

SCHWERT TOOL STEELS


SCHWERT
TOOL STEELS

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About us

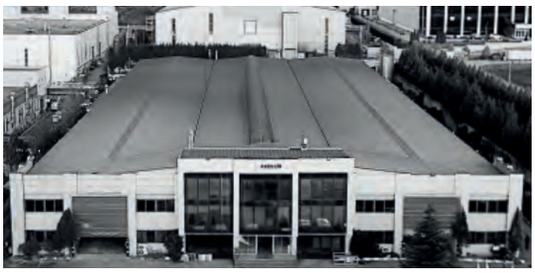
As Akçelik Group, we operate in the field of tool steels under the **SCHWERT TOOL STEELS** brand. We regularly meet any tool steel requirements of our customers with our 44 years of experience and our wide distribution network throughout Turkey.

We are able to perform cutting operations with very precise measurement tolerances with the state-of-the-art circular and laser-controlled band saws we have in our distribution centres.

We bring our **SCHWERT** brand, which we created thanks to our R&D and advanced laboratory infrastructure, together with industrialists by offering the highest level of product and service quality in the entire supply chain, from the smelting of steel to its delivery to the final consumer.

History



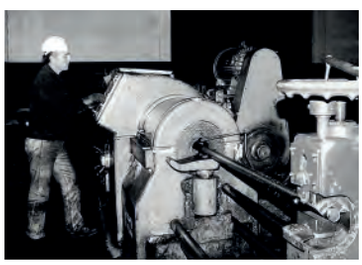


1978

It was founded by the entrepreneur Salih Kılıç in Izmir.

1990

Its first bright steel factory was commissioned in Izmir AOSB.



2002

Its 2nd Bright Steel Factory was commissioned in Kocaeli TOSB Organized Industrial Zone.

2006

Konya Steel Service Center went into operation.

2012

Ankara Steel Service Center went into operation.

2013

Steel Service Center went into operation in Kocaeli TOSB Organized Industrial Zone.



2014

Steel Service Center went into operation on the European Side of Istanbul.

SCHWERT
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2016

Sales Office was opened in Houston, USA.

2019

Online Platform for E-Commerce came into service.

AKCELİK Online

2020

Tool Steel sales started in Turkiye under the brand of Schwert Tool Steels.

2021

A new partnership was made by acquiring 58% shares of Tristar Steel company in Romania.

TRISTARSTEEL
SHAFTS CRAFTED FOR MOTION

2023

Akçelik established the world's first fully automated Chrome Plating Facility in Kocaeli.



2023

Our new-generation Logistics and Steel Service Center investment in Gebze started its activity.



In its Kocaeli Bright Steel Factory, the annual production capacity was increased to 90,000 tons.





SCHWERT TOOL STEELS

It is the Akçelik Group's brand in the field of tool steels.

The Emergence of Schwert Tool Steel (STS)

As the result of our long-term and detailed cooperation with our customers, we determined their tool steel needs and expectations from quality products.

Based on the technical expectations of the STS specifications prepared by our R&D, we identified and inspected competent steel producers globally and selected them as our suppliers.

After establishing trial production processes and product approvals with our selected suppliers, we started the production of our STS steel.

We regularly bring the STS steels we order to be produced to our headquarters in Kocaeli through our extensive international logistics facilities.

We start the distribution process by completing the preliminary quality control processes of our STS steel with our advanced laboratory infrastructure.

We serve our customers through our own logistics network by cutting to the desired special size with our circular and band saws located in our distribution centres throughout Turkiye.

What is Tool Steel?

Tool steel is a group of steel used in the construction of tools and moulds that shape the hot or cold work piece by using methods such as cutting, forging, drilling, bending, twisting, forming, extrusion and injection.



Basic Characteristics Expected from Tool Steels;

- High wear resistance,
- High hardness,
- High toughness,
- High temperature resistance,
- Good machinability,
- High hardenability,
- Homogeneous and fine microstructure.



Effect of Alloying Elements on Tool Steels

Carbon (C): As the carbon content increases, the hardening ability and consequently the wear resistance of steel increase. It ensures these properties by forming carbides with other alloy elements. As the carbon content decreases, the toughness and weldability of the steel increases.

Manganese (Mn): It increases the strength of steel. It is the most important element that increases the hardening depth towards the core (core) in steels.

Sulphur (S): It makes steel brittle. The most important feature of sulphur is that it increases the machinability.

Chromium (Cr): It increases the wear resistance, heat resistance and corrosion resistance with high content.

Molybdenum (Mo): It increases the wear resistance, tensile strength, heat resistance and weldability of steel.

Vanadium (V): It increases the tensile and yield strength and wear resistance of steel. Low ''V'' content reduces the grain size.

Wolfram (W): It increases the yield and tensile strength, wear resistance and resistance to high temperatures of steel.

Nickel (Ni): It increases the toughness of steels and thru hardenability. High Chromium and high Nickel content form as stainless Steels.

Silicon (Si): It is one of the basic elements used as a deoxidizer in steel production. Low alloyed steels and especially spring steels contain up to 2% silicon.

Effects of Alloying Elements on Steel Properties

Alloying Element	Hardness	Tensile strength	Yield Strength	Elongation	Reduction of Area	Impact Resistance	Elasticity	Heat Resistance	Cooling Rate	Carbide Formation	Wear Resistance	Hot Formability	Machinability	Scaling	Corrosion Resistance
Si Silicon	↑	↑	↑↑	↓	~	↓	↑↑↑	↑	↓	↓	↓↓↓	↓	↓	↓	▬
Mn* Manganese	↑	↑	↑	~	~	~	↑	~	↓	~	↓↓	↑	↓	~	▬
Mn** Manganese	↓↓↓	↑	↓	↑↑↑	~	▬	▬	▬	↓↓	▬	▬	↓↓↓	↓↓↓	↓↓	▬
Cr Chromium	↑↑	↑↑	↑↑	↓	↓	↓	↑	↑	↓↓↓	↓↓	▬	↓	↓	↓	▬
Ni* Nickel	↓↓	↑	↓	~	~	~	▬	↑	↓↓	▬	↓↓	↓	↓	↓	▬
Ni** Nickel	↓↓	↑		↑↑↑	↑↑	↑↑↑	▬	↑↑↑	↑↑	▬	▬	↓↓↓	↓↓↓	↓↓	↑↑
Al Aluminium	▬	▬	▬	▬	↓	↓	▬	▬	▬	▬	▬	↓↓	▬	↓↓	▬
W Wolfram	↑	↑	↑	↓	↓	~	▬	↑↑↑	↓↓	↑↑	↑↑↑	↓↓	↓↓	↓↓	▬
V Vanadium	↑	↑	↑	~	~	↑	↑	↑↑	↓↓	↑↑↑↑	↑↑	↑	▬	↓	↑
Co Cobalt	↑	↑	↑	↓	↓	↓	▬	↑↑	↑↑	▬	↑↑↑	↓	~	↓	▬
Mo Molybdenum	↑	↑	↑	↓	↓	↓	▬	↑↑	↓↓	↑↑↑	↑↑	↓	↓	↑↑	▬
S Sulphur	▬	▬	▬	↓	↓	↓	▬	▬	▬	▬	▬	↓↓↓	↑↑↑	▬	↓
P Phosphorus	↑	↑	↑	↓	↓	↓↓↓	▬	▬	▬	▬	▬	↓↓↓	↓↓↓	↓↓	↑↑

