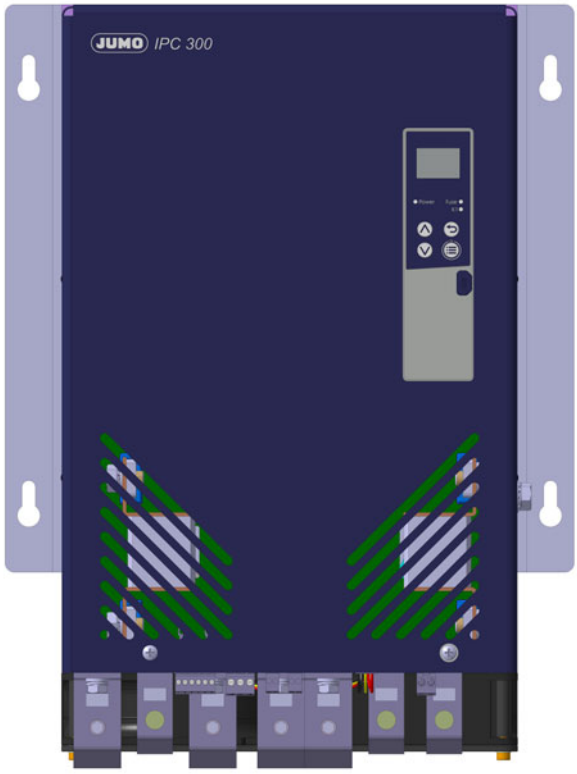
JUMO IPC 300

Electronic transformer



Modbus interface description

70905100T92Z001K000

V1.00/EN/30048311/2023-02-25

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1.1 Preface

Read this operating manual before putting the device into operation. Keep the operating manual in a place that is accessible to all users at all times.
Your comments are appreciated and may assist us in improving this operating manual.

Warranty

All necessary settings are described in this operating manual.
Manipulations not described in the operating manual or which are expressly forbidden will jeopardize your warranty rights.
If you have any problems, please contact the nearest branch office or the head office.

Service

For service addresses see back cover

1.2 Safety information

1.2.1 Warning symbols

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.

1.2.2 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.

Footnotes

Footnotes are remarks that refer to specific parts of the text[1]. Footnotes consist of two parts: A marker in the text, and the footnote text. The markers in the text are arranged as consecutive superscript numbers.

1 Introduction

Command sequence

Config level -> Power controller -> Operating mode
Small arrows between words are designed to make it easier to find parameters in the configuration level.

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.

1.3 Display types

Hexadecimal number

0x0010
A hexadecimal number is identified by a "0x" prefix (in this case 16 decimal).

1.4 Available interfaces

The setup interface on the front (USB connector type B Micro 5-pole) is provided in every device.

An RS422/RS485 interface (4-pole screwed connector) must be stated in the order.

This operating manual only describes communication via the RS422/485 interface using the Modbus protocol.

1.5 Identifying the device version

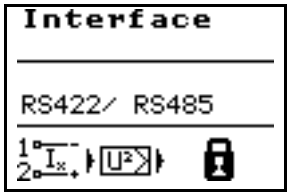
Only devices with a 54 in the order code (5) are equipped with the RS422/485 interface.

02		English
03		French
	(4)	**Load current**
70		DC 70 A ⎓ (configurable from 5 to 73,5 A)
100		DC 100 A ⎓ (configurable from 5 to 105 A)
200		DC 200 A ⎓ (configurable from 5 to 210 A)
	(5)	**Interface**
00		None
54		RS422/485 Modbus RTU
63		PROFINET
	(6)	**Extra codes**
252		Relay, (changeover contact)
257		Optocoupler

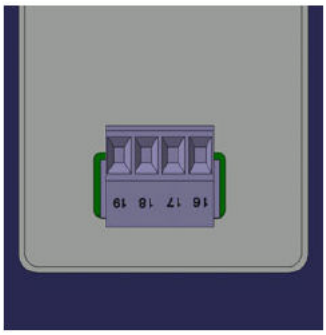
	(1)		(2)		(3)		(4)		(5)		(6)
Order code		/		-		-		-		/	
Order example	709051	/	8	-	01	-	100	-	54	/	252

On the device

1. Press PGM.
2. Select the "Device info" menu item and press PGM.



1.6 Connection of the interface

Anschluss Modbus	RS422	RS485
 steckbare Schraub-klemmen	TxD (-)	RxD/TxD B(-)
	TxD (+)	RxD/TxD A(+)
	RxD (-)	-
	RxD (+)	-
Der Schirm der Modbus Leitungen ist auf Erd-potential (PE) zu legen! 		

