utp
by voestalpine

Tailor-Made Protectivity™

SOLUTIONS FOR THE CEMENT INDUSTRY

voestalpine Böhler Welding
www.voestalpine.com/welding

voestalpine
ONE STEP AHEAD.

TAILOR-MADE PROTECTIVITY™

Proven under the toughest conditions: Our products protect metal surfaces from wear and corrosion. With over 70 years of experience and the broadest product portfolio in the industry, we are your preferred partner for Surface Protection solutions. We deliver what we promise: Surface Protection tailored to your needs.

Our customers benefit from a partner with

- the highest expertise in joining, rendering the best application support globally available
- specialized and best in class product solutions for their local and global challenges
- an absolute focus on customer needs and their success
- a worldwide presence through factories, offices and distributors

TAILOR-MADE PROTECTIVITY™

Industry experience and applications know-how – combined with innovative and custom (tailor-made) products – guarantee that our customers obtain the ideal combination of productivity and protection, within the shortest operating times and up to the maximum performance capacity of their products.
This explains UTP's guiding principle – "Tailor-Made Protectivity™" – which puts the focus on the customer.

RESEARCH AND DEVELOPMENT FOR CUSTOMIZED SOLUTIONS

At UTP, research and development, conducted in collaboration with customers, plays a crucial role. Because of our strong commitment to research and development, combined with our tremendous innovative capacity, we are constantly engineering new products, and improving existing ones on an ongoing basis.
The result is a vast number of innovative products for solving individual problems and complex matters.

CUSTOMIZED PRODUCTS OF SUPERIOR QUALITY

We continuously adapt our product portfolio of about 600 products to customer and industry specifications, while ensuring that we meet the highest quality specifications.

From its in-house production facilities, UTP delivers innovative, tailor-made welding filler metals for: unalloyed and fine-grained structural steel, low-grade alloyed steels, rust-proof, acid-proof, and heat-proof steels, nickel-based alloys, cast iron, copper and copper alloys, manganese steels, tool steels, and cobalt steels.

The product portfolio comprises:
- Stick electrodes
- Solid wires and rods
- Flux cored wires
- Submerged arc wires and fluxes
- Submerged arc and electroslag strips & fluxes
- Spraying- and PTA-powders

SOLUTIONS AT EVERY POINT ON THE GLOBE

UTP provides products and services through the global branches of voestalpine Böhler Welding and its dealer network in more than 150 countries throughout the world.

A team of welding engineers stand at the customer's side, providing advice and support in all matters related to the challenges of welding technology.

CONTENT

CEMENT INDUSTRY

We help optimize the plant productivity by providing high-quality maintenance and repair welding consumables, valuable counseling and continuous support.

Cement processing equipment is exposed to severe wear due to impact, abrasion, and high temperatures.

The wear rate is influenced by several factors, including the raw materials, clinker, and cement, the material used for wear-resistant components; and the design and operational parameters of the mill. Excessive wear leads to reduced grinding efficiency and product quality, increased energy consumption, equipment vibrations and the risk of damage to the mill. It also leads to higher maintenance costs.

Hardfacing allows maintaining the original components' profile to guarantee optimum production conditions. It should be applied before energy consumption rises or grinding efficiency drops to unacceptable levels.

The process enhances wear resistance by depositing a surface layer with an austenitic matrix enriched with hard carbides, offering excellent protection.

Applications

Vertical mills; Rotary kilns and presses; Crushers; Classifiers; Cones; Hammers; Wear plates

Products

We provide iron-based, copper-based, cobalt-based and nickel-based hardfacing products allowing preventive or curative overlay welding in a large range of industries and in process with wear challenges.

Service

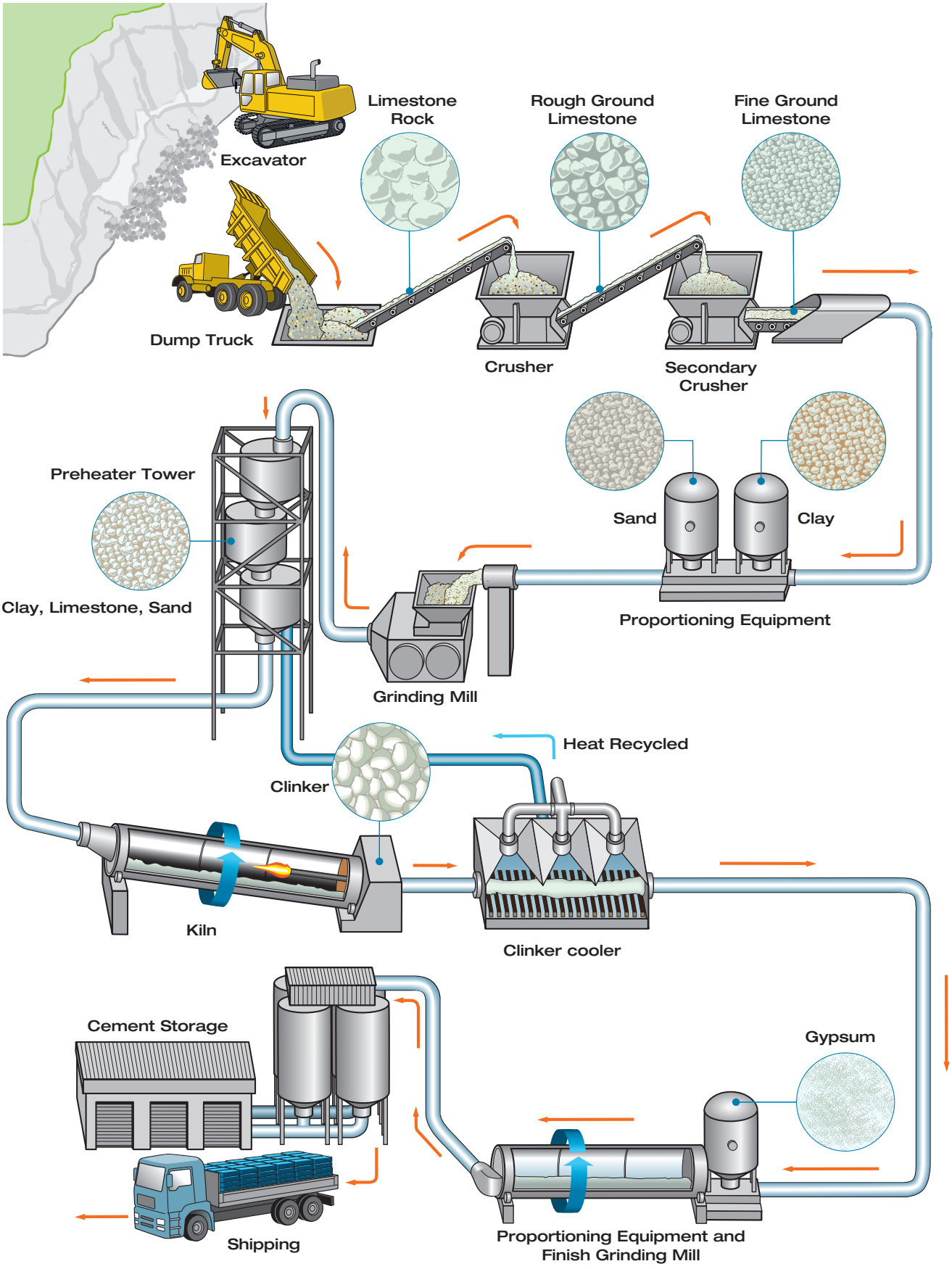
We provide additional value by offering the following:

- Network of service partners able to provide excellence in in-situ or ex-situ hardfacing
- Expertise in overlay welding and hardfacing techniques and applications
- Training of welders, supervisors and engineers

Approvals

We manufacture welding consumables that comply with quality programs such as ISO 9001 (2008) and ASME QSC580.

FLOWCHART CEMENT PRODUCTION

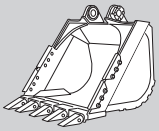
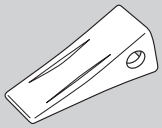
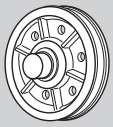
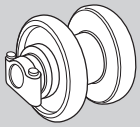
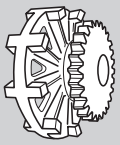
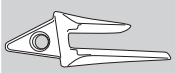


LIMESTONE MINING

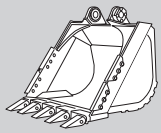
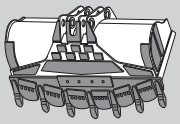
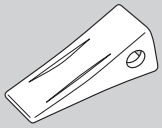
The most important component in cement production is limestone. Limestone is extracted through blasting in opencast mines before being crushed. The crushed limestone is then transported via conveyor belts to a blending bed for temporary storage.

