

User Manual

Connection to Modbus RTU

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TSwin .net 4.1x

Version	Date	Modifications
1	20.07.2005	First edition
2	21.11.2005	Validation extended, Chapter "Important Notes" added

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1 Important Notes

1.1 Symbols

The symbols in this manual are used to draw your attention on notes and dangers.



Danger

This symbol is used to refer to instructions which, if ignored or not carefully followed could result in personal injury.



Note

This symbol indicates application tips or supplementary notes.



Reference to source of information

This symbol refers to detailed sources of information on the current topic.

1.2 Safety Notes

- Read this manual carefully before using the operating device. Keep this manual in a place where it is always accessible to all users.
- Proper transportation, handling and storage, placement and installation of this product are prerequisites for its subsequent flawless and safe operation.
- This user manual contains the most important information for the safe operation of the device.
- The user manual, in particular the safety notes, must be observed by all personnel working with the device.
- Observe the accident prevention rules and regulations that apply to the operating site.
- Installation and operation must only be carried out by qualified and trained personnel.

1.3 Intended Use

- The device is designed for use in the industry.
- The device is state-of-the-art and has been built to the latest standard safety requirements. However, dangerous situations or damage to the machine itself or other property can arise from the use of this device.
- The device fulfills the requirements of the EMC directives and harmonized European standards. Any modifications to the system can influence the EMC behavior.

1.4 Target Group

All configuration and programming work in connection with the automation system must be performed by trained personnel only (e.g. qualified electricians, electrical engineers).

The configuration and programming personnel must be familiar with the safety concepts of automation technology.

2 Modbus RTU

The Modbus RTU protocol allows you random read and write access to all data types.

You can connect the operating device either as a master or a slave.

2.1 Operating Device as a Slave

You can connect several operating devices to the Modbus. Each operating device is able to access the controller.

2.2 Operating Device as a Master

You can connect an operating device as a master directly to the PU interface or connect it by means of an interface converter to the Modbus. The operating device is able to access several controllers.

2.3 Data Types

Direct access is possible to the following data types.

The address of a variable is always a decimal number with 6 digits.

Table 2-1 Data types sorted by data area

Type	Access	Data Area	Address
Bit	Read and Write	0	0xxxxx
	Read Only	1	1xxxxx
Word	Read Only	3	3xxxxx
	Read and Write	4	4xxxxx

Table 2-2 Data types sorted by function code

Type	Access	Data Area	Address	Function Code
Bit	Read and Write	0	B1xxxxx	Read = 1 Write = 5 or 15
	Read Only	1	B2xxxxx	Read = 2
Word	Read Only	3	W4xxxxx	Read = 4
	Read and Write	4	W3xxxxx	Read = 3 Write = 6 or 16
Double-word	Read Only	3	D4xxxxx	Read = 4
	Read and Write	4	D3xxxxx	Read = 3 Write = 6 or 16

2.3.1 Single Variables

Variables with a length of 2 bytes are interpreted in the controller as WORD.
Variables with a length of 4 bytes are interpreted in the controller as LONG WORD.
Floating point numbers are interpreted in the controller as IEEE formatted.

2.3.2 String Variables

Alphanumerical variables are interpreted in the controller as byte with ascending addresses.

2.4 Programming

2.4.1 Protocol parameters

With the protocol parameters, you can adapt the communication of the controller used.

2.4.1.1 Baud Rate

This parameter specifies the communication rate.

Table 2-3 Baud rate

Configurable Values (Baud)	Default value
300	
600	
1200	
2400	
4800	
9600	X
19200	
38400	
57600	
76800	
115200	

2.4.1.2 Parity

This parameter specifies the parity used to control the communication.

Table 2-4 Parity

Configurable values	Default Value
None	
Even	
Odd	X

2.4.1.3 Data Bits

This parameter specifies the number of data bits.

Table 2-5 Data bits

Configurable Values	Default Value
5	
6	
7	
8	X

2.4.1.4 Stop Bits

This parameter specifies the number of stop bits.

Table 2-6 Stop bits

Configurable Values	Default Value
1	X
1.5	
2	

2.4.1.5 Handshake

This parameter specifies the method used to control the communication.

