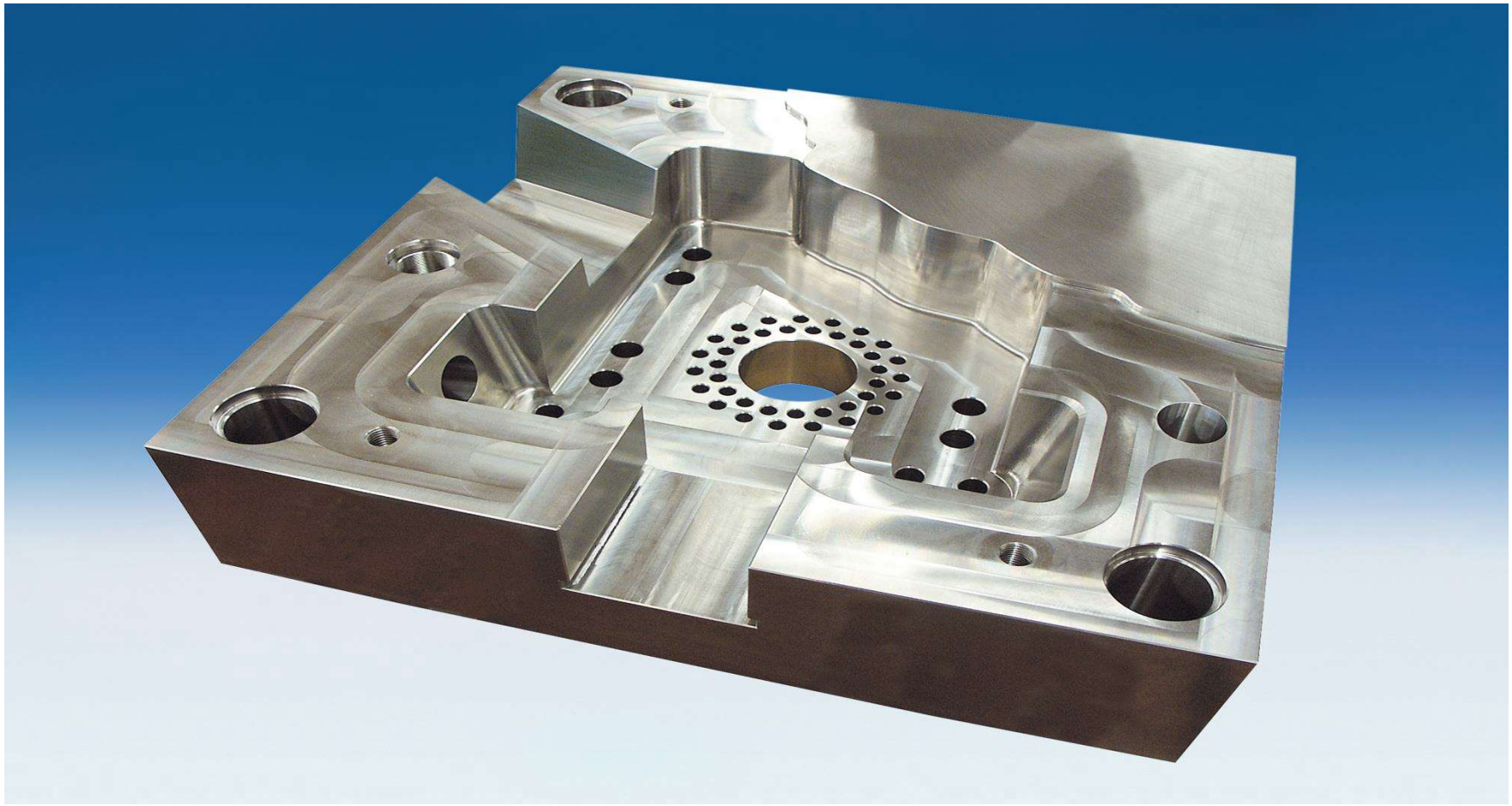
P20 (W.nr 1.2311)



- Area fraction of carbides 10.0%

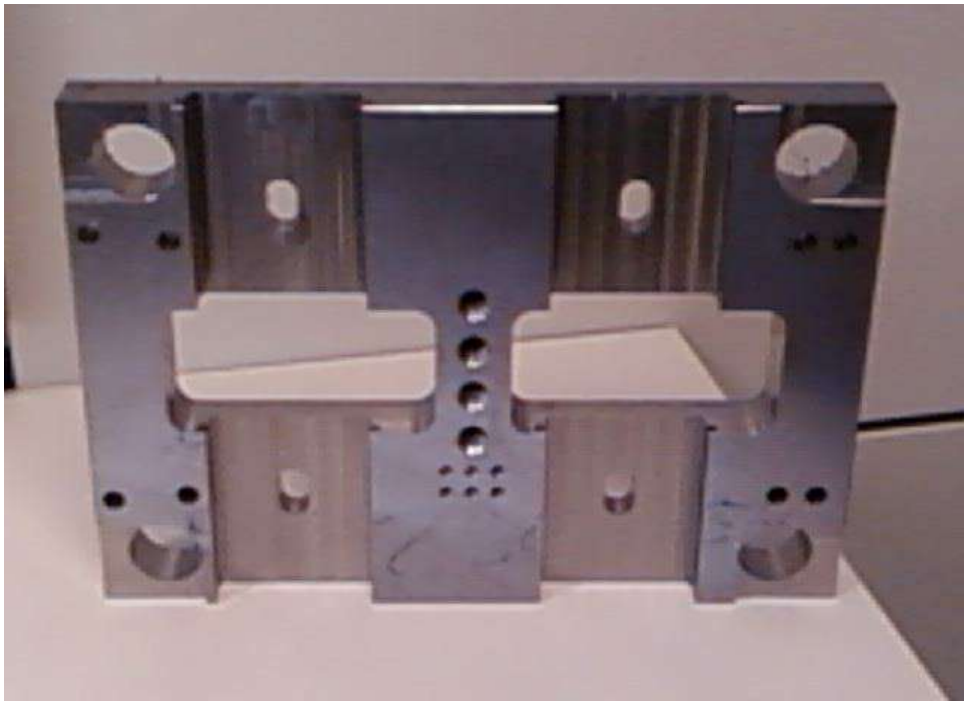

Milling speed
25 – 35 %
3 x
Decreasing carbide content
TOOLOX 33
W.Nr 1.2312
Insert life length

