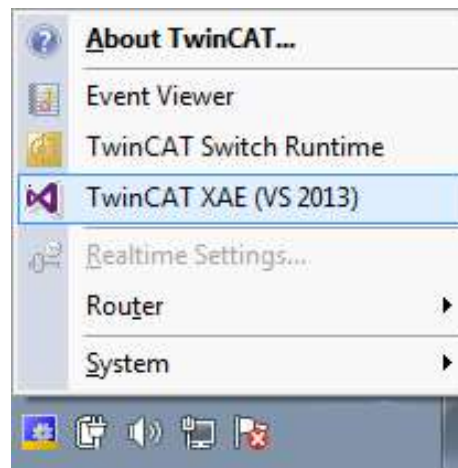


BECKHOFF

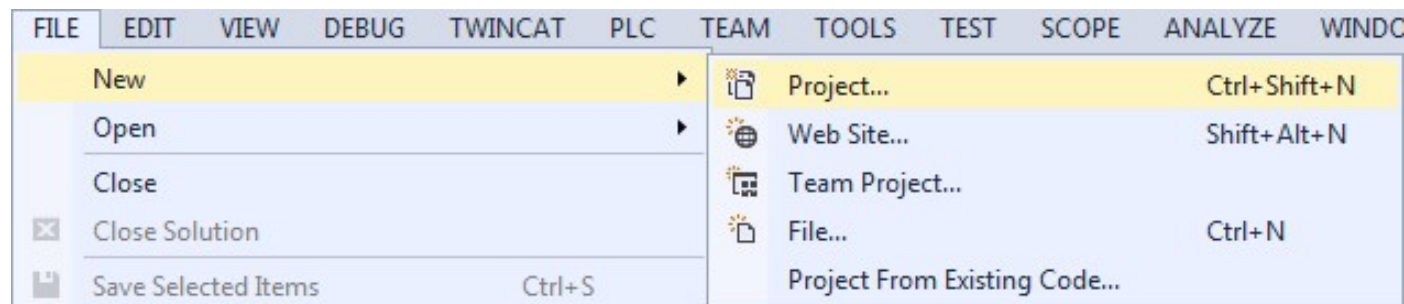


- Start a new project
- Place TwinCAT in Config Mode
- Scan Hardware
- Activate Free Run
- Verify Communication
- Test I/O

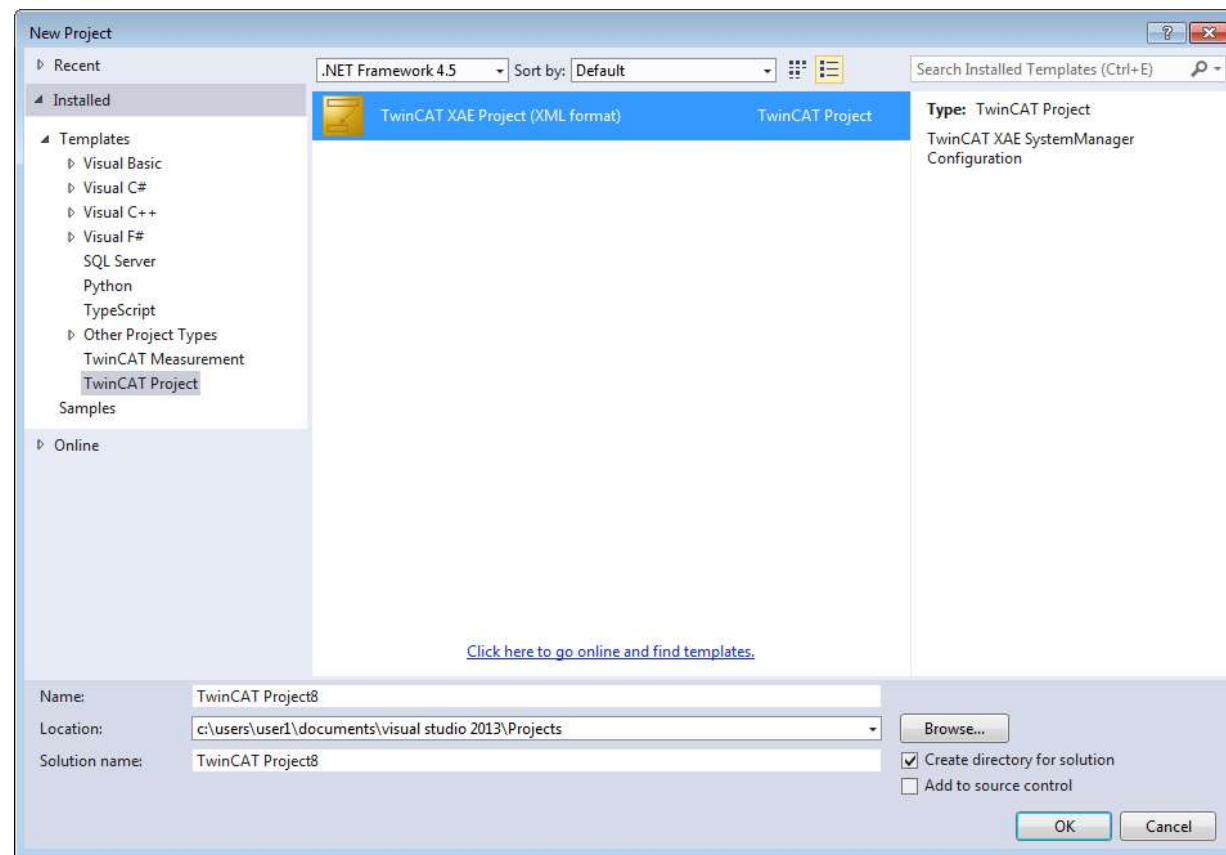
- Click on the TwinCAT Icon and select TwinCAT XAE



- From the File menu, select New -> Project



- Select TwinCAT XAE Project
- Provide a Name, and Click 'OK'



