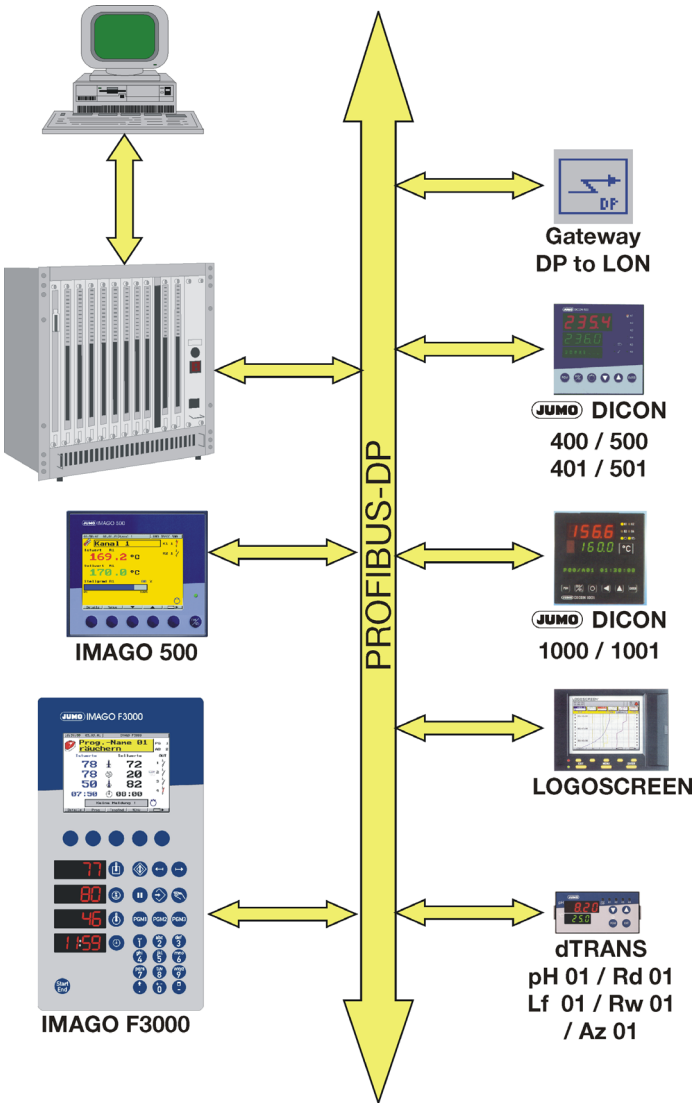


PROFIBUS-DP

B 70.3560.2.3

Interface Description

04.05/00381142

Contents

Contents

1.1 Preface

Please read this Interface Description before starting up the instrument. Keep the manual in a place which is accessible to all users at all times.

You comments will help us improve this interface description, where necessary.

Phone +49 6616003-0
Fax +49 6616003-607
e-mail mail@jumo.net

All necessary settings are described in this manual. If any difficulties should arise during commissioning, you are asked not to carry out any manipulations that could endanger your rights under the instrument warranty!

Please contact the nearest subsidiary or the head office in such a case.

When returning chassis, modules or components, the regulations of EN 100 015 “Protection of electrostatically sensitive components” must be observed. Use only the appropriate **ESD** packaging for transport.

Please note that we cannot accept any liability for damage caused by ESD (electrostatic discharge).

1.2 Typographical conventions

1.2.1 Warnings

The signs for **Danger** and **Caution** are used in this manual under the following conditions:

Danger

This symbol is used where there may be **danger to personnel** if the instructions are disregarded or not followed accurately!

Caution

This symbol is used where there may be **damage to equipment or data** if the instructions are disregarded or not followed accurately!

Caution

This symbol is used if precautions must be taken when handling **electrostatically sensitive components**.

1.2.2 Note signs

Note

This symbol is used to draw your **special attention** to a remark.

Reference

This symbol refers to **additional information** in other manuals, chapters or sections.

abc[1]

Footnote

Footnotes are comments that **refer to specific parts** of the text. Footnotes consist of two parts:

1) The marking in the text, arranged as continuous superscript numbers.

2) The footnote text, at the bottom of the page, in a smaller typeface than the main text, and preceded by a number and a stop.

Handling instructions

*

This symbol marks the description of **a required action**.

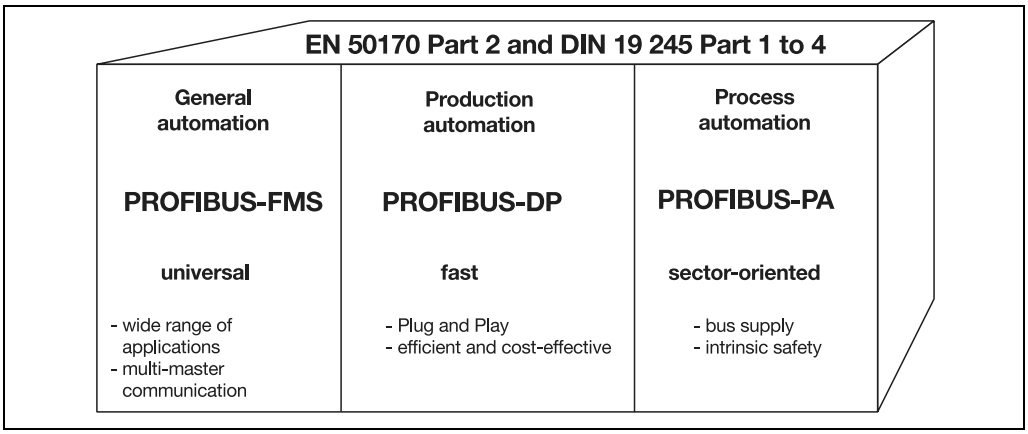
The individual steps are indicated by an asterisk, e.g.

* Start the PLC software

* Click on Hardware catalog

PROFIBUS 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 standard EN 50 170.
Using PROFIBUS, devices from different manufacturers can communicate without any special interface adjustments. PROFIBUS can be employed for both high-speed time-critical data transmission and extensive, complex communications tasks. The PROFIBUS family consists of three versions.

2.1 Profibus types



The PROFIBUS family

PROFIBUS-DP This PROFIBUS version, which is optimized for high speed and low connection costs, has been especially designed for communication between automation control systems (PLC) and distributed field devices (typical access time < 10 msec). PROFIBUS-DP can be used to replace conventional, parallel signal transmission with 24 V or 0/4 — 20 mA.

DPV0: cyclic data transfer:
--> is supported by all JUMO devices.

DPV1: cyclic and acyclic data transfer:
--> is not supported by JUMO devices.

DPV2: slave-to-slave communication takes place in addition to cyclic and acyclic data transfer:
--> is not supported by JUMO devices.

PROFIBUS-PA PROFIBUS-PA has been specifically designed for process engineering. It permits the linking of sensors and actuators to a common bus cable, even in hazardous areas. PROFIBUS-PA enables data communication and energy supply for devices in two-wire technology according to the international IEC 1158-2 standard.

PROFIBUS-FMS This is the universal solution for communication tasks at cell level (typical access time: approx. 100 msec). 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 description

2.2 RS485 transmission technology

Transmission takes place according to the RS485 standard. It covers all areas in which high transmission speed and simple, cost-effective installation are 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 the other stations. Later expansions have no influence on the stations which are already in operation.

Transmission speeds between 9.6 kbit/sec and 12 Mbit/sec are available. One uniform transmission speed is selected for all devices on the bus when the system is commissioned.

Network topology	linear bus, active bus termination at both ends, stub cables are only permissible for baud rates <1.5 Mbit/sec.
Medium	shielded twisted-pair cable
Number of stations	32 stations in each segment without repeater (line amplifier). With repeaters, this can be expanded to 126.
Connector	preferably 9-pin sub-D connector

Basic features of the RS485 transmission technology

Installation tips

All devices are connected in a bus structure (line). Up to 32 stations (master or slaves) can be linked up in one segment.
The bus is terminated by an active bus terminator at the start and end of each segment. Both bus terminators must always be powered, to ensure fault-free operation.
If there are more than 32 stations, repeaters must be used to link up the individual bus segments.

Cable length

The maximum cable length depends on the transmission speed. The cable length specified can be extended by using repeaters. It is recommended not to connect more than 3 repeaters in series.

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

Range based on transmission speed

Cable data

These cable length specifications refer to the cable type described below:

Characteristic impedance: 135 — 165 Ω
Capacitance per unit length: < 30 pf/m
Loop resistance: 110 Ω/km
Core dia.: 0.64 mm
Core cross-section: > 0.34 mm²

It is preferable to use a 9-pin sub-D 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 supplied by several manufacturers. Please refer to the PROFIBUS product catalog (www.profibus.com) for types and addresses of suppliers.

When connecting up the devices, make sure that the data lines are not reversed. It is absolutely essential to used shielded data lines. The braided shield and the screen foil underneath (if present) should be connected to the protective earth on both sides, and with good conductivity. Furthermore, the data lines should be routed separately from all high-voltage cables, as far as this is possible.

As a suitable cable we recommend the following type from Siemens:

Simatic Net Profibus 6XV1
Order No. 830-0AH10
*** (UL) CMX 75 °C (Shielded) AWG 22 ***

2 Profibus description

Data rate

For installation, the use of stub cables must be avoided for data rates above 1.5 Mbit/sec.

☞ For important tips on installation, please refer to the Installation Guidelines PROFIBUS-DP, Order No. 2.111 by the PNO (Profibus User Organization).

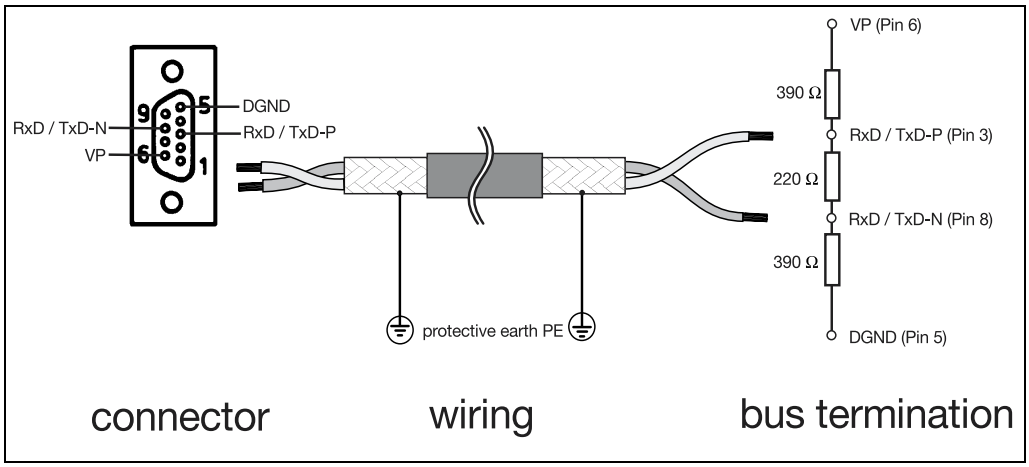
Address:
Profibus Nutzerorganisation e.V.
Haid- u. Neu-Straße 7
D-76131 Karlsruhe, Germany

Internet: www.profibus.com

Recommendation:

Please follow the installation recommendations made by the PNO, especially for the simultaneous use of frequency inverters.

Wiring and bus termination



2.3 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. The communication functions required for this are defined by the basic PROFIBUS-DP functions in accordance with EN 50 170.

Basic functions

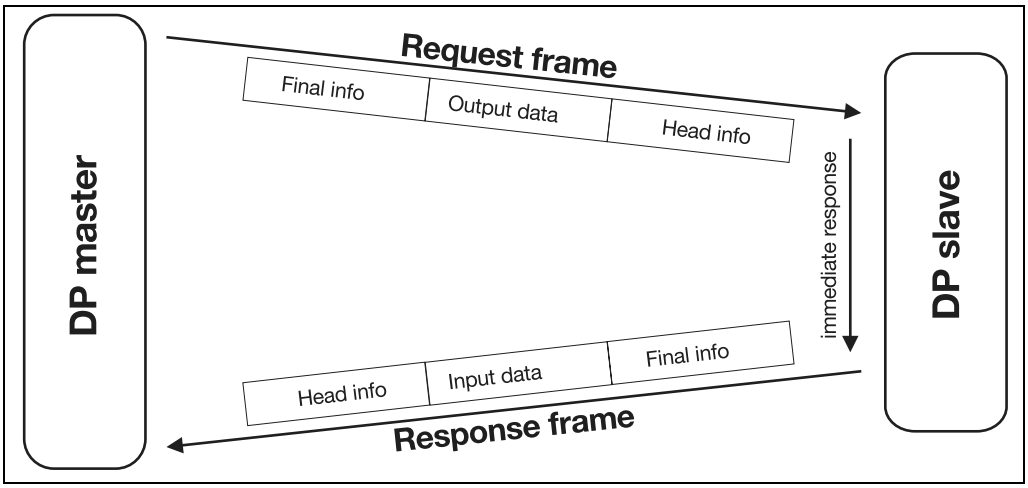
The central controller (master) reads the input information cyclically from the slaves and writes the output information cyclically to the slaves. The bus cycle time must be shorter than the program cycle time of the central PLC. In addition to cyclic user data transmission, PROFIBUS-DP provides powerful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

Transmission technology: • RS485 twisted pair • Baud rates of 9.6 kbit/sec up to 12 Mbit/sec
Bus access: • Master and slave devices, max. 126 users 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 secure state • Stop: Only master-master data transfer is possible
Synchronization: • Sync mode: not supported by JUMO instruments • Freeze mode: not supported by JUMO instruments
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 • Configuration of the DP master via the bus • maximum of 246 bytes input/output data for each DP slave
Protective functions: • Address monitoring for the DP slaves • Access protection for inputs/outputs of the DP slaves • Monitoring of user data communication with adjustable monitoring timer in the master
Device types: • DP master Class 2, e. g. programming/project design devices • DP master Class 1, e. g. central automation devices such as 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 carried out by the master in a defined, recurring order. When configuring the bus system, the user defines the assignment of a DP slave to the master. It is also defined which DP slaves are to be included in, or excluded from, the cyclic user data communication.

Data transmission between the master and the DP slaves is divided into three phases: parameterization, configuration and data transfer. Before a DP slave enters the data transfer phase, the DP master checks in the parameterization and configuration phase whether the planned 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 agree. These checks provide the user with reliable protection against parameterization errors. In addition to the user data transfer, which is performed automatically 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

3.1 GSD files

Device base data (GSD) enable open project design.

PROFIBUS devices have different features. They differ with respect to the available functionality (e. g. number of I/O signals, diagnostic messages) or possible bus parameters, such as baud rate and time monitoring. These parameters vary individually for each device type and manufacturer. In order to obtain simple Plug & Play configuration for PROFIBUS-DP, the characteristic device features are defined in an electronic data sheet (Device Data Base File, GSD file). The standardized GSD files expand open communication up to the operator level. By means of the project design tool, which is based on the GSD files, devices from different manufacturers can be integrated into a bus system, simply and user-friendly. The GSD files provide a clear and comprehensive description of a device type in a precisely defined format. GSD files are prepared according to the application. The defined data format permits the project design system to simply read in the GSD files of any PROFIBUS-DP device and automatically use this information when configuring the bus system. Already during 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 divided into three sections.

- **General specifications**
  This section contains information on manufacturer and device names, hardware and software release states and the baud rates supported.
- **DP master-related specifications**
  This section contains all the parameters related to DP master devices only, such as 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-related specifications**
  This section contains all slave-related specifications, such as the number and type of I/O channels, specifications of diagnostic texts and information on the consistency of I/O data.

The GSD format is designed for flexibility. It contains lists, such as the baud rates supported by the device, as well as the possibility of describing the modules available in a modular device.

