Initial Startup of the EtherCAT Interface for optris® CTi and CTratio Series

Content

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1 Introduction

This manual describes the initial steps to bring the new EtherCAT interface for the Optris CTi and CTratio series online. It covers the network integration and activation of the device within your EtherCAT master system.
For detailed parameter descriptions, process data configuration, and advanced functionality, please refer to the separate parameter table.

2 Safety and Guidelines

2.1 Manufacturer Information

This device is manufactured by Optris GmbH & Co. KG. As per the EtherCAT Technology Group (ETG) membership and logo usage guidelines, the following statement is applicable:

- EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

2.2 Safety Precautions

Please observe all general safety instructions provided in the main operating manual of your Optris device. Ensure the device is powered correctly and that all electrical connections are made with the power switched off.

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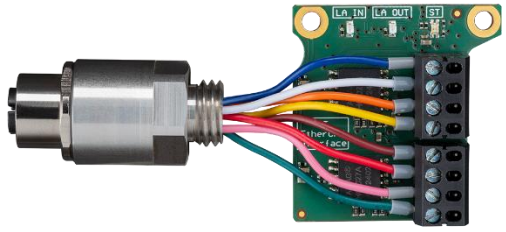
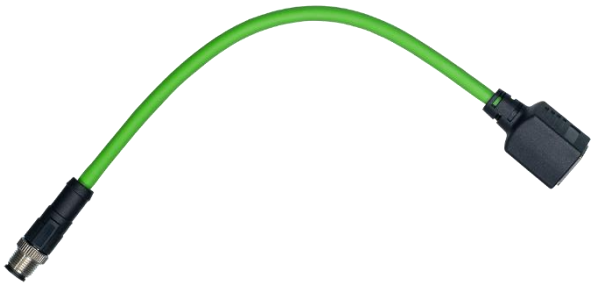
3 Scope of supply

- Interface PCB incl. wires and connector



- Y-Cable for EC IN and EC OUT signals with 4-pin M12 D-coded connectors

- 2 x Adapter cable 4-pin M12 D-coded connectors to RJ45 socket



- CTi EtherCAT-Cover with windows for EtherCAT Status-LEDs for exchanging existing CTi-Cover

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4 Hardware Setup

4.1 Install interface board

Please plug the EtherCAT Interface board into the place provided, which is located beside the display. In the correct position, the holes of the Interface board match with the thread holes of the CTi box.
Press the Interface board down to connect it with the Optris CTi Electronic Box. Use both M3x5 screws for fixing the interface on the electronic board. Exchange the blind screw on the CT box by M12 8-pin connector and connect the wires corresponding to the colors as shown in **Figure 1**.

Figure 1: opened CTi Electronic Box with EtherCAT interface board

Figure 2: CTi with EtherCAT-Cover and Y-Cable for EC IN and EC OUT signals

4.2 Physical Connection

Network Cable: Use a standard Ethernet cable (CAT5e or higher) to connect the device to your EtherCAT network segment.

Connection: The cable is terminated with 4-pin M12 D-coded connectors on both ends. Alternatively, you can use the supplied RJ 45 socket adapter**.**

Port Usage: The device features two EtherCAT ports (IN and OUT). Connect the upstream device (e.g., the EtherCAT master or previous slave) to the **IN** port. Connect the downstream device to the **OUT** port to continue the EtherCAT ring.

Power: Ensure the device is powered via its designated power supply input. **Do not** use the side USB port for power during EtherCAT operation, as this will interrupt EtherCAT communication.

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4.3 Network Integration

Integrate the device into your EtherCAT network as you would any other EtherCAT Slave device. The physical topology is a line or bus.

5 Software Configuration

5.1 Scanning the Network

- Start your EtherCAT Master configuration tool (e.g., TwinCAT, CODESYS, etc.).
- Initiate a "Scan for Devices" or "Online Scan" on the appropriate Ethernet adapter.
- The Optris device should be detected as a slave device. It will be identified by its **Vendor ID**, **Product Code**, and **Revision Number**. These values are pre-configured and will be listed in the separate parameter table.

