Application Note

FESTO

CECC-LK as IO-Link Master Connected to SDAT

The application note contains a step by step explanation how to configure a SDAT sensor as IO-Link device connected to CECC-LK in Codesys V3.

CECC-LK;
SDAT

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1 Components/Software/ IP address used

Type/Name	Version Software/Firmware	IP address	Subnet mask
CECC-LK	V 1.4.0.1	192.168.0.20	255.255.0.0
Laptop	--	192.168.0.100	255.255.0.0
Codesys V3.5	SP7 Patch 4	--	--
SDAT-MHS-M100-1L-SA-E-0.3-M8	REV 4	--	--
NEBU-M8G4-K-2.5-LE4	--	--	--
ADN-16-100-A-P-A	--	--	--

Table 1.1: 1 Components/Software used

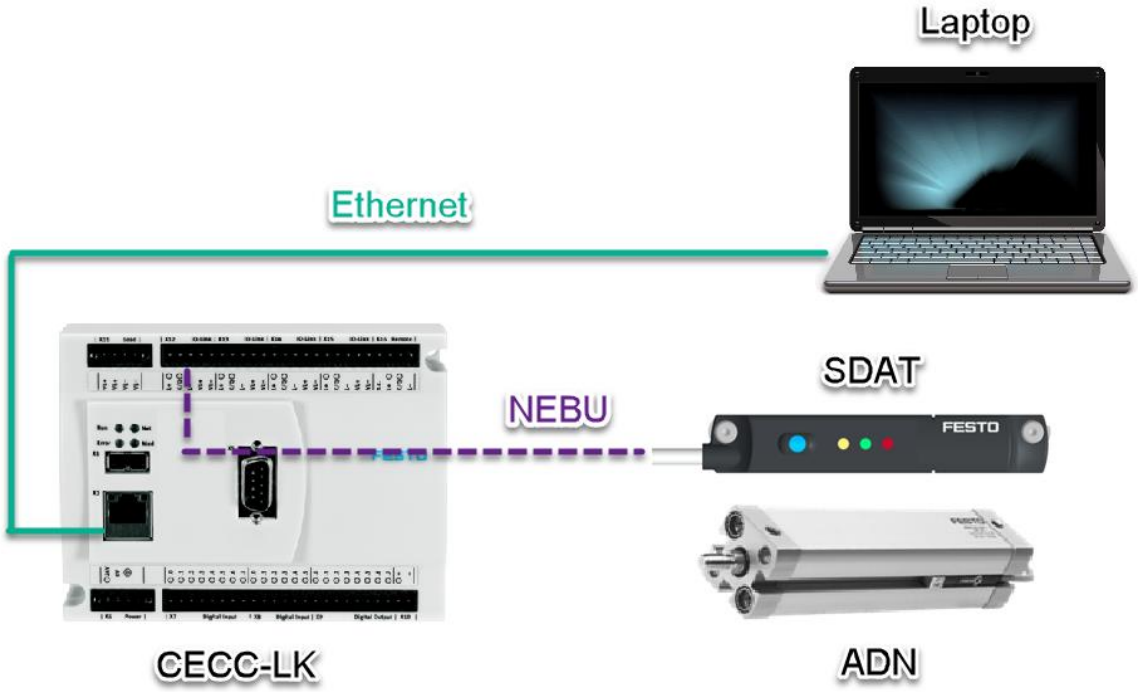
1.1 Recommended manuals / IODD

SDAT manual:
https://www.festo.com/net/en-gb_gb/SupportPortal/Downloads/351653/443787/SDAT-MHS_2016-07d_8064926g1.pdf
IODD:
https://www.festo.com/net/en-gb_gb/SupportPortal/default.aspx?q=1531267+IODD&tab=4

CECC manual:
https://www.festo.com/net/SupportPortal/Files/407042/CECC_2014-03a_8036062g1.pdf
Target Support:
https://www.festo.com/net/en-gb_gb/SupportPortal/Downloads/415525/443515/CECC_3.5.7.159(ad778b5e1029).package

NEBU catalog:
https://www.festo.com/net/en-gb_gb/SupportPortal/Downloads/272418/208021/nebu_en.pdf

1.2 Topology

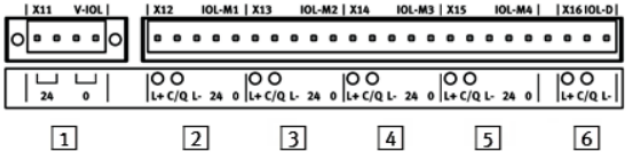


1.3 Wiring

IO-Link is a point to point communication (1 Master -› 1 Slave). In our example, we use port 1 of IO-Link master from CECC-LK. Festo has the NEBU cable series to connect the CECC-LK and SDAT. To get the correct wiring, please check the following pin assignments.

