Cat. No. I111E-EN-02

MX2/RX PROFIBUS Option Board

Model: 3G3AX-MX2-PRT-E
3G3AX-RX-PRT-E

USER'S MANUAL

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

OMRON Product References

All OMRON products are capitalized in this manual. The word "Unit" is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

Trademarks and Copyrights

PROFIBUS, PROFIBUS FMS and PROFIBUS DP are trademarks of PROFIBUS International.

Other product names and company names in this manual are trademarks or registered trademarks of their respective companies.

The copyright of the Option Board Option Board belongs to OMRON Corporation.

Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.
- Personnel in charge of maintaining FA systems.

About this Manual

This manual describes the:

- PROFIBUS 3G3AX-MX2-PRT-E Option Board for OMRON's MX2 Inverter.
- PROFIBUS 3G3AX-RX-PRT-E Option Board for OMRON’s RX Inverter.

It also describes how to install and operate the Unit.

Please read this manual carefully so that you understand the information provided before installing or using the Option Board. Start with the Safety Messages on page ix. They describe the operating environment and application safety measures which must be observed prior to and when using the Option Board Option Board.

For the remainder of this manual, both the 3G3AX-MX2-PRT-E PROFIBUS Option Board as the 3G3AX-RX-PRT-E PROFIBUS Option Board will be referred as Option Board or Unit. The MX2 and RX Inverters will be referred as Inverter.

In case information is especially for the MX2 or for the RX Inverter, a clear notification will be included for which the note is meant.

If information especially is meant for the MX2, this symbol is shown: MX2

If information especially is meant for the RX, this symbol is shown: RX

Please be sure to read the related user manuals to use the
Option Board Option Board safely and properly. Be sure you are using the most current version of the manual:

Manual	Products	Contents	Cat No.
MX2 User's Manual	MX2 Inverter	Describes the installation and operation of the MX2 Inverter	I570
RX User's Manual	RX Inverter	Describes the installation and operation of the RX Inverter	I560
PROFIBUS Installation Guideline for Cabling and Assembly	PROFIBUS	Provides information on how to properly install PROFIBUS wiring and to provide practical guidance on the best ways to achieve this	PNO Order No. 8.022
PROFIBUS Profile for Variable Speed Drives	PROFIdrive	Provides information on the PROFIdrive device profile and it's usage	PNO Order No. 3.072
PROFIBUS Master Units	CS1W-PRM21 CJ1W-PRM21	Operation manual for PROFIBUS master units	W409

Warranty and Limitations of Liability

WARRANTY
OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NONINFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY
OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY. In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted. IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE
OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products. At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use. The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products: o Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual. o Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations. o Systems, machines, and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to the products. NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS
OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS
Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS
Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA
Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS
The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

Table of contents

Safety Messages

Read this manual and the warning labels attached to the Inverter carefully, before you start to install and operate the Inverter.

Please follow the instructions exactly.

Keep this manual handy for quick reference.

Definitions and Symbols

A safety instruction (message) includes a "Safety Alert Symbol" and a signal word or phrase such as WARNING or CAUTION. Each signal word has the following meaning:

⚠ HIGH VOLTAGE Indicates a potentially hazardous situation which, if not avoided, could result in electric shock. It calls your attention to items or operations that could be dangerous to you and other persons operating this equipment.

Read the message and follow the instructions carefully.

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.

⚠ Caution Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury, or property damage.

Step 1 Indicates a step in a series of action steps required to accomplish a goal. The number of the step will be contained in the step symbol.

Note Notes indicate an area or subject of special merit, emphasizing either the product's capability or common errors in operation or maintenance.

Tip Tips give a special instruction that can save time or provide other benefits while installing or using the product. The tip calls attention to an idea that may not be obvious if you are a first-time user of the product.

1 Hazardous High Voltage

⚠ HIGH VOLTAGE Motor control equipment and electronic controllers are connected to hazardous line voltages. When servicing drives and electronic controllers, there may be exposed components with housing or protrusions at or above line potential. Extreme care should be taken to protect against shock.
Stand on an insulating pad and make it a habit to use only one hand when checking components. Always work with another person in case an emergency occurs. Disconnect power before checking controllers or performing maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on electronic controllers or rotating machinery.

