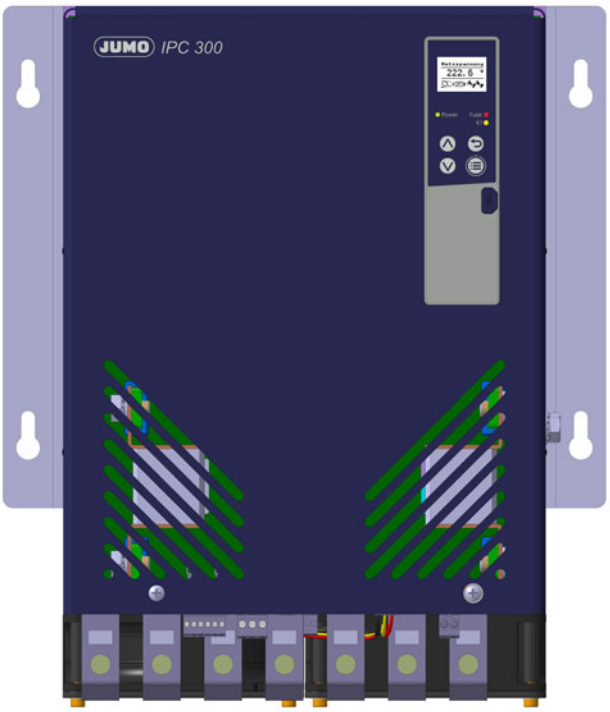
JUMO IPC 300

Electronic transformer



PROFINET interface description

70905107T92Z001K000

V2.00/EN/00770753/2023-03-01

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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.

1 Safety information

2 Compatibility and system requirements

2.1 Certification

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

- MRP (Media Redundancy Protocol) is supported, i.e., it is possible to set up a redundant ring topology
- Device Access (enables a configuration tool to access a device and parameters to be read or written)
- Only 1 AR (Application Relation), i.e., the IPC 300 can only be connected to 1 PLC at a time

2.2 PROFINET IO and Ethernet standard services

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 IPC 300

To use PROFINET IO with the IPC 300, the device must meet the following minimum requirements:

- Device software version 389.02.01 or higher

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

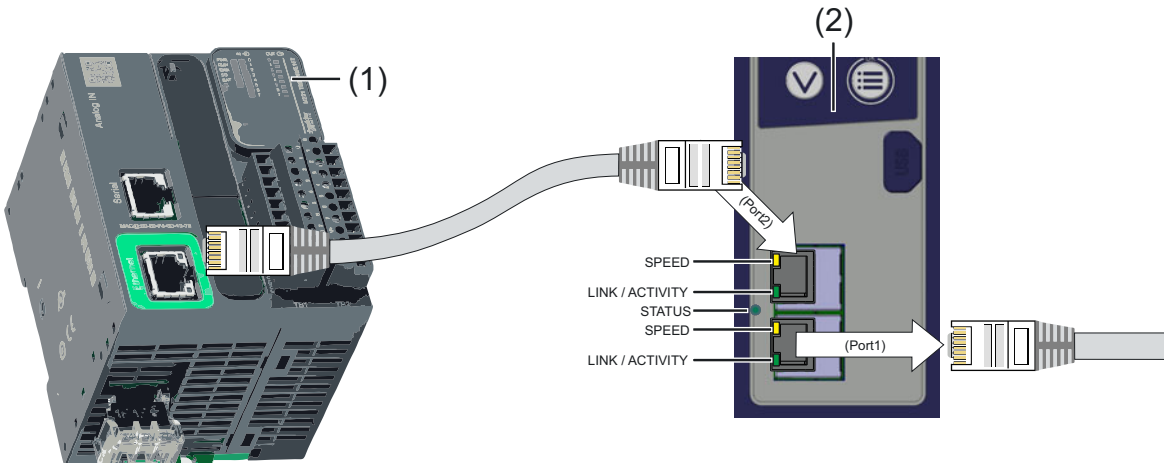
Open device software version:

Device menu >Device info

2 Compatibility and system requirements

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 device

NOTE!

The cyclical data exchange with JUMO PROFINET IO devices is based on the RT/IRT protocol (Conformance Class B/C). PROFINET RT/IRT 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).

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 IPC 300. It must be imported into the engineering system so that the IPC 300 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.

The GSDML file can be downloaded from: qr-sw-709051-gsdml-de.jumo.info

4.2 Module description

4.2.1 Introduction to the module concept

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

The "Primary data" module 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 of the IPC 300. 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 "Secondary data" module also has a fixed configuration. It can be selected in the PLC as an optional extra.

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!

Module 1 "Primary data of the IPC 300"

The following tables list the data in the "Primary data" module of the IPC 300.

