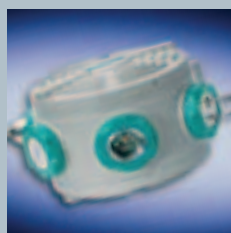


**Process Instrumentation  
and Process Analytics**  
for the Chemical Industry

# chemical INDUSTRY



**SIEMENS**





## Reliable Solutions for the Chemical Industry: Process instruments and analytics

Siemens instruments and analytics for process automation combine innovative technologies with solutions for any and all applications – from customized single installations to comprehensive system solutions.

### Your partner for all process application areas

Increasing competitive pressure, investment security, high system availability, quality conformity, environmental standards and regulations, safe and cost favorable operation, harsh ambient conditions – the requirements within the industrial sector are complex and many.

Having a partner who not only offers a broad product spectrum for process automation, but also possesses expert knowledge on procedural processes and the specific requirements of your sector – whether basic chemistry, special chemistry or fine chemistry – is to your advantage. With Siemens, you have a competent partner for meeting these requirements. Decades of experience in the measuring, analysis, regulation and control of industrial processes form the basis for an unmatched know-how in all fields of process engineering. We are the technology leader in many fields and have set new standards with our products.

As a manufacturer for process control technology, Siemens has maintained an intensive dialog with NAMUR for many years. Siemens is able to offer support in the field of process automation and instrumentation, and closely cooperates with various NAMUR task forces. NAMUR is the process control technology association of the chemical and pharmaceutical industry. The association consists entirely of process control users and currently has 90 member companies.

### Totally Integrated Automation

Process instruments and analytics also form an integral part of Siemens' Totally Integrated Automation strategy.

With Totally Integrated Automation (TIA), Siemens is the only supplier to offer a complete spectrum of matched products, systems and solutions for the chemical industry – from field level, through production control, to the management level. TIA makes an essential contribution to production process optimization, and complexity reduction. This results in an increase in productivity with a high degree of investment security.





# solutions



Rely on Siemens as your partner with many years of know-how in process automation. Constant innovations to our product line are achieved due to the cooperation and interchange of ideas with our customers. This results in reliable and profitable solutions for all your process automation tasks – whether that is a single measurement application or a complete system solution.

## All from a single source

- Process instrumentation
  - Measurement transducers for pressure, temperature, flow and level
  - Positioners for pneumatic linear and rotary actuators
  - Process controllers and recorders
- Process analytics
  - Process gas chromatography
  - Mass spectrometry
  - Process gas analysis
  - In-situ laser spectrometry
  - Solutions and systems
- Weighing technology
  - Components for weighing systems, belt scales, weigh feeders and solids flowmeters
  - Components for process monitoring
- SIMATIC-PDM software for operation, maintenance and diagnostics
- Consistent engineering and standardization for field instrumentation
- SIPLAN C/E engineering tool for efficient project management
- Open systems thanks to connections via PROFIBUS or HART communication as standards for the easy integration of existing and future components



[www.siemens.com/chemicals](http://www.siemens.com/chemicals)



## Reliability and Safety in Every Process Phase:

### Process instruments and analytics for the chemical industry's special requirements

With an extensive product range, which is matched to the needs of the chemical industry, Siemens meets the varying requirements of measuring technology. All our product families are comprised of instruments that are approved in accordance with the global standards of the chemical industry. By working closely with testing laboratories and industry workshops, new developments support existing and evolving NAMUR requirements.

#### The right solution for every measuring task!

The spectrum of process measurement applications can range from simple to very difficult. Because the specific requirements of the measurement application are not always known, finding the most suitable measuring method for each application can present a big challenge. In such cases, it is all the more important to have a partner who not only offers a suitable product spectrum consisting of various technologies, but who also possesses the required process experience and knowledge to find the optimum solution.