2 General Precautions - Read These First!

⚠ WARNING Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

⚠ WARNING This equipment should be installed, adjusted, and serviced by qualified electrical maintenance personnel familiar with the construction and operation of the equipment and the hazards involved. Failure to observe this precaution could result in bodily injury.

⚠ WARNING Wiring, maintenance or inspection must be performed by authorized personnel. Not doing so may result in electrical shock or fire.

⚠ WARNING Hazard of electrical shock! Disconnect incoming power before working on the Option Board or the Inverter!

⚠ HIGH VOLTAGE Turn the power supply OFF and wait for the time specified on the Option Board front cover before performing wiring, maintenance or inspection. Not doing so may result in electrical shock.

The Option Board is attached to an Inverter.

Dangerous voltage exists until the Inverter power light is OFF.

⚠ HIGH VOLTAGE Do not touch the conductive parts such as the internal PCB, terminals or connector while power is being supplied. Doing so may result in electrical shock.

⚠ WARNING Do not attempt to take an Option Board apart or touch any internal parts while the power is being supplied. Doing so may result in electric shock.

⚠ WARNING Do not attempt to disassemble, repair, or modify an Option Board. Any attempt to do so may result in malfunction, fire, or electric shock.

⚠ WARNING Provide emergency stop circuits, interlock circuits, limit circuits and similar safety measures in external circuits (NOT in the Option Board). This ensures safety in the system if an abnormality occurs due to malfunction of the Option Board or another external factor affecting the Option Board operation. Not doing so may result in serious accidents.

⚠ WARNING Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes. Not doing so may result in serious accidents.

⚠ Caution Do not touch the Inverter during power on, and immediately after power off. Hot surface may cause injury.

⚠ Caution The product will be used to control an adjustable speed drive connected to high voltage sources and rotating machinery that is inherently dangerous if not operated safely. Interlock all energy sources, hazardous locations, and guards in order to restrict the exposure of personnel to hazards. The adjustable speed drive may start the motor without warning. Signs on the equipment installation must be posted to this effect. A familiarity with auto-restart settings is a requirement when controlling adjustable speed drives. Failure of external or ancillary components may cause intermittent system operation, i.e., the system may start the motor without warning or may not stop on command. Improperly designed or improperly installed system interlocks and permissives may render a motor unable to start or stop on command.

3 Installation Precautions

⚠WARNING Always connect the grounding cable to one of the ground terminals of the Inverter. Failure to abide could lead to serious or possibly fatal injury.

⚠Caution Failure to observe these precautions could lead to faulty operation of the Option Board or the Inverter, or could damage either of the two. Always read these precautions.

- Install external breakers and take other safety measures against short-circuits in external wiring. Not observing this may result in burning.
- Be sure that all cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.
- Do not allow metal clippings to enter either Option Board or Inverter when wiring or installing the unit.
- Follow "PROFIBUS Installation Guideline for Cabling and Assembly" (PNO Order No. 8.022)
  - Wire the PROFIBUS cables and connectors correctly. Incorrect wiring may result in burning.
  - Apply termination at both ends of a PROFIBUS cable segment. Do not apply termination anywhere else.
- Be sure that the Option Board is mounted correctly. Improper mounting may result in malfunction.
- Disconnect the grounding cable when performing withstand-voltage tests. Not disconnecting the grounding cable may result in burning.

4 Configuration Precautions

⚠Caution Failure to observe these precautions could lead to unexpected operation of the Option Board or the Inverter. Always read these precautions.

- Check the network related Inverter settings regarding PROFIBUS node address and PROFIBUS map selection. Not doing so may result in unexpected operation.
- When replacing an Inverter be sure that all Inverter settings of the Inverter being replaced are restored to the replacement.
- Restoring parameters stored in the remote operator also restores the PROFIBUS node address. Always check the node address and other network related Inverter settings after restore.

