

User manual

English



Perception CSI Extension Harmonic Analysis Sheet



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For Harmonic Analysis version 3.6.20155 For Perception 6.60 or higher

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1 Introduction

Welcome to the **Harmonic Analysis Sheet** software manual. This document describes how to use this software application.

The purpose of the software is to calculate the amplitude of the harmonic components of a periodic signal using the Fourier series. A special user interface is created to make this possible. 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 may like to use the Perception User Manual as a reference.

2 Scope

This Perception software extension enables the use of Harmonic Analysis Sheet with any GEN DAQ hardware.

Via the new software the operator can do the following things:

- Calculate a variable number of harmonics over a selected period of time.
- Period of time is selected by the active cursor and may use a cycle detect signal to find the correct start and end times.
- Show the harmonics graphically in a special display
- Show the numerical values of the harmonics in a table
- Calculate the Total Harmonic Distortion (THD)
- All used and calculated values are available as data sources. Therefore they can be used throughout Perception for displaying, reporting or special additional user calculations.
- Various wizards will help you to set up your configuration. One of the wizards is the table configuration wizard, via this wizard you can interactively configure a new or existing user table with results from the Harmonic analysis calculations.
- Harmonic Analysis can be controlled from Perception automation



3 Getting Started

3.1 Installation

The Harmonic Analysis Sheet software is included with documentation.

The software can be installed via an install file. The name of the install file contains the version number and looks like:

Perception CSI Harmonic Analysis Sheet 64 bit 3.6.20145.msi

Installing procedure:

Run the msi install file:

Berception Harmonic Analysi	is Sheet - InstallShield Wizard
нвм	Welcome to the InstallShield Wizard for Perception Harmonic Analysis Sheet
	The installShield(R) Wizard will install Perception Harmonic Analysis Sheet on your computer. To continue, click Next.
	WARNING: This program is protected by copyright law and international treaties.
	< Back Next > Cancel

• Click **Next** and follow the on-screen instructions to complete the installation. When the process is complete, a message tells you that the option is installed. Click **Finish**.

Now the software and manual should be installed on your PC. The Harmonic Analysis Sheet software is **not** a stand-alone program which can be started from the Windows Start menu! It is an integrated part of the Perception software program. Once you start Perception you will see an extra sheet called: **Harmonic Analysis Sheet**

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

If you cannot open this pdf file, then you may 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 **User Manual Harmonic Analysis Sheet** (See previous shown installation screen).



3.2 Requirements

Harmonic Analysis Sheet software operates on any PC where Perception is running.

The Harmonic Analysis Sheet application can only be used when the HASP® USB key CSI option has been enabled. You can check it has been enabled 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:





4 Harmonic Analysis Sheet

4.1 General

The Harmonic Analysis sheet contains a Menu Panel, a standard Perception display, a standard Perception User table and a special display for showing the spectral components.





Before the calculations can be done the following things have to be prepared:

- The periodic signal of interest should be the active trace in the Harmonic Analysis Display.
- Optionaly a cycle detect signal can be defined, if not then the zero crossings of the signal itself will be used to find the correct cycle(s)
- The number of harmonics to be calculated has to be entered.
- The number of cycles used per calculation has to be entered.

Signals	Data \$	Sources	Harmonic Dis	play	Coefficient	s Table			
The cycl defined t The func	e signa hen the tion @	l is used e zero cro CycleDet	to find the cycl ossings of the tr ect() can be us	es in f ace c æd in	the trace to or traces itse the formula	be analy If will be sheet to	sed. If no used. generate	o cycle e a cyc	signal is le signal.
<u>C</u> ycle si	gnal:	Formula	Cycle					ρ	1
<u>N</u> umber	of harr	nonics to	be calculated.	5	* *				
Number	cycles	used pe	r calculation.	1	* *				
									-

- The cursor position and the cycle detect signal are used to find the correct cycle to be used for the calculations.
- The calculations can be done automatically after moving the cursor or can be done by pressing a special Re-Calculate button. The calculations will only be done automatically after cursor movement when you have not blocked the auto calculation via the **Block Auto Calculation** button.
- The results of the calculations are available as Perception Data Sources.



These data sources can be used by a Perception User table:

ě	Trace	i_1	
lqe	F	51.25 Hz	
Ľ,	DC	-0.0273 A	
ent	RMS	1.314 A	
Į ci	THD	0.066	
Pef	t1	22.51 s	
ŭ	t2	22.53 s	
		Amplitude [A]	Frequency [Hz]
	1	1.854	51.25
	2	0.01	102.5
	3	0.068	153.8
	4	0.006	205
	5	0.049	256.3

The Spectrum waveform data source can be shown in a regular Perception display:





But can also be displayed in the special spectrum display at the Harmonic analysis sheet:



4.2 Calculations

The Harmonic Analysis Sheet will calculate the various spectral components based on the Fourier series.

The calculations are based on the following formulas:

$$f(t) = DC + \sum_{k=1}^{\infty} \left(A_k \cos\left(\frac{2\pi kt}{T}\right) + B_k \sin\left(\frac{2\pi kt}{T}\right) \right)$$
$$T = t_2 - t_1$$
$$DC = \frac{2}{T} \int_{t_1}^{t_2} f(t) dt$$
$$A_k = \frac{2}{T} \int_{t_1}^{t_2} f(t) \cos\left(\frac{2\pi kt}{T}\right) dt$$
$$B_k = \frac{2}{T} \int_{t_1}^{t_2} f(t) \sin\left(\frac{2\pi kt}{T}\right) dt$$
$$AB_k = \sqrt{A_k^2 + B_k^2}$$
$$\varphi_k = a\cos\left(\frac{A_k}{AB_k}\right)$$

The Total Harmonic Distortion (**THD**) uses the RMS of the function during the selected cycle (Urms) together with the RMS of the fundamental (Urmsfund). The fundamental is the same as the first harmonic.

$$THD = \frac{\sqrt{Urms^2 - Urmsfund^2}}{Urmsfund} \times 100\%$$

$$Urmsfund = \frac{AB_1}{\sqrt{2}}$$

$$THD = \frac{\sqrt{Urms^2 - 0.5 AB_1^2}}{\frac{AB_1}{\sqrt{2}}} \times 100\%$$

The Total Harmonic Current distortion (**THC**) uses the RMS of the first n harmonics (excluding the fundamental with n=1), adds them up geometrically and puts the result in relation to the RMS of the fundamental. The fundamental is the same as the first harmonic.

$$THC = \frac{\sqrt{\sum_{h=2}^{n} I_h^2}}{Irmsfund} \times 100\%$$

Where:

- I_h = The RMS of the hth harmonic.
- *Irmsfund* = The RMS of the fundamental

Formula is listed on page 28 of the EN 61400-21:20008(D) paper



This THC calculation is done according to **EN 61400-21:2008** Wind turbines – Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines. The **EN 61400-21:2008** defines this calculation to be done on the current and up to the 50th harmonics.