#### In extreme cases: individual solutions!

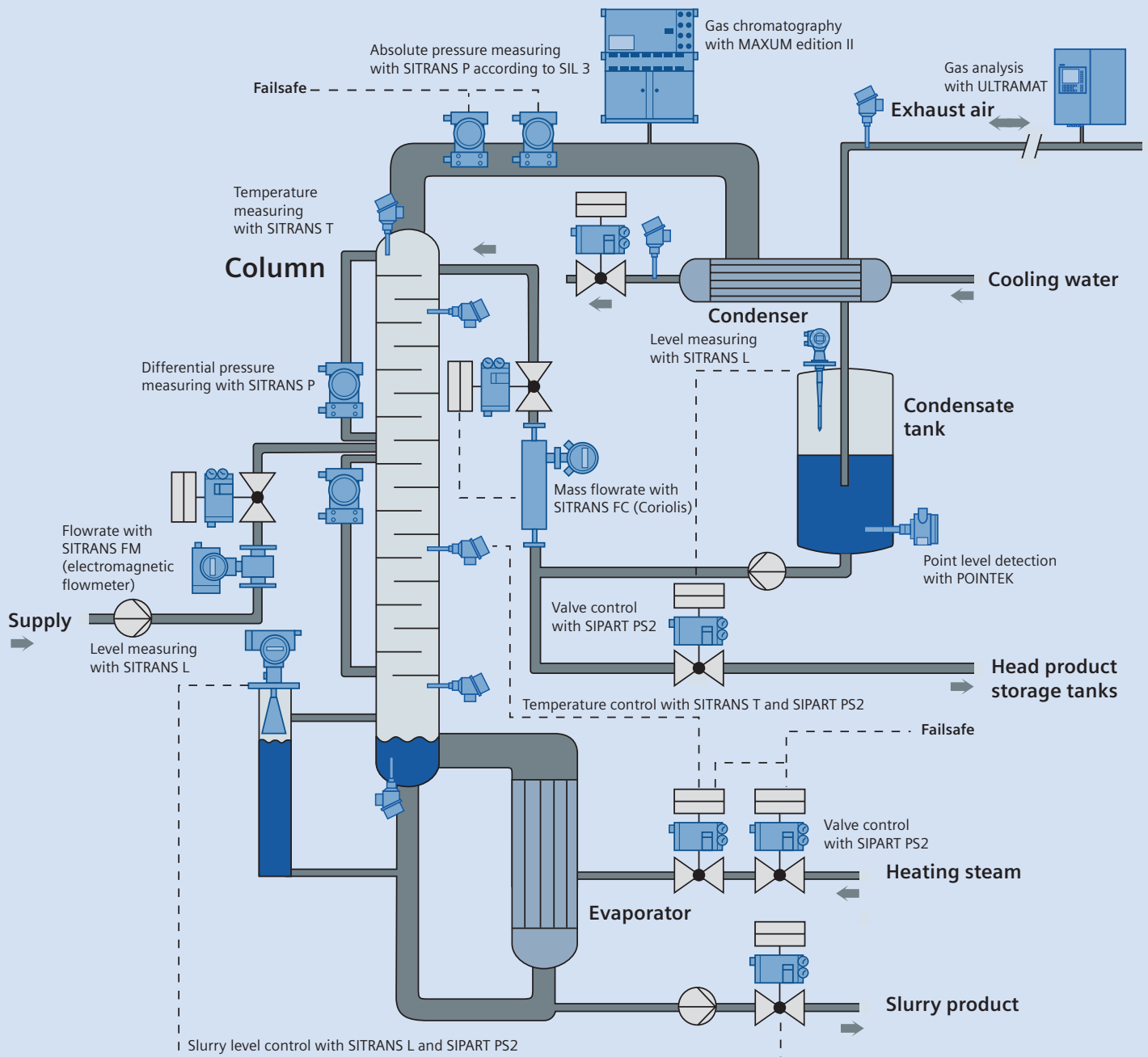
Our specialists welcome the challenge of highly complicated or entirely new applications. In co-operation with you, they will find the suitable solution on site and, if required, adapt the measuring devices to meet your specific application.

#### Communication is everything!

Within a process automation system, reliable, effective communication between a field device (field level instruments) and the control system is critical for optimum process control. To facilitate the connection of our field devices to varying protocols like HART, PROFIBUS etc., we have integrated the required interfaces. Thus, consistent fieldbus communication even throughout Ex zones, e.g. based on PROFIBUS-PA, can be realized via a simple 0/4 – 20 mA signal – also with HART.