SOLUTIONS FOR LIMESTONE QUARRY APPLICATIONS

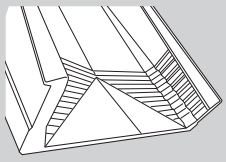
Crawler excavators

		Product recommendations			
Component	**Description of wear**	**Covered Electrode**	**Solid wire**	**Gas shielded cored wire**	**Open Arc wire**
Excavator shevel 	Wear is predominantly caused by abrasion and can be accompanied with a great deal of impact. Most buckets are fabricated from combination of carbon steel & manganese steel & may be lined with a abrasion resistant liners.	WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
Bucket teeth 	Bucket teeth come to use in the excavating of ore, stones or other materi-als. Wear is predominantly caused by abrasion and can be accompanied with a great deal of impact.	WEARstick MnCr4			WEARcore MnCr8-O
		WEARstick MnCr13			WEARcore MnCr13-O
		WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
Idler 	Undercarriage components typically wear by metal to metal, abrasion and slight impact.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick DUR 350		UTP ROBOTIC 352	
Track roller 	Undercarriage components typically wear by metal to metal, abrasion and impact.	WEARstick DUR 350		UTP ROBOTIC 352	
Drive sprocket 	Undercarriage components typically wear by metal to metal, abrasion and impact.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		UTP 65 D	Thermanit 30/10		
		WEARstick MnCr4			WEARcore MnCr8-O
		WEARstick MnCr13			WEARcore MnCr13-O
		WEARstick Dur 250	WEARmig 250		WEARcore Dur 200-O
Tooth Adaptor 	In addition to abrasive wear, cracks may occur due to overload.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O

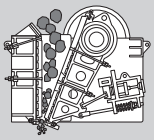
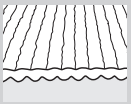
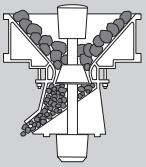
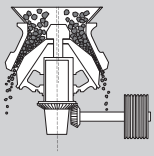
Wheel loader

		Product recommendations			
Component	**Description of wear**	**Covered Electrode**	**Solid wire**	**Gas shielded cored wire**	**Open Arc wire**
Payloader Bucket 	Wear is predominantly caused by abrasion and can be accompanied with a great deal of impact.	WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
Payloader Bucket 	Wear is predominantly caused by abrasion and can be accompanied with a great deal of impact.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
Bucket teeth 	Bucket teeth come to use in the excavating of ore, stones or other materials. Wear is predominantly caused by abrasion and can be accompanied with a great deal of impact.	WEARstick MnCr4			
		WEARstick MnCr13			WEARcore MnCr13-O
		WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O

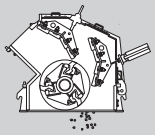
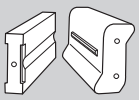
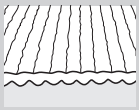
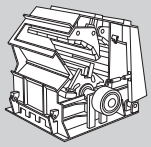
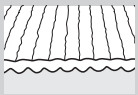
Dumper

		Product recommendations			
Component	**Description of wear**	**Covered Electrode**	**Solid wire**	**Gas shielded cored wire**	**Open Arc wire**
Load Liner 	Wear is predominantly caused by abrasion and can be accompanied with a great deal of impact. Liner plates are used for protecting the dump area. These liner plates needs to be joined to base plate of carbon steel.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		UTP 65 D	Thermanit 30/10		
		WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
				UTP ROBOTIC 601	WEARcore Dur 58 TiC-O

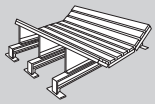
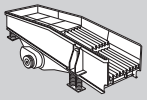
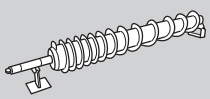
Crushers

			Product recommendations			
Product	**Component**	**Description of wear**	**Covered Electrode**	**Solid wire**	**Gas shielded cored wire**	**Open Arc wire**
Jaw Crusher 	Jaw plates 	Jaw plates are subjected to high stress abrasion coupled with moderate impact.	UTP 63			
			WEARstickMnCr4			WEARcore MnCr8-O
			WEARstick MnCr13			WEARcore MnCr13-O
			WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
			WEARstick XD 61			WEARcore XD 60-O
			WEARstick XD 63			WEARcore XD 63-O
		Crusher Mantle is subjected to high stress abrasion coupled with moderate impact.	UTP 63			
			WEARstickMnCr4			WEARcore MnCr8-O
			WEARstick MnCr13			WEARcore MnCr13-O
			WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
			WEARstick XD 61			WEARcore XD 60-O
			WEARstick XD 63			WEARcore XD 63-O
		Crusher Mantle is subjected to high stress abrasion coupled with moderate impact.	WEARstickMnCr4			WEARcore MnCr8-O
			WEARstick MnCr13			WEARcore MnCr13-O
			WEARstick Dur 350	WEARmig Dur 450	UTP ROBOTIC 352	WEARcore Dur 400-O
			WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
			WEARstick XD 61			WEARcore XD 60-O
			WEARstick XD 63			WEARcore XD 63-O

Crushers

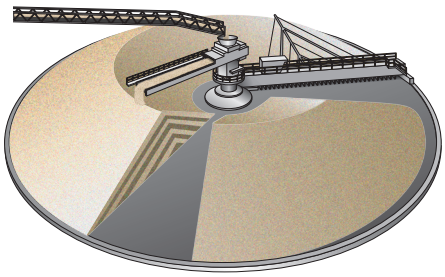
			Product recommendations			
Product	**Component**	**Description of wear**	**Covered Electrode**	**Solid wire**	**Gas shielded cored wire**	**Open Arc wire**
Impact crusher 	Impactor Arm 	Impactor arm is subjected to high impact & abrasion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
			WEARstickMnCr4			WEARcore MnCr8-O
			WEARstick MnCr13			WEARcore MnCr13-O
			WEARstick Dur 350	WEARmig Dur 450	UTP ROBOTIC 352	WEARcore Dur 400-O
			WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
			WEARstick XD 61			WEARcore XD 60-O
			WEARstick XD 63			WEARcore XD 63-O
	Impactor Plates 	Impactor plates are subjected to moder-ate impact & high stress abrasion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
			WEARstickMnCr4			WEARcore MnCr8-O
			WEARstick MnCr13			WEARcore MnCr13-O
			WEARstick Dur 350	WEARmig Dur 450	UTP ROBOTIC 352	WEARcore Dur 400-O
			WEARstick Dur 650	WEARmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
			WEARstick XD 61			WEARcore XD 60-O
			WEARstick XD 63			WEARcore XD 63-O
Hammer crusher 	Hammers 	Hammers are subjected to high impact & abrasion. Usually the base material is manganese steel.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
			WEARstickMnCr4			WEARcore MnCr8-O
			WEARstick MnCr13			WEARcore MnCr13-O
			WEARstick Dur 350	WEARmig Dur 450	UTP ROBOTIC 352	WEARcore Dur 400-O
			WEARstick Dur 650	WEARmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
			WEARstick XD 61			WEARcore XD 60-O
			WEARstick XD 63			WEARcore XD 63-O
	Side wear liners 	Side wear lin-ers are sub-jected to high stress abra-sion with mod-erate impact. Ususally the base material is manganese steel.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
			WEARstickMnCr4			WEARcore MnCr8-O
			WEARstick MnCr13			WEARcore MnCr13-O
			WEARstick Dur 350	WEARmig Dur 450	UTP ROBOTIC 352	WEARcore Dur 400-O
			WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
			WEARstick XD 61			WEARcore XD 60-O
			WEARstick XD 63			WEARcore XD 63-O

Conveyor systems

		Product recommendations			
Component	**Description of wear**	**Covered Electrode**	**Solid wire**	**Gas shielded cored wire**	**Open Arc wire**
Gear wheel 	These drive gears & pinion are made either from cast iron or steel. Standard problem are of friction wear or breakage of tooth.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		UTP 65D	Thermanit 30/10		
		WEARstick Dur 350		UTP ROBOTIC 352	
		UTP 86 FN	UTP A8051 Ti	UTP FNM4-G	
Collection tray 	Wear is predominantly caused by moderate impact and abrasion. Wearplates are welded with crack resistant welding consumables	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		UTP 65D	Thermanit 30/10		
Vibrating feeder 	Wear is predominantly caused by impact and abrasion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		UTP 65D	Thermanit 30/10		
Screw-conveyor 	Screw conveyor flights wall & edge wear out due to abrasion.	WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61		UTP ROBOTIC 6010	WEARcore XD 60-O
		WEARstick XD 62			
					WEARcore XD 70-O
				WEARcore XD NiW46	

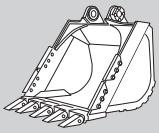
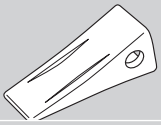
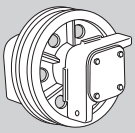
BLENDING BED

At the cement plant the crushed stone is stored in blending beds. Homogenization is usually necessary if there are major fluctuations in raw material composition. The stockpiles consists of different layers of various types of raw materials. The stockpiles are subsequently cleared away layer by layer. The calcium carbonate content of the raw material mixture should be at least 76-78%. Attention must also be paid to the ratio of silica, iron oxide and alumina.



