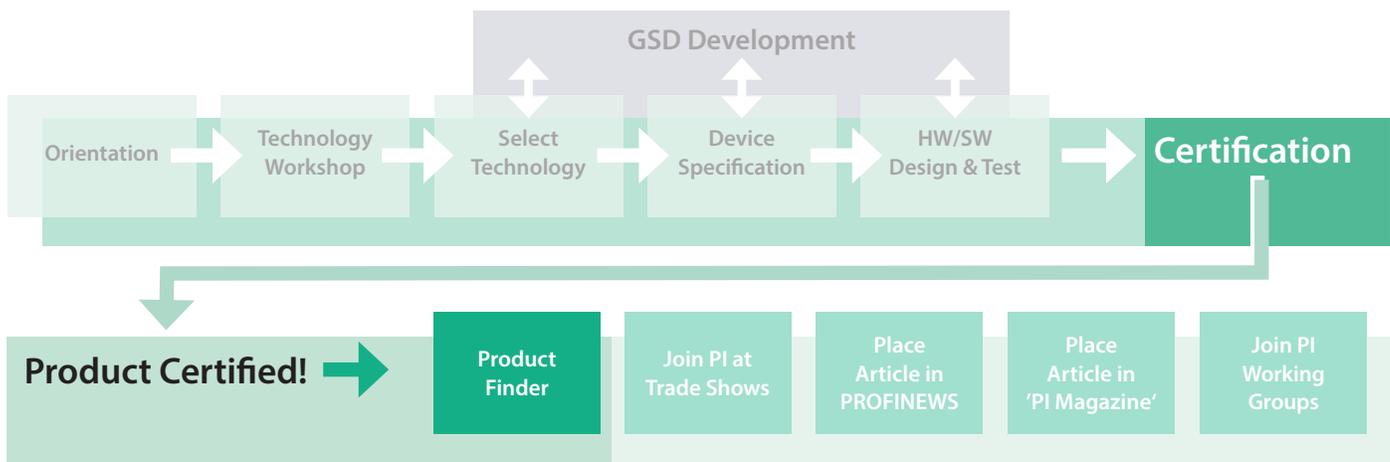


# PROFINET Product Testing & Certification Guide

# PROFINET Product Testing & Certification Guide

*This guide is aimed toward device manufacturers and solution providers looking to implement PROFINET in devices, controllers or machines. It covers a specific subset of the development cycle: product testing and certification.*

*By reading this document, device manufacturers will learn how testing and certification work, how to prepare for testing, and how to get a product certified. Also, this guide contains suggestions and resources to complete the certification process with ease.*



## *Partners for Product Testing and Certification*

The list below includes the contact information of several partners that device manufacturers will need to interface with to complete the testing and certification process.

### **PI: PROFIBUS and PROFINET International**

PI is the creator, maintainer, and promoter of open, industrial communication standards such as PROFINET and PROFIBUS.

**T:** +49 721 9658 590

**E:** [question@profibus.com](mailto:question@profibus.com)

**W:** <https://www.profibus.com>

### **PICO: PI Certification Office**

The PICO issues and updates product certificates. They also provide support for the certification process and issue Vendor IDs.

**T:** +49 721 9658 586

**E:** [certification@profibus.com](mailto:certification@profibus.com)

**W:** <https://www.profibus.com/products/certification-office/>

### **PITL: PI Test Lab**

PI Test Laboratories (PITLs) are test centers authorized by PI to execute certification tests on PROFIBUS and PROFINET products. There are currently nine across the world in major industrial countries.

**W:** <https://www.profibus.com/pitl>

### **PIC: PROFI Interface Center**

The PIC is a PI accredited test lab, competence center, and training center for PROFIBUS and PROFINET, located in North America.