3 Configuring a PROFIBUS system

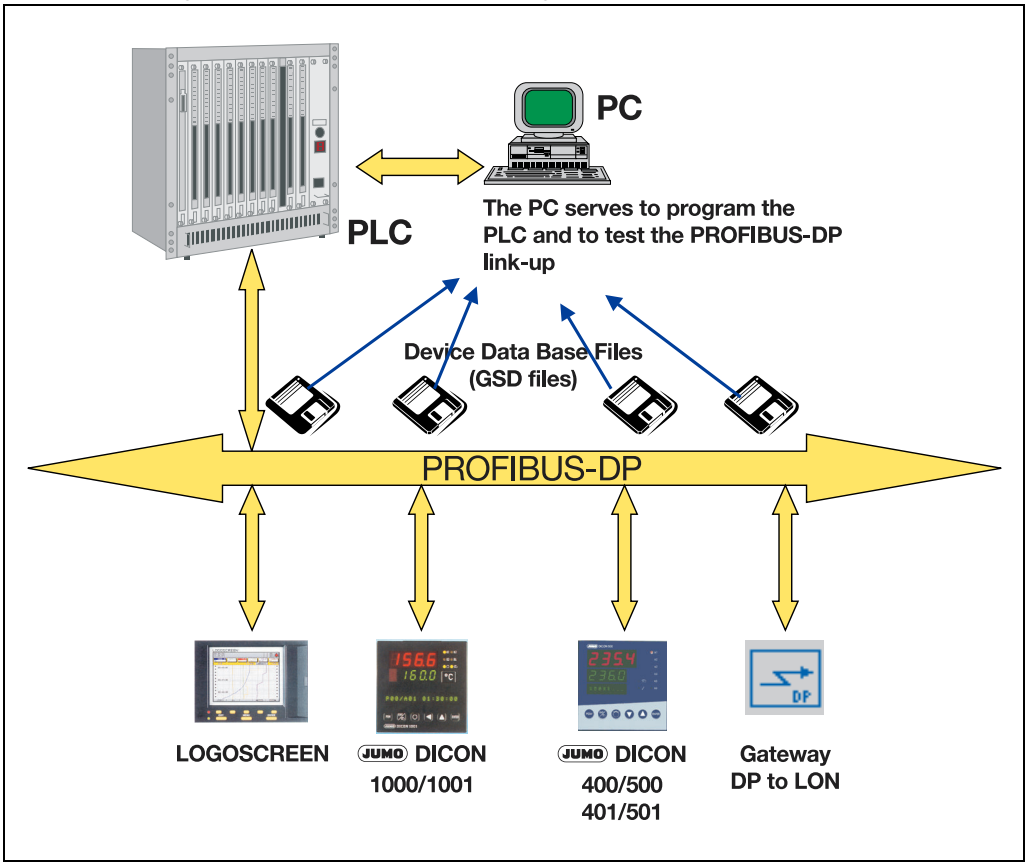
3.2 Configuration procedure

Plug & Play

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

Configuration steps:

- Create GSD file by using the GSD generator
- Load GSD files of the PROFIBUS-DP slaves into the PROFIBUS-DP network configuration software
- Perform configuration
- Load configuration into the system (e.g. PLC)



The GSD file

The characteristic device features of a DP slave are specified by the manufacturer, clearly and comprehensively in a precisely defined format, in the GSD file (Device Data Base File).

The PROFIBUS configurator / hardware configurator (PLC)

This software can read in the GSD files for PROFIBUS-DP devices of any manufacturer and integrate them for the configuration of the bus system.

Already in the project design phase, the PROFIBUS configurator automatically checks the files that have been entered for errors in system consistency.

The result of the configuration is read into the DP master (PLC).

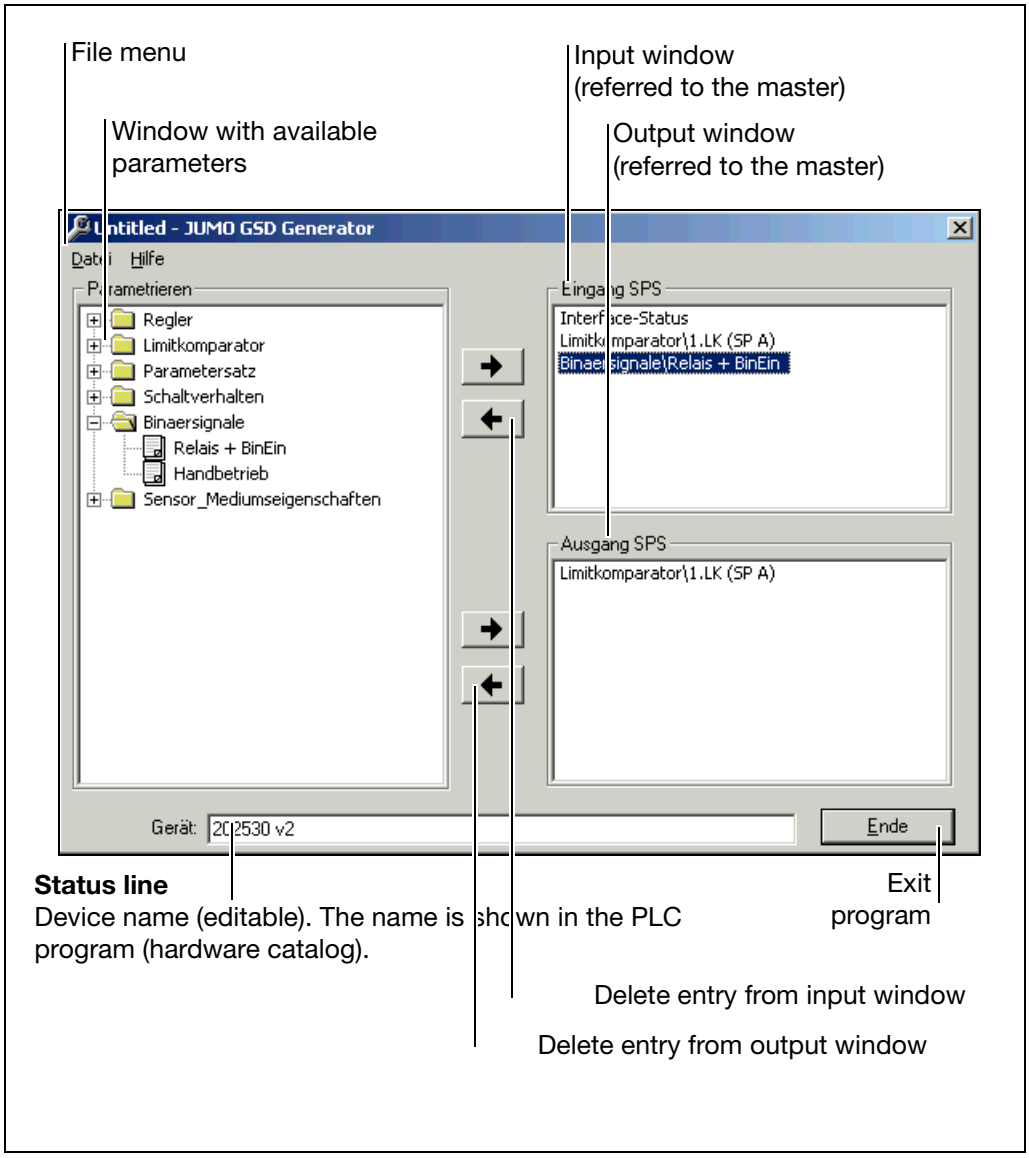
3.3 The GSD generator

3.3.1 General

GSD files for JUMO instruments with a PROFIBUS interface are generated by the user with the aid of the GSD generator.
The devices with a PROFIBUS interface that are available from JUMO can send or receive a large variety of variables (parameters). Since, however, in most applications, only a portion of these variables will be sent via PROFIBUS, the GSD generator makes a selection of these variables.

After selection of the device, all available variables are shown in the “Parameters” window. Only after these have been copied to the “Input” or “Output” window will they later be contained in the GSD file for processing or preprocessing by the DP master (PLC).

3.3.2 Operation



File menu

The file menu can be called up by using the Alt-D combination or the left mouse button. It provides the following options:

New	After calling up the function which creates a new GSD file, the available devices are selected. After selection of the required device, all available parameters are shown in the parameter window.
Open	This function opens an existing GSD file.
Save/ Save as	This function is available for saving the generated or altered GSD file.
Diagnosis	Using this function, the GSD file can be tested in conjunction with a PROFIBUS-DP adapter from B+W.
Print preview	shows the preview of a report[1] that can be printed.
Print	prints a report[1].
Standard settings	The language to be used at the next restart of the program can be selected here.
Exit	exits the program.

1. The report contains additional information for the PLC programmer (e.g. data type of the selected parameters).

⇨ Chapter 3.3.3 “Example report”

3.3.3 Example report

I/O report

Device: JUMO DICON 400/401/500/501

Length of inputs (byte): 33
Length of outputs (byte): 8

Inputs

Byte	Description	Type
[0]	Interface status	BYTE
[1]	Controller\process value	REAL
[5]	Controller\setpoint	REAL
[9]	Controller\control deviation	REAL
[13]	Controller\output indication	REAL
[17]	Analog inputs\measurement 1	REAL
[21]	Analog inputs\measurement2	REAL
[25]	Parameter set1\XP1	REAL
[29]	binary signals\binary inputs 0x100E	INTEGER
[31]	Binary signals\limit comparators 0x1016	INTEGER

Outputs

Byte	Description	Type
[0]	Setpoints\Setpoint RAM	REAL
[4]	Parameter set1\XP1	REAL

MODBUS address of parameter
You will find additional information in the MODBUS address table that is included on the installation CD or in the interface description.

3.3.4 Arrangement of a GSD file

```
; ============================
; GSD-File Gateway PROFIBUS-DP
; JUMO IMAGO 500
; Release 22.07.2002
; ============================
;
;
#Profibus_DP
GSD_Revision = 2                        ;extended GSD-file is supported
;                                       ;according to PNO directive of 14.12.95
Vendor_Name = "MK Juchheim"             ;name of the manufacturer
Model_Name = "IMAGO Neu"                ;name of the DP-instrument
Revision = "Ausgabestand 2.0"           ;actual edition of the DP-instrument
Ident_Number = 0x0629                   ;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 baud rates 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  TTl-level
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 baud rate
Set_Slave_Add_supp = 1                  ;Set_Slave_Add is supported
Min_Slave_Intervall = 6                 ;Slave-Interval  = 0.6 ms
Modular_Station = 1                     ;Modular station
Max_Module = 13
Max_Diag_Data_Len = 6                   ;
Slave_Family = 5                        ;
```

```
;                                   ;*** Parameterization ***
;
;This lines are for locating PBC file, and initial data length.
;Do not disturb!!!
;@PBC_File = C:\PROGRAMME\JUMO\GSDGEN\14401XX\D\ju_i500.PBC
;@INIT_LEN = 2
;
User_Prm_Data_Len = 52
User_Prm_Data = 0x00, 0x03, 0x08, 0x04, 0x13, 0x00, 0xCA, 0x04, 0x13, 0x00, \
0xCE, 0x04, 0x13, 0x00, 0xDE, 0x04, 0x13, 0x00, 0xE2, 0x04, 0x13, \
0x00, 0xF2, 0x04, 0x13, 0x00, 0xF6, 0x04, 0x13, 0x01, 0x06, 0x04, \
0x13, 0x01, 0x0A, 0x04, 0x23, 0x00, 0xCE, 0x04, 0x23, 0x00, 0xE2, \
0x04, 0x23, 0x00, 0xF6, 0x04, 0x23, 0x01, 0x0A, 0x04
Max_Input_Len = 33
Max_Output_Len = 16
Max_Data_Len = 49
;==================== Input Master ========================================
Module = "Interface Mode" 0x10
Preset = 1
Endmodule
Module = "Regler/Regler1/Istwert" 0x13
Preset = 1
Endmodule
Module = "Regler/Regler1/Sollwert" 0x13
Preset = 1
Endmodule
Module = "Regler/Regler2/Istwert" 0x13
Preset = 1
Endmodule
Module = "Regler/Regler2/Sollwert" 0x13
Preset = 1
Endmodule
Module = "Regler/Regler3/Istwert" 0x13
Preset = 1
Endmodule
Module = "Regler/Regler3/Sollwert" 0x13
Preset = 1
Endmodule
Module = "Regler/Regler4/Istwert" 0x13
Preset = 1
Endmodule
Module = "Regler/Regler4/Sollwert" 0x13
Preset = 1
Endmodule
;==================== Output Master =======================================
Module = "Regler/Regler1/Sollwert" 0x23
Preset = 1
Endmodule
Module = "Regler/Regler2/Sollwert" 0x23
Preset = 1
Endmodule
Module = "Regler/Regler3/Sollwert" 0x23
Preset = 1
Endmodule
Module = "Regler/Regler4/Sollwert" 0x23
Preset = 1
Endmodule
```

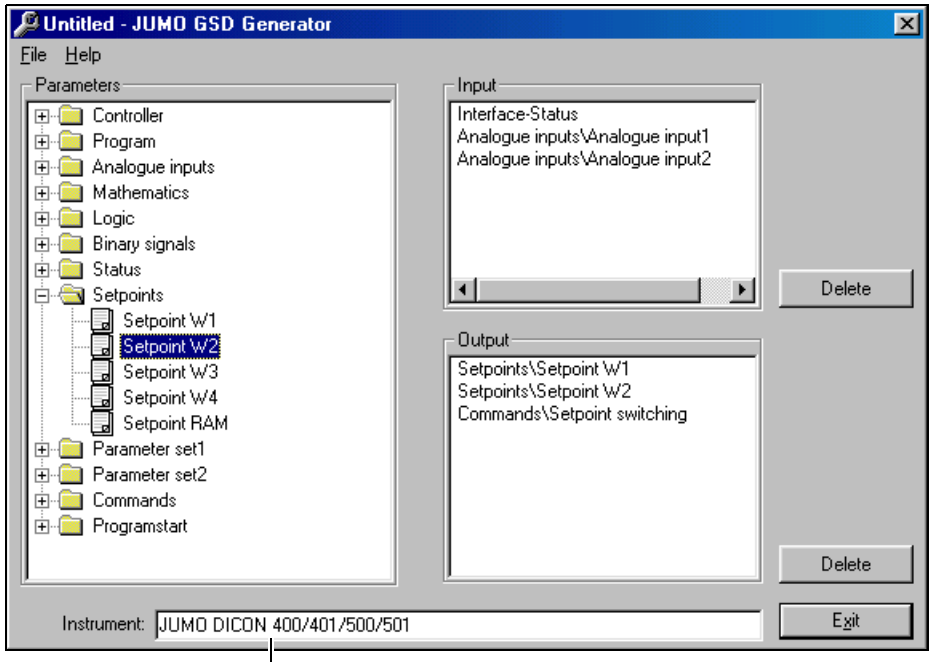
The GSD file has been arranged for installation on the SIMATIC S7 (SIEMENS).

Should installation problems occur with other control systems, all entries Preset=1 must be deleted.

In this case, it is additionally necessary to set up the variables selected in the GSD generator in the correct sequence in the process image of the PLC.

Select parameter

If an existing file has been opened, or a new one created, all available parameters are shown in the parameter window.



Device name (editable).
The name is shown in the PLC program (hardware catalog).

A click with the left mouse button on the "+" (Setpoint) or "-" (Setpoints) symbol will extend the parameter list or reduce it.

Click on the parameter with the left mouse button, and, keeping it pressed, copy it to the input or output window by Drag & Drop.

Remove parameter

Parameters are deleted from the input or output window using the corresponding Delete button.

The parameter "Interface status" will automatically appear in the input window and cannot be deleted. It is used for diagnosis of the internal data transmission in the device and can be requested by the PLC.

0	: internal communication in device is OK
unequal 0	: faulty communication in device

3.4 Connection example

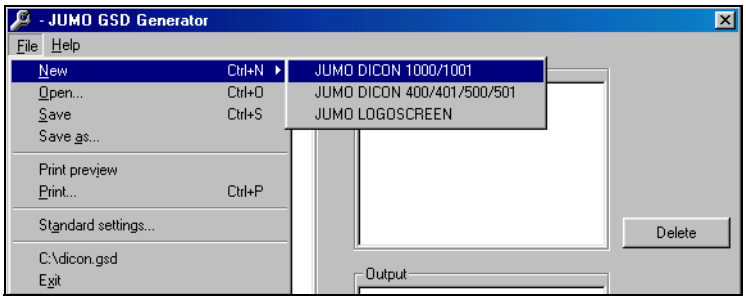
The example below shows the path for the connection of a JUMO controller (DICON 1000) to a SIMATIC S7 from Siemens.

3.4.1 DICON 1000

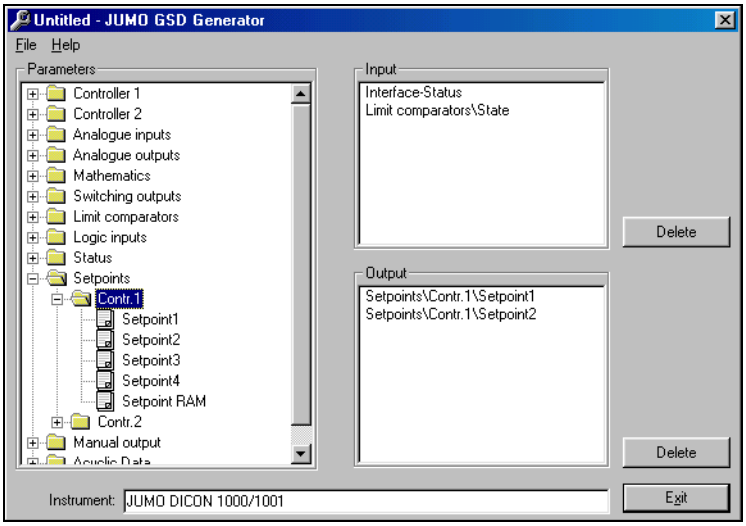
* Connect the device to the PLC.
* Set the device address.
  The device (instrument) address can be selected via the instrument keys or through the setup program.

