



**Buderus** | Edelstahl

**DEĞİŞİM ÇELİK**  
ISIL İŞLEM LTD. ŞTİ.

# Plastic Mold Steels

Production and Applications

# WHO ARE WE ?

**As DÇ Değişim Çelik; Since 2000, we have been serving the steel industry with our European origin guaranteed, first class, certified products and our expert engineer staff and we are pleased to share our knowledge, experience and service with our customers.**

**We provide the steel needs of sectors such as Automotive, White Goods, Plastic, Machinery, Injection, Extrusion, Mold with the highest service and engineering knowledge by cutting the Qualified Steels that we import from European Countries such as Germany, Italy, France, Belgium with precise measurements.**

**Apart from the brands under the Voestalpine High Performance Group and of course Buderus**

**Our goal is to ensure steady growth by reflecting our world-class superior service understanding and ethics to our local and international trade and production. We are proud to be a brand in our sector with our strong financial structure, a wide range and volume of stock, and many customers with whom we have long-standing partnerships.**

**We are taking very serious steps to ensure our position as the pioneer and leader of our sector in our country; also another step and target on a global scale. Our great strength based on years in areas such as financial, infrastructure, stocks, customer network; to grow professionally in an institutionalized and systematic way; in this sense, in our steps we take to realize our goal of becoming a global brand; we also receive support from expert and leading consultancy firms.**

**With our very strong and long-term experienced, hardworking, young and dynamic staff, we are always in the supply chain of our valued customers with our solution partnership, technical support and superior service understanding.**

# OUR FACILITY



**Our company and factory operates in a closed area of 4.500 m<sup>2</sup> and is located in Hadımköy/ISTANBUL and provides 24/7 service with our expert engineer staff. In addition to all these, we purchased an industrial land where we will build a 10.000 m<sup>2</sup> closed factory area. Our factory construction has started on this land and we expect to complete it within 2 years.**



**Our 17-machines machine park in our factory; cutting can be made in accordance with every size and dimension, especially our 1100x2200 saw.**



# OUR STOCK

**Our steel stock is approximately 5.000 tons includes the following steel groups;**

## **TOOL STEELS**

- Hot Work Tool Steels
- Cold Work Tool Steels

## **PLASTIC MOLD STEELS**

## **HIGH SPEED STEELS**

## **CARBON STEELS**

## **RECLEMENTATION STEELS**

## **CEMENTATION STEELS**

## **NITRIDING STEELS**



## OUR PRODUCTS



**U-cutted and milled steel for  
TOGG / Sedan Project  
970x1300x2700 1.2738 HH**

**Plastic mold steel for  
TOFAS/STELLANTIS  
project  
850x1250x2750 1.2738**



**Plastic mold steel for our  
customer producing white  
goods  
960x1100x3300 1.2312**

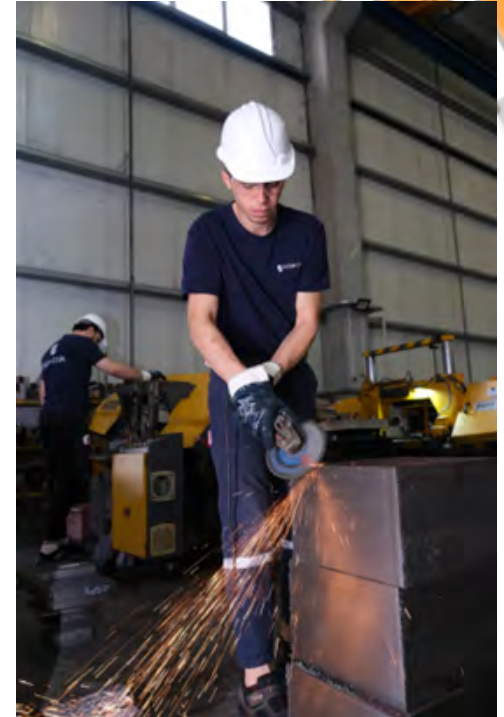




# OUR SERVICES

Some of the services we provide to our customers includes;

- Cutting
- Hardening
- Heat Treatment
- Cementation
- Borwerk



# OUR CUSTOMERS

We serve almost all industrial sectors. Our customers mainly operate in Automotive, White Goods, Plastic, Machinery, Injection, Extrusion, Mold sectors.

There are 2 highlights that we would like to share about our customers.

The first one; most of our customers are the largest and leading companies in their sectors which they operate. Secondly, we have a long-term business relationship with most of our customers.

The services we provide, our competent staff, the good relationships we have established based on mutual trust, our professional approach, our ability to keep our promises, our strength in all areas; has enabled our customers to trust us and to establish long-term commercial cooperation with them.

We would like to proudly add that due to our power and capacity to export to all over the world; our export volume is increasing exponentially ever day.

# OUR ACTIVITIES

As Değişim Çelik, we participated in many sectoral fairs both in Turkey and abroad as « exhibitors» for years.

A few examples of fairs in Turkey are 'Metal Expo', which is organized in September/ every year that is the largest in the sector and 'Kast Expo', which is organized in December, which we have been participating in every year since they were organized.

Another examples of fair abroad such as the UK Metal NEC, Made in Steel Milan, Tube Dusseldorf which we already participated last year.

We planned for 2024 being exhibitor at UK Metal NEC 2024 , Tube 2024 Dusseldorf abroad and Metal Expo 2024 in Turkey and more. On this occasion, we both closely follow innovations , developments and expand our international customer network

# OUR TEAM

We currently have more than 50 employees in total in our factory.

Our Sales team, consisting entirely of engineers, is currently 5 people in total.

In addition to this, we also have a Quality and Business Development Manager, who is a competent and expert engineer in his field, and is a solution partner to all our customers by supporting them in efficiency, the most suitable products and processes.

# DEĞİŞİM ÇELİK / BUDERUS EDELSTAHL

We would like to proudly share that we are the sole authorized distributor of BUDERUS in Turkey as of 2024.

When the corporate identity of the Buderus brand, the efficiency of its unique branded products in tool steels and our strength, commercial capacity, wide customer network and well-equipped staff come together as Değişim Çelik, a tremendous synergy has been created.

This cooperation and the synergy it creates provides added value and efficiency to the Turkish industry and all sectors that use tool steels. Below, general information about Buderus Edeltahl and technical information and examples about PLASTIC MOLD STEELS, one of the most important, well-known and unrivaled product groups of the brand, are shared.

