SUPPORT FOR YOUR DEVICE DEVELOPMENT

PROFINET driver – the faster path to the PROFINET controller and device

The PROFINET driver lets you develop both PROFINET RT/IRT controllers for embedded and PC-based products and PROFINET devices with standard Ethernet hardware more easily and efficiently.

1. Controller development

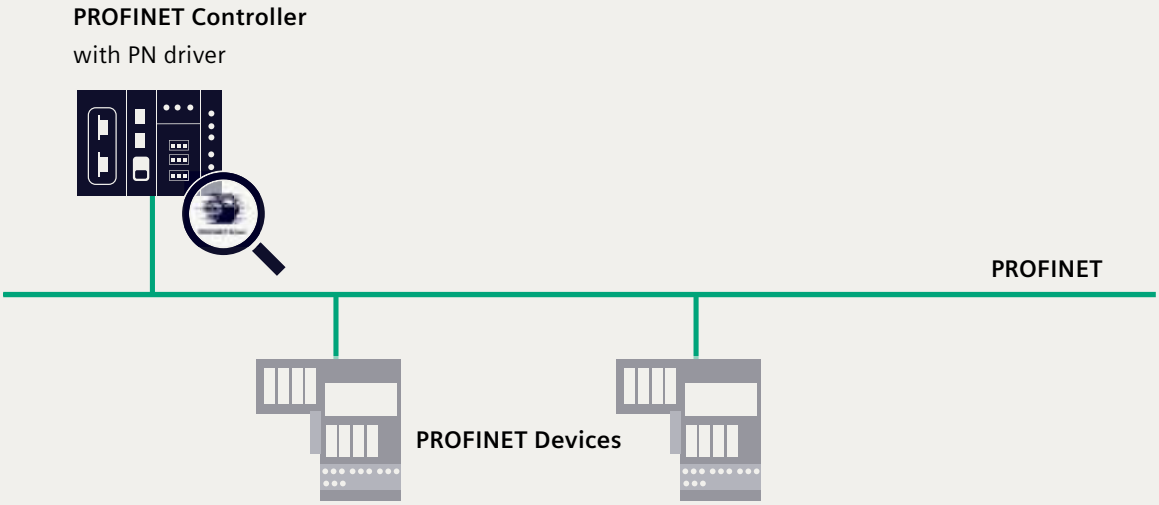
Development of PROFINET RT/IRT controllers for embedded and PC-based products with PROFINET driver, with or without CP1625/SOC1

Low-cost components are a major competitive advantage especially in machine mass production, where users often utilize control software developed in-house. For reasons of performance, flexibility, or cost, the individual application is implemented on standard PCs. The PROFINET driver supports these in-house developers and requires no special hardware. PROFINET communication can be implemented on a standard Ethernet interface.

Because the PROFINET driver is supplied as source code, in-house solutions can be ported to a range of operating systems and hardware platforms. This means that the PROFINET driver is also perfectly suited for use in the embedded systems for in-house control solutions. Configuration is easy via an open XML interface with no need for engineering tools. It can also be done conveniently in the usual way via TIA Portal. The centerpiece is the SIMATIC PROFINET stack, which has been proven in use for many years.



> Go to the PROFINET driver in the Industry Mall



Development of a PROFINET RT controller solution
PROFINET over RT has no special requirements for Ethernet hardware. Almost any Ethernet controller can be used with the PROFINET driver thanks to RAW socket support.

Development of a PROFINET IRT controller solution
PROFINET over IRT requires hardware support for the Ethernet controller. This is provided by the PROFINET driver in conjunction with the CP 1625 or the SOC1-ASIC installed on it. For the development of an embedded system, we offer the layout of the CP 1625 and the design constraints of the SOC1.

The PROFINET driver is suitable both for simple applications, such as individual PROFINET lines, and for complex machines. The standard Ethernet interface supports PROFINET over
RT for cycle times as of 1 ms and PROFINET over IRT as of 250 µs.

Additional functions
The PROFINET driver offers additional functions for series machines:

- I-Device:
  In addition to the controller functionality for controlling your own field devices, the same interface can also be used to exchange data with a higher-level controller via PROFINET.
- Tool changer:
  If field devices do not have to or cannot be permanently connected, such as on the gripper arm of a robot, they can be added or removed dynamically at runtime using the “Tool changer” function.
- Fast Startup:
  In conjunction with the tool changer, this is an essential function for quickly starting up PROFINET devices. PROFINET defines the Fast Startup (FSU) function, which can be supported by the field devices. This makes it possible to start production virtually without interruption after 500 milliseconds once the voltage has been applied to the device.
  -and much more.