SOLUTIONS FOR BLENDING BED APPLICATIONS

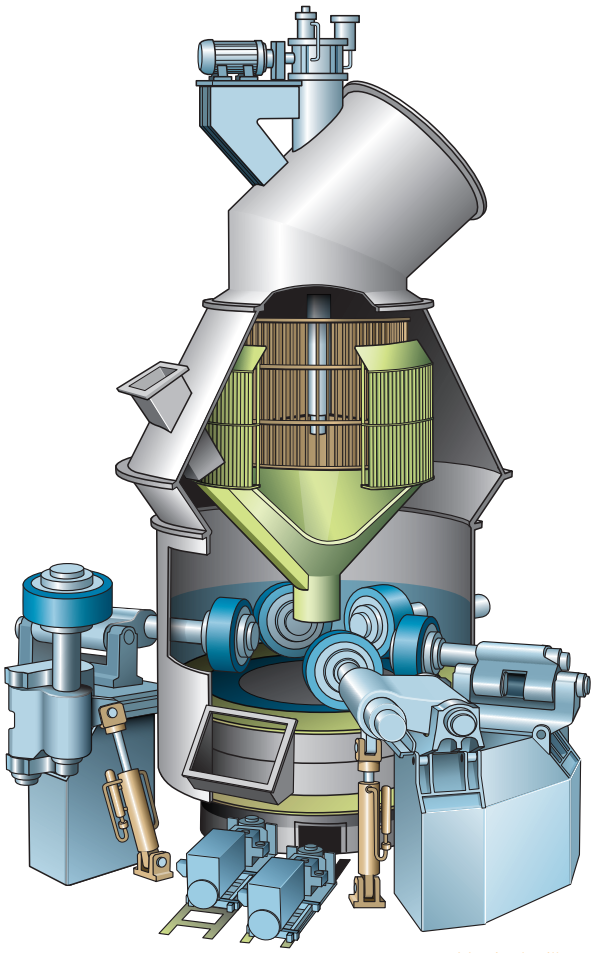
Wheel loader

		Product recommendations			
Component	**Description of wear**	**Covered Electrode**	**Solid wire**	**Gas shielded cored wire**	**Open Arc wire**
Bucket 	Wear is predominantly caused by abrasion and can be accompanied with mild impact at lip areas. Most buckets are fabricated from combination of carbon steel & may be lined with a abrasion resistant liners	WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
Bucket teeth 	Wear is predominantly caused by abrasion and can be accompanied with a great deal of impact.	WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
Stacker wheels 	Wear is predominantly caused due to presence of silica/raw material dust on tracks & abrasion caused by movement of stacker wheels on these tracks.	WEARstick Dur 350		UTP ROBOTIC 352	

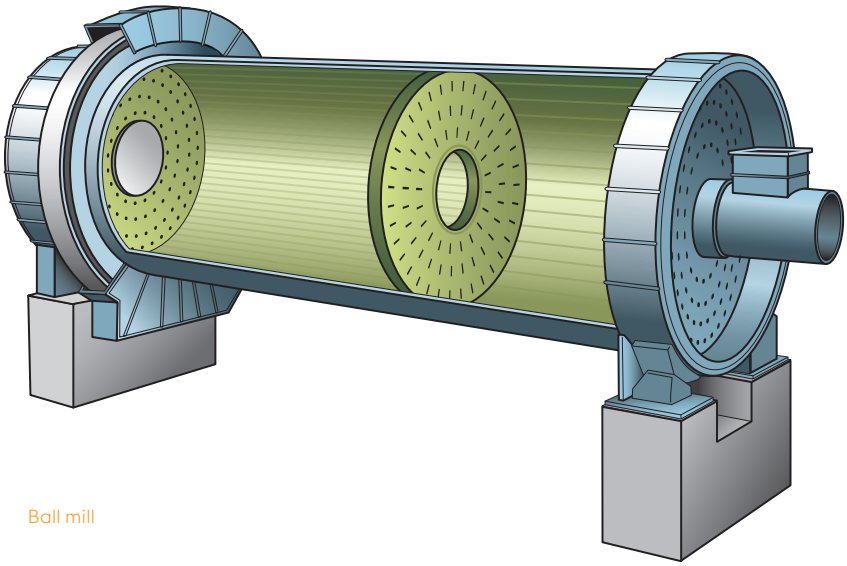
RAW MATERIAL MILLS

After being stored in the blending bed, the crushed stone (raw material) is transported to the drying plant. Here the crushed stone is dried before being transferred to the raw material mill. A dosage unit feeds in the admixtures sand, iron ore and ash in the required proportions.

Type of mill
Roller press
For roller press, the grinding parts are two rollers of the same size rotating on opposite direction. The materials fall vertically from the top to the two rollers , which forces particles to crush one another reducing to 20-30 % of original volume.
Ball mill
A ball mill is a horizontal cylinder filled with with steel balls. They are usually round but sometimes take other shapes. The raw materials are crushed between the balls by the rotating and cascading effect.
Vertical mill
Vertical mills are available with different types of grinder, and vary according to manufacturer. The various components in a vertical mill, such as grinding table, grinding rollers and grinding track, are usually manufactured from chill-casting alloys. The grinding rollers press down onto the rotating grinding table, either through their own weight or with the aid of hydraulic cylinders, to crush the rawmix. The grinding rollers are usually conical, cylindrical or spherical, depending on the form of the grinding table.



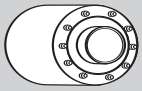
Vertical mill



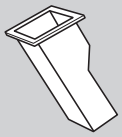
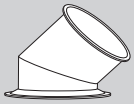
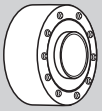
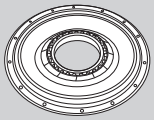
Ball mill

SOLUTIONS FOR ROLLER PRESS, VERTICAL AND BALL MILLS

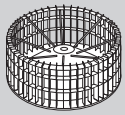
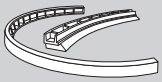
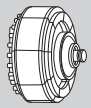
Roller press

Component	Description of wear	Product recommendations			
		Covered Electrode	Solid wire	Gas shielded cored wire	Open Arc wire
Roller press 	Subjected to high grinding impact and pressure			WEARcore Dur 400-S (SAW)	
				WEARcore Dur 58 Nb-S (SAW)	
			WEARmig Dur 600	UTP ROBOTIC 600	WEARcore Dur 58 TiC-O
		WEARstick XD 63			

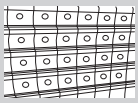
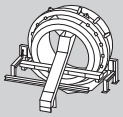
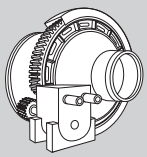
Vertical mill

Component	Description of wear	Product recommendations			
		Covered Electrode	Solid wire	Gas shielded cored wire	Open Arc wire
Inlet chute 	Feeding the vertical mill with crushed stone. Wear is primarily the result of abrasion.	UTP 63			
		WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARrmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
					WEARcore XD 62-O
		WEARstick XD 63			WEARcore XD 63-O
Outlet duct 	The light and finely crushed material is extracted from the mill via the outlet duct. Wear is primarily the result of abrasion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
Grinding roller 	The grinding rollers press down onto the rotating grinding table, either through their own weight or with the aid of hydraulic cylinders, to crush the feed material. The grinding rollers are usually conical, cylindrical or spherical, depending on the form of the grinding table. Wear is primarily the result of abrasion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick XD 61			WEARcore XD 60-O
					WEARcore XD 62-O
		WEARstick XD 63			WEARcore XD 63-O
Reject cone 	Wear is primarily the result of abrasion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
Grinding table 	The rawmix is crushed finely as it passes between the grinding table and grinding rollers. Wear is primarily the result of abrasion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick XD 61			WEARcore XD 60-O
					WEARcore XD 62-O
		WEARstick XD 63			WEARcore XD 63-O

Vertical mill

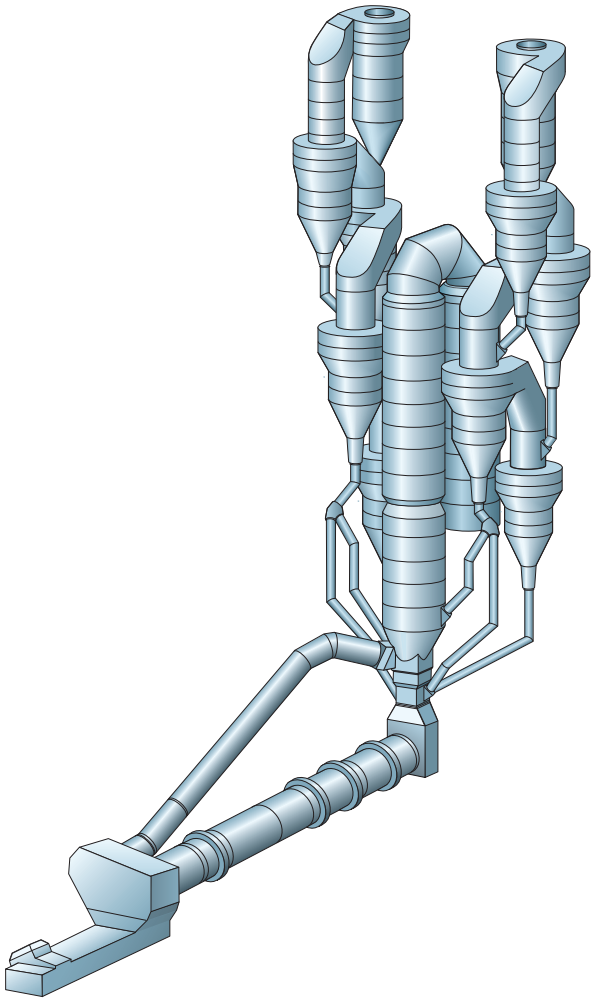
Component	Description of wear	Product recommendations			
		Covered Electrode	Solid wire	Gas shielded cored wire	Open Arc wire
Classifier Guide vanes 	Wear is primarily the result of abrasion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
		WEARstick XD 65			WEARcore XD 65-O
Dam ring 	Wear due to abrasion caused by limestone spill overs while crushing on table.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
Crushing roll shaft guards 	Wear due to erosion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
Roller Hub 	Wear due to friction / abrasion caused by loosening of tyre.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		UTP 65			
		UTP 86 FN	UTP A 8051 Ti		UTP FNM4-G
Vertical mill body	Repair of cracked sections.	Thermanit Nicro 82	Thermanit Nicro 82	FOXcore Nicro 82-T0	
		UTP 7015			

