

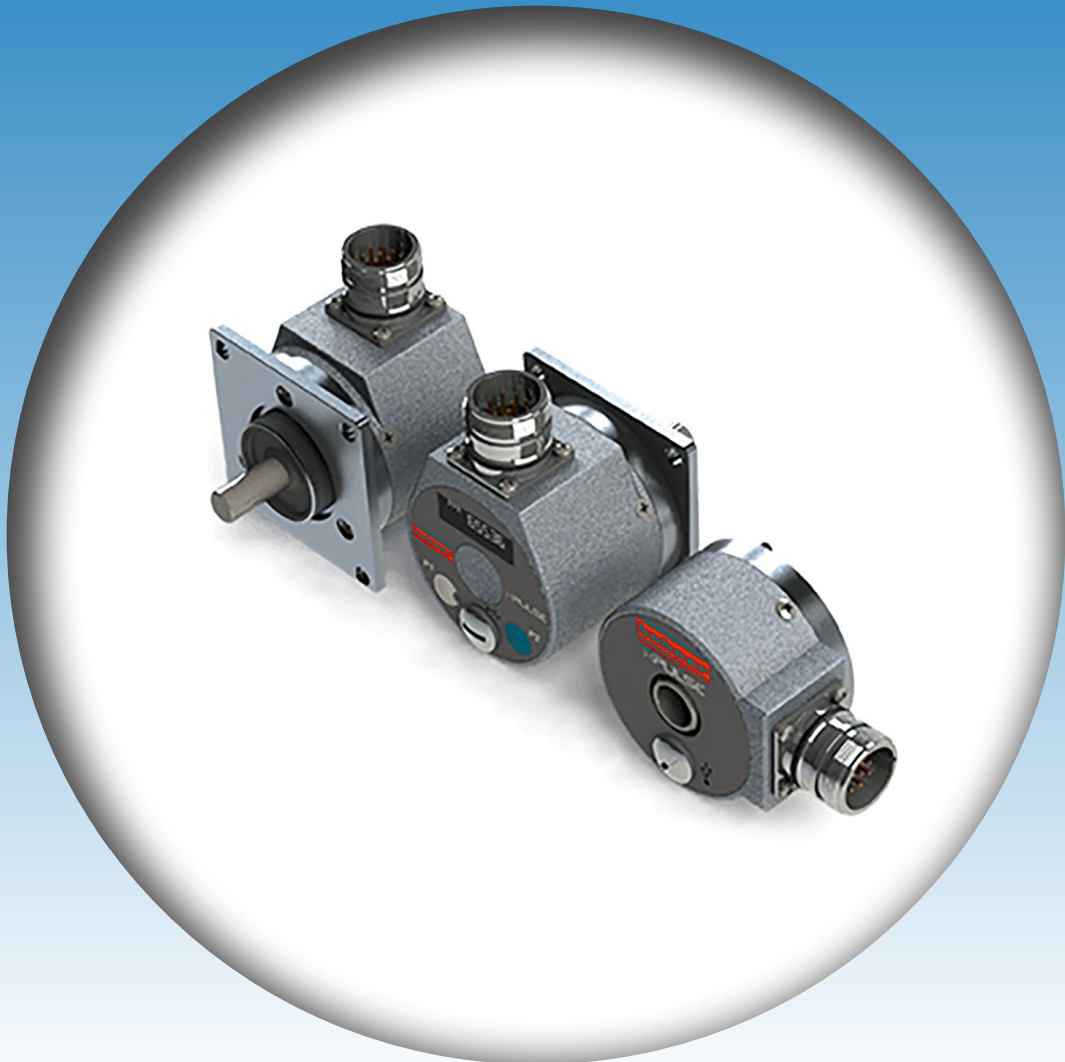
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Elektrotechnik Werne

User's Manual

X<PULSE

CAM Software · CAM Programmable Encoder



- Power supply 24 volts DC
- 8 CAM ways (6 differential + 2 single-ended)

Your partner for standard and special designs
- precise, reliable and fast -

IDE Interface

The screenshot shows the 'CAM Mode' window of the xPULSE r12 software. The interface is divided into several sections:

- CAM Mode:** Contains radio buttons for 'FULL Mode 8192' (selected) and 'ANGLE Mode 0.25°'.
- CELL Right Click:** Contains radio buttons for 'None' (selected), 'Set to 0 X→0', 'Set to 1 X→1', and 'Negate X→ \bar{X} '.
- Special Functions:** Includes buttons for 'INC Encoder', 'HALL Encoder', 'ABS Encoder', and 'Custom Sign.', each with a small waveform icon.
- CAM View:** A large grid with columns labeled WAY0 through WAY7 and rows numbered 0 to 31. A vertical orange double-headed arrow on the right side of the grid is labeled '32 pos'. To the right of the grid is a zoomed-in view of the data, showing a vertical axis with values from 0 to 8192 in increments of 512. The zoomed view shows a complex pattern of green and white cells.
- Encoder Connection:** A 'Connect' button is located in the bottom right corner of the software window.

Annotations with arrows point to these features:

- CAM Mode:** Select the cam resolution
- CELL Right Click:** Select right mouse click action
- CAM Zoom:** Zoomable CAM view
- Special Function:** Automatic CAM generation features
- CAM View:** Main area to manually change CAM value
- Encoder Connection:** Command to connect with the xPulse Encoder

CAM View

Area in the middle of the IDE shows a portion of the CAM data.

This area is made up of 8 columns and numerous rows where each column represents a single CAM way and a row indicates angular position of the encoder shaft. Row labels depend on **CAM Mode**.

Visible rows depends on the screen resolution (for example 32 rows on a 1920x1080 screen).

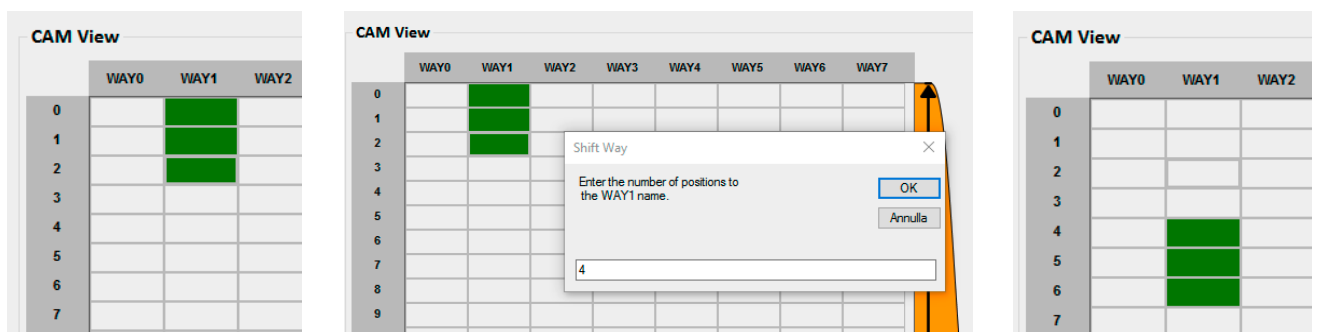
Green Cells represent CAM position set to logic 1.
Grey Cells represent CAM position set to logic 0.

	WAY0	WAY1	WAY2	WAY3	WAY4	WAY5	WAY6	WAY7
0								
1								
2		1						
3			1					
4								
5		1	1					
6								
7								
8	1							
9								

RIGHT CLICK 'MENUS'

A right click menu is available on column headers. This menu permits to:

- Rename WAY: useful to help customer to identify WAY meaning;
- Set WAY to 0: set to 0 all selected WAY
- Set WAY to 1: set to 1 all selected WAY
- Negate WAY: clear all selected WAY
- Shift WAY: shifts the WAY by a number of positions (see below)



- Copy WAY: entirely copy selected WAY
- Cut WAY: cut selected WAY, all data of the selected WAY will be cut
- Paste WAY: paste previously cut or copied WAY on selected WAY, overwriting WAY

