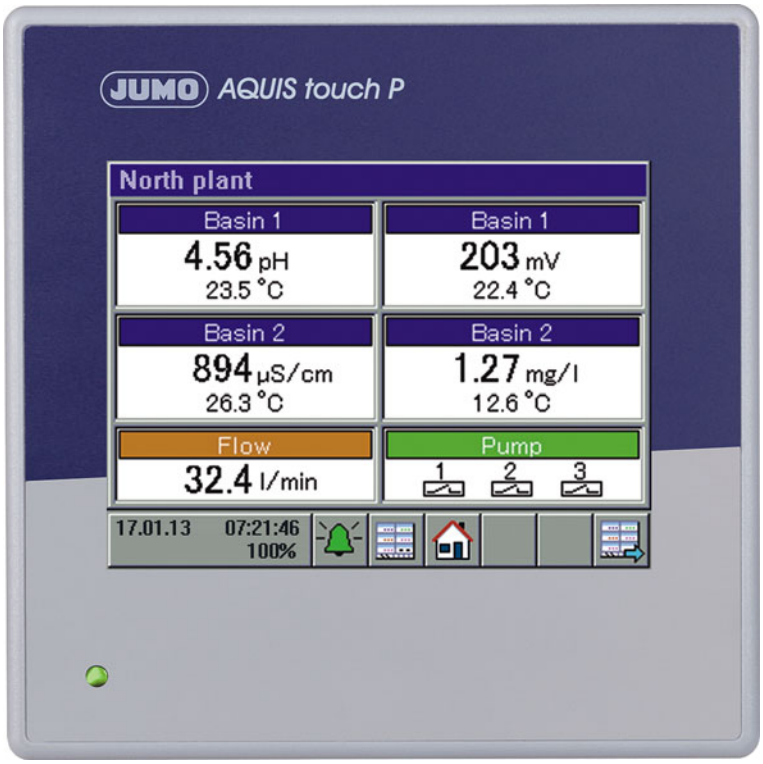
JUMO AQUIS touch P

Modular Multichannel Measuring Device for Liquid Analysis with Integrated Controller and Paperless Recorder



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Contents

1 Safety information 5

1.1 Warning symbols 5
1.2 Note signs 5

2 Compatibility and system requirements 7

2.1 Certification 7
2.2 PROFINET IO and Ethernet standard services 7
2.3 Requirements for hardware, software, and cabling 7

3 Electrical connection 9

4 The GSDML file 11

4.1 General information 11
4.2 Module description 11
4.2.1 Introduction to the module concept 11
4.2.2 Modules 11

5 Noncyclical data exchange 19

5.1 Programming the noncyclical data exchange in the IO controller 19
5.1.1 Single-ID and Multi-ID 21
5.2 Data tables of noncyclical data 27
5.2.1 Configuration data and parameters 27
5.2.2 Process values 36

6 Project planning 37

6.1 Project integration of JUMO IO devices 37
6.2 Configuring PROFINET modules 38
6.3 Configuring the JUMO IO device 42
6.3.1 Start-up parameters 42
6.3.2 Communication parameters 42
6.3.3 Device information 45

7 Error messages 49

7.1 Error messages for invalid values 49
7.2 Error messages for acyclic services 49

Contents

1.1 Warning symbols



DANGER!

This symbol indicates that **personal injury from electrocution** may occur if the appropriate precautionary measures are not taken.



WARNING!

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



CAUTION!

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



CAUTION!

This symbol indicates that **components could be destroyed** by electrostatic discharge (ESD = Electro Static Discharge) if the respective cautionary measures are not taken.

Only use the ESD packages intended for this purpose to return device inserts, assembly groups, or assembly components.



READ THE DOCUMENTATION!

This symbol, which is attached to the device, indicates that the associated **documentation for the device** must be **observed**. This is necessary to identify the nature of the potential hazard, and to take measures to prevent it.

1.2 Note signs



NOTE!

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



REFERENCE!

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



FURTHER INFORMATION!

This symbol is used in tables and indicates that **further information** is provided after the table.



DISPOSAL!

At the end of its service life, the device and any batteries present do not belong in the trash! Please ensure that they are **disposed of** properly and in an **environmentally friendly** manner.

1 Safety information

2 Compatibility and system requirements

2.1 Certification

JUMO IO devices are certified by the PNO to Conformance Class B (abbreviated to CC-B) and net load class "Netload Class III".

The certificate for the JUMO AQUIS touch P is available for download from the product page on the Internet.

The following QR code or web address will take you to the product page of the JUMO AQUIS touch P:

qr-202580-en.jumo.info

2.2 PROFINET IO and Ethernet standard services

The PROFINET interface supports all Ethernet standard services. Over this interface, the device can also be accessed via the JUMO PC setup program and the JUMP PCC/PCA software. Additionally, the JUMO field device can send its e-mails over this interface. The Ethernet standard services are also available during the cyclical PROFINET communication.

The PROFINET IO communication occurs in a parameterizable time pattern (RT channel). This ensures that the IO data are transferred in real-time without being affected by Ethernet standard services. The remaining time between the RT phases (NRT channel) is used for the communication between the Ethernet standard services. Broadband bottlenecks impair the performance of the standard services. The real-time capability of the PROFINET IO communication is guaranteed by the reserved RT channel.

2.3 Requirements for hardware, software, and cabling

Network installation

Any switches used to network PROFINET IO devices must support the following standards and functions:

- 100 Mbit/s (transfer rate of the switchports)
- Auto negotiation (automatic setting of the switchport transfer rate)
- Cut through (direct relaying of the data between the switchports)

  Full duplex support for the switchports

  IEEE 802.1 Q (VLAN support for at least 4 priority classes)

The network installation must be executed compliant with the requirements of a 100Base TX Ethernet network with cabling to CLASS D or higher. The "PROFINET Cabling and Interconnection Technology" guideline also provides information on correct cabling.

JUMO AQUIS touch P

To use the PROFINET IO with JUMO AQUIS touch, the device must meet the following minimum requirements:

- Device software version 304.04.xx or higher
- Hardware compatibility index 0x2 or higher

2 Compatibility and system requirements

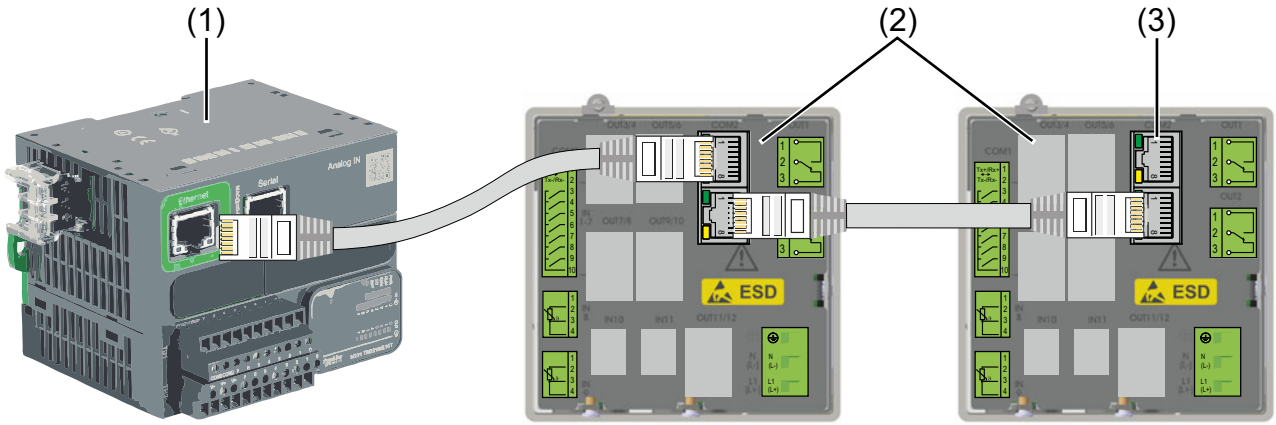
The information can be displayed and reviewed with the aid of the device menu.

Open device software version:
Device menu > Device info > General > Version > SW version

Open hardware compatibility index:
Device menu > Device info > General > Version > HW compatibility index

Cabling

JUMO field devices with PROFINET IO interface have two Ethernet switchports. Additional field devices, IO controllers, an IO supervisor (programming device and/or PC for project planning) or other Ethernet components such as switches, routers etc. can be connected to each Ethernet switchport on the device.



(1) PROFINET IO controller (PLC, control station PC or similar)
(2) JUMO PROFINET IO devices
(3) free Ethernet port (e.g. for additional PROFINET IO devices)

NOTE!

The cyclical data exchange with JUMO PROFINET IO devices is based on the RT protocol (Conformance Class B). PROFINET RT communication cannot be routed. It is thus necessary that the PROFINET IO controller and the IO devices be in a common broadcast domain (not connected via a router). Ethernet standard services (webserver, access via JUMO PC setup program/PCA/PCC and e-mail function) and NRT communication (e.g. project planning on the IO supervisor, system boot, noncyclical data, etc.) function via routers as before.

3 Electrical connection

4.1 General information

The GSDML file of a PROFINET device contains all the information required to provide your PLC engineering system with the PROFINET IO functionality of the JUMO AQUIS touch P. It must be imported into the engineering system so that the JUMO AQUIS touch P is available here for project planning. Once the GSDML file has been imported, the relevant device and its IO functions can be integrated into the programming system of your PLC projects.

4.2 Module description

4.2.1 Introduction to the module concept

The configuration of the IO data of JUMO field devices to be transferred via the PROFINET IO is defined by the PROFINET modules of the device software.

The "DeviceStatusBlock" module of JUMO field devices has a defined configuration and cannot be changed. It contains a range of cyclical IO data on the device status and the PROFINET start-up parameters for the JUMO field device concerned. In the project structure of the IO controller, this module is always located in Slot 1 of JUMO IO devices. It cannot be relocated or removed.

The JUMO PC setup program can be used to create additional modules in the module configuration of the device concerned. This involves device data being selected from the selectors in the JUMO field device and assigned to the corresponding IO items in the modules. The PC setup program can be used to print the finished module configuration as a basis for the project planning of the IO controller. In the project configuration of the IO controller, the modules to be transferred via the PROFINET-IO have to be assigned to the free slots of the JUMO IO device in the project structure of the IO controller. The IO items of the inserted modules are then available for the programming of the IO controller. The assignment of the JUMO field device data to the IO items of the individual modules is provided for the programmer in the printed module configuration list.

⇨ chapter 6 "Project planning", Page 37

4.2.2 Modules



CAUTION!

All temperature values of the JUMO IO device are transferred in the unit "°C".

Misinterpretation of measured values of a JUMO IO device in the IO controller can cause errors in the system control.

▶ Note the unit for the transferred temperature values!

"DeviceStatusBlock" module of the JUMO AQUIS touch P

The "DeviceStatusBlock" module of JUMO IO devices has a defined configuration and cannot be changed. It contains a range of cyclical IO data on the device status and the PROFINET start-up parameters. The IO controller is only able to read the data of this module. The tables below list the data in the "DeviceStatusBlock" module of the JUMO AQUIS touch P.