CECC-LK:

3.5.8 IO-Link on the CECC-LK



1 IO-Link load voltage supply X11

2...5 IO-Link master ports for connecting IO-Link devices X12 ... X15

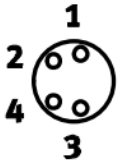
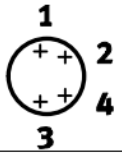
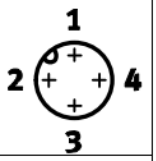
6 IO-Link device port for connecting the CECC-LK as an IO-Link device X16

Figure: CECC-LK, top manifold rail with IO-Link interfaces

IO-Link	Pin	Signal	Comment
1	X11.1	24	Connection for load voltage supply for IO-Link master ports[1]: UA+
	X11.2		
	X11.3	0	Connection for load voltage supply for IO-Link master ports[1]: UA– (GND)
	X11.4		
2... 5	X12...15.1	L+	24 V
	X12...15.2	C/Q	IO-Link communication signal
	X12...15.3	L–	0 V
	X12...15.4	24	UA+
	X12...15.5	0	UA–
6	X16.1	L+	24 V
	X16.2	C/Q	IO-Link communication signal
	X16.3	L–	0 V
1) Port class B			

Table: Pin allocation of the IO-Link interfaces on the CECC-LK

NEBU:

Electrical connection: socket, 4-pin, M8 – plug, 4-pin				
	1	BN	1	Plug M8  Plug M12 
	2	WH	2	
	3	BU	3	
	4	BK	4	

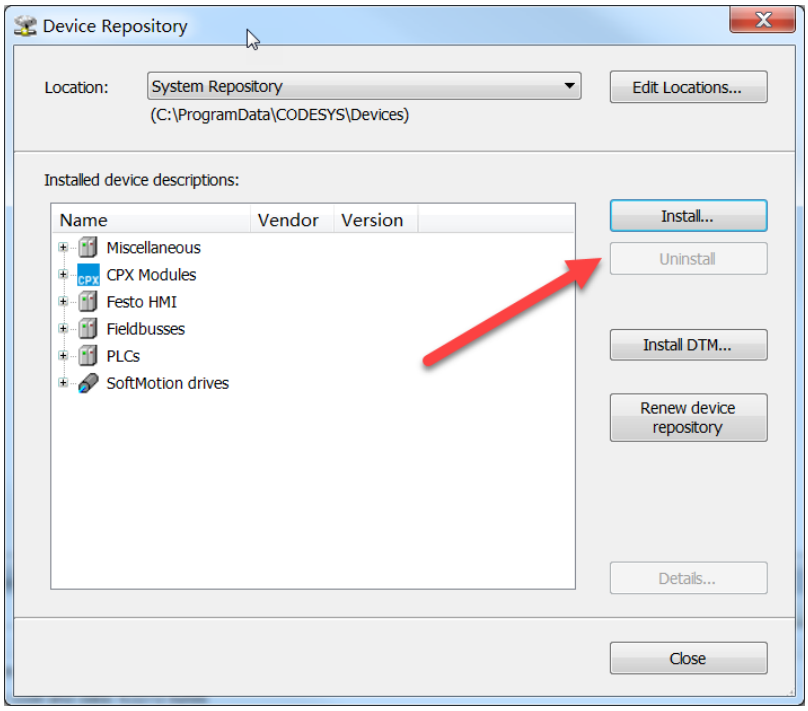
SDAT:

Pin allocation				
Plug M8x1, 4-pin			Wire colours	
	1	Operating voltage +24 V DC	1	BN = brown
	2	Analogue output 4 ... 20 mA	2	WH = white
	3	0 V	3	BU = blue
	4	IO-Link/switching output	4	BK = black