5 Application Precautions

⚠WARNING Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

⚠WARNING It is extremely important that the Unit is used for its specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult your OMRON representative before using it in a system in the above-mentioned applications.

⚠ **WARNING** Failure to observe these precautions could lead to serious or possibly fatal injury. Always read these precautions.

- Check any user program in the system that acts as a PROFIBUS master before actually running it. Not checking the program may result in unexpected operation.

MX2

- A revision AAAA Inverter allows the motor to run immediately if a trip condition is reset, and at the same time, a run command is active via PROFIBUS. For safe operation clear the run command via PROFIBUS as soon as a trip condition is detected. Refer to section *1-1-2 Inverter Support* to determine the Inverter revision.

⚠ **Caution** Failure to observe these precautions could lead to faulty operation of the Option Board or the Inverter, or could damage to either of the two. Always read these precautions.

- Check the Inverter settings for proper Inverter behavior before actually operating the Inverter remotely via the PROFIBUS network.
- Check the Inverter's EzSQ program and its interaction with the PROFIBUS master before actually running it on the Inverter. Not checking the program may result in unexpected operation.
- Confirm that no adverse effect will occur at the moment the PROFIBUS master stops communicating with the Inverter or at the moment the PROFIBUS master has not yet started communicating to the Inverter.
- Confirm that no adverse effect will occur in the Inverter before force-setting/force-resetting any bit in the system that acts as a PROFIBUS master.

6 Operating Environment Precautions

⚠ **Caution** Do not operate the Inverter with a mounted Option Board in the following locations (doing so may result in malfunction, electric shock or burning):

- Locations subject to direct sunlight
- Locations subject to temperatures or humidity outside the range specified in the specifications
- Locations subject to condensation as the result of severe changes in temperature
- Locations subject to corrosive or flammable gases
- Locations subject to dust (especially iron dust) or salts
- Locations subject to exposure to water, oil, or chemicals
- Locations subject to shock or vibration

⚠ **Caution** Take appropriate and sufficient countermeasures when installing systems in the following locations (doing so may result in malfunction):

- Locations subject to static electricity or other forms of noise
- Locations subject to strong electromagnetic fields
- Locations subject to possible exposure to radioactivity
- Locations close to power supplies

⚠ **Caution** The operating environment of the Inverter with a mounted Option Board can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the system. Make sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

7 Handling, Storage and Disposal

⚠ **Caution** Failure to observe these precautions could lead to faulty operation of- or damage to the Option Board. Always read these precautions.

- Before touching the Option Board or Inverter, be sure to first touch a grounded metallic object in order to discharge any static built-up. Not doing so may result in malfunction or damage.
- When transporting or storing the Option Board keep the product within the specified storage temperature range.

⚠ **Caution** Never dispose electrical components by incineration. Contact your state environmental agency for details on disposal of electrical components and packaging in your area.

8 Compliance with EC Directives

This product complies with EC Directives when mounted to an Inverter with the grounding cable connected.

SECTION 1
Getting Started

1-1 Introduction

1-1-1 Main Features

The Option Board 3G3AX-MX2-PRT-E and the 3G3AX-RX-PRT-E allow controlling, monitoring and parameterization of an Inverter via a PROFIBUS network.

The Option Board serves as a gateway that passes communicated register values from the PROFIBUS network to the Inverter and vice versa.

The following functions are available via PROFIBUS communication by installing the Option Board:

Cyclic Data Exchange

The PROFIBUS Master and Option Board can exchange data via a PROFIBUS DP-V0 message connection:

- Output data (from PROFIBUS Master to Option Board):
  E.g. Run/stop, Reference frequency and Fault reset
- Input data (from Option Board to PROFIBUS Master):
  E.g. Inverter status, Output frequency and Output current

Inverter Parameter Access

The PROFIBUS Master can read and write parameter data via the Option Board using the mailboxes provided by some modules, as well as a PROFIdrive DP-V1 parameter channel.