Cyclical IO data, DeviceStatusBlock

IO item	Type	Bit item	Bit address	Explanation
Sub-module 1				
Status bits 1	UINT	Collective alarm	0	Alarms and internal signals from the binary selection on the JUMO AQUIS touch P
		Collective alarm acknowledged	1	
		Collective alarm for control acknowledged	2	
		Memory alarm	3	
		Logon	4	
		Malfunction	5	
		USB inserted	6	
		–	7	
		Battery empty	0	
		Pre-alarm battery	1	
		Calibration active	2	
		Controller manual mode	3	
		Temperature in °F	4	
		Temperature inside device too high	5	
		–	6	
		–	7	
Bit field for digital inputs	UINT	Digital input 1 (IN1)	0	Binary input signals from the binary selection on the JUMO AQUIS touch P
		Digital input 2 (IN2)	1	
		Digital input 3 (IN3)	2	
		Digital input 4 (IN13)	3	
		Digital input 5 (IN14)	4	
		Digital input 6 (IN15)	5	
		Digital input 7 (IN16)	6	
		Digital input 8 (IN17)	7	
		Digital input 9 (IN18)	0	
		–	1	
		–	2	
		–	3	
		–	4	
		–	5	
		–	6	
		–	7	

Cyclical IO data, DeviceStatusBlock

IO item	Type	Bit item	Bit address	Explanation
Controller 1 actual value	REAL	–	–	Analog input signals from the analog input selection on the JUMO AQUIS touch P
Controller 1 setpoint value	REAL	–	–	
Controller 1 output level 1	REAL	–	–	
Controller 1 output level 2	REAL	–	–	
Controller 2 actual value	REAL	–	–	
Controller 2 setpoint value	REAL	–	–	
Controller 2 output level 1	REAL	–	–	
Controller 2 output level 2	REAL	–	–	
Temperature input 1 (IN4)	REAL	–	–	
Temperature input 2 (IN5)	REAL	–	–	
Universal input 1 (IN6)	REAL	–	–	
Analysis input 1 (IN7)	REAL	–	–	
Analysis input 2 (IN8)	REAL	–	–	
–	REAL	–	–	
–	REAL	–	–	
–	REAL	–	–	
–	REAL	–	–	
Analog output 1 (OUT4)	REAL	–	–	Analog output signals from the analog output selection on the JUMO AQUIS touch P
–	REAL	–	–	
Analog output 3 (OUT6)	REAL	–	–	
Analog output 4 (OUT8)	REAL	–	–	

Cyclical IO data, DeviceStatusBlock

IO item	Type	Bit item	Bit address	Explanation
Bit field for binary outputs/limit values	USINT	Digital output 1 (OUT1)	0	Digital output signals from the digital output selection on the JUMO AQUIS touch P
		Digital output 2 (OUT2)	1	
		–	2	
		Digital output 4 (OUT6)	3	
		Digital output 5 (OUT7)	4	
		Digital output 6 (OUT8)	5	
		Digital output 7 (OUT9)	6	
		Digital output 8 (OUT10)	7	
Bit field for binary outputs/limit values	USINT	Digital output 9 (OUT11)	0	
		Digital output 10 (OUT12)	1	
		Digital output 11 (OUT13)	2	
		–	3	
		–	4	
		–	5	
		–	6	
		–	7	
Bit field for binary outputs/limit values	USINT	–	0	
		Limit value monitoring 1 alarm 1	1	
		Limit value monitoring 1 alarm 2	2	
		Limit value monitoring 2 alarm 1	3	
		Limit value monitoring 2 alarm 2	4	
		Limit value monitoring 3 alarm 1	5	
		Limit value monitoring 3 alarm 2	6	
		Limit value monitoring 4 alarm 1	7	
Bit field for binary outputs/limit values	USINT	Limit value monitoring 4 alarm 2	0	
		Limit value monitoring 5 alarm 1	1	
		Limit value monitoring 5 alarm 2	2	
		Limit value monitoring 6 alarm 1	3	
		Limit value monitoring 6 alarm 2	4	
		Limit value monitoring 7 alarm 1	5	
		Limit value monitoring 7 alarm 2	6	
		–	7	

Cyclical IO data, DeviceStatusBlock

IO item	Type	Bit item	Bit address	Explanation
Empty byte	USINT	–		Not used

DeviceStatusBlock start-up parameter

Parameter	Type	Values	Explanation
Byte sequence for cyclical data	Bit	0 (Big Endian) 1 (Little Endian)	Selection of byte sequence for transferred cyclical data The byte sequence to be set is specified by the IO controller.
Byte sequence for noncyclical data	Bit	0 (Big Endian) 1 (Little Endian)	Selection of byte sequence for transferred noncyclical data The byte sequence to be set is specified by the IO controller.
IOPS handling	Bit	0 (OFF) 1 (ON)	Handling of the IOPS status via the IO device **0 (OFF):** The IOPS status of the relevant IO device slot is valid following successful system boot and no longer depends on the validity of the input data. The validity check of the input values must be implemented in the IO controller if necessary. **1 (ON):** The IOPS status of the respective IO device slot communicates to the IO controller the validity status of the input values following successful system boot. If the IOPS status is valid, all values of the slot are valid. If at least 1 invalid input value occurs in the slot concerned, the IOPS status is likewise set to invalid. In case of invalid float values (REAL type), JUMO field devices map an error code in the transferred input values. As a result, the error number rather than the input value is contained. ⇨ chapter 7.1 "Error messages for invalid values", Page 49

Configurable modules

The configurable modules are intended exclusively for transferring cyclical IO data. The assignment of the modules can be compiled and printed via the JUMO PC setup program of the AQUIS touch P. The printed list will help you maintain an overview of the configured modules of the JUMO IO device during the project planning and programming of the IO controller (PLC, host PC or similar).

⇨ chapter 4.2.2 "Modules", Page 11

The JUMO AQUIS touch P supports up to 10 slots in total (9 configurable slots + DeviceStatusBlock) in the device and 10 slots in the IO controller project. The possible types of configurable modules are listed in the table below.

Module types	IO items	Data type	Data direction IO controller
Analog input values	Analog values 1 to 16,	REAL	read
Digital input values	Digital values 1 to 32	BOOL	read
Analog output values	Analog values 1 to 8	REAL	write
Digital output values	Digital values 1 to 3	BOOL	write

4 The GSDML file



CAUTION!

All temperature values of the JUMO IO device are transferred in the unit "°C".

Misinterpretation of measured values of a JUMO IO device in the IO controller can cause errors in the system control.

▶ Note the unit for the transferred temperature values!

5.1 Programming the noncyclical data exchange in the IO controller

In addition to the cyclical data exchange between IO controller and IO device in the RT channel, PROFINET IO also offers the option of event-controlled noncyclical data exchange. The noncyclical communication is controlled by the IO controller (similar to the master-slave principle) via write/read requests and has to be implemented by the user. Noncyclical data are provisioned by PROFINET IO users as "Record Data". The transfer occurs in the NRT channel.

For the programming of write/read requests, the engineering systems of the various manufacturers contain libraries with relevant function blocks such as "RDREC" (Read Record) and "WRREC" (Write Record).

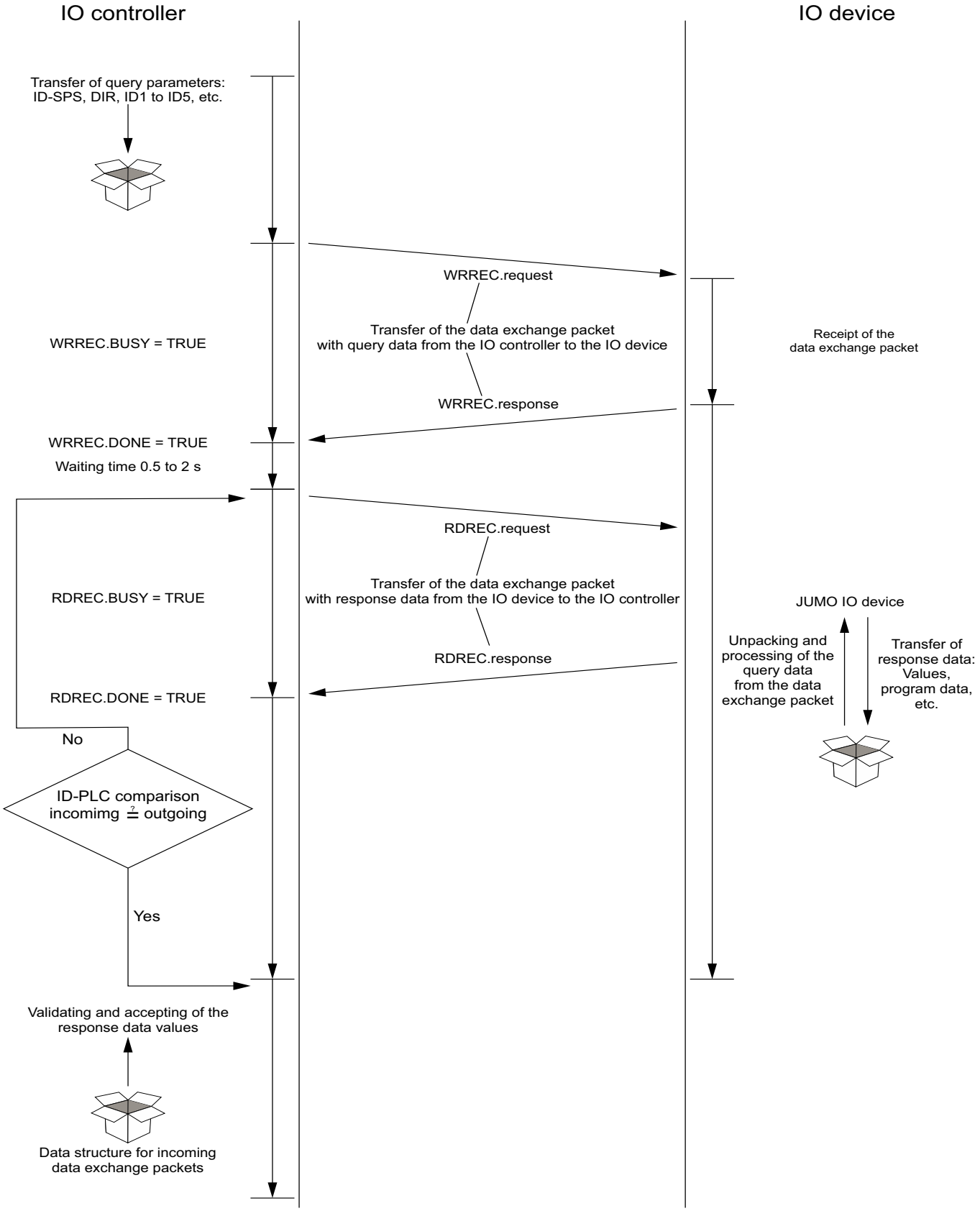
With JUMO PROFINET IO devices, the write/read requests do not access the "Record Data" directly. Instead, they transfer data exchange packets between IO controller and IO device, which are further processed in the background by the field devices. For an IO controller to be able to exchange noncyclical data with a JUMO IO device, appropriate data structures (data blocks/data type objects) have to be created in the IO controller for the data exchange packet concerned. These data structures provide the memory for the outgoing and incoming data exchange packets. Data exchange packets are identified by an index, which have to be transferred to the write/read function blocks in the form of parameters. JUMO PROFINET IO devices have 3 indices for 3 different types of data exchange packets, which are transferred via the write/read commands. The table below lists the available indices of JUMO field devices.

Index	Data exchange packets	Explanation
201	Single-ID	For the write and read transfer of single noncyclical data points with a length of up to 243 bytes within a data exchange sequence Length of the data exchange packet: 255 bytes
202	Multi-ID	For the write and read transfer of multiple noncyclical data points within a data exchange sequence, the single data points are allowed to be up to 4 bytes long. Length of the data exchange packet: 640 bytes

Within a data exchange sequence, the IO controller transfers a data exchange packet to the IO device. The IO device processes the data exchange packet and re-provisions it for pick-up by the IO controller (response with data or status messages). In order to control processing by the IO device (e.g. defining the data direction and selection of noncyclical data), the data exchange packet must be parameterized accordingly.