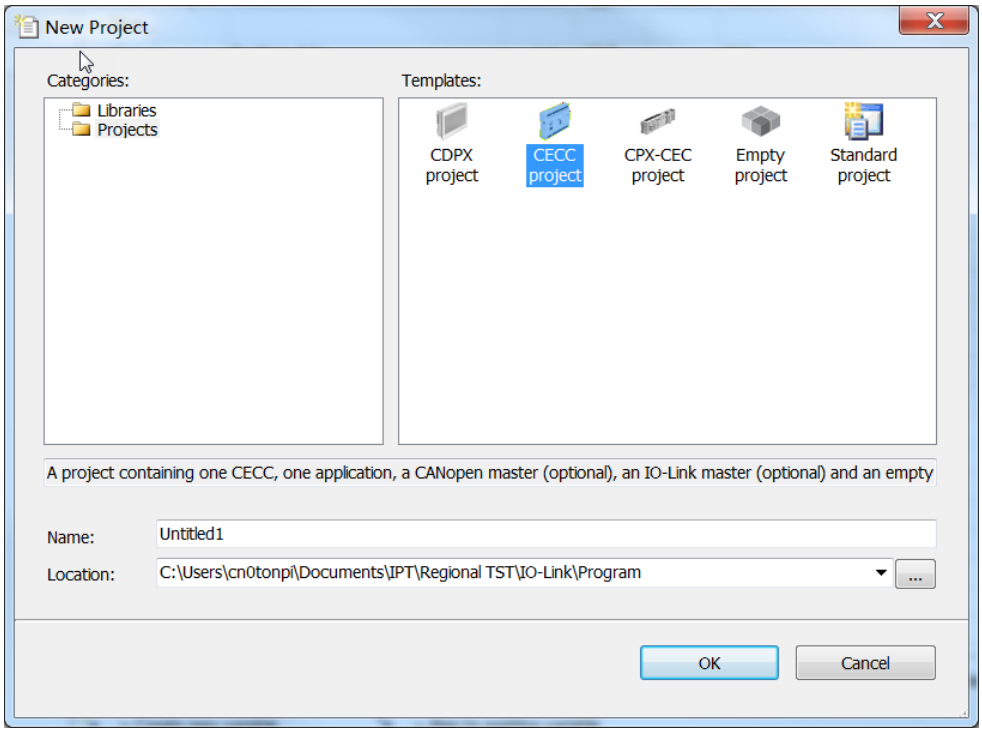
2 Configuring the IO-Link master

2.1 IO-Link configuration

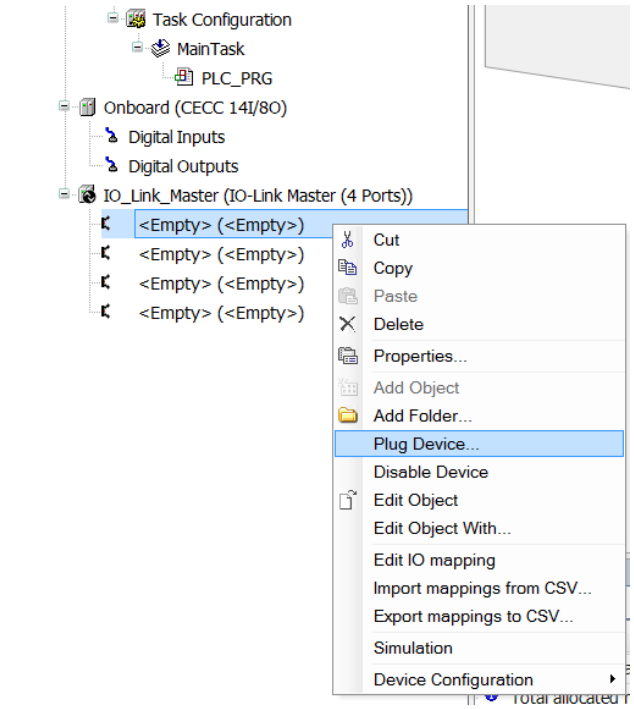
Download the IODD file of SDAT and install it in the Codesys