# workflow



Scheme of a multi-level distillation process

Level measurement of dyes:  
Application of a SITRANS LR 300  
with non-contact radar technology



## From Simple to Demanding: Process instruments from standard tasks to individual solutions

Throughout the chemical industry, measurement requirements can be extreme. Everyday tasks include the measuring of gases, liquids and solids, as well as all intermediate forms such as powders, pastes, pulps and slurries. Every substance is different and calls for an individual solution. Because the measurements are often carried out in extremely harsh ambient conditions, specialized process instruments (e.g. pressurized enclosures) are often required for the safety-relevant approvals (ATEX, FM, SIL, WHG, ...).

### Level measurement

The requirements placed upon level measurement in the chemical industry are many. They range from protection against over filling, to measurements in potentially explosive dust zones, to difficult process-related procedures – in both simple storage tanks or in complex process tanks.

The media to be measured may have extreme varying characteristics. Steam, dust, foam and high temperatures and pressures, for example, often occur simultaneously with turbulences, caking, condensate formation and other product characteristics. We offer a broad range of level sensors for all these requirements, whether for point level detection or continuous measurement. With our SITRANS L level transmitters and

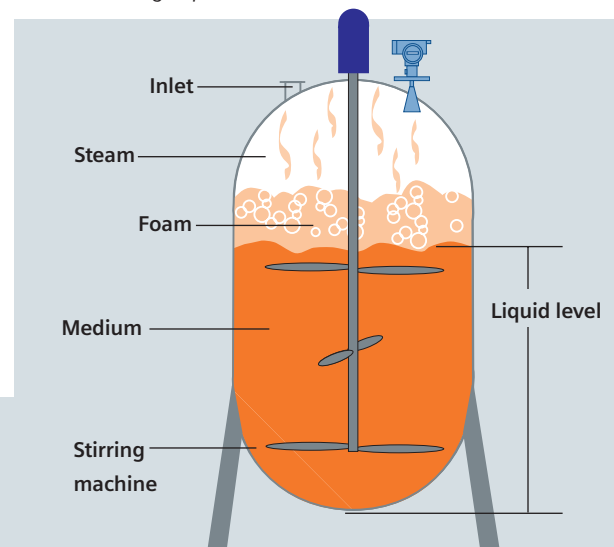
the Pointek sensors, we have redefined level measurement. Against this background, our broad application experience and demonstrated performance deliver value to your process.

When it comes to selecting the suitable measuring method and specifying the respective device, you will profit from our experience. We understand the difficulties faced with level measurements: aggressive media, tank geometries, and tank installations such as heating systems, stirring machines, scrapers, inlets and outlets. With our various level technologies (radar, ultrasound, capacitance, pressure or weighing), we will provide you with the optimum solution!



Installed in an application for the production of titanium dioxide, the pulse radar delivers reliable measurement results despite extreme deposits at the horn antenna

Level measuring in process tanks with foam formation



Flow measurement  
at a measuring orifice  
with SITRANS P



# applications



Often used in pilot systems or  
for dosing applications:  
Coriolis flowmeter SITRANS FC  
for small flowrates

## Flow measurement

Liquids, steam, gases, pulps, slurries or pastes – the wide range and varying conditions of media to be measured in the chemical industry require comprehensive knowledge and experience to determine the correct measuring point location. Large and small tube diameters, varying pressures, high temperatures, high viscosities – which measuring method assures the best solution? An experienced partner like Siemens can offer a complete range of flow measurement technologies to fit many different flow applications. Often, the diverse requirements demand extensive application experience coupled with state-of-the-art technology and innovative products.

In order to provide optimum solutions to flow measuring requirements, we offer a broad range of measuring technologies. Here the central focus is placed on our low maintenance electronics which require no installation in the measuring tube, including ultrasonic flowmeters, electromagnetic flowmeters, and mass flowmeters in accordance with the Coriolis measuring principle. For the chemical industry, the 0.1 % measuring accuracy of the Coriolis flowrate meter is highly attractive, particularly since the measuring process is largely carried out with no disruption to the process parameters. "Classical" mechanical methods are also available: Rotary piston meters, variable-area flowmeters, or measuring orifices remain an integral part of our product family.

Not only do we recommend the suitable measuring method for the various applications in the chemical industry, we also offer numerous device technologies. Our electromagnetic flowmeters can, for example, carry out precise measuring tasks in media with contents which influence the magnetic field (e.g. iron). The measuring principle of the pulsed-alternated field system required for such tasks has been patented and is exclusively produced by Siemens.

