PROFINET for the process industry

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1. Introduction: From fieldbuses to „Ethernet to the Field“

In the past, the process industry has enjoyed many positive effects by using fieldbus technology for the automation of its production lines. The feature set of fieldbuses tailored to the needs of process automation (PROFIBUS PA, FOUNDATION Fieldbus) includes support for digital communication and manufacturer-neutral device replacement while also reducing cabling requirements. As a result, fieldbuses have been used to automate many process systems over the last 20 to 25 years.

Conventional bus systems have key limitations for users now wanting to add Industrie 4.0 capabilities to their systems, however. Properties inherent in the fieldbuses mentioned lead to problems when implementing data-intensive applications as part of digitalization. Companies looking for future-proof automation of process systems will necessarily need to transition to a communication system using Ethernet down to the field level, since process manufacturing upgrades for Industrie 4.0, the Industrial Internet of Things, or Big Data need edge networking standards capable of handling large volumes of process/diagnostic data from field devices over long distances and at high speeds. All data which is present at the field level will be available to Industrie 4.0 applications. Via Ethernet to the Field, these data traverse the control layer to higher levels (such as DCS and MES) and from here – as required – to the cloud.

![Figure 1: NOA as an Extension of the Automation Pyramid](https://www.namur.net/fileadmin/media_www/fokusthemen/NOA_Homepage_EN_2018-06-20.pdf)

Ethernet to the Field is a foundational element in the NAMUR Open Architecture (NOA) model, which is then used as the basis for accessing data from the core automation systems used to date for monitoring and optimization (M+O) tasks. As specified by NAMUR, the rollout of Ethernet to the Field should be planned in a way that does not endanger the availability and protection of existing equipment. NOA recommends building the rollout around a core of current standards like the fieldbus systems mentioned.

While the migration from conventional fieldbuses to Ethernet-based communication solutions at the field level has already been completed in factory automation, the process industry faces a number of hurdles before it can do the same. One challenge here is to ensure the necessary level of explosion protection. These and other requirements have now been met with several solution strategies that are the subject of this white paper. One such strategy is the proxy technology that now already permits the direct integration of PROFIBUS PA segments with PROFINET, for example. One new transmission technology still in development is Advanced Physical Layer (APL), which intends to make Ethernet fully compatible with deployment in an explosion-protected environment.

2. Special requirements in Ethernet to the Field process automation

Unlike factory automation, the most important requirement for Ethernet to the Field is intrinsic safety. In many areas of manufacturing systems involving process-level activities, intrinsically safe equipment installations need to be used to avoid any risk of an explosion. Devices having intrinsically safe ignition protection limit system current and voltage to prevent sparking even in the event of a malfunction. Even if a potentially explosive gas/air mixture is present, it will not be ignited (secondary explosion protection for ATEX zone 0/zone 1). Devices of this type work by throttling their performance. Field buses deployed in Ex zones must also meet stringent sets of requirements: alongside intrinsic safety, power over the bus is another key feature for powering field devices via the fieldbus. This is achieved by using a twisted-pair cable. Conventional PROFIBUS PA and FOUNDATION Fieldbus H1 fieldbuses can meet these requirements, as must any Ethernet-based communication solutions used at the field level of process automation.

Other requirements also exist, as follows:

**High availability:** Plant downtime in the process industry is time-consuming and cost-intensive. Unplanned outages must therefore be avoided at all costs – and for some (e.g. exothermic) processes, even brief periods of downtime cannot be tolerated. It must be possible to rectify faults without taking systems offline. As just one example, there needs to be a straightforward procedure for hot-swapping defective field devices. High availability also implies ongoing support for existing engineering tools (e.g. Field Device Integration, FDI) that simplify work with field device installations.

**Redundancy:** Redundancy models prevent plant downtime and therefore increase availability, since a single error doesn’t endanger plant operations in general. Redundancy models should also be adaptable to process requirements and should be designed to be scalable.