Table 2-7 Handshake

Configurable values	Default Value
No Handshake	X
Hardware	
Software	

2.4.1.6 Maximum Waiting Time For Response

This parameter specifies how long the operating device waits for a response from the controller.

Table 2-8 Maximum waiting time for response

Configurable Values	Default Value
100 ms to 25500 ms	1000 ms

2.4.1.7 Delay until Connection Set-Up

This parameter specifies the waiting time after which the operating device starts the communication.

Table 2-9 Delay until connection set-up

Configurable Values	Default Value
1000 ms to 25000 ms	5000 ms

2.4.1.8 Character Delay Time

This parameter specifies the timeout between the transfer of two characters of a telegram, before the operating device detects the end of the telegram.

Table 2-10 Character delay time

Configurable Values	Default Value
0 ms to 1000 ms	0 ms

2.4.1.9 Slave Number

This parameter specifies whether the operating device is the master or the slave.

Table 2-11 Slave number

Configurable Values	Default Value
0 to 255 0 = Master 1 to 255 = Slave	0

2.4.1.10 Half Duplex

This parameter specifies whether the communication is performed in half duplex mode.

Table 2-12 Half duplex

Configurable Values	Default Value
ON	
OFF	X

2.4.1.11 Word Swap in Double-Word

This parameter specifies whether the words of a double-word are to be swapped.

Table 2-13 Word swap in double-word

Configurable Values	Default Value
ON	
OFF	X

2.4.1.12 Area B Must be Initialized by Master

This parameter can only be influenced if you enter a slave number. If you activate this parameter, the master has to write into area B during the first communication and initialize it.

Table 2-14 Area B must be initialized by master

Configurable Values	Default Value
ON	X
OFF	

2.4.1.13 Controllers

This parameter specifies which function code could be used for communication with the controller.

Table 2-15 Controllers

Configurable Values	Default Value
Address is decremented by; F-Codes 1, 2, 3, 4, 5, 6, 15, 16	X
Address remains unchanged; F-Codes 1, 2, 3, 4, 5, 6	
Address remains unchanged; F-Codes 1, 2, 3, 4, 5, 6, 15, 16	
Address remains unchanged; F-Codes 1, 2, 3, 4, 15, 16	

2.4.2 Poll Area

You should use the WORD data type If you like to use the poll area function. Please enter the start address of the data block in **Additional Functions, Polling Area**.

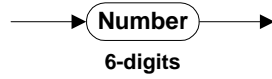
Table 2-16 Poll area, Modbus TCP

Word Address	Reference	High Byte	Low Byte
Word Address +0	400010	WCB	Reserved
Word Address +1	400011	Message Channel High Byte	Message Channel Low Byte
Word Address +2	400012	LED 1 to 4	LED 5 to 8
Word Address +3	400013	LED 9 to 12	LED 13 to 16
Word Address +4	400014	LED 17 to 20	LED 21 to 24
Word Address +5	400015	LED 25 to 28	LED 29 to 32

2.4.3 Input Syntax

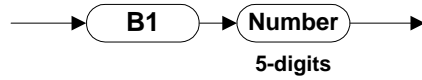
The following image illustrates the structure of the input syntax for variables in the programming software.

Syntax without function codes

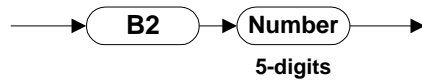


Syntax with function codes

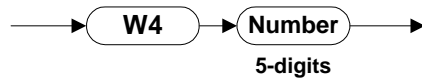
Read bit with FC5 and write bit with FC15



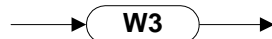
Read-only bit with FC2



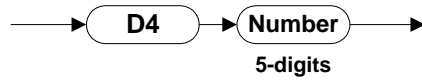
Read-only word with FC4



Read word with FC3 and write word with FC6 or FC16



Read-only doubleword with FC4



Read doubleword with FC3 and write doubleword with FC6 or FC16

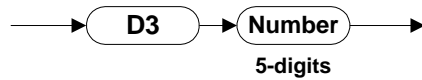


Figure 2-1 Syntax diagram

2.4.4 Physical Connection

Plug-in connectors on the operating device for connection to the controller.