# BUDERUS EDELSTAHL GMBH

## Company Key Figures

Fiscal Year 2021/2022



RAW STEEL PRODUCTION  
**242,000 t**



DELIVERIES  
**186,000 t**



TURNOVER  
**382 Mio. €**



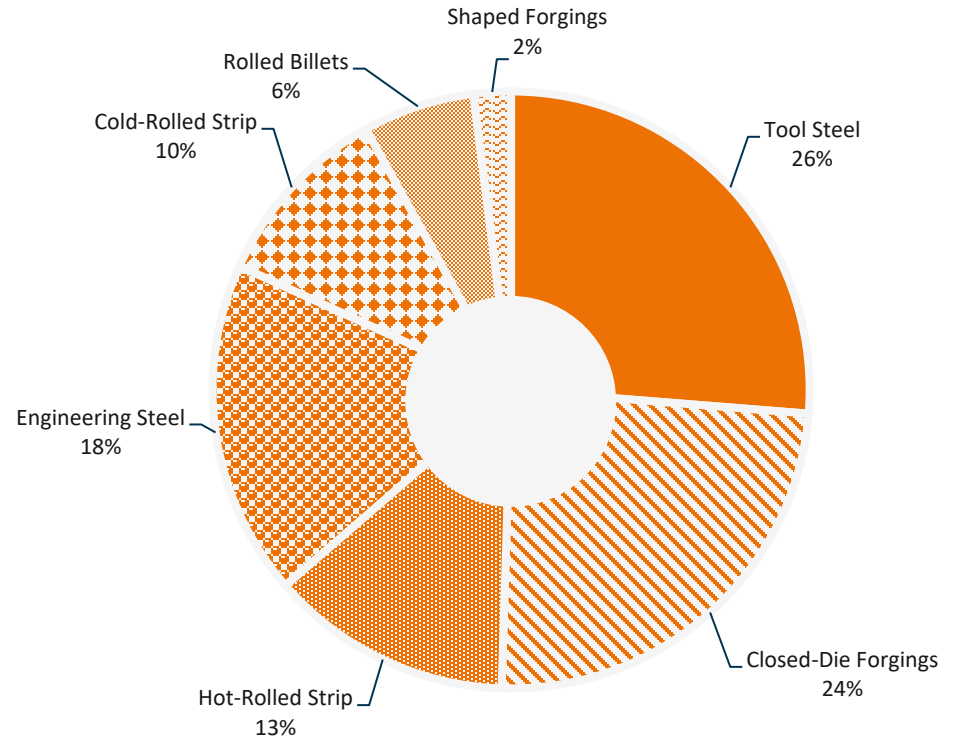
EMPLOYEES  
**1,263**



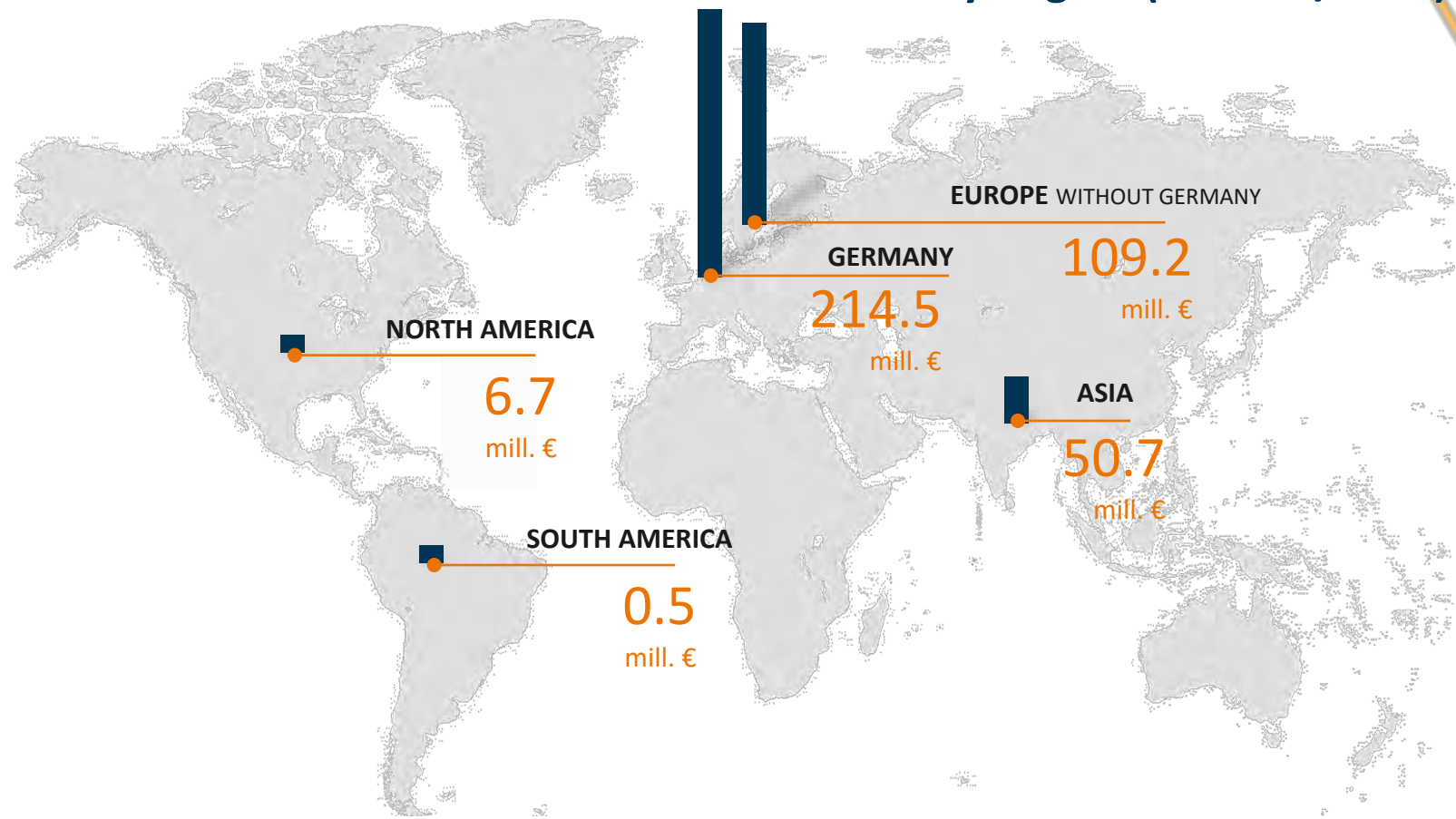
APPRENTICES  
**55**

# BUDERUS EDELSTAHL GMBH Company Key Figures

Fiscal Year 2021/2022



# Buderus Edelstahl - Turnover by Region (FY 2021/2022)



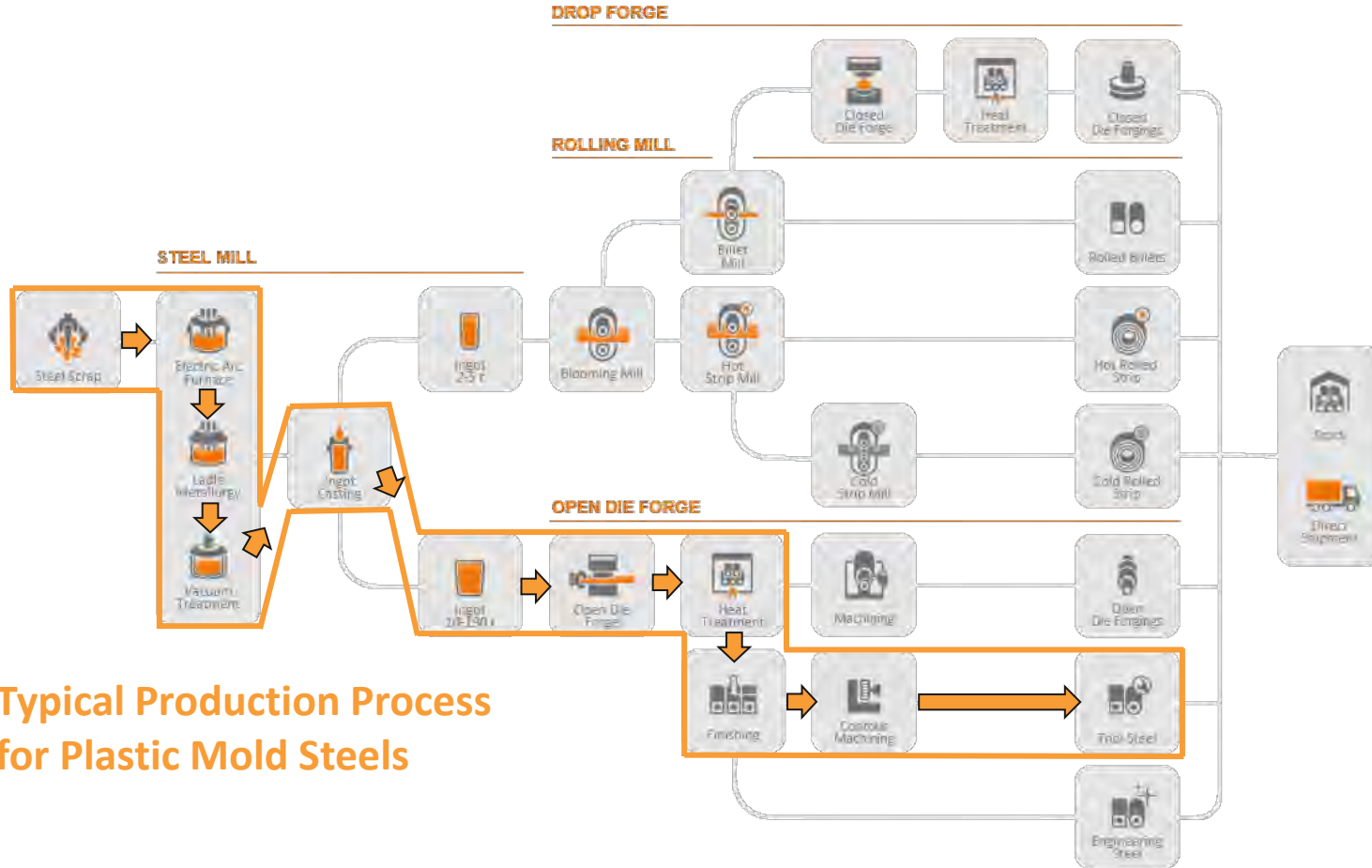


# Buderus Edelstahl – Our Global Sales Network





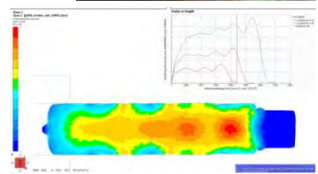
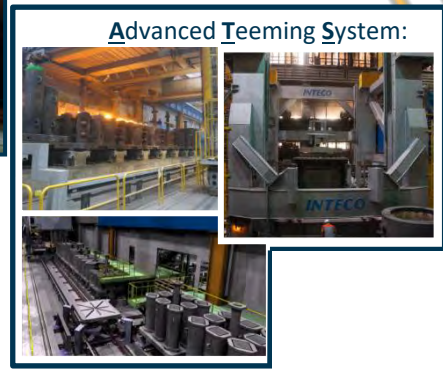
- 1 Steel Mill
- 2 Open-Die Forge
- 3 Hot Rolling Mill
- 4 Cold Rolling Mill
- 5 Closed-Die Forge
- 6 Heat Treatment
- 7 Machine Shop
- 8 Bar Stockholding



