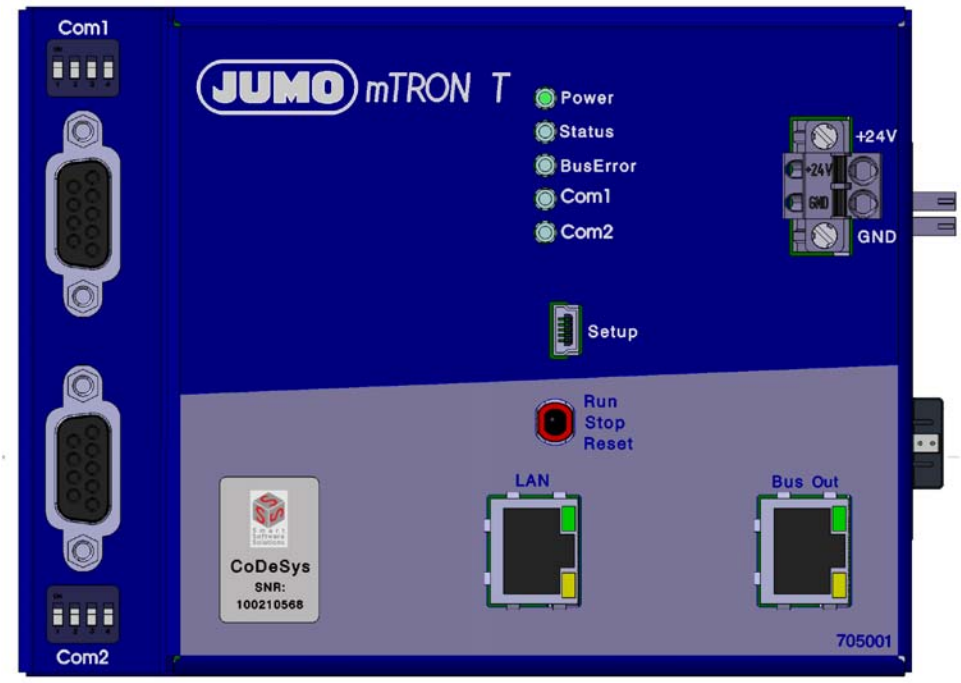
JUMO mTRON T

Measuring, Control, and Automation System
Central Processing Unit



Interface Description
PROFIBUS-DP

70500103T92Z001K000

V1.00/EN/00575591

Contents

1 Introduction 5

1.1 Available technical documentation 5
1.1.1 General information 5
1.1.2 Base units 5
1.1.3 Input/output modules 6
1.1.4 Special modules 6
1.1.5 Operating, visualization, recording 7
1.1.6 Power supply units 7
1.2 Content of the technical documentation 8
1.2.1 Device documentation in printed form 8
1.2.2 Device documentation in the form of PDF files 8
1.2.3 Documentation for optional software 9
1.2.4 Device documentation on the Internet 10
1.2.5 Training documents on the Internet 10
1.3 Safety information 11
1.3.1 Warning symbols 11
1.3.2 Note signs 11
1.4 Qualification of personnel 12
1.5 Additional documentation 12

2 PROFIBUS-DP description 13

2.1 Introduction 13
2.2 PROFIBUS types 13
2.3 RS485 transmission technology 14
2.4 PROFIBUS-DP 16

3 PROFIBUS-DP interface on the device 19

3.1 Position 19
3.2 Terminal assignment 20
3.3 Terminating resistors 20
3.4 Configuration 20
3.5 Timeframe for data processing 21
3.6 LED indication 21
3.7 Error messages 21

4 Configuring a PROFIBUS-DP system 23

4.1 GSD file 23
4.2 General procedure 23
4.3 Configuration example 25
4.3.1 Configure the interface of the central processing unit 705001 (CPU) 25
4.3.2 Provide GSD file 26
4.3.3 Configure the Modbus frames of the central processing unit 705001 (CPU) 31
4.3.4 PLC configuration 38

Contents

4.4 Error codes for measured values in float format 40

1.1 Available technical documentation

The documents specified below are available for the measuring, control, and automation system (previous document number in parentheses).

1.1.1 General information

Product	Type of documentation	No.	Printed	PDF file
Measuring, control, and automation system	Data sheet	70500000T10...	-	X
	System manual[1]	70500000T90... (B 705000.0)	X	-
	Setup program manual	70500000T96... (B 705000.6)	-	X
	System description[2]	70500000T98... (B 705000.8)	-	X

[1] Accessory subject to charge

[2] Includes an overview of the purpose and content of all documents

1.1.2 Base units

Product	Type of documentation	No.	Printed	PDF file
Central processing unit	Data sheet	70500100T10...	-	X
	Operating manual	70500100T90... (B 705001.0)	-	X
	Modbus interface description	70500100T92... (B 705001.2.0)	-	X
	PROFIBUS-DP interface description	70500103T92... (B 705001.2.3)	-	X
	digiLine interface description	70500106T92...	-	X
	Installation instructions	70500100T94... (B 705001.4)	X	X
	CODESYS OPC server operating manual	70500151T90... (B 705001.5.1)	-	X
	Process engineering application operating manual	70500152T90...	-	X
	Operating manual Thyristor power controller (type 70906x; integration in the measuring, control, and automation system)	70500153T90...	-	X

1.1.3 Input/output modules

Product	Type of documentation	No.	Printed	PDF file
Multichannel controller module	Data sheet	70501000T10...	-	X
	Operating manual	70501000T90... (B 705010.0)	-	X
	Installation instructions	70501000T94... (B 705010.4)	X	X
Relay module 4-channel	Data sheet	70501500T10...	-	X
	Operating manual	70501500T90... (B 705015.0)	-	X
	Installation instructions	70501500T94... (B 705015.4)	X	X
Analog input module 4-channel	Data sheet	70502000T10...	-	X
	Operating manual	70502000T90... (B 705020.0)	-	X
	Installation instructions	70502000T94... (B 705020.4)	X	X
Analog input module 8-channel	Data sheet	70502100T10...	-	X
	Operating manual	70502100T90... (B 705021.0)	-	X
	Installation instructions	70502100T94... (B 705021.4)	X	X
Analog output module 4-channel	Data sheet	70502500T10...	-	X
	Operating manual	70502500T90...	-	X
	Installation instructions	70502500T94...	X	X
Digital input/ output module 12-channel	Data sheet	70503000T10...	-	X
	Operating manual	70503000T90... (B 705030.0)	-	X
	Installation instructions	70503000T94... (B 705030.4)	X	X

1.1.4 Special modules

Product	Type of documentation	No.	Printed	PDF file
Router module	Data sheet	70504000T10...	-	X
	Installation instructions	70504000T94... (B 705040.4)	X	X

1.1.5 Operating, visualization, recording

Product	Type of documentation	No.	Printed	PDF file
Multifunction panel 840	Data sheet	70506000T10...	-	X
	Operating manual	70506000T90... (B 705060.0)	-	X
	Modbus interface description	70506000T92... (B 705060.2.0)	-	X
	Installation instructions	70506000T94... (B 705060.4)	X	X
Operating panels	Data sheet	70506500T10...	-	X

1.1.6 Power supply units

Product	Type of documentation	No.	Printed	PDF file
24 V power supply units	Data sheet	70509000T10...	-	X
	Operating instructions QS5.241		X	-
	Operating instructions QS10.241		X	-

1 Introduction

1.2 Content of the technical documentation

The documentation for the measuring, control, and automation system is intended for plant manufacturers and users with specialist training. It has a modular structure and comprises different sections.

In the following subsections, the various types of documents are listed (previous document number in parentheses).

1.2.1 Device documentation in printed form

7050XX00T94... (B 7050XX.4)

Installation instructions

A hard copy of the installation instructions is included in the scope of delivery of every module.

The installation instructions describe the installation of the device and the connection of the supply and signal cables. They also contain the order details and a list of technical data.

The scope of delivery for a power supply unit includes a hard copy of the operating instructions. These include information on installation and electrical connection.

70500000T90... (B 705000.0)

System manual

A hard copy of the system manual can be provided as an accessory subject to charge.

The system manual describes the scope of services of the measuring, control, and automation system and provides all information for project design and startup.

Index divider 1 "System description" summarizes the information applicable to all modules. Module-specific descriptions in the following sections complement the specifications stated here.

Index divider 2 "Setup program" describes the project design of the overall system.

1.2.2 Device documentation in the form of PDF files

The device documentation files specified below are saved as PDF files on the DVD contained in the scope of delivery of a base unit.

70500000T10... (T 705000)

Data sheet

The data sheet provides general information on the measuring, control, and automation system and forms the basis for plant planning and purchase decisions.

7050XX00T10... (T 7050XX)

Data sheet

The data sheets of the individual modules provide specific information, order details, and technical data.

70500000T98... (B 705000.8)

System description

The system description provides an overview of the measuring, control, and automation system. It describes properties that affect the entire system or are equally applicable for all modules.