System redundancy is created by using two host controllers (e.g. PLCs or DCSs) that stay perfectly synchronized with one another. Two physically separate communication lines also ensure a high level of availability if a failover is made automatically to a second, intact line in the event of a cable failure. Media redundancy models use ring topologies to safeguard network and plant availability. One approach here is the Media Redundancy Protocol (MRP): if the transmission pathway goes down, an alternative communication channel is quickly used as a fallback.

To date, fieldbus communication solutions have achieved these goals only with a relatively extensive – and expensive – array of hardware.

**Robustness and flexibility:** Process facilities may be operated over very long time frames (up to 30 years or more). During this lifetime, it must be possible to change, expand, and optimize automation functions – and ideally without taking the system offline.

**Protecting investments and existing equipment:** For existing installations – based on conventional fieldbuses, for example – modernization must be possible without needing to replace all of the ‘legacy’ technology. Automation for new equipment must be futureproof – i.e. the relevant process manufacturing concepts related to digitalization and Industrie 4.0 must be accounted for and developed in parallel.

Some of these requirements already tally with the typical, standard fieldbus concepts already used in process automation. Future Industrie 4.0-compatible equipment must also meet these requirements: ideally, it will enable requirements to be met even more simply and cost-effectively. Considerable gains should also be possible for data package sizes and transmission speeds.
3. PROFIBUS PA upgraded for PROFINET

PI (PROFIBUS & PROFINET International) defined PA Profile 4.0 with the aim of developing a purely Ethernet-based platform. Development work was completed in June 2018 and the profile fulfills the criterion for communication protocol independence. All parameters and functions are usable both over PROFINET and via PROFIBUS. While reference is also often made to PROFINET PA in this context, PA Profile 4.0 is just one component for Ethernet to the Field in the process industry: for the Ethernet to be used itself, 2-wire connectivity, power over the bus, and – above all – intrinsic safety must all be implemented. All of these requirements will be met with the Advanced Physical Layer (APL, see section 5.2), which is still in development.

3.1 General information on PA profiles

For each device class, PA profiles (PROFIBUS profiles for process control devices, PA = process automation) define a set of device parameters that affect commissioning, operation, maintenance, and diagnostics. These profiles also describe the mechanism used to link the parameters. A profile GSD (General Station Description) enables a device to be replaced – even with a compatible device from another manufacturer – without needing to change the network configuration of the automation system. This replacement can be supported by the use of a field device tool that stores the necessary (profile-/manufacturer-specific) device parameters.

One key aspect of digital communication is diagnostics, and PA profiles are based on NAMUR recommendation NE 107 (‘Self-Monitoring and Diagnosis of Field Devices’).

3.2 Special features of PA Profile 4.0

As mentioned above, PA Profile 4.0 has been developed with an eye on deployment options in the context of Ethernet to the Field. A key aspect of the profile specification is the rigorous separation of the application layers (with device functions) from the communication protocols. Dedicated support is also offered for manufacturer-neutral device replacement with the ‘start-up parameters’ that a new device receives from the controller for provisional commissioning. These form part of the device description (PROFIBUS: GSD, PROFINET: GSDML). In the new PA Profile 4.0, the GSD is oriented on device measurement principles and contains full details of the respective measurement procedure (e.g. coriolis flow measurement), including associated NAMUR diagnostics.

Earlier Profile 3.02-based PA installations are integrated to ensure retention of existing installations. PA Profile 4.0 is used primarily with PROFINET: in mixed-profile plants, a suitable process controller can be used to ensure the simultaneous operation of 3.02 (e.g. PROFIBUS PA) and 4.0 (e.g. PROFINET) devices. In this way, PA Profile 4.0 helps ensure future viability.