Ball mill

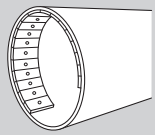
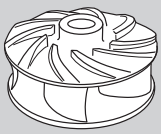
Component	Description of wear	Product recommendations			
		Covered Electrode	Solid wire	Gas shielded cored wire	Open Arc wire
Wear plates 	Wear is primarily the result of abrasion as well as impact.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
Trunnion Magnet 	Cracks	UTP 7015			
		Thermanit Nicro 82	Thermanit Nicro 82	FOXcore Nicro 82-T0	
Gear Ring 	Cracks These drive gears & pinion are made either from cast iron or steel. Standard problem are frictional wear or breakage of tooth.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		UTP 86 FN	UTP A 8051 Ti	UTP FNM4-G	
		WEARstick Dur 350		UTP ROBOTIC 352	

PREHEATER CYCLONE

The ground limestone is fed into the preheater cyclone where it is heated together with silica and additives including iron and aluminium oxide, and neutralized. Before leaving the preheater the raw-mix will have been heated to a temperature of approx. 1000 °C.

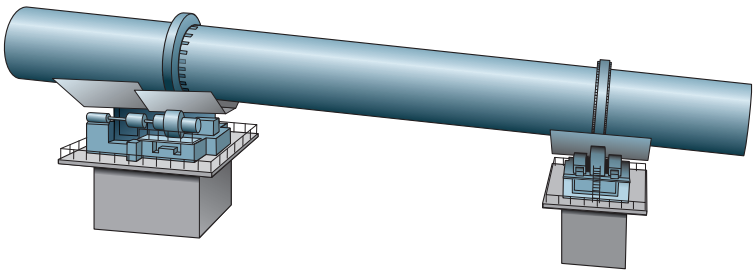


SOLUTIONS FOR PREHEATER CYCLONE

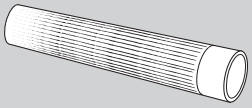
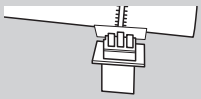
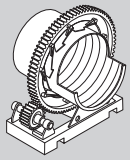
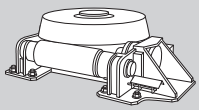
Component	Description of wear	Product recommendations			
		Covered Electrode	Solid wire	Gas shielded cored wire	Open Arc wire
Cast Pipes 	Wear due to abrasion. Welding of wear plates	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
Preheater Fan 	Wear Due to erosion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
		WEARstick XD 65			WEARcore XD 65-O
				WEARcore XD NiW46	WEARcore XD 70-O

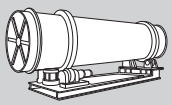
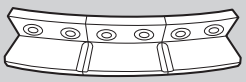
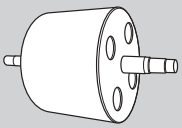
ROTARY KILN

In the rotary kiln the preheated raw mix is converted into cement clinker at a temperature of approx. 1400°C. The slight inclination and constant rotation of the rotary kiln transports the heated raw materials from the feed in side through to the exit.



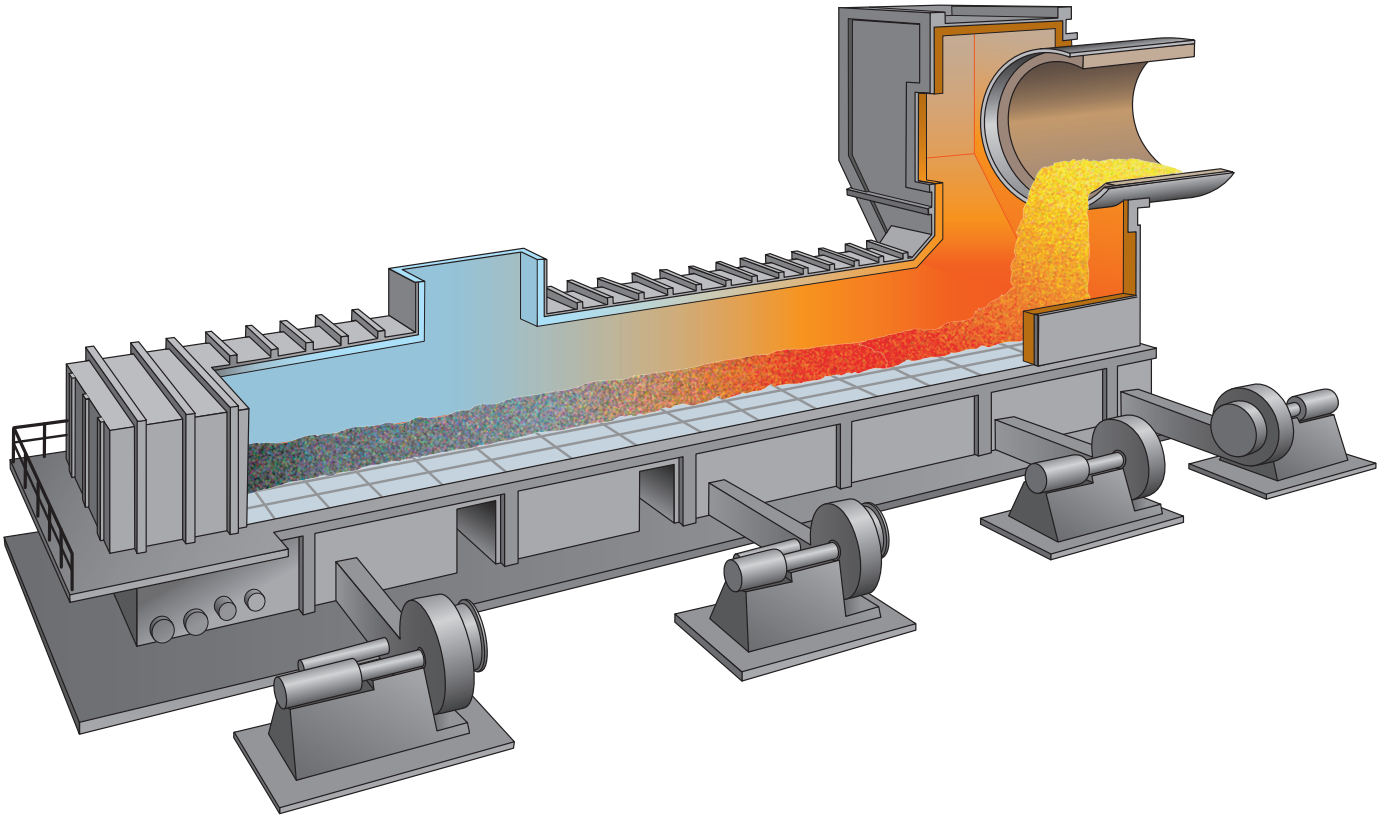
SOLUTIONS FOR ROTARY KILN

Component	Description of wear	Product recommendations			
		Covered Electrode	Solid wire	Gas shielded cored wire	Open Arc wire
Thermo bar 	Wear caused by high temperatur oxidation.	UTP 6225 AL			
Kiln Tyre 	Repair of cracked sections.	Thermanit Nicro82	Thermanit Nicro82	FOXcore Nicro 82-T0	
		UTP 7015			
Girth Gear & Pinion 	The gear develops cracks in service. The teeth profile wears out in service due to friction.	Thermanit Nicro82	Thermanit Nicro82	FOXcore Nicro 82-T0	
		UTP 7015			
		UTP 86 FN	UTP A 8051 Ti	UTP FNM4-G	
Thrust Rollers 	Wear due to friction.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		UTP 65D	Thermanit 30/10		
		WEARstick Dur 350		UTP ROBOTIC 352	

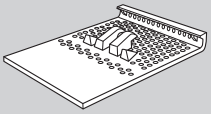
Component	Description of wear	Product recommendations			
		Covered Electrode	Solid wire	Gas shielded cored wire	Open Arc wire
Weld-on anchor 	Welding of stainless steel anchors to carbon steel Kiln shell.	Thermanit Nicro 82	Thermanit Nicro82	FOXcore Nicro 82-T0	
		UTP 68 H	Thermanit 310 Mn		
Steel shell 	Cracks due to fatigue wear	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		Thermanit Nicro 82	Thermanit Nicro82	FOXcore Nicro 82-T0	
Tip casting segments 	Wear due to abrasion at elevated temperature.	Thermanit Nicro 82	Thermanit Nicro82	FOXcore Nicro 82-T0	
		WEARstick XD 65			
Kiln support rollers 	Wear due to friction / abrasion	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		Thermanit Nicro 82	Thermanit Nicro82	FOXcore Nicro 82-T0	
		WEARstick Dur 250	WEARmig Dur 250		
					WEARcore Dur 200-O
		WEARstick Dur 350		UTP ROBOTIC 352	