So in order to be compliant the user must add one or more current channels of interest to the **Harmonic Analysis Display** which resides at the **Harmonics Analysis sheet** and set the number of harmonics to be calculated to 50.

4.3 How to get started

When you have installed the Harmonic Analysis Sheet and then start Perception you will see the following rather empty screen:



Before you can continue you need to have at least one periodic signal which will be used for the analysis. This signal can come from a recording you just have recorded, or by opening an existing recording.

So the initial steps you have to do when you start from scratch are:

- Open an existing recording or record a new one.
- We recommend you to use the formula database function @CycleDetect() for creating a cycle detect signal, see also chapter with example about the usage of the CycleDetect() function; This step is optional and can be skipped, then the zero crossings of the periodic signal itself will be used to determine the cycles. However often the results are better when using the @CycleDetect() function because it contains special logic to handle noisy signals.

Num	Name	Formula
1	Cycles	@CycleDetect(Active.Group1.Recorder_A.i_1)





- Press the Config Wizard button Wizard to initially configuring your Harmonic Analysis application.
- The following dialog will be shown:

Auto Configure Harmonic Analysis Sheet	
To be able to auto configure this sheet you need to select on The selected signals are shown in the Harmonic Analysis Disp From all these signals the spectral components are calculated You can always modify the number of traces in the Harmonic	e or more periodic input signals. vlay. and the results are published as data sources. Analysis Display manually.
Periodic Signals	
Available Traces:	Selected Traces:
∎-∰ Active ⊕-∰ Display	
The cycle signal is optional, if not entered the zero crossings	s of the periodic signals itself will be used.
Cycle signal:	ρ
Number of harmonics to be calculated: 10 -	
	OK Cancel

- Now select the Periodic signal(s) you want to use for the calculations.
- Enter optionally the cycle signal, this is the signal which will be used to find the correct period (t₁ and t₂ in the formulas above) around the location of the first cursor. See information (@CycleDetect()) above.
- Enter the number of harmonics you want to be calculated
- Enter the number of cycles used per calculation.
- Your dialog can now look like:

Auto Configure Harmonic Analysis Sheet		— ———————————————————————————————————
To be able to auto configure this sheet you need to select one The selected signals are shown in the Harmonic Analysis Disp From all these signals the spectral components are calculated You can always modify the number of traces in the Harmonic .	e or more lay. and the Analysis I	periodic input signals. results are published as data sources. Display manually.
Periodic Signals		
Available Traces:		Selected Traces:
Active eDrive Recorder_A 		Active.eDrive.Recorder_Ai_1 Active.eDrive.Recorder_Ai_2 Active.eDrive.Recorder_Ai_3
The cycle signal is optional, if not entered the zero crossings	of the pe	eriodic signals itself will be used.
Cycle signal: Formula.Cycle		ρ
Number of harmonics to be calculated: 10 - Number of cycles used per calculation: 1 -		
		OK Cancel

- Press the OK button and the system will configure the Harmonic Analysis sheet and will also do the calculations.
- The result can look like:





- You are now ready, after you moved cursor 1 the calculations will automatically be started again, using a new period.
- If you like the configuration you can save this into a virtual workbench and reuse it later again.

4.4 Modify an existing configuration

If the default configuration is not what you want, you can modify it.

• You can always add more traces to the Harmonic Analysis Display. The calculations are always done on all the traces in the display; if the active trace is the cycle signal then the program automatically will change the active trace to another trace. The cycle signal is the signal as defined via the Harmonic Analysis Properties dialog. The program assumes that the cycle signal can be used for all the traces you add to the Harmonic Analysis Display.



Use the vertical or horizontal splitters to resize the displays or coefficients table.



- Press the **Properties** button to modify various properties.
- The Harmonic Analysis Properties dialog has four different tabs:
 - o Signals Tab

You can change:

- The cycle signal
- The number of harmonics to be calculated
- The number of cycles per calculation

rmonic	Analy	sis Prope	rties					
Cincelle					o			
Signals	Data	Sources	Harmonic Disp	olay	Coefficients Tab	le		
The cycl defined t The fund	le signa then th ction @	al is used e zero cro CycleDet	to find the cycle ssings of the tra ect() can be us	es in ti ace or ed in f	he trace to be ar r traces itself will the formula shee	alysed. If i be used. t to genera	no cycle ate a cyc	signal is de signal.
<u>C</u> ycle si	ignal:	Formula.	Cycle				ρ	1
<u>N</u> umber	r of har	monics to	be calculated.	10	*			
N <u>u</u> mber	r cycles	used per	calculation.	1	-			
						ОК		Cancel

o Data Sources

For some of the harmonic calculation results it is optional weather or not you want them to be available as data sources. These are:

 A_k , B_k and φ_k (in radians or degrees)

Signals Data Sources Harmonic Display	Coefficients Table
For some harmonic calculation results you c sources.	an select if they have to be available as data
Ak coefficient	
Bk coefficient	
📝 φk in <u>d</u> egrees	
📝 φk in <u>r</u> adians	

• Harmonic Display

The X-axis of the Harmonic display can either be set to Frequency or Order. The spectral values can be the peak amplitude or the RMS of the amplitude

Signals (Harmonic Displa	V Coefficients Table
X-Axis	
Frequency	
Order	
Spectral value	
Amplitude	
RMS value	
<u>R</u> MS value	

Coefficients Table
 The coefficients table can show a percentage column, the 1st harmonic or
 fundamental frequency is set to 100% the other spectral components are related in
 percentage to this value.

Signals	Harmonic Display Coefficients Table	0
	Show percentage column.	
	Show percontage column.	

• Use right mouse click on the displays to change the setup or properties. For the **Harmonic Analysis Display** you can use the Perception user manual to see what possibilities there are, however the spectral display called **Harmonics Display** works differently because it is not a standard Perception display.





 You can also use the toolbar buttons; they only appear when the spectral harmonic display is selected.



• Via the properties menu you can modify the Spectral display, most properties are selfexplaining and most of the time the default settings will be OK.