Simplified Start-up

The Option Board can be set up easily, just by wiring the Unit, setting the PROFIBUS node address (P180) and device profile (P182) and restarting the unit. The Unit's configuration is read automatically when the power is turned ON. It is not necessary to make any settings with a special Programming Device.

Simplified Replacement

All parameters required by the Option Board are stored in the Inverter. The Option Board can be replaced, requiring no re-configuration.

Automatic Baud Rate Recognition

The Option Board automatically detects the Master's communication baud rate, and no user configuration is required.

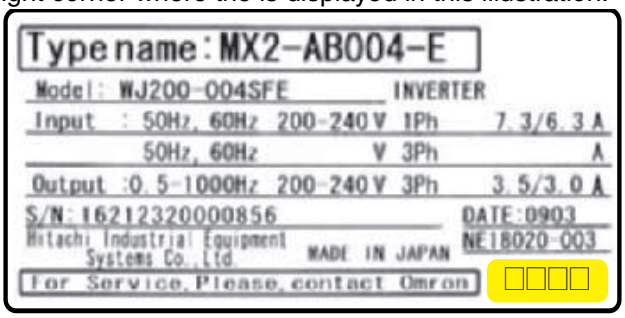
Note The PROFIdrive DP-V1 parameter channel is only available if the PROFIBUS Master also provides DP-V1 Class 2 (MSAC2) Messaging to the user.

Note If the PROFIBUS Master's baud rate changes, the PROFIBUS Communication Unit must be turned OFF and then ON to detect the new baud rate.

1-1-2 Inverter Support

1-1-2-1 Inverter support for the MX2

MX2 The 3G3AX-MX2-PRT-E Option Board supports the MX2 Inverter with minimum revision of AAAA. An MX2 Inverter that supports the 3G3AX-MX2-PRT-E Option Board can be recognized from the Inverter type label. Please check that your Inverter type label displays revision characters in the bottom right corner where the is displayed in this illustration.



Please note if these characters are absent, your Inverter does not support the 3G3AX-MX2-PRT-E, so please contact your local OMRON representative.

1-1-2-2 Inverter support for the RX

RX The 3G3AX-RX-PRT-E Option Board supports the RX Inverter with minimum revision of RX-□-E1F or RX-□-V1. An RX Inverter that supports the 3G3AX-RX-PRT-E Option Board can be recognized from the Inverter type label.

Note If your RX Inverter has no postfix on type label (e.g.RX-A4004) or the EF postfix (e.g. RX-A4004-EF) the 3G3AX-RX-PRT-E option is not supported, so please contact your local OMRON representative.

1-1-3 Inverter Safety (ISO 13849-1)

MX2 An Inverter provides a Gate Suppress function to perform a safe stop according to the EN60204-1, stop category 0. The Option Board has been designed not to interfere with this safety function.

The Option Board is not a safety device and does not implement any safety protocols.

Note The Option Board is not a safety device and does not implement any safety protocols such as PROFIsafe.