Typical Production Process  
for Plastic Mold Steels

## Melting

- | melting in our own Electric Arc Furnace
- | heat lots of up to 110 metric tons of liquid steel
- | refining in ladle furnace incl. automated alloying
- | Vacuum Degassing (VD) & melting to fine-grain practice of all our Tool Steels
- | Vacuum Oxygen Decarburization (VOD) for low-Carbon Stainless Steel Grades (Super13%-Cr, F6NM, 16-5-1, etc.)
- | ISO-B inclusion shape modification process (controlled calcium treatment) for enhanced transverse ductility & toughness
- | extremely low content of non-metallic inclusions
- | sulphur contents of less than 0.002% as well as tight control of residuals and impurities (Sn, Sb, etc.) are standard at Buderus
- | internal laboratory for precise fine tuning of the chemical composition
- | bottom poured ingots in a weight range of 2.8 to 190 metric tons
- | argon shielding of pouring stream
- | **semi-automatic advanced teeming system for ingots up to 10 metric tons**



## Open Die Forging

- | forging presses with 20MN, 50MN and 80/100 MN press force
- | hollow forging, stretching, upsetting, disc forgings up to a maximum diameter of approximately 4000mm (158")
- | flame cutting up to a diameter of 2000mm (79")
- | 20x forging furnaces with a maximum width of 4000mm (158")
- | Finite Element Method calculation of forging processes to ensure closure of all internal voids caused by shrinkage during solidification of the ingot

## Heat Treatment

- | 6x vertical furnaces, max. length: 11400mm (37 ft.), max. weight: 56 metric tons
- | 1x vertical water quenching tank
- | 34x horizontal batch-type furnaces, max. length: 16200mm (53 ft.)
- | 3x horizontal water quenching tanks, 1x oil-/ polymer quenching tank each max. length: 15000mm (49 ft.)
- | 5 continuous furnaces with 2x water quenching tanks (optional: polymer quenching for special Applications)
- | separate fully automated heat treatment shop for closed-die forgings with 5x low- and 5x high-temperature furnaces with attached polymer quenching tank
- | furnaces with calibration and pyrometry acc. AMS 2750E / API 6A Annex M for special applications



## Machining

- | machining of forgings with weights up to 120 metric tons
- | as-delivered weights up to 100 metric tons after final-machining
- | numerically controlled horizontal turning lathes, max. Ø 2100mm (Ø 82"), max. length: 15000mm (49 ft.)
- | deep-hole drilling up to a max. length of 13000mm (42 ft.)
- | horizontal bore- and cylinder honing machine
- | boring and milling operations (including core trepanning)
- | saw cutting of cross-sections up to 2000 x 2000mm (79" x 79")



## Quality Assurance

- | certified according to ISO 9001, ISO 14001, ISO 50001, ISO TS 16949 by LRQA
- | health and safety management system acc. OHSAS 18001
- | chemical analysis in laboratory fully certified acc. ISO / IEC 17025
- | mechanical- and metallographic laboratories fully certified acc. ISO / IEC 17025
- | level III and level II NDT-inspectors qualified acc. EN 473, ISO 971 and SNT-TC-1A
- | manual-, mechanized- and automated ultrasonic inspection
- | dye penetrant testing / magnetic particle testing
- | 3.1-/ 3.2-inspections/ approved by: LRS, DNV, ABS, TÜV, GL, BV, etc.
- | Approvals for the production of pressure equipment acc. PED 97/23/EC

# Typical Composition of Buderus Plastic Mold Steels

Typical Chemical Composition (wt-%)

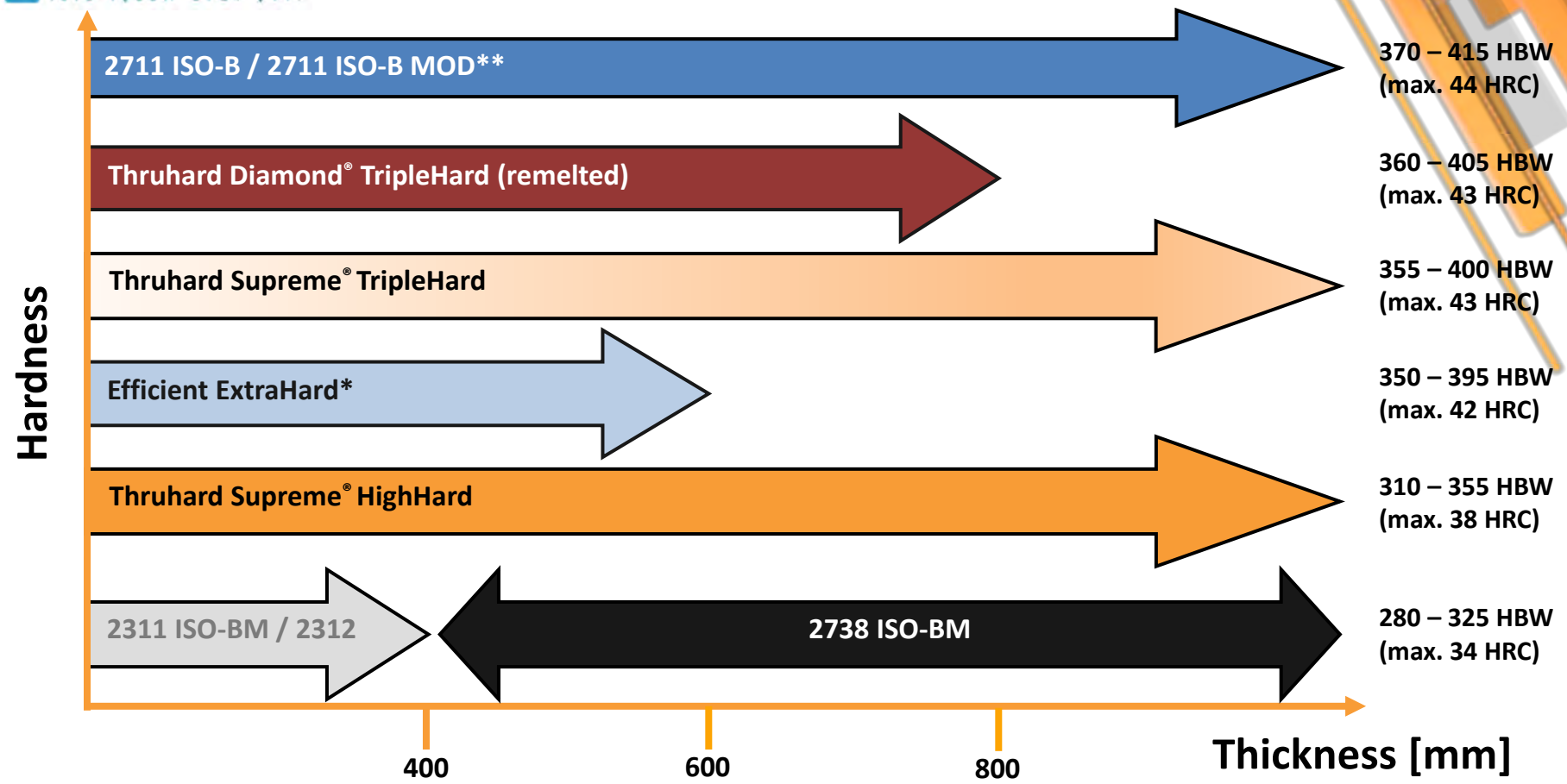
Steel Grade	DIN / EN / ISO	C	Si	Mn	S	Cr	Ni	Mo	V
<b>Carbon Steel</b>									
1203	C55E	0.53	0.20	0.80	< 0.003	-	-	-	-
1730	C45U	0.45	0.30	0.70	< 0.003	-	-	-	-
<b>Low-Alloyed Tool Steel (Quenched + Tempered)</b>									
2311 ISO-B	40 CrMnMo 7	0.38	0.30	1.50	< 0.002	2.00	-	0.20	-
2312	40 CrMnMoS 8-6	0.38	0.30	1.50	0.070	2.00	-	0.20	-
2738 ISO-BM	40 CrMnNiMo 8-6-4	0.38	0.30	1.50	< 0.002	2.00	1.00	0.20	-
Efficient Extrahard	-	0.30	0.10	1.45	< 0.002	1.35	0.65	0.50	-
2711 ISO-B	54 NiCrMoV 6	0.52	0.20	0.70	< 0.003	0.75	1.70	0.30	0.10
2711 ISO-B MOD	-	0.52	0.20	0.95	< 0.003	1.05	2.00	0.75	0.12
Thruhard Supreme®	-	0.26	0.10	1.45	< 0.002	1.25	1.05	0.60	0.12
Thruhard Diamond®	-	0.28	0.10	1.45	< 0.002	1.25	1.05	0.70	0.15