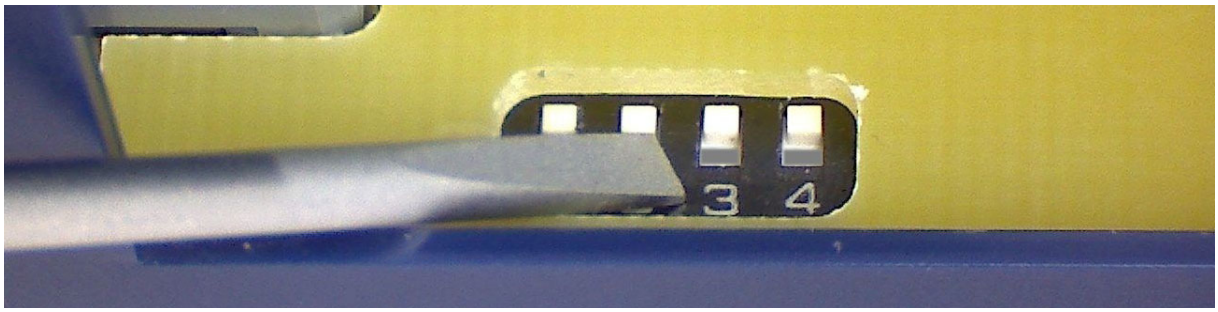
1.7 Terminating resistor of the RS422/485 serial interface

To ensure problem-free operation of several devices in a line structure, their internal terminating resistors must be activated at the beginning and end.

1. Disconnect the device from the supply voltage
2. Open the housing

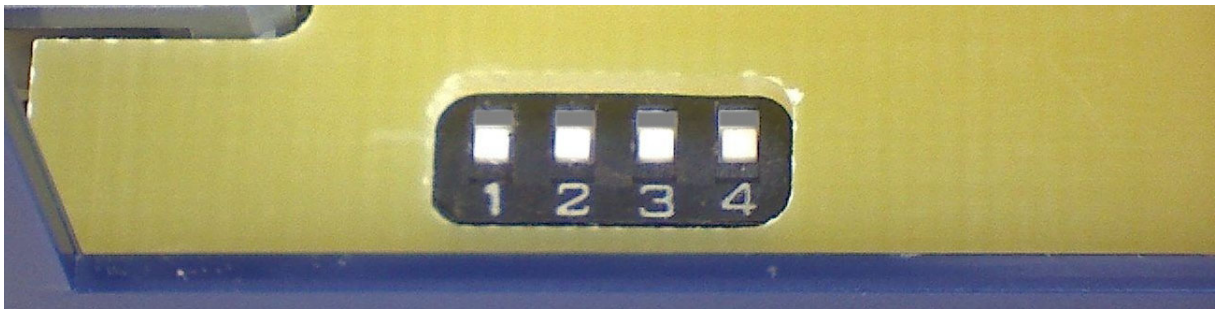
Bus terminating resistor active

Press all 4 switches up.



No bus termination (default setting)

Press all 4 switches down.



1.8 Configuration

The configuration is set either on the device or using the setup program.

1.8.1 Baud rate

9600 baud, 19200 baud, or 38400 baud

1.8.2 Data format

Number of data bits-Number of stop bits-Parity:

- 8-1-none
- 8-1-even
- 8-1-odd
- 8-2-none

1.8.3 Device address

The device address must lie in the range 1 to 255.

Address 0 is reserved for broadcast messages, i.e., the instruction is executed by the IPC 300 but not answered.

If an instruction with the device address 255 is received in the device, it will always be processed, even if a different device address has been configured.
If a device address of 0 is configured, the power controller will not signal a bus error if it has not received an instruction for 10 s.

1.8.4 Minimum response time

A value within the range 0 to 500 ms can be entered here.

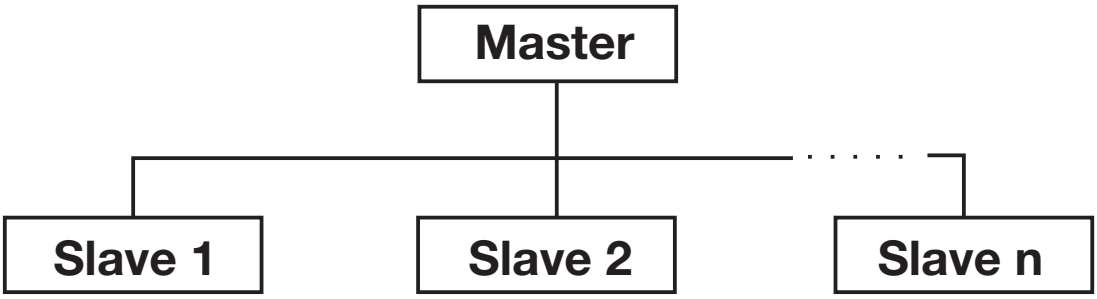
After receiving a Modbus instruction, the specified period of time must first elapse before the response is sent to the master. The parameter should be used for the RS422/485 interface if the master or one of the other slaves connected to the bus needs a certain period of time to switch from transmit to reception mode.