With JUMO IO devices, the noncyclical services are always assigned to Slot 1. In JUMO IO devices, Slot 1 is always pre-configured. Consequently, the noncyclical services are not dependent upon the module configuration or project planning in the IO controller, and are available as soon as the system has successfully booted.

Sequence of a WRREC-RDREC cycle for transferring data exchange packets



5.1.1 Single-ID and Multi-ID

To implement the exchange of single (Single-ID) or multiple (Multi-ID) noncyclical data points, you must take the following steps:

- Declare 1 data structure each for both the outgoing and the incoming direction. Select the "Single-ID" format to transfer 1 data point within a data exchange sequence. Select the "Multi-ID" format to transfer up to 4 data points within a data exchange sequence.
- Program a sequence control for the data exchange sequence.

The procedure is described below.

Declaration of a data structure in the "Single-ID" format

In the IO controller, you need to declare 1 data structure each (user-defined "STRUCT variable") for incoming and outgoing data exchange packets as the target and source memory for data exchange packets. Data exchange packets in the "Single-ID" format have a fixed length of 65 bytes and must be created with the following structure:

Structure variable for data exchange packets in the "Single-ID" format

Data type	Name	Explanation
BYTE	ID-PLC	Sequential numbering for assigning the data exchange packets from queries and responses The "ID-PLC" value can be used by the IO controller for sequentially numbering the outgoing data exchange packets. JUMO IO devices enter the same number in the ID-PLC in the data exchange packet of the ensuing response, so that response and query can be assigned at the IO controller, or so that an error in the sequence of query and response can be intercepted by suitable control structures in the IO controller.
BYTE	**Outgoing:** DIR **Incoming:** ERROR	**Data structure for outgoing data exchange packets:** „DIR“ ist die Data direction for transferring noncyclical data. The data direction must be specified by the PLC programmer in the data exchange packet of the query from the IO controller and controls the processing of the data in the JUMO IO device accordingly. Coding: Value = 1: Write (from IO controller to IO device) Value = 2: Read (from IO device to IO controller) **Data structure for incoming data exchange packets:** In case of "ERROR", the JUMO IO device enters an integer value as error indicator. In the IO controller, "ERROR" can be evaluated via a corresponding control structure. List of error values: ⇨ chapter 7 "Error messages", Page 49
WORD	ID1	5-element ID of the data point from the noncyclical data table (see chapter 5.2 "Data tables of noncyclical data", Page 27)
WORD	ID2	
WORD	ID3	
WORD	ID4	
WORD	ID5	
ARRAY[53 bytes] (e.g. REAL, INT, BYTE)	VALUE	Data point to be queried or overwritten of the noncyclical data with a length of 53 bytes; however, only a maximum of 4 bytes are currently used. Value to be read/written of the data point; this variable can be declared as any data type with a length of 4 bytes.

Declaration of a data structure in the "Multi-ID" format

In the IO controller, you need to declare 1 data structure each (user-defined "STRUCT variable") for incoming and outgoing data exchange packets as the target and source memory for incoming/outgoing data exchange packets. Data exchange packets in the "Multi-ID" format have a fixed length of 65 bytes and must be created with the following structure:

Structure variable for data exchange packets in the "Multi-ID" format

Data type	Name	Explanation
BYTE	ID-PLC	Sequential numbering for assigning the data exchange packets from queries and responses The "ID-PLC" value must be used by the IO controller for sequentially numbering the outgoing data exchange packets. JUMO IO devices enter the same number in the ID-PLC in the data exchange packet of the ensuing response, so that response and query can be assigned at the IO controller, or so that an error in the sequence of query and response can be intercepted by suitable control structures in the IO controller.

Structure variable for data exchange packets in the "Multi-ID" format

<table>
<tr><th>Data type</th><th>Name</th><th colspan="2">Explanation</th></tr>
<tr><td>BYTE</td><td>DIR_1[a]</td><td rowspan="8">Query/response data for data point 1</td><td rowspan="10">Data for transferring up to 4 data points of noncyclical data; the following variables are declared for each data point:
DIR: Data direction for transferring the respective data point;
The data direction of each data point must be specified by the PLC programmer in the data exchange packet of the query from the IO controller. The "DIR" variables control the processing of the single data points in the JUMO IO device accordingly.
Coding:
Value = 1: Write (from IO controller to IO device)
Value = 2: Read (from IO device to IO controller)

ERROR:
Data structure for incoming data exchange packets:
In case of "ERROR", the JUMO IO device enters an integer value as error indicator. In the IO controller, "ERROR" can be evaluated via a corresponding control structure.
List of error values:
⇨ chapter 7 "Error messages", Page 49
ID1 to ID5: 5-element ID of the respective data point from the noncyclical data table
⇨ chapter 5.2 "Data tables of noncyclical data", Page 27
VALUE: Value to be read/written of the respective data point; this variable must always be declared as a basic data type with a length of 32 bits. If the query aims at an IO device data type with 16 or 8 bits, only the corresponding lower-value bytes are relevant. The higher-value bytes are to be considered pure fill bits.</td></tr>
<tr><td>BYTE</td><td>ERROR_1[a]</td></tr>
<tr><td>WORD</td><td>ID1_1[a]</td></tr>
<tr><td>WORD</td><td>ID2_1[a]</td></tr>
<tr><td>WORD</td><td>ID3_1[a]</td></tr>
<tr><td>WORD</td><td>ID4_1[a]</td></tr>
<tr><td>WORD</td><td>ID5_1[a]</td></tr>
<tr><td>Any basic data type with a length of 32 bits</td><td>VALUE_1[a]</td></tr>
<tr><td>.
.
.</td><td>.
.
.</td><td>Query/response data for data points 2 and 3 with identical structure</td></tr>
<tr><td>BYTE</td><td>DIR_32[a]</td><td rowspan="8">Query/response data for data point 4</td></tr>
<tr><td>BYTE</td><td>ERROR_32[a]</td></tr>
<tr><td>WORD</td><td>ID1_32[a]</td></tr>
<tr><td>WORD</td><td>ID2_32[a]</td></tr>
<tr><td>WORD</td><td>ID3_32[a]</td></tr>
<tr><td>WORD</td><td>ID4_32[a]</td></tr>
<tr><td>WORD</td><td>ID5_32[a]</td></tr>
<tr><td>Any basic data type with a length of 32 bits</td><td>VALUE_32[a]</td></tr>
</table>

[a] In the "Multi-ID" format, all variables are declared and also transferred for 4 data points.



CAUTION!

The data exchange packets have a predefined format.

If the data structures are not filled with fill bytes to the correct length, errors can occur during the data exchange.

▶ Be sure to respect the data structure defined above (data types, sequence of the variables and total length, including fill bytes) when declaring the data structures for data exchange packets.

Data exchange sequence for data exchange packets in the "Single-ID" and "Multi-ID" formats

With JUMO IO devices, the noncyclical data are not directly accessed via the "WRREC" and "RDREC" PROFINET IO function blocks. Instead, data exchange packets that are processed by the IO device are transferred. The IO controller has to write a data exchange packet with query data to the JUMO IO device (WRREC). JUMO IO devices accept the data from the data exchange packet and then prepare this packet with response data for the IO controller. The IO controller must pick up this data exchange packet with response data again (RDREC). The data exchange packets in the "Single-ID" format can be used to transfer single data points within a data exchange sequence. The "Multi-ID" format can be used to transfer up to 4 data points within a data exchange sequence. This requires a suitable sequence control to be implemented in the IO controller.The sequence control of a data exchange sequence in the "Single-ID" and "Multi-ID" formats can be designed as follows:

Sequence control of a data exchange sequence for single-ID data exchange packets

1. **Parameterize data structure for outgoing data exchange packets with query data:** To be able to correctly control the processing of the query in the JUMO IO device, the "ID-PLC" count variable is incremented. It can be used to check the affiliation of query and response data. In the "DIR" variable, the transfer direction (write/read) for the single data points must be defined (see description of the data structures for the "Single-ID" and "Multi-ID" formats above). The 5-element IDs of the respective data points to be written to/read in the JUMO IO device are entered into fields ID1 to ID5 (see chapter 5.2 "Data tables of noncyclical data", Page 27). For write data exchange sequences (IO controller sends data points to IO device), the values to be transferred must be entered into the "VALUE" variables. For queries in "Multi-ID" format, the number of data points to be transferred must be entered into the "NUMBER" variable. The first of the indicated number of corresponding data points are read/written. The subsequent data points are not processed by the JUMO IO device.
2. **Transfer the data exchange packet to the IO device:** The data exchange packet must now be transferred to the IO device. This is done by calling up the write function (WRREC) in the IO controller. The parameters that have to be transferred at call-up appear in the table at the end of this section.
3. **Wait for the successfully completed transfer of the outgoing data exchange packet:** The JUMO IO device acknowledges the "Write Request" of the IO controller following successful transfer (Write Response). "WRREC.DONE", "WRREC.BUSY", "WRREC.ERROR" and "WRREC.STATUS" can be evaluated to be able to query the status of the transfer. The JUMO IO device reports back WRREC.DONE = TRUE to the IO controller to signal successful receipt of the data exchange packet. The JUMO IO device starts to process the transferred query data. At this point, the IO controller should respect a waiting period of 0.5 to 2 seconds before continuing with the next steps in the data exchange sequence.
4. **Pick-up of the data exchange packet with response data from the IO device:** The IO controller must pick-up data exchange packets from the device in cycles and check their validity as response data by means of "ID-PLC" (polling). If the values of outgoing and incoming "ID-PLC" match, valid response data have been read from the JUMO IO device. The IO controller can then end the polling process and accept the response data from the data structure of the incoming data exchange packets.
   a) **Polling:** The IO controller has to pick-up, via cyclical read accesses (RDREC), data exchange packets from the JUMO IO device, place them in the data structure for incoming data exchange packets and compare the "ID-PLC" variables in the data structures for outgoing and incoming data exchange packets with one another (polling). Unless the outgoing and incoming values of "ID-PLC" are identical, processing in the JUMO IO device is still ongoing and the IO controller must continue with the polling process. If the values of outgoing and incoming "ID-PLC" match, the IO controller has received valid response data from the JUMO IO device and polling can be ended.

      In order to query the status of the individual RDREC transfers within the poll cycles, "RDREC.VALID", "RDREC.BUSY", "RDREC.ERROR" and "RDREC.STATUS" can be evaluated. When RDREC.VALID = TRUE, the data exchange packet has been successfully received and transferred to the data structure for incoming data exchange packets. Following the successful transfer of a data exchange packet, outgoing and incoming "ID-PLC" must be compared and

a decision made as to whether a further poll cycle is required ("ID-PLC" different) or valid response data were received ("ID-PLC" identical). The parameters that need to be transferred at cyclical call-ups of RDREC appear in the table at the end of this section.

b) **Acceptance of response data:** As soon as a data exchange packet is received from the JUMO IO device and the values for "ID-PLC" in the data structures for outgoing and incoming data exchange packets are identical, the data structure for incoming data exchange packets contains the valid response data from the JUMO IO device. The data have to be copied from here to the target before they are overwritten by another read request.

