

---

# **UAM-05LECA**

## **EtherCAT Communication Specification**



---

Revision History

| Revision Symbol | Revision Date | Revision Details |
|-----------------|---------------|------------------|
| —               | July, 2025    | First release    |

---

## Table of Contents

|                                                       |    |
|-------------------------------------------------------|----|
| Table of Contents .....                               | 2  |
| 1. Introduction .....                                 | 3  |
| 2. Abbreviations and Descriptions .....               | 3  |
| 3. EtherCAT Specification .....                       | 3  |
| 4. Data Structure .....                               | 4  |
| 4.1 Safety Data .....                                 | 4  |
| 4.1.1 Safety Input Data for Area Input Mode .....     | 4  |
| 4.1.2 Safety Input Data for Encoder Input Mode .....  | 5  |
| 4.1.3 FSoE RxPDO-Mapping .....                        | 6  |
| 4.1.4 Safety Output Data For Area Input Mode .....    | 8  |
| 4.1.5 Safety Output Data for Encoder Input Mode ..... | 9  |
| 4.1.6 FSoE TxPDO-Mapping .....                        | 10 |
| 4.1.7 Safety PDO Assign .....                         | 13 |
| 4.1.8 Safety Information .....                        | 13 |
| 4.2 Non-Safety Data .....                             | 15 |
| 4.2.1 FoE Communication .....                         | 15 |
| 4.2.2 EoE Communication .....                         | 17 |
| 4.2.3 CoE Communication .....                         | 19 |
| 5. FSoE Setting .....                                 | 24 |
| 5.1 Safety Module .....                               | 24 |
| 5.2 Safety Address .....                              | 25 |
| 6. UDP Communication .....                            | 26 |
| 6.1 On Request Mode .....                             | 26 |
| 6.2 Target Mode .....                                 | 26 |



## 1. Introduction

This document outlines the data exchanged between UAM-05LECA and the controller over the EtherCAT network.

Description in this document is based on the TwinCAT master controller by Beckhoff Automation GmbH.

## 2. Abbreviations and Descriptions

FSoE: Fail Safe over EtherCAT

CoE: CAN Application Protocol over EtherCAT

EoE: Ethernet over EtherCAT

FoE: File Access over EtherCAT

CRC: Cyclic Redundancy Check

## 3. EtherCAT Specification

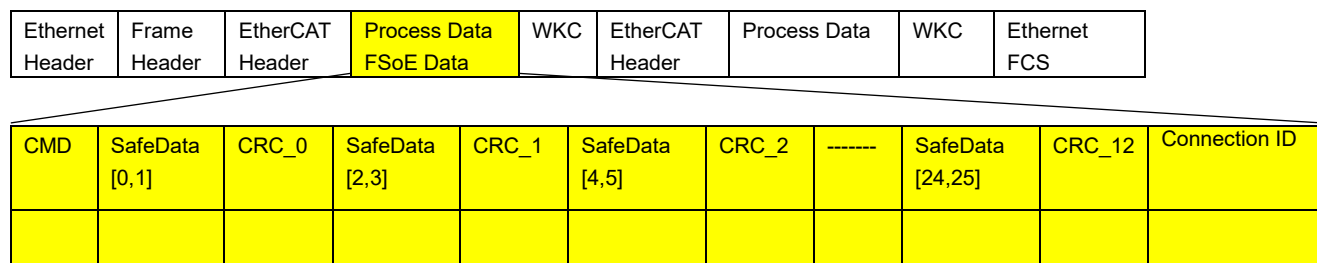
| Names                                     | Properties / Possibilities                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device Profile                            | 5001 (Modular device with fixed configuration)                                                                                                                                                                                                                                                                                                                      |
| Module Profile                            | 195 (Safety input and Output device)                                                                                                                                                                                                                                                                                                                                |
| Safety Module Ident                       | Area Input Mode (0x00C3F050), Encoder Input Mode (0x00C3F051)                                                                                                                                                                                                                                                                                                       |
| Cyclic Time                               | More than 0.500ms in Run Mode                                                                                                                                                                                                                                                                                                                                       |
| Cyclic communication (Process data)       | FSoE TxPDO & RxPDO with fixed mapping                                                                                                                                                                                                                                                                                                                               |
| FSoE Cyclic Time                          | 100ms + FSoE cycle time (Depends on the main device system)                                                                                                                                                                                                                                                                                                         |
| FSoE Safe Address                         | 1 ~ 65535                                                                                                                                                                                                                                                                                                                                                           |
| FSoE watch dog timer                      | 100ms ~ 10s Default: 500ms                                                                                                                                                                                                                                                                                                                                          |
| Safety application                        | Not supported                                                                                                                                                                                                                                                                                                                                                       |
| Acyclic communication (Mailbox)           | CAN application layer over EtherCAT (CoE)<br>File Access over EtherCAT (FoE)<br>Ethernet Access over EtherCAT (EoE)<br>Simultaneously FoE, EoE communication is not supported.                                                                                                                                                                                      |
| CoE (CAN application layer over EtherCAT) | SDO complete access (SDO upload and SDO Download)<br>SDO Information service (Object Dictionary)                                                                                                                                                                                                                                                                    |
| FoE                                       | FoE Download (Size: 4MB max)<br>File type: xxxx.foe, (UAM Setting file generated by UAM Project Designer, No password needed)<br>FoE Upload (Not Supported)                                                                                                                                                                                                         |
| Ethernet Access over EtherCAT (EoE)       | IP, DHCP, TCP and UDP are supported<br>Simultaneously TCP and UDP communication is not supported<br>(Priority: TCP > UDP)<br>Port No = 10940,<br>TCP Connection = 1 max,<br>UDP Connection = 2 max<br>Data transfer rate = less than 90ms (1ms of EtherCAT cycle, Mailbox size = 1024)<br>Data transfer rate = 30ms (0.30ms of EtherCAT cycle, Mailbox size = 1024) |
| DC                                        | Not supported                                                                                                                                                                                                                                                                                                                                                       |
| Mailbox size                              | Standard mailbox length = Max 1024 Bytes (Variable length is supported 128bytes ~ 1024bytes)                                                                                                                                                                                                                                                                        |
| Explicit Device Identification            | Not supported                                                                                                                                                                                                                                                                                                                                                       |
| LED Indicators                            | ECAT RUN, ECAT ERROR                                                                                                                                                                                                                                                                                                                                                |
| EtherCAT Conformance                      | EtherCAT protocol:<br>- EtherCAT Conformance Test Tool V2.1.0.2<br>- EtherCAT Conformance Test Record ETG7000-2 V1.2.8<br>ETG 1300 Indicator Specification<br>ETG 9001 Marking rules                                                                                                                                                                                |
| Supported Topology                        | Line or Ring                                                                                                                                                                                                                                                                                                                                                        |



## 4. Data Structure

### 4.1 Safety Data

Safety data between UAM and controller are exchanged via FSoE communication. Data structure is shown below.



#### 4.1.1 Safety Input Data for Area Input Mode

| Safety input data from controller to sensor for area input mode |                                    |               |                       |                                                       |
|-----------------------------------------------------------------|------------------------------------|---------------|-----------------------|-------------------------------------------------------|
| Size                                                            | Name                               | Bit field     | Description           | Value                                                 |
| 1 byte                                                          | Area Input Signal State            | Bit 0         | Area Input 1          | 1 ~ 176                                               |
|                                                                 |                                    | Bit 1         | Area Input 2          |                                                       |
|                                                                 |                                    | Bit 2         | Area Input 3          |                                                       |
|                                                                 |                                    | Bit 3         | Area Input 4          |                                                       |
|                                                                 |                                    | Bit 4         | Area Input 5          |                                                       |
|                                                                 |                                    | Bit 5         | Area Input 6          |                                                       |
|                                                                 |                                    | Bit 6         | Area Input 7          |                                                       |
|                                                                 |                                    | Bit 7         | Area Input 8          |                                                       |
| 1 byte                                                          | Reset Input Signal State           | Bit 0         | Protection1 Reset In  | 0: Signal is low<br>1: Signal is high                 |
|                                                                 |                                    | Bit 1         | Protection2 Reset In  |                                                       |
|                                                                 |                                    | Bit 2         | Protection3 Reset In  |                                                       |
|                                                                 |                                    | Bit 3         | Protection4 Reset In  |                                                       |
|                                                                 |                                    | Bit 4         | Protection5 Reset In  |                                                       |
|                                                                 |                                    | Bit 5 ~ Bit 7 | Reserved              | 0                                                     |
| 2 bytes                                                         | Muting/Override Input Signal State | Bit 0         | Protection1 Muting 1  | 0: Signal is low<br>1: Signal is high                 |
|                                                                 |                                    | Bit 1         | Protection1 Muting 2  |                                                       |
|                                                                 |                                    | Bit 2         | Protection2 Muting 1  |                                                       |
|                                                                 |                                    | Bit 3         | Protection2 Muting 2  |                                                       |
|                                                                 |                                    | Bit 4         | Protection3 Muting 1  |                                                       |
|                                                                 |                                    | Bit 5         | Protection3 Muting 2  |                                                       |
|                                                                 |                                    | Bit 6         | Protection4 Muting 1  |                                                       |
|                                                                 |                                    | Bit 7         | Protection4 Muting 2  |                                                       |
|                                                                 |                                    | Bit 8         | Protection5 Muting 1  |                                                       |
|                                                                 |                                    | Bit 9         | Protection5 Muting 2  |                                                       |
|                                                                 |                                    | Bit 10        | Protection1 Override  |                                                       |
|                                                                 |                                    | Bit 11        | Protection2 Override  |                                                       |
|                                                                 |                                    | Bit 12        | Protection3 Override  |                                                       |
|                                                                 |                                    | Bit 13        | Protection4 Override  |                                                       |
|                                                                 |                                    | Bit 14        | Protection5 Override  |                                                       |
|                                                                 |                                    | Bit 15        | Reserved              | 0                                                     |
| 1 byte                                                          | Other Input Signal State           | Bit 0         | Laser off Mode        | 0: Laser off mode disable<br>1: Laser off mode enable |
|                                                                 |                                    | Bit 1         | Restart Safety Device | Always 0 or 1: None                                   |



|          |          |               |          |                                                                 |
|----------|----------|---------------|----------|-----------------------------------------------------------------|
|          |          |               |          | 0 – 1 – 0 pulse of more than 60ms:<br>Restart UAM safety device |
|          |          | Bit 2 ~ Bit 7 | Reserved | 0                                                               |
| 21 bytes | Reserved | -             | Reserved | 0                                                               |

