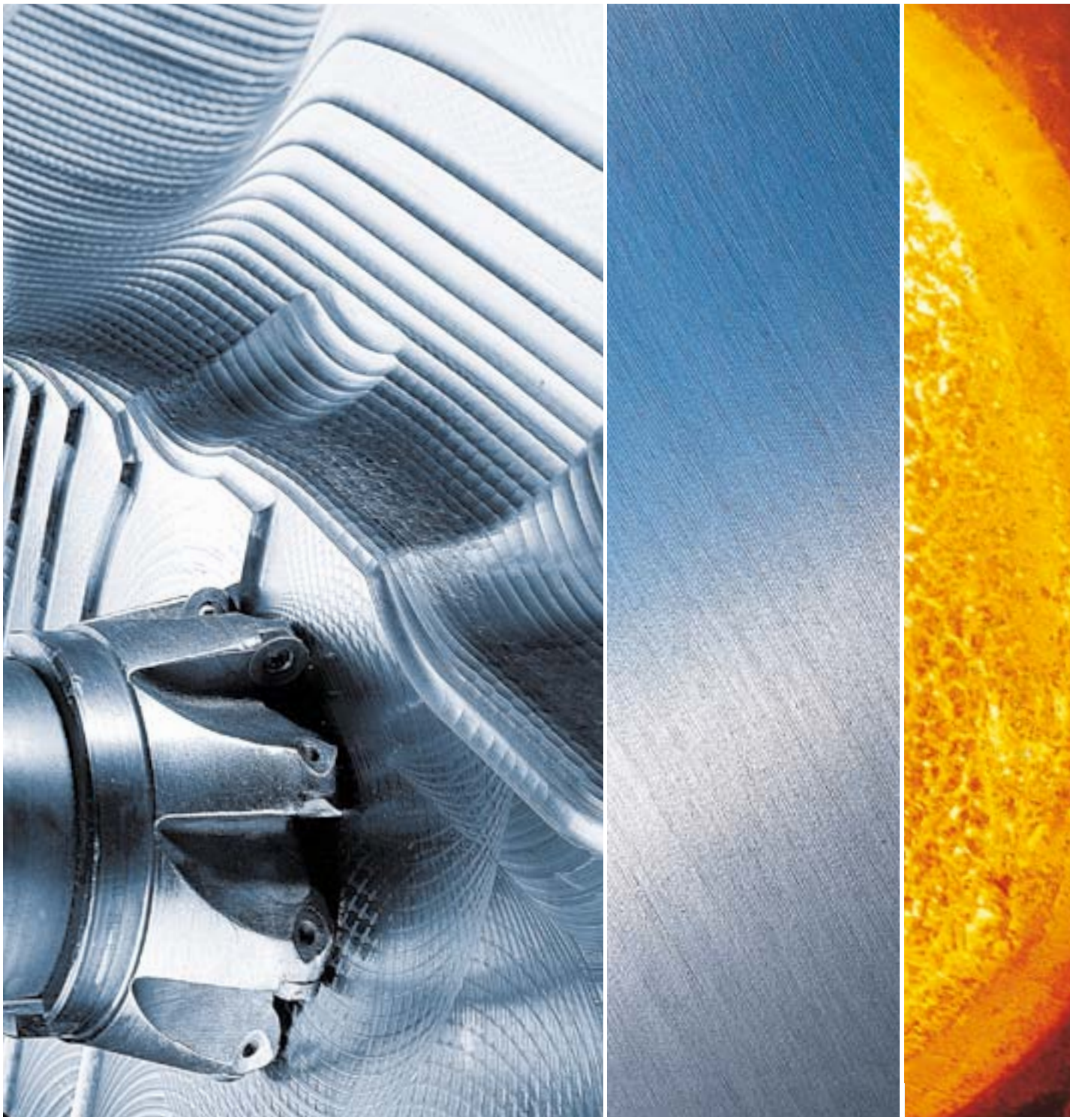
Buderus | Edelstahl

Tool Steels
for the Plastics Industry

I Production Technology I Properties I Applications



Buderus – the Leading-Edge Specialist in Plastic Mould Steels

State-of-the-art Metallurgy

Production and development of tool steels for the plastics processing industry is the specialist field of Edelstahlwerke Buderus GmbH

- Producing high-purity electric steel melts using secondary and vacuum metallurgical processes
- Producing Buderus ISO-B grade tool steels, i.e. special melting with extremely low sulfur content and a high level of purity
- Bottom-poured ingots and special hood type furnace technology for manufacturing low-segregation raw ingots
- Hot forming to programmed forging sequences for ingots of up to 160 tonnes
- All heat treatment processes in continuous and bogie hearth furnaces under protective gas, vacuum atmosphere with compressed gas tempering and salt bath hardening
- Efficient machining to customer specification and drawing

100 tonne ladle furnace (LF-VD/VOD) for producing high-purity tool steels involving secondary and vacuum metallurgical processes

Scrap metal is the basic component of the raw material for our high-grade tool steels

80/100 MN forging press

Swaging a 100 tonne ingot

Custom-made steels and moulds for the tool-making industry

- A wide variety of tool steels in stock, round, square and flat
- Blanks split longitudinally or across; prompt delivery from material in stock
- Production of die bases
- Pre-machining to 3D data
- Finish machining of holder blocks and ancillary fittings
- Available heat treatment for premachined moulds
- Service for etch-graining and polishing
- Consult on all material, heat treatment and finishing questions