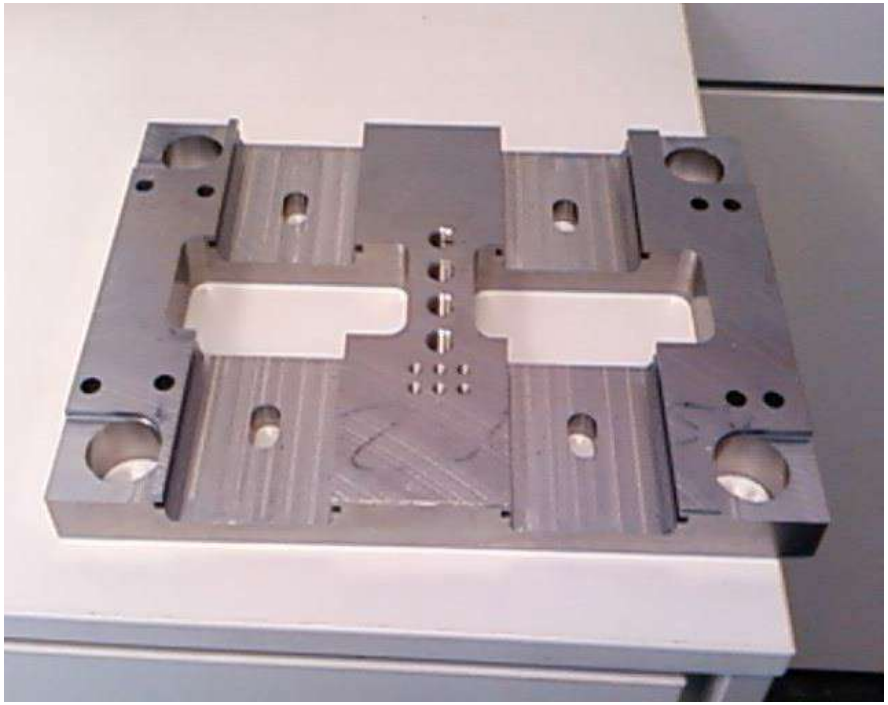
HASCO – test piece
TOOLOX 33



	1.2312	Toolox 33
Material Cost	671	976
Machining	4,960	3930
Stress Reliving	191	0
Griding	260	70
Total Cost after 70 Hr.	6,062	4,976

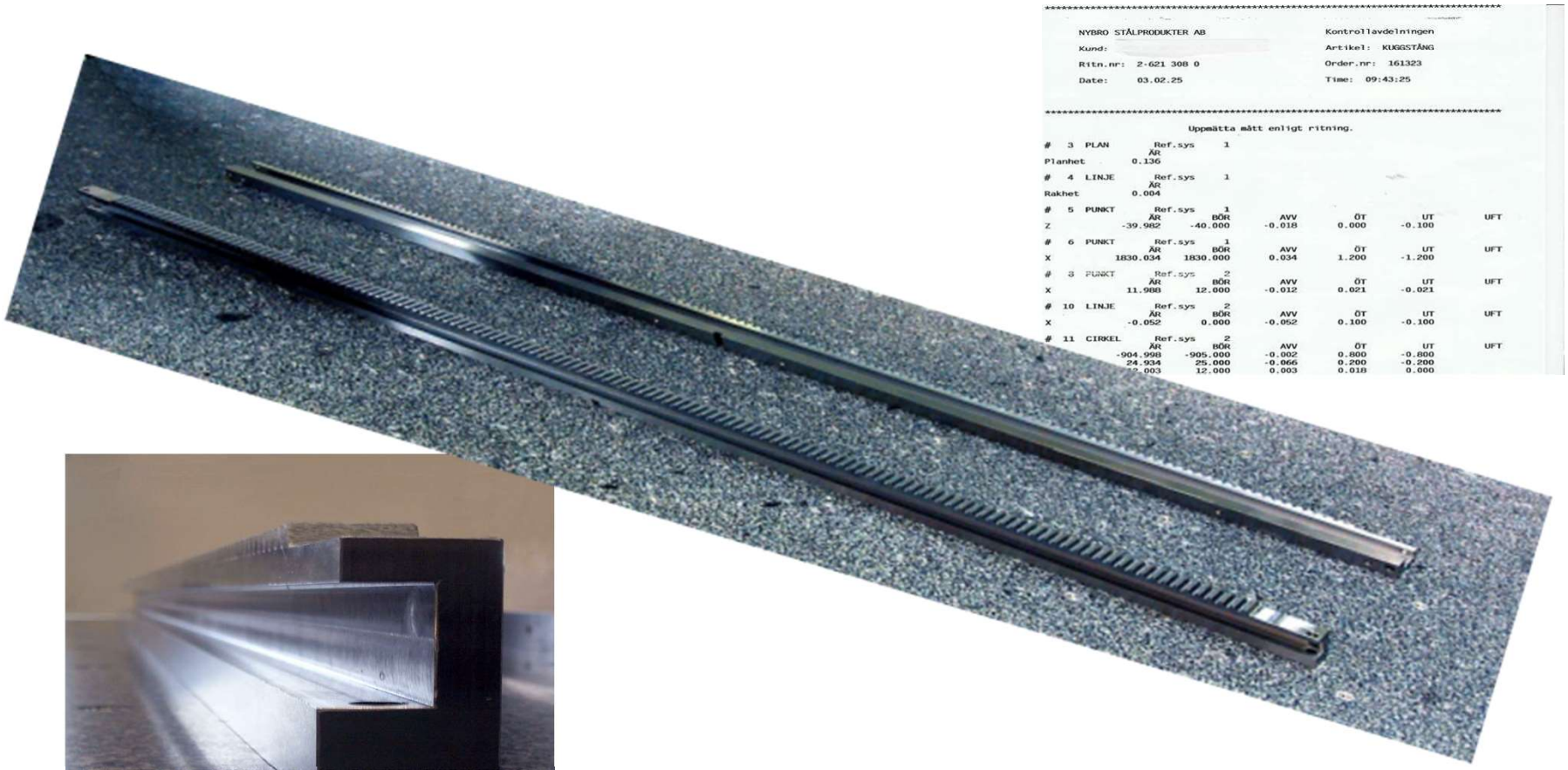
HASCO – test piece
TOOLOX 44





HASCO – results machining TOOLOX 44

- Milling with average speeds for hard milling possible
- Very good behavior when drilling and thread milling with very low tool wear
- Long hole drilling with 30 x D possible
- Optimal surface quality after finishing
- Safe behavior when achieving close tolerances
- The test piece was absolutely stress free
- Thanks to this production using clamping is possible
- Usage of tools for hard milling necessary