#### 4.1.2 Safety Input Data for Encoder Input Mode

| Safety input data from controller to sensor for encoder input mode |                                    |               |                          |                                                                                        |
|--------------------------------------------------------------------|------------------------------------|---------------|--------------------------|----------------------------------------------------------------------------------------|
| Size                                                               | Name                               | Bit field     | Description              | Value                                                                                  |
| 1 byte                                                             | Encoder Pattern Input Signal State | Bit 0         | Encoder Pattern Input 1  | 1 ~ 32                                                                                 |
|                                                                    |                                    | Bit 1         | Encoder Pattern Input 2  |                                                                                        |
|                                                                    |                                    | Bit 2         | Encoder Pattern Input 3  |                                                                                        |
|                                                                    |                                    | Bit 3         | Encoder Pattern Input 4  |                                                                                        |
|                                                                    |                                    | Bit 4         | Encoder Pattern Input 5  |                                                                                        |
|                                                                    |                                    | Bit 5         | Encoder Pattern Input 6  |                                                                                        |
|                                                                    |                                    | Bit 6 ~ Bit 7 | Reserved                 | 0                                                                                      |
| 1 byte                                                             | Reset Input Signal State           | Bit 0         | Protection1 Reset In     | 0: Signal is low<br>1: Signal is high                                                  |
|                                                                    |                                    | Bit 1         | Protection2 Reset In     |                                                                                        |
|                                                                    |                                    | Bit 2         | Protection3 Reset In     |                                                                                        |
|                                                                    |                                    | Bit 3         | Protection4 Reset In     |                                                                                        |
|                                                                    |                                    | Bit 4         | Protection5 Reset In     |                                                                                        |
|                                                                    |                                    | Bit 5 ~ Bit 7 | Reserved                 | 0                                                                                      |
| 2 bytes                                                            | Muting/Override Input Signal State | Bit 0         | Protection1 Muting 1     | 0: Signal is low<br>1: Signal is high                                                  |
|                                                                    |                                    | Bit 1         | Protection1 Muting 2     |                                                                                        |
|                                                                    |                                    | Bit 2         | Protection2 Muting 1     |                                                                                        |
|                                                                    |                                    | Bit 3         | Protection2 Muting 2     |                                                                                        |
|                                                                    |                                    | Bit 4         | Protection3 Muting 1     |                                                                                        |
|                                                                    |                                    | Bit 5         | Protection3 Muting 2     |                                                                                        |
|                                                                    |                                    | Bit 6         | Protection4 Muting 1     |                                                                                        |
|                                                                    |                                    | Bit 7         | Protection4 Muting 2     |                                                                                        |
|                                                                    |                                    | Bit 8         | Protection5 Muting 1     |                                                                                        |
|                                                                    |                                    | Bit 9         | Protection5 Muting 2     |                                                                                        |
|                                                                    |                                    | Bit 10        | Protection1 Override     |                                                                                        |
|                                                                    |                                    | Bit 11        | Protection2 Override     |                                                                                        |
|                                                                    |                                    | Bit 12        | Protection3 Override     |                                                                                        |
|                                                                    |                                    | Bit 13        | Protection4 Override     |                                                                                        |
|                                                                    |                                    | Bit 14        | Protection5 Override     |                                                                                        |
|                                                                    |                                    | Bit 15        | Reserved                 | 0                                                                                      |
| 1 byte                                                             | Other Input Signal State           | Bit 0         | Laser off Mode           | 0: Laser off mode disable<br>1: Laser off mode enable                                  |
|                                                                    |                                    | Bit 1         | Restart Safety Device    | Always 0 or 1: None<br>0 – 1 – 0 pulse of more than 60ms:<br>Restart UAM safety device |
|                                                                    |                                    | Bit 2 ~ Bit 7 | Reserved                 | 0                                                                                      |
| 1 bytes                                                            | Reserved                           | Bit 0 ~ 7     | Reserved                 | 0                                                                                      |
| 2 bytes                                                            | Encoder Velocity                   | SINT16        | Encoder 1 Velocity       | -32768 ~ 32767 cm/s                                                                    |
| 2 bytes                                                            |                                    | SINT16        | Encoder 2 Velocity       |                                                                                        |
| 2 bytes                                                            |                                    | SINT16        | Encoder 3 Velocity       |                                                                                        |
| 2 bytes                                                            |                                    | SINT16        | Encoder 4 Velocity       |                                                                                        |
| 2 bytes                                                            | Encoder Linear Velocity            | SINT16        | Encoder Linear Velocity  | -32768 to 32767 cm/s                                                                   |
| 2 bytes                                                            | Encoder Angular Velocity           | SINT16        | Encoder Angular Velocity | -360 to 360 deg/s                                                                      |
| 8 bytes                                                            | Reserved                           | -             | Reserved                 | 0                                                                                      |



### 4.1.3 FSoE RxPDO-Mapping

| Safety Data from Controller to sensor with PDO mapping Index number |           |                |                    |                                    |           |        |                           |
|---------------------------------------------------------------------|-----------|----------------|--------------------|------------------------------------|-----------|--------|---------------------------|
| Index                                                               | Sub Index | PDO Data Index | PDO Data Sub Index | Name                               | Data Type | Access | Description               |
| 0x1600                                                              | -         | -              |                    | FSoE RxPDO-Map for Area Input Mode | -         | -      | -                         |
|                                                                     | 1         | 0x7000         | 2                  | Main Device Command                | UINT8     | RO     | FSoE Main Device Command  |
|                                                                     | 2         | 0x7001         | 1                  | SafeData_0_Bit_0                   | BOOL      | RO     | Area Input 1              |
|                                                                     | 3         | 0x7001         | 2                  | SafeData_0_Bit_1                   | BOOL      | RO     | Area Input 2              |
|                                                                     | 4         | 0x7001         | 3                  | SafeData_0_Bit_2                   | BOOL      | RO     | Area Input 3              |
|                                                                     | 5         | 0x7001         | 4                  | SafeData_0_Bit_3                   | BOOL      | RO     | Area Input 4              |
|                                                                     | 6         | 0x7001         | 5                  | SafeData_0_Bit_4                   | BOOL      | RO     | Area Input 5              |
|                                                                     | 7         | 0x7001         | 6                  | SafeData_0_Bit_5                   | BOOL      | RO     | Area Input 6              |
|                                                                     | 8         | 0x7001         | 7                  | SafeData_0_Bit_6                   | BOOL      | RO     | Area Input 7              |
|                                                                     | 9         | 0x7001         | 8                  | SafeData_0_Bit_7                   | BOOL      | RO     | Area Input 8              |
|                                                                     | 10        | 0x7001         | 9                  | SafeData_1_Bit_0                   | BOOL      | RO     | Protection1 Reset In      |
|                                                                     | 11        | 0x7001         | 10                 | SafeData_1_Bit_1                   | BOOL      | RO     | Protection2 Reset In      |
|                                                                     | 12        | 0x7001         | 11                 | SafeData_1_Bit_2                   | BOOL      | RO     | Protection3 Reset In      |
|                                                                     | 13        | 0x7001         | 12                 | SafeData_1_Bit_3                   | BOOL      | RO     | Protection4 Reset In      |
|                                                                     | 14        | 0x7001         | 13                 | SafeData_1_Bit_4                   | BOOL      | RO     | Protection5 Reset In      |
|                                                                     | 15        | 0x7001         | 14                 | SafeData_1_Bit_5_7                 | PAD_3     | RO     | Reserved (3 Bit Padding)  |
|                                                                     | 16        | 0x7000         | 4                  | CRC_0                              | UINT16    | RO     | FSoE Main Device CRC      |
|                                                                     | 17        | 0x7001         | 15                 | SafeData_2_Bit_0                   | BOOL      | RO     | Protection1 Muting 1      |
|                                                                     | 18        | 0x7001         | 16                 | SafeData_2_Bit_1                   | BOOL      | RO     | Protection1 Muting 2      |
|                                                                     | 19        | 0x7001         | 17                 | SafeData_2_Bit_2                   | BOOL      | RO     | Protection2 Muting 1      |
|                                                                     | 20        | 0x7001         | 18                 | SafeData_2_Bit_3                   | BOOL      | RO     | Protection2 Muting 2      |
|                                                                     | 21        | 0x7001         | 19                 | SafeData_2_Bit_4                   | BOOL      | RO     | Protection3 Muting 1      |
|                                                                     | 22        | 0x7001         | 20                 | SafeData_2_Bit_5                   | BOOL      | RO     | Protection3 Muting 2      |
|                                                                     | 23        | 0x7001         | 21                 | SafeData_2_Bit_6                   | BOOL      | RO     | Protection4 Muting 1      |
|                                                                     | 24        | 0x7001         | 22                 | SafeData_2_Bit_7                   | BOOL      | RO     | Protection4 Muting 2      |
|                                                                     | 25        | 0x7001         | 23                 | SafeData_3_Bit_0                   | BOOL      | RO     | Protection5 Muting 1      |
|                                                                     | 26        | 0x7001         | 24                 | SafeData_3_Bit_1                   | BOOL      | RO     | Protection5 Muting 2      |
|                                                                     | 27        | 0x7001         | 25                 | SafeData_3_Bit_2                   | BOOL      | RO     | Protection1 Override      |
|                                                                     | 28        | 0x7001         | 26                 | SafeData_3_Bit_3                   | BOOL      | RO     | Protection2 Override      |
|                                                                     | 29        | 0x7001         | 27                 | SafeData_3_Bit_4                   | BOOL      | RO     | Protection3 Override      |
|                                                                     | 30        | 0x7001         | 28                 | SafeData_3_Bit_5                   | BOOL      | RO     | Protection4 Override      |
|                                                                     | 31        | 0x7001         | 29                 | SafeData_3_Bit_6                   | BOOL      | RO     | Protection5 Override      |
|                                                                     | 32        | 0x7001         | 30                 | SafeData_3_Bit_7                   | PAD_1     | RO     | Reserved (1 Bit Padding)  |
|                                                                     | 33        | 0x7000         | 5                  | CRC_1                              | UINT16    | RO     | FSoE Main Device CRC      |
|                                                                     | 34        | 0x7001         | 31                 | SafeData_4_Bit_0                   | BOOL      | RO     | Laser Off Mode            |
|                                                                     | 35        | 0x7001         | 32                 | SafeData_4_Bit_1                   | BOOL      | RO     | Restart Safety Function   |
|                                                                     | 36        | 0x7001         | 33                 | SafeData_4_Bit_2_7                 | PAD_6     | RO     | Reserved (6 Bit Padding)  |
|                                                                     | 37        | 0x7001         | 34                 | SafeData_5                         | PAD_8     | RO     | Reserved (8 Bit Padding)  |
|                                                                     | 38        | 0x7000         | 6                  | CRC_2                              | UINT16    | RO     | FSoE Main Device CRC      |
|                                                                     | 39        | 0x7001         | 35                 | SafeData_6_7                       | PAD_16    | RO     | Reserved (16 Bit Padding) |
|                                                                     | 40        | 0x7000         | 7                  | CRC_3                              | UINT16    | RO     | FSoE Main Device CRC      |
|                                                                     | 41        | 0x7001         | 36                 | SafeData_8_9                       | PAD_16    | RO     | Reserved (16 Bit Padding) |
|                                                                     | 42        | 0x7000         | 8                  | CRC_4                              | UINT16    | RO     | FSoE Main Device CRC      |
|                                                                     | 43        | 0x7001         | 37                 | SafeData_10_11                     | PAD_16    | RO     | Reserved (16 Bit Padding) |
|                                                                     | 44        | 0x7000         | 9                  | CRC_5                              | UINT16    | RO     | FSoE Main Device CRC      |
|                                                                     | 45        | 0x7001         | 38                 | SafeData_12_13                     | PAD_16    | RO     | Reserved (16 Bit Padding) |



