

Function Block

MODBUS_TCP_Client_V1_1x

for the PC WorX 5 Control System

Revision 0

Function Description and Documentation for
Phoenix Contact System Blocks

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1 Introduction

1.1 General

MODBUS is an open protocol for control communication, in which various functions for read and write access to digital inputs and outputs and to registers are defined. MODBUS is maintained by a dedicated user organization; documents with a detailed protocol description are available from the organization's homepage at www.modbus.org. Depending on the transmission system, a distinction is made between the MODBUS RTU, MODBUS ASCII, and MODBUS TCP protocols.

The *MODBUS_TCP_Client_V1_1x* function block implements a MODBUS client for the PC WorX 5 (Version 5.10.22 SP 2.31 Hotfix 3 or later) automation software using TCP/IP communication. The task of the MODBUS client is to read and write data from the MODBUS server of a remote bus device and make it available in the application program. The following table lists the MODBUS functions that are supported:

Supported MODBUS Functions		
Function Code	Function Designation	Function Description
01	Read Coils	Read internal bits or digital outputs.
02	Read Discrete Inputs	Read digital inputs.
05	Write Single Coil	Write an internal bit or digital output.
15	Write Multiple Coils	Write multiple internal bits or digital outputs.
04	Read Input Register	Read multiple input registers.
03	Read Holding Registers	Read multiple internal registers or output registers.
06	Write Single Register	Write an internal register or output register.
16	Write Multiple Registers	Write multiple internal registers or output registers.
23	Read/Write Multiple Registers	Simultaneously read and write multiple internal registers or output registers.

To operate the MODBUS client, the *MODBUS_TCP_Client_V1_1x* block is required once for each device and the corresponding function block from the above table is required for each function. The individual blocks are described in the sections that follow. For startup instructions, please refer to Section 12.

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2 MODBUS_TCP_Client_V1_1x Block Description

2.1 General

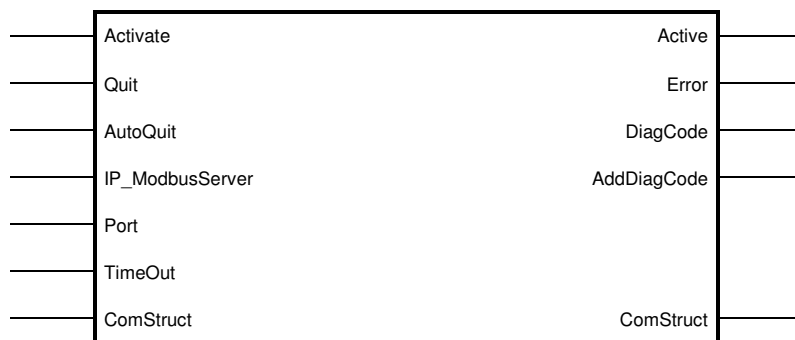
This block organizes access via MODBUS TCP to a remote MODBUS server and must be called once per server. The "ComStruct" communication structure is used to connect this block to the function blocks described in the sections that follow, all of which implement a MODBUS function. A maximum of ten MODBUS function blocks can be called per MODBUS_TCP_Client. Please note that the cycle time for MODBUS communication increases with the number of connected blocks.

2.2 Block Data

Block name: MODBUS_TCP_Client_V1_1x
 Block type: Function block
 Version: V1_1x
 Author: PxC/SFR
 Controller variants: ILC 150 ETH: FW 2.00 and later
 ILC 330: FW > 2.00
 ILC 350: FW 2.12 and later
 ILC 390: FW > 2.12
 Module types: -

2.3 Block Call

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2.4 Input Parameters

Input Parameters		
Name	Type	Description
Activate	BOOL	Block activation (TRUE = Active).
Quit	BOOL	Error reset. No block re-initialization.
AutoQuit	BOOL	Automatic error acknowledgement TRUE = errors are acknowledged automatically. Error data are true at the <i>Error</i> , <i>DiagCode</i> and <i>AddDiagCode</i> outputs for one cycle only.
IP_ModbusServer	STRING	IP address of the MODBUS server. The address should be specified as follows: xxx.xxx.xxx.xxx
Port	INT	TCP port of the MODBUS server. If no address is specified here, the default address 502 is used.
TimeOut	TIME	Timeout for communication monitoring. The MODBUS server must respond to a request within the time specified here, otherwise an error is triggered. If no value is specified here, the block operates with a timeout of 2 seconds.

2.5 Output Parameters

Output Parameters		
Name	Type	Description
Active	BOOL	The block is operating, initialization has been executed.
Error	BOOL	An error has occurred. The <i>DiagCode</i> and <i>AddDiagCode</i> parameters can be used for precise error analysis.
DiagCode	WORD	Diagnostic code. Interpretation using the diagnostics table (Section 2.7).
AddDiagCode	WORD	Extended diagnostic code. Interpretation using the diagnostics table (Section 2.7).

2.6 IN/OUT Parameters

IN/OUT Parameters		
Name	Type	Description
ComStruct	COM_UDT_COMMUNICATION_V2	Communication structure of the block family. The blocks are connected together using this structure.

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2.7 Diagnostics

DiagCode	Meaning	
0000 _{hex}	The block is not active	
8000 _{hex}	The block is active	
C010 _{hex}	A parameterization error has occurred	
	AddDiagCode	Meaning
	0010 _{hex}	The IP address of the MODBUS server was not specified.
C020 _{hex}	Timeout error	
C030 _{hex}	IP_CONNECT block error message	
	AddDiagCode	Meaning
	xxxx _{hex}	See DiagCode C050 _{hex} .
C040 _{hex}	IP_USEND block error message	
	AddDiagCode	Meaning
	xxxx _{hex}	See DiagCode C050 _{hex} .
C050 _{hex}	IP_URCV block error message	
	AddDiagCode	Meaning
	0000 _{hex}	No error occurred.
	0001 _{hex}	Failed to create one or more tasks.
	0002 _{hex}	Socket interface initialization failed. (WinNT only)
	0003 _{hex}	Dynamic memory could not be reserved.
	0004 _{hex}	Function block cannot be started, as an error occurred when starting the asynchronous communication task.
	0010 _{hex}	Socket initialization failed.
	0011 _{hex}	Error sending a message.
	0012 _{hex}	Error receiving a message.
	0013 _{hex}	Unknown service code in the telegram header.
	0021 _{hex}	Invalid state transition on connection establishment.
	0030 _{hex}	No more free channels available.
	0031 _{hex}	The connection was aborted.
	0033 _{hex}	General timeout, receiver no longer responding and transmitter has not finished transmitting.
	0034 _{hex}	Connection request was acknowledged negatively.
	0035 _{hex}	Receiver has not confirmed transmission, receiver may be overloaded (repeat transmission).
	0040 _{hex}	Partner string is too long (255 characters, maximum).
	0041 _{hex}	The specified IP address is invalid or could not be interpreted correctly.
	0042 _{hex}	Non-admissible port number
	0050 _{hex}	Transmission attempt on invalid connection (transmitter or receiver).
	0053 _{hex}	All available connections are occupied.
	0061 _{hex}	Negative confirmation from receiver. An invalid sequential number was used.
	0062 _{hex}	Transmitter and receiver data types do not match.
	0063 _{hex}	Receiver is currently not ready to receive. Possible cause: receiver is disabled or is transferring data (NDR = TRUE).
	0064 _{hex}	A receive block with the corresponding R_ID was not found.
	0065 _{hex}	Another block instance is already operating on this connection.