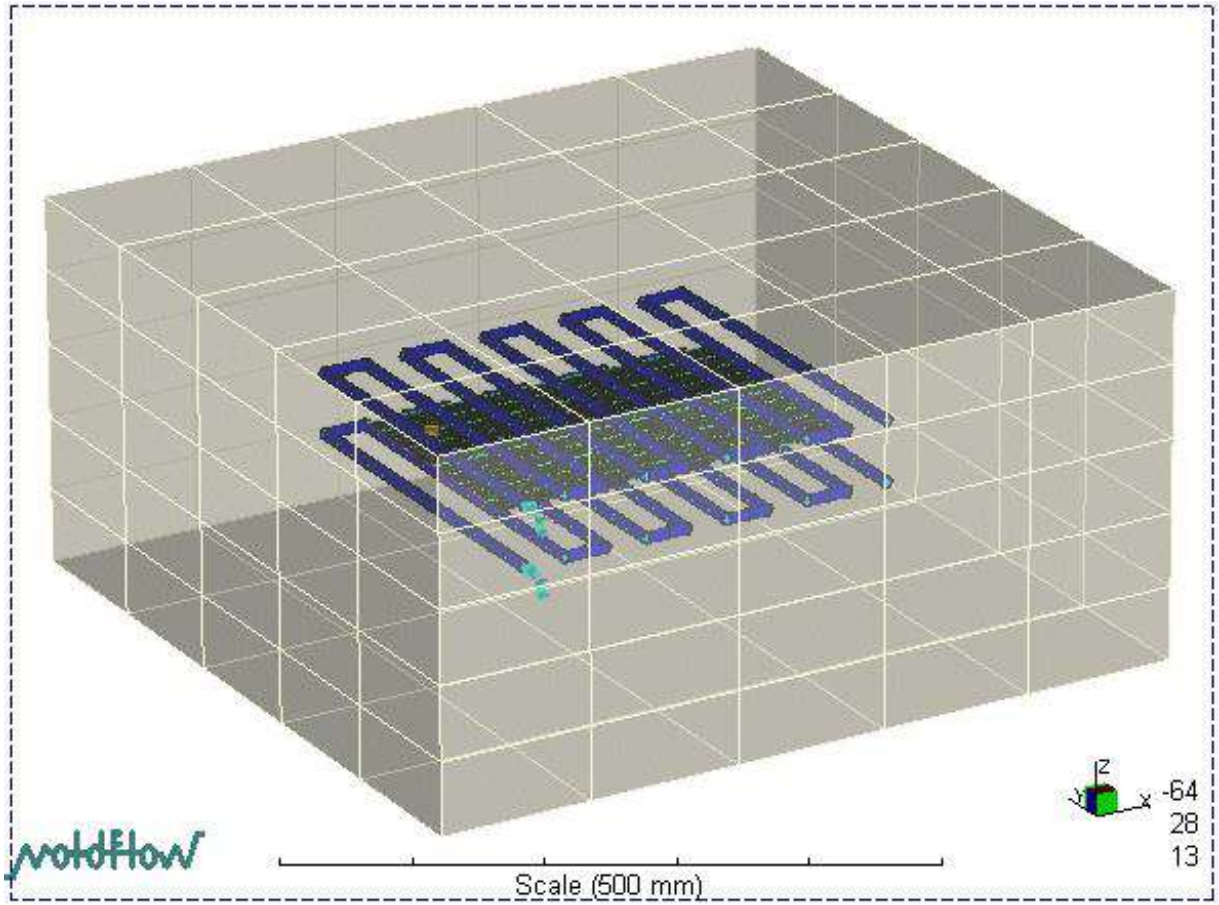
NYBRO STÅLPRODUKTER AB — Kontrollavdelningen
Kund: — Artikel: KUGGSTÅNG
Ritn.nr: 2-621 308 0 — Order.nr: 161323
Date: 03.02.25 — Time: 09:43:25

Uppmätta mått enligt ritning.

# 3 PLAN	Ref.sys 1						
	ÄR						
Planhet	0.136						
# 4 LINJE	Ref.sys 1						
	ÄR						
Rakhet	0.004						
# 5 PUNKT	Ref.sys 1						
	ÄR	BÖR	AVV	ÖT	UT	UFT	
Z	-39.982	-40.000	-0.018	0.000	-0.100		
# 6 PUNKT	Ref.sys 1						
	ÄR	BÖR	AVV	ÖT	UT	UFT	
X	1830.034	1830.000	0.034	1.200	-1.200		
# 8 PUNKT	Ref.sys 2						
	ÄR	BÖR	AVV	ÖT	UT	UFT	
X	11.988	12.000	-0.012	0.021	-0.021		
# 10 LINJE	Ref.sys 2						
	ÄR	BÖR	AVV	ÖT	UT	UFT	
X	-0.052	0.000	-0.052	0.100	-0.100		
# 11 CIRKEL	Ref.sys 2						
	ÄR	BÖR	AVV	ÖT	UT	UFT	
	-904.998	-905.000	-0.002	0.800	-0.800		
	24.934	25.000	-0.066	0.200	-0.200		
	12.003	12.000	0.003	0.018	0.000		

Tommy Petterson, Stena Stål. ”To start with flat instead of round material saved a lot of production time. The gear-racks were absolutely straight; 0.004 mm sidewise deflection and 0.136 mm longitudinal deflection on 1.8 m measuring length!”