Machining	
Horizontal band sawing	up to 2,000 mm
Vertical band sawing	up to 1,500 mm
Portal milling machines	up to L x W x H 6,000 x 2,000 x 2,500 mm
Horizontal boring machines	up to 1,500 x 2,200 mm
Deep hole drilling machine	drill hole diameter / depth 6–42 mm/3,200 mm
Surface grinding facilities	up to 2,500 x 4,200 mm
Profile saw cutting	up to 2,000 mm

Premachining on gantry milling machines

Lagerservice

Roughing

Largest dimensions in the world for plastic moulds

Plastic mould steels for all plastic products with high-grade product surfaces

Special features	2311 ISO-BM 40CrMnMo7	2312 40CrMnMoS8-6	2316 ISO-B mod. ~X38CrMo16	2343 ISO-B mod. ~X37CrMoV5-1	2711 ISO-B 54NiCrMoV6	2738 ISO-BM 40CrMnNiMo8-6-4	2738mod.TS(HH) 26MnCrNiMo6-5-4	2767 ISO-B X45NiCrMo16
Hardness	●	●	●	●●●	●●	●	●●	●●●
Toughness	●	○	●	●	●●	●	●	●●●
Workability	●●	●●●	●	●	●●	●●	●●	●●
Etch-grainability	●●	○	●	●	●●	●●	●●●	●●
Suitability for hard chrome plating	●	○	●	●	●	●	●	●
Polishability	●	○	●	●●	●●●*	●	●●●*	●●●*
Corrosion resistance	○	○	●●●	○	○	○	○	○
Flame hardenability	●	○	○	●	●	●	●	○
Thermal conductivity	●●	●●	●	●	●●	●●	●●●	●●
Dimensional constraints	< 400 mm	no	yes	no	no	no	no	no

●●● very good
●● good
● normal
○ unsuitable

** Reliable high-gloss polishability on request*

High quality plastic mouldings for the automotive industry, consumer durables industry, components and electronics

Large Dimensions are our Strength

From melting through to the end product

160 t forging grade ingot under the 80/100 MN press

Preparing the mould

Demoulding the plastic item in production

The process of producing a complete plastic mould, consisting of the core and bottom die made of 2738mod.TS(HH). Buderus tool steels are ideally suited for high-quality plastic moulds in the automotive industry.

Front bumper cladding

Pioneer of the Mould Steel Family

For sophisticated products in the small dimension range

Edelstahlwerke Buderus GmbH has carried out developments with a view to adapting material properties of forgings of the steel grade 23 11 to the current state of mould making and plastics processing technology, in order to meet all relevant quality requirements. The result is the material 2311 ISO-BM for dimensions up to 400 mm thick. For large and extremely large plastic moulds we recommend the material 2738 ISO-BM *(page 11)* and especially steel 2738mod.TS(HH) *(page 12)*.
This provides quality products with all the properties required.
The grain reliability of steel 2311 ISO-BM is assured.
ISO-BM stands for: isotropic properties with excellent machinability.

Contour milling to 3D data

Delivered condition*
Hardened and tempered to 280–325 HB
≙ 950–1100 MPa
annealed on request

SEL	40CrMnMo7
DIN EN ISO 4957	40CrMnMo7
AFNOR	40CMD8
AISI	~P20
BS	~P20

Chemical analysis (percentage by mass)

	C	Si	Mn	P	S	Cr	Mo
Typical values	0.38	0.30	1.50	0.020	0.003	2.00	0.20
SEL analysis	0.35–0.45	0.20–0.40	1.30–1.60	≤ 0.035	≤ 0.035	1.80–2.10	0.15–0.25

** Surface hardness in Brinell, converted into MPa to DIN EN ISO 18265 Table A.1*

The Economic Option

Mould steel with excellent workability and ideal machining properties for injection moulding and compression moulding dies

The mould steel 2312, 40CrMnMoS8-6 is used where there is requirement for surface finishing such as polishing, etch-graining or hard chrome plating.
The controlled sulfur content gives mould steel 2312 particularly economic machining properties.
In mould making, suitable only for core parts and ejector sides of injection moulding and compression moulding dies with no special surface finish requirements, and subject to low mechanical stress.

2312 core part undergoing rough machining

Delivered condition*
Heat treated to 280–325 HB
≙ 950–1100 MPa
annealed on request

SEL	40CrMnMoS8-6
DIN EN ISO 4957	40CrMnMoS8-6
AFNOR	40CMD8S
AISI	~P20 + S
BS	~P20 + S

Chemical analysis (percentage by mass)

	C	Si	Mn	P	S	Cr	Mo
Typical values	0.38	0.30	1.50	0.020	0.070	2.00	0.20
SEL analysis	0.35–0.45	0.30–0.50	1.40–1.60	≤ 0.030	0.050–0.100	1.80–2.00	0.15–0.25

** Surface hardness in Brinell, converted into MPa to DIN EN ISO 18265 Table A.1*

The Stainless Option

High degree of resistance in use with aggressive materials

Well suited for processing chemically aggressive and acid-releasing plastics such as PVC, amino plastics and halogenated flame retardant additives. Modified corrosion-resistant mould steel, polishable, etch-grain-able and economic to machine. Applications: Injection moulds, mould inserts, slit dies, profile dies, extrusion dies, drop forging tools and coaxial housings for processing PVC amino plastics and additives; blow moulds.
The steel Buderus 2316 ISO-B mod. is machined and used in the hardened and tempered state. It has a wear-resistant surface, is pressure-resistant and tough, and after annealing treatment it can be used hardened to about 50 HRC because of its modified composition.
When processing amino plastics and PVC alloys, highly aggressive by-products such as hydrochloric acid (HCl) can occur at high working temperatures (>160 °C), causing corrosive attack of the mould surface. No mould steel is resistant to that. A production temperature of 160 °C should therefore not be exceeded.
To avoid inter-crystalline corrosion effects (surface and pitting corrosion), environmental factors such as the plastic, operating temperature and corrosiveness of the cooling water must be taken into account.

