PRIMETALS TECHNOLOGIES
PIONEERS AT HEART

PRIMETALS
TECHNOLOGIES

> **Our customers in the metals industry are at the center of what we do. We innovate on their behalf to ensure their long-term profitability.”**
>
> Koji Sakatani
> Chief Executive Officer

KOJI SAKATANI
CEO of Primetals Technologies

COMMITTED TO **EXCELLENCE**

OUR COMMITMENT

The Board, the leadership team, and the entire staff of Primetals Technologies care deeply about their customers in the steel industry. From the start of the company in 2015, intense customer focus has always been at the company's core. The many innovations of Primetals Technologies are targeted directly toward resolving those pressing issues that the steel producers of today are facing.

The mission of Primetals Technologies is to provide optimal support to metals producers around the world in all kinds of scenarios: from turnkey projects and the installation of new production lines to upgrades and maintenance services, Primetals Technologies builds close partnerships with steel manufacturers worldwide to ensure that their operations remain profitable for years to come.

A PASSION FOR **INNOVATION**

PIONEERS AT HEART

At Primetals Technologies, we are determined to explore new frontiers. We are driven to pioneer new solutions in metals production. Innovation is part of our DNA. Our curiosity fuels our passion to find new solutions. We strive to establish exceptional, future-oriented ways to produce steel, aluminum, and other metals.

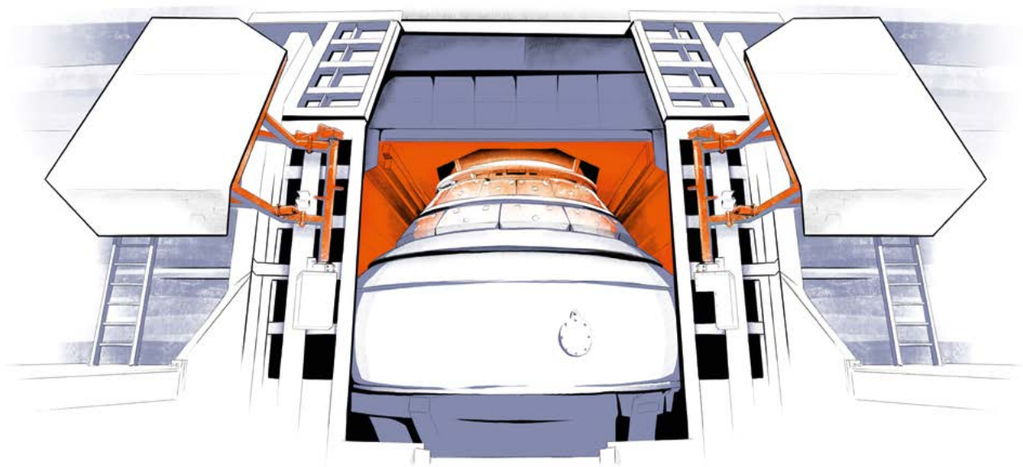
Our extensive R&D efforts are directed toward advanced and future-oriented solutions—solutions that will maximize the efficiency, reliability, and environmental compatibility of tomorrow's metals-production facilities. And because we are all on the road to Industry 4.0, we are continually refining and extending our portfolio of technologies that will give steel producers a head start on their journey toward the smart plant of the future.

At Primetals Technologies, we are pioneers at heart—innovators with passion.

Digitalization is changing metals production, and we are changing with it. The frontiers of today are vastly different from those of yesteryear, and our dedication is to what's to come. In an ever-changing environment, delivering solutions, continuous innovation, and an unwavering commitment to our customers are the cornerstones of our philosophy. We are pioneers at heart—tireless innovators with an absolute passion for metals production.

PIONEERING **THE FUTURE**

Primetals Technologies is continually developing new solutions for its customers in the metals industry. Over time, the company has achieved many world-renowned technological breakthroughs, some of which are highlighted here.



REVOLUTIONIZING STEELMAKING

LD steelmaking forever changed the way in which steel is produced: the majority of the output of today's steel plants is based on the process also known as the "basic oxygen furnace" (BOF) production process. "LD" stands for "Linz-Donawitz," and it is the two cities that make up this name where the groundbreaking innovation was developed—by engineers of Primetals Technologies' Austrian-based predecessor company VÖEST.