A set time of 0 ms means that the IPC 300 responds as quickly as possible. This setting should be deployed when using the RS422/485 interface.

⇨ chapter 2.4 "Chronological sequence of communication", Page 10

2.1 Master-slave principle

Communication between a PC (master) and a device (slave) with Modbus takes place according to the master/slave principle in the form of data request/instruction – response.



The master controls the data exchange; the slaves only have a response function. They are identified by their device address.

2.2 RTU transmission mode

RTU mode (Remote Terminal Unit) is used as the transmission mode. Data is transmitted in binary format (hexadecimal) with 8 bits. The LSB (least significant bit) is transmitted first. The ASCII operating mode is not supported.

Data format

The data format describes the structure of the characters that are transferred. The following options are provided for the data format:

Data word	Parity bit	Stop bit 1/2 bit	Number of bits
8-bit	-	1	9
8-bit	even	1	10
8-bit	odd	1	10
8-bit	-	2	10

2.3 Device address

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if it has not received an instruction for 10 s.

NOTE!

A maximum of 31 slaves can be addressed via the RS485 interface.

Two different options are available for data exchange:

Query

Data request/instruction by the master to a slave via the corresponding device address.
The addressed slave responds.

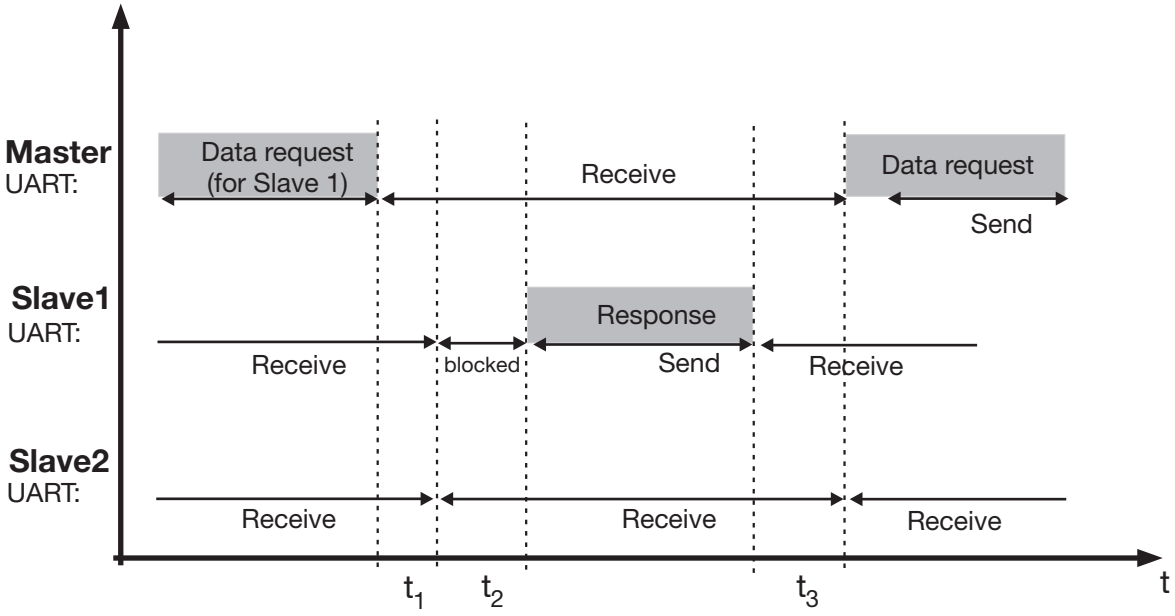
Broadcast

Instruction from the master to all slaves via device address 0. The connected slaves do not respond. This makes it possible to transfer a specific setpoint value to all slaves, for example. In such a case, the correct acceptance of the value by the slaves should be checked by a subsequent readout of the setpoint value.
A data request with device address 0 does not make sense.

2.4 Chronological sequence of communication

Time diagram

Example of the chronological sequence for communication based on 1 Modbus master (e.g., SCADA software on a PC or a PLC) and 2 IPC 300s as Modbus slave 1 and Modbus slave 2:



t1

Identifies the end of the request:
According to the Modbus specification it is at least 3.5 times as long as the transfer time for 1 character, depending on the baud rate. In the IPC 300 the time is:

- at 9600 baud: 4.1 ms
- at 19200 baud: 2.1 ms
- at 38400 baud: 1.1 ms

t2

Internal processing time:
The time required by the power controller to process the request it has received and prepare the response. In the IPC 300 it is typically 1 to 3 ms and a maximum of 6 ms.

t3

Identifies the end of the response:
Same duration as t1.