3.4.2 JUMO GSD generator

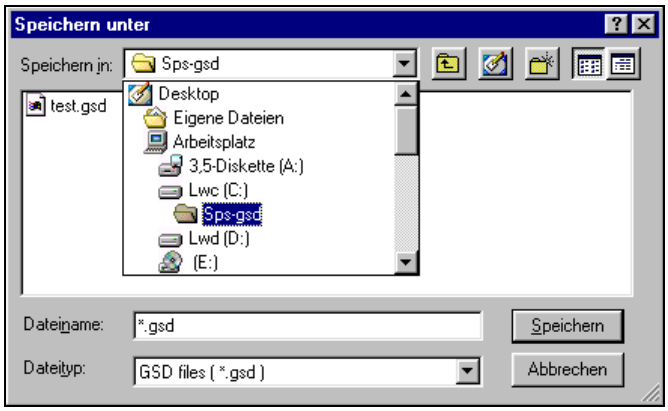
* Start up the GSD generator (Example: *Start* ➔ *Programs* ➔ *JUMO devices* (instruments) ➔ *PROFIBUS* ➔ *JUMO GSD generator*).
* Select the controller



* Select the variables that are transmitted to the DP master

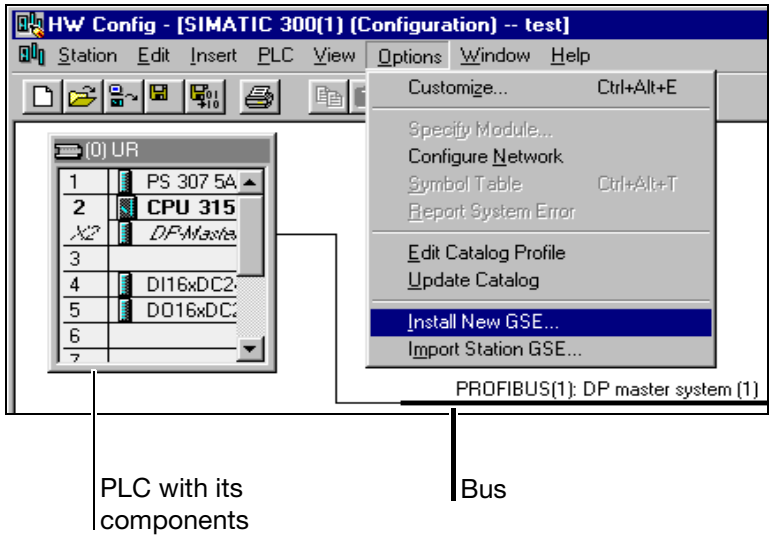


* Save the GSD file in any folder.



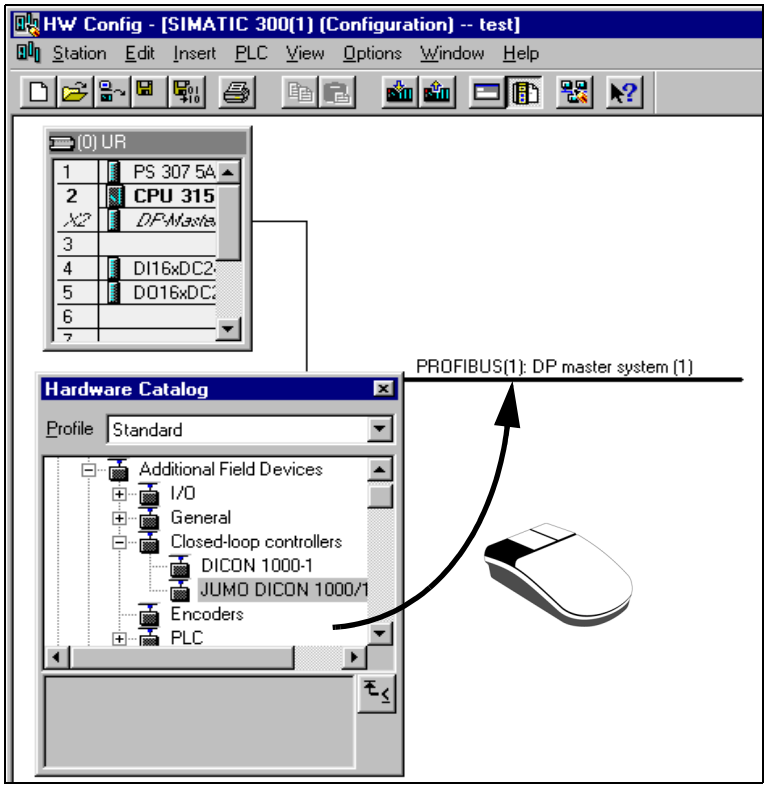
3.4.3 PLC configuration

* Start the PLC software.
* Call up the hardware configuration and execute menu command “Install new GSD”.



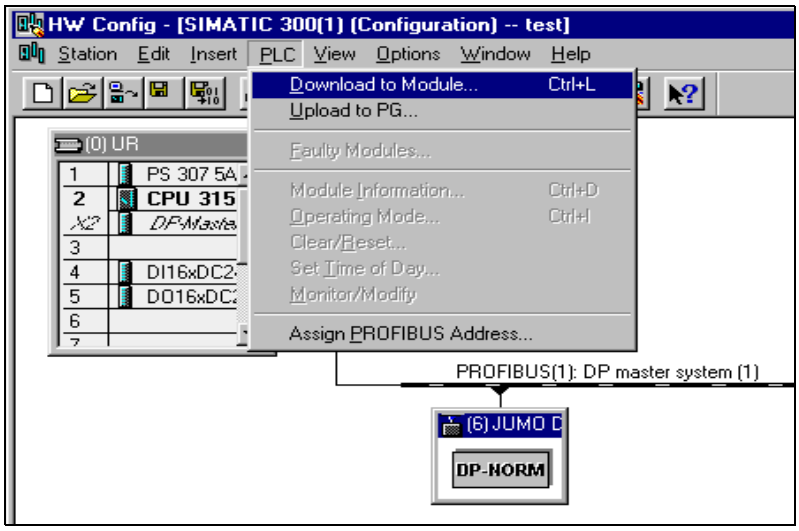
The new GSD file is read in and processed, and the controller is inserted in the hardware catalog.

* Open the hardware catalog and place the new device in the working area.



The controller is placed on the bus using the left mouse button. After releasing the mouse button, the controller address has to be assigned.
The baud rate is determined automatically.

* Finally, you have to load the configuration into the PLC (*PLC ➔ Download to module*)



If a JUMO device with a PROFIBUS-DP interface is operated on a master system (PLC), suitable error analysis routines should be provided on the master side.

Example

In conjunction with a SIMATIC S7, the OB86 should be installed in the PLC, so that failure of a PROFIBUS-DP device can be detected, analyzed and registered for the specific plant.

When using JUMO devices in a PROFIBUS-DP system, please take note of their data format.

Integer values

Integer values are transmitted in the following format:

- first the high byte,
- then the low byte.

Float values/ real values

The float/real values of the cyclic data for the paperless recorder are transmitted using the IEEE-754 standard format (32 bits).

The float/real values for the controllers/generators and for the acyclic data of the paperless recorder are transmitted in the MODbus format.

The IEEE-754 standard format and the MODbus format differ in the transmission sequence of the individual bytes. In the MODbus format bytes 1 and 2 are swapped with bytes 3 and 4 (first the high byte, then the low byte).

Single-float format (32 bits) as per IEEE 754 standard

SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
byte 1	byte 2	byte 3	byte 4

S - sign bit (bit31)
E - exponent in complement to base 2 (bit23 — bit30)
M - 23 bit normalized mantissa (bit0 — bit22)

Example:
calculation of the real number from sign, exponent and mantissa.

byte1 = 40h, byte2 = F0, byte 3 = 0, byte 4 = 0

40F00000h = 0100 0000 1111 0000 0000 0000 0000 0000b

S = 0
E = 100 0000 1
M = 111 0000 0000 0000 0000 0000

$$\text{Value} = -1^{S} \cdot 2^{\text{exponent}-127} \cdot (1 + M_{b22} \cdot 2^{-1} + M_{b21} \cdot 2^{-2} + M_{b20} \cdot 2^{-3} + M_{b19} \cdot 2^{-4} + \ldots)$$

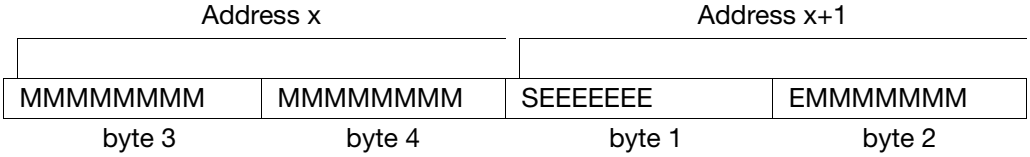
$$\text{Value} = -1^{0} \cdot 2^{129-127} \cdot (1 + 1 \cdot 2^{-1} + 1 \cdot 2^{-2} + 1 \cdot 2^{-3} + 0 \cdot 2^{-4})$$

$$\text{Value} = 1 \cdot 2^{2} \cdot (1 + 0.5 + 0.25 + 0.125 + 0)$$

$$\text{Value} = 1 \cdot 4 \cdot 1.875$$

$$\text{Value} = 7.5$$

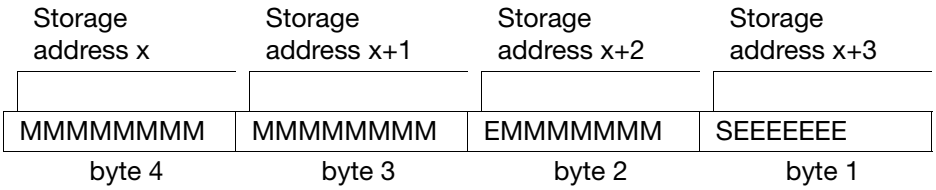
MODbus float format



After/before the transmission from/to the device, the bytes of the float value have to be swapped accordingly.

Many compilers (e. g. Microsoft C++, Turbo C++, Turbo Pascal, Keil C51) store the float values in the following order (Intel compatibility):

float value



Please check how float values are stored in your application. If necessary, the bytes have to be swapped accordingly.

The following pages describe the connection to PROFIBUS-DP for the following devices:

- Universal process controller JUMO DICON 1000,
- Universal profile controller JUMO DICON 1001,
- Universal process controller JUMO DICON 400/500,
- Universal profile controller/generator JUMO DICON 401/501
- Multi-channel process and program controller JUMO IMAGO 500
- Process controller for the meat processing industry JUMO IMAGO F3000
- Paperless recorder LOGOSCREEN
- Microprocessor transmitter /controller for pH JUMO dTRANS pH 01
- Microprocessor transmitter/controller for redox potential JUMO dTRANS Rd 01
- Microprocessor transmitter /controller for conductivity JUMO dTRANS Lf 01
- Microprocessor transmitter /controller for high-purity water JUMO dTRANS Rw 01 and
- Microprocessor indicator /controller for analytical measurements JUMO dTRANS Az 01

All the devices described can be used exclusively as DP slaves.

5 Device overview

6.1 Controller series JUMO DICON 1000/1001

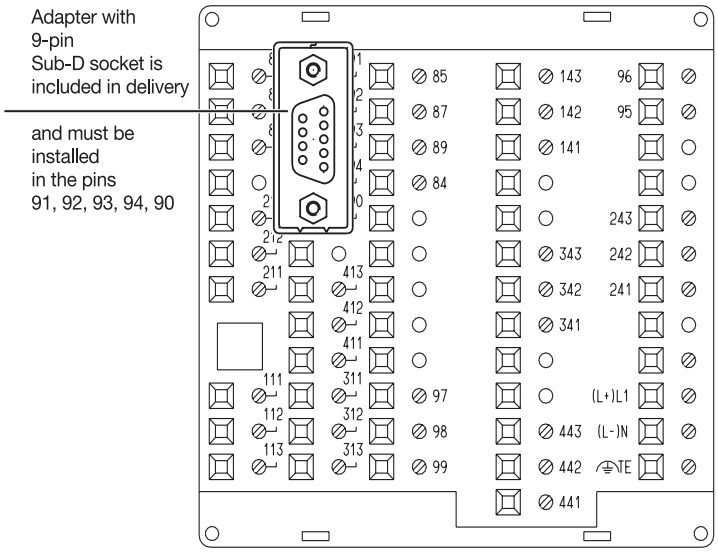
6.1.1 System requirements

The following requirements have to be met when connecting a JUMO process controller to the PROFIBUS-DP interface:

- Fit the PROFIBUS-DP interface to the controller
- Program version from 073.03.01 (DICON 1000)
  or 084.03.01 (DICON 1001)
  The program version can be requested through the parameter *Configuration level C3* ➔ *Version*.

6.1.2 Connection diagram JUMO DICON 1000/1001

Rear view of process controller



JUMO DICON 1000/1001 (90, 92, 93, 94) / Sub-D adapter

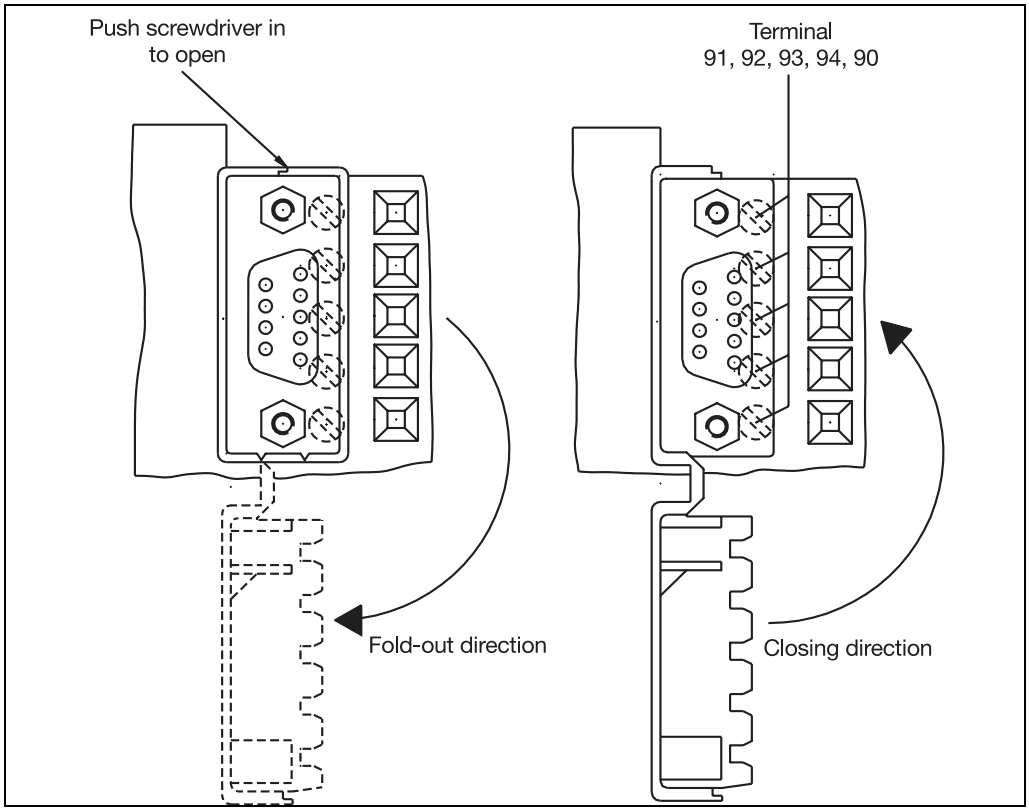
Interface

PROFIBUS-DP

Connections

DICON	Sub-D	Signal	Designation
91	-----	-----	not used
92	6	VP	Supply voltage positive (P5V)
93	3	RxD/TxD-P	Receive/Transmit Data positive, B-cable
94	8	RxD/TxD-N	Receive/Transmit Data negative, A-cable
90	5	DGND	Data transmission potential

The Sub-D adapter can only be installed when the cover is open, since the terminal screws are hidden by the adapter.



6.1.3 Setting the slave address

The slave address is set through the parameter *Configuration level C2* ➔ *Interface* ➔ *Device (instrument) address*.

