

# Instructions

**How to set up a WEBER C30S with  
EtherCAT fieldbus on Beckhoff  
TwinCAT 3**





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## 1 ESI File for TwinCAT

Use the `ABC_CAN_ETHERCAT_V_x.yy.xml` file and copy it in the ESI (EtherCAT Slave Information) directory of TwinCAT 3. The path is normally located on Your local PC under `C:\TwinCAT\3.1\Config\Io\EtherCAT`.

The File is used by TwinCAT 3 to know about the C30S EtherCAT device.

## 2 Hardware connection

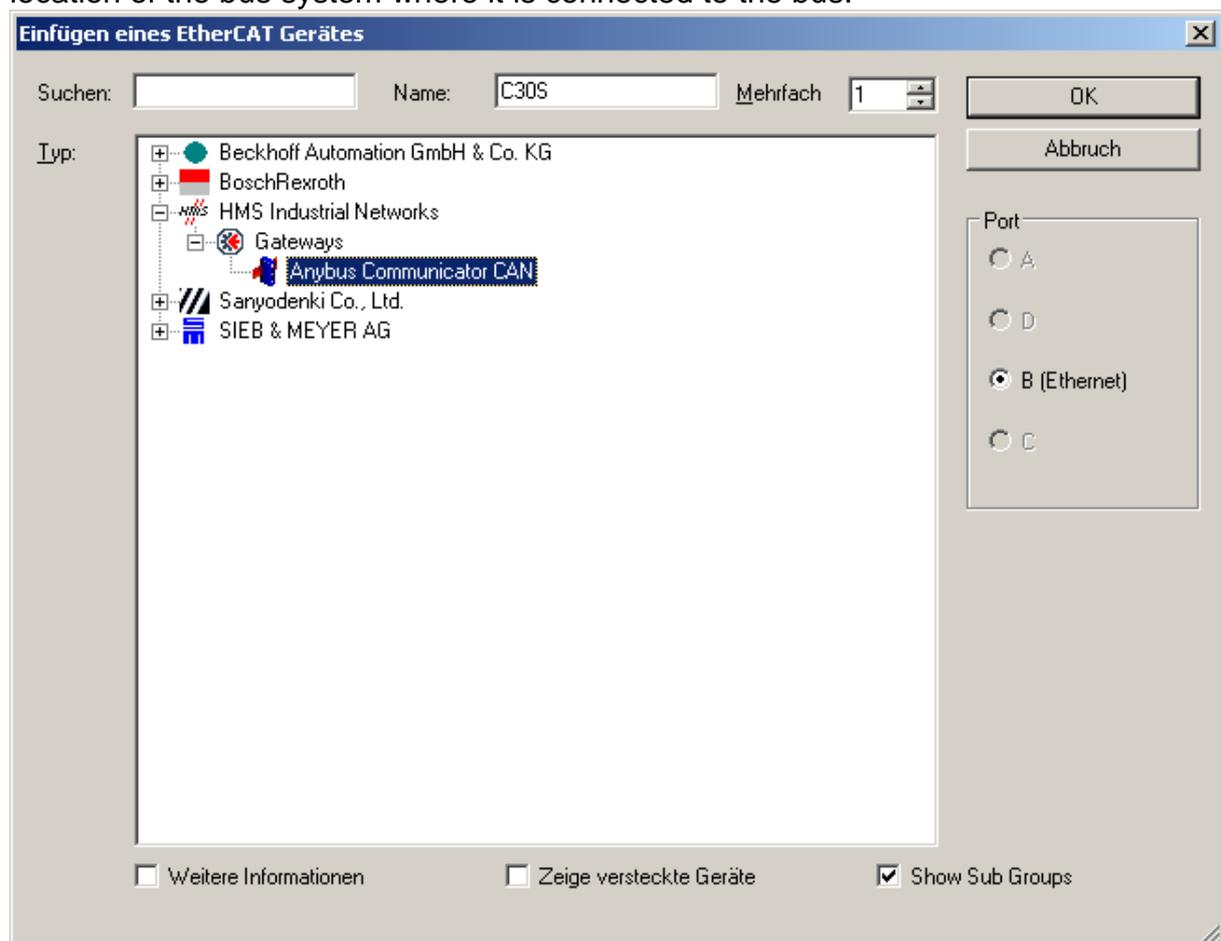
Make sure that the C30S is connected to the EtherCAT Network and the unit is switched on.

