



Modular Telecontrol Network

MFW

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— info

## Profibus DP protocol

### Interface Description

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## 1 Applicability

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The description applies to the following MFW modules:

Item number	Name
97BZA3MN0BX0	MF-ZDM12-3PPDP-DIA-0-BX-0

## 2 General notes

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This documentation only describes the MFW module's Profibus DP interface, and assumes that the reader is familiar with both the Profibus DP standard and the MFW system. We refer you to the corresponding descriptions.

In order to communicate with a PLC, or with other higher-level control equipment, the master module of an MFW system can be fitted with a Profibus DP interface. All the I/O modules in an MFW system can be addressed through this interface. The MFW is operated on the Profibus as a modular slave. The device master data file (GSD file) is available for the purposes of configuring and setting up a Profibus network. The MFW modules can be linked into the network with the aid of this file and of the configuration tools belonging to your application. The GSD file contains all the data necessary for configuring the project (e.g. module types, supported bus speeds and so forth).



The Profibus DP configuration tools belong to the Profibus DP master module, and are not part of what is supplied by EES.

The GSD file for the system has been examined, and corresponds to the GSD specification (GSD Revision 2.0). The GSD file is registered with the PNO under the name EESZ063D.GSD and has identification number 063D. The devices' Profibus interface corresponds to the interoperability requirements in accordance with the "PROFIBUS, Test Specifications for PROFIBUS-DP Slaves, Version 2.0, February 2000" guideline from the Profibus user organisation (PNO).



The organisation blocks OB80 to OB86 must be linked into the S7 software in order to operate with an S7 PLC.



It is assumed that a full implementation of the Profibus DP master function has been provided at the host system (Profibus master). PLCs with restricted functions are offered at present (e.g. with a restricted number of inputs, outputs or configuration bytes).

The content of the documentation has been examined for consistency with the hardware and software described. It is nevertheless not possible to exclude the possibility of differences, and we are therefore unable to offer a guarantee of total correctness.

## 2.1 Symbols used

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The following symbols are used in this document:



### **Safety instruction**

This symbol marks warnings, prohibitions and directions relating to hazards. It is essential that they are observed and obeyed.



### **Additional note**

This symbol indicates additional information.



### **Important section**

This symbol indicates particularly important information.



### **Fact**

The preconditions for or consequences of an action follow this symbol.



### **Cross-reference**

This symbol refers to diagrams and to other locations within the document.

## 2.2 Terminology

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### **MFW**

The MFW modular telecontrol network consists of a central station and up to 31 outstations. Each station requires at least one basic module. Up to 15 expansion modules can be connected to this.

### **Basic module**

The basic modules represent the minimum core of a telecontrol station. They contain at least the following function groups:

- internal modem
- optionally 8 binary inputs or outputs with status LED, or an additional serial interface for protocol coupling
- two CAN bus interfaces for connecting the expansion modules
- watchdog LED and fault signalling contact

The basic modules are obtainable in two versions – master module and outstation module.

### **Master module**

Only one master module, whose type name contains “MF-...”, needs to be present in the system, and is usually used in the central station. It co-ordinates the flow of data.

### **Outstation module**

The outstation module, whose type name contains “UF-...”, is used in the outstations.

### **Expansion module**

Each basic module can be fitted with up to a maximum of 15 expansion modules in order to increase the I/O scope. These are connected via the CAN bus interface.

## I/O module

The majority of basic modules contain 8 inputs or outputs. These are referred to as I/O modules. In the same way, the expansion modules contain an I/O module consisting of 8 binary inputs, 8 binary outputs, 4 analog inputs or 4 analog outputs.

## Station address

To identify the stations in the MFW system, each outstation module is given a station address (1 -31). The address 0 is reserved for the master module, but does not have to be entered there. Station addresses must be unique.

## Module number

Each I/O module is given a module number. The data is exchanged between modules with the same module number. The physical arrangement of the modules within the system (the station address) is of no significance at all here.