Input values
(cyclical IO data which is read from the IO device by the IO controller)

Name	Type	Signal designation	Number of bytes
Load voltage	FLOAT	Load voltage in V	4
Load current	FLOAT	Load current in A	4
Power	FLOAT	Power in W	4
Load resistance	FLOAT	Load resistance in Ω	4
DC link voltage	FLOAT	DC link voltage in V	4
Fault signals 1a	BYTE	Bit 0: Min. alarm	1
		Bit 1: Max. alarm	
		Bit 2: Load error	
		Bit 3: Load failure virtual current sensor 1	
		Bit 4: Load failure external current sensor 2	
		Bit 5: Load failure external current sensor 3	
		Bit 6: Teach-In missing	
		Bit 7: Fuse failure	
Fault signals 1b	BYTE	Bit 0: IGBT break	1
		Bit 1: IGBT short-circuit	
		Bit 2: Limited power due to excess temperature	
		Bit 3: Excess temperature	
		Bit 4: Mains voltage too low	
		Bit 5: Wire break at current input	
		Bit 6: Wire break at voltage input	
		Bit 7: Bus error	
Fault signals 2a	BYTE	Bit 0: Reserved	1
		Bit 1: Reserved	
		Bit 2: SiC voltage reserve exhausted	
		Bit 3: Inhibit input	
		Bit 4: Inhibit due to excessive peak current	
		Bit 5: External inhibit input	
		Bit 6: UCEsat 1 emergency-off	
		Bit 7: UCEsat 2 emergency-off	
Fault signals 2b	BYTE	Bit 0: Fault current too high	1
		Bit 1: Failure of fan 1	
		Bit 2: Failure of fan 2	
		Bit 3: Invalid configuration	
		Bit 4: External current sensor 2 faulty	
		Bit 5: External current sensor 3 faulty	
		Bit 6: Ext. current sensor incorrectly configured	
		Bit 7: Reserved	

Input values
(cyclical IO data which is read from the IO device by the IO controller)

Name	Type	Signal designation	Number of bytes
Binary signals 1a	BYTE	Bit 0: Hardware level inhibit input	1
		Bit 1: Hardware level digital input 1	
		Bit 2: Hardware level digital input 2	
		Bit 3: Inhibit input	
		Bit 4: Digital input 1	
		Bit 5: Digital input 2	
		Bit 6: Inhibit due to excessive peak current	
		Bit 7: External inhibit input	
Binary signals 1b	BYTE	Bit 0: External digital input 1	1
		Bit 1: External digital input 2	
		Bit 2: Digital output	
		Bit 3: Inhibit	
		Bit 4: Voltage limitation active	
		Bit 5: Current limiting active	
		Bit 6: Power limitation active	
		Bit 7: Resistance limitation active	
Binary signals 2a	BYTE	Bit 0: Voltage, current, power, or resistance limitation active	1
		Bit 1: Soft start running	
		Bit 2: External toggling of setpoint specification active	
		Bit 3: Power controller is currently being reconfigured	
		Bit 4: Reserved	
		Bit 5: Reserved	
		Bit 6: Manual mode active	
		Bit 7: Keypad has been locked	
Binary signals 2b	BYTE	Bit 0: Display lighting has been switched off	1
		Bit 1: Voltage supply via USB only	
		Bit 2: Reserved	
		Bit 3: Signal for collective fault	
		Bit 4: Reserved	
		Bit 5: Reduced power due to load failure, detected by ext. current sensor(s)	
		Bit 6: Trigger for manual Teach-In is active	
		Bit 7: Reserved	

Output values
(cyclical IO data which is written to the IO device by the IO controller)

Name	Type	Signal designation	Number of bytes
Input setpoint value	FLOAT	Input setpoint value in % (writing process only takes effect if setpoint specification -> via interface)	4

Output values
(cyclical IO data which is written to the IO device by the IO controller)

Name	Type	Signal designation	Number of bytes
Binary signals 1a	BYTE		1
	Bit 0:	External inhibit input	
	Bit 1:	External digital input 1	
	Bit 2:	External digital input 2	
	Bit 3:	Digital output (writing process only takes effect if control signal -> from interface)	
	Bit 4:	Reserved	
	Bit 5:	Reserved	
	Bit 6:	Reserved	
	Bit 7:	Reserved	
Binary signals 1b	BYTE		1
	Bit 0:	Reserved	
	Bit 1:	Reserved	
	Bit 2:	Reserved	
	Bit 3:	Reserved	
	Bit 4:	Reserved	
	Bit 5:	Reserved	
	Bit 6:	Reserved	
	Bit 7:	Reserved	
	Bit 7:	Reserved	

Start-up parameters of the IPC 300

Name	Type	Signal designation	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

Module 2 "Secondary data of the IPC 300"

The "Secondary data" module contains additional cyclical data for reading out of the device. It also has a fixed configuration and cannot be changed. In the project structure of the IO controller, this module is always located in slot 2 (optional extra).