For PROFINET PA devices, the PROFINET specification applies (as per IEC 61784-2 CP3/4, CP3/5, or CP3/6), which complies with the “Process Automation” application class. The transmission technology used is Ethernet (as per IEEE 802.3). A forthcoming version of the PROFINET protocol specification will also offer full support for 2-wire connectivity. The 10 MBit/s transmission speed is currently one of the key obstacles to implementing this support.
PROFINET for PA supports:

- Scalable network redundancy
- S2 and DR redundancy
- Simple device/controller replacements and expansion/modification with zero downtime (Configuration in Run (CiR) and Dynamic Reconfiguration)
- Diagnostics as per NAMUR Recommendation NE 107 (e.g. color-coded fault indication: red-orange-yellow-blue-green)

4. PROFINET redundancy models

Networking system components over PROFINET allows the creation of reliable, high-availability systems. This assures compliance with one important requirement from process manufacturing: keeping production downtime to a minimum. The effort required to do so is less than that required for traditional fieldbus systems. PROFINET System Redundancy (PROFINET SR) is achieved with redundant controllers, redundant Ethernet as a medium, and/or redundant devices. ^2

System redundancy is essentially achieved by setting up multiple connections to a device or controller. If devices and controllers utilize multiple PROFINET interfaces – or Network Access Points (NAPs) – they can keep connections alive even in the event of hardware faults. With controller redundancy, devices can support multiple Application Relationships (ARs) – in which the data exchange is embedded – via a NAP; this enables the device to tolerate the loss of a controller.

PROFINET utilizes the redundancy configurations S1, S2, R1, and R2.

This terminology is explained below.

S (single): PROFINET node with one NAP – the node can connect to a single network.

R (redundant): PROFINET node with a set of redundant NAPs – either two interface modules each with a PN interface or one interface module with two PN interfaces. Node can connect to a redundant network (e.g. double line, double ring).

The numbers 1 or 2 are used to indicate the potential number of application relationships (AR). With an S1 NAP or R1 NAP, each PROFINET interface can therefore establish exactly one application relationship with another PROFINET interface (such as an IO controller). With an S2 or R2 NAP, a PN interface can be assigned to two PROFINET nodes although it uses only one of these actively for data transfers. The second connection is activated during a failover event.

As can be seen, S1 system redundancy does not increase plant availability and is not technically a redundant setup. S2 and R1 on the other hand are truly redundant configurations that prevent data transfer outages and offer a suitable solution for a wide range of applications in the process industry. Lastly, R2 supports high-availability models but is “over-specified” for many applications.

^2 CiR enables the reconfiguration or replacement of devices or modules (e.g. due to a device fault) without taking the system offline (i.e. without stopping the control application). This is achieved by using a ‘CiR object’ that has the function of a placeholder in the system configuration.

^3 See also https://profinetuniversity.com/system-redundancy/redundancy-terms-s1-s2-r1-r2
4.1 PROFINET S2 system redundancy

Higher availability is created by S2 system redundancy, which involves an interface device having a PROFINET interface as with S1 but being able to utilize two application relationships – by using two controllers, for example. One relationship (primary AR) is used for data transfer while the second is held in reserve (backup AR), and activated as and when necessary.

This provides adequate communications redundancy for many applications. If the S2 device’s interface develops a fault, however, then the device will be unable to connect to either of the redundant controllers.

![Figure 2: S1 and S2 Redundancy in PROFINET](image)

4.2 PROFINET R1 system redundancy

A redundant system can also be set up by using an R1 device equipped with two PROFINET interfaces. This is achieved with two interface modules with one interface each or with an interface module that is populated with two interfaces. Each interface maintains an application relationship with one controller. This solution is typically chosen for redundant ring or line topologies.

![Figure 3: R1 and R2 Redundancy in PROFINET](image)

4.3 PROFINET R2 system redundancy

In this configuration, each device uses two PROFINET interfaces, with each of these interfaces maintaining an application relationship to two controllers, which results in four potential application relationships. In the event of a fault, the device switches to one of the other communication channels, whereby the channel chosen depends on the nature of the fault.
4.4 High availability with a ring topology

High availability is supported by the Media Redundancy Protocol (MRP), which is a standardized mechanism for constructing a ring topology using off-the-shelf components. Unlike a line topology, communication is still maintained even if a line goes down. If the CPU detects a line interruption or a station outage, the CPU reverses the direction of the telegrams that are sent through the ring. The fault is also flagged: the operator can then resolve this fault without needing to stop the process.

