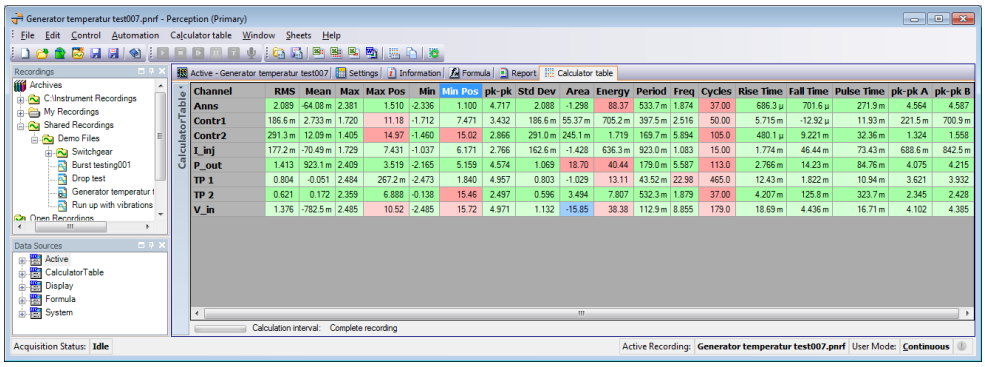
Genesis HIGH SPEED

User manual

English



Perception Calculator Table

Version 3.0

HBK HOTTINGER BRÜEL & KJÆR

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For Perception 8.30 or higher

Hottinger Brüel & Kjaer GmbH
Im Tiefen See 45
64293 Darmstadt
Germany
Tel: +49 6151 80 30
Fax: +49 6151 8039100
Email: info@hbm.com
www.hbm.com/highspeed

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1 Introduction

Welcome to the Calculator Table software. This document describes how to use this software application. The software is developed for doing automatic calculations on recorded data.
The application extends the Perception software program; it adds a new sheet to it. This sheet contains all the functionality to get specific (statistical) information from recorded data.
The results are displayed in a table. This table can be posted to Microsoft Word or Excel just like the User Table which is available as a standard component in Perception.
The Calculator Table can also be used by the Perception report generator.

The application is based on the Perception Custom Software Interface (CSI).
This manual assumes you understand your Genesis HighSpeed Test and Measurement equipment, software and basic acquisition terminology. You can use the Perception User Manual as a reference.

2 Scope

This Perception software extension adds a new sheet; this sheet calculates and displays statistical information of recorded data on all channels automatically. It should be possible to post the results to Microsoft Word. Setting up and using this feature should be as easy as possible. Using standard Perception functions like Formula database and Meters was too complex for the huge amount of different parameters.
Version 3.0 now also supports two new columns for showing the results of Peak to Peak calculated values using probability calculations.

Getting Started

2.1 Installation

The Calculator Table software consists of software and documentation provided by a downloadable install file. Use this file to install the software.

The Calculator Table software is **not** a standalone program which can be started from the Windows Start menu! It is an extension of the Perception software program. Once you start Perception you will see an extra sheet called: **Calculator Table**

The manual has also been installed on your PC. It is a PDF file which can be opened via the windows start menu.

If you cannot open this pdf file then you have to install the Acrobat® Reader® which can be found on the installation CD.
The manual is also available on the CD, you can read it before installing the software, to do this you just have to click **Calculator Table manual** (See previous shown installation screen).

2.2 Requirements

Calculator Table software operates on any PC where Perception is running.

The Calculator Table application can only be used when the HASP® USB key CSI option has been enabled. You can check this by going to the Help About dialog and click **More…**.
The “More About Perception” dialog shows which options are enabled.

The CSI option icon looks like: 

3 Application functionality

3.1 General

Perception has been extended with one extra sheet. This sheet is an integrated part of the Perception application. The sheet is called “Calculator Table”.
The sheet contains a table where the results of specific calculations per selected channel (or other datasource) are displayed.

The basic purpose of the program is to get the calculated results automatically, fast and structured. The Calculator Table has implemented alarm levels, therefore you can immediately see if there is something wrong with a specific channel.

3.2 Quick Start

Before start explaining the way the calculator table works we recommend you to load the Perception demo recording called: “*Generator temperatur test007.pnrf*”.

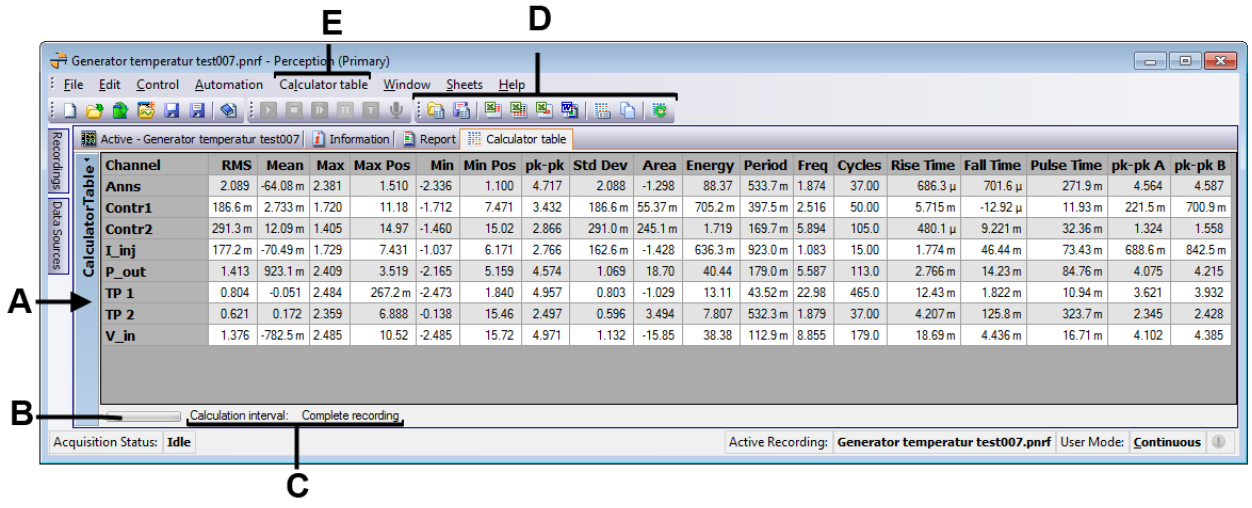
Loading the recording “*Generator temperatur test007.pnrf*”