* Martensitic Steels

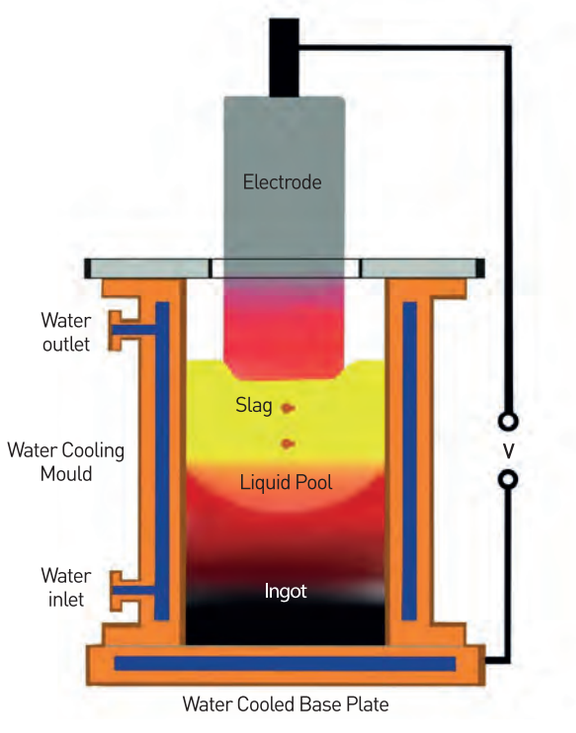
** for Austenitic steels

↑ Increases ↓ Decreases ~ Unchanged ▬ Insignificant / Unknown

Tool Steel Production Processes

ESR Production (Electro Slag Re-melting)

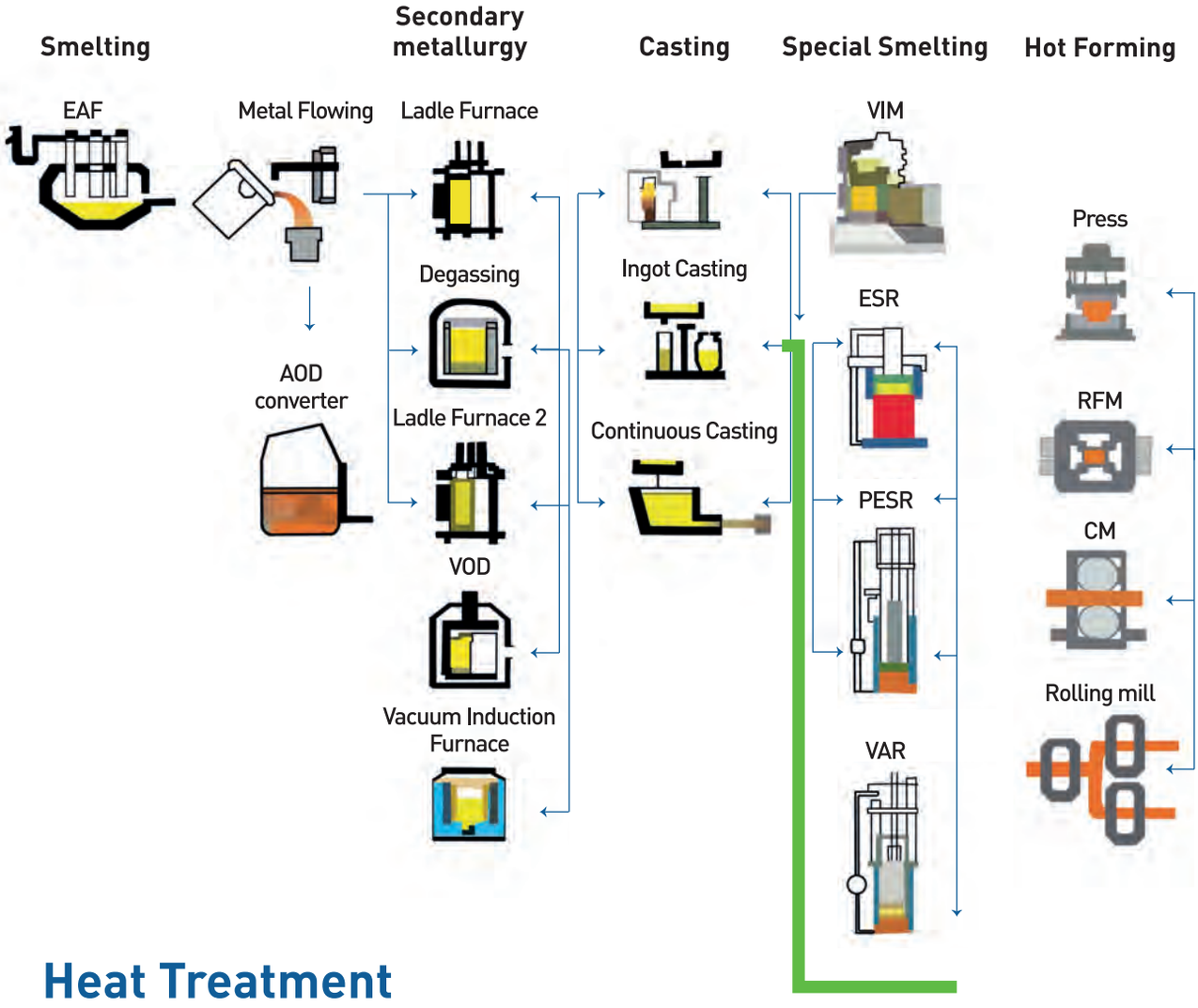
The material to be refined in the ESR Process must initially be an ingot that is turned into a flat or conical electrode with a very small angle. The electrode is suspended on an elevator mechanism, which can move vertically. A reactive slag bath is located just below this device in a water-cooled crucible.
The tip of the electrode is kept immersed in the molten slag pool by applying a high amperage low voltage current.



The temperature of the slag bath is kept around 200°C higher than the melting temperature of the electrode. Thus, a thin molten metal film is formed at the electrode tip. Metal droplets formed from the melt pass through the slag, accumulate at the bottom of the mould, and begin to solidify.

