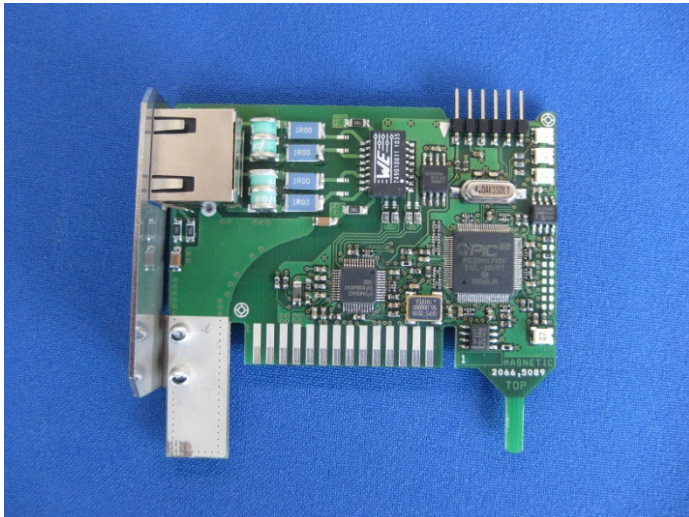


Technical Manual

Ethernet Module MGC-PRO MicroDrive



This technical manual is a supplement to the operating instructions "Barrier MHTM™ MicroDrive" (5815,5001) and describes the Ethernet module.

Before using the Ethernet module, read this handbook and the operating instructions "Barrier MHTM™ MicroDrive" carefully!

Doc-ID: 5815,0001EN

Version: 00

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1 General

1.1 Information regarding the technical manual

This manual offers important information on handling of the Ethernet module. The Ethernet module can only be operated installed in the MAGNETIC MHTM™ MicroDrive barriers.

Prerequisite for secure work is compliance with all indicated safety notes, warning notes and instructions in this manual and in the operating instructions "Barrier MHTM™ MicroDrive" (5815,5001). For better overview, the safety notes and warnings of the operating instructions "Barrier MHTM™ MicroDrive" are not repeated.

Before using the Ethernet module, read this handbook and the operating instructions "Barrier MHTM™ MicroDrive" carefully!



NOTE!

*This technical manual is valid as of the following firmware version:
4915,3004 – v0.2*

1.2 Function

The Ethernet module can be used to parameterise and control the MAGNETIC barrier MHTM™ MicroDrive via a web surface or Modbus TCP.

General

1.3 Reference documents



NOTE!

This technical manual is based on the documents listed in the following table.

All listed reference documents are available free of charge via the indicated procurement source.

Number	Title	Author	Procurement source
5815,5001	Operating instructions "Barrier MHTM™ MicroDrive"	MAGNETIC Autocontrol GmbH	info@ac-magnetic.com
5815,0000	MicroDrive MGC/MGC-PRO Additional Information for System integrators	MAGNETIC Autocontrol GmbH	info@ac-magnetic.com
CIA309-1 CIA309-2	Interfacing CANopen with TCP/IP	© CAN in Automation (CiA) e. V.	www.can-via.org
–	MODBUS APPLICATION PROTOCOL SPECIFICATION	Modbus-IDA	www.Modbus-IDA.org
–	Modbus Messaging Implementation Guide	Modbus-IDA	www.Modbus-IDA.org

Table 1: Reference documents

1.4 Pictogram explanation

Warning Notes

Warning notes are characterised by pictograms in this manual. It is absolutely essential to observe the notes and to proceed with caution in order to prevent property damage.

NOTICE!



NOTICE!

... points to a potentially harmful situation, which can lead to property damage if it is not avoided.

Hints and recommendations



NOTE!

... highlights useful hints and recommendations as well as information for an efficient and trouble-free operation.

1.5 Intended use

The plug-in module "Ethernet" is exclusively intended for expansion of the MGC-PRO control devices by the function "Ethernet". The plug-in module can only be operated installed in the MAGNETIC MHTM™ MicroDrive barriers. This plug-in module can be used to parameterise and control the MAGNETIC barrier MHTM™ MicroDrive via a web surface or Modbus TCP.

Installation, connection and commissioning of the Ethernet module and operation via the Ethernet module must only be performed by specialists.

Any types of claims due to damage arising from improper use are excluded. The operator alone shall be responsible for any damage arising from improper use.



NOTE!