Delivered condition*
Hardened and tempered to 265–310 HB
≙ 900-1050 MPa

Sizing tool for PVC profiles

SEL	~X38CrMo16
DIN EN ISO 4957	~X38CrMo16
AFNOR	Z35CD17
AISI	~422
BS	

Chemical analysis (percentage by mass)

	C	Si	Mn	P	S	Cr	Ni	Mo
Typical values	0.28	0.30	0.95	0.030	0.003	14.2	~0.50	1.10
SEL analysis	0.33–0.45	≤ 1.00	≤ 1.50	≤ 0.030	≤ 0.030	15.5–17.5	≤ 1.00	0.80–1.30

** Surface hardness in Brinell, converted into MPa to DIN EN ISO 18265 Table A.1*

2343 ISO-B mod.

The Tough Option

Special mould steel that shows its strengths under extreme abrasive stress

This high-alloy hot working steel has become established in recent years for plastic moulds subject to high stress. In addition to hardenability to 52 HRC, the grade 2343 ISO-B mod. is distinguished by high resistance to abrasion and high pressure resistance.It is therefore suitable for processing thermosetting plastics and thermoplastics with additives and composite materials.
Additional surface coatings can be readily applied by PVD and nitriding. The high working hardness of the steel gives it very good polishability.

Characteristic profile

- Quasi isotropic material properties
- Improved toughness properties with high component hardness
- Good pressure resistance and resistance to fracture
- Excellent wear resistance, especially in combination with diverse surface coatings

Bottom mould for a car door module with a tool hardness of 50 HRC and Balinit® A coating

Delivered condition*
Annealed to
max. 229 HB ≙ 775 MPa
Heat treated to customer specification

SEL	~X37CrMoV5-1
DIN EN ISO 4957	~X37CrMoV5-1
AFNOR	Z38CDV5
AISI	~H11mod.
BS	~BH11

Chemical analysis (percentage by mass)

	C	Si	Mn	P	S	Cr	Mo	V
Typical values	0.35	0.30	0.40	0.010	0.003	5.00	1.35	0.50
SEL analysis	0.33–0.41	0.80–1.20	0.25–0.50	≤ 0.030	≤ 0.020	4.80–5.50	1.10–1.50	0.30–0.50

** Surface hardness in Brinell, converted into MPa to DIN EN ISO 18265 Table A.1*

The Brilliant Finish

For processing transparent melts and for large-surface plastic parts

For high quality surface finishes with mould hardness 355 to 415 HB the nickel alloy steel 2711 ISO-B is recommended. For large moulds such as tailgates, mudguards, spoilers etc. with hardness values in excess of 355 HB contour hardening is preferred.

The machinability of 2711 ISO-B is lower compared to 2311/2738 ISO-BM, 2738 ISO-BM and 2738mod.TS(HH) because of its low sulfur content. It may be necessary to adjust the cutting conditions, especially with deep hole drilling.

Characteristic profile

- High sulfidic and oxidic percentage purity by using special metallurgical methods
- Very good polishability (reliable high-gloss polishability on request)
- Largely isotropic, i.e. non-directional material properties
- Very good toughness and hence higher resistance to fracture
- Grain reliable
- Suitable for hard chrome plating
- Also suitable for high hardnesses up to 415 HB with abrasive stress

Premachined mould part for contour hardening

Delivered condition*
Annealed to max. 248 HB,
hardened and tempered to 280–325 HB = 950–1100 MPa or to
355–415 HB = 1200–1400 MPa
or to customer specification

SEL	54NiCrMoV6
AFNOR	55NCDV7
AISI	~6F2
BS	~BH224

Chemical analysis (percentage by mass)

	C	Si	Mn	P	S	Cr	Ni	Mo	V
Typical values	0.52	0.20	0.70	0.020	0.002	0.75	1.75	0.30	0.10
SEL analysis	0.50–0.60	0.15–0.35	0.50–0.80	≤ 0.025	≤ 0.025	0.60–0.80	1.50–1.80	0.25–0.35	0.07–0.12