Steel Grade	Machinability	Thermal Conductivity	Fracture Toughness	Corrosion Resistance	Weldability	Wear Resistance	Polishability	Texturability	Chrome-Platibility	Through-Hardenability	Nitridability	PVD-Coatability	High-Temperature Strength
<b>Low-Alloyed Tool Steel (Quenched + Tempered)</b>													
2311 ISO-BM	●●	●●	●●	○○	●●●	●	●●	●●	●●	●	●	○	●●
2312	●●●	●●	○	○○	●●	●	○○	○○	○	●	●	○	●●
2738 ISO-BM	●●	●●	●●	○○	●●●	●	●●	●●	●●	●●	●	○	●●
Efficient ExtraHard	●●	●●●	●●	○○	●●●	●●	●●●	●●	●●	●+	●	●	●●+
2711 ISO-B	●●	●●	●●●	○○	●●	●●●	●●●	●●●	●●●	●●	●	●	●●
2711 ISO-B MOD	●●	●●	●●●+	○○	●+	●●●	●●●	●●●	●●●	●●●	●●+	●●	●●
Thruhard Supreme®	●●	●●●	●●	○○	●●●	●●●	●●●	●●●	●●●	●●●	●●	●+	●●●
Thruhard Diamond®	●●	●●●	●●●	○○	●●●	●●●	●●●+	●●●	●●●	●●●	●●●	●+	●●●

●●● = excellent      ●● = good      ● = standard      ○ = low      ○○ = very low

# Low-Alloyed Plastic Mold Steels

# Recommended Size Limitations for Plastic Mold Steels



\* : width on request

\*\* : for Standard Grade 2714 ISO-B we recommend Quench + Temper in Near-Net Shape (Contour-Hardening) for applications that require high toughness levels





Contour milling to 3D-data

Steel Grade	Limit	Typical Chemical Composition (wt-%)					
		C	Si	Mn	S	Cr	Mo
2311 acc. SEE 202	min.	0.35	0.20	1.30	max.	1.80	0.15
	max.	0.45	0.40	1.60	0.035	2.10	0.25
2311 ISO-BM	typical	0.38	0.30	1.50	0.001	2.00	0.20

## Characteristics:

- standard Mold Steel with sufficient through-hardenability for heat treated section thicknesses up to 400mm
- good Machinability
- easy to Polish
- Hard-Chrome Plateable

## Heat Treatment Condition\*:

- Quenched and Tempered to 280 – 325 HBW

## Typical Applications:

- Small and medium-sized Injection- & Press Molds
- Mold Frames

\*) Surface Hardness



Core Part made of 2312  
undergoing rough machining

Steel Grade	Limit	Typical Chemical Composition (wt-%)					
		C	Si	Mn	S	Cr	Mo
2312 acc. SEL	min.	0.35	0.30	1.40	0.050	1.80	0.15
	max.	0.45	0.50	1.60	0.100	2.00	0.25
2312	typical	0.38	0.30	1.50	0.070	2.00	0.20

## Characteristics:

- resulphurized Mold Steel with sufficient through-hardenability for heat treated section thicknesses up to 400mm
- excellent Machinability due to controlled Sulphur-Alloying

*not recommended for Polishing, Photo-Etching or Hard-Chrome Plating*

## Heat Treatment Condition\*:

- Quenched and Tempered to 280 – 325 HBW

## Typical Applications:

- Core Parts without requirements for the Surface Finish
- Mold Frames subjected to low Mechanical Stresses

...an Invention of Buderus Edelstahl !



Cavity for Truck Motor Hood

Steel Grade	Limit	Typical Chemical Composition (wt-%)						
		C	Si	Mn	S	Cr	Ni	Mo
2738 acc. ISO 4957	min.	0.35	0.20	1.30	max.	1.80	0.90	0.15
	max.	0.45	0.40	1.60	0.030	2.10	1.20	0.20
2738 ISO-BM	typical	0.38	0.30	1.50	0.001	2.00	1.00	0.20

### Characteristics:

- Alloying with about 1% of Nickel drastically improves through-hardenability compared to 2311 ISO-BM and allows for good core properties even in large dimension Tooling
- Nitridable and Hard-Chrome plateable
- Flame Hardenable
- good Polishability and suitable for Photo-Etching

### Heat Treatment Condition\*:

- Quenched and Tempered to 280 – 325 HBW

### Typical Applications:

- Large Tools for Press Dies and Injection Molds with a thickness in excess of 600mm

\*) Surface Hardness

## Typical Chemical Composition (wt-%)

Steel Grade	C	Si	Mn	S	Cr	Ni	Mo
Efficient ExtraHard	0.30	0.10	1.45	0.001	1.35	0.65	0.50



## Characteristics:

- Cost-Effective, high-hardness Mold Steel
- with it's added Nickel-content, the through-hardenability is sufficient for dimensions up to 600 mm thickness (width on request)
- Nitridable and Hard-Chrome plateable
- Flame- & Laser Hardenable
- good Polishability and suitable for Photo-Etching

## Heat Treatment Condition\*:

- Quenched and Tempered to 350 - 395 HBW

## Typical Applications:

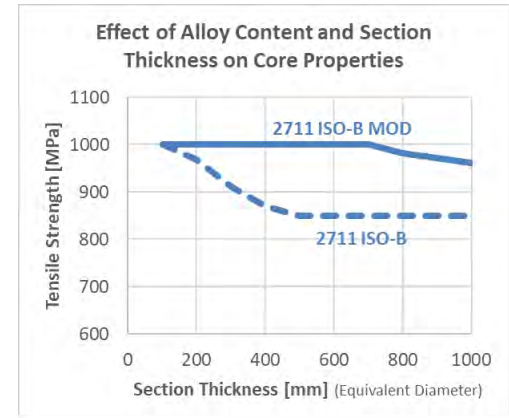
- medium-sized Compression- & Injection Molds with high hardness requirements and a maximum heat-treated section thickness of 600mm

## Typical Chemical Composition (wt-%)

Steel Grade	Limit	C	Si	Mn	S	Cr	Ni	Mo	V
2711 acc. SEL	min.	0.50	0.15	0.50	max.	0.60	1.50	0.25	0.07
	max.	0.60	0.35	0.80	0.025	0.80	1.80	0.35	0.12
2711 ISO-B	typ.	0.52	0.20	0.70	0.001	0.70	1.70	0.30	0.10



**Pre-machined Mudguard Mold, prepared for Quench + Temper in Near-Net Shape**  
(generally recommended for Standard-Grade 2711 ISO-B)



**Due to its superior Through-Hardenability, we recommend 2711 ISO-B MOD when using larger, pre-hardened blocks without subsequent Heat Treatment**

### Characteristics:

- Plastic Mold Steel with good Toughness, good Strength at elevated temperatures and high compressive strength
- Nitridable and Hard-Chrome plateable
- Flame-Hardenable
- good Polishability and suitable for Photo-Etching

### Heat Treatment Condition\*:

- Annealed to max. 250 HBW
- Quenched and Tempered to 280 – 325 HBW or 370 – 415 HBW (we recommend Q+T in Near-Net Shape)

### Typical Applications:

- large Compression- & Injection Molds subjected to high Mechanical- & Thermal Stresses
- at higher working hardness, also suitable for processing SMC & GMT, in combination with surface coating if applicable

*\*) Oberflächenhärte*

Typical Chemical Composition (wt-%)

Steel Grade	Limit	C	Si	Mn	S	Cr	Ni	Mo	V
2711 acc. SEL	min.	0.50	0.15	0.50	max.	0.60	1.50	0.25	0.07
	max.	0.60	0.35	0.80	0.025	0.80	1.80	0.35	0.12
2711 ISO-B	typ.	0.52	0.20	0.70	0.001	0.70	1.70	0.30	0.10
<b>2711 ISO-B MOD</b>	typ.	0.52	0.20	<b>0.95</b>	0.001	<b>1.05</b>	<b>2.00</b>	<b>0.75</b>	0.12

