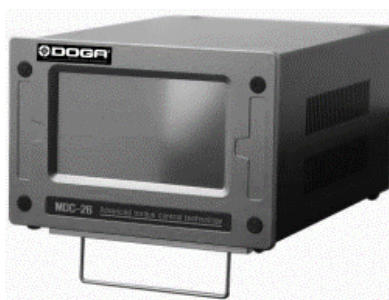


# COM Protocol MODBUS TCP MDv2/MDT series



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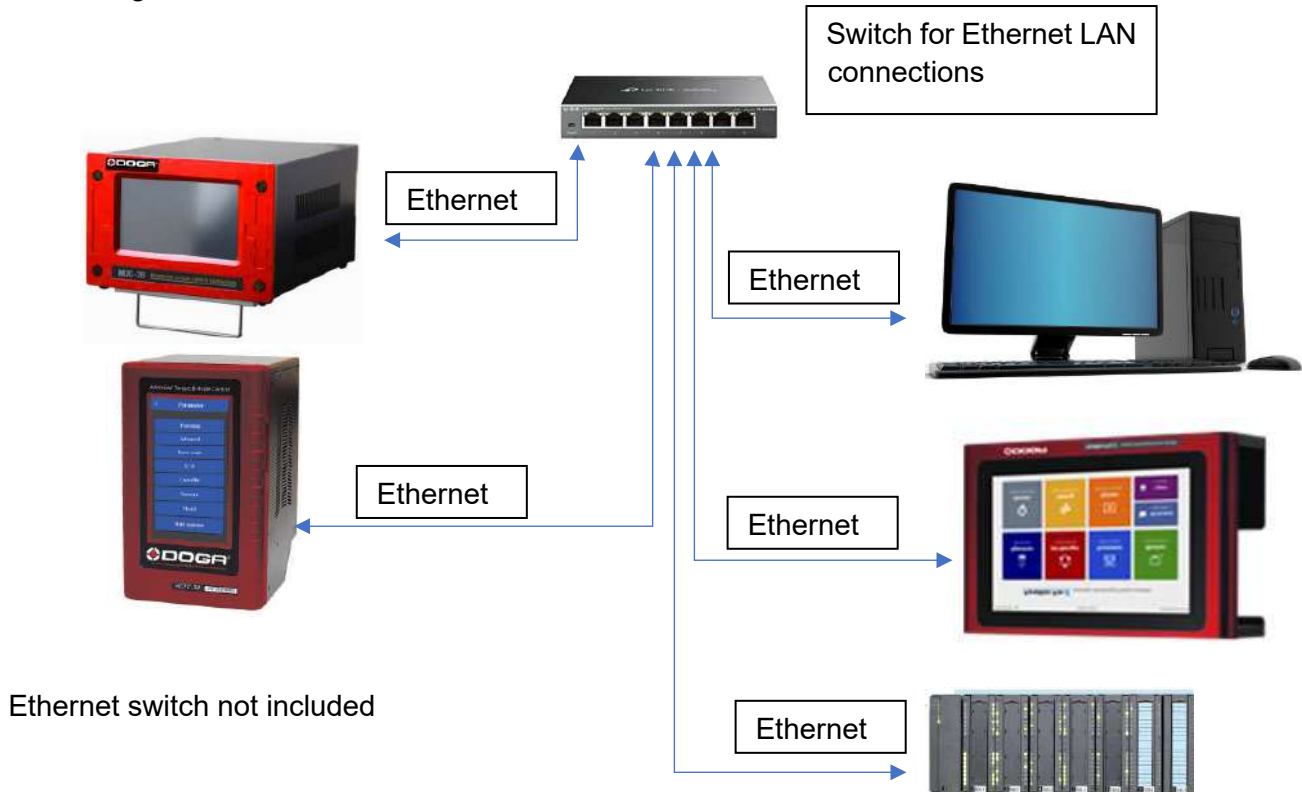
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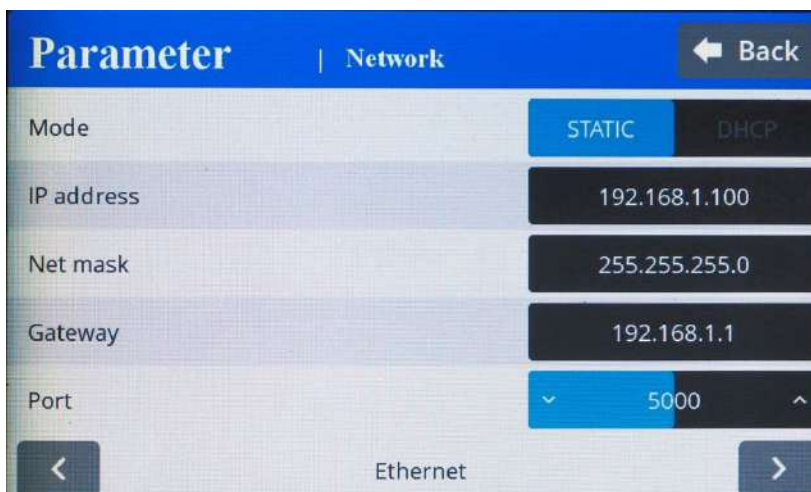
## 1. Overview and Communication Specifications

