



**SIROLLS**™

**sij** | ravne systems

**FORGED  
PRODUCTS**  
FOR ALUMINIUM INDUSTRY

SIJ Ravne Systems has considerable experience and a long tradition in producing forged products for cold rolling mills, and much more. We manufacture all kinds of through hardened and surface hardened rolls for cold rolling. 400 years of production tradition is supported by ISO quality certificates.

## **TYPES OF PRODUCTS PRODUCED BY SIJ RAVNE SYSTEMS FOR THE ALUMINUM INDUSTRY:**

- Forged rolls for cold rolling mills
- Forged rolls for foil rolling mills
- Roll cores for continuous strip casting
- Shells for continuous strip casting, etc.

## **FORGED ROLLS**

### **Dimensional range of roll production:**

- Up to 800 mm (31.5") in diameter
- Up to 5,500 mm (216") in length
- Up to 8,000 kg (18,000 lbs) in weight

### **Key characteristics of rolls:**

- Application of ultra-clean steels
- Application of steels developed specifically for cold rolling
- Computerized guidance and control of the volume and surface heat treatment processes
- Permanent and sustained efforts to improve the quality and application of rolls in the form of research and development
- Application of modern NDT inspection methods
- Independent quality assurance system
- Partnership relations with customer-based experience

Rolls are produced from special alloyed tool steels which are made by using electric arc furnace with advanced vacuum technology processes or by an additional electroslag remelting process (ESR).

**We guarantee uniform hardness in the range +/-0.5 HRC.**



## SURFACE HARDENED ROLLS

We produce all types of rolls (within our dimensional range) for all types of rolling mills.

For the rolls produced by SIJ Ravne Systems, we guarantee the hardness of the entire hardened layer according to the steel used and optimal mechanical properties.

Our forged rolls withstand high pressure and are characterized by uniform hardness within +/- 0.5 HRC throughout the working barrel and a homogeneous steel microstructure.

Hardness drop throughout the hardened layer is max. 3%.

### Our rolls offer:

- Higher productivity
- High reliability
- Safety in operation
- Finer surface quality
- Higher rolling rate
- Positive influence on TCO

### Which is achieved by:

- A combination of the best steel grades
- State-of-the-art heat treatment equipment
- Precise machining
- Multi-step inspection of each roll
- Continuous investment into the development of new grades

We have our own heat treatment facilities for optimal mechanical properties – optimal working hardness is guaranteed by a **bi-frequency** induction hardening machine which was developed, designed and produced in-house.