→ For any further information on the barrier MHTM™ MicroDrive, see operating instructions. See page 6, chapter 1.3. "Reference documents."

Technical data

2 Technical data

Designation	Unit	Value
Current consumption	mA	50
Data transfer rate	Mbit/s	10 /100
Max. line length:	m	30
Cable type	–	Cat-5, Twisted Pair
Plug type	–	RJ-45
Default IP address	–	192.168.1.2
Supported services	–	HTTP (Web server), ICMP (ping), TCP/IP (Modbus), DHCP Client, NetBIOS

Table 2: Technical data

3 Installation and network connection

3.1 Installing Ethernet module in control unit MGC-PRO

Hints and recommendations


NOTE!

The Ethernet module can only be operated with the MAGNETIC control units MGC-PRO.

The Ethernet module is installed and set in the factory. Observe the following safety note in case of retrofitting by the customer.

Retrofitting Ethernet module

NOTICE!

NOTICE!

Property damage from improper installation and improper commissioning.

Therefore:

- Only qualified staff must install the Ethernet module, connect and commission it.
- Take ESD precautions and comply with them.

1. Open barrier casing according to operating instructions "Barrier MHTM™ MicroDrive". Observe warning notes.
2. Switch off power supply. Ensure that the system is powered down. Secure against reactivation. The balancing springs in the lever system are relaxed.
3. Take care when opening control unit cover.
4. Plug in plug-in module in a free slot.


NOTE!

Slot selection influences the plug-in module's module address. → See page 21, chapter 5.2.2.

5. Switch on power supply.
6. Check LEDs at the plug-in module. The green LED at the centre must be lit. → If applicable, read the following chapter "Corrective action".
7. The main menu shows the menu "Ethernet".
8. Apply cover of the barrier control.
9. Close barrier casing according to operating instructions "Barrier MHTM™ MicroDrive".

Installation and network connection


3.1.1 Corrective action

Malfunction	Possible cause	Corrective action
Green LED at the centre is not permanently lit.	The Ethernet module is only supported by the control units MGC-PRO.	Check label or type sign of the control unit.
	The Ethernet module is not plugged in correctly.	Check plug contacts. Plug in Ethernet module again.
Green LED at the centre is not lit.	Firmware update not performed correctly.	Perform firmware update via the service module SM01.

Table 3: Corrective action

3.2 Perform network connection

Connect the barrier to a suitable network cable in your ethernet devices. The socket for the network cable is located in the plug-in module.

NOTICE!	
	<p>NOTICE! Property damage from improper network connection.</p> <p>The service interface X9 (RJ-45 socket) at the control unit is used for service purposes. This is not an Ethernet interface. MAGNETIC assumes no liability for any damage from improper network connection.</p> <p>Therefore:</p> <ul style="list-style-type: none"> – Only qualified staff must connect the Ethernet module with the network. – Ethernet devices must only be connected to the Ethernet interface at the Ethernet module.

3.3 Network Configuration

DHCP is activated by default. The IP address is thus automatically assigned by the customer's DHCP server. The assigned IP address can be called via the display of the MGC-PRO control.

If no DHCP server is available, you may deactivate the function via the parameter "DHCP". The default IP address is then used.

→ See page 8, chapter 2, IP address.

You can adjust the IP address via the web surface.

Changes to the settings are only assumed after restarting the control unit.

3.4 Menu "Ethernet" of the control unit MGC-PRO

Once the Ethernet module is plugged in and the control unit supplied with power, the menu "Ethernet" appears in the main menu.

The position of the menu "Ethernet" in the main menu depends on the other plug-in modules installed and the slot used.

Operating view → Main menu → Ethernet	
Parameters	Description
Network settings	Display and setting of the network settings
Web server	Switching the web server on and off. You may switch off the web server to prevent unauthorised access to the barrier. With the webserver switched off, communication is only possible via Modbus. Factory setting ■ ON
Information	Displays information via the Ethernet module. The serial number, hardware version, software number and software version of the Ethernet module are displayed.

Table 4: Menu "Ethernet"

Operating view → Main menu → Ethernet → Network settings	
Parameters	Description
MAC	MAC address display
NAME	Plug-in module's host name Factory setting ■ microdrive-XXX "XXX" corresponds to the last digits of the serial number of the plug-in module.
DHCP	Activating and deactivating DHCP.
IP	MAC address display
Mask	Subnet mask display
Gateway	Display of the IP address of the default gateway
1. DNS	Display of the IP address of the preferred DNS server
2. DNS	Display of the IP address of the alternative DNS server

Table 5: Menu "Network settings"

4 Operation via web interface

4.1 Web interface

You can request the conditions of the barrier and operate the barrier via the web interface.