7050XX00T90... (B 7050XX.0)

Operating manual

The operating manuals of the individual modules contain all information on installation, electrical connection, startup, operation, and – if required – parameterization and configuration.

7050XX0XT92... (B 7050XX.2.X)

Interface description

The interface description provides information about the use of that interface and on communication with other devices, superordinate systems or certain sensors.

7050XX00T94... (B 7050XX.4)

Installation instructions

The installation instructions describe the installation of the device and the connection of the supply and signal cables. The instructions also contain a list of the technical data.

7050XX5XT90... (B 7050XX.5.X)

Operating manual (application)

The operating manual describes the use of a certain application (e. g. PLC application).

1.2.3 Documentation for optional software

The manuals specified below are available on the Internet as PDF files. They also form part of the scope of delivery of the respective software.

70500000T96... (B 705000.6)

Setup program

The manual describes the function of the setup program.

70970100T90... (B 709701.0)

PC evaluation software PCA3000

The operating manual describes the operation and the features of the PC evaluation software. The PC evaluation software helps to visualize and evaluate the recorded process data (measurement data, batch data, messages, etc.).

70970200T90... (B 709702.0)

PCA communication software PCC

The operating manual describes the operation and the features of the PCA communication software. The PCA communication software is responsible for the data transfer from a device or system to a PC or to a network.

70075500T90... (B 700755.0)

Plant visualization software SVS3000

The operating manual describes the operation and features of the plant visualization software. The plant visualization software is responsible for networking interface-ready process devices with a PC.

1.2.4 Device documentation on the Internet

All documents are available for download on the Internet at www.jumo.net.
Download procedure:

Step	Action
1	On the JUMO website, enter the number of the relevant product group in the search field at the top right (e.g. 705001 for the central processing unit) and start the search. *The search results are listed.*
2	Select product (click the link).
3	In the "Documentation" dropdown list, select the desired documentation in the required national language (click the link).
4	+++++Open the PDF document or save it as a file.

1.2.5 Training documents on the Internet

Training documents (eLearning courses) on various topics are available at www.jumo.net.
Procedure:

Step	Action
1	On the JUMO website, navigate to the "Support/Services" area.
2	In the "Information & Training" menu on the left-hand side, select "eLearning courses".
3	Click the link "Review of our eLearning courses".
4	Select the desired eLearning course from the overview (click the link). *The presentation starts.*

1.3 Safety information

1.3.1 Warning symbols



DANGER!
This symbol indicates that **personal injury caused by electrical shock** may occur if the respective precautionary measures are not carried out.



WARNING!
This symbol in connection with the signal word indicates that personal injury may occur if the respective precautionary measures are not carried out.



CAUTION!
This symbol in connection with the signal word indicates that **damage to assets or data loss** will occur if the respective precautionary measures are not taken.



CAUTION!
This symbol indicates that **components could be destroyed** by electrostatic discharge (ESD = Electro Static Discharge) if the respective cautionary measures are not taken.
Only use the ESD packages intended for this purpose to return device inserts, assembly groups, or assembly components.



READ DOCUMENTATION!
This symbol – placed on the device – indicates that the associated **device documentation has to be observed**. This is necessary to recognize the kind of the potential hazards as well as the measures to avoid them.

1.3.2 Note signs



NOTE!
This symbol refers to **important information** about the product, its handling, or additional use.



REFERENCE!
This symbol refers to **further information** in other sections, chapters, or manuals.



FURTHER INFORMATION!
This symbol is used in the tables and refers to **further information** in connection with the table.



DISPOSAL!
This device and the batteries (if installed) must not be disposed in the garbage can after use! Please ensure that they are disposed properly and in an **environmentally friendly manner**.

1.4 Qualification of personnel

This document is meant for technically qualified individuals who have been especially trained and have the appropriate know-how in the field of automation technology (measurement and control instrumentation).

Only qualified personnel have the required specialist knowledge to correctly interpret and implement the safety information contained in this document in specific situations.

1.5 Additional documentation

The instructions and safety information in the operating manual B 705001.0 or the installation instructions B 705001.4 must also be observed (the installation instructions are included in the scope of delivery of the central processing unit).

This is especially true for

- the installation,
- the electrical connection, and
- the retrofitting of the PROFIBUS-DP interface.

2.1 Introduction

PROFIBUS-DP is a manufacturer-independent, open fieldbus standard for a wide range of applications in manufacturing, process and building automation. Manufacturer independence and openness are ensured by the international standards IEC 61158 and IEC 61784.

With PROFIBUS-DP, devices from different manufacturers can communicate without any special interface adaptation. PROFIBUS-DP can be employed for both high-speed time-critical data transmission and extensive, complex communications tasks.

2.2 PROFIBUS types

General automation	Manufacturing automation	Process automation
PROFIBUS-FMS	**PROFIBUS-DP**	**PROFIBUS-PA**
universal	**fast**	**sector-oriented**
- wide range of applications - multi-master communication	- plug and play - efficient and cost-effective	- bus supply - intrinsic safety

PROFIBUS-DP

This PROFIBUS variant, which is optimized for speed and low connection costs, has been especially tailored for communication between automation control systems (PLCs) and distributed field devices (typical access time < 10 ms).

PROFIBUS-DP can be used to replace conventional, parallel signal transmission using 24 V or 0(4) to 20 mA signals.

DPV0: cyclic data transfer
(is supported by the central processing unit (705001) as slave)

DPV1: cyclic and acyclic data transfer
(not supported by the central processing unit)

DPV2: cyclic and acyclic data transfer
and, among others, slave-to-slave communication
(not supported by the central processing unit)

PROFIBUS-PA

PROFIBUS-PA has been especially designed for process engineering. It permits the linking of sensors and actuators to a common bus cable, even in explosion endangered zones. PROFIBUS-PA allows data communication between and supply of power to devices based on two-wire technology in acc. with MBP (Manchester Bus Powering) as specified in IEC 61158-2.

PROFIBUS-FMS

This is the universal solution for communication tasks at the cell level (typical access time approx. 100 ms). The powerful FMS services open up a wide range of applications and provide a high degree of flexibility. FMS is also suitable for extensive communication tasks.

2 PROFIBUS-DP description

2.3 RS485 transmission technology



CAUTION!
Observe installation guidelines
When installing PROFIBUS systems, the PROFIBUS-DP/FMS installation guidelines of PNO (PROFIBUS NUTZERORGANISATION e. V.) must be met. The installation guidelines mentioned therein must be observed, especially for the simultaneous use of frequency changers.

Address:
PROFIBUS Nutzerorganisation e. V.
Haid-und-Neu-Straße 7
76131 Karlsruhe
GERMANY
www.profibus.com

Aufbaurichtlinien PROFIBUS-DP/FMS, Order No. 2.111 (German)
Installation Guideline PROFIBUS-DP/FMS, Order No. 2.112 (English)

Transmission takes place according to the RS485 standard. It covers all areas in which a high transmission rate and simple, cost-effective installation technology is required. A shielded, twisted copper cable with one conductor pair is used.

The bus structure permits addition and removal of stations or step-by-step commissioning of the system without affecting other stations. Later expansions have no influence on the stations already in operation.

The transmission speed is selectable within a range of 9.6 kbit/s to 12 Mbit/s. During system commissioning, one common transmission speed is selected for all devices on the bus.

Basic characteristics

Network topology	Line topology with bus termination at both ends per bus segment Several bus segments can be connected by repeaters (signal amplifiers).
Medium	Shielded, twisted-pair cable acc. to IEC 61158-2
Number of stations	32 stations (master or slaves) in each segment; with repeaters, extension to 126 stations possible
Connector	Preferably, 9-pin D-Sub connector

Cable length

The maximum cable length depends on the transmission speed. The specified cable length can be extended by the use of repeaters. It is recommended to limit the number of repeaters connected in series to a total of 3.

Transmission rate (kbit/s)	9.6	19.2	93.75	187.5	500	1500	12000
Range/segment (m)	1200	1200	1200	1000	400	200	100

Cable data

The cable length specifications refer to the cable type A described as follows.

Characteristic impedance	135 to 165 Ω
Capacitance per unit length	< 30 pF/m
Loop resistance	110 Ω/km
Core diameter	0.64 mm
Core cross-section	> 0.34 mm^2

It is preferable to use a 9-pin D-Sub connector for PROFIBUS networks incorporating RS485 transmission technology. The PIN assignment at the connector and the wiring are shown at the end of this chapter.

PROFIBUS-DP cables and connectors are offered by several manufacturers. Please refer to the PROFIBUS product catalog (www.profibus.com) for types and addresses of suppliers.

When connecting the devices, make sure that the data lines are not reversed. A shielded data line must be used!

The braided shield and the shielding foil underneath (if present) should be connected to the functional ground at both ends; ensure good conductivity of the connection.

Route the data line separately from all power cables.

