

# **Open Advanced Process Control**

## **BeamSDK / BeamConstruct Developers Manual**

Version 5.4

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# 1 General

## 1.1 Disclaimer

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## 1.2 Overview

This document describes the BeamConstruct programming interface. It can be used to create own applications that access existing BeamConstruct functionalities or to extend BeamConstruct by some specific functions. The programming interface itself is structured in a way that gives programmers the possibility to decide how deep one wants to go. It is possible to use all the default functionalities and user interface and just to extend it by some own functions. Or it is possible to go much deeper into it – right away to a level where the well-known GUI is hidden completely and the functions or parts of its functionalities are provided to an own application.

The BeamConstruct API splits into some parts. One part is libbeamconstruct.dll/.so which contains all the functionality known from the main application. This library itself uses an other library libcnco.dll/.so - which is the second part.

This shared library contains some very low-level functionalities which can (but don't necessarily have to) be used out of own applications too.

For Windows-applications that do not base on wxWidgets-toolkit (like a plain WinAPI-application or when using the programming interface out of a C#/NET application) please note: instead of libbeamconstruct.dll in these special cases libbeaminter.dll has to be used. Functions names of libbeaminter.dll are slightly different, instead of naming scheme beam\_xxx() here names beam\_xxx\_winapi() has to be used.

This manual describes available functions and definitions only partial. As the BeamSDK is a subset of the OpenSDK from <https://sourceforge.net/p/oapc/code/ci/master/tree/>, the full documentation also consists of the OpenSDK-manual (available as free download at [https://sourceforge.net/p/oapc/code/ci/master/tree/sdk\\_manual.pdf](https://sourceforge.net/p/oapc/code/ci/master/tree/sdk_manual.pdf)) plus the specifications contained in this document. So in case of any constants, definitions or functions that are not described within this manual, please check out the OpenSDK-manual “sdk\_manual.pdf”.

## 1.3 Installation

The BeamSDK requires the full contents of the OpenSDK to be used. It is recommended to fetch the OpenSDK from public GIT repository directly in order to get the latest updates and modifications automatically. This GIT repository can be found at <https://sourceforge.net/p/oapc/code/ci/master/tree/>.

Within this repository a sub-folder BeamSDK can be found, which is empty. Here the contents of the BeamSDK have to be copied into so that the resulting structure looks like this

```
/your/path/to/OpenSDK/BeamSDK/<contents of BeamSDK>
```

...where <contents of BeamSDK> are the different directories and files of the BeamSDK (means you should NOT have two directories BeamSDK!).

The BeamSDK mainly contains sources and header files but not the full software package with the required libraries (such as libbeamconstruct.dll/.so). These files all are contained in the standard software distribution package which can be downloaded at <https://halaser.eu/download.php>. After installation of this package these libraries are available for usage:

- for Windows they can be found in installation directory of the software (typically C:\Program Files\OpenAPC or any other, custom folder you selected); when running an own BeamSDK-based application this folder should be used as working directory
- for Linux they are available system wide after installation of the package, so no further actions are necessary in order to use them

## 1.4 Structure

In wide parts the BeamConstruct programming interface makes use of a specific concept, that is somewhat uncommon but has several advantages. Beside the fact that it is portable and available for all relevant programming languages there is one major point that makes this concept perfectly suitable for industrial applications: it is fully up- and downwards compatible, means there are no changes in API imaginable that would require an incompatible redesign of this concept.

The BeamConstruct programming interface does not use fixed structures but easily expandable lists that consist of a tag and a related value. These lists can have nearly any size. Since the size is not fixed for function calls one can imagine that extensions can be made easily. On the other hand the calling application does not to know and use every parameter, it can set just these values that have to be changed and ignore all other ones - to work with default values there.

Such a list handed over to a function of libbeamconstruct.dll/.so always consists of a tag (which is a human-readable text) and a value (which depends on the tag and can be a text, a number or a pointer). The end of such a list - that can consist of several tag/value pairs - always has to be marked with a NULL. Here it is recommended not only to use a number "0" but to have a null-pointer or something like (void\*)0 to avoid troubles on 64 bit systems.

So such a call can look like this:

```
beam_function(&var,  
             "Tag1",42,  
             "Tag2","some text",  
             "Tag3",&myvar,  
             (void*)0);
```

Here `var` is a function-specific parameter that returns useful information. The tags of course have some more meaningful names, there also exists a header file "beamconstruct.h" where all tags are predefined.

Please note: the tag names are case-sensitive, means "Tag1" is not the same like "tag1"!

## 1.5 Usage of libbeamconstruct

The usage principle is quite simple. As very first the programming interface has to be initialised by calling `beam_init_if()` (or `beam_init_if_winapi()`) together with some required parameters. Then all other `beam_...-` and `cnco_...-` functions can be used until function `beam_exit_if()` (or `beam_exit_if_winapi()`) is called which destructs the programming interface and closes the connection to it.

All required definitions can be found in headerfile "beamconstruct.h" (and "libbeaminter.h"). To use it, one of the operating system defines

- `ENV_WINDOWS` – for all Windows operating systems
- `ENV_WINDOWS` and `ENV_WINDOWSCE` – for all Windows CE 5.0 and 6.0 operating systems
- `ENV_LINUX` – for all Linux operating systems

has to be defined.

### 1.5.1 Functions and Tags of libbeamconstruct

This section describes all functions of `libbeamconstruct.dll/so` as well as all parameters that are accepted by these functions. The tags/value pairs that can be handed over to some of these functions are described in following format:

"Tagname"	TAG_CONSTANT as defined in beamconststruct.h	Allowed range of value that belongs to tag and measurement unit if applicable
Description of tag, value and its meaning		

```
unsigned long beam_init_if(int *var,...)
```

```
unsigned long beam_init_if_winapi(int *var,...)
```

Initialises the BeamConstruct programming interface. The variable the pointer `var` points to returns a number in case of an error. This number specifies position of the tag in initialisation list that failed. In case the initialisation was successful and the function returns `OAPC_OK`, the content `var` points to, is undefined. For a description of other possible return codes and their meaning please refer to the general OpenAPC SDK manual.

This functions supports following tags:

...

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