

**SIEMENS**

# Process Instrumentation and Analytics

From coal mines to gold mines

Mining



Answers for industry.

# Mining is your business. Making your processes cost-effective, safer, and more efficient is ours.

We understand the mining industry's needs and can configure solutions to match your exact operating conditions. For a full portfolio of products and solutions for each process step in the value chain, with seamless integration for your entire company, choose a world-class brand delivering leading-edge automation technology.

## When you partner with Siemens, you get:

- Optimal resource efficiency – through innovative platform concepts
- A high degree of product safety – through maximum process transparency
- More flexibility – for faster and safer production changeover
- Increased productivity – with optimal solutions for the operating phase
- Simplified inventory – fewer different components with highly efficient maintenance
- An emphasis on user-friendly products – for safer, faultless operation

**Come with us as we  
show you how.**

## Table of Contents

Introduction	02
Emerging trends in the mining industry	04
Material handling	06
Flotation and separation	08
Mining diagram	10
Solution mining & in-situ leaching	12
Leaching	14
Coal preparation	16
Smelting and refining	17
Totally integrated automation	18
Industrial communications	18
Services and support	19









# Emerging trends and process instrumentation solutions

## Growing demand and declining natural resources

**Challenge:** As the demand for natural resources increases in countries throughout the world, we are also facing a decline in ore grade. Industry uses millions of tons of mined minerals each year. However, the concentration of minerals per square meter is decreasing in many regions.

**You need:** Reliable monitoring and control; reduced downtime and maintenance; increased productivity and efficiency.

**Our solution:** Devices suitable for tough applications; advanced asset management, diagnostics, and preventive maintenance functions.

## Environmental regulations and energy costs on the rise

**Challenge:** Energy costs are growing and industry is feeling the effects. Sustainable business is smart business, helping you keep up with environmental regulations directed towards water and energy efficiency and emission monitoring.

**You need:** Prevention of failures and waste; meeting regulations and avoiding additional costs; decreased energy consumption.

**Our solution:** Accurate monitoring of water consumption; advanced pump control; minimized air consumption; continuous emission monitoring (CEMs).

## Shortage of skilled mining labor worldwide

**Challenge:** Finding the right people for the job can be difficult in any industry. Finding workers skilled in the intricate parts of the mining process, even more challenging. Complicated process instrumentation creates maintenance requirements that you and your workers can't afford.

**You need:** Easy setup and commissioning; simplified engineering, installation, and routine maintenance.

**Our solution:** Quick Start Wizards; devices that require minimal maintenance; easy-to-understand diagnostics; seamless integration into DCS (Distributed Control System).

## Essential workforce safety practices

**Challenge:** The mining industry has no shortage of tough applications. High temperatures, hazardous materials, potentially dangerous situations. These conditions can be harmful to workers as well as to your company.

**You need:** Reliable instrumentation that reduces the need to send operators into hazardous applications.

**Our solution:** Heavy duty dust-tight enclosures; remote-mounted transmitters;



suitable accessories; wireless communications.

**Access to difficult locations means increased infrastructure costs**

**Challenge:** Many new sites your company prepares for mining operations are located in challenging areas. Remote mining sites require a great deal of costly infrastructure. Sending technicians to these locations is time consuming and expensive.

**You need:** Minimal product variance; reliable instruments and communication; minimal spares; ease of use.

**Our solution:** Single product types for a broad range of applications; user-friendly diagnostics; Quick Start Wizards; wireless communications.

## Key mining figures

### Precious metals

4 top gold producers:  
China, Australia, US, South Africa

### Coal

42% of the world's electricity  
7,678 million tons – global  
production in 2011

### Iron ore

1.92 billion tons produced  
globally in 2011  
1,400 kg of iron ore to  
produce one ton of crude steel

Sources: World Coal Association; UN News Center; World Steel Association; Bloomberg







# Material handling

Materials in your process are on the move. Transporting raw materials, feeding additives into a process, loading out finished products. Material handling requires speed and precision – provided by Siemens process instrumentation.

