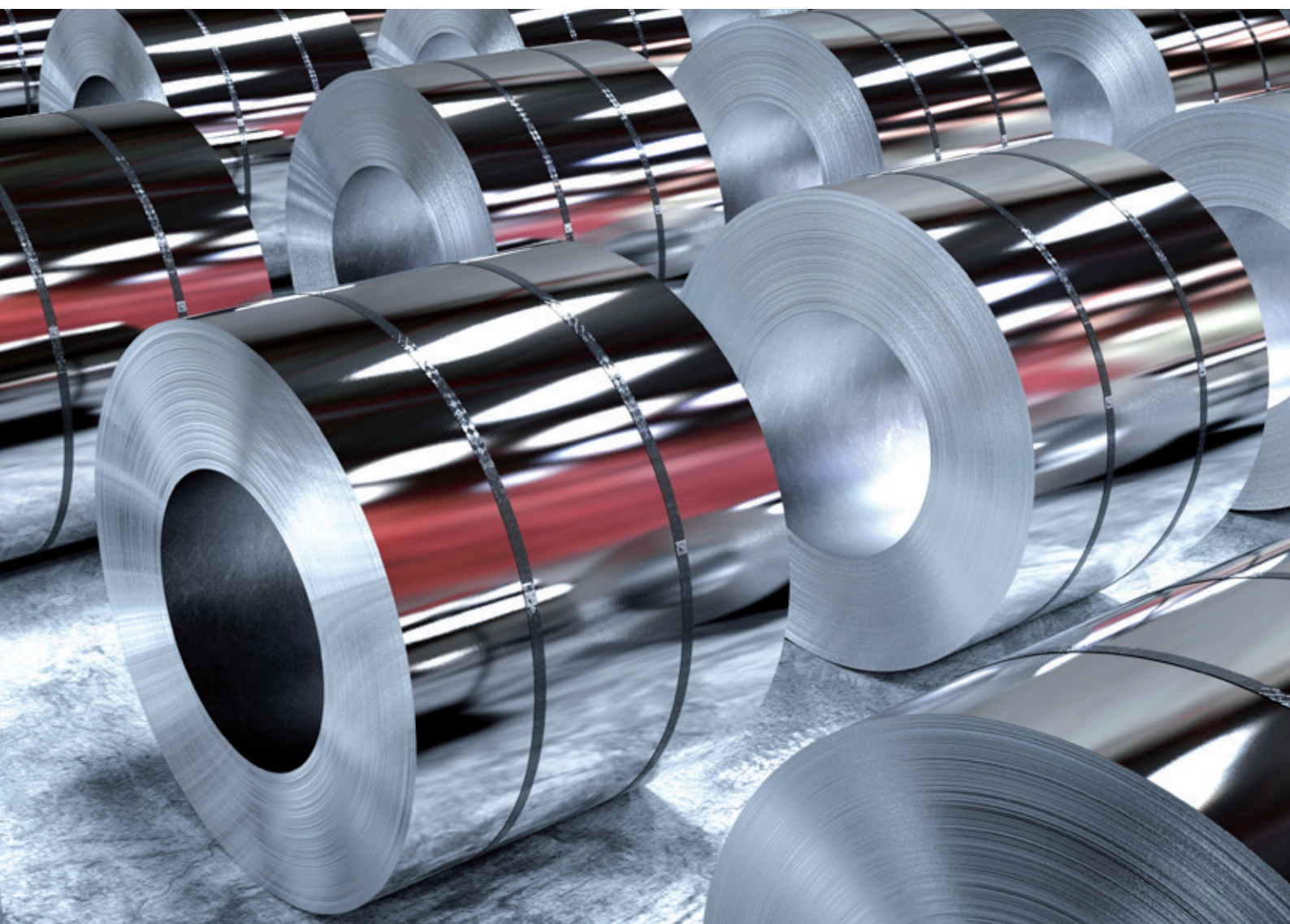

MEASUREMENT & ANALYTICS | MEASUREMENT MADE EASY

Instruments and analyzers

Products, solutions and services
for the metals industry



Measurement made easy

ABB's Measurement & Analytics business unit is among the world's leading manufacturers and suppliers of instrumentation and analyzers.

With thousands of experts around the world and high-performance technology, ABB's team is dedicated to making measurement easy for its customers.

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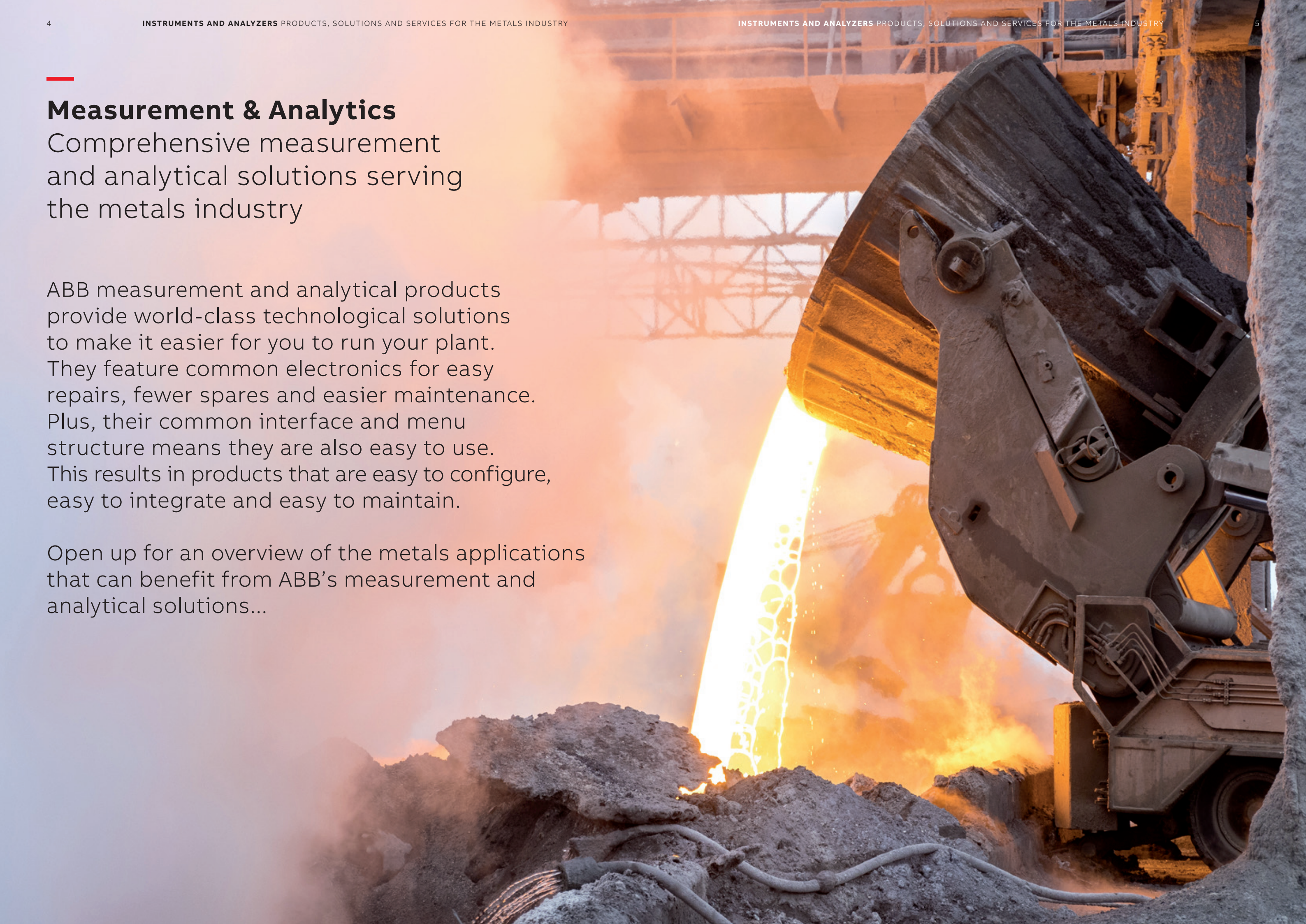
- 38–41** Products, solutions and services for the metals industry

Measurement & Analytics

Comprehensive measurement and analytical solutions serving the metals industry

ABB measurement and analytical products provide world-class technological solutions to make it easier for you to run your plant. They feature common electronics for easy repairs, fewer spares and easier maintenance. Plus, their common interface and menu structure means they are also easy to use. This results in products that are easy to configure, easy to integrate and easy to maintain.