The lower Ethernet port (Port1) is the In while the upper port (Port2) is the Out. More information on the hardware connection can be found in the C30S manual.

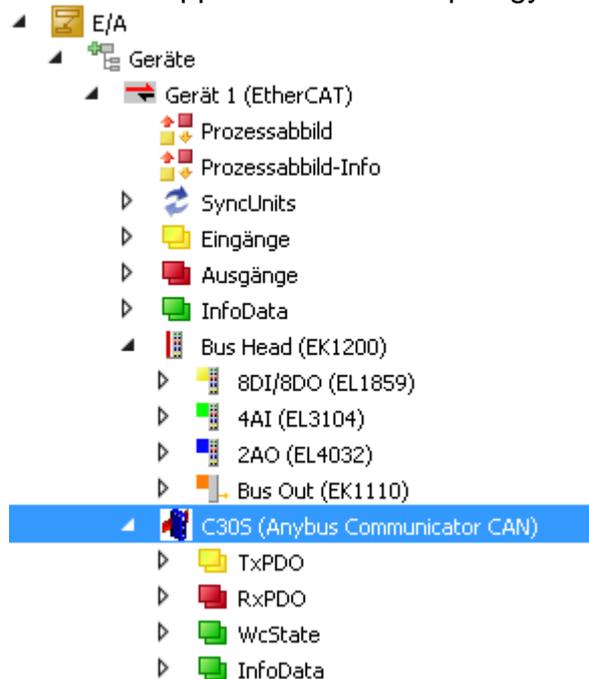
## 3 Configure a C30S slave

### 3.1 Insert the C30S bus coupler

In the TwinCAT 3 project at the E/A tree add the `Anybus Communicator CAN` at the location of the bus system where it is connected to the bus:



It will then appear at the bus topology:

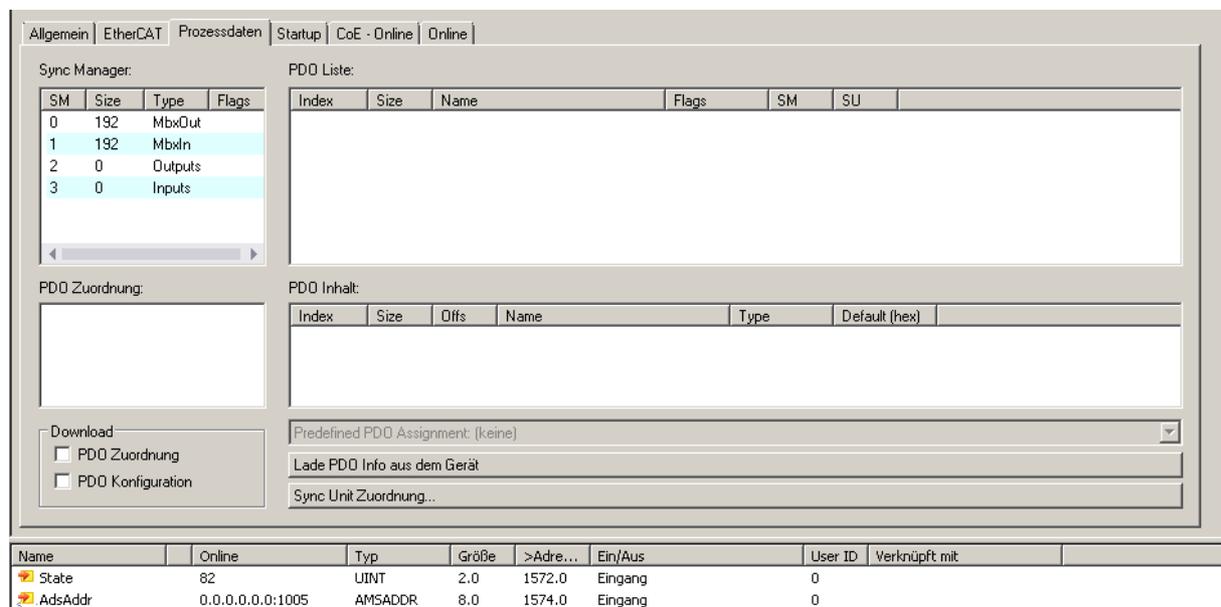


Name the Device C30Sxx, so You can identify it later.