|        |    |        |    |                                       |        |    |                                |
|--------|----|--------|----|---------------------------------------|--------|----|--------------------------------|
|        | 46 | 0x7000 | 10 | CRC_6                                 | UINT16 | RO | FSoE Main Device CRC           |
|        | 47 | 0x7001 | 39 | SafeData_14_15                        | PAD_16 | RO | Reserved (16 Bit Padding)      |
|        | 48 | 0x7000 | 11 | CRC_7                                 | UINT16 | RO | FSoE Main Device CRC           |
|        | 49 | 0x7001 | 40 | SafeData_16_17                        | PAD_16 | RO | Reserved (16 Bit Padding)      |
|        | 50 | 0x7000 | 12 | CRC_8                                 | UINT16 | RO | FSoE Main Device CRC           |
|        | 51 | 0x7001 | 41 | SafeData_18_19                        | PAD_16 | RO | Reserved (16 Bit Padding)      |
|        | 52 | 0x7000 | 13 | CRC_9                                 | UINT16 | RO | FSoE Main Device CRC           |
|        | 53 | 0x7001 | 42 | SafeData_20_21                        | PAD_16 | RO | Reserved (16 Bit Padding)      |
|        | 54 | 0x7000 | 14 | CRC_10                                | UINT16 | RO | FSoE Main Device CRC           |
|        | 55 | 0x7001 | 43 | SafeData_22_23                        | PAD_16 | RO | Reserved (16 Bit Padding)      |
|        | 56 | 0x7000 | 15 | CRC_11                                | UINT16 | RO | FSoE Main Device CRC           |
|        | 57 | 0x7001 | 44 | SafeData_24_25                        | PAD_16 | RO | Reserved (16 Bit Padding)      |
|        | 58 | 0x7000 | 16 | CRC_12                                | UINT16 | RO | FSoE Main Device CRC           |
|        | 59 | 0x7000 | 3  | Connection ID                         | UINT16 | RO | FSoE Main Device Connection ID |
|        |    |        |    |                                       |        |    |                                |
| 0x1601 | -  | -      |    | FSoE RxPDO-Map for Encoder Input Mode | -      | -  | -                              |
|        | 1  | 0x7010 | 2  | Main Device Command                   | UINT8  | RO | FSoE Main Device Command       |
|        | 2  | 0x7011 | 1  | SafeData_0_Bit_0                      | BOOL   | RO | Encoder Pattern Input 1        |
|        | 3  | 0x7011 | 2  | SafeData_0_Bit_1                      | BOOL   | RO | Encoder Pattern Input 2        |
|        | 4  | 0x7011 | 3  | SafeData_0_Bit_2                      | BOOL   | RO | Encoder Pattern Input 3        |
|        | 5  | 0x7011 | 4  | SafeData_0_Bit_3                      | BOOL   | RO | Encoder Pattern Input 4        |
|        | 6  | 0x7011 | 5  | SafeData_0_Bit_4                      | BOOL   | RO | Encoder Pattern Input 5        |
|        | 7  | 0x7011 | 6  | SafeData_0_Bit_5                      | BOOL   | RO | Encoder Pattern Input 6        |
|        | 8  | 0x7011 | 7  | SafeData_0_Bit_6                      | BOOL   | RO | Reserved (1 Bit Padding)       |
|        | 9  | 0x7011 | 8  | SafeData_0_Bit_7                      | BOOL   | RO | Reserved (1 Bit Padding)       |
|        | 10 | 0x7011 | 9  | SafeData_1_Bit_0                      | BOOL   | RO | Protection1 Reset In           |
|        | 11 | 0x7011 | 10 | SafeData_1_Bit_1                      | BOOL   | RO | Protection2 Reset In           |
|        | 12 | 0x7011 | 11 | SafeData_1_Bit_2                      | BOOL   | RO | Protection3 Reset In           |
|        | 13 | 0x7011 | 12 | SafeData_1_Bit_3                      | BOOL   | RO | Protection4 Reset In           |
|        | 14 | 0x7011 | 13 | SafeData_1_Bit_4                      | BOOL   | RO | Protection5 Reset In           |
|        | 15 | 0x7011 | 14 | SafeData_1_Bit_5_7                    | PAD_3  | RO | Reserved (3 Bit Padding)       |
|        | 16 | 0x7010 | 4  | CRC_0                                 | UINT16 | RO | FSoE Main Device CRC           |
|        | 17 | 0x7011 | 15 | SafeData_2_Bit_0                      | BOOL   | RO | Protection1 Muting 1           |
|        | 18 | 0x7011 | 16 | SafeData_2_Bit_1                      | BOOL   | RO | Protection1 Muting 2           |
|        | 19 | 0x7011 | 17 | SafeData_2_Bit_2                      | BOOL   | RO | Protection2 Muting 1           |
|        | 20 | 0x7011 | 18 | SafeData_2_Bit_3                      | BOOL   | RO | Protection2 Muting 2           |
|        | 21 | 0x7011 | 19 | SafeData_2_Bit_4                      | BOOL   | RO | Protection3 Muting 1           |
|        | 22 | 0x7011 | 20 | SafeData_2_Bit_5                      | BOOL   | RO | Protection3 Muting 2           |
|        | 23 | 0x7011 | 21 | SafeData_2_Bit_6                      | BOOL   | RO | Protection4 Muting 1           |
|        | 24 | 0x7011 | 22 | SafeData_2_Bit_7                      | BOOL   | RO | Protection4 Muting 2           |
|        | 25 | 0x7011 | 23 | SafeData_3_Bit_0                      | BOOL   | RO | Protection5 Muting 1           |
|        | 26 | 0x7011 | 24 | SafeData_3_Bit_1                      | BOOL   | RO | Protection5 Muting 2           |
|        | 27 | 0x7011 | 25 | SafeData_3_Bit_2                      | BOOL   | RO | Protection1 Override           |
|        | 28 | 0x7011 | 26 | SafeData_3_Bit_3                      | BOOL   | RO | Protection2 Override           |
|        | 29 | 0x7011 | 27 | SafeData_3_Bit_4                      | BOOL   | RO | Protection3 Override           |
|        | 30 | 0x7011 | 28 | SafeData_3_Bit_5                      | BOOL   | RO | Protection4 Override           |
|        | 31 | 0x7011 | 29 | SafeData_3_Bit_6                      | BOOL   | RO | Protection5 Override           |
|        | 32 | 0x7011 | 30 | SafeData_3_Bit_7                      | PAD_1  | RO | Reserved (1 Bit Padding)       |
|        | 33 | 0x7010 | 5  | CRC_1                                 | UINT16 | RO | FSoE Main Device CRC           |
|        | 34 | 0x7011 | 31 | SafeData_4_Bit_0                      | BOOL   | RO | Laser Off Mode                 |
|        | 35 | 0x7011 | 32 | SafeData_4_Bit_1                      | BOOL   | RO | Restart Safety Function        |
|        | 36 | 0x7011 | 33 | SafeData_4_Bit_2_7                    | PAD_6  | RO | Reserved (6 Bit Padding)       |
|        | 37 | 0x7011 | 34 | SafeData_5                            | PAD_8  | RO | Reserved (8 Bit Padding)       |
|        | 38 | 0x7010 | 6  | CRC_2                                 | UINT16 | RO | FSoE Main Device CRC           |



|  |    |        |    |                |        |    |                                |
|--|----|--------|----|----------------|--------|----|--------------------------------|
|  | 39 | 0x7011 | 35 | SafeData_6_7   | INT16  | RO | Encoder 1 Velocity             |
|  | 40 | 0x7010 | 7  | CRC_3          | UINT16 | RO | FSoE Main Device CRC           |
|  | 41 | 0x7011 | 36 | SafeData_8_9   | INT16  | RO | Encoder 2 Velocity             |
|  | 42 | 0x7010 | 8  | CRC_4          | UINT16 | RO | FSoE Main Device CRC           |
|  | 43 | 0x7011 | 37 | SafeData_10_11 | INT16  | RO | Encoder 3 Velocity             |
|  | 44 | 0x7010 | 9  | CRC_5          | UINT16 | RO | FSoE Main Device CRC           |
|  | 45 | 0x7011 | 38 | SafeData_12_13 | INT16  | RO | Encoder 4 Velocity             |
|  | 46 | 0x7010 | 10 | CRC_6          | UINT16 | RO | FSoE Main Device CRC           |
|  | 47 | 0x7011 | 39 | SafeData_14_15 | INT16  | RO | Encoder Linear Velocity        |
|  | 48 | 0x7010 | 11 | CRC_7          | UINT16 | RO | FSoE Main Device CRC           |
|  | 49 | 0x7011 | 40 | SafeData_16_17 | INT16  | RO | Encoder Angular Velocity       |
|  | 50 | 0x7010 | 12 | CRC_8          | UINT16 | RO | FSoE Main Device CRC           |
|  | 51 | 0x7011 | 41 | SafeData_18_19 | PAD_16 | RO | Reserved (16 Bit Padding)      |
|  | 52 | 0x7010 | 13 | CRC_9          | UINT16 | RO | FSoE Main Device CRC           |
|  | 53 | 0x7011 | 42 | SafeData_20_21 | PAD_16 | RO | Reserved (16 Bit Padding)      |
|  | 54 | 0x7010 | 14 | CRC_10         | UINT16 | RO | FSoE Main Device CRC           |
|  | 55 | 0x7011 | 43 | SafeData_22_23 | PAD_16 | RO | Reserved (16 Bit Padding)      |
|  | 56 | 0x7010 | 15 | CRC_11         | UINT16 | RO | FSoE Main Device CRC           |
|  | 57 | 0x7011 | 44 | SafeData_24_25 | PAD_16 | RO | Reserved (16 Bit Padding)      |
|  | 58 | 0x7010 | 16 | CRC_12         | UINT16 | RO | FSoE Main Device CRC           |
|  | 59 | 0x7010 | 3  | Connection ID  | UINT16 | RO | FSoE Main Device Connection ID |

#### 4.1.4 Safety Output Data For Area Input Mode

| Safety output data from sensor to controller for area input mode |                                           |               |                             |                                                                                          |
|------------------------------------------------------------------|-------------------------------------------|---------------|-----------------------------|------------------------------------------------------------------------------------------|
| Size                                                             | Name                                      | Bit field     | Details                     | Value                                                                                    |
| 1 byte                                                           | Protection Detection Output Signal States | Bit 0         | Protection1 detection       | 0: Off (Obstacle detected/Error/Laser off mode/Setting mode)<br>1: On (Obstacle absent)  |
|                                                                  |                                           | Bit 1         | Protection2 detection       |                                                                                          |
|                                                                  |                                           | Bit 2         | Protection3 detection       |                                                                                          |
|                                                                  |                                           | Bit 3         | Protection4 detection       |                                                                                          |
|                                                                  |                                           | Bit 4         | Protection5 detection       |                                                                                          |
|                                                                  |                                           | Bit 5 ~ Bit 7 | Reserved                    | 0                                                                                        |
| 1 byte                                                           | Warning Detection Output Signal States    | Bit 0         | Warning1 detection          | 0: Off (Obstacle detected/Error/Laser off mode/Setting mode)<br>1: On (Obstacle absent)  |
|                                                                  |                                           | Bit 1         | Warning2 detection          |                                                                                          |
|                                                                  |                                           | Bit 2         | Warning3 detection          |                                                                                          |
|                                                                  |                                           | Bit 3         | Warning4 detection          |                                                                                          |
|                                                                  |                                           | Bit 4 ~ Bit 7 | Reserved                    | 0                                                                                        |
| 1 byte                                                           | Muting/Override Output Signal States      | Bit 0         | Protection1 Muting/Override | 0: Device is not in Muting or Override state<br>1: Device is in Muting or Override state |
|                                                                  |                                           | Bit 1         | Protection2 Muting/Override |                                                                                          |
|                                                                  |                                           | Bit 2         | Protection3 Muting/Override |                                                                                          |
|                                                                  |                                           | Bit 3         | Protection4 Muting/Override |                                                                                          |
|                                                                  |                                           | Bit 4         | Protection5 Muting/Override |                                                                                          |
|                                                                  |                                           | Bit 5 ~ Bit 7 | Reserved                    | 0                                                                                        |
| 1 byte                                                           | Reset Request Output Signal States        | Bit 0         | Protection1 Reset Request   | 0: Device is not ready to accept reset input<br>1: Device is ready to accept reset input |
|                                                                  |                                           | Bit 1         | Protection2 Reset Request   |                                                                                          |
|                                                                  |                                           | Bit 2         | Protection3 Reset Request   |                                                                                          |
|                                                                  |                                           | Bit 3         | Protection4 Reset Request   |                                                                                          |
|                                                                  |                                           | Bit 4         | Protection5 Reset Request   |                                                                                          |
|                                                                  |                                           | Bit 5 ~ Bit 7 | Reserved                    | 0                                                                                        |
| 1 byte                                                           | Other Output states                       | Bit 0         | Operation Mode              | 0: Normal operation<br>1: Setting mode                                                   |
|                                                                  |                                           | Bit 1         | Laser off State             | 0: Device is not in laser off state<br>1: Device is in laser off state                   |



|          |                |            |                        |                                                                    |
|----------|----------------|------------|------------------------|--------------------------------------------------------------------|
|          |                | Bit 2      | Lockout State          | 0: Device is not in lockout state<br>1: Device is in lockout state |
|          |                | Bit 3      | Error State            | 0: No error<br>1: Error present                                    |
|          |                | Bit 4      | Reference Error Status | 0: No error<br>1: Reference detection error                        |
|          |                | Bit 5      | Contamination Error    | 0: Contamination error is off<br>1: Contamination error is on      |
|          |                | Bit 6      | Contamination Warning  | 0: Contamination Warning is off<br>1: Contamination Warning is on  |
|          |                | Bit 7      | Reserved               | 0                                                                  |
| 1 byte   | Reserved       | Bit 0 ~ 7  | Reserved               | 0                                                                  |
| 2 bytes  | Operating Area | Bit 0 ~ 15 | Operating area number  | Area number 1 to 176                                               |
| 2 bytes  | Error Code     | Bit 0 ~ 15 | Error code             | Error code 65 to 255                                               |
| 16 bytes | Reserved       | -          | Reserved               | 0                                                                  |