Disalaura	aces Setup Report Set	up	
Display name	Unerrente a Directory		_
Display name:	Harmonics Display		
Show displ	ay sidebar		
Header			
Header text:	Signal: '{Harmonic.Act	ve.TraceName!Value}' Fundar	nent 💉
Font:	Arial 11pt	<u>S</u> elect ▼ Sh	ow header
Backgroun <u>d</u> :		Foreground:]•
Show			
✓ Grid			
Subgrid			
Zero <u>Y</u> -Axis	s line		
Zero X-Axis	s line		
Control bar			
Cursor read	ding		
Colors			
Background:		Sub grid:	
Gri <u>d</u> :		T <u>e</u> xt:	

Some properties which might be interesting are:

Header text

You can modify the header text above the **Harmonics Display**; you can use data sources to create a dynamic header. If you have used the **Configure Wizard** you see the following header definition text:

Signal: '{Harmonic.Active.TraceName!Value}' Fundamental Frequency = {Harmonic.Active.F01!Value,####.!Units} Fundamental amplitude = {Harmonic.Active.Value.RMS.AB01!Value,####.!Units}

This results in the following header:

Signal: 'i_1'	Fundamental Frequency = 49.95 Hz	Fundamental amplitude = 1.784 A
It is also possibl	e to switch off the header.	

• Report Setup settings

Those settings will be used when you want to use this display at a Perception report. For more information see chapter reporting.

• You can modify the **Coefficient Table**; this table is a standard Perception user table, information on how to modify this can be found in the standard Perception user manual.

4.5 Reporting

The Harmonic Analysis sheet contains three main components, two displays and a table; all those components can be used by the report sheet to create nice reports. Read the Perception user manual to see how the standard Perception display and user table can be used by the report sheet. The spectral **Harmonics Display** however is not a standard Perception display and therefore it works different when you want to have this display at your report. You should use the report **Image** component and use the **Harmonics Display** as the local source.

Steps for using the spectral Harmonics Display at a Perception report:

- Before you start make sure the layout of your display is OK for you
- Go to the report sheet
- Select the Image in the Tools panel and drop it on the report



• Select the Harmonics Display as the local source

Properties of Image I001	
Source External Source Local Harmonics Disp	Browse
Size <u>Wi</u> dth: 214.31 mm <u>H</u> eight: 93.93 mm	
Fitting	Centerimane
 Fit image to frame 	 Entitle image Fit image proportionally
Fit frame to image	
Lin <u>k</u> image	OK Cancel Apply



• Preferred setting for fitting is: *Fit image proportionally* however you can use a different setting as well. The best choice also depends on the harmonic display **Report Setup** settings.

Traces Setup	Data Source	piay ses Fr	velopes	Repor	t Setup
Show				J	
Grid					
Subarid					
Color					
Black o	n white			_	
Color or	1 I		▼	•]	
🔘 Asiis (M	YSIWYG)				
Size					
Eixed size	ze				
Report <u>h</u> eig	ht in pixels:	400			
Report widt	n in pixels:	600			

- You just can experiment and find out what you like the most.
- An example of a report:



4.6 Harmonic Analysis Data Sources

After the calculations have been done the various results are available as data sources. Per trace (as shown in the **Harmonic Analysis Display**) there will be a sub tree in the main entry called **Harmonic**. There is also always a sub tree called **Active**. This **Active** tree is a copy of one of the *trace* trees, and is controlled by the Harmonic Analysis Display. The results of the harmonic calculations of the **active** trace in the **Harmonic Analysis Display** are also available in the **Harmonic.Active** tree in the data sources. By doing this the **Coefficients Table** and the spectral **Harmonics Display** will be automatically updated when another trace is selected in the time display. Both these components are linked to this *active* data source tree.

- Period

123 DC

123 t1

123 t2

123 THC

123 THD

123 RMS



In the picture above you can see that there are three results of three traces called i_1 , i_2 and i_3 Next to this you can see the **Active** tree.

All these trees have the same structure.



Each sub tree has a TraceName field; this is the name of the trace used for the calculations.

The sub trees are:

• Frequency

F01 to **F05** are the harmonic frequencies, where **F01** is the fundamental frequency The number of frequencies depends on the selected number of harmonics to be calculated; in this example this was set to 5



• Period

The period contains:

- **DC** is the DC component
- **RMS** the RMS value of the selected cycle
- \circ **t**₁ the begin of the cycle
- \circ t₂ the end of the cycle
- **THD** the Total Harmonic Distortion of the selected cycle
- o THC the Total Harmonic Current Distortion of the selected cycle



0

This section contains information on the various harmonic coefficients:

• **Peak**: The values are related to the signal Peak amplitude value,

- **Percentage**: The values are related to the fundamental frequency
 - RMS: The values are related to the RMS value of the signal



The Peak tree looks like:





In this example the number of harmonics is 5; the various data sources have the following meaning:

- **A01** to **A05** are A_k where k = 1 to 5 in the formula below.
- **B01** to **B05** are B_k where k = 1 to 5 in the formula below.

$$f(t) = \mathrm{DC} + \sum_{k=1}^{\infty} \left(A_k \cos\left(\frac{2\pi kt}{T}\right) + B_k \sin\left(\frac{2\pi kt}{T}\right) \right)$$

• **AB01** to **AB05** are AB_k where k = 1 to 5 in the formula below.

$$AB_k = \sqrt{A_k^2 + B_k^2}$$

- φd_01 to φd_05 are φ_k in degrees where k = 1 to 5 in the formula below
- φ **r_01** to φ **r_05** are φ_k in radians where k = 1 to 5 in the formula below

$$\varphi_k = \operatorname{acos}(\frac{A_k}{AB_k})$$

• **PeakSpectrum_F** is a waveform data source constructed from the spectral components the y-axis are the values AB01, AB02, etc... the x-axis is the frequency in Hz.

• **PeakSpectrum_O** is a waveform data source constructed from the spectral components the y-axis are the values AB01, AB02, etc... the x-axis is the order of the harmonic.

Remark: The green marked data sources are optional; they can be disabled via the properties dialog!

The Percentage tree looks like:



The harmonic values are now expressed in percentage, where AB01 is set to 100%, the other values are related to this value.

The RMS tree looks like:



All the variables have the same meaning as the described for the Peak tree, except that now the values are RMS (= Peak values divided by $\sqrt{2}$).

4.7 Harmonic Analysis Menus and Toolbars

The Harmonic Analysis sheet comes with the following menu and toolbar

Harr	nonic Analysis	Window	Sheets	Help
	<u>L</u> oad settings			
7	Save settings			
	About			
	Move Sheet 'H	armonic A	nalysis' to	•

The menu items or toolbar buttons have the following functionality:





The configuration of the Harmonic Analysis sheet can be saved to and loaded from a Harmonic Analysis Settings file (*.**pHAS**). This mechanism is the same as for example the formula sheet where the configuration can also be saved and loaded from a *.pFormulas file. Via the Load settings menu you can however also load the Harmonic Analysis configuration from an existing **Virtual Workbench** or an existing **Experiment**.



