

Manual | EN

# TS8037

TwinCAT 2 | Bang & Olufsen Server

Supplement | Building Automation





# Table of contents

<b>1 Foreword</b> .....	<b>5</b>
1.1 Notes on the documentation.....	5
1.2 Safety instructions .....	6
1.3 Notes on information security .....	7
<b>2 Introduction</b> .....	<b>8</b>
<b>3 Hardware requirements</b> .....	<b>9</b>
<b>4 User requirements</b> .....	<b>10</b>
<b>5 Functional description</b> .....	<b>11</b>
<b>6 Installation / Configuration</b> .....	<b>12</b>
6.1 Installation under Windows CE (WEC).....	12
6.2 Installation under Windows Embedded Standard (WES) .....	12
6.3 Configuration .....	12
<b>7 Custom String</b> .....	<b>15</b>
<b>8 PLC API</b> .....	<b>17</b>
8.1 FB_BangOlufsenGetDeviceInfo .....	17
8.2 FB_BangOlufsenVirtualButtonEvent .....	18
8.3 FB_BangOlufsenGetClientConnectionState.....	19
8.4 E_MLGWClientConnectionState .....	20
<b>9 Error codes / error messages</b> .....	<b>21</b>
<b>10 Programming Examples</b> .....	<b>22</b>



# 1 Foreword

## 1.1 Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with applicable national standards.

It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.

It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

### Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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EP1590927, EP1789857, EP1456722, EP2137893, DE102015105702  
with corresponding applications or registrations in various other countries.



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## 1.2 Safety instructions

### Safety regulations

Please note the following safety instructions and explanations!  
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

### Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

### Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

### Description of symbols

In this documentation the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

#### DANGER

##### **Serious risk of injury!**

Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.

#### WARNING

##### **Risk of injury!**

Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.

#### CAUTION

##### **Personal injuries!**

Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.

#### NOTE

##### **Damage to the environment or devices**

Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.



#### **Tip or pointer**

This symbol indicates information that contributes to better understanding.

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In addition, the recommendations from Beckhoff regarding appropriate protective measures should be observed. Further information regarding information security and industrial security can be found in our <https://www.beckhoff.com/secguide>.

Beckhoff products and solutions undergo continuous further development. This also applies to security functions. In light of this continuous further development, Beckhoff expressly recommends that the products are kept up to date at all times and that updates are installed for the products once they have been made available. Using outdated or unsupported product versions can increase the risk of cyber threats.

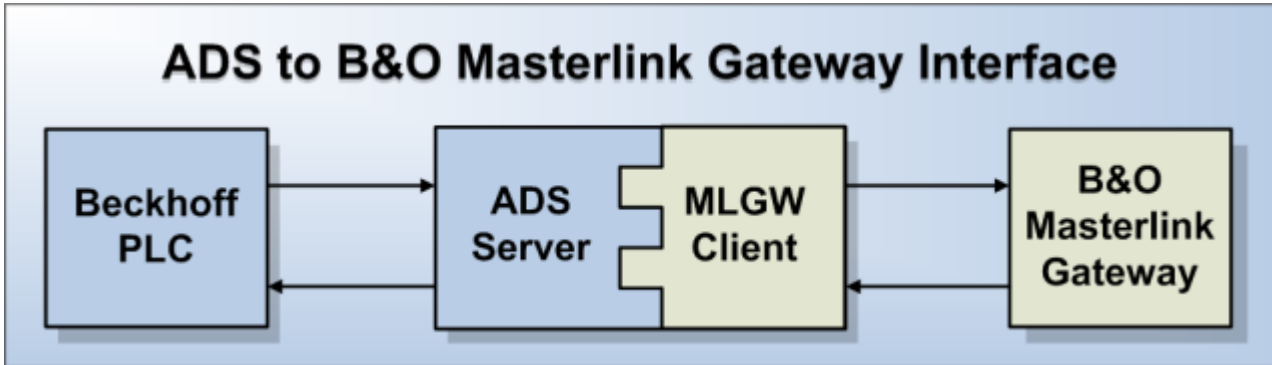
To stay informed about information security for Beckhoff products, subscribe to the RSS feed at <https://www.beckhoff.com/secinfo>.