### 1.1 Overview

MDCv2 and MDTC controllers are capable of connecting to the host controller (Handy Loader, HMI, PLC, PC, etc.) through ethernet, allowing the user to use such functions as parameter change and data monitoring.



Example of controller network settings :



## 2. Basic Structure of Communication Protocol MODBUS TCP

### 2.1 Modbus TCP Frame Format

Name	Length(byte)	Function
Transaction Identifier	2	For synchronization between messages of server & client
Protocol Identifier	2	Zero for Modbus/TCP
Length Field	2	Number of remaining bytes in this frame
Unit Identifier	1	Slave Address.
Function	1	Function codes as in other variants
Data	n	Data as response or commands

Format of Modbus/TCP frame is described in the below figure.



- byte 0 ~ 1: transaction ID (Transaction Identification)

This means the sequence number of queries and responses. While TCP operates as a master, it is incremented by one in every query (It doesn't matter if this field is set to 0x0000).

- byte 2 ~ 3: protocol ID (Protocol Identification)

This means the protocol identification and the value is fixed as 0x0000 for Modbus/TCP

- byte 4 ~ 5: length

The value of this means the number of bytes from next byte of length field to the end of the frame.

- byte 6: unit ID(Slave Address)  
set to 0 for direct COM with controller (1 controller per IP address)  
or tool number (0 to 7) if COM goes through ParaMonPro X in gateway mode.
- byte 7: FC (Function Code)
- byte 8~ : data depending on function code

### 3. Function code & message details

Function code	Description	Remark
03 (0x03)	<b>Read</b> Holding Register	16bit data (Integer) ex) parameter
04 (0x04)	<b>Read</b> Input Register	16bit data ex) monitoring data
06 (0x06)	<b>Write</b> Single Register	16bit integer format ex) parameter data
16 (0x16)	<b>Write</b> Multiple Registers	16bit integer format ex) parameter data
17 (0x11)	<b>Request</b> Slave ID	

#### 3.1 < READ > Function code 03 & 04 details

Function code 03 is used to read the register as like parameters (address 1 to 725)

Function code 04 is used to read the register as like alarm & monitoring data (address 3100 to 3399).

The only integer number is allowed.

[Query ( Request) ]

Slave address	Function Code	Start address High	Start address Low	No of address High	No of address Low
---------------	---------------	--------------------	-------------------	--------------------	-------------------

Function code consist of one byte. But start address and number of address are consisted by 2 bytes with 4 digits of hexadecimal, starting with first 2 digits for high number, second 2 digits for low number.

[OK Response ]

Slave address	Function Code	No of byte	Data #1 High	Data #1 Low	... x n data
---------------	---------------	------------	--------------	-------------	--------------

The number of data is consisted by 2 bytes with 4 digits of hexadecimal. So the total number of data is equal to 1/2 of the number of byte.