** Surface hardness in Brinell, converted into MPa to DIN EN ISO 18265 Table A.1*

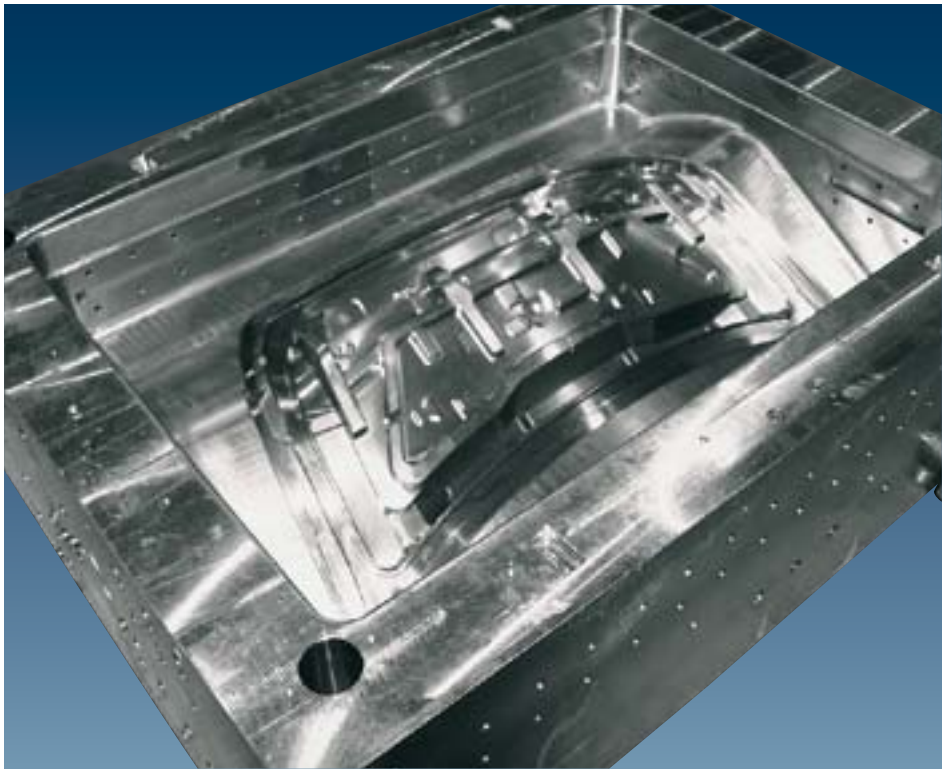
The Proven Steel

For large dimensions with good through tempering properties

The plastic mould steel 2738 ISO-BM has been developed from the standard grade 2311. It is best suited for mould dimensions from 400 mm thick.
Adding up to 1.2 % nickel by alloying signifi-cantly improves penetration hardening up to 1,000 mm thickness. Good machinability combined with polishability and etch-grainability are the defining characteristics of this standard steel.

Characteristic profile
- Higher degree of through hardening for large dimensions
- Polishability
- Grain reliable
- Hard chrome platable
- Nitridability
- Flame hardenable

Delivered condition*
Hardened and tempered to 280–325 HB
= 950–1100 MPa
annealed on request
Where high polishability and etch-grainability are required, in the case of large dimensions, and because of its greater toughness also for higher levels of tool hardness, we recommend 2738mod.TS(HH)
(see page 12)



Tool die for boot cladding

SEL	40CrMnNiMo8-6-4
DIN EN ISO 4957	40CrMnNiMo8-6-4
AFNOR	40CMND8
AISI	~P20 + Ni
BS	~P20 + Ni

Chemical analysis (percentage by mass)

	C	Si	Mn	P	S	Cr	Ni	Mo
Typical values	0.36	0.30	1.50	0.020	0.003	2.00	1.00	0.20
SEL analysis	0.35–0.45	0.20–0.40	1.30–1.60	≤ 0,030	≤ 0,030	1.80–2.10	0.90–1.20	0.15–0.25

** Surface hardness in Brinell, converted into MPa to DIN EN ISO 18265 Table A.1*

2738 mod.TS
2738 mod.TS(HH)

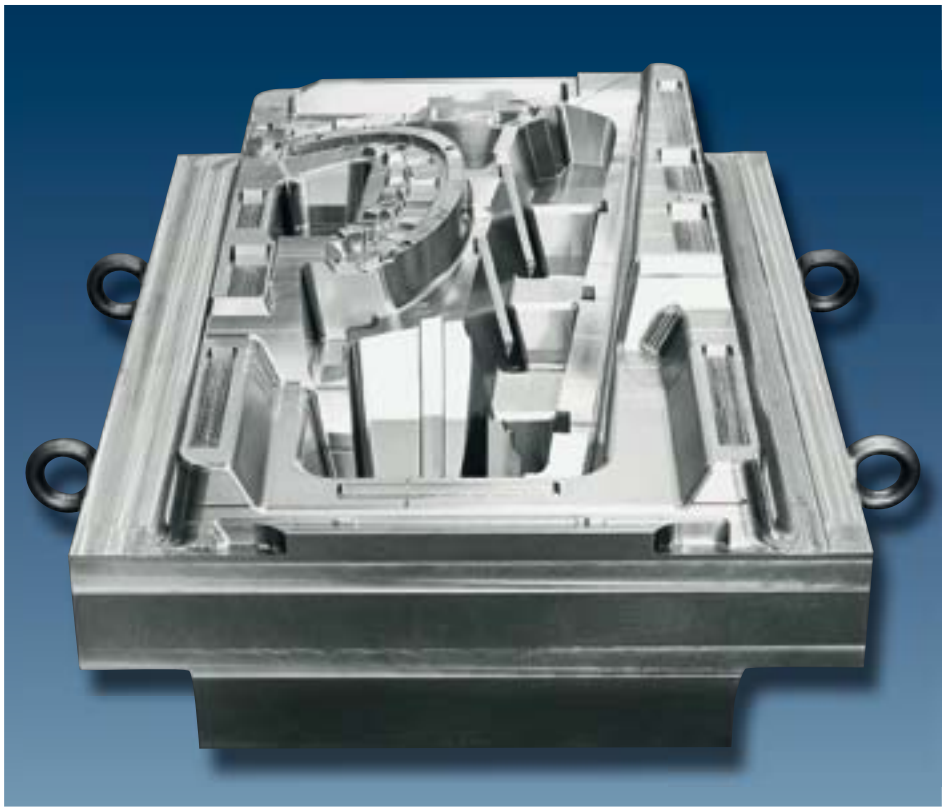
Buderus | Edelstahl

The Perfect Steel for the Future

The plastic mould steel THRUHARD SUPREME® (TS) is ideally suited for almost all applications in the plastics industry

Excellent prospects for the future
By systematically developing the mould steel 2738, we have pioneered an outstanding high-quality and versatile mould steel for low-segregation, through-hardening steel ingots with extremely large dimensions, THRUHARD SUPREME® (TS). The modified composition and specially adapted heat treatment achieve a higher level of hardness through to the core of even the largest dimensions.