Typical substances to be measured in the chemical industry are often aggressive acids and bases. Some materials may also be abrasive. Here, Siemens offers its patented NOVOLAK flow tube lining, a material with extraordinary resistance. The smooth, nonporous surface is suited for full vacuum, offers excellent pressure rating, and is resistant to chemicals, abrasion and excess wear.



Ultrasound flowmeter SITRANS F US in a  
formaldehyde production plant





*Absolute pressure measurement with SITRANS P in a loading system for toluene*



*SIPART PS2 positioner with explosion protection in a chemical plant*

### Pressure measurement

Whether relative, differential or absolute pressure, the SITRANS P pressure transmitters provide precise pressure measurements. The SITRANS P instrument is ideal in the chemical industry, where highly aggressive media requires experienced solutions. In order to find the right solution for every application, we offer stainless steel, Hastelloy, Monel, tantalum and gold diaphragms. For harsh ambient conditions, stainless steel and aluminum diecast enclosures are available.

The construction of the SITRANS P DS III transmitter provides a device-integrated zone separation. Thanks to this design, the device's process connection can be operated in zone 0 and simultaneously supplied with EEX Ib auxiliary energy.

Cost reductions by inventory simplification:

With the SITRANS DS III transmitter, your inventory costs are reduced to a minimum because our standard device fulfills the criteria for inventory applications in accordance with SIL 2. The SITRANS DS III transmitter can also be used for safety-related measuring points. The subsequent reduction to only one device type simplifies your instrument inventory and thereby reduces your costs.

Thanks to the device's modular design, the electronic components can be replaced individually. In doing so, the sensor-specific data remains reliably stored in the measuring cell. Based on this principle, a HART device can quickly and individually be converted into a PROFIBUS device, while on-site repairs – quite rare with a device MTBF of over 300 years – may also be carried out easily and with minimal expense.

In large process plants, reduced commissioning and maintenance times are a welcome bonus. The SITRANS P DS III transmitter features simple 3-key operation for fast modification of all required parameters. Additional functions like loop check and pressure simulation save time and effort and many long tours through the plant.

Functions such as self-test, drag indication, various diagnostics, and several adjustable limit values are available during operation, and convince many chemical companies to select the SITRANS P instrument as their plant standard for pressure measurement.

### Weighing and dosing

With the SIWAREX weighing system, Siemens has been setting standards in weighing technology for many years. The high accuracy of the SIWAREX weighing systems is a result of the SIMATIC standard components. They can easily be integrated into the automation structure of the process, and the SIMATIC PCS 7 process control system. In addition to electronic weighing systems and cells, you can select from an extensive range of Siemens-Milltronics belt scales, weigh feeders and solids flowmeters – to meet your individual requirements.

*Guaranteed safety!  
SITRANS P DS III applicable for SIL 2,  
redundant also for SIL 3*







# applications

## Temperature measurement

The SITRANS T temperature transmitters stand up to extreme process conditions and provide reliable and precise measuring results. Whether you select a sensor, converter, panel, field or head transmitters, or the complete measuring device, Siemens has mastered temperature measuring down to the detail, and can supply the instruments that precisely meet the requirements of the chemical industry.

Whether it is high temperatures, high pressures, or aggressive media, temperature measurement applications are not always easy and are often carried out in harsh ambient conditions. Sensor options include protective and long-collar pipes or sturdy aluminium diecast, or stainless steel enclosures. Our SITRANS T transmitters are available in varying styles, including simple designs to intrinsically-safe models with diagnostics and simulation options.

## Process monitoring, control and recording

In the chemical processing industry the monitoring, control and recording of processes is often subject to special requirements. Plants in the chemical industry have been using our process controllers and recorders for many decades. The Siemens' offering encompasses SIPART DR compact controllers and SIREC process recorders, available in traditional paper recorder designs or the latest generation digital display recorders.

## Valve control and regulation

Valve control is the crucial link in many chemical processes where precise operation with diagnostic capabilities is critical. These are the perfect applications for the SIPART PS2 electropneumatic digital smart positioners. The SIPART PS2 positioner is available for linear and rotary actuator mounting or for remote mounting applications. Other application specific designs are also possible.

