Manual

SUPREMA MBC20-Modbus Gateway (CAN / Modbus TCP and RTU)

Supplement to the SUPREMA / SUPREMA Touch manual

Order No.: 10125609/03

Schlüsselstrasse 12
8645 Rapperswil-Jona
Switzerland

Revision History

Rev.	Description	Date	Author
00	Initial version	30.11.2011	Schütze
01	Updated for firmware rev. 1.02.01	31.08.2012	Schütze
01	Updated for firmware rev. 1.03.01	19.10.2017	Schütze

Contents

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1. Introduction

The SUPREMA MBC20 with the software “MBC-20-Modbus” can be used as a part of a SUPREMA or SUPREMA Touch system to establish a connection to a Modbus Master (SCADA system or PLC) using the Modbus protocol. Both, the RTU and the TCP version of the Modbus protocol are supported.

This manual refers to the following software version:

MBC20-Modbus 1.03.01

2. SUPREMA MBC20-Modbus

2.1. General Information

ATTENTION

The MBC20 hardware uses integrated circuits that can be damaged by electrostatic discharge (ESD). This is even valid for all other microcontroller based products. When handling with the PCBs, care must be taken to protect the device.

ATTENTION

Observe precaution for handling electrostatic discharge sensitive devices!

ATTENTION

The MBC20 hardware is designed to be used for different applications. This manual describes only the behaviour of the module with installed software “MBC20-Modbus”. This combination of hardware and software is referred to in this manual as “MBC20-Modbus” module.

The MBC20-Modbus module is delivered ready for use. If changes to the module hardware configuration are necessary, these should be made with no voltage applied. In case of systems that have already been configured, the module configuration should be checked to ensure it is suitable for the application.

2.2. Ordering Information

Order No.	Name
10126387	SUPREMA Modbus Gateway Kit
10122578	SUPREMA MBC20-Modbus
10105279	SUPREMA MBT20
10125609	SUPREMA MBC20-Modbus Instruction Manual, Englisch
10121863	SUPREMA Touch Instruction Manual, Englisch
10088495	SUPREMA Instruction Manual, Englisch

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2.3. System Integration

The module MBC20-Modbus was designed to connect a SUPREMA or SUPREMA Touch system to a SCADA system or PLC. The MBC20-Modbus provides connections to up to 5 SCADA systems or PLCs using Modbus TCP and 1 connection using Modbus RTU.

The data transfer from the SUPREMA Touch to the MBC20-Gateway is done using the system internal CAN bus. When this connection is interrupted, the measuring data transferred to the SCADA system or PLC is declared as invalid by the gateway.

The MBC20 will be internally installed in one of the SUPREMA racks. The physical connection to the SCADA system or PLC will be done using the connectors of the MBT20. This module is installed on the rear of the rack on the same position as the MBC20. Fig. 1 illustrates the integration of a MBC20-Modbus in a system.

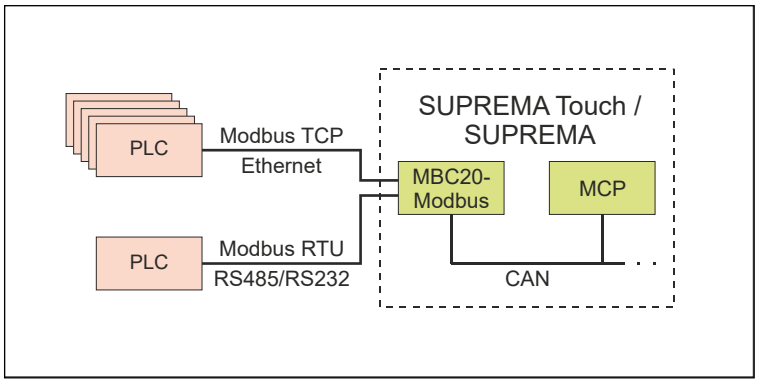

Fig. 1 Integration of an MBC20-Modbus into a SUPREMA Touch system

The MBC20-Modbus is able to offer the data to the SCADA system or PLC in 5 different register modes.
See chapter 5 „Register“ for details.

Additionally, the MBC20-Modbus offers a service to send an email notification when an alarm or signal failure rises or the communication is lost.

2.4. Hardware Settings

DIP Switch Settings

The MBC20 has one block of 4 DIP switches (see Fig. 2 for location). Each of the 4 DIP switches has a single function. After one has been switched, the MBC20 must be rebooted.

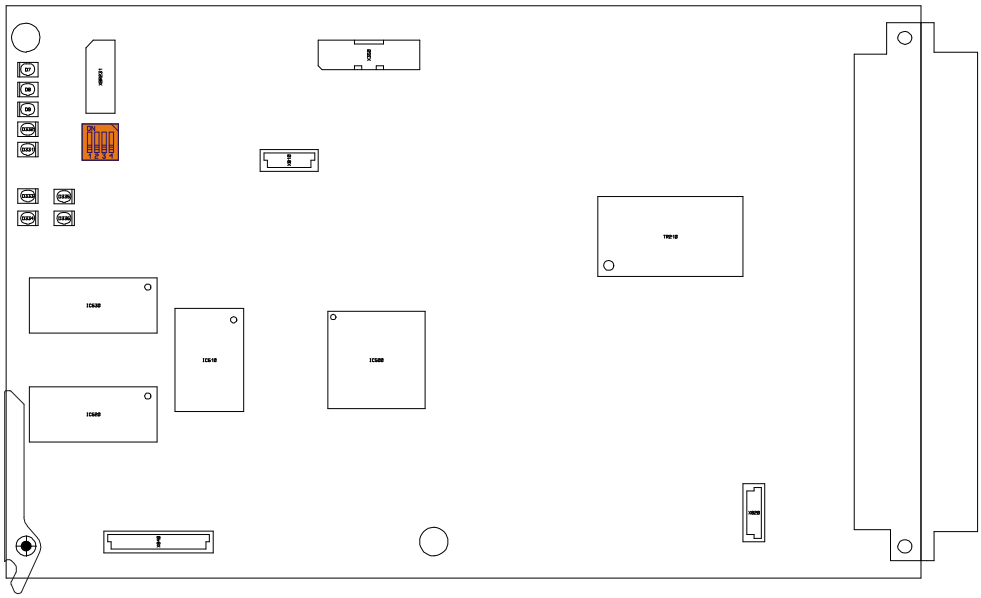

Fig. 2 Position of the DIP switches

DIP switch settings				
1	2	3	4	
OFF	OFF	OFF	OFF	Operation on CAN A (factory setting)
OFF	OFF	OFF	ON	Operation on CAN B
ON	OFF	OFF	OFF	Bootloader
OFF	OFF	ON	OFF	Reset all parameters
All other combinations				Reserved

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CAN Bitrate and Node ID Settings

The CANopen node ID being used by the MBC20 depends on the SUPREMA rack number and the number of the slot being used.

2.5. Status LEDs

There are 12 status LEDs on the MBC20 module. The location of each LED is shown in Fig. 3 and the function of each is described in the table below.

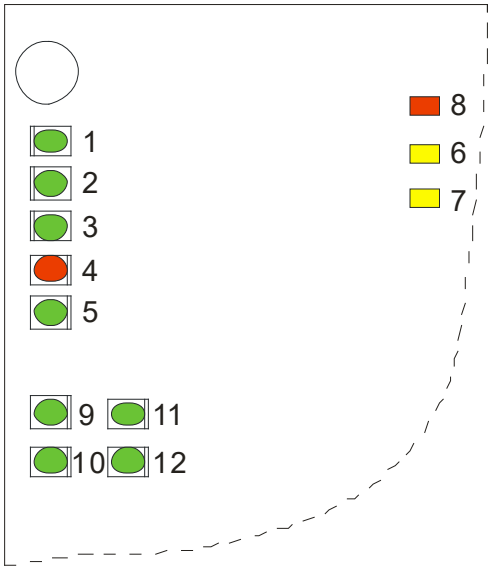

Fig. 3 Location of the MBC20's status LEDs

The following table shows the function of each MBC20 LED.