[Abnormal Respons]

Slave address	Function code 0x080	Error code
---------------	---------------------	------------

By adding 0x080 to the function code, it response any abnormal or wrong message

### Example message of “ 03 “ for parameter data

To read the data of parameter 1 and 2, which is torque & speed value of Preset #1

( 03 : Query)

Slave address	03	00	02	00	02
---------------	----	----	----	----	----

Start address : 2 ( 0002h )

Number of address : 2 (0002h)

Read data of two addresses starting from address #2

( 03 : Response )

Slave address	Function Code	No of byte	Data #1 High	Data #1 Low	... x n data
---------------	---------------	------------	--------------	-------------	--------------

Slave address	03	04	01	0F	03	21
---------------	----	----	----	----	----	----

Data value of 1<sup>st</sup> address : 010F (hex) = 271 (dec) ← torque value of Preset #1

Date value of 2<sup>nd</sup> address : 03E8(hex) = 1000 (dec) ← Torque limit value 10.00%

[ Address for parameters ]

Refer the appendix A for all address details for parameters

1 – 725 : Parameter address

( 1001 – 1724 : Parameter value range MIN )

( 2001 – 2724 : Parameter value range MAX )

## Example message of “ 04 ” for fastening data

To read the fastening data which is renewed by the event such as start, stop, F/R rotation...

( 04 : Query)

Slave address	04	0c	84	00	02
---------------	----	----	----	----	----

Start address : 3204 ( 0c84h )

Number of address : 2 ( 0002h )

Read data of two addresses starting from address #3204

( 04 : Response )

Slave address	Function Code	No of byte	Data #1 High	Data #1 Low	... x n data
---------------	---------------	------------	--------------	-------------	--------------

Slave address	04	04	01	0F	03	21
---------------	----	----	----	----	----	----

Data value of 1<sup>st</sup> address : 010Fh = 2.71 (dec) ← Converted torque value

Data value of 2<sup>nd</sup> address : 03E8h = 1000 (dec) ← Target speed

[ Address for monitoring ]

Refer the appendix A for all address details for monitoring

3100 – 3101 : Alarm data

3200 – 3213 : Data updated by event ( Start, F/L, Preset change, Torque up )

3300 – 3313 : Real-time data

### 3.2 < WRITE > Function code 06 : writing parameters

Function code 06 is used to WRITE the parameter value in each register. The only integer number is allowed.

( Query )

Slave address	Function Code	Address High	Address Low	Date High	Data Low

( OK Response )

Slave address	Function Code	Address High	Address Low	Date High	Data Low

It provides the echo response on the query (request) after writing data in register.

- Refer the appendix A for all address details for writing.

4000 – 4005 : remote inputs (preset selection, remote start, driver lock, F/L, alarm reset)

### Example message of “ 06 “ for Real-time monitoring data Auto output → ON

To read the renewed fastening data automatically and continuously, repeat the same query as below in every 10 seconds.

( 06 : Query)

Slave address	06	0F	A2	00	01
---------------	----	----	----	----	----

Address : 4002 ( 0FA2h )

Data : 1 ( 0001h )

( 06 : Response )

It response the same as the query

01	06	0F	A2	00	01
----	----	----	----	----	----

Once it write “ 1 “ on the address 4002, the real-time monitoring data is responded with the function code “04” automatically when there is the event as like torque-up, F/R change, preset # change, etc.

Repeat the same query in every 10 seconds to keep the data output.

### 3.3 < WRITE > Function code 16 : writing multiple parameters

Implemented in firmware :

- MDC v2.31.7\_20230321 and newer
- MDTC\_Normal\_v1.31.5\_20230321 and newer
- MDTC\_Plus\_v3.31.5\_20230321 and newer

Function code 16 is used to WRITE several parameter values in multiple register. The only integer number is allowed.

( Query )

Slave address	Function Code	Starting Address High	Starting Address Low	Quantity register High	Quantity Register Low	Byte count	Data #1 High	Data #1 Low	...Data # n ...
---------------	---------------	-----------------------	----------------------	------------------------	-----------------------	------------	--------------	-------------	-----------------

( OK Response )

Slave address	Function Code	Starting Address High	Starting Address Low	Quantity register High	Quantity Register Low
---------------	---------------	-----------------------	----------------------	------------------------	-----------------------

It provides the echo response on the query (request) after writing data in register.