The refining process takes place thanks to the chemical reactions that occur during the passage of metal droplets through the slag. The solidification rate is controlled through the melting rate and cooling rate. There is no rolling direction in steels produced with the ESR method. Steel shows the same mechanical properties in all directions (Vertical and Horizontal). Steels produced with the ESR method are defined as "PRIME". *Schwert 2379 Prime, Schwert 2344 Prime, Schwert 2367 Prime.* After the ESR process is completed, the forming process begins with the rolling or forging method.

Conventional Production



Heat Treatment

It is the combination of heating and cooling processes, depending on time and temperature, applied to a metal or alloy in order to obtain the desired properties.

Heat treatment is the most important parameter on tool steels. Heat treatment applied incorrectly to tool steels has a very negative effect on the steel performance, causing damage in a short time. Getting good performance from the mould depends on choosing the right steel and applying the right heat treatment process.

Hot Work Tool Steels

These are steels used in applications where the work piece is at temperatures of 200 °C and above. It is mostly used for forming ferrous, non-ferrous metals and their alloys without cutting.

Chemical Compositions of Hot Work Tool Steels (%)

Schwert Code	C	Si	Mn	S	Cr	Mo	V	Ni	Hardness
Schwert 2343 EFS / Prime	0,37	1,00	0,40	0,003	5,10	1,30	0,40	-	200 HB
Schwert 2344 EFS / Prime	0,40	1,00	0,40	0,003	5,10	1,40	1,00	-	200 HB
Schwert 2367 EFS / Prime	0,38	0,30	0,40	0,001	5,00	3,00	0,60	-	200 HB
Schwert 2714 QT	0,55	0,25	0,70	0,005	1,10	0,50	0,10	1,70	420 HB

**Prime: ESR (Electro Slag Remelting) Production*
**Produced suitable to EFS (Extra-Fine Structure) standards.*

Hot Work Tool Steels Comparison Table

Schwert Code	Hardness	Toughness	Hot Wear Resistance	Thermal Conductivity	Thermal Shock Resistance
Schwert 2343 EFS / Prime	+++	++++	+++	++++	++
Schwert 2344 EFS / Prime	+++	+++	+++	++++	+++
Schwert 2367 EFS / Prime	++++	+++	++++	+++	++++
Schwert 2714 QT	++	++++	++	++	+

Hot Work Tool Steels

Steel Selection in Metal Injection Moulds

Applications

Aluminium and Alloys (Zinc, Tin, Lead)			Copper and Alloys		
Tool	Steel	Recommended Hardness	Tool	Material	Recommended Hardness
Holder	C45 Schwert 2312	180 HB 310 HB	Holder	Schwert 2312	310 HB
Insert/Core	Schwert 2344 EFS / Prime Schwert 2367 EFS / Prime	44-48 HRC 44-48 HRC	Insert/Core	Schwert 2367 EFS / Prime	40-44 HRC
Slideway	Schwert 2714 QT Schwert 2842	40-44 HRC 54-56 HRC	Slideway	Schwert 2714 Schwert 2842	40-44 HRC 54-56 HRC
Mandrel	Schwert 2344 EFS / Prime Schwert 2367 EFS / Prime	44-48 HRC 44-48 HRC	Mandrel	Schwert 2367 EFS / Prime	44-48 HRC
Sleeve	Schwert 2344 EFS / Prime Schwert 2367 EFS / Prime	44-48 HRC 44-48 HRC	Sleeve	Schwert 2367 EFS / Prime	44-48 HRC
Core Pin	Schwert 2344 EFS / Prime	44-48 HRC	Pin	Schwert 2344 EFS / Prime	44-48 HRC



Cylinder Head Mould



Engine Block Mould



Steel Selection in Forging Moulds

Applications

Forging Type	Tool	Steel Grade	Recommended Hardness
Hammer	Drop Hammer Mould	Schwert 2714 QT Schwert 2343 Prime	38-44 HRC 40-45 HRC
	Mold Core	Schwert 2344 EFS / Prime Schwert 2367 EFS / Prime	42-50 HRC 42-50 HRC
Press	Drop Hammer Mould	Schwert 2344 EFS / Prime Schwert 2367 EFS / Prime	42-50 HRC 42-50 HRC
	Mold Core	Schwert 2344 EFS / Prime Schwert 2367 EFS / Prime	42-50 HRC 42-50 HRC
Horizontal Forging		Schwert 2367 EFS / Prime	46-50 HRC
Chipping Mould (Hot)		Schwert 2344 EFS / Prime	44-52 HRC
Chipping Mould (Cold)		Schwert 2379 Prime	54-58 HRC



Cardan Shaft Mould



Weld Neck Flange

Schwert 2343
EFS / Prime

Chemical Composition (%)

C	Si	Cr	Mo	V
0,38	1,00	5,30	1,30	0,40

Delivery Hardness: Max. 230 HB

Applications: It is used as a mould in Forging Moulds, pressure casting moulds of light metals and metal extrusion presses.

Physical Characteristics:

Thermal Conductivity W / (M*K)	20°C	350°C	700°C
Annealed	29,8	30,0	33,4
Hardened + Tempered	26,8	27,3	30,3

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
750-800 °C	Furnace	Max. 230
Hardening	**Cooling Conditions**	**Hardness After Hardening**
1000-1030 °C	Air, Oil or Salt Bath 500-550 °C	54 HRC

Tempering °C	100	200	300	400	500	550	600	650
HRC	52	52	52	52	54	52	48	38

Schwert 2344
EFS / Prime

Chemical Composition (%)

C	Si	Mn	Cr	Mo	V
0,40	1,00	0,35	5,30	1,40	1,00

Delivery Hardness: Max. 230 HB

Applications: It is used as a mould in forging dies, pressure casting moulds of light metals and metal extrusion presses. It is used in injection moulds of corrosive type plastics (such as Nylon and Glass Fibre). For superior properties, "Prime" quality produced by ESR method is recommended.

Physical Characteristics:

Thermal Conductivity W / (M*K)	20°C	350°C	700°C
Annealed	27,2	30,4	33,3
Hardened + Tempered	25,5	27,5	30,3

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
750-800 °C	Furnace	Max. 230
Hardening	**Cooling Conditions**	**Hardness After Hardening**
1010-1050 °C	Air, Oil or Salt Bath 500-550 °C	54 HRC

Tempering °C	100	200	300	400	500	550	600	650
HRC	53	52	52	54	56	54	50	42

Schwert 2367
EFS / Prime

Chemical Composition (%)

C	Si	Cr	Mo	V
0,38	0,30	5,00	3,00	0,60

Delivery Hardness: Max. 230 HB

Applications: Recommended for metal injection moulds, forging moulds and extrusion of heavy metals (Copper, Brass).