1-2 Option Board Specifications

Table 1 Option Board Specifications

Item		Specification
Installation MX2	Unit type	MX2 Series Option Card
	Model	Option Board
	Dimensions (W x H x D)	68 x 58 x 45 mm
	Weight	170g (typical)
Installation RX	Unit type	RX Series Option Card
	Model	3G3AX-RX-PRT-E
	Dimensions (W x H x D)	80 x 67 x 49 mm
	Weight	170gram (typical)
Environment	Ambient operating temperature*1	-10 to 55°C (no icing or condensation)
	Ambient operating humidity	20 to 90%RH
	Ambient storage temperature	-20 to 65°C (no icing or condensation)
	Vibration resistance	5.9m/s^2 (0.6G) at 10…55Hz
	Dielectric strength	500 VAC (between isolated circuits)
	Conformance to EMC and Electrical safety standards	EN61800-3: 2004 (2004/108/EC) Second environment, Category C3
		EN61800-5-1: 2007 (2006/95/EC) SELV
	Enclosure rating	IP 20
Front Case	Indicators	4 LEDs, indicating Option Board and PROFIBUS status: Option Board Status: RUN (Green) ERR(Red) PROFIBUS Status: BF (Red) COMM (Green)
	PROFIBUS connector	9-pin sub-D female connector (#4/40 UNC thread)
PROFIBUS Interface	Applicable standards	IEC 61158 Industrial communication networks - Fieldbus specifications
	Protocol type supported	PROFIBUS DP
		PROFIBUS DP-V1, Class 2 (MSAC2 acyclic messaging)
	PROFIBUS Unit type	PROFIBUS DP-V1 Slave
	PROFIBUS Media type	RS-485, galvanically isolated from the Inverter
	PROFIBUS Connector	9-pin sub-D female connector (#4/40 UNC thread)
		Termination according to EN50170 provided by the cable connector
	Certificate	Test Specification for PROFIBUS DP Slaves, Version 3.0 DP-V0 DP-V1 Physical Layer
	Unit device address range	0 ~ 125, set with inverter parameter P180
	Baud rates supported	Automatically detected from: 9.6 kbit/s 19.2 kbit/s 45.45 kbit/s 93.75 kbit/s 187.5 kbit/s 500 kbit/s 1.5 Mbit/s 3 Mbit/s 6 Mbit/s 12 Mbit/s

Note 1 The derated- or ambient operating temperature of the Inverter takes precedence over that of the Option Board.

Table 1 Option Board Specifications (continued)

Item		Specification			
PROFIBUS DP Services and Profiles	Master Class 1 – Slave cyclic services	Set_Prm	Chk_Cfg	Slave_Diag	Data_Exchange
		Get_Cfg	Rd_Inp	Rd_Outp	
		Global-Control (*SYNC/UNSYNC, FREEZE/UNFREEZE & CLEAR*)			
	Master Class 1 – Slave acyclic services	Not supported			
	Master Class 2 – Slave acyclic services	MSAC2_Initiate	MSAC2_Read	MSAC2_Write	MSAC2_Abort
	Profiles supported	PROFIdrive V2	(If P182 = 0)		
		Conventional	(If P182 = 1)		
		Flexible	(If P182 = 2)		
	Supported I/O modules	PROFIdrive V2 (If P182 = 0)	PPO Type 1 (4 words PKW + 2 words PZD)		
			PPO Type 2 (4 words PKW + 6 words PZD)		
			PPO Type 3 (2 words PZD)		
			PPO Type 4 (6 words PZD)		
			PPO Type 5 (4 words PKW + 10 words PZD)		
		Conventional (If P182 = 1)	Basic Data		
			Extended Data 1		
			Extended Data 2		
		Flexible (If P182 = 2)	Flexible (10 words output and input)		
I/O Data	I/O data	28 bytes max. input data using PPO Type 5			
		28 bytes max. output data using PPO Type 5			
	Diagnostics data size	11 bytes			
MX2 GSD file		OC_0C6A.gsd			
RX GSD file		OC_0D2F.gsd			

1-3 Introduction to PROFIBUS

1-3-1 The Purpose of PROFIBUS

PROFIBUS (PROcess FIeldBUS) is an open fieldbus standard for a wide range of applications in manufacturing, processing and building automation. The Standard, IEC 61158 (Industrial communication networks), to which PROFIBUS adheres, guarantees vendor independence and transparency of operation. It enables devices of various manufacturers to intercommunicate without having to make any special interface adaptations.

1-3-2 What is PROFIBUS DP

PROFIBUS DP (for Decentralized Periphery) is a variant optimized for high speed and low-cost interfacing. It is specially designed for communication between automation control systems and distributed I/O at the device level.

PROFIBUS DP uses the same transmission technology and uniform bus access protocol as PROFIBUS FMS (for Fieldbus Message Specification). Consequently, both versions can be operated simultaneously on the same bus. DP field devices, however, cannot be controlled by FMS masters and vice versa.

⚠ **Caution** It is not possible to exchange a PROFIBUS DP device or master for a PROFIBUS FMS device or master. This will cause faulty operation.