Input values
(cyclical IO data which is read from the IO device by the IO controller)

Name	Type	Signal designation	Number of bytes
Device temperature	FLOAT	Device temperature in °C	4
External current sensor 2	FLOAT	Scaled value for fault current in mA, otherwise in A	4
External current sensor 3	FLOAT	Scaled value for fault current in mA, otherwise in A	4
Voltage input	FLOAT	Voltage input in V	4

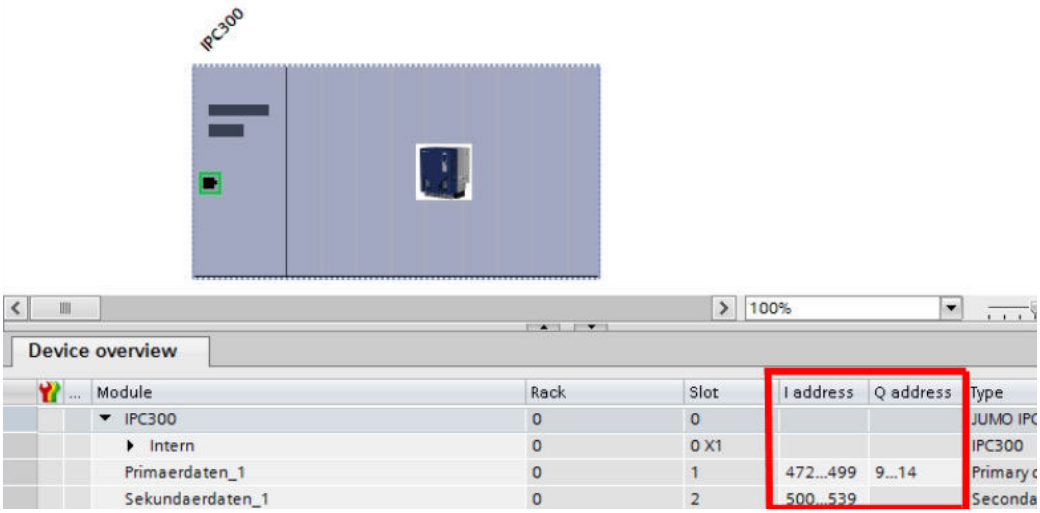
Input values
(cyclical IO data which is read from the IO device by the IO controller)

Name	Type	Signal designation	Number of bytes
Current input	FLOAT	Current input in mA	4
Effective setpoint value	FLOAT	Effective setpoint value in %	4
Output level, controller	FLOAT	Output level of controller in %	4
Output level, PWM	FLOAT	Output level of PWM in %	4
Input setpoint value	FLOAT	Input setpoint value in %	4
Actual value	FLOAT	Actual value in %	4

4.2.3 PROFINET PLC address offset

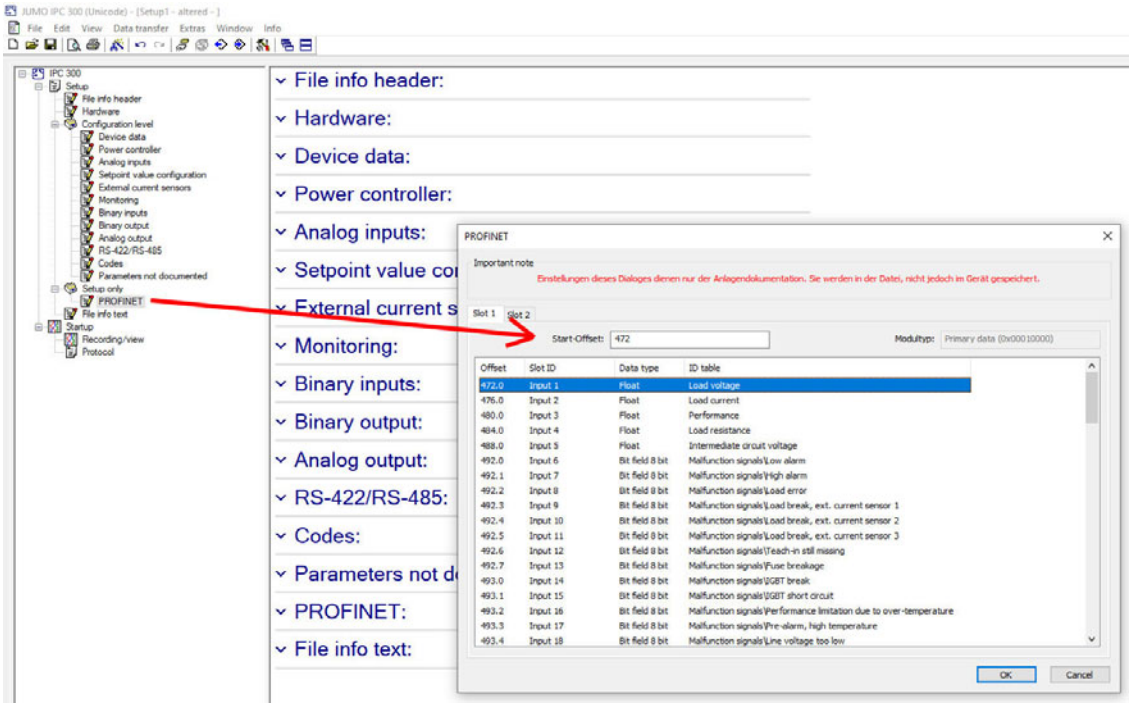
Calculation of address offset (PLC inputs/outputs) using the JUMO setup program

Calculating the address offset assists with configuration and makes it easier to program the PLC (IO controller). The following example uses an excerpt from the Siemens TIA Portal to explain how to use the offset calculation.