Isave setting

Saving the existing configuration into a separate Harmonic Analysis Settings file (*.pHAS).

4.8 Persistency

The setup of the Harmonic Analysis Sheet is saved just like other setup settings of Perception into a virtual workbench file (pVWB) or recording file (pNRF). If you reopen a recording file or virtual workbench file, the Harmonic Analysis sheet will be set the same as at the moment of saving.

4.9 When does re-calculation happen

In the menu there are two buttons related to the Harmonic Analysis calculations:



The first button is used to block or unblock the automatic recalculation of the Harmonics when moving the 1st cursor. If the recalculations are blocked the button looks like:



The Re-Calculate button can be used to force a re-calculation.

The picture below shows the cycle signal (purple) and the periodic signal to be analyzed (yellow). The time markers t_1 and t_2 show the used cycle. When moving the cursor outside the current cycle a re-calculation will happen; this happens of course when the **Block Auto Calculations** is enabled.





4.10 Use time markers to show selected cycle

In the picture above you see two time markers which indicate the start and end of the used cycle. We will describe here how you can do this.

- Make sure you have done a calculation and all information is available as data sources
- Add a time marker. 4 You can do this by right mouse click at cursor 2 or use the toolbar button
- Change the properties of the time marker as follows:

Marker 'DM001' P	roperties			— ×
Marker type:	Trace marke	r, linked to: Signa	11	
<u>L</u> abel text:	t1			*
L <u>e</u> ss 🔺				
Anchor format		Automation		
Type: Diamo	nd 🔻	Anchor 1 (x):	Harmonic.Active.Period.t1	1
Size: Small	•	Anchor 1 (y):	-189.2 mA	<i>.</i>
<u>S</u> tyle: Open	•	Anch <u>o</u> r 2 (x):		<i>.</i>
Hide l <u>a</u> bel		Ancho <u>r</u> 2 (y):		Ŵ.
Marker <u>n</u> ame:	DM001		ОК	Cancel

- Create a second time marker and now use as *label text* **t2** and set the *Anchor* 1(*x*) to **Harmonic.Active.Period.t2**
- If you now move the cursor you will see the time markers are automatically repositioned to the correct start and end of the used cycle.



4.11 Table creation Wizard

The table creation wizard can be used to create new or modify existing user tables. This wizard uses the data sources as created by the harmonic analysis calculations. You can interactively setup a table layout.



The wizard can be started via the **Create table** Analysis sheet.

button at the menu panel of the Harmonic

Harmonic Analysis Table Wizard	
	Welcome to the Harmonic Analysis Table Wizard
	This wizard enables you to create a new user table or modify an existing user table. It will use the data generated by the harmonic analysis calculations. This data can be found in the data sources window and are all behind the sub tree "Harmonic"
	Cancel < Back

The next page looks like:

Harmonic Analysis Table Wiz	zard	×
Trace Selection Select the traces to be used by	y the new table	
Available Traces M N S W -Active trace-	Selected Traces	
<u>C</u> ancel	< <u>B</u> ack <u>N</u> ext <u>F</u> ir	iish

At the left you see the names of the traces as they are available in the **Harmonic Analysis Display**. However there is one extra item called **-Active trace-**, you should select this if you want to use the calculated results from the **Harmonic.Active** tree.



Select the traces from which you want to use the calculated results. In the picture below M, N, S and W are selected.

Harmonic Analysis Table Wizard		×
Trace Selection Select the traces to be used by the n	ew table	
Available Traces M N S W -Active trace-	M N S W	
<u>C</u> ancel < <u>B</u> i	ack <u>N</u> ext <u>F</u> ini	sh

The next wizard page shows the Header Lines selection. Via this page you can select which Header Lines per trace should be shown in the user table.

Select the heade	er lines per trace				4
<u>H</u> eader lines:	7				
Header line 1	Trace 🔻	Trace	M		
		*	1300 Hz		
Header line 2	F 🔻	DC	0.9		
Header line 3	DC 👻	RMS	0.741 V	Header	ines
		THD	0.311	Header	lines
Header line 4	RMS 👻	13	50.77 ms		
Header line 5	THD 🔻	12	\$3.08 ms		
Header line 6	t1 •	Order	Amplitude [A]	Percentage [%]	Frequency [Hz
Headerline 7	[12 _]	1	1	100	1300.39
	12	2	0.25	25.03	2600.78
		3	0.15	15.03	3901.17
		4	0.1	10.04	\$201.56
		5	0.05	5.042	6501.95

The next wizard page you can select the columns definition. Per calculated order there will be a row added into the user table. Via this page you define which fields should be shown per order results line.



olumns s	ie columns per t election	race			
					8
Number	of columns per trac	e: 4 📼			
Column 1	Colu	mn 2 (Column 3	Column 4	
Order	▼ Amp	itude 🔻 🛛	Percentage 🔹	Frequency	•
Trace	м			1	
F	1300 Hz			1	
DC	0 V				
RMS	0.741 V			1	
THD	0.311				
t1	50.77 ms				
t2	53.08 ms	Columns p	er Trace		
Order	Amplitude [A]	Percentage [%	Frequency [Hz]		
1	1	100	1300.39		
2	0.25	25.03	2600.78		
3	0.15	15.03	3901.17		
4	0.1	10.04	5201.56		
5	0.05	5.042	6501.95		

The next wizard page is used to define how the trace blocks should be layouted in the targeted user table. In the example below we have chosen for two trace blocks horizontal and also two blocks vertical.