## 2 Introduction

### Requirements

Bang & Olufsen is recognised all over the world for its unmistakable range of high-quality audio, video and multimedia products.

The TwinCAT Bang & Olufsen Server is a software package for accessing the B&O Masterlink Gateway. It makes communication between a TwinCAT PLC and Bang & Olufsen multimedia networking possible. Communication takes place by TCP/IP.





### **3 Hardware requirements**

The TwinCAT Bang & Olufsen Server can be used on any PC controller that is compatible to TwinCAT (except for the CX9000).

The following items are required in order to install the TwinCAT Bang & Olufsen Server on a TwinCAT-compatible hardware platform:

- TwinCAT PLC Runtime
- Microsoft .NET Framework / .NET Compact Framework. (at least version 2.0 or higher)
- Ethernet interface

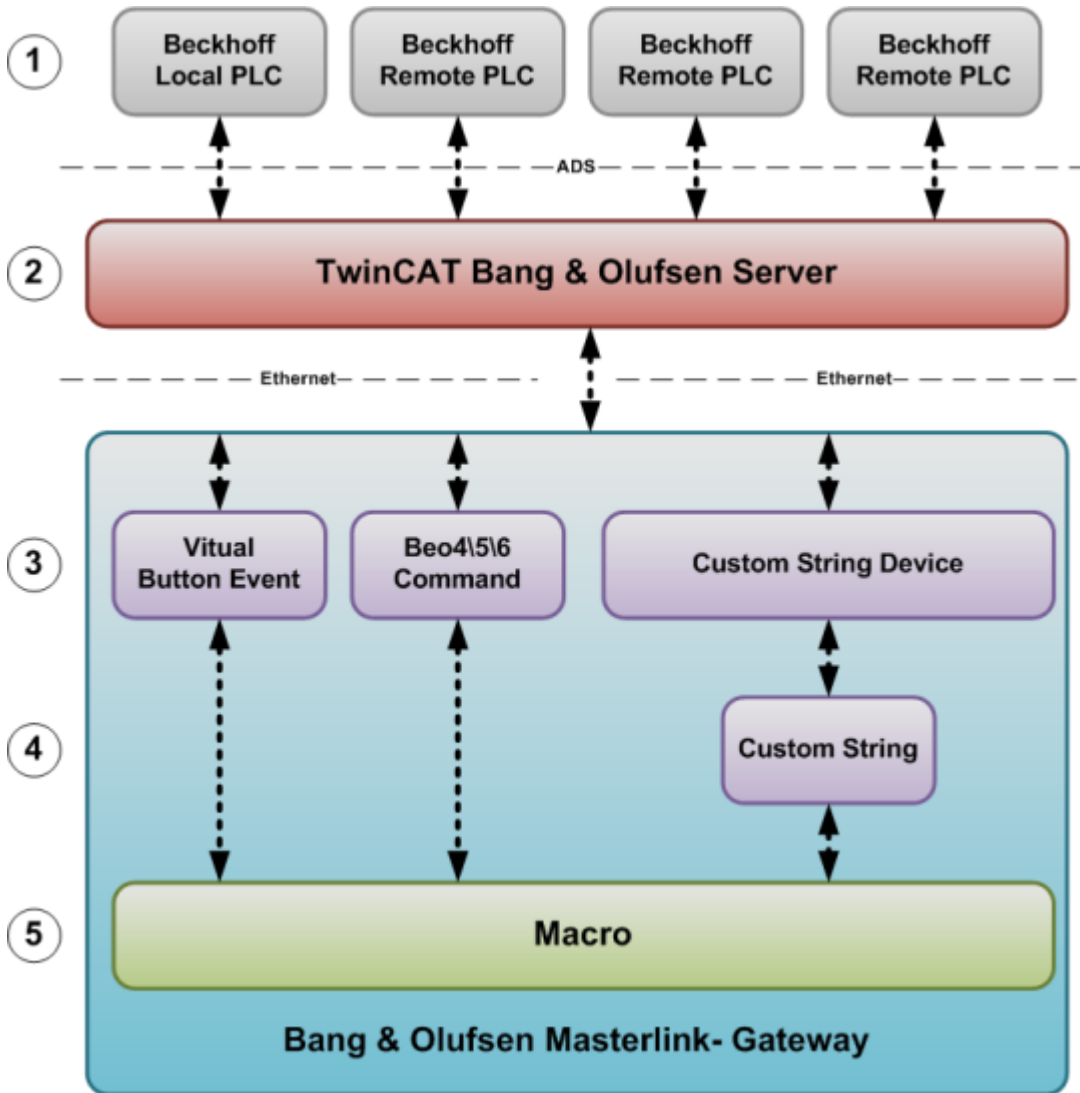
Please refer to the Beckhoff Information System as to which hardware with which image fulfils these requirements.