There are limits on this kind of ring structure, however. Loop-powered trunks, as are envisaged by the Advanced Physical Layer, for example, cannot be used in a ring topology. In this case, ring structures can be implemented only as far as the power switch.

5. Technical solutions for Ethernet to the Field in process manufacturing

When developing solutions that enable Ethernet-based communication down to the field level of process automation, building on existing fieldbus standards is a recommended approach. This complies with the demands made by NAMUR as part of the NOA model and protects investments and existing installations. The following section provides a thorough introduction to Europe’s leading standard PROFIBUS and illustrates the transition from PROFIBUS PA to PROFINET.

PROFIBUS solutions that have been used to date to connect field devices in process automation:

- In non-Ex zones – connection of 4...20 mA devices via remote I/O to PROFIBUS DP or direct connection of PROFIBUS DP devices
- In Ex zones – PROFIBUS PA for connecting specialized PROFIBUS PA devices (2-wire, low-power devices; intrinsic safety possible); segments with multiple PA devices are connected to controllers with the aid of a segment coupler via PROFIBUS DP.

These solutions are unable to meet the demands of Industrie 4.0. PROFINET meets the Industrial Ethernet standard (IEEE 802.3), however, and is a future-proof solution for the digitalization of field-level processes.
The following table presents the key differences between PROFINET and PROFIBUS PA.

### Comparison of PROFINET/PROFIBUS PA properties

<table>
<thead>
<tr>
<th></th>
<th>PROFINET</th>
<th>PROFIBUS PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data transfer rate</td>
<td>100 Mbit/s</td>
<td>31.25 kBit/s</td>
</tr>
<tr>
<td>Data packet size</td>
<td>up to 1,500 bytes</td>
<td>up to 244 bytes</td>
</tr>
<tr>
<td>Potential stations</td>
<td>1,024</td>
<td>Ex zones: 6–12 *</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-Ex zones: 32</td>
</tr>
<tr>
<td>Physical layer</td>
<td>4-wire copper/fiber-optic cable, wireless</td>
<td>MBP or MBP-IS (Manchester encoding Bus Powered – Intrinsically Safe)</td>
</tr>
<tr>
<td>Device power supply</td>
<td>Separate or Power over Ethernet (PoE)</td>
<td>Via bus (MBP-IS)</td>
</tr>
<tr>
<td>Max. length</td>
<td>For copper cable, 100 m between individual devices</td>
<td>From segment coupler: 1,900 m for non-Ex and EEx ib applications 1,000 m for EEx ia applications</td>
</tr>
</tbody>
</table>

* Depending on power draw from individual stations, max. total 120 mA

PROFINET therefore meets the requirements of Industrie 4.0 for high transmission speeds and large data volumes. In contrast, while PROFIBUS PA offers considerably lower transmission speeds and smaller volumes, the physical layer used does allow intrinsically safe installations. PROFINET for PA is intended to combine the benefits of PROFINET and PROFIBUS.

As part of a PROFINET migration, the following options are available for connecting field devices:

- Connecting traditional I/O field devices via remote I/O (non-Ex zones)
- Connecting PROFINET field devices to Ethernet via switches (non-Ex zones)
- NEW: connecting segments with PROFIBUS PA field devices to PROFINET (Ethernet) via a proxy model (this is Ex-compatible!)
- FUTURE: use of the new Advanced Physical Layer (APL) to connect via switches (also suitable for Ex zones)

Products from a range of manufacturers are already available for the first three options, including: controllers; remote I/Os, gateways, and power supplies that support redundancy models; network infrastructure; and various field devices (gages, actuators, data recorders, etc.). Some providers have now also announced components that support APL. Selected products are introduced in section 6.