### 3.2 Configure the I/O Data

The I/O data has a fixed definition in the C30S. To get those use the following procedure:

Please select the C30S participant on the bus, so You can view it's properties. Select the Tab Process Data.



Now press the Load PDO info from device button.

TwinCAT will determine all the I/O bytes and inserts those.

There are 29 input bytes and 2 output bytes:

The screenshot shows the EtherCAT configuration interface with the following data:

**Sync Manager:**

SM	Size	Type	Flags
0	192	MbxOut	
1	192	MbxIn	
2	2	Outputs	F
3	29	Inputs	F

**PDO Liste:**

Index	Size	Name	Flags	SM	SU
0x1A00	29.0	TxPDO	MF	3	0
0x1600	2.0	RxPDO	MF	2	0

**PDO Zuordnung (0x1C12):**

- 0x1600

**PDO Inhalt (0x1A00):**

Index	Size	Offs	Name	Type	Default (hex)
0x2000:01	1.0	0.0	Input byte 0000	USINT	
0x2000:02	1.0	1.0	Input byte 0001	USINT	
0x2000:03	1.0	2.0	Input byte 0002	USINT	
0x2000:04	1.0	3.0	Input byte 0003	USINT	

**Download:**

- PDO Zuordnung
- PDO Konfiguration

**Predefined PDO Assignment: (keine)**

Lade PDO Info aus dem Gerät

Sync Unit Zuordnung...

Now the I/O data should be showing up at the C30S hardware tree:

The hardware tree for C30S (Anybus Communicator CAN) is expanded to show the following structure:

- C30S (Anybus Communicator CAN)
  - TxPDO
    - Input byte 0000
    - Input byte 0001
    - Input byte 0002
    - Input byte 0003
    - Input byte 0004
    - Input byte 0005
    - Input byte 0006
    - Input byte 0007
    - Input byte 0008
    - Input byte 0009
    - Input byte 0010
    - Input byte 0011
    - Input byte 0012
    - Input byte 0013
    - Input byte 0014
    - Input byte 0015
    - Input byte 0016
    - Input byte 0017
    - Input byte 0018
    - Input byte 0019
    - Input byte 0020
    - Input byte 0021
    - Input byte 0022
    - Input byte 0023
    - Input byte 0024
    - Input byte 0025
    - Input byte 0026
    - Input byte 0027
    - Input byte 0028
  - RxPDO
    - Output byte 0000
    - Output byte 0001

### 3.3 Use the data

As the data is now available as a byte array under the PLC Hardware tree, we need to sort out the values at the byte positions. The C30S manual is pointing out those in the Interface description.

#### 3.3.1 Create data areas and make the mapping

An easy way to map the data is to create a byte array with the same size, as the C30S data in Your code:

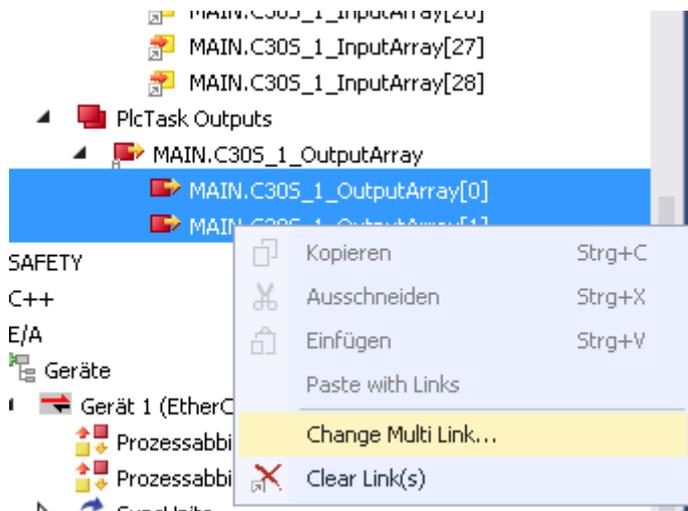
```
C30S_1_InputArray AT%I*: ARRAY[0..28] OF BYTE;
```

```
C30S_1_OutputArray AT%Q*: ARRAY[0..1] OF BYTE;
```