LED No.	Name	Description
1	External power	Indicates whether external power is used as main power supply
2	Internal power	Indicates whether internal power is used as main power supply
3	Battery	Indicates whether a battery is used as main power supply
4	Fail	Indicates whether the MBC has detected a software failure
5	CAN	Indicates normal CAN bus status
6	System failure	Indicates an system failure set by this module
7	Voltage failure	Indicates an voltage failure on this PCB
8	Reset	Indicates the reset state of the module
9	MOD A	Indicates traffic on the serial interface
10	MOD B	- not used -
11	CAN A	Indicates whether CAN bus A is used
12	CAN B	Indicates whether CAN bus B is used

3. Web-based Configuration

3.1. General

All parameters can be displayed or edited via the integrated web server of the MBC20-Modbus. A standard web browser can be used.

Each access to the configuration is protected and it is necessary to log in before accessing the data (see Fig. 4). Only one user is allowed to access this data at the same time. After 5 minutes without activity the user will be logged out automatically.

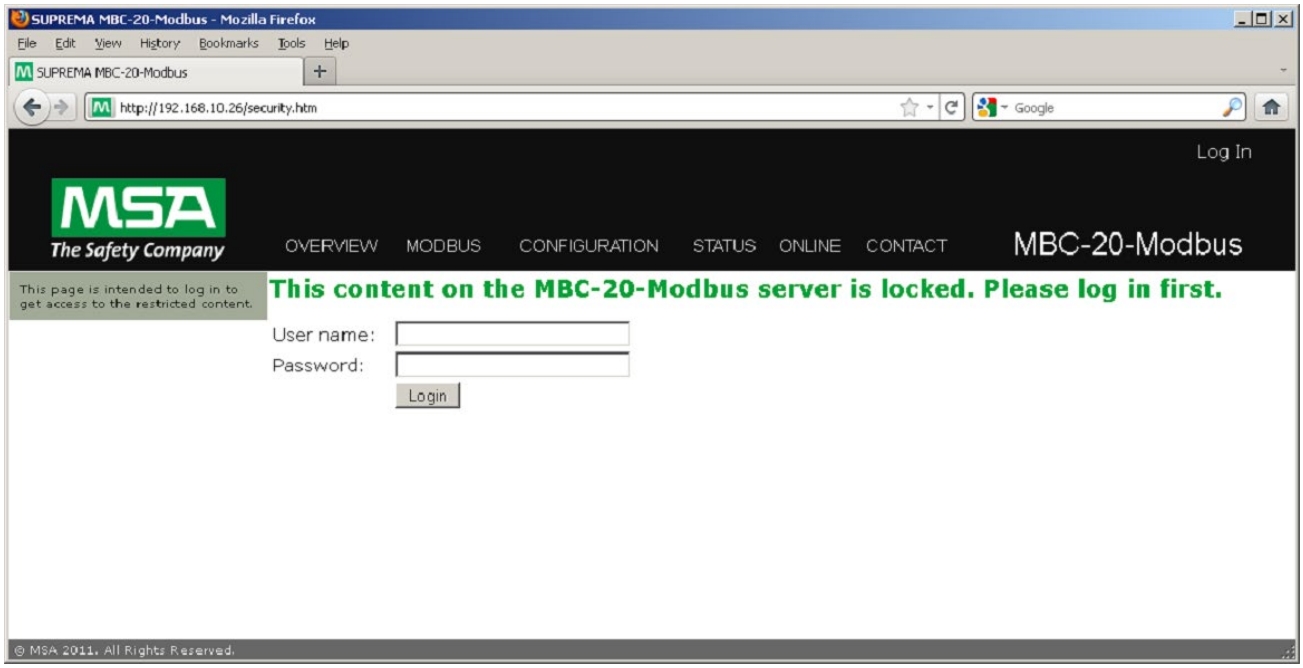

Fig. 4 Security configuration page

Default Access Data

Parameter	Value
User name	Customer
Password	MSA

Each configuration page has a “Submit” button. Clicking this button saves the entered data in a non-volatile memory of the MBC20-Modbus. After reboot of the module the new configuration is active.

3.2. Security Configuration

All security values are defined by default, but to improve the security these values should be changed to user-specific values.

ATTENTION

For security reasons, the access data should be changed before productive use of the MBC20-Modbus!

Changing the Settings

All security-related parameters can be displayed or edited in the section “CONFIGURATION” / “Security” of the integrated web server (see Fig. 5).

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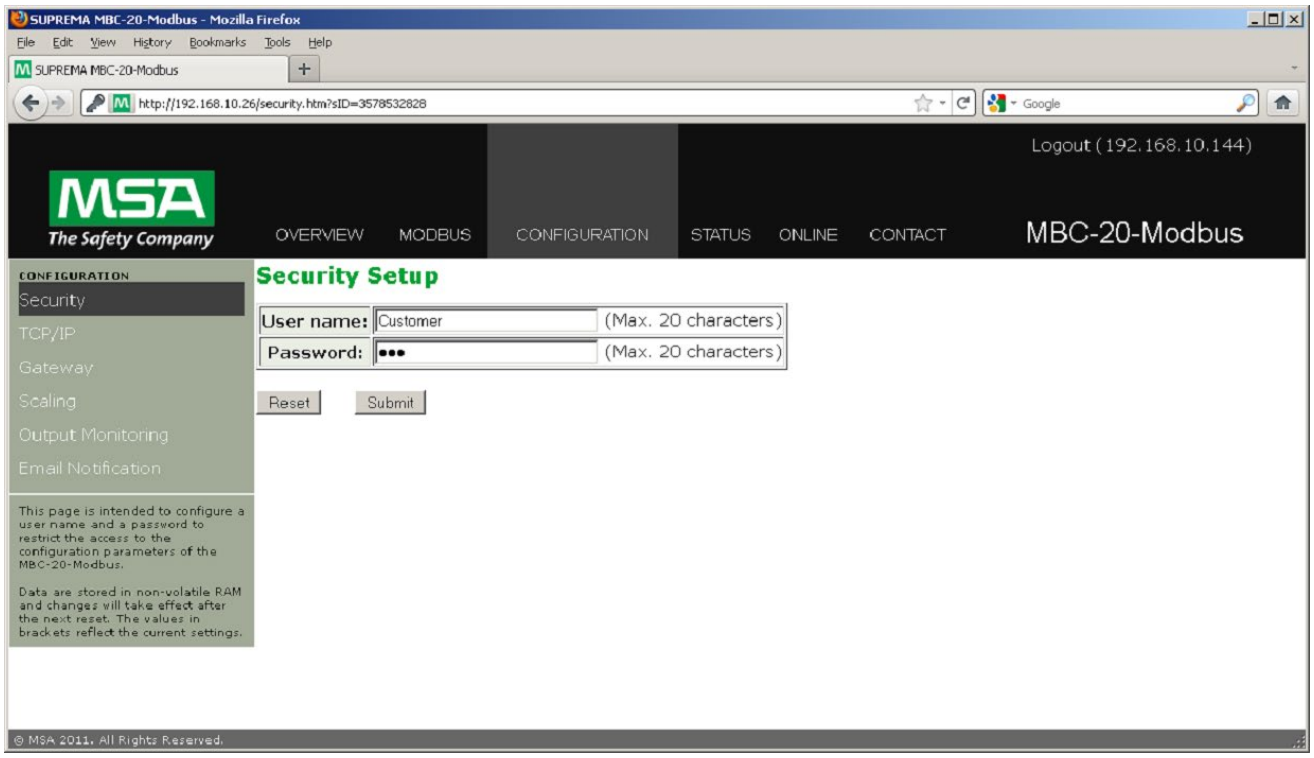

Fig. 5 Security configuration page

3.3. TCP/IP Configuration

All configuration values are defined by default, but in most applications some values need to be changed to match the requirements of the local network.

ATTENTION

For safety reasons, the MBC20-Modbus and the connected Modbus TCP Master (SCADA system or PLC) shall be used in an own, separated network!

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Default Settings

The following table shows the default configuration of the MBC20-Modbus.

Parameter	Value
MAC adresse	Factory defined
IP adresse	192.168.10.1
Network subnet mask	255.255.255.0
TCP/IP Gateway address	192.168.10.100
Name server (DNS)	192.168.10.20

Changing the Settings

All network-related parameters can be displayed or edited in the section “CONFIGURATION” / “TCP/IP” of the integrated web server (see Fig. 6).