5.2 Loading the Description File (ESI)

- To ensure correct configuration, the EtherCAT Slave Information (ESI) file must be available to your master.
- The ESI file (optris_CT_Series_Exxx.xml) can be obtained from the optris website or your support package.
- Import this file into your master's EtherCAT repository if it is not already included in its standard library.
- Once the ESI file is loaded, the master will correctly map the device's Process Data Objects (PDOs) and CoE (CANopen over EtherCAT) parameters.

5.3 Setting to Operational Mode (OP)

- After the device is correctly identified and the PDO mapping is set (typically via the ESI file), you can change the state of the EtherCAT slave from PRE-OPERATIONAL to SAFE-OPERATIONAL and finally to OPERATIONAL.
- In OPERATIONAL mode, the cyclic exchange of process data (e.g., temperature values) begins.

6 Initial Operation Check

- Link Status: Verify that the Link/Activity (L/A) LEDs (see: **Figure *3***) on the device's EtherCAT ports are illuminated, indicating a successful physical connection.
- Master Status: In your EtherCAT master software, confirm that the slave status for the Optris device is reported as "OP" (Operational).
- Data Validation: Check the incoming process data in your master's visualization or I/O monitor against the expected values to confirm successful communication.

Figure 3: Cover for the Optris Devices with EtherCAT interface

7 Troubleshooting

Symptom	Possible Cause	Solution
Device not found during scan.	Incorrect physical connection; No power; Defective cable.	Check power and cable connections. Verify the device is connected to the IN port.
Slave remains in "INIT" state.	ESI file not loaded or incorrect.	Import the correct ESI file for your device model into the EtherCAT master configuration tool.
Communication errors/lost link.	Network cable issues; Electrical noise; Incorrect network termination.	Use a shielded Ethernet cable. Ensure the network is correctly terminated if required.

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Symptom	Possible Cause	Solution
Process data is incorrect.	PDO mapping does not match the expected structure.	Verify that the PDO assignment and mapping in the master match the definitions in the provided ESI file.

8 Parameter Table

8.1 Device Profile

Device Profile:	5001	Modular Device Profile
Modul Profile:	0	
IndexIncrement:	0x10	
PdoIndexIncrement:	0x1	

Usage Notes:

- The PDO mapping object and SyncManager assignment object doesn't need to be defined. In that case they are created automatically.
- The following objects are fixed included in the SSC and shall not be defined in the file : 0x1000, 0x1001, 0x1008, 0x1009, 0x100a, 0x1010, 0x1011, 0x1018, 0x10F0, 0x10F1, 0x10F3, 0x1c00, 0x1c32, 0x1c33
- Entries less or equal one 8Bit shall not overlap byte borders
- Entries greater 8Bit shall always start at an exact word border

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The object dictionary defined here shall be used complementary with ETG.5001 and ETG.1000

Index	ObjectCode	SI	DataType	Name	Default	Min	Max	M/O/C	B/S	Access	rx/tx	CoeRead	CoeWrite	Description
//0x04xx	Units													
//0x8xx	Enums (0x0800 - 0xFFF)													
//0x6nnx	Input Data of the Module (0x6000 - 0x6FFF)													
0x6010	RECORD			Temperatures (LT and xM device)										
		1	REAL32	Process		0xc2480000	0x455ac000			ro	tx			Process temperature
		2	REAL32	Averaging		0xc2480000	0x455ac000			ro	tx			Averaging temperature
		3	REAL32	Current		0xc2480000	0x455ac000			ro	tx			Current temperature
		4	REAL32	Head		0xc2480000	0x43af0000			ro	tx			Head temperature
		5	REAL32	Electronic		0xc2480000	0x42fa0000			ro	tx			Electronic temperature
0x6020	RECORD			Temperatures Ratio device										
		1	REAL32	Ratio		0xc2480000	0x455ac000			ro	tx			Ratio temperature
		2	REAL32	Ratio T1		0xc2480000	0x455ac000			ro	tx			Ratio T1 temperature
		3	REAL32	Ratio T2		0xc2480000	0x455ac000			ro	tx			Ratio T2 temperature
		4	REAL32	Ratio Attenuation		0xc2480000	0x455ac000			ro	tx			Ratio attenuation
0x6030	RECORD			IO pins										
		1	REAL32	Voltage IO1						ro	tx			Current voltage on IO1