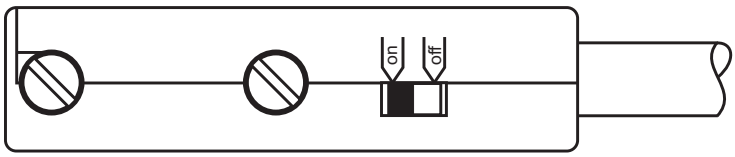
Wiring and bus termination

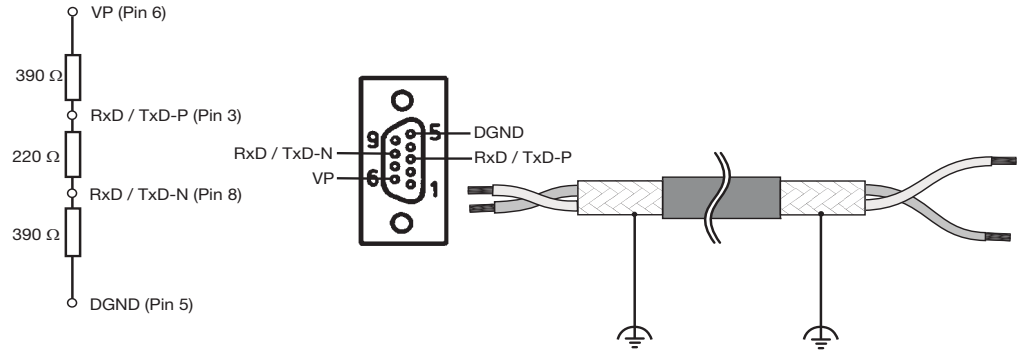
At both ends of each segment the bus is terminated by terminating resistors.

To ensure malfunction-free operation, make sure that voltage is applied to both bus terminations at all times.

The terminating resistors are located in the PROFIBUS connectors and can be activated by moving the slide switch to "On".

Spur lines should always be avoided for the bus cabling.





2.4 PROFIBUS-DP

PROFIBUS-DP is designed for high-speed data exchange at the field level. The central control devices, PLC/PC for instance, communicate through a fast serial connection with distributed field devices such as I/O, paperless recorders, and controllers. Data exchange with these distributed devices is mainly cyclic. Communication functions required for this purpose are defined by the basic PROFIBUS-DP functions in accordance with IEC 61158 and IEC 61784.

Basic functions

The central control system (master) reads the input information from the slaves cyclically and writes the output information to the slaves cyclically. The bus cycle time must be shorter than the program cycle time of the central PLC. In addition to cyclic user data transmission, PROFIBUS-DP also provides powerful functions for diagnostics and commissioning.

Transmission technology: • RS485, twisted pair cable • Transfer rates of 9.6 kbit/s up to 12 Mbit/s
Bus access: • Master and slave devices, max. 126 stations on one bus
Communication: • Peer-to-peer (user data communication) • Cyclic master-slave user data communication
Operating states: • Operate: cyclic transmission of input and output data • Clear: inputs are read, outputs remain in a secure state • Stop: only master-master data transfer is possible
Synchronization: • Sync mode: is not supported • Freeze mode: is not supported
Functionality: • Cyclic user data transfer between DP master and DP slave(s) • Dynamic activation or deactivation of individual DP slaves • Checking the configuration of the DP slaves • Address assignment for the DP slaves via the bus (is not supported) • Configuration of the DP master via the bus • Maximum of 176 bytes of input/output data for each DP slave possible

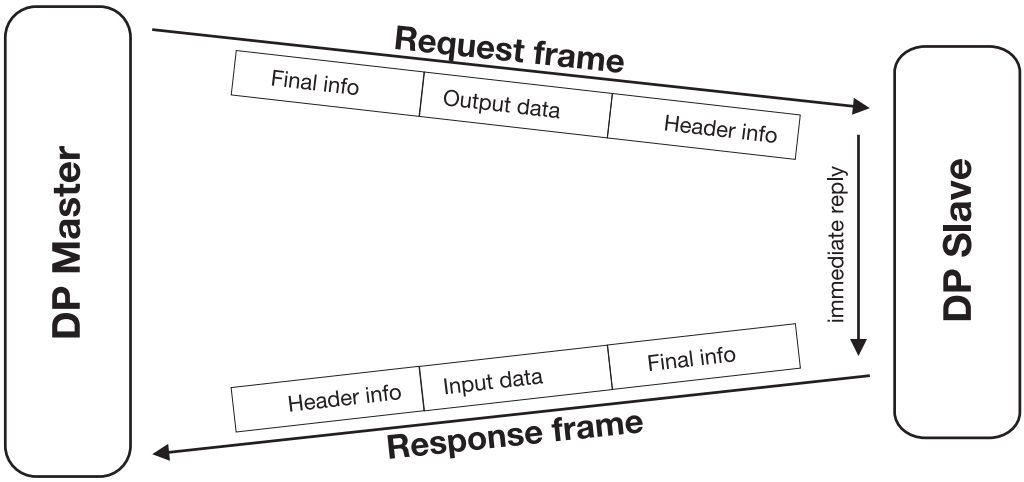
Protective functions: • Response monitoring for the DP slaves • Access protection for inputs/outputs of the DP slaves • Monitoring of the user data communication with adjustable monitoring timer in the DP master
Device types: • DP master class 2, e.g. programming/project design devices • DP master class 1, e.g. central automation devices (PLC, PC) • DP slave, e.g. devices with binary or analog inputs/outputs, controllers, recorders

Cyclic data transmission

The data transmission between the DP master and the DP slaves is automatically carried out by the DP master in a defined, recurring order. During bus system configuration, the user defines the assignment of a DP slave to the DP master. The user also defines the DP slaves that are to be included in, or excluded from, the cyclic user data transmission.

Data transmission between the DP master and the DP slaves is divided into three phases: parameterization, configuration, and data transfer. Prior to a DP slave entering the data transfer phase, the DP master checks in the parameterization and configuration phase whether or not the intended configuration matches the actual device configuration. In the course of this check, the device type, format and length information, as well as the number of inputs and outputs must coincide. These checks provide the user with reliable protection against parameterization errors. In addition to the user data transfer, which is automatically performed by the DP master, new parameterization data can be sent to the DP slaves at the request of the user.

User data transmission in PROFIBUS-DP:

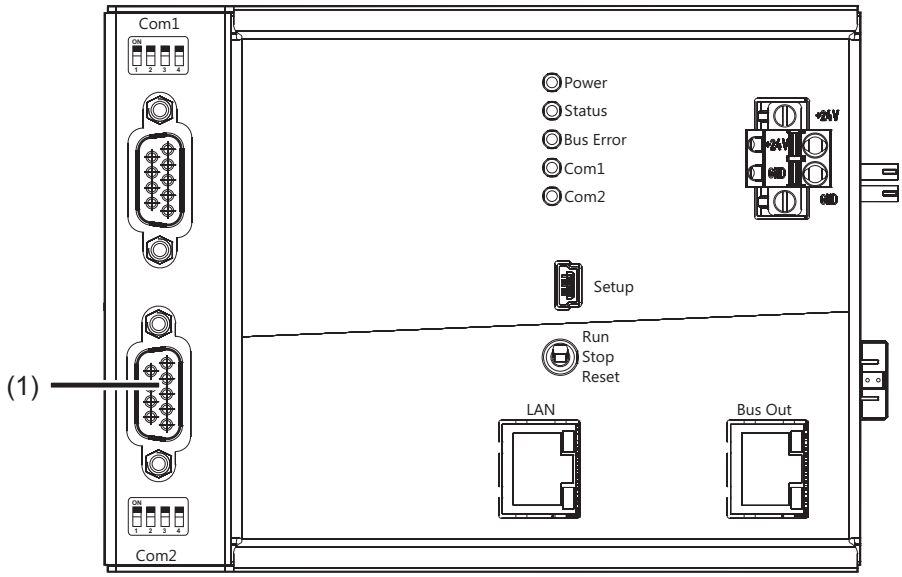


2 PROFIBUS-DP description

NOTE!
PROFIBUS-DP V0 (slave) is supported by the central processing unit (705001) as of system version 02.
The retrofitting of the PROFIBUS-DP interface is possible from the central processing unit's production date 27/2013 (calendar week).

3.1 Position

The PROFIBUS-DP interface can only be used in the COM2 expansion slot.



(1) Interface Com2

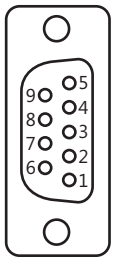
NOTE!
The type designation on the nameplate of the device indicates the optional interfaces that were **factory-assembled**.
The relevant information can be found in the chapter entitled "Identifying device version" in operating manual B 705001.0 or installation instructions B 705001.4 (the installation instructions are included in the scope of delivery of the central processing unit).

NOTE!
Optional interfaces can be **retrofitted** by the user.
Information on this can be found in the chapter "Retrofitting interfaces" in the operating manual B 705001.0 or the installation instructions B 705001.4 (the installation instructions are included in the scope of delivery of the central processing unit).