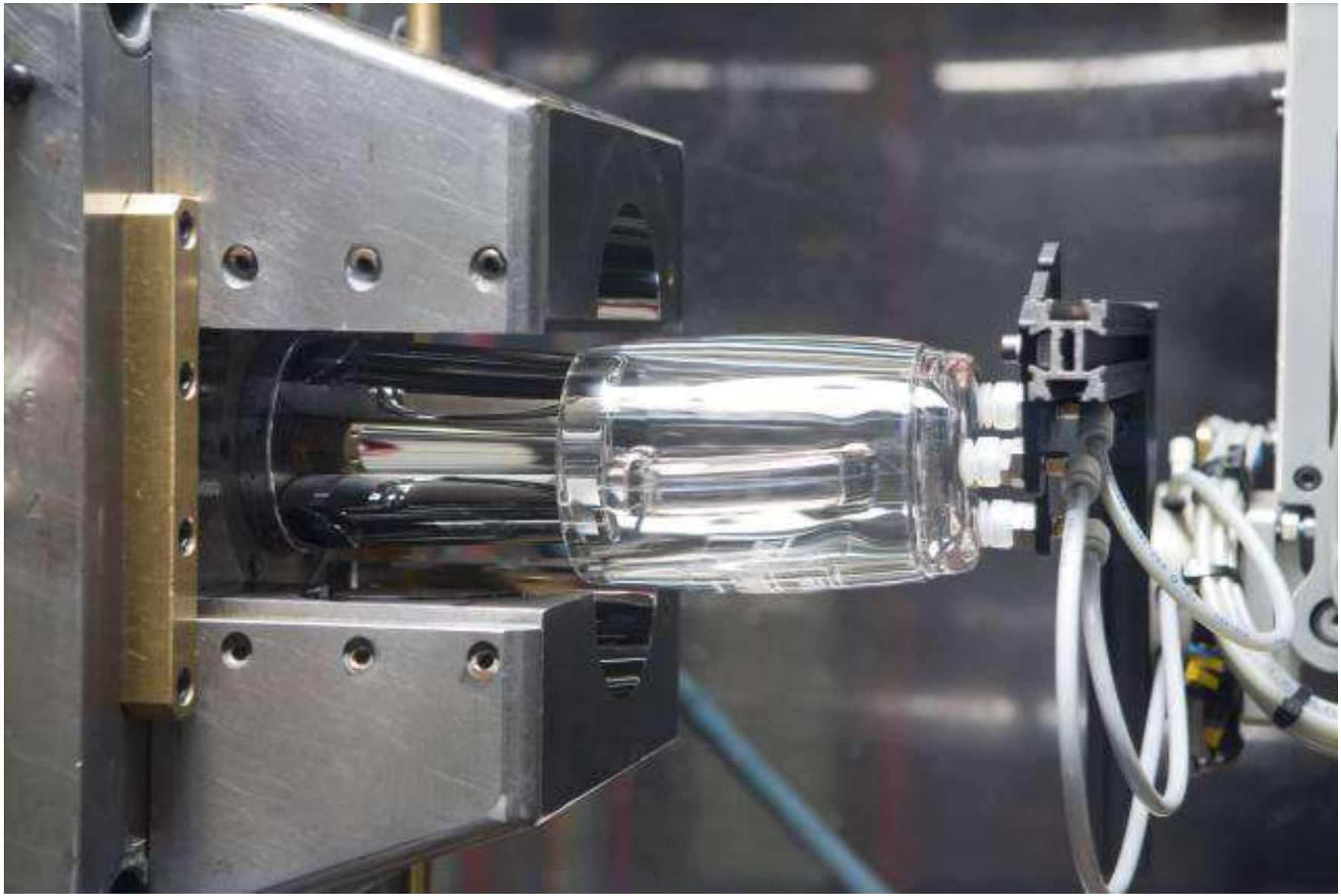
Thermal conductivity…

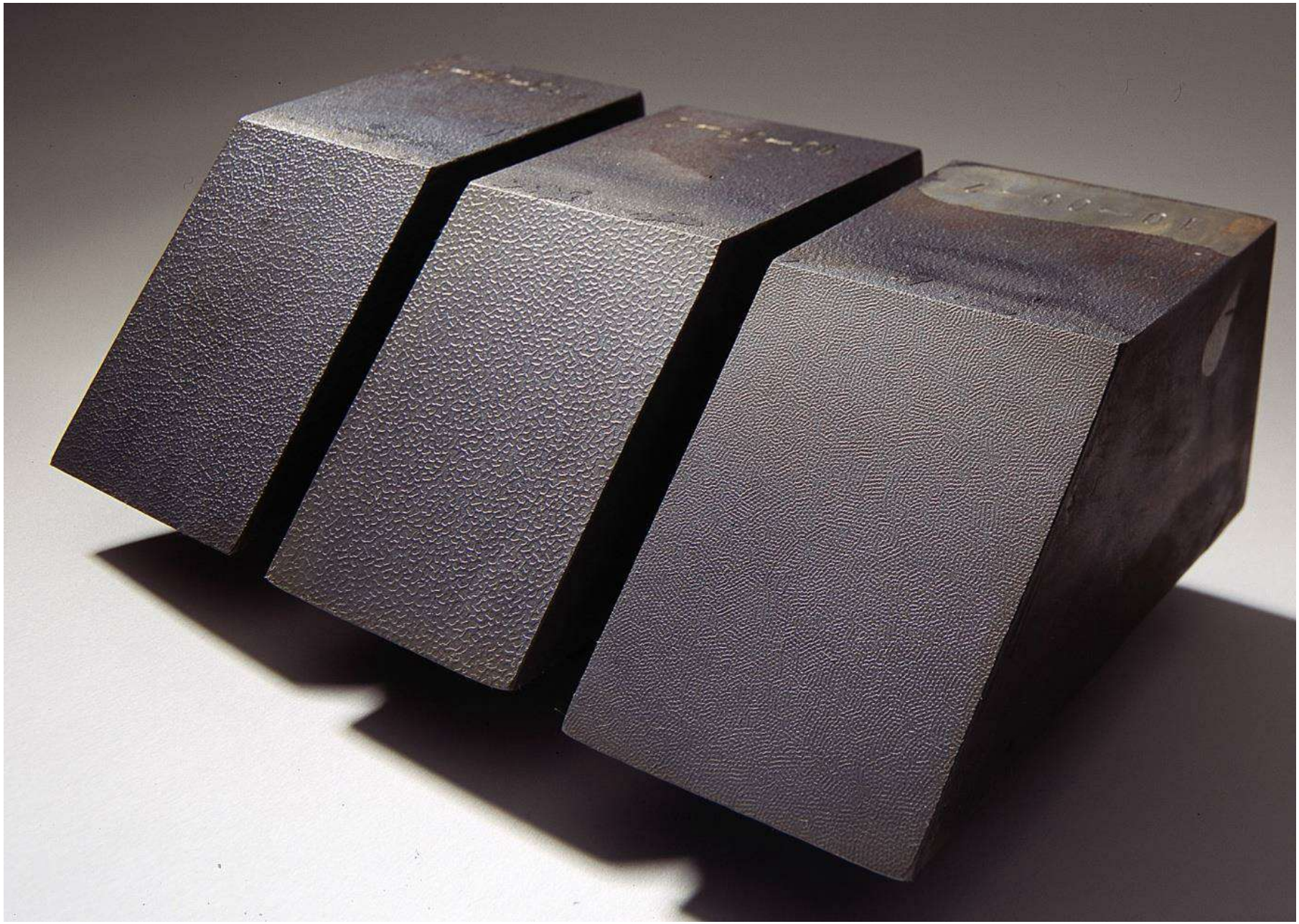


Thermal conductivity…

- Higher mould thermal conductivity will shorten the cooling time.
- The analysis shows that a reduction in cycle time due to the increased thermal conductivity of TOOLOX 44 gives 3-5 % shorter cooling time when compared to W.Nr 1.2344 (Q&T to 45 HRC)

ZANOVI
WWW.LUCIDATURA.COM





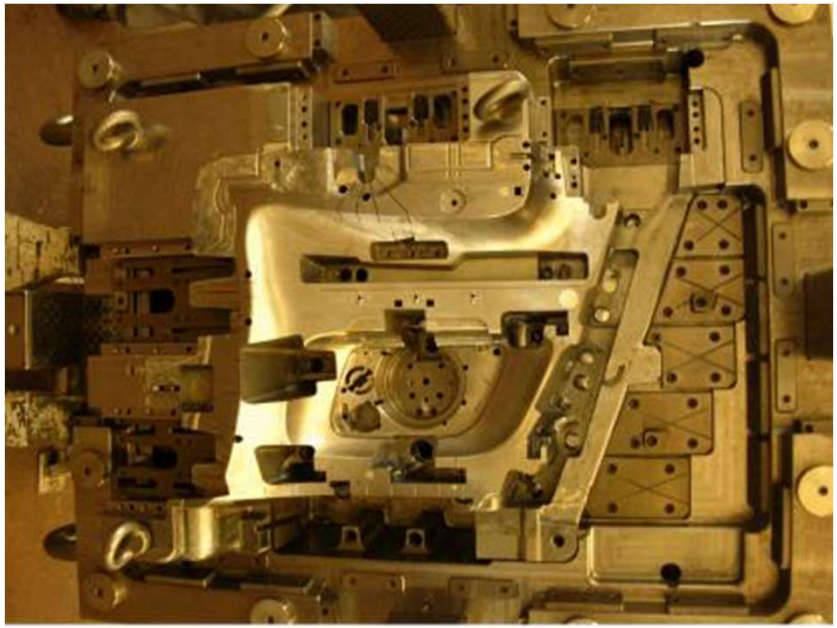
Polycarbonate plastic cover for a head light glass