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3 MT_ReadCoils_V1_1x Block Description

3.1 General

This block implements the MODBUS function with function code 1 (Read Coils). It is used to read internal bits and digital outputs.

The data is read in the form of a byte array (*CoilStatus* parameter), the first bit in the first byte of this array corresponds to the first output to be read. The following diagram shows the assignment of the bits in the byte array to the outputs and the internal bits, in this example outputs 1 to 16 are read:

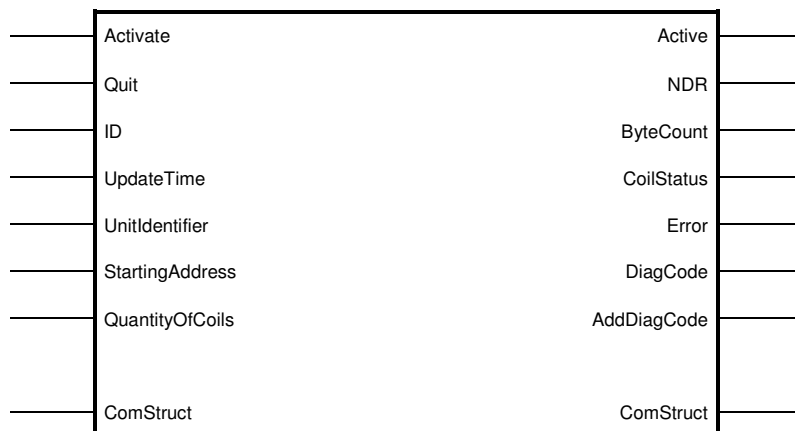
	Byte 1 (<i>CoilStatus</i>)								Byte 2 (<i>CoilStatus</i>)							
Bit number	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output number	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

3.2 Block Data

Block name: MT_ReadCoils_V1_1x
 Block type: Function block
 Version: V1_1x
 Author: PxC/SFR
 Controller variants: ILC 150 ETH: FW 2.00 or later
 ILC 330: FW > 2.00
 ILC 350: FW 2.12 or later
 ILC 390: FW > 2.12
 Module types: -

3.3 Block Call

MT_ReadCoils_V1_1x



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3.4 Input Parameters

Input Parameters		
Name	Type	Description
Activate	BOOL	Block activation (TRUE = Active).
Quit	BOOL	Error acknowledgement.
ID	INT	Value in the range from 1 to 10. Represents the connection between the blocks and may only be assigned once per MODBUS_TCP_Client. This parameter should be static.
UpdateTime	TIME	Waiting time in ms between two read tasks.
StartingAddress	WORD	Address of the first bit/output to be read. During addressing, the address of the first output is zero.
QuantityOfCoils	WORD	Number of bits/outputs to be read. Valid value range: 1 - 1000

3.5 Output Parameters

Output Parameters		
Name	Type	Description
Active	BOOL	The block is ready, initialization has been executed.
NDR	BOOL	New data has been received. The parameter is TRUE in the receive cycle.
ByteCount	BYTE	Number of bytes received.
CoilStatus	COM_ARR_B_1_250	Status of the outputs/internal bits. BYTE array with the limits 1 to 250. The first output corresponds to the first bit of the first byte.
Error	BOOL	An error has occurred. The <i>DiagCode</i> and <i>AddDiagCode</i> parameters can be used for precise error analysis.
DiagCode	WORD	Diagnostic code. Interpretation using the diagnostics table (Section 3.7).
AddDiagCode	WORD	Extended diagnostic code. Interpretation using the diagnostics table (Section 3.7).

3.6 IN/OUT Parameters

IN/OUT Parameters		
Name	Type	Description
ComStruct	COM_UDT_COMMUNICATION_V2	Communication structure of the block family. The blocks are connected together using this structure.

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3.7 Diagnostics

DiagCode	Meaning	
0000 _{hex}	The block is not active.	
8000 _{hex}	The block is active.	
C010 _{hex}	The MODBUS_TCP_Client block is not ready.	
C030 _{hex}	The ID used is invalid. The ID must be in the range from 1 to 10.	
C040 _{hex}	The ID used is assigned twice. Several MODBUS function blocks use the same ID, in this case only the first called block operates, all other blocks indicate this error.	
C050 _{hex}	MODBUS error message	
	AddDiagCode	Meaning
	01 _{hex}	ILLEGAL FUNCTION
	02 _{hex}	ILLEGAL DATA ADDRESS
	03 _{hex}	ILLEGAL DATA VALUE
	04 _{hex}	SLAVE DEVICE FAILURE
	05 _{hex}	ACKNOWLEDGE
	06 _{hex}	SLAVE DEVICE BUSY
	08 _{hex}	MEMORY PARITY ERROR
	0A _{hex}	GATEWAY PATH UNAVAILABLE
	0B _{hex}	GATEWAY TARGET DEVICE FAILED TO RESPOND

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4 MT_ReadDiscrInputs_V1_1x Block Description

4.1 General

This block implements the MODBUS function with function code 2 (Read Discrete Inputs). It is used to read digital inputs.

The data is read in the form of a byte array (*InputStatus* parameter), the first bit in the first byte of this array corresponds to the first input to be read. The following diagram shows the assignment of the bits in the byte array to the inputs, in this example inputs 1 to 16 are read:

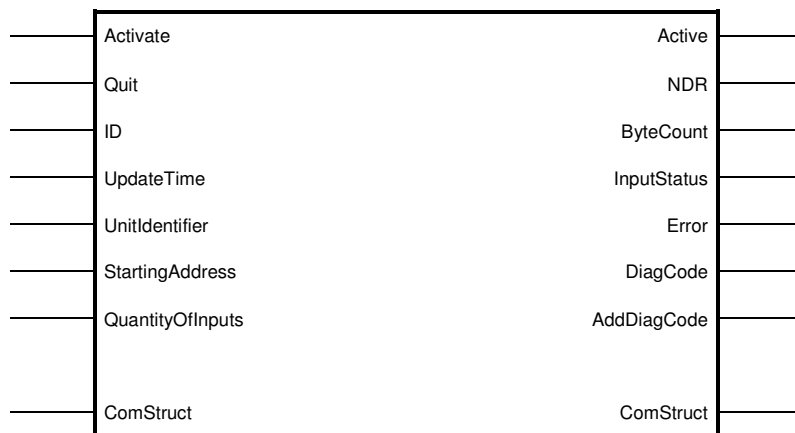
	Byte 1 (<i>InputStatus</i>)								Byte 2 (<i>InputStatus</i>)							
Bit number	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input number	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