Powerful arguments for mould makers
- One single pre-hardened plastic mould steel for a wide range of applications
- Available in standard grade and in HighHard grade (HH).
- Improved toughness compared to 2738 ISO-BM
- Good machinability and high hardness
- Weldability improved with low C content
- Very good polishability in the HighHard variant (reliable high-gloss polishability on request)



Bottom die for car side panel

Delivered condition*
Standard grade:
280–325 HB ≙ 950–1100 MPa
Abbreviated designation: 2738mod.TS
HighHard grade:
310–355 HB ≙ 1050–1200 MPa
Abbreviated designation: 2738mod.TS(HH)

DIN designation	~26MnCrNiMo6-5-4
AFNOR	
AISI	
BS	

Chemical analysis (percentage by mass)

	C	Si	Mn	P	S	Cr	Ni	Mo	V
Typical values	0.26	0.10	1.45	0.015	0.002	1.25	1.05	0.50	0.12

** Surface hardness in Brinell, converted into MPa to DIN EN ISO 18265 Table A.1*

Hard and Tough

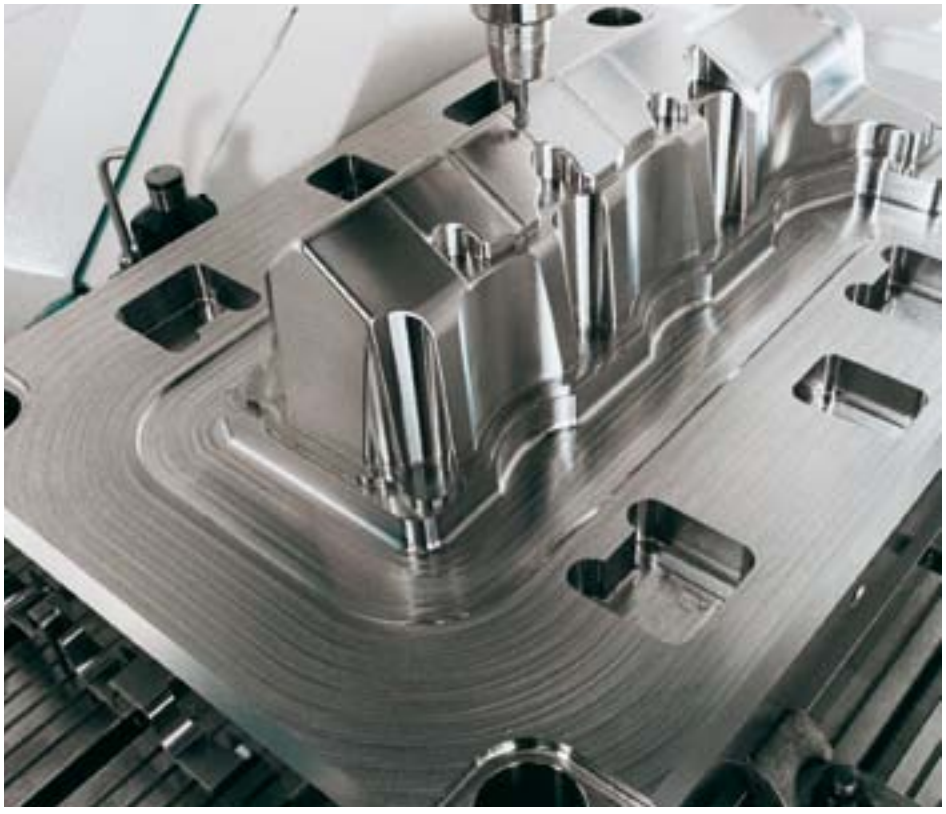
The mould steel for extreme stress, with a wide range of applications

Low-distortion, air quench through-hardening, nickel alloy tool steel with excellent toughness characteristics; very good polishability and grain reliable. This type of steel is particularly suitable for all large and medium-sized highly stressed compression and injection moulds that are pre-machined and contour hardened, such as injection moulding of transparent resins and large-surface plastic parts such as tailgates and mudguards, also mould inserts for high levels of hardness up to 54 HRC, and abrasive stress.