This function can be used with :

- parameters registers 1 to 874
- remote control registers 4000 to 4008

Max number of registers to be written at once: 100.

**Example message of “ 16 “ for writing preset#1 parameters (15 registers)**

(16 : Query)

00 01 00 00 00 25 00 10 00 01 00 0F 1E 00 00 00 65 05 DC 00 00 00 00 00 00 00 00 01 51 00  
00 00 00 00 00 00 28 00 3C 00 46 00 60

**Modbus frame :**

- Transaction ID 0x0001/Protocol ID 0x0000/Length Field 0x0025(37bytes)/Unit ID 0x00
- Function code 16 :0x10
- Starting Address : 0x0001
- Quantity of Register : 0x000F (15)
- Byte count : 0x001E (30 = Register x2)
- Data # : 15 registers datas

(16 : Response )

00 01 00 00 00 06 00 10 00 01 00 0F

**Modbus frame :**

- Transaction ID 0x0001/Protocol ID 0x0000/Length Field 0x0006(6bytes)/Unit ID 0x00
- Function code 16 :0x10
- Starting Address : 0x0001
- Quantity of Register : 0x000F (15)

### 3.4 Auto data output – data description

Auto data output is same data format as the answer to a read request (code 04) of 14 register addresses 3200 to 3213 but sent spontaneously without read request when a new event occurs

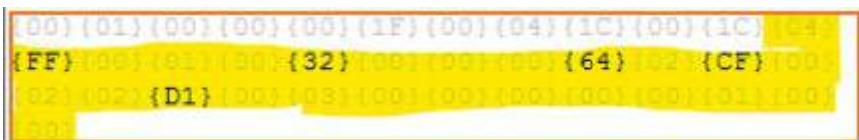
Data description :

Data updated on events (Start, F/L, Preset, Torque up)	Event count no. ( 1- 65,535 )	3200	Read : 0x04	
	Fastening time (ms)	3201	Read : 0x04	
	Preset no.	3202	Read : 0x04	
	Target torque ( * x 100 )	3203	Read : 0x04	[value: 4321] -> [mean: 43.21]
	Converted torque ( * x 100 )	3204	Read : 0x04	
	Target speed (rpm)	3205	Read : 0x04	
	A1 (degree)	3206	Read : 0x04	
	A2 (degree)	3207	Read : 0x04	
	A3 (degree)	3208	Read : 0x04	
	Screw count value	3209	Read : 0x04	
	Error	3210	Read : 0x04	
	Forward / Loosening	3211	Read : 0x04	0: Forward, 1: Loosening
	Status	3212	Read : 0x04	Other = 0, Fastening complete = 1, Fastening NG (E330,332,333,334,335,336,337,338,339)= 2, F/L change = 3, Preset change = 4, Alarm reset = 5, Error(except fastening NG) = 6 Barcode = 7 Screw count-1 = 8
	Snug torque angle (degree)	3213	Read : 0x04	

Event generating an auto data output for any of the following status :

- 0 = Other
- 1 = Fastening complete
- 2 = Fastening NG (E330,332,333,334,335,336,337,338,339)
- 3 = F/L change
- 4 = Preset change
- 5 = Alarm reset
- 6 = Error(except fastening NG)
- 7 = Barcode (not implemented)
- 8 = Screw count-1

Example of auto data output frame:



Auto data frame explanation:

- 00 01 : transmission ID
- 00 00 : protocol ID
- 00 1F : length in bytes (31 in bytes)
- 00 : unit
- 04 : modbus function code (read)
- 1C: number of bytes (28 in dec)
- 00** .... : data registers 3200 to 3213

### 3.5 < REQUEST > Function code 17 : Slave device information

Function code 17 is used to read the slave device information about ID no, controller model, screwdriver model, serial no and firmware version.



#### Information

This request can be used at communication open to monitor controller & screwdriver connected and also as a keep alive polling with controller to check connection.

