Optris Ethernet TCP/IP / Modbus TCP communication Interface Kit

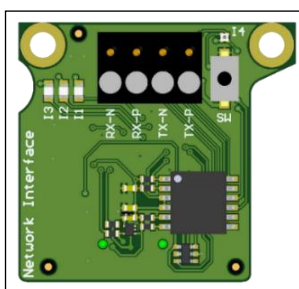# Optris Ethernet TCP/IP / Modbus TCP communication Interface Kit

1. General

The Optris Ethernet TCP/IP /Modbus TCP interface board can be easily installed inside the electronic box of any CT, CTlaser or CTratio. The interface connector is a 4-pin M12 connector, D-coded, installed on the left side of the CT electronic box. It is suited for industrial communication with an IP67 protection rate and a screw retention feature.

The network settings are stored on the board and the board communicates with the Optris CT via serial interface. The network settings remain on the board in case of interchanging the Optris CT electronic box.

2. Scope

The Optris Ethernet TCP/IP / Modbus TCP communication Interface allows you to communicate with your CT via the TCP/IP or Modbus TCP protocol in a network.

For the communication different possibilities are supplied:
- Compact Connect or CompactPlus Connect – software communication tool for Optris pyrometers.
- Excel sheet with macros for the TCP/IP communication
- Communication with your Modbus tool via the Modbus TCP protocol
- Fully developed C# scripts as pre-installed examples as window batch files

Figure 1: Optris Ethernet TCP/IP / Modbus TCP communication interface board

3. Installation overview

3.1 Hardware Installation

Insert the Ethernet TCP/IP / Modbus TCP communication interface board in the CT electronic board like described in ACCTENMBTCPK-MAD-E2024-01-A.pdf. Power the CT electronic box with 8-36 V, the Ethernet TCP/IP / Modbus TCP communication interface board gets the power from the CT electronic box. Connect the Ethernet TCP/IP / Modbus TCP communication interface board socket with a network cable to a switch in your network (*DHCP mode*) – recommended, or directly to your PC (*direct mode*) – delivery status. You can change the network mode manually as described in chapter **5**.

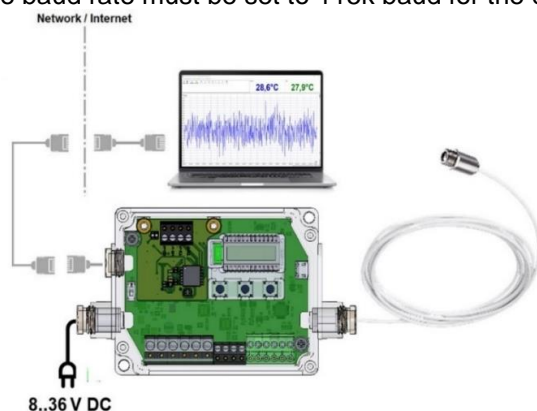The baud rate must be set to 115k baud for the communication between the Optris CT electronic box.

Figure 2: Installation overview

3.2 IP-address mode

The Network interface is supplied in static mode by default, the static IP address is **192.168.0.102**. To change the mode to the DHCP mode are different possibilities available.
1. Supplied Excel sheet (**3.3**)
2. Web browser of the network adapter (**3.4**)
3. Manually, as described in chapter **5.**

Note: In the DHCP mode you have to connect the interface to your company network to get the IP address of the interface. To find the IP address use the supplied Excel sheet (**3.3**), or the software CompactConnect (**3.5**) or CompactPlus Connect (**3.6**) or your own DHCP commissioning tool.

