How to get a certificate for a PROFIBUS device

Guideline for PROFIBUS

Version 1.4 – Date February 2014
Order No.: 2.922b

File name : How-to-get-PB-certifcate_2922b_V14_Feb14

In this specification the following key words (in **bold** text) will be used:

may: indicates flexibility of choice with no implied preference.

should: indicates flexibility of choice with a strongly preferred implementation.

shall: indicates a mandatory requirement. Designers **shall** implement such mandatory requirements to ensure interoperability and to claim conformance with this specification.

Publisher:
PROFIBUS Nutzerorganisation e.V.
Haid-und-Neu-Str. 7
76131 Karlsruhe
Germany
Phone: +49 (0) 721 / 96 58 590
Fax: +49 (0) 721 / 96 58 589
E-mail: info@profibus.com
Web site: www.profibus.com

Content

List of figures

Revision Log

Identification	Version	Originator	Date	Change Note / History / Reason
TC1-05-0006	0.9	Patz	17Oct95	Initial version
TC1-05-0006d	1.0	Patz	18Sept06	Version after TC1 review
	1.10	Wenzel Diedrich	01Feb12 08Jun12	Changes because of harmonization with the Framework document and the Rules for PITLs document Spelling, Content update
	1.2	Wenzel	11Jun12	Re-formatting work
	1.3	Diedrich AvE	07. Jan 2014 09.Jan.2014	Change to a document which are for PROFIBUS only Harmonization with PROFINET document “How to get a certificate …” PROFINET removed,
	1.4	Wenzel, Diedrich, Popp, AvE	Feb 14	version after C2 review

1 Management Summary - Scope of this Document

The responsibility for an operating communication between fieldbus based automation devices lies with open fieldbus systems no longer with a special equipment manufacturer but common at all manufacturers whose equipment accomplishes an automation task together. The test of the fieldbus interface to determine its conformity to the communication specification is of an outstanding significance at each of the equipment involved. At the PROFIBUS & PROFINET International (PI) this test is carried out by accredited PI Test Laboratories (PITL). General rules are fixed in Document 1: "Framework for Testing and Certification of PROFIBUS and PROFINET Products". After having passed the test successfully the equipment manufacturer can apply for a certificate which underlines the quality of its product. With this intention in mind this conformity test is called "certification test" below.

This guideline describes the procedures necessary for the attainment of a certificate for a PROFIBUS device. Furthermore in sections 7,8,9 it gives hints for the successful preparations for the certification test as well as describing procedures for brand labelling and dealing with equipment variants.

2 Introduction

Since the specifications for PROFIBUS and PROFINET are open and standardized, it is possible for anyone to build and sell devices. However, not all devices are equal and to ensure that users get the quality of product they deserve, PI operates conformance programs. Enacted via the network of independent PITLs and securely administered by PI itself, conformance testing ensures that devices meet relevant specifications and that interoperability is never an issue in the field.

Certified devices are an end user's guarantee of quality.

But not all devices have to be tested and certified. The following table gives an overview for which technology certification is mandatory:

	Mandatory	Strongly Recommended	Not Certifiable
PROFIBUS		**X**	
PROFINET	**X**		
PROFIsafe	**X**[1]		
PROFIdrive		**X**	
PROFIenergy	**X**		
PROFIBUS PA		**X**	
Passive PROFINET Components			**X**[2]

[1] see PROFIsafe Policy for additional requests!

[2] see www.profibus.com / Products / Product Certification to read about PROFINET Passive Network Component Declarations

3 List of affected patents

There is no affected patent known by the members of the Working Group. The list is empty. No patent search, neither external nor internal, has been done by the members of the Working Group up to now. PI does not guarantee the completeness of this list.

4 References and related documents

4.1 Reference

Document 2: Framework for Testing and Certification of PROFIBUS and PROFINET Products

4.2 Related documents

[1] *Registration of a PROFIBUS Device*, www.profibus.com.
[2] *Technical Guideline, Specification for PROFIBUS Device Description and Device Integration, Volume 1,* www.profibus.com.
[3] P*ROFIBUS GSD Editor*, www.profibus.com
[4] *Application form for PROFIBUS Certificate*, www.profibus.com
[5] *Manufacturer Declaration*, available on request at the PI Certification Office

5 Definitions and Abbreviations

5.1 Definitions

See Document 3: Framework for Testing and Certification of PROFIBUS and PROFINET Products