#### 4.1.5 Safety Output Data for Encoder Input Mode

| Safety output data from sensor to controller for encoder input mode |                                           |               |                             |                                                                                          |
|---------------------------------------------------------------------|-------------------------------------------|---------------|-----------------------------|------------------------------------------------------------------------------------------|
| Size                                                                | Name                                      | Bit field     | Details                     | Value                                                                                    |
| 1 byte                                                              | Protection Detection Output Signal States | Bit 0         | Protection1 detection       | 0: Off (Obstacle detected/Error/Laser off mode/Setting mode)<br>1: On (Obstacle absent)  |
|                                                                     |                                           | Bit 1         | Protection2 detection       |                                                                                          |
|                                                                     |                                           | Bit 2         | Protection3 detection       |                                                                                          |
|                                                                     |                                           | Bit 3         | Protection4 detection       |                                                                                          |
|                                                                     |                                           | Bit 4         | Protection5 detection       |                                                                                          |
|                                                                     |                                           | Bit 5 ~ Bit 7 | Reserved                    | 0                                                                                        |
| 1 byte                                                              | Warning Detection Output Signal States    | Bit 0         | Warning1 detection          | 0: Off (Obstacle detected/Error/Laser off mode/Setting mode)<br>1: On (Obstacle absent)  |
|                                                                     |                                           | Bit 1         | Warning2 detection          |                                                                                          |
|                                                                     |                                           | Bit 2         | Warning3 detection          |                                                                                          |
|                                                                     |                                           | Bit 3         | Warning4 detection          |                                                                                          |
|                                                                     |                                           | Bit 4 ~ Bit 7 | Reserved                    | 0                                                                                        |
| 1 byte                                                              | Muting/Override Output Signal States      | Bit 0         | Protection1 Muting/Override | 0: Device is not in Muting or Override state<br>1: Device is in Muting or Override state |
|                                                                     |                                           | Bit 1         | Protection2 Muting/Override |                                                                                          |
|                                                                     |                                           | Bit 2         | Protection3 Muting/Override |                                                                                          |
|                                                                     |                                           | Bit 3         | Protection4 Muting/Override |                                                                                          |
|                                                                     |                                           | Bit 4         | Protection5 Muting/Override |                                                                                          |
|                                                                     |                                           | Bit 5 ~ Bit 7 | Reserved                    | 0                                                                                        |
| 1 byte                                                              | Reset Request Output Signal States        | Bit 0         | Protection1 Reset Request   | 0: Device is not ready to accept reset input<br>1: Device is ready to accept reset input |
|                                                                     |                                           | Bit 1         | Protection2 Reset Request   |                                                                                          |
|                                                                     |                                           | Bit 2         | Protection3 Reset Request   |                                                                                          |
|                                                                     |                                           | Bit 3         | Protection4 Reset Request   |                                                                                          |
|                                                                     |                                           | Bit 4         | Protection5 Reset Request   |                                                                                          |
|                                                                     |                                           | Bit 5 ~ Bit 7 | Reserved                    | 0                                                                                        |
| 1 byte                                                              | Other Output states                       | Bit 0         | Operation Mode              | 0: Normal operation<br>1: Setting mode                                                   |
|                                                                     |                                           | Bit 1         | Laser off State             | 0: Device is not in laser off state<br>1: Device is in laser off state                   |
|                                                                     |                                           | Bit 2         | Lockout State               | 0: Device is not in lockout state<br>1: Device is in lockout state                       |
|                                                                     |                                           | Bit 3         | Error State                 | 0: No error<br>1: Error present                                                          |
|                                                                     |                                           | Bit 4         | Reference Error Status      | 0: No error<br>1: Reference detection error                                              |
|                                                                     |                                           | Bit 5         | Contamination Error         | 0: Contamination error is off                                                            |



|         |                                         |            |                                         |                                                                   |
|---------|-----------------------------------------|------------|-----------------------------------------|-------------------------------------------------------------------|
|         |                                         |            |                                         | 1: Contamination error is on                                      |
|         |                                         | Bit 6      | Contamination Warning                   | 0: Contamination Warning is off<br>1: Contamination Warning is on |
|         |                                         | Bit 7      | Reserved                                | 0                                                                 |
| 1 byte  | Reserved                                | Bit 0 ~ 7  | Reserved                                | 0                                                                 |
| 2 bytes | Operating Area                          | Bit 0 ~ 15 | Operating area number                   | Area number 1 to 176                                              |
| 2 bytes | Error Code                              | Bit 0 ~ 15 | Error code                              | Error code 65 to 255                                              |
| 2 bytes | HW Encoder Channel Velocity             | Bit 0 ~ 15 | HW Encoder1 Velocity                    | -32768 to 32767 cm/s<br>0: In case of unused                      |
| 2 bytes |                                         | Bit 0 ~ 15 | HW Encoder2 Velocity                    |                                                                   |
| 2 bytes |                                         | Bit 0 ~ 15 | HW Encoder3 Velocity                    |                                                                   |
| 2 bytes |                                         | Bit 0 ~ 15 | HW Encoder4 Velocity                    |                                                                   |
| 2 bytes | HW Encoder Liner Velocity               | Bit 0 ~ 15 | HW Encoder Linear Velocity              | -32768 to 32767 cm/s<br>0: In case of unused                      |
| 2 bytes | HW Encoder Angular Velocity             | Bit 0 ~ 15 | HW Encoder Angular Velocity             | -360 to 360 deg/s<br>0: In case of unused                         |
| 2 bytes | Area Switching Encoder Liner Velocity   | Bit 0 ~ 15 | Area Switching Encoder Linear Velocity  | -32768 to 32767 cm/s<br>0: In case of unused                      |
| 2 bytes | Area Switching Encoder Angular Velocity | Bit 0 ~ 15 | Area Switching Encoder Angular Velocity | -360 to 360 deg/s<br>0: In case of unused                         |

#### 4.1.6 FSoE TxPDO-Mapping

| Safety data from UAM to Controller with PDO mapping Index number |           |                   |                       |                                    |           |        |                             |
|------------------------------------------------------------------|-----------|-------------------|-----------------------|------------------------------------|-----------|--------|-----------------------------|
| Index                                                            | Sub Index | PDO Mapping Index | PDO Mapping Sub Index | Name                               | Data Type | Access | Description                 |
| 0x1A00                                                           | -         | -                 |                       | FSoE TxPDO-Map for Area Input Mode | -         | -      | -                           |
|                                                                  | 1         | 0x6000            | 2                     | Sub Device Command                 | UINT8     | RO     | FSoE Sub Device Command     |
|                                                                  | 2         | 0x6001            | 1                     | SafeData_0_Bit_0                   | BOOL      | RO     | Protection1 detection       |
|                                                                  | 3         | 0x6001            | 2                     | SafeData_0_Bit_1                   | BOOL      | RO     | Protection2 detection       |
|                                                                  | 4         | 0x6001            | 3                     | SafeData_0_Bit_2                   | BOOL      | RO     | Protection3 detection       |
|                                                                  | 5         | 0x6001            | 4                     | SafeData_0_Bit_3                   | BOOL      | RO     | Protection4 detection       |
|                                                                  | 6         | 0x6001            | 5                     | SafeData_0_Bit_4                   | BOOL      | RO     | Protection5 detection       |
|                                                                  | 7         | 0x6001            | 6                     | SafeData_0_Bit_5_7                 | PAD_3     | RO     | Reserved (3 Bit Padding)    |
|                                                                  | 8         | 0x6001            | 7                     | SafeData_1_Bit_0                   | BOOL      | RO     | Warning1 detection          |
|                                                                  | 9         | 0x6001            | 8                     | SafeData_1_Bit_1                   | BOOL      | RO     | Warning2 detection          |
|                                                                  | 10        | 0x6001            | 9                     | SafeData_1_Bit_2                   | BOOL      | RO     | Warning3 detection          |
|                                                                  | 11        | 0x6001            | 10                    | SafeData_1_Bit_3                   | BOOL      | RO     | Warning4 detection          |
|                                                                  | 12        | 0x6001            | 11                    | SafeData_1_Bit_4_7                 | PAD_4     | RO     | Reserved (4 Bit Padding)    |
|                                                                  | 13        | 0x6000            | 4                     | CRC_0                              | UINT16    | RO     | FSoE Sub Device CRC         |
|                                                                  | 14        | 0x6001            | 12                    | SafeData_2_Bit_0                   | BOOL      | RO     | Protection1 Muting/Override |
|                                                                  | 15        | 0x6001            | 13                    | SafeData_2_Bit_1                   | BOOL      | RO     | Protection2 Muting/Override |
|                                                                  | 16        | 0x6001            | 14                    | SafeData_2_Bit_2                   | BOOL      | RO     | Protection3 Muting/Override |
|                                                                  | 17        | 0x6001            | 15                    | SafeData_2_Bit_3                   | BOOL      | RO     | Protection4 Muting/Override |
|                                                                  | 18        | 0x6001            | 16                    | SafeData_2_Bit_4                   | BOOL      | RO     | Protection5 Muting/Override |
|                                                                  | 19        | 0x6001            | 17                    | SafeData_2_Bit_5_7                 | BOOL      | RO     | Reserved (3 Bit Padding)    |
|                                                                  | 20        | 0x6001            | 18                    | SafeData_3_Bit_0                   | BOOL      | RO     | Protection1 Reset Request   |
|                                                                  | 21        | 0x6001            | 19                    | SafeData_3_Bit_1                   | BOOL      | RO     | Protection2 Reset Request   |
|                                                                  | 22        | 0x6001            | 20                    | SafeData_3_Bit_2                   | BOOL      | RO     | Protection3 Reset Request   |
|                                                                  | 23        | 0x6001            | 21                    | SafeData_3_Bit_3                   | BOOL      | RO     | Protection4 Reset Request   |
|                                                                  | 24        | 0x6001            | 22                    | SafeData_3_Bit_4                   | BOOL      | RO     | Protection5 Reset Request   |
|                                                                  | 25        | 0x6001            | 23                    | SafeData_3_Bit_5_7                 | PAD_3     | RO     | Reserved (3 Bit Padding)    |