- Select “Load Recording…” from the main menu “File”
- Select “Shared Recordings” and then “Demo Files”
- Select and “*Open*” the recording “*Generator temperatur test007.pnrf”*
- Now the calculator table will automatically be configured with the channels of the just opened recording. The calculations are also been done in the background and the results will be shown.

From here this manual is using the same demo file and often there will be a reference to this during the explanation of the usage of the calculator table.

3.3 About the Calculator Table application work area

The Calculator Table application adds new functionality to your existing Perception program. It adds the following components:



Channel	RMS	Mean	Max	Max Pos	Min	Min Pos	pk-pk	Std Dev	Area	Energy	Period	Freq	Cycles	Rise Time	Fall Time	Pulse Time	pk-pk A	pk-pk B
Anns	2.089	-64.08 m	2.381	1.510	-2.336	1.100	4.717	2.088	-1.298	88.37	533.7 m	1.874	37.00	686.3 µ	701.6 µ	271.9 m	4.564	4.587
Contr1	186.6 m	2.733 m	1.720	11.18	-1.712	7.471	3.432	186.6 m	55.37 m	705.2 m	397.5 m	2.516	50.00	5.715 m	-12.92 µ	11.93 m	221.5 m	700.9 m
Contr2	291.3 m	12.09 m	1.405	14.97	-1.460	15.02	2.866	291.0 m	245.1 m	1.719	169.7 m	5.894	105.0	480.1 µ	9.221 m	32.36 m	1.324	1.558
I_inj	177.2 m	-70.49 m	1.729	7.431	-1.037	6.171	2.766	162.6 m	-1.428	636.3 m	923.0 m	1.083	15.00	1.774 m	46.44 m	73.43 m	688.6 m	842.5 m
P_out	1.413	923.1 m	2.409	3.519	-2.165	5.159	4.574	1.069	18.70	40.44	179.0 m	5.587	113.0	2.766 m	14.23 m	84.76 m	4.075	4.215
TP 1	0.804	-0.051	2.484	267.2 m	-2.473	1.840	4.957	0.803	-1.029	13.11	43.52 m	22.98	465.0	12.43 m	1.822 m	10.94 m	3.621	3.932
TP 2	0.621	0.172	2.359	6.888	-0.138	15.46	2.497	0.596	3.494	7.807	532.3 m	1.879	37.00	4.207 m	125.8 m	323.7 m	2.345	2.428
V_in	1.376	-782.5 m	2.485	10.52	-2.485	15.72	4.971	1.132	-15.85	38.38	112.9 m	8.855	179.0	18.69 m	4.436 m	16.71 m	4.102	4.385

A. Calculator Table

B. Indicates if calculations are busy
C. Shows the (time) interval of the calculations
D. Calculator Table toolbar
E. Calculator Table main menu

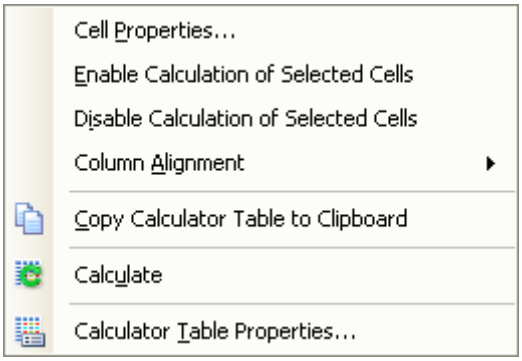
The Calculator Table contains columns and rows.
The rows are related to a specific calculation. The following calculations are available:

- RMS – Root Mean Square or Quadratic Mean
- Mean – Mean value
- Max – Maximum value
- Max Pos – Position of the maximum value
- Min – Minimum
- Min Pos – Position of the minimum value
- pk-pk – Peak to Peak value
- Std Dev – Standard Deviation (σ)
- Pk-pk A – Peak to Peak value based on statistical calculation
- Pk-pk B – Peak to Peak value based on statistical calculation

Each row is linked to a channel or other datasource, this depends on the way you configure the table; we will come back on this later on.
The individual cell shows the result of a specific calculation on a specific channel. The calculation can be done over the complete length of the recorded channel or a specific interval can be selected. You can see the selected interval at the bottom of the Calculator table (see above picture location C).
The calculations are automatically (re) started in the background when a channel has been changed or when the calculation interval has been modified.