Parameterizing function blocks WRREC/RDREC

Input parameters for WRREC/ RDREC	**Transfer values**	
	Single-ID	**Multi-ID**
LEN (Length of the data to be written for WRREC in bytes)	65	65
MLEN (Maximum length of the data to be read for RDREC in bytes)		
ID (Hardware detection of slots/subslots to be addressed on the IO device)	Hardware detection of Slot 1 on JUMO IO devices (DeviceStatusBlock)	
INDEX (Index of the target range for data exchange packets of JUMO IO devices)	201	202
RECORD (Pointer on data points to be read/ written; with JUMO IO devices, data structures for incoming and outgoing data exchange packets are transferred.)	for WRREC: Pointer on the data structure for **outgoing** data exchange packets for RDREC: Pointer on the data structure for **incoming** data exchange packets	

5.2 Data tables of noncyclical data



CAUTION!

All temperature values of the JUMO IO device are transferred in the unit "°C".

Misinterpretation of measured values of a JUMO IO device in the IO controller can cause errors in the system control.

▶ Note the unit for the transferred temperature values!

5.2.1 Configuration data and parameters



CAUTION!

Write operations of Read/Write parameters result in saving to the flash memory. This memory accommodates only a limited number of write cycles.

Writing to it with constantly changing values can therefore result in a memory error in the event of a power failure.

▶ Avoid rapid write accesses with constantly changing values!

Limit values for limit value monitoring 1 to 8

Index					Signal designation	Data type	Access
2	84	0	3	0	Limit value monitoring 1 alarm 1	REAL	Read/Write
2	84	1	3	0	Limit value monitoring 1 alarm 2	REAL	Read/Write
2	84	2	3	0	Limit value monitoring 2 alarm 1	REAL	Read/Write
2	84	3	3	0	Limit value monitoring 2 alarm 2	REAL	Read/Write
2	84	4	3	0	Limit value monitoring 3 alarm 1	REAL	Read/Write
2	84	5	3	0	Limit value monitoring 3 alarm 2	REAL	Read/Write
2	84	6	3	0	Limit value monitoring 4 alarm 1	REAL	Read/Write
2	84	7	3	0	Limit value monitoring 4 alarm 2	REAL	Read/Write
2	84	8	3	0	Limit value monitoring 5 alarm 1	REAL	Read/Write
2	84	9	3	0	Limit value monitoring 5 alarm 2	REAL	Read/Write
2	84	10	3	0	Limit value monitoring 6 alarm 1	REAL	Read/Write
2	84	11	3	0	Limit value monitoring 6 alarm 2	REAL	Read/Write
2	84	12	3	0	Limit value monitoring 7 alarm 1	REAL	Read/Write
2	84	13	3	0	Limit value monitoring 7 alarm 2	REAL	Read/Write
2	84	14	3	0	Limit value monitoring 8 alarm 1	REAL	Read/Write
2	84	15	3	0	Limit value monitoring 8 alarm 2	REAL	Read/Write

Limit values for temperature inputs IN4 and IN5

Index					Signal designation	Data type	Access
2	44	0	3	0	Limit value for temperature input IN4 alarm 1	REAL	Read/Write
2	44	1	3	0	Limit value for temperature input IN4 alarm 2	REAL	Read/Write
2	44	2	3	0	Limit value for temperature input IN5 alarm 1	REAL	Read/Write
2	44	3	3	0	Limit value for temperature input IN4 alarm 2	REAL	Read/Write

Limit values for universal inputs IN6, IN11 and IN12

Index					Signal designation	Data type	Access
2	48	0	3	0	Limit value for universal input IN6 alarm 1	REAL	Read/Write
2	48	1	3	0	Limit value for universal input IN6 alarm 2	REAL	Read/Write
2	48	2	3	0	Limit value for universal input IN11 alarm 1	REAL	Read/Write
2	48	3	3	0	Limit value for universal input IN11 alarm 2	REAL	Read/Write
2	48	4	3	0	Limit value for universal input IN12 alarm 1	REAL	Read/Write
2	48	5	3	0	Limit value for universal input IN12 alarm 2	REAL	Read/Write

Limit values of pH/redox/NH_3 for analysis inputs IN7 and IN8

Index					Signal designation	Data type	Access
2	57	0	3	0	Limit value for analysis input IN7 alarm 1	REAL	Read/Write
2	57	1	3	0	Limit value for analysis input IN7 alarm 2	REAL	Read/Write
2	57	2	3	0	Limit value for analysis input IN8 alarm 1	REAL	Read/Write
2	57	3	3	0	Limit value for analysis input IN8 alarm 2	REAL	Read/Write

Limit values of CR (conductive conductivity) for analysis inputs IN7 and IN8

Index					Signal designation	Data type	Access
2	61	0	3	0	Limit value for analysis input IN7 measuring range 1 alarm 1	REAL	Read/Write
2	61	0	3	1	Limit value for analysis input IN7 measuring range 2 alarm 1	REAL	Read/Write
2	61	0	3	2	Limit value for analysis input IN7 measuring range 3 alarm 1	REAL	Read/Write
2	61	0	3	3	Limit value for analysis input IN7 measuring range 4 alarm 1	REAL	Read/Write
2	61	1	3	0	Limit value for analysis input IN7 measuring range 1 alarm 2	REAL	Read/Write
2	61	1	3	1	Limit value for analysis input IN7 measuring range 2 alarm 2	REAL	Read/Write
2	61	1	3	2	Limit value for analysis input IN7 measuring range 3 alarm 2	REAL	Read/Write
2	61	1	3	3	Limit value for analysis input IN7 measuring range 4 alarm 2	REAL	Read/Write
2	61	2	3	0	Limit value for analysis input IN8 measuring range 1 alarm 1	REAL	Read/Write
2	61	2	3	1	Limit value for analysis input IN8 measuring range 2 alarm 1	REAL	Read/Write
2	61	2	3	2	Limit value for analysis input IN8 measuring range 3 alarm 1	REAL	Read/Write
2	61	2	3	3	Limit value for analysis input IN8 measuring range 4 alarm 1	REAL	Read/Write

Index					Signal designation	Data type	Access
2	61	3	3	0	Limit value for analysis input IN8 measuring range 1 alarm 2	REAL	Read/Write
2	61	3	3	1	Limit value for analysis input IN8 measuring range 2 alarm 2	REAL	Read/Write
2	61	3	3	2	Limit value for analysis input IN8 measuring range 3 alarm 2	REAL	Read/Write
2	61	3	3	3	Limit value for analysis input IN8 measuring range 4 alarm 2	REAL	Read/Write

Limit values of Ci (inductive conductivity) for analysis inputs IN7 and IN8

Index					Signal designation	Data type	Access
2	65	0	3	0	Limit value for analysis input IN7 measuring range 1 alarm 1	REAL	Read/Write
2	65	0	3	1	Limit value for analysis input IN7 measuring range 2 alarm 1	REAL	Read/Write
2	65	0	3	2	Limit value for analysis input IN7 measuring range 3 alarm 1	REAL	Read/Write
2	65	0	3	3	Limit value for analysis input IN7 measuring range 4 alarm 1	REAL	Read/Write
2	65	1	3	0	Limit value for analysis input IN7 measuring range 1 alarm 2	REAL	Read/Write
2	65	1	3	1	Limit value for analysis input IN7 measuring range 2 alarm 2	REAL	Read/Write
2	65	1	3	2	Limit value for analysis input IN7 measuring range 3 alarm 2	REAL	Read/Write
2	65	1	3	3	Limit value for analysis input IN7 measuring range 4 alarm 2	REAL	Read/Write
2	65	2	3	0	Limit value for analysis input IN8 measuring range 1 alarm 1	REAL	Read/Write
2	65	2	3	1	Limit value for analysis input IN8 measuring range 2 alarm 1	REAL	Read/Write
2	65	2	3	2	Limit value for analysis input IN8 measuring range 3 alarm 1	REAL	Read/Write
2	65	2	3	3	Limit value for analysis input IN8 measuring range 4 alarm 1	REAL	Read/Write
2	65	3	3	0	Limit value for analysis input IN8 measuring range 1 alarm 2	REAL	Read/Write
2	65	3	3	1	Limit value for analysis input IN8 measuring range 2 alarm 2	REAL	Read/Write
2	65	3	3	2	Limit value for analysis input IN8 measuring range 3 alarm 2	REAL	Read/Write
2	65	3	3	3	Limit value for analysis input IN8 measuring range 4 alarm 2	REAL	Read/Write

5 Noncyclical data exchange

Manual values 1 to 16

Index					Signal designation	Data type	Access
2	76	0	0	0	Manual value 1	REAL	Read/Write
2	76	0	1	0	Manual value 2	REAL	Read/Write
2	76	0	2	0	Manual value 3	REAL	Read/Write
2	76	0	3	0	Manual value 4	REAL	Read/Write
2	76	0	4	0	Manual value 5	REAL	Read/Write
2	76	0	5	0	Manual value 6	REAL	Read/Write
2	76	0	6	0	Manual value 7	REAL	Read/Write
2	76	0	7	0	Manual value 8	REAL	Read/Write
2	76	0	8	0	Manual value 9	REAL	Read/Write
2	76	0	9	0	Manual value 10	REAL	Read/Write
2	76	0	10	0	Manual value 11	REAL	Read/Write
2	76	0	11	0	Manual value 12	REAL	Read/Write
2	76	0	12	0	Manual value 13	REAL	Read/Write
2	76	0	13	0	Manual value 14	REAL	Read/Write
2	76	0	14	0	Manual value 15	REAL	Read/Write
2	76	0	15	0	Manual value 16	REAL	Read/Write

Controller 1 parameter block 1

Index					Signal designation	Data type	Access
2	96	0	0	0	XP1 proportional band (P component)	REAL	Read/Write
2	96	0	1	0	XP2 proportional band (P component)	REAL	Read/Write
2	96	0	2	0	TV1 derivative time (D component)	REAL	Read/Write
2	96	0	3	0	TV2 derivative time (D component)	REAL	Read/Write
2	96	0	4	0	TN1 reset time (I component)	REAL	Read/Write
2	96	0	5	0	TN2 reset time (I component)	REAL	Read/Write
2	96	0	6	0	CY1 cycle time	REAL	Read/Write
2	96	0	7	0	CY2 cycle time	REAL	Read/Write
2	96	0	8	0	Contact spacing	REAL	Read/Write
2	96	0	9	0	Switch hyst. 1	REAL	Read/Write
2	96	0	10	0	Switch hyst. 2	REAL	Read/Write
2	96	0	11	0	TT actuator time	UINT	Read/Write
2	96	0	12	0	Y0 working point	INT	Read/Write
2	96	0	13	0	Y1 output value limit (max.)	INT	Read/Write
2	96	0	14	0	Y2 output value limit (min.)	INT	Read/Write
2	96	0	15	0	TK1 minimum pick-up time of 1st relay	REAL	Read/Write
2	96	0	16	0	TK2 minimum pick-up time of 2nd relay	REAL	Read/Write
2	96	0	17	0	Maximum pulse frequency 1	UINT	Read/Write
2	96	0	18	0	Maximum pulse frequency 2	UINT	Read/Write
2	96	0	19	0	Pick-up delay 1	REAL	Read/Write
2	96	0	20	0	Pick-up delay 2	REAL	Read/Write
2	96	0	21	0	Drop-out delay 1	REAL	Read/Write
2	96	0	22	0	Drop-out delay 2	REAL	Read/Write
2	96	0	23	0	Alarm tolerance	REAL	Read/Write
2	96	0	24	0	Alarm delay	UINT	Read/Write