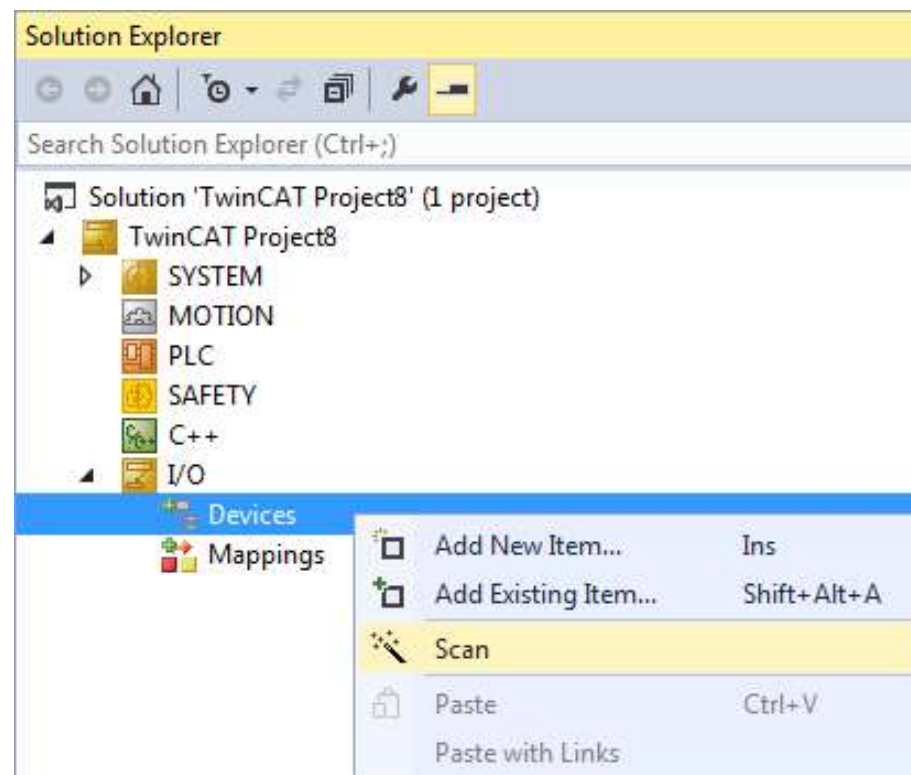
- From the TwinCAT Menu, Select 'Restart TwinCAT (Config Mode)'



- Confirm the prompt by click 'OK'



- Click the triangle to expand 'I/O'
- Right-Click on 'Devices' and select 'Scan'



- 3rd party devices may not be found, click OK to acknowledge the HINT

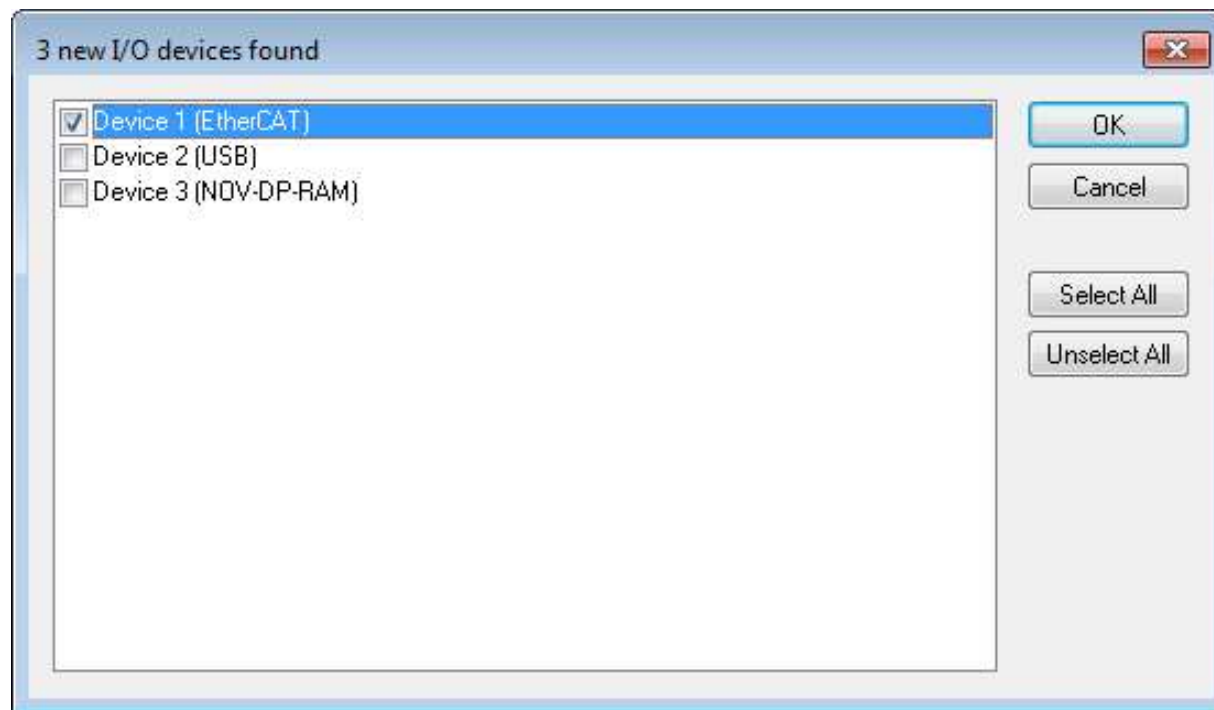


- Note: Configuration files from 3rd party vendors should be placed in the appropriate fieldbus folder under C:\TwinCAT \ IO \

- Click Yes to scan for boxes. TwinCAT will now attempt to search for IO devices and drives on all fieldbus networks.

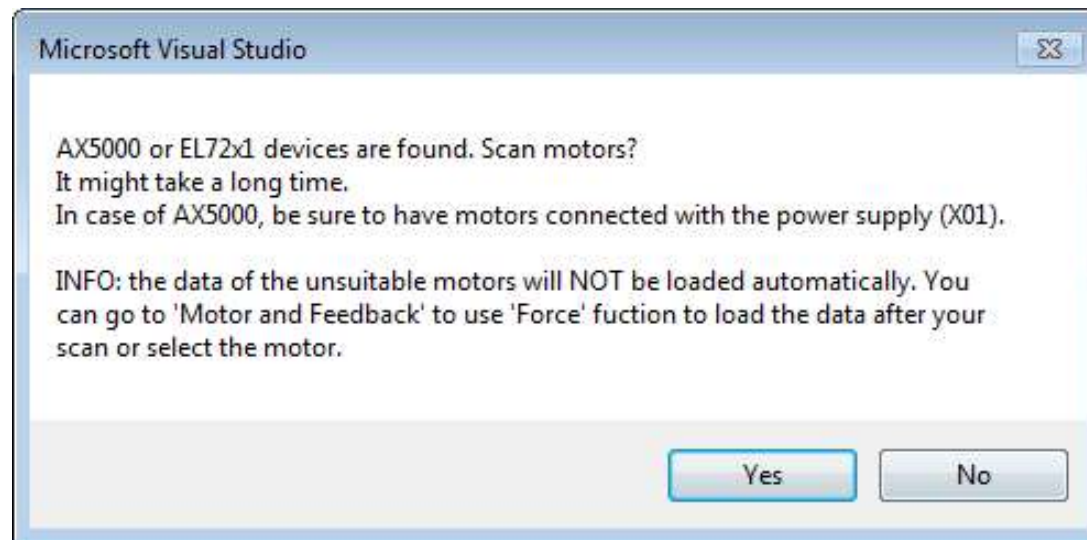


- TwinCAT will find all devices inside the PC that can be used as a fieldbus controller. Select all fieldbus controllers you wish to use and click OK