Network convergence
Network convergence is an essential topic for digitalization. The PROFINET driver is designed in such a way that, in addition to PROFINET over RT or IRT, standard TCP/IP applications can also be operated on the same line and thus on the same Ethernet controller.

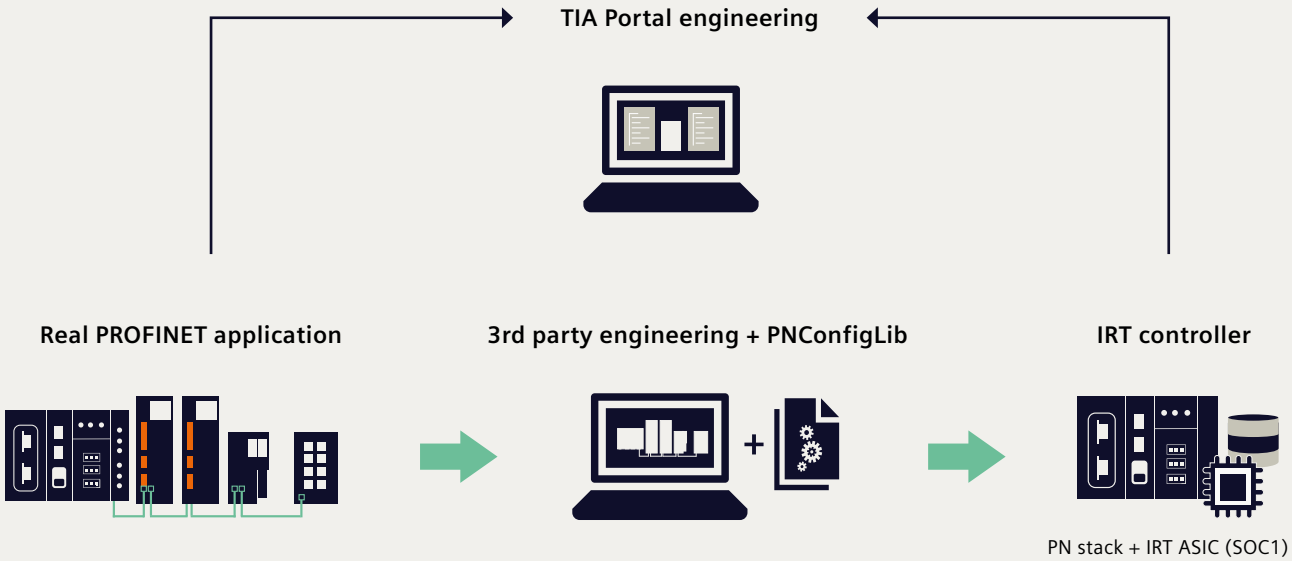
Hardware configuration (PNConfigLib/TIA Portal)
PROFINET controllers require configuration of the lower-level devices. This includes network design, device design and parameters, update rate settings, addressing, etc. The PROFINET hardware configuration can be configured in two different ways:

1. Using PNConfigLib
2. In TIA Portal

1. PNConfigLib
PNConfigLib is an API that is supplied in source code together with the PROFINET driver. PNConfigLib configures the PROFINET network hardware for the PROFINET driver.
Inputs for PNConfigLib are the included PROFINET devices:

- Manufacturer-specific GSDML files
- Configuration
- Parametrization
- Optional: network topology

2. TIA Portal
Alternatively, the hardware can be configured using TIA Portal, the engineering, simulation, and monitoring framework from Siemens for Totally Integrated Automation. No license is required for TIA Portal.



Development of an IRT controllers with CP 1625

With the SIMATIC CP 1625, Siemens offers a development board for developing a PROFINET IRT controller for cycle times of 250 µs or more. The centerpiece is the ASIC SOC1, which assures the hardware support needed to construct an IRT controller.

The IRT controller based on the PROFINET driver with CP 1625/SOC1 supports isochronous mode. Control systems for measurement or sophisticated motion control applications can be created, such as electronic gears, path interpolation, and coordinated axis control.
An example containing a PROFIdrive connection is available for download:
> Go to sample applications

A faster and easier start can be achieved using the CP 1625 evaluation board as a development platform. The CP 1625 can be used in PC systems directly. For the development of an embedded system, we offer the layout of the CP 1625 and the design constraints to the SOC1. The SOC1 can thus be connected to a host processor via PCIe.

Licensing concept

The licensing model ensures extreme flexibility for manufacturers. No additional runtime license is necessary on SIMATIC hardware. If another type of hardware is used, you can choose between a quantity-based licensing model and a product line license. License fees are not due until after development.