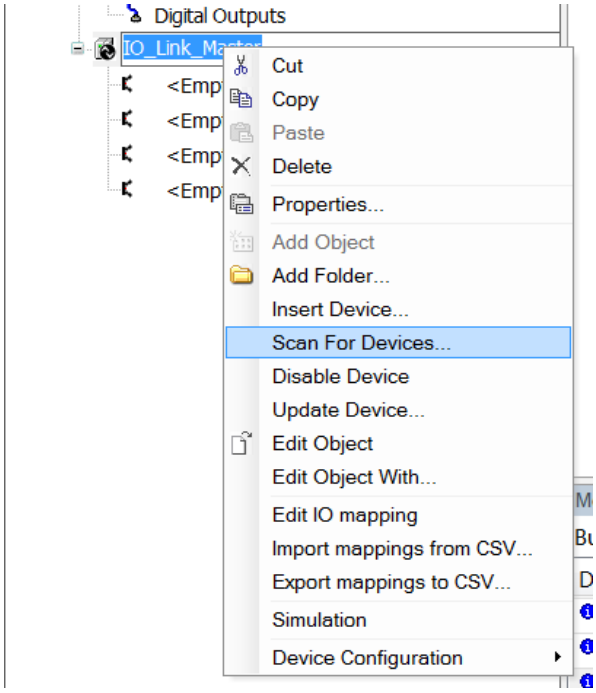
New an IO-Link master project, select CECC-LK and activate IO-Link Master



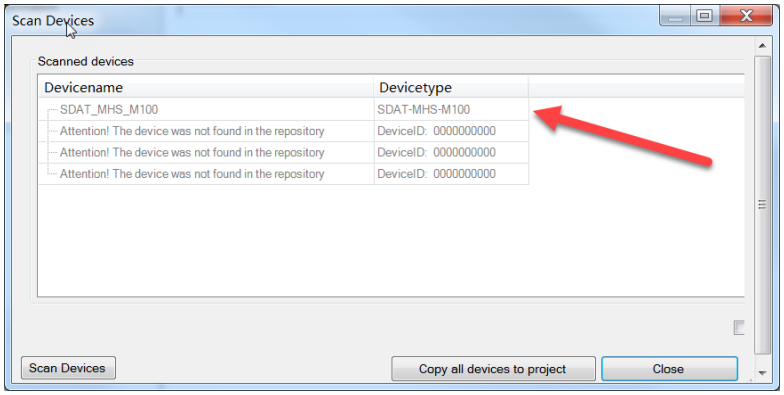
You can either right click the port 1 -› Plug Device to add sensor manually



Or right click the IO_Link_Master -› Scan For Devices



And after a moment, you will automatically find the device



2.2 Configuration of Parameters and Testing

Test the cylinder from zero point to max stroke, make sure that the SDAT sensor does not have a red LED indicating piston outside maximum range. If there is a red LED illuminated, then use screw to adjust the position of the sensor.