Physical Characteristics:

Thermal Conductivity W / (M*K)	20°C	350°C	700°C
Annealed	30,7	33,6	35,1
Hardened + Tempered	29,8	33,9	35,4

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
730-780 °C	Furnace	Max. 230
Hardening	**Cooling Conditions**	**Hardness After Hardening**
1020-1050 °C	Air, Oil or Salt Bath 500-550 °C	57 HRC

Tempering °C	100	200	300	400	500	550	600	650
HRC	57	55	53	52	55	55	52	45

Schwert 2714 QT

Chemical Composition (%)

C	Si	Cr	Mo	V	Ni
0,56	0,25	1,10	0,50	0,10	1,70

Delivery Hardness: 400 - 440 HB

Applications: It is the steel grade used in all forging moulds. It is used in extrusion presses for press punches, bolsters, liners. It is also used in plastic moulds.

Physical Characteristics:

Thermal Conductivity W / (M*K)	20°C	350°C	700°C
Hardened + Tempered	36,00	38,20	35,10

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
650-700 °C	Furnace	Max. 250
Hardening	**Cooling Conditions**	**Hardness After Hardening**
830-870 °C	Oil	58 HRC
860-900 °C	Air	56 HRC

Tempering °C	100	200	300	400	450	500	550	600
Oil / HRC	57	54	52	49	47	46	43	38
Air / HRC	55	52	50	47	45	43	40	36



Cold Work Tool Steels

Steels used in temperature where the workpiece is below 200 °C. It is mostly used for forming ferrous, non-ferrous metals and their alloys by bending, cutting, driling etc.

Cold Work Tool Steels Chemical Composition (%)

Schwert Code	C	Si	Mn	Cr	Mo	V	W	Ni	Hardness
Schwert 2379 Prime	1,55	0,30	0,40	12,00	0,80	0,80	-	-	250 HB
Schwert 2436	2,10	0,35	0,35	12,00	-	-	0,70	-	250 HB
Schwert 2767 Prime	0,45	0,40	0,40	1,40	0,30	-	-	4,00	260 HB
Schwert S-8Cr	0,95	1,00	0,40	8,00	2,00	0,30	-	-	250 HB

**Prime: ESR (Electro Slag Remelting) Production*
**Produced suitable to EFS (Extra-Fine Structure) standards.*

Cold Work Tool Steels Comparison Table

Schwert Code	Hardness	Toughness	Abrassive Wear Resistance	Adhesive Wear Resistance	Machinability
Schwert 2379 Prime	+++	++	+++	++	++
Schwert 2436	++++	+	++++	++	++
Schwert 2767 Prime	++	++++	++	+	+++
Schwert S-8Cr	++++	++	++++	++	++
Schwert 3343	+++++	+++	+++++	+++	+

Cutting and Forming Applications

Work Material	Work Material Thickness	Recommended Steel	Hardness
Steel sheets and strips, aluminium and copper alloys (Hardness<180 HB)	Up to 3 mm	Schwert 2379 Schwert S-8Cr	60-62 HRC
	3-6 mm	Schwert 2379 Schwert S-8Cr	56-60 HRC
	6-15 mm	Schwert 2767 Prime	52-56 HRC
	Above 15 mm	Schwert 2767 Prime Schwert 2344 EFS / Prime	48-52 HRC 48-52 HRC
Silicon sheets and strips		Schwert 2379 Schwert S-8Cr	61-63 HRC
Stainless sheets and strips		Schwert 2379 Schwert S-8Cr	56-62 HRC
Plastic and rubber log/runner crushing and trimming knives		Schwert 2379 Schwert S-8Cr	54-60 HRC
Leather/Textile Industry		Schwert 2379 Schwert S-8Cr	60-62 HRC
Steel bars, billets, Plates		Schwert 2767 Prime Schwert 2344 EFS / Prime	48-52 HRC 48-52 HRC

Steel Selection in Pipe Production

Name of Mould	Type of Steel	Hardness
Form Rolls	Schwert 2379	60-62 HRC
Straightening Rolls	Schwert 2379	60-62 HRC
Calibration Rolls	Schwert 2379	60-62 HRC
Welding Rolls	Schwert 2344 EFS / Prime	48-52 HRC
Slitting Knives	Schwert 2379	60-62 HRC



Slitting Knives



Pipe Rolls

Schwert 2379 / Prime

Chemical Composition (%)

C	Si	Mn	Cr	Mo	V
1,55	0,30	0,40	12,00	0,80	0,80

Delivery Hardness: Max 250 HB

Applications: It is used in cold forming moulds, metal press moulds, precision cutting moulds with sheet thickness up to 6 mm, cold punching moulds, pipe rolls, cutting and punching moulds, marking moulds, etc.

Physical Characteristics:

Thermal Conductivity W / (M*K)	20°C	350°C	700°C
Hardened + Tempered	16,5	20,7	24,1
Thermal Expansion Coefficient 10^{-6m}(m.K)	20-100°C	20-200°C	20-300°C
	10,6	11,5	12,1

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
830-860 °C	Furnace	Max. 250
Hardening	**Cooling Conditions**	**Hardness After Hardening**
1000-1050 °C	Air, Oil or Salt Bath	63 HRC
Stress Relief Annealing	**Cooling**	
650-700 °C	Furnace	

Tempering °C	100	200	300	400	500	525	550	600
Oil/ HRC	63	61	58	58	58	60	56	50

Special Heat Treatment

Hardening	Cooling	Hardness
1050-1080°C	Air, Oil or Salt Bath (500-550 °C)	61 HRC

Tempering °C	100	200	300	400	500	525	550	600
Oil/ HRC	61	60	58	59	62	62	57	50

Schwert S-8Cr

Chemical Composition (%)

C	Mn	Si	Cr	Mo	V	Other
0,95	0,40	1,00	8,00	2,00	0,30	+

Delivery Hardness: Max 250 HB

Applications: Cutting knives, cutting dies and tools, punches, rolls, adhesive dies, cold pressing and cold forging dies. Due to its high hardness and high toughness, it is preferred for erosion blocks compared to 2379.

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
800-850 °C	Furnace	Max. 250
Hardening	**Cooling Conditions**	**Hardness After Hardening**
1020-1040 °C	Air, Oil or Salt Bath 500-550 °C	64 HRC

Tempering °C	520	540	550
Oil / HRC	62-64	60-62	58-60

Schwert 2436

Chemical Composition (%)

C	Si	Mn	Cr	Mo	W
2,10	0,35	0,35	12,00	-	0,70

Delivery Hardness: Max. 250 HB

Applications: It is used in sheet metal cutting moulds up to 2 mm thick, paper and plastic cutting blades, deep drawing moulds, cutting blades and punches.
It is the ideal quality especially for cutting transformer and dynamo silicon sheets.