Toolox 33 for car motor sealing

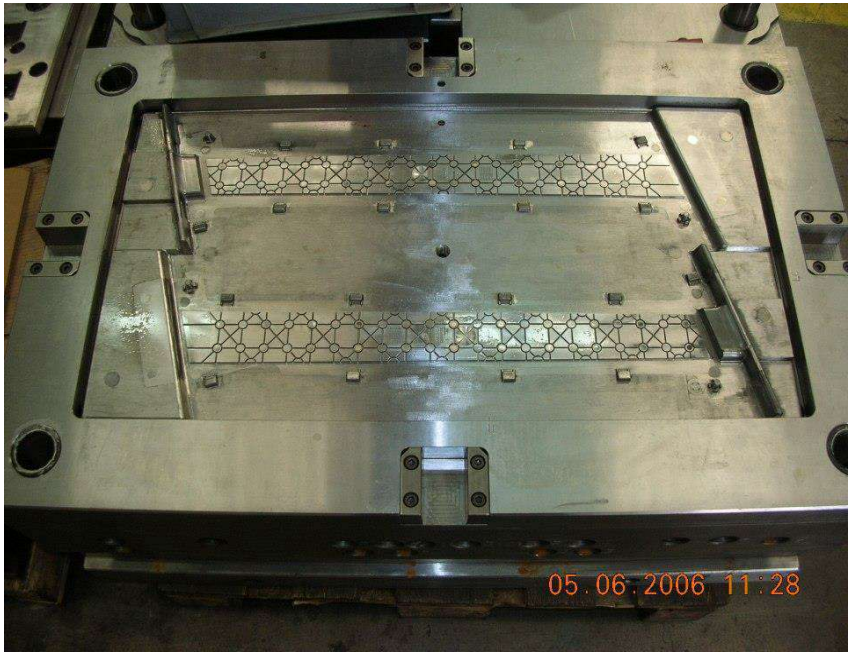
Front grill for Ford car
Toolox 44

TOOLOX 44 in a mould for Audi TT

W.Nr 1.2738 HH due to the large thickness (400 mm)