As can be seen, the PROFINET IO device is assigned certain input and output address ranges when being integrated into an engineering tool (such as Siemens TIA Portal). In the JUMO setup program, the relevant start address then needs to be entered, e.g. 472 for the start of the input address range, based on the example above. As a result, all the associated IO data is adjusted by this "Start" offset and it is no longer necessary to individually calculate the correct addresses for the IO data required. As can be seen below, the setup program shows the correct addresses directly.

Setup only -> PROFINET -> Configuration -> Start offset



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).

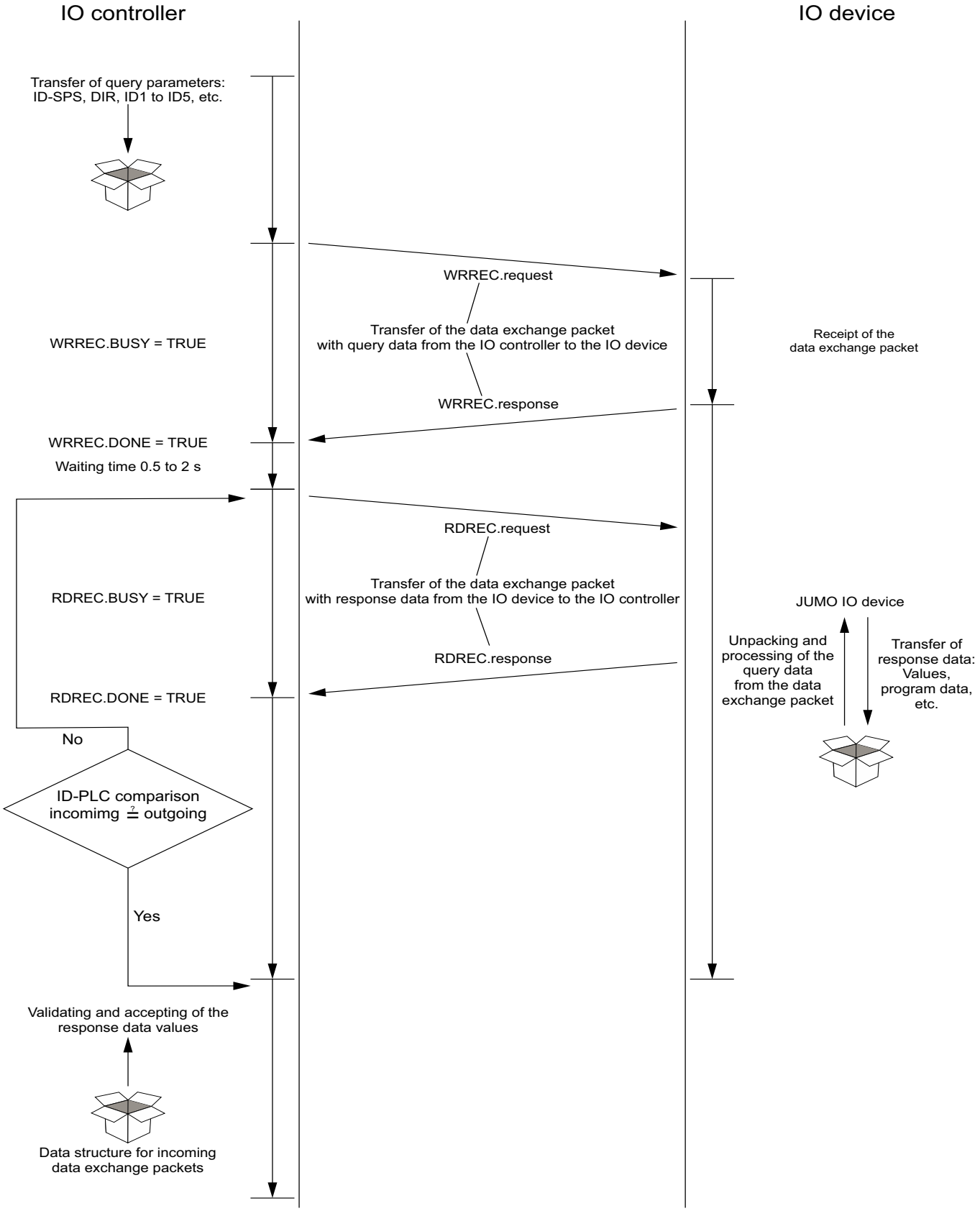
With JUMO PROFINET IO devices, the write/read requests do not access the "Record Data" directly. Instead, they transfer data exchange packets between IO controller and IO device, which are further processed in the background by the field devices. For an IO controller to be able to exchange noncyclical 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 storage for the outgoing and incoming data exchange packets. Data exchange packets are identified by an index, which has to be transferred to the write/read function blocks in the form of parameters.