The connection is established in the web browser by entering the IP address. You may have the IP address displayed via the control unit. → See page 11, Table 5.

If the customer has a DNS server, you may also initiate the connection via the host name.



NOTE!

To prevent abuse of the barrier web server, we recommend limiting access to the web server by measures in the customer's network.

You may switch off the web server via the display menu.

Boom operation

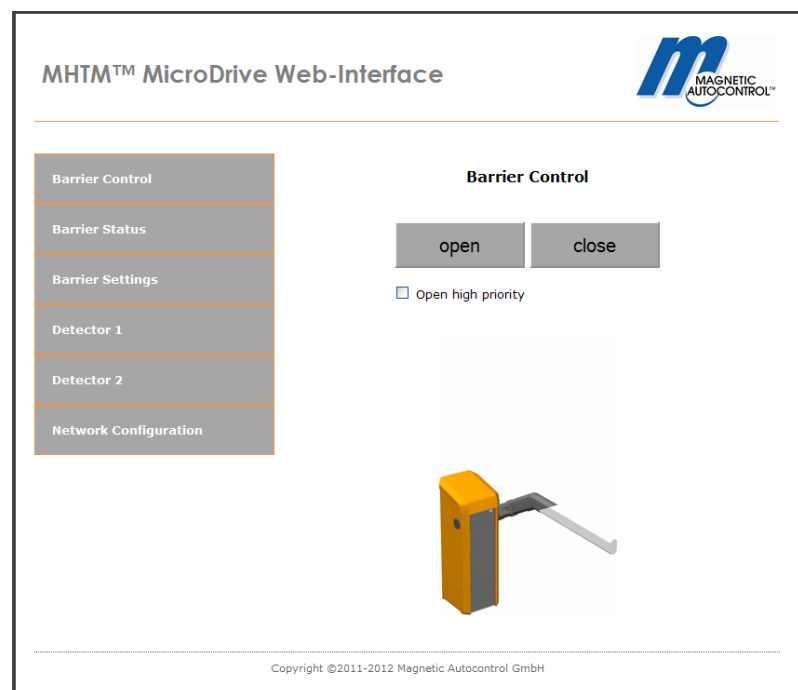


Fig. 1: Web surface – operation of the barrier

Use the check box "Open high priority" to open the barrier with high priority. The barrier remains open until the checkmark is removed again. You may use this to have the barrier permanently on.

Barrier operation (not operational)

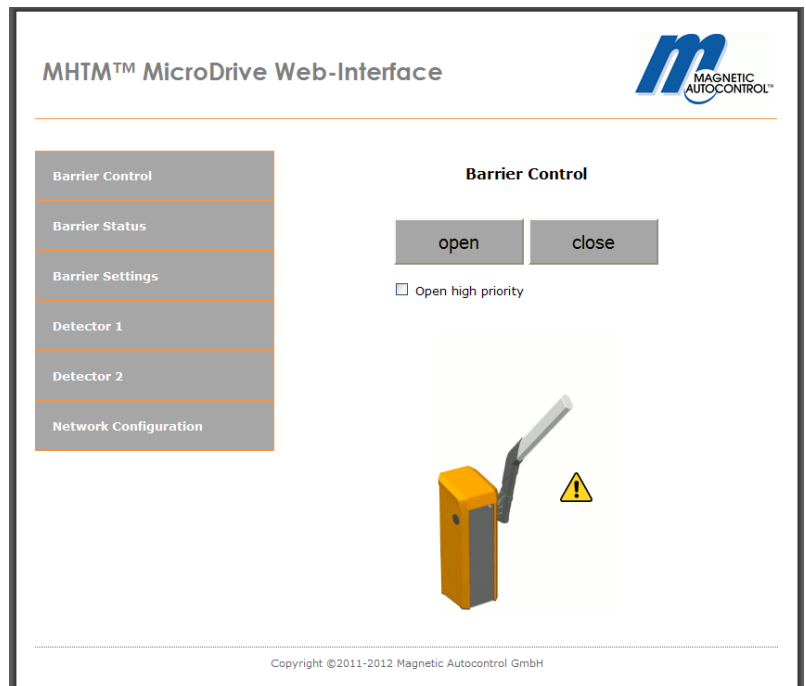


Fig. 2: Web surface – operation of the barrier (not operational)