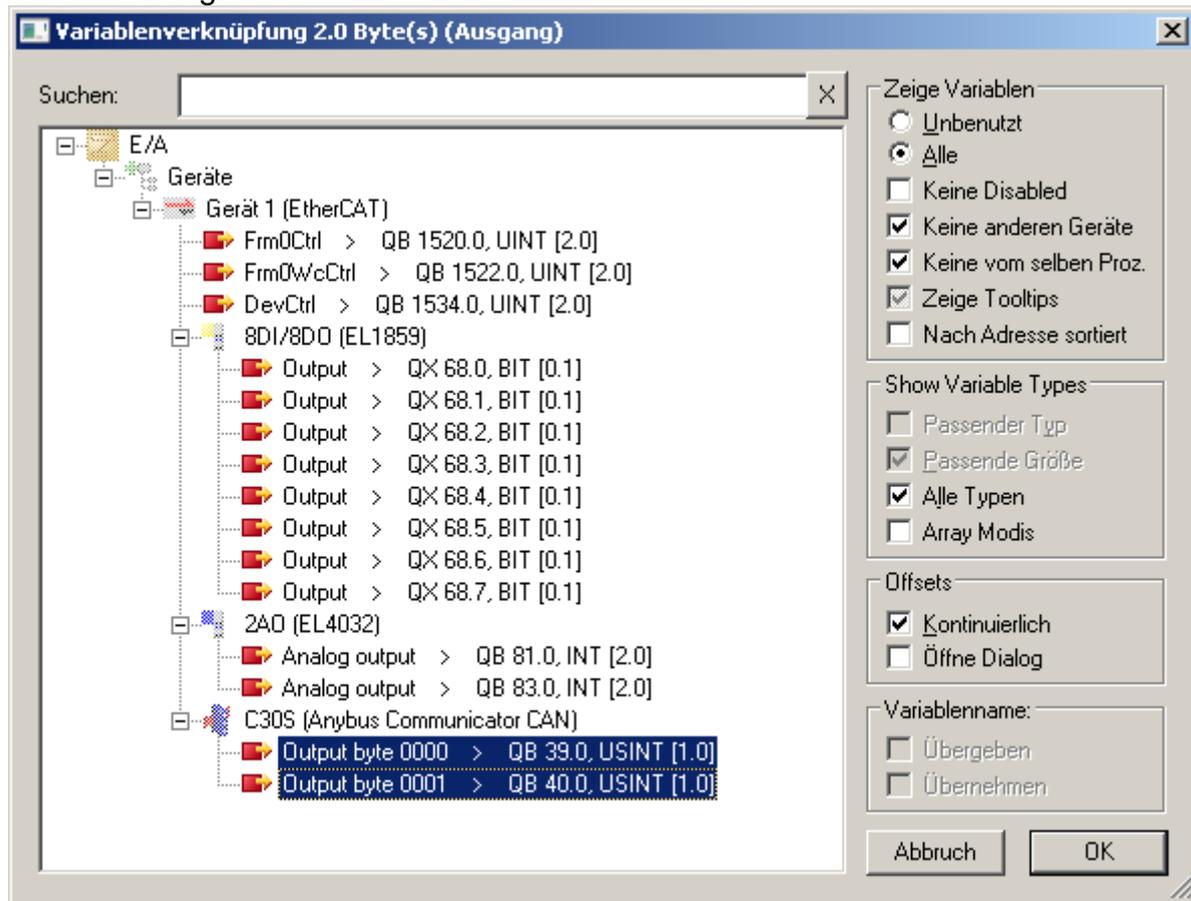
Now select all 28 input bytes and map them with the *Change Multi Link...* function to the 28 output bytes of the C30S hardware.

Same thing with the 2 output bytes, which need to be connected with the 2 input bytes of the C30S hardware.

Here the example for the 2 output bytes:



The link dialog:



Now all hardware bytes are represented by arrays in Your code. You can access all the bytes there.

### 3.3.2 Easy access to values

As we have only the byte arrays, we'd like to have a more practical way to access the C30S values. Especially on Intel platforms there is also the byte swapping, which needs to be done to interpret the values.