3 PROFIBUS-DP interface on the device

3.2 Terminal assignment

Pin	Signal	Function
3	RxD/TxD-P	Transmission/received data + (b-wire)
5	DGND	Data reference potential
6	VP (+5 V)	Voltage supply +
8	RxD/TxD-N	Transmission/received data - (a-wire)

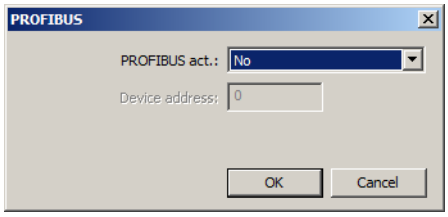


3.3 Terminating resistors

CAUTION!
Only use terminating resistors in the PROFIBUS connector
For bus termination at the central processing unit (705001), the terminating resistors in the PROFIBUS connector must be activated (see section "Wiring and bus termination" in Chapter 2.3 "RS485 transmission technology", page 14).
The internal terminating resistors of the central processing unit must be disabled (slide switch of Com2 in OFF position).

3.4 Configuration

The parameters of the PROFIBUS interface are set in the configuration of the central processing unit (CPU):
CPU > Configuration level > PROFIBUS



Parameters	Value range	Factory setting	Description
PROFIBUS active	No, Yes	No	Activation of the PROFIBUS interface Prerequisite: Interface module is equipped.
Device address	0 to 127	0	PROFIBUS device address

NOTE!
Changing the device address via the bus is not supported by the central processing unit.
The transfer rate is determined automatically (max. 12 Mbit/s).

3.5 Timeframe for data processing

The central processing unit processes interface data cyclically in a timeframe of 125 ms.

3.6 LED indication

The status of the PROFIBUS-DP interface is indicated by the LED "Com2":

- LED off: interface module is not equipped or not activated
- LED is lit green: interface module is equipped, no communication
- LED flashes green: communication is active
- LED flashes red: external communication to the master is disturbed
- LED is lit red: internal error

General information on the LED indication can be found in the operating manual B 705001.0.

3.7 Error messages

Internal and external errors of the PROFIBUS-DP interface are classified as fault and are used to generate the "system fault" signal (collective fault). In addition, the errors are entered in the event list of the central processing unit.

When errors occur, the wiring, device address, and operation of the PROFIBUS master (PLC) must be checked.



CAUTION!
In case of an external fault (e.g. interface cable disconnected), the last received value is retained.
As a result the risk exists that the used value is out of date.
Therefore, it is necessary to evaluate the status of the "fieldbus error" signal. This allows to set outputs to a safe state by the PLC, if applicable.

3 PROFIBUS-DP interface on the device

4.1 GSD file

Device data (GSD) allow open project design.

PROFIBUS-DP devices have different performance features. They differ with respect to the available functionality (e.g. number of I/O signals, diagnostic messages) or the possible bus parameters, such as baud rate (transfer rate) and time monitoring. These parameters vary individually for each device type and manufacturer. To provide simple Plug and Play configuration for PROFIBUS-DP, the characteristic device features are defined in the form of an electronic data sheet, the device database file (ddf = GSD file). The standardized GSD files expand open communication up to the operator level. Simple and user friendly integration of devices from different manufacturers in a bus system is possible by means of the project design tool, which is based on the GSD files. GSD files are produced for the specific application. The defined file format permits the project design system to simply read in the device data of any PROFIBUS-DP device and to automatically use this information for the bus system configuration. As early as in the project design phase, the project design system can automatically perform checks for input errors and the consistency of data entered in relation to the entire system.

The GSD files are subdivided into three sections.

- **General specifications**
  This section contains, among other items, information on manufacturer and device names, hardware and software release versions, and the supported baud rates.
- **DP master-referenced specifications**
  This section is used to enter all parameters related solely to DP master devices, e.g. the maximum number of DP slaves that can be connected, or upload and download options; this section is not available for slave devices.
- **DP slave-referenced specifications**
  This section contains all slave-related information, e.g. the number and type of I/O channels, specifications for diagnostic texts and information on the consistency of I/O data.

The GSD file includes not only lists, such as information on the baud rate supported by the device, but also the possibility of describing the modules available in a modular device.

4.2 General procedure

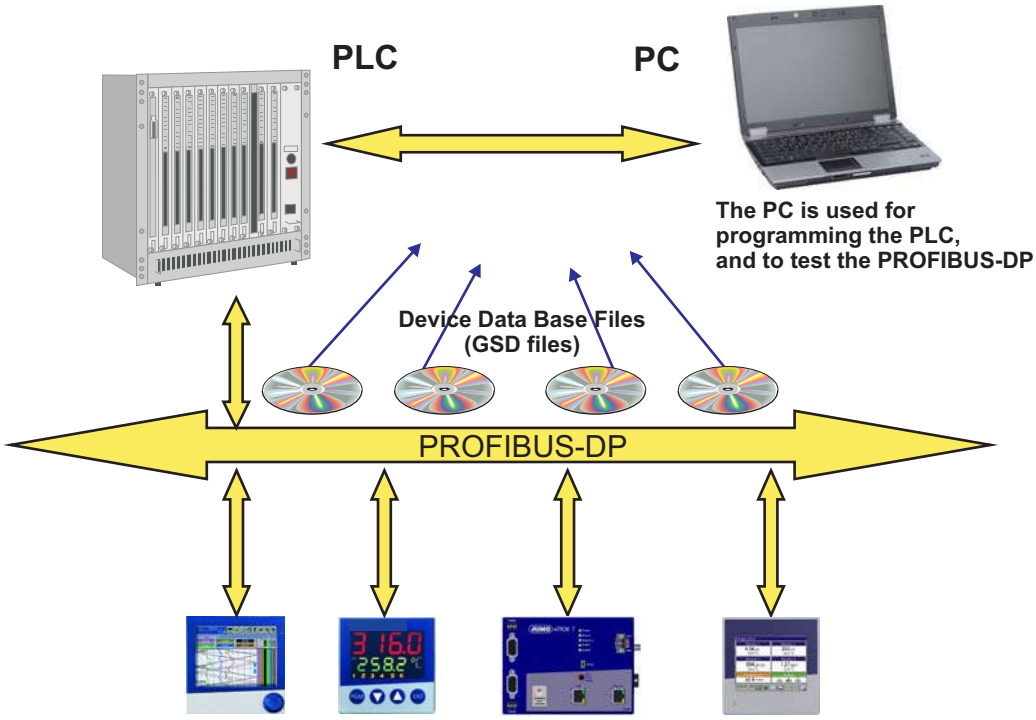
Plug & Play

To simplify configuration of the PROFIBUS-DP system, the DP master (PLC) is configured with the aid of the PROFIBUS-DP configurator and the GSD files, or with the hardware configurator in the PLC.

Sequence of a configuration

Step	Activity
1	Create a GSD file with the aid of the GSD generator or use the GSD file provided by the manufacturer
2	Loading the GSD files of the PROFIBUS-DP slaves into the PROFIBUS-DP network configuration software
3	Carry out configuration
4	Loading the configuration into the system (e.g. PLC)

4 Configuring a PROFIBUS-DP system



The GSD file

The individual device features of a DP slave are specified clearly and comprehensively in a precisely defined format in the GSD file by the manufacturer.

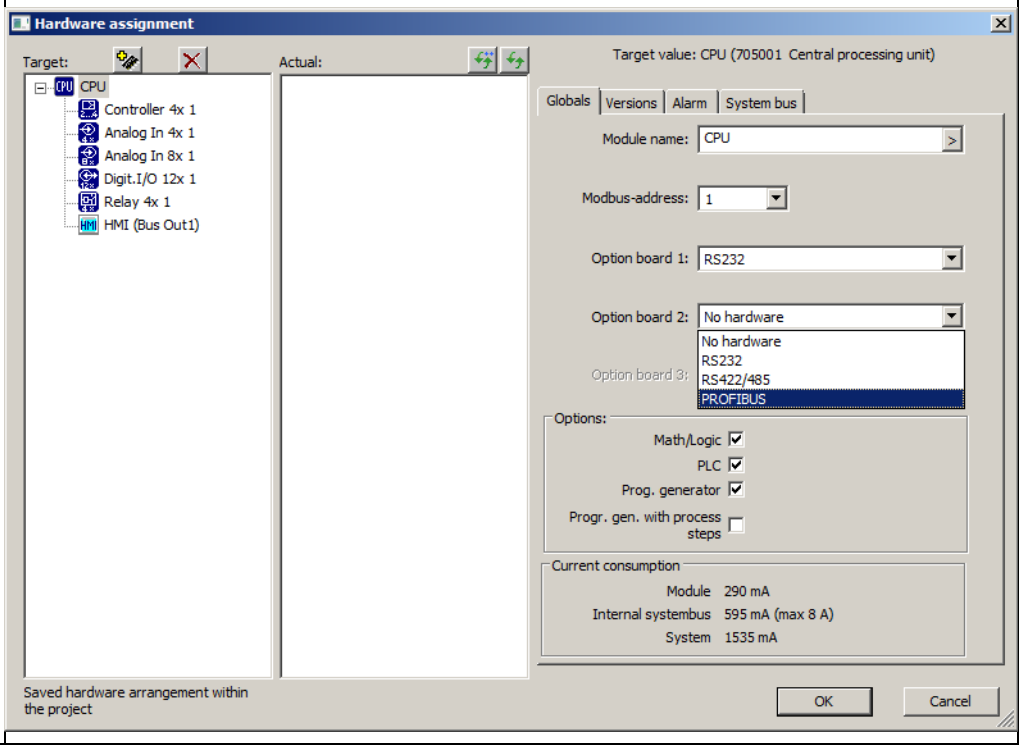
The PROFIBUS-DP configurator / hardware configurator (PLC)