Barrier settings

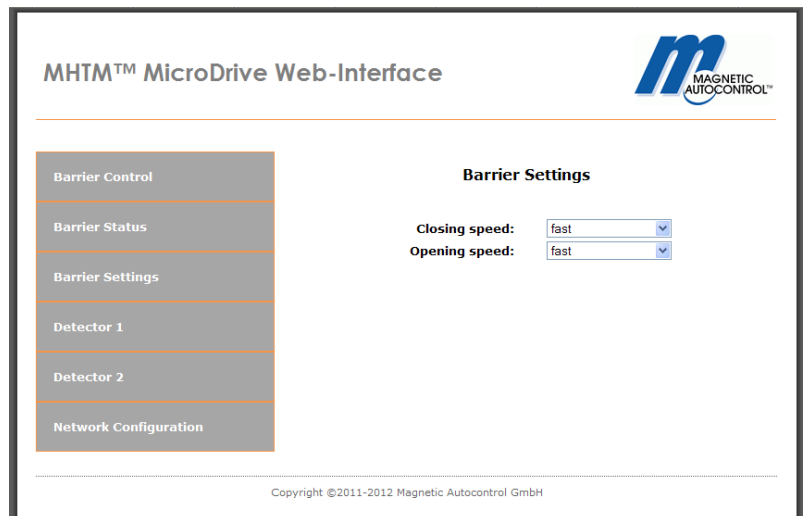


Fig. 3: Web interface – barrier settings

Operation via web interface

Conditions of the in-/outputs

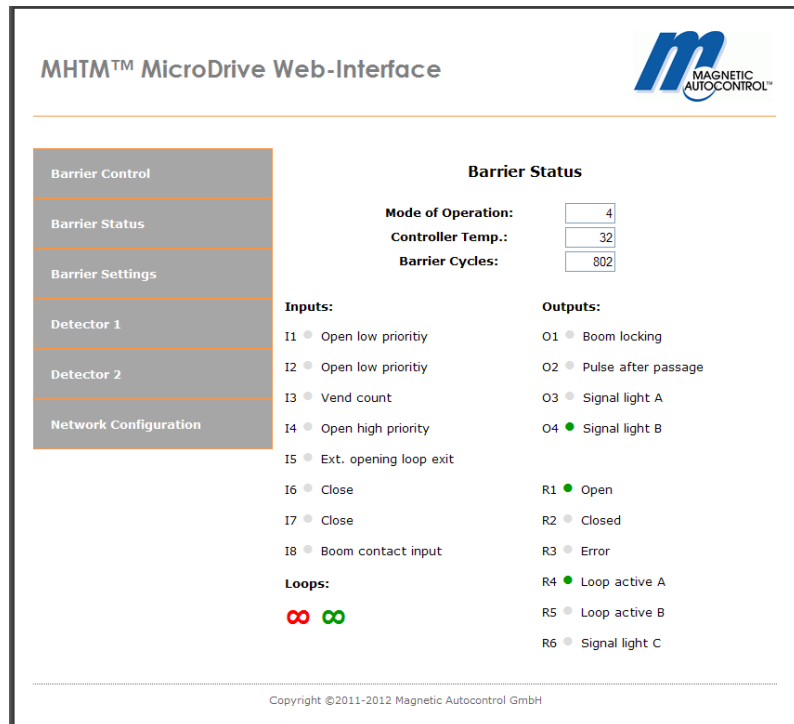


Fig. 4: Web surface – conditions of the in-/outputs

Loop overview

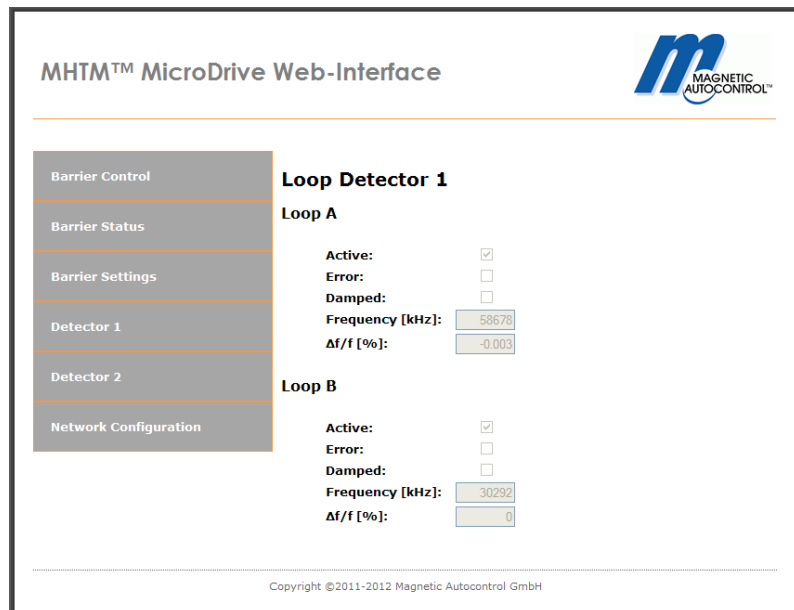
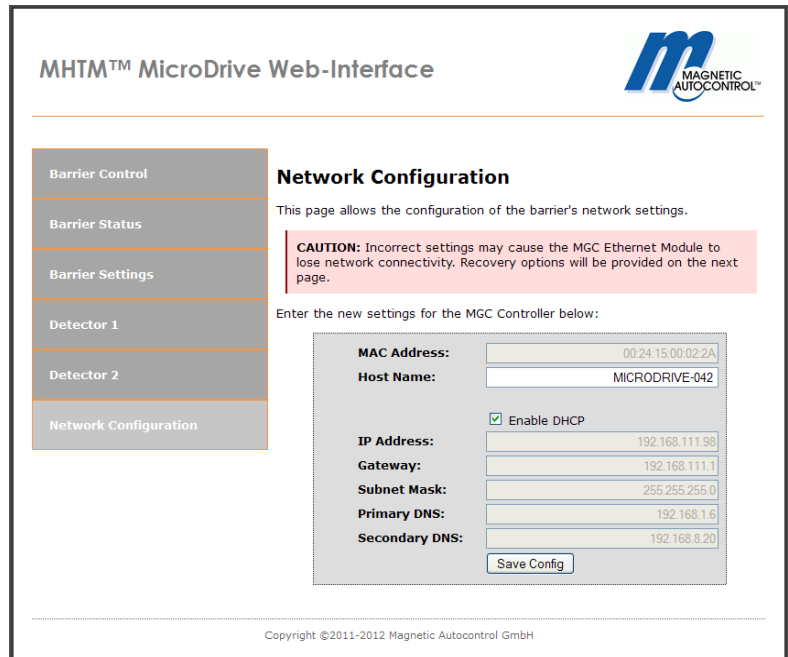


Fig. 5: Web interface – loop overview

Network Configuration



MHTM™ MicroDrive Web-Interface

Network Configuration

This page allows the configuration of the barrier's network settings.