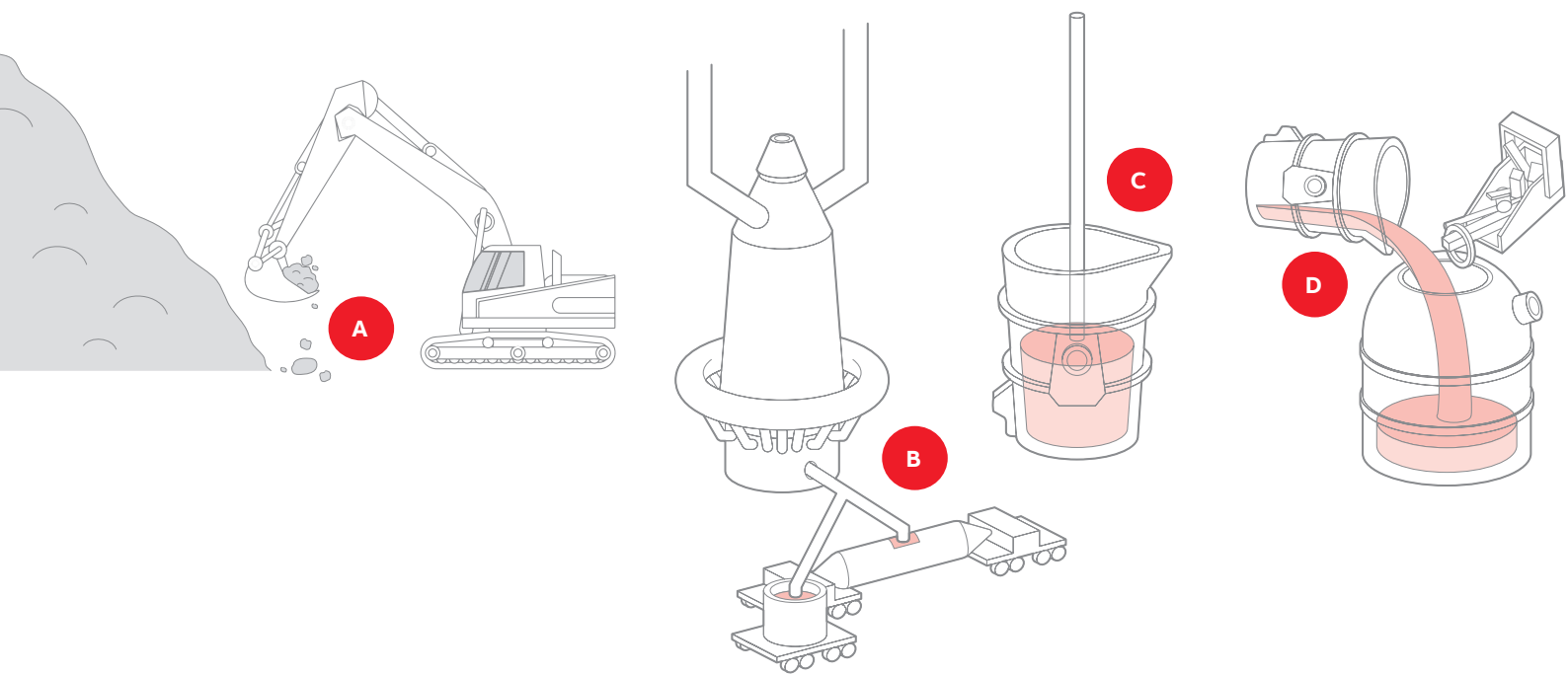
Open up for an overview of the metals applications that can benefit from ABB's measurement and analytical solutions...



Measurement & Analytics

From yard to market

A complete portfolio of measurement and analytical solutions. ABB's superior measurement and analytical products, solutions and services ensure the highest possible return over the entire life of your plant.



A Preparation for blast furnace

Raw material handling, coke oven battery, sinter plant and pellet plant are well-equipped with ABB products for flow measurement, pressure measurement, temperature measurement, control valve actuators, level measurement, weighing systems and analyzers.

B Blast furnace

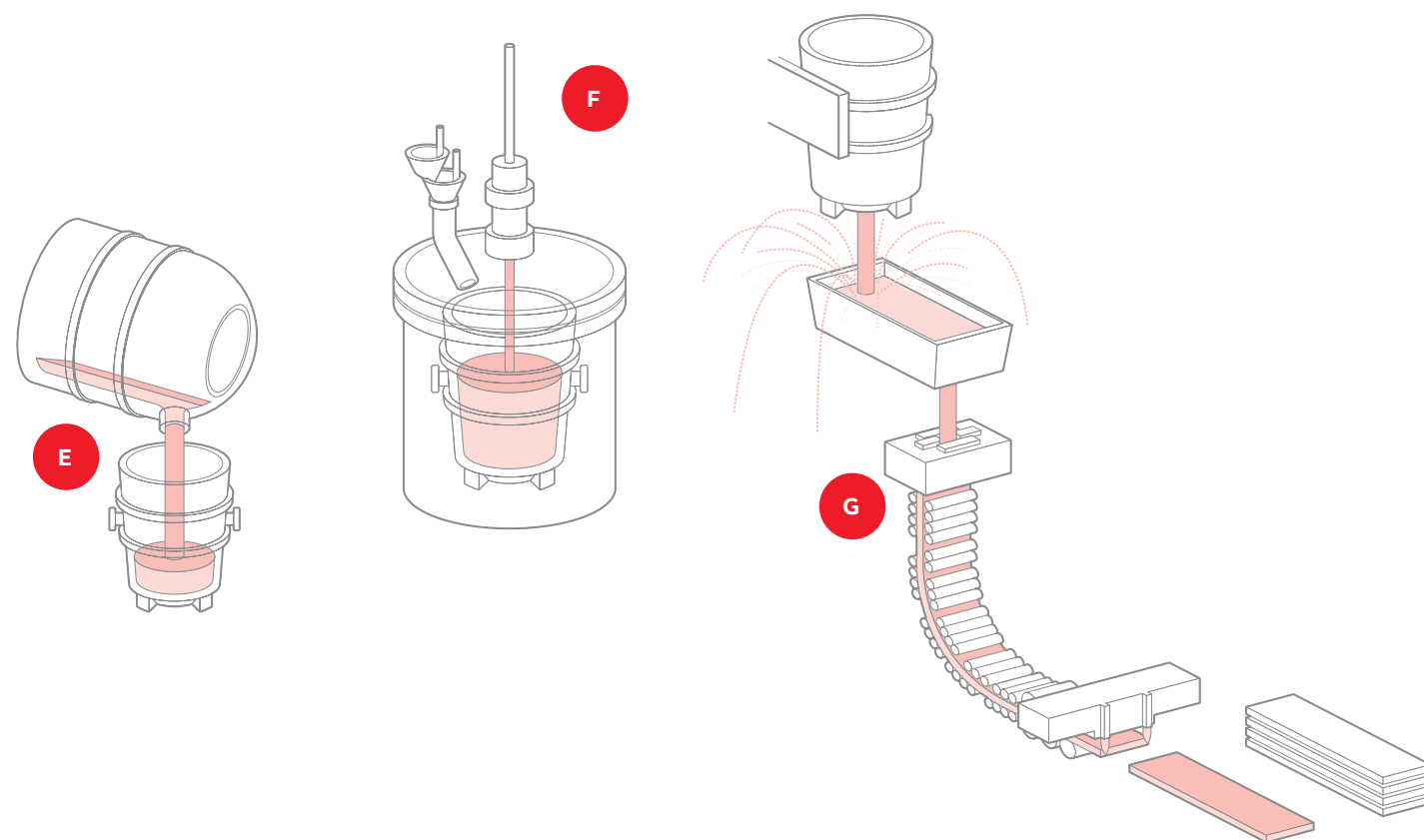
A blast furnace is a type of metallurgical furnace used for smelting to produce industrial metals, generally iron, but also others such as lead or copper. In a blast furnace, fuel, ores, and flux (limestone) are continuously supplied through the top of the furnace, while a hot blast of air (sometimes with oxygen enrichment) is blown into the lower section of the furnace through a series of pipes called tuyeres, so that the chemical reactions take place throughout the furnace as the material moves downward. The end products are usually molten metal and slag phases tapped from the bottom, and flue gases exiting from the top of the furnace. The downward flow of the ore and flux in contact with an upflow of hot, carbon monoxide-rich combustion gases is a countercurrent exchange and chemical reaction process.

C Ladle furnace

In a foundry, a ladle is a vessel used to transport and pour out molten metals. Ladles range in size from small hand carried vessels that resemble a kitchen ladle and hold 20 kilograms (44 lb) to large steel mill ladles that hold up to 300 tonnes (330 tons). Many non-ferrous foundries also use ceramic crucibles for transporting and pouring molten metal and will also refer to these as ladles.

D, E, F Basic oxygen furnace

After tapping from electrical arc furnace, the ladle furnace (LF) is put on LF refining position. LF refining is conducted through arc heating and argon blowing. During this process, the steel deoxidization, desulfurization, the adjustment of steel temperature and chemical composition are completed. In primary slag, there is no vacuum function in LF. The ladle containing qualified liquid steel is hoisted to a ladle rotator on continuous casting machine and then it taps from the base of the receiving ladle to tundish, after that, it drops down into crystallizer to cast into bloom, which are severally straightening and cut to set dimensions and sent to a cooling bed through a roller table. It turns into qualified bloom.



Basic oxygen steelmaking (BOS, BOP, BOF, and OSM), also known as Linz-Donawitz (LD) steelmaking or the oxygen converter process is a method of primary steelmaking in which carbon-rich molten pig iron is made into steel. Blowing oxygen through molten pig iron lowers the carbon content of the alloy and changes it into low-carbon steel. The process is known as basic because fluxes of burnt lime or dolomite, which are chemical bases, are added to promote the removal of impurities and protect the lining of the converter. The vast majority of steel manufactured in the world is produced using the basic oxygen furnace. In 2000, it accounted for 60 % of global steel output. Modern furnaces will take a charge of iron of up to 400 tons and convert it into steel in less than 40 minutes, compared to 10–12 hours in an open hearth furnace.

