Type 202530
Type 202535
Type 202540
Type 202545
Type 202550

B 20.2530.2
Interface Description

02.03 / 00415372

Please read these operating instructions before commissioning the instrument. Keep this manual in a place which is accessible to all users at all times. Please assists us to improve these operating instructions, where necessary. Your suggestions will be appreciated.

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All necessary settings and possible adjustments inside the instrument are described in these operating instructions. However, if any problems should still arise during start-up, you are asked not to carry out any unauthorized manipulations on the unit. You could endanger your rights under the instrument warranty! Please contact the nearest subsidiary or the head office in such a case.

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

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

Contents

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Typographical conventions

Warning signs

Danger

This symbol is used when there may be **danger to personnel** if the instructions are ignored or not followed correctly!

Caution

This symbol is used when there may be **damage to equipment or data** if the instructions are ignored or not followed correctly!

Note signs

Note

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

see abcd

Reference

Text in *italics* refers to **further information** in other chapters or sections.

abc[1]

Footnote

Footnotes are remarks that **refer to specific points** in the text. Footnotes consist of two parts:

A marker in the text, and the footnote text.

The markers in the text are arranged as continuous superscript numbers.

The footnote text (in smaller typeface) is placed below the corresponding paragraph and starts with a number.

*****

Action

This symbol indicates that an **action to be performed** is described.

The individual steps are marked by this asterisk.

Representation

0x12EA

Hexadecimal number

A hexadecimal number is identified by being preceded by a “0x”. Example: 0x12EA = 4842 decimal

Application

Interface description

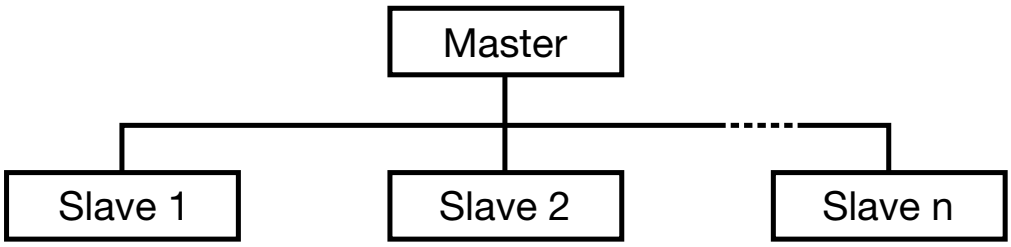
This interface description provides all necessary information for operating the optional RS422/RS485 interface on instruments in the 202530, 202535, 202540, 202545 and 202750 series. The protocol used is MOD/Jbus.

All the required settings are contained in this interface description. However, if any problems should still arise during operation, you are asked not to carry out any unauthorized manipulations. You could endanger your rights under the instrument warranty. Please contact your supplier.

Protocol description

Master-slave principle

The communication between a PC (master) and a device (slave) using MOD/Jbus takes place according to the master-slave principle in the form of a data request/instruction - response.



The master controls the data exchange, the slaves only have a response function. They are identified by their device address. A maximum of 255 slaves can be addressed.

Transmission mode (RTU)

The transmission mode used is the RTU mode (Remote Terminal Unit). Data are transmitted in binary form (hexadecimal) with 8 bits, 16 bits for integers and 32 bits for float values. The LSB (least significant bit) is transmitted first. The ASCII operating mode is not supported.

Data format

The data format describes the arrangement of a byte transmitted. The data formats can be as follows:

Data word	Parity bit	Stop bit 1/2 bit	Bit number
8 bits	—	1	9
8 bits	even	1	10
8 bits	odd	1	10

Device address

The device address of the slave can be set between 1 and 99. The device address 0 is reserved.

☞ A maximum of 31 slaves can be connected to the RS422/RS485 interface.

There are two forms of data exchange:

Query

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

Broadcast

Instruction by the master to all slaves via the device address 0. The connected slaves do not respond. A data request with device address 0 is not meaningful. A specific setpoint can, for instance, be transmitted to all slaves. In this case, the correct acceptance of the value by the slaves should be verified by a subsequent readout of the setpoint.

Transmission time

Start and end of a data block are marked by transmission pauses. The maximum permissible interval between two consecutive characters is three times the transmission time of a single character.

The character transmission time (time for transmission of one character) depends on the baud rate and the data format used.

For a data format of 8 data bits, no parity bit and one stop bit, this is:

character transmission time [msec] = 1000 * 9 bits/(baud rate)

for other data formats this is:

character transmission time [msec] = 1000 * 10 bits/(baud rate)

Sequence

Data request from master transmission time = n characters * 1000 * x bits/(baud rate)
Marker for end of data request 3 characters * 1000 * x bits/(baud rate)
processing of the data request by the slave (≤ 250msec)
Response of slave transmission time = n characters * 1000 * x bits/(baud rate)
Marker for end of response 3 characters * 1000 * x bits/(baud rate)

Example

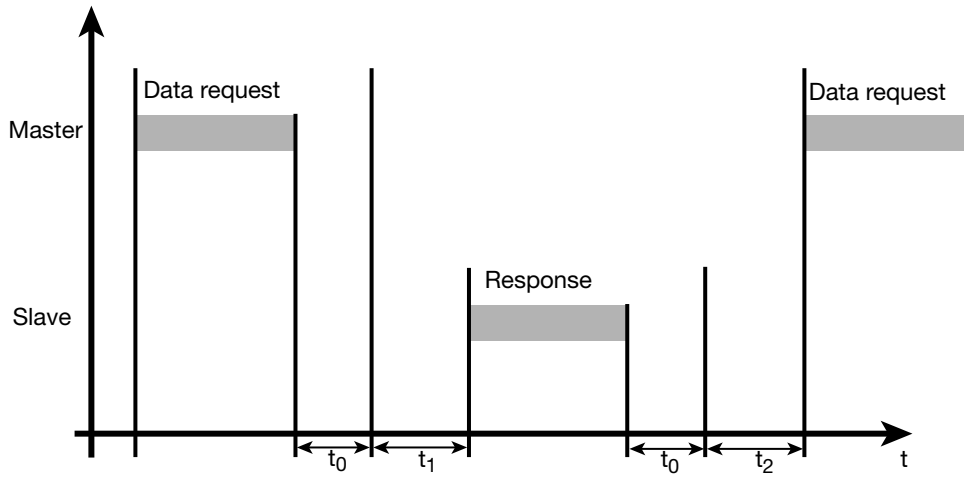
Marker for end of data request or end of response for 10/9 bit data format.