3.3 Supplied Excel sheet

Open the supplied Excel sheet. Under the tab *Discover* click on the button **Discover devices**. All connected Xi/CSV Ethernet TCP/IP modules in your network will be shown in the table.
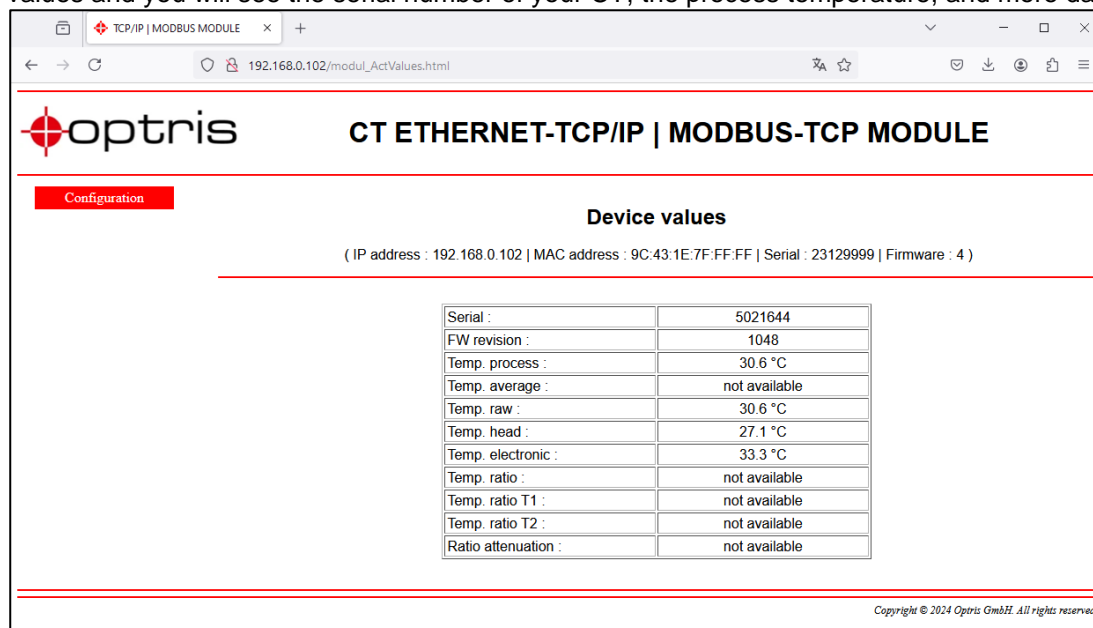
TCP/IP devices :							
IP address	MAC address	Ipmode	static IP	subnet mask	Port config	Port command	Port Modbus
192.168.49.77	00:1A:B6:00:02:74	0	10.10.10.1	255.255.255.0	55001	55002	502

Use the found IP address to change the IP mode under the tab *Configuration*.

Under the tab *Read_Temp* use the drop-down menu button to select founded IP addresses of the Ethernet TCP/IP modules and click on the button **Connect**, the table will be filled, and the diagram will show the measured temperature values. The table is limited to the set number of values.

3.4 Webbrowser

Open your web browser and type the IP-address in the address line in the web browser. Click on show CT values and you will see the serial number of your CT, the process temperature, and more data.
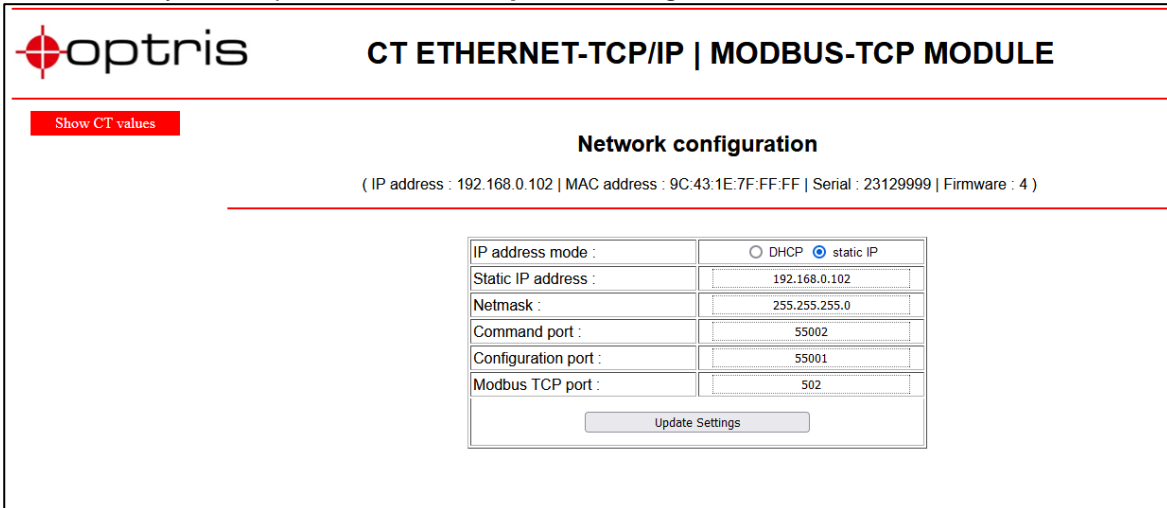
Figure 3: Web interface of the Network CT-TCP/IP Module