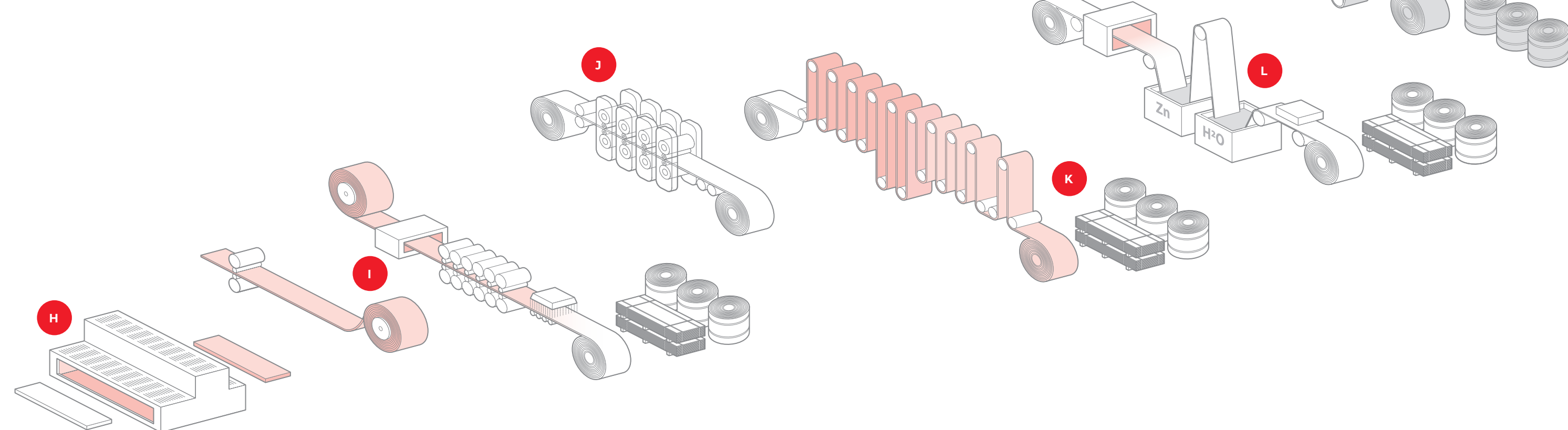
G Continuous casting

Continuous casting, also called strand casting, is the process whereby molten metal is solidified into a "semifinished" billet, bloom, or slab for subsequent rolling in the finishing mills. Prior to the introduction of continuous casting in the 1950s, steel was poured into stationary molds to form ingots. Since then, "continuous casting" has evolved to achieve improved yield, quality, productivity and cost efficiency.

It allows lower-cost production of metal sections with better quality, due to the inherently lower costs of continuous, standardised production of a product, as well as providing increased control over the process through automation. This process is used most frequently to cast steel (in terms of tonnage cast). Aluminium and copper are also continuously cast.

H Re-heating oven

In steel plants reheating furnaces are used in hot rolling mills to heat the steel stock (Billets, blooms or slabs) to temperatures of around 1200 °C which is suitable for plastic deformation of steel and hence for rolling in the mill. The heating process in a reheating furnace is a continuous process where the steel stock is charged at the furnace entrance, heated in the furnace and discharged at the furnace exit. Heat is transferred to the steel stock during its traverse through the furnace mainly by means of convection and radiation from the burner gases and the furnace walls.



I Hot rolling mill

Hot rolling is a metalworking process that occurs above the recrystallization temperature of the material. After the grains deform during processing, they recrystallize, which maintains an equiaxed microstructure and prevents the metal from work hardening. The starting material is usually large pieces of metal, like semi-finished casting products, such as slabs, blooms, and billets. If these products came from a continuous casting operation the products are usually fed directly into the rolling mills at the proper temperature. In smaller operations the material starts at room temperature and must be heated. This is done in a gas- or oil-fired soaking pit for larger workpieces and for smaller workpieces induction heating is used. As the material is worked the temperature must be monitored to make sure it remains above the recrystallization temperature. To maintain a safety factor a finishing temperature is defined above the recrystallization temperature; this is usually 50 to 100 °C (90 to 180 °F) above the recrystallization temperature. If the temperature does drop below this temperature the material must be re-heated before more hot rolling.

J Cold rolling mill

Cold rolling occurs with the metal below its recrystallization temperature (usually at room temperature), which increases the strength via strain hardening up to 20 %. It also improves the surface finish and holds tighter tolerances. Commonly cold-rolled products include sheets, strips, bars, and rods; these products are usually smaller than the same products that are hot rolled. Because of the smaller size of the workpieces and their greater strength, as compared to hot rolled stock, four-high or cluster mills are used. Cold rolling cannot reduce the thickness of a workpiece as much as hot rolling in a single pass and it is designed to achieve any thickness under some 6 mm.

K Processing line – Continuous Annealing Line (CAL)

This line facility changes the crystal structure of steel sheet by heat treatment, and improves properties such as hardness, strength, and elongation. It integrates the 5 processes of cleaning, cooling, heating, temper rolling, and refining, and carries them out in a single line, thus saving space and lowering costs.

L Processing line – Continuous Galvanizing Line (CGL)

Hot-dip galvanization is the process of coating iron and steel with a layer of zinc by immersing the metal in a bath of molten zinc at a temperature of around 840 °F (449 °C). When exposed to the atmosphere, the pure zinc (Zn) reacts with oxygen (O₂) to form zinc oxide (ZnO), which further reacts with carbon dioxide (CO₂) to form zinc carbonate (ZnCO₃), a usually dull grey, fairly strong material that protects the steel underneath from further corrosion in many circumstances.

M Processing line – Color Coating Line (CCL)

A color coating line produces products for roofing and cladding applications. Metal coated coils are delivered to the color coating mill for further processing where they first undergo a pre-treatment before painting begins. Once the pre-treatment has been applied a prime coating is applied to both sides of the strip and baked on in the prime oven. This process is then repeated with the application of the finish coating. The strip is then branded and wound, ready for delivery to customers.

Our product portfolio by application

For more information:
abb.com/flow
abb.com/pressure
abb.com/temperature
abb.com/actuators
abb.com/positioners
abb.com/level
abb.com/analytical
abb.com/weighing
abb.com/rollforce
abb.com/stressometer
abb.com/stripension
abb.com/thicknessgauging
abb.com/stripsscanner
abb.com/measurement-service

Measurement & Analytics

Our product portfolio by application

Legend

In the following pages we reference products for:

- 01** Flow measurement
- 02** Pressure measurement
- 03** Temperature measurement
- 04** Actuators and positioners
- 05** Level measurement
- 06** Analytical measurement
- 07** Weighing systems
- 08** Roll force measurement
- 09** Flatness measurement and control
- 10** Strip tension measurement
- 11** Thickness gauging systems
- 12** Position and width measurement



Primary metal making

Preparation for blast furnace

Raw material handling, coke oven battery, sinter plant and pellet plant are well equipped with ABB products for flow measurement, pressure measurement, temperature measurement, control valve actuators, level measurement, weighing systems and analyzers.

01 Flow measurement

With ABB's knowledge about flow measurement and management, you have access to over 100 years of flow measurement and control experience to help you save cost and increase profits.

• Vortex/Swirl flowmeters

VortexMaster and SwirlMaster are used in the whole metals industry process. Air/steam/water systems are needed to keep the process running smoothly. Vortex and swirl meters are widely used in these systems to ensure process control and safety. Also used for oxygen/industrial gases measurement in the metals industry.

• Electromagnetic flowmeters for water

ElectroMagnetic Flowmeters (EMF) are placed in the control loop and installed in water flows such as cooling water, recycled water and waste water.

• DP flow based on orifice or Venturi and 2600T differential pressure transmitters or multivariable transmitter for steam, water and gas

02 Pressure measurement

The multiplicity of pressure transmitters and application capabilities from ABB allow you to standardize transmitter installations – plant-wide.

• Differential pressure and multivariable transmitters from 2600T series

2600T pressure transmitters are typically mounted on furnaces, boilers or any other piping system where high pressures are involved. Multivariable transmitters can as well be applied to boilers or flow measurements points thanks to their intrinsic ability to provide complex calculations (i.e. flow, level, density). In addition, the metals industry is characterized by abrasive media. Within 2600T product line we have a special nano-structured coating called Diaflex that dramatically increases diaphragm hardness and resistance to abrasion while maintaining its intrinsic elasticity.

The main distinctive features can be summarized as:

- High static pressure range
- High overload
- Diaflex coating

03 Temperature measurement

With over 125 years of experience in temperature measurement, we have the technology and application knowledge for even the most difficult environments and hazardous areas.

• RTD-PT-100

• Thermocouple (K, S, N type)

• Head-mount temperature transmitters TTH 200

• Rail-mount temperature transmitters TTR 200

04 Actuators and positioners

From electrical and pneumatic actuators and state-of-the-art digital and electro-pneumatic positioners to I/P converters, ABB provides a comprehensive range of products, designed, engineered and manufactured to deliver first class performance in the metals industry.

• Electrical and pneumatic actuators

• Electro-pneumatic and digital positioners

• Field and panel mount I/P converters

05 Level measurement

As a market leader in level detection with the largest selection of agency approved level switch technologies, the ABB K-TEK level line has the proven technology to provide solutions for the most difficult liquids and solids level applications.

• Guided radar level transmitter for solids

• Ultrasonic level transmitter for mixed material/water

• Level switches for water/solids

• LLT100 laser level

Inventory control (measuring level in silos and bunkers) and positioning (measurement of moving objects like tripper cars or wagons).

• KM26 magnetic level gauges

• LMT100/200 magnetostrictive level

06 Analytical measurement

For over half a century, ABB has developed, manufactured, supplied and installed analytical instruments for a wide variety of industries.

• Continuous gas analyzers (CGA)

Continuous gas analyzers (CGA) are suitable for all major process steps of iron and steel making covering processes in three major categories – iron making/steel making/steel refining. Our products are also used in raw material preparations such as sintering/coke ovens. CGA is used for process control or emission monitoring from different processes.

• Process optimization with measurement of CO, CO₂, O₂ at sinter plant and coke furnace

- AO2000/EL3000/LS4000

- Emission monitoring with NO_x, SO₂, CO and O₂ at sinter plant and coke furnace

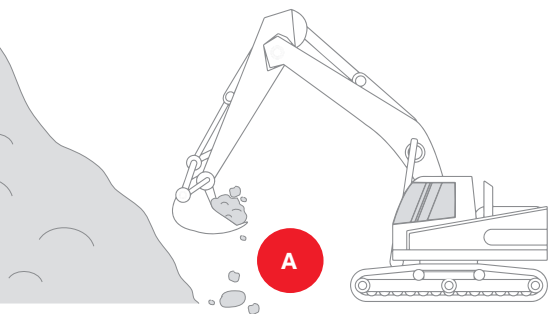
• Conductivity analyzer

• pH analyzer

07 Weighing systems

In the demanding environment of the metals processing industry getting the right balance between accuracy, speed and reliability in your sensing systems can mean a great deal. ABB offers a wide range of dedicated products for weighing applications for crane, scrap, blast furnace and continuous casting.