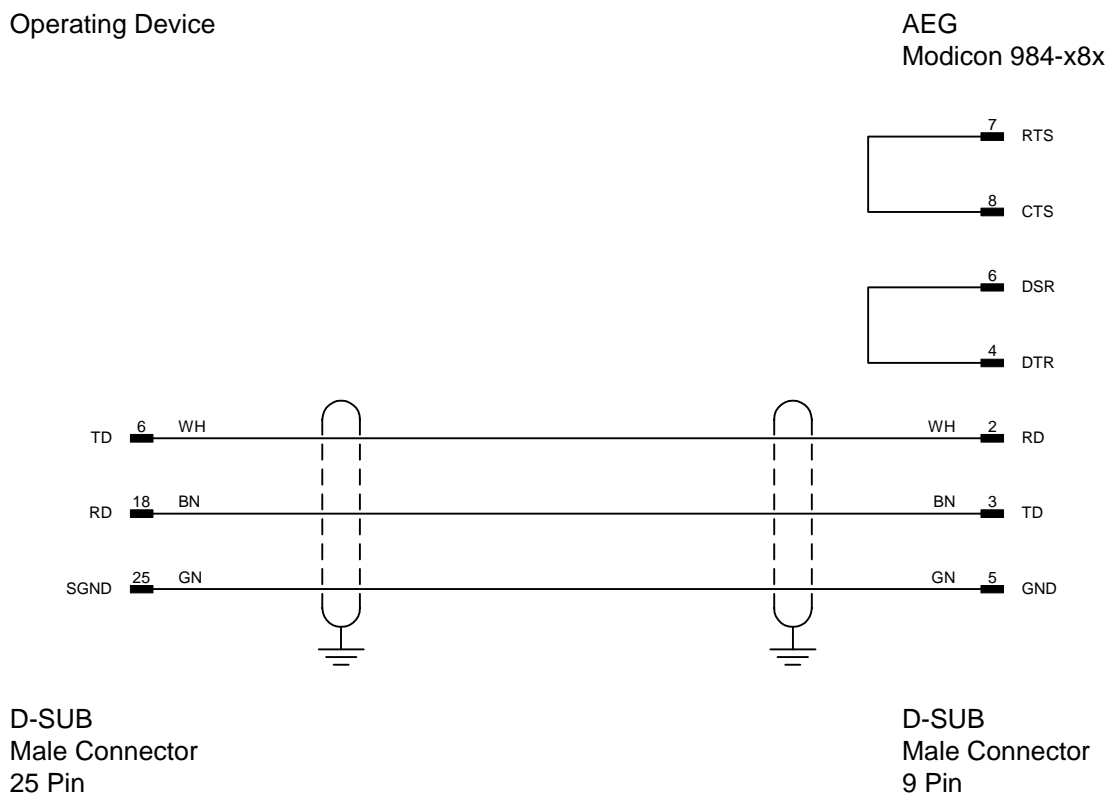
2.4.4.1 Pin Assignment for Operating Devices with an Universal Interface

Table 2-17 Pin assignment RS232

Pin	Designation	Function
6	TD	Transmitted Data
15	CTS	Clear to send
17	RTS	Request to send
18	RD	Received data
25	SGND	Signal Ground