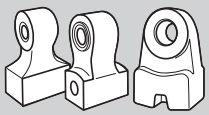
CLINKER COOLER

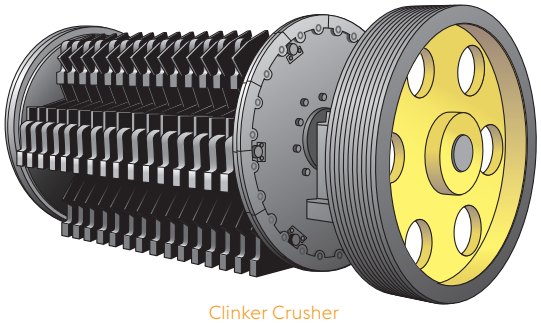
In the grate cooler the hot clinker is evenly distributed over perforated grating and subjected to a stream of cold air. The grating is made from steel and the cold air prevents the steel grating from melting or burning. In contrast to modern grate coolers, rotary coolers are still often used.



SOLUTIONS FOR CLINKER COOLER

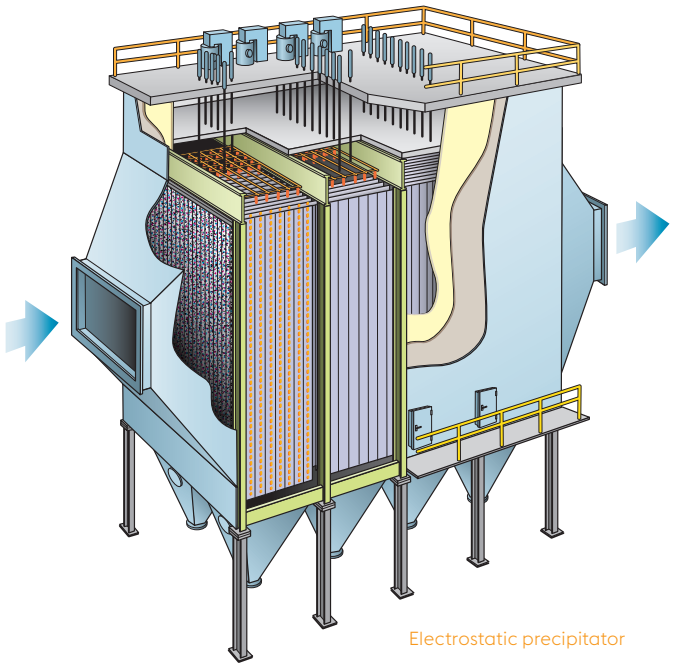
Component	Description of wear	Product recommendations			
		Covered Electrode	Solid wire	Gas shielded cored wire	Open Arc wire
Cooler grate plates 	Cracks Wear due to abrasion at elevated temperature.	Thermanit Nicro 82	Thermanit Nicro82	FOXcore Nicro 82-T0	
		WEARstick XD 65			WEARcore XD 65-O
					WEARcore XD 70-O

Component	Description of wear	Product recommendations			
		Covered Electrode	Solid wire	Gas shielded cored wire	Open Arc wire
Clinker Hammers 	Wear due to impact and abrasion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick MnCr4			WEARcore MnCr8-O
		WEARstick MnCr13			WEARcore MnC13-O
		WEARstick XD 65			WEARcore XD 65-O



Clinker Crusher

ELECTROSTATIC PRECIPITATOR



Electrostatic precipitator

SOLUTIONS FOR ELECTROSTATIC PRECIPITATOR

Component	Description of wear	Product recommendations			
		Covered Electrode	Solid wire	Gas shielded cored wire	Open Arc wire
I D Fan 	Wear Due to erosion.	UTP 63	Thermanit X	UTP 402-G	UTP 402-O
		WEARstick Dur 600	WEARmig Dur 600	UTP ROBOTIC 600	
		WEARstick Dur 650	WEARmig Tool 58	UTP ROBOTIC 601	WEARcore Dur 58 TiC-O
		WEARstick XD 61			WEARcore XD 60-O
		WEARstick XD 63			WEARcore XD 63-O
		WEARstick XD 65			WEARcore XD 65-O
					WEARcore XD 70-O
				WEARcore XD NiW46	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ALL PRODUCTS

with classification, properties, characteristics and fields of use

- Covered electrodes for repair of cracked material
- Surfacing electrodes for wearprotection
- Solid wires for repair, wear and corrosion protection
- Gasshielded cored wires for wear protection
- Open arc cored wires for wear protection

Covered electrodes for repair of cracked material

Name	Classification	Mechanical properties of the weld metal		Composition % (All weld metal)												
				C	Mn	Si	Cr	Ni	Mo	Nb	Ti	Al	Y	W	V	Fe
UTP 63	EN 14700 E Fe10 EN ISO 3581-A E 18 8 Mn R 32	**Yield strength $R_{P0,2}$**	**Tensile strength R_m**	0,1	5,5	0,5	19,0	8,5								bal.
		> 350 MPa	> 600 MPa													
		Elongation A	**Impact strength K_V**													
		> 40 %	> 60J (RT)													
	Characteristics and field of use	With the fully austenitic UTP 63, non-alloy structural and heat-treatable steels can be welded, also in combination with austenitic CrNi steels.														
UTP 65 D	EN 14700 E Z Fe11 EN ISO 3581-A ~ E 29 9 R 12	**Yield strength $R_{P0,2}$**	**Tensile strength R_m**	0,1	1,0	1,0	30,0	9,5								bal.
		> 640 MPa	> 800 MPa													
		Elongation A														
		> 20 %														
	Characteristics and field of use	UTP 65 D has been developed to satisfy the highest requirements for repair and surfacing. It is extremely crack-resistant when joining steels of difficult weldability.														
UTP 68 H	AWS A5.4 E310-16 EN 1600 E 25 20 R	**Yield strength R_p**	**Tensile strength R_m**	0,1	1,5	0,6	25	20								bal.
		> 350 MPa	> 550 MPa													
		Elongation A5														
		> 30 %														
	Characteristics and field of use	The rutile coated stick electrode UTP 68 H is suitable for joining and surfacing of heat resistant Cr-, CrSi-, CrAl-, CrNi-steels/cast steels. It is used for operating temperatures up to 1100° C in lowsulphur combustion gas.														
UTP 86 FN	EN ISO 1071 E C NiFe-13 AWS A5.15 E NiFe-Cl	**Yield strength $R_{P0,2}$**		1,2				bal.								45,0
		approx. 340 MPa														
		Hardness HB														
		approx. 220														
	Characteristics and field of use	Universally applicable for repair, construction and production welding.														
Thermanit Nicro 82	AWS 5.11 E NiCrFe-3 (mod.) EN ISO 14172 E Ni 6082	**Yield strength $R_{P0,2}$**	**Tensile strength R_m**	0,025	5,0	<0,4	19,0	bal.	1,5	2,2						3,0
		420 MPa	680 MPa													
		Elongation A	**Impact strength K_V**													
		40 %	120 J (RT)													
	Characteristics and field of use	Thermanit Nicro 82 is predominantly used for repair identical or similar heat resistant Ni-base alloys, heat resisdent austenites, cold tough Ni-steel, and for joining heat resistant austenitic-ferritic materials.														
UTP 7015	AWS 5.11 E Ni 6182 EN ISO 14172 E NiCrFe-3	**Yield strength $R_{P0,2}$**	**Tensile strength R_m**	0,025	6,0	0,4	16,0	bal.		2,2						8,0
		400 MPa	670 MPa													
		Elongation A	**Impact strength K_V**													
		40 %	120 J (RT)													
	Characteristics and field of use	UTP 7015 is employed for repair and surfacing of nickel-base materials. UTP 7015 ist also recommended for welding different materials, such as austenitic to ferritic steels, as well as for weld claddings on unalloyed and low-alloyed steels, e.g. for reactor construction.														
UTP 6225 AL	AWS 5.11 E NiCrFe-12 (mod.) EN 14172 E Ni 6704	**Yield strength R_p**	**Tensile strength R_m**	0,2	0,1	0,6	25	bal.			0,1	1,8	0,22			10
		550 (≥ 500) MPa	740 (≥ 700) MPa													
		Elongation A5														
		15 %														
	Characteristics and field of use	UTP 6225 Al is suitable for joining high-temperature and heat resistant nickel-base alloys of identical and similar nature and high nickel containing cast alloys. The special features of the weld metal include an excellent resistance against oxidation and carburization and a good creep rupture strength. For service temperature up to 1200° C														