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		2	REAL32	Voltage IO2			ro	tx		Current voltage on IO2
		3	REAL32	Voltage IO3			ro	tx		Current voltage on IO3
0x6040	RECORD			Other values						
		1	REAL32	Current emissivity	0x3d4ccccd	0x3f8ccccd	ro	tx		Current used emissivity
		2	REAL32	Current transmissivity	0x3d4ccccd	0x3f8ccccd	ro	tx		Current used transmissivity
//0x7nnx	Output Data of the Module (0x7000 - 0x7FFF)									
//0x8nnx	Configuration Data of the Module (0x8000 - 0x8FFF)									
0x8000	RECORD			Settings				CTsdoRead	CTsdoWrite	Configuration
		1	BOOL	TempUnit C	0	1	rw			Temp unit
		2	BOOL	Panel lock	0	1	rw			Panel keys lock
		3	BOOL	Laser on	0	1	rw			Laser Off/On
		4	pad_13							
		5	REAL32	Emissivity	0x3d4ccccd	0x3f8ccccd	rw			Emissivity
		6	REAL32	Transmissivity	0x3d4ccccd	0x3f8ccccd	rw			Transmissivity
		7	REAL32	Ratio slope	0x3d4ccccd	0x3f8ccccd	rw			Ratio slope
		8	REAL32	Ratio emissivity T1	0x3d4ccccd	0x3f8ccccd	rw			Ratio emissivity for T1
		9	BYTE	Averaging mode			rw			Averaging mode
		10	pad_8							
		11	REAL32	Averaging time	0	0x42820000	rw			Averaging time
		12	REAL32	Smart threshold			rw			Averaging smart threshold
		13	REAL32	Attenuation max			rw			Attenuation max

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		14	BYTE	Attenuation mode	0	2	rw		Attenuation mode
		15	pad_8						
		16	REAL32	Attenuation fix			rw		Attenuation fix
0x8010	RECORD			CT_Command_Request				CTsdoRead CTsdoWrite	CT request
		1	ARRAY [0..31] OF BYTE	Buffer			rw		request byte array
		2	BYTE	bytesToSend			rw		request length
		3	BYTE	BytesToReceive			rw		response length
		4	UINT16	Timeout			rw		timeout in ms
		5	BOOL	ReadyToSend			rw		true - start request
		6	pad_7						
0x8011	RECORD			CT_Command_Response				CTsdoRead	CT response
		1	BYTE	BytesReceived			ro		responsed bytes
		2	ARRAY [0..31] OF BYTE	Buffer			ro		response byte array
		3	BOOL	Busy			ro		true - pending request
		4	BOOL	Timeout			ro		true - timout occured
		5	pad_7						
//0x9nnx	Information Data of the Module (0x9000 - 0x9FFF)								
0x9000	RECORD			Device informations					
		1	UINT32	Serial			ro		CT serial
		2	UINT16	Firmware revision			ro		CT firmware revision
		3	BOOL	TempUnit C			ro		TempUnit C

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4	pad_15			
5	REAL32	Measuring range low	ro	Measuring range low
6	REAL32	Measuring range high	ro	Measuring range high
7	REAL32	Measuring range T1 low	ro	Measuring range T1 low
8	REAL32	Measuring range T2 low	ro	Measuring range T2 low
9	REAL32	Ambient range low	ro	Ambient range low
10	REAL32	Ambient range high	ro	Ambient range high
11	STRING(24)	Modelname	ro	Modelname
12	ARRAY [0..15] OF BYTE	Device flags	ro	Modelflags

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9 Support

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