The following subsections look at the communication solutions based on a proxy model and APL, which are suitable for Ex zones and therefore predestined for use in process automation.
5.1 Connecting PROFIBUS PA to PROFINET via a proxy

By directly connecting PROFIBUS PA networks in Ex zones to PROFINET without a PROFIBUS DP intermediate segment, futureproof installations can now already be implemented, offering long-term advantages that include both diagnostics and availability. This involves the use of gateways (proxies) that contain a number of modules, including a submodule that acts as a PROFIBUS PA proxy (an ‘interpreter’). The PA gateway to PROFINET is installed in place of the former DP/PA segment coupler via which the PA segments were connected to PROFIBUS DP. Thanks to direct connectivity between the PA segments and PROFINET, the new solution avoids the ‘detour’ via PROFIBUS DP. Depending on perspective, the gateway acts simultaneously as a PROFINET device and as a PROFIBUS PA master, offering support for the basic requirements of process manufacturing and especially the redundancy models required for PROFINET that guarantee a high level of availability.

The gateway itself should also be easy to integrate – by using standard integration tools like FDI (FDT/DTM tools), for example – and should enable straightforward device parameter setting. It is also important to ensure that there is a clear and simple migration pathway to future Ethernet to the Field solutions such as APL.

The proxy submodule should support the following PROFINET functions:

- Transmission of I/O data
- Transmission of alarms
- Data recording

In the same way, DP networks in non-Ex zones can be connected to PROFINET via DP proxies.

The technologies used by these solutions will be introduced in section 6.

5.2 Ethernet to the Field based on the Advanced Physical Layer (APL)

The connection of PROFIBUS PA segments via gateways with proxy modules (see 5.1) is an important milestone before rolling out Ethernet to the Field. The APL (Advanced Physical Layer) project takes this one step further, having set itself the goal of developing a new physical layer for the IP-based field communication of the future. This is intended to overcome prior obstacles to the use of Ethernet in explosion hazard areas. These are the objectives of the standard development organizations PI, FieldComm Group, and ODVA, as well as several major process manufacturing suppliers who are supporting development of the Advanced Physical Layer (APL). APL is intended to enable the direct connection of suitable field devices (e.g. with PA Profile 4.0) to Ethernet in a potentially explosive atmosphere (Ex zone 0, zone 1).

In the future, APL will

- enable data transfer rates of 10 Mbit/s (in the first phase of development; talks are ongoing about a second phase with up to 100 Mbit/s) and so support Industrie 4.0 and digitalization
- permit high transmission speeds (up to 300x faster than previous protocols)
- enable comparable coverage for PA as achieved by current fieldbus protocols
- work independently of existing protocols (identical physical layer for OPC UA, EtherNet/IP, HART-IP, and PROFINET)
- supply power to field devices as with current PA fieldbuses (loop-powered field devices)
- be as robust and fault-resistant as these fieldbuses and
- be deployable in explosion hazard areas and enable intrinsic safety (when using intrinsically safe field devices)
The new communications standard for single-pair Ethernet according to 10BASE-T1L is being developed as part of the IEEE 802.3cg project (amendment to the IEEE 802.3 Ethernet standard).

### 5.2.1 APL infrastructure

APL modifies only the physical layer and not the protocols for Industrial Ethernet. This layer essentially consists of physical Ethernet plus an APL frontend. The typical structure is therefore as shown below:

![Diagram](image)

Figure 4: Communication Layers with APL

This structure can make use of flexible topologies such as star, trunk-and-spur, or ring.