### Characteristics:

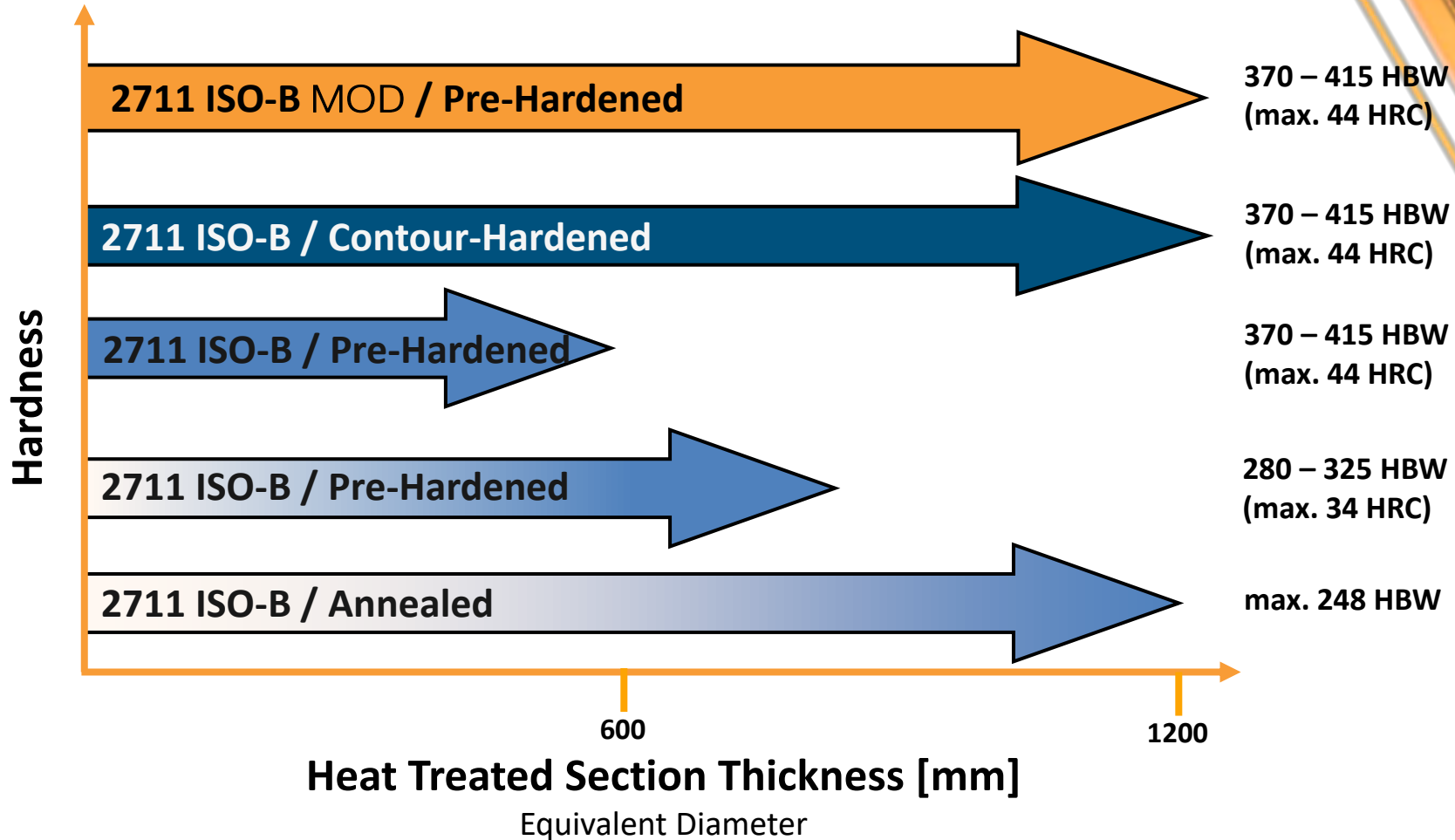
- Modified Plastic Mold Steel with good toughness, excellent Strength at elevated temperatures as well as high compressive strength
- improved Toughness and Wear Resistance compared to Standard-Grade 2711 ISO-B
- drastically improved Through-Hardenability compared to Standard-Grade 2711 ISO-B
- good Polishability and suitable for Photo-Etching
- Nitridable & Hard-Chrome plateable
- Flame- & Laser-Hardenable
- excellent Base-Metal Hardness in as-delivered conditions provides adequate support for PVD-Coatings

### Heat Treatment Condition:

- Quenched + Tempered to a Surface Hardness of 370 – 415 HBW

### Typical Applications:

- large Compression- & Injection Molds subjected to high Mechanical- & Thermal Stresses
- suitable for processing SMC & GMT, in combination with surface coating if applicable



# **Thruhard Supreme®**

## **The Gold Standard for Plastic Molding in Large Dimensions**



Steel Grade	Typical Chemical Composition (wt-%)							
	C	Si	Mn	S	Cr	Ni	Mo	V
Thruhard Supreme®	0.26	0.10	1.45	0.001	1.25	1.05	0.60	0.12



**Car Bumper Mold**  
(1160 x 1010 x 2700 mm, weight 22 metric tons)

## Characteristics:

Thruhard Supreme® is distinguished from grade 2738 ISO-BM by:

- | Higher Hardness and better Through-Hardenability
- | Polishability up to 600 grit for HH & HHH Condition (High Gloss Finish available on request)
- | Grain Reliability even with highly sensitive etch-graining designs
- | improved Weldability
- | higher Thermal Conductivity
- | Flame- & Laser Hardenable, Nitridable, Hard-Chrome plateable and suitable for PVD as supplied

## Heat Treatment Conditions\*:

- | TripleHard (HHH) : Quenched and Tempered to 355-400 HBW
- | HighHard (HH) : Quenched and Tempered to 310-355 HBW
- | Regular (HH) : Quenched and Tempered to 280-325 HBW

## Applications:

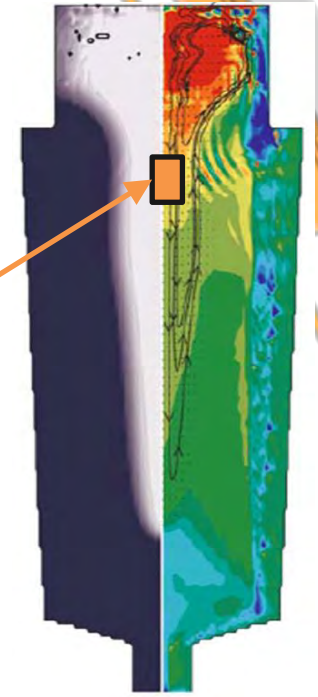
Compression- & Injection Molds to accommodate large-dimension Parts such as Bumpers, Dashboards etc.

\*) Surface Hardness

Chemical Composition (wt-%)

Steel Grade	Limit	C	Si	Mn	S	Cr	Ni	Mo	V
2738 acc. ISO 4957	min.	0.35	0.20	1.30	max.	1.80	0.90	0.15	-
	max.	0.45	0.40	1.60	0.030	2.10	1.20	0.25	-
2738 ISO-BM	typical	0.38	0.30	1.50	0.001	2.00	1.00	0.20	-
Thruhard Supreme®	typical	0.26	0.10	1.45	0.001	1.25	1.05	0.60	0.12

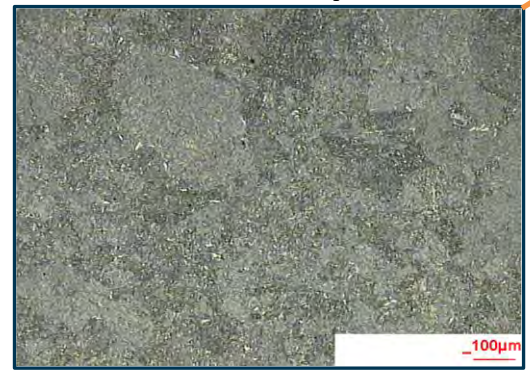
The chemical composition of Thruhard Supreme® has been optimized to reduce the detrimental effects of Macrosegregation in ingots dimensions required for large-sized Plastic Molds



1.2738



Thruhard Supreme®



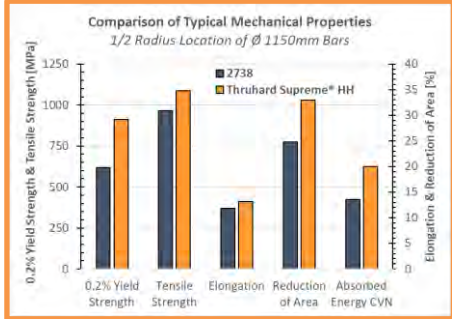
Test Location

Microstructures in the core area after quenching and Tempering of a large plastic mould steel block 1150 x 1150 x 3000mm (31t)

# There are lots of Reasons for choosing Thruhard Supreme®



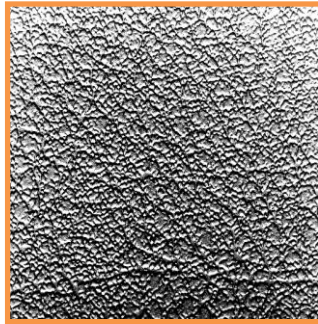
uniform Hardness distribution throughout the entire Cross-Section



drastically improved Mechanical Properties



excellent Polishability (up to 600 grit)



excellent Texturability & high Grain Reliability



reduced susceptibility to Stress-Cracking during Welding or Surface Hardening

## Applications for Thruhard Supreme® HighHard (HH)

**Porsche Panamera Turbo**

Injection Mold for the Bumper



## Applications for Thruhard Supreme® HighHard (HH)



as-forged Dimensions:  
1270 x 1830 x 2020mm



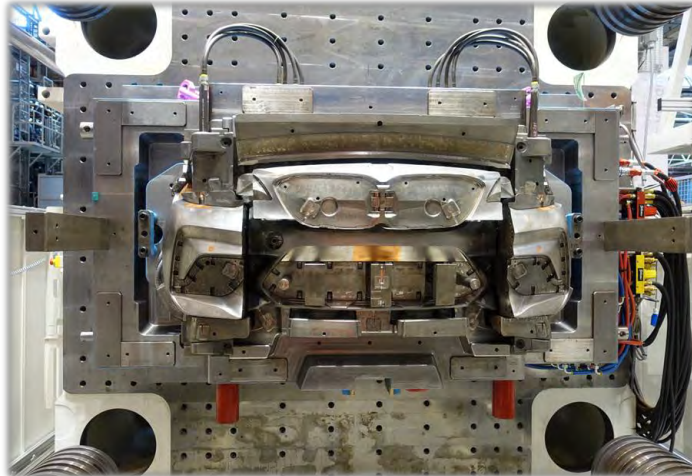
as-forged Dimensions:  
1270 x 1830 x 900mm