CAUTION: Incorrect settings may cause the MGC Ethernet Module to lose network connectivity. Recovery options will be provided on the next page.

Enter the new settings for the MGC Controller below:

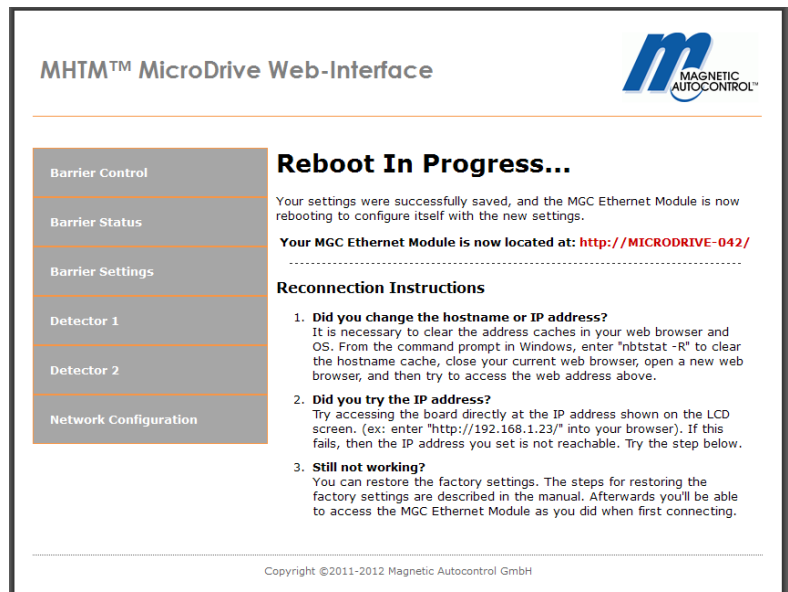
MAC Address: 00:24:15:00:02:2A
Host Name: MICRODRIVE-042
 Enable DHCP
IP Address: 192.168.111.98
Gateway: 192.168.111.1
Subnet Mask: 255.255.255.0
Primary DNS: 192.168.1.6
Secondary DNS: 192.168.8.20

Save Config

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Fig. 6: Web interface – network configuration

Messages (Reboot)



MHTM™ MicroDrive Web-Interface

Reboot In Progress...

