DOC273.53.90696

BioTector B3500 Analyzer Modbus V1.1 Addendum

User Manual

10/2019, Edition 1

Table of Contents

Section 1 Introduction

This document supplies the Modbus installation and configuration instructions and the Modbus registers for the B3500 analyzers.

This document is an addendum to the user manual. The content in this addendum supercedes the content in the user manual.

The software requirement for Modbus is 2.12.01 or later.

Section 2 Electrical installation

⚠ DANGER

Electrocution hazard. Always remove power to the instrument before making electrical connections.

2.1 Connect Modbus RTU (RS485)

For Modbus RTU data transmission, connect the Modbus RTU terminals in the analyzer to a Modbus master device as follows:

1. Remove power to the analyzer. Refer to the illustrated steps in Figure 1.
2. Put a 4-wire, twisted pair, shielded cable through a cable strain-relief fitting on the left side of the analyzer. Use wire gauge of 0.2 mm^2 (24 AWG) minimum.
3. Connect three of the wires to the Modbus RTU terminals in the analyzer. Refer to Figure 2 and Table 1 for wiring information.

   Refer to Figure 3 for the location of the Modbus RTU terminals in the analyzer.
4. Connect the shield wire of the cable to terminal 73 of the analyzer. Refer to Figure 2 and Table 1 for wiring information.

   Note: *As an alternative, connect the shield wire to the ground terminal of the Modbus master device.*
5. Tighten the cable strain-relief fitting.
6. Connect the other end of the cable to a Modbus master device. Refer to Figure 2.
7. Make sure that the wire connected to terminal 71 (D+) is positively biased compared to terminal 72 (D–) when the bus is in an idle condition.
8. To terminate the bus, install a jumper on J18 of the motherboard. Refer to Figure 3.

   The motherboard is in the electronic enclosure on the door behind the cover.

Figure 1 Remove power to the analyzer

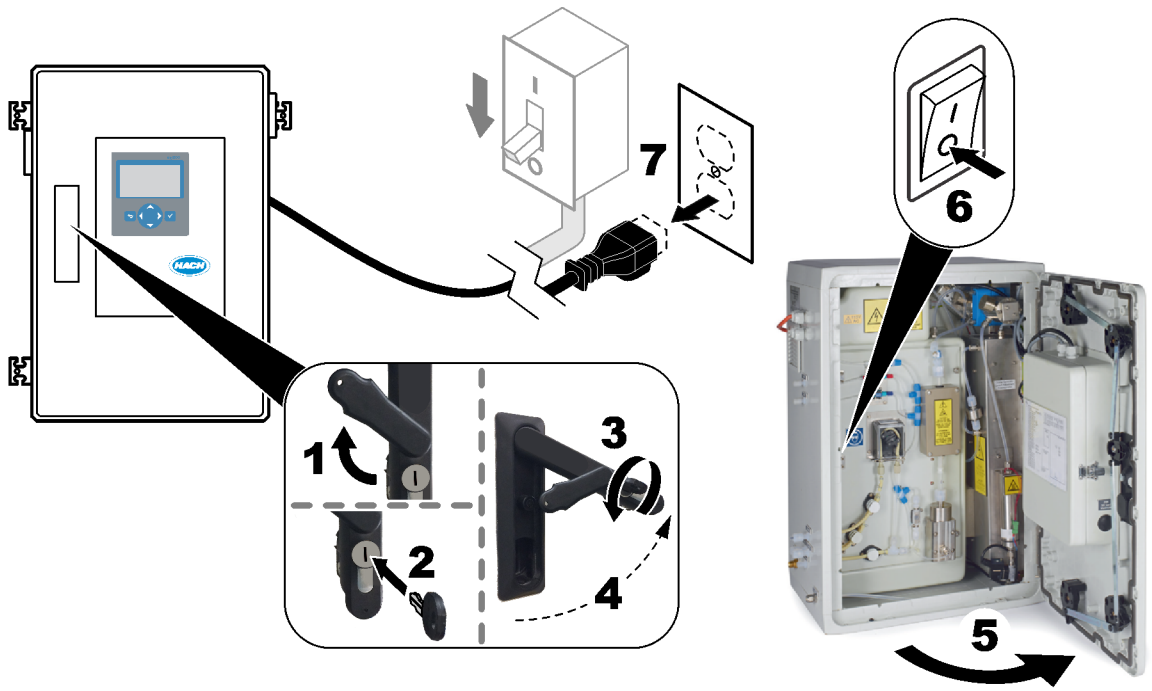
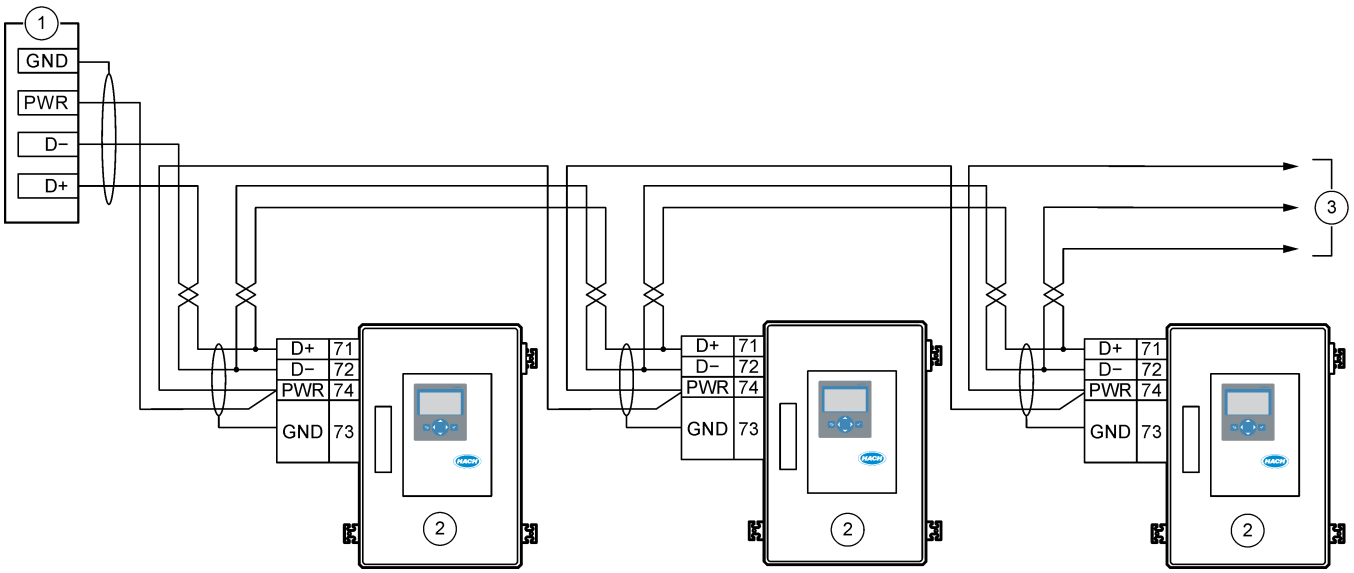