Waiting time = 3 characters * 1000 * 10 bits/(baud rate)

Baud rate [Baud]	**Data format** [bit]	**Waiting time** [msec]
9600	10	3.125
	9	2.813
4800	10	6.250
	9	5.625

Data request

The data request runs according to the following timing scheme:



t_0 End marker = 3 characters.
The time depends on the baud rate.

t_1 This time depends on the internal processing.
The maximum processing time is 250 msec.

t_2 This time is needed by the device to switch from transmit back to receive. The master must wait for this time before starting a new data request. It must always be observed, even when the new data request is directed to a different device.

$t_2 \geq 20\,\text{msec}$

Communication during the internal processing time of the slave

No data requests from the master are permitted during the internal processing time of the slave. Any data request made during this time will be ignored by the slave.

Communication during the response time of the slave

No data requests from the master are permitted during the response time of the slave. Any data request made during this time will result in all the data currently on the bus becoming invalid.

Structure of the data blocks

All data blocks have the same structure:

Data structure

Slave address	Function code	Data field	Checksum CRC16
1 byte	1 byte	x byte(s)	2 bytes

Each data block contains four fields:

Slave address device address of a specific slave

Function code function selection (read, write words)

Data field contains the information:

- word address
- word number
- word value

Checksum recognition of transmission errors

Error handling

There are five error codes:

1	invalid function
2	invalid parameter address
3	parameter value outside the value range[1]
4	slave not ready
8	write access to parameter denied

[1] The parameters are not checked for plausibility.

Response in the event of error

Slave address	Function XX OR 80h	Error code	Checksum CRC16
1 byte	1 byte	1 byte	2 bytes

The function code is ORed with 0x80, i.e. the MSB (most significant bit) is set to 1.

Example

Data request:

01	02	00	00	00	04	CRC16

Response:

01	82	01	CRC16

Special cases

The slave will not respond in the following cases:

- the checksum (CRC16) is not correct.
- the instruction from the master is incomplete or overdefined.
- the number of words or bits to be read is zero.

Distinction MODbus/Jbus

The MODbus protocol is compatible with the Jbus protocol. The structure of the data blocks is identical.

MODbus differs from Jbus in the absolute adresses of the data. The addresses of the MODbus are shifted by one compared with those of Jbus.

Absolute address	Jbus address	MODbus address
1	1	0
2	2	1
3	3	2
...	...	...

Checksum (CRC16)

The checksum (CRC16) is used to detect transmission errors. If an error is identified during evaluation, the corresponding device will not respond.

Calculation scheme

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

The low byte of the checksum is transmitted first.

Example

Data request: Read two words from address 6 (CRC16 = 0xA024)

0B	03	00	06	00	02	24	A0
						CRC16	

Response: (CRC16 = 0x0561)

0B	03	04	00	00	42	C8	61	05
			Word 1		Word 2		CRC16	

The following functions are available for the device:

Function number	Function
0x03/0x04	read n words
0x06	write one word
0x10	write n words

The function reads n words from a defined address.

Data request

Slave address	Function 0x03 or 0x04	Address of first word	Word number (6 max.)	Checksum CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response

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

Example

Read the 2 controller setpoints

Word address = 0x0006 (setpoint 1 SP1)

Data request:

0B	03	00	06	00	04	CRC16

Response:

0B	03	08	0000	42C8	0000	4316	CRC16
			Setpoint 1 (100)		Setpoint 2 (150)		

The data blocks for instruction and response are identical in the “write one word” function.

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 the limit value for limit comparator (AL3) (= 275)

Word address = 0x0012

Instruction: Write first part of value

0B	06	00	12	80	00	CRC16

Response (same as instruction):

0B	06	00	12	80	00	CRC16

Instruction: Write second part of value

0B	06	00	13	43	89	CRC16

Response (same as instruction):

0B	06	00	13	43	89	CRC16

Instruction

Slave address	Function 0x10	Address of first word	Word number	Byte number	Word value(s)	Checksum CRC16
1 byte	1 byte	2 bytes	2 bytes	1 byte	x byte(s)	2 bytes

Response

Slave address	Function 0x10	Address of first word	Word number	Checksum CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Example

Write setpoint (SP1 = 100)

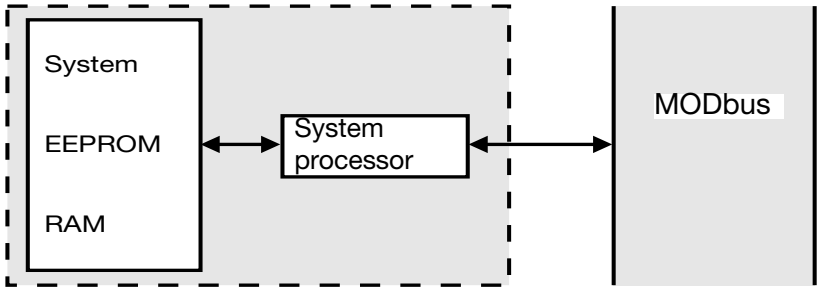
Word address = 0x0006

Instruction:

0B	10	00	06	00	02	04	00	00	42	C8	CRC16

Response:

0B	10	00	06	00	02	CRC16



Controller

"char" data type

As a rule, only ASCII characters are transmitted. Th ey are transmitted according to the order in which they are stored in the memory.