Physical Characteristics:

Thermal Conductivity W / (M*K)	20°C	350°C	700°C		
Hardened + Tempered	16,6	20,4	24,1		
Thermal Expansion Coefficient 10^{-6m} (m.K)	20-100°C	20-200°C	20-300°C	20-400°C	20-500°C
	10,9	11,8	12,3	12,6	13,00

Heat Treatment

Soft Annealing	**Cooling**	**Delivery Hardness**
800-840 °C	Furnace	Max. 250
Hardening	**Cooling Conditions**	**Hardness After Hardening**
950-980 °C	Air, Oil or Salt Bath 500-550 °C	64 HRC
Stress Relief Annealing	**Cooling**	
650-700 °C	Furnace	

Tempering °C	100	200	300	400	500	600
HRC	63	62	60	58	56	48

Schwert 2767 Prime

Chemical Composition (%)

C	Si	Mn	Cr	Mo	Ni
0,45	0,40	0,40	1,40	0,30	4,00

Delivery Hardnessi: Max. 260 HB

Applications: It is used in cutting and forming moulds, cutlery and knife moulds, coin etc. moulds of sheets with a thickness of more than 10 mm. In plastic applications, it is used in injection moulds of hard abrasive type plastics.

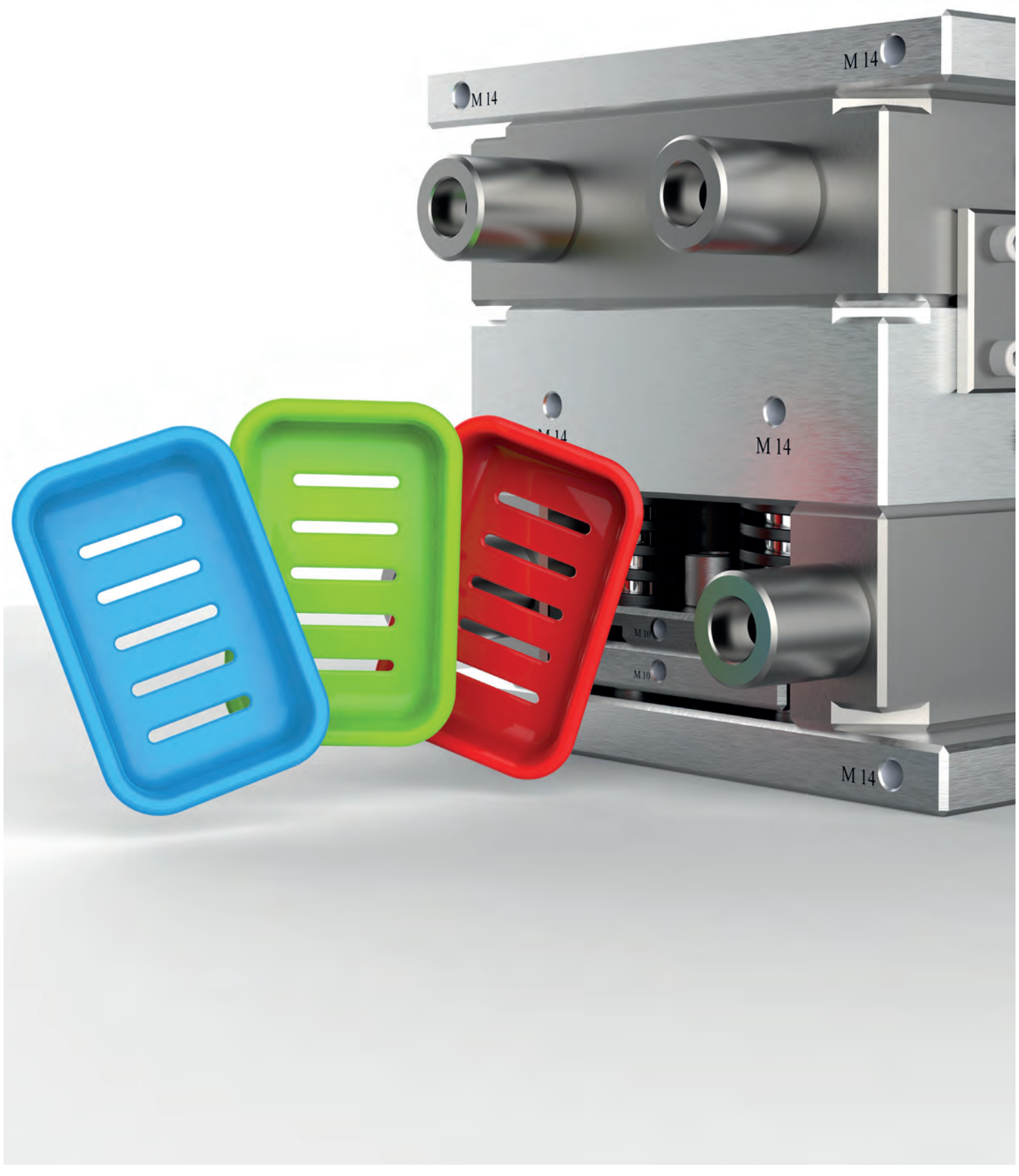
Physical Characteristics:

Thermal Conductivity W / (M*K)	20°C				
Hardened + Tempered	28				
Thermal Expansion Coefficient 10^{-6m} (m.K)	20-100°C	20-200°C	20-300°C	20-400°C	20-500°C
	11	12,5	13	13,6	14