|        |    |        |    |                                       |        |    |                               |
|--------|----|--------|----|---------------------------------------|--------|----|-------------------------------|
|        | 26 | 0x6000 | 5  | CRC_1                                 | UINT16 | RO | FSoE Sub Device CRC           |
|        | 27 | 0x6001 | 24 | SafeData_4_Bit_0                      | BOOL   | RO | Operation Mode                |
|        | 28 | 0x6001 | 25 | SafeData_4_Bit_1                      | BOOL   | RO | Laser Off Mode                |
|        | 29 | 0x6001 | 26 | SafeData_4_Bit_2                      | BOOL   | RO | Lockout state                 |
|        | 30 | 0x6001 | 27 | SafeData_4_Bit_3                      | BOOL   | RO | Error State                   |
|        | 31 | 0x6001 | 28 | SafeData_4_Bit_4                      | BOOL   | RO | Reference Error Status        |
|        | 32 | 0x6001 | 29 | SafeData_4_Bit_5                      | BOOL   | RO | Contamination Error           |
|        | 33 | 0x6001 | 30 | SafeData_4_Bit_6                      | BOOL   | RO | Contamination Warning         |
|        | 34 | 0x6001 | 31 | SafeData_4_Bit_7                      | PAD_1  | RO | Reserved (1 Bit Padding)      |
|        | 35 | 0x6001 | 32 | SafeData_5                            | PAD_8  | RO | Reserved (8 Bit Padding)      |
|        | 36 | 0x6000 | 6  | CRC_2                                 | UINT16 | RO | FSoE Sub Device CRC           |
|        | 37 | 0x6001 | 33 | SafeData_6_7                          | UINT16 | RO | Operating Area Number         |
|        | 38 | 0x6000 | 7  | CRC_3                                 | UINT16 | RO | FSoE Sub Device CRC           |
|        | 39 | 0x6001 | 34 | SafeData_8_9                          | UINT16 | RO | Error Code                    |
|        | 40 | 0x6000 | 8  | CRC_4                                 | UINT16 | RO | FSoE Sub Device CRC           |
|        | 41 | 0x6001 | 35 | SafeData_10_11                        | PAD_16 | RO | Reserved (16 Bit Padding)     |
|        | 42 | 0x6000 | 9  | CRC_5                                 | UINT16 | RO | FSoE Sub Device CRC           |
|        | 43 | 0x6001 | 36 | SafeData_12_13                        | PAD_16 | RO | Reserved (16 Bit Padding)     |
|        | 44 | 0x6000 | 10 | CRC_6                                 | UINT16 | RO | FSoE Sub Device CRC           |
|        | 45 | 0x6001 | 37 | SafeData_14_15                        | PAD_16 | RO | Reserved (16 Bit Padding)     |
|        | 46 | 0x6000 | 11 | CRC_7                                 | UINT16 | RO | FSoE Sub Device CRC           |
|        | 47 | 0x6001 | 38 | SafeData_16_17                        | PAD_16 | RO | Reserved (16 Bit Padding)     |
|        | 48 | 0x6000 | 12 | CRC_8                                 | UINT16 | RO | FSoE Sub Device CRC           |
|        | 49 | 0x6001 | 39 | SafeData_18_19                        | PAD_16 | RO | Reserved (16 Bit Padding)     |
|        | 50 | 0x6000 | 13 | CRC_9                                 | UINT16 | RO | FSoE Sub Device CRC           |
|        | 51 | 0x6001 | 40 | SafeData_20_21                        | PAD_16 | RO | Reserved (16 Bit Padding)     |
|        | 52 | 0x6000 | 14 | CRC_10                                | UINT16 | RO | FSoE Sub Device CRC           |
|        | 53 | 0x6001 | 41 | SafeData_22_23                        | PAD_16 | RO | Reserved (16 Bit Padding)     |
|        | 54 | 0x6000 | 15 | CRC_11                                | UINT16 | RO | FSoE Sub Device CRC           |
|        | 55 | 0x6001 | 42 | SafeData_24_25                        | PAD_16 | RO | Reserved (16 Bit Padding)     |
|        | 56 | 0x6000 | 16 | CRC_12                                | UINT16 | RO | FSoE Sub Device CRC           |
|        | 57 | 0x6000 | 3  | Connection ID                         | UINT16 | RO | FSoE Sub Device Connection ID |
|        |    |        |    |                                       |        |    |                               |
| 0x1A01 | -  | -      |    | FSoE TxPDO-Map for Encoder Input Mode | -      | -  | -                             |
|        | 1  | 0x6010 | 2  | Sub Device Command                    | UINT8  | RO | FSoE Sub Device Command       |
|        | 2  | 0x6011 | 1  | SafeData_0_Bit_0                      | BOOL   | RO | Protection1 detection         |
|        | 3  | 0x6011 | 2  | SafeData_0_Bit_1                      | BOOL   | RO | Protection2 detection         |
|        | 4  | 0x6011 | 3  | SafeData_0_Bit_2                      | BOOL   | RO | Protection3 detection         |
|        | 5  | 0x6011 | 4  | SafeData_0_Bit_3                      | BOOL   | RO | Protection4 detection         |
|        | 6  | 0x6011 | 5  | SafeData_0_Bit_4                      | BOOL   | RO | Protection5 detection         |
|        | 7  | 0x6011 | 6  | SafeData_0_Bit_5_7                    | PAD_3  | RO | Reserved (3 Bit Padding)      |
|        | 8  | 0x6011 | 7  | SafeData_1_Bit_0                      | BOOL   | RO | Warning1 detection            |
|        | 9  | 0x6011 | 8  | SafeData_1_Bit_1                      | BOOL   | RO | Warning2 detection            |
|        | 10 | 0x6011 | 9  | SafeData_1_Bit_2                      | BOOL   | RO | Warning3 detection            |
|        | 11 | 0x6011 | 10 | SafeData_1_Bit_3                      | BOOL   | RO | Warning4 detection            |
|        | 12 | 0x6011 | 11 | SafeData_1_Bit_4_7                    | PAD_4  | RO | Reserved (4 Bit Padding)      |
|        | 13 | 0x6010 | 4  | CRC_0                                 | UINT16 | RO | FSoE Sub Device CRC           |
|        | 14 | 0x6011 | 12 | SafeData_2_Bit_0                      | BOOL   | RO | Protection1 Muting/Override   |
|        | 15 | 0x6011 | 13 | SafeData_2_Bit_1                      | BOOL   | RO | Protection2 Muting/Override   |
|        | 16 | 0x6011 | 14 | SafeData_2_Bit_2                      | BOOL   | RO | Protection3 Muting/Override   |
|        | 17 | 0x6011 | 15 | SafeData_2_Bit_3                      | BOOL   | RO | Protection4 Muting/Override   |
|        | 18 | 0x6011 | 16 | SafeData_2_Bit_4                      | BOOL   | RO | Protection5 Muting/Override   |
|        | 19 | 0x6011 | 17 | SafeData_2_Bit_5_7                    | BOOL   | RO | Reserved (3 Bit Padding)      |
|        | 20 | 0x6011 | 18 | SafeData_3_Bit_0                      | BOOL   | RO | Protection1 Reset Request     |



|    |        |    |                    |        |    |                                         |
|----|--------|----|--------------------|--------|----|-----------------------------------------|
| 21 | 0x6011 | 19 | SafeData_3_Bit_1   | BOOL   | RO | Protection2 Reset Request               |
| 22 | 0x6011 | 20 | SafeData_3_Bit_2   | BOOL   | RO | Protection3 Reset Request               |
| 23 | 0x6011 | 21 | SafeData_3_Bit_3   | BOOL   | RO | Protection4 Reset Request               |
| 24 | 0x6011 | 22 | SafeData_3_Bit_4   | BOOL   | RO | Protection5 Reset Request               |
| 25 | 0x6011 | 23 | SafeData_3_Bit_5_7 | PAD_3  | RO | Reserved (3 Bit Padding)                |
| 26 | 0x6010 | 5  | CRC_1              | UINT16 | RO | FSoE Sub Device CRC                     |
| 27 | 0x6011 | 24 | SafeData_4_Bit_0   | BOOL   | RO | Operation Mode                          |
| 28 | 0x6011 | 25 | SafeData_4_Bit_1   | BOOL   | RO | Laser Off Mode                          |
| 29 | 0x6011 | 26 | SafeData_4_Bit_2   | BOOL   | RO | Lockout state                           |
| 30 | 0x6011 | 27 | SafeData_4_Bit_3   | BOOL   | RO | Error State                             |
| 31 | 0x6011 | 28 | SafeData_4_Bit_4   | BOOL   | RO | Reference Error Status                  |
| 32 | 0x6011 | 29 | SafeData_4_Bit_5   | BOOL   | RO | Contamination Error                     |
| 33 | 0x6011 | 30 | SafeData_4_Bit_6   | BOOL   | RO | Contamination Warning                   |
| 34 | 0x6011 | 31 | SafeData_4_Bit_7   | PAD_1  | RO | Reserved (1 Bit Padding)                |
| 35 | 0x6011 | 32 | SafeData_5         | PAD_8  | RO | Reserved (8 Bit Padding)                |
| 36 | 0x6010 | 6  | CRC_2              | UINT16 | RO | FSoE Sub Device CRC                     |
| 37 | 0x6011 | 33 | SafeData_6_7       | UINT16 | RO | Operating Area Number                   |
| 38 | 0x6010 | 7  | CRC_3              | UINT16 | RO | FSoE Sub Device CRC                     |
| 39 | 0x6011 | 34 | SafeData_8_9       | UINT16 | RO | Error Code                              |
| 40 | 0x6010 | 8  | CRC_4              | UINT16 | RO | FSoE Sub Device CRC                     |
| 41 | 0x6011 | 35 | SafeData_10_11     | PAD_16 | RO | HW Encoder 1 Velocity                   |
| 42 | 0x6010 | 9  | CRC_5              | UINT16 | RO | FSoE Sub Device CRC                     |
| 43 | 0x6011 | 36 | SafeData_12_13     | PAD_16 | RO | HW Encoder 2 Velocity                   |
| 44 | 0x6010 | 10 | CRC_6              | UINT16 | RO | FSoE Sub Device CRC                     |
| 45 | 0x6011 | 37 | SafeData_14_15     | PAD_16 | RO | HW Encoder 3 Velocity                   |
| 46 | 0x6010 | 11 | CRC_7              | UINT16 | RO | FSoE Sub Device CRC                     |
| 47 | 0x6011 | 38 | SafeData_16_17     | PAD_16 | RO | HW Encoder 4 Velocity                   |
| 48 | 0x6010 | 12 | CRC_8              | UINT16 | RO | FSoE Sub Device CRC                     |
| 49 | 0x6011 | 39 | SafeData_18_19     | PAD_16 | RO | HW Encoder Linear Velocity              |
| 50 | 0x6010 | 13 | CRC_9              | UINT16 | RO | FSoE Sub Device CRC                     |
| 51 | 0x6011 | 40 | SafeData_20_21     | PAD_16 | RO | HW Encoder Angular Velocity             |
| 52 | 0x6010 | 14 | CRC_10             | UINT16 | RO | FSoE Sub Device CRC                     |
| 53 | 0x6011 | 41 | SafeData_22_23     | PAD_16 | RO | Area Switching Encoder Linear Velocity  |
| 54 | 0x6010 | 15 | CRC_11             | UINT16 | RO | FSoE Sub Device CRC                     |
| 55 | 0x6011 | 42 | SafeData_24_25     | PAD_16 | RO | Area Switching Encoder Angular Velocity |
| 56 | 0x6010 | 16 | CRC_12             | UINT16 | RO | FSoE Sub Device CRC                     |
| 57 | 0x6010 | 3  | Connection ID      | UINT16 | RO | FSoE Sub Device Connection ID           |



#### 4.1.7 Safety PDO Assign

| Safety PDO Assign with Index number |             |           |           |              |              |                    |                                       |
|-------------------------------------|-------------|-----------|-----------|--------------|--------------|--------------------|---------------------------------------|
| Index                               | Object Type | Sub Index | Data Type | Name         | Access       | Assigned PDO Index | Description                           |
| 0x1C12                              | Array       | -         | -         | RxPDO Assign | -            | -                  | -                                     |
|                                     |             | 1         | UINT16    | SubIndex 01  | RO, WR_PREOP | 0x1600             | FSoE RxPDO-Map for Area Input Mode    |
|                                     |             | 2         | UINT16    | SubIndex 02  | RO, WR_PREOP | 0x1601             | FSoE RxPDO-Map for Encoder Input Mode |
| 0x1C13                              | Array       | -         | -         | TxPDO Assign | -            | -                  | -                                     |
|                                     |             | 1         | UINT16    | SubIndex 01  | RO, WR_PREOP | 0x1A00             | FSoE TxPDO-Map for Area Input Mode    |
|                                     |             | 2         | UINT16    | SubIndex 02  | RO, WR_PREOP | 0x1A01             | FSoE TxPDO-Map for Encoder Input Mode |

#### 4.1.8 Safety Information

| Safety information |             |           |                                |                      |        |                                                                            |
|--------------------|-------------|-----------|--------------------------------|----------------------|--------|----------------------------------------------------------------------------|
| Index              | Object Type | Sub Index | Name                           | Data Type            | Access | Description                                                                |
| 0x9001             | RECORD      | -         | FSoE Communication Parameters  | -                    | -      | The information data of the FSoE Module                                    |
|                    |             | 1         | Version                        | STRING (2)           | RO     | Supported FSoE Version                                                     |
|                    |             | 2         | Safety Address                 | UINT16               | RO     | FSoE sub device address                                                    |
|                    |             | 3         | FSoE Connection ID             | UINT16               | RO     | Connection ID, assigned by the FSoE main device                            |
|                    |             | 4         | Watchdog Time                  | UINT16               | RO     | Watchdog Time, Assigned by the FSoE main device                            |
|                    |             | 5         | Unique Device ID               | ARRAY [0..5] OF BYTE | RO     | 0: Device ID is not used                                                   |
|                    |             | 6         | Connection Type                | DT0801EN16           | RO     | 0: Main device connection<br>1: Sub device connection                      |
|                    |             | 7         | Communication Parameter Length | UINT16               | RO     | 2: Number of bytes of the communication parameter (Watch Dog timer)        |
|                    |             | 8         | Application Parameter Length   | UINT16               | RO     | 0: Length of application Parameter (not used)                              |
|                    |             | 9         | SRA CRC                        | UINT32               | RO     | 0: CRC checksum of the Safety-related Application Parameter set (not used) |
|                    |             | 10        | SW version                     | STRING (16)          | RO     | 0: Software version of the FSoE software (not used)                        |
|                    |             | 11        | Software CRC1                  | STRING (4)           | RO     | 0: Software CRC of CPU1 (not used)                                         |
|                    |             | 12        | Software CRC2                  | STRING (4)           | RO     | 0: Software CRC of CPU2 (not used)                                         |
|                    |             | 13        | HW version                     | STRING (16)          | RO     | 0: Hardware version of the FSoE hardware (not used)                        |
| 0xA000             | RECORD      | -         | FSoE Connection Diagnosis      | -                    | -      | Status and diagnosis of the FSoE Module                                    |



|        |        |   |                           |           |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------|--------|---|---------------------------|-----------|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |        | 1 | Connection State          | ENUM [16] | RO | State of the FSoE Connection<br>100: Reset<br>101: Session<br>102: Connection<br>103: Parameter<br>104: Data<br>105: Failsafe                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|        |        | 2 | Connection Diagnosis      | UINT16    | RO | Diagnosis Bits of FSoE Connection<br>Bit 0 ~ 3:<br>0: No error<br>1: Wrong command<br>2: Unknown command<br>3: Wrong Connection ID<br>4: Wrong CRC<br>5: Watchdog expired<br>6: Wrong FSoE Address<br>7: Wrong Data<br>8: Wrong Communication Parameter Length<br>9: Wrong Communication Parameter<br>10: Wrong Application Parameter Length<br>11: Wrong Application Parameter<br>Bit 4:<br>0: Error in FSoE main device<br>1: Error in FSoE sub device<br>Bit 5:<br>1: FSoE slave is in Failsafe<br>Bit 6:<br>1: Connection in startup<br>Bit 7:<br>1: FSoE main device is in Failsafe |
| 0xF000 | RECORD |   | Modular Device Profile    | -         | -  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|        |        | 1 | Index Distance            | UINT16    | RO | 16: Index distance between two modules                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|        |        | 2 | Maximum Number Of Modules | UINT16    | RO | 2: Maximum Number of Modules                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 0xF010 | RECORD |   | Module List               |           | RO |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|        |        | 1 | Connection Type           | UINT32    | RO | 0: Sub device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 0xF050 | RECORD |   | Detected Modules          | -         | -  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|        |        | 1 | Safety Module Ident       | UINT32    | RO | 0x00C3F050: Area Input mode module ident<br>0x00C3F051: Encoder input mode module ident                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 0xF980 | RECORD |   | Device Safe Address       | -         | -  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|        |        | 1 | FSoE Address              | UINT16    | RO | Safety address set by the user                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|        |        | 2 | Serial Number             | UINT16    | RO | Not used                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



---

## 4.2 Non-Safety Data

Non safety data between UAM and controller is exchanged using FoE, CoE and EoE communication of EtherCAT.