Chronological sequence

The master sends a data request for slave 1. After the last character is sent, all connected IPC 300 slaves wait for a time of t1. Then the instruction is evaluated.
Slave 2 discards the instruction because the device address does not match. On the other hand, slave

1 begins processing the request and preparing the response. This takes place within time t2. Then slave 1 sends the response and switches back to reception again immediately after the last character. Slave 2, which "listens in" on the response in the case of an RS485, must wait for time t3 before it can evaluate the response that is received. Because the device address again does not match, it ignores the response and switches back to reception. The master cannot send a new instruction until all these times have elapsed!

No data requests may be made by the master within t1, t2, and t3. Otherwise the IPC 300 would ignore the instruction or the data on the bus would become invalid because of data collisions.

Time t3 is required by all other slaves on the bus to switch back to reception. (In the case of the RS485, every IPC 300 connected to the bus also receives the response, so it is essential that the master waits for this waiting period to elapse before sending a new instruction! Otherwise the other power controllers will not be ready yet to receive instructions again.)

Minimum response time

In the IPC 300, it is also possible to set a minimum response time of 0 to 500 ms in the configuration. The IPC 300 will not send back a response before this time elapses (measured since the last character was received), meaning the duration of t1 + t2 is extended accordingly.

This setting is required for RS485 interfaces in order to:

a) give the master time to switch from "transmit" to "receive"
b) provide the necessary time to other devices that need much longer before evaluating the device address of the protocol that is received.

For the RS485 interface, the **minimum response time** should be configured to ensure that even the slowest bus user already evaluates the data request from the master and notices that the instruction is not for them before the response from the IPC 300 begins.

2.5 Error handling

In the event of the following malfunctions, the IPC 300 will not respond to the instruction that was sent:

- The baud rate and/or data format of the master and IPC 300 do not match
- The device address of the IPC 300 does not match the one contained in the protocol and is not 255 (a response is always sent if it is 255)
- The checksum (CRC) is not correct
- The instruction is defined incompletely or excessively
- The number of words to read is 0

In these cases, the instruction from the master should be sent again after the timeout time has elapsed. If the instruction from the master was received without any transmission errors but cannot be processed for a certain reason, the IPC 300 will respond as provided for in the Modbus protocol – in the response, the received function code is OR linked to 0x80 as error identification and the error code is sent back in the data field.

Error codes

- 01: Invalid Modbus function
- 02: Invalid data address
- 03: Data value outside admissible value range
- 04: Error when processing the instruction (e.g., unable to write to flash)
- 06: Currently unable to execute the instruction, please try again
- 08: Write-protected

If the number of words to be read or written exceeds the maximum admissible number (see table of Modbus functions), the IPC 300 will also return the error code 02. When reading float values, the error number will be entered in the value itself if the value is invalid, i.e., the error code will be transferred as a float value, rather than the measured value.

Error	Error code for float values
Measuring range underflow (Underrange)	0xFF800000 (Negative Infinity)
Measuring range overflow (Overrange)	0x7F800000 (Positive Infinity)
Other invalid value	0x7FC00000 (Not a Number)

2.6 Detection of bus errors

A bus error will be signaled if the device has an RS422/485 interface and a Modbus telegram is not received for at least 10 s.
In the event of a malfunction, the power controller can thus switch to a configurable replacement value, because the failure of the master means the setpoint value specified via Modbus is missing.
This behavior can be deactivated by setting the Modbus device address of the power controller to 0.

2.7 Checksum (CRC16)

Transmission errors are detected with the aid of the checksum (CRC16). If an error is detected during evaluation, the device concerned does not respond.

Calculation principle

CRC = 0xFFFF			
	CRC = CRC XOR BytesOfMessage		
	For (1 to 8)		
		CRC = SHR(CRC)	
		if (flag shifted to the right = 1)	
		then CRC = CRC XOR 0xA001	else
while (not all BytesOfMessage processed);			

Example

Data request: read two words starting at address 0x00CE
(CRC16 = 0xA592)

07	03	00	CE	00	02	A5	92
						CRC16	

Response: (CRC16 = 0xADF5)

07	03	04	00	00	41	C8	AD	F5
			Word 1		Word 2		CRC16	

The following functions are available for the device:

Function number	Function	Maximum number
0x03 or 0x04	Reading n words	Max. 127 words (= 254 bytes)
0x06	Writing one word	1 word
0x10	Writing n words	Max. 127 words (= 254 bytes)

If the device receives an instruction with a different function number, it will respond with the Modbus error code 1 (ILLEGAL FUNCTION) in this case.