• Load cell based bin weighing system for hopper/bunker



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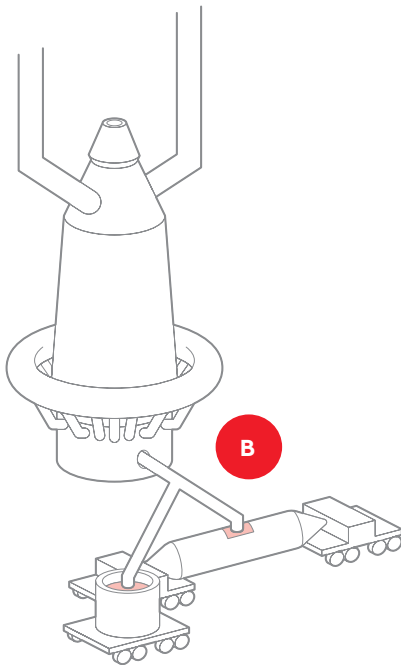
Primary metal making

Blast furnace

Blast furnaces operate on the principle of chemical reduction whereby carbon monoxide, having a stronger affinity for the oxygen in iron ore than iron does, reduces the iron to its elemental form.

Blast furnaces differ from bloomeries and reverberatory furnaces in that flue gas is in direct contact with the ore and iron, allowing carbon monoxide to diffuse into the ore and reduce the iron oxide to elemental iron mixed with carbon.

The blast furnaces operate as a countercurrent exchange process whereas a bloomery does not. Another difference is that bloomeries operate as a batch process while blast furnaces operate continuously for long periods because they are difficult to start up and shut down.



01 Flow measurement

- **Vortex/Swirl flowmeters** *p. 12
- **Electromagnetic flowmeter for water** *p. 12
- **Thermal mass flowmeters**
Thermal mass flowmeters are used for natural gas and air/oxygen flow measurement in burners/furnaces to sensitively control the process, avoid excessive fuel consumption and improve product quality.
- **Rotameter for gas and water**
- **Orifice plate and Venturi for water and gas**

02 Pressure measurement

- **Differential pressure transmitter 2600T series** *p. 12
- **Pressure transmitters 2600T series**
- **Multivariable transmitter 2600T series**

03 Temperature measurement

- **RTD-PT-100**
- **Thermocouple (K, S, N type)**
- **Temperature transmitter TTR 200, TTH 200**

04 Actuators and positioners

- **Control valve positioners for gas/air/cooling water valves, EDP300/TZIDC**
- **Actuators for flue gas damper control, Contrac/UP/LP**



05 Level measurement

- **Guided radar level transmitter for solids and water**
- **Vibration fork level switch for liquids and solids**
- **Ultrasonic level transmitter for water and solids**
- **Buoyancy level sensor and switches for water**
- **Level switch magnetic float type for water and gas**
- **Laser level measurement**
Inventory control (measuring level in silos and bunkers) and positioning (measurement of moving objects like tripper cars or wagons).

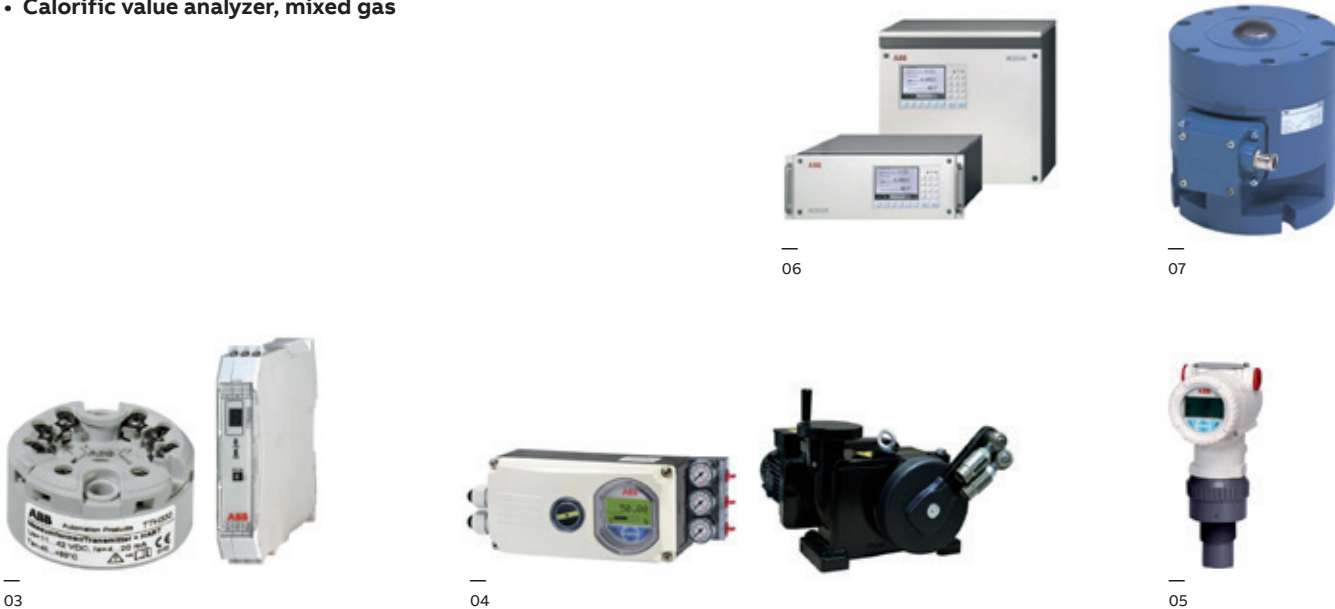
06 Analytical measurement

- **AO2000/EL3000/LS4000**
 - Coal bunker monitoring application, CO, O₂
 - Coal blast analyzer, O₂
- **AO2000/EL3000**
 - Cowper waste gas (burner optimization) with CO and O₂
 - Transverse probe blast furnace optimization with CO, CO₂, H₂, (O₂)
 - Riser tube measurement with CO, CO₂, H₂
 - Top gas measurement with CO, CO₂, H₂, (O₂)
 - Emission monitoring with CO, NOx, SO₂, O₂
- **Dust analyzer for clean gas**
- **Moisture analyzer for hot blast**
- **Calorific value analyzer, mixed gas**

07 Weighing systems

- **9QGPL series**
 - Bin weighing system for bunker
 - Storage hopper weighing
 - Top hopper weighing
 - Torpedo transfer car weighing
 - Ladle transfer car weighing

* Read more on indicated page.

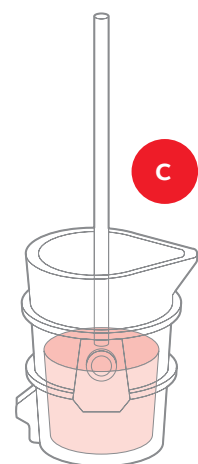


Primary metal making

Ladle furnace (and pump house)

In a foundry, a ladle is a vessel used to transport and pour out molten metals. Many non-ferrous foundries also use ceramic crucibles for transporting and pouring molten metal and will also refer to these as ladles.

After tapping from electrical arc furnace, the ladle furnace is put on a ladle furnace refining position. Ladle furnace refining is conducted through arc heating and argon blowing. During this process, the steel deoxidization, desulfurization, the adjustment of steel temperature and chemical composition are completed. In primary slag, there is no vacuum function in ladle furnace, but a vacuum device may be obligated in the ladle furnace zone for future development. The ladle containing qualified liquid steel is hoisted to a ladle rotator of continuous the casting machine and then it taps from the base of the receiving ladle to tundish, after that, it drops down into the crystallizer to cast into bloom, which are straightened and cut to set dimensions and sent to a cooling bed through a roller table. It turns into qualified bloom.



01 Flow measurement

• Vortex/Swirl flowmeters

VortexMaster and SwirlMaster are used in the whole metals industry process. Air/steam/water systems are needed to keep the process running smoothly. Vortex and swirl meters are widely used in these systems to ensure process control and safety. Also used for oxygen/industrial gases measurement in the metals industry. Especially for the process of smelting oven, swirl meter is one of the top choices for oxygen beam measurement.

Pump house

01 Flow measurement

- Electromagnetic type flow measuring instrument for water applications



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02 Pressure measurement

The multiplicity of pressure transmitters and application capabilities from ABB allow you to standardize transmitter installations – plant-wide.

• Differential pressure and multivariable transmitters from 2600T series

2600T pressure transmitters are typically mounted on furnaces, boilers or any other piping system where high pressures are involved. Multivariable transmitters can as well be applied to boilers or flow measurements points thanks to their intrinsic ability to provide complex calculations (i.e. flow, level, density). In addition, the metals industry is characterized by abrasive media. Within 2600T product line we have a special nano-structured coating called Diaflex that dramatically increases diaphragm hardness and resistance to abrasion while maintaining its intrinsic elasticity.

The main distinctive features can be summarized as:

- High static pressure range
- High overload
- Diaflex coating

• Gauge pressure transmitter 2600T series

Despite not applicable to the primary process, gauge pressure transmitters can be installed on all those gas, water and liquids ancillary cycles inside the plant.

As differential pressure transmitters, Diaflex coating provides superior mechanical properties. In case of overpressure, 2600T gauge pressure transmitters can sustain up to 105 MPa/1050 bar/15255 psi.

03 Temperature measurement

With over 125 years of experience in temperature measurement, we have the technology and application knowledge for even the most difficult environments and hazardous areas.