Setting	Meaning
1 — 124	Slave address, as selected
125	The setting of the slave address can be defined by the bus master.

The baud rate is determined automatically (max. 12 Mbps).

If a new device address is selected, the device has to be reset (switch off/on) for the new address to be accepted.

6.1.4 Diagnostic and status messages

If errors occur during communication with the device, the error message “PROFIBUS ERROR” appears in the dot-matrix display.

Please check the wiring and the master (PLC). It may be necessary to restart the system.

6.2 Controller series JUMO DICON 400/500/401/501

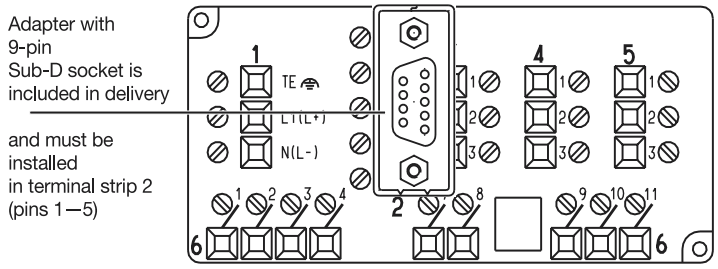
6.2.1 System requirements

The following requirements have to be met when connecting a JUMO process controller to the PROFIBUS-DP interface:

- Fit the PROFIBUS-DP interface to the controller
- Program version from 050.01.05.
  The program version can be requested through the parameter *Configuration level C2* ➔ *Version*.

6.2.2 Connection diagram JUMO DICON 400/401

Rear view of process controller



JUMO DICON 400/401 (Terminal strip 2, Pin 2,3,4,5) / Sub-D adapter

Interface

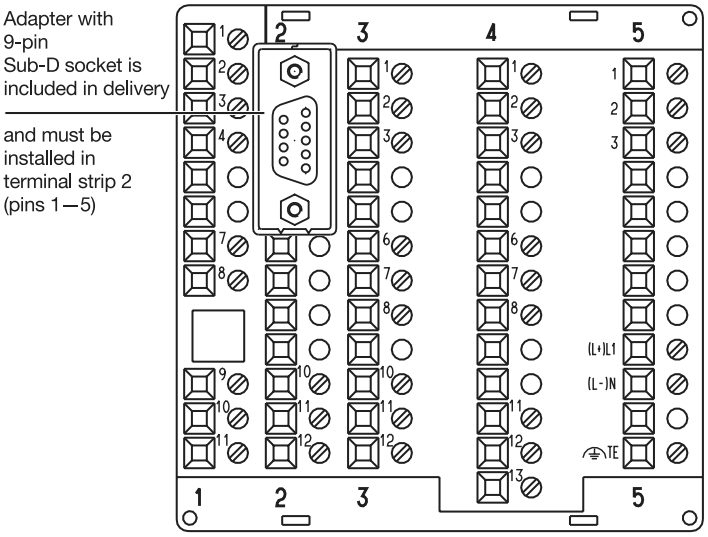
PROFIBUS-DP

Connections

DICON	Sub-D	Signal	Designation
1	-----	-----	not used
2	6	VP	Supply voltage positive (P5V)
3	3	RxD/TxD-P	Receive/Transmit Data positive, B-cable
4	8	RxD/TxD-N	Receive/Transmit Data negative, A-cable
5	5	DGND	Data transmission potential

6.2.3 Connection diagram JUMO DICON 500/501

Rear view of process controller



JUMO DICON 500/501 (Terminal strip 2, Pin 2,3,4,5) / Sub-D adapter

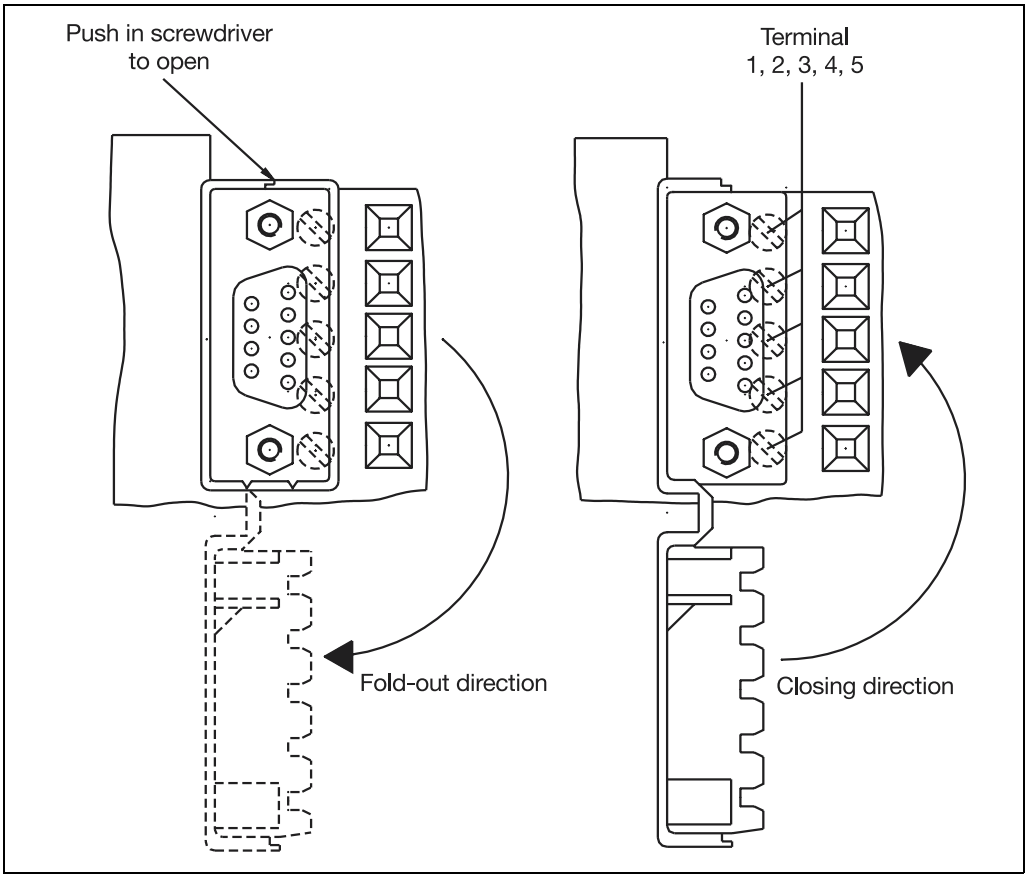
Interface

PROFIBUS-DP

Connections

DICON	Sub-D	Signal	Designation
1	-----	-----	not used
2	6	VP	Supply voltage positive (P5V)
3	3	RxD/TxD-P	Receive/Transmit Data positive, B-cable
4	8	RxD/TxD-N	Receive/Transmit Data negative, A-cable
5	5	DGND	Data transmission potential

The Sub-D adapter can only be installed when the cover is open, since the terminal screws are hidden by the adapter.



6.2.4 Setting the slave address

The slave address is set through the parameter *Configuration level C1* ➔ *Interface* ➔ *Device (instrument) address*.

Setting	Meaning
1 — 124	Slave address, as selected
125	The setting of the slave address can be defined by the bus master.

The baud rate is determined automatically (max. 12 Mbps).

☞ If a new device address is selected, the device has to be reset (switch off/on) for the new address to be accepted.

6.2.5 Diagnostic and status messages

If errors occur during communication with the device, the error message “BUSERROR” appears in the dot-matrix display.

Please check the wiring and the DP master (PLC).
It may be necessary to restart the system.

Suppression

The error message “BUSERROR” can be suppressed by setting the slave address 0.

If the start-up function of the setup program is used, no more data can be exchanged via the PROFIBUS-DP interface. The interface status signals that the internal communication in the device is faulty.

6.2.6 Acyclic data transmission

You can use *acyclic data transmission* to read and write a large number of the parameters, measurements and process data for the JUMO DICON 40X/50X that are documented in the interface description 70.3570.2.

The acyclic data are also transmitted with the cyclic data transfer (DPVO).

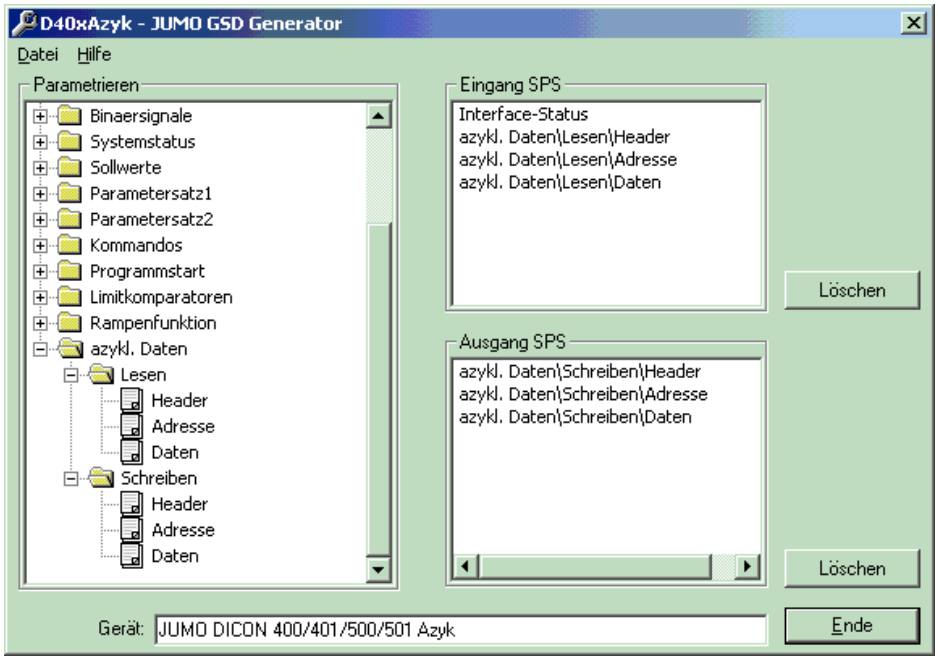
In order to establish communication with the JUMO DICON 40X/50X (device), 4 info bytes and a maximum of 4 bytes of user data must be transmitted. Communication by means of acyclic data is mainly through the well-known MODBUS communication, i.e. the mechanisms of MODBUS communication, such as the function (CMD) and address are used in this case.

While cyclic data are repeatedly transmitted between the PLC and the device, the acyclic transmission method is only used when it is required, i. e. temporary alterations to the device can also be made through the device operating facilities.

The advantage of the acyclic transmission method is that it is possible to break through the limits imposed by the PLC, such as a maximum of 128 bytes of input and output data in the process image, or a maximum of 31 module entries (number of cyclic parameters) in the GSD file. Any number of parameters can be transmitted one after another and then processed.
The disadvantage of acyclic transmission is that an additional interface must be integrated into the PLC, to ensure the operation of the transmission procedure described below.

On the installation CD you will find a PLC demo program (DICON 40X/50X.ZIP) for the Siemens SIMATIC S7, using the widely-used CPU 315-2 DP. JUMO can only make the demo program available for the SIMATIC S7. JUMO does not provide any guarantee that the program, which is intended to facilitate the first commissioning of the acyclic transmission method, will function without errors in all applications.

Selecting the acyclic transmission method in the GSD generator:



6.2.6.1 Arrangement of the protocol

<table>
<tr><td>Byte no.</td><td colspan="5">1..2</td><td>3..4</td><td>5..8</td></tr>
<tr><td>Field</td><td colspan="5">Control word</td><td>Modbus address</td><td>Data</td></tr>
<tr><td>Contents</td><td colspan="5"><table>
<tr><td colspan="4">Control</td><td>Length</td><td>Function</td></tr>
<tr><td colspan="4">4-bit (bits 7…4)</td><td>4-bit
(bits 3…0)</td><td>1 byte</td></tr>
<tr><td>Job OK</td><td>Job error</td><td>Job Toggle 1</td><td>Job Toggle 2</td><td>0… 2 words</td><td>0x03 read
0x10 write</td></tr>
</table></td><td></td><td></td></tr>
</table>

Control bits 0..3 Quantity of user data (in words)

Control bits 4..5 Job Toggle 1, Job Toggle 2

These two bits are required to control the interaction between the PLC and the device. Control bits 4 and 5 may only be set after the transmit buffer has been completely filled up. In order to ensure that the correct data are evaluated and processed, the following procedure must be adhered to.

Bit 5	Bit 4	
0	0	Job 1 is mirrored by the device.
0	1	Bit 4 is set, job 1 is processed for the first time.
1	0	Bit 5 is set, job 1 is processed again.
0	0	Job 2 is mirrored by the device.
0	1	Bit 4 is set, job 2 is processed for the first time.
...	...	.....

The internal design of the device means that it is mandatory to adhere to the procedure above. Otherwise, it will not be possible to guarantee that the data accumulated in the PLC are consistent.

Bit 5	Bit 4	
0	0	Job 1 is mirrored by the device.

The mirrored telegram is checked by comparing the telegram data lengths, functions and Modbus addresses of the input data and the output data. If these items of information match each other, then Bit 4 will be set, so that processing can carry on.

Control bits 6... 7

Job OK, job error

Bit 6 and Bit 7 are signals to the PLC, indicating that the telegram has been evaluated by the device, and the PLC can generate and transmit the next command for the device.

Sequence: Case 1, everything is functioning OK

Bit 7	Bit 6	Bit 5	Bit 4	
0	0	0	0	No job-bit has been set, i.e. the device must mirror the job.
0	0	0	0	The mirrored telegram is sent back by the device.
0	0	0	1	The PLC has set the job through Bit 4 = 1, i.e. the device evaluates the telegram.
1	0	0	1	Job with Bit 4 = 1 has been successfully processed, no errors appeared.
0	0	1	0	The PLC has set the job through Bit 5 = 1, i.e. the device evaluates the telegram again.
1	0	1	0	Job with Bit 5 = 1 has been sucessfully processed, no errors appeared. The processing of the job is thereby finished.

Sequence: Case 2, not everything is functioning OK

Bit 7	Bit 6	Bit 5	Bit 4	
0	0	0	0	No job-bit has been set, i.e. the device must mirror the job.
0	0	0	0	The mirrored telegram is sent back by the device.
0	0	0	1	The PLC has set the job through Bit 4 = 1, i.e. the device evaluates the telegram.
1	0	0	1	Job with Bit 4 = 1 has been successfully processed, no errors appeared.
0	0	1	0	The PLC has set the job through Bit 5 = 1, i.e. the device evaluates the telegram again.
0	1	1	0	Job with Bit 5 = 1 has **not** been successfully processed, **an error** appeared. The processing of the job is thereby canceled.

Sequence: Case 3, not everything is functioning OK

Bit 7	Bit 6	Bit 5	Bit 4	
0	0	0	0	No job-bit has been set, i. e. the device must mirror the job.
0	0	0	0	The mirrored telegram is sent back by the device.
0	0	0	1	The PLC has set the job through Bit 4 = 1, i.e. the device evaluates the telegram.
0	1	0	1	Job with Bit 4 = 1 has **not** been successfully processed, **an error** appeared. Processing can be canceled, since there is probably an error in the telegram layout.

Time-out error: The interface must be monitored not only for telegram errors, but also for time-out errors. It is not possible to give a fixed time-out interval that must be observed, since it depends on the number of parameters that are cyclically transmitted.

Acyclic data communication alone (without cyclic data) requires about 5 seconds to transmit a parameter.

Address: A large number of the addresses which are listed in the Interface Description 70.3570.2 can be transmitted through the acyclic transmission procedure. The transmission follows the well-known MODBUS commmunication very closely.

User data: Max. 4 bytes of user data can be transmitted. The quantity of user data applied is entered (in words) in Bits 0...3.

Example: An example will clarify the basic sequence to be used for the data transmission between the PLC and the device. In this case, the controller setpoint = 50.0 is defined by the PLC for Controller 1.

Byte no.	**1..2**			**3...4**	**5...8**
Field	Control word			Modbus address	Data
Contents	Control	Length	Function		

6 Device-specific data

1.) Telegram from the PLC to the device.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x02	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

2.) Device mirrors the received telegram.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x02	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

3.) PLC transmits telegram with the information Toggle 1.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x12	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

4.) Device evaluates the telegram, and sends back Job OK or Job error.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x92	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

5.) If the PLC receives Job OK, the telegram is sent again to the device, with Toggle 2. If Job error is received, processing can be canceled immediately, since there is an error in the telegram layout.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x22	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

6.) Device evaluates the telegram, and sends back Job OK or Job error.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0xA2	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

6.2.6.2 Demo program DICON 40X/50X.ZIP

The demo program for the JUMO DICON 40X/50X can be found on the installation CD.
JUMO can only make it available for the SIMATIC S7. The CPU 315-2 DP is used.
You can find a program listing in PDF format on the installation CD, by first calling up the installation program, and then clicking on Documentation ➔ DICON 40X.pdf.
JUMO does not provide any guarantee that the program, which is intended to facilitate the first commissioning of the acyclic transmission method, will function without errors in all applications.