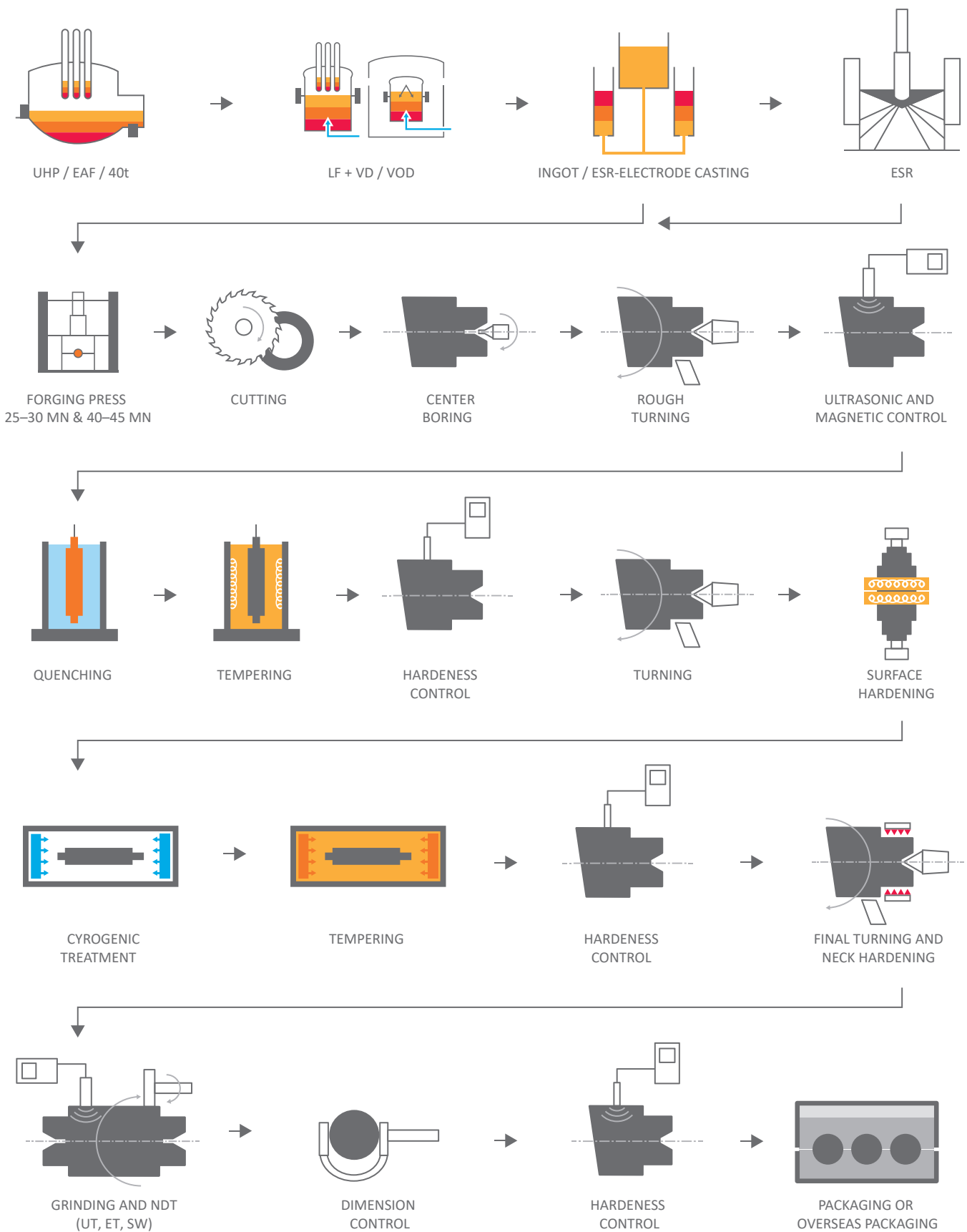
**A highly advanced 3-D induction hardening machine** (manually adjustable induction frequency) for the best mechanical characteristics of roll necks.

**Cryogenic treatment** – a step forward in the heat treatment hardening process, which completes the transformation of the steel microstructure from austenite to a stronger martensitic structure with greater hardness. Steel hardness increases by raising the percentage of martensite in the steel structure – hence, wear resistance increases as it correlates positively with hardness.

Surface hardened rolls are made from high-quality steels and in accordance with customer requirement.