Characteristic profile

- Through hardening for large dimensions
- Excellent dimensional stability and extremely low distortion
- Simple heat treatment
- Extreme toughness characteristics combined with high hardness
- Very good polishability (reliable high-gloss polishability on request)
- Grain reliable
- Good suitability for hard chrome plating

Delivered condition*
Annealed to max. 260 HB = 880 MPa
For large moulds we recommend contour hardening



HSC milling a hardened bottom mould

SEL	45NiCrMo16
DIN EN ISO 4957	45NiCrMo16
AFNOR	45NCD16
AISI	6F7

Chemical analysis (percentage by mass)

	C	Si	Mn	P	S	Cr	Ni	Mo
Typical values	0.45	0.25	0.30	0.025	0.003	1.30	4.00	0.25
SEL analysis	0.40–0.50	0.10–0.40	0.20–0.50	≤ 0.030	≤ 0.030	1.20–1.50	3.80–4.30	0.15–0.35

** Surface hardness in Brinell, converted into MPa to DIN EN ISO 18265 Table A.1*

Properties and applications

Steel group and Material number	SEL designation	AISI	AFNOR	Material characteristic
Unalloyed tool steel				
1730	C45U	SAE 1045	XC 48	Surface hardenable to 55 HRC
Heat-treatable mould steels				
2311 ISO-BM	40CrMnMo7	~ P 20	40 CMD 8	Mould steel, economical to machine, good polishability, grain-reliable for dimensions less than 400 mm thick, hard chrome platable, flame hardenable, nitridable
2738 ISO-BM	40CrMnNiMo8-6-4	~ P 20 + Ni	40 CMND 8	Properties as for 2311 ISO-BM, but reliable penetration hardening-characteristics for larger dimensions
2738mod.TS 2738mod.TS(HH)	26MnCrNiMo6-5-4			Pre-hardened mould steel for the largest dimensions, grain reliable, good polishability, good weldability, good machinability, high thermal conductivity
2312	40CrMnMoS8-6	~ P 20 + S	40 CMD 8 S	Mould steel with very good machinability, not suitable for polishing, etch graining or hard chrome plating purposes
2711 ISO-B	54NiCrMoV6	~ 6 F 2	55 NCDV 7	Tough heat-resistant mould steel grain reliable, good polishability, hard chrome platable, high percentage purity due to ISO-B process
Case hardening steel				
2764 ISO-B	X19NiCrMo4	P 21	~ 19 NCD 16	Low-distortion mould steel with surface hardness from 60–62 HRC and core hardness 325–415 HB after case hardening (in air), very good polishability
Penetration hardening tool steels				
2343 ISO-B mod.	~ X37CrMoV5-1	~ H 11mod.	Z38 CDV 5	Wear-resistant hot working steels, hardenability up to 50 HRC, good nitriding performance, can also be used for large moulds, high percentage purity
2379 ISO-B	X153CrMoV12	~ D 2	Z 160 CDV 12	Inserts nitridable after special heat treatment
2767 ISO-B	45NiCrMo16	6 F 7	45 NCD 16	Air hardening steel with high dimensional stability, very good toughness, hardenability 50–54 HRC, very good polishability
2842	90MnCrV8	O 2	90 MV 8	Simple heat treatment, low-distortion, surface layer hardness 58–62 HRC, no special requirements in terms of polishability
Corrosion resistant steels				
2083 ISO-B	X40Cr14	420	Z 40 C 14	Corrosion-resistant mould steel with good polishability, good workability, hardenability 50–54 HRC
2085	X33CrS16	~ 422 + S	~ Z 33 CS 16	Corrosion-resistant mould steel with very good machining properties
2316 ISO-B mod.	~ X38CrMo16	~ 422	Z 35 CD 17	Mould steel with very good corrosion resistance, polishable, also hardenable to 50 HRC
Maraging steel				
2709	X3NiCoMoTi18-9-5	Maraging 300	Z 2 NKD 18–09	This steel permits simple, non-warping heat treatment with precipitation hardening at 480 °C after finish machining, hardenability up to 55 HRC
Nitriding steels				
2344 ISO-B	X40CrMoV5-1	H 13	Z 40 CDV 5	Nitridable hot working steel for extreme stress exposure to wear and torsion at high temperatures
7735	14CrMoV6-9		20 CDV 5.07	CrMoV nitriding steel with high toughness and thermal strength, weldable
8519	31CrMoV9		32 CDV 12	CrMoV nitriding steel for higher wear exposure
8550	34CrAlNi7-10		34 CAND 7	Aluminium alloyed standard nitriding steel surface hardness after nitriding 1,000 HV approx.

Delivered condition	For which tools
Normalised, max. 190 HB	Attachments, holding blocks and tool holding fixtures with low stress, prototyping
Tempered to 280–325 HB ≙ 950–1100 MPa*	Dies for compression and injection moulding tools less than 400 mm thick
Tempered to 280–325 HB ≙ 950–1100 MPa*	Dies for compression and injection tools, holding blocks production for dimensions ≥ 400 mm thick
Normal hardness: 2738mod.TS Tempered to 280–325 HB ≙ 950–1100 MPa*	Large tools for compression and injection moulds, bumpers, dashboards, garbage containers, TV cabinets
HighHard: 2738mod.TS(HH) Tempered to 310–355 HB ≙ 1050–1200 MPa*	Compression and injection moulding tools subject to higher mechanical and thermal stress and special surface requirements such as good polishability and hard-chrome platability
Tempered to 280–325 HB ≙ 950–1100 MPa*	Cores for compression and injection moulding tools with no surface requirements and low mechanical stress mould assemblies, holding blocks subject to low stress, prototyping
Annealed to max. 248 HB Tempered to 280–325 HB ≙ 950–1100 MPa* or to 355–415 HB ≙ 1200 - 1400 MPa*	Compression and injection tools with higher mechanical and thermal stress and special surface requirements such as good polishability and hard chrome plateability; contour hardening is recommended
Annealed max. 250 HB	Compression and injection moulding tools with high compression stress combined with abrasive surface stress
Annealed, max. 229 HB	Highly stressed plastic moulds, mould inserts for high hardnesses and abrasive stress
Annealed, max. 255 HB	For highly abrasive stress and high hardnesses from 58 to 63 HRC
Annealed, max. 260 HB	for high-speed inserts up to 54 HRC
Annealed, max. 229 HB	
Annealed, max. 241 HB Tempered on request	Mould inserts
Tempered to 265–310 HB ≙ 900–1050 MPa*	Mould fittings and mould frames
Tempered to 265–310 HB ≙ 900–1050 MPa*	Mould inserts, slit dies, profile dies, sizing tools, blowing moulds, extrusion dies
Solution annealed, 300 HB approx ≙ 1000 MPa*	Injection moulding tools subject to high compression stress, part inserts, cores, ejectors
Tempered to 280–325 HB ≙ 950–1100 MPa*	
Tempered to 265–310 HB ≙ 900–1050 MPa*	
Tempered to 265–310 HB ≙ 900–1050 MPa*	
Tempered to 237–297 HB ≙ 800–1000 MPa*	Extruder tools such as screws and cylinders, plastifying tools