- RTD for motor bearing and winding temperatures

04 Actuators and positioners

- Electrical and pneumatic actuators
- Digital positioners for control valve applications

05 Level measurement

- Ultrasonic level transmitter for water

07 Weighing systems

- 9QGPK series
 - Ladle crane weighing
- 9QGPS series
 - Crane overload protection

Primary metal making

Basic oxygen furnace (LD converter)

Basic Oxygen Furnace (BOF) is a pear shaped vessel where the pig iron from the blast furnace, and ferrous scrap, is refined into steel by injecting a jet high-purity oxygen through the hot metal.

01 Flow measurement

With ABB's knowledge about flow measurement and management, you have access to over 100 years of flow measurement and control experience to help you save cost and increase profits.

- **Electromagnetic flowmeter for water**
ElectroMagnetic Flowmeters (EMF) are placed in the control loop and they are installed where there is water flows such as cooling water, recycled water and waste water.
- **DP flow based on orifice or Venturi and 2600T differential pressure transmitters or multivariable transmitter for steam, water and gas**

02 Pressure measurement

- **Differential pressure transmitter 2600T series** *p. 17
- **Gauge pressure transmitter 2600T series** *p. 17
- **Multivariable transmitter 2600T series** *p. 17

03 Temperature measurement

- **Thermocouple (K, S, N type)**
- **Temperature sensor RTD-PT100**
- **Temperature transmitter TTH200, TTR200**

04 Actuators and positioners

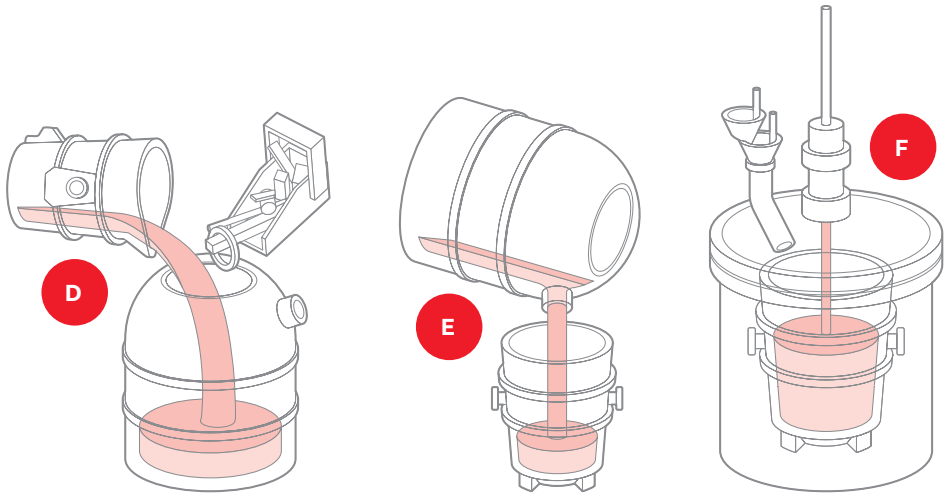
All ABB actuators offer continuous control with a virtually wear-free operation, as well as the highest positioning accuracy and stability available, regardless of positioning time. ABB offers a versatile series of digital and electro-pneumatic positioners, as well as being the leading supplier of I/P converters in the world today.

- **EDP300/TZIDC (control valve positioners for gas/air/cooling water valves)**
- **Contrac/UP/LP (electric or pneumatic actuators for damper control applications)**

05 Level measurement

As a market leader in level detection with the largest selection of agency approved level switch technologies, the ABB K-TEK level line has the proven technology to provide solutions for the most difficult liquids and solids level applications.

- **Guided radar level transmitter for solids and liquids**
- **Ultrasonic level transmitter for mixed material/water**
- **Level switch magnetic float type for water**
- **Laser level measurement**



06 Analytical measurement

- **AO2000/EL3000/LS4000**
 - Process control and safety measurement (at blowing period) with CO, CO₂, H₂, O₂
 - ESP, flare or consumer safety measurement with CO and O₂
 - Safety measurement with O₂ during CO recovery

07 Weighing systems

- **9QGPL /9QGPK series**
 - Scrap weighing
 - Recipe control (batch handling)
 - Ladle crane weighing
- **9QGPS101 series**
 - Crane overload protection

* Read more on indicated page.



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Primary metal making

By-product plant

The coke oven by-product plant is an integral part of the by-product coke-making process. In the process of converting coal into coke using the by-product coke oven, the volatile matter in the coal is vaporized and driven off.

01 Flow measurement

- Electromagnetic flowmeter for water *p. 12
- DP flow based on orifice or Venturi and 2600T differential pressure transmitters for steam, water and gas
- Multivariable transmitter for steam, water and gas

02 Pressure measurement

- Differential pressure transmitter 2600T series *p. 17
- Gauge pressure transmitter 2600T series *p. 17
- Multivariable transmitter 2600T series *p. 17

03 Temperature measurement

- Thermocouple (K, S, N type)
- Temperature sensor RTD-PT100
- Temperature transmitter TTH200, TTR200

04 Actuators and positioners

- Electrical and pneumatic actuators
- Electro-pneumatic and digital positioners I/P converters

05 Level measurement

- Guided radar level transmitter for solids
- Ultrasonic level transmitter for mixed material/water

06 Analytical measurement

- AO2000/EL3000/LS4000
 - Process optimization with CO, CO₂ and O₂ at coke furnace
 - Emission monitoring with CO, NO_x, SO₂ and O₂ at coke furnace
 - Safety measurement with O₂ of cleaned coke oven gas used as fuel in further processes

* Read more on indicated page.



Primary metal making

Boiler control, water and hydrogen analysis

Hydrogen analysis technology provides a proven solution for direct measurement of dissolved hydrogen in molten aluminium. Boiler water is the liquid phase of steam within a boiler.

07 Level Measurement

- KM26 level gauge
 - The ABB K-TEK level products KM26 level gauge provides reliable visual indication of boiler water level without concerns of glass scaling, leaking or maintenance seen with other indicator technologies.
 - When the LMT200 magnetostrictive level transmitter is combined with the KM26, the user has a non-intrusive level measurement which allow for reliable and accurate boiler control.

Hydrogen analysis (for liquid aluminium)

06 Analytical measurement

- AISCAN and AISCAN Argon
 - The technology provides a proven solution for direct measurement of dissolved hydrogen in molten aluminium. The AISCAN analyzer provides an on-line quantitative measurement based on field proven probe and Closed-LoopRecirculation (CLR) technologies.
 - Benefits of AISCAN:
 - Accurate on-line quantitative measurement of dissolved hydrogen
 - Continuous monitoring capabilities
 - Probe failure detection option

Boiler water analysis and treatment

06 Analytical measurement

- Continuous water analyzers (CWA) and steam and water analysis (SWAS):
 - Conductivity analyzers
 - pH analyzers
 - Sodium analyzers
 - Silica analyzers
 - Phosphate analyzers



Primary metal making

Continuous casting

Continuous casting is the process whereby molten steel is solidified into a “semi-finished” billet, bloom, or slab for subsequent rolling in the finishing mills. Continuous casting has evolved to achieve improved yield, quality, productivity and cost efficiency.

Steel from the electric or basic oxygen furnace is tapped into a ladle and taken to the continuous casting machine. The ladle is raised onto a turret that rotates the ladle into the casting position above the tundish. Liquid steel flows out of the ladle into the tundish, and then into a water-cooled copper mold. Solidification begins in the mold, and continues through the First Zone and Strand Guide. The strand is then straightened, torch-cut, then discharged for intermediate storage or hot charged for finished rolling.

01 Flow measurement

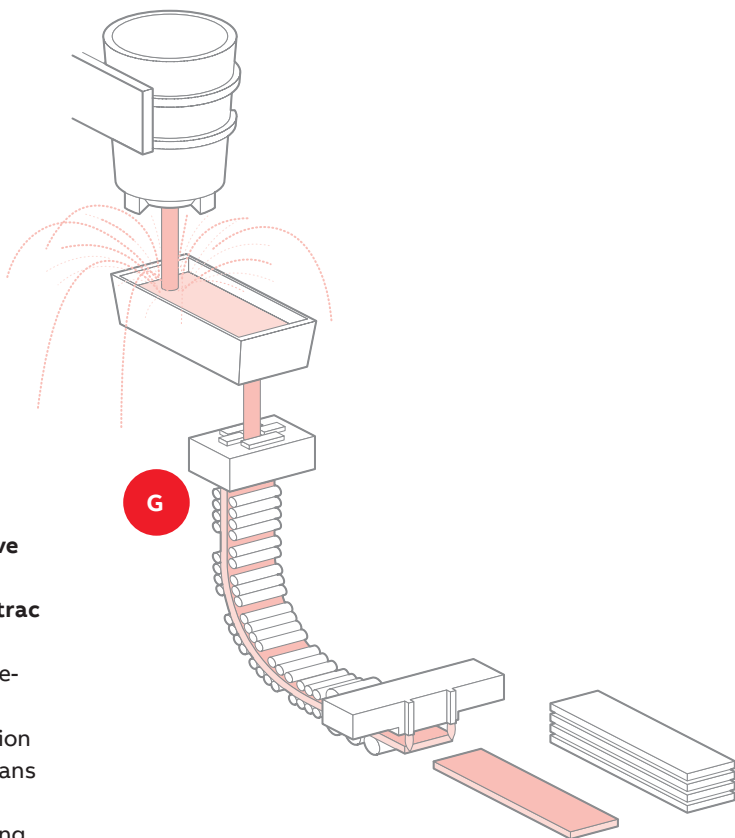
- **Electromagnetic flowmeters for water**
ElectroMagnetic Flowmeters (EMF) are placed in the control loop and installed in water flows such as cooling water, recycled water and waste water.
- **DP flow based on orifice or Venturi and 2600T differential pressure transmitters or multivariable transmitter for steam, water and gas**

02 Pressure measurement

- **Differential pressure transmitter 2600T series** *p. 17
- **Gauge pressure transmitter 2600T series** *p. 17
- **Multivariable transmitter 2600T series** *p. 17

03 Temperature measurement

- **Thermocouple (K, S, N type)**
- **Temperature sensor RTD-PT100**
- **Temperature transmitter TTR200, TTH200**



04 Actuators and positioners

- **Electric actuators and positioners for cooling water valve control**
- **Spray water control for steel cooling process with Contrac part turn actuators**
Electrical actuators are designed for longest maintenance-free operation. They feature an oil-lubricated spur gear with drive shafts supported by ball bearings. Rotary motion is converted to linear motion in the linear actuator by means of a highly efficient ball screw spindle. Contrac actuators are characterized by a deadband of just $\pm 0.05\%$, providing high-accuracy positioning for all valve types. With their robust design and IP66/NEMA 4X protection, Contrac actuators withstand even the most arduous operating conditions.