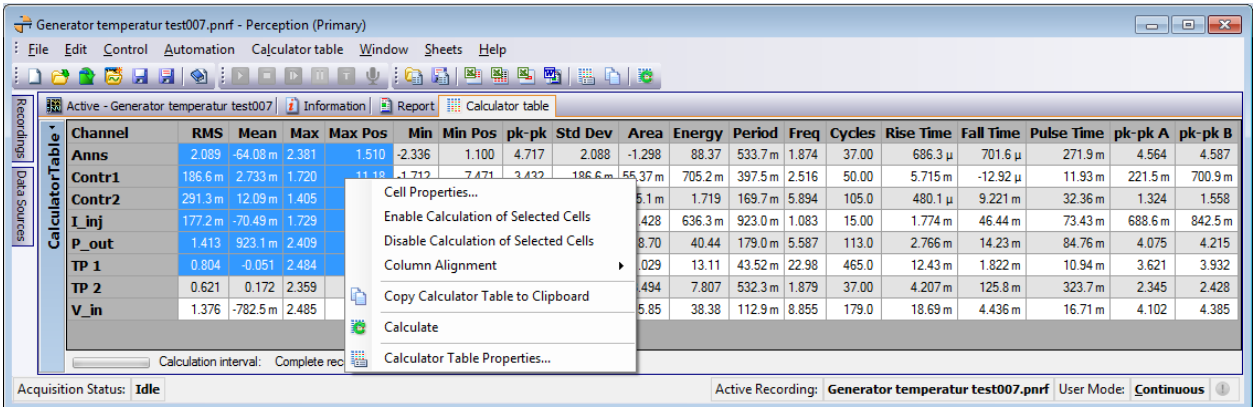
4 Table Context Menu

If you do a right mouse click on a selected cell then the Table Context Menu will be shown.
The menu looks like the following picture:



The first 4 menu items work on the selected cells or columns, while the other menu items are more general cell independent table properties.

The next figure shows a multiple select:



In this case you will modify the cell properties of all selected (blue) cells.
To select all available cells you can use the short cut key “Ctrl-A”.

The next paragraphs will explain the usage of the context menu items.

4.1 Cell Properties

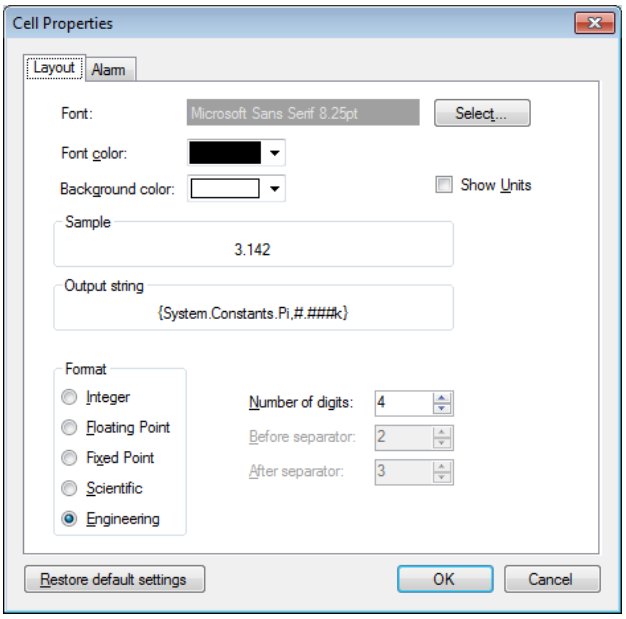
You will use the “*Cell Properties*” dialog to modify cell specific properties.
The cell properties dialog contains two tab pages:

- Layout
- Alarm

The button “Restore Default” works per selected tab and restores the properties to factory default values.

4.1.1 Layout

The layout tab looks like the next figure:



The following properties can be modified:

4.1.1.1 Font

This property sets the font of the text in a cell. This font is used in normal an in alarm mode.

4.1.1.2 Font color

This is the font color of the text in a cell, it only applies to the normal mode.

4.1.1.3 Background color

This is the background color of a cell, it only applies to the normal mode.

4.1.1.4 Show Units

If this property is enabled then the units of the calculated result will be shown in the cell.

4.1.1.5 Format and number of digits

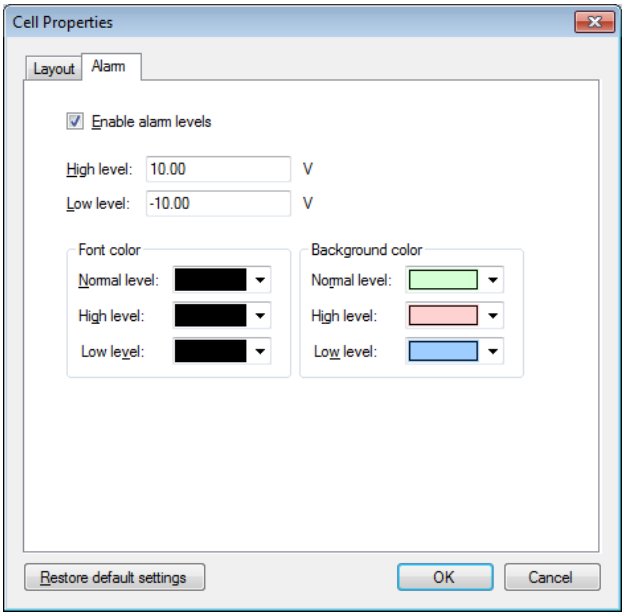
These properties are used to modify the numerical presentation of the result, for more information you should read the manual of Perception.

4.1.2 Alarm

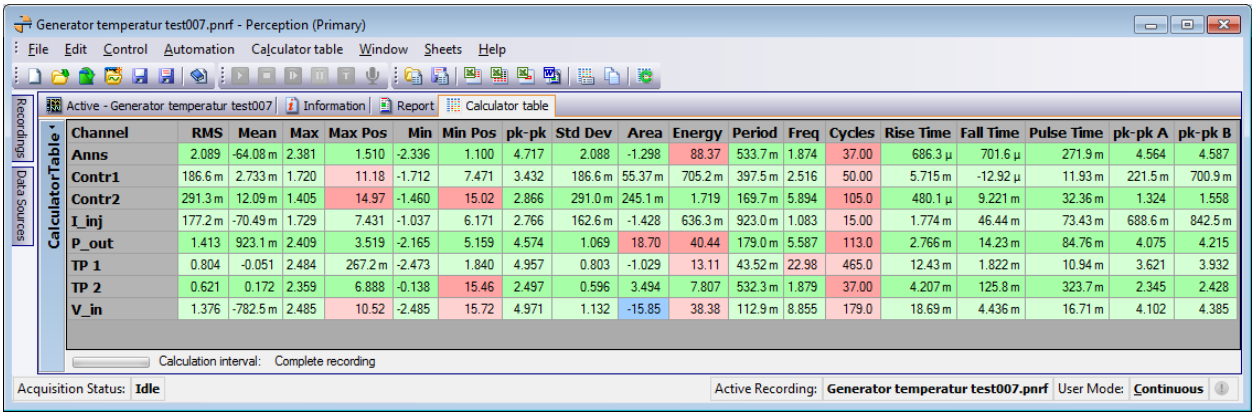
Via the alarm tab the alarm functionality can be en- or disabled.
If the alarm levels are enabled then the background color of a cell and the text color depend on its value.