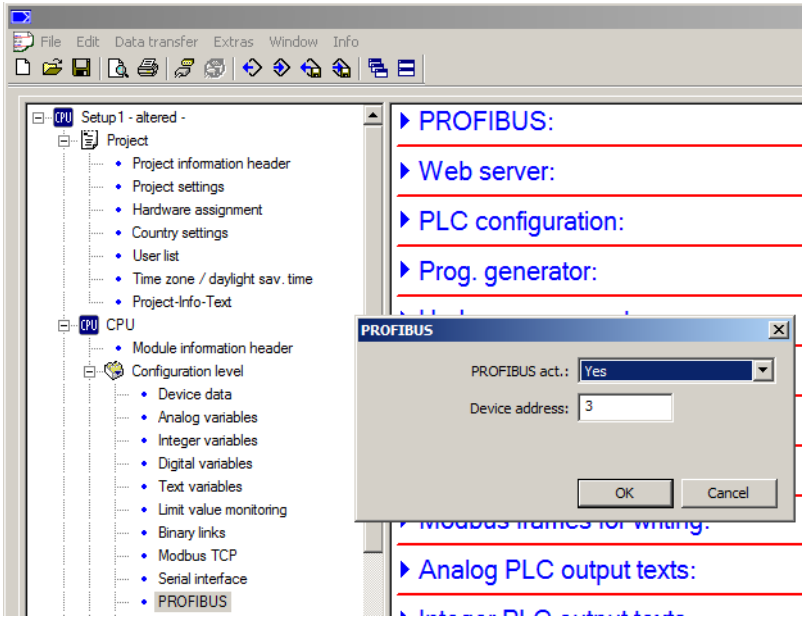
This software can read in the GSD files of PROFIBUS-DP devices of any manufacturer and integrate them for bus system configuration. As early as in the project design phase, the PROFIBUS-DP configurator automatically checks the entered files for system consistency errors. The result of the configuration is read into the DP master (PLC).

4.3 Configuration example

4.3.1 Configure the interface of the central processing unit 705001 (CPU)

NOTE!
PROFIBUS-DP V0 (slave) is supported by the central processing unit as of system version 02.

Step	Activity
1	Connect the central processing unit to the PLC via PROFIBUS (see Chapter 3 "PROFIBUS-DP interface on the device", page 19)
2	Setup program (Project > Hardware assignment): Select the PROFIBUS interface in the hardware assignment (CPU > Option board 2). 

Step	Activity
3	Setup program: activate the PROFIBUS interface in the CPU configuration and assign a device address. 

4.3.2 Provide GSD file

Between the central processing unit (705001) and the PROFIBUS-DP master a maximum of 176 bytes can be transferred. With the GSD file included in the scope of delivery, 21 input and 21 output data are transmitted (length 4 bytes).

The GSD file is designed for installation on the Siemens SIMATIC S7. Customer specific adaptations of the GSD file can be provided upon request by the manufacturer. PLC-side constraints are to be considered.

Step	Activity
1	Copy the GSD file from the MiniDVD to any folder. The MiniDVD is part of the central processing unit's scope of delivery. Alternatively, the GSD file is available for download under www.jumo.de (see JUMO mTRON T, Central processing unit, "Software" section).

NOTE!
If Siemens SIMATIC S7 is used for project design, the name of the GSD file must not be longer than 8 characters.

Structure of GSD file

```
; ============================
; GSD-File Gateway PROFIBUS-DP
; JUMO mTRON T Zentraleinheit
; File-Rev 2.0
; ============================
;
;
#Profibus_DP
GSD_Revision = 2                          ;extended GSD-file is supported
;                                         ;according to PNO directrive of 14.12.95
Vendor_Name = "JUMO GmbH & Co. KG"        ;name of the manufacturer
Model_Name = "JUMO mTRON T Zentraleinheit" ;name of the DP-instrument
Revision = "Ausgabestand 2.0"             ;actual edition of the DP-instrument
Ident_Number = 0x0E81                    ;exact type designation of the DP-instrument
Protocol_Ident = 0                       ;protocol characteristica PROFIBUS-DP
Station_Type = 0                         ;DP-Slave
FMS_supp = 0                             ;DP-instrument only
Hardware_Release = "1.00"                ;actual edition of the hardware
Software_Release = "2.00"                ;actual edition of the software
;                                        ;the following baudrates are supported
9.6_supp = 1                                   ;   9.6  kBaud
19.2_supp = 1                                  ;  19.2  kBaud
;                                              ;  31.25 kBaud (PA)
45.45_supp = 1                                 ;  45.45 kBaud
93.75_supp = 1                                 ;  93.75 kBaud
187.5_supp = 1                                 ; 187.5  kBaud
500_supp = 1                                   ; 500    kBaud
1.5M_supp = 1                                  ;   1.5  MBaud
3M_supp = 1                                    ;   3    MBaud
6M_supp = 1                                    ;   6    MBaud
12M_supp = 1                                   ;  12    MBaud
;
MaxTsdr_9.6 = 60
MaxTsdr_19.2 = 60
;                                              ;  31.25 kBaud (PA)
MaxTsdr_45.45 = 60
MaxTsdr_93.75 = 60
MaxTsdr_187.5 = 60
MaxTsdr_500 = 100
MaxTsdr_1.5M = 150
MaxTsdr_3M = 250
MaxTsdr_6M = 350
MaxTsdr_12M = 800
;
Redundancy = 0                                 ;no redundant transmission
Repeater_Ctrl_Sig = 1                          ;Plug signal  CNTR-P  RS485
24V_Pins = 0                                   ;Plug signals  M24V and P24 V not
connected
Implementation_Type = "SPC3"                   ;Application of ASIC SPC3
;
;
```

```
;                                               ;*** Slave specific values ***
Freeze_Mode_supp = 0                            ;Freeze-mode is not supported
Sync_Mode_supp = 0                              ;Sync-mode is not supported
Auto_Baud_supp = 1                              ;Automatic recognition of baudrate
Set_Slave_Add_supp = 0                          ;Set_Slave_Add is not supported
Min_Slave_Intervall = 6                         ;Slave-Interval  = 0.6 ms
Modular_Station = 1                             ;Modular station
Max_Module = 45
Max_Diag_Data_Len = 6                           ;
Slave_Family = 0                                ;Allgemein
;
;

;                                               ;*** Parameterization ***
;
;This lines are for locating PBC file, and initial data length.
;Do not disturb!!!
;atPBC_File = C:\PROGRAM FILES (X86)\JUMO\GSDGEN\14401XX\D\ju_mTRON_T_Basis.PBC
;atINIT_LEN = 2
;
User_Prm_Data_Len = 172          ; max User_Prm_Data_Len = 180
User_Prm_Data = \
0x00, \                ; fix 0x00
0x03, \                ; definition block-length UPD (for JUMO gsd 0x03 => 4Byte)
0x15, \                ; number of input-definitions  (all in all max 44 definitions)
0x15, \                ; number of output-definitions (all in all max 44 definitions)
0x13, 0x8A, 0x00, 0x04, 0x13, 0x8A, 0x02, 0x04, 0x13, 0x8A, 0x04, 0x04, \; input def.
0x13, 0x8A, 0x06, 0x04, 0x13, 0x8A, 0x08, 0x04, 0x13, 0x8A, 0x0A, 0x04, \
0x13, 0x8A, 0x0C, 0x04, 0x13, 0x8A, 0x0E, 0x04, 0x13, 0x8A, 0x10, 0x04, \
0x13, 0x8A, 0x12, 0x04, 0x13, 0x8A, 0x14, 0x04, 0x13, 0x8A, 0x16, 0x04, \
0x13, 0x8A, 0x18, 0x04, 0x13, 0x8A, 0x1A, 0x04, 0x13, 0x8A, 0x1C, 0x04, \
0x13, 0x8A, 0x1E, 0x04, 0x13, 0x8A, 0x20, 0x04, 0x13, 0x8A, 0x22, 0x04, \
0x13, 0x8A, 0x24, 0x04, 0x13, 0x8A, 0x26, 0x04, 0x13, 0x8A, 0x28, 0x04, \
0x23, 0x82, 0x00, 0x04, 0x23, 0x82, 0x02, 0x04, 0x23, 0x82, 0x04, 0x04, \; output def.
0x23, 0x82, 0x06, 0x04, 0x23, 0x82, 0x08, 0x04, 0x23, 0x82, 0x0A, 0x04, \
0x23, 0x82, 0x0C, 0x04, 0x23, 0x82, 0x0E, 0x04, 0x23, 0x82, 0x10, 0x04, \
0x23, 0x82, 0x12, 0x04, 0x23, 0x82, 0x14, 0x04, 0x23, 0x82, 0x16, 0x04, \
0x23, 0x82, 0x18, 0x04, 0x23, 0x82, 0x1A, 0x04, 0x23, 0x82, 0x1C, 0x04, \
0x23, 0x82, 0x1E, 0x04, 0x23, 0x82, 0x20, 0x04, 0x23, 0x82, 0x22, 0x04, \
0x23, 0x82, 0x24, 0x04, 0x23, 0x82, 0x26, 0x04, 0x23, 0x82, 0x28, 0x04


Max_Input_Len = 85                          ; Summe In/Out max 176
Max_Output_Len = 84                         ; Summe In/Out max 176
Max_Data_Len = 177
```