Controller 1 parameter block 2

Index					Signal designation	Data type	Access
2	96	1	0	0	XP1 proportional band (P component)	REAL	Read/Write
2	96	1	1	0	XP2 proportional band (P component)	REAL	Read/Write
2	96	1	2	0	TV1 derivative time (D component)	REAL	Read/Write
2	96	1	3	0	TV2 derivative time (D component)	REAL	Read/Write
2	96	1	4	0	TN1 reset time (I component)	REAL	Read/Write
2	96	1	5	0	TN2 reset time (I component)	REAL	Read/Write
2	96	1	6	0	CY1 cycle time	REAL	Read/Write
2	96	1	7	0	CY2 cycle time	REAL	Read/Write
2	96	1	8	0	Contact spacing	REAL	Read/Write
2	96	1	9	0	Switch hyst. 1	REAL	Read/Write
2	96	1	10	0	Switch hyst. 2	REAL	Read/Write
2	96	1	11	0	TT actuator time	UINT	Read/Write
2	96	1	12	0	Y0 working point	INT	Read/Write
2	96	1	13	0	Y1 output value limit (max.)	INT	Read/Write
2	96	1	14	0	Y2 output value limit (min.)	INT	Read/Write
2	96	1	15	0	TK1 minimum pick-up time of 1st relay	REAL	Read/Write
2	96	1	16	0	TK2 minimum pick-up time of 2nd relay	REAL	Read/Write
2	96	1	17	0	Maximum pulse frequency 1	UINT	Read/Write
2	96	1	18	0	Maximum pulse frequency 2	UINT	Read/Write
2	96	1	19	0	Pick-up delay 1	REAL	Read/Write
2	96	1	20	0	Pick-up delay 2	REAL	Read/Write
2	96	1	21	0	Drop-out delay 1	REAL	Read/Write
2	96	1	22	0	Drop-out delay 2	REAL	Read/Write
2	96	1	23	0	Alarm tolerance	REAL	Read/Write
2	96	1	24	0	Alarm delay	UINT	Read/Write

Controller 2 parameter block 1

Index					Signal designation	Data type	Access
2	96	2	0	0	XP1 proportional band (P component)	REAL	Read/Write
2	96	2	1	0	XP2 proportional band (P component)	REAL	Read/Write
2	96	2	2	0	TV1 derivative time (D component)	REAL	Read/Write
2	96	2	3	0	TV2 derivative time (D component)	REAL	Read/Write
2	96	2	4	0	TN1 reset time (I component)	REAL	Read/Write
2	96	2	5	0	TN2 reset time (I component)	REAL	Read/Write
2	96	2	6	0	CY1 cycle time	REAL	Read/Write
2	96	2	7	0	CY2 cycle time	REAL	Read/Write
2	96	2	8	0	Contact spacing	REAL	Read/Write
2	96	2	9	0	Switch hyst. 1	REAL	Read/Write
2	96	2	10	0	Switch hyst. 2	REAL	Read/Write
2	96	2	11	0	TT actuator time	UINT	Read/Write
2	96	2	12	0	Y0 working point	INT	Read/Write

Index					Signal designation	Data type	Access
2	96	2	13	0	Y1 output value limit (max.)	INT	Read/Write
2	96	2	14	0	Y2 output value limit (min.)	INT	Read/Write
2	96	2	15	0	TK1 minimum pick-up time of 1st relay	REAL	Read/Write
2	96	2	16	0	TK2 minimum pick-up time of 2nd relay	REAL	Read/Write
2	96	2	17	0	Maximum pulse frequency 1	UINT	Read/Write
2	96	2	18	0	Maximum pulse frequency 2	UINT	Read/Write
2	96	2	19	0	Pick-up delay 1	REAL	Read/Write
2	96	2	20	0	Pick-up delay 2	REAL	Read/Write
2	96	2	21	0	Drop-out delay 1	REAL	Read/Write
2	96	2	22	0	Drop-out delay 2	REAL	Read/Write
2	96	2	23	0	Alarm tolerance	REAL	Read/Write
2	96	2	24	0	Alarm delay	UINT	Read/Write

Controller 2 parameter block 2

Index					Signal designation	Data type	Access
2	96	3	0	0	XP1 proportional band (P component)	REAL	Read/Write
2	96	3	1	0	XP2 proportional band (P component)	REAL	Read/Write
2	96	3	2	0	TV1 derivative time (D component)	REAL	Read/Write
2	96	3	3	0	TV2 derivative time (D component)	REAL	Read/Write
2	96	3	4	0	TN1 reset time (I component)	REAL	Read/Write
2	96	3	5	0	TN2 reset time (I component)	REAL	Read/Write
2	96	3	6	0	CY1 cycle time	REAL	Read/Write
2	96	3	7	0	CY2 cycle time	REAL	Read/Write
2	96	3	8	0	Contact spacing	REAL	Read/Write
2	96	3	9	0	Switch hyst. 1	REAL	Read/Write
2	96	3	10	0	Switch hyst. 2	REAL	Read/Write
2	96	3	11	0	TT actuator time	UINT	Read/Write
2	96	3	12	0	Y0 working point	INT	Read/Write
2	96	3	13	0	Y1 output value limit (max.)	INT	Read/Write
2	96	3	14	0	Y2 output value limit (min.)	INT	Read/Write
2	96	3	15	0	TK1 minimum pick-up time of 1st relay	REAL	Read/Write
2	96	3	16	0	TK2 minimum pick-up time of 2nd relay	REAL	Read/Write
2	96	3	17	0	Maximum pulse frequency 1	UINT	Read/Write
2	96	3	18	0	Maximum pulse frequency 2	UINT	Read/Write
2	96	3	19	0	Pick-up delay 1	REAL	Read/Write
2	96	3	20	0	Pick-up delay 2	REAL	Read/Write
2	96	3	21	0	Drop-out delay 1	REAL	Read/Write
2	96	3	22	0	Drop-out delay 2	REAL	Read/Write
2	96	3	23	0	Alarm tolerance	REAL	Read/Write
2	96	3	24	0	Alarm delay	UINT	Read/Write

Controller 3 parameter block 1

Index					Signal designation	Data type	Read/ Write
2	96	4	0	0	XP1 proportional band (P component)	REAL	Read/Write
2	96	4	1	0	XP2 proportional band (P component)	REAL	Read/Write
2	96	4	2	0	TV1 derivative time (D component)	REAL	Read/Write
2	96	4	3	0	TV2 derivative time (D component)	REAL	Read/Write
2	96	4	4	0	TN1 reset time (I component)	REAL	Read/Write
2	96	4	5	0	TN2 reset time (I component)	REAL	Read/Write
2	96	4	6	0	CY1 cycle time	REAL	Read/Write
2	96	4	7	0	CY2 cycle time	REAL	Read/Write
2	96	4	8	0	Contact spacing	REAL	Read/Write
2	96	4	9	0	Switch hyst. 1	REAL	Read/Write
2	96	4	10	0	Switch hyst. 2	REAL	Read/Write
2	96	4	11	0	TT actuator time	UINT	Read/Write
2	96	4	12	0	Y0 working point	INT	Read/Write
2	96	4	13	0	Y1 output value limit (max.)	INT	Read/Write
2	96	4	14	0	Y2 output value limit (min.)	INT	Read/Write
2	96	4	15	0	TK1 minimum pick-up time of 1st relay	REAL	Read/Write
2	96	4	16	0	TK2 minimum pick-up time of 2nd relay	REAL	Read/Write
2	96	4	17	0	Maximum pulse frequency 1	UINT	Read/Write
2	96	4	18	0	Maximum pulse frequency 2	UINT	Read/Write
2	96	4	19	0	Pick-up delay 1	REAL	Read/Write
2	96	4	20	0	Pick-up delay 2	REAL	Read/Write
2	96	4	21	0	Drop-out delay 1	REAL	Read/Write
2	96	4	22	0	Drop-out delay 2	REAL	Read/Write
2	96	4	23	0	Alarm tolerance	REAL	Read/Write
2	96	4	24	0	Alarm delay	UINT	Read/Write

Controller 3 parameter block 2

Index					Signal designation	Data type	Access
2	96	5	0	0	XP1 proportional band (P component)	REAL	Read/Write
2	96	5	1	0	XP2 proportional band (P component)	REAL	Read/Write
2	96	5	2	0	TV1 derivative time (D component)	REAL	Read/Write
2	96	5	3	0	TV2 derivative time (D component)	REAL	Read/Write
2	96	5	4	0	TN1 reset time (I component)	REAL	Read/Write
2	96	5	5	0	TN2 reset time (I component)	REAL	Read/Write
2	96	5	6	0	CY1 cycle time	REAL	Read/Write
2	96	5	7	0	CY2 cycle time	REAL	Read/Write
2	96	5	8	0	Contact spacing	REAL	Read/Write
2	96	5	9	0	Switch hyst. 1	REAL	Read/Write
2	96	5	10	0	Switch hyst. 2	REAL	Read/Write
2	96	5	11	0	TT actuator time	UINT	Read/Write
2	96	5	12	0	Y0 working point	INT	Read/Write

Index					Signal designation	Data type	Access
2	96	5	13	0	Y1 output value limit (max.)	INT	Read/Write
2	96	5	14	0	Y2 output value limit (min.)	INT	Read/Write
2	96	5	15	0	TK1 minimum pick-up time of 1st relay	REAL	Read/Write
2	96	5	16	0	TK2 minimum pick-up time of 2nd relay	REAL	Read/Write
2	96	5	17	0	Maximum pulse frequency 1	UINT	Read/Write
2	96	5	18	0	Maximum pulse frequency 2	UINT	Read/Write
2	96	5	19	0	Pick-up delay 1	REAL	Read/Write
2	96	5	20	0	Pick-up delay 2	REAL	Read/Write
2	96	5	21	0	Drop-out delay 1	REAL	Read/Write
2	96	5	22	0	Drop-out delay 2	REAL	Read/Write
2	96	5	23	0	Alarm tolerance	REAL	Read/Write
2	96	5	24	0	Alarm delay	UINT	Read/Write

Controller 4 parameter block 1

Index					Signal designation	Data type	Access
2	96	6	0	0	XP1 proportional band (P component)	REAL	Read/Write
2	96	6	1	0	XP2 proportional band (P component)	REAL	Read/Write
2	96	6	2	0	TV1 derivative time (D component)	REAL	Read/Write
2	96	6	3	0	TV2 derivative time (D component)	REAL	Read/Write
2	96	6	4	0	TN1 reset time (I component)	REAL	Read/Write
2	96	6	5	0	TN2 reset time (I component)	REAL	Read/Write
2	96	6	6	0	CY1 cycle time	REAL	Read/Write
2	96	6	7	0	CY2 cycle time	REAL	Read/Write
2	96	6	8	0	Contact spacing	REAL	Read/Write
2	96	6	9	0	Switch hyst. 1	REAL	Read/Write
2	96	6	10	0	Switch hyst. 2	REAL	Read/Write
2	96	6	11	0	TT actuator time	UINT	Read/Write
2	96	6	12	0	Y0 working point	INT	Read/Write
2	96	6	13	0	Y1 output value limit (max.)	INT	Read/Write
2	96	6	14	0	Y2 output value limit (min.)	INT	Read/Write
2	96	6	15	0	TK1 minimum pick-up time of 1st relay	REAL	Read/Write
2	96	6	16	0	TK2 minimum pick-up time of 2nd relay	REAL	Read/Write
2	96	6	17	0	Maximum pulse frequency 1	UINT	Read/Write
2	96	6	18	0	Maximum pulse frequency 2	UINT	Read/Write
2	96	6	19	0	Pick-up delay 1	REAL	Read/Write
2	96	6	20	0	Pick-up delay 2	REAL	Read/Write
2	96	6	21	0	Drop-out delay 1	REAL	Read/Write
2	96	6	22	0	Drop-out delay 2	REAL	Read/Write
2	96	6	23	0	Alarm tolerance	REAL	Read/Write
2	96	6	24	0	Alarm delay	UINT	Read/Write