There are three possible situations:

- Normal level: The value is between "*High Level*" and "*Low Level*"
- High level: The value is above "*High Level*"
- Low level: The value is below "*Low Level*"



When the alarm levels are enabled then the Calculator Table can look like:



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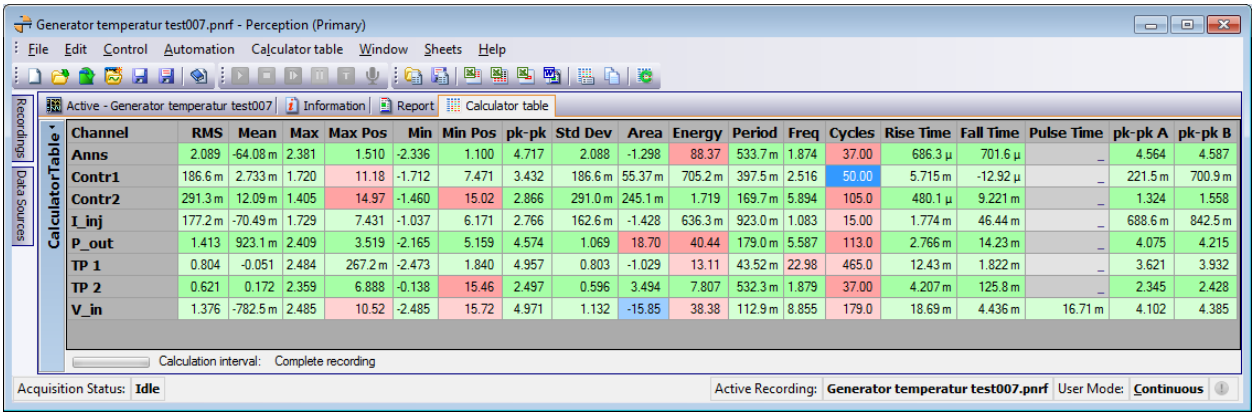
I_inj	177.2 m	-70.49 m	1.729	7.431	-1.037	6.171	2.766	162.6 m	-1.428	636.3 m	923.0 m	1.083	15.00	1.774 m	46.44 m	73.43 m	688.6 m	842.5 m
P_out	1.413	923.1 m	2.409	3.519	-2.165	5.159	4.574	1.069	18.70	40.44	179.0 m	5.587	113.0	2.766 m	14.23 m	84.76 m	4.075	4.215
TP 1	0.804	-0.051	2.484	267.2 m	-2.473	1.840	4.957	0.803	-1.029	13.11	43.52 m	22.98	465.0	12.43 m	1.822 m	10.94 m	3.621	3.932
TP 2	0.621	0.172	2.359	6.888	-0.138	15.46	2.497	0.596	3.494	7.807	532.3 m	1.879	37.00	4.207 m	125.8 m	323.7 m	2.345	2.428
V_in	1.376	-782.5 m	2.485	10.52	-2.485	15.72	4.971	1.132	-15.85	38.38	112.9 m	8.855	179.0	18.69 m	4.436 m	16.71 m	4.102	4.385

4.2 Enable Calculation of Selected Cells

This menu item is used to enable the calculations of the selected cells.
If a cell is disabled it does not show results anymore and the background calculation will not be done.
If you look at the picture below you see that the "*Pulse Time*" calculations of the first 7 channels are disabled.
To enable these cells do the following steps:

- Select the disabled cells with your mouse
- Right click to enable the context menu
- Select "*Enable Calculation of Selected Cells*" to enable the cells



4.3 Disable Calculation of Selected Cells

This menu item is used to disable the calculations of the selected cells. For more information see "*Enable Calculation of Selected Cells*".

4.4 Column Alignment

The alignment of the text in a cell can be set per column.
There are three different alignments:

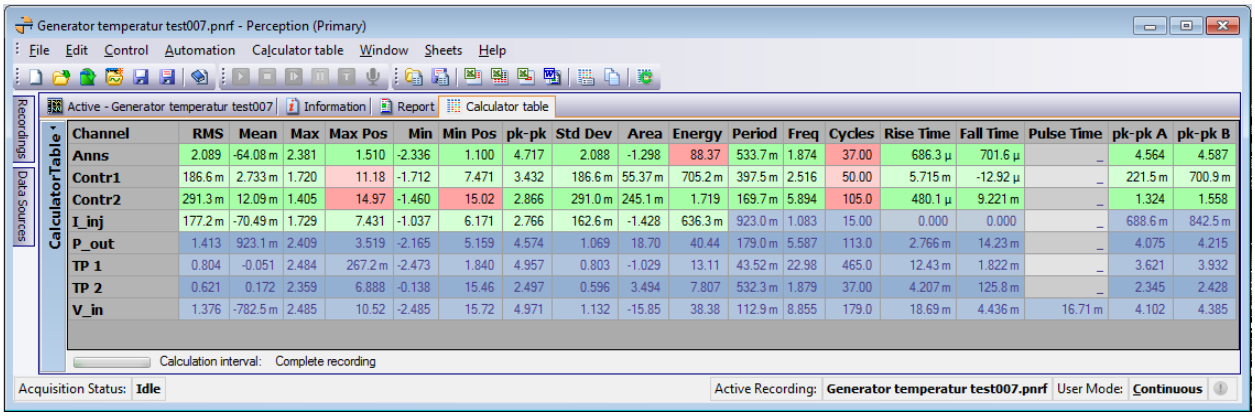
- Left
- Center
- Right

4.5 Copy Calculator Table to Clipboard

Via this menu the complete calculator table is copied into the clipboard.
If you however only want to copy a selected number of cells into the clipboard then you first have to select the desired cells and then use the key combination "Ctrl-C" or use the Perception main menu item "Edit->Copy".