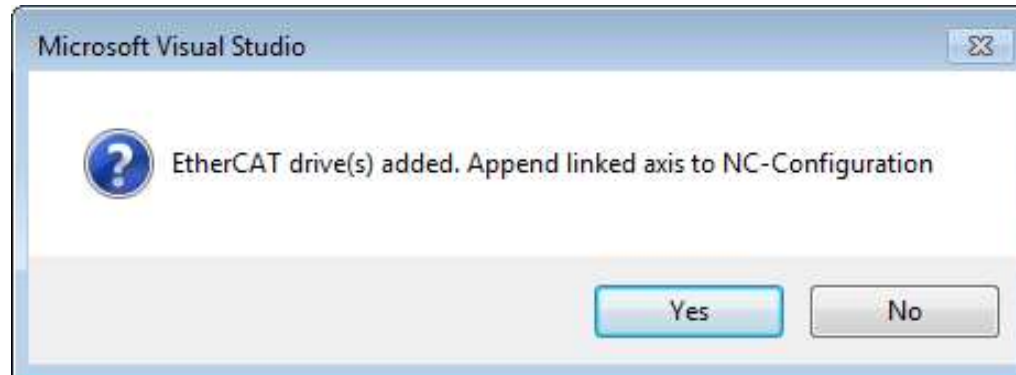


- Note: If you are expecting an EtherCAT device that is not listed, but instead have a RT-Ethernet device, then check the cabling from the PC to the first EtherCAT device on the network

- Click 'No' – we will not be using the motors in this lab.



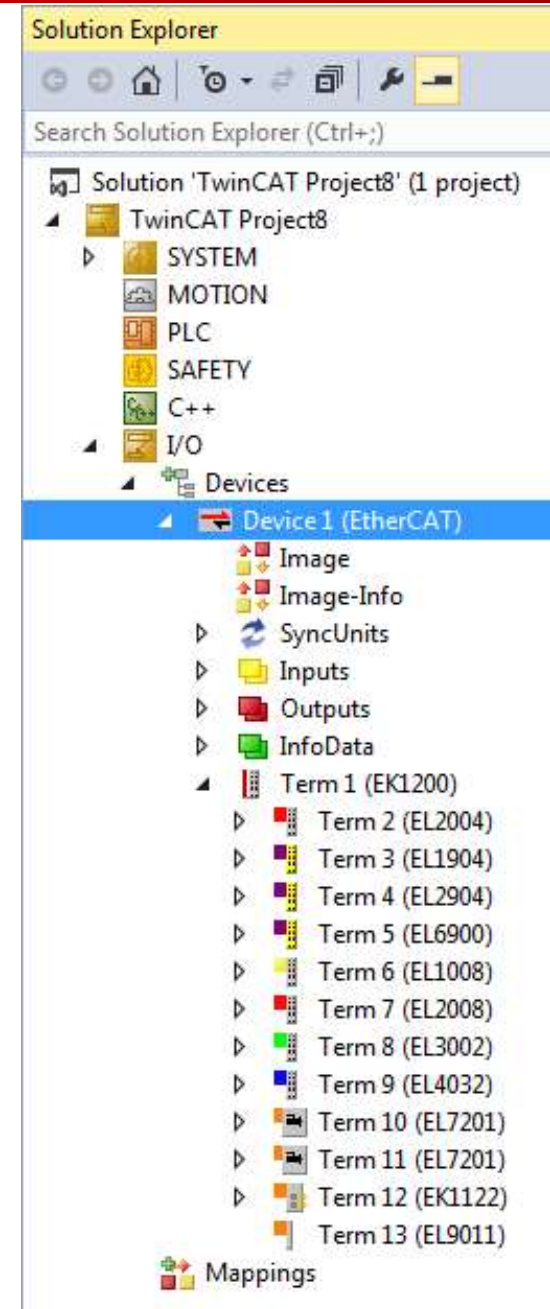
- Click 'No' – we will not be using the servos in this lab.



- Click Yes to Activate Free Run
- This will update the I/O values and display them in the I/O section of the Project



- The I/O section now displays the fieldbus controllers and the I/O devices on the network



- Double click on the EtherCAT controller then, then select the Online tab
- Verify all devices are in OP

Note: The EL7201 Servo Terminals will not be in OP unless TwinCAT is in Run Mode

The screenshot displays the TwinCAT software interface. On the left, the 'Solution Explorer' shows a project tree with 'TwinCAT Project8' expanded, and 'Device 1 (EtherCAT)' selected under the 'I/O' folder. On the right, the 'EtherCAT Online' tab is active, showing a table of device states. The 'State' column indicates that most terminals are in 'OP' (Operational) state, except for Term 10 and Term 11, which are in 'SAFEOP' state. Below the table, the 'Actual State' is set to 'OP', and the 'Counter' section shows statistics for Send Frames, Frames / sec, Lost Frames, and Tx/Rx Errors.

No	Addr	Name	State	CRC
1	1001	Term 2 (EL2004)	OP	0, 0
2	1002	Term 3 (EL1904)	OP	0, 0
3	1003	Term 4 (EL2904)	OP	0, 0
4	1004	Term 5 (EL6900)	OP	0, 0
5	1005	Term 6 (EL1008)	OP	0, 0
6	1006	Term 7 (EL2008)	OP	0, 0
7	1007	Term 8 (EL3002)	OP	0, 0
8	1008	Term 9 (EL4032)	OP	0, 0
9	1009	Term 10 (EL7201)	SAFEOP	0, 0
10	1010	Term 11 (EL7201)	SAFEOP	0, 0
11	1011	Term 12 (EK1122)	OP	0

Actual State:

Buttons: Init, Pre-Op, Safe-Op, Op, Clear CRC, Clear Frames

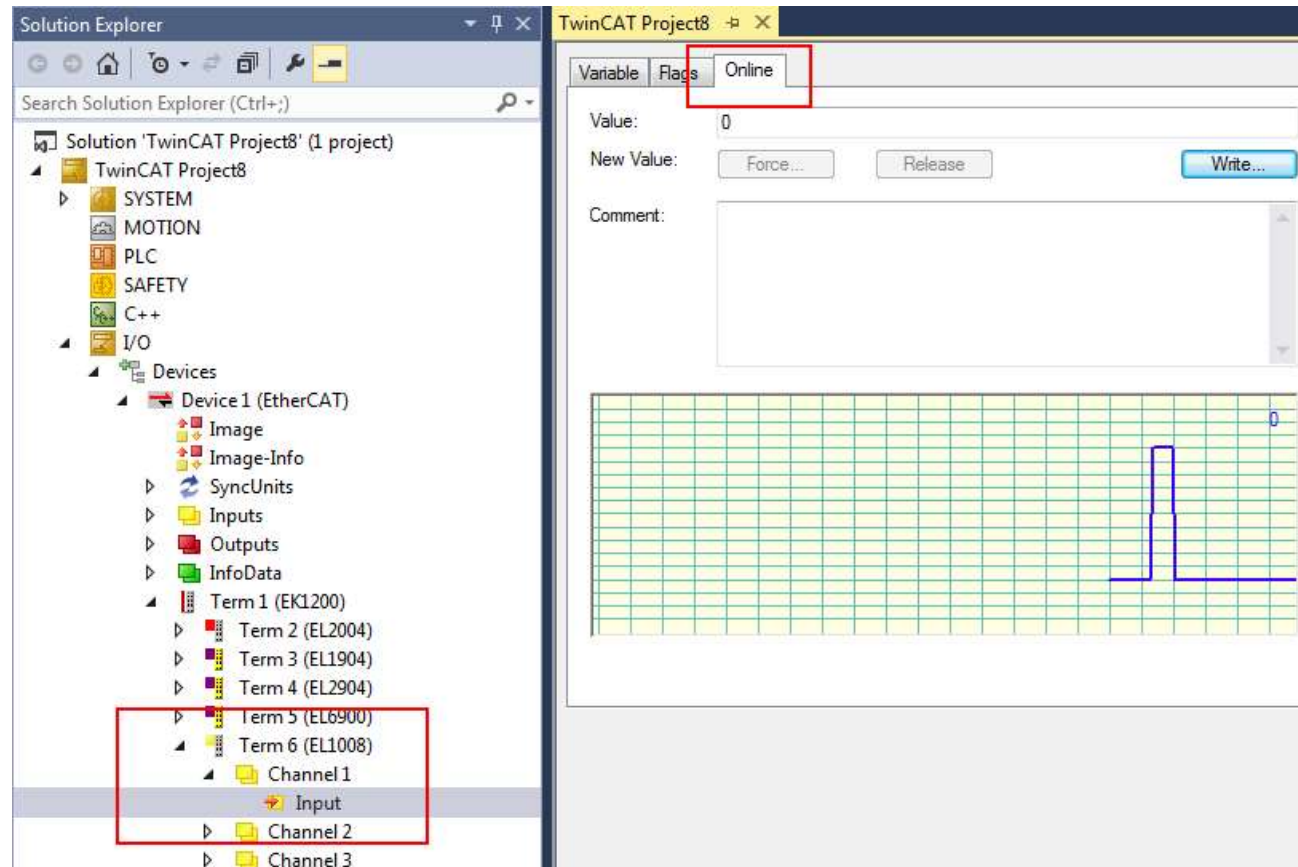
Counter	Cyclic	Queued
Send Frames	10185	+ 9523
Frames / sec	500	+ 103
Lost Frames	0	+ 0
Tx/Rx Errors	0	/ 0

- Expand the EK1200
- Select the EL1008
- Use the Online column to verify the Inputs are working correctly

The screenshot displays the TwinCAT Project8 interface. On the left, the Solution Explorer shows the project structure. The 'I/O' folder is expanded, and the 'Term 6 (EL1008)' is selected. On the right, the Properties window is open, showing the 'General' tab. The 'Name' field is 'Term 6 (EL1008)', the 'Object Id' is '0x03020006', and the 'Type' is 'EL1008 8Ch. Dig. Input 24V, 3ms'. Below the Properties window, a table lists the inputs and their status.

Name	Online	Type	Size	>Addr...	In/Out	User ID	Linked to
Input	0	BIT	0.1	137.0	Input	0	
Input	0	BIT	0.1	137.1	Input	0	
Input	0	BIT	0.1	137.2	Input	0	
Input	0	BIT	0.1	137.3	Input	0	
Input	0	BIT	0.1	137.4	Input	0	
Input	0	BIT	0.1	137.5	Input	0	
Input	0	BIT	0.1	137.6	Input	0	
Input	0	BIT	0.1	137.7	Input	0	
WcState	0	BIT	0.1	1522.5	Input	0	
InputToggle	0	BIT	0.1	1524.5	Input	0	
State	8	UINT	2.0	1580.0	Input	0	

- Expand the EL1008, then expand a specific channel
- Select Input then the Online tab
- The graph will display the value of the input

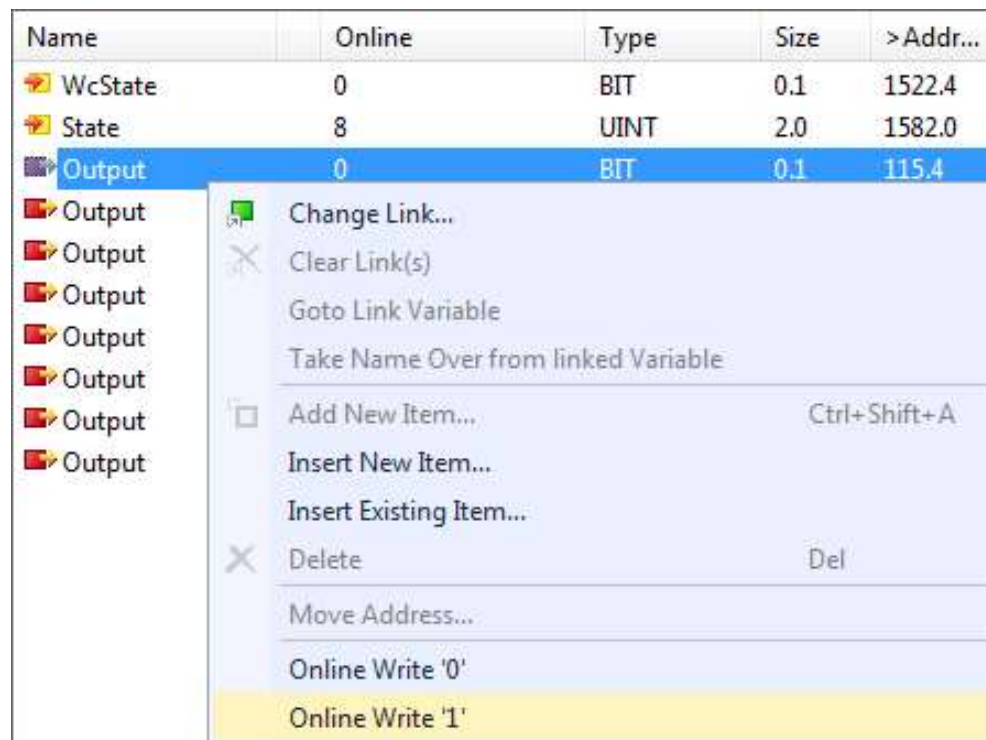


- Select the EL2008
- The output column displays the value of the outputs

The screenshot shows the Beckhoff TwinCAT software interface. On the left, the 'Solution Explorer' displays a project tree for 'TwinCAT Project8'. Under the 'I/O' folder, 'Device1 (EtherCAT)' is expanded, showing a list of terms. 'Term 7 (EL2008)' is selected and highlighted with a blue background. A red rectangle is drawn around 'Term 7 (EL2008)' and 'Term 8 (EL2002)'. On the right, the 'Properties' window for 'Term 7 (EL2008)' is open, showing the 'General' tab. The 'Name' is 'Term 7 (EL2008)', 'Object Id' is '0x03020007', and 'Type' is 'EL2008 8Ch. Dig. Output 24V, 0.5A'. Below the properties, a table displays the online status of the outputs.