### 4.2.1 FoE Communication

Use the UAM project designer application to generate FoE file containing the configuration parameters of UAM. This file can be uploaded on the device using the FoE communication.

#### Generating the FoE File:

After configuring and confirming all parameters on UAM Project Designer click the “Save to FoE File”. The following window will appear. Enter the sensor’s serial number and password and click the “Save” button to generate and save the FoE file.

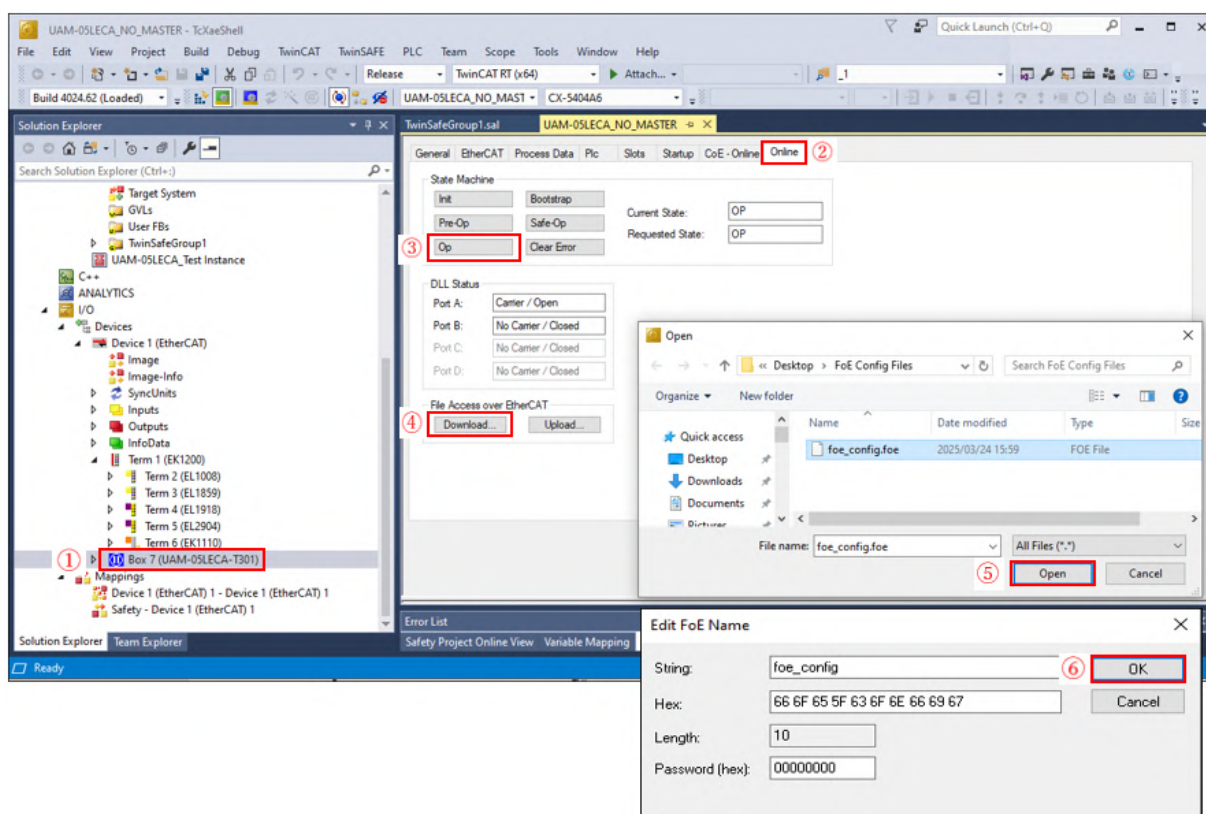
The screenshot shows the 'UAM Project Designer 4.0.0b0' application window. The 'Configuration' tab is active, and the 'Save to FoE file' button is highlighted. The 'FoE settings' dialog box is open, displaying the following fields:

- Device count:** 1
- Target devices:** A table with two columns: 'Serial number' and 'Password'. The first row contains the values 'H12345678' and '12345678'.
- Note:** Enter product serial number and 8 digits password.
- Save** button.

The status bar at the bottom right shows: Product name: --, Firmware version: --, Serial number: --.

### Uploading the setting using FoE file:

1. On the TwinCAT Project, go to “Device” and select “UAM-05LECA” from the list.
2. Click on the “Online” button
3. Check the “Current State” on the window. If it is not “OP”, click the “OP” button and wait for the state to change to “OP”.
4. Click “Download” button under “File access over EtherCAT” section.
5. Select the location of saved FoE file when file open dialog box appears and click “Open” button.
6. When “Edit FoE Name” dialog appears click the “OK” button to start the file upload (password is not required).



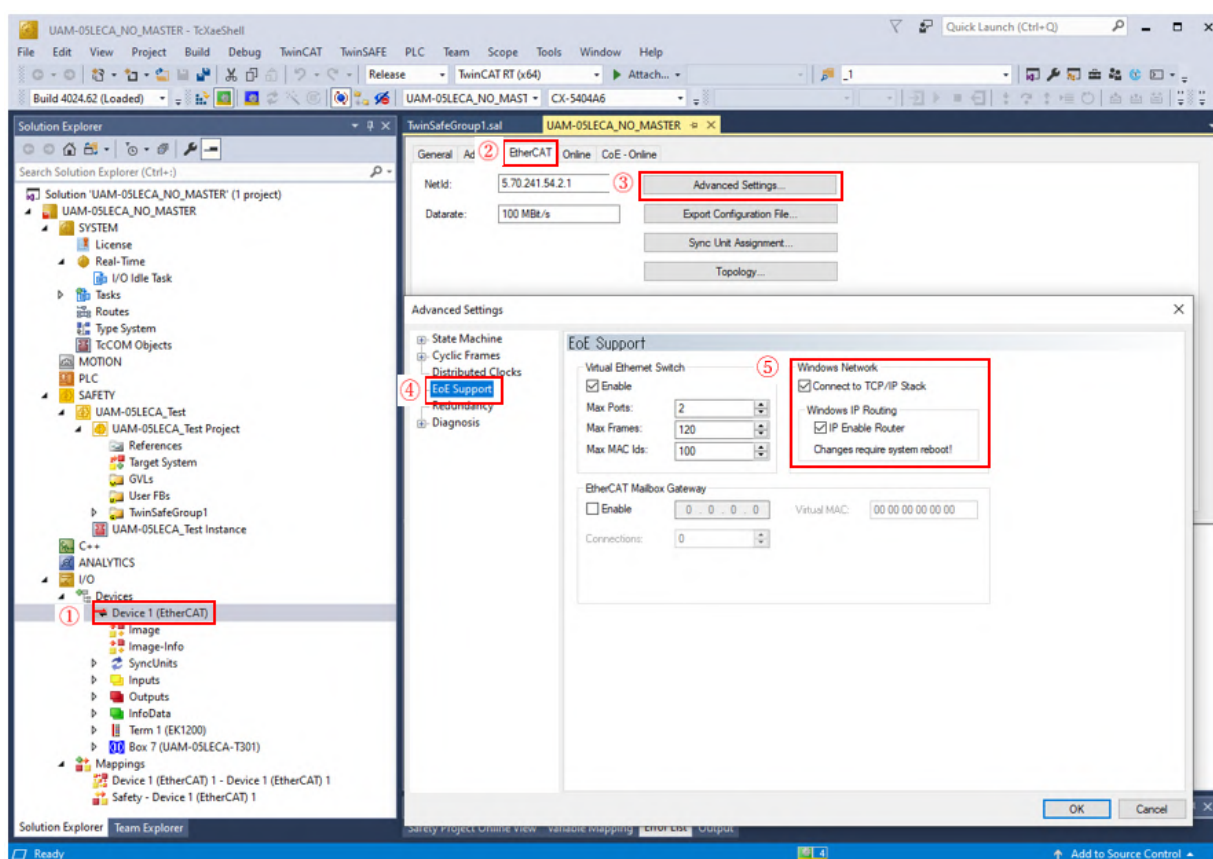
## 4.2.2 EoE Communication

Measurement data for the monitoring can be obtained from UAM by using UAM Project designer or EoE compatible application developed by the user. Refer UAM-05LECA Communication Protocol Specification for details on data transfer. Configuration required for EoE communication is explained below.

### EoE Communication Setting

Enabling the IP routing on Master controller using TwinCAT project.

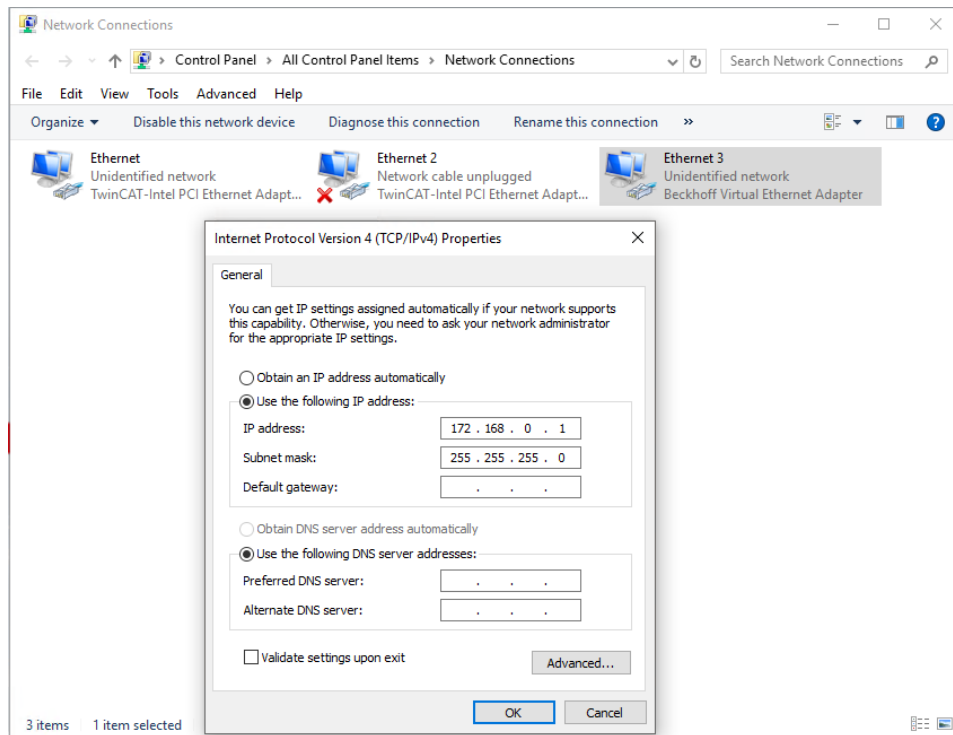
1. On the TwinCAT Project, go to “Devices” and select “Device 1 (EtherCAT)” from the list.
2. Click the “EtherCAT” button on the window.
3. Click the “Advanced Setting” button. Advanced setting dialog will appear.
4. Select the “EoE support” from the list.
5. Check the boxes next to “Connect to TCP/IP Stack” and “IP Enable Router” if not already checked.
6. Restart the system (PLC).