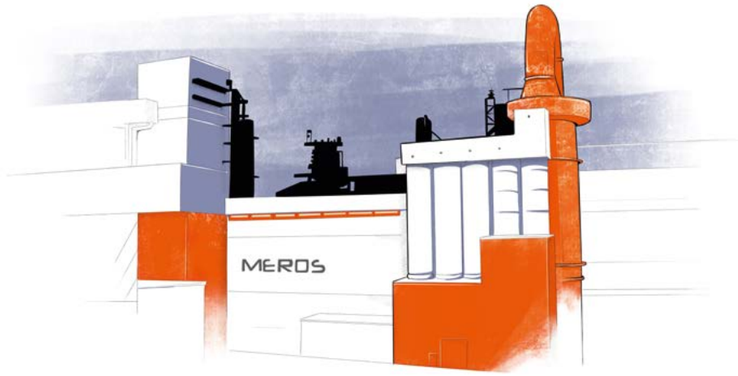
INNOVATION POWER

TRANSPARENCY FOR STEEL PLANTS

"Through-Process Optimization," TPO for short, is a process optimization system that brings transparency to integrated steel plants and minimills. TPO covers all parts of the metals-production chain—from the hot metal all the way to the strapped coil.

TAKING CARE OF AIR QUALITY

MEROS is a highly advanced dry off-gas cleaning system for sinter and pelletizing plants that relies on a series of treatment steps, in which dust and other harmful components are removed from the off-gas, all the while realizing a water-free working principle.



BETTER ROLLING WITH SMALLER ROLLS

The Hyper UCM (Universal Crown Control Mill) is a highly innovative cold-rolling mill that is designed to work with rolls 20–30% smaller than those used in the predecessor model and can roll thinner gauges of higher-strength material with fewer rolling stands.

MEETING TODAY'S **CHALLENGES**

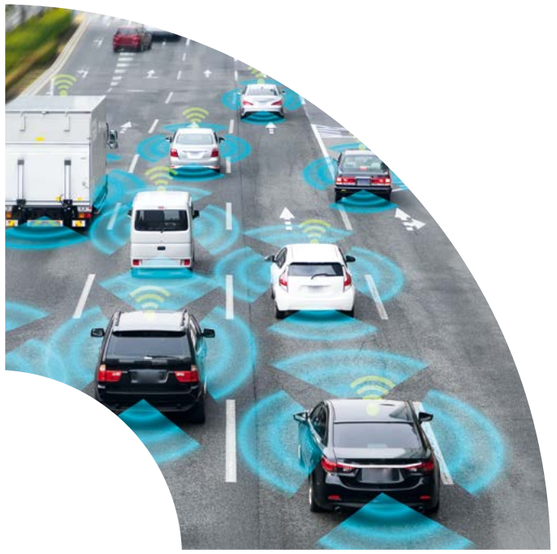
Primetals Technologies is closely monitoring global developments in order to pioneer the solutions that the steel industry will require in the world of tomorrow. Four of today's megatrends indicate the direction the company is taking in terms of its R&D work and business strategy.

TODAY'S CHALLENGES

MASS URBANIZATION

With mass urbanization on the rise, Primetals Technologies expects that investments in construction projects will double from 2015 to 2035. For the steel industry, this means that new steel grades for high-performance applications will be required, for example for construction projects that involve especially effective thermal and acoustic insulation. In hot and humid environments, there will be a growing need for steels with further improved corrosion resistance. The development of steel composites will have to be promoted, and super-tall buildings and very long bridges will necessitate new special steels to support their design.

- Increased investment in construction
- Steels for new architectural designs



GREENER MOTORIZATION

Projections assume a further increase in worldwide car ownership, which in itself would be good news for the steel industry. However, cars based on the internal combustion engine will eventually be replaced by electric models that are more environmentally friendly and more lightweight. As a consequence, steel strip for the automotive industry will have to become increasingly thinner and lighter without compromising on strength. This development will significantly lower the CO_2 footprint of future cars. Silicon steels will also grow in importance, because they are essential for the advanced motors found in latest-design electric vehicles.

- Increase in worldwide car ownership
- Lighter and harder automotive steels

4TH INDUSTRIAL REVOLUTION

Terms such as "Digitalization" and "Industry 4.0" are indicative of a massive shift in how industrial goods will be produced. Increased automation will not only transform the labor market but also impact the metals industry in terms of the production technologies used. Primetals Technologies is continually developing sophisticated digital solutions to support metals producers in staying ahead of the curve and addressing the challenges raised by the 4th Industrial Revolution.