**T:** +1 423 262 2576

**E:** [PIC.industry@siemens.com](mailto:PIC.industry@siemens.com)

**W:** <https://profinterfacecenter.com>

### **RPA: Regional PI Association**

Regional PI Associations represent PI around the world. RPAs act independently to support PROFIBUS and PROFINET in their own region.

**W:** <https://www.profibus.com/pi-organization/regional-pi-associations>

### **PI North America: PROFIBUS and PROFINET North America**

PI North America is the RPA responsible for the North American region. Also, they are a non-profit, member-supported organization.

**T:** +1 480 483 2456

**E:** [info@pinorthamerica.com](mailto:info@pinorthamerica.com)

**W:** <https://us.profinet.com>

## 1. Getting Started

### What is PROFINET certification?

Certification is the process by which a PROFINET product is tested in a PITL for conformance and, upon successful completion of the testing, issued a certificate by PI.

Products are certified to verify the correct behavior of communication according to IEC 61158 and IEC 61784. Specifically, PROFINET devices are tested for the correct implementation of the following items:

- › Hardware interface
- › PROFINET mandatory and optional functionality
- › Reaction on faulty behavior
- › Robustness against netload
- › Proper operation in a reference automation environment
- › State machines
- › GSD file

### What is a GSD file?

PROFINET GSD files are written in XML format (therefore sometimes also called “GSDML files”), and they describe a PROFINET device’s functionality. The contents of the GSD file consist of configuration information, parameters, modules, diagnostics and alarms, and vendor and device identification. For certification, the device manufacturer must provide a GSD file for each device.

### Is certification mandatory?

Certification is mandatory for PROFINET devices and controllers. Each product must be certified according to its Conformance Class. Also, some additional PROFINET features, such as the PROFIsafe and PROFIenergy Application Profile, require certification. The table below summarizes the certification requirements:

Technology/Certification	Mandatory	Strongly Recommended
PROFINET	X	
PROFIsafe	X	
PROFIdrive		X
Encoder Profile		X
PROFIenergy	X	

## 1. Getting Started *cont.*

### What about passive components?

Passive components include infrastructure components like switches, cables, and connectors, and do not require certification. An exception would be if a switch also functions as a PROFINET device, and has its own GSD file, in which case certification is required.

For passive PROFINET components the conformity must be declared by the manufacturer of the product. These products can then be added to the list of PROFINET Passive Network Components posted on the PI website.

### What about optional features?

PROFINET allows for several optional features such as Media Redundancy Protocol (MRP), Isochronous Real Time (IRT), or Fast Start-Up (FSU). If a device supports them as defined in its GSD file, then these optional features must also be certified to verify compliance.

### Does PI allow self-certification?

PI does not allow product self-certification. PROFINET components must be tested at a PITL and certified by PI before product launch.

### What is the difference between a certified product and a certified reference design?

A product certificate shows compliance of a device manufacturer's product, such as an IO, sensor, drive, or encoder. The certificate proves a device has passed all testing according to the PROFINET standards.

A technology certificate certifies the compliance of a reference design (solution), usually in form of a development or evaluation board, that implements the PROFINET protocol inside a device manufacturer's product. The chosen solution might be, for example, an ASIC, software stack, module, or plugin board. This certificate shows that the solution intended to be used in the PROFINET device is certifiable according to the PROFINET standards.

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## 1. Getting Started *cont.*

### How to acquire documentation and resources?

Companies that are not members in PI can purchase the PROFINET specification:

- › On the IEC website at: <https://webstore.iec.ch/>
- › On the PI website at: <https://www.profibus.com/download/literature-list-order-form/>

Besides technology specifications, PI offers many free and paid documentation and resources. The following are some commonly used (member-only) development resources:

- › PROFINET IO Test Bundle
- › PROFINET GSD Checker
- › Application Profile Specifications
- › Test Specifications

PI members have full access to all standards, guidelines, specifications, software, resources, and documentation at no charge. PI members can obtain the PROFINET specification at no-cost as a membership benefit. Upon joining PI, members are issued a company-wide login with rights to these downloads. The full PI documentation and resource list is available at the PI download center: <https://www.profibus.com/download/>

### How to become a member?

Since the PROFINET specification is open and standardized, anyone can build and sell PROFINET products; a PI membership is not required. However, joining the membership is beneficial, especially during the development process. The affiliation gives members access to the aforementioned downloads along with cost reductions for training and certificates, among other benefits.