## 2.3 Safety instructions

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**These operating instructions must be carefully read, understood and followed!**



**Risk of ignition from electromagnetic fields!**

**The MFW modules must not be operated in the neighbourhood of inflammable gases or liquids (fuel depots, petrol stations, chemical works, gas containers etc.)!**



**Risk of damage!**

**The MFW modules must not be opened or subjected to improper modification!**

## 2.4 Correct and proper usage

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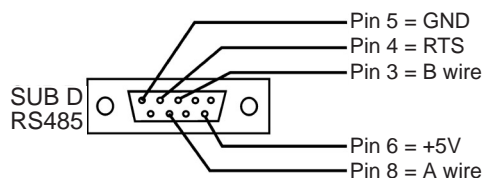
The telecontrol system is intended exclusively for the applications described in these operating instructions.

**Any other usage can be hazardous and is forbidden. The manufacturer cannot be held liable for the consequences of improper use of the MFW modules or for any application that does not accord with the contents of these operating instructions.**

## 2.5 Pin assignments of the RS485 Profibus DP interface

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The Profibus DP interface is implemented as a 9-pin sub-D socket with the pin assignments shown below.



The device does not provide a 24 V output voltage for powering operating or servicing devices.

## 3 Configuring the telecontrol system

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### 3.1 General principles

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Data within the telecontrol system is exchanged on the basis of module numbers. A module number is assigned to every basic or expansion module that contains an I/O module. The data is exchanged between modules with the same module number. The physical arrangement of the modules within the system (the station address) is of no significance at all here. The input module with number 5, for instance, transmits its data to all the output modules whose module number is 5. More than one output module can have the same module number. An input module number, however, can only be used once within one system.

The module number is set by means of a DIP switch. The modules must be listed in the master's configuration list, beginning with module number 0. This means that the position of a module in the module list corresponds to the module number set at the module. There must not be any gaps in the list. Modules that are not in fact present in the system must be entered as "dummy modules" in the configuration list.

The values for all the I/O modules are available over the Profibus DP interface at the MFW master module. The module is integrated as a slave into the Profibus system, and receives a Profibus station address by means of which the module is addressed by the Profibus master.

 The Profibus station address is pre-set at the factory to 31, and can be modified over the bus.


### 3.2 Modul types

The different module types and the number of data words they occupy is defined in the GSD file.

Name	Typ / function	Number of data bytes / data words occupied
4 Analog Output	G4AA0: Modul with 4 analog outputs	8 / 4
4 Analog Input	G4AE0: Modul with 4 analog inputs	8 / 4
Digital Output	G8DAR bzw. G8DAL Module with 8 digital outputs	2 / 1
Digital Input	G8DEX: Module with 8 digital inputs	2 / 1
Digital + 1 Zähler Input	G8DEX: Module with 8 digital inputs, of which one is configured as a counter input	4 / 2
Digital + 2 Zähler Input	G8DEX: Module with 8 digital inputs, of which two are configured as counter inputs	6 / 3
Digital + 3 Zähler Input	G8DEX: Module with 8 digital inputs, of which three are configured as counter inputs	8 / 4
Digital + 4 Zähler Input	G8DEX: Module with 8 digital inputs, of which four are configured as counter inputs	10 / 5
Modul Empty	Dummy module	0

Because of the limited amount of data that can be handled by the Profibus DP protocol and the restrictions associated with various masters, the maximum possible implementation of the MFW system cannot be operated over the Profibus. An MFW module's Profibus interface allows a maximum of 88 input words and 64 output words to be handled.

Attention must therefore be paid to ensure that these limits are not exceeded in the project planning and configuration of the Profibus.

-  Up to 128 modules (with module numbers 0 ... 127) can be configured, depending on the particular Profibus system in use. Make sure that you bear in mind any restrictions that may be imposed by the Profibus master that you are using.


