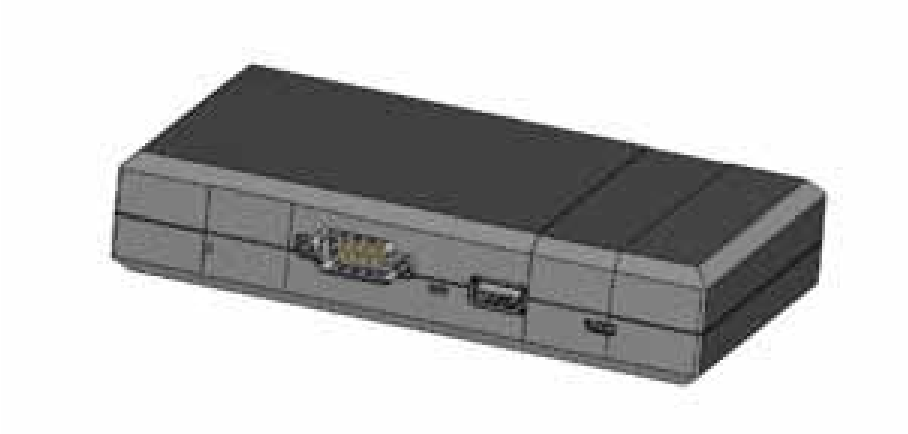
thermoscientific



Thermo Scientific

HeraCell VIOS/Steri-Cycle i

CO_2 Incubators

Service Manual

KIT OPC UA Gateway

50168280_Rev._ January 2023

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Preface

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General Notes

This service manual describes service work on the OPC UA gateway (only in conjunction with a Heracell VIOS or Steri-Cycle i incubator). The gateway has been manufactured in keeping with the latest technological developments and is operationally safe.

The device shall only be operated and maintained by qualified personnel. Before performing any activity with or on the device, all personnel shall be familiar with and understand the contents of these instructions.

Safety notices on the device shall be kept legible and must not be removed.

The device shall be operated using only original spare parts and original accessories.

Occupational safety regulations shall be complied with at all times!

The illustrations in this document have been reduced to depict essential details and my deviate from the actual product.

Information to User

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Requirements regarding personnel

DANGER Persons who are currently in training or have not yet received final instruction in handling the device shall work on the device only under continuous supervision by an experienced person.

WARNING Operation and maintenance is only permitted and may only be carried out by qualified, trained and sufficiently instructed personnel.

Responsibility of the operator

The operator is responsible for ensuring the device is in proper working order. In particular the operator shall ensure that

- the device is in proper working order and fully intact prior to start-up.
- the device is used properly and for its intended use.
- the device is operated only by qualified personnel.
- such personnel always wear the required protective equipment while working on or with the device.
- the operator is familiar with all regulations and requirements and informs all other personnel of these.
- written procedures are created, targeted at personnel working with this device.

  These shall be based on:

  - the applicable safety data sheets,
  - the plant hygiene guidelines and
  - the corresponding technical rules

  In particular these procedures shall stipulate:

  - which disinfection measures are to be applied for the device and accessories,
  - which protective measures apply when specific agents are used,
  - the measures to be taken in case of accidents,
  - which precautions and rules of conduct are necessary when entering and working in a clean room.
- that maintenance work be performed only by qualified personnel.
- that the specified maintenance intervals are adhered to.
- that the device shall only be operated in a clean, dry, orderly and suitable environment.
- that it shall be ensured that unauthorized persons do not gain access to the device.

Applicability of the Instructions

- These service instructions are a supplement to the original operating instructions. They do not replace the original operating instructions and are valid only in conjunction with them.
- The safety notices in the original operating instructions must be observed at all times.
- The contents of this service manual are subject to change without further notice.
- Concerning translations into foreign languages, the German version of this service manual is binding.

Should you encounter problems that are not detailed adequately in these operating instructions or the operating instructions, please contact Thermo Scientific immediately for your own safety.

Warranty

Thermo Fisher Scientific warrants the operational safety and functions of the gateway only under the condition that:

- the device is operated and serviced exclusively in accordance with its intended purpose and as described in these operating instructions,
- the device is not modified,
- only original spare parts and accessories that have been approved by Thermo Fisher Scientific are used,
- inspections and maintenance are performed at the specified intervals.

Explanation of Safety Information and Symbols

Safety Instructions

DANGER Indicates a hazardous situation which, if not avoided, could result in death or serious injuries.

WARNING Indicates a hazardous situation which, if not avoided, could result in minor or moderate injuries.

CAUTION Indicates a situation which, if not avoided, could result in property damage.