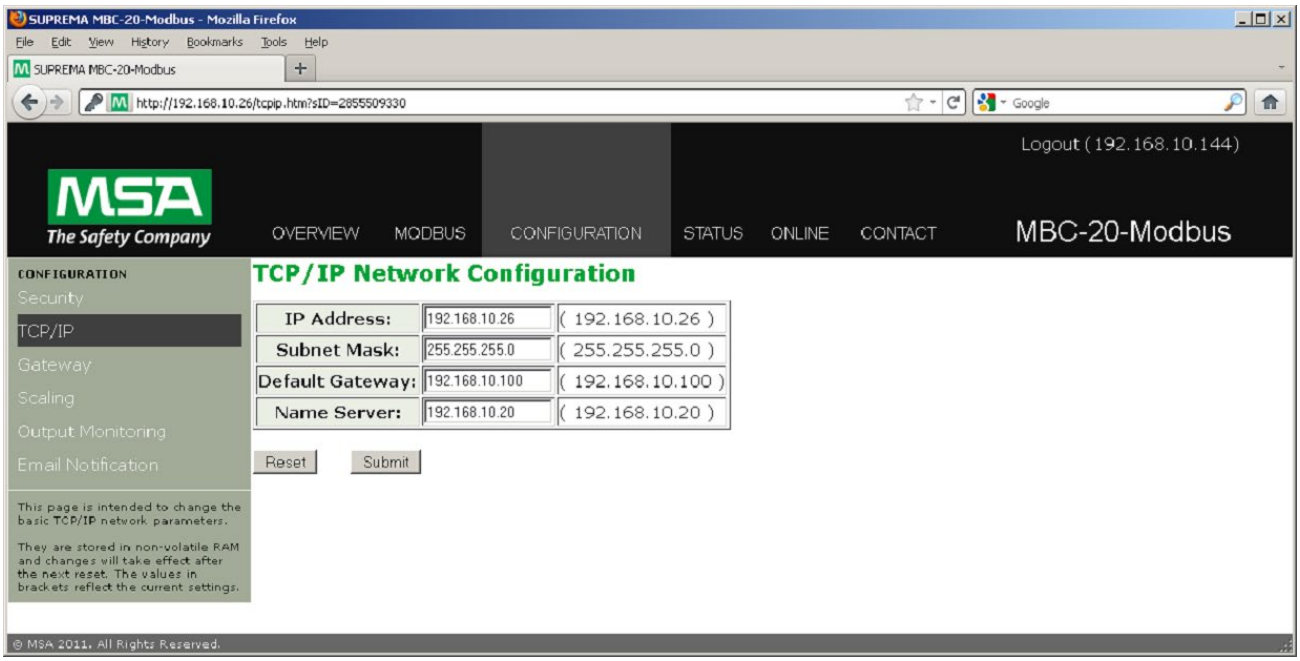

Fig. 6 TCP/IP configuration page

3.4. Gateway Configuration

All Modbus gateway settings are defined by default, but in most applications some values need to be changed to match the requirements of the connected Modbus Master (SCADA system or PLC).

Changing the Settings

All Modbus gateway related parameters can be displayed or edited in the section “CONFIGURATION” / “Gateway” of the integrated web server (see Fig. 7).

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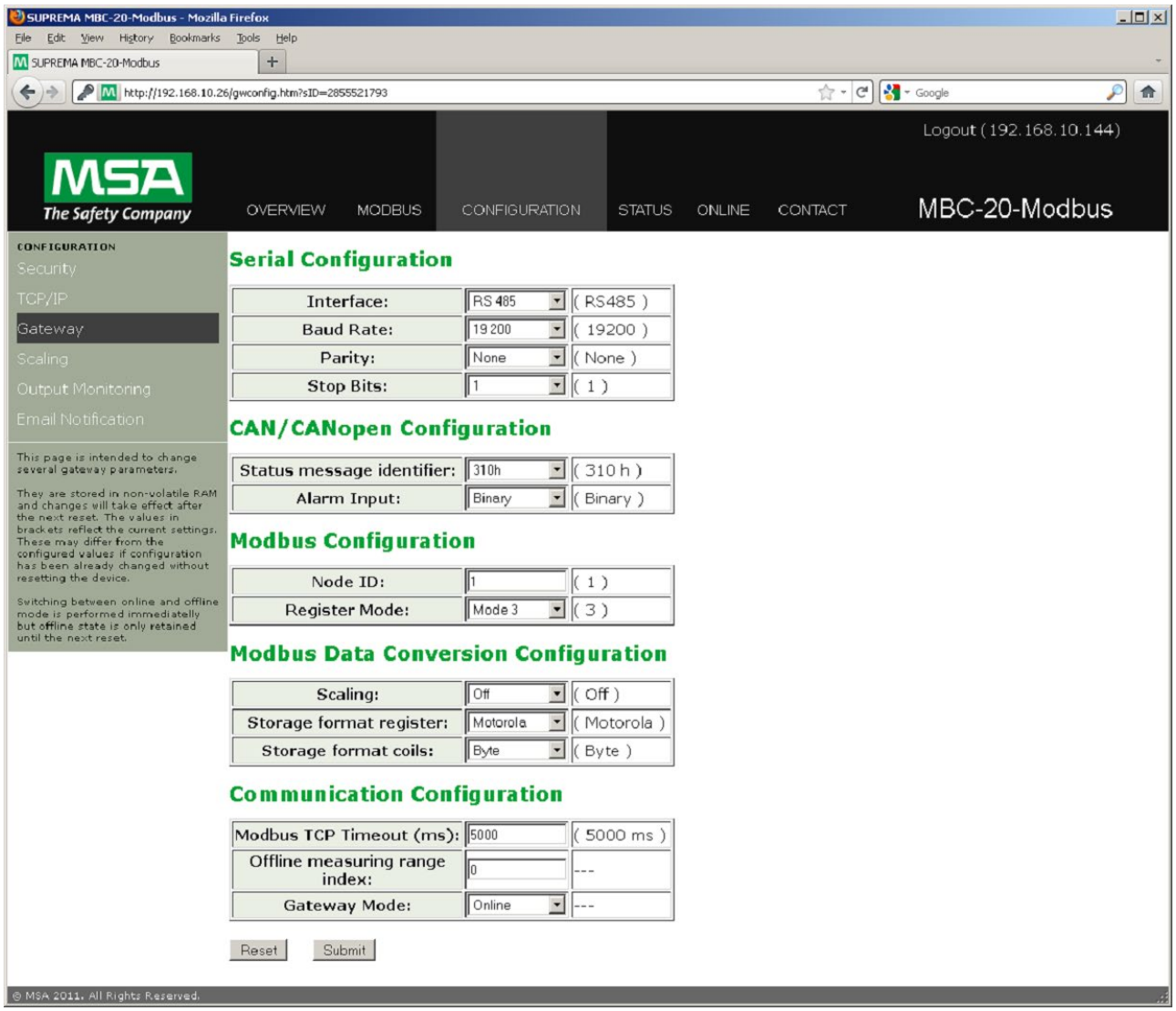

Fig. 7 Modbus Gateway configuration page

Description of the Serial Configuration Parameters

Interface (default is RS485): In this field the standard (RS232 full duplex or RS485 half duplex) to be used for the serial line can be selected.

Baud Rate (default is 19200): In this field the baud rate for the serial line can be selected.

Parity (default is None): In this field the parity mode for the serial line can be selected.

Stop Bits (default is 1): In this field the number of stop bits for the serial line can be selected.

Description of the CAN/CANopen Parameters

Status message identifier (default is 310h): In addition to transmitting the measuring values, the SUPREMA also transmits special alarm and event information for each measuring point with a higher frequency than the measuring values. In this drop down list the identifier that is used by the SUPREMA can be configured to merge this additional alarm information with the standard alarm information or evaluating this information can be deactivated. The identifier is defined by the position of the MDO, i.e. if the MDO is mounted in the first rack, the value of the identifier is 310h, if it is mounted in the second rack, the identifier is 320h, etc.

This parameter will be ignored, if a SUPREMA Touch is used and the gateway is correctly configured as an MBC20-Modbus (not as general gateway).

Alarm Input (default is Binary): The alarm status byte of the SUPREMA measuring point CAN message can be interpreted as binary bit mask or decimal value. If they are interpreted as binary value they are copied transparently into the process

image of the gateway. If they are interpreted as decimal value the given alarm and all alarms with a lower number are stored (values above 4 are discarded).