- Increased industrial automation
- Transformation of the labor market

GLOBAL CLIMATE ACTION

Figures from 2018 show that the metals industry is responsible for around 8% of all CO_2 emitted worldwide. For every ton of steel produced via the integrated route, about 1.9 tons of CO_2 are released into the atmosphere. The steel industry will be dependent on effective and efficient solutions for making steel production substantially greener than today. In addition to the existing ECO Solutions of Primetals Technologies, it is clear that the company must—and will—continue to innovate for nature.

- Stricter environmental regulations
- New and innovative ECO Solutions

HIGHLY ADVANCED **TECHNOLOGIES**

The uniquely comprehensive portfolio of Primetals Technologies covers all aspects of metals production, with numerous outstanding solutions for each step of the steel-production chain. This overview showcases some of the most remarkable innovations Primetals Technologies has created to date.

IRONMAKING

Midrex DRI plants
... represent the world's leading technology for the production of direct-reduced iron.

Circular Pelletizing
... realizes high-quality, power-efficient pelletizing in a plant half the size of conventional facilities.

STEELMAKING

Vaicon Stopper
... ensures minimal slag carry-over by pneumatically sealing the tap hole when tapping ends.

EAF Quantum
... is designed to pre-heat 100% of the used scrap for higher furnace output and lower power consumption.

CONTINUOUS CASTING

Single-Roll DynaGap
... controls the roll gap at every single caster-segment roll for minimal center segregation.

DynaJet Flex Nozzle
... enables an enhanced cooling strategy for a reduction of cracks at the edges of the cast slabs.

HOT ROLLING

Pair-Cross Mill
... achieves excellent crown control by slightly crossing the axes of the upper and lower rolls.

Cooling Technologies
... are an integral part of the portfolio with innovations like Power Cooling and Mulpic.

COLD ROLLING

Hyper UCM
... is the evolution of the Universal Crown Control Mill and can roll material of even higher strength.

Minimum Q Lubrication
... intelligently controls the thickness of the oil film on work rolls for lower rolling forces.

STRIP PROCESSING

iBox Pickling Line
... delivers high descaling performance without the need for circulation heating or jet nozzles.

Laser-Welder Solutions
... can work as both a welder and a cutter in combination with many advanced steel grades.

PORTFOLIO HIGHLIGHTS

COMBINED TECHNOLOGIES
... use synergies between individual process steps to create uniquely powerful solutions.

Arvedi Endless Strip Production (ESP)
... combines endless thin-slab casting and rolling in one innovative layout.

WinLink for Minimills
... enables the endless or semi-endless rolling of long products directly after the liquid phase.

ACHIEVING DIGITAL **ORCHESTRATION**

The Metals Orchestra is a concept developed by Primetals Technologies for the advancement of comprehensive digitalization in steel production. Just like players in an orchestra, all of a plant's production equipment needs to be synchronized—through smart solutions that connect to all aggregates and enable them to work in harmony.

An orchestra can only be as good as the sum of its individual players. That is why it's so important for every single musician to attain a certain level of proficiency, which depends on both talent and training. The same is true for the numerous aggregates in a steel plant. In order to manufacture top-quality end products, all equipment must be good enough to support the overarching goal. Sometimes, certain parts have to be upgraded. In other cases, the interplay of distinct sections needs to be optimized.

Equally important as the skill of the players is a competent and experienced conductor. In the Metals Orchestra of Primetals Technologies, the conductor is represented by the "Digital Unity" of three intelligent systems: Through-Process Optimization (TPO), Maintenance and Asset Technology (MAT), and a Production Management System (PMS). These three Industry 4.0 solutions, which are discussed in more detail below, ensure that all equipment "plays in unison" by virtue of now being digitally orchestrated.

METALS ORCHESTA

TPO

THROUGH-PROCESS OPTIMIZATION

One part of the "conductor" in the Metals Orchestra, the Through-Process Optimization (TPO) solution is capable of tracking and evaluating every single product manufactured in a steel plant. TPO enables extensive quality control, KPI-based benchmarking, smarter root-cause analysis in the case of deviations, and faster product development. Primetals Technologies is continually refining its machine-learning algorithms to make TPO even more powerful in the future.