5.2 Abbreviations

EMC	Electromagnetic Compatibility	The extent to which an electric or electronic device will tolerate electrical interference from other equipment (immunity), and will interfere with other equipment. Within the European Community as well as in other countries it is regulated by law that electric and electronic components and equipment comply with basic standards such as IEC 61000-6-2 or IEC 61326 or corresponding individual product standards.
DUT	Device under Test	The device to be tested
GSD	General Station Description	A GSD is an electronically readable file that contains both general and device-specific parameters for communication and network configuration for either PROFIBUS or PROFINET devices. The GSD for PROFIBUS is an ASCII text file; the GSD for PROFINET is a GSDML based file.
MBP	Manchester coded Bus Powered	MBP IEC 61158-2: Type of medium attachment unit (MAU) suited for process automation: - line, tree, and star topology with - two wire transmission - 31.25 kBaud (preferred), high speed variants w/o bus powering and intrinsic safety - synchronous transmission (--> Manchester encoding) - optional: bus powered devices (>= 10mA per device = -->low power option) - optional: --> intrinsic safety (Ex-i) via additional constraints according to FISCO model

5.3 Defining the Responsibility and the Scope of a Certification Test

A PROFIBUS field device has to fulfill a specified functionality within an automation plant. Such devices are configured with an engineering tool. A controller processes the application program and the device itself covers the PROFIBUS communication as well as the real application to control the correctness of the inputs and outputs. PROFIBUS itself can only take control of the communication part. Therefore during a certification test only the correct behaviour of the communication acc. to IEC 61158 and IEC 61784 can be checked.

The certification test therefore checks the correct implementation of

- the hardware interface,
- the PROFIBUS mandatory and optional functionality
- the GSD-file
- the reaction on faulty behaviour
- the proper working in a reference automation plant in a test laboratory
- of the state machine

It is not goal of the PROFIBUS certification test to check the functionality of an engineering tool and the correct working of the real application (Controller and/or Device) e.g. the nominal rotation speed is intended to be 3000 rpm but the measured rpm is 2800.

This guideline describes the procedures necessary for the attainment of a certificate for a **PROFIBUS Slave** and a **PROFIBUS Master** which is always the basis for the additionally supported profiles like

- **PROFIBUS** PA for process automation devices
- **PROFIdrive** for drives and motion control
- **PROFIsafe** for functional safety

It is highly recommended to every manufacturer of a PROFIBUS field device with or without supported profiles to read this document before the development starts. It helps to safe time, money and trouble. The responsible bodies of PI keep this document up to date and give useful hints to be kept in mind to have a ready field device which meets the requirements of the market.

6 PROFIBUS PITL

6.1 General

A Certification test is performed by a PITL. A list of PROFIBUS PITLs can be obtained from the PI Website www.profibus.com. Just get in contact with one of the mentioned PITL and they will guide you through the certification process.

6.2 Quotation and order of test services

The test effort depends to a high extent on the numbers of errors. The guidance how to perform a test is regulated by the quality documents of PI. The quote of the PI Test Laboratory is regulated by the PITL itself. Double check in advance that the PITL, where you would like to have the DUT tested, is allowed to offer the test. Then fill out a test contract and fix a date for the test rather early to make sure you can launch your field device just in time
The contact addresses and the accredited scope of the PI Test Laboratories can be found on the PI Website.

7 Before you start the development

It is natural to take into account the requirements of the test specification already at the beginning of a development of a field device. At uncertainties the experts of the PITLs can be asked for advice. As a matter of fact, changes at the device can be performed considerably much easier at the beginning of a device development. Therefore a first verification test saves a lot of effort in the early developmental stages.

A comprehensive test of the fieldbus interface at the manufacturer labs (in-house test) is indispensable for the preparations for the certification test. As an optimum the test systems used by the PI Test Laboratories are also used for the in-house test.

PI does not offer a PROFIBUS test system. But the recommended test system is offered by ifak e.V. in charge of PI. (Send email to testlab@ifak.eu)

8 The way to the certificate

8.1 Formal sequence of the certification procedure

The formal sequence of the certification procedure is represented in Figure 1. Starting out from an enquiry of an equipment manufacturer the PI Test Laboratory prepares a written quotation for the execution of a certification test. After placing a corresponding certification test order for a device that should be tested (DUT) as well as the accompanying documents are submitted to the PITL. The PITL will check the documents and will get into contact with the applicant to guide him on his way. Please take into account that only a complete interface (Hardware, communication software and the application software) is tested.