The setting decimal must only be used for systems with an MCP10 / MDO10 software version earlier than 1.02.03. This parameter will be ignored, if a SUPREMA Touch is used and the gateway is correctly configured as an MBC20-Modbus (not as general gateway).

Description of the Modbus Parameters

Node ID (default is 1): In this field the Modbus node ID can be defined.

Register Mode (default is 3): The measuring data received from the SUPREMA can be stored in the Modbus register in 4 different modes with a different structure and a different level of detail. See chapter 5 „Register“ for details.

Description of the Modbus Data Conversion Parameters

Scaling (default is Off-High): In register modes 1, 2 and 4 the data can be scaled according to the measuring range that is part of the measuring point data. Scaling of the data can be activated or deactivated with this field. Additionally, it can be selected whether the values shall be pulled on a high or low value in case of a signal fail.

If scaling is activated, the floating point measuring values are scaled to an integer.

Modes 1 and 2:

- The value is scaled in that manner that values within the measuring range are scaled to values between 1 a 4094. Negative values and invalid measuring ranges result in a value of 0. Measuring values that exceed the measuring range are represented as 4095.
- If scaling is deactivated, the floating point measuring value is just rounded. Negative values and invalid measuring ranges result in a value of 0. If the rounded value exceeds 4094, it is set to 4095.

Mode 4:

- The value is scaled in that manner that values within the measuring range are scaled to values between 0 and 1000. Values outside the measuring range are valid and will be scaled similarly to values below 0 or above 1000. The result is limited to a range of -32,768 till +32,767.
- If scaling is deactivated, the floating point measuring value is just rounded and limited to a range of –32,768 till +32,767.

Storage format Register (default is Motorola): This field defines the endianness of the register values in the MBC20-Modbus process image. This can be configured to Motorola format (big endian, MSB last) or Intel format (little endian, MSB first). The Modbus-TCP/IP protocol defines big endian (Motorola) as default.

Storage format Coils (default is Byte): This check box defines the way the status information of the measuring points is organised in the MBC20-Modbus process image. This may be either a byte string or the 8 bit of status information of 2 or 4 consecutive measuring points are organised as word (16 bit) or long word (32 bit) in Intel or Motorola format.

Byte	Byte string
Word(I)	Wort format (16 bit) in Intel mode (little endian)
LWord(I)	Long word format (32 bit) in Intel mode (little endian)
Word(M)	Word format (16 bit) in Motorola mode (big endian)
LWord(M)	Long word format (32 bit) in Motorola mode (big endian)

Description of the Communication Parameters

Modbus TCP Timeout (default is 5000 ms): Without any error the Modbus TCP connection is established by the Modbus Master (SCADA system or PLC) and is terminated if no longer needed. If the Modbus master terminates without closing the connection gracefully or the Ethernet connection is interrupted, the standard TCP/IP timeout of the MBC20-Modbus will wait for minutes before this connection is closed. In this time this communication channel (socket) can not be used to establish a new connection. To decrease the time after the connection is closed actively by the MBC20-Modbus, you can configure a timeout. If no Modbus request is received within this period, the connection is closed actively by the gateway. The timer starts with the first reception of a Modbus request. Configuring this parameter to 0 ms disables the timeout.

Offline measuring range (default is 0): If the data is scaled in “Offline” mode, a measuring range can be defined independently from the measuring range defined for the “Offline” data. If set to 0, the measuring range of the “Offline” data is used for scaling.

In contrast to other parameters which can be configured via this page, this parameter is activated immediately and won’t be stored persistently.

Gateway mode (default is Online): If no SUPREMA is connected to the CAN bus, the MBC20-Modbus can be put into a special “Offline” mode. In this mode a predefined static set of process data for the 256 measuring points (see chapter 6 “Offline Status Values”) is used as process image. This mode may be used to check the communication between the gateway and the Modbus master (SCADA system or PLC) without a SUPREMA. All other data conversion configurations affect these values in the same way as in the standard “Online” mode with process data received from the SUPREMA.

In contrast to other parameters which can be configured via this page, this parameter is activated immediately and won’t be stored persistently.

3.5. Scaling Configuration

Some modes of operation require a scaling of the measuring values. To process this scaling the gateway needs to know all measuring ranges used by the connected SUPREMA system. All standard ranges are predefined, but to support future versions of the SUPREMA software and to support user defined ranges, it may be necessary to define additional ranges.

Changing the Settings

Additional ranges can be displayed or edited in the section “CONFIGURATION” / “Scaling” of the integrated web server (see Fig. 8).

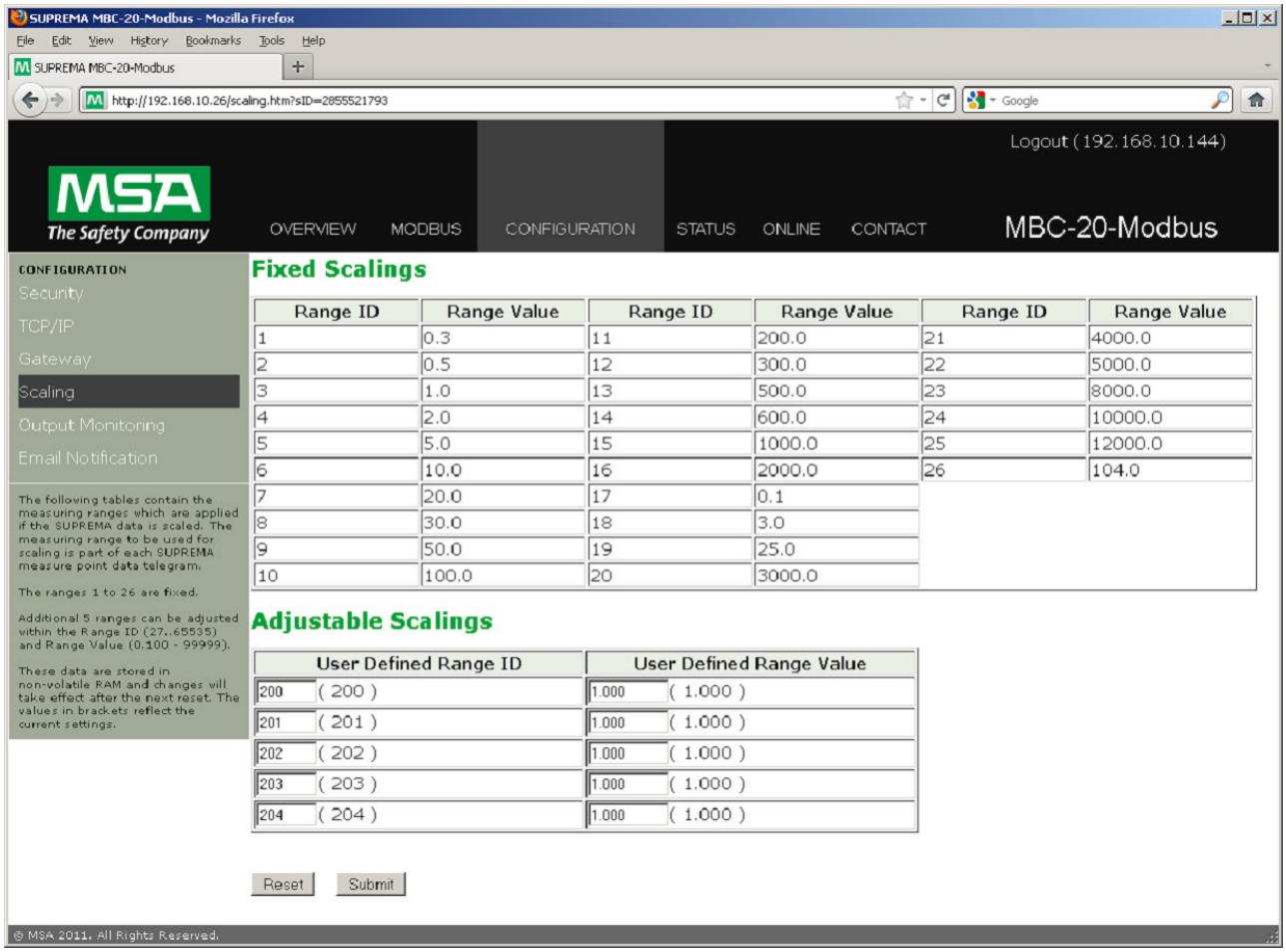

Fig. 8 Scaling configuration page

3.6. Output Monitoring Configuration (Classic SUPREMA Only)

It is possible to enter the CAN node IDs of the MGOs in the connected SUPREMA system (only these on the same CAN bus). This is necessary for classic SUPREMA systems to support the function to read out the status of all digital outputs.