Name	Online	Type	Size	>Addr...	In/Out	User ID	Linked to
WcState	0	BIT	0.1	1522.4	Input	0	
State	8	UINT	2.0	1582.0	Input	0	
Output	0	BIT	0.1	115.4	Output	0	
Output	0	BIT	0.1	115.5	Output	0	
Output	0	BIT	0.1	115.6	Output	0	
Output	0	BIT	0.1	115.7	Output	0	
Output	0	BIT	0.1	116.0	Output	0	
Output	0	BIT	0.1	116.1	Output	0	
Output	0	BIT	0.1	116.2	Output	0	
Output	0	BIT	0.1	116.3	Output	0	

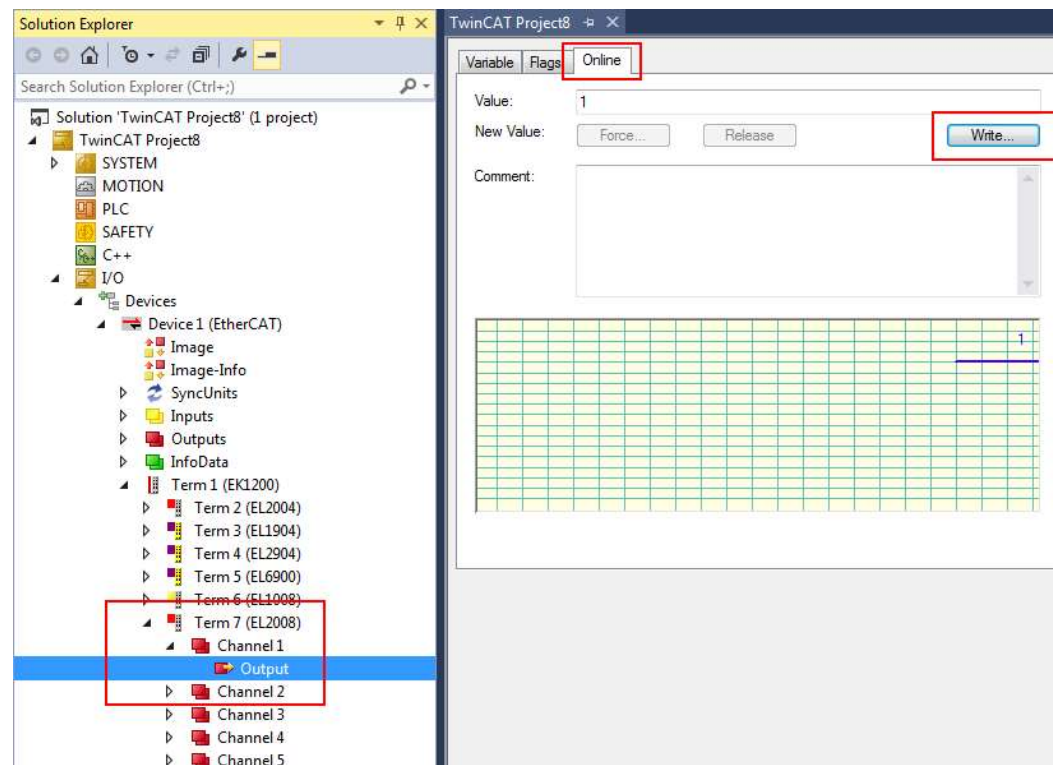
- Right click on an output and select Online Write '1'



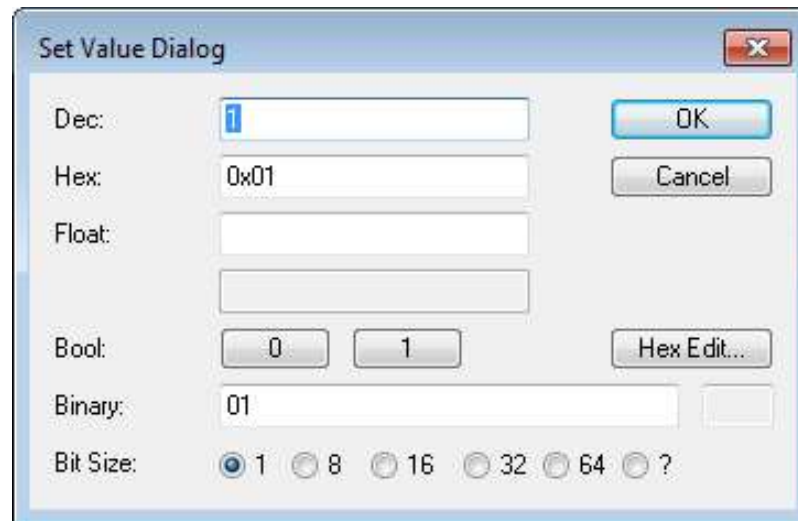
- The output now displays the status as a 1 and the output is energized

Name	Online
 WcState	0
 State	8
 Output	1
 Output	0
 Output	0
 Output	0
 Output	0
 Output	0
 Output	0
 Output	0