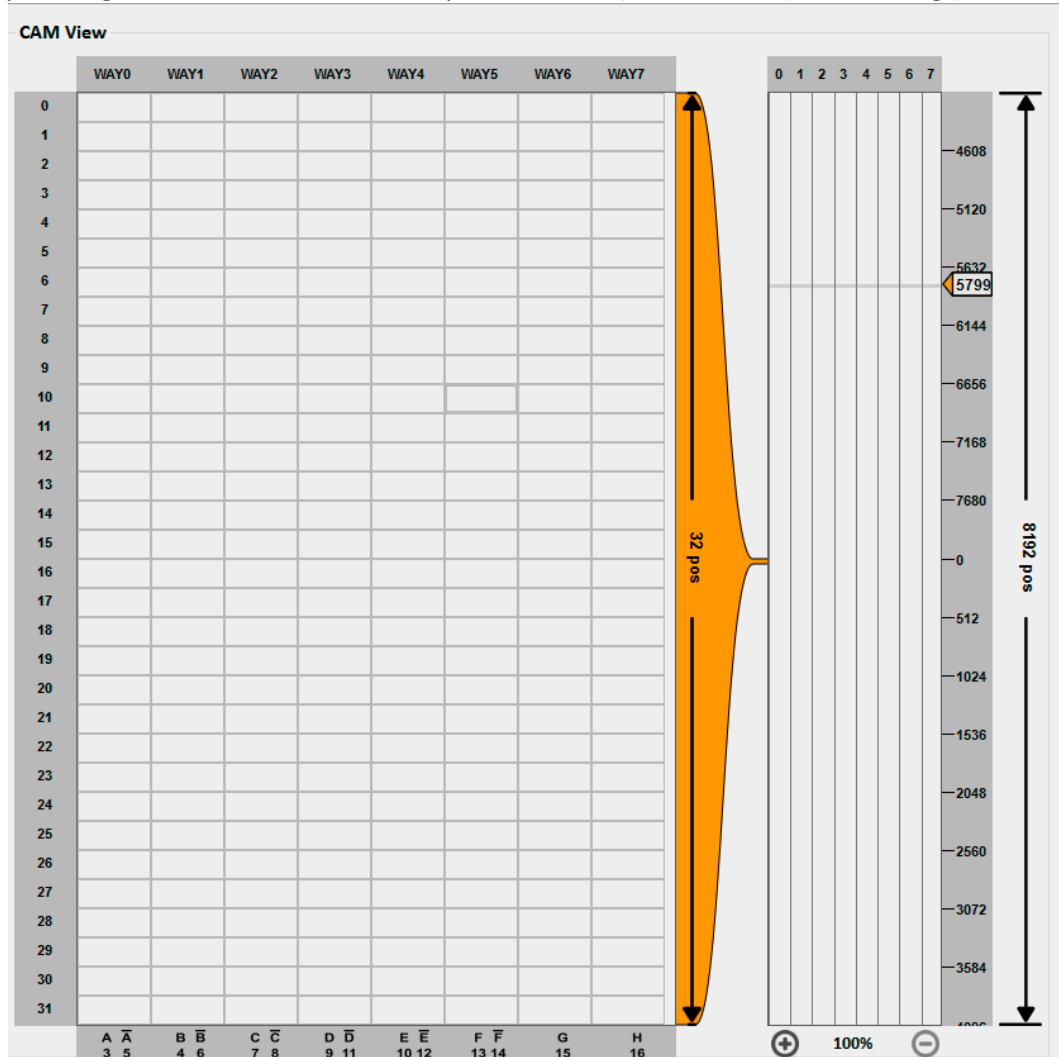
CAM VIEW NAVIGATION

It is possible to change shown CAM portion by:

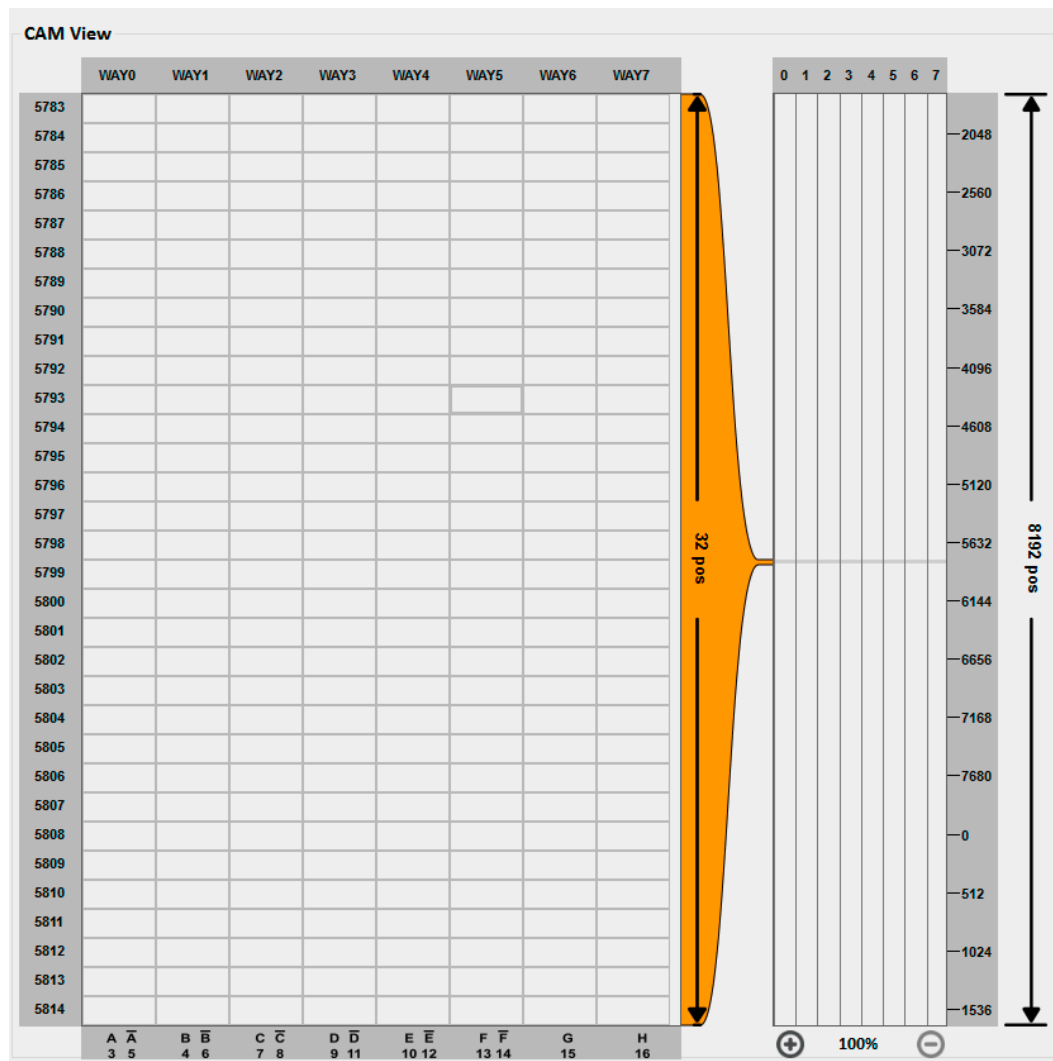
- **Mouse wheel rotation:** in this case each wheel step is equivalent to 32 positions/scroll (in case of 1920x1080 screen);
- **Mouse wheel rotation + Shift:** in this case each wheel step is equivalent to 1 position/scroll;
- **Click on CAM Zoom:** clicking anywhere on the CAM zoom area centers the CAM view accordingly

Example:

By moving mouse over Zoom View to position 5799 (shown below) and clicking (see further below)



The CAM view centers on that position as seen here



COLUMNS - LOWER LABELS

Lower column labels replicate the encoder connection label. As already mentioned, the first 6 ways are differential output and the last 2 are single-ended.

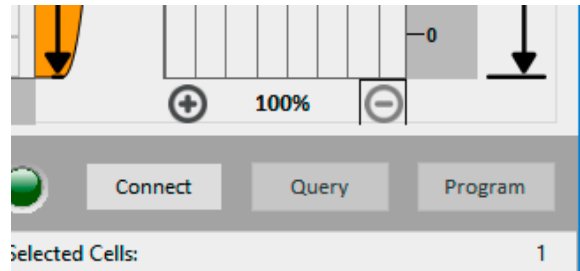
Note

CAM Zoom

In this area it is possible to display the complete (360° turn of encoder) CAM data. Usually the complete CAM data is displayed (as shown on the right side, this number indicates the displayed positions number); it is also possible to increase the zoom and display less positions.