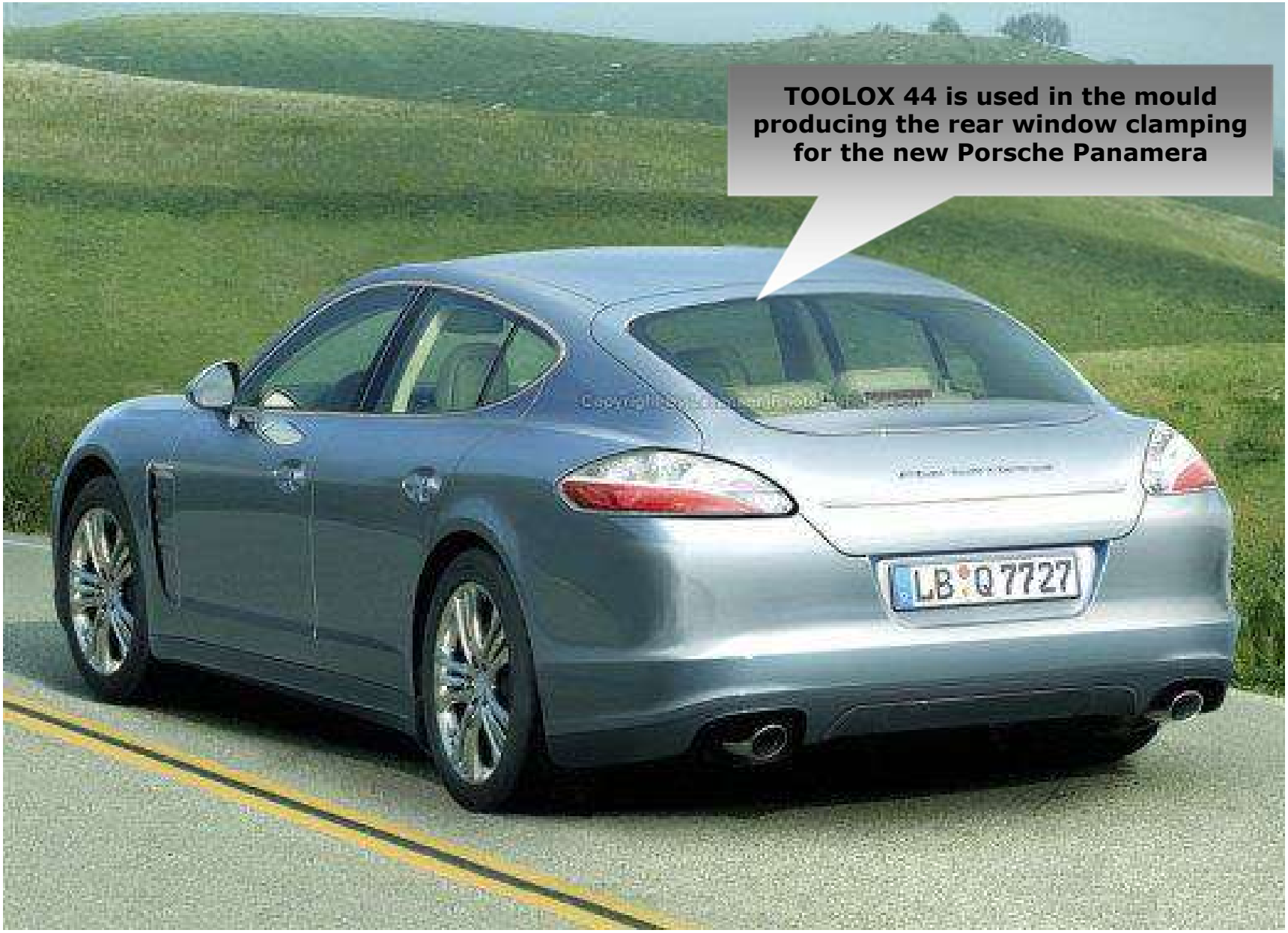


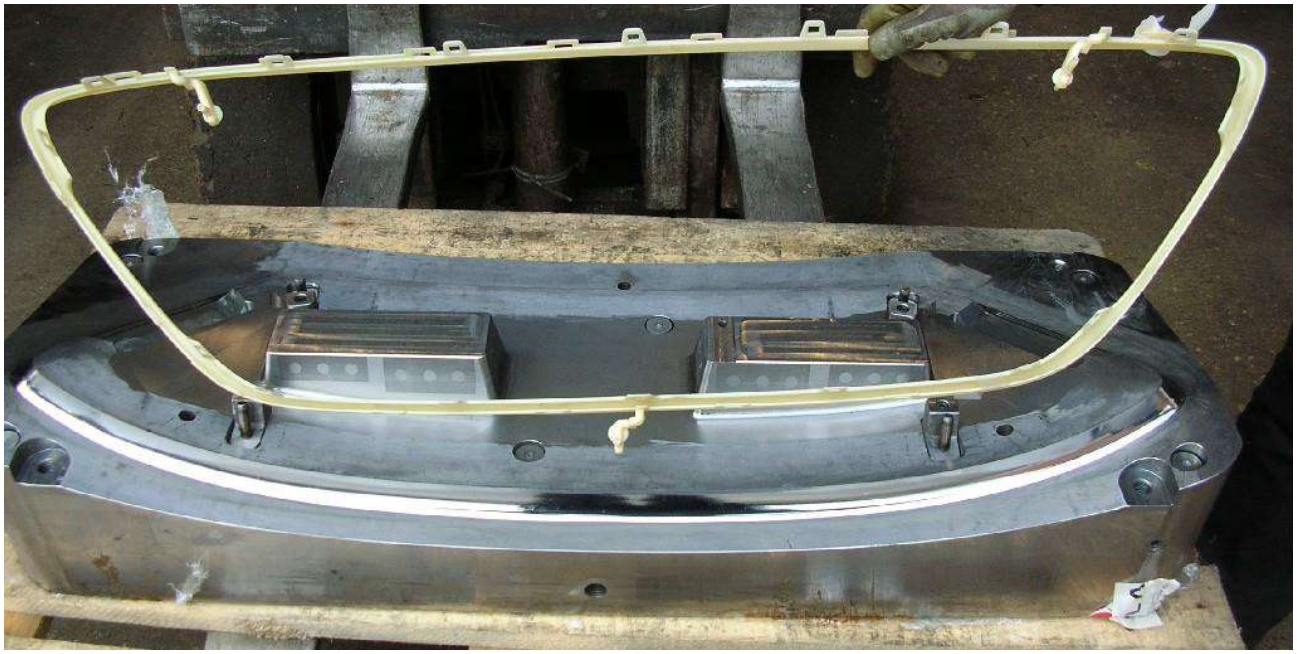
All inserts are made in TOOLOX 44



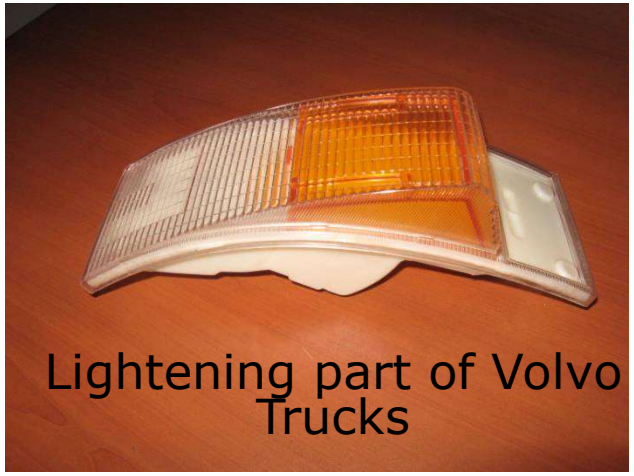
Mould for injection moulding of an automotive security belt guide. The temperature of the molten plastic during injection is estimated to 220°C. This gives an estimated mould surface temperature of 80°C.
A 600x400x110 mm TOOLOX 44 blank was used. Due to elimination of heat treatment in mould production, 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 small deformations. No surface hardening was carried out.

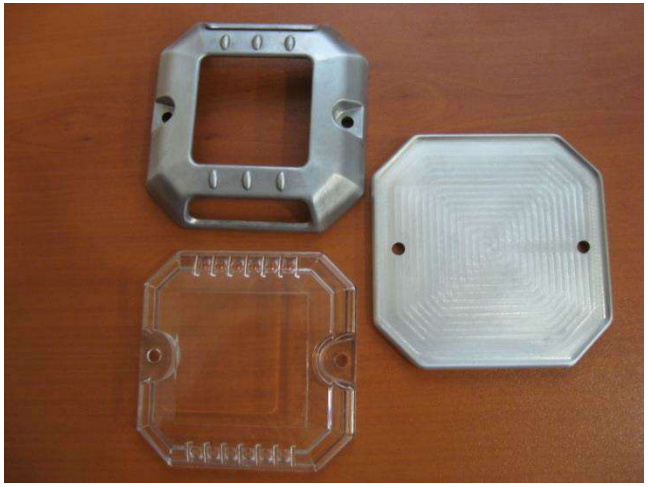

TOOLOX 44 is used in the mould producing the rear window clamping for the new Porsche Panamera
LB Q 7727



Mold producer: Bay Plastik/Turkey
Raw Material:Acrylic
Much better machinability
than 1.2738
Higher polishabilty than 1.2738



Lightening part of Volvo Trucks



Cover for motorcycle lamp
1 week shorter manufacture time
Much lower cost
Full series made with excellent result

TOOLOX 44 in a mould for door handle to Fiat

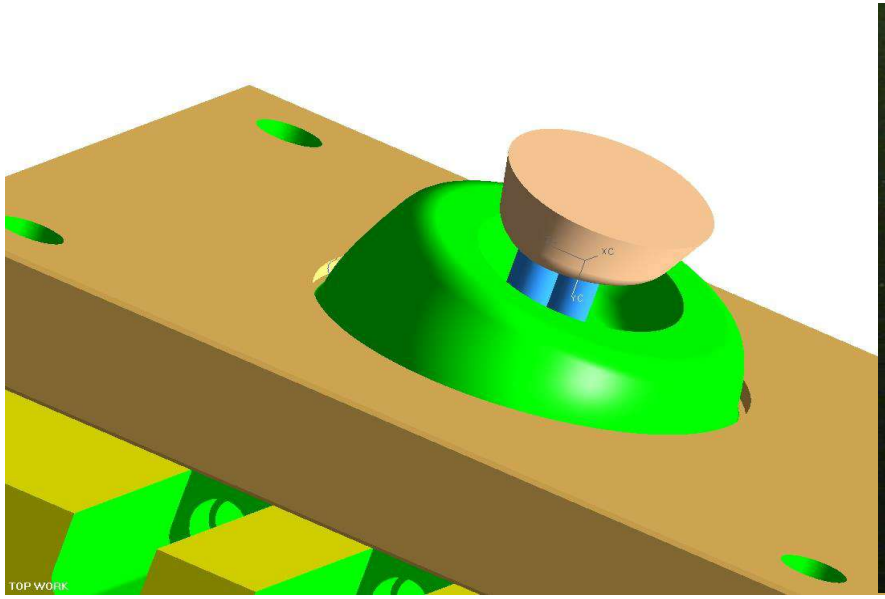
W.Nr 1.2343 Q&T was the earlier choice.

TOOLOX 44 is now the choise to shorten mould manufacturing time.


The mould producing the central tunnel for the Mercedes E class is made in TOOLOX 44
CLASSE E
EVO

Nitrided TOOLOX 44 was used in a mould producing glass-fibre reinforced nylon components.
The demand of mould service life was production of 50,000 components.

Polycarbonate plastic
1.2343 ESR > Toolox 44
Machining from 130 mm > 20 mm



Conventionally 1.2344 would normally have been used. By using Toolox 44 at least 5 days were saved in the manufacture of this core. Two to three days in heat treatment and two days extra wire erosion and machining.