3.1 Reading n words

This function is used to read n words starting at a specific address.

Data request

Slave address	Function 0x03 or 0x04	Address First word	Number of words (max. 127)	Checksum CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response

Slave address	Function 0x03 or 0x04	Number Number of bytes read	Word value(s)	Checksum CRC16
1 byte	1 byte	1 byte	x bytes	2 bytes

Example

Reading the measured value for the load current

Modbus address of the load current = 0x00B1

Data request:

01	03	00	B1	00	02	942C

Response:

01	03	04	70	A3	41	45	E172
			Load current = 12.24 A				CRC

3.2 Writing one word

The data blocks for the instruction and response are identical when writing a word.

Instruction

Slave address	Function 0x06	Word address	Word value	Checksum CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response

Slave address	Function 0x06	Word address	Word value	Checksum CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Example

Write external inhibit input = 1

Modbus address = 0x00CD

Instruction:

01	06	00	CD	00	01	D9F5

Response (same as instruction):

01	06	00	CD	00	01	D9F5

3.3 Writing n words

This function is used to write n words starting at a specific address.

Instruction

Slave address	Function 0x10	Address First word	Number of words (max. 127)	Number of bytes	Word values	Checksum CRC16
1 byte	1 byte	2 bytes	2 bytes	1 byte	x bytes	2 bytes

Response

Slave address	Function 0x10	Address First word	Number of words	Checksum CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Example

Write setpoint value = 12.34

Modbus address = 0x00D5

Instruction:

01	10	00	D5	00	02	04	70	A3	41	45	258D
							Setpoint value = 12.34				CRC

Response:

01	10	00	D5	00	02	5030

4.1 Transmission formats

4.1.1 Integer values

The "Big Endian" format (Motorola® format) is used to transfer integer values (also for the addresses):

The high byte first, followed by the low byte

Example: Request of the int value of Modbus address `0x000D`, if 45 (= `0x002D`) is written beneath this address:

Request:`0103000D000115C9`

Response:`010302002D7859`

4.1.2 Floating-point values

In the case of Modbus float values, the IPC 300 operates with the IEEE-754 standard format (32 bits), the only difference being that byte 1 and 2 are interchanged with byte 3 and 4.

SEEEEEE	EMMMMMMM	MMMMMMM	MMMMMMM	Single-float format (32-bit) according to standard IEEE 754
Byte 1	Byte 2	Byte 3	Byte 4	

S - Prefix sign bit

E - Exponent (two's complement)

M - 23-bit normalized mantissa

Modbus address x		Modbus address x+1		
MMMMMMM	MMMMMMM	SEEEEEE	EMMMMMMM	Modbus float format
Byte 3	Byte 4	Byte 1	Byte 2	

Example: Request of the float value of Modbus address `0x0104`, if 550.0 (= `0x44098000 in IEEE-754 format`) is written beneath this address:

Request:`0103010400028436`

Response:`0103048000440920F5`

Please find out the way float values are saved in your application. After being transmitted from the power controller, the bytes for the float value may need to be interchanged accordingly.

4.1.3 Character strings (texts)

Character strings always finish with '\0' (ASCII code 0x00) as the end flag. Any characters after this mark have no significance.

Example: Request of the text of Modbus address `0x000E` to which "IPC300" (ASCII code:`0x49, 0x50, 0x43, 0x33, 0x30, 0x30, 0x20, 0x20, 0x00`) is written:

Request:`0103000E0005E40A`

Response:`01030A495043333030202000000296`

(instead of 0x00 directly preceding CRC, any other value could also be stated)

The number of characters stated for strings in the following tables includes the final '\0'.

Example: "text (10 bytes)" means that the text is up to 9 characters long. The end flag '\0' is then added.

4 Data flow

The following tables in this chapter list the addresses of the readable and writable words. SCADA programs, PLCs, or similar can be used to read and/or write the values.

The entries under "Access" mean the following:

R Read Only, value can only be read

R/W Read/Write, value can be written and read

The number of characters stated under "Data type" for character strings includes the final '\0'.

Example: "text (10 bytes)" means that the text is up to 9 characters long. The end flag '\0' is then added.