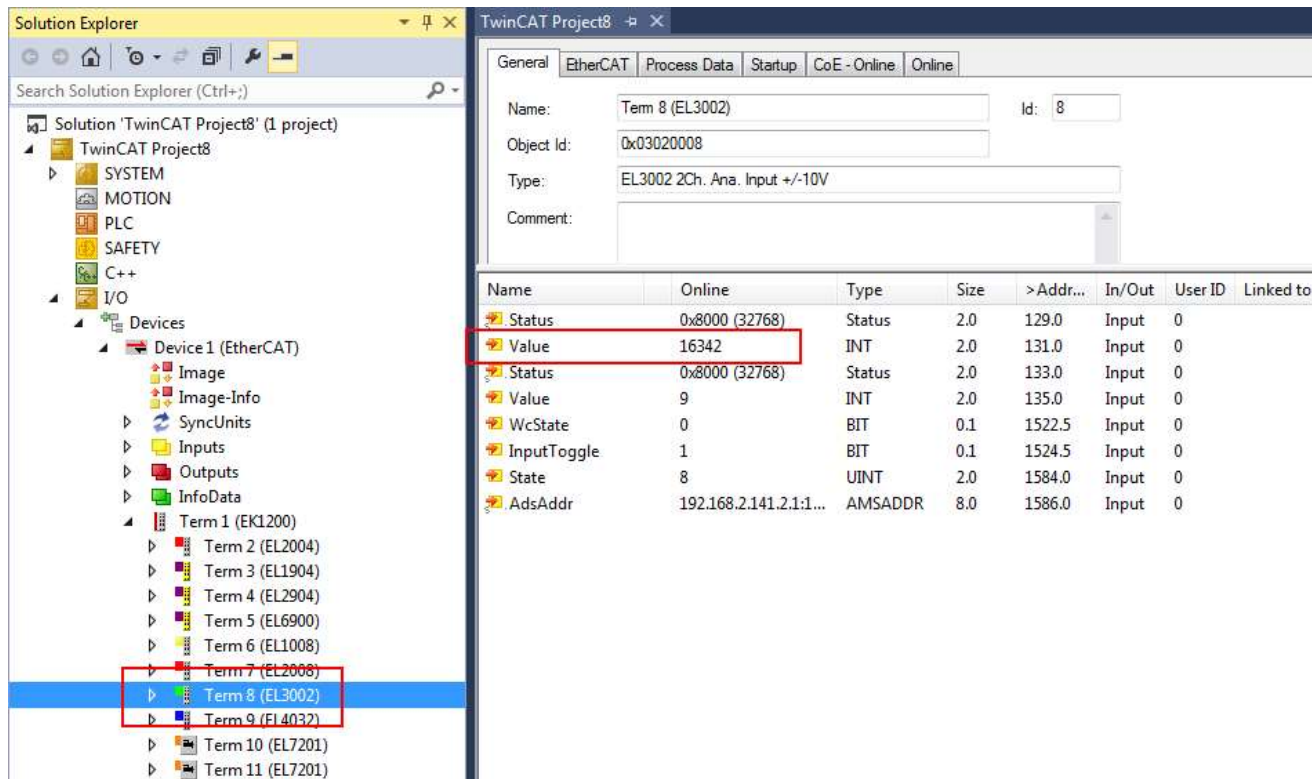
- Expand the EL2008, then expand a specific channel
- Select Output then the Online tab
- The graph will display the value of the output, use the Write button to change the value



- In the 'Set Value Dialog' window you can use the '1' button next to 'Bool:' or type a '1' in the 'Dec:' box and click 'OK'



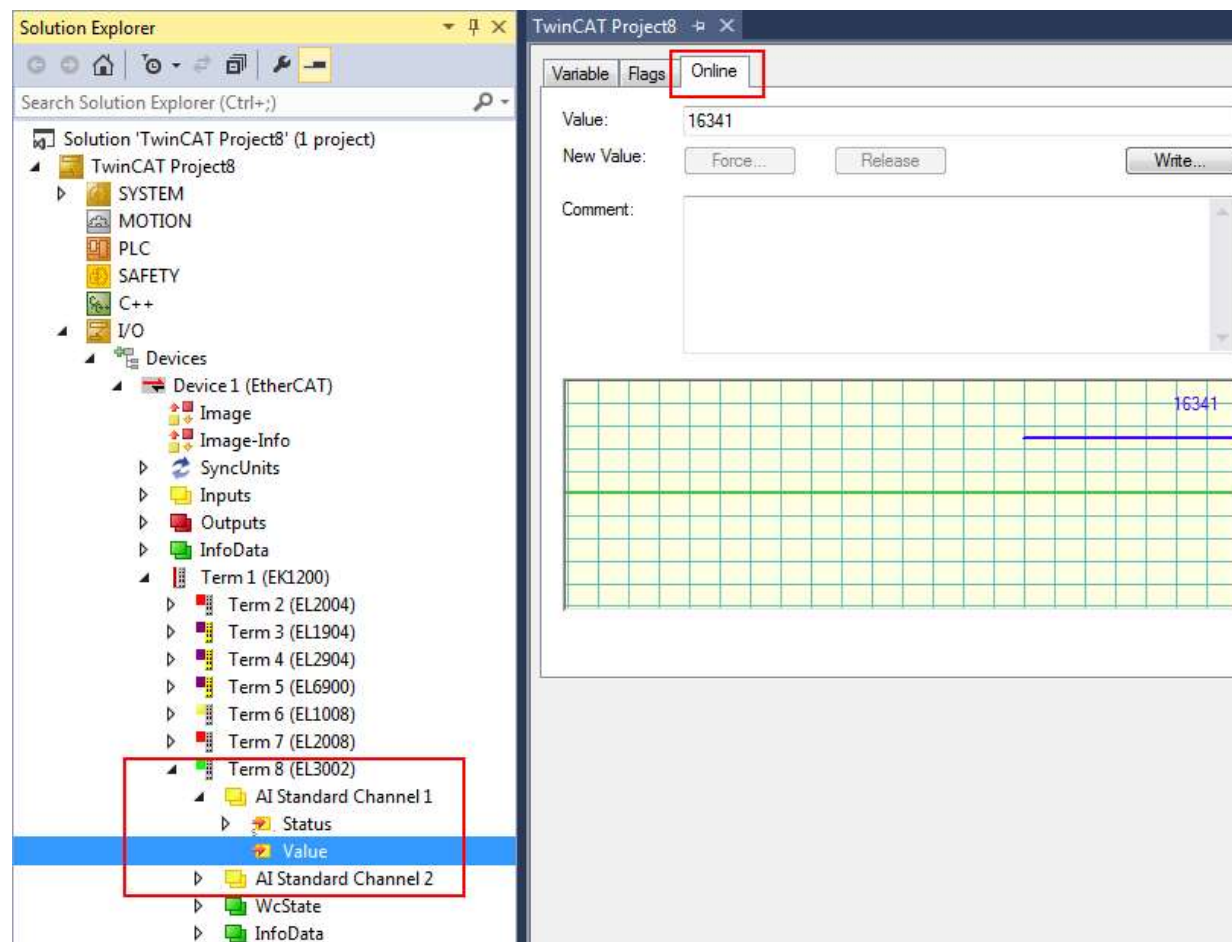
- Select the EL3002 to check the analog input
- The value is displayed in as an Integer
- 0-10 Vdc is scaled to 0-32767 INT