2.4.4.2 Cable SER1 RS232 - Modicon 984-x8x

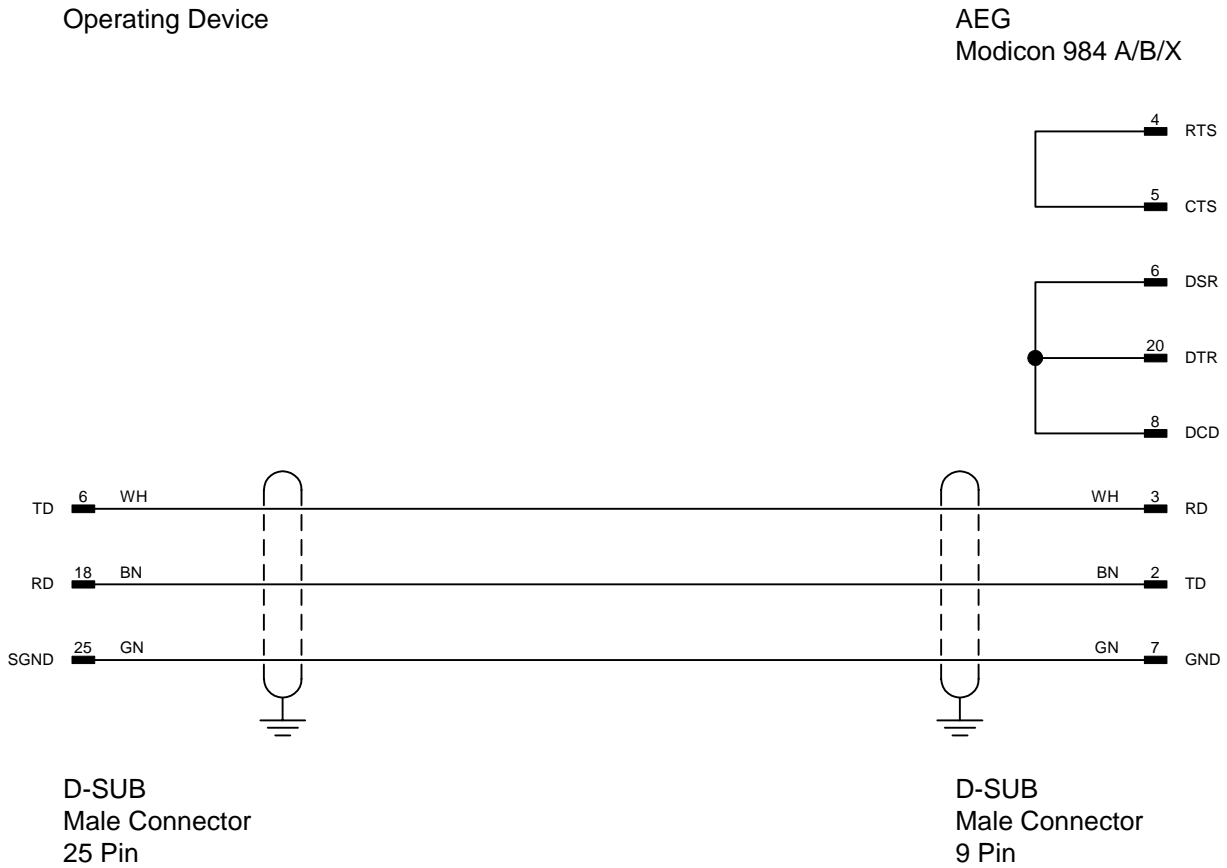
The following cabling diagram applies to operating devices with an universal interface **only**.



Both ends of the shield are connected to the metallic housing.

2.4.4.3 Cable SER1 RS232 - Modicon 984 A/B/X

The following cabling diagram applies to operating devices with an universal interface **only**.



Both ends of the shield are connected to the metallic housing.

2.5 Error Messages

Error messages are displayed on the operating device along with a code and sub-code. Error messages are composed as follows:

Communication Error

Code XXXXX

Subcode XXXXX

Retries XXXXX

Table 2-18 Error messages for Modbus Modbus/RTU

Code	Subcode	Error Type	Possible Cause
1	1	Slave not ready	Wrong slave address or connecting cable not plugged
	2	Wrong sequence of the packets	
	3	Protocol framing error	
	4	Timeout error	Connection is cut off
	5	CRC or BCC error	
	6	Wrong parity	
	7	Send process aborted	
	8	Receive process aborted	
	9	Cyclic buffer overrun	Insufficient cyclic buffer
	10	No cyclic data defined	
	12	Cyclic data already defined	
	15	Protocol error	Selected protocol is not supported
	16	Receive buffer overrun	
	40	System variable error	Undefined system variable
	50	Missing memory	No memory available for Slave-mode
2	60	No response telegram	Master mode: No answer from slave
	68	Number of data received is incorrect	
	70	No cyclical data	Slave mode: Operating device is not polled
Error messages if the operating device is used as a master			
3	1	Invalid function code	
	2	Invalid address	
	3	Invalid data value	
	4	General abort	
	8	Address is write protected	

Table 2-18 Error messages for Modbus Modbus/RTU

Code	Subcode	Error Type	Possible Cause
Error messages if the operating device is used as a slave			
3	200	Area B is not initialized	
	202	Master writes to area B (after intialization)	

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