Controller 4 parameter block 2

Index					Signal designation	Data type	Access
2	96	7	0	0	XP1 proportional band (P component)	REAL	Read/Write
2	96	7	1	0	XP2 proportional band (P component)	REAL	Read/Write
2	96	7	2	0	TV1 derivative time (D component)	REAL	Read/Write
2	96	7	3	0	TV2 derivative time (D component)	REAL	Read/Write
2	96	7	4	0	TN1 reset time (I component)	REAL	Read/Write
2	96	7	5	0	TN2 reset time (I component)	REAL	Read/Write
2	96	7	6	0	CY1 cycle time	REAL	Read/Write
2	96	7	7	0	CY2 cycle time	REAL	Read/Write
2	96	7	8	0	Contact spacing	REAL	Read/Write
2	96	7	9	0	Switch hyst. 1	REAL	Read/Write
2	96	7	10	0	Switch hyst. 2	REAL	Read/Write
2	96	7	11	0	TT actuator time	UINT	Read/Write
2	96	7	12	0	Y0 working point	INT	Read/Write
2	96	7	13	0	Y1 output value limit (max.)	INT	Read/Write
2	96	7	14	0	Y2 output value limit (min.)	INT	Read/Write
2	96	7	15	0	TK1 minimum pick-up time of 1st relay	REAL	Read/Write
2	96	7	16	0	TK2 minimum pick-up time of 2nd relay	REAL	Read/Write
2	96	7	17	0	Maximum pulse frequency 1	UINT	Read/Write
2	96	7	18	0	Maximum pulse frequency 2	UINT	Read/Write
2	96	7	19	0	Pick-up delay 1	REAL	Read/Write
2	96	7	20	0	Pick-up delay 2	REAL	Read/Write
2	96	7	21	0	Drop-out delay 1	REAL	Read/Write
2	96	7	22	0	Drop-out delay 2	REAL	Read/Write
2	96	7	23	0	Alarm tolerance	REAL	Read/Write
2	96	7	24	0	Alarm delay	UINT	Read/Write

Setpoint values controller 1 parameter level

Index					Signal designation	Data type	Access
2	98	0	0	0	Setpoint value W1 (controller 1)	REAL	Read/Write
2	98	0	1	0	Setpoint value W2 (controller 1)	REAL	Read/Write

Setpoint values controller 2 parameter level

Index					Signal designation	Data type	Access
2	98	1	0	0	Setpoint value W1 (controller 2)	REAL	Read/Write
2	98	1	1	0	Setpoint value W2 (controller 2)	REAL	Read/Write

Setpoint values controller 3 parameter level

Index					Signal designation	Data type	Access
2	98	2	0	0	Setpoint value W1 (controller 3)	REAL	Read/Write
2	98	2	1	0	Setpoint value W2 (controller 3)	REAL	Read/Write

Setpoint values controller 4 parameter level

Index					Signal designation	Data type	Access
2	98	3	0	0	Setpoint value W1 (controller 4)	REAL	Read/Write

Index					Signal designation	Data type	Access
2	98	3	1	0	Setpoint value W2 (controller 4)	REAL	Read/Write

5.2.2 Process values

Current controller setpoint values

Index					Signal designation	Data type	Access
2	177	0	1	0	Setpoint value controller 1	REAL	Read
2	177	1	1	0	Setpoint value controller 2	REAL	Read
2	177	2	1	0	Setpoint value controller 3	REAL	Read
2	177	3	1	0	Setpoint value controller 4	REAL	Read

External analog signals

Index					Signal designation	Data type	Access
2	196	0	0	0	External analog input 1	REAL	Read
2	196	1	0	0	External analog input 2	REAL	Read
2	196	2	0	0	External analog input 3	REAL	Read
2	196	3	0	0	External analog input 4	REAL	Read
2	196	4	0	0	External analog input 5	REAL	Read
2	196	5	0	0	External analog input 6	REAL	Read
2	196	6	0	0	External analog input 7	REAL	Read
2	196	7	0	0	External analog input 8	REAL	Read

External binary signals

Index					Signal designation	Data type	Access
2	197	0	0	0	External digital input 1	INT/BOOL	Read
2	197	1	0	0	External digital input 2	INT/BOOL	Read
2	197	2	0	0	External digital input 3	INT/BOOL	Read
2	197	3	0	0	External digital input 4	INT/BOOL	Read
2	197	4	0	0	External digital input 5	INT/BOOL	Read
2	197	5	0	0	External digital input 6	INT/BOOL	Read
2	197	6	0	0	External digital input 7	INT/BOOL	Read
2	197	7	0	0	External digital input 8	INT/BOOL	Read

6.1 Project integration of JUMO IO devices

For JUMO field devices to be integrated into the project structure of the IO controller as IO device, the GSDML file of the respective device must be imported into the engineering system of your IO controller. The GSDML file describes all PROFINET-IO features of IO devices and delivers to the engineering system all the information required for the project planning phase. This file is located on the DVD from the supply scope of your JUMO field device, or can alternatively be downloaded from the JUMO website. Once the GSDML file has been imported into the engineering system, the corresponding field device is available as an IO device in the engineering system (e.g. "Hardware catalog" for SIMATIC®[1] or "Device repository" for CODESYS®[2]), and can be incorporated into the hardware structure of your projects. With JUMO IO devices, modules can then be added as slots. In the engineering system, modules are treated as modular devices for expanding IO devices. They are selected from the engineering system catalog and assigned to the slots in the JUMO IO device. The procedure for integrating devices into project structures is described in the documentation for the engineering system of your IO controller.

Procedure

1. Import the GSDML file for your JUMO IO device into the engineering system of your IO controller. Make sure the device software version matches the version data in the GSDML file.

NOTE!

The GSDML file for the current device version is located on the DVD from the scope of delivery of your JUMO field device. Alternatively, you can download the GSDML file from the JUMO website.

2. Configure the PROFINET modules for your JUMO field device using the JUMO PC setup program and print out the finished module configuration.

   ⇨ chapter 6.2 "Configuring PROFINET modules", Page 38

3. Integrate the desired JUMO field device into the project structure of your IO controller. Make sure the device software version matches the version data of the JUMO field device integrated into the project structure.

NOTE!

The JUMO IO device appears in the project structure with the "DeviceStatusBlock" module in Slot 1. The "DeviceStatusBlock" module is immovably placed in Slot 1.

NOTE!

The exact procedure for integrating PROFINET IO devices can be found in the description of your engineering system.

4. Assign a device name.

NOTE!

Engineering systems offer a function for **identifying** field devices. If JUMO field devices are addressed via the **"Identification function"** of the engineering system, this is signaled by the flashing of the front display.

5. Insert the configured modules into the project structure of the IO controller in the desired slot position below the 1st slot on the JUMO IO device.
6. Set the communication parameters of the JUMO field device in the project structure of the IO controller.

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1 SIMATIC is a registered trademark of Siemens AG in 80333 Munich, Germany.
2 CODESYS is a registered trademark of 3S-Smart Software Solutions GmbH in 87439 Kempten, Germany.

⇨ chapter 6.3.2 "Communication parameters", Page 42

7. Set the start-up parameters in the project structure of the IO controller correctly. Pay attention in particular to the settings for the byte sequence for cyclical and noncyclical data. The byte sequence to be set is specified by the IO controller. Please refer to the documentation for your IO controller.
8. The IO data of the JUMO IO device are now available for the programming of the IO controller. To localize the IO data configured in the JUMO field device, refer to the printed module configuration list. During programming, the assignment of the device data to the IO items of the modules can be taken from this list.

6.2 Configuring PROFINET modules

For project configuration in the engineering system of your PROFINET IO controller, you can populate all slots with modules apart from Slot 1 on your JUMO IO device. Slot 1 is permanently assigned with the immovable "DeviceStatusBlock" module. You can create additional modules for various data types via the JUMO PC setup program for the field device concerned and configure their contents to suit your needs. During this process, the selectable IO data in a module are filtered by data type suitable for the module type. An overview of the module types can be found in the "Module description" chapter.
⇨ chapter 4.2 "Module description", Page 11

The placeholders in the respective module can be assigned data from the selectors of the JUMO field device and be provided with a comment. In other words, the content of the configurable modules can be determined by the user. In the project configuration of the IO controller, the modules have to be assigned to the free slots in the JUMO IO device.

Once the configuration has been created by means of the JUMO PC setup program and loaded into the field device, the PROFINET configuration can be printed. The printout contains an overview of the complete module configuration of the JUMO field device with all IO data, which the field devices provisions for the PROFINET IO communication. In the engineering system, the modules must then be assigned to the slots in the JUMO IO device, so that they can be queried by the IO controller during the cyclical communication.



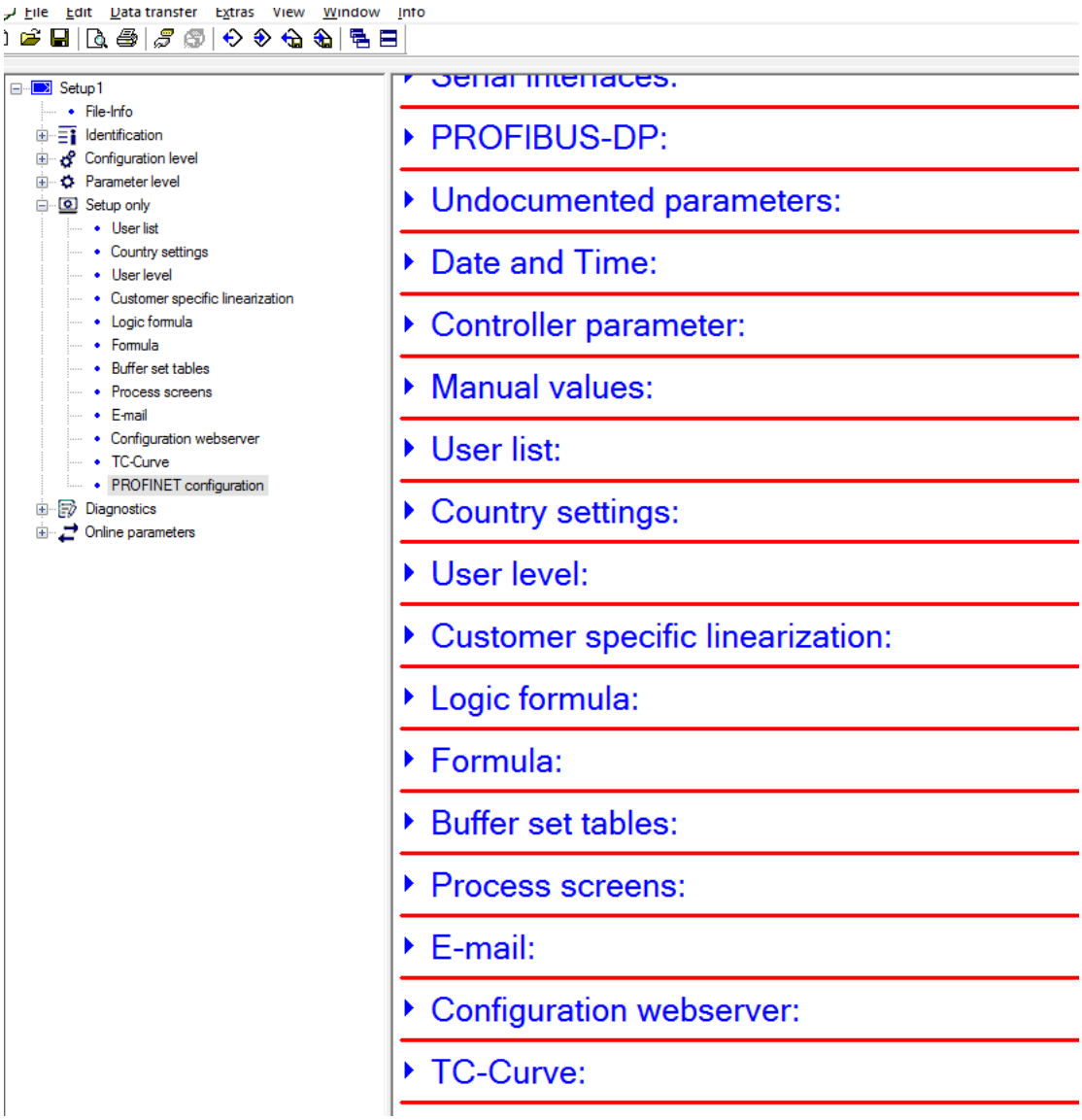
NOTE!