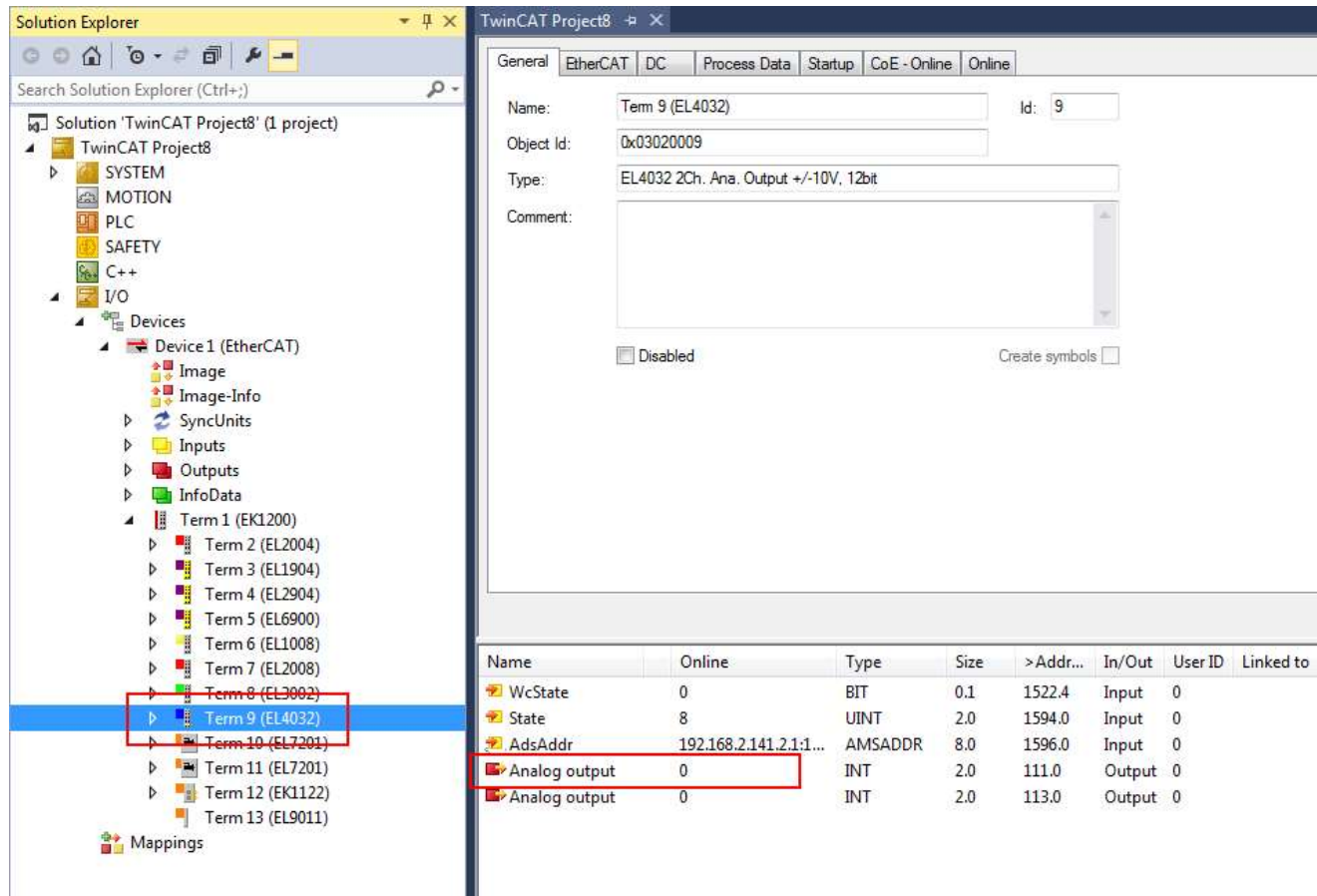
The screenshot displays the Beckhoff TwinCAT software interface. On the left, the Solution Explorer shows the project structure for 'TwinCAT Project8'. The 'I/O' folder is expanded, and 'Term 8 (EL3002)' is selected. On the right, the Properties window for 'Term 8 (EL3002)' is open, showing the 'General' tab. The 'Name' is 'Term 8 (EL3002)', 'Object Id' is '0x03020008', and 'Type' is 'EL3002 2Ch. Ana. Input +/-10V'. Below the properties, a table lists the variables and their values:

Name	Online	Type	Size	>Addr...	In/Out	User ID	Linked to
Status	0x8000 (32768)	Status	2.0	129.0	Input	0	
Value	16342	INT	2.0	131.0	Input	0	
Status	0x8000 (32768)	Status	2.0	133.0	Input	0	
Value	9	INT	2.0	135.0	Input	0	
WcState	0	BIT	0.1	1522.5	Input	0	
InputToggle	1	BIT	0.1	1524.5	Input	0	
State	8	UINT	2.0	1584.0	Input	0	
AdsAddr	192.168.2.141.2.1:1...	AMSADDR	8.0	1586.0	Input	0	

- Expand the EL3002 then expand AI Standard Channel 1 and select Value
- Select the Online tab and the value can be monitored



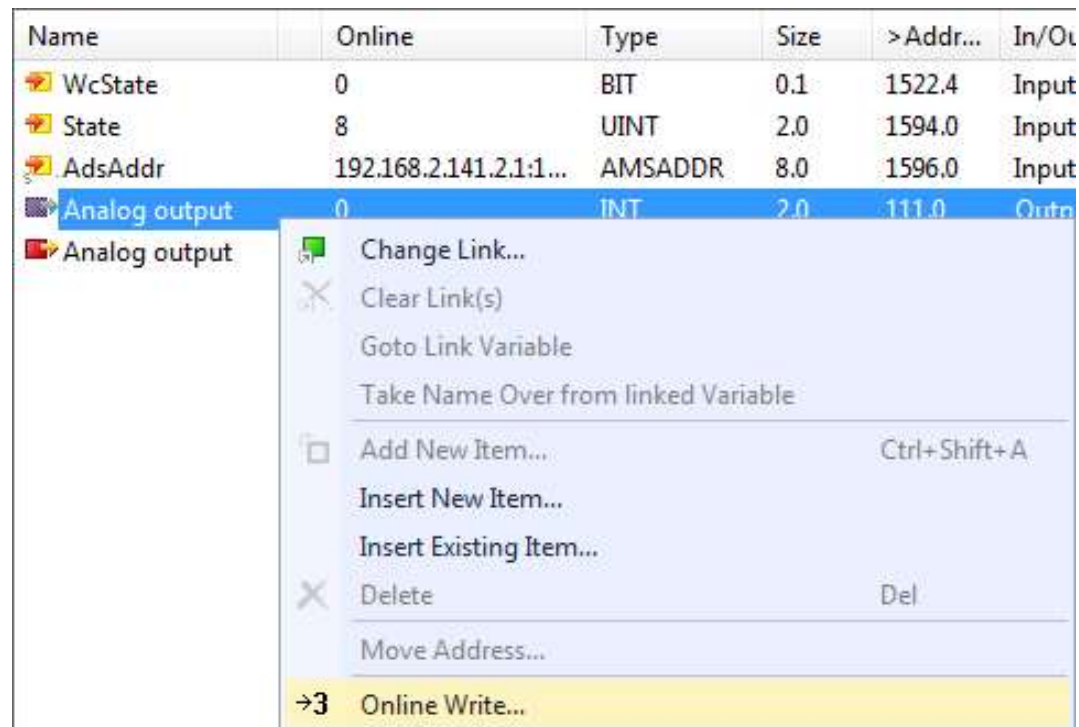
- Select the EL4032
- The value is displayed in as an Integer
- 0-10 Vdc is scaled to 0-32767 INT