4.2 Block Data

Block name: MT_ReadDiscrInputs_V1_1x
 Block type: Function block
 Version: V1_1x
 Author: PxC/SFR
 Controller variants: ILC 150 ETH: FW 2.00 or later
 ILC 330: FW > 2.00
 ILC 350: FW 2.12 or later
 ILC 390: FW > 2.12
 Module types: -

4.3 Block Call

MT_ReadDiscrInputs_V1_1x



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4.4 Input Parameters

Input Parameters		
Name	Type	Description
Activate	BOOL	Block activation (TRUE = Active).
Quit	BOOL	Error acknowledgement.
ID	INT	Value in the range from 1 to 10. Represents the connection between the blocks and may only be assigned once per MODBUS_TCP_Client. This parameter should be static.
UpdateTime	TIME	Waiting time in ms between two read tasks.
StartingAddress	WORD	Address of the first input to be read. During addressing, the address of the first digital input is zero.
QuantityOfInputs	WORD	Number of inputs to be read. Valid value range: 1 - 1000

4.5 Output Parameters

Output Parameters		
Name	Type	Description
Active	BOOL	The block is ready, initialization has been executed.
NDR	BOOL	New data has been received. The parameter is TRUE in the receive cycle.
ByteCount	BYTE	Number of bytes received.
InputStatus	COM_ARR_B_1_250	Status of the inputs. BYTE array with the limits 1 to 250. Each input is represented by a bit, the first input corresponds to the first bit of the first byte.
Error	BOOL	An error has occurred. The <i>DiagCode</i> and <i>AddDiagCode</i> parameters can be used for precise error analysis.
DiagCode	WORD	Diagnostic code. Interpretation using the diagnostics table (Section 4.7).
AddDiagCode	WORD	Extended diagnostic code. Interpretation using the diagnostics table (Section 4.7).

4.6 IN/OUT Parameters

IN/OUT Parameters		
Name	Type	Description
ComStruct	COM_UDT_COMMUNICATION_V2	Communication structure of the block family. The blocks are connected together using this structure.

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4.7 Diagnostics

DiagCode	Meaning	
0000 _{hex}	The block is not active.	
8000 _{hex}	The block is active.	
C010 _{hex}	The MODBUS_TCP_Client block is not ready.	
C030 _{hex}	The ID used is invalid. The ID must be in the range from 1 to 10.	
C040 _{hex}	The ID used is assigned twice. Several MODBUS function blocks use the same ID, in this case only the first called block operates, all other blocks indicate this error.	
C050 _{hex}	MODBUS error message	
	AddDiagCode	Meaning
	01 _{hex}	ILLEGAL FUNCTION
	02 _{hex}	ILLEGAL DATA ADDRESS
	03 _{hex}	ILLEGAL DATA VALUE
	04 _{hex}	SLAVE DEVICE FAILURE
	05 _{hex}	ACKNOWLEDGE
	06 _{hex}	SLAVE DEVICE BUSY
	08 _{hex}	MEMORY PARITY ERROR
	0A _{hex}	GATEWAY PATH UNAVAILABLE
	0B _{hex}	GATEWAY TARGET DEVICE FAILED TO RESPOND

5 MT_WriteSingleCoil_V1_1x Block Description

5.1 General

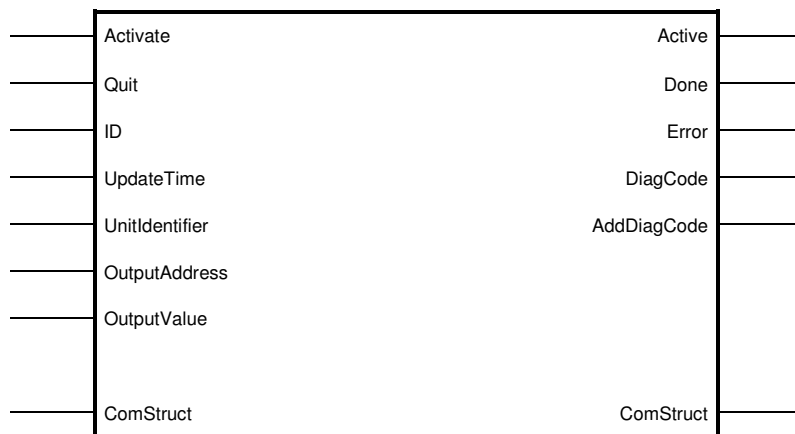
This block implements the MODBUS function with function code 5 (Write Single Coil). It is used to write an internal bit or a digital output.

5.2 Block Data

Block name: MT_WriteSingleCoil_V1_1x
 Block type: Function block
 Version: V1_1x
 Author: PxC/SFR
 Controller variants: All
 Module types: ILC 150 ETH: FW 2.00 or later
 ILC 330: FW > 2.00
 ILC 350: FW 2.12 or later
 ILC 390: FW > 2.12

5.3 Block Call

MT_WriteSingleCoil_V1_1x



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5.4 Input Parameters

Input Parameters		
Name	Type	Description
Activate	BOOL	Block activation (TRUE = Active).
Quit	BOOL	Error acknowledgement.
ID	INT	Value in the range from 1 to 10. Represents the connection between the blocks and may only be assigned once per MODBUS_TCP_Client. This parameter should be static.
UpdateTime	TIME	Waiting time in ms between two write tasks.
UnitIdentifier	UINT	Parameter for addressing a MODBUS-RTU device that is connected via a gateway.
OutputAddress	WORD	Address of the bit/output to be written. During addressing, the address of the first digital output is zero.
OutputValue	WORD	Value to be written. Only the following two values are permitted: TRUE: FF00 _{hex} FALSE: 0000 _{hex}

5.5 Output Parameters

Output Parameters		
Name	Type	Description
Active	BOOL	The block is ready, initialization has been executed.
Done	BOOL	The data was sent successfully. The parameter is TRUE in one cycle.
Error	BOOL	An error has occurred. The <i>DiagCode</i> and <i>AddDiagCode</i> parameters can be used for precise error analysis.
DiagCode	WORD	Diagnostic code. Interpretation using the diagnostics table (Section 5.7).
AddDiagCode	WORD	Extended diagnostic code. Interpretation using the diagnostics table (Section 5.7).

5.6 IN/OUT Parameters

IN/OUT Parameters		
Name	Type	Description
ComStruct	COM_UDT_COMMUNICATION_V2	Communication structure of the block family. The blocks are connected together using this structure.