2. Device development

Development of PROFINET devices with PROFINET driver and standard Ethernet hardware

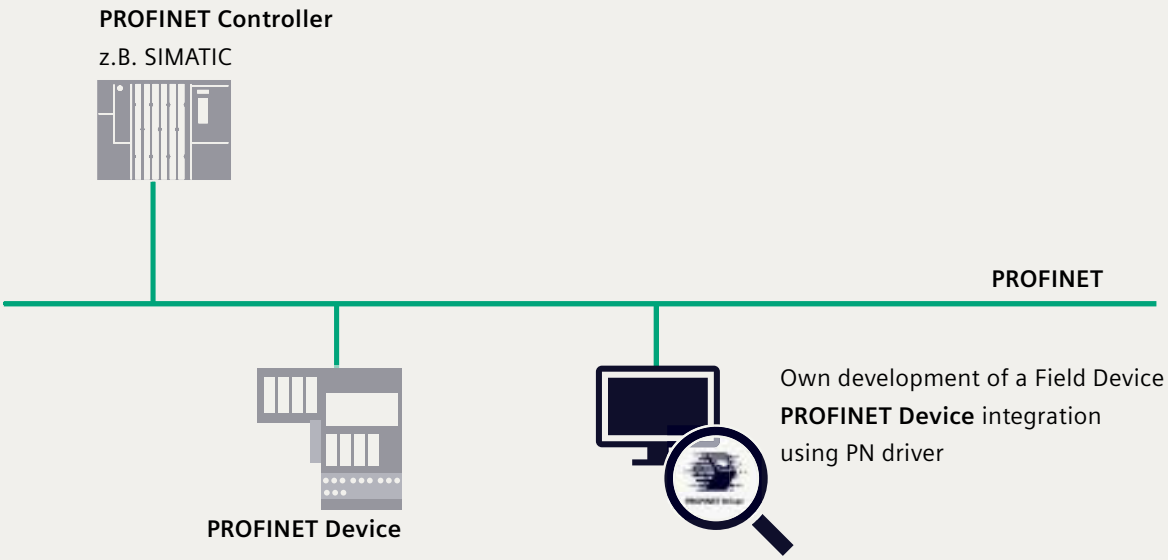
The PROFINET driver lets you develop your own PROFINET field devices and requires no special hardware. PROFINET communication can be implemented on a standard Ethernet interface. Because the PROFINET driver is supplied as source code, the in-house solutions developed can be ported to a range of operating systems and hardware platforms.

Benefits of the PROFINET driver at a glance:

- Linux: Open operating system, broad range of hardware support, the virtual standard in industry, PN driver supports Debian
- Co-existence of PROFINET and TCP/IP: In combination with Linux, the IP stack from Linux can be used. This makes it possible to send and receive standard TCP data directly from Linux via the PROFINET interface. The real-time capability of PROFINET is retained.
- PC technology: The PROFINET driver under Debian is ready for immediate use without additional adaptations.
- Licensing concept: The licensing model ensures extreme flexibility for manufacturers. No additional runtime license is necessary on SIMATIC hardware. If another type of hardware is used, you can choose between a quantity-based licensing model and a product line license. License fees are not due until after development.
- Maximum quality: Regular, free updates with the latest technology certificates ensure that the PROFINET driver is always state of the art.