The procedure for data communication is controlled by markers. In all, the demo program processes 3 commands. 2 analog values (Controller\Controller1\Process_value, Controller\Controller1\Setpoint) are read by the DICON 40X/50X, and 1 analog value is written (Controller\Controller1\Setpoint).

OB1 The operating system of the PLC processes OB1 cyclically. If the processing of OB1 is finished, then the operating system starts processing OB1 again. The cyclic processing of OB1 is started when the start-up has finished.

OB86 The operating system of the PLC calls up OB86 if it detects the failure of an expansion device, a DP master system or a station in the decentralized periphery (both for incoming and outgoing events). If such an error occurs, and OB86 is not present, then the CPU goes to the STOP status. The demo program only evaluates the incoming events for error codes 0xC4 and 0xC5, by incrementing marker word 28.

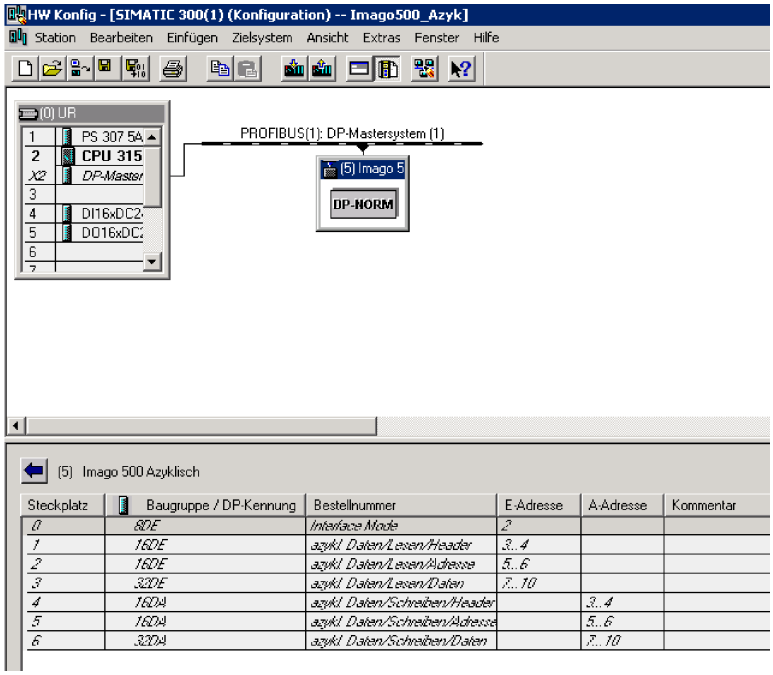
FC1 : Function for reading 2 analog values and writing 1 analog value into the SIMATIC S7 - 300 (315 - 2 DP). The reading and writing of process values is carried out separately, and can be started separately. Reading is started once through the marker 30.3 *StartTransferZyklisch*, i. e. both analog values are read, one after another, and then the procedure is terminated. The marker 30.1 *StartTransferAzyklisch* can be used to separately start the writing of the analog value. The markers 30.0 *SteuerFlagZyklisch* and 30.2 *SteuerFlagAzyklisch* indicate the duration of the transmission separately for reading and writing.

The command processing is set up in a sequential list, i.e. if one command has been processed, the next is started automatically.

FC10 : Operates the Profibus interface (driver). The function has some defined transfer parameters, which are explained in the following text.

6 Device-specific data

Addr : Address for the acyclic data in the process image of the PLC. The addresses for the acyclic data in the input process image and the output process image must be identical. It is not possible to use different addresses.



Command : Command syntax that is to be sent to the device, e. g. Controller 1 set Setpoint = 50.0, ... The program is laid out so that a pool of possible commands is predefined in a data block (DB).

Response: The response that the device sends to the PLC is also saved in a data block, and can be interpreted and evaluated by other PLC program components.

STRT : Start pulse, i.e. the start of command processing. The telegram that is transferred under Command is sent to the device.

RDY: Command processing finished. The device has sent back a response to the PLC, after which the RDY flag is set by FC10 in order to indicate to the higher-level processing that the execution of the telegram has been concluded. The RDY flag will also be set after a time-out error.

Toggle: The Toggle flag is reset by FC10. The toggle flag that is to be transferred is interpreted and the toggle information is preprared for the device.

TimeoutError: The FC10 driver is laid out so that a telegram must be processed within 20 seconds. If this is not achieved, a time-out error is generated, i.e. a flag is set and the driver is closed. Time-out errors are recorded in a separate data block (DB).

DB10 : The response from the device is placed in this data block. At present, 6 different response messages can be stored. The size of DB10 can be adjusted at any time. DB10 saves the complete response telegram from the JUMO DICON 40X/50X, i. e. the user data as well as the control information and the address.

DB20 : Data Block 20 holds several predefined commands that can be individually used in this demo program. For each command, there is a short description of the data that can be transferred. You can alter DB20 or add other commands at any time. The necessary information can be found in the Operating Instructions B 70.3570.2.

Command 000:
Read Controller\Controller1\Process_value

Command 001
Read Controller\Controller1\Setpoint

Command 002
Write Controller\Controller1\Setpoint

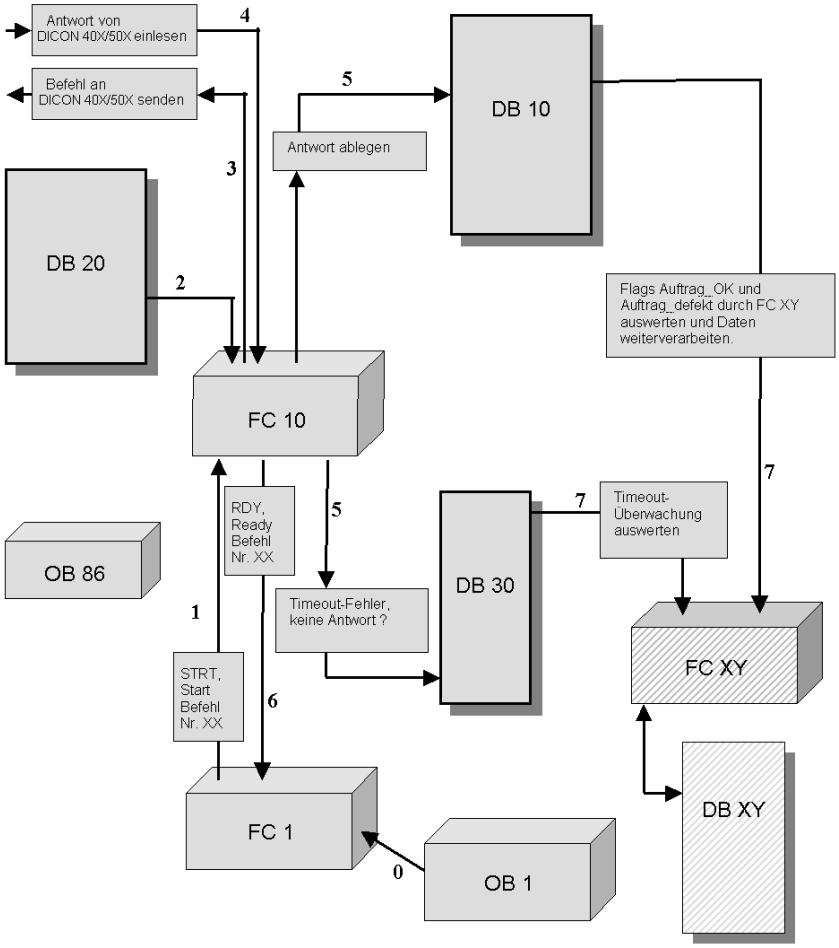
DB30 : In this demo program, the time-out errors are placed in Data Block 30.

UDT10 : Universal Data Type. The organization of the input and output data channel for the device is defined in UDT10.

VAT1 : The table of variables that is set up makes it possible to check the data communication or control the command processing.

⇨ An example is shown on page 48, for the IMAGO 500.

6.2.6.3 Block diagram of the demo program DICON 40X/50X:



0:OB1 is automatically and cyclically executed by the CPU of the PLC.

1)	FC1 is also called up cyclically by the PLC. If the marker 30.3 *StartTransferZyklisch* is set, the consequence is that processing of the command starts in FC1, whereby the first command is prepared by FC10 and sent to the DICON 40X/50X.
2)	FC10 loads the required command from DB20, prepares the corresponding toggle information, and starts a time-out timer.
3)	The data telegram is entered into the process image of the PLC by FC10, and thus transmitted to the JUMO DICON 40X/50X.
4)	The JUMO DICON 40X/50X processes the data telegram that has been received, and makes a response message available for FC10 in the process image of the PLC.
5)	FC10 evaluates the response by comparing it with the transmitted telegram, and saving it in DB10 for the following PLC program. If no response is received, a time-out flag is set in DB30 for the corresponding command when the time has run out.

6)	FC1 receives a signal, through the RDY flag, that the processing of a command has been concluded. When this information reaches FC1, the next command is immediately dispatched to the JUMO DICON 40X/50X.
7)	The data that is collected or is to be sent to the JUMO DICON 40X/ 50X is, in practice, evaluated or handled by other PLC program functions. As a consequence, it is always necessary to check whether the data are correct before they can be interpreted. The two control flags in the telegram header (Job OK and Job error) and the corresponding time-out flag must be checked.
1... 8	Processing sequence

JUMO can not provide any guarantee that the components or extensions listed above will ensure fault-free operation of the system, since any error handling must always be defined on a system-specific basis.

6.2.6.4 Timing of acyclic data

Acyclic data transmission enables universal access to a large number of the data and parameters that are accessible via MODBUS (without alteration to the configuration or program). However, because of the larger number of processing steps, it requires a longer time to update the process data for the PROFIBUS-DP slave.

6.2.6.5 Commands (GSD generator)

If you require additional information on the commands within the GSD generator, please refer to the Interface Description 70.3570.2.

6 Device-specific data

6.3 Multi-channel process and program controller JUMO IMAGO 500

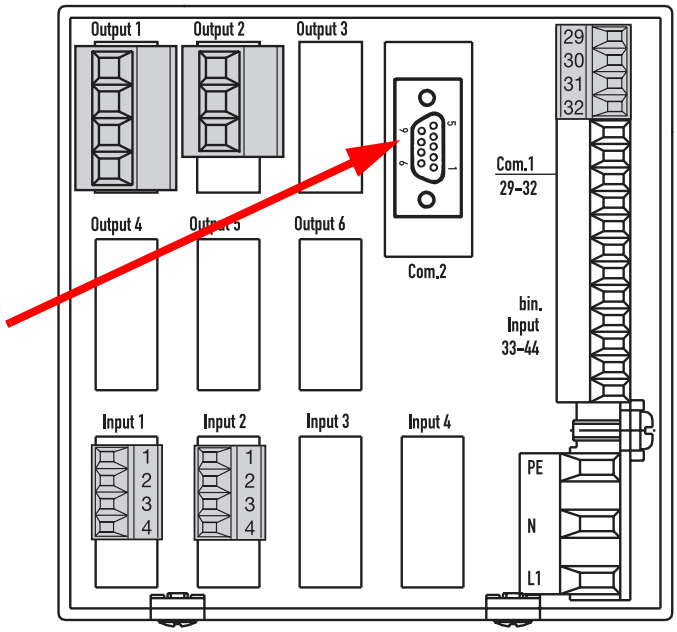
6.3.1 System requirements

The following requirements have to be met when connecting a JUMO IMAGO 500 to the PROFIBUS-DP interface:

- Fit the PROFIBUS-DP interface to the controller

6.3.2 Connection diagram JUMO IMAGO 500

Rear view of the process controller



JUMO IMAGO 500 / COM2

Interface

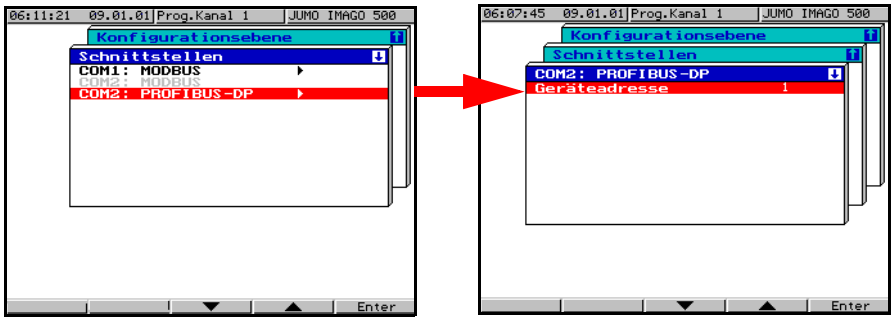
PROFIBUS-DP

Connections

COM2 SUB-D socket	Signal	Designation
3	RxD/TxD-P	Receive/transmit data positive
4	RTS	-
5	DGND	Ground
6	VP	Supply voltage positive
8	RxD/TxD-N	Receive/transmit data negative

6.3.3 Setting the slave address

The slave address is set through the commmand sequence:
Menu ➔ *Configuration level* ➔ *Interfaces* ➔ *COM2:PROFIBUS-DP*
.



Setting	Meaning
1 — 124	Slave address, as selected
125	The setting for the slave address can be defined by the bus master.

The baud rate is determined automatically (max. 12 Mbps).

If a new device address is selected, the device has to be reset (switch off/on) for the new address to be accepted.

6.3.4 Diagnostic and status messages

If errors occur during communication with the device, the error message “PROFIBUS-DP ERROR” appears in the color display.

Please check the wiring and the master (PLC).
It may be necessary to restart the system.

Suppression

The error message “PROFIBUS-DP ERROR” can be suppressed by setting the slave address to be 0.

If the start-up function of the setup program is used, data can no longer be exchanged via the PROFIBUS-DP interface. The interface status signals that the internal communication in the device is faulty.

6.3.5 Acyclic data transmission

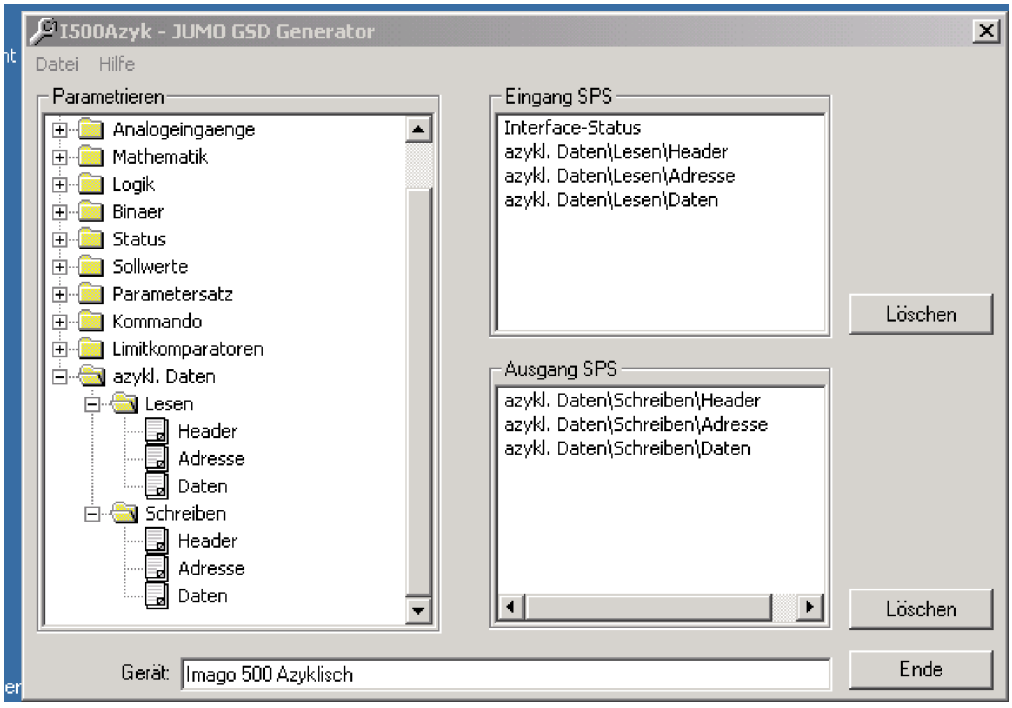
You can use acyclic data transmission to read and write a large number of the parameters, measurements and process data for the JUMO IMAGO 500 that are documented in the interface description B 70.3590.2.

The acyclic data are also transmitted with the cyclic data transfer (DPVO).