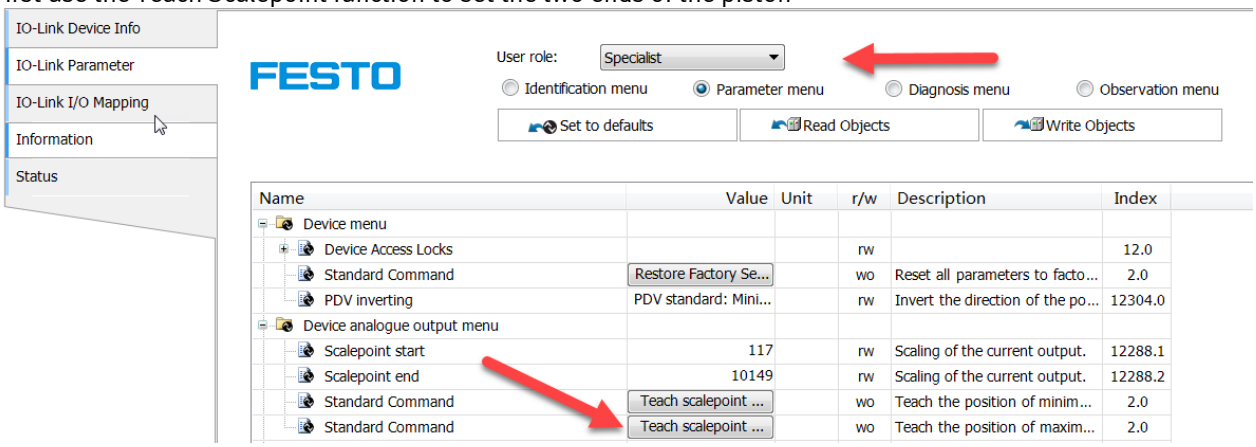
Status signals in normal operation

LED indicator Yellow	Green	Red	Description
○	☀	○	Green LED illuminated: Ready status (yellow: Any, red: Off). – Analogue output function or switching output operating mode. – Piston within the sensing range.
○	☀	○	Green LED flashing at 1 Hz: Ready status. – IO-Link operating mode.
☀	☀	○	Yellow and green LEDs illuminated: Ready status. – Switching output switched. – Piston in the range of a programmed function.
○	☀	○	Green LED flashing 3 seconds at 3 Hz while the operating key is pressed: Operating key blocked.
○	○	☀	Red LED illuminated: Status display. – Piston outside the sensing range.

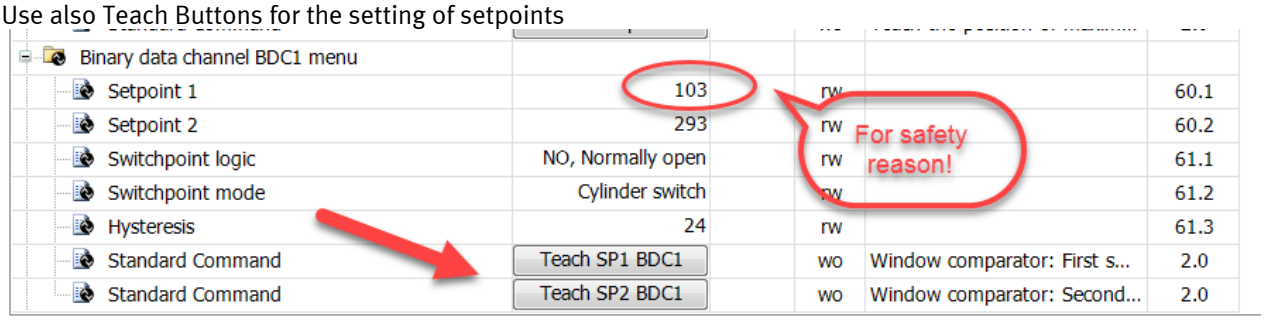
Tab. 4 LED displays in normal operation

The IO-Link function cannot be set via the operating keys on the device. All settings for set-up, commissioning and parameterisation are made in the higher-level controller of the IO-Link master.

Go to the SDAT IO-Link configurator
First use the Teach Scalepoint function to set the two ends of the piston



There are three possible modes and 4 record entries we can use in SDAT, here in our example, we use both Cylinder Switch as Switchpoint Logic for BDC1 & BDC3.
Use also Teach Buttons for the setting of setpoints



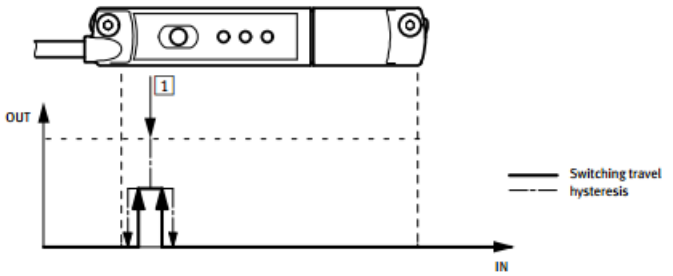
Here I use value 103 for Setpoint 1, which is smaller than scaled zero point valued 117 for the safety reason, because sometimes due to the big force, the piston can go further than your taught static zero point.

Set also Switchpoint Logic for maximum stroke

Binary data channel BDC3 menu				
Setpoint 1	9782	rw		16384.1
Setpoint 2	10178	rw		16384.2
Switchpoint logic	NO, Normally open	rw		16385.1
Switchpoint mode	Window comparator	rw		16385.2
Hysteresis	24	rw		16385.3
Standard Command	Teach SP1 BDC3	wo	Window comparator: First s...	2.0
Standard Command	Teach SP2 BDC3	wo	Window comparator: Second...	2.0

For safety reason!