Note Is used for applicational hints and useful information.

Additional Symbols for Safety Information

Wear safety gloves!

Wear safety goggles!

Harmful liquids!

Electric shock!

Hot surfaces!

Fire hazard!

Explosion hazard!

Suffocation hazard!

General Safety Instructions

DANGER

Electric shock!

Contact with live parts can result in a fatal electric shock. Check the power supply unit for damage before connecting the device to the mains. Do not use a damaged power supply unit to connect the device to the mains! Maintenance may only be carried out by a service technician authorized by Thermo Electron LED GmbH. Only carry out troubleshooting as described in the operating instructions.

DANGER

Electric shock!

Before beginning installation or maintenance work, follow the five safety rules:

- Switch the device off.
- Secure the power supply connection to prevent unintentional reactivation.
- Make sure the device is de-energized.
- Ground and/or short-circuit the device.
- Cover adjacent parts or parts to be repaired or install safety barriers.

WARNING

Handle the components with care. To prevent electrostatic discharge, do not touch the gateway contacts.

CAUTION

Risk of destruction of the device due to carelessness in handling

Make sure to handle the device with care!

CAUTION

Risk of damage to device due to improper installation

If you wish to secure the device using magnetic holders, make sure to mount them on a suitable surface. Wipe the surface dry and clean if necessary.

CAUTION

Risk of destruction of the device due to high humidity.

Do not operate the device at humidity levels exceeding 80%.

CAUTION

Risk of damage to device due to high storage temperatures

Note that storage temperatures must not exceed 70 °C.

Note

Note that the surface temperature of the incubator during the Steri-Run routine will not harm the instrument.

Correct Use

The OPC UA Gateway enables an integration into a TCP/IP network.

The OPC UA Gateway has the following maintasks:

– Reading the operating data via USB

– Providing the operating data via OPC UA

As an OPC UA server, it enables the connection to an OPC UA client (control systems, lab management software). This device is intended for professional use only and must only operated by trained staff.

OPC UA - test and update

Test connection OPC — PC via Ethernet

Configuration data known

Note This test only works if the OPC UA has a static IP address.

1. Connect the laptop to VIOS using a PC program to ensure the function of the USB interface.
2. Connect an Ethernet cable to the OPC UA Gateway and the PC, the USB cable (2) to the Gateway and to VIOS and the Micro-USB cable to the power supply (3, 4).

Figure 1-1. Overview

3. Set the IP address of the laptop to the current customer IP address (must be supplied by the customer)[1]. For setting the IP adress, see figure 1-6 ff.
4. Ping the customer IP address (see page 1-6 ff.). If this works, data can be read via UAExpert, for example.
5. If the customer is unable to provide the configuration data or if communication with the Gateway cannot be established, the Gateway must be reset to factory settings.

[1] IP address assigned by the customer: 192.168.178.1 --> address for the laptop: 192.168.178.2. Address must be in the same subnet.

Configuration data unknown

CAUTION Following the check, the Gateway cannot communicate with the customer network again until it has been reconfigured. For this reason, clarify this step with the customer in advance!

- Perform a factory reset.

Factory Reset

- Disconnect the Gateway from the USB power supply.
- Press and hold the ‘S1’ button while you reconnect the Gateway to the power supply unit and the red LED lights up and remains lit.
  This process can take about 15 seconds.
- Release the ‘S1’ button.
- Perform another mains reset.
- After the mains reset it takes approx. 15-20 seconds until the Gateway is accessible via the Web browser.

Configuration

- Connect the gateway to a PC using the Micro-USB cable provided.
  A connection is established via USB which is needed only for configuration.
- Open the Web interface of the gateways via a Web browser (Microsoft Edge, Google Chrome, Mozilla Firefox, etc.) using the address

  `https://192.168.7.1`

  When the Web interface is accessible a warning appears in the display (Fig. 1-2). A direct link to the gateway is established.
- Click Advanced .