Heat Treatment

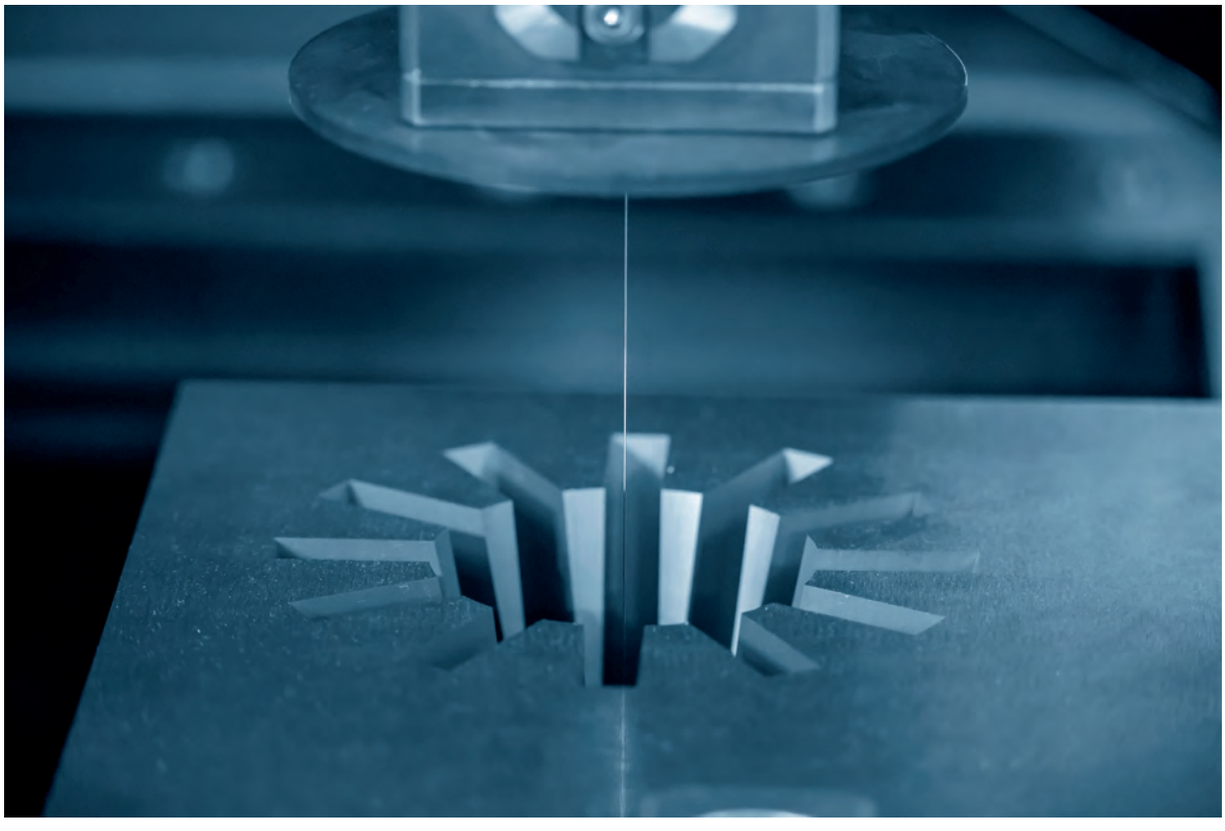
Soft Annealing	**Cooling**	**Delivery Hardness**
610-650 °C	Furnace	Max. 260
Hardening	**Cooling Conditions**	**Hardness After Hardenin**
840-870 °C	Air, Oil or Salt Bath 300-350 °C	58 HRC
Stress Relief Annealing	**Cooling**	
650 °C	Furnace	

Tempering °C	100	200	300	400	500
HRC	56	54	52	48	42


M 14
M 14
M 14
M 14
M 10
M 10

Wire Erosion Blocks

Wire erosion is a non-contact machining process that uses an electrically charged, thin electrode wire that follows a precisely programmed path through a dielectric fluid to cut a metal part into different shapes.



As a company, we have ready-made wire erosion blocks made of Schwert 2379 and Schwert S-8Cr quality steels in our stocks. Our wire erosion blocks are subjected to special heat treatment after machining. Following the order of our customers, delivery is made on the same day from our stocks.

Plastic Mould Steels

Tool steels used in the forming of plastics by injection.
Extrusion, moulding and various pressing techniques.

Plastic Mould Steels
Chemical Composition (%)

Schwert Code	C	Si	Mn	S	Cr	Mo	Cu	Ni	Hardness
Schwert 2311 QT	0,4	0,40	1,50	-	1,90	0,2	-	-	310 HB
Schwert 2312 QT	0,40	0,40	1,50	0,07	1,90	0,20	-	-	310 HB
Schwert 2738 QT	0,40	0,30	1,50	0,03	1,90	0,20	-	1,10	310 HB
Schwert 2738 HH	0,40	0,30	1,50	0,03	1,90	0,20	-	1,10	420 HB
Schwert 2316 QT	0,36	-	-	-	16,50	0,40	-	-	230 HB

**Prime: ESR (Electro Slag Remelting) Production*
**Produced suitable to EFS (Extra-Fine Structure) standards.*

Plastic Mould Steels
Comparison Table

Schwert Code	Wear Resistance	Corrosion Resistance	Toughness	Weldability	Machinability	Polishability
Schwert 2312 QT	+	+	+++	+++	++++	+
Schwert 2738 QT	+	+	+++	+++	+++	++
Schwert 2738 HH	++	+	++	+++	++	++
Schwert 2714 QT	++	+	++	++	++	++
Schwert 2344 EFS / Prime	+++	+	++	++	++	+++
Schwert 2767 Prime	+++	+	+++	++	++	+++
Schwert 2316 QT	+	+++	+++	++	+++	++

Applications

Applications	Plastic Material and Properties	Steel Grade	Recommended Hardness
Injection moulds	Abrassive Plastics Nylon 6-66, Glass, Fibre etc.	Schwert 2767 Prime Schwert 2344 EFS / Prime	52-56 HRC 50-52 HRC
	Non-Corrosive Plastics, PS PE, PP, ABS, Acrylic, Crystal	Schwert 2312 Schwert 2738 Schwert 2738 HH Schwert 2344 EFS / Prime	30-34 HRC 30-34 HRC 38-42 HRC 50-52 HRC
	Abrassive Plastics Pvc etc.	Schwert 2085 Schwert 2316	30-34 HRC 30-34 HRC
Blowing Moulds	Non-Corrosive Plastics PS	Schwert 2738 Schwert 2738 HH Schwert 2344 EFS / Prime	30-34 HRC 38-42 HRC 50-52 HRC
	Abrassive Plastics Pvc etc.	Schwert 2085 Schwert 2316	30-34 HRC 30-34 HRC



Blowing Mould



Injection mould



Bumper mould



Headlamp mould

Schwert 2311

Chemical Composition (%)

C	Si	Mn	Cr	Mo
0,40	0,40	1,50	1,90	0,20

Delivery Hardness: Max. 310 HB

Applications: Pre-hardened plastic mould steel. Suitable quality for low and medium production quantities. It is used in injection moulds of non-corrosive plastics; its polishing capacity is better than 2312.

Physical Properties:

Thermal Conductivity W / (M*K)	100°C	150°C	200°C	250°C
Hardened + Tempered	34,2	34	33,5	32,8
Thermal Expansion Coefficient 10^{-6m} (m.K)	20-100°C	20-200°C	20-300°C	
	12,4	13,1	13,5	

Heat Treatment

Soft Annealing	**Cooling**	**Hardness (HB)**
710-740 °C	Furnace	Max. 235
Hardening	**Cooling Conditions**	**Hardness After Hardening**
840-870 °C	Oil or Salt Bath 180-220 °C	51 HRC

Tempering °C	100	200	300	400	500	600	700
Oil / HRC	51	50	48	46	42	36	28

Schwert 2312

Chemical Composition (%)

C	S	Si	Mn	Cr	Mo
0,40	0,07	0,40	1,50	1,90	0,20

Delivery Hardness: Max. 310 HB

Applications: Pre-hardened plastic mould steel. Suitable quality for low and medium production quantities. It is widely used in extrusion presses and as holders in metal injection moulds. It is used in injection moulds of non-corrosive plastics; it is easier to machine due to the addition of "S".