Plastic mould. Tap of spice grinder. Nitriding will be made.
Polishing better than 1.2738

Company : World 4th Largest LCD TV Manufacturers (China)

Product : 46’’ LCD TV Frame

Work Material : ABS+~45%GF

Moulding Temp. : ~100°C

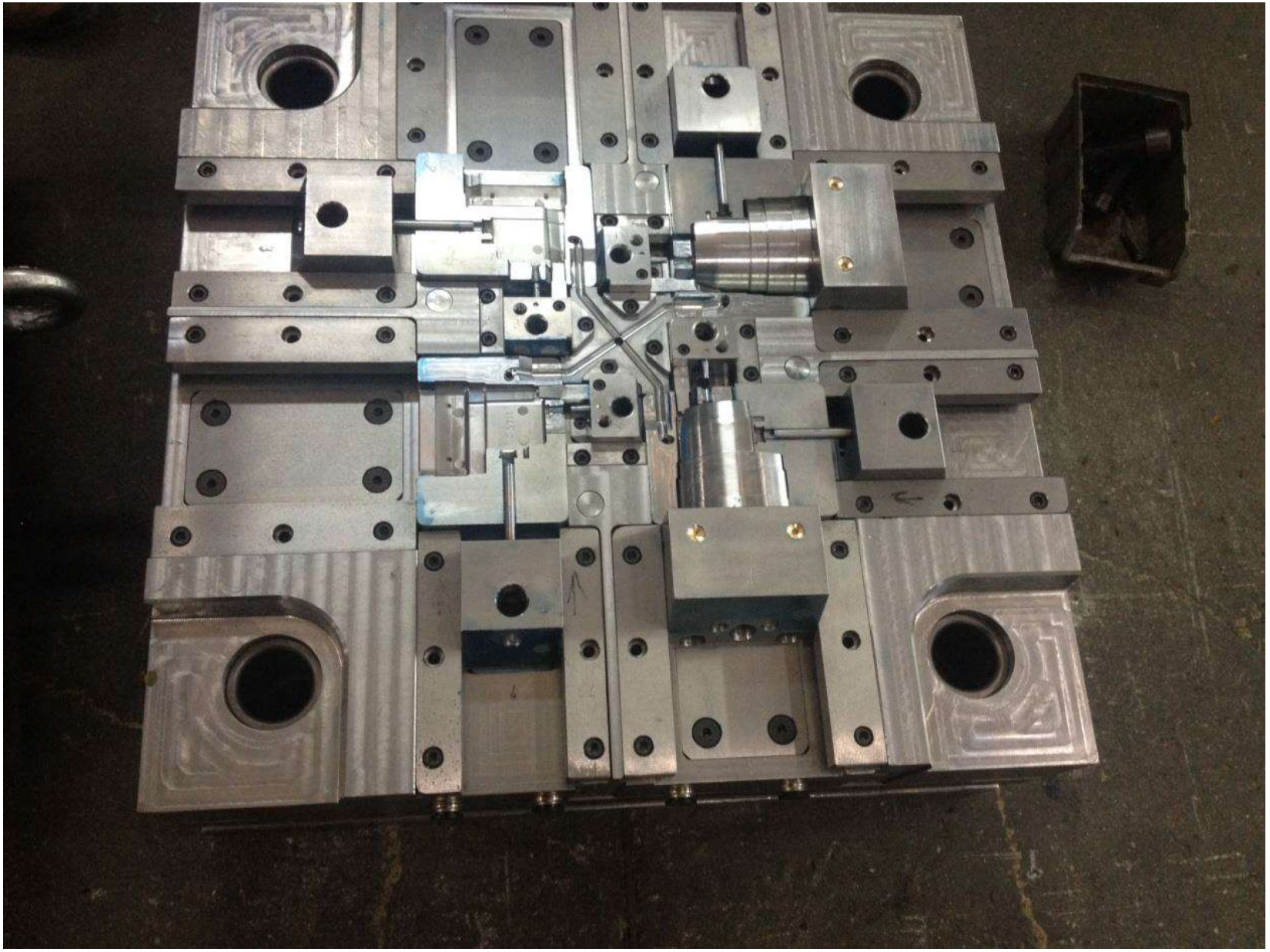
Mould Style : One Cavity Injection Mould

Tooling Type : Mold Cavity

Tooling Size(mm): 98mm x 550mm x 580mm

Tool Steel	S STAR (Japan)	Toolox44
Heat Treatment	Yes	No
Hardness	48 - 52HRC	~45HRC
Surface Treatment	None	
Cycle Time (sec)	45-60 sec	
Expected Tool Life	300,000 shots	
Problems Encountered	1. Warpage/Distortion after Q & T 2. Cracks during production runs	Still Running
Comments on Toolox44	1. Satisfied with polishing result 2. Fine texture finish is easily achievable 3. No heat treatment risks 4. Apply surface treatment if necessary	

Toolox 40 + Cr plating
ABS plastic. Designed for 500000 pieces



Test at plastic mould maker
2 pcs 80x960x1155

High speed rough milling with MECOF AGILE 500 machine.

Hitachi ASRB-3052RM-7-22 tool with diam 52 mm and 7 inserts.
EPNW-08T3TN-R10 inserts with JP4020 insert grade

Vc = rpm. Fz = 1.587 mm/tooth
Ap = 0.659 mm

Insert lifetime 180 min
Chip volume removed 161 cm2/min
(28980 cm2 removed chip volume)
Cooling with mist
Very small deformations
(<0.1 mm on flatness) despite a lot of machining
Good surface quality (enough to avoid polishing)

Traditional milling
Vc = 130-150 m/min

Air cooling

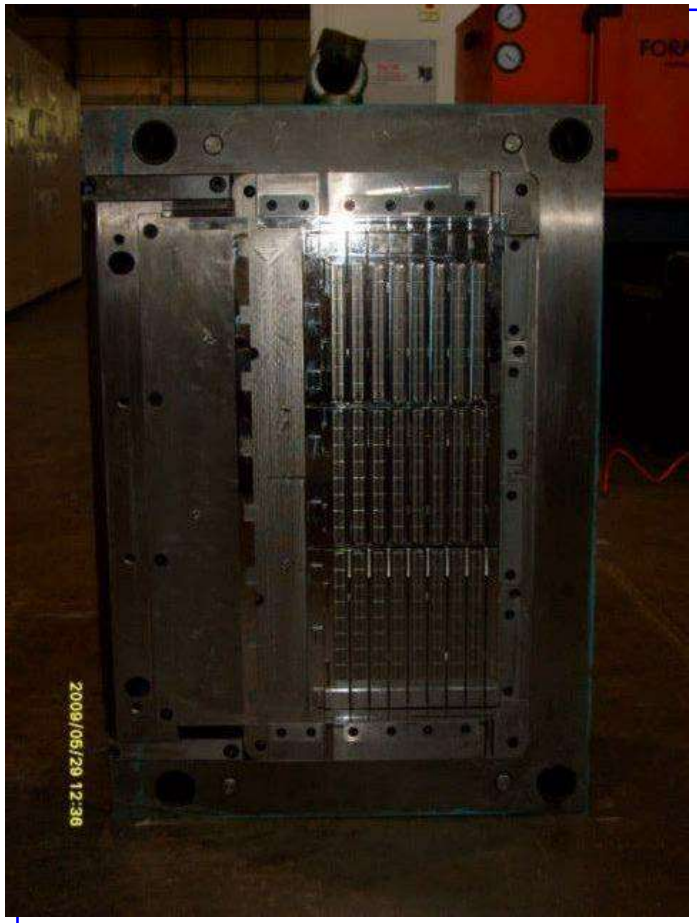
Inserts;