## Crusher level control

Crushers are harsh environments for sensors because of substantial vibration, high electrical and acoustic noise levels, in addition to rapidly moving material. Installing ultrasonic level measurement technology to control the feed on the crusher improves operational productivity. Prevent the crusher from inefficiencies such as running empty or being overfed with material.

### SITRANS LUT430 and Echomax XPS transducer

- Reliable continuous level device using proven ultrasonic technology
- Separated controller and transducer protect electronics from extreme vibration
- High frequency, non-contacting ultrasonic transducer is free of electronic components and fully potted to provide long-term reliability in harsh environments
- Sonic Intelligence provides superior performance in difficult conditions



### Certified conveyor load out

As an alternative to platform-based weighing, producers sometimes need the capability to load rail cars, trucks, or ships with material directly from a conveyor belt while still providing custody transfer weighing. This maximizes efficiency by decreasing loading time.

#### Milltronics MMI belt scale and Milltronics BW500 integrator

- Suitable for retrofit to existing conveyor systems offering accuracy to meet custody transfer requirements
- Typical approvals include NTEP, OIML, MID, Measurement Canada, and others
- Patented use of parallelogram-style load cells results in fast reaction to vertical forces, ensuring instant response to product loading
- Milltronics BW500 full feature integrator for use with certified installations, offering rate, totals, alarms, analogue outputs, and digital communications



### Inventory monitoring

Maintaining accurate inventory is required to control inventory costs and ensure appropriate amounts of stock are available. Automated inventory control reduces manual intervention, improving efficiency and worker safety.

#### SITRANS LR560 radar transmitter

- 78 GHz radar transmitter allows for measurement through dust within enclosed silos
- An exceptionally narrow 4-degree beam angle can cope with complicated silo geometry
- Sealed lens cavity is highly resistant to dust buildup
- Easy to install and configure with Quick Start Wizard
- Small size fits most existing silo nozzles





# Flotation and Separation

In the first stages of processing, you need to separate valuable materials from processed ore. To keep flotation and separation operations running smoothly, process instrumentation plays a crucial role.

## Slurry volumetric flow measurement

Flow measurement in slurries is critical for recovery and production rates. High-density abrasive slurries are commonplace, sometimes with high concentrations of magnetite. These conditions are often challenging for traditional flowmeters.

### SITRANS F M TRANSMAG 2

- Pulsed AC technology delivers a much stronger signal compared to typical DC electromagnetic flowmeters
- Suitable liners and electrodes available for abrasive applications
- Specific sensor calibration data stored directly in the meter body, not in electronics
- Integral compensation coil to eliminate the effects of magnetic materials (magnetite)

## Improved flotation cell performance

Flotation cells separate minerals and metals from raw material. Measuring the interface in this process between froth and pulp levels is critical for desired mineral/metal extraction rates. One transmitter measures the level of the froth and a second measures the level of the interface using a reflector plate.

### SITRANS Probe LU transmitter

- Cost-effective 2-wire loop powered ultrasonic level device
- Auto False-Echo Suppression for fixed obstruction avoidance
- Optimal signal-to-noise ratio gives high accuracy and reliability
- Available with ETFE or PVDF to suit chemical conditions of the application
- Field-proven Sonic Intelligence echo processing