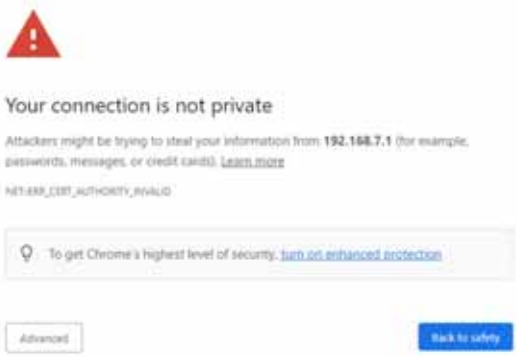


Figure 1-2. Establishing a link to the gateway - 1

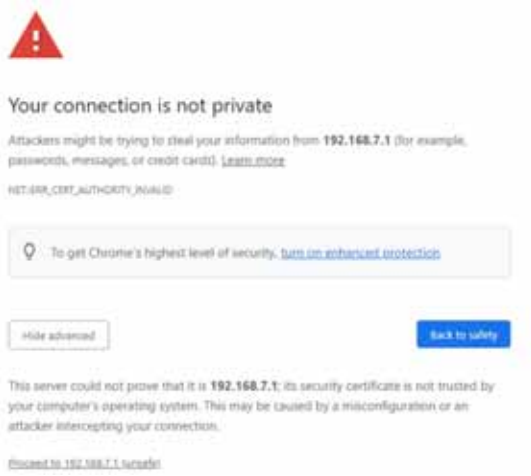


Figure 1-3. Establishing a link to the gateway - 2

- Click Proceed to 192.168.7.1 (unsafe) .
- Configure the device to a static IP address (Fig. 1-4):

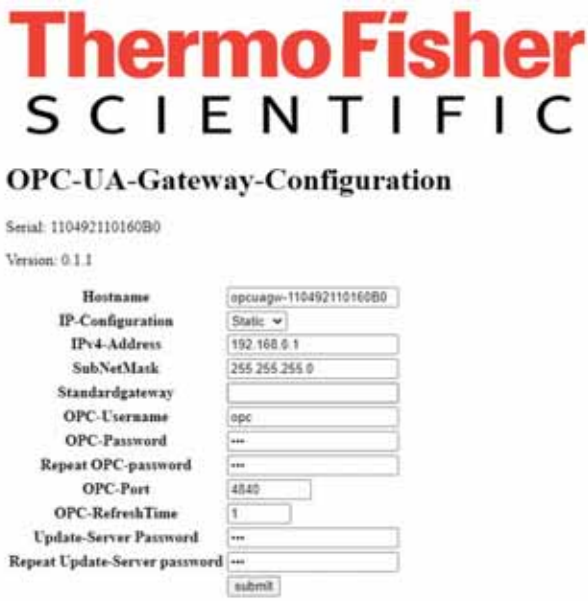


Figure 1-4. Configuring to a static IP address

- For reasons of simplicity, set the OPC password and the password for the update server to “opc”.
- Click on submit and then on Reboot (Fig. 1-5).
  The screen display indicates “Rebooting” even if the process has already been completed.
  The process is completed when the green LED starts blinking.

Figure 1-5. Configuration successful

- Connect the Micro-USB cable using the power supply unit.
- Connect the gateway to the Ethernet port of the PC using an Ethernet cable.
- Navigate to „Network and Internet“.
- Call up the adapter options in the Ethernet (Fig. 1-6).

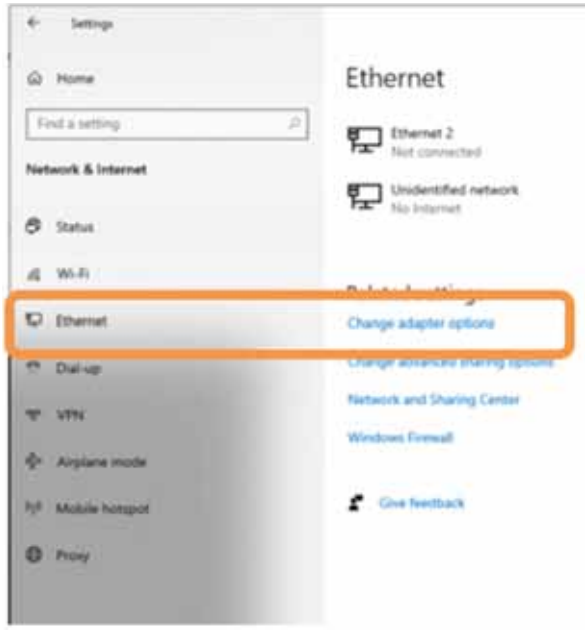


Figure 1-6. Adapter options

- Adjust the characteristics of the Ethernet adapter in use (right mouse button; Fig. 1-7).

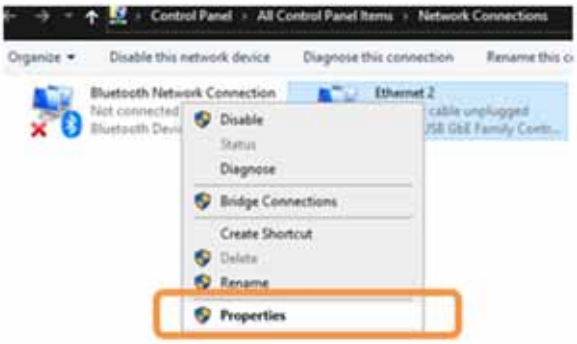


Figure 1-7. Adjust Ethernet adapter characteristics

- Select “Internet Protocol Version 4 (TCP/IPv4)“.
- Click the properties button (Fig. 1-8).