To change zoom there are 2 buttons on the bottom of CAM Zoom.

Zoom can also be changed by **Mouse wheel rotation + CTRL**



Note

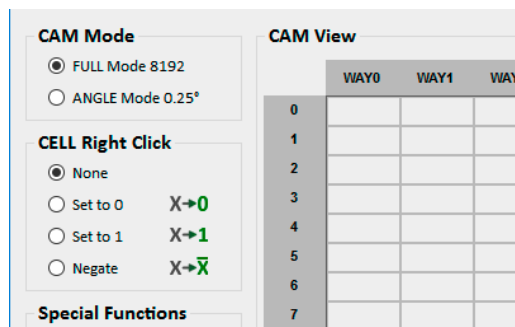
CAM Mode

In CAM Mode it is possible to select the CAM resolution. There are 2 CAM resolutions:

- **FULL Mode:** resolution 8192. This means that each cam is divided by 8192 per 360° (one shaft turn).
- **ANGLE Mode:** resolution 0.25° (mechanical degree). This means that each cam is divided by 1440 per 360°.

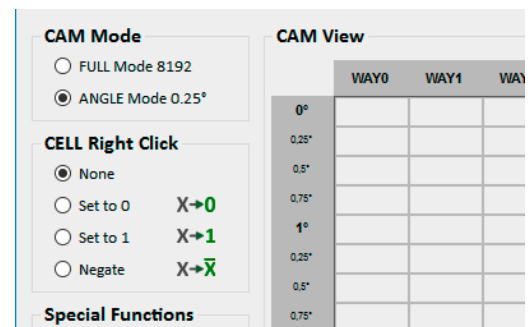
When CAM resolution changes, the **CAM View** row labels also change accordingly.

FULL Mode



Row labels show position number

ANGLE Mode



Row labels show angle in degrees (resolution 0.25°)

Note

When changing CAM mode all CAMs will be reset. Save the cam information before change mode if necessary.

CELL Right Click

The simplest way to modify a CAM position is by clicking on relevant cells in **CAM View**. The change is defined by the selected **CELL Right Click** mode. There are 4 clicking mode:

- **None:** nothing happens on cell click.
- **Set to 0:** cell click turns CAM position to value 0.
- **Set to 1:** cell click turns CAM position to value 1.
- **Negate:** cell click turn CAM position to value 0 if it was 1 and vice versa.

Note

Special Functions

There are 4 Macro functions that enable the user to generate the CAM data simply by setting some parameters (depends on selected function).

Here are the available macros:

- **INC Encoder:** Incremental encoder data generation;
- **HALL Encoder:** completely parameterizable Motor Feedback data generation;
- **ABS Encoder:** completely parameterizable Absolute encoder data generation;
- **Custom Signal:** custom signals generation.

All function buttons open a dedicated window. See below for each function usage.

Note

To start a Macro simply click on the requested button. Affected WAYs will be subsequently selected

INCREMENTAL Encoder Function

CAM - INCREMENTAL Signals

PPR
02048

Index - Z
 90° 180°
 270° 360°

Leading
A lead B

Channel Assignment
A B Z
Way 0 1 2 Rename Ways

Mono
 Mono Dir

Waveforms
A B Z CW

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In this window it is possible to select all the necessary parameters to generate Incremental Encoder data to import to the main window (CAM View).

PPR

Type the number of the pulses per revolution required
Min 1 ppr
Max 2048 ppr for bi-directional encoder data
Max 4096 ppr for mono-directional encoder data

INDEX

Select the Index dimension. There are 4 possibilities:

90° (Locked to A_{high} and B_{high})

180° (Locked to A_{high})

270° (Locked to A_{high} or B_{low})

360° (Locked to A_{high} or A_{low})

LEADING

Select the leading channel. Click on button to switch leading channel.