Example:
Text: "115.01.01"
MODbus:
0x31, 0x31, 0x35, 0x2E, 0x30, 0x31, 0x2E, 0x30, 0x31

"int-hex" data type

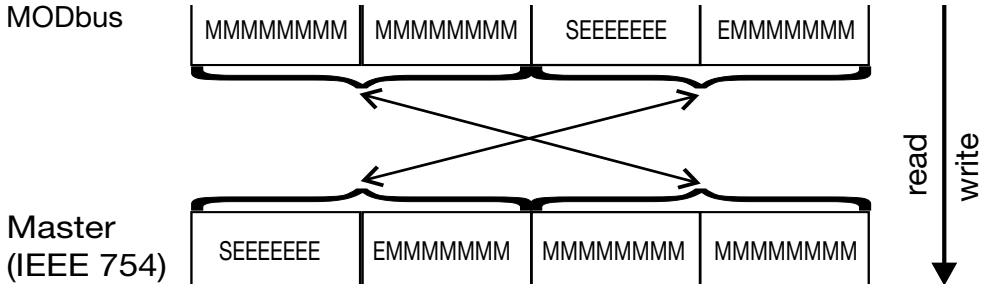
In case of the integer-hex value, the high byte and the low byte are swapped respective to the display.

Example:
Configuration code C211: "3120"
MODbus: 0x01, 0x03, 0x000, 0x02

"float" data type

The explanation below applies, provided that the master uses the IEEE-754 format. Before transmitting a value, the bytes must be swapped in such as way that the order in which they are shown corresponds to that of the MODbus (see diagram).

M - 23 bit normalized mantissa
E - exponent (complement to base 2)
S - sign bit; 1 = negative, 0 = positive



Example:
Transmitting the decimal value "550":
MODbus: 0x80, 0x00, 0x44, 0x09

☞ Each modification of a process value that is stored in the EEPROM results in the data being updated in the EEPROM. Please note that the EEPROM can be rewritten up to 100,000 times.

Explanation

All process values (variables) together with their addresses, the data type and the access mode are described below.

References are as follows:

R / O	read access only
R / W	read and write access

char xx	character string of length xx; xx = length **including** string stop character /0
float	float value (4 bytes/2 words)
int	integer (2 bytes/1 word)
int-hex	configuration code (4 bytes / 2 words)

The process values are divided into logical areas.

On the indicator (type 202550), the choice of the correct address table depends on the measurement variable to be displayed. For instance, if the pH value is to be displayed, then you require the address table for type 202530.

Device data

Address	Access	Data type	Parameter designation
0x0301		char device name [9+1]	device (instrument) name
0x0306		char SW version [11+1]	software version
0x030C		char VDN No. [13+1]	VdN number

Process data at the operating level

Address	Access	Data type	Parameter	Value range	Default
0x0000	R / O	float	proc. value 1	-1999...9999	
0x0002	R / W	float	proc. value 2	-58.0...482.0	25.0
0x0006	R / W	float	SPA	-1.00...14.00 pH or -50 to 250°C	-1.00
0x0008	R / W	float	SPB		
0x000A	R / W	float	SPC		
0x000C	R / W	float	SPD		
0x000E	R / W	float	SPE		
0x0010	R / W	float	SP1	SPL...SPH	-1.00
0x0012	R / W	float	SP2		14.00
0x0014	R / W	float	SP3		-1.00
0x0016	R / W	float	SP4		14.00
0x0108	R / O	long	error code		

Process data at the parameter level

Address	Access	Data type	Parameter	Value range	Default
0x0018	R / W	float	AL1	0.00...99.99	0
0x001A	R / W	float	AL2	0...9999	300
0x001C	R / W	float	Pb1	0.00...99.9	7.00
0x001E	R / W	float	Pb2	0.00...99.9	7.00
0x0020	R / W	float	dt1	0...9999	0
0x0022	R / W	float	dt2	0...9999	0
0x0024	R / W	float	rt1	0...9999	0
0x0026	R / W	float	rt2	0...9999	0
0x0028	R / W	float	tr1	0.2...999.9	0.2
0x002A	R / W	float	tr2	0.2...999.9	0.2
0x002C	R / W	float	Hys1	0.00...99.9	0.30
0x002E	R / W	float	Hys2	0.00...99.9	0.30
0x0030	R / W	float	Hys3	0.00...99.9	0.30
0x0032	R / W	float	Hys4	0.00...99.9	0.30
0x0034	R / W	float	Hys5	0.00...99.9	0.30
0x0036	R / W	float	Ond1	0.0...999.9	1.0
0x0038	R / W	float	Ond2	0.0...999.9	1.0
0x003A	R / W	float	Ond3	0.0...999.9	1.0
0x003C	R / W	float	Ond4	0.0...999.9	1.0
0x003E	R / W	float	Ond5	0.0...999.9	1.0
0x0040	R / W	float	Ofd1	0.0...999.9	0.2
0x0042	R / W	float	Ofd2	0.0...999.9	0.2
0x0044	R / W	float	Ofd3	0.0...999.9	0.2
0x0046	R / W	float	Ofd4	0.0...999.9	0.2
0x0048	R / W	float	Ofd5	0.0...999.9	0.2
0x004A	R / W	float	Fr1	0...150	100
0x004C	R / W	float	Fr2	0...150	100
0x004E	R / W	float	CY1	1.0...999.9	20.0
0x0050	R / W	float	CY2	1.0...999.9	20.0
0x0052	R / W	float	working point	0...100	0
0x0054	R / W	float	Y1	0...100	100
0x0056	R / W	float	Y2	0...100	100
0x0058	R / W	float	dF	0.0...100.0	0.6
0x005A	R / W	float	tt	15...3000	15

Process data at the configuration level

Address	Access	Data type	Parameter	Value range	Default
0x0060	R / W	int-hex	C111	1112	1 0 0 0
0x0062	R / W	int-hex	C112	6611	0 0 0 0
0x0064	R / W	int-hex	C113	9953	0 1 0 0
0x0066	R / W	int-hex	C114	0001	0 0 0 0
0x0068	R / W	int-hex	C211	3533	2 2 2 0
0x006A	R / W	int-hex	C212	3333	0 0 1 0
0x006C	R / W	int-hex	C213	7753	8 0 3 0
0x006E	R / W	int-hex	C214	b777	0 0 1 1
0x0072	R / W	int-hex	C215	0111	0 0 0 0
0x0076	R / W	int-hex	CodE	9999	0 0 0 0
0x0078	R / W	float	SiL[1]	-1999...1999	600
0x007A	R / W	float	SiH[1]	-1999...1999	-600
0x007C	R / W	float	SoL1	-1.00...14.00	-1.00
0x007E	R / W	float	SoH1	-1.00...14.00	14.00
0x0080	R / W	float	SoL2	-1.00...14.00	-1.00
0x0082	R / W	float	SoH2	-1.00...14.00	14.00
0x0084	R / W	float	SPL	-1.00...14.00	-1.00
0x0086	R / W	float	SPH	-1.00...14.00	14.00
0x0088	R / W	float	rAng	20...26[1]	21
0x008A	R / W	float	SLoP	75.0...110.00 (10.0...110.0 for special electrode)	100.0
0x008C	R / W	float	nuLL	5.00...9.00 (-2.00...16.00 for special electrode)	7.00
0x0090	R / W	float	OFFS	-199.9...199.9	0