MAT

MAINTENANCE AND ASSET TECHNOLOGY

Maintenance and Asset Technology (MAT) from Primetals Technologies is a system for the intelligent management of all maintenance-related assets, and can do much more than just cost tracking and maintenance scheduling. By applying Industry 4.0 principles to maintenance management, MAT delivers intelligence that transforms maintenance activities from a burdensome cost factor into a strategic advantage for more effective and streamlined plant operations.

PMS

PRODUCTION-MANAGEMENT SYSTEM

The state-of-the-art Production Management System (PMS) provided by Primetals Technologies covers the entire steel production process, from iron- and steelmaking to rolling and processing to the shipping of final products. The PMS ensures optimal plant and equipment utilization, and takes care of raw-material and inventory management. Its smart functionality leads to streamlined logistics, shorter order-turnaround times, and the ability to anticipate future demand.

THE SMART PLANT
OF THE FUTURE

The smart steel plant is a major step into the future of metals production. Everything produced at the plant is constantly monitored, tracked, and evaluated, resulting in seamless production documentation for every single order. End products can be tailored to even more specific customer requests. The smart plant enables producers to obtain input materials from a multitude of sources, as the manufacturing chain can be more easily adjusted to accommodate changes in raw-material quality. Efficiency improvements lead to benefits like lower energy consumption and a reduction in human labor, and environmental friendliness is significantly increased.

Primetals Technologies has pioneered many cutting-edge digital solutions over time, and continues to advance and extend its portfolio of interconnected Industry 4.0 technologies. All of these innovations combined result in more intelligent steel production—with the plant able to determine its own state, and learn from its own assessments and analyses over time. Primetals Technologies believes that the smart plant of the future is not just a vision, it is a certainty. It will make the life of steel producers much easier, thanks to more streamlined processes, advanced production scheduling, better quality control, and much swifter product development.

THE DIGITAL STEEL PLANT

MORE TRANSPARENT PROCESSES

Smart sensors provide essential information about the processes taking place inside the production facility. They either directly measure physical values or use preexisting data to calculate additional information, leading to greater transparency.

FOCUSING ON THE ESSENTIAL

Repetitive, labor-intensive, and dangerous work is supported by fully automated robots, mechatronics solutions, and assistance systems. These solutions free up staff to focus on those tasks where human input is absolutely required.

ZERO UNPLANNED DOWNTIME

Predictive maintenance has several benefits: it significantly reduces the overall maintenance effort and enables steel producers to rule out any unplanned downtime, thereby optimizing plant performance and costs at the same time.

THE PLANT'S DIGITAL TWIN

The "digital twin" of a steel plant represents the next generation of model-based process control. It can be used online to optimize the production facility, and offline for the simulation and development of new production strategies.

MONITORING THE STATE OF THE PLANT

Comprehensive information about the condition of both equipment and the associated processes enables predictive maintenance. Plant availability is dramatically improved, and plant productivity is also raised considerably.

ARTIFICIAL INTELLIGENCE

The smart plant of the future makes use of artificial-intelligence (AI) functions to learn from previous states. It can draw conclusions from past events, improve processes, and make suggestions to human operators. AI is a major step into the future of steel production.

ECO SOLUTIONS FOR GREENER STEEL PRODUCTION

The ECO Solutions of Primetals Technologies represent a major contribution to greener steel production. They consist of services and advanced technologies that minimize the environmental impact of steel production, improve energy efficiency, and optimize by-product management. Primetals Technologies offers expert consulting services, advanced processes, and holistic solutions along the entire iron and steel production chain. The ECO Solutions portfolio is designed to ensure that even the most stringent emission regulations are followed and support steel producers in achieving substantial cost savings. The objective is always two-fold: to save resources and create value.

GREEN PRODUCTION

SAVING RESOURCES

- Optimized use of raw materials
- Lower energy consumption
- Reduced particulate and gaseous emissions
- Efficient by-product handling
- Improved by-product recycling

CREATING VALUE

- Reduced environmental taxes and disposal costs
- Improved energy recovery
- Lower operating costs
- Value gain for by-products
- Better working conditions and improved safety

FROM THE ECO SOLUTIONS PORTFOLIO

MEROS

The sinter off-gas cleaning system for a 99% reduction in emissions

EAF ENERGY RECOVERY SYSTEM

The solution that turns EAF waste heat into steam, hot water, or electrical energy.