Your settings were successfully saved, and the MGC Ethernet Module is now rebooting to configure itself with the new settings.

Your MGC Ethernet Module is now located at: <http://MICRODRIVE-042/>

Reconnection Instructions

- Did you change the hostname or IP address?**
It is necessary to clear the address caches in your web browser and OS. From the command prompt in Windows, enter "nbtstat -R" to clear the hostname cache, close your current web browser, open a new web browser, and then try to access the web address above.
- Did you try the IP address?**
Try accessing the board directly at the IP address shown on the LCD screen. (ex: enter "http://192.168.1.23/" into your browser). If this fails, then the IP address you set is not reachable. Try the step below.
- Still not working?**
You can restore the factory settings. The steps for restoring the factory settings are described in the manual. Afterwards you'll be able to access the MGC Ethernet Module as you did when first connecting.

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Fig. 7: Web interface – messages (Reboot)

5 TCP/IP Interface

5.1 Modbus

In addition to operation of the barrier via the web interface, communication is possible via the ethernet field bus as Modbus TCP as well.

Port 502 is used for Modbus.

After the connection between the client (master) and server (slave) is established, the master sends modbus requests to the server. The result is returned as a modbus response.

The PDU (Protocol Data Unit) defined in the modbus protocol is independent of the underlying communication layer. The PDU consists of "Function Code" and "Data". The modbus ADU (Application Data Unit) consists of MBAP Header and PDU at modbus TCP.

The "Function Code" of the message determines the modbus service to be performed. Depending on "Function Code", "Data" includes additional information.

The MBAP header enables unique identification of the recipient of a message.



NOTE!

→ For more information on the modbus specifications, see reference document "Modbus Application Protocol Specification", page 6, chapter 1.3.

5.1.1 Function Codes

MicroDrive ethernet supports the following "Function Codes":

Function Code	Function
03	Access via modbus address table
04	
06	
43/13	Expanded parameter access

Table 6: Function Codes

5.1.2 Address table

The following modbus address table permits access to the most important functions and conditions of the barrier.

For this, the "Function Codes" 0x3 to 0x6 are used.

→ See page 6, chapter 1.3 "Reference documents".

Address	Name	Data type	Area	Access	Description
0000	BarControl	16Bit	0 ... 4	RW	Barrier commands: 0000 – delete commands 0001 – open 0002 – close 0004 ¹⁾ – open high priority
0001	Status	32Bit		RO	Barrier status word
0003	Inputs	16Bit		RO	Conditions of the inputs of the MGC-PRO control unit
0004	Outputs	16Bit		RO	Conditions of the outputs of the MGC-PRO control unit
0005	Loop A	16Bit		RO	Status loop A
0006	Loop B	16Bit		RO	Status loop B
0007	Loop C	16Bit		RO	Status loop C
0008	Loop D	16Bit		RO	Status loop D

1) The command "Open high priority" is not self-resetting. This must be explicitly deleted using "0000 – delete commands".

Table 7: Address table

TCP/IP Interface

5.1.3 Examples

Reading status – request

Description		Value
MBAP	Transaction ID	12
		34
	Protocol ID	00
		00
	Length (Number of following Bytes)	00
06		
Unit ID	FF	
PDU	Function Code (Read Holding Register)	03
	Starting Address	00
		01
	Quantity of Register	00
02		

Reading status – response

Description		Value
MBAP	Transaction ID	12
		34
	Protocol ID	00
		00
	Length (Number of following Bytes)	00
06		
Unit ID	FF	
PDU	Function Code (Read Holding Register)	03
	Byte Count	04
	Register Value HiHi	59
	Register Value HiLo	80
	Register Value LoHi	02
	Register Value LoLo	01