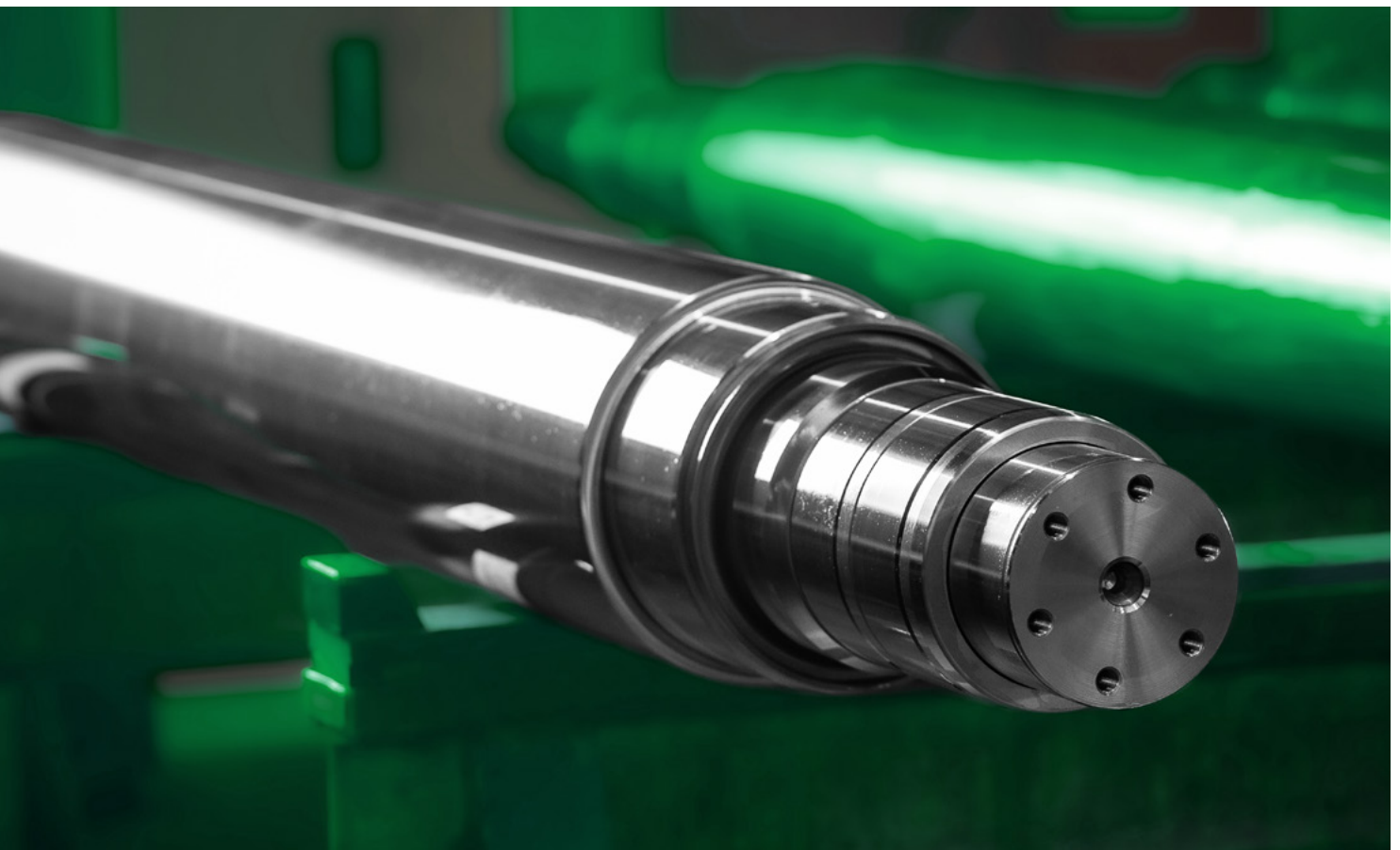
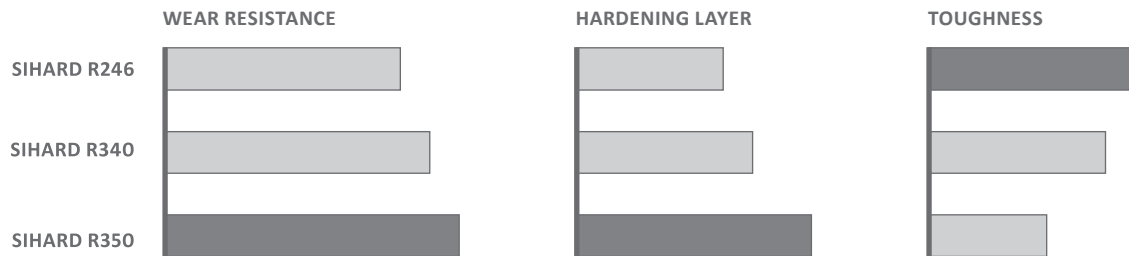
## ROLL PRODUCTION FLOWCHART – SURFACE HARDENED



## MOST FREQUENTLY USED STEEL GRADES

Ravne brand name	W.Nr.	DIN	Directional Chemical Composition (%)						
			C	Si	Mn	Cr	Mo	Ni	V
SIHARD 2327	1.2327	86CrMoV7	0.85	0.40	0.40	1.80	0.25		0.10
SIHARD 2375	1.2375	83CrMoV9	0.88	0.30	0.40	2.15	0.35		0.10
SIHARD R246	/	/	0.85	0.85	0.65	3.10	0.50	0.40	0.10
SIHARD R247	/	/	0.83	0.85	0.35	3.00	0.35	0.50	0.10
SIHARD R340	/	/	0.83	0.80	0.35	4.00	0.50	0.30	
SIHARD R350	/	/	0.82	0.80	0.30	5.00	0.30		
SIHARD R342	/	/	0.80	0.40	0.40	4.00	0.35	0.50	0.10

Comparison of the main properties:



## FORGED ROLLS FOR FOIL

**Our customer reaches the highest speed of production with our rolls for foil, up to – 2000 m per minute.**

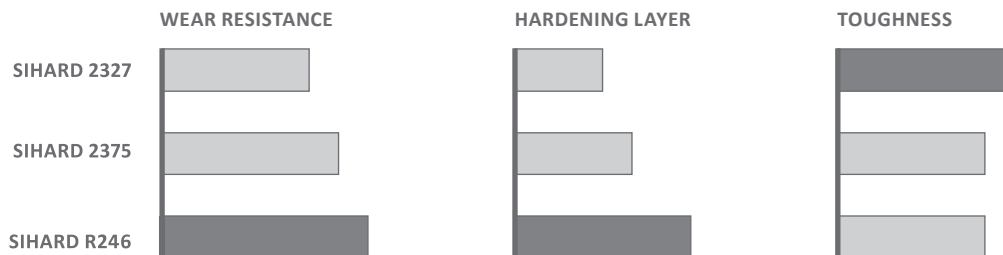
- Suitable for the highest rolling speeds and loads
- Meets the highest demands for surface quality
- High-quality and high-speed rolling of foil down to 4.5 microns

Special ESR technology for the production of ultra-clean steel glades, optimized for the cold rolling of foil. Second refining, combined with our heat treatment technology, gives optimal results:

- The cleanest steel available on the market (DIN 50602 method K, K1 <5)
- Dense structure without porosity, greater cleanliness, homogenous structure and chemical analysis of the whole roll
- Concentricity between the barrel and bearing seats in tolerances of  $\leq 0.005$ , or  $\leq 0.002$  mm if required

Ravne brand name	Roll nomenclature	W.Nr.	DIN	C	Si	Mn	Cr	Mo	Ni	V
SIHARD 2327	2% Cr steel	1.2327	86CrMoV7	0.85	0.40	0.40	1.80	0.25		0.10
SIHARD 2375	2% Cr steel	1.2375	83CrMoV9	0.88	0.30	0.40	2.15	0.35		0.10
SIHARD R246	3% Cr steel	/	/	0.85	0.85	0.65	3.10	0.50	0.40	0.10

Comparison of the main properties:



## OTHER PRODUCTS PRODUCED BY SIJ RAVNE SYSTEMS FOR ALUMINIUM INDUSTRY:

- Shells for continuous strip casting
- Roll cores for continuous strip casting



## SIJ RAVNE SYSTEMS PRODUCTS AND SERVICES OVERVIEW:

- Complete assembled equipment
- Subassemblies
- Components
- Spare parts
- Industrial knives for hot and cold rolling mills
- Wear plates and liners
- Complete package of services, including maintenance, reconstruction, and revamping

## IN-HOUSE R&D DEPARTMENT

We are continuously working to find optimal solutions for our customers according to their requirements and applications. Our inhouse R&D department has over 30 employees, and our modern testing equipment allows us to develop and implement turn-key capex projects to meet even the most complex and technically demanding tasks and requirements of our customers.

- Problem solving - unique products and solutions
- Innovative products outperforming the average supplier on the market
- Development and testing of new steel grades as a result of the SIJ Group's vertical integration

## IN-HOUSE ACCREDITED LABORATORIES

SIJ Ravne Systems also has many well-respected accredited laboratories with highly qualified staff, who perform a wide range of calibrations, tests and inspections according to SIST EN ISO/IEC 17025:2017 and SIST EN ISO/IEC 17020. The services provided by our laboratories are all carried out in line with accredited internal procedures, which conform to international standards.

### Our main services include:

- Calibration of length gauges and instruments, including shape and roughness testing
- Calibration of mechanical quantities: hardness, torque, force, etc.
- Non-destructive testing using RT, MT, PT, UT and VT methods
- Ultrasonic measuring instrument inspection
- Residual stress measurement



## WHY SIJ RAVNE SYSTEMS?

Perfect quality, excellent service and the desire to build a longterm partnership. This is who we are – SIJ Ravne Systems, your reliable partner.

- A unique combination of metallurgical and engineering know-how.
- The highest product quality as a result of tight integration in a vertical chain, from steelmaking to the final product.
- Rolls made from ultra-clean steel as a result of the ESR method.
- In-house accredited laboratories performing a wide range of tests, inspections and calibrations.
- The ability to offer a complete package of products and services for the steel mills; from complete assembled equipment, subassemblies, components, spare parts and industrial knives for metal, to maintenance, reconstruction and revamping.



OUR PRODUCTS  
HAVE EU ORIGIN

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