The SIPART PS2 valve positioner requires very little system energy and can rapidly provide return on investment. With negligible air consumption, advanced diagnostics, and automated commissioning, both considerable time savings and control optimization are achieved. SIPART PS2 has been accepted by the chemical industry for many years and is the standard in many fields.

**SIPART PS2**  
*The most frequently used intelligent positioner for linear and rotary actuators*





*Analysis house with process gas analyzers and sample preparation in an acrylic acid plant*

## Information Optimization Thanks to Innovative Online Analytics: Siemens Process Analytics

The requirements placed upon modern process analytics in the chemical industry include the quantitative analysis of one or more components of a complex chemical composition with maximum selectivity. Therefore, the call for process-relevant, substance-specific online information for the optimization and control of chemical production processes is quite essential.

Continuous innovations in the field of online analytics provide system operators with increasingly current process information, and facilitate an early intervention for important process parameters. Innovative analytics by Siemens offer all possibilities: from process-close in-situ measuring tasks, to the components' system integration with sampling and processing, to complete analysis houses.

### Process gas chromatography

Process gas chromatographs accompany production processes from raw material analysis all the way to quality monitoring of all chemical processes.

- Thanks to its modular concept, MAXUM Edition II can be optimally adjusted to the respective analysis task. Maximum accuracy of the analysis results, reduced maintenance expenditures, and a multitude of the most varying applications in the chemical industry are convincing arguments – whether with the detection of sulfur compounds, aromatic hydrocarbons or raw material pollutants, even on trace level!
- The most modern micro-mechanics form the basis of the smallest explosion-protected online process gas chromatograph, MicroSAM. It is so compact and sturdy that it can be directly mounted at the sampling point, even in the harshest ambient conditions. It analyzes both aliphatic and chlorinated hydrocarbons or O<sub>2</sub> and N<sub>2</sub> in the most complex product matrix.



*Direct oxygen and ethylene measuring at an EDC (ethylene di-chloride) boiling reactor with a process gas chromatograph*

# applications

## Process gas analysis – extracted –

Process gas analysis optimizes a chemical process from the reaction gases' input control, to product flow control, to emission monitoring at the flue for local, state and federal compliance. The safety-relevant measuring of explosive or toxic substances enhances personnel and system protection.

- Paramagnetic oxygen measuring with maximum accuracy, even in the smallest measuring areas, is no problem with OXYMAT 6 and OXYMAT 61. Avoiding movable components assures maximum cost efficiency thanks to minimal maintenance requirements and maximum device service life. You get guaranteed maximum measuring accuracy, whether with O<sub>2</sub> purity monitoring in air separation plants or O<sub>2</sub> trace analysis in potentially explosive processes.
- NDIR gas analyzers, such as ULTRAMAT 6 and ULTRAMAT 23, are used for highly selective concentration determinations for IR-active gases and gas compounds. With ULTRAMAT, you can solve several measuring tasks with one device at a favorable cost. This is especially important for many production processes involving inorganic and organic chemistry.
- The FIDAMAT 6 provides total hydrocarbon analysis with an FID (flame ionization detector). Almost all applications can be carried out from hydrocarbon trace analysis in pure gases to hydrocarbon sum measuring in corrosive gases.
- Do you need to measure hydrogen or inert gas concentrations in binary compounds on the basis of specific thermal conductivity, even in potentially explosive areas? The CALOMAT thermal conductivity based gas analyzer distinguishes itself by high measuring range dynamics and short response times.
- Thanks to its FT-ICR technology (ion cyclotron resonance), the QUANTRA mass spectrometer offers a high resolution which facilitates a direct and precise analysis of even complex gas compounds without any additional measurements. The QUANTRA's electron source (filament) ensures resistance against aggressive and corrosive samples. The spectrometer is so sturdy, reliable, small, and easy-to-operate that it delivers reliable results even in harsh ambient process conditions. The detection of trace elements in a complex product matrix is no problem.