The basic APL components involved are:
- APL power switches (either in control room or distribution box): for connecting to standard Ethernet, these power APL field switches and field devices
- APL field switches (in zone 1 or 2, div. 2): distribute communication signals and electrical energy via spurs
Example: With the trunk-and-spur topology often chosen for process automation, the installation could look as follows:

![Typical APL System Structure](image)

- From controller to APL power switch (increased safety; in zone 2/div. 2), connection via available Ethernet technology (copper/fiber-optic)
- Power adapter output with up to 60 W for up to 50 field devices, each of which can receive up to 500 mW
- Bidirectional from APL trunk port to APL field switches (trunk up to 1,000 m cable length) with up to 10 Mbit/s in version 1, bidirectional to APL field switches
- From APL field switch via spur on to field devices in zone 2 or in zone 0 and 1/div. 1, 2; also Ex i spur connection to field devices, spurs up to 200 m

### 5.2.2 Advantages of APL

Ethernet/APL doesn’t just enable the digitalization of process plants by making use of Internet technologies and high-speed communications: it also fundamentally simplifies the installation, configuration, and maintenance of instruments and automation systems. The engineering and integration workload is also reduced, because only one structure (Ethernet network) is now needed for remote I/O, fieldbus, and 4...20 mA (and HART) devices. Since installations have reverse polarity protection, this results in lower error rates and less need for training.
5.2.3 Migrating from PROFIBUS PA

APL enables a simple migration from PROFIBUS PA field devices to PROFINET APL field devices. Cables (type A), topology (usually trunk-and-spur), and cable lengths are all identical.

5.2.4 Outlook

Following the completion of IEEE 802.3cg (the amendment is scheduled for the second half of 2019), the corresponding technical IEC specifications that enable the installation of Ethernet devices via APL in explosion hazard areas will also be drafted before the end of the year. For 2020, ODVA, PI (PROFIBUS & PROFINET International), and FieldComm Group plan to update the current Industrial Ethernet specifications. By 2021 (no later than 2022), the first infrastructure components and compatible single-pair field devices will then be available.

6. Available Ethernet to the Field systems in process technology

Several manufacturers of process control systems and infrastructure components have already mastered the technical requirements needed to use Ethernet-based communication solutions – currently via proxies and later via APL. A selection of these products are introduced in the following sections.

6.1 Process control systems / controllers

6.1.1 Simatic PCS 7 process control system (Siemens)

Version 9.0 of the Simatic PCS 7 PCS has been developed with a focus on bringing digitalization to the field level. The following accessory hardware supports PROFINET (Industrial Ethernet):

Simatic CPU 410 E
- Controller for applications with few process objects
- With two PROFINET interfaces and one PROFIBUS interface
- PROFINET Y-switch for redundant setups

Simatic ET 200SP HA4
- Distributed I/O system with redundant PROFINET connections (copper/fiber-optic cable)
- PROFINET IO communication standard
- Up to 56 distributed I/O modules per station
- Modules can be inserted and pulled using Configuration in Run (dynamic reconfiguration)

6.1.2 800xA process control system (ABB)

The ABB Ability 800xA PCS supports PROFINET, DeviceNet, Ethernet/IP, IEC61850, and Modbus alongside FOUNDATION Fieldbus and PROFIBUS.

ABB Ability System Networks offer a range of network components, including modular transceivers for wired networks and switches (for rack/DIN rail installation) plus routers/firewalls.

The following components are of particular interest for Ethernet-based communication:

800xA controller with PROFINET IO CI871

CI871
- Communication interface for PROFINET IO over Ethernet
- With two RJ45 Ethernet interfaces and one 100 MBit/s PROFINET interface

Select I/O
- Ethernet-based single-channel I/O solution
- Zone 2 and class 1 div. 2 certification
- Supports full redundancy up to the SCM signal processing module

S800 I/O
- Distributed, modular process I/O system
- Permits module hot-swapping
- Supports redundancy concepts/redundancy also at I/O module level
- I/O modules with intrinsically safe interfaces

6.2 Fieldbus infrastructure

6.2.1 Components for proxy solutions

As indicated in section 5.1, fieldbus infrastructure can already be set up based on PROFIBUS PA and FOUNDATION Fieldbus H1 with the aim of providing futureproof support for Ethernet-based communication. In these scenarios, gateways (proxies) act as ‘interpreters’ for the process control system and are used to connect fieldbus segments directly to Ethernet. This solution is rounded off by appropriate power supply units, physical layer diagnostics, field device couplers, and terminating resistors. The following sections introduce suitable components from Softing and R. Stahl as examples.

