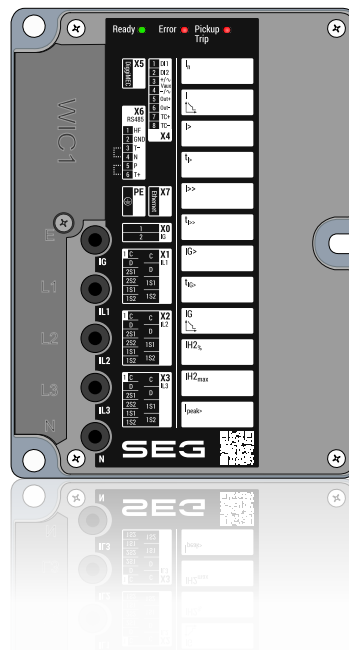


## WI Line

### WIC1

### SELF-/DUAL-POWERED PROTECTION DEVICE

WIC1-4 | Dual-powered device, parameter settings via DiggiMEC / Smart view



**WIC1-4**

Version: 2.0

Original document

English

**MODBUS Specification**

Build 59883

Revision A

MODBUS SCADA Documentation

**SEG Electronics GmbH**

Krefelder Weg 47 • D-47906 Kempen (Germany)

Telephone: +49 (0) 21 52 145 1

Internet: [www.SEGelectronics.de](http://www.SEGelectronics.de)

Sales

Telephone: +49 (0) 21 52 145 331

Fax: +49 (0) 21 52 145 354

E-mail: [sales@SEGelectronics.de](mailto:sales@SEGelectronics.de)

Service

Telephone: +49 (0) 21 52 145 600

Fax: +49 (0) 21 52 145 354

E-mail: [support@SEGelectronics.de](mailto:support@SEGelectronics.de)

SEG Electronics GmbH reserves the right to update any portion of this publication at any time.

Information provided by SEG Electronics GmbH is believed to be correct and reliable.

However, no responsibility is assumed by SEG Electronics GmbH unless otherwise expressly undertaken.

© 2023 SEG Electronics GmbH. All rights reserved.

# Table of Contents

<b>1</b>	<b>Modbus Parameters</b> .....	<b>4</b>
1.1	Notes for the SCADA-System .....	5
<b>2</b>	<b>Specific Modbus Function Codes</b> .....	<b>6</b>
2.1	Function Code 1/2 .....	7
2.2	Function Code 3/4 .....	8
2.3	Float Values IEEE 754 .....	9
2.4	Function Code 5 .....	10
2.5	Supported MODBUS Error Messages .....	11
<b>3</b>	<b>Data Point Lists</b> .....	<b>12</b>

# 1 Modbus Parameters

For the Modbus Protocol several parameters have to be set which are relevant for the communication between the control system (SCADA) and the device. The parameters and their setting possibilities or value ranges are shown in the tables below.

## NOTICE!



The Parameters are described within the Reference Manual of the device (separate document).

## 1.1 Notes for the SCADA-System

When using Modbus RTU the following times have to be considered by the control system and are fixed within the device:

The dwell times ( $t_D$ ) before start of a telegram must be set at least to 3.5 characters.

Examples:

- 3.5 characters 9600 Baud = 4 ms
- 3.5 characters 19200 Baud = 2 ms
- 3.5 characters 38400 Baud = 1 ms

Start of a new telegram is expected when the dwell time ( $t_D$ ) is  $> 3.5$  characters.

The fact that the probability of disruptions during transmission of a telegram increases with its length has to be taken into duly consideration and thus a query to the Slave should be possibly such that the response telegram is not much longer than 32 Bytes.

## 2 Specific Modbus Function Codes

For reading out data from the device or to carry out commands, the services listed in the table, also called »Function Codes«, are supported.

Function Code	Designation	Description
1	Read Coils (output bits)	This function code is used to read the status bits. Max. 2000 contiguous addresses can be read with one request.
3	Read Holding Registers	There are single or several data words read as from a specific data word address. Only status addresses and parameter addresses can be read.
4	Read Input Registers	There are single or several data words read as from a specific data word address. Only measuring values can be read.
5	Write single Coil (output bit)	All other values are illegal and will not affect the output. Via this function code acknowledgments can be executed as well as counters reseted or blockings set.

On the following pages the Modbus functions are described in detail.

## 2.1 Function Code 1/2

### Request

Function code	1 Byte	0x01
Starting Address	2 Bytes	0x0000 to 0xFFFF
Quantity of Coils	2 Bytes	1 to 2000 (0x0001 to 0x07D0)

### Response

Function code	1 Byte	0x01
Byte count	1 Byte	N
Coil Status	n Bytes	n = N or N+1

**Example** of a request to read discrete outputs 20-38:

Request			Response	
Field Name	(HEX)		Field Name	(HEX)
Function	01		Function	01
Starting Address HI	00		Byte Count	03
Starting Address LO	13		Status of Outputs 27-20	CD
Quantity of Outputs HI	00		Status of Outputs 35-28	6B
Quantity of Outputs LO	13		Status of Outputs 38-36	05

## 2.2 Function Code 3/4

### Query

Slave address	3/4	Register address	Register address	Register number	Register number	Check-sum	Check-sum
		HI	LO	HI	LO	HI	LO

### Response

Slave address	3/4	Byte number	Register 0	Register 0	...	Check-sum	Check-sum
			HI	LO		HI	LO

Register address (HI · 256 + LO) — The data word address from where reading should start.