If necessary, the applicant provides additional support to the personnel of the PI Test Laboratory during a certification test. Within a reasonable extent, the applicant also provides its own testing means. If required, the staff of the applicant must be available to operate these testing.

After execution of the certification test the equipment manufacturer will receive a test report. With the original of the test report the equipment manufacturer can then apply for a certificate at the PI Certification Office. The PI Certification Office is established at the PI Business Office of PROFIBUS Nutzerorganisation e.V., Germany (PNO). PNO is responsible for the certification on behalf of PI.

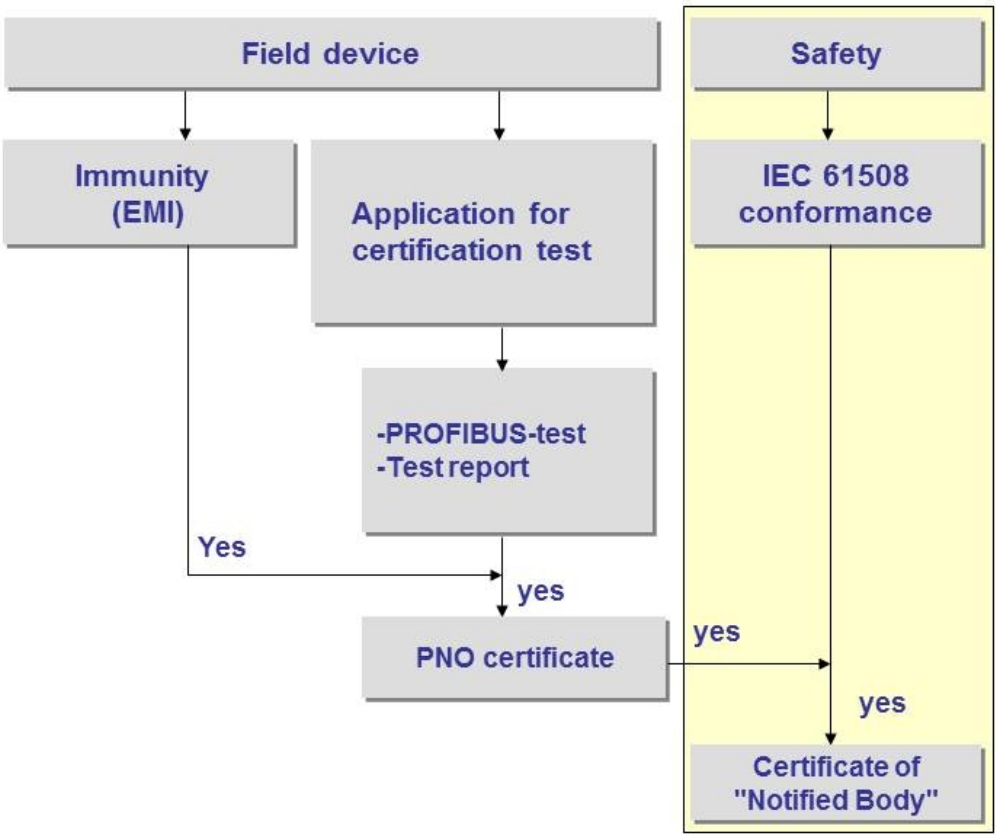

Figure 1: Formal sequence of certification

It is up to the manufacturer to offer his PROFIBUS products with or without a certificate. For PROFIsafe products certification is mandatory. The certificate is valid for a period of three years. It can be prolonged if certain criteria are fulfilled (see 8.7).

By any modification of the device the certificate gets invalid. The individual steps for the attainment of a certificate are represented in detail below.

8.2 Preparations for the certification test

Before execution of the certification test the manufacturer has to provide the following documents to the PI Test Laboratory:

- Registration confirmation of the PNO see [1]
- Manufacturer declaration about the successful EMC examination
- Manufacturer declaration that the device meets the required safety regulations
- General Station Description (GSD) in electronic form
- Wiring diagram of the PROFIBUS interface
- Device documentation
- Manufacturer declaration about component use (only at MBP equipment)

The required documents are described in detail:

8.2.1 Registration confirmation of the PNO

Before execution of the certification test, the manufacturer of the PROFIBUS device to be tested has to apply for an ID via PI. This ID is for one device type of one manufacturer. The assignment of the ID of PI shall be delivered to the PI Test Laboratory in copy by the manufacturer.