Index	Data exchange packet	Explanation
201	Single-ID	For the write and read transfer of single noncyclical data points with a length of up to 4 bytes within a data exchange sequence Length of the data exchange packet: 65 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. Slot 1 is always permanently configured in JUMO IO devices. 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

To exchange single (Single-ID) noncyclical data points, 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.
- 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	**With the 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)
	Incoming: ERROR	**With the data structure for incoming data exchange packets:** The JUMO IO device enters the value "1", for example, into "ERROR" if an invalid ID was indicated in the query data (outgoing data exchange packet). In the IO controller, "ERROR" can be evaluated via a corresponding control structure. Applicable to all JUMO devices: ⇨ chapter 7.1 "Error messages for invalid values", Page 35)
WORD	ID1	5-element ID of the data point from the noncyclical data table (see chapter 5.2 "Data tables of noncyclical data", Page 22)
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.

5 Noncyclical data exchange

Data exchange sequence for data exchange packets in the "Single-ID" format

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. 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" format 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" format 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 22). 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.
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 access (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.

Parameterization of function blocks WRREC/RDREC

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

5 Noncyclical data exchange

5.2 Data tables of noncyclical data

5.2.1 Device data

JUMO ID	Name	Data type	Value range	Default setting
2.1.0.0.0	Mains frequency	USINT	0: 50 Hz 1: 60 Hz	0
2.1.0.1.0	Language wizard active	USINT	0: NO 1: YES	1
2.1.0.2.0	Language	USINT	0: GERMAN 1: ENGLISH 2: FRENCH 3: Language via SETUP	0
2.1.0.3.0	Temperature unit	USINT	0: DEGREES_C 1: DEGREES_F	0
2.1.0.4.0	Switch-off of display lighting	UINT	0 to 100 min	0 min

5.2.2 Power controller

JUMO ID	Name	Data type	Value range	Default setting
2.2.0.0.0	Subordinate control loop	USINT	0: NONE 1: U^2 2: U 3: I^2 4: I 5: P	1
2.2.0.1.0	Soft start	USINT	0: NO 1: YES	0
2.2.0.2.0	Soft start duration	UINT	0 to 65535 sec.	10 s
2.2.0.3.0	Voltage supply U-N(V)	USINT	0: 115 V 1: 230 V 2: 400 V 3: Customer-specific mains voltage	2
2.2.0.4.0	Customer-specific voltage	REAL	30 to 400 V	400 V
2.2.0.5.0	Max. load voltage	REAL	20 to 380 V	380 V
2.2.0.6.0	Max. load current	REAL	5 to 210 A	200 A
2.2.0.7.0	Max. power	REAL	0.1 to 38000 W	38000 W
2.2.0.8.0	Resistance limitation	USINT	0: NO 1: YES	0
2.2.0.9.0	Max. load resistance	REAL	0.1 to 9999.9 Ω	10 Ω

5.2.3 Analog inputs

JUMO ID	Name	Data type	Value range	Default setting
2.3.0.0.0	Current measuring range	USINT	0: OFF 1: Current 0 to 20 mA 2: Current 4 to 20 mA 3: Voltage 0 to 10 V 4: Voltage 2 to 10 V 5: Voltage 0 to 5 V 6: Voltage 1 to 5 V 7: Customer-specific	1
2.3.0.1.0	Current range start	REAL	0 to 20 mA	0 mA
2.3.0.2.0	Current range end	REAL	0 to 20 mA	20 mA
2.3.0.3.0	Voltage measuring range	USINT	0: OFF 1: Current 0 to 20 mA 2: Current 4 to 20 mA 3: Voltage 0 to 10 V 4: Voltage 2 to 10 V 5: Voltage 0 to 5 V 6: Voltage 1 to 5 V 7: Customer-specific	3
2.3.0.4.0	Voltage range start	REAL	0 to 10 V	0 V
2.3.0.5.0	Voltage range end	REAL	0 to 10 V	10 V

5.2.4 Setpoint value configuration

JUMO ID	Name	Data type	Value range	Default setting
2.4.0.0.0	Setpoint preset	USINT	0: No preset 1: Last value 2: Via current input 3: Via voltage input 4: Value adjustable 5: Via interface	2
2.4.0.1.0	Preset in case of error	USINT	0: No preset 1: Last value 2: Via current input 3: Via voltage input 4: Value adjustable 5: Via interface	1
2.4.0.2.0	Value in case of error	REAL	0 to 100 %	0 %
2.4.0.3.0	Basic load	REAL	0 to 100 %	0 %