### 3.3 Example

An MFW system is constructed from 7 I/O modules, and the module numbers are set up as follows:

Module type	Set module number	Comment
G4AE0	0	
G4AE0	1	
G4AA0	2	
G8DEX	3	
G8DEX	6	
G8DEX	7	Two inputs are configured as counters
G8DAR	8	

The Profibus master is configured for this example according to the table shown below:

Type from GSD	Module number	Module type	Number of input words	Number of output words
4 Analog Input	0	G4AE0	4	0
4 Analog Input	1	G4AE0	4	0
4 Analog Output	2	G4AA0	0	4
Digital Input	3	G8DEX	1	0
Modul Empty	-	-	0	0
Modul Empty	-	-	0	0
Digital Input	6	G8DEX	1	0
Digital + 2 Zähler Input	7	G8DEX	3	0
Digital Output	8	G8DAR	0	1

 Please bear in mind the maximum number of I/O words or bytes of your master implementation. An MFW module's Profibus interface allows a maximum of 88 input words and 64 output words to be handled.

## 4 Data formats

### 4.1 Binary values

Digital modules implement 8 binary inputs or outputs. These are represented in the low byte of the data words, where

input / output 1 occupies bit 0 and  
input / output 8 occupies bit 7.



## 4.2 Counter values

Counter values are transmitted as 16 bits. The counter roll-over can be parameterised in the master module to a value between 1 and 65535 (see the master module description). When this value is reached the counter is immediately reset to 0. The counter roll-over is set to 32768 as standard.

## 4.3 Analog values

The I/O modules can handle both 0...10V and 0...20mA signals. In either event, however, they are always represented in the Profibus protocol as a word in the range from 0 ... 10000 mV. The digital resolution is therefore 1mV or 2 $\mu$ A. A few typical values are represented in the following table.

Voltage value	Current value	Hexadecimal representation	Binary representation
1mV	2 $\mu$ A	0x0001	0000.0000 0000.0001
50mV	100 $\mu$ A	0x0032	0000.0000 0011.0010
1V	2mA	0x03E8	0000.0011 1110.1000
5V	10mA	0x1388	0001.0011 1000.1000
10V	20mA	0x2710	0010.0111 0001.0000

## 5 Diagnostics

Errors in the MFW system are transmitted in the Profibus DP interface's diagnostic telegram. The format of the device-specific diagnostics is used here for the user-specific diagnostics. A maximum of 32 bytes of user diagnostics - depending on the number of MFW outstations - is appended to the 6 bytes of standard diagnostics, in accordance with the table shown below.

Byte number	Meaning
1	Station status 1
2	Station status 2
3	Station status 3
4	Diag-Master-Add
5	Ident-Number High
6	Ident-Number Low
7	Number of user bytes
8	Central error code (master module)
9	Outstation 1 error code
...	
40	Outstation 31 error code

The significance of the six standard bytes (byte numbers 1 ... 6) can be found in the Profibus standard. The 7<sup>th</sup> byte indicates how many bytes of user diagnostics follow. The user diagnostic bytes themselves contain the error codes for the associated outstations (see the description of the corresponding MFW system). The first byte of the user diagnostics contains the error code of any error present in the central (master) MFW system, the second byte contains the code for any error present at outstation 1 and so on up to the 32<sup>nd</sup> byte, which contains the error code for outstation 31. The error codes are listed in the MFW system's instructions for use, and are represented in hexadecimal or binary form, depending on the Profibus master being used.

For example:

Error 12 – CAN bus error

is represented as follows:

hexadecimal	0x0C
binary	0000.1100

## 6 Technical data

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Transmission protocol	Profibus DP in accordance with EN 50170
Transmission rate	automatic detection up to a maximum of 6 Mbit/s
Profibus address	may be set (31 is standard)
Connection	9-pin sub-D socket
ID number	063D
Maximum number of input words	88
Maximum number of output words	64

The right to make technical changes is reserved

Further accessories and more detailed information may be found in the appropriate product sections in the catalogue.



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