5.1 Device data

5.1.1 ID

Address	Access	Data type	Signal designation
0x0000	R	text (11 bytes)	Software version
0x0006	R	text (13 bytes)	VdN number
0x000D	R	word (16 bits)	Internal software version
0x000E	R	text (9 bytes)	Device name ("IPC 300")
0x0013	R	text (20 bytes)	Fabrication number
0x001D	R	text (9 bytes)	Inspection ID
0x0023	R	word (16 bits)	Reserve
0x0024	R	word (16 bits)	Reserve
0x0025	R	word (16 bits)	Reserve
0x0026	R	word (16 bits)	Reserve
0x0027	R	text (31 bytes)	Order code
0x0037	R	enum	Basic type: 0 = IPC300_709051
0x0038	R	enum	Nominal current: 0 = 70 A, 1 = 100 A 2 = 200 A
0x0039	R	enum	Equipped digital output: 0 = Relay 1 = Optocoupler
0x003A	R	enum	Equipped interface: 0 = None 1 = RS422/485 2 = PROFINET
0x003B	R	word (16 bits)	Reserve
...	R	word (16 bits)	Reserve
0x0096	R	word (16 bits)	Reserve

5.1.2 Operating level parameters

The following parameters are applied in the RAM when writing data. This means they can be re-written cyclically, but are lost when the device is switched off.

Address	Access	Data type	Signal designation
0x0097	R, W	enum	Language

Address	Access	Data type	Signal designation
0x0098	R, W	word (16 bits)	Switch-off of display lighting (in min)
0x0099	R, W	float	Load voltage limit value (in V)
0x009B	R, W	float	Current limit value (in A)
0x009D	R, W	float	Power limit value (in W)
0x009F	R, W	float	Resistance limit value (in ohms)
0x00A1	R, W	float	Setpoint value in case of bus error/wire break (in %)
0x00A3	R, W	float	Base load (in %, not in V / A / W / kW / Ω / °C / °F like on the device)
0x00A5	R, W	float	Limit value for min. alarm (in V / A / W / kW / Ω / °C / °F depending on what is being monitored)
0x00A7	R, W	float	Limit value for max. alarm (in V / A / W / kW / Ω / °C / °F depending on what is being monitored)
0x00A9	R, W	float	Limit value for hysteresis (in V / A / W / kW / Ω / °C / °F depending on what is being monitored)
0x00AB	R, W	float	Limit value for load monitoring (0 to 100 %, default value is set to 10 %)
0x00AD	R, W	float	Setpoint value (fixed value) for switching over the setpoint specification via digital input

5.2 Input and output variables

5.2.1 RMS measured values

Address	Access	Data type	Signal designation
0x00AF	R	float	Load voltage (in V)
0x00B1	R	float	Load current (in A)
0x00B3	R	float	Load current, mains current, or fault current of Ext. current sensor 2, scaled to standard signal used (0-20 mA, 4-20 mA, or customer-specific)
0x00B5	R	float	Load current, mains current, or fault current of Ext. current sensor 3, scaled to standard signal used (0-20 mA, 4-20 mA, or customer-specific)
0x00B7	R	float	Load current, mains current, or fault current of Ext. current sensor 2, scaled to measuring range used (in mA or A)
0x00B9	R	float	Load current, mains current, or fault current of Ext. current sensor 3, scaled to measuring range used (in mA or A)
0x00BB	R	float	Power (in W)
0x00BD	R	float	Load resistance (in Ω)
0x00BF	R	float	DC link voltage (in V)

5.2.2 Analog values

Address	Access	Data type	Signal designation
0x00C1	R	float	Voltage input (in V)
0x00C3	R	float	Current input (in mA)
0x00C5	R	float	Device temperature (in °C)
0x00C7	R	float	Device temperature (in °F)

5.2.3 Digital inputs/outputs

Address	Access	Data type	Signal designation
0x00C9	R	bool	Digital input 1
0x00CA	R	bool	Digital input 2
0x00CB	R	bool	Inhibit input
0x00CC	R	bool	Inhibit peak current
0x00CD	R, W	bool	External inhibit input
0x00CE	R, W	bool	External digital input 1
0x00CF	R, W	bool	External digital input 2
0x00D0	R, W	bool	Digital output

5.2.4 Controller

Address	Access	Data type	Signal designation
0x00D1	R	float	Output level of controller (in %)
0x00D3	R	float	Output level of PWM (in %)
0x00D5	R, W	float	Input setpoint value (in %)
0x00D7	R	float	Effective setpoint value (in %)
0x00D9	R	float	Actual value (in %)

5.2.5 Device states

Address	Access	Data type	Signal designation
0x00DB	R	bool	Inhibit active
0x00DC	R	bool	Voltage limitation active
0x00DD	R	bool	Current limiting active
0x00DE	R	bool	Power limitation active
0x00DF	R	bool	Resistance limitation active
0x00E0	R	bool	Limitation active
0x00E1	R	bool	Soft start active
0x00E2	R	bool	External toggle switch of setpoint specification active
0x00E3	R	bool	Reconfiguration active
0x00E4	R	bool	Calibration mode active
0x00E5	R	bool	Manual mode active
0x00E6	R	bool	Keypad locked
0x00E7	R	bool	Display switched off
0x00E8	R	bool	Voltage supply via USB only
0x00E9	R	bool	Reserve
0x00EA	R	bool	Malfunction
0x00EB	R	bool	Power reduction
0x00EC	R	bool	Trigger for manual Teach-In