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5.7 Diagnostics

DiagCode	Meaning	
0000 _{hex}	The block is not active.	
8000 _{hex}	The block is active.	
C010 _{hex}	The MODBUS_TCP_Client block is not ready.	
C030 _{hex}	The ID used is invalid. The ID must be in the range from 1 to 10.	
C040 _{hex}	The ID used is assigned twice. Several MODBUS function blocks use the same ID, in this case only the first called block operates, all other blocks indicate this error.	
C050 _{hex}	MODBUS error message	
	AddDiagCode	Meaning
	01 _{hex}	ILLEGAL FUNCTION
	02 _{hex}	ILLEGAL DATA ADDRESS
	03 _{hex}	ILLEGAL DATA VALUE
	04 _{hex}	SLAVE DEVICE FAILURE
	05 _{hex}	ACKNOWLEDGE
	06 _{hex}	SLAVE DEVICE BUSY
	08 _{hex}	MEMORY PARITY ERROR
	0A _{hex}	GATEWAY PATH UNAVAILABLE
	0B _{hex}	GATEWAY TARGET DEVICE FAILED TO RESPOND

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6 MT_WriteMultiCoils_V1_1x Block Description

6.1 General

This block implements the MODBUS function with function code 15 (Write Multiple Coils). It is used to write multiple internal bits or digital outputs.

The data is read in the form of a byte array (*OutputsValue* parameter), the first bit in the first byte of this array corresponds to the first output to be written. The following diagram shows the assignment of the bits in the byte array to the outputs, in this example outputs 1 to 16 are written:

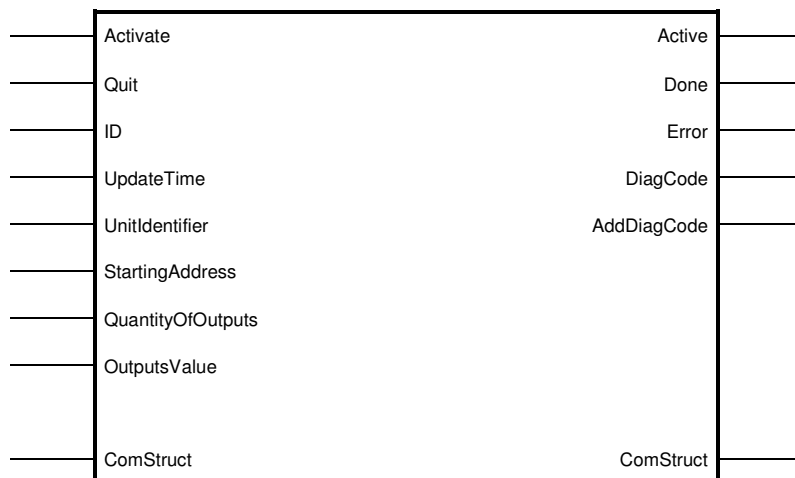
	Byte 1 (<i>OutputsValue</i>)								Byte 2 (<i>OutputsValue</i>)							
Bit number	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output number	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

6.2 Block Data

Block name: MT_WriteMultiCoils_V1_1x
 Block type: Function block
 Version: V1_1x
 Author: PxC/SFR
 Controller variants: ILC 150 ETH: FW 2.00 or later
 ILC 330: FW > 2.00
 ILC 350: FW 2.12 or later
 ILC 390: FW > 2.12
 Module types: -

6.3 Block Call

MT_WriteMultiCoils_V1_1x



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6.4 Input Parameters

Input Parameters		
Name	Type	Description
Activate	BOOL	Block activation (TRUE = Active).
Quit	BOOL	Error acknowledgement.
ID	INT	Value in the range from 1 to 10. Represents the connection between the blocks and may only be assigned once per MODBUS_TCP_Client. This parameter should be static.
UpdateTime	TIME	Waiting time in ms between two write tasks.
UnitIdentifier	UINT	Parameter for addressing a MODBUS-RTU device that is connected via a gateway.
StartingAddress	WORD	Address of the first output to be written. During addressing, the address of the first digital output is zero.
QuantityOfOutputs	WORD	Number of outputs to be written. Valid value range: 1 - 1000
OutputsValue	COM_ARR_ B_1_250	Values that are to be written to the outputs. BYTE array with the limits 1 to 250. Each output is represented by a bit, the first output corresponds to the first bit of the first byte.

6.5 Output Parameters

Output Parameters		
Name	Type	Description
Active	BOOL	The block is ready, initialization has been executed.
Done	BOOL	The data was sent successfully. The parameter is TRUE in one cycle.
Error	BOOL	An error has occurred. The <i>DiagCode</i> and <i>AddDiagCode</i> parameters can be used for precise error analysis.
DiagCode	WORD	Diagnostic code. Interpretation using the diagnostics table (Section 6.7).
AddDiagCode	WORD	Extended diagnostic code. Interpretation using the diagnostics table (Section 6.7).

6.6 IN/OUT Parameters

IN/OUT Parameters		
Name	Type	Description
ComStruct	COM_UDT_ COMMUNICATION_V2	Communication structure of the block family. The blocks are connected together using this structure.

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6.7 Diagnostics

DiagCode	Meaning	
0000 _{hex}	The block is not active.	
8000 _{hex}	The block is active.	
C010 _{hex}	The MODBUS_TCP_Client block is not ready.	
C030 _{hex}	The ID used is invalid. The ID must be in the range from 1 to 10.	
C040 _{hex}	The ID used is assigned twice. Several MODBUS function blocks use the same ID, in this case only the first called block operates, all other blocks indicate this error.	
C050 _{hex}	MODBUS error message	
	AddDiagCode	Meaning
	01 _{hex}	ILLEGAL FUNCTION
	02 _{hex}	ILLEGAL DATA ADDRESS
	03 _{hex}	ILLEGAL DATA VALUE
	04 _{hex}	SLAVE DEVICE FAILURE
	05 _{hex}	ACKNOWLEDGE
	06 _{hex}	SLAVE DEVICE BUSY
	08 _{hex}	MEMORY PARITY ERROR
	0A _{hex}	GATEWAY PATH UNAVAILABLE
	0B _{hex}	GATEWAY TARGET DEVICE FAILED TO RESPOND

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7 MT_ReadInputReg_V1_1x Block Description

7.1 General

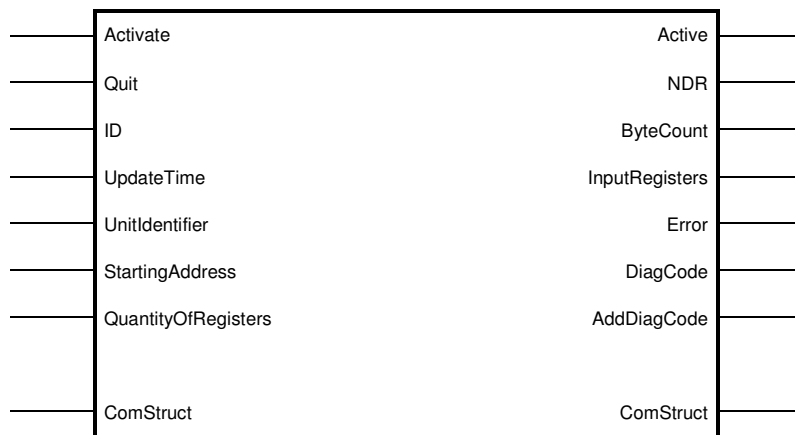
This block implements the MODBUS function with function code 4 (Read Input Registers). It is used to read input registers.