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Click on **Configuration**. Change the IP address mode to *Static IP* and set the IP address to the network IP address of your computer and click on *Update Settings.*

Figure 4: Network Configurations of the CT-TCP/IP module

3.5 CompactConnect

Start the supplied software *CompactConnect*. Go to **interface** and set the hook in **Scan device** under **Ethernet Mode**.
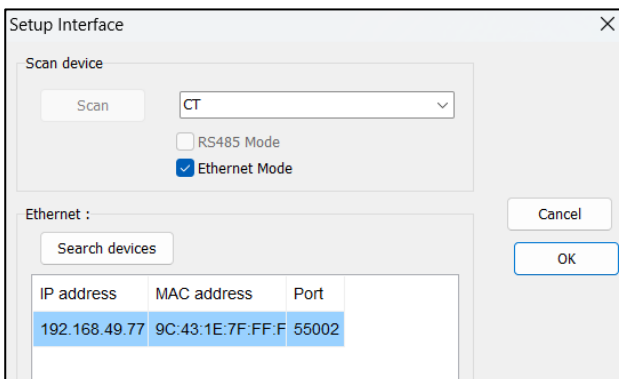
Figure 5: Setup interface CompactConnect

Click on Search Devices (**Figure 6**). After the *CompactConnect* has found your device click on **OK** and the measurement begins.

Figure 6: Search devices

Note: the earliest version of *CompactConnect* which supports the TCP/IP communication is **1.10.10.2**.

3.6 CompactPlus Connect

Start the software *CompactPlus Connect* and go to **Device** and **Scan Devices**. All devices are shown in a list. Click on wished device and click on **Select**.
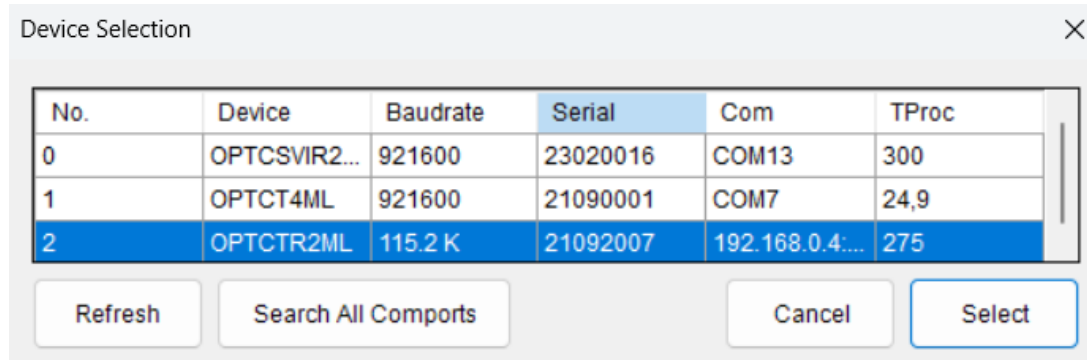
Note: the earliest version of *CompactPlus Connect* which supports the TCP/IP communication is **1.6.27**