4.6 Calculate

When selecting this menu item you force the Calculator Table to start the calculations.
If the calculations are already busy then the calculations will be cancelled and will be recalculated again.
Normally you do not need this because the calculations are started automatically when the data of a channel or the calculation interval changes.
Calculation starts automatically when a datasource has been modified, you can see this in the Calculator table because the background of the cells are changed, see next picture.



The upper rows (Anns, Contr1,Contr2) are already calculated, the program is now busy calculating the Period, Freq, Cycles, Rise Time, etc. of channel I_inj. The other rows are invalid and are waiting for until the calculated results are available.

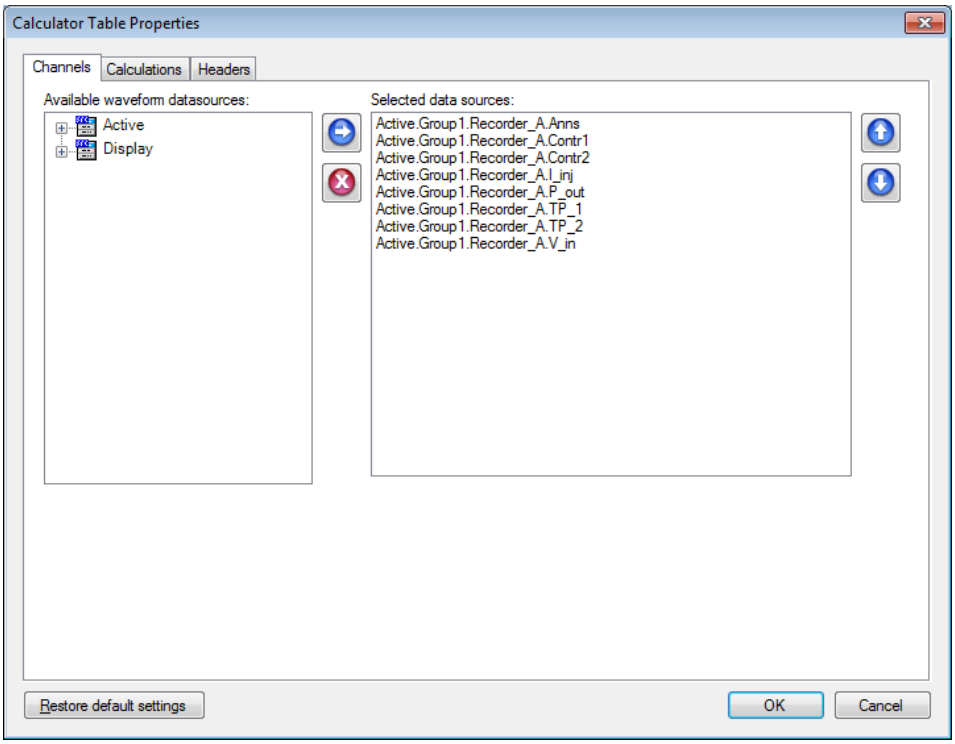
4.7 Table Properties

You will use the "*Table Properties*" dialog to modify general, non cell specific table properties.
The table properties dialog contains three tab pages:

- Channels
- Calculations
- Headers

4.7.1 Table Properties – Channels

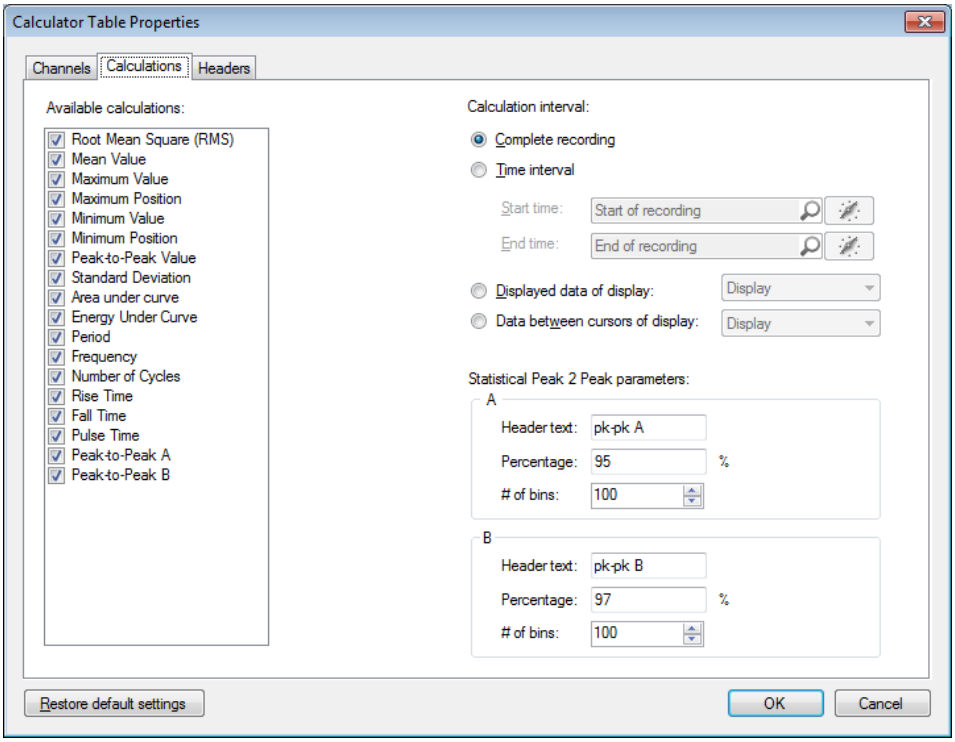
The "*Table Properties – Channels*" dialog looks like:



Via this menu you define the rows of the Calculator Table.
Each row is defined by a waveform datasource. This datasource can be a channel from a recording but it also can be a formula from the formula database. This formula can only be used if it produces a waveform.
You also can change the sequence of the rows by moving up or down the datasource name, the two buttons at the right side containing an up and down arrow can be used for this.
If you click the "*Restore Default*" button then all the waveform datasources of the "*Active*" three are selected.