7.2 Block Data

Block name: MT_ReadInputReg_V1_1x
 Block type: Function block
 Version: V1_1x
 Author: PxC/SFR
 Controller variants: ILC 150 ETH: FW 2.00 or later
 ILC 330: FW > 2.00
 ILC 350: FW 2.12 or later
 ILC 390: FW > 2.12
 Module types: -

7.3 Block Call

MT_ReadInputReg_V1_1x



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7.4 Input Parameters

Input Parameters		
Name	Type	Description
Activate	BOOL	Block activation (TRUE = Active).
Quit	BOOL	Error acknowledgement.
ID	INT	Value in the range from 1 to 10. Represents the connection between the blocks and may only be assigned once per MODBUS_TCP_Client. This parameter should be static.
UpdateTime	TIME	Waiting time in ms between two read tasks.
UnitIdentifier	UINT	Parameter for addressing a MODBUS-RTU device that is connected via a gateway.
StartingAddress	WORD	Address of the first register to be read.
QuantityOfRegisters	WORD	Number of registers to be read. Valid value range: 1 - 125

7.5 Output Parameters

Output Parameters		
Name	Type	Description
Active	BOOL	The block is ready, initialization has been executed.
NDR	BOOL	New data has been received. The parameter is TRUE in the receive cycle.
ByteCount	BYTE	Number of bytes received.
InputRegisters	COM_ARR_W_1_125	Values read from the registers. WORD array with the limits 1 to 125.
Error	BOOL	An error has occurred. The <i>DiagCode</i> and <i>AddDiagCode</i> parameters can be used for precise error analysis.
DiagCode	WORD	Diagnostic code. Interpretation using the diagnostics table (Section 7.7).
AddDiagCode	WORD	Extended diagnostic code. Interpretation using the diagnostics table (Section 7.7).

7.6 IN/OUT Parameters

IN/OUT Parameters		
Name	Type	Description
ComStruct	COM_UDT_COMMUNICATION_V2	Communication structure of the block family. The blocks are connected together using this structure.

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7.7 Diagnostics

DiagCode	Meaning	
0000 _{hex}	The block is not active.	
8000 _{hex}	The block is active.	
C010 _{hex}	The MODBUS_TCP_Client block is not ready.	
C030 _{hex}	The ID used is invalid. The ID must be in the range from 1 to 10.	
C040 _{hex}	The ID used is assigned twice. Several MODBUS function blocks use the same ID, in this case only the first called block operates, all other blocks indicate this error.	
C050 _{hex}	MODBUS error message	
	AddDiagCode	Meaning
	01 _{hex}	ILLEGAL FUNCTION
	02 _{hex}	ILLEGAL DATA ADDRESS
	03 _{hex}	ILLEGAL DATA VALUE
	04 _{hex}	SLAVE DEVICE FAILURE
	05 _{hex}	ACKNOWLEDGE
	06 _{hex}	SLAVE DEVICE BUSY
	08 _{hex}	MEMORY PARITY ERROR
	0A _{hex}	GATEWAY PATH UNAVAILABLE
	0B _{hex}	GATEWAY TARGET DEVICE FAILED TO RESPOND

8 MT_ReadHoldingReg_V1_1x Block Description

8.1 General

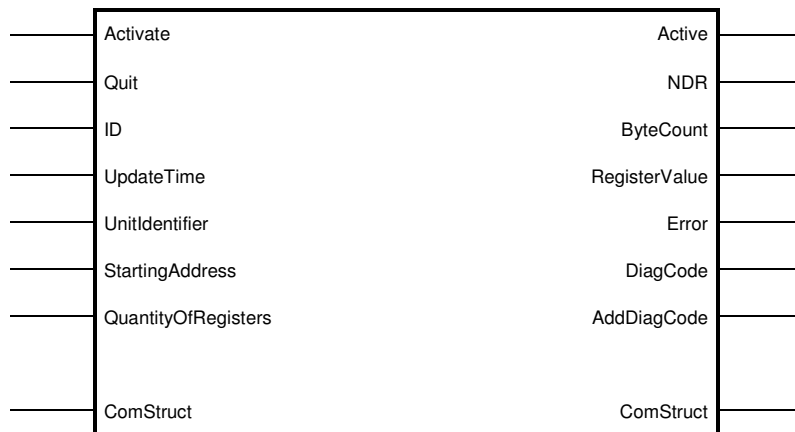
This block implements the MODBUS function with function code 3 (Read Holding Registers). It is used to read internal registers and output registers.

8.2 Block Data

Block name: MT_ReadHoldingReg_V1_1x
 Block type: Function block
 Version: V1_1x
 Author: PxC/SFR
 Controller variants: ILC 150 ETH: FW 2.00 or later
 ILC 330: FW > 2.00
 ILC 350: FW 2.12 or later
 ILC 390: FW > 2.12
 Module types: -

8.3 Block Call

MT_ReadHoldingReg_V1_1x



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8.4 Input Parameters

Input Parameters		
Name	Type	Description
Activate	BOOL	Block activation (TRUE = Active).
Quit	BOOL	Error acknowledgement.
ID	INT	Value in the range from 1 to 10. Represents the connection between the blocks and may only be assigned once per MODBUS_TCP_Client. This parameter should be static.
UpdateTime	TIME	Waiting time in ms between two read tasks.
UnitIdentifier	UINT	Parameter for addressing a MODBUS-RTU device that is connected via a gateway.
StartingAddress	WORD	Address of the first register to be read.
QuantityOfRegisters	WORD	Number of registers to be read. Valid value range: 1 - 125

8.5 Output Parameters

Output Parameters		
Name	Type	Description
Active	BOOL	The block is ready, initialization has been executed.
NDR	BOOL	New data has been received. The parameter is TRUE in the receive cycle.
ByteCount	BYTE	Number of bytes received.
RegisterValue	COM_ARR_W_1_125	Values read from the registers. WORD array with the limits 1 to 125.
Error	BOOL	An error has occurred. The <i>DiagCode</i> and <i>AddDiagCode</i> parameters can be used for precise error analysis.
DiagCode	WORD	Diagnostic code. Interpretation using the diagnostics table (Section 8.7).
AddDiagCode	WORD	Extended diagnostic code. Interpretation using the diagnostics table (Section 8.7).