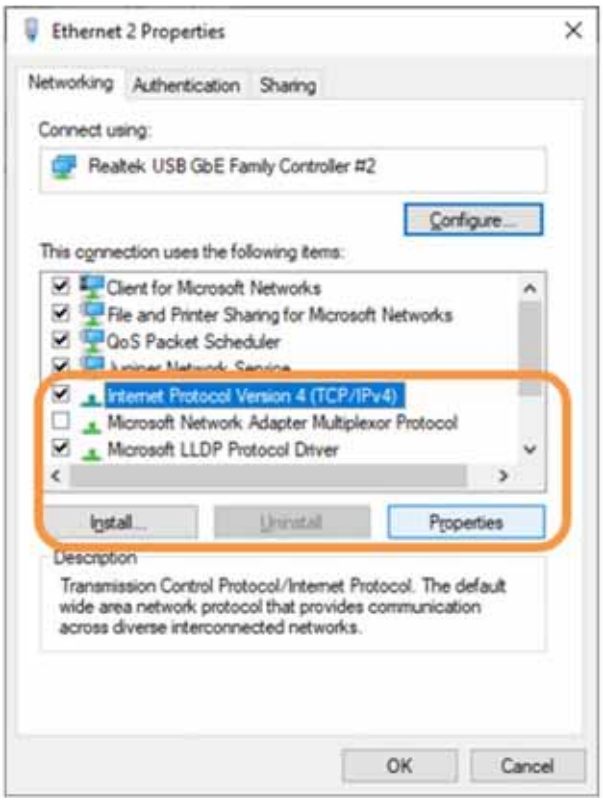


Figure 1-8. Adjust IP protocol (v4) characteristics

- Select “Use the following IP address”. Next enter 192.168.0.2 as the IP address and 255.255.255.0 as the Subnet mask. Then select OK (Fig. 1-9).

Figure 1-9. Change IP address

- Make a ping test on the accessibility of the IP address:
  - Open the PC input prompt and enter “ping 192.168.0.1” (Fig. 1-10).

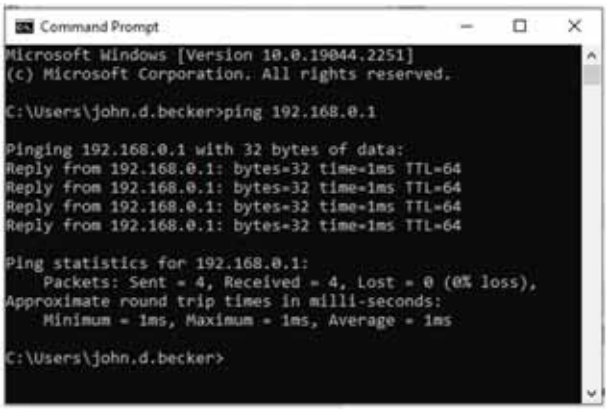


Figure 1-10. PC input prompt

- If the gateway is accessible, an OPC Client (e.g. UAExpert) is also accessible via the address

  `opc.tcp://192.168.0.1:4840`

  of the OPC server.

  Open UAExpert and enter the following information (Fig. 1-11). If the customer configuration is known to you, use this address!

- Reading out Vios data using UAExpert:
  - Connect the USB interface to the Gateway.
  - Connect the laptop to the Gateway using the Ethernet cable.
  - Use the Micro-USB cable to provide the Gateway with power.