### Controlling air flow to flotation cells

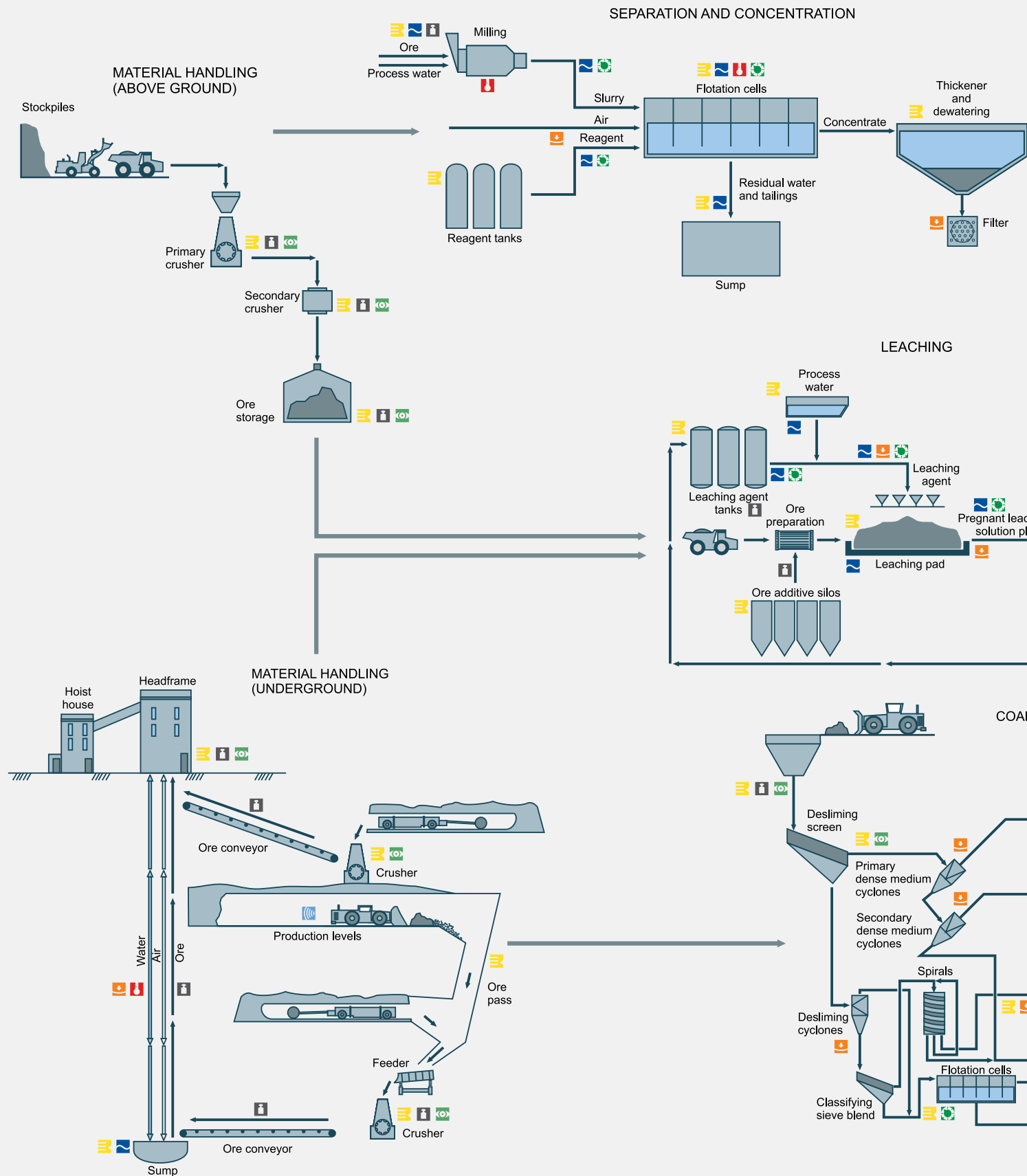
Maintaining the correct air flow to the flotation process is important for operating at maximum efficiency and optimizing recovery rates. Electro-pneumatic positioners are used to operate valves for optimum air control. These devices also save energy because they do not continuously bleed air.

#### SIPART PS2 valve positioner

- The industry benchmark for linear and rotary valves, double and single-acting actuators
- Easy retrofit with a variety of mounting options including remote mounting
- Simplified programming due to automatic spanning capability
- Advanced diagnostics including predictive maintenance



# The world of mining









# Solution mining and In-situ leaching

Flow and level measurements are the most important ways to keep your liquids and slurries moving efficiently. No matter the material, our instrumentation gives you the flexibility and accuracy you need.