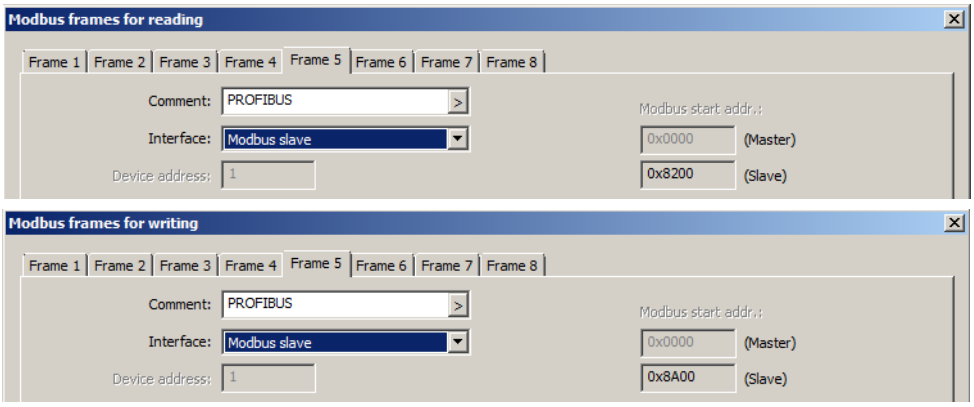
```
;=================== Input Master ======================================
Module = "Interface Mode" 0x10
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A00-4-Byte-Wert0" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A02-4-Byte-Wert1" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A04-4-Byte-Wert2" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A06-4-Byte-Wert3" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A08-4-Byte-Wert4" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A0A-4-Byte-Wert5" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A0C-4-Byte-Wert6" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A0E-4-Byte-Wert7" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A10-4-Byte-Wert8" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A12-4-Byte-Wert9" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A14-4-Byte-Wert10" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A16-4-Byte-Wert11" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A18-4-Byte-Wert12" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A1A-4-Byte-Wert13" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A1C-4-Byte-Wert14" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A1E-4-Byte-Wert15" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A20-4-Byte-Wert16" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A22-4-Byte-Wert17" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A24-4-Byte-Wert18" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A26-4-Byte-Wert19" 0x13
Preset = 1
Endmodule
Module = "Fr5-Wr/Adr0x8A28-4-Byte-Wert20" 0x13
Preset = 1
Endmodule
```

```
;==================== Output Master ======================================
Module = "Fr5-Rd/Adr0x8200-4-Byte-Wert0" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8202-4-Byte-Wert1" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8204-4-Byte-Wert2" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8206-4-Byte-Wert3" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8208-4-Byte-Wert4" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x820A-4-Byte-Wert5" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x820C-4-Byte-Wert6" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x820E-4-Byte-Wert7" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8210-4-Byte-Wert8" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8212-4-Byte-Wert9" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8214-4-Byte-Wert10" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8216-4-Byte-Wert11" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8218-4-Byte-Wert12" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x821A-4-Byte-Wert13" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x821C-4-Byte-Wert14" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x821E-4-Byte-Wert15" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8220-4-Byte-Wert16" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8222-4-Byte-Wert17" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8224-4-Byte-Wert18" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8226-4-Byte-Wert19" 0x23
Preset = 1
Endmodule
Module = "Fr5-Rd/Adr0x8228-4-Byte-Wert20" 0x23
Preset = 1
Endmodule
```

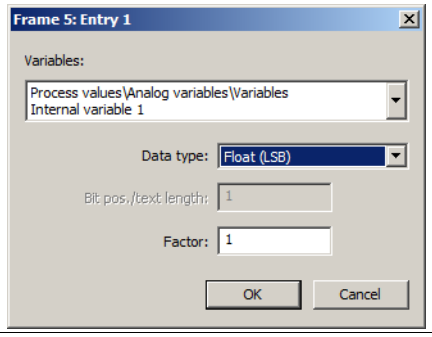
4.3.3 Configure the Modbus frames of the central processing unit 705001 (CPU)

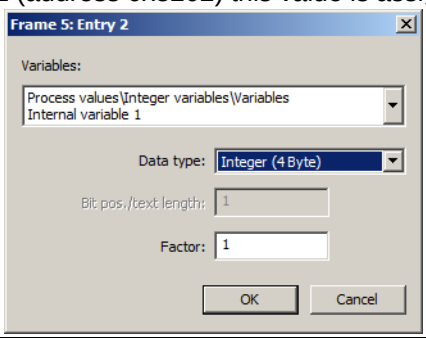
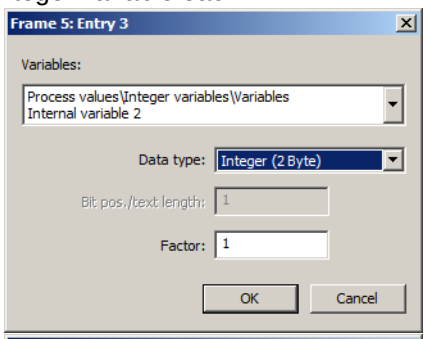
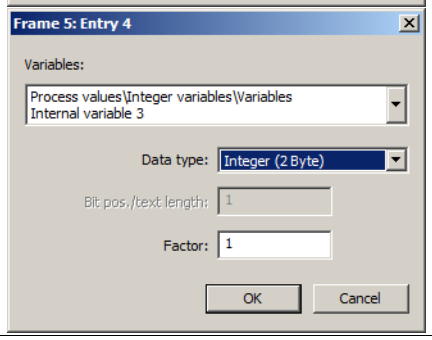
With the GSD file included in the scope of delivery, 21 input and 21 output data of the master are transmitted (length 4 bytes). Multiple values of different lengths and different data types can be included in each 4 bytes.

The input and output data of the GSD file are assigned to the modules of the system using the Modbus frames. For this purpose each frame 5 is provided, which is to be configured as a Modbus slave.

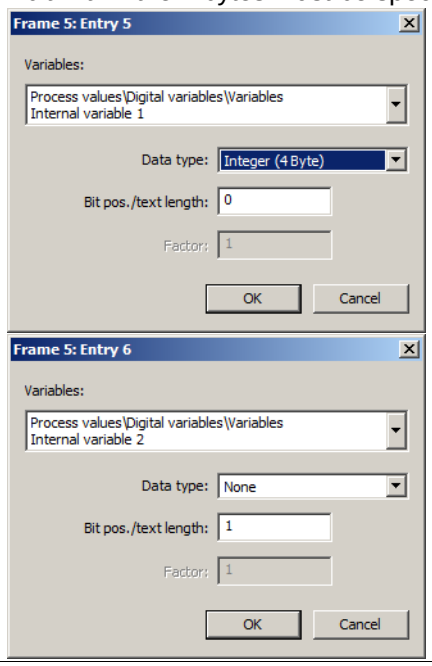


As a target of the output data, the variables of the central processing unit are available. These can be assigned to other Modules via the NV connection list. Source of the input data are all process values of the central processing unit and the connected modules.