4.7.2 Table Properties – Calculations

The "*Table Properties – Calculations*" dialog looks like:



4.7.2.1 Calculations Selection

At the left side you see all available calculations. These calculations are linked to the columns of the Calculator Table. The checkbox in front of the calculation description is used to en- or disable a calculation (= column). When a calculation is disabled then the related column is not visible anymore in the calculator table.
From version 3.0 two new calculations are added the **Peak-to-Peak A** and **Peak-to-Peak B**. These calculations are new and are not available in the formula database; all other calculations are available via a function in the formula database. For the calculation of the Peak to Peak values a specified probability percentage is used. Amplitudes outside the specified probability will be ignored. The used percentage and number of bins of the internal histogram function can be set per calculation, see **Statistical Peak 2 Peak parameters** paragraph.

4.7.2.2 Calculation Interval

The calculations are always done between a begin time till and an end time.
There are 4 different possibilities to define this “Calculation Interval”:

- *Complete recording*
  The calculation starts at the beginning of the channels data and stops after the last data sample.
- *Time interval*
  The start and end time of the interval are defined over here. This can be done in different ways, you can enter absolute fixed numerical values e.g. “Start time” is 0 (seconds) or you can enter a numerical datasource which delivers a start or end time e.g. “Start time” is “Display.Display2.Cursor1.XPosition”.
  This last way of using a datasource makes it possible to link the calculations to e.g. cursor positions of a display. If the datasource (e.g. cursor positions) changes then calculations are restarted automatically.
- *Displayed data of display*
  This radio button selection has been added to make it easy for you to set the begin and end time of the calculation interval to the displayed area of the selected display.
  It e.g. automatically selects the datasource variables:

  “*Display.Display.View.StartTime*”

And

"*Display.Display.View.EndTime*"

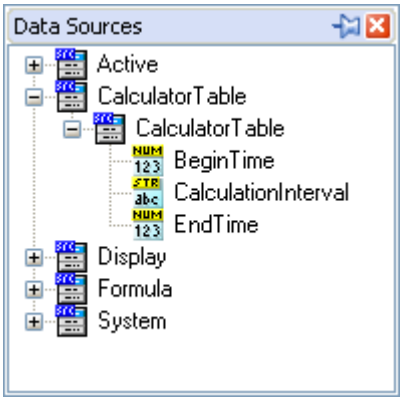
- *Data between cursors of display*
  This radio button selection has been added to make it easy for you to set the begin and end time of the calculation interval to the positions of the cursors of the selected display.
  It e.g. automatically selects the datasource variables:

  "*Display.Display.Cursor1.XPosition*"

  And

  "*Display.Display.Cursor2.XPosition*"

The calculation interval is published in the datapool, see next picture.

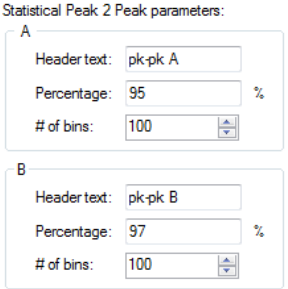


There are three datasources created:

- ***CalculatorTable.CalculatorTable.BeginTime***
  This datasource contains a numerical value indicating the begin of the calculating interval. When complete recording has been selected then the BeginTime value is set to the lowest possible double value: "*-1.7976931348623157E+308*".
- ***CalculatorTable.CalculatorTable.CalculatedInterval***
  This datasource contains a string value indicating the calculating interval as a string.
- ***CalculatorTable.CalculatorTable.EndTime***
  This datasource contains a numerical value indicating the end of the calculating interval. When complete recording has been selected then the EndTime value is set to the highest possible double value: "*1.7976931348623157E+308*".

These datasources can be used for reporting the calculating interval. You can use them at the Perception report sheet to create your own report together with the calculator table, see reporting chapter.

4.7.2.3 Statistical Peak 2 Peak parameters



The following parameters can be set per statistical Peak 2 Peak calculation:

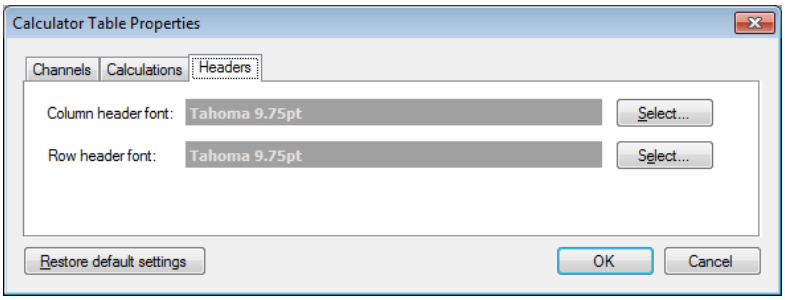
- **Header text**
  This is the columns header text as displayed in the calculator table
- **Percentage**
  This is the used percentage for the statistical Peak 2 Peak calculations. For example 97% means that amplitudes below 1.5% and above 98.5% are ignored.
- **# of bins**
  The number of bins used by the histogram function

The calculations do not use the formula database but are programmed internally. However the formulas below define how these internal calculations are working, they produce the same results.