This configuration does not apply to SUPREMATouch. The MBC20-Modbus assigns sequential numbers (indexes) to all discovered MGO modules in run-time, see chapter 5.1.Discrete Input Registers. These numbers start from 1 and each next discovered MGO gets an incremented number. Thus the numbers depend only on the SUPREMA hardware configuration: the exact order of the MGO modules in the rack and the slot on the same CAN bus.

Changing the Settings

The output monitoring settings can be displayed or edited in the section “CONFIGURATION” / “Output Monitoring” of the integrated web server (see Fig. 9).

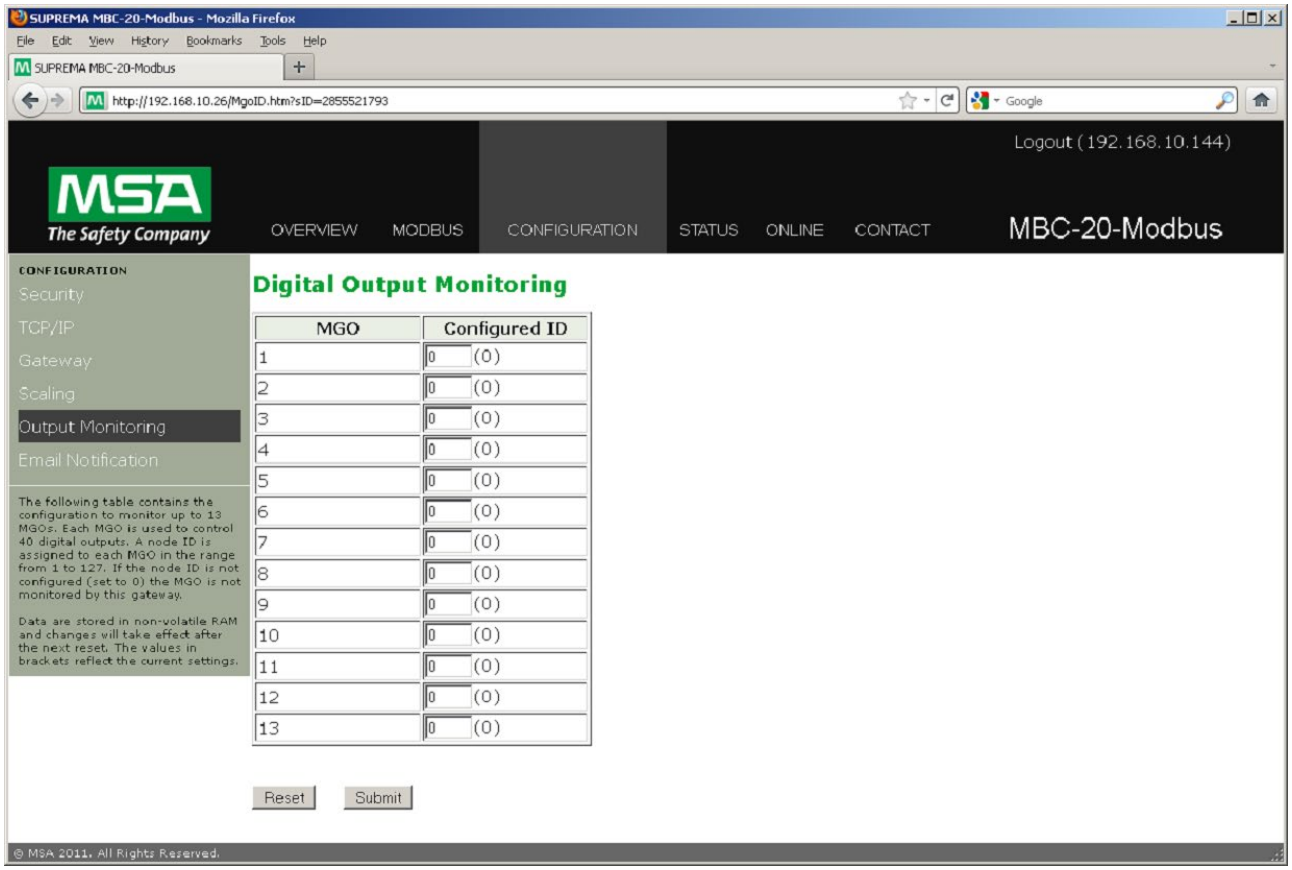

Fig. 9 Output Monitoring configuration page

3.7. Email Notification Configuration

It is possible to configure the MBC20-Modbus to send out email notifications in the case of special events or periodically. This function is not active by default.

Changing the Settings

To activate this functionality, the parameters in the section “CONFIGURATION” / “Email Notification” of the integrated web server (see Fig. 10) have to be set appropriately.

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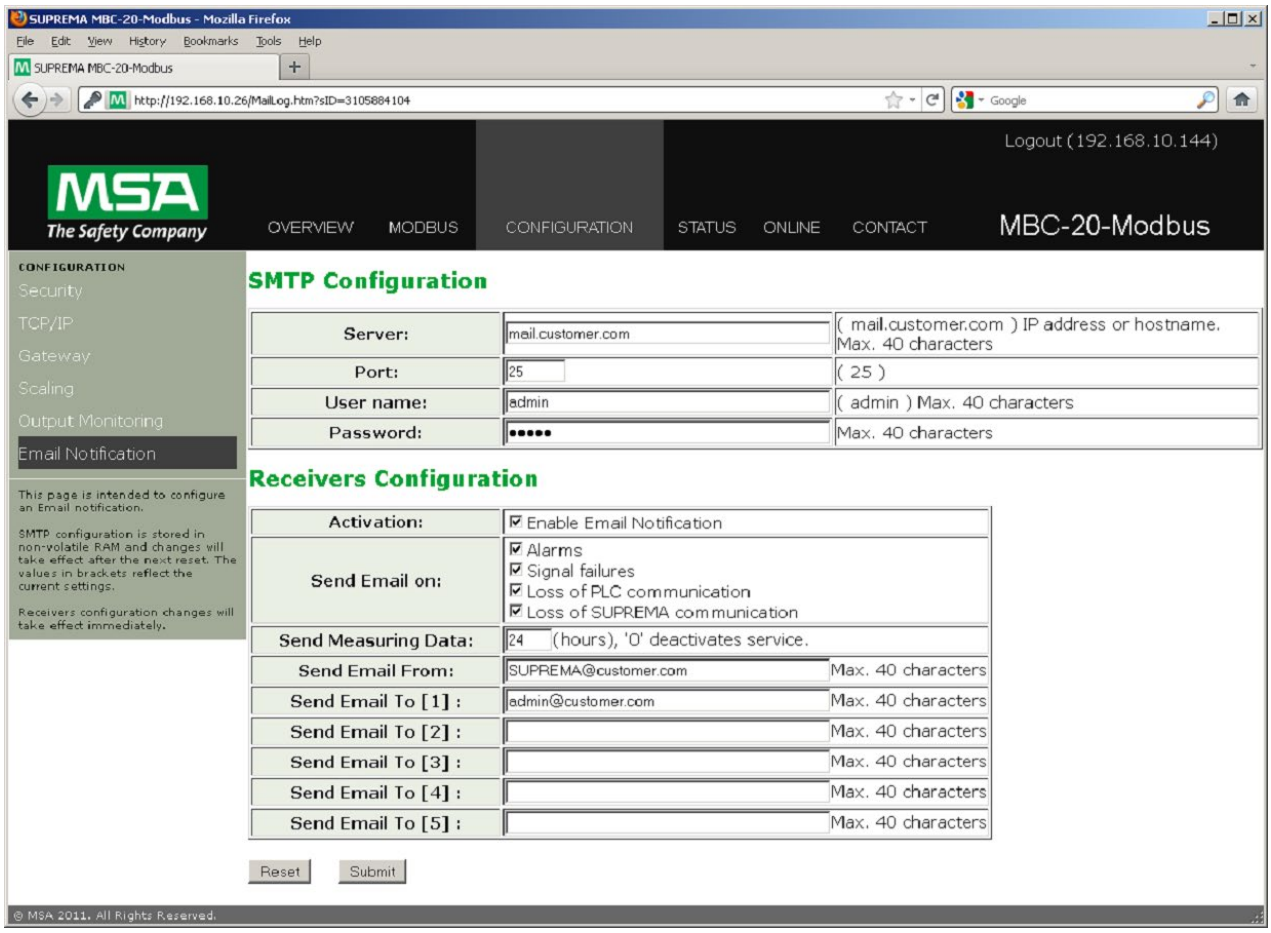

Fig. 10 Email Notification configuration page

Description of the SMTP Configuration Parameters

Server (empty by default): In this field the name or IP address of the email server to be used has to be specified. Only servers supporting the Simple Mail Transfer Protocol (SMTP) can be used. When the server is specified using a name, a valid name server (DNS) has to be specified (see chapter 3.3 „TCP/IP Configuration“).