---

## **Setting up the Master Virtual IP:**

Run the TC3 XAE in Config Mode and select the Virtual Ethernet Adapter's IP address and subnet mask.

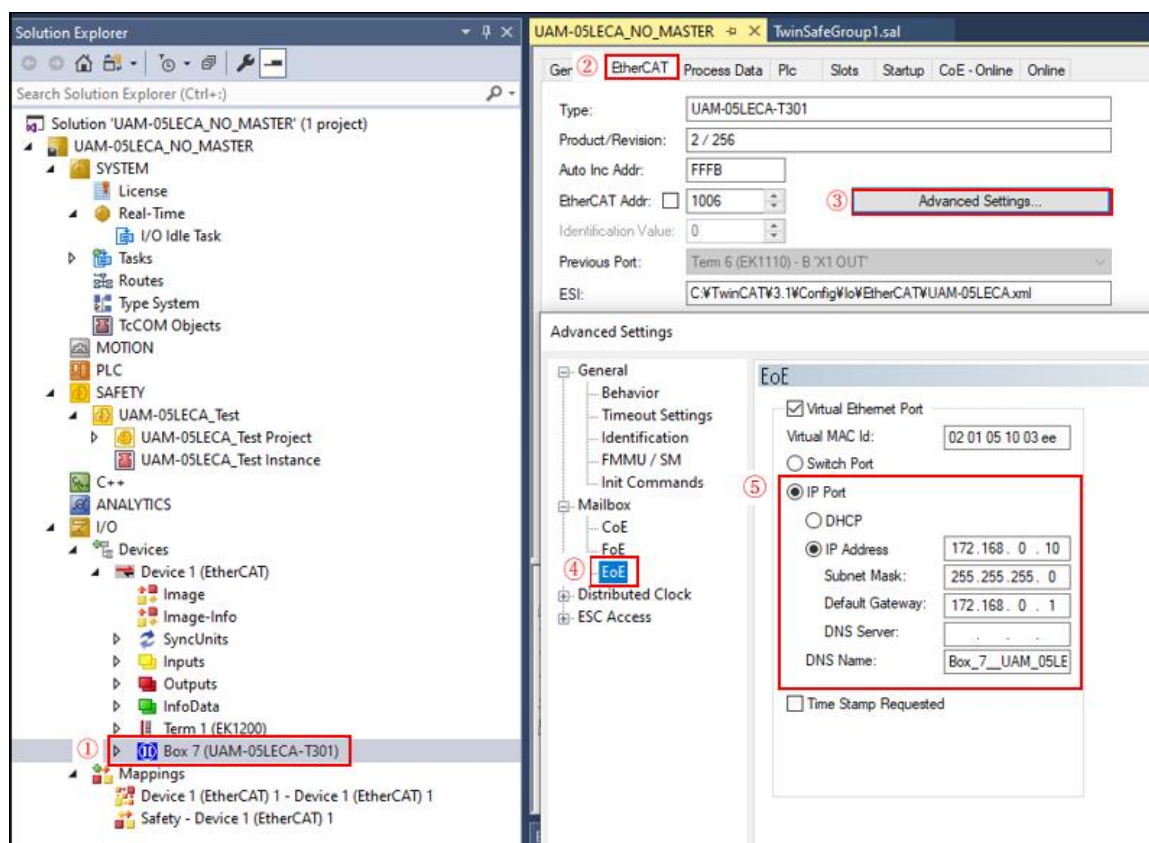


## **Configuring the UAM's IP address:**

1. On the TwinCAT Project, go to "Device" and select "UAM-05LECA" from the list.
2. Click on the "EtherCAT" button on the window.
3. Click the "Advance Setting" button. Advance setting dialog will appear.
4. Expand the "Mailbox" menu and select "EoE" from the list.
5. Configure the IP address to be on the same network as Master Virtual IP. Set the default gateway to Master Virtual IP.

Note: If the host IP and UAM's IP address is different, add UAM's IP address on the static route of the host PC.





#### 4.2.3 CoE Communication

UAM's configuration parameters obtained through CoE communication are shown in table 3-2-3-

| UAM Setting parameter obtained through CoE with Index number |             |           |                               |             |        |     |                                                                                                                                       |
|--------------------------------------------------------------|-------------|-----------|-------------------------------|-------------|--------|-----|---------------------------------------------------------------------------------------------------------------------------------------|
| Index                                                        | Object Type | Sub Index | Name                          | Data Type   | Access | PDO | Description                                                                                                                           |
| 0x1000                                                       | VAR         | 0x00      | Device Type                   | UINT32      | RO     | No  | <Initial Value><br>0x00C31389<br><Remarks><br>Bit 0~15: 0x1389 (5001)<br>Device Profile.<br>Bit 16~31: 0x00C3 (195)<br>Module Profile |
| 0x1008                                                       | VAR         | 0x00      | Manufacturer Device Name      | STRING [29] | RO     | No  | <Initial Value><br>"UAM-05LECA"                                                                                                       |
| 0x1009                                                       | VAR         | 0x00      | Manufacturer Hardware Version | STRING [29] | RO     | No  | <Initial Value><br>00.00.00                                                                                                           |
| 0x100A                                                       | VAR         | 0x00      | Manufacturer Software Version | STRING [29] | RO     | No  | <Initial Value><br>00.00.00_00000000000000000000                                                                                      |
| 0x100B                                                       | VAR         | 0x00      | Serial Number                 | STRING [16] | RO     | No  | <Initial Value><br>0000000000000000                                                                                                   |
| 0x100C                                                       | VAR         | 0x00      | EtherCAT Software Version     | STRING [16] | RO     | No  | <Initial Value><br>00.00_00.00.00                                                                                                     |

| Index  | Object Type | Sub Index | Name            | Data Type | Access | PDO | Description                                                                                  |
|--------|-------------|-----------|-----------------|-----------|--------|-----|----------------------------------------------------------------------------------------------|
| 0x1018 | RECORD      | -         | Identity        | -         | -      | -   | -                                                                                            |
|        |             | 0x00      | Entry count     | UINT8     | RO     | No  | <Initial Value><br>4                                                                         |
|        |             | 0x01      | Vendor ID       | UINT32    | RO     | No  | <Initial Value><br>0x000000832<br><Remarks><br>Value supplied by ETG                         |
|        |             | 0x02      | Product Code    | UINT32    | RO     | No  | <Initial Value><br>0x000000002<br><Remarks><br>Value supplied by the vendor.                 |
|        |             | 0x03      | Revision Number | UINT32    | RO     | No  | <Initial Value><br>0x000000100<br><Remarks><br>Value supplied by the vendor.                 |
|        |             | 0x04      | Serial Number   | UINT32    | RO     | No  | <Initial Value><br>0x000000000<br><Remarks><br>Value supplied by the vendor for the product. |

| Index  | Object Type | Sub Index | Name                   | Data Type | Access | PDO | Description                                                                                                                                                                     |
|--------|-------------|-----------|------------------------|-----------|--------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x2000 | RECORD      | -         | Sensor Setting         | -         | -      | -   | -                                                                                                                                                                               |
|        |             | 0x00      | Entry count            | UINT8     | RO     | No  | <Initial Value><br>12                                                                                                                                                           |
|        |             | 0x01      | Area Switch Delay      | UINT8     | RO     | No  | <Initial Value><br>30ms (1)<br><Remarks><br>30ms (1)<br>120ms (4)<br>270ms (9)<br>1000ms (34)<br>2000ms (67)                                                                    |
|        |             | 0x02      | LCD Inverted Mode      | UINT8     | RO     | No  | <Initial Value><br>Disable (0)<br><Remarks><br>Disable (0)<br>Enable (1)                                                                                                        |
|        |             | 0x03      | User Area Count        | UINT8     | RO     | No  | <Initial Value><br>0x00 (0)<br><Remarks><br>Range 0x01 ~ 0xB0 (1 ~ 176)                                                                                                         |
|        |             | 0x04      | Auxiliary Output1 Mode | UINT8     | RO     | No  | <Initial Value><br>None (0)<br><Remarks><br>None (0)<br>Error Output (1)<br>Contamination Error Output (2)<br>Contamination Warning Output (3)<br>Synchronous Signal Output (4) |
|        |             | 0x05      | Auxiliary Output2      | UINT8     | RO     | No  | <Initial Value>                                                                                                                                                                 |



|  |  |      |                                       |       |    |    |                                                                                                                                                              |
|--|--|------|---------------------------------------|-------|----|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |      | Mode                                  |       |    |    | None (0)<br><Remarks><br>None (0)<br>Error Output (1)<br>Contamination Error Output (2)<br>Contamination Warning Output (3)<br>Synchronous Signal Output (4) |
|  |  | 0x06 | HW Muting 1                           | UINT8 | RO | No | <Initial Value><br>Disable (0)<br><Remarks><br>Disable (0)<br>Enable (1)                                                                                     |
|  |  | 0x07 | HW Muting 2                           | UINT8 | RO | No | <Initial Value><br>Disable (0)<br><Remarks><br>Disable (0)<br>Enable (1)                                                                                     |
|  |  | 0x08 | HW Interlock<br>Reset 1               | UINT8 | RO | No | <Initial Value><br>Disable (0)<br><Remarks><br>Disable (0)<br>Enable (1)                                                                                     |
|  |  | 0x09 | HW Interlock<br>Reset 2               | UINT8 | RO | No | <Initial Value><br>Disable (0)<br><Remarks><br>Disable (0)<br>Enable (1)                                                                                     |
|  |  | 0x0A | Contamination<br>Warning<br>Threshold | UINT8 | RO | No | <Initial Value><br>Lower Threshold (0)<br><Remarks><br>Lower Threshold (0)<br>Medium Threshold (1)<br>Higher Threshold (2)                                   |

| Index  | Object<br>Type | Sub Index | Name                            | Data Type | Access | PDO | Description                                                                                                                                    |
|--------|----------------|-----------|---------------------------------|-----------|--------|-----|------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x2001 | RECORD         | -         | UDP<br>Communication<br>Setting | -         | -      | -   | -                                                                                                                                              |
|        |                | 0x00      | Entry count                     | UINT8     | RO     | No  | <Initial Value><br>6                                                                                                                           |
|        |                | 0x01      | Communication                   | UINT8     | RO     | No  | <Initial Value><br>Disable (0)<br><Remarks><br>Disable (0)<br>Enable (1)                                                                       |
|        |                | 0x02      | Communication<br>Mode           | UINT8     | RO     | No  | <Initial Value><br>On Request Mode (0)<br><Remarks><br>On Request Mode (0)<br>Target Mode (1)                                                  |
|        |                | 0x03      | Data Type                       | UINT8     | RO     | No  | <Initial Value><br>XR00: Status Only (0)<br><Remarks><br>XR00: Status Only (0)<br>AR02: Status and Distance (1)<br>AR04: Status, Distance, and |



|        |        |      |                             |              |    |    |                                                                                                                                                                                                                                            |
|--------|--------|------|-----------------------------|--------------|----|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |        |      |                             |              |    |    | Intensity (2)<br>AR07: Status and Full Step Distance (3)<br>UR00: Status and Distance (Multiple packets) (4)<br>UR01: Status, Distance, and Intensity (Multiple packets) (5)<br>UR02: Status and Full Step Distance (Multiple packets) (6) |
|        |        | 0x04 | Data Interval               |              | RO |    | <Initial Value><br>0x00 (0)<br><Remarks><br>Range 0 ~ 0xFF (0 to 255) cycles<br>One cycle is 30ms (approx.).                                                                                                                               |
|        |        | 0x05 | Port Number                 | UINT16       | RO | No | Target port number for target mode<br><Initial Value><br>0x000<br><Remarks><br>Range 0 ~ 0xFFFF (0 ~ 65535)                                                                                                                                |
|        |        | 0x06 | IP Address                  | STRING [12]  | RO | No | Target IP address for target mode<br><Initial Value><br>000000000000<br><Remarks><br>Range 0 ~ 255.255.255.255                                                                                                                             |
| 0x2002 | RECORD | -    | Project Information Setting | -            | -  | -  | -                                                                                                                                                                                                                                          |
|        |        | 0x00 | Entry count                 | UINT8        | RO | No | <Initial Value><br>3                                                                                                                                                                                                                       |
|        |        | 0x01 | Configuration Name          | STRING [128] | RO | No | <Initial Value><br>None<br><Remarks><br>Configuration name given during device setting.                                                                                                                                                    |
|        |        | 0x02 | Configuration Date          | STRING [128] | RO | No | <Initial Value><br>None<br><Remarks><br>Date of device configuration.                                                                                                                                                                      |
|        |        | 0x03 | Configured By               | STRING [128] | RO | No | <Initial Value><br>None<br><Remarks><br>Person who configured the device.                                                                                                                                                                  |
| 0x2003 | RECORD | -    | Configuration ID            | -            | -  | -  | -                                                                                                                                                                                                                                          |
|        |        | 0x00 | Entry count                 | UINT8        | RO | No | <Initial Value><br>3                                                                                                                                                                                                                       |
|        |        | 0x01 | Configuration ID1           | UINT32       | RO | No | <Initial Value><br>0x00000000<br><Remarks><br>Configuration ID with date                                                                                                                                                                   |
|        |        | 0x02 | Configuration ID2           | UINT32       | RO | No | <Initial Value><br>0x00000000<br><Remarks><br>Configuration ID without date                                                                                                                                                                |