> Go to the PROFINET driver in the Industry Mall



3. Functional overview of the PROFINET driver

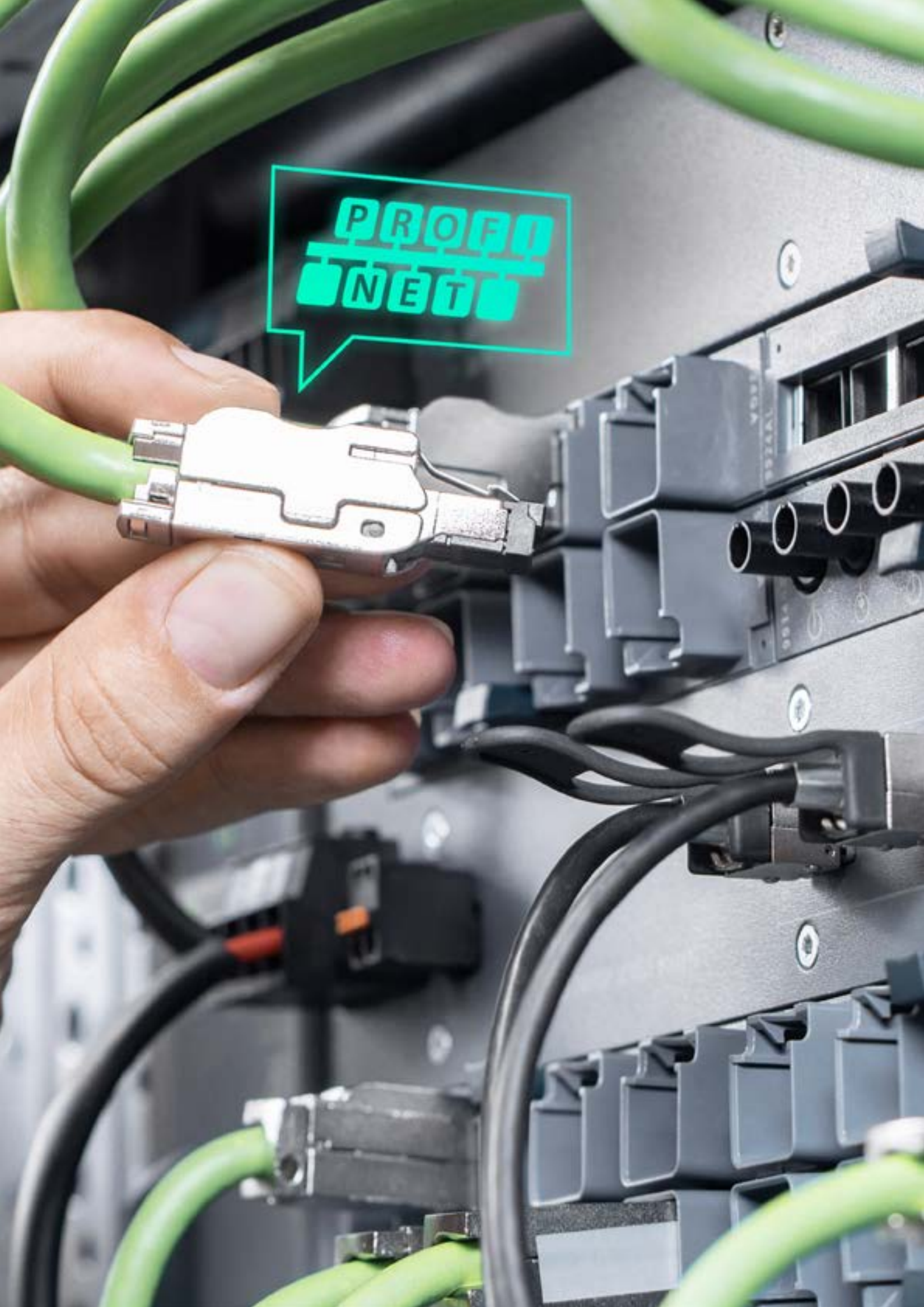
Functional overview for controllers

- Update times:
  - PROFINET over RT as of 1 ms cycle time when using a real-time operating system
  - PROFINET over RT as of 32 ms when using Windows
  - PROFINET over IRT as of 250 µs when using CP 1625/SOC1 and a real-time
- Quantity structure: 128 devices for Debian Linux, 16 devices for Windows
- Sample implementation for Debian Linux with RT patch
- Windows version not approved for productive operation
- Support of Linux IP stacks for parallel TCP/IP services and PROFINET data via the same interface (co-existence of PROFINET and TCP and/or IIoT protocols such as OPC-UA or MQTT)
- Programming examples for PROFIdrive controller application and PROFINET certification app
- PROFINET functions:
  - I-Device
  - Shared Device
  - Tool changer
  - Fast Startup of PROFINET devices

Functional overview of devices

- Update times: PROFINET over RT as of 1 ms cycle time
- Sample implementation for Debian Linux with RT patch
- Support of Linux IP stacks for parallel TCP/IP services and PROFINET data via the same interface (co-existence of PROFINET and TCP and/or IIoT protocols such as OPC-UA or MQTT)
- Support for standard Linux Ethernet drivers regardless of Ethernet hardware
- PROFINET Conformance Class B (CC-B)

You can learn even more about the PROFINET driver from Siemens Industry Online Support:
> More technical details


PROFI
NET

Published by
Siemens AG

Digital Industries
Factory Automation
Postfach 48 48
90026 Nuremberg
Germany

For the U.S. published by
Siemens Industry Inc.

100 Technology Drive
Alpharetta, GA 30005
United States

Article No.: DIFA-B10240-00-7600

© Siemens 2024

Subject to changes and errors. The information given in this document only contains general descriptions and/or performance features which may not always specifically reflect those described, or which may undergo modification in the course of further development of the products. The requested performance features are binding only when they are expressly agreed upon in the concluded contract.