Round shape diam 12 mm

Walter WKP35S

DIJES JC8015

0.4 mm deformation on flatness during rough milling



TOOLOX 44

Plastic Part:

Part Name: GLASS SHELF

Raw Material: PS (ŞEFFAF)

Weight of the part:427 GR

Closing Force of the Injection Press: 300 TON

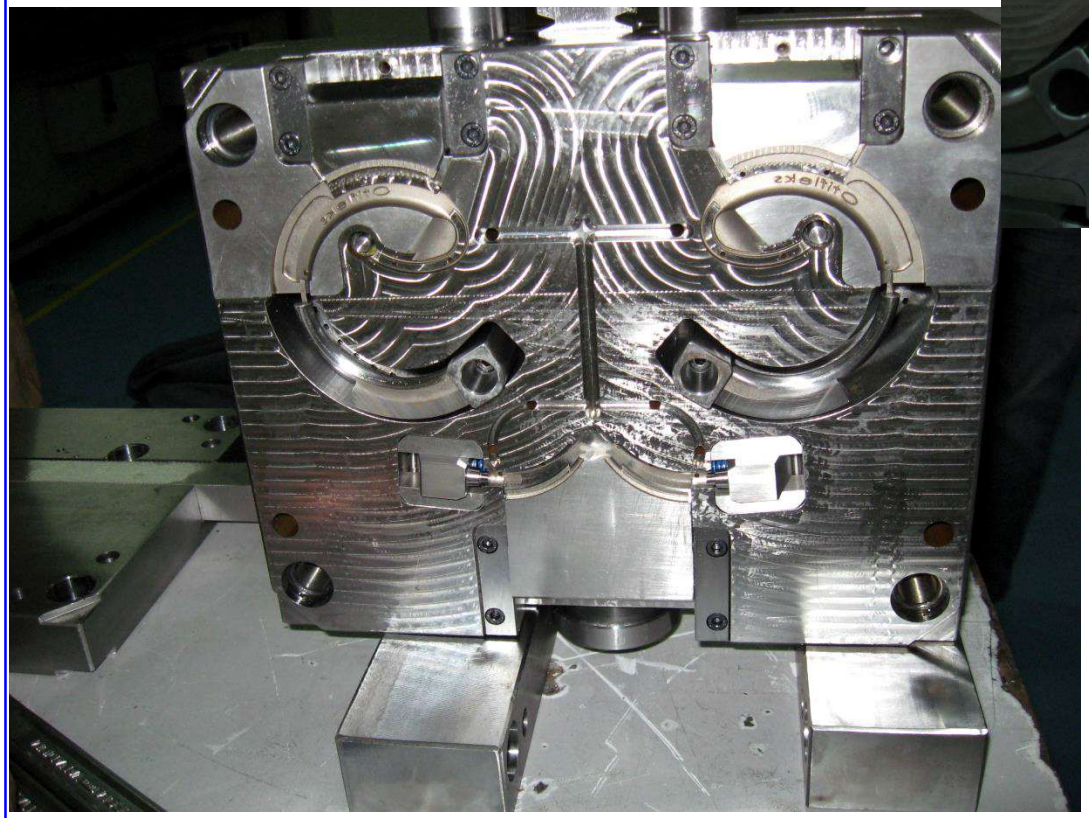
Total part: 5.000-10.000 / Year

Mould and Part Producer : BALKAN PLASTİK

End User : BSH

Mold Producer: Elit Kalıp

End User: Otifleks



TOOLOX 44

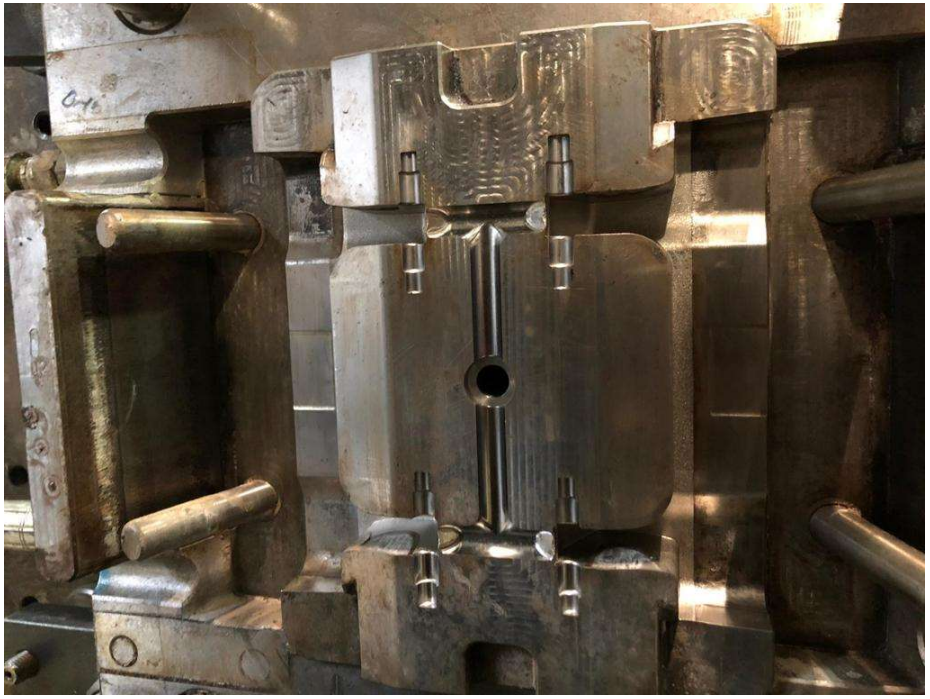
TOOLOX33 is used in core and cavity side

Home Applicance
Toolox44 (Dia 200 mm)
Core side of Kettle mold

Toolox44 (no surface Treatment)

After 500.000 shots There is no problem

PA66 + %45 Glass fibre



Heavy Machined Tool Part

Toolox 44 Shows High Form

Stability after Heavy Material remotion by machining.

Customer: Valmasser

Application: special ejector of Plastic Mould.

Status: approved

Which grade to choose in moulding?

Plastic	Choose
PP	TOOLOX 33
PA6 (nylon)	TOOLOX 44
PA66	TOOLOX 44
PC	TOOLOX 44
ABS	TOOLOX 44
PMMA (Styrene)	TOOLOX 33 alt. TOOLOX 44
PCPBT	TOOLOX 44
With filler (glass-fibre)	TOOLOX 44 + Nitriding