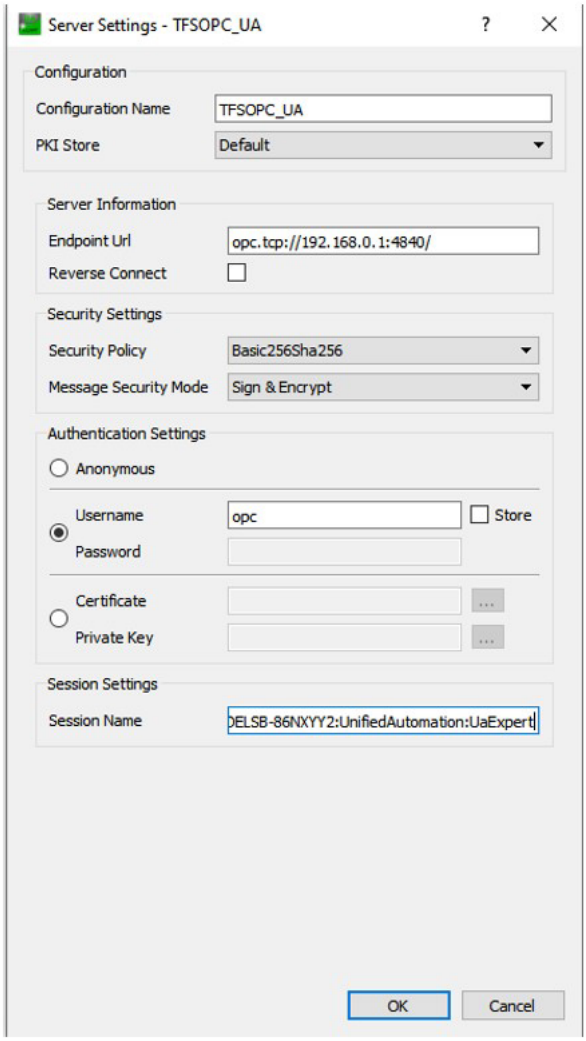


Figure 1-11. Server Settings

- Confirm with OK.

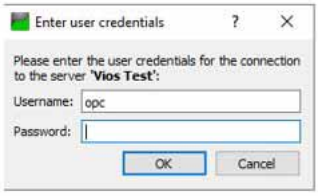


Figure 1-12. Setting User Information

Password: opc

- Confirm with OK.
- On initial use of the UAExpert software, the correct certificate for this application is requested.

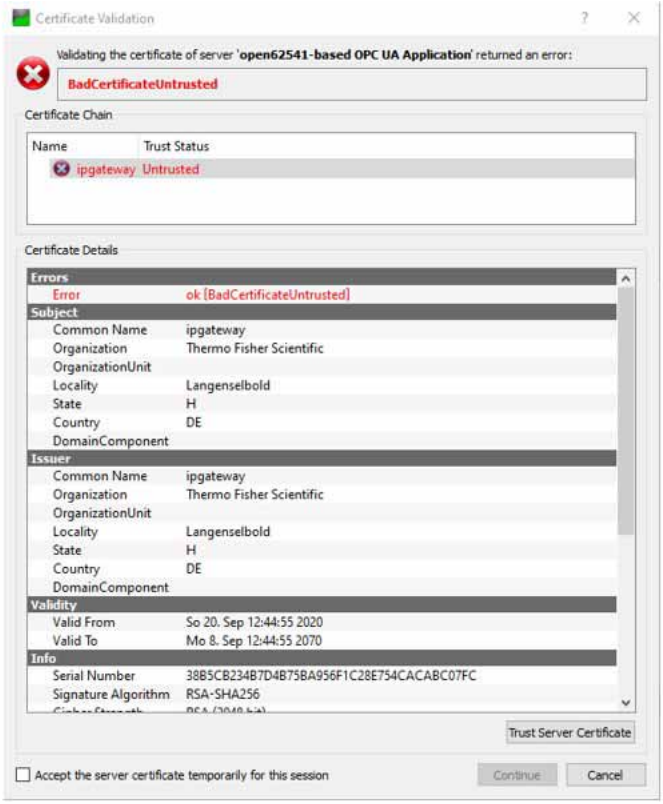


Figure 1-13. Validate server certificate

- Click Trust Server Certificate.

Figure 1-14. Server certificate validated

- Click Continue .

Example of server characteristics:

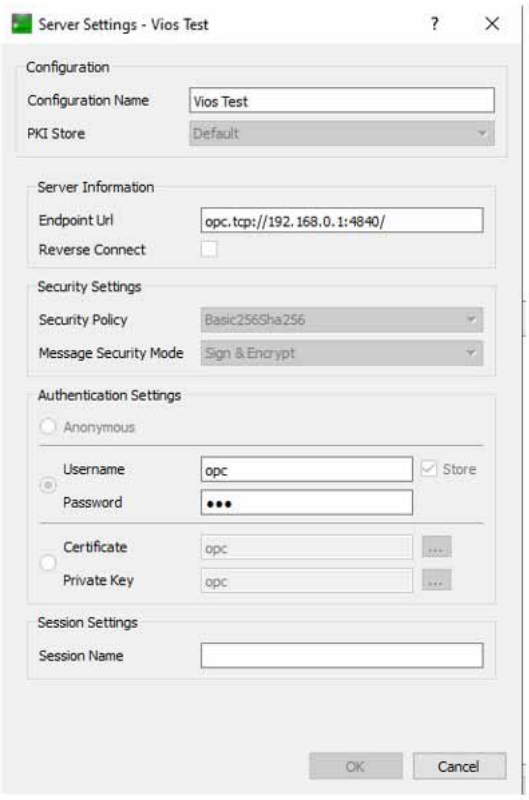


Figure 1-15. Server characteristics, example

- If necessary, connect to Connect by right-clicking with the mouse on the server (Vios Test).