Physical Properties:

Thermal Conductivity W / (M*K)	100°C	150°C	200°C	250°C
Hardened + Tempered	39,8	40,5	40,4	39,9
Thermal Expansion Coefficient 10^{-6m}(m.K)	20-100°C	20-200°C	20-300°C	
	12,3	13,1	13,7	

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
710-740 °C	Furnace	Max. 235
Hardening	**Cooling Conditions**	**Hardness After Hardening**
840-870 °C	Oil or Salt Bath 180-220 °C	51 HRC

Tempering °C	100	200	300	400	500	600	700
Oil / HRC	51	50	48	46	42	36	28

Schwert 2316

Material Code: X36CrMo17

Chemical Composition (%)

C	Cr	Mo
0,36	16,50	0,40

Delivery Hardness: 30-35 HRC

Applications: It is used for extrusion and injection molds of corrosive plastics such as PVC. It is a stainless alloyed plastic mould steel in prehardened condition.

Physical Properties:

Thermal Conductivity W / (M*K)	20°C	350°C
Hardened + Tempered	19,6	21,1

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
750-800 °C	Furnace	Max. 230
Hardening	**Cooling Conditions**	**Hardness After Hardening**
1020-1050 °C	Oil, Air or Hot Bath 500-550°C	54 HRC

Tempering °C	100	200	300	400	500	600
HRC	49	47	46	46	47	32

Schwert 2738 (310 HB)

Chemical Composition (%)

C	Si	Mn	Cr	Mo	Ni
0,40	0,40	1,50	1,90	0,20	1,00

Delivery Hardness: Max. 310 HB

Applications: Pre-hardened plastic mould steel. Suitable quality for low and medium production quantities. Used in injection moulds of non-corrosive plastics. Recommended for moulds up to 300 mm thickness.

Physical Properties:

Thermal Conductivity W / (M*K)	20°C	350°C	700°C
Hardened + Tempered	34,5	33,6	32,0

Thermal Expansion Coefficient 10^{-6m} (m.K)	20-100°C	20-200°C	20-300°C	20-400°C	20-500°C	20-600°C	20-700°C
	11,1	12,9	13,5	13,9	14,2	14,6	14,9

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
710-740 °C	Furnace	Max. 235
Hardening	**Cooling Conditions**	**Hardness After Hardening**
840-870 °C	Oil or Salt Bath (180-220 °C)	51 HRC

Tempering °C	100	200	300	400	500	600	700
Oil / HRC	51	50	48	46	42	39	28

Schwert 2738 HH (420 HB)

Chemical Composition (%)

C	Si	Mn	Cr	Mo	Ni
0,40	0,40	1,50	1,90	0,20	1,00

Delivery Hardness: Max. 420 HB

Applications: Due to its high hardness, it is suitable for high production quantities. Used in injection moulds of non-corrosive plastics. It should be preferred especially in large volume moulds due to its higher core hardness. Recommended for moulds thicker than 300 mm.

Physical Properties:

Thermal Conductivity W / (M*K)	20°C	350°C	700°C
Hardened + Tempered	34,5	33,6	32,0

Thermal Expansion Coefficient 10^{-6m} (m.K)	20-100°C	20-200°C	20-300°C	20-400°C	20-500°C	20-600°C	20-700°C
	11,1	12,9	13,5	13,9	14,2	14,6	14,9

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
710-740 °C	Furnace	Max. 235
Hardening	**Cooling Conditions**	**Hardness After Hardening**
840-870 °C	Oil or Salt Bath (180-220 °C)	51 HRC

Tempering °C	100	200	300	400	500	600	700
Oil / HRC	51	50	48	46	42	39	28

High Speed Steel

Schwert 3343

Material Code: HS 6-5-2 / M2

Chemical Composition (%)

C	Cr	Mo	V	W
0,90	4,00	5,00	1,90	6,40

Delivery Hardness: 250-300 HB

Applications: In various cutting tools such as milling cutters, circular saws, broaches, thread rolling balls, various drills, reamers, taps, planer blades, etc. It is used in matrix, punch and blowing tools used in bolt nut manufacturing.

Physical Properties:

Thermal Conductivity W / (M*K)	20°C	350°C	700°C
Hardened + Tempered	27,7	27,1	26,1

Heat Treatment

Soft Annealing	Cooling	Hardness (HB)
780-860 °C	Furnace	Max. 265 HB
Hardening	**Cooling Conditions**	**Hardness After Hardening**
1180-1230 °C	Air, Oil or Salt Bath 50-55 °C	65 HRC

Tempering °C	100	300	400	500	550	575	600	650
HRC	63	61	61	62,5	65	64	62,5	57

Tensile Strength (Rm)	Hardness Brinell		Hardness Vickers	Hardness Rockwell		
N / mm²	d (mm)	HB	HV	HRB	HRC	HR 30 N
265	6.63	76	80	-	-	-
270	6.45	80.7	85	41	-	-
285	6.3	85.5	90	48	-	-
305	6.16	90.2	95	52	-	-
320	6.01	95	100	56.2	-	-
335	5.9	98.8	105	-	-	-
350	5.75	105	110	62.3	-	-
370	5.65	109	115	-	-	-
385	5.54	114	120	66.7	-	-
400	5.43	119	125	-	-	-
415	5.33	124	130	71.2	-	-
430	5.26	128	135	-	-	-
450	5.16	133	140	75	-	-
465	5.08	138	145	-	-	-
480	4.99	143	150	78.7	-	-
495	4.93	147	155	-	-	-
510	4.85	152	160	81.7	-	-
530	4.79	156	165	-	-	-
545	4.71	162	170	85	-	-
560	4.66	166	175	-	-	-
575	4.59	171	180	87.1	-	-
595	4.43	176	185	-	-	-
610	4.47	181	190	89.5	-	-
625	4.43	185	195	-	-	-
640	4.37	190	200	91.5	-	-
660	4.32	195	205	92.5	-	-
675	4.27	199	210	93.5	-	-
690	4.22	204	215	94	-	-