[1] Type 202550 only

Range selection on the type 202750 indicator

rAng	Range	Range end pH	Range end mV
20	0/4...20 mA (redox)		±1999
21	0/4...20 mA (pH)	-2...16	
22	0/4...20 mA (no decimal place)	9999	9999
23	0/4...20 mA (conductivity, 1 decimal place)	999.9	999.9
24	0/4...20 mA (conductivity, 2 decimal places)	99.99	99.99
25	0/4...20 mA (conductivity, 3 decimal places)	9.999	9.999
26	0/4...20 mA (high-purity water)	20 MΩ	10 µS
27	0/4...20 mA (universal indicator, no decimal place)	9999	9999
28	0/4...20 mA (universal indicator, 1 decimal place)	999.9	999.9
29	0/4...20 mA (universal indicator, 2 decimal places)	99.99	99.99
30	0/4...20 mA (universal indicator, 3 decimal places)	9.999	9.999

Device status

Address	Access	Data type		Parameter designation
0x0200	R / O	word		outputs and logic functions
		– – – – – – – –	– – – – – – – 1	output 1 off
		– – – – – – – –	– – – – – – 1 –	output 2 off
		– – – – – – – –	– – – – – 1 – –	output 3 off
		– – – – – – – –	– – – – 1 – – –	output 4 off
		– – – – – – – –	– – – 1– – – –	output 5 off
		– – – – – – – –	– – 1– – – – –	logic input 1 closed
		– – – – – – – –	– 1– – – – – –	logic input 2 closed
		– – – – – – 0 0	– – – – – – – –	redox device
		– – – – – – 0 1	– – – – – – – –	pH device
		– – – – – – 1 0	– – – – – – – –	conductivity device
		– – – – – – 1 1	– – – – – – – –	high-purity water device
0x0201	R / O	word		
		– – – – – – – –	– – – – – – – 1	calibration mode
		– – – – – – – –	– – – – – – 1 –	manual mode
		– – – – – – – –	– – – – – 1 – –	HoLd mode
		– – – – – – – –	– – – – 1 – – –	universal indicator
		– – – – – – – 1	– – – – – – – –	overrange, input 1
		– – – – – – 1 –	– – – – – – – –	overrange, input 2
		– – – – – 1 – –	– – – – – – – –	controller output 1 active
		– – – – 1 – – –	– – – – – – – –	controller output 2 active
		1 – – – – – – –	– – – – – – – –	electrode calibration

Error codes The upper 16 bits are always 0.
=> 0000 0000 0000 0000 – – – – – – – – – – – – – – – –

Error	Description
F010	alarm tolerance exceeded (process value) – – – – – – – – – – – – – – – 1
F011	electrode monitoring – – – – – – – – – – – – – – 1 –
F022	underrange – – – – – – – – – – – – – 1 – – –
F023	overrange – – – – – – – – – – – – 1 – – – – – – –
F024	outside temperature range (-50 to +250°C) – – – – – – – – – – – 1 – – – – – – –
F026	error during temperature compensation (HPW) – – – – – – – – – 1 – – – – – – –
F030	process value output below its minimum value (SOL) – – – – – – – – 1 – – – – – – –
F031	process value output above its maximum value (SOH) – – – – – – – 1 – – – – – – – –
F050	SOL > SOH for process value output – – – – – – 1 – – – – – – – –
F053	wrong setpoint combination – – – 1 – – – – – – – – – – – –
F060	tr1 > CY1 or tr1> Fr1/60 – – 1 – – – – – – – – – – – –
F061	tr2 > CY2 or tr2 > Fr2/60 – 1 – – – – – – – – – – – –
Err	calibration error 1 – – – – – – – – – – – – – – –

Device data

Address	Access	Data type	Parameter designation
0x0301		char device name [9+1]	device (instrument) name
0x0306		char SW version [11+1]	software version
0x030C		char VDN No. [13+1]	VdN number

Process data at the operating level

Address	Access	Data type	Parameter	Value range	Default
0x0000	R / O	float	proc. value 1	-1999...9999	
0x0002	R / W	float	proc. value 2	-58.0...482.0	25.0
0x0006	R / W	float	SPA	-1999...1999 mV or -50 to 250°C	+1999
0x0008	R / W	float	SPB		
0x000A	R / W	float	SPC		
0x000C	R / W	float	SPD		
0x000E	R / W	float	SPE		
0x0010	R / W	float	SP1	-1999...1999	-1999
0x0012	R / W	float	SP2		1999
0x0014	R / W	float	SP3		-1999
0x0016	R / W	float	SP4		1999
0x0108	R / O	long	error code		