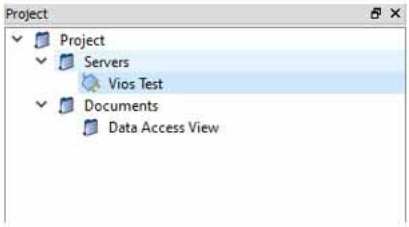


Figure 1-16. Connect to Connect

The available parameters appear in the address space:

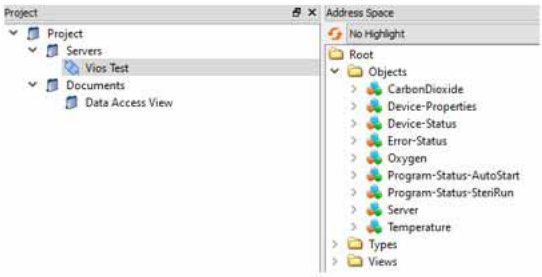


Figure 1-17. Available parameters

Now the parameters required can by dragged and dropped into the data access view.

The following message appears:

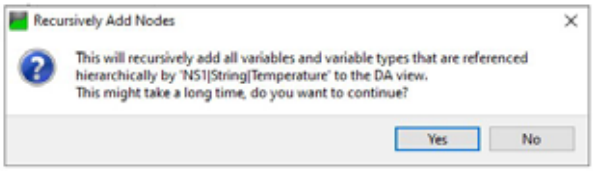
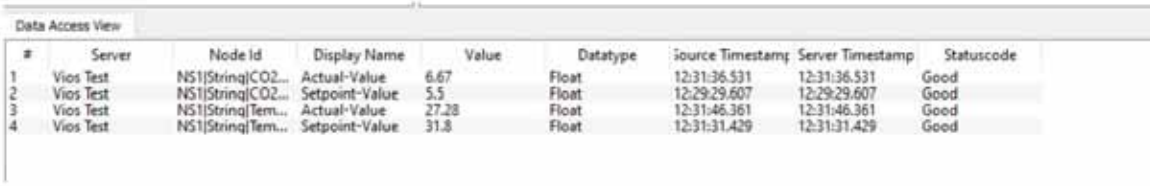


Figure 1-18.

- Confirm with Yes.

The current values and set values (for CO2 and temperature in this example) are visible:



Data Access View

#	Server	Node Id	Display Name	Value	Datatype	Source Timestamp	Server Timestamp	Statuscode
1	Vios Test	NS1|String|CO2...	Actual-Value	6.67	Float	12:31:36.531	12:31:36.531	Good
2	Vios Test	NS1|String|CO2...	Setpoint-Value	5.5	Float	12:29:29.607	12:29:29.607	Good
3	Vios Test	NS1|String|Tem...	Actual-Value	27.28	Float	12:31:46.361	12:31:46.361	Good
4	Vios Test	NS1|String|Tem...	Setpoint-Value	31.8	Float	12:31:31.429	12:31:31.429	Good

Figure 1-19.

Note After the check, reset the Ethernet adapter characteristics to “obtain IP address automatically”.

OPC UA gateway - install update

- Connect the laptop to the Gateway using the Micro-USB cable.

  The update server is available as soon as initial configuration has been completed.
- Press the “S1” button shortly on the OPC UA gateway to activate the update server.
- Call up the Web interface using the following URL scheme:

  `https://<IP address of the gateway>`

  `https://192.168.7.1`

On initial login the following appears:

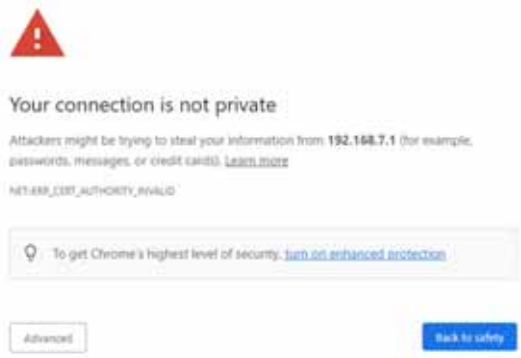


Figure 1-20. Connection not private

- Select Advanced .