able Layout able layout selection									ø
Number of traces:	4	Trace	м			Trace	N		
		F	1300 Hz			F	1300 Hz		
		RMS	0.741V	T	1	RMS	0.761 A	Troos	2
		THD	0.311	race	1	THD	0.399	race	2
Number of traces horizontal:	2 🚔	ti.	50.77 ms			t1	50.77 ms		
		t2	53.08 ms			t2	53.08 ms		
		Owner	Amalituda (A)	Rescentage [84]	Energy and a list of	Order	AmoStuda [A]	Recentane Phi-1	Energy and a list
Number of traces vertical:	2 📥	1	1	100	1300.39	1	1	100	1300.39
	-	2	0.25	25.03	2600.78	2	0.35	35.03	2600.78
		3	0.15	15.03	3901.17	3	0.13	13.03	3901.17
		4	0.1	10.04	5201.56	4	0.11	11.03	5201.56
		5	0.05	5.042	6501.95	5	0.09	9,046	6501.95
		Trace	s			Trace	w		
		F	1300 Hz			F	1300 Hz		
		OC .	0 A	Trace	2	DC	0.A	Trace	4
		RMS	0.806 A	nace	5	RMS	0.749 A	nace	-
		THD	0.547 60.77 me			THD	0.348		
		12	53.08 ms			t2	53.08 ms		
		Order	Amplitude [A]	Percentage [%]	Frequency [Hz]	Order	Amplitude [A]	Percentage [%]	Frequency [Ha
		1	1	100	1300.39	1	1	100	1300.39
		2	0.3	30.03	3901.17	3	0.52	11.34	3901.17
		4	0.201	20.05	5201.56	4	0.08	8.042	5201.56
		5	0.901	10.07	6501.95	5	0	0.039	6501.95
			<u>C</u> ar	ncel	< <u>B</u> ack		<u>N</u> ext		<u>F</u> inish

The next wizard page is used to see how the table will look like with the so far selected settings. This step is only for convenience and can also be skipped. If the layout is not what you expected you can go back and change the selections.

1	Trace	M			Trace	N		
2	F	1300 Hz			F	1300 Hz		
3	DC	0 V			DC	0 A		
4	RMS	0.741 V			RMS	0.761 A		
5	THD	0.311			THD	0.399		
6	t1	50.77 ms			t1	50.77 ms		
7	t2	53.08 ms			t2	53.08 ms		
8								
9	Order	Amplitude [V]	Percentage [%]	Percentage [%]	Order	Amplitude [V]	Percentage [%]	Percentage [%]
10	1	1	100	100	1	1	100	100
11	2	0.25	25.03	25.03	2	0.35	35.03	35.03
12	3	0.15	15.03	15.03	3	0.13	13.03	13.03
13	4	0.1	10.04	10.04	4	0.11	11.03	11.03
14	5	0.05	5.042	5.042	5	0.09	9.046	9.046
15								
16	Trace	S			Trace	W		
17	F	1300 Hz			F	1300 Hz		
18	DC	0 A 0			DC	0 A		
		0.000.4		<u> </u>	P.1.5	0.740.4		

When you are pleased with the layout you can select an existing or create a new table and configure this table with your new configuration.

Harmonic Analysis Table Wizard	×
Create new Table or modify existing Table Select an existing table or let the wizard create a new user table at a new sheet. Select '-Create new table-' in the selection table list if you want to create a new result table.	R
Table: Coefficients Table	
When the table selection is OK click at the 'Configurate table' button to configure the selected table by this wizard.	
Configurate table	
Cancel < Back Close	

The table selection entry shows all existing user sheets plus a **-Create new table-** selection. When you select this then a new user sheet will be created and a new user table will be added to this new user sheet.

Table:	Coefficients Table 🔹
	Coefficients Table
	-Create new table-

If you have done the correct table selection press the **Configurate table** button to actualy configure the selected table.

Remark: If you configure an existing table the old content will be deleted completely and will be overridden by new data.

If the Wizard does not excactly produce the content as what you want; you can always manualy change the user table.



For example if you do not like the formatting of the **Frequency** column in the table below.

ě	•	1	Trace	М		
lqe		2	F	1300 Hz		
Ĕ		3	DC	0 V		
井		4	RMS	0.741 V		
Res		5	THD	0.311		
Ę.		6	t1	50.77 ms		
ē		7	t2	53.08 ms		
arn		8				
Т		9	Order	Amplitude [V]	Percentage [%]	Frequency [Hz]
		10	1	1	100	1300.39
		11	2	0.25	25.03	2600.78
		12	3	0.15	15.03	3901.17
		13	4	0.1	10.04	5201.56
		14	5	0.05	5.042	6501.95

Select all the frequency cells you want to reformat:



Select the 1st menu option called **Data Source Properties...**, this will show the **Format Data Source** dialog. Now you can select the formatting of your choice.

Fo	ormat Data Sour	ce	
	Value propertie	s Integer	
	Format		
	Number of digit	3	6 🌩
	Before separate)r	6
	<u>A</u> fter separator		1
	Sample:	1300	
	Output String:	{Harmonic.M.Frequency.F	01!Value,#####
		ОК	Cancel

This will result in the following Frequency column:

6]	Frequency [Hz]
	1300
	2601
	3901
	5202
	6502



4.12 Example on how to use the @CycleDetect() function

For better results we recommend to use the standard function called **@CycleDetect()**; The calculations might be faster and more accurate. Information on how the **@CycleDetect()** function works can be found in the Perception documentation. This chapter only shows you how this function can help you to get better results in doing the harmonic analysis calculations.

It is very important to find the correct cycles when doing the harmonic analysis calculations, the **@CycleDetect()** function is specially built for finding the correct cycles. It contains special argorithms to make it perform better for noisy signals. One of the input parameters of this function is the **Hysteresis** input parameter. The example below shows you what this can bring to you.

We have created a signal which is the addition of a 50Hz and a 200Hz sine signals, the amplitude of the 50Hz is 555mV and the 200Hz is 444mV.

If we do the harmonic analysis without using a cycle detect signal we see the following results:



The frequency of 61Hz is not correct, you can see from the picture that t1 and t2 are the found zero crossings which were used.

If we now however use the @CycleDetect() function as shown below, we get better results.

Num Name		Formula	Units	
1 cycle		@CycleDetect(Active.Group1.Recorder_A.Ch_A1; 0; 300m)		

The detection Level is set to 0V and the Hysteresis is set to 300mV.

The cycle signal is the red signal below. You can see that the calculated results are now correct because t1 and t2 are better.





The CycleDetect signal has also a parameter called **SuppressTime**, you can use this when you already know the main frequency to be expected, you then calculate the minimum required duration of half a cycle and use this value as the SuppresTime.

4.13 Example using the formula sheet for creating test signals

To understand the working of the harmonic analysis calculations it might be helpful to generate some test signals using the formula sheet. The function **@SineWave()** can be used for this. The picture below shows an example of a simulated periodic signal by adding various sine waves with different frequencies and different amplitudes.