8.2.2 General Station Description (GSD)

The equipment manufacturer must make an equipment master file in accordance with the GSD specification [2] for its product. The entries of the GSD must describe the qualities of the device correctly. The entries

- Manufacturer ID (only if I&M functions supported)
- Device_ID
- as well as the name of the GSD

have to be identical with those on the registration confirmation.

The use of the PROFIBUS GSD editor [3] for a PROFIBUS GSD is recommended to ensure comfortable and syntax correct editing of the GSD.

8.2.3 Equipment documentation

The documentation shall describe the PROFIBUS specific communication functions of the device. Furthermore the structure and the meaning of manufacturer specific parameters and diagnosis data shall be explained. Further the configurable data which are transferred cyclically shall be explained in agreement with the module definition of the GSD.
Currently PI has not defined any formal regulations for the structure and the contents of the documentation.

8.2.4 EMC conformity declaration

For the attainment of a certificate the device in question must have passed an EMC test successfully in accordance with the current technical guidelines. The existence of a corresponding EMC conformity declaration is checked and documented in the test report by the PI Test Laboratory.

8.2.5 Declaration of required safety regulations

For the attainment of a certificate the manufacturer of the device in question shall provide the PI Test Laboratory with a declaration, that the device meets the safety requirements for its intended operation field.

8.2.6 Wiring diagram of the PROFIBUS interface (at DP equipment with RS485 interface)

Only necessary for PROFIBUS devices with RS485 interface.

For equipment with RS485 interface a wiring diagram of the PROFIBUS interface must be presented that shows the pin occupancy of the PROFIBUS interface, the used RS485 driver, the used optical coupling devices as well as the PROFIBUS ASIC.

8.2.7 Manufacturer declaration about component use (at equipment with MBP interface)

For equipment with MBP interface (primarily for equipment of the process automation) the used components must be indicated for the medium access unit (MAU), PROFIBUS ASIC and the used microcontroller.

Only necessary for PROFIBUS devices with MBP interface.

8.2.8 Testing of Profiles and Enhanced Features

A profile or enhanced feature test always requires a PROFIBUS testing in advance.
At present there is certification available for the profiles PROFIsafe, PROFIdrive and PA Devices.

8.3 Quotation and order of test services

The examining effort depends to a high extent on the numbers of errors. The quote of the PI Test Laboratory usually contains only an effort estimate for the execution of the certification test together with a price quotation of the daily rate. If the manufacturer accepts the quotation, he shall provide the order in writing. In connection with this, the date of the examination shall be agreed between the parties (manufacturer and PI Test Laboratory).
The contact addresses and the accredited scope of the PI Test Laboratories can be found on the PI Website.

8.4 Execution of the certification test

For the certification test the device to be tested shall be submitted to the PI Test Laboratory with the documents mentioned in section 8.2. The device must correspond to those produced in series. A test of prototypes is possible at most PI Test Laboratories, but the test of a prototype doesn't result in a test report with which a certificate can be applied for. The scope of the certification test is documented in test specifications, which can be downloaded from the PI Website by members free of charge. Non-members can order the test specifications from the PI Business Office.

The equipment manufacturer has the possibility of being present in the PI Test Laboratory during the certification test. Thus, he can benefit from the expertise of the tester. Furthermore stated deviations of the DUT from the communication standard can be immediately discussed and explained. All test results are archived in electronic and/or as hard copy by the PI Test Laboratory.

8.5 Test report

Based on the electronic and hard copy examining notes, a test report is generated by the PI Test Laboratory. The test report documents all examinations together with the respective results to which the device has been subjected in the context of the certification test. Observations which differ from the relevant PROFIBUS specifications are adhered. Furthermore the test report contains a recommendation for the PI Certification Office whether or not a certificate should be issued.

The test report is sent to the applicant. The PI Test Laboratory shall hold the test results and the test report in strict confidence.

8.6 Application for a certificate

After receiving a positive test report, the device manufacturer can apply for a certificate for his device. The manufacturer passes the pdf of the test report together with the correspondent application form (see [4]) to the PI Certification Office. This shall be done within 3 years after the test report is issued, otherwise a certificate can only be granted with a new test at a PI Test Laboratory.