## Liquid flow in mineral processing

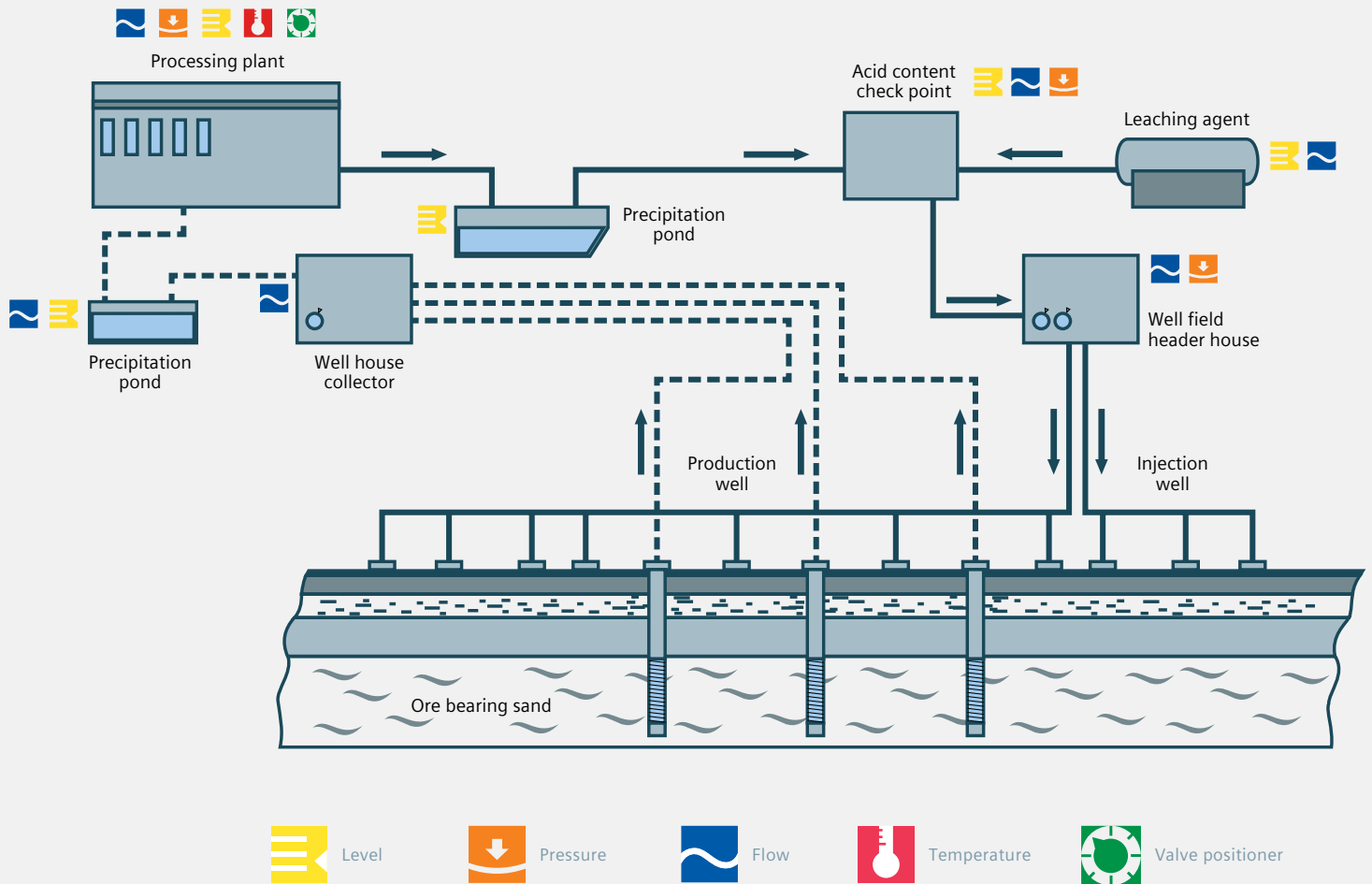
Mining and mineral processing plants require liquid flow measurement in a variety of areas, from high-accuracy water usage to slurry flow to wastewater processing. Flow is important for both process control and measuring efficiency. Electromagnetic flowmeters are widely accepted by the industry as flexible devices for measuring industrial water, slurries, and chemicals.