MONO

Check to generate single channel Incremental data. In case of Mono Direction, the maximum PPR is increased to 4096 and the Index is restricted to 180° and 360°

CHANNEL ASSIGNMENT

In this frame it is possible to select which signals to import in CAM View and in which way.

For example, if a bi-directional encoder is selected, then there are 3 available signals, A, B and Index (Z), for each signal there's a drop down menu with all the available WAYS. As default the A signal is assigned to WAY 0, B on WAY 1, Z on WAY 2.

It is possible to select any Way for each channel. It is not possible to assign signals to the same way, software will generate alert on error, and the user will be notified if an alternate WAY should be used or if the WAY should be overwritten (select 'X' to not import / overwrite)

Rename Ways: if checked, selected ways will be renamed according to selected signals. For example, way for channel A will be renamed as A400 for a 400ppr encoder.

WAVEFORMS

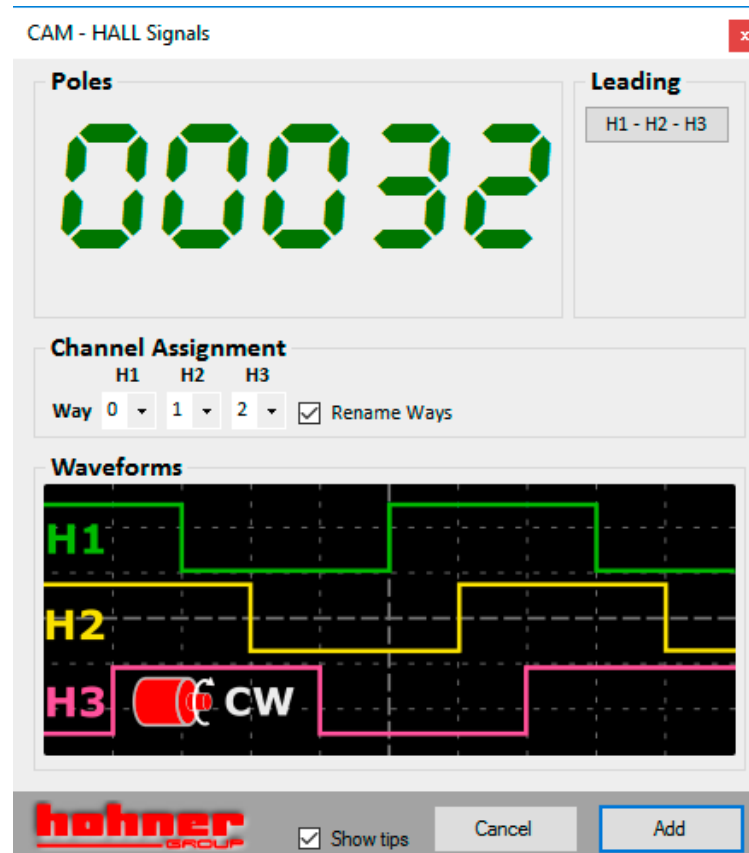
This is a visualization of the above selection

ADD/CANCEL

Click Add to generate selected signals on selected ways. CAM View will be immediately updated.

Note

HALL Encoder Function



In this window it is possible to select all the necessary parameters to generate motor feedback encoder data to import into the main window (CAM View).

POLES

Type the number pole pairs per revolution requested
Min 1 ppr - Max 32 ppr

LEADING

Select the leading channel. Click on button to switch leading channel

CHANNEL ASSIGNMENT

In this frame it is possible to select which signal to import on CAM View and on which way. As default motor feedback generates 3 signals, H1, H2 and H3. For each signal there is a drop down menu with all the available WAYS. As default the H1 is assigned to WAY 0, H2 on WAY 1, H3 on WAY 2. It is possible to select any Way for each channel. It is not possible to assign signals to the same way, software will generate alert on error, and the user will be notified if an alternate WAY should be used or if the WAY should be overwritten (select 'X' to not import / overwrite)

Rename Ways: if checked, selected ways will be renamed according to selected signals. For example, way for channel H1 will be renamed as H1.