Table 8: Example "Reading status", request and response

Closing barrier – request

Description		Value
MBAP	Transaction ID	12
		34
	Protocol ID	00
		00
	Length (Number of following Bytes)	00
06		
Unit ID	FF	
PDU	Function Code (Write Single Register)	06
	Register Address	00
		00
	Register Value	00
02		

Closing barrier – response

Description		Value
MBAP	Transaction ID	12
		34
	Protocol ID	00
		00
	Length (Number of following Bytes)	00
06		
Unit ID	FF	
PDU	Function Code (Write Single Register)	06
	Register Address	00
		00
	Register Value	00
02		

Table 9: Example "Closing barrier", request and response

TCP/IP Interface

Opening barrier – request

Description		Value
MBAP	Transaction ID	12
		34
	Protocol ID	00
		00
	Length (Number of following Bytes)	00
06		
Unit ID	FF	
PDU	Function Code (Write Single Register)	06
	Register Address	00
		00
	Register Value	00
01		

Opening barrier – response

Description		Value
MBAP	Transaction ID	12
		34
	Protocol ID	00
		00
	Length (Number of following Bytes)	00
06		
Unit ID	FF	
PDU	Function Code (Write Single Register)	06
	Register Address	00
		00
	Register Value	00
01		

Table 10: Example "Opening barrier", request and response

5.2 Expanded access via modbus "Function Code 43/13"

5.2.1 CANopen TCP/IP Interface

In addition to the control via standard modbus, access to further parameters is possible via "Function Code 43/13".

→ See page 6, chapter 1.3 "Reference documents", document "Interfacing CANopen with TCP/IP". You may read and set the parameters of the control unit and all inserted plug-in modules via the expanded access.

5.2.2 Module addresses

The MGC-PRO control unit is modularly built. Every plug-in module has a unique basic address. The module address is the sum of the basic address and slot number. This enables operation of several equal plug-in modules like two detector modules in the same control unit.

Basic address	Module
0x01	MGC logic and motor control
0x02	
0x09	Detector module
0x18	Radio module
0x20	Ethernet Module
0x28	RS485/422-Module

Table 11: Module addresses

The Ethernet modules thus can have the addresses 0x20 to 0x24. To be able to access parameters of the Ethernet module, the module address must be known.

5.2.3 Supported commands



NOTE!

For more information, refer to reference document "CIA309-1/ -2, Interfacing CANopen with TCP/IP".
→ See to page 6, chapter 1.3, "Reference documents".

The Ethernet module supports only a subset of the SDO commands defined in document CiA DS 309, section 4.1.

- Simple transfer
- Default network number
- Encoded/default data type of the protocol
→ Refer to CiA DS 309-2, 3.2.3.4.2 Protocol control.



NOTE!

→ In the firmware version 0.1, the order of bits in the "Protocol Control Byte" was misinterpreted. As of Version 0.2, this error has been removed. If you want to continue using version 0.1 for Modbus communication, contact us.

TCP/IP Interface

5.2.4 Examples

Reading cycle counter – request

Description		Value	
MBAP	Transaction ID	12	
		34	
	Protocol ID	00	
		00	
	Length (Number of following Bytes)	00	
0E			
Unit ID	FF		
PDU	Function Code	2B	
		MEI Type	0D
	Protocol Option Fields	Protocol Control	02
		Reserved Field	00
		Encoded Data	00
	Node ID	01	
	Index	Hi	21
		Lo	01
	Sub-index	01	
	Starting Address	Hi	00
		Lo	00
	Number of data values	Hi	00
		Lo	04

Reading cycle counter – response

Description		Value	
MBAP	Transaction ID	12	
		34	
	Protocol ID	00	
		00	
	Length (Number of following Bytes)	00	
12			
Unit ID	FF		
PDU	Function Code	2B	
		MEI Type	0D
	Protocol Option Fields	Protocol Control	02
		Reserved Field	00
		Encoded Data	00
	Node ID	01	
	Index	Hi	21
		Lo	01
	Sub-index	01	
	Starting Address	Hi	00
		Lo	00
	Number of data values	Hi	00
		Lo	04
Data Values (0x0000C59A = 50586 cycles)	HiHi	9A	
	HiLo	C5	
	LoHi	00	
	LoLo	00	