### SITRANS F electromagnetic flowmeters

- High accuracy of up to 0.2% on water
- Standard DC pulsed flowmeters suitable for most mining applications
- AC flowmeters available for high solids content applications
- Specialised small diameter for dosing process chemicals
- Stainless steel construction and liners such as PTFE or Linatex available, in addition to a wide selection of electrode materials to ensure compatibility with corrosives or abrasive materials



# In-situ leaching: the process



# Leaching

## Non-intrusive flow measurement

When you need to monitor the flow rate of water or slurry but do not want to install a sensor directly in the process, a clamp-on ultrasonic flowmeter is your preferred solution. Because this technology is installed outside the pipe, there is very little maintenance or problems from abrasion. Both portable and fixed versions are available to suit your requirements. Ultrasonics is compatible with the majority of piping material found in the mineral processing industries.

### SITRANS FUS1010 clamp-on ultrasonic flowmeter

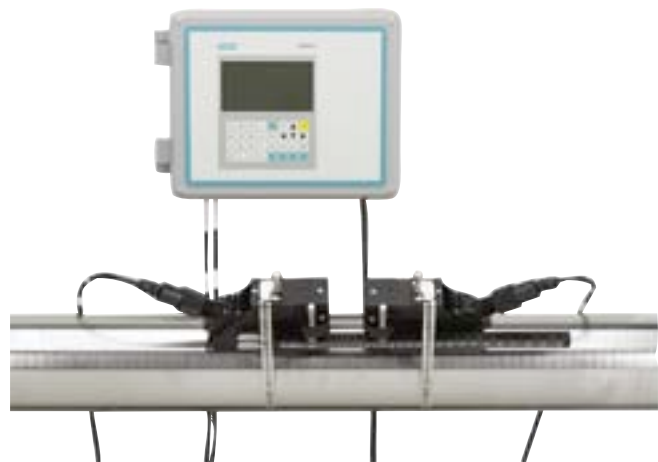
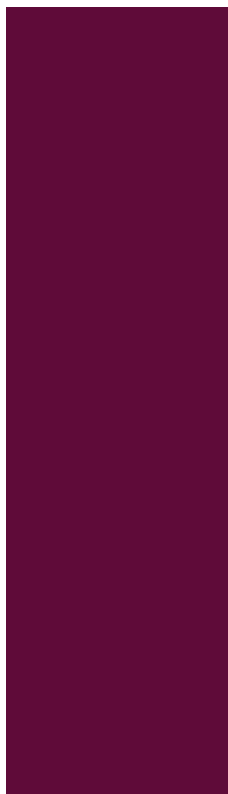
- Transit time and Doppler allow for measurement of clean liquids or slurries
- Both flow technologies may be applied on the same pipe to measure applications where water and slurries flow at different times
- Easy installation and minimal maintenance
- Extremely cost-effective solution for large pipe diameter applications

## Non-contacting level measurement

For monitoring chemical or reagent levels without installing a sensor that is directly in contact with the aggressive medium, a non-contacting high frequency radar is your preferred choice. Radar is not influenced by vapors, temperature, pressure, or process conditions, making it a universal solution for chemical level measurement regardless of the medium type.

### SITRANS LR250 radar transmitter

- Uses a non-contacting microwave so that measurement reliability is not distorted by buildup or vapors
- Built-in Process Intelligence prevents interference from the agitators and vessel obstructions commonly found in mining and mineral processing
- 2-wire, loop-powered device reduces installation costs and a PROFIBUS PA or Foundation Fieldbus option is available for bus-enabled sites
- Fully insulated PVDF antenna design resists most aggressive chemicals







# Coal preparation

Before coal can be marketed, you must remove any debris or waste materials. Keep product quality high and processes safe with flow control and pressure monitoring solutions.

## Reagent flow for flotation control

In hard coal flotation, reagents are required to improve the recovery rate of coal from the other mineral substances, such as sulphur, and to improve the froth structure. Accurate flow measurement is important because the chemicals are costly. In addition, valuable end product is lost to the rejects area when the flotation process is not operating at peak efficiency. Coal preparation plants use mass flowmeters, based on the Coriolis principle, for measuring reagent and flocculent dosage rates to a high level of accuracy.