Num	Name	Formula	Units
1		Noise input signal	
2	Signal	5 + @Noise(1k;1001)	Bar
3		Get Max and Min of input signal	
4	MaxSignal	@Max(Formula.Signal)	
5	MinSignal	@Min(Formula.Signal)	
6	Delta	@ABS(Formula.MaxSignal - Formula.MinSignal) / 20	
7		Use the Max and Min to define the input amplitudes of the histogram function	
8	Amplitude1	Formula.MinSignal - Formula.Delta	
9	Amplitude2	Formula.MaxSignal + Formula.Delta	
10	Histo	@Histogram(Formula.Signal; Formula.Amplitude1; Formula.Amplitude2; 100)	
11		Use the integrate function for an "summation" of the histogram	
12	Summation	@Integrate(Formula.Histo)	
13		Get the maximum of the summation, this maximum will be used to calculate the summation expressed in %	
14	MaxSum	@Max(Formula.Summation)	
15	SummationPercenta	100 * Formula.Summation / Formula.MaxSum	%
16		Find the 1.5% and 98.5% levels	
17	Value1_5%	@NextLvlCross(Formula.SummationPercentage; 0; 1.5)	
18	Value98_5%	@NextLvlCross(Formula.SummationPercentage; 0; 98.5)	
19	PeakToPeak97%	Formula.Value98_5% - Formula.Value1_5%	

4.7.3 Table Properties – Headers

The "*Table Properties – Headers*" dialog looks like:



Via this dialog you can select a different column or header font.

5 Calculator Table toolbar

The toolbar contains the following tool buttons:

1.  Load an existing calculator table setup.
2.  Save the current existing calculator table setup to disk.
3.  Calculate.
4.  Post to Excel.
5.  Append to Excel.
6.  Copy to Excel.
7.  Post to Word
8.  Calculator table properties
9.  Copy calculator table into clipboard

Tool bar buttons 1 and 2 are used to load and save the calculator table setup to or from a disk file. This functionality is similar to the load/save of the Perception sheets "*Report*", "*Formula*" and "*Information*".

The functionality of the toolbar buttons: *Calculate (3)*, *Calculator table properties* (8) and *Copy calculator table into clipboard (9)* is already described during the previous chapter.

Tool buttons *Post/Append/Copy to Excel (4,5,6)* and *Post to Word* (7) are identical to those buttons of the "*User Tables*", therefore we recommend to read the Perception user manual for more details.

6 Reporting

The Calculator Table can be reported in different ways. Although this functionality has already been described during the previous chapters an overview will be given over here.

The following report methods are available:

- Using Perceptions “Report” for reporting
- Using Word for reporting
- Using Excel for reporting
- Using a third party tool for reporting

The various methods will be described in the next paragraphs.

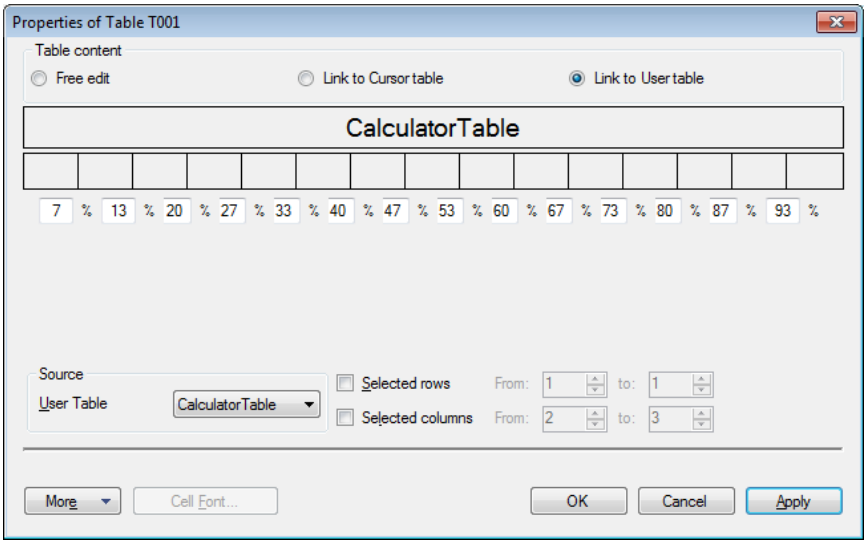
6.1 Using Perceptions “Report” for reporting

For more information on this theme you should read the “Reporter Option” chapter of the Perception manual.

However a brief example will be shown over here.

To make a report containing the calculator table you should do the following steps:

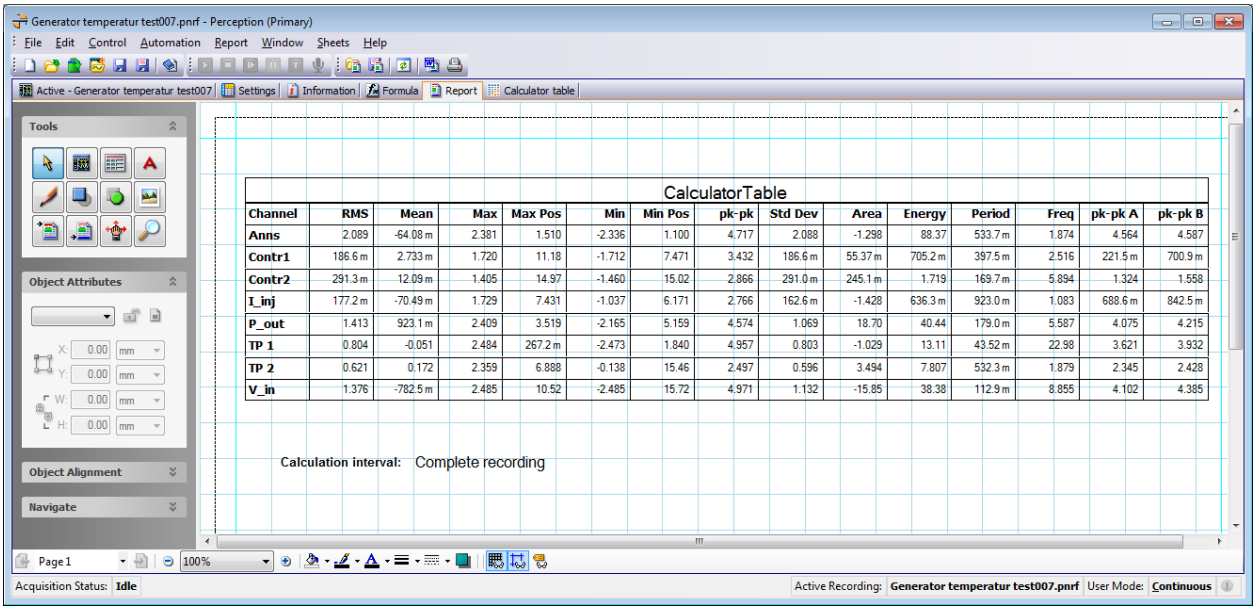
- Select the Perception “Report” sheet.
-  Select the “Cursor or report table” button to add a table to the report.
- Open the table properties window and select “Link to User table”
- As Source select “Calculator Table”



- Close the properties window.
- Add two text labels to the report.
- Enter the following text for the first text label: “**Calculation interval:**”
- The 2nd label has to be linked to the “*CalculationInterval*” data source.
  The text of the text label will look like:

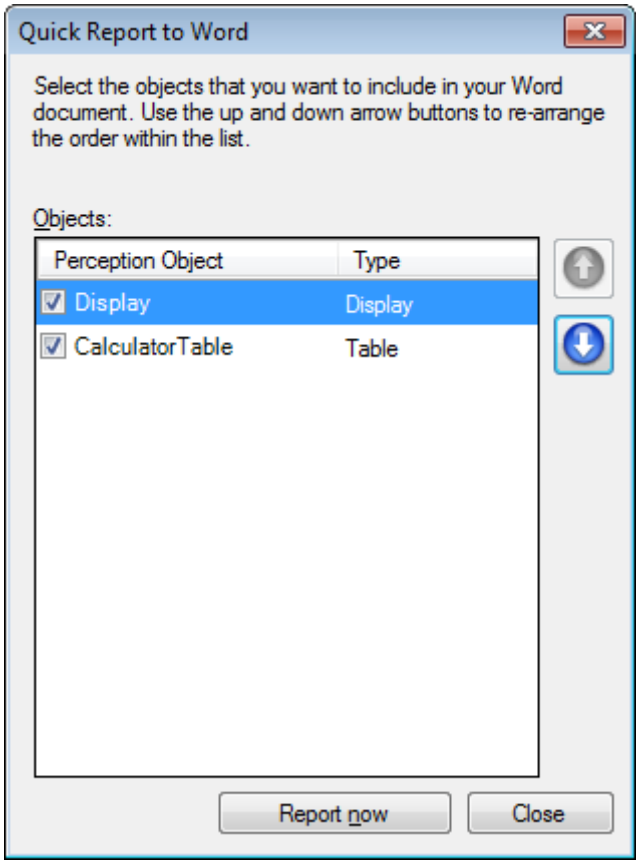
  “{CalculatorTable.CalculatorTable.CalculationInterval!Value,#.###k}”

- Close the text properties window and your report is ready and looks like the following figure.



6.2 Using Word for reporting

Just like a user table the calculator table can be posted to Microsoft Word. This can be done via a toolbar button, or via a menu item.
It is also possible to use the “Quick Report to Word” function, which can be found in the main menu “Automation”. The “Calculator Table” will be added automatically, see following picture:



Finally you can also use the “Report to Word” function. This functionality makes it possible to create your own word document and define positions (bookmarks) where the calculator table (and possible other Perception components) should be inserted. You can also insert the calculator table datasource

variables containing information about the calculation interval into the word document. For more detailed information you should read the Perception manual.

6.3 Using Excel for reporting

You can post the calculator table contents into Excel. This can be done via the three toolbar buttons:

-  "*Post to Excel*"
-  "*Append to Excel*"
-  "*Copy to Excel*"

For more detailed information you should read the Perception manual.

6.4 Using a third party tool for reporting

If you want to get the calculator table results into a third party tool then the clipboard has to be used. You should click the toolbar button  "Copy Calculator table to Clipboard". All the results from the Calculator Table are then copied into the clipboard. The other third party tool has to support the reading of the clipboard.
If you want only a number of cells to be copied into the clipboard then you have to select these cells and use the Perception main menu item "*Edit -> Copy*" or the short cut key combination "Ctrl-C".

Germany
Head Office
Hottinger Brüel & Kjaer GmbH
Im Tiefen See 45 . 64293 Darmstadt
Tel: +49 6151 8030 . Email: info@hbm.com

France
HBM France SAS
46 rue du Champoreux
BP76
91542 Mennecy Cedex
Tél:+33 (0)1 69 90 63 70
Fax: +33 (0) 1 69 90 63 80
Email: info@fr.hbm.com

UK
HBM United Kingdom
1 Churchill Court, 58 Station Road
North Harrow, Middlesex, HA2 7SA
Tel: +44 (0) 208 515 6100
Email: info@uk.hbm.com

USA
HBM, Inc.
19 Bartlett Street
Marlborough, MA 01752, USA
Tel : +1 (800) 578-4260
Email: info@usa.hbm.com

PR China
HBM Sales Office
Room 2912, Jing Guang Centre
Beijing, China 100020
Tel: +86 10 6597 4006
Email: hbmchina@hbm.com.cn

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