Port (default is 25): In this field the port to be used to contact the mail server can be specified.

User name (empty by default): In this field the user name to be used to authenticate against the email server can be specified.

Password (empty by default): In this field the password to be used to authenticate against the email server can be specified. The currently valid password is not displayed for security reasons.

Description of the Receivers Configuration Parameters

Activation (unselected by default): With selecting/unselecting “Enable Email Notification”, the email notification service is enabled/disabled in general.

Send Email on / Alarms (unselected by default): If this entry is selected, an email will be sent in the case of a rising alarm.

Send Email on / Signal failures (unselected by default): If this entry is selected, an email will be sent in the case of a rising signal fault.

Send Email on / Loss of PLC communication (unselected by default): If this entry is selected, an email will be sent in the case of lost of communication to the SCADA system or PLC. The relevant timeout is 5 minutes.

Send Email on / Loss of SUPREMA communication (unselected by default): If this entry is selected, an email will be sent in the case of lost of communication between MBC20-Modbus and the rest of the SUPREMA system. The relevant timeout is 10 seconds with a start-up window of up to 20 minutes.

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Send Measuring Data (default is 0): This entry specifies the time interval between two email notifications giving an overview of the currently measured values. The interval is specified in hours. When this value is set to 0, this service is inactive.

Send Email From (default is “SUPREMA”): This entry specifies an email address used for the “From” field of all emails created. This field identifies the sender of the mail and can be used as return address. It should be a valid email address.

Send Email To (default is “SUPREMA”): These entries specify email addresses used for the “To” field of all emails created. I. e. all emails will be sent to these addresses. It should be valid email addresses.

4. Installation of the Module

4.1. Installation of the MBC20-Modbus

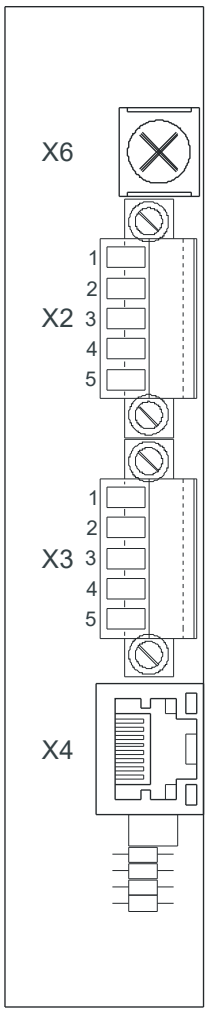
Before installing the MBC20 in the rack, check the DIP switch settings (see chapter 2.3 “System Integration”). After that, the MBC20-Modbus can be installed in any rack and in the slots 6 to 15.

4.2. Installation of the MBT20

The slot with the MBC20-Modbus must have a MBT20 (Bus Terminal) module connected at the rear of the rack.

4.3. Installing Wiring

The serial connection to be used for Modbus RTU must be done on connector X2 (the upper terminal) of the MBT20. The mode to be used has to be configured properly (see chapter 3.4 “Gateway Configuration”). The Ethernet connection to be used for configuration and Modbus TCP must be done on connector X4 (the RJ45 connector) of the MBT.



Pin MBT20 - X2	RS232	RS485 full duplex	RS485 half duplex
1	RX	A	-
2	-	B	-
3	-	Y	A
4	TX	Z	B
5	Signal GND	Signal GND	Signal GND

Fig. 11 MBT20 wiring

4.4. Configuring in a SUPREMA System

For software version 2.06.XX (on the MDO10), the SUPREMA Manager software can be used to set the configuration of a SUPREMA system. For older versions the SUPREMA ServicePack has to be used.

The MBC20-Modbus will be added to the configuration using the special gateway fields. The ID to be selected is the ID of the slot the MBC20-Modbus is installed in.

4.5. Configuring in a SUPREMATouch System (MCP20 Firmware 3.01.01)

The SUPREMA Manager software has to be used to set the configuration of a SUPREMA Touch system. The MBC20-Modbus will be added to the configuration using the special gateway fields. The ID to be selected is the ID of the slot the MBC20-Modbus is installed in.

4.6. Configuring in a SUPREMATouch System (MCP20 Firmware 3.01.02 and Later)

The SUPREMA Manager software has to be used to set the configuration of a SUPREMA Touch system. The MBC20-Modbus will be added to the configuration similar to all other modules. Don’t use the special gateway fields to achieve the full functionality of the module. These fields are only available for the backward compatibility to older gateways.

5. Registers

5.1. Discrete Input Registers

Mode	Index	Description (FC2)
Mode 1 Mode 2 Mode 3	10001	Measure point 1: Alarm 1
	10002	Measure point 1: Alarm 2
	10003	Measure point 1: Alarm 3
	10004	Measure point 1: Alarm 4
	10005	Measure point 1: Calibration status
	10006	Measure point 1: Signal error
	10007	Measure point 1: Inhibit
	10008	Measure point 1: Measuring range overflow
	10009	Measure point 2: Alarm 1
	10010	Measure point 2: Alarm 2
	…	…
	12047	Measure point 256: Inhibit
	12048	Measure point 256: Measuring range overflow
	12049	Monitored digital output MGO 1, output 1
	12050	Monitored digital output MGO 1, output 2
	…	…
	12088	Monitored digital output MGO 1, output 40
	12089	Monitored digital output MGO 2, output 1
	…	…
	12568	Monitored digital output MGO 13, output 40
Mode 4	10001-10003	Free
	10004	Measure point 1: Alarm 3
	10005	Measure point 1: Alarm 2
	10006	Measure point 1: Alarm 1
	10007	Measure point 1: Inhibit or calibration status
	10008	Measure point 1: Signal error
	10009	Measure point 1: No data available
	10010-10016	Free
	10017-10019	Free
	10020	Measure point 2: Alarm 3
	10021	Measure point 2: Alarm 2
	10022	Measure point 2: Alarm 1
	10023	Measure point 2: Inhibit or calibration status
	10024	Measure point 2: Signal error
	10025	Measure point 2: No data available
	10026-10032	Free
	…	…
	14089	Measure point 256: No data available
	14090-14096	Free

Mode	Index	Description (FC2)
Modus 5	10001	Measure point 1: Alarm 1 pending
	10002	Measure point 1: Alarm 2 pending
	10003	Measure point 1: Alarm 3 pending
	10004	Measure point 1: Alarm 4 pending
	10005	Measure point 1: Signal fail pending
	10006	Measure point 1: Alarm 1 new (not acknowledged)
	10007	Measure point 1: Alarm 2 new (not acknowledged)
	10008	Measure point 1: Alarm 3 new (not acknowledged)
	10009	Measure point 1: Alarm 4 new (not acknowledged)
	10010	Measure point 1: Signal Fail new (not acknowledged)
	10011	Measure point 1: Measuring range overflow
	10012	Measure point 1: Inhibit
	10013	Measure point 1: Calibration status
	10014-10016	Free
	10017	Measure point 2: Alarm 1 pending
	…	…
	14093	Measure point 256: Calibration status
	14094-15000	Free
	15001	Monitored digital output MGO 1, output 1
	15002	Monitored digital output MGO 1, output 2
	…	…
	15040	Monitored digital output MGO 1, output 40
	15041	Monitored digital output MGO 2, output 1
	…	…
	15520	Monitored digital output MGO 13, output 40