Source:  
Fa. Otto



### Core and Cavity for a Dust Bin Mold

## Applications for Thruhard Supreme® HighHard (HH)



### BMW M2 Competition (F87-Facelift)

#### Injection Mold for the front Bumper

as-forged Dimension:  
1200 x 1170 x 2800mm



Source: Magna Exteriors (Meerane) GmbH

# **Thruhard Diamond®**

## **Supreme Performance with a Mirror-Finish**

# Thruhard Diamond® TripleHard (HHH)

Steel Grade	C	Si	Mn	S	Cr	Ni	Mo	V
Thruhard Diamond®	0.28	0.10	1.45	0.001	1.25	1.05	0.70	0.15

## Characteristics:

HighGloss Plastic Mold Steel developed by Buderus Edelstahl

Thruhard Diamond® is pushing the proven Thruhard Supreme® Material Concept one step further:

- | Remelting for extreme Cleanliness and the most homogeneous Microstructure possible
- | polishability up to 3 µm diamond paste (e.g. Mirror-Surface Finish acc. class SPI-A1 or ISO 1302-N1)
- | excellent Texturability even with highly sensitive etch-graining designs
- | Laser Hardenable or Nitridable, Hard Chrome plateable and suitable for PVD as supplied
- | up to 45% higher Thermal Conductivity compared to ESR Lens Mold Steels like H11/H13 or 1.2083
- | vastly superior Weldability compared to H11/H13 or 1.2083

## Heat Treatment Condition:

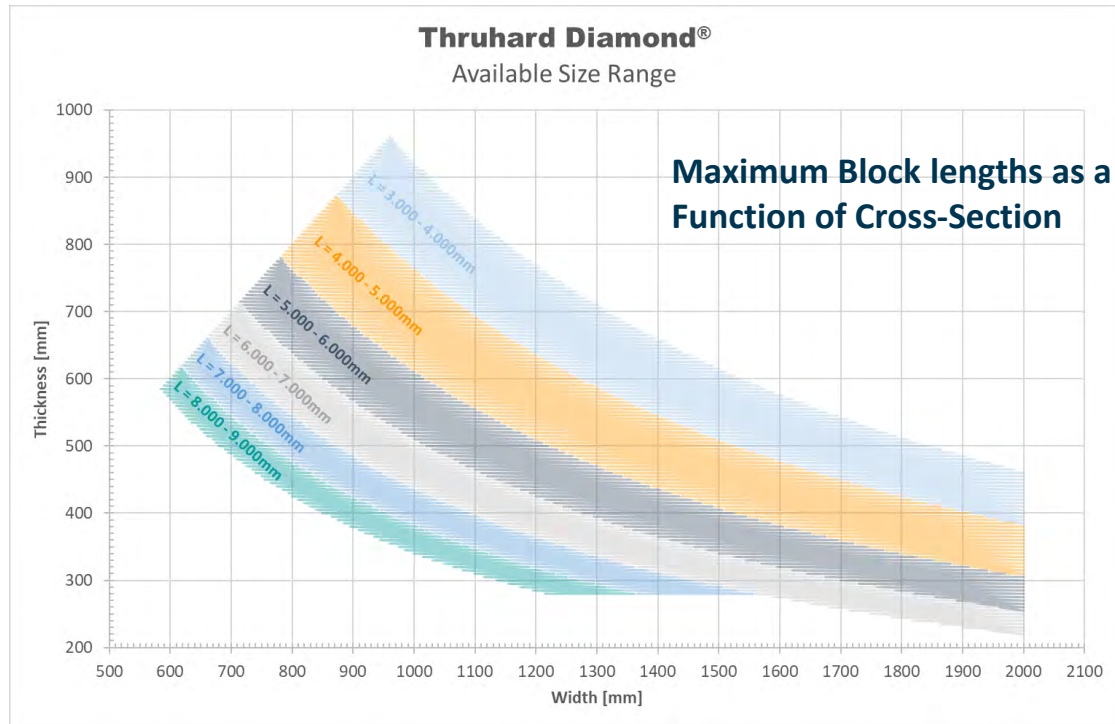
- | Quenched and Tempered to a Surface Hardness of 360 – 405 HBW

## Applications:

Injection Molds and Compression Dies with the most demanding Surface Finish Requirements for producing items such as transparent Headlight Components, Automotive Trim and Radiator Grille Panels. Ideally suited for interior use, both for polished surfaces and for extra fine-grained surfaces.



# Available Sizes | Thruhard Diamond® TripleHard (HHH)



Size Limits for Rectangular / Square Blocks		
<b>Width:</b>	<b>2.000</b>	<b>mm</b>
<b>Thickness:</b>	<b>960</b>	<b>mm</b>
<b>Cross-Section:</b>	<b>924.000</b>	<b>mm<sup>2</sup></b>
<b>Weight:</b>	<b>25.000</b>	<b>KG</b>

# Buderus Plastic Mold Steels for Polishability Requirements

SPI	ISO 1302	Ra [µm]	Grinding / Polishing	Products	Buderus Steel Grade	Hardness
A-1	N1	0.025	3 µm Diamond-Paste	transparent with optical Function (e.g. Headlight – Lens)	<b>Thruhard Diamond® TripleHard</b>	360 – 405 HBW
A-2	N2	0.05	6 µm Diamond-Paste	transparent, without optical Function (e.g. Headlight – Cover)	<b>Thruhard Diamond® TripleHard</b>	360 – 405 HBW
A-3	N3	0.1	15 µm Diamond-Paste	non-transparent, coated (e.g. Radiator – Cowling)	Thruhard Supreme® TripleHard	355 – 400 HBW
B-1	N4	0.2	600-grit Paper	non-transparent, painted (e.g. Bumper)	Thruhard Supreme® HighHard 2767 ISO-B	310 – 355 HBW min. 50 HRC
B-2	N5	0.4	400-grit Paper	non-transparent, coated (e.g. Exhaust Header – Cowling)	2711 ISO-B / 2711 ISO-B MOD Efficient ExtraHard 2343 ISO-B MOD	370 – 415 HBW 350 – 395 HBW min. 44 HRC
B-3	N6	0.8	320-grit Paper	non-transparent, etched / painted (e.g. Dashboard)	Thruhard Supreme® 2738 ISO-BM Efficient® 2311 ISO-B 2316 ISO-B MOD (Corrosion Resistant)	280 – 325 HBW 280 – 325 HBW 280 – 325 HBW 280 – 325 HBW 265 – 310 HBW
C-1	N7	1.6	600-grit Stone	non-visible Components	2738 ISO-BM Efficient® 2311 ISO-B 2316 ISO-B MOD (Corrosion Resistant)	280 – 325 HBW 280 – 325 HBW 280 – 325 HBW 265 – 310 HBW

# Typical Applications for Surface Quality Class SPE – A1

## Headlight (PC, PMMA, etc.)



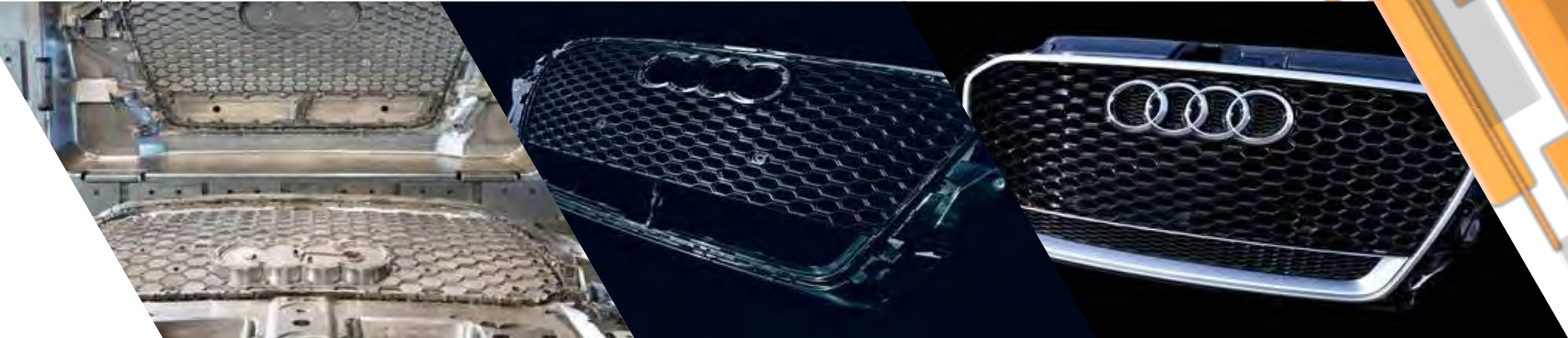
**Bezel – A1**  
(non-transparent, Al-coated PC)