5.2.6 Binary signals

Address	Access	Data type	Signal designation
0x00ED	R	word (16 bits)	Malfunction signal 1
	R	Bit0	Min. alarm

5 Address tables

Address	Access	Data type	Signal designation
	R	Bit1	Max. alarm
	R	Bit2	Load error
	R	Bit3	Load failure virtual current sensor 1
	R	Bit4	Load failure external current sensor 2
	R	Bit5	Load failure external current sensor 3
	R	Bit6	Teach-In for load monitoring is missing
	R	Bit7	Fuse failure
	R	Bit8	IGBT break
	R	Bit9	IGBT short-circuit
	R	Bit10	Limited power due to excess temperature
	R	Bit11	Pre-alarm due to excess temperature
	R	Bit12	Mains voltage too low
	R	Bit13	Wire break at current input
	R	Bit14	Wire break at voltage input
	R	Bit15	Bus error
0x00EE	R	word (16 bits)	Malfunction signal 2
	R	Bit0	Reserved
	R	Bit1	Reserved
	R	Bit2	Adjustment not possible
	R	Bit3	Inhibit input
	R	Bit4	Inhibit due to excessive peak current
	R	Bit5	External inhibit input
	R	Bit6	Inhibit via U_{CEsat} – detection1
	R	Bit7	Inhibit via U_{CEsat} – detection2
	R	Bit8	Error current too large
	R	Bit9	Failure of fan 1
	R	Bit10	Failure of fan 2
	R	Bit11	Invalid configuration
	R	Bit12	Wire break at external current sensor 2
	R	Bit13	Wire break at external current sensor 3
	R	Bit14	External current sensor incorrectly configured
	R	Bit15	Reserve
0x00EF	R	word (16 bits)	Binary signal 1
	R	Bit0	Hardware level digital input 1
	R	Bit1	Hardware level digital input 2
	R	Bit2	Hardware level inhibit input
	R	Bit3	Digital input 1
	R	Bit4	Digital input 2
	R	Bit5	Inhibit input
	R	Bit6	Signal of peak current monitoring circuit
	R	Bit7	External digital input 1
	R	Bit8	External digital input 2
	R	Bit9	External inhibit input
	R	Bit10	Digital output
	R	Bit11	Inhibit

Address	Access	Data type	Signal designation
	R	Bit12	The voltage limitation is active
	R	Bit13	The current limiting is active
	R	Bit14	The power limitation is active
	R	Bit15	The resistance limitation is active
0x00F0	R	word (16 bits)	Binary signal 2
	R	Bit0	The voltage, current, power, or resistance limitation is active
	R	Bit1	Soft start running
	R	Bit2	The external switchover of the setpoint specification is active
	R	Bit3	The power controller is currently being reconfigured
	R	Bit4	Reserve
	R	Bit5	Reserve
	R	Bit6	The power controller is operating in manual mode
	R	Bit7	The keypad has been locked
	R	Bit8	The display lighting has been switched off
	R	Bit9	Voltage supply via USB only
	R	Bit10	Reserve
	R	Bit11	Malfunction
	R	Bit12	Reserve
	R	Bit13	Reduced power due to load failure, detected by ext. current sensor(s)
	R	Bit14	Trigger for manual Teach-In is active
	R	Bit15	Reserve
0x00F1	W	word (16 bits)	Binary signal (write only)
	W	Bit0	External inhibit input
	W	Bit1	External digital input 1
	W	Bit2	External digital input 2
	W	Bit3	Digital output
	W	Bit4	Reserve
	W	Bit5	Reserve
	W	Bit6	Reserve
	W	Bit7	Reserve
	W	Bit8	Reserve
	W	Bit9	Reserve
	W	Bit10	Reserve
	W	Bit11	Reserve
	W	Bit12	Reserve
	W	Bit13	Reserve
	W	Bit14	Reserve
	W	Bit15	Reserve

5.2.7 Errors and malfunctions

Address	Access	Data type	Signal designation
0x00F2	R	bool	Min. alarm
0x00F3	R	bool	Max. alarm
0x00F4	R	bool	Load error