6 Device-specific data

In order to establish communication with the JUMO IMAGO 500 (device), 4 info bytes and a maximum of 4 bytes of user data must be transmitted. Communication by means of acyclic data is mainly through the well-known MODBUS communication, i.e. the mechanisms of MODBUS communication, such as the function (CMD) and address are used in this case.
While cyclic data are repeatedly transmitted between the PLC and the device, the acyclic transmission method is only used when it is required, i. e. temporary alterations to the device can also be made through the device operating facilities.
The advantage of the acyclic transmission method is that it is possible to break through the limits imposed by the PLC, such as a maximum of 128 bytes of input and output data in the process image, or a maximum of 31 module entries (number of cyclic parameters) in the GSD file. Any number of parameters can be transmitted one after another and then processed.
The disadvantage of acyclic transmission is that an additional interface must be integrated into the PLC, to ensure the operation of the transmission procedure described below.
On the installation CD supplied with the PROFIBUS interface, you will find a PLC demo program (IMAGO500.ZIP) for the Siemens SIMATIC S7, using the widely-used CPU 315-2 DP. JUMO can only make this demo program available for the SIMATIC S7. JUMO does not provide any guarantee that the program, which is intended to facilitate the first commissioning of the acyclic transmission method, will function without errors in all applications.

Selecting the acyclic transmission method in the GSD generator:



6.3.5.1 Arrangement of the protocol

Byte no.	1..2						3..4	5..8
Field	Control word						Modbus address	Data
Contents	Control				Length	Function		
	4-bit (bits 7...4)				4-bit (bits 3...0)	1 byte		
	Job OK	Job error	Job Toggle 1	Job Toggle 2	0 .. 2 words	0x03 read 0x10 write		

Control bits 0...3

Quantity of user data (in words)

Control bits 4...5

Job Toggle 1, Job Toggle 2

These two bits are required to control the interaction between the PLC and the device. Control bits 4 and 5 may only be set after the transmit buffer has been completely filled up. In order to ensure that the correct data are evaluated and processed, the following procedure must be adhered to.

Bit 5	Bit 4	
0	0	Job 1 is mirrored by the device.
0	1	Bit 4 is set, job 1 is processed for the first time.
1	0	Bit 5 is set, job 1 is processed again.
0	0	Job 2 is mirrored by the device.
0	1	Bit 4 is set, job 2 is processed for the first time.
...	...	.....

The internal design of the device means that it is mandatory to adhere to the procedure above. Otherwise, it will not be possible to guarantee that the data accumulated in the PLC are consistent.

Bit 5	Bit 4	
0	0	Job 1 is mirrored by the device.

The mirrored telegram is checked by comparing the telegram data lengths, functions and Modbus addresses of the input data and the output data. If the items of information match each other, then Bit 4 will be set, so that processing can be continued.

Control bits 6...7

Job OK, job error

Bit 6 and Bit 7 are signals to the PLC, when the telegram has been evaluated by the device, and the PLC can generate and transmit the next command for the device.

Sequence: Case 1, everything is functioning OK

Bit 7	Bit 6	Bit 5	Bit 4	
0	0	0	0	No job-bit has been set, i.e. the device must mirror the job.
0	0	0	0	The mirrored telegram is sent back by the device.
0	0	0	1	The PLC has set the job through Bit 4 = 1, i.e. the device evaluates the telegram.
1	0	0	1	Job with Bit 4 = 1 has been successfully processed, no errors appeared.
0	0	1	0	The PLC has set the job through Bit 5 = 1, i.e. the device evaluates the telegram again.
1	0	1	0	Job with Bit 5 = 1 has been successfully processed, no errors appeared. The processing of the job is thereby finished.

Sequence: Case 2, not everything is functioning OK

Bit 7	Bit 6	Bit 5	Bit 4	
0	0	0	0	No job-bit has been set, i.e. the device must mirror the job.
0	0	0	0	The mirrored telegram is sent back by the device.
0	0	0	1	The PLC has set the job through Bit 4 = 1, i.e. the device evaluates the telegram.
1	0	0	1	Job with Bit 4 = 1 has been successfully processed, no errors appeared.
0	0	1	0	The PLC has set the job through Bit 5 = 1, i.e. the device evaluates the telegram again.
0	1	1	0	Job with Bit 5 = 1 has **not** been successfully processed, **an error** appeared. The processing of the job is thereby canceled.

Sequence: Case 3, not everything is functioning OK

Bit 7	Bit 6	Bit 5	Bit 4	
0	0	0	0	No job-bit has been set, i.e. the device must mirror the job.
0	0	0	0	The mirrored telegram is sent back by the device.
0	0	0	1	The PLC has set the job through Bit 4 = 1, i.e. the device evaluates the telegram.
0	1	0	1	Job with Bit 4 = 1 has **not** been successfully processed, **an error** appeared. Processing can be canceled, since there is probably an error in the telegram layout.

Time-out error: The interface must be monitored not only for telegram errors, but also for time-out errors. It is not possible to give a fixed time-out interval that must be observed, since it depends on the number of parameters that are cyclically transmitted.

Acyclic data communication alone (without cyclic data) requires about 5 seconds to transmit a parameter.

Address: A large number of the addresses which are listed in the Interface Description B 70.3590.2 can be transmitted through the acyclic transmission procedure. The transmission follows the well-known MODBUS commmunication very closely.

User data: A maximum of 4 bytes of user data can be transmitted. The quantity of user data applied is entered (in words) in Bits 0 ... 3.

Example: An example will clarify the basic sequence to be used for the data transmission between the PLC and the device. In this case, the controller setpoint = 50.0 is defined by the PLC for Controller 1.

Byte no.	**1 ... 2**			**3 ... 4**	**5 ... 8**
Field	Control word			Modbus address	Data
Contents	Control	Length	Function		

1.) Telegram from the PLC to the device.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x02	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

2.) Device mirrors the received telegram.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x02	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

3.) PLC transmits telegram with the information Toggle 1.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x12	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

4.) Device evaluates the telegram, and sends back Job OK or Job error.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x92	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

5.) If the PLC receives Job OK , the telegram is sent again to the device, with Toggle 2. If Job error is received, processing can be canceled immediately, since there is an error in the telegram layout.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x22	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

6.) Device evaluates the telegram, and sends back Job OK or Job error.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0xA2	0x10	0x00	0xCE	0x42	0x48	0x00	0x00

6.3.5.2 Demo program IMAGO500.ZIP

The demo program for the JUMO IMAGO 500 can be found on the installation CD. JUMO can only make it available for the SIMATIC S7. The CPU 315-2 DP is used.
You can find a program listing in PDF format on the installation CD, by first calling up the installation program, and then clicking on Documentation ➔ IMAGO 500.pdf.
JUMO does not provide any guarantee that the program, which is intended to facilitate the first commissioning of the acyclic transmission method, will function without errors in all applications.

The procedure for data communication is controlled by markers. In all, the demo program processes 6 commands. 4 analog values (Controller\Controller1\Process_value, Controller\Controller2\Process_value, Controller\Controller1\Setpoint, Controller\Controller2\Setpoint) are read by the IMAGO 500, and 2 analog values (Controller\Controller1\Setpoint, Controller\Controller2\Setpoint) are written.

OB1

The operating system of the PLC processes OB1 cyclically. If the processing of OB1 is finished, then the operating system starts processing OB1 again. The cyclic processing of OB1 is started when the start-up has finished.

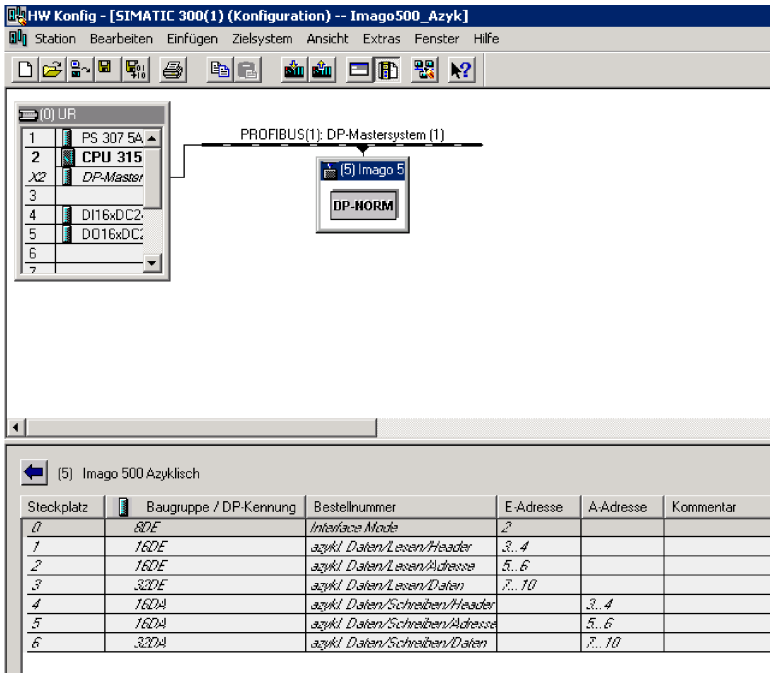
OB86 The operating system of the PLC calls up OB86 if it detects the failure of an expansion device, a DP master system or a station in the decentralized periphery (both for incoming and outgoing events). If such an error occurs, and OB86 is not present, then the CPU goes to the STOP status. The demo program only evaluates the incoming events for error codes 0xC4 and 0xC5, by incrementing marker word 28.

FC1 : Function for reading 4 analog values and writing 2 analog values into the SIMATIC S7 - 300 (315 - 2 DP). The reading and writing of process values is carried out separately, and can be started separately. Reading is started once through the marker 30.3 *StartTransferZyklisch*, i.e. all 4 analog values are read, one after another, and then the procedure is terminated. The marker 30.1 *StartTransferAzyklisch* can be used to separately start the writing of the 2 analog values. The markers 30.0 *SteuerFlagZyklisch* and 30.2 *SteuerFlagAzyklisch* indicate the duration of the transmission separately for reading and writing.

The command processing is set up in a sequential list, i.e. if one command has been processed, the next is started automatically.

FC10 : Operates the Profibus interface (driver). The function has some defined transfer parameters, which are explained in the following text.

Addr : Address for the acyclic data in the process image of the PLC. The addresses for the acyclic data in the input process image and the output process image must be identical. It is not possible to use different addresses.



Command : Command syntax that is to be sent to the device, e.g. Controller 1 set Setpoint = 50.0, ... The program is laid out so that a pool of possible commands is predefined in a data block (DB).

Response: The response that the device sends to the PLC is also saved in a data block, and can be interpreted and evaluated by other PLC program components.

STRT : Start pulse, i. e. the start of command processing. The telegram that is transferred under Command is sent to the device.

RDY: Command processing finished. The device has sent back a response to the PLC, after which the RDY flag is set by FC10 in order to indicate to the higher-level processing that the execution of the telegram has been concluded. The RDY flag will also be set after a time-out error.

Toggle: The Toggle flag is reset by FC10. The toggle flag that is to be transferred is interpreted and the toggle information is preprared for the device.

TimeoutError: The FC10 driver is laid out so that a telegram must be processed within 20 seconds. If this is not achieved, a time-out error is generated, i. e. a flag is set and the driver is closed. Time-out errors are recorded in a separate data block (DB).

DB10 : The response from the device is placed in this data block. At present, 6 different response messages can be stored. The size of DB10 can be adjusted at any time. DB10 saves the complete response telegram from the JUMO IMAGO 500, i. e. the user data as well as the control information and the address.

DB20 : Several predefined commands are stored in Data Block 20. These can be used individually in this demo program. For each command, there is a short description of the data that can be transferred. You can alter DB20 or add other commands at any time. The necessary information can be found in the Operating Instructions B 70.3590.2.

Command 000:
Read Controller\Controller1\Process_value

Command 001
Read Controller\Controller2\Process_value

Command 002
Read Controller\Controller1\Setpoint

Command 003
Read Controller\Controller2\Setpoint

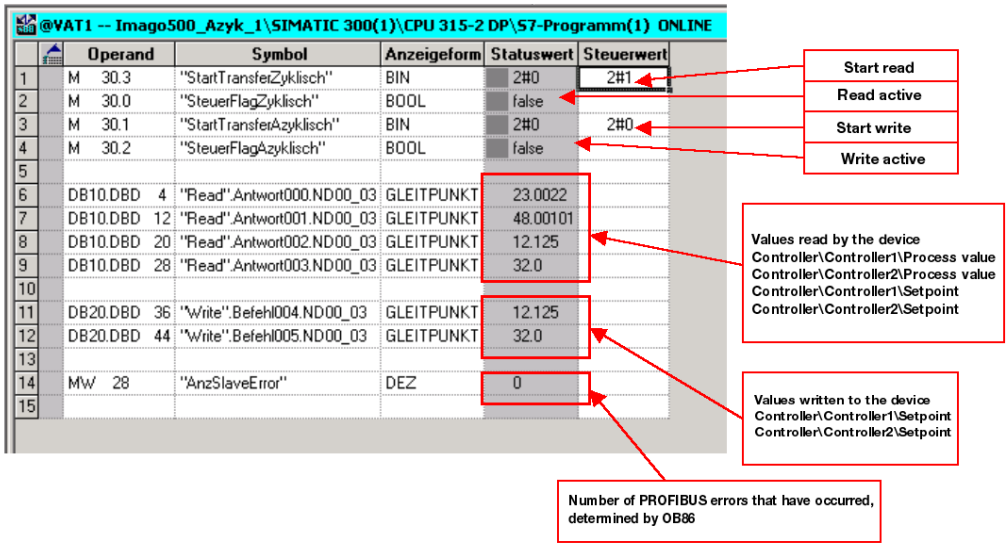
Command 004
Write Controller\Controller1\Setpoint

Command 005
Write Controller\Controller2\Setpoint

DB30 : In this demo program, the time-out errors are placed in Data Block 30.

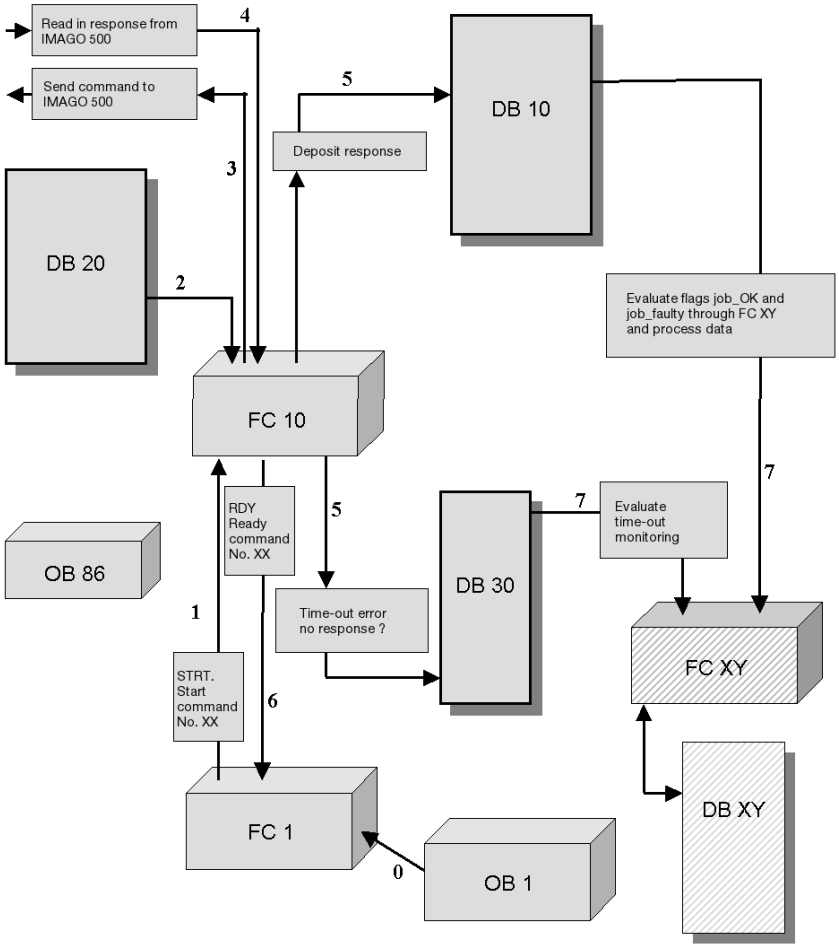
UDT10 : Universal Data Type. The organization of the input and output data channel for the device is defined in UDT10.

VAT1 : The table of variables that is set up makes it possible to check the data communication or control the command processing.