Surfacing electrodes for wear protection

Name	Classification	Mechanical properties of the weld metal		Composition % (All weld metal)										
		HB	HRC	C	Mn	Si	Cr	Ni	Mo	Nb	Ti	W	V	Fe
WEARstick MnCr4	EN 14700 EZ Fe9 AWS A5.13 ~ E FeMn-A	approx. 200 - 250		0,6	13,0	0,8	4,5	4,0						bal.
	Characteristics and field of use			WEARstick MnCr4 is predominantly suited for tough and crack resistant joinings and surfacings on parts of high Mn-steel subject to extreme impact, compression and shock.										
WEARstick MnCr13	EN 14700 E Fe9	approx. 260		0,7	16,5	0,8	13,5							bal.
	Characteristics and field of use			WEARstick MnCr13 is suitable for claddings on parts subject to highest pressure and shock in combination with abrasion.										
WEARstick Dur 250	EN 14700 E Fe11	approx 270		0,15	1,2	1,1	0,8							bal.
	Characteristics and field of use			WEARstick Dur 250 is used for surfacing on parts, where a tough and easily machinable deposit is required. Also suitable as cushion and filler layer on non-alloyed and low-alloyed teels and cast steels.										
WEARstick DUR 350	EN 14700 E Fe1	approx. 370		0,06	1,0	0,7	3,0							bal.
	Characteristics and field of use			WEARstick DUR 350 is particularly suited for wear resistant surfacings on Mn-Cr-V alloyed parts.										
WEARstick DUR 600	EN 14700 E Fe8		56 - 58	0,5	0,4	2,3	9,0							bal.
	Characteristics and field of use			WEARstick DUR 600 is universally applicable for cladding on parts of steel, cast steel and high Mn-steel, subject simultaneously to abrasion, impact and compression.										
WEARstick DUR 650	EN 14700 E Fe8		58 - 60	0,5	1,3	0,8	7,0		1,3	0,5				bal.
	Characteristics and field of use			WEARstick DUR 650 is suitable for cladding structural parts subject to abrasion combined with impact.										
WEARstick XD 61	AWS A5.13 ~ E FeCr-A 1 EN 14700 EZ Fe14		approx. 60	3,2		1,3	32,0							bal.
	Characteristics and field of use			WEARstick XD 61 is suited for highly wear resistant claddings on parts subject to strong grinding abrasion combined with medium impact.										
WEARstick XD 63	EN 14700 EZ Fe15		1 layer 62 2 layers 63	6,5	1,5	1,5	24,5			7,0				bal.
	Characteristics and field of use			WEARstick XD 63 is used for hardfacing of parts subject to heavy abrasion with moderate impact.										
WEARstick XD 65	EN 14700 E Fe16		approx. 65	4,5			23,5		6,5	5,5		2,2	1,5	bal.
	Characteristics and field of use			WEARstick XD 65 is suited for highly abrasion resistant claddings on parts subject to extreme sliding mineral abrasion, also at elevated temperatures up to 500 °C.										

Solid wires for repair, wear and corrosion protection

Name	Classification	Mechanical properties of the weld metal		Composition % (All weld metal)										
				C	Mn	Si	Cr	Ni	Mo	Nb	Ti	V	W	Fe
Thermanit X	AWS A5.9 ER 307 (mod.) EN ISO 14343-A W 18 8 Mn	**Yield strength $R_{P0,2}$**	**Tensile strength R_m**	0,08	6,5	0,8	19,5	9,0						bal.
		> 370 MPa	> 600 MPa											
		Elongation A												
		> 30 %												
	Characteristics and field of use	Thermanit X is suitable for particularly crack resistant joining, repair and surfacing of high-strength ferritic and austenitic steels, hard manganese steels and cold-tough steels, as cushioning layer under hard alloys, dissimilar metal joints.												
Thermanit 30/10	AWS A5.9/SFA-5.9 ER 312 EN ISO 14343-A G 29 9	**Yield strength R**	**Tensile strength R_m**	0,15	1,6	0,5	30	9						
		500 (≥ 450) MPa	≥ 750 MPa											
		Elongation A												
		20 (≥ 15) %												
	Characteristics and field of use	Thermanit 30/10 is used for welding unalloyed steels with limited weldability and low-alloyed steels of higher strength and as stress-relieved buffer layer when surfacing cold and warm machine tools.												
Thermanit 310 Mn	AWS5.9/SFA-5.9 ER310 (mod) EN ISO 1434-A G 25 20 Mn	**Yield strength R**	**Tensile strength R_m**	0,13	3,2	0,9	24,6	20,5						
		400(≥ 350) MPa	620 (≥ 55) MPa											
		Elongation A5												
		38 (≥ 20)												
	Characteristics and field of use	Thermanit 310 Mn for joining and surfacing of matching / similar heat resisting, rolled, forged and cast steel.												
Thermanit Nicro 82	AWS5.14/SFA-5.14 ERniCr-3 EN ISO 18274 S Ni 6082	**Yield strength R**	**Tensile strength R_m**	0,02	2,8	0,2	19,5	67		2,5				<0,2
		≥ 380 MPa	≥ 620 Mpa											
		Elongation A5												
		> 35												
	Characteristics and field of use	Thermanit Nicro 82 can be used for repair welding of hardly weldable steels such as heattreatable steels or tool steels. Additionally mixed joints of austenitic and ferritic materials with elevated service temperatures can be welded.												
UTP A 8051 Ti	EN ISO 1071 S C NiFe-2	**Yield strength R**	**Tensile strength R_m**	0,1	3,5			55			0,5			bal.
		> 300 MPa	> 500 MPa											
		Elongation A5												
		> 25												
	Characteristics and field of use	UTP A 8051 Ti is particularly suited for MIG/MAG welding of ferritic and austenitic nodular cast iron as well as for joining it with unalloyed and high-alloyed steels, copper and nickel alloys.												
WEARmig Dur 250	EN 14700 SZ Fe1	**Hardness HB**		w0,1	1,0	0,6	2,5		1					bal.
		250												
	Characteristics and field of use	WEARmig Dur 250 is used for MAG buildups on structural parts subject to rolling wear and where a good machinability is required.												
WEARmig DUR 450	EN 14700 SZ Fe 2	**Hardness HB**		0,7	2	0,3	1,0				0,2			bal.
		approx. 450												
	Characteristics and field of use	WEARmig A DUR 450 is suited for MAG buildups on structural parts subject to compression, impact and abrasion, such as caterpillar track components, machine and gear parts, stamps.												
WEARmig DUR 600	EN 14700 S Fe 8	**Hardness HRC**		0,5	0,5	3	9,5							bal.
		54 - 60												
	Characteristics and field of use	WEARmig DUR 600 is universally applicable for MAG buildups on structural parts subject to high impact and medium abrasion.												
WEARmig Tool 58	EN 14700 S Fe 8	**Hardness HRC**		0,36	0,4	1,1	5,2		1,4			0,3	1,3	bal.
		55 - 60												
	Characteristics and field of use	WEAR Tool 58 is universally used for MAG buildups on structural parts subject to high impact and abrasion.												

Gas shielded cored wires for wear protection

Name	Classification	Hardness		Composition % (All weld metal)												
		HB	HRC	C	Mn	Si	Cr	Ni	Mo	Nb	Ti	Cu	W	V	B	Fe
UTP 402-G	EN 14700 T Z Fe10			0,1	6,6	0,6	17,1	7,8								bal.
	Characteristics and field of use			Austenitic alloy type 18Cr8Ni7Mn recommended for build up and buffer layer prior to hard-facing. It can also be used for joining of dissimilar metals.												
FOXcore Nicro 82-T0	AWS A5.34 ENiCr3 T0-4			≤ 0.03	3,2	0,4	19,5	bal.		2,5						1,4
	Characteristics and field of use			Ni-base rutile flux-cored wire for high-quality welding of ni-base alloys and difficult to weld combinations.												
UTP FNM4-G	EN ISO 1071 T C NiFe-2	160		0,7	1,7	0,6		bal.								47,5
	Characteristics and field of use			FeNi alloy with 2% Manganese designed for joining and surfacing of cast iron pieces. Can also be used for dissimilar welding between cast iron and steel.												
UTP ROBOTIC 352	EN 14700 T Fe 1	325-375		0,25	1,75	0,55	1,7									bal.
	Characteristics and field of use			Seamless medium alloyed core wire for wear resistant applications of medium hard steels.												
UTP ROBOTIC 600	EN 14700 T Fe 8		57-62	0,45	0,4	3	9									bal.
	Characteristics and field of use			Seamless, chromium-alloyed, metal-cored wire for wear-resistant hardfacing applications on parts subject to a combination of pressure, impact and abrasion wear												
UTP ROBOTIC 601	EN 14700 T Fe 8		57-62	1,4	0,7	1,0	6,0			5,5						
	Characteristics and field of use			Seamless Cr-NB alloyed metal cored wire for hardfacing wear resisting parts subject to heavy impact and abrasion. Deposit with high but crack free hardness.												
UTP ROBOTIC 6010	EN 14700 T Fe 15		57-62	3,5	0,2	0,8	22,0			0,4						
	Characteristics and field of use			Seamless high chromium alloyed metal-cored wire for surfacing applications with Ar-CO_2 shielding gases or even without shielding gas protection. The alloy designed to resist high stress grinding abrasion with low impact. The deposits can show stress relief cracks.												
WEARcore XD NiW46	EN 14700 T Ni 20		57-62	2,8	0,1	0,1		bal.					42		0,7	1,1
	Characteristics and field of use			Hardfacing cored wire containing about 45% special tungsten carbide particles incorporated into a NiB matrix. Thanks to the high degree of preservation of the tungsten carbides in the deposit, this wire offers an outstanding resistance to abrasive wear, even in corrosive environments.												
WEARcore Dur 400-S (SAW)	EN 14700 T Fe 1		40	0,15	1,6	0,75	2	0,75						0,4		bal.
	Characteristics and field of use			Submerged arc surfacing wire for rebuilding and hard surfacing alloys of carbon steel parts.												
WEARcore Dur 58 Nb-S (SAW)	EN 14700 T Fe 8		57	1,6	0,8	0,8	6,0			8,0			1,4			bal.
	Characteristics and field of use			Sub-arc flux-cored wire designed to deposit a crack-free martensitic alloy.												