**Lens**  
A1

**Transparent Components with  
light-optical Function**  
A1

# Typical Applications for Surface Quality Class SPE – A2

Source: Company Finke-Formenbau GmbH



Mold made from Thruhard Supreme® HighHard

painted PC Radiator Cowling

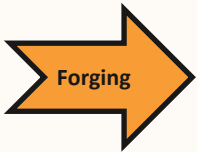
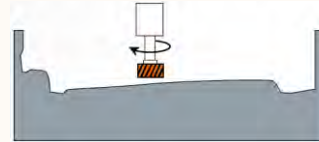
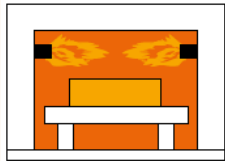
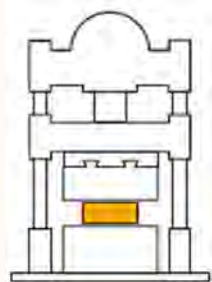
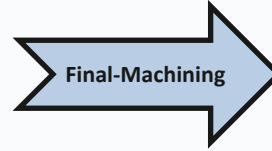
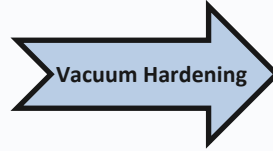
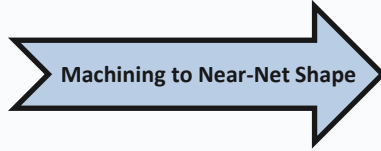
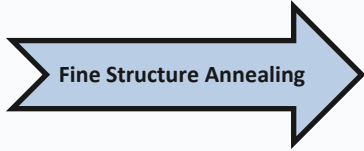
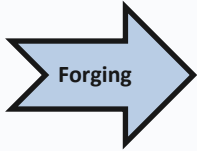
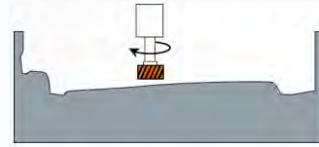
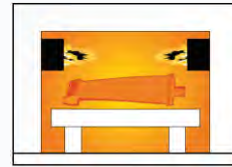
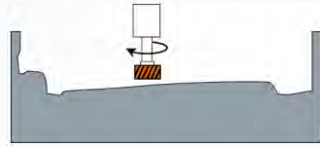
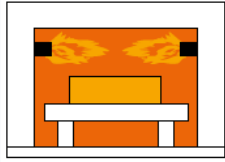
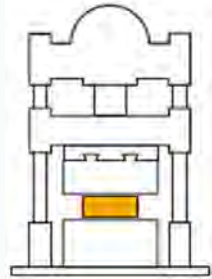
incl. Al-coated Design Elements

**Taillight**  
(typically made from PMMA)



# Production Process of Thruhard Diamond® Molds

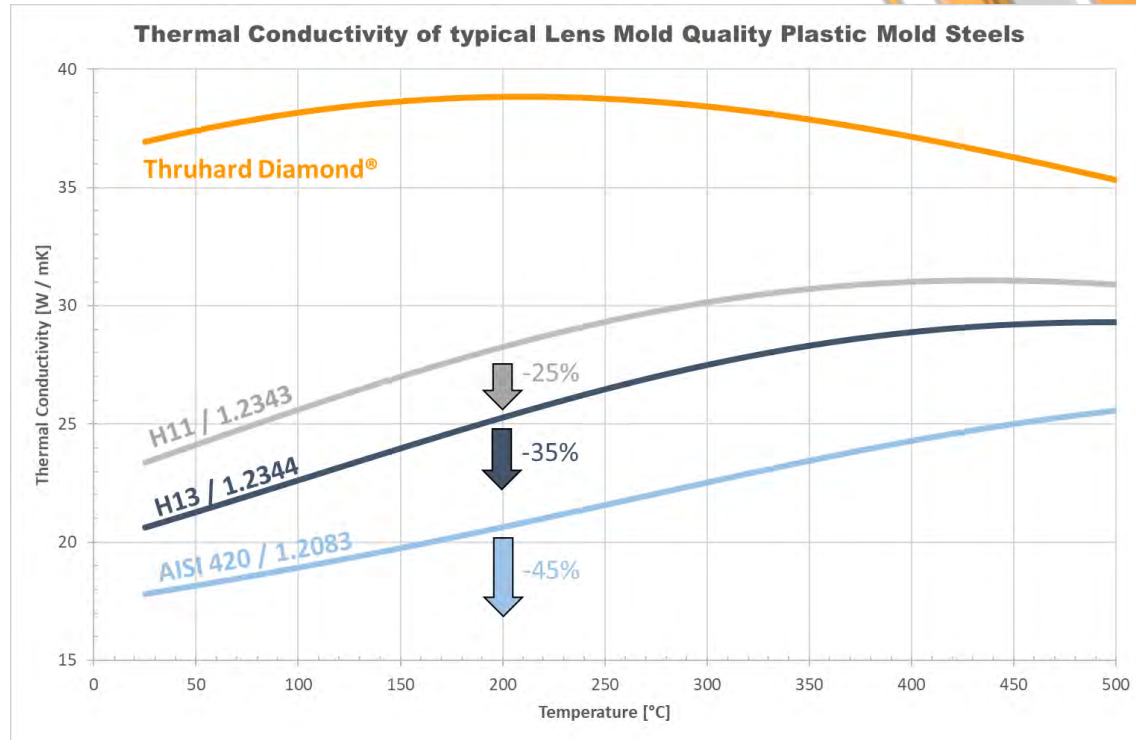
## Typical Lens Mold Production Process for 1.2343 (H11) or 1.2344 (H13)



## Thermal Conductivity of Thruhard Diamond®

Achievable cycle times and therefore the cost-effectiveness of the plastic injection molding process itself are highly dependent on the intensity of heat transfer from the molten plastic to the cooling media through the mold's base metal.

For optimum productivity and efficiency, Thruhard Diamond® offers up to 45% higher Thermal Conductivity compared to other Lens Mold steel grades.



# Material Concept | Thruhard Diamond®

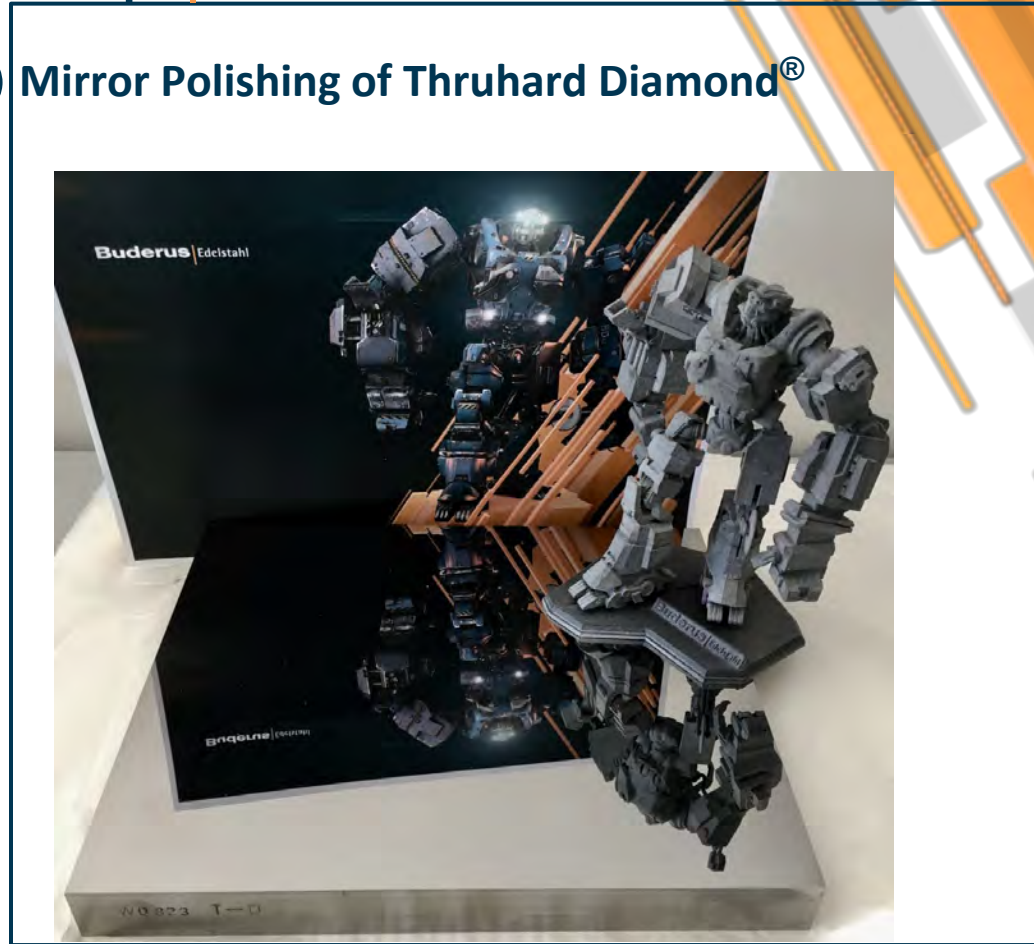
## TripleHard (HHH) Mirror Polishing of Thruhard Diamond®

Statement of our Polishing Partner  
(Translated from German Language):

*“In all process steps, the material showed **very good** polishability.*

*We’d also rate the final result of the High-Gloss Polish (considering the fact that it is a Pre-Hardened Plastic Mold Steels) as **very good**.*

*Compared to conventional airmelted Steels, this remelted Grade offers a **very good High-Gloss Polishability**, that is very well-suited for the production of headlights“*

