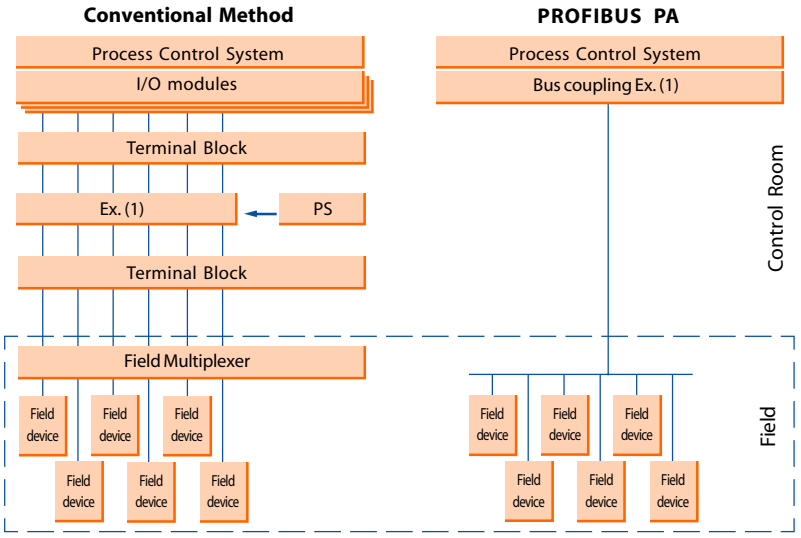
PROFIBUS PA
INTRODUCTION

PROFIBUS PA is the PROFIBUS solution for process automation. PROFIBUS PA connects automation systems and process control systems with field devices such as pressure, temperature and level transmitters. PROFIBUS PA can be used as a substitute for the analog 4 to 20 mA technology. PROFIBUS PA achieves cost savings of over 40% in planning, cabling, commissioning and maintenance and offers a significant increase in functionality and security. The Figure below shows the differences between wiring of a conventional 4 to 20 mA system and a system based on PROFIBUS PA.



Wiring efforts from the field to the field multiplexer remain nearly the same. However, if the measuring points are widely distributed, PROFIBUS PA requires decidedly less cabling. When using the conventional wiring method, each individual signal line must be connected to the I/O module of the process control system.

A separate power supply (a power supply for potentially explosive zones may even be necessary) is required for every device. In contrast, when PROFIBUS PA is used, only one two-wire line is needed to transmit all information and the power for the field devices. This not only saves wiring costs but also lessens the number of required I/O modules in the process control system. PROFIBUS PA permits measuring, control and regulation via a simple two-wire line. It also

permits powering of the field devices even in intrinsically safe areas.
PROFIBUS PA permits maintenance and connection/disconnection of devices during operation without effect on other stations even in potentially explosive areas. PROFIBUS PA has been developed in close cooperation with users in the Process Control Industry (NAMUR) and meets the special requirements of this application area:

- Unique application profiles for process automation and interoperability of field devices from different vendors.
- Addition and removal of bus stations even in intrinsically safe areas without influence to other stations.
- Transparent communication via segment couplers between the PROFIBUS PA bus segments in process automation and the PROFIBUS-DP bus segments in manufacturing automation.
- Remote powering and data transmission over the same two wires based on IEC 1158-2 technology.
- Use in potentially explosive areas with explosion protection type "intrinsically safe" or "not intrinsically safe".

Series 303 - Field Device Family

With SMAR's PROFIBUS PA 303 device family, you are able to take full advantage of fieldbus technology in distributed systems, process control, automation and engineering.
They can be totally integrated into modular systems from sensor monitoring to the management level.

A wide range of products, including transmitters, converters and positioners, are available and if necessary, can be integrated with other PROFIBUS PA compliant devices from different manufacturers.
The connection of transmitters, converters and positioners to a PROFIBUS DP network is done via a coupler or a link device.

The same devices can be used on Intrinsically safe applications in potentially explosive environments.
The two-wire cable combining power and data communication for each device provides easy installation, which results in lower hardware costs, shorter startup time, problem-free maintenance, low-cost software engineering and higher operation reliability

The PROFIBUS PA protocol uses the European Standard EN50170. The Physical Layer is defined according to IEC 1158-2, which can also be used for intrinsically safe applications.
The PROFIBUS PA protocol uses the same communication protocol as PROFIBUS DP. This is due to the fact that the communication services and telegrams are identical. In fact, PROFIBUS PA = PROFIBUS DP communication protocol + Extended Acyclic Services + IEC 1158 which is the Physical Layer, also known as H1. It permits uniform and full integration between all levels of the automation and process control plant areas. This means that the integration of all plant areas can be accomplished with one communication protocol using different variations.