## 4 User requirements

The user of this ADS server / this library requires basic knowledge of the following:

- Handling the TwinCAT PLC Control
- Handling the TwinCAT System Manager
- PC and network knowledge
- Relevant safety regulations for building technical equipment

## 5 Functional description



### Calling a Virtual Button Event from the PLC

1. Calling the Virtual Button Event function block in the PLC. The Virtual Button Event is sent to the TwinCAT Bang & Olufsen Server by ADS.
2. Processing of the Virtual Button Event requests. The event is passed on to the Masterlink Gateway via Ethernet.
3. The event is received and the macros linked with it are implemented.

### Sending a Custom String to the TwinCAT Bang & Olufsen Server

4. A macro is called in the Masterlink Gateway.
5. The Custom Strings linked to the called macro are processed.
6. The Custom Strings are sent by the Custom String device via Ethernet to the TwinCAT Bang & Olufsen Server.
7. The TwinCAT Bang & Olufsen Server processes the Custom Strings and describes the PLC variables.

## 6 Installation / Configuration

### 6.1 Installation under Windows CE (WEC)

#### Transfer of the installation to the Windows CE device

If the TwinCAT Bang & Olufsen Server was successfully installed, two subfolders will be found in the folder "**..\TwinCAT\CE\Bang Olufsen Server**".

- **\ARMV4I**
  - This folder contains the CE installation:  
**TcBangOlufsenServerCe.ARMV4I.CAB** for ARMV4 CPUs (e.g. CX900x)
- **\I586**
  - This folder contains the CE installation:  
**TcBangOlufsenServerCe.I586.CAB** for X86 CPUs (e.g. CX10xx)

Transfer the file "**TcBangOlufsenServerCe.I586.CAB**" to the Windows CE device. This can take place via

- a shared folder (public folder)
- FTP
- ActiveSync
- Compact Flash (CF) adaptors

#### Installation on the Windows CE device

The "**TcBangOlufsenServerCe.I586.CAB**" installation can be executed with a normal double click. Confirm the preselected (default) directory "**\\hard disk\System\TC-BangOlufsen-Server**" with "OK".

Following the installation, the file "**TcBangOlufsenServerCe.I586.CAB**" will be deleted automatically. Restart the device after the installation has finished.

### 6.2 Installation under Windows Embedded Standard (WES)

#### Starting the installation

Start the installation and follow the instructions in the dialogs.

#### After the installation.

Once the installation is finished, two new directories will be found in the TwinCAT folder: "**..\TwinCAT\CE\Bang Olufsen Server**" and "**..\TwinCAT\Bang Olufsen Server**".

The installation files (.CAB) for the different Windows CE platforms ARM and X86 can be found in the directory "**..\TwinCAT\CE\Bang Olufsen Server**".

### 6.3 Configuration

Configuration takes place via the file **TcBangOlufsenServer.cfg**, in which the following elements are configured:

- A Masterlink Gateway Client for calling virtual buttons.
- An ADS device route for describing PLC variables via Custom Strings.



**General:**

- The configuration file **TcBangOlufsenServer.cfg** is located in the installation directory.
- If a parameter cannot be read in or if it lies outside the permissible size, then the PLC blocks from the TcBangOlufsen.Lib return a specific error.
- If a firewall is in use, the port via which the Custom Strings are sent to the controller must be entered in the firewall configuration.  
The ports that are used by other programs, e.g. FTP, HTTP or Remote Desktop, must also be entered in the firewall configuration.