Figure 2 Wiring diagram

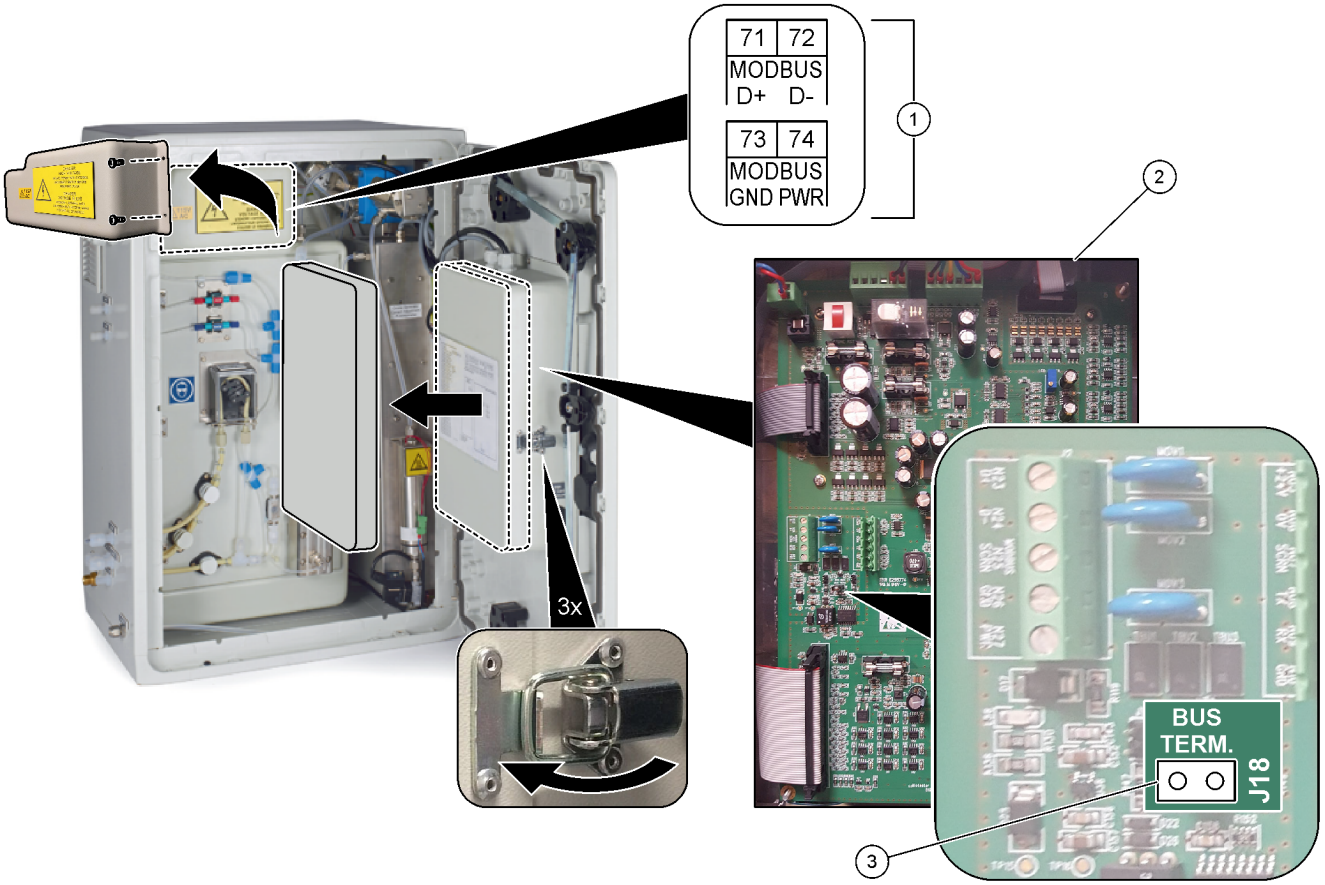


1 Modbus master	**3** To other RS485 devices
2 Analyzer	

Table 1 Wiring information

Terminal	Signal
71	D+
72	D–
73	Modbus ground
74	Modbus power

Figure 3 Location of Modbus RTU terminals and bus-termination jumper



1 Modbus RTU terminals	**3** Bus-termination jumper (J18)
2 Motherboard	

2.2 Connect Modbus TCP/IP (Ethernet)

If the optional Modbus TCP/IP module is installed in the analyzer, configure the Modbus module and connect the module to a Modbus master device. Refer to the sections that follow.