5.2. Holding / Input Registers

Mode	Index	Description (FC3, FC4)
Mode 1 Mode 2 Mode 3 Mode 5	40001	Last received measure point (0..255)
	40002	Configured register mode (1..3)
	40003	Gateway status ▪ Bit 0 = Connection to SUPREMA (0 = faulty / 1 = good) ▪ Bit 1 = Data mode (0 = SUPREMA, 1 = simulation) ▪ Bit 2-14 = MGO data status (0 = valid, 1 = invalid)
	40004	Last error
	40005	Last erroneous measuring point (0..255)
	40006	Number of received node guard requests (High word)
	40007	Number of received node guard requests (Low word)
	40008	Number of errors
	40009	Low Byte: Scaling of data ▪ Bit 0 = Scaling (0 = OFF / 1 = ON) ▪ Bit 1 = Value when SignalFail (0 = High / 1 = Low)

Mode	Index	Description (FC3, FC4)
	40009	High Byte: Active SUPREMA CAN bus (0 = No active bus, 1 = CAN-A, 2 = CAN-B)
Mode 1	40010, 30010	Measure point 1: Measuring value (scalable data)[1]
	40011, 30011	Measure point 1: Dimension
	40012, 30012	Measure point 1: Range
	40013, 30013	Measure point 2: Measuring value (scalable data)
	…	…
	40777, 30777	Measure point 256: Range
Mode 2	40010, 30010	Measure point 1: Measuring value (scalable data)[2]
	40011, 30011	Measure point 2: Measuring value (scalable data)
	…	…
	40265, 30265	Measure point 256: Measuring value (scalable data)
Mode 3	40010, 30010	Measure point 1: Measuring value (float32) - Byte 0 and 1
	40011, 30011	Measure point 1: Measuring value (float32) - Byte 3 and 2
	40012, 30012	Measure point 1: Measure point number and status
	40013, 30013	Measure point 1: Dimension and range
	40014, 30014	Measure point 2: Measuring value (float32) - Byte 0 and 1
	…	…
	41033, 31033	Measure point 256: Dimension and range
Mode 4	40001, 30001	Measure point 1: Measuring value (scalable data)[3]
	40002, 30002	Measure point 2: Measuring value (scalable data)
	…	…
	40256, 30256	Measure point 256: Measuring value (scalable data)
Mode 5	30010, 40010	Measure point 1: Measuring value (float32) - Byte 0 and 1
	30011, 40011	Measure point 1: Measuring value (float32) - Byte 3 and 2
	30012, 40012	Measure point 1: Number and status
	30013, 40013	Measure point 1: Alarm status (0: off, 1: new; 2: acknowledged; 3: hold) ▪ Bit 00..03 Alarm 1 ▪ Bit 04..07 Alarm 2 ▪ Bit 08..11 Alarm 3 ▪ Bit 12..15 Alarm 4
	30014, 40014	Measure point 1: Signal status ▪ Bit 00..03 Signal fail (0: off, 1: new; 2: acknowledged; 3: hold) ▪ Bit 04..07 Inhibit ▪ Bit 08..15 Calibration status
	30015, 40015	Measure point 1: Dimension ID
	30016, 40016	Measure point 1: Range ID
	30017, 40017	Measure point 1: Measuring gas ID

[1] If data are not scaled then: Result = Value; if scaled the following formula is used:
Result = 1+((4093/Range)*Value)
Valid range: <1..4094>, Negative: 0, Exceeding valid range: 4095
[2] If data are not scaled then: Result = Value; if scaled the following formula is used:
Result = 1+((4093/Range)*Value)
Valid range: <1..4094>, Negative: 0, Exceeding valid range: 4095
[3] If data are not scaled then: Result = Value; if scaled the following formula is used: Result = (1000/Range)*Value
Limited to range: <-32768..32767>

Mode	Index	Description (FC3, FC4)
	30018, 40018	Measure point 1: Sensor type ID
	30019, 40019	Measure point 1: Reserved (0)
	…	…
	32568, 42568	Measure point 256: Sensor type ID
	32569, 42569	Measure point 256: Reserved (0)

5.3. Data Formats

Measuring Point Number

The measuring point number is in the range from 0 to 255 for the measuring points 1 to 256.

Measuring Values in Mode 3

In gateway mode 3 the measuring value is transferred unchanged from CAN to the Modbus Master (SCADA system or PLC). The data of the measured value is structured in accordance with IEEE-754:

Byte	Bit							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
n	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}
n + 1	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}
n + 2	+/-	e^{7}	e^{6}	e^{5}	e^{4}	e^{3}	e^{2}	e^{1}
n + 3	e^{0}	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}

The following table gives some examples for transmitted values and their meaning:

Values of transmitted bytes [hex]				Measured value [dec]
n	**n + 1**	**n + 2**	**n + 3**	
00	00	41	20	10,00
00	00	C1	20	-10,00
70	A4	40	AD	5,42
70	52	BF	9E	-1,23

Status

The bits of the measuring point status byte have the following meaning:

Bit	Value	Meaning
0	0	1. alarm not set
	1	1. alarm set
1	0	2. alarm not set
	1	2. alarm set
2	0	3. alarm not set
	1	3. alarm set
3	0	4. alarm not set
	1	4. alarm set
4	0	Measuring point is in not in calibration mode
	1	Measuring point is in calibration mode
5	0	Measuring point has no signal failure
	1	Measuring point has a signal failure

GB

Bit	Value	Meaning
6	0	Measuring point is not inhibit
	1	Measuring point is inhibit
7	0	Measuring point is not in overflow
	1	Measuring point is in overflow

Dimension

The value in the dimension byte has the following meaning:

Value	Dimension
1	ppm
2	ppm.m
3	% UEG
4	UEG m
5	vol.-%
6	% rel. h
7	°C
8	ppb
9	BIN
10	dB
200	*user defined*
201	*user defined*
202	*user defined*

Measuring Range

The index of the measuring range maps to the following values.

Value	Measuring range
1	0.3
2	0.5
3	1
4	2
5	5
6	10
7	20
8	30
9	50
10	100
11	200
12	300
13	500
14	600
15	1000
16	2000
17	0.1
18	3

Value	Measuring range
19	25
20	3000
21	4000
22	5000
23	8000
24	10000
25	12000
26	104
27	120
200	*user defined*
201	*user defined*
202	*user defined*

6. Offline Status Values

Measuring point	Measuring value	Measuring range ID	Dimension ID	Status
1	0.00	1	1	0
2	0.10	2	2	80
3	0.20	3	3	40
4	0.30	4	4	20
5	0.40	5	5	10
6	0.50	6	6	8
7	0.60	7	7	4
8	0.70	8	8	2
9	0.80	9	9	1
10	0.90	10	1	0
11	1.00	11	2	80
12	1.10	12	3	40
13	1.20	13	4	20
14	1.30	14	5	10
15	1.40	15	6	8
16	1.50	16	7	4
17	1.60	17	8	2
18	1.70	18	9	1
19	1.80	19	1	0
20	1.90	20	2	80
21	2.00	21	3	40
22	2.10	22	4	20
23	2.20	23	5	10
24	2.30	24	6	8
25	2.40	25	7	4
26	2.50	26	8	2
27	2.60	1	9	1
28	2.70	2	1	0
29	2.80	3	2	80
30	2.90	4	3	40
31	3.00	5	4	20
32	3.10	6	5	10
33	3.20	7	6	8
34	3.30	8	7	4
35	3.40	9	8	2
36	3.50	10	9	1
37	3.60	11	1	0
38	3.70	12	2	80
39	3.80	13	3	40
40	3.90	14	4	20
41	4.00	15	5	10

Measuring point	Measuring value	Measuring range ID	Dimension ID	Status
42	4.10	16	6	8
43	4.20	17	7	4
44	4.30	18	8	2
45	4.40	19	9	1
46	4.50	20	1	0
47	4.60	21	2	80
48	4.70	22	3	40
49	4.80	23	4	20
50	4.90	24	5	10
51	5.00	25	6	8
52	5.10	26	7	4
53	5.20	1	8	2
54	5.30	2	9	1
55	5.40	3	1	0
56	5.50	4	2	80
57	5.60	5	3	40
58	5.70	6	4	20
59	5.80	7	5	10
60	5.90	8	6	8
61	6.00	9	7	4
62	6.10	10	8	2
63	6.20	11	9	1
64	6.30	12	1	0
65	6.40	13	2	80
66	6.50	14	3	40
67	6.60	15	4	20
68	6.70	16	5	10
69	6.80	17	6	8
70	6.90	18	7	4
71	7.00	19	8	2
72	7.10	20	9	1
73	7.20	21	1	0
74	7.30	22	2	80
75	7.40	23	3	40
76	7.50	24	4	20
77	7.60	25	5	10
78	7.70	26	6	8
79	7.80	1	7	4
80	7.90	2	8	2
81	8.00	3	9	1
82	8.10	4	1	0
83	8.20	5	2	80
84	8.30	6	3	40