Open arc cored wires for wear protection

Name	Classification	Hardness		Composition % (All weld metal)													
		HB	HRC	C	Mn	Si	Cr	Ni	Mo	Nb	Ti	Cu	W	V	B	Al	Fe
UTP 402-O	EN 14700 T Z Fe10	160		0,09	6,0	0,9	18,0	7,8									bal.
	Characteristics and field of use			Austenitic alloy type recommended for build up and buffer layer prior to hardfacing. It can also be used for joining dissimilar metals.													
WEARcore MnCr8-O	EN 14700 T Z Fe9	240		1	17,2	0,3	8,2			2,5	0,12						bal.
	Characteristics and field of use			High Chromium – Manganese alloy enriched with Niobium, designed to resist abrasion and solid erosion wear combined with heavy impact. High Managnese alloy resulting in a workhardnable deposit.													
WEARcore MnCr13-O	EN 14700 T Fe9 after hardening	205	48-53	0,37	16,0	0,3	12,8										bal.
	Characteristics and field of use			Multi-purpose cored wire, mainly used for rebuilding and joining of Carbon and 14% manganese steels. Can also be used as buffer layer prior to hard overlay. Work-hardenable alloy													
WEARcore Dur 200-O	EN 14700 T Fe9	190		0,28	0,4	0,1										1,5	bal.
	Characteristics and field of use			Open-arc flux cored wire designed for joining and rebuilding of mild and low alloy steels. High deposition rate for applications in flat positions. Highly crack resistant and easy slag removal properties													
WEARcore 58 TiC-O	EN 14700 T Z Fe6		58	1,8	0,9	0,2	6,1		1,4		5,5						bal.
	Characteristics and field of use			Martensitic Chromium-Titanium alloy designed to resist high stress abrasion with heavy impact. Deposits usually do not relieve cracks.													
WEARcore Dur 400-O	EN 14700 T Fe1		40	0,11	0,6	0,6	2,4										
	Characteristics and field of use			Open-arc wire designed for rebuilding and hard surfacing of Carbon steel parts subjected to adhesive wear with impacts.													
WEARcore XD 60-O	EN 14700 T Fe16		60	4,5	0,6	0,7	27								0,5		bal.
	Characteristics and field of use			Self-shielded cored wire designed to deposit an alloy resistant to high stress grinding abrasion with low impact.													
WEARcore XD 62-O	EN 14700 T Fe16		63	5,4	0,2	1,3	27										bal.
	Characteristics and field of use			High Chromium alloy designed to resist high stress grinding abrasion with low impact. The deposit will show readily stress relief cracks.													
WEARcore XD 63-O	EN 14700 T Fe16		63	5,6	0,2	1,3	20,2			6,7							bal.
	Characteristics and field of use			Self-shielded flux cored wire designed to resist high stress grinding abrasion at service temperature not exceeding													
WEARcore XD 65-O	EN 14700 T Fe16		63	5,3	0,2	0,7	21,2		6,3	6,1			1,9	1,0			bal.
	Characteristics and field of use			Self-shielded flux cored wire designed to resist high stress grinding abrasion with low impact and solid erosion at service temperatures up to 650 °C													
WEARcore XD 70-O	EN 14700 T Z Fe8		70	Special Fe base alloy													
	Characteristics and field of use			Self-shielded flux cored wire designed to give an extreme resistance against high-stress-grinding abrasion and erosion without impact, hardness can be achieved in the first layer													

METALLOGRAPHIC STRUCTURES

Austenitic

Field of use & properties comments

An alloy that after solidification and cooling down to room temperature according to such micostructure is generally qualified as an austenitic one. Alloying elements stabilizing the austenite structure are most of the time Carbon, Manganese and Nickel but Chromium and Niobium might be used in combination in order to modify work hardenability and/or abrasion resistance. Austenitic alloys appreciated for building-up tasks, buffering prior overlaying with carbide containing alloys. Austenitic alloys with up to 0,7 % C and 20 - 30 (Mn + Cr) % with or without Ni, providing very stable austenite are appreciated for overlay on carbon and low alloyed steels no matter the dilution could be as well for joints on “hard to weld” steels or dissimilar joints between carbon or low alloy steels and 14 % Mn Hadfield steels. Carbon level has a relative low influence on the final hardness at room temperature. High Manganese steels should not be exposed over long time intervals to temperatures exceeding 350 °C in order to avoid any embrittlement by carbide precipitation.

Main characteristics

Usual Austenitic & Martensitic single microstructures used in overlay welding.

- Work hardenable
- Not magnetic in as cast state
- Strongly resistant to impacts
- Not prone to crack propagation
- Moderately resistant to abrasion most over in the work hardened state
- Fairly resistant to rusting
- Not hardenable by heat treatment
- Cannot be flame cut

Martensitic

Field of use & properties comments

3 subfamilies of martensitic alloys are existing: unalloyed (mainly alloyed with C & Cr), medium alloyed (alloyed with C, Cr < 11 %, Mo, W, V, Nb) & stainless grades (alloyed with min. 12 % Cr). The martensite is a microstructure out of equilibrium, obtained by rapid cooling, the faster the cooling rate, the harder the microstructure. Low carbon, unalloyed martensitic alloys are primarily used for building-up to original dimensions or for buffering prior to hardfacing with harder materials. Overlay welding with martensitic alloys (as substrate or consumable) generally require preheating (≥ 150 - 350 °C depending on chemistry and thickness concerned) in order to avoid cold cracking due inappropriate cooling rate. Medium alloyed martensitics thanks to their good tempering resistance may be used to repair welding on cold & hot working tool steels up to 500 - 550 °C.
Stainless martensitic alloys are fairly resisting to thermal shock, to wet corrosion and show a good behaviour face to adhesion and hot oxidation that makes them appreciated for overlays on caster and steel mill hot rollers and for Sulphur bearing fumes exhaust systems. These alloys don't suit for joining purposes nor used for overlaying austenitic grades.

Main characteristics

Usual Austenitic & Martensitic single microstructures used in overlay welding.

- Generally good resistance against impacts up to 0,5 % C
- Quite high resistance against compressive stresses
- High response to heat treating
- Particular good behaviour to adhesion wear (metal to metal sliding wear)
- Prone to crack propagation
- Low resistant to rusting with exception for martensitic stainless grades
- Resistant to hot oxidation up to 800 °C and to hot corrosion for stainless grades

Complex carbide microstructure with austenitic or martensitic iron matrix

Field of use & properties comments

Alloys of this family perform very well when abrasion is concerned thanks to their variable proportions of widely dispersed carbides. Therefore most of these alloys contain as main alloying elements both carbon and chromium. Low carbon (1,5 - 3 %) favours small carbides quantities related to the matrix so they exhibit good abrasion resistance combined with a good thoughness properties making them capable to make a good compromise when both shocks and abrasion are present.
Increased level of carbon (up to 6 - 7 %), allow to boost the carbide number and sizes while the matrix progressively loses its toughness. As consequence of this, relief check cracks appear more frequently and are closer from each other's. With a few exceptions requiring specific procedures, it is generally preferred to use these alloys on substrates buffered with austenitic layers avoiding check cracks to move to the base material. The risk of spalling associated with check cracks and high hardness imposes to minimise the number of layers to 3 or 4. Combination of large and small carbides sizes allow to extend the abrasion wear resistance to fine abrasive particles.