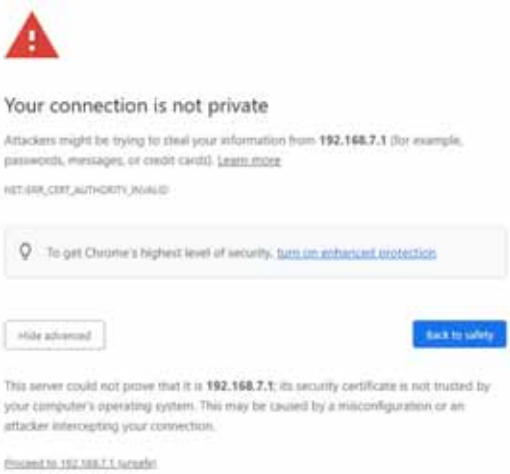


Figure 1-21. Connection not private _ extended

- Click Proceed to 192.168.7.1 (unsafe) .

- Login in Fig. 1-22 as follows:
  Username: ipgw
  Password: opc

Figure 1-22. Update server login

Following successful login there are two buttons available (Fig. 1-23):

Figure 1-23. Detail of the update server Web interface

Choose file	Open the file explorer to select the update file. Only file types with the extensions ".tar" and "tar.gz" and files up to 100 Mb max. are accepted. Use only update files supplied by Thermo-Fisher!

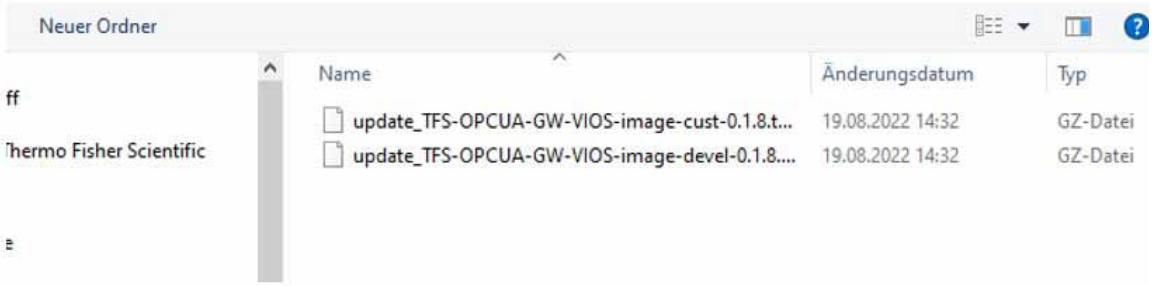


Figure 1-24. Update Files

Upload and Update	Once a file has been selected the upload can be started by pressing this button. After successful uploading and file verification the update process is initiated. The update process may take up to 10 minutes.

Figure 1-25. Upload

- Confirm with **OK**.

Note The update continues as long as the circle in the screen that opens continues to rotate. This process can take up to 10 minutes.

Figure 1-26. Update

When the update is successfully completed the following appears:

Figure 1-27. Update successful

- Press Reboot and wait approx. 1 minute.

Note To complete the update process the OPC UA gateway must be re-started.

Note After a successful firmware upgrade, perform a factory reset on the device!

Note After 30 minutes the update server goes into timeout mode and can no longer be accessed. You can restart the update server following a mains reset by pressing the “S1” button.

Note After the initial update, IP address 192.168.7.1 can be called up immediately using the login screen.

Codes and Technical Specifications

OPC UA data register

Note If the device displays an actual value of -999.98 in the control loop for temperature, CO2 or O2, the device is in the heat-up phase.

If the value displayed is -999.99, there is a sensor fault in the control loop.

OPC UA register	Datatype	Function	READ/WRITE
Device Configuration			
Mainboard Version	String	Mainboard software version	R
Device-Name	String	Device name / model	R
Date-Time	DateTime	Time and date of the device	R
Device-Status			
Water-Level	Boolean	Water level (100 or 0)	R
Low-Humidity	Boolean	Function Low Humidity active	R
CO2-Cylinder-Status	ulnt16	Cylinder A active (0x01), cylinder B active (0x02), pressure in cylinder A OK (0x10), pressure in cylinder B OK (0x20)	R
O2-Cylinder-Status	ulnt16	Cylinder A active (0x01), cylinder B active (0x02), pressure in cylinder A OK (0x10), pressure in cylinder B OK (0x20)	R
HEPA configuration	ulnt8	Active/inactive (1/0)	R
Door-Status	Boolean	Door open/Door closed (1/0)	R
Is-Present	Boolean	Indicates whether there is active communication between the incubator and the gateway	R
Error-Status			
CO2-Error	ulnt32	Control loop error status (see below, 5.7)	R
Device-Errors	ulnt32	Control loop error status (see below, 5.7)	R