Make sure that your JUMO IO device has the software version required to use PROFINET IO (see chapter 2.3 "Requirements for hardware, software, and cabling", Page 7). The PROFINET configuration in the JUMO setup program of your device is available only for device software versions that are compatible with PROFINET IO.

Procedure for module configuration

1. Call up the module configuration dialog in the JUMO PC setup program:

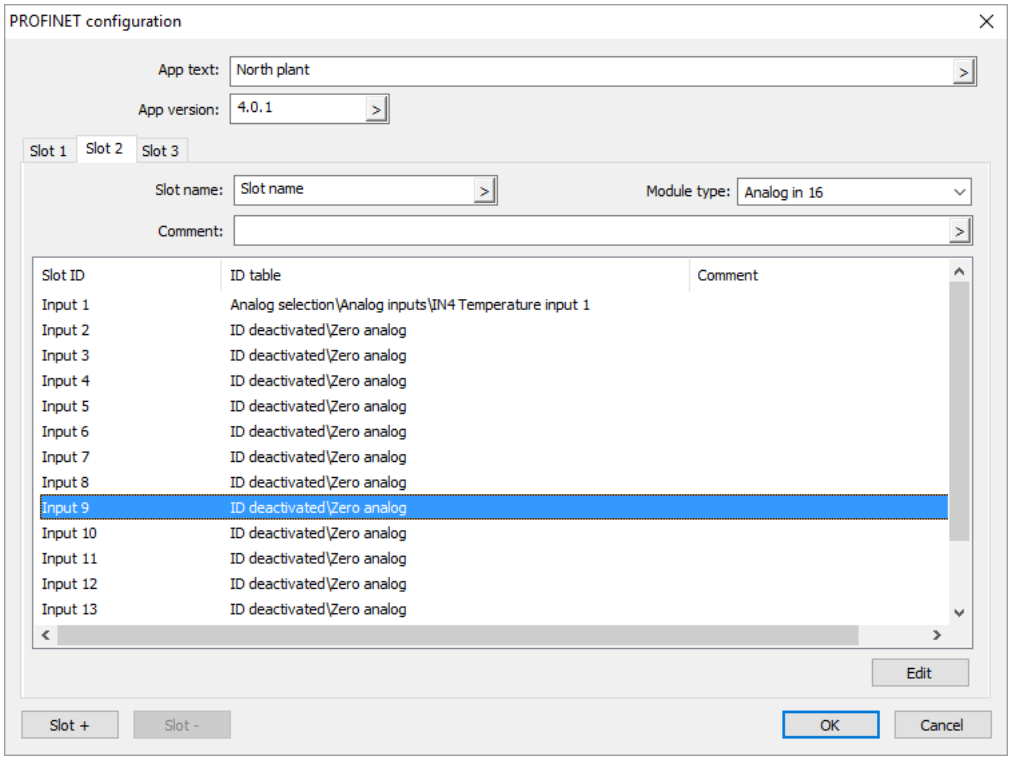
   Double-click on: Setup only > PROFINET configuration



2. In the "App text" and "App Version" fields of the module configuration dialog, assign information about the application (e.g. system or system part), for which the configuration is intended. This information will appear later on the printout of the module configuration. In addition, the "App-Version" is displayed in the "Device info" of the JUMO field device.

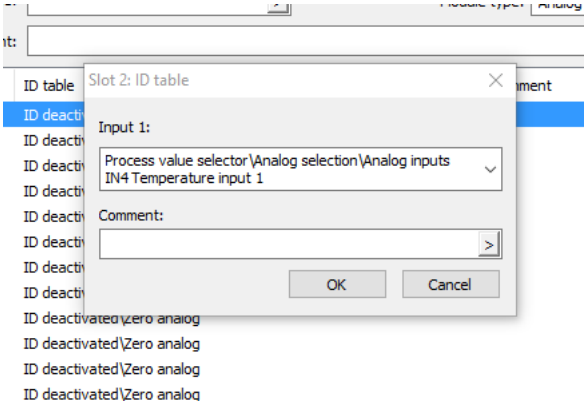
NOTE!

Entry fields with an arrow button are multilingual. By pressing the arrow button, you can open a dialog for entry and maintenance of the field contents for all languages installed on the device.



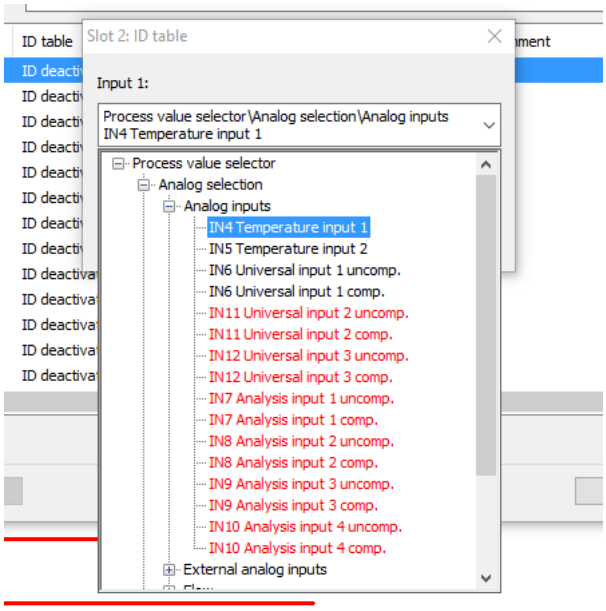
3. The module configuration contains 1 tab for each activated module. Define the number of modules you want to configure. To add modules, press the "Slot +" button. To reduce the number of modules, click the next module tab to activate it and press the "Slot -" button.
4. Now determine the type you require for each module in the "Module type" field (see chapter 4.2.2 "Modules", Page 11).
5. In each module, select the IO data required for the cyclical communication.
   a) Open the configuration dialog for each item in the module list by double-clicking the required item or by selecting it and pressing the "Edit" button.

Configuration dialog for IO data

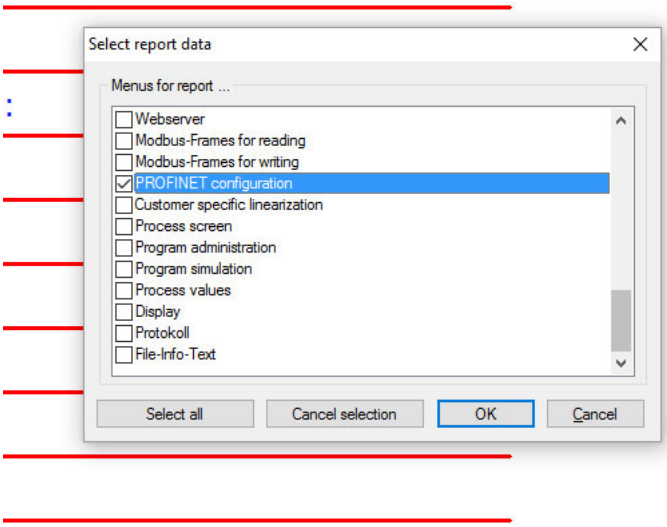


   b) Double-clicking the selection field at the top opens the selector with selectable device data, which you can assign to the module list item. In the "Comment" field, you can enter a name for the data point (e.g. equipment designation). The content of the comment field also appears in the module configuration printout to make it easier to identify the IO data.

Configuration dialog for IO data with selector expanded



6. Once you have completed the configuration for all the required modules, click the "OK" button in the module configuration window to confirm the configuration.
7. Transfer the configuration to the JUMO field device and save the configuration file on the PC if required.
8. Print out the module configuration.
   a) Do this by calling up the print command from the menu bar of the PC setup program. This opens "Select protocol data".
   File> Print
   b) In this selection field, activate the "PROFINET configuration" item and click "OK".



The module list will be printed on your default printer. This is helpful for the configuration and programming of your IO controller.

6 Project planning

6.3 Configuring the JUMO IO device

6.3.1 Start-up parameters

When the system boots, the start-up parameters are transferred from the IO controller to the JUMO field device during the course of the IO device parameterization procedure. Prior to start-up, you must configure the settings for the start-up parameters with the engineering system in the project planning of your IO controller. The start-up parameters for each JUMO field device are located in the "DeviceStatusBlock" module (Slot 1.)

The list of start-up parameters to be configured can be found in the module description.

⇨ chapter 6.3.1 "Start-up parameters", Page 42

6.3.2 Communication parameters

Station name

To improve the overview in the IO controller project structure, each device should be assigned a self-explanatory and preferably unique station name. This permits a better overview for programming and project planning. The station name is entered in the engineering system of your IO controller at the PNIO identification data of the JUMO IO device.

IP configuration

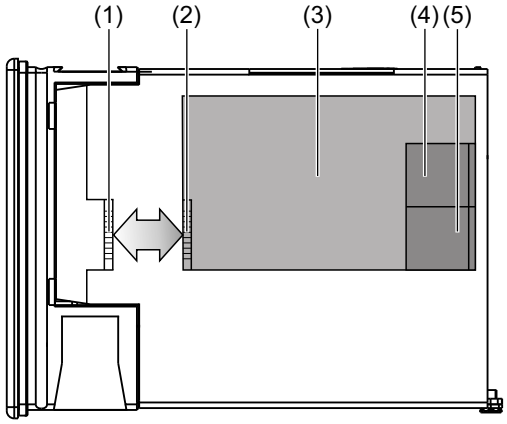
JUMO IO devices communicate with your PROFINET optional board via the internal Ethernet interface of the device. In order for the PROFINET optional board in a JUMO IO device to become operational, internal communication must be established between the optional board and the device. This requires valid IP configuration of the Ethernet interface of the JUMO IO device. Without valid IP configuration of the Ethernet interface, the device does not connect to the PROFINET IO interface and the PROFINET optional board is not initialized.



NOTE!

The IP addresses of the internal Ethernet interface and PROFINET interface are both visible from the outside and can be reached via both ports of the PROFINET optional board. The networks can be separately logically into different networks through use of different network IDs. The internal Ethernet interface support only standard Ethernet services and cannot be used for PROFINET IO. For PROFINET network segments, the PROFINET interface must be used.