5.2.5 External current sensors

external current sensor 2

JUMO ID	Name	Data type	Value range	Default setting
2.5.0.0.0	Measured value	USINT	0: NONE 1: EXT_SENSOR_ERROR CURRENT 2: EXT_SENSOR_LOADCURRENT 3: EXT_SENSOR_MAINS CURRENT	0
2.5.0.1.0	Sensor output signal	USINT	0: OFF 1: Current 0 to 20 mA 2: Current 4 to 20 mA 3: Voltage 0 to 10 V 4: Voltage 2 to 10 V 5: Voltage 0 to 5 V 6: Voltage 1 to 5 V 7: Customer-specific	1
2.5.0.2.0	Output range start	REAL	0 to 20 mA	0 mA
2.5.0.3.0	Output range end	REAL	0 to 20 mA	20 mA
2.5.0.4.0	Sensor input measuring range	USINT	0: EXT_CURRENT_500mA 1: EXT_CURRENT_100A 2: EXT_CURRENT_200A 3: EXT_CURRENT_Customer-specific	3
2.5.0.5.0	Input measuring range start	REAL	0 to 999,99	0
2.5.0.6.0	Input measuring range end	REAL	0 to 999,99	20
2.5.0.7.0	Limit value error current	REAL	0 to 500 mA	100 mA

external current sensor 3

JUMO ID	Name	Data type	Value range	Default setting
2.5.0.8.0	Measured value	USINT	0: NONE 1: EXT_SENSOR_ERROR CURRENT 2: EXT_SENSOR_LOADCURRENT 3: EXT_SENSOR_MAINS CURRENT	0
2.5.0.9.0	Sensor output signal	USINT	0: OFF 1: Current 0 to 20 mA 2: Current 4 to 20 mA 3: Voltage 0 to 10 V 4: Voltage 2 to 10 V 5: Voltage 0 to 5 V 6: Voltage 1 to 5 V 7: Customer-specific	1
2.5.0.10.0	Output range start	REAL	0 to 20 mA	0 mA
2.5.0.11.0	Output range end	REAL	0 to 20 mA	20 mA
2.5.0.12.0	Sensor input measuring range	USINT	0: EXT_CURRENT_500mA 1: EXT_CURRENT_100A 2: EXT_CURRENT_200A 3: EXT_CURRENT_Customer-specific	3
2.5.0.13.0	Input measuring range start	REAL	0 to 999,99	0
2.5.0.14.0	Input measuring range end	REAL	0 to 999,99	20

JUMO ID	Name	Data type	Value range	Default setting
2.5.0.15.0	Limit value error current	REAL	0 to 500 mA	100 mA

Further parameters

JUMO ID	Name	Data type	Value range	Default setting
2.5.0.16.0	Tolerance range load current	REAL	0 ...100 %	20 %
2.5.0.17.0	Power reduction	USINT	0: NO 1: YES	0

5.2.6 Monitoring

JUMO ID	Name	Data type	Value range	Default setting
2.6.0.0.0	Limit value monitoring function	USINT	0: SWITCHED OFF 1: LOAD VOLTAGE 2: LOAD VOLTAGE_QUADRATIC 3: LOAD CURRENT 4: LOAD CURRENT_QUADRATIC 5: POWER_IN_W 6: POWER_IN_kW 7: LOAD RESISTANCE 8: DC LINK VOLTAGE 9: MAINS CURRENT 10: DEVICE TEMPERATURE 11: SETPOINT VALUE 12: FROM_INTERFACE	0
2.6.0.1.0	Limit value for min. alarm	REAL	0 to 9999.9	0
2.6.0.2.0	Limit value for max. alarm	REAL	0 to 9999.9	0
2.6.0.3.0	Limit value for hysteresis	REAL	0 to 9999.9	0
2.6.0.4.0	Load monitoring	USINT	0: NO_LOAD MONITORING 1: UNDERCURRENT 2: OVERCURRENT	0
2.6.0.5.0	Limit value for load monitoring	REAL	0 to 100 %	10 %
2.6.0.6.0	Teach-In for load monitoring	USINT	0: MANUAL 1: AUTOMATICALLY_ONCE 2: AUTOMATICALLY_CYCLICALLY	0
2.6.0.7.0	Load type for load monitoring	USINT	0: STANDARD 1: INFRARED RADIATOR	0
2.6.0.8.0	SiC monitoring	USINT	0: NO 1: YES	0

5.2.7 Digital inputs

JUMO ID	Name	Data type	Value range	Default setting
2.7.0.0.0	Toggling of setpoint specification	USINT	0: SWITCHED OFF 1: DIGITAL INPUT 1 2: DIGITAL INPUT 2 3: EXT_DIGITAL INPUT 1 4: EXT_DIGITAL INPUT 2	0