Table 12: Example "Reading cycle counter", request and response

Setting programme mode – request

Description			Value
MBAP	Transaction ID		12 34
	Protocol ID		00 00
	Length (Number of following Bytes)		00 0F
	Unit ID		FF
	Function Code		2B
PDU	MEI Type		0D
	Protocol Option Fields	Protocol Control	03
		Reserved Field	00
		Encoded Data	00
	Node ID		01
	Index	Hi	21
		Lo	04
	Sub-index		01
	Starting Address	Hi	00
		Lo	00
	Number of data values	Hi	00
		Lo	01
	New Value		05

Setting programme mode – response

Description			Value
MBAP	Transaction ID		12 34
	Protocol ID		00 00
	Length (Number of following Bytes)		00 0E
	Unit ID		FF
	Function Code		2B
PDU	MEI Type		0D
	Protocol Option Fields	Protocol Control	03
		Reserved Field	00
		Encoded Data	00
	Node ID		01
	Index	Hi	21
		Lo	04
	Sub-index		01
	Starting Address	Hi	00
		Lo	00
	Number of data values	Hi	00
		Lo	00

Table 13: Example "Setting programme mode", request and response

TCP/IP Interface

Reading device name module 1 – request

Description		Value	
MBAP	Transaction ID	12	
		34	
	Protocol ID	00	
		00	
	Length (Number of following Bytes)	00	
0E			
Unit ID	FF		
PDU	Function Code	2B	
		MEI Type	0D
	Protocol Option Fields	Protocol Control	02
		Reserved Field	00
		Encoded Data	50
	Node ID	01	
	Index	Hi	10
		Lo	08
	Sub-index	00	
	Starting Address	Hi	00
		Lo	00
	Number of data values	Hi	00
		Lo	09

Reading device name module 1 – response

Description		Value	
MBAP	Transaction ID	12	
		34	
	Protocol ID	00	
		00	
	Length (Number of following Bytes)	00	
1E			
Unit ID	FF		
PDU	Function Code	2B	
		MEI Type	0D
	Protocol Option Fields	Protocol Control	02
		Reserved Field	00
		Encoded Data	50
	Node ID	01	
	Index	Hi	10
		Lo	08
	Sub-index	00	
	Starting Address	Hi	00
		Lo	00
	Number of data values	Hi	00
		Lo	09
Data Values (= "Logic Controller")	...		

Table 14: Example "Reading Device Name Module 1", Request and Response

6 Commissioning

6.1 Procedure

We recommend the following procedure for initial commissioning:

1. Taking control unit into operation without network cable.
2. Check DHCP settings.
3. Switch off control unit.
4. Connect network cable.
5. Switch on control unit.
6. Read IP address via display.
7. Check connection between host computer and control unit via "Ping".
8. Check connection to the web browser via read IP address.

6.2 Corrective action

Malfunction	Possible cause	Corrective action
Ethernet module is not recognised.	The Ethernet module is not plugged in correctly.	Check plug contacts. Plug in Ethernet module again.
	Firmware update not performed correctly.	Perform firmware update via the service module SM01.
	The Ethernet module is only supported by the control units MGC-PRO.	Check label or type sign of the control unit.
Network connection cannot be established	Firewall blocks access	Configure firewall.
	No IP address	Check DHCP settings/servers
Object access error	Object locked	

Table 15: Corrective action

6.3 Software Tools

The following software tools can be helpful to support development:

Name	Manufacturer
Docklight Scripting	http://www.docklight.de/
ModbusDoctor	http://kikos31.developpement.com/modbusdoctor/
Modbus TK	http://code.google.com/p/modbus-tk/
Dual DHCP+DNS	http://dhcp-dns-server.sourceforge.net/

Table 16: Software Tools

Appendix

7 Appendix

The description of the status words and object tables are available in document 5815,0000 "MicroDrive MGC/MGC-PRO Additional Information for System integrators".

8 List of abbreviations

Abbreviation	Meaning	Description
MGC	Magnetic Gate Controller	Control unit for the barriers MicroDrive MHTM™
CANopen	Controller Area Network	Fieldbus system
DHCP	Dynamic Host Configuration Protocol	Protocol for assignment of the network configuration to clients by a server
HTTP	Hypertext Transfer Protocol	Protocol to transfer websites
TCP/IP	Transmission Control Protocol / Internet Protocol	Internet protocol family
MBAP	Modbus Application Protocol Header	Header in modbus TCP messages
PDU	Protocol Data Unit	Function code and data of the modbus message
SDO	Service Data Object	CANopen communications object for parameterisation of object directory entries

Table 17: List of abbreviations

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