8.6 IN/OUT Parameters

IN/OUT Parameters		
Name	Type	Description
ComStruct	COM_UDT_COMMUNICATION_V2	Communication structure of the block family. The blocks are connected together using this structure.

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8.7 Diagnostics

DiagCode	Meaning	
0000 _{hex}	The block is not active.	
8000 _{hex}	The block is active.	
C010 _{hex}	The MODBUS_TCP_Client block is not ready.	
C030 _{hex}	The ID used is invalid. The ID must be in the range from 1 to 10.	
C040 _{hex}	The ID used is assigned twice. Several MODBUS function blocks use the same ID, in this case only the first called block operates, all other blocks indicate this error.	
C050 _{hex}	MODBUS error message	
	AddDiagCode	Meaning
	01 _{hex}	ILLEGAL FUNCTION
	02 _{hex}	ILLEGAL DATA ADDRESS
	03 _{hex}	ILLEGAL DATA VALUE
	04 _{hex}	SLAVE DEVICE FAILURE
	05 _{hex}	ACKNOWLEDGE
	06 _{hex}	SLAVE DEVICE BUSY
	08 _{hex}	MEMORY PARITY ERROR
	0A _{hex}	GATEWAY PATH UNAVAILABLE
	0B _{hex}	GATEWAY TARGET DEVICE FAILED TO RESPOND

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9 MT_WriteSingleReg_V1_1x Block Description

9.1 General

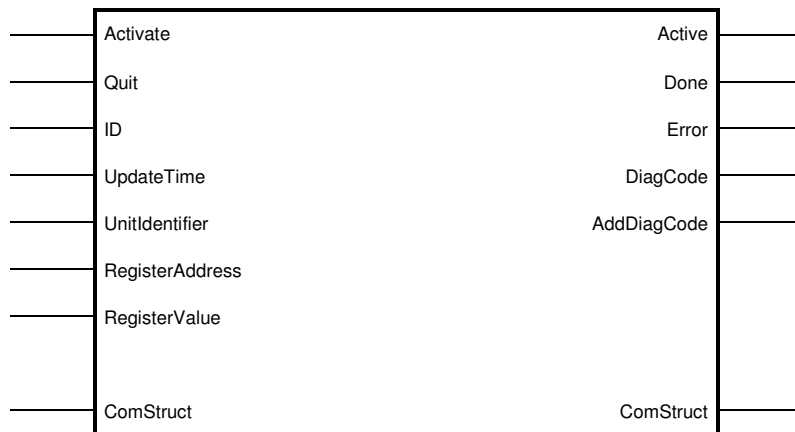
This block implements the MODBUS function with function code 6 (Write Single Register). It is used to write an output register or internal register.

9.2 Block Data

Block name: MT_WriteSingleReg_V1_1x
 Block type: Function block
 Version: V1_1x
 Author: PxC/SFR
 Controller variants: ILC 150 ETH: FW 2.00 or later
 ILC 330: FW > 2.00
 ILC 350: FW 2.12 or later
 ILC 390: FW > 2.12
 Module types: -

9.3 Block Call

MT_WriteSingleReg_V1_1x



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9.4 Input Parameters

Input Parameters		
Name	Type	Description
Activate	BOOL	Block activation (TRUE = Active).
Quit	BOOL	Error acknowledgement.
ID	INT	Value in the range from 1 to 10. Represents the connection between the blocks and may only be assigned once per MODBUS_TCP_Client. This parameter should be static.
UpdateTime	TIME	Waiting time in ms between two write tasks.
UnitIdentifier	UINT	Parameter for addressing a MODBUS-RTU device that is connected via a gateway.
RegisterAddress	WORD	Address of the register to be written.
RegisterValue	WORD	Value to be written to the register.

9.5 Output Parameters

Output Parameters		
Name	Type	Description
Active	BOOL	The block is ready, initialization has been executed.
Done	BOOL	The data was sent successfully. The parameter is TRUE in one cycle.
Error	BOOL	An error has occurred. The <i>DiagCode</i> and <i>AddDiagCode</i> parameters can be used for precise error analysis.
DiagCode	WORD	Diagnostic code. Interpretation using the diagnostics table (Section 9.7).
AddDiagCode	WORD	Extended diagnostic code. Interpretation using the diagnostics table (Section 9.7).

9.6 IN/OUT Parameters

IN/OUT Parameters		
Name	Type	Description
ComStruct	COM_UDT_COMMUNICATION_V2	Communication structure of the block family. The blocks are connected together using this structure.

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9.7 Diagnostics

DiagCode	Meaning	
0000 _{hex}	The block is not active.	
8000 _{hex}	The block is active.	
C010 _{hex}	The MODBUS_TCP_Client block is not ready.	
C030 _{hex}	The ID used is invalid. The ID must be in the range from 1 to 10.	
C040 _{hex}	The ID used is assigned twice. Several MODBUS function blocks use the same ID, in this case only the first called block operates, all other blocks indicate this error.	
C050 _{hex}	MODBUS error message	
	AddDiagCode	Meaning
	01 _{hex}	ILLEGAL FUNCTION
	02 _{hex}	ILLEGAL DATA ADDRESS
	03 _{hex}	ILLEGAL DATA VALUE
	04 _{hex}	SLAVE DEVICE FAILURE
	05 _{hex}	ACKNOWLEDGE
	06 _{hex}	SLAVE DEVICE BUSY
	08 _{hex}	MEMORY PARITY ERROR
	0A _{hex}	GATEWAY PATH UNAVAILABLE
	0B _{hex}	GATEWAY TARGET DEVICE FAILED TO RESPOND

10 MT_WriteMultiReg_V1_1x Block Description

10.1 General

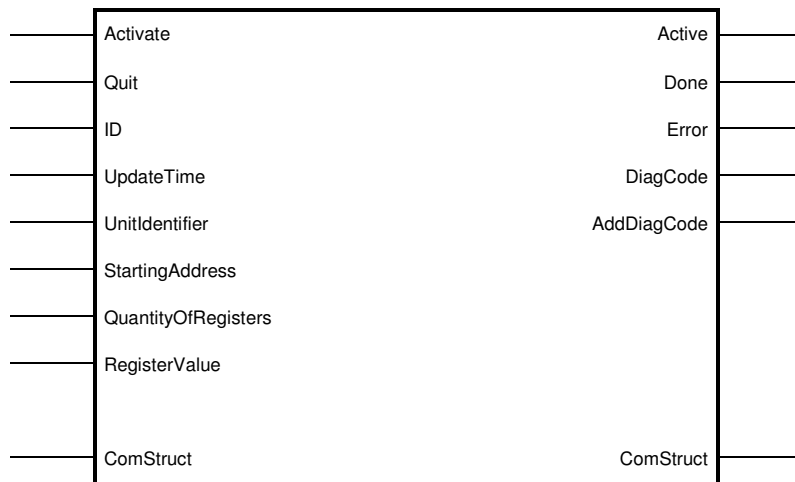
This block implements the MODBUS function with function code 16 (Write Multiple Registers). It is used to write multiple registers.