Num	Name	Fomula	Units
1	S1	2*@SineWave(1M;100k;1k)	A
2	S2	0.4*@SineWave(1M;100k;2k)	Α
3	S3	0.3*@SineWave(1M;100k;3k)	Α
4	S4	0.2*@SineWave(1M;100k;4k)	Α
5	S5	0.1*@SineWave(1M;100k;5k)	Α
6	S6	0.23*@SinelWave(1M;100k;6k)	Α
7	S7	0.1*@SineWave(1M;100k;7k)	Α
8	S8	0.05*@SinelWave(1M;100k;8k)	Α
9	S9	0.01*@SinelWave(1M;100k:9k)	Α
10	S10	0.05*@SinelWave(1M;100k;10k)	Α
11	S11	0.2*@SineWave(1M;100k;11k)	A
12	S12	0.4*@SineWave(1M;100k;12k)	A
13	S13	0.3*@SineWave(1M;100k;13k)	A
14	S14	0.2*@SineWave(1M;100k;14k)	A
15	S15	0.1*@SineWave(1M;100k;15k)	А
16	S16	0.23*@Sinelv/ave(1M;100k;16k)	А
17	S17	0.1*@SineWave(1M;100k;17k)	А
18	S18	0.05*@Sinelv/ave(1M;100k;18k)	А
19	S19	0.01*@Sinelv/ave(1M;100k;19k)	А
20	S20	0.14*@Sinelv/ave(1M; 100k; 20k)	А
21	S21	0.07*@Sinelw/ave(1M; 100k; 21k)	А
22	S22	0.32*@Sinelw/ave(1M; 100k; 22k)	А
23	S23	0.1*@SineWave(1M; 100k; 23k)	А
24	S24	0.5*@SineWave(1M; 100k; 24k)	Α
25	S25	0.2*@SineWave(1M; 100k; 25k)	А
26			
27			
28	Signal1	S1 + S2 + S3 + S4 + S5 + S6 + S7+S8 + S9 + S10+S11 + S12 + S13 + S14 + S15 + S16 + S17+S18 + S19 + S20+S21 + S22 + S23 + S24 + S25	Α
29			
30	Cycle	@CydeDetect(Signal1; 0; 0.5; 0.25/1k)	

You now can use the signal **Formula.Signal1** in the Harmonic Analysis sheet, for the cycle detection the formula **Formuls.Cycle** is used. The results are shown below. You now can check if the calculated amplitudes are simular to the amplitudes as entered in the formulas.





5 Harmonic Analysis User key and automation

A recalculate of the harmonic analysis sheet can be requested via a user key action. This action is doing exactly the same as the Re-Calculate button in the harmonic analysis sheet:



The user key is called **Calculate Harmonics** and can be found in the **Harmonic Analysis** category. The main purpose of the user key action is to use it via the Perception automation. This gives the possibility to calculate the harmonics for each sweep during a recording. For motor analysis (eDrive) this is often done for a so-called set-point, in a set-point the speed and torque are set to wanted values and the voltages and currents are then measured. The automation can then use the **Calculate Harmonics** user key action to force to calculate the spectral components and use the Perception logging functionality to log the calculated values. This will be done automatically during a recoding.

User key example:



The Calculate Harmonics action can be configured using the following dialog:

Configure 'Calcu	ate Harmonics'				×
Forc	e the harmonic analy	ysis sheet to re-calc	ulate the spect	tral components	
	The time to be use	d for the namonic a	analysis is defin	led below	
Use the time of	f the cursor				
 Use the time a 	s <u>d</u> efined below:				
Formula.Trigg	erTime				P
			C	OK	Cancel

You can either use the time of cursor 1 in the Harmonic Analysis display or a pre-defined time position. This time position can be a fixed time or you can use a dynamic data source. As an example you can use your own formula to define the time to be used. For example **Formula.TriggerTime** where:

Num	Name	Formula
1	TriggerTime	@TriggerTime(Active.Group1.Recorder_A.Ch_A1; Display.Display.ActiveSweep.Index)

In this example the active sweep of the display with name "Display" is used.

In the following text it will be explained how to use this user-key action from within the Perception automation. The automation will force the harmonic analysis calculations for each sweep and logs the harmonic analysis results into an xml file which can be viewed in Microsoft Excel.



Make sure you have a setup for a multi sweep recording with some pre-trigger set.

Open the Recording Automated Processing dialog and add the three actions to the action list:

- 1. Run an Action: Harmonic Analysis Calculate Harmonics
- 2. Run an Action: Animation Wait
- 3. Add to logfile

Recording Automated Proc	cessing		×
Interval selection Complete recording Triggered segments All segments	After Recording Ville Recording	Automation actions Select action and add to action list: Add to logfile	Add
Einst 10 Exery 2 Data source for Export and • Recorder data	segments	Show segme all displays Run an action Harmonic Analysis - Calculate Harmonics Run an action Animation - Wait Add to logfile Image: Calculate Harmonic Analysis - Calculate Harmonics	
Recorder and on-line co Show progress dialog wh Enable automation	mp <u>u</u> ted data en automation starts		onfigure Close

1. Set the following configuration to the Calculate Harmonics action:

Force the harmonic analysis sheet to re-calculate the spectral components The time to be used for the harmonic analysis can be defined in the action
○ <u>U</u> se the time of cursor 1 in the Harmonic Analysis display
Use the time as <u>d</u> efined below:
Formula.TriggerTime
OK Cancel

See above for the definition of Formula.TriggerTime

 A Wait action has been added because it takes some time for doing the Harmonic calculations. How long depends on several things the most important are the performance of the used PC, the number of channels used, the number of harmonics to be calculated and the used sample rate. You should experiment how much time this cost and according to this set the correct delay time.

Configure 'Wait'		X
<u>D</u> elay (s):	1.0	•
	OK	Cancel

3. An example of a logfile configuration can look like:

Configure Logfile Select the items you want to see in each logfile re Use the up and down arrow buttons to re-arrange	cord from t the order	the list of ava within the list	ailable data	sources.		×
Available data sources:	0	Selected da Recording Date_and_ Entry_type_ Display.Har Display.Har Display.Har Mamonic.C Harmonic.C Harmonic.C Harmonic.C Harmonic.C	ta sources JD Time_(PC) (manual_o monic_Ana h_A1.Freq h_A1.Freq h_A1.Freq h_A2.Freq h_A2.Freq h_A2.Freq h_A2.Freq	: <u>r_automatic</u> alysis_Displa yajsis_Displa veName uency.F03 uency.F03 uency.F01 uency.F01 uency.F03	:) ay.ActiveSwe ay.Cursor1.XF	0
Options			Brov	vse	Build	
				ОК	Ca	ncel

But it is up to you what you want to log.