Note: There may be a deviation of hardness values where portable hardness testing equipment is used. Please refer to the equipment manufacturer to determine the possible deviation.

** Surface hardness in Brinell, converted into MPa to DIN EN ISO 18265 Table A.1*

Cutting speed (V_c in $^m/_{min}$) for ROUGH-[1] and FINISH MILLING[2] of pl

Steel group and Material No.	HT condition and Brinell hardness in HB	Rough milling					
		HSS		Hard alloy uncoated [3]		Hard alloy coated [3]	
				P25	P25	P25	P35
Milling conditions		+	-	+	-	+	-
Tempering steel							
	hardened and tempered						
2311 ISO-BM	280–325	•	•	•• (130)	•• (110)	170	140
2312	280–325	•	•	•• (140)	•• (120)	180	150
2711 ISO-B	280–415	•	•	•• (85)	•• (75)	140	100
2738 ISO-BM	280–415	•	•	•• (100)	•• (85)	150	120
2738mod.TS(HH)	310–355	•	•	•• (120)	•• (100)	180	140
Through-hardening tool steel							
	annealed						
2343 ISO-B mod.	max. 229	•	•	•• (100)	•• (85)	130	110
2344 ISO-B	max. 229	•	•	•• (100)	•• (85)	130	110
2379 ISO-B	max. 255	•	•	•• (75)	•• (65)	110	85
2767 ISO-B	max. 260	•	•	•• (100)	•• (85)	130	110
2842	max. 229	•	•	•• (85)	•• (75)	120	95
Corrosion-resistant steel							
	hardened and tempered						
2316 ISO-B mod.	265–310	•	•	•	•	120	110
Case hardening steel							
	annealed						
2764 ISO-B	max. 250	•	•	•• (150)	•• (130)	200	170
Unalloyed steel							
	normalised						
1730	max. 190	•	•	•• (150)	•• (130)	200	160

For tool diameters > 70 mm, reduce the cutting speed by a factor of 0.7

[1] In the case of rough milling: Feed per tooth (fz) = 0.1 - 0.3 mm Ratio between milling path width and tool diameter < 3/4

[2] In the case of finish milling: Feed per tooth (fz) = 0.03 - 0.3 mm Ratio between milling path width and tool diameter = 1/10

astic mould steels

Finish Milling

HSS (1.3243) fz=max. 0.1 mm		Hard alloy uncoated [3]		Hard alloy coated [3]		Hard alloy Cermet [3]	
		P25	P25	K15	P25	P15	
+	-	+	-	+	-	+	-
20	12	•• (190)	•• (160)	260	260	300	•
25	15	•• (210)	•• (180)	270	270	320	•
25	20	•• (130)	•• (110)	210	210	260	•
20	12	•• (160)	•• (130)	220	220	270	•
20	12	•• (210)	•• (170)	270	260	320	•
20	10	•• (150)	•• (130)	190	190	220	•
20	10	•• (150)	•• (130)	190	190	220	•
15	10	•• (110)	•• (95)	160	160	190	•
25	20	•• (150)	•• (130)	190	190	220	•
25	15	•• (130)	•• (110)	180	180	210	•
•• (20)	•• (12)	•	•	180	180	•	•
25	20	•• (220)	•• (190)	300	300	370	•
30	20	•• (220)	•• (190)	300	300	370	•

[3] Depth of cut(ap) = approx. 1/2 x cutting edge length (Lc), for larger feed depths > 1/2 x Lc, select a lower tooth feed value.