The Modbus TCP/IP module is marked "MODBUS" and is below the terminals for the mains power, analog output and relays.

2.2.1 Configure the Modbus TCP/IP module

1. Set the analyzer power to on.
2. Use an Ethernet cable to connect a laptop to the Modbus TCP/IP (RJ45) connector in the analyzer. Refer to Figure 4 on page 9.
3. On the laptop, click the Start icon and select Control Panel.
4. Select Network and Internet.
5. Select Network and Sharing Center.
6. On the right side of the window, select Change adapter settings.
7. Right-click Local Area Connection and select Properties.
8. Select Internet Protocol Version 4 (TCP/IPv4) from the list, then click **Properties**.
9. Record the properties to go back to the properties in the future as necessary.
10. Select Use the following IP address.
11. Enter the IP address and subnet mask that follow:
    - IP address: 192.168.254.100
    - Subnet mask: 255.255.255.0
12. Click **OK**.
13. Close the open windows.
14. Open a web browser.
15. In the address bar of the web browser, enter the default IP address (192.168.254.254).

    The web-interface of the Modbus TCP module shows.
16. Enter the user name and password:
    - User name: Admin
    - Password: admin
17. Use a web-interface at port 80 to change the configuration of the Modbus TCP module, such as the IP address (192.168.254.254) or the TCP/IP port (502).

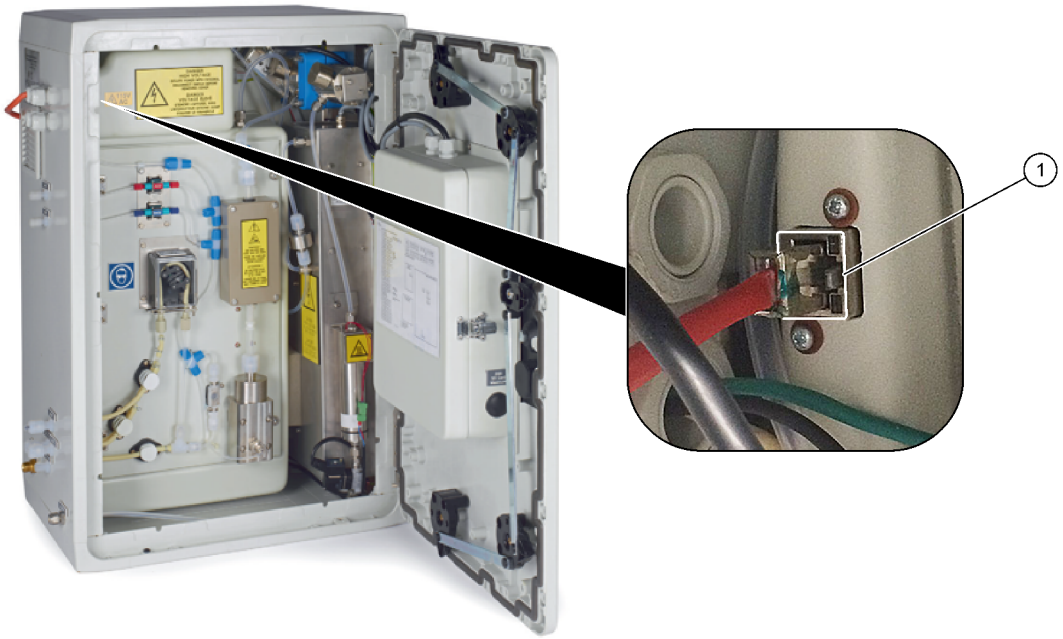
2.2.2 Connect the Modbus TCP/IP module

For Modbus TCP data transmission, connect the Modbus TCP/IP connector in the analyzer to a Modbus master device as follows:

1. Put an Ethernet cable through a cable strain-relief fitting on the left side of the analyzer.
2. Connect the Ethernet cable to the Modbus TCP/IP connector in the analyzer. Refer to Figure 4.
3. Tighten the cable strain-relief fitting.
4. Connect the other end of the Ethernet cable to a Modbus master device. Refer to Figure 5.