*Process gas chromatograph in the analysis house of an aromatics plant*





# applications

## Process gas analysis – in-situ –

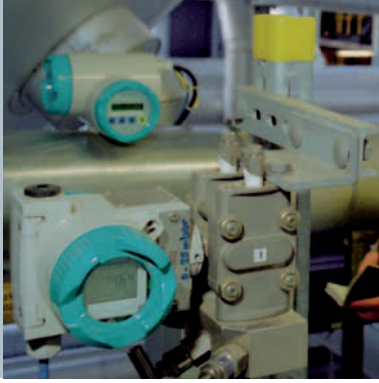
While with mass spectrometry the “fingerprint” of the subject substance is determined on the basis of the molecular weight, laser spectrometry utilizes the optical absorption characteristics. A characteristic absorption band of the subject substance is selectively extracted and measured from a complex absorption spectrum. The sturdy and reliable LDS 6 laser diode spectrometer is able to detect more than a dozen of gases such as  $O_2$ ,  $NH_3$ , HF, HCl, and water vapor in-situ.

## System construction

In addition to our product competence in the chemical industry, Siemens process analytics offers customized solutions that include fully air-conditioned analysis houses. Our specialists design analysis systems together with the user and develop a custom system based on the most modern process analyzers and Siemens' experience in determining which details should be considered within the scope of each individual application.

*LDS 6 diode laser spectrometer: The eye in the process of a DeNOx plant – detects the  $NH_3$  slip directly behind the denitrification*





### Configuration software for all process devices

With SIMATIC PDM (Process Device Manager), Siemens offers a uniform software tool for central access to all communication-capable process devices within a system. It facilitates the manufacturer-independent operation, adjustment, maintenance and diagnostics of intelligent process devices. This ensures that all devices and procedures integrated in your process automation system are safely under control.

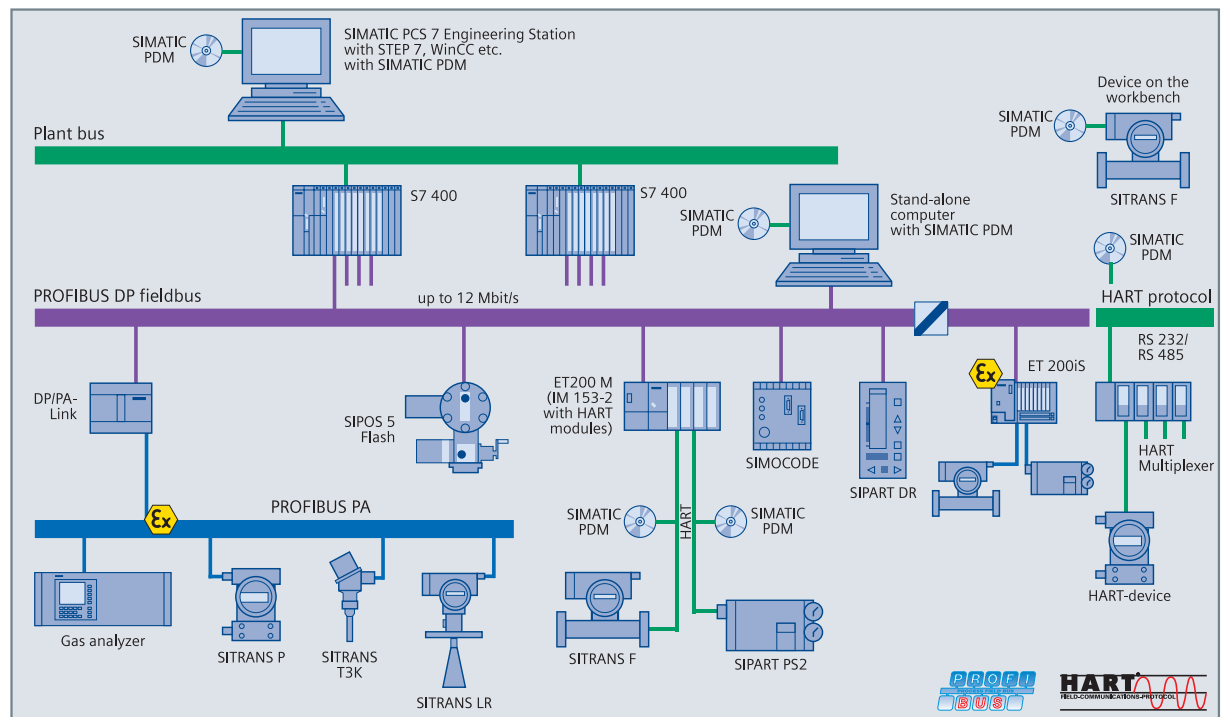
Regardless of the automation system, it can be applied via PC, or programming devices, or integrated into the SIMATIC PCS 7 automation system.