3.7 Communication with programmed C#-script

A folder with pre-installed files written in C# you can find on the USB flash drive as an example. There are three windows batch files to demonstrate the possibilities of integration into your own software. To communicate with the TCP/IP interface, change in the batch files the IP address to the IP address of the interface and execute the batch files. *Discovery.bat* and *GetConfig.bat* are files to see your configurations and ports. For the temperatures, execute the *command.bat* file.

4. LED functions

The Ethernet TCP/IP / Modbus TCP module has 4 LED (I1…I4).
I1 – LED on → The connection to the IR device is established
I2 – LED → no function
I3 – LED on → Ethernet connection is established
I3 – LED is flashing → data transfer
I4 – LED → reset function

5. Reset Button – change IP mode

5.1 How to set the interface to DHCP mode

The interface must be switched off. Press the button **SW** on the board and switch the box on in the meantime. The I4 – LED flashes red. Release the button during or after the **fifth** time it flashes. I4 – LED flashes green 5 times as confirmation. After reset follow settings are restored:

IP-Mode:	**DHCP**
Static IP:	**0.0.0.0**
Subnet mask:	**0.0.0.0**
Port Modbus:	**502**
Port Config data:	**55001**
Port direct device:	**55002**

5.2 How to set the interface to direct mode

The interface must be switched off. Press the button **SW** on the board and switch the box on in the meantime. The I4 – LED flashes red. Release the button during or after the **sixth** time it flashes. I4 – LED flashes green 6 times as confirmation. After reset follow settings are restored:

IP-Mode:	**static**
Static IP:	**192.168.0.102**
Subnet mask:	**255.255.255.0**
Port Modbus:	**502**
Port Config data:	**55001**
Port direct device:	**55002**

6. Connection of multiple devices

Each of the devices must get an own IP address but they must be in the same subnet.

7. Troubleshooting

In case of missing .NET packages lease go to the website https://dotnet.microsoft.com/en-us/download/dotnet/thank-you/runtime-6.0.25-windows-x64-installer and download the package for your operating system.

For the communication with the supplied Excel sheet the macros must be activated and accepted.

In case of a possibility to communicate directly via the IP address but the CompactConnect software cannot find the TCP/IP module in the network
1. Check the subnet mask, the subnet of your Network and of the interface must be the same
2. Check your firewall settings, the firewall has to be permitted for the Communication for the software

Set the module to its default settings if required. Like described in chapter **5.**

Make sure that you have the right firmware. The LED I4 must flash once after powering the module.

8. Modbus Register list

For the communication with a PLC, you can use a Modbus tool. The complete list you will find on the manufacturer's website.

Use a Modbus tool with following settings.

Read out the data is done via the **Read Holding Register** and **Read Input Register**.

Changing the settings of the device is done over the **Write Holding Register**.

Connection type:	Tcp
Host address:	192.168.49.77
Port:	502
Byte order:	4321

| 03 Read Holding Registers ▼ |
| 01 Read Coils |
| 02 Read Discrete Inputs |
| 03 Read Holding Registers |
| 04 Read Input Registers |
| 05 Write Single Coil |
| 06 Write Single Register |
| 08 Diagnostics |
| 15 Write Multiple Coils |
| 16 Write Holding Registers |

8.1 Input Register

Description	Type	Register Address	Register-Size	Data-Format	Comment
Modbus CT FW Revision	R - Input Register	1000	1	= Value/100	Set by Firmware
Error-FileID	R - Input Register	1001	1	FileID where error is triggered	
Error-Line	R - Input Register	1002	1	Line in file where error is triggered	
Error-Code	R - Input Register	1003	1	Error code e.g. HAL_ERROR	
Error-Data	R - Input Register	1004	1	Additional data e.g. state	
Error-Count	R - Input Register	1005	1	Count how often this error has occurred	