	Operand	Symbol	Anzeigeform	Statuswert	Steuerwert
1	M 30.3	"StartTransferZyklisch"	BIN	2#0	2#1
2	M 30.0	"SteuerFlagZyklisch"	BOOL	false	
3	M 30.1	"StartTransferAzyklisch"	BIN	2#0	2#0
4	M 30.2	"SteuerFlagAzyklisch"	BOOL	false	
5					
6	DB10.DBD 4	"Read".Antwort000.ND00_03	GLEITPUNKT	23.0022	
7	DB10.DBD 12	"Read".Antwort001.ND00_03	GLEITPUNKT	48.00101	
8	DB10.DBD 20	"Read".Antwort002.ND00_03	GLEITPUNKT	12.125	
9	DB10.DBD 28	"Read".Antwort003.ND00_03	GLEITPUNKT	32.0	
10					
11	DB20.DBD 36	"Write".Befehl004.ND00_03	GLEITPUNKT	12.125	
12	DB20.DBD 44	"Write".Befehl005.ND00_03	GLEITPUNKT	32.0	
13					
14	MW 28	"AnzSlaveError"	DEZ	0	
15					

6.3.5.3 Block diagram of the demo program IMAGO500:



0:OB1 is automatically and cyclically executed by the CPU of the PLC.

1)	FC1 is also called up cyclically by the PLC. If the marker 30.3 *StartTransferZyklisch* is set, the result is that processing of the command starts in FC1, whereby the first command is prepared by FC10 and sent to the IMAGO 500.
2)	FC10 loads the required command from DB20, prepares the corresponding toggle information, and starts a time-out timer.
3)	The data telegram is entered into the process image of the PLC by FC10, and thus transmitted to the JUMO IMAGO 500.
4)	The JUMO IMAGO 500 processes the data telegram that has been received, and makes a response message available for FC10 in the process image of the PLC.
5)	FC10 evaluates the response by comparing it with the transmitted telegram, and saving it in DB10 for the following PLC program. If no response is received, a time-out flag is set in DB30 for the corresponding command when the time has run out.

6)	FC1 receives a signal, through the RDY flag, that the processing of a command has been concluded. When this information reaches FC1, the next command is immediately dispatched to the JUMO IMAGO 500.
7)	The data that is collected or is to be sent to the JUMO IMAGO 500 is, in practice, evaluated or handled by other PLC program functions. As a consequence, it is always necessary to check whether the data are correct before they can be interpreted. The two control flags in the telegram header (Job OK and Job error) and the corresponding time-out flag must be checked.
1... 8	Processing sequence

JUMO can not provide any guarantee that the components or extensions listed above will ensure fault-free operation of the system, since any error handling must always be defined on a system-specific basis.

6.3.5.4 Timing of acyclic data

Acyclic data transmission enables universal access to a large number of the data and parameters that are accessible via MODBUS (without alteration to the configuration or program). However, because of the larger number of processing steps, it requires a longer time to update the process data for the PROFIBUS-DP slave.

6.3.5.5 Commands (GSD generator)

If you require additional information on the commands within the GSD generator, please refer to the Interface Description B 70.3590.2.
The GSD file has been laid out for installation on the SIMATIC S7 Should installation problems occur with other controls, all entries Preset=1 must be deleted.
⇨ Chapter 3.3.4

In this case it will also be necessary to set up the variables selected in the GSD generator in the process image of the PLC, in the correct sequence.

6 Device-specific data

6.4 Process controller for the meat processing industry JUMO IMAGO F3000

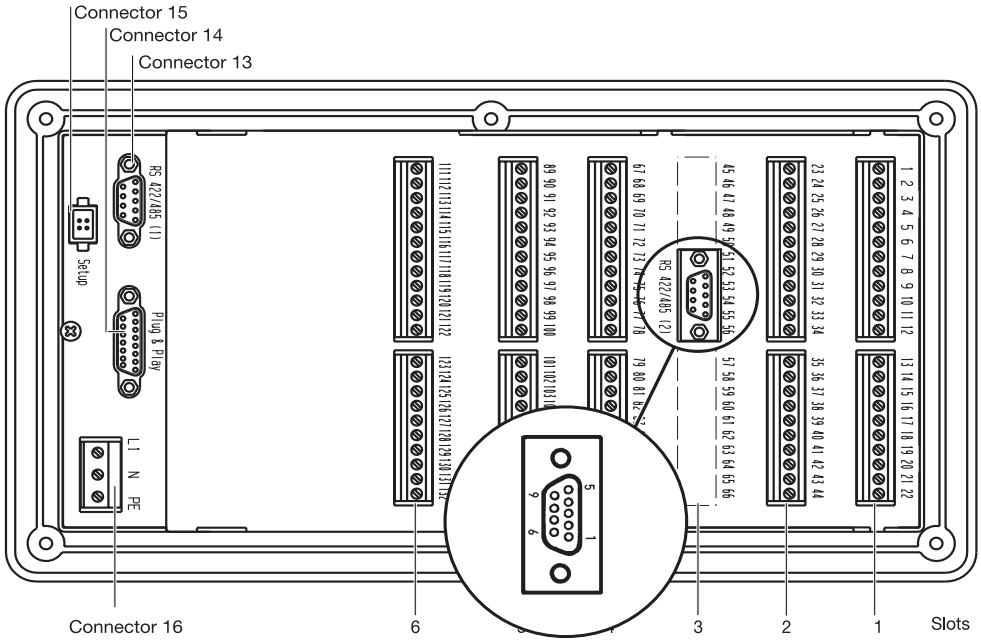
6.4.1 System requirements

The following requirements have to be met when connecting a JUMO process controller to the PROFIBUS-DP interface:

- Fit the PROFIBUS-DP interface to the controller

6.4.2 Connection diagram JUMO IMAGO F3000

Rear view of the process controller



JUMO IMAGO F3000 / slot 3

Interface

PROFIBUS-DP

Connections

SUB-D socket	Signal	Designation
3	B (-)	Receive/Transmit data positive, B-cable
5	GND	Ground
6	VCC	Supply voltage positive
8	A (+)	Receive/Transmit data negative, A-cable
9	GND	Ground

6.4.3 Setting the slave address

✱ *Menu* ➔ *Configuration level* ➔ Fieldbus *interface* ➔ *PROFIBUS-DP-DP* must be executed.

Fault signal

If the PROFIBUS-DP connector is disconnected, no error messsage will be output by the device. This should only be the case for address 125.

Alarm acknowledge-ment

The acknowledgement of several alarms via PROFIBUS-DP can only be made one by one, as for the device itself. To acknowledge several alarms, the control signal on the bus must also change its logic level several times.

Numbering

The numbering of present program segments, process steps and parameter sets is 1 lower than on the device.

It is not possible to distinguish between an active program and Program 1.

When the active parameter set is read out for Controllers 1 to 4, the value is 1 lower than for the device.

Interface addresses

Addresses 1 to 255 can be set freely, although for PROFIBUS-DP applications, only addresses from 1 to 126 are envisaged.

☞ Please note that addresses from 127 to 255 are required for MODBUS interface applications.

6 Device-specific data

6.5 Paperless recorder LOGOSCREEN

By using the paperless recorder, you can visualize and record up to 36 analog channels of a PLC.

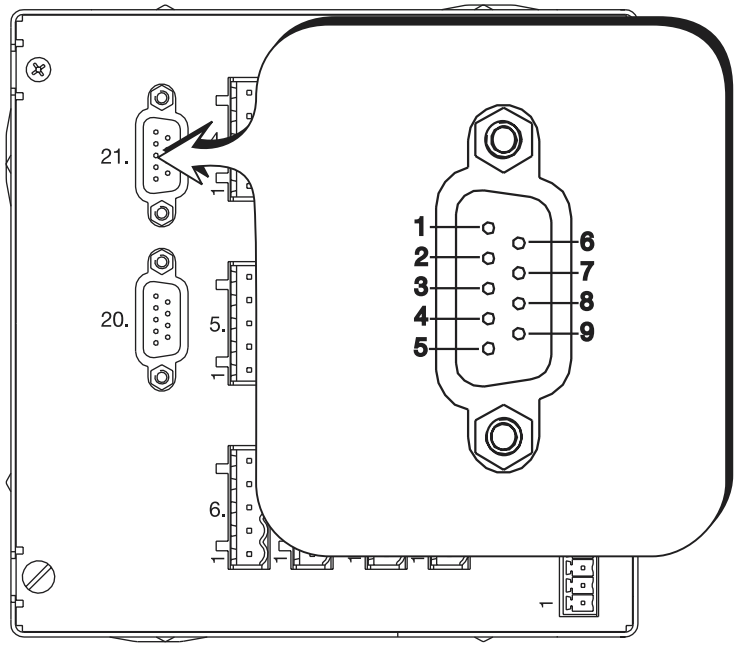
6.5.1 System requirements

The following requirements have to be met when connecting a paperless recorder to a PROFIBUS-DP interface:

- Paperless recorder with PROFIBUS-DP interface
- Program version from 100.03.02
  The program version can be requested from the paperless recorder menus via *Device (Instrument) info* ➔ *Version number*.

6.5.2 Connection diagram LOGOSCREEN

Rear view of paperless recorder



Connector 21

Interface

PROFIBUS-DP

Connections

Sub-D	Signal	Designation
3	RxD/TxD-P	Receive/Transmit data positive, B-cable
5	DGND	Data transmission potential
6	VP	Supply voltage positive (P5V)
8	RxD/TxD-N	Receive/Transmit data negative, A-cable

When making the connection to the PROFIBUS-DP, it is important to ensure that connectors 20 and 21 are not swapped. Connector 20 is reserved for the serial interface. The serial interface is used to read out instrument and process data from the paperless recorder. The connection and function of the serial interface are described in the Interface Description B 95.5010.2.2.

6.5.3 Setting the slave address

The slave address is set via the paperless recorder or the setup program.

Setting	Meaning
1 — 124	Slave address, as selected
125	The setting of the slave address can be predefined by the bus master.

The baud rate is determined automatically (max. 12 Mbps).

If a new device address is selected, the device has to be reset (switch off/on) for the new address to be accepted.

6.5.4 Diagnostic and status messages

If errors occur during communication with the device, (i) will blink in the header and a message appears in the “Device info” menu.
The measurements are marked as “invalid” (200003).
"-------" appears on the Logoscreen display.
Please check the wiring and the master (PLC).
It may be necessary to restart the system.

Suppression The error message in the “Device info” menu and the (i) in the header can be suppressed by setting the slave address 125.

6.5.5 Acyclic data transmission

You can use acyclic data transmission to read and write various measurements and process data for the paperless recorder (from program version 100.03.03).

The acyclic data are also transmitted with cyclic data transfer.

In order to establish communication with the paperless recorder (device), 3 info bytes and a maximum of 10 bytes of user data must be sent to the recorder.

6 Device-specific data

Arrangement of the protocol

Byte no.	1	2	3	4 … 13
Contents	Control byte	Function	Address	User data

Control byte

The control byte (Byte 1) is structured as follows:

Bit 0 … 3: Length of user data (in words)

Bit 4 … 5: "toggle flag"
Both bits must be changed (toggled) with every new job that is sent to the device, so that the device can recognize the new command. The bits must only be set after the transmit buffer has been completely prepared for the new command.
Example:

Bit 5	Bit 4	
0	0	No job available
0	1	Bit 4 is set, job 1 is processed
1	0	Bit 5 is set, job 2 is processed
0	1	Bit 4 is set, job 3 is processed
...	...	.....

Bit 6 … 7: Response OK: Bit 6 = 0 and Bit 7 = 1
Response error: Bit 6 = 1 and Bit 7 = 0
Bit 6 and Bit 7 are signals to the PLC, when the telegram has been evaluated by the device and the PLC can generate and transmit the next command for the device.

Bit 7	Bit 6	Bit 5	Bit 4	
0	0	0	1	Bits 4 and 5 are returned unaltered by the device, as information that the job is being processed.
0	0	1	0	Bits 4 and 5 are returned unaltered by the device, as information that the job is being processed.
1	0	0	1	Job with Bit 4 = 1 was processed without error
0	1	0	1	Job with Bit 4 = 1 could not be processed without error
0	0	1	0	Bits 4 and 5 are returned unaltered by the device, as information that the job is being processed.
1	0	1	0	Job with Bit 5 = 1 was processed without error
0	1	1	0	Job with Bit 5 = 1 could not be processed without error
...	...	...	...	.....

Function

03x: read
10x: write

Address

The following addresses can be read and written. The list corresponds to a portion of the addresses that are listed in the interface description for the paperless recorder.
The addresses that are given in the protocol are derived as:

Address = base address + variable address

Example: Address for the measurement from analog input 6:

Address = 0x35 + 0x0A = 0x3F

6.6 Process data

Base address: 0x0035

Address	Access	Data type	Signal designation
0x0000	R/O	float	Measurement input 1 (analog input 1)
0x0002	R/O	float	Measurement input 2 (analog input 2)
0x0004	R/O	float	Measurement input 3 (analog input 3)
0x0006	R/O	float	Measurement input 4 (analog input 4)
0x0008	R/O	float	Measurement input 5 (analog input 5)
0x000A	R/O	float	Measurement input 6 (analog input 6)
0x000C	R/O	float	Measurement input 7 (analog input 7)
0x000E	R/O	float	Measurement input 8 (analog input 8)
0x0010	R/O	float	Measurement input 9 (analog input 9)
0x0012	R/O	float	Measurement input 10 (analog input 10)
0x0014	R/O	float	Measurement input 11 (analog input 11)
0x0016	R/O	float	Measurement input 12 (analog input 12)
0x0018	R/O	float	free
0x001A	R/O	float	free
0x001C	R/O	float	free
0x001E	R/O	float	free
0x0020	R/O	float	Counter value 1
0x0022	R/O	float	Counter value 2
0x0024	R/O	float	External counter value 1 (from ext. I/O modules)
0x0026	R/O	float	External counter value 2 (from ext. I/O modules)
0x0028	R/W	float	External analog input 1 (from ext. I/O modules) or via MODbus)
0x002A	R/W	float	External analog input 2
0x002C	R/W	float	External analog input 3
0x002E	R/W	float	External analog input 4
0x0030	R/W	float	External analog input 5
0x0032	R/W	float	External analog input 6

0x0034	R/W	float	External analog input 7
0x0036	R/W	float	External analog input 8
0x0038	R/W	float	External analog input 9
0x003A	R/W	float	External analog input 10
0x003C	R/W	float	External analog input 11
0x003E	R/W	float	External analog input 12
0x0040	R/W	float	External analog input 13
0x0042	R/W	float	External analog input 14
0x0044	R/W	float	External analog input 15
0x0046	R/W	float	External analog input 16
0x0048	R/W	float	External analog input 17
0x004A	R/W	float	External analog input 18
0x004C	R/W	float	External analog input 19
0x004E	R/W	float	External analog input 20
0x0050	R/W	float	External analog input 21
0x0052	R/W	float	External analog input 22
0x0054	R/W	float	External analog input 23
0x0056	R/W	float	External analog input 24
0x0058	R/W	float	External analog input 25
0x005A	R/W	float	External analog input 26
0x005C	R/W	float	External analog input 27
0x005E	R/W	float	External analog input 28
0x0060	R/W	float	External analog input 29
0x0062	R/W	float	External analog input 30
0x0064	R/W	float	External analog input 31
0x0066	R/W	float	External analog input 32
0x0068	R/W	float	External analog input 33
0x006A	R/W	float	External analog input 34
0x006C	R/W	float	External analog input 35
0x006E	R/W	float	External analog input 36

Base address: 0x00A6

Address	Access	Data type	Signal designation
0x0000	R/W	char 21	Text 1 for batch reporting
0x000B	R/W	char 21	Text 2 for batch reporting
0x0016	R/W	char 21	Text 3 for batch reporting
0x0021	R/W	char 21	Text 4 for batch reporting
0x002C	R/W	char 21	Text 5 for batch reporting
0x0037	R/W	char 21	Text 6 for batch reporting
0x0042	R/W	char 21	Text 7 for batch reporting
0x004D	R/W	char 21	Text 8 for batch reporting
0x0058	R/W	char 21	Text 9 for batch reporting
0x0063	R/W	char 21	Text 10 for batch reporting

Base address: 0x0114

Address	Access	Data type	Signal designation
0x0000	R/W	char 21	Message text (for entry in the event list)

Base address: 0x011F

Address	Access	Data type	Signal designation
0x0000	W/O	char 11	Only for LOGOSCREEN cf: password
0x0006	R/O	12 byte	(*) reserve

Base address: 0x012B

Address	Access	Data type	Signal designation
0x0000	R/W	char 400	Recipe for batch reporting

External logic/binary inputs (R/W), external counters (R/0) and external analog inputs (R/W) can be programmed via the serial interface, or connected to the paperless recorder in the form of modules from the JUMO mTRON automation system. Further information can be found in the Operating Instructions B 95.5011.2.1 (LON interface).