Main characteristics

- Highly resistant to abrasion under low & high compressive stresses
- Moderate to low resistance to impacts
- Fairly resistant to corrosion
- Good resistance to heat
- Only machinable by grinding
- May develop relief check cracks
- Cannot be flame cut

HARDNESS CONVERSION TABLE

R_m = Tensile strength (MPa)
HV = Vickers hardness
HB = Brinell hardness
HRC = Rockwell hardness

R_m	HV	HB	HRC
200	63	60	-
210	65	62	-
220	69	66	-
225	70	67	-
230	72	68	-
240	75	71	-
250	79	75	-
255	80	76	-
260	82	78	-
270	85	81	-
280	88	84	-
285	90	86	-
290	91	87	-
300	94	89	-
305	95	90	-
310	97	92	-
320	100	95	-
330	103	98	-
335	105	100	-
340	107	102	-
350	110	105	-
360	113	107	-
370	115	109	-
380	119	113	-
385	120	114	-
390	122	116	-
400	125	119	-
410	128	122	-
415	130	124	-
420	132	125	-
430	135	128	-
440	138	131	-
450	140	133	-
460	143	136	-
465	145	138	-
470	147	140	-
480	150	143	-
490	153	145	-
495	155	147	-
500	157	149	-

R_m	HV	HB	HRC
545	170	162	-
550	172	163	-
560	175	166	-
570	178	169	-
575	180	171	-
580	181	172	-
590	184	175	-
595	185	176	-
600	187	178	-
610	190	181	-
620	193	184	-
625	195	185	-
630	197	187	-
640	200	190	-
650	203	193	-
660	205	195	-
670	208	198	-
675	210	199	-
680	212	201	-
690	215	204	-
700	219	208	-
705	220	209	-
710	222	211	-
720	225	214	-
730	228	216	-
740	230	219	-
750	233	221	-
755	235	223	-
760	237	225	-
770	240	228	-
780	243	231	21
785	245	233	
790	247	235	
800	250	238	22
810	253	240	
820	255	242	23
830	258	245	
835	260	247	24
840	262	249	
850	265	252	

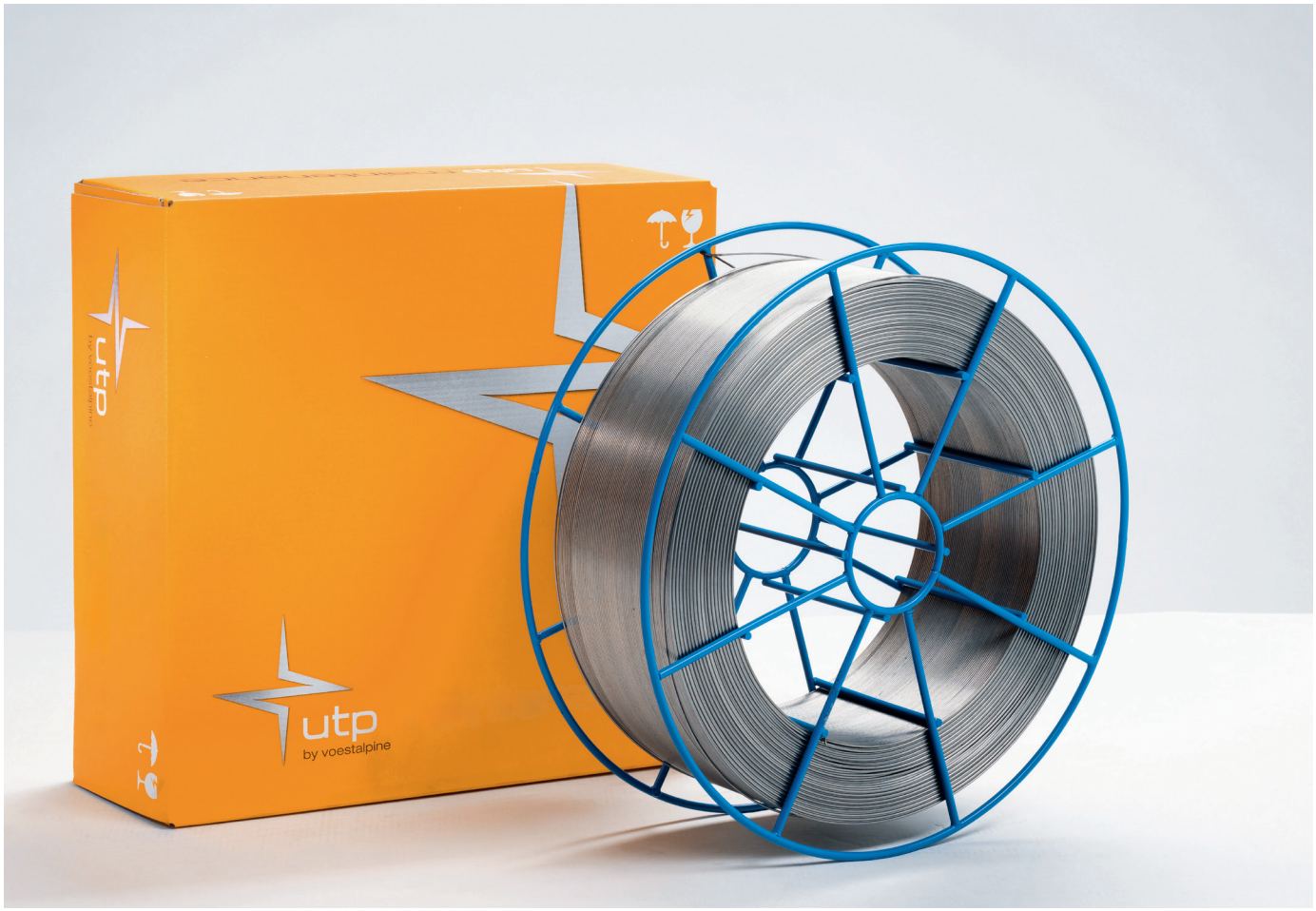
R_m	HV	HB	HRC
890	278	264	
900	280	266	27
910	283	269	
915	285	271	
920	287	273	28
930	290	276	
940	293	278	29
950	295	280	
960	299	284	
965	300	285	
970	302	287	30
980	305	290	
990	308	293	
995	310	295	31
1000	311	296	
1010	314	299	
1020	317	301	32
1030	320	304	
1040	323	307	
1050	327	311	33
1060	330	314	
1070	333	316	
1080	336	319	34
1090	339	322	
1095	340	323	
1100	342	325	
1110	345	328	35
1120	349	332	
1125	350	333	
1130	352	334	
1140	355	337	36
1150	358	340	
1155	360	342	
1160	361	343	
1170	364	346	37
1180	367	349	
1190	370	352	
1200	373	354	38
1210	376	357	
1220	380	361	

R_m	HV	HB	HRC
510	160	152	-
520	163	155	-
530	165	157	-
540	168	160	-
1260	392	372	40
1270	394	374	
1280	397	377	
1290	400	380	
1300	403	383	41
1310	407	387	
1320	410	390	
1330	413	393	42
1340	417	396	
1350	420	399	
1360	423	402	43
1370	426	405	
1380	430	409	
1390	431	410	
1400	434	413	44
1410	437	415	
1420	440	418	
1430	443	421	45
1440	446	424	
1450	449	427	
1455	450	428	
1460	452	429	
1470	455	432	
1480	458	435	46
1485	460	437	
1490	461	438	
1500	464	441	
1510	467	444	
1520	470	447	
1530	473	449	47
1540	476	452	
1550	479	455	
1555	480	456	
1560	481		
1570	484		48
1580	486		
1590	489		
1595	490		
1600	491		
1610	494		

R_m	HV	HB	HRC
860	268	255	25
865	270	257	
870	272	258	26
880	275	261	
1620	497		49
1630	500		
1640	503		
1650	506		
1660	509		
1665	510		
1670	511		
1680	514		50
1690	517		
1700	520		
1710	522		
1720	525		
1730	527		51
1740	530		
1750	533		
1760	536		
1770	539		
1775	540		
1780	541		
1790	544		52
1800	547		
1810	550		
1820	553		
1830	556		
1840	559		
1845	560		53
1850	561		
1860	564		
1870	567		
1880	570		
1890	572		
1900	575		
1910	578		54
1920	580		
1930	583		
1940	586		
1950	589		
1955	590		
1960	591		
1970	594		

R_m	HV	HB	HRC
1230	382	363	39
1240	385	366	
1250	388	369	
1255	390	371	
1980	596		55
1990	599		
1995	600		
2000	602		
2010	605		
2020	607		
2030	610		
2040	613		
2050	615		56
2060	618		
2070	620		
2080	623		
2090	626		
2100	629		
2105	630		
2110	631		
2120	634		
2130	636		
2140	639		57
2145	640		
2150	641		
2160	644		
2170	647		
2180	650		
2190	653		
2200	655		58
	675		59
	698		60
	720		61
	745		62
	773		63
	800		64
	829		65
	864		66
	900		67
	940		68

Caution: Because of their approximate nature, conversion tables must be regarded as only an estimate of comparative values. It is recommended that hardness conversions be applied primarily to values such as specification limits, which are established by agreement or mandate, and that the conversion of test data be avoided whenever possible.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Lasting Connections – Perfect alignment of welding machines, consumables and technologies combined with our renowned application and process know-how provide the best result for your requirements: A true and proven connection between people, products and technologies. The result is what we promise: The Perfect Weld Seam for Lasting Connections.

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In-Depth Know-How – As a manufacturer of soldering and brazing consumables, we offer proven solutions based on 60 years of industrial experience, tested processes and methods, made-in-Germany. This in-depth know-how makes us the internationally preferred partner to meet your soldering and brazing challenge through innovative solutions. The result is what we promise: Innovation based on in-depth know-how.

The Management System of voestalpine Böhler Welding Group GmbH, Peter-Mueller-Strasse 14-14a, 40469 Duesseldorf, Germany has been approved by Lloyd's Register Quality Assurance to: ISO 9001:2015, ISO 14001:2015, OHSAS 18001:2007, applicable to: Development, Manufacturing and Supply of Welding and Brazing Consumables.
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