Description	Type	Register Address	Register-Size	Data-Format	Comment
Serial number	R - Input Register	1010	2	= Value1*2^16 + Value2	For CTLT and CTxM
Serial number	R - Input Register	1010	2	= Value1*2^16 + Value2	For CTratio and CT4M
CT FW Revision	R - Input Register	1012	1	= Value	
CT Sensor Information	R - Input Register	1013	3	Value 1 = Sensor type Value 2 = Lower Temperature Value 3 = Upper Temperature	For CTLT

Description	Type	Register Address	Register-Size	Unit [ ]	Data-Format	Comment
Temp. - process	R - Input Register	1020	1	°C	= (Value - 1000) / 10	
Temp. - Head	R - Input Register	1021	1	°C	= (Value - 1000) / 10	
Temp. - Box	R - Input Register	1022	1	°C	= (Value - 1000) / 10	
Temp. - Act	R - Input Register	1023	1	°C	= (Value - 1000) / 10	
Temp. - Avg	R - Input Register	1024	1	°C	= (Value - 1000) / 10	For CTratio and CT4M

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Description	Type	Register Address	Register-Size	Unit [ ]	Data-Format	Comment
Temp - Ratio	R - Input Register	1025	1	°C	= (Value - 1000) / 10	Only for CTratio
Temp - T2	R - Input Register	1026	1	°C	= (Value - 1000) / 10	Only for CTratio
Temp - T1	R - Input Register	1027	1	°C	= (Value - 1000) / 10	Only for CTratio
Temp - Attenuation	R - Input Register	1028	1	°C	= (Value - 1000) / 10	Only for CTratio

Description	Type	Register Address	Register-Size	Unit [ ]	Data-Format	Comment
Epsilon Act	R - Input Register	1040	1		= (Value) / 1000	For CTratio and CT4M
Transmission Act	R - Input Register	1041	1		= (Value) / 1000	For CTratio and CT4M
Epsilon T1	R - Input Register	1042	1		= (Value) / 1000	Only for CTratio
Epsilon T2	R - Input Register	1043	1		= (Value) / 1000	Only for CTratio
Slope	R - Input Register	1044	1		= (Value) / 1000	Only for CTratio

8.2 Holding Register

Description	Type	Register Address	Register-Size	Data-Format	Comment
MODBUS-ID	R/W - Holding Register	10000	1	ID: 1 - 247	MODBUS Setting
MODBUS Baudrate	R/W - Holding Register	10001	1	1: 9600 Baud 2: 19200 Baud	MODBUS Setting
Error-Count Reset	R/W - Holding Register	10002	1	0: Idle 1: Reset	Resets the error repetition count to 0

Description	Type	Register Address	Register-Size	Unit [ ]	Data-Format	Comment
Transmission 2	R/W - Holding Register	10008	1		= (Value) / 1000	Only for CTratio
Epsilon Slope	R/W - Holding Register	10009	1		= (Value) / 1000	Only for CTratio
Epsilon	R/W - Holding Register	10010	1		= (Value) / 1000	
Transmission	R/W - Holding Register	10011	1		= (Value) / 1000	
Spot Illumination Laser	R/W - Holding Register	10012	1		1 = On 0 = Off	
AVG Time	R/W - Holding Register	10013	1	ms	= Value	
AVG Mode	R/W - Holding Register	10014	1		1 = Smart Averaging 0 = Normal	

Peak Hold Time	R/W - Holding Register	10015	1	ms	= Value	Only CTLT
Smart Threshold	R/W - Holding Register	10015	1	ms	= Value	Only for CTratio and CT4M
Valley Hold Time	R/W - Holding Register	10016	1	ms	= Value	Only CTLT
Temp. Unit	R/W - Holding Register	10053	1		0 = °C 1 = °F	

9. Contact information

If you have further questions, please contact:

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