Measuring point	Measuring value	Measuring range ID	Dimension ID	Status
85	8.40	7	4	20
86	8.50	8	5	10
87	8.60	9	6	8
88	8.70	10	7	4
89	8.80	11	8	2
90	8.90	12	9	1
91	9.00	13	1	0
92	9.10	14	2	80
93	9.20	15	3	40
94	9.30	16	4	20
95	9.40	17	5	10
96	9.50	18	6	8
97	9.60	19	7	4
98	9.70	20	8	2
99	9.80	21	9	1
100	9.90	22	1	0
101	10.00	23	2	80
102	10.10	24	3	40
103	10.20	25	4	20
104	10.30	26	5	10
105	10.40	1	6	8
106	10.50	2	7	4
107	10.60	3	8	2
108	10.70	4	9	1
109	10.80	5	1	0
110	10.90	6	2	80
111	11.00	7	3	40
112	11.10	8	4	20
113	11.20	9	5	10
114	11.30	10	6	8
115	11.40	11	7	4
116	11.50	12	8	2
117	11.60	13	9	1
118	11.70	14	1	0
119	11.80	15	2	80
120	11.90	16	3	40
121	12.00	17	4	20
122	12.10	18	5	10
123	12.20	19	6	8
124	12.30	20	7	4
125	12.40	21	8	2
126	12.50	22	9	1
127	12.60	23	1	0

Measuring point	Measuring value	Measuring range ID	Dimension ID	Status
128	12.70	24	2	80
129	12.80	25	3	40
130	12.90	26	4	20
131	13.00	1	5	10
132	13.10	2	6	8
133	13.20	3	7	4
134	13.30	4	8	2
135	13.40	5	9	1
136	13.50	6	1	0
137	13.60	7	2	80
138	13.70	8	3	40
139	13.80	9	4	20
140	13.90	10	5	10
141	14.00	11	6	8
142	14.10	12	7	4
143	14.20	13	8	2
144	14.30	14	9	1
145	14.40	15	1	0
146	14.50	16	2	80
147	14.60	17	3	40
148	14.70	18	4	20
149	14.80	19	5	10
150	14.90	20	6	8
151	15.00	21	7	4
152	15.10	22	8	2
153	15.20	23	9	1
154	15.30	24	1	0
155	15.40	25	2	80
156	15.50	26	3	40
157	15.60	1	4	20
158	15.70	2	5	10
159	15.80	3	6	8
160	15.90	4	7	4
161	16.00	5	8	2
162	16.10	6	9	1
163	16.20	7	1	0
164	16.30	8	2	80
165	16.40	9	3	40
166	16.50	10	4	20
167	16.60	11	5	10
168	16.70	12	6	8
169	16.80	13	7	4
170	16.90	14	8	2

Measuring point	Measuring value	Measuring range ID	Dimension ID	Status
171	17.00	15	9	1
172	17.10	16	1	0
173	17.20	17	2	80
174	17.30	18	3	40
175	17.40	19	4	20
176	17.50	20	5	10
177	17.60	21	6	8
178	17.70	22	7	4
179	17.80	23	8	2
180	17.90	24	9	1
181	18.00	25	1	0
182	18.10	26	2	80
183	18.20	1	3	40
184	18.30	2	4	20
185	18.40	3	5	10
186	18.50	4	6	8
187	18.60	5	7	4
188	18.70	6	8	2
189	18.80	7	9	1
190	18.90	8	1	0
191	19.00	9	2	80
192	19.10	10	3	40
193	19.20	11	4	20
194	19.30	12	5	10
195	19.40	13	6	8
196	19.50	14	7	4
197	19.60	15	8	2
198	19.70	16	9	1
199	19.80	17	1	0
200	19.90	18	2	80
201	20.00	19	3	40
202	20.10	20	4	20
203	20.20	21	5	10
204	20.30	22	6	8
205	20.40	23	7	4
206	20.50	24	8	2
207	20.60	25	9	1
208	20.70	26	1	0
209	20.80	1	2	80
210	20.90	2	3	40
211	21.00	3	4	20
212	21.10	4	5	10
213	21.20	5	6	8

Measuring point	Measuring value	Measuring range ID	Dimension ID	Status
214	21.30	6	7	4
215	21.40	7	8	2
216	21.50	8	9	1
217	21.60	9	1	0
218	21.70	10	2	80
219	21.80	11	3	40
220	21.90	12	4	20
221	22.00	13	5	10
222	22.10	14	6	8
223	22.20	15	7	4
224	22.30	16	8	2
225	22.40	17	9	1
226	22.50	18	1	0
227	22.60	19	2	80
228	22.70	20	3	40
229	22.80	21	4	20
230	22.90	22	5	10
231	23.00	23	6	8
232	23.10	24	7	4
233	23.20	25	8	2
234	23.30	26	9	1
235	23.40	1	1	0
236	23.50	2	2	80
237	23.60	3	3	40
238	23.70	4	4	20
239	23.80	5	5	10
240	23.90	6	6	8
241	24.00	7	7	4
242	24.10	8	8	2
243	24.20	9	9	1
244	24.30	10	1	0
245	24.40	11	2	80
246	24.50	12	3	40
247	24.60	13	4	20
248	24.70	14	5	10
249	24.80	15	6	8
250	24.90	16	7	4
251	25.00	17	8	2
252	25.10	18	9	1
253	25.20	19	1	0
254	25.30	20	2	80
255	25.40	21	3	40
256	25.50	22	4	20

7. Troubleshooting

Issue	Possible solutions
SUPREMA / SUPREMA Touch indicates system failure.	▪ Check whether the MBC20-Modbus is configured for the right slot. ▪ Check SUPREMA Manager / ServicePack Configuration (see chapter 4.4 “Configuring in a SUPREMA System“ or 4.5 “Configuring in a SUPREMATouch System (MCP20 Firmware 3.01.01)”). ▪ Check whether the right CAN-bus is selected. ▪ Check DIP switch configuration (see chapter 2.3 “System Integration”). ▪ Check whether DIP switch configuration is right. ▪ Except DIP switch for CAN-bus selection all DIP switches have to be set to OFF (see chapter 2.3 “System Integration”). ▪ Check whether the MBC20-Modbus is plugged correctly. ▪ Unplug the module, then try to push module into the right slot until you notice a resistance. ▪ RAM / ROM / FLASH damaged? ▪ Check Logbook entries at MDO, call MSA. ▪ Call MSA for assistance.
Modbus Master (SCADA system or PLC) doesn’t get any data via Modbus RTU.	▪ Check whether the serial settings are correct. ▪ Compare the settings of the MBC (see chapter 3.4 “Gateway Configuration”) with the settings of the Modbus master; they must match. ▪ Check the wiring between the Modbus master and MBC/MBT (see chapter 4.3 “Installing Wiring”). ▪ Check whether the MBC has an connection to the SUPREMA (see point “SUPREMA connection” on the “OVERVIEW” page of the internal web server). ▪ If not, check the wiring of the CAN bus. ▪ Check whether it is possible to access the MBC20 with an alternative system; if it is possible see the manual of the Modbus master for further troubleshooting. ▪ Call MSA for assistance.
Modbus Master (SCADA system or PLC) doesn’t get any data via Modbus TCP.	▪ Check whether the IP settings are correct. ▪ Compare the settings of the MBC (see chapter 3.3 “TCP/IP Configuration”) with the settings of the Modbus master; they must match. ▪ Check the wiring between Modbus master and MBC/MBT (see chapter 4.3 “Installing Wiring”). ▪ Check whether the MBC has an connection to the SUPREMA (see point “SUPREMA connection” on the “OVERVIEW” page of the internal web server). ▪ If not, check the wiring of the CAN bus. ▪ Check whether it is possible to access the MBC20 with an alternative system; if it is possible see the manual of the Modbus master for further troubleshooting. ▪ Call MSA for assistance.

Notes

Notes