The screenshot displays the TwinCAT Project8 interface. On the left, the Solution Explorer shows the project structure, with 'Term 9 (EL4032)' selected under 'I/O' > 'Devices' > 'Device 1 (EtherCAT)' > 'Outputs'. On the right, the Properties window for 'Term 9 (EL4032)' is open, showing the 'General' tab. The 'Name' is 'Term 9 (EL4032)', 'Object Id' is '0x03020009', and 'Type' is 'EL4032 2Ch. Ana. Output +/-10V, 12bit'. Below the Properties window, a table lists the variables and their properties.

Name	Online	Type	Size	>Addr...	In/Out	User ID	Linked to
WcState	0	BIT	0.1	1522.4	Input	0	
State	8	UINT	2.0	1594.0	Input	0	
AdsAddr	192.168.2.141.2.1:1...	AMSADDR	8.0	1596.0	Input	0	
Analog output	0	INT	2.0	111.0	Output	0	
Analog output	0	INT	2.0	113.0	Output	0	

- Right click on the Analog Output and select 'Online Write...'



- Enter a value for the analog output
- The Dec value will range from 0 to 32767
- Hex from 0x0 to 0x7FFF
- The +/- 10 range uses the scaled value
- After entering a value click OK



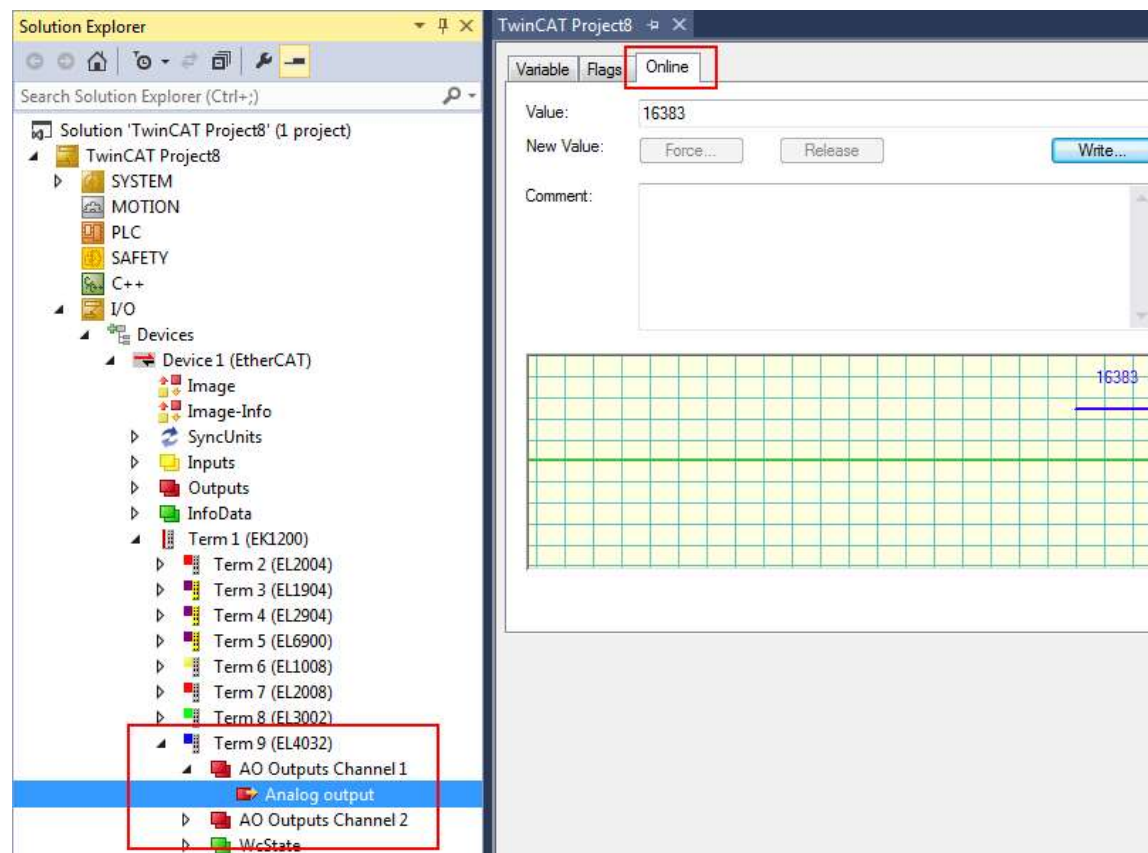
The image shows a 'Set Value Dialog' window with the following fields and controls:

- Dec:** Text input field containing '16383'.
- Hex:** Text input field containing '0x3FFF'.
- Float:** Text input field containing '16383'.
- +/- 10:** Text input field containing '5.000'.
- Bool:** Two radio buttons labeled '0' and '1'.
- Binary:** Text input field containing 'FF 3F' and a small numeric input field containing '2'.
- Bit Size:** A row of radio buttons with labels '1', '8', '16', '32', '64', and '?'. The '16' option is selected.
- Buttons:** 'OK' (highlighted in blue), 'Cancel', and 'Hex Edit...'.

- The value is displayed in the Online Column

Name	Online
 WcState	0
 State	8
 .AdsAddr	192.168.2.141.2.1:1...
 Analog output	16383
 Analog output	0

- Expand the EL4032
- Expand AO Outputs Channel 1, select the Analog Output, then the Online tab
- The graph will display the value of the output, use the Write button to change the value



Beckhoff Automation GmbH & Co. KG

Headquarters
Huelshorstweg 20
33415 Verl
Germany

Phone: +49 5246 963-0
Fax: +49 5246 963-198
E-Mail: info@beckhoff.com
Web: www.beckhoff.com

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Beckhoff Automation GmbH & Co. KG

Unternehmenszentrale
Hülshorstweg 20
33415 Verl
Deutschland

Telefon: +49 5246 963-0
Fax: +49 5246 963-198
E-Mail: info@beckhoff.de
Web: www.beckhoff.de

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