Process data at the parameter level

Address	Access	Data type	Parameter	Value range	Default
0x0018	R / W	float	AL1	0.000...9999	0
0x001A	R / W	float	AL2	0...9999	300
0x001C	R / W	float	Pb1	0.00...9999	1000
0x001E	R / W	float	Pb2	0.00...9999	1000
0x0020	R / W	float	dt1	0...9999	0
0x0022	R / W	float	dt2	0...9999	0
0x0024	R / W	float	rt1	0...9999	0
0x0026	R / W	float	rt2	0...9999	0
0x0028	R / W	float	tr1	0.2...999.9	0.2
0x002A	R / W	float	tr2	0.2...999.9	0.2
0x002C	R / W	float	Hys1	0.00...9999	80
0x002E	R / W	float	Hys2	0.00...9999	80
0x0030	R / W	float	Hys3	0.00...9999	80
0x0032	R / W	float	Hys4	0.00...9999	80
0x0034	R / W	float	Hys5	0.00...9999	80
0x0036	R / W	float	Ond1	0.0...999.9	1.0
0x0038	R / W	float	Ond2	0.0...999.9	1.0
0x003A	R / W	float	Ond3	0.0...999.9	1.0
0x003C	R / W	float	Ond4	0.0...999.9	1.0
0x003E	R / W	float	Ond5	0.0...999.9	1.0
0x0040	R / W	float	Ofd1	0.0...999.9	0.2
0x0042	R / W	float	Ofd2	0.0...999.9	0.2
0x0044	R / W	float	Ofd3	0.0...999.9	0.2
0x0046	R / W	float	Ofd4	0.0...999.9	0.2
0x0048	R / W	float	Ofd5	0.0...999.9	0.2
0x004A	R / W	float	Fr1	0...150	100
0x004C	R / W	float	Fr2	0...150	100
0x004E	R / W	float	CY1	1.0...999.9	20.0
0x0050	R / W	float	CY2	1.0...999.9	20.0
0x0052	R / W	float	working point	0...100	0
0x0054	R / W	float	Y1	0...100	100
0x0056	R / W	float	Y2	0...100	100
0x0058	R / W	float	dF	0.0...100.0	0.6
0x005A	R / W	float	tt	15...3000	15

Process data at the configuration level

Address	Access	Data type	Parameter	Value range	Default
0x0060	R / W	int-hex	C111	1112	0 0 1 0
0x0062	R / W	int-hex	C112	6611	0 0 0 0
0x0064	R / W	int-hex	C113	9953	0 1 0 0
0x0068	R / W	int-hex	C211	3533	1 1 0 0
0x006A	R / W	int-hex	C212	3333	0 0 1 0
0x006C	R / W	int-hex	C213	7753	8 0 3 0
0x006E	R / W	int-hex	C214	b777	0 0 1 1
0x0072	R / W	int-hex	C215	0111	0 0 0 0
0x0076	R / W	int-hex	CodE	9999	0 0 0 0
0x0078	R / W	float	SiL[1]	-1999...1999	-1000
0x007A	R / W	float	SiH[1]	-1999...1999	1000
0x007C	R / W	float	SoL1	-1999...9999	-1999
0x007E	R / W	float	SoH1		1999
0x0080	R / W	float	SoL2		-1999
0x0082	R / W	float	SoH2		1999
0x0084	R / W	float	SPL		-1999
0x0086	R / W	float	SPH		9999
0x0088	R / W	float	rAng	20...26[1]	20
0x008C	R / W	float	nuLL	-199.9...199.9	0
0x0090	R / W	float	OFFS	-199.9...199.9	0

[1] Type 202550 only

Range selection on the type 202750 indicator

rAng	Range	Range end µS	Range end mS
20	0/4...20 mA (redox)	±1999	
21	0/4...20 mA (pH)	-2...16	
22	0/4...20 mA (conductivity, no decimal place)	9999	9999
23	0/4...20 mA (conductivity, 1 decimal place)	999.9	999.9
24	0/4...20 mA (conductivity, 2 decimal places)	99.99	99.99
25	0/4...20 mA (conductivity, 3 decimal places)	9.999	9.999
26	0/4...20 mA (high-purity water)	20 MΩ	10 µS
27	0/4...20 mA (universal indicator, no decimal place)	9999	9999
28	0/4...20 mA (universal indicator, 1 decimal place)	999.9	999.9
29	0/4...20 mA (universal indicator, 2 decimal places)	99.99	99.99
30	0/4...20 mA (universal indicator, 3 decimal places)	9.999	9.999

Device status

Address	Access	Data type		Parameter designation
0x0200	R / O	word		outputs and logic functions
		– – – – – – – –	– – – – – – – 1	output 1 off
		– – – – – – – –	– – – – – – 1 –	output 2 off
		– – – – – – – –	– – – – – 1 – –	output 3 off
		– – – – – – – –	– – – – 1 – – –	output 4 off
		– – – – – – – –	– – – 1– – – –	output 5 off
		– – – – – – – –	– – 1– – – – –	logic input 1 closed
		– – – – – – – –	– 1– – – – – –	logic input 2 closed
		– – – – – – 0 0	– – – – – – – –	redox device
		– – – – – – 0 1	– – – – – – – –	pH device
		– – – – – – 1 0	– – – – – – – –	conductivity device
		– – – – – – 1 1	– – – – – – – –	high-purity water device
0x0201	R / O	word		
		– – – – – – – –	– – – – – – – 1	calibration mode
		– – – – – – – –	– – – – – – 1 –	manual mode
		– – – – – – – –	– – – – – 1 – –	HoLd mode
		– – – – – – – –	– – – – 1 – – –	universal indicator
		– – – – – – – 1	– – – – – – – –	overrange, input 1
		– – – – – – 1 –	– – – – – – – –	overrange, input 2
		– – – – – 1 – –	– – – – – – – –	controller output 1 active
		– – – – 1 – – –	– – – – – – – –	controller output 2 active
		1 – – – – – – –	– – – – – – – –	electrode calibration

Error codes The upper 16 bits are always 0.
=> 0000 0000 0000 0000 ---- ---- ---- ----

Error	Description
F010	alarm tolerance exceeded (process value) ---- ---- ---- ---1
F022	underrange ---- ---- ---- 1---
F023	overrange ---- ---- ---1 ----
F024	outside temperature range (-50 to +250°C) ---- ---- --1- ----
F026	error during temperature compensation (HPW) ---- ---- -1-- ----
F030	process value output below its minimum value (SOL) ---- ---- 1--- ----
F031	process value output above its maximim value (SOH) ---- ---1 ---- ----
F050	SOL > SOH for process value output ---- --1- ---- ----
F053	wrong setpoint combination ---1 ---- ---- ----
F060	tr1 > CY1 or tr1> Fr1/60 --1- ---- ---- ----
F061	tr2 > CY2 or tr2 > Fr2/60 -1-- ---- ---- ----
Err	calibration error 1--- ---- ---- ----