Tensile Strength (Rm)	Hardness Brinell		Hardness Vickers	Hardness Rockwell		
N / mm²	d (mm)	HB	HV	HRB	HRC	HR 30 N
1095	3.39	323	340	-	34.4	54.4
1125	3.34	333	350	-	35.5	55.4
1155	3.29	342	360	-	36.6	56.4
1190	3.26	352	370	-	37.7	57.4
1220	3.21	361	380	-	38.8	58.4
1225	3.17	371	390	-	39.8	59.3
1290	3.13	380	400	-	40.8	60.2
1320	3.09	390	410	-	41.8	61.1
1350	3.06	399	420	-	42.7	61.9
1385	3.02	409	430	-	43.6	62.7
1420	2.99	418	440	-	44.5	63.5
1455	2.95	428	450	-	45.3	64.3
1485	2.92	437	460	-	46.1	64.9
1520	2.89	447	470	-	46.9	65.7
1555	2.86	456	480	-	48.4	67.1
1630	2.81	475	500	-	49.1	67.7
1665	2.78	485	510	-	49.8	68.3
1700	2.75	494	520	-	50.5	69
1740	2.73	504	530	-	51.1	69.5
1775	2.7	513	540	-	51.7	70
1810	2.68	523	550	-	52.3	70.5
1845	2.66	532	560	-	53	71.2
1880	2.63	542	570	-	53.6	71.7
1920	2.6	551	580	-	54.1	72.1
1955	2.59	561	590	-	54.7	72.7
1955	2.59	570	600	-	55.2	73.2
2030	2.54	580	610	-	55.7	73.7
2070	2.52	589	620	-	56.3	74.2

705	4.18	209	220	95	-	-
720	4.13	214	225	96	-	-
740	4.08	219	230	96.7	-	-
755	4.05	223	235	-	-	-
770	4.01	228	240	98.1	20.3	41.7
785	3.97	233	245	-	21.3	42.5
800	3.92	238	250	99.5	22.2	43.4
820	3.89	242	255	-	23.1	44.2
835	3.86	247	260	101	24	45
850	3.82	252	265	-	24.8	45.7
865	3.78	257	270	102	25.6	46.4
880	3.75	261	275	-	26.4	47.2
900	3.72	266	280	104	27.1	47.8
915	3.69	271	285	-	27.8	48.4
930	3.66	276	290	105	28.5	49
950	3.63	280	295	-	29.2	49.7
965	3.6	285	300	-	29.8	50.2
995	3.54	295	310	-	31	51.3
1030	4.49	304	320	-	32.2	52.3
1060	3.43	314	330	-	33.3	53.6

2105	2.51	599	630	-	56.8	74.6
2145	2.49	608	640	-	57.3	75.1
2180	2.47	618	650	-	57.8	75.5
-		-	660	-	58.3	75.9
-		-	670	-	58.8	76.4
-		-	680	-	59.2	76.8
-		-	690	-	59.7	77.2
-		-	700	-	60.1	77.6
-		-	720	-	61	78.4
-		-	740	-	61.8	79.1
-		-	760	-	62.5	79.7
-		-	780	-	63.3	80.4
-		-	800	-	64	81.1
-		-	820	-	64.7	81.7
-		-	840	-	65.3	82.2
-		-	860	-	65.9	82.7
-		-	880	-	66.4	83.1
-		-	900	-	67	83.6
-		-	920	-	67.5	84
-		-	940	-	68	84.4

Hardness Conversion Table



Our Quality

As Akçelik Group, we carry out all our planning, production, distribution and after-sales activities accredited to international quality assurance systems and we operate in accordance with ISO 9001:2015, IATF 16949:2016, ISO 14001:2015 and ISO 27001:2013 norms.

Scan for Quality Certificates

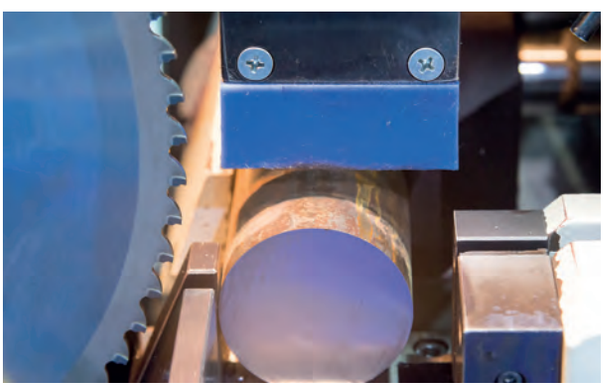


We ensure that all procurement processes of our Schwert Tool Steel branded tool steels, from production in our approved suppliers to meeting with our customers, are implemented by following and applying this quality understanding.
Our advanced laboratory infrastructure at our Logistics Centre in Gebze, Kocaeli enables us to continuously control the product quality of our tool steels and to monitor product traceability after sales.

Our Services

Customized Cut

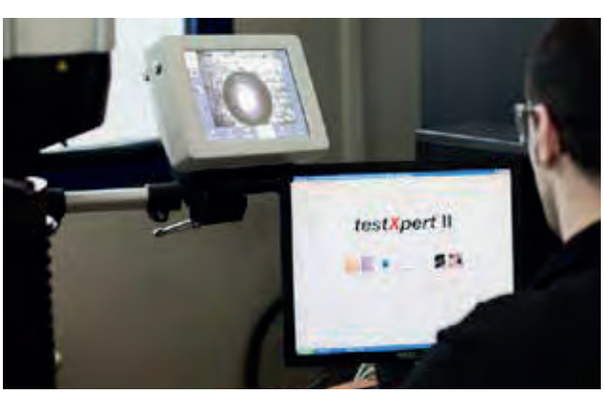
We meet the special size demands of our customers with a precision of ± 2.00 mm and perform a total of 14 million cutting operations every year with our state-of-the-art circular and laser-controlled circular and laser-controlled series saws in our distribution centres located in 5 different provinces throughout Turkey.

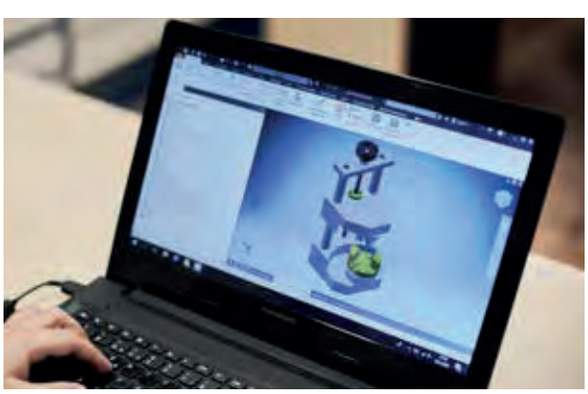




Analysis and Certification

We provide certification services not only in our production and sales processes, but also in the testing and analysis need of our after-sales customers in accordance with DIN EN 10204 norm with our advanced laboratory facilities in our Logistics Centre in Gebze, Kocaeli.





Our Locations

We serve you with more than 500 employees in 10 different parts of Europe and America through our headquarters in Kocaeli.

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