06 Analytical measurement

- **pH/conductivity transmitters and sensors**

07 Weighing systems

- **9QGPL/9QGPK series**
 - Ladle weighing in ladle turret
 - Ladle transfer car
 - Tundish weighing
 - Slab weighing
 - Crane weighing (load cells with high temperature options up to 180 °C/356 °F)

* Read more on indicated page.



Primary metal making

Re-heating oven

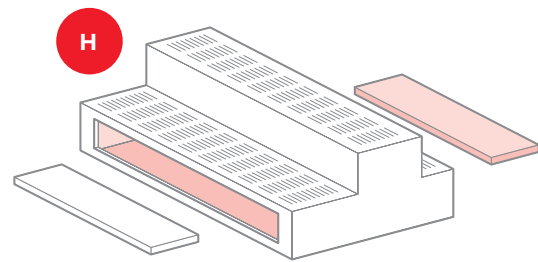
In steel plants reheating furnaces are used in hot rolling mills to heat the steel stock (billets, blooms or slabs) to temperatures of around 1200 °C (2192 °F) which is suitable for deformation of steel and hence for rolling in the mill.

The heating process in a reheating furnace is a continuous process where the steel stock is charged at the furnace entrance, heated in the furnace and discharge at the furnace exit. Heat is transferred to the steel stock during its traverse through the furnace mainly by means of convection and radiation from the burner gases and the furnace walls.

01 Flow measurement

• Vortex/Swirl flowmeters

VortexMaster and SwirlMaster are used in the whole metals industry process. Air/steam/water systems are needed to keep the process running smoothly. Vortex and swirl meters are widely used in these systems to ensure process control and safety. Also used for oxygen/industrial gases measurement in the metals industry. Especially for the process of smelting oven, swirl meter is one of the top choices for oxygen beam measurement.



04 Actuators and positioners

• EDP300/TZIDC digital positioners

Control valve positioners for gas/air cooling water valves. The EDP300 and TZIDC are electronically configurable positioners with communication capabilities designed for mounting to linear or rotary actuators. Standard or advanced performance with 4 to 20 mA and HART capability.

• Contrac electric and UP/LP pneumatic actuators

Actuators for combustion air damper control and ID & FD fan damper control. ABB's extensive portfolio of actuators provides highly accurate and stable positioning of your final control element to achieve your operational targets:

- Energy efficiency processes
- Reliable performance

06 Analytical measurement

• AO2000/EL3000 LS4000

- Process optimization of reheating furnace with O₂, CO
- Emission monitoring O₂, CO, CO₂, NO_x



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Hot rolling mill

From hot flat to profile and tube mills

Since 1894, the number of ABB innovative solutions and “world firsts” have made it an attractive supplier for rolling mills. ABB is a leading long-term supplier for all types of hot flat, profile and tube mills.

Our offerings are for:

- Plate mills
- Steckel mills
- Hot strip mills
- Section mills
- Rod and bar mills
- Rail mills
- Bloom and billet mills
- Seamless tubes mills
- Welded pipes

In depth knowledge of technological functions, process models, advanced process control and diagnostics allows ABB to guarantee high-quality performance in terms of thickness, width, flatness and temperature at the highest level of productivity.

01 Flow measurement

With ABB's knowledge about flow measurement and management, you have access to over 100 years of flow measurement and control experience to help you save cost and increase profits.

- **Electromagnetic flowmeters for water** *p. 12
- **CoriolisMaster FCB400 massflow meter**
Meters for flow and density measurement. By measuring the density of the lubrication oil, possible water inclusions resulting in massive wear out or damages can be detected.

04 Actuators and positioners

- **Digital positioners**
ABB's extensive portfolio of positioners provides highly accurate and stable positioning of your control valves, crucial to achieve your operational targets:
 - 55 Energy efficiency processes
 - 55 Reliable performance



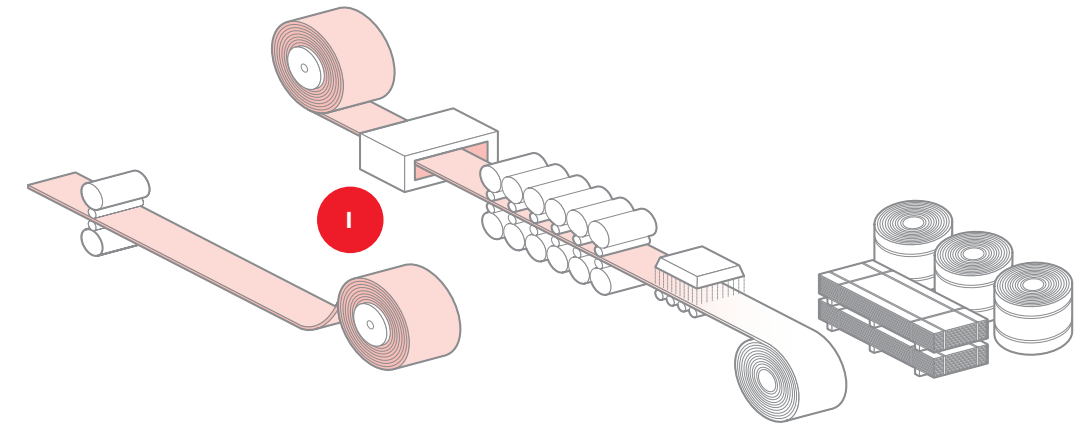
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05 Level measurement

- **Laser level measurement** *p. 13

08 Roll force measurement

A truly measured roll force is crucial in achieving correct roll gap settings, true force distribution from operator side to drive side of your mill and supervision of the backup bearings and roll eccentricity. The reliable and user-friendly roll force measurement systems are based on the unique Pressductor technology.

- **Millmate roll force systems**

09 Flatness measurement and control

Flatness control system will minimize rejects, pass times and strip breaks. This is achieved thru the use of all mill actuators, both mechanical and thermal, in an optimal way for creating the best possible flatness – running in automatic control all the time.

- **Stressometer flatness measurement and control systems**

10 Strip/looper tension measurement

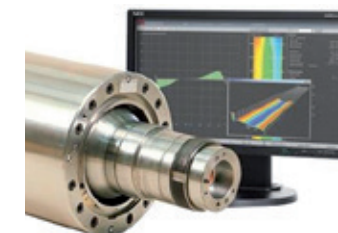
One of the crucial parameters in achieving correct strip thickness during hot and cold rolling is the strip tension. In order to reach the highest possible accuracy, an ABB strip/looper tensiometer is the best and most reliable alternative. It measures accurately even in the harshest environment, ensuring that the strip tension can be controlled within the desired range, during both acceleration and deceleration.

- **Large PillowBlock tensiometers**
- **Millmate looper tensiometer systems**

* Read more on indicated page.



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Cold rolling mill

For carbon steel, stainless steel and non-ferrous metals

The quality of rolled metal is determined by the quality of the technology used in its cold mill processing. Surface characteristics, flatness and strip thickness all need to be precisely monitored and controlled in order to produce a perfect product.

Our offerings are for:

- Single stand mills (non-reversing mills, reversing mills, inline mills)
- Tandem cold rolling mills (batch, compact cold mills, continuous/inline mills)
- Skin pass/temper mills
- Double cold reduction mills
- Foil mills

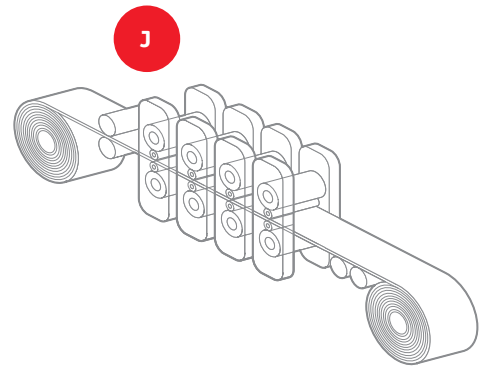


ABB offers a solution package to optimize and control rolling mill processes. It covers a range of features from auto-adaptive set-up models, advanced technological control, and simulation solutions through to the efficient visualization of the entire process, including operation and diagnosis concepts that together help guarantee maximum productivity, quality and yield.

01 Flow measurement

• CoriolisMaster FCB400 massflow meter

A wide range of meter sizes provide precise measurement of massflow, volume flow, density, temperature and concentration. Benefits are low pressure drop in the meter and wide flow measurement range. ABB's CoriolisMaster series has a history of success in a wide variety of industries and applications. With innovations like SensorApplicationMemory, Easy Set-up and with up to 5 modular I/Os – they save time and money during installation, commissioning and maintenance.

07 Weighing

- 9QGPL series
- Coil weighing

08 Roll force measurement

- Millmate roll force systems *p. 27

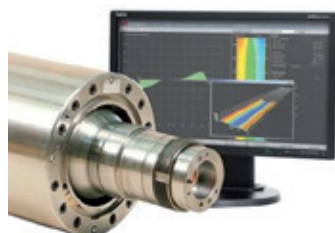
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- Stressometer flatness measurement and control systems

10 Strip tension measurement

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- Large PillowBlock tensiometers

11 Thickness gauging systems

The Box Gauge measures aluminium strip thickness with a gapless sensor – excitation and receiver in one single unit. The compact and robust design, together with insensitivity to alloy variations and harsh rolling mill environments, enables accurate measurements in any position, even interstand in a tandem mill. The MTG Gauge is ideal for use with all types of AGC, for control of thickness as well as for reducing thickness errors of all non-ferrous metals.