Device data

Address	Access	Data type	Parameter designation
0x0301		char device name [9+1]	device (instrument) name
0x0306		char SW version [11+1]	software version
0x030C		char VDN No. [13+1]	VdN number

Process data at the operating level

Addresse	Access	Data type	Parameter	Value range	Default
0x0000	R / O	float	proc. value 1	-1999...9999	
0x0002	R / W	float	proc. value 2	-58.0...482.0	25.0
0x0004	R / W	float	HUSP	0...100%	0
0x0006	R / W	float	SPA	depending on “rAng” or -50 to 250°C	1
0x0008	R / W	float	SPB		
0x000A	R / W	float	SPC		
0x000C	R / W	float	SPD		
0x000E	R / W	float	SPE		
0x0010	R / W	float	SP1		0
0x0012	R / W	float	SP2		1
0x0014	R / W	float	SP3		0
0x0016	R / W	float	SP4		1
0x0108	R / O	long	error code		

Process data at the parameter level

Address	Access	Data type	Parameter	Value range	Default
0x0018	R / W	float	AL1	0.000...SPH	0
0x001A	R / W	float	AL2	0...9999	300
0x001C	R / W	float	Pb1	0.000...variable	50% range
0x001E	R / W	float	Pb2	0.000...variable	50% range
0x0020	R / W	float	dt1	0...9999	80
0x0022	R / W	float	dt2	0...9999	80
0x0024	R / W	float	rt1	0...9999	350
0x0026	R / W	float	rt2	0...9999	350
0x0028	R / W	float	tr1	0.2...999.9	0.2
0x002A	R / W	float	tr2	0.2...999.9	0.2
0x002C	R / W	float	Hys1	0.001...variable	2% range
0x002E	R / W	float	Hys2	0.001...variable	2% range
0x0030	R / W	float	Hys3	0.001...variable	2% range
0x0032	R / W	float	Hys4	0.001...variable	2% range
0x0034	R / W	float	Hys5	0.001...variable	2% range
0x0036	R / W	float	Ond1	0.0...999.9	1.0
0x0038	R / W	float	Ond2	0.0...999.9	1.0
0x003A	R / W	float	Ond3	0.0...999.9	1.0
0x003C	R / W	float	Ond4	0.0...999.9	1.0
0x003E	R / W	float	Ond5	0.0...999.9	1.0
0x0040	R / W	float	Ofd1	0.0...999.9	0.2
0x0042	R / W	float	Ofd2	0.0...999.9	0.2
0x0044	R / W	float	Ofd3	0.0...999.9	0.2
0x0046	R / W	float	Ofd4	0.0...999.9	0.2
0x0048	R / W	float	Ofd5	0.0...999.9	0.2
0x004A	R / W	float	Fr1	0...150	100
0x004C	R / W	float	Fr2	0...150	100
0x004E	R / W	float	CY1	1.0...999.9	20.0
0x0050	R / W	float	CY2	1.0...999.9	20.0
0x0052	R / W	float	working point	0...100	0
0x0054	R / W	float	Y1	0...100	100
0x0056	R / W	float	Y2	0...100	100
0x0058	R / W	float	dF	0.0...100.0	0.6
0x005A	R / W	float	tt	0.0...100.0	15

Process data at the configuration level

Address	Access	Data type	Parameter	Value range	Default
0x0060	R / W	int-hex	C111	1112	1 0 0 0
0x0062	R / W	int-hex	C112	6611	0 0 0 0
0x0064	R / W	int-hex	C113	9953	0 1 0 0
0x0068	R / W	int-hex	C211	3533	1 1 2 0
0x006A	R / W	int-hex	C212	3333	0 0 1 0
0x006C	R / W	int-hex	C213	7753	8 0 3 0
0x006E	R / W	int-hex	C214		0 0 1 1
0x0072	R / W	int-hex	C215	0111	0 0 0 0
0x0070	R / W	int-hex	C311	5000	0 0 0 0
0x0076	R / W	int-hex	CodE	9999	0 0 0 0
0x0078	R / W	float	SiL[1]	0...range end[2]	600
0x007A	R / W	float	SiH[1]	0...range end[2]	-600
0x007C	R / W	float	SoL1	0...range end[2]	
0x007E	R / W	float	SoH1	0...range end[2]	
0x0080	R / W	float	SoL2	0...range end[2]	
0x0082	R / W	float	SoH2	0...range end[2]	
0x0084	R / W	float	SPL	0...range end[2]	
0x0086	R / W	float	SPH	0...range end[2]	
0x0088	R / W	float	rAng	0...19 20...26 on type 202750	11 22 to 25 with standard signal input
0x008A	R / W	float	CELL	80.0...120.0	100.0
0x008C	R / W	float	ALPH	0.0...5.5	2.3
0x008E	R / W	float	LOFF	0.00...99.99	0.50
0x0090	R / W	float	OFFS	-199.9...199.9	0

[1] Type 202550 only.
[2] see “Ranges” on next page.

Range selection on the type 202550 indicator

rAng	Range	Range end µS	Range end mS	Cell constant
1	< 0.5 µS/cm	0.500		0.01
2	< 2 µS/cm	2.000	0.002	0.01
3	< 10 µS/cm	10.00	0.010	0.01
4	< 5 µS/cm	5.000	0.005	0.1
5	< 20 µS/cm	20.00	0.020	0.1
6	< 100 µS/cm	100.0	0.100	0.1
7	< 1 mS/cm	1000	1.000	0.1
8	< 5 mS/cm	5000	5.000	0.1
9	< 50 µS/cm	50.00	0.050	1
10	< 100 µS/cm	100.0	0.100	1
11	< 1 mS/cm	1000	1.000	1
12	< 5 mS/cm	5000	5.000	1
13	< 20 mS/cm	9999[1]	20.00	1
14	< 100 mS/cm	9999[1]	100.0	1
15	< 1 mS/cm	1000	1.000	3
16	< 5 mS/cm	5000	5.000	3
17	< 30 mS/cm	9999[1]	30.00	3
18	< 30 mS/cm	9999[1]	30.00	10
19	< 200 mS/cm	9999[1]	200.0	10