An example of a created log file:

	_	
1	- 년<	LogFile>
2	Д	<log></log>
3	H	<log></log>
4		<recording_id>Recording004</recording_id>
5		<pre><date_and_time>2020-06-02T13:34:25</date_and_time></pre>
6		<entry_type>Automatic</entry_type>
7		<display.harmonic_analysis_display.activesweep.index>1</display.harmonic_analysis_display.activesweep.index>
8		<pre><display.harmonic_analysis_display.cursorl.xposition>7.2306516817610067</display.harmonic_analysis_display.cursorl.xposition></pre>
9		<display.harmonic_analysis_display.cursorl.xposition_units>s</display.harmonic_analysis_display.cursorl.xposition_units>
10		<harmonic.ch_al.tracename>Ch_Al</harmonic.ch_al.tracename>
11		<pre><harmonic.ch_al.frequency.f0l>99.2887442762125</harmonic.ch_al.frequency.f0l></pre>
12		<pre><harmonic.ch_al.frequency.f01_units>Hz</harmonic.ch_al.frequency.f01_units></pre>
13		<pre><harmonic.ch_al.frequency.f02>199.98577488552425</harmonic.ch_al.frequency.f02></pre>
14		<pre><harmonic.ch_al.frequency.f02_units>Hz</harmonic.ch_al.frequency.f02_units></pre>
15		<pre><harmonic.ch_al.frequency.f03>299.97866232828636</harmonic.ch_al.frequency.f03></pre>
16		<pre><harmonic.ch_al.frequency.f03_units>Hz</harmonic.ch_al.frequency.f03_units></pre>
17		<harmonic.ch_a2.tracename>Ch_A2</harmonic.ch_a2.tracename>
18		<pre><harmonic.cn_a2.frequency.f01>239.68502315177622</harmonic.cn_a2.frequency.f01></pre>
19		<pre><harmonic.ch_a2.frequency.f01_units>Hz</harmonic.ch_a2.frequency.f01_units></pre>
20		<pre><harmonic.cn_a2.frequency.f03>719.0506945532863</harmonic.cn_a2.frequency.f03></pre>
21		<pre><harmonic.cn_a2.frequency.f03_units>Hz</harmonic.cn_a2.frequency.f03_units></pre>
22	L	
23	T	<log></log>
24		<pre><recording_id>keeorainguu4/keeoraing_ID></recording_id></pre>
25		<pre><back and="" lime="">2020-06-02113:34:33</back></pre> / Date and lime>
20		<pre></pre>
21		(Display.harmonic_Analysis_Display.ActiveSweep.index/2
20		(Display, Harmonic, Analysis, Display, Actives/Webs, Index)
20		(Diplay, Remonic_Analysis_Display, Cursor: APOsition, 304100/31/61006
20		<pre></pre>
29		(Diplay, nationic_Analysis_Display, cursor: Arosicion_Units)
30		(Jusping, Halmonic, Analysis, Display, Cursoli, Arbaine, Netro
31		<pre>cHarmonic.ch_Al Fraguency F01x90 003366115115137//Hermonic.ch_Al Fraguency F01x</pre>
32		(Harmonic Ch Al Frequency FOI Units)Hz/(Harmonic Ch Al Frequency FOI Units)
33		<pre>charmonic.ch_AllFrequency.F02.1190_08673023023023//Harmonic.ch_AllFrequency.F02.</pre>
34		(Harmonic, Ch. Al Frequency, FO2/Units)Hz/(Harmonic, Ch. Al Frequency, FO2/Units)
35		<pre>cHarmonic.Ch_AllFrequency_F03_299_9800984534543</pre> /Harmonic.Ch_AllFrequency_F03_
36		<pre>cHarmonic Ch_Al Frequency F03_Units>Hz</pre>
37		<pre></pre>
38		<pre>charmonic Ch A2 Frequency E01224 5172625881265</pre> charmonic Ch A2 Frequency E012
39		<pre>cHarmonic.ch_A2.Frequency.F01/242.StarWonic.ch_A2.Frequency.F01 CHarmonic.ch_A2.Frequency.F01/Units>Hzz/Harmonic.ch_A2.Frequency.F01Units></pre>
40		<pre><harmonic a2="" ch="" f03="" frequency="">727 547178776738</harmonic></pre>
41		<pre><harmonic.ch a2.frequency.f03="" units="">Hz</harmonic.ch></pre>
42		
43	L L	Clog>
44	T	<pre><recording td="">Recording004</recording></pre>
45		<pre>chate and Time>2020-06-02T13:34:42</pre> and Time>
46		<patry type="">Antomatic</patry>
47		<pre></pre>
		sprobrel.usrmenze_ungriere.probrel.user.com.co.tuger.e

Or if you open this XML file in Excel:

	А	В	С	D	E F	G	н	1	J	к	L	м	N	0	Ρ	Q	R
1	Recording_ID	Date_and_Time 💌	Entry_type	E 🖛	Display.Harn 🔻 🔫	Harn	Harmonic.Cl 💌	H 🔻	Harmoni	H 💌	Harmonic.C 💌	-	Harm	Harmonic.C 🔻	H 🔻	Harmonic.Ch_ 💌 H	Hari 🔻
2	Recording004	02-06-20 13:34	Automatic	1	7.230651682 s	Ch A1	99.99288744	Hz	199.985775	Hz	299.9786623	Hz	Ch A2	239.6850232	Hz	719.0550695 H	Hz
3	Recording004	02-06-20 13:34	Automatic	2	15.30410073 s	Ch A1	99.99336612	Hz	199.986732	Hz	299.9800983	Hz	Ch A2	242.5157263	Hz	727.5471788 H	Hz
4	Recording004	02-06-20 13:34	Automatic	3	24.31627588 s	Ch A1	99.97393347	Hz	199.947867	Hz	299.9218004	Hz	Ch A2	219.8617032	Hz	659.5851095 H	Hz
5	Recording004	02-06-20 13:34	Automatic	4	31.54941218 s	Ch A1	99.97255655	Hz	199.945113	Hz	299.9176697	Hz	Ch A2	1191.872491	Hz	3575.617472 H	Hz ,

Now everything has been configured and you can test the configuration. To test this it is recommended to use manual triggering, this way you can better see what is happening.

It is also recommended to block the auto calculations of the harmonic analysis sheet to prevent possible unwanted recalculations.





6 Harmonic Analysis RPC calls

This section describes the Harmonic Analysis RPC calls. These calls are only interesting for when you want to initiate the Harmonic Analysis calculations from within your own software program; for example from your own LabVIEW program. You can do the harmonic analysis calculations at a time specified by you; when the calculations are ready you can read the results into your own program.

For more information on RPC and Perception we will recommend to get the appropriate information from the HBM web site section Products – Software – Perception – RPC.