Communication connection can be accomplished via HART, PROFIBUS-DP, PROFIBUS-PA, or other protocols.

### Plant-oriented asset management

SIMATIC PDM complies with NAMUR specification NA64 on status signaling of field devices and supports the NAMUR recommendation NE91 on plant-oriented asset management.

Thanks to the process devices' diagnostics options in connection with PROFIBUS communication and the Electronic Device Description EDD used in SIMATIC PDM, an added value is created, which is quickly realized in chemical industry plants through faster and more focused maintenance personnel support.





## Process Instruments, Analytics and More: Services and Support

Siemens offers proven solution concepts for process instrumentation and overall systems, all from a single source, from consulting, to engineering, to connection, to the control system. This is completed by professional installation, commissioning, and comprehensive after-sales services.

### Our services at a glance

- System and schedule planning by an experienced project management team
- Complete planning/engineering of the field level, manufacturer-independent device requirements
- Specialist consultation on the selection and dimensioning of the process instruments and analytics
- Effective, efficient system planning with SIPLAN C/E engineering tool
- System documentation:
  - System and procedural concepts
  - Mechanical documentation
  - Electrical documentation
- Selection and supply of all required process instruments
- Supply of all mounting brackets and installation material
- Installation, testing and commissioning
- Comprehensive after-sales services

### Consistent engineering tool

Often, all affected partners are subjected to enormous time pressures until a plant's commissioning. Any change in the planning specifications increases this pressure for all parties. Siemens has met this challenge by developing an engineering tool which facilitates a fast reaction to your requirements, SIPLAN C/E. With this tool, all developed applications are stored in a library. Among others, this library contains the various versions of our field devices, as well as already solved measuring problems. This enables us to prepare a complete plant engineering structure, including the documentation for process instruments and analytics, considerably faster than with conventional planning tools. With E-plan, you are furnished with the complete project, including device documentation, construction plans, circuit diagrams, mounting and commissioning documentation, cable lists, and measuring points lists.



# service

## **Our service – available to our customers around the world**

Plants must function reliably around the clock. While efficient and effective process instruments and analytics are an indispensable prerequisite for this, you also need fast and competent service from your device manufacturer! As a modern, global operating company, Siemens is available to you around the world, whether you require consulting or quick delivery and installation of new devices.

In many countries, our local specialists can provide you with their automation and process know-how. We are also at your service via the Internet. Our product portfolio and our consulting potential are available to you at any place and at all times.

## **Further details on the Siemens product and service portfolio are available at:**

**[www.siemens.com/chemicals](http://www.siemens.com/chemicals)**

## **Online support: Rapid assistance via a mouseclick**

Our online support, with its interactive information system and extensive product portfolio, is available to you at all times. It offers rapid, comprehensive assistance without any time delays. From product support, to service information, to interactive services, our online support is always the first choice, around the clock and 365 days a year.

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



*Since June 2001, Siemens has been listed as a supplier on cc-chemplorer, the leading electronic marketplace for indirect goods of the chemical and life science industries and chemical sectors.*

## For further information, visit:

[www.siemens.com/processinstrumentation](http://www.siemens.com/processinstrumentation)

[www.siemens.com/processanalytics](http://www.siemens.com/processanalytics)

[www.siemens.com/weighing-technology](http://www.siemens.com/weighing-technology)

[www.siemens.com/chemicals](http://www.siemens.com/chemicals)

### Siemens AG

Automation and Drives (A&D)  
Process Instrumentation and Analytics  
76181 Karlsruhe, Germany  
Tel. +49 (0) 721 595-4560  
Fax +49 (0) 721 595-4100

[www.siemens.com/processautomation](http://www.siemens.com/processautomation)

*Product designations such as SITRANS, SIMATIC, SIPART, etc., are registered trademarks of Siemens. All other designations contained in this brochure may be trademarks whose use by third parties for their purposes may infringe the rights of the owners.*

*The information listed in this brochure merely contain general descriptions or capacity characteristics, which need not necessarily always apply to specific application cases or which may change due to the products' redevelopment. The desired capacity characteristics are only binding if they are expressly specified upon contract conclusion.*