1 The display cannot show the entire measurement range here; the display range does not go beyond 9999.

Range selection on the type 202550 indicator

rAng	Range	Range end µS	Range end mS
20	0/4...20 mA (redox)		±1999
21	0/4...20 mA (pH)	-2...16	
22	0/4...20 mA (conductivity, no decimal place)	9999	9999
23	0/4...20 mA (conductivity, 1 decimal place)	999.9	999.9
24	0/4...20 mA (conductivity, 2 decimal places)	99.99	99.99
25	0/4...20 mA (conductivity, 3 decimal places)	9.999	9.999
26	0/4...20 mA (high-purity water)	20 MΩ	10 µS
27	0/4...20 mA (universal indicator, no decimal place)	9999	9999
28	0/4...20 mA (universal indicator, 1 decimal place)	999.9	999.9
29	0/4...20 mA (universal indicator, 2 decimal places)	99.99	99.99
30	0/4...20 mA (universal indicator, 3 decimal places)	9.999	9.999

Device status

Address	Access	Data type		Parameter designation
0x0200	R / O	word		outputs and logic functions
		– – – – – – – –	– – – – – – – 1	output 1 off
		– – – – – – – –	– – – – – – 1 –	output 2 off
		– – – – – – – –	– – – – – 1 – –	output 3 off
		– – – – – – – –	– – – – 1 – – –	output 4 off
		– – – – – – – –	– – – 1 – – – –	output 5 off
		– – – – – – – –	– – 1 – – – – –	logic input 1 closed
		– – – – – – – –	– 1 – – – – – –	logic input 2 closed
		– – – – – – 0 0	– – – – – – – –	redox device
		– – – – – – 0 1	– – – – – – – –	pH device
		– – – – – – 1 0	– – – – – – – –	conductivity device
		– – – – – – 1 1	– – – – – – – –	high-purity water device
0x0201	R / O	word		
		– – – – – – – –	– – – – – – – 1	calibration mode
		– – – – – – – –	– – – – – – 1 –	manual operation
		– – – – – – – –	– – – – – 1 – –	HoLd mode
		– – – – – – – –	– – – – 1 – – –	universal indicator
		– – – – – – – 1	– – – – – – – –	overrange, input 1
		– – – – – – 1 –	– – – – – – – –	overrange, input 2
		– – – – – 1 – –	– – – – – – – –	controller output 1 active
		– – – – 1 – – –	– – – – – – – –	controller output 2 active
		1 – – – – – – –	– – – – – – – –	electrode calibration

Error codes The upper 16 bits are always 0.
=> 0000 0000 0000 0000 ---- ---- ---- ----

Error	Description
F010	alarm tolerance exceeded (process value) ---- ---- ---- ---1
F022	underrange ---- ---- ---- 1---
F023	overrange ---- ---- ---1 ----
F024	outside temperature range (-50 to +250°C) ---- ---- --1- ----
F026	error during temperature compensation (HPW) ---- ---- -1-- ----
F030	process value output below its minimum value (SOL) ---- ---- 1--- ----
F031	process value output above its maximum value (SOH) ---- ---1 ---- ----
F050	SOL > SOH for process value output ---- --1- ---- ----
F053	wrong setpoint combination ---1 ---- ---- ----
F060	tr1 > CY1 or tr1> Fr1/60 --1- ---- ---- ----
F061	tr2 > CY2 or tr2 > Fr2/60 -1-- ---- ---- ----
Err	calibration error 1--- ---- ---- ----

Device data

Address	Access	Data type	Parameter designation
0x0301		char device name [9+1]	device (instrument) name
0x0306		char SW version [11+1]	software version
0x030C		char VDN No. [13+1]	VdN number

Process data at the operating level

Address	Access	Data type	Parameter	Value range	Default
0x0000	R / O	float	proc. value 1	-1999...9999	
0x0002	R / W	float	proc. value 2	-58.0...482.0	25.0
0x0004	R / W	float	HUSP	0...100%	0
0x0006	R / W	float	SPA	depending on “rAng” or -50 to 250°C	1
0x0008	R / W	float	SPB		
0x000A	R / W	float	SPC		
0x000C	R / W	float	SPD		
0x000E	R / W	float	SPE		
0x0010	R / W	float	SP1		0
0x0012	R / W	float	SP2		20
0x0014	R / W	float	SP3		0
0x0016	R / W	float	SP4		20
0x0108	R / O	long	error code		

Process data at the parameter level

Address	Access	Data type	Parameter	Value range	Default
0x0018	R / W	float	AL1	0.000...SPH	0
0x001A	R / W	float	AL2	0...9999	300
0x001C	R / W	float	Pb1	0.000...variable	50% range
0x001E	R / W	float	Pb2	0.000...variable	50% range
0x0020	R / W	float	dt1	0...9999	0
0x0022	R / W	float	dt2	0...9999	0
0x0024	R / W	float	rt1	0...9999	0
0x0026	R / W	float	rt2	0...9999	0
0x0028	R / W	float	tr1	0.2...999.9	0.2
0x002A	R / W	float	tr2	0.2...999.9	0.2
0x002C	R / W	float	Hys1	0.001...variable	2% range
0x002E	R / W	float	Hys2	0.001...variable	2% range
0x0030	R / W	float	Hys3	0.001...variable	2% range
0x0032	R / W	float	Hys4	0.001...variable	2% range
0x0034	R / W	float	Hys5	0.001...variable	2% range
0x0036	R / W	float	Ond1	0.0...999.9	1.0
0x0038	R / W	float	Ond2	0.0...999.9	1.0
0x003A	R / W	float	Ond3	0.0...999.9	1.0
0x003C	R / W	float	Ond4	0.0...999.9	1.0
0x003E	R / W	float	Ond5	0.0...999.9	1.0
0x0040	R / W	float	Ofd1	0.0...999.9	0.2
0x0042	R / W	float	Ofd2	0.0...999.9	0.2
0x0044	R / W	float	Ofd3	0.0...999.9	0.2
0x0046	R / W	float	Ofd4	0.0...999.9	0.2
0x0048	R / W	float	Ofd5	0.0...999.9	0.2
0x004A	R / W	float	Fr1	0...150	100
0x004C	R / W	float	Fr2	0...150	100
0x004E	R / W	float	CY1	1.0...999.9	20.0
0x0050	R / W	float	CY2	1.0...999.9	20.0
0x0052	R / W	float	working point	0...100	0
0x0054	R / W	float	Y1	0...100	100
0x0056	R / W	float	Y2	0...100	100
0x0058	R / W	float	dF	0.0...100.0	0.6
0x005A	R / W	float	tt	15...3000	15