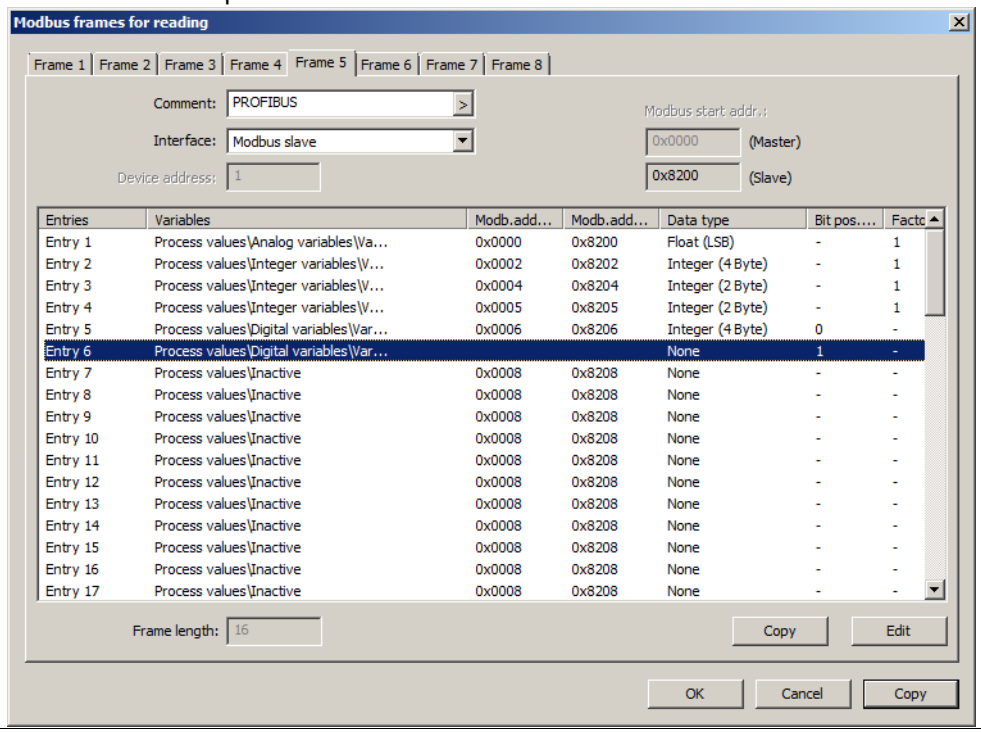
Step	Action
1	Setup program (CPU > Setup only): **Configure Modbus frame 5 for reading** (read-in the output data of the PROFIBUS-DP master to the central processing unit). The entries in the frame must be configured sequentially (starting with entry 1, address 0x8200).
	Example 1: a float value (length 4 bytes, least significant bit first) is transferred within the first 4 bytes (value 0) of the GSD file. In entry 1 (address 0x8200) this value is assigned to an analog variable. 

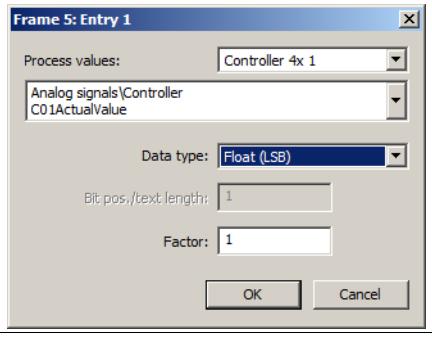
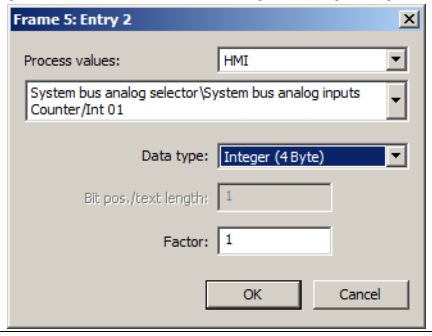
Step	Action
1 (continued)	Example 2: an integer value (length 4 bytes) is transferred within the second 4 bytes (value 1) of the GSD file. In entry 2 (address 0x8202) this value is assigned to an integer variable. 
	Example 3: two integer values (length 2 bytes each) are transferred within the third 4 bytes (value 2) of the GSD file. In entry 3 (address 0x8204) and entry 4 (address 0x8205) these values are assigned to an integer variable each.  

Step	Action
1 (continued)	Example 4: several digital values (length 1 byte each) are transferred within the fourth 4 bytes (value 3) of the GSD file. In entry 5 (address 0x8206) and the subsequent entries these values are assigned to a digital variable each. In entry 5 the data type "Integer (4 Byte)" is selected; in the subsequent entries the data type "None" is selected. In every entry the bit position of each bit within the 4 bytes must be specified (starting with 0).

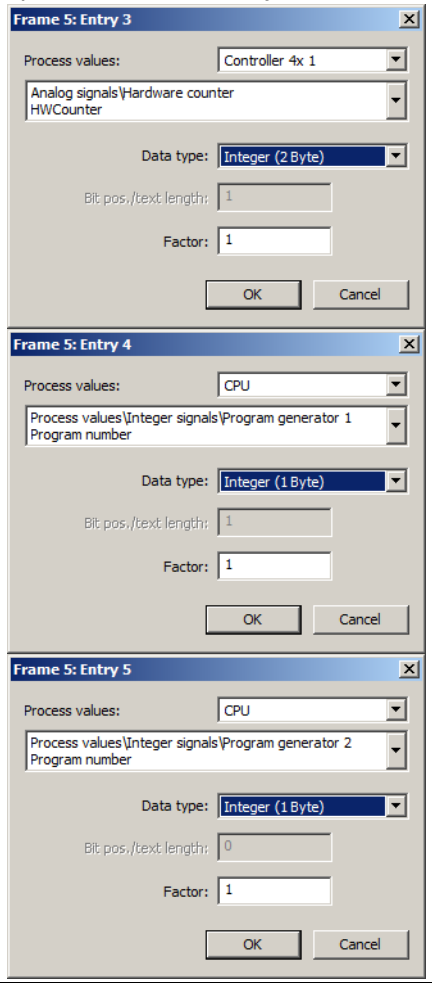


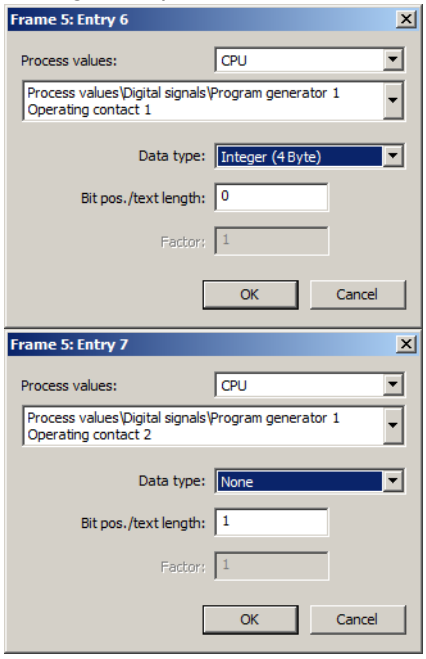
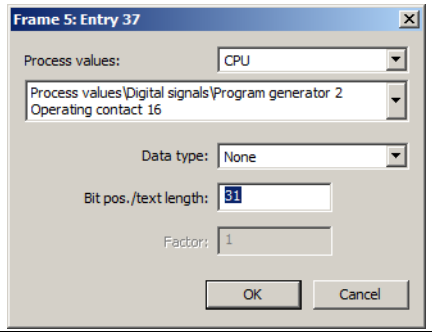
The result of the examples mentioned above:



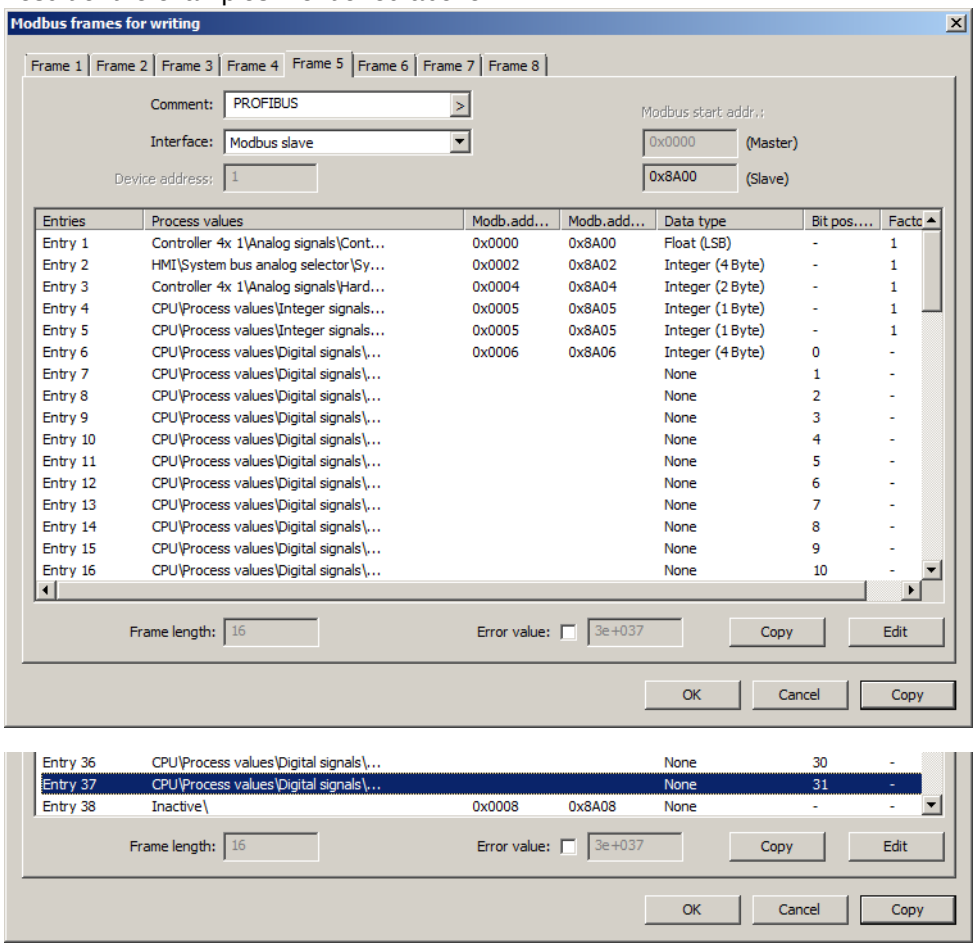
Step	Action
2	Setup program (CPU > Setup only): **Configure Modbus frame 5 for writing** (write the output data of the central processing unit to the PROFIBUS-DP master). The entries in the frame must be configured sequentially (starting with entry 1, address 0x8A00).
	Example 1: a float value (length 4 bytes, least significant bit first) shall be transferred within the first 4 bytes (value 0) of the GSD file. For this purpose, in entry 1 (address 0x8A00) the actual value of controller channel 1 (C01ActualValue) of the multichannel controller module (controller 4x) is selected. 
	Example 2: an integer value (length 4 bytes) shall be transferred within the second 4 bytes (value 1) of the GSD file. For this purpose, in entry 2 (address 0x8A02) the counter reading of counter 1 (Counter/Int 01) of the multifunction panel (HMI) is selected. 