The protocol addresses are given as bytes,
the data addressing is as words.

User data

A maximum of 10 bytes of user data can be defined. The quantity of user data applied is recorded (in words) in Bits 4 ... 13.

Command sequence

- PLC sends job1
  - PLC sets Bit 4 in the control byte
  - PLC receives the response Job OK or Job error
- PLC sends job 2
  - PLC resets Bit 4 in the control byte, and sets Bit 5
  - PLC receives the response Job OK or Job error
- PLC sends job 3
  - PLC resets Bit 5 in the control byte, and sets Bit 4
  - PLC receives the response Job OK or Job error
- etc.

Example (write):

Text 1 for batch reporting is to be written. Since a batch text can have a maximum of 20 characters, it is transmitted in two sections of 10 characters each. Character 21 (0x) can be omitted.

The following bytes must be transmitted to the recorder:

a.) Bytes 1 … 10

0x25	0x10	0xA6	0x54	0x68	0x75	0x65	0x72	0x69	0x6E	0x67	0x65	0x72
			T	h	u	e	r	i	n	g	e	r

b.) Bytes 11 … 20

0x15	0x10	0xAB	0x2D	0x42	0x72	0x61	0x74	0x77	0x75	0x72	0x73	0x74
			-	B	r	a	t	w	u	r	s	t

The start address for sending the first 10 characters is 0xA6. Since addressing is made as words, the second group of 10 characters must be sent addressed from 0xAB (0xA6 + 5).

6.6.1 PLC data in 16-bit format

The functions described below are only available for paperless recorders with a program version 100.03.05 or higher.

Internal measurement inputs of the paperless recorder

From program version 100.03.05 on, the internal measurement inputs (1 — 6 or 1 — 12) can be sent to the PROFIBUS master (PLC) not only in Real format (4 bytes), but also in Integer format (2 bytes).

With the help of the setup program of the paperless recorder, four values must be entered **for all the internal channels** (not for each one separately) for normalization of the measurements:

- Range start
- Range end
- Value for underflow
- Value for overflow

The internal measurements are converted from Real format into the Integer format. These four parameters were introduced so that one standard conversion could be used for all channels.

The parameters are entered in the section Interface 21. Call up the dialog by a double-click in the working area, or through the menu *Edit ➔ Interface 21 (PROFIBUS-DP)*.

External measurement inputs of the paperless recorder

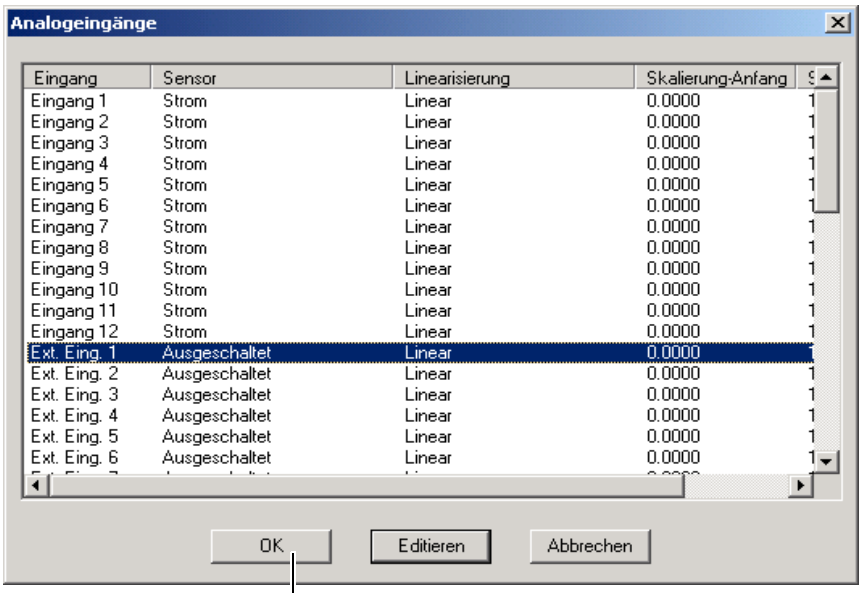
The external measurement inputs (1 — 36) can also be sent to the paperless recorder in Real format (4 bytes) as well as in Integer format (2 bytes). The GSD generator is also used here to decide which data format should be applied.

For the Integer format, the parameters *Range start* and *Range end* must be used to make the normalization for 16 bits. This can be done either through the setup program or by using the keypad on the device.

The analog input of the PLC provides a 16-bit measurement in the range from -27648 to +27648. The ranges depend on the input sensor that is selected and the input card that is used.

Example

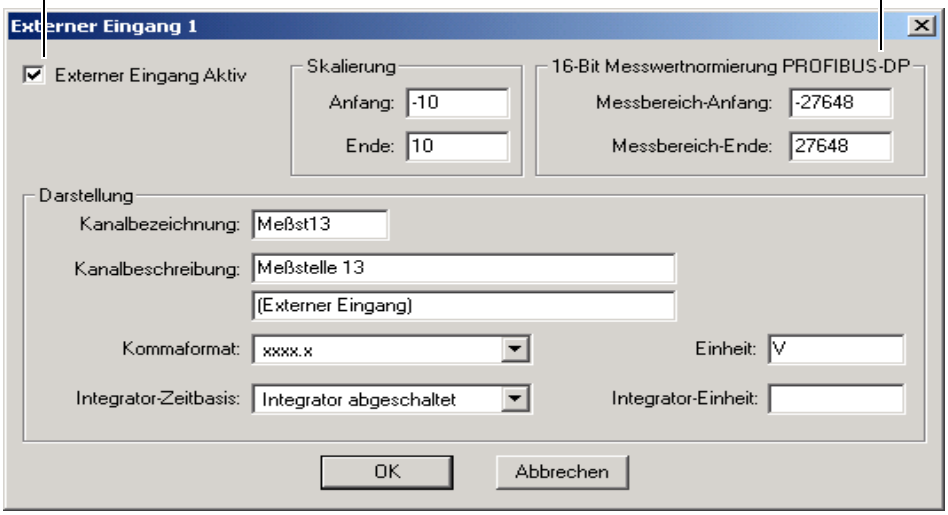
	Input meas. range of the PLC	Normalization range of the PLC	Meas. range of paperless recorder	Scaling of paperless recorder
Range start	-10V	-27648	-27648	-10
Range end	+10V	+27648	+27648	+10



For the external measurement inputs, the Edit button must be pressed first, …

... next, the external input can be activated and ...

... finally, carry out the normalization.



6.6.2 Bit-wise coded binary signals

The signals described below can be accessed with the help of the GSD generator.

Base address: 0x002F

Address	Access	Data type	Signal designation
0x0000	R/O	int	Group alarms and states of the binary logic inputs
	R/O	Bit0	Alarm group 1 0 = no alarm 1 = at least 1 limit infringed in the group
	R/O	Bit1	Alarm group 2
	R/O	Bit2	Alarm group 3
	R/O	Bit3	Alarm group 4
	R/O	Bit4	Alarm group 5
	R/O	Bit5	Alarm group 6
	R/O	Bit6-7	free
	R/O	Bit8	Binary input 1 0 = open / 1 = closed
	R/O	Bit9	Binary input 2
	R/O	Bit10	Binary input 3
	R/O	Bit11	Binary input 4
	R/O	Bit12	Binary input 5
	R/O	Bit13	Binary input 6
	R/O	Bit14	Binary input 7
	R/O	Bit15	free
0x0001	R/O	int	Binary signals
	R/O	Bit0	CompactFlash card in slot (0 = no, 1 = yes)
	R/O	Bit1	Stolen CF card (0 = no, 1 = removed while nobody was logged in)
	R/O	Bit2	Memory alarm: Not enough internal memory available. Data must be fetched with the CF card!

Address	Access	Data type	Signal designation
	R/O	Bit3	Memory alarm: Not enough internal memory available. Data must be removed via the serial interface!
	R/O	Bit4	Memory alarm: Not enough memory available on the Compact Flash card!
	R/O	Bit5	Log-in status: 0 = nobody logged in 1 = somebody is logged in
	R/O	Bit6	free
	R/O	Bit7	free
	R/O	Bit8	Combination alarm 0 = no alarm 1 = at least 1 limit infringed in the device
	R/O	Bit9	free
	R/O	Bit10	Fault 0 = no fault / 1 = fault
	R/O	Bit11-15	free
0x0002	R/O	int	binary logic outputs
	R/O	Bit0	Relay output 1 0 = not active / 1 = active
	R/O	Bit1	Relay output 2
	R/O	Bit2	Relay output 3
	R/O	Bit3	Relay output 4
	R/O	Bit4	Relay output 5
	R/O	Bit5	Open-collector output 0 = not active / 1 = active
	R/O	Bit6-15	free
0x0003	R/W	int	External binary logic inputs (either from external I/O modules or via MODbus)
	R/W	Bit0	External binary input 1 0 = open / 1 = closed
	R/W	Bit1	External binary input 2
	R/W	Bit2	External binary input 3
	R/W	Bit3	External binary input 4

Address	Access	Data type	Signal designation
	R/W	Bit4	External binary input 5
	R/W	Bit5	External binary input 6
	R/W	Bit6-15	free
0x0004	R/W	int	Flag for control of various device functions
	R/W	Bit0	Modbus flag (control flag) 0 = False / 1 = True
	R/W	Bit1-15	free

6.6.3 External inputs and a fault in the data exchange

As long as there is no exchange of data between the PLC and the recorder, the external analog inputs of the paperless recorder are treated as invalid (display --------). In this way, it is possible to recognize, when the measurements are evaluated, that no valid values exist for this period. This only applies to the external measurement inputs.

All other external data (binary logic signals, batch texts, ...) are frozen, and remain static at their present value.

6.7 JUMO µP transmitter/contr. dTRANS pH 01 and dTRANS Rd 01

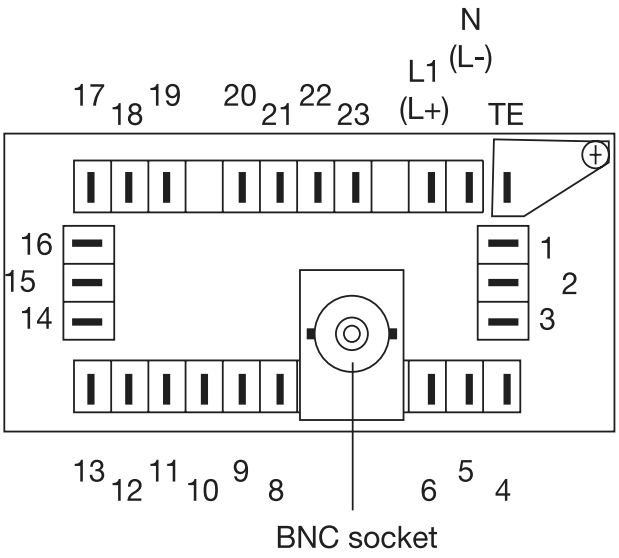
6.7.1 System requirements

The following requirements have to be met when connecting a JUMO dTRANS pH 01 or a JUMO dTRANS Rd 01 to a PROFIBUS-DP interface:

- The device must be equipped with a PROFIBUS-DP interface (order option).
- Software version 115.02.01 or newer is required.
  (Version can be queried by pressing the key combination PGM and ▲, the last 4 figures of the software version will be displayed).

6.7.2 Connection diagram dTRANS pH 01 and dTRANS Rd 01

Rear view of the device



Interface

PROFIBUS-DP

Connections

Sub-D[1]	dTRANS	Signal	Designation
8 brown	1	RxD/TxD-N	Receive/Transmit data negative A-cable
3 yellow	2	RxD/TxD-P	Receive/transmit data positive, B-cable
5 green	3	GND	Ground
6 white	4	VP	Supply voltage positive, (P5V)

[1] An adapter with a 9-pole Sub-D socket is included in the delivery.
Caution: Provide strain relief for the adapter!

6.7.3 Setting the slave address

The slave address is set with the help of the parameter *Serial interface... C113,* see Operating Instructions B 20.2530.0, Chapter 14.4 Serial interface... C113.

Setting	Meaning
1 — 99	Slave address, as selected

The baud rate is determined automatically (max. 12 Mbps).

If a new device address is selected, the device has to be reset (switch off/on again) for the new address to be accepted.

6.7.4 Diagnostic and status messages

If errors occur during communication with the device, the error message “PErr” appears in the lower 7-segment display.

Please check the wiring and the master (PLC). It may be necessary to restart the system.

6.8 JUMO µP transmitter/contr. dTRANS Lf 01, dTRANS Rw 01, and µP indicator/contr. for analytical measurements dTRANS Az 01

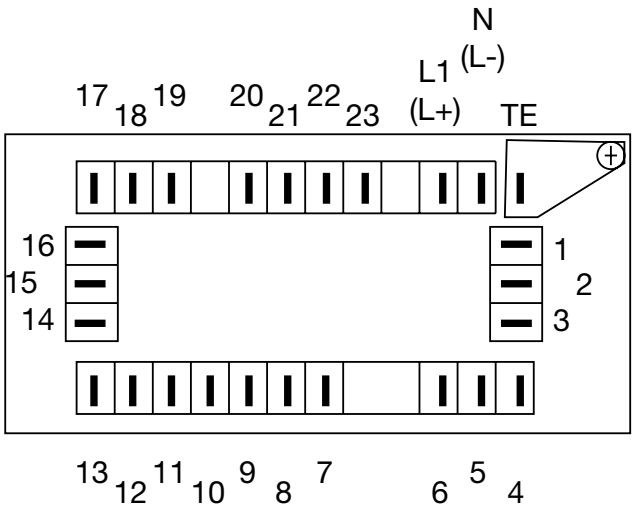
6.8.1 System requirements

The following requirements have to be met when connecting a JUMO dTRANS Lf 01, JUMO dTRANS Rw 01 or JUMO dTRANS Az 01 to the PROFIBUS-DP interface:

- The device must be equipped with a PROFIBUS-DP interface (order option).
- Software version 115.02.01 or newer is required.
  (Version can be queried by pressing the key combination PGM and ▲, the last 4 figures of the software version will be displayed).

6.8.2 Connection diagram dTRANS Lf 01, dTRANS Rw 01 and dTRANS Az 01

Rear view of the device



Interface

PROFIBUS-DP

Connections

Sub-D[1]	dTRANS	Signal	Designation
8 brown	1	RxD/TxD-N	Receive/Transmit data negative, A-cable
3 yellow	2	RxD/TxD-P	Receive/transmit data positive, B-cable
5 green	3	GND	Ground
6 white	4	VP	Supply voltage positive, (P5V)

[1] An adapter with a 9-pole Sub-D socket is included in the delivery.
Caution: Provide strain relief for the adapter!

6.8.3 Setting the slave address

The slave address is set with the help of the parameter *Serial interface... C113,* see Operating Instructions B20.2540.0, resp. B20.2545.0 Chapter 14.4 Serial Interface... C113.

Setting	Meaning
1 — 99	Slave address, as selected

The baud rate is determined automatically (max. 12Mbps).

☞ If a new device address is selected, the device has to be reset (switch off/on again) for the new address to be accepted.

6.8.4 Diagnostic and status messages

If errors occur during communication with the device, the error message “PErr” appears in the 7-segment display.

Please check the wiring and the master (PLC). It may be necessary to restart the system.

☞ If you require additional information on the commands within the GSD generator, please refer to the Interface Description B 70.3590.2.
The GSD file has been laid out for installation on the SIMATIC S7. Should installation problems occur with other controls, all entries Preset=1 must be deleted.
⇨ Chapter 3.3.4

In this case it is additionally necessary to set up the variables selected in the GSD generator in the process image of the PLC, in the correct sequence.

JUMO GmbH & Co. KG

Street address:
Moltkestraße 13 - 31
36039 Fulda, Germany
Delivery address:
Mackenrodtstraße 14
36039 Fulda, Germany
Postal address:
36035 Fulda, Germany
Phone: +49 661 6003-0
Fax: +49 661 6003-607
E-mail: mail@jumo.net
Internet: www.jumo.net

JUMO Instrument Co. Ltd.

JUMO House
Temple Bank, Riverway
Harlow, Essex CM20 2TT, UK
Phone: +44 1279 635533
Fax: +44 1279 635262
E-mail: sales@jumo.co.uk
Internet: www.jumo.co.uk

JUMO PROCESS CONTROL INC.

885 Fox Chase, Suite 103
Coatesville, PA 19320, USA
Phone: 610-380-8002
1-800-554-JUMO
Fax: 610-380-8009
E-mail: info@JumoUSA.com
Internet: www.JumoUSA.com