WAVEFORMS

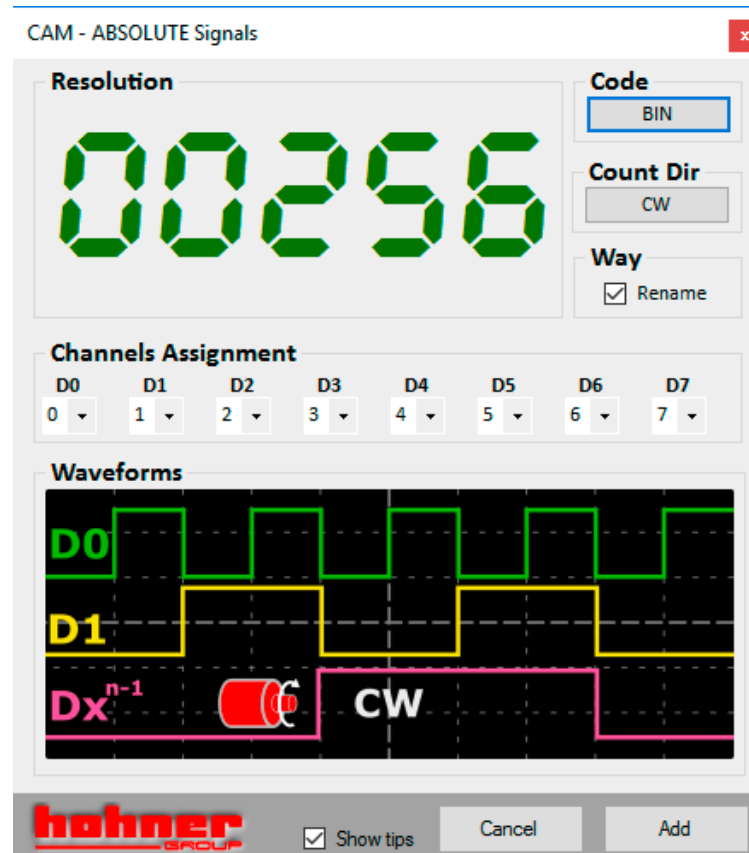
This is a visualization of the above selection.

ADD/CANCEL

Click Add to generate selected signals on selected ways. CAM View will be immediately updated.

Note

ABSOLUTE Encoder Function



In this window it is possible to select all the necessary parameters to generate absolute encoder data to import into the main window (CAM View).

RESOLUTION

Type the absolute position requested.
Min 1 position.
Max 256 positions.

CODE

Select code for generated data. Each click changes code type as follows:

1. BIN : Binary code
2. GRAY: Gray code
3. BCD 0...N-1: Binary Coded Decimal, counts from 0 to Resolution-1
4. BCD 1...N: Binary Coded Decimal, counts from 1 to Resolution

COUNTING DIRECTION

Select counting direction. Click on button to switch direction from CW to CCW and vice versa.

WAY RENAME

If checked, selected ways will be renamed according to selected signals. For example, WAY for channel D0 will be renamed as D0.

CHANNEL ASSIGNMENT

In this frame it is possible to select which signal to import into CAM View and in which way. The number of generated signals depends by typed resolution. For example for resolution of 256 , 8 signals are generated.

For each signal there's a drop down menu with all the available WAYs. As default the D0 is assigned to WAY 1, D1 to WAY 1 and onwards.

It is possible to select any Way for each channel. It is not possible to assign signals to the same way, software will generate alert on error, and the user will be notified if an alternate WAY should be used or if the WAY should be overwritten (select 'X' to not import / overwrite)