PROFIBUS PA is a two-wire network carrying digital information and power for the devices. When they are used in potentially explosive atmospheres, the PROFIBUS PA bus and all connected devices must comply with "Intrinsically-safe" guidelines. The Series 303 devices from SMAR are indeed "intrinsically safe."

A maximum of 31 field devices in the non-hazardous area and a maximum of 10 field devices in a hazardous area can be connected to a PROFIBUS PA segment.

Migration of existing interfaces to PROFIBUS

Devices with conventional digital and analog interfaces in the chemical and process engineering industries can be connected to PROFIBUS PA via SMAR PROFIBUS PA 303 Converters, using the FI303, IF303 and FP303. These products are the PROFIBUS PA to Current, Current to PROFIBUS PA and PROFIBUS PA to Pneumatic Signal Converter, respectively. Also they can be connected to PROFIBUS DP via distributed I/O systems using PLCs or modules I/O. This permits the migration of an existing field device interface to PROFIBUS. Choosing PROFIBUS means that you are investing in the future and you are simultaneously protecting your existing investments.

PROFIBUS DP/PA Interface

To guarantee a smooth transition between PROFIBUS DP and PROFIBUS PA, due to the fact that they use different data baud-rates and methods, the DP/PA coupler and a DP/PA link should be used as a "gateway".

The DP/PA coupler is used for simple networks and low processing time requirements. The DP/PA coupler is used to translate the physical bus characteristics between PROFIBUS DP and PROFIBUS PA. The DP/PA coupler is available in two versions: for applications without hazardous requirements and for applications with field devices in potentially explosive atmospheres. When the bus system is configured, the DP/PA coupler is invisible. The connected field devices are addressed or accessed directly from the programmable controller or automation system. The coupler operates as an invisible gateway to the control system and all parameter changes are done automatically by the PROFIBUS system which proves that in fact its a single protocol with different variations.

The field devices on PROFIBUS PA can be connected to PROFIBUS DP via a DP/PA link. The DP/PA link is used for large networks and in this case more than one DP/PA link can be connected to one PROFIBUS DP line depending on the network complexity and the requirements for processing time. The DP/PA link acts as a slave on the PROFIBUS DP and as a master on the PROFIBUS PA decoupling all data communication on the network. It means that PROFIBUS DP and PROFIBUS PA can thus be combined without influencing the processing performance of PROFIBUS DP. The DP/PA link can be operated on all standard PROFIBUS DP Masters and the addressing capacity of the system is considerably increased due to the fact that a maximum of 31 field devices can be connected to a DP/PA link, but the DP/PA link only reserves one PROFIBUS DP address.

Configuration of Series 303 Devices

The Series 303 uses the SIMATIC PDM (Process Device Manager) as a configurator and parameterization tool and it is a totally integrated and manufacturer-independent tool for configuring, parameterization, commissioning and diagnosis of intelligent process field devices. The Series 303 can be configured by others configurators tools compatible with PROFIBUS PA and this family of devices can be integrated into a particular HMI tool if this tool is open, manufacturer-independent and interoperable with PROFIBUS PA technology.

Diagnostics and startup is performed from a PC or programming device connected to the PROFIBUS-DP. The SIMATIC PDM configuring tool can be used on a PC for the following tasks:

- Parameterization and Commissioning
- Network configuration and project management
- Uniform operation of all process devices
- Network and instrument diagnosis during breakdown or start-up (phase failure, ...)
- Extended diagnostic functions (device-specific)
- Maintenance
- Calibration and other device methods
- Asset Management
- Life Cycle Management of devices and TAGs
- Comparison and checking of parameter values
- Logging of user activities
- User administration
- Views of Process Devices
- Network view
- Plant view
- Offline parameterization
- Status of parameter values

This HMI is a multi-language program (German, English, French, Spanish and Italian) and it can be used with MS Windows 95 / Windows-NT 4.0 / (Windows 98 in preparation)