Step	Action
2 (continued)	Example 3: three integer values – one value with a length of 2 bytes and two values with 1 byte each – shall be transferred within the third 4 bytes (value 2) of the GSD file. In entry 3 (address 0x8A04) the counter reading of the HW counter (HWCounter) of the multichannel controller module is selected as 2-byte value. In entry 4 (address 0x8A05) and entry 5 (same address 0x8A05) the program numbers of the program generators 1 and 2 (of the central processing unit, CPU) are selected as 1-byte values.



Step	Action
2 (continued)	Example 4: several digital values (length 1 byte each) shall be transferred within the fourth 4 bytes (value 3) of the GSD file. For this purpose, in entry 6 (address 0x8A06) and in the subsequent entries a digital signal is selected each (here: control contacts of the program generators). In entry 6 the data type "Integer (4 Byte)" is selected; in the subsequent entries the data type "None" is selected. In every entry the bit position of each bit within the 4 bytes must be specified (starting with 0).  All 32 control contacts of program generators 1 and 2 can be transferred within the 4 bytes. With the last entry – in this example – control contact 16 of program generator 2 is transferred in bit position 31. 

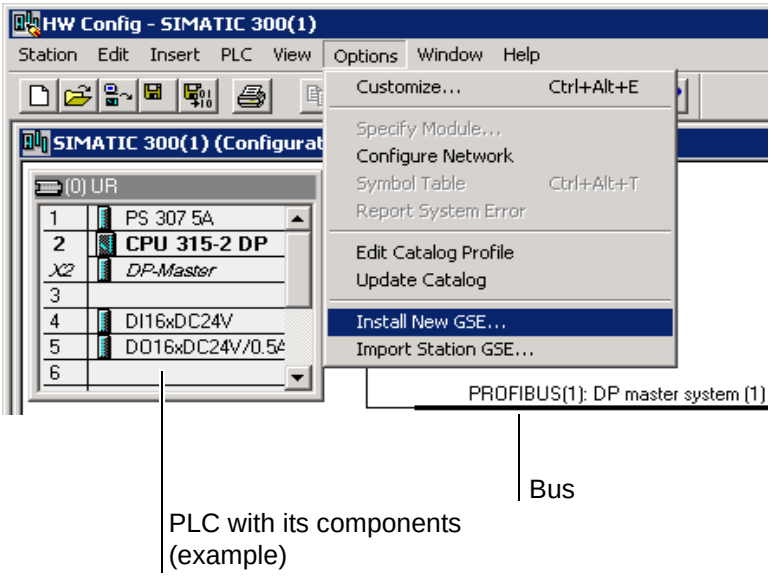
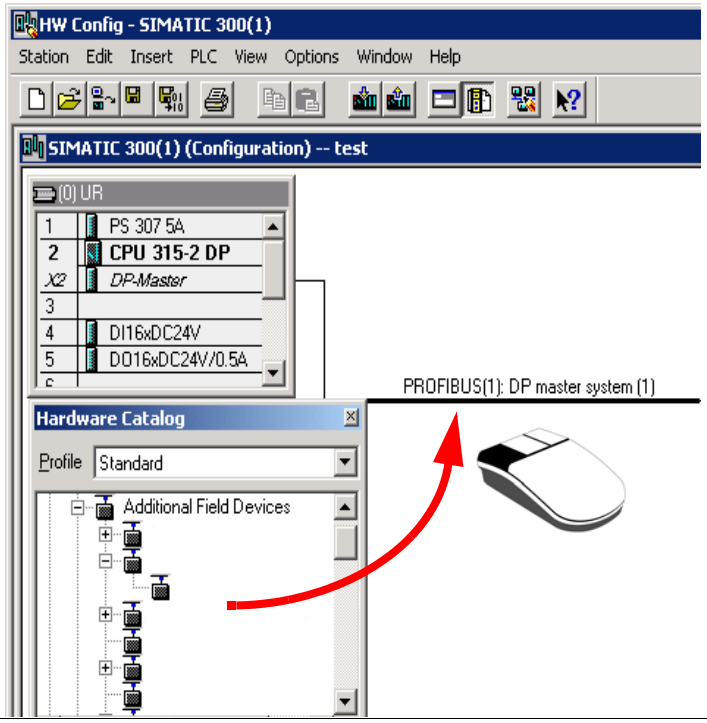
Step	Action
2 (continued)	The result of the examples mentioned above:

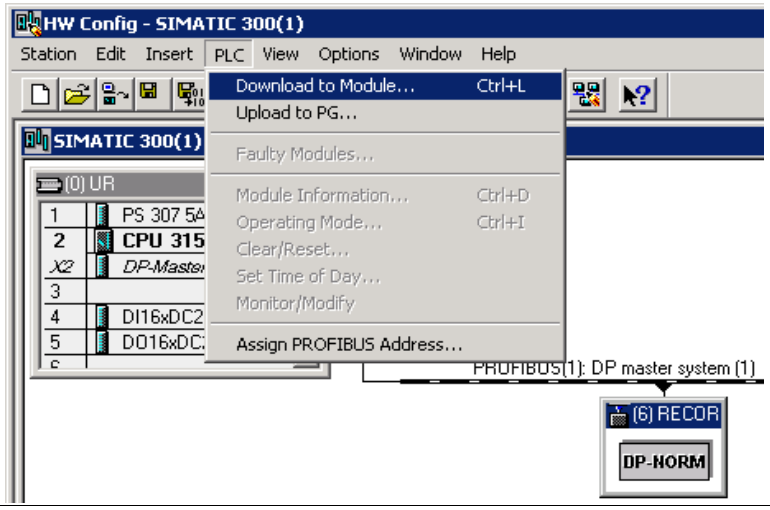


CAUTION!
The use of frame 5 for Modbus and PROFIBUS at the same time is not inhibited by the system.
Variables may be accidentally overwritten.
For simultaneous operation of Modbus and PROFIBUS frame 5 is not allowed to be used for Modbus.

NOTE!
For more information on configuring the Modbus frames refer to the Interface description Modbus (B 705001.2.0).

4.3.4 PLC configuration

Step	Action
1	Start the PLC software
2	Open the hardware configuration and execute the menu command "Install new GSD".  Select the GSD file in the respective folder. The GSD file will be read in and processed. The new device is inserted into the hardware catalog.
3	Open the hardware catalog and place the new device "JUMO mTRON T Central processing unit" in the working area. 
4	Use the symbol editor to assign symbolic names to the process values (if necessary).

Step	Action
5	Load the configuration into the PLC (*Target system / Load into module*). 
6	Test the communication in the master (PLC). In the variables table the input data of the master can be checked and the output data can be controlled.
7	Test the communication in the slave (central processing unit). In the setup program ("online data" window) the input data of the slave (CPU variables) can be checked.

CAUTION!
Error evaluation required
If a device with PROFIBUS-DP interface is operated on a master system (PLC), suitable error analysis routines should be provided in the master system.
In conjunction with a Siemens SIMATIC S7, installation of the OB86 in the PLC is recommended so that failure of a PROFIBUS-DP device can be detected and analyzed.

NOTE!
The "Interface status" parameter automatically appears in the input window and cannot be deleted.

4.4 Error codes for measured values in float format

For measured values in the float format, the error number appears directly in the value, i.e. it contains the error number instead of the measured value.

Error code with float values	**Errors**
1.0×10^{37}	Underrange
2.0×10^{37}	Overrange
3.0×10^{37}	No valid input value
4.0×10^{37}	Division by zero
5.0×10^{37}	Math error
6.0×10^{37}	Invalid terminal temperature of thermocouple
7.0×10^{37}	Invalid float value
8.0×10^{37}	Integrator or statistics destroyed

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