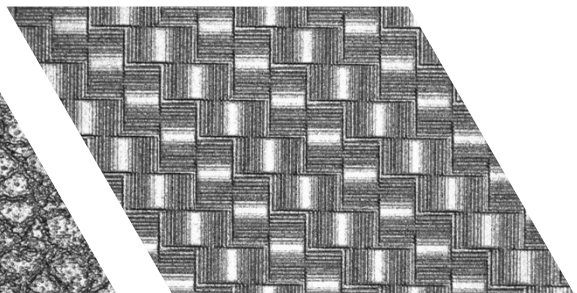
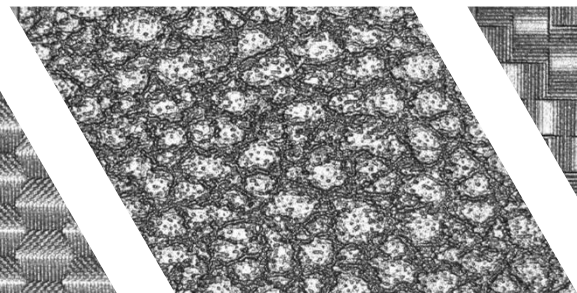
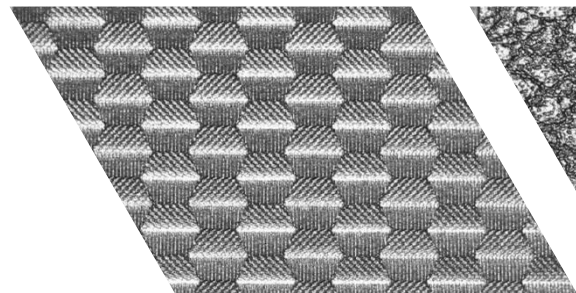


# Material Concept | Thruhard Diamond® TripleHard (HHH)

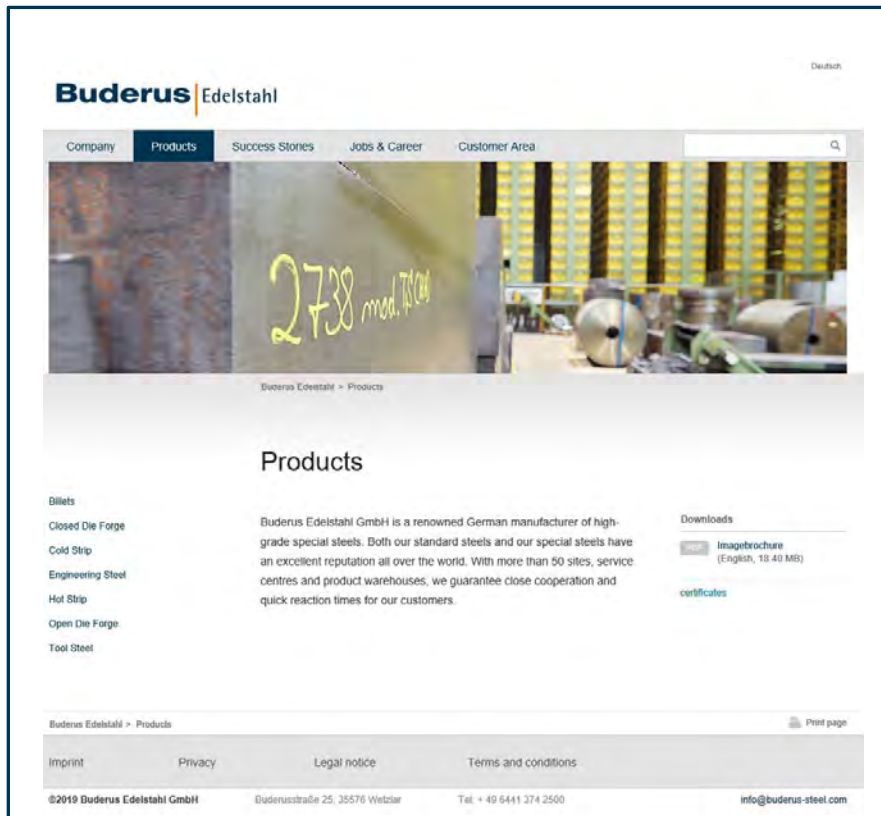
## Laser-Texturing of Thruhard Diamond®



- | Structure KL5447: “Diamond-like”
- | Structure KL5110: “Leather-like”
- | Structure KL5756: “Carbon-like”







**Buderus Edelstahl**

Company | **Products** | Success Stories | Jobs & Career | Customer Area

2738 mod. 15000

Buderus Edelstahl > Products

## Products

Buderus Edelstahl GmbH is a renowned German manufacturer of high-grade special steels. Both our standard steels and our special steels have an excellent reputation all over the world. With more than 50 sites, service centres and product warehouses, we guarantee close cooperation and quick reaction times for our customers.

**Downloads**

- imagebrochure (English, 18.40 MB)
- certificates

©2019 Buderus Edelstahl GmbH | Buderusstraße 25, 35576 Wetzlar | Tel. +49 6441 374 2500 | info@buderus-steel.com



**Lloyd's Register**

### Certificate of Approval

This is to certify that the Management System of **Buderus Edelstahl GmbH**, Buderusstraße 25, 35576 Wetzlar, Germany, has been approved by LRQA to the following standards: ISO 9001:2015

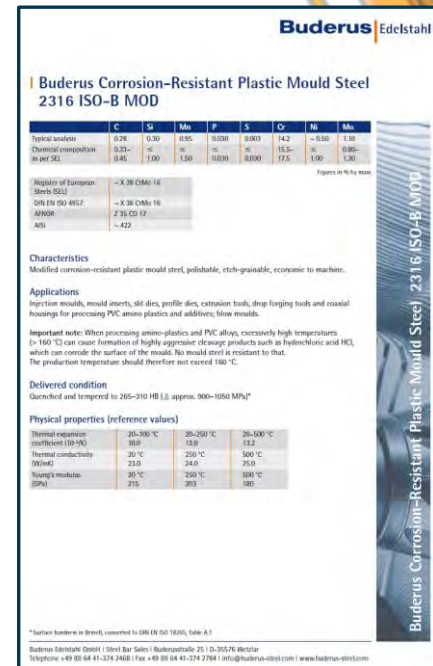
P. G. Cornelissen - Area Manager North Europe  
Issued by: Lloyd's Register Deutschland GmbH  
for and on behalf of: Lloyd's Register Quality Assurance Limited

Current issue date: 15 August 2018 (Original approval)  
Expiry date: 4 July 2021 ISO 9001 - 7 December 1992  
Certificate identity number: 101216002

Approval number(s): ISO 9001 - 0020095-001

The scope of this approval is applicable to:  
Production of alloyed and unalloyed steels and manufacture of products by appropriate refining processes

**UKAS** 9001



**Buderus Edelstahl**

### Buderus Corrosion-Resistant Plastic Mould Steel 2316 ISO-B MOD

	C	Si	Mn	P	S	Cr	Ni	Mo
Typical analysis	2.23	0.50	0.85	0.008	0.007	14.2	0.50	1.10
Chemical composition as per EN	0.23 - 0.45	< 0.50	< 1.00	< 0.010	< 0.010	13.5 - 17.5	< 1.00	0.80 - 1.30

Figures in % by mass

Regime of European Steels (EN):  
EN 10 50 4057  
AISI: 2316  
ASTM: A287

**Characteristics**  
Modified corrosion-resistant plastic mould steel, polishable, etc-granular, economic to machine.

**Applications**  
Injection moulds, mould inserts, die dies, profile dies, extrusion tools, drop forging tools and coaxial housings for processing PVC amine plastics and additives; flow moulds.

**Important note:** When processing amino-plastics and PVC alloys, excessively high temperatures (> 160 °C) can cause formation of highly aggressive cleavage products such as hydrochloric acid HCl, which can corrode the surface of the mould. No mould steel is resistant to that. The production temperature should therefore not exceed 160 °C.

**Delivered condition**  
Gasheated and tempered to 265-310 MB (i.e. approx. 900-1050 MPa)\*

**Physical properties (reference values)**

	26-300 °C	26-260 °C	26-500 °C
Thermal expansion coefficient (10 <sup>-6</sup> /K)	10.0	13.0	13.2
Thermal conductivity (W/mK)	20 °C	230 °C	500 °C
Young's modulus (GPa)	21.0	24.0	25.0
	25 °C	200 °C	500 °C
	270	300	380

\*Surface hardness in Brinell, converted to EN 10 002, Table A.1

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Buderus Corrosion-Resistant Plastic Mould Steel | 2316 ISO-B MOD

For further Information as well as current Certificates and Material Datasheets, please visit our Website at:

[www.Buderus-Steel.com](http://www.Buderus-Steel.com) and [www.degisimcelik.com.tr](http://www.degisimcelik.com.tr)



**Buderus** | Edelstahl

**DEĞİŞİM ÇELİK**  
ISIL İŞLEM LTD. ŞTİ.

# Thank You!

Hadımköy Mah Mustafa İnan

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