Cylinder Switch Mode means



1 Teach point

Fig. 5 Cylinder switch function

Now we can make the test.
At the zero position

Channels

Variable	Map...	Channel	Address	Type	Defa...	Current Value	Prepared Val...	Unit	Description
Position data and switches									
		Position data	%IW1	UINT		24			0..2088 Position...
		Binary data channel BDC4	%IX4.0	BIT		FALSE			On Off
		Binary data channel BDC3	%IX4.1	BIT		FALSE			On Off
		Binary data channel BDC2	%IX4.2	BIT		FALSE			On Off
		Binary data channel BDC1	%IX4.3	BIT		TRUE			On Off

At the end position

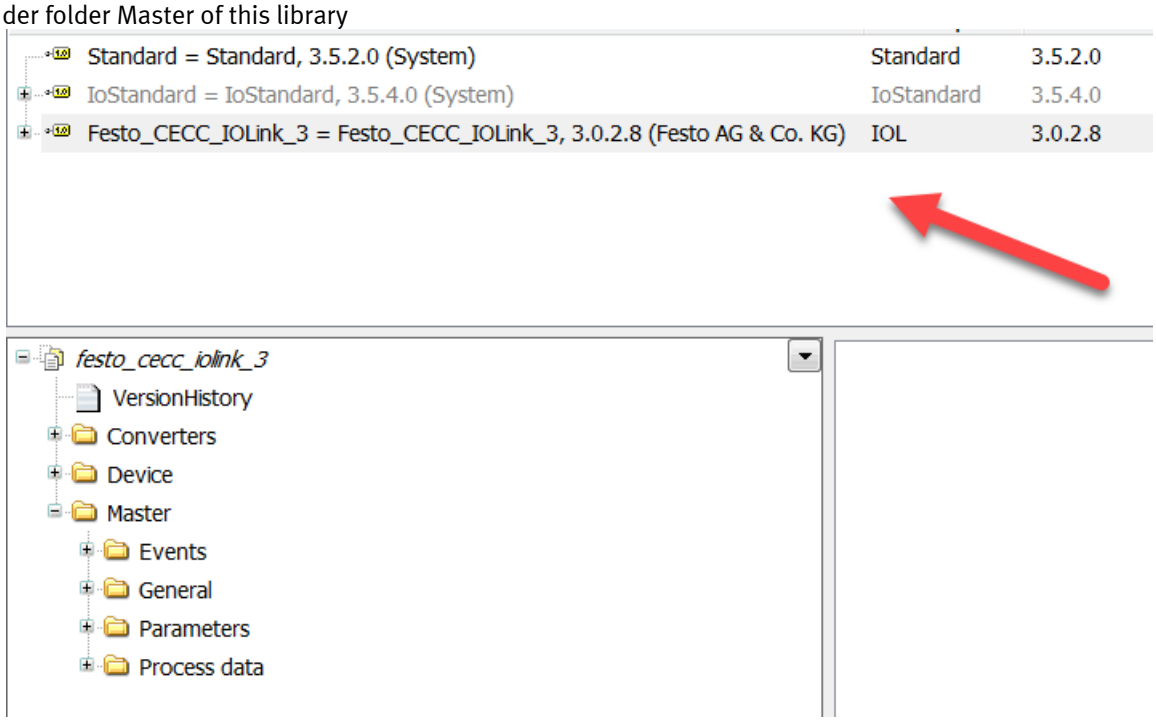
Channels

Variable	Map...	Channel	Address	Type	Defa...	Current Value	Prepared Val...	Unit	Description
Position data and switches									
		Position data	%IW1	UINT		2079			0..2088 Position...
		Binary data channel BDC4	%IX4.0	BIT		FALSE			On Off
		Binary data channel BDC3	%IX4.1	BIT		TRUE			On Off
		Binary data channel BDC2	%IX4.2	BIT		FALSE			On Off
		Binary data channel BDC1	%IX4.3	BIT		FALSE			On Off