( Query )

Slave address	Function Code (17)
---------------	--------------------

( Response )

Slave address	Function Code	No. of byte	Driver ID High	Driver ID Low	Controller model High	Controller model Low	Driver model High	Driver model Low	FW Ver. High	FW Ver. Low	S/N 5	S/N 4	S/N 3	S/N 2	S/N 1

**Driver ID High/Low :**  
by default 0x00 0x01

#### Controller model list

Value	Controller model MDCv2	Controller model MDTC
1	MDC26	MDTC38
2	MDC32	
3	MDC22	

#### Firmware version (Controller)

Value High/Low	MDCv2 controller firmware always starts with v2.xx.x	MDTC controller firmware always starts with v1.xx.x	MDTC+ controller firmware always starts with v3.xx.x
0x0D 0x02 1302	NA	v1.30.2	NA
0x17 0x02 2302	v2.30.2	NA	NA
0x21 0x02 3302	NA	NA	v3.30.2

## Driver model list

Value	MD Driver model	MDT Driver model
0	Unknown	Unknown
1	MD2601	MDT2604
2	MD2602	MDT2611
3	MD2604	MDT2616
4	MD2611	MDT3204
5	MD2616	MDT3211
6	MD3201	MDT3216
7	MD3202	MDT3228
8	MD3204	MDT3258
9	MD3211	MDTP3204 MDT(H)3204/L
10	MD3216	MDTP3206 MDT(H)3206/L
11	MD3236	MDTP3211 MDT(H)3211/L
12	MD3264	MDTP3216 MDT(H)3216/L
13	MD2201	MDTP3220 MDT(H)3220/L
14	MD3208	MDTP3224 MDT(H)3224/L
15	MD3210	MDTP3236 MDT(H)3236/L
16	MD2203	MDTP3245 MDT(H)3245/L
17	MD2202	MDTP3264 MDT(H)3264/L
18	MD3203	MDT3208
19		MDT3243
20		MDT2628
21		MDPT3280 MDT(H)3280/L

## Serial no (driver serial number)

SN example : 1811010077

SN5	SN4	SN3	SN2	SN1
Product number low	Product number high	Screwdriver series	Month of production	Year of production
0x4D = 77	0x00= 00	0x01= 01	0x0B= 11	0x12= 18

### SN3 details:

- 01. MD(V2)
- 02. AD
- 10. BM
- 15. MDT and MDT+
- 19. BMT

### 3.6 Error code for abnormal response

If there are wrong function code or communication failure by protocol ( parity, LRC, CRC..etc.), there will be no response. The master will show “ TIME OUT ” error.

If the query contains wrong function code or address, the function code + 0x80 will be responded together with the following error code in data registry.

Error code	Description
0x01	No defined function code or wrong function code
0x02	Wrong address or no existing address
0x03	Data length over the capacity
0x07	Wrong CRC value in query
0x0C	Over the number of byte
0x0E	Range of data is not available

#### Example message

To read the 5 parameter data starting from 564 to 568

( 01 : Query)

Slave address	01	02	34	00	05
---------------	----	----	----	----	----

Start address : 564 (0234h), Number of address : 5 (0005h)

Function code 01 is not defined. → Function code error

Parameter from 564 to 568 are not existing. → No existing address

( 01 + 80 : Response )