• Not recommended

•• We recommend using coated hard alloy; if not available, the () values apply

Data established by Messrs. WALTER of Tübingen

Comparison of standards and analyses

Steel group and Material No.	DIN	C	Si	Mn	P	S	Cr	Mo	Ni	V
Unalloyed tool steel										
1730	C45U	0.42–0.50	0.15–0.40	0.60–0.80	≤ 0.030	≤ 0.030	--	--	--	--
Heat-treatable mould steels										
2311 ISO-BM	40CrMnMo7	0.35–0.45	0.20–0.40	1.30–1.60	≤ 0.035	≤ 0.003	1.80–2.10	0.15–0.25	--	--
2312	40CrMnMoS8-6	0.35–0.45	0.30–0.50	1.40–1.60	≤ 0.030	0.05–0.10	1.80–2.00	0.15–0.25	--	--
2711 ISO-B	54NiCrMoV6	0.50–0.60	0.15–0.35	0.50–0.80	≤ 0.025	≤ 0.003	0.60–0.80	0.25–0.35	1.50–1.80	0.07–0.12
2738 ISO-BM	40CrMnNiMo8-6-4	0.35–0.45	0.20–0.40	1.30–1.60	≤ 0.030	≤ 0.003	1.80–2.10	0.15–0.25	0.90–1.20	--
2738mod.TS*	26MnCrNiMo6-5-4	0.26	0.10	1.45	≤ 0.015	0.002	1.25	0.50	1.05	0.12
2738mod.TS(HH)*	26MnCrNiMo6-5-4	0.26	0.10	1.45	≤ 0.015	0.002	1.25	0.50	1.05	0.12
Case hardening steel										
2764 ISO-B	X19NiCrMo4	0.16–0.22	0.10–0.40	0.15–0.45	≤ 0.030	≤ 0.003	1.10–1.40	0.15–0.25	3.80–4.30	--
Through-hardening tool steels										
2343 ISO-B mod.*	~ X37CrMoV5-1	0.35	0.30	0.40	≤ 0.010	≤ 0.003	5.00	1.35	--	0.50
2379 ISO-B	X153CrMoV12	1.45–1.60	0.10–0.60	0.20–0.60	≤ 0.030	≤ 0.005	11.00–13.00	0.70–1.00	--	0.70–1.00
2767 ISO-B	45NiCrMo16	0.40–0.50	0.10–0.40	0.20–0.50	≤ 0.030	≤ 0.003	1.20–1.50	0.15–0.35	3.80–4.30	--
2842	90MnCrV8	0.85–0.95	0.10–0.40	1.80–2.20	≤ 0.030	≤ 0.030	0.20–0.50	--	--	0.05–0.20
Corrosion-resistant steels										
2083 ISO-B	X40Cr14	0.36–0.42	≤ 1.00	≤ 1.00	≤ 0.030	≤ 0.003	12.50–14.50	--	--	--
2085	X33CrS16	0.28–0.38	≤ 1.00	≤ 1.40	≤ 0.030	0.05–0.10	15.00–17.00	--	≤ 1.00	--
2316 ISO-B mod.*	~ X38CrMo16	0.28	0.30	0.95	≤ 0.030	≤ 0.003	14.20	1.10	~ 0.50	--
Nitriding steels										
7735	14CrMoV6-9	0.11–0.17	≤ 0.25	0.80–1.00	≤ 0.020	≤ 0.015	1.25–1.50	0.80–1.00	--	0.20–0.30
8519	31CrMoV9	0.27–0.34	≤ 0.40	0.40–0.70	≤ 0.025	≤ 0.035	2.30–2.70	0.15–0.25	--	0.10–0.20
8550	34CrAlNi7-10	0.30–0.37	≤ 0.40	0.40–0.70	≤ 0.025	≤ 0.035	1.50–1.80	0.15–0.25	0.85–1.15	Al 0.80–1.20

SEL analyses (%), with S. reservations for ISO-B grades

* Typical analysis

DEVILLE Rectification Buderus

DEVILLE RECTIFICATION

Buderus Edelstahl

An Innovative and Dynamic Partner

Deville Rectification is an important partner for Buderus Edelstahl GmbH, producing high-grade milled and ground plate and ingots of steel, stainless special steel and aluminium. DEVILLE RECTIFICATION holds an exceptional range of stock, and guarantees the highest quality, combined with speed and service. DEVILLE RECTIFICATION zeichnet sich durch seine ständigen Fortschritt im Hinblick auf die Kundenzufriedenheit seiner Kunden aus und ist ISO 9001 Version 2008 zertifiziert. DEVILLE RECTIFICATION is distinguished by its systematic pursuit of customer satisfaction, and is certified to ISO 9001 version 2008.

Deville Rectification offers:

- Pre-machined parts, ingots and plate with weights ranging from a few grams to 25 tonnes
- A range of stock with a total of 16 grades of steel and 5 grades of aluminium
- Dimensions ranging from 7 to 500 mm in thickness available ex stock
- Larger and smaller dimensions available on request

Deville machining equipment is amongst the most efficient in the industry:

- Sawing max.: 1,000 x 1,250 x 4,000 mm
- Flame cutting max.: 3,000 x 13,000 mm
- Grinding max.: 2,500 x 4,200 mm
- Milling max.: 2,500 x 8,000 mm
- Tolerances: to specification
- Grades in stock: approx. 5 days delivery

Supply and machining of plate in all dimensions for all industrial applications: general machine building, tool and machine maintenance, mould making, stamping / deep drawing, special-purpose machines, inspection instruments

Blanks: flame cut, sawn, laser cut
Sides: burnt, sawn, milled, ground
Support surfaces: milled, disk ground, surface ground
Machining: drilling, milling, grinding, CNC machining

Surface machining: grinding

Versandvorbereitung

Buderus | Edelstahl

ISO 9001
ISO 14001

Global network

Buderus Edelstahl, a name that stands for the production and refinement of high-grade special steels. Buderus Edelstahl is a global front runner in this sophisticated sector. Outstanding quality, efficiency and speed are as much a matter of course for Buderus Edelstahl GmbH as flexibility and service. More than 50 agents with stockholding and service centres provide close customer support and market coverage.

We supply quality products that are used in automotive and drive technology, in plant engineering and machine building, and in die and mould making:

- Rolled billets
- Open die forgings from ingots weighing up to 160 tonnes
- Tool steels for mould and die making
- Special engineering steels for plant and gear engineering
- Hot and cold strip

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