### SITRANS FC430 Coriolis mass flowmeters

- Offers high accuracy over a range of flow rates
- Multi-parameter measurement enables simultaneous monitoring of density leading to higher dosage quality
- Coriolis technology enables measurement of non-conducting liquids
- Advanced communications allow access to multiple measuring parameters
- Can be retrofit to existing installations



## Pressure measurement in cyclone separation

A mixture of raw coal, denser debris and waste material enters the cyclone at a controlled flow rate and pressure. The high density rejects are forced to the outside of the cyclone and the cleaned coal goes longitudinally down the axis of the cyclone and discharges into the process. Coal preparation plants require accurate and robust pressure sensors to control this process.

### SITRANS DSIII digital pressure transmitter

- Remote mounting capability allows isolation from high temperatures and vibration sources
- Local display and local programming without opening the enclosure
- Advanced communications and predictive maintenance functions enable efficient maintenance cycles





# Smelting and Refining

Precision is crucial for removing impurities and extracting materials from metal or ore. Gas analysis keeps your workers safe and your emissions controlled during these processes.

## Furnace off-gas measurement

Extremely high furnace temperatures, combined with cooling water leakage is the main risk for furnace explosions. As water ingress occurs inside the furnace, more steam accumulates, causing internal pressure buildup. Siemens laser analyzers provide accurate and high-speed monitoring of gas composition in the furnace off-gas. Small leaks in the furnace, which have traditionally been undetectable, can now be accurately monitored.

### LDS 6 laser spectrometer

- Fast and cost-efficient solution for hostile environments, measuring up to three sample points with one unit
- Reliable real time in-situ measurement to track increase of inertisation thresholds, cut downtime, and reduce inert gas consumption and false alarms
- Installation and maintenance simplicity with built-in calibration system
- Elimination of influences, such as dust and temperature, from the instrument's integrated dynamic dust load compensation



# Totally Integrated Automation

## Products from the controller level to the field level

With Totally Integrated Automation (TIA), Siemens is the only provider of an end-to-end integrated portfolio of products and systems for the automation of the entire production workflow. From the goods receiving area to the finished goods warehouse.

Totally Integrated Automation reduces the complexity of the automation solution and enables what really counts: the practical combination of optimally coordinated individual components – without interface problems.

Totally Integrated Automation integrates not only the production process but all parts of the company – from the field level to the management level. The result: a perfectly coordinated overall concept that enables higher productivity.

# Industrial Communication

Communication networks are of utmost importance for automation solutions. SIMATIC NET – Networking for Industry – stands for a diverse range of modular blocks – Designed for Industry – which contribute to efficiently solving your communications tasks:

- In the different automation areas
- Across the entire workflow
- For the complete plant life cycle
- For all industries

SIMATIC NET offers solutions which both maximize the benefits of Ethernet and simply integrate fieldbus systems. Noticeable examples are:

- The development of the field level for the use of Industrial Ethernet
- Complete integration from the field level to the corporate management level
- The implementation of new solutions by means of wireless communication
- The integration of IT technologies





# Services and support

## Custom engineering

Siemens provides custom-engineered products to solve your special application needs. From material compatibility challenges to unique size requirements, Siemens custom engineering team can help.