**Name convention:**

- Must be unique
- Upper/lower case is ignored
- Letters and numbers
- No special characters or umlauts, except “\_” (underscore)
- Minimum length 1 character
- Maximum length 80 characters

**Example: TcBangOlufsenServer.cfg file**

```
<?xml version="1.0" encoding="utf-8" ?>
<TcBangOlufsenServerConfig>
  <MLGW Name="name" Ip="0.0.0.0" Port="9000" />
  <ADSDevice Name="name" AmsNetId="0.0.0.0.1.1" />
</TcBangOlufsenServerConfig>
```

**Configuring a Masterlink Gateway Client**

Masterlink Gateway Clients represent the connection between the TwinCAT Bang & Olufsen Server and the Bang & Olufsen Masterlink Gateway. They are needed in order to dispatch Virtual Button Events via Ethernet.

Add the following XML nodes to the *<TcBangOlufsenServerConfig>* section:

```
<MLGW Name="name" Ip="0.0.0.0" Port="9000" />
```

In this way you generate a new Masterlink Gateway Client in service. Repeat the procedure if you have several Bang & Olufsen Masterlink Gateways.

Parameter	Description
Name	Name of the Bang & Olufsen Masterlink Gateway. It is used in the PLC to assign requests to the MLGW Client.
Ip	Internet Protocol address (IP). Address via which the Masterlink Gateway can be reached in the network.
Port	The port is part of the address and describes the network entry point on the Masterlink Gateway. The default setting is 9000.

**Configuring ADS device routes**

The ADS device routes contain the parameters that are needed so that the TwinCAT Bang & Olufsen Server can assign received Custom Strings to a controller.

Add the following XML nodes to the *<TcBangOlufsenServerConfig>* section:

```
<ADSDevice Name="name" AmsPort="801" AmsNetId="0.0.0.0.1.1" />
```

In this way you generate a new ADS device route in service. Repeat the procedure if you have several controllers that are to be addressed via Custom Strings.

Parameter	Description
Name	Name of the controller. It is used in the Custom String configuration to assign Custom Strings to a controller.

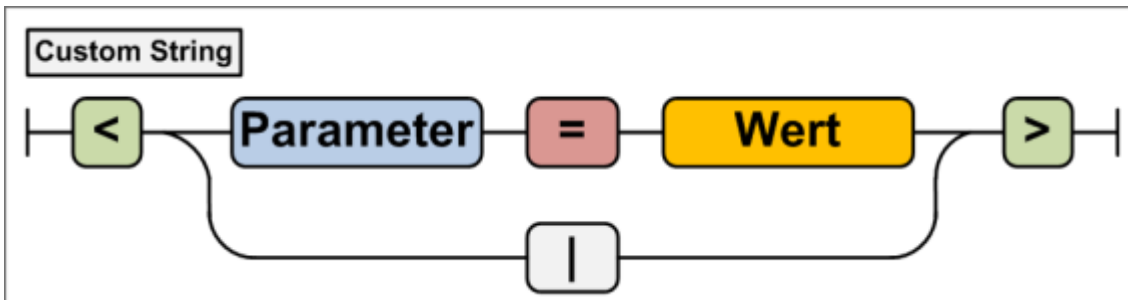
<b>Parameter</b>	<b>Description</b>
AmsPort	PLC runtime system. The default setting is 801.
AmsNetId	AmsNetId of the controller.

# 7 Custom String

With a Custom String, a variable of the type *BOOL* can be described with the value *TRUE* in the PLC. In this way it is possible to release triggers or to activate scenes.

## Syntax description

A Custom String is an ordered quantity of pre-defined parameters/value pairs. A Custom String begins with "<" (*left angle bracket*) and ends with ">" (*right angle bracket*). Each parameter is followed by "=" (*equals signs*) followed by the value. The individual parameters/value pairs are separated from each other by "|" (*vertical line*).