Address	Access	Data type	Signal designation
0x00F5	R	bool	Wire break at external current sensor 1
0x00F6	R	bool	Wire break at external current sensor 2
0x00F7	R	bool	Wire break at external current sensor 3
0x00F8	R	bool	Teach-In for load monitoring is missing
0x00F9	R	bool	Fuse failure
0x00FA	R	bool	IGBT break
0x00FB	R	bool	IGBT short-circuit
0x00FC	R	bool	Limited power due to excess temperature
0x00FD	R	bool	Pre-alarm due to excess temperature
0x00FE	R	bool	Mains voltage too low
0x00FF	R	bool	Wire break at current input
0x0000	R	bool	Wire break at voltage input
0x0101	R	bool	Bus error
0x0102	R	bool	Reserve
0x0103	R	bool	Energy meter configuration is incorrect
0x0104	R	bool	SiC voltage reserve exhausted
0x0105	R	bool	Inhibit via inhibit input
0x0106	R	bool	Inhibit via peak current
0x0107	R	bool	Inhibit via external input
0x0108	R	bool	Inhibit via $U_{CE\ sat}$ – detection 1
0x0109	R	bool	Inhibit via $U_{CE\ sat}$ – detection 2
0x010A	R	bool	Error current too large
0x010B	R	bool	Failure of fan 1
0x010C	R	bool	Failure of fan 2
0x010D	R	bool	Invalid configuration
0x010E	R	bool	Defect in external current sensor 2
0x010F	R	bool	Defect in external current sensor 3
0x0110	R	bool	Configuration error in external current sensor (2 and/or 3)

5.2.8 Controlling the analog output

Address	Access	Data type	Signal designation
0x0111	R	float	Reserve
0x0113	R, W	float	Value of analog output when controlled via interface (in %)
0x0115	R	bool	Reserve

6.1 Setpoint specification

If the setpoint value needs to be specified via the interface for a power controller, it must be configured accordingly. Using the keypad on the device or the setup program, navigate to:
Configuration level > Setpoint value configuration > Setpoint value and set "Via interface". Otherwise, a value written to the Modbus address 0x00D5 will not be taken into account.

The setpoint value must be written to the Modbus address 0x00D5 as a percentage. The range of the transmitted setpoint value is not checked. Therefore, the power controller never responds with the Modbus error code 03 (data value outside admissible value range). If the setpoint value is too big or too small, it will simply be corrected to 100 % or 0 % later on when determining the setpoint value.

The internal setpoint value calculation may also take into account other measurands such as the base load and soft start. This results in the effective setpoint value, which is fed into the controller and can be read out from the Modbus address 0x00D7 if necessary.

The transferred setpoint value is used for thyristor control until a new setpoint value is sent via the interface.

Setpoint values that are transferred to the power controller are only stored in the RAM, meaning they are lost if the mains voltage supply fails. The "Input in the event of an error" parameter determines which setpoint value is used for the IGBT control if a bus error is detected.

Following power on, 0 % is used as the setpoint value until the first value is received via the interface or a bus error is detected.

6.2 Controlling the analog output

To control the analog output of the power controller via the interface, the parameter
Configuration level > Analog output > Value to be output must be set to "From interface".
The Configuration level > Analog output > Signal range starting value should be set to 0.0 % and the end value to 100.0 %. The desired output value is then written to the Modbus address 0x0113 of the power controller as a percentage. If, for example, the signal type 4 to 20 mA has been configured and the float value 50.0 is written to Modbus address 0x0113, the power controller will output 12 mA on the analog output.
The transferred value is output until a new value is received via the interface.

6.3 Controlling the digital output

The digital output of the power controller (i.e., the relay or the optocoupler as an optional extra) can be controlled via the interface.
For this purpose, the parameter Configuration level > Binary output > Output mode has to be set to "Interface signal". The desired state of the binary output is then written as 0 or 1 to Modbus address 0x00D0 of the power controller. This is output on the digital output until a new value is sent via the interface.
The digital output is switched off (i.e., 0 is output) following power on and in the event of a bus error. Status values that are transferred to the power controller are only stored in the RAM, meaning they are lost if the mains voltage supply is switched off. After power on, the digital output remains at "low" until a 1 is written to Modbus address 0x00D0 via the interface.

NOTE!

When the digital input is written and read back, it becomes clear that the statuses are opposites if the control direction of the digital output has been configured as an NC contact. This is because the Boolean values 0 and 1 which are written to the digital input, are evaluated as active and inactive. However, when reading the data the 0 and 1 mean opened and closed.

6 Specification of values via interface

6.4 External inhibit input and external digital input 1 and 2

The external inhibit input (0x00CD) and the external digital inputs 1 (0x00CE) and 2 (0x00CF) can be written using the addresses 0x00CD-0x00CF.
They can be used in exactly the same way as the hardware inhibit and digital inputs on the power controller, i.e., to block the power controller or for functions such as the keyboard lock or display switch-off.

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