Register number (HI · 256 + LO) — Number of data words to be read. Valid range: 1...125

Byte number — Number of subsequent Bytes containing data words.

Register — Data words read out of the device (Highbyte and Lowbyte).

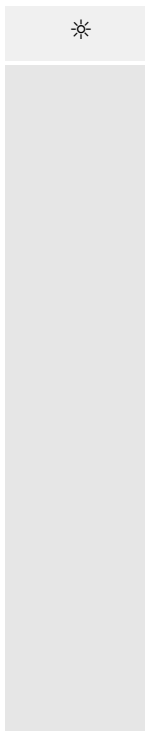


## 2.3 Float Values IEEE 754

	Sign	Exponent	Mantissa
Value:	+1	2 <sup>13</sup>	1.34199857711792
Encoded as:	0	140	2868892
Binary:	□	☑□□□☑☑□□	□☑□☑□☑☑☑☑□□□☑☑□□☑☑□□☑☑□□
Decimal Representation:	10993.652		
Binary Representation:	01000110001010111100011010011100		
Hexadecimal Representation:	0x462bc69c		

For displaying a float value, it is important to save received bytes in a correct order. A float value in Modbus will be transmitted in “Big Endian” format (Motorola Format), that means the most significant byte is transmitted first.

For saving received bytes in Modbus master it must be considered which architecture is used. Is Modbus Master is a “Little Endian” architecture, the received frame needs to be swapped to corresponding memory addresses. If it is not saved in correct order it is possible that the displayed value is useless.



**Example:**

The following value is transmitted:

Modbus transmit value			
0x46	0x2b	0xc6	0x9c

Then the representation in the receiving device's internal memory has to be as follows:

Memory Addresses	Big Endian		Little Endian	
	Hex	Value	Hex	Value
Address	Hex	10993.65	Hex	10993.65
1000	0x46		0x9c	
1001	0x2b		0xc6	
1002	0xc6		0x2b	
1003	0x9c		0x46	

## 2.4 Function Code 5

### Query

Slave address	5	Register address	Register address	Register data	Register data	Check-sum	Check-sum
		HI	LO	HI	LO	HI	LO

### Response

Slave address	5	Register address	Register address	Register data	Register data	Check-sum	Check-sum
		HI	LO	HI	LO	HI	LO

Register address (HI · 256 + LO) — Data word address to be written

Register data — Value of the data word to be written (High-byte and Low-byte).

Permitted value range:

- FF00 hex request for a single bit to be on: This often means to reset a counter, execute acknowledgments or set blockings signals.
- 0000 hex request for a single bit to be off: This often means to deactivate blocking signals or to reset single bits.

## 2.5 Supported MODBUS Error Messages

Exception Response Telegrams are described within the general "Modbus Application Protocol Specification". An exception response table with examples is shown there. The table below contains just the actually used codes. In case the device has recognized an error it will react in the following way:

Exception Code	Designation	Description
1	Illegal Function	The message received includes a function code which is not supported by the Slave.
2	Illegal Data Address	Access was sought on a data word address not included in the data module.
3	Illegal Data Value	The received message contains an invalid data structure (e. g. wrong number of data bytes).
4	Slave Device Failure	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.

The response given by the *device* in case of a failure has the following format:

Slave Address	0x80	Exception Code	Check-sum	Check-sum
	+ Function Code		HI	LO

In the second Byte of the response the Function Code is sent with the highest Bit set to 1. This is equivalent to an addition by 0x80. The third Byte holds the Exception Code of the error message.

### 3 Data Point Lists



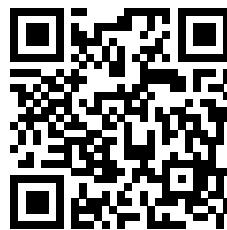
The WIC1 data points are listed in a separate document in Microsoft Excel file format.

## WI Line

## WIC1

## MODBUS SPECIFICATION

[docs.SEGelectronics.de/wic1](https://docs.SEGelectronics.de/wic1)



SEG Electronics GmbH reserves the right to update any portion of this publication at any time. Information provided by SEG Electronics GmbH is believed to be correct and reliable. However, SEG Electronics GmbH assumes no responsibility unless otherwise expressly undertaken.



### SEG Electronics GmbH

Krefelder Weg 47 • D-47906 Kempen (Germany)

Telephone: +49 (0) 21 52 145 1

Internet: [www.SEGelectronics.de](http://www.SEGelectronics.de)

#### Sales

Telephone: +49 (0) 21 52 145 331

Fax: +49 (0) 21 52 145 354

E-mail: [sales@SEGelectronics.de](mailto:sales@SEGelectronics.de)

#### Service

Telephone: +49 (0) 21 52 145 600

Fax: +49 (0) 21 52 145 354

E-mail: [support@SEGelectronics.de](mailto:support@SEGelectronics.de)

Complete address / phone / fax / email information for all locations is available on our website.