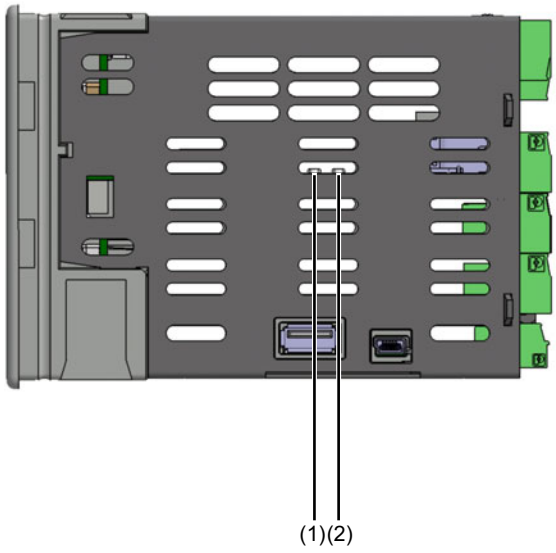
Block diagram of a PROFINET optional board with its interfaces



(1) Ethernet slot in a JUMO IO device (COM2) with its own MAC address (cf. chapter 6.3.3 "Device information", Page 45)
(2) Internal interface (SMK socket) of the PROFINET optional board for the slot in the JUMO IO device with its own MAC address (PROFINET MAC address of the JUMO IO device, cf. chapter 6.3.3 "Device information", Page 45)
(3) PROFINET optional board
(4) Switchport RJ-45 with its own MAC address (cf. chapter 6.3.3 "Device information", Page 45)
(5) Switchport RJ-45 with its own MAC address (cf. chapter 6.3.3 "Device information", Page 45)

The operating status and IP configuration data of the PROFINET interface can be viewed on the device's display with the information in ***Device menu > Device info > PROFINET*** and ***Device menu > Device info > Ethernet*** as well as with the aid of 2 status LEDs located on the PROFINET optional board. The status LEDs can be viewed through a ventilation slot on the top of the device housing.

Status LED on PROFINET optional board



(1) Front status LED on PROFINET optional board
(2) Rear status LED on PROFINET optional board

A **non-initialized** PROFINET optional board can be recognized from the following indicators:

- the MAC addresses of the interfaces on the PROFINET optional board ***Device menu > Device info > PROFINET > Info*** are not initialized (display: 00-00-00-00-00-00)
- the connection status of the PROFINET interface in ***Device menu > Device info > PROFINET > Status > Status*** shows "unknown"
- the front status LED on the PROFINET optional board is off
- the rear status LED on the PROFINET optional board flashes red

Cyclical transfer timing

Send clock and reduction ratio determine the frequency at which an IO device transfers cyclical data in a PROFINET IO network. The transfer cycle time of the JUMO IO device is calculated by dividing the send clock by the reduction ratio. On JUMO field devices, these parameters apply globally for all slots. The setting is configured in the engineering system of your IO controller at the PNIO parameters of the JUMO IO device.

NOTE!

In order to set meaningful transfer cycles, it is advisable to observe the processing cycle time of the respective JUMO field device.

JUMO AQUIS touch P: 250 ms

Watchdog

If the watchdog function is activated, the cyclical communication is monitored in cycles. The watchdog cycle time can be set as a multiple of the transfer cycle time (maximum 1.92 s). If a "consumer" detects a communication failure, it dismantles the "Application Relation" and hence also the "Communication Relation" to the provider.

NOTE!

The watchdog cycle time can be set up to a maximum of 1.92 s. This is defined by the PROFINET IO standard for RT communication.

Starting up the PROFINET interface of a JUMO IO device

Proceed as follows to start up the PROFINET interface of a JUMO IO device:

1. Log on to the JUMO IO device as "Master" (see JUMO IO device operating manual).

   Open user log-on: *Device menu > Log-on/Log-out*

2. The Ethernet interface of the JUMO IO device must be configured for the PROFINET optional board to connect internally to the JUMO IO device and be initialized. Either manually assign an IP configuration that is valid in your network or set the Ethernet interface to automatic configuration. If automatic IP configuration is set, the device must be physically connected to a network with a DHCP server. The DHCP server assigns a valid IP configuration to the Ethernet interface. If manual IP configuration is set, a physical connection is not yet absolutely essential at this point.

   Open the Ethernet configuration: *Device Menu > Configuration > Ethernet*

3. After a valid IP configuration has been saved in the JUMO IO device, the PROFINET IO interface connects to the JUMO IO device and is initialized. To test, check the following indicators: The **front status LED on the PROFINET optional board must glow green** and the **MAC addresses of the PROFINET optional board** must now have valid content (not 00-00-00-00-00-00).

   Check the MAC addresses: *Device menu > Device info > PROFINET > Info*

   ⇨ chapter 6.3.3 "Device information", Page 45

4. If you have not yet inserted a network connector into the switchports of the PROFINET interface, establish the connections to your network now. As soon as the physical connection to the network has been established, the PROFINET status changes to "Link Up".

   Check the PROFINET status: *Device menu > Device info > PROFINET > Status*

   ⇨ chapter 6.3.3 "Device information", Page 45

5. Make sure that the correct communication settings have been defined in the project planning for your IO controller. Check for correct assignment of the IP configuration and unique station name for the JUMO IO device.

   The subnet configuration for PROFINET communication must be saved in the IO controller. Then, as the system is booted, the IP configuration (IP address, subnet mask and default gateway) is transferred from the PROFINET IO controller to the IO device according to the IO controller configuration. The procedure for project planning can be found in the documentation of the engineering system you are using for the project planning of your system.

6. After the system has booted successfully with DCP assignment of the IP configuration to the JUMO IO device by the IO controller, the device is ready to communicate with the IO controller. The PROFINET status changes to "Network Up". Immediately thereafter, communication with the IO controller starts and the PROFINET status changes to "PLC Connection Up".

6.3.3 Device information

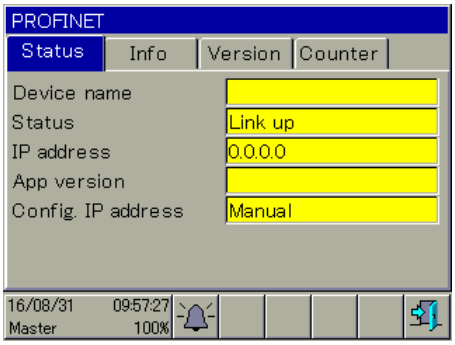
The device info for the JUMO IO device displays, for control and error diagnostics, information about network configuration, hardware and software component versions, as well as counters for evaluating data traffic. For more details about the displayed data, see the operating manual for your JUMO IO device.

Call-up: Device menu> Device info> PROFINET

Status: Data for connecting the JUMO IO device to the IO controller

In addition to the essential IP configuration data for the JUMO IO device, additional important information is displayed. For example: The "App Version" from the module configuration of the device (see chapter 6.2 "Configuring PROFINET modules", Page 38) and in the "Status" field the connection status of the JUMO IO device. The last PROFINET diagnosis event is displayed as the current connection status:

- **Unknown**
  Connection status unknown (no previous diagnosis event)
- **Link Up/Down**
  At least one RJ45 switchport of the PROFINET optional board has established or lost a physical connection.
- **Network Up/Down**
  IP configuration status of the IO devices valid or invalid (e. g. address conflict).
- **PLC Connection Up/Down**
  The IO device has established or lost a communication connection to the IO controller.

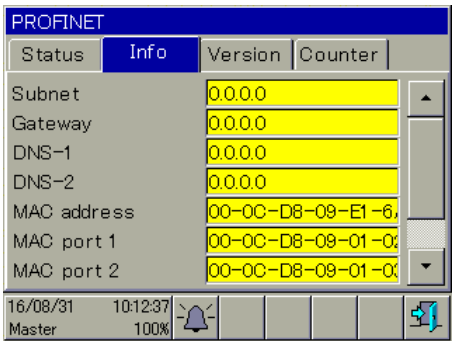


Info: Network data of the IO device

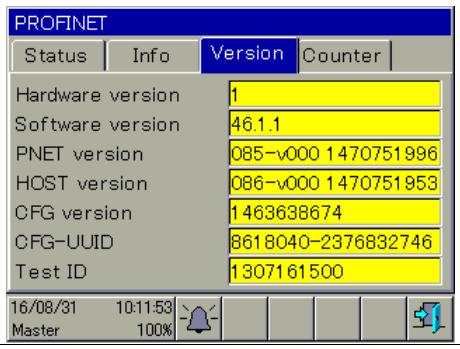
The network configuration data of the PROFINET interface such as the MAC addresses of the 3 interfaces of the PROFINET optional board are displayed here (cf. chapter 6.3.2 "Communication parameters", Page 42).

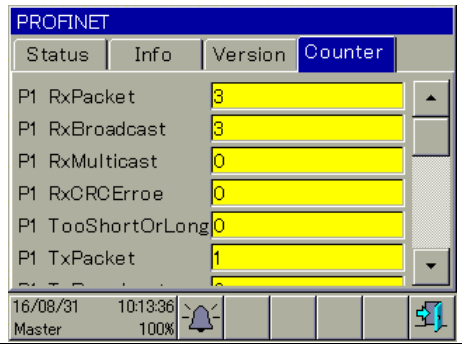
The individual MAC addresses:

- **MAC address**
  MAC address of the internal interface (SMK socket) of the PROFINET optional board for connection to the internal Ethernet interface of the JUMO IO device (COM2 slot); this MAC address represents the JUMO IO device in your project planning for device detection and topology recognition
- **MAC port 1/2**
  MAC addresses of the 2 switchports (RJ 45) of the PROFINET optional board



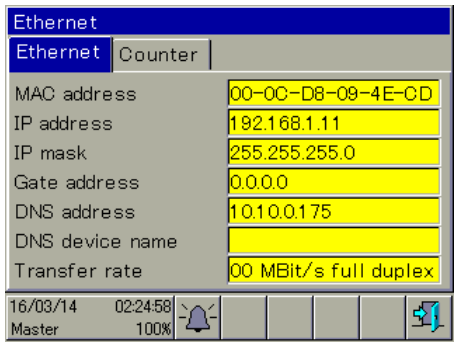
Version: Version numbers of hardware and software components



Counter: Packet statistics of the JUMO IO device for control and error diagnostics for evaluating data traffic	

The status of the Ethernet interface is relevant for the PROFINET interface because the PROFINET optional board communicates internally with the JUMO IO device via the Ethernet interface (COM2 slot). It is essential for communication that the Ethernet interface of the JUMO IO device be configured with a valid IP address (cf. chapter 6.3.2 "Communication parameters", Page 42). For checking and for diagnostic purposes, the IP configuration of the Ethernet interface can be viewed in Device info.

Open: Device menu > Device info > Ethernet > Ethernet info

IP configuration data of the internal Ethernet interface of the JUMO IO device (cf. chapter 6.3.2 "Communication parameters", Page 42)	

6 Project planning

7.1 Error messages for invalid values

For measured values in float format, the error number itself is displayed as a value, i.e. instead of the measured value, the error number is returned.

Error code for float values	Error
1.0×10^{37}	Underrange
2.0×10^{37}	Overrange
3.0×10^{37}	Not a valid input value
4.0×10^{37}	Division by zero
5.0×10^{37}	Mathematical error
6.0×10^{37}	Invalid compensation temperature
7.0×10^{37}	Invalid floating-point value
8.0×10^{37}	Integrator or statistics destroyed

7.2 Error messages for acyclic services

The ERROR variable contains error messages from the IO device that can be evaluated by the IO controller. The following error IDs are used:

Error ID	Description
0	No error
3	Incorrect ID

7 Error messages

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