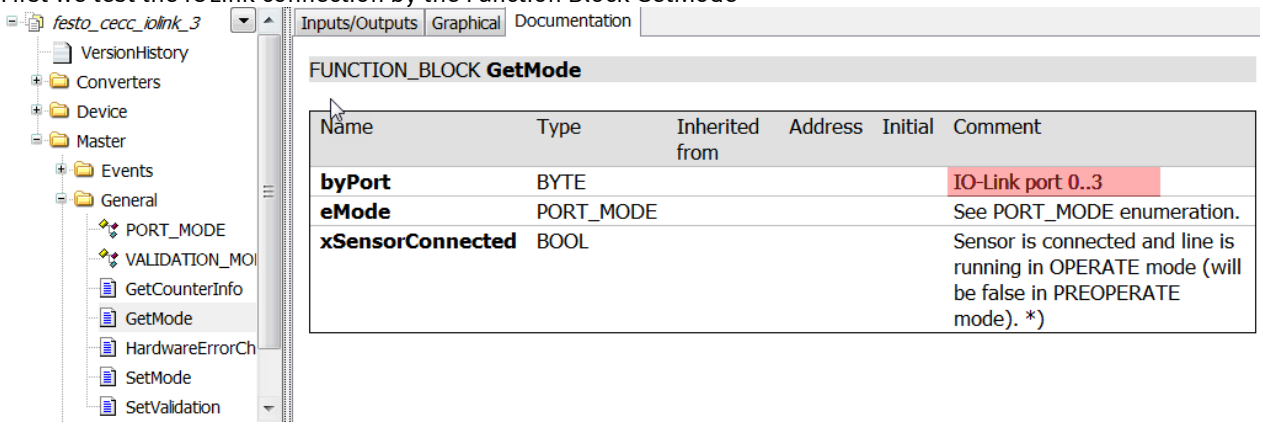
2.3 Programming in Codesys

2.3.1 Program to read parameter by coding

Import Festo_CECC_IOLink_3 library to project, in the project we are using the Functions & Function Blocks under folder Master of this library

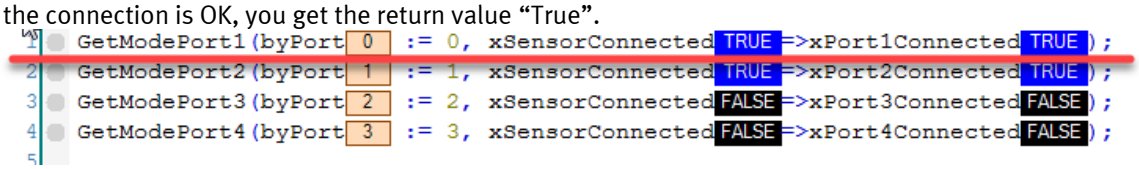


First we test the IOLink connection by the Function Block GetMode



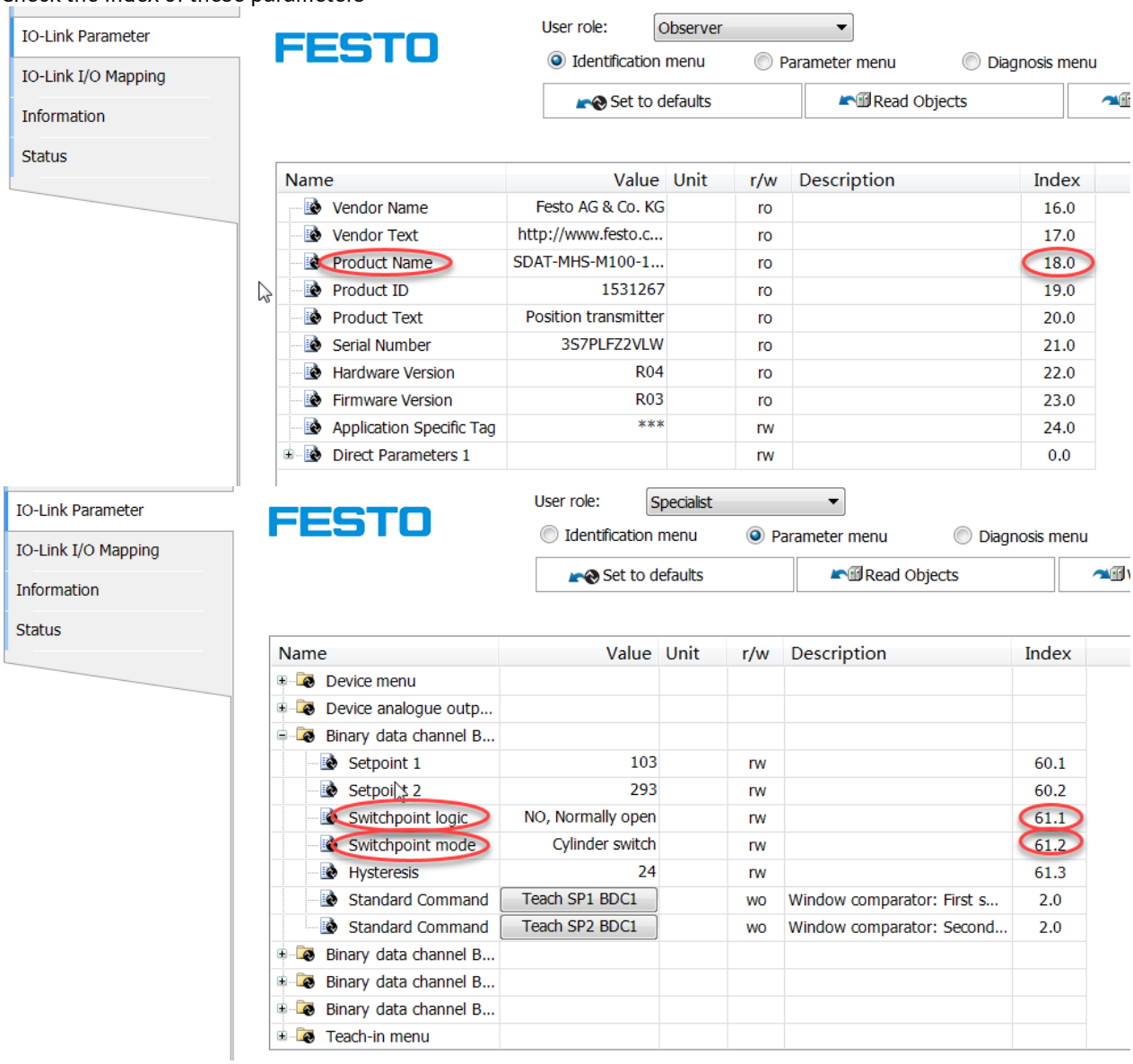
Being noticed that we are using IOL port 1, but in this FB we should use port number “0”!