## Parameter and values description

Parameter	Description
ADSDDevice	ADS device route. Used in the TwinCAT Bang & Olufsen server to assign Custom Strings to a controller (see Configuration [▶_12]).
VarName	Variable name of the variable to be described.
IdxGroup	Index Group
IdxOffset	Index Offset

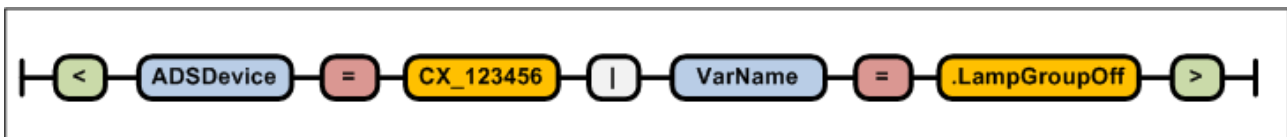
**i** **ADSDDevice / VarName convention:**

- Letters and numbers
- Upper/lower case is ignored
- No special characters or umlauts, except “\_” (underscore) and “.” (dot)
- Minimum length 1 character
- Maximum length 80 characters

**i** **IndexGroup / IndexOffset convention:**

- Can be specified in hexadecimal or decimal notation.
- In the case of hexadecimal notation, the prefix (0x) must be placed before the value.
- If the prefix is not set, the value is taken to be a decimal value.

## Examples



## Describing a global variable by name

```
<ADSDDevice=CX_123456|VarName=.LampGroupOff>
<ADSDDevice=CX_123456|VarName=.LampGroupOn>
```

**Describing a variable within the flag range by IndexGroup \ IndexOffset**

```
<ADSDDevice=CX_123456 | IdxGroup=0x4020 | IdxOffset=0x00>  
<ADSDDevice=CX_123456 | IdxGroup=0x4020 | IdxOffset=0x01>
```

[Download Bang & Olufsen Masterlink-Gateway Custom String configuration example as a CSV file \[► 22\]](#)



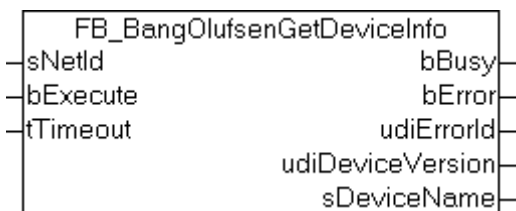
# 8 PLC API

## Overview

Name	Function
<a href="#">FB_BangOlufsenGetDeviceInfo [► 17]</a>	Reads the version and the name of the TwinCAT Bang & Olufsen Server.
<a href="#">FB_BangOlufsenVirtualButtonEvent [► 18]</a>	Triggers a Virtual Button Event in the Bang & Olufsen Masterlink Gateway.
<a href="#">FB_BangOlufsenGetClientConnectionState [► 19]</a>	Reads the status of the connection of a Masterlink Gateway Client to the Bang & Olufsen Masterlink Gateway.

Enum
<a href="#">E_MLGWClientConnectionState [► 20]</a>

## 8.1 FB\_BangOlufsenGetDeviceInfo



Reads the version and the name of the TwinCAT Bang & Olufsen Server.

### Examples

[Download demo project \[► 22\]](#)

### VAR\_INPUT

```

sNetId      : T_AmsNetId;
bExecute    : BOOL;
tTimeout    : TIME := t#5s;
  
```

**sNetId:** AMS Net ID of the target device on which the TwinCAT Bang & Olufsen Server is operated.

**bExecute:** The command is triggered by a rising edge at this input.

**tTimeout:** Indicates the time before the function is cancelled.

### VAR\_OUTPUT

```

bBusy       : BOOL;
bError      : BOOL;
udiErrorId  : UDINT;
udiDeviceVersion : UDINT;
sDeviceName : STRING;
  
```

**bBusy:** This output remains TRUE until the block has executed a command request, but at the longest for the time period applied at the *tTimeout* input. No new commands are accepted at the inputs as long as *bBusy* = TRUE.