The PI Certification Office issues the certificate based on the test report according to the rules of this document.

In case of a positive test result, the PI Certification Office will provide the certificate to the applicant. Is the test result negative and the applicant does not agree with the result the applicant may start the arbitration procedure according to Document 4: “Framework for Testing and Certification of PROFIBUS and PROFINET Products”.
The certificate issued will be identified by a unique certification number and must unequivocally identify the tested product, and contain unequivocal references to the PI Test Laboratory, to the test report issued by this laboratory, date of issue of the certificate, length of validity and type of test.

8.7 Prolongation of a certificate

A certificate is valid for three years.

The manufacturer can ask for prolongation of the validity of the certificate. For this purpose, it is necessary to provide the PI Certification Office not later than three (3) months after the certificates validity expires with a manufacturer declaration. This declaration must contain the following statements:

- declaring the unchanged conformance of the product with the tested prototype in hardware and software in accordance with the test report (the last favorable test).
- That there is no newer version of the device that uses the same Ident-Number.

Otherwise the prolongation requires a re-test.

The text for the manufacturer declaration (see [5]) can be obtained from the PI Certification Office.

On the basis of existing test report, the current test specifications and the applicant's statement, the certification office grants the certificate prolongation.

Certificate

PROFIBUS Nutzerorganisation e.V. grants to

Muster AG
Muster Str. 25, 12345 Musterstadt, Germany

the Certificate No: **Z01010** for the PROFIBUS device:

Model Name: **Musterdevice**
Revision: **1.0; SW/FW: 1.0; HW: 1.0**
GSD: **MUST1234.GSD, File Version: V1.0 from 11.06.2012**

This certificate confirms that the product has successfully passed the certification tests with the following scope:

☑ DP-V0 MSO, Sync, Freeze, Fail_Safe
☑ DP-V1 MS1, MS2, I&M
☑ Physical Layer RS485

Test Report Number: 012-3
Authorized Test Laboratory: **Testlab AG, Musterstadt, Germany**

The tests were executed in accordance with the following documents:
"Test Specifications for PROFIBUS DP Slaves, Version 3.0 from November 2005".
This certificate is granted according to the document:
"Framework for testing and certification of PROFIBUS and PROFINET products".
For all products that are placed in circulation by April 29, 2013 the certificate is valid for life.

Board of PROFIBUS Nutzerorganisation e. V.

(Official in Charge)

(Vorstand)

(2. Vorstand)

Figure 2 Outline of the PROFIBUS certificate

9 Remarks for device developers

9.1 General notes

It is natural to take into account the requirements of the test specification already at construction of the device specifications. At uncertainties the experts of the PITLs can be asked for advice. As a matter of fact, changes at the device can be performed considerably much easier at the beginning of a device development. Therefore a first verification test saves a lot of effort in the early developmental stages.

A comprehensive test of the fieldbus interface at the manufacturer labs (in-house test) is indispensable for the preparations for the certification test. As an optimum the test systems used by the PI Test Laboratories are also used for the in-house test.

9.2 Method for brand labelling and device variants

9.2.1 Brand labelling

A device is offered by a company which is different from the manufacturer of the device. Under the assumption that the device named D_a registered at the PNO with the Ident number ID_A is certified, a manufacturer B can apply for a certificate for an identical device with the device name D_b if the following conditions are fulfilled:

1. The manufacturer declares in writing that the device with name D_B is functionally identical with the device named D_A.
2. The GSDs of G_A and G_B are only different in
   - the entry "Vendor_Name"
   - the entry "Model_Name"
   - the first four signs of the GSD name (manufacturer contraction).

Both devices D_A and D_B get the same Ident number ID_A, but there are two different GSDs. The certification process leads to two different certificates for the devices named D_A and D_b.

9.2.2 Device variants

Device variants which have an identical PROFIBUS interface can have the same Ident number and a common GSD. After presentation of a corresponding manufacturer declaration a reduction of the certification test to a subset of the device variants can if necessary be agreed on. It is recommended to coordinate the test procedure at the test of device variants with the PI Test Laboratory.

9.3 Test procedure regarding product naming (device families)

If a vendor manufactures a device which is represented by several product names on the market, there are two options and corresponding procedures to enable him to advertise the product names in the certificate:

1) Vendor declaration: Vendor delivers declaration about identity of product variants to the PI Test Laboratory. In the declaration, vendor shall clearly state the product variants differ not in PROFIBUS functionality, software or hardware implementation but in other technical or technological parts which are out of scope of PI certification requirements. All relevant vendor declarations shall be part of the Test Report in this case.