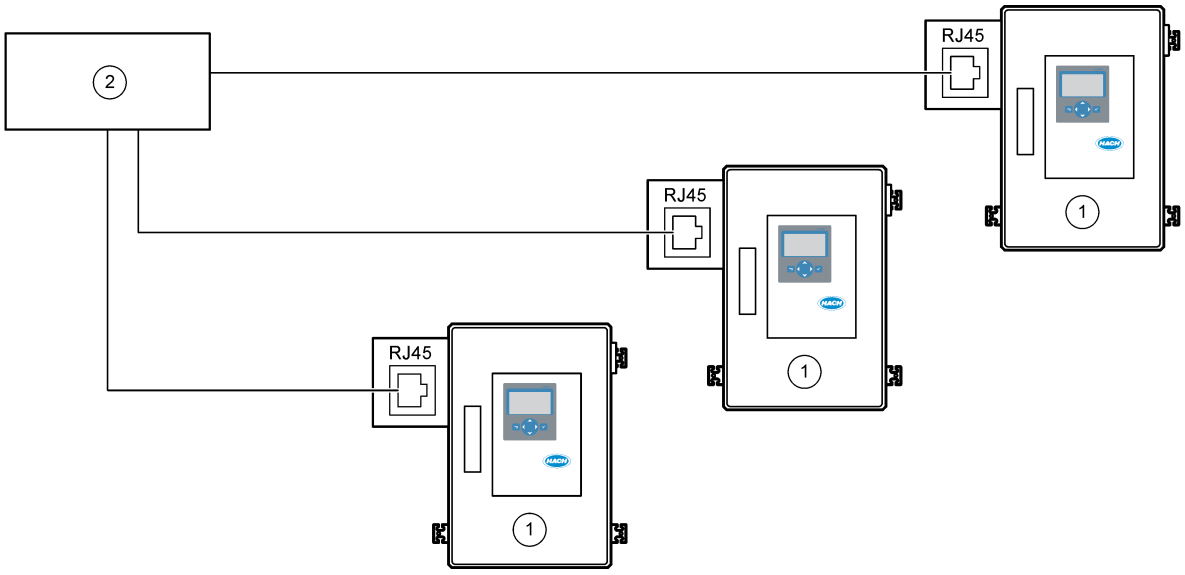
   If the analyzer has two Modbus TCP/IP connectors, fully redundant data transmission is possible. To connect an analyzer to two Modbus master devices, refer to Figure 6.

Figure 4 Modbus TCP/IP connector



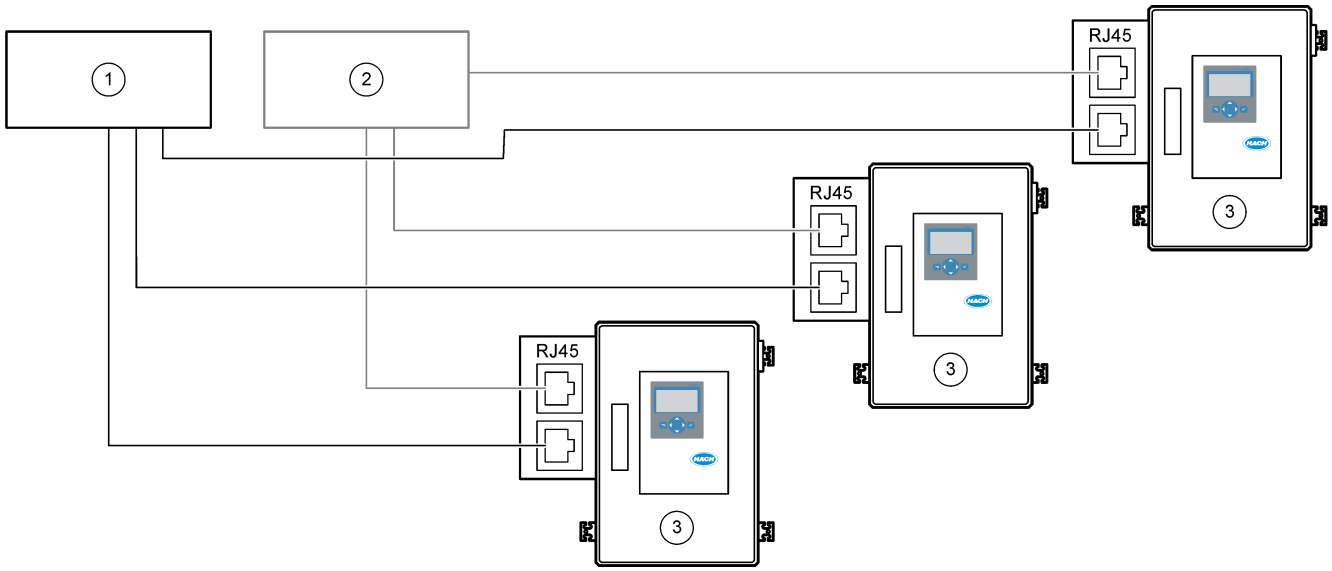
1	Modbus TCP/IP connector

Figure 5 Normal Modbus TCP wiring



1	Analyzer	**2**	Modbus master

Figure 6 Redundant Modbus TCP wiring



1 Modbus Master 1	**3** Analyzer
2 Modus Master 2	

Section 3 Configure the Modbus TCP/IP settings

1. Select MAINTENANCE > COMMISSIONING > MODBUS PROGRAM.
2. Select an option.

Option	Description
MODE	Shows the Modbus operating mode: BIOTECTOR. The MODE setting cannot be changed.
BAUDRATE	Sets the Modbus baudrate for the instrument and the Modbus master device (1200 to 115200 bps, default: 57600). ***Note:*** *For Modbus TCP/IP, do not change the BAUDRATE setting. The RTU-to-TCP converter uses the default BAUDRATE setting.*
PARITY	Sets the parity to NONE (default), EVEN, ODD, MARK or SPACE. ***Note:*** *For Modbus TCP/IP, do not change the PARITY setting. The RTU-to-TCP converter uses the default PARITY setting.*
DEVICE BUS ADDRESS	Sets the Modbus address of the instrument (0 to 247, default: 1). Enter a fixed address that a Modbus protocol message cannot change. If DEVICE BUS ADDRESS is set to 0, the analyzer will not communicate with the Modbus Master.
MANUFACTURE ID	Sets the manufacturer ID of the instrument (default: 1 for Hach).
DEVICE ID	(Optional) Sets the class or family of the instrument (default: 1234).
SERIAL NUMBER	Sets the serial number of the instrument. Enter the serial number that is on the instrument.
LOCATION TAG	Sets the location of the instrument. Enter the country where the instrument is installed.
FIRMWARE REV	Shows the firmware revision installed on the instrument.
REGISTERS MAP REV	Shows the Modbus register map version used by the instrument.