OPC UA register	Datatype	Function	READ/WRITE
O2 errors	uint32	Control loop error status (see below, 5.7)	R
Rh-Value-Errors	uint32	Control loop error status (see below, 5.7)	R
Temperature-Errors	uint32	Control loop error status (see below, 5.7)	R
Temperature			
Setpoint-Value	Float	Setpoint of the control loop	R
Actual-Value	Float	Actual value of the control loop, 2 decimal places	R
CO2-Concentration			
Setpoint-Value	Float	Setpoint of the control loop	R
Actual-Value	Float	Actual value of the control loop, 2 decimal places	R
O2-Concentration			
Setpoint-Value	Float	Setpoint of the control loop	R
Actual-Value	Float	Actual value of the control loop, 2 decimal places	R
Program-Status-SteriRun			
Active status	uint16	Current status of the routine (see below)	R
Remaining-Time	uint16	Remaining time in the routine (min.)	R
Date-Time	DateTime	Starting time of the routine	R
Program-Status-AutoStart			
Active status	Boolean	Current status of routine 0/1 (inactive/active)	R
Date-Time	DateTime	Starting time of the routine	R

Current disinfection status

Bit	Disinfection
0x00	Disinfection inactive
0x01	Initializing
0x02	Waiting for door opening
0x03	Door opening
0x04	Waiting for confirmation
0x05	Start
0x06	Heating
0x07	Hold
0x08	-
0x09	Cooling down
0x0A	Drying
0x0B	Waiting for confirmation/completed
0x0C	Cancellation
0x0D	-
0x0E	-
0x0F	-

Error Codes

Bit	Error Events
Device Error (lower 16 bits, are stored in the data logger and error memory)	
0x00000002	Device door open too long (10 min)
0x00000004	Display does not communicate
0x00000008	Parameter mainboard implusible (EEPROM defective)
0x00000010	Data logger defective (device is still functional)
0x00000040	Error in disinfection / ContraCon
0x00000080	PowerDown during ContraCon
0x00000100	Plausibility measurement at reference resistor failed
0x00000200	Error bottle rotator does not communicate
0x00000400	Fan error (tolerance band is left)
0x00000800	Nautica: no water (menu button red)

Bit	Error Events
0x00002000	Status bit: Autostart active (info)
0x00004000	Status bit: disinfection active (info)

Control loop error	
Temperature	
0x0001	Sensor / probe break
0x0002	Actual value above
0x0004	Actual value below
0x0008	Actual value not plausible
0x0010	Calibration values too high/too low
0x0020	reserve
0x0040	reserve
0x0080	reserve
0x0100	reserve
0x0200	reserve
0x0400	reserve
0x0800	reserve
0x1000	reserve
0x2000	reserve
CO2	
0x0001	Sensor / probe break
0x0002	Actual value above
0x0004	Actual value below
0x0008	Communication error RH sensor
0x0010	Calibration values too high/too low
0x0020	Fault communication to sensor (I2C)
0x0040	Error gas cylinder switch does not communicate (I2C bus)
0x0080	No gas present, bottle A and B empty
0x0100	Sensor break RH sensor
0x0200	Gas bottle A empty
0x0400	Gas bottle B empty
0x0800	reserve
0x1000	reserve
0x2000	reserve

O2	
0x0001	Sensor / probe break
0x0002	Actual value above
0x0004	Actual value below
0x0008	Communication error RH sensor
0x0010	Calibration values too high/too low
0x0020	Fault communication to sensor (I2C)
0x0040	Error gas cylinder switch does not communicate (I2C bus)
0x0080	No gas present, bottle A and B empty
0x0100	Sensor break RH sensor
0x0200	Gas bottle A empty
0x0400	Gas bottle B empty
0x0800	reserve
0x1000	reserve
0x2000	reserve
rH (Kronos Silver)	
0x0001	reserve
0x0002	reserve
0x0004	reserve
0x0008	reserve
0x0010	reserve
0x0020	reserve
0x0040	reserve
0x0080	reserve
0x0100	No water
0x0200	reserve

Technical Specifications

Designation	Unit	Value
Power requirements	V DC	5
Rated current	A	1.4
Tolerance	%	± 5
Temperature operating range	°C	0 - 34
Relative humidity	%	5 - 80
Storage temperature	°C	0 - 70
Pollution degree		2
Protection type		IP 20 in separate cabinet
Housing data:		
Length x Width x Height	mm	150 x 82 x 30
Altitude	m above sea level	2000