2) Test of all product variants: Vendor delivers all product variants to PI Test Laboratory. All are tested and the test results are summarized in one Test Report.

All product names are stated in the Test Report and will be published on the Certificate.
In case of PROFIsafe devices a case to case decision is necessary and up to the appropriate WG.

10 PROFIBUS DP

10.1 Available Specifications

The test of PROFIBUS DP is based on the international standard IEC 61158 part 3. The tests to be performed are based on the PI-documents

- Test specifications for PROFIBUS DP Masters
- Test Specifications for PROFIBUS DP-Slaves
- Test cases: are only available as software (test program)

10.2 Available Test Tool

PI does not offer a PROFIBUS test system. But the recommended test system is offered by ifak e.V. in charge of PI. (Send email to testlab@ifak.eu)

10.3 PROFIBUS DP Certificate

The following data is shown on the certificate

- Certificate Number
- Model_name
- Revision SW-Version, HW-Version
- GSD file name
- Test report number
- Authorized Test Laboratory
- Validity of the Certificate

11 PROFdrive

PROFIdrive is an application profile which can be used in combination with PROFIBUS. Therefore it is necessary to use a certified PROFIBUS device with which a PROFIdrive module can be tested. The rules for a PROFIBUS certification do apply here. This profile is tested when the following entry in the GSD-file is defined: **ProfileName** “PROFIdrive”.

11.1 Available Specifications

The test of a PROFIdrive module is based on the

- Profile Drive Technology PROFIdrive
- Amendment PROFIdrive on PROFIsafe

The tests to be performed is based on the PI-document

- Test Specification for PROFIdrive Profile V4.1

11.2 PROFIdrive Certificate

The following data is shown on the certificate

- Certificate Number
- Model_name
- Order_ID
- Revision SW-Version, HW-Version
- Test report number
- Authorized Test Laboratory
- Validity of the Certificate
- Validity of the Certificate

12 PROFIsafe Device on PROFIBUS

A PROFIsafe module is always tested in combination with an already certified PROFIBUS head station. If only the PROFIsafe module should be tested a certified head station shall be available to perform the test. If the head station is not yet certified a separate certification test with the head station has to be performed in advance. This profile is tested when the following entry in the GSD-file is defined: **ProfileName** “PROFIsafe”

12.1 Available Specifications

The test of PROFIsafe on PROFIBUS is based on the international standard IEC 61158 part 3. The tests to be performed is based on the PI-documents

- PROFIsafe – Profile for Safety Technology on PROFIBUS DP and PROFINET IO
- PROFIsafe Test & Certification
- Test cases: are only available as software (test program)

12.2 PROFIsafe Certificate

The following data is shown on the certificate

- Certificate Number
- Model_name
- Order_ID
- Revision SW-Version, HW-Version
- Application CRC for each channel
- Scope of the test (functionality V2)
- Test report number
- Authorized Test Laboratory
- Validity of the Certificate

13 PROFIBUS PA

The PA profile of a PROFIBUS DP device is always tested after testing the PROFIBUS DP functionality. The PA profile test report is an attachement to the DP test report. Both test reports result in one certificate mentioning the PA profile. This profile is tested when the following entry in the GSD-file is defined: ProfileName “PA”.

13.1 Available Specifications

The test of PROFIBUS PA is based on the international standard IEC 61158 part 3. The tests to be performed are based on the PI-documents

- Profile for Process Control Devices
- Test Specifications for PA Devices
- Test cases: are only available as software (test program)

13.2 PROFIBUS PA Certificate

The following data is shown on the certificate

- Certificate Number
- Model_name
- Revision SW-Version, HW-Version
- GSD file name and/or profile specific GSD file name
- Profile
- Physical Layer
- Test report number
- Authorized Test Laboratory
- Validity of the Certificate

PROFIBUS Nutzerorganisation e. V. (PNO)
PROFIBUS & PROFINET International (PI)
Haid-und-Neu-Str. 7 • 76131 Karlsruhe• Germany
Phone +49 721 96 58 590 • Fax +49 721 96 58 589
E-mail info@profibus.com
www.profibus.com • www.profinet.com