10.2 Block Data

Block name: MT_WriteMultiReg_V1_1x
 Block type: Function block
 Version: V1_1x
 Author: PxC/SFR
 Controller variants: ILC 150 ETH: FW 2.00 or later
 ILC 330: FW > 2.00
 ILC 350: FW 2.12 or later
 ILC 390: FW > 2.12
 Module types: -

10.3 Block Call

MT_WriteMultiReg_V1_1x



MODBUS_TCP_Client_V1_1x

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10.4 Input Parameters

Input Parameters		
Name	Type	Description
Activate	BOOL	Block activation (TRUE = Active).
Quit	BOOL	Error acknowledgement.
ID	INT	Value in the range from 1 to 10. Represents the connection between the blocks and may only be assigned once per MODBUS_TCP_Client. This parameter should be static.
UpdateTime	TIME	Waiting time in ms between two write tasks.
UnitIdentifier	UINT	Parameter for addressing a MODBUS-RTU device that is connected via a gateway.
StartingAddress	WORD	Address of the first register to be written.
QuantityOfRegisters	WORD	Number of registers to be written. Valid value range: 1 - 123
RegisterValue	COM_ARR_ W_1_125	Values to be written to the register. WORD array with the limits 1 to 125.

10.5 Output Parameters

Output Parameters		
Name	Type	Description
Active	BOOL	The block is ready, initialization has been executed.
Done	BOOL	The data was sent successfully. The parameter is TRUE in one cycle.
Error	BOOL	An error has occurred. The <i>DiagCode</i> and <i>AddDiagCode</i> parameters can be used for precise error analysis.
DiagCode	WORD	Diagnostic code. Interpretation using the diagnostics table (Section 10.7).
AddDiagCode	WORD	Extended diagnostic code. Interpretation using the diagnostics table (Section 10.7).

10.6 IN/OUT Parameters

IN/OUT Parameters		
Name	Type	Description
ComStruct	COM_UDT_ COMMUNICATION_V2	Communication structure of the block family. The blocks are connected together using this structure.

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10.7 Diagnostics

DiagCode	Meaning	
0000 _{hex}	The block is not active.	
8000 _{hex}	The block is active.	
C010 _{hex}	The MODBUS_TCP_Client block is not ready.	
C030 _{hex}	The ID used is invalid. The ID must be in the range from 1 to 10.	
C040 _{hex}	The ID used is assigned twice. Several MODBUS function blocks use the same ID, in this case only the first called block operates, all other blocks indicate this error.	
C050 _{hex}	MODBUS error message	
	AddDiagCode	Meaning
	01 _{hex}	ILLEGAL FUNCTION
	02 _{hex}	ILLEGAL DATA ADDRESS
	03 _{hex}	ILLEGAL DATA VALUE
	04 _{hex}	SLAVE DEVICE FAILURE
	05 _{hex}	ACKNOWLEDGE
	06 _{hex}	SLAVE DEVICE BUSY
	08 _{hex}	MEMORY PARITY ERROR
	0A _{hex}	GATEWAY PATH UNAVAILABLE
	0B _{hex}	GATEWAY TARGET DEVICE FAILED TO RESPOND

11 MT_RWMultiReg_V1_1x Block Description

11.1 General

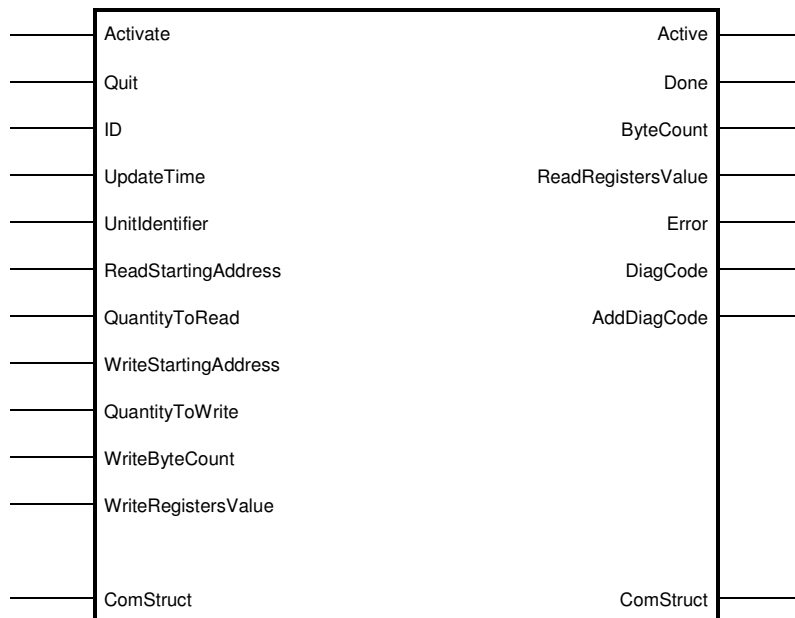
This block implements the MODBUS function with function code 23 (Read/Write Multiple Registers). It is used to simultaneously read and write multiple registers.

11.2 Block Data

Block name: MT_RWMultiReg_V1_1x
 Block type: Function block
 Version: V1_1x
 Author: PxC/SFR
 Controller variants: ILC 150 ETH: FW 2.00 or later
 ILC 330: FW > 2.00
 ILC 350: FW 2.12 or later
 ILC 390: FW > 2.12
 Module types: -

11.3 Block Call

MT_RWMultiReg_V1_1x



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11.4 Input Parameters

Input Parameters		
Name	Type	Description
Activate	BOOL	Block activation (TRUE = Active).
Quit	BOOL	Error acknowledgement.
ID	INT	Value in the range from 1 to 10. Represents the connection between the blocks and may only be assigned once per MODBUS_TCP_Client. This parameter should be static.
UpdateTime	TIME	Waiting time in ms between two read/write tasks.
UnitIdentifier	UINT	Parameter for addressing a MODBUS-RTU device that is connected via a gateway.
ReadStartingAddress	WORD	Address of the first register to be read.
QuantityToRead	WORD	Number of registers to be read.
WriteStartingAddress	WORD	Address of the first register to be written.
QuantityToWrite	WORD	Number of registers to be written.
WriteRegistersValue	COM_ARR_W_1_125	Values to be written to the register. WORD array with the limits 1 to 125.

11.5 Output Parameters

Output Parameters		
Name	Type	Description
Active	BOOL	The block is ready, initialization has been executed.
Done	BOOL	The data was sent and received successfully. The parameter is TRUE in a cycle.
ByteCount	WORD	Number of bytes that were received.
ReadRegistersValue	COM_ARR_W_1_125	Values read from the registers. WORD array with the limits 1 to 125.
Error	BOOL	An error has occurred. The <i>DiagCode</i> and <i>AddDiagCode</i> parameters can be used for precise error analysis.
DiagCode	WORD	Diagnostic code. Interpretation using the diagnostics table (Section 11.7).
AddDiagCode	WORD	Extended diagnostic code. Interpretation using the diagnostics table (Section 11.7).