With the following structures the data can be accessed in a comfortable way. We define a structure for the C30S outputs, which become inputs to the PLC:

```
{attribute 'pack_mode' := '1'}
TYPE C30SOut_To_PLCIn :
STRUCT
    NoFault:BIT;
    ReadyToStart:BIT;
    OK:BIT;
    NOK:BIT;
    DepthReached:BIT;
    Reserve0:BIT;
    Reserve1:BIT;
    Reserve2:BIT;
    Result_Prg:BYTE;
    Result_DiagType:BYTE;
    Result_Code:UINT;
    Result_Torque:REAL;
    Result_PreTorque:REAL;
```

```

    Result_Angle:REAL;
    Result_Depth:REAL;
    Result_ScrewTime:REAL;
    Result_CycleNo:UDINT;
END_STRUCT
END_TYPE

```

As well we define a structure for the C30S inputs, which are outputs from the PLC:

```

TYPE C30SIn_To_PLCOut :
STRUCT
    Automatic:BIT;
    Start:BIT;
    AckcoledgeFault:BIT;
    TM1:BIT;
    TM2:BIT;
    ExternDigital:BIT;
    Reserve1:BIT;
    Reserve2:BIT;
    Prg:BYTE;
END_STRUCT
END_TYPE

```

If the byte swapping is necessary, the code could be looking like this in the Init section:

```

PROGRAM MAIN
VAR
    C30S_1_InputArray AT%I*: ARRAY[0..28] OF BYTE;
    C30S_1_OutputArray AT%Q*: ARRAY[0..1] OF BYTE;
    InputsFromC30s_1 :C30SOut_To_PLCIn;
    OutputsToC30s_1 :C30SIn_To_PLCOut;
    fb_Swap2Bytes: Swap2Bytes;
    fb_Swap4Bytes: Swap4Bytes;
END_VAR

```

The Code section:

```

//perform the byte swapping for all inputs, if runs on a intel processor
fb_Swap2Bytes( in_bytes:=ADR(C30S_1_InputArray[3]));
fb_Swap4Bytes( in_bytes:=ADR(C30S_1_InputArray[5]));
fb_Swap4Bytes( in_bytes:=ADR(C30S_1_InputArray[9]));
fb_Swap4Bytes( in_bytes:=ADR(C30S_1_InputArray[13]));
fb_Swap4Bytes( in_bytes:=ADR(C30S_1_InputArray[17]));
fb_Swap4Bytes( in_bytes:=ADR(C30S_1_InputArray[21]));
fb_Swap4Bytes( in_bytes:=ADR(C30S_1_InputArray[25]));
//copy over the data to the struct, to get easy access
MEMCPY(ADR(InputsFromC30s_1), ADR(C30S_1_InputArray), 29);

//insert here your step ladder code, to evaluate the C30S inputs and set
the outputs accordingly
OutputsToC30s_1.Start:=FALSE; //reset start singal
OutputsToC30s_1.Prg:=10; //set programm

```

```
//copy the values from the struct to the data array
MEMCPY(ADR(C30S_1_OutputArray), ADR(OutputsToC30s_1), 2);
```

If the PLC runs on a Motorola processor, the swapping has to be omitted!

### 3.3.3 Swap FB's

For the byte swapping the following function blocks can be used:

#### 3.3.3.1 2 Byte swapping

Init Section:

```
FUNCTION_BLOCK Swap2Bytes
VAR_INPUT
    in_bytes: POINTER TO ARRAY[0..1] OF BYTE;
END_VAR
VAR_OUTPUT
END_VAR
VAR
    temp: BYTE;
END_VAR
```

Code section:

```
temp:=in_bytes^[0];

in_bytes^[0]:=in_bytes^[1];
in_bytes^[1]:=temp;
```

#### 3.3.3.2 4 byte swapping

Init Section:

```
FUNCTION_BLOCK Swap4Bytes
VAR_INPUT
    in_bytes: pointer TO ARRAY[0..3] OF BYTE;
END_VAR
VAR_OUTPUT
END_VAR
VAR
    temp: ARRAY[0..1] OF BYTE;
END_VAR
```

Code section:

```
temp[0]:=in_bytes^[0];
temp[1]:=in_bytes^[1];

in_bytes^[0]:=in_bytes^[3];
in_bytes^[1]:=in_bytes^[2];
in_bytes^[2]:=temp[1];
in_bytes^[3]:=temp[0];
```