Slave address	81	02
---------------	----	----

Function code (01) + 0x80 = 81

Error code for wrong data address = 02

## 4. Appendix A

### 4.1 Parameter factory setting, Address and Function code details for MDCv2

Please refer 60454 datasheet



MODBUS - Address and Function code details						
MDCv2 series						
DOC 60454-88/21						
IMPORTANT						
This document is an extension of Modbus manual 60307.						
Address and function codes details MDCv2						
Appendix A Parameter factory setting, Address and Function code details for MDCv2 2001008						
Firmware: v2.01.0 or later CD: v1.01.3 or later						
Param #	Parameter	Address	Factory setting	Address Min value	Address Max value	Function code
1	Torque ACT/W	1	0	1001	2001	Read (0x01 Write 0x06)
	Torque	2	Auto	1001	2001	Read (0x01 Write 0x06)
	Torque min/max (%)	3	0	1001	2001	Read (0x01 Write 0x06)
	Target angle(degrees)	4	0	1004	2004	Read (0x01 Write 0x06)
	Min angle(degrees)	5	0	1006	2006	Read (0x01 Write 0x06)
	Max angle(degrees)	6	0	1006	2006	Read (0x01 Write 0x06)
	Drag torque	7	0	1007	2007	Read (0x01 Write 0x06)
	Speed (rpm)	8	Auto	1008	2008	Read (0x01 Write 0x06)
	Free feeding angle(degrees)	9	0	1009	2009	Read (0x01 Write 0x06)
	Free feeding speed(rpm)	10	0	1010	2010	Read (0x01 Write 0x06)
	Soft start/stop time	11	0	1011	2011	Read (0x01 Write 0x06)
	Zeroing point (%) 10-40	12	Auto	1012	2012	Read (0x01 Write 0x06)
	Torque limit (deg/s) 0-200	13	0	1013	2013	Read (0x01 Write 0x06)
	Bump up speed(rpm) 20-60% of max	14	Auto	1014	2014	Read (0x01 Write 0x06)
	Torque compensation (%) 0-110	15	100	1015	2015	Read (0x01 Write 0x06)
	Torque ACT/W	16	0	1016	2016	Read (0x01 Write 0x06)
2	Torque	17	Auto	1017	2017	Read (0x01 Write 0x06)
	Torque min/max (%)	18	0	1018	2018	Read (0x01 Write 0x06)
	Target angle(degrees)	19	0	1019	2019	Read (0x01 Write 0x06)
	Min angle(degrees)	20	0	1020	2020	Read (0x01 Write 0x06)
	Max angle(degrees)	21	0	1021	2021	Read (0x01 Write 0x06)

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### 4.2 Parameter factory setting, Address and Function code details for MDTC

Please refer 60455 datasheet



MODBUS - Address and Function code details						
MDTC series						
DOC 60455-08/21						
IMPORTANT						
This document is an extension of Modbus manual 60307.						
Address and function codes details MDTC						
Appendix A Parameter factory setting, Address and Function code details for MDTC 2001002						
Param #	Parameter	Address	Factory setting	Address Min value	Address Max value	Function code
1	Torque ACT/W	1	0	1001	2001	Read (0x01 Write 0x06)
	Torque	2	Auto	1001	2001	Read (0x01 Write 0x06)
	Torque min/max (%)	3	0	1003	2003	Read (0x01 Write 0x06)
	Target angle(degrees)	4	0	1004	2004	Read (0x01 Write 0x06)
	Min angle(degrees)	5	0	1005	2005	Read (0x01 Write 0x06)
	Max angle(degrees)	6	0	1006	2006	Read (0x01 Write 0x06)
	Drag torque	7	0	1007	2007	Read (0x01 Write 0x06)
	Speed (rpm)	8	Auto	1008	2008	Read (0x01 Write 0x06)
	Free feeding angle(degrees)	9	0	1009	2009	Read (0x01 Write 0x06)
	Free feeding speed(rpm)	10	0	1010	2010	Read (0x01 Write 0x06)
	Soft start/stop time	11	0	1011	2011	Read (0x01 Write 0x06)
	Zeroing point (%) 10-40	12	Auto	1012	2012	Read (0x01 Write 0x06)
	Torque limit (deg/s) 0-200	13	0	1013	2013	Read (0x01 Write 0x06)
	Bump up speed(rpm) 20-60% of max	14	Auto	1014	2014	Read (0x01 Write 0x06)
	Torque compensation (%) 0-110	15	100	1015	2015	Read (0x01 Write 0x06)
	Torque ACT/W	16	0	1016	2016	Read (0x01 Write 0x06)
2	Torque	17	Auto	1017	2017	Read (0x01 Write 0x06)
	Torque min/max (%)	18	0	1018	2018	Read (0x01 Write 0x06)
	Target angle(degrees)	19	0	1019	2019	Read (0x01 Write 0x06)
	Min angle(degrees)	20	0	1020	2020	Read (0x01 Write 0x06)

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