WAVEFORMS

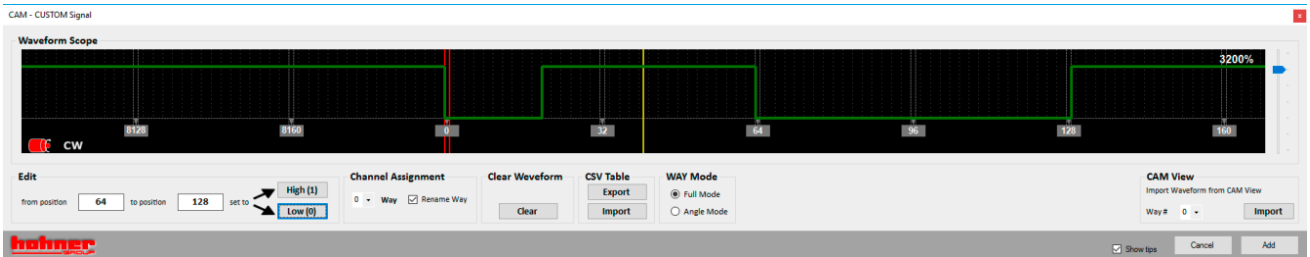
This is a visualization of the above selection

ADD/CANCEL

Click Add to generate selected signals on selected ways. CAM View will be immediately updated

Note

CUSTOM Signal Function



In this window it is possible to generate CUSTOM data to import into the main window (CAM View).

WAVEFORM SCOPE

This is the waveform representation of designed signals.

The waveform is:

- Fast scrollable by **Mouse Wheel**;
- Slow scrollable by **Mouse Wheel + Shift**;
- Zoomable by **Mouse Wheel + CTRL** or by the slide on the left of the waveform;

Red line represents the Zero position of the shaft

Yellow line represents the middle of the shown waveform

X axis labels depend on WAY Mode (the same as CAM Mode on CAM View) and zoom.

EDIT

The only way to change waveforms is by setting the edit frame.

For any change, it is necessary to specify the start and end position of the waveform portion to be changed, then, by clicking on button **High(1)** the selected range is set to 1, or by clicking on **Low(0)** it is set to 0.

When FULL Mode is selected then each position is a portion of the waveform that can be set to 1 or 0 level; for example, user can select range 0 to 0 to change only the position 0.

When ANGLE Mode is selected then each position does not represent a portion of the waveform but a position (angle), for this reason to make a change it is necessary to define an angle; the minimum change allowed is of 0.25°. For example, user can select range from 0° to 0.25°, but cannot specify the same angle for start and end because it does not identify an angle range.

Warning! It is possible to specify a start position bigger than end position; in this case, range is intended form start position to Maximum position and from Minimum position to end position. Example: In Full Mode, Start = 4000, End = 1000, change involves position from 4000 to 8191 and from 0 to 1000.

CHANNEL ASSIGNMENT

In this frame it is possible to select in which WAY the signal is composed in CAM View.

It is possible to select any Way for each channel, it is the users responsibility to verify if selected way can be overwritten by the generated data.

Rename Ways: if checked, selected ways will be renamed according to selected signal. For example, way0 becomes CUST0.

CLEAR WAVEFORM

This button clears all waveform, save waveforms before if necessary.

CSV TABLE

In this frame the user has the possibility to export/import a signal composed of a CSV (comma separated value) table.

This is useful if the user prefers to fill in the range on a table instead of select the range on this app.

This is an example of CSV file exported.

```
1 'TITLE : xPULSE WAY data'
2
3 'RESOLUTION','8192'
4
5 'Starting Pos','Ending Pos','VALUE (0=Low, 1=High)'
```

CSV File formatted as above can be imported on Waveform.

WAY MODE

As for CAM View, this button permits the user to change the resolution of the waveform accordingly

CAM VIEW

This button enables the user to import waveforms from the CAM view. For example: the user can generate an Incremental Signal with INC Function, then by CUSTOM Function can import the channel A into the Waveform, and modify with available edit modes.

To import a WAY, first select the WAY number from drop down menu, then click on Import button.

Waveform will be updated immediately.

Attention! This function will overwrite any existing waveform information.

Note

If CAM View is set as CAM Mode FULL then in the CUSTOM Function the user can use both FULL Mode and ANGLE Mode.

If CAM View is set as ANGLE Mode then the CUSTOM Function is available as ANGLE Mode only.

Revision History

Release	Release Date	Chapter	Modification	Page
A1	17-10-2016	-	Emission	-
A2	25-10-2016	ABSOLUTE Func	Added BCD features	13
A3	02-11-2016	-	Minor changes	-

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