DRY SLAG GRANULATION

The blast-furnace innovation that transforms slag into an energy source and a valuable by-product

ASSET MANAGEMENT

ASSET-PRODUCTIVITY **MAXIMIZATION**

A thorough knowledge of what goes on in a plant is crucial for any steel producer; as is making this information available to those who need it, when they need it. The Maintenance and Asset Technology (MAT) from Primetals Technologies is designed to guide all maintenance-related activities by providing maintenance staff with customized, knowledge-based support. All instructions given by MAT are aligned with the core maintenance strategy of the respective steel producer. Other important aspects of asset productivity are plant upgrades and modernization projects. In many cases, they can provide more economic alternatives to building a new facility from scratch. Plant modernization, which can often be executed during scheduled plant downtimes, preserves existing value from previous investments and extends plant lifetime. Primetals Technologies offers many more solutions that promote asset productivity and continues to extend its portfolio in this area.

PLANT AND BUSINESS **DEVELOPMENT**

How can an entrepreneur best break into the metals business? What steps should a veteran steel producer take to improve operations, make portfolio adjustments, and find the right market segments to maximize profitability? The specialists at Primetals Technologies have decades of experience, both in building greenfield metals-production plants and in providing the proper guidance when new opportunities for established producers arise—for instance the manufacture of advanced high-strength steels. In all of these scenarios, detailed market analysis and technology-oriented consulting are required. Primetals Technologies offers support in project development at the earliest stages, opportunity and feasibility studies, environmental concepts and solutions, process- and technology-related know-how, and logistics optimization. These services are all possible thanks to Primetals Technologies' vast application knowledge and its uniquely innovative solutions.

BUSINESS DEVELOPMENT

A WIDE RANGE OF SERVICES

The service specialists of Primetals Technologies strive to ensure that all customer needs are optimally met—from spare parts and upgrades to the actual execution of maintenance tasks. Experts take care of any mechanical or hydraulic issues a metals producer is facing and help to eliminate problems related to the mechatronics or Electrics and Automation aspects of a plant.

SERVICES PORTFOLIO

SPARE PARTS AND COMPONENTS

Readily available, high-quality spare parts are a crucial factor in maintaining the smooth operation of a plant. Primetals Technologies always selects the most reliable and cost-efficient components.

REVAMPS AND UPGRADES

With decades of experience in building and upgrading metals-production facilities, Primetals Technologies provides the advanced and innovative solutions required to boost plant performance.

TROUBLESHOOTING AND REPAIRS

In the event of an unexpected shutdown, Primetals Technologies will support its customers with prompt expert assistance. All repairs are conducted quickly and responsibly by experienced specialists.

MAINTENANCE EXECUTION

Primetals Technologies' global network of highly skilled service experts, with dedicated workshops in numerous locations, helps to avoid plant downtime and lower maintenance-related expenditures.

TECHNICAL ASSISTANCE

Primetals Technologies' service engineers will happily team up with a steel producer's own staff to detect, analyze, and fix any open issues that negatively affect plant performance and product quality.

PLANT EVALUATION

Changing market conditions can force steel producers to re-evaluate their plant's capability and make portfolio adjustments. Primetals Technologies helps determine the correct measures for sustained success.

CONSULTING SERVICES

Primetals Technologies offers comprehensive consulting and technical assistance as part of its operational-support package. Experts will provide the information needed to make the right investments.

TRAINING SESSIONS

In order to support steel producers in keeping the skills of their employees up-to-date, Primetals Technologies has developed specialized training sessions to share its expertise with customers.

E-SERVICES

The m.space web platform makes it even easier to procure services from Primetals Technolgies. m.space represents the company's commitment to creating innovative digital solutions for the metals industry.

A GLOBAL NETWORK

Spanning the globe with 65 locations in 23 countries—including workshops and sales offices—Primetals Technologies is always at your service, combining decades of experience in all fields of metals production with in-depth knowledge of market-specific requirements. We have formed long-lasting relationships with countless partners in the industry and constantly engage the scientific community as we strive for metals excellence.