**bError:** This output is switched to TRUE if an error occurs during the execution. The command-specific error code [\[► 21\]](#) is contained in *udiErrorId*. If the function block is called again with TRUE on *bExecute*, then *bError* is reset to FALSE and *udiErrorId* to 0.

**udiErrorId:** Contains the command-specific [error code](#) [► 21] of the most recently executed command. Is reset to 0 by the execution of a command at the inputs.

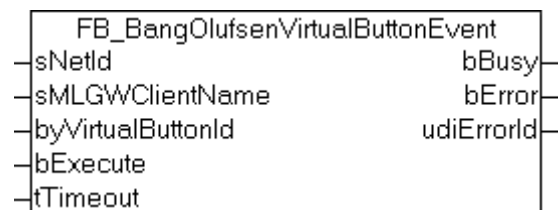
**udiDeviceVersion:** Version of the TwinCAT Bang & Olufsen Server.

**sDeviceName:** Name of the TwinCAT Bang & Olufsen Server.

### Requirements

Development environment	Target system	Required libraries
TwinCAT 2.11 R3/x64	PC/CX	TcBangOlufsen library from V1.0.0

## 8.2 FB\_BangOlufsenVirtualButtonEvent



Triggers a Virtual Button Event in the Bang & Olufsen Masterlink Gateway.

### Examples

[Download demo project](#) [► 22]

### VAR\_INPUT

```
sNetId      : T_AmsNetId;
sMLGWClientName : STRING;
byVirtualButtonId : BYTE;
bExecute    : BOOL;
tTimeout    : TIME := t#5s;
```

**sNetId:** AMS Net ID of the target device on which the TwinCAT Bang & Olufsen Server is operated.

**sMLGWClientName:** Name of the Masterlink Gateway Client on which the Virtual Button Event is to be triggered.

**byVirtualButtonId:** Contains the ID of the Virtual Button whose event is to be triggered.

**bExecute:** The command is triggered by a rising edge at this input.

**tTimeout:** Indicates the time before the function is cancelled.

#### ● sMLGWClientName convention

- i**
  - Upper/lower case is ignored
  - Letters and numbers
  - No special characters or umlauts, except “\_” (underscore)
  - Minimum length 1 character
  - Maximum length 80 characters

#### ● byVirtualButtonId convention

- i**
  - must lie between 1 and 255

**VAR\_OUTPUT**

```
bBusy      : BOOL;
bError     : BOOL;
udiErrorId : UDINT;
```

**bBusy:** This output remains TRUE until the block has executed a command request, but at the longest for the time period applied at the *tTimeout* input. No new commands are accepted at the inputs as long as *bBusy* = TRUE.

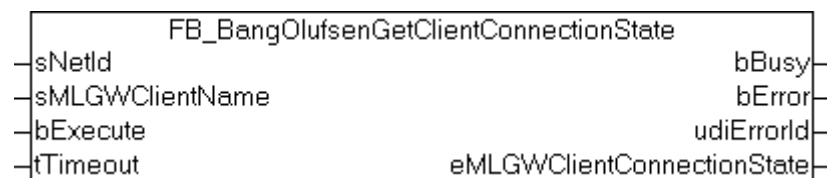
**bError:** This output is switched to TRUE if an error occurs during the execution. The command-specific error code [▶ 21] is contained in *udiErrorId*. If the function block is called again with TRUE on *bExecute*, then *bError* is reset to FALSE and *udiErrorId* to 0.

**udiErrorId:** Contains the command-specific error code [▶ 21] of the most recently executed command. Is reset to 0 by the execution of a command at the inputs.

**Requirements**

Development environment	Target system	Required libraries
TwinCAT 2.11 R3/x64	PC/CX	TcBangOlufsen library from V1.0.0

### 8.3 FB\_BangOlufsenGetClientConnectionState



Reads the status of the Ethernet connection between the Masterlink Gateway and the TwinCAT Bang & Olufsen Server.