- Millmate thickness gauging systems – MTG Box gauge
- Millmate thickness gauging systems – C-frame gauge

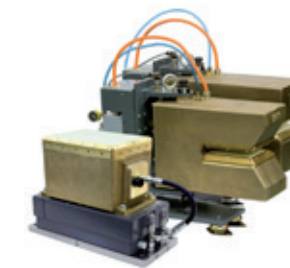
12 Position and width measurement

Keep track of your strip edges in your mills and process lines using the Millmate Strip Scanner System (MSS), a well-proven robust sensor with negligible maintenance costs. Based on ABB's patented Pulsed Eddy Current (PEC) technology, it is a non-contact sensor with no moving parts. The measurement is extremely stable, even during the worst conditions. Mill coolant, steam, heat and dust do not affect the measurement.

- Millmate strip scanner systems



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Processing Lines

Open up to see ABB Measurement & Analytics' processing line offerings...

Processing lines

Continuous Annealing Line (CAL), Continuous Galvanizing Line (CGL) and Color Coating Line (CCL)

Processing lines, mastering the cold route steel process. Reliable process control requires reliable long-term measurements. ABB products provide outstanding performance even in the harshest mill environments, fulfilling the core values of mill reliability and strip quality.

K Continuous Annealing Line (CAL)

This line facility changes the crystal structure of steel sheet by heat treatment, and improves properties such as hardness, strength, and elongation. It integrates the 5 processes of cleaning, cooling, heating, temper rolling, and refining, and carries them out in a single line, thus saving space and lowering costs.

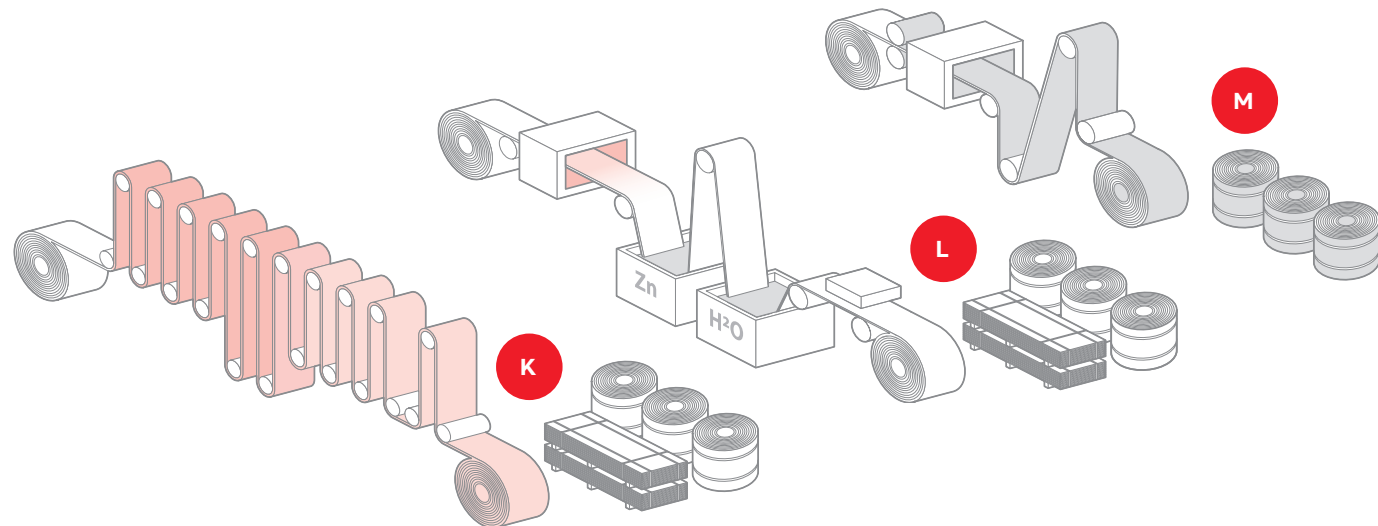
L Continuous Galvanizing Line (CGL)

Hot-dip galvanization is a form of galvanization. It is the process of coating iron and steel with a layer of zinc by immersing the metal in a bath of molten zinc at a temperature of around 840 °F (449 °C). When exposed to the atmosphere, the pure zinc (Zn) reacts with oxygen (O₂) to form zinc oxide (ZnO), which further reacts with carbon dioxide (CO₂) to form zinc carbonate (ZnCO₃), a usually dull grey, fairly strong material that protects the steel underneath from further corrosion in many circumstances.

Galvanized steel is widely used in applications where corrosion resistance is needed without the cost of stainless steel, and can be identified by the crystallization patterning on the surface (often called a “spangle”).

M Color Coating Line (CCL)

Color coating line produces products for roofing and cladding applications. Metal coated coils are delivered to the color coating mill for further processing where they first undergo a pre-treatment before painting begins. Once the pre-treatment has been applied a prime coating is applied to both sides of the strip and baked on in the prime oven. This process is then repeated with the application of the finish coating. The strip is then branded and wound, ready for delivery to customers.



01 Flow measurement

• Electromagnetic flowmeters for water

ElectroMagnetic Flowmeters (EMF) are placed in the control loop and they are installed where there is water flows such as cooling water, recycled water and waste water.

• ABB FAM540 metal variable area flowmeter

The VA Master FAM540 flowmeter can be utilized for measuring the flow of liquids, steam and gases, especially when aggressive or opaque fluids are to be metered. It is ideal for the chemical, pharmaceutical and food and beverage industries.

• Vortex/Swirl flowmeters ^{*p.12}

• ABB FSS450 and FSV450 enhanced Vortex/Swirl flowmeters

With an integrated flow computer and temperature compensation, the latest generation VortexMaster and SwirlMaster flowmeters allow one device to provide direct mass, energy calculations for steam or natural gas compensation.



01



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02 Pressure measurement

The multiplicity of pressure transmitters and application capabilities from ABB allow you to standardize transmitter installations – plant-wide.

• Differential pressure and Multivariable transmitters from 2600T series

2600T pressure transmitters are typically mounted on furnaces, boilers or any other piping system where high pressures are involved. Multivariable transmitters can as well be applied to boilers or flow measurements points thanks to their intrinsic ability to provide complex calculations (i.e. flow, level, density). In addition, the metals industry is characterized by abrasive media. Within 2600T product line we have a special nano-structured coating called Diaflex that dramatically increases diaphragm hardness and resistance to abrasion while maintaining its intrinsic elasticity.

The main distinctive features can be summarized as:

- High static pressure range
- High overload
- Diaflex coating

04 Actuators and positioners

All ABB actuators offer continuous control with a virtually wear-free operation, as well as the highest positioning accuracy and stability available, regardless of positioning time.

ABB offers a versatile series of pneumatic and electro-pneumatic positioners, as well as being the leading supplier of I/P converters in the world today.

• Contrac electric valve actuators

Electrical actuators are designed for longest maintenance-free operation. They feature an oil-lubricated spur gear with drive shafts supported by ball bearings. Rotary motion is converted to linear motion in the linear actuator by means of a highly efficient ball screw spindle. Contrac actuators are characterized by a deadband of just ± 0.05 %, providing high-accuracy positioning for all valve types. With their robust design and IP66/NEMA 4X protection, Contrac actuators withstand even the most arduous operating conditions.



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06 Analytical measurement

For over half a century, ABB has developed, manufactured, supplied and installed analytical instruments for the laboratory, process, environmental, steam and power industries.

• AO2000/EL3000

- Process optimization with CO₂, O₂ at annealing furnace

• Aztec ATS430

Turbidity and Total Suspended Solids (TSS) sensor. Certified by MCERTS for measuring turbidity and featuring ABB's innovative adaptive TSS calibration technology, the ATS430 can be counted on to provide improved control of turbidity and suspended solids throughout its operational life. Its service-free design, plus features including in-situ cleaning, simplified calibration, predictive maintenance diagnostics and EZLink connectivity, enables it to offer the lowest cost of ownership of any device on the market.

09 Flatness measurement and control

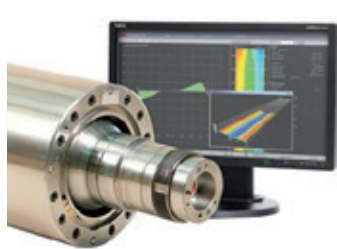
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• Large PillowBlock tensiometers



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• Millmate strip scanner systems

* Read more on indicated page.

Measurement & Analytics

Service for the metals industry

Dedicated to optimizing your productivity and performance, ABB's services enable improved utilization and performance of your automation equipment, processes and personnel.

ABB provides comprehensive support – from planning and commissioning, through to complete life-cycle services for all of its measurement solutions, including flow, pressure, temperature, level, thickness, flatness and tension measurement, valve automation, liquid and gas analyzers.



ABB provides a highly flexible, modular and cost-effective range of services for measurement products and analyzers called Measurement Care, primarily consisting of three service modules:

- Rapid Response
- Lifecycle Management
- Performance Improvement

What ABB products qualify for Measurement Care agreements?

Included are products for measuring flow, pressure, temperature, level, thickness, flatness, and tension, as well as valve positioners and analyzers of liquids and gases.

How does ABB handle support for Measurement Care?

We have attempted to make it as easy and convenient for customers as possible. You have a single point of contact for contract management when needed – someone who knows you as well as your agreement terms, conditions and scope of supply.

What are some service examples that fall within the Rapid Response module?