If the connection is OK, you get the return value “True”.



Next we will use the FB ReadParameter to read the parameters from SDAT.
In this case, we read the Product Name, Switchpoint Logic of BDC1 and Switchpoint Mode of BDC1.

Check the index of these parameters



Only **one function block** for read/write parameter for **one port** is allowed!

We program accordingly, and get the results

```
IF xPort1Connected TRUE THEN
    CASE byStep 3 OF
    0:  //read product name
        IF NOT ReadParameterPort1.xBusy FALSE THEN
            ReadParameterPort1(xExecute FALSE := TRUE, byPort 0 :=0, wIndex 61 := 18, pbyData 16#404C2B21 := ADR(strProductPort1 'SDAT-MHS-M ));
        ELSIF ReadParameterPort1.xBusy FALSE THEN
            ReadParameterPort1(xExecute FALSE := FALSE);
        END_IF
        IF ReadParameterPort1.xDone TRUE THEN
            byStep 3 := 1;
        END_IF

    1:  //read Swtichpoint Logic in BDC1
        IF NOT ReadParameterPort1.xBusy FALSE THEN
            ReadParameterPort1(xExecute FALSE := TRUE, byPort 0 := 0, wIndex 61 := 61, bySubindex 2 := 1, pbyData 16#404C2B21 := ADR(xSwitchPointLogic FALSE));
        ELSIF ReadParameterPort1.xBusy FALSE THEN
            ReadParameterPort1(xExecute FALSE := FALSE);
        END_IF
        IF ReadParameterPort1.xDone TRUE THEN
            byStep 3 := 2;
        END_IF

    2:  //read Switchpoint Mode in BDC1
        IF NOT ReadParameterPort1.xBusy FALSE THEN
            ReadParameterPort1(xExecute FALSE := TRUE, byPort 0 := 0, wIndex 61 := 61, bySubindex 2 := 2, pbyData 16#404C2B21 := ADR(bSwitchPointMode 1));
        ELSIF ReadParameterPort1.xBusy FALSE THEN
            ReadParameterPort1(xExecute FALSE := FALSE);
        END_IF
        IF ReadParameterPort1.xDone TRUE THEN
            byStep 3 := 3;
        END_IF
```

We get the result:
strProductPort1 = ‘SDAT-MHS-M100-1L-SA-E-0.3-M8’
xSwtichPoint = False //which means Normally Open
bSwitchPointMode = 1 //which means Cylinder Switch

2.3.2 Read process data

You can read the process data directly under the IO-Link I/O Mapping of this sensor in IO-Link configurator