Process data at the configuration level

Address	Access	Data type	Parameter	Value range	Default
0x0060	R / W	int-hex	C111	1132	0 0 0 1
0x0062	R / W	int-hex	C112	8801	0 0 0 0
0x0064	R / W	int-hex	C113	9953	0 1 0 0
0x0068	R / W	int-hex	C211	6534	1 1 0 0
0x006A	R / W	int-hex	C212	3333	0 0 1 0
0x006C	R / W	int-hex	C213	B773	8 0 3 0
0x006E	R / W	int-hex	C214	B777	0 0 1 1
0x0072	R / W	int-hex	C215	0111	0 0 0 0
0x0070	R / W	int-hex	C311	9900	5 0 0 0
0x0076	R / W	int-hex	CodE	9999	0 0 0 0
0x0078	R / W	float	SiL[1]	0...range end[2]	0
0x007A	R / W	float	SiH[1]	0...range end[2]	range end[2]
0x007C	R / W	float	SoL1	0...range end[2]	0
0x007E	R / W	float	SoH1	0...range end[2]	range end[2]
0x0080	R / W	float	SoL2	0...range end[2]	0
0x0082	R / W	float	SoH2	0...range end[2]	range end[2]
0x0084	R / W	float	SPL	0...range end[2]	0
0x0086	R / W	float	SPH	0...range end[2]	range end[2]
0x0088	R / W	float	rAng	0...19 20...26 on type 202750	2 (26 with standard signal input)
0x008A	R / W	float	CELL	80.0...120.0	100.0
0x008C	R / W	float	ALPH	0.0...20.0	2.3
0x008E	R / W	float	LOFF	0.00...99.99	0.50
0x0090	R / W	float	OFFS	-199.9...199.9	0

[1] Type 202550 only
[2] see “Ranges” on next page.

Ranges

rAng	Range	Range end µS	Range end MΩ	Cell constant
1	< 0.5 µS/cm	0.500	– –[1]	0.01
2	< 2 µS/cm	2.000		0.01
2	< 20 MΩcm		20.00	0.01
3	< 10 µS/cm	10.00	– –[1]	0.01
4	< 5 µS/cm	5.000	– –[1]	0.1
5	< 20 µS/cm	20.00	– –[1]	0.1

1 These settings are not permissible and may result in an incorrect reading.
2 The display cannot show the entire measurement range here; the display range does not go beyond 9999.

Range selection on the type 202750 indicator

rAng	Range	Range end µS	Range end mS
20	0/4...20 mA (redox)		±1999
21	0/4...20 mA (pH)	-2...16	
22	0/4...20 mA (conductivity, no decimal place)	9999	9999
23	0/4...20 mA (conductivity, 1 decimal place)	999.9	999.9
24	0/4...20 mA (conductivity, 2 decimal places)	99.99	99.99
25	0/4...20 mA (conductivity, 3 decimal places)	9.999	9.999
26	0/4...20 mA (high-purity water)	20 MΩ	10 µS
27	0/4...20 mA (universal indicator, no decimal place)	9999	9999
28	0/4...20 mA (universal indicator, 1 decimal place)	999.9	999.9
29	0/4...20 mA (universal indicator, 2 decimal places)	99.99	99.99
30	0/4...20 mA (universal indicator, 3 decimal places)	9.999	9.999

Device status

Address	Access	Data type		Parameter designation
0x0200	R / O	word		outputs and logic functions
		– – – – – – – –	– – – – – – – 1	output 1 off
		– – – – – – – –	– – – – – – 1 –	output 2 off
		– – – – – – – –	– – – – – 1 – –	output 3 off
		– – – – – – – –	– – – – 1 – – –	output 4 off
		– – – – – – – –	– – – 1– – – –	output 5 off
		– – – – – – – –	– – 1– – – – –	logic input 1 closed
		– – – – – – – –	– 1– – – – – –	logic input 2 closed
		– – – – – – 0 0	– – – – – – – –	redox device
		– – – – – – 0 1	– – – – – – – –	pH device
		– – – – – – 1 0	– – – – – – – –	conductivity device
		– – – – – – 1 1	– – – – – – – –	high-purity water device
0x0201	R / O	word		
		– – – – – – – –	– – – – – – – 1	calibration mode
		– – – – – – – –	– – – – – – 1 –	manual mode
		– – – – – – – –	– – – – – 1 – –	HoLd mode
		– – – – – – – –	– – – – 1 – – –	universal indicator
		– – – – – – – 1	– – – – – – – –	overrange, input 1
		– – – – – – 1 –	– – – – – – – –	overrange, input 2
		– – – – – 1 – –	– – – – – – – –	controller output 1 active
		– – – – 1 – – –	– – – – – – – –	controller output 2 active
		1 – – – – – – –	– – – – – – – –	electrode calibration

Error codes The upper 16 bits are always 0.
=> 0000 0000 0000 0000 ---- ---- ---- ----

Error	Description
F010	alarm tolerance exceeded (process value) ---- ---- ---- ---1
F022	underrange ---- ---- ---- 1---
F023	overrange ---- ---- ---1 ----
F024	outside temperature range (-50 to +250°C) ---- ---- --1- ----
F026	error during temperature compensation (HPW) ---- ---- -1-- ----
F030	process value output is below its minimum value (SOL) ---- ---- 1--- ----
F031	process value output above its maximum value (SOH) ---- ---1 ---- ----
F050	SOL > SOH for process value output ---- --1- ---- ----
F053	wrong setpoint combination ---1 ---- ---- ----
F060	tr1 > CY1 or tr1> Fr1/60 --1- ---- ---- ----
F061	tr2 > CY2 or tr2 > Fr2/60 -1-- ---- ---- ----
Err	calibration error 1--- ---- ---- ----