Section 4 Show the Modbus status

1. Select MAINTENANCE > DIAGNOSTICS > MODBUS STATUS.
2. Select an option.

Option	Description
MODE	Shows the Modbus operating mode, which is BIOTECTOR.
DEVICE BUS ADDRESS	Shows the Modbus address of the instrument.
BUS MESSAGE COUNT	Shows the number of Modbus messages that were correctly received and were sent to the Modbus address of the instrument. ***Note:*** *When the count is 65,535, the subsequent message received sets the count to 1.*
BUS COM ERROR COUNT	Shows the number of corrupted or not fully received Modbus messages that the Modbus received. ***Note:*** *When the count is 65,535, the subsequent message received sets the count to 1.*
MANUFACTURE ID	Shows the manufacturer ID for the instrument (e.g., 1 for Hach).
DEVICE ID	Shows the class or family of the instrument, if entered (default: 1234).
SERIAL NUMBER	Shows the serial number of the instrument.
LOCATION TAG	Shows the location of the instrument.
FIRMWARE REV	Shows the firmware revision installed on the instrument.
REGISTERS MAP REV	Shows the Modbus register map version used by the instrument. Refer to Modbus register maps on page 19.

After the menu options, the first 17 bytes of the last received (RX) and transmitted (TX) Modbus message show.

Section 5 Modbus warning

Warning	Description	Solution
135_MODBUS WARN	Internal Modbus tasks are in an unknown condition.	When this warning occurs, the Modbus circuit starts again automatically. Acknowledge the warning and tell the distributor or the manufacturer. If the warning continues, replace the motherboard[1].

[1] The motherboard part number is 19-PCB-055.

1. Make sure that the device bus address is correct. Refer to Configure the Modbus TCP/IP settings on page 11.
2. Make sure that the register address (5-digit code) is correct.
3. Select MAINTENANCE > DIAGNOSTICS > MODBUS STATUS > BUS COM ERROR COUNT. Look at the bus transmission error count.

   The bus error count should increase each time the analyzer reads an invalid or not fully received Modbus message.

   Note: *Valid messages that are not addressed to the instrument do not increase the counter.*
4. For the Modbus RTU option, make sure that the wire connected to terminal D+ is positively biased compared to the wire connected to terminal D– when the bus is in an idle condition.
5. Make sure that there is a jumper installed on J18 of the motherboard at the end of the bus to terminate the bus. The motherboard is in the electronic enclosure on the door behind the cover. Refer to Figure 3 on page 7.
6. For the Modbus TCP option, open the web interface. Refer to Configure the Modbus TCP/IP module on page 8. If the web interface does not open, do the steps that follow:

   a. Make sure that the network settings are correct.
   b. Make sure that the Ethernet cable connectors are fully installed in the Ethernet ports.
   c. Make sure that the LED for the Modbus TCP/IP (RJ45) connector is green.

Section 7 Modbus register maps

7.1 Measurement registers

Stream 1 measurements

Name	Description	Register	Data type
STREAM_1_RLOG_TIC	Stream 1: Last total inorganic carbon measurement	40001, 40002	float, read only -1.0^6 to 1.0^6
STREAM_1_RLOG_TOC	Stream 1: Last total organic carbon measurement	40003, 40004	
STREAM_1_RLOG_TC	Stream 1: Last total carbon measurement	40005, 40006	
STREAM_1_RLOG_VOC	Stream 1: Last volatile organic carbon measurement	40007, 40008	
STREAM_1_RLOG_COD	Stream 1: Last chemical oxygen demand measurement	40013, 40014	
STREAM_1_RLOG_BOD	Stream 1: Last biochemical oxygen demand measurement	40015, 40016	

Note: *When a register is read, the value in the _TIME register for that register (e.g., STREAM_1_RLOG_TIC_TIME) is updated.*

Stream 2 measurements

Name	Description	Register	Data type
STREAM_2_RLOG_TIC	Stream 2: Last total inorganic carbon measurement	40029, 40030	float, read only -1.0^6 to 1.0^6
STREAM_2_RLOG_TOC	Stream 2: Last total organic carbon measurement	40031, 40032	
STREAM_2_RLOG_TC	Stream 2: Last total carbon measurement	40033, 40034	
STREAM_2_RLOG_VOC	Stream 2: Last volatile organic carbon measurement	40035, 40036	
STREAM_2_RLOG_COD	Stream 2: Last chemical oxygen demand measurement	40041, 40042	
STREAM_2_RLOG_BOD	Stream 2: Last biochemical oxygen demand measurement	40043, 40044	

Note: *When a register is read, the value in the _TIME register for that register (e.g., STREAM_1_RLOG_TIC_TIME) is updated.*