11.6 IN/OUT Parameters

IN/OUT Parameters		
Name	Type	Description
ComStruct	COM_UDT_COMMUNICATION_V2	Communication structure of the block family. The blocks are connected together using this structure.

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11.7 Diagnostics

DiagCode	Meaning	
0000 _{hex}	The block is not active.	
8000 _{hex}	The block is active.	
C010 _{hex}	The MODBUS_TCP_Client block is not ready.	
C030 _{hex}	The ID used is invalid. The ID must be in the range from 1 to 10.	
C040 _{hex}	The ID used is assigned twice. Several MODBUS function blocks use the same ID, in this case only the first called block operates, all other blocks indicate this error.	
C050 _{hex}	MODBUS error message	
	AddDiagCode	Meaning
	01 _{hex}	ILLEGAL FUNCTION
	02 _{hex}	ILLEGAL DATA ADDRESS
	03 _{hex}	ILLEGAL DATA VALUE
	04 _{hex}	SLAVE DEVICE FAILURE
	05 _{hex}	ACKNOWLEDGE
	06 _{hex}	SLAVE DEVICE BUSY
	08 _{hex}	MEMORY PARITY ERROR
	0A _{hex}	GATEWAY PATH UNAVAILABLE
	0B _{hex}	GATEWAY TARGET DEVICE FAILED TO RESPOND

12 Startup Instructions

12.1 Block Connection

For startup, it is first necessary to parameterize the IP address and the port of the MODBUS server at the *MODBUS_TCP_Client* block. For each MODBUS function to be used, the corresponding function block is also called and connected to the *MODBUS_TCP_Client* using the *ComStruct* parameter. These blocks must be supplied with the data from the registers to be read or written before data exchange can be started.

In this example, ten input words are to be cyclically read on a MODBUS module and then written to the outputs of the module.

According to the module user manual, the inputs start at MODBUS address 0 and the outputs start at MODBUS address 500. The *Read Input Register* and *Write Multiple Registers* MODBUS functions are used as the solution to this task. As shown in the figure below, the corresponding function blocks are inserted in the project and connected to the *MODBUS_TCP_Client* block. The start address of the input and output registers and the number of registers (in this case 10) are parameterized at both blocks. As the data should be read and written as quickly as possible, an update time of 0 ms is specified.

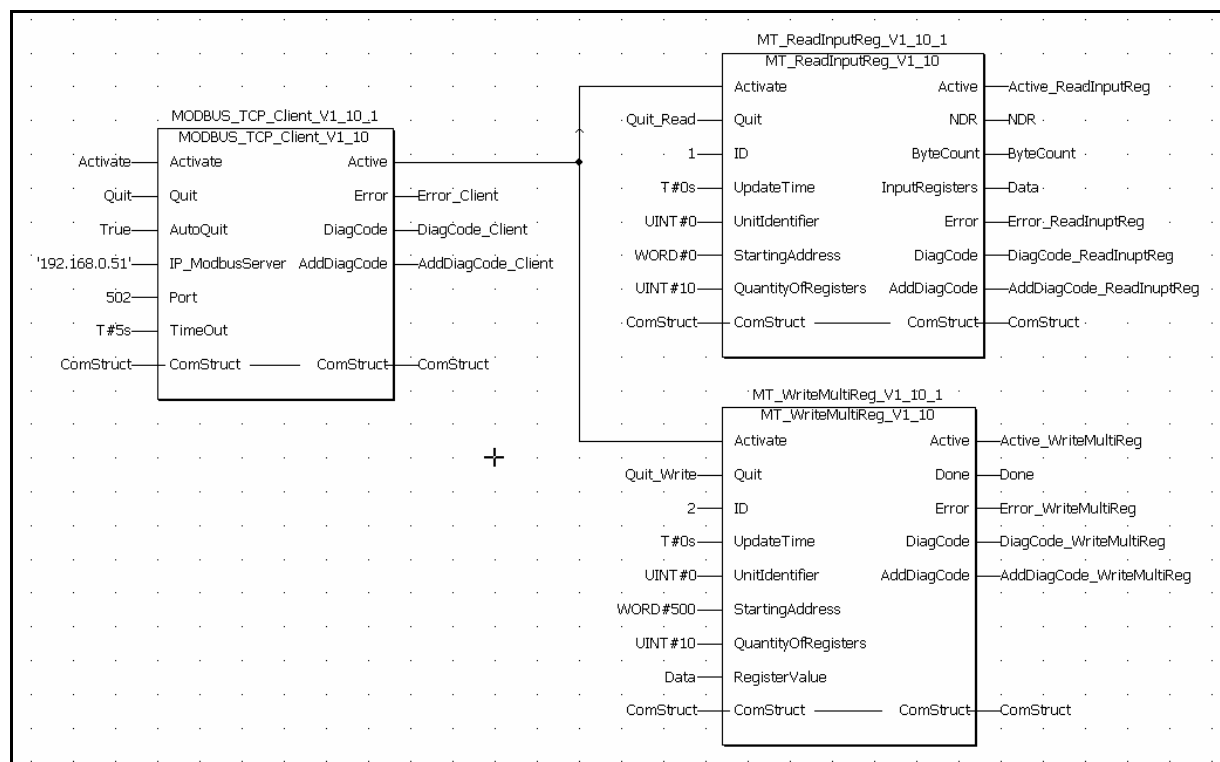


Fig. 1 Connection example for MODBUS_TCP_Client_V1_0x

Following parameterization, communication is started by setting the *Activate* input at the *MODBUS_TCP_Client* block. As soon as this has successfully established a connection to the MODBUS server, the *Active* output parameter is set to TRUE, which activates the subsequent blocks. The input registers of the module are read by the MODBUS server and saved in the *Data* variable at the *InputRegisters* parameter of the *MT_ReadInputReg* block. This variable is itself connected to the *RegisterValue* input parameter of the

MODBUS_TCP_Client_V1_1x

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MT_WriteMultiReg block and is transmitted by it to the MODBUS server and thus to the outputs of the connected MODBUS device.

In the event of an error, the *Error* output parameter is set and the *Active* output parameter is reset. Detailed diagnostics are available via the *DiagCode* and *AddDiagCode* output parameters.

13 FAQs

FAQs	
FAQ	Answer
Communication is slow	<ul style="list-style-type: none"> The value of the <i>UpdateTime</i> parameter is too high. Data is not read in groups. Associated data blocks should be replaced with the functions for reading and writing multiple registers, ideally the <i>Read/Write Multiple Registers</i> function is used.
During project compilation the following error message occurs: 'No POE 'SWAP support!'	'Insert the <i>Bit_UTIL</i> firmware library into the project.

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