**Examples**

[Download demo project \[▶ 22\]](#)

**VAR\_INPUT**

```
sNetId      : T_AmsNetId;
sMLGWClientName : STRING(80);
bExecute    : BOOL;
tTimeout    : TIME := t#5s;
```

**sNetId:** AMS Net ID of the target device on which the TwinCAT Bang & Olufsen Server is operated.

**sMLGWClientName:** Name of the Masterlink Gateway Client whose connection status is to be read.

**bExecute:** The command is triggered by a rising edge at this input.

**tTimeout:** Indicates the time before the function is cancelled.

**i sMLGWClientName convention**

- Upper/lower case is ignored
- Letters and numbers
- No special characters or umlauts, except “\_” (underscore)
- Minimum length 1 character
- Maximum length 80 characters

**VAR\_OUTPUT**

```

bBusy          : BOOL;
bError         : BOOL;
udiErrorId     : UDINT;
eMLGWClientConnectionState : E_MLGWClientConnectionState;

```

**bBusy:** This output remains TRUE until the block has executed a command request, but at the longest for the time period applied at the *tTimeout* input. No new commands are accepted at the inputs as long as *bBusy* = TRUE.

**bError:** This output is switched to TRUE if an error occurs during the execution. The command-specific error code [► 21] is contained in *udiErrorId*. If the function block is called again with TRUE on *bExecute*, then *bError* is reset to FALSE and *udiErrorId* to 0.

**udiErrorId:** Contains the command-specific error code [► 21] of the most recently executed command. Is reset to 0 by the execution of a command at the inputs.

**eConnectionState:** This output is set to eMLGWClientConnected [► 20] as soon as the connection is established. If there is no connection the output is set to eMLGWClientDisconnected [► 20].

**Requirements**

Development environment	Target system	Required libraries
TwinCAT 2.11 R3/x64	PC/CX	TcBangOlufsen library from V1.0.0

**8.4 E\_MLGWClientConnectionState**

```

TYPE E_MLGWClientConnectionState:
(
  eUnknown:= 0,
  eInitialized,
  eInitializing,
  eConnected,
  eConnecting,
  eDisconnected,
  eDisconnecting
);
END_TYPE

```

## 9 Error codes / error messages

Hex code	Dec code	Description
0x8501	34049	Invalid parameter value(s) at a PLC function block.
0x8502	34050	The configuration file <b>TcBangOlufsenServer.cfg</b> was not found.
0x8503	34051	Internal processing error while loading the configuration file <b>TcBangOlufsenServer.cfg</b> .
0x8504	34052	Error in the configuration file. The XML node " <b>MLGW</b> " was not found.
0x8505	34053	Error in the configuration file. The XML attribute " <b>Ip</b> " was not found in the MLGW XML node, or it contains an incorrect value.
0x8506	34054	Error in the configuration file. The XML attribute " <b>Port</b> " was not found in the MLGW XML node, or it contains an incorrect value.
0x8507	34055	Error in the configuration file. The XML attribute " <b>Name</b> " was not found in the MLGW XML node, or it contains an incorrect value.
0x8508	34056	Error in the configuration file. The XML node " <b>ADSDevice</b> " was not found.
0x8509	34057	Error in the configuration file. The XML attribute " <b>Name</b> " was not found in the ADSDevice XML node, or it contains an incorrect value.
0x850A	34058	Error in the configuration file. The XML attribute " <b>Port</b> " was not found in the ADSDevice XML node, or it contains an incorrect value.
0x850B	34059	Error in the configuration file. The XML attribute " <b>AmsNetId</b> " was not found in the ADSDevice XML node, or it contains an incorrect value.
0x850C	34060	Internal server error while processing a request. The specified MLGW Client does not exist.
0x850D	34061	Internal server error while processing a <b>Get Client Connection Status</b> request.
0x850E	34062	Internal server error while processing a <b>Virtual Button Event</b> request.

# 10 Programming Examples

## **Download TwinCAT PLC Demo Project**

<https://infosys.beckhoff.com/content/1033/tcbangolufsenserver/Resources/zip/11366805003.zip>

## **Download Bang & Olufsen Masterlink-Gateway Custom String Example Configuration as CSV file**

<https://infosys.beckhoff.com/content/1033/tcbangolufsenserver/Resources/zip/11366806411.zip>



More Information:  
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