Companies become a PI member once they join an RPA. Companies can choose to join multiple RPAs since each RPA offers unique local marketing and training opportunities. PI North America is the North American RPA. Among other benefits, PI North America members can participate in comprehensive marketing programs. To join PI North America, an application form can be submitted at: <https://us.profinet.com/membership/become-a-member/>.

## 1. Getting Started *cont.*

### How to obtain a Vendor ID and a Device ID?

All PROFINET components have two associated IDs: A Vendor ID and a Device ID. Device manufacturers must obtain a Vendor ID and define a Device ID before testing since both IDs are included in the device's GSD file.

Vendor IDs are unique, and therefore managed and assigned by PI to each company. Device manufacturers can obtain their PROFINET Vendor ID at no charge by sending an email to: **certification@profibus.com**. Vendor IDs are the same for PROFIBUS, PROFINET, and IO-Link. If a device manufacturer already has a Vendor ID for PROFIBUS, there is no need to request a new one for PROFINET.

The Device ID is chosen and managed by the device manufacturer. Each device should have a unique Device ID specifically for the device. The "GSDML Technical Specification for PROFINET" document in the PROFINET IO Test Bundle contains details about Device ID formatting.

### How do I know which PROFINET specification and GSD file versions are current?

The PROFINET IO Test Bundle contains a "PROFINET Versions for Certification" document. This document lists the current PROFINET specification and GSD versions. It also indicates the certification testing validity dates for specific versions. The PROFINET IO Test Bundle is available to members at: **<https://www.profibus.com/download/profinet-test-bundle/>**.

### How to handle certification if a device will be sold under different names/models (brand labeling)?

Brand labeling occurs when another vendor resells a device without any change of hardware or firmware.

Brand labeled PROFINET devices need a unique Vendor ID and an updated GSD file. The brand labeling vendor can apply for a certificate based on the original device manufacturer's test report simply by adding a Manufacturer's Declaration. The Manufacturer's Declaration is available upon request from the PICO.

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## 2. Before Certification Test

### How to prepare for the certification test?

The same tools and software used by PITLs for testing are also available for free to PI members as part of the PROFINET IO Test Bundle.

The PIC also offers a “pre-test”, an abbreviated test that covers the most critical parts without going in depth. The result indicates a list of issues to resolve before the actual test. The pre-test is recommended for first-time applicants or new/complex devices.

### How to start the certification test process?

To begin the process, the device manufacturer must fill out and sign the standard test application form. As part of it, they must specify all supported application types, features, and Application Profiles. The PIC test application form can be found at:

<https://profinterfacecenter.com/testlab/forms/>.

It is also recommended to send the device’s GSD file together with the completed test application form. Based on the completed test application form and GSD file, the test length and cost can be calculated. Then, the PIC can provide a quotation if required. The final step to book the test is to send a Purchase Order (PO). Once the PO is accepted, the PIC will schedule and confirm the test date based on the device manufacturer’s requirements and the PIC’s schedule.

### Who should apply for the test?

The information provided in the completed test application form will be reflected in the eventual test report and shown on the official certificate. The device manufacturer should submit the completed test application form in their name, even if they work with a third-party developer. The manufacturer can also choose to endorse a third party allowing the PIC to work with a third-party developer during the test. The PO can come from either party.

### When to apply for the test?

As a recommendation, the device manufacturer can start the application process as soon as they can forecast the end of development or internal testing. The PIC test application form contains a field to specify the “earliest test date”.