Well, suppose lack of a field instrument or analyzer operation adversely affects your process to the point that you require quick action. ABB will agree to get a professional to your site within a mutually agreed time to get your process quickly back to normal. We will expedite the right part to facilitate swift repairs. In other situations, troubleshooting by a specialist via remote support or resident on-site ABB engineer can lead to even faster process recovery. In addition, we give priority to off-line repairs. This occurs when we request that you unplug the device from the process and ship it to an ABB repair facility. We will perform the repair and send the device back to you within an agreed-upon time.

What Measurement Care services are available on a regular basis?

Our Lifecycle Module includes the inspection and condition monitoring of measurement products and analyzers at regular intervals. These services help to increase process uptime throughout an instrument's lifetime. We will recommend spare parts inventories for maintaining and/or replacing products when onsite or remote inspections indicate these actions are warranted.

How about training?

Flexible training options for your in-house workforce are also part of the Lifecycle Module. Our professional training services qualify your engineers, maintenance and operations staff for running a safe and productive plant. Your personnel can receive training in our classrooms, at your plant, via webinar or online using our eLearning courses.

Can ABB handle on-demand calibration of measurement products?

Yes. In fact ABB pioneered onsite verification of accuracies in the field by our service engineers. This eliminates the need and expense of removing the unit from its installation and shipping to our laboratory. Otherwise ABB's global calibration laboratories incorporate the latest technology and processes to calibrate all ABB measurement products as well as those from many other global manufacturers. Calibration results are traceable to international standards.

How does Measurement Care services help to improve process performance?

Our service experts have extensive application knowledge. They can evaluate plant conditions, identify opportunities for improvement and implement a cost-effective performance enhancement program. They will also recommend an ongoing upgrade/replacement plan to secure peak performance of the installed base, keeping your plant competitive.

Can ABB provide advanced services to protect measurement integrity and optimize process uptime when ABB service engineers are not on-site?

Yes. We can remotely check the health and performance of your measurement devices on an agreed-upon timetable. Based on the results we will propose a plan to optimize reliability and/or recommend practices for predictive maintenance.

abb.com/measurement-service

ABB complete offering

Products, solutions and services for the metals industry

Your future in metals requires the right partner. International competition, fluctuating market demand, uncertain economic times and partial substitution processes are placing the steel and non-ferrous industries under enormous pressure.

Additionally, stringent environmental legislation and high expenditures incurred for restructuring and product innovation are raising costs and affecting operational efficiency in mills around the world.

Nevertheless metal has its future, they just need have the right partner – one with the experience, technology and know-how to help you meet and master the challenges ahead. That partner is ABB.

Solutions to help you succeed.

Take control and reduce costs

Take control of your process with solutions that will reduce costs and increase efficiency of your plant. Solutions with benefits that go directly to your bottom line. One of your most significant costs is energy. To decrease power consumption and reduce your electric utility expense, ABB's Static Var Compensators can stabilize the feeding voltages for your process. Industrial instrumentation and control technology can optimize every step of your production process by ensuring exact timing and sequencing.

You can also reduce raw material consumption by using ABB's batch computation system for electric arc furnaces. Lower energy consumption can be achieved in furnaces by implementing a model that incorporates the operating cycle with planned downtimes.

For optimum operator efficiency and control system interface, ABB provides comprehensive visualization based on industry-leading control systems technology and automated start-up functions. The metal making expertise of ABB engineers, backed by computer-aided process simulation capabilities, can ensure optimized design and efficiency throughout your meltshop and rolling mill.

Increase productivity

Using ABB systems and products, mills can increase productivity by maximizing the utilization of material and minimizing throughput times. Model computations and Static Var Compensation (SVC), for example, cut the tap-to-tap time in electric arc furnaces. More saleable material is obtained from a cold rolling process through a consistent increase in the usable strip length.

ABB inventory management systems minimize access times and reduce the amount of capital tied up in your warehouse. Advanced ABB electrics and mechanics, Power Quality equipment like SVCs and Dynamic Voltage Regulators (DVR), reliable AC and DC drives, industrial transformers, instrumentation and control equipment, comprehensive diagnostic systems – with remote capabilities – all combine to increase the availability and efficiency of your production line.

Enhance flexibility

Smaller batch sizes mean that production lines must cope with more frequent product change-overs. As a result, MRP (Manufacturing Requirements Planning) systems need to support your production schedule. ABB control systems, in interactive dialogue with plant master computers, can adapt control parameters for you according to the material flow and apply batch-referenced setpoints. Lengths are then optimized during continuous casting to ensure maximum flexibility and cost efficiency even for small batch sizes.

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01 Steel smelting
in furnace
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02 Hot rolling mill
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03 Cold rolling mill

Deliver consistent quality

The use of digital data processing technology enables ABB systems to deliver tighter manufacturing tolerances while measuring and analyzing relevant quality parameters for product certification. In meltshops, correct alloying, accurate chemical analyses and temperature control ensure proper metallurgical quality of the steel casted. For flat rolling mills, uniform strip thickness, tolerances and physical properties are maintained. ABB's shape measurement and regulation system, combined with an exactly monitored and model-controlled rolling process, assures a rolled strip of consistent flatness.

Upgrade eco-friendliness

Cost-efficient, reliable and eco-friendly power generation is one of ABB's main activities. ABB also offers effective environmental control technologies for the metals industry including media and materials treatment systems for recycling processes.

By monitoring carbon-monoxide, NOx, dioxins, furans, and other contaminants with intelligent ABB systems, emissions can be controlled and greatly reduced. With the help of ABB instrumentation and automation solutions, the eco-friendliness of your mill is assured.

ABB – Partner for the metals industry

ABB offers a comprehensive range of equipment, systems, and services to optimize production processes, mill-wide. Innovative technology and years of process experience has resulted in proven electrical and mechanical solutions for steel and non-ferrous metals producers, worldwide.

ABB engineers input all their product and process expertise, gathered from new plant construction and retrofit projects from around the world, to ensure that our commitment becomes your success. Throughout the entire project, you can rely on ABB as your competent partner.

Complete equipment packages

ABB is one of the leading electrical suppliers to the metals industry offering reliable, state-of-the-art components and systems. From power generation, transmission and distribution systems, to power supply, control and drives technology. From complete meltshops, automation packages with instrumentation equipment, to the complete electrical infrastructure for your mill. ABB can provide individually customized total plant solutions to meet your requirements today, and tomorrow.

Process optimization

Process control systems from ABB enable you to increase plant efficiency, improve product quality, reduce costs, and conserve raw materials and energy. ABB systems can provide the process optimization you need to produce a broader range of products with shorter change-over times. Products that will help you succeed in increasingly competitive markets.

Measurement & Analytics Service

Dedicated to optimizing your productivity and performance, ABB's services enable improved utilization and performance of your automation equipment, processes, and personnel. ABB provides comprehensive support – from planning and commissioning, through to complete life-cycle services for all of its measurement solutions, including: flow, pressure, temperature, level, thickness, flatness and tension measurement, valve automation, liquid and gas analyzers.

Ferrous and non-ferrous metals

ABB offers the same range of proven products, services and systems solutions for both ferrous and non-ferrous metals producers. With a large number of installation references, including many of the world's leading steel and non-ferrous mills, ABB offers the highest quality products and services, as well as extensive process know-how, to increase plant efficiency and help you remain competitive in a changing global market.

ABB strengths

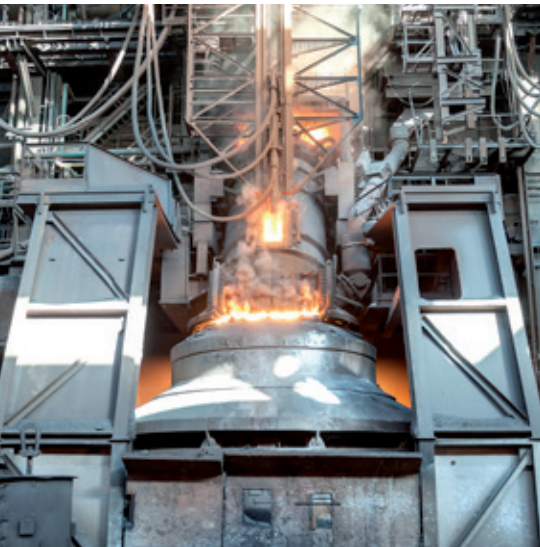
Operating at the leading edge of technology, ABB optimizes manufacturing processes in steel and non-ferrous metals industries. From large integrated plants to minimills, ladle metallurgy, hot and cold rolling mills (including flat mills and profile mills) and processing lines, ABB can draw upon its comprehensive process expertise and an application-matched range of electrical equipment. Open Control Systems for total plant process automation, measuring instruments, AC/DC drives, motors, environmental, control products, and other electrical and mechanical equipment from ABB can help you meet your targets.

Successful customers, including steel and non-ferrous metals producers around the world, confirm the high quality of ABB products and systems – proven solutions backed by extensive process know-how and decades of experience. To strengthen your future, contact ABB, your long-term partner in the metals industry.

Our solutions become standards.

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04 Cluster mill
—
05 Processing line
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06 Stainless steel
production

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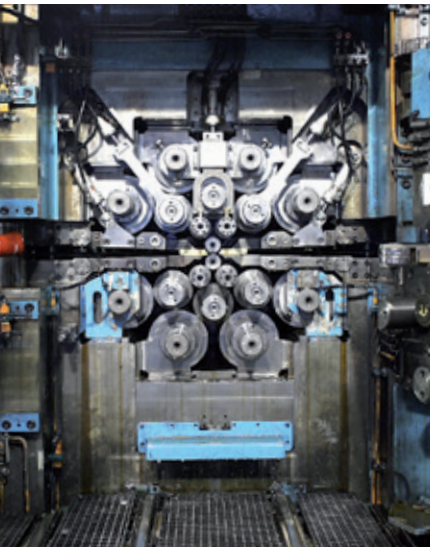
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To find your local ABB contact, visit:
abb.com/contacts