Stream 3 measurements

Name	Description	Register	Data type
STREAM_3_RLOG_TIC	Stream 3: Last total inorganic carbon measurement	40057, 40058	float, read only -1.0^6 to 1.0^6
STREAM_3_RLOG_TOC	Stream 3: Last total organic carbon measurement	40059, 40060	
STREAM_3_RLOG_TC	Stream 3: Last total carbon measurement	40061, 40062	
STREAM_3_RLOG_VOC	Stream 3: Last volatile organic carbon measurement	40063, 40064	
STREAM_3_RLOG_COD	Stream 3: Last chemical oxygen demand measurement	40069, 40070	
STREAM_3_RLOG_BOD	Stream 3: Last biochemical oxygen demand measurement	40071, 40072	

Note: *When a register is read, the value in the _TIME register for that register (e.g., STREAM_1_RLOG_TIC_TIME) is updated.*

7.2 Measurement time registers

Stream 1 measurement times

Name	Description	Register	Data type
STREAM_1_RLOG_TIC_TIME	Stream 1 Time and date of the last total inorganic carbon measurement	40300, 40301	integer, read only 0x00000000 to 0xFFFFFFFF
STREAM_1_RLOG_TOC_TIME	Stream 1 Time and date of the last total organic carbon measurement	40302, 40303	
STREAM_1_RLOG_TC_TIME	Stream 1 Time and date of the last total carbon measurement	40304, 40305	
STREAM_1_RLOG_VOC_TIME	Stream 1 Time and date of the last volatile organic carbon measurement	40306, 40307	
STREAM_1_RLOG_COD_TIME	Stream 1 Time and date of the last chemical oxygen demand measurement	40312, 40313	
STREAM_1_RLOG_BOD_TIME	Stream 1 Time and date of the last biochemical oxygen demand measurement	40314, 40315	

Stream 2 measurement times

Name	Description	Register	Data type
STREAM_2_RLOG_TIC_TIME	Stream 2 Time and date of the last total inorganic carbon measurement	40328, 40329	integer, read only 0x00000000 to 0xFFFFFFFF
STREAM_2_RLOG_TOC_TIME	Stream 2 Time and date of the last total organic carbon measurement	40330, 40331	
STREAM_2_RLOG_TC_TIME	Stream 2 Time and date of the last total carbon measurement	40332, 40333	
STREAM_2_RLOG_VOC_TIME	Stream 2 Time and date of the last volatile organic carbon measurement	40334, 40335	
STREAM_2_RLOG_COD_TIME	Stream 2 Time and date of the last chemical oxygen demand measurement	40340, 40341	
STREAM_2_RLOG_BOD_TIME	Stream 2 Time and date of the last biochemical oxygen demand measurement	40342, 40343	

Stream 3 measurement times

Name	Description	Register	Data type
STREAM_3_RLOG_TIC_TIME	Stream 3 Time and date of the last total inorganic carbon measurement	40356, 40357	integer, read only 0x00000000 to 0xFFFFFFFF
STREAM_3_RLOG_TOC_TIME	Stream 3 Time and date of the last total organic carbon measurement	40358, 40359	
STREAM_3_RLOG_TC_TIME	Stream 3 Time and date of the last total carbon measurement	40360, 40361	
STREAM_3_RLOG_VOC_TIME	Stream 3 Time and date of the last volatile organic carbon measurement	40362, 40363	
STREAM_3_RLOG_COD_TIME	Stream 3 Time and date of the last chemical oxygen demand measurement	40368, 40369	
STREAM_3_RLOG_BOD_TIME	Stream 3 Time and date of the last biochemical oxygen demand measurement	40370, 40371	

7.3 Sample status registers

Name	Description	Register	Data type
RLOG_SMPL_STATUS	Sample status Quality of the sample, which is measured by the ultrasonic sensor	40200, 40201	float, read only 0.0 to 100.0
RLOG_SMPL_STATUS_TIME	Time and date of the last sample status measurement	40202, 40203	integer, read only 0x00000000 to 0xFFFFFFFF

Note: *When a register is read, the value in the _TIME register for that register is updated.*

7.4 Settings registers

Name	Description	Register	Data type	Min/Max
DEVICE_ADDR	DEVICE BUS ADDRESS setting	40500	integer, read/write	0x0000 to 0x00C8
DEVICE_ID	DEVICE ID setting	40501	integer, read/write	0x0000 to 0xFFFF
MANUF_ID	MANUFACTURE ID setting	40502	integer, read/write	0x0000 to 0x00FF
DEVICE_SERIAL_ID	SERIAL NUMBER setting	40503, 40504, 40505	uint48, read only	0x000000000000 to 0xFFFFFFFFFFFF
PROTO_REV	Modbus protocol implementation revision rev AA.BB = 0xAABB	40506	integer, read only	0x0000 to 0x9999
FRMW_REV	FIRMWARE REVsetting rev AA.BB = 0xAABB	40507	integer, read only	0x0000 to 0x9999