The RPC Harmonic Analysis Sheet implementation is using the general RPC function **ExecuteCommand**():

HBM - RPC/COM ExecuteC Namespaces	Perception Interfaces ommand Method <u>RPC_COM</u> ► <u>IPerception</u>	d (Topic, Item, onCOM ► ExecuteCor	Command) nmand(String, String, String)
RPC/COM Per Executes a co	ception Interfaces mmand as described by	string Command	
🖃 Declarat	tion Syntax		
C#	Visual Basic	Visual C++	
void Execu s s)	teCommand(tring Topic, tring Item, tring Command		
🖃 Paramet	ters		
Topic (Stri ID of t	ng) he handler of the comm	and	
Item (Strin Additio	1 9) Mal information which ca	an be used by the hand	ller of the command
Command String	(<u>String</u>) which contains a descrip	otion of the command to	o be executed

There are a number of Harmonic Analysis Sheet related RPC calls:



- RPC call to check if the calculations are still busy
- RPC call to force a recalculation
- RPC call to do a calculation at a specified time.
- RPC call to get all trace names used by the calculations
- RPC calls to get and set the number of harmonics to be calculated
- RPC calls to get set the number of cycles used per calculation

Note: You can only use RPC when the Remote API key item has been enabled! This item is a cost option and can be ordered at HBM.

You can check if the option has been enabled by looking in the Perception main menu: *Help – About Perception – More..* dialog.



Remote API: control Perception using the SOAP interface or using RPC calls.

6.1 RPC IsCalculating Call

This RPC call is used to check if the Harmonic Analysis sheet is still busy with calculating the various harmonics. It is recommended to check this "**IsCalculating**" flag before you start a new calculation or change some settings.

Below you see how you can create your own function to check if the calculations are still busy.

In the above example you see that the **ExecuteRequest** function returns a string called strBusy. This string contains an integer value, where 0 means that *IsCalculating* is false and all other values mean that *IsCalculating* is true.

6.2 RPC Recalculate Call

The recalculate command acts the same as what happens when the Re-**Calculate** button is pressed. The Harmonic Analysis Sheet will do a recalculating using the current cursor 1 position. The call looks like:

m_Perception.ExecuteCommand("HarmonicAnalysis", string.Empty, "DoReCalculate()");

Where:

```
private PerceptionCOM m_Perception = new PerceptionCOM();
```

Before you do this call, make sure that you are connected to Perception!

```
m_Perception.SetServerAddress("localhost");
m_Perception.ConnectToServer();
```



6.3 RPC Calculate at specified time Call

This call is used when you want to force a recalculation at specified time. The call looks like:

The specified time in this example is 0.02 = 200 ms.

Attention: Use the correct decimal symbol! If you are not sure which decimal symbol you should use then check the Windows **Region and Language** settings.

6.4 RPC call to get all trace names as used by the calculations

Via this call you get a list of all trace names used by the harmonic analysis calculations.

```
string strTraceNames = String.Empty;
m_Perception.ExecuteRequest("HarmonicAnalysis", string.Empty, "GetTraceNames", out
strTraceNames);
```

strTraceNames contains a semicolumn separated list of trace names.

6.5 RPC call to get the number of calculated harmonics

You can use this call to get the number of calculated harmonics.

strHarmonics is a string containing the number of harmonics.

6.6 RPC call to set the number of harmonics to be calculated

You can use this call to set the number harmonics to be calculated. The example below sets the number of harmonics to 10.

6.7 RPC call to get the number of cycles used by the harmonic analysis calculations

You can use this call to get the number of cycles used by the harmonic analysis

strNumberOfUsedCycles is a string containing the number of used cycles per calculation.

6.8 RPC call to set the number of cycles used by the harmonic analysis calculations

You can use this call to set the number of cycles used per calculation. The example below sets the number of harmonics to 2.

```
m Perception.ExecuteCommand("HarmonicAnalysis", string.Empty,
```



6.9 Getting the Harmonic analysis calculated results

As you can read above all calculated results are available as data sources; see chapter "**Harmonic Analysis Data Sources**".

Via the RPC commands DSGetNumericalValue, DSGetUnits and DSGetStringValue you can read them from Perception.

HBM - RPC/COM Perception Interfaces DSGetNumericalValue Method (Datas Namespaces ► RPC_COM ► IPerceptionCOM ► DSGetN	rcPath, Value, TimeOfUpdate
RPC/COM Perception Interfaces Get numerical value of the specified datasource	
Declaration Syntax	
C# Visual Basic Visual C++	
void DSGetNumericalValue(
out double Value.	
out double TimeOfUpdate	
)	
Parameters	
Path/identifier of the data source	
Numerical value of the data source	
TimeOfUpdate (<u>Double</u>) Time since start recording that value was update	d in case of hardware data sources
HBM - RPC/COM Perception Interfaces	
DSGetStringValue Method (Dat Namespaces > RPC_COM > IPercentionCOM >	aSrcPath, Result)
	bodetoringvalae(oring, oring)
RPC/COM Perception Interfaces	
Declaration Syntax	
C# Visual Basic Visual	I C++
void DSGetStringValue(
string DataSrcPath,	
out string Result	
,	
Parameters	
DataSrcPath (<u>String</u>) Path/identifier of the data source	
Result (<u>String</u>)	
String value of the data source	
HBM - RPC/COM Perception Interfaces DSGetUnits Method (DataSrcPa Namespaces ► RPC_COM ► IPerceptionCOM ►	a th, XUnit, YUnit) • DSGetUnits(String, String, String)
RPC/COM Perception Interfaces Get the horizontal and vertical units of the dat	a source
Declaration Syntax	
C# Visual Basic Visua	I C++
void DSGetUnits(
out string XUnit,	
out string YUnit)	
Parameters	
DataSrcPath (<u>String</u>)	
Path/identifier of the data source XUnit (String)	
The horizontal unit string YUnit (String)	
The vertical unit string	



The code below shows how the peak values of the harmonics and corresponding frequencies can be read:

The output of this code can look like:

01: 1.0000003	393892 A	A - 1300 Hz	
02: 0.4000000	882374 A	- 2600 Hz	
03: 0.30000010	3435537	A - 3900 H	z
04: 0.20000013	8173532	A - 5200 H	z
05: 0.10000017	2599827	A - 6500 H	z
06: 0.10000020	693303 A	A - 7800 Hz	
07: 0.04000024	1348067	5 A - 9100 I	+z
08: 0.03000027	5131327	A - 10400 H	+z
09: 0.15000030	9792921	A - 11700 H	Ηz
10: 0.05000034	5388227	7 A - 13000	Hz

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