| Index  | Object Type | Sub Index | Name                      | Data Type | Access | PDO | Description                                                                                                                                                                          |
|--------|-------------|-----------|---------------------------|-----------|--------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0xF000 | RECORD      | -         | Modular Device Profile    | -         | -      | -   | -                                                                                                                                                                                    |
|        |             | 0x00      | Entry count               | UINT8     | RO     | No  | <Initial Value><br>2                                                                                                                                                                 |
|        |             | 0x01      | Index Distance            | UINT16    | RO     | No  | <Initial Value><br>0x16<br><Remarks><br>Index distance between two modules                                                                                                           |
|        |             | 0x02      | Maximum Number of Modules | UINT16    | RO     | No  | <Initial Value><br>0x2<br><Remarks><br>Maximum number of modules                                                                                                                     |
| 0xF050 | RECORD      | -         | Detected Modules          | -         | -      | -   | -                                                                                                                                                                                    |
|        |             | 0x00      | Entry count               | UINT8     | RO     | No  | <Initial Value><br>1                                                                                                                                                                 |
|        |             | 0x01      | Safety Module Ident       | UINT32    | RO     | No  | <Initial Value><br>0x00C3F050 / 0x00C3F051<br><Remarks><br>Module ID of the active module<br>0x00C3F050: Area input mode module Ident<br>0x00C3F051: Encoder input mode module Ident |
| 0xF980 | RECORD      | -         | Detected Modules          | -         | -      | -   | -                                                                                                                                                                                    |
|        |             | 0x00      | Entry count               | UINT8     | RO     | No  | <Initial Value><br>2                                                                                                                                                                 |
|        |             | 0x01      | FSoE Address              | UINT16    | RO     | No  | <Initial Value><br>0x0000 (0)<br><Remarks><br>Safety address of the device                                                                                                           |
|        |             | 0x02      | Serial Number             | UINT16    | RO     | No  | <Initial Value><br>0x0000 (0)<br><Remarks><br>Not used                                                                                                                               |

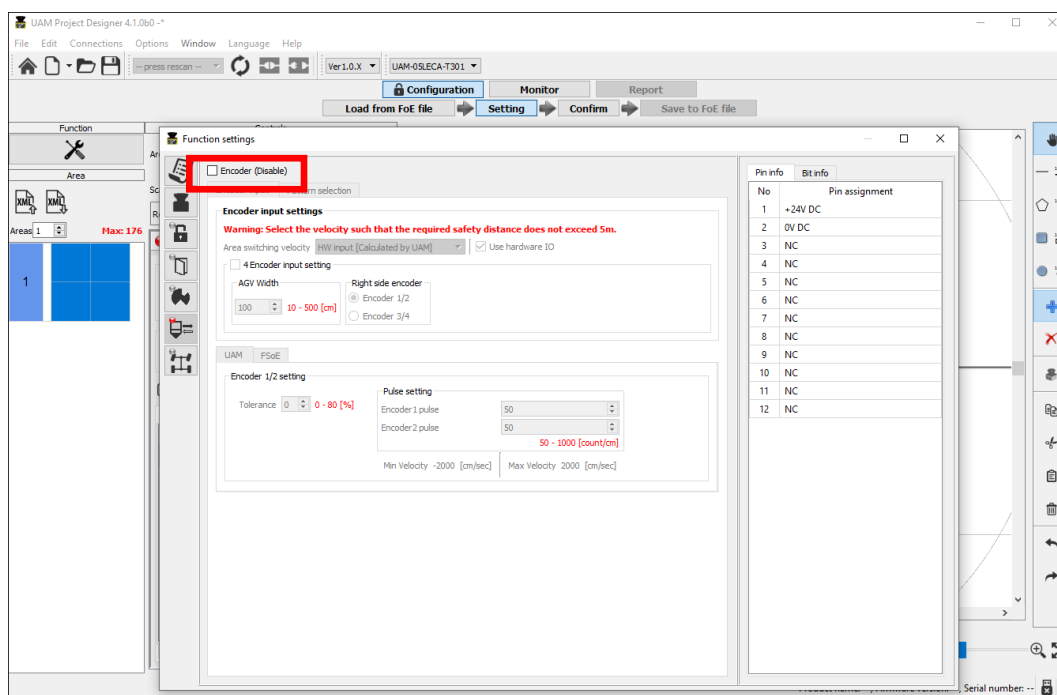


## 5. FSoE Setting

### 5.1 Safety Module

The module has been configured in accordance with the specified settings. When the encoder setting is enabled, the Encoder Input Mode Module will become active; conversely, if this setting is not enabled, the Area Input Mode Module will be activated. Setting is done by UAM project Designer application.

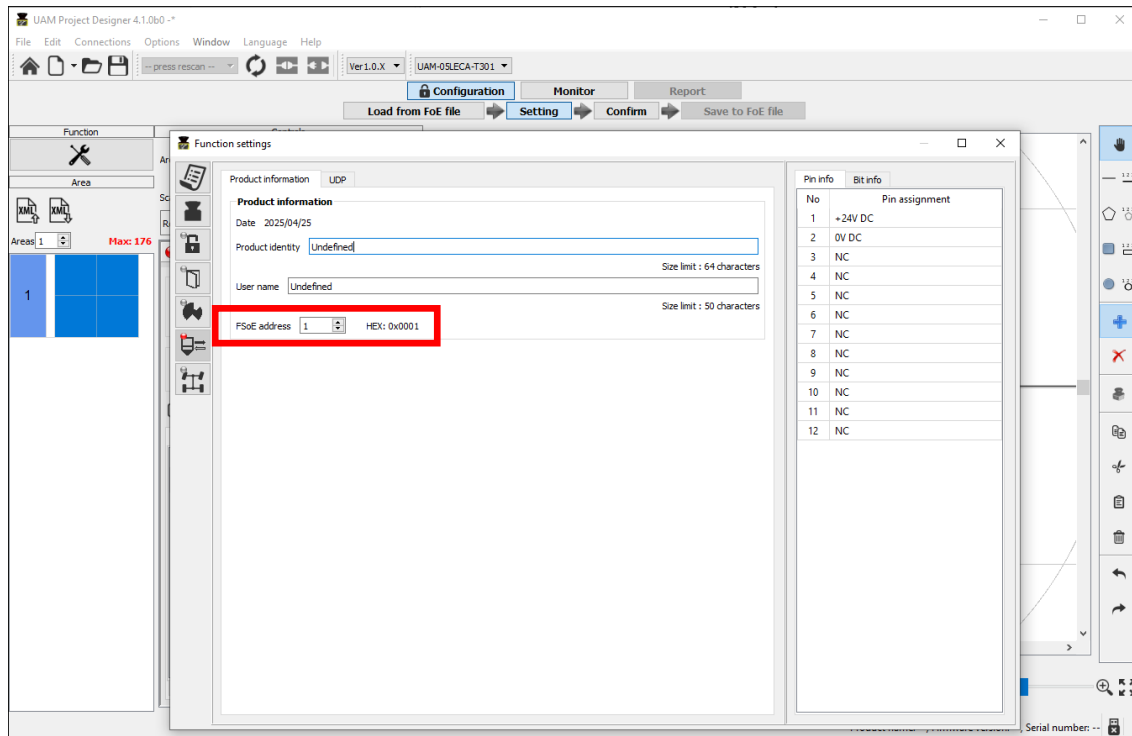
Note: When changing the encoder setting, it is required to perform rescan on the main device.



| Setting                      | Module                                |
|------------------------------|---------------------------------------|
| Encoder setting is active    | 0x00C3F051: Encoder Input Mode Module |
| Encoder setting is in-active | 0x00C3F050: Area Input Mode Module    |

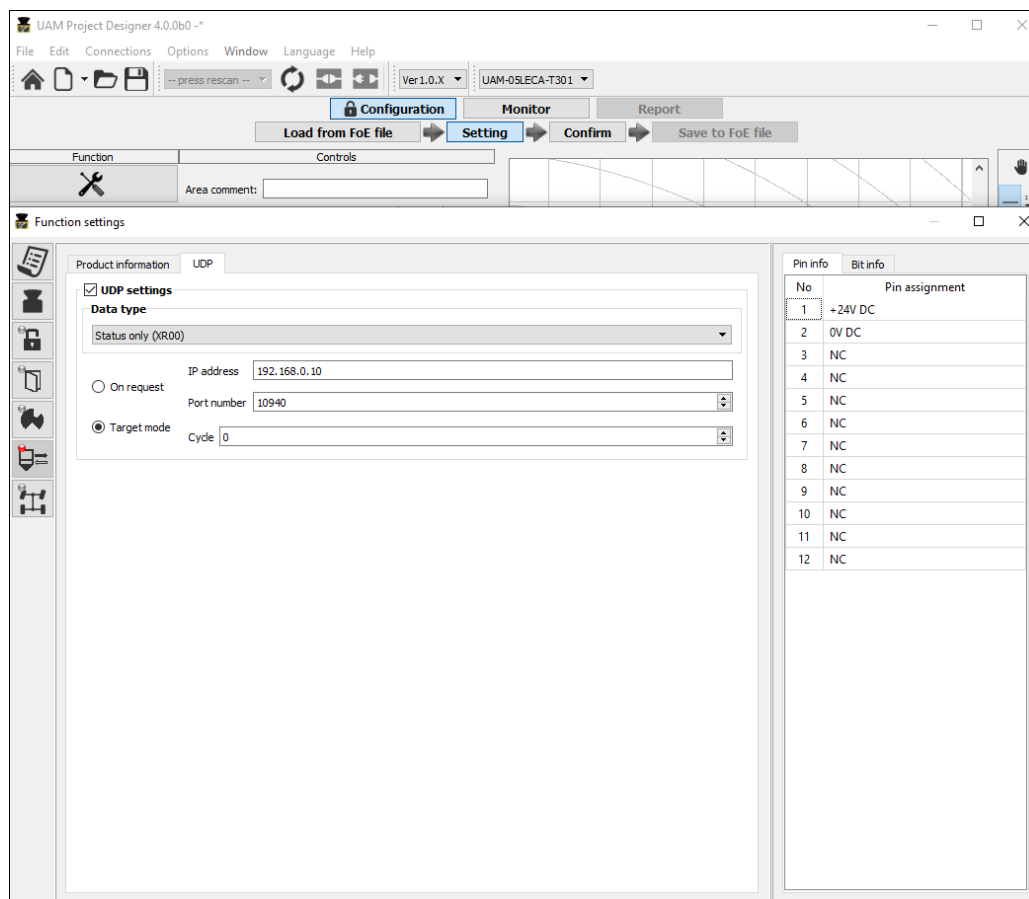
## 5.2 Safety Address

Safety (FSoE) address of UAM is configured by UAM Project Designer application.



## 6. UDP Communication

UAM supports the UDP communication. Device will output the status and measurement data based on the setting on UAM Project Designer. Refer to UAM Communication Protocol Specification for the types of data that can be obtained from UAM.



### 6.1 On Request Mode

If "On Request Mode" is selected, UAM will output the specified data after every specified cycle. However, it is necessary to send the respective commands to start and end the data transmission. Refer to UAM Communication Protocol Specification for the commands.

### 6.2 Target Mode

If "Target Mode" is selected, UAM will output the specified data to the specified IP address after every specified cycle. It is not necessary to send start or end commands for data transmission.