JUMO ID	Name	Data type	Value range	Default setting
2.7.0.1.0	Setpoint specification for toggling	USINT	0: NO_SPECIFICATION 1: LAST_VALUE 2: VIA_CURRENT_INPUT 3: VIA_VOLTAGE_INPUT 4: ADJUSTABLE_VALUE 5: VIA_INTERFACE	4
2.7.0.2.0	Setpoint value for toggling	REAL	0 to 100 %	0 %
2.7.0.3.0	Keyboard lock	USINT	0: SWITCHED OFF 1: DIGITAL INPUT 1 2: DIGITAL INPUT 2 3: EXT_DIGITAL INPUT 1 4: EXT_DIGITAL INPUT 2	0
2.7.0.4.0	Ext. switch-off of display lighting	USINT	0: SWITCHED OFF 1: DIGITAL INPUT 1 2: DIGITAL INPUT 2 3: EXT_DIGITAL INPUT 1 4: EXT_DIGITAL INPUT 2	0
2.7.0.5.0	Ext. Teach-In for load monitoring	USINT	0: SWITCHED OFF 1: DIGITAL INPUT 1 2: DIGITAL INPUT 2 3: EXT_DIGITAL INPUT 1 4: EXT_DIGITAL INPUT 2	0
2.7.0.6.0	Control direction inhibit input	USINT	0: ACTIVE_IF_BE_LOW 1: ACTIVE_IF_BE_HIGH	1
2.7.0.7.0	Control direction of digital input 1	USINT	0: ACTIVE_IF_BE_LOW 1: ACTIVE_IF_BE_HIGH	1
2.7.0.8.0	Control direction of digital input 2	USINT	0: ACTIVE_IF_BE_LOW 1: ACTIVE_IF_BE_HIGH	1

5.2.8 Digital outputs

JUMO ID	Name	Data type	Value range	Default setting
2.8.0.0.0	Output mode Digital output	USINT	0: DIGITAL OUTPUT_COLLECTIVE FAULT 1: DIGITAL OUTPUT_ENERGY METER 2: DIGITAL OUTPUT_ST_SIGNAL_FROM_INTERFACE	0
2.8.0.1.0	Control direction, digital output	USINT	0: NORMALLY OPEN CONTACT 1: NORMALLY CLOSED CONTACT	0

5.2.9 Analog output

JUMO ID	Name	Data type	Value range	Default setting
2.9.0.0.0	Signal type - analog output	USINT	0: OFF 1: Current 0 to 20 mA 2: Current 4 to 20 mA 3: Voltage 0 to 10 V 4: Voltage 2 to 10 V 5: Voltage 0 to 5 V 6: Voltage 1 to 5 V 7: Customer-specific	3
2.9.0.1.0	Value to be output	USINT	0: SWITCHED OFF 1: LOAD VOLTAGE 2: LOAD VOLTAGE_QUADRATIC 3: LOAD CURRENT 4: LOAD CURRENT_QUADRATIC 5: POWER_IN_W 6: POWER_IN_kW 7: LOAD RESISTANCE 8: DC LINK VOLTAGE 9: MAINS CURRENT 10: DEVICE TEMPERATURE 11: SETPOINT VALUE 12: FROM_INTERFACE	11
2.9.0.2.0	Signal range start value	REAL	0 to 100 %	0 %
2.9.0.3.0	Signal range end value	REAL	0 to 100 %	100 %

5.2.10 Codes

JUMO ID	Name	Data type	Value range	Default setting
2.11.0.0.0	Code, manual mode	UINT	0 to 9999	0
2.11.0.1.0	Code, operating level	UINT	0 to 9999	0
2.11.0.2.0	Code, configuration level	UINT	0 to 9999	0

5.2.11 Undocumented integer parameters

JUMO ID	Name	Data type	Value range	Default setting
2.12.1.0.0	Parameter 1	UINT	0 to 65535	-
.	.			
.	.			
.	.			
2.12.1.49.0	Parameter 50	UINT	0 to 65535	-

5.2.12 Undocumented float parameters

JUMO ID	Name	Data type	Value range	Default setting
2.13.0.0.0	Parameter 1	REAL	0 to 9999.9	-
.	.			

5 Noncyclical data exchange

JUMO ID	Name	Data type	Value range	Default setting
.	.			
.	.			
2.13.0.24.0	Parameter 25	REAL	0 to 9999.9	-

6.1 Project integration of JUMO IO devices

For JUMO field devices to be integrated into the project structure of the IO controller as an IO device, the GSDML file of the respective device must be imported into the engineering system of the 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. 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 of 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. 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 "Primary data" module in slot 1. The "Primary data" 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.

3. 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.

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

   ⇨ chapter 6.2 "Configuring the JUMO IO device", Page 30
6. 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.