## 2. Before Certification Test *cont.*

### What is the expected lead time for testing?

Lead times in the test lab depend on lab availability and vary from 'immediately' to several weeks out. Device manufacturers can obtain the current lead time by contacting the PIC directly.

### What if there is a need to change the scheduled test slot?

The customer must contact the PIC immediately when schedule changes arise. The PIC coordinates closely with device manufacturers to reschedule test slots.

### What are the length and cost of testing?

The length and cost of testing depend on the supported features, device complexity, variants, and other factors. For example, a simple device takes about three days of testing; a complex device family can take up to two weeks.

The PIC test application form includes a fee schedule as an initial estimate. The PIC can provide a final quote after receipt of the completed test application form and associated GSD file.

### Is the process for testing a PROFINET controller the same as for a device?

Testing a PROFINET controller is similar to testing a PROFINET device. The test application form has extra fields to provide controller-specific information. The PIC offers a controller test information bundle which will be provided after receipt of the completed test application form.



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## 3. During Certification Test

### **If there are several similar devices based on the same implementation, can they all be certified at once?**

It is possible to certify several “variants” of a device along with the representative device. Variants usually differ in terms of application features (number of IO modules, etc). The variant list must be included in the completed test application form.

### **How many products do I need to send?**

Normally, sending one device for testing is sufficient.

If there are several variants, the PIC and device manufacturer will discuss before the test which ‘main devices’ (full test) and ‘variants’ (partial test) require testing. Usually, not all variants need to be tested.

Also, even with just one main device, it can be beneficial to send more than one device. For example, some tests can run in parallel, or the testing can continue if one device locks up.

### **What type of power and Ethernet media does the PIC support in the test lab?**

The PIC provides the following power supplies in its test lab. If the PROFINET device requires additional power supplies, they should be sent along with the sample device for testing.

- › 24 V DC for current draw up to 10 A
- › 120 V / 60 Hz AC 1P for current draw up to 10 A
- › 240 V / 60 Hz AC 1P for current draw up to 3 A
- › 230 V / 50 Hz AC 1P for current draw up to 3 A

The PIC can supply the following network cabling in its test lab. If the PROFINET device requires additional cables, converters, PoE or interface types, they should be sent along with the sample device for testing.

- › RJ-45 / 4 conductor
- › RJ-45 / 8 conductor
- › M12 / D-Coded / 4 conductor
- › M8 / D-Coded / 4 conductor

### **If a device is large, heavy, or requires more power than the lab can supply, how to certify it?**

The best option is to supply the PROFINET interface component along with a system simulator that runs a full implementation of the application software without the large, heavy, or power-hungry physical apparatus.

## 3. During Certification Test *cont.*

Another alternative to certify the device is to inquire about on-site testing services. For example, PITLs are allowed to perform an on-site test if the device meets one or more of these criteria:

- › Device or any device part exceeds the maximum transport size of 1800 x 1500 x 700 mm
- › Total transport weight of the device is greater than 300 kg
- › Device utilizes or is technically possible to adapt it to utilize input power higher than 32 A, 400 V AC, 50 Hz, or corresponding values for countries outside Europe

### Can a representative attend the test?

While not required, it is recommended that a representative from the device manufacturer's team attends the test for the first one or two days. Having a representative on hand helps to quickly resolve issues that arise during testing. If issues cannot be resolved, the representative can learn to reproduce the issues outside of the test lab. This is especially true for customers completing their first PROFINET project or submitting a complex device for testing.

### What if a product fails the test?

Each PITL has different strategies when reporting issues with a device during testing.

For example, the PIC will report minor issues back to the device manufacturer as they happen while continuing to test other aspects of the device. Once the PIC receives a fix, they will verify the issues are resolved. For major issues (hardware/performance/stack issues), the PIC can put the test on hold and resume after receiving the updated device.

The certification test should not be seen as a pass/fail test. The PIC and the customer have the same goal: to have the device successfully certified.