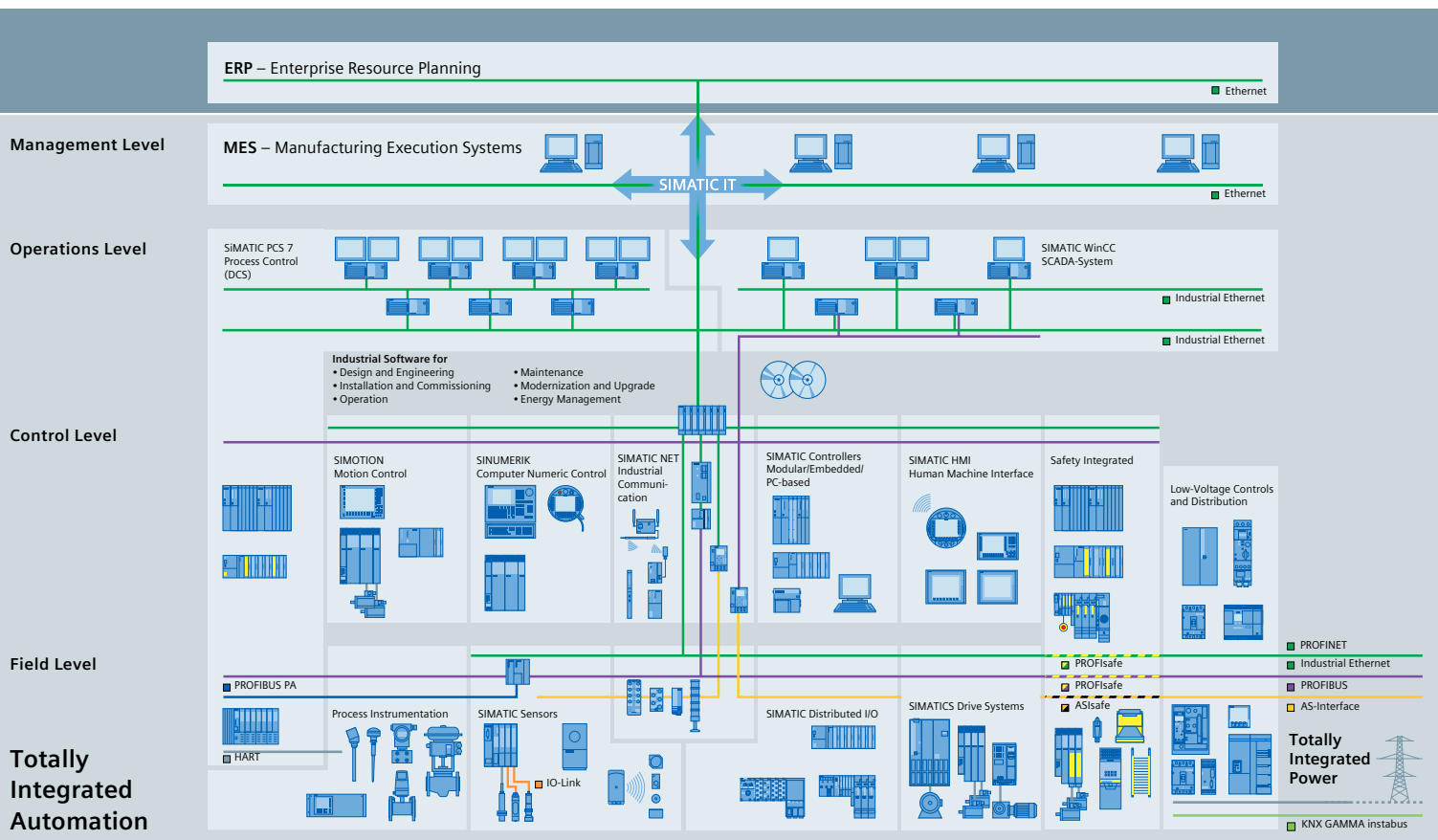
## Service around the world

Plants must function reliably at all times. Efficient and effective process instrumentation and analytics are an indispensable requirement to this end. You also need to be certain of fast and competent service from your supplier. Siemens is a global company that reacts locally. Whether you require consulting, quick delivery, or installation of new devices, the Siemens network of specialists is available to you around the world, wherever your location.

## Service around the clock

Our online support system offers rapid, comprehensive assistance regardless of time or location. From product support to service information, Siemens Industry online support is your first choice – around the clock, 365 days a year.

[www.siemens.com/automation/service&support](http://www.siemens.com/automation/service&support)



## More information:

[www.siemens.com/sensors/mining](http://www.siemens.com/sensors/mining)

Siemens AG  
Industry Sector  
Sensors and Communication  
76181 KARLSRUHE  
GERMANY

Subject to change without prior notice 03/13  
Order No.: E20001-A220-P780-X-7600  
DISPO 27900  
MI.SC.IM.XXXX.52.3.07 WS 04133.0  
Printed in Germany  
© Siemens AG 2013

The information provided in this brochure contains merely general descriptions or characteristics of performance which in case of actual use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract.

All product designations may be trademarks or product names of Siemens AG or supplier companies whose use by third parties for their own purposes could violate the rights of the owners.