GLOBAL NETWORKS

23
COUNTRIES
where we are located

80
INDUSTRY AND SCIENTIFIC RESEARCH PARTNERS

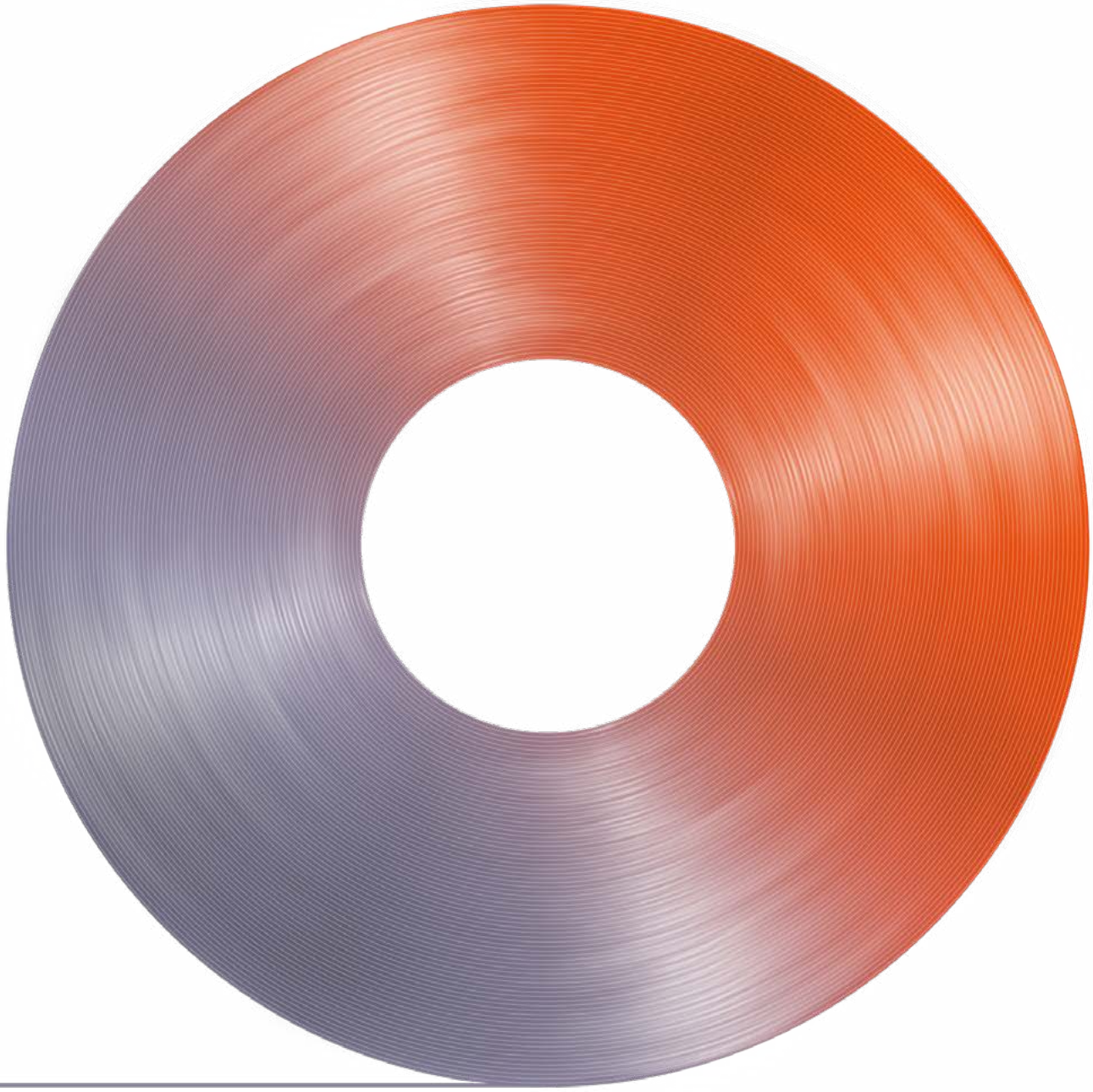
7000 +
REFERENCES
in the last 60 years

70 +
YEARS OF EXPERIENCE
in metallurgical plant building

Primetals Technologies, Limited
A Group Company of
Mitsubishi Heavy Industries

Chiswick Park, Building 11
566 Chiswick High Road
London, W4 5YA
United Kingdom

contact@primetals.com
primetals.com



© Copyright 2022 Primetals Technologies, Limited

Designations used in this document may be trademarks, the use of which by third parties for their own purposes could violate the rights of the trademark owners.

T10-0-N016-L9-I-V13-EN