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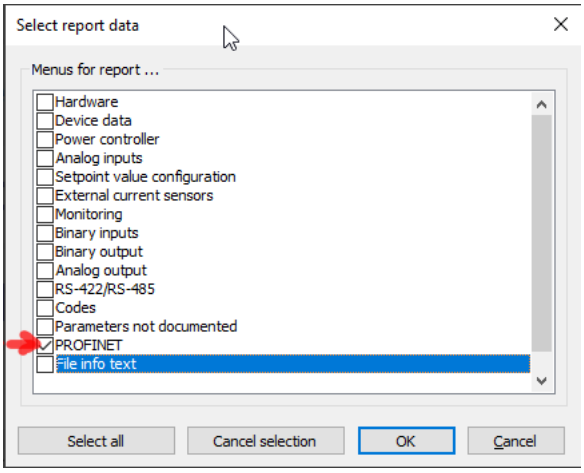
1 SIMATIC is a registered trademark of Siemens AG in 80333 Munich, Germany.
2 CODESYS is a registered trademark of 3S-Smart Software Solutions GmbH in 87439 Kempten, Germany.

7. 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.

NOTE!

For this purpose, you can call up the print command from the menu bar of the setup program.

- **File -> Print**
- Set the checkmark for PROFINET configuration
- Click OK



The module list will be printed on your default printer.

6.2 Configuring the JUMO IO device

6.2.1 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 startup, 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 "Primary data" module (slot 1).

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

⇨ chapter 4.2.2 "Modules", Page 11

6.2.2 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.

Modules

The modules have a fixed configuration. Slot 1 is always pre-assigned. Slot 2 can always be added as an optional extra.

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.

>> Processing cycle time in the JUMO IPC 300: 8 ms <<

Watchdog

If the watchdog function is activated, the cyclical communication is monitored. 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.

6.3 Startup

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

1. 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 6.4 "Diagnostics", Page 32

2. If you have not yet inserted a network connector into the switchports of the PROFINET interface, establish the connections to your network now.

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

   ⇨ chapter 6.4 "Diagnostics", Page 32

3. 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 a 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 standard 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.

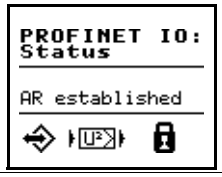
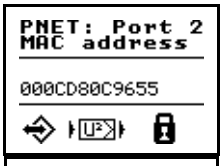
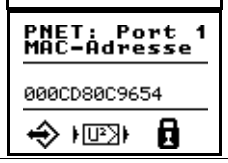
4. After the system has booted successfully with DCP assignment of the IP configuration to the JUMO IO device by the IO controller, the device is ready to communicate with the IO controller. Immediately thereafter, communication with the IO controller starts and the PROFINET status changes to "PLC Connection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

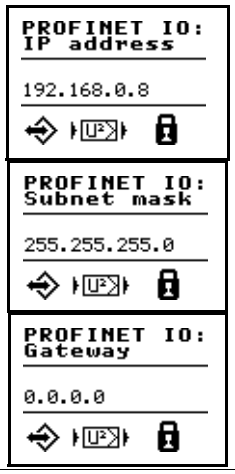
6 Project planning

6.4 Diagnostics

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

Call-up: Device menu > Device info > PROFINET IO

Status: Data for connecting the JUMO IO device to the IO controller The last PROFINET diagnosis event is displayed as the current connection status: • **Init Error** Unable to initialize the PROFINET interface. Restart the device. • **Initialized** The PROFINET interface was initialized and is ready to establish the connection. • **AR established** There is an active connection to a PROFINET controller. • **AR not in op** Connection to a PROFINET controller was terminated.	
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 (see ⇨ chapter 6.2.2 "Communication parameters", Page 30). 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 two switchports (RJ 45) of the PROFINET optional board	  

Version: Version numbers of hardware and software components	
IP configuration data of the internal PROFINET interface of the JUMO IO device	

The status LED indicates the bus status of the device.
It lights up red, green, or red and green simultaneously.
Red indicates a bus error and green indicates whether the PROFINET IO device is ready.
The status details are as follows:

Color	Flash response	Meaning
Red	ON	No connection to the Ethernet network
	flashing	Connected to Ethernet, but no communication with PROFINET IO controller
	OFF	Communication with the PROFINET IO controller is active
Green	ON	PROFINET IO device has started up correctly
	flashing	Internal communication error
	OFF	Internal error in the PROFINET IO device

6 Project planning

7.1 Error messages for invalid values

For measured values in floating-point format (cyclical transfer), the error number appears directly in the value, i.e. it contains the error number instead of the measured value.

Error code for floating-point values	Error
3.0×10^{37}	Not a valid input value

7.2 Error message for noncyclical services

In the ERROR item, possible errors are reported back to the PLC.
The following error IDs have been defined for JUMO:

Error ID	Description
0	No error
3	Incorrect ID
14	Currently unable to write to the config. parameters
15	Incorrect DIRECTION (only 1 (PLC_WRITE) and 2 (PLC_READ) are permitted)

⇨ chapter 5 "Noncyclical data exchange", Page 17

7 Error messages

8.1 PROFINET certificate

The certificate is available as a download:

qr-709051-de.jumo.info

8 PROFINET

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