pnGate PA (Softing): proxy system gateway

The PROFINET to PROFIBUS PA Master Gateway pnGate PA enables direct integration of PROFIBUS PA segments into PROFINET networks without a ‘detour’ via PROFIBUS DP. PROFIBUS DP/PA segment couplers can be simply swapped out. Migration to Ethernet APL is also supported by pnGate PA – existing PA segments do not need to be modified. The pnGate PA gateway acts as both a PROFINET device and PROFIBUS PA master (proxy).
Benefits offered by pnGate PA:

- Supports PROFINET redundancy to increase availability
- Supports PROFINET engineering tools like TIA Portal, Step7, PC Worxs, 800xA Control Builder
- Existing power conditioners can continue to be used as before
- Simple integration with FDT/DTM tools by using a CommDTM
- Device parameterization with EDD/Siemens Simatic PDM is possible

pnGate PA is available in three separate models:

- pnGate PA for 2 PROFIBUS PA segments (for up to 32 PA devices)
- pnGate PA for 4 PROFIBUS PA segments (for up to 64 PA devices)
- pnGate PA for Stahl carriers for 4 PROFIBUS PA segments

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Figure 6: pnGate Application Scenarios

**pnGate PB for proxy systems (Softing)**

The functionality and benefits offered by pnGate PB are very similar to pnGate PA. This model supports 2 PROFIBUS PA segments (up to 32 PA devices) and 1 PROFIBUS DP segment.
Fieldbus power supply series 9412 – ISbus (R. Stahl)

This fieldbus power supply unit is suitable for the simple or redundant powering of FOUNDATION Fieldbus H1 segments or PROFIBUS PA segments. Offering high-power output of up to 28 V/500 mA, the unit enables the operation of numerous devices even at great distances. For very high power requirements of up to 1 A, two power supply units can be used in boost mode.

The power supply features integrated diagnostics compliant with NAMUR Recommendation NE 123 (jitter, signal level, voltage/current, noise, asymmetries, etc.).

Field device coupler (R. Stahl)

This field device coupler with power management minimizes trunk current loads, limiting rush and short-circuit currents.

Available as:
- Ex i field device coupler as zone 1 and zone 2 model with 4 or 8 channels (for zone 1 field devices)
- Ex e coupler for 4 or 8 non-intrinsically safe fieldbus devices
- Ex n coupler: 4-, 8- and 12-channel variant for Ex ic and non-intrinsically safe fieldbus devices

6.2.2 commModule APL – integration solution for APL (Softing)

Advanced Physical Layer (APL) is intended to enable Ethernet-based communication at the field level of process technology (see 5.2). APL will be suitable for loop-powered and intrinsically safe devices, allow transmission speeds of 10 Mbit/s, and ensure continued use for existing 2-wire fieldbuses. The first APL components have been announced for 2021, and will enable the direct integration of automation protocols such as PROFINET or Ethernet/IP with 2-wire field devices. This will also make the use of OPC UA possible for field devices.

The commModule APL integration solution helps field device manufacturers make the transition to Ethernet-capable devices. Integrating commModule APL with HART and Modbus devices is straightforward. It acts as the interface to APL and communicates via HART or Modbus with the field devices. In the future, this universal hardware will enable manufacturers to support field device communication over Ethernet/APL via the protocols PROFINET, Ethernet IP, and OPC UA, for example.

This works in a similar way to Softing’s current commModule MBP, which enables the use of devices for PROFIBUS PA and FF H1. Device manufacturers simply need to create a corresponding script, which is then interpreted by commModule. In the packaged commKit solution, Softing supplies commModule with the commScripter software tool, which uses the textual description of device functionality (script) to generate the mapping tables in commModule, so as to avoid any extra programming effort.
This solution offers field device makers a fairly straightforward path towards upgrading their devices to the future APL-based Ethernet communication standard. commModule APL will be available from 2021.