Name	Description	Register	Data type	Min/Max
REGS_MAP_REV	REGISTERS MAP REV setting rev AA.BB = 0xAABB	40508	integer, read only	0x0000 to 0x9999
LOCATION_STR	LOCATION TAG setting ***Note:*** *Null terminate the string if there are less than 16 characters.*	40509, 40510, 40511, 40512, 40513, 40514, 40515, 40516	string, read/write	16 characters maximum
BAUDRATE	BAUDRATE setting 0 = 1200 bps 1 = 2400 bps 2 = 4800 bps 3 = 9600 bps 4 = 14400 bps 5 = 19200 bps 6 = 38400 bps 7 = 57600 bps 8 = 115200 bps	40517	integer, read/write	0x0000 to 0x0008
SYS_TIMEDATE[2]	System time and date in seconds since January 1, 1970.	40518, 40519	integer, read/write	0x00000000 to 0xFFFFFFFF
SYS_TIME[2]	System time in higher/lower bytes HH:MM = 0xHHMM	40520	integer, read/write	0x0000 to 0x3B3B
SYS_DATE[2]	System date in 4 bytes Higher word DAY:MON = 0xDDMM Lower word YEAR = 0x0YYY	40521, 40522	integer, read/write	0x00000000 to 0x1F0C0833
REACT_TIC_RANGE1[3]	TIC range 1	40550, 40551	float, read only	0.0 to 1000000.0
REACT_TIC_RANGE2[3]	TIC range 2	40552, 40553		
REACT_TIC_RANGE3[3]	TIC range 3	40554, 40555		
REACT_TOC_RANGE1[3]	TOC range 1	40556, 40557		
REACT_TOC_RANGE2[3]	TOC range 2	40558, 40559		
REACT_TOC_RANGE3[3]	TOC range 3	40560, 40561		
REACT_TC_RANGE1[3]	TC range 1	40562, 40563		
REACT_TC_RANGE2[3]	TC range 2	40564, 40565		
REACT_TC_RANGE3[3]	TC range 3	40566, 40567		

[2] This register cannot be changed until the system is fully stopped.
[3] Shown as 0.0 if in the analysis mode for this result is not available.

7.5 Calibration registers

Name	Description	Register	Data type	Min/Max
AUTOCAL_PROG	Auto calibration day bit 0 = off bit 1 = Monday bit 2 = Tuesday bit 3 = Wednesday bit 4 = Thursday bit 5 = Friday bit 6 = Saturday bit 7 = Sunday	40700	integer, read only	0x0000 to 0x000F
AUTOCAL_PROG_TIME	Time of scheduled auto calibration in higher/lower bytes HH:MM = 0xHHMM	40701	integer, read only	0x0000 to 0x3B3B
CLOG_CAL_SELECT[4]	Calibration type 0 = TIC 1 = TOC 2 = TC 3 = TN 4 = TP 5 = TPR	40702	integer, read/write	0x0000 to 0x0004
CLOG_CAL1_SPAN_STATUS	Status of the last span calibration bit 0 = calibration bit 1 = check bit 2 = calibration successful bit 3 = result outside band bit 4 = calculated from other range bit 5 = calculated from TOC/TC result bit 6 = entered by operator ***Note:*** *If a calibration failure occurs on the master range, it is necessary to update the derived results status also.*	40703	integer, read only	0x0000 to 0x007F
CLOG_CAL2_SPAN_STATUS		40717		
CLOG_CAL3_SPAN_STATUS		40731		
Note: *The CLOG_CALx register values are only updated when the associated CLOG_CALx_SPAN_STATUS register is read.*				
CLOG_CAL1_SPAN_TIME	Time and date of the last span calibration	40704, 40705	integer, read only	0x00000000 to 0xFFFFFFFF
CLOG_CAL2_SPAN_TIME		40718, 40719		
CLOG_CAL3_SPAN_TIME		40732, 40733		
CLOG_CAL1_SPAN_STD	Calibration standard ***Note:*** *Null if bits 4–6 are set in the _STATUS register.*	40706, 40707	float, read only	-1.0^6 to 1.0^6
CLOG_CAL2_SPAN_STD		40720, 40721		
CLOG_CAL3_SPAN_STD		40734, 40735		

[4] This register value changes the values of the CLOG registers that follow.

Name	Description	Register	Data type	Min/Max
CLOG_CAL1_SPAN_RSLT	Calibration results ***Note:*** *Null if bits 4–6 are set in the _STATUS register.*	40708, 40709	float, read only	-1.0^6 to 1.0^6
CLOG_CAL2_SPAN_RSLT		40722, 40723		
CLOG_CAL3_SPAN_RSLT		40736, 40737		
CLOG_CAL1_SPAN_FACTOR	Span adjustment factor	40710, 40711	float, read only	-1.0^6 to 1.0^6
CLOG_CAL2_SPAN_FACTOR		40724, 40725		
CLOG_CAL3_SPAN_FACTOR		40738, 40739		
CLOG_CAL1_ZERO_STATUS	Status of the last zero calibration bit 0 = zero calibration bit 1 = zero check bit 2 = zero successful bit 3 = result outside band bit 4 = calculated from other range bit 5 = TIC: no zero required bit 6 = entered by operator	40712	integer, read/write	0x0000 to 0x007F
CLOG_CAL2_ZERO_STATUS		40726		
CLOG_CAL3_ZERO_STATUS		40740		
CLOG_CAL1_ZERO_TIME	Time and date of the last zero calibration	40713, 40714	integer, read only	0x00000000 to 0xFFFFFFFF
CLOG_CAL2_ZERO_TIME		40727, 40728		
CLOG_CAL3_ZERO_TIME		40741, 40742		
CLOG_CAL1_ZERO_OFFSET	Zero offset	40715, 40716	float, read only	-1.0^6 to 1.0^6
CLOG_CAL2_ZERO_OFFSET		40729, 40730		
CLOG_CAL3_ZERO_OFFSET		40743, 40744		