### What is the final test result?

Once the device has passed the testing, the PITL sends an accredited test report to the device manufacturer.

It is important to know that PITLs do not issue certificates directly. The device manufacturer will use the test report to apply for the actual certificate from the PICO.

### Will I get my product back after testing?

After testing, the PIC can send the device back to the device manufacturer. The device manufacturer must indicate a carrier account number on the completed test application form or send a prepaid shipping label with the product.

If the device manufacturer does not need the device back, the PIC will repurpose and add it to its integration test network to use in future tests and to showcase the variety of devices available.

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## 4. After Certification Test

### How to obtain the certificate?

After testing, the device manufacturer will receive a test report from the PITL. To obtain the certificate, the device manufacturer must send the positive test report and a completed certificate application form to the PICO:

<https://www.profibus.com/download/application-form-for-a-certificate/>

### What is the cost of the certificate?

The certificate costs 900 EUR for PI members and 3000 EUR for non-members.

### For how long is the certificate valid?

The granted certificate is valid for three years. It can be prolonged if specific criteria are met.

### How can a certificate be prolonged?

The device manufacturer can request to prolong the validity of a certificate. The request must be made within three months prior to, and three months after, the certificate's expiration date. For this purpose, the device manufacturer must send a completed certificate application form and a Manufacturer's Declaration to the PICO.

The declaration must contain the following statements:

- ▶ Declaring the unchanged conformance of the product with the tested prototype in hardware and software per the latest test report.
- ▶ Declaring there is no newer version of the device that uses the same device identification, i.e., Vendor ID, Device ID, or DAP-Module-ID.

Otherwise, the prolongation of a certificate requires a retest.

### How is the certificate affected by product changes?

Product modifications invalidate the certificate. Depending on the modification, the PICO can update the certificate via a Manufacturer's Declaration, a new test report, or a positive statement from a PITL.

Some product changes only require a Manufacturer's Declaration; other modifications require partial or full retesting. For example, changes in the communication interface or firmware modifications require retesting. Contact a PITL to assess the retest requirement.



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## 4. After Certification Test *cont.*

### Is the certificate affected by GSD file changes?

Device Manufacturers can update a GSD file to a new version by ensuring compatibility with the old version under their own responsibility. Then, the device manufacturer must submit a statement directly to the PICO. In any case, the device manufacturer is responsible that at any time, only one valid GSD file exists for a product. If the device manufacturer wants to update their certificate with a new GSD file name, they must contact the PICO to obtain an updated certificate.

### When to use PI trademarks and logos?

ASSOCIATION  
TRADEMARK



CERTIFICATION  
TRADEMARK



CERTIFIED BY PI  
TRADEMARK



TECHNOLOGY TRADEMARKS



The rights to use the Association Trademark and Technology Trademarks are acquired through membership. Member companies can use these logos as part of the marketing of their products or simply to display support of PI's technologies.

The Certification Trademark can be used to identify products certified by PI. The right to use the Certification Trademark terminates automatically if the product is modified and no longer satisfies the established test criteria.

### How to add products to the Product Finder?

The Product Finder on [profibus.com](http://profibus.com) is a central repository where end-users search for PROFIBUS and PROFINET enabled products. As a member benefit, PI members can add their products to the Product Finder.

It is the manufacturer's responsibility to add and update their product information.

To add new entries to the Product Finder or edit existing entries, members must log in to:

<https://www.profibus.com>.

## *Related Resources*

**PI website:**

<https://www.profibus.com/>

**PI download center:**

<https://www.profibus.com/download>

**PROFINET IO Test Bundle:**

<https://www.profibus.com/download/profinet-test-bundle/>

**PI product finder:**

<https://www.profibus.com/productfinder>

**PI North America membership page:**

<https://us.profinet.com/membership/become-a-member/>

**PIC website:**

<https://profiinterfacecenter.com/>

## **Contact Us**

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