7.6 Diagnostics registers

Name	Description	Register	Data type	Min/Max
OXP_ANLS	Shows the oxidation analysis type bit 0 = TIC+TOC bit 1 = TC bit 2 = VOC bit 3 = TIC+TOCe bit 4 = TCe	40586	integer, read only	0x0000 to 0x07FF
PANEL_TEMP	Temperature in the enclosure (°C)	40800, 40801	float, read only	-100.0 to 150.0
ATM_PRESS	Atmospheric pressure measurement from sensor (kPa)	40802, 40803	float, read only	0.0 to 250.0

Name	Description	Register	Data type	Min/Max
CO2A_ZERO[5]	CO_2 analyzer zero setting	40804, 40805	float, read only	-1.0^6 to 1.0^6
GCTRL_AIR_PRESSURE	Air pressure measured at the gas controller circuit board (kPa)	40812, 40813	float, read only	0.0 to 250.0
GCTRL_O2_PRESS	Oxygen pressure measured at the gas controller circuit board (kPa)	40814, 40815	float, read only	0.0 to 250.0
REACT_STREAM_VALVE	Analysis reaction stream valve 0 = no analysis on any stream valve 1 = analysis on Stream 1 valve 2 = analysis on Stream 2 valve 3 = analysis on stream 3 valve 4 = analysis on Stream 4 valve 5 = analysis on Stream 5 valve 6 = analysis on Stream 6 valve	40816	integer, read only	0 to 6
REACT_RANGE	Analysis reaction range 0 = no analysis reaction 1 = analysis reaction range 1 2 = analysis reaction range 2 3 = analysis reaction range 3	40817	integer, read only	0 to 3
ACID_RGNT_STATUS	Number of days of acid remaining	40818	integer, read only	0 to 999
BASE_RGNT_STATUS	Number of days of base remaining	40819	integer, read only	0 to 999
REACT_CNTR	Reaction counter	40824, 40825	integer, read only	0x00000000 to 0xFFFFFFFF
SERVICE_REQ	Number of days until service is necessary	40826	integer, read only	0x0000 to 0xFFFF

[5] This register is set to 0.0 when power is set to on and is set to the correct value during the ANALYZER_ZERO reaction condition.

7.7 Error, Warning and Notification registers

For descriptions of the fault codes, refer to *Troubleshooting of System Faults, Warnings and Notification Events* in the analyzer documentation.

Name	Description	Register	Data type	Min/Max
SYS_ALARM_STATUS	Alarm status bit 0 = fault bit 1 = warning bit 2 = notification bit 3 = Drinking water warning	49930	integer, read only	0x0000 to 0x000F
SYS_COND_GRP	bit 0 = fault 01_LOW O2 FLOW - EX bit 1 = fault 02_LOW O2 FLOW - SO ... bit 15 = fault 16_SAMPLE VALVE SEN3	49950		
SYS_COND_GRP	bit 0 = fault 17_SMPL VALVE NOT SYNC bit 1 = fault 18_LIQUID LEAK DET ... bit 15 = fault 33_TOC SPAN CHCK FAIL	49951		
...	...	...		
SYS_COND_GRP	bit 0 = fault 241 bit 1 = fault 242 ... bit 15 = fault 257	49966		

7.8 Status and external control registers

Name	Description	Register	Data type	Min/Max
SYS_OP_STATUS	Operation status bit 0 = normal operation bit 1 = manual operation bit 2 = calibration bit 3 = zero bit 4 = remote standby is activated bit 5 = maintenance switch is activated	49931	integer, read only	0x0000 to 0x003F
SYS_REM_CTRL	System remote control 0 = no change 1 = system finish and stop 2 = analysis start 3 = zero cal start 4 = zero check start 5 = span cal start 6 = span check start 7 = reagents purge and zero	499332	integer, read/write	0 to 7
SYS_REM_CTRL_STANDBY	Set Remote Standby function 0 = Modbus remote standby deactivated 1 = Modbus remote standby activated ***Note:*** *The content of this register is internally ORed (boolean logic) with the Remote Standby digital input, if available.*	49933	integer, read/write	0 to 1

Name	Description	Register	Data type	Min/Max
SYS_REM_CTRL_SYNC	Synchronization output for remote control operation ***Note:*** *This register is enabled even when no SYNC output is identified.*	49934	integer, read only	0 to 1
SYS_REM_CTRL_RANGE	Select next range 0 = not selected / auto 1 = range 1 2 = range 2 3 = range 3 ***Note:*** *If this register value is 0, the range is selected with the EXT_RANGE_MUX1-2 digital inputs, if available.* *If the EXT_RANGE_MUX1-2 digital inputs are not available, the value of this register controls the digital input lines.*	49935	integer, read/write	0 to 3
SYS_REM_CTRL_STREAM	Next stream to be selected bit 0 = Stream 1 bit 1 = Stream 2 bit 2 = Stream 3 bit 3 = Stream 4 bit 4 = Stream 5 bit 5 = Stream 6 ***Note:*** *The content of this register is internally ORed (boolean logic) with the STREAM SEL 1-6 digital inputs to enable or disable stream selection.*	49936	integer, read/write	0x0000 to 0x007f
SYS_DEBUG_MODE	System debug mode register 0 = normal system operation 1 = system supplies pre-defined Modbus registers values	45000	integer, read/write	0x0000 to 0x0001

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